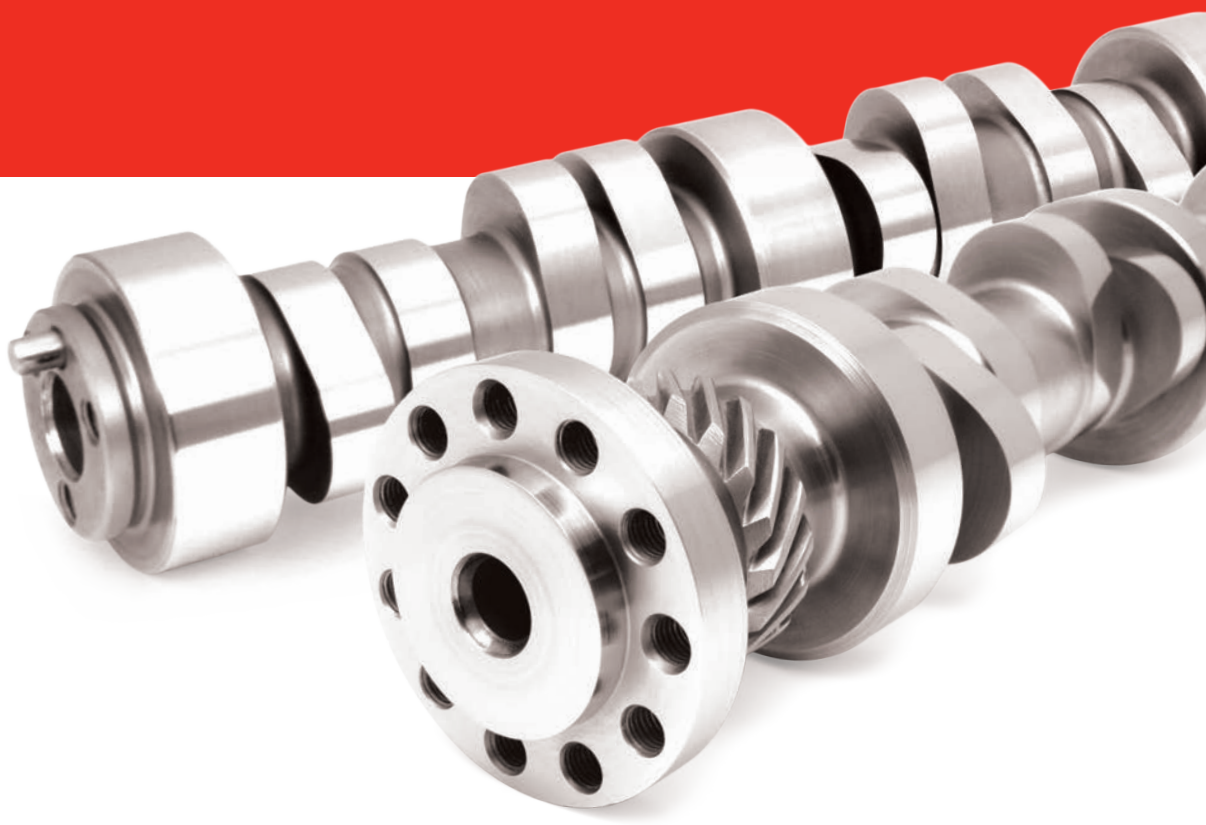
CRANE Cams®



MASTER CATALOG

QUALITY PRODUCTS SINCE 1953

CRANECAMS.COM

New Products

Custom Tool Steel Camshafts

Custom made to match any engine configuration.

Options Include

- Cam bearing journal diameters
- Nose configurations
- Linear spacing and widths of journals and lobes, cam barrel diameters
- Lobe angular placement for different lifter bank angle blocks
- Firing orders
- Gun drilling
- Distributor/oil pump drive gears hobbed on camshaft, fuel pump eccentrics
- Rear drive configurations
- Oil passages
- Micro polishing



Pages 18–19

Break-In Engine Oil 10W-40

Specially formulated 10W-40 conventional engine oil copes with the stresses created with flat-faced follower camshafts.

Protects Against Wear and Failure

- Flat Tappet and Roller Cams
- Lifters
- Valve Guides
- Pistons and Rings
- Crank Journals
- Rod Bearings



Page 285

CRANE Cams®

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How to Use This Catalog

About the Catalog

This catalog is organized into three separate sections. First is the Cam & Valve Train Application pages which includes all of the necessary information needed to choose the right camshaft for your needs. Next is the Cam & Valve Train Buyer's Guide. The Buyer's Guide contains additional product applications and additional information not found on the regular applications pages.

Each product section is organized in alphabetical order, and in "Make, number of cylinders, year, engine" fashion. Cam & Valve Train Applications are organized in alphabetical order, by engine make. Cam profiles ("grinds") are listed beginning with the "mildest" duration (lowest numerical duration shown at .050" cam lobe lift) through the "wildest" duration figures.

Catalog Sections

Cam & Valve Train Applications: Pages 20–263
Valve Train Buyer's Guide: Pages 264–350

Choosing the Correct Cam

All Crane Cams are organized in typical "Make, number of cylinders, year, engine" fashion, and according to the type of lifter used... ***Hydraulic, Hydraulic Roller, Mechanical*** (Sometimes called "solid" or "flat tappet"), and ***Mechanical Roller***. Cam profiles ("grinds") are listed beginning with the mildest duration through the most radical in each lifter type.

Each left page begins with the **Application** column. This column gives basic application information. In the next column is the **Cam Series** and **Grind Number**. Next is the **RPM Power Range**, and then the cam **Part Number**. "Cam Only" cams usually have a suffix (last) digit "1" in the part number. Cam & Lifter Kits usually have a "2" digit suffix. Application provides additional information about the camshaft. If the idle quality is other than stock, it is also noted in this column. **Cam specs data** such as **valve lift, duration** and **lobe separation** is shown at the far-right of each cam listing. To choose a street performance cam refer to "***Choosing The Right Cam***", and "***Getting Information***", found on pages 11 and 12–13. Note the part number of the cam you select.

For the latest ***all-out race cam profiles*** or ***custom grind services*** contact us at: **866-388-5120, FAX: 386-236-9983**. Our hours are normal business hours Monday–Friday, Eastern Daylight Time.

Choose the Correct Valve Train Components

You can find these by reading right, across the page. For detailed info and applications on ***Valve Train Components*** see the ***Buyers Guide*** section, pages 264–350.

Product Emissions Codes

Product Emissions Codes For California Air Resources Board (CARB) Regulations

The product Emissions Code is designed to aid in determining the correct application of emissions related motor vehicle components. Please use our Master Catalog to be sure that purchases comply with all emission laws.

1 Green — Product bearing this product identification code has been granted a California Air Resources Board (CARB) exemption ("EO" number), or is a direct or consolidated replacement part. It is 50-state legal, per the manufacturer's application guide. See pages 16 and 17 for a complete list of products that have been granted EO numbers.

2 Blue — The manufacturer of the product bearing this identification code represents that it has not been found, nor is it believed to be, unlawful for use under provisions of the Clean Air Act, per the manufacturer's application guidelines. This product is not legal for sale or use in the State of California (or in states which have adopted California emission standards) except on pre-emission-controlled vehicles/motor vehicle engines (pre-1966 model years).

3 Amber — Products bearing this product identification code are legal only for off-highway use (except CA or states that have standards), or pre-emissions controlled engines (pre-1966 domestic vehicles certified to CA standards, pre-1968 domestic vehicles certified to federal standards and all pre-1968 foreign vehicles), per the manufacturer's application guide.

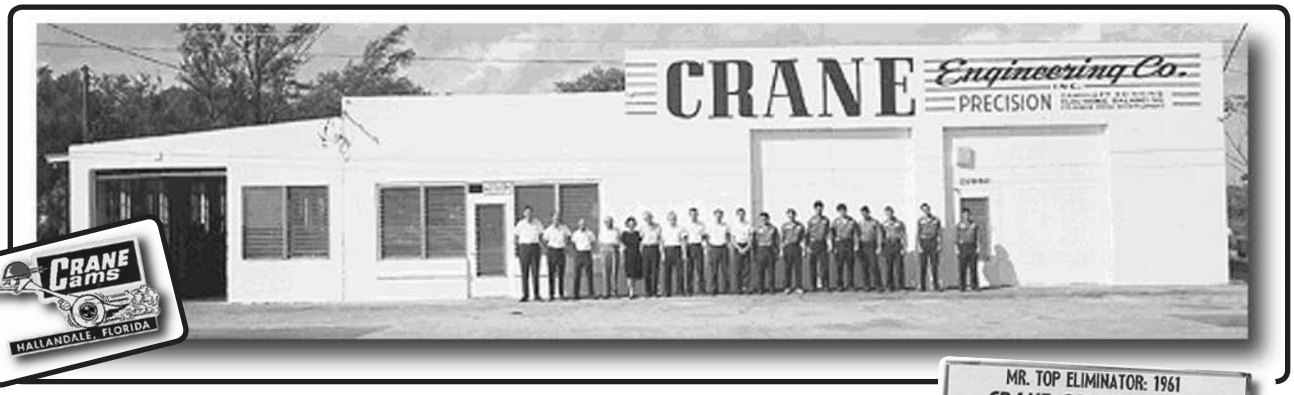
Table of Contents

How to Use this Catalog	*1*
Crane Cams History	*4–5*
Cam and Valve Train Applications	*6–263*
Crane Camshaft Series	*8–9*
How the Cam and Valve Train Section is Organized	*10*
Basic Tips on Choosing the Right Cam	*11*
Getting Information	*12–13*
Advanced Tips to Choose the Proper Camshaft	*14–15*
C.A.R.B. E.O. Authorization Numbers	*16–17*
Custom Tool Steel Camshafts	*18–19*
Camshaft and Valve Train Applications	*20–263*
Chevrolet Small Block V8 Tech Tips and Notes	*34–35*
Chevrolet Big Block V8 Tech Tips and Notes	*88–89*
Chrysler Small Block V8 Tech Tips and Notes	*132–133*
Chrysler Big Block V8 Tech Tips and Notes	*150–151*
Ford Small Block V8 Tech Tips and Notes	*176–177*
Ford Big Block V8 Tech Tips and Notes	*224–225*
Oldsmobile and Pontiac V8 Tech Tips and Notes	*250–251*
Cam and Valve Train Buyers Guide	*264–364*
Camshaft Components	*266–267*
Distributor-Magneto Drive Gears	*268–271*
Fuel System Accessories	*271*
Lifters	*272–284*
Lubricants	*285*

Table of Contents

Pushrods	*286–289*
Pushrod Accessories	*290–291*
Rocker Arms and Accessories	*292–307*
Timing Chains and Components	*308–309*
Tools	*310–312*
Vacuum Kits and Accessories	*313*
Valve Springs	*314–327*
Valve Spring Retainers	*328–339*
Valve Stem Locks	*340–341*
Valve Seals, Valve Train Accessories	*342–343*
Promotional Items	*344*
How to Identify your Crane Cam	*345*
Custom Ground Cams	*346*
Camshaft Recommendation Form	*347*
Regrind and Special Cam Service	*348–349*
Other Engine Applications	*350*
Flat Tappet Camshaft Break-In Procedure	*351–352*
Adjusting the Valve Train	*353–355*
Commonly Asked Valve Spring Questions	*356–357*
Commonly Asked Valve Train Questions	*358–359*
Degreeing the Cam	*360–362*
Cam Timing Explained	*363*
Understanding the Cam Specification Card	*364*
Warranty	*365*

Crane Cams History



Crane Cams was originally known as known as "Crane Engineering Company, Inc.", and was founded on January 1st, 1953. In 1970 the original name, "Crane Engineering", was shortened to "Crane Cams, Incorporated", better defining the company's products and market of that era.



From that very humble beginning, Crane Cams has evolved into a manufacturing and marketing company. Amazingly, it all began in an unused corner of the company owned by the founder's father's machine shop.

The founder, a young apprentice machinist, became interested in "souping-up" his flathead Ford V-8 hot rod. Like most others, he was strongly influenced by the various "hot rodding" magazines, ordering his first cam from a California cam company's ad. The founder's machinist's training and hot-rodder's ingenuity had already taught him that camshaft design and accuracy exacts a critical effect on engine power. He also knew he was easily capable of designing and manufacturing camshafts. What's more, he knew he could design more powerful, far more accurate and repeatable camshafts.

Although money was scarce, the young apprentice traded his way into a well-used cylindrical grinder. In rebuilding this old, used machine he quickly developed cam manufacturing and design knowledge. His initial "home made" cams were accurately made and surprisingly more powerful than anything he'd previously purchased. Other local hot rodders soon found out, and began buying his camshafts. The reputation of the backroom Crane cam company spread quickly across Florida and further into the Southeast. In response, Crane Engineering Company was founded, which was an impressive name for a tiny yet highly ambitious firm.

By the mid-1950's the flathead Ford and early overhead-valve Oldsmobile and Cadillac V-8's were replaced by the powerful, compact Chevrolet 265-283 V-8 engine family. It seemed that with the early small-block Chevys came a surge of growth for all forms of auto racing. Drag strips and oval tracks suddenly appeared, not only across Florida, but the nation, and the tiny backroom cam company grew as well.

In 1960, a Georgia Tech University engineering student and weekend drag racer, Pete Robinson, bought a Crane cam for his supercharged Buick powered 1940 Ford. After success on the street and at the drags, Robinson sold the '40 and bought a dragster chassis from the Dragmaster Chassis company, in California. Pete carefully assembled a stroker crankshaft,



supercharged, small-block Chevy, and installed a Crane roller cam. Robinson's new car ran well on Atlanta area tracks and at a few NHRA Division 2 events. On a whim, he entered the "Southwind" dragster into the field at the 1961 NHRA Nationals, an event that had previously been dominated by California based cars and drivers.

A virtual unknown, Robinson's little single-engine dragster shocked the race field and the nation, winning Top Eliminator and smashing records in a major upset. Several other Crane-cammed racers were also successful, but it was "Sneaky Pete" Robinson and Crane Cams that suddenly captured the racing world's imagination!

Soon, word of the amazing power produced by Crane Cams reached circle track racers. This reputation attracted a number of racers and engine builders including: A.J. Foyt, Red Farmer, The Wood Brothers, Bud Moore, Bill Elliott, Junior Johnson, Dale Earnhardt, Richard Petty,



Crane Cams History (continued)



Darrell Waltrip, Bobby Allison, Donnie Allison, Cale Yarborough, and David Pearson, all using Crane Cams and winning heat and feature circle track races across the South.

Crane Cams prospered greatly during the "car culture" years of the 1960's, and soon outgrew the building where the founder's father had once operated his own machine shop. In 1965, Crane Engineering purchased property and began construction on a brand new building. The firm moved into its brand new facilities in January of 1966, allowing an expansion of its product line and services.

Soon Crane introduced its hallmark, gold-anodized, full-roller aluminum rockers, was granted a U.S. Patent on a brand new roller lifter design, began selling mass-produced, custom-ported, all-out racing cylinder heads, heat treated chromemoly pushrods, aluminum, steel and titanium valve spring retainers, machined steel valve locks, high-rev kits, and stud girdles.

Crane's rapidly expanding product line was chocked full of unique and innovative items, all engineered to boost horsepower and reliability in race engines as well as street performance applications. That plus the huge success that Crane cammed racers were enjoying firmly established Crane as the industry's No. 1 cam company.

It was also during this time Crane Cams became a pioneer in the science of computerized cam lobe design. Previously, cam profile designs required lengthy, tedious mathematical exercises with a slide rule or mechanical calculator. Computer technology slashed this time and substantially increased lobe accuracy. For Crane Cams, the result was an explosion of knowledge gathered, expanded and utilized. Computerization of the science of cam lobe profile design also enabled Crane's design staff to explore new possibilities in cam and valve train function. Each day brought new innovations and a tremendous amount of data that could all be applied to the design and manufacture of new, even more powerful camshafts!

As Detroit accelerated and expanded its motorsports programs, Crane Cams was tapped as a provider of cam design knowledge as well as becoming a trusted supplier to the automotive industry. Ford, American Motors, Chrysler, and Holden all selected Crane Cams as their choice for a variety of racing and street performance related products and services.

For many years Crane had purchased its steel cam cores from Universal Camshaft Company, of Muskegon, Michigan. When that company became available in 1975, Crane acquired it, thereby providing itself with a stable, long-term source for steel cam cores. That operation was moved in 1981 to a newly constructed manufacturing center in Daytona Beach. In 1985 the entire company left its founding city, Hallandale, Florida, and relocated to Daytona Beach.

In February, 1994, Crane Cams acquired Camshaft Machine Company and its plants in Michigan and Indiana. To better reflect its new market mix, the company's na-me was changed to Crane Technologies Group, Inc. Seeking to return to its core cam and valve train business and its roots in the performance market, Crane sold Camshaft Machine to Federal-Mogul Corp. in early 1999.

Crane Cams now has an expanded amount of state-of-the art manufacturing firepower and R&D at its beck and call. This includes a substantial number of the latest CNC machining centers, the ability to produce fully digitized camshafts using Landis CNC equipment, as well as grinding cams via traditional methods using production masters, dyno cells, and Spintrons. Quality control is aided by state-of-the-art testing equipment such Zeiss optical and Adcole computerized devices, along with a dedicated staff that has helped to maintain the industry's highest standards since "day one."

New facilities have been set up in Daytona Beach, with a large number of veteran Crane Cams employees continuing in their technical and manufacturing capacities. The engineering staff utilizes the latest in design and analytical software to continue the company tradition of developing the best possible components for each application.

Customers can be secure in the knowledge that the company will strive to lead the industry in quality and performance while improving product availability to levels that racers require.

With the industry's largest camshaft database, which exceeds 80,000 profiles, new products being introduced, an impressive manufacturing capability, and an experienced tech staff ready to provide racers with race-winning valve train components, Crane is prepared to meet your performance needs and expectations.

Camshaft Table of Contents

Cam and Valve Train Applications	*6–263*
Crane Camshaft Series	*8–9*
How the Cam and Valve Train Section is Organized	*10*
Basic Tips on Choosing the Right Cam	*11*
Getting Information	*12–13*
Advanced Tips to Choose the Proper Camshaft	*14–15*
C.A.R.B. E.O. Authorization Numbers	*16–17*
Custom Tool Steel Camshafts	*18–19*
Camshaft and Valve Train Applications	*20–263*
American Motors/Jeep 6 Cylinder 64-05, 199-258 cu.in.	20–21
American Motors/Jeep V-8 66-91, 290-401 cu.in.	22–25
Buick V-8 67-76, 400-455 cu.in.	26–27
Cadillac V-8 68-81, 368-500 cu.in.	26–27
Chevrolet 6 Cylinder 62-84, 194-250 cu.in.	28–29
Chevrolet 60° V-6 80-94, 173 cu.in. 3.1-3.4L	30–31
Chevrolet 90° V-6 92-02, 4.3L	32–33
Chevrolet Small Block V8 Tech Tips and Notes	34–35
Chevrolet V-8 57-87, 262-400 cu.in.	36–67
Chevrolet V-8 87-92, 305-350 cu.in.	68–69
Chevrolet V-8 87-99, 305 (5.0L) - 350 (5.7L) cu.in.	70–75
Chevrolet V-8 92-96, 5.0-5.7L LT1	74–75
Chevrolet V-8 97-15, 4.8-6.2L LS1, LS2, LS3/L92, LS6	76–85
Chevrolet V-8 06-15, 7.0L LS7	86–87
Chevrolet V-8 07-15, 6.2L LS3/L92/Vortec 6.2 with three bolt timing gear	86–87
Chevrolet Big Block V8 Tech Tips and Notes	88–89
Chevrolet V-8 58-65, 348-409-427 (Z-11) cu.in.	90–93
Chevrolet V-8 67-95, 396-454 cu.in.	94–119
Chevrolet V-8 96-00, 454 (7.4L)-502 (8.2L) cu.in. Gen VI	120–125
Chevrolet V-8 01-08, 8.1L L18	126–127
Chrysler/Dodge Neon, 4 cyl. 95-05, 2.0L SOHC 4V	128–129
Chrysler/Dodge Neon, 4 cyl. 95-10, 2.0-2.4L DOHC 4V	130–131
Chrysler Small Block V8 Tech Tips and Notes	132–133
Chrysler Hemi V-8 51-56 301-331-354 cu.in. and 57-58 392 cu.in.	134–135

Camshaft Table of Contents

Chrysler-Dodge-Plymouth "LA" V-8 64-87, 273-360 cu.in.	136–145
Chrysler-Dodge-Plymouth "LA" V-8 86-91, 318 (5.2L)-360 (5.9L) cu.in.	146–147
Chrysler-Dodge-Plymouth Magnum V-8 92-02, 5.2-5.9L	146–147
Chrysler-Dodge V-8 03-15, 5.7-6.1L Hemi (non-VCT)	148–149
Chrysler Big Block V8 Tech Tips and Notes	150–151
Chrysler-Dodge-Plymouth "B" V-8 58-78, 350-440 cu.in. Single Bolt—see pages 151–161	
Chrysler-Dodge-Plymouth "B" V-8 70-78, 383-440 cu.in. Three Bolt	152–161
Chrysler-Dodge-Plymouth V-8 "Hemi 426" 66-71	162–167
Ford 4 Cylinder 74-87, 2.3L SOHC and 83-87 2.0L SOHC	168–169
Ford 4 Cylinder 88-98, 2.3L SOHC	170–171
Ford Zetec 4 Cylinder 95-02, 2.0L DOHC 4V Zetec	172–173
Ford 6 Cylinder 65-96, 240-300 cu.in.	174–175
Ford Small Block V8 Tech Tips and Notes	176–177
Ford-Mercury V-8 62-87, 221-302 cu.in.	178–185
Ford-Mercury V-8 85-95, 302 (5.0L) cu.in. H.O.	186–193
Ford-Mercury V-8 69-93, 351W & 82-84 302 (5.0L) cu.in. H.O.	194–211
Ford-Mercury "Cleveland" V-8 70-82, Boss 351-351C-351M-400 cu.in.	212–219
Ford-Mercury V-8 91-15, 4.6-5.4L SOHC 2V	220–221
Ford-Mercury V-8 93-15, 4.6-5.4L DOHC 4V	222–223
Ford-Mercury V-8 05-15, 4.6-5.4L SOHC 3V	222–223
Ford Big Block V8 Tech Tips and Notes	224–225
Ford-Mercury V-8 63-76, 352-428 cu.in. "FE"	226–231
Ford-Mercury V-8 68-97, 370-460 (7.5L) cu.in.	232–243
MG TC-TD-TF 4 cyl. 40-55, 1250-1466cc	244–245
MGA-MGB 4 cyl. 57-80, 1598-1798cc	244–245
MG Midget-Mini-Sprite 4 cyl. 57-84, BMCA 848-1275cc	244–245
Mitsubishi 4G63/4G63-T 4 cyl. Eclipse-Talon-Gallant 1989-1999, 2.0L DOHC 4V	246–247
Mitsubishi 4G63BT EVO 8 4 cyl. 2003-2005, 2.0L DOHC 4V	248–249
Oldsmobile and Pontiac V8 Tech Tips and Notes	250–251
Oldsmobile V-8 67-84, 260-455 cu.in. 39° Bank Angle	252–255
Pontiac V-8 55-81, 265-455 cu.in.	256–261
Toyota 20R-22R-22RE 4 cyl. 74-89, SOHC 2V	262–263

Crane Camshaft Series

Blueprint™ Cams for Musclecars

Crane Blueprint™ musclecar cams are duplicates of popular original equipment musclecar cams from the 60's and 70's. These hydraulic and mechanical cams are computer smoothed for added performance and increased valve train life. They are an excellent choice for a true musclecar restoration where engine authenticity, correct idle quality and detail are critical to the restoration. This catalog lists our most popular Blueprint grinds, but many more are available on request. We have an extensive library of profiles, enabling us to match the correct year and horsepower, or factory part number, camshaft for your specific requirements.

We also provide regrinding services for the restoration of older and antique camshafts, when outright cam cores are no longer available. Contact a Crane Technical Service representative at: 866-388-5120, FAX 386-236-9983.

Energizer™ Hydraulic

Energizer street performance cams are produce sizeable torque, HP, and RPM increases at an affordable price. Energizer cams use the same computer techniques and software that developed the world's fastest and quickest cams. These single-pattern cams have tighter lobe separations, for added torque, mid-range power, throttle response and that popular lumpy idle for non-computer controlled V-8 engines. They are available as camshaft and lifter kits, or as a camshaft only.

Emissions Legal-Computer Compatible

Crane emissions legal camshafts produce amazing increases in torque, horsepower, and throttle response while extending the rpm powerband of computer controlled performance passenger cars, 2x4 and 4x4 light trucks. Emissions legal camshafts also permit full function of stock engine control computers. Emissions legal camshafts also work well with performance "chips." Emissions legal camshaft profiles are available in both standard "flat-faced" hydraulic lifter cast-billet designs as well as Hydraulic Roller designs. Crane Emissions legal camshafts are available for GM, Ford, and Dodge Magnum® V-8 engines as well as selected GM V-6 engines.

Hydraulic, Hydraulic Roller, Mechanical Non-Roller and Mechanical Roller Cams

Most cams feature a dual-pattern lobe design, for optimum intake/exhaust flow, maximum low-end, mid-range and upper rpm power. Hydraulic cams begin at 248° advertised duration (192°/204°@ .050"), .400/.427" valve lift, up through 312°/319° advertised duration (262°/270° @ .050") and .636" valve lift. Many are designed to maximize the effects of power enhancing systems such as nitrous-oxide, superchargers, and turbochargers.

Whenever practical, the lobes are optimized to take full advantage of the maximum flat-faced lifter diameter of each engine family (such as .842" for most GM, .875" for Ford, and .904" for AMC/Jeep and Chrysler). This produces the best powerband without sacrificing durability, idle quality, and responsiveness. These include Crane Cams' Hydraulic Roller and Street-Roller mechanical roller cams.

Crane Camshaft Series (continued)

Hydraulic Roller Cams

Crane Hydraulic Roller cams offer the sizeable power and torque increases that are available only with roller cams, plus the low-maintenance convenience of a hydraulic cam. Hydraulic Roller cams are available for retrofit (converting earlier non-hydraulic roller cam engines), and to increase power output of engines already equipped with hydraulic roller cams. Crane Hydraulic Roller cams are produced using our own industry standard, steel billet cam cores, carburized or induction-hardened for strength and wear resistance. Hydraulic Roller cams are available as catalogued plus custom grind lobe availability.

Street-Roller Mechanical Roller Cams

Street-Roller cams are available in a variety of profiles, ground on our famous steel billet cam cores and fitted with iron distributor drive gears (where applicable). Street-Roller cam lobe profiles feature exclusive lobe ramp designs that minimize valve train noise and increase valve train durability for street driving engine applications. Street-Roller profiles are also available for nitrous-oxide systems, superchargers, and turbochargers, offering even greater horsepower and torque output for these power enhancing systems.

Saturday Night Special™ Cams for Circle Track and Drag Racing

Crane Saturday Night Specials are hydraulic and mechanical lifter cam, lifter, and valve spring kits, primarily developed for rules-limited oval track racing and ET-Bracket drag racing applications. For oval track racing they produce maximum off-the-corner torque, with strong upper-rpm horsepower to pull the straightaways. For drag racing they produce maximum torque, for starting line launch and the upper rpm power to pull through the gears. Saturday Night Special cams are available for Small-block and Big-block Chevy; 289-302-351W Ford; and 429-460 Ford V-8's. (For circle track racing we also offer many other profiles for specific track cam rules not covered by Saturday Night Specials. Contact Crane Technical Services for details.

Crane Racing Cams for All-Out Competition

Crane pioneered the use of computers for lobe profile design and dual-pattern cam profiles. With over 80,000 grind numbers in our cam library, we've designed and produced cams for drag racing, circle track, road racing, boat racing, 4x4 off-road, mud racing, truck and tractor pulling, even airboats and swamp buggies. Some of our most popular racing profiles are listed in this catalog. We also custom design and grind cams for specific race engine needs. For more information contact a Crane Technical Service rep at: 866-388-5120, FAX: 386-236-9983.

How the Cam and Valve Train Section is Organized

Crane Cam & Valve Train Applications catalog pages are organized by **"Make, Number of Cylinders, Year, Engine"** fashion .

After locating your desired **"Engine"** comes the **type of lifter** the camshaft is designed for. These begin with Standard flat-face Hydraulic Lifters, then Hydraulic Rollers, then Mechanical flat-face Lifters (also called Solids or Flat Tappets), and Mechanical Roller Lifters.

Important information on each left-hand page is arranged in columns.

Application

This column describes the basic usage that each cam is intended for, along with any pertinent advised component items to produce the best results.

Camshaft Series and Grind Number

Identifies the cam series and the cam grind number. (Grind Number is different from the cam Part Number. To order, always use the cam Part Number.)

RPM Power Range

States the RPM range at which the cam produces **maximum torque and horsepower** (The engine will typically rev 500-1,000 RPM above the stated RPM Power Range but not at peak power levels)

Camshaft Part Number/Emissions Code

Identifies the actual Part Number for this camshaft. Cams sold as Cam Only (without lifters) usually end with the numeral 1. Cam & Lifter Kits include matching Crane lifters. Their Part Numbers usually end in the numeral 2. The "Emissions Code" states the California (CARB) emissions designation for that particular cam.

Lifters

These are the lifters recommended for best durability and performance for each camshaft. Upgrade options are also conveniently listed.

Complete Cam Specifications

Under this bar you'll find all of the cam's critical specifications. These include: Degrees Duration @ .050"; Advertised Degrees Duration; Degrees Lobe Separation; Open/Close @ .050 Cam Lift; Lash Hot; and Gross Lift.

Cam Facts and Notes

More helpful information on the correct application of this cam as related to the specific engine. Also provides helpful hints to insure proper camshaft and component application and installation.

Right Page: Matched Valve Train Products

Provides part numbers for related valve train components and refers to the catalog page of the **Buyer's Guide** catalog section (pages 264–350) where more detailed information on the recommended valve train components and the wide range of optional Valve Train Components we offer are located.

Basic Tips on Choosing the Right Cam

Cam selection accuracy begins with knowing how you intend to use the vehicle, engine and drivetrain modifications already made or planned, and the lifter type (Hydraulic, Hyd. Roller, Mechanical ("Solid" or "Flat Tappet"), or Mech. Roller you wish to use. You'll find additional information to help you choose the correct cam on **Pages 12–15**. We urge you to take a little extra time now in making your selection. This will insure that you make the right choice, the first time! To choose the correct cam and valve train for your engine, vehicle and application follow the steps below:

What to Look for First

First, find your **engine make, number of cylinders, year, and original engine displacement** as listed in cubic inches or metric reference. (Example: Chevrolet, 1986, 350 cu. in.)

Decide Which Lifter Style

Decide on the **lifter type** you wish to use in your engine. For convenience and ease of maintenance we recommend a hydraulic cam and lifters, either "flat-face" or hydraulic roller for most street performance and daily-driving applications.

NOTE: Passenger car engines up through 1987 model year generally used conventional hydraulic or mechanical (solid) lifters and cams. In the GM family 1988-up pass. car and 1996-up truck engines were factory equipped with hydraulic roller cams and lifters. (Light trucks (pick-up's, etc.) generally used flat-face lifters and cams up through 1995 model year.) We offer many different hydraulic roller cams, our exclusive Crane Cams hydraulic roller lifters (drop-in installation), correct-length pushrods and other valve train components for converting a flat-face lifter engine to the tremendous power benefits found with a Crane hydraulic roller cam. Look under **Hydraulic Roller Retrofit Cams** for specific engine details.

Determine Your Vehicle's 60 MPH Cruise RPM

Determine your **Cruising RPM At 60 MPH** by reading Page 12 (Getting Information). Match your **Cruise RPM At 60 MPH** with the information found under **Application**) See the gear ratio/tire diameter chart on Page 13 to help you determine this RPM. Note: This is critical in making the right choice for a vehicle that is street driven. Be sure your information is accurate!

Choose Your Cam

Use the **Cruise RPM At 60 MPH** numbers and match this RPM range with the **RPM Power Range** numbers shown on the left-hand page. Be sure to consult the **Application** info before you make your cam choice. Pay particular attention to the recommended engine compression ratio. Also, engines using aluminum cylinder heads dissipate heat more rapidly and can therefore use approximately +.75 (three-quarters "point") compression ratio. (Example: Iron heads, 9.0:1 c/r; Alum. heads, 9.75:1 c/r)

Remember: If you are in doubt, always choose **the next milder** cam profile. Be sure to specify the Part Number when ordering!

Choose Your Valve Train Components

The Valve Train Buyer's Guide (Pages 264–350) contains **additional product applications and additional information** not found on the regular applications pages. Be sure to consult these pages for optional products that will add even more horsepower, torque, rpm, response and reliability to your cam selection.

Getting Information

How To Determine Your Cruising RPM at 60 MPH

1. Hold a constant 60 MPH and check the tachometer, if so equipped. You can also hook up a test-type tachometer, providing it has a sufficient RPM range.
2. Using the reference chart, locate your tire diameter (height) and rear end ratio, then read the RPM indicated.

How To Determine Your True Rear Axle Ratio

1. The actual ratio, or a reference code, will normally be found on either a tag attached to a bolt, or will be actually stamped into the axle housing. Your car dealer can tell you how your vehicle is marked.
2. Raise both rear wheels of the vehicle, with the transmission in neutral. Make sure that you support the vehicle with safety stands and block the front tires. Make a reference mark on the driveshaft and on the housing. Next, without rotating them, make a mark on both of the tires and the fenderwells. With a friend watching the driveshaft carefully, rotate both tires at the same time exactly one revolution. The number of turns the driveshaft makes indicates the ratio, i.e.,: 3½ turns = 3.5 to 1; 2¾ turns = 2.75 to 1; etc. You an also use the above procedure the next time you have your vehicle lubed at the service station.
3. Many vehicles are equipped with overdrive-type transmissions. If this occurs, you must multiply your rear end ratio by the final transmission ratio. EXAMPLE: You have a 3.23 rear end ratio and a .85 high gear in the transmission: 3.23 x .85 = 2.75 final drive ratio.

How To Determine Your Engine's Compression Ratio

1. If your engine has stock-type pistons, and the original cylinder heads, you should be able to locate the compression ratio by:
   A. Checking your owner's manual.
   B. Checking a repair or service manual such as "Chiltons" or "Motors".
   C. Call your car dealer's parts department with the engine description or serial number.
2. If your engine has non-stock pistons, refer to the piston manufacturer's catalog.

NOTE: If the cylinder heads are not stock, check to see if they have the same size combustion chambers. If not, refigure the compression ratio. Milling the block or heads also affects the compression ratio. Contact a Crane Performance Consultant for additional information.

Getting Information (continued)

RPM Shown at 60 MPH (Cruise RPM)

RPM FORMULA: $\frac{\text{MPH x Axle Ratio x 336}}{\text{Tire Diameter}}$

	Tire Diameter											
Rear End Ratio	24″	26″	28″	30″	32″	34″	36″	38″	40″	42″	44″	46″
2.18	1831	1690	1570	1465	1373	1293	1221	1157	1099	1046	999	955
2.50	2100	1938	1800	1680	1575	1482	1400	1326	1290	1200	1145	1096
2.74	2301	2124	1973	1841	1726	1625	1534	1454	1381	1315	1255	1201
3.08	2587	2388	2218	2070	1940	1826	1725	1634	1552	1478	1411	1350
3.23	2713	2504	2326	2170	2035	1915	1809	1714	1628	1550	1480	1416
3.50	2940	2714	2520	2352	2205	2075	1960	1857	1764	1680	1604	1534
3.73	3133	2892	2686	2507	2349	2212	2089	1979	1880	1790	1709	1635
3.90	3276	3024	2808	2621	2457	2312	2184	2069	1966	1872	1787	1709
4.10	3444	3179	2952	2755	2583	2431	2296	2175	2066	1968	1879	1797
4.56	3830	3536	3283	3064	2873	2704	2554	2419	2298	2189	2089	1998
4.88	4099	3784	3513	3279	3074	2894	2733	2589	2460	2342	2236	2139

Finding Overall Tire Diameter, RPM, MPH, or Rear Axle Ratio

OVERALL TIRE DIAMETER: $\frac{\text{MPH x Axle Ratio x 336}}{\text{RPM}}$

RPM: $\frac{\text{MPH x Axle Ratio x 336}}{\text{Tire Diameter}}$

MPH: $\frac{\text{RPM x Overall Diameter}}{\text{Axle Ratio x 336}}$

Axle Ratio: $\frac{\text{RPM x Tire Diameter}}{\text{MPH x 336}}$

Advanced Tips to Choose the Proper Camshaft

Although pages 12 and 13 of this catalog outline the very basic steps in selecting the best camshaft for a particular application, we can certainly add to the criteria needed for the best possible results. For general street (or marine) applications, the following will help provide an enhanced guideline.

Exactly What Engine Is It?

This sounds really obvious, but a lot of folks aren't really knowledgeable on what they're working with. For example, "I've got a small-block Chevrolet." It could be a 1957-87 power plant that was originally equipped with a flat faced lifter camshaft, or it could be a 1987-96 style engine that came with a hydraulic roller camshaft. Each basic engine requires a different style camshaft. Similar choices can also occurs with the evolution of big block Chevrolets, small block Fords, small block Mopars, and many others. In the 1970's General Motors exchanged the Buick, Oldsmobile, and Pontiac bodies and engines, with some folks not understanding that the Buick 455, Oldsmobile 455, and Pontiac 455 V-8s are all totally different engines. Any information that can be obtained to verify which engine that the customer has, will help make the correct choice the first time.

What Cubic Inch Displacement Is the Engine?

A smaller engine will usually require a shorter duration camshaft than a larger engine, given all other factors being equal.

What Compression Ratio Is the Engine?

An answer of "stock" is not really sufficient, as compression ratios of most engines changed during their production runs, due to differing horsepower ratings, emissions concerns, the vehicle that it was originally installed in, etc. A basic generalization that higher compression ratio engines can use camshafts with larger (more radical) duration figures will normally apply.

What Cylinder Heads Do You Have?

Iron or aluminum, stock or ported, standard combustion chamber size or milled? These factors are also critical. Aluminum cylinder heads dissipate heat more readily, enabling them to use slightly milder camshafts for best torque characteristics. A good approximation is that going from iron heads to aluminum heads is like lowering the compression ratio 0.75 (i.e.: a 9.25:1 engine with iron heads will have similar characteristics to a 10.00:1 engine with aluminum heads). Installing heads with smaller combustion chambers will raise the compression ratio, so don't forget to take that into account. High compression combined with too mild a camshaft will cause problems with detonation, and reducing the ignition timing to compensate for this will usually hurt the torque and horsepower everywhere throughout the power band.

What Intake Manifold Is On It?

In carbureted applications, a dual plane manifold will favor low-end and mid-range power, with a single plane unit being good for upper RPM usage. If you've got a single plane manifold on a relatively mild street machine, you may want a milder cam to pick up the bottom-end torque.

Do You Have a Supercharger/ Turbocharger/Nitrous Oxide?

All of these enhancements will greatly influence the camshaft recommendation. Supercharged combinations tend to have slightly lower compression ratios, with slightly milder camshafts on wide lobe separation. Turbocharged engines might have slightly lower compression ratios (or not, if an intercooler is used), with a mild cam used to minimize overlap area. Heavy NOX applications might need a longer exhaust duration with a wide lobe separation in order to relieve the greater exhaust heat that's generated.

Section Continued

Advanced Tips to Choose the Proper Camshaft (continued)

What Carburetor/Throttle Body Are You Using?

The larger units favor upper-end performance, so a proper match here is essential to put the power into your intended RPM operating range.

What's Your Cranking Compression?

With the advent and widespread usage of the cylinder leakdown checkers, most folks have forgotten about the compression gauge. This is still a very valuable tool to verify your cylinder pressure, as it will illustrate the effects of a camshaft (or compression ratio) change, which a leakdown tester won't. Higher pressures will give an indication of how much ignition timing that you can run, what octane gasoline that's required to prevent detonation, and help to provide a tuning baseline for varying atmospheric conditions.

Headers or Stock Exhaust Manifolds?

A good exhaust system can be really beneficial in most any application. Going to really large diameter systems in a mild application can hurt the torque curve, so don't get carried away there. In V-8 situations, a crossover pipe is advised for dual exhaust systems.

What Transmission Do You Have?

Manual vs. automatic, how many gears, additional stall speed in the converter? This will help determine how broad the power curve needs to be, with milder cams traditionally having better torque and drivability over a wider RPM range.

What's the Rear End Ratio and Rear Tire Diameter?

This will provide the basic operating and cruising RPM of the vehicle, one of the most critical portions of the camshaft selection process. Each of our grinds lists a basic operating band to help in the selection.

How Much Does the Vehicle Weigh?

Heavier cars may need milder camshafts with wider torque bands for best results.

At What Altitude Will This Engine Normally Be Used?

An engine at sea level will normally use a more radical camshaft than one at 5,000 feet (we're back to the compression gauge/cylinder pressure factor again).

What Idle Quality and Drivability Factor Are You Looking For?

This is the one area where the customer's individual desires can influence overall choices. If a radical idle is wanted with no concern for vacuum readings, go with the higher duration/narrower lobe separation options. If a smooth idle with lots of low-end torque is the choice, use the shorter duration/wider lobe separation cam.

All of this adds up to formulating a workable combination to produce the best overall performance that's needed to get the job done. We see combinations every day that are put together with little thought to the overall picture. Too much compression ratio, in too heavy a car, and a single plane intake manifold, with low numerical rear end ratios: no camshaft will be able to make up for a drastic mismatch of components. If possible, try to help the customer obtain the correct components from the beginning of his project. This will produce the best results, with time and money being saved by not having to repurchase items that were poorly chosen the first time.

C.A.R.B. E.O. Authorization Numbers

Crane Cams Products with C.A.R.B. E.O. Authorization Numbers

Crane Cams has been certifying many of its products to be 50-state legal, as approved by the California Air Resources Board. These Exemption Orders are granted after passing a thorough testing process that's required for these applications. Some of these products are year, model, cubic inch, and horsepower specific, so be aware that not all exemptions are universal. The following products are approved, and include a special mandated sticker that must be placed in the vehicle in a designated location. As the C.A.R.B. regulations are now accepted in other states, having the appropriate sticker is necessary to pass inspection. Additional application information can be found on the product's page number that's referenced.

Part Number	Description	C.A.R.B. E.O. Number	Page Number
10003	260 H10 Camshaft - Ch. 262-400 V8 57-87	D-225-21	36
100032	260 H10 Camshaft and Lifter Kit - Ch. 262-400 V8 57-87	D-225-21	36
10004	266 H10 Camshaft - Ch. 262-400 V8 57-87	D-225-21	36
100042	266 H10 Camshaft and Lifter Kit - Ch. 262-400 V8 57-87	D-225-21	36
10005	272 H10 Camshaft - Ch. 262-400 V8 57-87	D-225-21	38
100052	272 H10 Camshaft and Lifter Kit - Ch. 262-400 V8 57-87	D-225-21	38
104201	2010 Camshaft - Ch. 305 (5.0L)-350 (5.7L) V8 87-92	D-225-22	68
104204	2011 Camshaft - Ch. 305 (5.0L)-350 (5.7L) V8 87-92	D-225-22	68
104211	2020 Camshaft - Ch. 305 (5.0L)-350 (5.7L) V8 87-92	D-225-22	68
104221	2030 Camshaft - Ch. 305 (5.0L)-350 (5.7L) V8 87-92	D-225-22	68
104224	2032 Camshaft - Ch. 305 (5.0L)-350 (5.7L) V8 87-92	D-225-22	68
104225	2031 Camshaft - Ch. 305 (5.0L)-350 (5.7L) V8 87-92	D-225-22	68
104241	2050 Camshaft - Ch. 5.0-5.7L V8 LT1 92-96	D-225-55	74
10758-1	Gold Race Rocker Arms - Ch. 305-350 V8 1.6 3/8" self-align. pkg/1	D-225-50	297
10758-16	Gold Race Rocker Arms - Ch. 305-350 V8 1.6 3/8" self-align. set/16	D-225-50	297
10759-1	Gold Race Rocker Arms - Ch. 305-350 V8 1.6 3/8" pkg/1	D-225-50	297
10759-16	Gold Race Rocker Arms - Ch. 305-350 V8 1.6 3/8" set/16	D-225-50	297
113901	H-260-2 Camshaft - Ch. 262-400 V8 57-87	D-225-18	36
113902	H-260-2 Camshaft and Lifter Kit - Ch. 262-400 V8 57-87	D-225-18	36
113931	H-266-2 Camshaft - Ch. 262-400 V8 57-87	D-225-18	38
113932	H-266-2 Camshaft and Lifter Kit - Ch. 262-400 V8 57-87	D-225-18	38
113941	H-272-2 Camshaft - Ch. 262-400 V8 57-87	D-225-18	38
113942	H-272-2 Camshaft and Lifter Kit - Ch. 262-400 V8 57-87	D-225-18	38
113971	H-248-2 Camshaft - Ch. 262-400 V8 57-87	D-225-18	36
113972	H-248-2 Camshaft and Lifter Kit - Ch. 262-400 V8 57-87	D-225-18	36
114102	2010 Camshaft and Lifter Kit - Ch. 262-400 V8 57-87	D-225-51	36
114112	2020 Camshaft and Lifter Kit - Ch. 262-400 V8 57-87	D-225-51	36
114122	2030 Camshaft and Lifter Kit - Ch. 262-400 V8 57-87	D-225-51	36
114132	2040 Camshaft and Lifter Kit - Ch. 262-400 V8 57-87	D-225-25	36
114142	2050 Camshaft and Lifter Kit - Ch. 262-400 V8 57-87	D-225-25	38
11746-1	Energizer Rocker Arms. - Ch. 262-400 V8 1.6 3/8" pkg/1	D-225-50	295
11746-16	Energizer Rocker Arms. - Ch. 262-400 V8 1.6 3/8" set/16	D-225-50	295
11747-1	Energizer Rocker Arms. - Ch. 262-400 V8 1.6 7/16" pkg/1	D-225-50	295
11747-16	Energizer Rocker Arms. - Ch. 262-400 V8 1.6 7/16" set/16	D-225-50	295
11748-16	Gold Race Rocker Arms - Ch. 262-400 V8 8-1.5/8-1.6 3/8" set/16	D-225-50	297
11752-1	Gold Race Rocker Arms - Ch. 262-400 V8 1.5 7/16" pkg/1	D-225-17	297
11752-16	Gold Race Rocker Arms - Ch. 262-400 V8 1.5 7/16" set/16	D-225-17	297

Section Continued

Crane Cams Products with C.A.R.B. E.O. Authorization Numbers (continued)

Part Number	Description	C.A.R.B. E.O. Number	Page Number
11755-1	Gold Race Rocker Arms - Ch. 262-400 V8 1.6 7/16" pkg/1	D-225-50	297
11755-16	Gold Race Rocker Arms - Ch. 262-400 V8 1.6 7/16" set/16	D-225-50	297
11759-1	Gold Race Rocker Arms - Ch. 262-400 V8 1.6 3/8" pkg/1	D-225-50	297, 298
11759-16	Gold Race Rocker Arms - Ch. 262-400 V8 1.6 3/8" set/16	D-225-50	297, 298
11802-1	Rocker Arms - Ch. 262-400 V8 Stamped 1.6 x-long pkg/1	D-225-50	292
11802C-1	Rocker Arms - Ch. 262-400 V8 Nitro-Carb Stamped 1.6 x-long pkg/1	D-225-50	293
11802C-16	Rocker Arms - Ch. 262-400 V8 Nitro-Carb Stamped 1.6 x-long set/16	D-225-50	293
11803-16	Rocker Arms - Ch. 262-400 V8 Stamped 8-1.5 / 8-1.6 x-long set/16	D-225-50	292
13755-16	Gold Race Rocker Arms - Ch. 396-454 V8 1.8 7/16" set/16	D-225-50	298
363901	H-260-2 Camshaft - Fd. 221-302 V8 62-87	D-225-32	178
363902	H-260-2 Camshaft and Lifter Kit - Fd. 221-302 V8 62-87	D-225-32	178
363941	H-272-2 Camshaft - Fd. 221-302 V8 62-87	D-225-32	178
363942	H-272-2 Camshaft and Lifter Kit - Fd. 221-302 V8 62-87	D-225-32	178
364112	2021 Camshaft and Lifter Kit - Fd. 221-302 V8 62-87	D-225-24	178
364211	2020 Camshaft - Fd. 221-302 V8 62-87	D-225-46	182
36750-1	Gold Race Rocker Arms - AMC 290-401 / Fd. 221-351W V8 1.6 3/8" pkg/1	D-225-17	297, 299
36750-16	Gold Race Rocker Arms - AMC 290-401 / Fd. 221-351W V8 1.6 3/8" set/16	D-225-17	297, 299
36757-1	Gold Race Rocker Arms - AMC 290-401 / Fd. 221-351W V8 1.7 7/16" pkg/1	D-225-17	297, 299
36757-16	Gold Race Rocker Arms - AMC 290-401 / Fd. 221-351W V8 1.7 7/16" set/16	D-225-17	297, 299
443901	H-260-2 Camshaft - Fd. 351W V8 69-93 and 5.0L HO 82-84	D-225-32	194
443902	H-260-2 Camshaft and Lifter Kit - Fd. 351W V8 69-93 and 5.0L HO 82-84	D-225-32	194
443941	H-272-2 Camshaft - Fd. 351W V8 69-93 and 5.0L HO 82-84	D-225-32	194
443942	H-272-2 Camshaft and Lifter Kit - Fd. 351W V8 69-93 and 5.0L HO 82-84	D-225-32	194
444211	2020 Camshaft - Fd. 5.0L V8 85-95	D-225-46	186, 202
444212	2020 Camshaft, Spring, Retainer Kit - Fd. 5.0L V8 85-95	D-225-46	186, 202
444221	2030 Camshaft - Fd. 5.0L V8 85-95	D-225-46	186
444222	2030 Camshaft, Spring, Retainer Kit - Fd. 5.0L V8 85-95	D-225-46	186
444225	2031 Camshaft - Fd. 5.0L V8 85-95	D-225-46	186
444226	2031 Camshaft, Spring, Retainer Kit - Fd. 5.0L V8 85-95	D-225-46	186
444231	2040 Camshaft - Fd. 5.0L V8 85-95	D-225-46	186
444232	2030 Camshaft and Lifter Kit - Fd. 351W V8 69-93 and 5.0L HO 82-84	D-225-46	194
694111	2020 Camshaft - Chry. LA 318-360 V8 86-91	D-225-23	146
704111	2020 Camshaft - Chry. Magnum 5.2-5.9L V8 92-02	D-225-47	146
704121	2030 Camshaft - Chry. Magnum 5.2-5.9L V8 92-02	D-225-54	146
99377-16	Hi Int. Hydraulic Lifters - Ch. .842" set/16	D-225-27	273
99377-2	Hi Int. Hydraulic Lifters - Ch. .842" pkg/2	D-225-27	273

Custom Tool Steel Camshafts

New Product—Custom Tool Steel Camshafts

Crane Cams announces new tool steel camshafts custom made to match any engine configuration. These cams can be built "one-off" to any linear spacing, journal size, or firing order that you need.

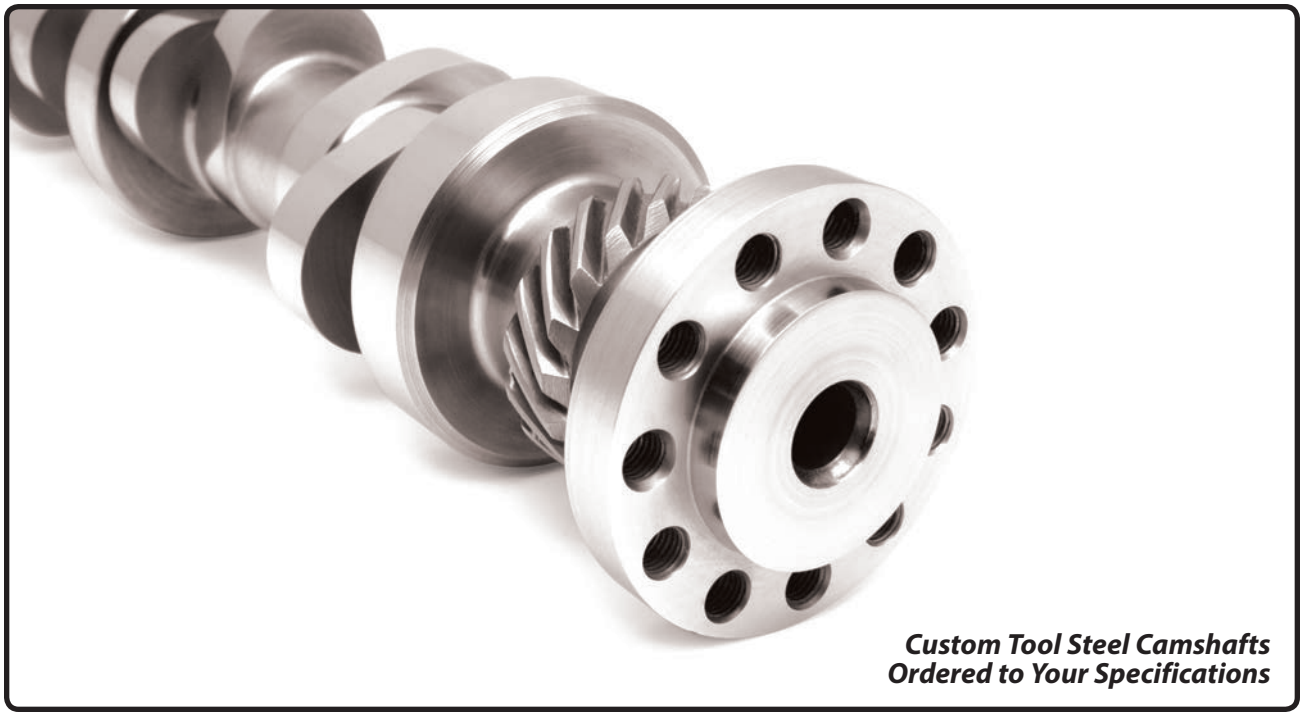
This service meets the demand for the incredible variety of design combinations created by the cylinder head and block manufactures of today. These are the ultimate camshafts for high performance and all out racing applications.

These new camshafts are made from a dedicated variety of tool steel using a through hardening heat treating process to create an extremely stable part that is resistant to surface wear, twist and deflection with the ability to withstand high surface loading and shock.

These finish ground camshafts can be ordered to your specifications either one at a time, or in quantity. Once the cam core is produced, it is rough ground, through hardened, then finish ground to best suit your application.

If you can supply a print, a sample camshaft, or specify what modifications are needed to an existing product, we can produce a camshaft to meet your requirements. For unique applications, we maintain a proprietary relationship, making the camshaft exclusive to the customer.

We are currently able to expedite delivery on these items, along with competitive pricing. Note: Popular applications, such as Chrysler 426 Hemi and Johnson/Rodeck 481X cores are maintained in stock.



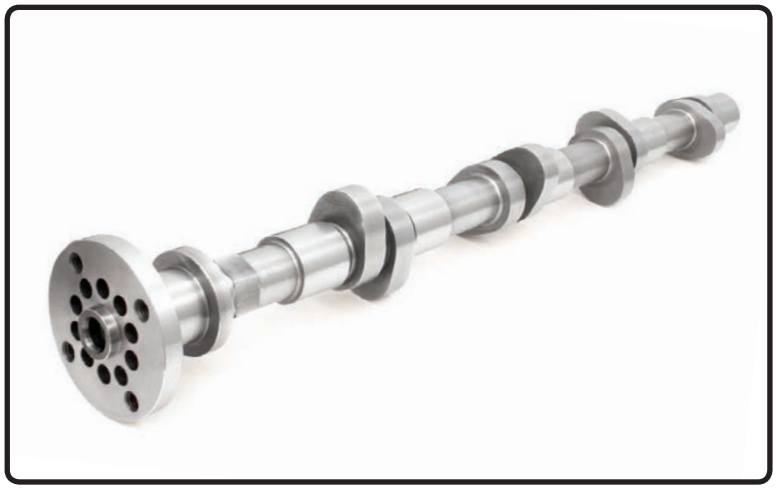
Custom Tool Steel Camshafts Ordered to Your Specifications

Section Continued

New Product—Custom Tool Steel Camshafts (continued)

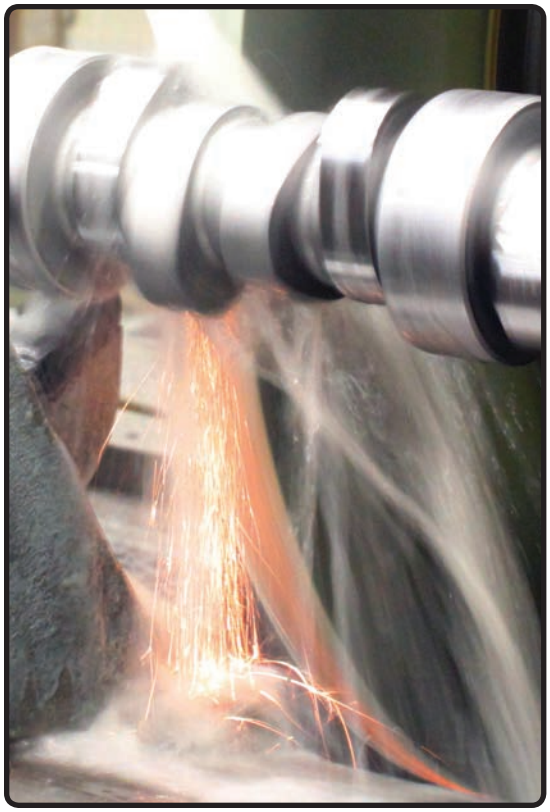
Custom Options

- *Cam bearing journal diameters*
- *Nose configurations (bolt holes, dowel pins/ keyways, integral gear drive flanges)*
- *Linear spacing and widths of journals and lobes, cam barrel diameters*
- *Lobe angular placement for different lifter bank angle blocks*
- *Firing orders*
- *Gun drilling*
- *Distributor/oil pump drive gears hobbed on camshaft, fuel pump eccentrics*
- *Rear drive configurations*
- *Oil passages*
- *Micro polishing*









American Motors/Jeep 6 Cylinder 64-05

**199-232-243 (4.0L)
258 (4.2L) cu.in.**

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	*See pg. 273* LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts										
Brute low-end torque, smooth idle, daily usage, fuel economy, fuel injection compatible, 1600-2200 cruise RPM, 7.75 to 8.75 compression ratio advised.	**H-192/2667-2S-10**	800-4200	**750501**[*a] ◆3	**99278-12**	192 204	248 260	110	(9) 21 37 (13)	.000 .000	.427 .456
Good low-end torque, smooth idle, daily usage, fuel economy, fuel injection compatible, off road, towing, also mild turbocharged, 2200-2600 cruise RPM, 8.0 to 9.5 compression ratio advised.	**H-260-2**	1200-4800	**753901**[*a] ◆3	**99278-12**	204 216	260 272	112	(5) 29 45 (9)	.000 .000	.456 .484
Good low and midrange torque, good idle, daily usage and off road, towing, performance and fuel efficiency, 2600-3000 cruise RPM, 8.75 to 10.5 compression ratio advised.	**H-272-2**	1800-5400	**753941**[*a] ◆3	**99278-12**	216 228	272 284	112	1 35 51 (3)	.000 .000	.484 .512
Performance usage, good mid and upper RPM HP, serious off road, limited oval track, 10.25 to 11.75 compression ratio advised.	**H-222/3200-2-8**	2600-6200	**750591**[*a] ◆3	**99278-12**	222 232	294 304	108	8 34 49 3	.000 .000	.512 .538
Mechanical Lifter Camshafts										
Good low-end torque, good idle, daily performance usage, good low and mid-range HP, 3200-3600 cruise RPM, 9.5 to 10.75 compression ratio advised.	**F-228/3334-2-12**	2200-6000	**751101**[*a] ◆3	**99260-12**	228 238	264 274	112	7 41 56 2	.028 .030	.533 .555
Good mid range torque and HP, fair idle, moderate performance usage, serious off-road usage, mild bracket racing, auto trans w/2500+ converter, 3400-3800 cruise RPM, 9.5 to 11.0 compression ratio advised. Good w/plate nitrous system.	**F-238/3467-2-8**	2800-6600	**751121**[*a] ◆3	**99260-12**	238 248	264 274	108	16 42 57 11	.028 .030	.555 .576

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT NOTE: The 1999-05 4.0 litre engines have a camshaft with a different nose configuration. Our camshafts listed above can be used in these engines if the following factory parts are used: 53020443 gear, 53020444 chain, 53020445 gear, and 83502890 bolt kit.

NOTE: To provide the most accurate valve adjustment on hydraulic lifter camshafts for 1964-early 1972 engines, special length pushrods can be ordered. Refer to page 353 for checking your hydraulic lifter preload. For late 1972-1998 engines, the rocker stands can be shimmed or longer pushrods installed to provide the proper hydraulic lifter preload. For mechanical camshafts in late 1972-05 engines, screw-in rocker arm studs and pushrod guideplates must be installed to effect valve adjustment. Special order heat treated pushrods are required for use with guideplates.

IMPORTANT: For late 1972-05 engines, if your preload is excessive, this can be remedied by using Crane's Rocker Arm Bridge Shim Kit (99179-1). Refer to page 304 for details.

NOTE: 1974 American Motors/Jeep 232 and 258 cu.in. engines were equipped with exhaust valve rotators and 11/32" stem exhaust valves. In these instances use 3 of **99936-2** valve spring retainers and 3 of **99820-2** valve seals (on exhaust valves only) to prevent excessive valve spring shimming.

NOTE: 1987-05 American Motors/Jeep 4.0 litre engines are equipped with 5/16" stem valves, requiring appropriate retainers and valve stem seals as indicated.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

CRANE Cams®

Custom Grind Cams Also Available – Call 866-388-5120 or go to cranecams.com for ordering information

CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	ALUMINUM ROCKERS — ENERGIZER	ALUMINUM ROCKERS — GOLD RACE
	96803-12[b] 96806-12[c]	99948-12[b]	99822-12[b,d] 99824-12[c,d]						
	96803-12[b] 96806-12[c]	99948-12[b]	99822-12[b,d] 99824-12[c,d]						
	96803-12[b] 96806-12[c]	99948-12[b]	99822-12[b,d] 99824-12[c,d]						
	96803-12[b] 96806-12[c]	99948-12[b]	99822-12[b,d] 99824-12[c,d]						
	99838-12[d]	99948-12[b]	99822-12[b,d] 99824-12[c,d]						
	99838-12[d]	99948-12[b]	99822-12[b,d] 99824-12[c,d]						

a To install these camshafts in 1995-05 4.0 litre engines, see the IMPORTANT NOTE on the opposite page.
b Except 4.0 litre engines.
c For 4.0 litre engines.
d Must machine cylinder head.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts										
Brute low-end torque, smooth idle, daily usage, fuel economy, 1600-2200 cruise RPM, 7.75 to 8.75 compression ratio advised.	**H-192/2667-2S-10**	800-4200	**860501*** ◆3	**99278-16**	192 204	248 260	110	(9) 21 37 (13)	.000 .000	.427 .456
Great low-end torque, smooth idle, daily usage, off road, towing, economy, also mild turbocharged, 2200-2800 cruise RPM, 8.0 to 9.5 compression ratio advised.	**H-260-2**	1200-4800	**863901*** **863902***a ◆3	**99278-16**	204 216	260 272	112	(5) 29 45 (9)	.000 .000	.456 .484
Good low and mid range torque, good idle, daily usage and off road, towing, performance and fuel efficiency, 2600-3000 cruise RPM, 8.75 to 10.5 compression ratio advised.	**H-272-2**	1800-5400	**863941*** **863942***a ◆3	**99278-16**	216 228	272 284	112	1 35 51 (3)	.000 .000	.484 .512
Good mid range torque and HP, good idle, daily performance usage, mild bracket racing, 3000-3400 cruise RPM, mild supercharged, mild nitrous, 9.5 to 10.75 compression ratio advised.	**H-278-2**	2200-5800	**863801*** **863802***a ◆3	**99278-16** **99378-16***b	222 234	278 290	114	2 40 56 (2)	.000 .000	.498 .527
Good mid range to upper RPM torque and HP, good idle, moderate performance usage, bracket racing, 3200-3600 cruise RPM, 9.5 to 11.0 compression ratio advised.	**H-288-2**	2400-6000	**864441*** **864442***a ◆3	**99278-16** **99378-16***b	226 230	288 292	112	6 40 52 (2)	.000 .000	.488 .496
Good mid range to upper RPM torque, rough idle, moderate performance usage, serious off road, bracket racing, 3200-3600 cruise RPM, 10.0 to 11.0 compression ratio advised.	**H-232/310-8**	2800-6200	**860641*** ◆3	**99278-16** **99378-16***b	232 232	312 312	108	14 38 50 2	.000 .000	.496 .496
Good mid to upper RPM HP, rough idle, performance usage, auto trans w/2500+ converter, 3400-3800 cruise RPM, mild nitrous, supercharged 10-14#, 10.0 to 11.5 compression ratio advised.	**H-302-2**	3000-6600	**864561*** ◆3	**99278-16** **99378-16***b	232 242	302 312	112	9 43 58 4	.000 .000	.538 .563
Good upper RPM HP, rough idle, performance usage, bracket racing, 390 cu.in., auto trans w/3500+ converter, 3800-4200 cruise RPM, mild nitrous, 11.0 to 12.5 compression ratio advised.	**H-242/3520-2-12**	3400-7000	**860661*** ◆3	**99278-16** **99378-16***b	242 252	314 324	112	14 48 63 9	.000 .000	.563 .589
Moderate competition only, rough idle, good upper RPM HP, bracket racing, 401+ cu.in., auto trans w/4000+ converter, good with aluminum heads, plate nitrous, 12.5 minimum compression ratio advised.	**H-252/3680-2-10**	4000-7200	**860681*** ◆3	**99278-16** **99378-16***b	252 262	314 334	110	21 51 66 16	.000 .000	.589 .614

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

NOTE: To provide the most accurate valve adjustment on hydraulic lifter camshafts for 1966-1973 engines, a set of positive locking nuts should be obtained for the rocker arm studs. For 1974-1991 engines, the rocker stands can be shimmed, or longer pushrods installed to provide the proper hydraulic lifter preload. Special order heat treated pushrods are required for use with guideplates.

IMPORTANT: If your hydraulic lifter preload is excessive, this can be easily remedied by using Crane's Rocker Arm Bridge Shim Kit (99179-1). Refer to page 304 for details.

NOTE: Special length pushrods can be ordered to provide proper hydraulic lifter preload. Refer to page 353 for checking your hydraulic lifter preload.

NOTE: Some 1978 and 1979 engines may not be able to obtain the correct valve spring assembled height with the components listed. Different springs and retainers may be required. Contact Crane's Performance Consultants for details.

NOTE: 1973 and 1974 American Motors/Jeep 360 and 401 cu.in. engines are equipped with exhaust valve rotators and 11/32" stem exhaust valves. In these instances, use 4 of **99936-2** valve spring retainers and **99820-8** valve seals (on the exhaust valves only) to prevent excessive valve spring shimming.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	ALUMINUM ROCKERS — ENERGIZER	ALUMINUM ROCKERS — GOLD RACE
64308-1[c]	**99839-16**[c]	**99957-16**		**99098-1**[e]	**95637-16**[f]	**86977-1***[h]		**11746-16**[j,i]	**36750-16**[k,i] **86757-16**[l,i]
64308-1[c]	**99839-16**[c]	**99957-16**		**99098-1**[e]	**95637-16**[f]	**86977-1***[g]		**11746-16**[j,i]	**36750-16**[k,i] **86757-16**[l,i]
64308-1[c]	**99839-16**[c]	**99957-16**		**99098-1**[e]	**95637-16**[f]	**86977-1***[g]		**11746-16**[j,j]	**36750-16**[k,j] **86757-16**[l,j]
64308-1[c]	**99839-16**[c]	**99957-16**		**99098-1**[e]	**95637-16**[f]	**86977-1***[g]		**11746-16**[j,i]	**36750-16**[k,i] **86757-16**[l,i]
64308-1[c]	**99839-16**[c]	**99957-16**		**99098-1**[e]	**95637-16**[f]	**86977-1***[g]		**11746-16**[j,i]	**36750-16**[k,i] **86757-16**[l,i]
	99838-16[d]	**99948-16**		**99098-1**[e]	**95637-16**[f]	**86977-1***[g]		**11746-16**[j,i]	**36750-16**[k,i] **86757-16**[l,i]
	99838-16[d]	**99948-16**	**99822-16**[d]	**99098-1**[e]	**95637-16**[f]	**86977-1***[g]		**11746-16**[j,i]	**36750-16**[k,i] **86757-16**[l,i]
	99838-16[d]	**99948-16**	**99822-16**[d]	**99098-1**[e]	**95637-16**[f]	**86977-1***[g]		**11746-16**[j,i]	**36750-16**[k,i] **86757-16**[l,i]
	99893-16[d]	**99954-16**	**99822-16**[d]	**99098-1**[e]	**95637-16**[f]	**86977-1***[g]		**11746-16**[j,i]	**36750-16**[k,i] **86757-16**[l,i]

a Cam and lifter kit, includes installation lubricants and Rocker Arm Bridge Shim Kit.
b Optional Hi Intensity hydraulic lifters, see page 272 for details.
c Contains standard diameter valve springs, no machining required.
d Must machine cylinder heads.
e Machined steel, heat treated, for engines with single groove valve stems.
f Pro Series one-piece, for 1970-1991 304 thru 401 engines.
g Pro Series steel billet gears and roller chain with thrust bearing.
i Must machine 74-91 cylinder heads and install **99156-16** 3/8" rocker arm studs (or **99157-16** 7/16 rocker arm studs for **86757-16** rockers) and aftermarket pushrod guideplates. Special order heat-treated pushrods are required for use with guideplates.
j Energizer, 1.6 ratio, 3/8" stud.
k 1.6 ratio, 3/8" stud.
l 1.6 ratio, 7/16" stud.

American Motors/Jeep V-8 66-91

290-304-343-360 (5.9L)-390-401 cu.in.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts — Retrofit										
Brute low end torque and HP, good idle, daily usage, performance and fuel efficiency, towing, 2200-3000 cruise RPM, 8.0 to 9.5 compression ratio advised.	**HR-208/3313-2S-12**	1000-5200	**869501*** ◆3	**86532-16**[a]	208 216	264 272	112	(3) 31 45 (9)	.000 .530 .000 .530	
Excellent low end torque and HP, good idle, daily usage, off road, performance and fuel efficiency, mild turbocharged, 2600-3400 cruise RPM, 8.75 to 10.5 compression ratio advised.	**HR-216/325-2S-12**	1600-5600	**869511*** ◆3	**86532-16**[a]	216 224	278 286	112	1 35 49 (5)	.000 .520 .000 .542	
Good low end and mid range torque and HP, fair idle, moderate performance usage, serious off road, mild bracket racing, auto trans w/2500+ converter, 3000-3800 cruise RPM, 9.5 to 10.75 compression ratio advised.	**HR-224/339-2S-12**	2000-6000	**869521*** ◆3	**86532-16**[a]	224 232	286 294	112	5 39 53 (1)	.000 .542 .000 .563	
Good mid range torque and HP, fair idle, moderate performance usage, serious off road, mild bracket racing, 390+ cu.in., auto trans w/2800+ converter, 3400-4200 cruise RPM, 10.0 to 11.5 compression ratio advised.	**HR-232/352-2S-10**	2600-6600	**869531*** ◆3	**86532-16**[a]	232 240	294 302	110	11 41 55 5	.000 .563 .000 .584	
Good upper RPM torque and HP, rough idle, performance usage, professional off road, bracket racing, 401+ cu.in., auto trans w/3500+ converter, good with aluminum heads, 4000-4800 cruise RPM, 11.0 to 12.5 compression ratio advised.	**HR-244/372-2S-12**	3200-7000	**869541*** ◆3	**86532-16**[a]	244 256	306 318	112	15 49 65 11	.000 .595 .000 .595	
Mechanical Lifter Camshafts										
Good mid range torque and HP, fair idle, moderate performance usage, off road, 3200-3600 cruise RPM, 10.0 to 11.5 compression ratio advised.	**F-238/3200-2-12**	2800-6400	**861201*** ◆3	**99260-16**	238 248	300 310	112	12 46 61 7	.022 .512 .022 .533	
Good mid range to upper RPM torque and HP, rough idle, performance usage, 3800-4200 cruise RPM, serious off road, 10.5 to 12.0 compression ratio advised.	**F-248/3334-2-12**	3400-7000	**861241*** ◆3	**99260-16**	248 258	310 320	112	17 51 66 12	.022 .533 .022 .555	
Good upper RPM torque and HP, rough idle, performance usage, serious off road, bracket racing, 390+ cu.in., auto w/3500+ converter, good with aluminum heads, 11.0 to 12.5 compression ratio advised.	**F-258/3468-8**	4000-7400	**861321*** ◆3	**99260-16**	258 258	320 320	108	26 52 62 16	.022 .555 .022 .555	
Mechanical Roller Camshafts										
Good low end and mid range torque and HP, fair idle, moderate performance usage, serious off road, mild bracket racing, auto trans w/2500+ converter, 3200-3600 cruise RPM, 10.0 to 11.25 compression ratio advised.	**SR-236/350-2S-10**	2600-6600	**868511*** ◆3	**66550-16**[b]	236 244	286 294	110	13 43 57 7	.020 .560 .020 .579	
Competition only, good mid and upper RPM torque and HP, oval track, bracket racing, auto trans w/3500+ converter, professional off road, 11.5 minimum compression ratio advised.	**R-258/420-2S-6**	3800-7800	**868821*** ◆3	**66550-16**[b]	258 266	290 298	106	26 52 62 24	.020 .672 .020 .672	

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

NOTE: Hydraulic roller camshafts require special length pushrods. Refer to page 353 for checking your lifter preload. To provide the most accurate valve adjustment on hydraulic roller lifter camshafts, screw-in rocker arm studs and pushrod guideplates can be installed to effect valve adjustment.

NOTE: For mechanical or roller lifter camshafts, screw-in rocker arm studs and pushrod guideplates must be installed to effect valve adjustment. Special order heat treated pushrods are required for use with guideplates.

NOTE: Some 1978 and 1979 engines may not be able to obtain the correct valve spring assembled height with the components listed. Different springs and retainers may be required. Contact Crane's Performance Consultants for details.

NOTE: 1973 and 1974 American Motors/Jeep 360 and 401 cu.in. engines are equipped with exhaust valve rotators and 11/32" stem exhaust valves. In these instances, use 4 of **99936-2** valve spring retainers and **99820-8** valve seals (on the exhaust valves only) to prevent excessive valve spring shimming.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99893-16[c]	99954-16	99822-16[c]	99098-1[d]	95622-16[e]	86977-1[*f]		11746-16[i,h]	36750-16[j,h] 86757-16[k,h]
	99893-16[c]	99954-16	99822-16[c]	99098-1[d]	95622-16[e]	86977-1[*f]		11746-16[i,h]	36750-16[j,h] 86757-16[k,h]
	99893-16[c]	99954-16	99822-16[c]	99098-1[d]	95622-16[e]	86977-1[*f]		11746-16[i,h]	36750-16[j,h] 86757-16[k,h]
	99893-16[c]	99954-16	99822-16[c]	99098-1[d]	95622-16[e]	86977-1[*f]		11746-16[i,h]	36750-16[j,h] 86757-16[k,h]
	99893-16[c]	99954-16	99822-16[c]	99098-1[d]	95622-16[e]	86977-1[*f]		11746-16[i,h]	36750-16[j,h] 86757-16[k,h]
	99838-16[c]	99948-16	99822-16[c]	99098-1[d]	95641-16[e]	86977-1[*f]			36750-16[j,h] 86757-16[k,h]
	99838-16[c]	99954-16	99822-16[c]	99098-1[d]	95641-16[e]	86977-1[*f]			36750-16[j,h] 86757-16[k,h]
	99838-16[c]	99954-16	99822-16[c]	99098-1[d]	95641-16[e]	86977-1[*f]			36750-16[j,h] 86757-16[k,h]
	99838-16[c]	99954-16	99822-16[c]	99098-1[d]	95645-16[e]	86977-1[*f]			36750-16[j,h] 86757-16[k,h]
	99876-16[c]	99963-16	99822-16[c]	99098-1[d]	95645-16[e]	86977-1[*f]			36750-16[j,h] 86757-16[k,h]

a Special length pushrods are required.
b Ultra Pro Series roller lifters, with -.200" height pushrod seats, special length pushrods are required.
c Must machine cylinder heads.
d Machined steel, heat treated for engines with single groove valve stems.
e Pro Series one piece, for 1970-1995 304 thru 401 engines.
f Pro Series steel billet gears and roller chain with thrust bearing.
h Must machine 74-91 cylinder heads and install **99156-16** rocker arm studs and aftermarket pushrod guideplates. Special order heat-treated pushrods are required for use with guideplates.
i Energizer, 1.6 ratio, 3/8"stud.
j 1.6 ratio, 3/8" stud.
k 1.6 ratio, 7/16" stud.

Buick V-8 67-76

400-430-455 cu.in.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts										
Brute low end torque, smooth idle, daily usage, fuel economy, 1600-2200 cruise RPM, 7.75 to 8.75 compression ratio advised.	**H-194/250-2S-10**	800-4200	**850501*** ◆3	**99284-16**	194 202	252 260	110	(8) 22 36 (14)	.000 .000	.400 .416
Good low end torque, smooth idle, daily usage, towing, economy, also mild turbocharged, 2200-2800 cruise RPM, 8.0 to 9.5 compression ratio advised.	**H-202/260-2S-10**	1200-4800	**850521*** ◆3	**99284-16**	202 210	260 268	110	(4) 26 40 (10)	.000 .000	.416 .432
Good low to mid range torque, good idle, daily usage, towing,performance and fuel efficiency, 2600-3000 cruise RPM, 8.75 to 10.5 compression ratio advised.	**H-218/280-2S-12**	1800-5400	**850571*** ◆3	**99284-16**	218 226	276 284	112	2 36 50 (4)	.000 .000	.448 .464
Good mid range torque, fair idle, moderate performance usage, good mid-range HP, excellent for 455GS, bracket racing, 3400-3800 cruise RPM, 9.5 to 11.0 compression ratio advised.	**H-226/290-2S-10**	2200-5800	**850631*** ◆3	**99284-16** **99384-16*a**	226 234	284 292	110	8 38 52 2	.000 .000	.464 .480
Replacement for factory Stage 2 camshaft.	**BluePrinted 1385557**	2200-5800	**850421*** ◆1	**99284-16** **99384-16*a**	226 255	312 332	115	4.5 41.5 69 6	.000 .000	.453 .482
Rough idle, performance usage, good mid-range HP, 3800-4200 cruise RPM,10.5 to 12.0 compression ratio advised.	**H-242/310-2S-10**	2800-6600	**850671*** ◆3	**99284-16** **99384-16*a**	242 250	300 308	110	16 46 60 10	.000 .000	.496 .512
Performance usage, good upper RPM HP for large displacement engines, bracket racing, auto trans w/race converter, also nitrous, 12.0 minimum compression ratio advised.	**H-252/348-2S-12**	3600-6800	**850701*** ◆3	**99284-16** **99384-16*a**	252 260	322 330	112	19 53 37 13	.000 .000	.557 .576

Cadillac V-8 68-81

368-425-472-500 cu.in.

Hydraulic Lifter Camshafts										
Excellent low end torque, smooth idle, daily usage, towing, economy, also mild turbocharged, 2200-2600 cruise RPM, 8.0 to 9.5 compression ratio advised.	**H-202/260-2S-14**	1200-4800	**1020541*** ◆3	**99284-16**	202 210	260 268	114	(8) 30 44 (14)	.000 .000	.447 .464
Good low end torque, good idle, daily usage, towing, economy, mild marine usage, airboat, mild turbocharged, 2400-2800 cruise RPM, 8.5 to 10.0 compression ratio advised.	**H-210/270-2S-12**	1400-5200	**1020561*** ◆3	**99284-16**	210 218	268 276	112	(2) 32 46 (8)	.000 .000	.464 .482
Good low and mid range torque, good idle, daily usage, performance, 2600-3000 cruise RPM, 8.75 to 10.5 compression ratio advised.	**H-218/280-2S-12**	1800-5600	**1020571*** ◆3	**99284-16**	218 226	276 284	112	2 36 50 (4)	.000 .000	.482 .499
Good mid range torque and HP, fair idle, moderate performance usage, bracket racing, auto trans w/2500+ converter, 3400-3800 cruise RPM, 9.5 to 11.0 compression ratio advised.	**H-226/290-2S-12**	2200-5800	**1020631*** ◆3	**99284-16** **99384-16*a**	226 234	284 292	112	6 40 54 0	.000 .000	.499 .516
Rough idle, performance usage, good mid and upper RPM torque and HP, bracket racing, auto trans w/3000+ converter, 10.0 to 11.5 compression ratio advised.	**H-234/300-2S-12**	2800-6400	**1020641*** ◆3	**99284-16** **99384-16*a**	234 242	292 300	112	10 44 58 4	.000 .000	.516 .533

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

NOTE: Mechanical lifter camshafts and components are available on special order.

NOTE: To provide the most accurate valve adjustment on hydraulic lifter camshafts, special length pushrods can be ordered. Refer to page 353 for checking your hydraulic lifter preload.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	ALUMINUM ROCKERS — ENERGIZER	ALUMINUM ROCKERS — GOLD RACE
	99838-16	99910-16	99822-16[b]						
	99838-16	99910-16	99822-16[b]						
	99838-16	99910-16	99822-16[b]						
	99838-16	99910-16	99822-16[b]						
	99838-16	99910-16	99822-16[b]						
	99838-16	99910-16	99822-16[b]						
	99838-16	99910-16	99822-16[b]						
	99848-16	99916-16	99820-16[b]	99097-1[c]	102621-16[d]				
	99848-16	99916-16	99820-16[b]	99097-1[c]	102621-16[d]				
	99848-16	99916-16	99820-16[b]	99097-1[c]	102621-16[d]				
	99848-16	99916-16	99820-16[b]	99097-1[c]	102621-16[d]				
	99848-16	99916-16	99820-16[b]	99097-1[c]	102621-16[d]				

a Optional Hi Intensity hydraulic lifters, see page 272 for details.
b Must machine cylinder heads.
c Machined steel, heat treated.
d Heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts										
Brute low end torque, smooth idle, daily usage, fuel economy, 1600-2200 cruise RPM, 7.75 to 8.75 compression ratio advised.	**H-192/2667-2S-12**	800-4200	**200511*** ◆3	**99277-12**	192 204	248 260	112	(11) 23 39 (15)	.000 .000	.467 .498
Good low end torque, smooth idle, daily usage, off road, towing, economy, also mild turbocharged, 2200-2600 cruise RPM, 8.0 to 9.5 compression ratio advised.	**H-260-2**	1200-4800	**203901*** ◆3	**99277-12**	204 216	260 272	112	(5) 29 45 (9)	.000 .000	.498 .530
Good low to mid range torque, good idle, daily usage and off road, towing, performance and fuel efficiency, 2600-3000 cruise RPM, 8.75 to 10.5 compression ratio advised.	**H-272-2**	1800-5400	**204541*** ◆3	**99277-12**	216 228	272 284	112	1 35 51 (3)	.000 .000	.530 .560
Performance usage, good mid range to upper RPM torque and HP, oval track, radical off road, 10.5 minimum compression ratio advised.	**H-234/3250-2-6**	3000-6000	**200541*** ◆3	**99277-12**	234 244	304 314	106	15 39 52 12	.000 .000	.569 .593
Mechanical Lifter Camshafts										
Good mid range torque and HP, fair idle, moderate performance usage, 1/4-3/8 oval track, off road, 3400-3800 cruise RPM,10.0 to 11.5 compression ratio advised.	**F-238/3200-2-8**	2800-6600	**201141*** ◆3	**99250-12**	238 248	304 314	108	16 42 57 11	.022 .022	.560 .583
Rough idle, performance usage, good mid and upper RPM HP, 3/8-1/2 oval track, bracket racing, 11.0 to 12.5 compression ratio advised.	**F-248/3334-2-6**	3400-6800	**201221*** ◆3	**99250-12**	248 258	310 320	106	22 46 59 19	.022 .022	.583 .607
Performance usage, good mid and upper RPM HP, bracket racing, long unlimited oval track, 12.25 minimum compression ratio advised.	**F-256/3634-2S-8**	4200-7200	**201311*** ◆3	**99250-12**	256 260	292 296	108	23 53 61 19	.026 .026	.636 .646

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

NOTE: Roller camshafts and components are available on special order. See page 349 regarding outright steel billet camshafts.

NOTE: The 1963-84 Chevrolet I6 292 cu. in. engines use a different camshaft core than the 194-230-250 engines, and are not interchangeable.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99838-12	99944-12	99820-12[a]	99097-1[b]	20621-12[c] 20622-12[d]				20750-12[e] 13750-12[f]
	99838-12	99944-12	99820-12[a]	99097-1[b]	20621-12[c] 20622-12[d]				20750-12[e] 13750-12[f]
	99838-12	99944-12	99820-12[a]	99097-1[b]	20621-12[c] 20622-12[d]				20750-12[e] 13750-12[f]
	99838-12	99944-12	99820-12[a]	99097-1[b]	20621-12[c] 20622-12[d]				20750-12[e] 13750-12[f]
	99893-12	99953-12	99820-12[a]	99097-1[b]	20621-12[c] 20622-12[d]				20750-12[e] 13750-12[f]
	99893-12	99953-12	99820-12[a]	99097-1[b]	20621-12[c] 20622-12[d]				20750-12[e] 13750-12[f]
	99893-12	99953-12	99820-12[a]	99097-1[b]	20621-12[c] 20622-12[d]				20750-12[e] 13750-12[f]

a Must machine cylinder head
b Machined steel, heat treated
c Heavy wall, heat treated, for 194-230-250 engines
d Heavy wall, heat treated, for 194-230-250 engines, for use with Crane aluminum rocker arms
e 1.7 ratio, 3/8 stud, requires **20622-12** pushrods
f 1.7 ratio, 7/16 stud, requires **20622-12** pushrods

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts										
Brute low end torque, smooth idle, daily usage, fuel economy, 1600-2200 cruise RPM, 7.75 to 8.75 compression ratio advised.	**H-192/2667-2S-12**	800-4200	**250511**[*] ◆3	**99286-12**	192 204	248 260	112	(11) 23 39 (15)	.000 .400 .000 .427
Low and mid-range torque and HP, great choice for cars and 4x4 trucks, highway or off road. Works really great for trailer towing.	**2020**	800-4200	**254112**[*a,b] ◆3	**99286-12**	198 204	258 264	104	(1) 19 30 (6)	.000 .401 .000 .427
Mid and upper range torque and HP improver for cars, especially Camaros, S-10 pick-up's, Blazers, Jimmy's , etc., and all performance applications.	**2030**	1200-4600	**254122**[*a,b] ◆3	**99286-12**	204 214	264 274	109	(3) 27 40 (6)	.000 .423 .000 .423
Good low end torque, good idle, daily usage and off road, towing, economy, also mild turbocharged, 2200-3000 cruise RPM, 8.0 to 9.5 compression ratio advised.	**H-260-2**	1200-4800	**253901**[*] **253902**[*b] ◆3	**99286-12**	204 216	260 272	112	(5) 29 45 (9)	.000 .427 .000 .454
Good low to mid range torque, good idle, daily usage & off road, towing, performance & fuel efficiency, increased compress. ratio & gearing advised, 2600-3200 cruise RPM, 8.75 to 10.5 compression ratio advised.	**H-272-2**	1800-5400	**253941**[*] ◆3	**99286-12**	216 228	272 284	112	1 35 51 (3)	.000 .454 .000 .480
Good mid to upper RPM torque and HP, fair idle, serious off road, moderate performance usage, 3000-3600 cruise RPM, 9.75 minimum compression ratio advised.	**H-222/3114-2S-10**	2200-6000	**250321**[*] ◆3	**99286-12**	222 234	278 290	110	6 36 52 2	.000 .467 .000 .494

RPM range shown is for average usage. These cam profiles will RPM higher,depending upon application.

IMPORTANT: These camshafts are for use in distributor equipped engines only.

IMPORTANT: Certain 1991 and later engines may have 8mm diameter valve stems. Our 11/32"retainers and valve stem locks will not be applicable in these instances. Some engines also have a 1.600" valve spring assembly height,that will not allow the use of our recommended valve springs and retainers.

IMPORTANT: Some engines may have oversize (.010") diameter lifters, check for white paint markings above lifter bores indicating their use.

NOTE: Roller camshafts and components are available on special order. Contact Crane's Performance Consultants for details.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99848-12[c]	**99915-12**		**99097-1**[e,f]	**25621-12**[g]				**25750-12**[h] **25759-12**[i]
	99848-12[c]	**99915-12**		**99097-1**[e,f]	**25621-12**[g]				**25750-12**[h] **25759-12**[i]
	99848-12[c]	**99915-12**		**99097-1**[e,f]	**25621-12**[g]				**25750-12**[h] **25759-12**[i]
	99848-12[c]	**99915-12**		**99097-1**[e,f]	**25621-12**[g]				**25750-12**[h] **25759-12**[i]
	99848-12[c] **96802-12**[c,d]	**99915-12**		**99097-1**[e,f] **99095-1**[e,f]	**25621-12**[g]				**25750-12**[h] **25759-12**[i]
	99848-12[c] **96802-12**[c,d]	**99915-12**		**99097-1**[e,f] **99095-1**[e,f]	**25621-12**[g]				**25750-12**[h] **25759-12**[i]

a For 1981-89 applications.
b Cam and Lifter Kit, includes installation lubricants.
c Standard diameter valve springs, no machining required.
d Additional assembly height required, use **99095-1** valve stem locks.
e For 11/32" diameter valve stems.
f Machined steel, heat treated.
g For cast iron inline-valve cylinder heads, heavy wall, heat treated, for use with pushrod guideplates.
h 1.5 ratio,narrow body (not self-aligning), with special 10mm x 1.50 bottom x 3/8"x 24 top rocker arm studs included.
i 1.6 ratio,narrow body (not self-aligning), with special 10mm x 1.50 bottom x 3/8"x 24 top rocker arm studs included.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts										
Brute low end torque, smooth idle, low and mid-range performance in passenger car, van and truck applications. Great choice for either manual four or five speed or automatic transmission. Greatly improves drivability, especially on the highway. Runs strongest from 2000 RPM and up.	**HR-194/271-2-12**	800-4600	**1439801*** ◆3	**10530-12[a]**	194 204	250 260	112	(10) 24 39 (15)	.000 .000	.407 .429
Good low end torque, smooth idle, daily usage, light towing, economy, also mild turbo-charged, 2200-3000 cruise RPM, 8.0 to 9.5 compression ratio advised.	**HR-204/286-2S-12**	1200-5200	**1439811*** ◆3	**10530-12[a]**	204 214	260 276	112	(5) 29 44 (10)	.000 .000	.429 .430
Good low end torque, good idle, daily usage, off road, towing, performance and fuel economy, 2600-3400 cruise RPM, 8.75 to 10.75 compression ratio advised.	**HR-214/325-2S-12**	1600-5600	**1439721*** ◆3	**10530-12[a]**	214 222	276 284	112	(0) 34 48 (6)	.000 .000	.488 .509
Good low and mid range torque, fair idle, moderate performance usage, mild bracket racing, auto trans w/2500+ converter, 3000-3800 cruise RPM, 9.5 to 10.75 compress. ratio advised, also mild supercharged.	**HR-222/339-2S-12**	2200-6000	**1439731*** ◆3	**10530-12[a]**	222 230	284 292	112	(4) 38 52 (2)	.000 .000	.509 .528
Good mid to upper RPM torque and HP, fair idle, moderate performance usage, serious off road, bracket racing, auto trans with 2800+ converter, 10.25 to 11.5 compression ratio advised, also mild supercharged.	**HR-230/352-2S-12**	2600-6400	**1439531*** ◆3	**10530-12[a]**	230 234	292 296	112	8 42 54 0	.000 .000	.528 .539

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

NOTE: The hydraulic roller camshafts listed above do not have a fuel pump eccentric, therefore a mechanical fuel pump cannot be used with them (as some marine applications may require).

NOTE: 1985-91 Chevrolet 90º V-6 262 cu.in. (4.3L) engines have a different firing configuration than the 200-229 cu.in. engines, and cannot use the 200-229 camshaft. The 1987-91 262 cu.in. (4.3L) engines are equipped with hydraulic roller camshafts that use a different configuration camshaft core than the 85-86 engines and cannot be interchanged. These 1992-2002 (4.3L) engines incorporate a balance shaft and utilize a different camshaft core that cannot be interchanged with previous models.

NOTE: Mechanical roller camshafts and components are available on special order.

NOTE: Many Chevrolet 262-400 V-8 valve train components are applicable to the 90º V-6 engines. Contact Crane's Performance Consultants for details.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	96802-12[b]	**99915-12**		**99097-1**[d]	**10621-12**[e]		**11801-12**[f,k]	**11744-12**[h,k]	**11750-12**[i,k] **10751-12**[j,k]
	96802-12[b]	**99915-12**		**99097-1**[d]	**10621-12**[e]		**11801-12**[f,k]	**11744-12**[h,k]	**11750-12**[i,k] **10751-12**[j,k]
	99838-12[c]	**99944-12**	**99820-12**[c]	**99097-1**[d]	**10621-12**[e]		**11801-12**[f,k]	**11744-12**[h,k]	**11750-12**[i,k] **10751-12**[j,k]
	99838-12[c]	**99944-12**	**99820-12**[c]	**99097-1**[d]	**10621-12**[e]		**11801-12**[f,k]	**11744-12**[h,k]	**11750-12**[i,k] **10751-12**[j,k]
	99838-12[c]	**99944-12**	**99820-12**[c]	**99097-1**[d]	**10621-12**[e]		**11801-12**[f,k]	**11744-12**[h,k]	**11750-12**[i,k] **10751-12**[j,k]

a For use with standard GM alignment bars.
b Standard diameter valve springs, no machining required.
c Must machine cylinder heads.
d Machined steel, heat treated.
e Heat treated, heavy wall, for use with or without pushrod guideplate cylinder heads.
f 1.5 ratio, 3/8" stud, extra long slot (not self-aligning).
h Energizer 1.5 ratio, 3/8" stud (not self-aligning).
i 1.5 ratio, 3/8" stud (not self-aligning).
j 1.5 ratio, 3/8" stud, self-aligning, narrow body for center bolt valve covers.
k Early 1992 engines are equipped with 3/8" stud self-aligning rocker arms. Late 1992 and later engines have 8mm stud self-aligning rocker arms. These engines can be converted to 3/8" studs by installing 6 of our **99148-2** rocker arm studs which have a 10mm bottom thread and a 3/8"-24 top thread (no machining is required). Appropriate pushrod guideplates must be installed if non self-aligning type rocker arms are used. If aluminum rocker arms are desired, only the narrow body configuration will fit if standard center bolt valve covers are being used.

1957–1987 262-400 V8 (262-265-267 (4.4L)-283-302-305 (5.0L)-307-327-350 (5.7L)-400 cu.in.)

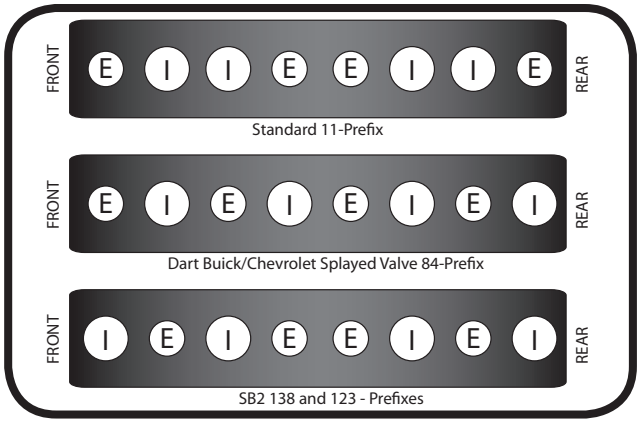
The classic Small Block Chevrolet V8 was introduced in 1955, in a 265 cu.in. version. The 1955-56 265 engines required a camshaft having a flat machined on the rear cam bearing journal to allow for oil flow to the lifter galleries and the top end. If you are using one of these blocks, a flat must be machined in center of the rear cam journal, .350" wide and .080" deep. Another option would be installing later model cam bearings in these early blocks. If your camshaft already has a flat on the rear journal, it will not cause any oiling problems if used in a later engine.

The entire family of engines, designated by Crane Cams' 11 prefix (except the Energizer line of camshafts), were equipped from the factory with flat faced lifters, either hydraulic or mechanical, throughout their production run. We offer complete lines of hydraulic, hydraulic roller, mechanical, and mechanical roller camshafts, lifters, and valve train components for these. Although we list this engine family as running through 1987, some truck applications continued through 1995. It's important to verify the engine type when dealing with these vehicles to insure the proper components are being obtained.

Cast hydraulic and mechanical lifter camshafts are available with standard cam bearing sizes, and also optional Chevrolet Big Block bearing sized journals (1.948" dia.), indicated by a BB suffix in the grind number. The standard firing order is 1-8-4-3-6-5-7-2, and cast standard journal camshafts can also be ordered with our SFO suffix firing order configuration of 1-8-7-3-6-5-4-2.

Crane Cams' retrofit hydraulic roller and mechanical roller camshafts are produced from steel billet material, heat treated, and finish ground in a variety of versions. Our retrofit hydraulic roller lifters do not require any block machining, and are a drop-in configuration, incorporating a vertical locking bar. For street and endurance applications, we offer camshafts equipped with a cast iron distributor drive gear and rear journal installed on the steel camshaft. These are noted by an IG suffix (Iron Gear), allowing the use of a standard type distributor gear for long term reliability.

There are many journal size options available for the roller camshafts, including: Standard (1.868"); Roller Bearing (1.875") – RB suffix; Big Block (1.948") – BB suffix; Large Roller Bearing (50mm/1.969") – LRB suffix; 55mm (2.165") –55J suffix. Other sizes are available on request. Camshafts with larger then stock journals have a step ground on the front journal, so a standard size camshaft sprocket can be used.



We offer camshafts with different lobe layouts for the various cylinder head options that can be installed on these engines. On this page are drawings illustrating the standard Small Block, Dart Buick/Chevrolet Splayed Valve (84 – prefix), and Chevrolet SB2 (138 – prefix) cylinder head valve layouts that are primarily in use today.

Standard, SFO (1-8-7-3-6-5-4-2), and SFO1 (1-8-7-2-6-5-4-3) firing orders are offered, along with other custom options for 180 degree crankshafts and other unique situations.

Drilling and tapping the rear cam journal for the Sander accessory drive is offered (RD – suffix), as is gun drilling of the camshaft for lightness and reduced torsional deflection (DR – suffix). For certain usages, we offer special lightweight camshafts (LW – suffix) having undercut bearing journals, narrow lobes, and gun drilling where weight saving is of prime importance.

1987–1999 305 (5.0L)- 350 (5.7L) V8

This first major upgrade to the traditional Small Block V8 incorporated a hydraulic roller camshaft and lifters. These are sometimes referred to as Vortec engines when checking some reference materials. The bolt pattern on the front of the camshaft was reduced in diameter, allowing for a step on the front journal, permitting the installation of a thrustplate to control camshaft endplay.

This engine family is referred to as Crane Cams' 10-prefix, and our early steel billet camshaft cores did not incorporate provisions for the front ignition drive that was later used on the 1992-1997 LT-1 and LT-4 engines.

We have separated these engines from the LT-1 & LT-4 versions in this catalog to properly define the emissions legalities of the camshafts, although they will now physically interchange. Since the late 90's, all of our

camshafts for these power plants have been machined for the front ignition drive and include the long cam dowel pin that's also needed. If you have an engine that does not require the long dowel pin, you can drive the pin in further to the proper length for your application.

The lifter bores on these blocks were increased in height to accommodate the hydraulic roller lifters. When using a camshaft with greater than standard lobe lift, or a small base circle cam, you must use taller-than-standard lifters to prevent them dropping out of the factory alignment bars when on the base circle. Our **10535-16** hydraulic roller lifters are intended for these purposes. Our vertical guidebar **11532-16** retrofit hydraulic roller lifters are also suitable for these applications.

We also offer mechanical roller lifter camshafts and components for these engines, in either standard or Iron Gear configurations.

1992–1996 305 (5.0L)- 350 (5.7L)LT-1 & LT-4 V8

Additional changes in 1992 resulted in the Gen II, or LT-series of engines. Reverse cooling, front mounted distributors, a different timing chain and gear set, and other improvements resulted in greater power potential and reliability. All of these were hydraulic roller camshaft and lifters equipped, incorporating the tall lifter bores. The Crane Cams 10-prefix is again used for these engines. On applications where higher than stock lift, or small base circle camshafts are used, our **10535-16** or **11532-16** hydraulic roller lifters should be used.

Mechanical roller lifter camshafts and components are offered, in standard or Iron Gear versions.

1997–2015 4.8-5.3-5.7-6.0-6.2-7.0L LS-Series V8

A clean sheet design for the Small Block, this new engine has virtually no interchangeability with the earlier engines. Crane Cams 144, 201, and 203 prefixes designate these camshafts and specific components. The camshaft has large 55mm (2.165") diameter journals, three bolts to attach the cam sprocket, and no distributor drive gear. Hydraulic roller camshafts and lifters are standard.

LS1 and LS6 engines have a camshaft position sensor split ring incorporated into the barrel of the cam, near the rear of the camshaft. LS2, LS3, LS7, and L92 engines have the camshaft position sensor incorporated into the camshaft sprocket. Our camshafts have the sensor split ring on the cam, and can be used in either version. The standard firing order is 1-8-7-2-6-5-4-3.

The LS3, LS7, and L92 engines are originally equipped with camshafts that have a single bolt to attach the cam sprocket. Our camshafts can be installed in these engines if the proper three bolt type cam sprocket is used.

Standard rocker arm ratio for these engines is 1.7:1, except the LS7, which comes equipped with 1.8:1 rockers.

Again, when using camshafts with greater than stock lobe lifts (or reduced base circle diameters), there can be a danger of the lifters dropping out of the alignment blocks. Crane Cams offers specific long travel lifters to prevent this occurrence, with our **144536-16** steel billet hydraulic roller lifters. Long travel mechanical roller lifters **144511-16** (that use the standard alignment blocks) are also available for those demanding the increased RPM capabilities of a mechanical roller camshaft (available on special order).

We're constantly adding to our product offerings for this family of engines, as its popularity continues to grow. Heavy wall pushrods, stud and shaft mounted rocker arms, valve springs, retainers, and steel billet valve locks provide performance and reliability improvements that you will find throughout this catalog.

1996–2010 SB2 V8

Designed specifically for racing applications, and never installed in any production vehicles, the SB2 engine has a unique cylinder block and cylinder heads. Although the SB2 heads have a different valve layout from other members of the Small Block family, they can also be installed on a conventional 262-400 type engine, provided many other changes are made, among these being the camshaft (use our 138-prefix camshafts for this application as noted earlier).

An SB2.2 block has staggered lifter bores, similar to the Big Block Chevys, straightening the pushrod angles for the canted valve SB2 series of cylinder heads. Our 123-prefix camshafts have been created expressly for these engines. Steel billet roller camshafts are offered with Large Roller Bearing (50mm/1.969") LRB – suffix, and 55mm (2.165") 55J –suffix options. As these are usually produced for specific racing applications, we custom grind them per order to insure the latest cam lobe design technologies are used.

Roller lifters are offered in standard .842", .875" and .904" diameter. Any of these are available with appropriate pushrod seat offsets as required by the cylinder head preparation that was performed.

Contact Crane Cams directly for the latest product information on these engines.

Chevrolet V-8 57-87

262-267 (4.4L)-283-302-305 (5.0L)-307-327-350 (5.7L)-400 cu. in. (also: 87-95 trucks w/standard [non-roller] hydraulic lifters)

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	COMPLETE CAM SPECIFICATIONS: Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts										
Brute low end torque, great for standard 267 and 305 engines. (50 state legal in 81-87 car and 81-92 truck 267-305 applications only. C.A.R.B. E.O. D-225-51)	**2010**	500-4000	**114102**[a,b] ◆1	**99277-16**	184 194	244 254	104	(12) 16 21 (7)	.000 .000	.378 .401
Brute low end torque, smooth idle, daily usage, fuel economy, 1600-2200 cruise RPM, 7.75 to 8.75 compression ratio advised. (50 state legal, pre-computer, C.A.R.B. E.O. D-225-51)	**H-248-2**	800-4600	**113971** **113972**[b] ◆1	**99277-16**	192 204	248 260	112	(11) 23 39 (15)	.000 .000	.400 .427
Great for 305 engines in cars, light and intermediate trucks with optional gearing. Good low and mid-range torque and HP. (50 state legal in 81-87 car applications only. C.A.R.B. E.O. D-225-19)	**2020**	800-4400	**114112**[a,b] ◆1	**99277-16**	194 204	254 264	104	(7) 21 26 (2)	.000 .000	.401 .423
Replacement for factory 300 HP 327 cu.in. camshaft.	**BluePrinted 3896929**	800-4500	**968711** ◆1	**99277-16**	195 202		112	(10.5) 25.5 37 (15)	.000 .000	.390 .410
Excellent low end torque, smooth idle, daily usage, fuel economy, 1600-2200 cruise RPM, 8.0 to 95 compression ratio advised. (50 state legal, pre-computer, C.A.R.B. E.O. D-225-21)	**Energizer 260 H10**	1000-4600	**10003** **100032**[c] ◆1	**99277-16**	204 204	260 260	110	(3) 27 37 (13)	.000 .000	.427 .427
Good mid-range and top-end performance in Monte Carlo SS, Camaro and Firebird with 305 HO, and 350 trucks. (50 state legal in 81-87 car and 81-92 truck 267-305 applications only. C.A.R.B. E.O. D-225-51)	**2030**	1200-4800	**114122**[a,b] ◆1	**99277-16**	204 214	264 274	110	(8) 32 37 (3)	.000 .000	.423 .446
Excellent low end torque and HP, smooth idle, daily usage, off road, towing, economy, also mild turbo-charged, marine applications: primarily used in 305 and 350 cu.in. near-stock engines for mild performance applications in heavy boats, OK for through-prop exhaust, 2200-2600 cruise RPM, 8.0 to 9.5 compression ratio advised. (50 state legal, pre-computer, C.A.R.B. E.O. D-225-18)	**H-260-2**	1200-5000	**113901** **113902**[b] ◆1	**99277-16**	204 216	260 272	112	(5) 29 45 (9)	.000 .000	.427 .454
Excellent low end torque and HP, smooth idle, daily usage, off road, towing, economy, also mild turbo-charged, marine applications: primarily used in 305 and 350 cu.in. near-stock engines for mild performance applications in heavy boats, OK for through-prop exhaust, 2200-2600 cruise RPM, 8.0 to 9.5 compression ratio advised.	**Z-256-2**	1200-5200	**113501**[*] **113502**[*b] ◆3	**99277-16**	206 218	256 268	112	(4) 30 46 (8)	.000 .000	.432 .459
Good low end torque, smooth idle, daily usage, fuel economy, light towing, off road, 2200-2700 cruise RPM, 8.5 to 10.0 compression ratio advised. (50 state legal, pre-computer, C.A.R.B. E.O. D-225-21).	**Energizer 266 H10**	1400-5000	**10004** **100042**[c] ◆1	**99277-16**	210 210	266 266	110	0 30 40 (10)	.000 .000	.440 .440
Great for 305 HO and performance 350 trucks, good mid and top end torque and HP, axle ratios of 3.73 or numerically higher required, auto or 5-speed manual, must use 99470-1 Adjustable Fuel Pressure Regulator. (50 state legal in 81-87 267-400, carb equipped cars only. C.A.R.B. E.O. D-225-25)	**2040**	1600-5400	**114132**[a,b] ◆1	**99277-16**	210 216	270 276	114	(4) 34 47 (11)	.000 .000	.440 .454

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

NOTE: 1988-99 Chevrolet 305 and 350 V-8 engines (and some 1987 350 V-8 engines) use a different configuration camshaft core than the 57-87 engines and cannot be interchanged.

NOTE: Camshafts having standard size journals with SFO firing order (1-8-7-3-6-5-4-2, or 4/7 swap) are available on special order. Contact Crane's Performance Consultants for details.

NOTE: Camshafts for modified standard blocks, or Oldsmobile/ Dart blocks, having Big Block Chevrolet size (1.948") cam bearings are available on special order. Contact Crane's Performance Consultants for details.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
11308-1[d,e]	99848-16[d,e]	99915-16[e]		99097-1[f]	11621-16[g]	11975-1*[h]	11800-16[i]	11744-16[k]	11750-16[l] 10750-16[m] 10751-16[n]
11308-1[d,e]	99848-16[d,e]	99915-16[e]		99097-1[f]	11621-16[g]	11975-1*[h]	11800-16[i]	11744-16[k]	11750-16[l] 10750-16[m] 10751-16[n]
11308-1[d,e]	99848-16[d,e]	99915-16[e]		99097-1[f]	11621-16[g]	11975-1*[h]	11800-16[i]	11744-16[k]	11750-16[l] 10750-16[m] 10751-16[n]
11308-1[d,e]	99848-16[d,e]	99915-16[e]		99097-1[f]	11621-16[g]	11975-1*[h]	11800-16[i]	11744-16[k]	11750-16[l] 10750-16[m] 10751-16[n]
11308-1[d,e]	99848-16[d,e]	99915-16[e]		99097-1[f]	11621-16[g]	11975-1*[h]	11800-16[i]	11744-16[k]	11750-16[l] 10750-16[m] 10751-16[n]
11308-1[d,e]	99848-16[d,e]	99915-16[e]		99097-1[f]	11621-16[g]	11975-1*[h]	11800-16[i]	11744-16[k]	11750-16[l] 10750-16[m] 10751-16[n]
11308-1[d,e]	99848-16[d,e]	99915-16[e]		99097-1[f]	11621-16[g]	11975-1*[h]	11800-16[i]	11744-16[k]	11750-16[l] 10750-16[m] 10751-16[n]
11308-1[d,e]	99848-16[d,e]	99915-16[e]		99097-1[f]	11621-16[g]	11975-1*[h]	11800-16[i]	11744-16[k]	11750-16[l] 10750-16[m] 10751-16[n]
11308-1[d,e]	99848-16[d,e]	99915-16[e]		99097-1[f]	11621-16[g]	11975-1*[h]	11800-16[i]	11744-16[k]	11750-16[l] 10750-16[m] 10751-16[n]

Section Continued

a For 81-87 applications.
b Cam and Lifter Kit, includes installation lubricants and Cam Sprocket bolt Locking Plate.
c Cam and Lifter Kit, includes assembly lubricants.
d Contains standard diameter valve springs, no machining required.
e For 1967-87 with 1.700" assembly height.
f Machined steel, heat treated.
g Heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
h Performance steel billet gears and roller chain set.
i 1.5 ratio, 3/8" stud, long slot, (not self-aligning).
k Energizer, 1.5 ratio, 3/8" stud (not self-aligning).
l 1.5 ratio, 3/8" stud (not self-aligning).
m 1.5 ratio, 3/8"stud (not self-aligning), narrow body for center bolt valve covers.
n 1.5 ratio, 3/8" stud, self-aligning narrow body for center bolt valve covers.

Chevrolet V-8 57-87

262-267 (4.4L)-283-302-305 (5.0L)-307-327-350 (5.7L)-400 cu. in. (also: 87-95 trucks w/standard [non-roller] hydraulic lifters)

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	COMPLETE CAM SPECIFICATIONS: Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts										
Good low end and mid range torque and HP, good idle, daily usage, off road, towing, economy, marine applications: primarily used in 350 cu.in. mildly modified engines for mild performance applications in light boats, OK for through-prop exhaust, 2400-2800 cruise RPM, 8.5 to 10.0 compression ratio advised. (50 state legal, pre-computer, C.A.R.B. E.O. D-225-18)	**H-266-2**	1600-5200	**113931** **113932**[a] ◆1	**99277-16**	210 216	266 272	114	(4) 34 47 (11)	.000 .000	.440 .454
Good low end and mid range torque and HP, good idle, daily usage, off road, towing, economy, marine applications: primarily used in 350 cu.in. mildly modified engines for mild performance applications in light boats, OK for through-prop exhaust, 2400-2800 cruise RPM, 8.5 to 10.0 compression ratio advised.	**Z-262-2**	1600-5400	**113511**[*] **113512**[*a] ◆3	**99277-16**	212 218	262 268	114	(3) 35 48 (10)	.000 .000	.446 .459
Good low end and mid range torque, good idle, daily usage, off road, highway towing, fuel efficiency plus performance, 2600-3000 cruise RPM, 8.75 to 10.0 compression ratistate legal, pre-computer, C.A.R.B. E.O. D-225-21)	**Energizer 272 H10**	1600-5400	**10005** **100052**[b] ◆1	**99277-16**	216 216	272 272	110	3 33 43 (7)	.000 .000	.454 .454
Serious performance for 305 and 350 carb equipped cars w/aftermarket intake, performance cylinder heads and free flow exhaust, auto or manual trans or modified 305 w/5-speed, axle ratios 3.73 or numerically higher required. **11308-1** Spring and Retainer Kit required for maximum perfomance. (50 state legal in 81-87 267 thru 400 carb equipped cars only. C.A.R.B. E.O. D-225-25).	**2050**	1800-5600	**114142**[a,c] ◆1	**99277-16**	216 228	272 284	112	1 35 51 (3)	.000 .000	.454 .480
Good low end and mid range torque and HP, good idle, daily usage and off road, towing, performance and fuel efficiency, marine applications: for 350+ cu.in. modified engines with free flowing above water exhaust systems for performance applications in light pleasure and ski boats, including jet boats, 2600-3000 cruise RPM, 8.75 to 10.75 compression ratio advised, good w/plate nitrous system. Good w/centrifugal or Roots supercharger, 8 lbs. maximum boost w/8.5 maximum compression ratio advised. (50 state legal, pre-computer, C.A.R.B. E.O. D-225-18).	**H-272-2**	1800-5600	**113941** **113942**[a] ◆1	**99277-16**	216 228	272 284	112	1 35 51 (3)	.000 .000	.454 .480

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

NOTE: 1988-99 Chevrolet 305 and 350 V-8 engines (and some 1987 350 V-8 engines) use a different configuration camshaft core than the 57-87 engines and cannot be interchanged.

NOTE: Camshafts having standard size journals with SFO firing order (1-8-7-3-6-5-4-2, or 4/7 swap) are available on special order. Contact Crane's Performance Consultants for details.

NOTE: Camshafts for modified standard blocks, or Oldsmobile/Dart blocks, having Big Block Chevrolet size (1.948") cam bearings are available on special order. Contact Crane's Performance Consultants for details.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
11308-1[d,e]	99848-16[d,e]	99915-16[e]		99097-1[f]	11621-16[g]	11975-1[*h]	11800-16[i]	11744-16[k]	11750-16[l] 10750-16[m] 10751-16[n]
11308-1[d,e]	99848-16[d,e]	99915-16[e]		99097-1[f]	11621-16[g]	11975-1[*h]	11800-16[i]	11744-16[k]	11750-16[l] 10750-16[m] 10751-16[n]
11308-1[d,e]	99848-16[d,e]	99915-16[e]		99097-1[f]	11621-16[g]	11975-1[*h]	11800-16[i]	11744-16[k]	11750-16[l] 10750-16[m] 10751-16[n]
11308-1[d,e]	99848-16[d,e]	99915-16[e]		99097-1[f]	11621-16[g]	11975-1[*h]	11800-16[i]	11744-16[k]	11750-16[l] 10750-16[m] 10751-16[n]
11308-1[d,e]	99848-16[d,e]	99915-16[e]		99097-1[f]	11621-16[g]	11975-1[*h]	11800-16[i]	11744-16[k]	11750-16[l] 10750-16[m] 10751-16[n]

Section Continued

a Cam and Lifter Kit, includes installation lubricants and Cam Sprocket bolt Locking Plate.
b Cam and Lifter Kit, includes assembly lubricants.
c For 81-87 applications.
d Contains standard diameter valve springs, no machining required.
e For 1967-87 with 1.700" assembly height.
f Machined steel, heat treated.
g Heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
h Performance steel billet gears and roller chain set.
i 1.5 ratio, 3/8" stud, long slot, (not self-aligning).
k Energizer, 1.5 ratio, 3/8" stud (not self-aligning).
l 1.5 ratio, 3/8" stud (not self-aligning).
m 1.5 ratio, 3/8" stud (not self-aligning), narrow body for center bolt valve covers.
n 1.5 ratio, 3/8" stud, self-aligning narrow body for center bolt valve covers.

Chevrolet V-8 57-87

262-267 (4.4L)-283-302-305 (5.0L)-307-327-350 (5.7L)-400 cu. in. (also: 87-95 trucks w/standard [non-roller] hydraulic lifters)

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts										
Good low and mid range torque, rough idle, moderate performance usage, mild bracket racing, auto trans w/2500+ converter, 2600-3000 cruise RPM, oval track; Street Stock, Enduro, Hobby, etc, 1/4-3/8 mile, 8.75 to 10.0 compression ratio advised.	**Energizer 274 H06**	1800-5400	**10017**[*] **100172**[*b] ◆3	**99277-16**	218 218	274 274	106	7 31 39 (1)	.000 .000	.450 .450
Good idle, daily usage and off road, towing, performance and fuel efficiency, marine applications: for 350+ cu.in. modified engines with free flowing above water exhaust systems for performance applications in light pleasure and ski boats, including jet boats. 2600-3000 cruise RPM, 8.75 to 10.75 compression ratio advised, good w/plate nitrous system. Good w/centrifugal or small Roots supercharger, 8 lbs. maximum boost w/8.5 maximum compression ratio advised.	**Z-268-2**	1800-5800	**113521**[*] **113522**[*a] ◆3	**99277-16**	218 230	268 280	112	2 36 52 (2)	.000 .000	.459 .486
Good mid range torque, good to fair idle, daily performance usage, mild bracket racing, auto trans w/stock to 2500 converter, 2700-3200 cruise RPM, 9.5 to 10.75 compression ratio advised.	**Energizer 278 H10**	2000-5800	**10013** **100132**[*b] ◆3	**99277-16** **99377-16**[d]	222 222	278 278	110	6 36 46 (4)	.000 .000	.467 .467
Replacement for factory 350 HP 327 cu.in. camshaft.	**BluePrinted 3863151**	2000-5600	**967601** ◆1	**99277-16** **99377-16**[d]	222 222		114	1 41 49 (7)	.000 .000	.447 .447
Performance usage, good upper RPM HP, 360+ cu.in., bracket racing; Pro ET, Super ET, etc., auto trans w/4000+ converter, 11.5 minimum compression ratio advised.	**H-284**	2200-6000	**114201** ◆1	**99277-16** **99377-16**[d]	222 222	284 284	114	2 40 50 (8)	.000 .000	.450 .450

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

NOTE: 1988-99 Chevrolet 305 and 350 V-8 engines (and some 1987 350 V-8 engines) use a different configuration camshaft core than the 57-87 engines and cannot be interchanged.

NOTE: Camshafts having standard size journals with SFO firing order (1-8-7-3-6-5-4-2, or 4/7 swap) are available on special order. Contact Crane's Performance Consultants for details.

NOTE: Camshafts for modified standard blocks, or Oldsmobile/Dart blocks, having Big Block Chevrolet size (1.948") cam bearings are available on special order. Contact Crane's Performance Consultants for details.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
11309-1[g,h] **11310-1**[i]	**96802-16**[j] **99846-16**[h] **99838-16**[i]	**99915-16**[f] **99944-16**	**99820-16**[i]	**99097-1**[k]	**11621-16**[l] **11630-16**[m]	**11975-1**[*n] **11984-1**[*o] **11977-1**[*p]	**11801C-16**[q] **10800C-16**[r]	**11744-16**[u]	**11750-16**[v] **10750-16**[w] **10751-16**[x]
11308-1[e,f]	**99848-16**[e,f] **96802-16**[j]	**99915-16**[f]		**99097-1**[k]	**11621-16**[l] **11630-16**[m]	**11975-1**[*n] **11984-1**[*o] **11977-1**[*p]	**11801-16**[s] **11801C-16**[q] **10800C-16**[r]	**11744-16**[u]	**11750-16**[v] **10750-16**[w] **10751-16**[x]
11308-1[e,f]	**99848-16**[e,f] **96802-16**[j]	**99915-16**[f]		**99097-1**[k]	**11621-16**[l] **11630-16**[m]	**11975-1**[*n] **11984-1**[*o] **11977-1**[*p]	**11801-16**[s] **11801C-16**[q] **10800C-16**[r]	**11744-16**[u]	**11750-16**[v] **10750-16**[w] **10751-16**[x]
11308-1[e,f]	**99848-16**[e,f] **96802-16**[j]	**99915-16**[f]		**99097-1**[k]	**11621-16**[l] **11630-16**[m]	**11975-1**[*n] **11984-1**[*o] **11977-1**[*p]	**11801-16**[s] **11801C-16**[q] **10800C-16**[r]	**11744-16**[u]	**11750-16**[v] **10750-16**[w] **10751-16**[x]
11308-1[e,f]	**99848-16**[e,f] **96802-16**[j]	**99915-16**[f]		**99097-1**[k]	**11621-16**[l] **11630-16**[m]	**11975-1**[*n] **11984-1**[*o] **11977-1**[*p]	**11801-16**[s] **11801C-16**[q] **10800C-16**[r]	**11744-16**[u]	**11750-16**[v] **10750-16**[w] **10751-16**[x]

Section Continued

a Cam and Lifter Kit, includes installation lubricants and Cam Sprocket bolt Locking Plate.
b Cam and Lifter Kit, includes assembly lubricants.
d Optional Hi Intensity Lifters, see page 272 for details.
e Contains standard diameter valve springs, no machining required.
f For 1967-87 with 1.700" assembly height.
g Contains standard diameter valve springs and machined steel valve stem locks (**99095-1**), no machining required.
h Standard diameter XHTCS tool steel valve springs for 1.800" assembly height.
i Must machine cylinder heads.
j Standard diameter chrome silicon valve springs for 1.750" assembly height.
k Machined steel, heat treated.
l Heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
m Heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
n Performance steel billet gears and roller chain set.
o Pro Series steel billet gears and roller chain set.
p Pro Series steel billet gears and roller chain set with thrust bearing.
q 1.5 ratio, 3/8" stud, extra long slot, Nitro Carb (not self-aligning).
r 1.5 ratio, 3/8" stud self-aligning, Nitro Carb.
s 1.5 ratio, 3/8" stud, extra long slot (not self-aligning).
u Energizer, 1.5 ratio, 3/8" stud (not self-aligning).
v 1.5 ratio, 3/8" stud (not self-aligning).
w 1.5 ratio, 3/8" stud (not self-aligning), narrow body for center bolt valve covers.
x 1.5 ratio, 3/8" stud, self-aligning narrow body for center bolt valve covers.

Chevrolet V-8 57-87

262-267 (4.4L)-283-302-305 (5.0L)-307-327-350 (5.7L)-400 cu. in. (also: 87-95 trucks w/standard [non-roller] hydraulic lifters)

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts										
Good mid range to upper RPM torque and HP, good idle, daily performance usage, mild bracket racing, 3000-3400 cruise RPM, 9.5 to 10.75 compression ratio advised.	**H-278-2**	2200-6200	**113801**[*] **113802**[*a] ◆3	**99277-16** **99377-16**[d]	222 234	278 290	114	2 40 56 (2)	.000 .000	.467 .494
Good mid range to upper RPM torque and HP, fair idle, daily performance usage, mild bracket racing, 3000-3400 cruise RPM, 9.5 to 10.75 compression ratio advised.	**Z-274-2**	2200-6400	**113531**[*] **113532**[*a] ◆3	**99277-16**	224 230	274 280	110	7 37 50 0	.000 .000	.473 .486
Rough idle, moderate performance usage, good mid range to upper RPM HP, 3000-3400 cruise RPM, bracket racing; Street, Heavy, etc., auto trans w/3000+ converter, oval track; Street Stock, Enduro, Hobby, etc., 1/4-3/8 mile, serious off road, 9.5 to 11.0 compress. ratio advised.	**Energizer 282 H06**	2400-6200	**10008**[*] **100082**[*b] ◆3	**99277-16** **99377-16**[d]	226 226	282 282	106	12 34 44 (2)	.000 .000	.470 .470
Good mid range HP, fair idle, moderate performance usage, w/plate or manifold nitrous system, mild bracket racing, auto trans w/2500+ converter, 3400-3800 cruise RPM, 9.5 to 11.0 compression ratio advised. Good w/centrifugal or Roots supercharger, 10 lbs maximum boost w/8.0 maximum ratio advised.	**H-288-2**	2600-6400	**113821**[*] **113822**[*a] ◆3	**99277-16** **99377-16**[d]	226 234	288 296	114	4 42 56 (2)	.000 .000	.458 .473
Performance usage, good mid range torque and HP, bracket racing; Street, Heavy, etc., auto trans w/3000+ converter, 9.5 to 11.5 compression ratio advised.	**H-228/320-6**	2800-6400	**110551**[*] ◆3	**99277-16** **99377-16**[d]	228 228	284 284	106	12 36 44 4	.000 .000	.480 .480
Good mid range to upper RPM torque and HP, fair idle, moderate performance usage, good mid range HP, 3400-3800 cruise RPM, 9.5 to 11.0 compression ratio advised.	**Energizer 284 H12**	2800-6200	**10007** **100072**[*b] ◆3	**99277-16** **99377-16**[d]	228 228	284 284	112	7 41 51 (3)	.000 .000	.480 .480
Good upper RPM torque and HP, fair idle, moderate performance usage, 3600-4000 cruise RPM, 10.0 to 11.5 compression ratio advised. Good w/centrifugal or Roots supercharger, 12 lbs. maximum boost w/8.0 maximum compression ratio advised.	**H-228/3200-14**	3000-6400	**110601**[*] ◆3	**99277-16** **99377-16**[d]	228 228	284 284	114	5 43 53 (5)	.000 .000	.480 .480
Oval track; .390/.410 lift rule classes, 2-bbl or 4-bbl, 1/4-3/8 mile, 9.0 to 10.5 compression ratio advised.	**H-228/260-2S-7**	2800-6000	**110251**[*] ◆3	**99277-16** **99377-16**[d]	228 232	288 292	107	11 37 47 5	.000 .000	.390 .410
Performance usage, good mid range torque and HP, bracket racing; Street, Heavy, etc., auto trans w/3000+ converter, oval track; Street Stock, Enduro, Hobby, etc., 1/4-3/8 mile, 10.0 to 11.5 compression ratio advised.	**Saturday Night Special H-228/3200-2S-6**	2800-6400	**110591**[*] **110594**[*a] ◆3	**99277-16** **99377-16**[d]	228 234	284 290	106	12 36 47 7	.000 .000	.480 .494
Performance usage, good mid and upper RPM HP, bracket racing; Street, Heavy, etc., auto trans w/3000+ converter, oval track; Street Stock, Enduro, Hobby, etc., 1/4-3/8 mile, serious off road, 10.0 to 11.5 compression ratio advised.	**Energizer 286 H06**	3000-6400	**10018**[*] **100182**[*b] ◆3	**99277-16** **99377-16**[d]	230 230	286 286	106	13 37 45 5	.000 .000	.465 .465

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

NOTE: 1988-99 Chevrolet 305 and 350 V-8 engines (and some 1987 350 V-8 engines) use a different configuration camshaft core than the 57-87 engines and cannot be interchanged.

NOTE: Camshafts having standard size journals with SFO firing order (1-8-7-3-6-5-4-2, or 4/7 swap) are available on special order. Contact Crane's Performance Consultants for details.

NOTE: Camshafts for modified standard blocks, or Oldsmobile/ Dart blocks, having Big Block Chevrolet size (1.948") cam bearings are available on special order. Contact Crane's Performance Consultants for details.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
11308-1[e,f]	**99848-16**[e,f] **96802-16**[j]	**99915-16**[f]		**99097-1**[m]	**11621-16**[o] **11630-16**[p]	**11975-1**[*q] **11984-1**[*r] **11977-1**[*s]	**11801-16**[t] **11801C-16**[u] **10800C-16**[v]	**11744-16**[x]	**11750-16**[y] **10750-16**[z] **10751-16**[aa]
11308-1[e,f]	**99848-16**[e,f] **96802-16**[j]	**99915-16**[f]		**99097-1**[m]	**11621-16**[o] **11630-16**[p]	**11975-1**[*q] **11984-1**[*r] **11977-1**[*s]	**11801-16**[t] **11801C-16**[u] **10800C-16**[v]	**11744-16**[x]	**11750-16**[y] **10750-16**[z] **10751-16**[aa]
11309-1[g,h] **11310-1**[i]	**96802-16**[j] **99846-16**[h] **99838-16**[i] **96874-16**[i,k]	**99915-16**[f] **99944-16** **99969-16**[l]	**99820-16**[i]	**99097-1**[m] **99094-1**[n]	**11621-16**[o] **11630-16**[p]	**11975-1**[*q] **11984-1**[*r] **11977-1**[*s]	**11801C-16**[u] **10800C-16**[v]	**11744-16**[x]	**11750-16**[y] **10750-16**[z] **10751-16**[aa]
11308-1[e,f]	**99848-16**[e,f] **96802-16**[j]	**99915-16**[f]		**99097-1**[m]	**11621-16**[o] **11630-16**[p]	**11975-1**[*q] **11984-1**[*r] **11977-1**[*s]	**11801-16**[t] **11801C-16**[u] **10800C-16**[v]	**11744-16**[x]	**11750-16**[y] **10750-16**[z] **10751-16**[aa]
11309-1[g,h] **11310-1**[i]	**96802-16**[j] **99846-16**[h] **99838-16**[i] **96874-16**[i,k]	**99915-16**[f] **99944-16** **99969-16**[l]	**99820-16**[i]	**99097-1**[m] **99094-1**[n]	**11621-16**[o] **11630-16**[p]	**11975-1**[*q] **11984-1**[*r] **11977-1**[*s]	**11801C-16**[u] **10800C-16**[v]	**11744-16**[x]	**11750-16**[y] **10750-16**[z] **10751-16**[aa]
11309-1[g,h] **11310-1**[i]	**96802-16**[j] **99846-16**[h] **99838-16**[i] **96874-16**[i,k]	**99915-16**[f] **99944-16** **99969-16**[l]	**99820-16**[i]	**99097-1**[m] **99094-1**[n]	**11621-16**[o] **11630-16**[p]	**11975-1**[*q] **11984-1**[*r] **11977-1**[*s]	**11801C-16**[u] **10800C-16**[v]	**11744-16**[x]	**11750-16**[y] **10750-16**[z] **10751-16**[aa]
11309-1[g,h] **11310-1**[i]	**96802-16**[j] **99846-16**[h] **99838-16**[i] **96874-16**[i,k]	**99915-16**[f] **99944-16** **99969-16**[l]	**99820-16**[i]	**99097-1**[m] **99094-1**[n]	**11621-16**[o] **11630-16**[p]	**11975-1**[*q] **11984-1**[*r] **11977-1**[*s]	**11801C-16**[u] **10800C-16**[v]	**11744-16**[x]	**11750-16**[y] **10750-16**[z] **10751-16**[aa]
11309-1[g,h] **11310-1**[i]	**96802-16**[j] **99846-16**[h] **99838-16**[i] **96874-16**[i,k]	**99915-16**[f] **99944-16** **99969-16**[l]	**99820-16**[i]	**99097-1**[m] **99094-1**[n]	**11621-16**[o] **11630-16**[p]	**11975-1**[*q] **11984-1**[*r] **11977-1**[*s]	**11801C-16**[u] **10800C-16**[v]	**11744-16**[x]	**11750-16**[y] **10750-16**[z] **10751-16**[aa]
11309-1[g,h] **11310-1**[i]	**96802-16**[j] **99846-16**[h] **99838-16**[i] **96874-16**[i,k]	**99915-16**[f] **99944-16** **99969-16**[l]	**99820-16**[i]	**99097-1**[m] **99094-1**[n]	**11621-16**[o] **11630-16**[p]	**11975-1**[*q] **11984-1**[*r] **11977-1**[*s]	**11801C-16**[u] **10800C-16**[v]	**11744-16**[x]	**11750-16**[y] **10750-16**[z] **10751-16**[aa]

Section Continued

a Cam and Lifter Kit, includes installation lubricants and Cam Sprocket Bolt Locking Plate.
b Cam and Lifter Kit, includes assembly lubricants.
d Optional Hi Intensity Lifters, see page 272 for details.
e Contains standard diameter valve springs, no machining required.
f For 1967-87 with 1.700" assembly height.
g Contains standard diameter valve springs and machined steel valve stem locks (**99095-1**), no machining required.
h Standard diameter XHTCS tool steel valve springs for 1.800" assembly height.
i Must machine cylinder heads.
j Standard diameter chrome silicon valve springs for 1.750" assembly height.
k Dual valve springs for +.100" length valves.
l Requires Crane Multi Fit valve locks.
m Machined steel, heat treated.
n Machined steel, heat treated, Multi Fit.
o Heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
p Heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
q Performance steel billet gears and roller chain set.
r Pro Series steel billet gears and roller chain set.
s Pro Series steel billet gears and roller chain set with thrust bearing.
t 1.5 ratio, 3/8" stud, extra long slot (not self-aligning).
u 1.5 ratio, 3/8" stud, extra long slot, Nitro Carb (not self-aligning).
v 1.5 ratio, 3/8" stud, self-aligning, Nitro Carb.
x Energizer, 1.5 ratio, 3/8" stud (not self-aligning).
y 1.5 ratio, 3/8" stud (not self-aligning).
z 1.5 ratio, 3/8" stud (not self-aligning), narrow body for center bolt valve covers.
aa 1.5 ratio, 3/8" stud, self-aligning narrow body for center bolt valve covers.

Chevrolet V-8 57-87

262-267 (4.4L)-283-302-305 (5.0L)-307-327-350 (5.7L)-400 cu. in. (also: 87-95 trucks w/standard [non-roller] hydraulic lifters)

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts										
Performance usage, good mid and upper RPM HP, fair idle, auto trans w/3000+ converter, 10.0 to 11.5 compression ratio advised.	**H-230/318-12**	3000-6600	**110501**[*] ◆3	**99277-16** **99377-16**[c]	230 230	290 290	112	8 42 52 (2)	.000 .000	.477 .477
Oval track; .390/.410 lift rule classes, 2-bbl or 4-bbl, 1/4-3/8 mile, 10.0 to 11.0 compression ratio advised.	**H-232/260-2S1-6**	3000-6400	**110271**[*] ◆3	**99277-16** **99377-16**[c]	232 236	292 296	106	14 38 48 8	.000 .000	.390 .410
Oval track; .410 lift rule classes, 2-bbl or 4-bbl, 1/4-3/8 mile, 10.0 to 11.0 compression ratio advised.	**H-232/2732-6**	3000-6400	**110301**[*] ◆3	**99277-16** **99377-16**[c]	232 232	290 290	106	14 38 46 6	.000 .000	.410 .410
Fair idle, performance usage, good mid range HP, 3800-4200 cruise RPM, 10.25 to 12.0 compression ratio advised.	**H-296-2**	3000-6600	**114561**[*] ◆3	**99277-16** **99377-16**[c]	234 242	296 304	110	12 42 56 6	.000 .000	.473 .488
Oval track; .390/.410 lift rule classes, 3/8-1/2 mile, 10.0 to 11.0 compression ratio advised.	**H-236/260-2S1-6**	3200-6600	**110291**[*] ◆3	**99277-16** **99377-16**[c]	236 242	296 302	106	16 40 51 11	.000 .000	.390 .410
Fair idle, performance usage, good mid range HP, 3800-4200 cruise RPM, 10.25 to 12.0 compression ratio advised.	**Z-286-2**	3000-6800	**113541**[*] **113542**[*a] ◆3	**99277-16** **99377-16**[c]	236 244	286 294	110	13 43 57 7	.000 .000	.491 .497
Performance usage, good mid and upper RPM torque, bracket racing; Street, Heavy, Pro ET, Super ET, etc., auto trans w/3500+ converter, oval track; Street Stock, Enduro, Hobby, etc., 1/4-3/8 mile, 10.5 to 12.0 compression ratio advised.	**H-238/3347-6**	3200-6600	**110651**[*] ◆3	**99277-16** **99377-16**[c]	238 238	294 294	106	17 41 49 9	.000 .000	.502 .502
Rough idle, performance usage, good mid and upper RPM torque and HP, bracket racing, auto trans w/3500+ converter, 4200-4600 cruise RPM, 10.5 to 12.0 compression ratio advised.	**H-238/3347-2S2-10**	3200-6800	**110521**[*] ◆3	**99277-16** **99377-16**[c]	238 242	294 304	110	14 44 56 6	.000 .000	.502 .520
Performance usage, good mid and upper RPM torque and HP, bracket racing; Street, Heavy, Pro ET, Super ET, etc., auto trans w/3500+ converter, oval track; Street Stock, Enduro, Hobby, etc., 1/4-3/8 mile, 10.5 to 12.0 compression ratio advised.	**Saturday Night Special** **H-238/3347-2S-6**	3200-6800	**110691**[*] **110694**[*a] ◆3	**99277-16** **99377-16**[c]	238 244	294 300	106	17 41 52 12	.000 .000	.502 .516
Rough idle, performance usage, w/manifold nitrous system, good mid and upper RPM HP, bracket racing, auto trans w/3500+ converter, 4200-4600 cruise RPM, 10.5 to 12.0 compression ratio advised. Good w/Roots supercharger, 15 lbs. maximum boost w/8.0 maximum compression ratio advised.	**H-300-2**	3200-7000	**114051**[*] ◆3	**99277-16** **99377-16**[c]	238 246	300 308	112	12 46 60 6	.000 .000	.480 .495

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

NOTE: 1988-99 Chevrolet 305 and 350 V-8 engines (and some 1987 350 V-8 engines) use a different configuration camshaft core than the 57-87 engines and cannot be interchanged.

NOTE: Camshafts having standard size journals with SFO firing order (1-8-7-3-6-5-4-2, or 4/7 swap) are available on special order. Contact Crane's Performance Consultants for details. .

NOTE: Camshafts for modified standard blocks, or Oldsmobile/ Dart blocks, having Big Block Chevrolet size (1.948") cam bearings are available on special order. Contact Crane's Performance Consultants for details.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
11309-1[d,e] **11310-1**[f]	**96802-16**[g] **99846-16**[e] **99838-16**[f] **96874-16**[f,h]	**99915-16**[i] **99944-16** **99969-16**[j]	**99820-16**[f]	**99097-1**[k] **99094-1**[l]	**11621-16**[m] **11630-16**[n]	**11975-1**[*o] **11984-1**[*p] **11977-1**[*q]	**11801C-16**[r] **10800C-16**[s]	**11744-16**[u]	**11750-16**[v] **10750-16**[w] **10751-16**[x]
11309-1[d,e] **11310-1**[f]	**96802-16**[g] **99846-16**[e] **99838-16**[f] **96874-16**[f,h]	**99915-16**[i] **99944-16** **99969-16**[j]	**99820-16**[f]	**99097-1**[k] **99094-1**[l]	**11621-16**[m] **11630-16**[n]	**11975-1**[*o] **11984-1**[*p] **11977-1**[*q]	**11801C-16**[r] **10800C-16**[s]	**11744-16**[u]	**11750-16**[v] **10750-16**[w] **10751-16**[x]
11309-1[d,e] **11310-1**[f]	**96802-16**[g] **99846-16**[e] **99838-16**[f] **96874-16**[f,h]	**99915-16**[i] **99944-16** **99969-16**[j]	**99820-16**[f]	**99097-1**[k] **99094-1**[l]	**11621-16**[m] **11630-16**[n]	**11975-1**[*o] **11984-1**[*p] **11977-1**[*q]	**11801C-16**[r] **10800C-16**[s]	**11744-16**[u]	**11750-16**[v] **10750-16**[w] **10751-16**[x]
11310-1[f]	**99838-16**[f] **96874-16**[f,h]	**99944-16** **99969-16**[j]	**99820-16**[f]	**99097-1**[k] **99094-1**[l]	**11621-16**[m] **11630-16**[n]	**11975-1**[*o] **11984-1**[*p] **11977-1**[*q]	**11801C-16**[r] **10800C-16**[s]	**11744-16**[u]	**11750-16**[v] **10750-16**[w] **10751-16**[x]
11309-1[d,e] **11310-1**[f]	**96802-16**[g] **99846-16**[e] **99838-16**[f] **96874-16**[f,h]	**99915-16**[i] **99944-16** **99969-16**[j]	**99820-16**[f]	**99097-1**[k] **99094-1**[l]	**11621-16**[m] **11630-16**[n]	**11975-1**[*o] **11984-1**[*p] **11977-1**[*q]	**11801C-16**[r] **10800C-16**[s]	**11744-16**[u]	**11750-16**[v] **10750-16**[w] **10751-16**[x]
11310-1[f]	**99838-16**[f] **96874-16**[f,h]	**99944-16** **99969-16**[j]	**99820-16**[f]	**99097-1**[k] **99094-1**[l]	**11621-16**[m] **11630-16**[n]	**11975-1**[*o] **11984-1**[*p] **11977-1**[*q]	**11801C-16**[r] **10800C-16**[s]	**11744-16**[u]	**11750-16**[v] **10750-16**[w] **10751-16**[x]
11310-1[f]	**99838-16**[f] **96874-16**[f,h]	**99944-16** **99969-16**[j]	**99820-16**[f]	**99097-1**[k] **99094-1**[l]	**11621-16**[m] **11630-16**[n]	**11975-1**[*o] **11984-1**[*p] **11977-1**[*q]	**11801C-16**[r] **10800C-16**[s]	**11744-16**[u]	**11750-16**[v] **10750-16**[w] **10751-16**[x]
11309-1[d,e] **11310-1**[f]	**96802-16**[g] **99846-16**[e] **99838-16**[f] **96874-16**[f,h]	**99915-16**[i] **99944-16** **99969-16**[j]	**99820-16**[f]	**99097-1**[k] **99094-1**[l]	**11621-16**[m] **11630-16**[n]	**11975-1**[*o] **11984-1**[*p] **11977-1**[*q]	**11801C-16**[r] **10800C-16**[s]	**11744-16**[u]	**11750-16**[v] **10750-16**[w] **10751-16**[x]
11309-1[d,e] **11310-1**[f]	**96802-16**[g] **99846-16**[e] **99838-16**[f] **96874-16**[f,h]	**99915-16**[i] **99944-16** **99969-16**[j]	**99820-16**[f]	**99097-1**[k] **99094-1**[l]	**11621-16**[m] **11630-16**[n]	**11975-1**[*o] **11984-1**[*p] **11977-1**[*q]	**11801C-16**[r] **10800C-16**[s]	**11744-16**[u]	**11750-16**[v] **10750-16**[w] **10751-16**[x]
11310-1[f]	**99838-16**[f] **96874-16**[f,h]	**99944-16** **99969-16**[j]	**99820-16**[f]	**99097-1**[k] **99094-1**[l]	**11621-16**[m] **11630-16**[n]	**11975-1**[*o] **11984-1**[*p] **11977-1**[*q]	**11801C-16**[r] **10800C-16**[s]	**11744-16**[u]	**11750-16**[v] **10750-16**[w] **10751-16**[x]

Section Continued

- **a** Cam and Lifter Kit, includes installation lubricants and Cam Sprocket Bolt Locking Plate.
- **c** Optional Hi Intensity Lifters, see page 272 for details.
- **d** Contains standard diameter valve springs and machined steel valve stem locks (**99095-1**), no machining required.
- **e** Standard diameter XHTCS tool steel valve springs for 1.800" assembly height.
- **f** Must machine cylinder heads.
- **g** Standard diameter chrome silicon valve springs for 1.750" assembly height.
- **h** Dual valve springs for +.100" length valves.
- **i** For standard diameter valve springs, no machining required.
- **j** Requires Crane Multi Fit valve locks.
- **k** Machined steel, heat treated.
- **l** Machined steel, heat treated, Multi Fit.
- **m** Heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
- **n** Heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
- **o** Performance steel billet gears and roller chain set.
- **p** Pro Series steel billet gears and roller chain set.
- **q** Pro Series steel billet gears and roller chain set with thrust bearing.
- **r** 1.5 ratio, 3/8" stud, extra long slot, Nitro Carb (not self-aligning).
- **s** 1.5 ratio, 3/8" stud, self-aligning, Nitro Carb.
- **u** Energizer, 1.5 ratio, 3/8" stud (not self-aligning).
- **v** 1.5 ratio, 3/8" stud (not self-aligning).
- **w** 1.5 ratio, 3/8" stud (not self-aligning), narrow body for center bolt valve covers.
- **x** 1.5 ratio, 3/8" stud, self-aligning narrow body for center bolt valve covers.

Chevrolet V-8 57-87

262-267 (4.4L)-283-302-305 (5.0L)-307-327-350 (5.7L)-400 cu. in. (also: 87-95 trucks w/standard [non-roller] hydraulic lifters)

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh		Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts											
Performance usage, good mid to upper RPM torque, bracket racing; Heavy, Pro ET, Super ET, etc., auto trans w/3500+ converter, oval track; Street Stock, Enduro, Hobby, etc., 3/8-1/2 mile, 10.5 to 12.0 compression ratio advised.	**H-244/3439-6**	3200-6800	**110711*** ◆3	**99277-16** **99377-16[c]**	244 244	300 300	106	20 44 52 12		.000 .000	.516 .516
Performance usage, good upper RPM torque and HP, bracket racing; Heavy, Pro ET, Super ET, etc., auto trans w/3500+ converter, 10.5 to 12.0 compression ratio advised.	**Saturday Night Special** **H-244/3439-2S-6**	3400-7000	**110741*** **110744*[a]** ◆3	**99277-16** **99377-16[c]**	244 252	300 308	106	20 44 56 16		.000 .000	.516 .525
Performance usage, good upper RPM torque and HP, bracket racing; Heavy, Pro ET, Super ET, etc., auto trans w/3500+ converter, oval track; Street Stock, Enduro, Hobby, etc., 3/8-1/2 mile, 10.5 to 12.0 compression ratio advised.	**Energizer** **302 H06**	3400-7000	**10011*** **100112*[b]** ◆3	**99277-16** **99377-16[c]**	246 246	302 302	106	21 45 53 13		.000 .000	.500 .500
Rough idle, performance usage, good w/manifold nitrous system, good upper RPM HP, bracket racing, auto trans w/3500+ converter, 11.25 to 13.0 compression ratio advised. Good w/Roots supercharger, 18 lbs. maximum boost w/8.0 maximum compression ratio advised.	**H-308-2**	3400-7200	**114571*** ◆3	**99277-16** **99377-16[c]**	246 254	308 316	112	16 50 64 10		.000 .000	.495 .510
Competition only, good upper RPM HP, 360+ cu.in., bracket racing w/light car; Pro ET, Super ET, etc., auto trans w/4000+ converter, 12.0 minimum compression ratio advised.	**H-252/3500-12**	3600-7200	**110541*** ◆3	**99277-16** **99377-16[c]**	252 252	308 308	112	19 53 63 9		.000 .000	.525 .525
Competition only, NHRA Stock Eliminator 255 HP 350 cu.in.	**654-655-08 T2 0A**	4200-7200	**110311*** ◆3	**99277-16** **99377-16[c]**	252 272	286 306	108	18 54 64 28		.000 .000	.390 .410
Competition only, good upper RPM HP, 360+ cu.in., bracket racing; Pro ET, Super ET, etc., auto trans w/4000+ converter, 11.5 minimum compression ratio advised.	**H-256/3500-8**	3800-7200	**114581*** ◆3	**99277-16** **99377-16[c]**	256 256	312 312	108	25 51 61 15		.000 .000	.525 .525

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

NOTE: 1988-99 Chevrolet 305 and 350 V-8 engines (and some 1987 350 V-8 engines) use a different configuration camshaft core than the 57-87 engines and cannot be interchanged.

NOTE: Camshafts having standard size journals with SFO firing order (1-8-7-3-6-5-4-2, or 4/7 swap) are available on special order. Contact Crane's Performance Consultants for details.

NOTE: Camshafts for modified standard blocks, or Oldsmobile/ Dart blocks, having Big Block Chevrolet size (1.948") cam bearings are available on special order. Contact Crane's Performance Consultants for details.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

CRANE Cams®

Custom Grind Cams Also Available – Call 866-388-5120 or go to cranecams.com for ordering information

CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
11310-1[d]	**99838-16[d]** **96874-16[g]**	**99944-16** **99969-16[i]**	**99820-16[d]**	**99097-1[k]** **99094-1[l]**	**11621-16[m]** **11630-16[n]**	**11975-1[*o]** **11984-1[*p]** **11977-1[*q]**	**11801C-16[r]** **10800C-16[s]**	**11744-16[u]**	**11750-16[v]** **10750-16[w]** **10751-16[x]**
11309-1[e,f] **11310-1[d]**	**96802-16[h]** **99846-16[f]** **99838-16[d]** **96874-16[g]**	**99915-16[j]** **99944-16** **99969-16[i]**	**99820-16[d]**	**99097-1[k]** **99094-1[l]**	**11621-16[m]** **11630-16[n]**	**11975-1[*o]** **11984-1[*p]** **11977-1[*q]**	**11801C-16[r]** **10800C-16[s]**	**11744-16[u]**	**11750-16[v]** **10750-16[w]** **10751-16[x]**
11309-1[e,f] **11310-1[d]**	**96802-16[h]** **99846-16[f]** **99838-16[d]** **96874-16[g]**	**99915-16[j]** **99944-16** **99969-16[i]**	**99820-16[d]**	**99097-1[k]** **99094-1[l]**	**11621-16[m]** **11630-16[n]**	**11975-1[*o]** **11984-1[*p]** **11977-1[*q]**	**11801C-16[r]** **10800C-16[s]**	**11744-16[u]**	**11750-16[v]** **10750-16[w]** **10751-16[x]**
11310-1[d]	**99838-16[d]** **96874-16[g]**	**99944-16** **99969-16[i]**	**99820-16[d]**	**99097-1[k]** **99094-1[l]**	**11621-16[m]** **11630-16[n]**	**11975-1[*o]** **11984-1[*p]** **11977-1[*q]**	**11801C-16[r]** **10800C-16[s]**	**11744-16[u]**	**11750-16[v]** **10750-16[w]** **10751-16[x]**
11310-1[d]	**99838-16[d]** **96874-16[g]**	**99944-16** **99969-16[i]**	**99820-16[d]**	**99097-1[k]** **99094-1[l]**	**11621-16[m]** **11630-16[n]**	**11975-1[*o]** **11984-1[*p]** **11977-1[*q]**	**11801C-16[r]** **10800C-16[s]**	**11744-16[u]**	**11750-16[v]** **10750-16[w]** **10751-16[x]**
11309-1[e,f]	**99846-16[f]**	**99915-16[j]**		**99097-1[k]**	**11630-16[n]**	**11975-1[*o]** **11984-1[*p]** **11977-1[*q]**	**11801C-16[r]** **10800C-16[s]**		
11310-1[d]	**99838-16[d]** **96874-16[g]**	**99944-16** **99969-16[i]**	**99820-16[d]**	**99097-1[k]** **99094-1[l]**	**11621-16[m]** **11630-16[n]**	**11975-1[*o]** **11984-1[*p]** **11977-1[*q]**	**11801C-16[r]** **10800C-16[s]**	**11744-16[u]**	**11750-16[v]** **10750-16[w]** **10751-16[x]**

a Cam and Lifter Kit, includes installation lubricants and Cam Sprocket Bolt Locking Plate
b Cam and Lifter Kit, includes assembly lubricants.
c Optional Hi intensity lifters, see page 272 for details.
d Must machine cylinder heads.
e Contains standard diameter valve springs and machined steel valve stem locks (**99095-1**), no machining required.
f Standard diameter XHTCS tool steel valve springs for 1.800" assembly height.
g Dual valve springs for +.100" length valves.
h Standard diameter chrome silicon valve springs for 1.750" assembly height.
i Requires Crane Multi Fit valve locks.
j For standard diameter valve springs, no machining required.
k Machined steel, heat treated.
l Machined steel, heat treated, Multi Fit.
m Heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
n Heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
o Performance steel billet gears and roller chain set.
p Pro Series steel billet gears and roller chain set.
q Pro Series steel billet gears and roller chain set with thrust bearing.
r 1.5 ratio, 3/8" stud, extra long slot, Nitro Carb (not self-aligning).
s 1.5 ratio, 3/8" stud, self-aligning, Nitro Carb.
u Energizer, 1.5 ratio, 3/8" stud (not self-aligning).
v 1.5 ratio, 3/8" stud (not self-aligning).
w 1.5 ratio, 3/8" stud (not self-aligning), narrow body for center bolt valve covers.
x 1.5 ratio, 3/8" stud, self-aligning narrow body for center bolt valve covers.

Chevrolet V-8 57-87

262-267 (4.4L)-283-302-305 (5.0L)-307-327-350 (5.7L)-400 cu. in. (also: 87-95 trucks w/standard [non-roller] hydraulic lifters)

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts — Retrofit										
Brute low end torque and HP, smooth idle, daily usage, towing, economy, also mild turbocharged, 2200-3000 cruise RPM, 8.0 to 9.5 compression ratio advised.	**HR-260-2-12 IG**	1000-5200	**119811**[*a] ◆3	**11532-16**[b]	204 214	260 270	112	(5) 29 44 (10)	.000 .000	.429 .452
Excellent low end and mid range torque and HP, good idle, daily usage, off road, performance and fuel efficiency, 2400-3200 cruise RPM, 8.75 to 10.5 compression ratio advised. Good w/small centrifugal or Roots supercharger, 8 lbs. maximum boost w/8.5 maximum compression ratio advised, .900" base circle for long stroke clearance.	**HR-210/325-2S-12.90 IG**	1400-5600	**119561**[*a] ◆3	**11532-16**[b]	210 218	272 280	112	(2) 32 46 (8)	.000 .000	.488 .509
Excellent low end and mid range torque and HP, good idle, daily usage, off road, performance and fuel efficiency, 2600-3400 cruise RPM, good w/small plate nitrous system, 8.75 to 10.5 compression ratio advised. Good w/ centrifugal or small Roots supercharger, 8 lbs. maximum boost w/8.5 maximum compression ratio advised.	**HR-276-2S-12 IG**	1600-5800	**119821**[*a] ◆3	**11532-16**[b]	214 222	276 284	112	0 34 48 (6)	.000 .000	.488 .509
Excellent low end and mid range torque and HP, good idle, daily usage, off road, performance and fuel efficiency, 2600-3400 cruise RPM, good w/small plate nitrous system, 8.75 to 10.5 compression ratio advised. Good w/ centrifugal or small Roots supercharger, 8 lbs. maximum boost w/8.5 maximum compression ratio advised, .900" base circle for long stroke clearance.	**HR-216/339-2S-12.90 IG**	1600-5800	**119671**[*a] ◆3	**11532-16**[b]	216 224	284 292	112	1 35 49 (5)	.000 .000	.509 .528
Good mid range torque and HP, fair idle, moderate performance usage, mild bracket racing, auto trans w/2500+ converter, good w/plate or manifold nitrous system, 3000-3800 cruise RPM, 9.5 to 10.75 compression ratio advised. Good w/centrifugal or Roots supercharger, 10 lbs. max. boost w/8.0 max. compression ratio advised.	**HR-284-2S-12 IG**	2000-6200	**119831**[*a] ◆3	**11532-16**[b]	222 230	284 292	112	4 38 52 (2)	.000 .000	.509 .528
Good mid range torque and HP, fair idle, moderate performance usage, mild bracket racing, auto trans w/2500+ converter, good w/plate or manifold nitrous system, 3000-3800 cruise RPM, 9.5 to 10.75 compression ratio advised. Good w/centrifugal or Roots supercharger, 10 lbs. maximum boost w/8.0 maximum compression ratio advised, .900" base circle for long stroke clearance.	**HR-222/345-2S-12.90 IG**	2000-6200	**119701**[*a] ◆3	**11532-16**[b]	222 230	288 296	112	4 38 52 (2)	.000 .000	.518 .539
Good mid range torque and HP, fair idle, moderate performance usage, serious off road, mild bracket racing w/ heavy car, auto trans w/2500+ converter, 3000-3800 cruise RPM, 9.5 to 10.75 compression ratio advised.	**HR-230/352-2S1-8 IG**	2400-6400	**119571**[*a] ◆3	**11532-16**[b]	230 238	292 300	108	12 38 52 6	.000 .000	.528 .548
Good mid range torque and HP, fair idle, performance usage, 3600-4400 cruise RPM, good with manifold nitrous system, 10.0 to 11.5 compression ratio advised. Good w/Roots supercharger, 15 lbs. maximum boost w/8.0 maximum compression ratio advised, .900" base circle for long stroke clearance.	**HR-230/359-2S-12.90 IG**	2600-6600	**119661**[*a] ◆3	**11532-16**[b]	230 238	292 300	112	8 42 56 2	.000 .000	.539 .558
Good mid range torque and HP, fair idle, performance usage, mild bracket racing, auto trans w/3000+ converter, 3800-4600 cruise RPM, good with manifold nitrous system, 10.0 to 11.5 compression ratio advised. Good w/ Roots supercharger, 15 lbs. maximum boost, w/8.0 maximum compression ratio advised.	**HR-296-2S-12 IG**	2800-6800	**119841**[*a] ◆3	**11532-16**[b]	234 242	296 304	112	10 44 58 4	.000 .000	.539 .558

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT NOTE: Crane Hydraulic Roller Cams offer tremendous power, torque and RPM potential. Due to their RPM capability, and to insure that correct components are used, the appropriate CamPonent Kit is recommended. Each Crane CamPonent Kit contains the valve train components needed for maximum performance.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

NOTE: 1988-99 Chevrolet 305 and 350 V-8 engines (and some 1987 350 V-8 engines) use a different configuration camshaft core than the 57-87 engines and cannot be interchanged.

NOTE: When using 55-56, 265 cu.in. blocks, late model cam bearings must be installed.

NOTE: Camshafts having standard size journals with SFO firing order (1-8-7-3-6-5-4-2, or 4/7 swap) are available on special order. Contact Crane's Performance Consultants for details. .

NOTE: Camshafts for modified standard blocks, or Oldsmobile/ Dart blocks, having Big Block Chevrolet size (1.948") cam bearings are available on special order. Contact Crane's Performance Consultants for details.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

CRANE Cams®

Custom Grind Cams Also Available – Call 866-388-5120 or go to cranecams.com for ordering information

CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
11307-1[c,d]	**99838-16**[d] **96802-16**[e] **144846-16**[x]	**99944-16** **99915-16**[g]	**99820-16**[d]	**99097-1**[i]	**11628-16**[k] **95621-16**[l]	**11975-1**[*m] **11984-1**[*n] **11977-1**[*o]	**11801-16**[p] **11801C-16**[q] **10800C-16**[r]	**11744-16**[t]	**11750-16**[u] **10750-16**[v] **10751-16**[w]
11307-1[c,d]	**99838-16**[d] **96802-16**[e] **144846-16**[x]	**99944-16** **99915-16**[g]	**99820-16**[d]	**99097-1**[i]	**11628-16**[k] **95621-16**[l]	**11975-1**[*m] **11984-1**[*n] **11977-1**[*o]	**11801-16**[p] **11801C-16**[q] **10800C-16**[r]	**11744-16**[t]	**11750-16**[u] **10750-16**[v] **10751-16**[w]
11307-1[c,d]	**99838-16**[d] **96802-16**[e] **144846-16**[x]	**99944-16** **99915-16**[g]	**99820-16**[d]	**99097-1**[i]	**11628-16**[k] **95621-16**[l]	**11975-1**[*m] **11984-1**[*n] **11977-1**[*o]	**11801-16**[p] **11801C-16**[q] **10800C-16**[r]	**11744-16**[t]	**11750-16**[u] **10750-16**[v] **10751-16**[w]
11307-1[c,d]	**99838-16**[d] **96802-16**[e] **144846-16**[x]	**99944-16** **99915-16**[g]	**99820-16**[d]	**99097-1**[i]	**11628-16**[k] **95621-16**[l]	**11975-1**[*m] **11984-1**[*n] **11977-1**[*o]	**11801-16**[p] **11801C-16**[q] **10800C-16**[r]	**11744-16**[t]	**11750-16**[u] **10750-16**[v] **10751-16**[w]
11307-1[c,d]	**99838-16**[d] **96877-16**[d,f] **144846-16**[x]	**99944-16** **99969-16**[h]	**99820-16**[d]	**99097-1**[i] **99088-1**[j]	**11628-16**[k] **95621-16**[l]	**11975-1**[*m] **11984-1**[*n] **11977-1**[*o]	**11801-16**[p] **11801C-16**[q]	**11744-16**[t]	**11750-16**[u] **10750-16**[v] **10751-16**[w]
11307-1[c,d]	**99838-16**[d] **96877-16**[d,f] **144846-16**[x]	**99944-16** **99969-16**[h]	**99820-16**[d]	**99097-1**[i] **99088-1**[j]	**11628-16**[k] **95621-16**[l]	**11975-1**[*m] **11984-1**[*n] **11977-1**[*o]	**11801-16**[p] **11801C-16**[q]	**11744-16**[t]	**11750-16**[u] **10750-16**[v] **10751-16**[w]
11307-1[c,d]	**99838-16**[d] **96877-16**[d,f] **144846-16**[x]	**99944-16** **99969-16**[h]	**99820-16**[d]	**99097-1**[i] **99088-1**[j]	**11628-16**[k] **95621-16**[l]	**11975-1**[*m] **11984-1**[*n] **11977-1**[*o]	**11801-16**[p] **11801C-16**[q]	**11744-16**[t]	**11750-16**[u] **10750-16**[v] **10751-16**[w]
11307-1[c,d]	**99838-16**[d] **96877-16**[d,f] **144846-16**[x]	**99944-16** **99969-16**[h]	**99820-16**[d]	**99097-1**[i] **99088-1**[j]	**11628-16**[k] **95621-16**[l]	**11975-1**[*m] **11984-1**[*n] **11977-1**[*o]	**11801-16**[p] **11801C-16**[q]	**11744-16**[t]	**11750-16**[u] **10750-16**[v] **10751-16**[w]

Section Continued

a Requires cam button spacer, aluminum-bronze distributor drive gear not required. For engines equipped with mechanical fuel pumps, fuel pump pushrod **11985-1** is highly recommended to prevent fuel pump lobe wear.
b Vertical locking bar hydraulic roller lifters, no machining required.
c CamPonent Kit contents:
Hydraulic Roller Lifters, set of 16 (**11532-16**)
Pushrods, Special Length, set of 16 (**11628-16**)
Valve Springs, set of 16 (**99838-16**)
Valve Spring Retainers, set of 16 (**99944-16**)
Machined Steel Valve Stem Locks, set of 32 (**99097-1**)
Valve Stem Seals, set of 16 (**99820-16**)
Fuel Pump Pushrod (**11985-1**)
Cam Sprocket Bolt Locking Plate Kit (**99168-1**)
Needle Bearing Cam Button Spacer (**99164-1**)
d Must machine cylinder heads.
e Standard diameter chrome silicon valve springs for 1.750" assembly height.
f For +.100" long valves.
g For standard diameter valve springs.
h Requires Crane Multi Fit valve locks.
i Machined steel, heat treated.
j Machined steel, heat treated, Multi Fit.
k Heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
l Pro Series one-piece, for use with or without pushrod guideplate cylinder heads.
m Performance steel billet gears and roller chain set.
n Pro Series steel billet gears and roller chain set.
o Pro Series steel billet gears and roller chain set with thrust bearing.
p 1.5 ratio, 3/8" stud, extra long slot (not self-aligning).
q 1.5 ratio, 3/8" stud, extra long slot, Nitro Carb (not self-aligning).
r 1.5 ratio, 3/8" stud, self-aligning, Nitro Carb.
t Energizer, 1.5 ratio, 3/8" stud (not self-aligning).
u 1.5 ratio, 3/8" stud (not self-aligning). Valve Train Stabilizer available, see page 343.
v 1.5 ratio, 3/8" stud (not self-aligning), narrow body for center bolt valve covers.
w 1.5 ratio, 3/8" stud, self-aligning narrow body for center bolt valve covers.
x Standard diameter PAC Enhanced valve springs for 1.750" assembly height.

