



The First and Only No Worry Hydraulic Flat Tappet Cam & Lifter Sets

Confidence! That's what you get when you install a New Max Certified Cam and Lifter Set. A superior product with quality control goes far beyond, including batch testing and verification on an Adcole 911NT. The Adcole is the premier measurement equipment for camshafts in the world. So you know you're getting the finest camshaft for your application available. Each set includes a performance hydraulic camshaft, a set of matching hydraulic flat tappet lifters and a bottle of Max ZPM oil additive for break-in (Max ZPM must be added to every oil change). So what happens if you still have a cam damaging event?...You're Covered! We will replace your Max Certified Cam & Lifter Set at no charge for up to five years from date of original purchase. Just completely fill out the supplied warranty card and return along with your camshaft, lifters and the original receipt. No

worries that you may have overlooked something that damaged your new Max Certified camshaft. Didn't notice that retainer to seal clearance wasn't enough?...Covered! Valve spring coil bind...Covered! Have a problem with your oiling system that damages the cam?...Covered! While installing the cam, you drop it and it breaks in two?...Covered! So what are you waiting for? Isn't it time to make a real performance change to your engine? With Max Certified Cam & Lifter Sets you're covered! For extra insurance most kits available with Direct Lube lifters.

* Max Certified warranty applies to Max Certified Cam & Lifter Sets only. Max Certified 5 year warranty starts from the original date of purchase. Any and all replacements are covered for the remainder of the original warranty as long as any or all repairs or adjustments to end user's equipment, determined by Howards Cams, is completed. Max Certified warranty covers camshaft and lifter set only. Warranty does not cover removal/installation cost, damage to related components, cost incurred due to down time, towing or shipping. Warranty is non-transferable. Warranty card must be completed for credit to be applied.

Cam & Lifter Set Part No.	Cam & Direct Lube Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/OE Ratio Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
AMERICAN MOTORS V8 • 290-401 1966-1991												
MC312481-11	NA	269	269	215	215	.475	.475	111	107	Hyd.	Hyd.	1
		<i>1200-5200 Good idle, Street, Off-Road, Towing. Good fuel efficiency.</i>										
MC311451-08	NA	267	267	220	220	.540	.540	108	104	Hyd.	Hyd.	1,15
		<i>1800-5800 Classic performance idle, strong mid range torque & power.</i>										
CHEVROLET SMALL BLOCK • 262-400 1955-1998												
MC112001-14	MC112001-14DL ⁴	255	261	201	207	.410	.420	114	110	Hyd.	Hyd.	
		<i>600-4800 Smooth idle, Strong low end. High vacuum, good fuel economy.</i>										
MC112011-11	MC112011-11DL ⁴	261	261	207	207	.420	.420	111	107	Hyd.	Hyd.	
		<i>800-4800 Good idle, Street, Off-Road, Towing. Good torque.</i>										
MC110931-11	MC110931-11DL ⁴	267	267	213	213	.450	.450	111	107	Hyd.	Hyd.	
		<i>1100-5200 Strong low & mid-range torque & horsepower.</i>										
MC110991-08	MC110991-08DL ⁴	275	275	221	221	.470	.470	108	104	Hyd.	Hyd.	1
		<i>1700-5700 Good low & mid-range horsepower. Needs 4 barrel & headers.</i>										
MC110951-10	MC110951-10DL ⁴	275	285	221	231	.470	.470	110	106	Hyd.	Hyd.	1
		<i>2000-6000 Street & Strip. Needs 4 barrel, headers & lower gears.</i>										
MC112431-08	MC112431-08DL ⁴	277	277	223	223	.450	.450	108	104	Hyd.	Hyd.	
		<i>2200-6200 Hot Street cam. 4 barrel & headers recommended.</i>										
MC110041-10	MC110041-10DL ⁴	279	289	225	235	.465	.488	110	106	Hyd.	Hyd.	1
		<i>1800-6000 Fair idle, Hot Street & mild Bracket Racing.</i>										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

4 Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.

15 Lobes designed to take maximum advantage of .904" dia. lifter.

Max Certified Cam & Lifter Sets continued on page 4

CAMSHAFTS



MAX CERTIFIED CAM & LIFTER SETS (cont.)

Cam & Lifter Set Part No.	Cam & Direct Lube Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/OE Ratio Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
CHEVROLET SMALL BLOCK • 262-400 1955-1998 (cont.)												
MC110041-12	MC110041-12DL ⁴	279	289	225	235	.465	.488	112	108	Hyd.	Hyd.	1
		<i>1800-6000 Fair idle, Hot Street & mild Bracket Racing.</i>										
MC110961-08	MC110961-08DL ⁴	285	285	231	231	.470	.470	108	104	Hyd.	Hyd.	1
		<i>2000-6200 Hot Street/Brackets, broad power range, strong top end.</i>										
MC112031-08	MC112031-08DL ⁴	285	285	231	231	.480	.480	108	104	Hyd.	Hyd.	1
		<i>2800-6400 Fair idle. Broad power band. Works well in heavy vehicles.</i>										
MC112141-10	MC112141-10DL ⁴	285	289	231	235	.480	.488	110	106	Hyd.	Hyd.	1
		<i>2000-6000 Lopey idle, Strong mid range. Good throttle response. 2400+ stall</i>										
MC110971-08	MC110971-08DL ⁴	289	289	235	235	.470	.470	108	104	Hyd.	Hyd.	1
		<i>2600-6400 Lopey idle. Pro-Street & Bracket Racing profile. 9.5:1+ CR, 2700+ stall</i>										
CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996												
MC122501-12	MC122501-12DL ⁴	259	263	205	209	.476	.476	112	108	Hyd.	Hyd.	1
		<i>800-4000 Great low end torque replacement cam, good fuel economy.</i>										
MC120021-12	MC120021-12DL ⁴	259	269	205	215	.476	.516	112	108	Hyd.	Hyd.	1
		<i>800-4000 Exceptional low end torque. Good in PUs, 4x4s & RVs.</i>										
MC120931-12	MC120931-12DL ⁴	267	267	213	213	.510	.510	112	108	Hyd.	Hyd.	1
		<i>1500-5000 Good idle, Street, Off-Road, Towing. Good fuel efficiency.</i>										
MC120031-12	MC120031-12DL ⁴	269	279	215	225	.516	.527	112	108	Hyd.	Hyd.	1
		<i>1600-5200 Great low & mid-range torque. OK in heavy vehicle.</i>										
MC122521-15	MC122521-15DL ⁴	275	289	221	235	.504	.504	115	111	Hyd.	Hyd.	1
		<i>1800-5400 Fair idle. Excellent in Performance & Marine applications.</i>										
MC120941-11	MC120941-11DL ⁴	279	279	225	225	.527	.527	111	107	Hyd.	Hyd.	1
		<i>1800-5400 Fair idle. Strong mid-range. Needs 4 barrel & headers.</i>										
CHRYSLER BIG BLOCK B/RB • 383-440 1959-1980												
MC720931-11	NA	267	267	213	213	.450	.450	111	107	Hyd.	Hyd.	1
		<i>1000-5000 Super low & mid-range performance. Good idle.</i>										
MC720031-12	NA	269	277	215	223	.445	.465	112	108	Hyd.	Hyd.	1
		<i>1400-5200 Good idle & throttle response. Needs 4 barrel & good exhaust.</i>										
MC722241-08	NA	289	289	235	235	.488	.488	108	104	Hyd.	Hyd.	1
		<i>2600-6400 Runs strong 3,500 & up. 9.5+ comp., auto OK with gears.</i>										
FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)												
MC210021-12	MC210021-12DL ⁴	259	267	205	215	.448	.480	112	108	Hyd.	Hyd.	1
		<i>1000-4500 Great low & mid-range. Smooth idle. Good in PUs & RVs.</i>										
MC210031-12	MC210031-12DL ⁴	267	277	213	223	.475	.496	112	108	Hyd.	Hyd.	1
		<i>1500-5400 Broad power band. Excellent in Hot Street & Marine.</i>										
MC210931-10	MC210931-10DL ⁴	269	269	215	215	.475	.475	110	106	Hyd.	Hyd.	1
		<i>1500-5200 Strong low & mid-range, fuel efficiency & driveability.</i>										
MC210951-10	MC210951-10DL ⁴	275	285	221	231	.501	.501	110	106	Hyd.	Hyd.	1
		<i>2000-6000 Street & Strip. Needs 4 barrel, headers & low gears.</i>										
MC210041-12	MC210041-12DL ⁴	279	285	225	231	.496	.512	112	108	Hyd.	Hyd.	1
		<i>2500-6200 Strong mid-range. Great E.T. Bracket cam. OK w/NOS.</i>										
MC210961-08	MC210961-08DL ⁴	285	285	231	231	.501	.501	108	104	Hyd.	Hyd.	1
		<i>2600-6300 Broad power range, extra performance in smaller engine.</i>										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

4 Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



MAX CERTIFIED CAM & LIFTER SETS (cont.)

Cam & Lifter Set Part No.	Cam & Direct Lube Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/OE Ratio Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
FORD SMALL BLOCK • 351W 1969-1996												
MC220021-12	MC220021-12DL ⁴	259	267	205	213	.448	.480	112	108	Hyd.	Hyd.	1
		<i>1000-5000 Great low & mid-range. Smooth idle. Good in PUs & RVs.</i>										
MC220931-10	MC220931-10DL ⁴	269	269	215	215	.475	.475	110	106	Hyd.	Hyd.	1
		<i>1400-5200 Lopey idle. Excellent Street Performance cam.</i>										
MC220041-12	MC220041-12DL ⁴	275	275	221	221	.475	.475	112	108	Hyd.	Hyd.	1
		<i>1200-5400 Good idle & throttle response. Ok with small blower.</i>										
MC220951-10	MC220951-10DL ⁴	275	285	221	231	.501	.501	110	106	Hyd.	Hyd.	1
		<i>2000-6000 Street & Strip. Needs 4 barrel, headers & low gears.</i>										
MC220051-12	MC220051-12DL ⁴	277	289	223	235	.496	.520	112	108	Hyd.	Hyd.	1
		<i>2400-6600 Strong mid-range. Great E.T. Bracket cam. OK w/NOS.</i>										
MC220961-08	MC220961-08DL ⁴	285	285	231	231	.501	.501	108	104	Hyd.	Hyd.	1
		<i>2600-6800 Broad power range, extra performance in smaller engine.</i>										
FORD CLEVELAND/M • 351C-351M-400 1970-1983												
MC231031-10	MC231031-10DL ⁴	267	267	213	213	.496	.496	110	106	Hyd.	Hyd.	1
		<i>1600-5000 Fair idle, good low & mid-range torque. Needs 4 bbl. & headers.</i>										
MC230041-12	MC230041-12DL ⁴	279	289	225	235	.536	.542	112	108	Hyd.	Hyd.	1
		<i>2400-6400 Lopey idle, moderate performance. Higher CR is recommended.</i>										
FORD FE • 352-428 1963-1977												
MC250021-11	NA	263	263	209	209	.490	.490	111	107	Hyd.	Hyd.	1
		<i>1000-4400 Smooth idle, increased low end torque. Great in PUs or other heavy vehicles.</i>										
MC250031-12	NA	267	277	213	223	.525	.525	112	108	Hyd.	Hyd.	1
		<i>1400-5200 Good idle. Excellent Street Performance dual pattern cam.</i>										
FORD BIG BLOCK • 429-460 1968-1995												
MC240931-11	MC240931-11DL ⁴	269	269	215	215	.514	.514	111	107	Hyd.	Hyd.	1
		<i>1600-5000 Good idle & throttle response with 4bbl & good exhaust.</i>										
MC242201-10	MC242201-10DL ⁴	273	273	219	219	.496	.496	110	106	Hyd.	Hyd.	1
		<i>1500-5400 Good idle, strong bottom end. Great daily usage cam.</i>										
MC240041-12	MC240041-12DL ⁴	279	289	225	235	.536	.562	112	107	Hyd.	Hyd.	1
		<i>1800-5600 Strong mid-range. Needs 4bbl, headers & medium stall.</i>										
OLDSMOBILE 39° V8 • 260-455 1967-1990												
MC510931-11	NA	267	267	213	213	.480	.480	111	107	Hyd.	Hyd.	1
		<i>1200-5500 Good low end & mid-range. Will work well in jet boats.</i>										
MC510991-08	NA	275	275	221	221	.501	.501	108	104	Hyd.	Hyd.	1
		<i>1500-5800 Good low & mid-range horsepower. Needs 4 barrel & headers.</i>										
PONTIAC V8 • 265-455 1955-1981												
MC410931-11	NA	267	267	213	213	.450	.450	111	107	Hyd.	Hyd.	1
		<i>1500-5500 Good idle, Strong low & mid-range torque.</i>										
MC410021-12	NA	267	277	213	223	.450	.450	112	108	Hyd.	Hyd.	1
		<i>1500-5800 Super low & mid-range torque. Excellent driveability.</i>										
MC410961-08	NA	285	285	231	231	.480	.480	108	104	Hyd.	Hyd.	1
		<i>2200-6200 Hot Street, improved mid-range. Best with 9.5:1+ comp., 4-barrel.</i>										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

4 Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.



- High Grade Race Quality Cores
- Dedicated Precision CNC Cam Grinders
- 100% Rockwell Checked
- Most Shipped in Hard Protective Packaging

All Howards™ Cams use the highest-grade race quality cores available. All hydraulic and mechanical flat tappet camshafts are 100% Rockwell checked and Parkerized to ensure the highest quality control standards available anywhere. Howards™ Cams are manufactured on dedicated high precision CNC cam grinding machines. Most Howards™ Cams are packaged and shipped in our unique, hard, high impact plastic reusable cases. This ensures that the high quality camshaft that went into the case comes out in the same condition, when delivered, as when it was packed.



Max Certified™ Camshaft & Lifter Sets with 5-Year “No Fault” Warranty

The only hydraulic flat tappet Cam and Lifter sets to offer a 5 year “No Fault” warranty. An industry first and only. So what happens if you still have a cam damaging event?...You’re Covered! We will replace your Max Certified Cam & Lifter Set at no charge for up to five years from date of original purchase. No worries that you may have overlooked something that damaged your new Max Certified camshaft. For more information see page 3.



American Muscle™ Hydraulic and Mechanical Flat Tappet Camshafts

Near duplicates of some of the most iconic original equipment camshaft grinds from the ‘60s to the early ‘70s. We took these fantastic grinds and made slight changes to the ramp speeds and minor duration changes to give you better reliability and horsepower. You still get the same throttle response and of course the original style exhaust rumble. Great cams for restoration projects and perfect for the street machines. Grinds available for Chevrolet, Chrysler, Ford, Oldsmobile and Pontiac.



Street Force™ Hydraulic Flat Tappet Camshafts

Designed for the street performance enthusiast. They feature true street performance with little or no added maintenance. These grinds feature lobes designed to be easy on the valvetrain, and add useable torque, horsepower and throttle response. They also have 112° lobe separations to help maintain vacuum. **Note:** some applications may require a vacuum canister or pump.

Street Force™ 1 cams are great for engines with minor or no additional improvements. A good dual plane intake and dual exhaust is great for additional performance.

Street Force™ 2 are designed for engines with improved intake and exhaust. Ignition improvements along with 1600-1800 torque converter really wakes this combo up.

Street Force™ 3 needs a street 2200-2500 stall converter, improved intake and dual exhaust. 3.20 to 3.90 gear ratio and a good ignition system will give you additional performance.

Street Force™ 4 requires an improved intake and exhaust. A good street 2800-3200 converter is also needed. The addition of small tube headers, a good ignition and lower gears makes this combination a lot of fun.

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CAM & LIFTER SETS

More performance, less money! Whether your goal is to boost low-end torque, increase fuel economy, street, strip or all out competition, you'll find the ideal answer right here. Computer designed. Each kit includes a Howards™ performance camshaft and a matching set of Howards™ premium lifters. Cam and lifter sets are listed with a "CL" prefix.