Chevrolet V-8 57-87

262-267 (4.4L)-283-302-305 (5.0L)-307-327-350 (5.7L)-400 cu. in. (also: 87-95 trucks w/standard [non-roller] hydraulic lifters)

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts — Retrofit										
Good mid range torque and HP, fair idle, performance usage, mild bracket racing, auto trans w/3000+ converter, 3800-4600 cruise RPM, good with manifold nitrous system, 10.0 to 11.5 compression ratio advised. Good w/ Roots supercharger, 15 lbs. maximum boost, w/8.0 maximum compression ratio advised, .900" base circle for long stroke clearance.	**HR-234/365-2S-12.90 IG**	2800-6800	**119691**[*a] ◆3	**11532-16**[b]	234 242	296 304	112	10 44 58 4	.000 .000	.548 .558
Good mid to upper RPM torque and HP, fair idle, performance usage, mild bracket racing, auto trans w/3000+ converter, 3800-4600 cruise RPM, good with manifold nitrous system, 10.5 to 112.0 compression ratio advised. Good w/Roots supercharger, 18 lbs. maximum boost, w/8.0 maximum compression ratio advised, .900" base circle for long stroke clearance.	**HR-238/372-2S2-10.90 IG**	3000-6800	**119581**[*a] ◆3	**11532-16**[b]	238 242	300 304	110	14 44 56 6	.000 .000	.558 .558
Good upper RPM torque and HP, rough idle, performance usage, bracket racing, auto trans w/3500+ converter, 4200-5000 cruise RPM, 10.5 to 12.0 compression ratio advised, 370+ cu.in. Also mild supercharged and/or nitrous, .860" base circle for long stroke clearance.	**HR-306-2S-10.86 IG**	3200-7000	**119651**[*a] ◆3	**11532-16**[b]	240 248	306 314	110	15 45 59 9	.000 .000	.558 .558
Rough idle, performance usage, good w/large nitrous system, good upper RPM torque and HP, 370+ cu.in., bracket racing, auto trans w/3500+ converter, 4200-5000 cruise RPM, 10.5 to 12.0 compression ratio advised, .860" base circle for long stroke clearance. Good w/ Roots supercharger, 18 lbs. maximum boost w/8.0 maximum compression ratio advised.	**HR-240/372-2S1-14.86 IG**	3400-7200	**119681**[*a] ◆3	**11532-16**[b]	240 248	306 314	114	11 49 63 5	.000 .000	.558 .558
Rough idle, performance usage, good w/large nitrous system, good upper RPM torque and HP, 370+ cu.in., bracket racing, auto trans w/3500+ converter, 10.5 to 12.5 compression ratio advised, .900" base circle for long stroke clearance. Good w/ Roots supercharger, 20 lbs. max. boost w/8.0 max. compression ratio advised.	**HR-242/372-2S-12.90 IG**	3600-7200	**119591**[*a] ◆3	**11532-16**[b]	242 250	304 312	112	14 48 62 8	.000 .000	.558 .558
Rough idle, performance usage, good w/large nitrous system, good upper RPM torque and HP, 380+ cu.in., bracket racing, auto trans w/4000+ converter, 11.0 to 12.5 compression ratio advised. Good w/ Roots supercharger, 22 lbs. maximum boost w/8.0 maximum compression ratio advised.	**HR-246/372-2S-14 IG**	3800-7200	**119601**[*a] ◆3	**11532-16**[b]	246 254	308 316	114	14 52 66 8	.000 .000	.558 .558
Competition only, good upper RPM torque and HP, 370+ cu.in., bracket racing, auto trans w/4000+ converter, 11.5 to 13.0 compression ratio advised, .860" base circle for long stroke clearance.	**HR-250/372-2S-10.86 IG**	4000-7200	**119611**[*a] ◆3	**11532-16**[b]	250 258	316 324	110	20 50 64 14	.000 .000	.558 .558
Competition only, good upper RPM torque and HP, 370+ cu.in., bracket racing, auto trans w/race converter, 12.0 minimum compression ratio advised.	**HR-252/400-2S-8 IG**	4200-7200	**119711**[*a] ◆3	**11532-16**[b]	252 256	322 326	108	22.5 49.5 60.5 15.5	.000 .000	.600 .600
Competition only, good upper RPM HP, 380+ cu.in., bracket racing, auto trans w/race converter, good w/large nitrous system, 12.5 minimum compression ratio advised.	**HR-258/372-2S-12.86 IG**	4400-7200	**119721**[*a] ◆3	**11532-16**[b]	258 266	320 328	112	22 56 70 16	.000 .000	.558 .558

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT NOTE: Crane Hydraulic Roller Cams offer tremendous power, torque and RPM potential. Due to their RPM capability, and to insure that correct components are used, the appropriate CamPonent Kit is recommended. Each Crane CamPonent Kit contains the valve train components needed for maximum performance.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

NOTE: 1988-99 Chevrolet 305 and 350 V-8 engines (and some 1987 350 V-8 engines) use a different configuration camshaft core than the 57-87 engines and cannot be interchanged.

NOTE: When using 55-56, 265 cu.in. blocks, late model cam bearings must be installed.

NOTE: Camshafts having standard size journals with SFO firing order (1-8-7-3-6-5-4-2, or 4/7 swap) are available on special order. Contact Crane's Performance Consultants for details. .

NOTE: Camshafts for modified standard blocks, or Oldsmobile/ Dart blocks, having Big Block Chevrolet size (1.948") cam bearings are available on special order. Contact Crane's Performance Consultants for details.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

CRANE Cams®

Custom Grind Cams Also Available – Call 866-388-5120 or go to cranecams.com for ordering information

CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
11307-1[c,d]	**99838-16**[d] **96877-16**[d,e] **144846-16**[u]	**99944-16** **99969-16**[f]	**99820-16**[d]	**99097-1**[g] **99088-1**[h]	**11628-16**[i] **95621-16**[j]	**11975-1**[*k] **11984-1**[*l] **11977-1**[*m]	**11801-16**[n] **11801C-16**[o]	**11744-16**[q]	**11750-16**[v] **10750-16**[s] **10751-16**[t]
11307-1[c,d]	**99838-16**[d] **96877-16**[d,e] **144846-16**[u]	**99944-16** **99969-16**[f]	**99820-16**[d]	**99097-1**[g] **99088-1**[h]	**11628-16**[i] **95621-16**[j]	**11975-1**[*k] **11984-1**[*l] **11977-1**[*m]	**11801-16**[n] **11801C-16**[o]	**11744-16**[q]	**11750-16**[v] **10750-16**[s] **10751-16**[t]
11307-1[c,d]	**99838-16**[d] **96877-16**[d,e] **144846-16**[u]	**99944-16** **99969-16**[f]	**99820-16**[d]	**99097-1**[g] **99088-1**[h]	**11628-16**[i] **95621-16**[j]	**11975-1**[*k] **11984-1**[*l] **11977-1**[*m]	**11801-16**[n] **11801C-16**[o]	**11744-16**[q]	**11750-16**[v] **10750-16**[s] **10751-16**[t]
11307-1[c,d]	**99838-16**[d] **96877-16**[d,e] **144846-16**[u]	**99944-16** **99969-16**[f]	**99820-16**[d]	**99097-1**[g] **99088-1**[h]	**11628-16**[i] **95621-16**[j]	**11975-1**[*k] **11984-1**[*l] **11977-1**[*m]	**11801-16**[n] **11801C-16**[o]	**11744-16**[q]	**11750-16**[v] **10750-16**[s] **10751-16**[t]
11307-1[c,d]	**99838-16**[d] **96877-16**[d,e] **144846-16**[u]	**99944-16** **99969-16**[f]	**99820-16**[d]	**99097-1**[g] **99088-1**[h]	**11628-16**[i] **95621-16**[j]	**11975-1**[*k] **11984-1**[*l] **11977-1**[*m]		**11744-16**[q]	**11750-16**[v] **10750-16**[s] **10751-16**[t]
11307-1[c,d]	**99838-16**[d] **96877-16**[d,e] **144846-16**[u]	**99944-16** **99969-16**[f]	**99820-16**[d]	**99097-1**[g] **99088-1**[h]	**11628-16**[i] **95621-16**[j]	**11975-1**[*k] **11984-1**[*l] **11977-1**[*m]		**11744-16**[q]	**11750-16**[v] **10750-16**[s] **10751-16**[t]
11307-1[c,d]	**99838-16**[d] **96877-16**[d,e] **144846-16**[u]	**99944-16** **99969-16**[f]	**99820-16**[d]	**99097-1**[g] **99088-1**[h]	**11628-16**[i] **95621-16**[j]	**11975-1**[*k] **11984-1**[*l] **11977-1**[*m]		**11744-16**[q]	**11750-16**[v] **10750-16**[s] **10751-16**[t]
11307-1[c,d]	**99838-16**[d] **96877-16**[d,e] **144846-16**[u]	**99944-16** **99969-16**[f]	**99820-16**[d]	**99097-1**[g] **99088-1**[h]	**11628-16**[i] **95621-16**[j]	**11975-1**[*k] **11984-1**[*l] **11977-1**[*m]		**11744-16**[q]	**11750-16**[v] **10750-16**[s] **10751-16**[t]
11307-1[c,d]	**99838-16**[d] **96877-16**[d,e] **144846-16**[u]	**99944-16** **99969-16**[f]	**99820-16**[d]	**99097-1**[g] **99088-1**[h]	**11628-16**[i] **95621-16**[j]	**11975-1**[*k] **11984-1**[*l] **11977-1**[*m]		**11744-16**[q]	**11750-16**[v] **10750-16**[s] **10751-16**[t]

a Requires cam button spacer, aluminum-bronze distributor drive gear not required. For engines equipped with mechanical fuel pumps, fuel pump pushrod **11985-1** is highly recommended to prevent fuel pump lobe wear.
b Vertical locking bar hydraulic roller lifters, no machining required.
c CamPonent Kit contents:
Hydraulic Roller Lifters, set of 16 (**11532-16**)
Pushrods, Special Length, set of 16 (**11628-16**)
Valve Springs, set of 16 (**99838-16**)
Valve Spring Retainers, set of 16 (**99944-16**)
Machined Steel Valve Stem Locks, set of 32 (**99097-1**)
Valve Stem Seals, set of 16 (**99820-16**)
Fuel Pump Pushrod (**11985-1**)
Cam Sprocket Bolt Locking Plate Kit (**99168-1**)
Needle Bearing Cam Button Spacer (**99164-1**)
d Must machine cylinder heads.
e For +.100" long valves.
f Requires Crane Multi Fit valve locks.
g Machined steel, heat treated.
h Machined steel, heat treated, Multi Fit.
i Heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
j Pro Series one-piece, for use with or without pushrod guideplate cylinder heads.
k Performance steel billet gears and roller chain set.
l Pro Series steel billet gears and roller chain set.
m Pro Series steel billet gears and roller chain set with thrust bearing.
n 1.5 ratio, 3/8" stud, extra long slot (not self-aligning).
o 1.5 ratio, 3/8" stud, extra long slot, Nitro Carb (not self-aligning).
q Energizer, 1.5 ratio, 3/8" stud (not self-aligning).
r 1.5 ratio, 3/8" stud (not self-aligning). Valve Train Stabilizer available, see page 343.
s 1.5 ratio, 3/8" stud (not self-aligning), narrow body for center bolt valve covers.
t 1.5 ratio, 3/8" stud, self-aligning narrow body for center bolt valve covers.
u Standard diameter PAC Enhanced valve springs for 1.750" assembly height.

Chevrolet V-8 57-87

262-267 (4.4L)-283-302-305 (5.0L)-307-327-350 (5.7L)-400 cu. in. (also: 87-95 trucks w/standard [non-roller] hydraulic lifters)

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Lifter Camshafts										
Replacement for factory 340 HP 327 cu.in. Duntov camshaft.	**BluePrinted 3736097**	2000-5600	**110901** ❶	**99250-16**	227 230	260 268	110.5	3.5 43.5 46 4	.012 .018	.393 .399
Excellent low end and mid range torque and HP, fair idle, moderate performance usage, mild bracket racing, auto trans w/2500+ converter, 2600-3000 cruise RPM, limited oval track, 8.75 to 10.0 compression ratio advised.	**F-228/3067-2-6**	2400-6000	**110911*** ❸	**99250-16**	228 238	290 300	106	12 36 49 9	.022 .022	.460 .480
Good low end and mid range torque and HP, good idle, daily performance usage, auto trans w/stock to 2500 converter, 2600-3000 cruise RPM, 9.25 to 10.75 compression ratio advised.	**F-228/3067-2-10**	2600-6200	**110931*** ❸	**99250-16**	228 238	290 300	110	9 39 54 4	.022 .022	.460 .480
Good mid range to upper RPM torque and HP, fair idle, moderate performance usage, 3400-3800 cruise RPM, 9.5 to 11.0 compression ratio advised. Good w/centrifugal or Roots supercharger, 8 lbs. maximum boost w/8.5 maximum compression ratio advised.	**F-238/3200-14**	3000-6600	**110941*** ❸	**99250-16**	238 238	278 278	114	10 48 58 0	.022 .022	.480 .480
Good low end and mid range torque and HP, fair idle, moderate performance usage, bracket racing, good w/plate or manifold nitrous system, 3400-3800 cruise RPM, 10.0 to 11.5 compression ratio advised. Good w/centrifugal or Roots supercharger, 10 lbs. maximum boost w/8.5 maximum compression ratio advised.	**F-278-2**	3000-6800	**113841*** ❸	**99250-16**	238 248	278 288	114	10 48 63 5	.022 .022	.480 .500
Replacement for factory 330 HP 350 cu.in. camshaft.	**BluePrinted 3972182**	2800-6600	**110951** ❸	**99250-16**	242 254		116	11 51 69 5	.020 .025	.459 .485
Good mid range torque, performance usage, bracket racing; Heavy, Pro ET, Super ET, etc., auto trans w/3000+ converter, oval track; Late Model, Sportsman, I.M.C.A., etc., 1/4-3/8 mile, 10.5 to 12.0 compression ratio advised.	**Saturday Night Special F-244/3454-2S-6**	3200-6800	**110921*** **110924*[a]** ❸	**99250-16**	244 252	280 288	106	19 45 55 17	.026 .026	.518 .536
Good mid range torque and HP, rough idle, moderate performance usage, 3600-4000 cruise RPM, good with plate or small manifold nitrous system, 10.5 to 12.0 compression ratio advised. Also good for mild supercharged.	**F-280-2**	3200-7000	**114681*** ❸	**99250-16**	244 252	280 288	112	14 50 62 10	.026 .026	.518 .536
Performance usage, bracket racing; Heavy, Pro ET, Super ET, etc., auto trans w/3000+ converter, oval track; Late Model, Sportsman, I.M.C.A., etc., 1/4-3/8 mile, 11.0 to 12.5 compression ratio advised.	**F-248/3334-6**	3400-7000	**110961*** ❸	**99250-16**	248 248	288 288	106	22 46 54 14	.022 .022	.500 .500

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Self-aligning rocker arms cannot be used with mechanical lifter camshafts.

NOTE: When using 55-56, 265 cu.in. blocks, late model cam bearings must be installed.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

NOTE: 1988-99 Chevrolet 305 and 350 V-8 engines (and some 1987 350 V-8 engines) use a different configuration camshaft core than the 57-87 engines and cannot be interchanged.

NOTE: Camshafts having standard size journals with SFO firing order (1-8-7-3-6-5-4-2, or 4/7 swap) are available on special order. Contact Crane's Performance Consultants for details.

NOTE: Camshafts for modified standard blocks, or Oldsmobile/Dart blocks, having Big Block Chevrolet size (1.948") cam bearings are available on special order. Contact Crane's Performance Consultants for details.

NOTE: Camshafts specifically engineered for engines that have .875" or .904" diameter lifters are available on special order. Contact Crane's Performance Consultants for details.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	ALUMINUM ROCKERS — ENERGIZER	ALUMINUM ROCKERS — GOLD RACE
11308-1[b,c]	**99848-16[b,c]**	**99915-16[h]**		**99097-1[i]** **99095-1[j]**	**11621-16[k]** **11630-16[l]** **95636-16[m]**	**11975-1*[n]** **11984-1*[o]** **11977-1*[p]**	**11801-16[q]**		**11750-16[t]** **10750-16[u]**
11309-1[d,e]	**99846-16[e]** **96877-16[f]**	**99915-16[h]** **99943-16**	**99820-16[f]**	**99097-1[i]** **99095-1[j]**	**11621-16[k]** **11630-16[l]** **95636-16[m]**	**11975-1*[n]** **11984-1*[o]** **11977-1*[p]**	**11801-16[q]**		**11750-16[t]** **10750-16[u]**
11309-1[d,e]	**99846-16[e]** **96877-16[f]**	**99915-16[h]** **99943-16**	**99820-16[f]**	**99097-1[i]** **99095-1[j]**	**11621-16[k]** **11630-16[l]** **95636-16[m]**	**11975-1*[n]** **11984-1*[o]** **11977-1*[p]**	**11801-16[q]**		**11750-16[t]** **10750-16[u]**
	96877-16[f]	**99943-16**	**99820-16[f]**	**99097-1[i]** **99095-1[j]**	**11621-16[k]** **11630-16[l]** **95636-16[m]**	**11975-1*[n]** **11984-1*[o]** **11977-1*[p]**	**11801-16[q]**		**11750-16[t]** **10750-16[u]**
	96877-16[f]	**99943-16**	**99820-16[f]**	**99097-1[i]** **99095-1[j]**	**11621-16[k]** **11630-16[l]** **95636-16[m]**	**11975-1*[n]** **11984-1*[o]** **11977-1*[p]**	**11801-16[q]**		**11750-16[t]** **10750-16[u]**
	96877-16[f]	**99943-16**	**99820-16[f]**	**99097-1[i]** **99095-1[j]**	**11621-16[k]** **11630-16[l]** **95636-16[m]**	**11975-1*[n]** **11984-1*[o]** **11977-1*[p]**	**11801-16[q]**		**11750-16[t]** **10750-16[u]**
11309-1[d,e]	**99846-16[e]** **96877-16[f]**	**99915-16[h]** **99943-16**	**99820-16[f]**	**99097-1[i]** **99095-1[j]**	**11621-16[k]** **11630-16[l]** **95636-16[m]**	**11975-1*[n]** **11984-1*[o]** **11977-1*[p]**	**11801-16[q]** **11801C-16[r]**		**11750-16[t]** **10750-16[u]**
	96877-16[f]	**99943-16**	**99820-16[f]**	**99097-1[i]** **99095-1[j]**	**11621-16[k]** **11630-16[l]** **95636-16[m]**	**11975-1*[n]** **11984-1*[o]** **11977-1*[p]**	**11801-16[q]** **11801C-16[r]**		**11750-16[t]** **10750-16[u]**
11309-1[d,e]	**99846-16[e]** **96877-16[f]**	**99915-16[h]** **99943-16**	**99820-16[f]**	**99097-1[i]** **99095-1[j]**	**11621-16[k]** **11630-16[l]** **95636-16[m]**	**11975-1*[n]** **11984-1*[o]** **11977-1*[p]**	**11801-16[q]** **11801C-16[r]**		**11750-16[t]** **10750-16[u]**

Section Continued

a Cam and Lifter Kit, includes installation lubricants and Cam Sprocket Bolt Locking Plate
b Contains standard diameter valve springs, no machining required.
c For 1967-87 with 1.700" assembly height.
d Contains standard diameter valve springs and machined steel valve stem locks (**99095-1**), no machining required.
e Standard diameter XHTCS tool steel valve springs for 1.800" assembly height.
f Must machine cylinder heads.
g Standard diameter chrome silicon valve springs for 1.750" assembly height.
h For standard diameter valve springs, no machining required.
i Machined steel, heat treated.
j Machined steel, heat treated, +.050" assembly height.
k Heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
l Heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
m Pro Series one-piece.
n Performance steel billet gears and roller chain set.
o Pro Series steel billet gears and roller chain set.
p Pro Series steel billet gears and roller chain set with thrust bearing.
q 1.5 ratio, 3/8" stud, extra long slot (not self-aligning).
r 1.5 ratio, 3/8" stud, extra long slot, Nitro Carb (not self-aligning).
t 1.5 ratio, 3/8" stud (not self-aligning). Valve Train Stabilizer available, see page 343.
u 1.5 ratio, 3/8" stud (not self-aligning), narrow body for center bolt valve covers.

Chevrolet V-8 57-87

262-267 (4.4L)-283-302-305 (5.0L)-307-327-350 (5.7L)-400 cu. in. (also: 87-95 trucks w/standard [non-roller] hydraulic lifters)

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Lifter Camshafts										
Good mid range torque and HP, rough idle, moderate performance usage, good w/manifold nitrous system, bracket racing, auto trans w/3000+ converter, 3800-4200 cruise RPM, 11.0 to 12.5 compression ratio advised. Good w/Roots supercharger, 15 lbs. maximum boost w/8.0 maximum compression ratio advised.	**F-288-2**	3400-7200	**113861*** ◆3	**99250-16**	248 258	288 298	114	15 53 68 10	.022 .022	.500 .520
Performance usage, good mid and upper RPM torque and HP, bracket racing; Pro, Pro ET, Super ET, etc., auto trans w/race converter, oval track; Late Model, Sportsman, I.M.C.A., etc., 3/8-1/2 mile, 11.0 to 12.5 compression ratio advised.	**285-295-06**	3600-7000	**12003*** ◆3	**99250-16**	250 260	285 295	106	21 49 58 22	.026 .028	.533 .555
Performance usage, good mid range torque and HP, bracket racing; Pro, Pro ET, Super ET, etc., auto trans w/race converter, oval track; Late Model, Sportsman, I.M.C.A., etc., 3/8-1/2 mile, 11.5 to 12.5 compression ratio advised.	**Saturday Night Special F-252/3574-2S-6**	3800-7200	**110981*** **110984*a** ◆3	**99250-16**	252 260	288 296	106	22 50 58 22	.026 .026	.536 .554
Good mid range HP, rough idle, performance usage, 4000-4400 cruise RPM, good w/manifold nitrous system, 11.5 to 12.5 compression ratio advised. Good w/ Roots supercharger, 18 lbs. maximum boost w/8.0 maximum compression ratio advised.	**F-290-2**	3800-7600	**114691*** ◆3	**99250-16**	252 260	290 298	112	17 55 65 15	.026 .026	.536 .554
Replacement for factory 290 HP 302 cu.in. Z-28 camshaft.	**BluePrinted 3849346**	4000-7000	**967251** ◆1	**99250-16**	254 254		114	15 59 63 11	.030 .030	.485 .485
Competition only, serious flat lifter restricted oval track; Late Model, Sportsman, etc., 3/8-1/2 mile, intended for 1.8 intake and 1.7 exhaust ratio rocker arms, 11.5 to 12.5 compression ratio advised.	**F-256/340-2S-8**	4000-7800	**110971*** ◆3	**99250-16**	256 260	288 292	108	26 50 64 16	.018 .020	.612 .578
Performance usage, good mid range torque and HP, bracket racing; Pro, Pro ET, Super ET, etc., auto trans w/race converter, oval track; Late Model, Sportsman, I.M.C.A., etc., 3/8-1/2 mile, 11.5 to 12.5 compression ratio advised.	**Saturday Night Special F-256/3634-2S-5**	4000-7600	**111411*** **111414*a** ◆3	**99250-16**	256 264	292 300	105	25 51 59 25	.026 .026	.545 .563
Replacement for factory Off Road Special camshaft.	**BluePrinted 3927140**	4200-7200	**968821** ◆1	**99250-16**	257 269		112	20.5 56.5 70.5 18.5	.024 .026	.493 .512
Performance usage, good mid and upper RPM HP, bracket racing; Pro, Super Pro, Hot Rod, Super ET, etc., auto trans w/race converter, oval track; Late Model, Sportsman, I.M.C.A., etc., 3/8-1/2 mile, 11.5 minimum compression ratio advised.	**F-260/3694-2S-6**	4400-7600	**111431*** ◆3	**99250-16**	260 268	296 304	106	26 54 62 26	.026 .026	.554 .572

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Self-aligning rocker arms cannot be used with mechanical lifter camshafts.

NOTE: When using 55-56, 265 cu.in. blocks, late model cam bearings must be installed.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

NOTE: 1988-99 Chevrolet 305 and 350 V-8 engines (and some 1987 350 V-8 engines) use a different configuration camshaft core than the 57-87 engines and cannot be interchanged.

NOTE: Camshafts having standard size journals with SFO firing order (1-8-7-3-6-5-4-2, or 4/7 swap) are available on special order. Contact Crane's Performance Consultants for details.

NOTE: Camshafts for modified standard blocks, or Oldsmobile/ Dart blocks, having Big Block Chevrolet size (1.948") cam bearings are available on special order. Contact Crane's Performance Consultants for details.

NOTE: Camshafts specifically engineered for engines that have .875" or .904" diameter lifters are available on special order. Contact Crane's Performance Consultants for details.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	ALUMINUM ROCKERS — ENERGIZER	ALUMINUM ROCKERS — GOLD RACE
	96877-16[f]	99943-16	99820-16[f]	99097-1[i] 99095-1[j]	11621-16[k] 11630-16[l] 95636-16[m]	11975-1*[n] 11984-1*[o] 11977-1*[p]	11801-16[q] 11801C-16[r]		11750-16[t] 10750-16[u]
11309-1[b,c]	99846-16[c] 96802-16[g] 96877-16[f]	99915-16[h] 99943-16	99820-16[f]	99097-1[i] 99095-1[j]	11621-16[k] 11630-16[l] 95636-16[m]	11975-1*[n] 11984-1*[o] 11977-1*[p]	11801C-16[r]		11750-16[t] 10750-16[u]
11309-1[b,c]	99846-16[c] 96802-16[g] 96877-16[f]	99915-16[h] 99943-16	99820-16[f]	99097-1[i] 99095-1[j]	11621-16[k] 11630-16[l] 95636-16[m]	11975-1*[n] 11984-1*[o] 11977-1*[p]	11801C-16[r]		11750-16[t] 10750-16[u]
11309-1[b,c]	99846-16[c] 96802-16[g] 96877-16[f]	99915-16[h] 99943-16	99820-16[f]	99097-1[i] 99095-1[j]	11621-16[k] 11630-16[l] 95636-16[m]	11975-1*[n] 11984-1*[o] 11977-1*[p]	11801C-16[r]		11750-16[t] 10750-16[u]
11308-1[d,e]	99848-16[d,e] 96802-16[g]	99915-16[h] 99943-16		99097-1[i] 99095-1[j]	11621-16[k] 11630-16[l] 95636-16[m]	11975-1*[n] 11984-1*[o] 11977-1*[p]	11801-16[q] 11801C-16[r]		11750-16[t] 10750-16[u]
	96877-16[f]	99943-16	99820-16[f]	99097-1[i] 99095-1[j]	11621-16[k] 11630-16[l] 95636-16[m]	11975-1*[n] 11984-1*[o] 11977-1*[p]	11801C-16[r]		11750-16[t] 10750-16[u]
11309-1[b,c]	99846-16[c] 96802-16[g] 96877-16[f]	99915-16[h] 99943-16	99820-16[f]	99097-1[i] 99095-1[j]	11621-16[k] 11630-16[l] 95636-16[m]	11975-1*[n] 11984-1*[o] 11977-1*[p]	11801C-16[r]		11750-16[t] 10750-16[u]
11309-1[b,c]	99846-16[c] 96802-16[g] 96877-16[f]	99915-16[h] 99943-16	99820-16[f]	99097-1[i] 99095-1[j]	11621-16[k] 11630-16[l] 95636-16[m]	11975-1*[n] 11984-1*[o] 11977-1*[p]	11801C-16[r]		11750-16[t] 10750-16[u]
11309-1[b,c]	99846-16[c] 96802-16[g] 96877-16[f]	99915-16[h] 99943-16	99820-16[f]	99097-1[i] 99095-1[j]	11621-16[k] 11630-16[l] 95636-16[m]	11975-1*[n] 11984-1*[o] 11977-1*[p]	11801C-16[r]		11750-16[t] 10750-16[u]

Section Continued

a Cam and Lifter Kit, includes installation lubricants and Cam Sprocket Bolt Locking Plate
b Contains standard diameter valve springs and machined steel valve stem locks (**99095-1**), no machining required.
c Standard diameter XHTCS tool steel valve springs for 1.800" assembly height.
d Contains standard diameter valve springs, no machining required.
e For 1967-87 with 1.700" assembly height.
f Must machine cylinder heads.
g Standard diameter chrome silicon valve springs for 1.750" assembly height.
h For standard diameter valve springs, no machining required.
i Machined steel, heat treated.
j Machined steel, heat treated, +.050" assembly height.
k Heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
l Heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
m Pro Series one-piece.
n Performance steel billet gears and roller chain set.
o Pro Series steel billet gears and roller chain set.
p Pro Series steel billet gears and roller chain set with thrust bearing.
q 1.5 ratio, 3/8" stud, extra long slot (not self-aligning).
r 1.5 ratio, 3/8" stud, extra long slot, Nitro Carb (not self-aligning).
t 1.5 ratio, 3/8" stud (not self-aligning). Valve Train Stabilizer available, see page 343.
u 1.5 ratio, 3/8" stud (not self-aligning), narrow body for center bolt valve covers.

Chevrolet V-8 57-87

262-267 (4.4L)-283-302-305 (5.0L)-307-327-350 (5.7L)-400 cu. in. (also: 87-95 trucks w/standard [non-roller] hydraulic lifters)

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	COMPLETE CAM SPECIFICATIONS: Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Lifter Camshafts										
Performance usage, good mid and upper RPM HP, bracket racing; Pro, Super Pro, Hot Rod, Super ET, etc., auto trans w/race converter, oval track; Late Model, Sportsman, I.M.C.A., etc., 3/8-1/2 mile, serious off road, 11.5 minimum compression ratio advised.	**Saturday Night Special F-260/370-2-6**	4400-7600	**111451*** **111454*a** ◆3	**99250-16**	260 270	295 305	106	28 52 65 25	.026 .028	.555 .578
Competition only, serious flat lifter restricted oval track; Late Model, Sportsman, etc., 3/8-5/8 mile, intended for 1.8 intake and 1.5 ratio exhaust rocker arms, 12.0 minimum compression ratio advised.	**F-262/340-2S-7**	4400-7800	**110991*** ◆3	**99250-16**	262 268	294 304	107	28 54 64 24	.020 .026	.612 .572
Good upper RPM torque and HP, rough idle, moderate performance usage, good upper RPM HP, 4400-4800 cruise RPM, good w/large manifold nitrous system, 11.5 to 12.5 compression ratio advised. Good w/Roots supercharger, 20 lbs. maximum boost w/8.0 maximum compression ratio advised.	**F-300-2**	4600-8200	**114701*** ◆3	**99250-16**	264 272	300 308	112	23 61 71 21	.026 .026	.563 .581
Competition only, good upper RPM torque and HP, bracket racing; Pro, Super Pro, Hot Rod, etc., auto trans w/race converter, oval track; Late Model, Sportsman, I.M.C.A., etc., 3/8-1/2 mile, 12.0 minimum compression ratio advised.	**Saturday Night Special F-268/3814-2S-6**	4600-8000	**111501*** **111504*a** ◆3	**99250-16**	268 276	304 312	106	31 57 67 29	.026 .026	.572 .590
Competition only, good upper RPM torque and HP, 360+ cu.in., bracket racing; Quick ET, etc., auto trans w/race converter, 12.5 minimum compression ratio advised.	**F-310**	4800-8200	**114711*** ◆3	**99250-16**	272 272	310 310	108	31 61 67 25	.026 .026	.581 .581
Competition only, good upper RPM HP, 370+ cu.in., bracket racing; Quick ET, etc., auto trans w/race converter, 12.5 minimum compression ratio advised.	**F-276/3934-2S-6**	4800-8400	**111001*** ◆3	**99250-16**	276 284	312 320	106	34 62 70 34	.026 .026	.590 .608
Radical Competition only, good high RPM HP, 380+ cu. in., flat lifter restricted classes, stick or auto trans. w/race converter, 12.5 minimum compression ratio advised.	**F-320**	5000-8600	**114721*** ◆3	**99250-16**	280 280	320 320	108	35 65 71 29	.026 .026	.599 .599
Radical Competition only, good high RPM HP, 388+ cu. in., flat lifter restricted classes, stick or auto trans. w/race converter, 12.5 minimum compression ratio advised.	**F-280/3994-2S-8**	5000-8800	**111751*** ◆3	**99250-16**	280 288	316 324	108	35 65 75 33	.026 .026	.599 .617

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Self-aligning rocker arms cannot be used with mechanical lifter camshafts.

NOTE: When using 55-56, 265 cu.in. blocks, late model cam bearings must be installed.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

NOTE: 1988-99 Chevrolet 305 and 350 V-8 engines (and some 1987 350 V-8 engines) use a different configuration camshaft core than the 57-87 engines and cannot be interchanged.

NOTE: Camshafts having standard size journals with SFO firing order (1-8-7-3-6-5-4-2, or 4/7 swap) are available on special order. Contact Crane's Performance Consultants for details.

NOTE: Camshafts for modified standard blocks, or Oldsmobile/ Dart blocks, having Big Block Chevrolet size (1.948") cam bearings are available on special order. Contact Crane's Performance Consultants for details.

NOTE: Camshafts specifically engineered for engines that have .875" or .904" diameter lifters are available on special order. Contact Crane's Performance Consultants for details.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
11309-1[c,d]	99846-16[d] 96877-16[b]	99915-16[e] 99943-16	99820-16[b]	99097-1[f] 99095-1[g]	11621-16[h] 11630-16[i] 95636-16[j]	11975-1[*k] 11984-1[*l] 11977-1[*m]	11801C-16[n]		11750-16[p] 10750-16[q]
	96877-16[b]	99943-16	99820-16[b]	99097-1[f] 99095-1[g]	11621-16[h] 11630-16[i] 95636-16[j]	11975-1[*k] 11984-1[*l] 11977-1[*m]	11801C-16[n]		11750-16[p] 10750-16[q]
	96877-16[b]	99943-16	99820-16[b]	99097-1[f] 99095-1[g]	11621-16[h] 11630-16[i] 95636-16[j]	11975-1[*k] 11984-1[*l] 11977-1[*m]			11750-16[p] 10750-16[q]
	96877-16[b]	99943-16	99820-16[b]	99097-1[f] 99095-1[g]	11621-16[h] 11630-16[i] 95636-16[j]	11975-1[*k] 11984-1[*l] 11977-1[*m]			11750-16[p] 10750-16[q]
	96877-16[b]	99943-16	99820-16[b]	99097-1[f] 99095-1[g]	11621-16[h] 11630-16[i] 95636-16[j]	11975-1[*k] 11984-1[*l] 11977-1[*m]			11750-16[p] 10750-16[q]
	96877-16[b]	99943-16	99820-16[b]	99097-1[f] 99095-1[g]	11621-16[h] 11630-16[i] 95636-16[j]	11975-1[*k] 11984-1[*l] 11977-1[*m]			11750-16[p] 10750-16[q]
	96877-16[b]	99943-16	99820-16[b]	99097-1[f] 99095-1[g]	11621-16[h] 11630-16[i] 95636-16[j]	11975-1[*k] 11984-1[*l] 11977-1[*m]			11750-16[p] 10750-16[q]
	96877-16[b]	99943-16	99820-16[b]	99097-1[f] 99095-1[g]	11621-16[h] 11630-16[i] 95636-16[j]	11975-1[*k] 11984-1[*l] 11977-1[*m]			11750-16[p] 10750-16[q]

a Cam and Lifter Kit, includes installation lubricants and Cam Sprocket Bolt Locking Plate
b Must machine cylinder heads.
c Contains standard diameter valve springs and machined steel valve stem locks (**99095-1**), no machining required.
d Standard diameter XHTCS tool steel valve springs for 1.800" assembly height.
e For standard diameter valve springs, no machining required.
f Machined steel, heat treated.
g Machined steel, heat treated, +.050" assembly height.
h Heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
i Heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
j Pro Series one-piece.
k Performance steel billet gears and roller chain set.
l Pro Series steel billet gears and roller chain set.
m Pro Series steel billet gears and roller chain set with thrust bearing.
n 1.5 ratio, 3/8" stud, extra long slot, Nitro Carb (not self-aligning).
p 1.5 ratio, 3/8" stud (not self-aligning). Valve Train Stabilizer available, see page 343.
q 1.5 ratio, 3/8" stud (not self-aligning), narrow body for center bolt valve covers.

Chevrolet V-8 57-87

262-267 (4.4L)-283-302-305 (5.0L)-307-327-350 (5.7L)-400 cu. in. (also: 87-95 trucks w/standard [non-roller] hydraulic lifters)

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 276 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Roller Camshafts										
Excellent low end and mid range torque and HP, good idle, daily performance usage, mild bracket racing, auto trans w/2500+ converter, 3000-3400 cruise RPM, 9.5 to 11.0 compression ratio advised.	**SR-228/338-2S-12 IG**	2200-6200	**118541**[*a] ◆3	**11515-16**[c] **11519-16**[d] **11570-16**[e]	228 236	278 280	112	7 41 55 1	.020 .020	.507 .525
Good low end & mid range torque & HP, fair idle, moderate performance usage, mild bracket racing, auto trans w/3000+ converter, 3400-3800 cruise RPM, good w/ plate or manifold nitrous system, 10.5 to 11.5 compression ratio advised, .900" base circle for long stroke clearance. Good w/centrifugal or small Roots supercharger, 10 lbs. max. boost w/8.5 max. compression ratio advised.	**SR-232/350-2S-12.90 IG**	2400-6600	**118571**[*a] ◆3	**11515-16**[c] **11519-16**[d] **11570-16**[e]	232 240	286 294	112	9 43 57 3	.020 .020	.525 .543
Good low end and mid range torque and HP, fair idle, moderate performance usage, mild bracket racing, auto trans w/3000+ converter, 3400-3800 cruise RPM, good w/plate or manifold nitrous system, 10.5 to 11.5 compression ratio advised. Good w/centrifugal or small Roots supercharger, 10 lbs. maximum boost w/8.5 maximum compression ratio advised.	**SR-236/350-2S-12 IG**	2400-6600	**118551**[*a] ◆3	**11515-16**[c] **11519-16**[d] **11570-16**[e]	236 244	286 294	112	11 45 59 5	.020 .020	.525 .543
Good mid range torque and HP, fair idle, bracket racing, auto trans w/3500+ converter, 3800-4200 cruise RPM, 10.5 to 12.0 compression ratio advised, .900" base circle for long stroke clearance in 388+ cu.in.	**SR-240/362-2S-10.90 IG**	3000-7000	**118581**[*a] ◆3	**11515-16**[c] **11519-16**[d] **11570-16**[e]	240 248	294 302	110	15 45 59 9	.020 .020	.543 .561
Good mid to upper RPM torque and HP, fair idle, performance usage, good w/manifold nitrous system, bracket racing, auto trans w/3500+ converter, 3800-4200 cruise RPM, 10.5 to 12.0 compress. ratio advised, .900" base circle for long stroke clearance. Good w/Roots supercharger, 14 lbs. max. boost w/8.0 max. compress. ratio advised.	**SR-240/362-2S-12.90 IG**	3400-7200	**118611**[*a] ◆3	**11515-16**[c] **11519-16**[d] **11570-16**[e]	240 248	294 302	112	13 47 61 7	.020 .020	.543 .561
Good mid range torque and HP, performance usage, bracket racing, Heavy, Pro, etc., auto trans w/race converter, serious off road, oval track, good mid-range torque and HP, 2-bbl or 4-bbl, 1/4-3/8 mile, 11.0 to 12.5 compression ratio advised.	**TR-242/3867-2S-6**	3600-7200	**118131**[*b] ◆3	**11515-16**[c] **11519-16**[d] **11570-16**[e]	242 250	282 290	106	17 45 53 17	.022 .022	.580 .600
Good mid to upper RPM torque and HP, fair idle, performance usage, bracket racing, auto trans w/3500+ converter, 3800-4200 cruise RPM, 10.5 to 12.0 compression ratio advised.	**SR-244/362-2S-12 IG**	3400-7200	**118521**[*a] ◆3	**11515-16**[c] **11519-16**[d] **11570-16**[e]	244 252	294 302	112	15 49 63 9	.020 .020	.543 .561
Good mid to upper RPM torque and HP, fair idle, performance usage, good w/manifold nitrous system, bracket racing, auto trans w/3500+ converter, 3800-4200 cruise RPM, 10.5 to 12.0 compression ratio advised. Good w/ Roots supercharger, 14 lbs. maximum boost w/8.0 maximum compression ratio advised.	**SR-244/362-2S-14 IG**	3600-7400	**118531**[*a] ◆3	**11515-16**[c] **11519-16**[d] **11570-16**[e]	244 252	294 302	114	13 51 63 7	.020 .020	.543 .561
Good mid to upper RPM torque and HP, fair idle, performance usage, serious off road, bracket racing, auto trans w/3500+ converter, 3800-4200 cruise RPM, 10.75 to 12.5 compression ratio advised.	**SR-248/400-2S-8 IG**	3600-7400	**118631**[*a] ◆3	**11515-16**[c] **11519-16**[d] **11570-16**[e]	248 252	286 290	108	21 47 59 13	.020 .022	.600 .600

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Self-aligning rocker arms cannot be used with mechanical lifter roller camshafts.

NOTE: When using 55-56, 265 cu.in. blocks, late model cam bearings must be installed.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

NOTE: 1988-99 Chevrolet 305 and 350 V-8 engines (and some 1987 350 V-8 engines) use a different configuration camshaft core than the 57-87 engines and cannot be interchanged.

NOTE: Many options are available for these camshafts, and any of our custom ground camshafts. An iron distributor drive gear and rear journal can be specified. Drilling and tapping for Sander rear drive is available. SF0 firing order (1-8-7-3-6-5-4-2, or 4/7 swap) and SF01 (1-8-7-2-6-5-4-3, or 4/7 3/2 swap) are offered. Optional journal sizes are Roller Bearing (1.875"), Big Block (1.949"), Large Roller Bearing/50mm (1.969"), and 55mm (2.165") Gun drilling (where applicable) is available. Lightweight undercut journal, narrow lobe cores are offered. Lobe layouts for Buick Race/Dart, Splayed Valve, and SB2 cylinder heads are available.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99893-16[f] **96870-16**[f,g]	**99953-16** **99943-16**[g]	**99820-16**[f]	**99097-1**[k]	**11630-16**[m] **95636-16**[n]	**11975-1**[*o] **11984-1**[*p] **11977-1**[*q]			**11750-16**[s] **10750-16**[t]
	99893-16[f] **96870-16**[f,g]	**99953-16** **99943-16**[g]	**99820-16**[f]	**99097-1**[k]	**11630-16**[m] **95636-16**[n]	**11975-1**[*o] **11984-1**[*p] **11977-1**[*q]			**11750-16**[s] **10750-16**[t]
	99893-16[f] **96870-16**[f,g]	**99953-16** **99943-16**[g]	**99820-16**[f]	**99097-1**[k]	**11630-16**[m] **95636-16**[n]	**11975-1**[*o] **11984-1**[*p] **11977-1**[*q]			**11750-16**[s] **10750-16**[t]
	99893-16[f] **96870-16**[f,g]	**99953-16** **99943-16**[g]	**99820-16**[f]	**99097-1**[k]	**11630-16**[m] **95636-16**[n]	**11975-1**[*o] **11984-1**[*p] **11977-1**[*q]			**11750-16**[s] **10750-16**[t]
	99893-16[f] **96870-16**[f,g]	**99953-16** **99943-16**[g]	**99820-16**[f]	**99097-1**[k]	**11630-16**[m] **95636-16**[n]	**11975-1**[*o] **11984-1**[*p] **11977-1**[*q]			**11750-16**[s] **10750-16**[t]
	99885-16[f] **96883-16**[f,g]	**99956-16** **99675-16**[i] **99970-16**[j]	**99820-16**[f]	**99097-1**[k] **99087-1**[l]	**11630-16**[m] **95636-16**[n]	**11975-1**[*o] **11984-1**[*p] **11977-1**[*q]			**11750-16**[s] **10750-16**[t]
	99893-16[f] **96870-16**[f,g]	**99953-16** **99943-16**[g]	**99820-16**[f]	**99097-1**[k]	**11630-16**[m] **95636-16**[n]	**11975-1**[*o] **11984-1**[*p] **11977-1**[*q]			**11750-16**[s] **10750-16**[t]
	99893-16[f] **96870-16**[f,g]	**99953-16** **99943-16**[g]	**99820-16**[f]	**99097-1**[k]	**11630-16**[m] **95636-16**[n]	**11975-1**[*o] **11984-1**[*p] **11977-1**[*q]			**11750-16**[s] **10750-16**[t]
	99893-16[f] **96870-16**[f,g]	**99953-16** **99943-16**[g]	**99820-16**[f]	**99097-1**[k]	**11630-16**[m] **95636-16**[n]	**11975-1**[*o] **11984-1**[*p] **11977-1**[*q]			**11750-16**[s] **10750-16**[t]

Section Continued

a Requires cam button spacer, camshaft incorporates an integral cast iron distributor drive gear, aluminum-bronze distributor drive gear not required. For engines equipped with mechanical fuel pumps, fuel pump pushrod **11985-1** is highly recommended to prevent fuel pump lobe wear.
b Requires cam button spacer and a **11990-1** (.489" I.D.) or **11989-1** (.500" I.D. Accel) aluminum-bronze distributor drive gear. For engines equipped with mechanical fuel pumps, fuel pump pushrod **11985-1** is highly recommended to prevent fuel pump lobe wear.
c Horizontal locking bar roller lifters.
d Vertical locking bar roller lifters.
e Ultra Pro Series vertical locking bar roller lifters.
f Must machine cylinder heads.
g For cylinder heads with +.100" long valves, use **99943-16** retainers.
h For cylinder heads with +.100" long valves, use **99970-16** retainers and **99087-1** valve stem locks.
i Titanium, must use **99097-1** valve stem locks, included with the retainers.
j Requires Crane Multi Fit valve locks.
k Machined steel, heat treated.
l Machined steel, heat treated, Multi Fit.
m Heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
n Pro Series one-piece, for use with or without pushrod guideplate cylinder heads.
o Performance steel billet gears and roller chain set.
p Pro Series steel billet gears and roller chain set.
q Pro Series steel billet gears and roller chain set with thrust bearing.
s 1.5 ratio, 3/8" stud (not self-aligning). Valve Train Stabilizer available, see page 343.
t 1.5 ratio, 3/8" stud (not self-aligning), narrow body for center bolt valve covers.

Chevrolet V-8 57-87

262-267 (4.4L)-283-302-305 (5.0L)-307-327-350 (5.7L)-400 cu. in. (also: 87-95 trucks w/standard [non-roller] hydraulic lifters)

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 276 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Roller Camshafts										
Performance usage, bracket racing, good mid-range torque and HP, Heavy, Pro, etc., auto trans w/race converter, oval track, 1/4-3/8 mile, 11.0 to 12.5 compression ratio advised.	**R-248/420-2S2-6**	3800-7400	**118741**[*a] ◆3	**11519-16**[d] **11570-16**[e]	248 256	280 288	106	21 47 57 19	.020 .020	.630 .630
Good upper RPM torque and HP, rough idle, performance usage, bracket racing, auto trans w/3500+ converter, 4200-4600 cruise RPM, 11.0 minimum compression ratio advised, 388+ cu.in., supercharged and/or nitrous.	**SR-250/374-2S-10.90 IG**	3800-7400	**118591**[*b] ◆3	**11515-16**[f] **11519-16**[d] **11570-16**[e]	250 258	300 308	110	20 50 64 14	.020 .020	.561 .561
Good upper RPM torque and HP, rough idle, performance usage, good w/manifold nitrous system, 388+ cu.in., Pro Street, bracket racing, auto trans w/3500+ converter, 4200-4600 cruise RPM, 11.0 minimum compression ratio advised, .900" base circle for long stroke clearance. Good w/Roots supercharger, 18 lbs. maximum boost w/8.0 maximum compression ratio advised.	**SR-250/374-2S-12.90 IG**	3800-7400	**118691**[*b] ◆3	**11519-16**[d] **11570-16**[e]	250 258	300 308	112	18 52 66 12	.020 .020	.561 .561
Performance usage, bracket racing, good mid range torque & HP, Heavy, Pro, etc., auto trans w/race converter, oval track, good mid range torque and HP, 1/4-3/8 mile, serious off-road, 11.0 to 12.5 compression ratio advised.	**R-252/420-2S-6** **R-252/420-2S-6 SFO**	4000-7600	**118751**[*a] **118761**[*a,c] ◆3	**11519-16**[d] **11570-16**[e]	252 260	284 292	106	23 49 59 21	.020 .020	.630 .630
Performance usage, w/manifold nitrous system, good mid and upper RPM torque and HP, bracket racing, auto trans w/3500+ converter, 11.0 to 12.5 compression ratio advised. Good w/Roots supercharger, 18 lbs. maximum boost w/8.0 maximum compression ratio advised.	**R-252/420-2S-10**	4000-7600	**118911**[*a] ◆3	**11519-16**[d] **11570-16**[e]	252 260	284 292	110	20 52 64 16	.020 .020	.630 .630
Rough idle, performance usage, good w/manifold nitrous system, good upper RPM torque and HP, 388+ cu.in., Pro Street, bracket racing, auto trans w/3500+ converter, 4200-4600 cruise RPM, 11.0 minimum compression ratio advised. Good w/Roots supercharger, 18 lbs. max. boost w/8.0 max. compression ratio advised.	**SR-252/374-2S-12 IG**	3800-7400	**118711**[*b] ◆3	**11515-16**[g] **11519-16**[d] **11570-16**[e]	252 260	302 310	112	19 53 67 13	.020 .020	.561 .561
Competition only, oval track, 1/4 - 3/8 mile, flat top pistons w/7600 RPM rev limit, 12.5 minimum compression ratio advised. Lift with 1.75:1 ratio rocker arms.	**R-256/4301-2S-6**	4000-7800	**118971**[*a] ◆3	**11519-16**[d] **11570-16**[e]	256 262	284 290	106	25 51 60 22	.020 .022	.753 .753
Competition only, oval track, special for 360 Sprint Car, tapped for Sander rear drive, for roller bearing journals (1.875"), 12.5 minimum compression ratio advised. Lift with 1.75:1 ratio rocker arms.	**R-256/4301-2S-6 RB RD**	4000-7800	**118811**[*a] ◆3	**11519-16**[d] **11570-16**[e]	256 262	284 290	106	25 51 60 22	.020 .022	.753 .753
Performance usage, bracket racing, good mid range torque & HP, Pro, Super Pro, etc., auto trans w/race converter, oval track, good mid range torque & HP, 1/4-3/8 mile, serious off road, 11.5 to 12.5 compress. ratio advised.	**R-256/420-2S1-6**	4000-7800	**118821**[*a] ◆3	**11519-16**[d] **11570-16**[e]	256 264	288 296	106	25 51 61 23	.020 .020	.630 .630
Competition only, oval track, Sprint Car, tapped for Sander rear drive, for large roller bearing journals (1.9685"/50mm), 12.5 minimum compression ratio advised. Lift with 1.65:1 ratio rocker arms.	**R-258/452-2S4-8 LRB RD SFO**	4000-7800	**118951**[*a] ◆3	**11519-16**[d] **11570-16**[e]	258 260	287 289	108	26 52 63 17	.020 .022	.746 .746

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Self-aligning rocker arms cannot be used with mechanical lifter roller camshafts.

NOTE: When using 55-56, 265 cu.in. blocks, late model cam bearings must be installed.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

NOTE: 1988-99 Chevrolet 305 and 350 V-8 engines (and some 1987 350 V-8 engines) use a different configuration camshaft core than the 57-87 engines and cannot be interchanged.

NOTE: Many options are available for these camshafts, and any of our custom ground camshafts. An iron distributor drive gear and rear journal can be specified. Drilling and tapping for Sander rear drive is available. SFO firing order (1-8-7-3-6-5-4-2, or 4/7 swap) and SFO1 (1-8-7-2-6-5-4-3, or 4/7 3/2 swap) are offered. Optional journal sizes are Roller Bearing (1.875"), Big Block (1.949"), Large Roller Bearing/50mm (1.969"), and 55mm (2.165") Gun drilling (where applicable) is available. Lightweight undercut journal, narrow lobe cores are offered. Lobe layouts for Buick Race/Dart, Splayed Valve, and SB2 cylinder heads are available.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	96886-16[g,h] **96885-16**[g,h]	**99970-16**[k] **99659-16**[w] **99675-16**[j]	**99820-16**[g]	**99097-1**[m] **99087-1**[n]	**11630-16**[o] **95636-16**[p]	**11975-1**[*q] **11984-1**[*r] **11977-1**[*s]			**11750-16**[u] **11771-16**[v]
	99893-16[g] **96870-16**[g,i]	**99953-16** **99943-16**[l]	**99820-16**[g]	**99097-1**[m]	**11630-16**[o] **95636-16**[p]	**11975-1**[*q] **11984-1**[*r] **11977-1**[*s]			**11750-16**[u] **11771-16**[v]
	99893-16[g] **96870-16**[g,i]	**99953-16** **99943-16**[l]	**99820-16**[g]	**99097-1**[m]	**11630-16**[o] **95636-16**[p]	**11975-1**[*q] **11984-1**[*r] **11977-1**[*s]			**11750-16**[u] **11771-16**[v]
	96886-16[g,h] **96885-16**[g,h]	**99970-16**[k] **99659-16**[w] **99675-16**[j]	**99820-16**[g]	**99097-1**[m] **99087-1**[n]	**11630-16**[o] **95636-16**[p]	**11975-1**[*q] **11984-1**[*r] **11977-1**[*s]			**11750-16**[u] **11771-16**[v]
	96886-16[g,h] **96885-16**[g,h]	**99970-16**[k] **99659-16**[w] **99675-16**[j]	**99820-16**[g]	**99097-1**[m] **99087-1**[n]	**11630-16**[o] **95636-16**[p]	**11975-1**[*q] **11984-1**[*r] **11977-1**[*s]			**11750-16**[u] **11771-16**[v]
	99893-16[g] **96870-16**[g,i]	**99953-16** **99943-16**[l]	**99820-16**[g]	**99097-1**[m]	**11630-16**[o] **95636-16**[p]	**11975-1**[*q] **11984-1**[*r] **11977-1**[*s]			**11750-16**[u] **11771-16**[v]
	96886-16[g,h] **96885-16**[g,h]	**99970-16**[k] **99659-16**[w] **99675-16**[j]	**99820-16**[g]	**99097-1**[m] **99087-1**[n]	**11630-16**[o] **95636-16**[p]	**11984-1**[*r] **11977-1**[*s]			**11750-16**[u] **11771-16**[v]
	96886-16[g,h] **96885-16**[g,h]	**99970-16**[k] **99659-16**[w] **99675-16**[j]	**99820-16**[g]	**99097-1**[m] **99087-1**[n]	**11630-16**[o] **95636-16**[p]	**11984-1**[*r] **11977-1**[*s]			**11750-16**[u] **11771-16**[v]
	96886-16[g,h] **96885-16**[g,h]	**99970-16**[k] **99659-16**[w] **99675-16**[j]	**99820-16**[g]	**99097-1**[m] **99087-1**[n]	**11630-16**[o] **95636-16**[p]	**11984-1**[*r] **11977-1**[*s]			**11750-16**[u] **11771-16**[v]
	96886-16[g,h] **96885-16**[g,h]	**99970-16**[k] **99659-16**[w] **99675-16**[j]	**99820-16**[g]	**99097-1**[m] **99087-1**[n]	**11630-16**[o] **95636-16**[p]	**11984-1**[*r] **11977-1**[*s]			**11750-16**[u] **11771-16**[v]

Section Continued

a Requires cam button spacer and a **11990-1** (.489" I.D.) or **11989-1** (.500" I.D. Accel) aluminum-bronze distributor drive gear. For engines equipped with mechanical fuel pumps, fuel pump pushrod **11985-1** is highly recommended to prevent fuel pump lobe wear.
b Requires cam button spacer, camshaft incorporates an integral cast iron distributor drive gear, aluminum-bronze distributor drive gear not required. For engines equipped with mechanical fuel pumps, fuel pump pushrod **11985-1** is highly recommended to prevent fuel pump lobe wear.
c Camshaft has SFO firing order, with 4/7 swap.
d Vertical locking bar roller lifters.
e Ultra Pro Series vertical locking bar roller lifters.
f Horizontal locking bar roller lifters.
g Must machine cylinder heads.
h For cylinder heads with +.100" long valves, use **99970-16** retainers and **99087-1** valve stem locks.
i For cylinder heads with +.100" long valves, use **99943-16** retainers.
j Titanium, must use **99097-1** valve stem locks, included with the retainers.
k Requires Crane Multi Fit valve locks.
l For cylinder heads with +.100" long valves.
m Machined steel, heat treated.
n Machined steel, heat treated, Multi Fit.
o Heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
p Pro Series one-piece, for use with or without pushrod guideplate cylinder heads.
q Performance steel billet gears and roller chain set.
r Pro Series steel billet gears and roller chain set.
s Pro Series steel billet gears and roller chain set with thrust bearing.
u 1.5 ratio, 3/8" stud (not self-aligning). Valve Train Stabilizer available, see page 343.
v 1.5 ratio, 7/16" stud (not self-aligning), Wide Body. Valve Train Stabilizer available, see page 343.
w Titanium, for **96886-16** valve springs.

Chevrolet V-8 57-87

262-267 (4.4L)-283-302-305 (5.0L)-307-327-350 (5.7L)-400 cu. in. (also: 87-95 trucks w/standard [non-roller] hydraulic lifters)

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 276 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Roller Camshafts										
Rough idle, performance usage, good upper RPM HP, 388+ cu.in., Pro Street, bracket racing, auto trans w/3500+ converter, 4600-5000 cruise RPM, 12.0 minimum compression ratio advised.	**SR-260/400-2S-8 IG**	4000-7600	**118661**[*a]	**11519-16**[d] **11570-16**[e]	260 264	298 302	108	27 53 65 19	.020 .022	.600 .600
Performance usage, bracket racing, good mid to upper RPM torque and HP, Pro, Super Pro, etc., auto trans w/ race converter, oval track, good mid to upper RPM torque and HP, 2-bbl or 4-bbl, 1/4-3/8 mile, 11.5 minimum compression ratio advised.	**R-260/420-2S2-6**	4200-8000	**118831**[*b]	**11519-16**[d] **11570-16**[e]	260 264	292 296	106	27 53 61 23	.020 .020	.630 .630
Competition only, oval track, special for 360 Sprint Car, .950" base circle diameter, tapped for Sander rear drive, 12.5 minimum compression ratio advised.	**294-304-08RRD.95**	4200-8200	**19145**[*b]	**11548-16**[g] **11570-16**[e]	260 266	294 304	108	23 57 62 24	.012 .020	.670 .630
Performance usage, bracket racing, good mid to upper RPM torque and HP, Pro, Super Pro, etc., auto trans w/ race converter, oval track, 1/4-3/8 mile, .960" base circle diameter, 11.5 minimum compression ratio advised.	**R-260/4467-2S-6.96** **R-260/4467-2S-6.96 SFO**	4200-8000	**118411**[*b] **118431**[*b,c]	**11519-16**[d] **11570-16**[e]	260 268	290 306	106	26 54 62 26	.012 .022	.670 .625
Performance usage, bracket racing, good mid to upper RPM torque and HP, Pro, Super Pro, etc., auto trans w/ race ocnverter, oval track, good mid to upper RPM torque and HP, 1/4-3/8 mile, 12.5 minimum compression ratio advised.	**R-260/420-2-6** **R-260/420-2-6 SFO**	4200-8000	**118841**[*b] **118931**[*b,c]	**11519-16**[d] **11570-16**[e]	260 270	292 302	106	27 53 64 26	.020 .020	.630 .630
Competition only, oval track, Sprint Car, Modified, Super Modified, 3/8-1/2 mile dirt or asphalt, 355-406 cu.in., .950" base circle diameter, tapped for Sander rear drive, 12.0 minimum compression ratio advised.	**294-306-06 RRD.95**	4200-8000	**19137**[*b]	**11519-16**[d] **11570-16**[e]	260 270	294 306	106	26 54 63 27	.012 .030	.670 .615
Competition only, oval track, good mid range torque and HP, 2-bbl or 4-bbl, 1/4-3/8 mile, 9.0 compression restricted classes.	**295-299-06R.98**	4200-7800	**19128**[*b]	**11519-16**[d] **11570-16**[e]	262 266	295 299	106	27 55 61 25	.012 .012	.650 .650
Competition only, oval track, for 410 Sprint Car and W00, .950" base circle diameter, tapped for Sander rear drive, lightweight gun drilled core, for roller bearing (1.875") journals. Lift w/1.8:1 rocker arms.	**383-431-08R.95 LWD RB RD**	4400-8400	**19146**[*b]	**11570-16**[e]	264 268	294 298	108	26 58 64 24	.020 .022	.770 .770
Competition only, bracket racing, good mid to upper RPM HP, Super Pro, etc., auto trans w/race converter, oval track, 3/8-1/2 mile, 12.5 minimum compression ratio advised.	**R-264/420-2S1-6**	4200-8000	**118861**[*b]	**11519-16**[d] **11570-16**[e]	264 272	296 304	106	29 55 65 27	.020 .020	.630 .630
Competition only, w/large manifold nitrous system, good mid to upper RPM torque and HP, bracket racing, auto trans w/race converter, 12.5 minimum compression ratio advised. Good w/Roots supercharger, 20 lbs. maximum boost w/8.0 maximum compression ratio advised.	**R-264/420-2S1-10** **R-264/420-2S1-10 SFO**	4200-8200	**118921**[*b] **118941**[*b,c]	**11519-16**[d] **11570-16**[e]	264 272	296 304	110	26 58 70 22	.020 .020	.630 .630

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Self-aligning rocker arms cannot be used with mechanical lifter roller camshafts.

NOTE: When using 55-56, 265 cu.in. blocks, late model cam bearings must be installed.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

NOTE: 1988-99 Chevrolet 305 and 350 V-8 engines (and some 1987 350 V-8 engines) use a different configuration camshaft core than the 57-87 engines and cannot be interchanged.

NOTE: Many options are available for these camshafts, and any of our custom ground camshafts. An iron distributor drive gear and rear journal can be specified. Drilling and tapping for Sander rear drive is available. SFO firing order (1-8-7-3-6-5-4-2, or 4/7 swap) and SFO1 (1-8-7-2-6-5-4-3, or 4/7 3/2 swap) are offered. Optional journal sizes are Roller Bearing (1.875"), Big Block (1.949"), Large Roller Bearing/50mm (1.969"), and 55mm (2.165") Gun drilling (where applicable) is available. Lightweight undercut journal, narrow lobe cores are offered. Lobe layouts for Buick Race/Dart, Splayed Valve, and SB2 cylinder heads are available.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	ALUMINUM ROCKERS — ENERGIZER	ALUMINUM ROCKERS — GOLD RACE
	99893-16[f] 96870-16[f,g]	99953-16 99943-16[g]	99820-16[e]	99097-1[l]	11630-16[n] 95636-16[o]	11984-1[*r] 11977-1[*q]			11750-16[s] 11771-16[t]
	96886-16[f,i] 96885-16[f,i]	99970-16[k] 99659-16[u] 99675-16[j]	99820-16[e]	99097-1[l] 99087-1[m]	11630-16[n] 95636-16[o]	11984-1[*r] 11977-1[*q]			11750-16[s] 11771-16[t]
	96886-16[f,i] 96885-16[f,i]	99970-16[k] 99659-16[u] 99675-16[j]	99820-16[e]	99097-1[l] 99087-1[m]	11630-16[n] 95636-16[o]	11984-1[*r] 11977-1[*q]			11750-16[s] 11771-16[t]
	96886-16[f,i] 96885-16[f,i]	99970-16[k] 99659-16[u] 99675-16[j]	99820-16[e]	99097-1[l] 99087-1[m]	11630-16[n] 95636-16[o]	11984-1[*r] 11977-1[*q]			11750-16[s] 11771-16[t]
	96886-16[f,i] 96885-16[f,i]	99970-16[k] 99659-16[u] 99675-16[j]	99820-16[e]	99097-1[l] 99087-1[m]	11630-16[n] 95636-16[o]	11984-1[*r] 11977-1[*q]			11750-16[s] 11771-16[t]
	96886-16[f,i] 96885-16[f,i]	99970-16[k] 99659-16[u] 99675-16[j]	99820-16[e]	99097-1[l] 99087-1[m]	11630-16[n] 95636-16[o]	11984-1[*r] 11977-1[*q]			11750-16[s] 11771-16[t]
	96886-16[f,i] 96885-16[f,i]	99970-16[k] 99659-16[u] 99675-16[j]	99820-16[e]	99097-1[l] 99087-1[m]	11630-16[n] 95636-16[o]	11984-1[*r] 11977-1[*q]			11750-16[s] 11771-16[t]
	96886-16[f,i] 96885-16[f,i]	99970-16[k] 99659-16[u] 99675-16[j]	99820-16[e]	99097-1[l] 99087-1[m]	11630-16[n] 95636-16[o]	11984-1[*r] 11977-1[*q]			11750-16[s] 11771-16[t]
	96886-16[f,i] 96885-16[f,i]	99970-16[k] 99659-16[u] 99675-16[j]	99820-16[e]	99097-1[l] 99087-1[m]	11630-16[n] 95636-16[o]	11984-1[*r] 11977-1[*q]			11750-16[s] 11771-16[t]
	96886-16[f,i] 96885-16[f,i]	99970-16[k] 99659-16[u] 99675-16[j]	99820-16[e]	99097-1[l] 99087-1[m]	11630-16[n] 95636-16[o]	11984-1[*r] 11977-1[*q]			11750-16[s] 11771-16[t]

Section Continued

a Requires cam button spacer, camshaft incorporates an integral cast iron distributor drive gear, aluminum-bronze distributor drive gear not required. For engines equipped with mechanical fuel pumps, fuel pump pushrod **11985-1** is highly recommended to prevent fuel pump lobe wear.
b Requires cam button spacer and a **11990-1** (.489" I.D.) or 11989-1 (.500" I.D. Accel) aluminum-bronze distributor drive gear. For engines equipped with mechanical fuel pumps, fuel pump pushrod **11985-1** is highly recommended to prevent fuel pump lobe wear.
c Camshaft has SFO firing order, with 4/7 swap.
d Vertical locking bar roller lifters.
e Ultra Pro Series vertical locking bar roller lifters.
f Must machine cylinder heads.
g For cylinder heads with +.100" long valves, use **99943-16** retainers.
h For cylinder heads with +.100" long valves.
i For cylinder heads with +.100" long valves, use **99970-16** retainers and **99087-1** valve stem locks.
j Titanium, must use **99097-1** valve stem locks, included with the retainers.
k Requires Crane Multi Fit valve locks.
l Machined steel, heat treated.
m Machined steel, heat treated, Multi Fit.
n Heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
o Pro Series one piece, for use with or without pushrod guideplate cylinder heads.
p Pro Series steel billet gears and roller chain set.
q Pro Series steel billet gears and roller chain set with thrust bearing.
s 1.5 ratio, 3/8" stud (not self-aligning). Valve Train Stabilizer available, see page 343.
t 1.5 ratio, 7/16" stud (not self-aligning), Wide Body.Valve Train Stabilizer available, see page 343.
u Titanium, for **96886-16** valve springs.

Chevrolet V-8 57-87

262-267 (4.4L)-283-302-305 (5.0L)-307-327-350 (5.7L)-400 cu. in. (also: 87-95 trucks w/standard [non-roller] hydraulic lifters)

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 276 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical RollerCamshafts										
Competition only, oval track, Sprint Car, Modified, Super Modified, 1/2-5/8 mile dirt or asphalt, 355-406 cu.in., .950" base circle diameter, tapped for Sander rear drive, 12.5 minimum compression ratio advised.	**298-311-06RRD.95**	4400-8000	**19139**[*a] ◆3	**11570-16**[c]	264 273	298 311	106	27 57 64.5 28.5	.012 .030	.670 .615
Competition only, oval track, for 410 Sprint Car and W00, tapped for Sander rear drive, for roller bearing (1.875") journals. Lift w/1.7:1 rocker arms.	**R-264/4381-2S-8 RB RD**	4400-8000	**118771**[*a] ◆3	**11570-16**[c]	264 268	296 300	108	26 58 66 22	.020 .022	.745 .745
Competition only, oval track, for 410 Sprint Car and W00, tapped for Sander rear drive, lightweight gun drilled core, for 55mm journals. Lift w/1.7:1 rocker arms.	**R-264/4381-2S-8 LWD RD 55J**	4400-8000	**118781**[*a] ◆3	**11570-16**[c]	264 268	296 300	108	26 58 66 22	.020 .022	.745 .745
Competition only, bracket racing, good upper RPM HP, Super Pro, etc., auto trans w/race converter, oval track, 2-bbl or 4-bbl, 3/8-1/2 mile, 12.5 minimum compression ratio advised.	**R-268/420-2S1-7**	4600-8200	**118871**[*a] ◆3	**11519-16**[d] **11570-16**[c]	268 272	300 304	107	30 58 66 26	.020 .020	.630 .630
Competition only, bracket racing, good mid to upper RPM torque and HP, Super Pro, Super Gas, etc., auto trans w/race converter, .960" base circle diameter, 12.5 minimum compression ratio advised.	**R-268/4467-2S-6.96** **R-268/4467-2S-6.96 SFO**	4400-8200	**118421**[*a] **118441**[*a,b] ◆3	**11519-16**[d] **11570-16**[c]	268 276	298 314	106	31 57 67 29	.012 .022	.670 .625
Competition only, bracket racing, good mid to upper RPM torque and HP, Super Pro, Super Gas, etc., auto trans w/race converter, 12.5 minimum compression ratio advised. Lift with 1.65:1 rocker arms.	**R-268/452-2S-7**	4400-8200	**118791**[*a] ◆3	**11570-16**[c]	268 272	297 301	107	31 57 67 25	.020 .022	.746 .746
Competition only, bracket racing, good mid to upper RPM torque and HP, Super Pro, Super Gas, etc., auto trans w/race converter, 12.5 minimum compression ratio advised.	**R-270/420-2S8-6**	4400-8200	**118881**[*a] ◆3	**11570-16**[c]	270 276	302 308	106	32 58 67 29	.020 .020	.630 .630
Competition only, good w/large manifold nitrous system, good upper RPM torque and HP, bracket racing, auto trans w/race converter, 12.5 minimum compression ratio advised. Good w/large Roots supercharger, 24 lbs. maximum boost w/8.0 maximum compression ratio advised.	**R-272/4334-2S2-10** **R-272/4334-2S2-10 SFO**	4400-8200	**118321**[*a] **118331**[*a,b] ◆3	**11570-16**[c]	272 282	312 322	110	29 63 74 28	.026 .026	.650 .641
Competition only, drag racing, Super Stock, 350 cu.in., auto transmission w/race converter, lift with 1.8 intake, 1.6 exhaust rockers.	**R-272/428-2S-6 SFO**	4600-8200	**118291**[*a,b] ◆3	**11570-16**[c]	272 280	302 310	106	34 58 69 31	.020 .014	.770 .715

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Self-aligning rocker arms cannot be used with mechanical lifter roller camshafts.

NOTE: When using 55-56, 265 cu.in. blocks, late model cam bearings must be installed.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

NOTE: 1988-99 Chevrolet 305 and 350 V-8 engines (and some 1987 350 V-8 engines) use a different configuration camshaft core than the 57-87 engines and cannot be interchanged.

NOTE: Many options are available for these camshafts, and any of our custom ground camshafts. An iron distributor drive gear and rear journal can be specified. Drilling and tapping for Sander rear drive is available. SFO firing order (1-8-7-3-6-5-4-2, or 4/7 swap) and SFO1 (1-8-7-2-6-5-4-3, or 4/7 3/2 swap) are offered. Optional journal sizes are Roller Bearing (1.875"), Big Block (1.949"), Large Roller Bearing/50mm (1.969"), and 55mm (2.165") Gun drilling (where applicable) is available. Lightweight undercut journal, narrow lobe cores are offered. Lobe layouts for Buick Race/Dart, Splayed Valve, and SB2 cylinder heads are available.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	ALUMINUM ROCKERS — ENERGIZER	ALUMINUM ROCKERS — GOLD RACE
	96886-16[e,g] 96885-16[e,g]	99970-16[i] 99659-16[r] 99675-16[h]	99820-16[e]	99097-1[j] 99087-1[k]	11630-16[l] 95636-16[m]	11984-1*[n] 11977-1*[o]			11750-16[p] 11771-16[q]
	96886-16[e,g] 96885-16[e,g]	99970-16[i] 99659-16[r] 99675-16[h]	99820-16[e]	99097-1[j] 99087-1[k]	11630-16[l] 95636-16[m]	11984-1*[n] 11977-1*[o]			11750-16[p] 11771-16[q]
	96886-16[e,g] 96885-16[e,g]	99970-16[i] 99659-16[r] 99675-16[h]	99820-16[e]	99097-1[j] 99087-1[k]	11630-16[l] 95636-16[m]	11984-1*[n] 11977-1*[o]			11750-16[p] 11771-16[q]
	96886-16[e,g] 96885-16[e,g]	99970-16[i] 99659-16[r] 99675-16[h]	99820-16[e]	99097-1[j] 99087-1[k]	11630-16[l] 95636-16[m]	11984-1*[n] 11977-1*[o]			11750-16[p] 11771-16[q]
	96886-16[e,g] 96885-16[e,g]	99970-16[i] 99659-16[r] 99675-16[h]	99820-16[e]	99097-1[j] 99087-1[k]	11630-16[l] 95636-16[m]	11984-1*[n] 11977-1*[o]			11750-16[p] 11771-16[q]
	96886-16[e,g] 96885-16[e,g]	99970-16[i] 99659-16[r] 99675-16[h]	99820-16[e]	99097-1[j] 99087-1[k]	11630-16[l] 95636-16[m]	11984-1*[n] 11977-1*[o]			11750-16[p] 11771-16[q]
	96886-16[e,g] 96885-16[e,g]	99970-16[i] 99659-16[r] 99675-16[h]	99820-16[e]	99097-1[j] 99087-1[k]	11630-16[l] 95636-16[m]	11984-1*[n] 11977-1*[o]			11750-16[p] 11771-16[q]
	99880-16[e,f]	99675-16[h]	99820-16[e]	99097-1[j]	11630-16[l] 95636-16[m]	11984-1*[n] 11977-1*[o]			11750-16[p] 11771-16[q]
	99880-16[e,f]	99675-16[h]	99820-16[e]	99097-1[j]	11630-16[l] 95636-16[m]	11984-1*[n] 11977-1*[o]			11750-16[p] 11771-16[q]

Section Continued

a Requires cam button spacer and a **11990-1** (.489" I.D.) or **11989-1** (.500" I.D. Accel) aluminum-bronze distributor drive gear. For engines equipped with mechanical fuel pumps, fuel pump pushrod **11985-1** is highly recommended to prevent fuel pump lobe wear.
b Camshaft has SFO firing order, with 4/7 swap.
c Ultra Pro Series vertical locking bar roller lifters.
d Vertical locking bar roller lifters.
e Must machine cylinder heads.
f For cylinder heads with +.100" long valves.
g For cylinder heads with +.100" long valves, use **99970-16** retainers and **99087-1** valve stem locks.
h Titanium, must use **99097-1** valve stem locks, included with the retainers.
i Requires Crane Multi Fit valve locks.
j Machined steel, heat treated.
k Machined steel, heat treated, Multi Fit.
l Heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
m Pro Series one piece, for use with or without pushrod guideplate cylinder heads.
n Pro Series steel billet gears and roller chain set.
o Pro Series steel billet gears and roller chain set with thrust bearing.
p 1.5 ratio, 3/8" stud (not self-aligning). Valve Train Stabilizer available, see page 343.
q 1.5 ratio, 7/16" stud (not self-aligning), Wide Body. Valve Train Stabilizer available, see page 343.
r Titanium, for **96886-16** valve springs.

Chevrolet V-8 57-87

262-267 (4.4L)-283-302-305 (5.0L)-307-327-350 (5.7L)-400 cu. in. (also: 87-95 trucks w/standard [non-roller] hydraulic lifters)

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 276 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Roller Camshafts										
Competition only, good upper RPM torque and HP, bracket racing, 360+ cu.in., .900" base circle diameter, auto trans w/race converter, 12.5 minimum compression ratio advised.	**R-274/4541-2S-6.90**	4600-8200	**118801**[*a] ◆3	**11570-16**[c]	274 282	305 313	106	35 59 71 31	.020 .022	.681 .681
Competition only, bracket racing, good upper RPM HP, Super Pro, Super Gas, etc., auto transmission w/race converter, 12.5 minimum compression ratio advised.	**R-276/420-2S1-6**	4600-8400	**118891**[*a] ◆3	**11570-16**[c]	276 284	308 316	106	35 61 71 33	.020 .020	.630 .630
Competition only, high RPM maximum performance applications, Super Stock/Competition Eliminator, 292-340 cu.in., etc., stick or auto transmission w/race converter, for 55mm journals, 14.0 minimum compression ratio advised. Lift w/1.8:1 intake rocker arms.	**R-276/5152-2S-14 SF0 55J**	6000-9800	**118991**[*a,b] ◆3	**11570-16**[c] **11574-16**[d]	276 292	306 326	114	29 67 83 29	.020 .026	.927 .720
Competition only, drag racing, Super Stock, 350 cu.in., auto transmission w/race converter, lift with 1.65:1 rocker arms.	**R-278/452-2S2-6 SF0**	4800-8400	**118961**[*a,b] ◆3	**11570-16**[c] **11574-16**[d]	278 284	307 313	106	37 61 72 32	.020 .022	.746 .746
Competition only, bracket racing, good upper RPM HP, Super Quick, Super Comp, etc., auto transmission w/race converter, 12.5 minimum compression ratio advised.	**R-280/420-2S-8**	5000-8600	**118901**[*a] ◆3	**11570-16**[c]	280 284	312 316	108	36 64 74 30	.020 .020	.630 .630
Competition only, good upper RPM HP, Super Stock, Super Quick, stick or auto transmission w/race converter, 12.5 minimum compression ratio advised.	**R-280/450-2S-8**	5000-8600	**118361**[*a] ◆3	**11570-16**[c] **11574-16**[d]	280 284	320 324	108	35 65 73 31	.026 .026	.675 .641
Competition only, 370+ cu.in., Super Quick, etc., stick or auto transmission w/race converter, good w/large multi-stage nitrous system, 13.0 minimum compression ratio advised. Good w/large Roots supercharger, 30 lbs. maximum boost w/8.0 maximum compression ratio advised.	**R-282/4765-2S2-10**	5000-8600	**118381**[*a] ◆3	**11570-16**[c] **11574-16**[d]	282 290	316 324	110	36 66 80 30	.035 .030	.715 .688
Competition only, high RPM maximum performance applications, Competition Eliminator, 292-340 cu.in., etc., Super Quick w/400+ cu.in., stick or auto transmission w/race converter, 14.0 minimum compression ratio advised. Lift w/1.65 rocker arms.	**R-282/4765-2S2-12** **R-282/4765-2S2-12 SF0**	6000-9400	**118451**[*a] **118461**[*a,b] ◆3	**11570-16**[c] **11574-16**[d]	282 290	316 324	112	34 68 82 28	.035 .030	.786 .757
Competition only, high RPM Competition Eliminator, stick or auto transmission w/race converter, 14.0 minimum compression ratio advised. Lift w/1.65 rocker arms.	**R-282/5002-2S-13 SF0**	6000-9600	**118491**[*a,b] ◆3	**11570-16**[c] **11574-16**[d]	282 290	312 330	113	33 69 83 27	.020 .030	.825 .776
Competition only, high RPM maximum performance applications, good w/large multi-stage nitrous system, 388+ cu.in., Super Quick, etc., stick or auto transmission w/race converter, 14.0 minimum compression ratio advised. Good w/large Roots supercharger, 388+ cu.in., 35 lbs. maximum boost with 7.5 maximum compression ratio advised. Lift w/1.65 rocker arms.	**R-286/4765-2S3-12** **R-286/4765-2S3-12 SF0**	6000-9800	**118471**[*a] **118481**[*a,b] ◆3	**11570-16**[c] **11574-16**[d]	286 294	320 328	112	36 70 84 30	.035 .030	.786 .757

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Self-aligning rocker arms cannot be used with mechanical lifter roller camshafts.

NOTE: When using 55-56, 265 cu.in. blocks, late model cam bearings must be installed.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

NOTE: 1988-99 Chevrolet 305 and 350 V-8 engines (and some 1987 350 V-8 engines) use a different configuration camshaft core than the 57-87 engines and cannot be interchanged.

NOTE: Many options are available for these camshafts, and any of our custom ground camshafts. An iron distributor drive gear and rear journal can be specified. Drilling and tapping for Sander rear drive is available. SF0 firing order (1-8-7-3-6-5-4-2, or 4/7 swap) and SF01 (1-8-7-2-6-5-4-3, or 4/7 3/2 swap) are offered. Optional journal sizes are Roller Bearing (1.875"), Big Block (1.949"), Large Roller Bearing/50mm (1.969"), and 55mm (2.165") Gun drilling (where applicable) is available. Lightweight undercut journal, narrow lobe cores are offered. Lobe layouts for Buick Race/Dart, Splayed Valve, and SB2 cylinder heads are available.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	ALUMINUM ROCKERS — ENERGIZER	ALUMINUM ROCKERS — GOLD RACE
	99880-16[e,f]	99675-16[h]	99820-16[e]	99097-1[j] 99087-1[k]	11630-16[l] 95636-16[m]	11984-1[*n] 11977-1[*o]			11771-16[p]
	99885-16[e,f] 96883-16[e,g]	99956-16 99675-16[h] 99970-16[i]	99820-16[e]	99097-1[j] 99087-1[k]	11630-16[l] 95636-16[m]	11984-1[*n] 11977-1[*o]			11750-16[q] 11771-16[p]
	99885-16[e,f] 96883-16[e,g]	99956-16 99675-16[h] 99970-16[i]	99820-16[e]	99097-1[j] 99087-1[k]	95636-16[m]	11984-1[*n] 11977-1[*o]			11771-16[p]
	99885-16[e,f] 96883-16[e,g]	99956-16 99675-16[h] 99970-16[i]	99820-16[e]	99097-1[j] 99087-1[k]	11630-16[l] 95636-16[m]	11984-1[*n] 11977-1[*o]			11771-16[p]
	99885-16[e,f] 96883-16[e,g]	99956-16 99675-16[h] 99970-16[i]	99820-16[e]	99097-1[j] 99087-1[k]	11630-16[l] 95636-16[m]	11984-1[*n] 11977-1[*o]			11750-16[q] 11771-16[p]
	99880-16[e,f]	99675-16[h]	99820-16[e]	99097-1[j]	11630-16[l] 95636-16[m]	11984-1[*n] 11977-1[*o]			11771-16[p]
	99880-16[e,f]	99675-16[h]	99820-16[e]	99097-1[j]	95636-16[m]	11984-1[*n] 11977-1[*o]			11771-16[p]
	99880-16[e,f]	99675-16[h]	99820-16[e]	99097-1[j]	95636-16[m]	11984-1[*n] 11977-1[*o]			11771-16[p]
	99880-16[e,f]	99675-16[h]	99820-16[e]	99097-1[j]	95636-16[m]	11984-1[*n] 11977-1[*o]			11771-16[p]
	99880-16[e,f]	99675-16[h]	99820-16[e]	99097-1[j]	95636-16[m]	11984-1[*n] 11977-1[*o]			11771-16[p]

a Requires cam button spacer and a **11990-1** (.489" I.D.) or **11989-1** (.500" I.D. Accel) aluminum-bronze distributor drive gear. For engines equipped with mechanical fuel pumps, fuel pump pushrod **11985-1** is highly recommended to prevent fuel pump lobe wear.
b Camshaft has SFO firing order, with 4/7 swap.
c Ultra Pro Series vertical locking bar roller lifters.
d Ultra Pro Series vertical locking bar roller lifters for .904" diameter lifter bores.
e Must machine cylinder heads.
f For cylinder heads with +.100" long valves.
g For cylinder heads with +.100" long valves, use **99970-16** retainers and **99087-1** valve stem locks.
h Titanium, must use **99097-1** valve stem locks, included with the retainers.
i Requires Crane Multi Fit valve locks.
j Machined steel, heat treated.
k Machined steel, heat treated, Multi Fit.
l Heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
m Pro Series one-piece, for use with or without pushrod guideplate cylinder heads.
n Pro Series steel billet gears and roller chain set.
o Pro Series steel billet gears and roller chain set with thrust bearing.
p 1.5 ratio, 7/16" stud (not self-aligning), Wide Body. Valve Train Stabilizer available, see page 343.
q 1.5 ratio, 3/8" stud (not self-aligning). Valve Train Stabilizer available, see page 343.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts										
For low-end and mid-range performance in 87-92 cars and light trucks. Fine w/auto or manual and stock rear gears, great for 305 requiring extra low-end torque to cruise below 1800 RPM, ideal for TBI engines w/auto trans and stock converter. (50 state legal for listed applications, C.A.R.B. E.O. D-225-22).	**2010**	500-4200	**104201** ❶	**10530-16**[a]	184 194	246 256	106	(14) 18 23 9	.000 .000	.384 .407
Designed for TPI 305 engines in 87-89 Camaros and Firebirds w/auto trans. Good all-around performance. An adjustable fuel pressure regulator is recommended for maximum performance. (50 state legal for listed applications, C.A.R.B. E.O. D-225-22).	**2011**	500-4400	**104204** ❶	**10530-16**[a]	184 204	246 266	108	(11) 15 35 (11)	.000 .000	.384 .429
For mid and top end torque and HP. Mainly for 87-92 305 cars w/TBI and manual 4 or 5-speed. (50 state legal for listed applications, C.A.R.B. E.O. D-225-22).	**2020**	800-4600	**104211** ❶	**10530-16**[a]	194 204	256 266	111	(14) 28 33 (9)	.000 .000	.407 .429
Builds mid and upper RPM performance in 87 TPI engines with 5-speed transmission and all rear gear ratios. Also fits 88-89 305 engines w/5-speed and 2.73 or 3.27 rear gears for mid-range performance. An adjustable fuel pressure regulator is recommended for maximum performance. (50 state legal for listed applications, C.A.R.B. E.O. D-225-22).	**2030**	1200-5200	**104221** ❶	**10530-16**[a]	204 214	260 270	116	(14) 38 43 9	.000 .000	.429 .452
For mid & upper RPM performance in 88-89 305 engines w/5-speed and 3.45 or numerically higher rear gear ratios. An adjustable fuel pressure regulator is recommended for maximum performance. (50 state legal for listed applications, C.A.R.B. E.O. D-225-22).	**2031**	1400-5400	**104225** ❶	**10530-16**[a]	208 214	264 270	112	(3) 31 44 (10)	.000 .000	.438 .452
For 87-89 Corvettes, Camaros and Firebirds factory equipped w/350 TPI engines. An adjustable fuel pressure regulator is recommended for maximum performance. (50 state legal for listed applications, C.A.R.B. E.O. D-225-22).	**2032**	1800-5800	**104224** ❶	**10530-16**[a]	214 220	270 276	112	0 34 47 (7)	.000 .000	.452 .465

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT NOTE: Crane Hydraulic Roller Cams offer tremendous power, torque and RPM potential. Due to their RPM capability and increased valve travel, it is HIGHLY RECOMMENDED that the appropriate Crane valve train components be installed for maximum performance and reliability.

NOTE: The camshafts listed above incorporate the front ignition drive pilot hole for late model applications. A long cam dowel pin is installed, which can be driven in further when required for short dowel pin application engines.

NOTE: Mechanical roller tappet camshafts and components are available on special order. Contact Crane's Performance Consultants for details.

NOTE: 1988-99 Chevrolet 305 and 350 V-8 engines (and some 1987 350 V-8 engines) use a different configuration camshaft core than the 57-87 engines and cannot be interchanged.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
11308-1[b]	99848-16[b] 144846-16[r]	99915-16		99097-1[d]	10621-16[e] 95624-16[f]	10975-1[*g]	11801-16[h,i] 11806-16[j,i] 10800C-16[k]	11744-16[m,i]	11750-16[n,i] 10750-16[o,i] 10751-16[p] 10758-16[q]
11308-1[b]	99848-16[b] 144846-16[r]	99915-16		99097-1[d]	10621-16[e] 95624-16[f]	10975-1[*g]	11801-16[h,i] 11806-16[j,i] 10800C-16[k]	11744-16[m,i]	11750-16[n,i] 10750-16[o,i] 10751-16[p] 10758-16[q]
11308-1[b]	99848-16[b] 144846-16[r]	99915-16		99097-1[d]	10621-16[e] 95624-16[f]	10975-1[*g]	11801-16[h,i] 11806-16[j,i] 10800C-16[k]	11744-16[m,i]	11750-16[n,i] 10750-16[o,i] 10751-16[p] 10758-16[q]
	96802-16[c] 144846-16[r]	99915-16		99097-1[d]	10621-16[e] 95624-16[f]	10975-1[*g]	11801-16[h,i] 11806-16[j,i] 10800C-16[k]	11744-16[m,i]	11750-16[n,i] 10750-16[o,i] 10751-16[p] 10758-16[q]
	96802-16[c] 144846-16[r]	99915-16		99097-1[d]	10621-16[e] 95624-16[f]	10975-1[*g]	11801-16[h,i] 11806-16[j,i] 10800C-16[k]	11744-16[m,i]	11750-16[n,i] 10750-16[o,i] 10751-16[p] 10758-16[q]
	96802-16[c] 144846-16[r]	99915-16		99097-1[d]	10621-16[e] 95624-16[f]	10975-1[*g]	11801-16[h,i] 11806-16[j,i] 10800C-16[k]	11744-16[m,i]	11750-16[n,i] 10750-16[o,i] 10751-16[p] 10758-16[q]

a For use with standard GM alignment bars.
b Contains standard diameter valve springs, no machining required.
c Standard diameter valve springs, for 1.750" assembly height.
d Machined steel, heat treated.
e Heavy wall, heat treated, for use with either pushrod guideplate or non-guideplate cylinder heads.
f Pro Series, one-piece
g Performance steel billet gears and roller chain set, for 1987-91 applications.
h 1.5 ratio, extra long slot (not self-aligning).
i In order to use these rocker arms on engines originally equipped with self-aligning rockers, hardened pushrod guideplates must be installed, and valve cover clearance checked.
j 1.5 ratio, roller tip, extra long slot (not self-aligning).
k 1.5 ratio, self-aligning, Nitro Carb.
m Energizer, 1.5 ratio (not self-aligning). Will not have sufficient clearance in factory cast valve covers.
n 1.5 ratio (not self-aligning). Factory cast valve covers may require internal clearancing.
o 1.5 ratio (not self-aligning), narrow body for center bolt valve covers.
p 1.5 ratio, self-aligning narrow body for center bolt valve covers.
q 1.6 ratio, self-aligning narrow body for center bolt valve covers.
r Standard diameter PAC Enhanced valve springs for 1.750" assembly height.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts										
Brute low end torque and HP, smooth idle, daily usage, light towing, economy, also mild turbocharged, 2200-3000 cruise RPM, marine applications: primarily used in 350 cu.in. near-stock engines for mild performance applications in heavy boats, 8.0 to 9.5 compression ratio advised.	**HR-260-2-12 IG**	1000-5200	**109811**[*a] ◆3	**10530-16**[b] **10535-16**[c]	204 214	260 270	112	(5) 29 44 (10)	.000 .000	.429 .452
Brute low end torque and HP, smooth idle, daily usage, light towing, economy, also mild turbocharged, primarily used in 383+ cu.in. engines, 2200-3000 cruise RPM, marine applications: use for mild performance applications in heavy boats, 8.0 to 9.5 compression ratio advised, .900" base circle for long stroke clearance.	**HR-206/319-2S-12.90 IG**	1000-5200	**109851**[*a] ◆3	**10535-16**[c]	206 214	268 276	112	(4) 30 44 (10)	.000 .000	.479 .498
Excellent low end and mid range torque and HP, good idle, daily usage, off road, performance and fuel efficiency, 2600-3400 cruise RPM, marine applications: primarily used in 350 cu.in. mildly modified engines with high flow exhaust systems, for performance applications in light boats, 8.75 to 10.75 compression ratio advised. Good w/small supercharger, 8 lbs. maximum boost w/8.5 maximum compression ratio advised.	**HR-276-2S-12 IG**	1600-5800	**109821**[*a] ◆3	**10530-16**[b] **10535-16**[c]	214 222	276 284	112	0 34 48 (6)	.000 .000	.488 .509
Excellent low end and mid range torque and HP, good idle, daily usage, off road, performance and fuel efficiency, primarily used in 383+ ci.in. engnes, 2600-3400 cruise RPM, marine applications: for mildly modified engines with high flow exhaust systems, for performance applications in light boats, 8.75 to 10.75 compression ratio advised. Good w/small supercharger, 8 lbs. maximum boost w/8.5 maximum compression ratio advised, .900" base circle for long stroke clearance.	**HR-216/339-2S-12.90 IG**	1600-5800	**109671**[*a] ◆3	**10535-16**[c]	216 224	284 292	112	1 35 49 (5)	.000 .000	.509 .528
Excellent mid range torque and HP, good idle, moderate performance usage, crate motor upgrade, mild bracket racing, auto trans w/2000+ converter, marine applications: for 350 cu.in. modified engines with free-flowing above water exhaust systems for performance applications in light pleasure and ski boats, including jet boats, 2800-3600 cruise RPM, 9.0 to 11.0 compression ratio advised. Good w/supercharger, 10 lbs. maximum boost w/8.0 maximum compression ratio advised.	**HR-218/332-2S3-12 IG**	1800-6000	**109861**[*a] ◆3	**10535-16**[c]	218 226	280 288	112	2 36 50 (4)	.000 .000	.498 .518
Good mid range torque and HP, fair idle, moderate performance usage, crate motor upgrade, mild bracket racing, auto trans w/2500+ converter, marine applications: for 350+ cu.in. modified engines with free-flowing above water exhaust systems for performance applications in light pleasure and ski boats, including jet boats, 3000-3800 cruise RPM, 9.5 to 11.0 compression ratio advised. Good w/supercharger, 10 lbs. maximum boost w/8.0 maximum compression ratio advised.	**HR-284-2S-12 IG**	2000-6200	**109831**[*a] ◆3	**10535-16**[c]	222 230	284 292	112	4 38 52 (2)	.000 .000	.509 .528

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT NOTE: Crane Hydraulic Roller Cams offer tremendous power, torque and RPM potential. Due to their RPM capability and increased valve travel, it is HIGHLY RECOMMENDED that the appropriate Crane valve train components be installed for maximum performance and reliability.

NOTE: The camshafts listed above incorporate the front ignition drive pilot hole for late model applications. A long cam dowel pin is installed, which can be driven in further when required for short dowel pin application engines.

NOTE: 1988-99 Chevrolet 305 and 350 V-8 engines (and some 1987 350 V-8 engines) use a different configuration camshaft core than the 57-87 engines and cannot be interchanged.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
11309-1[d,f] **11310-1**[e,f]	**99846-16**[g] **99838-16**[e] **96802-16**[h] **144846-16**[aa]	**99915-16**[j] **99944-16**	**99820-16**[e]	**99051-1**[l] **99097-1**[m]	**10621-16**[o] **95624-16**[p]	**10975-1**[*q]	**11801-16**[r] **10800C-16**[s]	**11744-16**[u,z]	**11750-16**[v,z] **10750-16**[w,z] **10751-16**[x] **10758-16**[y]
11309-1[d,f] **11310-1**[e,f]	**99846-16**[g] **99838-16**[e] **96802-16**[h] **144846-16**[aa]	**99915-16**[j] **99944-16**	**99820-16**[e]	**99051-1**[l] **99097-1**[m]	**10621-16**[o] **95624-16**[p]	**10975-1**[*q]	**11801-16**[r] **10800C-16**[s]	**11744-16**[u,z]	**11750-16**[v,z] **10750-16**[w,z] **10751-16**[x] **10758-16**[y]
11309-1[d,f] **11310-1**[e,f]	**99846-16**[g] **99838-16**[e] **96802-16**[h] **144846-16**[aa]	**99915-16**[j] **99944-16**	**99820-16**[e]	**99051-1**[l] **99097-1**[m]	**10621-16**[o] **95624-16**[p]	**10975-1**[*q]	**11801-16**[r] **10800C-16**[s]	**11744-16**[u,z]	**11750-16**[v,z] **10750-16**[w,z] **10751-16**[x] **10758-16**[y]
11309-1[d,f] **11310-1**[e,f]	**99846-16**[g] **99838-16**[e] **96877-16**[e,i] **144846-16**[aa]	**99915-16**[j] **99944-16** **99969-16**[k]	**99820-16**[e]	**99051-1**[l] **99097-1**[m] **99094-1**[n]	**95624-16**[p]	**10975-1**[*q]	**11801-16**[r] **10800C-16**[s]	**11744-16**[u,z]	**11750-16**[v,z] **10750-16**[w,z] **10751-16**[x] **10758-16**[y]
11309-1[d,f] **11310-1**[e,f]	**99846-16**[g] **99838-16**[e] **96877-16**[e,i] **144846-16**[aa]	**99915-16**[j] **99944-16** **99969-16**[k]	**99820-16**[e]	**99051-1**[l] **99097-1**[m] **99094-1**[n]	**10621-16**[o] **95624-16**[p]	**10975-1**[*q]	**11801-16**[r] **10800C-16**[s]	**11744-16**[u,z]	**11750-16**[v,z] **10750-16**[w,z] **10751-16**[x] **10758-16**[y]
11309-1[d,f] **11310-1**[e,f]	**99846-16**[g] **99838-16**[e] **96877-16**[e,i] **144846-16**[aa]	**99915-16**[j] **99944-16** **99969-16**[k]	**99820-16**[e]	**99051-1**[l] **99097-1**[m] **99094-1**[n]	**10621-16**[o] **95624-16**[p]	**10975-1**[*q]	**11801-16**[r] **10800C-16**[s]	**11744-16**[u,z]	**11750-16**[v,z] **10750-16**[w,z] **10751-16**[x] **10758-16**[y]

Section Continued

- **a** Camshaft incorporates an integral cast iron distributor drive gear, aluminum-bronze distributor drive gear not required.
- **b** For use with standard GM alignment bars.
- **c** For use with standard GM alignment bars. Required for use with camshafts having greater than stock lobe lift or reduced base circle diameters.
- **d** Contains standard diameter valve springs (**99846-16**), and machined steel valve stem locks (**99095-1**), no machining required.
- **e** Must machine cylinder heads.
- **f** Valve guide machining may be required to insure sufficient valve guide-to-retainer clearance at full valve lift due to limited travel with stock components.
- **g** Standard diameter XHTCS tool steel valve springs, no machining required.
- **h** Standard diameter chrome silicon valve springs for 1.750" assembly height.
- **i** For +.100" length valves.
- **j** For standard diameter valve springs.
- **k** Requires Crane Multi Fit valve locks.
- **l** Machined steel, heat treated, .050" additional assembly height for **99846-16** and **96802-16** valve springs. May interfere with self-aligning rocker arms.
- **m** Machined steel, heat treated.
- **n** Machined steel, heat treated, Multi Fit.
- **o** Heavy wall, heat treated, for use with either pushrod guideplate or non-guideplate cylinder heads.
- **p** Pro Series one-piece, for use with either pushrod guideplate or non-guideplate cylinder heads.
- **q** Performance steel billet gears and roller chain set (for 1987-91 applications).
- **r** 1.5 ratio, extra long slot (not self-aligning).
- **s** 1.5 ratio, extra long slot, Nitro Carb (not self-aligning).
- **u** Energizer, 1.5 ratio (not self-aligning), will not have sufficient clearance in factory cast valve covers.
- **v** 1.5 ratio (not self-aligning). Factory cast valve covers may require internal clearancing.
- **w** 1.5 ratio, (not self-aligning), narrow body for center bolt valve covers.
- **x** 1.5 ratio, self-aligning narrow body for center bolt valve covers.
- **y** 1.6 ratio, self-aligning narrow body for center bolt valve covers.
- **z** In order to use these rocker arms on engines originally equipped with self-aligning rockers, hardened pushrod guideplates and heat-treated pushrods must be installed, and valve cover clearance checked.
- **aa** Standard diameter PAC Enhanced valve springs for 1.750" assembly height.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts										
Good mid range torque and HP, fair idle, moderate performance usage, mild bracket racing, primarily used in 383+ cu.in. engines, auto trans w/2500+ converter, marine applications: for modified engines with free-flowing above water exhaust systems for performance applications in light pleasure and ski boats, including jet boats, 3000-3800 cruise RPM, 9.5 to 11.0 compression ratio advised. Good w/supercharger, 14 lbs. maximum boost w/8.0 maximum compression ratio advised, 1.040" base circle for long stroke clearance.	**HR-224/345-2S-14.04 IG**	2200-6400	**109871**[*a] ◆3	**10535-16**[b]	224 232	286 294	114	3 41 55 (3)	.000 .000	.518 .539
Good mid range torque and HP, fair idle, performance usage, 3600-4400 cruise RPM, good with manifold nitrous system, 10.0 to 11.5 compression ratio advised. Good w/Roots supercharger, 15 lbs. maximum boost w/8.0 maximum compression ratio advised, .900" base circle for long stroke clearance.	**HR-230/359-2S-12.90 IG**	2600-6600	**109661**[*a] ◆3	**10535-16**[b]	230 238	292 300	112	8 42 56 2	.000 .000	.539 .558
Good mid range torque and HP, fair idle, performance usage, mild bracket racing, auto trans w/3000+ converter, 3800-4600 cruise RPM, good w/manifold nitrous system, 10.0 to 11.5 compression ratio advised. Good w/Roots supercharger, 15 lbs. maximum boost, w/8.0 maximum compression ratio advised.	**HR-296-2S-12 IG**	2800-6800	**109841**[*a] ◆3	**10535-16**[b]	234 242	296 304	112	10 44 58 4	.000 .000	.539 .558
Good mid range torque and HP, fair idle, performance usage, mild bracket racing, auto trans w/3000+ converter, 3800-4600 cruise RPM, good w/manifold nitrous system, 10.0 to 11.5 compression ratio advised. Good w/Roots supercharger, 15 lbs. maximum boost, w/8.0 maximum compression ratio advised, .900" base circle for long stroke clearance.	**HR-234/365-2S-12.90 IG**	2800-6800	**109691**[*a] ◆3	**10535-16**[b]	234 242	296 304	112	10 44 58 4	.000 .000	.548 .558
Rough idle, performance usage, good upper RPM torque and HP, bracket racing, auto trans w/3500+ converter, 4200-5000 cruise RPM, 10.5 to 12.0 compression ratio advised, 370+ cu.in. supercharged and/or nitrous, 1.040" base circle for long stroke clearance.	**HR-302-2S-10.04 IG**	3200-7200	**109651**[*a] ◆3	**10535-16**[b]	240 244	302 306	110	15 45 57 7	.000 .000	.558 .558

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT NOTE: Crane Hydraulic Roller Cams offer tremendous power, torque and RPM potential. Due to their RPM capability and increased valve travel, it is HIGHLY RECOMMENDED that the appropriate Crane valve train components be installed for maximum performance and reliability.

NOTE: The camshafts listed above incorporate the front ignition drive pilot hole for late model applications. A long cam dowel pin is installed, which can be driven in further when required for short dowel pin application engines.

NOTE: 1988-99 Chevrolet 305 and 350 V-8 engines (and some 1987 350 V-8 engines) use a different configuration camshaft core than the 57-87 engines and cannot be interchanged.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
11309-1[c,e] **11310-1**[d,e]	**99846-16**[f] **99838-16**[d] **96877-16**[d,h] **144846-16**[y]	**99915-16**[h] **99944-16** **99969-16**[i]	**99820-16**[d]	**99051-1**[j] **99097-1**[k] **99094-1**[l]	**95624-16**[n]	**10975-1**[*o]	**11801-16**[p] **10800C-16**[q]	**11744-16**[s,x]	**11750-16**[t,x] **10750-16**[u,x] **10751-16**[v] **10758-16**[w]
11309-1[c,e] **11310-1**[d,e]	**99846-16**[f] **99838-16**[d] **96877-16**[d,h] **144846-16**[y]	**99915-16**[h] **99944-16** **99969-16**[i]	**99820-16**[d]	**99051-1**[j] **99097-1**[k] **99094-1**[l]	**95626-16**[n]	**10975-1**[*o]	**11801-16**[p] **10800C-16**[q]	**11744-16**[s,x]	**11750-16**[t,x] **10750-16**[u,x] **10751-16**[v] **10758-16**[w]
11309-1[c,e] **11310-1**[d,e]	**99846-16**[f] **99838-16**[d] **96877-16**[d,h] **144846-16**[y]	**99915-16**[h] **99944-16** **99969-16**[i]	**99820-16**[d]	**99051-1**[j] **99097-1**[k] **99094-1**[l]	**10621-16**[m] **95624-16**[n]	**10975-1**[*o]	**11801-16**[p] **10800C-16**[q]	**11744-16**[s,x]	**11750-16**[t,x] **10750-16**[u,x] **10751-16**[v] **10758-16**[w]
11309-1[c,e] **11310-1**[d,e]	**99846-16**[f] **99838-16**[d] **96877-16**[d,h] **144846-16**[y]	**99915-16**[h] **99944-16** **99969-16**[i]	**99820-16**[d]	**99051-1**[j] **99097-1**[k] **99094-1**[l]	**95626-16**[n]	**10975-1**[*o]	**11801-16**[p] **10800C-16**[q]	**11744-16**[s,x]	**11750-16**[t,x] **10750-16**[u,x] **10751-16**[v] **10758-16**[w]
11309-1[c,e] **11310-1**[d,e]	**99846-16**[f] **99838-16**[d] **96877-16**[d,h] **144846-16**[y]	**99915-16**[h] **99944-16** **99969-16**[i]	**99820-16**[d]	**99051-1**[j] **99097-1**[k] **99094-1**[l]	**95625-16**[n]	**10975-1**[*o]	**11801-16**[p] **10800C-16**[q]	**11744-16**[s,x]	**11750-16**[t,x] **10750-16**[u,x] **10751-16**[v] **10758-16**[w]

a Camshaft incorporates an integral cast iron distributor drive gear, aluminum-bronze distributor drive gear not required.
b For use with standard GM alignment bars. Required for use with camshafts having greater than stock lobe lift or reduced base circle diameters.
c Contains standard diameter valve springs (**99846-16**), and machined steel valve stem locks (**99095-1**), no machining required.
d Must machine cylinder heads.
e Valve guide machining may be required to insure sufficient valve guide-to-retainer clearance at full valve lift due to limited travel with stock components.
f Standard diameter XHTCS tool steel valve springs, no machining required.
g For +.100" length valves.
h For standard diameter valve springs.
i Requires Crane Multi Fit valve locks.
j Machined steel, heat treated, .050" additional assembly height for **99846-16** and **96802-16** valve springs. May interfere with self-aligning rocker arms.
k Machined steel, heat treated.
l Machined steel, heat treated, Multi Fit.
m Heavy wall, heat treated, for use with either pushrod guideplate or non-guideplate cylinder heads.
n Pro Series one-piece, for use with either pushrod guideplate or non-guideplate cylinder heads.
o Performance steel billet gears and roller chain set (for 1987-91 applications).
p 1.5 ratio, extra long slot (not self-aligning).
q 1.5 ratio, extra long slot, Nitro Carb (not self-aligning).
s Energizer, 1.5 ratio (not self-aligning), will not have sufficient clearance in factory cast valve covers.
t 1.5 ratio (not self-aligning). Factory cast valve covers may require internal clearancing.
u 1.5 ratio, (not self-aligning), narrow body for center bolt valve covers.
v 1.5 ratio, self-aligning narrow body for center bolt valve covers.
w 1.6 ratio, self-aligning narrow body for center bolt valve covers.
x In order to use these rocker arms on engines originally equipped with self-aligning rockers, hardened pushrod guideplates and heat-treated pushrods must be installed, and valve cover clearance checked.
y Standard diameter PAC Enhanced valve springs for 1.750" assembly height.

Chevrolet V-8 87-99

305 (5.0L)-350 (5.7L) cu.in. (except 5.7L LS1)

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 276 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Roller Camshafts										
Excellent low end and mid range torque and HP, good idle, daily performance usage, mild bracket racing, auto trans w/2500+ converter, 3000-3400 cruise RPM, 9.5 to 11.0 compression ratio advised.	**SR-228/338-2S-12 IG**	2200-6200	**108541**[*a] ◆3	**11570-16**[b]	228 236	278 280	112	7 41 55 1	.020 .020	.507 .525
Good low end and mid range torque and HP, fair idle, moderate performance usage, mild bracket racing, 383+ cu.in., auto trans w/3000+ converter, 3400-3800 cruise RPM, good with plate or manifold nitrous system, 10.5 to 11.5 compression ratio advised, .900" base circle for long stroke clearance. Good with centrifugal or small Roots supercharger, 10 lbs. maximum boost w/8.5 maximum compression ratio advised.	**SR-232/350-2S-12.90 IG**	2400-6600	**108571**[*a] ◆3	**11570-16**[b]	232 240	286 294	112	9 43 57 3	.020 .020	.525 .543
Good low end and mid range torque and HP, fair idle, moderate performance usage, mild bracket racing, auto trans w/3000+ converter, 3400-3800 cruise RPM, good with plate or manifold nitrous system, 10.5 to 11.5 compression ratio advised. Good with centrifugal or small Roots supercharger, 10 lbs. maximum boost w/8.5 maximum compression ratio advised.	**SR-236/350-2S-12 IG**	2400-6600	**108551**[*a] ◆3	**11570-16**[b]	236 244	286 294	112	11 45 59 5	.020 .020	.525 .543
Good mid range torque and HP, fair idle, performance usage, w/manifold nitrous system, bracket racing, 383+ cu.in., auto trans w/3500+ converter, 3800-4200 cruise RPM, 10.5 to 12.0 compression ratio advised, .900" base circle for long stroke clearance. Good w/Roots supercharger, 14 pounds maximum boost w/8.0 maximum compression ratio advised.	**SR-240/362-2S-12.90 IG**	3400-7200	**108611**[*a] ◆3	**11570-16**[b]	240 248	294 302	112	13 47 61 7	.020 .020	.543 .561
Good mid to upper RPM torque and HP, fair idle, performance usage, w/manifold notrous system, bracket racing, auto trans w/3500+ converter, 3800-4200 cruise RPM, 10.5 to 12.0 compression ratio advised. Good w/ Roots supercharger, 14 pounds maximum boost w/ 8.0 maximum compression ratio advised.	**SR-244/362-2S-12 IG**	3400-7200	**108521**[*a] ◆3	**11570-16**[b]	244 252	294 302	112	15 49 63 9	.020 .020	.543 .561

Chevrolet V-8 92-96

305 (5.0L)-350 (5.7L) cu.in. LT1

Hydraulic Roller Camshafts										
Good low end torque, for 94-96 aluminum head equipped LT1 Camaros, Firebirds and Corvettes. Works in stock and mild modified engines. Boosts mid and top end without low end loss. Use **10758-16** 1.6 ratio rocker arms for more power. Not for use w/stock springs. For mass air F.I. only.	**2033**	1500-5700	**104227**[*a] ◆3	**10530-16**[c] **10535-16**[d]	210 224	272 286	112	(2) 32 49 (6)	.000 .000	.479 .518
For 94-95 highly modified, aluminum head LT1 Camaros, Firebirds and Corvettes. High flow heads, headers and exhaust required. Manual transmission recommended. Top end power with some low end loss. Use **10758-16** 1.6 ratio rocker arms for more power. Not for use w/stock springs. For mass air F.I. only. (50 state legal for listed applications, C.A.R.B. E.O. D-225-55).	**2050**	2400-6400	**104241**[a] ◆1	**10535-16**[d]	218 218	280 280	116	(2) 40 50 (12)	.000 .000	.498 .498

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT NOTE: Crane Hydraulic Roller Cams offer tremendous power, torque and RPM potential. Due to their RPM capability and increased valve travel, it is HIGHLY RECOMMENDED that the appropriate Crane valve train components be installed for maximum performance and reliability.

NOTE: The camshafts listed above incorporate the front ignition drive pilot hole for late model applications. A long cam dowel pin is installed, which can be driven in further when required for short dowel pin application engines.

NOTE: 1988-99 Chevrolet 305 and 350 V-8 engines (and some 1987 350 V-8 engines) use a different configuration camshaft core than the 57-87 engines and cannot be interchanged.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

CRANE Cams®

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	ALUMINUM ROCKERS — ENERGIZER	ALUMINUM ROCKERS — GOLD RACE
	99893-16[f]	99951-16	99820-16[e]	99097-1[h]	11621-16[i] 95638-16[j]	10975-1[*k]			11750-16[n,o] 10750-16[n,p]
	99893-16[f]	99951-16	99820-16[e]	99097-1[h]	95638-16[j]	10975-1[*k]			11750-16[n,o] 10750-16[n,p]
	99893-16[f]	99951-16	99820-16[e]	99097-1[h]	11621-16[i] 95638-16[j]	10975-1[*k]			11750-16[n,o] 10750-16[n,p]
	99893-16[f]	99951-16	99820-16[e]	99097-1[h]	95638-16[j]	10975-1[*k]			11750-16[n,o] 10750-16[n,p]
	99893-16[f]	99951-16	99820-16[e]	99097-1[h]	11621-16[i] 95638-16[j]	10975-1[*k]			11750-16[n,o] 10750-16[n,p]
11308-1[e]	99893-16[e] 96802-16[g]	99951-16[e] 99915-16[g]		99097-1[h]	10621-16[i] 95624-16[j]		10800C-16[l]		10751-16[q] 10758-16[r]
11308-1[e]	99893-16[e] 96802-16[g]	99951-16[e] 99915-16[g]		99097-1[h]	10621-16[i] 95624-16[j]		10800C-16[l]		10751-16[q] 10758-16[r]

a Camshaft incorporates an integral cast iron distributor drive gear, aluminum-bronze distributor gear not required.
b Ultra Pro Series vertical locking bar roller lifters.
c For use with standard GM alignment bars.
d Optional Crane long travel hydraulic roller lifters, for use with standard GM alignment bars. Required for use with high lift and small base circle camshafts.
e For LT1 aluminum cylinder heads.
f Must machine cylinder heads.
g For LT1 iron cylinder heads.
h Machined steel, heat treated.
i Heavy wall, heat treated, for use with either pushrod guideplate or non-guideplate cylinder heads.
j Pro Series one-piece, for use with either pushrod guideplate or non-guideplate cylinder heads.
k Performance steel billet gears and roller chain set (for 1987-91 applications).
l 1.5 ratio, extra long slot, Nitro Carb (not self-aligning).
o 1.5 ratio (not self-aligning). Factory cast valve covers may require internal clearancing.
p 1.5 ratio (not self-aligning), narrow body for center bolt valve covers.
q 1.5 ratio, self-aligning narrow body for center bolt valve covers.
r 1.6 ratio, self-aligning narrow body for center bolt valve covers. Valve springs and retainers must be changed to allow for increased valve travel.

Chevrolet V-8 97-15 4.8 - 5.3 - 5.7 (346) - 6.0 - 6.2L LS1, LS2, LS3/L92, LS6 (also 99-13 Vortec 4800, 5300, 6000, 6200)

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts										
Great daily driver or truck towing, for stock 4.8L thru 5.7L, smooth idle, great fuel economy, good torque and HP increase, computer upgrades not required, can use stock valve springs, good w/1.8:1 rocker arms.	**HR-206/294-2S-14.55**	1400-5500	**1449511*** ◆3	**144530-16[a]** **144536-16[b]** **144532-16[c]** **144533-16[x]**	206 214	270 278	114	(6) 32 46 (12)	.000 .000	.500 .500
Good daily driver, for stock or slightly modified 4.8L thru 6.0L, light choppy idle, good fuel economy, overall torque and HP increase, computer upgrades not required, good w/1.8:1 rocker arms.	**HR-210/3241-2S-14 4A**	1800-6000	**1449041*** ◆3	**144530-16[a]** **144536-16[b]** **144532-16[c]** **144533-16[x]**	210 218	272 280	114	(5) 35 47 (9)	.000 .000	.551 .551
Great daily driver, for stock 4.8L thru 6.0L, slight idle note, great fuel economy, overall torque and HP increase, computer upgrades not required, good w/1.8:1 rocker arms.	**HR-210/3241-2S-16 2A**	1600-6000	**1449051*** ◆3	**144530-16[a]** **144536-16[b]** **144532-16[c]** **144533-16[x]**	210 218	272 280	116	(9) 39 47 (9)	.000 .000	.551 .551
Good daily driver, for stock or slightly modified 4.8L thru 6.0L, light choppy idle, good fuel economy, 10.5+ compression ratio advised, computer upgrades required, good w/1.8:1 rocker arms.	**HR-216/3241-15**	2200-6300	**1449061*** ◆3	**144530-16[a]** **144536-16[b]** **144532-16[c]** **144533-16[x]**	216 216	278 278	115	(2) 38 48 (12)	.000 .000	.551 .551
Good daily driver, for stock or modified 4.8L thru 6.0L, light choppy idle, good fuel economy, 10.5+ compression ratio advised, good with supercharger or nitrous, computer upgrades required.	**HR-216/344-2S1-16 3A**	1900-6000	**1449071*** ◆3	**144530-16[a]** **144536-16[b]** **144532-16[c]** **144533-16[x]**	216 222	277 283	116	(5) 41 50 (8)	.000 .000	.585 .585
Good daily driver, for stock or modified 4.8L thru 6.0L, light choppy idle, good fuel economy, good with supercharger or nitrous, computer upgrades required, good w/1.8:1 ratio rocker arms.	**HR-216/3241-2S-15**	2000-6500	**1449561*** ◆3	**144530-16[a]** **144536-16[b]** **144532-16[c]** **144533-16[x]**	216 224	278 286	115	(2) 38 52 (8)	.000 .000	.551 .551
Good daily driver, for stock or modified 5.7L thru 6.0L, light choppy idle, good fuel economy, 10.5+ compression ratio advised, computer upgrades required.	**HR-216/344-2S-14**	2200-6500	**1449081*** ◆3	**144530-16[a]** **144536-16[b]** **144532-16[c]** **144533-16[x]**	216 224	277 285	114	(1) 37 51 (7)	.000 .000	.585 .585
Great daily driver, near stock idle but awesome response and mid-range and upper end power, good fuel economy. 10.5+ compression ratio advised.	**HR-216/347-2S1-15**	2000-6500	**1449351*** ◆3	**144530-16[a]** **144536-16[b]** **144532-16[c]** **144533-16[x]**	216 224	272 280	115	(3.5) 39.5 50.5 (6.5)	.000 .000	.590 .590
Daily driver, for modified 5.7L thru 6.0L, light choppy idle, fair fuel economy, headers and aft cat exhaust advised, 10.5+ compression ratio advised, auto trans w/2400-2800 stall converter, computer upgrades required, good w/1.8:1 ratio rocker arms.	**HR-220/3241-2S1-14**	2400-6500	**1449011*** ◆3	**144530-16[a]** **144536-16[b]** **144532-16[c]** **144533-16[x]**	220 224	282 286	114	1 39 51 (7)	.000 .000	.551 .551

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT NOTE: Crane Hydraulic Roller Cams offer tremendous power, torque and RPM potential. Due to their RPM capability and increased valve travel, it is HIGHLY RECOMMENDED that the appropriate Crane valve train components be installed for maximum performance and reliability.

NOTE: 1997-up Chevrolet 5.7L LS1/LS6, 1988-99 305 and 350 V-8 (and some 1987 350 V-8) engines, and the 1957-87 262-400 V-8 engines, each use different configuration camshaft cores, and cannot be interchanged.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

Crane Cams offers many different cam lobe profiles for the GM "LS1/LS2/LS6 Engine Family". These hydraulic roller cams are designed for applications ranging from mild street performance upgrades, serious torque and HP increases for trucks, to all-out competition profiles for LS1 powered race cars.

Crane's LS engine family's grinds are designed to take optimum advantage of the LS1/LS2/LS6's lighter valve train and greated reduced component inertia. This low inertia allows extraordinarily quick valve acceleration rates. This actually increases the "area beneath the lift curve" in each profile. Simply put, they begin moving the valve off its seat at a much quicker rate, to initiate earlier flow. The profiles retains and lengthens this rate of acceleration during the valve-opening cycle and as it approaches maximum valve lift. They function like a much "bigger" cam (greater duration) yet they increase low-end and mid-range torque in the most often used rpm range. Peak horsepower and torque output are enhanced throughout the entire rpm range. The valve lift tables were also designed to minimize horsepower-robbing harmonic frequency pulses when matched with the recommended Crane valve springs and pushrods.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

Custom Grind Cams Also Available – Call 866-388-5120 or go to cranecams.com for ordering information

CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	— ALUMINUM ROCKERS — GOLD RACE
144318-1[y] **144317-1**[d] **144316-1**[e]	**99831-16**[f] **144838-16**[g] **144847-16**[h]	**99637-16**[i] **99657-16**[j] **144944-16**[k] **144661-16**[l]	**99818-16**[m]	**99108-1**[n] **99107-1**[o]	**144621-16**[p] **144622-16**[q] **95627-16**[r]	**144984-1**[*s] **144985-1**[*t] **144986-1**[*u]	
144318-1[y] **144317-1**[d] **144316-1**[e]	**99831-16**[f] **144838-16**[g] **144847-16**[h]	**99637-16**[i] **99657-16**[j] **144944-16**[k] **144661-16**[l]	**99818-16**[m]	**99108-1**[n] **99107-1**[o]	**144621-16**[p] **144622-16**[q] **95627-16**[r]	**144984-1**[*s] **144985-1**[*t] **144986-1**[*u]	
144318-1[y] **144317-1**[d] **144316-1**[e]	**99831-16**[f] **144838-16**[g] **144847-16**[h]	**99637-16**[i] **99657-16**[j] **144944-16**[k] **144661-16**[l]	**99818-16**[m]	**99108-1**[n] **99107-1**[o]	**144621-16**[p] **144622-16**[q] **95627-16**[r]	**144984-1**[*s] **144985-1**[*t] **144986-1**[*u]	
144318-1[y] **144317-1**[d] **144316-1**[e]	**99831-16**[f] **144838-16**[g] **144847-16**[h]	**99637-16**[i] **99657-16**[j] **144944-16**[k] **144661-16**[l]	**99818-16**[m]	**99108-1**[n] **99107-1**[o]	**144621-16**[p] **144622-16**[q] **95627-16**[r]	**144984-1**[*s] **144985-1**[*t] **144986-1**[*u]	
144318-1[y] **144317-1**[d] **144316-1**[e]	**99831-16**[f] **144838-16**[g] **144847-16**[h]	**99637-16**[i] **99657-16**[j] **144944-16**[k] **144661-16**[l]	**99818-16**[m]	**99108-1**[n] **99107-1**[o]	**144621-16**[p] **144622-16**[q] **95627-16**[r]	**144984-1**[*s] **144985-1**[*t] **144986-1**[*u]	
144318-1[y] **144317-1**[d] **144316-1**[e]	**99831-16**[f] **144838-16**[g] **144847-16**[h]	**99637-16**[i] **99657-16**[j] **144944-16**[k] **144661-16**[l]	**99818-16**[m]	**99108-1**[n] **99107-1**[o]	**144621-16**[p] **144622-16**[q] **95627-16**[r]	**144984-1**[*s] **144985-1**[*t] **144986-1**[*u]	
144318-1[y] **144317-1**[d] **144316-1**[e]	**99831-16**[f] **144838-16**[g] **144847-16**[h]	**99637-16**[i] **99657-16**[j] **144944-16**[k] **144661-16**[l]	**99818-16**[m]	**99108-1**[n] **99107-1**[o]	**144621-16**[p] **144622-16**[q] **95627-16**[r]	**144984-1**[*s] **144985-1**[*t] **144986-1**[*u]	
144318-1[y] **144317-1**[d] **144316-1**[e]	**99831-16**[f] **144838-16**[g] **144847-16**[h]	**99637-16**[i] **99657-16**[j] **144944-16**[k] **144661-16**[l]	**99818-16**[m]	**99108-1**[n] **99107-1**[o]	**144621-16**[p] **144622-16**[q] **95627-16**[r]	**144984-1**[*s] **144985-1**[*t] **144986-1**[*u]	

Section Continued

a OE replacement, for use with standard GM alignment bars and standard base circle camshafts.
b For use with standard GM alignment bars, long body design for up to .715" valve lift and reduced base circle camshafts.
c Vertical locking bar hydraulic roller lifters, cylinder head removal is required.
d Contains **144838-16** dual valve springs, **144944-16** steel retainers, **144460-16** spring seats, **99818-16** valve seals, **99108-1** valve locks.
e Contains **144838-16** dual valve springs, **144661-16** titanium retainers, **14460-16** spring seats, **99818-16** valve seals, **99108-1** valve locks.
f Single ovate wire beehive valve springs.
g Dual valve springs for up to .680" lift, requires Crane **144944-16** or **144661-16** retainers, no machining required. 2002-up cylinder heads will require Crane **144460-16** spring seats.
h Dual valve springs for up to .660" lift, XHTCS material, requires Crane **144944-16** or **144661-16** retainers, no machining required. 2002-up cylinder heads will require Crane **144460-16** spring seats.
i Titanium, for **99831-16** single valve springs.
j Titanium, for **99831-16** single valve springs, requires Crane Multi Fit valve locks.
k Steel, for **144838-16** and **144847-16** dual valve springs.
l Titanium, for **144838-16** and **144847-16** dual valve springs.
m No machining required.
n Machined steel, heat treated.
o Machined steel, heat treated, Multi Fit.
p Pro Series one-piece, stock length.
q Pro Series one-piece, for use with Crane aluminum rocker arm kits (included in **144750-16** and **144759-16** kits).
r Pro Series one piece, stock length -.050".
s Pro Series steel billet gears and double roller chain set with vernier adjustment, for LS1 and LS6, without cam sensor trigger.
t Pro Series steel billet gears and double roller chain set with 9 keyway crank sprocket, for early LS2, with single trigger cam sensor feature.
u Pro Series steel billet gears and double roller chain set with 9 keyway crank sprocket, for late LS2, LS3, LS7, and L92, with four trigger cam sensor feature.
x Vertical locking bar hydraulic roller lifters, cylinder head removal is required. For Warhawk blocks.
y Contains **99831-16** beehive valve springs, **144943-16** steel retainers, **99454-16** spring seats, **99818-16** valve seals, **99108-1** valve locks.

Chevrolet V-8 97-15 4.8 - 5.3 - 5.7 (346) - 6.0 - 6.2L LS1, LS2, LS3/L92, LS6 (also 99-13 Vortec 4800, 5300, 6000, 6200)

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts										
Daily driver, for modified 5.7L thru 6.0L, choppy idle, fair fuel economy, headers and aft cat exhaust advised, 10.8+ compression ratio advised, auto trans w/2800-3000 stall converter, computer upgrades required, good w/1.8:1 ratio rocker arms.	**HR-222/3241-2S-15 3A**	2300-6800	**1449091*** ◆3	**144530-16[a]** **144536-16[b]** **144532-16[c]** **144533-16[x]**	222 228	284 290	115	(1) 43 52 (4)	.000 .000	.551 .551
Daily driver, for modified 5.7L thru 6.0L, choppy idle, fair fuel economy, headers and aft cat exhaust advised, 11.0+ compression ratio advised, auto trans w/3000-3400 stall converter, computer upgrades required, good w/1.8:1 ratio rocker arms.	**HR-224/3241-14**	2300-6500	**1449591*** ◆3	**144530-16[a]** **144536-16[b]** **144532-16[c]** **144533-16[x]**	224 224	286 286	114	3 41 51 (7)	.000 .000	.551 .551
Weekend driver, for modified 5.7L thru 6.0L, choppy idle, fair fuel economy, headers and aft cat exhaust advised, 10.8+ compression ratio advised, auto trans w/2800-3200 stall converter, computer upgrades required, good w/1.8:1 ratio rocker arms.	**HR-224/3241-2S-14 2A**	2200-6500	**1449101*** ◆3	**144530-16[a]** **144536-16[b]** **144532-16[c]** **144533-16[x]**	224 228	286 290	114	0 44 50 (2)	.000 .000	.551 .551
Weekend driver, for modified 5.7L thru 7.0L, choppy idle, fair fuel economy, headers and aft cat exhaust required, 11.0+ compression ratio advised, low ratio gearing required, auto trans w/2800-3200 stall converter, computer upgrades required.	**HR-224/347-2S-14 4A**	2300-6500	**1449111*** ◆3	**144536-16[b]** **144532-16[c]** **144533-16[x]**	224 228	280 283	114	0.5 43.5 50.5 (2.5)	.000 .000	.590 .590
Weekend driver, for modified 5.7L thru 7.0L, choppy idle, fair fuel economy, headers and aft cat exhaust required, 11.0+ compression ratio advised, low ratio gearing required, auto trans w/3000-3400 stall converter, computer upgrades required.	**HR-224/347-2S1-15 4A**	2400-6500	**1449121*** ◆3	**144536-16[b]** **144532-16[c]** **144533-16[x]**	224 232	280 287	115	0.5 44.5 53.5 (1.5)	.000 .000	.590 .590
Weekend driver, for modified 5.7L thru 7.0L, choppy idle, fair fuel economy, headers and aft cat exhaust required, 11.5+ compression ratio advised, low ratio gearing required, auto trans w/3200-3600 stall converter, computer upgrades required.	**HR-228/353-13 4A**	2700-6500	**1449131*** ◆3	**144536-16[b]** **144532-16[c]** **144533-16[x]**	228 228	290 290	113	5 43 51 (3)	.000 .000	.600 .600
Weekend driver, for modified 5.7L thru 6.0L, choppy idle, upgraded cylinder heads and valvetrain required, headers and aft cat exhaust required, 11.5+ compression ratio advised, low ratio gearing required, auto trans w/3200-3600 stall converter, computer upgrades required, good w/1.8:1 ratio rocker arms.	**HR-228/3241-2S-12**	2700-6500	**1449141*** ◆3	**144530-16[a]** **144536-16[b]** **144532-16[c]** **144533-16[x]**	228 232	290 294	112	7 41 43 (1)	.000 .000	.551 .551

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT NOTE: Crane Hydraulic Roller Cams offer tremendous power, torque and RPM potential. Due to their RPM capability and increased valve travel, it is HIGHLY RECOMMENDED that the appropriate Crane valve train components be installed for maximum performance and reliability.

NOTE: 1997-up Chevrolet 5.7L LS1/LS6, 1988-99 305 and 350 V-8 (and some 1987 350 V-8) engines, and the 1957-87 262-400 V-8 engines, each use different configuration camshaft cores, and cannot be interchanged.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

Crane Cams offers many different cam lobe profiles for the GM "LS1/LS2/LS6 Engine Family". These hydraulic roller cams are designed for applications ranging from mild street performance upgrades, serious torque and HP increases for trucks, to all-out competition profiles for LS1 powered race cars.

Crane's LS engine family's grinds are designed to take optimum advantage of the LS1/LS2/LS6's lighter valve train and greated reduced component inertia. This low inertia allows extraordinarily quick valve acceleration rates. This actually increases the "area beneath the lift curve" in each profile. Simply put, they begin moving the valve off its seat at a much quicker rate, to initiate earlier flow. The profiles retains and lengthens this rate of acceleration during the valve-opening cycle and as it approaches maximum valve lift. They function like a much "bigger" cam (greater duration) yet they increase low-end and mid-range torque in the most often used rpm range. Peak horsepower and torque output are enhanced throughout the entire rpm range. The valve lift tables were also designed to minimize horsepower-robbing harmonic frequency pulses when matched with the recommended Crane valve springs and pushrods.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

CRANE Cams®

Custom Grind Cams Also Available – Call 866-388-5120 or go to cranecams.com for ordering information

CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	— ALUMINUM ROCKERS — GOLD RACE
144318-1[y] **144317-1**[d] **144316-1**[e]	**99831-16**[e] **144838-16**[g] **144847-16**[h]	**99637-16**[g] **99657-16**[h] **144944-16**[i] **144661-16**[j]	**99818-16**[k]	**99108-1**[l] **99107-1**[m]	**144621-16**[n] **144622-16**[o] **95627-16**[p]	**144984-1***[q] **144985-1***[r] **144986-1***[u]	
144318-1[y] **144317-1**[d] **144316-1**[e]	**99831-16**[e] **144838-16**[g] **144847-16**[h]	**99637-16**[g] **99657-16**[h] **144944-16**[i] **144661-16**[j]	**99818-16**[k]	**99108-1**[l] **99107-1**[m]	**144621-16**[n] **144622-16**[o] **95627-16**[p]	**144984-1***[q] **144985-1***[r] **144986-1***[u]	
144318-1[y] **144317-1**[d] **144316-1**[e]	**99831-16**[e] **144838-16**[g] **144847-16**[h]	**99637-16**[g] **99657-16**[h] **144944-16**[i] **144661-16**[j]	**99818-16**[k]	**99108-1**[l] **99107-1**[m]	**144621-16**[n] **144622-16**[o] **95627-16**[p]	**144984-1***[q] **144985-1***[r] **144986-1***[u]	
144318-1[y] **144317-1**[d] **144316-1**[e]	**99831-16**[e] **144838-16**[g] **144847-16**[h]	**99637-16**[g] **99657-16**[h] **144944-16**[i] **144661-16**[j]	**99818-16**[k]	**99108-1**[l] **99107-1**[m]	**144621-16**[n] **144622-16**[o] **95627-16**[p]	**144984-1***[q] **144985-1***[r] **144986-1***[u]	
144318-1[y] **144317-1**[d] **144316-1**[e]	**99831-16**[e] **144838-16**[g] **144847-16**[h]	**99637-16**[g] **99657-16**[h] **144944-16**[i] **144661-16**[j]	**99818-16**[k]	**99108-1**[l] **99107-1**[m]	**144621-16**[n] **144622-16**[o] **95627-16**[p]	**144984-1***[q] **144985-1***[r] **144986-1***[u]	
144318-1[y] **144317-1**[d] **144316-1**[e]	**99831-16**[e] **144838-16**[g] **144847-16**[h]	**99637-16**[g] **99657-16**[h] **144944-16**[i] **144661-16**[j]	**99818-16**[k]	**99108-1**[l] **99107-1**[m]	**144621-16**[n] **144622-16**[o] **95627-16**[p]	**144984-1***[q] **144985-1***[r] **144986-1***[u]	

Section Continued

a OE replacement, for use with standard GM alignment bars and standard base circle camshafts.
b For use with standard GM alignment bars, long body design for up to .715" valve lift and reduced base circle camshafts.
c Vertical locking bar hydraulic roller lifters, cylinder head removal is required.
d Contains **144838-16** dual valve springs, **144944-16** steel retainers, **144460-16** spring seats, **99818-16** valve seals, **99108-1** valve locks.
e Contains **144838-16** dual valve springs, **144661-16** titanium retainers, **14460-16** spring seats, **99818-16** valve seals, **99108-1** valve locks.
f Single ovate wire beehive valve springs.
g Dual valve springs for up to .680" lift, requires Crane **144944-16** or **144661-16** retainers, no machining required. 2002-up cylinder heads will require Crane **144460-16** spring seats.
h Dual valve springs for up to .660" lift, XHTCS material, requires Crane **144944-16** or **144661-16** retainers, no machining required. 2002-up cylinder heads will require Crane **144460-16** spring seats.
i Titanium, for **99831-16** single valve springs.
j Titanium, for **99831-16** single valve springs, requires Crane Multi Fit valve locks.
k Steel, for **144838-16** and **144847-16** dual valve springs.
l Titanium, for **144838-16** and **144847-16** dual valve springs.
m No machining required.
n Machined steel, heat treated.
o Machined steel, heat treated, Multi Fit.
p Pro Series one-piece, stock length.
q Pro Series one-piece, for use with Crane aluminum rocker arm kits (included in **144750-16** and **144759-16** kits).
r Pro Series one piece, stock length -.050".
s Pro Series steel billet gears and double roller chain set with vernier adjustment, for LS1 and LS6, without cam sensor trigger.
t Pro Series steel billet gears and double roller chain set with 9 keyway crank sprocket, for early LS2, with single trigger cam sensor feature.
u Pro Series steel billet gears and double roller chain set with 9 keyway crank sprocket, for late LS2, LS3, LS7, and L92, with four trigger cam sensor feature.
x Vertical locking bar hydraulic roller lifters, cylinder head removal is required. For Warhawk blocks.
y Contains **99831-16** beehive valve springs, **144943-16** steel retainers, **99454-16** spring seats, **99818-16** valve seals, **99108-1** valve locks.

Chevrolet V-8 97-15 4.8 - 5.3 - 5.7 (346) - 6.0 - 6.2L LS1, LS2, LS3/L92, LS6 (also 99-13 Vortec 4800, 5300, 6000, 6200)

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts										
Weekend driver, for modified 5.7L thru 6.0L, choppy idle, upgraded cylinder heads and valvetrain required, headers and aft cat exhaust required, 11.5+ compression ratio advised, low ratio gearing required, auto trans w/3200-3600 stall converter, computer upgrades required.	**HR-228/353-2S1-12**	2400-6500	**1449601*** ◆3	**144536-16[b]** **144532-16[c]** **144533-16[x]**	228 232	290 294	112	7 41 53 (1)	.000 .000	.600 .600
Weekend driver, for modified 5.7L thru 6.0L, choppy idle, upgraded cylinder heads and valvetrain required, headers and aft cat exhaust required, 11.0+ compression ratio advised, low ratio gearing required, auto trans w/3200-3600 stall converter, computer upgrades required.	**HR-228/353-2S1-14 2A**	2400-6500	**1449151*** ◆3	**144536-16[b]** **144532-16[c]** **144533-16[x]**	228 232	290 294	114	2 46 52 0	.000 .000	.600 .600
Weekend driver, for modified 5.7L thru 6.0L, choppy idle, upgraded cylinder heads and valvetrain required, headers and aft cat exhaust required, 11.0+ compression ratio advised, low ratio gearing required, auto trans w/3200-3600 stall converter, computer upgrades required.	**HR-228/347-2S-15 0A**	2400-6500	**1449161*** ◆3	**144536-16[b]** **144532-16[c]** **144533-16[x]**	228 236	283 291	115	(2.5) 50.5 51.5 4.5	.000 .000	.590 .590
Weekend driver, for turbocharged 5.7L thru 6.0L, choppy idle, upgraded cylinder heads and valvetrain required, headers and aft cat exhaust required, low ratio gearing required, auto trans w/3200-3600 stall converter, computer upgrades required.	**HR-232/353-2SR-17 2A**	2600-6400	**1449171*** ◆3	**144536-16[b]** **144532-16[c]** **144533-16[x]**	232 228	294 290	117	1 51 53 (5)	.000 .000	.600 .600
Weekend driver, for modified 5.7L thru 6.0L, rough idle, upgraded cylinder heads and valvetrain required, headers and aft cat exhaust required, 11.5+ compression ratio advised, low ratio gearing required, auto trans w/3400-4000 stall converter, computer upgrades required.	**HR-232/353-2S1-12 4A**	2900-6500	**1449181*** ◆3	**144536-16[b]** **144532-16[c]** **144533-16[x]**	232 236	294 298	112	8 44 54 2	.000 .000	.600 .600
Weekend driver, for modified 5.7L thru 6.0L, choppy idle, upgraded cylinder heads and valvetrain required, headers and aft cat exhaust required, 11.5+ compression ratio advised, low ratio gearing required, auto trans w/3600-4000 stall converter, computer upgrades required.	**HR-232/353-2S1-14**	2900-6500	**1449331*** ◆3	**144536-16[b]** **144532-16[c]** **144533-16[x]**	232 236	294 298	114	7 45 57 (1)	.000 .000	.600 .600
Weekend driver, for modified 5.7L thru 6.0L, choppy idle, upgraded cylinder heads and valvetrain required, headers and aft cat exhaust required, 11.0+ compression ratio advised, low ratio gearing required, auto trans w/3200-3600 stall converter, computer upgrades required, good w/1.8:1 ratio rocker arms.	**HR-232/3241-2S1-17 3A**	2600-6600	**1449191*** ◆3	**144530-16[a]** **144536-16[b]** **144532-16[c]** **144533-16[x]**	232 240	294 302	117	2 50 60 0	.000 .000	.551 .551
Pro Street & Drags, for modified 5.7L - 8.0L, rough idle, upgraded cylinder heads and valvetrain required, headers and aft cat exhaust required, 12.0+ compression ratio advised, low ratio gearing required, auto trans w/3600-4400 stall converter, computer upgrades required.	**HR-232/353-2S-10 0A**	2900-6600	**1449201*** ◆3	**144536-16[b]** **144532-16[c]** **144533-16[x]**	232 240	294 302	110	6 46 50 10	.000 .000	.600 .600

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	— ALUMINUM ROCKERS — GOLD RACE
144318-1[y] **144317-1**[d] **144316-1**[e]	**99831-16**[e] **144838-16**[g] **144847-16**[h]	**99637-16**[g] **99657-16**[h] **144944-16**[i]	**99818-16**[k]	**99108-1**[l] **99107-1**[m]	**144621-16**[n] **144622-16**[o] **95627-16**[p]	**144984-1***[q] **144985-1***[r] **144986-1***[u]	
144318-1[y] **144317-1**[d] **144316-1**[e]	**99831-16**[e] **144838-16**[g] **144847-16**[h]	**99637-16**[g] **99657-16**[h] **144944-16**[i] **144661-16**[j]	**99818-16**[k]	**99108-1**[l] **99107-1**[m]	**144621-16**[n] **144622-16**[o] **95627-16**[p]	**144984-1***[q] **144985-1***[r] **144986-1***[u]	
144318-1[y] **144317-1**[d] **144316-1**[e]	**99831-16**[e] **144838-16**[g] **144847-16**[h]	**99637-16**[g] **99657-16**[h] **144944-16**[i] **144661-16**[j]	**99818-16**[k]	**99108-1**[l] **99107-1**[m]	**144621-16**[n] **144622-16**[o] **95627-16**[p]	**144984-1***[q] **144985-1***[r] **144986-1***[u]	
144318-1[y] **144317-1**[d] **144316-1**[e]	**99831-16**[e] **144838-16**[g] **144847-16**[h]	**99637-16**[g] **99657-16**[h] **144944-16**[i] **144661-16**[j]	**99818-16**[k]	**99108-1**[l] **99107-1**[m]	**144621-16**[n] **144622-16**[o] **95627-16**[p]	**144984-1***[q] **144985-1***[r] **144986-1***[u]	
144318-1[y] **144317-1**[d] **144316-1**[e]	**99831-16**[e] **144838-16**[g] **144847-16**[h]	**99637-16**[g] **99657-16**[h] **144944-16**[i] **144661-16**[j]	**99818-16**[k]	**99108-1**[l] **99107-1**[m]	**144621-16**[n] **144622-16**[o] **95627-16**[p]	**144984-1***[q] **144985-1***[r] **144986-1***[u]	
144318-1[y] **144317-1**[d] **144316-1**[e]	**99831-16**[e] **144838-16**[g] **144847-16**[h]	**99637-16**[g] **99657-16**[h] **144944-16**[i] **144661-16**[j]	**99818-16**[k]	**99108-1**[l] **99107-1**[m]	**144621-16**[n] **144622-16**[o] **95627-16**[p]	**144984-1***[q] **144985-1***[r] **144986-1***[u]	
144318-1[y] **144317-1**[d] **144316-1**[e]	**99831-16**[e] **144838-16**[g] **144847-16**[h]	**99637-16**[g] **99657-16**[h] **144944-16**[i] **144661-16**[j]	**99818-16**[k]	**99108-1**[l] **99107-1**[m]	**144621-16**[n] **144622-16**[o] **95627-16**[p]	**144984-1***[q] **144985-1***[r] **144986-1***[u]	

Section Continued

a OE replacement, for use with standard GM alignment bars and standard base circle camshafts.
b For use with standard GM alignment bars, long body design for up to .715" valve lift and reduced base circle camshafts.
c Vertical locking bar hydraulic roller lifters, cylinder head removal is required.
d Contains **144838-16** dual valve springs, **144944-16** steel retainers, **144460-16** spring seats, **99818-16** valve seals, **99108-1** valve locks.
e Contains **144838-16** dual valve springs, **144661-16** titanium retainers, **14460-16** spring seats, **99818-16** valve seals, **99108-1** valve locks.
f Single ovate wire beehive valve springs.
g Dual valve springs for up to .680" lift, requires Crane **144944-16** or **144661-16** retainers, no machining required. 2002-up cylinder heads will require Crane **144460-16** spring seats.
h Dual valve springs for up to .660" lift, XHTCS material, requires Crane **144944-16** or **144661-16** retainers, no machining required. 2002-up cylinder heads will require Crane **144460-16** spring seats.
i Titanium, for **99831-16** single valve springs.
j Titanium, for **99831-16** single valve springs, requires Crane Multi Fit valve locks.
k Steel, for **144838-16** and **144847-16** dual valve springs.
l Titanium, for **144838-16** and **144847-16** dual valve springs.
m No machining required.
n Machined steel, heat treated.
o Machined steel, heat treated, Multi Fit.
p Pro Series one-piece, stock length.
q Pro Series one-piece, for use with Crane aluminum rocker arm kits (included in **144750-16** and **144759-16** kits).
r Pro Series one piece, stock length -.050".
s Pro Series steel billet gears and double roller chain set with vernier adjustment, for LS1 and LS6, without cam sensor trigger.
t Pro Series steel billet gears and double roller chain set with 9 keyway crank sprocket, for early LS2, with single trigger cam sensor feature.
u Pro Series steel billet gears and double roller chain set with 9 keyway crank sprocket, for late LS2, LS3, LS7, and L92, with four trigger cam sensor feature.
x Vertical locking bar hydraulic roller lifters, cylinder head removal is required. For Warhawk blocks.
y Contains **99831-16** beehive valve springs, **144943-16** steel retainers, **99454-16** spring seats, **99818-16** valve seals, **99108-1** valve locks.

Chevrolet V-8 97-15 4.8 - 5.3 - 5.7 (346) - 6.0 - 6.2L LS1, LS2, LS3/L92, LS6 (also 99-13 Vortec 4800, 5300, 6000, 6200)

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts										
Pro Street & Drags, for modified 5.7L - 8.0L, rough idle, upgraded cylinder heads & valvetrain required, headers & aft cat exhaust required, 12.0+ compress. ratio advised, low ratio gearing required, auto trans w/3200-3600 stall converter, computer upgrades required.	**HR-236/347-2S-14 0A**	3000-6800	**1449211*** ◆3	**144536-16[b]** **144532-16[c]** **144533-16[x]**	236 240	291 295	114	2.5 53.5 52.5 7.5	.000 .000	.590 .590
Pro Street and Drags, for modified 5.7L thru 8.0L, rough idle, upgraded cylinder heads and valvetrain required, headers and aft cat exhaust required, 12.0+ compression ratio advised, low ratio gearing required, auto trans w/3400-4000 stall converter, computer upgrades required.	**HR-236/353-2S-12**	3100-6800	**1449611*** ◆3	**144536-16[b]** **144532-16[c]** **144533-16[x]**	236 240	298 302	112	11 45 57 3	.000 .000	.600 .600
Pro Street and Drags, for modified 5.7L thru 8.0L, rough idle, upgraded cylinder heads and valvetrain required, headers and aft cat exhaust required, 11.5+ compression ratio advised, low ratio gearing required, auto trans w/3200-3600 stall converter, computer upgrades required.	**HR-236/347-2S1-15**	2800-6800	**1449221*** ◆3	**144536-16[b]** **144532-16[c]** **144533-16[x]**	236 244	291 299	115	6.5 49.5 60.5 3.5	.000 .000	.590 .590
Pro Street and Drags, for modified 5.7L thru 8.0L, rough idle, upgraded cylinder heads and valvetrain required, headers and aft cat exhaust required, 12.0+ compression ratio advised, low ratio gearing required, auto trans w/3600-4400 stall converter, computer upgrades required.	**HR-236/353-2-10 0A**	3200-6800	**1449231*** ◆3	**144536-16[b]** **144532-16[c]** **144533-16[x]**	236 246	298 308	110	8 48 53 13	.000 .000	.600 .600
Pro Street and Drags, for turbocharged 5.7L thru 6.0L, choppy idle, upgraded cylinder heads and valvetrain required, headers and aft cat exhaust required, 12.0+ compression ratio advised, low ratio gearing required, auto trans w/3400-3600 stall converter, computer upgrades required.	**HR-240/353-2SR-14**	3300-7000	**1449241*** ◆3	**144536-16[b]** **144532-16[c]** **144533-16[x]**	240 236	302 298	114	11 49 57 (1)	.000 .000	.600 .600
Pro Street and Drags, for modified 5.7L thru 8.0L, rough idle, upgraded cylinder heads and valvetrain required, headers and aft cat exhaust required, 11.5+ compression ratio advised, low ratio gearing required, auto trans w/3600-4400 stall converter, computer upgrades required.	**HR-240/353-2S-14 4A**	3000-7000	**1449251*** ◆3	**144536-16[b]** **144532-16[c]** **144533-16[x]**	240 246	302 308	114	10 50 61 5	.000 .000	.600 .600
Pro Street and Drags, for modified 5.7L thru 8.0L, rough idle, upgraded cylinder heads and valvetrain required, headers and aft cat exhaust required, 12.0+ compression ratio advised, low ratio gearing required, auto trans w/3600-4400 stall converter, computer upgrades required.	**HR-246/367-2-14**	3200-7200	**1449261*** ◆3	**144536-16[b]** **144532-16[c]** **144533-16[x]**	246 256	303 313	114	12.5 53.5 65.5 10.5	.000 .000	.624 .624

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT NOTE: Crane Hydraulic Roller Cams offer tremendous power, torque and RPM potential. Due to their RPM capability and increased valve travel, it is HIGHLY RECOMMENDED that the appropriate Crane valve train components be installed for maximum performance and reliability.

NOTE: 1997-up Chevrolet 5.7L LS1/LS6, 1988-99 305 and 350 V-8 (and some 1987 350 V-8) engines, and the 1957-87 262-400 V-8 engines, each use different configuration camshaft cores, and cannot be interchanged.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

Crane Cams offers many different cam lobe profiles for the GM "LS1/LS2/LS6 Engine Family". These hydraulic roller cams are designed for applications ranging from mild street performance upgrades, serious torque and HP increases for trucks, to all-out competition profiles for LS1 powered race cars.

Crane's LS engine family's grinds are designed to take optimum advantage of the LS1/LS2/LS6's lighter valve train and greated reduced component inertia. This low inertia allows extraordinarily quick valve acceleration rates. This actually increases the "area beneath the lift curve" in each profile. Simply put, they begin moving the valve off its seat at a much quicker rate, to initiate earlier flow. The profiles retains and lengthens this rate of acceleration during the valve-opening cycle and as it approaches maximum valve lift. They function like a much "bigger" cam (greater duration) yet they increase low-end and mid-range torque in the most often used rpm range. Peak horsepower and torque output are enhanced throughout the entire rpm range. The valve lift tables were also designed to minimize horsepower-robbing harmonic frequency pulses when matched with the recommended Crane valve springs and pushrods.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

CRANE Cams®

Custom Grind Cams Also Available – Call 866-388-5120 or go to cranecams.com for ordering information

CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	— ALUMINUM ROCKERS — GOLD RACE
144318-1[y] **144317-1[d]** **144316-1[e]**	**99831-16[e]** **144838-16[g]** **144847-16[h]**	**99637-16[g]** **99657-16[h]** **144944-16[i]** **144661-16[j]**	**99818-16[k]**	**99108-1[l]** **99107-1[m]**	**144621-16[n]** **144622-16[o]** **95627-16[p]**	**144984-1[*q]** **144985-1[*r]** **144986-1[*u]**	
144318-1[y] **144317-1[d]** **144316-1[e]**	**99831-16[e]** **144838-16[g]** **144847-16[h]**	**99637-16[g]** **99657-16[h]** **144944-16[i]** **144661-16[j]**	**99818-16[k]**	**99108-1[l]** **99107-1[m]**	**144621-16[n]** **144622-16[o]** **95627-16[p]**	**144984-1[*q]** **144985-1[*r]** **144986-1[*u]**	
144318-1[y] **144317-1[d]** **144316-1[e]**	**99831-16[e]** **144838-16[g]** **144847-16[h]**	**99637-16[g]** **99657-16[h]** **144944-16[i]** **144661-16[j]**	**99818-16[k]**	**99108-1[l]** **99107-1[m]**	**144621-16[n]** **144622-16[o]** **95627-16[p]**	**144984-1[*q]** **144985-1[*r]** **144986-1[*u]**	
144318-1[y] **144317-1[d]** **144316-1[e]**	**99831-16[e]** **144838-16[g]** **144847-16[h]**	**99637-16[g]** **99657-16[h]** **144944-16[i]** **144661-16[j]**	**99818-16[k]**	**99108-1[l]** **99107-1[m]**	**144621-16[n]** **144622-16[o]** **95627-16[p]**	**144984-1[*q]** **144985-1[*r]** **144986-1[*u]**	
144318-1[y] **144317-1[d]** **144316-1[e]**	**99831-16[e]** **144838-16[g]** **144847-16[h]**	**99637-16[g]** **99657-16[h]** **144944-16[i]** **144661-16[j]**	**99818-16[k]**	**99108-1[l]** **99107-1[m]**	**144621-16[n]** **144622-16[o]** **95627-16[p]**	**144984-1[*q]** **144985-1[*r]** **144986-1[*u]**	
144317-1[d] **144316-1[e]**	**144838-16[g]** **144847-16[h]**	**144944-16[i]** **144661-16[j]**	**99818-16[k]**	**99108-1[l]** **99107-1[m]**	**144621-16[n]** **144622-16[o]** **95627-16[p]**	**144984-1[*q]** **144985-1[*r]** **144986-1[*u]**	

b For use with standard GM alignment bars, long body design for up to .715" valve lift and reduced base circle camshafts.
c Vertical locking bar hydraulic roller lifters, cylinder head removal is required.
d Contains **144838-16** dual valve springs, **144944-16** steel retainers, **144460-16** spring seats, **99818-16** valve seals, **99108-1** valve locks.
e Contains **144838-16** dual valve springs, **144661-16** titanium retainers, **14460-16** spring seats, **99818-16** valve seals, **99108-1** valve locks.
f Single ovate wire beehive valve springs.
g Dual valve springs for up to .680" lift, requires Crane **144944-16** or **144661-16** retainers, no machining required. 2002-up cylinder heads will require Crane **144460-16** spring seats.
h Dual valve springs for up to .660" lift, XHTCS material, requires Crane **144944-16** or **144661-16** retainers, no machining required. 2002-up cylinder heads will require Crane **144460-16** spring seats.
i Titanium, for **99831-16** single valve springs.
j Titanium, for **99831-16** single valve springs, requires Crane Multi Fit valve locks.
k Steel, for **144838-16** and **144847-16** dual valve springs.
l Titanium, for **144838-16** and **144847-16** dual valve springs.
m No machining required.
n Machined steel, heat treated.
o Machined steel, heat treated, Multi Fit.
p Pro Series one-piece, stock length.
q Pro Series one-piece, for use with Crane aluminum rocker arm kits (included in **144750-16** and **144759-16** kits).
r Pro Series one piece, stock length -.050".
s Pro Series steel billet gears and double roller chain set with vernier adjustment, for LS1 and LS6, without cam sensor trigger.
t Pro Series steel billet gears and double roller chain set with 9 keyway crank sprocket, for early LS2, with single trigger cam sensor feature.
u Pro Series steel billet gears and double roller chain set with 9 keyway crank sprocket, for late LS2, LS3, LS7, and L92, with four trigger cam sensor feature.
x Vertical locking bar hydraulic roller lifters, cylinder head removal is required. For Warhawk blocks.
y Contains **99831-16** beehive valve springs, **144943-16** steel retainers, **99454-16** spring seats, **99818-16** valve seals, **99108-1** valve locks.

Chevrolet V-8 97-15 4.8 - 5.3 - 5.7 (346) - 6.0 - 6.2L LS1, LS2, LS3/L92, LS6 (also 99-13 Vortec 4800, 5300, 6000, 6200)

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 276 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Roller Camshafts										
Serious Pro Street and Drags, for modified 5.7L thru 8.0L, very rough idle, upgraded cylinder heads and valvetrain required, headers and aft cat exhaust required, 12.0+ compression ratio advised, low ratio gearing required, auto trans w/3600-4000 stall converter, serious computer upgrades required.	**R-240/3821-2S-10**	3500-7500	**1448051*** ◆3	**144511-16[a]** **144570-16[b]** **144572-16[c]**	240 244	269 273	110	14.5 45.5 56.5 7.5	.020 .022	.649 .649
Serious Pro Street and Drags, for modified 5.7L thru 8.0L, very rough idle, good with supercharger or nitrous, upgraded cylinder heads and valvetrain required, headers and aft cat exhaust required, 12.0+ compression ratio advised w/o supercharger, low ratio gearing required, auto trans w/3600-4600 stall converter, serious computer upgrades required.	**R-242/353-2S-14**	3300-7500	**1448011*** ◆3	**144511-16[a]** **144570-16[b]** **144572-16[c]**	242 248	273 279	114	10.5 51.5 61.5 6.5	.020 .022	.600 .600
Serious Pro Street and Drags, for modified 5.7L thru 8.0L, very rough idle, upgraded cylinder heads and valvetrain required, headers and aft cat exhaust required, 12.0+ compression ratio advised, low ratio gearing required, auto trans w/3800-4200 stall converter, serious computer upgrades required.	**R-244/382-2S-10**	3600-7600	**1448061*** ◆3	**144511-16[a]** **144570-16[b]** **144572-16[c]**	244 248	273 277	110	16.5 47.5 58.5 9.5	.020 .022	.649 .649
Serious Pro Street and Drags, for modified 5.7L thru 8.0L, very rough idle, good with supercharger or nitrous, upgraded cylinder heads and valvetrain required, headers and aft cat exhaust required, 12.0+ compression ratio advised w/o supercharger, low ratio gearing required, auto trans w/4000-4800 stall converter, serious computer upgrades required.	**R-248/353-2S-10 0A**	3600-7600	**1448021*** ◆3	**144511-16[a]** **144570-16[b]** **144572-16[c]**	248 260	279 292	110	14 54 60 20	.020 .022	.600 .600
Serious Pro Street and Drags, for modified 5.7L thru 8.0L, very rough idle, upgraded cylinder heads and valvetrain required, headers and aft cat exhaust required, 12.0+ compression ratio advised, low ratio gearing required, auto trans w/4000-4800 stall converter, serious computer upgrades required.	**R-262/395-2S-8**	3800-7800	**1448031*** ◆3	**144511-16[a]** **144570-16[b]** **144572-16[c]**	262 268	296 302	108	27 55 66 22	.020 .022	.671 .671
Serious Pro Street and Drags, for modified 5.0L thru 8.0L, very rough idle, upgraded cylinder heads and valvetrain required, headers and aft cat exhaust required, 12.0+ compression ratio advised, low ratio gearing required, auto trans w/5000-5500 stall converter, serious computer upgrades required.	**R-276/420-2-14**	4600-8800	**1448041*** ◆3	**144511-16[a]** **144570-16[b]** **144572-16[c]**	276 286	308 318	114	28 68 82 25	.020 .022	.714 .714

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT NOTE: Crane Roller Cams offer tremendous power, torque and RPM potential. Due to their RPM capability and increased valve travel, it is HIGHLY RECOMMENDED that the appropriate Crane valve train components be installed for maximum performance and reliability.

NOTE: 1997-up Chevrolet 5.7L LS1/LS6, 1988-99 305 and 350 V-8 (and some 1987 350 V-8) engines, and the 1957-87 262-400 V-8 engines, each use different configuration camshaft cores, and cannot be interchanged.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

Crane Cams offers many different cam lobe profiles for the GM "LS1/LS2/LS6 Engine Family". These roller cams are designed for applications ranging from Pro Street performance, to all-out competition profiles for LS1 powered race cars.