- Hydraulic Flat Tappet Cam & Lifter Sets
- Hydraulic Retro-Fit Roller Cam & Lifter Sets
- Mechanical Flat Tappet Cam & Lifter Sets
- Mechanical Flat Tappet Cam & Direct Lube™ Lifter Sets



Rattler Cams™ Hydraulic Flat Tappet and Hydraulic Roller Camshafts

Rattler cams are for street enthusiasts who want the classic exhaust sound but also want true performance to go with it. These camshafts offer performance that just doesn't thump around. They give you the performance and throttle response you expect from a performance cam. Don't let the others fool you, sound is not everything. If you want both sound and performance, you need a Howards Cams Rattler™. The best of both worlds. **Note:** To get the best exhaust note, you should use a good dual exhaust system *without* a cross-over. A cross-over will add minor performance, but mellow the exhaust tone.

Rattler™ Choppy idle. Great for high performance street, stock converter ok, best with 1800+ converter and gears.

Big Mama Rattler™ Lopey idle. Performance street or street/strip applications. Needs 9.0:1 compression, 2500+ stall, good intake and exhaust. Best with lower gears.

Big Daddy Rattler™ Rough idle. Pro street or street/strip. Needs 9.5:1 compression, 2800+ stall, good intake, gears and exhaust.



BOOST™ Cams for Forced Induction Applications

Boost is a series of camshafts developed specifically for forced induction applications. If its a small street supercharger, or 8-71, to a dual turbo setup, Boost is for you. Developed with specific high intensity lobes to give you the maximum power and overall performance with a wide power band. Designs for the daily street car to the weekend warrior. Hydraulic flat tappet and hydraulic roller grinds are available for blower and turbo applications. Custom grinds are also available for high boost applications.



Big Bottle™ Cams for Nitrous Oxide Applications

Designed specifically for nitrous oxide applications. These camshafts have camshaft lobes matched to the application to give you the best performance and horsepower. Most applications are designed for good power and throttle response without the nitrous, but give you big gains when the nitrous oxide is engaged. Grinds available for small plate systems to big multi-stage port injected systems.

CAMSHAFTS



AMERICAN MOTORS L6 • 199-258/4.0L 1964-1995

Street Force™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•5•3•6•2•4

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
330111-12	CL330111-12	257	263	203	209	.443	.448	112	108	Hyd.	Hyd.	
1000-4400 Street Force™ 1, Mild Street performance, strong low end torque. Fuel Injection.												



AMERICAN MOTORS L6 • 199-258/4.0L 1964-1995

Hydraulic Flat Tappet Camshafts

Firing Order: 1•5•3•6•2•4

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
330111-10	CL330111-10	257	263	203	209	.443	.448	110	106	Hyd.	Hyd.	
1000-4400 Mild Street performance, strong low end torque.												
331021-12	CL331021-12	269	269	215	215	.475	.475	112	108	Hyd.	Hyd.	1
1400-5000 Moderate Street with headers and better carb/intake. Fuel Injection.												
330991-08	CL330991-08	275	275	221	221	.501	.501	108	104	Hyd.	Hyd.	1
1800-5600 Fair idle, Hot Street, aftermarket induction & headers a must. Not for Fuel Injection.												
339991	NA	Custom Grind Camshaft								Hyd.	Hyd.	1
Hydraulic Flat Tappet Special Order Camshaft.												



AMERICAN MOTORS L6 • 4.0L FI 1996-2006

Street Force™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•5•3•6•2•4

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
320111-12	CL320111-12	257	263	203	209	.443	.448	112	108	Hyd.	Hyd.	
1000-4400 Street Force™ 1, Good idle, Mild Street performance, strong low end torque.												



AMERICAN MOTORS L6 • 4.0L FI 1996-2006

Hydraulic Flat Tappet Camshafts

Firing Order: 1•5•3•6•2•4

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
320111-10	CL320111-10	257	263	203	209	.443	.448	112	108	Hyd.	Hyd.	
1000-4400 Good idle, Mild Street performance, strong low end torque.												
329991	NA	Custom Grind Camshaft								Hyd.	Hyd.	1
Hydraulic Flat Tappet Special Order Camshaft.												

Cam Notes: master note list on page 260

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AMERICAN MOTORS L6 • 199-258/4.0L 1964-1995

Street Force™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91711-12 ³	NA	NA	98511-12 ²⁵	97110-12	NA	93045-12	93321 ²⁵	NA	NA	NA	NA	NA	NA

AMERICAN MOTORS L6 • 199-258/4.0L 1964-1995

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91711-12 ³	NA	NA	98511-12 ²⁵	97110-12	NA	93045-12	93321 ²⁵	NA	NA	NA	NA	NA	NA
91711-12 ³	NA	NA	98511-12 ²⁵	97110-12	NA	93045-12	93321 ²⁵	NA	NA	NA	NA	NA	NA
91711-12 ³	NA	NA	98511-12 ²⁵	97110-12	NA	93045-12	93321 ²⁵	NA	NA	NA	NA	NA	NA
91711-12	NA	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA

AMERICAN MOTORS L6 • 4.0L FI 1996-2006

Street Force™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91711-12 ³	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

AMERICAN MOTORS L6 • 4.0L FI 1996-2006

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91711-12 ³	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
91711-12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

²⁵ Machining Required.

CAMSHAFTS



AMERICAN MOTORS V8 • 290-401 1966-1991

Max Certified™ Hydraulic Flat Tappet Cam & Lifter Sets - 5 Year No Fault Warranty (see page 3 for details)

Cam & Lifter Set Part No.	Cam & Direct Lube Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
MC312481-11	NA	269	269	215	215	.475	.475	111	107	Hyd.	Hyd.	1
		<i>1200-5200 Good idle, Street, Off-Road, Towing. Good fuel efficiency.</i>										
MC311451-08	NA	267	267	220	220	.540	.540	108	104	Hyd.	Hyd.	1,15
		<i>1800-5800 Classic performance idle, strong mid range torque & power.</i>										



AMERICAN MOTORS V8 • 290-401 1966-1991

Street Force™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
310101-12	CL310101-12	259	269	205	215	.448	.474	112	108	Hyd.	Hyd.	
		<i>800-4800 Street Force™ 1, Good idle, Mild Street performance, strong low end torque.</i>										
311101-12	CL311101-12	269	279	215	225	.474	.496	112	108	Hyd.	Hyd.	1
		<i>1200-5200 Street Force™ 2, Good idle & throttle response. Needs 4 barrel & good exhaust.</i>										



AMERICAN MOTORS V8 • 290-401 1966-1991

Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes	
		IN	EX	IN	EX	IN	EX			IN	EX		
310011-10	CL310011-10	257	269	203	215	.443	.475	110	106	Hyd.	Hyd.		
		<i>800-4800 Smooth idle, improved low end. High vacuum, good fuel economy.</i>											
312481-11	CL312481-11	269	269	215	215	.475	.475	111	107	Hyd.	Hyd.	1	
		<i>1200-5200 Good idle, Street, Off-Road, Towing. Good fuel efficiency.</i>											
314131-10	CL314131-10	261	267	214	220	.527	.540	110	106	Hyd.	Hyd.	1,15	
		<i>1400-5400 Good idle, Strong Street performance.</i>											
311451-08	CL311451-08	267	267	220	220	.540	.540	108	104	Hyd.	Hyd.	1,15	
		<i>1800-5800 Classic performance idle, strong mid range torque & power.</i>											
310021-14	CL310021-14	277	277	223	223	.480	.480	114	110	Hyd.	Hyd.	1	
		<i>1500-5500 Strong low & mid-range torque & horsepower.</i>											
310031-12	CL310031-12	289	297	235	243	.520	.541	112	107	Hyd.	Hyd.	1	
		<i>2200-6200 Strong low & mid-range torque & horsepower. Manual or auto with stall.</i>											
315011-08	CL315011-08	291	299	244	252	.604	.629	108	104	Hyd.	Hyd.	1,15	
		<i>2600-5400 Rough idle, better with 390 & larger ci. Needs 2000+ stall & gears.</i>											
319991	NA	Custom Grind Camshaft									Hyd.	Hyd.	1
		<i>Hydraulic Flat Tappet Special Order Camshaft.</i>											

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

15 Lobes designed to take maximum advantage of .904" dia. lifter.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



AMERICAN MOTORS V8 • 290-401 1966-1991

Max Certified™ Hydraulic Flat Tappet Cam & Lifter Set Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91711 ³	NA	NA	98445 ²⁵	97110	NA	93045	93321 ²⁵	NA	NA	95205	NA	NA	NA
91711 ³	NA	NA	98445 ²⁵	97110	NA	93045	93321 ²⁵	NA	NA	95205	NA	NA	NA

AMERICAN MOTORS V8 • 290-401 1966-1991

Street Force™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91711 ³ 91712	NA	NA	98445 ²⁵	97110	NA	93045	93321 ²⁵	NA	NA	95205	NA	NA	NA
91711 ³ 91712	NA	NA	98445 ²⁵	97110	NA	93045	93321 ²⁵	NA	NA	95205	NA	NA	NA

AMERICAN MOTORS V8 • 290-401 1966-1991

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91711 ³ 91712	NA	NA	98445 ²⁵	97110	NA	93045	93321 ²⁵	NA	NA	95205	NA	NA	NA
91711 ³ 91712	NA	NA	98445 ²⁵	97110	NA	93045	93321 ²⁵	NA	NA	95205	NA	NA	NA
91711 ³ 91712	NA	NA	98445 ²⁵	97110	NA	93045	93321 ²⁵	NA	NA	95205	NA	NA	NA
91711 ³ 91712	NA	NA	98445 ²⁵	97110	NA	93045	93321 ²⁵	NA	NA	95205	NA	NA	NA
91711 ³ 91712	NA	NA	98445 ²⁵	97110	NA	93045	93321 ²⁵	NA	NA	95205	NA	NA	NA
91711 ³ 91712	NA	NA	98445 ²⁵	97110	NA	93045	93321 ²⁵	NA	NA	95205	NA	NA	NA
91711 ³ 91712	NA	NA	98445 ²⁵	97110	NA	93045	93321 ²⁵	NA	NA	95205	NA	NA	NA
91711 91712	NA	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

²⁵ Machining Required.

CAMSHAFTS



AMERICAN MOTORS V8 • 290-401 1966-1991

Mechanical Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
312012-08	CL312012-08	277	281	242	246	.544	.549	108	104	.022	.022	1
		<i>2800-6200 Street/Strip. Needs 10.0+ CR, 2500+ stall & gears.</i>										
310812-08	CL310812-08	276	280	248	252	.571	.576	108	104	.016	.016	1,34
		<i>3000-6500 Hot Street/Bracket, powerful through entire rpm range. 10.0:1+ CR, 3000+ Stall.</i>										
310342-08	CL310342-08	289	295	254	260	.587	.592	108	104	.022	.022	1
		<i>3500-7000 Rough idle, Great mid-range & top end performer. 3200+ stall & gears needed.</i>										
319992	NA	Custom Grind Camshaft										1
		<i>Mechanical Flat Tappet Special Order Camshaft.</i>										



BUICK V6 EVEN FIRE • 181-252 1977-1989

Hydraulic Flat Tappet Camshafts

Firing Order: 1•6•5•4•3•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.55 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
569991	NA	Custom Grind Camshaft										1
		<i>Hydraulic Flat Tappet Special Order Camshaft.</i>										
										Hyd.	Hyd.	



BUICK/OLDSMOBILE • 215-300-340 1961-1967 ROVER • 215-240-256 1968-1994

Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
530011-10	NA	257	269	203	215	.443	.475	110	106	Hyd.	Hyd.	1
		<i>1000-4000 Smooth idle, Strong low end performance.</i>										
531911-12	NA	269	269	215	215	.475	.475	112	108	Hyd.	Hyd.	1
		<i>1400-4400 Good idle, Improved low & mid range power. Great all around performance.</i>										
530561-08	NA	269	275	215	221	.475	.501	108	104	Hyd.	Hyd.	1
		<i>1500-4600 Good idle, Strong low & mid-range torque & horsepower.</i>										
530991-08	NA	275	275	221	221	.501	.501	108	104	Hyd.	Hyd.	1
		<i>2000-5000 Fair idle, strong mid-range performance.</i>										
539991	NA	Custom Grind Camshaft										1
		<i>Hydraulic Flat Tappet Special Order Camshaft.</i>										
										Hyd.	Hyd.	

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 34 Provisions for increased oiling recommended.

Some items are not legal for sale or use on any pollution controlled motor vehicle



AMERICAN MOTORS V8 • 290-401 1966-1991

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91715 ³ 91718	NA	NA	98445 ²⁵	97128 ¹⁰	97126 ¹⁰	93080 ¹⁰	93321 ²⁵	NA	NA	95013	NA	NA	NA
91715 ³ 91718	NA	NA	98445 ²⁵	97128 ¹⁰	97126 ¹⁰	93080 ¹⁰	93321 ²⁵	NA	NA	95013	NA	NA	NA
91715 ³ 91718	NA	NA	98445 ²⁵	97128 ¹⁰	97126 ¹⁰	93080 ¹⁰	93321 ²⁵	NA	NA	95013	NA	NA	NA
91715 91718	NA	--	--	--	--	--	--	NA	NA	--	NA	NA	NA

BUICK V6 EVEN FIRE • 181-252 1977-1989

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91312-12	NA	--	98111-12	97112-12	NA	93040-12	--	NA	NA	NA	NA	NA	NA

BUICK/OLDSMOBILE • 215-300-340 1961-1967 ROVER • 215-240-256 1968-1994

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91311	NA	NA	98341 ²⁵	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
91311	NA	NA	98341 ²⁵	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
91311	NA	NA	98341 ²⁵	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
91311	NA	NA	98341 ²⁵	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
91311	NA	--	--	--	--	--	--	NA	NA	--	NA	NA	NA

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



BUICK/OLDSMOBILE • 215-300-340 1961-1967 ROVER • 215-240-256 1968-1994

Mechanical Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
539992	NA	Custom Grind Camshaft <i>Mechanical Flat Tappet Special Order Camshaft.</i>										



BUICK • 350 1968-1980

Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
540011-12	CL540011-12	257	269	203	215	.443	.475	112	108	Hyd.	Hyd.	
<i>800-4800 Smooth idle, Street, strong low end torque. Good fuel economy</i>												
540931-10	CL540931-10	269	269	215	215	.475	.475	110	106	Hyd.	Hyd.	1
<i>1100-5000 Good idle, Performance Street with modified intake & exhaust.</i>												
540731-12	CL540731-12	275	277	221	223	.501	.496	112	108	Hyd.	Hyd.	1
<i>1800-5500 Hot Street with high compression, aftermarket intake & headers.</i>												
549991	NA	Custom Grind Camshaft <i>Hydraulic Flat Tappet Special Order Camshaft.</i>										



BUICK • 350 1968-1980

Mechanical Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
549992	NA	Custom Grind Camshaft <i>Mechanical Flat Tappet Special Order Camshaft.</i>										



BUICK • 400-430-455 1967-1976

Street Force™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
550101-12	CL550101-12	259	269	205	215	.448	.474	112	108	Hyd.	Hyd.	1
<i>1000-5000 Street Force™ 1, Good idle, Mild Street performance, strong low end torque.</i>												
550121-12	CL550121-12	269	279	215	225	.474	.496	112	108	Hyd.	Hyd.	1
<i>1200-5200 Street Force™ 2, Good idle & throttle response. Needs 4 barrel & good exhaust.</i>												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



BUICK/OLDSMOBILE • 215-300-340 1961-1967 ROVER • 215-240-256 1968-1994

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91415	NA	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA

BUICK • 350 1968-1980

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91311 ³	NA	NA	98411	NA	NA	NA	93321 ²⁵	NA	NA	NA	NA	NA	NA
91311 ³	NA	NA	98411	NA	NA	NA	93321 ²⁵	NA	NA	NA	NA	NA	NA
91311 ³	NA	NA	98411	NA	NA	NA	93321 ²⁵	NA	NA	NA	NA	NA	NA
91311	NA	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA

BUICK • 350 1968-1980

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91415	NA	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA

BUICK • 400-430-455 1967-1976

Street Force™ Hydraulic Flat Tappet Camshaft Components

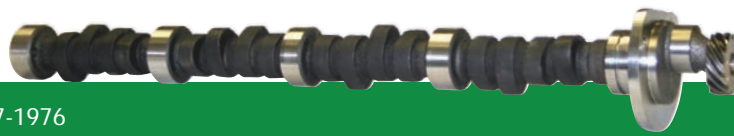
Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91311 ³	NA	NA	98412	NA	NA	NA	93321 ²⁵	NA	NA	NA	NA	NA	NA
91311 ³	NA	NA	98412	NA	NA	NA	93321 ²⁵	NA	NA	NA	NA	NA	NA

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

²⁵ Machining Required.

CAMSHAFTS



BUICK • 400-430-455 1967-1976

Rattler Cams™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
558021-09	CL558021-09	281	289	227	235	.501	.501	109	103	Hyd.	Hyd.	1
1800-5600 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.												
558061-09	CL558061-09	289	297	235	243	.501	.480	109	103	Hyd.	Hyd.	1
2000-5900 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.												
558101-09	CL558101-09	297	305	243	251	.512	.528	109	103	Hyd.	Hyd.	1
2400-6200 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												



BUICK • 400-430-455 1967-1976

Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
550931-12	CL550931-12	269	269	215	215	.475	.475	112	108	Hyd.	Hyd.	1
1000-5000 Good idle, Mild Street performance, strong low end torque.												
550991-08	CL550991-08	275	275	221	221	.501	.501	108	104	Hyd.	Hyd.	1
1200-5200 Fair idle, Performance Street, Strong torque curve.												
550241-10	CL550241-10	279	285	225	231	.496	.501	110	106	Hyd.	Hyd.	1
1500-5500 Fair idle, Hot Street, needs modified intake & exhaust.												
550441-10	CL550441-10	289	295	235	241	.520	.501	110	106	Hyd.	Hyd.	1
2000-6000 Nice idle, Street/Strip for 430+ ci., monster torque.												
550451-08	CL550451-08	294	301	241	247	.536	.544	108	104	Hyd.	Hyd.	1
2400-6400 Rough idle, Street/Strip, needs 2500+ stall, aftermarket intake & headers.												
559991	NA	Custom Grind Camshaft								Hyd.	Hyd.	1
Hydraulic Flat Tappet Special Order Camshaft.												



BUICK • 400-430-455 1967-1976

Mechanical Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
559992	NA	Custom Grind Camshaft										1
Mechanical Flat Tappet Special Order Camshaft.												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



BUICK • 400-430-455 1967-1976

Rattler Cams™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91311 ³	NA	NA	98438 ²⁵	NA	NA	NA	93321 ²⁵	NA	NA	NA	NA	NA	NA
91311 ³	NA	NA	98438 ²⁵	NA	NA	NA	93321 ²⁵	NA	NA	NA	NA	NA	NA
91311 ³	NA	NA	98438 ²⁵	NA	NA	NA	93321 ²⁵	NA	NA	NA	NA	NA	NA

BUICK • 400-430-455 1967-1976

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91311 ³	NA	NA	98412	NA	NA	NA	93321 ²⁵	NA	NA	NA	NA	NA	NA
91311 ³	NA	NA	98438 ²⁵	NA	NA	NA	93321 ²⁵	NA	NA	NA	NA	NA	NA
91311 ³	NA	NA	98438 ²⁵	NA	NA	NA	93321 ²⁵	NA	NA	NA	NA	NA	NA
91311 ³	NA	NA	98438 ²⁵	NA	NA	NA	93321 ²⁵	NA	NA	NA	NA	NA	NA
91311 ³	NA	NA	98438 ²⁵	NA	NA	NA	93321 ²⁵	NA	NA	NA	NA	NA	NA
91311	NA	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA

BUICK • 400-430-455 1967-1976

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91415	NA	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

²⁵ Machining Required.

CAMSHAFTS



CADILLAC • 365-390 1956-1962

Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
529996	NA	Custom Grind Camshaft <i>Hydraulic Flat Tappet Special Order Camshaft.</i>										



CADILLAC • 390-429 1963-1967

Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•7•2•6•5•4•3

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
529998	NA	Custom Grind Camshaft <i>Hydraulic Flat Tappet Special Order Camshaft.</i>										



CADILLAC • 368-425-472-500 1968-1984

Street Force™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•5•6•3•4•2•7•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.65 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
520101-12	CL520101-12	269	279	215	225	.490	.512	112	108	Hyd.	Hyd.	1
1000-5000 Street Force™ 2, Good idle & throttle response. Needs 4 barrel & good exhaust.												
522121-12	CL522121-12	279	289	225	235	.512	.517	112	108	Hyd.	Hyd.	1
1200-5200 Street Force™ 3, Noticeable idle, Hot Street & mild Bracket Racing.												



CADILLAC • 368-425-472-500 1968-1984

Rattler Cams™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•5•6•3•4•2•7•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.65 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
528021-09	CL528021-09	281	289	227	235	.517	.517	109	103	Hyd.	Hyd.	1
1800-5600 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.												
528061-09	CL528061-09	289	297	235	243	.517	.495	109	103	Hyd.	Hyd.	1
2000-5900 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.												
528101-09	CL528101-09	297	305	243	251	.528	.545	109	103	Hyd.	Hyd.	1
2400-6200 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

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CADILLAC • 365-390 1956-1962

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91311	NA	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA

CADILLAC • 390-429 1963-1967

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91311	NA	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA

CADILLAC • 368-425-472-500 1968-1984

Street Force™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91311 ³	NA	98214-K11 ²⁵	98214 ²⁵	97112	NA	93005	93316 ²⁵	NA	NA	NA	NA	NA	NA
91311 ³	NA	98214-K11 ²⁵	98214 ²⁵	97112	NA	93005	93316 ²⁵	NA	NA	NA	NA	NA	NA

CADILLAC • 368-425-472-500 1968-1984

Rattler Cams™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91311 ³	NA	98214-K11 ²⁵	98214 ²⁵	97112	NA	93005	93316 ²⁵	NA	NA	NA	NA	NA	NA
91311 ³	NA	98214-K11 ²⁵	98214 ²⁵	97112	NA	93005	93316 ²⁵	NA	NA	NA	NA	NA	NA
91311 ³	NA	98214-K11 ²⁵	98214 ²⁵	97112	NA	93005	93316 ²⁵	NA	NA	NA	NA	NA	NA

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

²⁵ Machining Required.

CAMSHAFTS



CADILLAC • 368-425-472-500 1968-1984

Hydraulic Flat Tappet Camshafts

Firing Order: 1•5•6•3•4•2•7•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.65 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
520021-12	CL520021-12	263	263	209	209	.462	.462	112	108	Hyd.	Hyd.	1
		<i>1000-4200 Smooth idle, builds good low end torque & power.</i>										
520031-12	CL520031-12	269	269	215	215	.500	.500	112	108	Hyd.	Hyd.	1
		<i>1200-4800 Good idle, strong low end torque & horsepower.</i>										
520991-10	CL520991-10	275	275	221	221	.517	.517	110	106	Hyd.	Hyd.	1
		<i>1500-4800 Fair idle, Strong low & mid range performance.</i>										
520051-12	CL520051-12	275	285	221	231	.490	.517	112	108	Hyd.	Hyd.	1
		<i>1800-5000 Good low end torque & mid-range horsepower.</i>										
520291-08	CL520291-08	279	285	225	231	.512	.517	108	104	Hyd.	Hyd.	1
		<i>2000-5200 Noticeable idle, Strong mid range torque & power.</i>										
520071-12	CL520071-12	285	295	231	241	.528	.517	112	108	Hyd.	Hyd.	1
		<i>2400-5600 Lopey idle, great mid-range torque & top end power. Needs stall.</i>										
521261-10	CL521261-10	291	299	237	245	.536	.561	110	106	Hyd.	Hyd.	1
		<i>2600-6000 Rough idle, good mid-range power. Needs 3200+ stall.</i>										
529991	NA	Custom Grind Camshaft								Hyd.	Hyd.	1
		<i>Hydraulic Flat Tappet Special Order Camshaft.</i>										



CADILLAC • 368-425-472-500 1968-1984

Rattler Cams™ Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•5•6•3•4•2•7•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.65 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
528025-09	CL528025-09	280	288	227	235	.539	.539	109	103	Hyd.	Hyd.	1
		<i>1800-5600 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.</i>										
528045-09	CL528045-09	288	296	235	243	.583	.583	109	103	Hyd.	Hyd.	1
		<i>2000-5900 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.</i>										
528085-09	CL528085-09	296	304	243	251	.583	.567	109	103	Hyd.	Hyd.	1
		<i>2400-6200 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.</i>										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

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CADILLAC • 368-425-472-500 1968-1984

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91311 ³	NA	98214-K11 ²⁵	98214 ²⁵	97112	NA	93005	93316 ²⁵	NA	NA	NA	NA	NA	NA
91311 ³	NA	98214-K11 ²⁵	98214 ²⁵	97112	NA	93005	93316 ²⁵	NA	NA	NA	NA	NA	NA
91311 ³	NA	98214-K11 ²⁵	98214 ²⁵	97112	NA	93005	93316 ²⁵	NA	NA	NA	NA	NA	NA
91311 ³	NA	98214-K11 ²⁵	98214 ²⁵	97112	NA	93005	93316 ²⁵	NA	NA	NA	NA	NA	NA
91311 ³	NA	98214-K11 ²⁵	98214 ²⁵	97112	NA	93005	93316 ²⁵	NA	NA	NA	NA	NA	NA
91311 ³	NA	98214-K11 ²⁵	98214 ²⁵	97112	NA	93005	93316 ²⁵	NA	NA	NA	NA	NA	NA
91311 ³	NA	98214-K11 ²⁵	98214 ²⁵	97112	NA	93005	93316 ²⁵	NA	NA	NA	NA	NA	NA
91311	NA	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA

CADILLAC • 368-425-472-500 1968-1984

Rattler Cams™ Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91462 ³	NA	98438-K12 ¹⁰	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA
91462 ³	NA	98438-K12 ¹⁰	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA
91462 ³	NA	98438-K12 ¹⁰	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



CADILLAC • 368-425-472-500 1968-1984

Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•5•6•3•4•2•7•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.65 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
520055-12	CL520055-12	272	278	219	225	.495	.495	112	108	Hyd.	Hyd.	1
		<i>1800-5500 Good idle, broad power range with strong mid-range performance.</i>										
521125-10	CL521125-10	280	286	227	233	.539	.539	110	106	Hyd.	Hyd.	1
		<i>2000-5400 Fair idle, Performance usage. Mid-range torque & horsepower.</i>										
522105-10	CL522105-10	286	294	233	241	.583	.583	110	106	Hyd.	Hyd.	1
		<i>2500-6000 Rough idle, strong mid-range torque & horsepower.</i>										
529995	NA	Custom Grind Camshaft								Hyd.	Hyd.	1
		<i>Retro-Fit Hydraulic Roller Special Order Camshaft.</i>										



CADILLAC • 368-425-472-500 1968-1984

Mechanical Flat Tappet Camshafts

Firing Order: 1•5•6•3•4•2•7•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.65 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
529992	NA	Custom Grind Camshaft										1
		<i>Mechanical Flat Tappet Special Order Camshaft.</i>										



CHEVROLET L6 • 194-230-250 1962-1984

Street Force™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•5•3•6•2•4

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.75 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
160131-12	CL160131-12	257	263	203	209	.438	.484	112	108	Hyd.	Hyd.	
		<i>1000-4000 Street Force™ 1, Good idle, Mild Street performance, strong low end torque.</i>										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

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CADILLAC • 368-425-472-500 1968-1984

Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91462 ³	NA	98438-K12 ¹⁰	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA
91462 ³	NA	98438-K12 ¹⁰	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA
91462 ³	NA	98438-K12 ¹⁰	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA
91462 ³	NA	98438-K12 ¹⁰	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA

CADILLAC • 368-425-472-500 1968-1984

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91415 91418	NA	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA

CHEVROLET L6 • 194-230-250 1962-1984

Street Force™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111-12 ³ 91112-12	NA	NA	98214-12	97112-12	NA	93005-12	93316 ²⁵	NA	NA	NA	NA	NA	NA

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



CHEVROLET L6 • 194-230-250 1962-1984

Hydraulic Flat Tappet Camshafts

Firing Order: 1•5•3•6•2•4

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.75 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
162011-09	CL162011-09	261	261	207	207	.490	.490	109	105	Hyd.	Hyd.	
		<i>1000-4000 Smooth idle, strong low end. Good vacuum, good fuel economy.</i>										
161021-10	CL161021-10	267	267	213	213	.502	.502	110	106	Hyd.	Hyd.	1
		<i>1500-4400 Good idle, Street, Off-Road, Towing. Good fuel efficiency.</i>										
160041-08	CL160041-08	275	275	221	221	.519	.519	108	104	Hyd.	Hyd.	1
		<i>2000-4800 Nice idle, good low & mid range horsepower. Requires stall converter.</i>										
160911-08	CL160911-08	277	285	223	231	.525	.548	108	104	Hyd.	Hyd.	1
		<i>2500-5400 Fair idle, Hot Street performance. Strong mid range. 2500+ stall.</i>										
169991	NA	Custom Grind Camshaft								Hyd.	Hyd.	1
		<i>Hydraulic Flat Tappet Special Order Camshaft.</i>										



CHEVROLET L6 • 194-230-250 1962-1984

Mechanical Flat Tappet Camshafts

Firing Order: 1•5•3•6•2•4

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.75 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
160892-06	CL160892-06	265	265	230	230	.508	.508	106	102	.022	.022	1
		<i>1800-5600 Rough idle, Hot Street, multi carb & headers. Best with 2500+ stall.</i>										
160892-08	CL160892-08	265	265	230	230	.508	.508	108	104	.022	.022	1
		<i>1800-5600 Fair idle, Hot Street, multi carb & headers. Best with 2500+ stall.</i>										
161672-06	CL161672-06	265	265	240	240	.589	.589	106	102	.022	.022	1
		<i>2800-6200 Rough idle, Circle Track, Drag Race. A major favorite at the track.</i>										
161672-10	CL161672-10	265	265	240	240	.589	.589	110	106	.022	.022	1
		<i>3000-6500 Fair idle, big cubic inch with 10.0:1+ CR. Drag or Circle Track.</i>										
169992	NA	Custom Grind Camshaft										1
		<i>Mechanical Flat Tappet Special Order Camshaft.</i>										



CHEVROLET L6 • 216-235-261 1957-1963

Hydraulic Flat Tappet Camshafts

Firing Order: 1•5•3•6•2•4

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
179991	NA	Custom Grind Camshaft								Hyd.	Hyd.	1
		<i>Hydraulic Flat Tappet Special Order Camshaft.</i>										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

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CHEVROLET L6 • 194-230-250 1962-1984

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111-12 ³ 91112-12	NA	NA	98111-12	97112-12	NA	93005-12	93316 ²⁵	NA	NA	NA	NA	NA	NA
91111-12 ³ 91112-12	NA	NA	98111-12	97112-12	NA	93005-12	93316 ²⁵	NA	NA	NA	NA	NA	NA
91111-12 ³ 91112-12	NA	NA	98212-12	97112-12	NA	93005-12	93316 ²⁵	NA	NA	NA	NA	NA	NA
91111-12 ³ 91112-12	NA	NA	98212-12	97112-12	NA	93005-12	93316 ²⁵	NA	NA	NA	NA	NA	NA
91111-12 91112-12	NA	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA

CHEVROLET L6 • 194-230-250 1962-1984

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91115-12 ³ 91118-12	NA	NA	98438-12 ²⁵	97112-12	NA	93005-12	93316 ²⁵	NA	NA	NA	NA	NA	NA
91115-12 ³ 91118-12	NA	NA	98438-12 ²⁵	97112-12	NA	93005-12	93316 ²⁵	NA	NA	NA	NA	NA	NA
91115-12 ³ 91118-12	NA	NA	98438-12 ²⁵	97112-12	NA	93005-12	93316 ²⁵	NA	NA	NA	NA	NA	NA
91115-12 ³ 91118-12	NA	NA	98438-12 ²⁵	97112-12	NA	93005-12	93316 ²⁵	NA	NA	NA	NA	NA	NA
91115-12 91118-12	NA	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA

CHEVROLET L6 • 216-235-261 1957-1963

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
--	NA	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

²⁵ Machining Required.