Crane's roller camshafts are designed to take optimum advantage of the LS1/LS2/LS6's lighter valve train and greated reduced component inertia. This low inertia allows extraordinarily quick valve acceleration rates. This actually increases the "area beneath the lift curve" in each profile. Simply put, these new Crane cams begin moving the valve off its seat at a much quicker rate, to initiate earlier flow. The profile retains and lengthens this rate of acceleration during the valve-opening cycle and as it approaches maximum valve lift. They function like a much "bigger" cam (greater duration) yet they increase low-end and mid-range torque in the most often used rpm range. Peak horsepower and torque output are enhanced throughout the entire rpm range. Crane valve lift tables were also designed to minimize horsepower-robbing harmonic frequency pulses when matched with the recommended Crane valve springs and pushrods.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

CRANE Cams®

Custom Grind Cams Also Available – Call 866-388-5120 or go to cranecams.com for ordering information

CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 286*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	— ALUMINUM ROCKERS — GOLD RACE
144316-1[d] **144314-1**[e]	**144838-16**[f] **144847-16**[g]	**144944-16**[h] **144661-16**[i]	**99818-16**[j]	**99108-1**[k]	**144621-16**[l] **144622-16**[m] **95627-16**[n]	**144984-1***[o] **144985-1***[p] **144986-1**[q]	
144316-1[d] **144314-1**[e]	**144838-16**[f] **144847-16**[g]	**144944-16**[h] **144661-16**[i]	**99818-16**[j]	**99108-1**[k]	**144621-16**[l] **144622-16**[m] **95627-16**[n]	**144984-1***[o] **144985-1***[p] **144986-1**[q]	
144316-1[d] **144314-1**[e]	**144838-16**[f] **144847-16**[g]	**144944-16**[h] **144661-16**[i]	**99818-16**[j]	**99108-1**[k]	**144621-16**[l] **144622-16**[m] **95627-16**[n]	**144984-1***[o] **144985-1***[p] **144986-1**[q]	
144316-1[d] **144314-1**[e]	**144838-16**[f] **144847-16**[g]	**144944-16**[h] **144661-16**[i]	**99818-16**[j]	**99108-1**[k]	**144621-16**[l] **144622-16**[m] **95627-16**[n]	**144984-1***[o] **144985-1***[p] **144986-1**[q]	
					144621-16[l] **144622-16**[m] **95627-16**[n]	**144984-1***[o] **144985-1***[p] **144986-1**[q]	
					144621-16[l] **144622-16**[m] **95627-16**[n]	**144984-1***[o] **144985-1***[p] **144986-1**[q]	

a For use with standard GM alignment bars, long body design for up to .715" valve lift and reduced base circle camshafts.
b Ultra Pro Series vertical locking bar roller lifters.
c Ultra Pro Series vertical locking bar roller lifters for Warhawk blocks.
d Contains **144838-16** dual valve springs, **144661-16** titanium retainers, **144460-16** spring seats, **99818-16** valve seals, **99108-1** valve locks.
e Contains **144847-16** XHTCS dual valve springs, **144661-16** titanium retainers, **144460-16** spring seats, **99818-16** valve seals, **99108-1** valve locks.
f Dual valve springs, requires **144661-16** or **144944-16** retainers.
g Dual XHTCS valve springs, requires **144661-16** or **144944-16** retainers.
h Steel, for **144838-16** and **144847-16** dual valve springs.
i Titanium, for **144838-16** and **144847-16** dual valve springs.
j No machining required.
k Machined steel, heat treated.
l Pro Series one-piece, stock length.
m Pro Series one-piece, for use with Crane aluminum rocker arm kits (included in **144750-16** and **144759-16** kits).
n Pro Series one piece, stock length -.050".
o Pro Series steel billet gears and double roller chain set with vernier adjustment, for LS1 and LS6, without cam sensor trigger.
p Pro Series steel billet gears and double roller chain set with 9 keyway crank sprocket, for early LS2, with single trigger cam sensor feature.
q Pro Series steel billet gears and double roller chain set with 9 keyway crank sprocket, for late LS2, LS3, LS7, and L92 with four trigger cam sensor feature.

Chevrolet V-8 06-15

7.0L LS7

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts										
Good daily driver, for stock or modified LS7, light choppy idle, good fuel economy, 10.5+ compression ratio advised, computer upgrades required, auto trans w/3000-3400 stall converter.	**HR-220/3333-2S1-14 4A**	2100-6400	**2039271*** ◆3	**144536-16[a]** **144532-16[b]** **144533-16[z]**	220 238	281 299	114	0 40 57 1	.000 .000	.600 .600
Weekend driver, for modified LS7, choppy idle, fair fuel economy, headers and aft cat exhaust advised, 11.0+ compression ratio advised, computer upgrades required, auto trans w/3400-3800 stall converter and low ratio gearing required.	**HR-224/347-2S2-12 4A**	2600-6800	**2039281*** ◆3	**144536-16[a]** **144532-16[b]** **144533-16[z]**	224 244	280 299	112	2.5 41.5 56.5 7.5	.000 .000	.625 .625
Weekend driver, for modified LS7, choppy idle, fair fuel economy, headers and aft cat exhaust advised, 11.0+ compression ratio advised, computer upgrades required, auto trans w/3200-3600 stall converter.	**HR-224/347-2S2-15 4A**	2300-6800	**2039291*** ◆3	**144536-16[a]** **144532-16[b]** **144533-16[z]**	224 244	280 299	115	(0.5) 44.5 59.5 4.5	.000 .000	.625 .625
Pro Street and Drags, for modified LS7. 1.7 rockers recommended for higher RPM. Choppy to rough idle, headers and aft cat exhaust advised, 11.5+ compression ratio advised, computer upgrades required, auto trans w/3400-4000 stall converter and low ratio gearing required.	**HR-228/367-2S1-12 4A**	2800-7000	**2039341*** ◆3	**144536-16[a]** **144532-16[b]** **144533-16[z]**	228 246	285 303	112	4.5 43.5 57.5 8.5	.000 .000	.661 .661

Chevrolet V-8 07-15

6.2L LS3/L92/Vortec 6.2 (with three bolt timing gear)

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts										
Good daily driver, light choppy idle, good fuel economy, computer upgrades required, good w/1.8:1 rocker arms.	**HR-216/347-2S-13 4A**	2000-6000	**2019371*** ◆3	**144530-16[b]** **144536-16[a]** **144532-16[c]** **144533-16[z]**	216 232	272 289	113	(2.5) 38.5 51.5 0.5	.000 .000	.590 .624
Daily driver, light choppy idle, fair fuel economy, headers and aft cat exhaust advised, auto trans w/2400-2800 stall converter, computer upgrades required, good w/1.8:1 rocker arms.	**HR-220/347-2S-13 4A**	2200-6400	**2019381*** ◆3	**144530-16[b]** **144536-16[a]** **144532-16[c]** **144533-16[z]**	220 236	276 293	113	(0.5) 40.5 53.5 2.5	.000 .000	.590 .624
Daily driver, choppy idle, fair fuel economy, headers and aft cat exhaust advised, auto trans w/3000-3400 stall converter, computer upgrades required, good w/1.8:1 rocker arms.	**HR-226/367-2S1-14**	2600-6000	**2019391*** ◆3	**144530-16[b]** **144536-16[a]** **144532-16[c]** **144533-16[z]**	226 240	283 297	114	2.5 43.5 57.5 2.5	.000 .000	.624 .624

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT NOTE: Crane Hydraulic Roller Cams offer tremendous power, torque and RPM potential. Due to their RPM capability and increased valve travel, it is HIGHLY RECOMMENDED that the appropriate Crane valve train components be installed for maximum performance and reliability.

Crane Cams offers many different cam lobe profiles for the GM "LS1/LS2/LS6 Engine Family". These hydraulic roller cams are designed for applications ranging from mild street performance upgrades, serious torque and HP increases for trucks, to all-out competition profiles for LS1 powered race cars.

Crane's LS engine family's grinds are designed to take optimum advantage of the LS1/LS2/LS6's lighter valve train and greated reduced component inertia. This low inertia allows extraordinarily quick valve acceleration rates. This actually increases the "area beneath the lift curve" in each profile. Simply put, these cams begin moving the valve off its seat at a much quicker rate, to initiate earlier flow, and are stable at higher RPM's. Peak horsepower and torque output are enhanced throughout the entire rpm range. The profiles were also designed to minimize horsepower-robbing harmonic frequency pulses when matched with the recommended Crane valve springs and pushrods.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 297*
							— ALUMINUM ROCKERS —
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	PRO SERIES STUD MOUNT
	99832-16[f]	**99976-16**[j]	**99818-16**[o]	**99107-1**[p]		**144986-1**[*u]	
	99832-16[f]	**99976-16**[j]	**99818-16**[o]	**99107-1**[p]		**144986-1**[*u]	
	99832-16[f]	**99976-16**[j]	**99818-16**[o]	**99107-1**[p]		**144986-1**[*u]	
			99918-16[o]	**99108-1**[p]		**144986-1**[*u]	
144317-1[d] **144316-1**[e]	**99831-16**[g] **144838-16**[h] **144847-16**[i]	**99637-16**[k] **99657-16**[l] **144944-16**[m] **144661-16**[n]	**99818-16**[o]	**99108-1**[p] **99107-1**[q]	**144621-16**[r] **144622-16**[s] **95627-16**[t]	**144984-1**[*v] **144985-1**[*w] **144986-1**[*u]	
144317-1[d] **144316-1**[e]	**99831-16**[g] **144838-16**[h] **144847-16**[i]	**99637-16**[k] **99657-16**[l] **144944-16**[m] **144661-16**[n]	**99818-16**[o]	**99108-1**[p] **99107-1**[q]	**144621-16**[r] **144622-16**[s] **95627-16**[t]	**144984-1**[*v] **144985-1**[*w] **144986-1**[*u]	
144317-1[d] **144316-1**[e]	**99831-16**[g] **144838-16**[h] **144847-16**[i]	**99637-16**[k] **99657-16**[l] **144944-16**[m] **144661-16**[n]	**99818-16**[o]	**99108-1**[p] **99107-1**[q]	**144621-16**[r] **144622-16**[s] **95627-16**[t]	**144984-1**[*v] **144985-1**[*w] **144986-1**[*u]	

a OE replacement, for use with standard GM alignment bars and standard base circle camshafts.
b For use with standard GM alignment bars, long body design for up to .715" valve lift and reduced base circle camshafts.
c Vertical locking bar hydraulic roller lifters, cylinder head removal is required.
d Contains **144838-16** dual valve springs, **144944-16** steel retainers, **144460-16** spring seats, **99818-16** valve seals, **99108-1** valve locks.
e Contains **144838-16** dual valve springs, **144661-16** titanium retainers, **144460-16** spring seats, **99818-16** valve seals, **99108-1** valve locks.
f Single ovate wire beehive valve springs, 1.450" dia., LS3 and L92 cylinder heads will require machining.
g Single ovate wire beehive valve springs.
h Dual valve springs for up to .680" lift, requires Crane **144944-16** or **144661-16** retainers, no machining required. 2002-up cylinder heads will require Crane **144460-16** spring seats.
i Dual valve springs for up to .660" lift, XHTCS material, requires Crane **144944-16** or **144661-16** retainers, no machining required. 2002-up cylinder heads will require Crane **144460-16** spring seats.
j Steel, requires Crane Multi Fit valve locks.
k Titanium, for **99831-16** single valve springs.
l Titanium, for Crane **99631-16** single valve springs, requires Crane Multi Fit valve locks.
m Steel, for **144838-16** and **144847-16** dual valve springs.
n Titanium, for Crane **144838-16** and **144847-16** dual valve springs.
o No machining required.
p Machined steel, heat treated, Multi Fit.
q Machined steel, heat treated.
r Pro Series one piece, stock length.
s Pro Series one piece, for use with Crane aluminum rocker arms kits (included in **144750-16** and **144759-16** kits).
t Pro Series one piece, stock length -.050".
u Pro Series steel billet gears and double roller chain set with 9 keyway crank sprocket, for late LS2, LS3, LS7, and L92, with four trigger cam sensor features.
v Pro Series steel billet gears and double roller chain set with vernier adjustment, for LS1 and LS6, without cam sensor trigger.
w Pro Series steel billet gears and double roller chain set with 9 keyway crank sprocket, for early LS2, with single trigger cam sensor feature.
z Vertical locking bar hydraulic roller lifters, cylinder head removal is required. For Warhawk blocks.

1958–1965 348-409-427 (Z11) V8

Introduced in 1958, the "W" series engines were considered to be Chevrolet's first big block power plants, referred to as Mark 1 engines within GM. Available in many power levels, from mild truck usage to multiple carbureted performance, they are noted by their offset valves, angled deck surfaces (not perpendicular to the cylinder bores), and having no combustion chambers in the cylinder heads, but instead the "chamber" was contained within the piston domes and cylinder bores. The lifter bores in the block are inline, not canted. This engine family is designated by Crane Cams' 15 prefix. The camshaft bearing journal diameters are the same as the small block V8 family (1.868"), as is the firing order of 1-8-4-3-6-5-7-2. Engines were offered with camshafts in both hydraulic and mechanical flat faced lifter configurations. Rocker arms are adjustable stamped steel 1.75:1 ratio with ball pivots, mounted on 3/8" studs.

The 427 cu.in. Z11 limited production option was intended for drag racing only, with a unique two-piece aluminum dual four barrel intake manifold. The camshafts and valve train components remained the same basic configuration as the 348-409.

We offer hydraulic, hydraulic roller, mechanical, and mechanical roller camshafts, lifters, and most valve train components, including needle bearing roller tip rocker arms, and heat treated chromemoly tubular pushrods, for these engines. With more aftermarket components becoming available, interest in these engines is increasing, primarily in the restoration, muscle car, and street rod areas.

1963 Mark 2 427 V8

The legendary "Mystery Motor" was intended specifically for NASCAR usage, and was an evolution of the W series. The cylinder deck surfaces were made perpendicular to the bores, the combustion chambers are incorporated into the cylinder heads, and the canted valve configuration (called "Porcupine" in the press) was now employed, although the lifter bores were still inline. The camshaft journals remained at 1.868" diameter. The valve layout of the cylinder heads was changed, so special camshafts having a different lobe layout are required.

If you are extremely fortunate enough to have one of these rare pieces, we can custom produce roller camshafts, and supply roller lifters and many other valve train components for it.

1967–1990 396-402-427-454 V8

In 1965, the first of the Mark IV engines appeared, in a 396 cu.in. configuration. In 1966, a 427 cu.in version was added. The cylinder blocks were completely different from the earlier W series, with staggered lifter bores and larger camshaft journals (1.948"). The canted valve cylinder heads were now incorporated into production. The rocker arm ratio of the adjustable stamped steel units is 1.7:1. This engine is referred by Crane Cams' 13 prefix for camshafts and components. Additional displacement versions were added throughout the years, with production line vehicle installation of the Mark IV engines ceasing in 1995 (including the Gen V iteration).

One unique feature of the camshafts used only in the 1965 and 1966 engines, was the oil groove machined into the center of the rear cam journal (3/16" wide and 7/64" deep). This was required to supply the lifter galleries and top end of the engine with oil. This was revised in 1967 by changing the machining configuration on the blocks where the rear cam bearing presses in. A different rear cam bearing was used, and the camshaft no longer required the groove. Due to a performance magazine article published in the late 1960's, an urban legend appeared (and continues today), stating if you used an early grooved camshaft in a later engine, a massive internal oil leak would occur. This is not true, there is no problem using a 1965-1966 type grooved cam in a later block. If you do have an early block with its original configuration cam bearings, the camshaft must have the groove in the rear journal. This option is available from us on request.

The Mark IV engines were equipped from the factory with camshafts having either hydraulic or mechanical flat faced lifter configurations. Certain industrial and marine versions had gear drive, reverse rotation, and gear drive reverse rotation camshafts installed. Make sure of exactly what camshaft your application requires if you have other than a standard rotation, conventional timing chain drive engine.

We offer cast hydraulic and mechanical lifter camshafts with standard bearing journals having the standard firing order (1-8-4-3-6-5-7-2) and also the optional SFO suffix firing order (1-8-7-3-6-5-4-2).

Crane Cams' retrofit hydraulic roller and mechanical roller camshafts are produced in house from steel billet material, heat treated, and finish ground in a variety of versions.

Our retrofit hydraulic roller lifters do not require any block machining, are a drop-in configuration, and incorporate a vertical locking bar. Mechanical roller lifters are also drop-in, and are available in both horizontal and vertical locking bar versions. In 2005 we increased the bar height of our roller lifters, so that most of today's blocks having taller than stock lifter bosses should have sufficient locking bar to block clearance (the height of the pushrod seat did not change). This should always be checked prior to final assembly, as machining variances in the blocks and different camshaft base circle diameters may result in unwanted contact.

For street and endurance applications, we offer hydraulic and mechanical roller camshafts equipped with a cast iron distributor drive gear and rear journal installed on the steel camshaft. These are noted by an IG suffix (Iron Gear), allowing the use of a standard type distributor gear for long term reliability.

There are a number of journal size options available for the roller camshafts, including: Standard (1.948"); Roller Bearing (1.968"/50mm) – RB suffix; Big Bearing (2.125") – BB suffix; 55mm (2.165") – 55J suffix; 60mm (2.362") – 60J suffix. Other sizes are available on request. Camshafts having larger than stock journals incorporate a step ground on the front journal, so that a standard size camshaft sprocket can be used.

Standard firing order (1-8-4-3-6-5-7-2) and SFO (1-8-7-3-6-5-4-2) firing order hydraulic roller and mechanical roller camshafts are offered, along with other custom options for 180 degree crankshafts and other unique situations.

In some applications where large diameter camshafts are being used, this may result in the lifter sitting too high in the lifter bore for proper oiling to occur. We currently offer specific roller lifters to maintain proper oil flow. Check the Roller Lifter pages for part numbers and applications.

Drilling and tapping the rear cam journal for the Sander accessory drive is offered (RD suffix), as is gun drilling the camshaft for lightness and reduced torsional deflection (DR suffix).

1991–1995 Gen V 454 V8

This is one of the more misunderstood variations of the basic Mark IV engine configuration. During these years, Chevrolet was offering the Gen V 454 just about exclusively in truck applications, with some marine use occurring. The engine block was updated for provisions to install a camshaft thrust plate, and hydraulic roller lifter guidebars, although a hydraulic camshaft and flat faced lifters were installed. The front of the camshaft was slightly stepped down at the front, requiring a special cam sprocket, but the normal cam bolt pattern was retained. Some of these blocks had provisions for a mechanical fuel pump, while others did not. The rocker arms were no longer adjustable, as a stepped stud net-lash system was employed.

At this time, a number of different aftermarket engine suppliers began offering their own iterations of the Mark IV, which they sometimes called the "Mark V", but were not the same as the factory items. These were basically engines assembled from Mark IV type OEM or aftermarket components, and could be loosely thought of as independently continued Mark IV production. Caution needs to be used when ordering replacement components for these engines, as they could become confused with the factory Gen V items.

Most of our 13 prefix camshafts and components as used in the Mark IV engines can be applied to the Gen V. A Mark IV style timing set will be required. We offer special rocker arm studs, **99152-16**, that will thread into the Gen V cylinder heads, 3/8" – 16 on the bottom, with a conventional 7/16" – 20 threaded top, permitting the use of adjustable Mark IV type rocker arms, while using the Gen V pushrod guideplates.

The availability of aftermarket components and complete engines for the now legendary Big Block, in it's many versions, assures it's popularity for some time to come. Crane Cams will continue to produce new product offerings for this very prolific power plant.

1996–2000 Gen VI 454 (7.4L) – 502 (8.2L) V8

The upgrades that Chevrolet hinted at in the Gen V engine, achieved production status in the Gen VI. This engine family is designated by Crane Cams' 16 prefix camshafts and components. A hydraulic roller camshaft was installed, incorporating a reduced diameter bolt pattern on the stepped journal front, accommodating the installed thrust plate, and hydraulic roller lifters were now standard equipment. A new timing set was required for the new configuration camshaft, and reduced depth under the standard front cover allowed room for only a single row roller timing chain. There is no provision for a mechanical fuel pump. The rocker arms were still the non-adjustable net-lash style, which could again be converted to an adjustable configuration by using our **99152-16** rocker arm studs and Mark IV type rocker arms. Cam bearing diameter was maintained at 1.948", as was the 1-8-4-3-6-5-7-2 firing order.

We offer steel billet hydraulic roller and mechanical roller camshafts that incorporate the Cast Iron distributor drive gear and rear camshaft journal (IG suffix) for these engines.

Versions of these basic engines continue to be available through the GM Performance Parts catalog, equipped with various cylinder head combinations. Gen V blocks with Mark IV type heads being a popular assembly. Be sure of what components are needed when ordering.

2001–2008 8.1L (Vortec 8100) V8

What appears to be the final factory production Big Block, received additional upgrades in its latest version. This is a distributorless engine, incorporating a new hydraulic roller camshaft (having a 1-8-7-2-6-5-4-3 firing order), new timing set (incorporating a cam position sensor), relocated lifter oil galleries, and a different net lash rocker arm system (with the cylinder heads now tapped with 10mm threads). Our 26 prefix is used for these camshafts and components.

Crane Cams' steel billet hydraulic roller camshafts for these engines are equipped with cast iron distributor drive gears and rear journals (IG suffix) for oil pump drive gear compatibility. The 26 and 16 prefix (Gen VI) camshafts can be interchanged, with appropriate engine changes required for their different firing orders.

Due to the relocated lifter oil galleries, different lifters are required. We offer our steel billet bodied **26535-16** hydraulic roller lifters for use with the factory alignment bars to allow the use of higher than stock lift camshafts.

The rocker arms can be converted to an adjustable configuration by using our **99155-16** rocker arm studs. These have 10mm threads on the bottom, and 7/16" – 20 on the top, for use with the Mark IV style rocker arms.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts										
Brute low end torque, smooth idle, daily usage, towing, economy, 348 pickup special, 2200-2600 cruise RPM, 8.0 to 9.5 compression ratio advised.	**H-200/2717-2-10**	800-4400	**150061** ◆3	**99277-16**	200 210	264 274	110	(5) 25 40 (10)	.000 .000	.475 .502
Good low and mid range torque, good idle, daily performance usage, mild bracket racing, 3000-3400 cruise RPM, 9.0 to 10.5 compression ratio advised.	**H-218/300-2S-12**	1800-5400	**150291** ◆3	**99277-16**	218 230	288 300	112	2 36 52 (12)	.000 .000	.525 .543
Good mid range torque, fair idle, moderate performance usage, good mid-range HP, hydraulic substitute for 409 HP mechanical camshaft, 3200-3600 cruise RPM, 9.5 to 11.0 compression ratio advised.	**H-224/3090-2-12**	2200-6000	**150301** ◆3	**99277-16**	224 234	294 304	112	5 39 54 0	.000 .000	.541 .569
Fair idle, moderate performance usage, good mid and upper RPM torque and HP, hydraulic substitute for 425 HP mechanical camshaft, 3600-4000 cruise RPM, 10.0 to 11.5 compression ratio advised.	**H-230/3101-2S-14**	2800-6400	**150311** ◆3	**99277-16**	230 234	292 296	114	6 44 56 (2)	.000 .000	.543 .551
Moderate performance usage, rough idle, good mid and upper RPM torque and HP, bracket racing, auto trans w/2500+ converter, 3800-4200 cruise RPM, good for increased displacement stroked engines, 10.5 to 12.0 compression ratio advised.	**H-236/325-2-10**	3000-6000	**150171** ◆3	**99277-16**	236 246	296 306	110	13 43 58 0	.000 .000	.569 .588
Hydraulic Roller Camshafts — Retrofit										
Good idle, excellent low end torque and HP, daily performance usage, 2600-3400 cruise RPM, 9.0 to 10.5 compression ratio advised.	**HR-218/332-2S-10**	1600-5600	**159511**[a] ◆3	**11532-16**	218 226	280 288	110	4 34 48 (2)	.000 .000	.581 .604
Fair idle, moderate performance usage, good mid range torque and HP, auto trans w/2000+ converter, 3000-3800 cruise RPM, 9.5 to 11.0 compression ratio advised.	**HR-224/319-2S-10**	2000-6000	**159521**[a] ◆3	**11532-16**	224 230	280 286	110	7 37 50 0	.000 .000	.558 .574
Fair idle, performance usage, good mid-range torque and HP, 3600-4400 cruise RPM, 10.0 to 11.5 compression ratio advised.	**HR-230/352-2S-12**	2600-6600	**159531**[a] ◆3	**11532-16**	230 234	292 296	112	8 42 54 0	.000 .000	.616 .628

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	96873-16[b]	99957-16	99822-16[b]	99098-1[c]	15621-16[d] 15634-16[e]			13744-16[i]	15750-16[j] 13750-16[k]
	96873-16[b]	99957-16	99822-16[b]	99098-1[c]	15621-16[d] 15634-16[e]			13744-16[i]	15750-16[j] 13750-16[k]
	96873-16[b]	99957-16	99822-16[b]	99098-1[c]	15621-16[d] 15634-16[e]			13744-16[i]	15750-16[j] 13750-16[k]
	96873-16[b]	99957-16	99822-16[b]	99098-1[c]	15621-16[d] 15634-16[e]			13744-16[i]	15750-16[j] 13750-16[k]
	96873-16[b]	99957-16	99822-16[b]	99098-1[c]	15621-16[d] 15634-16[e]			13744-16[i]	15750-16[j] 13750-16[k]
	96873-16[b]	99969-16	99822-16[b]	99098-1[c]	15630-16[f] 15640-16[g]			13744-16[i]	15750-16[j] 13750-16[k]
	96873-16[b]	99969-16	99822-16[b]	99098-1[c]	15630-16[f] 15640-16[g]			13744-16[i]	15750-16[j] 13750-16[k]
	96873-16[b]	99969-16	99822-16[b]	99098-1[c]	15630-16[f] 15640-16[g]			13744-16[i]	15750-16[j] 13750-16[k]

a Requires cam button spacer and **11990-1** aluminum-bronze distributor drive gear
b Must machine cylinder heads
c Machined steel, heat treated
d 5/16" diameter, heavy wall, heat treated
e 3/8" diameter, heavy wall, heat treated
f Pro Series one-piece, 5/16" diameter
g Pro Series one-piece, 3/8" diameter
i Energizer 1.7 ratio, 7/16"stud
j 1.7 ratio, 3/8" stud
k 1.7 ratio, 7/16" stud

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Lifter Camshafts										
Excellent low and mid range torque, good idle, daily usage, 2800-3400 cruise RPM, 8.5 to 9.75 compression ratio advised.	**F-228/3067-2-10**	2500-5800	**150811*** ◆3	**99250-16**	228 238	268 278	110	9 39 54 4	.022 .022	.537 .560
Replacement for Factory Mark IV 409 HP 409 cu.in. camshaft.	**BluePrinted 3796077**	3000-6200	**150421** ◆1	**99250-16**	234 234	280 280	116.5	(.5) 54.5 52.5 1.5	.018 .022	.434 .434
Replacement for Factory Mark VI 425 HP 409 cu.in. camshaft.	**BluePrinted 3830690**	3200-6500	**150431** ◆1	**99250-16**	237 241	274 281	113.5	5 52 54 7	.022 .030	.504 .515
Replacement for Factory Mark VII 430 HP Z-11 camshaft.	**BluePrinted 3837735**	3800-7000	**150441** ◆1	**99250-16**	250 250	296 296	113.5	11.5 58.5 58.5 11.5	.030 .030	.555 .555
Performance usage, good mid and upper RPM torque and HP, bracket racing, auto trans w/3000+ converter, 11.5 minimum compression ratio advised.	**F-256/3412-2-10**	3800-7200	**151341*** ◆3	**99250-16**	256 266	292 302	110	21 55 66 20	.026 .026	.617 .634
Mechanical Roller Camshafts										
Good low and mid range torque, fair idle, moderate performance usage, 3200-3600 cruise RPM, auto trans w/2000+ converter, 10.5 to 11.5 compression ratio advised.	**SR-236/350-2S-12**	2600-5800	**158511*a** ◆3	**15519-16**	236 244	286 294	112	11 45 59 5	.020 .020	.613 .634
Good mid range torque and HP, fair idle, performance usage, bracket racing, auto trans w/2500+ converter, 11.0 to 12.0 compression ratio advised.	**SR-244/362-2S-10**	3000-6200	**158171*a** ◆3	**15519-16**	244 252	294 302	110	17 47 61 11.5	.020 .020	.634 .655
Good upper RPM torque and HP, performance usage, bracket racing, auto trans w/3500+ converter, good for increased displacement stroked engines, 11.5 minimum compression ratio advised.	**SR-252/374-2S-12**	3400-6800	**158711*a** ◆3	**15519-16**	252 260	302 310	112	19 53 67 13	.020 .020	.655 .655

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	ALUMINUM ROCKERS — ENERGIZER	ALUMINUM ROCKERS — GOLD RACE
	96873-16[b]	99957-16	99822-16[b]	99098-1[c]	15621-16[d] 15634-16[e]				15750-16[g] 13750-16[h]
	96873-16[b]	99957-16	99822-16[b]	99098-1[c]	15621-16[d] 15634-16[e]				15750-16[g] 13750-16[h]
	96873-16[b]	99957-16	99822-16[b]	99098-1[c]	15621-16[d] 15634-16[e]				15750-16[g] 13750-16[h]
	96873-16[b]	99957-16	99822-16[b]	99098-1[c]	15621-16[d] 15634-16[e]				15750-16[g] 13750-16[h]
	96873-16[b]	99957-16	99822-16[b]	99098-1[c]	15621-16[d] 15634-16[e]				15750-16[g] 13750-16[h]
	96870-16[b]	99969-16	99822-16[b]	99098-1[c]	15621-16[d] 15634-16[e]				15750-16[g] 13750-16[h]
	96870-16[b]	99969-16	99822-16[b]	99098-1[c]	15621-16[d] 15634-16[e]				15750-16[g] 13750-16[h]
	96870-16[b]	99969-16	99822-16[b]	99098-1[c]	15621-16[d] 15634-16[e]				15750-16[g] 13750-16[h]

a Requires cam button spacer and **11990-1** aluminum-bronze distributor drive gear
b Must machine cylinder heads
c Machined steel, heat treated
d 5/16" diameter, heavy wall, heat treated
e 3/8" diameter, heavy wall, heat treated
g 1.7 ratio, 3/8" stud
h 1.7 ratio, 7/16" stud

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts										
Brute low end torque, smooth idle, daily usage, fuel economy, 1200-2000 cruise RPM, 8.0 to 9.25 compression ratio advised.	**H-248-2**	600-4200	**133971** ◆1	**99277-16**	192 204	248 260	110	(9) 21 37 (13)	.000 .000	.453 .484
Improves torque and HP throughout entire power range. Proven for towing in Dualies, Crew Cabs, SS454s and Suburbans. (50 state legal, 94 and earlier, C.A.R.B. E.O. D-225-51).	**2020**	800-4400	**134112**[a] ◆1	**99277-16**	202 210	262 270	110	(4) 26 40 (10)	.000 .000	.468 .485
Brute low end torque, smooth idle, daily usage, off road, towing, 1600-2200 cruise RPM, 8.0 to 9.5 compression ratio advised.	**Energizer 260 H10**	1000-4500	**10303**[*] **103032**[*b] ◆3	**99277-16**	204 204	260 260	110	(3) 27 37 (13)	.000 .000	.484 .484
Excellent low end torque and HP, smooth idle, daily usage, off road, towing, economy, also mild turbocharged, 2200-2600 cruise RPM, 8.0 to 9.5 compression ratio advised. (50 state legal, 94 and earlier, C.A.R.B. E.O. D-225-51).	**H-260-2**	1000-4800	**133901** **133902**[a] ◆1	**99277-16**	204 216	260 272	112	(5) 29 45 (9)	.000 .000	.484 .515
Good low end torque and HP, smooth idle, daily usage, fuel economy, light towing, off road, 2200-2700 cruise RPM, 8.5 to 10.0 compression ratio advised.	**Energizer 266 H10**	1200-4800	**10304**[*] **103042**[*b] ◆3	**99277-16**	210 210	266 266	110	0 30 40 (10)	.000 .000	.499 .499
Primarily for SS454, increased mid range to top-end HP and torque, especially 3500 RPM and up, slight decrease below 2500 RPM in stock engine. Excellent with aftermarket intake, performance heads, headers and free-flow exhaust. Good idle, daily usage, off road, towing, economy, good low and mid range torque and HP, 2400-2800 cruise RPM 8.5 to 10.0 compression ratio advised. (50 state legal, 94 and earlier, C.A.R.B. E.O. D-225-51).	**2030**	1200-5000	**133931** **134122**[a] ◆1	**99277-16**	210 218	266 274	114	(4) 34 48 (10)	.000 .000	.485 .502
Replacement for factory 350 HP 396 cu.in. camshaft.	**BluePrinted 3883986**	1200-4600	**969391** ◆1	**99277-16**	214 218		115	(3) 37 49 (11)	.000 .000	.461 .480
Good mid range torque and HP, good idle, daily usage, off road, highway towing, fuel efficiency plus performance, 2600-3000 cruise RPM, 8.75 to 10.0 compression ratio advised.	**Energizer 272 H10**	1400-5000	**10305**[*] **103052**[*b] ◆3	**99277-16**	216 216	272 272	110	3 33 43 (7)	.000 .000	.515 .515
Excellent mid range torque and HP, good idle, daily usage and off road, towing, performance and fuel efficiency, good w/small plate nitrous system, 2600-3000 cruise RPM, 8.75 to 10.5 compression ratio advised. Good w/centrifugal or small Roots supercharger, 8 lbs. maximum boost w/8.5 maximum compression ratio advised.	**H-272-2**	1600-5400	**133941**[*] **133942**[*a] ◆3	**99277-16** **99377-16**[c]	216 228	272 284	112	1 35 51 (3)	.000 .000	.515 .510

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT NOTE: 1991-95 Gen V engines can use these camshafts and components if lifter preload is checked, or if converted to use adjustable rocker arms by installing **99152-16** rocker arm studs (no machining required) and appropriate rocker arms.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

NOTE: In order to use these cams in 65-66 engines, you must groove the center of the rear cam bearing journal, 3/16" wide and 7/64" deep.

NOTE: Camshafts with SFO firing order (1-8-7-3-6-5-4-2, or 4/7 swap), are available on special order. Contact Crane's Performance Consultants for details.

IMPORTANT NOTE: Some 1973 thru 1981 454 cu.in. engines were equipped with exhaust valve rotators. In these instances when using dual valve springs, use either our **99459-8** Spring Seat Spacers or 4 of **99948-2** valve spring retainers (on the exhaust valves only) to prevent excessive valve spring shimming when eliminating the rotators. Some later engines were equipped with rotators on both the intake and exhaust valves. For these applications when using dual valve springs, use either 2 of our **99459-8** Spring Seat Spacers or our **99948-16** valve spring retainers to prevent excessive valve spring shimming when eliminating the rotators.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
13308-1[d] **13309-1**[e]	**99839-16**[d] **96801-16**[e]	**99948-16** **99957-16**[f]		**99098-1**[g]	**13634-16**[h] **13640-16**[i]	**13975-1**[*j] **13984-1**[*k] **13977-1**[*l]	**13800-16**[m,n]	**13744-16**[n,p]	**13750-16**[o,q] **13763TR-16**[o,r]
13308-1[d] **13309-1**[e]	**99839-16**[d] **96801-16**[e]	**99948-16** **99957-16**[f]		**99098-1**[g]	**13634-16**[h] **13640-16**[i]	**13975-1**[*j] **13984-1**[*k] **13977-1**[*l]	**13800-16**[m,n]	**13744-16**[n,p]	**13750-16**[o,q] **13763TR-16**[o,r]
13308-1[d] **13309-1**[e]	**99839-16**[d] **96801-16**[e]	**99948-16** **99957-16**[f]		**99098-1**[g]	**13634-16**[h] **13640-16**[i]	**13975-1**[*j] **13984-1**[*k] **13977-1**[*l]	**13800-16**[m,n]	**13744-16**[n,p]	**13750-16**[o,q] **13763TR-16**[o,r]
13308-1[d] **13309-1**[e]	**99839-16**[d] **96801-16**[e]	**99948-16** **99957-16**[f]		**99098-1**[g]	**13634-16**[h] **13640-16**[i]	**13975-1**[*j] **13984-1**[*k] **13977-1**[*l]	**13800-16**[m,n]	**13744-16**[n,p]	**13750-16**[o,q] **13763TR-16**[o,r]
13308-1[d] **13309-1**[e]	**99839-16**[d] **96801-16**[e]	**99948-16** **99957-16**[f]		**99098-1**[g]	**13634-16**[h] **13640-16**[i]	**13975-1**[*j] **13984-1**[*k] **13977-1**[*l]	**13800-16**[m,n]	**13744-16**[n,p]	**13750-16**[o,q] **13763TR-16**[o,r]
13308-1[d] **13309-1**[e]	**99839-16**[d] **96801-16**[e]	**99948-16** **99957-16**[f]		**99098-1**[g]	**13634-16**[h] **13640-16**[i]	**13975-1**[*j] **13984-1**[*k] **13977-1**[*l]	**13800-16**[m,n]	**13744-16**[n,p]	**13750-16**[o,q] **13763TR-16**[o,r]
13308-1[d] **13309-1**[e]	**99839-16**[d] **96801-16**[e]	**99948-16** **99957-16**[f]		**99098-1**[g]	**13634-16**[h] **13640-16**[i]	**13975-1**[*j] **13984-1**[*k] **13977-1**[*l]	**13800-16**[m,n]	**13744-16**[n,p]	**13750-16**[o,q] **13763TR-16**[o,r]
13308-1[d] **13309-1**[e]	**99839-16**[d] **96801-16**[e]	**99948-16** **99957-16**[f]		**99098-1**[g]	**13634-16**[h] **13640-16**[i]	**13975-1**[*j] **13984-1**[*k] **13977-1**[*l]	**13800-16**[m,n]	**13744-16**[n,p]	**13750-16**[o,q] **13763TR-16**[o,r]

Section Continued

a Cam and Lifter Kit, includes installation lubricants and Cam Sprocket Bolt Locking Plate.
b Cam and Lifter Kit, includes assembly lubricant.
c Optional Hi Intensity hydraulic lifters, see page 272 for details.
d Contains standard diameter valve springs, no machining required. **NOTE:** 1980 and later truck 366, 402, 427 and 454 engines have a short valve spring assembly height and should use **99837-16** standard diameter valve springs and **99957-16** retainers, contained in **13309-1** spring and retainer kit.
e For 1980-95 truck 366, 402, 427 and 454 engines with short valve spring assembly height, contains standard diameter valve springs.
f For 1980-95 truck 366, 402, 427 and 454 engines with short valve spring assembly height.
g Machined steel, heat treated.
h Heavy wall, heat treated, 3/8" diameter.
i Pro Series one-piece, 3/8" diameter.
j Performance steel billet gears and roller chain set.
k Pro Series steel billet gears and roller chain set.
l Pro Series steel billet gears and roller chain set with thrust bearing.
m 1.7 ratio, 3/8" stud, long slot for 1.560" maximum O.D. valve springs.
n 1991-95 engines require the installation of **99152-16** 7/16" rocker arm studs (no machining required) and factory pushrod guideplates.
p Energizer, 1.7 ratio, 7/16" stud. Valve Train Stabilizer available, see page 343.
q 1.7 ratio, 7/16" stud. Valve Train Stabilizer available, see page 343.
r 1.7 ratio, 7/16" stud, Wide Body. Valve Train Stabilizer available, see page 343.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts										
Good mid range torque and HP, fair idle, performance usage, serious off road, mild bracket racing w/heavy car, 9.5 to 10.75 compression ratio advised.	**H-222/3114-2S1-8**	1800-5600	**130201**[*] ◆3	**99277-16** **99377-16**[d]	222 234	278 290	108	8 34 50 4	.000 .529 .000 .525
Good mid range torque and HP, good idle, daily performance usage, mild bracket racing, 3000-3400 cruise RPM, marine applications, primarily used in up to 350 HP near-stock engines for mild performance applications w/standard marine exhaust systems, 9.5 to 10.75 compression ratio advised.	**H-278-2**	2000-5800	**133801**[*] **133802**[*a] ◆3	**99277-16** **99377-16**[d]	222 234	278 290	114	2 40 56 (2)	.000 .529 .000 .525
Fair idle, moderate performance usage, good mid range to upper RPM torque and HP, mild bracket racing, Street, Heavy, Pro ET, Street ET, etc., auto trans w/2500+ converter, 3000-3400 cruise RPM, oval track; Street Stock, Enduro, Hobby, etc., 1/4-3/8 mile, serious off road, 9.5 to 11.0 compression ratio advised.	**Energizer 282 H08**	2200-5600	**10307**[*] **103072**[*b] ◆3	**99277-16** **99377-16**[d]	226 226	282 282	108	7 39 43 3	.000 .533 .000 .533
Good mid range torque & HP, fair idle, moderate performance usage, mild bracket racing, auto trans w/2500+ converter, good w/plate or manifold nitrous system, marine applications; primarily used in 350+ HP mildly modified engines with free-flowing above water exhaust systems for performance applications, responds well to improved cylinder heads. 3200-3600 cruise RPM, 9.5 to 11.5 compression ratio advised. Good w/centrifugal or Roots supercharger, 10 lbs. max. boost w/8.5 max. compression ratio advised.	**H-286-2**	2400-6200	**134241**[*] **134242**[*a] ◆3	**99277-16** **99377-16**[d]	226 236	286 296	112	6 40 55 1	.000 .534 .000 .553
Good mid range to upper RPM torque and HP, fair idle, moderate performance usage, mild bracket racing, auto trans w/2500+ converter, 3400-3800 cruise RPM, 9.5 to 11.0 compression ratio advised.	**Energizer 284 H12**	2800-6200	**10306**[*] **103062**[*b] ◆3	**99277-16** **99377-16**[d]	228 228	284 284	112	7 41 51 (3)	.000 .544 .000 .544
Fair idle, standard camshaft for Mercruiser 400, 405, 420, 425 HP & 525SC-454 cu.in. engines, applicable to 350, 365, 370 HP mildly modified engines with free-flowing above water exhaust systems for performance applications, 9.5 to 11.5 compression ratio advised.	**H-228/312-2S-14 T1.2**	2800-6600	**132561**[*] ◆3	**99277-16** **99377-16**[d]	228 236	298 306	114	5 43 57 (1)	.000 .530 .000 .551
Good mid range to upper RPM torque and HP, rough idle, moderate performance usage, mild bracket racing, auto trans w/2500+ converter, 3600-4000 cruise RPM, 9.75 to 11.0 compression ratio advised.	**H-230/318-2-10**	3000-6600	**130211**[*] ◆3	**99277-16** **99377-16**[d]	230 240	290 300	110	10 40 55 5	.000 .541 .000 .559
Performance usage, good mid and upper RPM torque and HP, bracket racing; Heavy, Pro ET, Super ET, etc., auto trans w/3000+ converter, oval track; Street Stock, Enduro, Hobby, etc., 3/8-1/2 mile,10.0 to 11.5 compression ratio advised.	**Saturday Night Special H-236/325-2-10**	3000-6600	**134551**[*] **134554**[*a] ◆3	**99277-16** **99377-16**[d]	236 246	296 306	110	13 43 58 8	.000 .553 .000 .571

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT NOTE: 1991-95 Gen V engines can use these camshafts and components if lifter preload is checked, or if converted to use adjustable rocker arms by installing **99152-16** rocker arm studs (no machining required) and appropriate rocker arms.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

NOTE: In order to use these cams in 65-66 engines, you must groove the center of the rear cam bearing journal, 3/16" wide and 7/64" deep.

NOTE: Camshafts with SFO firing order (1-8-7-3-6-5-4-2, or 4/7 swap), are available on special order. Contact Crane's Performance Consultants for details.

IMPORTANT NOTE: Some 1973 thru 1981 454 cu.in. engines were equipped with exhaust valve rotators. In these instances when using dual valve springs, use either our **99459-8** Spring Seat Spacers or 4 of **99948-2** valve spring retainers (on the exhaust valves only) to prevent excessive valve spring shimming when eliminating the rotators. Some later engines were equipped with rotators on both the intake and exhaust valves. For these applications when using dual valve springs, use either 2 of our **99459-8** Spring Seat Spacers or our **99948-16** valve spring retainers to prevent excessive valve spring shimming when eliminating the rotators.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338 | *See pg. 317* | *See pg. 330* | *See pg. 343* | *See pg. 340* | *See pg. 286* | *See pg. 308* | *See pg. 292* | *See pg. 295* | *See pg. 297*

VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	ALUMINUM ROCKERS — ENERGIZER	ALUMINUM ROCKERS — GOLD RACE
13308-1[e] 13309-1[f]	99839-16[e] 96801-16[f]	99948-16 99957-16[h]		99098-1[k]	13634-16[l] 13640-16[m]	13975-1*[n] 13984-1*[o] 13977-1*[p]	13800-16[q,r]	13744-16[r,v]	13750-16[r,w] 13763TR-16[r,x]
13308-1[e] 13309-1[f]	99839-16[e] 96801-16[f]	99948-16 99957-16[h]		99098-1[k]	13634-16[l] 13640-16[m]	13975-1*[n] 13984-1*[o] 13977-1*[p]	13800-16[q,r]	13744-16[r,v]	13750-16[r,w] 13763TR-16[r,x]
13308-1[e] 13309-1[f]	99839-16[e] 96801-16[f]	99948-16 99957-16[h]		99098-1[k]	13634-16[l] 13640-16[m]	13975-1*[n] 13984-1*[o] 13977-1*[p]	13800-16[q,r]	13744-16[r,v]	13750-16[r,w] 13763TR-16[r,x]
13308-1[e] 13309-1[f]	99839-16[e] 96801-16[f]	99948-16 99957-16[h]		99098-1[k]	13634-16[l] 13640-16[m]	13975-1*[n] 13984-1*[o] 13977-1*[p]	13800-16[q,r]	13744-16[r,v]	13750-16[r,w] 13763TR-16[r,x]
13308-1[e] 13309-1[f]	99839-16[e] 96801-16[f]	99948-16 99957-16[h]		99098-1[k]	13634-16[l] 13640-16[m]	13975-1*[n] 13984-1*[o] 13977-1*[p]	13800-16[q,r]	13744-16[r,v]	13750-16[r,w] 13763TR-16[r,x]
	99893-16 99896-16[g]	99954-16 99955-16[i]	99822-16[j]	99098-1[k]	13634-16[l] 13640-16[m]	13975-1*[n] 13984-1*[o] 13977-1*[p]	13801-16[r,s] 13801C-16[r,t]	13744-16[r,v]	13750-16[r,w] 13763TR-16[r,x]
	99893-16 99896-16[g]	99954-16 99955-16[i]	99822-16[j]	99098-1[k]	13634-16[l] 13640-16[m]	13975-1*[n] 13984-1*[o] 13977-1*[p]	13801-16[r,s] 13801C-16[r,t]	13744-16[r,v]	13750-16[r,w] 13763TR-16[r,x]
	99893-16 99896-16[g]	99954-16 99955-16[i]	99822-16[j]	99098-1[k]	13634-16[l] 13640-16[m]	13975-1*[n] 13984-1*[o] 13977-1*[p]	13801-16[r,s] 13801C-16[r,t]	13744-16[r,v]	13750-16[r,w] 13763TR-16[r,x]

Section Continued

a Cam and Lifter Kit, includes installation lubricants and Cam Sprocket Bolt Locking Plate.
b Cam and Lifter Kit, includes assembly lubricant.
d Optional HI Intensity hydraulic lifters, see page 272 for details.
e Contains standard diameter valve springs, no machining required. NOTE: 1980 and later truck 366, 402, 427 and 454 engines have a short valve spring assembly height and should use **99837-16** standard diameter valve springs and **99957-16** retainers, contained in **13309-1** spring and retainer kit.
f For 1980-95 truck 366, 402, 427 and 454 engines with short valve spring assembly height, contains standard diameter valve springs.
g Optional harmonic frequency optimized valve springs for street, marine, and endurance applications. Requires **99955-16** retainers.
h For 1980-95 truck 366, 402, 427 and 454 engines with short valve spring assembly height.
i For **99896-16** valve springs.
j Must machine cylinder heads.
k Machined steel, heat treated.
l Heavy wall, heat treated.
m Pro Series one-piece, 3/8" diameter.
n Performance steel billet gears and roller chain set.
o Pro Series steel billet gears and roller chain set.
p Pro Series steel billet gears and roller chain set with thrust bearing.
q 1.7 ratio, 7/16" stud, long slot for 1.560" maximum O.D. valve springs.
r 1991-95 engines require the installation of **99152-16** 7/16" rocker arm studs (no machining required) and factory pushrod guideplates.
s 1.7 ratio, extra long slot for 1.560" maximum O.D. valve springs.
t 1.7 ratio, Nitro Carb, extra long slot for 1.560" maximum O.D. valve springs.
v Energizer, 1.7 ratio, 7/16" stud. Valve Train Stabilizer available, see page 343.
w 1.7 ratio, 7/16" stud. Valve Train Stabilizer available, see page 343.
x 1.7 ratio, 7/16" stud, Wide Body. Valve Train Stabilizer available, see page 343.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts										
Fair idle, performance usage, good mid range HP, mild bracket racing, auto trans w/3000+ converter, marine performance for 500+ cu.in. modified engines w/ center riser type exhaust system & 4" outlets, requires large oval or rectangular port cylinder heads for performance applications, 3800-4200 cruise RPM, good w/ manifold nitrous system, 10.0 to 11.5 compression ratio advised. Good w/ Roots supercharger, 15 lbs. max. boost w/8.0 max. compression ratio advised.	**H-296-2**	3000-6800	**134561**[*] ◆3	**99277-16** **99377-16**[b]	236 246	296 306	114	9 47 62 4	.000 .000	.553 .571
Rough idle, performance usage, good mid range HP, bracket racing, auto trans w/3000+ converter, 3800-4200 cruise RPM, 10.0 to 11.5 compression ratio advised. Good w/Roots supercharger, 15 lbs. max. boost w/8.0 max. compression ratio advised.	**Energizer 294-304 H14**	3200-6800	**10313**[*] ◆3	**99277-16** **99377-16**[b]	238 248	294 304	114	10 48 63 5	.000 .000	.569 .595
Rough idle, performance usage, good mid to upper RPM torque and HP, bracket racing, auto trans w/3200+ converter, marine performance, 3800-4200 cruise RPM, 10.5 to 11.75 compression ratio advised.	**H-240/329-2S-12**	3000-6800	**130221**[*] ◆3	**99277-16** **99377-16**[b]	240 246	300 306	112	13 47 60 6	.000 .000	.559 .571
Rough idle, performance usage, good upper RPM torque and HP, Pro Street 500+ cu.in., bracket racing, auto trans w/3500+ converter, marine performance, 4000-4400 cruise RPM, good w/manifold nitrous system, 11.0 to 12.5 compression ratio advised. Good w/ Roots supercharger, 16 lbs. maximum boost w/8.0 maximum compression ratio advised.	**H-242/322-2-14**	3200-7000	**130231**[*] ◆3	**99277-16** **99377-16**[b]	242 252	322 332	114	12 50 65 7	.000 .000	.547 .566
Performance usage, good upper RPM torque and HP, bracket racing; Heavy, Pro ET, Super ET, etc., auto trans w/3500+ converter, also oval track; Street Stock, Enduro, Hobby, etc., 3/8-1/2 mile, 10.5 to 12.0 compression ratio advised.	**Saturday Night Special 328 H08**	3400-6800	**133101**[*] **133104**[*a] ◆3	**99277-16** **99377-16**[b]	246 246	328 328	108	17 49 53 13	.000 .000	.567 .567
Rough idle, performance usage, good upper RPM HP, bracket racing, auto trans w/3500+ converter, marine performance, 4000-4400 cruise RPM, good w/ manifold nitrous system, 10.5 to 12.0 compression ratio advised. Good w/Roots supercharger, 18 lbs. max. boost w/8.0 max. compression ratio advised.	**H-306-2**	3400-7000	**134571**[*] ◆3	**99277-16** **99377-16**[b]	246 254	306 314	112	16 50 64 10	.000 .000	.571 .585
Performance usage, good mid & upper RPM HP, for large displacement engines (500 cu.in.+), bracket racing, auto trans w/race converter, good w/large manifold nitrous system, radical marine performance, 10.75 to 12.5 compression ratio advised. Good w/large Roots supercharger, 20 lbs. maximum boost w/8.0 maximum compression ratio advised.	**H-248/3500-2S-14**	3600-7000	**130241**[*] ◆3	**99277-16** **99377-16**[b]	248 256	304 312	114	15 53 67 9	.000 .000	.595 .595
Performance usage, good mid & upper RPM HP, for large displacement engines (500 cu.in.+), bracket racing, auto trans w/race converter, also w/large manifold nitrous system, marine performance, 10.5 to 12.0 compression ratio advised. Good w/large Roots supercharger, 22 lbs. maximum boost w/8.0 maximum compression ratio advised.	**H-254/344-2S-14**	3800-7200	**130721**[*] ◆3	**99277-16** **99377-16**[b]	254 262	314 322	114	18 56 70 12	.000 .000	.585 .600
Performance usage, good upper RPM HP, for large displacement engines (500 cu.in.+), bracket racing, auto trans w/race converter, also nitrous and radical marine performance, 11.5 min. compression ratio advised.	**H-262/353-2S-14**	4000-7200	**130731**[*] ◆3	**99277-16** **99377-16**[b]	262 270	322 330	114	22 60 74 16	.000 .000	.600 .615

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT NOTE: 1991-95 Gen V engines can use these camshafts and components if lifter preload is checked, or if converted to use adjustable rocker arms by installing **99152-16** rocker arm studs (no machining required) and appropriate rocker arms.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

NOTE: In order to use these cams in 65-66 engines, you must groove the center of the rear cam bearing journal, 3/16" wide and 7/64" deep.

NOTE: Camshafts with SFO firing order (1-8-7-3-6-5-4-2, or 4/7 swap), are available on special order. Contact Crane's Performance Consultants for details.

IMPORTANT NOTE: Some 1973 thru 1981 454 cu.in. engines were equipped with exhaust valve rotators. In these instances when using dual valve springs, use either our **99459-8** Spring Seat Spacers or 4 of **99948-2** valve spring retainers (on the exhaust valves only) to prevent excessive valve spring shimming when eliminating the rotators. Some later engines were equipped with rotators on both the intake and exhaust valves. For these applications when using dual valve springs, use either 2 of our **99459-8** Spring Seat Spacers or our **99948-16** valve spring retainers to prevent excessive valve spring shimming when eliminating the rotators.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99893-16 **99896-16**[c]	**99954-16** **99955-16**[d]	**99822-16**[e]	**99098-1**[f]	**13634-16**[g] **13640-16**[h]	**13975-1**[*i] **13984-1**[*j] **13977-1**[*k]	**13801-16**[i,m] **13801C-16**[m,n]	**13744-16**[m,p]	**13750-16**[m,q] **13763TR-16**[m,r]
	99893-16 **99896-16**[c]	**99954-16** **99955-16**[d]	**99822-16**[e]	**99098-1**[f]	**13634-16**[g] **13640-16**[h]	**13975-1**[*i] **13984-1**[*j] **13977-1**[*k]	**13801-16**[i,m] **13801C-16**[m,n]	**13744-16**[m,p]	**13750-16**[m,q] **13763TR-16**[m,r]
	99893-16 **99896-16**[c]	**99954-16** **99955-16**[d]	**99822-16**[e]	**99098-1**[f]	**13634-16**[g] **13640-16**[h]	**13975-1**[*i] **13984-1**[*j] **13977-1**[*k]	**13801-16**[i,m] **13801C-16**[m,n]	**13744-16**[m,p]	**13750-16**[m,q] **13763TR-16**[m,r]
	99893-16 **99896-16**[c]	**99954-16** **99955-16**[d]	**99822-16**[e]	**99098-1**[f]	**13634-16**[g] **13640-16**[h]	**13975-1**[*i] **13984-1**[*j] **13977-1**[*k]	**13801-16**[i,m] **13801C-16**[m,n]	**13744-16**[m,p]	**13750-16**[m,q] **13763TR-16**[m,r]
	99893-16 **99896-16**[c]	**99954-16** **99955-16**[d]	**99822-16**[e]	**99098-1**[f]	**13634-16**[g] **13640-16**[h]	**13975-1**[*i] **13984-1**[*j] **13977-1**[*k]	**13801-16**[i,m] **13801C-16**[m,n]	**13744-16**[m,p]	**13750-16**[m,q] **13763TR-16**[m,r]
	99893-16 **99896-16**[c]	**99954-16** **99955-16**[d]	**99822-16**[e]	**99098-1**[f]	**13634-16**[g] **13640-16**[h]	**13975-1**[*i] **13984-1**[*j] **13977-1**[*k]	**13801-16**[i,m] **13801C-16**[m,n]	**13744-16**[m,p]	**13750-16**[m,q] **13763TR-16**[m,r]
	99893-16 **99896-16**[c]	**99954-16** **99955-16**[d]	**99822-16**[e]	**99098-1**[f]	**13634-16**[g] **13640-16**[h]	**13975-1**[*i] **13984-1**[*j] **13977-1**[*k]	**13801-16**[i,m] **13801C-16**[m,n]	**13744-16**[m,p]	**13750-16**[m,q] **13763TR-16**[m,r]
	99893-16 **99896-16**[c]	**99954-16** **99955-16**[d]	**99822-16**[e]	**99098-1**[f]	**13634-16**[g] **13640-16**[h]	**13975-1**[*i] **13984-1**[*j] **13977-1**[*k]	**13801-16**[i,m] **13801C-16**[m,n]	**13744-16**[m,p]	**13750-16**[m,q] **13763TR-16**[m,r]

a Cam and lifter kit, includes installation lubricants.
b Optional HI Intensity hydraulic lifters, see page 272 for details.
c Optional harmonic frequency optimized valve springs for street, marine, and endurance applications. Requires **99955-16** retainers.
d For **99896-16** valve springs.
e Must machine cylinder heads.
f Machined steel, heat treated.
g Heavy wall, heat treated.
h Pro Series one-piece, 3/8" diameter.
i Performance steel billet gears and roller chain set.
j Pro Series steel billet gears and roller chain set.
k Pro Series steel billet gears and roller chain set with thrust bearing.
l 1.7 ratio, extra long slot for 1.560" maximum O.D. valve springs.
m 1991-95 engines require the installation of **99152-16** 7/16" rocker arm studs (no machining required) and factory pushrod guideplates.
n 1.7 ratio, Nitro Carb, extra long slot for 1.560" maximum O.D. valve springs.
p Energizer, 1.7 ratio, 7/16" stud. Valve Train Stabilizer available, see page 343.
q 1.7 ratio, 7/16" stud. Valve Train Stabilizer available, see page 343.
r 1.7 ratio, 7/16" stud, Wide Body. Valve Train Stabilizer available, see page 343.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts — Retrofit										
Brute low end torque, smooth idle, daily usage, fuel economy, 1200-2000 cruise RPM, 8.0 to 9.25 compression ratio advised.	**HR-204/286-2-12 IG**	800-4600	**139601**[*a] ◆3	**13532-16**[b]	204 214	260 270	112	(5) 29 44 (10)	.000 .000	.486 .512
Excellent low end torque & HP, good idle, daily usage, off road, towing, performance & fuel efficiency, 2600-3000 cruise RPM, marine applications: primarily used in 454 cu.in. near-stock engines for mild performance applications w/ free-flowing above water exhaust systems. 8.75 to 10.5 compression ratio advised.	**ZHR-276-2S-10 IG**	1200-5000	**139001**[*a] ◆3	**13532-16**[b]	214 222	276 284	110	2 32 46 (4)	.000 .000	.553 .576
Good low end torque & HP, good idle, daily usage, w/ plate nitrous system, 2600-3000 cruise RPM, 8.75 to 10.5 compression ratio advised. Good w/centrifugal or Roots supercharger, 8 lbs. max. boost w/8.5 max. compression ratio advised.	**HR-214/325-2S-12 IG**	1200-5200	**139351**[*a] ◆3	**13532-16**[b]	214 222	276 284	112	0 34 48 (6)	.000 .000	.553 .576
Good low end torque and HP, good idle, daily usage, 2600-3000 cruise RPM, 8.75 to 10.5 compression ratio advised. Crate motor upgrade. Good w/small centrifugal or Roots supercharger, 8 lbs. maximum boost w/8.5 maximum compression ratio advised.	**HR-218/3001-2S-14 IG**	1400-5200	**139611**[*a] ◆3	**13532-16**[b]	218 224	278 284	114	(1) 39 50 (6)	.000 .000	.510 .510
Good low end and mid range torque and HP, fair idle, daily usage, off road, 2600-3000 cruise RPM, 9.0 to 10.5 compression ratio advised.	**HR-222/339-2S-10 IG**	1600-5400	**139761**[*a] ◆3	**13532-16**[b]	222 230	284 292	110	6 36 50 0	.000 .000	.576 .598
Excellent mid range torque and HP, fair idle, moderate performance usage, mild bracket racing, auto trans w/2500+ converter, good w/plate or manifold nitrous system, marine applications: for 454-502 cu.in. modified engines in performance applications with aftermarket high flow above water exhaust systems. 3000-3400 cruise RPM, 9.5 to 11.0 compression ratio advised. Good w/centrifugal or Roots supercharger, 10 lbs. maximum boost w/8.5 compression ratio advised.	**ZHR-288-2S-12 IG**	1800-5600	**139011**[*a] ◆3	**13532-16**[b]	226 234	288 296	112	6 40 54 0	.000 .000	.587 .610
Good mid range torque and HP, fair idle, moderate performance usage, mild bracket racing, auto trans w/2500+ converter, marine applications: for 502+ cu.in. modified engines in performance applications with aftermarket high flow above water exhaust systems. 3200-3600 cruise RPM, 9.75 to 11.25 compression ratio advised.	**HR-230/352-2S1-14 IG**	2000-5800	**139771**[*a] ◆3	**13532-16**[b]	230 236	292 298	114	6 44 57 (1)	.000 .000	.598 .610
Good mid range torque & HP, fair idle, performance usage, mild bracket racing, good w/manifold nitrous system, auto trans w/3000+ converter, marine applications: for 454-502+ cu.in. modified engines in performance applications w/ aftermarket dry pipe exhaust systems. 3400-3800 cruise RPM, 10.0 to 11.5 compression ratio advised. Good w/Roots supercharger, 15 lbs. max. boost w/8.0 max. compression ratio advised.	**ZHR-296-2S-12 IG**	2200-6000	**139021**[*a] ◆3	**13532-16**[b]	234 242	296 304	112	10 44 58 4	.000 .000	.610 .632

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

NOTE: In order to use these cams in 65-66 engines, you must groove the center of the rear cam bearing journal, 3/16" wide and 7/64" deep.

NOTE: The 1991-95 Gen V engines can use these camshafts and components if they are converted to adjustable rocker arms by installing **99152-16** rocker arm studs (no machining required) and appropriate rocker arms. Custom length pushrods can also be made to achieve correct lifter preload if standard non-adjustable rocker arms are retained. See page 353 for checking your hydraulic lifter preload.

NOTE: Camshafts with SFO firing order (1-8-7-3-6-5-4-2, or 4/7 swap), are available on special order. Contact Crane's Performance Consultants for details.

IMPORTANT NOTE: Some 1973 thru 1981 454 cu.in. engines were equipped with exhaust valve rotators. In these instances when using dual valve springs, use either our **99459-8** Spring Seat Spacers or 4 of **99948-2** valve spring retainers (on the exhaust valves only) to prevent excessive valve spring shimming when eliminating the rotators. Some later engines were equipped with rotators on both the intake and exhaust valves. For these applications when using dual valve springs, use either 2 of our **99459-8** Spring Seat Spacers or our **99948-16** valve spring retainers to prevent excessive valve spring shimming when eliminating the rotators.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99896-16 99832-16[q]	99955-16 99976-16[r]	99822-16[c]	99098-1[d]	13628-16[e] 13642-16[e,f] 13629-16[g] 13643-16[f,g]	13975-1[*h] 13984-1[*i] 13977-1[*j]	13801-16[k,l]	13744-16[l,n]	13750-16[l,o] 13763TR-16[l,p]
	99896-16 99832-16[q]	99955-16 99976-16[r]	99822-16[c]	99098-1[d]	13628-16[e] 13642-16[e,f] 13629-16[g] 13643-16[f,g]	13975-1[*h] 13984-1[*i] 13977-1[*j]	13801-16[k,l]	13744-16[l,n]	13750-16[l,o] 13763TR-16[l,p]
	99896-16 99832-16[q]	99955-16 99976-16[r]	99822-16[c]	99098-1[d]	13628-16[e] 13642-16[e,f] 13629-16[g] 13643-16[f,g]	13975-1[*h] 13984-1[*i] 13977-1[*j]		13744-16[l,n]	13750-16[l,o] 13763TR-16[l,p]
	99896-16 99832-16[q]	99955-16 99976-16[r]	99822-16[c]	99098-1[d]	13628-16[e] 13642-16[e,f] 13629-16[g] 13643-16[f,g]	13975-1[*h] 13984-1[*i] 13977-1[*j]		13744-16[l,n]	13750-16[l,o] 13763TR-16[l,p]
	99896-16 99832-16[q]	99955-16 99976-16[r]	99822-16[c]	99098-1[d]	13628-16[e] 13642-16[e,f] 13629-16[g] 13643-16[f,g]	13975-1[*h] 13984-1[*i] 13977-1[*j]		13744-16[l,n]	13750-16[l,o] 13763TR-16[l,p]
	99896-16 99832-16[q]	99955-16 99976-16[r]	99822-16[c]	99098-1[d]	13628-16[e] 13642-16[e,f] 13629-16[g] 13643-16[f,g]	13975-1[*h] 13984-1[*i] 13977-1[*j]		13744-16[l,n]	13750-16[l,o] 13763TR-16[l,p]
	99896-16 99832-16[q]	99955-16 99976-16[r]	99822-16[c]	99098-1[d]	13628-16[e] 13642-16[e,f] 13629-16[g] 13643-16[f,g]	13975-1[*h] 13984-1[*i] 13977-1[*j]		13744-16[l,n]	13750-16[l,o] 13763TR-16[l,p]
	99896-16 99832-16[q]	99955-16 99976-16[r]	99822-16[c]	99098-1[d]	13628-16[e] 13642-16[e,f] 13629-16[g] 13643-16[f,g]	13975-1[*h] 13984-1[*i] 13977-1[*j]		13744-16[l,n]	13750-16[l,o] 13763TR-16[l,p]

Section Continued ➥

a Requires cam button spacer, camshaft incorporates an integral cast iron distributor drive gear, aluminum-bronze distributor drive gear not required. For engines equipped with mechanical fuel pumps, fuel pump pushrod **11985-1** is highly recommended to prevent fuel pump lobe wear.
b Vertical locking bar hydraulic roller lifters, no machining required.
c Must machine cylinder heads.
d Machined steel, heat treated.
e Heavy wall, heat treated, for standard deck height blocks.
f Pro Series, one piece.
g Heavy wall, heat treated, for +.400" deck height "Tall Blocks".
h Performance steel billet gears and roller chain set.
i Pro Series steel billet gears and roller chain set.
j Pro Series steel billet gears and roller chain set with thrust bearing.
k 1.7 ratio, extra long slot for 1.560" maximum O.D. valve springs.
l 1991-95 engines require the installation of **99152-16** 7/16" rocker arm studs (no machining required) and factory pushrod guideplates.
n Energizer, 1.7 ratio, 7/16" stud. Valve Train Stabilizer available, see page 343.
o 1.7 ratio, 7/16" stud. Valve Train Stabilizer available, see page 343.
p 1.7 ratio, 7/16" stud, Wide Body. Valve Train Stabilizer available, see page 343.
q Ovate wire beehive spring, requires **99976-16** retainers.
r Steel, for **99832-16** beehive springs.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts — Retrofit										
Good mid range torque and HP, fair idle, performance usage, bracket racing, good with manifold nitrous system, auto trans w/3000+ converter, 3400-3800 cruise RPM, best in 502+ cu.in. engines. 10.0 to 11.5 compression ratio advised. Good w/supercharger, 16 lbs. max. boost w/8.0 max. compression ratio advised.	**HR-236/359-2S-14 IG**	2200-6000	**139671**[*a] ◆3	**13532-16**[b]	236 244	298 306	114	9 47 61 3	.000 .000	.610 .632
Excellent mid range to upper RPM torque & HP, rough idle, performance usage, bracket racing, auto trans w/3000+ converter, 3600-4000 cruise RPM, marine usage: for 500+ modified engines w/dry aftermarket exhaust. 10.5 to 12.0 compression ratio advised.	**HR-240/365-2S-12 IG**	2600-6200	**139681**[*a] ◆3	**13532-16**[b]	240 248	302 310	112	13 47 61 7	.000 .000	.621 .632
Good mid range to upper RPM torque, rough idle, performance usage, bracket racing, auto trans w/3500+ converter, marine performance for 480+ cu.in. modified engines in performance applications with aftermarket dry pipe exhaust systems, or tube headers, 3600-4000 cruise RPM, for 500+ cu.in. engines. 10.5 to 12.0 compression ratio advised.	**HR-244/372-2S-10 IG**	2800-6200	**139781**[*a] ◆3	**13532-16**[b]	244 256	306 318	110	17 47 63 13	.000 .000	.632 .632
Good mid range to upper RPM torque & HP, rough idle, performance usage, bracket racing, auto trans w/3500+ converter, marine performance for 500+ cu.in. modified engines in performance applications w/aftermarket dry pipe exhaust systems, or tube headers, good w/manifold nitrous system, 3800-4200 cruise RPM, for 500+ cu.in. engines. 10.5 to 12.5 compression ratio advised. Good w/Roots supercharger, 18 lbs. max. boost w/8.0 max. compression ratio advised.	**HR-306-2S-14 IG**	3000-6400	**139651**[*a] ◆3	**13532-16**[b]	244 256	306 318	114	13 51 67 9	.000 .000	.632 .632
Good mid range to upper RPM torque and HP, rough idle, performance usage, Pro Street, bracket racing, auto trans w/3500+ converter, 3800-4200 cruise RPM, for 500+ cu.in. engines. 11.0 to 12.5 compression ratio advised. Good w/Roots supercharger, 18 lbs. max. boost w/8.0 max. compression ratio advised.	**HR-246/400-2S-14 IG**	3200-6400	**139791**[*a] ◆3	**13532-16**[b]	246 254	316 324	114	13.5 52.5 65.5 8.5	.000 .000	.680 .680
Good mid range to upper RPM torque, rough idle, performance usage, bracket racing, auto trans w/3500+ converter, 3600-4000 cruise RPM, for 500+ cu.in. engines. 11.0 to 12.5 compression ratio advised.	**HR-248/372-2S-10 IG**	3000-6400	**139801**[*a] ◆3	**13532-16**[b]	248 256	310 318	110	19 49 63 13	.000 .000	.632 .632
Excellent upper RPM torque and HP, performance usage, bracket racing, good w/manifold nitrous system, auto trans w/3500+ converter, best in 540+ cu. in. engines. 11.0 to 12.5 compression ratio advised. Good w/supercharger, 20 lbs. maximum boost, w/8.0 maximum compression ratio advised.	**HR-248/372-2S-14 IG**	3200-6400	**139691**[*a] ◆3	**13532-16**[b]	248 256	310 318	114	15 53 67 9	.000 .000	.632 .632
Performance usage, bracket racing, good w/manifold nitrous system, auto trans w/race converter, best in 540+ cu.in. engines. 11.5 to 13.0 compression ratio advised. Good w/supercharger, 20 lbs. maximum boost, w/8.0 maximum compression ratio advised.	**HR-250/400-2S1-14 IG**	3200-6400	**139811**[*a] ◆3	**13532-16**[b]	250 258	320 328	114	15.5 54.5 68 10	.000 .000	.680 .680

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

NOTE: In order to use these cams in 65-66 engines, you must groove the center of the rear cam bearing journal, 3/16" wide and 7/64" deep.

NOTE: The 1991-95 Gen V engines can use these camshafts and components if they are converted to adjustable rocker arms by installing **99152-16** rocker arm studs (no machining required) and appropriate rocker arms. Custom length pushrods can also be made to achieve correct lifter preload if standard non-adjustable rocker arms are retained. See page 353 for checking your hydraulic lifter preload.

NOTE: Camshafts with SFO firing order (1-8-7-3-6-5-4-2, or 4/7 swap), are available on special order. Contact Crane's Performance Consultants for details.

IMPORTANT NOTE: Some 1973 thru 1981 454 cu.in. engines were equipped with exhaust valve rotators. In these instances when using dual valve springs, use either our **99459-8** Spring Seat Spacers or 4 of **99948-2** valve spring retainers (on the exhaust valves only) to prevent excessive valve spring shimming when eliminating the rotators. Some later engines were equipped with rotators on both the intake and exhaust valves. For these applications when using dual valve springs, use either 2 of our **99459-8** Spring Seat Spacers or our **99948-16** valve spring retainers to prevent excessive valve spring shimming when eliminating the rotators.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99896-16 **99832-16**[p]	**99955-16** **99976-16**[q]	**99822-16**[c]	**99098-1**[d]	**13628-16**[e] **13642-16**[e,f] **13629-16**[g] **13643-16**[f,g]	**13975-1**[*h] **13984-1**[*i] **13977-1**[*j]		**13744-16**[k,m]	**13750-16**[k,n] **13763TR-16**[k,o]
	99896-16 **99832-16**[p]	**99955-16** **99976-16**[q]	**99822-16**[c]	**99098-1**[d]	**13628-16**[e] **13642-16**[e,f] **13629-16**[g] **13643-16**[f,g]	**13975-1**[*h] **13984-1**[*i] **13977-1**[*j]		**13744-16**[k,m]	**13750-16**[k,n] **13763TR-16**[k,o]
	99896-16 **99832-16**[p]	**99955-16** **99976-16**[q]	**99822-16**[c]	**99098-1**[d]	**13628-16**[e] **13642-16**[e,f] **13629-16**[g] **13643-16**[f,g]	**13975-1**[*h] **13984-1**[*i] **13977-1**[*j]		**13744-16**[k,m]	**13750-16**[k,n] **13763TR-16**[k,o]
	99896-16 **99832-16**[p]	**99955-16** **99976-16**[q]	**99822-16**[c]	**99098-1**[d]	**13628-16**[e] **13642-16**[e,f] **13629-16**[g] **13643-16**[f,g]	**13975-1**[*h] **13984-1**[*i] **13977-1**[*j]		**13744-16**[k,m]	**13750-16**[k,n] **13763TR-16**[k,o]
	99896-16	**99955-16**	**99822-16**[c]	**99098-1**[d]	**13628-16**[e] **13642-16**[e,f] **13629-16**[g] **13643-16**[f,g]	**13975-1**[*h] **13984-1**[*i] **13977-1**[*j]		**13744-16**[k,m]	**13750-16**[k,n] **13763TR-16**[k,o]
	99896-16 **99832-16**[p]	**99955-16** **99976-16**[q]	**99822-16**[c]	**99098-1**[d]	**13628-16**[e] **13642-16**[e,f] **13629-16**[g] **13643-16**[f,g]	**13975-1**[*h] **13984-1**[*i] **13977-1**[*j]		**13744-16**[k,m]	**13750-16**[k,n] **13763TR-16**[k,o]
	99896-16 **99832-16**[p]	**99955-16** **99976-16**[q]	**99822-16**[c]	**99098-1**[d]	**13628-16**[e] **13642-16**[e,f] **13629-16**[g] **13643-16**[f,g]	**13975-1**[*h] **13984-1**[*i] **13977-1**[*j]		**13744-16**[k,m]	**13750-16**[k,n] **13763TR-16**[k,o]
	99896-16	**99955-16**	**99822-16**[c]	**99098-1**[d]	**13628-16**[e] **13642-16**[e,f] **13629-16**[g] **13643-16**[f,g]	**13975-1**[*h] **13984-1**[*i] **13977-1**[*j]		**13744-16**[k,m]	**13750-16**[k,n] **13763TR-16**[k,o]

Section Continued

a Requires cam button spacer, camshaft incorporates an integral cast iron distributor drive gear, aluminum-bronze distributor drive gear not required. For engines equipped with mechanical fuel pumps, fuel pump pushrod **11985-1** is highly recommended to prevent fuel pump lobe wear.
b Vertical locking bar hydraulic roller lifters, no machining required.
c Must machine cylinder heads.
d Machined steel, heat treated.
e Heavy wall, heat treated, for standard deck height blocks.
f Pro Series, one piece.
g Heavy wall, heat treated, for +.400" deck height "Tall Blocks".
h Performance steel billet gears and roller chain set.
i Pro Series steel billet gears and roller chain set.
j Pro Series steel billet gears and roller chain set with thrust bearing.
k 1991-95 engines require the installation of **99152-16** 7/16" rocker arm studs (no machining required) and factory pushrod guideplates.
m Energizer, 1.7 ratio, 7/16" stud. Valve Train Stabilizer available, see page 343.
n 1.7 ratio, 7/16" stud. Valve Train Stabilizer available, see page 343.
o 1.7 ratio, 7/16" stud, Wide Body. Valve Train Stabilizer available, see page 343.
p Ovate wire beehive spring, requires **99976-16** retainers.
q Steel, for **99832-16** beehive springs.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts — Retrofit										
Performance usage, good upper RPM torque & HP, bracket racing, good w/large manifold nitrous system, auto trans w/3500+ converter, best in 540+ cu.in. engines w/prepared cylinder heads. 12.0 min. compression ratio advised. Good w/large supercharger, 22 lbs. max. boost w/8.5 max. compression ratio advised.	**HR-254/400-2S-14 IG**	3400-6600	**139701**[*a] ◆3	**13532-16**[b]	254 262	324 332	114	17.5 56.5 69.5 12.5	.000 .680 .000 .680
Good upper RPM torque and HP, bracket racing, auto trans w/3500+ converter, best in 540+ cu.in. engines w/prepared cylinder heads. 12.0 minimum compression ratio advised.	**HR-256/372-2S-10 IG**	3400-6600	**139821**[*a] ◆3	**13532-16**[b]	256 264	318 326	110	23 53 67 17	.000 .632 .000 .632
Performance usage, good upper RPM HP, bracket racing, good w/large manifold nitrous system, auto trans w/3500+ converter, marine performance, 4000-4400 cruise RPM, for 540+ cu.in. engines. 11.0 minimum compression ratio advised. Good w/large Roots supercharger, good upper RPM HP, 480+ cu.in., 22 lbs. max. boost w/8.0 max. compression ratio advised.	**HR-318-2S-14 IG**	3600-6600	**139661**[*a] ◆3	**13532-16**[b]	256 264	318 326	114	19 57 71 13	.000 .632 .000 .632
Competition only, bracket racing, good w/large manifold nitrous system, auto trans w/race converter, 4000-4400 cruise RPM, for 540+ cu.in. engines. 12.0 min. compression ratio advised. Good w/large Roots supercharger, good upper RPM HP, 480+ cu.in., 22 lbs. max. boost w/8.0 max. compression ratio advised.	**HR-258/4001-2S-14 IG**	3600-6600	**139831**[*a] ◆3	**13532-16**[b]	258 266	328 336	114	19.5 58.5 71.5 14.5	.000 .680 .000 .680
Competition only, bracket, Super Gas, Super Comp racing, auto trans w/race converter, best in 540+ cu.in. engines w/prepared cylinder heads, 12.5 minimum compression ratio advised.	**HR-262/400-2S2-14 IG**	3800-6600	**139841**[*a] ◆3	**13532-16**[b]	262 266	332 336	114	21.5 60.5 71.5 14.5	.000 .680 .000 .680
Competition only, bracket, Super Gas, Super Comp racing, auto trans w/race converter, best in 572+ cu.in. engines w/prepared cylinder heads, good w/large manifold nitrous system, 12.5 minimum compression ratio advised. Good w/large supercharger, 26 lbs. max. boost w/8.5 max. compression ratio advised.	**HR-262/400-2S1-14 IG**	3800-6600	**139711**[*a] ◆3	**13532-16**[b]	262 270	332 340	114	21.5 60.5 73.5 16.5	.000 .680 .000 .680
Competition only, best in 572+ cu.in. high torque applications: drag, marine, radical Pro Street, 13.0 minimum compression ratio advised.	**HR-264/420-2S-15 IG**	4000-6800	**139861**[*a] ◆3	**13532-16**[b]	264 272	328 336	115	21 63 75 17	.000 .714 .000 .714
Competition only, best in 572+ cu.in., high torque and RPM applications: drag, radical Pro Street, good w/ large manifold nitrous system, 13.0 minimum compression ratio advised. Good w/large supercharger, 28 lbs. maximum boost w/9.0 maximum compression ratio advised.	**HR-270/400-2S-14 IG**	4400-6800	**139851**[*a] ◆3	**13532-16**[b]	270 282	340 347	114	25.5 64.5 79 23	.000 .680 .000 .680

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

NOTE: In order to use these cams in 65-66 engines, you must groove the center of the rear cam bearing journal, 3/16" wide and 7/64" deep.

NOTE: The 1991-95 Gen V engines can use these camshafts and components if they are converted to adjustable rocker arms by installing **99152-16** rocker arm studs (no machining required) and appropriate rocker arms. Custom length pushrods can also be made to achieve correct lifter preload if standard non-adjustable rocker arms are retained. See page 353 for checking your hydraulic lifter preload.

NOTE: Camshafts with SFO firing order (1-8-7-3-6-5-4-2, or 4/7 swap), are available on special order. Contact Crane's Performance Consultants for details.

IMPORTANT NOTE: Some 1973 thru 1981 454 cu.in. engines were equipped with exhaust valve rotators. In these instances when using dual valve springs, use either our **99459-8** Spring Seat Spacers or 4 of **99948-2** valve spring retainers (on the exhaust valves only) to prevent excessive valve spring shimming when eliminating the rotators. Some later engines were equipped with rotators on both the intake and exhaust valves. For these applications when using dual valve springs, use either 2 of our **99459-8** Spring Seat Spacers or our **99948-16** valve spring retainers to prevent excessive valve spring shimming when eliminating the rotators.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99896-16	**99955-16**	**99822-16**[c]	**99098-1**[d]	**13628-16**[e] **13642-16**[e,f] **13629-16**[g] **13643-16**[f,g]	**13975-1**[*h] **13984-1**[*i] **13977-1**[*j]			**13750-16**[k,n] **13763TR-16**[k,o]
	99896-16 **99832-16**[p]	**99955-16** **99976-16**[q]	**99822-16**[c]	**99098-1**[d]	**13628-16**[e] **13642-16**[e,f] **13629-16**[g] **13643-16**[f,g]	**13975-1**[*h] **13984-1**[*i] **13977-1**[*j]		**13744-16**[k,m]	**13750-16**[k,n] **13763TR-16**[k,o]
	99896-16 **99832-16**[p]	**99955-16** **99976-16**[q]	**99822-16**[c]	**99098-1**[d]	**13628-16**[e] **13642-16**[e,f] **13629-16**[g] **13643-16**[f,g]	**13975-1**[*h] **13984-1**[*i] **13977-1**[*j]		**13744-16**[k,m]	**13750-16**[k,n] **13763TR-16**[k,o]
	99896-16	**99955-16**	**99822-16**[c]	**99098-1**[d]	**13628-16**[e] **13642-16**[e,f] **13629-16**[g] **13643-16**[f,g]	**13975-1**[*h] **13984-1**[*i] **13977-1**[*j]			**13750-16**[k,n] **13763TR-16**[k,o]
	99896-16	**99955-16**	**99822-16**[c]	**99098-1**[d]	**13628-16**[e] **13642-16**[e,f] **13629-16**[g] **13643-16**[f,g]	**13975-1**[*h] **13984-1**[*i] **13977-1**[*j]			**13750-16**[k,n] **13763TR-16**[k,o]
	99896-16	**99955-16**	**99822-16**[c]	**99098-1**[d]	**13628-16**[e] **13642-16**[e,f] **13629-16**[g] **13643-16**[f,g]	**13975-1**[*h] **13984-1**[*i] **13977-1**[*j]			**13750-16**[k,n] **13763TR-16**[k,o]
	99896-16	**99955-16**	**99822-16**[c]	**99098-1**[d]	**13628-16**[e] **13642-16**[e,f] **13629-16**[g] **13643-16**[f,g]	**13975-1**[*h] **13984-1**[*i] **13977-1**[*j]			**13750-16**[k,n] **13763TR-16**[k,o]

a Requires cam button spacer, camshaft incorporates an integral cast iron distributor drive gear, aluminum-bronze distributor drive gear not required. For engines equipped with mechanical fuel pumps, fuel pump pushrod **11985-1** is highly recommended to prevent fuel pump lobe wear.
b Vertical locking bar hydraulic roller lifters, no machining required.
c Must machine cylinder heads.
d Machined steel, heat treated.
e Heavy wall, heat treated, for standard deck height blocks.
f Pro Series, one piece.
g Heavy wall, heat treated, for +.400" deck height "Tall Blocks".
h Performance steel billet gears and roller chain set.
i Pro Series steel billet gears and roller chain set.
j Pro Series steel billet gears and roller chain set with thrust bearing.
k 1991-95 engines require the installation of **99152-16** 7/16" rocker arm studs (no machining required) and factory pushrod guideplates.
m Energizer, 1.7 ratio, 7/16" stud. Valve Train Stabilizer available, see page 343.
n 1.7 ratio, 7/16" stud. Valve Train Stabilizer available, see page 343.
o 1.7 ratio, 7/16" stud, Wide Body. Valve Train Stabilizer available, see page 343.
p Ovate wire beehive spring, requires **99976-16** retainers.
q Steel, for **99832-16** beehive springs.

Mechanical Lifter Camshafts

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	COMPLETE CAM SPECIFICATIONS Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Excellent low end and mid range torque and HP, fair idle, moderate performance usage, bracket racing w/ heavy car, off road, auto trans w/2000+ converter, 3200-3600 cruise RPM, 10.5 to 11.5 compression ratio advised.	**F-238/3200-2-8**	2600-6200	**131101**[*a] ◆3	**99250-16**	238 248	300 310	108	16 42 57 11	.022 .022	.544 .567
Good low end and mid range torque and HP, fair idle, moderate performance usage, bracket racing, auto trans w/2000+ converter, also w/plate or manifold nitrous system, 3400-3800 cruise RPM, 10.5 to 11.5 compression ratio advised. Good w/centrifugal or Roots supercharger, 10 lbs. maximum boost w/8.5 maximum compression ratio advised.	**F-304-2**	2800-6600	**133841** ◆3	**99250-16**	238 248	304 314	114	10 48 63 5	.022 .022	.544 .567
Replacement for factory 375 HP 396 cu.in., 425 HP 427 cu.in., 435 HP 427 cu.in., 460 HP 454 cu.in. camshaft.	**BluePrinted 3863143**	3000-6400	**969961** ◆1	**99250-16**	242 242		114	13 49 61 1	.024 .028	.520 .520
Good low end and mid range torque and HP, fair idle, moderate performance usage, bracket racing, auto trans w/2000+ converter, 3600-4000 cruise RPM, 10.5 to 11.5 compression ratio advised.	**F-244/3454-2S-8**	3200-6600	**131111**[*] ◆3	**99250-16**	244 252	280 288	108	18 46 58 14	.026 .026	.587 .608
Good mid range torque and HP, fair idle, moderate performance usage, bracket racing, auto trans w/2500+ converter, good w/plate or manifold nitrous system, 3600-4000 cruise RPM, 10.75 to 12.0 compression ratio advised. Good w/centrifugal or Roots supercharger, 14 lbs. maximum boost w/8.5 maximum compression ratio advised.	**F-244/3454-2S-14**	3400-6800	**131121**[*] ◆3	**99250-16**	244 252	280 288	114	12 52 64 8	.026 .026	.587 .608
Good mid range torque & HP, rough idle, moderate performance usage, auto trans w/2500+ converter, 3800-4200 cruise RPM, bracket racing: Pro E.T., Super E.T., Super Pro, Hot Rod, auto trans w/race converter; oval track; Street Stock, Modified, etc., 1/4-3/8 mile, & marine performance usage in 454-502 cu.in. modified engines w/aftermarket high flow above water exhaust systems. 11.0 to 12.0 compression ratio advised.	**Saturday Night Special F-314-2**	3400-7000	**134781**[*] **134784**[*a] ◆3	**99250-16**	248 258	314 324	110	19 49 64 14	.022 .022	.567 .590
Good mid range torque and HP, performance usage, fair idle, bracket racing, auto trans w/3000+ converter, 4000-4400 cruise RPM, 11.25 to 12.25 compression ratio advised.	**F-252/3574-2S-8**	3600-7000	**131131**[*] ◆3	**99250-16**	252 260	288 296	108	21 51 61 19	.026 .026	.608 .628
Good mid range torque and HP, performance usage, fair idle, bracket racing, auto trans w/3000+ converter, 4000-4400 cruise RPM, good w/manifold nitrous system, 11.5 to 12.5 compression ratio advised. Good w/Roots supercharger, 18 lbs. max. boost w/8.0 max. compression ratio advised.	**F-252/3574-2S-14**	3600-7200	**131271**[*] ◆3	**99250-16**	252 260	288 296	114	16 56 68 12	.026 .026	.608 .628

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT NOTE: 1991-95 Gen V engines can use these camshafts and components if they are converted to adjustable rocker arms by machining the cylinder heads for **99157-16** 7/16" screw-in studs and **13650-1** pushrod guideplates, and installing appropriate rocker arms.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

NOTE: In order to use these cams in 65-66 engines, you must groove the center of the rear cam bearing journal, 3/16" wide and 7/64" deep.

NOTE: Camshafts with SFO firing order (1-8-7-3-6-5-4-2, or 4/7 swap), are available on special order. Contact Crane's Performance Consultants for details.

IMPORTANT NOTE: Some 1973 thru 1981 454 cu.in. engines were equipped with exhaust valve rotators. In these instances when using dual valve springs, use either our **99459-8** Spring Seat Spacers or 4 of **99948-2** valve spring retainers (on the exhaust valves only) to prevent excessive valve spring shimming when eliminating the rotators. Some later engines were equipped with rotators on both the intake and exhaust valves. For these applications when using dual valve springs, use either 2 of our **99459-8** Spring Seat Spacers or our **99948-16** valve spring retainers to prevent excessive valve spring shimming when eliminating the rotators.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99893-16	**99954-16**	**99822-16[b]**	**99098-1[c]**	**13634-16[d]** **13640-16[e]**	**13975-1[*f]** **13984-1[*g]** **13977-1[*h]**	**13801-16[i,j]** **13801C-16[i,k]**		**13750-16[j,m]** **13763TR-16[j,n]**
	99893-16	**99954-16**	**99822-16[b]**	**99098-1[c]**	**13634-16[d]** **13640-16[e]**	**13975-1[*f]** **13984-1[*g]** **13977-1[*h]**	**13801-16[i,j]** **13801C-16[i,k]**		**13750-16[j,m]** **13763TR-16[j,n]**
	99893-16	**99954-16**	**99822-16[b]**	**99098-1[c]**	**13634-16[d]** **13640-16[e]**	**13975-1[*f]** **13984-1[*g]** **13977-1[*h]**	**13801-16[i,j]** **13801C-16[i,k]**		**13750-16[j,m]** **13763TR-16[j,n]**
	99893-16	**99954-16**	**99822-16[b]**	**99098-1[c]**	**13634-16[d]** **13640-16[e]**	**13975-1[*f]** **13984-1[*g]** **13977-1[*h]**	**13801-16[i,j]** **13801C-16[i,k]**		**13750-16[j,m]** **13763TR-16[j,n]**
	99893-16	**99954-16**	**99822-16[b]**	**99098-1[c]**	**13634-16[d]** **13640-16[e]**	**13975-1[*f]** **13984-1[*g]** **13977-1[*h]**	**13801-16[i,j]** **13801C-16[i,k]**		**13750-16[j,m]** **13763TR-16[j,n]**
	99890-16	**99974-16**	**99822-16[b]**	**99098-1[c]**	**13634-16[d]** **13640-16[e]**	**13975-1[*f]** **13984-1[*g]** **13977-1[*h]**			**13750-16[j,m]** **13763TR-16[j,n]**
	99890-16[a]	**99974-16**	**99822-16[b]**	**99098-1[c]**	**13634-16[d]** **13640-16[e]**	**13975-1[*f]** **13984-1[*g]** **13977-1[*h]**			**13750-16[j,m]** **13763TR-16[j,n]**
	99890-16[a]	**99974-16**	**99822-16[b]**	**99098-1[c]**	**13634-16[d]** **13640-16[e]**	**13975-1[*f]** **13984-1[*g]** **13977-1[*h]**			**13750-16[j,m]** **13763TR-16[j,n]**

Section Continued

a Cam and lifter kit, includes installation lubricants.
b Must machine cylinder heads.
c Machined steel, heat treated.
d Heavy wall, heat treated.
e Pro Series, one piece.
f Performance steel billet gears and roller chain set.
g Pro Series steel billet gears and roller chain set.
h Pro Series steel billet gears and roller chain set with thrust bearing.
i 1.7 ratio, extra long slot for 1.560" maximum O.D. valve springs.
j 1991-95 engines require the installation of **99157-16** 7/16" rocker arm studs and **13650-1** pushrod guideplates (machining required).
k 1.7 ratio, Nitro Carb, extra long slot for 1.560" maximum O.D. valve springs.
m 1.7 ratio, 7/16" stud. Valve Train Stabilizer available, see page 343.
n 1.7 ratio, 7/16" stud, Wide Body. Valve Train Stabilizer available, see page 343.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Lifter Camshafts										
Good mid range and upper RPM torque and HP, rough idle, performance usage, bracket racing, auto trans w/3000+ converter, 4000-4400 cruise RPM 11.5 to 12.5 compression ratio advised.	**F-326-2**	3800-7400	**134261*** ◆3	**99250-16**	252 262	326 336	110	21 51 66 16	.022 .024	.554 .554
Good mid range and upper RPM torque and HP, performance usage, bracket racing, auto trans w/race converter, marine performance usage in 500+ cu.in. modified engines with aftermarket dry pipe exhaust system or tube headers, also replacement cam for Mercruiser 575 HP 540 cu.in. engines. 11.5 to 12.5 compression ratio advised.	**F-256/3634-2S-8**	4000-7400	**131311*** ◆3	**99250-16**	256 264	292 300	108	23 53 63 21	.026 .026	.618 .638
Good mid range and upper RPM torque and HP, performance usage, auto trans w/3000+ converter, 4200-4600 cruise RPM, bracket racing; Pro, Pro E.T., Super E.T., Super Pro, Hot Rod, auto trans w/race converter; oval track; Street Stock, Modified, etc., 3/8-1/2 mile, 11.5 to 12.5 compression ratio advised.	**Saturday Night Special F-290-2**	4000-7500	**134691*** **134694***a ◆3	**99250-16**	256 266	290 300	110	23 53 68 18	.026 .026	.580 .600
Strong mid range torque and HP, performance usage, bracket racing, auto trans w/race converter, oval track; Street Stock, Modified, etc., 3/8-1/2 mile, marine, radical performance usage in 540+ cu.in. modified engines with ported cylinder heads and tube headers, 12.0 minimum compression ratio advised.	**F-260/3694-2S-8**	4200-7600	**131441*** ◆3	**99250-16**	260 268	296 304	108	25 55 65 23	.026 .026	.628 .648
Rough idle, performance usage, good upper RPM HP, 480+ cu.in., Pro Street, bracket racing, auto trans w/3500+ converter, 4400-4800 cruise RPM, also good w/manifold nitrous system, good upper RPM HP, 12.0 minimum compression ratio advised. Good w/large Roots supercharger, 20 lbs. maximum boost w/8.0 maximum compression ratio advised.	**F-260/3694-2S-14**	4200-7800	**131281*** ◆3	**99250-16**	260 268	296 304	114	19 61 71 17	.026 .026	.628 .648
Replacement for factory 430 HP 427 cu.in. (2nd design L88), ZL1 427 cu.in., LS7 454 cu.in. camshaft.	**BluePrinted 3959180**	4400-7200	**131141*** ◆1	**99250-16**	262 272		110	24 58 69 23	.022 .024	.575 .615
Replacement for 400 HP 427 cu.in. (1st design L88) camshaft.	**BluePrinted 3925535**	4400-7200	**968561** ◆1	**99250-16**	264 269		112	24 60 70.5 18.5	.024 .026	.560 .580
Moderate competition only, good upper RPM torque and HP, bracket racing: Super Pro, Hot Rod, auto trans w/race converter, oval track; Street Stock, Modified, etc., 3/8-1/2 mile. 12.0 minimum compression ratio advised.	**Saturday Night Special F-310-2**	4400-7800	**134761*** **134764***a ◆3	**99250-16**	266 276	310 320	110	28 58 73 23	.026 .026	.600 .620

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT NOTE: 1991-95 Gen V engines can use these camshafts and components if they are converted to adjustable rocker arms by machining the cylinder heads for **99157-16** 7/16" screw-in studs and **13650-1** pushrod guideplates, and installing appropriate rocker arms.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

NOTE: In order to use these cams in 65-66 engines, you must groove the center of the rear cam bearing journal, 3/16" wide and 7/64" deep.

NOTE: Camshafts with SFO firing order (1-8-7-3-6-5-4-2, or 4/7 swap), are available on special order. Contact Crane's Performance Consultants for details.

IMPORTANT NOTE: Some 1973 thru 1981 454 cu.in. engines were equipped with exhaust valve rotators. In these instances when using dual valve springs, use either our **99459-8** Spring Seat Spacers or 4 of **99948-2** valve spring retainers (on the exhaust valves only) to prevent excessive valve spring shimming when eliminating the rotators. Some later engines were equipped with rotators on both the intake and exhaust valves. For these applications when using dual valve springs, use either 2 of our **99459-8** Spring Seat Spacers or our **99948-16** valve spring retainers to prevent excessive valve spring shimming when eliminating the rotators.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99890-16	**99974-16**	**99822-16**[b]	**99098-1**[c]	**13634-16**[d] **13640-16**[e]	**13975-1**[*f] **13984-1**[*g] **13977-1**[*h]			**13750-16**[i,m] **13763TR-16**[i,n]
	99890-16	**99974-16**	**99822-16**[b]	**99098-1**[c]	**13634-16**[d] **13640-16**[e]	**13975-1**[*f] **13984-1**[*g] **13977-1**[*h]			**13750-16**[i,m] **13763TR-16**[i,n]
	99890-16	**99974-16**	**99822-16**[b]	**99098-1**[c]	**13634-16**[d] **13640-16**[e]	**13975-1**[*f] **13984-1**[*g] **13977-1**[*h]			**13750-16**[i,m] **13763TR-16**[i,n]
	99890-16	**99974-16**	**99822-16**[b]	**99098-1**[c]	**13634-16**[d] **13640-16**[e]	**13975-1**[*f] **13984-1**[*g] **13977-1**[*h]			**13750-16**[i,m] **13763TR-16**[i,n]
	99890-16	**99974-16**	**99822-16**[b]	**99098-1**[c]	**13634-16**[d] **13640-16**[e]	**13975-1**[*f] **13984-1**[*g] **13977-1**[*h]			**13750-16**[i,m] **13763TR-16**[i,n]
	99893-16	**99954-16**	**99822-16**[b]	**99098-1**[c]	**13634-16**[d] **13640-16**[e]	**13975-1**[*f] **13984-1**[*g] **13977-1**[*h]	**13801-16**[i,j] **13801C-16**[i,k]		**13750-16**[i,m] **13763TR-16**[i,n]
	99893-16	**99954-16**	**99822-16**[b]	**99098-1**[c]	**13634-16**[d] **13640-16**[e]	**13975-1**[*f] **13984-1**[*g] **13977-1**[*h]	**13801-16**[i,j] **13801C-16**[i,k]		**13750-16**[i,m] **13763TR-16**[i,n]
	99890-16	**99974-16**	**99822-16**[b]	**99098-1**[c]	**13634-16**[d] **13640-16**[e]	**13975-1**[*f] **13984-1**[*g] **13977-1**[*h]			**13750-16**[i,m] **13763TR-16**[i,n]

Section Continued ➥

a Cam and lifter kit, includes installation lubricants.
b Must machine cylinder heads.
c Machined steel, heat treated.
d Heavy wall, heat treated.
e Pro Series, one piece.
f Performance steel billet gears and roller chain set.
g Pro Series steel billet gears and roller chain set.
h Pro Series steel billet gears and roller chain set with thrust bearing.
i 1.7 ratio, extra long slot for 1.560" maximum O.D. valve springs.
j 1991-95 engines require the installation of **99157-16** 7/16" rocker arm studs and **13650-1** pushrod guideplates (machining required).
k 1.7 ratio, Nitro Carb, extra long slot for 1.560" maximum O.D. valve springs.
m 1.7 ratio, 7/16" stud. Valve Train Stabilizer available, see page 343.
n 1.7 ratio, 7/16" stud, Wide Body. Valve Train Stabilizer available, see page 343.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Lifter Camshafts										
Moderate competition only, good upper RPM HP, 454+ cu.in., bracket racing, auto trans w/race converter, also good w/large manifold nitrous system, 12.0 minimum compression ratio advised. Good w/ large Roots supercharger, 20 lbs. maximum boost w/8.0 maximum compression ratio advised.	**F-266/3528-2-14**	4400-8000	**131151*** ◆3	**99250-16**	266 276	302 312	114	22 64 75 21	.026 .026	.600 .620
Moderate competition only, good upper RPM HP, bracket racing, auto trans w/race converter, 12.0 minimum compression ratio advised.	**F-268/3814-2S-8**	4600-7800	**131541*** ◆3	**99250-16**	268 276	304 312	108	29 59 69 27	.026 .026	.648 .669
Moderate competition only, good upper RPM HP, 460+ cu.in. bracket racing, auto trans w/race converter, 12.5 minimum compression ratio advised.	**F-270/3867-2S-10**	4600-8000	**131161*** ◆3	**99250-16**	270 276	300 312	110	29 61 71 25	.012 .026	.657 .620
Moderate competition only, good upper RPM HP, bracket racing, auto trans w/race converter, 12.5 minimum compression ratio advised.	**F-316-2**	4800-8000	**134771*** ◆3	**99250-16**	272 280	316 324	110	30 62 74 26	.026 .026	.659 .679
Competition only, good upper RPM HP, 500+ cu.in., bracket racing, auto trans w/race converter, also good w/large manifold nitrous system, 12.5 minimum compression ratio advised. Good w/large Roots supercharger, 22 lbs. maximum boost w/8.0 maximum compression ratio advised.	**F-272/3874-2S-14**	4600-8200	**131291*** ◆3	**99250-16**	272 280	308 316	114	26 66 78 22	.026 .026	.659 .679
Competition only, good upper RPM HP, bracket racing, auto trans w/race converter, 12.5 minimum compression ratio advised.	**F-276/3934-2S-8** **F-276/3934-2S-8 SFO**	4800-8200	**131641*** **131171*** ◆3	**99250-16**	276 284	312 320	108	34 62 74 30	.026 .026	.669 .689
Radical competition only, good high RPM HP, flat tappet restricted classes, 540+ cu.in., 13.0 minimum compression ratio advised.	**F-280/3994-2S-10**	5000-8400	**131761*** ◆3	**99250-16**	280 288	316 324	110	33 67 77 31	.026 .026	.679 .699
Radical competition only, good high RPM HP, flat tappet restricted classes, 540+ cu.in., good w/manifold ntrous system, 13.0 minimum compression ratio advised. Good w/Roots supercharger, 26 lbs. maximum boost w/8.5 maximum compression ratio advised.	**F-280/3994-2S-14**	5200-8400	**131181*** ◆3	**99250-16**	280 288	316 324	114	30 70 82 26	.026 .026	.679 .699

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT NOTE: 1991-95 Gen V engines can use these camshafts and components if they are converted to adjustable rocker arms by machining the cylinder heads for **99157-16** 7/16" screw-in studs and **13650-1** pushrod guideplates, and installing appropriate rocker arms.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

NOTE: In order to use these cams in 65-66 engines, you must groove the center of the rear cam bearing journal, 3/16" wide and 7/64" deep.

NOTE: Camshafts with SFO firing order (1-8-7-3-6-5-4-2, or 4/7 swap), are available on special order. Contact Crane's Performance Consultants for details.

IMPORTANT NOTE: Some 1973 thru 1981 454 cu.in. engines were equipped with exhaust valve rotators. In these instances when using dual valve springs, use either our **99459-8** Spring Seat Spacers or 4 of **99948-2** valve spring retainers (on the exhaust valves only) to prevent excessive valve spring shimming when eliminating the rotators. Some later engines were equipped with rotators on both the intake and exhaust valves. For these applications when using dual valve springs, use either 2 of our **99459-8** Spring Seat Spacers or our **99948-16** valve spring retainers to prevent excessive valve spring shimming when eliminating the rotators.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99890-16	**99974-16**	**99822-16**[a]	**99098-1**[b]	**13634-16**[c] **13640-16**[d]	**13975-1**[*e] **13984-1**[*f] **13977-1**[*g]			**13750-16**[h,j] **13763TR-16**[h,k]
	99890-16	**99974-16**	**99822-16**[a]	**99098-1**[b]	**13634-16**[c] **13640-16**[d]	**13975-1**[*e] **13984-1**[*f] **13977-1**[*g]			**13750-16**[h,j] **13763TR-16**[h,k]
	99890-16	**99974-16**	**99822-16**[a]	**99098-1**[b]	**13634-16**[c] **13640-16**[d]	**13975-1**[*e] **13984-1**[*f] **13977-1**[*g]			**13750-16**[h,j] **13763TR-16**[h,k]
	99890-16	**99974-16**	**99822-16**[a]	**99098-1**[b]	**13634-16**[c] **13640-16**[d]	**13975-1**[*e] **13984-1**[*f] **13977-1**[*g]			**13750-16**[h,j] **13763TR-16**[h,k]
	99890-16	**99974-16**	**99822-16**[a]	**99098-1**[b]	**13634-16**[c] **13640-16**[d]	**13975-1**[*e] **13984-1**[*f] **13977-1**[*g]			**13750-16**[h,j] **13763TR-16**[h,k]
	99890-16	**99974-16**	**99822-16**[a]	**99098-1**[b]	**13634-16**[c] **13640-16**[d]	**13975-1**[*e] **13984-1**[*f] **13977-1**[*g]			**13750-16**[h,j] **13763TR-16**[h,k]
	99890-16[a]	**99974-16**	**99822-16**[a]	**99098-1**[b]	**13634-16**[c] **13640-16**[d]	**13975-1**[*e] **13984-1**[*f] **13977-1**[*g]			**13750-16**[h,j] **13763TR-16**[h,k]
	99890-16[a]	**99974-16**	**99822-16**[a]	**99098-1**[b]	**13634-16**[c] **13640-16**[d]	**13975-1**[*e] **13984-1**[*f] **13977-1**[*g]			**13750-16**[h,j] **13763TR-16**[h,k]

a Must machine cylinder heads.
b Machined steel, heat treated.
c Heavy wall, heat treated.
d Pro Series, one piece.
e Performance steel billet gears and roller chain set.
f Pro Series steel billet gears and roller chain set.
g Pro Series steel billet gears and roller chain set with thrust bearing.
h 1991-95 engines require the installation of **99157-16** 7/16" rocker arm studs and **13650-1** pushrod guideplates (machining required).
j 1.7 ratio, 7/16" stud. Valve Train Stabilizer available, see page 343.
k 1.7 ratio, 7/16" stud, Wide Body. Valve Train Stabilizer available, see page 343.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 276 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Roller Camshafts										
Excellent low end and mid range torque and HP, good idle, moderate performance usage, marine performance, mild bracket racing, auto trans w/3000+ converter, good with plate nitrous system, 3400-3800 cruise RPM, 10.5 to 11.5 compression ratio advised. Good w/supercharger, 10 lbs. maximum boost w/8.5 maximum compression ratio advised.	**SR-238/350-2S-12 IG**	2800-6600	**138551**[*a] ◆3	**13519-16**[c] **13570-16**[d]	238 246	288 296	112	12 46 60 6	.020 .020	.595 .615
Good low end and mid range torque and HP, fair idle, moderate performance usage, marine performance, radical off road, bracket racing, auto trans w/3500+ converter, 3800-4200 cruise RPM, 10.5 to 12.0 compression ratio advised.	**SR-246/362-2S-10 IG**	3000-6800	**138601**[*a] ◆3	**13519-16**[c] **13570-16**[d]	246 254	296 304	110	18 48 62 12	.020 .020	.615 .636
Excellent mid range torque & HP, fair idle, moderate performance usage, marine performance, good w/manifold nitrous system, mild bracket racing, auto trans w/3500+ converter, 3800-4200 cruise RPM, 10.5 to 12.0 compression ratio advised. Good w/supercharger, 16 lbs. max. boost w/8.0 max. compress. ratio advised.	**SR-246/362-2S-14 IG**	3200-6800	**138781**[*a] ◆3	**13519-16**[c] **13570-16**[d]	246 254	296 304	114	14 52 66 8	.020 .020	.615 .636
Excellent mid range torque & HP, fair idle, performance usage, good w/manifold nitrous system, mild bracket racing, auto trans w/3500+ converter, 10.5 to 12.0 compression ratio advised. Good w/supercharger, 16 lbs. max. boost w/8.0 max. compress. ratio advised.	**R-246/420-2-14 IG**	3200-7000	**138141**[*] ◆3	**13519-16**[c] **13570-16**[d]	246 256	278 288	114	13 53 66 10	.020 .020	.714 .714
Good mid range torque and HP, performance usage, bracket racing, Heavy, Pro, etc., auto trans w/race converter, 11.0 to 12.5 compression ratio advised.	**R-250/420-2S-10**	3200-7000	**138871**[*b] ◆3	**13519-16**[c] **13570-16**[d]	250 258	282 290	110	19 51 63 15	.020 .020	.714 .714
Good mid range to upper RPM torque & HP, rough idle, performance usage, marine performance, bracket racing, auto transmission w/4000+ converter, 4200-4600 cruise RPM, 11.0 minimum compression ratio advised, 480+ cu.in., mild supercharged and/or nitrous.	**SR-254/374-2S-12 IG**	3400-7200	**138631**[*a] ◆3	**13519-16**[c] **13570-16**[d]	254 262	304 312	112	20 54 68 14	.020 .020	.636 .636
Performance usage, good low and mid range torque and HP, bracket racing, auto trans w/3500+ converter, 11.0 to 12.5 maximum compression ratio advised. Good w/manifold nitrous system. Good w/Roots supercharger, 18 lbs. maximum boost w/8.0 maximum compression ratio advised.	**R-254/420-2S1-12 IG**	3600-7200	**138101**[*a] ◆3	**13519-16**[c] **13570-16**[d]	254 262	286 294	112	19 55 67 15	.020 .020	.714 .714
Good mid range to upper RPM torque & HP, rough idle, performance usage, 480+ cu.in., radical marine performance, Pro Street, bracket racing, auto trans w/3500+ converter, 4200-4600 cruise RPM, 11.0 min. compression ratio advised. Good w/manifold nitrous system. Good w/Roots supercharger, 20 lbs. maximum boost w/8.0 maximum compression ratio advised.	**SR-254/374-2S-14 IG**	3600-7200	**138791**[*a] ◆3	**13519-16**[c] **13570-16**[d]	254 262	304 312	114	18 56 70 12	.020 .020	.636 .636
Performance usage, bracket racing, good mid range torque and HP, Heavy, Pro, etc., auto trans w/race converter, 11.0 to 12.5 compression ratio advised.	**R-254/420-2-10**	3800-7200	**138881**[*b] ◆3	**13519-16**[c] **13570-16**[d]	254 264	286 296	110	21 53 66 18	.020 .020	.714 .714

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

IMPORTANT NOTE: 1991-95 Gen V engines can use these camshafts and components if they are converted to adjustable rocker arms by machining the cylinder heads for **99157-16** 7/16" screw-in studs and **13650-1** pushrod guideplates, and installing appropriate rocker arms.

NOTE: Many options are available for these camshafts, and any of our custom ground camshafts. An iron distributor drive gear and rear journal can be specified. SFO firing order (4/7 swap) is offered. Optional journal sizes are: Roller Bearing (1.968"), 2.125", and 55mm (2.165"). Gun drilling (where applicable) is available. Camshafts for the GM DRCE family of V-8's are also offered in 55mm and 60mm journal versions.

NOTE: In order to use these cams in 65-66 engines, you must groove the center of the rear cam bearing journal, 3/16" wide and 7/64" deep.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338 | *See pg. 317* | *See pg. 330* | *See pg. 343* | *See pg. 340* | *See pg. 286* | *See pg. 308* | *See pg. 292* | *See pg. 295* | *See pg. 297*

VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	ALUMINUM ROCKERS — ENERGIZER	ALUMINUM ROCKERS — GOLD RACE
	99876-16[e] 96883-16[e,f] 99832-16[w]	99955-16 99676-16[g] 99678-16[h] 99976-16[x]	99822-16[e,i] 99820-16[e,j]	99098-1[k] 99094-1[l] 99097-1[m]	13634-16[n] 13640-16[o]	13975-1*[p] 13984-1*[q] 13977-1*[r]			13750-16[t,u] 13763TR-16[t,v]
	99876-16[e] 96883-16[e,f] 99832-16[w]	99955-16 99676-16[g] 99678-16[h] 99976-16[x]	99822-16[e,i] 99820-16[e,j]	99098-1[k] 99094-1[l] 99097-1[m]	13634-16[n] 13640-16[o]	13975-1*[p] 13984-1*[q] 13977-1*[r]			13750-16[t,u] 13763TR-16[t,v]
	99876-16[e] 96883-16[e,f] 99832-16[w]	99955-16 99676-16[g] 99678-16[h] 99976-16[x]	99822-16[e,i] 99820-16[e,j]	99098-1[k] 99094-1[l] 99097-1[m]	13634-16[n] 13640-16[o]	13975-1*[p] 13984-1*[q] 13977-1*[r]			13750-16[t,u] 13763TR-16[t,v]
	96886-16[e]	99970-16 99676-16[g] 99678-16[h]	99822-16[e,i] 99820-16[e,j]	99098-1[k] 99094-1[l] 99097-1[m]	13634-16[n] 13640-16[o]	13975-1*[p] 13984-1*[q] 13977-1*[r]			13750-16[t,u] 13763TR-16[t,v]
	96886-16[e]	99970-16 99676-16[g] 99678-16[h]	99822-16[e,i] 99820-16[e,j]	99098-1[k] 99094-1[l] 99097-1[m]	13634-16[n] 13640-16[o]	13975-1*[p] 13984-1*[q] 13977-1*[r]			13750-16[t,u] 13763TR-16[t,v]
	99876-16[e] 96883-16[e,f] 99832-16[w]	99955-16 99676-16[g] 99678-16[h] 99976-16[x]	99822-16[e,i] 99820-16[e,j]	99098-1[k] 99094-1[l] 99097-1[m]	13634-16[n] 13640-16[o]	13975-1*[p] 13984-1*[q] 13977-1*[r]			13750-16[t,u] 13763TR-16[t,v]
	96886-16[e]	99970-16 99676-16[g] 99678-16[h]	99822-16[e,i] 99820-16[e,j]	99098-1[k] 99094-1[l] 99097-1[m]	13634-16[n] 13640-16[o]	13975-1*[p] 13984-1*[q] 13977-1*[r]			13750-16[t,u] 13763TR-16[t,v]
	99876-16[e] 96883-16[e,f] 99832-16[w]	99955-16 99676-16[g] 99678-16[h] 99976-16[x]	99822-16[e,i] 99820-16[e,j]	99098-1[k] 99094-1[l] 99097-1[m]	13634-16[n] 13640-16[o]	13975-1*[p] 13984-1*[q] 13977-1*[r]			13750-16[t,u] 13763TR-16[t,v]
	96886-16[e]	99970-16 99676-16[g] 99678-16[h]	99822-16[e,i] 99820-16[e,j]	99098-1[k] 99094-1[l] 99097-1[m]	13634-16[n] 13640-16[o]	13975-1*[p] 13984-1*[q] 13977-1*[r]			13750-16[t,u] 13763TR-16[t,v]

Section Continued

- **a** Requires cam button spacer, camshaft incorporates an integral cast iron distributor drive gear, aluminum-bronze distributor drive gear not required. For engines equipped with mechanical fuel pumps, fuel pump pushrod **11985-1** is highly recommended to prevent fuel pump lobe wear.
- **b** Requires cam button spacer and a **11990-1** (.489" I.D.) or **11989-1** (.500" I.D. Accel) aluminum-bronze distributor drive gear. For engines equipped with mechanical fuel pumps, fuel pump pushrod **11985-1** is highly recommended to prevent fuel pump lobe wear.
- **c** Vertical locking bar roller lifters.
- **d** Ultra Pro Series vertical locking bar roller lifters.
- **e** Must machine cylinder heads.
- **f** For supercharged applications, use **99679-16** or **99678-16** retainers.
- **g** Titanium for 3/8" dia. valve stems, must use **99098-1** valve stem locks, included with the retainers.
- **h** Titanium for 11/32" dia. valve stems, must use **99097-1** valve stem locks, included with the retainers.
- **i** For 3/8" dia. valve stems.
- **j** For 11/32" dia. valve stems.
- **k** Machined steel, heat treated for 3/8" dia. valve stems.
- **l** Machined steel, heat treated, for 11/32" diameter valve stems, Multi Fit.
- **m** Machined steel, heat treated for 11/32" dia. valve stems.
- **n** Heavy wall, heat treated.
- **o** Pro Series one-piece.
- **p** Performance steel billet gears and roller chain set.
- **q** Pro Series steel billet gears and roller chain set.
- **r** Pro Series steel billet gears and roller chain set with thrust bearing.
- **s** 1991-95 engines require the installation of **99157-16** 7/16" rocker arm studs and **13650-1** pushrod guideplates (machining required).
- **u** 1.7 ratio, 7/16" stud. Valve Train Stabilizer available, see page 343.
- **v** 1.7 ratio, 7/16" stud, Wide Body. Valve Train Stabilizer available, see page 343.
- **w** Ovate wire beehive spring, requires **99976-16** retainers.
- **x** Steel, for **99832-16** beehive springs.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 276 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Roller Camshafts										
Performance usage, good upper RPM torque and HP, radical marine performance, bracket racing, auto trans w/race converter, 12.0 min. compression ratio advised.	**R-258/420-2S1-14 IG**	4000-7200	**138681**[*a] ◆3	**13519-16**[d] **13570-16**[e]	258 262	290 294	114	19 59 69 13	.020 .020	.714 .714
Performance usage, bracket racing, good mid range torque and HP, Heavy, Pro, etc., auto trans w/race converter, 12.0 minimum compression ratio advised.	**R-258/420-2S-8**	4000-7200	**138891**[*b] ◆3	**13519-16**[d] **13570-16**[e]	258 266	290 298	108	25 53 65 21	.020 .020	.714 .714
Good upper RPM HP, rough idle, performance usage, marine performance, bracket racing, auto trans w/4000+ converter, 4400-4800 cruise RPM, 11.5 minimum compression ratio advised, 540+ cu.in. Good w/large manifold nitrous system. Good w/large Roots supercharger, 22 lbs. maximum boost w/8.0 maximum compression ratio advised.	**SR-262/374-2S1-14 IG**	4200-7400	**138641**[*a] ◆3	**13519-16**[d] **13570-16**[e]	262 270	312 320	114	22 60 74 16	.020 .020	.636 .636
Performance usage, good mid range torque and HP, 480+ cu.in., bracket racing, auto trans w/4000+ converter, 11.5 minimum compression ratio advised. Good w/large manifold nitrous system. Good w/large Roots supercharger, 20 lbs. maximum boost w/8.0 maximum compression ratio advised.	**R-262/420-2S1-14 IG**	4200-7600	**138131**[*a] ◆3	**13519-16**[d] **13570-16**[e]	262 270	294 302	114	21 61 73 17	.020 .020	.714 .714
Performance usage, bracket racing, w/heavy car, good mid range torque and HP, Pro, Super Pro, oval track, Modified, etc., auto trans w/race converter, 12.0 minimum compression ratio advised.	**R-262/420-2-6**	4200-7200	**138801**[*b] ◆3	**13519-16**[d] **13570-16**[e]	262 272	294 304	106	28 54 65 27	.020 .020	.714 .714
Performance usage, bracket racing, good mid to upper RPM torque and HP, Pro, Super Pro, etc., auto trans w/race converter, oval track, Modified, etc., 12.0 minimum compression ratio advised.	**R-262/420-2-10**	4200-7400	**138811**[*b] ◆3	**13519-16**[d] **13570-16**[e]	262 272	294 304	110	25 57 70 22	.020 .020	.714 .714
Performance usage, bracket racing w/heavy car, good mid to upper RPM torque and HP, Pro, Super Pro, etc., auto trans w/race converter, oval track, Modified, etc., 12.0 minimum compression ratio advised.	**R-268/420-2S-8** **R-268/420-2S-8 SFO**	4400-7600	**138831**[*b] **138671**[*b,c] ◆3	**13519-16**[d] **13570-16**[e]	268 272	300 304	108	30 58 68 24	.020 .020	.714 .714
Competition only, good upper RPM HP, 480+ cu.in., bracket racing, auto trans w/race converter, good w/large manifold nitrous system, 12.5 minimum compression ratio advised. Good w/large Roots supercharger, 22 lbs. maximum boost w/8.0 maximum compression ratio advised.	**R-270/420-2S2-14**	4400-7800	**138661**[*b] ◆3	**13519-16**[d] **13570-16**[e]	270 278	302 310	114	25 65 77 21	.020 .020	.714 .714
Performance usage, bracket racing, good mid to upper RPM torque and HP, Super Pro, etc., auto trans w/race converter, oval track, Super Modified, 12.5 minimum compression ratio advised.	**R-272/420-2S1-10**	4400-7800	**138841**[*b] ◆3	**13519-16**[d] **13570-16**[e]	272 278	304 310	110	30 62 73 25	.020 .020	.714 .714
Competition only, bracket racing, good upper RPM torque and HP, Super Pro, Super Gas, Super Comp, auto transmission w/race converter, 12.5 minimum compression ratio advised.	**R-274/4334-2S-10** **R-274/4334-2S-10 SFO**	4600-8000	**138291**[*b] **138301**[*b,c] ◆3	**13519-16**[d] **13570-16**[e] **13574-16**[f]	274 284	314 324	110	30 64 75 29	.026 .026	.737 .726

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

IMPORTANT NOTE: 1991-95 Gen V engines can use these camshafts and components if they are converted to adjustable rocker arms by machining the cylinder heads for **99157-16** 7/16" screw-in studs and **13650-1** pushrod guideplates, and installing appropriate rocker arms.

NOTE: Many options are available for these camshafts, and any of our custom ground camshafts. An iron distributor drive gear and rear journal can be specified. SFO firing order (4/7 swap) is offered. Optional journal sizes are: Roller Bearing (1.968"), 2.125", and 55mm (2.165"). Gun drilling (where applicable) is available. Camshafts for the GM DRCE family of V-8's are also offered in 55mm and 60mm journal versions.

NOTE: In order to use these cams in 65-66 engines, you must groove the center of the rear cam bearing journal, 3/16" wide and 7/64" deep.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338 | *See pg. 317* | *See pg. 330* | *See pg. 343* | *See pg. 340* | *See pg. 286* | *See pg. 308* | *See pg. 292* | *See pg. 295* | *See pg. 297*

VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	ALUMINUM ROCKERS — ENERGIZER	ALUMINUM ROCKERS — GOLD RACE
	96886-16[g]	99970-16 99676-16[i] 99678-16[j]	99822-16[g,k] 99820-16[g,l]	99098-1[m] 99094-1[n] 99097-1[o]	13634-16[p] 13640-16[q]	13975-1[*r] 13984-1[*s] 13977-1[*t]			13750-16[u,w] 13763TR-16[u,x]
	96886-16[g]	99970-16 99676-16[i] 99678-16[j]	99822-16[g,k] 99820-16[g,l]	99098-1[m] 99094-1[n] 99097-1[o]	13634-16[p] 13640-16[q]	13975-1[*r] 13984-1[*s] 13977-1[*t]			13750-16[u,w] 13763TR-16[u,x]
	99876-16[g] 96883-16[g,h]	99955-16 99676-16[i] 99678-16[j]	99822-16[g,k] 99820-16[g,l]	99098-1[m] 99094-1[n] 99097-1[o]	13634-16[p] 13640-16[q]	13975-1[*r] 13984-1[*s] 13977-1[*t]			13750-16[u,w] 13763TR-16[u,x]
	96886-16[g]	99970-16 99676-16[i] 99678-16[j]	99822-16[g,k] 99820-16[g,l]	99098-1[m] 99094-1[n] 99097-1[o]	13634-16[p] 13640-16[q]	13975-1[*r] 13984-1[*s] 13977-1[*t]			13750-16[u,w] 13763TR-16[u,x]
	96886-16[g]	99970-16 99676-16[i] 99678-16[j]	99822-16[g,k] 99820-16[g,l]	99098-1[m] 99094-1[n] 99097-1[o]	13634-16[p] 13640-16[q]	13975-1[*r] 13984-1[*s] 13977-1[*t]			13750-16[u,w] 13763TR-16[u,x]
	99876-16[g] 96883-16[g,h]	99955-16 99676-16[i] 99678-16[j]	99822-16[g,k] 99820-16[g,l]	99098-1[m] 99094-1[n] 99097-1[o]	13634-16[p] 13640-16[q]	13975-1[*r] 13984-1[*s] 13977-1[*t]			13750-16[u,w] 13763TR-16[u,x]
	96886-16[g]	99970-16 99676-16[i] 99678-16[j]	99822-16[g,k] 99820-16[g,l]	99098-1[m] 99094-1[n] 99097-1[o]	13634-16[p] 13640-16[q]	13975-1[*r] 13984-1[*s] 13977-1[*t]			13750-16[u,w] 13763TR-16[u,x]
	96886-16[g]	99970-16 99676-16[i] 99678-16[j]	99822-16[g,k] 99820-16[g,l]	99098-1[m] 99094-1[n] 99097-1[o]	13634-16[p] 13640-16[q]	13975-1[*r] 13984-1[*s] 13977-1[*t]			13750-16[u,w] 13763TR-16[u,x]
	96886-16[g] 961226-16[g,y]	99970-16 99676-16[i] 99678-16[j] 99661-16[z]	99822-16[g,k] 99820-16[g,l]	99098-1[m] 99094-1[n] 99097-1[o]	13634-16[p] 13640-16[q]	13975-1[*r] 13984-1[*s] 13977-1[*t]			13750-16[u,w] 13763TR-16[u,x]

Section Continued

- **a** Requires cam button spacer, camshaft incorporates an integral cast iron distributor drive gear, aluminum-bronze distributor drive gear not required. For engines equipped with mechanical fuel pumps, fuel pump pushrod **11985-1** is highly recommended to prevent fuel pump lobe wear.
- **b** Requires cam button spacer and a **11990-1** (.489″ I.D.) or 11989-1 (.500″ I.D. Accel) aluminum-bronze distributor drive gear. For engines equipped with mechanical fuel pumps, fuel pump pushrod **11985-1** is highly recommended to prevent fuel pump lobe wear.
- **c** Camshaft has SFO firing order, with 4/7 swap.
- **d** Vertical locking bar roller lifters.
- **e** Ultra Pro Series vertical locking bar roller lifters.
- **f** Ultra Pro Series vertical locking bar roller lifters for .904″ diameter lifter bores.
- **g** Must machine cylinder heads.
- **h** For supercharged applications, use **99679-16** or **99678-16** retainers.
- **i** Titanium for 3/8″ dia. valve stems, must use **99098-1** valve stem locks, included with the retainers.
- **j** Titanium for 11/32″ dia. valve stems, must use **99097-1** valve stem locks, included with the retainers.
- **k** For 3/8″ dia. valve stems.
- **l** For 11/32″ dia. valve stems.
- **m** Machined steel, heat treated for 3/8″ dia. valve stems.
- **n** Machined steel, heat treated, for 11/32″ diameter valve stems, Multi Fit.
- **o** Machined steel, heat treated for 11/32″ dia. valve stems.
- **p** Heavy wall, heat treated.
- **q** Pro Series one-piece.
- **r** Performance steel billet gears and roller chain set.
- **s** Pro Series steel billet gears and roller chain set.
- **t** Pro Series steel billet gears and roller chain set with thrust bearing.
- **u** 1991-95 engines require the installation of **99157-16** 7/16″ rocker arm studs and **13650-1** pushrod guideplates (machining required).
- **w** 1.7 ratio, 7/16″ stud. Valve Train Stabilizer available, see page 343.
- **x** 1.7 ratio, 7/16″ stud, Wide Body. Valve Train Stabilizer available, see page 343.
- **y** Requires **99661-16** titanium retainers.
- **z** Titanium, requires Crane Multi Fit valve stem locks.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 276 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Roller Camshafts										
Competition only, good upper RPM HP, 500+ cu.in., bracket racing, auto trans w/race converter, good w/ large manifold nitrous system, 12.5 minimum compression ratio advised. Good w/large Roots supercharger, 24 lbs. maximum boost w/8.0 maximum compression ratio advised.	**R-274/4334-2S-14** **R-274/4334-2S-14 SFO**	4600-8200	**138351**[*a] **138361**[*a,b] 3	**13570-16**[d] **13574-16**[e]	274 284	314 324	114	26 68 79 25	.026 .026	.737 .726
Radical competition only, good upper RPM HP, 500+ cu.in., bracket racing, Pro Street, auto trans w/race converter, intended for large manifold nitrous system, 12.5 minimum compression ratio advised.	**R-274/5002-2S-14 SFO**	4600-8600	**138931**[*a,b] 3	**13570-16**[d] **13574-16**[e]	274 300	304 331	114	28 66 89 31	.020 .016	.850 .818
Competition only, good upper RPM torque and HP, 540+ cu.in., bracket racing w/heavy car, auto trans w/race converter, marine performance, good w/manifold nitrous system, 12.5 minimum compression ratio advised. Good w/large Roots supercharger, 24 lbs. maximum boost w/8.0 maximum compression ratio advised.	**R-276/420-2S1-14** **R-276/420-2S1-14 IG**	4600-8200	**138451**[*a] **138461**[*c] 3	**13570-16**[d] **13574-16**[e]	276 280	308 312	114	28 68 78 22	.020 .020	.714 .714
Competition only, bracket racing, good upper RPM torque and HP, Super Pro, Super Gas, Super Comp, etc., 427-468 cu.in., auto trans w/race converter, 12.5 minimum compression ratio advised.	**R-278/420-2S-10**	4600-8000	**138851**[*a] 3	**13570-16**[d] **13574-16**[e]	278 282	310 314	110	33 65 75 27	.020 .020	.714 .714
Competition only, good upper RPM torque and HP, 540+ cu.in., bracket racing, auto trans w/race converter, good w/manifold nitrous system, 12.5 minimum compression ratio advised. Good w/large Roots supercharger, 26 lbs. maximum boost w/8.0 maximum compression ratio advised.	**R-278/420-2-14 IG**	4600-8200	**138471**[*c] 3	**13570-16**[d] **13574-16**[e]	278 288	310 320	114	29 69 82 26	.020 .020	.714 .714
Competition only, bracket racing, good upper RPM HP, Super Pro, Super Comp, etc., 454+ cu.in., auto trans w/ race converter, 12.5 minimum compression ratio advised.	**R-282/420-2-12**	4800-8200	**138861**[*a] 3	**13570-16**[d] **13574-16**[e]	282 292	314 324	112	33 69 81 31	.020 .020	.714 .714
Radical competition only, good upper RPM HP, 540+ cu.in., bracket racing, Pro Street, auto trans w/race converter, intended for large manifold nitrous system, 13.5 minimum compression ratio advised.	**R-282/490-2S2-13 SFO**	4800-8600	**138941**[*a,b] 3	**13570-16**[d] **13574-16**[e]	282 304	318 339	113	33 69 88.5 35.5	.026 .022	.833 .772
Competition only, drag racing Super Stock, 396-427 high compression. Lift with 1.75 intake, 1.7 exhaust rockers.	**R-282/5002-2S-10 SFO**	5000-8200	**138711**[*a,b] 3	**13570-16**[d] **13574-16**[e]	282 286	312 330	110	36 66 78 28	.020 .030	.875 .800
Competition only, good upper RPM HP, single 4-bbl, Comp. Elim., 427+ cu.in., strong mid range for 540+ cu. in. Super Gas and Super Comp, auto transmission w/race converter, 13.0 minimum compression ratio advised.	**R-284/456-2S1-10** **R-284/456-2S1-10 SFO**	4800-8200	**138591**[*a] **138701**[*a,b] 3	**13570-16**[d] **13574-16**[e]	284 292	324 332	110	35 69 79 33	.026 .026	.775 .723

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

IMPORTANT NOTE: 1991-95 Gen V engines can use these camshafts and components if they are converted to adjustable rocker arms by machining the cylinder heads for **99157-16** 7/16" screw-in studs and **13650-1** pushrod guideplates, and installing appropriate rocker arms.

NOTE: Many options are available for these camshafts, and any of our custom ground camshafts. An iron distributor drive gear and rear journal can be specified. SFO firing order (4/7 swap) is offered. Optional journal sizes are: Roller Bearing (1.968"), 2.125", and 55mm (2.165"). Gun drilling (where applicable) is available. Camshafts for the GM DRCE family of V-8's are also offered in 55mm and 60mm journal versions.

NOTE: In order to use these cams in 65-66 engines, you must groove the center of the rear cam bearing journal, 3/16" wide and 7/64" deep.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	ALUMINUM ROCKERS — ENERGIZER	ALUMINUM ROCKERS — GOLD RACE
	96886-16[f] 96848-16[f,g] 961226-16[f,w]	99970-16 99676-16[h] 99678-16[i] 99661-16[y]	99822-16[g,j] 99820-16[g,k]	99098-1[l] 99094-1[m] 99097-1[n]	13634-16[o] 13640-16[p]	13975-1[*q] 13984-1[*r] 13977-1[*s]			13750-16[t,u] 13763TR-16[t,v]
	96848-16[f,g] 961356-16[x]	99676-16[h] 99678-16[i] 99663-16[z]	99822-16[g,j] 99820-16[g,k]	99098-1[l] 99097-1[n]	13640-16[p]	13984-1[*r] 13977-1[*s]			13763TR-16[t,v]
	96886-16[f] 96848-16[f,g]	99970-16 99676-16[h] 99678-16[i]	99822-16[g,j] 99820-16[g,k]	99098-1[l] 99094-1[m] 99097-1[n]	13634-16[o] 13640-16[p]	13975-1[*q] 13984-1[*r] 13977-1[*s]			13750-16[t,u] 13763TR-16[t,v]
	96886-16[f] 96848-16[f,g]	99970-16 99676-16[h] 99678-16[i]	99822-16[g,j] 99820-16[g,k]	99098-1[l] 99094-1[m] 99097-1[n]	13634-16[o] 13640-16[p]	13975-1[*q] 13984-1[*r] 13977-1[*s]			13750-16[t,u] 13763TR-16[t,v]
	96886-16[f] 96848-16[f,g]	99970-16 99676-16[h] 99678-16[i]	99822-16[g,j] 99820-16[g,k]	99098-1[l] 99094-1[m] 99097-1[n]	13634-16[o] 13640-16[p]	13975-1[*q] 13984-1[*r] 13977-1[*s]			13750-16[t,u] 13763TR-16[t,v]
	96886-16[f] 96848-16[f,g]	99970-16 99676-16[h] 99678-16[i]	99822-16[g,j] 99820-16[g,k]	99098-1[l] 99094-1[m] 99097-1[n]	13634-16[o] 13640-16[p]	13975-1[*q] 13984-1[*r] 13977-1[*s]			13750-16[t,u] 13763TR-16[t,v]
	96848-16[f,g] 961356-16[x]	99676-16[h] 99678-16[i] 99663-16[z]	99822-16[g,j] 99820-16[g,k]	99098-1[l] 99097-1[n]	13640-16[p]	13984-1[*r] 13977-1[*s]			13763TR-16[t,v]
	96848-16[f,g] 961356-16[x]	99676-16[h] 99678-16[i] 99663-16[z]	99822-16[g,j] 99820-16[g,k]	99098-1[l] 99097-1[n]	13640-16[p]	13984-1[*r] 13977-1[*s]			13763TR-16[t,v]
	96886-16[f] 96848-16[f,g] 961226-16[f,w]	99970-16 99676-16[h] 99678-16[i] 99661-16[y]	99822-16[g,j] 99820-16[g,k]	99098-1[l] 99094-1[m] 99097-1[n]	13634-16[o] 13640-16[p]	13975-1[*q] 13984-1[*r] 13977-1[*s]			13750-16[t,u] 13763TR-16[t,v]

Section Continued

- **a** Requires cam button spacer and a **11990-1** (.489" I.D.) or **11989-1** (.500" I.D. Accel) aluminum-bronze distributor drive gear. For engines equipped with mechanical fuel pumps, fuel pump pushrod **11985-1** is highly recommended to prevent fuel pump lobe wear.
- **b** Camshaft has SFO firing order, with 4/7 swap.
- **c** Requires cam button spacer, camshaft incorporates an integral cast iron distributor drive gear, aluminum-bronze distributor drive gear not required. For engines equipped with mechanical fuel pumps, fuel pump pushrod **11985-1** is highly recommended to prevent fuel pump lobe wear.
- **d** Ultra Pro Series vertical locking bar roller lifters.
- **e** Ultra Pro Series vertical locking bar roller lifters for .904" diameter lifter bores.
- **f** Must machine cylinder heads.
- **g** For supercharged applications, use **99679-16** or **99678-16** retainers.
- **h** Titanium for 3/8" dia. valve stems, must use **99098-1** valve stem locks, included with the retainers.
- **i** Titanium for 11/32" dia. valve stems, must use **99097-1** valve stem locks, included with the retainers.
- **j** For 3/8" dia. valve stems.
- **k** For 11/32" dia. valve stems.
- **l** Machined steel, heat treated for 3/8" dia. valve stems.
- **m** Machined steel, heat treated, for 11/32" diameter valve stems, Multi Fit.
- **n** Machined steel, heat treated for 11/32" dia. valve stems.
- **o** Heavy wall, heat treated.
- **p** Pro Series one-piece.
- **q** Performance steel billet gears and roller chain set.
- **r** Pro Series steel billet gears and roller chain set.
- **s** Pro Series steel billet gears and roller chain set with thrust bearing.
- **t** 1991-95 engines require the installation of **99157-16** 7/16" rocker arm studs and **13650-1** pushrod guideplates (machining required).
- **u** 1.7 ratio, 7/16" stud. Valve Train Stabilizer available, see page 343.
- **v** 1.7 ratio, 7/16" stud, Wide Body. Valve Train Stabilizer available, see page 343.
- **w** Requires **99661-16** titanium retainers
- **x** For 2.100" assembly height, requires **99663-16** titanium retainers.
- **y** Titanium, for **961226-16** valve springs, requires Crane Multi Fit valve stem locks.
- **z** Titanium, for **961356-16** valve springs, requires Crane Multi Fit valve stem locks.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 276 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Roller Camshafts										
Competition only, strong mid range and top end for 572+ cu.in. Super Gas and Super Comp, good upper RPM HP, 540+ cu.in., drag racing, auto transmission w/race converter, 12.5 minimum compression ratio advised. Good w/large manifold nitrous system. Good w/large Roots supercharger, 30 lbs. maximum boost w/8.0 maximum compression ratio advised.	**R-284/456-2S5-14** **R-284/456-2S5-14 SFO**	5000-8400	**138391**[*a] **138401**[*a,b] ◆3	**13570-16**[c] **13574-16**[d]	284 296	324 336	114	31 73 85 31	.026 .026	.775 .740
Competition only, 600+ cu.in., Top Sportsman, Quick 16, Top Dragster, auto transmission w/race converter, 13.0 minimum compression ratio advised.	**R-286/490-2S1-14 SFO**	5000-8000	**138771**[*a,b] ◆3	**13570-16**[c] **13574-16**[d]	286 306	326 352	114	34 72 92 34	.026 .030	.833 .810
Competition only, 640+ cu.in., Top Sportsman, Quick 16, Top Dragster, auto transmission w/race converter, 14.0 minimum compression ratio advised.	**R-286/500-2S3-16 SFO**	5000-7600	**138951**[*a,b] ◆3	**13570-16**[c] **13574-16**[d]	286 298	326 348	116	30 76 89 29	.026 .030	.850 .816
Radical competition only, good upper RPM HP, 640+ cu.in., bracket racing, Pro Street, auto trans w/race converter, intended for large manifold nitrous system, 14.5 minimum compression ratio advised.	**R-286/5151-2S-16 SFO**	6000-8400	**138961**[*a,b] ◆3	**13570-16**[c] **13574-16**[d]	286 310	320 344	116	31 75 94 36	.024 .026	.876 .794
Competition only, maximum performance applications, 500+ cu.in., Super Quick, etc., auto transmission w/race converter, 13.0 minimum compression ratio advised.	**321-334-10R**	5000-8200	**19315**[*a] ◆3	**13570-16**[c] **13574-16**[d]	287 292	321 334	110	37.5 69.5 80 32	.030 .030	.723 .714
Competition only, maximum performance applications, 500+ cu.in., Super Comp, Super Quick, etc., stick or auto transmission w/race converter, 14.0 minimum compression ratio advised.	**333-344-14R**	5000-8400	**19333**[*a] ◆3	**13570-16**[c] **13574-16**[d]	287 297	333 344	114	33.5 73.5 87.5 29.5	.035 .030	.774 .726
Competition only, maximum performance applications, 560+ cu.in., Super Comp, Super Quick, etc., stick or auto transmission w/race converter, 14.0 minimum compression ratio advised.	**R-288/5002-2S2-12 SFO**	5000-8400	**138971**[*a,b] ◆3	**13570-16**[c] **13574-16**[d]	288 300	318 332	112	37 71 87 33	.020 .022	.850 .850
Competition only, large cu.in. Top Sportsman, Pro Stock, Quick 16, good also w/large manifold nitrous systems, auto transmission w/race converter, 14.5 minimum compression ratio advised.	**R-288/515-2S2-16 SFO**	5000-8400	**138911**[*a,b] ◆3	**13570-16**[c] **13574-16**[d]	288 312	322 352	116	31 77 96 36	.024 .030	.876 .800
Competition only, unlimited Street, very large cu.in. applications, also good w/large manifold nitrous systems, 14.5 minimum compression ratio advised.	**R-288/515-2S3-18 SFO**	5200-8400	**138921**[*a,b] ◆3	**13570-16**[c] **13574-16**[d]	288 316	318 348	118	30 78 100 36	.020 .022	.876 .850
Competition only, Supercharged Unlimited Street, very large cu.in. applications, for 55mm bearing journals. Also good w/large manifold nitrous systems.	**R-292/5152-2S-17 SFO 55J**	5800-8600	**138981**[*a,b] ◆3	**13570-16**[c] **13574-16**[d]	292 310	322 342	117	34 78 97 33	.020 .022	.876 .850

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kits available. See page 313 for details.

IMPORTANT NOTE: 1991-95 Gen V engines can use these camshafts and components if they are converted to adjustable rocker arms by machining the cylinder heads for **99157-16** 7/16" screw-in studs and **13650-1** pushrod guideplates, and installing appropriate rocker arms.

NOTE: Many options are available for these camshafts, and any of our custom ground camshafts. An iron distributor drive gear and rear journal can be specified. SFO firing order (4/7 swap) is offered. Optional journal sizes are: Roller Bearing (1.968"), 2.125", and 55mm (2.165"). Gun drilling (where applicable) is available. Camshafts for the GM DRCE family of V-8's are also offered in 55mm and 60mm journal versions.

NOTE: In order to use these cams in 65-66 engines, you must groove the center of the rear cam bearing journal, 3/16" wide and 7/64" deep.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338 | *See pg. 317* | *See pg. 330* | *See pg. 343* | *See pg. 340* | *See pg. 286* | *See pg. 308* | *See pg. 292* | *See pg. 295* | *See pg. 297*

VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	ALUMINUM ROCKERS — ENERGIZER	ALUMINUM ROCKERS — GOLD RACE
	96848-16[e] 961226-16[e,q]	99676-16[f] 99681-16[g] 99661-16[s]	99822-16[e,h] 99820-16[e,i]	99098-1[j] 99097-1[k]	13640-16[l]	13984-1[*m] 13977-1[*n]			13763TR-16[o,p]
	96848-16[e] 961356-16[e,r]	99676-16[f] 99681-16[g] 99663-16[t]	99822-16[e,h] 99820-16[e,i]	99098-1[j] 99097-1[k]	13640-16[l]	13984-1[*m] 13977-1[*n]			13763TR-16[o,p]
	96848-16[e] 961356-16[e,r]	99676-16[f] 99681-16[g] 99663-16[t]	99822-16[e,h] 99820-16[e,i]	99098-1[j] 99097-1[k]	13640-16[l]	13984-1[*m] 13977-1[*n]			13763TR-16[o,p]
	96848-16[e] 961356-16[e,r]	99676-16[f] 99681-16[g] 99663-16[t]	99822-16[e,h] 99820-16[e,i]	99098-1[j] 99097-1[k]	13640-16[l]	13984-1[*m] 13977-1[*n]			13763TR-16[o,p]
	96848-16[e] 961226-16[e,q]	99676-16[f] 99681-16[g] 99661-16[s]	99822-16[e,h] 99820-16[e,i]	99098-1[j] 99097-1[k]	13640-16[l]	13984-1[*m] 13977-1[*n]			13763TR-16[o,p]
	96848-16[e] 961226-16[e,q]	99676-16[f] 99681-16[g] 99661-16[s]	99822-16[e,h] 99820-16[e,i]	99098-1[j] 99097-1[k]	13640-16[l]	13984-1[*m] 13977-1[*n]			13763TR-16[o,p]
	96848-16[e] 961356-16[e,r]	99676-16[f] 99681-16[g] 99663-16[t]	99822-16[e,h] 99820-16[e,i]	99098-1[j] 99097-1[k]	13640-16[l]	13984-1[*m] 13977-1[*n]			13763TR-16[o,p]
	96848-16[e] 961356-16[e,r]	99676-16[f] 99681-16[g] 99663-16[t]	99822-16[e,h] 99820-16[e,i]	99098-1[j] 99097-1[k]	13640-16[l]	13984-1[*m] 13977-1[*n]			13763TR-16[o,p]
	96848-16[e] 961356-16[e,r]	99676-16[f] 99681-16[g] 99663-16[t]	99822-16[e,h] 99820-16[e,i]	99098-1[j] 99097-1[k]	13640-16[l]	13984-1[*m] 13977-1[*n]			13763TR-16[o,p]

a Requires cam button spacer and a **11990-1** (.489" I.D.) or **11989-1** (.500" I.D. Accel) aluminum-bronze distributor drive gear. For engines equipped with mechanical fuel pumps, fuel pump pushrod **11985-1** is highly recommended to prevent fuel pump lobe wear.
b Camshaft has SFO firing order, with 4/7 swap.
c Pro Series vertical locking bar roller lifters.
d Ultra Pro Series vertical locking bar roller lifters for .904" diameter lifter bores.
e Must machine cylinder heads.
f Titanium for 3/8" dia. valve stems, must use **99098-1** valve stem locks, included with the retainers.
g Titanium for 11/32" dia. valve stems, must use **99097-1** valve stem locks, included with the retainers.
h For 3/8" dia. valve stems.
i For 11/32" dia. valve stems.
j Machined steel, heat treated for 3/8" dia. valve stems.
k Machined steel, heat treated for 11/32" dia. valve stems.
l Pro Series one-piece.
m Pro Series steel billet gears and roller chain set.
n Pro Series steel billet gears and roller chain set with thrust bearing.
o 1991-95 engines require the installation of **99157-16** 7/16" rocker arm studs and **13650-1** pushrod guideplates (machining required).
p 1.7 ratio, 7/16" stud, Wide Body. Valve Train Stabilizer available, see page 343.
q Requires **99661-16** titanium retainers
r For 2.100" assembly height, requires **99663-16** titanium retainers.
s Titanium, for **961226-16** valve springs, requires Crane Multi Fit valve stem locks.
t Titanium, for **961356-16** valve springs, requires Crane Multi Fit valve stem locks.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts										
Brute low end torque and HP, smooth idle, daily usage, fuel efficiency, towing, 2000-2600 cruise RPM, 8.5 to 9.5 compression ratio advised. Good cam for Tuner.	**HR-204/286-2-12 IG**	800-5000	**168711**[*a] ◆3	**26535-16**[b] **13532-16**[c]	204 214	260 270	112	(5) 29 44 (10)	.000 .000	.486 .512
Excellent low end & mid range torque and HP, good idle, daily usage, off road, towing, performance & fuel efficiency, 2600-3000 cruise RPM, 8.75 to 10.5 compression ratio advised. Good cam for Tuner.	**HR-214/325-2S-12 IG**	1200-5000	**168721**[*a] ◆3	**26535-16**[b] **13532-16**[c]	214 220	276 282	112	0 34 47 (7)	.000 .000	.553 .564
Good low end and mid range torque and HP, good idle, moderate performance usage, auto trans w/2000+ converter, 2800-3200 cruise RPM, 9.0 to 10.75 compression ratio advised. Also mild marine performance w/performance exhaust.	**HR-222/339-2S-12 IG**	1400-5400	**168781**[*a] ◆3	**26535-16**[b] **13532-16**[c]	222 230	284 292	112	4 38 52 (2)	.000 .000	.576 .598
Excellent mid range torque and HP, fair idle, moderate performance usage, crate motor upgrade, mild bracket racing, auto trans w/2500+ converter, mild marine performance, mild supercharged, 3000-3400 cruise RPM, 9.5 to 11.0 compression ratio advised. Good cam for Tuner.	**HR-226/345-2S-12 IG**	1600-5600	**168731**[*a] ◆3	**26535-16**[b] **13532-16**[c]	226 236	288 298	112	6 40 55 1	.000 .000	.587 .610
Excellent mid range torque and upper RPM HP, fair idle, moderate performance usage, crate motor upgrade, auto trans w/2800+ converter, mild supercharged, 3200-3600 cruise RPM, 9.75 to 11.25 compression ratio advised. Good cam for Tuner.	**HR-226/345-2S-14 IG**	1800-5800	**168791**[*a] ◆3	**26535-16**[b] **13532-16**[c]	226 236	288 298	114	4 42 57 (1)	.000 .000	.587 .610
Good mid range torque and HP, fair idle, moderate performance usage, crate motor upgrade, good mid range HP, mild bracket racing, auto trans w/2500+ converter, marine performance, mild supercharged, 3200-3600 cruise RPM, 10.0 to 11.5 compression ratio advised.	**HR-230/352-2S-12 IG**	2000-5800	**168761**[*a] ◆3	**26535-16**[b] **13532-16**[c]	230 236	292 298	112	8 42 57 (1)	.000 .000	.598 .610
Excellent mid range and upper RPM torque and HP, rough idle, performance usage, mild bracket racing w/ heavy car, auto trans w/3000+ converter, 3400-3800 cruise RPM, 10.0 to 11.25 compression ratio advised.	**HR-236/359-2S-10 IG**	2200-5800	**168801**[*a] ◆3	**26535-16**[b] **13532-16**[c]	236 244	298 306	110	13 43 57 7	.000 .000	.610 .632
Good mid range and upper RPM torque and HP, rough idle, performance usage, crate motor upgrade, mild bracket racing, auto trans w/3000+ converter, marine performance, 3400-3800 cruise RPM, 10.5 to 11.75 compression ratio advised.	**HR-236/359-2S-12 IG**	2200-6000	**168741**[*a] ◆3	**26535-16**[b] **13532-16**[c]	236 244	298 306	112	11 45 59 5	.000 .000	.610 .632

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT NOTE: Crane Hydraulic Roller Cams offer tremendous power, torque and RPM potential. Due to their RPM capability and increased valve travel it is HIGHLY RECOMMENDED that the appropriate Crane valve train components be installed for maximum performance and reliability.

NOTE: The 1996-00 Gen VI engines can use these camshafts and components if they are converted to adjustable rocker arms by installing **99152-16** rocker arm studs (no machining required) and factory pushrod guideplates, providing open valve spring pressures do not exceed 480 pounds. Custom length pushrods can also be made to achieve correct lifter preload if standard non-adjustable rocker arms are retained. See page 353 for checking your hydraulic lifter preload.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99896-16 99832-16[d]	99955-16 99976-16[e]	99822-16[f]	99098-1[g]	13628-16[h] 13642-16[h,i] 13629-16[j] 13643-16[j,i]	16977-1[*k]	13801C-16[l,m]	13744-16[m,o]	13750-16[m,p] 13763TR-16[m,q]
	99896-16 99832-16[d]	99955-16 99976-16[e]	99822-16[f]	99098-1[g]	13628-16[h] 13642-16[h,i] 13629-16[j] 13643-16[j,i]	16977-1[*k]	13801C-16[l,m]	13744-16[m,o]	13750-16[m,p] 13763TR-16[m,q]
	99896-16 99832-16[d]	99955-16 99976-16[e]	99822-16[f]	99098-1[g]	13628-16[h] 13642-16[h,i] 13629-16[j] 13643-16[j,i]	16977-1[*k]	13801C-16[l,m]	13744-16[m,o]	13750-16[m,p] 13763TR-16[m,q]
	99896-16 99832-16[d]	99955-16 99976-16[e]	99822-16[f]	99098-1[g]	13628-16[h] 13642-16[h,i] 13629-16[j] 13643-16[j,i]	16977-1[*k]	13801C-16[l,m]	13744-16[m,o]	13750-16[m,p] 13763TR-16[m,q]
	99896-16 99832-16[d]	99955-16 99976-16[e]	99822-16[f]	99098-1[g]	13628-16[h] 13642-16[h,i] 13629-16[j] 13643-16[j,i]	16977-1[*k]	13801C-16[l,m]	13744-16[m,o]	13750-16[m,p] 13763TR-16[m,q]
	99896-16 99832-16[d]	99955-16 99976-16[e]	99822-16[f]	99098-1[g]	13628-16[h] 13642-16[h,i] 13629-16[j] 13643-16[j,i]	16977-1[*k]	13801C-16[l,m]	13744-16[m,o]	13750-16[m,p] 13763TR-16[m,q]
	99896-16 99832-16[d]	99955-16 99976-16[e]	99822-16[f]	99098-1[g]	13628-16[h] 13642-16[h,i] 13629-16[j] 13643-16[j,i]	16977-1[*k]		13744-16[m,o]	13750-16[m,p] 13763TR-16[m,q]
	99896-16 99832-16[d]	99955-16 99976-16[e]	99822-16[f]	99098-1[g]	13628-16[h] 13642-16[h,i] 13629-16[j] 13643-16[j,i]	16977-1[*k]		13744-16[m,o]	13750-16[m,p] 13763TR-16[m,q]

Section Continued

a Camshaft incorporates an integral cast iron distributor drive gear, aluminum-bronze distributor drive gear not required.
b For use with standard GM alignment bars. Required for use with camshafts having greater than stock lobe lift.
c Vertical locking bar hydraulic roller lifters, no machining required.
d Ovate wire beehive spring, requires **99976-16** retainers.
e Steel, for **99832-16** beehive springs.
f Must machine cylinder heads.
g Machined steel, heat treated.
h Heavy wall, heat treated, for standard deck height blocks with adjustable rocker arms and hydraulic roller lifters.
i Pro Series one piece.
j Heavy wall, heat treated, for +.400" deck height "Tall Blocks" with adjustable rocker arms and hydraulic roller lifters.
k Pro Series steel billet gears and roller chain set with thrust bearing.
l 1.7 ratio, Nitro Carb, extra long slot for 1.560" maximum O.D. valve springs.
m Gen VI cylinder heads require the installation of **99152-16** 7/16" rocker arm studs (no machining required) and factory pushrod guideplates.
o Energizer, 1.7 ratio. Valve Train Stabilizer available, see page 343.
p 1.7 ratio. Valve Train Stabilizer available, see page 343.
q 1.7 ratio Wide Body. Valve Train Stabilizer available, see page 343.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts										
Good mid range & upper RPM HP, rough idle, performance usage, bracket racing, manifold nitrous system, auto trans w/3500+ converter, marine performance for 540+ engines, 3800-4200 cruise RPM, 10.5 to 12.5 compression ratio advised. Good w/supercharger 18 lbs. max. boost w/8.0 max. compression ratio advised.	**HR-240/365-2S-14 IG**	2600-6200	**168771**[*a] ◆3	**26535-16**[b] **13532-16**[c]	240 248	302 310	114	11 49 63 5	.000 .000	.621 .632
Good mid range to upper RPM torque, rough idle, performance usage, bracket racing, auto trans w/3500+ converter, marine perf. w/aftermarket dry pipe exhaust systems or tube headers, 3600-4000 cruise RPM, best for 540+ cu.in. engines, 11.0 to 12.75 compression ratio advised.	**HR-242/372-2S-12 IG**	2800-6200	**168811**[*a] ◆3	**26535-16**[b] **13532-16**[c]	242 246	304 308	112	14 48 60 6	.000 .000	.632 .632
Good mid range to upper RPM torque and HP, rough idle, performance usage, bracket racing, auto trans w/3500+ converter, marine perf. for 540+ cu.in. modified engines in performance applications w/aftermarket dry pipe exhaust systems or tube headers. Good w/manifold nitrous system, 3800-4200 cruise RPM, best for 540+ cu.in. engines, 11.5 minimum compression ratio advised. Good w/Roots supercharger, 20 lbs. max. boost w/8.0 max. compression ratio advised.	**HR-244/372-2S2-14 IG**	3000-6400	**169651**[*a] ◆3	**26535-16**[b] **13532-16**[c]	244 256	306 318	114	13 51 67 9	.000 .000	.632 .632
Excellent upper RPM torque and HP, performance usage, bracket racing, good w/manifold nitrous system, auto trans w/3500+ converter, best in 540+ cu.in. engines. 11.5 to 12.75 compression ratio advised. Good w/supercharger, 20 lbs. maximum boost, w/8.0 maximum compression ratio advised.	**HR-248/372-2S-14 IG**	3200-6400	**169691**[*a] ◆3	**26535-16**[b] **13532-16**[c]	248 256	310 318	114	15 53 67 9	.000 .000	.632 .632
Performance usage, good upper RPM torque and HP, bracket racing, Pro, Super Pro, etc., auto trans w/4000+ converter, best in 540+ cu.in., 12.5 minimum compression ratio advised.	**HR-254/400-2S2-10 IG**	3400-6600	**168831**[*a] ◆3	**26535-16**[b] **13532-16**[c]	254 262	324 332	110	21.5 52.5 66.5 16.5	.000 .000	.680 .680
Performance usage, good upper RPM torque and HP, bracket racing, good w/large manifold nitrous system, auto trans w/race converter, best in 540+ cu.in. engines w/prepared cylinder heads. 12.5 minimum compression ratio advised. Good w/large supercharger, 22 lbs. maximum boost w/8.5 maximum compression ratio advised.	**HR-254/400-2S4-14 IG**	3600-6800	**168841**[*a] ◆3	**26535-16**[b] **13532-16**[c]	254 262	324 332	114	17.5 56.5 69.5 12.5	.000 .000	.680 .680
Performance usage, good upper RPM torque and HP, bracket racing, Super Gas, Super Comp, auto trans w/race converter, best in 572+ cu.in. engines w/prepared cylinder heads, 12.5 minimum compression ratio advised.	**HR-262/400-2S-14 IG**	3800-6800	**168851**[*a] ◆3	**26535-16**[b] **13532-16**[c]	262 264	332 326	114	21.5 60.5 71 13	.000 .000	.680 .680
Performance usage, good upper RPM HP, bracket racing, Super Gas, Super Comp, auto trans w/4000+ converter, best in 572+ cu.in. engines w/prepared cylinder heads, good w/large manifold nitrous system, 12.5 min. compression ratio advised. Good w/large supercharger 26 lbs. max. boost w/8.5 max. compression ratio advised.	**HR-262/400-2S1-14 IG**	3800-7000	**169711**[*a] ◆3	**26535-16**[b] **13532-16**[c]	262 270	332 340	114	21.5 60.5 73.5 16.5	.000 .000	.680 .680

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT NOTE: Crane Hydraulic Roller Cams offer tremendous power, torque and RPM potential. Due to their RPM capability and increased valve travel it is HIGHLY RECOMMENDED that the appropriate Crane valve train components be installed for maximum performance and reliability.