CAMSHAFTS



CHEVROLET L6 • 216-235-261 1957-1963

Mechanical Flat Tappet Camshafts

Firing Order: 1•5•3•6•2•4

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes	
		IN	EX	IN	EX	IN	EX			IN	EX		
179992	NA	Custom Grind Camshaft <i>Mechanical Flat Tappet Special Order Camshaft.</i>											1



CHEVROLET L6 • 292 1963-1990

Street Force™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•5•3•6•2•4

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.75 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
150011-12	CL150011-12	259	267	205	213	.490	.501	112	108	Hyd.	Hyd.	1
<i>1200-4200 Street Force™ 1, Good idle, Mild Street performance, strong low end torque.</i>												



CHEVROLET L6 • 292 1963-1990

Hydraulic Flat Tappet Camshafts

Firing Order: 1•5•3•6•2•4

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.75 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes	
		IN	EX	IN	EX	IN	EX			IN	EX		
151021-10	CL151021-10	267	267	213	213	.502	.502	110	106	Hyd.	Hyd.	1	
<i>1200-4200 Good idle, Street, Off-Road, Towing. Good fuel efficiency.</i>													
150041-08	CL150041-08	275	275	221	221	.519	.519	108	104	Hyd.	Hyd.	1	
<i>1600-4500 Nice idle, good low & mid range horsepower. Requires stall converter.</i>													
150911-08	CL150911-08	277	285	223	231	.525	.548	108	104	Hyd.	Hyd.	1	
<i>2000-5000 Fair idle, Hot Street performance. Strong mid range. 2500+ stall.</i>													
151481-10	CL151481-10	291	295	237	241	.525	.548	110	106	Hyd.	Hyd.	1	
<i>2500-5500 Lopey idle, good mid-range power. Needs 3200+ stall.</i>													
159991	NA	Custom Grind Camshaft <i>Hydraulic Flat Tappet Special Order Camshaft.</i>											1

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET L6 • 216-235-261 1957-1963

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91125	NA	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA

CHEVROLET L6 • 292 1963-1990

Street Force™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111-12 ³ 91112-12	NA	NA	98111-12	97112-12	NA	93005-12	93316 ²⁵	NA	NA	NA	NA	NA	NA

CHEVROLET L6 • 292 1963-1990

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111-12 ³ 91112-12	NA	NA	98111-12	97112-12	NA	93005-12	93316 ²⁵	NA	NA	NA	NA	NA	NA
91111-12 ³ 91112-12	NA	NA	98111-12	97112-12	NA	93005-12	93316 ²⁵	NA	NA	NA	NA	NA	NA
91111-12 ³ 91112-12	NA	NA	98212-12	97112-12	NA	93005-12	93316 ²⁵	NA	NA	NA	NA	NA	NA
91111-12 ³ 91112-12	NA	NA	98212-12	97112-12	NA	93005-12	93316 ²⁵	NA	NA	NA	NA	NA	NA
91111-12 91112-12	NA	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

²⁵ Machining Required.

CAMSHAFTS



CHEVROLET L6 • 292 1963-1990

Mechanical Flat Tappet Camshafts

Firing Order: 1•5•3•6•2•4

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.75 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
150892-08	CL150892-08	265	265	230	230	.508	.508	108	104	.022	.022	1
1600-5400 Fair idle, Hot Street, multi carb & headers. Best with 2200+ stall.												
151672-06	CL151672-06	265	265	240	240	.589	.589	106	102	.022	.022	1
2600-6000 Rough idle, Circle Track, Drag Race. A major favorite at the track.												
151672-10	CL151672-10	265	265	240	240	.589	.589	110	106	.022	.022	1
2800-6200 Fair idle, big cubic inch with 10.0:1+ CR. Drag or Circle Track.												
159992	NA	Custom Grind Camshaft										1
Mechanical Flat Tappet Special Order Camshaft.												



CHEVROLET V6 ODD FIRE • 200-229 1978-1984

Hydraulic Flat Tappet Camshafts

Firing Order: 1•6•5•4•3•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
149998	NA	Custom Grind Camshaft										1
Hydraulic Flat Tappet Special Order Camshaft.												



CHEVROLET 60° V6 • 2.8L/3.1L/3.4L 1980-1991

Hydraulic Flat Tappet Camshafts

Firing Order: 1•2•3•4•5•6

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
149996	NA	Custom Grind Camshaft										1
Hydraulic Flat Tappet Special Order Camshaft.												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

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IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET L6 • 292 1963-1990

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91115-12 ³ 91118-12	NA	NA	98438-12 ²⁵	97112-12	NA	93005-12	93316 ²⁵	NA	NA	NA	NA	NA	NA
91115-12 ³ 91118-12	NA	NA	98438-12 ²⁵	97112-12	NA	93005-12	93316 ²⁵	NA	NA	NA	NA	NA	NA
91115-12 ³ 91118-12	NA	NA	98438-12 ²⁵	97112-12	NA	93005-12	93316 ²⁵	NA	NA	NA	NA	NA	NA
91115-12 91118-12	NA	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA

CHEVROLET 90° V6 ODD FIRE • 200-229-262 1978-1986

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111-12 91112-12	NA	--	--	--	--	--	--	NA	NA	NA	NA	NA	94200 94300

CHEVROLET 60° V6 • 2.8L/3.1L/3.4L 1980-1991

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111-12 91112-12	NA	--	--	--	--	--	--	NA	NA	NA	NA	NA	NA

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

²⁵ Machining Required.

CAMSHAFTS



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Max Certified™ Hydraulic Flat Tappet Cam & Lifter Sets - 5 Year No Fault Warranty (see page 3 for details)

Cam & Lifter Set Part No.	Cam & Direct Lube Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
MC112001-14	MC112001-14DL ⁴	255	261	201	207	.410	.420	114	110	Hyd.	Hyd.	
		<i>600-4800 Smooth idle, Strong low end. High vacuum, good fuel economy.</i>										
MC112011-11	MC112011-11DL ⁴	261	261	207	207	.420	.420	111	107	Hyd.	Hyd.	
		<i>800-4800 Good idle, Street, Off-Road, Towing. Good torque.</i>										
MC110931-11	MC110931-11DL ⁴	267	267	213	213	.450	.450	111	107	Hyd.	Hyd.	
		<i>1100-5200 Strong low & mid-range torque & horsepower.</i>										
MC110991-08	MC110991-08DL ⁴	275	275	221	221	.470	.470	108	104	Hyd.	Hyd.	1
		<i>1700-5700 Good low & mid-range horsepower. Needs 4 barrel & headers.</i>										
MC110951-10	MC110951-10DL ⁴	275	285	221	231	.470	.470	110	106	Hyd.	Hyd.	1
		<i>2000-6000 Street & Strip. Needs 4 barrel, headers & lower gears.</i>										
MC112431-08	MC112431-08DL ⁴	277	277	223	223	.450	.450	108	104	Hyd.	Hyd.	
		<i>2200-6200 Hot Street cam. 4 barrel & headers recommended.</i>										
MC110041-10	MC110041-10DL ⁴	279	289	225	235	.465	.488	110	106	Hyd.	Hyd.	1
		<i>1800-6000 Fair idle, Hot Street & mild Bracket Racing.</i>										
MC110041-12	MC110041-12DL ⁴	279	289	225	235	.465	.488	112	108	Hyd.	Hyd.	1
		<i>1800-6000 Fair idle, Hot Street & mild Bracket Racing.</i>										
MC110961-08	MC110961-08DL ⁴	285	285	231	231	.470	.470	108	104	Hyd.	Hyd.	1
		<i>2000-6200 Hot Street/Brackets, broad power range, strong top end.</i>										
MC112031-08	MC112031-08DL ⁴	285	285	231	231	.480	.480	108	104	Hyd.	Hyd.	1
		<i>2800-6400 Fair idle. Broad power band. Works well in heavy vehicles.</i>										
MC112141-10	MC112141-10DL ⁴	285	289	231	235	.480	.488	110	106	Hyd.	Hyd.	1
		<i>2000-6000 Lopey idle, Strong mid range. Good throttle response. 2400+ stall.</i>										
MC110971-08	MC110971-08DL ⁴	289	289	235	235	.470	.470	108	104	Hyd.	Hyd.	1
		<i>2600-6400 Lopey idle. Pro-Street & Bracket Racing profile. 9.5:1+ CR, 2700+ stall.</i>										



CHEVROLET SMALL BLOCK • 262-400 1955-1998

American Muscle™ Hydraulic Flat Tappet Camshafts Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
117071-12	CL117071-12	256	262	194	203	.390	.410	112	108	Hyd.	Hyd.	
		<i>600-4800 Smooth idle, near duplicate of the Chev L75 300HP/327 cam (GM #3733431/3896929).</i>										
110031-14	CL110031-14	290	290	223	223	.447	.447	114	110	Hyd.	Hyd.	
		<i>1800-5800 Nice idle, near duplicate of the Chev 325HP/327 cam (GM #3863151).</i>										
117091-14	CL117091-14	292	288	224	224	.450	.460	114	114	Hyd.	Hyd.	1
		<i>2000-6000 Nice idle, near duplicate of the Chev L46 350HP/350 cam (GM #3896962).</i>										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

4 Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.

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IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Max Certified™ Hydraulic Flat Tappet Cam & Lifter Set Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111 ³ 91116 ⁴	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91116 ⁴	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91116 ⁴	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91116 ⁴	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91116 ⁴	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91116 ⁴	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91116 ⁴	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91116 ⁴	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91116 ⁴	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91116 ⁴	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91116 ⁴	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91116 ⁴	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300

CHEVROLET SMALL BLOCK • 262-400 1955-1998

American Muscle™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111 ³ 91116	NA	98111-K11	98111	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91116	NA	98111-K11	98111	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91116	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300

Components Notes: master note list on page 260

- ³ Included in Cam & Lifter Sets.
- ⁴ Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.
- ¹⁰ 10° Valve lock Angle, must use matching retainers/locks.
- ²⁵ Machining Required.

CAMSHAFTS



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Street Force™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
112561-12	CL112561-12	259	269	205	215	.420	.455	112	108	Hyd.	Hyd.	1
<i>1000-5000 Street Force™ 1, Good idle, Mild Street performance, strong low end torque.</i>												
112561-12S	CL112561-12S	259	269	205	215	.420	.455	112	108	Hyd.	Hyd.	1
<i>1000-5000 Small Base Circle, Street Force™ 1, Mild Street performance, strong low end torque.</i>												
112571-12	CL112571-12	269	279	215	225	.455	.465	112	108	Hyd.	Hyd.	1
<i>1200-5500 Street Force™ 2, Good idle & throttle response. Needs 4 barrel & good exhaust.</i>												
112571-12S	CL112571-12S	269	279	215	225	.455	.465	112	108	Hyd.	Hyd.	1
<i>1200-5500 Small Base Circle, Street Force™ 2, Good idle & throttle response. Needs good exhaust.</i>												
110041-12	CL110041-12	279	289	225	235	.465	.488	112	108	Hyd.	Hyd.	1
<i>1800-6000 Street Force™ 3, Noticeable idle, Hot Street & mild Bracket Racing.</i>												
112601-12	CL112601-12	289	294	235	241	.488	.503	112	108	Hyd.	Hyd.	1
<i>2200-6400 Street Force™ 4, Lopey idle, good mid-range power. Needs 3200+ stall.</i>												
112601-12S	CL112601-12S	289	294	235	241	.488	.503	112	108	Hyd.	Hyd.	1
<i>2200-6400 Small Base Circle, Street Force™ 4, Lopey idle, good mid-range power. Needs 3200+ stall.</i>												



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Rattler Cams™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
118001-09	CL118001-09	281	289	227	235	.480	.488	109	103	Hyd.	Hyd.	1
<i>1800-5600 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.</i>												
118041-09	CL118041-09	289	297	235	243	.488	.480	109	103	Hyd.	Hyd.	1
<i>2000-5900 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.</i>												
118081-09	CL118081-09	297	305	243	251	.507	.495	109	103	Hyd.	Hyd.	1
<i>2400-6200 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.</i>												



CHEVROLET SMALL BLOCK • 262-400 1955-1998

BOOST™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
119141-14	CL119141-14	279	289	225	235	.490	.488	114	110	Hyd.	Hyd.	1
<i>2200-5800 Blower, Fair idle. Pro Street or Street/Strip. Needs 9.5+ Comp. 2000+ Conv.</i>												
119261-14	CL119261-14	289	299	235	245	.488	.488	114	110	Hyd.	Hyd.	1
<i>2400-6200 Blower, Lopey idle. 9.0:1 Comp. 8+ lbs Boost 2500+ Conv.</i>												
119421-14	CL119421-14	303	313	243	251	.507	.495	109	103	Hyd.	Hyd.	1
<i>3000-6800 Blower, Rough idle. Needs Good Heads, 10+ Boost 3200- Conv.</i>												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

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CHEVROLET SMALL BLOCK • 262-400 1955-1998

Street Force™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111 ³ 91116	NA	98111-K11	98111	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91116	NA	98111-K11	98111	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91116	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91116	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91116	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91116	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91116	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300