NOTE: The 1996-00 Gen VI engines can use these camshafts and components if they are converted to adjustable rocker arms by installing **99152-16** rocker arm studs (no machining required) and factory pushrod guideplates, providing open valve spring pressures do not exceed 480 pounds. Custom length pushrods can also be made to achieve correct lifter preload if standard non-adjustable rocker arms are retained. See page 353 for checking your hydraulic lifter preload.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99896-16 **99832-16**[d]	**99955-16** **99976-16**[e]	**99822-16**[f]	**99098-1**[g]	**13628-16**[h] **13642-16**[h,i] **13629-16**[j] **13643-16**[j,i]	**16977-1**[*k]		**13744-16**[m,o]	**13750-16**[m,p] **13763TR-16**[m,q]
	99896-16 **99832-16**[d]	**99955-16** **99976-16**[e]	**99822-16**[f]	**99098-1**[g]	**13628-16**[h] **13642-16**[h,i] **13629-16**[j] **13643-16**[j,i]	**16977-1**[*k]		**13744-16**[m,o]	**13750-16**[m,p] **13763TR-16**[m,q]
	99896-16 **99832-16**[d]	**99955-16** **99976-16**[e]	**99822-16**[f]	**99098-1**[g]	**13628-16**[h] **13642-16**[h,i] **13629-16**[j] **13643-16**[j,i]	**16977-1**[*k]		**13744-16**[m,o]	**13750-16**[m,p] **13763TR-16**[m,q]
	99896-16 **99832-16**[d]	**99955-16** **99976-16**[e]	**99822-16**[f]	**99098-1**[g]	**13628-16**[h] **13642-16**[h,i] **13629-16**[j] **13643-16**[j,i]	**16977-1**[*k]		**13744-16**[m,o]	**13750-16**[m,p] **13763TR-16**[m,q]
	99896-16	**99955-16**	**99822-16**[f]	**99098-1**[g]	**13642-16**[h,i] **13643-16**[j,i]	**16977-1**[*k]			**13750-16**[m,p] **13763TR-16**[m,q]
	99896-16	**99955-16**	**99822-16**[f]	**99098-1**[g]	**13642-16**[h,i] **13643-16**[j,i]	**16977-1**[*k]			**13750-16**[m,p] **13763TR-16**[m,q]
	99896-16	**99955-16**	**99822-16**[f]	**99098-1**[g]	**13642-16**[h,i] **13643-16**[j,i]	**16977-1**[*k]			**13750-16**[m,p] **13763TR-16**[m,q]
	99896-16	**99955-16**	**99822-16**[f]	**99098-1**[g]	**13642-16**[h,i] **13643-16**[j,i]	**16977-1**[*k]			**13750-16**[m,p] **13763TR-16**[m,q]

a Camshaft incorporates an integral cast iron distributor drive gear, aluminum-bronze distributor drive gear not required.
b For use with standard GM alignment bars. Required for use with camshafts having greater than stock lobe lift.
c Vertical locking bar hydraulic roller lifters, no machining required.
d Ovate wire beehive spring, requires **99976-16** retainers.
e Steel, for **99832-16** beehive springs.
f Must machine cylinder heads.
g Machined steel, heat treated.
h Heavy wall, heat treated, for standard deck height blocks with adjustable rocker arms and hydraulic roller lifters.
i Pro Series one piece
j Heavy wall, heat treated, for +.400" deck height "Tall Blocks" with adjustable rocker arms and hydraulic roller lifters.
k Pro Series steel billet gears and roller chain set with thrust bearing.
l 1.7 ratio, Nitro Carb, extra long slot for 1.560" maximum O.D. valve springs.
m Gen VI cylinder heads require the installation of **99152-16** 7/16" rocker arm studs (no machining required) and factory pushrod guideplates.
o Energizer, 1.7 ratio. Valve Train Stabilizer available, see page 343.
p 1.7 ratio. Valve Train Stabilizer available, see page 343.
q 1.7 ratio Wide Body. Valve Train Stabilizer available, see page 343.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 276 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Roller Camshafts										
Excellent low end and mid range torque and HP, fair idle, moderate performance usage, marine performance, bracket racing, auto trans w/2500+ converter, 3400-3800 cruise RPM, 10.5 to 11.5 compression ratio advised. Also mild supercharged, 10 lbs. maximum boost w/8.5 maximum compression ratio advised.	**SR-238/350-2S-12 IG**	2800-6600	**168551**[*a] ◆3	**16510-16**[b] **13570-16**[c]	238 246	288 296	112	12 46 60 6	.020 .020	.595 .615
Good low end and mid range torque and HP, fair idle, moderate performance usage, marine performance, bracket racing, auto trans w/3000+ converter, 3800-4200 cruise RPM, 10.5 to 12.0 compression ratio advised.	**SR-246/362-2S-10 IG**	3000-6800	**168601**[*a] ◆3	**16510-16**[b] **13570-16**[c]	246 254	296 304	110	18 48 62 12	.020 .020	.615 .636
Good mid range to upper RPM torque and HP, rough idle, performance usage, marine performance, bracket racing, auto trans w/4000+ converter, 4200-4600 cruise RPM, 11.0 to 12.5 compression ratio advised.	**SR-254/374-2S-12 IG**	3400-7200	**168631**[*a] ◆3	**16510-16**[b] **13570-16**[c]	254 262	304 312	112	19 55 67 15	.020 .020	.636 .636
Performance usage, good low and mid range torque and HP, rough idle, bracket racing, auto trans w/3500+ converter, 11.0 to 12.5 compression ratio advised. Good w/ manifold nitrous system. Also supercharged, 18 lbs. maximum boost w/ 8.0 maximum compression ratio advised.	**R-254/420-2S-12 IG**	3600-7200	**168401**[*a] ◆3	**16510-16**[b] **13570-16**[c]	254 262	286 294	112	19 55 67 15	.020 .020	.714 .714
Performance usage, bracket racing, good mid to upper RPM Torque and HP, Pro, Super Pro, etc., auto trans w/ race converter, 12.0 minimum compression ratio advised.	**R-264/420-2S-10 IG**	4200-7400	**168411**[*a] ◆3	**16510-16**[b] **13570-16**[c]	264 270	296 302	110	26 58 69 21	.020 .020	.714 .714
Competition only, bracket racing, good upper RPM Torque and HP, Super Pro, Super Gas, Super Comp, etc., auto trans w/race converter, 12.5 minimum compression ratio advised.	**R-274/4334-2S-10 IG**	4600-8000	**168291**[*a] ◆3	**16510-16**[b] **13570-16**[c]	274 284	314 324	110	30 64 75 29	.026 .026	.737 .726
Competition only, good upper RPM HP, 500+ cu.in., bracket racing, auto trans w/race converter, good w/large manifold nitrous system, 12.5 minimum compression ratio advised. Good w/large Roots supercharger, 24 lbs. maximum boost w/8.0 maximum compression ratio advised.	**R-274/4334-2S-14 IG**	4800-8200	**168351**[*a] ◆3	**16510-16**[b] **13570-16**[c]	274 284	314 324	114	26 68 79 25	.026 .026	.737 .726

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

NOTE: The 1996-00 Gen VI engines can use these camshafts and components if they are converted to adjustable rocker arms by installing **99152-16** rocker arm studs (no machining required) and factory pushrod guideplates, providing open valve spring pressures do not exceed 480 pounds.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99876-16[d] 99832-16[e]	99955-16 99676-16[f] 99976-16[g]	99822-16[d]	99098-1[h]	13634-16[i] 13640-16[j] 13635-16[k]	16977-1*[l]			13750-16[m,o] 13763TR-16[m,p]
	99876-16[d] 99832-16[e]	99955-16 99676-16[f] 99976-16[g]	99822-16[d]	99098-1[h]	13634-16[i] 13640-16[j] 13635-16[k]	16977-1*[l]			13750-16[m,o] 13763TR-16[m,p]
	99876-16[d] 99832-16[e]	99955-16 99676-16[f] 99976-16[g]	99822-16[d]	99098-1[h]	13634-16[i] 13640-16[j] 13635-16[k]	16977-1*[l]			13750-16[m,o] 13763TR-16[m,p]
	96886-16[d]	99955-16 99676-16[f]	99822-16[d]	99098-1[h]	13634-16[i] 13640-16[j] 13635-16[k]	16977-1*[l]			13750-16[m,o] 13763TR-16[m,p]
	96886-16[d]	99955-16 99676-16[f]	99822-16[d]	99098-1[h]	13634-16[i] 13640-16[j] 13635-16[k]	16977-1*[l]			13750-16[m,o] 13763TR-16[m,p]
	96886-16[d]	99955-16 99676-16[f]	99822-16[d]	99098-1[h]	13634-16[i] 13640-16[j] 13635-16[k]	16977-1*[l]			13750-16[m,o] 13763TR-16[m,p]
	96886-16[d]	99955-16 99676-16[f]	99822-16[d]	99098-1[h]	13634-16[i] 13640-16[j] 13635-16[k]	16977-1*[l]			13750-16[m,o] 13763TR-16[m,p]

a Camshaft incorporates an integral cast iron distributor drive gear, aluminum-bronze distributor drive gear not required.
b For use with standard GM alignment bars.
c Ultra Pro Series vertical locking bar roller lifters, no machining required.
d Must machine cylinder heads.
e Ovate wire beehive spring, requires **99976-16** retainers.
f Titanium, must use **99098-1** valve stem locks, included with the retainers.
g Steel, for **99832-16** beehive springs.
h Machined steel, heat treated.
i Heavy wall, heat treated.
j Pro Series one piece.
k Heavy wall, heat treated, for +.400" deck height "Tall Blocks".
l Pro Series steel billet gears and roller chain set with thrust bearing.
n Gen VI cylinder heads require the installation of **99152-16** 7/16" rocker arm studs (no machining required) and factory pushrod guideplates. 480 pounds maximum valve spring pressure advised.
o 1.7 ratio. Valve Train Stabilizer available, see page 343.
p 1.7 ratio Wide Body. Valve Train Stabilizer available, see page 343.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts										
Brute low end torque, smooth idle, daily usage, fuel economy, towing, mild marine usage, 1600-2200 cruise RPM, 8.0 to 9.5 compression ratio advised.	**HR-208/292-2S-16 IG**	800-4600	**268701**[*a] ◆3	**26535-16**[b]	208 214	264 270	116	(7) 35 48 (14)	.000 .000	.496 .512
Excellent low end torque and HP, good idle, daily usage, off road, towing, performance and fuel efficiency, computer upgrades may be required, 2600-3000 cruise RPM, 8.75 to 10.5 compression ratio advised. Marine performance usage with free flowing above water exhaust system.	**HR-216/325-2S-14 IG**	1200-5000	**268711**[*a] ◆3	**26535-16**[b]	214 220	276 241	114	(2) 36 49 (9)	.000 .000	.553 .564
Good mid range torque and HP, good idle, moderate performance usage, mild supercharged, computer upgrades required, 8.75 to 10.5 compression ratio advised. Marine performance usage with free flowing above water exhaust system.	**HR-222/339-2S-12 IG**	1400-5400	**268721**[*a] ◆3	**26535-16**[b]	222 230	284 292	112	4 38 52 (2)	.000 .000	.576 .598
Good mid range torque and HP, fair idle, moderate performance usage, mild supercharged, computer upgrades required, 9.0 to 11.0 compression ratio advised. Marine performance usage in modified engines with aftermarket high flow abovve water exhaust systems.	**HR-226/345-2S-14 IG**	1600-5600	**268731**[*a] ◆3	**26535-16**[b]	226 234	288 296	114	4 42 56 (2)	.000 .000	.587 .610
Good mid range HP, fair idle, performance usage, computer upgrades required, 9.5 to 11.0 compression ratio advised. Marine performance usage w/ modified engines having aftermarket dry pipe exhaust systems.	**HR-230/352-2S-14 IG**	1800-5800	**268761**[*a] ◆3	**26535-16**[b]	230 236	292 298	114	6 44 57 (1)	.000 .000	.598 .610
Good mid range HP, rough idle, performance usage, mild supercharged, computer upgrades required, 10.0 to 11.5 compression ratio advised. Marine performance usage with modified engines having aftermarket dry pipe exhaust systems.	**HR-236/359-2S1-14 IG**	2200-6000	**268741**[*a] ◆3	**26535-16**[b]	236 244	298 306	114	9 47 61 3	.000 .000	.610 .632
Good upper RPM HP, rough idle, performance usage for increased displacement engines, computer upgrades required, 10.0 to 11.0 compression ratio advised. Marine performance for highly modified engines with aftermarket dry pipe exhaust or tube headers.	**HR-240/365-2S-12 IG**	2600-6200	**268771**[*a] ◆3	**26535-16**[b]	240 248	302 310	112	13 47 61 7	.000 .000	.621 .632

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT NOTE: Crane Hydraulic Roller Cams offer tremendous power, torque and RPM potential. Due to their RPM capability and increased valve travel it is **HIGHLY RECOMMENDED** that the appropriate Crane valve train components be installed for maximum performance and reliability.

NOTE: For best performance and reliability, these engines should be converted to adjustable rocker arms by installing **99155-16** rocker arm studs (no machining required) and appropriate rocker arms. Custom length pushrods can also be made to achieve correct lifter preload if standard non-adjustable rocker arms are retained. See page 353 for checking your hydraulic lifter preload.

Since 1975, General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99896-16 **99832-16**[c]	**99964-16** **99976-16**[d]	**99822-16**[e]	**99098-1**[f]	**26640-16**[g]	**26977-1**[*h]		**13744-16**[i,k]	**13750-16**[i,l] **13763TR-16**[i,m]
	99896-16 **99832-16**[c]	**99964-16** **99976-16**[d]	**99822-16**[e]	**99098-1**[f]	**26640-16**[g]	**26977-1**[*h]		**13744-16**[i,k]	**13750-16**[i,l] **13763TR-16**[i,m]
	99896-16 **99832-16**[c]	**99964-16** **99976-16**[d]	**99822-16**[e]	**99098-1**[f]	**26640-16**[g]	**26977-1**[*h]		**13744-16**[i,k]	**13750-16**[i,l] **13763TR-16**[i,m]
	99896-16 **99832-16**[c]	**99964-16** **99976-16**[d]	**99822-16**[e]	**99098-1**[f]	**26640-16**[g]	**26977-1**[*h]		**13744-16**[i,k]	**13750-16**[i,l] **13763TR-16**[i,m]
	99896-16 **99832-16**[c]	**99964-16** **99976-16**[d]	**99822-16**[e]	**99098-1**[f]	**26640-16**[g]	**26977-1**[*h]		**13744-16**[i,k]	**13750-16**[i,l] **13763TR-16**[i,m]
	99896-16 **99832-16**[c]	**99964-16** **99976-16**[d]	**99822-16**[e]	**99098-1**[f]	**26640-16**[g]	**26977-1**[*h]		**13744-16**[i,k]	**13750-16**[i,l] **13763TR-16**[i,m]
	99896-16 **99832-16**[c]	**99964-16** **99976-16**[d]	**99822-16**[e]	**99098-1**[f]	**26640-16**[g]	**26977-1**[*h]		**13744-16**[i,k]	**13750-16**[i,l] **13763TR-16**[i,m]

a Camshaft incorporates an integral cast iron distributor drive gear, aluminum-bronze distributor drive gear not required.
b For use with standard GM alignment bars. Required for use with camshafts having greater than stock lobe lift (.335").
c Ovate wire beehive spring, requires **99976-16** retainers.
d Steel, for **99832-16** beehive springs.
e Must machine cylinder heads.
f Machined steel, heat treated.
g Pro Series one piece.
h Pro Series steel billet gears and roller chain set with thrust bearing.
i 8.1L cylinder heads require the installation of **99155-16** 7/16" rocker arm studs (no machining required) and factory pushrod guideplates.
k Energizer, 1.7 ratio, 7/16" stud.
l 1.7 ratio, 7/16" stud.
m 1.7 ratio Wide Body.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 266 FOLLOWERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Valve Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Follower Camshafts										
Good idle, performance usage, good mid to upper RPM HP, street, drag race, OK with nitrous, aftermarket intake/exhaust advised.	**CHR-242-2S-6**	1000-6500	**158-0010**[*] ◆3		196 200	242 250	106	(11) 27 27 (7)	.000 .000	.335 .315
Good idle, performance usage, for use with turbo, good upper RPM HP, intercooler advised, aftermarket intake/low restriction exhaust required.	**CHR-250-2SR-8**	1500-6800	**158-0012**[*] ◆3		204 200	250 250	108	(9) 33 29 (9)	.000 .000	.355 .315
Performance usage, primarily drag race, good upper RPM HP, good with turbo, intercooler advised, high flowing cylinder head/intake/large exhaust advised, aftermarket ECM required, 12.0+ minimum compression ratio required.	**CHR-262-2SR-8**	2500-7500	**158-0014**[*] ◆3		216 212	262 262	108	(3) 39 35 (3)	.000 .000	.355 .345
Performance usage, drag race, good upper RPM HP, for use with turbo, intercooler advised, high flowing cylinder head/intake/large exhaust advised, aftermarket ECM required, 12.0+ minimum compression ratio required.	**CHR-272-2S-14**	3000-7800	**158-0016**[*] ◆3		226 226	272 282	114	1 45 52 (6)	.000 .000	.355 .345
Competition only, radical drag race, good upper RPM HP, turbo with intercooler, high flowing cylinder head/intake/large exhaust advised, aftermarket ECM required, 12.0+ minimum compression ratio required.	**CHR-232/400-2SR-10**	3200-8000	**158-0018**[*a] ◆3		232 230	280 285	110	7 45 50 0	.000 .000	.400 .400
Competition only, radical drag race, good high RPM HP, turbo with intercooler, high flowing cylinder head/intake/large exhaust advised, aftermarket ECM required, 12.0+ minimum compression ratio required.	**CHR-236/440-2SR-12**	3500-8500	**158-0020**[*a] ◆3		236 230	280 285	112	8 48 52 (2)	.000 .000	.440 .400
	Stock (For comparison purposes only)				192 198	247 265	110		.000 .000	.309 .275

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING BELT AND SPROCKET ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
903-2003[b]	**158830-16[c]**	**158660-16[d]**							
903-2003[b]	**158830-16[c]**	**158660-16[d]**							
903-2003[b]	**158830-16[c]**	**158660-16[d]**							
903-2003[b]	**158830-16[c]**	**158660-16[d]**							
903-2003[b]	**158830-16[c]**	**158660-16[d]**							
903-2003[b]	**158830-16[c]**	**158660-16[d]**							

Custom grinds available using the following lobes:

Intake	**CHR-226/355**	**CHR-232/400***	**CHR-236/440***
Exhaust	**CHR-226/345**	**CHR-230/400***	

* Requires Ferrea lash caps, part no. **C10008**

a Requires Ferrea lash caps, part no. C10008.
b Includes valve springs and titanium retainers.
c Requires **158660-16** retainers.
d Titanium, for use with standard valve locks.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 266 FOLLOWERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Valve Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Follower Camshafts										
Good idle, daily usage, good mid range HP, performance upgrade for stock engine, aftermarket intake/exhaust and ECM advised.	**CHR-242-6[a]**	1000-6500	**180-0010*[a]** ◆3		200 200	242 242	106	(3) 23 29 (9)	.000 .000	.354 .354
Good idle, performance usage, for use with turbo, good upper RPM HP, intercooler advised, aftermarket intake/low restriction exhaust required.	**CHR-246-2SR-6[a]**	1500-6800	**180-0014*[a]** ◆3		204 196	246 238	106	1 23 29 (13)	.000 .000	.364 .345
Good idle, performance usage, street, drag race, intended for use with nitrous, aftermarket intake/exhaust and ECM advised.	**CHR-246-8[a]**	1500-6800	**180-0012*[a]** ◆3		204 204	246 246	108	(3) 27 33 (9)	.000 .000	.364 .364
Performance usage, drag race, turbocharger with intercooler, good upper RPM HP, high flowing cylinder head/intake/large exhaust advised, 11.0+ minimum compression ratio and aftermarket ECM required.	**CHR-250-2SR-6[a]**	2200-7500	**180-0015*[a]** ◆3		208 204	250 246	106	(2) 30 28 (4)	.000 .000	.374 .364
Fair idle, performance usage, drag race, good mid and upper RPM HP, high flowing cylinder head/intake/exhaust and aftermarket ECM advised.	**CHR-250-6[a]**	2000-7200	**180-0016*[a]** ◆3		208 208	250 250	106	2 26 34 (6)	.000 .000	.374 .374
Performance usage, drag race, good upper RPM HP, high flowing cylinder head/intake/large exhaust advised, 12.0+ minimum compression ratio and aftermarket ECM required.	**CHR-258-8[a]**	2500-7500	**180-0018*[a]** ◆3		216 216	258 258	108	4 32 40 (4)	.000 .000	.394 .394
Competition only, drag race, good upper RPM HP, high flowing cylinder head/intake/large exhaust advised, 12.5+ minimum compression ratio and aftermarket ECM required.	**CHR-266-10[a]**	2800-7800	**180-0020*[a]** ◆3		224 224	266 266	110	2 42 42 2	.000 .000	.413 .413
Competition only, drag race, good high RPM HP, high flowing cylinder head/intake/large exhaust advised, 13.0+ minimum compression ratio and aftermarket ECM required.	**CHR-274-10[a]**	3200-8000	**180-0022*[a]** ◆3		232 232	274 274	110	6 46 46 6	.000 .000	.433 .433
Competition only, drag race, good high RPM HP, high flowing cylinder head/intake/large exhaust advised, 13.0+ minimum compression ratio and aftermarket ECM required.	**CHR-282-6[a]**	3600-8200	**180-0024*[a]** ◆3		240 240	282 282	106	18 42 50 10	.000 .000	.453 .453
Competition only, radical drag race, high RPM HP, high flowing cylinder head/intake/large exhaust advised, 13.0+ minimum compression ratio and aftermarket ECM required.	**CHR-290-6[a]**	4000-8600	**180-0026*[a]** ◆3		248 248	290 290	106	22 46 54 14	.000 .000	.472 .472
Competition only, radical drag race, high RPM HP, high flowing cylinder head/intake/large exhaust advised, 13.5+ minimum compression ratio and aftermarket ECM required.	**CHR-296-6[a]**	4400-8800	**180-0028*[a]** ◆3		256 256	296 296	106	26 50 58 18	.000 .000	.492 .492
	Stock 2.0-2.4L (For comparison purposes only)				196 196	243 243	108		.000 .000	.344 .315
	Stock SRT4-PT 2.4L (For comparison purposes only)				194 196	248 248	113		.000 .000	.325 .259

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING BELT AND SPROCKET ASSEMBLY	STEEL ROCKER ARMS	ALUMINUM ROCKERS — ENERGIZER	ALUMINUM ROCKERS — GOLD RACE
903-2002[c]	**180830-16[d]**	**158660-16[e]**							
903-2002[c]	**180830-16[d]**	**158660-16[e]**							
903-2002[c]	**180830-16[d]**	**158660-16[e]**							
903-2002[c]	**180830-16[d]**	**158660-16[e]**							
903-2002[c]	**180830-16[d]**	**158660-16[e]**							
903-2002[c]	**180830-16[d]**	**158660-16[e]**							
903-2002[c]	**180830-16[d]**	**158660-16[e]**							
903-2002[c]	**180830-16[d]**	**158660-16[e]**							
903-2002[c]	**180830-16[d]**	**158660-16[e]**							
903-2002[c]	**180830-16[d]**	**158660-16[e]**							

Custom grinds available using the following lobes:
CHR-224/413 CHR-232/433 CHR-240/453
CHR-248/472 CHR-256/492 CHR-264/492
CHR-268/492

a For Neon 2.0 - 2.4L.
c Includes valve springs and titanium retainers.
d Requires **158660-16** retainers.
e Titanium, for use with standard valve locks.

1951–1956 301-331-354 Hemi V8 & 1957–1958 392 Hemi V8

Although not usually considered to be a Chrysler Small Block, these early Chysler Hemi engines provided the basic architecture for the "A" and "LA" engines that followed. Although visually similar, the Dodge and DeSoto hemis (and the polyspherical variants) of the 1950's were unique engines that had little interchangeability with the Chrysler versions.

Our 53 prefix is for the 1951–1956 301–331–354 hemis, while the 54 prefix designates the 1957–1958 392 hemi. There is a lifter bore bank angle change between these two families, so be careful since these camshafts have the same basic dimensions. The cams can be physically interchanged, but performance would be poor, as valve timing would be incorrect from bank to bank. A 392 type timing chain set will also be required when installing these camshafts in the earlier 301–354 engines.

Retrofit hydraulic roller camshafts and drop in hydraulic roller lifters are offered, along with most valve train components. With the hydraulic roller applications, there may have to be some clearancing performed on the cylinder block and heads where the pushrods pass through, due to the taller lifters changing the pushrod angles, but modern camshaft technology can easily be applied to this half-century old power plant.

Mechanical roller camshafts and drop in roller lifters for applications ranging from mild street to Nostalgia Top Fuel are also available, along with most valve train components. Whether you're using stock cast iron heads, or the latest billet aluminum pieces, we can supply the proper valve springs, retainers, and other parts to suit your needs.

1964–1987 273-340-360 (5.9L) & 1967–1986 318 "LA" V8

This engine family is commonly referred to as the Small Block Chrysler V8. Properly called the "LA" series, it is an evolution of the 1956-1966 "A" family, which included displacements of 277-301-303-318-326 cu.in. The A was noted for its Polyspherical combustion chamber/staggered valve cylinder heads (one rocker shaft per head, with the intake and exhaust rockers pointing in opposite directions), and mechanical lifters (except the 1959 Chrysler 326). The important part of this heritage is to help explain the unusual 59 degree lifter bore bank angle that carried over into the LA family. This was used in the A to provide the best compromise for lifter to pushrod angles for its inline lifter bore blocks. Also note there were 1964-1966 318 engines that were still the A version, and should not be confused with the 1967-1986 LA 318.

When upgrading to the LA (Lightweight A) family, Chrysler maintained the 59 degree lifter bore angle in the blocks, even though the valves were now inline, in a normally configured wedge chambered cylinder head. Shaft mounted 1.5:1 ratio rocker arms were employed. This resulted in an awkward appearing angle between the lifters and pushrods. With the change in cylinder head configuration, a different valve layout was incorporated into the heads, however the basic camshaft dimensions were maintained. Therefore, while A and LA camshafts will physically interchange, half of the lobes will be in the wrong location, allowing only four cylinders to run properly. The 1964-1967 273 engines were equipped with mechanical lifter camshafts and adjustable rocker arms. Later engines had hydraulic lifters and non-adjustable rocker arms (with a couple of rare exceptions).

There were also left-hand rotation marine engines produced that required a unique camshaft. Make certain of the engine's rotation if you have a marine application.

Be aware of both OE production and factory replacement cylinder blocks that may incorporate very large chamfers on the tops of the lifter bores. This is not usually a problem when hydraulic and mechanical flat faced camshafts and lifters are used. In certain cases, if hydraulic and mechanical roller lifters are installed in these blocks, the oiling passages in the lifters may become exposed to the chamfer at full valve lift, causing a loss of oil pressure. Possible solutions would be sleeving the lifter bores, or having a camshaft custom ground having a reduced base circle diameter.

Crane Cams' 69 prefix has been assigned to the camshafts and components for this engine family, along with its factory produced variants. Principal among these are the R3 blocks that are available from Chrysler. These are offered in 59 degree and 48 degree lifter bank angle options (also, 45 and 47 degrees on the aluminum blocks), with the 59 degree R3 block not intended for roller lifter usage. There are also a number of choices of camshaft bearing journal sizes being used. These range from the standard stepped journals, plus: 50mm

(1.968") – RB (first four journals) or 5RB (all five journals) suffix; 2.000" – BB suffix; 54mm (2.125") – 54J suffix; 60mm (2.362") – 60J suffix.

We offer cast hydraulic and mechanical lifter camshafts for the LA engines having the standard journal diameter, lifter bank angle, and firing order.

Steel billet retrofit hydraulic roller camshafts and components are available. The hydraulic roller lifters have a vertical locking bar, and are a drop-in configuration, with no machining required. These camshafts are produced from steel billet material, are heat treated, and then finish ground. They also incorporate a cast iron distributor drive gear and rear journal (IG suffix), allowing the use of a standard type distributor gear for long term reliability. Some early production and some later replacement and aftermarket cylinder heads may require modifications for pushrod clearance, due to their angle having changed resulting from the higher pushrod seats in the hydraulic roller lifters.

Steel billet mechanical roller camshafts are offered with Iron Gear versions for street performance and endurance racing, having standard diameter journals. Racing mechanical roller camshafts are available in standard firing order (1-8-4-3-6-5-7-2) and SFO (1-8-7-3-6-5-4-2) firing order. Mechanical roller camshafts are also available for the various camshaft journal diameters and lifter bore bank angles as previously mentioned.

1986–1991 318 (5.2L) & 1987–1991 360 (5.9L) "LA" V8

These engines are a continuation of the LA series, being factory upgraded with hydraulic roller camshafts and lifters. Cylinder head changes were also made, with the valve spring envelope being reduced, making it very difficult to fit performance valve springs. Still designated with our 69 prefix, this engine group is listed separately to properly define the emissions legalities of the camshafts.

Hydraulic roller camshafts are offered, along with many valve train components.

1992–2002 5.2L & 5.9L Magnum V8

The final upgrade to the LA family, the Magnum engines received non-adjustable pedestal mounted 1.6:1 ratio rocker arms from the factory. The nose of the camshaft was also shortened as a result of vehicle packaging requirements, so there is no camshaft interchangeability with the earlier LA engines. Our 70 prefix indicates this version.

We offer hydraulic roller camshafts and many valve train components for the Magnum. Our **36655-16** Pushrod Guideplate and Rocker Arm Stud Conversion Kit can be used to install adjustable stud mounted rocker arms, with no cylinder head machining required.

2002–2015 5.7L & 6.1L HEMI V8

Chrysler's latest pushrod V8 capitalizes on the heritage of the legendary Chrysler Hemi powerplants of the 50's, 60's, and 70's. Loosely based around the LA engine's architecture, these are equipped with a hydraulic roller camshaft and .842" diameter hydraulic roller lifters. Crane Cams' 198 prefix denotes our products for these engines. Whenever upgrading to a performance camshaft, the cylinder deactivation system (MDS) lifters can not be used, and computer upgrades will be required. The 392 Crate engines are also included in this group.

We currently offer hydraulic roller camshafts, and other valve train components, with more products to be introduced.

Dodge R5

This is an evolution of the LA engine, designed for rules specific oval track racing. These engines were never installed in any vehicles, or sold as a complete assembly. Normally paired with the P7 cylinder heads, these are built per application for each form of competition. This is known as our 184 prefix, with 8620 steel billet roller cams having 60mm journals available on special order.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts—Retrofit										
Good low end and mid range and HP, good idle, daily and performance usage, auto trans w/2500+ converter, 2600-3400 cruise RPM, 8.75 to 10.5 compression ratio advised.	**HR-224/339-10**	2000-6000	**539521**[a] **549521**[b] ◆3	**68532-16**[c]	224 224	286 286	110	7 37 47 (3)	.000 .000	.509 .509
Good mid to upper RPM torque and HP, fair idle, daily and performance usage, also mild supercharged, auto trans w/2500+ converter, 3200-4000 cruise RPM, 9.5 to 11.0 compression ratio advised, or 8.5 to 10.0 w/supercharger	**HR-230/352-2-14**	2600-6600	**539531**[a] **549531**[b] ◆3	**68532-16**[c]	230 240	292 302	114	6 44 59 1	.000 .000	.528 .548
Good upper RPM torque and HP, rough idle, performance usage, auto trans w/ 3000+ converter, 4000-4800 cruise RPM, 11.0 to 12.5 compression ratio advised.	**HR-240/365-2S-8**	3200-6800	**539541**[a] **549541**[b] ◆3	**68532-16**[c]	240 248	302 310	108	17 43 57 11	.000 .000	.548 .558
Mechanical Roller Camshafts										
Good low end and mid range torque, good idle, daily and performance usage, 2600-3400 cruise RPM, 8.75 to 9.75 compression ratio advised.	**SR-230/338-8**	2200-6200	**538491**[a,e] **548491**[b,e] ◆3	**66515-16** **66542-16**[d]	230 230	280 280	108	12 38 48 2	.020 .020	.507 .507
Good mid range RPM torque and HP, good idle, daily and performance usage, also mild supercharged, auto trans w/2000+ converter, 2800-3600 cruise RPM, 9.0 to 10.5 compression ratio advised, or 8.0 to 9.0 with supercharger.	**SR-230/338-2S-10**	2200-6200	**538501**[a,e] **548501**[b,e] ◆3	**66515-16** **66542-16**[d]	230 238	280 288	110	10 40 54 4	.020 .020	.507 .525
Good mid to upper RPM torque and HP, fair idle, daily and performance usage, also mild supercharged, auto trans w/2500+ converter, 3200-4000 cruise RPM, 9.5 to 11.0 compression ratio advised, or 8.5 to 10.0 with supercharger.	**SR-238/350-2S-12**	2800-6600	**538511**[a,e] **548511**[b,e] ◆3	**66515-16** **66542-16**[d]	238 246	288 296	112	12 46 60 6	.020 .020	.525 .543
Good upper RPM torque and HP, rough idle, performance usage, also supercharged, auto trans w/3000+ converter, 3600-4400 cruise RPM, 10.0 to 11.5 compression ratio advised, or 8.5 to 10.5 with supercharger.	**SR-246/362-12**	3200-7000	**538521**[a,e] **548521**[b,e] ◆3	**66515-16** **66542-16**[d]	246 246	296 296	112	16 50 60 6	.020 .020	.543 .543
Competition only, nostalgia A/F.	**R-278/458-10**	6000-8600	**538701**[a,e] **548701**[b,e] ◆3	**66542-16**[d]	278 278	310 310	110	33 65 73 25	.020 .022	.687 .687
Competition only, baseline nostalgia T/F.	**R-284/456-10**	6000-9900	**538661**[a,e] **548661**[b,e] ◆3	**66542-16**[d]	284 284	324 324	110	35 69 75 29	.026 .026	.684 .684
Competition only, cacklefest exhibition.	**R-285/410-8**		**538711**[a,e] **548711**[b,e] ◆3	**66542-16**[d]	285 285	328 328	108	39.5 65.5 75.5 29.5	.026 .028	.615 .615

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

NOTE: Although the 1951-1956 301-331-354 camshafts have the basic same dimensions as the 1957-1958 392 camshafts, and are physically interchangeable, the lifter bore bank angle is different between these two groups. You must use the correct camshaft for your particular block to achieve proper performance.

NOTE: All camshafts are the short nose (1.100"), internally threaded (7/16"-14) configuration, requiring the 57-58 timing set.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 300*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99838-16[f]	**99957-16**[g] **99944-16**[h]	**99822-16**[f,g] **99820-16**[f,h]	**99098-1**[g,j] **99097-1**[h,j]		**69975-1**[k]			
	99838-16[f]	**99957-16**[g] **99944-16**[h]	**99822-16**[f,g] **99820-16**[f,h]	**99098-1**[g,j] **99097-1**[h,j]		**69975-1**[k]			
	99838-16[f]	**99957-16**[g] **99944-16**[h]	**99822-16**[f,g] **99820-16**[f,h]	**99098-1**[g,j] **99097-1**[h,j]		**69975-1**[k]			
	99893-16[f]	**99954-16**[g] **99953-16**[h]	**99822-16**[f,g] **99820-16**[f,h]	**99098-1**[g,j] **99097-1**[h,j]		**69975-1**[k]			
	99893-16[f]	**99954-16**[g] **99953-16**[h]	**99822-16**[f,g] **99820-16**[f,h]	**99098-1**[g,j] **99097-1**[h,j]		**69975-1**[k]			
	99893-16[f]	**99954-16**[g] **99953-16**[h]	**99822-16**[f,g] **99820-16**[f,h]	**99098-1**[g,j] **99097-1**[h,j]		**69975-1**[k]			
	99893-16[f]	**99954-16**[g] **99953-16**[h]	**99822-16**[f,g] **99820-16**[f,h]	**99098-1**[g,j] **99097-1**[h,j]		**69975-1**[k]			
	96884-16[f]	**99675-16**[i]		**99097-1**[h,j]					
	96884-16[f]	**99675-16**[i]		**99097-1**[h,j]					
	96884-16[f]	**99675-16**[i]		**99097-1**[h,j]					

a For 1951-1956 301-331-354 cu.in.
b For 1957-1958 392 cu.in.
c Vertical locking bar hydraulic roller lifters. Due to the increased height of these lifters, the cylinder heads will require clearancing for the changed pushrod angles.
d Ultra Pro series roller lifters.
e Requires either **69990-1** aluminum bronze, or **69970-1** coated steel distributor gears.
f Must machine cylinder heads.
g For 3/8″ valve stems.
h For 11/32″ valve stems.
i Titanium, for 11/32″ single groove valve stems, must use **99097-1** valve stem locks (included with the retainers).
j Machined steel, heat treated, single groove.
k Performance steel billet gears and roller chain set.

Chrysler-Dodge-Plymouth "LA" V-8 64-87

273-340-360 (5.9L) and 67-86 318 (5.2L) cu.in

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts										
Brute low end torque, smooth idle, daily usage, fuel economy, 1600-2200 cruise RPM, 7.75 to 8.75 compression ratio advised.	**H-248-2**	800-4200	**693971**[*] ◆3	**99278-16**	192 204	248 260	112	(11) 23 39 (15)	.000 .400 .000 .427
Great low end torque and HP, smooth idle, daily usage, off road, towing, economy, mild marine performance, also mild turbocharged, 2200-2600 cruise RPM, 8.0 to 9.5 compression ratio advised.	**H-260-2**	1200-4800	**693901**[*] **693902**[*a] ◆3	**99278-16**	204 216	260 272	112	(5) 29 45 (9)	.000 .427 .000 .454
Good low end and mid range torque and HP, good idle, daily usage, off road, towing, economy, mild marine performance, also mild turbocharged, 2400-2800 cruise RPM, 8.5 to 10.0 compression ratio advised.	**Z-268-2**	1200-5000	**693511**[*] **693512**[*] ◆3	**99278-16**	212 220	268 276	112	(1) 33 47 (7)	.000 .459 .000 .480
Good low end to mid range torque, good idle, daily usage, off road, highway towing, fuel efficiency plus performance, 2600-3000 cruise RPM, 8.75 to 10.0 compression ratio advised.	**Energizer 272 H10**	1800-5200	**15005**[*] **150052**[*a] ◆3	**99278-16**	216 216	272 272	110	3 23 43 (7)	.000 .454 .000 .454
Good low end and mid range torque and HP, good idle, daily usage and off road, towing, performance and fuel efficiency, marine performance, 2600-3000 cruise RPM, 8.75 to 10.5 compression ratio advised.	**H-272-2**	1800-5400	**693941**[*] **693942**[*a] ◆3	**99278-16**	216 228	272 284	112	1 35 51 (3)	.000 .454 .000 .480
Good low end and mid range torque and HP, good idle, daily usage and off road, towing, performance and fuel efficiency, marine performance, 2600-3000 cruise RPM, 8.75 to 10.5 compression ratio advised.	**Z-276-2**	1800-5600	**693521**[*] **693522**[*a] ◆3	**99278-16**	220 228	276 284	110	5 35 49 (1)	.000 .480 .000 .501
Excellent mid range torque, rough idle,moderate performance usage, limited oval track, mild bracket racing, auto trans w/3000+ converter, serious off road, 9.5 to 11.0 compression ratio advised.	**H-222/3200-6**	2200-5600	**690141**[*] ◆3	**99278-16** **99378-16**[*b]	222 222	294 294	106	9 33 41 1	.000 .480 .000 .480
Good mid range torque and HP, fair idle, daily performance usage, mild bracket racing, mild supercharged, small nitrous system, 3000-3400 cruise RPM, 9.5 to 10.75 compression ratio advised.	**H-278-2**	2200-5800	**693801**[*] **693802**[*a] ◆3	**99278-16** **99378-16**[*b]	222 234	278 290	114	2 40 56 (2)	.000 .467 .000 .494

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

NOTE: For maximum performance, and to provide the most accurate valve adjustment on hydraulic lifter camshafts, the use of our **69770-16** adjustable rocker arms and **69691-16** pushrods is highly recommended.

NOTE: Early 1986-91 318 (5.2L) and early 1987-91 360 (5.9L) engines are equipped with hydraulic roller camshafts and lifters. Conventional hydraulic, mechanical, or roller camshafts and lifters can be installed in these engines, providing the appropriate kit components are used.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 300*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	CAST ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
69308-1[c]	99835-16[c]	99948-16			69621-16[e]	69975-1*[f]	69770-16[g] 69771-16*[h]		
69308-1[c]	99835-16[c]	99948-16			69621-16[e]	69975-1*[f]	69770-16[g] 69771-16*[h]		
69308-1[c]	99835-16[c]	99948-16			69621-16[e]	69975-1*[f]	69770-16[g] 69771-16*[h]		
69308-1[c]	99835-16[c]	99948-16			69621-16[e]	69975-1*[f]	69770-16[g] 69771-16*[h]		
69308-1[c]	99835-16[c]	99948-16			69621-16[e]	69975-1*[f]	69770-16[g] 69771-16*[h]		
69308-1[c]	99835-16[c]	99948-16			69621-16[e]	69975-1*[f]	69770-16[g] 69771-16*[h]		
	99838-16[d]	99948-16	99822-16[d]		69621-16[e]	69975-1*[f]	69770-16[g] 69771-16*[h]		
69308-1[c]	99835-16[c]	99948-16			69621-16[e]	69975-1*[f]	69770-16[g] 69771-16*[h]		

Section Continued ➜

a Cam and lifter kit, includes installation lubricants.
b Optional Hi Intensity hydraulic lifters, see page 272 for details.
c Contains standard diameter valve springs, no machining required.
d Must machine cylinder heads.
e Heavy wall, heat treated, for use with adjustable rocker arms.
f Performance steel billet gears and roller chain set.
g 1.5 ratio iron rocker arms, adjustable, must use appropriate Crane pushrods (shafts not included).
h 1.6 ratio iron rocker arms, adjustable, must use appropriate Crane pushrods (shafts not included).

Chrysler-Dodge-Plymouth "LA" V-8 64-87

273-340-360 (5.9L) and 67-86 318 (5.2L) cu.in

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts										
Good mid range to upper RPM torque and HP, fair idle, moderate performance usage, bracket racing, 340+ cu.in., 3200-3600 cruise RPM, 9.5 to 11.0 compression ratio advised.	**H-288-2**	2600-6000	**694301**[*] **694302**[*a] ◆3	**99278-16** **99378-16**[*b]	226 230	288 292	110	8 38 50 0	.000 .000	.458 .465
Good mid range torque, fair idle, moderate performance usage, mild bracket racing, auto trans w/2500+ converter, 3400-3800 cruise RPM, serious off road, 9.5 to 11.0 compression ratio advised.	**Energizer 284 H12**	3000-6200	**15006**[*] **150062**[*a] ◆3	**99278-16** **99378-16**[*b]	228 228	284 284	112	7 41 51 (3)	.000 .000	.480 .480
Performance usage, good mid range torque & HP, bracket racing; Street, Heavy, etc., auto trans w/3000+ converter, oval track; Street Stock, Enduro, etc., 1/4-3/8 mile, radical off road, 10.0 to 11.5 compression ratio advised.	**H-228/3200-2S-8**	3000-6200	**690591**[*] ◆3	**99278-16** **99378-16**[*b]	228 234	284 290	108	11 37 50 4	.000 .000	.480 .494
Performance usage, strong mid range to upper RPM torque and HP, bracket racing, auto trans w/3000+ converter, 10.0 to 11.5 compression ratio advised.	**H-232/3360-6**	3200-6400	**690221**[*] ◆3	**99278-16** **99378-16**[*b]	232 232	304 304	106	14 38 46 6	.000 .000	.504 .504
Good mid range to upper RPM torque and HP, rough idle, performance usage, auto trans w/3000+ converter, 3800-4200 cruise RPM, radical street, also mild supercharged, nitrous, 340+ cu.in., 10.0 to 11.5 compression ratio advised.	**H-302-2**	3200-6800	**694561**[*] ◆3	**99278-16** **99378-16**[*b]	232 242	302 312	114	7 45 60 2	.000 .000	.504 .528
Moderate competition, good upper RPM HP, performance usage, bracket racing, 360+ cu.in., auto trans w/3500+ converter, 360+ cu.in., 10.5 to 12.0 compression ratio advised.	**H-312-2**	3600-7000	**694571**[*] ◆3	**99278-16** **99378-16**[*b]	242 252	312 322	108	18 59 44 13	.000 .000	.528 .552
Moderate competition, good upper RPM HP, bracket racing, 360+ cu.in., auto trans w/3500+ converter, oval track 3/8-1/2 mile, 360+ cu.in., 11.5 to 13.0 compression ratio advised.	**H-244/3439-6**	3800-7000	**690711**[*] ◆3	**99278-16** **99378-16**[*b]	244 244	300 300	106	20 44 52 12	.000 .000	.516 .516
Moderate competition only, good upper RPM HP, bracket racing, auto trans w/3500+ converter, 360+ cu.in., good with aluminum cylinder heads, 12.5 minimum compression ratio advised.	**H-252/3680-2-10**	4400-7200	**690241**[*] ◆3	**99278-16** **99378-16**[*b]	252 262	324 334	110	21 51 66 16	.000 .000	.552 .576

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

NOTE: For maximum performance, and to provide the most accurate valve adjustment on hydraulic lifter camshafts, the use of our **69770-16** adjustable rocker arms and **69691-16** pushrods is highly recommended.

NOTE: Early 1986-91 318 (5.2L) and early 1987-91 360 (5.9L) engines are equipped with hydraulic roller camshafts and lifters. Conventional hydraulic, mechanical, or roller camshafts and lifters can be installed in these engines, providing the appropriate kit components are used.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 300*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	CAST ROCKER ARMS	ALUMINUM ROCKERS — ENERGIZER	ALUMINUM ROCKERS — GOLD RACE
69308-1[c]	99835-16[c]	99948-16			69621-16[e]	69975-1*[f]	69770-16[g] 69771-16*[h]		
69308-1[c]	99835-16[c]	99948-16			69621-16[e]	69975-1*[f]	69770-16[g] 69771-16*[h]		
	99838-16[d]	99957-16	99822-16[d]		69621-16[e]	69975-1*[f]	69770-16[g] 69771-16*[h]		
	99838-16[d]	99957-16	99822-16[d]		69621-16[e]	69975-1*[f]	69770-16[g] 69771-16*[h]		
	99838-16[d]	99957-16	99822-16[d]		69621-16[e]	69975-1*[f]	69770-16[g] 69771-16*[h]		
	99838-16[d]	99957-16	99822-16[d]		69621-16[e]	69975-1*[f]	69770-16[g] 69771-16*[h]		
	99838-16[d]	99957-16	99822-16[d]		69621-16[e]	69975-1*[f]	69770-16[g] 69771-16*[h]		
	99838-16[d]	99957-16	99822-16[d]		69621-16[e]	69975-1*[f]	69770-16[g] 69771-16*[h]		

a Cam and lifter kit, includes installation lubricants.
b Optional Hi Intensity hydraulic lifters, see page 272 for details.
c Contains standard diameter valve springs, no machining required.
d Must machine cylinder heads.
e Heavy wall, heat treated, for use with adjustable rocker arms.
f Performance steel billet gears and roller chain set.
g 1.5 ratio iron rocker arms, adjustable, must use appropriate Crane pushrods (shafts not included).
h 1.6 ratio iron rocker arms, adjustable, must use appropriate Crane pushrods (shafts not included).

Chrysler-Dodge-Plymouth "LA" V-8 64-87

273-340-360 (5.9L) and 67-86 318 (5.2L) cu.in

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts — Retrofit										
Excellent low end torque and HP, smooth idle, daily usage, towing, economy, also mild turbocharged, 2200-3000 cruise RPM, 8.0 to 9.5 compression ratio advised.	**HR-204/286-2-12 IG**	800-4800	**699601**[*a] ◆3	**69532-16**[b]	204 214	260 270	112	(5) 44 29 (10)	.000 .000	.429 .452
Good low end torque and HP, good idle, daily usage, off road, performance and fuel efficiency, also mild turbocheaged, 2600-3400 cruise RPM, 8.75 to 10.5 compression ratio advised.	**HR-214/325-2S-12 IG**	1400-5400	**699611**[*a] ◆3	**69532-16**[b]	214 222	276 284	112	0 34 48 (6)	.000 .000	.488 .509
Good low end and mid range torque and HP, fair idle, moderate performance usage, mild bracket racing, auto trans w/2500+ converter, 3000-3800 cruise RPM, 9.5 to 10.75 compression ratio advised.	**HR-222/339-2S-12 IG**	2000-6000	**699621**[*a] ◆3	**69532-16**[b]	222 230	284 292	112	4 38 52 (2)	.000 .000	.509 .528
Good mid range torque and HP, fair idle, moderate performance usage, bracket racing w/heavy car, auto trans w/2500+ converter, serious off road, 3200-4000 cruise RPM, 10.0 to 11.5 compression ratio advised.	**HR-226/345-2S1-10 IG**	2000-6000	**699651**[*a] ◆3	**69532-16**[b]	226 230	288 292	110	8 38 50 0	.000 .000	.518 .528
Good mid to upper RPM torque and HP, fair idle, performance usage, 3600-4400 cruise RPM, good w/manifold nitrous system, 10.0 to 11.5 compression ratio advised.	**HR-230/352-2S-12 IG**	2600-6600	**699631**[*a] ◆3	**69532-16**[b]	230 238	292 300	112	8 42 56 10	.000 .000	.528 .548
Good mid range to upper RPM torque and HP, rough idle, performance usage, bracket racing, auto trans w/3500+ converter, 360+ cu.in., 4000-4800 cruise RPM, 10.5 to 12.0 compression ratio advised.	**HR-238/365-2S-8 IG**	2800-6800	**699661**[*a] ◆3	**69532-16**[b]	238 246	300 308	108	16 42 56 10	.000 .000	.548 .558
Good mid range to upper RPM torque and HP, rough idle, performance usage, mild bracket racing, auto trans w/3500+ converter, 4200-4800 cruise RPM, 10.5 to 12.0 compression ratio advised, also mild supercharged.	**HR-238/365-2S-14 IG**	3000-7000	**699641**[*a] ◆3	**69532-16**[b]	238 246	300 308	114	10 48 62 4	.000 .000	.548 .558
Rough idle, performance usage, bracket racing, auto trans w/3500+ converter, 4000-4800 cruise RPM, 360+ cu.in., 11.0 to 12.5 compression ratio advised.	**HR-242/372-2-8 IG**	3200-7000	**699671**[*a] ◆3	**69532-16**[b]	242 252	304 314	108	18 44 59 13	.000 .000	.558 .558
Performance usage, bracket racing w/ heavy car, auto trans w/4000+ converter, 380+ cu.in., 11.5 to 13.0 compression ratio advised.	**HR-246/372-2S-8 IG**	3400-7000	**699681**[*a] ◆3	**69532-16**[b]	246 254	308 316	108	20 46 60 14	.000 .000	.558 .558
Performance usage, good upper RPM HP, bracket racing, good w/manifold nitrous system, auto trans w/4000+ converter, 380+ cu.in., 13.0 minimum compression ratio advised, also mild supercharged.	**HR-252/372-2S-10 IG**	4000-7200	**699691**[*a] ◆3	**69532-16**[b]	252 262	314 324	110	21 51 66 16	.000 .000	.558 .558

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Due to the increased pushrod seat height of the Crane retrofit hydarulic roller lifters, some early cylinder heads, and some aftermarket cylinder heads, may have to be modified for pushrod clearance.

NOTE: For maximum performance, and to provide the most accurate valve adjustment on hydraulic roller camshafts, the use of our **69770-16** or **69790-1** adjustable rocker arms and **69628-16** pushrods is highly recommended. Otherwise, special length pushrods will be required.

NOTE: Early 1986-91 318 (5.2L) and early 1987-91 360 (5.9L) engines are equipped with hydraulic roller camshafts and lifters. Conventional hydraulic, mechanical, or roller camshafts and lifters can be installed in these engines, providing the appropriate kit components are used.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 300*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	CAST ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99838-16[c]	99948-16	99822-16[c]		69628-16[d]	69975-1*[e]	69770-16[f] 69771-16*[g]		
	99838-16[c]	99948-16	99822-16[c]		69628-16[d]	69975-1*[e]	69770-16[f] 69771-16*[g]		
	99838-16[c]	99948-16	99822-16[c]		69628-16[d]	69975-1*[e]	69770-16[f] 69771-16*[g]		
	99838-16[c]	99948-16	99822-16[c]		69628-16[d]	69975-1*[e]	69770-16[f] 69771-16*[g]		
	99838-16[c]	99948-16	99822-16[c]		69628-16[d]	69975-1*[e]	69770-16[f] 69771-16*[g]		
	96874-16[c]	99957-16	99822-16[c]		69628-16[d]	69975-1*[e]	69770-16[f] 69771-16*[g]		
	96874-16[c]	99957-16	99822-16[c]		69628-16[d]	69975-1*[e]	69770-16[f] 69771-16*[g]		
	96874-16[c]	99957-16	99822-16[c]		69628-16[d]	69975-1*[e]	69770-16[f] 69771-16*[g]		
	96874-16[c]	99957-16	99822-16[c]		69628-16[d]	69975-1*[e]	69770-16[f] 69771-16*[g]		
	96874-16[c]	99957-16	99822-16[c]		69628-16[d]	69975-1*[e]	69770-16[f] 69771-16*[g]		

a Camshaft incorporates an integral cast iron distributor drive gear, aluminum-bronze distributor drive gear not required.
b Vertical locking bar hydraulic roller lifters, no machining required. Special length pushrods are required, use **69628-16** with adjustable rocker arms.
c Must machine cylinder heads.
d Heavy wall, heat treated, for use with adjustable rocker arms.
e Performance steel billet gears and roller chain set.
f 1.5 ratio iron rocker arms, adjustable, must use appropriate Crane pushrods (shafts not included).
g 1.6 ratio iron rocker arms, adjustable, must use appropriate Crane pushrods (shafts not included).

Chrysler-Dodge-Plymouth "LA" V-8 64-87

273-340-360 (5.9L) and 67-86 318 (5.2L) cu.in

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Lifter Camshafts										
Good low end and mid range torque and HP, fair idle, moderate performance usage, bracket racing, 3400-3800 cruise RPM, 10.0 to 11.5 compression ratio advised.	**F-238/3200-2-14**	2600-6400	**691191*** ◆3	**99260-16**	238 248	300 310	114	10 48 63 5	.022 .480 .022 .500
Good mid range torque, performance usage, limited oval track 1/4-3/8 mile, bracket racing w/heavy car, serious off road, auto trans w/2500+ converter, 10.5 to 12.0 compression ratio advised.	**F-244/3454-2S-6**	3200-6800	**690921*** ◆3	**99260-16**	244 252	280 288	106	19 45 55 17	.026 .518 .026 .536
Good mid range torque and HP, rough idle, performance usage, limited oval track, bracket racing, serious off road, auto trans w/2000+ converter, 10.5 to 12.0 compression ratio advised.	**F-248/3602-2-8**	3200-7000	**690911*** ◆3	**99260-16**	248 258	284 294	108	21 47 62 16	.026 .540 .026 .560
Performance usage, great mid range torque and HP, bracket racing, 340+ cu.in., auto trans w/2500+ converter, 11.0 to 12.5 compression ratio advised.	**F-256/383-2S-8**	3600-7400	**690931*** ◆3	**99260-16**	256 260	312 316	108	25 51 63 17	.014 .575 .016 .585
Good mid range and upper RPM torque and HP, rough idle, performance usage, bracket racing, 340+ cu.in., auto trans w/2500+ converter, 11.0 to 12.5 compression ratio advised.	**F-258/3735-2-8**	3600-7200	**691381*** ◆3	**99260-16**	258 268	294 304	108	26 52 67 21	.026 .560 .026 .580
Good upper RPM torque and HP, moderate competition only, bracket racing, 360+ cu.in., auto trans w/3000+ converter, good w/ plate nitrous system, aluminum cylinder heads recommended, 12.0 minimum compression ratio advised.	**F-262/394-2S-10**	3800-7600	**691391*** ◆3	**99260-16**	262 264	294 296	110	26 56 67 17	.018 .591 .018 .596
Good upper RPM torque and HP,moderate competition only, bracket racing, 360+ cu.in., auto trans w/3000+ converter, 12.0 minimum compression ratio advised.	**F-268/3868-2-8**	4000-7600	**691561*** ◆3	**99260-16**	268 278	304 314	108	31 57 72 26	.026 .580 .026 .600
Competition only, good upper RPM torque and HP, auto trans w/3500+ converter, good with manifold nitrous system, 360+ cu.in., 12.5 minimum compression ratio advised.	**F-274/412-2S-8**	4200-8000	**691571*** ◆3	**99260-16**	274 288	306 324	108	34 60 75 33	.018 .618 .026 .620
Competition only, good upper RPM HP, auto trans w/3500+ converter, 360+ cu.in., 12.5 minimum compression ratio advised.	**F-278/4002-8**	4400-8000	**691701*** ◆3	**99260-16**	278 278	314 314	108	36 62 72 26	.026 .600 .026 .600
Radical competition only, maximum performance applications, flat tappet restricted classes, aluminum cylinder heads advised, 13.5 minimum compression ratio advised.	**F-288/4134-8**	5000-8400	**691951*** ◆3	**99260-16**	288 288	324 324	108	41 67 77 31	.026 .620 .026 .620

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

NOTE: To effect valve adjustment, 318, 340 and 360 engines require the use of Crane Adjustable Rocker Arms and appropriate pushrods when using mechanical lifter cams.

NOTE: Early 1986-91 318 (5.2L) and early 1987-91 360 (5.9L) engines are equipped with hydraulic roller camshafts and lifters. Conventional hydraulic, mechanical, or roller camshafts and lifters can be installed in these engines, providing the appropriate kit components are used.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 300*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	CAST ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99838-16[a]	99948-16	99822-16[a]		69622-16[b]	69975-1*[c]	69770-16[d] 69771-16*[e]		
	99838-16[a]	99948-16	99822-16[a]		69622-16[b]	69975-1*[c]	69770-16[d] 69771-16*[e]		
	99838-16[a]	99948-16	99822-16[a]		69622-16[b]	69975-1*[c]	69770-16[d] 69771-16*[e]		
	99838-16[a]	99948-16	99822-16[a]		69622-16[b]	69975-1*[c]	69770-16[d] 69771-16*[e]		
	99838-16[a]	99948-16	99822-16[a]		69622-16[b]	69975-1*[c]	69770-16[d] 69771-16*[e]		
	99838-16[a]	99948-16	99822-16[a]		69622-16[b]	69975-1*[c]	69770-16[d] 69771-16*[e]		
	99838-16[a]	99948-16	99822-16[a]		69622-16[b]	69975-1*[c]	69770-16[d] 69771-16*[e]		
	99838-16[a]	99948-16	99822-16[a]		69622-16[b]	69975-1*[c]	69770-16[d] 69771-16*[e]		
	99838-16[a]	99948-16	99822-16[a]		69622-16[b]	69975-1*[c]	69770-16[d] 69771-16*[e]		
	99838-16[a]	99948-16	99822-16[a]		69622-16[b]	69975-1*[c]	69770-16[d] 69771-16*[e]		

a Must machine cylinder heads.
b Heavy wall, heat treated, for use with adjustable rocker arms.
c Performance steel billet gears and roller chain set.
d 1.5 ratio iron rocker arms, adjustable, must use appropriate Crane pushrods (shafts not included).
e 1.6 ratio iron rocker arms, adjustable, must use appropriate Crane pushrods (shafts not included).

COMPLETE CAM SPECIFICATIONS

Mechanical Roller Camshafts

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 276 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Good low end and mid range torque and HP, fair idle, moderate performance usage, mild bracket racing, auto trans w/2500+ converter, 3400-3800 cruise RPM, 10.5 to 11.5 compression ratio advised.	**SR-238/350-2S-12 IG**	2800-6600	**698521**[*a] ◆3	**69515-16** **69542-16**[c]	238 246	288 296	112	12 46 60 6	.020 .020	.525 .543
Good mid to upper RPM torque & HP, fair idle, moderate performance usage, mild bracket racing, good w/plate nitrous system, auto trans w/3000+ converter, 3800-4200 cruise RPM, 10.5 to 12.0 compression ratio advised. Good w/Roots supercharger, 14 lbs. maximum boost w/8.0 maximum compression ratio advised.	**SR-246/362-2S-12 IG**	3200-7000	**698531**[*a] ◆3	**69515-16** **69542-16**[c]	246 254	283 290	112	15 49 63 9	.020 .020	.543 .561
Competition only, bracket racing, heavy car, good w/manifold nitrous system, 360+ cu.in., auto trans w/race converter, aftermarket aluminum cylinder heads required, 12.0 to 13.0 compression ratio advised.	**R-256/452-2S-10**	3800-7800	**698271**[*b] ◆3	**69542-16**[c]	256 268	285 297	110	23 53 69 19	.020 .022	.746 .746
Good mid range torque and HP, rough idle, performance usage, oval track, bracket racing, auto trans w/race converter, 11.5 to 12.5 compression ratio advised.	**R-260/420-2S-8**	3800-7600	**698801**[*b] ◆3	**69515-16** **69542-16**[c]	260 266	292 298	108	26 54 65 21	.020 .020	.630 .630
Competition only, good mid to upper RPM HP, oval track, bracket racing, auto trans w/race converter, 12.5 minimum compression ratio advised.	**R-268/420-2S1-8**	4000-7800	**698821**[*b] ◆3	**69515-16** **69542-16**[c]	268 276	300 308	108	30 58 70 26	.020 .020	.630 .630
Competition only, good upper RPM HP, bracket racing, auto trans w/race converter, 12.5 minimum compression ratio advised.	**R-272/420-2-8**	4200-8000	**698831**[*b] ◆3	**69515-16** **69542-16**[c]	272 282	304 314	108	32 60 72 29	.020 .020	.630 .630
Competition only, good upper RPM torque and HP, bracket racing, Super Pro, Super Gas, auto trans w/race converter, aftermarket aluminum cylinder heads required, 13.0 minimum compression ratio advised.	**R-274/482-2S-8**	4200-8200	**698281**[*b] ◆3	**69542-16**[c]	274 278	318 334	108	30 64 72 26	.016 .030	.723 .735
Competition only, good upper RPM HP, bracket racing, auto trans w/race converter, nitrous, 12.5 minimum compression ratio advised.	**R-276/420-2-10**	4400-8200	**698841**[*b] ◆3	**69515-16** **69542-16**[c]	276 286	308 318	110	32 64 77 29	.020 .020	.630 .630
Competition only, bracket racing, good upper RPM HP, Super Quick, Super Comp, etc.,manual trans or auto w/trans brake, aftermarket aluminum cylinder heads required, 13.0 minimum compression ratio advised.	**R-280/452-2S-8**	5000-8600	**698291**[*b] ◆3	**69542-16**[c]	280 288	309 317	108	37 63 77 31	.020 .022	.678 .678
Competition only, Super Stock or Competition elim., manual trans or auto w/trans brake, 13.5 minimum compression ratio advised.	**R-284/4765-2S-8**	5200-9000	**698611**[*b] ◆3	**69542-16**[c]	284 292	318 326	108	39 65 79 33	.035 .030	.715 .688

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

NOTE: 8620 steel billet roller camshafts for Chrysler R series cylinder blocks with 50mm, 2.000", and 60mm diameter camshaft bearing journals, and 45, 47, or 48 degree lifter bore bank angles are available on special order. Lightweight, gun drilled rear drive camshafts are also an option. Appropriate oil conducting roller lifters are also available. Contact Crane's Performance Consultants for details.

IMPORTANT NOTE: Roller lifter camshafts are not intended for use in R blocks having 59 degree bank angle lifter bores. Contact Crane's Performance Consultants for details.

NOTE: Early 1986-91 318 (5.2L) and early 1987-91 360 (5.9L) engines are equipped with hydraulic roller camshafts and lifters. Conventional hydraulic,mechanical, or roller camshafts and lifters can be installed in these engines, providing the appropriate kit components are used.

NOTE: To effect valve adjustment, 318, 340 and 360 engines require the use of Crane Adjustable Rocker Arms and appropriate pushrods when using roller lifter cams.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 300*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	CAST ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99893-16[d]	99957-16	99822-16[d]		69622-16[f]	69975-1[*g]	69770-16[h] 69771-16[*i]		
	99893-16[d]	99957-16	99822-16[d]		69622-16[f]	69975-1[*g]	69770-16[h] 69771-16[*i]		
	96883-16[d]	99679-16[e]	99822-16[d]		69622-16[f]	69975-1[*g]	69770-16[h] 69771-16[*i]		
	99885-16[d]	99955-16	99822-16[d]		69622-16[f]	69975-1[*g]	69770-16[h] 69771-16[*i]		
	99885-16[d]	99955-16	99822-16[d]		69622-16[f]	69975-1[*g]	69770-16[h] 69771-16[*i]		
	99885-16[d]	99955-16	99822-16[d]		69622-16[f]	69975-1[*g]	69770-16[h] 69771-16[*i]		
	96883-16[d]	99679-16[e]	99822-16[d]		69622-16[f]	69975-1[*g]	69770-16[h] 69771-16[*i]		
	99885-16[d]	99955-16	99822-16[d]		69622-16[f]	69975-1[*g]	69770-16[h] 69771-16[*i]		
	96883-16[d]	99679-16[e]	99822-16[d]		69622-16[f]	69975-1[*g]	69770-16[h] 69771-16[*i]		
	96883-16[d]	99679-16[e]	99822-16[d]		69622-16[f]	69975-1[*g]	69770-16[h] 69771-16[*i]		

a Camshaft incorporates an integral cast iron distributor drive gear, aluminum-bronze distributor drive gear not required.
b Requires **69990-1** aluminum-bronze, or **69970-1** coated steel distributor drive gears.
c Ultra Pro Series roller lifters.
d Must machine cylinder heads.
e Titanium, must use **99098-1** single-groove valve stem locks, included with the retainers.
f Heavy wall, heat treated, for use with adjustable rocker arms.
g Performance steel billet gears and roller chain set.
h 1.5 ratio iron rocker arms, adjustable, must use appropriate Crane pushrods (shafts not included).
i 1.6 ratio iron rocker arms, adjustable, must use appropriate Crane pushrods (shafts not included).

Chrysler-Dodge-Plymouth "LA" V-8 86-91

86-91 318 (5.2L) and 87-91 360 (5.9L) cu.in. (except 91 Dakota)

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int.	Lash Hot Exh.	Gross Lift Int.	Gross Lift Exh.
Hydraulic Roller Camshafts												
Brute low end torque, for 86-91 318 (5.2L) and 87-92 360 (5.9L) TBI equipped Dodge trucks and vans (except 91 Dakota), designed to improve low end torque and HP for street performance, towing and economy.	**2010**	800-4200	**694101*** ◆3	**70530-16**[a]	194 184	250 240	107	(6) 20 23 (19)	.000 .000		.407 .384	
Excellent low end torque, for 86-91 318 (5.2L) and 87-92 360 (5.9L) TBI equipped Dodge trucks and vans (except 91 Dakota), designed to improve low end torque and HP for street performance, and towing (50 States Legal, C.A.R.B. E.O. D-225-23).	**2020**	1000-4600	**694111** ◆1	**70530-16**[a]	204 194	260 250	112	(5) 29 34 (20)	.000 .000		.429 .407	
Good low end torque and HP, good idle, daily usage, towing, also mild turbocharged, computer upgrades required, 2200-3000 cruise RPM, 8.0 to 9.5 compression ratio advised.	**HR-204/286-2S-14**	1000-4800	**699701*** ◆3	**70530-16**[a]	204 208	260 250	114	(7) 31 43 (15)	.000 .000		.429 .438	

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT NOTE: The 1991 Dakota engines were fuel injected and used a camshaft core with a shorter nose. These would have the same configuration as the 70-prefix camshafts listed below.

NOTE: For maximum performance, and to provide the most accurate valve adjustment on hydraulic roller camshafts, the use of our **69770-16** or **69790-1** adjustable rocker arms and special length pushrods is highly recommended.

Chrysler-Dodge-Plymouth Magnum V-8 92-02

5.2-5.9 Litre

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int.	Lash Hot Exh.	Gross Lift Int.	Gross Lift Exh.
Hydraulic Roller Camshafts												
Brute low end torque, for 92-93 Dodge Magnum, improves low-end torque and HP, for street performance, towing and economy w/multi-point F.I. trucks and vans. (Compatible w/factory valve train.) (50 state legal, 94 and earlier Chrysler trucks with 5.2 or 5.9 eng. C.A.R.B. E.O. D-225-47)	**2020**	800-4600	**704111** ◆1	**70530-16**[e]	194 204	250 260	112	(10) 24 39 (15)	.000 .000		.434 .458	
Excellent low end torque, for 92-93 V-8, improves low and midrange torque and HP, for street performance and towing w/stock or modified multi-point F.I. trucks and vans. (Compatible w/factory valve train.) (50 state legal, 94 and earlier Chrysler trucks with 5.2 or 5.9 eng. C.A.R.B. E.O. D-225-54)	**2030**	1200-5200	**704121** ◆1	**70530-16**[e]	204 208	260 264	114	(7) 31 43 (15)	.000 .000		.458 .467	
Good low end and mid range torque, good idle, daily usage, performance and towing, off road, mild supercharged, computer upgrades required, 2200-3000 cruise RPM, 8.5 to 9.75 compression ratio advised.	**HR-208/292-2S1-10**	1600-5600	**708501*** ◆3	**70530-16**[e]	208 216	264 272	110	(1) 29 43 (7)	.000 .000		.467 .482	
Good mid range torque and HP, good idle, daily usage, mild supercharged, cylinder head and computer upgrades required, 2600-3400 cruise RPM, 8.75 to 10.5 compression ratio advised.	**HR-214/325-2S-14**	1800-5800	**708511*** ◆3	**70530-16**[e]	214 220	276 282	114	(2) 36 49 (9)	.000 .000		.520 .531	
Good mid to upper RPM torque and HP, fair idle, moderate performance usage, cylinder head and computer upgrades required, 3000-3800 cruise RPM, 9.5 to 11.0 compression ratio advised. good w/supercharger, 10 lbs. max. boost w/8.0 max. compression ratio advised.	**HR-222/339-2S-14**	2200-6200	**708521*** ◆3	**70530-16**[e]	222 226	284 288	114	2 40 52 (6)	.000 .000		.542 .552	

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon applications.

NOTE: 1992-2002 5.2L and 5.9L Magnum engines no longer use shaft mount rocker arms, but instead have individually mounted non-adjustable 1.6 ratio pedestal rockers. For street applications, Crane offers a method to convert to stud mounted adjustable rocker arms without cylinder head removal or machining. Install Pushrod guideplate and Rocker Arm Stud Conversion Kit, **36655-16**, along with aluminum roller rocker arms (such as **11776-16**, **11746-16**, or **11759-16**). Pushrods, **36621-16**, are also required. Valve cover clearance will have to be checked.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 300*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	CAST ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
						69975-1*[b]	**69770-16[c]**		
						69975-1*[b]	**69770-16[c]**		
						69975-1*[b]	**69770-16[c]**		

a For use with standard Chrysler alignment bars.
b Performance steel billet gears and roller chain set.
c 1.5 ratio rocker arms, adjustable, must use special Crane pushrods (shafts not included).

					36621-16[f]	**69975-1*[g]**		**11746-16[i]**	**11759-16[j]**
					36621-16[f]	**69975-1*[g]**		**11746-16[i]**	**11759-16[j]**
					36621-16[f]	**69975-1*[g]**		**11746-16[i]**	**11759-16[j]**
					36621-16[f]	**69975-1*[g]**		**11746-16[i]**	**11759-16[j]**
					36621-16[f]	**69975-1*[g]**		**11746-16[i]**	**11759-16[j]**

e For use with standard Chrysler alignment bars.
f Heavy wall, heat treated, for use with **36655-16** Pushrod Guideplate and Rocker Arm Stud Conversion Kit.
g Performance steel billet gears and roller chain set.
i Energizer, 1.6 ratio, for use with **36655-16** Pushrod Guideplate and Rocker Arm Stud Conversion Kit. Requires **36621-16** pushrods.
j 1.6 ratio, for use with **36655-16** Pushrod Guideplate and Rocker Arm Stud Conversion Kit. Requires **36621-16** pushrods.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts										
Excellent low end and mid range torque and HP, smooth idle, daily usage, off road, towing, economy, MDS compatible, 2200-2600 cruise RPM.	**HR-208/297-2S-16**	1000-5000	**1989491*** ◆3	[a]	208 214	268 274	116	(10.5) 38.5 44.5 (10.5)	.000 .505 .000 .505
Excellent low end and mid range torque and HP, smooth idle, daily usage, off road, towing, economy, valve spring upgrade required, 2200-2600 cruise RPM.	**HR-210/3236-2S-12**	1200-5200	**1989501*** ◆3	[b]	210 216	268 274	112	(2) 32 45 (9)	.000 .550 .000 .550
Good mid range torque and HP, good idle, daily usage, also mild supercharged or nitrous, valve spring and computer upgrades required, 2400-2800 cruise RPM.	**HR-216/3236-2S-12**	1800-5800	**1989511*** ◆3	[b]	216 222	274 280	112	1 35 48 (6)	.000 .550 .000 .550
Good upper RPM HP, fair idle, radical street, valve spring and computer upgrades required, 2600-3000 cruise RPM.	**HR-222/3236-2S-14**	2200-6200	**1989521*** ◆3	[b]	222 228	280 286	114	(3) 45 48 0	.000 .550 .000 .550

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	CAST ROCKER ARMS	ALUMINUM ROCKERS — ENERGIZER	ALUMINUM ROCKERS — GOLD RACE
	99831-16[c]								
	99831-16[c]								
	99831-16[c]								
	99831-16[c]								

a Re-use standard lifters.
b Must use non-MDS lifters.
c Compatible with standard retainers and valve stem locks.

1958–1978 350-361-383-400-413-426-440 B & RB V8

The B and RB Big Block Chrysler engines vary primarily due to cylinder block deck height differences. Intake manifolds, distributor housings, and pushrod lengths are noticeable changes from one to the other. The B (Low Block) engines are 350-361-383-400- (1962) 413, while RB (High Block) engines are 413-426-400 cu.in. Characterized by inline lifter bores in the block, inline valves in the cylinder heads, 1.5:1 ratio shaft mounted rocker arms, and a front mounted distributor, these engines were used throughout Chrysler's product lines for over two decades. Be aware that there are reverse rotation marine, and also gear drive cam industrial versions of these engines, that require unique camshafts.

Early cylinder heads had removable rocker pedestals for the rocker shafts, as did the 1960's performance engines (Stage II, Stage III, Max Wedge, etc., which also featured adjustable rocker arms and mechanical lifter camshafts), while later heads have integral shaft stands.

From 1958 to 1969, all camshafts used a single bolt to retain the cam sprocket. These have been the Crane 64 prefix camshafts, with hydraulic and mechanical flat faced lifter grinds offered. In 1970, the 440 Six Pack engines were upgraded by having a three bolt configuration camshaft installed. These are our 68 prefix items, which include hydraulic, mechanical, retrofit hydraulic roller, and mechanical roller camshafts and components. The single bolt and three bolt camshafts can be interchanged among these engines, providing the appropriate timing set is used. **Due to their superior reliability, we will now be offering only the 68 prefix three bolt camshafts for their engines.**

The Chrysler Hemi 426 camshafts will also physically fit into the B engines, but due to their different lobe layout, only four cylinders would function properly.

Our offerings include retrofit 8620 steel billet hydraulic roller camshafts and steel billet roller lifters to provide an excellent torque and power band increase. The lifters are a drop in type (no block machining, or lifter bore sleeving required), having a vertical locking bar to prevent rotation. Special pushrods are required due to the increased height of the lifters.

Our steel billet mechanical roller camshafts are available in standard firing order (1-8-4-3-6-5-7-2) and SFO (1-8-7-3-6-5-4-2) firing orders. Roller camshafts for the Chrysler Mega blocks with 47 degree lifter bank angles, and other aftermarket blocks having 48 degree lifter bank angles are also available. Roller camshafts with 2.125" diameter and 60mm journals can be custom ordered. Engines equipped with Koffel B1 cylinder heads will require grooving the fourth camshaft bearing journal for proper upper end lubrication, optional labor number **98088** accomplishes this. All of our roller lifters are designed to drop into the block, with no machining or lifter bore sleeving required.

Early raised cam Chrysler Mega blocks had very tall lifter bores and a 47 degree lifter bore bank angle, so part number **66554-16** roller lifters (with the pushrod seats and guidebars raised .400") can be used to avoid additional block machining. Special camshafts are also required for the change in lifter bank angle, so be certain of what you have before ordering.

Aftermarket cylinder heads may require different rocker arms, shafts, pushrods, valve springs, retainers, locks, etc, than standard. Make sure of exactly what you need before ordering additional components.

1966–1971 426 Hemi V8

The famed 426 Hemi is related to the RB V8. One primary change to the cylinder block includes additional head bolt bosses for the Hemi head's internal attaching bolts. These cylinder heads utilize the classic Chrysler double shaft system for the intake and exhaust rockers. Standard rocker ratios are 1.57:1 intake, and 1.52:1 exhaust. Lifter bores are inline, inclined at a 45 degree bank angle. These engines are indicated by our 66 prefix.

There were also 1964 –1965 426 Hemi 426 engines that had single bolt camshafts. We recommend using the later three bolt configuration camshafts and timing sets in these engines (no other modifications required) for increased reliability. The Chrysler B/RB camshafts will physically fit into the Hemi engines, but due to their different lobe layout, only four cylinders will function properly.

The currently available aftermarket cylinder blocks have either standard or raised camshaft locations. Most of the raised camshaft blocks have the lifter bores changed to a 48 degree lifter bank angle, for better pushrod geometry. Special camshafts are required to maintain proper cam timing for each side of the engine. Early

raised cam Chrysler Mega blocks had very tall lifter bores and a 50 degree lifter bore bank angle, so part number **66554-16** roller lifters (with the pushrod seats and guidebars raised .400") can be used to avoid additional block machining. Special camshafts are also required for this unique change in lifter bank angle. Some replacement iron blocks may also have tall lifter bores. Check your lifter guidebar to block clearance before final engine assembly in the event that modifications are required.

The aftermarket blocks may also have relocated lifter bore spacing. While the standard lifter centerline spacing is 1.812", there are also popular "Spread .100" (1.900") and "Spread .200" (2.000") configurations. Be sure of your spacing when ordering roller lifters so that you don't exceed the travel capabilities of the guidebar.

We offer hydraulic, retrofit hydraulic roller, mechanical, and mechanical roller camshafts and components for these engines. When installing our hydraulic roller camshafts and retrofit lifters, machining will be required on the block and cylinder heads to provide clearance for the pushrods. This is due to the increased pushrod seat height on the hydraulic roller lifters, changing the angle of the pushrods. Our roller lifters are designed to drop into the block, with no machining or lifter bore sleeving required.

Street roller camshafts are also offered, with their superior torque and horsepower potential popular among the Hemi crowd.

Mechanical roller camshafts are available with standard stepped journal diameters, 2.125" - BB suffix journal diameters (with standard or SFO (1-8-7-3-6-5-4-2) firing orders for standard 45 degree, or 48 degree lifter bank angle blocks), and 60mm (2.362") - 60J suffix journal diameters (with standard or SFO firing orders). These larger journal camshafts have a stepped front journal, so that a standard timing set can be used. The larger journal camshafts are machined for 3/8" – 24 bolts to attach the timing set, requiring special shouldered bolts, and two 5/16" dowel pins are installed. For increased oil distribution to the valve train area, we can machine the oil groove in the fourth camshaft bearing journal to a larger size. This can be performed under labor number **98088.**

While the standard valve stem diameter for these engines is 5/16", aftermarket heads are commonly set up for 11/32" valve stems. Some heads for supercharged fuel applications may have 3/8" exhaust valve stems. Verify your valve stem diameter when ordering retainers and valve locks.

HEMI 99 500 V8

This engine was developed specifically for maximum performance drag racing applications, and never installed in any vehicles, nor sold as a complete assembly. Designated by our 159 prefix, we offer custom ground 8620 steel billet roller camshafts with 60mm (2.362") bearing journals, and the SFO (1-8-7-3-6-5-4-2) firing order.

Chrysler-Dodge-Plymouth "B" V-8 70-78

383-400-440 cu.in. with Three Bolt Gear

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts										
Excellent low end torque, smooth idle, daily usage, off road, towing, economy, also mild turbocharged, 2200-2600 cruise RPM, 8.0 to 9.5 compression ratio advised	**H-260-2**	1200-4800	**683901**[*] **683902**[*a,b] ◆3	**99278-16**[b]	204 216	260 272	112	(5) 29 45 (9)	.000 .000	.427 .454
Replacement for factory 335 HP 383 cu.in. camshaft.	**BluePrinted 2843564 (3512907)**	1400-5000	**680101** ◆1	**99278-16**[b]	214 226	272 292	115	(5) 39 51 (5)	.000 .000	.447 .464
Excellent low end and mid range torque and HP, good idle, daily usage, off road, towing, performance and fuel efficiency, 2600-3000 cruise RPM, 8.75 to 10.5 compression ratio advised.	**H-272-2**	1600-5400	**683941**[*] **683942**[*a,b] ◆3	**99278-16**[b]	216 228	272 284	112	1 35 51 (3)	.000 .000	.454 .480
Good mid range torque and HP, good idle, daily performance usage, mild bracket racing, 3000-3400 cruise RPM, 9.5 to 10.75 compression ratio advised.	**H-222/3114-2S-12**	1800-5600	**680321**[*] ◆3	**99278-16**[b] **99378-16**[*c]	222 234	278 290	112	4 38 54 0	.000 .000	.467 .494
Good mid range torque and HP, good idle, daily performance usage, mild bracket racing, 3000-3400 cruise RPM, 9.5 to 10.75 compression ratio advised. Also mild supercharged.	**H-278-2**	1800-5600	**683801**[*] **683802**[*a,b] ◆3	**99278-16**[b] **99378-16**[*c]	222 234	278 290	114	2 40 56 (2)	.000 .000	.467 .494
Good mid range to upper RPM torque and HP, fair idle, moderate performance usage, 400+ cu.in., bracket racing, 3400-3800 cruise RPM, 9.5 to 11.0 compression ratio advised.	**H-286**	2200-6000	**684321**[*] ◆3	**99278-16**[b] **99378-16**[*c]	226 226	286 286	112	6 40 50 (4)	.000 .000	.471 .471
Excellent mid range torque and HP, rough idle, bracket racing w/heavy car, auto trans w/2500+ converter, 10.0 to 11.5 compression ratio advised.	**H-228/3200-2S-8**	2600-6400	**680591**[*] ◆3	**99278-16**[b] **99378-16**[*c]	228 234	284 290	108	11 37 50 4	.000 .000	.480 .494
Good mid range to upper RPM torque and HP, rough idle, performance usage, mild bracket racing, auto trans w/3000+ converter, 3800-4200 cruise RPM, 10.0 to 11.5 compression ratio advised.	**H-302-2**	2800-6600	**684561**[*] ◆3	**99278-16**[b] **99378-16**[*c]	232 242	302 312	112	9 43 58 4	.000 .000	.504 .528

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

NOTE: These three-bolt camshafts can be used in engines originally equipped with single-bolt camshafts if the appropriate timing chain and gear assembly, 68975-1 or 68977-1 s used.

NOTE: Camshafts for Chrysler Mega Blocks with 47 degree lifter bore bank angles, and aftermarket blocks with 48 degree lifter bore bank angles are available on special order.

NOTE: For maximum performance, and to provide the most accurate valve adjustment on hydraulic lifter camshafts, the use of our **64770-16** adjustable rocker arms and **64640-16** (low block) or **64641-16** (high block) pushrods is highly recommended. Adjustable rocker arms and appropriate pushrods are required for use with mechanical lifter camshafts.

NOTE: Low Block Engines are 350-361-383-400 cu.in., while High Block Engines are 413-426-440 cu.in.

Custom Grind Cams Also Available – Call 866-388-5120 or go to cranecams.com for ordering information

CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 300*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	CAST ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
64308-1[d]	99839-16[e]	99957-16			64640-16[g] 64641-16[h]	68975-1[i] 68977-1[j]	64770-16[k] 64771-16"[l]		
64308-1[d]	99839-16[e]	99957-16			64640-16[g] 64641-16[h]	68975-1[i] 68977-1[j]	64770-16[k] 64771-16"[l]		
64308-1[d]	99839-16[e]	99957-16			64640-16[g] 64641-16[h]	68975-1[i] 68977-1[j]	64770-16[k] 64771-16"[l]		
64308-1[d]	99839-16[e]	99957-16			64640-16[g] 64641-16[h]	68975-1[i] 68977-1[j]	64770-16[k] 64771-16"[l]		
64308-1[d]	99839-16[e]	99957-16			64640-16[g] 64641-16[h]	68975-1[i] 68977-1[j]	64770-16[k] 64771-16"[l]		
64308-1[d]	99839-16[e]	99957-16			64640-16[g] 64641-16[h]	68975-1[i] 68977-1[j]	64770-16[k] 64771-16"[l]		
	99839-16[e]	99954-16	99822-16[b]		64640-16[g] 64641-16[h]	68975-1[i] 68977-1[j]	64770-16[k] 64771-16"[l]		
	99839-16[e]	99954-16	99822-16[b]		64640-16[g] 64641-16[h]	68975-1[i] 68977-1[j]	64770-16[k] 64771-16"[l]		

Section Continued

a Cam and Lifter Kit, includes installation lubricants.
b For 68-78 engines.
c For 68-78 engines, optional Hi Intensity hydraulic lifters, see page 272 for details.
d Contains standard diameter valve springs, no machining required.
e Standard diameter valve springs, no machining required.
f Must machine cylinder heads.
g Heavy wall, heat treated, for Low Block engines with adjustable rocker arms.
h Heavy wall, heat treated, for High Block engines with adjustable rocker arms.
i Performance steel billet gears and roller chain set.
j Pro Series steel billet gears and roller chain set with thrust bearing.
k 1.5 ratio iron rocker arms, adjustable, must use appropriate Crane pushrods (shafts not included).
l 1.6 ratio iron rocker arms, adjustable, must use appropriate Crane pushrods (shafts not included).

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh		Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts											
Good mid range to upper RPM torque and HP, rough idle, performance usage, mild bracket racing, auto trans w/3000+ converter, 3800-4200 cruise RPM, modern upgrade from factory Six-Pack camshaft, 10.0 to 11.5 compression ratio advised.	**H-236/348-2S-12**	3000-6800	**680601*** ◆3	**99278-16** **99378-16*a**	236 244	292 300	112	11 45 59 5		.000 .000	.522 .543
Strong mid range torque, rough idle, bracket racing, serious off road, auto trans w/3000+ converter, 10.5 to 12.0 compression ratio advised.	**H-238/3347-6**	3000-6800	**680651*** ◆3	**99278-16** **99378-16*a**	238 238	294 294	106	17 41 49 9		.000 .000	.502 .502
Good upper RPM torque and HP, Pro Street with 440+ cu.in., rough idle, performance usage, bracket racing, auto trans w/3500+ converter, 4200-4600 cruise RPM, 10.5 to 12.0 compression ratio advised.	**H-312-2**	3200-7000	**684571*** ◆3	**99278-16** **99378-16*a**	242 252	312 322	112	14 48 63 9		.000 .000	.528 .552
Moderate competition only, rough idle, good upper RPM torque and HP, bracket racing, auto trans w/3500+ converter, 10.5 to 12.0 compression ratio advised.	**H-242/3520-2-8**	3600-7200	**680701*** ◆3	**99278-16** **99378-16*a**	242 252	314 324	108	18 44 59 13		.000 .000	.528 .552
Good upper RPM torque and HP, Pro Street with 440+ cu.in., rough idle, performance usage, bracket racing, auto trans w/3500+ converter, aftermarket aluminum cylinder heads advised, 4200-4600 cruise RPM, 11.0 to 12.5 compression ratio advised.	**H-244/362-2S-12**	3800-7200	**680711*** ◆3	**99278-16** **99378-16*a**	244 252	300 308	112	15 49 63 9		.000 .000	.543 .564
Performance usage, good upper RPM and HP, Pro Street with 440+ cu.in., rough idle, bracket racing, auto trans w/3800+ converter, aftermarket aluminum cylinder heads advised, 11.5 to 13.0 compression ratio advised.	**H-248/369-2S-12**	4000-7200	**680721*** ◆3	**99278-16** **99378-16*a**	248 256	304 312	112	17 51 65 11		.000 .000	.554 .575
Moderate competition only, good upper RPM HP, bracket racing, 440+ cu.in., auto trans w/4000+ converter, 12.0 miniumum compression ratio advised.	**H-252/3680-2-8**	4000-7200	**680761*** ◆3	**99278-16** **99378-16*a**	252 262	324 334	108	23 49 64 18		.000 .000	.552 .576

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

NOTE: These three-bolt camshafts can be used in engines originally equipped with single-bolt camshafts if the appropriate timing chain and gear assembly, 68975-1 or 68977-1 is used.

NOTE: Camshafts for Chrysler Mega Blocks with 47 degree lifter bore bank angles, and aftermarket blocks with 48 degree lifter bore bank angles are available on special order.

NOTE: For maximum performance, and to provide the most accurate valve adjustment on hydraulic lifter camshafts, the use of our **64770-16** adjustable rocker arms and **64640-16** (low block) or **64641-16** (high block) pushrods is highly recommended. Adjustable rocker arms and appropriate pushrods are required for use with mechanical lifter camshafts.

NOTE: Low Block Engines are 350-361-383-400 cu.in., while High Block Engines are 413-426-440 cu.in.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

CRANE Cams®

Custom Grind Cams Also Available – Call 866-388-5120 or go to cranecams.com for ordering information

CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 300*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	CAST ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99890-16[b]	99970-16	99822-16[b]		64640-16[c] 64641-16[d]	68975-1[*e] 68977-1[*f]	64770-16[g] 64771-16[*h]		
	99890-16[b]	99970-16	99822-16[b]		64640-16[c] 64641-16[d]	68975-1[*e] 68977-1[*f]	64770-16[g] 64771-16[*h]		
	99890-16[b]	99970-16	99822-16[b]		64640-16[c] 64641-16[d]	68975-1[*e] 68977-1[*f]	64770-16[g] 64771-16[*h]		
	99890-16[b]	99970-16	99822-16[b]		64640-16[c] 64641-16[d]	68975-1[*e] 68977-1[*f]	64770-16[g] 64771-16[*h]		
	99890-16[b]	99970-16	99822-16[b]		64640-16[c] 64641-16[d]	68975-1[*e] 68977-1[*f]	64770-16[g] 64771-16[*h]		
	99890-16[b]	99970-16	99822-16[b]		64640-16[c] 64641-16[d]	68975-1[*e] 68977-1[*f]	64770-16[g] 64771-16[*h]		
	99890-16[b]	99970-16	99822-16[b]		64640-16[c] 64641-16[d]	68975-1[*e] 68977-1[*f]	64770-16[g] 64771-16[*h]		

a Optional Hi Intensity hydraulic lifters, see page 272 for details.
b Must machine cylinder heads.
c Heavy wall, heat treated, for Low Block engines with adjustable rocker arms.
d Heavy wall, heat treated, for High Block engines with adjustable rocker arms.
e Performance steel billet gears and roller chain set.
f Pro Series steel billet gears and roller chain set with thrust bearing.
g 1.5 ratio iron rocker arms, adjustable, must use appropriate Crane pushrods (shafts not included).
h 1.6 ratio iron rocker arms, adjustable, must use appropriate Crane pushrods (shafts not included).

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts — Retrofit										
Brute low end torque, smooth idle, daily usage, towing, economy, also mild turbocharged, 2200-3000 cruise RPM, 8.0 to 9.5 compression ratio advised.	**HR-204/286-2-12**	800-5200	**689501**[*a] ◆3	**68532-16**[b]	204 214	260 270	112	(5) 29 44 (10)	.000 .000	.429 .452
Excellent low end and mid range torque and HP, good idle, daily usage, off road, performance and fuel efficiency, 2600-3400 cruise RPM, 8.75 to 10.5 compression ratio advised.	**HR-214/325-2S-12**	1400-5600	**689511**[*a] ◆3	**68532-16**[b]	214 222	276 284	112	0 34 48 (6)	.000 .000	.488 .509
Good low end and mid range torque and HP, fair idle, moderate performance usage, mild bracket racing, auto trans w/2500+ converter, 3000-3800 cruise RPM, 9.5 to 10.75 compression ratio advised.	**HR-222/339-2S-12**	1800-6000	**689521**[*a] ◆3	**68532-16**[b]	222 230	284 292	112	4 38 52 (2)	.000 .000	.509 .528
Good mid range torque and HP, fair idle, performance usage, 3600-4400 cruise RPM, excellent for 440 Six-Pack, mild supercharged, 10.0 to 11.5 compression ratio advised.	**HR-230/352-2S-12**	2200-6400	**689531**[*a] ◆3	**68532-16**[b]	230 236	292 298	112	8 42 55 1	.000 .000	.528 .539
Good mid to upper RPM torque and HP, fair idle, performance usage, 3800-4600 cruise RPM, mild supercharged, 10.5 to 12.0 compression ratio advised.	**HR-234/359-2S-12**	2600-6600	**689551**[*a] ◆3	**68532-16**[b]	234 242	296 304	112	10 44 58 4	.000 .000	.539 .558
Performance usage, good mid range torque and HP, rough idle, bracket racing w/heavy car, 440+ cu.in., auto trans w/3000+ converter, 4000-4800 cruise RPM, 10.5 to 12.0 compression ratio advised.	**HR-240/365-2S-10**	2800-6600	**689561**[*a] ◆3	**68532-16**[b]	240 248	302 310	110	15 45 59 9	.000 .000	.548 .558
Good mid range and upper RPM torque and HP, rough idle, performance usage, bracket racing, 440+ cu.in., auto trans w/3200+ converter, 4000-4800 cruise RPM, good w/mild supercharged or plate nitrous system, 11.5 to 13.0 compression ratio advised.	**HR-240/365-2S-14**	3000-6800	**689541**[*a] ◆3	**68532-16**[b]	240 248	302 310	114	11 49 63 5	.000 .000	.548 .558
Good upper RPM torque and HP, performance usage, bracket racing, 470+ cu.in., auto trans w/3500+ converter, good w/manifold nitrous system, 12.0 to 13.5 compression ratio advised. Good w/supercharger, 20 lbs. maximum boost w/8.0 maximum compression ratio advised.	**HR-248/372-2S-14**	3200-7000	**689571**[*a] ◆3	**68532-16**[b]	248 256	310 318	114	15 53 67 9	.000 .000	.558 .558
Performance usage, good upper RPM torque and HP, bracket racing, 490+ cu.in., aftermarket aluminum cylinder heads advised, auto trans w/3500+ converter, good w/ large manifold nitrous system, 12.5 minimum compression ratio advised. Good w/supercharger, 22 lbs. max. boost w/8.5 max. compression ratio advised.	**HR-254/400-2S-14**	3400-7000	**689701**[*a] ◆3	**68532-16**[b]	254 262	324 332	114	17.5 56.5 69.5 12.5	.000 .000	.600 .600

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

NOTE: These three-bolt camshafts can be used in engines originally equipped with single-bolt camshafts if the appropriate timing chain and gear assembly, 68975-1 or 68977-1 is used.

NOTE: Camshafts for Chrysler Mega Blocks with 47 degree lifter bore bank angles, and aftermarket blocks with 48 degree lifter bore bank angles are available on special order.

NOTE: For maximum performance, and to provide the most accurate valve adjustment on hydraulic roller camshafts, the use of our **64770-16** adjustable rocker arms and **64628-16** (low block) or **64629-16** (high block) pushrods is highly recommended. Otherwise, special length pushrods will be required.

NOTE: Low Block Engines are 350-361-383-400 cu.in., while High Block Engines are 413-426-440 cu.in.

NOTE: For engines equipped with B-1 cylinder heads, the fourth cam bearing journal must be grooved for proper oiling. Labor operation **98088** is an available option for this service.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 300*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	CAST ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99893-16[c] 99832-16[c,d]	99969-16 99976-16[e]	99822-16[c]		64628-16[f] 64629-16[g]	68975-1*[h] 68977-1*[i]	64770-16[j] 64771-16*[k]		
	99893-16[c] 99832-16[c,d]	99969-16 99976-16[e]	99822-16[c]		64628-16[f] 64629-16[g]	68975-1*[h] 68977-1*[i]	64770-16[j] 64771-16*[k]		
	99890-16[c] 99832-16[c,d]	99970-16 99976-16[e]	99822-16[c]		64628-16[f] 64629-16[g]	68975-1*[h] 68977-1*[i]	64770-16[j] 64771-16*[k]		
	99890-16[c] 99832-16[c,d]	99970-16 99976-16[e]	99822-16[c]		64628-16[f] 64629-16[g]	68975-1*[h] 68977-1*[i]	64770-16[j] 64771-16*[k]		
	99890-16[c] 99832-16[c,d]	99970-16 99976-16[e]	99822-16[c]		64628-16[f] 64629-16[g]	68975-1*[h] 68977-1*[i]	64770-16[j] 64771-16*[k]		
	99890-16[c] 99832-16[c,d]	99970-16 99976-16[e]	99822-16[c]		64628-16[f] 64629-16[g]	68975-1*[h] 68977-1*[i]	64770-16[j] 64771-16*[k]		
	99890-16[c] 99832-16[c,d]	99970-16 99976-16[e]	99822-16[c]		64628-16[f] 64629-16[g]	68975-1*[h] 68977-1*[i]	64770-16[j] 64771-16*[k]		
	99890-16[c] 99832-16[c,d]	99970-16 99976-16[e]	99822-16[c]		64628-16[f] 64629-16[g]	68975-1*[h] 68977-1*[i]	64770-16[j] 64771-16*[k]		
	99890-16[c] 99832-16[c,d]	99970-16 99976-16[e]	99822-16[c]		64628-16[f] 64629-16[g]	68975-1*[h] 68977-1*[i]	64770-16[j] 64771-16*[k]		

a Requires cam button spacer and **66990-1** aluminum-bronze, or **66970-1** coated steel distributor drive gears.
b Vertical locking bar hydraulic roller lifters, no machining required. Special length pushrods are required, use **64628-16** (Low Block) or **64629-16** (High Block) with adjustable rocker arms.
c Must machine cylinder heads.
d Ovate wire beehive spring, requires **99976-16** retainers.
e Steel, for **99832-16** beehive springs.
f Heavy wall, heat treated, for Low Block engines with adjustable rocker arms.
g Heavy wall, heat treated, for High Block engines with adjustable rocker arms.
h Performance steel billet gears and roller chain set.
i Pro Series steel billet gears and roller chain set with thrust bearing.
j 1.5 ratio iron rocker arms, adjustable, must use appropriate Crane pushrods (shafts not included).
k 1.6 ratio iron rocker arms, adjustable, must use appropriate Crane pushrods (shafts not included).

Chrysler-Dodge-Plymouth "B" V-8 70-78

383-400-440 cu.in. with Three Bolt Gear

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 276 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Lifter Camshafts										
Good low end and mid range torque and HP, fair idle, moderate performance usage, mild bracket racing, auto trans w/2000+ converter, 10.0 to 11.5 compression ratio advised.	**F-238/3467-2-12**	2800-6600	**681201*** ◆3	**99259-16**	238 248	284 294	112	12 46 61 7	.028 .022	.520 .540
Good mid range torque and HP, rough idle, moderate performance usage, good mid-range HP, bracket racing, auto trans w/2500+ converter, serious off road, 10.0 to 11.5 compression ratio advised.	**F-248/3334-2-12**	3200-7000	**681241*** ◆3	**99259-16**	248 258	310 320	112	17 51 66 12	.022 .022	.500 .520
Good mid range torque and HP, rough idle, performance usage, bracket racing, auto trans w/3000+ converter, 10.5 to 12.0 compression ratio advised.	**F-248/3600-2-8**	3400-7000	**680931*** ◆3	**99259-16**	248 258	284 294	108	21 47 62 16	.028 .030	.540 .560
Good mid range and upper RPM torque and HP, rough idle, performance usage, bracket racing, auto trans w/3000+ converter, 4000-4400 cruise RPM, 11.0 to 12.5 compression ratio advised.	**F-250/376-2S-12**	3600-7200	**680941*** ◆3	**99259-16**	250 254	282 286	112	18 52 64 10	.020 .018	.564 .573
Replacement for factory 425 HP 426 cu.in. camshaft.	**BluePrinted 2402293**	3600-7200	**680201*** ◆1	**99259-16**	256 256	304 304	112.5	20.5 55.5 65.5 10.5	.028 .032	.504 .504
Good mid range and upper RPM torque and HP, rough idle, performance usage, bracket racing, auto trans w/3500+ converter, 11.0 to 12.5 compression ratio advised.	**F-258/3468-8**	4000-7400	**681321*** ◆3	**99259-16**	258 258	320 320	108	26 52 62 16	.022 .022	.520 .520
Moderate competition only, good mid and upper RPM HP, bracket racing, auto trans w/3500+ converter, 11.5 to 13.0 compression ratio advised.	**F-268/3868-2-8**	4600-7800	**681561*** ◆3	**99259-16**	268 278	304 314	108	31 57 72 26	.026 .026	.580 .600
Competition only, good upper RPM HP, bracket racing, 1-4 bbl., manual trans or auto trans w/4000+ converter, 383+ cu.in., 12.0 minimum compression ratio advised.	**F-274/3933-8**	4800-8000	**681681*** ◆3	**99259-16**	274 274	314 314	108	34 60 70 24	.028 .028	.590 .590
Competition only, good upper RPM HP, bracket racing, manual trans or auto trans w/4000+ converter, 440+ cu.in., 12.0 minimum compression ratio advised.	**F-278/4002-8**	5000-8200	**681701*** ◆3	**99259-16**	278 278	314 314	108	34 64 70 28	.026 .026	.600 .600
Competition only, good upper RPM HP, bracket racing, aftermarket aluminum cylinder heads advised, manual trans or auto trans w/race converter, 470+ cu.in., 13.0 minimum compression ratio advised.	**F-280/430-10**	5000-8400	**681721*** ◆3	**99259-16**	280 280	320 320	110	33 67 73 27	.018 .018	.645 .645
Radical competition only, maximum performance applications, flat tappet restricted classes, 1-4 bbl., manual trans or auto trans w/race converter, 13.0 minimum minimum compression ratio advised.	**F-288/4134-6**	5200-8400	**681941*** ◆3	**99259-16**	288 288	324 324	106	42 66 74 34	.026 .026	.620 .620

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

NOTE: These three-bolt camshafts can be used in engines originally equipped with single-bolt camshafts if the appropriate timing chain and gear assembly, 68975-1 or 68977-1 is used.

NOTE: Camshafts for Chrysler Mega Blocks with 47 degree lifter bore bank angles, and aftermarket blocks with 48 degree lifter bore bank angles are available on special order.

NOTE: To provide for valve adjustment on mechanical lifter camshafts, the use of our **64770-16** or **64790-1** adjustable rocker arms and **64621-16** (low block) or **64622-16** (high block) pushrods is highly recommended.

NOTE: Adjustable rocker arms and appropriate pushrods are required for use with mechanical lifter camshafts.

NOTE: Low Block Engines are 350-361-383-400 cu.in., while High Block Engines are 413-426-440 cu.in.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 300*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	CAST ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99890-16[a]	99970-16	99822-16[a]		64621-16[b] 64622-16[c]	68975-1*[d] 68977-1*[e]	64770-16[f] 64771-16*[g]		
	99890-16[a]	99970-16	99822-16[a]		64621-16[b] 64622-16[c]	68975-1*[d] 68977-1*[e]	64770-16[f] 64771-16*[g]		
	99890-16[a]	99970-16	99822-16[a]		64621-16[b] 64622-16[c]	68975-1*[d] 68977-1*[e]	64770-16[f] 64771-16*[g]		
	99890-16[a]	99970-16	99822-16[a]		64621-16[b] 64622-16[c]	68975-1*[d] 68977-1*[e]	64770-16[f] 64771-16*[g]		
	99893-16[a]	99954-16	99822-16[a]		64621-16[b] 64622-16[c]	64975-1[i] 68977-1*[e]	64770-16[f] 64771-16*[g]		
	99890-16[a]	99970-16	99822-16[a]		64621-16[b] 64622-16[c]	68975-1*[d] 68977-1*[e]	64770-16[f] 64771-16*[g]		
	99890-16[a]	99970-16	99822-16[a]		64621-16[b] 64622-16[c]	68975-1*[d] 68977-1*[e]	64770-16[f] 64771-16*[g]		
	99890-16[a]	99970-16	99822-16[a]		64621-16[b] 64622-16[c]	68975-1*[d] 68977-1*[e]	64770-16[f] 64771-16*[g]		
	99890-16[a]	99970-16	99822-16[a]		64621-16[b] 64622-16[c]	68975-1*[d] 68977-1*[e]	64770-16[f] 64771-16*[g]		
	99890-16[a]	99970-16	99822-16[a]		64621-16[b] 64622-16[c]	68975-1*[d] 68977-1*[e]	64770-16[f] 64771-16*[g]		
	99890-16[a]	99970-16	99822-16[a]		64621-16[b] 64622-16[c]	68975-1*[d] 68977-1*[e]	64770-16[f] 64771-16*[g]		

a Must machine cylinder heads.
b Heavy wall, heat treated, for Low Block engines with adjustable rocker arms.
c Heavy wall, heat treated, for High Block engines with adjustable rocker arms.
d Performance steel billet gears and roller chain set.
e Pro Series steel billet gears and roller chain set with thrust bearing.
f 1.5 ratio iron rocker arms, adjustable, must use appropriate Crane pushrods (shafts not included).
g 1.6 ratio iron rocker arms, adjustable, must use appropriate Crane pushrods (shafts not included).

CAMSHAFTS

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 276 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh		Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Roller Camshafts											
Excellent mid range torque and HP, fair idle, moderate performance usage, off road, mild bracket racing, auto trans w/2500+ converter, 3400-3800 cruise RPM, 10.5 to 11.5 compression ratio advised.	**SR-246/362-2S-12**	3200-7200	**688521**[*a] ◆3	**66515-16** **66542-16**[b]	246 254	296 304	112	16 50 64 10		.020 .020	.543 .561
Good mid range to upper RPM torque and HP, rough idle, moderate performance usage, mild bracket racing, auto trans w/3500+ converter, 4000-4400 cruise RPM, good w/plate nitrous system, 11.0 to 12.0 compression ratio advised.	**SR-254/374-2S-12**	3400-7200	**688531**[*a] ◆3	**66515-16** **66542-16**[b]	254 258	304 308	112	20 54 66 12		.020 .020	.561 .561
Good mid range and upper RPM torque and HP, rough idle, performance usage, oval track, bracket racing, auto trans w/3500+ converter, 11.5 to 13.0 compression ratio advised.	**R-260/420-2S-8**	3800-7600	**688801**[*a] ◆3	**66542-16**[b]	260 268	292 300	108	26 54 66 22		.020 .020	.630 .630
Good upper RPM torque and HP, moderate competition only, bracket racing, auto trans w/race converter, 12.0 minimum compression ratio advised.	**R-268/420-2-8**	4000-7800	**688811**[*a] ◆3	**66542-16**[b]	268 278	300 310	108	30 58 71 27		.020 .020	.630 .630
Competition only, good upper RPM HP, bracket racing, auto trans w/race converter, 12.5 minimum compression ratio advised.	**R-272/420-2-10**	4200-8000	**688821**[*a] ◆3	**66542-16**[b]	272 282	304 314	108	30 62 75 27		.020 .022	.630 .630
Competition only, good mid to upper RPM torque and HP, 440+ cu.in., bracket racing, auto trans w/race converter, good with plate or manifold nitrous system, aluminum aftermarket cylinder heads advised, 12.5 minimum compression ratio advised.	**R-274/454-2S-12**	4400-8200	**688651**[*a] ◆3	**66542-16**[b]	274 278	306 310	112	29 65 75 23		.020 .022	.681 .693
Competition only, good upper RPM HP, 440+ cu.in., bracket racing, auto trans w/race converter, 12.5 minimum compression ratio advised.	**R-276/420-2-10**	4400-8400	**688831**[*a] ◆3	**66542-16**[b]	276 286	308 318	110	32 64 77 29		.020 .020	.630 .630
Competition only, single 4-barrel, Super Stock 383-400 cu.in., auto trans w/race converter, 11.5 minimum compression ratio advised.	**R-280/4468-8**	4600-8200	**688981**[*a] ◆3	**66542-16**[b]	280 280	312 312	108	37 63 73 27		.028 .030	.670 .670
Competition only, Super Street, Super Gas, Pro E.T., auto trans w/race converter, aftermarket aluminum cylinder heads advised, 13.0 minimum compression ratio advised.	**R-280/450-2S4-10**	4600-8400	**688681**[*a] ◆3	**66542-16**[b]	280 288	320 328	114	33 67 77 31		.026 .026	.675 .638
Competition only, good upper RPM HP, 470+ cu.in., bracket racing, auto trans w/race converter, 13.0 minimum compression ratio advised.	**R-282/420-2-10**	4800-8600	**688841**[*a] ◆3	**66542-16**[b]	282 292	314 324	110	35 67 80 32		.020 .020	.630 .630
Competition only, Super Stock drags 426 cu.in., single 4-bbl, 11.5 minimum compression ratio advised.	**R-284/456-6**	5000-8200	**688561**[*a] ◆3	**66542-16**[b]	284 284	324 324	106	38 66 70 34		.026 .026	.684 .684
Radical competition only, maximum performance applications, Top Dragster, Top Sportsman, Quick 16, etc., 560+ cu.in., aftermarket aluminum cylinder heads required, good w/large manifold nitrous system.	**R-286/500-2S3-14**	5000-8400	**688671**[*a] ◆3	**66542-16**[b]	286 306	320 338	114	32 74 92 34		.026 .022	.750 .750

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

NOTE: These three-bolt camshafts can be used in engines originally equipped with single-bolt camshafts if the appropriate timing chain and gear assembly, 68975-1 or 68977-1 is used.

NOTE: Camshafts for Chrysler Mega Blocks with 47 degree lifter bore bank angles, and aftermarket blocks with 48 degree lifter bore bank angles are available on special order.

NOTE: Adjustable rocker arms and appropriate pushrods are required for use with roller lifter camshafts. To provide for valve adjustment on roller lifter camshafts, the use of our **64770-16** or **64790-1** adjustable rocker arms and **64621-16** (low block) or **64622-16** (high block) pushrods is highly recommended.

NOTE: Low Block Engines are 350-361-383-400 cu.in., while High Block Engines are 413-426-440 cu.in.

NOTE: For engines equipped with B-1 cylinder heads, the fourth cam bearing journal must be grooved for proper oiling. Labor operation **98088** is an available option for this service.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 300*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	CAST ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	96879-16[c] **99832-16**[c,d]	**99970-16** **99976-16**[f]	**99822-16**[c]	**99098-1**[j]	**64621-16**[m] **64622-16**[n]	**68975-1**[*o] **68977-1**[*p]	**64770-16**[q] **64771-16**[*r]		
	96879-16[c] **99832-16**[p,c]	**99970-16** **99976-16**[q]	**99822-16**[c]	**99098-1**[j]	**64621-16**[m] **64622-16**[n]	**68975-1**[*o] **68977-1**[*p]	**64770-16**[q] **64771-16**[*r]		
	99885-16[c]	**99955-16**	**99822-16**[c]	**99098-1**[j]	**64621-16**[m] **64622-16**[n]	**68975-1**[*o] **68977-1**[*p]	**64770-16**[q] **64771-16**[*r]		
	99885-16[c]	**99955-16**	**99822-16**[c]	**99098-1**[j]	**64621-16**[m] **64622-16**[n]	**68975-1**[*o] **68977-1**[*p]	**64770-16**[q] **64771-16**[*r]		
	99885-16[c]	**99955-16**	**99822-16**[c]	**99098-1**[j]	**64621-16**[m] **64622-16**[n]	**68975-1**[*o] **68977-1**[*p]	**64770-16**[q] **64771-16**[*r]		
	99885-16[c]	**99955-16**	**99822-16**[c]	**99098-1**[j]	**64621-16**[m] **64622-16**[n]	**68975-1**[*o] **68977-1**[*p]	**64770-16**[q] **64771-16**[*r]		
	99885-16[c]	**99955-16** **99681-16**[g]	**99822-16**[c]	**99098-1**[j]	**64621-16**[m] **64622-16**[n]	**68975-1**[*o] **68977-1**[*p]	**64770-16**[q] **64771-16**[*r]		
	99885-16[c]	**99955-16** **99681-16**[g]	**99822-16**[c]	**99098-1**[j]	**64621-16**[m] **64622-16**[n]	**68975-1**[*o] **68977-1**[*p]	**64770-16**[q] **64771-16**[*r]		
	99885-16[c]	**99955-16** **99681-16**[g]	**99822-16**[c]	**99098-1**[j]	**64621-16**[m] **64622-16**[n]	**68975-1**[*o] **68977-1**[*p]	**64770-16**[q] **64771-16**[*r]		
	99885-16[c]	**99955-16** **99681-16**[g]	**99822-16**[c]	**99098-1**[j]	**64621-16**[m] **64622-16**[n]	**68975-1**[*o] **68977-1**[*p]	**64770-16**[q] **64771-16**[*r]		
	96886-16[c] **961246-16**[c,e]	**99634-16**[h] **99962-16**[i]	**99828-16**[c]	**99081-1**[k] **99082-1**[l]	**64621-16**[m] **64622-16**[n]	**68975-1**[*o] **68977-1**[*p]	**64770-16**[q] **64771-16**[*r]		

a Requires cam button spacer and **66990-1** aluminum-bronze, or **66970-1** coated steel distributor drive gears.
b Ultra Pro Series roller lifters.
c Must machine cylinder heads.
d Ovate wire beehive spring, requires **99976-16** retainers.
e Triple, for 2.050" assembly height, requires **99662-16** retainers.
f Steel, for **99832-16** beehive springs.
g Titanium, Posi Stop, must use **99098-1** single groove valve stem locks, included with the retainers.
h Titanium, standard 10 degree configuration.
i Titanium, for **961246-16** valve springs.
j Machined steel Heat treated, single groove.
k Machined steel, heat treated, 10 degree for 11/32" single groove valve stems.
l Machined steel, heat treated, 10 degree for 3/8" single groove valve stems.
m Heavy wall, heat treated, for Low-Block engines with adjustable rocker arms.
n Heavy wall, heat treated, for High-Block engines with adjustable rocker arms.
o Performance steel billet gears and roller chain set.
p Pro Series steel billet gears and roller chain set with thrust bearing.
q 1.5 ratio iron rocker arms, adjustable, must use appropriate Crane pushrods (shafts not included).
r 1.6 ratio iron rocker arms, adjustable, must use appropriate Crane pushrods (shafts not included).

Chrysler-Dodge-Plymouth V-8 "Hemi 426" 66-71

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	COMPLETE CAM SPECIFICATIONS Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts										
Excellent low end torque, good idle, daily usage, 2600-3000 cruise RPM, 8.5 to 10.25 compression ratio advised.	**H-212/304-2-12**	1600-5200	**660091*** ◆3	**99278-16**	212 222	284 294	112	(1) 33 48 (6)	.000 .000	.477 .486
Great mid range torque and HP, street Hemi and Crate Motor upgrade, fair idle, mild bracket racing, auto trans w/2500+ converter, 3800-4200 cruise RPM, 10.0 to 11.5 compression ratio advised.	**H-232/3360-2-12**	2600-6000	**660611*** ◆3	**99278-16**	232 242	304 314	112	9 43 58 4	.000 .000	.528 .535
Good mid range torque and HP, street Hemi and Crate Motor upgrade, fair idle, mild bracket racing, good w/472+ cu.in., auto trans w/3000+ converter, 3800-4200 cruise RPM, 10.5 to 12.0 compression ratio advised.	**H-236/348-2S-12**	2800-6200	**660621*** ◆3	**99278-16**	236 244	292 300	112	11 45 59 5	.000 .000	.546 .550
Rough idle, performance usage, good upper RPM HP, bracket racing, auto trans w/3500+ converter, 4000-4400 cruise RPM, 11.0 to 12.5 compression ratio advised. Also good w/ supercharger, 18 lbs. maximum boost w/8.5 maximum compression ratio advised.	**H-244/362-2S-14**	3200-6600	**660631*** ◆3	**99278-16**	244 252	300 308	114	13 51 65 7	.000 .000	.568 .572
Hydraulic Roller Camshafts — Retrofit										
Great mid range torque and HP, fair idle, mild bracket racing, auto trans w/2500+ converter, 3000-3400 cruise RPM, 9.5 to 11.0 compression ratio advised.	**HR-226/345-2S1-12**	2200-6200	**669521*[a]** ◆3	**68532-16[b]**	226 230	288 292	112	6 40 52 (2)	.000 .000	.542 .535
Good mid range torque and HP, street Hemi and Crate Motor upgrade, fair idle, mild bracket racing, auto trans w/3000+ converter, 3400-3800 cruise RPM, 10.0 to 11.5 compression ratio advised.	**HR-236/359-2S-12**	2600-6600	**669531*[a]** ◆3	**68532-16[b]**	236 240	298 302	112	6 40 52 (2)	.000 .000	.564 .555
Crate Motor upgrade, rough idle, performance usage, good upper RPM torque and HP, bracket racing, auto trans w/3500+ converter, 3800-4200 cruise RPM, 10.5 to 12.0 compression ratio advised, supercharged and/or nitrous.	**HR-244/372-2S-14**	3000-6800	**669541*[a]** ◆3	**68532-16[b]**	244 248	306 310	114	13 51 63 5	.000 .000	.584 .565
Performance usage, good upper RPM torque and HP, bracket racing, auto trans w/3500+ converter, good w/472+ cu.in., good w/large nitrous system, 11.5 minumum compression ratio advised. Also supercharged, 22 lbs. maximum boost w/8.5 maximum compression ratio.	**HR-254/400-2S-14**	3400-7000	**669571*[a]** ◆3	**68532-16[b]**	254 258	324 328	114	17.5 56.5 68 10	.000 .000	.628 .608
Performance usage, good upper RPM HP, bracket racing, auto trans w/race converter, good w/496+ cu.in., good w/large nitrous system, 12.5 minumum compression ratio advised. Also supercharged, 28 lbs. maximum boost w/8.5 maximum compression ratio.	**HR-262/400-2S-14**	3600-7000	**669561*[a]** ◆3	**68532-16[b]**	262 266	332 336	114	21.5 60.5 72 14	.000 .000	.628 .608

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Due to the increased pushrod seat height of the Crane retrofit hydraulic roller lifters, the cylinder heads, and possibly the cylinder block, will have to be modified for pushrod clearance.

NOTE: Recently produced iron cylinder blocks may have taller than standard lifter bores. This may cause roller lifter guidebar interference, preventing the lifters from contacting the base circle of the camshaft. This will require clearancing, usually by grinding the block. This should be checked prior to final engine assembly.

NOTE: Camshafts for Chrysler Mega Blocks with 50 degree lifter bore bank angles, and aftermarket blocks with 48 degree lifter bore bank angles are available on special order.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

CRANE Cams®

Custom Grind Cams Also Available – Call 866-388-5120 or go to cranecams.com for ordering information

CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	CAST ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99893-16	99954-16[d]	99824-16[c]	99093-1[e]	66621-16[f]	68975-1*[g] 68977-1*[h]			
	99893-16	99954-16[d]	99824-16[c]	99093-1[e]	66621-16[f]	68975-1*[g] 68977-1*[h]			
	99893-16	99954-16[d]	99824-16[c]	99093-1[e]	66621-16[f]	68975-1*[g] 68977-1*[h]			
	99893-16	99954-16[d]	99824-16[c]	99093-1[e]	66621-16[f]	68975-1*[g] 68977-1*[h]			
	99896-16[c]	99970-16[d]	99824-16[c]	99093-1[e]	66628-16[f]	68975-1*[g] 68977-1*[h]			
	99896-16[c]	99970-16[d]	99824-16[c]	99093-1[e]	66628-16[f]	68975-1*[g] 68977-1*[h]			
	99896-16[c]	99970-16[d]	99824-16[c]	99093-1[e]	66628-16[f]	68975-1*[g] 68977-1*[h]			
	99896-16[c]	99970-16[d]	99824-16[c]	99093-1[e]	66628-16[f]	68975-1*[g] 68977-1*[h]			
	99896-16[c]	99970-16[d]	99824-16[c]	99093-1[e]	66628-16[f]	68975-1*[g] 68977-1*[h]			

a Requires cam button spacer and **66990-1** aluminum-bronze, or **66970-1** coated steel distributor drive gears.
b Vertical locking bar hydraulic roller lifters, machining possibly required (see **IMPORTANT NOTE** on opposite page). Special length pushrods are required, use **66628-16**.
c Must machine cylinder heads.
d Requires Crane Multi-Fit valve locks.
e Machined steel, heat treated, Multi-Fit.
f Heavy wall, heat treated.
g Performance steel billet gears and roller chain set.
h Pro Series steel billet gears and roller chain set with thrust bearing.

Chrysler-Dodge-Plymouth V-8 "Hemi 426" 66-71

Also: Brad Anderson aluminum, Johnson/Rodeck TFX-92, Keith Black aluminum, Milodon VII litre, and JP-1

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Lifter Camshafts										
Good low and mid range torque, street Hemi, fair idle, moderate performance usage, bracket racing, auto trans w/3000+ converter, 3600-4000 cruise RPM, 10.0 to 11.5 compression ratio advised.	**F-238/3200-2-12**	2800-6400	**661201*** ◆3	**99259-16**	238 248	300 310	112	12 46 61 7	.022 .022	.502 .507
Good mid range torque and HP, Crate Motor upgrade, rough idle, moderate performance usage, bracket racing, auto trans w/3500+ converter, 10.5 to 12.0 compression ratio advised. Also mild supercharged and/or nitrous.	**F-248/3600-2-12**	3600-7000	**660941*** ◆3	**99259-16**	248 258	294 304	112	17 52 66 12	.028 .030	.565 .568
Rough idle, moderate performance usage, bracket racing, auto trans w/4000+ converter, 11.5 to 13.0 compression ratio advised. Also mild supercharged and/or nitrous.	**F-260/391-2S-10**	4000-7200	**661381*** ◆3	**99259-16**	260 264	292 296	110	25 55 67 17	.018 .018	.614 .603
Mechanical Roller Camshafts										
Good low end and mid range torque and HP, Crate Motor upgrade, good idle, moderate performance usage, mild bracket racing, auto trans w/2500+ converter, 3200-3600 cruise RPM, 10.0 to 11.5 compression ratio advised. Also mild supercharged and/or nitrous.	**SR-238/350-2S-12**	3000-7000	**668511*[a]** ◆3	**66515-16** **66542-16[b]**	238 246	288 296	112	42 46 60 6	.020 .020	.550 .550
Good mid range torque and HP, Crate Motor upgrade, fair idle, moderate performance usage, mild bracket racing, auto trans w/2500+ converter, 3400-3800 cruise RPM, 10.5 to 11.5 compression ratio advised. Also mild supercharged and/or nitrous.	**SR-246/362-2S-12**	3200-7200	**668521*[a]** ◆3	**66515-16** **66542-16[b]**	246 254	296 304	112	16 50 64 10	.020 .020	.568 .568
Good mid range and upper RPM torque and HP, rough idle, mild bracket racing, auto trans w/3000+ converter, 11.0 to 12.5 compression ratio advised. Also mild supercharged and/or nitrous.	**SR-254/374-2S-12**	3600-7600	**668531*[a]** ◆3	**66515-16** **66542-16[b]**	254 262	304 312	112	20 54 68 14	.020 .020	.587 .565
Performance usage, Pro Street, mild bracket racing, auto trans w/race converter, 12.0 to 13.5 compression ratio advised. Also mild supercharged and/or nitrous.	**SR-262/400-2S-12**	3800-7600	**668541*[a]** ◆3	**66515-16** **66542-16[b]**	262 266	300 304	112	24 58 70 16	.020 .020	.628 .608
Performance usage, bracket racing, auto trans w/race converter, good w/large nitrous system, 12.0 to 13.5 compression ratio advised. Also supercharged w/22 lbs. maximum boost w/8.5 maximum compression ratio.	**R-262/452-2S-12**	4000-7800	**668301*[a]** ◆3	**66515-16** **66542-16[b]**	262 276	291 312	112	24 58 73 23	.020 .020	.710 .699
Competition only, bracket racing w/heavy car, single 4 bbl, auto trans w/race converter, 12.0 to 13.5 compression ratio advised.	**R-274/4334-8**	4400-8000	**668281*[a]** ◆3	**66515-16** **66542-16[b]**	274 274	314 314	108	32 62 68 26	.026 .026	.680 .659

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

NOTE: Recently produced iron cylinder blocks may have taller than standard lifter bores, causing roller lifter guidebar interference, preventing the lifters from contacting the base circle of the camshaft. This will require clearancing, usually by grinding the block. You must check for this prior to final engine assembly.

NOTE: Camshafts for Chrysler Mega Blocks with 50 degree lifter bore bank angles, and aftermarket blocks with 48 degree lifter bore bank angles are available on special order.

NOTE: Roller camshafts for the Keith Black 48º, Brad Anderson, and Johnson/Rodeck TFX-92 engines, with either standard, 2.125" or 60mm cam bearing journals, are available on special order. Contact Crane's Performance Consultants for details.

NOTE: Roller camshafts for the 2.125" 1-4 journal diameter configuration and those having 60mm journals are available with the 4/7 firing order swap (1-8-7-3-6-5-4-2).

NOTE: Custom ground tool steel roller camshafts are available for the 2.125" 1–4 journal diameter, and the 60mm journal diameter configuration blocks.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	CAST ROCKER ARMS	ALUMINUM ROCKERS — ENERGIZER	ALUMINUM ROCKERS — GOLD RACE
	99893-16	99954-16[d]	99824-16[c]	99093-1[e]	65689-16[f]	68975-1[*g] 68977-1[*h]			
	99893-16	99954-16[d]	99824-16[c]	99093-1[e]	65689-16[f]	68975-1[*g] 68977-1[*h]			
	99893-16	99954-16[d]	99824-16[c]	99093-1[e]	65689-16[f]	68975-1[*g] 68977-1[*h]			
	96878-16[c]	99970-16[d]	99824-16[c]	99085-1[e]	65689-16[f]	68975-1[*g] 68977-1[*h]			
	96878-16[c]	99970-16[d]	99824-16[c]	99085-1[e]	65689-16[f]	68975-1[*g] 68977-1[*h]			
	96878-16[c]	99970-16[d]	99824-16[c]	99085-1[e]	65689-16[f]	68975-1[*g] 68977-1[*h]			
	96878-16[c]	99970-16[d]	99824-16[c]	99085-1[e]	65689-16[f]	68975-1[*g] 68977-1[*h]			
	96886-16[c]	99970-16[d]	99824-16[c]	99085-1[e]	65689-16[f]	68975-1[*g] 68977-1[*h]			
	96886-16[c]	99970-16[d]	99824-16[c]	99085-1[e]	65689-16[f]	68975-1[*g] 68977-1[*h]			

Section Continued ➥

a Requires cam button spacer and **66990-1** aluminum-bronze, or **66970-1** coated steel distributor drive gears.
b Ultra Pro Series roller lifters.
c Must machine cylinder heads.
d Requires Crane Multi-Fit valve locks.
e Machined steel, heat treated, Multi-Fit.
f Heavy wall, heat treated.
g Performance steel billet gears and roller chain set.
h Pro Series steel billet gears and roller chain set with thrust bearing.

Chrysler-Dodge-Plymouth V-8 "Hemi 426" 66-71

Also: Brad Anderson aluminum, Johnson/Rodeck TFX-92, Keith Black aluminum, Milodon VII litre, and JP-1

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 276 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh		Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Roller Camshafts											
Competition only, NHRA A/FD.	**R-276/5401-2S-13XBB 48D**	4000-6800	**668821**[*a,b,c]	**66547-16**[e]	276 282	305 311	113	25 74	71 28	.020 .022	.848 .821
Competition only, serious race Super Stock w/2-4's, SFO (1-8-7-3-6-5-4-2) firing order.	**R-276/555-2S-13XBBA SFO**	5500-8500	**668351**[*a,b,d]	**66542-16**[f]	276 294	306 324	113	26 82	70 32	.020 .022	.871 .798
Competition only, drag racing single 4-barrel Super Stock, manual or auto trans w/race converter, 12.0 minimum compression ratio advised.	**320-324-12R**	4400-8400	**668951**[*a]	**66542-16**[f]	284 286	320 324	112	32 77	72 29	.028 .030	.785 .760
Competition only, Nostalgia F/C.	**R-292/480-10XBB 48D**	5000-8500	**668311**[*a,b,c]	**66547-16**[e]	292 292	332 332	110	36 76	76 36	.026 .026	.754 .730
Competition only, Nostalgia A/GS.	**R-292/500-2S4-14XBBA 48D**	5500-9500	**668321**[*a,b,c]	**66542-16**[f] **95542-16**[g]	292 296	332 336	114	35 85	77 31	.026 .026	.785 .760
Competition only, maximum performance, baseline high RPM normally aspirated applications, 12.5 minimum compression ratio advised.	**R-296/4778-8**	4600-8600	**669091**[*a]	**66542-16**[f]	296 296	328 328	108	42 78	74 38	.024 .026	.750 .726
Competition only, supercharged alcohol dragster up to 480 cu.in.	**R-296/4778-2S-14** **R-296/4778-2S-14XBBA 48D**	6000-10000	**669101**[*a] **669161**[*a,b,c]	**66542-16**[f] **95542-16**[g]	296 300	328 322	114	39 89	77 31	.024 .026	.750 .775
Competition only, supercharged alcohol funny car over 480 cu.in.	**R-296/500-16** **R-296/500-16 48D** **R-296/500-16 XBBA 48D**	6000-9600	**669121**[*a] **669131**[*a,c] **669171**[*a,b,c]	**66542-16**[f] **95542-16**[g]	296 296	336 336	116	35 87	81 29	.026 .026	.785 .760
Competition only, supercharged alcohol funny car over 480 cu.in., Pro Mod, with rigid valve train, SFO (1-8-7-3-6-5-4-2) firing order.	**R-296/5001-16XBBA 48D SFO**	6000-9600	**668331**[*a,b,c,d]	**66542-16**[f] **95542-16**[g]	296 296	330 330	116	36 88	80 28	.020 .022	.785 .760
Competition only, baseline supercharged Fuel Dragster or Funny Car, and Blown Fuel Hydro.	**R-298/4778-14XBB 48D**	5000-8600	**669181**[*a,b,c]	**66549-16**[h]	298 298	330 330	114	37 85	81 33	.026 .026	.750 .726
Competition only, Top Fuel Dragster and Funny Car.	**R-302/500-2SR-14XBB 48D**	5000-8600	**668341**[*a,b,c]	**66549-16**[h]	302 298	342 338	114	37 83	85 35	.026 .026	.785 .760

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

NOTE: Recently produced iron cylinder blocks may have taller than standard lifter bores, causing roller lifter guidebar interference, preventing the lifters from contacting the base circle of the camshaft. This will require clearancing, usually by grinding the block. you must check for this prior to final engine assembly.

NOTE: Camshafts for Chrysler Mega Blocks with 50 degree lifter bore bank angles, and aftermarket blocks with 48 degree lifter bore bank angles are available on special order.

NOTE: Camshafts for the Keith Black 48º, Brad Anderson, and Johnson/Rodeck TFX-92 engines, with either standard, 2.125" or 60mm cam bearing journals, are available on special order. Contact Crane's Performance Consultants for details.

NOTE: Camshafts for the 2.125" 1-4 journal diameter configuration and those having 60mm journals are available with the 4/7 firing order swap (1-8-7-3-6-5-4-2).

NOTE: Custom ground tool steel roller camshafts are available for the 2.125" 1–4 journal diameter, and the 60mm journal diameter configuration blocks.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	CAST ROCKER ARMS	ALUMINUM ROCKERS — ENERGIZER	ALUMINUM ROCKERS — GOLD RACE
	96848-16[i] **961356-16**[t]	**99681-16**[k] **99663-16**[v]	**99826-16**[n]	**99097-1**[r,o]					
	96849-16[j] **961355-16**[u]	**99656-16**[l] **99663-16**[v]	**99825-16**[o]	**99093-1**[s,p]					
	96848-16[i] **961356-16**[t]	**99656-16**[l] **99663-16**[v]	**99825-16**[o]	**99093-1**[s,p]	**66624-16**				
	96849-16[j] **961356-16**[t]	**99681-16**[k] **99663-16**[v]	**99826-16**[n]	**99097-1**[r,o]					
	96849-16[j] **961355-16**[u]	**99681-16**[k] **99663-16**[v]	**99826-16**[n]	**99097-1**[r,o]					
	96848-16[i] **961355-16**[u]	**99656-16**[l] **99663-16**[v]	**99825-16**[o]	**99093-1**[s,p]	**66624-16**				
	96848-16[i] **96849-16**[j] **961355-16**[u]	**99681-16**[k] **99663-16**[v]	**99826-16**[n]	**99097-1**[r,o]					
	96848-16[i] **96849-16**[j] **961355-16**[u]	**99681-16**[k] **99663-16**[v]	**99826-16**[n]	**99097-1**[r,o]					
	96848-16[i] **96849-16**[j] **961355-16**[u]	**99681-16**[k] **99663-16**[v]	**99826-16**[n]	**99097-1**[r,o]					
	96849-16[j] **961355-16**[u]	**99681-16**[k] **99678-16**[m] **99663-16**[v]	**99826-16**[n] **99828-16**[p]	**99097-1**[r,o] **99098-1**[r,q]					
	96849-16[j] **961355-16**[u]	**99681-16**[k] **99678-16**[m] **99663-16**[v]	**99826-16**[n] **99828-16**[p]	**99097-1**[r,o] **99098-1**[r,q]					

a Requires cam button spacer and **66990-1** aluminum-bronze, or **66970-1** coated steel distributor drive gears.
b 9310 steel camshaft with 2.125" cam bearing journals.
c For 48° lifter bank angle blocks.
d Camshaft has SFO firing order 1-8-7-3-6-5-4-2.
e Ultra Pro Series 1.000" diameter roller lifters for standard to .200" spread lifter bore blocks, requires cylinder block machining.
f Ultra Pro Series roller lifters.
g Ultra Pro Series roller lifters for .100 to .200" spread lifter bore blocks.
h Ultra Pro Series 1-1/16" diameter roller lifters for standard to .200" spread lifter bore blocks, requires cylinder block machining.
i For 2.100" assembly height, cylinder head machining may be required.
j For 2.200" assembly height, cylinder head machining may be required.
k Titanium, for 11/32" valve stems, must use **99097-1** valve stem locks (included with the retainers) and **99421-16** lash caps.
l Requires Crane Multi-Fit valve locks.
m Titanium, for 3/8" valve stems, must use **99098-1** valve stem locks (included with the retainers) and **99422-16** lash caps.
n Must machine cylinder heads.
o For 11/32" valve stems.
p For 5/16" valve stems.
q For 3/8" valve stems.
r Machined steel, heat treated.
s Machined steel, heat treated, Multi-Fit.
t Small diameter, low mass, Pacaloy wire for 2.100" assembly height. Requires **99963-16** titanium retainers.
u Small diameter, low mass, Pacaloy wire for 2.175" assembly height. Requires **99963-16** titanium retainers.
v Titanium, for **961356-16** and **961355-16** springs, requires Crane Multi Fit valve locks.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 266 FOLLOWERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Valve Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Follower Camshafts										
Excellent low end torque, smooth idle, upgrade for stock applications, economy, 1800-2400 cruise RPM, standard compression ratio advised.	**H-260-2**	1400-4600	**190021*** ◆3	**19800-8**	212 220	260 268	112	(1) 33 47 (7)	.000 .000	.415 .425
Good low end torque, smooth idle, daily usage, off road, towing, economy, also mild turbocharged, 2200-2600 cruise RPM, 8.75 to 10.0 compression ratio advised.	**H-270**	1400-4600	**194611*** ◆3	**19800-8**	218 218	270 270	113	1 37 47 (9)	.000 .000	.415 .415
Good low and mid-range torque, good idle, daily usage and off road, performance and fuel efficiency, turbocharged performance, 2600-3000 cruise RPM, 9.5 to 11.0 compression ratio advised.	**H-272-2**	1800-5200	**194621*** ◆3	**19800-8**	226 234	272 280	110	8 38 52 2	.000 .000	.420 .420
Fair idle, moderate performance usage, mini stock short oval, good mid-range HP, 3000-3400 cruise RPM, 10.0 to 11.5 compression ratio advised.	**H-278-2**	2400-5600	**190071*** ◆3	**19800-8**	234 242	278 286	110	12 42 56 6	.000 .000	.460 .480
Mechanical Follower Camshafts										
Moderate competition, good mid and upper RPM torque & HP, mini stock short oval, 10.0 to 11.5 compression ratio advised.	**FOR-272-2-10**	2500-6000	**192211*a** ◆3	**19800-8**	232 242	272 282	110	11 41 66 6	.008 .008	.435 .460
Moderate competition only, good mid and upper RPM torque & HP, mini stock short oval, 10.5 to 12.0 compression ratio advised.	**FOR-300-6**	3200-7000	**192251*a** ◆3	**19800-8**	264 264	300 300	106	30 54 62 22	.010 .010	.510 .510
Moderate competition only, good mid and upper RPM HP, mini stock long oval, 11.0 to 12.5 compression ratio advised.	**FOR-300-8**	3400-7200	**192221*a** ◆3	**19800-8**	264 264	300 300	108	29 55 65 19	.010 .010	.510 .510
Competition only, radical turbocharged, drag racing, high RPM road course, prepared cylinder head recommended.	**FOR-310-2R-8**	4200-8200	**192261*a** ◆3	**19800-8**	274 264	310 300	108	34 60 64 19	.010 .010	.535 .510
Competition only, good mid and upper RPM HP, mini stock, long oval track or road course, 12.0 minimum compression ratio advised.	**FOR-310-8**	4000-7600	**192241*a** ◆3	**19800-8**	274 274	310 310	108	34 60 70 24	.010 .010	.535 .535
Radical competition only, high RPM maximum performance applications, high boost and RPM turbocharged, 13.0 minimum compression ratio advised.	**FOR-320-10**	4600-8400	**192231*a** ◆3	**19800-8**	284 284	320 320	110	37 67 77 27	.010 .010	.560 .560

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT NOTE: Certain special order camshafts are not warranted against lobe wear.

NOTE: Although 1988 and later 2.3L and 2.5L engines are equipped with a composite steel camshaft and roller followers, conventional camshafts and followers can be fitted to them.

NOTE: To install mechanical type camshafts in the Ford 2300 c.c. engine, a methaod of effecting valve adjustment must be provided. Remove the hydraulic adjuster bodies from the cylinder head, then mill the top of the adjuster boss down .200". Machine 8 press-in sleeves from steel, approximately 1.700" long to replace the hydraulic adjusters. Drill and tap the center of each sleeve to 14mm x 1.25. The sleeves should then be pressed into the head, and secured by pinning or with a locking compound. The 71-74 Ford 2000 c.c. OHC engine's adjusters and locking nuts can then be used to provide valve adjustment. The rocker stabilizer springs from the 71-74 Ford 2000 c.c. OHC engine should also be used to maintain follower to valve stem contact.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

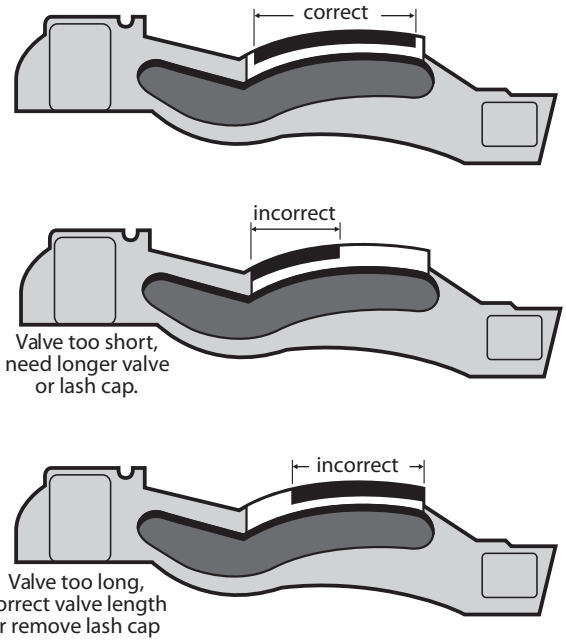
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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING BELT AND SPROCKET ASSEMBLY	STEEL ROCKER ARMS	ALUMINUM ROCKERS — ENERGIZER	ALUMINUM ROCKERS — GOLD RACE
	99882-8[b]								
	99882-8[b]								
	99882-8[b]								
	99884-8[c]	99967-8	99820-8[c]						
	99884-8	99967-8	99820-8						
	99884-8[b]	99967-8	99820-8[b]						
	99884-8[b]	99967-8	99820-8[b]						
	99884-8[b]	99967-8	99820-8[b]						
	99884-8[b]	99967-8	99820-8[b]						
	99884-8[b]	99967-8	99820-8[b]						

To avoid premature wear of the cam lobes the proper valve train geometry must be obtained. Put machinist dye (such as Dykem Layout Fluid) on the contact surface of the rocker followers. Hand turn the camshaft and observe the wear pattern created by the lobes. The drawing below shows you the correct and incorrect pattern. If necessary, correct the valve stem length or use a lash cap to obtain the correct pattern.



a Requires **99423-8** lash caps.
b Standard diameter valve springs, no machining required.
c Must machine cylinder head.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 266 FOLLOWERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Valve Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Follower Camshafts										
Excellent low end torque, smooth idle, daily usage, upgrade for stock applications, performance and fuel efficiency, 2200-3000 cruise RPM, 8.5 to 19.75 compression ratio advised.	**RFOR-214/420-12**	1000-4200	**199541*** ◆3		214 214	252 252	112	0 34 44 (10)	.000 .420 .000 .420
Good low end torque, good idle, daily usage, off road, performance and fuel efficiency, turbocharged performance, 2600-3200 cruise RPM, 8.75 to 10.5 compression ratio advised.	**RFOR-226/420-2S-12**	1400-4600	**199501*** ◆3		226 234	274 282	112	6 40 54 0	.000 .420 .000 .420
Good mid range torque, fair idle, moderate performance usage, good mid-range HP, autocross, medium oval track, bracket racing, auto w/2500+ converter, 3200-3600 cruise RPM, 9.5 to 10.75 compression ratio advised.	**RFOR-234/450-8**	2000-5600	**199511*** ◆3		234 234	282 282	108	14 40 50 4	.000 .450 .000 .450
Rough idle, performance usage, good mid-range torque and HP, oval track, bracket racing, auto w/3000+ converter, 10.0 to 11.5 compression ratio advised.	**RFOR-242/480-8**	2800-6600	**199521*** ◆3		242 242	290 290	108	18 44 54 8	.000 .480 .000 .480
Rough idle, performance usage, good upper RPM HP, oval track, bracket racing, auto w/3500+ converter, 10.5 to 12.0 compression ratio advised.	**RFOR-250/510-10**	3200-7000	**199531*** ◆3		250 250	298 298	110	20 50 60 10	.000 .510 .000 .510
Mechanical Roller Follower Camshafts										
Moderate competition only, good mid range RPM torque and HP, short oval track, bracket racing, auto w/3200+ converter, 10.5 to 12.0 compression ratio advised.	**RFOR-252/560-6**	3200-7000	**198091*** ◆3		252 252	284 284	106	24 48 56 16	.010 .560 .012 .560
Moderate competition only, good mid and upper RPM torque and HP, long oval track, bracket racing, auto w/4000+ converter, 11.5 minimum compression ratio advised.	**RFOR-260/584-8**	3600-7400	**198101*** ◆3		260 260	292 292	108	27 53 63 17	.010 .584 .012 .584
Competition only, good mid and upper RPM torque and HP, oval track, road course, bracket racing, auto w/ race converter, 12.0 minimum compression ratio advised.	**RFOR-268/608-6**	4000-7800	**198131*** ◆3		268 268	300 300	106	32 56 64 24	.010 .608 .012 .608
Competition only, high RPM maximum performance applications, bracket racing, auto w/race converter, 12.5 minimum compression ratio advised, also high boost/high RPM turbocharged.	**RFOR-276/632-8**	4600-8400	**198161*** ◆3		276 276	308 308	108	35 61 71 25	.010 .632 .012 .632

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT NOTE: Hydraulic Roller Camshafts are designed to be used with a Ford stock length valve. Failure to do this will give incorrect gross lift, incorrect rocker geometry, and cause premature wear and loss of power.

IMPORTANT NOTE: Mechanical roller cams must use a valve that is 4.900" overall length, such as a small block Chevrolet valve. There should be .300" from tip of valve to top of keeper groove. This valve combined with Crane springs, retainers and locks will enable you to obtain proper valve spring assembly height and give you a .090" cushion from coil bind.

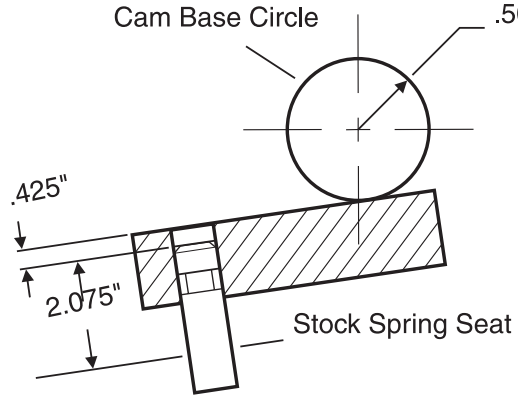
*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING BELT AND SPROCKET ASSEMBLY	STEEL ROCKER ARMS	ALUMINUM ROCKERS — ENERGIZER	ALUMINUM ROCKERS — GOLD RACE
	99884-8[a]	99967-8	99820-8[a]						
	99884-8[a]	99967-8	99820-8[a]						
	99884-8[a]	99967-8	99820-8[a]						
	99884-8[a]	99967-8	99820-8[a]						
	99884-8[a]	99967-8	99820-8[a]						
	99838-8[a]	99936-8	99820-8[a]	99096-1[b]					
	99838-8[a]	99936-8	99820-8[a]	99096-1[b]					
	99838-8[a]	99936-8	99820-8[a]	99096-1[b]					
	99838-8[a]	99936-8	99820-8[a]	99096-1[b]					



To arrive at the correct valve train geometry for a mechanical roller cam, the valve stem height must be checked. If the spring seats are stock, a dimension of 2.075" to the tip of the valve must be obtained. If the spring seats have been machined, then an alternate method of measuring must be used. Make a gauge from a block of material, by drilling an 11/32" perpendicular through hole. Insert the gauge over the valve stem and hold the flat side against the (.500" radius) base circle of the cam lobe. The dimension from the top surface of the gauge to the valve tip must be .425".

NOTE: To install Mechanical Type Camshafts in the Ford 2300 c.c. engine, a method of effecting valve adjustment must be provided. Remove the hydraulic adjuster bodies from the cylinder head, then mill the top of the adjuster boss down .200". Machine 8 press-in sleves from steel, approximately 1.700" long to replace the hydraulic adjusters. Drill and tap the center of each sleeve to 14mm x 1.25. The sleeves should then be pressed into the head, and secured by pinning or with a locking compound. The 71-74 Ford 2000 c.c. OHC engine's adjusters and locking nuts can then be used to provide valve adjustment. The rocker stabilizer springs from the 71-74 Ford 2000 c.c. OHC engine should also be used to maintain follower to adjuster contact.

a Must machine cylinder head.
b Machined steel, heat treated. Required to obtain correct assembly height.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 266 FOLLOWERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Cold Int. Exh.	Gross Lift Int. Exh.
Mechanical Lifter Camshafts										
Good low and mid range power, manual or auto trans OK, advise low restriction air intake and header with free-flowing exhaust	**F-210/374-2SR-10**	1000-6500	**223-0010*** ◆3		210 206	232 228	110	(1) 31 37 (11)	.008 .010	.374 .366
Moderate performace usage, good mid range to upper RPM power, manual trans, advise upgraded air intake system, header with free-flowing exhaust.	**F-214/382-2SR-9**	2000-7000	**223-0012*** ◆3		214 210	236 232	109	1 33 38 (8)	.008 .010	.382 .374
Performance usage, upper RPM power, manual trans, good intake and exhaust with ported head recommended, good with nitrous or supercharger, 10.5 to 12.0 compression ratio advised.	**F-218/390-2SR-10**	3000-8000	**223-0014*** ◆3		218 214	240 236	110	2 36 41 (7)	.008 .010	.390 .382

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

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CRANE VALVE TRAIN COMPONENTS

VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING BELT AND SPROCKET ASSEMBLY	STEEL ROCKER ARMS	ALUMINUM ROCKERS	
See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	ENERGIZER *See pg. 295*	GOLD RACE *See pg. 297*

Radical custom grinds are available on special order. Popular profiles include:
F-226/410 F-236/435 F-246/460
The maximum performance racing camshafts for these engines are produced in two versions: Stock base circle (1.418"), that will work with standard length valves, but will require the cylinder head casting to be clearanced for lobe clearance. Otherwise, the nose of the lobe will contact the head. Reduced base circle (1.318"), that will work with either stock length valves plus a .050" thick lash cap (Ferrea C10011), or with .050" longer valves. Lobe to cylinder head clearance should still be checked, particularly with the .460" lift grinds. You must specify the base circle diameter when ordering. These camshafts will not be applicable to the Focus SVT engines, due to their unique cam phaser and cam position sensors.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts										
Brute low end torque, smooth idle, daily usage, fuel economy, 1600-2200 cruise RPM, 7.75 to 8.75 compression ratio advised.	**H-192/2667-2S-12**	800-4200	**500511*** ◆3	**99280-12**	192 204	248 260	112	(11) 23 39 (15)	.000 .000	.429 .458
Good low end torque, smooth idle, daily usage, off road, towing, economy, also mild turbocharged, 2200-2600 cruise RPM, 8.0 to 9.5 compression ratio advised.	**H-260-2**	1200-4600	**503901*** ◆3	**99280-12**	204 216	260 272	112	(5) 29 45 (9)	.000 .000	.458 .487
Good low and mid range torque, good idle, daily usage and off road, towing, performance and fuel efficiency, 2600-3000 cruise RPM, 8.75 to 10.5 compression ratio advised.	**H-272-2**	1800-5400	**503941*** ◆3	**99280-12**	216 228	272 284	112	1 35 51 (3)	.000 .000	.487 .515
Good low and mid range torque, fair idle, moderate performance usage, limited 1/4 - 3/8 mile oval track, serious off road, mild bracket racing, auto with 2500+ converter, 8.75 to 10.5 compression ratio advised.	**H-224/309-2-6**	2200-5600	**500211*** ◆3	**99280-12**	224 234	288 298	106	10 34 47 7	.000 .000	.497 .523
Good mid to upper RPM torque and HP, performance usage, 3/8 - 1/2 mile oval track, radical off road, bracket racing, 11.0 to 12.25 compression ratio advised.	**H-238/3347-8**	3200-6400	**500641*** ◆3	**99280-12**	238 238	294 294	108	16 42 52 6	.000 .000	.539 .539
Mechanical Lifter Camshafts										
Good mid range torque and HP, fair idle, moderate performance usage, off road, mild bracket racing, auto trans with 2000+ converter, 3400-3800 cruise RPM, 10.0 to 11.5 compression ratio advised.	**F-238/3200-2-10**	2600-6000	**501181*** ◆3	**99257-12**[a]	238 248	304 314	110	14 44 59 9	.022 .022	.515 .537
Good upper to upper RPM torque and HP, 3/8 - 1/2 mile oval track, serious off road, bracket racing, auto with 2500+ converter, 11.5 minimum compression ratio advised.	**F-246/359-2S-6**	3000-6200	**501211*** ◆3	**99257-12**[a]	246 250	282 286	106	21 45 55 15	.012 .012	.578 .589
Good upper RPM HP, performance usage, 3/8 - 1/2 mile oval track, bracket racing, auto with 3000+ converter, 12.0 minimum compression ratio advised.	**F-256/3634-2S-8**	3600-6800	**501311*** ◆3	**99257-12**[a]	256 264	292 300	108	23 53 63 21	.026 .026	.585 .604

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

NOTE: Roller camshafts and kit components are available on special order.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING GEAR ASSEMBLY	STEEL ROCKER ARMS	ALUMINUM ROCKERS — ENERGIZER	ALUMINUM ROCKERS — GOLD RACE
	99838-12	99944-12	99820-12[b]	99097-1[c]	50621-12[d]				
	99838-12	99944-12	99820-12[b]	99097-1[c]	50621-12[d]				
	99838-12	99944-12	99820-12[b]	99097-1[c]	50621-12[d]				
	99838-12	99944-12	99820-12[b]	99097-1[c]	50621-12[d]				
	99838-12	99944-12	99820-12[b]	99097-1[c]	50621-12[d]				
	99893-12	99953-12	99820-12[b]	99097-1[c]	50621-12[d]				
	99893-12	99953-12	99820-12[b]	99097-1[c]	50621-12[d]				
	99893-12	99953-12	99820-12[b]	99097-1[c]	50621-12[d]				

a Requires appropriate Crane pushrods.
b Must machine cylinder head.
c Machined steel, heat treated.
d Heavy wall, heat treated.

1962–1987 221-255 (4.2L) – 260-289-302 (5.0L) cu.in. V8 and 1988–1995 302 (5.0L) cu.in. V8 trucks (except 1982-1995 302 (5.0L) H.O.)

Ford's modern line of small block V8 engines was introduced in 1962, with the 221 and 260 cu.in. versions. This engine family (properly referred to as the Windsor, even if it isn't the 351 cu.in. variety) has inline lifter bores in the block, and cylinder heads with inline valves equipped with 1.6:1 ratio rocker arms. The firing order is 1-5-4-2-6-3-7-8.

These engines are designated by Crane's 36 prefix. We offer hydraulic, hydraulic roller (retrofit and OE style), mechanical, and mechanical roller camshafts for them. A wide-ranging line of valve train components is also available.

The 1962 and 1963 cylinder heads have 5/16" diameter valve stems (different valve spring retainers, valve locks, and valve stem seals required), while the 1964 and later engines have 11/32" valve stems.

From 1962 to 1965, the rocker arm studs were a straight 3/8" diameter adjustable configuration. In 1966, bottleneck 3/8 – 5/16" rocker arm studs were installed, resulting in a non-adjustable configuration. The exception would be the HiPo 289 engines, offered through 1967, which had mechanical lifter camshafts, and retained the adjustable style straight 3/8" studs. Our **99768-16** positive locking nuts will permit valve adjustment on the bottleneck stud applications. In 1977, a net lash pedestal mount rocker arm system was installed, continuing with the remainder of production through 1995. These pedestal mount rocker cylinder heads can be easily converted to an adjustable configuration for hydraulic and hydraulic roller street applications by using our Pushrod Guideplate Conversion Kits. Part number **36655-16** provides for 3/8" stud mounted adjustable rocker arms, and **36656-16** is for 7/16" stud mounted rocker arms. No machining is necessary, and your standard pushrods can be maintained, thanks to the composite bushing inserts in the pushrod guideplates. For mechanical and mechanical roller applications, we advise the heads be machined for screw-in rocker arm studs and pushrod guideplates.

The production and aftermarket cylinder heads for the Windsor and Cleveland families all have the same valve layout, with the exception of the Gurney-Weslake pieces. If you are fortunate to have a set of these, we can custom produce a roller camshaft having the proper lobe layout.

Most 1985-1987 302, all 1988-97 302 passenger car, and all 1996-2000 302 truck engines are equipped with hydraulic roller camshafts and lifters. The firing order of 1-5-4-2-6-3-7-8 is maintained for these applications. Conventional hydraulic, mechanical, and roller lifter camshafts can be installed in these engines if the appropriate kit components are used.

The 1985-95 302 H.O. engines, although closely related, have a different firing order, and are discussed later on this page.

1969–1970 Boss 302 V8

Specifically developed for the Trans Am road racing series, the Boss 302 had canted valve "Cleveland" style cylinder heads installed on the 302 block. Since these heads have large ports and valves, and are intended for constant high RPM usage, a street driven application should have a relatively mild camshaft installed to enhance the torque and drivability. Rocker arm studs are a straight 7/16" diameter, with adjustable 1.73:1 ratio rocker arms required for the factory installed mechanical lifter camshaft. Although the valves are staggered, the same length pushrods are used for the intake and exhaust.

Due to the Boss heads' different valve spring requirements, and the increased rocker ratio, this engine is designated by Crane's 27 prefix (even though the camshaft is physically the same as the 36 prefix). We offer hydraulic, retrofit hydraulic roller, mechanical, and mechanical roller camshafts for them. An extensive line of valve train components is also available.

1985––1995 5.0L (302) H.O. V8

Although closely related to the standard 302, the 1985-95 5.0L H.O. are equipped with hydraulic roller lifters, with camshafts having a firing order of 1-3-7-2-6-5-4-8 (the same as the 351 Windsor). Our 44 prefix designates these engines. The camshafts are dimensionally the same as the 36 prefix, with the different firing order constituting the primary change. Camshafts can be interchanged, providing the necessary changes are performed for the proper firing order.

We offer hydraulic, hydraulic roller, mechanical, and mechanical roller camshafts. A wide-ranging line of valve train components is also available.

The standard pedestal mount rocker cylinder heads can be easily converted to an adjustable configuration for hydraulic and hydraulic roller street applications by using our Pushrod Guideplate Conversion Kits. Part number **36655-16** provides for 3/8" stud mounted adjustable rocker arms, and **36656-16** is for 7/16" stud mounted rocker arms. No machining is necessary, and your standard pushrods can be maintained, thanks to the composite bushing inserts in the pushrod guideplates. For mechanical and mechanical roller applications, we advise the heads be machined for screw-in rocker arm studs and pushrod guideplates.

1993-1995 SVT Cobra 5.0 Mustangs were factory equipped with aluminum needle bearing roller tip 1.7:1 pedestal mount rocker arms. These are our **44746-16**, designed for basic bolt-on installation, but make sure to check for adequate spring travel due to the increased valve lifts when installing on other engines.

1969–1993 351 (5.8L) cu.in. Windsor and 1982–1984 302 (5.0L) cu.in. H.O., also 1994–1997 351W, and 302 SVO/351 SVO V8

Another derivative in the Windsor family, the 351 engine blocks incorporate 1.3" taller deck heights to accommodate the increased displacement. Lifter bores are still inline, as are the valves in the cylinder heads, and the 1.6:1 rocker arm ratio is retained. Most notably, the firing order was changed to 1-3-7-2-6-5-4-8. Our 44 prefix designates these engines. The camshafts are dimensionally the same as the 36 prefix, with the different firing order being the primary change. Camshafts can be interchanged, providing the necessary changes are performed for the proper firing order. Additionally, the 1982-1984 302 H.O. engines also were equipped with hydraulic lifter camshafts having this revised firing order.

We offer hydraulic, hydraulic roller (retrofit and OE style), mechanical, and mechanical roller camshafts and a wide-ranging line of valve train components for these engines.

From 1969 to 1976, bottleneck 3/8 – 5/16" rocker arm studs were installed in the cylinder heads, resulting in a non-adjustable configuration. Our **99768-16** positive locking nuts will permit valve adjustment for these applications. In 1977, a net lash pedestal mount rocker arm system was installed, continuing for the remainder of production through 1997. These pedestal mount rocker cylinder heads can be easily converted to an adjustable configuration for hydraulic and hydraulic roller street applications by using our Pushrod Guideplate Conversion Kits. Part number **36655-16** provides for 3/8" stud mounted adjustable rocker arms, and **36656-16** is for 7/16" stud mounted rocker arms. No machining is necessary, and your standard pushrods can be maintained, thanks to the composite bushing inserts in the pushrod guideplates. For mechanical and mechanical roller applications, we advise the heads be machined for screw-in rocker arm studs and pushrod guideplates.

1970–1982 351C-Boss 351-351M-400 cu.in. V8

The Ford 335 engine family (commonly called the "Cleveland") shared cylinder bore spacing dimensions, and the head bolt pattern with the Windsor engines, but few other parts are interchangeable. The inline lifter bores were retained, but they are at a different bank angle from the Windsor. Cam bearing sizes are also different, as are the distributor gear dimensions. The valves in the cylinder heads are canted (staggered), but the same length pushrods are used for the intake and exhaust valves. The rocker arm ratio is 1.73:1.

These engines are designated by Crane's 52 prefix. We offer hydraulic, retrofit hydraulic roller, mechanical, and mechanical roller camshafts for them. A wide-ranging line of valve train components is also available.

The pedestal mount rocker cylinder heads can be easily converted to an adjustable configuration for hydraulic and hydraulic roller street applications by using our Pushrod Guideplate Conversion Kits. Part number **52655-16** provides for adjustable configuration 7/16" stud mounted rocker arms. No machining is necessary, and your standard pushrods can be maintained, thanks to the composite bushing inserts in the pushrod guideplates. For mechanical and mechanical roller applications, we advise the heads be machined for screw-in rocker arm studs and pushrod guideplates.

The 1971 Boss 351 and 1972 351C H.O. featured cylinder heads with straight 7/16" rocker arm studs and pushrod guideplates, required for the mechanical lifter camshafts that were standard equipment.

The Fontana Clevor block also uses our 52 prefix camshafts, not the 36 or 44 prefix Windsor style items.

There can be a possible misapplication of components when choosing the proper retainers and valve stem locks for these engines. Although the valve stems are all 11/32" diameter, the configuration of the valve locks were changed. Note the following explanation to insure that the proper components are being used:

1970–1977 351C-351M-400: Intake and exhaust valves use multiple groove valve stem locks, having a large outside diameter, requiring the use of 3/8" type valve spring retainers.

1971 Boss 351/1972 351C H.O.: Intake and exhaust valves use standard single groove valve stem locks, requiring the use of 11/32" valve spring retainers.

1978 351M-400: The intake valves use multiple groove valve stem locks, having a large outside diameter, requiring the use of 3/8" type valve spring retainers. The exhaust valves use standard single groove valve stem locks, requiring the use of 11/32" valve spring retainers.

1979–1982 351M-400: Intake and exhaust valves use standard single groove valve stem locks, requiring the use of 11/32" valve spring retainers.

Ford-Mercury V-8 62-87

221-255 (4.2L)-260-289-302 (5.0L) cu.in. and 88-95 302 cu.in. trucks (exc. 82-95 302 [5.0L] HO)

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts										
Improves low-end and mid-range torque and HP in speed density fuel injected (SFI) truck (non-roller tappet) applications. Fine for auto or manual trans. Calif. legal 91-93 Federally certified trucks with MFM5.8T5HZC0, NFM5.8T5HZC1, OR PFM5.8T5HZD4 engine families. (50 state legal, C.A.R.B. E.O. D-225-24)	**2021**	800-4200	**364112**[a] ◆1	**99280-16**	190 198	252 260	109	(9) 19 33 (15)	.000 .000	.416 .432
Excellent low end torque, smooth idle, daily usage, fuel economy, 1600-2200 cruise RPM, 8.0 to 9.5 compression ratio advised.	**Energizer 260 H10**	1200-4600	**13003**[*] **130032**[*b] ◆3	**99280-16**	204 204	260 260	110	(3) 27 37 13	.000 .000	.456 .456
Great low end torque and HP, smooth idle, daily usage, off road, towing, economy, also mild turbocharged, 2200-2600 cruise RPM, 8.0 to 9.5 compression ratio advised. (50 state legal, pre-computer, C.A.R.B. E.O. D-225-32)	**H-260-2**	1200-4800	**363901** **363902**[c] ◆1	**99280-16**	204 216	260 272	112	(5) 29 45 (9)	.000 .000	.456 .484
Great low end torque and HP, smooth idle, daily usage, off road, towing, economy, also mild turbocharged, 2200-2600 cruise RPM, 8.0 to 9.5 compression ratio advised.	**Z-256-2**	1200-5000	**363501**[*] **363502**[*c] ◆3	**99280-16**	206 212	256 262	112	(4) 30 43 (11)	.000 .000	.461 .475
Good low end torque, smooth idle, daily usage, fuel economy, light towing, off road, 2200-2700 cruise RPM, 8.5 to 10.0 compression ratio advised.	**Energizer 266 H10**	1400-4800	**13004**[*] **130042**[*b] ◆3	**99280-16**	210 210	266 266	110	0 30 40 (10)	.000 .000	.469 .469
Excellent low end and mid range torque and HP, good idle, daily usage, off road, towing, economy, 2400-2800 cruise RPM, 8.5 to 10.0 compression ratio advised.	**H-266-2**	1400-5200	**363931**[*] **363932**[*c] ◆3	**99280-16**	210 218	266 274	114	(4) 34 48 (10)	.000 .000	.456 .472
Good low end and mid range torque, good idle, daily usage, off road, fuel efficiency plus performance, 2600-3000 cruise RPM, 8.75 to 10.0 compression ratio advised.	**Energizer 272 H10**	1600-5200	**13005**[*] **130052**[*b] ◆3	**99280-16**	216 216	272 272	110	3 33 43 (7)	.000 .000	.484 .484
Good low end and mid range torque and HP, good idle, daily usage and off road, towing, performance and fuel efficiency, 2600-3000 cruise RPM, 8.75 to 10.5 compression ratio advised, w/centrifugal or small Roots supercharger, 8 lbs. maximum boost w/8.5 maximum compression ratio advised. Also good w/plate nitrous system. (50 state legal, pre-computer, C.A.R.B. E.O. D-225-32)	**H-272-2**	1800-5400	**363941** **363942**[c] ◆1	**99280-16**	216 228	272 284	112	1 35 51 (3)	.000 .000	.484 .512
Good low end and mid range torque and HP, good idle, daily usage and off road, towing, performance and fuel efficiency, 2600-3000 cruise RPM, 8.75 to 10.5 compression ratio advised, w/centrifugal or small Roots supercharger, 8 lbs. maximum boost w/8.5 maximum compression ratio advised. Also good w/plate nitrous system.	**Z-268-2**	1800-5600	**363511**[*] **363512**[*c] ◆3	**99280-16**	218 224	268 274	112	2 36 49 (5)	.000 .000	.490 .504

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

NOTE: Many 1985-87 302 engines, all 88-97 302 passenger car engines, all 96-00 302 truck engines, all 85-95 302 H.O., and all 94-97 351 Windsor engines are equipped with hydraulic roller camshafts and lifters. Conventional hydraulic, mechanical, or roller camshafts and lifters can be easily installed in these engines, providing the appropriate kit components are used.