CHEVROLET SMALL BLOCK • 262-400 1955-1998

Rattler Cams™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300

CHEVROLET SMALL BLOCK • 262-400 1955-1998

BOOST™ Hydraulic Flat Tappet Camshafts

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
112001-14	CL112001-14	255	261	201	207	.410	.420	114	110	Hyd.	Hyd.	
		<i>600-4800 Smooth idle, Strong low end. High vacuum, good fuel economy.</i>										
112011-11	CL112011-11	261	261	207	207	.420	.420	111	107	Hyd.	Hyd.	
		<i>800-4800 Good idle, Street, Off-Road, Towing. Good torque.</i>										
111021-11	CL111021-11	267	267	213	213	.430	.430	111	107	Hyd.	Hyd.	
		<i>1200-5000 Good idle, Street, Off-Road, Towing. Good fuel efficiency.</i>										
110931-11	CL110931-11	267	267	213	213	.450	.450	111	107	Hyd.	Hyd.	
		<i>1100-5200 Strong low & mid-range torque & horsepower.</i>										
112571-10	CL112571-10	269	279	215	225	.455	.465	110	106	Hyd.	Hyd.	1
		<i>1200-5500 Good idle, Strong low & mid-range torque & horsepower.</i>										
111221-10	CL111221-10	275	275	221	221	.445	.445	110	106	Hyd.	Hyd.	
		<i>1500-5600 Nice idle, Good low & mid range horsepower.</i>										
110991-08	CL110991-08	275	275	221	221	.470	.470	108	104	Hyd.	Hyd.	1
		<i>1700-5700 Good low & mid-range horsepower. Needs 4 barrel & headers.</i>										
110951-08	CL110951-08	275	285	221	231	.470	.470	108	104	Hyd.	Hyd.	1
		<i>1800-5800 Lopey idle, Strong Street performance. Needs 4 barrel, headers & lower gears.</i>										
110951-10	CL110951-10	275	285	221	231	.470	.470	110	106	Hyd.	Hyd.	1
		<i>2000-6000 Street & Strip. Needs 4 barrel, headers & lower gears.</i>										
110951-12	CL110951-12	275	285	221	231	.470	.470	112	108	Hyd.	Hyd.	1
		<i>2000-6200 Hot Street, Improved carburetion, exhaust & lower gears needed.</i>										
112431-06	CL112431-06	277	277	223	223	.450	.450	106	102	Hyd.	Hyd.	
		<i>2200-6200 Lopey idle, Good low end & mid-range horsepower & torque.</i>										
112431-08	CL112431-08	277	277	223	223	.450	.450	108	104	Hyd.	Hyd.	
		<i>2200-6200 Hot Street cam. 4 barrel & headers recommended.</i>										
112431-10	CL112431-10	277	277	223	223	.450	.450	110	106	Hyd.	Hyd.	
		<i>2000-6200 Hot Street cam. Nice mid range torque. 4 barrel & headers recommended.</i>										
112431-12	CL112431-12	277	277	223	223	.450	.450	112	108	Hyd.	Hyd.	
		<i>2000-6200 Hot Street cam. Nice mid range torque. 4 barrel & headers recommended.</i>										
110031-12	CL110031-12	290	290	223	223	.447	.447	112	108	Hyd.	Hyd.	
		<i>2000-6200 Good idle, Good mid range torque & horsepower. Needs 2400+ stall.</i>										
110941-11	CL110941-11	279	279	225	225	.465	.465	111	107	Hyd.	Hyd.	1
		<i>1500-5600 Fair idle, Strong mid-range performance.</i>										
110041-10	CL110041-10	279	289	225	235	.465	.488	110	106	Hyd.	Hyd.	1
		<i>1800-6000 Fair idle, Hot Street & mild Bracket Racing.</i>										
112581-08	CL112581-08	279	289	225	235	.465	.470	108	104	Hyd.	Hyd.	1
		<i>1800-5800 Hot Street performance in 383-406. 9.5:1, 2400 stall suggested.</i>										
112581-08S	CL112581-08S	279	289	225	235	.465	.470	108	104	Hyd.	Hyd.	1
		<i>1800-5800 Small Base Circle, Hot Street performance in 383-406. 9.5:1, 2400 stall suggested.</i>										
112581-10	CL112581-10	279	289	225	235	.465	.470	110	106	Hyd.	Hyd.	1
		<i>1800-6000 Hot Street, 4-barrel & headers required.</i>										
112581-10S	CL112581-10S	279	289	225	235	.465	.470	110	106	Hyd.	Hyd.	1
		<i>1600-6000 Small Base Circle, Hot Street, 4-barrel & headers required.</i>										
112581-12	CL112581-12	279	289	225	235	.465	.470	112	108	Hyd.	Hyd.	1
		<i>1600-6000 Hot Street, 4-barrel & headers required.</i>										
112581-12S	CL112581-12S	279	289	225	235	.465	.470	112	108	Hyd.	Hyd.	1
		<i>1600-6000 Small Base Circle, Hot Street, 4-barrel & headers required.</i>										
110961-08	CL110961-08	285	285	231	231	.470	.470	108	104	Hyd.	Hyd.	1
		<i>2000-6200 Hot Street/Brackets, broad power range, strong top end.</i>										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111 ³ 91112	NA	98111-K11	98111	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98111-K11	98111	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
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91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Hydraulic Flat Tappet Camshafts (cont.)

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
110961-10	CL110961-10	285	285	231	231	.470	.470	110	106	Hyd.	Hyd.	1
		<i>2000-6000 Fair idle, Street Machines with headers, gears & 2500+ stall.</i>										
112031-06	CL112031-06	285	285	231	231	.480	.480	106	104	Hyd.	Hyd.	1
		<i>2800-6400 Rough idle, Broad power band. Works well in heavy vehicles. Needs 3200+ stall.</i>										
112031-08	CL112031-08	285	285	231	231	.480	.480	108	106	Hyd.	Hyd.	1
		<i>2800-6400 Fair idle. Broad power band. Works well in heavy vehicles.</i>										
112031-10	CL112031-10	285	285	231	231	.480	.480	110	106	Hyd.	Hyd.	1
		<i>2600-6400 Fair idle, Hot Street/Strip performance. Needs headers, gears & 2500+ stall.</i>										
112141-08	CL112141-08	285	289	231	235	.480	.488	108	104	Hyd.	Hyd.	1
		<i>2200-6200 Lopey idle, broad power band, strong top end power.</i>										
112141-08S	CL112141-08S	285	289	231	235	.480	.488	108	104	Hyd.	Hyd.	1
		<i>2200-6200 Small Base Circle, Lopey idle, broad power band, strong top end power.</i>										
112141-10	CL112141-10	285	289	231	235	.480	.488	110	106	Hyd.	Hyd.	1
		<i>2000-6000 Lopey idle, Strong mid range. Good throttle response. 2400+ stall.</i>										
112141-10S	CL112141-10S	285	289	231	235	.480	.488	110	106	Hyd.	Hyd.	1
		<i>2000-6000 Small Base Circle, Lopey idle, Strong mid range. Good throttle response. 2400+ stall.</i>										
112141-12	CL112141-12	285	289	231	235	.480	.488	112	108	Hyd.	Hyd.	1
		<i>1800-6200 Fair idle, Strong mid range. Good throttle response. 2400+ stall.</i>										
112141-12S	CL112141-12S	285	289	231	235	.480	.488	112	108	Hyd.	Hyd.	1
		<i>1800-6200 Small Base Circle, Fair idle, Strong mid range. Good throttle response. 2400+ stall.</i>										
112591-08	CL112591-08	285	295	231	241	.470	.470	108	104	Hyd.	Hyd.	1
		<i>2000-6400 Lopey idle, Hot Street/Brackets. 2500+ stall, 9.0:1+ CR.</i>										
112591-08S	CL112591-08S	285	295	231	241	.470	.470	108	104	Hyd.	Hyd.	1
		<i>2000-6400 Small Base Circle, lopey idle, Hot Street/Brackets. 2500+ stall, 9.0:1+ CR.</i>										
112591-10	CL112591-10	285	295	231	241	.470	.470	110	106	Hyd.	Hyd.	1
		<i>1800-6200 Nice idle, Hot Street/Strip, Excellent mid range performance.</i>										
112591-10S	CL112591-10S	285	295	231	241	.470	.470	110	106	Hyd.	Hyd.	1
		<i>1800-6200 Small Base Circle, Nice idle, Hot Street/Strip, Excellent mid range performance.</i>										
112591-12	CL112591-12	285	295	231	241	.470	.470	112	108	Hyd.	Hyd.	1
		<i>1800-6000 Hot Street & mild Bracket Racing. Broad mid range.</i>										
112591-12S	CL112591-12S	285	295	231	241	.470	.470	112	108	Hyd.	Hyd.	1
		<i>1800-6000 Small Base Circle, Hot Street & mild Bracket Racing.</i>										
110971-08	CL110971-08	289	289	235	235	.470	.470	108	104	Hyd.	Hyd.	1
		<i>2600-6400 Lopey idle. Pro-Street & Bracket Racing profile.</i>										
112681-06	CL112681-06	289	291	235	237	.488	.488	106	102	Hyd.	Hyd.	1
		<i>3000-6800 Lopey idle, strong low to mid-range torque & horsepower.</i>										
112681-06S	CL112681-06S	289	291	235	237	.488	.488	106	102	Hyd.	Hyd.	1
		<i>3000-6800 Small Base Circle, choppy idle, strong low to mid-range torque & horsepower.</i>										
112681-08	CL112681-08	289	291	235	237	.488	.488	108	104	Hyd.	Hyd.	1
		<i>3000-6700 Fair idle, Street/Strip, strong mid-range torque & horsepower.</i>										
112681-08S	CL112681-08S	289	291	235	237	.488	.488	108	104	Hyd.	Hyd.	1
		<i>3000-6700 Small Base Circle, Fair idle, Street/Strip, strong mid-range torque & horsepower.</i>										
112681-10	CL112681-10	289	291	235	237	.488	.488	110	106	Hyd.	Hyd.	1
		<i>2800-6800 Fair idle, strong mid to upper range performance.</i>										
112681-10S	CL112681-10S	289	291	235	237	.488	.488	110	106	Hyd.	Hyd.	1
		<i>2800-6800 Small Base Circle, fair idle, strong mid to upper range performance.</i>										
112681-12	CL112681-12	289	291	235	237	.488	.488	112	108	Hyd.	Hyd.	1
		<i>2800-6800 Fair idle, strong mid to upper range performance.</i>										

Cam Notes: master note list on page 260

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Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
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91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Hydraulic Flat Tappet Camshafts (cont.)

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
112681-12S	CL112681-12S	289	291	235	237	.488	.488	112	108	Hyd.	Hyd.	1
<i>2800-6800 Small Base Circle, fair idle, strong mid to upper range performance.</i>												
112601-06	CL112601-06	289	294	235	241	.488	.503	106	102	Hyd.	Hyd.	1
<i>3000-6400 Bracket or 1/4 to 3/8 mile 4bbl. Limited Sportsman. Proven winner for .500" Lift Rule.</i>												
112601-06S	CL112601-06S	289	294	235	241	.488	.503	106	102	Hyd.	Hyd.	1
<i>3000-6400 Small Base Circle, Bracket or 1/4 to 3/8 mile 4bbl. Limited Sportsman.</i>												
112601-08	CL112601-08	289	294	235	241	.488	.503	108	104	Hyd.	Hyd.	1
<i>3000-6400 Lopey idle, good mid-range power. Needs 3200+ stall.</i>												
112601-08S	CL112601-08S	289	294	235	241	.488	.503	108	104	Hyd.	Hyd.	1
<i>3000-6400 Small Base Circle, lopey idle, good mid-range power. Needs 3200+ stall.</i>												
110051-08	CL110051-08	289	297	235	243	.488	.508	108	104	Hyd.	Hyd.	1
<i>2800-6200 Lopey idle, Serious Street/Strip. Needs 3200+ stall, header & gears.</i>												
110051-08S	CL110051-08S	289	297	235	243	.488	.508	108	104	Hyd.	Hyd.	1
<i>2800-6200 Small Base Circle, Lopey idle, serious Street/Strip. Needs 3200+ stall, header & gears.</i>												
110051-10	CL110051-10	289	297	235	243	.488	.508	110	106	Hyd.	Hyd.	1
<i>2800-6200 Lopey idle, Serious Street/Strip. Needs 3200+ stall, header & gears.</i>												
110051-12	CL110051-12	289	297	235	243	.488	.508	112	108	Hyd.	Hyd.	1
<i>2600-6400 Lopey idle, Street/Strip or nostalgia. Likes headers & gears.</i>												
110051-12S	CL110051-12S	289	297	235	243	.488	.508	112	108	Hyd.	Hyd.	1
<i>2600-6400 Small Base Circle, Lopey idle, Street/Strip or nostalgia. Likes headers & gears.</i>												
110981-08	CL110981-08	295	295	241	241	.470	.470	108	104	Hyd.	Hyd.	1
<i>2800-6400 Rough idle, runs strong 4,000 rpm up, needs compression.</i>												
111671-08	CL111671-08	297	297	243	243	.508	.508	108	104	Hyd.	Hyd.	1
<i>2800-6800 Lopey idle, needs low gears, headers & compression.</i>												
110061-08	CL110061-08	297	307	243	253	.508	.530	108	104	Hyd.	Hyd.	1
<i>2800-6800 Pro Street/Brackets, Strong mid & upper end power. 10.0:1+ CR.</i>												
110061-08S	CL110061-08S	297	307	243	253	.508	.530	108	104	Hyd.	Hyd.	1
<i>2800-6800 Small Base Circle, Pro Street/Brackets, Strong mid & upper end power. 10.0:1+ CR.</i>												
110061-12	CL110061-12	297	307	243	253	.508	.530	112	108	Hyd.	Hyd.	1
<i>2800-6600 Performance/Competition. Works well with small blower or NOS.</i>												
110061-12S	CL110061-12S	297	307	243	253	.508	.530	112	108	Hyd.	Hyd.	1
<i>2800-6600 Small Base Circle, Performance/Competition. Works well with small blower or NOS.</i>												
112041-09	CL112041-09	299	299	245	245	.510	.510	109	105	Hyd.	Hyd.	1
<i>3400-6700 Hot Street/Brackets. Needs 10.0:1+ CR, good heads & exhaust. 3500+ stall.</i>												
112041-09S	CL112041-09S	299	299	245	245	.510	.510	109	105	Hyd.	Hyd.	1
<i>3400-6700 Small Base Circle, E.T. Brackets. Strong mid & upper end power range.</i>												
112401-10	CL112401-10	301	301	247	247	.510	.510	110	106	Hyd.	Hyd.	1
<i>3200-6800 E.T. Brackets. Strong mid & upper end power range.</i>												
119991	NA	Custom Grind Camshaft <i>Hydraulic Flat Tappet Special Order Camshaft.</i>								Hyd.	Hyd.	1
119991-S	NA	Custom Grind Camshaft, Small Base Circle <i>Hydraulic Flat Tappet Special Order Camshaft.</i>								Hyd.	Hyd.	1
119991-P55	NA	Custom Grind Camshaft, Special Core <i>Hydraulic Flat Tappet Special Order Camshaft.</i>								Hyd.	Hyd.	1
114991	NA	Custom Grind Camshaft <i>4/7 Swap Hydraulic Flat Tappet Special Order Camshaft.</i>										1,22
114991-S	NA	Custom Grind Camshaft, Small Base Circle <i>4/7 Swap Hydraulic Flat Tappet Special Order Camshaft.</i>										1,22

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

22 Ignition firing order must be changed to 1-8-7-3-6-5-4-2.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 91112	NA	--	--	--	--	--	--	--	--	--	92150 94475	94402	94200 94300
91111 91112	NA	--	--	--	--	--	--	--	--	--	92150 94475	94402	94200 94300
91111 91112	NA	--	--	--	--	--	--	--	--	--	92150 94475	94402	94200 94300
91111 91112	NA	--	--	--	--	--	--	--	--	--	92150 94475	94402	94200 94300
91111 91112	NA	--	--	--	--	--	--	--	--	--	92150 94475	94402	94200 94300

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



CHEVROLET SMALL BLOCK • 262-400 1955-1998

4/7 Swap Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•7•3•6•5•4•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
114681-06	CL114681-06	289	291	235	237	.488	.488	106	102	Hyd.	Hyd.	1,22
		<i>2800-6800 Lopey idle, strong low to mid-range torque & horsepower.</i>										
114681-06S	CL114681-06S	289	291	235	237	.488	.488	106	102	Hyd.	Hyd.	1,22
		<i>2800-6800 Small Base Circle, choppy idle, strong low to mid-range torque & horsepower.</i>										
114681-08	CL114681-08	289	291	235	237	.488	.488	108	104	Hyd.	Hyd.	1,22
		<i>2800-6800 Lopey idle, strong low to mid-range torque & horsepower.</i>										
114681-08S	CL114681-08S	289	291	235	237	.488	.488	108	104	Hyd.	Hyd.	1,22
		<i>2800-6800 Small Base Circle, choppy idle, strong low to mid-range torque & horsepower.</i>										
114681-12	CL114681-12	289	291	235	237	.488	.488	112	108	Hyd.	Hyd.	1,22
		<i>2800-6800 Fair idle, strong mid to upper range performance.</i>										
114681-12S	CL114681-12S	289	291	235	237	.488	.488	112	108	Hyd.	Hyd.	1,22
		<i>2800-6800 Small Base Circle, fair idle, strong mid to upper range performance.</i>										
114601-06	CL114601-06	289	294	235	241	.488	.503	106	102	Hyd.	Hyd.	1,22
		<i>3000-6400 Bracket or 1/4 to 3/8 mile 4bbl. Limited Sportsman. Proven winner for .500" Lift Rule.</i>										
114601-06S	CL114601-06S	289	294	235	241	.488	.503	106	102	Hyd.	Hyd.	1,22
		<i>3000-6400 Small Base Circle, Bracket or 1/4 to 3/8 mile 4bbl. Limited Sportsman.</i>										
114601-08	CL114601-08	289	294	235	241	.488	.503	108	104	Hyd.	Hyd.	1,22
		<i>3000-6400 Lopey idle, good mid-range power. Needs 3200+ stall.</i>										
114601-08S	CL114601-08S	289	294	235	241	.488	.503	108	104	Hyd.	Hyd.	1,22
		<i>3000-6400 Small Base Circle, lopey idle, good mid-range power. Needs 3200+ stall.</i>										
114601-12	CL114601-12	289	294	235	241	.488	.503	112	108	Hyd.	Hyd.	1,22
		<i>3000-6400 Lopey idle, good mid-range power. Needs 3200+ stall.</i>										
114601-12S	CL114601-12S	289	294	235	241	.488	.503	112	108	Hyd.	Hyd.	1,22
		<i>3400-6800 Small Base Circle, Bracket Racing, strong mid & upper rpm.</i>										
114061-08	CL114061-08	297	307	243	253	.508	.530	108	104	Hyd.	Hyd.	1,22
		<i>2600-6600 Performance/Competition. Works well with small blower or NOS.</i>										
114061-08S	CL114061-08S	297	307	243	253	.508	.530	108	104	Hyd.	Hyd.	1,22
		<i>2600-6600 Small Base Circle, Performance/Competition. Works well with small blower or NOS.</i>										
114061-12	CL114061-12	297	307	243	253	.508	.530	112	108	Hyd.	Hyd.	1,22
		<i>2600-6600 Performance/Competition. Works well with small blower or NOS.</i>										
114061-12S	CL114061-12S	297	307	243	253	.507	.530	112	108	Hyd.	Hyd.	1,22
		<i>2600-6600 Small Base Circle, Performance/Competition. Works well with small blower or NOS.</i>										
114991	NA	Custom Grind Camshaft										1,22
		<i>4/7 Swap Hydraulic Flat Tappet Special Order Camshaft.</i>										
114991-S	NA	Custom Grind Camshaft, Small Base Circle										1,22
		<i>4/7 Swap Hydraulic Flat Tappet Special Order Camshaft.</i>										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

22 Ignition firing order must be changed to 1-8-7-3-6-5-4-2.

Some items are not legal for sale or use on any pollution controlled motor vehicle

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CHEVROLET SMALL BLOCK • 262-400 1955-1998

4/7 Swap Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91111 91112	NA	--	--	--	--	--	--	--	--	--	92150 94475	94402	94200 94300
91111 91112	NA	--	--	--	--	--	--	--	--	--	92150 94475	94402	94200 94300

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.



Oval Track Lift Rule Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
112811-06	CL112811-06	280	284	227	231	.390	.410	106	102	Hyd.	Hyd.	
<i>3200-6000 Stock Lift Rule. Best on 1/4 to short 3/8 mile tracks. Good torque.</i>												
112811-08	CL112811-08	280	284	227	231	.390	.410	108	104	Hyd.	Hyd.	
<i>3200-6000 Stock Lift Rule. Best on 1/4 to 3/8 mile tracks. Strong lower mid-range power.</i>												
112811-12	CL112811-12	280	284	227	231	.390	.410	112	108	Hyd.	Hyd.	
<i>3200-6000 Stock Lift Rule. Best on 1/4 to 3/8 mile tracks. Good Vacuum</i>												
112701-06	CL112701-06	280	288	227	235	.390	.410	106	102	Hyd.	Hyd.	
<i>3000-6200 Stock Lift Rule. Best on 1/4 to 3/8 mile tracks. Strong lower mid-range power.</i>												
112701-08	CL112701-08	280	288	227	235	.390	.410	108	104	Hyd.	Hyd.	
<i>2800-6400 Stock Lift Rule. Best on 1/4 to 3/8 mile tracks. Good mid-range horsepower.</i>												
112701-12	CL112701-12	280	288	227	235	.390	.410	112	108	Hyd.	Hyd.	14
<i>2600-6400 Stock Lift Rule & Vacuum Rule. Broad power band.</i>												
112711-06	CL112711-06	288	294	235	241	.390	.410	106	102	Hyd.	Hyd.	
<i>3500-6400 Stock Lift Rule. 3/8 & longer banked tracks. Good torque off corners. Strong mid-range.</i>												
112711-08	CL112711-08	288	294	235	241	.390	.410	108	104	Hyd.	Hyd.	
<i>3500-6200 Stock Lift Rule. 3/8 to 1/2 mile banked tracks. Good upper mid-range.</i>												
112711-12	CL112711-12	288	294	235	241	.390	.410	112	108	Hyd.	Hyd.	
<i>3400-6300 Stock Lift Rule. 3/8 to 1/2 mile banked tracks. Good top-end power.</i>												
112711-14	CL112711-14	288	294	235	241	.390	.410	114	110	Hyd.	Hyd.	14
<i>3200-6400 Stock Lift Rule & Vacuum Rule. Banked 3/8 & longer tracks.</i>												
112901-06	CL112901-06	294	300	241	247	.390	.410	106	102	Hyd.	Hyd.	
<i>3800-6600 Stock Lift Rule. Fast 3/8 mile banked tracks. Strong mid-range.</i>												
112901-12	CL112901-12	294	300	241	247	.390	.410	112	108	Hyd.	Hyd.	14
<i>3400-6200 Stock Lift Rule with Vacuum Rule. Fast 3/8 mile banked tracks. Strong mid-range.</i>												
112981-06	CL112981-06	300	306	247	253	.390	.410	106	102	Hyd.	Hyd.	
<i>4000-7000 Stock Lift Rule. Fast 3/8 to 1/2 mile banked tracks. Good top-end power.</i>												
112981-12	CL112981-12	300	306	247	253	.390	.410	112	108	Hyd.	Hyd.	14
<i>3800-7000 Stock Lift Rule with Vacuum Rule, fast 3/8 to 1/2 mile banked tracks.</i>												
112731-06	CL112731-06	298	304	245	251	.400	.400	106	102	Hyd.	Hyd.	
<i>3000-6800 Stock Lift Rule, fast 3/8-1/2 mile tracks. Nice mid-range power.</i>												
112731-08	CL112731-08	298	304	245	251	.400	.400	108	104	Hyd.	Hyd.	
<i>3000-6800 Stock Lift Rule, medium to high banked 3/8-1/2 mile tracks.</i>												
110071-06	CL110071-06	274	274	221	221	.410	.410	106	102	Hyd.	Hyd.	
<i>2500-6000 .420" Lift Rule cam, 1/4-3/8 mile, low to medium banked. 2bbl. & good exhaust.</i>												
112921-06	CL112921-06	274	278	221	225	.410	.410	106	102	Hyd.	Hyd.	
<i>2000-6200 .420" Lift Rule cam, low banked 1/4-3/8 mile. Great with 4bbl. & headers.</i>												
112921-10	CL112921-10	274	278	221	225	.410	.410	110	106	Hyd.	Hyd.	14
<i>2300-6200 .420" Lift Rule with Vacuum Rule, low banked 1/4-3/8 mile.</i>												
112921-12	CL112921-12	274	278	221	225	.410	.410	112	108	Hyd.	Hyd.	14
<i>2400-6200 .420" Lift Rule with Vacuum Rule, low banked 1/4-3/8 mile.</i>												
112851-06	CL112851-06	278	282	225	229	.410	.410	106	102	Hyd.	Hyd.	
<i>2800-6400 .420" Lift Rule cam, medium banked 1/4-3/8 mile tracks.</i>												
112851-12	CL112851-12	278	282	225	229	.410	.410	112	108	Hyd.	Hyd.	14
<i>2600-6400 .420" Lift Rule with Vacuum Rule, medium banked 1/4-3/8 mile tracks.</i>												
110081-06	CL110081-06	282	282	229	229	.410	.410	106	102	Hyd.	Hyd.	
<i>3000-6200 .420" Lift Rule cam. Good low & mid-range power. 1/4 to 3/8 mile banked tracks.</i>												
112911-06	CL112911-06	286	292	233	239	.410	.410	106	102	Hyd.	Hyd.	
<i>3400-6400 .420" Lift Rule cam, banked 3/8-1/2 mile. Strong mid-range.</i>												

Cam Notes: master note list on page 260

14 No specific vacuum rating is guaranteed.

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Oval Track Lift Rule Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300

Components Notes: master note list on page 260

- ³ Included in Cam & Lifter Sets.
- ¹⁰ 10° Valve lock Angle, must use matching retainers/locks.
- ¹¹ Sets of 8, Requires 2 sets per engine.
- ²⁵ Machining Required.

CAMSHAFTS



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Oval Track Lift Rule Hydraulic Flat Tappet Camshafts (cont.) Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve IN	Lash EX	Cam Notes
		IN	EX	IN	EX	IN	EX					
112911-12	CL112911-12	286 3200-6400	292	233	239	.410	.410	112	108	Hyd.	Hyd.	14
<i>.420" Lift Rule with Vacuum Rule, banked 3/8-1/2 mile. Strong mid-range.</i>												
110091-06	CL110091-06	294 3000-6400	294	241	241	.410	.410	106	102	Hyd.	Hyd.	
<i>.420" Lift Rule cam. 3/8 to 1/2 mile banked tracks. Good mid-range.</i>												
112951-06	CL112951-06	276 3000-6000	282	223	229	.420	.420	106	102	Hyd.	Hyd.	
<i>.420" Lift Rule, flat to low banked 1/4 mile tracks.</i>												
112951-12	CL112951-12	276 3000-6400	282	223	229	.420	.420	112	108	Hyd.	Hyd.	14
<i>.420" Lift Rule with Vacuum Rule, flat to low banked 1/4 mile tracks.</i>												
112841-06	CL112841-06	280 3200-6200	280	227	227	.420	.420	106	102	Hyd.	Hyd.	
<i>.420" Lift Rule, low banked 1/4-3/8 mile tracks. Good low to mid range power.</i>												
112841-08	CL112841-08	280 3200-6400	280	227	227	.420	.420	108	104	Hyd.	Hyd.	
<i>.420" Lift Rule, medium banked 1/4-3/8 mile tracks. 2bbl. & good exhaust.</i>												
112841-12	CL112841-12	280 3200-6600	280	227	227	.420	.420	112	108	Hyd.	Hyd.	14
<i>.420" Lift with Vacuum Rule, Medium banked 1/4-3/8 mile tracks. 2bbl. & good exhaust.</i>												
112871-06	CL112871-06	280 3200-6400	286	227	233	.420	.420	106	102	Hyd.	Hyd.	
<i>.420" Lift Rule, low banked 1/4-3/8 mile tracks. Good torque off of comers.</i>												
112871-08	CL112871-08	280 3200-6800	286	227	233	.420	.420	108	104	Hyd.	Hyd.	
<i>.420" Lift Rule, medium banked 1/4-3/8 mile tracks. 4bbl. & headers.</i>												
112871-12	CL112871-12	280 3400-6800	286	227	233	.420	.420	112	108	Hyd.	Hyd.	14
<i>.420" Lift with Vacuum Rule, Medium banked 1/4-3/8 mile tracks. 4bbl. & headers.</i>												
112961-06	CL112961-06	288 3600-6400	292	235	239	.420	.420	106	102	Hyd.	Hyd.	
<i>.420" Lift Rule, medium banked 3/8 mile tracks.</i>												
112961-08	CL112961-08	288 3600-6800	292	235	239	.420	.420	108	104	Hyd.	Hyd.	
<i>.420" Lift Rule, 3/8 mile tracks with fast comers. 4bbl. & good exhaust.</i>												
112961-12	CL112961-12	288 3600-6800	292	235	239	.420	.420	112	108	Hyd.	Hyd.	14
<i>.420" Lift Rule with Vacuum Rule, banked 3/8 mile tracks.</i>												
112761-06	CL112761-06	290 3600-6400	294	237	241	.420	.420	106	102	Hyd.	Hyd.	
<i>.420" Lift Rule. 3/8 & longer banked tracks. Strong mid-range.</i>												
112761-08	CL112761-08	290 3600-6600	294	237	241	.420	.420	108	104	Hyd.	Hyd.	
<i>.420" Lift Rule. 3/8 to 1/2 mile banked tracks. Good upper mid-range.</i>												
112761-12	CL112761-12	290 3800-6800	294	237	241	.420	.420	112	108	Hyd.	Hyd.	
<i>.420" Lift Rule. Fast 3/8 to 1/2 mile banked tracks. Good top end power.</i>												
112891-06	CL112891-06	294 3800-6600	298	241	245	.420	.420	106	102	Hyd.	Hyd.	
<i>.420" Lift Rule. Fast 3/8 to 1/2 mile tracks. Broad torque range.</i>												
112781-06	CL112781-06	296 3800-6600	296	243	243	.420	.420	106	102	Hyd.	Hyd.	
<i>.420" Lift Rule cam. Good upper mid-range torque. High banked 3/8 to 1/2 mile.</i>												
112971-06	CL112971-06	296 3800-6800	302	243	249	.420	.420	106	102	Hyd.	Hyd.	
<i>.420" Lift Rule cam. 2bbl. or 4bbl., heavy car with manifolds. Good throttle response.</i>												
112971-10	CL112971-10	296 4000-7000	302	243	249	.420	.420	110	106	Hyd.	Hyd.	
<i>.420" Lift Rule cam. 2bbl. or 4bbl., heavy car with manifolds. 3/8-1/2 mile banked.</i>												
112971-12	CL112971-12	296 4000-7000	302	243	249	.420	.420	112	108	Hyd.	Hyd.	14
<i>.420" Lift with Vacuum Rule, 2bbl. or 4bbl., heavy car with manifolds. 3/8-1/2 banked.</i>												
112741-06	CL112741-06	302 3800-7000	306	249	253	.420	.420	106	102	Hyd.	Hyd.	
<i>.420" Lift Rule, high banked 1/2 mile tracks.</i>												
112741-08	CL112741-08	302 3800-7000	306	249	253	.420	.420	108	104	Hyd.	Hyd.	
<i>.420" Lift Rule, fast high banked 1/2 mile tracks.</i>												
112741-12	CL112741-12	302 3800-7200	306	249	253	.420	.420	112	108	Hyd.	Hyd.	
<i>.420" Lift Rule, fast high banked 1/2 mile tracks with fast comers.</i>												

Cam Notes: master note list on page 260

14 No specific vacuum rating is guaranteed.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Oval Track Lift Rule Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

¹¹ Sets of 8, Requires 2 sets per engine.

²⁵ Machining Required.