NOTE: Specify if heads with 5/16" valve stems are used. These valve springs and retainers cannot be used with short valve stem heads.

NOTE: **Ford 221 thru 302 camshafts can be used in 351 Windsor engines if the engine is changed to 221 thru 302 firing order (1-5-4-2-6-3-7-8).** Ford 351W firing order is 1-3-7-2-6-5-4-8.

NOTE: To provide the most accurate valve adjustment on hydraulic lifter camshafts, the heads must be machined to accept screw-in studs (on engines not originally equipped). On engines equipped with bottleneck type studs, using **99768-16** positive locking nuts will permit valve adjustment. **For engines equipped with pedestal mounted rocker arms and hydraulic lifters, excessive lifter preload can be easily remedied by using Crane's Rocker Arm Pedestal Shim Kit (99170-1).** Refer to page 304 for details.

IMPORTANT: Crane offers a Pushrod Guideplate and Rocker Arm Stud Conversion Kit (**36655-16**) for street applications, enabling the 1977-00 255 and 302 cu.in. engines with pedestal mounted rockers to have adjustable rocker arms without cylinder head removal or machining. Refer to page 305 for details.

NOTE: Many 1972 and later Ford-Mercury V-8 engines are originally equipped with a retarded crankshaft sprocket. This may cause idling and performance problems when installing aftermarket camshafts. We recommend using our **44975-1** or **44984-1** timing chain and gear assemblies, a pre-1972 crankshaft sprocket, or by degreeing in your camshaft. The non-retarded sprocket will have the alignment dot and keyway slot directly in line with each other.

NOTE: Left hand rotation hydraulic camshafts are available on special order. Contact Crane's Performance Consultants for details.

NOTE: These camshafts also fit the 1969-70 Ford-Mercury Boss 302 V-8 engines. Some kit components will differ. Contact Crane's Performance Consultants for details.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
36308-1[d]	**96803-16**[d]	**99946-16**		**99097-1**[e]	**36621-16**[f] **36622-16**[g]	**44975-1**[*h]	**36800-16**[i] **36801-16**[j]	**11746-16**[l] **44746-16**[m]	**36750-16**[n] **36759-16**[o] **36758-16**[p]
36308-1[d]	**96803-16**[d]	**99946-16**		**99097-1**[e]	**36621-16**[f] **36622-16**[g]	**44975-1**[*h]	**36800-16**[i] **36801-16**[j]	**11746-16**[l] **44746-16**[m]	**36750-16**[n] **36759-16**[o] **36758-16**[p]
36308-1[d]	**96803-16**[d]	**99946-16**		**99097-1**[e]	**36621-16**[f] **36622-16**[g]	**44975-1**[*h]	**36800-16**[i] **36801-16**[j]	**11746-16**[l] **44746-16**[m]	**36750-16**[n] **36759-16**[o] **36758-16**[p]
36308-1[d]	**96803-16**[d]	**99946-16**		**99097-1**[e]	**36621-16**[f] **36622-16**[g]	**44975-1**[*h]	**36800-16**[i] **36801-16**[j]	**11746-16**[l] **44746-16**[m]	**36750-16**[n] **36759-16**[o] **36758-16**[p]
36308-1[d]	**96803-16**[d]	**99946-16**		**99097-1**[e]	**36621-16**[f] **36622-16**[g]	**44975-1**[*h]	**36800-16**[i] **36801-16**[j]	**11746-16**[l] **44746-16**[m]	**36750-16**[n] **36759-16**[o] **36758-16**[p]
36308-1[d]	**96803-16**[d]	**99946-16**		**99097-1**[e]	**36621-16**[f] **36622-16**[g]	**44975-1**[*h]	**36800-16**[i] **36801-16**[j]	**11746-16**[l] **44746-16**[m]	**36750-16**[n] **36759-16**[o] **36758-16**[p]
36308-1[d]	**96803-16**[d]	**99946-16**		**99097-1**[e]	**36621-16**[f] **36622-16**[g]	**44975-1**[*h]	**36800-16**[i] **36801-16**[j]	**11746-16**[l] **44746-16**[m]	**36750-16**[n] **36759-16**[o] **36758-16**[p]
36308-1[d]	**96803-16**[d]	**99946-16**		**99097-1**[e]	**36621-16**[f] **36622-16**[g]	**44975-1**[*h]	**36800-16**[i] **36801-16**[j]	**11746-16**[l] **44746-16**[m]	**36750-16**[n] **36759-16**[o] **36758-16**[p]

Section Continued

a Cam and Lifter Kit, includes installation lubricants and Rocker Arm Pedestal Shim Kit.
b Cam and Lifter Kit, includes assembly lubricant.
c Cam and Lifter Kit, includes installation lubricants, and rocker arm adjusting nuts.
d Contains standard diameter valve springs, no machining required.
e Machined steel, heat treated.
f For 63-68 engines, heavy wall, heat treated for use with or without guideplates.
g For 69-95 engines, heavy wall, heat treated for use with or without guideplates.
h For 73-00 engines, performance steel billet gears and roller chain set.
i 1.6 ratio, cast, non-rail type for 3/8" studs, must machine 1966-00 cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 1977-00 pedestal mount cylinder heads for street applications.
j 1.6 ratio, cast, rail type for 3/8" studs, non-adjustable with 5/16" top bottleneck studs, adjustable with straight 3/8" studs and locking nuts.
l Energizer, 1.6 ratio 3/8" stud, must machine 1966-00 cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 1977-00 pedestal mount cylinder heads for street applications.
m Energizer, 1.7 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
n 1.6 ratio 3/8" stud, must machine 1966-00 cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 1977-00 pedestal mount cylinder heads for street applications.
o 1.6 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
p 1.7 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.

Ford-Mercury V-8 62-87

221-255 (4.2L)-260-289-302 (5.0L) cu.in. and 88-95 302 cu.in. trucks (exc. 82-95 302 [5.0L] HO)

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts										
Good mid range torque, fair idle, daily usage, mild bracket racing, auto trans w/2500+ converter, 2700-3200 cruise RPM, 9.5 to 10.75 compression ratio advised.	**Energizer 278 H10**	2200-5600	**13009*** **130092***a ◆3	**99280-16** **99380-16***d	222 222	278 278	110	6 36 46 (4)	.000 .000	.498 .498
Moderate competition, rough idle, good mid-range torque and HP, limited oval track, mild bracket racing, serious off road, auto trans w/2500+ converter, 9.5 to 11.0 compression ratio advised.	**H-222/3114-2S1-6**	2200-5400	**360331*** ◆3	**99280-16** **99380-16***d	222 228	278 284	106	9 33 44 4	.000 .000	.498 .512
Good mid range torque and HP, good idle, daily performance usage, mild bracket racing, 3000-3400 cruise RPM, 9.5 to 10.75 compression ratio advised, also mild supercharged, nitrous.	**H-278-2**	2200-5800	**363801*** **363802***b ◆3	**99280-16** **99380-16***d	222 234	278 290	114	2 40 56 (2)	.000 .000	.498 .527
Good mid range torque and HP, good idle, daily performance usage, mild bracket racing, 3000-3400 cruise RPM, 9.5 to 10.75 compression ratio advised, also mild supercharged, nitrous.	**Z-274-2**	2200-6000	**363521*** **363522***b ◆3	**99280-16** **99380-16***d	224 230	274 280	110	3 41 54 (4)	.000 .000	.504 .518
Good mid range to upper RPM torque, fair idle, moderate performance usage, oval track, Street Stock, Enduro, Hobby, 1/4-3/8 mile, bracket racing, Street, Heavy, Pro E.T., Super E.T., auto trans w/3000+ converter, 3200-3600 cruise RPM, 9.5 to 11.0 compression ratio advised.	**H-288**	2400-6000	**364381*** **364382***c ◆3	**99280-16** **99380-16***d	226 226	288 288	108	10 36 46 0	.000 .000	.488 .488
Good mid range to upper RPM torque and HP, fair idle, moderate performance usage, mild bracket racing, auto trans w/2500+ converter, 3400-3800 cruise RPM, 9.5 to 11.5 compression ratio advised, also w/plate or manifold nitrous system, or w/centrifugal or Roots supercharger, 10 lbs. max. boost w/8.5 maximum compression ratio.	**H-286-2**	2600-6200	**364551*** **364552***b ◆3	**99280-16** **99380-16***d	226 236	286 296	110	8 38 53 3	.000 .000	.502 .520
Good mid range to upper RPM torque, fair idle, moderate performance usage, mild bracket racing, auto trans w/2500+ converter, 3400-3800 cruise RPM, 9.5 to 11.0 compression ratio advised.	**Energizer 284 H12**	2800-6200	**13006*** **130062***a ◆3	**99280-16** **99380-16***d	228 228	284 284	112	7 41 53 (3)	.000 .000	.512 .512
Good upper RPM torque and HP, rough idle, performance usage, bracket racing: Pro E.T., Super E.T., auto trans w/race converter, oval track: Street Stock, Enduro, Hobby, 3/8-1/2 mile, 3800-4200 cruise RPM, 10.0 to 11.5 compression ratio advised. Good w/Roots supercharger, 15 lbs. maximum boost w/8.0 max. compression ratio advised, or w/manifold nitrous system.	**H-296-2**	3200-6800	**364561*** **364562***c ◆3	**99280-16** **99380-16***d	236 240	296 300	110	13 43 55 5	.000 .000	.520 .526

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

NOTE: Many 1985-87 302 engines, all 88-97 302 passenger car engines, all 96-00 302 truck engines, all 85-95 302 H.O., and all 94-97 351 Windsor engines are equipped with hydraulic roller camshafts and lifters. Conventional hydraulic, mechanical, or roller camshafts and lifters can be easily installed in these engines, providing the appropriate kit components are used.

NOTE: Specify if heads with 5/16" valve stems are used. These valve springs and retainers cannot be used with short valve stem heads.

NOTE: Ford 221 thru 302 camshafts can be used in 351 Windsor engines if the engine is changed to 221 thru 302 firing order (1-5-4-2-6-3-7-8). Ford 351W firing order is 1-3-7-2-6-5-4-8.

NOTE: To provide the most accurate valve adjustment on hydraulic lifter camshafts, the heads must be machined to accept screw-in studs (on engines not originally equipped). On engines equipped with bottleneck type studs, using **99768-16** positive locking nuts will permit valve adjustment. **For engines equipped with pedestal mounted rocker arms and hydraulic lifters, excessive lifter preload can be easily remedied by using Crane's Rocker Arm Pedestal Shim Kit (99170-1).** Refer to page 304 for details.

IMPORTANT: Crane offers a Pushrod Guideplate and Rocker Arm Stud Conversion Kit (**36655-16**) for street applications, enabling the 1977-00 255 and 302 cu.in. engines with pedestal mounted rockers to have adjustable rocker arms without cylinder head removal or machining. Refer to page 305 for details.

NOTE: Many 1972 and later Ford-Mercury V-8 engines are originally equipped with a retarded crankshaft sprocket. This may cause idling and performance problems when installing aftermarket camshafts. We recommend using our **44975-1** or **44984-1** timing chain and gear assemblies, a pre-1972 crankshaft sprocket, or by degreeing in your camshaft. The non-retarded sprocket will have the alignment dot and keyway slot directly in line with each other.

NOTE: Left hand rotation hydraulic camshafts are available on special order. Contact Crane's Performance Consultants for details.

NOTE: These camshafts also fit the 1969-70 Ford-Mercury Boss 302 V-8 engines. Some kit components will differ. Contact Crane's Performance Consultants for details.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
36308-1[e]	96803-16[e]	99946-16		99097-1[h]	36621-16[j] 36622-16[k]	44975-1[*l]	36800-16[n] 36801-16[o]	11746-16[q] 44746-16[r]	36750-16[s] 36759-16[t] 36758-16[u]
36308-1[e]	96803-16[e]	99946-16		99097-1[h]	36621-16[j] 36622-16[k]	44975-1[*l] 44984-1[*m]	36800-16[n] 36801-16[o]	11746-16[q] 44746-16[r]	36750-16[s] 36759-16[t] 36758-16[u]
36308-1[e]	96803-16[e]	99946-16		99097-1[h]	36621-16[j] 36622-16[k]	44975-1[*l]	36800-16[n] 36801-16[o]	11746-16[q] 44746-16[r]	36750-16[s] 36759-16[t] 36758-16[u]
36308-1[e]	96803-16[e]	99946-16		99097-1[h]	36621-16[j] 36622-16[k]	44975-1[*l]	36800-16[n] 36801-16[o]	11746-16[q] 44746-16[r]	36750-16[s] 36759-16[t] 36758-16[u]
36308-1[e]	96803-16[e]	99946-16		99097-1[h]	36621-16[j] 36622-16[k]	44975-1[*l]	36800-16[n] 36801-16[o]	11746-16[q] 44746-16[r]	36750-16[s] 36759-16[t] 36758-16[u]
	96874-16[f]	99946-16 99969-16[g]	99820-16[g]	99097-1[h] 99094-1[i]	36621-16[j] 36622-16[k]	44975-1[*l] 44984-1[*m]	36800-16[n] 36801-16[o]	11746-16[q] 44746-16[r]	36750-16[s] 36759-16[t] 36758-16[u]
36308-1[e]	96803-16[e]	99946-16		99097-1[h]	36621-16[j] 36622-16[k]	44975-1[*l]	36800-16[n] 36801-16[o]	11746-16[q] 44746-16[r]	36750-16[s] 36759-16[t] 36758-16[u]
	96874-16[f]	99946-16 99969-16[g]	99820-16[g]	99097-1[h] 99094-1[i]	36621-16[j] 36622-16[k]	44975-1[*l] 44984-1[*m]	36800-16[n] 36801-16[o]	11746-16[q] 44746-16[r]	36750-16[s] 36759-16[t] 36758-16[u]

a Cam and Lifter Kit, includes assembly lubricant.
b Cam and lifter kit, includes installation lubricants, and rocker arm adjusting nuts.
c Cam, lifter, and valve spring kit, includes installation lubricants.
d Optional Hi Intensity hydraulic lifters, see page 272 for details.
e Contains standard diameter valve springs, no machining required.
f Must machine cylinder heads.
g Requires Crane Multi Fit valve locks.
h Machined steel, heat treated.
i Machined steel, heat treated, Multi Fit.
j For 63-68 engines, heavy wall, heat treated for use with or without guideplates.
k For 69-95 engines, heavy wall, heat treated for use with or without guideplates.
l For 73-00 engines, performance steel billet gears and roller chain set.
m For 73-00 engines, Pro Series steel billet gears and roller chain set.
n 1.6 ratio, cast, non-rail type for 3/8" studs, must machine 1966-00 cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 1977-00 pedestal mount cylinder heads for street applications.
o 1.6 ratio, cast, rail type for 3/8" studs, non-adjustable with 5/16" top bottleneck studs, adjustable with straight 3/8" studs and locking nuts.
q Energizer, 1.6 ratio 3/8" stud, must machine 1966-00 cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 1977-00 pedestal mount cylinder heads for street applications.
r Energizer, 1.7 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
s 1.6 ratio 3/8" stud, must machine 1966-00 cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 1977-00 pedestal mount cylinder heads for street applications.
t 1.6 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
u 1.7 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.

Ford-Mercury V-8 62-87

221-255 (4.2L)-260-289-302 (5.0L) cu.in. and 88-95 302 cu.in. trucks (exc. 82-95 302 [5.0L] HO)

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts — Retrofit										
Brute low end torque, smooth idle, daily usage, towing, performance and fuel efficiency, normally used in engines originally equipped with hydraulic roller camshafts. (50 state legal, C.A.R.B. E.O. D-225-46)	**2020**	800-4600	**364211**[*a] ◆1	**36530-16**[e]	198 208	260 270	112	(13) 31 36 (8)	.000 .000	.445 .470
Excellent low end and mid range torque and HP, good idle, daily usage, performance and fuel efficiency, off road, towing, 2400-3200 cruise RPM, 8.75 to 10.0 comp. ratio advised.	**HR-216/325-2S-12**	1800-5600	**369541**[*b,c] ◆3	**36532-16**[f]	216 224	278 286	112	1 35 49 (5)	.000 .000	.520 .542
Good mid range to upper RPM torque and HP, fair idle, moderate performance usage, mild bracket racing, auto trans w/2500+ converter, 3000-3400 cruise RPM, 9.0 to 10.75 comp. ratio advised.	**HR-224/339-2S-12**	2400-6400	**369601**[*b,c] ◆3	**36532-16**[f]	224 232	286 294	112	5 39 53 (1)	.000 .000	.542 .563
Mechanical Lifter Camshafts										
Replacement for factory 289 Hi-Po	**BluePrinted C3OZ-6250-C**	2200-6000	**360901**[*] ◆1	**99257-16**	227 227	266 266	114	3.5 43.5 51.5 (4.5)	.020 .024	.477 .477
Good low end & mid range torque & HP, fair idle, moderate performance usage, bracket racing, auto trans w/3000+ converter, 3400-3800 cruise RPM, 10.5 to 11.5 compress. ratio advised, also mild supercharged, nitrous.	**F-278-2**	2800-6600	**363841**[*] ◆3	**99257-16**	238 248	278 288	114	10 48 63 5	.022 .022	.512 .533
Radical street, performance usage, oval track: Late Model, Sportsman, 3/8-1/2 mile, bracket racing: Pro, Pro E.T., Super E.T., auto trans w/race converter; 11.0 to 12.5 compression ratio advised.	**F-280-2**	3200-7000	**364681**[*] **364682**[*d] ◆3	**99257-16**	244 252	280 288	108	16 48 56 16	.026 .026	.553 .572
Performance usage, good mid-range HP, bracket racing, auto trans w/4000+ converter, 11.0 to 12.5 compression ratio advised.	**F-310-2**	3600-7400	**364761**[*] ◆3	**99257-16**	248 258	310 320	108	21 47 62 16	.022 .022	.533 .555
Performance usage, good mid and upper range HP, oval track, bracket racing, auto trans w/race converter, 11.5 minimum compression ratio advised.	**F-260/3694-6**	4400-7800	**361421**[*] ◆3	**99257-16**	260 260	296 296	106	27 53 54 21	.026 .026	.591 .591
Moderate competition only, good upper RPM HP, bracket racing, auto trans w/race converter, 12.5 minim um compression ratio advised.	**F-268/394-2S2-8**	4800-8200	**361591**[*] ◆3	**99257-16**	268 272	304 302	108	29 59 67 25	.018 .012	.630 .640

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

NOTE: Many 1985-87 302 engines, all 88-97 302 passenger car engines, all 96-00 302 truck engines, all 85-95 302 H.O., and all 94-97 351 Windsor engines are equipped with hydraulic roller camshafts and lifters. Conventional hydraulic, mechanical, or roller camshafts and lifters can be easily installed in these engines, providing the appropriate kit components are used.

NOTE: Specify if heads with 5/16" valve stems are used. These valve springs and retainers cannot be used with short valve stem heads.

NOTE: **Ford 221 thru 302 camshafts can be used in 351 Windsor engines if the engine is changed to 221 thru 302 firing order (1-5-4-2-6-3-7-8).** Ford 351W firing order is 1-3-7-2-6-5-4-8.

NOTE: To provide the most accurate valve adjustment on hydraulic roller camshafts, and in order to effect valve adjustment when using mechanical lifter camshafts, the heads must be machined to accept screw-in studs (on engines not originally equipped). On engines equipped with bottleneck type studs, using **99768-16** positive locking nuts will permit valve adjustment. **For engines equipped with pedestal mounted rocker arms and hydraulic roller lifters, excessive lifter preload can be easily remedied by using Crane's Rocker Arm Pedestal Shim Kit (99170-1).** Refer to page 304 for details.

IMPORTANT: Crane offers a Pushrod Guideplate and Rocker Arm Stud Conversion Kit (**36655-16**) for street applications, enabling the 1977-00 255 and 302 cu.in. engines with pedestal mounted rockers to have adjustable rocker arms without cylinder head removal or machining. Refer to page 305 for details.

NOTE: Many 1972 and later Ford-Mercury V-8 engines are originally equipped with a retarded crankshaft sprocket. This may cause idling and performance problems when installing aftermarket camshafts. We recommend using our **44975-1** or **44984-1** timing chain and gear assemblies, a pre-1972 crankshaft sprocket, or by degreeing in your camshaft. The non-retarded sprocket will have the alignment dot and keyway slot directly in line with each other.

NOTE: Left hand rotation mechanical camshafts are available on special order. Contact Crane's Performance Consultants for details.

NOTE: These camshafts also fit the 1969-70 Ford-Mercury Boss 302 V-8 engines. Some kit components will differ. Contact Crane's Performance Consultants for details.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
36308-1[g]	**96803-16[g]**	**99946-16**		**99097-1[j]**	**36631-16[l]** **36625-16[m]**	**44975-1[*r]** **44984-1[*s]**	**36800-16[t]** **36801-16[u]**	**11746-16[w]** **44746-16[x]**	**36750-16[y]** **36759-16[z]** **36758-16[aa]**
	96874-16[h]	**99944-16** **99969-16[i]**	**99820-16[h]**	**99097-1[j]** **99094-1[k]**	**95610-16[q]** **95614-16[q]**	**44975-1[*r]** **44984-1[*s]**	**36800-16[t]** **36801-16[u]**	**11746-16[w]** **44746-16[x]**	**36750-16[y]** **36759-16[z]** **36758-16[aa]**
	96874-16[h]	**99944-16** **99969-16[i]**	**99820-16[h]**	**99097-1[j]** **99094-1[k]**	**95610-16[q]** **95614-16[q]**	**44975-1[*r]** **44984-1[*s]**	**36800-16[t]** **36801-16[u]**	**11746-16[w]** **44746-16[x]**	**36750-16[y]** **36759-16[z]** **36758-16[aa]**
	96803-16g	**99946-16**		**99097-1[j]**	**36622-16[p]** **95618-16[q]**	**44975-1[*r]** **44984-1[*s]**	**36800-16[t]**		**36750-16[y]** **86757-16[bb]**
	99893-16[h]	**99953-16** **99969-16[i]**	**99820-16[h]**	**99097-1[j]** **99094-1[k]**	**36622-16[p]** **95618-16[q]**	**44975-1[*r]** **44984-1[*s]**	**36800-16[t]**		**36750-16[y]** **86757-16[bb]**
	96877-16[h]	**99943-16** **99969-16[i]**	**99820-16[h]**	**99097-1[j]** **99094-1[k]**	**36622-16[p]** **95618-16[q]**	**44975-1[*r]** **44984-1[*s]**			**36750-16[y]** **86757-16[bb]**
	96877-16[h]	**99943-16** **99969-16[i]**	**99820-16[h]**	**99097-1[j]** **99094-1[k]**	**36622-16[p]** **95618-16[q]**	**44975-1[*r]** **44984-1[*s]**			**36750-16[y]** **86757-16[bb]**
	96877-16[h]	**99943-16** **99969-16[i]**	**99820-16[h]**	**99097-1[j]** **99094-1[k]**	**36622-16[p]** **95618-16[q]**	**44975-1[*r]** **44984-1[*s]**			**36750-16[y]** **86757-16[bb]**
	96877-16[h]	**99943-16** **99969-16[i]**	**99820-16[h]**	**99097-1[j]** **99094-1[k]**	**36622-16[p]** **95618-16[q]**	**44975-1[*r]** **44984-1[*s]**			**36750-16[y]** **86757-16[bb]**

a For 1986-89 (non-H.O.) engines originally equipped with hydraulic roller camshafts.
b Camshaft has standard base circle diameter, for use with **36532-16** or **36560-16** hydraulic roller lifters.
c Requires **36970-1** (.467" I.D.), **36971-1** (.500" I.D.), or **44970-1** (.531" I.D. SVO) steel, or **36990-1** (.467" I.D.), **36989-1** (.500" I.D.), or **44990-1** (.531" I.D. SVO), aluminum-bronze distributor drive gear.
d Cam, lifter, valve spring, and retainer kit, includes installation lubricants.
e For use with standard Ford alignment bars.
f Vertical locking bar hydraulic roller lifters, no machining required. Cylinder head removal will be required.
g Contains standard diameter valve springs, no machining required.
h Must machine cylinder heads.
i Requires Crane Multi Fit valve locks.
j Machined steel, heat treated.
k Machined steel, heat treated, Multi Fit.
l For engines with non-adjustable pedestal rocker arms and stock base circle camshafts, heavy wall, heat treated.
m For engines with non-adjustable pedestal mount rocker arms, heavy wall, heat treated.
n For engines with adjustable rocker arms with Crane's Pushrod Guideplate Conversion Kit (**36655-16**), heavy wall, heat treated.
o For engines with non-adjustable bottleneck studs or pedestal mount rocker arms , heavy wall, heat treated.
p For use with or without pushrod guideplate cylinder heads, heavy wall, heat treated.
q Pro Series one-piece.
r For 73-00 engines, performance steel billet gears and roller chain set.
s For 73-00 engines, Pro Series steel billet gears and roller chain set.
t 1.6 ratio, cast, non-rail type for 3/8" studs, must machine 1966-00 cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 1977-00 pedestal mount cylinder heads for street applications.
u 1.6 ratio, cast, rail type for 3/8" studs, non-adjustable with 5/16" top bottleneck studs, adjustable with straight 3/8" studs and locking nuts.
w Energizer, 1.6 ratio 3/8" stud, must machine 1966-00 cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 1977-00 pedestal mount cylinder heads for street applications.
x Energizer, 1.7 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
y 1.6 ratio 3/8" stud, must machine 1966-00 cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 1977-00 pedestal mount cylinder heads for street applications.
z 1.6 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
aa 1.7 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
bb 1.6 ratio, 7/16" stud, must machine 1966-00 cylinder heads and install **99157-16** rocker arm studs and **36650-1** pushrod guideplates.

COMPLETE CAM SPECIFICATIONS

Mechanical Roller Camshafts

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 276 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Good low end and mid range torque and HP, fair idle, moderate performance usage, off road, bracket racing, auto trans w/2500+ converter, 3400-3800 cruise RPM, 10.5 to 11.5 compression ratio advised.	**SR-238/350-2S-12**	2800-6600	**368511**[*a,b] ◆3	**44518-16**[n] **44570-16**[d,n]	238 246	288 296	112	12 46 60 6	.020 .020	.560 .579
Fair idle, moderate performance usage, good mid-range torque and HP, bracket racing, good w/manifold nitrous system, auto trans w/3500+ converter, 3800-4200 cruise RPM, 10.5 to 12.0 compression ratio advised. Good w/ Roots supercharger, 16 lbs. max. boost w/8.0 max. compression ratio advised.	**SR-246/362-2S-10**	3400-7000	**368601**[*a,b] ◆3	**44518-16**[n] **44570-16**[d,n]	246 254	296 304	110	18 48 62 12	.020 .020	.579 .598
Good mid range torque and HP, radical street, rough idle, performance usage, oval track, bracket racing, auto trans w/race converter, 11.0 to 12.5 compression ratio advised.	**R-252/420-2S-8**	3600-7400	**448801**[*a,b,c] ◆3	**44518-16**[n] **44570-16**[d,n]	252 258	284 290	108	22 50 61 17	.020 .020	.672 .672
Good mid range to upper RPM torque and HP, 302+ cu. in., rough idle, performance usage, oval track, bracket racing, auto trans w/race converter, 11.5 minimum compression ratio advised.	**R-258/420-2S-8**	3800-7600	**448831**[*a,b,c] ◆3	**44518-16**[n] **44570-16**[d,n]	258 262	290 294	108	25 53 63 19	.020 .020	.672 .672
Performance usage, good mid to upper RPM HP, 302+ cu.in., long oval track, bracket racing, auto trans w/race converter, 12.0 minimum compression ratio advised.	**R-262/420-2S3-8**	4200-7800	**448841**[*a,b,c] ◆3	**44518-16**[n] **44570-16**[d,n]	262 268	294 300	108	27 55 66 22	.020 .020	.672 .672
Competition only, good upper RPM HP, 302+ cu.in., bracket racing, Heavy, Street, etc., auto trans w/race converter, aftermarket aluminum cylinder heads advised, 12.5 minimum compression ratio advised.	**R-268/420-2S1-8**	4800-8200	**448851**[*a,b,c] ◆3	**44518-16**[n] **44570-16**[d,n]	268 272	300 304	108	30 58 68 24	.020 .020	.672 .672

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

NOTE: Many 1985-87 302 engines, all 88-97 302 passenger car engines, all 96-00 302 truck engines, all 85-95 302 H.O., and all 94-97 351 Windsor engines are equipped with hydraulic roller camshafts and lifters. Conventional hydraulic, mechanical, or roller camshafts and lifters can be easily installed in these engines, providing the appropriate kit components are used.

NOTE: Specify if heads with 5/16" valve stems are used. These valve springs and retainers cannot be used with short valve stem heads.

NOTE: Ford 221 thru 302 camshafts can be used in 351 Windsor engines if the engine is changed to 221 thru 302 firing order (1-5-4-2-6-3-7-8). Ford 351W firing order is 1-3-7-2-6-5-4-8.

NOTE: To effect valve adjustment when using roller lifter camshafts, the heads must be machined to accept screw-in studs (on engines not originally equipped).

IMPORTANT: Crane offers a Pushrod Guideplate and Rocker Arm Stud Conversion Kit (**36655-16**) for street applications, enabling the 1977-00 255 and 302 cu.in. engines with pedestal mounted rockers to have adjustable rocker arms without cylinder head removal or machining. Refer to page 305 for details.

NOTE: Many 1972 and later Ford-Mercury V-8 engines are originally equipped with a retarded crankshaft sprocket. This may cause idling and performance problems when installing aftermarket camshafts. We recommend using our **44975-1** or **44984-1** timing chain and gear assemblies, a pre-1972 crankshaft sprocket, or by degreeing in your camshaft. The non-retarded sprocket will have the alignment dot and keyway slot directly in line with each other.

NOTE: These camshafts also fit the 1969-70 Ford-Mercury Boss 302 V-8 engines. Some kit components will differ. Contact Crane's Performance Consultants for details.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99893-16	**99953-16**	**99820-16**[e]	**99097-1**[f]	**36622-16**[g] **95618-16**[h]	**44975-1**[*i] **44984-1**[*j]			**36750-16**[l] **86757-16**[m]
	99893-16	**99953-16**	**99820-16**[e]	**99097-1**[f]	**36622-16**[g] **95618-16**[h]	**44975-1**[*i] **44984-1**[*j]			**36750-16**[l] **86757-16**[m]
	99885-16[e]	**99956-16**	**99820-16**[e]	**99097-1**[f]	**36622-16**[g] **95618-16**[h]	**44975-1**[*i] **44984-1**[*j]			**36750-16**[l] **86757-16**[m]
	99885-16[e]	**99956-16**	**99820-16**[e]	**99097-1**[f]	**36622-16**[g] **95618-16**[h]	**44975-1**[*i] **44984-1**[*j]			**36750-16**[l] **86757-16**[m]
	99885-16[e]	**99956-16**	**99820-16**[e]	**99097-1**[f]	**36622-16**[g] **95618-16**[h]	**44975-1**[*i] **44984-1**[*j]			**36750-16**[l] **86757-16**[m]
	99885-16[e]	**99956-16**	**99820-16**[e]	**99097-1**[f]	**36622-16**[g] **95618-16**[h]	**44975-1**[*i] **44984-1**[*j]			**36750-16**[l] **86757-16**[m]

a Requires **36970-1** (.467″ I.D.), **36971-1** (.500″ I.D.), or **44970-1** (.531″ I.D. SVO) steel, or **36990-1** (.467″ I.D.), **36989-1** (.500″ I.D.), or **44990-1** (.531″ I.D. SVO), aluminum-bronze distributor drive gear.
b Requires 7/16-20 x 1-1/4″ grade 8 cam gear bolt and hardened washer.
c Camshaft has 351W firing order: 1-3-7-2-6-5-4-8
d Ultra Pro Series roller lifters.
e Must machine cylinder heads.
f Machined steel, heat treated.
g For use with or without pushrod guideplate cylinder heads, heavy wall, heat treated.
h Pro Series one-piece.
i For 73-00 engines, performance steel billet gears and roller chain set.
j For 73-00 engines, Pro Series steel billet gears and roller chain set.
l 1.6 ratio, 3/8″ stud, must machine 1966-00 cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 1977-00 pedestal mount cylinder heads for street applications.
m 1.6 ratio, 7/16″ stud, must machine 1966-00 cylinder heads and install **99157-16** rocker arm studs and **36650-1** pushrod guideplates.
n Cylinder head removal required for installation.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts										
Good low to mid-range torque and HP, for speed density (or mass airflow) style F.I., good idle, daily usage works w/auto or 4/5 speed manual and stock rear end gears, 2200-2600 cruise RPM, (50 state legal 85-93, C.A.R.B. E.O. D-225-46). Good w/centrifugal or small Roots supercharger, with speed density (of mass airflow) style F.I., 8 lbs. maximum boost w/stock 9.2 compression ratio advised, and good w/SEFI-type nitrous system, with speed density (or mass airflow) style F.I., stock 9.2 compression ratio advised.	**2020**	1000-5000	**444211** **444212**[a] ◆1	**36530-16**[b] **36532-16**[c]	208 216	262 270	112	(3) 31 45 (9)	.000 .000	.530 .530
Good mid-range torque and HP, good idle, daily usage, designed for use with 1.7 ratio rockers and mass airflow style F.I. engines with aftermarket intake, heads, exhaust, 5-speed or auto w/mild stall converter, 2400-2800 cruise RPM, (50 state legal 85-93, C.A.R.B. E.O. D-225-46). Good w/centrifugal or small Roots supercharger, with mass airflow style F.I., 10 lbs. maximum boost w/8.5 maximum compression ratio advised, and good w/SEFI-type nitrous system, with mass airflow style F.I., stock 9.2 compression ratio advised.	**2031**	1400-5400	**444225** **444226**[a] ◆1	**36530-16**[b] **36532-16**[c]	214 220	276 282	112	0 34 47 (7)	.000 .000	.513[d] .529[d]
Delivers mid-range torque and HP, good idle, daily usage, requires mass airflow style F.I. for best idle control, works w/4/5 speed manual or auto, may require higher stall converter, use with 3.08 or numerically higher rear gears, 2400-2800 cruise RPM, (50 state legal 85-93, C.A.R.B. E.O. D-225-46) Basic RPM 2000-5500. Good w/centrifugal or small Roots supercharger, with mass airflow style F.I., 10 lbs maximum boost w/8.5 maximum compression ratio advised, and good w/SEFI-type nitrous system, with mass airflow style F.I., stock 9.2 compression ratio advised.	**2030**	1400-5400	**444221** **444222**[a] ◆1	**36530-16**[b] **36532-16**[c]	216 220	270 278	112	1 35 47 (7)	.000 .000	.533 .544
Good low end torque and HP, good idle, daily usage, performance and fuel efficiency, off road, towing, 2400-3000 cruise RPM, 8.75 to 10.0 compression ratio advised.	**HR-216/325-2S-12**	1400-5400	**449541**[*] ◆3	**36530-16**[b] **36532-16**[c]	216 224	278 286	112	1 35 49 (5)	.000 .000	.520 .542
Good mid-range and strong top-end power, E303 replacement, requires modified mass airflow, aftermarket intake, performance cylinder heads and headers, must use 5-speed and 3.55 or numerically higher rear gears, 2600-3000 cruise RPM, (50 state legal 85-93, C.A.R.B. E.O. D-225-46. Good w/centrifugal or Roots supercharger, 15 lbs. maximum boost w/8.0 maximum compression ratio advised, and good w/SEFI-type nitrous system, with mass airflow style F.I., stock 9.2 comp. ratio advised.	**2040**	1800-5800	**444231** ◆1	**36530-16**[b] **36532-16**[c]	220 220	282 282	110	0 40 40 0	.000 .000	.498 .498

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

NOTE: Many 1985-87 302 engines, all 88-97 302 passenger car engines, all 96-00 302 truck engines, all 85-95 302 H.O., and all 94-97 351 Windsor engines are equipped with hydraulic roller camshafts and lifters. Conventional hydraulic, mechanical, or roller lifters can be easily installed in these engines, providing the appropriate kit components are used.

NOTE: To provide the most accurate valve adjustment on hydraulic roller camshafts, the heads must be machined to accept screw-in studs (on engines not originally equipped). On engines equipped with bottleneck type studs, using **99768-16** positive locking nuts will permit valve adjustment. For engines equipped with pedestal mounted rocker arms and hydraulic lifters, excessive lifter preload can be easily remedied by using Crane's Rocker Arm Pedestal Shim Kit (**99170-1**). Refer to page 304 for details.

NOTE: Crane offers a Pushrod Guideplate and Rocker Arm Stud Conversion Kit (**36655-16**) for street applications, enabling the 1977-00 302 cu.in. and 351W engines with pedestal mounted rockers to have adjustable rocker arms without cylinder head removal or machining. Refer to page 305 for details.

NOTE: Special length pushrods can be ordered to provide proper hydraulic lifter preload. See page 353 for checking your hydraulic lifter preload.

NOTE: Some engines have long valve stems which will result in excessive valve spring assembly height. Different springs and retainers may be required to prevent excessive shimming. Contact Crane's Performance consultants for details.

NOTE: Many 1972 and later Ford-Mercury V-8 engines are originally equipped with a retarded crankshaft sprocket. This may cause idling and performance problems when installing aftermarket camshafts. We recommend using our **44975-1** or **44984-1** timing chain and assemblies, a pre-1972 crankshaft sprocket, or degreeing in your camshaft. The non-retarded sprocket will have the alignment dot and keyway slot directly in line with each other.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
44308-1[e] **44309-1**[v]	**99841-16**	**99942-16**		[h]	**36631-16**[k] **36625-16**[l] **95608-16**[l,m]	**44975-1**[*n] **44984-1**[*o]		**44746-16**[r]	**36759-16**[s] **36758-16**[t] **36750-16**[u]
44308-1[e] **44309-1**[v]	**99841-16**	**99942-16**		[h]	**36631-16**[k] **36625-16**[l] **95608-16**[l,m]	**44975-1**[*n] **44984-1**[*o]		**44746-16**[r]	**36759-16**[s] **36758-16**[t] **36750-16**[u]
44308-1[e] **44309-1**[v]	**99841-16**	**99942-16**		[h]	**36631-16**[k] **36625-16**[l] **95608-16**[l,m]	**44975-1**[*n] **44984-1**[*o]		**44746-16**[r]	**36759-16**[s] **36758-16**[t] **36750-16**[u]
44308-1[e] **44309-1**[v]	**96870-16**[f]	**99943-16** **99969-16**[g]	**99820-16**[f]	[h] **99097-1**[i] **99087-1**[j]	**36631-16**[k] **36625-16**[l] **95608-16**[l,m]	**44975-1**[*n] **44984-1**[*o]		**44746-16**[r]	**36759-16**[s] **36758-16**[t] **36750-16**[u]
44308-1[e] **44309-1**[v]	**99841-16** **96870-16**[f]	**99942-16** **99943-16** **99969-16**[g]	**99820-16**[f]	[h] **99097-1**[i] **99087-1**[j]	**36631-16**[k] **36625-16**[l] **95608-16**[l,m]	**44975-1**[*n] **44984-1**[*o]		**44746-16**[r]	**36759-16**[s] **36758-16**[t] **36750-16**[u]

Section Continued

a Cam and spring kit, includes **44308-1** kit, containing valve springs, valve spring retainers, and valve stem locks.
b For use with standard Ford alignment bars.
c Vertical locking bar hydraulic roller lifters, no machining required. Cylinder head removal required for installation in 302 and 302 H.O. applications.
d Gross valve lift with 1.7 ratio rocker arms.
e Includes standard diameter conical valve springs (**99841-16**), valve spring retainers (**99942-16**), and valve stem locks (**99094** and **99097**). No machining required.
f Must machine cylinder heads.
g Requires Crane Multi Fit valve stem locks.
h Included in **44308-1** valve spring and retainer kit.
i Machined steel, heat treated.
j Machined steel, heat treated, Multi Fit.
k For engines with non-adjustable pedestal mount rocker arms, heavy wall, heat treated.
l For 302 H.O. engines with adjustable rocker arms with Pushrod Guideplate Conversion Kit (**36655-16**), heavy wall, heat treated. See page 305 for details.
m Pro Series one-piece.
n Performance steel billet gears and roller chain set.
o Pro Series steel billet gears and roller chain set.
r Energizer 1.7 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
s 1.6 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
t 1.7 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
u 1.6 ratio, 3/8" stud, must machine cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on pedestal mount cylinder heads for street applications.
v For GT40P and similar long exhaust valve cylinder heads. No machining required.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts										
Good mid-range torque and HP, fair idle, moderate performance usage, for use with 1.7 ratio rocker arms, bracket racing, auto trans w/2500+ converter. Good w/ centrifugal or Roots supercharger, 20 lbs. maximum boost w/8.0 maximum compression ratio advised, and/ or nitrous, 2500-3600 cruise RPM, 8.75 to 10.5 compression ratio advised.	**HR-220/311-2S-14**	2000-6000	**449591*** ◆3	**36530-16**[a] **36532-16**[b]	220 226	282 288	114	1 39 52 (6)	.000 .000	.529[c] .544[c]
Good mid range torque and HP, fair idle, moderate performance usage, 2600-3200 cruise RPM, good w/plate nitrous system, auto trans w/2500+ converter, 9.0 to 10.5 compression ratio advised. Also good w/supercharger, 20 lbs. maximum boost w/ 8.5 maximum compression ratio advised.	**HR-220/332-2S2-14**	2000-6200	**449631*** ◆3	**36530-16**[a] **36532-16**[b]	220 228	282 290	114	1 39 53 (5)	.000 .000	.531 .552
Good mid range and upper RPM torque and HP, fair idle, performance usage, B303 upgrade, X303 replacement, bracket racing, auto trans with 2500+ converter, 3000-3400 cruise RPM, 9.5 to 10.75 compression ratio advised.	**HR-224/339-12**	2200-6000	**449661*** ◆3	**36530-16**[a] **36532-16**[b]	224 224	286 286	112	5 39 49 (5)	.000 .000	.542 .542
Good mid range to upper RPM torque and HP, fair idle, moderate performance usage, good for use with 1.7 rocker arms, mild bracket racing, auto trans with 2500+ converter, 3000-3400 cruise RPM, 9.0 to 10.75 compression ratio advised. Good w/centrifugal or Roots supercharger, 18 lbs. maximum boost w/8.0 maximum comperssion ratio advised, and good with SEFI-type or manifold nitrous system.	**HR-224/339-2S2-12**	1400-5400	**449671*** ◆3	**36530-16**[a] **36532-16**[b]	224 232	286 294	112	5 39 53 (1)	.000 .000	.576[c] .559[c]
Good mid range to upper RPM torque and HP, fair idle, moderate performance usage, mild bracket racing, auto trans with 2500+ converter, 3000-3400 cruise RPM, 9.0 to 10.75 compression ratio advised. Good w/centrifugal or Roots supercharger, 18 lbs. maximum boost w/8.0 maximum comperssion ratio advised, and good with SEFI-type or manifold nitrous system.	**HR-224/339-2S-12**	2400-6400	**449601*** ◆3	**36530-16**[a] **36532-16**[b]	224 232	286 294	112	5 39 53 (1)	.000 .000	.542 .563

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

NOTE: Many 1985-87 302 engines, all 88-97 302 passenger car engines, all 96-00 302 truck engines, all 85-95 302 H.O., and all 94-97 351 Windsor engines are equipped with hydraulic roller camshafts and lifters. Conventional hydraulic, mechanical, or roller lifters can be easily installed in these engines, providing the appropriate kit components are used.

NOTE: To provide the most accurate valve adjustment on hydraulic roller camshafts, the heads must be machined to accept screw-in studs (on engines not originally equipped). On engines equipped with bottleneck type studs, using **99768-16** positive locking nuts will permit valve adjustment. For engines equipped with pedestal mounted rocker arms and hydraulic lifters, excessive lifter preload can be easily remedied by using Crane's Rocker Arm Pedestal Shim Kit (**99170-1**). Refer to page 304 for details.

NOTE: Crane offers a Pushrod Guideplate and Rocker Arm Stud Conversion Kit (**36655-16**) for street applications, enabling the 1977-00 302 cu.in. and 351W engines with pedestal mounted rockers to have adjustable rocker arms without cylinder head removal or machining. Refer to page 305 for details.

NOTE: Special length pushrods can be ordered to provide proper hydraulic lifter preload. See page 353 for checking your hydraulic lifter preload.

NOTE: Some engines have long valve stems which will result in excessive valve spring assembly height. Different springs and retainers may be required to prevent excessive shimming. Contact Crane's Performance consultants for details.

NOTE: Many 1972 and later Ford-Mercury V-8 engines are originally equipped with a retarded crankshaft sprocket. This may cause idling and performance problems when installing aftermarket camshafts. We recommend using our **44975-1** or **44984-1** timing chain and assemblies, a pre-1972 crankshaft sprocket, or degreeing in your camshaft. The non-retarded sprocket will have the alignment dot and keyway slot directly in line with each other.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	96870-16[d]	99943-16 99969-16[e]	99820-16[d]	99097-1[f] 99087-1[g]	36631-16[h] 36625-16[i] 95608-16[i,j]	44975-1[*k] 44984-1[*l]		44746-16[o]	36759-16[p] 36758-16[q] 36750-16[r]
	96870-16[d]	99943-16 99969-16[e]	99820-16[d]	99097-1[f] 99087-1[g]	36631-16[h] 36625-16[i] 95608-16[i,j]	44975-1[*k] 44984-1[*l]		44746-16[o]	36759-16[p] 36758-16[q] 36750-16[r]
	96870-16[d]	99943-16 99969-16[e]	99820-16[d]	99097-1[f] 99087-1[g]	36631-16[h] 36625-16[i] 95608-16[i,j]	44975-1[*k] 44984-1[*l]		44746-16[o]	36759-16[p] 36758-16[q] 36750-16[r]
	96870-16[d]	99943-16 99969-16[e]	99820-16[d]	99097-1[f] 99087-1[g]	36631-16[h] 36625-16[i] 95608-16[i,j]	44975-1[*k] 44984-1[*l]		44746-16[o]	36759-16[p] 36758-16[q] 36750-16[r]
	96870-16[d]	99943-16 99969-16[e]	99820-16[d]	99097-1[f] 99087-1[g]	36631-16[h] 36625-16[i] 95608-16[i,j]	44975-1[*k] 44984-1[*l]		44746-16[o]	36759-16[p] 36758-16[q] 36750-16[r]

Section Continued

a For use with standard Ford alignment bars.
b Vertical locking bar hydraulic roller lifters, no machining required. Cylinder head removal required for installation in 302 and 302 H.O. applications.
c Gross valve lift with 1.7 ratio rocker arms.
d Must machine cylinder heads.
e Requires Crane Multi Fit valve stem locks.
f Machined steel, heat treated.
g Machined steel, heat treated, Multi Fit.
h For engines with non-adjustable pedestal mount rocker arms, heavy wall, heat treated.
i For 302 H.O. engines with adjustable rocker arms with Pushrod Guideplate Conversion Kit (**36655-16**), heavy wall, heat treated. See page 305 for details.
j Pro Series one-piece.
k Performance steel billet gears and roller chain set.
l Pro Series steel billet gears and roller chain set.
o Energizer 1.7 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
p 1.6 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
q 1.7 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
r 1.6 ratio, 3/8" stud, must machine cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on pedestal mount cylinder heads for street applications.

COMPLETE CAM SPECIFICATIONS

Hydraulic Roller Camshafts

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Good mid range to upper RPM torque and HP, fair idle, normally used with 1.7 rocker arms, moderate performance usage, F303 upgrade, bracket racing, auto trans with 3000 converter, 3200-3600 cruise RPM, good with 347+ cu.in., 8.5 to 11.0 compression ratio advised. Good w/centrifugal or Roots supercharger, 22 lbs. maximum boost w/8.0 maximum compression ratio advised, also good with manifold nitrous system.	**HR-226/320-2S-14**	2600-6600	**449651*** ◆3	**36530-16**[a] **36532-16**[b]	226 232	288 294	114	4 42 55 (3)	.000 .000	.544[c] .559[c]
Good mid to upper RPM torque and HP, fair idle, performance usage, Z303 upgrade, bracket racing, auto trans with 3000+ converter, 3400-3800 cruise RPM, good with 347+ cu.in., with modified intake and cylinder heads, 10.0 to 11.5 compression ratio advised. Good w/centrifugal or Roots supercharger, 24 lbs. maximum boost with 8.5 maximum compression ratio advised, also good with manifold nitrous system.	**HR-228/345-2S1-14**	2600-6600	**449681*** ◆3	**36530-16**[a] **36532-16**[b]	228 232	290 249	114	5 43 55 (3)	.000 .000	.552 .563
Good upper RPM torque and HP, fair idle performance usage, bracket racing, auto w/3000+ converter, 3600-4000 cruise RPM, suitable for upper RPM with 347+ cu. in. with upgraded intake system and cylinder heads, 10.25 to 12.0 compression ratio advised. Good w/large centrifugal or Roots supercharger, 24 lbs. maximum boost with 9.0 maximum compression ratio, also good with large manifold nitrous system.	**HR-228/345-2S-14**	2600-6600	**449691*** ◆3	**36530-16**[a] **36532-16**[b]	228 236	290 298	114	5 93 57 (1)	.000 .000	.552 .574
Good upper RPM torque and HP, fair idle, performance usage, bracket racing, auto w/3000+ converter, 3400-4000 cruise RPM, 10.0 to 11.5 compression ratio advised, best with 347+ cu.in.. Good w/Roots supercharger, 20 lbs. maximum boost w/8.0 maximum compression ratio advised, also good with SEFI-type or manifold nitrous system.	**HR-232/352-2S-12**	2800-6800	**449761*** ◆3	**36530-16**[a] **36532-16**[b]	232 244	294 306	112	9 43 59 5	.000 .000	.563 .595
Good mid to upper RPM torque and HP, rough idle, performance usage, bracket racing, auto trans w/3000+ converter, 3600-4000 cruise RPM, 10.5 to 12.0 compression ratio advised, best with 331+ cu.in.	**HR-236/359-2S-10**	2800-6800	**449641*** ◆3	**36530-16**[a] **36532-16**[b]	236 244	298 306	110	13 43 57 7	.000 .000	.574 .595

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

NOTE: Many 1985-87 302 engines, all 88-97 302 passenger car engines, all 96-00 302 truck engines, all 85-95 302 H.O., and all 94-97 351 Windsor engines are equipped with hydraulic roller camshafts and lifters. Conventional hydraulic, mechanical, or roller lifters can be easily installed in these engines, providing the appropriate kit components are used.

NOTE: To provide the most accurate valve adjustment on hydraulic roller camshafts, the heads must be machined to accept screw-in studs (on engines not originally equipped). On engines equipped with bottleneck type studs, using **99768-16** positive locking nuts will permit valve adjustment. For engines equipped with pedestal mounted rocker arms and hydraulic lifters, excessive lifter preload can be easily remedied by using Crane's Rocker Arm Pedestal Shim Kit (**99170-1**). Refer to page 304 for details.

NOTE: Crane offers a Pushrod Guideplate and Rocker Arm Stud Conversion Kit (**36655-16**) for street applications, enabling the 1977-00 302 cu.in. and 351W engines with pedestal mounted rockers to have adjustable rocker arms without cylinder head removal or machining. Refer to page 305 for details.

NOTE: Special length pushrods can be ordered to provide proper hydraulic lifter preload. See page 353 for checking your hydraulic lifter preload.

NOTE: Some engines have long valve stems which will result in excessive valve spring assembly height. Different springs and retainers may be required to prevent excessive shimming. Contact Crane's Performance consultants for details.

NOTE: Many 1972 and later Ford-Mercury V-8 engines are originally equipped with a retarded crankshaft sprocket. This may cause idling and performance problems when installing aftermarket camshafts. We recommend using our **44975-1** or **44984-1** timing chain and assemblies, a pre-1972 crankshaft sprocket, or degreeing in your camshaft. The non-retarded sprocket will have the alignment dot and keyway slot directly in line with each other.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	96870-16[d]	99943-16 99969-16[e]	99820-16[d]	99097-1[f] 99087-1[g]	36631-16[h] 36625-16[i] 95608-16[i,j]	44975-1[*k] 44984-1[*l]		44746-16[o]	36759-16[p] 36758-16[q] 36750-16[r]
	96870-16[d]	99943-16 99969-16[e]	99820-16[d]	99097-1[f] 99087-1[g]	36631-16[h] 36625-16[i] 95608-16[i,j]	44975-1[*k] 44984-1[*l]		44746-16[o]	36759-16[p] 36758-16[q] 36750-16[r]
	96870-16[d]	99943-16 99969-16[e]	99820-16[d]	99097-1[f] 99087-1[g]	36631-16[h] 36625-16[i] 95608-16[i,j]	44975-1[*k] 44984-1[*l]		44746-16[o]	36759-16[p] 36758-16[q] 36750-16[r]
	96870-16[d]	99943-16 99969-16[e]	99820-16[d]	99097-1[f] 99087-1[g]	36631-16[h] 36625-16[i] 95608-16[i,j]	44975-1[*k] 44984-1[*l]		44746-16[o]	36759-16[p] 36758-16[q] 36750-16[r]
	96870-16[d]	99943-16 99969-16[e]	99820-16[d]	99097-1[f] 99087-1[g]	36631-16[h] 36625-16[i] 95608-16[i,j]	44975-1[*k] 44984-1[*l]		44746-16[o]	36759-16[p] 36758-16[q] 36750-16[r]

Section Continued

a For use with standard Ford alignment bars.
b Vertical locking bar hydraulic roller lifters, no machining required. Cylinder head removal required for installation in 302 and 302 H.O. applications.
c Gross valve lift with 1.7 ratio rocker arms.
d Must machine cylinder heads.
e Requires Crane Multi Fit valve stem locks.
f Machined steel, heat treated.
g Machined steel, heat treated, Multi Fit.
h For engines with non-adjustable pedestal mount rocker arms, heavy wall, heat treated.
i For 302 H.O. engines with adjustable rocker arms with Pushrod Guideplate Conversion Kit (**36655-16**), heavy wall, heat treated. See page 305 for details.
j Pro Series one-piece.
k Performance steel billet gears and roller chain set.
l Pro Series steel billet gears and roller chain set.
o Energizer 1.7 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
p 1.6 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
q 1.7 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
r 1.6 ratio, 3/8" stud, must machine cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on pedestal mount cylinder heads for street applications.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts										
Rough idle, performance usage, good upper RPM torque and HP, bracket racing, auto trans w/3500+ converter, also supercharged and/or nitrous, 10.0 to 11.5 compression ratio advised.	**HR-236/359-2S-14**	3000-7000	**449811*** ◆3	**36530-16**[a] **36532-16**[b]	236 244	298 306	114	9 47 61 3	.000 .000	.574 .595
Moderate performance usage, rough idle, bracket racing, auto trans w/3500+ converter, good w/manifold nitrous system, 10.5 to 12.0 compression ratio advised. Also good w/centrifugal or Roots supercharger, 28 lbs. maximum boost w/8.5 maximum compression ratio.	**HR-240/365-2S1-14**	3200-7000	**449711*** ◆3	**36530-16**[a] **36532-16**[b]	240 244	302 306	114	11 49 61 3	.000 .000	.584 .595
Good high RPM HP, rough idle, competition usage, bracket racing, auto w/race converter, 347+ cu.in., 11.5 minimum compression ratio advised.	**HR-244/372-2S-10**	3400-7000	**449581*** ◆3	**36530-16**[a] **36532-16**[b]	244 256	306 318	110	17 47 63 13	.000 .000	.595 .595
Good high RPM HP, rough idle, competition usage, bracket racing, auto w/race converter, 347+ cu.in., 12.0 minimum compression ratio advised. Also good for mild supercharged or mild nitrous.	**HR-244/372-2S-12**	3600-7000	**449571*** ◆3	**36530-16**[a] **36532-16**[b]	244 256	306 318	112	15 49 65 11	.000 .000	.595 .595
Performance usage, for 347+ cu.in., NMRA, good w/large plate nitrous, aftermarket aluminum cylinder heads advised, auto trans w/race converter, 13.0 minimum compression ratio advised. Also good w/centrifugal or Roots supercharger, 34 lbs. maximum boost w/8.5 maximum compression ratio.	**HR-252/400-2S-14**	3800-7200	**449741*** ◆3	**36532-16**[b]	252 260	322 330	114	15.5 56.5 68 12	.000 .000	.640 .640

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

NOTE: Many 1985-87 302 engines, all 88-97 302 passenger car engines, all 96-00 302 truck engines, all 85-95 302 H.O., and all 94-97 351 Windsor engines are equipped with hydraulic roller camshafts and lifters. Conventional hydraulic, mechanical, or roller lifters can be easily installed in these engines, providing the appropriate kit components are used.

NOTE: To provide the most accurate valve adjustment on hydraulic roller camshafts, the heads must be machined to accept screw-in studs (on engines not originally equipped). On engines equipped with bottleneck type studs, using **99768-16** positive locking nuts will permit valve adjustment. For engines equipped with pedestal mounted rocker arms and hydraulic lifters, excessive lifter preload can be easily remedied by using Crane's Rocker Arm Pedestal Shim Kit (**99170-1**). Refer to page 304 for details.

NOTE: Crane offers a Pushrod Guideplate and Rocker Arm Stud Conversion Kit (**36655-16**) for street applications, enabling the 1977-00 302 cu.in. and 351W engines with pedestal mounted rockers to have adjustable rocker arms without cylinder head removal or machining. Refer to page 305 for details.

NOTE: Special length pushrods can be ordered to provide proper hydraulic lifter preload. See page 353 for checking your hydraulic lifter preload.

NOTE: Some engines have long valve stems which will result in excessive valve spring assembly height. Different springs and retainers may be required to prevent excessive shimming. Contact Crane's Performance consultants for details.

NOTE: Many 1972 and later Ford-Mercury V-8 engines are originally equipped with a retarded crankshaft sprocket. This may cause idling and performance problems when installing aftermarket camshafts. We recommend using our **44975-1** or **44984-1** timing chain and assemblies, a pre-1972 crankshaft sprocket, or degreeing in your camshaft. The non-retarded sprocket will have the alignment dot and keyway slot directly in line with each other.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	96870-16[c]	**99943-16** **99969-16**[d]	**99820-16**[c]	**99097-1**[e] **99087-1**[f]	**36631-16**[g] **36625-16**[h] **95608-16**[h,i]	**44975-1**[*j] **44984-1**[*k]		**44746-16**[n]	**36759-16**[o] **36758-16**[p] **36750-16**[q]
	96870-16[c]	**99943-16** **99969-16**[d]	**99820-16**[c]	**99097-1**[e] **99087-1**[f]	**36631-16**[g] **36625-16**[h] **95608-16**[h,i]	**44975-1**[*j] **44984-1**[*k]		**44746-16**[n]	**36759-16**[o] **36758-16**[p] **36750-16**[q]
	96870-16[c]	**99943-16** **99969-16**[d]	**99820-16**[c]	**99097-1**[e] **99087-1**[f]	**36631-16**[g] **36625-16**[h] **95608-16**[h,i]	**44975-1**[*j] **44984-1**[*k]		**44746-16**[n]	**36759-16**[o] **36758-16**[p] **36750-16**[q]
	96870-16[c]	**99943-16** **99969-16**[d]	**99820-16**[c]	**99097-1**[e] **99087-1**[f]	**36631-16**[g] **36625-16**[h] **95608-16**[h,i]	**44975-1**[*j] **44984-1**[*k]		**44746-16**[n]	**36759-16**[o] **36758-16**[p] **36750-16**[q]
	96870-16[c]	**99943-16** **99969-16**[d]	**99820-16**[c]	**99097-1**[e] **99087-1**[f]	**36631-16**[g] **36625-16**[h] **95608-16**[h,i]	**44975-1**[*j] **44984-1**[*k]		**44746-16**[n]	**36759-16**[o] **36758-16**[p] **36750-16**[q]

a For use with standard Ford alignment bars.
b Vertical locking bar hydraulic roller lifters, no machining required. Cylinder head removal required for installation in 302 and 302 H.O. applications.
c Must machine cylinder heads.
d Requires Crane Multi Fit valve stem locks.
e Machined steel, heat treated.
f Machined steel, heat treated, Multi Fit.
g For engines with non-adjustable pedestal mount rocker arms, heavy wall, heat treated.
h For 302 H.O. engines with adjustable rocker arms with Pushrod Guideplate Conversion Kit (**36655-16**), heavy wall, heat treated. See page 305 for details.
i Pro Series one-piece.
j Performance steel billet gears and roller chain set.
k Pro Series steel billet gears and roller chain set.
n Energizer 1.7 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
o 1.6 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
p 1.7 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
q 1.6 ratio, 3/8" stud, must machine cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on pedestal mount cylinder heads for street applications.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts										
Brute low end torque, smooth idle, daily usage, fuel economy, 1600-2200 cruise RPM, 7.75 to 8.75 compression ratio advised.	**H-192/2667-2S-10**	800-4200	**440501*** ◆3	**99280-16**	192 204	248 260	110	(9) 21 37 (13)	.000 .000	.427 .456
Great low end torque and HP, smooth idle, daily usage, off road, towing, economy, also mild turbocharged, 2200-2600 cruise RPM, marine application: primarily used in 302 cu.in. (firing order change required) and 351W cu.in. near-stock engines for mild performance applications in heavy boats, O.K. for through-prop exhaust, 8.0 to 9.5 compression ratio advised. (50 state legal, pre-computer, C.A.R.B. E.O. D-225-32).	**H-260-2**	1200-4800	**443901** **443902**[a] ◆1	**99280-16**	204 216	260 272	112	(5) 29 45 (9)	.000 .000	.456 .484
Good mid-range and top end torque and HP, works well with most engine modifications, for non-roller equipped 351 cu.in. Lightning trucks with speed density (or mass airflow) style F.I. (50 state legal, C.A.R.B. E.O. D-225-46)	**2030**	1400-5200	**444232***[b] ◆1	**99280-16**	206 214	268 276	114	(6) 32 46 (12)	.000 .000	.448 .464
Great low end torque and HP, smooth idle, daily usage, off road, towing, economy, also mild turbocharged, 2200-2600 cruise RPM, marine application: primarily used in 302 cu.in. (firing order change required) and 351W cu.in. near-stock engines for mild performance applications in heavy boats, O.K. for through-prop exhaust, 8.0 to 9.5 compression ratio advised.	**Z-256-2**	1200-5000	**443501*** **443502***[b] ◆3	**99280-16**	206 212	256 262	112	(4) 30 43 (11)	.000 .000	.461 .475
Good low end and mid range torque, good idle, daily usage, off road, fuel efficiency plus performance, 2600-3000 cruise RPM, 8.75 to 10.0 compression ratio advised.	**Energizer 272 H10**	1600-5200	**18005*** **180052***[a] ◆3	**99280-16**	216 216	272 272	110	3 33 43 (7)	.000 .000	.484 .484
Good low end and mid range torque and HP, good idle, daily usage, off road, towing, economy, performance and fuel efficiency, 2600-3000 cruise RPM, marine application: primarily used in 351W cu.in. near-stock to mildly modified engines for mild performance applications in light boats, O.K. for through-prop exhaust, 8.75 to 10.0 compression ratio advised. Good w/centrifugal or small Roots supercharger, 8 lbs. maximum boost w/8.5 maximum compression ratio advised, good for plate nitrous system. (50 state legal, pre-computer C.A.R.B. E.O. D-225-32).	**H-272-2**	1800-5400	**443941** **443942**[b] ◆1	**99280-16**	216 228	272 284	112	1 35 51 (3)	.000 .000	.484 .512

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

NOTE: Many 1985-87 302 engines, all 88-97 302 passenger car engines, all 96-00 302 truck engines, all 85-95 302 H.O., and all 94-97 351 Windsor engines are equipped with hydraulic roller camshafts and lifters. Conventional hydraulic, mechanical, or roller lifters can be easily installed in these engines, providing the appropriate kit components are used.

NOTE: To provide the most accurate valve adjustment on hydraulic roller camshafts, the heads must be machined to accept screw-in studs (on engines not originally equipped). On engines equipped with bottleneck type studs, using **99768-16** positive locking nuts will permit valve adjustment. For engines equipped with pedestal mounted rocker arms and hydraulic lifters, excessive lifter preload can be easily remedied by using Crane's Rocker Arm Pedestal Shim Kit (**99170-1**). Refer to page 304 for details.

NOTE: Crane offers a Pushrod Guideplate and Rocker Arm Stud Conversion Kit (**36655-16**) for street applications, enabling the 1977-00 302 cu.in. and 351W engines with pedestal mounted rockers to have adjustable rocker arms without cylinder head removal or machining. Refer to page 305 for details.

NOTE: Special length pushrods can be ordered to provide proper hydraulic lifter preload. See page 353 for checking your hydraulic lifter preload.

NOTE: Some engines have long valve stems which will result in excessive valve spring assembly height. Different springs and retainers may be required to prevent excessive shimming. Contact Crane's Performance consultants for details.

NOTE: Many 1972 and later Ford-Mercury V-8 engines are originally equipped with a retarded crankshaft sprocket. This may cause idling and performance problems when installing aftermarket camshafts. We recommend using our **44975-1** or **44984-1** timing chain and assemblies, a pre-1972 crankshaft sprocket, or degreeing in your camshaft. The non-retarded sprocket will have the alignment dot and keyway slot directly in line with each other.

NOTE: Left hand rotation hydraulic camshafts are available on special order. Contact Crane's Performance Consultants for details.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
36308-1[c]	**96803-16[c]**	**99946-16**		**99097-1[d]**	**95644-16[e]** **36622-16[f]**	**44975-1[*g]**	**36801-16[h]** **36800-16[i]**	**11746-16[k]** **44746-16[l]**	**36750-16[m]** **36759-16[n]** **36758-16[o]**
36308-1[c]	**96803-16[c]**	**99946-16**		**99097-1[d]**	**95644-16[e]** **36622-16[f]**	**44975-1[*g]**	**36801-16[h]** **36800-16[i]**	**11746-16[k]** **44746-16[l]**	**36750-16[m]** **36759-16[n]** **36758-16[o]**
36308-1[c]	**96803-16[c]**	**99946-16**		**99097-1[d]**	**95644-16[e]** **36622-16[f]**	**44975-1[*g]**	**36801-16[h]** **36800-16[i]**	**11746-16[k]** **44746-16[l]**	**36750-16[m]** **36759-16[n]** **36758-16[o]**
36308-1[c]	**96803-16[c]**	**99946-16**		**99097-1[d]**	**95644-16[e]** **36622-16[f]**	**44975-1[*g]**	**36801-16[h]** **36800-16[i]**	**11746-16[k]** **44746-16[l]**	**36750-16[m]** **36759-16[n]** **36758-16[o]**
36308-1[c]	**96803-16[c]**	**99946-16**		**99097-1[d]**	**95644-16[e]** **36622-16[f]**	**44975-1[*g]**	**36801-16[h]** **36800-16[i]**	**11746-16[k]** **44746-16[l]**	**36750-16[m]** **36759-16[n]** **36758-16[o]**
36308-1[c]	**96803-16[c]**	**99946-16**		**99097-1[d]**	**95644-16[e]** **36622-16[f]**	**44975-1[*g]**	**36801-16[h]** **36800-16[i]**	**11746-16[k]** **44746-16[l]**	**36750-16[m]** **36759-16[n]** **36758-16[o]**

Section Continued

a Cam and Lifter Kit, includes installation lubricants.
b Cam and Lifter Kit, includes installation lubricants, and rocker arm adjusting nuts.
c Contains standard diameter valve springs, no machining required.
d Machined steel, heat treated.
e Pro Series one-piece, for 351 engines, heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
f For 302 engines, heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
g For 73-93 engines, performance steel billet gears and roller chain set.
h 1.6 ratio, cast, rail type for 3/8" studs for 69-76 engines, non-adjustable with 5/16" top bottleneck studs, adjustable if straight 3/8" studs and locking nuts are installed.
i 1.6 ratio, cast, non-rail type for 3/8" studs, must machine cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 77-93 pedestal mount cylinder heads for street applications.
k Energizer, 1.6 ratio 3/8" stud, must machine 1966-00 cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 1977-00 pedestal mount cylinder heads for street applications.
l Energizer, 1.7 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
m 1.6 ratio 3/8" stud, must machine 1966-00 cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 1977-00 pedestal mount cylinder heads for street applications.
n 1.6 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
o 1.7 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts										
Good low end and mid range torque and HP, good idle, daily usage, off road, towing, economy, performance and fuel efficiency, 2600-3000 cruise RPM, marine application: primarily used in 351W cu.in. near-stock to mildly modified engines for mild performance applications in light boats, OK for through-prop exhaust, 8.75 to 10.0 compression ratio advised. Good w/centrifugal or small Roots supercharger, 8 lbs. maximum boost w/8.5 maximum compression ratio advised, good for plate nitrous system.	**Z-268-2**	1800-5600	**443511*** **443512***a ◆3	**99280-16**	218 224	268 274	112	2 36 49 (5)	.000 .000	.490 .504
Performance usage, bracket racing, Street, Heavy, auto trans w/3000+ converter, oval track: Street Stock, 4-bbl, 1/4-3/8 mile, serious off road, 9.0 to 10.5 compression ratio advised.	**H-220/307-2-10**	2400-5800	**440131*** ◆3	**99280-16** **99380-16***b	220 230	280 290	110	5 35 50 0	.000 .000	.491 .509
Performance usage, Street Stock, Enduro, Hobby, 2-bbl or 4-bbl, 1/4-3/8 mile, 9.0 to 10.5 compression ratio advised.	**H-222/3114-10**	2600-6000	**440211*** ◆3	**99280-16** **99380-16***b	222 222	278 278	110	6 36 46 (4)	.000 .000	.498 .498
Good mid range RPM torque and HP, fair idle, moderate performance usage, bracket racing, good w/aluminum cylinder heads, auto trans w/2000+ converter, 3000-3400 cruise RPM, 9.25 to 11.0 compression ratio advised. Good w/centrifugal or Roots supercharger, 10 lbs. Maximum boost w/8.5 maximum compression ratio advised, good w/plate or manifold nitrous system.	**H-224/315-2S1-10**	2800-6200	**440221*** ◆3	**99280-16** **99380-16***b	224 230	274 280	110	7 37 50 0	.000 .000	.504 .518
Performance usage, bracket racing, Street, Heavy, auto trans w/3000+ converter, oval track: Street Stock, Enduro, Hobby, 4-bbl, 1/4-3/8 mile, 9.5 to 11.0 compression ratio advised.	**H-226/314-2-10**	2800-6200	**440141*** ◆3	**99280-16** **99380-16***b	226 236	286 296	110	8 38 53 3	.000 .000	.502 .520

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

NOTE: Many 1985-87 302 engines, all 88-97 302 passenger car engines, all 96-00 302 truck engines, all 85-95 302 H.O., and all 94-97 351 Windsor engines are equipped with hydraulic roller camshafts and lifters. Conventional hydraulic, mechanical, or roller lifters can be easily installed in these engines, providing the appropriate kit components are used.

NOTE: To provide the most accurate valve adjustment on hydraulic roller camshafts, the heads must be machined to accept screw-in studs (on engines not originally equipped). On engines equipped with bottleneck type studs, using **99768-16** positive locking nuts will permit valve adjustment. For engines equipped with pedestal mounted rocker arms and hydraulic lifters, excessive lifter preload can be easily remedied by using Crane's Rocker Arm Pedestal Shim Kit (**99170-1**). Refer to page 304 for details.

NOTE: Crane offers a Pushrod Guideplate and Rocker Arm Stud Conversion Kit (**36655-16**) for street applications, enabling the 1977-00 302 cu.in. and 351W engines with pedestal mounted rockers to have adjustable rocker arms without cylinder head removal or machining. Refer to page 305 for details.

NOTE: Special length pushrods can be ordered to provide proper hydraulic lifter preload. See page 353 for checking your hydraulic lifter preload.

NOTE: Some engines have long valve stems which will result in excessive valve spring assembly height. Different springs and retainers may be required to prevent excessive shimming. Contact Crane's Performance consultants for details.

NOTE: Many 1972 and later Ford-Mercury V-8 engines are originally equipped with a retarded crankshaft sprocket. This may cause idling and performance problems when installing aftermarket camshafts. We recommend using our **44975-1** or **44984-1** timing chain and assemblies, a pre-1972 crankshaft sprocket, or degreeing in your camshaft. The non-retarded sprocket will have the alignment dot and keyway slot directly in line with each other.

NOTE: Left hand rotation hydraulic camshafts are available on special order. Contact Crane's Performance Consultants for details.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
36308-1[c]	**96803-16[c]**	**99946-16**		**99097-1[f]**	**95644-16[h]** **36622-16[i]**	**44975-1[*j]**	**36801-16[l]** **36800-16[m]**	**11746-16[o]** **44746-16[p]**	**36750-16[q]** **36759-16[r]** **36758-16[s]**
	96874-16[d]	**99943-16** **99969-16[e]**	**99820-16[d]**	**99097-1[f]** **99094-1[g]**	**95644-16[h]** **36622-16[i]**	**44975-1[*j]** **44984-1[*k]**	**36801-16[l]** **36800-16[m]**	**11746-16[o]** **44746-16[p]**	**36750-16[q]** **36759-16[r]** **36758-16[s]**
	96874-16[d]	**99943-16** **99969-16[e]**	**99820-16[d]**	**99097-1[f]** **99094-1[g]**	**95644-16[h]** **36622-16[i]**	**44975-1[*j]** **44984-1[*k]**	**36801-16[l]** **36800-16[m]**	**11746-16[o]** **44746-16[p]**	**36750-16[q]** **36759-16[r]** **36758-16[s]**
	96874-16[d]	**99943-16** **99969-16[e]**	**99820-16[d]**	**99097-1[f]** **99094-1[g]**	**95644-16[h]** **36622-16[i]**	**44975-1[*j]** **44984-1[*k]**	**36801-16[l]** **36800-16[m]**	**11746-16[o]** **44746-16[p]**	**36750-16[q]** **36759-16[r]** **36758-16[s]**
	96874-16[d]	**99943-16** **99969-16[e]**	**99820-16[d]**	**99097-1[f]** **99094-1[g]**	**95644-16[h]** **36622-16[i]**	**44975-1[*j]** **44984-1[*k]**	**36801-16[l]** **36800-16[m]**	**11746-16[o]** **44746-16[p]**	**36750-16[q]** **36759-16[r]** **36758-16[s]**

Section Continued

a Cam and Lifter Kit, includes installation lubricants, and rocker arm adjusting nuts.
b Optional Hi Intensity hydraulic lifters, see page 272 for details.
c Contains standard diameter valve springs, no machining required.
d Must machine cylinder heads.
e Requires Crane Multi Fit valve locks.
f Machined steel, heat treated.
g Machined steel, heat treated, Multi Fit.
h Pro Series one-piece, for 351 engines, for use with or without pushrod guideplate cylinder heads.
i For 302 engines, heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
j For 73-93 engines, performance steel billet gears and roller chain set.
k For 73-93 engines, Pro Series steel billet gears and roller chain set.
l 1.6 ratio, cast, rail type for 3/8" studs for 69-76 engines, non-adjustable with 5/16" top bottleneck studs, adjustable if straight 3/8" studs and locking nuts are installed.
m 1.6 ratio, cast, non-rail type for 3/8" studs, must machine cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 77-93 pedestal mount cylinder heads for street applications.
o Energizer, 1.6 ratio 3/8" stud, must machine 1966-00 cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 1977-00 pedestal mount cylinder heads for street applications.
p Energizer, 1.7 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
q 1.6 ratio 3/8" stud, must machine 1966-00 cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 1977-00 pedestal mount cylinder heads for street applications.
r 1.6 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
s 1.7 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.

COMPLETE CAM SPECIFICATIONS

Hydraulic Lifter Camshafts

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Good mid range to upper RPM torque and HP, fair idle, moderate performance usage, bracket racing, auto trans w/2500+ converter, 3200-3600 cruise RPM, 9.5 to 11.0 compression ratio advised. Good w/centrifugal or Roots supercharger, 10 lbs. Maximum boost w/8.5 maximum compression ratio advised, good w/plate or manifold nitrous system.	**H-286-2**	2800-6600	**444551*** **444552***a ◆3	**99280-16** **99380-16***b	226 236	286 296	112	6 40 55 1	.000 .000	.502 .520
Performance usage, good mid-range to upper RPM torque and HP, Street Stock, Enduro, Hobby, 2-bbl or 4-bbl, 1/4-3/8 mile, serious off road, 9.0 to 10.5 compression ratio advised.	**H-228/3200-6**	2800-6400	**440551*** ◆3	**99280-16** **99380-16***b	228 228	284 284	106	12 36 44 4	.000 .000	.512 .512
Performance usage, bracket racing, Street, Heavy, auto trans w/3000+ converter, oval track 1/4-3/8 mile: Street Stock, Enduro, Hobby, 4-bbl, 10.0 to 11.5 compression ratio advised.	**H-230/318-2-8**	3000-6600	**440151*** ◆3	**99280-16** **99380-16***b	230 240	290 300	108	12 38 53 7	.000 .000	.509 .526
Performance usage, radical street, bracket racing, good mid range to upper RPM torque and HP, Street, Heavy, auto trans w/3000+ converter, oval track: good low to mid-range torque and HP, Street Stock, Enduro, Hobby, 2-bbl or 4-bbl, 1/4-3/8 mile, 10.0 to 11.5 compression ratio advised.	**H-234/3294-2S-10**	3200-6800	**440161*** ◆3	**99280-16** **99380-16***b	234 238	290 294	110	12 42 54 4	.000 .000	.527 .536
Performance usage, bracket racing, good upper RPM torque and HP, Street, Heavy, Pro ET, auto trans w/race converter, 10.5 to 11.5 compression ratio advised.	**H-236/325-2S-10**	3400-7000	**440171*** ◆3	**99280-16** **99380-16***b	236 240	296 300	110	13 43 55 5	.000 .000	.520 .526
Performance usage, bracket racing, good upper RPM HP, Street, Heavy, Pro ET, good w/manifold nitrous system, auto trans w/race converter, 10.5 to 11.5 compression ratio advised. Good with supercharger, 15 lbs. maximum boost w/8.0 maximum compression ratio advised.	**H-236/325-2S-14**	3400-7200	**440231*** ◆3	**99280-16** **99380-16***b	236 240	296 300	114	9 47 59 1	.000 .000	.520 .526

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

NOTE: Many 1985-87 302 engines, all 88-97 302 passenger car engines, all 96-00 302 truck engines, all 85-95 302 H.O., and all 94-97 351 Windsor engines are equipped with hydraulic roller camshafts and lifters. Conventional hydraulic, mechanical, or roller lifters can be easily installed in these engines, providing the appropriate kit components are used.

NOTE: To provide the most accurate valve adjustment on hydraulic roller camshafts, the heads must be machined to accept screw-in studs (on engines not originally equipped). On engines equipped with bottleneck type studs, using **99768-16** positive locking nuts will permit valve adjustment. For engines equipped with pedestal mounted rocker arms and hydraulic lifters, excessive lifter preload can be easily remedied by using Crane's Rocker Arm Pedestal Shim Kit (**99170-1**). Refer to page 304 for details.

NOTE: Crane offers a Pushrod Guideplate and Rocker Arm Stud Conversion Kit (**36655-16**) for street applications, enabling the 1977-00 302 cu.in. and 351W engines with pedestal mounted rockers to have adjustable rocker arms without cylinder head removal or machining. Refer to page 305 for details.

NOTE: Special length pushrods can be ordered to provide proper hydraulic lifter preload. See page 353 for checking your hydraulic lifter preload.

NOTE: Some engines have long valve stems which will result in excessive valve spring assembly height. Different springs and retainers may be required to prevent excessive shimming. Contact Crane's Performance consultants for details.

NOTE: Many 1972 and later Ford-Mercury V-8 engines are originally equipped with a retarded crankshaft sprocket. This may cause idling and performance problems when installing aftermarket camshafts. We recommend using our **44975-1** or **44984-1** timing chain and assemblies, a pre-1972 crankshaft sprocket, or degreeing in your camshaft. The non-retarded sprocket will have the alignment dot and keyway slot directly in line with each other.

NOTE: Left hand rotation hydraulic camshafts are available on special order. Contact Crane's Performance Consultants for details.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	96874-16[c]	99943-16 99969-16[d]	99820-16[c]	99097-1[e] 99094-1[f]	95644-16[g] 36622-16[h]	44975-1[*i] 44984-1[*j]	36801-16[k] 36800-16[l]	11746-16[n] 44746-16[o]	36750-16[p] 36759-16[q] 36758-16[r]
	96874-16[c]	99943-16 99969-16[d]	99820-16[c]	99097-1[e] 99094-1[f]	95644-16[g] 36622-16[h]	44975-1[*i] 44984-1[*j]	36801-16[k] 36800-16[l]	11746-16[n] 44746-16[o]	36750-16[p] 36759-16[q] 36758-16[r]
	96874-16[c]	99943-16 99969-16[d]	99820-16[c]	99097-1[e] 99094-1[f]	95644-16[g] 36622-16[h]	44975-1[*i] 44984-1[*j]	36801-16[k] 36800-16[l]	11746-16[n] 44746-16[o]	36750-16[p] 36759-16[q] 36758-16[r]
	96874-16[c]	99943-16 99969-16[d]	99820-16[c]	99097-1[e] 99094-1[f]	95644-16[g] 36622-16[h]	44975-1[*i] 44984-1[*j]	36801-16[k] 36800-16[l]	11746-16[n] 44746-16[o]	36750-16[p] 36759-16[q] 36758-16[r]
	96874-16[c]	99943-16 99969-16[d]	99820-16[c]	99097-1[e] 99094-1[f]	95644-16[g] 36622-16[h]	44975-1[*i] 44984-1[*j]	36801-16[k] 36800-16[l]	11746-16[n] 44746-16[o]	36750-16[p] 36759-16[q] 36758-16[r]
	96874-16[c]	99943-16 99969-16[d]	99820-16[c]	99097-1[e] 99094-1[f]	95644-16[g] 36622-16[h]	44975-1[*i] 44984-1[*j]	36801-16[k] 36800-16[l]	11746-16[n] 44746-16[o]	36750-16[p] 36759-16[q] 36758-16[r]

Section Continued

a Cam and Lifter Kit, includes installation lubricants, and rocker arm adjusting nuts.
b Optional Hi Intensity hydraulic lifters, see page 272 for details.
c Must machine cylinder heads.
d Requires Crane Multi Fit valve locks.
e Machined steel, heat treated.
f Machined steel, heat treated, Multi Fit.
g Pro Series one piece, for 351 engines, for use with or without pushrod guideplate cylinder heads.
h For 302 engines, heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
i For 73-93 engines, performance steel billet gears and roller chain set.
j For 73-93 engines, Pro Series steel billet gears and roller chain set.
k 1.6 ratio, cast, rail type for 3/8" studs for 69-76 engines, non-adjustable with 5/16" top bottleneck studs, adjustable if straight 3/8" studs and locking nuts are installed.
l 1.6 ratio, cast, non-rail type for 3/8" studs, must machine cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 77-93 pedestal mount cylinder heads for street applications.
n Energizer, 1.6 ratio 3/8" stud, must machine 1966-00 cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 1977-00 pedestal mount cylinder heads for street applications.
o Energizer, 1.7 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
p 1.6 ratio 3/8" stud, must machine 1966-00 cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 1977-00 pedestal mount cylinder heads for street applications.
q 1.6 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
r 1.7 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.

COMPLETE CAM SPECIFICATIONS

Hydraulic Lifter Camshafts

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	LIFTERS (See pg. 273)	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Rough idle, performance usage, radical street, good upper RPM HP, bracket racing, auto trans w/3500+ converter, 3800-4200 cruise RPM, 10.5 to 112.0 compression ratio advised. Good w/Roots supercharger, 15 lbs. maximum boost w/8.0 maximum compression ratio advised, good w/manifold nitrous system.	**H-238/3347-2-10**	3400-7200	**440661*** ◆3	**99280-16** **99380-16*a**	238 248	294 304	110	14 44 59 9	.000 .000	.536 .560
Moderate competition, bracket racing, Heavy, Pro ET, Super ET, auto trans w/race converter, 11.0 to 12.0 compression ratio advised.	**H-242/310-6**	3400-7000	**440241*** ◆3	**99280-16** **99380-16*a**	242 242	300 300	106	19 43 51 11	.000 .000	.496 .496
Moderate competition, bracket racing, Heavy, Pro ET, Super ET, auto trans w/race converter, 11.0 to 12.5 compression ratio advised.	**H-246/3334-6**	3600-7200	**440181*** ◆3	**99280-16** **99380-16*a**	246 246	306 306	106	21 45 53 13	.000 .000	.533 .533
Moderate competition, good upper RPM HP, bracket racing, auto trans w/race converter, 11.5 to 13.0 compression ratio advised.	**H-246/336-2S-8**	3800-7200	**440191*** ◆3	**99280-16** **99380-16*a**	246 254	306 314	108	20 46 60 14	.000 .000	.538 .550
Competition only, good upper RPM HP, bracket racing w/ light car, flat tappet restricted classes, auto trans w/race converter, 12.5 minimum compression ratio advised.	**H-260/360-2S-8**	4200-7200	**440201*** ◆3	**99280-16** **99380-16*a**	260 268	330 338	108	27 53 67 21	.000 .000	.576 .595

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

NOTE: Many 1985-87 302 engines, all 88-97 302 passenger car engines, all 96-00 302 truck engines, all 85-95 302 H.O., and all 94-97 351 Windsor engines are equipped with hydraulic roller camshafts and lifters. Conventional hydraulic, mechanical, or roller lifters can be easily installed in these engines, providing the appropriate kit components are used.

NOTE: To provide the most accurate valve adjustment on hydraulic roller camshafts, the heads must be machined to accept screw-in studs (on engines not originally equipped). On engines equipped with bottleneck type studs, using **99768-16** positive locking nuts will permit valve adjustment. For engines equipped with pedestal mounted rocker arms and hydraulic lifters, excessive lifter preload can be easily remedied by using Crane's Rocker Arm Pedestal Shim Kit (**99170-1**). Refer to page 304 for details.

NOTE: Crane offers a Pushrod Guideplate and Rocker Arm Stud Conversion Kit (**36655-16**) for street applications, enabling the 1977-00 302 cu.in. and 351W engines with pedestal mounted rockers to have adjustable rocker arms without cylinder head removal or machining. Refer to page 305 for details.

NOTE: Special length pushrods can be ordered to provide proper hydraulic lifter preload. See page 353 for checking your hydraulic lifter preload.

NOTE: Some engines have long valve stems which will result in excessive valve spring assembly height. Different springs and retainers may be required to prevent excessive shimming. Contact Crane's Performance consultants for details.

NOTE: Many 1972 and later Ford-Mercury V-8 engines are originally equipped with a retarded crankshaft sprocket. This may cause idling and performance problems when installing aftermarket camshafts. We recommend using our **44975-1** or **44984-1** timing chain and assemblies, a pre-1972 crankshaft sprocket, or degreeing in your camshaft. The non-retarded sprocket will have the alignment dot and keyway slot directly in line with each other.

NOTE: Left hand rotation hydraulic camshafts are available on special order. Contact Crane's Performance Consultants for details.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	96874-16[b]	99943-16 99969-16[c]	99820-16[b]	99097-1[d] 99094-1[e]	95644-16[f] 36622-16[g]	44975-1*[h] 44984-1*[i]	36801-16[j] 36800-16[k]	11746-16[m] 44746-16[n]	36750-16[o] 36759-16[p] 36758-16[q]
	96874-16[b]	99943-16 99969-16[c]	99820-16[b]	99097-1[d] 99094-1[e]	95644-16[f] 36622-16[g]	44975-1*[h] 44984-1*[i]	36801-16[j] 36800-16[k]	11746-16[m] 44746-16[n]	36750-16[o] 36759-16[p] 36758-16[q]
	96874-16[b]	99943-16 99969-16[c]	99820-16[b]	99097-1[d] 99094-1[e]	95644-16[f] 36622-16[g]	44975-1*[h] 44984-1*[i]	36801-16[j] 36800-16[k]	11746-16[m] 44746-16[n]	36750-16[o] 36759-16[p] 36758-16[q]
	96874-16[b]	99943-16 99969-16[c]	99820-16[b]	99097-1[d] 99094-1[e]	95644-16[f] 36622-16[g]	44975-1*[h] 44984-1*[i]	36801-16[j] 36800-16[k]	11746-16[m] 44746-16[n]	36750-16[o] 36759-16[p] 36758-16[q]
	96874-16[b]	99943-16 99969-16[c]	99820-16[b]	99097-1[d] 99094-1[e]	95644-16[f] 36622-16[g]	44975-1*[h] 44984-1*[i]	36801-16[j] 36800-16[k]	11746-16[m] 44746-16[n]	36750-16[o] 36759-16[p] 36758-16[q]

a Optional Hi Intensity hydraulic lifters, see page 272 for details.
b Must machine cylinder heads.
c Requires Crane Multi Fit valve locks.
d Machined steel, heat treated.
e Machined steel, heat treated, Multi Fit.
f Pro Series one-piece, for 351 engines, heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
g For 302 engines, heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
h For 73-93 engines, performance steel billet gears and roller chain set.
i For 73-93 engines, Pro Series steel billet gears and roller chain set.
j 1.6 ratio, cast, rail type for 3/8" studs for 69-76 engines, non-adjustable with 5/16" top bottleneck studs, adjustable if straight 3/8" studs and locking nuts are installed.
k 1.6 ratio, cast, non-rail type for 3/8" studs, must machine cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 77-93 pedestal mount cylinder heads for street applications.
m Energizer, 1.6 ratio 3/8" stud, must machine 1966-00 cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 1977-00 pedestal mount cylinder heads for street applications.
n Energizer, 1.7 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
o 1.6 ratio 3/8" stud, must machine 1966-00 cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 1977-00 pedestal mount cylinder heads for street applications.
p 1.6 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
q 1.7 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts — Retrofit										
Excellent low end torque and HP, smooth idle, daily usage, towing, economy, also mild turbocharged, 2200-3000 cruise RPM, 8.0 to 9.5 compression ratio advised. (50 state legal, C.A.R.B. E.O. D-225-46)	**2020**	800-4800	**444211**[*a,b] **444212**[*a,b,c] ◆1	**36530-16**[d] **36532-16**[e]	208 216	262 270	112	(3) 31 45 (9)	.000 .530 .000 .530	
Good low end torque and HP, good idle, daily usage, performance and fuel efficiency, off road, towing, 2400-3000 cruise RPM, 8.75 to 10.0 compression ratio advised.	**HR-216/325-2S-12**	1400-5400	**449541**[*a,b] ◆3	**36530-16**[d] **36532-16**[e]	216 224	278 286	112	1 35 49 (5)	.000 .520 .000 .542	
Good low end and mid range torque and HP, good idle, moderate performance usage, 2600-3200 cruise RPM, good w/plate nitrous system, 9.0 to 10.5 compression ratio advised. Also good w/supercharger, 20 lbs. maximum boost w/ 8.5 maximum compression ratio advised.	**HR-220/332-2S2-14**	1600-5600	**449631**[*a,b] ◆3	**36530-16**[d] **36532-16**[e]	220 228	282 290	114	1 39 53 (5)	.000 .531 .000 .552	
Good low end and mid range torque and HP, fair idle, moderate performance usage, mild bracket racing, auto trans w/2000+ converter, serious off road, 2800-3400 cruise RPM, 9.5 to 10.75 compression ratio advised.	**HR-224/339-2S-12**	1800-5800	**449601**[*a,b] ◆3	**36530-16**[d] **36532-16**[e]	224 232	286 294	112	5 39 53 (1)	.000 .542 .000 .563	
Good mid range torque and HP, fair idle, performance usage, bracket racing, auto trans with 2500+ converter, 3000-3600 cruise RPM, 10.0 to 11.5 compression ratio advised. Also good w/centrifugal or Roots supercharger, 24 lbs. maximum boost with 8.5 maximum compression ratio advised, also good with manifold nitrous system.	**HR-228/345-2S1-14**	2400-6400	**449681**[*a,b] ◆3	**36530-16**[d] **36532-16**[e]	228 232	290 294	114	5 43 55 (3)	.000 .552 .000 .563	

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

NOTE: Cylinder head removal will be required in 82-84 302 H.O. applications in order to install the **36532-16** or **36560-16** hydraulic roller tappets.

NOTE: Many 1985-87 302 engines, all 88-97 302 passenger car engines, all 96-00 302 truck engines, all 85-95 302 H.O., and all 94-97 351 Windsor engines are equipped with hydraulic roller camshafts and lifters. Conventional hydraulic, mechanical, or roller lifters can be easily installed in these engines, providing the appropriate kit components are used.

NOTE: To provide the most accurate valve adjustment on hydraulic roller camshafts, the heads must be machined to accept screw-in studs (on engines not originally equipped). On engines equipped with bottleneck type studs, using **99768-16** positive locking nuts will permit valve adjustment. For engines equipped with pedestal mounted rocker arms and hydraulic lifters, excessive lifter preload can be easily remedied by using Crane's Rocker Arm Pedestal Shim Kit (**99170-1**). Refer to page 304 for details.

NOTE: Crane offers a Pushrod Guideplate and Rocker Arm Stud Conversion Kit (**36655-16**) for street applications, enabling the 1977-00 302 cu.in. and 351W engines with pedestal mounted rockers to have adjustable rocker arms without cylinder head removal or machining. Refer to page 305 for details.

NOTE: Special length pushrods can be ordered to provide proper hydraulic lifter preload. See page 353 for checking your hydraulic lifter preload.

NOTE: Some engines have long valve stems which will result in excessive valve spring assembly height. Different springs and retainers may be required to prevent excessive shimming. Contact Crane's Performance consultants for details.

NOTE: Many 1972 and later Ford-Mercury V-8 engines are originally equipped with a retarded crankshaft sprocket. This may cause idling and performance problems when installing aftermarket camshafts. We recommend using our **44975-1** or **44984-1** timing chain and assemblies, a pre-1972 crankshaft sprocket, or degreeing in your camshaft. The non-retarded sprocket will have the alignment dot and keyway slot directly in line with each other.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
44308-1[f] **44309-1**[w]	**96870-16**[g]	**99943-16** **99969-16**[h]	**99820-16**[g]	**99097-1**[i] **99087-1**[j]	**95636-16**[k] **95640-16**[l]	**44975-1**[*m] **44984-1**[*n]	**36801-16**[o] **36800-16**[p]	**11746-16**[r] **44746-16**[s]	**36750-16**[t] **36759-16**[u] **36758-16**[v]
44308-1[f] **44309-1**[w]	**96870-16**[g]	**99943-16** **99969-16**[h]	**99820-16**[h]	**99097-1**[i] **99087-1**[j]	**95636-16**[k] **95640-16**[l]	**44975-1**[*m] **44984-1**[*n]	**36801-16**[o] **36800-16**[p]	**11746-16**[r] **44746-16**[s]	**36750-16**[t] **36759-16**[u] **36758-16**[v]
	96870-16[g]	**99943-16** **99969-16**[h]	**99820-16**[h]	**99097-1**[i] **99087-1**[j]	**95636-16**[k] **95640-16**[l]	**44975-1**[*m] **44984-1**[*n]	**36801-16**[o] **36800-16**[p]	**11746-16**[r] **44746-16**[s]	**36750-16**[t] **36759-16**[u] **36758-16**[v]
	96870-16[g]	**99943-16** **99969-16**[h]	**99820-16**[h]	**99097-1**[i] **99087-1**[j]	**95636-16**[k] **95640-16**[l]	**44975-1**[*m] **44984-1**[*n]	**36801-16**[o] **36800-16**[p]	**11746-16**[r] **44746-16**[s]	**36750-16**[t] **36759-16**[u] **36758-16**[v]
	96870-16[g]	**99943-16** **99969-16**[h]	**99820-16**[h]	**99097-1**[i] **99087-1**[j]	**95636-16**[k] **95640-16**[l]	**44975-1**[*m] **44984-1**[*n]	**36801-16**[o] **36800-16**[p]	**11746-16**[r] **44746-16**[s]	**36750-16**[t] **36759-16**[u] **36758-16**[v]

Section Continued

a Camshaft has standard base circle diameter, for use with **36532-16** or **36560-16** hydraulic roller lifters. Also applicable to 94-97 351W engines.
b Requires **36970-1** (.467" I.D.) or **44970-1** (.531" I.D.) steel, or **36990-1** (.467" I.D.) or **44990-1** (.531" I.D.) aluminum-bronze distributor drive gear.
c Cam and spring kit, includes **44308-1** kit, containing valve springs, valve spring retainers, and valve stem locks.
d For use with standard Ford alignment bars, on engines originally equipped with hydraulic roller lifters.
e Vertical locking bar hydraulic roller lifters, no machining required. Cylinder head removal required in 82-84 302 H.O. applications. Appropriate pushrods required.
f Optional conical spring, retainer, and lock kit for 79-93 engines, no machining required.
g Must machine cylinder heads.
h Requires Crane Multi Fit valve locks.
i Machined steel, heat treated.
j Machined steel, heat treated, Multi Fit.
k Pro Series one-piece, for 351W engines with non-adjustable pedestal mount rocker arms.
l Pro Series one -piece, for 351W engines with adjustable rocker arms with Pushrod Guideplate Conversion Kit (**36655-16**). See page 305 for details.
m For 73-93 engines, performance steel billet gears and roller chain set.
n For 73-93 engines, Pro Series steel billet gears and roller chain set.
o 1.6 ratio, cast, rail type for 3/8" studs. Non-adjustable with 5/16" top bottleneck studs, adjustable with straight 3/8" studs and locking nuts.
p 1.6 ratio, cast, non-rail type for 3/8" studs, must machine cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 77-93 pedestal mount cylinder heads for street applications.
r Energizer, 1.6 ratio 3/8" stud, must machine 1966-00 cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 1977-00 pedestal mount cylinder heads for street applications.
s Energizer, 1.7 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
t 1.6 ratio, 3/8" stud, must machine cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 77-93 pedestal mount cylinder heads for street applications.
u 1.6 ratio, non-adjustable, for 77-93 pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
v 1.7 ratio, non-adjustable, for 77-93 pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
w Optional conical spring, retainer, and lock kit for GT40P and similar long exhaust valve cylinder heads. No machining required.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh		Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts — Retrofit											
Good mid range torque and HP, fair idle, performance usage, supercharged, nitrous, bracket racing, auto trans w/3000+ converter, 3400-3800 cruise RPM, 10.0 to 11.5 compression ratio advised.	**HR-232/352-2S1-12**	2600-6600	**449561**[*a,b] ◆3	**36530-16**[c] **36532-16**[d]	232 240	294 302	112	9 43 57 3		.000 .000	.563 .584
Good mid to upper RPM torque and HP, rough idle, performance usage, bracket racing, auto trans w/3000+ converter, 3600-4000 cruise RPM, 10.5 to 12.0 compression ratio advised.	**HR-236/359-2S-10**	2800-6800	**449641**[*a,b] ◆3	**36530-16**[c] **36532-16**[d]	236 244	298 306	110	13 43 57 7		.000 .000	.574 .595
Moderate performance usage, rough idle, bracket racing, auto trans w/3500+ converter, good w/manifold nitrous system,3600-4000 cruise RPM, 10.5 to 12.0 compression ratio advised. Also good w/centrifugal or Roots supercharger, 28 lbs. maximum boost w/8.5 maximum compression ratio.	**HR-240/365-2S1-14**	3000-7000	**449711**[*a,b] ◆3	**36530-16**[c] **36532-16**[d]	240 244	302 306	114	11 49 61 3		.000 .000	.584 .595
Moderate performance usage, rough idle, performance usage, supercharged, nitrous, for 400+ cu.in., bracket racing, auto trans w/3500+ converter, 3800-4200 cruise RPM, 11.5 minimum compression ratio advised.	**HR-244/372-2S-12**	3200-7000	**449571**[*a,b] ◆3	**36530-16**[c] **36532-16**[d]	244 256	306 318	112	15 49 65 11		.000 .000	.595 .595
Performance usage, for 400+ cu.in., bracket racing, good w/large plate nitrous, auto trans w/4000+ converter, 12.5 minimum compression ratio advised. Also good w/ centrifugal or Roots supercharger, 34 lbs. maximum boost w/8.5 maximum compression ratio.	**HR-252/400-2S-14**	3600-7200	**449741**[*a,b] ◆3	**36532-16**[d]	252 260	322 330	114	15.5 56.5 68 12		.000 .000	.640 .640

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

NOTE: Cylinder head removal will be required in 82-84 302 H.O. applications in order to install the **36532-16** or **36560-16** hydraulic roller tappets.

NOTE: Many 1985-87 302 engines, all 88-97 302 passenger car engines, all 96-00 302 truck engines, all 85-95 302 H.O., and all 94-97 351 Windsor engines are equipped with hydraulic roller camshafts and lifters. Conventional hydraulic, mechanical, or roller lifters can be easily installed in these engines, providing the appropriate kit components are used.

NOTE: To provide the most accurate valve adjustment on hydraulic roller camshafts, the heads must be machined to accept screw-in studs (on engines not originally equipped). On engines equipped with bottleneck type studs, using **99768-16** positive locking nuts will permit valve adjustment. For engines equipped with pedestal mounted rocker arms and hydraulic lifters, excessive lifter preload can be easily remedied by using Crane's Rocker Arm Pedestal Shim Kit (**99170-1**). Refer to page 304 for details.

NOTE: Crane offers a Pushrod Guideplate and Rocker Arm Stud Conversion Kit (**36655-16**) for street applications, enabling the 1977-00 302 cu.in. and 351W engines with pedestal mounted rockers to have adjustable rocker arms without cylinder head removal or machining. Refer to page 305 for details.

NOTE: Special length pushrods can be ordered to provide proper hydraulic lifter preload. See page 353 for checking your hydraulic lifter preload.

NOTE: Some engines have long valve stems which will result in excessive valve spring assembly height. Different springs and retainers may be required to prevent excessive shimming. Contact Crane's Performance consultants for details.

NOTE: Many 1972 and later Ford-Mercury V-8 engines are originally equipped with a retarded crankshaft sprocket. This may cause idling and performance problems when installing aftermarket camshafts. We recommend using our **44975-1** or **44984-1** timing chain and assemblies, a pre-1972 crankshaft sprocket, or degreeing in your camshaft. The non-retarded sprocket will have the alignment dot and keyway slot directly in line with each other.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	96870-16[e]	99943-16 99969-16[f]	99820-16[e]	99097-1[g] 99087-1[h]	95636-16[i] 95640-16[j]	44975-1[*k] 44984-1[*l]	36801-16[m] 36800-16[n]	11746-16[p] 44746-16[q]	36750-16[r] 36759-16[s] 36758-16[t]
	96870-16[e]	99943-16 99969-16[f]	99820-16[e]	99097-1[g] 99087-1[h]	95636-16[i] 95640-16[j]	44975-1[*k] 44984-1[*l]	36801-16[m] 36800-16[n]	11746-16[p] 44746-16[q]	36750-16[r] 36759-16[s] 36758-16[t]
	96870-16[e]	99943-16 99969-16[f]	99820-16[e]	99097-1[g] 99087-1[h]	95636-16[i] 95640-16[j]	44975-1[*k] 44984-1[*l]	36801-16[m] 36800-16[n]	11746-16[p] 44746-16[q]	36750-16[r] 36759-16[s] 36758-16[t]
	96870-16[e]	99943-16 99969-16[f]	99820-16[e]	99097-1[g] 99087-1[h]	95636-16[i] 95640-16[j]	44975-1[*k] 44984-1[*l]	36801-16[m] 36800-16[n]	11746-16[p] 44746-16[q]	36750-16[r] 36759-16[s] 36758-16[t]
	96870-16[e]	99943-16 99969-16[f]	99820-16[e]	99097-1[g] 99087-1[h]	95636-16[i] 95640-16[j]	44975-1[*k] 44984-1[*l]	36801-16[m] 36800-16[n]	11746-16[p] 44746-16[q]	36750-16[r] 36759-16[s] 36758-16[t]

a Camshaft has standard base circle diameter, for use with **36532-16** or **36560-16** hydraulic roller lifters. Also applicable to 94-97 351W engines.
b Requires **36970-1** (.467" I.D.) or **44970-1** (.531" I.D.) steel, or **36990-1** (.467" I.D.) or **44990-1** (.531" I.D.) aluminum-bronze distributor drive gear.
c For use with standard Ford alignment bars, on engines originally equipped with hydraulic roller lifters.
d Vertical locking bar hydraulic roller lifters, no machining required. Cylinder head removal required in 82-84 302 H.O. applications. Appropriate pushrods required.
e Must machine cylinder heads.
f Requires Crane Multi Fit valve locks.
g Machined steel, heat treated.
h Machined steel, heat treated, Multi Fit.
i For 351W engines with non-adjustable pedestal mount rocker arms.
j Pro Series one -piece, for 351W engines with adjustable rocker arms with Pushrod Guideplate Conversion Kit (**36655-16**). See page 305 for details.
k For 73-93 engines, performance steel billet gears and roller chain set.
l For 73-93 engines, Pro Series steel billet gears and roller chain set.
m 1.6 ratio, cast, rail type for 3/8" studs. Non-adjustable with 5/16" top bottleneck studs, adjustable with straight 3/8" studs and locking nuts.
n 1.6 ratio, cast, non-rail type for 3/8" studs, must machine cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 77-93 pedestal mount cylinder heads for street applications.
p Energizer, 1.6 ratio 3/8" stud, must machine 1966-00 cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 1977-00 pedestal mount cylinder heads for street applications.
q Energizer, 1.7 ratio, non-adjustable, for pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
r 1.6 ratio, 3/8" stud, must machine cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 77-93 pedestal mount cylinder heads for street applications.
s 1.6 ratio, non-adjustable, for 77-93 pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.
t 1.7 ratio, non-adjustable, for 77-93 pedestal mount cylinder heads, no machining required, includes Rocker Arm Pedestal Shim Kit.

Ford-Mercury V-8 69-93

351 (5.8L) Windsor and 82-84 302 (5.0) H.O., also: 302 SVO and 351 SVO

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Lifter Camshafts										
Good mid range torque & HP, performance usage, bracket racing, Street, Heavy, auto trans w/3000+ converter, oval track Sportsman, etc., 2-bbl or 4-bbl, 1/4-3/8 mile, serious off road, 10.5 to 11.5 compression ratio advised.	**F-238/3200-8**	2800-6600	**441161*** ◆3	**99257-16**	238 238	300 300	108	16 42 52 6	.022 .022	.512 .512
Performance usage, bracket racing, good mid-range torque, Heavy, Pro ET, auto trans w/race converter, oval track Sportsman, IMCA, etc., 2-bbl or 4-bbl, 1/4-3/8 mile, 11.0 to 12.5 compression ratio advised.	**F-246/3467-2S2-6**	3200-6800	**440881*** ◆3	**99257-16**	246 250	278 282	106	20 46 54 16	.012 .012	.555 .565
Performance usage, bracket racing, good mid-range torque and HP, Heavy, Pro ET, auto trans w/race converter, oval track Late Model, Sportsman, IMCA, etc., 4-bbl, 1/4-3/8 mile, serious off road, 11.0 to 12.5 compression ratio advised.	**F-248/3334-2-8**	3400-7200	**441231*** ◆3	**99257-16**	248 258	310 320	108	21 47 62 16	.022 .022	.533 .555
Rough idle, performance usage, radical street, good upper RPM HP, bracket racing, auto trans w/3500+ converter, 3800-4200 cruise RPM, 10.5 to 112.0 compression ratio advised. Good w/Roots supercharger, 15 lbs. maximum boost w/8.0 maximum compression ratio advised, good w/manifold nitrous system.	**F-252/3574-2S1-10**	3800-7400	**440991*** ◆3	**99257-16**	252 256	288 292	110	20 52 62 14	.026 .026	.572 .581
Performance usage, bracket racing, good mid-range HP, Pro, Pro ET, Super ET, auto trans w/race converter, oval track Late Model, etc., 4-bbl, 3/8-1/2 mile, 11.5 minimum compression ratio advised.	**F-252/3574-2S-6**	3800-7200	**440981*** ◆3	**99257-16**	252 260	288 296	106	22 50 58 22	.026 .026	.572 .591
Performance usage, bracket racing, good mid-range HP, Pro, Pro ET, Super Pro, auto trans w/race converter, oval track: Late Model, etc., 4-bbl, 3/8-1/2 mile, 11.5 minimum compression ratio advised.	**F-256/3634-2S-6**	4000-7400	**441301*** ◆3	**99257-16**	256 264	292 300	106	25 51 61 23	.026 .026	.581 .601
Performance usage, bracket racing, good mid to upper RPM HP, Pro, Super Pro, etc., auto trans w/race converter, oval track Late Model, etc., 2-bbl or 4-bbl, 3/8-1/2 mile, 11.5 minimum compression ratio advised.	**F-260/3694-2S7-6**	4200-7600	**441431*** ◆3	**99257-16**	260 264	296 300	106	27 53 61 23	.026 .026	.591 .601
Competition only, bracket racing, good upper RPM HP, Pro, Super Pro, auto trans w/race converter, high RPM long oval track, 12.0 minimum compression ratio advised.	**F-268/394-2S5-8**	4600-8000	**441551*** ◆3	**99257-16**	268 272	304 308	108	29 59 67 25	.018 .018	.630 .640
Competition only, good mid and upper RPM torque and HP, flat tappet restricted classes, bracket racing, auto trans w/race converter, 1/2 - 5/8 mile oval track, good with aftermarket cylinder heads, 12.0 minimum compression ratio advised.	**F-272/400-2S-6**	4800-8200	**441591*** ◆3	**99257-16**	272 276	308 312	106	32 60 66 30	.018 .018	.640 .650
Radical competition only, good upper RPM torque and HP, flat tappet restricted classes, bracket racing, good with aftermarket cylinder heads, auto trans w/race converter, 12.5 minimum compression ratio advised.	**F-276/406-2S1-8**	5000-8400	**441621*** ◆3	**99257-16**	276 284	312 320	108	34 62 74 30	.018 .018	.650 .660

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

NOTE: Many 1985-87 302 engines, all 88-97 302 passenger car engines, all 96-00 302 truck engines, all 85-95 302 H.O. engines, and all 94-97 351 Windsor engines are equipped with hydraulic roller camshafts and lifters. Conventional hydraulic, mechanical, or roller lifters can be easily installed in these engines, providing the appropriate kit components are used.

NOTE: Ford 221 thru 302 camshafts can be used in 351 Windsor engines if the engine is changed to 221 thru 302 firing order (1-5-4-2-6-3-7-8). Ford 351W firing order is 1-3-7-2-6-5-4-8.

NOTE: In order to effect valve adjustment when using mechanical lifter camshafts, the heads must be machined to accept screw-in studs (on engines not originally equipped). On engines equipped with bottleneck type studs, using **99768-16** positive locking nuts will permit valve adjustment.

NOTE: Crane offers a Pushrod Guideplate and Rocker Arm Stud Conversion Kit (**36655-16**) for street applications, enabling the 1977-00 302 cu.in. and 351W engines with pedestal mounted rockers to have adjustable rocker arms without cylinder head removal or machining. Refer to page 305 for details.

NOTE: Some engines have long valve stems which will result in excessive valve spring assembly height. Different springs and retainers may be required to prevent excessive shimming. Contact Crane's Performance consultants for details.

NOTE: Many 1972 and later Ford-Mercury V-8 engines are originally equipped with a retarded crankshaft sprocket. This may cause idling and performance problems when installing aftermarket camshafts. We recommend using our **44975-1** or **44984-1** timing chain and assemblies, a pre-1972 crankshaft sprocket, or degreeing in your camshaft. The non-retarded sprocket will have the alignment dot and keyway slot directly in line with each other.

NOTE: Left hand rotation mechanical camshafts are available on special order. Contact Crane's Performance Consultants for details.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	ALUMINUM ROCKERS — ENERGIZER	ALUMINUM ROCKERS — GOLD RACE
	96877-16[a]	99943-16 99969-16[b]	99820-16[a]	99097-1[c] 99087-1[d]	95644-16[e] 36622-16[f] 95618-16[g]	44975-1*[h] 44984-1*[i]			36750-16[k] 86757-16[l] 36757-16[m]
	96877-16[a]	99943-16 99969-16[b]	99820-16[a]	99097-1[c] 99087-1[d]	95644-16[e] 36622-16[f] 95618-16[g]	44975-1*[h] 44984-1*[i]			36750-16[k] 86757-16[l] 36757-16[m]
	96877-16[a]	99943-16 99969-16[b]	99820-16[a]	99097-1[c] 99087-1[d]	95644-16[e] 36622-16[f] 95618-16[g]	44975-1*[h] 44984-1*[i]			36750-16[k] 86757-16[l] 36757-16[m]
	96877-16[a]	99943-16 99969-16[b]	99820-16[a]	99097-1[c] 99087-1[d]	95644-16[e] 36622-16[f] 95618-16[g]	44975-1*[h] 44984-1*[i]			36750-16[k] 86757-16[l] 36757-16[m]
	96877-16[a]	99943-16 99969-16[b]	99820-16[a]	99097-1[c] 99087-1[d]	95644-16[e] 36622-16[f] 95618-16[g]	44975-1*[h] 44984-1*[i]			36750-16[k] 86757-16[l] 36757-16[m]
	96877-16[a]	99943-16 99969-16[b]	99820-16[a]	99097-1[c] 99087-1[d]	95644-16[e] 36622-16[f] 95618-16[g]	44975-1*[h] 44984-1*[i]			36750-16[k] 86757-16[l] 36757-16[m]
	96877-16[a]	99943-16 99969-16[b]	99820-16[a]	99097-1[c] 99087-1[d]	95644-16[e] 36622-16[f] 95618-16[g]	44975-1*[h] 44984-1*[i]			36750-16[k] 86757-16[l] 36757-16[m]
	96877-16[a]	99956-16 99973-16[b]	99820-16[a]	99097-1[c] 99087-1[d]	95644-16[e] 36622-16[f] 95618-16[g]	44975-1*[h] 44984-1*[i]			36750-16[k] 86757-16[l] 36757-16[m]
	96877-16[a]	99956-16 99973-16[b]	99820-16[a]	99097-1[c] 99087-1[d]	95644-16[e] 36622-16[f] 95618-16[g]	44975-1*[h] 44984-1*[i]			36750-16[k] 86757-16[l] 36757-16[m]
	96877-16[a]	99956-16 99973-16[b]	99820-16[a]	99097-1[c] 99087-1[d]	95644-16[e] 36622-16[f] 95618-16[g]	44975-1*[h] 44984-1*[i]			36750-16[k] 86757-16[l] 36757-16[m]

a Must machine cylinder heads.
b Requires Crane Multi Fit valve locks.
c Machined steel, heat treated.
d Machined steel, heat treated, Multi Fit.
e Pro Series one-piece, for 351 engines, for use with or without pushrod guideplate cylinder heads.
f For 302 engines, heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
g Pro Series one-piece, for 302 engines, for use with or without pushrod guideplate cylinder heads.
h For 73-93 engines, performance steel billet gears and roller chain set.
i For 73-93 engines, Pro Series steel billet gears and roller chain set.
k 1.6 ratio, 3/8" stud, must machine 66-93 cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 77-93 pedestal mount cylinder heads for street applications.
l 1.6 ratio, 7/16" stud, must machine 66-93 cylinder heads and install **99157-16** rocker arm studs and **36650-1** pushrod guideplates.
m 1.7 ratio, 7/16" stud, must machine 66-93 cylinder heads and install **99157-16** rocker arm studs and **36650-1** pushrod guideplates.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 276 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh		Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Roller Camshafts											
Excellent low end and mid range torque and HP, good idle, daily performance usage, mild bracket racing, auto trans w/2500+ converter, 3000-3400 cruise RPM, 9.5 to 11.0 compression ratio advised.	**SR-230/338-2S-10**	2400-6400	**448501**[*a] ◆3	**44518-16** **44570-16**[b]	230 238	280 288	110	10 54	40 4	.020 .020	.541 .560
Rough idle, performance usage, good low to mid-range torque & HP, bracket racing, auto trans w/3000+ converter, good w/manifold nitrous system, 10.5 to 12.0 compression ratio advised. Good w/Roots supercharger, 16 lbs. maximum boost w/8.0 maximum compression ratio advised.	**TR-244/3867-2S-10**	3200-7000	**448031**[*a] ◆3	**44518-16** **44570-16**[b]	244 252	284 292	110	15 59	49 13	.022 .022	.619 .640
Fair idle, moderate performance usage, good mid-range torque and HP, bracket racing, auto trans w/3500+ converter, good w/manifold nitrous system,3800-4200 cruise RPM, 10.5 to 12.0 compression ratio advised. Good w/Roots supercharger, 16 lbs. maximum boost w/8.0 maximum compression ratio advised.	**SR-246/362-2S-10**	3400-7200	**448601**[*a] ◆3	**44518-16** **44570-16**[b]	246 254	296 304	110	15 59	51 15	.020 .020	.579 .598
Performance usage, bracket racing, good mid-range torque and HP, Heavy, Pro, etc., auto trans w/race converter, oval track 2-bbl or 4-bbl, 1/4-3/8 mile, 11.0 to 12.5 compression ratio advised.	**R-252/420-2S-8**	3600-7400	**448801**[*a] ◆3	**44518-16** **44570-16**[b]	252 258	284 290	108	22 61	50 17	.020 .020	.672 .672
Performance usage, bracket racing, good mid-range torque and HP, Heavy, Pro, etc., auto trans w/race converter, oval track 2-bbl or 4-bbl, 1/4-3/8 mile, 11.0 to 12.5 compression ratio advised.	**R-254/420-2S2-8**	3800-7600	**448821**[*a] ◆3	**44518-16** **44570-16**[b]	254 258	286 290	108	23 61	51 17	.020 .020	.672 .672
Rough idle, performance usage, w/manifold nitrous system, good mid and upper RPM torque and HP, bracket racing, auto trans w/3500+ converter, 4200-4600 cruise RPM, 11.0 minimum compression ratio advised. Good w/ Roots supercharger, 20 lbs. maximum boost w/8.0 maximum compression ratio advised.	**SR-254/374-2S-10**	3800-7800	**448511**[*a] ◆3	**44518-16** **44570-16**[b]	254 262	304 312	110	22 66	52 16	.020 .020	.599 .599
Performance usage, bracket racing, good mid to upper RPM torque and HP, Pro, Super Pro, etc., auto trans w/ race converter, oval track, 2-bbl or 4-bbl, 1/4-3/8 mile, 12.0 minimum compression ratio advised.	**R-258/420-2S-8**	4000-7600	**448831**[*a] ◆3	**44518-16** **44570-16**[b]	258 262	290 294	108	25 63	53 19	.020 .020	.672 .672
Rough idle, performance usage, w/large nitrous system, good mid to upper RPM torque & HP, bracket racing, auto trans w/3500+ converter, 11.5 minimum compression ratio advised. Good w/Roots supercharger, 20 lbs. maximum boost w/8.0 maximum compression ratio advised.	**R-258/420-2S-10**	4000-7800	**448861**[*a] ◆3	**44518-16** **44570-16**[b]	258 262	290 294	110	23 65	55 17	.020 .020	.672 .672
Performance usage, bracket racing, good mid to upper RPM HP, Pro, Super Pro, etc., auto trans w/race converter, good with small nitrous system, aftermarket cylinder heads advised, 12.0 minimum compression ratio advised.	**R-260/452-2S-10**	4000-8000	**448301**[*a] ◆3	**44518-16** **44570-16**[b]	260 268	289 300	112	25 68	55 20	.020 .020	.723 .672
Performance usage, bracket racing, good mid to upper RPM torque and HP, Pro, Super Pro, etc., auto trans w/ race converter, oval track, 2-bbl or 4-bbl, 3/8-1/2 mile, 12.0 minimum compression ratio advised.	**R-262/420-2S3-8**	4200-7800	**448841**[*a] ◆3	**44518-16** **44570-16**[b]	262 268	294 300	108	27 66	55 22	.020 .020	.672 .672

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

NOTE: Camshafts for engines with 52mm, 52.8mm (2.081"), and 55mm diameter camshaft bearing journals are available on special order.

NOTE: Many 1985-87 302 engines, all 88-97 302 passenger car engines, all 96-00 302 truck engines, all 85-95 302 H.O. engines, and all 94-97 351 Windsor engines are equipped with hydraulic roller camshafts and lifters. Conventional hydraulic, mechanical, or roller lifters can be easily installed in these engines, providing the appropriate kit components are used.

NOTE: Ford 221 thru 302 camshafts can be used in 351 Windsor engines if the engine is changed to 221 thru 302 firing order (1-5-4-2-6-3-7-8). Ford 351W firing order is 1-3-7-2-6-5-4-8.

NOTE: In order to effect valve adjustment when using roller lifter camshafts, the heads must be machined to accept screw-in studs (on engines not originally equipped).

NOTE: Some engines have long valve stems which will result in excessive valve spring assembly height. Different springs and retainers may be required to prevent excessive shimming. Contact Crane's Performance consultants for details.

NOTE: Many 1972 and later Ford-Mercury V-8 engines are originally equipped with a retarded crankshaft sprocket. This may cause idling and performance problems when installing aftermarket camshafts. We recommend using our **44975-1** or **44984-1** timing chain and assemblies, a pre-1972 crankshaft sprocket, or degreeing in your camshaft. The non-retarded sprocket will have the alignment dot and keyway slot directly in line with each other.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	ALUMINUM ROCKERS — ENERGIZER	ALUMINUM ROCKERS — GOLD RACE
	99893-16[c]	**99953-16**	**99820-16**[c]	**99097-1**[e]	**95644-16**[g] **36622-16**[h] **95618-16**[i]	**44975-1**[*j] **44984-1**[*k]			**36750-16**[m] **86757-16**[n] **36757-16**[o]
	99885-16[c]	**99956-16** **99970-16**[d]	**99826-16**[c]	**99097-1**[e] **99087-1**[f]	**95644-16**[g] **36622-16**[h] **95618-16**[i]	**44975-1**[*j] **44984-1**[*k]			**36750-16**[m] **86757-16**[n] **36757-16**[o]
	99893-16[c]	**99953-16**	**99820-16**[c]	**99097-1**[e]	**95644-16**[g] **36622-16**[h] **95618-16**[i]	**44975-1**[*j] **44984-1**[*k]			**36750-16**[m] **86757-16**[n] **36757-16**[o]
	99885-16[c]	**99956-16** **99970-16**[d]	**99826-16**[c]	**99097-1**[e] **99087-1**[f]	**95644-16**[g] **36622-16**[h] **95618-16**[i]	**44975-1**[*j] **44984-1**[*k]			**36750-16**[m] **86757-16**[n] **36757-16**[o]
	99885-16[c]	**99956-16** **99970-16**[d]	**99826-16**[c]	**99097-1**[e] **99087-1**[f]	**95644-16**[g] **36622-16**[h] **95618-16**[i]	**44975-1**[*j] **44984-1**[*k]			**36750-16**[m] **86757-16**[n] **36757-16**[o]
	99893-16[c]	**99953-16**	**99820-16**[c]	**99097-1**[e]	**95644-16**[g] **36622-16**[h] **95618-16**[i]	**44975-1**[*j] **44984-1**[*k]			**36750-16**[m] **86757-16**[n] **36757-16**[o]
	99885-16[c]	**99956-16** **99970-16**[d]	**99826-16**[c]	**99097-1**[e] **99087-1**[f]	**95644-16**[g] **36622-16**[h] **95618-16**[i]	**44975-1**[*j] **44984-1**[*k]			**36750-16**[m] **86757-16**[n] **36757-16**[o]
	99885-16[c]	**99956-16** **99970-16**[d]	**99826-16**[c]	**99097-1**[e] **99087-1**[f]	**95644-16**[g] **36622-16**[h] **95618-16**[i]	**44975-1**[*j] **44984-1**[*k]			**36750-16**[m] **86757-16**[n] **36757-16**[o]
	99885-16[c]	**99956-16** **99970-16**[d]	**99826-16**[c]	**99097-1**[e] **99087-1**[f]	**95644-16**[g] **36622-16**[h] **95618-16**[i]	**44975-1**[*j] **44984-1**[*k]			**36750-16**[m] **86757-16**[n] **36757-16**[o]

Section Continued

a Requires **36970-1** (.467″ I.D.), **36971-1** (.500″ I.D.), or **44970-1** (.531″ I.D. SVO) steel, or **36990-1** (.467″ I.D.), **36989-1** (.500″ I.D.), or **44990-1** (.531″ I.D. SVO), aluminum-bronze distributor drive gear, and 7/16-20 x 1-1/4″ grade 8 cam gear bolt and hardened washer.
b Ultra Pro Series roller lifters.
c Must machine cylinder heads.
d Requires Crane Multi Fit valve locks.
e Machined steel, heat treated.
f Machined steel, heat treated, Multi Fit.
g Pro Series one-piece, for 351 engines, for use with or without pushrod guideplate cylinder heads.
h For 302 engines, heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
i Pro Series one-piece, for 302 engines, for use with or without pushrod guideplate cylinder heads.
j For 73-93 engines, performance steel billet gears and roller chain set.
k For 73-93 engines, Pro Series steel billet gears and roller chain set.
m 1.6 ratio, 3/8″ stud, must machine 66-93 cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 77-93 pedestal mount cylinder heads for street applications.
n 1.6 ratio, 7/16″ stud, must machine 66-93 cylinder heads and install **99157-16** rocker arm studs and **36650-1** pushrod guideplates.
o 1.7 ratio, 7/16″ stud, must machine 66-93 cylinder heads and install **99157-16** rocker arm studs and **36650-1** pushrod guideplates.

COMPLETE CAM SPECIFICATIONS

Mechanical Roller Camshafts

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 276 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Rough idle, performance usage, good w/manifold nitrous system, good upper RPM HP, bracket racing, auto trans w/4000+ converter, 4400-4800 cruise RPM, 11.5 minimum compression ratio advised. Good w/Roots supercharger, 22 lbs. maximum boost w/8.0 maximum compression ratio advised.	**SR-262/374-2S-10**	4400-7800	**448671**[*a] ◆3	**44518-16** **44570-16**[b]	262 274	312 323	110	26 56 72 22	.020 .024	.598 .584
Competition only, good w/large nitrous system, good mid to upper RPM HP, bracket racing, auto trans w/race converter, 12.0 minimum compression ratio advised. Good w/Roots supercharger, 24 lbs. maximum boost w/8.0 maximum compression ratio advised.	**R-266/420-2S3-10**	4600-8000	**448871**[*a] ◆3	**44518-16** **44570-16**[b]	266 276	298 308	110	27 59 72 24	.020 .020	.672 .672
Competition only, good mid to upper RPM HP, bracket racing, auto trans w/race converter, 12.0 minimum compression ratio advised, aftermarket aluminum cylinder heads advised, good w/large nitrous system. Good w/ Roots supercharger, 24 lbs. maximum boost w/8.0 maximum compression ratio advised.	**R-266/452-2S-10**	4600-8200	**448311**[*a] ◆3	**44570-16**[b]	266 276	295 306	110	28 58 73 23	.020 .022	.746 .739
Performance usage, bracket racing, good upper RPM torque and HP, Super Pro, etc., auto trans w/race converter, oval track, high RPM 3/8-1/2 mile, 12.0 minimum compression ratio advised.	**R-268/420-2S1-8**	4800-8200	**448851**[*a] ◆3	**44518-16** **44570-16**[b]	268 272	300 304	108	30 58 68 24	.020 .020	.672 .672
Competition only, bracket racing, good upper RPM torque and HP, Super Pro, etc., auto trans w/race converter, aftermarket aluminum cylinder heads advised, 12.0 minimum compression ratio advised.	**R-272/4381-2S1-8**	5000-8400	**448891**[*a] ◆3	**44518-16** **44570-16**[b]	272 278	304 310	108	31 61 70 28	.020 .022	.701 .701
Competition only, bracket racing, good upper RPM torque and HP, Super Pro, Super Gas, etc., auto trans w/ race converter, aftermarket aluminum cylinder heads advised, 12.5 minimum compression ratio advised.	**R-276/4334-2S-8**	5200-8400	**448291**[*a] ◆3	**44518-16** **44570-16**[b]	276 284	316 284	108	33 63 73 31	.026 .026	.693 .683
Competition only, bracket racing, good upper RPM torque and HP, Super Pro, Super Gas, etc., auto trans w/ race converter, aftermarket aluminum cylinder heads advised, 12.5 minimum compression ratio advised.	**R-280/452-2S-10**	5400-8600	**448881**[*a] ◆3	**44570-16**[b]	280 288	310 320	110	35 65 78 30	.020 .020	.723 .672
Competition only, good upper RPM HP, stick or auto trans w/race converter, designed for large manifold nitrous system, professionally prepared cylinder heads, 13.5 minimum compression ratio advised.	**R-284/466-2S-15**	5400-8800	**448321**[*a] ◆3	**44570-16**[b]	284 296	316 336	115	30 74 87 29	.020 .030	.746 .753
Competition only, good upper RPM HP, stick or auto trans w/race converter, professionally prepared cylinder heads, 13.5 minimum compression ratio advised.	**R-286/456-2S1-10**	5200-8800	**448331**[*a] ◆3	**44570-16**[b]	286 290	326 330	110	36 70 78 32	.026 .026	.730 .734

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

NOTE: Camshafts for engines with 52mm, 52.8mm (2.081"), and 55mm diameter camshaft bearing journals are available on special order.

NOTE: Many 1985-87 302 engines, all 88-97 302 passenger car engines, all 96-00 302 truck engines, all 85-95 302 H.O. engines, and all 94-97 351 Windsor engines are equipped with hydraulic roller camshafts and lifters. Conventional hydraulic, mechanical, or roller lifters can be easily installed in these engines, providing the appropriate kit components are used.

NOTE: Ford 221 thru 302 camshafts can be used in 351 Windsor engines if the engine is changed to 221 thru 302 firing order (1-5-4-2-6-3-7-8). Ford 351W firing order is 1-3-7-2-6-5-4-8.

NOTE: In order to effect valve adjustment when using roller lifter camshafts, the heads must be machined to accept screw-in studs (on engines not originally equipped).

NOTE: Some engines have long valve stems which will result in excessive valve spring assembly height. Different springs and retainers may be required to prevent excessive shimming. Contact Crane's Performance consultants for details.

NOTE: Many 1972 and later Ford-Mercury V-8 engines are originally equipped with a retarded crankshaft sprocket. This may cause idling and performance problems when installing aftermarket camshafts. We recommend using our **44975-1** or **44984-1** timing chain and assemblies, a pre-1972 crankshaft sprocket, or degreeing in your camshaft. The non-retarded sprocket will have the alignment dot and keyway slot directly in line with each other.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99893-16[c]	**99953-16**	**99820-16**[c]	**99097-1**[f]	**95644-16**[h] **36622-16**[i] **95618-16**[j]	**44975-1**[*k] **44984-1**[*l]			**36750-16**[n] **86757-16**[o] **36757-16**[p]
	99885-16[c]	**99956-16** **99970-16**[d]	**99826-16**[c]	**99097-1**[f] **99087-1**[g]	**95644-16**[h] **36622-16**[i] **95618-16**[j]	**44975-1**[*k] **44984-1**[*l]			**36750-16**[n] **86757-16**[o] **36757-16**[p]
	99885-16[c]	**99956-16** **99970-16**[d]	**99826-16**[c]	**99097-1**[f] **99087-1**[g]	**95644-16**[h] **95618-16**[j]	**44975-1**[*k] **44984-1**[*l]			**36750-16**[n] **86757-16**[o] **36757-16**[p]
	99885-16[c]	**99956-16** **99970-16**[d]	**99826-16**[c]	**99097-1**[f] **99087-1**[g]	**95644-16**[h] **36622-16**[i] **95618-16**[j]	**44975-1**[*k] **44984-1**[*l]			**36750-16**[n] **86757-16**[o] **36757-16**[p]
	99885-16[c]	**99956-16** **99970-16**[d]	**99826-16**[c]	**99097-1**[f] **99087-1**[g]	**95644-16**[h] **36622-16**[i] **95618-16**[j]	**44975-1**[*k] **44984-1**[*l]			**36750-16**[n] **86757-16**[o] **36757-16**[p]
	99885-16[c]	**99956-16** **99970-16**[d]	**99826-16**[c]	**99097-1**[f] **99087-1**[g]	**95644-16**[h] **36622-16**[i] **95618-16**[j]	**44975-1**[*k] **44984-1**[*l]			**36750-16**[n] **86757-16**[o] **36757-16**[p]
	96886-16[c]	**99681-16**[e]	**99826-16**[c]	**99097-1**[f]	**95644-16**[h] **95618-16**[j]	**44984-1**[*l]			**36750-16**[n] **86757-16**[o] **36757-16**[p]
	96886-16[c]	**99681-16**[e]	**99826-16**[c]	**99097-1**[f]	**95644-16**[h] **95618-16**[j]	**44984-1**[*l]			**36750-16**[n] **86757-16**[o] **36757-16**[p]
	96886-16[c]	**99681-16**[e]	**99826-16**[c]	**99097-1**[f]	**95644-16**[h] **95618-16**[j]	**44984-1**[*l]			**36750-16**[n] **86757-16**[o] **36757-16**[p]

a Requires **36970-1** (.467" I.D.), **36971-1** (.500" I.D.), or **44970-1** (.531" I.D. SVO) steel, or **36990-1** (.467" I.D.), **36989-1** (.500" I.D.), or **44990-1** (.531" I.D. SVO), aluminum-bronze distributor drive gear, and 7/16-20 x 1-1/4" grade 8 cam gear bolt and hardened washer.
b Ultra Pro Series roller lifters.
c Must machine cylinder heads.
d Requires Crane Multi Fit valve locks.
e Titanium, must use **99097-1** valve stem locks (included with the retainers).
f Machined steel, heat treated.
g Machined steel, heat treated, Multi Fit.
h Pro Series one-piece, for 351 engines, for use with or without pushrod guideplate cylinder heads.
i For 302 engines, heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
j Pro Series one-piece, for 302 engines, for use with or without pushrod guideplate cylinder heads.
k For 73-93 engines, performance steel billet gears and roller chain set.
l For 73-93 engines, Pro Series steel billet gears and roller chain set.
n 1.6 ratio, 3/8" stud, must machine 66-93 cylinder heads and install **99156-16** rocker arm studs and **36650-1** pushrod guideplates, or use **36655-16** Conversion Kit on 77-93 pedestal mount cylinder heads for street applications.
o 1.6 ratio, 7/16" stud, must machine 66-93 cylinder heads and install **99157-16** rocker arm studs and **36650-1** pushrod guideplates.
p 1.7 ratio, 7/16" stud, must machine 66-93 cylinder heads and install **99157-16** rocker arm studs and 36650-1 pushrod guideplates.

COMPLETE CAM SPECIFICATIONS

Hydraulic Lifter Camshafts

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Brute low end torque, smooth idle, daily usage, fuel economy, 1600-2200 cruise RPM, 7.75 to 8.75 compression ratio advised.	**H-192/2667-2S-14**	800-4200	**520581**[*]	**99280-16**	192 204	248 260	114	(13) 25 41 (17)	.000 .000	.461 .493
Good low end torque, smooth idle, daily usage, off road, towing, economy, also mild turbocharged, 2200-2600 cruise RPM, 8.0 to 9.5 compression ratio advised.	**H-260-2**	1200-4800	**523901**[*] **523902**[*a]	**99280-16**	204 214	260 276	112	(5) 29 44 (10)	.000 .000	.493 .502
Good low end torque and HP, smooth idle, daily usage, fuel economy, light towing, off road, 2200-2700 cruise RPM, 8.5 to 10.0 compression ratio advised.	**Energizer 266 H10**	1400-4800	**13303**[*] **133032**[*b]	**99280-16**	210 210	266 266	110	0 30 40 (10)	.000 .000	.508 .508
Excellent low end and mid range torque and HP, good idle, daily usage, off road, towing, fuel economy, 2400-2800 cruise RPM, 8.5 to 10.0 compression ratio advised.	**H-266-2**	1500-5000	**523921**[*] **523922**[*a]	**99280-16**	210 218	266 280	112	(2) 32 46 (8)	.000 .000	.508 .510
Good low end and mid range torque and HP, good idle, daily usage, off road, highway towing, fuel efficiency plus performance, 2600-3000 cruise RPM, 8.75 to 10.0 compression ratio advised.	**Energizer 272 H10**	1600-5200	**13304**[*] **133042**[*a]	**99280-16**	216 216	272 272	110	3 33 43 (7)	.000 .000	.524 .524
Good low end and mid range torque, good idle, daily usage and off road, towing, performance and fuel efficiency, 2600-3000 cruise RPM, 8.75 to 10.5 compression ratio advised.	**H-272-2**	1800-5400	**523941**[*] **523942**[*b]	**99280-16**	216 228	272 284	112	1 35 51 (3)	.000 .000	.524 .519
Good mid range torque and HP, good to fair idle, daily usage, mild bracket racing, auto trans w/2500+ converter, 2700-3200 cruise RPM, 9.5 to 10.75 compression ratio advised.	**Energizer 278 H10**	2200-5600	**13313**[*] **133132**[*a]	**99280-16** **99380-16**[*c]	222 222	278 278	110	6 36 46 (4)	.000 .000	.539 .539
Good mid range torque and HP, good idle, daily performance usage, mild bracket racing, auto trans w/2000+ converter, 3000-3400 cruise RPM, 9.5 to 10.75 compression ratio advised.	**H-278-2**	2200-5800	**523801**[*] **523802**[*a]	**99280-16** **99380-16**[*c]	222 234	278 290	114	2 40 56 (2)	.000 .000	.539 .534
Rough idle, moderate performance usage, limited oval track, bracket racing, auto trans w/3000+ converter, 9.5 to 11.0 compression ratio advised.	**H-226/314-2S-6**	2400-6000	**520341**[*]	**99280-16** **99380-16**[*c]	226 230	286 290	106	11 35 45 5	.000 .000	.543 .550
Good mid range to upper RPM torque and HP, fair idle, moderate performance usage, bracket racing, auto trans w/2500+ converter, 3200-3600 cruise RPM, 9.5 to 11.0 compression ratio advised.	**H-288-2**	2400-6200	**524421**[*] **524422**[*a]	**99280-16** **99380-16**[*c]	226 230	288 292	110	8 38 50 0	.000 .000	.528 .536

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

IMPORTANT: If your hydraulic lifter preload is excessive, this can be easily remedied by using Crane's Rocker Arm Pedestal Shim Kit (**99170-1**). Refer to page 304 for details.

IMPORTANT: Crane offers a Pushrod Guideplate and Rocker Arm Stud Conversion Kit (52655-16) for street applications, enabling the 351C-351M-400 cu.in. engines with pedestal mounted rockers to have adjustable rocker arms without cylinder head removal or machining. See page 305 for details.

NOTE: To provide the most accurate valve adjustment on hydraulic lifter camshafts, the heads must be machined to accept **99159-16** screw-in studs and **52650-1** pushrod guideplates. Special length pushrods can be ordered to provide proper hydraulic lifter preload. Refer to page 353 for checking your hydraulic lifter preload.

NOTE: Many 1972 and later Ford-Mercury V-8 engines are originally equipped with a retarded crankshaft sprocket. This may cause idling and performance problems when installing aftermarket camshafts. We recommend using our **52975-1** timing chain and gear assembly, a pre-1972 crankshaft sprocket, or degreeing in your camshaft. The **non-retarded** sprocket will have the alignment dot and keyway slot directly in line with each other.

IMPORTANT NOTE: Many problems can occur if the proper valve spring retainers are not used on 351C-351M and 400 cu.in. engines. Ford made a number of production changes in these engines, possibly causing a misapplication of parts. Please refer to page 177 to insure that the proper components are being used.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
52308-1[d] 35308-1[e]	96801-16[f] 99839-16[g]	99944-16[i] 99948-16[j] 99969-16[k]		99097-1[l] 99094-1[m]	52621-16[n] 95650-16[o]	52975-1*[p]	52800-16[q]	27744-16[s]	27750-16[t] 27771-16[u]
52308-1[d] 35308-1[e]	96801-16[f] 99839-16[g]	99944-16[i] 99948-16[j] 99969-16[k]		99097-1[l] 99094-1[m]	52621-16[n] 95650-16[o]	52975-1*[p]	52800-16[q]	27744-16[s]	27750-16[t] 27771-16[u]
52308-1[d] 35308-1[e]	96801-16[f] 99839-16[g]	99944-16[i] 99948-16[j] 99969-16[k]		99097-1[l] 99094-1[m]	52621-16[n] 95650-16[o]	52975-1*[p]	52800-16[q]	27744-16[s]	27750-16[t] 27771-16[u]
52308-1[d] 35308-1[e]	96801-16[f] 99839-16[g]	99944-16[i] 99948-16[j] 99969-16[k]		99097-1[l] 99094-1[m]	52621-16[n] 95650-16[o]	52975-1*[p]	52800-16[q]	27744-16[s]	27750-16[t] 27771-16[u]
52308-1[d] 35308-1[e]	96801-16[f] 99839-16[g]	99944-16[i] 99948-16[j] 99969-16[k]		99097-1[l] 99094-1[m]	52621-16[n] 95650-16[o]	52975-1*[p]	52800-16[q]	27744-16[s]	27750-16[t] 27771-16[u]
52308-1[d] 35308-1[e]	96801-16[f] 99839-16[g]	99944-16[i] 99948-16[j] 99969-16[k]		99097-1[l] 99094-1[m]	52621-16[n] 95650-16[o]	52975-1*[p]	52800-16[q]	27744-16[s]	27750-16[t] 27771-16[u]
52308-1[d] 35308-1[e]	96801-16[f] 99839-16[g]	99944-16[i] 99948-16[j] 99969-16[k]		99097-1[l] 99094-1[m]	52621-16[n] 95650-16[o]	52975-1*[p]	52800-16[q]	27744-16[s]	27750-16[t] 27771-16[u]
	96877-16[h]	99944-16[i] 99948-16[j] 99969-16[k]		99097-1[l] 99094-1[m]	52621-16[n] 95650-16[o]	52975-1*[p]	52800-16[q]	27744-16[s]	27750-16[t] 27771-16[u]
52308-1[d] 35308-1[e]	96801-16[f] 99839-16[g]	99944-16[i] 99948-16[j] 99969-16[k]		99097-1[l] 99094-1[m]	52621-16[n] 95650-16[o]	52975-1*[p]	52800-16[q]	27744-16[s]	27750-16[t] 27771-16[u]

Section Continued

a Cam and Lifter Kit, includes installation lubricants.
b Cam and Lifter Kit, includes assembly lubricant
c Optional Hi Intensity hydraulic lifters, see page 272 for details.
d For 70-77 351C-351M-400 engines, contains standard diameter valve springs, no machining required.
e For 71-72 Boss 351 and 79-82 351M-400 engines, contains standard diameter valve springs, no machining required.
f Standard diameter valve springs, no machining required.
g Optional high rate 1.800" assembly height springs.
h Must machine cylinder heads.
i 11/32" type, see **IMPORTANT NOTE** for correct application.
j 3/8" type, see **IMPORTANT NOTE** for correct application.
k Requires Crane Multi Fit valve locks.
l Machined steel, heat treated 11/32" single groove type, see **IMPORTANT NOTE** for correct application.
m Machined steel, heat treated, Multi Fit 11/32" single groove type, see **IMPORTANT NOTE** for correct application.
n For 70-74 351C, heavy wall, heat treated, for use with or without pushrod guideplate cylinder heads.
o Pro Series one-piece, for 71-72 Boss 351, for use with or without pushrod guideplate cylinder heads.
p Performance steel billet gears and roller chain set.
q 1.71 ratio, for 351C-351M-400 engines, pedestal mount, non-adjustable.
s Energizer 1.72 ratio, requires 7/16" rocker arm studs and pushrod guideplates. See notes on opposite page.
t 1.73 ratio, requires 7/16" rocker arm studs and pushrod guideplates. See notes on opposite page.
u 1.73 ratio Wide Body, requires 7/16" rocker arm studs and pushrod guideplates. See notes on opposite page.

Ford-Mercury "Cleveland" V-8 70-82

Boss 351-351C-351M-400 cu.in.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh		Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts											
Good mid range HP, fair idle, moderate performance usage, mild bracket racing, auto trans w/2500+ converter, 3400-3800 cruise RPM, 9.5 to 11.0 compression ratio advised.	**Energizer** **284 H12**	2600-6400	**13305**[*] **133052**[*a] 3	**99280-16** **99380-16**[*d]	228 228	284 284	112	7 51	41 (3)	.000 .000	.554 .554
Good mid range to upper RPM HP, fair idle, moderate performance usage, bracket racing, auto trans w/2500+ converter, 3400-3800 cruise RPM, 10.0 to 11.5 compression ratio advised. Good w/nitrous, also mild supercharged.	**H-292-2**	2800-6600	**524551**[*] 3	**99280-16** **99380-16**[*d]	230 234	292 296	114	6 56	44 (2)	.000 .000	.536 .545
Good upper RPM HP, rough idle, performance usage, bracket racing, oval track 3/8-1/2 mile, auto trans w/3000+ converter, 3400-3800 cruise RPM, 10.75 to 12.5 compression ratio advised.	**H-238/3347-10**	3200-6800	**520641**[*] 3	**99280-16** **99380-16**[*d]	238 238	294 294	110	14 54	44 4	.000 .000	.579 .579
Rough idle, performance usage, good upper RPM HP, bracket racing, auto trans w/3500+ converter, 11.25 to 13.0 compression ratio advised.	**H-250/340-2S-10**	3600-7200	**520651**[*] 3	**99280-16** **99380-16**[*d]	250 254	310 314	110	20 62	50 12	.000 .000	.588 .595
Hydraulic Roller Camshafts — Retrofit											
Excellent low end torque and HP, good idle, daily usage, performance and fuel efficiency, off road, towing, mild turbocharged, 2400-3200 cruise RPM, 8.75 to 10.0 compression ratio advised.	**HR-216/325-2S-12**	1600-5600	**529541**[*b,c] 3	**36532-16**[e]	216 224	278 286	112	1 49	35 (5)	.000 .000	.562 .586
Good low and mid range torque and HP, fair idle, moderate performance usage, mild bracket racing, auto trans w/2000+ converter, 2800-3400 cruise RPM, 9.5 to 10.75 compression ratio advised.	**HR-224/339-2S-12**	2000-6000	**529551**[*b,c] 3	**36532-16**[e]	224 232	286 294	112	5 53	39 (1)	.000 .000	.586 .609
Good mid range torque and HP, fair idle, moderate performance usage, mild bracket racing, auto trans w/2500+ converter, 3200-3800 cruise RPM, 10.0 to 11.5 compression ratio advised.	**HR-228/345-2S-12**	2500-6500	**529801**[*b,c] 3	**36532-16**[e]	228 232	290 294	112	7 53	41 (1)	.000 .000	.597 .609
Good mid range to upper RPM torque and HP, rough idle, radical street, bracket racing, auto trans w/2500+ converter, 3400-4000 cruise RPM, 10.0 to 11.5 compression ratio advised.	**HR-232/352-2S-10**	2600-6800	**529821**[*b,c] 3	**36532-16**[e]	232 236	294 298	110	11 53	41 3	.000 .000	.609 .621
Good mid range to upper RPM torque and HP, rough idle, performance usage, mild bracket racing, auto trans w/3000+ converter, 3600-4200 cruise RPM, 10.5 to 12.0 compression ratio advised.	**HR-236/359-2S-12**	3000-7000	**529811**[*b,c] 3	**36532-16**[e]	236 240	298 302	112	11 57	45 3	.000 .000	.621 .631
Rough idle, performance usage, good upper RPM torque and HP, bracket racing, auto trans w/3500+ converter, 4200-5000 cruise RPM, good with aftermarket cylinder heads, 11.0 to 12.5 compression ratio advised.	**HR-240/365-2S-10**	3200-7200	**529831**[*b,c] 3	**36532-16**[e]	240 244	302 306	110	15 57	45 7	.000 .000	.631 .644

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

IMPORTANT: If your hydraulic lifter preload is excessive, this can be easily remedied by using Crane's Rocker Arm Pedestal Shim Kit (**99170-1**). Refer to page 304 for details.

IMPORTANT: Crane offers a Pushrod Guideplate and Rocker Arm Stud Conversion Kit (52655-16) for street applications, enabling the 351C-351M-400 cu.in. engines with pedestal mounted rockers to have adjustable rocker arms without cylinder head removal or machining. See page 305 for details.

NOTE: To provide the most accurate valve adjustment on hydraulic lifter and hydraulic roller camshafts, the heads must be machined to accept **99159-16** screw-in studs and **52650-1** pushrod guideplates. Special length pushrods can be ordered to provide proper hydraulic lifter preload. Refer to page 353 for checking your hydraulic lifter preload.

NOTE: Many 1972 and later Ford-Mercury V-8 engines are originally equipped with a retarded crankshaft sprocket. This may cause idling and performance problems when installing aftermarket camshafts. We recommend using our **52975-1** timing chain and gear assembly, a pre-1972 crankshaft sprocket, or degreeing in your camshaft. The **non-retarded** sprocket will have the alignment dot and keyway slot directly in line with each other.

IMPORTANT NOTE: Many problems can occur if the proper valve spring retainers are not used on 351C-351M and 400 cu.in. engines. Ford made a number of production changes in these engines, possibly causing a misapplication of parts. Please refer to page 177 to insure that the proper components are being used.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	96877-16[f]	99944-16[g] 99948-16[h] 99969-16[i]	99820-16[f]	99097-1[j] 99094-1[k]	52621-16[m] 95650-16[n]	52975-1[*r]	52800-16[s]	27744-16[u]	27750-16[v] 27771-16[w]
	96877-16[f]	99944-16[g] 99948-16[h] 99969-16[i]	99820-16[f]	99097-1[j] 99094-1[k]	52621-16[m] 95650-16[n]	52975-1[*r]	52800-16[s]	27744-16[u]	27750-16[v] 27771-16[w]
	96877-16[f]	99944-16[g] 99948-16[h] 99969-16[i]	99820-16[f]	99097-1[j] 99094-1[k]	52621-16[m] 95650-16[n]	52975-1[*r]	52800-16[s]	27744-16[u]	27750-16[v] 27771-16[w]
	96877-16[f]	99944-16[g] 99948-16[h] 99969-16[i]	99820-16[f]	99097-1[j] 99094-1[k]	52621-16[m] 95650-16[n]	52975-1[*r]	52800-16[s]	27744-16[u]	27750-16[v] 27771-16[w]
	99890-16[f]	99970-16[l]	99820-16[f]	99094-1[k]	95654-16[o] 95658-16[p] 95636-16[q]	52975-1[*r]	52800-16[s]	27744-16[u]	27750-16[v] 27771-16[w]
	99890-16[f]	99970-16[l]	99820-16[f]	99094-1[k]	95654-16[o] 95658-16[p] 95636-16[q]	52975-1[*r]	52800-16[s]	27744-16[u]	27750-16[v] 27771-16[w]
	99890-16[f]	99970-16[l]	99820-16[f]	99094-1[k]	95654-16[o] 95658-16[p] 95636-16[q]	52975-1[*r]	52800-16[s]	27744-16[u]	27750-16[v] 27771-16[w]
	99890-16[f]	99970-16[l]	99820-16[f]	99094-1[k]	95654-16[o] 95658-16[p] 95636-16[q]	52975-1[*r]	52800-16[s]	27744-16[u]	27750-16[v] 27771-16[w]
	99890-16[f]	99970-16[l]	99820-16[f]	99094-1[k]	95654-16[o] 95658-16[p] 95636-16[q]	52975-1[*r]	52800-16[s]	27744-16[u]	27750-16[v] 27771-16[w]
	99890-16[f]	99970-16[l]	99820-16[f]	99094-1[k]	95654-16[o] 95658-16[p] 95636-16[q]	52975-1[*r]	52800-16[s]	27744-16[u]	27750-16[v] 27771-16[w]

a Cam and Lifter Kit, includes assembly lubricant.
b Camshaft has standard base circle diameter, for use with **36532-16** hydraulic roller lifters.
c Requires **52970-1** (.500" I.D.) or **52971-1** (.531" I.D.) steel or **52990-1** (.500" I.D.) or **52989-1** (.531" I.D.) aluminum-bronze distributor drive gear.
d Optional Hi Intensity hydraulic lifters, see page 272 for details.
e Vertical locking bar hydraulic roller lifters, no machining required. Appropriate pushrods required.
f Must machine cylinder heads.
g 11/32" type, see **IMPORTANT NOTE** for correct application.
h 3/8" type, see **IMPORTANT NOTE** for correct application.
i Requires Crane Multi Fit valve locks with 11/32" single groove valve stems.
j Machined steel, heat treated 11/32" single groove type, see **IMPORTANT NOTE** for correct application.
k Machined steel, heat treated, Multi Fit 11/32" single groove type, see **IMPORTANT NOTE** for correct application.
l Multi Fit type retainers. **Use 99094-1** valve stem locks for single groove 11/32" applications, and standard valve stem locks for multiple groove 3/8" type applications. See **IMPORTANT NOTE** for correct application.
m For 70-74 351C, heavy wall, heat treated.
n Pro Series one-piece, for 71-72 Boss 351.
o Pro Series, one-piece, for 71-82 351M-400 engines with non-adjustable pedestal-mount rocker arms.
p Pro Series, one-piece, for 71-82 351M-400 engines with adjustable rocker arms with Crane's Pushrod Guideplate Conversion Kit (**52655-16**). See page 305 for details.
q Pro Series, one-piece, for 70-74 351C engines with adjustable rocker arms with Crane's Pushrod Guideplate Conversion Kit (**52655-16**). See page 305 for details.
r Performace steel billet gears and roller chain set.
s 1.71 ratio, for 351C-351M-400 engines, pedestal mount, non-adjustable.
u Energizer 1.72 ratio, requires 7/16" rocker arm studs and pushrod guideplates. See notes on opposite page.
v 1.73 ratio, requires 7/16" rocker arm studs and pushrod guideplates. See notes on opposite page.
w 1.73 ratio Wide Body, requires 7/16" rocker arm studs and pushrod guideplates. See notes on opposite page.

Ford-Mercury "Cleveland" V-8 70-82

Boss 351-351C-351M-400 cu.in.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Lifter Camshafts										
Replacement for factory Boss 351 camshaft.	**BluePrinted D1ZZ-6250-B**	2000-6000	**520321*** ◆3	**99257-16**	228 228	294 294	109	3 45 55 (7)	.024 .026	.502 .502
Good low end and mid range torque and HP, fair idle, moderate performance usage, limited oval track, mild bracket racing, auto trans w/2000+ converter, 3200-3600 cruise RPM, 10.0 to 11.0 compression raito advised.	**F-232/330-2S-8**	2800-6600	**521131*** ◆3	**99257-16**	232 238	264 270	108	(5) 29 44 (10)	.020 .022	.571 .581
Good low end and mid range torque and HP, fair idle, moderate performance usage, limited oval track, mild bracket racing, auto trans w/2500+ converter, 3400-3800 cruise RPM, 10.5 to 11.5 compression raito advised.	**F-238/3200-2-8**	2800-6600	**521141*** ◆3	**99257-16**	238 248	300 310	108	16 42 57 11	.022 .022	.554 .577
Good mid range torque and HP, rough idle, performance usage, short oval track, bracket racing, auto trans w/3500+ converter, 11.0 to 12.5 compression raito advised.	**F-246/3294-2-8**	3200-7000	**521211*** ◆3	**99257-16**	246 256	282 292	108	18 48 59 17	.026 .026	.570 .590
Good mid range to upper RPM torque and HP, rough idle, performance usage, bracket racing, auto trans w/race converter, also mild nitrous, mild supercharged, 11.5 minimum compression ratio advised.	**F-256/3634-2S1-10**	4000-7500	**521321*** ◆3	**99257-16**	256 266	292 302	110	22 54 66 20	.026 .026	.629 .610
Good mid range to upper RPM HP, performance usage, 1/4 - 1/2 mile oval track, bracket racing, auto trans w/ race converter, 11.5 minimum compression ratio advised.	**F-260/3694-6**	4200-7600	**521421*** ◆3	**99257-16**	260 260	296 296	106	26 54 58 22	.026 .026	.639 .639
Competition only, good mid and upper RPM torque and HP, flat tappet restricted classes, bracket racing, 1/2 - 5/8 mile oval track, good with aftermarket cylinder heads, auto trans w/race converter, 12.0 minimum compression ratio advised.	**F-266/400-2S-8**	4600-8000	**521501*** ◆3	**99257-16**	266 276	298 312	108	30 56 70 26	.018 .018	.692 .702
Radical competition only, good upper RPM torque and HP, flat tappet restricted classes, bracket racing, good with aftermarket cylinder heads, auto trans w/race converter, 12.5 minimum compression ratio advised.	**F-276/3934-8**	4800-8200	**521631*** ◆3	**99257-16**	276 276	312 312	108	33 63 69 27	.026 .026	.681 .681

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

NOTE: In order to effect valve adjustment on 351C-351M-400 cu.in. engines when using mechanical lifter camshafts, the heads must be machined to accept **99159-16** screw-in studs and **52650-1** pushrod guideplates.

NOTE: On engines with cylinder heads equipped with exhaust valve rotators, valve springs and retainers must be changed to allow for proper valve travel.

NOTE: Many 1972 and later Ford-Mercury V-8 engines are originally equipped with a retarded crankshaft sprocket. This may cause idling and performance problems when installing aftermarket camshafts. We recommend using our **52975-1** timing chain and gear assembly, a pre-1972 crankshaft sprocket, or degreeing in your camshaft. The **non-retarded** sprocket will have the alignment dot and keyway slot directly in line with each other.

IMPORTANT NOTE: Many problems can occur if the proper valve spring retainers are not used on 351C-351M and 400 cu.in. engines. Ford made a number of production changes in these engines, possibly causing a misapplication of parts. Please refer to page 177 to insure that the proper components are being used.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	96870-16[a]	99969-16[b]	99820-16[a]	99094-1[c]	52621-16[d] 95650-16[e]	52975-1[*f]			27750-16[h] 27771-16[i]
	96870-16[a]	99969-16[b]	99820-16[a]	99094-1[c]	52621-16[d] 95650-16[e]	52975-1[*f]			27750-16[h] 27771-16[i]
	96870-16[a]	99969-16[b]	99820-16[a]	99094-1[c]	52621-16[d] 95650-16[e]	52975-1[*f]			27750-16[h] 27771-16[i]
	96870-16[a]	99969-16[b]	99820-16[a]	99094-1[c]	52621-16[d] 95650-16[e]	52975-1[*f]			27750-16[h] 27771-16[i]
	96870-16[a]	99969-16[b]	99820-16[a]	99094-1[c]	52621-16[d] 95650-16[e]	52975-1[*f]			27750-16[h] 27771-16[i]
	96870-16[a]	99969-16[b]	99820-16[a]	99094-1[c]	52621-16[d] 95650-16[e]	52975-1[*f]			27750-16[h] 27771-16[i]
	96870-16[a]	99969-16[b]	99820-16[a]	99094-1[c]	52621-16[d] 95650-16[e]	52975-1[*f]			27750-16[h] 27771-16[i]
	96870-16[a]	99969-16[b]	99820-16[a]	99094-1[c]	52621-16[d] 95650-16[e]	52975-1[*f]			27750-16[h] 27771-16[i]

a Must machine cylinder heads.
b Requires appropriate Crane Multi Fit valve locks, see **IMPORTANT NOTE** for correct application.
c Machined steel, heat treated, Multi Fit 11/32″ single groove type, see **IMPORTANT NOTE** for correct application.
d For 70-74 351C, heavy wall, heat treated, for use with pushrod guideplate cylinder heads.
e Pro Series one piece, for 71-72 Boss 351, for use with pushrod guideplate cylinder heads.
f Performance steel billet gears and roller chain set.
h 1.73 ratio, requires 7/16″ rocker arm studs and pushrod guideplates. See notes on opposite page.
i 1.73 ratio Wide Body, requires 7/16″ rocker arm studs and pushrod guideplates. See notes on opposite page.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 276 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Roller Camshafts										
Good low end and mid range torque and HP, fair idle, moderate performance usage, mild bracket racing, auto trans w/2500+ converter, 3400-3800 cruise RPM, 10.5 to 11.5 compression ratio advised.	**SR-238/350-2S-12**	2800-6800	**528511**[*a] ◆3	**44518-16** **44570-16**[b]	238 246	288 296	112	12 46 60 6	.020 .020	.606 .626
Good mid range torque and HP, rough idle, moderate performance usage, short oval track, bracket racing, auto trans w/3000+ converter, 11.0 to 12.5 compression ratio advised.	**R-246/3236-2-8**	3200-7200	**528371**[*a] ◆3	**44518-16** **44570-16**[b]	246 256	284 294	108	20 46 61 15	.024 .026	.560 .585
Good mid range torque and HP, rough idle, moderate performance usage, mild bracket racing, auto trans w/3000+ converter, 3600-4000 cruise RPM, 11.0 to 12.0 compression ratio advised.	**SR-246/362-2S-12**	3200-7200	**528521**[*a] ◆3	**44518-16** **44570-16**[b]	246 254	296 304	112	16 50 64 10	.020 .020	.626 .647
Good mid range torque and HP, rough idle, performance usage, oval track, bracket racing, auto trans w/race converter, 11.5 to 12.5 compression ratio advised.	**R-252/420-2-8**	3600-7600	**528801**[*a] ◆3	**44518-16** **44570-16**[b]	252 262	284 294	108	22 50 63 19	.020 .020	.727 .727
Good mid range to upper RPM torque and HP, rough idle, performance usage, oval track, bracket racing, auto trans w/race converter, 12.0 minimum compression ratio advised.	**R-262/420-2-8**	4000-8000	**528811**[*a] ◆3	**44518-16** **44570-16**[b]	262 272	294 304	108	27 55 68 24	.020 .020	.727 .727
Competition only, good mid range to upper RPM torque and HP, bracket racing, NMRA, NMCA, auto trans w/race converter, 12.5 minimum compression ratio advised.	**R-262/4381-2S-8**	4200-8200	**528411**[*a] ◆3	**44518-16** **44570-16**[b]	262 268	294 300	108	26 56 65 23	.026 .022	.758 .758
Competition only, good upper RPM HP, bracket racing, auto trans w/race converter, 12.5 minimum compression ratio advised.	**R-272/420-2-8**	4400-8200	**528821**[*a] ◆3	**44570-16**[b]	272 282	304 314	108	32 60 73 29	.020 .020	.727 .727
Radical competition only, good upper RPM HP, bracket racing, NMCA, NMRA, good with nitrous, auto trans w/ race converter, 13.5 minimum compression ratio advised.	**R-278/5002-2S-12**	4600-8400	**528831**[*a] ◆3	**44570-16**[b]	278 292	306 320	112	32 66 83 29	.020 .022	.865 .865
Radical competition only, good upper RPM HP, bracket racing, NMCA, NMRA, good w/ 400+ cu.in. and aftermarket cylinder heads, auto trans w/race converter, 14.0 minimum compression ratio advised.	**R-282/5001-2S-10**	5000-8800	**528841**[*a] ◆3	**44570-16**[b]	282 286	314 318	110	33.5 68.5 78 28	.020 .016	.865 .832

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

NOTE: In order to effect valve adjustment on 351C-351M-400 cu.in. engines when using roller lifter camshafts, the heads must be machined to accept **99159-16** screw-in studs & **52650-1** pushrod guideplates.

NOTE: Many 1972 and later Ford-Mercury V-8 engines are originally equipped with a retarded crankshaft sprocket. This may cause idling and performance problems when installing aftermarket camshafts. We recommend using our **52975-1** timing chain and gear assembly, a pre-1972 crankshaft sprocket, or degreeing in your camshaft. The non-retarded sprocket will have the alignment dot and keyway slot directly in line with each other.

IMPORTANT NOTE: Many problems can occur if the proper valve spring retainers are not used on 351C-351M and 400 cu.in. engines. Ford made a number of production changes in these engines, possibly causing a misapplication of parts. Please refer to page 177 to insure that the proper components are being used.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99893-16[c]	**99953-16**[e] **99954-16**[f]	**99820-16**[d]	**99097-1**[i] **99094-1**[j]	**52621-16**[k] **95650-16**[l]	**52975-1***[m]			**27750-16**[o] **27771-16**[p]
	99893-16[c]	**99953-16**[e] **99954-16**[f]	**99820-16**[d]	**99097-1**[i] **99094-1**[j]	**52621-16**[k] **95650-16**[l]	**52975-1***[m]			**27750-16**[o] **27771-16**[p]
	99893-16[c]	**99953-16**[e] **99954-16**[f]	**99820-16**[d]	**99097-1**[i] **99094-1**[j]	**52621-16**[k] **95650-16**[l]	**52975-1***[m]			**27750-16**[o] **27771-16**[p]
	99885-16[c]	**99956-16**[e] **99970-16**[f]	**99820-16**[d]	**99097-1**[i] **99094-1**[j]	**52621-16**[k] **95650-16**[l]	**52975-1***[m]			**27750-16**[o] **27771-16**[p]
	99885-16[c]	**99956-16**[e] **99970-16**[f]	**99820-16**[d]	**99097-1**[i] **99094-1**[j]	**52621-16**[k] **95650-16**[l]	**52975-1***[m]			**27750-16**[o] **27771-16**[p]
	99885-16[c]	**99956-16**[e] **99970-16**[f]	**99820-16**[d]	**99097-1**[i] **99094-1**[j]	**52621-16**[k] **95650-16**[l]	**52975-1***[m]			**27750-16**[o] **27771-16**[p]
	99885-16[c]	**99956-16**[e] **99970-16**[f]	**99820-16**[d]	**99097-1**[i] **99094-1**[j]	**52621-16**[k] **95650-16**[l]	**52975-1***[m]			**27750-16**[o] **27771-16**[p]
	96888-16[c] **961226-16**[c,d]	**99681-16**[g] **99661-16**[s]	**99820-16**[d]	**99097-1**[i]	**52621-16**[k] **95650-16**[l]	**52975-1***[m]			**27750-16**[o] **27771-16**[p]
	96888-16[c] **961226-16**[c,d]	**99681-16**[g] **99661-16**[s]	**99820-16**[d]	**99097-1**[i]	**52621-16**[k] **95650-16**[l]	**52975-1***[m]			**27750-16**[o] **27771-16**[p]

a Requires **52970-1** (.500″ I.D.) or **52971-1** (.531″ I.D.) steel, or **52990-1** (.500″ I.D.) or **52989-1** (.531″ I.D.) aluminum-bronze distributor drive gear.
b Ultra Pro Series roller lifters.
c Must machine cylinder heads.
d For 2.100″ assembly height, requires **99661-16** titanium retainers.
e 11/32″ type, see **IMPORTANT NOTE** and page 177 for correct application.
f 3/8″ type, see **IMPORTANT NOTE** and page 177 for correct application.
g Titanium 11/32″ type, must use **99097-1** valve stem locks, included with the retainers, see **IMPORTANT NOTE** for correct application.
h Titanium, for **961226-16** valve springs, requires Crane Multi Fit valve stem locks.
i Machined steel, heat treated 11/32″ single groove type, see **IMPORTANT NOTE** for correct application.
j Machined steel, heat treated Multi Fit 11/32″ single groove type, see **IMPORTANT NOTE** for correct application.
k For 70-74 351C, heavy wall, heat treated, for use with pushrod guideplate cylinder heads.
l For 71-72 Boss 351, for use with or without pushrod guideplate cylinder heads.
m Performance steel billet gears and roller chain set.
o 1.73 ratio, requires 7/16″ rocker arm studs and pushrod guideplates. See notes on opposite page.
p 1.73 ratio Wide Body, requires 7/16″ rocker arm studs and pushrod guideplates. See notes on opposite page.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 266 FOLLOWERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Valve Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Follower Camshafts										
Good low end and mid range torque and HP, good idle, daily usage, off road, mild supercharged, mild nitrous, 2200-2600 cruise RPM.	**HR-218/500-2-16**	2000-5000	**379501**[*a] ◆3		218 228	254 264	116	(2) 40 55 (7)	.000 .500 .000 .500
Good mid range torque and HP, fair idle, performance usage, bracket racing, computer upgrades required, 2600-3000 cruise RPM.	**HR-228/500-2S-12**	2400-6200	**379511**[*a] ◆3		228 234	264 270	112	7 41 54 0	.000 .500 .000 .500
Excellent low end torque and HP, smooth idle, daily usage, towing, 1600-2200 cruise RPM.	**HR-212/550-2S-15**	1600-5500	**379601**[*b] ◆3		212 218	248 254	115	(4) 36 49 (11)	.000 .550 .000 .550
Good low end and mid range torque and HP, good idle, daily usage, off road, mild supercharged, mild nitrous, 2200-2600 cruise RPM.	**HR-218/550-2-16**	2000-5800	**379611**[*b] ◆3		218 228	254 264	116	(2) 40 55 7	.000 .550 .000 .550
Good mid range torque and HP, fair idle, performance usage, bracket racing, auto w/2000+ converter, computer upgrades required, must check valve to piston clearance, 2600-3000 cruise RPM.	**HR-228/550-2S-12**	2400-6200	**379621**[*b] ◆3		228 234	264 270	112	7 41 54 0	.000 .550 .000 .550
Good mid range to upper RPM torque and HP, rough idle, performance usage, bracket racing, auto w/2500+ converter, increased compression ratio required, computer upgrades required, must check valve to piston clearance, 2800-3400 cruise RPM. Also mild supercharged or nitrous.	**HR-236/600-2S-14**	2800-6600	**379631**[*b] ◆3		236 242	272 278	114	6 50 57 5	.000 .600 .000 .600

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

NOTE: Installing camshafts having greater than .500" valve lift in other than Performance Improvement 2V cylinder heads will require cylinder head machining to achieve correct valve spring assembly heights.

IMPORTANT NOTE: 1997 and later applications will require Ford bolt-on gears: Ford part number F8AZ-6256-AA for the right gear, and F8AZ-6256-BA for the left gear. One of the YF7Z-6279-AA bolt kits, two F1AZ-6278-A washers, and two F3AZ-6265-A spacers will also be required.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	ALUMINUM ROCKERS — ENERGIZER	ALUMINUM ROCKERS — GOLD RACE
	37830-16[c]	**37660-16[d]**							
	37830-16[c]	**37660-16[d]**							
	37830-16[c]	**37660-16[d]**							
	37830-16[c]	**37660-16[d]**							
	37830-16[c]	**37660-16[d]**							
	37830-16[c]	**37660-16[d]**							

a Pair of camshafts for 1992 and later engines with standard cylinder heads. 1997 and later applications will require Ford bolt-on gears: Ford part number F8AZ-6256-AA for the right gear, and F8AZ-6256-BA for the left gear.

b Pair of camshafts for 1999 and later engines with Power Improvement cylinder heads. Requires Ford bolt-on gears: Ford part number F8AZ-6256-AA for the right gear, and F8AZ-6256-BA for the left gear.

c Standard diameter ovate wire valve springs, no machining required. Can be used with stock valve spring retainers.

d Titanium retainers, for use with standard valve stem locks.

Ford-Mercury V-8 93-15

4.6-5.4 Litre DOHC 4 Valve

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 266 FOLLOWERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Valve Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Follower Camshafts										
Good low end and mid range torque and HP, good idle, daily usage, off road, computer upgrades required, mild supercharged, mild nitrous, 2200-2600 cruise RPM.	**HR-218/500-12**	2000-5800	**409501**[*a,e] **409502**[*b,e] **409503**[*c,e] **409504**[*d,e]	3	218 / 218	254 / 254	112	(3) 41 / 41 (3)	.000 / .000	.500 / .500
Good low end and mid range torque and HP, good idle, daily usage, off road, computer upgrades required, mild supercharged, mild nitrous, 2600-3000 cruise RPM.	**HR-228/500-12**	2400-6200	**409511**[*a,e] **409512**[*b,e] **409513**[*c,e] **409514**[*d,e]	3	228 / 228	264 / 264	112	2 46 / 46 2	.000 / .000	.500 / .500
Good mid range to upper RPM torque and HP, rough idle, performance usage, bracket racing, auto w/2500+ converter, increased compression ratio required, computer upgrades required, must check valve to piston clearance, 2800-3400 cruise RPM. Also mild supercharged or nitrous.	**HR-234/500-12**	2800-6600	**409521**[*a,e] **409522**[*b,e] **409523**[*c,e] **409524**[*d,e]	3	234 / 234	270 / 270	112	5 49 / 49 5	.000 / .000	.500 / .500
Good mid range torque and HP for 5.7L, good idle, performance usage, off road, computer upgrades required, mild supercharged, mild nitrous, 2600-3200 cruise RPM.	**HR-230/575-12**	2400-6200	**409601**[*a,e,f] **409602**[*b,e,f]	3	230	266	112	3 47	.000	.575
Good mid range to upper RPM torque and HP for 5.7L, rough idle, performance usage, bracket racing, auto w/2500+ converter, increased compression ratio required, computer upgrades required, must check valve to piston clearance, 2800-3400 cruise RPM. Also mild supercharged or nitrous.	**HR-234/575-12**	2800-6600	**409611**[*a,e,f] **409612**[*b,e,f]	3	234	270	112	7 49	.000	.575
Good upper RPM torque and HP for 5.7L, rough idle, performance usage, bracket racing, auto w/2800+ converter, increased compression ratio required, computer upgrades required, must check valve to piston clearance, 3000-3600 cruise RPM. Also mild supercharged or nitrous.	**HR-238/575-12**	3200-6800	**409621**[*a,e,f] **409622**[*b,e,f]	3	238	274	112	7 51	.000	.575

Ford-Mercury V-8 05-15

4.6-5.4 Litre SOHC 3 Valve

Hydraulic Roller Follower Camshafts										
Good low end and mid range torque and HP, smooth idle, daily usage, 5.4L towing, 2200-2600 cruise RPM, valve spring upgrades required. Also mild supercharged or mild nitrous.	**ZHR-208/468-2S-14**	1800-5000	**399501**[*j]	3	204 / 224	256 / 272	114	(5) 33 / 51 (7)	.000 / .000	.468 / .516
Good mid range torque and HP, good idle, performance usage, bracket racing, good w/supercharger or mild nitrous, 2600-3000 cruise RPM, valve spring and computer upgrades required.	**ZHR-216/492-2S-14**	2200-5400	**399511**[*j,k]	3	216 / 236	264 / 284	114	(1) 37 / 57 (1)	.000 / .000	.492 / .552
Good mid to upper RPM torque and HP, fair idle, performance usage, bracket racing, auto trans w2000+ converter, 11.0+ compression ratio advised, 3000-3600 cruise RPM, valve spring and computer upgrades required.	**ZHR-228/528-2S-12**	2600-6200	**399521**[*j,k]	3	228 / 244	276 / 292	112	7 41 / 59 5	.000 / .000	.528 / .576
Good upper RPM HP, rough idle, performance usage, bracket racing, auto trans w2500+ converter, 11.0+ compression ratio advised, 3200-3800 cruise RPM, valve spring and computer upgrades required.	**ZHR-236/552-2S-12**	2800-6600	**399531**[*j,k]	3	236 / 252	284 / 300	112	11 45 / 63 9	.000 / .000	.552 / .600

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT NOTE: The 4V high lift (.575") intake camshafts listed are for use in 4.7 or 5.4L cylinder heads that have aftermarket intake valves with relocated valve lock grooves (with the valve tip extending 10.65mm above the groove). This permits the necessary assembly height required, without follower interference.

IMPORTANT NOTE: In 3V applications, the use of stock pistons, cam phaser, and factory tuning can cause possible exhaust valve to piston contact when using performance camshafts. One, or more, of the following changes must occur: Install a fixed position cam gear that eliminates phaser retard; Install aftermarket pistons with increased piston to valve clearances; Install aftermarket tuning with altered phaser strategy.

NOTE: When changing 3-valve camshafts, use Ford timing chain and wedge handle ESST 303-636 and ESST 303-637 to hold chain in place. When changing valve springs, use Ford valve spring compressor ESST 303-1039.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	ALUMINUM ROCKERS — ENERGIZER	ALUMINUM ROCKERS — GOLD RACE
	40830-32[g]	**40660-32**[i]							
	40830-32[g]	**40660-32**[i]							
	40830-32[g]	**40660-32**[i]							
	37830-16[h]	**37660-16**[i]							
	37830-16[h]	**37660-16**[i]							
	37830-16[h]	**37660-16**[i]							
	37830-24[l]	**39660-24**[m]							
	37830-24[l]	**39660-24**[m]							
	37830-24[l]	**39660-24**[m]							
	37830-24[l]	**39660-24**[m]							

a Left intake camshaft.
b Right intake camshaft.
c Left exhaust camshaft.
d Right exhaust camshaft.
e Install adjustable cam gears for best performance. Install aftermarket tuning to achieve desired performance levels.
f Intake valves with relocated keeper grooves must be installed, along with recommended valve springs and retainers.
g Standard diameter ovate wire valve springs, requires **40660-32** retainers.
h Standard diameter ovate wire valve springs, requires **37660-16** retainers.
i Titanium retainers, for use with standard valve stem locks.
j Must install **37830-24** valve springs and **39660-24** valve spring retainers.
k The use of stock pistons, cam phaser, and factory tuning can cause possible exhaust valve to piston contact. At least one of the following is necessary: Install a fixed position cam gear that eliminates phaser retard; Install aftermarket pistons with increased piston to valve clearance; Install aftermarket tuning with altered phaser strategy.
l Standard diameter ovate wire valve springs, requires **37660-24** retainers.
m Titanium retainers, for use with standard valve stem locks.

1963–1976 352-360-390-406-410-427-428 FE V8

Ford's legendary big block FE engine series provided the foundation for their passenger car, truck and performance applications for nearly two decades. Actually, this series was introduced in 1958, with the early 332-352-390 FE engines having a different camshaft and cam drive configuration than the 1963-1976 engines, preventing their direct interchangeability. The early engines did not have a camshaft thrustplate, but relied on a spring to control cam endplay. These engines can use the later camshafts if the thrustplate is installed by removing the plugs in the front of the block on either side of the cam thrust surface, and tapping the holes for the 5/16-18 attaching bolts. A later model timing chain and gear set will also have to be installed.

There were also FT engines, used in truck applications. These were basically the same power plants as the FE, but with four-ring pistons installed.

For marine usage, some left hand rotation engines were produced, requiring a special camshaft and distributor drive gear.

Crane's 34 prefix designates this engine series, with a full line of camshafts and valve train components available. Hydraulic, retrofit hydraulic roller, mechanical, and mechanical roller camshafts are offered.

Do not confuse the FE with the MEL engine family that Ford offered from 1958 to 1968 (383-410-430-462 cu. in.). Note that a 410 cu.in. engine was also included in that series. About the only common parts between the two engine families were the lifters and the rocker arms.

FE engines were factory equipped with either hydraulic and mechanical lifter camshafts from the factory, depending upon horsepower requirements. The factory adjustable shaft mounted rocker arms have a 1.76:1 ratio, while the non-adjustable rockers have a 1.73:1 ratio. Lifter bores are inline, as are the valves in the cylinder heads.

Oiling for the top end of the engine is directed up through passages in the block and heads, through the rocker shaft stands and shafts, then out via holes on the rocker arms.

Watch for the 1965-1967 side-oiler 427 engines (and some rare 390 versions) specifically designed for mechanical lifter only usage. These blocks do not have oil galleys to supply hydraulic lifters. Therefore, hydraulic and hydraulic roller camshafts and lifters can not be used. The camshafts used in these blocks also require grooves in the second and fourth cam bearing journals (.044" wide and .035" deep, with a .022" radius) for proper oiling.

Cylinder head configurations ranged from the basic low-rise, the drag race and oval track oriented high-rise, a medium-rise, and the tunnel port. All employed the same valve layout, so no camshaft changes were required. The rocker arm shaft stands varied per version, although the low-riser and the tunnel port did share the same components.

A thriving aftermarket provides sufficient components to build an FE from scratch. We plan on supplying camshaft and valve train components for well into the future for this icon of Ford performance.

1963–1965 427 SOHC V8

Developed for oval track and drag racing, the single overhead cam 427 V8 was a real show of engineering force from Ford. Although this engine was banned from use at the big ovals, drag racing certainly benefited from this escalation of factory technology. Crane was fortunate to be involved in camshaft design for these engines from the beginning, and continues to custom produce tool steel camshafts for The "Cammer". We also offer valve springs, retainers, and valve locks. Our 32-prefix designates these camshafts.

Based on a variant of the 427 FE side oiler block, the iron cylinder heads incorporate one camshaft per bank, actuating valves in a hemispherical combustion chamber via shaft mounted mechanical roller followers, which have an effective 1.32:1 ratio. Valve lash adjustments are achieved by installing varying thickness lash caps on top of the valves. Single and dual four barrel carbureted versions were factory produced. There were a limited number of aluminum cylinder heads produced for the factory supported racers, but these did not come installed on any engines.

Although never officially "factory" installed in any vehicles, connected outside contractors did obtain complete engines, and put them into Mustangs, Fairlanes, and Galaxies for sale to the racing community.

This engine is also experiencing a rebirth by the aftermarket, with numerous components being offered. Expect more reproduction parts to be available in the next year.

1968–1997 370-429-460 (7.5L) V8

The final Ford big block family is the 385 series. Replacing the FE, newer casting techniques were used, along with more efficient cylinder heads, and a lighter valve train.

Crane's 35 prefix indicates parts specific to these engines. Hydraulic, retrofit hydraulic roller, mechanical, and mechanical roller camshafts and a full line of valve train components are offered.

The lifter bores in the block are inline, but the valves are staggered in the cylinder heads for better breathing and combustion. The standard 1.73:1 ratio rocker arms are stamped steel and either stud mounted (1968–1971) or pedestal mounted (1972–1997). The rocker arms were primarily non-adjustable, with a few exceptions. The 1970–1971 Cobra Jet 429 engines had adjustable rocker arms and pushrod guideplates, while the 1970–1971 Super Cobra Jet 429's came equipped with mechanical lifter camshafts and adjustable rocker arms and guideplates.

Oiling for the top end of the engine is conducted through the lifters and pushrods, providing lubrication for the rocker arm pivots and valve springs.

The 1968–1971 engines are equipped with bottleneck configuration rocker arm studs. Our 99768-16 positive locking nuts can be installed to permit individual valve adjustment. To conveniently convert the non-adjustable pedestal mounted rocker arm cylinder heads to a fully adjustable configuration, Crane offers two Pushrod Guideplate and Rocker Arm Stud conversion kits. Part number **52655-16** enables the installation of 7/16" stud mounted rocker arms and 5/16" diameter pushrods, while part number **35655-16** is for 7/16" stud mounted rocker arms and 3/8" diameter pushrods. Either set installs on the cylinder heads with no machining required, and are suitable for most street and moderate performance applications. For racing, we advise that the heads be machined for our **99159-16** 7/16" diameter studs, and heat treated pushrod guideplates. There are also a number of aftermarket cylinder heads available that already include studs and guideplates, permitting full adjustment.

For serious racing applications, we offer 8620 steel billet camshafts with either the standard firing order (1-5-4-2-6-3-7-8), or the SFO1 firing order (1-5-4-8-6-3-7-2).

1969–1970 429 Boss Hemi V8

Available only in the Boss 429 Mustang and the Torino Talladega , this rare variation of the 385 series has a number of unique features. Although quite similar to the standard blocks, the Boss has a wet deck surface, requiring individual sealing rings at the cylinder head interface in order to properly seal around each cylinder, and also around each oil and water passage. The other feature of the Boss block is the oiling system, with oiling to the top end coming up through passages in the block, cylinder heads, and rocker arm shafts, not up the pushrods.

Crane's 30 prefix indicates parts specific to these engines. Hydraulic, retrofit hydraulic roller, mechanical, and mechanical roller camshafts and a full line of valve train components are offered. Even though the camshaft is interchangeable with the 385 series engines, the different rocker arm ratios and valve spring requirements necessitate a different specification card.

The early 1969 S-series engines were equipped with a hydraulic lifter camshaft and lifters. The later 1969 and 1970 T-series engines had mechanical lifter camshafts and lifters. The "semi-hemi" cylinder heads are aluminum, and offered in oval track and street versions. The oval track heads had 1.75:1 ratio intake and exhaust rocker arms, with smaller diameter rocker shafts than the street version, which was equipped with 1.65:1 intake and 1.75:1 exhaust rocker arms. Different length pushrods are required for the intake and exhaust valves. Specific hydraulic and mechanical roller lifters are also required for proper pushrod clearance, due to the different angular displacement of the intake and exhaust pushrods.

For serious racing applications, we offer 8620 steel billet camshafts with either the standard firing order (1-5-4-2-6-3-7-8), or the SFO1 firing order (1-5-4-8-6-3-7-2).

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts										
Brute low end torque, F-150 pickup, smooth idle, daily usage, fuel economy, 1600-2200 cruise RPM, 7.75 to 8.75 compression ratio advised.	**H-248-2**	800-4200	**343971**[*] ◆3	**99281-16**	192 204	248 260	114	(13) 25 41 (17)	.000 .000	.469 .501
Good low end torque, smooth idle, daily usage, off road, towing, economy, also mild turbocharged, 2200-2600 cruise RPM, 8.0 to 9.5 compression ratio advised.	**H-260-2**	1200-4800	**343901**[*] **343902**[*a] ◆3	**99281-16**	204 216	260 272	112	(5) 29 45 (9)	.000 .000	.501 .533
Good low and mid range torque, smooth idle, daily usage, light towing, off road, 2200-2700 cruise RPM, 8.5 to 10.0 compression ratio advised.	**Energizer 266 H10**	1400-4800	**13404**[*] **134042**[*a] ◆3	**99281-16**	210 210	266 266	110	0 30 40 (10)	.000 .000	.516 .516
Good mid range torque, good idle, daily usage, off road, highway towing, fuel efficiency plus performance, 2600-3000 cruise RPM, 8.75 to 10.5 compression ratio advised.	**Energizer 272 H10**	1800-5200	**13405**[*] **134052**[*a] ◆3	**99281-16**	216 216	272 272	110	3 33 43 (7)	.000 .000	.533 .533
Good low and mid-range torque, good idle, daily usage and off road, towing, performance and fuel efficiency, 2600-3000 cruise RPM, 8.75 to 10.75 compression ratio advised.	**H-272-2**	1800-5200	**343941**[*] **343942**[*a] ◆3	**99281-16**	216 228	272 284	112	1 35 51 (3)	.000 .000	.533 .563
Replacement for over-the-counter Ford Factory Performance camshaft (also referred to as SK-39789)	**BluePrinted C8AX-6250-C**	1800-5200	**340301** ◆1	**99281-16**	220 230	278 290	116	(1) 41 56 (6)	.000 .000	.498 .498
Good mid-range torque, good idle, daily performance usage, mild bracket racing, 3000-3400 cruise RPM, 9.5 to 10.75 compression ratio advised.	**H-278-2**	2000-5400	**343801**[*] **343802**[*a] ◆3	**99281-16** **99381-16**[*b]	222 234	278 290	114	2 40 56 (2)	.000 .000	.548 .580
Good mid-range torque and HP, fair idle, moderate performance usage, bracket racing, 3200-3600 cruise RPM, 9.5 to 11.0 compression ratio advised.	**H-288**	2200-5600	**344341**[*] **344342**[*a] ◆3	**99281-16** **99381-16**[*b]	226 226	288 288	112	6 40 50 (4)	.000 .000	.537 .537
Fair idle, performance usage, good mid-range HP, 3800-4200 cruise RPM, 10.0 to 11.5 compression ratio advised.	**H-296-2**	2800-6200	**344621**[*] ◆3	**99281-16** **99381-16**[*b]	234 238	296 300	112	10 44 56 2	.000 .000	.554 .563
Rough idle, performance usage, good mid-range and upper RPM torque and HP, auto trans w/2500+ converter, good with aftermarket aluminum cylinder heads, 3600-4000 cruise RPM, 10.0 to 11.5 compression ratio advised.	**H-298**	3000-6500	**344561**[*] ◆3	**99281-16** **99381-16**[*b]	236 236	298 298	108	15 41 51 5	.000 .000	.572 .572
Performance usage, good upper RPM torque and HP, bracket racing, auto trans w/3500+ converter, good with aftermarket aluminum cylinder heads, 10.5 to 12.0 compression ratio advised.	**H-246/330-10**	3400-6800	**340721**[*] ◆3	**99281-16** **99381-16**[*b]	246 246	308 308	110	18 48 58 8	.000 .000	.581 .581

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

NOTE: Specify if late 62-406 cu.in. or 63-76 block is used, as the cam is different than the one used in 58-62 block.

NOTE: All grinds shown use the stock Ford 1.76 ratio adjustable rocker arms - Ford part number B8A-6564-B or Crane adjustable ductile iron rocker arms, **34772-16**, in order to achieve the listed gross valve lift figures.

NOTE: To provide the most accurate valve adjustment on hydraulic lifter camshafts, the use of Crane adjustable rocker arms (**34772-16** or **34791-1**) and appropriate pushrods (**34621-16** or **95819-16**) is highly recommended.

NOTE: Many 1972 and later Ford-Mercury V-8 engines are originally equipped with a retarded crankshaft sprocket. This may cause idling and performance problems when installing aftermarket camshafts. We recommend using a pre-1972 crankshaft sprocket, or by degreeing in your camshaft. The non-retarded sprocket will have the alignment dot and keyway slot directly in line with each other.

NOTE: Some cylinder heads have removable lower spring seats with an inner spring step. This step must be removed to allow the inner springs to set flush with the outer springs.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 301*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	CAST ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
13309-1[c]	**96801-16**[c]	**99957-16** **99969-16**[e]	**99822-16**[d]	**99098-1**[f]	**34621-16**[g] **95819-16**[h]		**34772-16**[i]		
13309-1[c]	**96801-16**[c]	**99957-16** **99969-16**[e]	**99822-16**[d]	**99098-1**[f]	**34621-16**[g] **95819-16**[h]		**34772-16**[i]		
13309-1[c]	**96801-16**[c]	**99957-16** **99969-16**[e]	**99822-16**[d]	**99098-1**[f]	**34621-16**[g] **95819-16**[h]		**34772-16**[i]		
13309-1[c]	**96801-16**[c]	**99957-16** **99969-16**[e]	**99822-16**[d]	**99098-1**[f]	**34621-16**[g] **95819-16**[h]		**34772-16**[i]		
13309-1[c]	**96801-16**[c]	**99957-16** **99969-16**[e]	**99822-16**[d]	**99098-1**[f]	**34621-16**[g] **95819-16**[h]		**34772-16**[i]		
13309-1[c]	**96801-16**[c]	**99957-16** **99969-16**[e]	**99822-16**[d]	**99098-1**[f]	**34621-16**[g] **95819-16**[h]		**34772-16**[i]		
13309-1[c]	**96801-16**[c]	**99957-16** **99969-16**[e]	**99822-16**[d]	**99098-1**[f]	**34621-16**[g] **95819-16**[h]		**34772-16**[i]		
13309-1[c]	**96801-16**[c]	**99957-16** **99969-16**[e]	**99822-16**[d]	**99098-1**[f]	**34621-16**[g] **95819-16**[h]		**34772-16**[i]		
	96877-16[d]	**99969-16**[e]	**99822-16**[d]	**99098-1**[f]	**34621-16**[g] **95819-16**[h]		**34772-16**[i]		
	96877-16[d]	**99969-16**[e]	**99822-16**[d]	**99098-1**[f]	**34621-16**[g] **95819-16**[h]		**34772-16**[i]		
	96877-16[d]	**99969-16**[e]	**99822-16**[d]	**99098-1**[f]	**34621-16**[g] **95819-16**[h]		**34772-16**[i]		

a Cam and Lifter Kit, includes installation lubricants.
b Optional Hi Intensity hydraulic lifters, see page 272 for details.
c Standard diameter valve springs, no machining required.
d Must machine cylinder heads.
e Requires **99098-1** valve locks.
f Machined steel, heat treated.
g Heavy wall, heat treated, for use with **34772-16** adjustable rocker arms with ball type adjusters.
h Pro Series one-piece, for use with **34791-1** adjustable rocker arms with cup type adjusters.
i 1.76 ratio, ductile iron, adjustable, requires appropriate **34645-16** Crane pushrods.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts — Retrofit										
Good low end torque, smooth idle, daily usage, towing, economy, also mild turbocharged, 2200-3000 cruise RPM, 8.0 to 9.5 compression ratio advised.	**HR-214/319-2S-12**	1400-5400	**349511**[*a] ◆3	**35532-16**[b]	214 222	276 284	112	0 34 48 (6)	.000 .000	.561 .584
Excellent low and mid-range torque and HP, good idle, moderate performance usage, mild bracket racing, 2800-3400 cruise RPM, 9.5 to 10.75 compression ratio advised.	**HR-222/320-2S1-12**	1800-5600	**349551**[*a] ◆3	**35532-16**[b]	222 226	286 290	112	3 39 49 (3)	.000 .000	.563 .563
Excellent low and mid-range torque and HP, fair idle, moderate performance usage, mild bracket racing, 3000-3600 cruise RPM, good with aftermarket aluminum cylinder heads, 10.0 to 11.5 compression ratio advised.	**HR-226/3201-2S-12**	2000-5800	**349561**[*a] ◆3	**35532-16**[b]	226 236	290 302	112	5 41 54 2	.000 .000	.563 .581
Excellent mid-range & upper RPM HP, lightweight kit car, rough idle, performance usage, good mid-range HP, mild bracket racing, auto trans w/2500+ converter, works well with aftermarket aluminum cylinder heads, 3600-4200 cruise RPM, 10.5 to 12.0 compression ratio advised.	**HR-234/354-2S-12**	2400-6200	**349571**[*a] ◆3	**35532-16**[b]	234 242	298 306	112	9 45 57 5	.000 .000	.623 .651
Good mid-range and upper RPM HP, lightweight kit car, rough idle, performance usage, mild bracket racing, auto trans w/3000+ converter, good with 450+ cu.in., good with aftermarket aluminum cylinder heads, 3800-4400 cruise RPM, 11.0 to 13.0 compression ratio advised.	**HR-242/350-2S-12**	2800-6400	**349581**[*a] ◆3	**35532-16**[b]	242 248	308 312	112	13 49 60 8	.000 .000	.616 .616
Mechanical Lifter Camshafts										
Good mid range torque, fair idle, moderate performance usage, good low and mid-range HP, off road, bracket racing, 3400-3800 cruise RPM, mild supercharged, 10.0 to 11.5 compression ratio advised.	**F-238/3200-2-14**	2400-6000	**341191**[*] ◆3	**99257-16** **99256-16**[c]	238 248	300 310	114	10 48 63 5	.026 .026	.563 .584
Replacement for factory 425 HP, 427 cu.in. camshaft.	**BluePrinted C3AZ-6250-AA**	3000-6600	**340321**[*] ◆1	**99257-16** **99256-16**[c]	244 244	284 284	114	13 51 61 3	.018 .022	.524 .524
Good mid range torque and HP, rough idle, moderate performance usage, good mid-range HP, 3600-4200 cruise RPM, 10.5 to 12.0 compression ratio advised.	**F-248/3334-12**	3400-7000	**340471**[*] ◆3	**99257-16** **99256-16**[c]	248 248	310 312	112	17 51 61 7	.026 .026	.587 .587
Moderate competition only, good mid and upper RPM torque and HP, bracket racing, auto w/race converter, 11.5 to 12.5 compression ratio advised.	**F-254/382-2S-10**	3800-7200	**341341**[*] ◆3	**99257-16** **99256-16**[c]	254 262	286 298	110	22 52 65 17	.018 .018	.672 .678
Moderate competition only, good mid and upper RPM HP, bracket racing, auto w/race converter, good with aftermarket aluminum cylinder heads, 12.0 minimum compression ratio advised.	**F-266/3528-8**	4200-7600	**341461**[*] ◆3	**99257-16** **99256-16**[c]	266 266	302 302	108	30 56 66 20	.026 .026	.621 .621

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

NOTE: Specify if late 62-406 cu.in. or 63-76 block is used, as the cam is different than the one used in 58-62 block.

NOTE: All grinds shown use the stock Ford 1.76 ratio adjustable rocker arms - Ford part number B8A-6564-B or Crane adjustable ductile iron rocker arms, **34772-16**, in order to achieve the listed gross valve lift figures.

NOTE: To provide the most accurate valve adjustment on hydraulic roller camshafts, the use of Crane adjustable rocker arms (**34772-16** or **34791-1**) and appropriate pushrods (**special order** or **95805-16**) is highly recommended.

NOTE: To effect valve adjustment with mechanical lifter camshafts, the use of Crane adjustable rocker arms (**34772-16** or **34791-1**) and the appropriate pushrods is required.

NOTE: In order to use these mechanical lifter camshafts in mechanical lifter only side oiler type blocks, you must groove the center of #2 and #4 cam bearing journals with a .022" radius (.044" width) and .035" deep.

NOTE: Many 1972 and later Ford-Mercury V-8 engines are originally equipped with a retarded crankshaft sprocket. This may cause idling and performance problems when installing aftermarket camshafts. We recommend using a pre-1972 crankshaft sprocket, or by degreeing in your camshaft. The non-retarded sprocket will have the alignment dot and keyway slot directly in line with each other.

NOTE: Some cylinder heads have removable lower spring seats with an inner spring step. This step must be removed to allow the inner springs to set flush with the outer springs.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 301*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	CAST ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99896-16[d] **99832-16**[e]	**99970-16**[f] **99976-16**[g]	**99822-16**[d]	**99099-1**[i]	[j] **95805-16**[k]		**34772-16**[p]		
	99896-16[d] **99832-16**[e]	**99970-16**[f] **99976-16**[g]	**99822-16**[d]	**99099-1**[i]	[j] **95805-16**[k]		**34772-16**[p]		
	99896-16[d] **99832-16**[e]	**99970-16**[f] **99976-16**[g]	**99822-16**[d]	**99099-1**[i]	[j] **95805-16**[k]		**34772-16**[p]		
	99896-16[d] **99832-16**[e]	**99970-16**[f] **99976-16**[g]	**99822-16**[d]	**99099-1**[i]	[j] **95805-16**[k]		**34772-16**[p]		
	99896-16[d] **99832-16**[e]	**99970-16**[f] **99976-16**[g]	**99822-16**[d]	**99099-1**[i]	[j] **95805-16**[k]		**34772-16**[p]		
	96877-16[d]	**99969-16**[h]	**99822-16**[d]	**99098-1**[i]	**34621-16**[l] **34622-16**[m] **95819-16**[n] **95847-16**[o]		**34772-16**[p]		
	96877-16[d]	**99969-16**[h]	**99822-16**[d]	**99098-1**[i]	**34621-16**[l] **34622-16**[m] **95819-16**[n] **95847-16**[o]		**34772-16**[p]		
	96877-16[d]	**99969-16**[h]	**99822-16**[d]	**99098-1**[i]	**34621-16**[l] **34622-16**[m] **95819-16**[n] **95847-16**[o]		**34772-16**[p]		
	96877-16[d]	**99969-16**[h]	**99822-16**[d]	**99098-1**[i]	**34621-16**[l] **34622-16**[m] **95819-16**[n] **95847-16**[o]		**34772-16**[p]		
	96877-16[d]	**99969-16**[h]	**99822-16**[d]	**99098-1**[i]	**34621-16**[l] **34622-16**[m] **95819-16**[n] **95847-16**[o]		**34772-16**[p]		

a Requires **34970-1** (.467" I.D.) steel, or **34990-1** (.467" I.D.) aluminum-bronze distributor drive gear, and 7/16-14 x 1-1/8" grade 8 cam gear bolt and hardened washer.
b Vertical locking bar hydraulic roller lifters, no machining required. Special length pushrods are required.
c Shell-type lifters, requires **34622-16** pushrods for **34772-16** rocker arms, or **95847-16** pushrods for **34791-1** rocker arms.
d Must machine cylinder heads.
e Ovate wire beehive spring, requires **99976-16** retainers.
f Requires **99099-1** valve locks.
g Steel, for **99832-16** beehive springs.
h Requires **99098-1** valve locks.
i Machined steel, heat treated.
j Special length pushrods are required for standard non-adjustable or **34772-16** adjustable rocker arms.
k For use with **34791-1** adjustable rocker arms with cup type adjusters.
l Heavy wall, heat treated, for use with **99257-16** lifters and **34772-16** adjustable rocker arms.
m Heavy wall, heat treated, for use with **99256-16** lifters and **34772-16** adjustable rocker arms.
n Pro Series one-piece, for use with **99257-16** lifters and **34791-1** adjustable rocker arms with cup type adjusters.
o Pro Series one-piece, for use with **99256-16** lifters and **34791-1** adjustable rocker arms with cup type adjusters.
p 1.76 ratio, ductile iron, adjustable, requires appropriate Crane pushrods.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 276 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Roller Camshafts										
Excellent low end and mid range torque and HP, fair idle, moderate performance usage, mild bracket racing, auto trans w/2800+ converter, 3200-3600 cruise rpm, 10.5 to 11.5 compression ratio advised.	**SR-240/350-2S-14**	2800-6600	**348511**[*a] ◆3	**30518-16** **35570-16**[b]	240 248	290 298	114	11 49 63 5	.020 .020	.616 .637
Excellent mid range torque and HP, fair idle, moderate performance usage, bracket racing, auto trans w/3500+ converter, 3800-4200 cruise RPM, 11.0 to 12.0 compression ratio advised.	**SR-248/362-2S-10**	3000-6800	**348521**[*a] ◆3	**30518-16** **35570-16**[b]	248 256	285 292	110	19 49 63 13	.020 .020	.637 .658
Good mid range torque and HP, rough idle, performance usage, bracket racing, auto trans w/3500+ converter, 11.0 to 12.5 compression ratio advised.	**R-252/420-2-8**	3400-7200	**348801**[*a] ◆3	**30518-16** **35570-16**[b]	252 262	284 294	108	22 50 63 19	.020 .020	.739 .739
Good mid range HP, rough idle, performance usage, bracket racing, auto trans w/race converter, also large plate or manifold nitrous system, 12.0 minimum compression ratio advised.	**R-260/420-2-10**	3800-7600	**348821**[*a] ◆3	**30518-16** **35570-16**[b]	260 270	292 302	110	24 56 69 21	.020 .020	.739 .739
Competition only, good upper RPM HP, bracket racing, auto trans w/race converter, also manifold nitrous system, good with aftermarket aluminum cylinder heads, 12.0 minimum compression ratio advised.	**R-266/420-2-10**	4200-7800	**348831**[*a] ◆3	**30518-16** **35570-16**[b]	266 276	298 308	110	27 59 72 24	.020 .020	.739 .739
Competition only, good upper RPM HP, bracket racing, auto trans w/race converter, also large manifold nitrous system, good with aftermarket aluminum cylinder heads, 12.5 minimum compression ratio advised.	**R-276/420-2-10**	4600-8200	**348841**[*a] ◆3	**30518-16** **35570-16**[b]	276 286	308 318	110	32 64 77 29	.020 .020	.739 .739
Competition only, good upper RPM HP, manual trans or auto trans w/race converter and trans brake, good with aftermarket aluminum cylinder heads, 13.0 minimum compression ratio advised.	**R-276/4334-2S2-10**	4800-8400	**348291**[*a] ◆3	**35570-16**[b]	276 282	316 322	110	31 65 74 28	.026 .026	.763 .727
Competition only, good upper RPM HP, manual trans or auto trans w/race converter and trans brake, good with aftermarket aluminum cylinder heads, 13.0 minimum compression ratio advised.	**R-282/427-2S1-8**	5000-8400	**348301**[*a] ◆3	**35570-16**[b]	282 282	286 320	108	38 64 74 32	.028 .026	.752 .752

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

NOTE: Specify if late 62-406 cu.in. or 63-76 block is used, as the cam is different than the one used in 58-62 block.

NOTE: In order to use these camshafts in mechanical lifter only side oiler type blocks, you must groove the center of #2 and #4 cam bearing journals with a .022" radius (.044" width) and .035" deep.

NOTE: All grinds shown use the stock Ford 1.76 ratio adjustable rocker arms - Ford part number B8A-6564-B or Crane adjustable ductile iron rocker arms, **34772-16**, in order to achieve the listed gross valve lift figures.

NOTE: To effect valve adjustment with roller lifter camshafts, the use of Crane adjustable rocker arms (**34772-16** or **34791-1**) and appropriate pushrods (**34641-16** or **95818-16**) is required.

NOTE: Many 1972 and later Ford-Mercury V-8 engines are originally equipped with a retarded crankshaft sprocket. This may cause idling and performance problems when installing aftermarket camshafts. We recommend using a pre-1972 crankshaft sprocket, or by degreeing in your camshaft. The non-retarded sprocket will have the alignment dot and keyway slot directly in line with each other.

NOTE: Some cylinder heads have removable lower spring seats with an inner spring step. This step must be removed to allow the inner springs to set flush with the outer springs.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 301*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	CAST ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99893-16 **99832-16**[c]	**99954-16** **99976-16**[f]	**99822-16**[d]	**99098-1**[i]	**34641-16**[j] **95818-16**[k]		**34772-16**[l]		
	99893-16 **99832-16**[c]	**99954-16** **99976-16**[f]	**99822-16**[d]	**99098-1**[i]	**34641-16**[j] **95818-16**[k]		**34772-16**[l]		
	96886-16[d]	**99955-16**	**99822-16**[d]	**99098-1**[i]	**34641-16**[j] **95818-16**[k]		**34772-16**[l]		
	96886-16[d]	**99955-16**	**99822-16**[d]	**99098-1**[i]	**34641-16**[j] **95818-16**[k]		**34772-16**[l]		
	96886-16[d]	**99955-16**	**99822-16**[d]	**99098-1**[i]	**34641-16**[j] **95818-16**[k]		**34772-16**[l]		
	96886-16[d]	**99955-16**	**99822-16**[d]	**99098-1**[i]	**34641-16**[j] **95818-16**[k]		**34772-16**[l]		
	96880-16[d] **961246-16**[e]	**99679-16**[g] **99662-16**[h]	**99822-16**[d]	**99098-1**[i]	**34641-16**[j] **95818-16**[k]		**34772-16**[l]		
	96880-16[d] **961246-16**[e]	**99679-16**[g] **99662-16**[h]	**99822-16**[d]	**99098-1**[i]	**34641-16**[j] **95818-16**[k]		**34772-16**[l]		

a Requires **34970-1** (.467" I.D.) steel, or **34990-1** (.467" I.D.) aluminum-bronze distributor drive gear, and 7/16-14 x 1-1/8" grade 8 cam gear bolt and hardened washer.
b Ultra Pro Series roller lifters.
c Ovate wire beehive spring, requires **99976-16** retainers.
d Must machine cylinder heads.
e Triple, for 2.050" assembly height, requires **99662-16** titanium retainers.
f Steel for **99832-16** beehive springs.
g Must use **99098-1** valve stem locks, included with the retainers.
h Titanium, for **961246-16** valve springs.
i Machined steel, heat treated.
j For use with **34772-16** adjustable rocker arms, heavy wall, heat treated.
k Pro Series one-piece, for use with **34791-1** adjustable rocker arms with cup type adjusters.
l 1.76 ratio, ductile iron, adjustable, requires appropriate **34641-16** Crane pushrods.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts										
Brute low end torque, smooth idle, daily usage, EFI compatible, fuel economy, 1600-2200 cruise RPM, 7.75 to 8.75 compression ratio advised.	**H-192/2667-2S-10**	800-4200	**350501*** ◆3	**99280-16**[c]	192 204	248 260	110	(9) 21 37 (13)	.000 .456 .000 .487
Good low end torque, smooth idle, daily usage, EFI compatible, off road, towing, economy, also mild turbocharged, 2200-2600 cruise RPM, 8.0 to 9.5 compression ratio advised.	**H-260-2**	1200-4800	**353901*** **353902***[a] ◆3	**99280-16**[c]	204 216	260 272	112	(5) 29 45 (9)	.000 .487 .000 .518
Good low end torque, towing, good idle, daily usage, mild off road, economy, good low and mid-range torque and HP, also mild turbocharged, 2400-2800 cruise RPM, 8.5 to 10.0 compression ratio advised.	**H-266-2**	1400-5000	**353931*** **353932***[a] ◆3	**99280-16**[c]	210 218	266 274	114	(4) 34 48 (10)	.000 .487 .000 .504
Excellent low end and mid range torque and HP, good idle, daily usage and off road, towing, performance and fuel efficiency, marine performance, mild supercharged, 2200-2600 cruise RPM, 8.75 to 10.5 compression ratio advised.	**H-272-2**	1800-5400	**353941*** **353942***[a] ◆3	**99280-16**[c]	216 228	272 284	112	1 35 51 (3)	.000 .518 .000 .513
Fair idle, performance usage, good mid-range torque and HP, auto w/2200+ converter, 3200-3600 cruise RPM, serious off road, heavy limited oval track, bracket racing: Street, Heavy; 9.0 to 10.5 compression ratio advised.	**H-226/314-2-8**	2200-5800	**350541*** ◆3	**99280-16**[c] **99380-16**[c,d]	226 236	286 296	108	10 36 51 5	.000 .537 .000 .556
Fair idle, performance usage, good mid-range HP, auto w/2500+ converter, 3400-3800 cruise RPM, oval track: Street Stock, Enduro, Hobby, 1/4-3/8 mile; bracket racing: Street, Heavy, Pro E.T., Super E.T.; Also mild supercharged, 9.5 to 11.0 compression ratio advised.	**H-288-2**	2400-6000	**354551*** **354552***[b] ◆3	**99280-16**[c] **99380-16**[c,d]	226 230	288 292	112	6 40 52 (2)	.000 .522 .000 .530

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

IMPORTANT: Check your hydraulic lifter preload, with your original pushrods, to first determine if different pushrods may be required. On 72-97 engines, if your hydraulic lifter preload is excessive, this can be remedied by using Crane's Rocker Arm Pedestal Shim Kit (**99170-1**). Refer to page 304 for details.

IMPORTANT: Crane offers Pushrod Guideplate and Rocker Arm Stud Conversion Kits, (**35655-16** and **52655-16**) for street applications, enabling the 370-429-460 cu.in. engines with pedestal mounted rockers to have adjustable rocker arms without cylinder head removal or machining. See page 305 for details.

NOTE: To provide the most accurate valve adjustment on hydraulic lifter camshafts, in other than 429 Super C.J. engines, a method of effecting valve adjustment is required. On 68-71 engines equipped with bottleneck type studs, using **99768-16** positive locking nuts will permit valve adjustment. On 72-97 engines, the heads must be machined to use **99159-16** screw-in studs and pushrod guideplates.

NOTE: Special length pushrods can be ordered to provide proper hydraulic lifter preload. Refer to page 353 for checking your hydraulic lifter preload.

NOTE: Many 1972 and later Ford-Mercury V-8 engines are originally equipped with a retarded crankshaft sprocket. This may cause idling and performance problems when installing aftermarket camshafts. We recommend using our **35975-1** timing chain and gear set, a pre-1972 crankshaft sprocket, or by degreeing in your camshaft. The non-retarded sprocket will have the alignment dot and keyway slot directly in line with each other.

NOTE: These camshafts also fit the 1969-70 Ford 429 Boss Hemi V-8 engines. Some kit components will differ. Contact Crane's Performance Consultants for details.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
35308-1[e]	**96801-16**[e] **99839-16**[f]	**99944-16** **99969-16**[g]	**99820-16**[h]	**99097-1**[i] **99094-1**[j]	**35622-16**[k] **35621-16**[l]	**35975-1***[n]	**52800-16**[o]	**27744-16**[q]	**27750-16**[r] **27771-16**[s]
35308-1[e]	**96801-16**[e] **99839-16**[f]	**99944-16** **99969-16**[g]	**99820-16**[h]	**99097-1**[i] **99094-1**[j]	**35622-16**[k] **35621-16**[l]	**35975-1***[n]	**52800-16**[o]	**27744-16**[q]	**27750-16**[r] **27771-16**[s]
35308-1[e]	**96801-16**[e] **99839-16**[f]	**99944-16** **99969-16**[g]	**99820-16**[h]	**99097-1**[i] **99094-1**[j]	**35622-16**[k] **35621-16**[l]	**35975-1***[n]	**52800-16**[o]	**27744-16**[q]	**27750-16**[r] **27771-16**[s]
35308-1[e]	**96801-16**[e] **99839-16**[f]	**99944-16** **99969-16**[g]	**99820-16**[h]	**99097-1**[i] **99094-1**[j]	**35622-16**[k] **35621-16**[l]	**35975-1***[n]	**52800-16**[o]	**27744-16**[q]	**27750-16**[r] **27771-16**[s]
	99893-16	**99953-16**	**99820-16**[h]	**99097-1**[i]	**35622-16**[k] **35621-16**[l] **95653-16**[m]	**35975-1***[n]	**52800-16**[o]	**27744-16**[q]	**27750-16**[r] **27771-16**[s]
	99893-16	**99953-16**	**99820-16**[h]	**99097-1**[i]	**35622-16**[k] **35621-16**[l] **95653-16**[m]	**35975-1***[n]	**52800-16**[o]	**27744-16**[q]	**27750-16**[r] **27771-16**[s]

Section Continued

a Cam and Lifter Kit, includes installation lubricants.
b Cam, lifter, valve spring, and retainer kit, includes installation lubricants.
c May require appropriate Crane pushrods, see **IMPORTANT NOTE** on opposite page.
d Optional Hi Intensity hydraulic lifters, see page 272 for details.
e Contains standard diameter valve springs, no machining required for installation.
f Optional 1.800" assembly height springs, requires **99969-16** retainers and **99094-1** valve locks.
g Requires **99094-1** Multi Fit valve locks.
h Must machine cylinder heads.
i Machined steel, heat treated.
j Machined steel, heat treated Multi Fit.
k Heavy wall, heat treated, for non-guideplate or guideplate cylinder heads.
l For 429 Super CJ, heavy wall, heat treated, for use with pushrod guideplate cylinder heads.
m Pro Series one-piece, for use with pushrod guideplate cylinder heads.
n Performance steel billet gears and roller chain set.
o 1.71 ratio, pedestal mount, non-adjustable, for 72-97 engines.
q Energizer, 1.72 ratio, requires 7/16" rocker arm studs and pushrod guideplates. See notes on opposite page. Valve Train Stabilizer Available, see page 343.
r 1.73 ratio, requires 7/16" rocker arm studs and pushrod guideplates. See notes on opposite page. Valve Train Stabilizer available, see page 343.
s 1.73 ratio Wide Body, requires 7/16" rocker arm studs and pushrod guideplates. Valve Train Stabilizer available, see page 343.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh		Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts											
Fair idle, performance usage, good mid-range HP, 3600-4000 cruise RPM, auto w/3000+ converter, bracket racing: Pro E.T., Super E.T., Super Pro; good with plate nitrous system, 11.0 to 12.0 compression ratio advised. Good with supercharger, 15 lbs. maximum boost w/8.5 maximum compression ratio advised.	**H-230/318-2-14**	2600-6200	**350551**[*] ◆3	**99280-16**[b] **99380-16**[b,c]	230 240	290 300	114	6 59	44 1	.000 .000	.544 .563
Fair idle, performance usage, good mid-range HP, 3800-4200 cruise RPM, auto w/3000+ converter, oval track: Street Stock, Enduro, Hobby, 3/8-1/2 mile; bracket racing: Pro E.T., Super E.T., Super Pro, Hot Rod; 10.0 to 11.5 compression ratio advised.	**H-296-2**	3000-6600	**354561**[*] **354564**[*a] ◆3	**99280-16**[b] **99380-16**[b,c]	236 240	296 300	110	13 55	43 5	.000 .000	.556 .563
Performance usage, good upper RPM HP, rough idle, bracket racing, auto w/race converter, good with manifold nitrous system, 11.5 to 13.0 compression ratio advised.	**H-244/3439-2S-12**	3200-6800	**350561**[*] ◆3	**99280-16**[b] **99380-16**[b,c]	244 252	300 308	112	15 63	49 9	.000 .000	.588 .599
Performance usage, good upper RPM HP, bracket racing, auto w/race converter, aluminum cylinder heads advised, 12.0 to 13.5 compression ratio advised.	**H-248/3500-8**	3400-7000	**350681**[*] ◆3	**99280-16**[b] **99380-16**[b,c]	248 248	304 304	108	21 57	47 11	.000 .000	.599 .599
Performance usage, good upper RPM HP, drag racing, auto w/race converter, good with manifold nitrous system, aluminum cylinder heads recommended, 13.5 to 14.5 compression ratio advised. Good w/Roots supercharger, 22 lbs. maximum boost w/8.5 maximum compression ratio advised.	**H-252/364-2S-12**	3800-7200	**350571**[*] ◆3	**99280-16**[b] **99380-16**[b,c]	252 262	304 314	112	19 68	53 14	.000 .000	.622 .604

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

IMPORTANT: Check your hydraulic lifter preload, with your original pushrods, to first determine if different pushrods may be required. On 72-97 engines, if your hydraulic lifter preload is excessive, this can be remedied by using Crane's Rocker Arm Pedestal Shim Kit (**99170-1**). Refer to page 304 for details.

IMPORTANT: Crane offers Pushrod Guideplate and Rocker Arm Stud Conversion Kits, (**35655-16** and **52655-16**) for street applications, enabling the 370-429-460 cu.in. engines with pedestal mounted rockers to have adjustable rocker arms without cylinder head removal or machining. See page 305 for details.

NOTE: To provide the most accurate valve adjustment on hydraulic lifter camshafts, in other than 429 Super C.J. engines, a method of effecting valve adjustment is required. On 68-71 engines equipped with bottleneck type studs, using **99768-16** positive locking nuts will permit valve adjustment. On 72-97 engines, the heads must be machined to use **99159-16** screw-in studs and pushrod guideplates.

NOTE: Special length pushrods can be ordered to provide proper hydraulic lifter preload. Refer to page 353 for checking your hydraulic lifter preload.

NOTE: Many 1972 and later Ford-Mercury V-8 engines are originally equipped with a retarded crankshaft sprocket. This may cause idling and performance problems when installing aftermarket camshafts. We recommend using our **35975-1** timing chain and gear set, a pre-1972 crankshaft sprocket, or by degreeing in your camshaft. The non-retarded sprocket will have the alignment dot and keyway slot directly in line with each other.

NOTE: These camshafts also fit the 1969-70 Ford 429 Boss Hemi V-8 engines. Some kit components will differ. Contact Crane's Performance Consultants for details.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99893-16	99953-16	99820-16[d]	99097-1[e]	35622-16[f] 35621-16[g]	35975-1[*i]	52800-16[j]	27744-16[l]	27750-16[m] 27771-16[n]
	99893-16	99953-16	99820-16[d]	99097-1[e]	35622-16[f] 35621-16[g]	35975-1[*i]	52800-16[j]	27744-16[l]	27750-16[m] 27771-16[n]
	99893-16	99953-16	99820-16[d]	99097-1[e]	35622-16[f] 35621-16[g] 95653-16[h]	35975-1[*i]	52800-16[j]	27744-16[l]	27750-16[m] 27771-16[n]
	99893-16	99953-16	99820-16[d]	99097-1[e]	35622-16[f] 35621-16[g]	35975-1[*i]	52800-16[j]	27744-16[l]	27750-16[m] 27771-16[n]
	99893-16	99953-16	99820-16[d]	99097-1[e]	35622-16[f] 35621-16[g] 95653-16[h]	35975-1[*i]	52800-16[j]	27744-16[l]	27750-16[m] 27771-16[n]

a Cam and lifter kit, includes installation lubricants.
b May require appropriate Crane pushrods, see **IMPORTANT NOTE** on opposite page.
c Optional Hi Intensity hydraulic lifters, see page 272 for details.
d Must machine cylinder heads.
e Machined steel, heat treated.
f Heavy wall, heat treated, for non-guideplate or guideplate cylinder heads.
g For 429 Super CJ, heavy wall, heat treated, for use with pushrod guideplate cylinder heads.
h Pro Series one-piece, for use with pushrod guideplate cylinder heads.
i Performance steel billet gears and roller chain set.
j 1.71 ratio, pedestal mount, non-adjustable, for 72-97 engines.
l Energizer, 1.72 ratio, requires 7/16" rocker arm studs and pushrod guideplates. See notes on opposite page. Valve Train Stabilizer available, see page 343.
m 1.73 ratio, requires 7/16" rocker arm studs and pushrod guideplates. See notes on opposite page. Valve Train Stabilizer available, see page 343.
n 1.73 ratio Wide Body, requires 7/16" rocker arm studs and pushrod guideplates. Valve Train Stabilizer available, see page 343.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts — Retrofit										
Brute low end torque, smooth idle, daily usage, off road, towing, economy, also mild turbocharged, 2200-3000 cruise RPM, 8.0 to 9.5 compression ratio advised.	**HR-200/311-2S-12**	800-4600	**359331**[*a] ◆3	**35532-16**[b]	200 212	262 274	112	(7) 27 43 (11)	.000 .000	.532 .568
Excellent low end torque and HP, smooth idle, daily usage, off road, towing, performance and fuel efficiency, also mild turbocharged, 2400-3200 cruise RPM, 8.5 to 10.0 compression ratio advised.	**HR-212/332-2S-14**	1200-5000	**359371**[*a] ◆3	**35532-16**[b]	212 216	274 278	114	(3) 35 47 (11)	.000 .000	.568 .556
Good low end torque, good idle, daily usage, off road, towing, performance and fuel efficiency, 2600-3400 cruise RPM, 8.75 to 10.5 compression ratio advised.	**HR-216/325-2S-12**	1400-5400	**359341**[*a] ◆3	**35532-16**[b]	216 224	278 286	112	1 35 49 (5)	.000 .000	.556 .580
Good mid range torque and HP, fair idle, moderate performance usage, mild bracket racing, auto w/2500+ converter, mild supercharged, 3000-3800 cruise RPM, 9.5 to 11.0 compression ratio advised.	**HR-228/345-2S-14**	2200-6200	**359351**[*a] ◆3	**35532-16**[b]	228 238	290 300	114	5 43 58 0	.000 .000	.590 .614
Good mid range torque and HP, rough idle, moderate performance usage, mild bracket racing with heavy car, serious off road, auto w/2800+ converter, 3200-3800 cruise RPM, 10.0 to 11.5 compression ratio advised.	**HR-234/340-2S-10**	2400-6400	**359381**[*a] ◆3	**35532-16**[b]	234 242	300 308	110	12 42 56 6	.000 .000	.581 .581
Good mid to upper RPM torque and HP, fair idle, performance usage, bracket racing, auto trans w/3000+ converter, also mild supercharged, best with 514+ cu.in., 10.5 to 12.0 compression ratio advised.	**HR-238/359-2S-12**	3000-6600	**359361**[*a] ◆3	**35532-16**[b]	238 246	300 308	112	12 46 60 6	.000 .000	.614 .636
Good mid to upper RPM torque and HP, rough idle, performance usage, bracket racing, auto trans w/3500+ converter, best with 514+ cu.in., 11.0 to 12.5 compression ratio advised.	**HR-246/372-2S-12**	3200-6800	**359391**[*a] ◆3	**35532-16**[b]	246 250	308 312	112	16 50 62 8	.000 .000	.636 .636
Performance usage, bracket racing, auto trans w/race converter, good w/large manifold nitrous system, best with 540+ cu.in., 12.5 minimum compression ratio advised. Good with large Roots supercharger, 22 lbs. maximum boost w/8.5 maximum compression ratio advised.	**HR-258/372-2S-14**	3600-6800	**359401**[*a] ◆3	**35532-16**[b]	258 266	320 328	114	20 58 72 14	.000 .000	.636 .636
Performance usage, best in 570+ cu.in., auto trans w/ race converter, 13.5 minimum compression ratio advised. Good with large Roots supercharger w/aluminum cylinder heads, 26 lbs. maximum boost w/8.5 maximum compression ratio advised.	**HR-264/400-2S-14**	4000-6800	**359411**[*a] ◆3	**35532-16**[b]	264 268	334 338	114	22.5 61.5 72.5 15.5	.000 .000	.684 .684

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

NOTE: Special length pushrods must be ordered to provide proper hydraulic roller lifter preload. Refer to page 353 for checking your hydraulic lifter preload.

IMPORTANT: Crane offers Pushrod Guideplate and Rocker Arm Stud Conversion Kits, (**35655-16** and **52655-16**) for street applications, enabling the 370-429-460 cu.in. engines with pedestal mounted rockers to have adjustable rocker arms without cylinder head removal or machining. See page 305 for details.

NOTE: To provide the most accurate valve adjustment on hydraulic roller lifter camshafts, in other than 429 Super C.J. engines, a method of effecting valve adjustment is required. On 68-71 engines equipped with bottleneck type studs, using **99768-16** positive locking nuts will permit valve adjustment. On 72-97 engines, the heads must be machined to use 429 Super C.J. rockers, studs, and pushrod guideplates.

NOTE: Many 1972 and later Ford-Mercury V-8 engines are originally equipped with a retarded crankshaft sprocket. This may cause idling and performance problems when installing aftermarket camshafts. We recommend using our **35975-1** timing chain and gear assembly, a pre-1972 crankshaft sprocket, or by degreeing in your camshaft. The non-retarded sprocket will have the alignment dot and keyway slot directly in line with each other.

NOTE: These camshafts also fit the 1969-70 Ford 429 Boss Hemi V-8 engines. Some kit components will differ. Contact Crane's Performance Consultants for details.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	96870-16	99957-16 99969-16[c]	99820-16[d]	99097-1[e] 99094-1[f]	95639-16[g] 95641-16[h]	35975-1*[i]	52800-16[j]	27744-16[l]	27750-16[m] 27771-16[n]
	96870-16	99957-16 99969-16[c]	99820-16[d]	99097-1[e] 99094-1[f]	95639-16[g] 95641-16[h]	35975-1*[i]	52800-16[j]	27744-16[l]	27750-16[m] 27771-16[n]
	96870-16	99957-16 99969-16[c]	99820-16[d]	99097-1[e] 99094-1[f]	95639-16[g] 95641-16[h]	35975-1*[i]	52800-16[j]	27744-16[l]	27750-16[m] 27771-16[n]
	99896-16	99956-16 99970-16[c]	99820-16[d]	99097-1[e] 99094-1[f]	95639-16[g] 95641-16[h]	35975-1*[i]	52800-16[j]	27744-16[l]	27750-16[m] 27771-16[n]
	99896-16	99956-16 99970-16[c]	99820-16[d]	99097-1[e] 99094-1[f]	95639-16[g] 95641-16[h]	35975-1*[i]	52800-16[j]	27744-16[l]	27750-16[m] 27771-16[n]
	99896-16	99956-16 99970-16[c]	99820-16[d]	99097-1[e] 99094-1[f]	95639-16[g] 95641-16[h]	35975-1*[i]	52800-16[j]	27744-16[l]	27750-16[m] 27771-16[n]
	99896-16	99956-16 99970-16[c]	99820-16[d]	99097-1[e] 99094-1[f]	95639-16[g] 95641-16[h]	35975-1*[i]	52800-16[j]	27744-16[l]	27750-16[m] 27771-16[n]
	99896-16	99956-16 99970-16[c]	99820-16[d]	99097-1[e] 99094-1[f]	95639-16[g] 95641-16[h]	35975-1*[i]	52800-16[j]	27744-16[l]	27750-16[m] 27771-16[n]
	99896-16	99956-16 99970-16[c]	99820-16[d]	99097-1[e] 99094-1[f]	95639-16[g] 95641-16[h]	35975-1*[i]		27744-16[l]	27750-16[m] 27771-16[n]

a Requires **52970-1** (.500" I.D.) or **52971-1** (.531" I.D.) steel, or **52990-1** (.500" I.D.) or **52989-1** (.531" I.D.) aluminum-bronze distributor drive gear, and 7/16-20 x 1-1/4" grade 8 cam gear bolt and hardened washer.
b Vertical locking bar hydraulic roller lifters, no machining required. Special length pushrods are required.
c Requires Crane Multi Fit valve locks.
d Must machine cylinder heads.
e Machined steel, heat treated.
f Machined steel, heat treated, Multi Fit.
g Pro Series one-piece, for non-guideplate cylinder heads.
h Pro Series one-piece, for use with pushrod guideplate cylinder heads.
i Performance steel billet gears and roller chain set.
j 1.71 ratio, pedestal mount, non-adjustable, for 72-97 engines.
l Energizer, 1.72 ratio, requires 7/16" rocker arm studs and pushrod guideplates. See notes on opposite page. Valve Train Stabilizer available, see page 343.
m 1.73 ratio, requires 7/16" rocker arm studs and pushrod guideplates. See notes on opposite page. Valve Train Stabilizer available, see page 343.
n 1.73 ratio Wide Body, requires 7/16" rocker arm studs and pushrod guideplates. See notes on opposite page. Valve Train Stabilizer available, see page 343.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Lifter Camshafts										
Good low end and mid range torque and HP, fair idle, moderate performance usage, bracket racing: Super Pro, Hot Rod, auto trans w/2500+ converter; off road, 10.0 to 11.5 compression ratio advised.	**F-238/3200-2-12**	3000-6600	**351201**[*] ◆3	**99257-16**[b]	238 248	300 310	112	12 46 61 7	.022 .022	.547 .570
Rough idle, performance usage, oval track: Late Model, Sportsman, 1/4-3/8 mile; bracket racing: Super Pro, Hot Rod, auto trans w/3000+ converter; serious off road, 10.5 to 12.0 compression ratio advised.	**F-246/3294-2-8**	3600-7000	**351211**[*] **351214**[*a] ◆3	**99257-16**[b]	246 256	282 292	108	20 46 61 15	.026 .026	.563 .583
Rough idle, performance usage, good mid to upper RPM torque and HP, bracket racing, auto trans w/3500+ converter, 11.0 to 12.5 compression ratio advised.	**F-256/3412-2-8**	4000-7400	**351341**[*] ◆3	**99257-16**[b]	256 266	292 302	108	25 51 66 20	.026 .026	.583 .603
Fair idle, performance usage, good upper RPM torque and HP, bracket racing, good w/plate nitrous system, auto trans w/3500+ converter, 11.5 to 12.5 compression ratio advised.	**F-256/3412-2-12**	2200-6200	**351351**[*] ◆3	**99257-16**[b]	256 266	292 302	112	19 57 68 18	.026 .026	.583 .603
Moderate competition only, good mid to upper RPM HP, bracket racing, auto trans w/3500+ converter, 11.5 to 13.0 compression ratio advised.	**F-266/3528-2-8**	4400-7800	**351511**[*] ◆3	**99257-16**[b]	266 276	302 312	108	30 56 71 25	.026 .026	.603 .624
Moderate competition only, good mid to upper RPM HP, bracket racing, auto trans w/race converter, 12.5 minimum compression ratio advised.	**F-272/3874-2S-8**	4600-8000	**351601**[*] ◆3	**99257-16**[b]	272 280	308 316	108	33 59 73 27	.026 .026	.662 .683
Competition only, good upper RPM HP, bracket racing, good with large plate or manifold nitrous system, auto trans w/race converter, 13.0 minimum compression ratio advised. Good w/large Roots supercharger, 22 lbs. maximum boost w/8.0 maximum compression ratio advised.	**F-272/3874-2S-12**	4800-8200	**351611**[*] ◆3	**99257-16**[b]	272 280	308 316	112	28 64 76 24	.026 .026	.662 .683
Competition only, good upper RPM torque and HP, bracket racing in heavy car, good w/514+ cu.in., alunimum cylinder heads advised, auto trans w/race converter, 13.0 minimum compression ratio advised.	**F-274/3934-2S-10**	4600-8200	**351621**[*] ◆3	**99257-16**[b]	274 278	304 308	110	31 63 73 25	.012 .012	.673 .684
Radical competition only, good upper RPM HP, flat tappet restricted classes, good w/540+ cu.in.w/ aluminum cylinder heads, auto trans w/race converter, 13.5 minimum compression ratio advised.	**F-286/3765-2S-12**	5000-8400	**351631**[*] ◆3	**99257-16**[b]	286 292	322 332	112	34 72 83 29	.026 .030	.644 .653

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

IMPORTANT: Crane offers Pushrod Guideplate and Rocker Arm Stud Conversion Kits, (**35655-16** and **52655-16**) for street applications, enabling the 370-429-460 cu.in. engines with pedestal mounted rockers to have adjustable rocker arms without cylinder head removal or machining. See page 305 for details.

NOTE: When installing mechanical lifter series cams and kits, in other than 429 Super C.J. engines, a method of effecting valve adjustment is required. On 68-71 engines equipped with bottleneck type studs, using **99768-16** positive locking nuts will permit valve adjustment. On 72-97 engines, the heads must be machined to use **99159-16** screw-in studs and pushrod guideplates.

NOTE: Many 1972 and later Ford-Mercury V-8 engines are originally equipped with a retarded crankshaft sprocket. This may cause idling and performance problems when installing aftermarket camshafts. We recommend using our **35975-1** timing chain and gear assembly, a pre-1972 crankshaft sprocket, or by degreeing in your camshaft. The non-retarded sprocket will have the alignment dot and keyway slot directly in line with each other.

NOTE: These camshafts also fit the 1969-70 Ford 429 Boss Hemi V-8 engines. Some kit components will differ. Contact Crane's Performance Consultants for details.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99890-16	99970-16[c]	99820-16[d]	99094-1[e]	35621-16[f] 95653-16[g]	35975-1*[h]			27750-16[j] 27771-16[k]
	99890-16	99970-16[c]	99820-16[d]	99094-1[e]	35621-16[f] 95653-16[g]	35975-1*[h]			27750-16[j] 27771-16[k]
	99890-16	99970-16[c]	99820-16[d]	99094-1[e]	35621-16[f] 95653-16[g]	35975-1*[h]			27750-16[j] 27771-16[k]
	99890-16	99970-16[c]	99820-16[d]	99094-1[e]	35621-16[f] 95653-16[g]	35975-1*[h]			27750-16[j] 27771-16[k]
	99890-16	99970-16[c]	99820-16[d]	99094-1[e]	35621-16[f] 95653-16[g]	35975-1*[h]			27750-16[j] 27771-16[k]
	99890-16	99970-16[c]	99820-16[d]	99094-1[e]	35621-16[f] 95653-16[g]	35975-1*[h]			27750-16[j] 27771-16[k]
	99890-16	99970-16[c]	99820-16[d]	99094-1[e]	35621-16[f] 95653-16[g]	35975-1*[h]			27750-16[j] 27771-16[k]
	99890-16	99970-16[c]	99820-16[d]	99094-1[e]	35621-16[f] 95653-16[g]	35975-1*[h]			27750-16[j] 27771-16[k]
	99890-16	99970-16[c]	99820-16[d]	99094-1[e]	35621-16[f] 95653-16[g]	35975-1*[h]			27750-16[j] 27771-16[k]
	99890-16	99970-16[c]	99820-16[d]	99094-1[e]	35621-16[f] 95653-16[g]	35975-1*[h]			27750-16[j] 27771-16[k]

a Cam and lifter kit, includes installation lubricants.
b Requires appropriate Crane pushrods.
c Requires Crane Multi Fit valve locks.
d Must machine cylinder heads.
e Machined steel, heat treated, Multi Fit.
f Heavy wall, heat treated, for use with pushrod guideplate cylinder heads.
g Pro Series one-piece, for use with pushrod guideplate cylinder heads.
h Performance steel billet gears and roller chain set.
j 1.73 ratio, requires 7/16" rocker arm studs and pushrod guideplates. See notes on opposite page. Valve Train Stabilizer available, see page 343.
k 1.73 ratio Wide Body, requires 7/16" rocker arm studs and pushrod guideplates. See notes on opposite page. Valve Train Stabilizer available, see page 343.

COMPLETE CAM SPECIFICATIONS

Mechanical Roller Camshafts

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 276 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Excellent low and mid range torque, fair idle, moderate performance usage, good low and mid-range HP, mild bracket racing, auto trans w/2500+ converter, 10.5 to 11.5 compression ratio advised.	**SR-232/338-2S-12**	2500-6500	**358501**[*a] ◆3	**30518-16** **35570-16**[b]	232 240	282 290	112	9 46 57 3	.020 .020	.578 .599
Good low and mid range torque and HP, fair idle, moderate performance usage, bracket racing, auto trans w/3500+ converter, 3800-4200 cruise RPM, 10.5 to 12.0 compression ratio advised.	**SR-248/362-2S1-12**	3000-6800	**358511**[*a] ◆3	**30518-16** **35570-16**[b]	248 256	298 306	112	17 51 65 11	.020 .020	.619 .640
Good low and mid range torque and HP, rough idle, performance usage, bracket racing, auto trans w/3000+ converter, 11.0 to 12.5 compression ratio advised.	**R-252/420-2-10**	3400-7200	**358801**[*a] ◆3	**30518-16** **35570-16**[b]	252 262	284 294	110	20 52 65 17	.020 .020	.718 .718
Good mid range torque to upper RPM torque & HP, rough idle, performance usage, 514+ cu.in., Pro Street, bracket racing, auto trans w/3500+ converter, 4200-4600 cruise RPM, 11.0 minimum compression ratio advised.	**SR-252/400-2S-10**	3200-7000	**358521**[*a] ◆3	**30518-16** **35570-16**[b]	252 260	290 298	110	21 51 65 15	.020 .022	.684 .684
Good mid range torque and HP, rough idle, radical street, performance usage, serious off road, bracket racing w/ heavy car, auto trans w/3500+ converter, 11.5 to 12.5 minimum compression ratio advised.	**R-258/420-2S-8**	3600-7400	**358201**[*a] ◆3	**30518-16** **35570-16**[b]	258 268	290 300	108	25 53 66 22	.020 .020	.718 .718
Performance usage, good mid-range HP, bracket racing, good w/514+ cu.in., auto trans w/race converter, 12.5 minimum compression ratio advised. Good with manifold nitrous system.	**R-266/434-2S-12**	3800-7800	**358211**[*a] ◆3	**30518-16** **35570-16**[b]	266 278	300 310	112	25 61 75 23	.020 .020	.742 .718
Performance usage, good mid-range HP, bracket racing, auto trans w/race converter, 12.5 minimum compression ratio advised.	**R-268/420-2-10**	4000-7800	**358821**[*a] ◆3	**30518-16** **35570-16**[b]	268 278	300 310	110	28 60 73 25	.020 .020	.718 .718

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

IMPORTANT: Crane offers Pushrod Guideplate and Rocker Arm Stud Conversion Kits, (**35655-16** and **52655-16**) for street applications, enabling the 370-429-460 cu.in. engines with pedestal mounted rockers to have adjustable rocker arms without cylinder head removal or machining. See page 305 for details.

NOTE: Roller camshafts with SFO1 firing order (1-5-4-8-6-3-7-2) are available on special order. Contact Crane's Performance Consultants for details.

NOTE: When installing roller lifter series cams and kits, in other than 429 Super C.J. engines, a method of effecting valve adjustment is required. On 68-71 engines equipped with bottleneck type studs, using **99768-16** positive locking nuts will permit valve adjustment. On 72-97 engines, the heads must be machined to use **99159-16** screw-in studs and pushrod guideplates.

NOTE: Many 1972-97 Ford-Mercury V-8 engines are originally equipped with a retarded crankshaft sprocket. This may cause idling and performance problems when installing aftermarket camshafts. We recommend using our **35975-1** timing chain and gear assembly, a pre-1972 crankshaft sprocket, or by degreeing in your camshaft. The non-retarded sprocket will have the alignment dot and keyway slot directly in line with each other.

NOTE: These camshafts also fit the 1969-70 Ford 429 Boss Hemi V-8 engines. Some kit components will differ. Contact Crane's Performance Consultants for details.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99893-16	**99953-16**	**99820-16[d]**	**99097-1[e]**	**35621-16[g]** **95653-16[h]**	**35975-1[*i]**			**27750-16[k]** **27771-16[l]**
	99893-16	**99953-16**	**99820-16[d]**	**99097-1[e]**	**35621-16[g]** **95653-16[h]**	**35975-1[*i]**			**27750-16[k]** **27771-16[l]**
	99885-16	**99956-16** **99974-16[c]**	**99820-16[d]**	**99097-1[e]** **99094-1[f]**	**35621-16[g]** **95653-16[h]**	**35975-1[*i]**			**27750-16[k]** **27771-16[l]**
	99893-16	**99953-16**	**99820-16[d]**	**99097-1[e]**	**35621-16[g]** **95653-16[h]**	**35975-1[*i]**			**27750-16[k]** **27771-16[l]**
	99885-16	**99956-16** **99974-16[c]**	**99820-16[d]**	**99097-1[e]** **99094-1[f]**	**35621-16[g]** **95653-16[h]**	**35975-1[*i]**			**27750-16[k]** **27771-16[l]**
	99885-16	**99956-16** **99974-16[c]**	**99820-16[d]**	**99097-1[e]** **99094-1[f]**	**35621-16[g]** **95653-16[h]**	**35975-1[*i]**			**27750-16[k]** **27771-16[l]**
	99885-16	**99956-16** **99974-16[c]**	**99820-16[d]**	**99097-1[e]** **99094-1[f]**	**35621-16[g]** **95653-16[h]**	**35975-1[*i]**			**27750-16[k]** **27771-16[l]**

Section Continued

a Requires **52970-1** (.500" I.D.) or **52971-1** (.531" I.D.) steel, or **52990-1** (.500" I.D.) or **52989-1** (.531" I.D.) aluminum-bronze distributor drive gear, and 7/16-20 x 1-1/4" grade 8 cam gear bolt and hardened washer.
b Ultra Pro Series roller lifters.
c Requires Crane Multi Fit valve locks.
d Must machine cylinder heads.
e Machined steel, heat treated.
f Machined steel, heat treated, Multi Fit.
g Heavy wall, heat treated, for use with pushrod guideplate cylinder heads.
h Pro Series one-piece.
i Performance steel billet gears and roller chain set.
k 1.73 ratio, requires 7/16" rocker arm studs and pushrod guideplates. See notes on opposite page. Valve Train Stabilizer available, see page 343.
l 1.73 ratio Wide Body, requires 7/16" rocker arm studs and pushrod guideplates. See notes on opposite page. Valve Train Stabilizer available, see page 343.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 276 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Roller Camshafts										
Competition only, good upper RPM torque and HP, bracket racing, auto trans w/race converter, 12.5 minimum compression ratio advised.	**R-272/420-2S1-10**	4200-8000	**358831**[*a] ◆3	**30518-16** **35570-16**[b]	272 280	304 312	110	30 62 74 26	.020 .020	.718 .718
Competition only, good upper RPM torque and HP, bracket racing, good w/540+ cu.in w/aluminum cylinder heads, good with large manifold nitrous system, auto trans w/race converter, 12.5 minimum compression ratio advised. Good with large Roots supercharger, 24 lbs. maximum boost w/8.0 maximum compression ratio advised.	**R-272/436-2S-14**	4200-8200	**358221**[*a] ◆3	**30518-16** **35570-16**[b]	272 280	302 312	114	27 65 79 21	.020 .022	.746 .732
Competition only, good upper RPM torque and HP, bracket racing, 510+ cu.in., auto trans w/race converter, 12.5 minimum compression ratio advised.	**R-276/420-2-10**	4400-8200	**358841**[*a] ◆3	**30518-16** **35570-16**[b]	276 286	308 318	110	32 64 77 29	.020 .020	.718 .718
Competition only, good upper RPM HP, bracket racing, good w/540+ cu.in w/aluminum cylinder heads, good with large manifold nitrous system, auto trans w/race converter, 13.0 minimum compression ratio advised. SFO1 firing order.	**R-276/4334-2S-12 SF01**	4600-8400	**358231**[*a] ◆3	**30518-16** **35570-16**[b]	276 286	316 326	112	29 67 78 28	.026 .026	.741 .730
Radical competition only, NMRA, Top Sportsman, large manifold nitrous system, good with 540+ cu.in., auto trans w/race converter, 14.0 minimum compression ratio advised. SFO1 firing order.	**R-280/5152-2S-14 SF01**	5000-8800	**358241**[*a] ◆3	**35570-16**[b]	280 296	310 336	114	31 69 87 29	.020 .030	.881 .805
Radical competition only, Unlimited Street, Quick 16, Top Sportsman, large manifold nitrous system, very large cu.in., auto trans w/race converter, 14.5 minimum compression ratio advised. SFO1 firing order.	**R-288/5152-2S-16 SF01**	5400-9200	**358251**[*a] ◆3	**35570-16**[b]	288 310	318 346	116	33 75 96 34	.020 .030	.881 .838

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

IMPORTANT: Crane offers Pushrod Guideplate and Rocker Arm Stud Conversion Kits, (**35655-16** and **52655-16**) for street applications, enabling the 370-429-460 cu.in. engines with pedestal mounted rockers to have adjustable rocker arms without cylinder head removal or machining. See page 305 for details.

NOTE: Roller camshafts with SFO1 firing order (1-5-4-8-6-3-7-2) are available on special order. Contact Crane's Performance Consultants for details.

NOTE: When installing roller lifter series cams and kits, in other than 429 Super C.J. engines, a method of effecting valve adjustment is required. On 68-71 engines equipped with bottleneck type studs, using **99768-16** positive locking nuts will permit valve adjustment. On 72-97 engines, the heads must be machined to use **99159-16** screw-in studs and pushrod guideplates.

NOTE: Many 1972-97 Ford-Mercury V-8 engines are originally equipped with a retarded crankshaft sprocket. This may cause idling and performance problems when installing aftermarket camshafts. We recommend using our **35975-1** timing chain and gear assembly, a pre-1972 crankshaft sprocket, or by degreeing in your camshaft. The non-retarded sprocket will have the alignment dot and keyway slot directly in line with each other.

NOTE: These camshafts also fit the 1969-70 Ford 429 Boss Hemi V-8 engines. Some kit components will differ. Contact Crane's Performance Consultants for details.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	ALUMINUM ROCKERS — ENERGIZER	ALUMINUM ROCKERS — GOLD RACE
	99885-16	**99956-16** **99974-16**[f]	**99820-16**[e]	**99097-1**[j] **99094-1**[k]	**35621-16**[l] **95653-16**[m]	**35975-1**[*o]			**27750-16**[q] **27771-16**[r]
	99885-16	**99956-16** **99974-16**[f]	**99820-16**[e]	**99097-1**[j] **99094-1**[k]	**35621-16**[l] **95653-16**[m]	**35975-1**[*o]			**27750-16**[q] **27771-16**[r]
	99885-16	**99956-16** **99974-16**[f]	**99820-16**[e]	**99097-1**[j] **99094-1**[k]	**35621-16**[l] **95653-16**[m]	**35975-1**[*o]			**27750-16**[q] **27771-16**[r]
	99885-16 **961226-16**[c,e]	**99956-16** **99974-16**[f] **99661-16**[g]	**99820-16**[e]	**99097-1**[j] **99094-1**[k]	**35621-16**[l] **95653-16**[m]	**35975-1**[*o]			**27750-16**[q] **27771-16**[r]
	96848-16[d] **961356-16**[d,e]	**99681-16**[i] **99663-16**[h]	**99826-16**[e]	**99097-1**[j]	**95810-16**[n]				**27750-16**[q] **27771-16**[r]
	96848-16[d] **961356-16**[d,e]	**99681-16**[i] **99663-16**[h]	**99826-16**[e]	**99097-1**[j]	**95810-16**[n]				**27750-16**[q] **27771-16**[r]

a Requires **52970-1** (.500" I.D.) or **52971-1** (.531" I.D.) steel, or **52990-1** (.500" I.D.) or **52989-1** (.531" I.D.) aluminum-bronze distributor drive gear, and 7/16-20 x 1-1/4" grade 8 cam gear bolt and hardened washer.
b Ultra Pro Series roller lifters.
c Requires **99661-16** titanium retainers.
d For 2.100" assembly height, requires **99663-16** titanium retainers.
e Must machine cylinder heads.
f Requires Crane Multi Fit valve locks.
g Titanium, for **961226-16** valve springs, requires Crane Multi Fit valve stem locks.
h Titanium, for **961356-16** valve springs, requires Crane Multi Fit valve stem locks.
i Must use **99097-1** valve stem locks, included with the retainers.
j Machined steel, heat treated.
k Machined steel, heat treated, Multi Fit.
l Heavy wall, heat treated, for use with pushrod guideplate cylinder heads.
m Pro Series one-piece.
n Pro Series one-piece, 3/8" diameter, special guideplates required.
o Performance steel billet gears and roller chain set.
q 1.73 ratio, requires 7/16" rocker arm studs and pushrod guideplates. See notes on opposite page. Valve train stabilizer available, see page 343.
r 1.73 ratio Wide Body, requires 7/16" rocker arm studs and pushrod guideplates. See notes on opposite page. Valve Train Stabilizer available, see page 343.

MG TC-TD-TF 4 cyl. 40-55

1250-1466cc

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	COMPLETE CAM SPECIFICATIONS: Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Lifter Camshafts										
Replacement for factory 168553 Camshaft. This camshaft features oversize lobes to reduce wear. Part number **905-0003** pushrods required, as stock pushrods will be too long.	**BluePrinted 553-0S**	1000-4500	**340-0002**		190 190	242 242	110	(15) 25 25 (15)	.018 .020	.357 .357
Good idle, daily usage, also mild supercharged, 2600-3200 cruise RPM, 9.0 to 10.75 compression ratio advised.	**F-222/280-2-10**	1800-5200	**340-0010**		222 232	260 270	110	6 36 51 1	.016 .018	.420 .441
Fair idle, good mid to upper RPM torque and HP, moderate performance usage, road course, hillclimb, 10.5 minimum compression ratio advised.	**MG-T-3**	2400-5800	**340-0012**		234 234	294 294	110	12 42 52 2	.022 .024	.443 .443

CAMSHAFTS

MGA-MGB 4 cyl. 57-80

1598-1798cc

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Lifter Camshafts										
Replacement for factory 88G303 camshaft (1964-80 "2 groove").	**BluePrinted 88G303**	1000-4500	**342-0002**		199 215	248 263	107.5	(7.5) 26.5 35.5 (0.5)	.012 .014	.376 .376
Good idle, daily usage, autocross, also mild supercharged, 2600-3200 cruise RPM, 9.0 to 10.75 compression ratio advised.	**F-222/280-2-10**	1800-5200	**342-0010**		222 232	260 270	110	6 36 51 1	.014 .016	.399 .419
Fair idle, good mid to upper RPM torque and HP, moderate performance usage, road course, hillclimb, 10.5 minimum compression ratio advised.	**F-232/294-8**	2400-5800	**342-0012**		232 232	270 270	108	13 39 49 3	.016 .018	.419 .419
Competition only, good upper RPM HP, road course, 12.0 minimum compression ratio advised.	**F-260/338-6**	4000-7500	**342-0107**		260 260	312 312	106	28 52 60 20	.028 .030	.482 .482

MG Midget—Mini—Sprite 4 cyl. 57–84

BMCA 848-1275cc

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Lifter Camshafts										
Good idle, daily usage, autocross, also mild turbocharged, 2600-3200 cruise RPM, 9.0 to 10.5 compression ratio advised.	**F-222/280-2-10**	1800-5200	**344-0010**		222 232	260 270	110	6 36 51 1	.012 .014	.353 .370
Fair idle, good mid to upper RPM torque and HP, moderate performance usage, autocross, hillclimb, 10.0 minimum compression ratio advised.	**F-232/294-2-10**	2200-5600	**344-0012**		232 242	270 280	110	11 41 56 6	.012 .014	.370 .388
Competition only, good upper RPM HP, road course, 12.0 minimum compression ratio advised.	**F-256/3526-2S-02**	4500-8000	**344-0102**		256 266	290 300	102	26 50 55 31	.020 .020	.444 .449

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	ALUMINUM ROCKERS — ENERGIZER	ALUMINUM ROCKERS — GOLD RACE
					905-0003				
					905-0003				
					905-0003				
	99884-8	99967-8			905-0004				
	99884-8	99967-8			905-0004				
	99884-8	99967-8			905-0004				
	99884-8	99967-8			905-0004				

Mitsubishi 4G63/4G63-T
4 cyl. Eclipse-Talon-Gallant 1989-1999

DOHC 4V 2.0 Litre

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 266 FOLLOWERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Valve Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Follower Camshafts										
Good idle, daily usage, performance upgrade for stock engine, aftermarket intake/exhaust and ECM advised, new valve springs recommended.	**MIT-248-2SR-10**	800-6500	**435-0010*** ◆3		208 200	248 240	110	(1.5) 29.5 34.5 (14.5)	.000 .000	.404 .384
Good idle, performance usage, street, drag race, OK with nitrous, aftermarket intake/exhaust and ECM advised, requires upgraded valve springs and retainers, valve guides must be shortened.	**MIT-256-2SR-10**	1200-6800	**435-0012*** ◆3		216 208	256 248	110	4.5 31.5 40.5 (12.5)	.000 .000	.424 .404
Fair idle, performance usage, for use with aftermarket turbo systems, intercooler advised, aftermarket intake/ low restriction exhaust and ECM required, requires upgraded valve springs and retainers, valve guides must be shortened.	**MIT-264-2SR-10**	1500-7500	**435-0014*** ◆3		224 216	264 256	110	10.5 33.5 46.5 (10.5)	.000 .000	.443 .424
	Stock (for comparison purposes only)				193 193	240 240	106.5			.335 .335

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

The 4G63 camshafts are suitable for both GEN 1 and GEN 2 engines. Chrysler Neon 2.0L camshafts will not function properly in the 420A engines, as the cam lobe layout and cam sensor locations are different.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	**VALVE SPRINGS**	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING BELT AND SPROCKET ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 266 FOLLOWERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Valve Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Follower Camshafts										
Good idle, daily usage, performance upgrade for stock engine, aftermarket intake/exhaust and ECM advised, new valve springs and retainers recommended.	**MIT-248-2SR-10**	800-6500	**440-0010*** ◆3		208 200	248 240	110	(7.5) 35.5 28.5 (8.5)	.000 .000	.404 .384
Good idle, performance usage, street, drag race, OK with nitrous, aftermarket intake/exhaust and ECM advised, requires upgraded valve springs and retainers, valve guides must be shortened.	**MIT-256-2SR-10**	1200-6800	**440-0012*** ◆3		216 208	256 248	110	(3.5) 39.5 32.5 (4.5)	.000 .000	.424 .404
Fair idle, performance usage, for use with aftermarket turbo systems, intercooler advised, aftermarket intake/ low restriction exhaust and ECM required, requires upgraded valve springs and retainers, valve guides must be shortened.	**MIT-264-2SR-10**	1500-7500	**440-0014*** ◆3		224 216	264 256	110	(0.5) 43.5 36.5 (0.5)	.000 .000	.444 .424
	HKS 264 (for comparison purposes only)				200 200	264 264				.425 .402
	HKS 272 (for comparison purposes only)				208 208	272 272				.425 .402
	HKS 280 (for comparison purposes only)				216 216	280 280				.425 .402

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

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Custom Grind Cams Also Available – Call 866-388-5120 or go to cranecams.com for ordering information

CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING BELT AND SPROCKET ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE

Oldsmobile V8 1967–1984 260-307 (5.0L) – 350 (5.7L) – 400-403-425-455 cu.in.

This popular Oldsmobile V8 engine family actually began in 1964, as a 330 cu.in. version. There are no "small block" or "big block" Olds V8's in this series, as the same basic engine architecture is used from the 260 to the 455 versions. Two different deck heights were used, depending upon displacement.

There were a number of changes from 1964 to 1967 that can complicate obtaining the correct camshaft and lifters, due to differing lifter bank angles and lifter diameters. The chart below will explain these by year and displacement. The 45 and 39 degree lifter bank angle camshafts will physically interchange, but the improper application will cause incorrect valve timing from bank to bank. To be certain that you have the proper camshaft in your block, check the cam timing on each bank of the engine. A cranking compression test will also be an indication, especially if one side varies consistently from the other. Our 79-prefix designates the 45 degree bank angle camshafts (available on special order), while the 80-prefix is for the more common 39-degree bank angle applications. All of these engines have inline lifter bores and are equipped with 1.6:1 ratio non-adjustable rocker arms.

1966-1967 400 cu.in. and 425 cu.in. Toronado engines had .921" diameter lifters, while the others had .842" diameter hydraulic lifters. The .921" lifters can be difficult to obtain, and many folks will sleeve their lifter bores so that the .842" items can be used.

We offer complete lines of hydraulic, retrofit hydraulic roller, mechanical, and roller lifter camshafts and valve train components for these engines.

The carburized steel retrofit hydraulic roller and street roller camshafts are equipped with a cast iron distributor drive gear and rear journal. These are noted by an IG suffix (Iron Gear), allowing the use of a standard type distributor gear for long term reliability.

There were also 260D and 350D cu.in. Diesel versions offered from 1978 to 1985, featuring more robust block and head castings. These engines had 39 degree bank angle camshafts and .842" flat faced lifters, with the exception of a few very early blocks intended for racing that were bored for .921" lifters.

From 1985 to 1990, this engine family continued with a 307 cu.in. powerplant, equipped with a 39 degree bank angle hydraulic roller camshaft and .921" diameter hydraulic roller lifters. Our 80-prefix camshafts can be used in these engines if a thrust spacer is fabricated, and the appropriate lifters are used.

The production cylinder heads can be machined for screw-in rocker arm studs and pushrod guideplates, permitting adjustable stud mounted rocker arms to be installed. Heat treated pushrods will be required for guideplate compatibility. This will provide more accurate lifter preload adjustment for hydraulic lifter applications, and are necessary to achieve lash adjustment for mechanical and roller lifter equipped engines. A number of aftermarket cylinder heads have been offered over the years, in iron and aluminum versions, with most of them having provisions for adjustable rockers already incorporated.

In the late 70's and early 80's, General Motors interchanged engines throughout the product offerings. Pontiacs could have Oldsmobile engines, Buicks with Chevy engines, etc. Make sure of exactly what engine you have before proceeding with your service or modifications.

Much confusion has arisen from ordering the wrong cam, lifters and pushrods for the 64–84 Olds engines. The following table should be used to avoid error when placing your order.

Year	Cu. In.	Model	Lifter Diameter	Cam Bank Angle	Order Cam w/Part# Beginning	Hydraulic Cam Lifters	Mechanical Cam Lifters	Hydraulic Lifter Cam Pushrods
64	330	ALL	.842	45°	79-	**99284-16***	**99250-16**	**95647-16**
65	330	ALL	.842	45°	79-	**99284-16***	**99250-16**	**95647-16**
65	400	ALL	.842	45°	79-	**99284-16***	**99250-16**	
65	425	ALL	.842	45°	79-	**99284-16***	**99250-16**	
66	330	ALL	.842	45°	79-	**99284-16***	**99250-16**	**95647-16**
66	400	ALL	.921	39°	80-			
66	425	ALL Except Tornado	.842	45°	79-	**99284-16***	**99250-16**	
66	425	Tornado Only	.921	39°	80-			
67	330	ALL	.842	45°	79-	**99284-16***	**99250-16**	**95647-16**
67	400	ALL	.921	39°	80-			**95647-16**
67	425	ALL Except Tornado	.842	39°	80-	**99284-16***	**99250-16**	
67	425	Tornado Only	.921	39°	80-			**95647-16**
68–69	400	ALL	.842	39°	80-	**99284-16***	**99250-16**	
68–80	350	ALL	.842	39°	80-	**99284-16***	**99250-16**	**95647-16**
68–76	455	ALL	.842	39°	80-	**99284-16***	**99250-16**	
75–82	260	ALL	.842	39°	80-	**99284-16***	**99250-16**	**95647-16**
77–79	403	ALL	.842	39°	80-	**99284-16***	**99250-16**	**95647-16**
80–84	307	ALL	.842	39°	80-	**99284-16***	**99250-16**	**95647-16**

Optional Hi Intensity hydraullic lifters (99384-16***) are available, see page 272 for details*

Oldsmobile DRCE V8

The DRCE (Drag Racing Corporate Engine) offered by Olds consisted of a block and cylinder heads based on big block Chevrolet dimensioning. The DRCE, DRCE2, DRCE3, and DRCE4 engines were never vehicle installed, nor were they offered as an engine assembly. Directed towards Pro Stock racing, many improvements were made over the Chevy, with these components offered as basic building blocks for the particular engine builder. Different lifter bore angles and camshaft journal diameters were used, so if you obtain one of these engines, be certain of exactly what dimensioned version you have when requiring parts.

Crane offers custom ground camshafts and other components for the DRCE series of engines. Please contact us directly for your specific requirements.

Pontiac V8 1955–1981 265 (4.3L) – 287 301 (4.9L) – 316-326-347-350-370-389-400 (6.6L) – 421-428-455 cu.in.

The fabled Pontiac V8 family is also based on a common dimensioned foundation. There are no "small block" or "big block" versions. The exceptions that might be noted are the 1977-81 265 and 301 cu.in. lightweight engines, that require the use of Chevrolet lifters due to relocated oil galleries, and also have a different deck height (the cylinder heads and many other internal parts were also unique).

These engines are designated by our 28-prefix. The blocks have inline lifter bores with .842" diameter lifters. The standard rocker arm ratio is 1.5:1, with the exception of the 1959-63 Super Duty engines (cylinder head casting numbers 540306, 544127, and 9771980) that were equipped with 1.65:1 ratio rockers.

We offer complete lines of hydraulic, retrofit hydraulic roller, mechanical, and roller lifter camshafts and components for these engines. The carburized steel retrofit hydraulic roller and street roller camshafts are equipped with a cast iron distributor drive gear and rear journal. These are noted by an IG suffix (Iron Gear), allowing the use of a standard type distributor gear for long term reliability.

The same camshafts are applicable to nearly all of these engines. One unique exception occurred in the 1973-74 455 Super Duty, which had an undersize distributor drive gear on the camshaft, and an oversize gear on the distributor. A standard configuration camshaft can be installed in these engines, as long as a standard gear is also installed on the distributor. We did produce some of the small gear camshafts during that era, and they were designated by an "SD" suffix after the grind number.

There was also a totally unique 1969 "Race Only" Ram Air V engine with tunnel port heads that incorporated a different valve layout, requiring a special camshaft. If you are fortunate to have one of these rare engines, we can custom manufacture a tool steel billet roller camshaft for it.

There are also aftermarket cylinder blocks being offered today, which have options of different diameter cam bearing journals. We can also produce special steel billet roller camshafts for these applications.

Although the Pontiac V8 engines had stud mounted stamped steel rocker arms with pivot balls, there were a number of variations. There were a few exceptions for special versions, but the basics are as follows: The 1955 engines had straight 3/8" studs, with a crimped locking nut used for adjustment. The 1956-60 engines had bottleneck 3/8" studs, with a 5/16" threaded top section. The nuts were torqued against the step, and were non-adjustable. The 1961-81 engines had bottleneck 7/16" studs, with a 3/8" threaded top section, and were again non- adjustable. There were Super Duty heads equipped with straight 7/16' studs, having an adjustable configuration. The bottleneck versions can be made adjustable with the appropriate sized positive locking adjusting nuts, providing the most accurate adjustment for hydraulic camshafts, and are a necessity for mechanical lifter camshafts. Today's aftermarket aluminum cylinder heads have straight studs intended for an adjustable rocker configuration. We offer 1.5:1 and 1.65:1 ratio rocker arms for most popular combinations.

In the late 70's and early 80's, General Motors interchanged engines throughout the product offerings. Pontiacs could have Oldsmobile engines, Buicks with Chevy engines, etc. Make sure of exactly what engine you have before proceeding with your service or modifications.

Oldsmobile V-8 67-84

260-307 (5.0L)-350 (5.7L)-400-403-425-455 cu.in. – 39° bank angle engines

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts										
Brute low end torque, smooth idle, daily usage, fuel economy, 1600-2200 cruise RPM, 7.75 to 8.75 compression ratio advised.	**H-192/2667-2S-10**	800-4200	**800501*** ◆3	**99284-16**[b]	192 204	248 260	110	(9) 21 37 (13)	.000 .000	.427 .456
Good low end torque, smooth idle, daily usage, off road, towing, economy, also mild turbocharged, 2200-2600 cruise RPM, 8.0 to 9.5 compression ratio advised.	**H-260-2**	1200-4800	**803901*** **803902***[a] ◆3	**99284-16**[b]	204 216	260 272	112	(5) 29 45 (9)	.000 .000	.456 .484
Good low and mid range torque, good idle, daily usage, off road, towing, mild marine, performance and fuel efficiency, 2600-3000 cruise RPM, 8.75 to 10.5 compression ratio advised.	**H-272-2**	1600-5400	**804541*** **804542***[a] ◆3	**99284-16**[b]	216 228	272 284	112	1 35 51 (3)	.000 .000	.484 .512
Good mid range torque and HP, fair idle, moderate performance usage, marine perf, bracket racing, auto trans w/2500+ converter, 3200-3600 cruise RPM, 9.5 to 11.0 compression ratio advised.	**H-284-2**	2200-5800	**804551*** **804552***[a] ◆3	**99284-16**[b] **99384-16***[c]	222 230	284 292	110	6 36 50 0	.000 .000	.480 .496
Good mid range HP, fair idle, moderate performance usage, bracket racing, auto trans w/3000+ converter, 3600-4000 cruise RPM, 10.0 to 11.5 compression ratio advised.	**H-292-2**	2800-6400	**804461*** ◆3	**99284-16**[b] **99384-16***[c]	230 234	292 296	110	10 40 52 2	.000 .000	.496 .504
Replacement for factory W-31 camshaft (advancing this camshaft 5 degrees will produce the equivalent specs of the 397328 W-30 camshaft).	**402194**	2600-6000	**800101** ◆1	**99284-16**[b] **99384-16***[c]	232 232	300 300	113.5	3 49 49 3	.000 .000	.474 .474
Good mid and upper RPM torque and HP, fair idle, performance usage, best in 425+ cu.in., bracket racing, auto trans w/3500+ converter, 10.5 to 12.0 compression ratio advised.	**H-234/325-2-10**	2800-6400	**800601*** ◆3	**99284-16**[b] **99384-16***[c]	234 244	304 314	110	12 42 57 7	.000 .000	.520 .542
Good mid and upper RPM torque and HP, rough idle, performance usage, best in 455+ cu.in., bracket racing, auto trans w/3500+ converter, 10.5 to 12.0 compression ratio advised.	**H-238/3347-2-10**	3000-6600	**800661*** ◆3	**99284-16**[b] **99384-16***[c]	238 248	294 304	110	14 44 59 9	.000 .000	.536 .560
Good mid and upper RPM torque and HP, rough idle, performance usage, best in 455+ cu.in. with aluminum heads, bracket racing, auto trans w/3500+ converter, 11.0 to 12.5 compression ratio advised.	**H-244/3439-2S-10**	3200-6800	**800741*** ◆3	**99284-16**[b] **99384-16***[c]	244 256	300 312	110	17 47 63 13	.000 .000	.550 .560
Good upper RPM and HP, rough idle, performance usage, best in 455+ cu.in. with aluminum heads, bracket racing, auto trans w/3800+ converter, 11.5 minimum compression ratio advised.	**H-248/3500-2S-12**	3400-6800	**800681*** ◆3	**99284-16**[b] **99384-16***[c]	248 256	304 312	112	17 51 65 11	.000 .000	.560 .560

Much confusion has arisen from ordering the wrong cam, lifters and pushrods fro the 64-84 Olds engines. See the chart on page 250 for IMPORTANT INFORMATION.

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

NOTE: Refer to the chart on page 250 to determine which bank angle engine you have.

NOTE: Camshafts for the 45° bank angle engines (79-prefix) are available on special order.

IMPORTANT: Check your hydraulic lifter preload, with your original pushrods, to first determine if different pushrods may be required. Refer to page 353 for the fast and easy way to check hydraulic lifter preload. If your hydraulic lifter preload is excessive, this can be easily remedied by using Crane's Rocker Arm Bridge Shim Kit (99179-1). Refer to page 304 for details.

NOTE: 1985-1990 307 cu.in. engines are 39° bank angle and are equipped with hydraulic roller camshafts and lifters. Lifter diameter is .921". Conventional hydraulic, mechanical, or roller camshafts and lifters can be installed in these engines if a thrust spacer is fabricated and the appropriate kit components are used.

Since 1975 General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
36308-1[d]	**96803-16**[d]	**99946-16**		**99097-1**[d]	[g]	**80975-1**[*h]	**80800-16**[i]	**80744-16**[*k]	**80757-16**[l]
36308-1[d]	**96803-16**[d]	**99946-16**		**99097-1**[d]	[g]	**80975-1**[*h]	**80800-16**[i]	**80744-16**[*k]	**80757-16**[l]
36308-1[d]	**96803-16**[d]	**99946-16**		**99097-1**[d]	[g]	**80975-1**[*h]	**80800-16**[i]	**80744-16**[*k]	**80757-16**[l]
36308-1[d]	**96803-16**[d]	**99946-16**		**99097-1**[f]	[g]	**80975-1**[*h]	**80800-16**[i]	**80744-16**[*k]	**80757-16**[l]
36308-1[d]	**96803-16**[d]	**99946-16**		**99097-1**[f]	[g]	**80975-1**[*h]	**80800-16**[i]	**80744-16**[*k]	**80757-16**[l]
36308-1[d]	**96803-16**[d]	**99946-16**		**99097-1**[f]	[g]	**80975-1**[*h]	**80800-16**[i]	**80744-16**[*k]	**80757-16**[l]
11310-1	**99838-16**	**99944-16**	**99820-16**[e]	**99097-1**[f]	[g]	**80975-1**[*h]	**80800-16**[i]	**80744-16**[*k]	**80757-16**[l]
11310-1	**99838-16**	**99944-16**	**99820-16**[e]	**99097-1**[f]	[g]	**80975-1**[*h]	**80800-16**[i]	**80744-16**[*k]	**80757-16**[l]
11310-1	**99838-16**	**99944-16**	**99820-16**[e]	**99097-1**[f]	[g]	**80975-1**[*h]	**80800-16**[i]	**80744-16**[*k]	**80757-16**[l]
11310-1	**99838-16**	**99944-16**	**99820-16**[e]	**99097-1**[f]	[g]	**80975-1**[*h]	**80800-16**[i]	**80744-16**[*k]	**80757-16**[l]

a Cam and lifter kit, includes installation lubricants and Rocker Arm Pedestal Shim Kit.
b Refer to chart on page 250 for correct application, may require appropriate Crane pushrods, see IMPORTANT NOTE on opposite page.
c Optional Hi Intensity hydraulic lifters, see page 272 for details. Refer to chart on page 250 for correct applications, may require appropriate Crane pushrods.
d Standard diameter valve springs, no machining required.
e Must machine cylinder heads.
f Machined steel, heat treated.
g Refer to chart on page 250 for correct application.
h Performance steel billet gears and roller chain set.
i 1.6 ratio, stamped steel, with individual fulcrums and bridge straps, fits 67-79 engines.
k Energizer, 1.65 ratio, 3/8" stud, must machine cylinder heads and install **99156-16** rocker arm studs and aftermarket pushrod guideplates. Special heat treated pushrods are required for use with pushrod guideplates.
l 1.6 ratio, 7/16" stud, must machine cylinder heads and install **99157-16** rocker arm studs and aftermarket pushrod guideplates. Special heat treated pushrods are required for use with pushrod guideplates.

Oldsmobile V-8 67-84

260-307 (5.0L)-350 (5.7L)-400-403-425-455 cu.in. – 39° bank angle engines

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 274 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Roller Camshafts — Retrofit										
Excellent low end torque, good idle, daily usage, towing, performance and fuel efficiency, 2600-3000 cruise RPM, 8.75 to 10.5 compression ratio advised.	**HR-214/325-2S-12 IG**	1400-5600	**809611**[*a] ◆3	**28532-16**[c]	214 222	276 284	112	0 34 48 (6)	.000 .000	.520 .542
Good low end and mid range torque and HP, fair idle, moderate performance usage, mild bracket racing, auto trans w/2500+ converter, 3000-3600 cruise RPM, 9.5 to 10.75 compression ratio advised.	**HR-222/339-2S-12 IG**	1800-6000	**809621**[*a] ◆3	**28532-16**[c]	222 230	284 292	112	4 38 52 (2)	.000 .000	.542 .563
Good mid range torque and HP, fair idle, performance usage, best in 400+ cu.in., mild bracket racing, auto trans w/3000+ converter, good w/plate nitrous system, 3600-4200 cruise RPM, 10.0 to 11.5 compression ratio advised.	**HR-230/352-2S-14 IG**	2200-6400	**809631**[*a] ◆3	**28532-16**[c]	230 242	292 304	114	6 44 60 2	.000 .000	.563 .595
Good mid range and upper RPM torque and HP, rough idle, performance usage, bracket racing, best in 455+ cu.in., auto trans w/3500+ converter, good w/manifold nitrous system, 4200-5000 cruise RPM, good with aluminum heads, 10.5 to 12.0 compression ratio advised.	**HR-242/372-2S-14 IG**	3000-6800	**809641**[*a] ◆3	**28532-16**[c]	242 254	304 316	114	12 50 66 8	.000 .000	.595 .595
Mechanical Lifter Camshafts										
Good low and mid range torque and HP, fair idle, moderate performance usage, bracket racing, auto trans w/2000+ converter, 3400-3800 cruise RPM, 10.0 to 11.5 compression ratio advised.	**F-238/3200-2-10**	2800-6600	**801181**[*] ◆3	**99250-16**[d]	238 248	300 310	110	14 44 58 9	.022 .022	.512 .533
Good mid range torque and HP, rough idle, moderate performance usage, bracket racing, best in 400+ cu.in., auto trans w/2500+ converter, 3800-4200 cruise RPM, 11.0 to 12.0 compression ratio advised.	**F-248/3334-2-8**	3600-7400	**801231**[*] ◆3	**99250-16**[d]	248 258	310 320	108	21 47 62 16	.022 .022	.533 .555
Mechanical Roller Camshafts										
Good mid range torque and HP, rough idle, performance usage, good low and mid range torque and HP, bracket racing, auto trans w/race converter, 11.0 to 12.5 compression ratio advised.	**R-252/420-2-8**	3200-7400	**808801**[*b] ◆3	**28570-16**[e]	252 262	284 294	108	22 50 63 19	.020 .020	.672 .672
Good mid to upper RPM torque and HP, rough idle, performance usage, bracket racing, auto trans w/race converter, good w/plate nitrous system, 11.5 minimum compression ratio advised.	**R-262/420-2-10**	3600-7600	**808811**[*b] ◆3	**28570-16**[e]	262 272	294 304	110	25 57 70 22	.020 .020	.672 .672
Good upper RPM torque and HP, competition only, good mid to upper RPM torque and HP, bracket racing, auto trans w/race converter, good w/manifold nitrous system. 12.5 minimum compression ratio advised.	**R-272/420-2-10**	4200-8200	**808821**[*b] ◆3	**28570-16**[e]	272 282	304 314	110	30 62 75 27	.020 .020	.672 .672
Competition only, good upper RPM HP, Super Stock, stick shift or auto w/trans brake, 12.5 minimum compression ratio advised.	**R-282/450-2S2-8**	5000-8800	**808351**[*b] ◆3	**28570-16**[e]	282 292	322 332	108	36 66 77 35	.026 .026	.720 .681

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

NOTE: Refer to the chart on page 250 to determine which bank angle engine you have.

NOTE: Camshafts for the 45° bank angle engines (79-prefix) are available on special order.

NOTE: The proper Crane pushrods should be used with Crane lifters to provide the most accurate valve adjustment. Refer to the chart on page 250 for the correct cam, lifter and pushrod applications.

NOTE: For hydraulic roller, mechanical lifter, and roller lifter camshaft applications, it is highly recommended that the cylinder heads be machined for **99157-16** 7/16" screw-in studs and pushrod guideplates, to provide a means of effecting valve adjustment. Custom length heat treated pushrods will then be required.

NOTE: 1985-1990 307 cu.in. engines are 39° bank angle and are equipped with hydraulic roller camshafts and tappets. Tappet diameter is .921". Conventional hydraulic, hydraulic roller, mechanical, or roller camshafts and lifters can be installed in these engines if a thrust spacer is fabricated and the appropriate kit components are used. Bushing the lifter bores to .842" diameter would also be required.

Since 1975 General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
	99838-16	**99953-16** **99969-16**[g]	**99820-16**[f]	**99097-1**[i] **99094-1**[j]	[c]	**80975-1**[*k]		**80744-16**[*m]	**80757-16**[n]
	99893-16	**99953-16** **99969-16**[g]	**99820-16**[f]	**99097-1**[i] **99094-1**[j]	[c]	**80975-1**[*k]		**80744-16**[*m]	**80757-16**[n]
	99893-16	**99953-16** **99969-16**[g]	**99820-16**[f]	**99097-1**[i] **99094-1**[j]	[c]	**80975-1**[*k]		**80744-16**[*m]	**80757-16**[n]
	99893-16	**99953-16** **99969-16**[g]	**99820-16**[f]	**99097-1**[i] **99094-1**[j]	[c]	**80975-1**[*k]		**80744-16**[*m]	**80757-16**[n]
11310-1	**99838-16**	**99944-16**	**99820-16**[f]	**99097-1**[i]		**80975-1**[*k]			**80757-16**[n]
11310-1	**99838-16**	**99944-16**	**99820-16**[f]	**99097-1**[i]		**80975-1**[*k]			**80757-16**[n]
	99885-16[f]	**99678-16**[h]	**99820-16**[f]	**99097-1**[i]		**80975-1**[*k]			**80757-16**[n]
	99885-16[f]	**99678-16**[h]	**99820-16**[f]	**99097-1**[i]		**80975-1**[*k]			**80757-16**[n]
	99885-16[f]	**99678-16**[h]	**99820-16**[f]	**99097-1**[i]		**80975-1**[*k]			**80757-16**[n]
	99885-16[f]	**99678-16**[h]	**99820-16**[f]	**99097-1**[i]		**80975-1**[*k]			**80757-16**[n]

a Camshaft incorporates an integral cast iron distributor drive gear, aluminum-bronze distributor drive gear not required.
b Requires **80990-1** aluminum-bronze distributor drive gear.
c Vertical locking bar hydraulic roller lifters, no machining required. Special length pushrods are required.
d Refer to chart on page 250 for correct application, requires appropriate Crane pushrods, see IMPORTANT NOTE on opposite page.
e Ultra Pro Series roller lifters.
f Must machine cylinder heads.
g Requires Crane Multi Fit valve locks.
h Must use **99097-1** valve stem locks, included with the retainers.
i Machined steel, heat treated.
j Machined steel, heat treated, Multi Fit.
k Performance steel billet gears and roller chain set.
m Energizer, 1.65 ratio, 3/8″ stud, must machine cylinder heads and install **99156-16** rocker arm studs and aftermarket pushrod guideplates. Special heat treated pushrods are required for use with pushrod guideplates.
n 1.6 ratio, 7/16″ stud, must machine cylinder heads and install **99157-16** rocker arm studs and aftermarket pushrod guideplates. Special heat treated pushrods are required for use with pushrod guideplates.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts										
Brute low-end torque, smooth idle, daily usage, fuel economy, 1600-2200 cruise RPM, 7.75 to 8.75 compression ratio advised.	**H-192/2667-2S-12**	800-4200	**280511**[*] ◆3	**99282-16**[c]	192 204	248 260	112	(11) 23 39 (15)	.000 .000	.400 .427
Good low end torque, smooth idle, daily usage, towing, economy, also mild turbocharged, 2200-2600 cruise RPM, 8.0 to 9.5 compression ratio advised.	**H-260-2**	1200-4800	**283901**[*] **283902**[*a] ◆3	**99282-16**[c]	204 216	260 272	112	(5) 29 49 (9)	.000 .000	.427 .454
Replacement for factory Ram Air or H.O. 400 cu.in. "S" camshaft.	**BluePrinted 9779068**	1600-5000	**968781** ◆1	**99282-16**[c]	212 225		115.5	(7) 39 50.5 (5.5)	.000 .000	.408 .407
Strong mid range torque, good idle, daily usage, off road, highway towing, fuel efficiency plus performance, 2600-3000 cruise RPM, 8.75 to 10.0 compression ratio advised.	**Energizer 272 H10**	1800-5200	**10507**[*] **105072**[*b] ◆3	**99282-16**[c]	216 216	272 272	110	3 33 43 (7)	.000 .000	.454 .454
Good low and mid range torque, good idle, daily usage, towing, performance and fuel efficiency, 2600-3000 cruise RPM, 8.75 to 10.5 compression ratio advised.	**H-272-2**	1800-5400	**283941**[*] **283942**[*a] ◆3	**99282-16**[c]	216 228	272 284	112	1 35 51 (3)	.000 .000	.454 .480
Good low and mid range torque and HP, good idle, daily usage, towing, performance and fuel efficiency, 2400-3200 cruise RPM, 8.75 to 10.5 compression ratio advised.	**Z-268-2**	1800-5600	**283511**[*] **283512**[*a] ◆3	**99282-16**[c]	218 224	268 274	112	2 36 49 (5)	.000 .000	.459 .473
Good mid range torque and HP, excellent for 455 SD, fair idle, moderate performance usage, mild bracket racing, 3000-3400 cruise RPM, 9.5 to 10.75 compression ratio advised.	**H-278-2**	2000-5600	**283801**[*] **283802**[*a] ◆3	**99282-16**[c] **99382-16**[*d]	222 234	278 290	114	2 40 56 (2)	.000 .000	.467 .494
Good mid range torque and HP, fair idle, moderate performance usage, mild bracket racing, auto trans w/2500+ converter, 3400-3800 cruise RPM, 9.5 to 11.0 compression ratio advised. Good w/plate nitrous system.	**H-288-2**	2400-6000	**283951**[*] **283952**[*a] ◆3	**99282-16**[c] **99382-16**[*d]	226 234	288 296	114	4 42 56 (2)	.000 .000	.458 .473
Good mid range HP, fair idle, moderate performance usage, mild bracket racing, auto trans w/2500+ converter, 3400-3800 cruise RPM, 9.5 to 11.0 compression ratio advised.	**Energizer 284 H12**	2800-6200	**10508**[*] **105082**[*b] ◆3	**99282-16**[c] **99382-16**[*d]	228 228	284 284	112	7 41 51 (3)	.000 .000	.480 .480
Replacement for factory Ram Air IV "T" camshaft.	**BluePrinted 9794041**	2600-6000	**969681** ◆1	**99282-16**[c] **99382-16**[*d]	230 240		113.5	2 48 54 6	.000 .000	.469 .469
Good mid to upper RPM torque and HP, fair idle, moderate performance usage, mild bracket racing, auto trans w/2500+ converter, 3400-4000 cruise RPM, 9.5 to 11.0 compression ratio advised. Good w/plate nitrous system.	**Z-280-2**	2600-6400	**283521**[*] **283522**[*a] ◆3	**99282-16**[c] **99382-16**[*d]	230 240	280 290	112	8 42 57 3	.000 .000	.486 .494
Performance usage, good mid range torque and HP, bracket racing, auto trans with 3000+ converter, good with aftermarket cylinder heads, 9.5 to 11.5 compression ratio advised.	**H-234/325-10**	3000-6400	**280441**[*] ◆3	**99282-16**[c] **99382-16**[*d]	234 234	304 304	110	12 42 52 2	.000 .000	.488 .488

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

NOTE: In order to effect valve adjustment when using mechanical lifter and roller lifter camshafts, and to provide the most accurate adjustment on hydraulic lifter camshafts, a set of positive locking nuts, such as **99768-16**, must be obtained for the rocker arm studs.

NOTE: Specify if casting number 540306, 544127, or 9771980 heads with 1.65 ratio rocker arms are being used, as different valve springs will be required.

NOTE: Be sure to maintain at least .040" clearance between the underside of the rocker arm and valve spring retainer when the valve is closed.

Since 1975 General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
28308-1[e]	**99840-16**[e] **99838-16**[f]	**99944-16**	**99820-16**[g]	**99097-1**[h]	**95654-16**[i] **28624-16**[j]	**28975-1**[*k]	**28800-16**[l]	**28747-16**[*n]	**28750-16**[o] **28758-16**[*p]
28308-1[e]	**99840-16**[e] **99838-16**[f]	**99944-16**	**99820-16**[g]	**99097-1**[h]	**95654-16**[i] **28624-16**[j]	**28975-1**[*k]	**28800-16**[l]	**28747-16**[*n]	**28750-16**[o] **28758-16**[*p]
28308-1[e]	**99840-16**[e] **99838-16**[f]	**99944-16**	**99820-16**[g]	**99097-1**[h]	**95654-16**[i] **28624-16**[j]	**28975-1**[*k]	**28800-16**[l]	**28747-16**[*n]	**28750-16**[o] **28758-16**[*p]
28308-1[e]	**99840-16**[e] **99838-16**[f]	**99944-16**	**99820-16**[g]	**99097-1**[h]	**95654-16**[i] **28624-16**[j]	**28975-1**[*k]	**28800-16**[l]	**28747-16**[*n]	**28750-16**[o] **28758-16**[*p]
28308-1[e]	**99840-16**[e] **99838-16**[f]	**99944-16**	**99820-16**[g]	**99097-1**[h]	**95654-16**[i] **28624-16**[j]	**28975-1**[*k]	**28800-16**[l]	**28747-16**[*n]	**28750-16**[o] **28758-16**[*p]
28308-1[e]	**99840-16**[e] **99838-16**[f]	**99944-16**	**99820-16**[g]	**99097-1**[h]	**95654-16**[i] **28624-16**[j]	**28975-1**[*k]	**28800-16**[l]	**28747-16**[*n]	**28750-16**[o] **28758-16**[*p]
28308-1[e]	**99840-16**[e] **99838-16**[f]	**99944-16**	**99820-16**[g]	**99097-1**[h]	**95654-16**[i] **28624-16**[j]	**28975-1**[*k]	**28800-16**[l]	**28747-16**[*n]	**28750-16**[o] **28758-16**[*p]
28308-1[e]	**99840-16**[e] **99838-16**[f]	**99944-16**	**99820-16**[g]	**99097-1**[h]	**95654-16**[i] **28624-16**[j]	**28975-1**[*k]	**28800-16**[l]	**28747-16**[*n]	**28750-16**[o] **28758-16**[*p]
28308-1[e]	**99840-16**[e] **99838-16**[f]	**99944-16**	**99820-16**[g]	**99097-1**[h]	**95654-16**[i] **28624-16**[j]	**28975-1**[*k]	**28800-16**[l]	**28747-16**[*n]	**28750-16**[o] **28758-16**[*p]
28308-1[e]	**99840-16**[e] **99838-16**[f]	**99944-16**	**99820-16**[g]	**99097-1**[h]	**95654-16**[i] **28624-16**[j]	**28975-1**[*k]	**28800-16**[l]	**28747-16**[*n]	**28750-16**[o] **28758-16**[*p]
11310-1[f]	**99838-16**[f]	**99944-16**	**99820-16**[g]	**99097-1**[h]	**28624-16**[j]	**28975-1**[*k]	**28800-16**[l]	**28747-16**[*n]	**28750-16**[o] **28758-16**[*p]

Section Continued

a Cam and Lifter Kit, includes assembly lubricants and rocker arm adjusting nuts (not for use in 265 and 301 cu.in. engines).
b Cam and Lifter Kit, includes assembly lubricants (not for use in 265 and 301 cu.in. engines).
c 265 and 301 cu.in. engines require **99277-16** lifters.
d Optional Hi Intensity hydraulic lifters, see page 272 for details (265 and 301 cu.in. engines require **99377-16** lifters).
e Contains standard diameter valve springs, no machining required.
f Dual valve springs, no machining required.
g Must machine cylinder heads.
h Machined steel, heat treated.
i Pro Series one-piece, for non-guideplate cylinder heads.
j Heavy wall, heat treated, for use with pushrod guideplate cylinder heads.
k Performance steel billet gears and roller chain set.
l 1.5 ratio, for 67-79 engines with 7/16" bottleneck studs and 3/8" nuts.
n Energizer 1.65 ratio, for straight 7/16" rocker arm studs.
o 1.5 ratio, for 7/16" bottleneck studs and 3/8" nuts.
p 1.65 ratio, for straight 7/16" rocker arm studs.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Hydraulic Lifter Camshafts										
Good mid to upper RPM torque and HP, 455+ with aluminum heads, fair idle, performance usage, bracket racing, auto trans w/3000+ converter, 3800-4200 cruise RPM, 10.0 to 11.5 compression ratio advised.	**H-296-2**	2800-6600	**284281**[*] ◆3	**99282-16**[b] **99382-16**[*c]	234 242	296 304	112	10 44 58 4	.000 .000	.473 .488
Good upper RPM torque and HP, rough idle, bracket racing, auto trans w/3500+ converter, 10.5 to 12.0 compression ratio advised.	**H-244/3387-2-8**	3400-6800	**280451**[*] ◆3	**99282-16**[b] **99382-16**[*c]	244 254	314 324	108	19 45 60 14	.000 .000	.508 .532
Good upper RPM HP, rough idle, performance usage, bracket racing, auto trans w/3500+ converter, 10.5 to 12.0 compression ratio advised. Good w/manifold nitrous system.	**H-308-2**	3400-7000	**284571**[*] ◆3	**99282-16**[b] **99382-16**[*c]	246 254	308 316	114	14 52 66 8	.000 .000	.495 .510
Moderate competition only, good upper RPM HP, bracket racing, auto trans w/4000+ converter, 12.0 minimum compression ratio advised.	**H-260/360-2S-8**	3800-7200	**280601**[*] ◆3	**99282-16**[b] **99382-16**[*c]	260 268	330 338	108	24 56 64 24	.000 .000	.540 .558
Hydraulic Roller Camshafts — Retrofit										
Excellent low end torque, good idle, daily usage, towing, performance and fuel efficiency, 2600-3000 cruise RPM, 8.75 to 10.5 compression ratio advised. Also mild turbocharged.	**HR-214/325-2S-12 IG**	1400-5600	**289611**[*a] ◆3	**28532-16**[d]	214 222	276 284	112	0 34 48 (6)	.000 .000	.488 .509
Good low end and mid range torque and HP, fair idle, moderate performance usage, mild bracket racing, auto trans w/2500+ converter, 3000-3400 cruise RPM, 9.5 to 10.75 compression ratio advised.	**HR-222/339-2S-12 IG**	1800-6000	**289621**[*a] ◆3	**28532-16**[d]	222 230	284 292	112	4 38 52 (2)	.000 .000	.509 .528
Good mid range torque and HP, fair idle, performance usage, mild bracket racing, auto trans w/2800+ converter, 3200-3600 cruise RPM, best in 389+ cu.in., 10.0 to 11.0 compression ratio advised.	**HR-226/345-2S1-12 IG**	2000-6200	**289661**[*a] ◆3	**28532-16**[d]	226 234	288 296	112	6 40 54 0	.000 .000	.518 .539
Good mid range torque and HP, fair idle, performance usage, mild bracket racing, auto trans w/3000+ converter, 3600-4200 cruise RPM, best in 400+ cu,in., 10.0 to 11.5 compression ratio advised.	**HR-230/352-2S1-14 IG**	2200-6400	**289631**[*a] ◆3	**28532-16**[d]	230 238	292 300	114	6 44 58 0	.000 .000	.528 .548
Good mid range and upper RPM torque and HP, fair idle, performance usage, bracket racing, auto trans w/3200+ converter, 4000-4600 cruise RPM, best in 455+ cu.in., 10.0 to 11.5 compression ratio advised.	**HR-238/365-2S1-14 IG**	2600-6600	**289651**[*a] ◆3	**28532-16**[d]	238 246	300 308	114	10 48 62 4	.000 .000	.548 .558
Good mid range and upper RPM torque and HP, rough idle, performance usage, bracket racing, auto trans w/3500+ converter, 4200-5000 cruise RPM, best in 455+ cu.in., 10.5 to 12.0 compression ratio advised.	**HR-242/372-2-14 IG**	3000-6800	**289641**[*a] ◆3	**28532-16**[d]	242 252	304 314	114	12 50 65 7	.000 .000	.558 .558

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

NOTE: To provide the most accurate adjustment on hydraulic lifter and hydraulic roller camshafts, a set of positive locking nuts, such as **99768-16**, must be obtained for the rocker arm studs.

NOTE: Specify if casting number 540306, 544127, or 9771980 heads with 1.65 ratio rocker arms are being used, as different valve springs will be required.

NOTE: Be sure to maintain at least .040" clearance between the underside of the rocker arm and valve spring retainer when the valve is closed.

Since 1975 General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
11310-1[e]	**99838-16**[e]	**99944-16**	**99820-16**[g]	**99097-1**[h]	**95654-16**[j] **28624-16**[k]	**28975-1**[*m]	**28800-16**[n]	**28747-16**[*p]	**28750-16**[q] **28758-16**[*r]
11310-1[e]	**99838-16**[e]	**99944-16**	**99820-16**[g]	**99097-1**[h]	**95654-16**[j] **28624-16**[k]	**28975-1**[*m]	**28800-16**[n]	**28747-16**[*p]	**28750-16**[q] **28758-16**[*r]
11310-1[e]	**99838-16**[e]	**99944-16**	**99820-16**[g]	**99097-1**[h]	**95654-16**[j] **28624-16**[k]	**28975-1**[*m]	**28800-16**[n]	**28747-16**[*p]	**28750-16**[q] **28758-16**[*r]
	99893-16[e]	**99953-16**	**99820-16**[g]	**99097-1**[h]	**95654-16**[j] **28624-16**[k]	**28975-1**[*m]	**28800-16**[n]	**28747-16**[*p]	**28750-16**[q] **28758-16**[*r]
	99893-16[e]	**99953-16** **99973-16**[f]	**99820-16**[g]	**99097-1**[h] **99094-1**[i]	[l]	**28975-1**[*m]		**28747-16**[*p]	**28750-16**[q] **28758-16**[*r]
	99893-16[e]	**99953-16** **99973-16**[f]	**99820-16**[g]	**99097-1**[h] **99094-1**[i]	[l]	**28975-1**[*m]		**28747-16**[*p]	**28750-16**[q] **28758-16**[*r]
	99893-16[e]	**99953-16** **99973-16**[f]	**99820-16**[g]	**99097-1**[h] **99094-1**[i]	[l]	**28975-1**[*m]		**28747-16**[*p]	**28750-16**[q] **28758-16**[*r]
	99893-16[e]	**99953-16** **99973-16**[f]	**99820-16**[g]	**99097-1**[h] **99094-1**[i]	[l]	**28975-1**[*m]		**28747-16**[*p]	**28750-16**[q] **28758-16**[*r]
	99893-16[e]	**99953-16** **99973-16**[f]	**99820-16**[g]	**99097-1**[h] **99094-1**[i]	[l]	**28975-1**[*m]		**28747-16**[*p]	**28750-16**[q] **28758-16**[*r]
	99893-16[e]	**99953-16** **99973-16**[f]	**99820-16**[g]	**99097-1**[h] **99094-1**[i]	[l]	**28975-1**[*m]		**28747-16**[*p]	**28750-16**[q] **28758-16**[*r]

a Camshaft incorporates an integral cast iron distributor drive gear, aluminum-bronze distributor drive gear not required. Not for use in 265 and 301 engines.
b 265 and 301 cu.in. engines require **99277-16** lifters.
c Optional Hi Intensity hydraulic lifters, see page 272 for details (265 and 301 cu.in. engines require **99377-16** lifters).
d Vertical locking bar hydraulic roller lifters, no machining required. Not for use in 265 and 301 engines. Special length pushrods are required.
e Contains dual valve springs, no machining required.
f Requires Crane Multi Fit valve locks.
g Must machine cylinder heads.
h Machined steel, heat treated.
i Machined steel, heat treated, Multi Fit.
j Pro Series one-piece, for non-guideplate cylinder heads.
k Heavy wall, heat treated, for use with pushrod guideplate cylinder heads.
l Special length pushrods are required.
m Performance steel billet gears and roller chain set.
n 1.5 ratio, for 67-79 engines with 7/16" bottleneck studs and 3/8" nuts.
p Energizer, 1.65 ratio, for straight 7/16" rocker arm studs.
q 1.5 ratio, for 7/16" bottleneck studs and 3/8" nuts.
r 1.65 ratio, for straight 7/16" rocker arm studs.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 273 LIFTERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Cam Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Lifter Camshafts										
Replacement for factory 389-421 Super Duty McKellar no. 10	**BluePrinted 541596**	2600-6400	**280901** ◆1	**99255-16**[c]	236 247	268 284	113.5	2 54 54.5 12.5	.012 .018	.416 .420
Good low end and mid range torque and HP, rough idle, moderate performance usage, limited oval track, bracket racing, auto trans w/2500+ converter, 10.5 to 12.0 compression ratio advised.	**F-244/3454-2S-6**	3000-7000	**280921**[*] ◆3	**99255-16**[c]	244 252	280 288	106	19 45 55 17	.026 .026	.518 .536
Good mid range torque and HP, fair idle, moderate performance usage, mild bracket racing, auto trans w/2500+ converter, good w/plate nitrous, 10.0 to 11.5 compression ratio advised.	**F-248/3334-2-12**	3400-7000	**281241**[*] ◆3	**99255-16**[c]	248 258	290 300	112	17 51 66 12	.022 .022	.500 .520
Good mid range torque and HP, rough idle, performance usage, short oval track, bracket racing, auto trans w/3000+ converter, 11.5 to 12.5 compression ratio advised.	**F-252/3574-2S1-6**	3600-7400	**280981**[*] ◆3	**99255-16**[c]	252 260	288 296	106	23 49 59 21	.026 .026	.536 .554
Good mid range and upper RPM torque and HP, rough idle, performance usage, bracket racing, auto trans w/3500+ converter, 12.0 minimum compression ratio advised.	**F-260/3694-2S-8**	4000-7600	**281441**[*] ◆3	**99255-16**[c]	260 268	296 304	108	25 55 65 23	.026 .026	.554 .572
Mechanical Roller Camshafts										
Excellent low end torque and HP, good idle, daily performance usage, mild bracket racing, 3000-3400 cruise RPM, 10.0 to 11.5 compression ratio advised.	**SR-228/338-2S-12 IG**	2200-6200	**288541**[*a] ◆3	**28570-16**[d]	228 236	278 286	112	7 41 55 1	.020 .020	.507 .525
Good low end and mid range torque and HP, fair idle, moderate performance usage, mild bracket racing, auto trans w/2500+ converter, good w/plate nitrous, 3400-3800 cruise RPM, 10.0 to 11.5 compression ratio advised.	**SR-236/350-2S-12 IG**	2600-6600	**288551**[*a] ◆3	**28570-16**[d]	236 244	286 294	112	11 45 59 5	.020 .020	.525 .543
Good mid to upper RPM torque and HP, fair idle, moderate performance usage, mild bracket racing, auto trans w/3000+ converter, good w/plate nitrous, 3800-4200 cruise RPM, best with 421+ cu.in., 10.5 to 12.0 compression ratio advised.	**SR-244/362-2S-12 IG**	3000-7000	**288521**[*a] ◆3	**28570-16**[d]	244 252	294 302	112	15 49 63 9	.020 .020	.543 .561
Good upper RPM torque and HP, rough idle, moderate performance usage, bracket racing, auto trans w/3500+ converter, good w/plate nitrous, 4000-4400 cruise RPM, best with 455+ cu.in. with aluminum heads, 11.0 minimum compression ratio advised.	**SR-252/374-2S-12 IG**	3400-7200	**288531**[*a] ◆3	**28570-16**[d]	252 256	302 306	112	19 53 65 11	.020 .020	.561 .561
Competition only, good mid to upper RPM torque and HP, bracket racing, auto trans w/race converter, good w/ manifold nitrous, best w/455+ cu.in. with aluminum heads, 12.0 minimum compression ratio advised.	**R-268/420-2S-10**	4200-7800	**288811**[*b] ◆3	**28570-16**[d]	268 276	300 308	110	28 60 72 24	.020 .020	.630 .630

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

IMPORTANT: Adjustable Vacuum Advance Kit available. See page 313 for details.

NOTE: In order to effect valve adjustment when using mechanical lifter and roller lifter camshafts, a set of positive locking nuts, such as **99768-16**, must be obtained for the rocker arm studs.

NOTE: Specify if casting number 540306, 544127, or 9771980 heads with 1.65 ratio rocker arms are being used.

NOTE: Be sure to maintain at least .040" clearance between the underside of the rocker arm and valve spring retainer when the valve is closed.

Since 1975 General Motors divisions have exchanged engines throughout different models. Be certain of exactly which engine you have before ordering.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	— ALUMINUM ROCKERS — ENERGIZER	GOLD RACE
11310-1	99838-16	99944-16	99820-16[f]	99097-1[g]	95654-16[i] 28624-16[j] 95663-16[k]	28975-1[*l]			28750-16[n] 28758-16[*o]
11310-1	99838-16	99944-16	99820-16[f]	99097-1[g]	95654-16[i] 28624-16[j] 95663-16[k]	28975-1[*l]			28750-16[n] 28758-16[*o]
11310-1	99838-16	99944-16	99820-16[f]	99097-1[g]	95654-16[i] 28624-16[j] 95663-16[k]	28975-1[*l]			28750-16[n] 28758-16[*o]
11310-1	99838-16	99944-16	99820-16[f]	99097-1[g]	95654-16[i] 28624-16[j] 95663-16[k]	28975-1[*l]			28750-16[n] 28758-16[*o]
11310-1	99838-16	99944-16	99820-16[f]	99097-1[g]	95654-16[i] 28624-16[j] 95663-16[k]	28975-1[*l]			28750-16[n] 28758-16[*o]
	96870-16	99973-16[e]	99820-16[f]	99094-1[h]	28624-16[j] 95663-16[k]	28975-1[*l]			28750-16[n] 28758-16[*o]
	96870-16	99973-16[e]	99820-16[f]	99094-1[h]	28624-16[j] 95663-16[k]	28975-1[*l]			28750-16[n] 28758-16[*o]
	96870-16	99973-16[e]	99820-16[f]	99094-1[h]	28624-16[j] 95663-16[k]	28975-1[*l]			28750-16[n] 28758-16[*o]
	96870-16	99973-16[e]	99820-16[f]	99094-1[h]	28624-16[j] 95663-16[k]	28975-1[*l]			28750-16[n] 28758-16[*o]
	99896-16[d]	99974-16[e]	99820-16[f]	99094-1[h]	28624-16[j] 95663-16[k]	28975-1[*l]			28750-16[n] 28758-16[*o]

a Camshaft incorporates an integral cast iron distributor drive gear, aluminum-bronze distributor drive gear not required. Not for use in 265 and 301 engines.
b Requires **28990-1** aluminum-bronze distributor drive gear. Not for use in 265 and 301 engines.
c Due to block casting variations, you must check that the lifter relief band is not exposed at the bottom of the lifter bore when the lifter is on the base circle of the camshaft.
d Ultra Pro Series roller lifters.
e Requires Crane Multi Fit valve locks.
f Must machine cylinder heads.
g Machined steel, heat treated.
h Machined steel, heat treated, Multi Fit.
i Pro Series one-piece, for non-guideplate cylinder heads.
j Heavy wall, heat treated, for use with pushrod guideplate cylinder heads.
k Pro Series one piece for use with or without pushrod guideplate cylinder heads.
l Performance steel billet gears and roller chain set.
n 1.5 ratio, for 7/16" bottleneck studs and 3/8" nuts.
o 1.65 ratio, for straight 7/16" studs.

COMPLETE CAM SPECIFICATIONS

Application	Camshaft Series/ Grind Number	RPM POWER RANGE	Camshaft PART NUMBER/ Emissions Code	See pg. 266 FOLLOWERS	Degrees Duration @ .050" Int/Exh.	Advertised Degrees Duration Int/Exh.	Degrees Lobe Separation	Open/Close @ .050" Valve Lift Int/Exh	Lash Hot Int. Exh.	Gross Lift Int. Exh.
Mechanical Follower Camshafts										
Good idle, daily usage, performance upgrade for stock engine, aftermarket intake/exhaust advised, new valve springs recommended, 8.75 to 10.5 compression ratio advised.	**T20-262-2-10**	1400-4800	**704-0010*** ◆3	[a]	214 224	262 272	110	2 32 47 (3)	.008 .416 .010 .430
Good idle, performance usage, off road, good with mild aftermarket turbo systems, intercooler advised, aftermarket intake/low restriction exhaust and ECM required, 9.5 to 10.75 compression ratio advised.	**T20-272-2-10**	1800-5200	**704-0012*** ◆3	[a]	224 234	272 282	110	7 37 52 2	.008 .430 .010 .444
Fair idle, good mid to upper RPM torque and HP, moderate performance usage, autocross, road course, 9.5 to 11.5 compression ratio advised.	**T20-282-2-10**	2200-5600	**704-0014*** ◆3	[a]	234 244	282 292	110	12 42 57 7	.008 .444 .010 .458
Fair idle, moderate performance usage, prepared autocross, bracket racing, aftermarket intake/low restriction exhaust and upgraded valve springs and retainers recommended, 10.5 to 12.0 compression ratio advised.	**T20-292-2-10**	2600-6000	**704-0016*** ◆3	[a]	244 254	292 302	110	17 47 62 12	.008 .458 .010 .472
Moderate competition only, good upper RPM HP, light weight closed course, bracket racing, fully prepared engine needed, 11.0 to 12.5 compression ratio advised.	**T20-302-10**	3000-6400	**704-0100*** ◆3	[a]	254 254	302 302	110	22 52 62 12	.008 .472 .010 .472

RPM range shown is for average usage. These cam profiles will RPM higher, depending upon application.

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CRANE VALVE TRAIN COMPONENTS

See pg. 338	*See pg. 317*	*See pg. 330*	*See pg. 343*	*See pg. 340*	*See pg. 286*	*See pg. 308*	*See pg. 292*	*See pg. 295*	*See pg. 297*
VALVE SPRING AND RETAINER KITS	VALVE SPRINGS	RETAINERS	VALVE STEM SEALS	VALVE STEM LOCKS	PUSHRODS	TIMING CHAIN AND GEAR ASSEMBLY	STEEL ROCKER ARMS	ALUMINUM ROCKERS — ENERGIZER	GOLD RACE

a We recommend the use of the 22R-22RE followers with the insert-type contact pad.

Cam and Valve Train Buyer's Guide
Table of Contents

Cam and Valve Train Buyers Guide	*264–364*
Camshaft Components	*266–267*
Cam Button Spacers	266
Camshaft Bolt and Locking Plate Kit	266
Cam Followers ("Slipper Followers")	266
Cam Degreeing Bushings	267
Cam Degreeing "Tune-A-Cam" Kit	267
Distributor-Magneto Drive Gears	*268–271*
Copper Alloy (Aluminum/Bronze)	268–269
Coated Steel Distributor Gears for Chevrolet	270
Coated Steel Distributor Gears for Fords	271
Fuel System Accessories	*271*
Fuel Pump Pushrods	271
Lifters	*272–284*
Lifter Comparisons	272
Hydraulic and Mechanical Applications	273
Hydraulic Roller Applications	274–275
Mechanical Roller Lifters	276–277
Choose the Right Mechanical Roller Lifters	277–278
Mechanical Roller Applications	279–284
Lubricants	*285*
Pushrods	*286–289*
Chromemoly Steel Pushrods	286–288
Pro-Series, One Piece Pushrods	289
Pushrod Accessories	290
Pushrod Guideplates	291
Pushrod Guideplate Conversion Kits	291
Rocker Arms & Accessories	*292–307*
Rocker Arms, Steel & Ductile Iron	292–293
Crane Aluminum Rocker Arms	294
Energizer Rocker Arms	295
Aluminum Roller Rockers, Gold Race Extruded - Stud Mount	297–299
Rocker Arm Adjusting Nuts, Screws	302–303
Rocker Arm Shim Kits	304
Rocker Arm Needle Bearing Roller Fulcrum Conversion Kit	304
Rocker Arm Guideplate Conversion Kits	305
Rocker Arm Stud Conversion Kits	306
Rocker Arm Studs	307
Timing Chains and Components	*308–309*
Performance Steel Billet, CNC Machined, Roller Timing Chain Sets	308
Pro-Series Steel Billet, CNC Machined, Roller Timing Chain Sets	309
Tools	*310–312*
Cam Degreeing "Tune-A-Cam" Kit	310
Checking Springs	310
Cylinder Pressurization Kit	310
Degree Wheel	310
Piston Stop	310
Oil Pump Primer	311
Organizer Tray for Valve Train	311
Valve Spring Compressors	311
Valve Spring Height Micrometer	312
Valve Spring Seat Machining Tool Bodies	312
Valve Spring Seat Machining Tool Arbors	312

Vacuum Kits and Accessories	*313*
Adjustable Vacuum Advance Kits	313
Vacuum Timing Limiter Plate	313
Vacuum Reserve System	313
Valve Springs	*314–327*
About Valve Springs	314
Valve Spring Rate and How to Use It	315
How to Select a Valve Spring	316
Single Valve Springs	317
Inner Valve Springs	317
Dual Valve Springs	318–319
Triple Valve Springs	319
What is Valve Spring Coil Bind ?	319
Valve Spring Spec Chart	320–327
Valve Spring Retainers	*328–339*
Steel Valve Spring Retainers	328
Titanium Valve Spring Retainers	328
How to Use the Valve Spring Retainer Charts	329
Valve Spring Retainer Dimensions - Steel	330
Valve Spring Retainer Dimensions - Titanium	331
Valve Spring Retainer Height Chart	332–334
Valve Spring to Retainer Cross Reference	335–337
Valve Spring and Retainer Kits	338–339
Valve Stem Locks (Split Keys)	*340–341*
Machined Steel Locks 7°	340
Multi-Fit Valve Stem Locks 7°	340–341
Multi-Fit Valve Stem Locks 10°	341
Machined Steel Locks 10° Conventional	341
Valve Seals, Valve Train Accessories	*342–343*
Valve Lash Caps	342
Valve Spring Locators and Cups	342
Valve Stem Seals	343
Valve Train Stabilizers (Stud Girdles)	343
Promotional Items	*344*
How to Identify Your Crane Cam	*345*
Custom Ground Cams	*346*
Camshaft Recommendation Form	*347*
Regrind and Special Cam Service	*348–349*
Other Engine Applications	*350*
Flat Tappet Camshaft Break In Procedure	*351–352*
Adjusting the Valve Train	*353–355*
Commonly Asked Valve Spring Questions	*356–357*
Commonly Asked Valve Train Questions	*358–359*
Degreeing the Cam	*360–362*
Cam Timing Explained	*363*
Understanding the Cam Specification Card	*364*

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Cam Button Spacers

Engines without a cam thrust plate must use a cam button spacer when using a roller lifter camshaft to limit lateral movement. Our unique needle bearing buttons reduce friction and deliver extra "free" horsepower. Crane solid aluminum spacers are priced for the budget minded racer. Machining of the cam sprocket may be required for proper installation.

Solid Aluminum Button Application	Part No.
Chevrolet 90° V-6 78-86, 200 thru 262	99001-1
Chevrolet V-8 55-95, 262 thru 400	99001-1
Chevrolet V-8 65-95, 396 thru 454	99005-1
Chrysler-Dodge-Plymouth V-8 "B" 70-78, w/3 bolt gear	99163-1
Chrysler-Dodge-Plymouth V-8 66-71, 426 Hemi w/3 bolt gear	99163-1

Needle Bearing Button Application	Part No.
Chevrolet 90° V-6 78-86, 200 thru 262	99164-1
Chevrolet V-8 55-95, 262 thru 400	99164-1
Chevrolet V-8 65-95, 396 thru 454	99165-1



Camshaft Bolt and Locking Plate Kit

A must to prevent costly valve train damage. Simply install on cam gear, torque bolts properly, bend locking tabs over to secure bolts from loosening.

Application	Part No.
Chevrolet 90° V-6 70-86, 200 thru 262 (except factory hydraulic roller engines)	99168-1
Chevrolet V-8 57-87, 262 thru 400 (except factory hydraulic roller engines)	99168-1
Chevrolet V-8 58-65, 348-409-427 (Z-11)	99168-1
Chevrolet V-8 65-95, 396-402-427-454-502	99168-1



Cam Followers

Crane cam followers are designed and engineered for maximum performance and reliability. They are metallurgically engineered to be compatible with the cam lobe composition of Crane camshafts. *We highly recommend the use of Crane Cams Assembly Lube and Crane Cams Super Lube Break-In Concentrate (see "Lubricants") when installing these followers.*

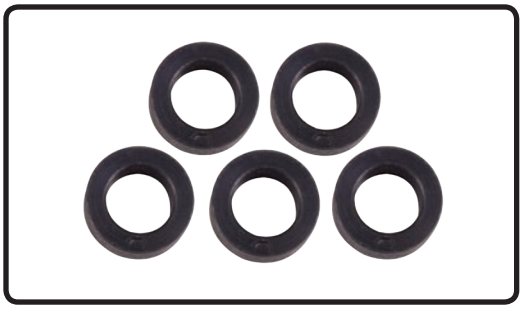
Application	Part No.
Ford SOHC I-4 1974-87, 2300 c.c. (also 1983-87 2000 c.c.)	19800-8



Cam Degreeing Bushings

Adjusting camshaft phasing with these bushings is one of the ways to vary the camshaft timing. These bushings are either color coded or number stamped with the degree of offset for easy identification. Included in each package are bushings in 0-2-4-6-8 degree increments. Machining of the cam sprocket may be required for proper installation.

Application	Part No.
Chevrolet 90° V-6 78-86, 200 thru 262	
	11991-1*
Chevrolet V-8 55-95, 262 thru 400	
	11991-1*
Chevrolet V-8 65-95, 396 thru 454	
	11991-1*
Chrysler-Dodge-Plymouth V-8 "B" 58-78, 350 thru 440	
	11991-1*
Chrysler-Dodge-Plymouth V-8 66-71, 426 Hemi	
	11991-1*



Cam Degreeing "Tune-A-Cam" Kit

Everything you need to quickly, easily and accurately degree-in your camshaft for maximum performance. Complete kit contains: precision dial indicator, with custom design base to mount to cylinder head, piston stop, pointer, checking springs, degree wheel and instructions—all in a hard molded plastic carrying case.

Description	Part No.
Tune-A-Cam Kit (Complete Kit)	
	99030-1



Distributor-Magneto Drive Gears

Copper Alloy (Aluminum/Bronze)

These drive gears are made from high silicon copper alloy ("aluminum-bronze") and precision machined. They are required when using an 8620 steel billet cam.

Certain special Crane roller camshafts are manufactured using an Iron Gear pressed onto the steel billet cam. These special cams ***DO NOT REQUIRE*** an aluminum bronze distributor drive gear. Refer to the specific camshaft application section of catalog. (Iron Gear cams' part numbers have an "IG" suffix at the end of their grind numbers)

Note: The "Shaft Diameter" dimension referred to is the portion of the distributor shaft, or intermediate shaft, that the gear registers on. It may be necessary to remove the original gear to measure the shaft diameter correctly.



Application	Part No.
Chevrolet I-4 62-71, 153	
For .491" shaft diameter	**20990-1**
Chevrolet I-6 62-84, 194 thru 250 & 292	
For .491" shaft diameter	**20990-1**
Chevrolet 90° V-6 78-86, 200 thru 262	
For .491" shaft diameter. Also fits Crane and Accel 34000, 35000, and 41000 series	**11990-1**
For .500" shaft diameter. Fits Crane, Accel and MSD with standard configuration gear	**11979-1**
Chevrolet 90° V-6 85-91, 262 (4.3 litre)	
For .427" shaft diameter GM HEI distributors with remote coil	**11988-1**
Chevrolet V-8 55-87, 262 thru 400	
For .491" shaft diameter. Also fits Crane and Accel 34000, 35000, and 41000 series	**11990-1**
For .500" shaft diameter. Fits Crane, Accel and MSD with standard configuration gear	**11979-1**
For .500" shaft diameter, with 5/16" hex drive	**11973-1**
Chevrolet V-8 85-99, 305-350	
For .427" shaft diameter GM HEI distributors with remote coil	**11988-1**
Chevrolet V-8 58-65, 348-409-427 (Z-11)	
For .491" shaft diameter	**11990-1**
Chevrolet V-8 65-90, 396 thru 502	
For .491" shaft diameter. Also fits Crane and Accel 34000, 35000, and 41000 series	**11990-1**
For .500" shaft diameter. Fits Crane, Accel and MSD with standard configuration gear	**11979-1**
For .500" shaft diameter, with 5/16" hex drive	**11973-1**
Chevrolet V-8 91-00, 454-502	
For .427" shaft diameter GM HEI distributors with remote coil	**11988-1**

Copper Alloy (Aluminum/Bronze) (continued)

Application	Part No.
Chrysler V-8 56-58, 354-392 and Donovan 417	
For .484" shaft diameter	**69990-1**
Chrysler-Dodge-Plymouth V-8 64-00, "LA" 273-360 and Magnum 5.2-5.9 litre	
For .484" shaft diameter	**69990-1**
Chrysler-Dodge-Plymouth V-8 58-78, "B" 350 thru 440	
For .484" shaft diameter	**66990-1**
Chrysler-Dodge-Plymouth V-8 66-71, 426 Hemi and Keith Black 426, JP-1, BA 426, Rodeck TFX-92	
For .484" shaft diameter	**66990-1**
Ford V-8 62-95, 221 thru 302 and Boss 302	
For .467" shaft diameter	**36990-1**
For .500" shaft diameter	**36989-1**
For .531" shaft diameter	**44990-1**
Ford V-8 82-95, 302 H.O. (5.0 litre)	
For .467" shaft diameter	**36990-1**
For .500" shaft diameter	**36989-1**
For .531" shaft diameter	**44990-1**
Ford V-8 69-00, 351W and 351 SVO	
For .467" shaft diameter	**36990-1**
For .500" shaft diameter	**36989-1**
For .531" shaft diameter	**44990-1**
Ford V-8 70-82, Boss 351-351C-351M-400	
For .500" shaft diameter	**52990-1**
For .531" shaft diameter	**52989-1**
Ford V-8 58-76, "FE" 332 thru 428	
For .467" shaft diameter	**34990-1**
For .500" shaft diameter	**52990-1**
For .531" shaft diameter	**52989-1**
Ford V-8 68-97, 370-429-460 (7.5 litre)	
For .500" shaft diameter	**52990-1**
For .531" shaft diameter	**52989-1**
Oldsmobile V-8 64-84, 260 thru 455	
For .491" shaft diameter	**80990-1**
Pontiac I-4 77-89, 151 and 2.5 litre S.D.	
For .491" shaft diameter, 77-78 distributor	**20990-1**
For .491" shaft diameter, 79-89 oil pump	**20990-1**
Pontiac V-8 55-81, 265 thru 455	
For .489" shaft diameter	**28990-1**

Coated Steel Distributor Gears

Crane Cams now offers precision machined, specially coated and processed steel distributor gears for popular engines using either cast flat faced lifter or steel roller camshafts. Since roller lifter cams are made from either induction hardened steel or carburized steel, neither of these materials are compatible with the normal stock distributor gears. In the past, "bronze" distributor gears were used. For street applications these gears can wear at a high rate and may have to be replaced on a regular basis.

By using modern heat treating and manufacturing processes, Crane Cams has developed a series of steel distributor gears that are compatible with standard cast cams and induction hardened and carburized steel roller cams. Crane Cams now makes it possible to use a steel distributor gear that provides OEM-style life-span, eliminating the need to frequently replace bronze alloy gears. These Crane steel gears are available for most popular engines for both stock and aftermarket distributors.

The use of these gears on camshafts that have been previously run with other types or materials of gears, or the unnecessary use of high volume/high pressure oil pumps, can be severely detrimental to the life of the camshaft gear.

Note: The "Shaft Diameter" dimension referred to is the portion of the distributor shaft, or intermediate shaft, that the gear registers on. It may be necessary to remove the original gear to measure the shaft diameter correctly.





Application	Part No.
Chevrolet 90° V-6 78-86, 200 –262	
For .491" shaft diameter. Also fits Crane and Accel 34000, 35000, and 41000 series	11951-1
For .500" shaft diameter with standard configuration gear	11950-1
Chevrolet V-8 55-87, 262–400	
For .491" shaft diameter. Also fits Crane and Accel 34000, 35000, and 41000 series	11951-1
For .500" shaft diameter with standard configuration gear	11950-1
Chevrolet V-8 65-90, 396–502	
For .491" shaft diameter. Also fits Crane and Accel 34000, 35000, and 41000 series	11951-1
For .500" shaft diameter with standard configuration gear	11950-1
Chrysler V-8 56-58, 354–392 and Donovan 417	
For .484" shaft diameter	69970-1
Chrysler-Dodge-Plymouth V-8 64-00, "LA" 273–360 and Magnum 5.2-5.9 litre	
For .484" shaft diameter	69970-1
Chrysler-Dodge-Plymouth V-8 58-78, "B" 350–440	
For .484" shaft diameter	66970-1
Chrysler-Dodge-Plymouth V-8 66–71, 426 Hemi and Keith Black 426, JP-1, BA 426, Rodeck TFX-92	
For .484" shaft diameter	66970-1

Section Continued

Coated Steel Distributor Gears (continued)

Application	Part No.
Ford V-8 62-95, 221 thru 302 and Boss 302	
For .467" shaft diameter	**36970-1**
For .500" shaft diameter	**36971-1**
For .531" shaft diameter	**44970-1**
Ford V-8 82-95, 302 H.O. (5.0 litre)	
For .467" shaft diameter	**36970-1**
For .500" shaft diameter	**36971-1**
For .531" shaft diameter	**44970-1**
Ford V-8 69-00, 351W and 351 SVO	
For .467" shaft diameter	**36970-1**
For .500" shaft diameter	**36971-1**
For .531" shaft diameter	**44970-1**
Ford V-8 70-82, Boss 351-351C-351M-400	
For .500" shaft diameter	**52970-1**
For .531" shaft diameter	**52971-1**
Ford V-8 58-76, 332 thru 428	
For .467" shaft diameter	**34970-1**
For .500" shaft diameter	**52970-1**
For .531" shaft diameter	**52971-1**
Ford V-8 68-97, 370-429-460 (7.5 litre)	
For .500" shaft diameter	**52970-1**
For .531" shaft diameter	**52971-1**

Fuel System Accessories

Fuel Pump Pushrods

Crane's heat treated tubular steel fuel pump pushrods for Chevrolet "small-block" and "big-block" V-8 engines are centerless ground for concentricity. They are also much lighter than solid steel O.E. type pushrods, while maintaining the strength and stiffness required for reliability in severe usage applications.

Part number **11986-1** is for hydraulic and mechanical ***"cast" type camshafts***. Both ends of this pushrod are steel tipped for best wear characteristics for quality stock engine rebuilds!

Part number **11985-1** is specifically for use with ***8620 and 9310 steel billet roller and slot hardfaced steel camshafts***. One end of the pushrod has a bronze tip to compatibly bear against the fuel pump eccentric on the camshaft, eliminating the wear problems that occur when using a standard fuel pump pushrod (especially in endurance type applications).

Application	Part No.
Chevrolet V-8 55-95, 262 thru 400	
For cast camshafts	**11986-1**
Chevrolet V-8 55-95, 262 thru 400	
For 8620 steel camshafts	**11985-1**
Chevrolet V-8 58-65, 348 thru 409	
For cast camshafts	**11986-1**
Chevrolet V-8 58-65, 348 thru 409	
For 8620 steel camshafts	**11985-1**
Chevrolet V-8 65-90, 396 thru 454	
For cast camshafts	**11986-1**
Chevrolet V-8 65-90, 396 thru 454	
For 8620 steel camshafts	**11985-1**

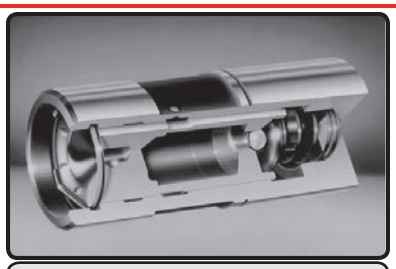




Lifters - Hydraulic and Mechanical

"Anti-Pump Up" Performance Hydraulic Lifters

Hydraulic lifters compensate for changes occurring within the valve train. Crane Cams' precision made "Anti-Pump Up" lifters allow the engine to reach its maximum RPM potential (with the correct cam and components). The "bleed rate" of this lifter is maintained by micro tolerances that prevent pump-up and limiting of full RPM potential. After proper preload has been set, hydraulic lifters seldom need maintenance.
Maximum RPM Potential: *6,500 to 7,000 RPM*.



Crane Cams performance hydraulic lifters offer precise oil metering and control. Our exclusive internal valving prevents hydraulic lifter "pump-up" with performance camshaft profiles, even at high RPM.

Hi Intensity Hydraulic Lifters

Crane Hi Intensity lifters produce a "variable duration effect." At lower RPM this can reduce running duration by 6° to 10° and decrease valve lift by .020" to .030". Hi Intensity lifters work best with a cam that requires more compression ratio than the engine actually has. Hi Intensity lifters restore vacuum, cylinder pressure and bottom end performance. As RPM increases, these lifters act more like a normal hydraulic lifter. At 2500 to 3000 RPM they will transmit the full duration and lift of the cam.

Use only if the engine's compression ratio is below the minimum recommended on the application page for the cam you have chosen. Hi Intensity lifters can cause "low speed detonation" if compression is too high. Slightly more noisy than standard lifters (NOT as noisy as a mechanical cam) and can trigger knock sensors.
Maximum RPM Potential: *6,500 to 7,000 RPM.*



Crane Hi Intensity lifters produce maximum performance with minimal noise. They offer increased vacuum, torque and overall power with near stock valve train noise.