CAMSHAFTS



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Oval Track Lift Rule Hydraulic Flat Tappet Camshafts (cont.) Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
112431-06	CL112431-06	277 2600-6400	277 .450" Lift Rule, flat to low banked 1/4-3/8 mile tracks.	223	223	.450	.450	106	102	Hyd.	Hyd.	
112431-10	CL112431-10	277 2600-6600	277 .450" Lift Rule, fast tight banked 1/4 mile tracks. 2bbl. OK.	223	223	.450	.450	110	106	Hyd.	Hyd.	
112431-12	CL112431-12	277 2600-6500	277 .450" Lift Rule with Vacuum Rule, flat to low banked 1/4 mile tracks.	223	223	.450	.450	112	108	Hyd.	Hyd.	14
112931-06	CL112931-06	276 2600-6600	280 .450" Lift Rule, low banked 1/4-3/8 mile tracks. Good throttle response.	223	227	.450	.450	106	102	Hyd.	Hyd.	
112931-12	CL112931-12	276 2600-6600	280 .450" Lift Rule, low banked 3/8-1/2 mile tracks. Good mid & top end power.	223	227	.450	.450	112	108	Hyd.	Hyd.	14
111241-06	CL111241-06	276 2600-6800	284 .450" Lift Rule cam, great on 3/8 mile tracks. Good low end response.	223	231	.450	.450	106	102	Hyd.	Hyd.	
111241-12	CL111241-12	276 2400-6400	284 .450" Lift Vacuum Rule cam. Great on 1/4-3/8 mile mild to medium bank tracks.	223	231	.450	.450	112	108	Hyd.	Hyd.	14
112691-06	CL112691-06	284 2500-6600	284 .450" Lift Rule cam. Strong low & mid-range power. Banked 1/4-3/8 mile tracks.	231	231	.450	.450	106	102	Hyd.	Hyd.	
112691-10	CL112691-10	284 2400-6800	284 .450" Lift Rule cam. Strong mid-range horsepower.	231	231	.450	.450	110	106	Hyd.	Hyd.	
112691-12	CL112691-12	284 2400-6800	284 .450" Lift Rule cam. Strong mid-range horsepower.	231	231	.450	.450	112	108	Hyd.	Hyd.	14
112791-06	CL112791-06	288 2800-6400	292 .450" Lift Rule, medium banked 3/8 mile tracks.	235	239	.450	.450	106	102	Hyd.	Hyd.	
112791-08	CL112791-06	288 2800-6400	292 .450" Lift Rule, medium banked 3/8 mile tracks.	235	239	.450	.450	108	104	Hyd.	Hyd.	
112791-12	CL112791-12	288 3000-6600	292 .450" Lift Rule with Vacuum Rule, banked 3/8 mile tracks.	235	239	.450	.450	112	108	Hyd.	Hyd.	14
112821-06	CL112821-06	290 3200-6600	290 .450" Lift Rule, medium banked 3/8-1/2 mile tracks. Good throttle response.	237	237	.450	.450	106	102	Hyd.	Hyd.	
112821-08	CL112821-08	290 3200-6600	290 .450" Lift Rule, medium banked 3/8-1/2 mile tracks. Strong mid-range power.	237	237	.450	.450	108	104	Hyd.	Hyd.	
112941-06	CL112941-06	294 3400-6600	298 .450" Lift Rule, high banked 3/8-1/2 mile tracks. Strong mid to top end.	241	245	.450	.450	106	102	Hyd.	Hyd.	
112941-12	CL112941-12	294 3400-6800	298 .450" Lift Rule with Vacuum Rule, high banked 1/2 mile tracks. Good mid to top end.	241	245	.450	.450	112	108	Hyd.	Hyd.	14
112831-06	CL112831-06	294 3400-7000	302 .450" Lift Rule, fast high banked 3/8-1/2 mile tracks. Strong mid to top end.	241	249	.450	.450	106	102	Hyd.	Hyd.	
112831-12	CL112831-12	294 3600-7000	302 .450" Lift Rule with Vacuum Rule, high banked 1/2 mile tracks. Strong mid to top end.	241	249	.450	.450	112	108	Hyd.	Hyd.	14
112721-06	CL112721-06	296 2600-6400	296 .450" Lift Rule cam. Good upper mid-range torque. High banked 3/8 to 1/2 mile.	243	243	.450	.450	106	102	Hyd.	Hyd.	
112751-06	CL112751-06	296 2600-6400	308 .450" Lift Rule cam. Good upper mid-range torque. High banked 3/8 to 1/2 mile.	243	255	.450	.450	106	102	Hyd.	Hyd.	
119991	NA	Custom Grind Camshaft Hydraulic Flat Tappet Special Order Camshaft.								Hyd.	Hyd.	1
119991-S	NA	Custom Grind Camshaft, Small Base Circle Hydraulic Flat Tappet Special Order Camshaft.								Hyd.	Hyd.	1
119991-P55	NA	Custom Grind Camshaft, Special Core Hydraulic Flat Tappet Special Order Camshaft.								Hyd.	Hyd.	1

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

14 No specific vacuum rating is guaranteed.

22 Ignition firing order must be changed to 1-8-7-3-6-5-4-2.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Oval Track Lift Rule Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91111 ³ 91112	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112 ³	NA	98214-K11	98214	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90045-8 ¹¹	90100	95205 95010	92150 94475	94402	94200 94300
91112	NA	--	--	--	--	--	--	--	--	--	92150 94475	94402	94200 94300
91112	NA	--	--	--	--	--	--	--	--	--	92150 94475	94402	94200 94300
91112	NA	--	--	--	--	--	--	--	--	--	92150 94475	94402	94200 94300

Components Notes: master note list on page 260

- ³ Included in Cam & Lifter Sets.
- ¹⁰ 10° Valve lock Angle, must use matching retainers/locks.
- ¹¹ Sets of 8, Requires 2 sets per engine.
- ²⁵ Machining Required.

CAMSHAFTS



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Rattler Cams™ Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
118005-09	CL118005-09	280	288	227	235	.525	.530	109	103	Hyd.	Hyd.	1,2
1800-5600 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.												
118045-09	CL118045-09	288	296	235	243	.530	.530	109	103	Hyd.	Hyd.	1,2
2000-5900 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.												
118085-09	CL118085-09	296	304	243	251	.530	.515	109	103	Hyd.	Hyd.	1,2
2400-6200 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												



CHEVROLET SMALL BLOCK • 262-400 1955-1998

BOOST™ Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
119165-14	CL119165-14	273	273	221	221	.510	.510	114	110	Hyd.	Hyd.	1,2
1800-5600 Turbo, Good idle. High Performance Street, stock converter ok, best with 1800+ and gears.												
119135-14	CL119135-14	277	287	225	235	.525	.536	114	110	Hyd.	Hyd.	1,2
2000-5900 Blower, Fair idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.												
119275-16	CL119275-16	287	285	235	233	.544	.540	116	112	Hyd.	Hyd.	1,2
2400-6200 Turbo, Fair idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												
119225-14	CL119225-14	287	297	235	245	.570	.560	114	110	Hyd.	Hyd.	1,2
2400-6200 Blower, Lopey/Fair idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												
119425-14	CL119425-14	307	317	255	265	.600	.600	114	110	Hyd.	Hyd.	1,2
2400-6200 Blower, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
110225-10	CL110225-10	260	266	207	213	.450	.465	110	106	Hyd.	Hyd.	1,2
800-4200 Great daily usage, smooth idle, great fuel economy.												
110225-10S	CL110225-10S	260	266	207	213	.450	.465	110	106	Hyd.	Hyd.	1,2
800-4200 Small Base Circle, Great daily usage, smooth idle, great fuel economy.												
110225-12	CL110225-12	260	266	207	213	.450	.465	112	108	Hyd.	Hyd.	1,2
800-4200 Great daily usage, smooth idle, great fuel economy.												
110315-10	CL110315-10	262	268	209	215	.465	.470	110	106	Hyd.	Hyd.	1,2
1000-4400 Improved throttle response & low end torque.												
110315-12	CL110315-12	262	268	209	215	.465	.470	112	108	Hyd.	Hyd.	1,2
1000-4500 Improved throttle response & low end torque.												

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 2 Requires Thrust Button.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Rattler Cams™ Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91164N ³ 91160	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91164N ³ 91160	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91164N ³ 91160	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300

CHEVROLET SMALL BLOCK • 262-400 1955-1998

BOOST™ Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91164N ³ 91160	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91164N ³ 91160	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91160 ³	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91160 ³		98218-K12 ¹⁰	98218 98221	97132 ¹⁰	97216	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91160 ³		98218-K12 ¹⁰	98218 98221	97132 ¹⁰	97216	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300

CHEVROLET SMALL BLOCK • 262-400 1955-1998

Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91164N ³ 91160	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91164N ³ 91160	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91164N ³ 91160	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91164N ³ 91160	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91164N ³ 91160	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Retro-Fit Hydraulic Roller Camshafts (cont.)

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
110235-10	CL110235-10	266	270	213	217	.485	.495	110	106	Hyd.	Hyd.	1,2
<i>1000-4800 Fair idle, good low & mid-range performance increase.</i>												
110235-10S	CL110235-10S	266	270	213	217	.485	.495	110	106	Hyd.	Hyd.	1,2
<i>1000-4800 Small Base Circle, Fair idle, good low & mid-range performance increase.</i>												
110235-12	CL110235-12	266	270	213	217	.485	.495	112	108	Hyd.	Hyd.	1,2
<i>1000-5000 Good idle, Off-Road & Street Performance. 9.0:1 CR advised.</i>												
110235-12S	CL110235-12S	266	270	213	217	.485	.495	112	108	Hyd.	Hyd.	1,2
<i>1000-5000 Small Base Circle, Good idle, Off-Road & Street Performance. 9.0:1 CR advised.</i>												
110235-14	CL110235-14	266	270	213	217	.485	.495	114	110	Hyd.	Hyd.	1,2
<i>1000-5000 Good idle, broad power range with strong mid-range performance.</i>												
113215-08	CL113215-08	270	278	217	225	.495	.500	108	104	Hyd.	Hyd.	1,2
<i>1200-5400 Noticeable idle, broad low to mid range power band. Needs 2000+ stall.</i>												
113215-10	CL113215-10	270	278	217	225	.495	.500	110	106	Hyd.	Hyd.	1,2
<i>1300-5500 Good idle, Street Performance. Strong lower mid range. Stock converter OK.</i>												
111145-10	CL111145-10	272	278	219	225	.525	.525	110	106	Hyd.	Hyd.	1,2
<i>1500-5600 Fair idle, Performance Street, Nice streetable mid range power. 1800+ stall suggested.</i>												
111145-12	CL111145-12	272	278	219	225	.525	.525	112	108	Hyd.	Hyd.	1,2
<i>1500-5600 Fair idle, good all around performance. Good vacuum. Computer compatible with chip.</i>												
111145-14	CL111145-14	272	278	219	225	.525	.525	114	110	Hyd.	Hyd.	1,2
<i>1500-5600 Good idle, good all around performance. Good vacuum. Computer compatible with chip.</i>												
110885-08	CL110885-08	278	278	225	225	.525	.525	108	104	Hyd.	Hyd.	1,2
<i>2000-5800 Mild choppy idle, strong torque curve. Likes good intake & exhaust, 2500+ stall.</i>												
110885-10	CL110885-10	278	278	225	225	.525	.525	110	106	Hyd.	Hyd.	1,2
<i>2000-5800 Fair idle, Street high performance. 2200+ stall, aftermarket intake, headers.</i>												
110245-10	CL110245-10	278	284	225	231	.500	.510	110	106	Hyd.	Hyd.	1,2
<i>1600-5400 Fair idle, Street/Strip. Auto OK with 2500+ stall.</i>												
110245-12	CL110245-12	278	284	225	231	.500	.510	112	108	Hyd.	Hyd.	1,2
<i>1800-5400 Fair idle, Street & mild Performance usage. Crisp throttle.</i>												
110245-12S	CL110245-12S	278	284	225	231	.500	.510	112	108	Hyd.	Hyd.	1,2
<i>1800-5400 Small Base Circle, Fair idle, Street & mild Performance usage. Crisp throttle.</i>												
110245-14	CL110245-14	278	284	225	231	.500	.510	114	110	Hyd.	Hyd.	1,2
<i>1800-5600 Mild idle, Street Performance, great with small blower or NOS.</i>												
110325-08	CL110325-08	278	286	225	233	.525	.530	108	104	Hyd.	Hyd.	1,2
<i>2000-5400 Choppy idle, Street performance usage. 2500+ stall.</i>												
110325-10	CL110325-10	278	286	225	233	.525	.530	110	106	Hyd.	Hyd.	1,2
<i>2200-5800 Rough idle, Street/Strip performance. Strong mid-range. 2500+ stall.</i>												
110325-10S	CL110325-10S	278	286	225	233	.525	.530	110	106	Hyd.	Hyd.	1,2
<i>2200-5800 Small Base Circle, Rough idle, Street/Strip performance. Strong mid-range. 2500+ stall.</i>												
110525-10	CL110525-10	280	286	227	233	.560	.560	110	106	Hyd.	Hyd.	1,2
<i>2300-6100 Choppy idle, Saturday nite special, Street/Strip. Needs good intake, headers & 2500+.</i>												
110525-12	CL110525-12	280	286	227	233	.560	.560	112	108	Hyd.	Hyd.	1,2
<i>2300-6200 Good idle & vacuum. Good all around mid range performance. 2500+ stall.</i>												
110305-08	CL110305-08	282	282	229	229	.480	.480	108	104	Hyd.	Hyd.	1,2
<i>2000-5500 Choppy idle, strong low & mid range performance. 2500+ stall.</i>												
110255-10	CL110255-10	284	288	231	235	.510	.530	110	106	Hyd.	Hyd.	1,2
<i>2200-5800 Rough idle, Street/Strip performance. Great low to mid-range torque & power.</i>												
110255-10S	CL110255-10S	284	288	231	235	.510	.530	110	106	Hyd.	Hyd.	1,2
<i>2200-5800 Small Base Circle, Rough idle, Street/Strip performance. Great low to mid-range torque & power.</i>												

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 2 Requires Thrust Button.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91164N ³ 91160	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91164N ³ 91160	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
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91164N ³ 91160	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
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91164N ³ 91160	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
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91164N ³ 91160	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91164N ³ 91160	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
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91164N ³ 91160	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91164N ³ 91160	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
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Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Retro-Fit Hydraulic Roller Camshafts (cont.)