Mechanical ("Solid") Lifters

Mechanical "solid" lifters should be used in applications when hydraulic cams would surpass their maximum RPM potential. Mechanical lifters have no hydraulic mechanism to pump-up. Theoretically, with the correct cam and engine components, a mechanical lifter cam has an RPM potential of 8000 to 8500 RPM

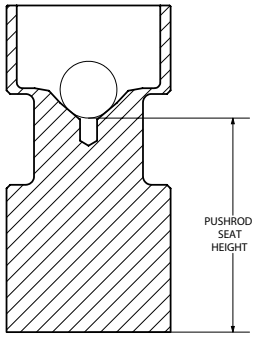
Mechanical lifters are noisier than hydraulics. The engine must have an adjustable valve train system. Valve lash must be set, periodically checked, and maintained. (Can NOT be used on a hydraulic design cam.)



Crane mechanical lifters are precision machined from finest quality alloyed materials to be metallurgically compatible with cam lobes.

Pushrod Seat Heights

The pushrod seat heights listed are measured from the bottom face of the lifter to the bottom of the pushrod seat. The hydraulic lifters are measured without any preload.



Application	Lifter Body Dia.	"Anti-Pump-Up" Hydraulic Lifters Part Number	Pushrod Seat Height	Hi Intensity Hydraulic Lifters Part Number	Pushrod Seat Height	Mechanical Lifters Part Number	Pushrod Seat Height
American Motors - AMC Jeep 64-05 I-6, 199 thru 258							
	.904"	**99278-12**	1.580"			**99260-12**	1.485"
American Motors - AMC Jeep 66-91 V-8, 290 thru 401							
	.904"	**99278-16**	1.580"	**99378-16***	1.515"	**99260-16**	1.485"
Buick 62-86 V-6, 196 thru 252							
	.842"	**99284-12**	1.755"	**99384-12***	1.655"	**99250-12**	1.560"
Buick 64-80 V-8, 300 thru 350							
	.842"	**99284-16**	1.755"	**99384-16***	1.655"	**99250-16**	1.560"
Buick 67-76 V-8, 400 thru 455							
	.842"	**99284-16**	1.755"	**99384-16***	1.655"	**99250-16**	1.560"
Cadillac 68-81 V-8, 368 thru 500							
	.842"	**99284-16**	1.755"	**99384-16***	1.655"	**99250-16**	1.560"
Chevrolet 62-71 I-4, 153							
	.842"	**99277-8**	1.690"			**99250-8**	1.560"
Chevrolet 62-84 I-6, 194 thru 250 & 292							
	.842"	**99277-12**	1.690"			**99250-12**	1.560"
Chevrolet 80-94 60D V-6, 173(2.8L)-189(3.1L)							
	.842"	**99286-12**	1.745"			**99250-12**	1.560"
Chevrolet 78-86 90D V-6, 200 thru 262							
	.842"	**99277-12**	1.690"			**99250-12**	1.560"
Chevrolet 55-95 V-8, 262 thru 400							
	.842"	**99277-16**	1.690"	**99377-16**[b]	1.620"	**99250-16**	1.560"
Chevrolet 58-65 V-8, 348-409-427(Z-11)							
	.842"	**99277-16**	1.690"	**99377-16**[b]	1.620"	**99250-16**	1.560"
Chevrolet 65-90 V-8, 396 thru 454 & 502							
	.842"	**99277-16**	1.690"	**99377-16**[b]	1.620"	**99250-16**	1.560"
Chrysler-Dodge-Plymouth 64-87 "LA" V-8, 273 thru 360							
	.904"	**99278-16**	1.580"	**99378-16**[b]	1.515"	**99260-16**	1.485"
Chrysler-Dodge-Plymouth 58-67 "B" V-8, 350 thru 440							
	.904"					**99259-16**	1.300"
Chrysler-Dodge-Plymouth 68-78 "B" V-8, 383 thru 440							
	.904"	**99278-16**	1.580"	**99378-16***	1.515"	**99259-16**	1.300"
Chrysler-Dodge-Plymouth 64-71 V-8, 426 Hemi							
	.904"	**99278-16**	1.580"	**99378-16***	1.515"	**99259-16**	1.300"
Ford-Mercury 60-83 I-6, 144 thru 250							
	.874"	**99281-12**	1.575"				
Ford-Mercury 65-96 I-6, 240-300							
	.874"	**99280-12**	1.710"			**99257-12**	1.635"
Ford-Mercury 62-95 V-8, 221 thru 302 & 351W							
	.874"	**99280-16**	1.710"	**99380-16***	1.635"	**99257-16**	1.635"
Ford-Mercury 69-82 V-8, Boss 302, Boss 351, 351C, 351M-400							
	.874"	**99280-16**	1.710"	**99380-16***	1.635"	**99257-16**	1.635"
Ford-Mercury 58-76 "FE" V-8, 332 thru 428							
	.874"	**99281-16**	1.575"	**99381-16***	1.500"	**99256-16**[a]	0.150"
Ford-Mercury 68-97 V-8, 370 thru 460							
	.874"	**99280-16**	1.710"	**99380-16***	1.635"	**99257-16**	1.635"
Oldsmobile 64-84 V-8, 260 thru 455							
	.842"	**99284-16**	1.755"	**99384-16***	1.655"	**99250-16**	1.560"
Pontiac 77-89 I-4, 151(2.5L)							
	.842"	**99284-8**	1.755"			**99250-8**	1.560"
Pontiac 55-81 V-8, 287 thru 455 (except 77-81 265 & 301)							
	.842"	**99282-16**	1.760"	**99382-16***	1.680"	**99255-16**	1.570"
Pontiac 77-81 V-8, 265 & 301							
	.842"	**99277-16**	1.690"	**99377-16***	1.620"	**99250-16**	1.560"
Rover 68-00 V-8, 215(3.5L)-240(3.9L)-4.2L							
	.842"	**99284-16**	1.755"	**99384-16***	1.655"	**99250-16**	1.560"

a Shell type
b 50 state legal C.A.R.B. E.O. D-225-27

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

Hydraulic Roller

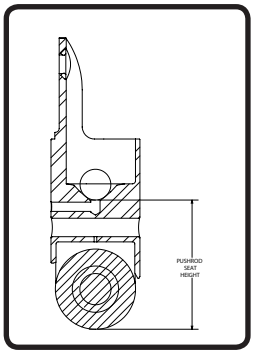


Crane hydraulic roller lifters are offered in two basic designs: Those for use with standard factory alignment bars (on engines originally equipped with hydraulic roller lifters); and vertical locking bar drop-in lifters (designed to retrofit engines not factory equipped with hydraulic roller lifters).

The Chevrolet standard alignment bar lifters are available in a normal dimensioned version, intended for use with standard lobe lift and standard base circle diameter cams. When lobe lifts increase, and base circle diameters decrease, our exclusive long body design lifters must be used to prevent the lifters from dropping out of the factory alignment bars when on the base circle of the camshaft. This would allow the lifters to rotate, causing severe engine damage. As these lifters are for engines originally equipped with hydraulic roller lifters, special length pushrods are not usually required.



Our retrofit vertical locking bar lifters are available for non-hydraulic roller equipped engines.. They can also be used in many applications to replace factory hydraulic roller lifters and alignment mechanisms. No machining is normally required for the drop-in installation of these lifters, however with differences in block castings and camshaft base circle diameters, care must be taken to insure that neither the locking bar, or its attaching rivets, contact the block casting throughout their normal cycles. If there is any interference, the block can usually be ground to provide the necessary clearance. This should be checked prior to final engine assembly. When used in retrofit applications, special length pushrods are required.



The retrofit vertical locking bar lifters are machined from 8620 steel billet, heat treated, and assembled at our own facilities. Precision fit plunger assemblies are used to provide proper bleed-down rates, permitting high RPM use in properly set-up engines. The additional inherent strength of the 8620 material also maintains greater stability in the lifter body, permitting more consistent operation in very high spring pressure and high RPM applications, by keeping the plunger to body clearance consistent throughout the operation range. Retrofit lifters also utilize our latest Monel pin and retaining flange assembly to attach the guidebar, providing superior long term durability.

Each lifter has its pushrod seat height listed. This is the measurement from the bottom of the pushrod seat, to the bottom face of the lifter. For hydraulic lifters, this is the measurement with no (zero) lifter preload. You can check or compare your lifters to these dimensions by placing a 5/16" diameter ball in the pushrod seat, and measuring from the bottom of the lifter to the top of the ball. Then subtract the 5/16" diameter of the ball, obtaining the seat height.

Application	Lifter Body Dia.	Follower Wheel Dia.	Pushrod Seat Height	O.E. Replacement Part No.	Crane Classic Part No.
American Motors/Jeep V-8 66-91, 290-304-343-360 (5.9L)-390-401 cu.in.					
Vertical locking bar design. No machining required for installation. ***NOTE:*** *Requires special length pushrods. See engine application pages for information.*	.904"	.700"	2.320"		**86532-16[a]**
Chevrolet V-8 55-87, 262-283-302-305-307-327-350-400 cu.in.					
Vertical locking bar design to retrofit pre-hydraulic roller blocks. No machining required for installation. ***NOTE:*** *Requires special length pushrods* ***11628-16***	.842"	.700"	2.320"		**11532-16[a]**
Vertical locking bar design to retrofit pre-hydraulic roller blocks. For .904" diameter lifter bores (machining required). ***NOTE:*** *Requires special length pushrods* ***11628-16***	.904"	.700"	2.320"		**11562-16[a]**
Chevrolet V-8 87-99, 305 and 350 cu.in. and LS1 5.7L					
O.E. replacement for 87-99 blocks originally equipped with hydraulic roller cam and lifters. For use with standard GM alignment bars.	.842"	.700"	2.340"	**10530-16[a]**	
Long body design for 87-99 blocks originally equipped with hydraulic roller cam and lifters. A necessity when camshafts have greater than stock lobe lift or reduced base circle diameter. For use with standard GM alignment bars.	.842"	.700"	2.320"		**10535-16[a]**
Chevrolet V-8 2000-up, 5.7L LS1/LS6 & Vortec 4800, 5300, 6000					
O.E. replacement for 2000-up blocks originally equipped with hydraulic roller cam and lifters. For use with standard GM alignment bars.	.842"	.700"	2.340"	**144530-16[a]**	
Long body design for 2000-up blocks originally equipped with hydraulic roller cam & lifters. A necessity when camshafts have greater than stock lobe lift or reduced base circle diameter. For use with standard GM alignment bars.	.842"	.700"	2.320"		**144536-16[a]**
Vertical locking bar, long travel design. No machining required for installation.	.842"	.700"	2.320"		**144532-16[a]**
Vertical locking bar, long travel design for Warhawk blocks. No machining required for installation.	.842"	.700"	2.320"		**144533-16[a]**
Chevrolet V-8 58-65, 348-409-427 (Z-11) cu.in.					
Vertical locking bar design. No machining required for installation. ***NOTE:*** *Requires special length pushrods. See engine application pages for information.*	.842"	.700"	2.320"		**11532-16[a]**

Section Continued

Hydraulic Roller

Application	Lifter Body Dia.	Follower Wheel Dia.	Pushrod Seat Height	O.E. Replacement Part No.	Crane Classic Part No.
Chevrolet V-8 65-95, 396-402-427-454-502 cu.in.					
Vertical locking bar design to retrofit pre-hydraulic roller blocks. No machining required for installation. ***NOTE:*** *Requires special length pushrods* ***13628-16*** *for standard deck block, or* ***13629-16*** *for +.400" tall deck block.*	.842"	.700"	2.320"		**13532-16[a]**
Vertical locking bar design to retrofit pre-hydraulic roller blocks. For .904" diameter lifter bores (machining required). ***NOTE:*** *Requires special length pushrods* ***13628-16*** *for standard deck block, or* ***13629-16*** *for +.400" tall deck block.*	.904"	.700"	2.320"		**13562-16[a]**
Chevrolet V-8 96-00, 454-502 cu.in. Gen VI					
Long body design for 96-00 blocks originally equipped with hydraulic roller cam and lifters. A necessity when camshafts have greater than stock lobe lift or reduced base circle diameter. For use with standard GM alignment bars.	.842"	.700"	2.320"		**26535-16[a]**
Chevrolet V-8 01-08, 8.1 Litre (8100)					
Long body design. A necessity when camshafts have greater than stock lobe lift or reduced base circle diameter. For use with standard GM alignment bars.	.842"	.700"	2.320"		**26535-16[a]**
Chrysler V-8 51-58, 301-331-354-392 cu.in.					
Vertical locking bar design. No machining required for installation. ***NOTE:*** *Requires special length pushrods. See engine application pages for information.*	.904"	.700"	2.320"		**68532-16[a]**
Chrysler-Dodge-Plymouth V-8 64-87, "LA" 273-318-340-360 cu.in.					
Vertical locking bar design. Machining not normally required for installation. However, some 340-360 blocks may require modification for guidebar clearance, while early 273 and some aftermarket cylinder heads may require modification for pushrod clearance. ***NOTE:*** *Requires special length pushrods. See engine application pages for information.*	.904"	.700"	2.320"		**69532-16[a]**
Chrysler-Dodge-Plymouth V-8 86-91, "LA" 5.2-5.9L & 92-02 Magnum 5.2-5.9L					
O.E. replacement for 86-02 blocks originally equipped with hydraulic roller cam and lifters. For use with standard Chrysler alignment bars.	.904"	.700"	2.355"	**70530-16[a]**	
Chrysler-Dodge-Plymouth V-8 58-78, "B" 350-361-383-400-426-440 cu.in.					
Vertical locking bar design. No machining required for installation. ***NOTE:*** *Requires special length pushrods. See engine application pages for information.*	.904"	.700"	2.320"		**68532-16[a]**
Chrysler-Dodge-Plymouth V-8 64-71, Hemi 426 cu.in.					
Vertical locking bar design. No machining required for lifter installation. However, due to the increased pushrod seat height of the Crane retrofit hydraulic roller lifters, the cylinder heads, and possibly the cylinder block, will have to be modified for pushrod clearance. ***NOTE:*** *Requires special length pushrods. See engine application pages for information.*	.904"	.700"	2.320"		**68532-16[a]**
Ford V-8 62-87, 221 thru 302, Boss 302, and 69-93, 351 Windsor					
Vertical locking bar design to retrofit pre-hydraulic roller blocks. No machining required for installation. Requires cylinder head removal for installation on 221 through 302 and 302 H.O. applications. ***NOTE:*** *Requires special length pushrods. See engine application pages for information.*	.874"	.700"	2.320"		**36532-16[a]**
Ford V-8 85-00, 302, 302 H.O., 5.0L, and 94-97, 351 Windsor					
O.E. replacement for blocks originally equipped with hydraulic roller cam and lifters. For use with standard Ford alignment bars.	.874"	.700"	2.320"	**36530-16[a]**	
Ford V-8 70-82, Boss 351-351C-351M-400 cu. in.					
Vertical locking bar design. No machining required for installation. ***NOTE:*** *Requires special length pushrods. See engine application pages for information.*	.874"	.700"	2.320"		**36532-16[a]**
Ford V-8 63-76, 352 thru 428 cu. in.					
Vertical locking bar design. No machining required for installation. ***NOTE:*** *Requires special length pushrods. See engine application pages for information.*	.874"	.700"	2.320"		**35532-16[a]**
Ford V-8 68-97, 370-429-460 cu. in. (except Boss 429 Hemi)					
Vertical locking bar design. No machining required for installation. ***NOTE:*** *Requires special length pushrods. See engine application pages for information.*	.874"	.700"	2.320"		**35532-16[a]**
Ford V-8 69-70, Boss 429 Hemi					
Vertical locking bar design. No machining required for installation. ***NOTE:*** *Requires special length pushrods. See engine application pages for information.*	.874"	.700"	2.320"		**30532-16[a]**
Oldsmobile V-8 64-84, 260-307 (5.0L)-330-350 (5.7L)-400-403-425-455 cu.in.					
Vertical locking bar design for .842" diameter lifter bores. No machining required for installation. ***NOTE:*** *Requires special length pushrods. See engine application pages for information.*	.842"	.700"	2.320"		**28532-16[a]**
Pontiac V-8 55-81, 287-316-326-347-350-370-389-400 (6.6L)-421-428-455 cu.in.					
Vertical locking bar design. No machining required for installation. Not for use in 265 (4.3L) or 301 (4.9L) engines. ***NOTE:*** *Requires special length pushrods. See engine application pages for information.*	.842"	.700"	2.320"		**28532-16[a]**

a To order spares, you may order any of these lifters in pairs by removing the -16 from the set part number and replacing it with a -2. For example, a **11532-16** set will become a **11532-2** when ordering one pair.

Mechanical Roller Lifters

Crane roller lifters are the standard by which all others are judged. From our first horizontal locking bar version, with patented roller shield body, to our latest Ultra Pro Series design, Crane has brought innovation and proven reliability to this critical component. For maximum reliability, pressure-fed oil is routed to the roller wheel and bearings on engines with this oiling system design. This is another Crane pioneered feature.



Horizontal Guide Bar — Crane Classic Design

Another Crane innovation is our use of Bearing Focused Oiling. As many racing engines do not have pressurized oil to the lifter bores, a method is needed to supply oil to the bearing assemblies. This utilizes two passages in the lifter body adjacent to the roller wheel, conducting the oil that is pressed out from between the roller and the camshaft lobe to the roller bearings. There are no small passages that can clog, and no engine oil pressure is sacrificed to provide this lubrication and cooling to the needle bearings. Bearing, roller, and axle life is therefore extended by the benefits of a continuous oil flow over these components.

Due to the proliferation of factory and aftermarket cylinder blocks (which may have relocated camshaft locations, relocated oil galleries, changed lifter boss heights, lifter bores of varied diameters and center-to-center distances, etc.), the manufacture and selection of the proper roller lifter has also become more exacting. This listing includes most popular applications available at the time of publication, but new items are being continuously released. We also offer custom roller lifters to suit specialized block-camshaft-cylinder head combinations. Contact Crane's Performance Consultants if you have any unique requirements.

Our Crane Classic design roller lifters are suitable for virtually all performance applications. Both the horizontal and vertical locking bar versions are used throughout motorsports today. Our Ultra Pro-Series lifters feature maximized lifter bore contact surfaces for less wear, weight removed from non-critical areas, increased body stiffness, and premium materials chosen wherever necessary.

Upgrades to the Ultra Pro-Series lifters include carburized 8620 steel bodies, upgraded materials and metal processing for the roller wheels, needle bearings, and axles. A new guidebar attachment system incorporates a retaining button in conjunction with an aerospace quality Monel pin to provide superior clamping forces and resistance to wear. Extreme Spintron and track testing has confirmed this configuration to be superior to anything else on the market today.

All machining, and assembly is performed at our own facilities, insuring absolute accuracy and total quality control. The spring-loaded horizontal locking bar lifters have the unique feature of permitting cam changes without intake manifold removal (providing a rev-kit is not used). Loosening the rocker arms and removing the pushrods allows the springs to pick the lifters up away from the camshaft. The cam can then be removed and replaced in minimal time. This convenience is especially helpful during dyno and on-track testing sessions.

We do not advise the use of oil restrictors with our roller lifters. Crane roller lifters are designed for use with normal oiling systems. The needle bearings within are dependent on oil flow to provide lubrication and transfer of the heat generated by today's high valve spring pressures and increased rocker arm ratios. Particularly hard on these components are prolonged periods of idling when oil flow is at a minimum but spring pressures are still high.

Whenever possible, standard pushrod seat height is maintained from the bottom of the wheel so that normal length pushrods are used. In consideration of special geometry applications, the seat may be higher, or lower, than standard for best fitment. These instances are noted in the application description where required. The pushrod socket radius is usually stock, and any deviations are also noted in the application description.

Block machining is not normally required for the installation of these lifters (other than the lifter bore diameter options), however with differences in block castings and camshaft base circle diameters, care must be taken to ensure that the lifter, locking bar, and locking bar attaching rivets (where applicable), do not encounter any bind, or unwanted contact, throughout their normal cycles. If there is any interference, the block can usually be ground to provide the necessary clearance. This should be checked prior to final engine assembly.

Mechanical Roller Lifters (continued)

We do not advise the use of offset pushrod seat roller lifters, when the pushrod angle imparts rotational forces upon the lifter. Offset roller lifters are acceptable for use when the pushrods are angled to the front or rear of the engine (parallel to the camshaft). If the pushrods lean toward the left or right of the lifter bores (as viewed from the front or rear of the engine), this will put severe loads on the lifter guidebar and it's attaching mechanism, which can lead to decreased reliability and possible failure. When building a serious racing engine, it's advisable to avoid using offset lifters whenever possible. Offset lifters can also be responsible for accelerated wear to the lifter bores, lifter bodies, roller wheel/bearings/axles, and cam lobes. Plan ahead when choosing and preparing your cylinder block and heads, so you can use centered lifters for best reliability.



Vertical Guide Bar — Crane Classic Design

Choose The Right Crane Roller Lifters for Your Application

Crane Classic Design or Ultra-Pro™ Roller Lifters?

With Crane Cams ***Ultra-Pro™*** series of roller lifters, you might be wondering just which series of lifters is right for your application. Listed below are some guidelines for making the correct choice and getting "the best performance for your dollar".



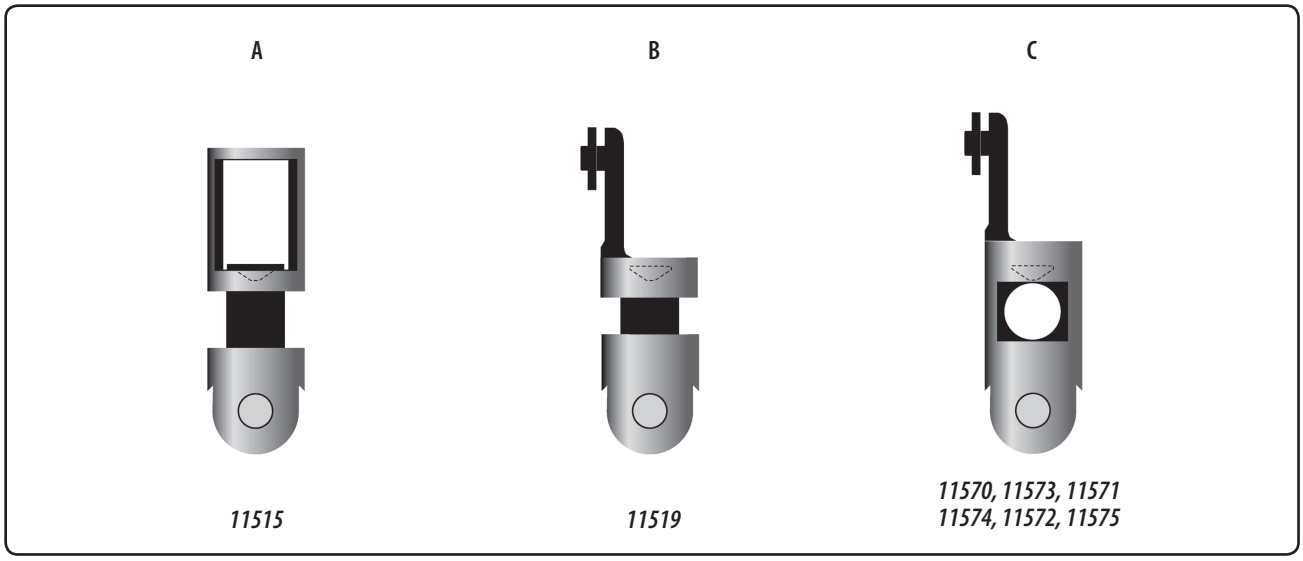
Crane Classic Design Crane roller lifters were developed when camshaft lobes were not nearly as violent as today. They are ideal for street-rollers, many bracket-race type applications and other racing uses where cam profiles aren't as aggressive. Made of carburized (heat treated) 8620 alloy steel, these rollers are capable of handling up to 240 lbs., of valve spring seat pressure in bracket race applications and up to 220 lbs., of seat pressure in endurance applications – providing the cam lobe profile is not extremely violent. Open pressures exceeding 600 lbs., are not recommended for these lifters. Crane Classic Design lifters feature high quality wheels and axles that "look alike" lifters do not have. You'll find that the materials, machining tolerances and overall quality of Crane Classic Design roller lifters far exceeds lifters being sold for a lower price. These roller lifters feature all the quality and durability you expect from a Crane Cams product yet they are very economically priced.



Crane ***Ultra-Pro™*** roller lifters are the ultimate in state-of-the-art, drop-in design premium quality roller lifters! Empirical design and development techniques have been used to eliminate any distortion effects of residual stresses resulting from the heat treat process. ***Ultra-Pro™*** roller lifters feature maximized strength; especially in the axle support struts. This insures geometrically perfect tracking of the roller wheel. Additionally, super-premium wheels, axles and bearings made from the finest grades of alloy steels are used to conquer even the most violent cam lobe profiles currently designed or anticipated for the next several years! These lifters represent the best combination of lightweight, ultimate strength and reliability. They should be used in all drag race applications with spring seat pressures in excess of 300 lbs., and open pressures over 900 lbs. In addition, they should be used in any short-track circle or endurance racing application where valve spring seat pressures exceed 250 lbs., and open pressures exceed 700 lbs. Use Crane Cams ***Ultra-Pro™* series** lifters when absolute durability is necessary.

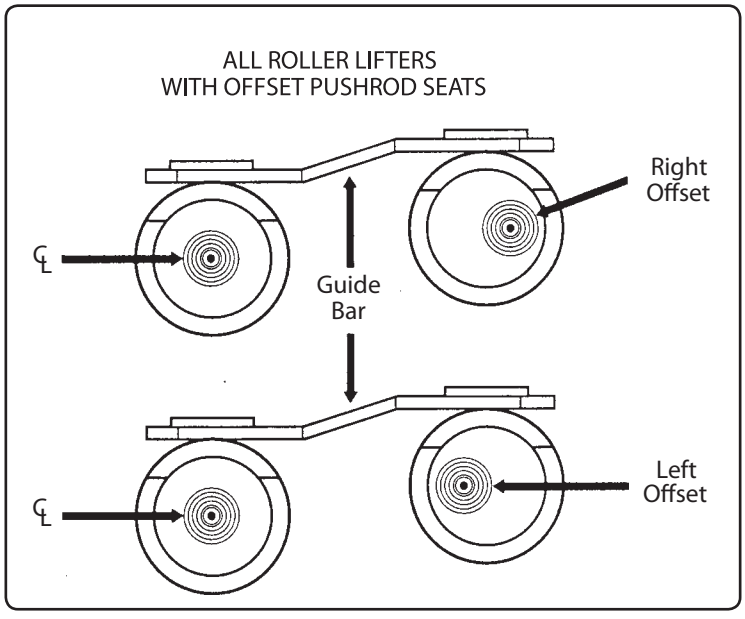
With Crane Cams ***Ultra-Pro™*** roller lifters, engine builders can now be sure that they're using the absolute finest available, professional quality roller lifters for high-stress race engine applications. Count on Crane Cams to give you a full selection of performance products with the best performance for the buck and peace of mind for you.

Choose The Right Crane Roller Lifters for Your Application (continued)



*These drawings represent the basic styles of Crane mechanical roller lifters for Chevy 262-400 V-8 type engines and their various heights. Example **A** is the horizontal locking bar (spring-loaded) Crane Classic design. The vertical locking bar version **B** is the Crane Classic design vertical locking bar design. **C** represents the Ultra-Pro Series design, as required for various lifter bore diameters and heights. Refer to the specific Buyer's Guide listing for the proper engine application of each variation.*

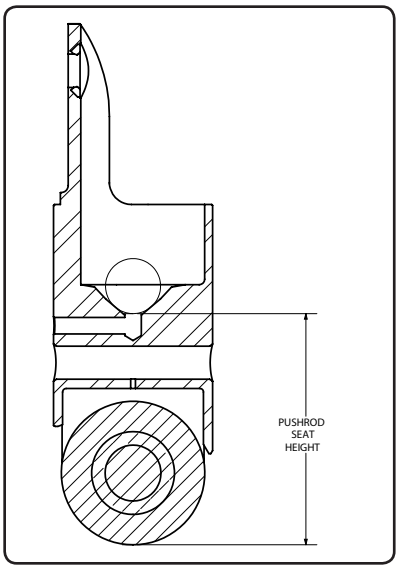
How to Identify Roller Lifter Offsets



*When ordering spare lifters with offset pushrod seat locations you MUST specify left or right offset. For example, a pair of lifters for set number **13571-16** would be either **13571L-2** (left) or **13571R-2** (right). See drawing to identify lifter offsets.*

Section Continued

Pushrod Seat Heights



The pushrod seat heights listed are measured from the bottom of the follower wheel to the bottom of the pushrod seat

Crane DOES NOT recommend the use of oil restrictors.

Application	Lifter Body Dia.	Follower Wheel Dia.	Pushrod Seat Height	Crane Classic Part No.	Ultra Pro Series Part No.
American Motors V-8 66-91, 290-304-343-360 (5.9L)-390-401 cu.in.					
Vertical locking bar with .200" short pushrod seat location	.904"	.815"	1.325"		**66550-16**
Arias/Fontana/MBR V-8, 8.3L					
Vertical locking bar	.904"	.815"	1.325"		**95542-16**
Vertical locking bar with .120" tall pushrod seat location	.904"	.815"	1.455"		**95543-16**
Vertical locking bar will accommodate pushrod oiling	.904"	.815"	1.325"		**95550-16**
Brad Anderson 426, Rodeck TFX-92, Keith Black Aluminum 426 V-8, JP-1					
Vertical locking bar	.904"	.815"	1.325"		**66542-16**
Vertical locking bar with .120" tall pushrod seat location	.904"	.815"	1.455"		**66543-16**
Vertical locking bar for spread lifter bore blocks	.904"	.815"	1.325"		**95542-16**
Vertical locking bar for spread lifter bore blocks, with .120" tall pushrod seat location	.904"	.815"	1.455"		**95543-16**
Vertical locking bar for spread lifter bore cylinder blocks, will accommodate pushrod oiling	.904"	.815"	1.325"		**95550-16**
Vertical locking bar for 1.000" diameter lifter bores, with standard to .200" spread lifter bore spacing	.998"	.920"	1.320"		**66547-16**
Vertical locking bar for 1.000" diameter lifter bores, with standard to .200" spread lifter bore spacing, with .200" tall pushrod seat location, will accommodate pushrod oiling.	.998"	.920"	1.515"		**66555-16**
Vertical locking bar for 1.062" diameter lifter bores, with standard to .200" spread lifter bore spacing, with .200" tall pushrod seat location.	1.060"	.920"	1.520"		**66549-16**
Chevrolet 90° V-6 78-86, 200-229-262 (4.3L) cu. in.					
Vertical locking bar for H.D. aluminum cylinder block or iron blocks with V-8 type lifter bore oiling	.842"	.750"	1.575"	**11519-2**	

Lifters - Mechanical Roller

Application (Crane DOES NOT recommend the use of oil restrictors.)	Lifter Body Dia.	Follower Wheel Dia.	Pushrod Seat Height	Crane Classic Part No.	Ultra Pro Series Part No.
Chevrolet V-8 55-00, 262-400 cu. in., GM Bow Tie, Donovan, Rodeck (except LS1 and SB2)					
Horizontal locking bar	.842"	.750"	1.575"	**11515-16**	
Vertical locking bar for standard or tall lifter bore Bow Tie, hydraulic roller, or aftermarket cylinder blocks	.842"	.750"	1.575"	**11519-16**	**11570-16**
Vertical locking bar for blocks with 55mm, or greater, oversize journal camshafts	.842"	.750"	1.575"		**11576-16**
Vertical locking bar with .180" offset left and right intake pushrod seats, for standard or tall lifter bore Bow Tie, hydraulic roller, or aftermarket cylinder blocks	.842"	.750"	1.575"		**11571-16**
Vertical locking bar with .180" offset left and right intake pushrod seats, for blocks with 55mm, or greater, oversize journal camshafts	.842"	.750"	1.575"		**11577-16**
Vertical locking bar for .875" diameter lifter bores, in standard or tall lifter bore Bow Tie, hydraulic roller, or aftermarket cylinder blocks	.874"	.750"	1.575"		**11572-16**
Vertical locking bar for .875" diameter lifter bores, for standard or tall lifter bore Bow Tie, hydraulic roller, or aftermarket cylinder blocks, with .180" offset left and right intake pushrod seats	.874"	.750"	1.575"		**11573-16**
Vertical locking bar for .904" diameter lifter bores, for standard or tall lifter bore Bow Tie, hydraulic roller, or aftermarket cylinder blocks	.904"	.815"	1.595"		**11574-16**
Vertical locking bar for .904" diameter lifter bores, for blocks with 55mm, or greater, oversize journal camshafts	.904"	.815"	1.595"		**11578-16**
Vertical locking bar for .904" diameter lifter bores, with .210" offset left and right intake pushrod seats, for standard or tall lifter bore Bow Tie, hydraulic roller, or aftermarket cylinder blocks	.904"	.815"	1.595"		**11575-16**
Vertical locking bar for .904" diameter lifter bores, with .210" offset left and right intake pushrod seats for blocks with 55mm, or greater, oversize journal camshafts	.904"	.815"	1.595"		**11579-16**
Chevrolet V-8 88-00, 305-350 cu. in., LS1 5.7L (except SB2)					
Long body design for use with standard GM alignment bars, in engines originally equipped with hydraulic roller lifters	.842"	.700"	2.310"	**10510-16**	

Section Continued

Crane DOES NOT recommend the use of oil restrictors.

Application	Lifter Body Dia.	Follower Wheel Dia.	Pushrod Seat Height	Crane Classic Part No.	Ultra Pro Series Part No.
Chevrolet V-8 2000-up, 5.7L LS1/LS2, LS3/L92, LS6 & Vortec 4800, 5300, 6000					
Long body design for use with standard GM alignment bars, in engines originally equipped with hydraulic roller lifters	.842"	.700"	2.310"	**144511-16**	
Vertical locking bar, long body design, for increased lift and reduced base circle camshafts	.842"	.750"	1.575"		**144570-16**
Vertical locking bar, long body design, for Warhawk blocks, for increased lift and reduced base circle camshafts.	.842"	.750"	1.575"		**144572-16**
Chevrolet V-8 58-65, 348-409-427 (Z-11) cu.in.					
Vertical locking bar	.842"	.750"	1.575"	**15519-16**	
Chevrolet V-8 65-00, 396-402-427-454-502 cu.in. (including Gen V and Gen VI), Donovan, Rodeck 481					
Horizontal locking bar—must use 3/8" diameter pushrods	.842"	.750"	1.575"	**13515-16**	
Vertical locking bar for standard or tall lifter bore cylinder blocks	.842"	.750"	1.575"	**13519-16**	**13570-16**
Vertical locking bar for blocks with 55mm, or greater, oversize journal camshafts	.842"	.750"	1.575"		**13576-16**
Vertical locking bar with .180" offset left and right intake pushrod seats, for standard or tall lifter bore cylinder blocks	.842"	.750"	1.575"		**13571-16**
Vertical locking bar with .180" offset left and right intake pushrod seats, for blocks with 55mm, or greater, oversize journal camshafts	.842"	.750"	1.575"		**13577-16**
Vertical locking bar for .875" diameter lifter bores, for standard or tall lifter bore cylinder blocks	.874"	.750"	1.575"		**13572-16**
Vertical locking bar for .875" diameter lifter bores, for standard or tall lifter bore cylinder blocks, with .180" offset left and right intake pushrod seats	.874"	.750"	1.575"		**13573-16**
Vertical locking bar for .904" diameter lifter bores, for standard or tall lifter bore cylinder blocks	.904"	.815"	1.595"		**13574-16**
Vertical locking bar for .904" diameter lifter bores, for blocks with 55mm, or greater, oversize journal camshafts	.904"	.815"	1.595"		**13578-16**
Vertical locking bar for .904" diameter lifter bores, with .210" offset left and right intake pushrod seats, for standard or tall lifter bore cylinder blocks	.904"	.815"	1.595"		**13575-16**
Vertical locking bar for .904" diameter lifter bores, with .210" offset left and right intake pushrod seats, for blocks with 55mm, or greater, oversize journal camshafts	.904"	.815"	1.595"		**13579-16**
Chevrolet V-8 96-00, 454 (7.4L)-502 (8.2L) cu.in. Gen VI					
Long body design for use with standard GM alignment bars in engines originally equipped with hydraulic roller lifters	.842"	.700"	2.310"	**16510-16**	

Lifters - Mechanical Roller

Application (Crane DOES NOT recommend the use of oil restrictors.)	Lifter Body Dia.	Follower Wheel Dia.	Pushrod Seat Height	Crane Classic Part No.	Ultra Pro Series Part No.
Chrysler V-8 51-58, 301-331-354-392 cu.in.					
Vertical locking bar	.904"	.750'	1.460"	**66515-16**	
Vertical locking bar	.904"	.815"	1.325"		**66542-16**
Vertical locking bar with .120" tall pushrod seat location	.904"	.815'	1.455"		**66543-16**
Chrysler-Dodge-Plymouth V-8 64-91, "LA" 273-318-340-360 cu.in. (Not Magnum) (No lifter bore oiling modifications required)					
Vertical locking bar	.904"	.750"	1.460"	**69515-16**	
Vertical locking bar	.904"	.815"	1.325"		**69542-16**
Vertical locking bar will accommodate pushrod oiling	.904"	.815"	1.325"		**69550-16**
Vertical locking bar for tall lifter bore cylinder blocks, with .400" tall pushrod seat location	.904"	.815"	1.725"		**69554-16**
Chrysler-Dodge-Plymouth V-8, "LA" R-block 318-360 cu.in. w/ 48° lifter bank angle (R-blocks having 59° lifter bank angles are not intended for use w/ roller camshafts)					
Vertical locking bar will accommodate pushrod oiling	.904"	.815"	1.325"		**69552-16**
Chrysler-Dodge-Plymouth V-8 58-78, "B" 350-361-383-400-426-440 cu.in. (No lifter bore oiling modifications required)					
Vertical locking bar	.904"	.750"	1.460"	**66515-16**	
Vertical locking bar	.904"	.815"	1.325"		**66542-16**
Vertical locking bar with .120" tall pushrod seat location	.904"	.815"	1.455"		**66543-16**
Vertical locking bar will accommodate pushrod oiling	.904"	.815"	1.325"		**66550-16**
Vertical locking bar for tall lifter bore cylinder blocks, with .400" tall pushrod seat location	.904"	.815"	1.725"		**66554-16**
Chrysler-Dodge-Plymouth V-8 64-71, Hemi 426 cu.in. (also see Keith Black roller lifter listings) (No lifter bore oiling modifications required)					
Vertical locking bar	.904"	.750"	1.460"	**66515-16**	
Vertical locking bar	.904"	.815"	1.325"		**66542-16**
Vertical locking bar with .120" tall pushrod seat location	.904"	.815"	1.455"		**66543-16**
Vertical locking bar will accommodate pushrod oiling	.904"	.815"	1.325"		**66550-16**
Vertical locking bar for tall lifter bore cylinder blocks with .400" tall pushrod seat location	.904"	.815"	1.725"		**66554-16**
Vertical locking bar for 1.000" diameter lifter bores, with standard to .200" spread lifter bore spacing, with .200" tall pushrod seat location, will accommodate pushrod oiling	.998"	.920"	1.515"		**66555-16**
Donovan V-8, 417 cu.in.					
Vertical locking bar	.904"	.750"	1.460"	**66515-16**	
Vertical locking bar	.904"	.815"	1.325"		**66542-16**
Vertical locking bar with .120" tall pushrod seat location	.904"	.815"	1.455"		**66543-16**
Vertical locking bar for 1.000" diameter lifter bores, with standard to .200" spread lifter bore spacing, with .200" tall pushrod seat location, will accommodate pushrod oiling	.998"	.920"	1.515"		**66555-16**

Crane DOES NOT recommend the use of oil restrictors.

Application	Lifter Body Dia.	Follower Wheel Dia.	Pushrod Seat Height	Crane Classic Part No.	Ultra Pro Series Part No.
Ford V-8 62-00, 221-255 (4.2L)-260-289-302-5.0L, 5.0L H.O., Boss 302, 351W cu.in.					
Vertical locking bar	.874"	.750"	1.720"	**44518-16**	
Vertical locking bar	.874"	.750"	1.720"		**44570-16**
Vertical locking bar with .180" offset right intake pushrod seats	.874"	.750"	1.720"		**44571-16**
Vertical locking bar for .904" diameter lifter bores	.904"	.815"	1.720"		**44574-16**
Vertical locking bar for .904" diameter lifter bores, with .210" offset right intake pushrod seats	.904"	.815"	1.720"		**44575-16**
Ford V-8 70-82, Boss 351-351C- 351M-400 cu.in.					
Vertical locking bar	.874"	.750"	1.720"	**44518-16**	
Vertical locking bar	.874"	.750"	1.720"		**44570-16**
Vertical locking bar with .180" offset right intake pushrod seats	.874"	.750"	1.720"		**44571-16**
Vertical locking bar for .904" diameter lifter bores	.904"	.815"	1.720"		**44574-16**
Vertical locking bar for .904" diameter lifter bores, with .210" offset right intake pushrod seats	.904"	.815"	1.720"		**44575-16**
Ford V-8, SVO 302 and SVO 351					
Vertical locking bar	.874"	.750"	1.720"	**44518-16**	
Vertical locking bar	.874"	.750"	1.720"		**44570-16**
Vertical locking bar with .180" offset right intake pushrod seats	.874"	.750"	1.720"		**44571-16**
Vertical locking bar for .904" diameter lifter bores	.904"	.815"	1.720"		**44574-16**
Vertical locking bar for .904" diameter lifter bores, with .210" offset right intake pushrod seats	.904"	.815"	1.720"		**44575-16**
Ford V-8 63-76, 352-360-390-406-410-427-428 cu.in.					
Vertical locking bar	.874"	.750"	1.720"	**30518-16**	
Vertical locking bar	.874"	.750"	1.720"		**35570-16**
Vertical locking bar with .180" offset left and right intake pushrod seats	.874"	.750"	1.720"		**35571-16**
Vertical locking bar for .904" diameter lifter bores	.904"	.815"	1.720"		**35574-16**
Vertical locking bar for .904" diameter lifter bores, with .210" offset left and right intake pushrod seats	.904"	.815"	1.720"		**35575-16**
Ford V-8 68-97, 370-429-460 cu.in. (except 429 Boss Hemi)					
Vertical locking bar	.874"	.750"	1.720"	**30518-16**	
Vertical locking bar	.874"	.750"	1.720"		**35570-16**
Vertical locking bar with .180" offset left and right intake pushrod seats	.874"	.750"	1.720"		**35571-16**
Vertical locking bar with .180" offset right intake pushrod seats, for Ford Racing C460 cylinder heads	.874"	.750"	1.720"		**35571R-16**
Vertical locking bar for .904" diameter lifter bores	.904"	.815"	1.720"		**35574-16**
Vertical locking bar for .904" diameter lifter bores, with .210" offset left and right intake pushrod seats	.904"	.815"	1.720"		**35575-16**
Vertical locking bar for .904" diameter lifter bores, with .210" offset right intake pushrod seats, for Ford Racing C460 cylinder heads	.904"	.815"	1.720"		**35575R-16**
Ford V-8 69-70, 429 Boss Hemi					
Vertical locking bar	.874"	.750"	1.720"		**30570-16**
Vertical locking bar for .904" diameter lifter bores	.904"	.815"	1.720"		**30574-16**

Lifters - Mechanical Roller

Crane DOES NOT recommend the use of oil restrictors.

Application	Lifter Body Dia.	Follower Wheel Dia.	Pushrod Seat Height	Crane Classic Part No.	Ultra Pro Series Part No.
Johnson/Rodeck V-8, 481X					
Vertical locking bar for .904" diameter lifter bores with pushrod oiling	.904"	.815"	1.385"		**140550-16**
Oldsmobile V-8 64-84, 260-307 (5.0L) -330-350 (5.7L) -400-403-425-455 cu.in.					
Vertical locking bar for .842" diameter lifter bores	.842"	.750"	1.705"		**28570-16**
Pontiac V-8 55-81, 287-316-326-347-350-370-389-400 (6.6L)-421-428-455 cu.in.					
Vertical locking bar	.842"	.750"	1.705"		**28570-16**
Rodeck V-8, 481 cu.in. (except 481X)					
Vertical locking bar	.842"	.750"	1.575"		**13570-16**
Vertical locking bar with .180" offset left and right intake pushrod seats	.842"	.750"	1.575"		**13571-16**
Vertical locking bar for .904" diameter lifter bores, for standard or tall lifter bore cylinder blocks	.904"	.815"	1.595"		**13574-16**
Vertical locking bar for .904" diameter lifter bores, with .210" offset left and right intake pushrod seats, for standard or tall lifter bore cylinder blocks	.904"	.815"	1.595"		**13575-16**

Replacement Locking Bar Kits for Horizontal Bar Roller Lifters (All Kits Include Two Locking Bars and Four Hold Down Springs)

Application	Part No.
Chevrolet V-8 262-400	
For Part Number: **11515-16**	**99557-1**
Chevrolet V-8 396-502	
For Part Number: **13515-16**	**99559-1**













*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

Assembly Lube (Paste)

Crane Super Moly Lube is a moly-disulfide base lubricant, for use on cam lobes, lifters and distributor drive gears and should be used for all cam installations (except for roller lifter applications). Advised for cup-end pushrod installation where only splash lubricant is utilized.

Also used in many areas of transmission and driveline assembly, where high initial loading occurs, and galling should be minimized. Not recommended where normal oil flow may be impeded due to the high viscosity of this product.



Description	Part No.
Two 1-ounce packages	99002-1
1-pound container	99004-1

Engine Assembly Lube

Crane Engine Assembly Lube is specially formulated to provide extra lubrication protection to engine components during assembly, and to provide outstanding resistance to scuffing, wear and friction during critical break-in. This lubricant is recommended for use on several different engine components, such as: rocker arm fulcrum balls, needle bearings, roller tips or rocker shafts; timing chain sprockets and gears; roller lifters and roller camshafts; engine bearing surfaces; outer surface of hydraulic or mechanical lifter bodies (use Super Moly Lube [paste] on face of these lifters).



Description	Part No.
4-ounce container	99008-1

Break-In Engine Oil

Crane Cams now offers a specially formulated 10W-40 conventional engine oil to cope with the stresses created with flat faced follower camshafts. This is to ensure that the critical first hour of your camshaft's life will lead to long term reliability. A formula of advanced petroleum base, combined with an additive package used in Crane Cams Super Lube, using a proportioned zinc (ZDDP) component (such as contained in Crane Cams Super Lube), this oil is intended for use with all conventional fuel types, with no additional oil additives required. Once your flat faced lifter camshaft is properly broken in, you should continue to use a performance type ZDDP content oil for the remainder of the engine's life, to ensure longevity.

It's more important than ever to use the properly formulated oil for the initial break-in of your flat faced follower camshaft and lifters, either hydraulic or mechanical. Oils specified for today's hydraulic roller engines no longer contain the additives necessary to provide the optimum environment for sliding surfaces, especially for cam lobe and lifter interface of a flat face follower design. Fresh rebuilds also need load carrying protection in lifter bores, distributor gears and valve guides. Even in roller lifter equipped engines, this break-in oil is highly recommended and this oil's additive package is mandatory for flat faced follower designs. Crane Cams Break-In Engine Oil **(Part # 99300-1)** or Crane Cams Super Lube **(Part # 99003-1)** must be used when installing a new Flat Tappet Camshaft and Lifters.



Description	Part No.
1-quart container	99300-1*
Case of 12 quarts	99300-12*

Super Lube Break-In Concentrate For Cam & Lifter Installation

The original Crane Cams Super Lube Break-In Concentrate is an anti-wear additive formulated with a high concentration of special zinc dithiophosphate to provide sustained protection against cam lobe and flat-faced lifter scuffing and wear. This is especially important when using modern oils that have been compounded for use with roller-type camshafts. This oil supplement is to be added to the engine oil for the initial break-in period after the installation of a new camshaft and lifters.



Description	Part No.
8-ounce container	99003-1

Pushrods

The Strongest, Most Reliable Chromemoly Steel Pushrods Available!

Crane Cams offers precision manufactured high strength tubular steel pushrods for almost any engine. Popular length and diameter pushrods are listed here. The length is expressed as ***Effective Length.*** On pushrods having a ball on each end, this represents the overall length of the pushrod. For pushrods with a cup on one end, and a ball on the other, this is the measurement from the bottom of the cup to the tip of the ball.



Crane's pushrods are manufactured from 4130 chromemoly steel tubing. The ball radius ends are formed from the tubing, and then hardened and centerless ground. Where indicated, Crane's pushrods are carbonitride hardened for use with (or without) pushrod guideplates. ***Hardened pushrods must be used with steel pushrod guideplate equipped cylinder heads*** (page 291) ***to prevent premature wear and failure.***

Also listed in this section, where applicable, are the **Crane Pro-Series One-Piece Pushrods**. These are cold-forged, die formed, heat treated and centerless ground pushrods for both small and big block Chevrolet V-8 engines and other engine applications where pushrods with 5/16" dia. ball ends are required. For additional information, see page 289.

Application	Length	Effective Length	Tubing Dia.	End Type Top	End Type Bottom	Part No.
American Motors V-8 (Includes AMC/Jeep)						
70-91, 304 thru 401 with hydraulic lifters, Pro Series One Piece, heat treated, heavy wall	Stock	7.850	5/16	B-4	B-4	**95637-16**
66-91, 290 thru 401 with mechanical lifters, Pro Series One Piece, heat treated, heavy wall	Stock	8.050	5/16	B-4	B-4	**95641-16**
66-91, 290 thru 401 with **66550-16** roller lifters, Pro Series One Piece, heat treated, heavy wall	+.200	8.250	5/16	B-4	B-4	**95645-16**
Cadillac V-8						
68-81, 368 thru 500 heat treated, heavy wall	Stock	10.200	5/16	B-4	B-4	**102621-16**
Chevrolet I-6						
62-84, 194-230-250 heat treated, heavy wall	Stock	9.718	5/16	B-4	B-4	**20621-12**
62-84, 194-230-250 with Crane aluminum rocker arms, heat treated, heavy wall	+.282	10.000	5/16	B-4	B-4	**20622-12**
Chevrolet V-6						
80-88, 60° 173 with cast iron in-line valve cylinder heads, heat treated, heavy wall	Stock	6.163	5/16	B-4	B-4	**25621-12**
78-86, 90° 200 thru 262 heat treated, heavy wall	Stock	7.765	5/16	B-4	B-4	**11621-12**
92-02, 90° 4.3L with Factory Hydraulic Roller Lifters, heat treated, heavy wall	Stock	7.178	5/16	B-4	B-4	**10621-12**
Chevrolet Small Block V-8						
55-87, 262 thru 400 with ***Crane Hydraulic Roller Lifters***, heat treated, heavy wall	-.719	7.046	5/16	B-4	B-4	**11628-16**
55-87, 262 thru 400 heat treated	Stock	7.765	5/16	B-4	B-4	**11621-16**
55-87, 262 thru 400 heat treated, heavy wall	Stock	7.765	5/16	B-4	B-4	**11630-16**
55-87, 262 thru 400 heat treated	+.100	7.865	5/16	B-4	B-4	**11622-16**
55-87, 262 thru 400 heat treated, heavy wall	+.100	7.865	5/16	B-4	B-4	**11632-16**
55-87, 262 thru 400 heat treated	+.160	7.925	5/16	B-4	B-4	**11624-16**
55-87, 262 thru 400 heat treated, heavy wall	+.200	7.965	5/16	B-4	B-4	**11633-16**
55-87, 262 thru 400 heat treated, heavy wall	+.250	8.015	5/16	B-4	B-4	**11635-16**
88-99, 305-350 with ***Factory Hydraulic Roller Lifters***, heat treated, heavy wall	Stock	7.178	5/16	B-4	B-4	**10621-16**
97-10, LS1-LS2-LS6 5.7L Pro Series One Piece, heat treated, heavy wall (.080)	Stock	7.400	5/16	B-4	B-4	**144621-16**
97-10, LS1-LS2-LS6 5.7L Pro Series One Piece, heat treated, heavy wall (.080) for Crane Adjustable Rocker Arm Conversion Kit	-.150	7.250	5/16	B-4	B-4	**144622-16**

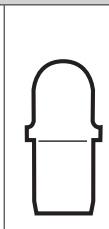
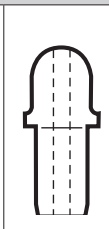
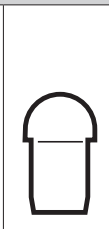
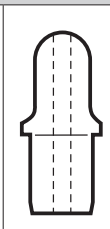
Application	Length	Effective Length	Tubing Dia.	End Type Top	End Type Bottom	Part No.
Chevrolet V-8						
58-65, 348-409-427 (Z-11) ***with Crane Hydraulic Roller Lifters***, heat treated, heavy wall	-.0686 -.0692	8.100 Int. 8.450 Exh.	5/16 5/16	B-4 B-4	B-4 B-4	**15630-16**
58-65, 348-409-427 (Z-11) ***with Crane Hydraulic Roller Lifters***, heat treated, heavy wall	-.0686 -.0692	8.100 Int. 8.450 Exh.	3/8 3/8	B-2 w/h B-2 w/h	B-2 w/h B-2 w/h	**15640-16**
58-65, 348-409-427 (Z-11), heat treated, heavy wall	Stock Stock	8.786 Int. 9.142 Exh.	5/16 5/16	B-4 B-4	B-4 B-4	**15621-16**
58-65, 348-409-427 (Z-11), heat treated, heavy wall	Stock Stock	8.786 Int. 9.142 Exh.	3/8 3/8	B-2 w/h B-2 w/h	B-2 w/h B-2 w/h	**15634-16**
Chevrolet Big Block V-8						
65-90, 396 thru 454 ***with Crane Hydraulic Roller Lifters***, heat treated, heavy wall	-.719 -.719	7.531 Int. 8.531 Exh.	3/8 3/8	B-2 w/h B-2 w/h	B-2 w/h B-2 w/h	**13628-16**
65-90, 396 thru 454 ***with Crane Hydraulic Roller Lifters***, Pro Series One Piece, heat treated, heavy wall	-.700 -.700	7.566 Int. 8.550 Exh.	3/8 3/8	B-2 w/h B-2 w/h	B-2 w/h B-2 w/h	**13642-16**
65-90, 396 thru 454 heat treated, heavy wall	Stock Stock	8.250 Int. 9.250 Exh.	3/8 3/8	B-2 w/h B-2 w/h	B-2 w/h B-2 w/h	**13634-16**
65-90, 396 thru 454 Pro Series One Piece, heat treated, heavy wall	Stock Stock	8.250 Int. 9.250 Exh.	3/8 3/8	B-2 w/h B-2 w/h	B-2 w/h B-2 w/h	**13640-16**
65-90, 396 thru 454 heat treated, heavy wall	Stock Stock	8.250 Int. 9.250 Exh.	7/16 7/16	B-14 B-14	B-14 B-14	**13630-16**
66-90, 366-427 Tall Deck (+.400") ***w/Crane Hyd. Roller Lifters***, heat treated,heavy wall	-.719 -.719	7.936 Int. 8.906 Exh.	3/8 3/8	B-2 w/h B-2 w/h	B-2 w/h B-2 w/h	**13629-16**
66-90, 366-427 Tall Deck (+.400") ***w/Crane Hyd. Roller Lifters***, Pro Series One Piece, heat treated, heavy wall	-.705 -.675	7.950 Int. 8.950 Exh.	3/8 3/8	B-2 w/h B-2 w/h	B-2 w/h B-2 w/h	**13643-16**
66-90, 366-427 Tall Deck (+.400") heat treated, heavy wall	Stock Stock	8.655 Int. 9.625 Exh.	3/8 3/8	B-2 w/h B-2 w/h	B-2 w/h B-2 w/h	**13635-16**
01-08, 8.1 Litre with hydraulic lifters and adjustable rockers, Pro Series One Piece, heat treated, heavy wall	Stock Stock	8.200 Int. 9.150 Exh.	3/8 3/8	B-2 w/h B-2 w/h	B-2 w/h B-2 w/h	**26640-16**
Chrysler-Dodge-Plymouth V-8						
64-91, 273 thru 360 "LA" with hydraulic lifters and adjustable rockers, heat treated, heavy wall	Stock	7.185	5/16	C-4	B-3	**69621-16**
64-91, 273 thru 360 "LA", ***with Crane Hydraulic Roller Lifters*** and adjustable rockers, heat treated, heavy wall	-.750	6.450	5/16	C-4	B-3	**69628-16**
64-91, 273 thru 360 "LA", with mechanical lifters and adjustable rockers, heat treated, heavy wall	Stock	7.325	5/16	C-4	B-3	**69622-16**
92-00, 318-360 "Magnum" ***with Factory Hydraulic Roller Lifters*** and Crane adjustable rockers with **36655-16** conversion kit, heat treated, heavy wall	Stock	6.812	5/16	B-4	B-4	**36621-16**
58-78, 350 thru 400 "B" ***Low Block*** with hydraulic lifters and adjustable rockers, heat treated, heavy wall	Stock	8.055	3/8	C-2	B-2	**64640-16**
58-78, 350 thru 400 "B" ***Low Block with Crane Hydraulic Roller Lifters*** and adjustable rockers, heat treated, heavy wall	-.750	7.290	3/8	C-2	B-2	**64628-16**
58-78, 350 thru 400 "B" ***Low Block*** with mechanical lifters and adjustable rockers, heat treated, heavy wall	Stock	8.425	3/8	C-2	B-1	**64621-16**
58-78, 413 thru 440 "B" ***High Block*** with hydraulic lifters and adjustable rockers, heat treated, heavy wall	Stock	8.930	3/8	C-2	B-2	**64641-16**
58-78, 413 thru 440 "B" ***High Block with Crane Hydraulic Roller Lifters*** and adjustable rockers, heat treated, heavy wall	-.750	8.180	3/8	C-2	B-2	**64629-16**
58-78, 413 thru 440 "B" ***High Block*** with mechanical lifters and adjustable rockers, heat treated, heavy wall	Stock	9.055	3/8	C-2	B-1	**64622-16**
64-71, 426 Hemi with hydraulic lifters, heat treated, heavy wall	Stock Stock	10.450 Int. 11.385 Exh.	3/8 3/8	C-2 C-2	B-1 B-1	**66621-16**
64-71, 426 Hemi ***with Crane Hydraulic Roller Lifters***, heat treated, heavy wall	-.750 -.750	9.710 Int. 10.650 Exh.	3/8 3/8	C-2 C-2	B-2 B-2	**66628-16**
64-71, 426 Hemi with mechanical lifters heat treated, heavy wall	Stock Stock	10.650 Int. 11.585 Exh.	3/8 3/8	C-2 C-2	B-1 B-1	**65689-16**

Section Continued

Pushrods

Application	Length	Effective Length	Tubing Dia.	End Type Top	End Type Bottom	Part No.
Ford I-6						
64-96, 240-300, heat treated, heavy wall	Stock	10.203	5/16	B-4	B-4	**50621-12**
Ford V-8						
63-68, 221 thru 302, heat treated, heavy wall	Stock	6.812	5/16	B-4	B-4	**36621-16**
69-95, 255 thru 302, heat treated, heavy wall	Stock	6.875	5/16	B-4	B-4	**36622-16**
68-87, 255 thru 302 with ***Crane Retrofit Hydraulic Roller Lifters*** and bottleneck studs or pedestal mount rocker arms, Pro Series One Piece, heat treated, heavy wall	-.332	6.500	5/16	B-4	B-4	**95610-16**
77-87, 255 thru 302 with ***Crane Retrofit Hydraulic Roller Lifters*** and adjustable rocker arms, Pro Series One Piece, heat treated, heavy wall	-.132	6.700	5/16	B-4	B-4	**95614-16**
86-96, 302 and 302 H.O. ***with Factory Hydraulic Roller Lifters***, standard base circle camshaft, and pedestal mount rocker arms, heat treated, heavy wall	Stock	6.258	5/16	B-4	B-4	**36631-16**
86-96, 302 and 302 H.O. ***with Factory Hydraulic Roller Lifters*** and Crane aluminum rocker arms, heat treated, heavy wall	+.117	6.375	5/16	B-4	B-4	**36625-16**
85-94, 302 and 302 H.O. ***with Factory Hydraulic Roller Lifters*** and Crane Fireball cylinder heads, Pro Series One Piece, heat treated, heavy wall	-.095	6.200	5/16	B-4	B-4	**95604-16**
69-93, 351W, Pro Series One Piece, heat treated, heavy wall	Stock	8.200	5/16	B-4	B-4	**95644-16**
69-93, 351W with ***Crane Retrofit Hydraulic Roller Lifters*** and bottleneck studs or pedestal mount rocker arms, Pro Series One Piece, heat treated, heavy wall	-.366	7.800	5/16	B-4	B-4	**95636-16**
77-93, 351W with ***Crane Retrofit Hydraulic Roller Lifters*** and adjustable rocker arms, Pro Series One Piece, heat treated, heavy wall	-.191	8.000	5/16	B-4	B-4	**95640-16**
69-70, Boss 302, Pro Series One Piece, heat treated, heavy wall	Stock	7.650	5/16	B-4	B-4	**95633-16**
70-74, 351C, heat treated, heavy wall	Stock	8.406	5/16	B-4	B-4	**52621-16**
70-74, 351C with ***Crane Retrofit Hydraulic Roller Lifters*** and adjustable rocker arms, heat treated, Pro Series One Piece, heat treated, heavy wall	-.625	7.781	5/16	B-4	B-4	**95636-16**
71-72, Boss 351, Pro Series One Piece, heat treated, heavy wall	Stock	8.500	5/16	B-4	B-4	**95650-16**
71-82, 351M-400 w/ ***Crane Retrofit Hydraulic Roller Lifters*** & pedestal mount rocker arms, Pro Series One Piece, heat treated, heavy wall	-.800	8.700	5/16	B-4	B-4	**95654-16**
71-82, 351M-400 with ***Crane Retrofit Hydraulic Roller Lifters*** and adjustable rocker arms with **52655-16** conversion kit, Pro Series One Piece, heat treated, heavy wall	-.625	8.900	5/16	B-4	B-4	**95658-16**
58-76, 332 thru 428 FE with hydraulic and mechanical lifters and adjustable rockers, heat treated, heavy wall	Stock	9.065	3/8	C-1	B-1	**34621-16**
58-76, 332 thru 428 FE with shell mechanical lifters and adjustable rockers, heat treated, heavy wall	Stock	10.485	3/8	C-1	B-1	**34622-16**
58-76, 332 thru 428 with roller lifters, heat treated, heavy wall	-.109	8.960	3/8	C-1	B-2	**34641-16**
69-97, 370 thru 460, heat treated, heavy wall	Stock	8.563	5/16	B-4	B-4	**35622-16**
70, 429 Super CJ, and all 370 thru 460 with 5/16" pushrod guideplates, heat treated, heavy wall	Stock	8.656	5/16	B-4	B-4	**35621-16**
MG-MGA-MGB 4 Cylinder						
40-55, 1250-1466cc TC, TD, TF	Stock	8.360	5/16	C-3	B-11	**905-0003**
57-80, 1598-1798cc MGA, MGB	Stock	10.485	5/16	C-3	B-11	**905-0004**
Oldsmobile V-8						
64-84, 260-307-330-350-403 with hydraulic lifters , Pro Series One Piece, heat treated, heavy wall	Stock	8.350	5/16	B-4	B-4	**95647-16**
Pontiac V-8						
57-81, 265-287-316-347-350-389-400-428-455, heat treated, heavy wall	Stock	9.125	5/16	B-4	B-4	**28624-16**
62-67, 326-389-400-421 , Pro Series One Piece, heat treated, heavy wall	Stock	8.700	5/16	B-4	B-4	**95654-16**

End Types

Ball or Cup Dia.	3/8	5/16	5/16	5/16	5/16	1/2	5/16	3/8	5/16	10mm	5/16
											
	B1	**B2**	**B2 w/h**	**B3**	**B4**	**B11**	**B14 w/h**	**C1**	**C2**	**C3**	**C4**
Tubing Dia	3/8	3/8	3/8	5/16	5/16	5/16	7/16	3/8	3/8	5/16	5/16

Pro Series, One-Piece, Cold-Forged Pushrods

Crane Cams Pro Series, one-piece pushrods are ***cold-forged***, with a precisely formed end that is ***actually stronger*** than the tubing wall itself!

Pro Series pushrods are made from aircraft quality, .080" wall, 4130 chromemoly steel tubing. Finished overall length is accurate to within ±.005" per pushrod. These are available in 5/16" and 3/8" diameter, each with 5/16" diameter ball ends, and .050" length increments (6.000" to 9.200" OAL in 5/16" diameter, and 7.050" to 11.000" OAL in 3/8" diameter), heat treated for use with or without pushrod guideplates. Each pushrod is laser etched with its overall length for quick identification.



Pro Series 5/16" Diameter One-Piece Pushrods

Overall Length	Part No.	Overall Length	Part No.	Overall Length	Part No.	Overall Length	Part No.
6.000"	95600-16	6.850"	95617-16	7.650"	95633-16	8.450"	95649-16
6.050"	95601-16	6.900"	95618-16	7.700"	95634-16	8.500"	95650-16
6.100"	95602-16	6.950"	95619-16	7.750"	95635-16	8.550"	95651-16
6.150"	95603-16	7.000"	95620-16	7.800"	95636-16	8.600"	95652-16
6.200"	95604-16	7.050"	95621-16	7.850"	95637-16	8.650"	95653-16
6.250"	95605-16	7.100"	95622-16	7.900"	95638-16	8.700"	95654-16
6.300"	95606-16	7.150"	95623-16	7.950"	95639-16	8.750"	95655-16
6.350"	95607-16	7.200"	95624-16	8.000"	95640-16	8.800"	95656-16
6.400"	95608-16	7.250"	95625-16	8.050"	95641-16	8.850"	95657-16
6.450"	95609-16	7.300"	95626-16	8.100"	95642-16	8.900"	95658-16
6.500"	95610-16	7.350"	95627-16	8.150"	95643-16	8.950"	95659-16
6.550"	95611-16	7.400"	95628-16	8.200"	95644-16	9.000"	95660-16
6.600"	95612-16	7.450"	95629-16	8.250"	95645-16	9.050"	95661-16
6.650"	95613-16	7.500"	95630-16	8.300"	95646-16	9.100"	95662-16
6.700"	95614-16	7.550"	95631-16	8.350"	95647-16	9.150"	95663-16
6.750"	95615-16	7.600"	95632-16	8.400"	95648-16	9.200"	95664-16
6.800"	95616-16						

Pro Series 3/8" Diameter One-Piece Pushrods

Overall Length	Part No.	Overall Length	Part No.	Overall Length	Part No.	Overall Length	Part No.
7.050"	95777-16	8.050"	95797-16	9.050"	95817-16	10.050"	95837-16
7.100"	95778-16	8.100"	95798-16	9.100"	95818-16	10.100"	95838-16
7.150"	95779-16	8.150"	95799-16	9.150"	95819-16	10.150"	95839-16
7.200"	95780-16	8.200"	95800-16	9.200"	95820-16	10.200"	95840-16
7.250"	95781-16	8.250"	95801-16	9.250"	95821-16	10.250"	95841-16
7.300"	95782-16	8.300"	95802-16	9.300"	95822-16	10.300"	95842-16
7.350"	95783-16	8.350"	95803-16	9.350"	95823-16	10.350"	95843-16
7.400"	95784-16	8.400"	95804-16	9.400"	95824-16	10.400"	95844-16
7.450"	95785-16	8.450"	95805-16	9.450"	95825-16	10.450"	95845-16
7.500"	95786-16	8.500"	95806-16	9.500"	95826-16	10.500"	95846-16
7.550"	95787-16	8.550"	95807-16	9.550"	95827-16	10.550"	95847-16
7.600"	95788-16	8.600"	95808-16	9.600"	95828-16	10.600"	95848-16
7.650"	95789-16	8.650"	95809-16	9.650"	95829-16	10.650"	95849-16
7.700"	95790-16	8.700"	95810-16	9.700"	95830-16	10.700"	95850-16
7.750"	95791-16	8.750"	95811-16	9.750"	95831-16	10.750"	95851-16
7.800"	95792-16	8.800"	95812-16	9.800"	95832-16	10.800"	95852-16
7.850"	95793-16	8.850"	95813-16	9.850"	95833-16	10.850"	95853-16
7.900"	95794-16	8.900"	95814-16	9.900"	95834-16	10.900"	95854-16
7.950"	95795-16	8.950"	95815-16	9.950"	95835-16	10.950"	95855-16
8.000"	95796-16	9.000"	95816-16	10.000"	95836-16	11.000"	95856-16

Adjustable Checking Pushrods

These Checking Pushrods are adjustable with over 1.000" of travel, enabling you to arrive at the correct pushrod length to create the correct valve train geometry for your particular engine, or when using hydraulic lifters, to determine hydraulic lifter preload. These pushrods ***are not to be run in your engine***. Once correct pushrod length is determined, refer to our pushrod listings on pages 286–288. Checking Pushrods come two per package.



Application	Length	Diameter	Part No.
American Motors V-8 290 thru 401			
	7.500 to 8.700"	5/16"	**99726-2**
Buick V-8 400 thru 455			
	8.500 to 9.800"	5/16"	**99727-2**
Chevrolet V-8 262 thru 400			
	7.500 to 8.700"	5/16"	**99726-2**
Chevrolet V-8 396 thru 454			
	7.500 to 8.700" 8.500 to 9.800"	5/16" 5/16"	**99730-2**
Chrysler "LA" V-8 273 thru 360			
	6.125 to 7.500"	5/16"	**99725-2**
Chrysler "B" V-8 Low Block 350, 361, 383, 400			
	7.500 to 8.700"	5/16"	**99726-2**
Chrysler "B" V-8 High Block 413, 426, 440			
	8.500 to 9.800"	5/16"	**99727-2**
Ford V-8 221 thru 302			
	6.125 to 7.500"	5/16"	**99725-2**
Ford V-8 Boss 302			
	6.125 to 7.500"	5/16"	**99725-2**
Ford V-8 351M-400			
	8.500 to 9.800"	5/16"	**99727-2**
Ford V-8 Boss 351, 351C, 370-429-460			
	7.500 to 8.700"	5/16"	**99726-2**
Oldsmobile V-8 260 thru 350 and 403			
	7.500 to 8.700"	5/16"	**99726-2**
Oldsmobile V-8 400, 425, 455			
	8.500 to 9.800"	5/16"	**99727-2**
Pontiac V-8 326, 389, 400, 421			
	8.500 to 9.800"	5/16"	**99727-2**

VALVE TRAIN

Section Continued

Pushrod Guideplates

Crane's pushrod guideplates feature a significant increase in strength over stock designs. Their unique design provides a more rigid guide, reduces flexing, stabilizes the pushrod and reduces rocker arm "wander." All sets include 8 guideplates.

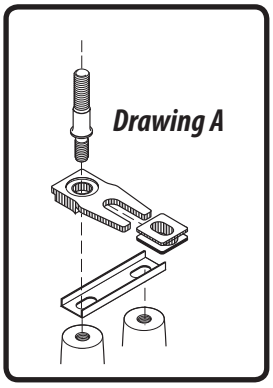
Heat treated and carburized pushrods *must be used* with these guideplates, or *premature pushrod wear and failure* will occur. Cylinder head machining and screw-in rocker arm studs may be required to install these guideplates. Refer to the engine application and rocker arm pages for additional information.

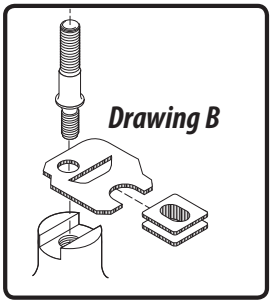


Application	Pushrod Diameter	Part No.
Chevrolet 90° V-6 78-86, 200 thru 262		
	5/16"	**11650-1**
Chevrolet V-8 55-95, 262 thru 400		
	5/16"	**11650-1**
Chevrolet V-8 97-10, LS1-LS2-LS6 5.7L Vortec 4800, 5300, 6000 (for use with Crane adjustable rocker arms)		
	5/16"	**144650-1**
	3/8"	**144651-1**
Chevrolet V-8 08-10, L92 cylinder heads (for use with Crane adjustable rocker arms)		
	5/16"	**201650-1**
	3/8"	**201651-1**
Chevrolet V-8 65-90, 396 thru 454 and 502		
	3/8"	**13650-1**
Ford V-8 62-92, 221 thru 302 and 351W		
	5/16"	**36650-1**
Ford V-8 69-82, 351C-351M-400		
	5/16"	**52650-1**

Rocker Arm Guideplate Conversion Kits

Converts Pedestal-Mount Dodge and Ford Cylinder Heads to Adjustable Rocker Arms
Crane Cams' rocker arm stud/pushrod guideplate conversion kits enable you to convert late-model Dodge and Ford V-8 engines with pedestal mount rocker arms to an adjustable-type valve train ***without machine work or cylinder head removal***. Detailed description on page 305.





Description	Part No.
Dodge 92-02, Magnum V-8 318 (5.2L) and 360 (5.9L) engines with 5/16"-18 threaded stud bosses. Must use **11746-16** or **11759-16** aluminum rocker arms for 3/8" rocker arm studs and 5/16" dia. **36621-16** (heat treated) pushrods.	**36655-16** (Drawing A)
Dodge 92-02, Magnum V-8 318 (5.2L) and 360 (5.9L) engines with 5/16"-18 threaded stud bosses. Must use **11747-16** or **11755-16** aluminum rocker arms for 7/16" rocker arm studs and 5/16" dia. **36621-16** (heat treated) pushrods.	**36656-16** (Drawing A)
Dodge Aluminum Magnum and Crate Motor cylinder heads with 3/8"-16 threaded stud bosses. Must use **11746-16** or **11759-16** aluminum rocker arms for 3/8" rocker arm studs and 5/16" dia. **36621-16** (heat treated) pushrods.	**70655-16** (Drawing A)
Ford V-8 77-00, 255-302, 302 H.O., 351W engines. Will accept 3/8" stud die-formed steel or Crane aluminum rocker arms and 5/16" diameter pushrods.	**36655-16** (Drawing A)
Ford V-8 77-00, 255-302, 302 H.O., 351W engines. Will accept 7/16" stud Crane aluminum rocker arms and 5/16" diameter pushrods.	**36656-16** (Drawing A)
Ford V-8 70-82, 351C, 351M, 400, and Ford V-8 72-97, 370-429-460 engines. Will accept 7/16" stud die-formed steel or Crane aluminum rocker arms and 5/16" dia. pushrods.	**52655-16** (Drawing B)
Ford V-8 72-97, 370, 429, 460 Engines. Will accept 7/16" stud die-formed steel or Crane aluminum rocker arms and 3/8" diameter pushrods.	**35655-16** (Drawing B)
Replacement guideplate insert for 5/16" diameter pushrods (included in kits)	**52655GB-16**
Replacement guideplate insert for 3/8" diameter pushrods (included in kits)	**35655GB-16**

Die-Formed Steel

Stock design with better material and heat treat. Many supplied with long slot or extra long slot to provide more travel for increased valve lift. Economically priced for budget engine rebuild.



Ductile Iron Shaft Mounted

Creates adjustable valve train for Chrysler "LA" and "B", and Ford "FE" series engines. Ductile iron is stronger than stock cast iron material. Allows valve lash or lifter preload to be accurately set. Can correct for valve stems that vary in length. Requires new pushrods with cup on one end to fit adjusting screw.



Application	Ratio	Stud Dia.	Part No.
Chevrolet 90° V-6 78-87, 200 thru 262			
Chevrolet V-8 55-87, 262 thru 400 (Not for use with valve springs over 1.520" O.D.)	***Die-Formed Steel, Non Self-Aligning***		
Stock ratio, factory performance replacement with long slot	1.50	3/8"	**11800-16**
Stock ratio, with extra long slot	1.50	3/8"	**11801-16**
Increased ratio, with extra long slot (50 state legal, C.A.R.B. E.O. D-225-50)	1.60	3/8"	**11802-16***
Eight each of 1.50 and 1.60 ratio, with extra long slot, includes Kool Nuts (50 state legal, C.A.R.B. E.O. D-225-50)	1.50/1.60	3/8"	**11803-16***
Chevrolet V-8 65-90, 396 thru 454 & 502 (Not for use with valve springs over 1.560" O.D.)	***Die-Formed Steel***		
Stock ratio, performance replacement, long slot for up to .560" valve lift	1.70	7/16"	**13800-16[a]**
Stock ratio, with extra long slot	1.70	7/16"	**13801-16[a]**
Chrysler-Dodge-Plymouth V-8 64-91, "LA" 273-318-340-360	***Ductile Iron Construction***		
Stock ratio, adjustable shaft mount design for standard cylinder heads, (will NOT fit Trans-Am, W-2 or W-5 heads), must use special pushrods. See page 287 for details. New shafts available separately (**69618-2**).	1.50	Shaft	**69770-16**
Increased ratio, adjustable shaft mount design for standard cylinder heads (will NOT fit Trans-Am, W-2 or W-5 heads), must use special pushrods. See page 287 for details. New shafts available separately (**69618-2**).	1.60	Shaft	**69771-16***
Chrysler-Dodge-Plymouth V-8 58-78, "B" 350-361-383-400-413-426-440	***Ductile Iron Construction***		
Stock ratio, adjustable shaft mount design for standard cylinder heads, (will NOT fit Stage IV or Stage V heads), must use special pushrods. See page 287 for details. When ordering spares, specify Left Adjuster Offset (**64770L-1**) or Right Adjuster Offset (**64770R-1**) New shafts available separately (**64618-2**).	1.50	Shaft	**64770-16**
Increased ratio, adjustable shaft mount design for standard cylinder heads, (Will NOT fit Stage IV or Stage V heads), must use special pushrods. See page 287 for details. When ordering spares, specify Left Adjuster Offset (**64771L-1**) or Right Adjuster Offset (**64771R-1**) New shafts available separately (**64618-2**).	1.60	Shaft	**64771-16***
Ford V-8 62-00, 221-260-289-302 and 351W	***Cast Construction***		
Stock ratio, non-rail type with standard stud diameter	1.60	3/8"	**36800-16**
Stock ratio, rail type (self aligning), with standard stud diameter, supplied with both 5/16"-24 and 3/8"-24 nuts.	1.60	3/8"	**36801-16**

TECH TIP: **Ford cylinder heads with pedestal mount type rocker arms can be easily converted to use adjustable style rocker arms by using a Crane Stud Conversion Kit with Guideplates. See page 305 for details.**

Ford V-8 69-82, Boss 302, Boss 351, 351C-351M-400	***Die-Formed Steel, Pedestal Mount***		
Stock ratio, for 70-82 cylinder heads, non-adjustable, secured with 5/16" bolt. For hydraulic lifter and hydraulic roller cam applications only.	1.71	5/16" Bolt	**52800-16**

TECH TIP: **Ford cylinder heads with pedestal mount type rocker arms can be easily converted to use adjustable style rocker arms by using a Crane Stud Rocker Arm Stud Conversion Kit. See page 305 for details.**

Ford V-8 63-76, "FE" 352-360-390-406-410-427-428	***Ductile Iron Construction***		
Adjustable shaft mount design, stock ratio, must use special pushrods. See page 288 for details. New shafts available separately (**34618-2**).	1.76	Shaft	**34772-16**
Ford V-8 68-97, 370-429-460	***Die-Formed Steel, Pedestal Mount***		
Stock ratio, for 72-97 cylinder heads, non-adjustable, secured with 5/16" bolt. For hydraulic lifter and hydraulic roller cam applications only.	1.71	5/16" Bolt	**52800-16[b]**

TECH TIP: **Ford cylinder heads with pedestal mount type rocker arms can be easily converted to use adjustable style rocker arms by using a Crane Stud Rocker Arm Stud Conversion Kit. See page 305 for details.**

Section Continued

Application	Ratio	Stud Dia.	Part No.
Oldsmobile V-8 67-84, 260-307-350-400-403-425-455	***Die-Formed Steel***		
Stock ratio, rocker arms supplied with individual fulcrums, bridge straps, and secured with bolt.	1.61	Bridge	**80800-16**
Pontiac V-8 67-81, 265-287-301-316-326-347-350-370-389-400-421-428-455	***Die-Formed Steel***		
Stock ratio, for use with bottleneck studs with 7/16" bottom and 3/8" top, includes spacer washers and 3/8" nuts.	1.50	7/16" BN	**28800-16**

Nitro-Carb Steel Rockers

For Race Use where Rules Require Stock Type Rockers
Crane Cams Nitro-Carb™ rockers offer 3 to 5 times greater resistance to wear, fatigue and fracture in high-stress areas. Available exclusively from Crane Cams, Nitro-Carb rockers eliminate pushrod cup and fulcrum failures with wear resistance and surface hardness properties that are similar to ceramics.

Nitro-Carb rockers deliver the most accurate ratios of any similar steel rockers. Nitro-Carb rockers are precision die-formed from heat treated steel. Most feature a long-slot design, and come complete with oil-groove pivot balls and adjusting nuts at no extra charge.

Crane Cams Nitro-Carb rockers are perfect for high valve spring pressure. Testing in-lab and on-track, (using Crane **99846-16**, XHTCS Tool Steel, stock diameter, 1.255" o.d. valve springs, 115 lb. seat, 350 lbs. open pressure) showed Crane Nitro-Carb rockers to be failure-free after enduring millions of running cycles.

Nitro-Carb rockers should be used anywhere rules require "stock type steel rockers". This includes NHRA Stock and IHRA Pure Stock Class drag racing applications plus oval track categories where stock-type rockers are required.



- *3 To 5 Times Stronger Than Stock-Type Steel Rockers*
- *Precision Die-Formed Steel*
- *Most Ratio-Accurate Available*
- *Small & Big-Block Chevy Applications*

Application	Part No.
Chevrolet 90° V-6 78-87, 200 thru 262	
1.5 ratio, extra long slot, 3/8" stud	**11801C-1** [c,d]
1.6 ratio, extra long slot, 3/8" stud	**11802C-1** [*c,d]
Chevrolet V-8 55-87, 262 thru 400	
1.5 ratio, extra long slot, 3/8" stud	**11801C-16** [c]
1.6 ratio, extra long slot, 3/8" stud (50 state legal, C.A.R.B. E.O. D-225-50)	**11802C-16** [*c]
Chevrolet V-8 88-99, 305 thru 350	
1.5 ratio, self aligning, 3/8" stud	**10800C-16** [e]
Chevrolet V-8 65-90, 396 thru 454	
1.7 ratio, long slot, 7/16" stud	**13801C-16** [f]

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

a 1991-00 454-502 Gen V and VI hydraulic cam engines require the installation of **99152-16** 7/16" rocker arm studs and factory pushrod guideplates (no machining required). Mechanical camshaft equipped engines require the installation of **99157-16** 7/16" rocker arm studs and **13650-1** pushrod guideplates (machining required).
b On 68-71 engines equipped with bottleneck studs, using **99768-16** positive locking nuts will permit valve adjustment. The 72-97 engines equipped with pedestal mount rocker arms can use our **36655-16** Conversion Kit for 3/8" pushrods (no machining required) for street applications.
c Non-self aligning, must be used with pushrod guideplate cylinder heads.
d Order in quantity of 12.
e For self-aligning applications only. Not for use with pushrod guideplates, or with cylinder head castings that guide the pushrod, as severe pushrod wear will occur. Not for LS1 series engines.
f 1992-00 Gen V and VI 454-502 engines require the installation of **99152-16** 7/16" rocker arm studs (no machining required) and factory pushrod guideplates.

Crane Cams Aluminum Rocker Arms

More Horsepower, Torque And Response In An Easy Bolt-On!

Crane Cams first introduced the racing world to aluminum rockers in 1964, and since then we've manufactured and sold more than seven million Crane aluminum rockers! From the beginning, our famous **Gold-Race™** aluminum rockers have been continually enhanced with design and engineering improvements as well as materials upgrades. Now many generations later, today's **Crane Classic, Energizer®, Gold-Race™, Pro Series** stud-mount, **Gold-Race™** shaft-mount or all-new **Quick-Lift™** rockers are absolutely the strongest, most ratio-accurate, most durable aluminum rockers made!

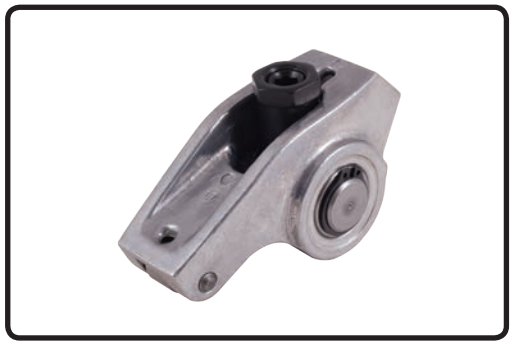
Crane aluminum rockers are preferred by professional racing engine builders and offer outstanding power and performance advantages for street applications. An easy "Saturday afternoon" installation project, bolting on a set of Crane aluminum rockers can add from 15 up to 30+ horsepower (with increased ratios), plus increase throttle response in a street performance engine. Crane aluminum rockers are so strong, durable and reliable that Ford Motor Company® selected our Crane Energizer® needle-bearing fulcrum, full-roller rockers for their Cobra V-8 production line engines. To further demonstrate their reliability, they carried the full Ford factory warranty coverage!

Crane Cams offers aluminum rocker arms for nearly all American V-8 and V-6 engines plus many inline four and six-cylinder applications. Stock, plus optional longer-than-stock ratios, are offered for most engines. Some applications also provide offset pushrod seats for use on aftermarket cylinder heads with non-stock port locations. All Crane Cams aluminum rockers come complete with a set of our own positive locking adjusting nuts, or adjusting screws, at no extra cost to you.





The Strongest, Lightest, Most Ratio-Accurate Aluminum Rockers





	Stud Mounted, Full-Roller Fulcrum, Roller Tip	
	Energizer®	***Gold-Race™***
Main Body Material	• Aerospace Quality, • Vacuum Die-Formed Casting Process	• Extruded Billet • Heat Treated
Manufacturing Method	• CNC Machined	• CNC Machined
Maximum Open Spring Pressure	• 450 lbs.	• 700 lbs. Std. • 900 lbs. Wide-Body
Fulcrum Design, Unique Features	• Precision Ground Steel Needle Bearings • Heat Treated Steel Roller Tips • Adjustable Lock Nuts Included	• Precision Ground Steel Needle Bearings • Heat Treated Steel Roller Tips • Adjustable Lock Nuts Included
Ideal Uses	• Hydraulic & Hydraulic Roller Lifter Equipped Engines • Street Performance • Bracket Drag Racing • Moderate Circle Track • Truck Performance	• Serious Street • Bracket Drag Racing • Circle Track Race • Truck Performance/Race • Marine Race or Pleasure Craft
Engine Applications	• Popular V-8 Engines	• Most V-8, 6 Cylinder Inline, V-6 & 4 Cylinder Engines

Energizer Rocker Arms

Die Formed Aluminum Body with Needle Bearing Fulcrum and Roller Tip

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.



Application	Ratio	Stud Dia.	Part No.
American Motors V-8 66-91, 290 thru 401			
Stock ratio and standard stud diameter	1.60	3/8″	**11746-16**[a]
Stock ratio with enlarged stud diameter	1.60	7/16″	**11747-16**[b]
Chevrolet 90° V-6 78-87, 200 thru 262			
Stock ratio and standard stud diameter	1.50	3/8″	**11744-12**[c]
Stock ratio with enlarged stud diameter	1.50	7/16″	**11745-12**[c]
Increased ratio with standard stud diameter	1.60	3/8″	**11746-12***[c]
Increased ratio with enlarged stud diameter	1.60	7/16″	**11747-12***[c]
Chevrolet V-8 55-87, 262 thru 400			
Stock ratio and standard stud diameter	1.50	3/8″	**11744-16**[c]
Stock ratio with enlarged stud diameter	1.50	7/16″	**11745-16**[c]
Increased ratio with standard stud diameter (50 state legal, C.A.R.B. E.O. D-225-50)	1.60	3/8″	**11746-16**[c]
Increased ratio with enlarged stud diameter (50 state legal, C.A.R.B. E.O. D-225-50)	1.60	7/16″	**11747-16**[c]
Chevrolet V-8 65-90, 396-402-427-454-502, also 91-00 454-502 Gen V and VI and 01-08 8.1 Litre			
Stock ratio and standard stud diameter	1.70	7/16″	**13744-16**[d]
Chrysler-Dodge-Plymouth 92-00, "Magnum" 318 (5.2L), 360 (5.9L) (except Magnum R/T)			
Stock ratio, must use Crane's stud conversion kit with guideplates (**36655-16**), and pushrods (**36668-16**), to convert from the stock pedestal rocker arm to this adjustable stud mount design. (Optional heat treated pushrods available, part no. **36621-16**.) Stock valve covers must be modified or spaced upward approximately 3/8″ to avoid interference	1.60	3/8″	**11746-16**
Ford V-8 62-00, 221-255-260-289-302-351W			
Stock ratio and standard stud diameter	1.60	3/8″	**11746-16**[e]
Stock ratio with enlarged stud diameter	1.60	7/16″	**11747-16**[f]
Ford V-8 77-00, 255-302, 5.0L H.O. and 351W			
Increased ratio, pedestal mount type for 77-00 cylinder heads, non-adjustable, secured with 5/16″ bolt. For hydraulic lifter, and hydraulic roller cam applications only.	1.70	5/16″ Bolt	**44746-16**[g]
Ford V-8 69-82, Boss 302, Boss 351, 351C-351M-400			
Stock ratio and standard Boss stud diameter	1.72	7/16″	**27744-16**[h]
Ford V-8 68-97, 370-429-460			
Stock ratio and standard Cobra Jet stud diameter	1.72	7/16″	**27744-16**[i]
Oldsmobile V-8 67-91, 260-307-350-400-403-425-455 cu.in.			
Increased ratio for 3/8" straight studs	1.65	3/8″	**80744-16***[j]
Pontiac V-8 67-81, 265 thru 455 with Straight 7/16″ Rocker Arm Studs			
Increased ratio with enlarged stud diameter.	1.65	7/16″	**28747-16***[k]

a Must machine 74-91 cylinder heads and install **99156-16** 3/8″ rocker arm studs and aftermarket pushrod guideplates. Special order heat treated pushrods are required for use with guideplates.

b Must machine 66-91 cylinder heads and install **99157-16** 7/16″ rocker arm studs and aftermarket pushrod guideplates. Special order heat treated pushrods are required for use with guideplates.

c The 1988-99 engines equipped with self-aligning rocker arms require the installation of pushrod guideplates (and **99157-16** 7/16″ rocker arm studs, if applicable) and appropriate heat treated pushrods in order for these rocker arms to function properly. Valve cover clearance must also be checked. Not suitable for use with center-bolt valve covers.

d The 1991-2000 Gen V & VI engines require the installation of **99152-16** 7/16″ rocker arm studs (no machining required) & factory pushrod guideplates. For applications w/ over 480 pounds open valve spring pressure, the cylinder heads must be machined for the installation of **99157-16** 7/16″ rocker arm studs & **13650-1** pushrod guideplates. The 2001-2008 8.1L engines require the installation of **99155-16** 7/16″ rocker arm studs (no machining required) & factory pushrod guideplates.

e Must machine 66-00 cylinder heads and install **99156-16** 3/8″ rocker arm studs and **36650-1** pushrod guideplates (heat treated pushrods required), or use **36655-16** Conversion Kit (no machining required) on 77-00 pedestal mount cylinder heads for street applications.

f Must machine 66-00 cylinder heads and install **99157-16** 7/16″ rocker arm studs and **36650-1** pushrod guideplates (heat treated pushrods required).

g Includes Rocker Arm Pedestal Shim Kit **99170-1**.

h The 351C-351M-400 engines equipped with pedestal mount rocker arms require the use of **52655-16** Conversion Kit (no machining required) for street applications.

i On 68-71 engines equipped with bottleneck studs, install **99159-16** straight 7/16″ studs to permit valve adjustment. The 72-97 engines equipped with pedestal mount rocker arms can use our **35655-16** Conversion Kit for 3/8″ pushrods (no machining required) for street applications.

j Must machine cylinder heads and install **99156-16** 3/8″ rocker arm studs and aftermarket pushrod guideplates (special length heat treated pushrods required).

k On engines not equipped with 7/16″ rocker arm studs, cylinder head machining is required for the installation of **99157-16** 7/16″ rocker arm studs.

NOTE:
Energizer rocker arms are recommended for hydraulic lifter and hydraulic roller camshaft equipped engines only. Energizer rocker arms with 11 and 44 prefix part numbers will accept a maximum valve spring dia. of 1.500″ and maximum spring pressure of 500 lbs. Energizer rockers with 13, 28, and 80 prefix part numbers will accept a maximum valve spring diameter of 1.550″ and 500 lbs. maximum spring pressure.

Crane Cams Aluminum Rocker Arms

More Horsepower, Torque And Response In An Easy Bolt-On!

Crane Cams first introduced the racing world to aluminum rockers in 1964, and since then we've manufactured and sold more than seven million Crane aluminum rockers! From the beginning, our famous **Gold-Race™** aluminum rockers have been continually enhanced with design and engineering improvements as well as materials upgrades. Now many generations later, today's **Crane Classic, Energizer®, Gold-Race™, Pro Series** stud-mount, **Gold-Race™** shaft-mount or all-new **Quick-Lift™** rockers are absolutely the strongest, most ratio-accurate, most durable aluminum rockers made!

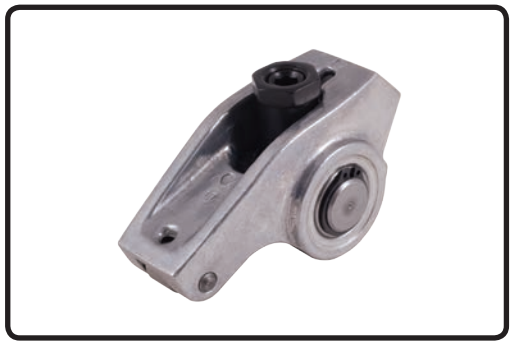
Crane aluminum rockers are preferred by professional racing engine builders and offer outstanding power and performance advantages for street applications. An easy "Saturday afternoon" installation project, bolting on a set of Crane aluminum rockers can add from 15 up to 30+ horsepower (with increased ratios), plus increase throttle response in a street performance engine. Crane aluminum rockers are so strong, durable and reliable that Ford Motor Company® selected our Crane Energizer® needle-bearing fulcrum, full-roller rockers for their Cobra V-8 production line engines. To further demonstrate their reliability, they carried the full Ford factory warranty coverage!

Crane Cams offers aluminum rocker arms for nearly all American V-8 and V-6 engines plus many inline four and six-cylinder applications. Stock, plus optional longer-than-stock ratios, are offered for most engines. Some applications also provide offset pushrod seats for use on aftermarket cylinder heads with non-stock port locations. All Crane Cams aluminum rockers come complete with a set of our own positive locking adjusting nuts, or adjusting screws, at no extra cost to you.





The Strongest, Lightest, Most Ratio-Accurate Aluminum Rockers





	Stud Mounted, Full-Roller Fulcrum, Roller Tip	
	Energizer®	***Gold-Race™***
Main Body Material	• Aerospace Quality, • Vacuum Die-Formed Casting Process	• Extruded Billet • Heat Treated
Manufacturing Method	• CNC Machined	• CNC Machined
Maximum Open Spring Pressure	• 450 lbs.	• 700 lbs. Std. • 900 lbs. Wide-Body
Fulcrum Design, Unique Features	• Precision Ground Steel Needle Bearings • Heat Treated Steel Roller Tips • Adjustable Lock Nuts Included	• Precision Ground Steel Needle Bearings • Heat Treated Steel Roller Tips • Adjustable Lock Nuts Included
Ideal Uses	• Hydraulic & Hydraulic Roller Lifter Equipped Engines • Street Performance • Bracket Drag Racing • Moderate Circle Track • Truck Performance	• Serious Street • Bracket Drag Racing • Circle Track Race • Truck Performance/Race • Marine Race or Pleasure Craft
Engine Applications	• Popular V-8 Engines	• Most V-8, 6 Cylinder Inline, V-6 & 4 Cylinder Engines

Gold Race Extruded Rocker Arms

Crane Cams' needle-bearing fulcrum, roller-tip, extruded aluminum rocker arms have been racing's most popular aluminum rockers since their introduction in 1964.

Now, over seven million rockers later, the nation's leading racers and engine builders know they can trust the strength, ratio accuracy, quality, and reliability of Crane's famous gold anodized, aluminum rockers.

Custom ratios, offsets, and stud sizes available. Contact Crane's Performance Consultants for details.



Application	Ratio	Stud Dia.	Part No.
American Motors V-8 66-91, 290-304-343-360 (5.9L)-390-401 cu.in.			
Stock ratio and standard stud diameter	1.60	3/8"	**36750-16**[a]
Stock ratio with enlarged stud diameter	1.60	7/16"	**86757-16**[b]
Increased ratio with enlarged stud diameter	1.70	7/16"	**36757-16***[b]
Chevrolet I-6 62-84, 194-230-250-292 cu.in.			
Stock ratio and standard stud diameter	1.70	3/8"	**20750-12**[c]
Stock ratio with enlarged stud diameter	1.70	7/16"	**13750-12**[c]
Chevrolet 60° V-6 80-94, 173 (2.8L) and 189 (3.1L) cu.in.	***Non-Self Aligning, Narrow Body Rocker Arms***		
Stock ratio with special stud diameter	1.50	3/8"	**25750-12**[d]
Increased ratio with special stud diameter	1.60	3/8"	**25759-12***[d]
Chevrolet 90° V-6 78-86, 200-229 (3.8L) and 262 (4.3L) and Chevrolet V-8 55-87, 262-267-283-302-305 (5.0L)-307-327-350 (5.0L)-400 cu.in.	***Non-Self Aligning Rocker Arms***		
Stock ratio and standard stud diameter	1.50	3/8"	**11750-16**
Stock ratio with enlarged stud diameter, clears 1.630" O.D. springs	1.50	7/16"	**11752-16**
Stock ratio with enlarged stud diameter, clears 1.630" O.D. springs, new "Wide Body" design for severe usage applications	1.50	7/16"	**11771-16**
Increased ratio and standard stud diameter (50 state legal, C.A.R.B. E.O. D-225-50)	1.60	3/8"	**11759-16**
Increased ratio with enlarged stud diameter, clears 1.630" O.D. springs (50 state legal, C.A.R.B. E.O. D-225-50)	1.60	7/16"	**11755-16**
Increased ratio with enlarged stud diameter, clears 1.630" O.D. springs, new "Wide Body" design for severe usage applications	1.60	7/16"	**11772-16**
Eight each of 1.5 (**11750**) and 1.6 (**11759**) ratio, with standard stud diameter (50 state legal, C.A.R.B. E.O. D-225-50)	1.5/1.6	3/8"	**11748-16**
Increased ratio and standard stud diameter	1.7	3/8"	**70759-16***
Chevrolet 90° V-6 87-91, 262 (4.3L) Chevrolet V-8 88-99, 305 (5.0L)-350 (5.7L) cu.in.	***Non-Self Aligning, Narrow Body Rocker Arms For Center Bolt Valve Covers***		
Stock ratio and standard stud diameter	1.50	3/8"	**10750-16**[e]
Increased ratio and standard stud diameter (50 state legal, C.A.R.B. E.O. D-225-50)	1.60	3/8"	**10759-16**[e]
	Self Aligning, Narrow Body Rocker Arms For Center Bolt Valve Covers		
Stock ratio and standard stud diameter (cannot be used with a mechanical lifter cam)	1.50	3/8"	**10751-16**[f]
Increased ratio and standard stud diameter (cannot be used with a mechanical lifter cam) (50 state legal, C.A.R.B. E.O. D-225-50)	1.60	3/8"	**10758-16**[f]
Increased ratio and standard stud diameter with limited lift travel (.550" maximum) and certified ratio for crate motor rules applications. (Non-anodized)	1.60	3/8"	**10756-16***[f]

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

Section Continued

a Must machine 74-91 cylinder heads and install **99156-16** 3/8" rocker arm studs and aftermarket pushrod guideplates. Special order heat treated pushrods are required for use with guideplates.

b Must machine 66-91 cylinder heads and install **99157-16** 7/16" rocker arm studs and aftermarket pushrod guideplates. Special order heat treated pushrods are required for use with guideplates.

c Requires **20622-12** pushrods for 194-230-250 engines.

d For inline valve cylinder heads. Set includes special 10mm x 1.50 bottom x 3/8" x 24 top rocker arm studs (**99148-12**), no machining required. Check valve covers and intake manifold for clearance throughout the lift cycle.

e The 1988-99 engines equipped with self-aligning rocker arms require the installation of pushrod guideplates (and **99156-16** rocker arm studs, if applicable) and appropriate heat treated pushrods in order for these rocker arms to function properly. Valve cover clearance must also be checked in late model applications.

f For use in self-aligning applications. Do not use with pushrod guideplates or with cylinder head castings that guide the pushrods, as severe pushrod wear will occur. Not for use in LS1 type engines.

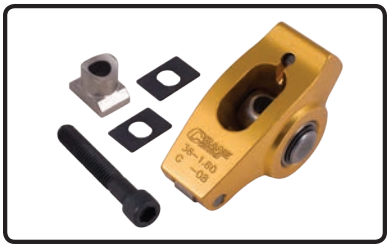
Aluminum Roller Rockers, Gold Race Extruded—Stud Mount

Gold Race Extruded Rocker Arms

Application	Ratio	Stud Dia.	Part No.
Chevrolet V-8 58-65, 348-409-427 (Z-11)			
Stock ratio and standard stud diameter	1.70	3/8"	**15750-16**
Stock ratio and enlarged stud diameter	1.70	7/16"	**13750-16**
Chevrolet V-8 65-90, 396-402-427-454-502 also 91-00, 454-502 Gen V and VI and 01-08 8.1 Litre			
Reduced ratio and standard stud diameter	1.65	7/16"	**13759-16**[b]
Stock ratio and standard stud diameter	1.70	7/16"	**13750-16**[b]
Stock ratio and standard stud diameter, new "Wide Body" design for severe usage applications	1.70	7/16"	**13763TR-16**[b]
Increased ratio and standard stud diameter (50 state legal, C.A.R.B. E.O. D-225-50)	1.80	7/16"	**13755-16**[b]
Chrysler-Dodge-Plymouth V-8 92-00, "Magnum" 318 (5.2L), 360 (5.9L) cu.in. (except Magnum R/T)			
Stock ratio, must use Crane's Rocker Arm Stud Conversion Kit, part no. **36655-16**, and pushrods, part no. **36668-16**, to convert from the stock pedestal rocker arm to this adjustable stud mount design. (Optional heat treated pushrods available, part no. **36621-16**.) Stock valve covers must be modified, or spaced upward approximately 3/8" to avoid interference.	1.60	3/8"	**11759-16**
Increased ratio, must use Crane's Rocker Arm Stud Conversion Kit, **36655-16** and pushrods, **36668-16** to convert from the stock pedestal rocker arm to this adjustable stud mount design (Optional heat-treated pushrods available **36621-16**) Stock valve covers must be modified, or spaced upward approximately 3/8" to avoid interference.	1.70	3/8"	**70759-16***



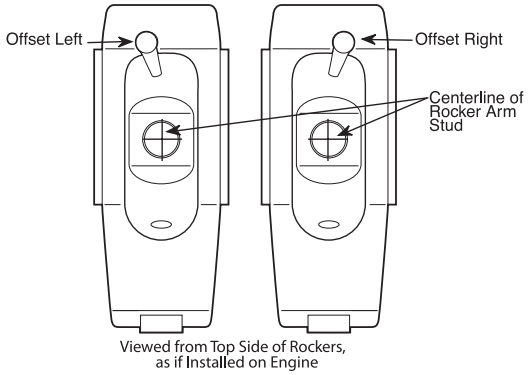
Narrow-body, self-aligning, extruded aluminum Gold Race rocker for late-model small-block Chevy, 88-99, 5.0-5.7L (except LS1 type applications), using center-bolt valve covers.



Extruded Gold Race rocker for Ford 289-302-351W-5.0L H.O., non-adjustable, 1.7 ratio. Uses stock-type 5/16" bolt. For hydraulic and hyd. roller cams only.

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

IDENTIFYING CRANE GOLD RACE ROCKER PUSHROD SEAT OFFSETS



Gold Race Extruded Rocker Arms

Application	Ratio	Stud Dia.	Part No.
Ford V-8 62-00, 221-260-289-302-351W cu.in. (And 5.0L H.O.)			
Stock ratio and standard stud diameter	1.60	3/8″	**36750-16**[d]
Stock ratio pedestal mount type for 77-00 cylinder heads, non-adjustable, secured with 5/16″ bolt. For hydraulic lifter and hydraulic roller cam applications only.	1.60	5/16″ Bolt	**36759-16**[e]
Stock ratio with enlarged stud diameter	1.60	7/16″	**86757-16**[f]
Increased ratio pedestal mount type for 77-00 cylinder heads, non-adjustable, secured w/ 5/16″ bolt. For hydraulic lifter and hydraulic roller cam applications only.	1.70	5/16″ Bolt	**36758-16**[e]
Increased ratio with enlarged stud diameter (50 state legal, C.A.R.B. E.O. D-225-17)	1.70	7/16″	**36757-16**[f]
Ford V-8 62-00, 221-260-289-302-351W and 302 SVO/302 Boss/351SVO blocks equipped with M-6049-N351 Sportsman cylinder heads			
Stock ratio with enlarged stud diameter, exhaust	1.60	7/16"	**86757-1**
NOTE: (These rocker arms are listed and sold individually)			
Ford V-8 351W and BOSS 351 Ford Racing blocks equipped with Dart Pro 1 cylinder heads			
Reduced ratio with enlarged diameter, and certified ratio for crate motor rules applications (Non-anodized)	1.50	7/16″	**44755-16**
Ford V-8 351W and BOSS 351 Ford Racing blocks equipped with Ford Racing Z304 cylinder heads			
Reduced ratio with enlarged diameter, .150″ right offset intake, and certified ratio for crate motor rules applications (Non-anodized)	1.50	7/16″	**44756-16**
Ford V-8 69-82, 351C-351M-400, Boss 302 and 351 cu.in.			
Reduced ratio and standard Boss stud diameter	1.60	7/16"	**27757-16**[g]
Reduced ratio and standard Boss stud diameter	1.65	7/16″	**27759-16**[g]
Stock ratio and standard Boss stud diameter	1.73	7/16″	**27750-16**[g]
Stock ratio and standard Boss stud diameter, new "Wide Body" design for severe usage applications	1.73	7/16″	**27771-16**[g]
Ford V-8 68-97, 370-429-460 cu.in.			
Reduced ratio and standard Cobra Jet stud diameter	1.60	7/16″	**27757-16**[h]
Reduced ratio and standard Cobra Jet stud diameter	1.65	7/16″	**27759-16**[h]
Stock ratio and standard Cobra Jet stud diameter	1.73	7/16″	**27750-16**[h]
Stock ratio and standard Cobra Jet stud diameter, new "Wide Body" design for severe usage applications	1.73	7/16″	**27771-16**[h]
Oldsmobile V-8 67-91, 260-307-350-400-403-425-455 cu.in.			
Stock ratio with enlarged stud diameter	1.60	7/16″	**80757-16**[i]
Increased ratio, with enlarged stud diameter	1.70	7/16″	**36757-16**
Pontiac V-8 67-81, 265-287-301-316-326-347-350-389-400-421-428-455 cu.in.			
Increased ratio for 7/16″ straight studs	1.65	7/16″	**28758-16**[*c]

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

b The 1991-2000 Gen V and VI engines require the installation of **99152-16** 7/16″ rocker arm studs (no machining required) and factory pushrod guideplates. For applications with over 480 pounds open valve spring pressure, the cylinder heads must be machined for the installation of **99157-16** 7/16″ rocker arm studs and **13650-1** pushrod guideplates. The 2001-2008 8.1L engines require the installation of **99155-16** 7/16″ rocker arm studs (no machining required) and factory pushrod guideplates.

c Must machine cylinder head and install **99157-16** 7/16″ rocker arm studs.

d Must machine 66-00 cylinder heads and install **99156-16** 3/8″ rocker arm studs and **36650-1** pushrod guideplates (heat treated pushrods required), or use **36655-16** Conversion Kit (no machining required) on 77-00 pedestal mount cylinder heads for street applications.

e Includes Rocker Arm Pedestal Shim Kit **99170-1**.

f Must machine 66-00 cylinder heads and install **99157-16** 7/16″ rocker arm studs and **36650-1** pushrod guideplates (heat treated pushrods required).

g The 351C-351M-400 engines equipped with pedestal mount rocker arms require the use of our **52655-16** Conversion Kit (no machining required) for street applications.

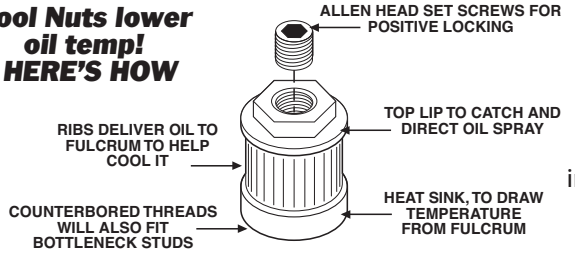
h On 68-71 engines equipped with bottleneck studs, install **99159-16** straight 7/16″ studs to permit valve adjustment. The 72-97 engines equipped with pedestal mount rocker arms can use our **35655-16** Conversion Kit for 3/8″ pushrods (no machining required) for street applications.

i Must machine cylinder heads and install **99157-16** 7/16″ rocker arm studs and aftermarket pushrod guideplates (special length heat treated pushrods required).

Steel Rocker Arm Adjusting Nuts, "Kool Nuts™"

Crane's locknuts for stamped steel rocker arms are available in self-locking type standard configurations, and in our patented ***Kool Nut™*** oil deflection design. These direct the pressure-fed oil flow to the pivot ball-rocker arm interface, resulting in superior lubrication and cooling this critical area.

Kool Nuts lower oil temp! HERE'S HOW



in



Stud Dia. & Thread	Description	Part No.
5/16"-24	Self locking	**99772-16**
3/8"-24	Self locking	**99770-16**
3/8"-24	***Kool Nuts™*** with oil deflector for improved cooling and lubrication. Counterbored on bottom to also fit bottleneck studs	**99768-16**
7/16"-20	Self locking	**99771-16**
7/16"-20	***Kool Nuts™*** with oil deflector for improved cooling and lubrication. Counterbored on bottom to also fit bottleneck studs	**99769-16**

Shaft-Type Rocker Arm Adjusting Screws

Crane shaft-type rocker arm adjusting screws are precision machined from premium steel billet material and selectively hardened to provide maximum strength. These screws are extremely lightweight and drilled for oiling when necessary.





Stud Dia. & Thread	Ball/Cup Diameter	Description	Part No.
3/8"-24	5/16" ball	Chrysler V-8 "LA", "B", and 426 Hemi, with locknut	**99802-16**
3/8"-24	5/16" cup	For Sportsman Series shaft mount rocker arms and Ford FE V8 332 through 428 with **34791-1** rocker arm set	**99785-16**
3/8"-24	5/16" cup	For Pro Series shaft mount rocker arms	**99785-16**
3/8"-24	3/8" ball	Chrysler V-8 "LA", "B", and 426 Hemi, with locknut (For severe duty applications, special pushrods required)	**99780-16**
7/16"-20	5/16" ball	Chrysler V-8 "LA", "B", and 426 Hemi, with locknut (For repair or ratio modification of rocker arms)	**66770AS-16**
7/16"-20	3/8" ball	Ford V-8 332 thru 428, with locknut, for **34772-16** ductile iron rocker arms	**99680-16**

Rocker Arm Adjusting Nuts

Crane locknuts for Crane's roller-tip, needle bearing aluminum rocker arms feature highest quality metal bar stock, precision machined on our own automatic screw machines and heat treated in house for maximum strength and durability. Each Crane locknut comes complete with an Allen-head set screw for positive jam nut operation.

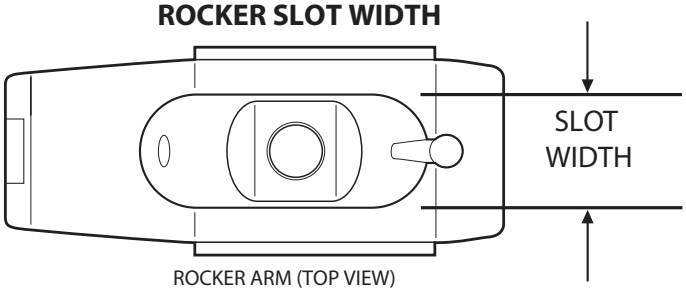
NOTE: Since mid-1985, most Crane Gold Race stud mount extruded rocker arms (except narrow body versions) and Crane Classic rocker arms have had a .600" wide top slot. Crane Energizer stud mount rocker arms have a .570" wide top slot.





Stud Diameter & Thread	Minimum Rocker Slot Width	Aluminum Rocker Adjusting Nut Part No.	Overall Height	VTS Bar (Stud Girdle) Adjusting Nut Part No.	Overall Height
3/8"-24	.550"	**99788-16**	1.063"	**99803-8**	2.013"
3/8"-24	.550"	**99795-16**	.860"		
		(For center bolt valve cover applications)			
3/8"-24	.600"	**99764-2**	.700"		
		(For Crane Chevrolet LS1 rocker arm kit)			
3/8"-24	.600"	**99793-16**	1.063"		
7/16"-20	.550"	**99790-16**	.922"		
7/16"-20	.550"			**99805-8**	2.512"
				(For Chevrolet V-8 396 thru 454 intake)	
7/16"-20	.600"	**99792-16**	.969"	**99810-8**	2.013"
7/16"-20	.600"			**99809-8**	2.637"
				(For Chevrolet V-8 396 thru 454 intake)	

HOW TO IDENTIFY ROCKER SLOT WIDTH



ROCKER ARM (TOP VIEW)

Rocker Arm Shim Kits

Rocker Arm Bridge Shim Kit

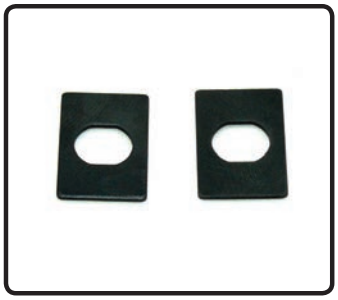
Crane's Rocker Arm Bridge Shim Kit will correct for excessive hydraulic lifter preload on late model American Motors V-8's, and I-6's, and Oldsmobile V-8's with the bridge mounted rocker arm assemblies. This kit will also work on the later model Pontiac 151 I-4's with shoulder bolt mounted rocker arms. Two different thickness shims are included to decrease lifter preload by approximately .030", .060" or .090" depending on the combination of shims being used between the bridge and the cylinder head. Excessive preload may be caused by a camshaft change, valve job, head resurfacing, etc. These shims can be a quick and easy alternative to resorting to different length pushrods.



Description	Part No.
Kit of 32 Rocker Arm Bridge Shims	99179-1

Rocker Arm Pedestal Shim Kit

Crane's Rocker Arm Pedestal Shim Kit is for use on Ford engines utilizing non-adjustable pedestal mounted rocker arms. The hydraulic lifters in these engines may have excessive preload due to a camshaft change, valve job, head resurfacing, etc. To cure this problem, without resorting to different pushrods, we offer this pedestal shim kit containing two different thickness shims. These shims are placed between the rocker arm pedestal and the cylinder head, and will reduce the preload by approximately .030", .060", or .090". These will fit the Ford V-8, 255-302, 302 H.O., 351W, 351C, 351M, 400, and 370-429-460 engines.



Description	Part No.
Kit of 32 Rocker Arm Pedestal Shims	99170-1

Needle Bearing Roller Fulcrum Conversion Kit

Crane Cams' drop-in needle bearing fulcrum conversion kit for Ford pedestal-mount rocker arms enables you to retrofit standard non-adjustable rockers with fully rollerized fulcrum assemblies. This eliminates the greatest source of friction in the rocker arm, resulting in less wasted horsepower, lower oil temperatures, greater strength and load carrying abilities, greater vacuum at a given RPM, and better fuel economy. This kit is intended for use with hydraulic lifter and hydraulic roller camshaft applications only.

All hardware is included: New heat treated fulcrums; needle bearing assemblies and hardened hold-down bolts. Pedestal shim kit also included to enable you to optimize hydraulic lifter preload for best performance and reliability. No machining required.

These will fit all pedestal mount factory rocker arms for Ford V-8 engines: 77-00 255 and 302, 77-97 351W, 70-82 351C, 351M, 400, 73-97 370-429-460. Rocker arms NOT included.

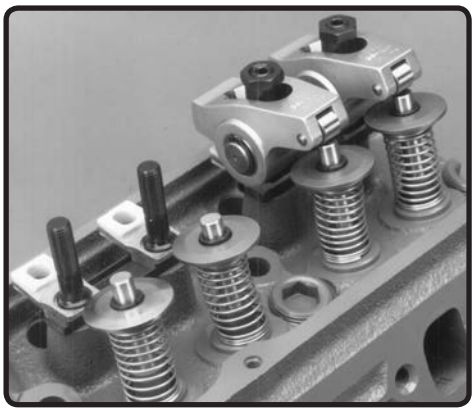


Application	Part No.
Complete drop-in assembly.	36806-16

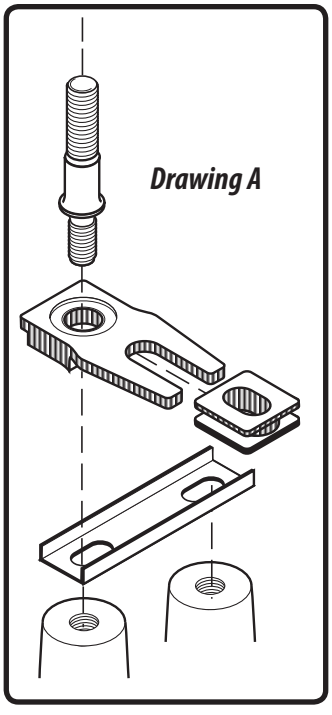
Rocker Arm Guideplate Conversion Kits

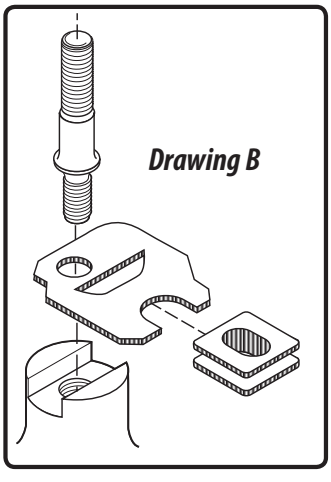
Converts Pedestal-Mount Dodge and Ford Cylinder Heads to Adjustable Rocker Arms

Crane Cams' rocker arm stud/pushrod guideplate conversion kits enable you to convert late-model Dodge and Ford V-8 engines with pedestal mount rocker arms to an adjustable-type valve train ***without machine work or cylinder head removal***. These kits allow standard pushrods to be retained, in most instances, as the guideplate uses a special composite insert that prevents metal-to-metal contact. Each kit includes guideplates, guideplate inserts, studs, stud installation nut, and complete instructions. *(Rocker arms, adjusting nuts, and pushrods are not included.)* These kits are intended for mild performance applications using hydraulic lifter or hydraulic roller cams, and are *not recommended for competition usage*.



Description	Part No.
Dodge 92-02, Magnum V-8 318 (5.2L) and 360 (5.9L) engines with 5/16"-18 threaded stud bosses. Must use **11746-16** or **11759-16** aluminum rocker arms for 3/8" rocker arm studs and 5/16" dia. **36621-16** (heat treated) pushrods.	**36655-16** (Drawing A)
Dodge 92-02, Magnum V-8 318 (5.2L) and 360 (5.9L) engines with 5/16"-18 threaded stud bosses. Must use **11747-16** or **11755-16** aluminum rocker arms for 7/16" rocker arm studs and 5/16" dia. **36621-16** (heat treated) pushrods.	**36656-16** (Drawing A)
Dodge Aluminum Magnum and Crate Motor cylinder heads with 3/8"-16 threaded stud bosses. Must use **11746-16** or **11759-16** aluminum rocker arms for 3/8" rocker arm studs and 5/16" dia. **36621-16** (heat treated) pushrods.	**70655-16** (Drawing A)
Ford V-8 77-00, 255-302, 302 H.O., 351W engines. Will accept 3/8" stud die-formed steel or Crane aluminum rocker arms and 5/16" diameter pushrods.	**36655-16** (Drawing A)
Ford V-8 77-00, 255-302, 302 H.O., 351W engines. Will accept 7/16" stud Crane aluminum rocker arms and 5/16" diameter pushrods.	**36656-16** (Drawing A)
Ford V-8 70-82, 351C, 351M, 400, and Ford V-8 72-97, 370-429-460 engines. Will accept 7/16" stud die-formed steel or Crane aluminum rocker arms and 5/16" dia. pushrods.	**52655-16** (Drawing B)
Ford V-8 72-97, 370, 429, 460 Engines. Will accept 7/16" stud die-formed steel or Crane aluminum rocker arms and 3/8" diameter pushrods.	**35655-16** (Drawing B)
Replacement guideplate insert for 5/16" diameter pushrods (included in kits)	**52655GB-16**
Replacement guideplate insert for 3/8" diameter pushrods (included in kits)	**35655GB-16**





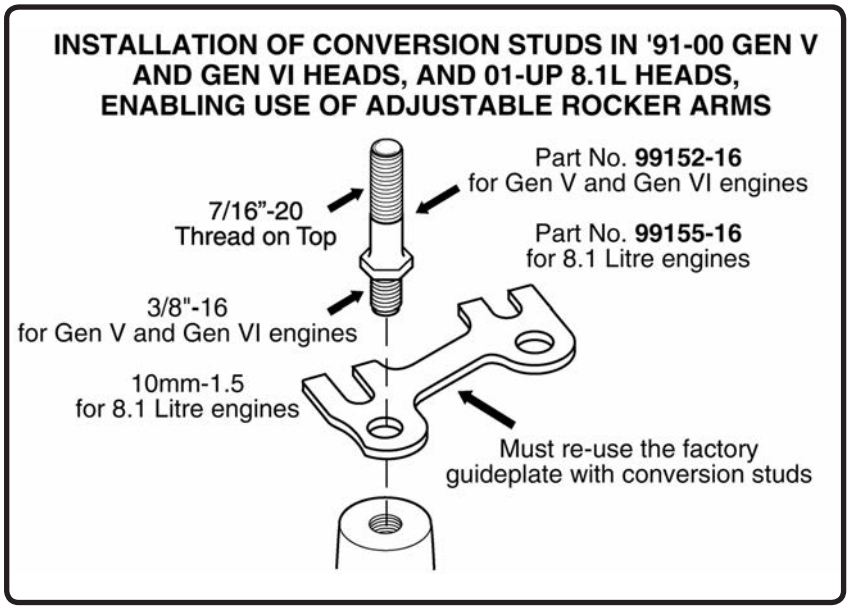
Rocker Arm Conversion Stud Kits for Big-Block Chevy Gen V & VI V-8, 454-502 cu.in. and 8.1 Litre V-8

Converts Non-Adjustable Chevrolet Gen V & VI 454-502 and 8.1L V-8 Engines to Adjustable Rocker Arms

Chevrolet's 1991-00 Gen V and VI, 454-502 and 01-08 8.1 litre big-block V-8 engines offer great performance potential but are handicapped by their non-adjustable, self-aligning rocker arms and valve train. In stock form this system works great, but for performance applications or any instance where an aftermarket camshaft and valve train are called for, the answer is "no way"!

Now Crane Cams offers an ingenious, simple, easy and low-cost way to convert these non-adjustable valve train engines to the obvious performance advantages of high strength, screw-in rocker studs, pushrod guideplates, and die-formed steel rockers or roller fulcrum, aluminum rocker arms.

These are unique rocker arm studs that replace the stock studs without retapping, machining or removal of the cylinder heads.





For the Gen V and VI, rocker arm stud kit **99152-16** is made with a 3/8" diameter bottom thread that bolts directly into the stock rocker bolt location. On top is a 7/16" threaded stud end that allows you to install any adjustable Chevy big-block rocker directly onto the stud. Factory pushrod guideplates must be used to correctly align the pushrods. You can use part no. **13634-16** heat treated pushrods or 3/8" diameter stock pushrods from any big-block Chevy V-8 equipped with adjustable rockers.

The Crane **99152-16** "big-and-small" studs are not recommended for use in competition applications, or with valve spring open pressures over 480 lbs. For those applications use **99157-16** 7/16" x 7/16" studs (you must drill and re-tap new threads in the heads) and **13650-1** guideplates.

For the 2001-08 8.1 litre engines, rocker arm stud kit **99155-16** incorporates a 10mm-1.5 bottom thread that bolts into the stock rocker stand location. The 7/16"-20 top thread again allows you to use any adjustable Chevy big-block rocker. Our **26640-16** Pro Series one piece heavy wall heat treated pushrods are recommended for proper valve train geometry.

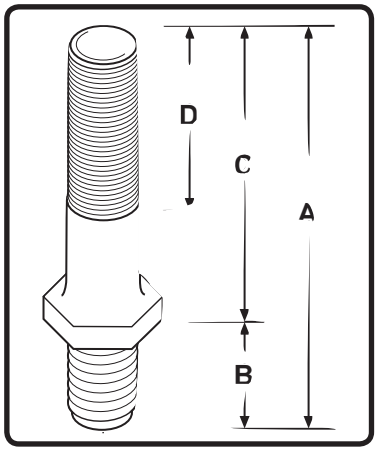
Application	Part No.
Chevrolet V-8 91-00, 454 and 502 Gen V and Gen VI Engines	**99152-16**
Chevrolet V-8 01-08, 8.1 Litre Engines	**99155-16**

Rocker Arm Studs

Crane's screw-in rocker arm studs eliminate problems resulting from press-in studs pulling out at high RPM and in high valve spring pressure applications. Made from high quality alloy steel, Crane studs are precision machined and heat treated for reliable operation with today's valve train loading. Specially machined threads and shoulder area assures firm and positive rocker arm support with minimum movement or distortion.

The **99148** studs are used to convert Chevrolet 60° V-6 80-94, 2.8-3.1L engines with non-self aligning 10mm stud rocker arms to use adjustable narrow body 3/8" stud rocker arms without cylinder head machining.





Top Stud Diameter & Thread	Bottom Stud Diameter & Thread	Dim. A	Dim. B	Dim. C	Dim. D	Part No.
3/8" -24	5/16"-18	2.313	.813	1.500	.875	**99146-16**
3/8" -24	3/8"-16	2.313	.813	1.500	.875	**99145-16**
3/8" -24	10mm-1.5	2.384	.813	1.572	.582	**99148-16**
3/8" -24	7/16" -14	2.396	.700	1.750	.806	**99156-16**
7/16" -20	5/16" -18	2.313	.813	1.500	.875	**99147-16**
7/16" -20	7/16" -14	2.560	.800	1.760	.860	**99157-16**
7/16" -20	3/8" -16	2.650	.750	1.900	1.000	**99152-16**
(Conversion stud for Chevrolet Gen V and VI, must use factory guideplates, not recommended for applications with over 480 pounds open valve spring pressure, no machining required.)						
7/16" -20	10mm-1.5	2.650	.750	1.900	1.000	**99155-16**
(Conversion stud for Chevrolet 8.1 litre V-8, must use factory guideplates, no machining required.)						
7/16" -20	7/16" -14	2.670	.740	1.930	1.060	**99159-16**

Pro Series Rocker Arm Studs

Crane Cams professional quality, Pro-Series rocker arm studs feature an extra large radii for reduced stud flex, even with today's extreme valve spring pressures and high rpm racing engine operating levels. Our Pro-Series rocker studs are precision manufactured from 190,000 P.S.I. strength alloy steel material with rolled threads, and precise top-to-bottom concentricity. These are state-of-the-art items designed and priced for those seeking the highest quality parts available. The **99151** stud has a longer than normal unthreaded portion in the top section, providing superior support and stability for the rocker arm fulcrum.

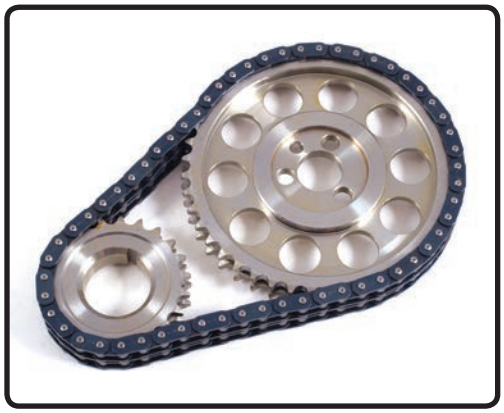


Top Stud Diameter & Thread	Bottom Stud Diameter & Thread	Dim. A	Dim. B	Dim. C	Dim. D	Part No.
3/8"-24	8mm-1.25	2.157	.720	1.437	.625	**99154-16**
3/8" -24	8mm-1.25	2.360	.615	1.745	.800	**99158-16**
7/16" -20	7/16" -14	2.650	.750	1.900	1.000	**99153-16**
7/16" -20	7/16" -14	2.700	.800	1.900	.800	**99151-16**

Performance Steel Billet, CNC Machined, Roller Timing Chain Sets

Crane Performance Steel Billet Gear and Roller Chain Sets offer the precision, strength and accuracy of billet steel, CNC machined camshaft and crankshaft sprockets with the strength, friction reduction and wear resistance of a double-row, roller timing chain. Most kits include a seven keyway crank sprocket for easy degreeing of your camshaft. Where applicable, most sets are machined for, and include, a thrust shim.

Note: Due to the increased width of the sprockets and chain, clearance must be checked between the timing set and the block casting. Some applications may require minor grinding of the block for clearance.

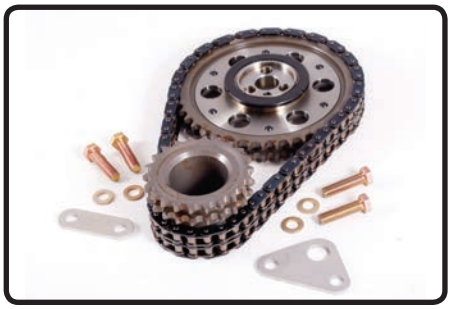


Application	Set Part No.
Chevrolet 90° V-6 78-86, 200 thru 262 cu. in. and Chevrolet V-8 55-87, 262 thru 400 cu. in.	
	11975-1*
Chevrolet 90° V-6 78-86, 200 thru 262 cu. in. and Chevrolet V-8 55-87, 262 thru 400 cu. in. with thrust bearing	
	11976-1*
Chevrolet V-8 87-91, 305 and 350 cu. in. with Factory Hydraulic Roller Camshaft	
Complete set with multiple keyway crank sprocket and captured needle bearing thrust washer.	**10975-1***
Chevrolet V-8 65-95, 396-402-427-454-502 cu. in. (including Gen V)	
(**NOTE:** Does not fit Gen VI or 8.1L)	**13975-1***
Chrysler Hemi V-8 51–56, 301-331-354 cu. in. and 57–58 392 cu. in.	
	69975-1*
Chrysler-Dodge-Plymouth "LA" V-8 64-93, 273-340-360 cu. in. and 67-91, 318 cu. in.	
	69975-1*
Chrysler-Dodge Magnum V8 92-02, 5.2-5.9 litre	
	69975-1*
Chrysler-Dodge-Plymouth "B" V-8 70-78, 383 thru 440 cu. in. (Three bolt), and Chrysler-Dodge-Plymouth V-8 66-71, 426 Hemi	
	68975-1*
Ford V-8 73-01, 255 (4.2 L)-302-302 H.O-351W	
	44975-1*
Ford V-8 69-82, 351C-351M-400 cu. in.	
	52975-1*
Ford V-8 68-97, 370-429-460 cu. in.	
	35975-1*
Oldsmobile V-8 64-84, 260-307-330-350-400-403-425-455 cu. in.	
	80975-1*
Pontiac V-8 55-81, 265 thru 455 cu. in.	
	28975-1*

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

Pro-Series Steel Billet, CNC Machined, Roller Timing Chain Sets

Crane Cams' Pro-Series Steel Billet Gear and Roller Chain Sets offer the precision, strength and accuracy of billet steel, nitride hardened, CNC machined camshaft and crankshaft sprockets with the strength, friction reduction and wear resistance of a premium quality, German manufactured, double-row, roller timing chain. The billet 4140 steel nitride hardened crankshaft sprocket features nine separate keyway locations, providing up to eight degrees of advance or retard.



Application	Set Part No.
American Motors V-8 66-91, 290 thru 401 cu. in.	
Complete set with multiple keyway crank sprocket and captured needle bearing thrust washer.	**86977-1***
Chevrolet 90° V-6 78-86, 200 thru 262 cu.in. and Chevrolet V-8 55-87, 262 thru 400 cu.in.	
Complete set with multiple keyway crank sprocket and machined to fit supplied thrust washer.	**11984-1***
Replacement Chain	**11978-1**
Replacement Thrust Washer (.031")	**11984TW-1**
Replacement Thrust Washer (.150")	**11984TWT-1**
Complete set with multiple keyway crank sprocket and captured needle bearing thrust washer	**11977-1***
Replacement Chain	**11978-1**
Chevrolet LS1/LS6 V-8 97-15, 5.7 Litre and Vortec 4800, 5300, 6000 (will not fit LS2)	
Complete set with steel billet gears and double roller chain, plus all attaching hardware. Cam sprocket has vernier adjustment. No cam sensor triggers.	**144984-1***
Chevrolet LS2 (early) V-8 6.0L	
Complete set with steel billet gears and double roller chain with thrust bearing. Cam sprocket has single trigger cam sensor feature. Crank sprocket has 9 keyways.	**144985-1***
Chevrolet LS2 (late), LS3, LS7, and L92 V-8 6.0-6.2-7.0L Three Bolt	
Complete set with steel billet gears and double roller chain with thrust bearing. Cam sprocket has four trigger cam sensor feature. Crank sprocket has 9 keyways.	**144986-1***
Chevrolet V-8 65-95, 396 thru 454 & 502 cu.in. (including Gen V)	
Complete set with multiple keyway crank sprocket and machined to fit supplied thrust washer. (**NOTE:** Does not fit Gen VI or 8.1L)	**13984-1***
Replacement Chain	**13978-1**
Replacement Thrust Washer (.031")	**13984TW-1**
Chevrolet V-8 65-95, 396 thru 454 & 502 cu.in. (including Gen V)	
Complete set with multiple keyway crank sprocket and captured needle bearing thrust washer. (**NOTE:** Does not fit Gen VI or 8.1L)	**13977-1***
Replacement Chain	**13978-1**
Chevrolet V-8 96-00, 454 (7.4L) - 502 (8.2L) Gen VI	
Complete set with multiple keyway crank sprocket and captured needle bearing thrust washer.	**16977-1***
Chevrolet V-8 01-08, 8.1L L18 (Vortec 8100)	
Complete set with multiple keyway crank sprocket and captured needle bearing thrust washer.	**26977-1***
Chrysler-Dodge-Plymouth "B" 70-78, 383 thru 440 cu. in. (Three bolt), and Chrysler-Dodge-Plymouth V-8 66-71, 426 Hemi	
Complete set with multiple keyway crank sprocket and captured needle bearing thrust washer.	**68977-1***
Ford V-8 73-01, 255 (4.2L), 302, 302 H.O., 351W, 351 SVO	
Complete set with multiple keyway crank sprocket and machined to fit supplied thrust washer.	**44984-1***
Replacement Chain	**11978-1**

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

NOTE: **Due to the increased width of the sprockets and chain, clearance must be checked between the timing set and the block casting. Some applications may require minor grinding of the block for clearance.**

Cam Degreeing "Tune-A-Cam" Kit

Everything you need to quickly, easily and accurately degree-in your camshaft for maximum performance. Complete kit contains: precision dial indicator, with custom design base to mount to cylinder head, piston stop, pointer, checking springs, degree wheel and instructions —all in a hard molded plastic carrying case.

Description	Part No.
Tune-A-Cam Kit (Complete Kit)	99030-1



Checking Spring

(Low Tension Valve Spring)
This low tension spring can be compressed with a single finger. It is to be used when "mocking-up" a cylinder head with a pair of valves and retainers, for checking such things as: valve lift, valve to piston clearance, and degreeing a cam at the retainer.

Description	Part No.
Pair of Low Tension Valve Train Checking Springs	99881-2



Cylinder Pressurization Kit

When changing the valve springs on an assembled engine while using one of our exclusive valve spring compressors, or performing other maintenance that requires your cylinders to be pressurized, this convenient kit provides a quick and economical method to accomplish this. The kit contains a premium quality hose, having an o-ringed 14mm and 18mm threaded adaptor at one end to thread into the spark plug hole, while the other end has a female ¼" NPT threaded brass fitting to receive your choice of quick-disconnect adaptors. There's also a long 14mm threaded adaptor for aluminum heads, to provide better sealing and providing superior thread engagement.

Description	Part No.
Cylinder Pressurization Kit for cylinder heads having 14 and 18mm spark plugs	99474-1



Degree Wheel

Crane's degree wheels are made from rigid, durable stamped steel, 9½" in diameter, and come with adapter inserts for 7/16", 1/2", and 5/8" center holes.

Description	Part No.
Degree Wheel with Adapters	99162-1



Piston Stop

(Top Dead Center Locator)
Provide a positive stop for the piston when locating true TDC (Top Dead Center), for camshaft degreeing. Made to screw directly into the cylinder head spark plug hole. Machined from brass to prevent piston damage, and incorporating an air bleed hold to prevent compression build-up while turning the engine over.

Description	Part No.
TDC Piston Stop—14mm thread	99412-1

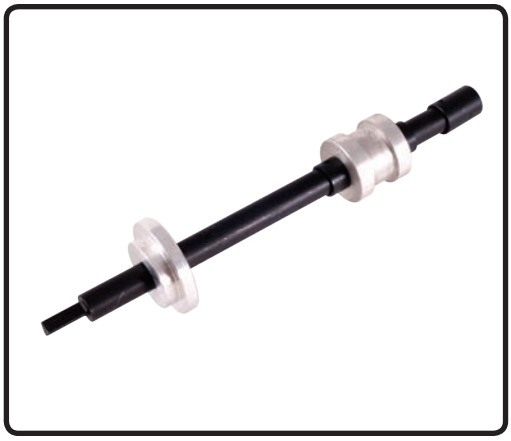


Pushrods, Adjustable Checking - See page 290

Oil Pump Primer

Successful engine builders know that externally priming the oiling system of a new engine eliminates dangerous "dry" initial start-up! Our Chevrolet oil pump primer tool features a special bushing that seals the oil galley and completely primes and pressurizes the entire engine oil system. All models feature an upper collar that also prevents oil pump drive side-loading. Use your heavy duty 3/8" drive drill motor to build oil pressure and uniformly distribute oil throughout the engine for initial start-up.

Application	Part No.
Chevrolet V-8, 262 thru 400, 396 thru 454, and 90° V-6	**99010-1**
Ford V-8, 221 thru 302, Boss 302, (1/4" hex)	**99012-1**



Organizer Tray for Valve Train

Lightweight tray accepts a wide range of rockers, pushrods, adjusting nuts, lifters and spark plugs. Integral handholds make handling easier. Resistant to heat, oils and solvents.

Description	Part No.
Valve Train Organizer Tray	**99015-1**



Valve Spring Compressors

For Small Block Chevrolet Models to fit all production small block V-8 and V-6 engines – including late model LS1/LS2/ LS6 & Vortec

This handy tool is designed for removing valve springs while the cylinder head is attached to the engine. This facilitates the installation of new valve springs in substantially less time than it takes using a conventional valve spring compressor. In fact, it reduces the spring removal and replacement time on F-body cars to one-quarter of the time required for other tools. Use a ratchet or impact wrench to compress the springs. The rugged heat-treated steel fixtures are precision CNC-machined to assure proper seating on the cylinder head & valve spring retainer.

Application	Part No.
1957-96 Chevrolet 262-400 V-8, including LT1/LT4 and Chevrolet 200-229-4.3L 90° V-6	**99473-1**
1997-up Chevrolet LS1/LS2/LS6 5.7L V-8 and Vortec 4800, 5300, 6000 V-8	**99472-1**
Chevrolet L92/LS3 cylinder heads for LS-series V-8	**99475-1**



Valve Spring Height Micrometer

Rotating the tool expands it to simulate installed height. The micrometer measurements make it extremely easy to read. The tool will measure from 1.600" to 2.100" installed height with an accuracy of .001".

Description	Part No.
Height Micrometer 1.600-2.100"	**99019-1**



Valve Spring Seat Machining Tool Bodies

These carbide-tipped tools machine the valve spring seat to the precise diameter and depth for high performance spring applications. Crane Machining Tool Arbors are required to pilot these tools in the valve stem bore.

Application	Part No.
Machines 1.320" O.D., .630" I.D.	**99404-1**
Machines 1.475" O.D., .630" I.D.	**99403-1**
Machines 1.570" O.D., .630" I.D.	**99406-1**
Machines 1.638" O.D., .630" I.D.	**99405-1**
Machines 1.760" O.D., .630" I.D.	**99414-1**



Valve Spring Seat Machining Tool Arbors

These arbors accurately pilot the Valve Spring Seat Machining Tools by locating in the valve stem bore.

Application	Part No.
Use with 5/16" valve stems	**99026-1**
Use with 11/32" valve stems	**99027-1**
Use with 3/8" valve stems	**99028-1**
Use with 8mm valve stems	**99025-1**



Adjustable Vacuum Advance Kits

Now you can actually tailor your ignition system to meet a wide variety of driving conditions and requirements with these unique, easy-to-install adjustable vacuum advance kits. Comes complete with adjustable vacuum canister, featuring the unique adjustable vacuum diaphragm, three sets of advance weight springs, and a 3/32" allen wrench, plus complete instructions for installation and operation.

The adjustability provided by these kits permits you to run the maximum ignition advance throughout the RPM range, without encountering detonation. Improved performance, efficiency, and dependability are the major benefits obtained. Once the kit is installed, you can also quickly compensate for changes in fuel quality and altitude.



Application	Part No.
Delco Point Type (Includes Limiter Plate)	99601-1*
Ford V-8 73-85 with Electronic Ignition (without computer controls)	99607-1*
G.M. H.E.I. (Includes Limiter Plate)	99600-1*

Vacuum Timing Limiter Plate

Here's an easy-to-install item that allows you to limit the amount of vacuum timing needed for certain engine/vehicle applications using the Crane Adjustable Vacuum Kit.

With Crane's Adjustable Vacuum Advance Kits, the adjustment made through the vacuum port of the cannister adjusts the rate of vacuum timing change as engine vacuum changes.

The Crane Vacuum Timing Limiter plate actually changes the amount of that vacuum timing. This is especially helpful with applications such as high compression ratio engines, heavy engine loads (such as very low numerical rear axle gearing) or heavy vehicle weights such as motor homes, trucks with trailers, etc..

Each plate notch will shorten the amount of vacuum timing by 2°. It will also advance the initial timing to 2° because of the change in the starting position of the breaker plate or magnetic pick up.



Application	Part No.
Vacuum Timing Limiter Plate — for GM/Delco V-8 point-type and H.E.I. ignition distributors	99619-1*

Vacuum Reserve System

Is That "Big Cam" Giving Your Vacuum Assisted Power Brakes And Other Accessories Problems? Our Original Vacuum Reserve System Delivers Needed Vacuum Storage!

This unique kit allows you to store needed vacuum to operate your vacuum assisted power brakes, even with a more radical camshaft! Crane's Vacuum Reserve System utilizes a one-way check valve that stores engine vacuum until it's needed . . . like when you apply the brakes and your engine can't supply the needed vacuum! Compactly sized at just 5" x 7", this unit can be installed in tight areas. Comes complete with all hardware. Power brake hose not included.



Application	Part No.
Vacuum Reserve System, Complete Kit including Fittings	99590-1

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

About Valve Springs

Valve Springs . . . Hardly An "Open & Shut" Subject!

Valve springs are at least as important as any other major performance component in an engine; yet, they are probably the most misunderstood and neglected. Incorrect or worn valve springs cause conditions that are often misdiagnosed as fuel or ignition problems. When all of the fuel and ignition system components have been replaced; and the "gremlins" are still in the engine, chances are the valve springs are either set up at the wrong tension, worn out, or just the wrong spring for the cam profile. This last factor is often the most puzzling, yet offers the greatest chance for significant improvements in engine performance.

Due to their highly stressed design (valve springs are coiled from specially heat-treated, super-clean, super-sophisticated alloys of steel), valve springs have several critical characteristics that are generally called "resonant frequency" or "natural harmonics". These are similar to those of a lead crystal goblet. By sounding a specific frequency musical note, the goblet will shatter. An undampened valve spring run at steady speed at its natural frequency will either self-destruct or lose enough of its strength and tension that it can no longer properly control the valve action.

At Crane, we design springs to maximize the performance of Crane Cams. In doing so, we put the resonant frequency outside of the intended operating range of the spring. This is not always the case, especially with springs produced by the OE manufacturers for production vehicles.

For years, especially before onboard computers, valve springs were used as "rev-limiters" to help the OE manufacturers in their efforts to minimize warranty problems caused by over-enthusiastic drivers. These springs usually had a resonant frequency located somewhere in the 4400-5200 RPM range. When a vehicle was accelerated, the engine would rev through the low end and mid-range perfectly until the engine speed hit somewhere in the 4400-5200 RPM range. Then it would either just stop pulling or the engine would start misfiring badly. This was typically diagnosed as a fuel or ignition problem when, in actuality, it was the factory's valve spring resonant frequency helping protect the engine.

A good set of valve springs, even on an otherwise stock engine, will usually provide a significant performance improvement throughout the RPM range as well as a marked improvement in fuel economy, smoother idle, improved cold start, and better cold weather drivability.

What is most important is selecting a valve spring with the correct seat pressure, open pressure, and spring rate for the camshaft in the engine. At Crane Cams, we constantly test and evaluate various cam lobe profiles vs. spring combinations, so that we can give you the right spring recommendations for your cam. However, with over 80,000 profiles in our camshaft lobe library and over 60 different valve springs in our catalog, it is impossible for us (or any company) to test every possible combination. Because of this, we offer guidelines on how to select springs for custom applications (special valve stem lengths, weights, etc.). It is in this area of the unknown or untested that the greatest opportunities exist of finding your own special combination that yields a power and performance increase beyond your competitors.

What we're talking about is virtually free HP just for choosing the right springs!

If you have purchased a cam (Crane or another brand), and it doesn't seem to perform to your expectations, it is quite likely a different valve spring might be able to make an improvement (It could also be a problem with pushrod stiffness and/or rocker arm geometry.) If you are pushing the envelope in any area of motorsports competition, it is necessary to constantly evaluate various combinations of engine components. Frequently, racers ignore the effects of the valve springs on the dynamics of the valve train. By experimenting with various valve spring combinations you will probably find the most power for your money and/or time. In addition, you just might cure that "fuel system" or "ignition system" problem you thought you had!



Valve Spring Rate and How to Use It

The rate of a spring is the force necessary to compress (or deflect) the spring a specified distance. For example, if we say that a spring has a rate of 250 lbs. per inch (250#/in.), it will take 250 pounds of force to compress the spring 1 inch. Fortunately, valve springs are coil springs, and coil springs are easy to understand because they have an almost linear spring rate. In other words, if it takes 400 lbs. to compress a spring 1 inch, it only takes 100 lbs. to compress the spring .250 in., 200 lbs. to compress it .500 in., and 300 lbs. to compress it .750 in. Some people refer to spring rate as "stiffness", and it is the understanding of this spring characteristic that is most important in selecting and setting up springs on an automotive cylinder head.

Frequently a taller, softer spring is a better choice for a performance application than a short, stiff spring.

Consider the following possibility:
A vehicle owner wants to use a .520" valve lift camshaft in an application and is considering different valve springs.

Spring A has an installed pressure of 125# at 1.750" installed height and has a rate of 280#/in.

Spring B has an installed pressure of 115# at 1.750" installed height with a rate of 410#/in.

At .520" lift, **Spring A** has an open pressure of 271# (this is 125# of seat pressure plus [.520" x 280#/in] = 146# from spring compression). At .520" lift, **Spring B** has an open pressure of 328# (this is 115# of seat pressure plus [.520" x 410#/in] = 213# from spring compression). Both of these springs would work on a street performance application requiring good performance and reliability. However, **Spring A** with a lower open pressure of 271# could probably be used on a cylinder head with pressed in rocker studs; while **Spring B** would definitely require screw in studs for adequate reliability. **Spring B** would probably provide better performance above 6000 RPM (especially with relatively heavy valves) because of its higher open pressure of 328#. **Spring A** would probably idle a little smoother with higher vacuum, especially if a high pressure oil pump or thicker oil is used. This is a result of **Spring A**'s higher seat pressure of 125#.

As you can see from the example above, there are often different springs that can offer different benefits on the same cam profile. **Spring A** offers good performance over a wide RPM range at a lower total valve train cost (this assumes that the heads were not machined for screw in studs). **Spring B** offers the possibility of somewhat improved performance beyond 6000 RPM. The vehicle owner needs to decide what he wants from his vehicle and what he wants to spend.

In all-out racing, we frequently see the need for different springs on the same lobe profile depending on the anticipated RPM range. Frequently, circle track racers will run two different tracks with the same engine but with different rear end gearing. Often there can be as much as 500-700 RPM difference in the top end engine speed between the two tracks. It is not uncommon to find that the car runs better on the track with the lower peak RPM using a spring with a lower seat pressure and softer rate. At the track where the engine runs to the higher speed, the engine needs more seat pressure and a stiffer spring rate. Every combination of engine, chassis, and track is different. Significant performance improvements can often be achieved by experimenting with valve springs. If you aren't paying attention to your springs, the guy winning most of the races probably is!

Choosing Valve Springs

How to Select a Valve Spring

With the many choices of aftermarket cylinder heads, most with longer-than-stock length valves, the recommendation of a specific spring for a specific cam is almost impossible. It is now necessary to select the spring that will best fit the cylinder head configuration. We offer the following as general guidelines only:

1) "FLAT FACED LIFTER" cam/lifter applications (Street & Street/Strip) seat pressures

a. Small Block: 105-125# Seat Pressure
b. Big Block: 115-130# Seat Pressure (Note: Big Block applications need higher seat pressures due to their larger, heavier valves.)

2) "FLAT FACED LIFTER" Open pressures should not exceed 330# open pressure (sustained after spring break-in for acceptable cam and lifter life.

a. Open pressures should be a minimum of 220# for applications up to 4000 RPM.
b. For good performance above 4000, open pressures should be at least 260# with stock weight valves. (Lightweight valves require less spring open pressure.)
c. Spring open pressures over 280# can cause pressed-in studs to come loose; therefore, we recommend screw-in studs for open pressures above 280#.

3) HYDRAULIC ROLLER CAMS require higher spring seat pressures to control the heavier roller tappets and the more aggressive opening and closing rates available to roller cam profiles.

a. Small Block applications: 120-145# seat pressure
b. Big Block applications: 130-165# seat pressure

4) HYDRAULIC ROLLER CAMS use higher open pressures to control the high vertical opening inertia of the heavier roller followers.

a. Small Block applications need at least 260# for general driving applications up to 4000 RPM.
b. Moderate performance small block applications like 300-360# open.
c. Serious small block applications can tolerate 400-425#* open pressures and still expect reasonable valve train life when top quality springs, pushrods, and lubricants are used.
d. Big Block applications need at least 280# for general driving applications up to 4000 RPM.
e. Moderate performance big block applications like 325-375# open pressure.
f. Serious big block performance applications can tolerate 450#* open pressure and still expect reasonable valve train life when top quality springs, pushrods, and lubricants are used.

*Note: Open pressures in excess of 360# require the use of roller tappet bodies made of billet steel. Crane hydraulic roller and solid roller tappets are made from heat treated steel billet to withstand the stresses of high-performance use. Most stock hydraulic roller tappet bodies are made of cast iron and cannot tolerate high spring loads.

5) MECHANICAL ROLLER CAM/LIFTER

Applications are generally for serious street/strip use and full competition. Most are not used in daily-drivers where day-to-day reliability is stressed. Instead, most of these cams are intended for winning performance. These cams are designed with very aggressive opening and closing rates. High seat pressures are necessary to keep the valves from bouncing when they come back to the seat. In all cases, the valve action and spring pressures required mandate the use of high-strength, one-piece valves. However, Crane does offer the SR-Series of Street Roller camshafts intended for daily usage.

a. **Seat Pressures** are determined by valve/retainer weight, engine RPM and life expectancy of components before replacement is required. Milder roller cams require 165# on the seat as an absolute minimum. 180-200# is common for most modest performance applications. 220-250# is common for most serious sport categories and some circle track professional categories. Pro-Stock and Blown Alcohol/Fuel drag applications use as much as 340-500# on the seat.

b. **Open Pressures** need to be high enough to control the valve train as the lifter goes over the nose of the cam. Ideally, the minimum amount of open pressure to eliminate or minimize valve train separation is desired. Any excess open pressure only contributes to pushrod flex, which can aggravate valve train separation. For serious racing applications this can be determined only by experimentation and track testing. For general guidelines we offer the following
   i. Street/Strip performance with long cam/lifter life desirable, 350-450# open.
   ii. Circle track and moderate bracket racing 450-600@ open.
   iii. Serious drag racing and limited distance circle track racing 600# and more.

Single Valve Springs

O.D	I.D.	Damper	Seat Press.	Open Press.	Coil Bind	Rate (lbs/in.)	Max Net Lift	Application	Part No.
1.000	0.730	No	62 lbs @1.475	130 @ 1.025	0.910	151 lbs/in.	0.475	Ford Duratec 1.8 – 2.3 litre DOHC 4V 4 cyl. included in **903-2007** valve spring and retainer kit.	**96845-16**
Top: 0.930 Bottom: 1.025	0.567 0.662	No	90 lbs @1.470	252 @ .970	0.900	324 lbs/in.	0.500	Ford Modular 4.6 – 5.4 litre DOHC 4V V-8 beehive, ovate wire.	**40830-32**
1.065	0.725	No	60 lbs @1.535	255 lbs @ 1.063	0.987	413 lbs/in.	0.500	Chrysler/Dodge Neon DOHC I-4	**180830-16**
1.065	0.725	No	85 lbs @1.535	244 lbs @ 1.135	1.014	398 lbs/in.	0.470	Chrysler/Dodge Neon SOHC I-4	**158830-16**
Top: 0.967 Bottom: 1.096	0.636 0.765	No	85 lbs @1.640	250 @ 1.040	1.000	275 lbs/in.	0.620	Ford 4.6-5.4L 2 valve & 3 valve V-8 beehive, ovate wire.	**37830-16**
1.255	0.870	Yes	114 lbs @1.700	340 @ 1.200	1.153	432 lbs/in.	0.487	Small Block Chevy Street/Strip: RV/Truck Power. Stock dia spring for 1.700" installed ht. .480" max recommended valve lift.	**99848-16**
1.255	0.870	No	124 lbs @1.750	374 @ 1.150	1.100	409 lbs/in.	0.640	Late Model LT-1 w/aluminum heads; LS1 or other alum. heads w/1.770-1.820" inst. hts. **XHTCS**	**99845-16**
1.255	0.870	Yes	125 lbs @ 1.800	383 @ 1.200	1.100	428 lbs/in.	0.640	SB Chevy apps. up to .600" valve lift with stock spring seats. Flat tappets install @ 1.800"; hyd rlr install @ 1.750-1.800" **XHTCS**	**99846-16**
1.260	0.876	Yes	107 lbs @ 1.800	348 @ 1.200	1.110	395 lbs/in.	0.600	SB Chevy hyd rlr w/1.750" installed ht. SB Chevy flat tappet w/1.770-1.800" inst. ht.	**96802-16**
1.265	0.775	Yes	125 lbs @ 1.750	388 @ 1.250	1.100	526 lbs/in.	0.600	SB Chevy Performance hydraulic roller cams, PAC enhanced wire	**144846-16**
Top: 1.055 Bottom: 1.290	0.650 0.885	No	130 lbs @ 1.800	318 @ 1.200	1.140	313 lbs/in.	0.600	LS1/LS2 Performance hydraulic roller cams beehive, ovate wire.	**99831-16**
1.435	1.035	Yes	107 lbs @ 1.700	317 @ 1.150	1.037	330 lbs/in.	0.600	Various Ford 302-351W V-8's, Ford 300 6cyl, Mopar 360's and Olds 350/400/455	**96803-16**
1.437	1.077	Yes	104 lbs @ 1.750	229 @ 1.150	1.069	204 lbs/in.	0.620	Ford V-8 RV and mild street appls. Used w/**96840, 96842, 96843** for various hyd roller and flat tappet street/strip and bracket apps.	**96806-16**
1.440	1.040	No	98 lbs @ 1.700	260 @ 1.200	1.080	328 lbs/in.	0.560	AMC 6cyl; SB Ford; Olds V-8's; Street/Strip, RV/Truck Power applications.	**99833-16**
Top: 1.095 Bottom: 1.445	0.650 1.000	No	155 lbs @ 1.880	377 @ 1.280	1.210	370 lbs/in.	0.650	Big Block Chevy and FE Ford, beehive ovate wire.	**99832-16**
Top: 1.295 Bottom: 1.450	0.859 1.014	No	118 lbs @ 1.950	375 @ 1.380	1.320	457 lbs/in.	0.580	Ford 5.0/351W Street/Strip, RV/Truck Power, Beehive	**99841-16**
1.460	1.060	Yes	110 lbs @ 1.550	303 @ 1.100	0.935	442 lbs/in.	0.605	Many Pontiac V-8 Street/Strip applications	**99840-16**
1.460	1.060	Yes	114 lbs @ 1.800	287 @ 1.250	1.139	310 lbs/in.	0.600	Ford V-8's w/1.770-1.850" installed hts. Used w/**96840** and **96842** for High Perf hyd rlrs and solid flat tappet cams.	**96801-16**
1.500	1.086	Yes	113 lbs @ 1.600	280 @ 1.150	1.000	412 lbs/in.	0.565	SB Chrysler; Street/Strip; RV/Truck Power	**99835-16**
1.500	1.086	Yes	121 lbs @ 1.800	298 @ 1.300	1.130	354 lbs/in.	0.660	AMC V-8; BB Chevy w/1.880" installed ht: Street/Strip, RV/Truck Power.	**99839-16**
1.539	1.125	Yes	129 lbs @ 1.950	358 @ 1.200	1.130	312 lbs/in.	0.700	BB Chevy and BB Chrysler hyd rlr and High Perf flat tappet cams. Use +.050" keepers. Used with **96843**, **96844** inners for several mech roller cams.	**96807-16**

Inner Valve Springs

The Inner Springs shown below are available separately for "Mix-and-Match" Dual Spring Combinations using "96" part number prefix single valve springs. See specific "96" Dual Springs for correct components. These Inner Springs are not recommended for use with "99" prefix springs. Sold in sets of 16.

0.937	0.697	No	29 lbs @ 1.600	90 @ 1.000	0.925	96 lbs/in.	0.615	For use with **96801, 96806,** Outer Valve Springs	**96842-16**
0.953	0.697	No	54 lbs @ 1.500	130 @ 1.000	0.916	132 lbs/in.	0.500	For use with **96806, 96807,** Outer Valve Springs	**96843-16**
0.970	0.700	No	51 lbs @ 1.750	134 @ 1.150	1.014	135 lbs/in.	0.676	For use with **96801, 96806** Outer Valve Springs	**96840-16**
1.015	0.731	No	57 lbs @ 1.800	160 @ 1.150	1.045	155 lbs/in.	0.650	For use with **96807** Outer Valve Springs	**96844-16**

Valve Springs

O.D	I.D.1	I.D.2	Damper	Seat Press.	Open Press.	Coil Bind	Max Net Lift w /.060" clearance	Rate (lbs/in.)	Application	Part No.
Dual Valve Springs										
1.212	0.900	0.674	No	93 lbs @ 1.550	266 @ .950	0.865	0.625	290 lbs/in.	Buick V-6 & Buick 350 V-8	**99891-16**
1.218	0.906	0.680	No	91 lbs @ 1.300	220 @ .900	0.783	0.457	337 lbs/in.	Early Ford 2.0L SOHC & VW liquid cooled	**99879-8**
1.297	0.667	0.917	No	148 lbs @ 1.800	413 @ 1.150	1.060	0.660	408 lbs/in.	LS Performance hydraulic roller camshafts.	**144838-16**
1.298	0.664	0.914	No	151 lbs @ 1.800	461 @ 1.150	1.080	0.680	477 lbs/in.	LS Performance hydraulic roller camshafts, XHTCS material.	**144847-16**
1.304	0.980	0.754	No	96 lbs @ 1.650	230 @ 1.150	0.927	0.663	215 lbs/in.	Nissan 4 cyl; Ford 2.3L SOHC	**99884-8**
1.344	1.000	0.730	No	107 lbs @ 1.820	274 @ 1.300	1.057	0.703	334 lbs/in.	Small Block Chevy 87-91 L98 and Fast Burn alum. heads w/hydraulic roller cams	**96887-16**
1.437	1.080	0.697	Yes	134 lbs @ 1.750	283 @ 1.250	1.185	0.600	296 lbs/in.	Several SB Chevy, SB Ford flat tappet and hyd rlr apps. **(96806 outer/96842 inner)**	**96873-16**
1.437	1.080	0.697	Yes	128 lbs @ 1.800	328 @ 1.200	1.115	0.625	322 lbs/in.	Various hyd rlr & flat tappet street perf. & mild bracket racing. **(96806 outer/96843 inner)**	**96874-16**
1.437	1.080	0.700	Yes	131 lbs @ 1.850	345 @ 1.200	1.110	0.680	326 lbs/in.	SB Chevy & SB Ford hyd rlrs and flat tappet bracket racing w/long valves or tall assy hts. **(96806 outer/96840 inner)**	**96872-16**
1.449	1.075	0.794	No	120 lbs @ 1.875	394 @ 1.175	1.035	0.625	392 lbs/in.	Hydraulic and mechanical flat faced lifter camshafts, mild hydraulic roller camshafts.	**99892-16**
1.460	1.060	0.697	Yes	126 lbs @ 1.850	366 @ 1.250	1.175	0.615	404 lbs/in.	BB Ford and BB Chrysler hyd rlr and flat tappet street/strip use. **(96801 outer/96842 inner)**	**96877-16**
1.460	1.075	0.803	No	130 lbs @ 1.850	402 @ 1.150	1.080	0.710	391 lbs/in.	BB Chevy, BB Ford, BB Chrysler premium RV/ Truck Power applications. Flat tappet racing use.	**99893-16**
1.460	1.060	0.700	Yes	134 lbs @ 1.900	424 @ 1.250	1.154	0.686	448 lbs/in.	High perf hydraulic rollers; Sportsman flat tappet racing, moderate perf solid rollers **(96801 outer/96840 inner)**	**96870-16**
1.465	1.091	0.807	No	112 lbs @ 1.650	336 @ 1.100	0.950	0.690	438 lbs/in.	AMC 6 cyl, Buick V-8's, many perf cams with short assy hts requiring high lifts and moderate spring rate	**99838-16**
1.500	1.050	0.726	No	300 lbs @ 2.100	1002 @ 1.200	1.130	0.900	780 lbs/in.	Small diameter, low mass, all-out race, Nano-Peened™, Pacaloy wire.	**961356-16**
1.500	1.050	0.726	No	420 lbs @ 2.175	1200 @ 1.175	1.130	1.000	780 lbs/in.	Small diameter, low mass, high lift drag race, Nano-Peened™, Pacaloy wire.	**961355-16**
1.522	1.050	0.726	No	400 lbs @ 2.250	1252 @ 1.300	1.190	0.950	895 lbs/in.	Small diameter, low mass, all-out race, Nano-Peened™, Pacaloy wire.	**961360-16**
1.530	1.116	0.766	Yes	131 lbs @ 1.900	410 @ 1.250	1.160	0.630	428 lbs/in.	BB Chevy hyd and solid flat tappet racing; BBC, BB Ford, & Ford 351/400 hyd rlr cams	**99890-16**
1.539	1.125	0.697	Yes	160 lbs @ 1.900	424 @ 1.300	1.145	0.700	444 lbs/in.	BB Chevy and BB Chrysler solid street rollers or hyd rlrs w/+.050" taller inst. ht. **(96807 outer/96843 inner)**	**96879-16**
1.539	1.125	0.731	Yes	200 lbs @ 1.900	508 @ 1.250	1.152	0.680	480 lbs/in.	Various solid rlr applications for Pro Street & bracket use **(96807 outer/96844 inner)**	**96878-16**
1.540	1.140	0.754	Yes	144 lbs @ 1.900	403 @ 1.300	1.175	0.665	434 lbs/in.	Various Big Block hyd rlr applications	**99895-16**
1.540	1.140	0.760	Yes	150 lbs @ 1.900	560 @ 1.150	1.135	0.755	528 lbs/in.	Various Big Block hyd rlr apps. Harmonics optimized for sustained high RPM marine use. Solid flat tappets with tall assembly hts.	**99896-16**
1.540	1.115	0.729	Yes	224 lbs @ 1.950	638 @ 1.200	1.130	0.760	544 lbs/in.	Professional roller cam race applications Electro-Polished	**96883-16**
1.550	1.100	0.706	Yes	275 lbs @ 2.000	805 @ 1.200	1.150	0.800	663 lbs/in.	Various Small and Big Block roller camshafts, drag racing	**961226-16**
1.550	1.100	0.788	No	250 lbs @ 2.000	765 @ 1.200	1.150	0.800	644 lbs/in.	High rate dual spring for aggressive valve train. Premium circle track, Nano-Peened™, PAC enhanced wire.	**961325-16**
1.550	1.100	0.706	Yes	275 lbs @ 2.000	805 @ 1.200	1.150	0.800	662 lbs/in.	High rate dual spring with damper for aggressive valve train. Premium circle track, Nano-Peened™, PAC enhanced wire.	**961326-16**
1.550	1.050	0.726	No	425 lbs @ 2.300	1440 @ 1.300	1.230	1.000	1015 lbs/in.	Small diameter, low mass, high lift drag race, Nano-Peened™, Pacaloy wire.	**961354-16**
1.551	1.119	0.699	Yes	226 lbs @ 2.000	717 @ 1.250	1.150	0.790	652 lbs/in.	Drag Race & Circle Track roller cams w/1.950-2.000" installed hts	**96886-16**

O.D	I.D.1	I.D.2	Damper	Seat Press.	Open Press.	Coil Bind	Max Net Lift w /.060" clearance	Rate (lbs/in.)	Application	Part No.
Dual Valve Springs										
1.555	1.130	0.743	Yes	256 lbs @ 2.000	652 @ 1.250	1.178	0.762	510 lbs/in.	Professional roller cam race applications Electro-Polished	**96884-16**
1.565	1.146	0.740	Yes	190 lbs @ 1.950	552 @ 1.250	1.200	0.690	504 lbs/in.	Solid street rollers/Bracket racing; Hi Perf big block hyd rlrs w/tall assy hts.	**99876-16**
1.565	1.129	0.749	Yes	215 lbs @ 1.950	685 @ 1.200	1.121	0.769	618 lbs/in.	Bracket Race & Circle Track Roller Cams XHTCS Spring	**99885-16**
1.593	1.154	0.741	Yes	254 lbs @ 2.050	687 @ 1.280	1.220	0.780	576 lbs/in.	Professional circle track endurance, ID chamfered coils, radiused damper ends, PAC enhanced wire.	**96885-16**
1.625	1.175	0.851	No	280 lbs @ 2.100	847 @ 2.100	1.100	0.900	629 lbs/in.	Bracket Race applications with height lift / aggressive valve train and RPM requirements, Pacaloy wire.	**961228-16**
1.625	1.175	0.769	Yes	244 lbs @ 2.000	801 @ 1.150	1.090	0.850	656 lbs/in.	Drag Race roller cams with approx. 2.00" inst hts. **XHTCS**	**99880-16**
1.625	1.175	0.769	Yes	250 lbs @ 2.050	673 @ 1.300	1.210	0.750	564 lbs/in.	Various Big Block roller camshafts, lower lift bracket racing, PAC enhanced wire.	**961299-16**
1.625	1.175	0.851	No	275 lbs @ 2.000	810 @ 1.150	1.100	0.850	625 lbs/in.	Various Big Block roller camshafts, high lift bracket racing, PAC enhanced wire.	**961224-16**
Triple Valve Springs										
1.645	1.195	0.635	No	250 lbs @ 2.050	801 @ 1.250	1.130	0.800	689 lbs/in.	Various Big Block roller camshafts, high lift bracket racing, PAC enhanced wire.	**961246-16**
1.645	1.195	0.635	No	290 lbs @ 2.070	835 @ 1.270	1.130	0.800	682 lbs/in.	Various Big Block roller camshafts, high lift bracket racing, Nano-Peened™, PAC enhanced wire.	**961347-16**
1.645	1.195	0.635	No	332 lbs @ 2.100	950 @ 1.200	1.130	0.900	688 lbs/in.	Various Big Block roller camshafts, high lift bracket racing, Nano-Peened™, PAC enhanced wire.	**961348-16**
1.667	1.195	0.635	No	300 lbs @ 2.100	963 @ 1.250	1.135	0.850	780 lbs/in.	Various Big Block roller camshafts, high lift bracket racing, PAC enhanced wire.	**96888-16**
1.675	1.203	0.634	No	362 lbs @ 2.100	1035 @ 1.200	1.161	0.879	684 lbs/in.	Pro Drag Racing including blown alcohol & fuel	**96848-16**
1.675	1.203	0.634	No	352 lbs @ 2.200	1024 @ 1.200	1.161	0.979	690 lbs/in.	Pro Drag Racing including blown alcohol & fuel	**96849-16**

More Valve Train Questions

What is Valve Spring Coil Bind and how does it relate to Spring Travel and Valve Lift?

When the valve spring is compressed until its coils touch one another and can travel no further, it is said to be in coil bind. The catalog (pages 317–319) shows the approximate coil bind height for the various Crane Cams valve springs. To measure this you must install the retainer in the valve spring, then compress the spring until it coil binds. Now measure from the bottom side of the retainer to the bottom of the spring. This measurement is the coil bind height. (See Figure 1) This can be done on the cylinder head with a spring compression tool in a bench vise, or in a professional valve spring tester.

Using Figure 1, subtract the coil bind height "B" from the valve spring installed height "A". The difference "C" is the maximum spring travel. The spring travel is usually at least .060" greater than the full lift of the valve. This safety margin of .060" (or more) is necessary to avoid the dangers of coil bind and over-stressing the spring.

If coil bind occurs, the resulting mechanical interference will severely damage the camshaft and valve train components.

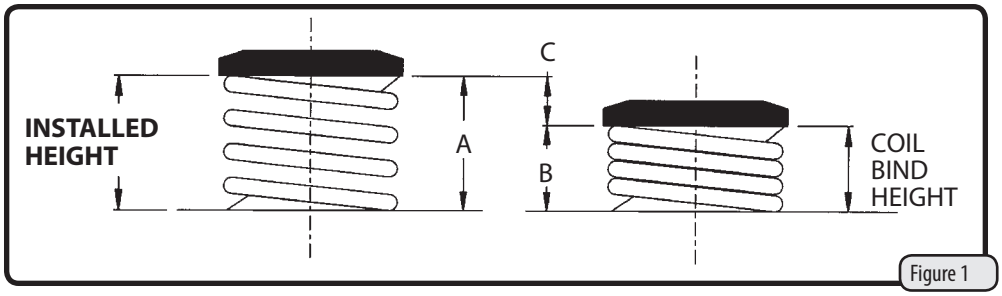


Figure 1

Valve Spring Spec Chart

BOLD Numbers are recommended closed pressures @ installed height.

Spring Type	Single	Single	Single	Single	Single	Single	Single	Single	Single
O.D.	1.000	1.065	1.065	1.025/0.930	1.096/0.967	1.255	1.255	1.255	1.260
I.D.	0.730	0.725	0.725	0.662/0.567	0.765/0.636	0.870	0.870	0.870	0.876
Damper	No	No	No	No	No	Yes	No	Yes	Yes
Installed Height	1.475	1.535	1.535	1.470	1.640	1.700	1.750	1.800	1.800
Coil Bind	0.910	0.987	1.014	0.900	1.000	1.153	1.100	1.100	1.110
Spring Rate (lbs/in.)	151	413	398	324	275	432	415	428	395
Max. Net. Lift	0.475	0.500	0.470	0.500	0.600	0.487	0.640	0.640	0.600
Part No.	**96845**	**180830**	**158830**	**40830**	**37830**	**99848**	**99845**	**99846**	**96802**
2.300									
2.250									
2.200									
2.150									
2.100									
2.050									
2.000									
1.950									
1.900									
1.850								104	
1.800						81	103	**125**	**107**
1.750						100	**124**	147	125
1.700					69	**114**	145	169	144
1.650					82	137	165	190	162
1.600					96	158	187	213	181
1.550		54	79	64	110	179	208	235	199
1.500	58	74	94	80	124	201	228	256	220
1.450	66	95	114	96	137	222	249	278	238
1.400	74	115	134	113	151	243	270	299	258
1.350	81	136	154	129	165	265	290	321	280
1.300	89	156	173	145	179	287	311	342	302
1.250	96	177	193	161	192	313	332	363	325
1.200	104	197	213	177	206	340	353	383	248
1.150	111	218	233	194	220		374	405	
1.100	119	238	253	210	234				
1.050	126	259		226	247				
1.000	134			242	261				
0.950	142			258					
0.900									

Popular Recommended Components

Steel Retainers (see page 330)						**99915 99916**	**99914**	**99915 99916**	**99915 99916**
Titanium Retainers 7° (see page 331)	**905-0003**	**158660**	**158660**	**40660**	**37660**				
Titanium Retainers 10° (see page 331)									
Spring Seats (see page 342)									

Valve Spring Spec Chart

BOLD Numbers are recommended closed pressures @ installed height.

Spring Type	Single	Single	Single	Single	Single	Single	Single
O.D.	1.265	1.290/0.885	1.435	1.437	1.440	1.445/1.095	1.450/1.295
I.D.	0.865	1.055/0.650	1.035	1.080	1.040	1.000/0.650	1.014/0.859
Damper	Yes	No	Yes	Yes	No	No	No
Installed Height	1.750	1.800	1.700	1.750	1.700	1.880	1.950
Coil Bind	1.100	1.140	1.037	1.069	1.080	1.210	1.139
Spring Rate (lbs/in.)	526	313	330	204	328	370	457
Max. Net. Lift	0.600	0.600	0.600	0.620	0.560	0.650	0.580
Part No.	**144846**	**99831**	**96803**	**96806**	**99833**	**99832**	**99841**
2.300							
2.250							
2.200							
2.150							
2.100							
2.050							
2.000							95
1.950						129	**118**
1.900		99				148	141
1.850	73	114		86		166	164
1.800	99	**130**		96		185	187
1.750	**125**	146	91	**104**	83	203	209
1.700	151	161	**107**	113	**98**	222	232
1.650	177	177	123	122	113	240	255
1.600	204	193	132	130	128	259	278
1.550	230	208	148	140	143	277	301
1.500	256	224	164	150	159	296	324
1.450	282	240	181	160	174	314	347
1.400	308	255	198	171	189	333	369
1.350	335	271	215	181	205	351	392
1.300	361	287	234	192	222	370	415
1.250	388	302	251	203	239	388	438
1.200	413	318	272	215	256		461
1.150	439		289	229	274		
1.100			317	240	293		
1.050							
1.000							
0.950							
0.900							

Popular Recommended Components

Steel Retainers (see page 330)	**99915** **99916**	**144943** **99976**	**99946** **99969**	**99936** **99944**	**99936** **99944**	**99976**	**99942**
Titanium Retainers 7° (see page 331)		**99637**				**99637**	
Titanium Retainers 10° (see page 331)					**99630**		
Spring Seats (see page 342)		**99454**					

Valve Spring Spec Chart

BOLD Numbers are recommended closed pressures @ installed height.

Spring Type	Single	Single	Single	Single	Single	Single	Single	Single
O.D.	1.460	1.460	1.500	1.500	1.539	0.937	0.953	0.970
I.D.	1.060	1.060	1.086	1.086	1.125	0.697	0.697	0.700
Damper	Yes	Yes	Yes	Yes	Yes	No	No	No
Installed Height	1.550	1.800	1.600	1.800	1.950	1.600	1.500	1.750
Coil Bind	0.935	1.139	1.000	1.130	1.130	0.925	0.916	1.014
Spring Rate (lbs/in.)	442	310	412	354	312	96	132	135
Max. Net. Lift	0.605	0.600	0.565	0.660	0.700	0.615	0.500	0.676
Part No.	**99840**	**96801**	**99835**	**99839**	**96807**	***96842**	***96843**	***96840**
2.300								
2.250								
2.200								
2.150								
2.100								
2.050								
2.000					115			
1.950		75			**129**			
1.900		88		86	136			
1.850		101		102	149			38
1.800		**114**		**121**	162			45
1.750		128		138	177	14		**51**
1.700		143		155	192	19		58
1.650		157	92	172	207	23		63
1.600	91	171	**113**	189	222	**29**	42	70
1.550	**110**	186	133	206	237	32	48	76
1.500	131	201	154	224	252	37	**54**	83
1.450	151	218	174	242	269	42	60	90
1.400	171	235	195	260	286	47	66	97
1.350	191	252	215	279	302	51	73	105
1.300	212	269	234	298	318	56	80	112
1.250	233	287	256	320	338	61	87	120
1.200	255	304	277	338	358	66	94	127
1.150	279		298	359		71	102	134
1.100	303		319			76	111	
1.050	328		342			82	120	
1.000	352		364			90	130	
0.950	378							
0.900								

Popular Recommended Components

Steel Retainers (see page 330)	**99936** **99944**	**99936** **99944**	**99936** **99944**	**99936** **99944**	**99962** **99970**
Titanium Retainers 7° (see page 331)					
Titanium Retainers 10° (see page 331)	**99630**		**99630**	**99630**	**99641**
Spring Seats (see page 342)	**99457**		**99459**	**99459**	

*** Denotes Inner Spring**

Valve Spring Spec Chart

BOLD Numbers are recommended closed pressures @ installed height.

Spring Type	Single	Dual	Dual	Dual	Dual	Dual	Dual	Dual
O.D.	1.015	1.212	1.218	1.298	1.298	1.304	1.344	1.437
I.D.	0.731	0.674	0.680	0.667	0.664	0.754	0.730	0.697
Damper	No	No	No	No	No	No	No	Yes
Installed Height	1.800	1.550	1.300	1.800	1.800	1.650	1.800	1.750
Coil Bind	1.045	0.865	0.783	1.060	1.080	0.927	1.057	1.185
Spring Rate (lbs/in.)	155	290	337	408	477	215	334	296
Max. Net. Lift	0.650	0.625	0.457	0.660	0.680	0.663	0.710	0.600
Part No.	***96844**	**99891**	**99879**	**144838**	**144847**	**99884**	**96887**	**96873**
2.300								
2.250								
2.200								
2.150								
2.100								
2.050								
2.000								
1.950	33							
1.900	41			107	103			
1.850	49			128	127			106
1.800	**57**			**148**	**151**		**114**	120
1.750	64			168	175	76	129	**134**
1.700	72			189	199	86	144	148
1.650	80	**66**		209	223	**96**	160	162
1.600	88	79		230	246	107	176	175
1.550	95	93		250	270	118	192	189
1.500	103	107		270	294	128	208	204
1.450	111	121		291	318	139	224	219
1.400	119	135		311	342	150	240	234
1.350	126	148	76	332	366	161	257	250
1.300	134	162	**91**	352	390	172	274	267
1.250	143	176	106	372	413	184	292	283
1.200	151	190	122	393	437	195	310	299
1.150	160	204	137	413	461	206	330	
1.100		219	152			218	350	
1.050		234	168			230		
1.000		250	184					
0.950		266	202					
0.900		284	220					

Popular Recommended Components

Steel Retainers (see page 330)	**99912** **99916**	**99926**	**144944**	**144944**	**99967**	**99935**	**99944** **99969**
Titanium Retainers 7° (see page 331)			**99975**	**99975**			**99669**
Titanium Retainers 10° (see page 331)			**144661**	**144661**			**99630**
Spring Seats (see page 342)			**99657**	**99657**			**99465**

*** Denotes Inner Spring**

Valve Spring Spec Chart

BOLD Numbers are recommended closed pressures @ installed height.

Spring Type	Dual	Dual	Dual	Dual	Dual	Dual	Dual	Dual
O.D.	1.437	1.437	1.449	1.460	1.460	1.460	1.465	1.500
I.D.	0.697	0.700	0.794	0.697	0.803	0.700	0.807	0.726
Damper	Yes	Yes	No	Yes	No	Yes	No	No
Installed Height	1.800	1.850	1.875	1.850	1.850	1.900	1.650	2.100
Coil Bind	1.115	1.110	1.035	1.175	1.080	1.154	0.950	1.130
Spring Rate (lbs/in.)	322	326	392	404	391	448	438	780
Max. Net. Lift	0.625	0.680	0.625	0.615	0.710	0.686	0.690	0.900
Part No.	**96874**	**96872**	**99892**	**96877**	**99893**	**96870**	**99838**	**961356**
2.300								
2.250								
2.200								222
2.150								261
2.100								**300**
2.050								339
2.000								378
1.950				88	92	113		417
1.900		115	110	107	112	**134**		456
1.850	112	**131**	130	**126**	**130**	154		495
1.800	**128**	146	149	144	149	174		534
1.750	142	160	169	163	167	194		573
1.700	156	175	189	183	186	215	91	612
1.650	171	189	208	203	205	236	**112**	651
1.600	186	205	228	222	223	256	131	690
1.550	202	221	247	242	242	278	151	729
1.500	218	238	267	261	261	300	171	768
1.450	234	255	287	282	279	323	190	807
1.400	252	272	306	304	298	348	210	846
1.350	270	291	326	324	318	373	230	885
1.300	289	309	345	346	338	398	251	924
1.250	308	327	365	366	358	424	271	963
1.200	328	345	385	389	380	447	292	1002
1.150	352	368	404		402		313	1041
1.100			424				336	
1.050							360	
1.000							383	
0.950								
0.900								

Popular Recommended Components

Steel Retainers (see page 330)	**99944** **99969**	**99944** **99969**	**99953** **99954**	**99944** **99969**	**99953** **99954**	**99944** **99969**	**99944** **99969**	**99970** **99974**
Titanium Retainers 7° (see page 331)	**99669**	**99669**	**99639**	**99669**	**99669**	**99669**	**99669**	**99663**
Titanium Retainers 10° (see page 331)	**99630**	**99630**		**99630**	**99630**	**99630**	**99630**	**99640**
Spring Seats (see page 342)	**99465**	**99465**		**99465**		**99465**		**99465** **99455**

Valve Spring Spec Chart

BOLD Numbers are recommended closed pressures @ installed height.

Spring Type	Dual	Dual	Dual	Dual	Dual	Dual	Dual	Dual	Dual
O.D.	1.500	1.522	1.530	1.539	1.539	1.540	1.540	1.540	1.550
I.D.	0.726	0.726	0.776	0.697	0.697	0.754	0.760	0.729	0.706
Damper	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Installed Height	2.175	2.250	1.900	1.900	1.900	1.900	1.900	1.950	2.000
Coil Bind	1.130	1.190	1.160	1.145	1.152	1.175	1.085	1.130	1.150
Spring Rate (lbs/in.)	780	895	428	444	480	434	528	544	663
Max. Net. Lift	1.000	0.950	0.630	0.700	0.680	0.665	0.755	0.760	0.800
Part No.	**961355**	**961360**	**99890**	**96879**	**96878**	**99895**	**99896**	**96883**	**961226**
2.300		357							
2.250	361	**402**							
2.200	**400**	447							
2.150	439	491							
2.100	478	536						148	209
2.050	517	581						174	242
2.000	556	626		116	154		110	200	**275**
1.950	595	670	112	137	178	123	128	**224**	308
1.900	634	715	**131**	**160**	**200**	**144**	**150**	250	341
1.850	673	760	151	180	222	165	173	275	374
1.800	712	805	171	202	244	186	196	300	407
1.750	751	849	190	223	266	207	220	327	441
1.700	790	894	210	244	288	228	244	352	474
1.650	829	939	229	266	311	250	267	379	507
1.600	868	984	250	286	335	272	290	404	540
1.550	907	1028	271	307	354	292	316	432	573
1.500	946	1073	292	328	383	312	343	458	606
1.450	985	1118	313	350	409	334	372	484	639
1.400	1025	1163	336	375	436	357	399	512	672
1.350	1064	1207	360	401	460	380	428	541	706
1.300	1103	1252	385	424	484	403	460	572	739
1.250	1142	1297	410	448	508	430	491	604	772
1.200	1181	1342	435	471	532	457	524	638	805
1.150	1220						560		838
1.100									
1.050									
1.000									
0.950									
0.900									

Popular Recommended Components

Steel Retainers (see page 330)	**99970** **99974**	**99970** **99974**	**99962** **99970**	**99926**	**99970** **99974**	**99956** **99970**	**99956** **99970**	**99970** **99974**	**99970** **99974**
Titanium Retainers 7° (see page 331)	**99663**	**99663**	**99659**		**99659**	**99678** **99681**	**99678** **99681**	**99678** **99681**	
Titanium Retainers 10° (see page 331)	**99640**	**99640**	**99641**	**99641**	**99634** **99641**	**99631** **99632**	**99631** **99632**		**99631** **99639**
Spring Seats (see page 342)	**99465** **99455**	**99465** **99455**	**99466**		**99460**	**99464**	**99466** **99464**	**99460**	**99465**

Valve Spring Spec Chart

BOLD Numbers are recommended closed pressures @ installed height.

Spring Type	Dual	Dual	Dual	Dual	Dual	Dual	Dual	Dual	Dual
O.D.	1.550	1.550	1.550	1.551	1.555	1.565	1.565	1.625	1.593
I.D.	0.788	0.706	0.726	0.699	0.743	0.740	0.749	0.851	0.741
Damper	No	Yes	No	Yes	Yes	Yes	Yes	No	Yes
Installed Height	2.000	2.000	2.300	2.000	2.000	1.950	1.950	2.100	2.050
Coil Bind	1.150	1.150	1.230	1.150	1.178	1.200	1.121	1.100	1.220
Spring Rate (lbs/in.)	644	662	1015	652	510	504	618	629	576
Max. Net. Lift	0.800	0.800	1.000	0.790	0.762	0.690	0.769	0.900	0.770
Part No.	**961325**	**961326**	**961354**	**96886**	**96884**	**99876**	**99885**	**961228**	**96885**
2.300			**425**						
2.250			476						
2.200			526					217	
2.150			577					249	
2.100	186	209	628	167	207			**280**	227
2.050	218	242	679	197	232		161	311	**254**
2.000	**250**	**275**	729	**226**	**256**	163	189	343	280
1.950	282	308	780	255	280	**190**	**215**	374	305
1.900	314	341	831	284	308	214	242	406	330
1.850	347	374	882	314	332	239	270	437	356
1.800	379	407	932	344	357	264	297	469	383
1.750	411	441	983	374	381	290	324	500	411
1.700	443	474	1034	406	407	314	352	532	440
1.650	475	507	1085	439	431	339	381	563	468
1.600	507	540	1136	473	458	364	411	595	496
1.550	540	573	1186	507	482	390	444	626	526
1.500	572	606	1237	541	508	415	475	658	556
1.450	604	639	1288	574	533	441	505	689	587
1.400	636	672	1339	610	560	466	536	721	618
1.350	668	706	1389	643	585	493	572	752	647
1.300	701	739	1440	683	612	522	606	784	676
1.250	733	772	1491	717	652	552	645	815	
1.200	765	805			692		685	846	
1.150								878	
1.100									
1.050									
1.000									
0.950									
0.900									

Popular Recommended Components

Steel Retainers (see page 330)	**99970** **99974**	**99970** **99974**	**99970** **99974**	**99974** **99970** **99974**	**99956** **99970**	**99956** **99970**	**99956** **99970**		**99970** **99974**
Titanium Retainers 7° (see page 331)	**99661**	**99661**	**99663**	**99659**	**99675** **99681**	**99678** **99681**	**99678** **99681**	**99660**	**99675**
Titanium Retainers 10° (see page 331)	**99639** **99641**	**99639** **99641**	**99640**	**99634** **99641**	**99631** **99632**	**99631** **99632**	**99634** **99641**	**99638**	**99635** **99632**
Spring Seats (see page 342)	**99464**	**99465** **99464**	**99465** **99455**	**99465**	**99460**	**99460** **99464**	**99460** **99464**	**99463**	**99460**

Valve Spring Spec Chart

BOLD Numbers are recommended closed pressures @ installed height.

Spring Type	Dual	Dual	Dual	Triple	Triple	Triple	Triple	Triple	Triple
O.D.	1.625	1.625	1.625	1.645	1.645	1.645	1.667	1.675	1.675
I.D.	0.769	0.769	0.851	0.635	0.635	0.635	0.635	0.634	0.634
Damper	Yes	Yes	No	No	No	No	No	No	No
Installed Height	2.000	2.050	2.000	2.050	2.070	2.100	2.100	2.100	2.200
Coil Bind	1.090	1.210	1.100	1.130	1.130	1.135	1.135	1.161	1.161
Spring Rate (lbs/in.)	656	564	625	689	682	688	780	684	690
Max. Net. Lift	0.850	0.750	0.850	0.800	0.800	0.900	0.850	0.879	0.979
Part No.	**99880**	**961299**	**961224**	**961246**	**961347**	**961348**	**96888**	**96848**	**96849**
2.300								230	289
2.250								262	320
2.200						263		295	**352**
2.150		194			236	298	261	329	385
2.100	182	222	212	216	270	**332**	**300**	**362**	418
2.050	213	**250**	244	**250**	304	366	339	396	452
2.000	**244**	278	**275**	284	338	401	378	430	487
1.950	275	306	306	319	372	435	417	462	520
1.900	306	335	338	353	406	469	456	498	554
1.850	337	363	369	388	440	504	495	530	588
1.800	368	391	401	422	474	538	534	564	623
1.750	400	419	432	457	508	572	573	598	657
1.700	431	447	464	491	542	607	612	633	692
1.650	463	476	495	526	576	641	651	668	727
1.600	496	504	527	560	610	675	690	704	761
1.550	528	532	558	594	644	710	729	740	797
1.500	560	560	590	629	678	744	768	776	832
1.450	594	588	621	663	712	778	807	815	870
1.400	627	617	653	698	746	813	846	857	906
1.350	663	645	684	732	781	847	885	900	942
1.300	696	673	716	767	815	881	924	942	981
1.250	731	701	747	801	849	916	963	987	1024
1.200	764		779	835	883	950	1002	1035	
1.150	801		810			984			
1.100									
1.050									
1.000									
0.950									
0.900									

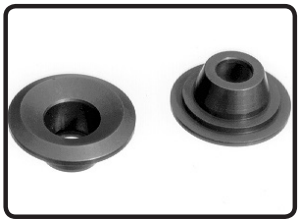
Popular Recommended Components

Steel Retainers (see page 330)	**99962**								
Titanium Retainers 7° (see page 331)	**99675**	**99660**	**99660**	**99662**	**99662**	**99662**	**99678** **99681**	**99678** **99681**	**99678** **99681**
Titanium Retainers 10° (see page 331)	**99638**	**99638**	**99638**	**99632**			**99632** **99636**	**99632** **99636**	**99632** **99636**
Spring Seats (see page 342)	**99466** **99463**	**99466** **99463**	**99463**	**99461**	**99461**	**99461**			

*** Denotes Inner Spring**

Valve Spring Retainers

Steel Valve Spring Retainers

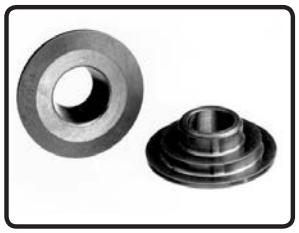


STANDARD CONFIGURATION
Crane Cams' steel valve spring retainers are precision manufactured from high quality bar stock steel, heat treated for maximum strength and durability, and black oxided for corrosion resistance. Crane steel retainers are made for *8mm, 5/16", 11/32", and 3/8" valve stem diameters* with 7° taper and are compatible with either Crane stamped steel or machined steel valve stem locks. Retainers for 3/8" diameter valve stems will also accommodate Crane Multi Fit steel locks (All locks sold separately. See pages 340–341). We additionally offer retainers designed for specific engine applications.

MULTI FIT STYLE STEEL RETAINERS WITH 7° TAPER
The Multi Fit style has the same basic tapered I.D. dimensions as a normal 7° steel retainer made for a 3/8" valve stem diameter, and are manufactured from premium quality bar stock material. By using the special thick Multi Fit Valve Stem Locks, these retainers can be used with either 5/16" or 11/32" valve stem diameters. By using Crane Cams' 3/8" machined steel valve locks, these same retainers will accommodate a 3/8" valve stem also. Locks are sold separately, see pages 340–341.

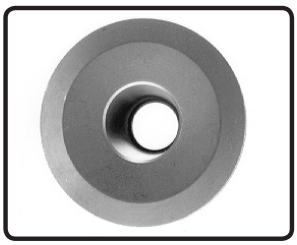
MULTI FIT STYLE STEEL RETAINERS WITH 10° TAPER
Our Multi Fit 10 degree retainers and locks differ from the conventional 10 degree items, as we use a smaller outside diameter lock, enabling the retainer to have a greater cross section in the critical area separating the inner spring steps from the tapered center hole. This provides superior strength and stability when compared to the competition, and these retainers are designed for use **only** with our Multi Fit locks. Compatible locks are offered for 8mm, 5/16", 11/32" and 3/8" valve stems in standard square groove and bead groove configurations. Optional assembly height locks are also offered, see pages 340–341.

Titanium Valve Spring Retainers



The lighter your valve train components, the quicker the engine will rev. Titanium retainers are ***40% lighter*** than steel. All Crane titanium retainers are machined from certified American-made bar stock. Beware of the recent influx of inexpensive "titanium" retainers. These are probably made of ***inferior imported material***, and ***will not*** pass certification standards.

MULTI FIT STYLE TITANIUM RETAINERS WITH 7° TAPER
The Multi Fit style has the same basic tapered I.D. dimensions as a normal 7° steel retainer made for a 3/8" valve stem diameter, and are manufactured from premium quality bar stock material. By using the special thick Multi Fit Valve Stem Locks, these retainers can be used with either 5/16" or 11/32" valve stem diameters. By using Crane Cams' 3/8" machined steel valve locks, these same retainers will accommodate a 3/8" valve stem also. Locks are sold separately, see pages 340–341.



POSI-STOP™ DESIGN TITANIUM RETAINERS WITH 7° TAPER
Absolutely The Strongest Titanium Retainer/Lock System Available! Proven In Competition By Nationally-Known Pro Stock, Top Fuel, Funny Car, And Short-Track Race Teams!
Crane Cams' Posi-Stop titanium retainers feature the patented stepped design that reinforces the bottom of the retainer. This both ***significantly increases the integral strength of the retainer***, and ***eliminates*** the valve lock's ability to ***pull through*** the bottom of the retainer. "Posi-Stop" retainers are made for 5/16", 11/32", or 3/8" valve stem diameters with 7° taper, and come with matching Crane machined valve stem locks.

MULTI FIT STYLE TITANIUM RETAINERS WITH 10° TAPER
Our Multi Fit 10 degree retainers and locks differ from the conventional 10 degree items, as we use a smaller outside diameter lock, enabling the retainer to have a greater cross section in the critical area separating the inner spring steps from the tapered center hole. This provides superior strength and stability when compared to the competition, and these retainers are designed for use **only** with our Multi Fit locks. Compatible locks are offered for 8mm, 5/16", 11/32" and 3/8" valve stems in standard square groove and bead groove configurations. Optional assembly height locks are also offered, see pages 340–341.

CONVENTIONAL DESIGN TITANIUM RETAINERS WITH 10° TAPER
Our conventional 10 degree titanium retainers are made from premium quality titanium alloy bar stock that is precisely machined on our own automated equipment. Each retainer is carefully quality control inspected for precision and accuracy. These retainers are available in the popular conventional 10° design, for strength and light weight. *Locks are sold separately*, see pages 340–341.

How to Use the Valve Spring Retainer Dimension, Retainer Height, and Spring to Retainer Charts

The following pages supply you with specific information on the various valve spring retainers, valve stem locks, and their compatibility with the valve springs that Crane Cams offers. These parts can be used anywhere their physical size can be accommodated, and where the resulting spring tension and spring travel is compatible with the camshaft, rocker arms, and lifters. Different combinations of valve springs, retainers and/or locks can be selected to match your particular needs.

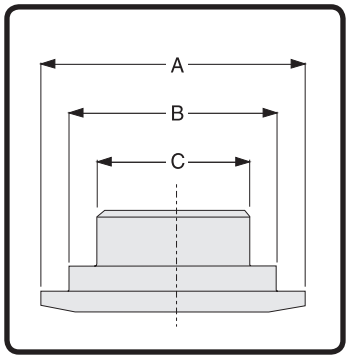
SPRING RETAINER DIMENSIONS

Spring Retainer Dimensions are provided so you can determine how the retainer fits the valve springs, see pages 330-331.

Retainer Dimension "A" fits over the outer spring;

Retainer Dimension "B" fits into the I.D. of the outer spring;

Retainer Dimension "C" fits into the I.D. of the innermost spring.

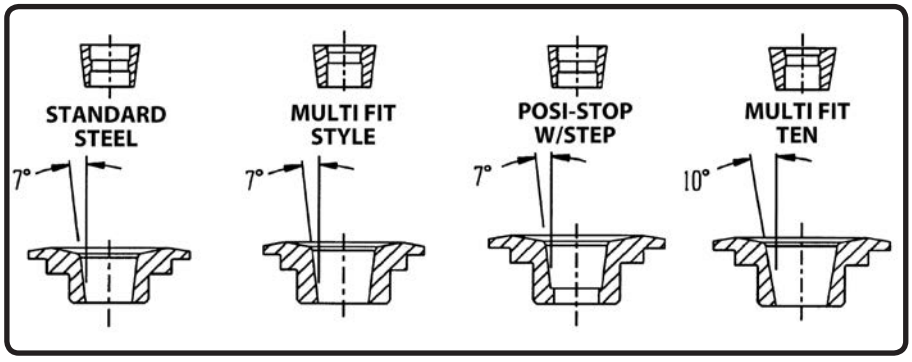


RETAINER HEIGHT CHART

Crane presents a new simplified method of matching the proper valve spring retainers and valve stem locks to your required assembly height. Simply measure your cylinder head from the spring seat to the top of the valve stem lock groove on the valve, and compare that to your needed assembly height. The chart indicates the relative heights for all of our retainer and standard height lock combinations, from the outer spring step to the top of the lock groove. No fixtures or sample parts are required, just the ability to measure! You can also take advantage of our wide range of +.050" and -.050" height locks to further refine your choices. This way you can minimize the shims required to achieve proper heights and pressures, and provide a more stable platform for your valve springs. See pages 332–334.

SPRING TO RETAINER CHART

This chart shows what retainers are available to fit a particular part number valve spring. It is based on the diameter of the spring and matching diameter of the retainers. It is further broken down by valve stem size, then the material and design of the retainer, see pages 335–337.



Crane Cams Has The Correct Valve Spring Retainers, Valve Springs And Valve Locks For Any Application... Street Or Race!

Valve Spring Retainer Dimensions - Steel

Valve Stem Dia.	Spring O.D., Type and Special Applications	Retainer Dimensions A	B	C	Part No.
7° Multi Fit Steel Retainers for 5/16", 11/32", and 3/8" Valve Stem Diameters					
	For 5/16" square groove valve stems: use **99093-1** (standard), **99085-1** (+.050"), or **99086-1** (-.050") valve stem locks ***For 11/32" square groove valve stems:*** use **99094-1** (standard), **99087-1** (+.050"), or **99088-1** (-.050") valve stem locks ***For 3/8" square groove valve stems:*** use **99098-1** (standard), **99099-1** (+.050"), or **99089-1** (-.050") valve stem locks ***Valve stem locks*** for 5/16", 11/32", and 3/8" valve stems with bead groove configuration also available, see pages 340–341.				
ALL	1.275" Dual	1.250	.910	.650	**99975-**
ALL	1.055/1.290" to 1.095/1.445" Conical Single	.980	.640		**99976-**
ALL	1.430" to 1.500" Dual	1.375	1.030	.675	**99950-**
ALL	1.430" to 1.500" Dual or Triple	1.375	1.060	.675	**99948-**
ALL	1.430" to 1.500" Dual or Triple	1.375	1.060	.675	**99957-**
ALL	1.430" to 1.500" Single or Dual	1.425	1.060	.685	**99969-**
ALL	1.430" to 1.500" Single or Dual	1.425	1.060	.685	**99973-**
ALL	1.460" Dual	1.375	1.075	.792	**99954-**
ALL	1.510" to 1.625" Dual	1.500	1.100	.690	**99970-**
ALL	1.510" to 1.625" Dual	1.500	1.100	.690	**99974-**
ALL	1.530" Dual	1.500	1.111	.765	**99962-**
ALL	1.540" Dual	1.500	1.135	.725	**99964-**
ALL	1.540" Dual	1.500	1.135	.725	**99961-**
ALL	1.540" to 1.630 Dual or Triple	1.500	1.135	.635	**99955-**
7° Steel Retainers for Specific Valve Stem Diameters and Applications					
8mm	1.055" top / 1.290" bottom Beehive Single Chevrolet LS1/LS2/LS6 V-8	1.027	.637		**144943-**
8mm	1.275" Dual Chevrolet LS1/LS2/LS6 V-8	1.250	.910	.640	**144944-**
11/32"	1.225" to 1.250" Single or Dual for self-aligning rocker arms	1.210	.865	.595	**99914-**
11/32"	1.225" to 1.250" Single or Dual	1.203	.867	.607	**99916-**
11/32"	1.225" to 1.250" Single or Dual	1.203	.867	.607	**99915-**
11/32"	1.295" top / 1.450" bottom Conical Single Ford 302 H.O. V-8	1.250	.859		**99942-**
11/32"	1.320" Dual Ford SOHC 2.3L I-4	1.250	.985	.745	**99967-**
11/32"	1.344" Dual Chevy L98/Fast Burn alum. heads	1.275	.990	.720	**99935-**
11/32"	1.430" to 1.500" Single or Dual	1.375	1.030	.675	**99946-**
11/32"	1.430" to 1.500" Single or Dual	1.375	1.060	.675	**99936-**
11/32"	1.430" to 1.500" Single or Dual	1.375	1.060	.675	**99944-**
11/32"	1.430" to 1.500" Single or Dual	1.375	1.060	.675	**99943-**
11/32"	1.460" Dual	1.375	1.075	.792	**99953-**
11/32"	1.460" Dual for self-aligning rocker arms	1.375	1.075	.792	**99951-**
11/32"	1.540" to 1.630" Dual or Triple	1.500	1.135	.635	**99956-**
10° Multi Fit Steel Retainers					
	For 5/16" square groove valve stems: use **99071-1** (standard), **99072-1** (+.050"), or **99070-1** (-.050") valve stem locks ***For 11/32" square groove valve stems:*** use **99074-1** (standard), **99075-1** (+.050"), or **99073-1** (-.050") valve stem locks ***For 3/8" square groove valve stems:*** use **99077-1** (standard), **99078-1** (+.050"), or **99076-1** (-.050") valve stem locks ***Valve stem locks*** for 5/16", 11/32", and 3/8" valve stems with bead groove configuration also available, see pages 340–341.				
ALL	1.430" to 1.500" Single or Dual	1.425	1.060	.685	**99971-**
ALL	1.510" to 1.625" Dual	1.500	1.100	.690	**99972-**
	NOTE: These recommended locks differ from competing conventional 10° locks and they increase the breakage strength of our Multi-Fit titanium retainers by 25%. Also, many competing 10 degree locks vary in production from 9° to 11-1/2°. Because of the accurate, robust design of Crane locks, they are incompatible with most competitors 10° retainers, and competitor's locks won't work with Crane Multi Fit 10° retainers.				
Steel Retainers with Unique Taper for Specific Applications					
11/32"	1.225" to 1.250" Single or Dual for Buick, 11° Taper	1.200	.867	.599	**99912-**
3/8"	1.430" to 1.500" Dual for Buick, 11° Taper	1.375	1.075	.698	**99910-**

NOTE: **The retainers are packaged in various quantities depending on the engine application. The suffix number (after the dash) in the part number indicates the quantity. For example, part no 99944-16 would be packaged with 16 retainers. Consult the engine application pages or the numerical price list for the correct quantity suffix.**

NOTE: **See pages 332-334 for our new Retainer Height Chart.**

Valve Spring Retainer Dimensions - Titanium

Valve Stem Dia.	Spring O.D., Type and Special Applications		Retainer Dimensions A	B	C	Part No.
7° Multi Fit Titanium Retainers for 5/16", 11/32", and 3/8" Valve Stem Diameters						
	For 5/16" square groove valve stems: use **99093-1** (standard), **99085-1** (+.050"), or **99086-1** (-.050") valve stem locks ***For 11/32" square groove valve stems:*** use **99094-1** (standard), **99087-1** (+.050"), or **99088-1** (-.050") valve stem locks ***For 3/8" square groove valve stems:*** use **99098-1** (standard), **99099-1** (+.050"), or **99089-1** (-.050") valve stem locks ***Valve stem locks*** for 5/16", 11/32", and 3/8" valve stems with bead groove configuration also available, see pages 340–341.				
ALL	1.275" Dual		1.250	.918	.640	**99657-**
ALL	1.500" to 1.550" Dual		1.400	1.040	.715	**99663-**
ALL	1.530" to 1.550" Dual		1.440	1.105	.687	**99659-**
ALL	1.540" to 1.595" Dual		1.500	1.150	.720	**99655-**
ALL	1.550" Dual		1.440	1.090	.695	**99661-**
ALL	1.625" Dual		1.510	1.165	.760	**99660-**
ALL	1.625" to 1.675" Triple		1.500	1.180/.860	.620	**99656-**
ALL	1.645" Triple		1.530	1.185	.860	**99662-**
7° Titanium Retainers for Specific Valve Stem Diameters and Applications						
5.5mm	1.000" Single	Ford Duratec 1.8 – 2.3L DOHC 4 Valve I-4	.945	.710		**903-0503**
6mm	.999" top/1.095" bottom Beehive Single	Ford 4.6 - 5.4L 3 Valve V-8	.885	.615		**39660-**
6mm	1.065" Single	Chrysler/Dodge SOHC/DOHC 4 Valve I-4	.995	.715		**158660-**
7mm	.930" top/1.025" bottom Beehive Single	Ford 4.6 - 5.4L 4 Valve V-8	.850	.560		**40660-**
7mm	.967" top/1.096" bottom Beehive Single	Ford 4.6 - 5.4L 2 Valve V-8	.885	.615	.503	**37660-**
8mm	1.055" top/1.290" bottom Beehive Single	Chevrolet LS1/LS2/LS6 V-8	.974	.620		**99637-**
8mm	1.255" Single		1.180	.856		**99658-**
8mm	1.275" Dual	Chevrolet LS1/LS2/LS6 V-8	1.250	.910	.640	**144661-**
7° Posi-Stop Titanium Retainers for Specific Valve Stem Diameters						
11/32"	1.430" to 1.500" Dual		1.375	1.045	.703	**99669-**
11/32"	1.540" Dual		1.500	1.135	.740	**99675-**
11/32"	1.560" to 1.630" Triple		1.500	1.135	.635	**99678-**
11/32"	1.560" to 1.630" Triple		1.500	1.135	.635	**99681-**
3/8"	1.540" Dual		1.500	1.135	.740	**99676-**
3/8"	1.560" to 1.630" Triple		1.500	1.135	.635	**99679-**
	NOTE: All "Posi-Stop" Titanium Retainers are packaged with appropriate Crane Cams machined valve stem locks.					
10° Crane Multi Fit Titanium Retainers						
	For 5/16" square groove valve stems: use **99071-1** (standard), **99072-1** (+.050"), or **99070-1** (-.050") valve stem locks ***For 11/32" square groove valve stems:*** use **99074-1** (standard), **99075-1** (+.050"), or **99073-1** (-.050") valve stem locks ***For 3/8" square groove valve stems:*** use **99077-1** (standard), **99078-1** (+.050"), or **99076-1** (-.050") valve stem locks ***Valve stem locks*** for 5/16", 11/32", and 3/8" valve stems with bead groove configuration also available, see pages 340–341.				
ALL	1.540" to 1.595" Dual		1.500	1.150	.720	**99635-**
ALL	1.625" to 1.675" Triple		1.500	1.180/.860	.620	**99636-**
	NOTE: These recommended locks differ from competing conventional 10° locks and they increase the breakage strength of our Multi-Fit titanium retainers by 25%. Also, many competing 10 degree locks vary in production from 9° to 11-1/2°. Because of the accurate, robust design of Crane locks, they are incompatible with most competitors 10° retainers, and competitor's locks won't work with Crane Multi Fit 10° retainers.					
10° Conventional Titanium Retainers						
ALL	1.430" to 1.500" Dual or Triple		1.375	1.060	.675	**99630-**
ALL	1.500" to 1.550" Dual		1.400	1.040	.715	**99640-**
ALL	1.510" to 1.625" Dual		1.500	1.100	.690	**99641-**
ALL	1.550" Dual		1.440	1.090	.695	**99639-**
ALL	1.540" to 1.560" Dual		1.500	1.120	.735	**99631-**
ALL	1.550" to 1.560" Dual		1.500	1.095	.700	**99634-**
ALL	1.560" to 1.630" Triple		1.500	1.135	.635	**99632-**
ALL	1.625" Dual		1.510	1.165	.760	**99638-**
	NOTE: These retainers can be used with 11/32" or 3/8" valve stems with single keeper grooves provided that the appropriate conventional 10 degree valve stem locks are used: **99080-1** for 5/16"; **99081-1** for 11/32"; **99082-1** for 3/8". See page 341 for +.050" and -.050" optional locks.					

NOTE: **The retainers are packaged in various quantities depending on the engine application. The suffix number (after the dash) in the part number indicates the quantity. For example, part no 99944-16 would be packaged with 16 retainers. Consult the engine application pages or the numerical price list for the correct quantity suffix.**

NOTE: **See pages 332-334 for our new Retainer Height Chart.**

Valve Spring Retainer Height Chart

Retainer Height Chart

To be able to achieve the proper valve spring height, while using the minimum amount of valve spring shims, can be challenging when working with applications that use other than stock components. There has never been an industry standard to compare the relationship of retainer heights with each other, although we have previously listed our retainer heights by comparing them with each other. This has been somewhat helpful if you have at least one of our retainers on hand for comparison purposes, but doesn't properly address the variations of valve stem diameters, valve stem lock thicknesses, and taper angles.

With this new listing, we are providing a measurable dimension that can be easily checked for the cylinder head and valve combination you're working with. No sample retainers or fixtures are needed. The Retainer Height dimensions listed indicate the relationship of the outer step of the retainer that the outer valve spring sets against, with the top of the valve stem lock groove in the valve stem.

If the dimension on the chart is .000", the outer retainer step, and the top of the lock groove are at the same height. If the dimension is positive, such as .060", then the outer retainer step is .060" above the top of the lock groove. If the dimension is negative, such as -.040", then the outer spring step is .040" below the top of the lock groove. Check the accompanying drawings for a visual explanation.

This will enable you to measure from the valve spring seat on the cylinder head, to the top of the lock groove in the valve, then compare that dimension to your desired valve spring assembly height (see the Valve Spring Retainer Dimension pages 330–331, and the Valve Spring to Retainer Cross Reference pages 335–337 for additional information). If you need an assembly height that's .060" higher than your measured dimension, check the listings for the applicable retainers for your valve springs, and look for a height figure close to .060".

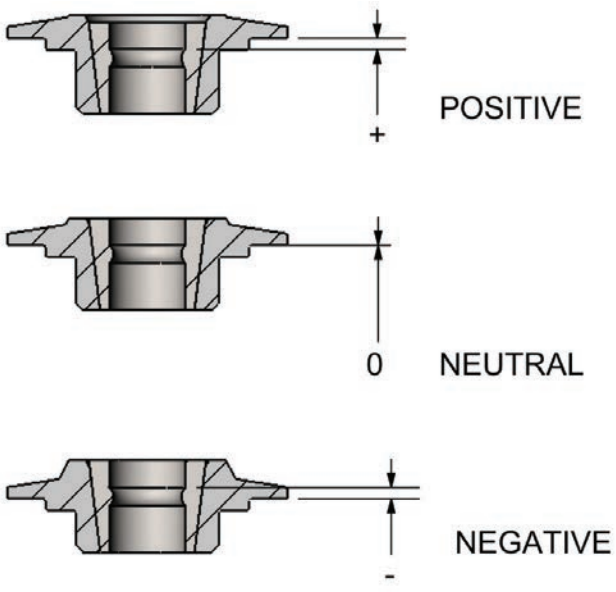
The standard height Crane Cams valve stem lock part numbers are listed with each diameter valve stem (where applicable) to achieve these figures. Remember, most of our valve stem locks are also available in +.050" and -.050" heights (see pages 340–341), to extend the available height combinations that can be created.

The retainers are listed by material, then by lock configuration.

The valve stems are listed by diameter and lock groove configuration.

Certain unique specific retainers are listed using their usual valve locks, such as the Buick 11 degree, and the Ford Modular items.

We hope this will make choosing your components easier, and provide a more reliable valve spring retainer/valve stem lock combination for your application.



Valve Spring Retainer Height Chart

Steel Retainers

Retainer Part No.	Valve Stem Diameter (Valve Stem Lock Part No.)						
7° Crane Multi Fit and 3/8″							
	5/16 sq.	5/16 bead	11/32 sq.	11/32 bead	3/8 sq.	7mm bead	8mm bead
	99093	**99101**	**99094**	**99104**	**99098**	**99106**	**99107**
99948	-.055	-.055	-.050	-.050	-.080	-.055	-.055
99950	.045	.045	.050	.050	.020	.045	.045
99954	.040	.040	.045	.045	.015	.040	.040
99955	.055	.055	.060	.060	.030	.055	.055
99957	.045	.045	.050	.050	.020	.045	.045
99961	.125	.125	.130	.130	.100	.125	.125
99962	.125	.125	.130	.130	.100	.125	.125
99964	.040	.040	.045	.045	.015	.040	.040
99969	.045	.045	.050	.050	.020	.045	.045
99970	.045	.045	050	.050	.020	.045	.045
99973	.110	.110	.115	.115	.085	.110	.110
99974	.110	.110	.115	.115	.085	.110	.110
99975	-.005	-.005	.000	.000	-.030	-.005	-.005
99976	.010	.010	.015	.015	-.015	.010	.010
7° Specific							
	11/32 sq.	8mm bead					
	99097	**99108**					
99914	.035						
99915	.020						
99916	-.055						
99935	.075						
99936	.005						
99942	.285						
99943	.135						
99944	.075						
99946	.075						
99951	.135						
99953	.135						
99956	.125						
99966	.135						
99967	.215						
144943		-.020					
144944		-.030					
10° Crane Multi Fit							
	5/16 sq.	11/32 sq.	3/8 sq.				
99971	.030	.055	.045				
99972	.030	.055	.045				
11° Specific							
99912	11/32 Buick	-.060					
99910	3/8 Buick	-.085					

Section Continued

Valve Spring Retainer Height Chart

Titanium Retainers

Retainer Part No.	Valve Stem Diameter (Valve Stem Lock Part No.)						
7° Crane Multi Fit and 3/8"							
	5/16 sq.	5/16 bead	11/32 sq.	11/32 bead	3/8 sq.	7mm bead	8mm bead
	99093	**99101**	**99094**	**99104**	**99098**	**99106**	**99107**
99655	.045	.045	.050	.050	.020	.045	.045
99656	.045	.045	.050	.050	.020	.045	.045
99657	-.005	-.005	.000	.000	-.030	-.005	-.005
99659	.115	.115	.115	.115	.085	.115	.115
99660	.115	.115	.115	.115	.085	.115	.115
99661	.115	.115	.115	.115	.085	.115	.115
99662	.115	.115	.115	.115	.085	.115	.115
99663	.115	.115	.115	.115	.085	.115	.115
7° Specific							
37660	7mm 3-groove	-.070					
39660	6mm	.050					
158660	6mm	.025					
40660	7mm 3-groove	.000					
99637	8mm	-.030					
99658	8mm	-.055					
144661	8mm	-.030					
903-0503	5.5mm	.020					
7° "Posi-Stop" Specific							
	11/32 sq.	3/8 sq.					
	99097	**99098**					
99669	.075						
99675	.150						
99676		.060					
99678	.075						
99679		.030					
99681	.165						
10° Crane Multi Fit							
	5/16 sq.	11/32 sq.	3/8 sq.				
	99071	**99074**	**99077**				
99635	.030	.055	.045				
99636	.030	.055	.045				
10° Conventional							
	5/16 sq.	5/16 bead	11/32 sq.	11/32 bead	3/8 sq.	3/8 bead	
	99080	**99115**	**99081**	**99116**	**99082**	**99117**	
99630	.110	.110	.110	.110	.080	.080	
99631	.150	.150	.150	.150	.120	.120	
99632	.095	.095	.095	.095	.065	.065	
99634	.045	.045	.045	.045	.015	.015	
99638	.115	.115	.115	.115	.115	.115	
99639	.115	.115	.115	.115	.115	.115	
99640	.115	.115	.115	.115	.115	.115	
99641	.155	.155	.155	.155	.155	.155	

Single Springs

Valve Spring Part No.	----------7° Steel Retainer ---------- 5/16″	11/32″	3/8″	10° Steel Retainer	-----Titanium Retainer ----- 7°	10°	8mm	Spring Seat (I.D.)
37830	None	None	None	None	**37660**	None	None	None
40830	None	None	None	None	**40660**	None	None	None
96801	**99969**	**99936** **99943** **99944** **99969**	**99948** **99957** **99969**	**99971**	None	None	None	None
96802	None	**99914** **99915** **99916**	None	None	None	None	None	None
96803	**99969**	**99946** **99969**	**99950** **99969**	**99971**	None	None	None	None
96806	**99969**	**99936** **99943** **99944** **99951** **99953** **99969**	**99948** **99954** **99957** **99969**	**99971**	None	None	None	None
96807	**99962** **99970**	**99962** **99970**	**99962** **99970**	**99972**	None	**99641**	None	None
96845	None	None	None	None	**903-0503**	None	None	None
99831	**99976**	**99976**	**99976**	None	**99637**	None	**144943**	**99454** (.502″)
99832	**99976**	**99976**	**99976**	None	**99637**	None	None	**99456** (.500″) **99457** (.570″) **99458** (.637″)
99833	**99950**	**99936** **99943** **99944** **99946** **99950**	**99948** **99950** **99957**	None	None	**99630**	None	**99457** (.570″)
99835	**99950** **99969**	**99936** **99943** **99944** **99950** **99969**	**99948** **99950** **99957** **99969**	**99971**	None	**99630**	None	**99459** (.637″)
99839	**99950** **99969**	**99936** **99943** **99944** **99950** **99969**	**99948** **99950** **99957** **99969**	**99971**	None	**99630**	None	**99459** (.637″)
99840	**99950** **99969**	**99936** **99943** **99944** **99950** **99969**	**99948** **99950** **99957** **99969**	**99971**	**None**	**99630**	None	**99457** (.570″)
99841	None	**99942**	None	None	None	None	None	None
99842	None	None	None	None	None	None	None	None
99846	None	**99914** **99915** **99916**	None	None	None	None	None	None
99848	None	**99914** **99915** **99916**	None	None	None	None	None	None

Section Continued

Valve Spring to Retainer Cross Reference

Single Springs

Valve Spring Part No.	----------7° Steel Retainer ---------- 5/16″	11/32″	3/8″	10° Steel Retainer	-----Titanium Retainer ----- 7°	10°	Spring Seat (I.D.)
144846	None	99914 99915 99916	None	None	99658	None	None
158830	None	None	None	None	158660	None	None
180830	None	None	None	None	158660	None	None

Dual Springs

Valve Spring Part No.	----------7° Steel Retainer ---------- 5/16″	11/32″	3/8″	10° Steel Retainer	---7° Titanium Posi-Stop--- 5/16″	11/32″	3/8″	--Titanium Retainer-- 7°	10°	8mm	Spring Seat (I.D.)
96870	99969	99936 99943 99944 99969	99957 99969	99971	None	99669	None	None	99630	None	99465 (.570″)
96872	99969	99936 99943 99944 99969	99948 99957 99969	99971	None	99669	None	None	99630	None	99465 (.570″)
96873	99969	99936 99943 99944 99969	99948 99957 99969	99971	None	99669	None	None	99630	None	99465 (.570″)
96874	99969	99936 99943 99944 99969	99948 99957 99969	99971	None	99669	None	None	99630	None	99465 (.570″)
96877	99969	99936 99943 99944 99969	99948 99957 99969	99971	None	99669	None	None	99630	None	99465 (.570″)
96878	99970 99974	99970 99974	99970 99974	99972	None	None	None	99659	99634 99641	None	99460 (.570″)
96879	99970 99974	99970 99974	99970 99974	99972	None	None	None	99659	99634 99641	None	99465 (.570″)
96883	99970 99974	99970 99974	99970 99974	99972	None	99678 99681	99679	99659	99641	None	99460 (.570″)
96884	99961 99964 99970 99974	99956 99961 99964 99970 99974	99955 99961 99964 99970 99974	99972	None	99675 99678 99681	99676 99679	None	99631 99632 99641	None	99460 (.570″)
96885	99970 99974	99970 99974	99970 99974	99972	None	99675	None	None	99631 99632 99663	None	99460 (.570″)
96886	99970 99974	99970 99974	99970 9997 4	99972	None	None	None	99659	99634 99641	None	99465 (.570″)
96887	None	99935	None	None	None	None	None	None	None	None	None
99838	99969	99936 99943 99944 99969	99948 99957 99969	99971	None	99669	None	None	99630	None	None

Section Continued

Dual Springs

Valve Spring Part No.	----------7° Steel Retainer ---------- 5/16″	11/32″	3/8″	10° Steel Retainer	---7° Titanium Posi-Stop--- 5/16″	11/32″	3/8″	--Titanium Retainer-- 7°	10°	8mm	Spring Seat (I.D.)
99876	**99970** **99974**	**99956** **99970** **99974**	**99955** **99970** **99974**	**99972**	None	**99678** **99681**	**99676**	None	**99631** **99632**	None	**99460** (.570″) **99464** (.637″)
99879	None	None	None	None	None	None	None	None	None	**99926**	None
99880	**99962**	**99962**	**99962**	**99972**	None	**99675**	**99676**	**99655**	**99638**	None	**99466** (.570″) **99463** (.637″)
99884	None	**99967**	None	None	None	None	None	None	None	None	None
99885	**99961** **99964** **99970** **99974**	**99956** **99961** **99964** **99970** **99974**	**99955** **99961** **99964** **99970** **99974**	**99972**	None	**99678** **99681**	**99676**	None	**99634** **99641**	None	**99460** (.570″) **99464** (637″)
99890	**99962** **99970** **99974**	**99962** **99970** **99974**	**99962** **99970** **99974**	**99972**	None	None	None	**99659**	**99641**	None	**99466** (.570″)
99891	None	**99912** **99914** **99915** **99916**	None	None	None	None	None	None	None	None	None
99892	**99954**	**99951** **99953** **99954**	**99954**	**99971**	None	None	None	None	None	**99639**	None
99893	**99952** **99969**	**99951** **99953** **99969**	**99954** **99969**	**99971**	None	**99669**	None	None	**99630**	None	None
99895 **99896**	**99961** **99964** **99970** **99974**	**99956** **99961** **99964** **99970** **99974**	**99955** **99961** **99964** **99970** **99974**	**99972**	None	**99675** **99678** **99681**	**99676** **99679**	None	**99631** **99632** **99641**	None	**99466** (.570″) **99464** (.637″)
144838	**99975**	**99975**	**99975**	None	None	None	None	**99657**	None	**144661**	None
144847	**99975**	**99975**	**99975**	None	None	None	None	None	None	**144661**	None
961224	None	None	None	None	None	None	None	**99660**	**99638**	None	**99463** (.637″)
961226	None	None	**99970** **99974**	**99972**	None	None	None	**99661**	**99639**	None	**99465** (.570″)
961228	None	None	None	None	None	None	None	**99660**	**99638**	None	**99463** (.637″)
961299	None	None	None	None	None	None	None	**99660**	**99638**	None	**99466** (.570″) **99463** (.637″)
961325	None	None	**99970** **99974**	**99972**	None	None	None	**99661**	**99639** **99641**	None	**99464** (.637″)
961326	None	None	**99970** **99974**	**99972**	None	None	None	**99661**	**99639** **99641**	None	**99465** (.570″) **99464** (.637″)
961354	None	None	**99970** **99974**	**99972**	None	None	None	**99663**	**99640**	None	**99465** (.570″) **99455** (.637″)
961355	None	None	**99970** **99974**	**99972**	None	None	None	**99663**	**99640**	None	**99465** (.570″) **99455** (.637″)
961356	None	None	**99970** **99974**	**99972**	None	None	None	**99663**	**99640**	None	**99465** (.570″) **99455** (.637″)
961360	None	None	**99970** **99974**	**99972**	None	None	None	**99663**	**99640**	None	**99465** (.570″) **99455** (.637″)

Triple Springs

96848	None	None	None	None	None	**99678** **99681**	**99679**	**99656**	**99632** **99636**	None	None
96849	None	None	None	None	None	**99678** **99681**	**99679**	**99656**	**99632** **99636**	None	None
96888	None	None	None	None	None	**99678** **99681**	**99679**	**99656**	**99632** **99636**	None	None
961246	None	None	None	None	None	None	None	**99662**	None	None	**99461** (.637″)
961347	None	None	None	None	None	None	None	**99662**	None	None	**99461** (.637″)
961348	None	None	None	None	None	None	None	**99662**	None	None	**99461** (.637″)

Valve Spring and Retainer Kits

Crane Cams Valve Spring and Retainer Kits offer an easy, cost-saving method of insuring that your performance camshaft installation has the correct, matched valve springs and retainers needed to deliver maximum performance. These springs are designed to allow the increased RPM and more aggressive valve train operation that allows a Crane performance cam installation to "wake up" even stock engines. Crane steel and titanium valve spring retainers are designed to correctly fit the supplied Crane springs. The steel retainers are made from premium quality steel, precisely machined and heat treat hardened for strength, durability and wear resistance. The titanium retainers are manufactured from certified American made bar stock. Best of all, most of these Crane Valve Spring and Retainer Kits can be easily installed with no cylinder head machining necessary.

Applications are available for popular I-4 and V-8 engines. Consult the engine applications pages for correct usage.



Application	Part No.	Contents: Valve Springs	Contents: Retainers
American Motors V-8 66-91, 290 thru 401			
	64308-1	**99839-16**	**99957-16**
Chevrolet V-8 67-87, 262 thru 400			
	11308-1	**99848-16**	**99915-16**
XHTCS material, Saturday Night Special	**11309-1**[a] (Includes Locks **99095-1**)	**99846-16**	**99915-16**
Chevrolet V-8 57-99, 262-400			
Requires cylinder head machining	**11310-1**[b]	**99838-16**	**99944-16**
Chevrolet V-8 92-99, 350 LT1			
With aluminum cylinder heads	**10308-1** (Includes Locks **99097-1**)	**99893-16**	**99951-16**
Chevrolet V-8 94-99, 350 LT1			
With iron cylinder heads	**10309-1**	**99845-16**	**99914-16**
Chevrolet V-8 95-96, Vortec 350			
	10309-1	**99845-16**	**99914-16**
Chevrolet V-8 97-Up, LS-Series 4.8-5.3-5.7-6.0-6.2 litre			
For up to .600" gross valve lift	**144318-1**	**99831-16**	**144943-16** (includes spring seats **99454-16**, seals **99818-16**, & locks **99108-1**)
For up to .680" gross valve lift, XHTCS material	**144313-1**	**144847-16**	**144944-16** (includes spring seats **144460-16**, seals **99818-16**, & locks **99108-1**)
For up to .680" gross valve lift, XHTCS material	**144314-1**	**144847-16**	**144661-16** (includes spring seats **144460-16**, seals **99818-16**, & locks **99108-1**)
For up to .660" gross valve lift	**144317-1**	**144838-16**	**144944-16** (includes spring seats **144460-16**, seals **99818-16**, & locks **99108-1**)
For up to .660" gross valve lift	**144316-1**	**144838-16**	**144661-16** (includes spring seats **144460-16**, seals **99818-16**, & locks **99108-1**)
Chevrolet V-8 65-98, 396 thru 502			
	13308-1	**99839-16**	**99948-16**
Chevrolet V-8 80-95, Truck 366 thru 454			
With short valve spring assembly height	**13309-1**	**96801-16**	**99957-16**

VALVE TRAIN

Section Continued

Valve Spring and Retainer Kits

Application	Part No.	Contents: Valve Springs	Contents: Retainers
Chrysler-Dodge Neon I-4 95-05, SOHC 4V 2.0L			
	903-2003	**158830-16**	**158660-16**
Chrysler-Dodge Neon, PT Cruiser I-4 95-09, DOHC 4V 2.0-2.4L			
	903-2002	**180830-16**	**158660-16**
Chrysler-Dodge-Plymouth V-8 64-91, "LA" 273 thru 360 and 67-91, 318			
	69308-1	**99835-16**	**99948-16**
Chrysler-Dodge-Plymouth V-8 58-78, "B" 350 thru 440			
	64308-1	**99839-16**	**99957-16**
Ford Duratec I-4 02-05, DOHC 4V 1.8-2.0-2.3L			
	903-2007	**99845-16**	**903-0503**
Ford V-8 62-87, 221-302 and 69-97, 351W			
	36308-1	**96803-16**	**99946-16**
Requires Cylinder Head Machining	**11310-1**[b]	**99838-16**	**99944-16**
Ford V-8 85-00, 302 and 302 H.O. w/Hydraulic Roller Camshafts			
Conical design, for stock cylinder head	**44308-1**[c] (Includes Locks **99094** and **99097**)	**99841-16**	**99942-16**
Conical design, for GT40P and similar long exhaust valve cylinder heads	**44309-1** (Includes locks **99094**)	**99841-16**	**99942-16**
Ford V-8 70-77, 351C-351M-400			
	52308-1	**96801-16**	**99948-16**
Ford V-8 71-72, Boss 351 and 79-82, 351M-400			
	35308-1	**96801-16**	**99944-16**
Ford V-8 63-76, FE 352 thru 428			
	13309-1	**96801-16**	**99957-16**
Ford V-8 68-97, 370 thru 460			
	35308-1	**96801-16**	**99944-16**
Oldsmobile V-8 67-84, 260 thru 455 39° Bank Angle and 64-67, 330 thru 425 45° Bank Angle			
	36308-1	**96803-16**	**99946-16**
Requires Cylinder Head Machining	**11310-1**[b]	**99838-16**	**99944-16**
Pontiac V-8 55-81, 265 thru 455			
	28308-1	**99840-16**	**99944-16**
Requires Cylinder Head Machining	**11310-1**[b]	**99838-16**	**99944-16**

a Standard diameter valve springs for 1967-87 cylinder heads with 1.700" assembly height. Check valve guide to lock/retainer clearance at maximum valve lift, valve guide machining may be required.
b Must machine cylinder heads. Check valve guide to lock/retainer clearance at maximum valve lift, valve guide machining may be required.
c Optional kit for 79-00 302, 302 H.O., and 351W engines to provide increased valve spring travel when using stock cylinder heads.

Valve Stem Locks

Machined Steel Locks 7° — Single Groove Design

The ultimate in strength and wear resistance. These locks are machined from highest quality alloy steel billet material using the finest automatic screw machines and then carefully heat treated. Engineered specifically for today's high engine speeds and high-tension valve springs. These machined steel locks are the only locks to be used with our "Posi Lock" valve spring retainers. Oxide finished for corrosion protection, and color coded for assembly height identification.



Description	Part No.
For 5/16" diameter Valve Stems (Black)	99091-1
For 11/32" diameter Valve Stems +.050" installed height (Yellow)	99095-1
For 11/32" diameter Valve Stems standard height (Black)	99097-1
For 11/32" diameter Valve Stems -.050" installed height (Silver)	99096-1
For 3/8" diameter Valve Stems +.050" installed height (Yellow)	99099-1
For 3/8" diameter Valve Stems standard height (Black)	99098-1
For 3/8" diameter Valve Stems -.050" installed height (Silver)	99089-1

NOTE: **This design lock is packaged with all Crane "Posi-Stop" Titanium Retainers.**

Machined Steel Locks 7° — Single Bead Design

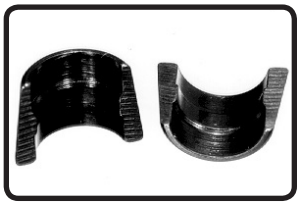
These machined steel locks are precision machined and heat treated in our own facility for the latest generation of engine technology. Although primarily designed for the Chevrolet LS1/LS2/LS6 families, they are also applicable to most valve stems that require a bead-style valve lock.



Description	Part No.
For 8 mm Valve Stems (standard OEM dimension)	99108-1
For 8 mm Valve Stems increased O.D. (Multi Fit)	99107-1

Multi-Fit Valve Stem Locks 7° — Single Groove Design

Our steel billet heat treated Multi-Fit locks feature an increased outside diameter for additional strength, durability and fatigue resistance. These Multi-Fit locks are highly recommended for any high RPM, high valve spring tension, or heavy valve application prone to lock distortion and retainer pull-through. The 7° taper actually provides more clamping force than wider 10° taper locks and are the preferred choice of professional engine builders and racers. (Use only with Crane Multi-Fit retainers).



Description	Part No.
For 5/16" diameter Valve Stems +.050" installed height (Yellow)	99085-1
For 5/16" diameter Valve Stems standard height (Green)	99093-1
For 5/16" diameter Valve Stems -.050" installed height (Silver)	99086-1
For 11/32" diameter Valve Stems +.050" installed height (Yellow)	99087-1
For 11/32" diameter Valve Stems standard height (Green)	99094-1
For 11/32" diameter Valve Stems -.050" installed height (Silver)	99088-1
For 3/8" diameter Valve Stems +.050" installed height (Yellow)	99099-1
For 3/8" diameter Valve Stems standard height (Black)	99098-1
For 3/8" diameter Valve Stems -.050" installed height (Silver)	99089-1

NOTE: **Crane Locks are color coded for easier identification.**

Section Continued

Multi-Fit Valve Stem Locks 7° — Single Bead Design

Our steel billet heat treated Single Bead Multi-Fit locks provide all of the strength and durability advantages of our single square groove design, and are compatible with most of the aftermarket bead lock valves currently available. Also available in +.050" and -.050" assembly height versions for 5/16" and 11/32" valve stems, these are designed specifically for use with only our Multi-Fit retainers.

Description	Part No.
For 5/16" diameter Valve Stems +.050" installed height (Yellow)	**99102-1**
For 5/16" diameter Valve Stems standard height (Black)	**99101-1**
For 5/16" diameter Valve Stems -.050" installed height (Silver)	**99100-1**
For 11/32" diameter Valve Stems +.050" installed height (Yellow)	**99105-1**
For 11/32" diameter Valve Stems standard height (Black)	**99104-1**
For 11/32" diameter Valve Stems -.050" installed height (Silver)	**99103-1**
For 7 mm Valve Stems standard height (Black)	**99106-1**
For 8 mm diameter Valve Stems standard height (Black)	**99107-1**



Multi-Fit Valve Stem Locks 10° — Single Groove Design

Crane 10 degree heat treated, fully machined steel billet, Multi-Fit locks were designed to allow the retainer to have an increased cross-section in the critical area between the tapered hole for the locks and the valve spring steps. Having greater retainer integrity will now provide a more stable platform for the valve springs, reducing retainer breakage and the possibility of the locks separating from the valve stem under adverse operating conditions. Many competing 10 degree locks vary in production from 9 deg to 11-1/2 degree. Because of the accurate, robust design of Crane locks, they are incompatible with most competitors 10 degree retainers, and competitor's locks won't work with Crane Multi-Fit 10 degree retainers.

Description	Part No.
For 5/16" diameter Valve Stems +.050" installed height (Silver)	**99072-1**
For 5/16" diameter Valve Stems standard height (Green)	**99071-1**
For 5/16" diameter Valve Stems -.050" installed height (Yellow)	**99070-1**
For 11/32" diameter Valve Stems +.050" installed height (Silver)	**99075-1**
For 11/32" diameter Valve Stems standard height (Green)	**99074-1**
For 11/32" diameter Valve Stems -.050" installed height (Yellow)	**99073-1**
For 3/8" diameter Valve Stems +.050" installed height (Silver)	**99078-1**
For 3/8" diameter Valve Stems standard height (Green)	**99077-1**
For 3/8" diameter Valve Stems -.050" installed height (Yellow)	**99076-1**



Machined Steel Locks 10° Conventional — Single Groove Design

Many engine builders are used to a conventional 10° taper, and these machined steel locks are perfect for any racing application where the conventional 10° design is specified. (Use only w/ **99630, 99631, 99632, 99633, 99634, 99638, 99639,** or **99640** Crane retainers or competitors' conventional 10° retainers). Locks are recessed for lash cap clearance.

Description	Part No.
For 5/16" diameter Valve Stems +.050" installed height (Yellow)	**99109-1**
For 5/16" diameter Valve Stems standard height (Black)	**99080-1**
For 5/16" diameter Valve Stems -.050" installed height (Silver)	**99112-1**
For 11/32" diameter Valve Stems +.050" installed height (Yellow)	**99110-1**
For 11/32" diameter Valve Stems standard height (Black)	**99081-1**
For 11/32" diameter Valve Stems -.050" installed height (Silver)	**99113-1**
For 3/8" diameter Valve Stems +.050" installed height (Yellow)	**99111-1**
For 3/8" diameter Valve Stems standard height (Black)	**99082-1**
For 3/8" diameter Valve Stems -.050" installed height (Silver)	**99114-1**



Machined Steel Locks 10° Conventional — Single Bead Design

Description	Part No.
For 5/16" diameter Valve Stems +.050" installed height (Yellow)	**99118-1**
For 5/16" diameter Valve Stems standard height (Black)	**99115-1**
For 5/16" diameter Valve Stems -.050" installed height (Silver)	**99121-1**
For 11/32" diameter Valve Stems +.050" installed height (Yellow)	**99119-1**
For 11/32" diameter Valve Stems standard height (Black)	**99116-1**
For 11/32" diameter Valve Stems -.050" installed height (Silver)	**99122-1**
For 3/8" diameter Valve Stems +.050" installed height (Yellow)	**99120-1**
For 3/8" diameter Valve Stems standard height (Black)	**99117-1**
For 3/8" diameter Valve Stems -.050" installed height (Silver)	**99123-1**



Valve Lash Caps

Precision machined from 8620 steel alloy, heat treated and black oxided. Provides a better wear surface and lengthens valve for correct geometry. *(Maintain .030" clearance from bottom of lash cap to top of the valve locks)*



Application	Part No.
5/16" diameter valve stems (.162" tall, .060" thick)	**99420-16**
11/32" diameter valve stems (.162" tall, .060" thick)	**99421-16**
11/32" diameter valve stems, for Ford 2300 c.c. SOHC (.210" tall, .100" thick)	**99423-8**
3/8" diameter valve stems (.162" tall, .060" thick)	**99422-16**
7mm diameter valve stems, for Ford 4.6-5.4L SOHC V-8 & 4.6L DOHC V-8(.200" tall, .080" thick)	**99424-16**
8mm diameter valve stems (.162" tall, .060" thick)	**99425-16**
8mm diameter valve stems, for Ford 2000 c.c. SOHC (.204" tall, .050" thick)	**99045-8**

Valve Spring Locators and Cups

Crane shatters the myth that "all spring seats are the same". Our new spring cups (those that contain the O.D. of the valve springs) and locators (that locate the I.D. of the valve springs) incorporate tapered vertical surfaces to eliminate the spring chafing that can quickly deteriorate and lead to premature failure and breakage of the most expensive valve springs. And when valve springs break, the damage is usually catastrophic. These heat-treated steel billet items are advised for applications ranging from street performance to professional racing. Available for specific applications, and most popular dimensioned valve springs. Don't chance your engine to an ordinary "spring seat".

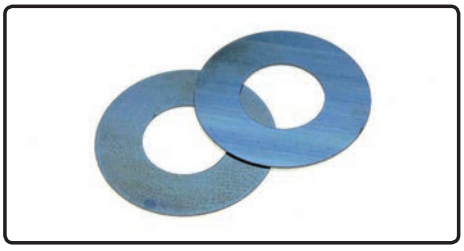


O.D.	I.D.	Spring O.D.	Spring I.D.	Base Thickness	Part No.
Locators					
1.240	.505	—	.650 (for LS1/LS2/LS6 applications)	.050	**144460-16**
1.290	.512	—	.990	.062	**99456-16**
1.290	.578	—	.990	.062	**99457-16**
1.290	.640	—	.870	.062	**99468-16**
1.290	.640	—	.990	.062	**99458-16**
1.295	.570	—	.718 (for L98/Fast Burn alum. head applications)	.050	**99467-16**
1.320	.502	—	.872 (for LS Series applications)	.060	**99454-16**
1.480	.640	—	.716	.062	**99455-16**
1.500	.570	—	.695	.055	**99465-16**
1.500	.570	—	.730	.055	**99460-16**
1.558	.570	—	.760	.055	**99466-16**
Cups					
1.685	.637	1.570	—	.062	**99464-16**
1.730	.630 (for eliminating rotators on Chevrolet 396-454-502 and 8.1L cylinder heads)	1.520	—	.300	**99459-8**
1.745	.637	1.630	—	.062	**99463-16**
1.745	.637	1.650	—	.062	**99461-16**

Valve Spring Shims

Durable steel shim stock, zinc plated for wear resistance.

Description	Set Part No.
.015 x 1.480 x .765 (Hardened, set of 16)	**99050-1**
.015 x 1.640 x .635 (Hardened, set of 16)	**99046-1**
.030 x 1.480 x .765 (Set of 32)	**99051-1**
.060 x 1.480 x .765(Set of 32)	**99052-1**



Valve Stem Seals *(Machining Required)*

Crane Cams valve stem seals provide maximum valve stem oil control. These seals wipe excess oil from the valve stem by means of a unique spring loaded wiper assembly, thus preventing unwanted oil from reaching and contaminating the cylinder. Machining usually required.



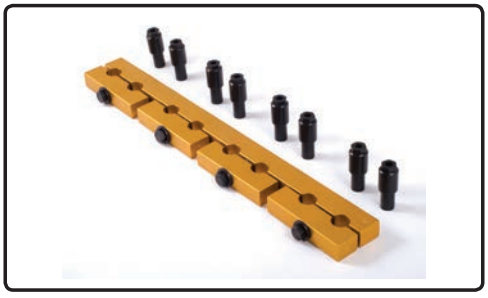


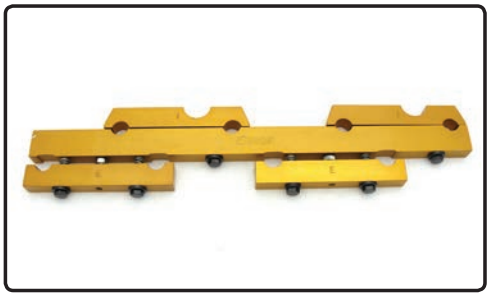
Valve Stem Diameter	Guide O.D.	Seal O.D.	Part No.
PTFE Seals			
5/16″	.500″	.600″	**99825-16**
5/16″	.531″	.620″	**99824-16**
11/32″	.500″	.600″	**99826-16**
11/32″	.531″	.620″	**99820-16**
3/8″	.500″	.600″	**99828-16**
3/8″	.531″	.620″	**99822-16**
Metal Jacket Viton Seals			
5/16″	.500″	.546″	**99710-16**
5/16″	.531″	.575″	**99711-16**
11/32″	.500″	.546″	**99712-16**
11/32″	.531″	.575″	**99713-16**
8mm	.500″	.600″	**99818-16**

Valve Train Stabilizers... Quick-Lock™ Stud Girdles

Crane Cams' Quick Lock Valve Train stabilizers are a unique approach to the now common use of stud girdles for racing engine applications. Most importantly, the Crane Quick-Lock unit slashes the time required for removal and replacement of the stabilizer unit to a fraction of the time other units require. Crane VTS bars are made from finest quality aluminum bar stock, machined to precise blueprint specifications and attractively gold anodized for corrosion resistance. Each Crane VTS comes complete with all necessary hardware including heat treated steel rocker arm adjusting nuts. They are easily installed and require no cylinder head machining or modifications for installation.

(CAUTION: Added height of the Crane VTS requires the use of aftermarket tall valve covers)





Application	Part No.
Chevrolet V-8 262 thru 400 cu.in. & Pontiac-Brodix w/ standard rocker arm stud spacing	
For 3/8″ rocker arm studs (**99803** nuts included)	**11600-1**
For .600″ wide top slot rocker arms and 7/16″ rocker arm studs (**99810** nuts included)	**11604-1**
Chevrolet V-8 396 thru 454 (will not fit casting 14044861)	
For .600″ wide top slot rocker arms (**99809** intake and **99810** exhaust nuts included)	**13602-1**
Ford V-8 370-429-460 cu.in.	
For .600″ wide top slot rocker arms and 7/16″ rocker arm studs (**99810** nuts included)	**35602-1**

Promotional Items

Description	Part No.
Catalogs	
Crane Cams Master Catalog	**99193-14**
Crane Cams Master Catalog on USB Drive	**PP0814A**
Crane Cams Lobe Master Listing	**PP1112A**
Decals - Contingency	
Crane Cams 11″ (32 sq. in.)	**99174-1**
Decals and Patches	
Crane Cams 6″ Decal	**99189-1**
Crane Cams 5″ Patch	**99209-1**
Key Tags	
Crane Cams White Tag with Red Logo	**PP0612B**
Banners and Clings	
30″ x 96″ Crane Cams Black on White Banner	**99196-1**
"Crane Cams Available Here" Cling	**99188-1**
Caps	
Crane Cams Black with White Logo	**PP1010B**





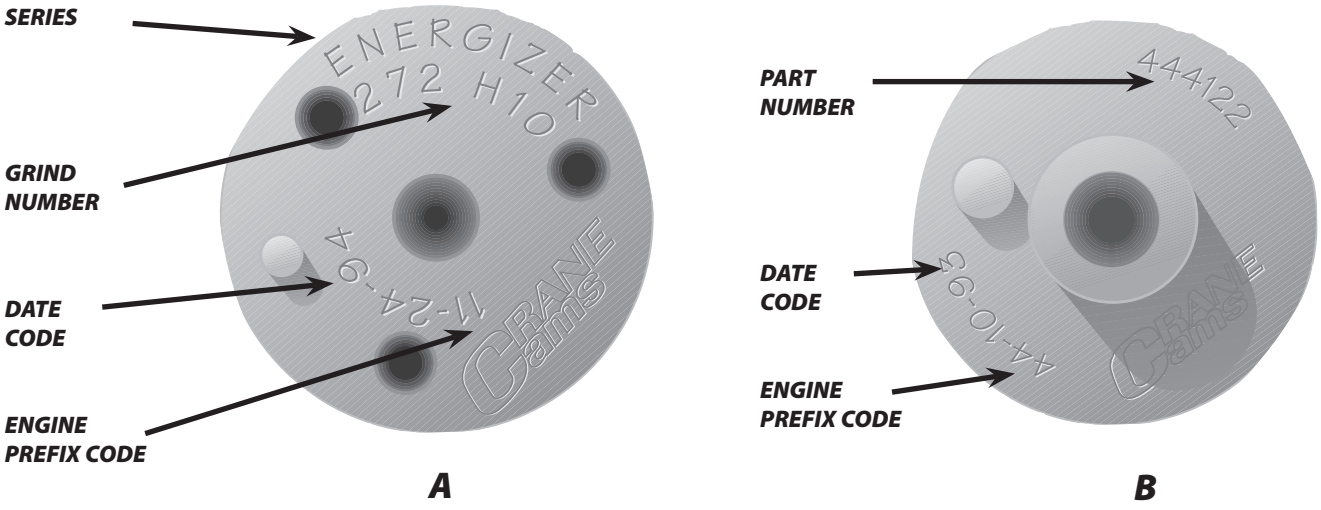








How to Identify Your Crane Cam



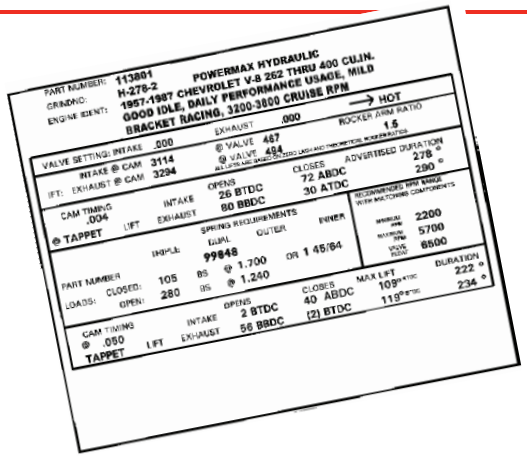
The above illustrates an easy method for identifying some of the most popular Crane camshafts. To use this, you must first view the end of the camshaft. (Some Crane and Cam Dynamics cams for thrustplate equipped engines are marked on the opposite end of that shown here.) Make note of the two digit engine prefix code number, the series name, and the grind number.

For example, the two cams listed above would be:

A
Engine Code – 11
Series – Energizer
Grind Number – 272 H10
(Part Number – **10005**)

B
Engine Code – 44
Part Number – 444122
Grind Number – 2030

NOTE: There are many more camshafts made by Crane Cams than are shown in this catalog. If you cannot find your particular cam, write down all the information (on "both" ends of the camshaft) and contact one of our Performance Consultants. Fax or write us: Crane Cams, 1830 Holsonbback Drive, Daytona Beach, FL 32117, Fax 386-236-9983.



Need Cam Spec Card Info?

Find it at:

cranecams.com

For information on reading and understanding Cam Spec Cards, see page 364.

Custom Ground Cams

Custom Ground Cams

Crane Cams offers custom designed and ground cams sold outright, when cam cores are available, or reground, with the customer providing the cam core. We have hundreds of different cam cores, cast (for flat face hydraulic and mechanical lifter applications) and steel roller (hydraulic roller and mechanical roller) cores for various cylinder blocks, heads, journal diameters, firing orders, etc. New cores are also constantly being added.

Each outright Crane custom-ground cam has its own unique part number. This includes your being able to reorder the exact same cam any time you wish to reorder. You won't need to re-state the lobe profile, centerline, or other option specs. Just refer to the Part Number shown in the upper left corner of your Crane Cam Timing Specs Card, or from your invoice. This nine or ten digit part number indicates the Crane engine prefix, basic type of cam and a numerical sequence per each type.

You can select lobes from our Cam Lobe Profile Catalog (Pt. No. **PP1112A**), or cranecams.com. The online listings are updated frequently, and are the most up-to-date listing available. Shown are only the most popular lobes, and there are tens of thousands of additional lobe profiles available. We also design and produce exclusive, proprietary lobe masters for our customers. Lobe separations can then be selected along with any other features you desire. These include cam journal diameters, journal bearing types, rear accessory drives, distributor gear material, additional dowel pins, gun drilling, journal grooving, etc. Our Tech Services staff can provide guidance on any custom cam issues.

There are tens of thousands of existing part numbers for custom grinds that may already include your own choice of profiles. If so, we can supply the grind part number for ordering. On new orders, once the order has been submitted the part number will be assigned and the order processed. Pricing information is available directly from Crane Cams.

Easy-Order Check List:

1. Choose the lobe profile you wish to have ground and the lifter type: ***Hydraulic; hydraulic roller; mechanical ("solid"); or mechanical roller.*** (See Lobe Master Catalog, Part No. **PP1112A** or cranecams.com, or call for a copy) For street performance cam applications use the recommendation form on Page 347.

2. Call Crane at: **866-388-5120 (FAX 386-236-9983)** Mon–Fri 8:00am–5:00pm). On regrind orders ***call first*** before sending us your cam core!

3. Give us your engine make, year and C.I.D., lobe profile info (intake and exhaust), lobe separation and particulars (small base circle, special drive, etc.).

4. Tell us your preferred return shipping method and ***requested delivery date*** (We normally ship UPS or FedEx).

5. If you're a Crane Cams Engine Builder or WD, give us your P.O. Number and Account Number plus any additional info you wish to provide.

Here's Why Crane Should Be Your Custom-Grind Cam Source!

- Order outright when new cam cores are available, or "regrind" (customer provides suitable core).
- Hundreds of different cam cores available. 80,000+ grinds available and new profiles being constantly added.
- Cast (hydraulic and "solid" lifter cams); and Billet Steel (hydraulic roller and mechanical "solid" roller) cores available for most popular applications.
- New cores constantly added for new blocks, heads, journal diameters, firing orders, etc.
- Each Crane custom cam has ***its own unique part number,*** for easy reorder. Just ***specify the part number*** or your invoice number.
- Choose profiles (lobe shapes) from the ***Crane Cam Lobe Profile Listing*** (part number **PP1112A**), from the website **www.cranecams.com**, or modify Crane catalog grinds.
- All Crane Cams are designed using the latest generation computer software, tooled and manufactured using the industry's most accurate equipment!
- All custom Crane cams feature that world famous Crane "Lobe-To-Lobe, Cam-To-Cam" accuracy!
- We also design and produce ***exclusive, proprietary*** lobe designs (Confidential to you alone!).
- Additional special services include: Different journal diameters, firing orders, rear accessory drives, distributor gear material, additional dowel pins, gun drilling, journal grooving, etc.
- Shipping Methods: UPS, FedEx. 24 Hour turnaround available with Next-Day shipping.

To Order:
866-388-5120 FAX: 386-236-9983
Mon–Fri. 8:00-5:00, EDT

Street/Strip, Off Road, Marine Camshaft Recommendation Form

CRANE Cams®

Personal Information:

Name_____ Home Phone_____

Address_____ Work Phone_____

City_____ State_____ Zip_____ Fax_____

Email_____

Which type cam are you interested in? O Hydraulic O Hydraulic Roller
O Mechanical O Mechanical Roller

Vehicle Information:

O Computer Controlled (w/Emissions Controls)
O Emissions Controlled without Computer
O Non-Emissions Controlled

Make:_____ Year:_____Model:_____ Weight:_____

Vehicle Use:

O Street O Street/Strip O Off Road O Towing

For Marine Use:

Hull Type:_____ Length:_____Weight:_____
Drive: O Jet O Prop Explain:_____
Exhaust System: Brand_____ O Wet O Dry
Does Exhaust Exit: O Above Water Line O Below Water Line

Options:

RPM Power Range Desired: O 1000-4000 O 1500-4500 O 2000-5000 O 2500-5500
O 3000-6000 O 3500-6500 O 4000-7000
Engine Idle Characteristics: O Smooth O Choppy O Rough
NOTE: Computer Controlled Vehicles Must Use Smooth Idle Camshafts ONLY.

Engine Information:

Make:_____ Year:_____ No. of Cylinders:_____
Cubic Inches:_____ Compression Ratio:_____ Cylinder Head Type:_____
Ported: O Yes O No Valve Size: Int._____ Exh._____
Rocker Arm Type: O Stock O Roller Rocker Ratio: Int._____ Exh._____
Intake Manifold Type:_____ Carburetor:_____
Type of Injection:_____ O Speed Density O Mass Air O Special_____
Nitrous Oxide System:_____ Supercharger Type:_____ Drive Ratio:_____
Turbocharger Type:_____ P.S.I. Boost:_____
Cranking Compression P.S.I.:_____
Transmission Model:_____ O Standard O Automatic O Automatic with Overdrive
Converter Stall Speed:_____ Rear Gear Ratio:_____
Cruise RPM @ 60 MPH:_____ Tire Diameter/Size:_____
Cam Now Used:_____ Part No.:_____ O Hydraulic O Hydraulic Roller
O Mechanical O Mechanical Roller
Lift: Int._____ Exh._____ Duration @ .050: Int._____ Exh._____
Lobe Separation:_____ Improvement Needed: O Low End Torque O Upper RPM Power

Camshaft Regrinding and Special Labor Services

Most combinations of intake and exhaust profiles and lobe separation may be ordered. We suggest that you contact our technical staff for recommendations, using our most current offerings. Be certain to send a completely filled out Cam Profile Recommendation Form to ensure prompt attention.

Pricing includes normal straightening, regrinding, and Parko lubrite treating where applicable. Additional charges will apply for any special machining that is required for regrinding (removing gears, oil pump drives, end plugs, drilling, tapping, centering, etc.). It is not practical to re-heat treat or re-harden camshafts that have already been processed.

We have restructured our regrinding labor pricing and part numbers to be representative of the variety of camshaft materials currently in use. The Labor Part Numbers have a suffix indicating these types of camshaft materials:

1. Cast or chillcast iron
2. Cast steel, induction hardened steel, and 8620 or 9310 carburized steel
3. Through-hardened tool steel
4. Exotic steel

*This product is applicable only to pre-1966 California and pre-1968 federally certified passenger cars. It is also applicable to non-emission controlled trucks and similar vehicles. It is not applicable or intended for use on any emission controlled vehicles operated on highways or roads.

Regrinding Your Camshaft

Engine Description	Labor Part No.
Most single cylinder	980061, 980062, 980063, 980064
Most two cylinder	980081, 980082, 980083, 980084
Most I-4	980071, 980072, 980073, 980074
Most I4 SOHC	980031, 980032, 980033, 980034
Most I4 DOHC—per pair	980821, 980822, 980823, 980824
Most I4 with multi-indexed lobes	981231, 981232, 981233, 981234
Most I4 OHC with multi-indexed lobes—per cam	981161, 981162, 981163, 981164
Most I4 with Inverse Radius lobes	980782, 980783, 980784
Most I6	980571, 980572, 980573, 980574
Most I6 SOHC	980791, 980792, 980793, 980794
Most I6 DOHC—per pair	980821, 980822, 980823, 980824
Most I6 with multi-indexed lobes	981231, 981232, 981233, 981234
Most I6 OHC with multi-indexed lobes—per cam	981161, 981162, 981163, 981164
Most I6 with Inverse Radius lobes	980632, 980633, 980634
Most V6	980571, 980572, 980573, 980574
Most V6 SOHC—per pair	980801, 980802, 980803, 980804
Most V6 DOHC—per set of four	980811, 980812, 980813, 980814
Most V6 with multi-indexed lobes	981221, 981222, 981223, 981224
Most V6 OHC with multi-indexed lobes—per cam	981241, 981242, 981243, 981244
Most V6 with Inverse Radius lobes	980632, 980633, 980634
Most I8	980771, 980772, 980773, 980774
Most I8 with multi-indexed lobes	981231, 981232, 981233, 981234
Most V8	980011, 980012, 980013, 980014
Most V8 SOHC—per pair	980121, 980122, 980123, 980124
Most V8 DOHC—per set of four	980131, 980132, 980133, 980134
Most V8 with multi-indexed lobes	981221, 981222, 981223, 981224
Most V8 OHC with multi-indexed lobes—per cam	981251, 981252, 981253, 981254
Most V8 with Inverse Radius lobes	980842, 980843, 980844
Most V12	980501, 980502, 980503, 980504
Most V12 SOHC— per pair	980651, 980652, 980653, 980654
Most V12 DOHC—per set of four	980551, 980552, 980553, 980554
Most industrial I6 or V8	980531, 980532, 980533, 980534

Round Lobe Steel Billet Camshafts

Rough grind, heat treat or harden, and finish grind customer's supplied round lobe spool. If copper plating is required, an additional charge will be incurred. Crane supplied cores may be available at an additional charge.

Engine Description	Labor Part No.
Most single cylinder	980702, 980703, 980704
Most two cylinder	980702, 980703, 980704
Most I4	980712, 980713, 980714
Most I6	980722, 980723, 980724
Most V6	980852, 980853, 980854
Most V8	980852, 980853, 980854
Most industrial I6	980482, 980483, 980484

Special Machining Operations

Description	Labor Part No.
Grind gearfit step on front journal	98073
Grind cam bearing journals—single size	98076
Grind cam bearing journals—stepped sizes	98126
Install additional dowel pin	98087
Cut additional keyway	98127
Groove cam bearing journal for oiling	98088
Hob distributor drive gear	98095
Install cast iron rear journal and distributor gear	98075
Drill and tap rear of cam for Sander drive	98089
Ultra Pro microfinish camshaft—single step process	98113
Ultra Pro microfinish camshaft—dual step process	98116
Nitride camshaft	98115
Gun drill camshaft (up to 28")	98096
Undercut barrel on customer's camshaft for regrind	98117
Turn barrel, journals, lobes on round lobe camshaft	98118
Copper plate customer's round lobe steel camshaft—up to 20"	98098-20
Copper plate customer's round lobe steel camshaft—20 to 30"	98098-30
Copper plate customer's round lobe steel camshaft—30 to 40"	98098-40
Remove broken bolts or dowel pins—each	98120
Miscellaneous cam grind labor (excessive straightening, recut centers, rust removal, etc.)	98093
Miscellaneous shop labor—per hour	98111

Camshaft Inspection and Design Services

Description	Labor Part No.
Camshaft inspection service	98014
Design standard type lobe shape	98015
Design Translating follower lobe shape	98019
Generate plate master from design	98016

Procedure for Sending Camshafts for Regrinding

Before shipping your camshaft, please directly contact Crane Cams for the assignment of a Return Goods Authorization (RGA) number. This is necessary for tracking your camshaft throughout our procedures. While in contact with our technical staff, have as much information as possible about your combination readily available, to assist in making the proper new grind choice, or to facilitate repairs. When shipping the camshaft to us, you must include your name, address, E-mail address and daytime phone number, along with your RGA number on the outside of the package. After receiving and inspecting your camshaft, we will contact you to verify the operations that will be performed, along with your method of payment.

Other Engine Applications

Although the following engines are not listed in the Applications Section of this catalog, we can regrind your camshaft and provide most kit components. Some new camshaft cores are available, as indicated by the asterisk (*).
For specific information, contact Crane Cams at 866-388-5120.

American Motors/Jeep

155 cu.in (2.5 Litre)		I-4	84-92
4.0 Litre		I-6	99-05

Arias/Fontana/MBR

2.5 Litre		I-4	84-09
8.3 Litre		V-8	85-09
10.0 Litre	*	V-8	85-05

Buick

198-225		V-6	62-67
231		V-6	75-77
196-231-252		V-6	78-86
3.3-3.8 Litre		V-6	87-94
248-263-320		I-8	39-53
264-322		V-8	53-56
364-401-425	*	V-8	57-66
215	*	V-8	61-63
300-340		V-8	64-67
350		V-8	68-80

Cadillac

331-365-390		V-8	49-62
390-429		V-8	63-67
250 (4.1 L)-4.5-4.9		V-8	82-94

Chevrolet

153		I-4	62-71
2300cc SOHC		I-4	71-75
2000cc DOHC		Cosworth I-4	75-76
1800-2000cc		I-4	82-93
216-235		I-6	37-53
235-261		I-6	54-62
292		I-6	63-84
140-145		Corvair 6 cyl.	60-63
164		Corvair 6 cyl.	64-69
200-229		V-6	78-84
262 (4.3 Litre)		V-6	85-91
3.4-3.5 Litre		V-6	ALL

Chrysler, DeSoto, Dodge, Plymouth

1700cc		I-4	78-83
2.2-2.5L OHC		I-4	81-94
235-250-265		Flathead I-6	37-54
218-230		Flathead I-6	42-59
170-198-225		I-6	60-85
3.9L		V-6	88-94
3.3L		60° V-6	90-94
301-331-354	*	V-8	51-56
276-291		V-8	52-55
241-259-270		V-8	53-56
330-341-345		V-8	56-57
315-325		V-8	56-58
392	*	V-8	57-58
277-301-303-318-326		V-8	56-66
350-440 Single Bolt B		V-8	58-78
5.7 Litre R5P7		V-8	ALL
Hemi 99 500	*	V-8	ALL

Crosley

44 cu.in.		I-4	46-55

Dart

500 5" bore spacing	*	V-8	ALL

Donovan

417	*	V-8	ALL

Ford, Lincoln, Mercury

1600cc		I-4	71-80
1.6-1.9 Litre		CVH I-4	81-93
2000cc SOHC		I-4	71-74
2300-2500cc		HSC I-4	85-93
215-223		I-6	52-53
223		I-6	54-64
262		I-6	62-64
144-170-200-250		I-6	60-83
2600-2800cc		V-6	72-82
2800cc		V-6	83-85
232		V-6	82-84
3.0L		V-6	86-94
4.5L SVO		V-6	88-98
221		Flathead V-8	32-41
239		Flathead V-8	42-53
279-317-341-368		V-8	52-57
256-272-292-312	*	V-8	55-62
332-352-390		V-8	58-62
383-410-430-462		V-8	58-68
302 Boss	*	V-8	69-70
427 SOHC	*	V-8	63
429 Boss Hemi	*	V-8	69-70

GMC

224-248-270-302		I-6	39-63

Johnson/Rodeck (AJPE)

481x	*	V-8	ALL

MG Midget - Sprite - Mini BMCA

848-1275cc	*	I-4	57-84

Oldsmobile

2.3 L DOHC Quad 4		I-4	88-96
2.3 SOHC Quad 4		I-4	92-96
303-324		V-8	49-55
324-371		V-8	56-58
371-394		V-8	59-64
215	*	V-8	61-63
307		V-8	85-90
330-400-425 45º	*	V-8	64-67
500 DRCE2	*	V-8	ALL
500 DRCE3	*	V-8	ALL

Pontiac

195		I-4	60-63
151		I-4	77-78
151 (2.5 Litre)		I-4	79-89
151 (2.5 Litre)		I-4	90-91
230-250 SOHC		I-6	66-69
215	*	V-8	61-63

Rambler

250-287-327		V-8	56-66

Rodeck

481x	*	V-8	ALL
481x2	*	V-8	ALL

Rover

215-3.5-3.9-4.2 Litre	*	V-8	68-00

Studebaker

224-232-259-289		V-8	51-64

Flat Tappet Camshaft Break-in Procedure

WARNING: NEW LIFTERS MUST BE INSTALLED WITH YOUR NEW CAMSHAFT

Prior to installation:

- Check the compatibility of the camshaft with the remainder of the valve train components (valve springs, rockers, etc.)
- On race type, high spring load applications, use lighter load springs or remove the inner spring (dual spring application) just for break-in.

CRANE FLAT TAPPET CAMSHAFT RECOMMENDED BREAK-IN PROCEDURE

Due to the EPA's mandate for zinc removal from most motor oils, proper flat tappet camshaft break-in procedure is more critical than ever before. This is true for both hydraulic and mechanical flat tappet camshafts. As a point of interest, the most critical time in the life of a flat tappet camshaft is the first 20 minutes of break-in during which the bottoms of the lifters "mate-in" with the cam lobes.

There are some oils with additive packages that are better for camshaft break-in, such as Crane's 10W-40 Break-In oil, (**Part # 99300-1**), or the Driven™ Hot Rod oils. Also consider a **"race only" petroleum- based** oil, and include **Crane Cams Part # 99003-1 Super Lube"** additive. ***Do not use API rated SL, SM, or SN oil.***

CAUTION: We do not recommend the use of synthetic oils for break-in. Prior to installing the camshaft and lifters, it is recommended that the crankcase be drained and filled with new, clean oil, as listed above. The oil filter should also be changed at this time. Proper flat tappet camshaft break-in starts with the cam installation and includes the following steps:

1. Before installing the camshaft and lifters, wash them thoroughly in clean mineral spirits to remove the rust preventative that is placed on the cam before shipping. NOTE: As a rule of thumb, always thoroughly clean any part before installing it in an engine. Never assume that the parts are cleaned before packaging. During shipping, packaging material can rub into the component surface and must be removed.

2. DO NOT "pump-up" hydraulic lifters before use. This can cause the lifters to hold a valve open during engine cranking, which will cause low compression. The low compression will delay engine start-up and is very detrimental to proper camshaft break-in.

3. *With the supplied moly paste lube, coat the bottom of the lifters, cam lobes and distributor gear. Use Crane Cams assembly lube Part # **99008-1** on all other surfaces and components.*

4. Set your valve lash or lifter preload. Try to minimize the number of times that you rotate the engine, as this can displace the moly paste from the lobes and lifters.

5. If possible, prime the oiling system. When priming, rotate the engine at least two complete revolutions to assure oil gets to all valve train components. **Valve covers should be off to assure that all rockers are oiling.**

6. Preset the ignition timing to start the engine at a fast idle. **It is important that the static ignition timing is set as close as possible and if the engine has a carburetor, it should be filled with fuel. The engine needs to start quickly without excessive cranking to insure immediate lubrication to the cam lobes.**

7. Start the engine and immediately bring to 3,000 rpm. Timing should be adjusted, as quickly as possible, to reduce excessive heat or load during break-in. Get the engine running fairly smooth and **vary the engine speed from 1500-3000 RPM** in a slow, to moderate, acceleration/deceleration cycle. During this time, be sure to check for any leaks and check out any unusual noises. If something doesn't sound right, shut the engine off and check out the source of the noise. Upon restart, resume the high idle speed cycling. Continue the varying break-in speed for 20–30 minutes. This is necessary to provide proper lifter rotation to properly mate each lifter to its lobe. Should the engine need to be shut down for any reason, upon re-start it should be immediately brought back to 3000 rpm and the break-in continued for a total run time of 20–30 minutes.

8. **Let the engine cool, and then drain the crankcase and properly dispose of the oil and oil filter. Refill the crankcase with a premium petroleum-based oil, not a synthetic oil. At this point the initial break-in is complete. You can drive the vehicle in your normal manner. We recommend changing the oil and filter after 500 miles. You might want to put another 5000 miles on the cam before switching to a synthetic, if that is your preference.**

Section Continued

Flat Tappet Camshaft Break-in Procedure (continued)

ADDITIONAL INFORMATION
Spring Pressures: For extended camshaft life, flat-tappet cams should not be run with more than the recommended open valve spring pressure. Racing applications will often need to run more spring pressure at the expense of reduced camshaft life. In order to break-in a camshaft with high open pressures, the inner springs should be removed to reduce break-in load. The inner springs can then be reinstalled after initial break-in is complete.

Lifter Rotation: Flat tappet cams (both hydraulic and mechanical) have the lobes ground on a slight taper and the lifters appear to sit offset from the lobe centerline. This will induce a rotation of the lifter on the lobe. This rotation draws oil to the mating surface between the lifter and the lobe. If it is possible to view the pushrods during break-in, they should be spinning as an indication that the lifter is spinning. If you don't see a pushrod spinning, immediately stop the engine and find the cause.

Never use old flat tappet lifters on a new cam. On flat tappet cams, the lobes and lifter bottoms mate together. If the lifters are removed from the engine, they must go back on the same lobe from which they were removed. **Crane Cams recommends the use of high quality lifters to prevent premature cam or lifter wear. Crane lifters are of the highest quality.**

Big Block Chevrolets have an oil-priming idiosyncrasy. When priming a Big Block Chevy with a drill motor and priming tool, it is often necessary to prime for as long as 20 minutes (while rotating the engine) to get oil to all of the lifters and rockers. It is advisable to prime these engines with the valve covers removed so you can check to see oil coming out of all of the rocker arms before firing the engine. This last step is advisable on all engines, but particularly on Big Block Chevrolets.



Hydraulic Lifters

Hydraulic lifters have been the choice of the automotive industry for many years for several good reasons. When compared to a mechanical lifter, the hydraulics are:

1. Quieter.
2. Low maintenance.
3. Able to adjust for thermal expansion of the engine.
4. Considered as a built in shock absorber, eases stress on valve train.
5. Capable of having a "Bleed Rate" that can be designed to accommodate different engine RPM ranges.

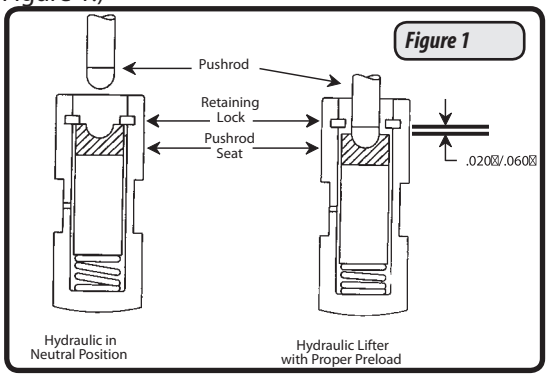
Most engines use either the standard design hydraulic lifter or the low friction, high performance hydraulic roller design. Hydraulic lifters are the best for street applications, high performance, and mild racing applications where low maintenance and low cost is a primary concern.

What is the difference in the design of a Hydraulic and Mechanical Lifter?

Basically, the hydraulic lifter pushrod seat is moveable, the mechanical lifter seat is not. Both lifter types can look the same from the outside, with both usually having pushrod seats held in by a retaining lock. The pushrod seat in a mechanical lifter usually registers upon an internal step inside the lifter body preventing it from moving (thus it gets the nickname "Solid Lifter"). What's below the pushrod seat in the hydraulic lifter is a different story. Its pushrod seat is not restricted by a step, but instead sits on top of a moveable hydraulic mechanism which acts like a tiny hydraulic pump. Below this mechanism is valving, and a spring to produce an upward force, moving the pushrod seat upward against the retaining lock.

What is Hydraulic Lifter Preload?

Mechanical cam designs require a running clearance or valve lash, while hydraulic lifters are just the opposite. When the rocker arm assembly is properly torqued down into position, the pushrod must take up all the clearance and descend into the hydraulic lifter, causing the pushrod seat to move down by .020" to .060". The distance that the pushrod seat moves down away from the retaining lock is the "Lifter Preload". The hydraulic mechanism requires this precise amount of "preload" for it to do its job properly. (See Figure 1.)



What happens if the amount of Hydraulic Lifter Preload is wrong?

If clearance exists between the pushrod and the seat in the hydraulic lifter, after the rocker arm assembly has been torqued down, you will have no lifter preload. In this case the valve train will be noisy when the engine is running. All of the hydraulic force produced by the lifter will be exerted against the lifter's retaining lock, and this could cause the lock to fail.

If the opposite occurs, and the pushrod descends too far (more than .060") with the lifter on the base circle, then you may have excessive lifter preload. In theory, a hydraulic lifter will only pump up to whatever preload it is set to. With excessive preload, as the engine RPM and oil pressure increases, the hydraulic mechanism could pump-up the pushrod seat if the valve spring cannot control the proper motion of the valve. This could cause the valve to stay off its seat during most of, or all, its entire cycle. This reduces the cylinder pressure, lowering the performance of the engine. Backfiring may also occur. The following sections will offer suggestions on how to correct this.

When rebuilding an engine, what can cause Lifter Preload to change?

Almost anything can affect lifter preload. If you do a valve job, surface the block or heads, change the head gasket thickness, or buy a new camshaft, the amount of preload can be affected. Sometimes these changes cancel one another out and your preload stays the same; this is more by luck than design. This is why you must always inspect the amount of preload the lifter has when reassembling the engine and be sure that it is correct.

A Fast and Easy Way to Check Hydraulic Lifter Preload when using Non-Adjustable Rocker Arms

With the cam, hydraulic lifters and pushrods in place, install your rocker arm assembly. Use the prescribed method in your repair manual and torque down all the valve train bolts in the proper sequence. Pick a cylinder that you are going to check. Hand rotate the engine in its normal direction of rotation until both valves are closed. You are on the compression cycle for that cylinder. (At this position the valve springs are at their least amount of tension making the job a little easier to do.) Wait a few minutes, allowing the lifters to bleed down. Now, lay a rigid straightedge across the cylinder head, supporting it on the surface of the head where the valve cover gasket would go. Using a metal scribe and the straightedge, carefully scribe a line on both pushrods. Now carefully remove the torque from all valve train bolts, removing any pressure from the pushrods. Wait a few minutes for the pushrod seat in the hydraulic lifter to move back to the neutral position. Carefully scribe a new line on both pushrods. Measure the distance between the two scribe marks, it represents the amount of lifter preload. If the lines are .020" to .060" apart you have proper lifter preload. If the lines are the same or less than .020" apart you have no, or insufficient, preload. If the lines are further apart than .060", you have excessive lifter preload. To bring your preload into tolerance, use one of the methods described in the next section if necessary, or call the Crane Tech Line for assistance (866-388-5120).

Methods to Adjust for Proper Hydraulic Lifter Preload

There are several different methods for increasing or decreasing the amount of lifter preload, depending on valve train design and how the rocker arm is held onto the cylinder head. Keep in mind that the automotive manufacturers have made changes to the valve train over the years. What may work on one year's engine may not work for another, even though they are basically the same engine. There is one method that universally works on all these engines, change the pushrod length! Use a longer pushrod to increase preload, a shorter to reduce preload. Crane offers various length pushrods, (see pages 286–289) and offers custom length pushrods.

Section Continued

Hydraulic Lifters (continued)

Many methods are illustrated throughout the catalog, here are a few of them:

- Custom length pushrods
- Bottleneck stud shims
- Bridge mount rocker arm shims
- Pedestal mount rocker arm shims
- Adjustable conversion rocker arm studs/kits
- "Kool Nut" adjusting nuts
- Guideplate and rocker arm conversion kits
- Adjustable rocker arms (both stud and shaft mounted)
- Replacement guideplates and studs

Using Adjustable Rocker Arms to set Hydraulic Lifter Preload

The easiest method to arrive at proper lifter preload is when you have an engine with "Adjustable Valve Train". Unfortunately, since 1967 most domestic engines, with the exception of small and big block Chevrolets, have been made with non-adjustable rocker arms. The Crane Catalog shows you several ways of converting your engine to an adjustable rocker arm system. The following sections will describe how to set the preload with adjustable rocker arms.

Hydraulic Lifters Can Be Adjusted at Any Engine Temperature

Since hydraulic lifters can compensate for thermal expansion of the engine, the adjusting can be done with the engine cold; hot adjustment is not necessary.

Adjusting Hydraulic Lifters for Proper Preload

In order to adjust the preload, the lifter must be properly located on the base circle or "Heel" of the lobe. (See Figure 2.) At this position the valve is closed and there is no lift taking place. You will need to watch the movement of the valves to determine which lifter is properly positioned for adjusting.

1. Remove the valve covers, and pick a cylinder that you are going to set the preload on.

2. Hand rotate the engine in its normal direction of rotation and watch the exhaust valve on that particular cylinder. When the exhaust valve begins to open, stop and adjust that cylinder's intake rocker arm. (Why? Because when the exhaust valve is just beginning to open, the intake lifter will be on the base circle of the lobe, the correct position for adjusting the intake.)

3. Back off the intake rocker arm adjuster and remove any tension from the pushrod. Wait a minute or two for that hydraulic lifter to return to a neutral position. The spring inside the lifter will move the pushrod seat up against the retaining lock if you give it time to do so. (If you are installing brand new lifters they will be in the neutral position when they come in the box.)

4. Now spin the intake pushrod with your fingers while tightening down the rocker arm. When you feel a slight resistance to the turning of the pushrod, you are at "Zero Lash". Turn the adjusting nut down one half to one full turn from that point. Lock the adjuster into position. The intake is now adjusted properly.

5. Continue to hand turn the engine, watching that same intake. It will go to full open and then begin to close. When it is almost closed, stop and adjust the exhaust rocker arm on that particular cylinder. (Again, when we see the intake almost closed, we are sure that exhaust lifter is on the base circle of the lobe.) Loosen the exhaust rocker arm and follow the same procedure described before in steps 3 and 4 to adjust this rocker arm.

6. Both valves on this cylinder are now adjusted, and you can move on to your next cylinder and follow the same procedure again.

Do Hydraulic Lifters Need to be Primed with Oil?

Many people mistakenly believe that hydraulic lifters must be soaked in oil overnight and be hand pumped up with a pushrod before installing into a new engine, however this is not necessary. In fact, this could cause the lifter to act as a "solid" and prevent obtaining proper preload.
What is very necessary is the priming of the entire engine's oil system before starting up a new engine for the first time. This is done by turning the oil pump with a drill motor to force oil throughout the entire engine. Crane Cams offers oil pump primers for Chevrolet and Ford engines. (see page 311)

What is a Hi Intensity Hydraulic Lifter?

Part of engineering a hydraulic lifter is to determine what its "Bleed Rate" will be. The "Bleed Rate" is a scientific method of determining the time it takes the hydraulic lifter to lose its pressure once it is fully pumped up solid with oil. By changing this rate, the lifter can give different performance factors to the engine. One such design is the Crane Cams Hi Intensity Lifter. Its increased bleed rate enables it to provide improved vacuum, increased cylinder pressure and performance in the lower RPM ranges. It is best suited for those engines that are using a big camshaft profile that requires more compression ratio than the engine actually has. This situation would normally cause a loss of bottom end performance, but with the Crane Cams Hi Intensity Lifter the bottom end torque is restored.

NOTE: Hi Intensity Lifters are only for use if the compression ratio is below the recommended minimum shown on the application page for the particular camshaft you have selected. Otherwise higher than desired cylinder pressures may result, causing detonation.

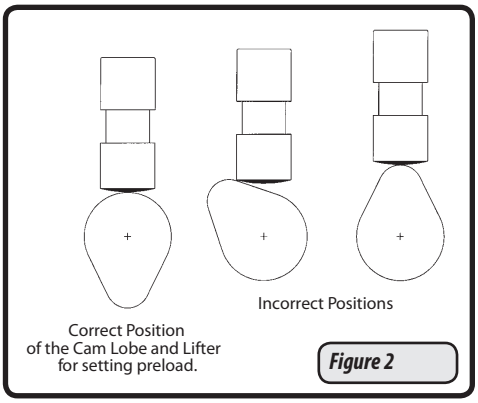


Figure 2

Mechanical Lifters

All pushrod engines using mechanical (solid) lifters, or mechanical roller lifters, must have an adjustable valve train so that precise adjustment for "Valve Lash" can be made to match the camshaft's requirements. Valve lash is the running clearance that exists between the tip of the valve stem and the valves mating surface of the rocker arm. (It is expressed in the Crane Catalog as "Valve Lash" and on the camshaft specification card as "Valve Setting". Both terms mean the same thing.) The amount of valve lash can vary between camshaft profile designs, being as small as .010" on some and as great as .035" on others. It is important to use the recommended valve lash when you first test the performance of the engine. You must also be concerned with thermal expansion of the engine components. This is especially true if using aluminum alloy cylinder heads, or block. For this reason, Crane requires that the valve lash be set with the engine "Hot" on all pushrod engines using mechanical lifters. This will insure that the minimum required clearance (valve lash) is maintained throughout the engine's operating temperature range.

Compensating for a Cold Engine when Adjusting Valve Lash

When installing a new cam, the engine will be cold but the lash specifications are for a hot engine. What are you to do? There is a correction factor that can be used to get close. We mentioned that the alloy of the engine parts can be affected by thermal expansion in different ways, therefore the amount of correction factor to the lash setting depends on whether the cylinder heads and block are made out of cast iron or aluminum. You can take the "hot" setting given to you in the catalog or cam specification card and alter it by the following amount to get a "cold" lash setting.

- **With iron block and iron heads, add .002"**
- **With iron block and aluminum heads, subtract .006"**
- **With both aluminum block and heads, subtract .012"**

Remember this correction adjustment is approximate and is only meant to get you close for the initial start up of the engine. After the engine is warmed up to its proper operating temperature range, you must go back and reset all the valves to the proper "hot" valve lash settings.

Setting Valve Lash on Mechanical Cams

All the valves must be set individually and only when the lifter is properly located on the base circle of the lobe. At this position the valve is closed and there is no lift taking place. How will you know when the valve you are adjusting is in the proper position with the lifter on the base circle of the cam? This can be accomplished by watching the movement of the valves.

1. When the engine is hot (at operating temperature) remove the valve covers and pick the cylinder that you are going to adjust.

2. Hand turn the engine in its normal direction of rotation while watching the exhaust valve on that particular cylinder. When the exhaust valve begins to open, stop and adjust that cylinder's intake valve. (Why? Because when the exhaust is just beginning to open, the intake lifter will be on the base circle of the lobe, so the intake is the one we can now adjust.)

3. Use a feeler gauge, set to the correct valve lash, and place it between the tip of the valve stem and rocker arm, unless otherwise specified. Adjust until you arrive at the proper setting and lock the adjuster in place.

4. After the intake valve has been adjusted, continue to rotate the engine, watching that same intake valve. The intake valve will go to full lift and then begin to close. When the intake is almost closed, stop and adjust the exhaust valve on that particular cylinder. (Again, when we see the intake valve almost closed, we are sure that the exhaust lifter is on the base circle of the lobe.) Use the feeler gauge and follow the procedure described before in step 3.

5. Both valves on this cylinder are now adjusted, so move to your next cylinder and follow the same procedure again. In the future you may find shortcuts to this method, but it still remains the best way to do the job correctly.

Using Valve Lash to Help Tune the Engine

The engine only responds to the actual movement of the valves. Since the valve cannot move until all the running clearance (valve lash) has been taken up, the amount of valve lash you use affects the engine's performance. For example, if you decrease the amount of (hot) valve lash, the valve will open slightly sooner, lift higher, and close later. This makes the camshaft look bigger to the engine, because of a slight increase of actual running duration and lift. If you increase the amount of (hot) lash the opposite occurs. The valve will open later, lift less, and close sooner. This shows the engine a smaller cam with slightly less actual running duration and lift. You can use this method on a trial basis to see what the engine responds to and keep the setting that works the best. Just remember, the more lash you run, the noisier the valve train will be. If the clearance is excessive it can be harsh on the other valve train components. Therefore, for prolonged running of the engine we do not recommend increasing the amount of hot lash by more than +.004" from the recommended setting. Nor do we recommend decreasing the hot lash by more than -.008".

Warning:

"Tight Lash" camshafts cannot deviate from the recommended hot lash setting by more than +.002" increase, or -.004" decrease. "Tight Lash" cams are those which have recommended valve settings of only .010", .012", or .014" on the specification card. These lobe designs have very short clearance ramps and cannot tolerate any increase in the recommended valve lash. The extra clearance can cause severe damage to valve train components.

With "Tight Lash" cams, we recommend using only the prescribed amount of hot valve lash, and that close inspection of the engine be maintained.

Please realize that changing valve lash settings from the recommended design specifications will change the harmonic characteristics of the valve train, possibly causing valve spring deterioration and breakage.

Commonly Asked Valve Spring Questions

What is Valve Spring Installed Height?
Installed height is the dimension measured from the bottom of the valve spring retainer, where the outer valve spring locates, to the spring pocket in the cylinder head, when the valve is closed. (See Figure 3)

How Does Installed Height Affect the Spring Tension?
Installed height is the determining factor of what the valve spring "Closed Tension" will be. The camshaft specification card, and the spring section of the catalog both show what the approximate tension a particular valve spring will exert if installed at a specific height. For example, spring part no. **99848** shows 114# @ 1.700". This means that if this spring is installed at a height of 1.700" it should exert 114# of tension with the valve closed.

How Do You Change Installed Height, and What Effect Does it Have?
The easiest way to lessen installed height is to insert a shim in the spring pocket below the valve spring. Another method is to use a different design valve spring retainer. Retainers with a deeper dish will have more installed height; with a shallower dish, less installed height. (See Figure 3) You can also use a valve lock that is designed to change the location where the retainer is positioned on the valve stem. For specific retainer or valve lock height specifications and options look in the Buyers Guide section of the catalog. Longer length valves can also be used.

The shorter the installed height, the higher the valve spring tension will be, and the less distance the spring can travel before reaching coil bind.

The taller the installed height, the less the valve spring tension and the further the spring can travel before coil bind occurs.

What is Valve Spring Coil Bind and How Does it Relate to Spring Travel and Valve Lift?
When the valve spring is compressed until its coils touch one another and can travel no further, it is said to be in coil bind. The catalog (pages 317–319) shows the approximate coil bind height for the various Crane Cams valve springs. To measure this you must install the retainer in the valve spring, then compress the spring until it coil binds. Now measure from the bottom side of the retainer to the bottom of the spring. This measurement is the coil bind height. (See Figure 4) This can be done on the cylinder head with a spring compression tool, in a bench vise, or in a professional valve spring tester.

Using Figure 4, subtract the coil bind height "B" from the valve spring installed height "A". The difference "C" is the maximum spring travel. The spring travel should usually be at least .060" greater than the full lift of the valve. This safety margin of .060" (or more) is necessary to avoid the dangers of coil bind and over-stressing the spring.

If coil bind occurs, the resulting mechanical interference will severely damage the camshaft and valve train components.

Figure 3

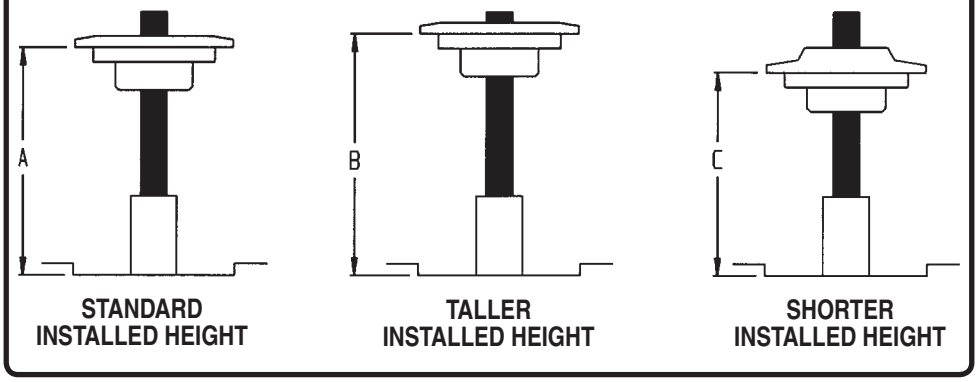
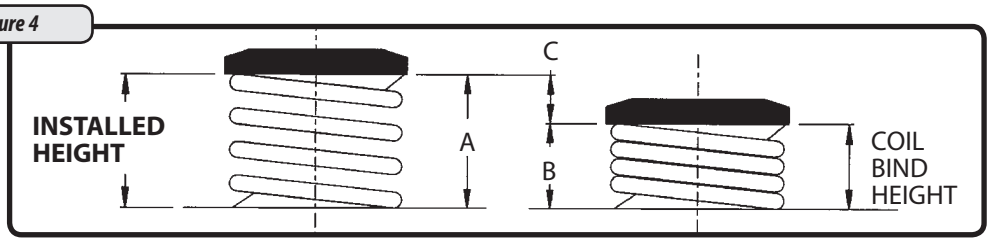


Figure 4



Section Continued

Commonly Asked Valve Spring Questions (continued)

How Do You Increase the Spring Travel?
The valve spring must have sufficient travel (plus .060" safety margin) to accommodate the amount of valve lift created by the camshaft and/or an increase in rocker arm ratio. To increase spring travel you can either raise the installed height (but this will lessen the spring tension), or change to a spring with additional travel. If there is not a standard diameter spring available with enough travel, then the cylinder heads will have to be machined and a larger spring installed.

Crane Cams offers some special valve springs in standard diameters which saves you from having to machine the cylinder heads. For example, a small block Chevrolet engine can use spring kit part no. **11309-1** to handle .550" to .600" valve lift. The 85-00 302 Ford hydraulic roller engines can use spring kit part no. **44308-1** to handle .550" lift. Consult the Buyers Guide for specific spring information and options.

Besides Coil Bind, What Other Types of Mechanical Interference Should You Look Out For?
When you increase the valve lift with a bigger cam or increased rocker arm ratio, you must be sure that there is no interference between any of the moving parts. Some of the components that must be inspected for clearance are:

1. Distance from the bottom of the valve spring retainer and the top of the valve stem guide (see Figure 5), or the top of the valve stem seal (see Figure 5), must be equal to the net valve lift of the valve plus at least .060" more for clearance.

2. When using rocker arms mounted on a stud, the length of the slot in the rocker arm body must be inspected to be sure it is long enough to avoid binding on the stud. The ends of the slot must be at least .060" away from the stud when the rocker is at full valve lift and when the valve is closed.

   Crane Cams offers steel long slot and extra long slot rocker arms to relieve this interference problem. Aluminum roller rocker arms may be required to provide sufficient travel on larger lift camshafts.

3. The underside of the rocker arm body cannot touch the valve spring retainer. You will need at least .040" clearance to the retainer throughout the full movement of the rocker arm. If necessary, a different shape retainer or rocker arm design will be required. In some cases, installing a lash cap on the tip of the valve stem can provide the clearance required.

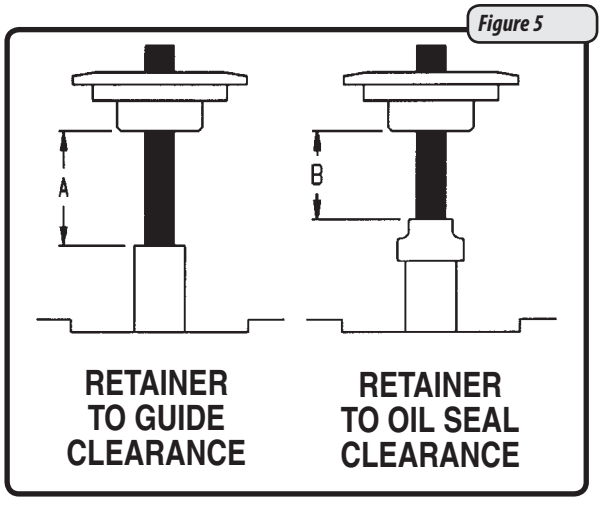
4. Valve to piston clearance must be checked to be sure there is sufficient clearance. The intake valve must have at least .100" clearance to the piston and at least .120" clearance on the exhaust valve.

What is a Quick Way to Check Valve to Piston Clearance on an Assembled Engine?
Low tension checking springs, part no. ***99881-2***, must be used (instead of your normal valve spring) to mock up your valve train and to check the piston to valve clearance on the engine. Assemble the valve train and verify correct lifter preload or valve lash. By mounting a dial indicator on the cylinder head with the plunger's tip on the valve spring retainer, you can quickly check the clearance. Hand rotate the engine through a complete cycle (two rotations of the crankshaft), stopping at several points before and after Top Dead Center (T.D.C.) to check the valve clearance. The least amount of clearance will usually occur between 15 degrees before T.D.C. and 15 degrees after T.D.C. This also provides a graphic illustration that gross valve lift does not determine piston to valve clearance, as the piston is fairly far down in the cylinder when maximum valve lift is reached. By pushing the rocker arm down with your finger, the valve will contact the piston. The amount of movement shown on the dial indicator is the valve clearance at that point of engine rotation. Rotate the crankshaft a few degrees and re-check the clearance. As the piston moves through this area, the dial indicator reading will lessen, then become larger as you rotate the engine past the critical point. The shortest reading you get is the actual valve to piston clearance.

What is the Critical Point of Crankshaft Rotation for Checking Valve to Piston Clearance?
The critical point for both valves is the "Overlap Period" as the exhaust cycle is ending and the intake cycle is beginning. You must start checking the clearance before and continue after T.D.C. on both the intake and exhaust valves to be sure you have the correct readings through the overlap period.

You can find all the tools required for checking valve to piston clearance (as well as degreeing a cam) in Crane Cams' Tune-A-Cam Kit, part no. **99030-1**.

Figure 5



Section Continued

Commonly Asked Valve Train Questions (continued)

What is meant by Basic RPM?
The camshaft's basic RPM is the RPM range within which the engine will produce its best power. The width of this power band is approximately 3000 to 3500 RPM with standard lifter cams, and 3500 to 4000 RPM with roller lifter cams. It is important that you select the camshaft with the "Basic RPM Range" best suited to your application, vehicle gearing and tire diameter.

Why is Cruise RPM at 60 MPH important?
When selecting a new camshaft, you can raise or lower the engine's basic RPM range. It is important to be sure the vehicle's drive train is capable of matching your selection. The cruise RPM at 60 MPH is a way of rating your rear end gearing and tire diameter to determine if these components match the RPM potential you are desiring. You can use the formulas and chart on page 13 to calculate your cruise RPM.

What is Camshaft Duration and why is it important?
Duration is the period of time, measured in degrees of crankshaft rotation, that a valve is open. Duration (at .050" lifter rise) is the deciding factor to what the engine's basic RPM range will be. Lower duration cams produce the power in the lower RPM range. Larger duration cams operate at higher RPM, but you will lose bottom end power to gain top end power as the duration is increased. (For each ten degree change in the duration at .050", the power band moves up or down in RPM range by approximately 500 RPM.)

What is the difference in Advertised Duration and Duration at .050" Lifter Rise (Tappet Lift)?
In order for duration to have any merit as a measurement for comparing camshaft size, the method for determining the duration must be the same. There are two key components for measuring duration— the degrees of crankshaft rotation and at what point of lifter rise the measurements were taken. Advertised durations are not taken at any consistent point of lifter rise, so these numbers can vary greatly. For this reason, advertised duration figures are not good for comparing cams. Duration values expressed at .050" lifter rise state the exact point the measurement was taken. These are the only duration figures that are consistent and can accurately be used to compare camshafts.

How does Valve Lift affect the operation of an engine?
Lift is the distance the valve actually travels. It is created by the cam lobe lift, which is then increased by the rocker arm ratio. The amount of lift you have and the speed at which the valve moves is a key factor in determining the torque the engine will produce.

What is Camshaft Lobe Separation and how does it affect the engine?
Lobe separation is the distance (in **camshaft** degrees) that the intake and exhaust lobe centerlines (for a given cylinder) are spread apart. Lobe separation is a physical characteristic of the camshaft and cannot be changed without regrinding the lobes. This separation determines where peak torque will occur within the engine's power range. Tight lobe separations (such as 106°) cause the peak torque to build early in basic RPM range of the cam. The torque will be concentrated, build quickly and peak out. Broader lobe separations (such as 112°) allow the torque to be spread over a broader portion of the basic RPM range and shows better power through the upper RPM.

What are Intake and Exhaust Centerlines?
The centerline of either the intake or exhaust lobe is the theoretical maximum lift point of the lobe in relationship to Top Dead Center in degrees of crankshaft rotation. (They are shown at the bottom of the camshaft specification card as "MAX LIFT.") The centerline of the cam can be moved by installing the camshaft in the engine to an advanced or a retarded position.

How does Advancing or Retarding the camshaft's position in the engine affect performance?
Advancing the cam will shift the basic RPM range downward. Four degrees of advance (from the original position) will cause the power range to start approximately 200 RPM sooner. Retarding it this same amount will move the power upward approximately 200 RPM. This can be helpful for tuning the power range to match your situation. If the correct cam has been selected for a particular application, installing it in the normal "straight up" position (per the opening and closing events at .050" lifter rise on the spec card) is the best starting point.

Why is it necessary to know the Compression Ratio of an engine in order to choose the correct cam?
The compression ratio of the engine is one of three key factors in determining the engine's cylinder pressure. The other two are the duration of the camshaft (at .050" lifter rise) and the position of the cam in the engine (advanced or retarded). The result of how these three factors interact with one another is the amount of cylinder pressure the engine will generate. (This is usually expressed as the "cranking pressure" that can be measured with a gauge installed in the spark plug hole.) It is important to be sure that the engine's compression ratio matches the recommended ratio for the cam you are selecting. Too little compression ratio (or too much duration) will cause the cylinder pressure to drop. This will lower the power output of the engine. With too much compression ratio (or too little duration) the cylinder pressure will be too high, causing pre-ignition and detonation. This condition could severely damage engine components. It is important to follow the guidelines for compression shown on the application pages of the catalog.

Section Continued

Commonly Asked Valve Train Questions (continued)

How does Cylinder Pressure relate to the octane rating of today's unleaded fuel?
In very basic terms, the more cylinder pressure we make the more power the engine will produce. But look out for the fuel! Today's pump gasoline cannot tolerate excessive cylinder pressures. About 165 PSI with iron cylinder heads and 180 PSI with aluminum cylinder heads are reasonable limits to adhere to. Remember, cylinder pressure is affected by the static compression ratio and the camshaft specifications (primarily the intake valve closing event). Excessive pressures will cause detonation, resulting in internal engine damage. Octane boosters, or a racing grade of fuel, may be required to avoid difficulties.

How does an increase in Rocker Arm Ratio improve the engine's performance?
The lobe lift of the cam is increased by the ratio of the rocker arm to produce the final amount of valve lift. A cam with a .320" lobe lift using a 1.50:1 ratio rocker arm will have .480" valve lift (.320" x 1.50 = .480"). If you install rocker arms with an increased ratio of 1.60:1, with the same cam, the lift would increase to .512" (.320" x 1.60 = .512"). The engine reacts to the movement of the valve. It doesn't know how the increased lift was generated. It responds the same way it would as if a slightly larger lift cam had been installed. In fact, since the speed of the valve is increased with the higher rocker arm ratio, the engine thinks it has also gained 2° to 4° of camshaft duration. The end result is an easy and quick way to improve the performance of the existing cam without having to install a new one. See the Buyers Guide section for availability of increased ratio rocker arms. Remember, whenever you increase the valve lift, with either a bigger cam or larger rocker arm ratio, you must check for valve spring coil bind and for other mechanical interference. Please review the previous sections concerning these matters.

Must new (Standard Design) lifters always be installed on a new camshaft?
YES! All new standard (flat-faced) hydraulic and mechanical camshafts must have new lifters installed. The face of these lifters do have a slight crown, and the mating lobe surface they ride on has been ground with a slight taper. The purpose of this is to create a "spinning" of the lifter as it rides on the lobe. This is necessary to prevent premature wear of the lifter and lobe. Therefore, these parts will be mated to one another during the initial break-in period. Used lifters will not mate properly, causing the lobe to fail.

If you are rebuilding an engine and plan to re-use the existing cam and lifters (in the same block) it can be done, as long as the lifter goes back on the same lobe it is mated to. To keep your components in order, a Crane Cams "Organizer Tray" part no. **99015-1** would be helpful. If the lifters get mixed up, they cannot be used, and a new set will be required. The new lifters would also have to go through the break-in procedure to mate to the old cam.

Can used Roller Lifters be installed on a new camshaft?
YES. Roller lifters are the only ones that can be re-used. This design lifter has a wheel (supported by needle bearings) attached to the bottom of it. The lobe the roller lifter rides on does not have any taper. This is a very low friction design and does not require the lifter to mate to the cam. As long as the wheel shows no wear, and the needle bearings are in good condition, the hydraulic roller or mechanical roller lifter can be re-used.

What Engine Oil and Lubricants should I use?
Crane Cams does not recommend the use of synthetic oils during the initial break-in period for a new camshaft. Use a good quality grade of naturally formulated motor oil during this period, such as Crane **99300-1** 10W-40 break-in oil. If you choose to use synthetic oil after the engine has been broken in, change the oil filter and follow the oil manufacturer's instructions.

When using either regular oil or synthetic it is important to pick the weight oil that best matches your engine bearing clearances, the engine's operating temperature, and the climate the vehicle will be operating in. Use the oil manufacturer's recommendation to satisfy these conditions.

Crane Cams offers lubricants to aid during the critical break-in procedure, and to prolong the engine's life. See the Buyers Guide section, page 285, for specific information on Crane Cams Lubricants and their application.

Should I use Oil Restrictors in my engine?
No, Crane Cams does not recommend the use of oil restrictors. The oil is the life blood of the engine, not only lubricating but cooling the engine components as well. For example, a valve spring builds in temperature as it compresses and relaxes. This increase of temperature affects the characteristics of the spring material, and if excessive, will shorten the life of the spring. Oil is the only means the spring has for cooling.

How do I prime the engine's oiling system?
It is critical that the engine's oiling system be primed before starting the newly built, or rebuilt, engine for the first time. This must be done by turning the oil pump with a drill motor to supply oil throughout the engine. If this is done with the valve covers off, you will be able to see that the oil is being delivered to the top of the engine and to all the valve train components. Crane Cams offers oil pump primers for Chevrolet and Ford engines, see page 311.

What is the Most Important thing to remember?
Reading and following the instructions supplied to you is most important. If there is something you don't understand, contact the people who supplied you the parts, or call one of the Crane Cams Technical Consultants. Get answers to your questions before proceeding.

Any non-roller camshaft and lifters must be pre-lubricated before installation. Use Crane Cams Assembly Lube, part number 99002-1, and Crane Cams Super-Lube, part number 99003-1, or Crane Cams 99300-1 10W-40 break-in oil.

Degreeing the Cam

What is Meant by Degreeing the Camshaft, and Why is it Necessary?
The term "Degreeing In Your Camshaft" means you are making sure the camshaft's position in the engine coincides with that of the crankshaft, so that their rotation is synchronized. This is the only way you will know if the rise and fall of the pistons properly matches the opening and closing of the valves, so the engine will run properly. A few degrees of misalignment can affect the engine's operation dramatically. If the circumstances were perfect, one would only need to line up the marks on the timing chain sprockets and the cam would be degreed. In reality, you are dealing with a group of components (the camshaft, crankshaft, timing chain, and sprockets), all with their own standards and tolerances. If these tolerances stack up against you, it could throw you out of alignment. Without degreeing the cam you can never be sure that the parts are in correct position. If you have the tools and expertise, we always recommend that the camshaft's position in the engine be degreed in.

Is There More Than One Way to Degree a Cam, and Which is Better?
Currently there are two popular methods for degreeing a cam: the **centerline method**, and the **duration at .050" lift method**. We believe it is far better to degree the camshaft with either method than not to degree the cam at all; but of the two methods, the **duration at .050" lift is *much more accurate***.

The main problem with the centerline method is it has you finding the theoretical centerline of the intake and/or exhaust lobe and line up on it. It makes the basic assumption that the lobe you are checking is symmetrical, with its opening side being the exact same shape and size as the closing side of the lobe. The truth is that most modern lobes are asymmetrical, with the opening side of the lobe being much more aggressive and the closing side being more gentle. Therefore, when you attempt to locate the middle (or centerline) of the asymmetrical lobe there is an automatic error factor. It could be as little as 2° off or as much as 6°, depending on the exact lobe shape and the procedure used during the degreeing operation. **Neither does it verify that the camshaft has been properly ground** with the correct duration lobes, which can drastically affect performance.

Since the duration at .050" lift method is not affected by the asymmetrical lobe design, we believe it is the more accurate way to degree.

What Tools Will I Need to Degree the Cam?
The basic tools required are:

1. A degree wheel, such as Crane Cams part no. **99162-1**. You can also use a professional fully degreed damper or hub, or install degree tape to your stock damper. Be sure to get the tape that matches the diameter of the damper. Use whatever will give you accurate markings for 360°.
2. A stable pointer that can be conveniently mounted to the engine.
3. A dial indicator with at least a half inch of travel in .001" increments. A rigid stand that mounts to the engine or with a magnetic base to hold the dial indicator will also be required.
4. A positive stop device to locate T.D.C. such as Crane Cams part no. **99410-1** or **99412-1** will be necessary. (You can make your own by using an old spark plug. Remove the porcelain insides, then drill and tap the interior of the spark plug housing and thread a long bolt through it.)

All of the above tools are in the Crane Cams Tune-A-Cam Kit, part no. **99030-1**.



Tune-A-Cam Kit

Critical cam and valve train checking chores can be made easier, more accurate and faster when you have the correct tools handy. Crane Cams' Tune-A-Cam Kit, Part No. ***99030-1,*** *contains all the items required to degree-in your camshaft, check valve-to-piston clearance, etc. These items are all enclosed in their own foam protected, hard plastic carrying case.*

Section Continued

Degreeing the Cam (continued)

How Do You Find Top Dead Center (T.D.C.)?
Determining exactly where Top Dead Center is can be tricky. The problem in finding the true T.D.C. of the piston's travel is that the piston dwells at T.D.C. for several degrees of crankshaft rotation. You must use a device to stop the piston in the same position on either side of T.D.C. and take readings from the degree wheel. You will then split the difference in these readings and move the pointer this amount, making it the true T.D.C. point.

Begin the procedure by first mounting the degree wheel on the end of the crankshaft securely, and rotating the engine to approximately T.D.C. Mount the pointer and line it up at zero on the degree wheel. Now rotate the engine to move the piston down into the cylinder. Install your positive stop device into the spark plug hole and extend the bolt. Now hand turn the engine (**do not use the starter motor or you will put a hole through the piston**), rotating it until the piston comes up and stops against the bolt. Look at the degree wheel and write down the number of degrees shown by the pointer. Hand turn the engine in the opposite direction until the piston comes up and stops on the bolt again. Go back to the degree wheel and write down the degrees it now reads. Add these two readings together and divide the answer by two. Now either move your pointer by this many degrees, or carefully loosen the degree wheel (without disturbing the position of the crankshaft) and move the wheel this required amount. Retighten the bolts, and rotate the engine again making sure that the readings on each side of T.D.C. are equal degrees away from zero. If they are, the zero on the degree wheel will now be the true T.D.C. point.

Be sure to remove the positive stop device from the spark plug hole, as this procedure is complete.

A Simple Explanation of Cam Degreeing
In simple terms, the degreeing process can be thought of as using a dial indicator and degree wheel as tools to map out one revolution around the cam lobe. You will start on the base circle of the lobe where there is no lift. (See Figure 6) Then by rotating the engine you will move up the opening side, go over the top of the lobe, then move down the closing side, finishing back on the base circle. The dial indicator will move from zero, up to maximum lobe lift, then back to zero during this revolution. You will watch the dial indicator, and stop at two key points to take readings from the degree wheel. Both points will be when the dial indicator shows .050" of lifter rise. This .050" reading will occur on the opening side and again on the closing side of the lobe. These readings will then be compared to the specification card to see how close you are. If necessary, corrections can be made to put the camshaft in the exact position.

Important Tips to Remember When Degreeing a Camshaft

1. You must always **use the same type and size lifter that your camshaft was designed for**. For example, you cannot use a .842" diameter lifter on a camshaft designed for a .875" diameter lifter. You cannot use a standard (flat) lifter to degree a roller camshaft. If your roller camshaft was designed to use a .920" diameter roller, it will not degree properly with a .750" diameter roller, etc.

2. **Clean off any excessive lubricant** from the lobes and lifters that you are checking. Thick oil, especially assembly lube (paste) can cause false readings to occur. Wipe the parts clean before checking, and remember to re-lubricate them when you are finished.

3. If you make a mistake and rotate the engine past the point you wished to take a reading, **do not back up the rotation**. If you do, any slack in the timing chain or lash in the gears will affect the readings, causing an error. If you miss your stopping point, just continue rotating the engine in the normal direction until you return to the desired point.

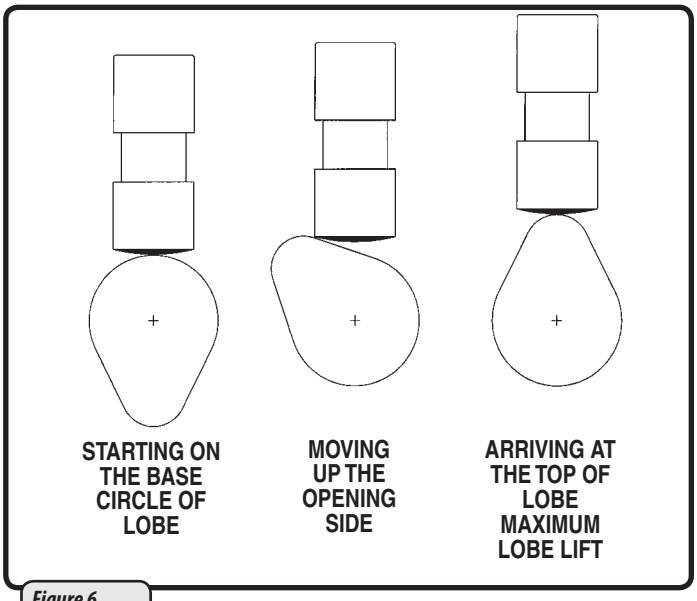


Figure 6

Section Continued

Degreeing the Cam *(continued)*

The Procedure to Degree the Camshaft

1. The dial indicator and stand must be attached securely to the engine. Any deflection could cause an error in your readings. Using the number one cylinder as a starting point, hand rotate the engine in a normal direction (usually clockwise, when standing in front of the engine) until the intake valve is closed (the lifter is down on the base circle of the cam lobe). If the intake manifold is off the engine, mount the plunger of the indicator directly on top of the intake lifter itself. If the intake manifold is on the engine, you can use the pushrod as an extension to the dial indicator and mount the plunger tip directly on top of the pushrod. In either case, it is important to make sure the angle of the dial indicator plunger is the same angle as the lifter or pushrod travel. We want to read "straight line" (linear) movement of these parts, so the plunger must be aligned properly. With the indicator in position, set the dial indicator to zero.

2. Hand rotate the engine in its normal direction of rotation while watching the dial indicator. As the lifter starts to move up the opening side of the lobe, the reading on the dial indicator will start to increase. Continue rotating the engine until the dial indicator shows .050" of rise. Stop and take a reading on the degree wheel and write it down.

3. As you continue to rotate the engine, the reading on the dial indicator will rise up to the maximum lobe lift. The lifter is now on the top of the lobe. (The maximum lobe lift is shown on the spec card and can be verified at this point). Continue the rotation and the lifter will start down the closing side of the lobe. Carefully watch the dial indicator as the numbers descend. When the indicator descends back to the .050" reading, stop, take a reading from the degree wheel and write it down. Rotate the engine and return to the base circle of the lobe. **The dial indicator must read zero again to be sure the process was correctly done.**

4. You now have the two important readings from the degree wheel, both taken when the dial indicator read .050". One reading as the indicator was ascending on the opening side, the other when it was descending on the closing side. Compare these numbers to those on your camshaft inspection card to verify the position of the intake lobe.
   The camshaft specification card provides much information, but the numbers you are most interested in for the degreeing of the cam are at the bottom of the card. In the box identified as "Cam timing at .050" Tappet Lift". (Just a reminder, the word tappet and lifter mean the same thing. This can also be expressed as .050" lifter rise.) Inside this box are the degree readings that the degree wheel would show for the intake "opening" side of the lobe and the intake "closing" side of the lobe when the dial indicator is at .050" of lift. (Below those figures are the opening and closing figures for the exhaust.) Compare your readings for the intake to those on the card. If you're within a degree, your camshaft is installed in the correct position. (See example of Specification Card on page 364.)

5. You can follow exactly the same procedure on the exhaust lobe to determine its opening and closing degree points at .050" of tappet (or lifter) rise, and compare these readings to those on the specification card. If you also check the exhaust lobe you will have four points of reference (intake opening and closing, and the exhaust opening and closing) to go by. Remember, if you are within plus or minus one degree of these readings, your cam is in the correct location and will be synchronized to the crankshaft's rotation.

What Can You Do If Your Camshaft is Off Of Location and Needs Correction?

There are several methods of adjusting the location of the camshaft to correct for misalignment. Most high performance timing chain sets have the lower crank sprocket machined with three or more keyways, allowing you to advance or retard the camshaft. There are also offset keys made for the crankshaft. Another popular method is offset eccentric timing bushings that can be installed in the upper camshaft sprocket to change the camshaft's position in relation to the sprocket on those camshafts that use a dowel pin for indexing. Use any of these methods, then degree the camshaft once again to be sure it is correct.

See the Buyers Guide section for degreeing bushings and performance timing chain sets.

Cam Timing Explained

Cam advance, lobe separation, lobe centerline, intake lobe centerline, etc. are all terms being used for comparing and devising camshaft specifications. With so many similar terms being used, there can be a bit of confusion when folks from different backgrounds start talking about them.

Lobe separation is the measurement in CAM degrees between the maximum lift point of the exhaust lobe to the maximum lift point of the intake lobe on any cylinder. Some also refer to this as lobe centerline. This dimension is ground into the camshaft and can not be changed by advancing or retarding the camshaft (unless it's an engine with separate intake and exhaust cams.)

Intake lobe centerline, or intake maximum lift, refers to the distance in crankshaft degrees from the cylinder's Top Dead Center point to the maximum lift point of the intake lobe on any one cylinder. This is usually measured as degrees After Top Dead Center. This figure WILL change when the cam is advanced or retarded. As you advance the cam, this number will get smaller, as you are opening it fewer degrees AFTER Top Dead Center. Retarding the cam will make this number larger, as you are opening it more degrees AFTER Top Dead Center.

Exhaust lobe centerline, or exhaust maximum lift, is usually expressed in crankshaft degrees Before Top Dead Center. As you advance the cam, this number will get larger, since you are opening it more degrees BEFORE Top Dead Center. Retarding the cam will make this number smaller.

The average of the intake lobe centerline and the exhaust lobe centerline should equal your lobe separation.

The cam timing figures (as measured at a specific lobe lift: .004", .020", .050", etc.) may show the maximum lift point to be distorted when you're dealing with non-symmetrical camshaft lobes (the opening side has a different shape than the closing side). If you split the difference between the opening and closing figures at .020" or .050" lobe lift, this figure will not coincide with the actual maximum lift point of the lobe. There are instances where a non-symmetrical intake lobe is paired with a symmetrical exhaust lobe (or vice-versa), or lobes with varying amounts of non-symmetry may be used as intake and exhaust. We believe that where the opening and closing events actually occur are the most important figures to pay attention to when degreeing your camshaft. Just finding the maximum lift points doesn't really tell you anything about the camshaft, or it's even the correct camshaft! By documenting the opening and closing numbers as you tune, you will gain more knowledge as to what actually helps or hinders your performance. This is also a good time to emphasize keeping track of your cranking compression whenever you change valve lash, cam timing, rocker arm ratio, and especially when changing camshafts.

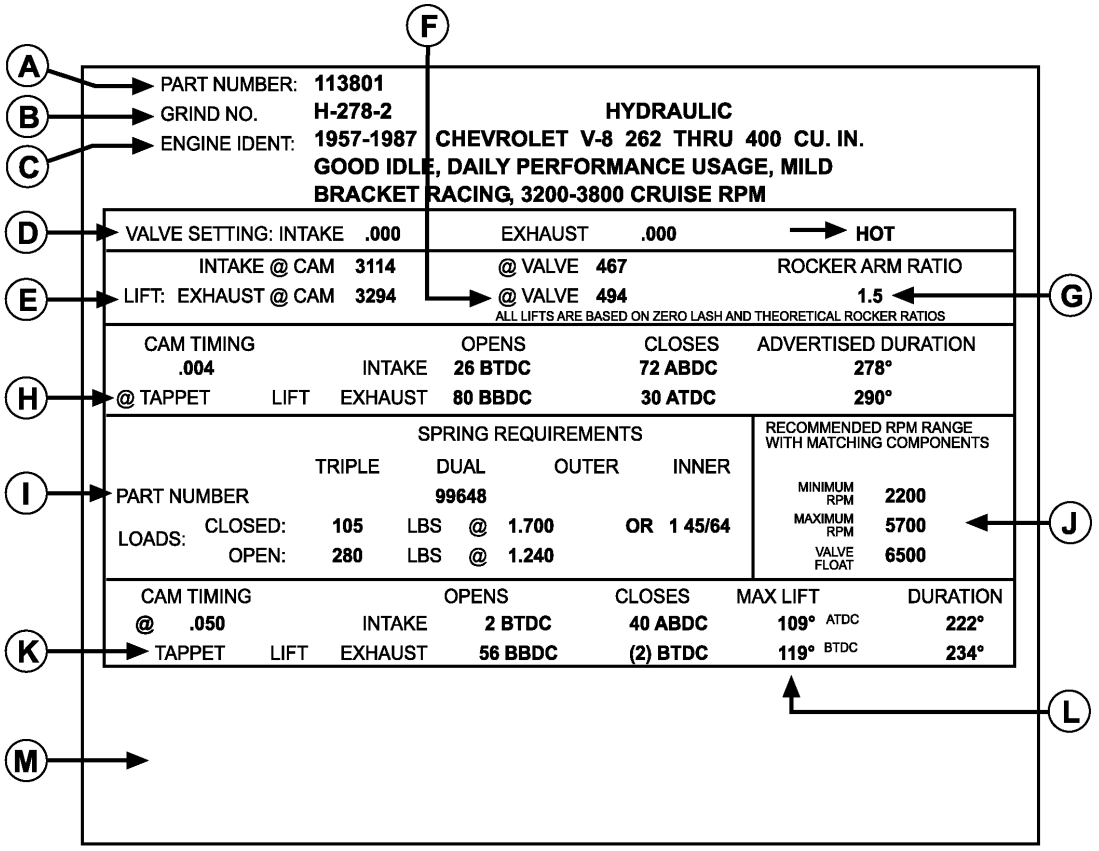
You may have noticed that most Crane Cams have a certain amount of advance ground into them when you check out the cam specification card. This is primarily done to insure that you have adequate torque to establish a good performance baseline. We have also found over the years, that the correct camshaft for most applications will run best with some amount of advance in it. We believe that it's certainly better to begin with too much bottom end and mid-range torque, and tune from there, than to have a shortage of torque, and try to figure out how to compensate for that.

The following is a general rule for how we grind most of our camshafts:

Lobe Separation	Degrees Advance
Up to 102	0
103-104	2
105	3
106-107	4
108 or more	5

This has certainly not been a list of all of the terms and philosophies we use when producing our camshafts, but it will hopefully provide a bit of insight as to some of our methods of camshaft recommendation and production. We invite any questions or comments that you may have.

Understanding the Cam Specification Card



A. Part Number

B. Grind Number refers to engineering design information only. (This is not a part number)

C. Identification of the engine series

D. Recommended **valve setting** for the particular cam shaft profile. This represents the running clearance or Valve Lash required. This setting is chosen for maximum performance and valve train reliability.

E. Cam lobe lift as measured at the lifter (tappet) with a dial indicator having .500 inch minimum travel capacity.

F. The **valve lift** data is determined by multiplying the cam lobe lift by the rocker arm ratio.

G. The **rocker arm ratio** listed is the engine manufacturer's standard specified (or otherwise recommended) ratio.

H. The **cam timing** events used to compute advertised duration. The opening and closing events, and at what lifter rise (tappet lift) they were taken, show how the **advertised duration** is calculated.

Example:

26°	B.T.D.C. Intake Opening
+ 180°	Crankshaft Rotation
+ 72°	A.B.D.C. Intake Closing
= 278°	Advertised Duration

These events are not meant for degreeing the cam. You should use the events (K) at .050" lifter rise (tappet lift) only for best accuracy.

I. The **valve spring** requirements shown represent the maximum safe closed and open spring loads, and the most reliable valve springs for the camshaft profile and valve train combination.

J. Recommended RPM range is to be used as a guideline. This will vary depending on engine displacement and other equipment combinations.

K. Cam timing figures at .050" lifter rise (tappet lift) are provided for degreeing of the camshaft. They are expressed in degrees of crankshaft rotation. See pages 360–363 for additional degreeing information.

L. The **maximum lift** (centerline) figures shown represent the theoretical maximum lift points of the intake and exhaust lobe centerlines. Due to most modern cam lobe designs being asymmetrical, this may not be the actual point at which the centerline occurs. This figure is provided as a point of reference and ***should not be used*** to degree a camshaft.

M. When necessary, special instructions are provided at the bottom of the cam card.

How to Return Product for Warranty

Should you encounter problems with any Crane Cams product, please contact our ***Crane Cams Technical Service Reps.*** before returning the items for warranty consideration. Many times problems come from the specific application, and its variances, and can be easily solved on the phone.

If you are advised by the Crane Cams Representative to return the parts for warranty consideration you will be issued a Return Goods Authorization (RGA) number. Please refer to this RGA number in all future actions or correspondence about your claim.

DO NOT RETURN CRANE PRODUCTS TO THE DISTRIBUTOR WHERE WERE THEY WERE ORIGINALLY PURCHASED!

Instead, provide detailed information regarding your problem (you must include your RGA number) and enclose the note along with the parts you wish to return.

Include your full name, address, daytime phone number, engine make, year, cubic inches, modifications to the engine, the Crane Cams representative with whom you spoke, and when and where the parts were purchased.

Even if you called, you must include the information above, along with the parts being returned. Failure to do this can delay your warranty claim.

If the product being returned is a hydraulic or mechanical lifter cam, you must also return all of the lifters used (if they are Crane) for evaluation. ***Crane's warranty is limited to repair or replacement of Crane products only.*** Non-Crane parts will be returned upon your request only. Send the note and the parts you wish to return to:

Crane Cams
Attn: Warranty Dept.
1830 Holsonback Drive
Daytona Beach, FL 32117

Should you call regarding warranty claim parts already returned to us, call our Technical Service Reps. at 866-388-5120). We are available Monday–Friday, 8:00 am–5:00 pm.

Crane Cams normally handles claims in less than 10 days of receipt of the parts. We will return any repaired or replaced warranty parts prepaid for surface shipping, at our expense. (We reserve the right to select the carrier.)

Crane Cams Limited Warranty

Crane Cams warrants that all of its products are free from defects in material and workmanship. All Crane Cams performance products are subject to the conditions established in this policy.

Crane Cams warrants that when our products are properly installed in their correct application, they will be free from defect and will function as specified.

Due to the variety of modifications made on performance engines that may affect performance, economy and engine life, Crane Cams' obligation under this warranty is limited to the repair or replacement, only of Crane products, when the consumer returns these Crane Cams products directly to:

Crane Cams
Attn: Warranty Department
1830 Holsonback Drive, Daytona Beach, FL 32117

There is absolutely no warranty, implied or otherwise, on Crane Cams parts used in competition (racing) engine applications.

This limited warranty begins on the date of purchase and is good for a period of one year from the validated date of purchase unless otherwise specified to the original purchaser.

This warranty will be void on all products that show evidence of misapplication, improper installation, abuse, lack of proper maintenance, negligence, racing engine use, or alteration from their original design.

Crane Cams reserves the right to make necessary changes in the products it manufactures and markets at any time to improve product performance. These changes in products will be made without obligation to change or improve products that were previously manufactured.

This warranty limits any implied warranty to one year, and no person, company or organization is authorized to assume for Crane Cams any other liability in connection with the sale of Crane Cams products. Some states do not allow limitations on how long an implied warranty lasts.

This limited warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

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866-388-5120

Monday–Friday, 8am–5pm EST

Call our Tech. Support Representatives for personalized technical assistance, or email us at **tech@cranecams.com.**

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