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
110255-12	CL110255-12	284	288	231	235	.510	.530	112	108	Hyd.	Hyd.	1,2
<i>2000-5600 Fair idle, performance usage. Great mid-range torque & horsepower.</i>												
110255-12S	CL110255-12S	284	288	231	235	.510	.530	112	108	Hyd.	Hyd.	1,2
<i>2000-5600 Small Base Circle, Fair idle, performance usage. Great mid-range torque & horsepower.</i>												
110265-10	CL110265-10	286	294	233	241	.530	.545	110	106	Hyd.	Hyd.	1,2
<i>2400-5800 Rough idle, Hot Street & Bracket Racing. 10.0:1-up CR advised. 2800+ stall.</i>												
110265-10S	CL110265-10S	286	294	233	241	.530	.545	110	106	Hyd.	Hyd.	1,2
<i>2400-5800 Small Base Circle, Rough idle, Hot Street & Bracket Racing. 10.0:1-up CR. 2800+ stall.</i>												
110265-12	CL110265-12	286	294	233	241	.530	.545	112	108	Hyd.	Hyd.	1,2
<i>2400-6000 Lopey idle, Hot Street & Bracket Racing. 10.0:1-up CR advised.</i>												
110265-12S	CL110265-12S	286	294	233	241	.530	.545	112	108	Hyd.	Hyd.	1,2
<i>2400-6000 Small Base Circle, Lopey idle, Hot Street & Bracket Racing. 10.0:1-up CR advised.</i>												
110265-14	CL110265-14	286	294	233	241	.530	.545	114	110	Hyd.	Hyd.	1,2
<i>2400-6200 Good idle, great mid range performance. 10.0:1+ CR, 2600+ stall & 3.73 or lower gears.</i>												
116115-10	CL116115-14	287	291	235	239	.600	.580	110	106	Hyd.	Hyd.	1,2
<i>2600-6500 Rough idle, Street/Strip, strong mid range. 10.0:1 CR, 2500+ stall.</i>												
116115-12	CL116115-14	287	291	235	239	.600	.580	112	108	Hyd.	Hyd.	1,2
<i>2600-6700 Fair idle, Street/Strip, strong mid range. 10.0:1 CR, 2500+ stall.</i>												
116115-14	CL116115-14	287	291	235	239	.600	.580	114	110	Hyd.	Hyd.	1,2
<i>2600-6800 Fair idle, Street/Strip, strong mid range. 10.0:1 CR, 2500+ stall.</i>												
116615-08	CL116615-08	262	268	235	241	.475	.480	108	104	Hyd.	Hyd.	1,2
<i>2400-6400 Rough idle, Street/Strip, strong mid range. 10.0:1 CR, 2500+ stall.</i>												
116615-10	CL116615-10	262	268	235	241	.475	.480	110	106	Hyd.	Hyd.	1,2
<i>2600-6500 Rough idle, Street/Strip, strong mid range. 10.0:1 CR, 2500+ stall.</i>												
116615-12	CL116615-12	262	268	235	241	.475	.480	112	108	Hyd.	Hyd.	1,2
<i>2600-6700 Fair idle, Street/Strip, strong mid range. 10.0:1 CR, 2500+ stall.</i>												
110635-10	CL110635-10	290	290	237	237	.560	.560	110	106	Hyd.	Hyd.	1,2
<i>2400-6400 Rough idle, Street/Strip, strong mid range. 10.0:1 CR, 2500+ stall.</i>												
111815-10	CL111815-10	290	298	237	245	.560	.560	110	106	Hyd.	Hyd.	1,2
<i>2400-6400 Rough idle, Street/Strip applications. 10.0:1 CR, good exhaust, 3000+ stall.</i>												
111815-12	CL111815-12	290	298	237	245	.560	.560	112	108	Hyd.	Hyd.	1,2
<i>2400-6500 Lopey idle, Hot Street & Bracket Racing, great mid range. 10.0:1+ CR, 3000+ stall.</i>												
110275-10	CL110275-10	294	300	241	247	.545	.565	110	106	Hyd.	Hyd.	1,2
<i>2600-6400 Rough idle, Hot Street & Bracket Racing. 10.5:1-up CR advised.</i>												
110275-10S	CL110275-10S	294	300	241	247	.545	.565	110	106	Hyd.	Hyd.	1,2
<i>2600-6400 Small Base Circle, Rough idle, Hot Street & Bracket Racing. 10.5:1-up CR advised.</i>												
110275-12	CL110275-12	294	300	241	247	.545	.565	112	108	Hyd.	Hyd.	1,2
<i>2600-6500 Rough idle, Bracket Race with excellent mid & upper end horsepower.</i>												
110275-12S	CL110275-12S	294	300	241	247	.545	.565	112	108	Hyd.	Hyd.	1,2
<i>2600-6500 Small Base Circle, Rough idle, Bracket Race with excellent mid & upper end HP.</i>												
111655-10	CL111655-10	296	302	243	249	.600	.600	110	106	Hyd.	Hyd.	1,2
<i>2800-6500 Rough idle, Hot Street/Strip, good mid-range torque.</i>												
111655-12	CL111655-12	296	302	243	249	.600	.600	112	108	Hyd.	Hyd.	1,2
<i>2800-6600 Rough idle, Hot Street/Strip, great with aftermarket EFI systems.</i>												
113365-10	CL113365-10	298	298	245	245	.560	.560	110	106	Hyd.	Hyd.	1,2
<i>2600-6600 Rough idle, Street/Strip, Needs 3000+ stall, headers & good intake.</i>												
110335-10	CL110335-10	300	304	247	251	.550	.540	110	106	Hyd.	Hyd.	1,2
<i>2800-6400 Rough idle, Hot Street/Brackets. Requires aftermarket heads, 3500+ stall.</i>												

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 2 Requires Thrust Button.

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91164N ³ 91160	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91164N ³ 91160	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91164N ³ 91160	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91160 ³	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91160 ³	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91160 ³	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91164N ³ 91160	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91164N ³ 91160	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91164N ³ 91160	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91164N ³ 91160	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91164N ³ 91160	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91164N ³ 91160	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91164N ³ 91160	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91160 ³	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91160 ³	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91160 ³	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91164N ³ 91160	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Retro-Fit Hydraulic Roller Camshafts (cont.)

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
110335-10S	CL110335-10S	300 2800-6400	304	247	251	.550	.540	110	106	Hyd.	Hyd.	1,2
<i>Small Base Circle, Hot Street/Brackets. Requires aftermarket heads, 3500+ stall.</i>												
110345-08	CL110345-08	300 2800-6400	306	247	253	.565	.580	108	104	Hyd.	Hyd.	1,2
<i>Rough idle, needs good heads. Good upper mid-range. Needs 3500+ stall.</i>												
110345-10	CL110345-10	300 2800-6400	306	247	253	.565	.580	110	106	Hyd.	Hyd.	1,2
<i>Rough idle, needs good heads. Good upper mid-range. Needs 3500+ stall.</i>												
110345-12	CL110345-12	300 2800-6600	306	247	253	.565	.580	112	106	Hyd.	Hyd.	1,2
<i>Loppy idle, broad mid to upper mid range power. 3500+ stall.</i>												
113155-10	CL113155-10	300 3000-6600	308	247	255	.600	.600	110	106	Hyd.	Hyd.	1,2
<i>Hot Street/Brackets. Requires aftermarket heads, 3500+ stall.</i>												
113155-10S	CL113155-10S	300 3000-6600	308	247	255	.600	.600	110	106	Hyd.	Hyd.	1,2
<i>Small Base Circle, Hot Street/Brackets. Requires aftermarket heads, 3500+ stall.</i>												
113155-12	CL113155-12	300 3000-6800	308	247	255	.600	.600	112	108	Hyd.	Hyd.	1,2
<i>Pro Street/Bracket, good top end horsepower. Needs compression & 3500+ stall.</i>												
116755-10	CL116755-10	304 3000-6800	308	251	255	.600	.580	110	106	Hyd.	Hyd.	1,2
<i>Rough idle, upper mid-range & top end power. Needs 11.0:1+ CR.</i>												
116755-10S	CL116755-10S	304 3000-6800	308	251	255	.600	.580	110	106	Hyd.	Hyd.	1,2
<i>Small Base Circle, Rough idle, upper mid-range & top end power. Needs 11.0:1+ CR.</i>												
110355-10	CL110355-10	304 3000-6800	310	251	257	.555	.555	110	106	Hyd.	Hyd.	1,2
<i>Rough idle, upper mid-range & top end power. Needs 11.0:1+ CR.</i>												
111335-10	CL111335-10	304 2800-6400	312	251	259	.600	.600	110	106	Hyd.	Hyd.	1,2
<i>Rough idle, best in large 420+ ci. engine. Great upper mid to top end performance.</i>												
111335-12	CL111335-12	304 2800-6400	312	251	259	.600	.600	112	108	Hyd.	Hyd.	1,2
<i>Rough idle, Broad mid to top end performance in 420+ ci.</i>												
111335-12S	CL111335-12S	304 2800-6400	312	251	259	.600	.600	112	108	Hyd.	Hyd.	1,2
<i>Small Base Circle, Rough idle, Broad mid to top end performance in 420+ ci.</i>												
116675-08	CL116675-08	312 3000-6800	320	257	267	.600	.600	110	106	Hyd.	Hyd.	1,2
<i>Rough idle, upper mid-range & top end power. Needs 11.0:1+ CR.</i>												
116675-10	CL116675-10	312 3000-6800	320	257	267	.600	.600	110	106	Hyd.	Hyd.	1,2
<i>Rough idle, upper mid-range & top end power. Needs 11.0:1+ CR.</i>												
116675-10S	CL116675-10S	312 3000-6800	320	257	267	.600	.600	110	106	Hyd.	Hyd.	1,2
<i>Small Base Circle, Rough idle, upper mid-range & top end power. Needs 11.0:1+ CR.</i>												
119995	NA	Custom Grind Camshaft <i>Retro-Fit Hydraulic Roller Special Order Camshaft.</i>								Hyd.	Hyd.	1,2
119995-S	NA	Custom Grind Camshaft <i>Small Base Circle, Retro-Fit Hydraulic Roller Special Order Camshaft.</i>								Hyd.	Hyd.	1,2
119999	NA	Custom Grind Camshaft, with Cast Distributor Gear <i>Retro-Fit Hydraulic Roller Special Order Camshaft. Std. or Small Base.</i>								Hyd.	Hyd.	1,2
114995	NA	Custom Grind Camshaft, 4/7 Swap Firing Order <i>Retro-Fit Hydraulic Roller Special Order Camshaft.</i>								Hyd.	Hyd.	1,2
114995-S	NA	Custom Grind Camshaft, 4/7 Swap Firing Order <i>Small Base Circle, Retro-Fit Hydraulic Roller Special Order Camshaft.</i>								Hyd.	Hyd.	1,2
114998	NA	Custom Grind Camshaft, "C" (LS) Firing Order <i>Retro-Fit Hydraulic Roller Special Order Camshaft.</i>								Hyd.	Hyd.	1,2
114998-S	NA	Custom Grind Camshaft, "C" (LS) Firing Order <i>Small Base Circle, Retro-Fit Hydraulic Roller Special Order Camshaft.</i>								Hyd.	Hyd.	1,2

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 2 Requires Thrust Button.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91164N ³ 91160	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91160 ³	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91160 ³	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91160 ³	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91160 ³	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91160 ³	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91160 ³	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91160 ³	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91160 ³	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91160 ³	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91160 ³	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91160 ³	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91160 ³	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91160 ³	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
91160 ³	90132	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90005 90070	90100	95201 95022	92150 94475	94402	94200 94300
--	--	--	--	--	--	--	--	--	--	--	92150 94475	94402	94200 94300
--	--	--	--	--	--	--	--	--	--	--	92150 94475	94402	94200 94300
--	--	--	--	--	--	--	--	--	--	--	92150 94475	94402	94200 94300
--	--	--	--	--	--	--	--	--	--	--	92150 94475	94402	94200 94300
--	--	--	--	--	--	--	--	--	--	--	92150 94475	94402	94200 94300
--	--	--	--	--	--	--	--	--	--	--	92150 94475	94402	94200 94300
--	--	--	--	--	--	--	--	--	--	--	92150 94475	94402	94200 94300

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



CHEVROLET SMALL BLOCK • 305/350 1987-1998 w/STEPED NOSE (CARBURETED)

Rattler Cams™ Hydraulic Roller Camshafts for OE Roller Applications

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
188005-09	CL188005-09	280	288	227	235	.525	.530	109	103	Hyd.	Hyd.	1
1800-5600 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.												
188045-09	CL188045-09	288	296	235	243	.530	.530	109	103	Hyd.	Hyd.	1
2000-5900 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall												
188085-09	CL188085-09	296	304	243	251	.530	.515	109	103	Hyd.	Hyd.	1
2400-6200 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												



CHEVROLET SMALL BLOCK • 262-400 1955-1998

BOOST™ Hydraulic Roller Camshafts for OE Roller Applications Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
189165-14	CL119165-14	273	273	221	221	.510	.510	114	110	Hyd.	Hyd.	1
1800-5600 Turbo, Good idle. High Performance Street, stock converter ok, best with 1800+ and gears.												
189135-14	CL119135-14	277	287	225	235	.525	.536	114	110	Hyd.	Hyd.	1
2000-5900 Blower, Fair idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall												
189275-16	CL18975-16	287	285	235	233	.544	.540	116	112	Hyd.	Hyd.	1
2400-6200 Turbo, Fair idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												
189225-14	CL119225-14	287	297	235	245	.570	.560	114	110	Hyd.	Hyd.	1
2400-6200 Blower, Lopey idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												
189425-14	CL119425-14	307	317	255	265	.600	.600	114	110	Hyd.	Hyd.	1
2400-6200 Blower, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												



CHEVROLET SMALL BLOCK • 305/350 1987-1998 w/STEPED NOSE (CARBURETED)

Hydraulic Roller Camshafts for OE Roller Applications Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
180225-10	CL180225-10	260	266	207	213	.450	.465	110	106	Hyd.	Hyd.	1
800-4200 Great daily usage, smooth idle, great fuel economy.												
180225-12	CL180225-12	260	266	207	213	.450	.465	112	108	Hyd.	Hyd.	1
800-4200 Great daily usage, smooth idle, great fuel economy.												
180315-10	CL180315-10	262	268	209	215	.465	.470	110	106	Hyd.	Hyd.	1
1000-4400 Improved throttle response & low end torque.												
180315-12	CL180315-12	262	268	209	215	.465	.470	112	108	Hyd.	Hyd.	1
1000-4400 Improved throttle response & low end torque. Poor Vacuum												
180235-10	CL180235-10	266	270	213	217	.485	.495	110	106	Hyd.	Hyd.	1
1000-4800 Fair idle, good low & mid-range performance increase.												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET SMALL BLOCK • 305/350 1987-1998 w/STEPED NOSE (CARBURETED)

Rattler Cams™ Retro-Fit Hydraulic Roller Camshaft for OE Roller Applications Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301

CHEVROLET SMALL BLOCK • 262-400 1955-1998

BOOST™ Hydraulic Roller Camshafts for OE Roller Applications Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91174 ³ 91174FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91174 ³ 91174FB	NA	98218-K12 ¹⁰ 98118-K12 ¹⁰	98213 92221	97132 ¹⁰ 97174 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91174 ³ 91174FB	NA	98218-K12 ¹⁰ 98118-K12 ¹⁰	98213 92221	97132 ¹⁰ 97174 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301

CHEVROLET SMALL BLOCK • 305/350 1987-1998 w/STEPED NOSE (CARBURETED)

Hydraulic Roller Camshafts for OE Roller Application Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.



Hydraulic Roller Camshafts for OE Roller Applications Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
180235-12	CL180235-12	266 1000-5000	270	213	217	.485	.495	112	108	Hyd.	Hyd.	1
<i>Good idle, Off-Road & Street Performance. 9.0:1 CR advised.</i>												
180235-14	CL180235-14	266 1000-5000	270	213	217	.485	.495	114	110	Hyd.	Hyd.	1
<i>Good idle, broad power range with strong mid-range performance.</i>												
183215-08	CL183215-08	270 1200-5400	278	217	225	.495	.500	108	104	Hyd.	Hyd.	1
<i>Noticeable idle, broad low to mid range power band. Needs 2000+ stall.</i>												
183215-10	CL183215-10	270 1300-5500	278	217	225	.495	.500	110	106	Hyd.	Hyd.	1
<i>Good idle, Street Performance. Strong lower mid range. Stock converter OK.</i>												
183215-14	CL183215-14	270 1300-5500	278	217	225	.495	.500	114	110	Hyd.	Hyd.	1
<i>Good idle, Street Performance. Strong lower mid range. Stock converter OK.</i>												
181145-10	CL181145-10	272 1500-5600	278	219	225	.525	.525	110	106	Hyd.	Hyd.	1
<i>Fair idle, Performance Street, Nice streetable mid range power. 1800+ stall suggested.</i>												
181145-12	CL181145-12	272 1500-5600	278	219	225	.525	.525	112	108	Hyd.	Hyd.	1
<i>Fair idle, good all around performance. Good vacuum. Computer compatible with chip.</i>												
181145-12S	CL181145-12S	272 1500-5600	278	219	225	.525	.525	112	108	Hyd.	Hyd.	1
<i>Small Base Circle, Fair idle, good all around performance. Computer compatible with chip.</i>												
181145-14	CL181145-14	272 1500-5600	278	219	225	.525	.525	114	110	Hyd.	Hyd.	1
<i>Fair idle, good all around performance. Good vacuum. Computer compatible with chip.</i>												
180885-08	CL180885-08	278 2000-5800	278	225	225	.525	.525	108	104	Hyd.	Hyd.	1
<i>Mild choppy idle, strong torque curve. Likes good intake & exhaust, 2500+ stall.</i>												
180885-10	CL180885-10	278 2000-5800	278	225	225	.525	.525	110	106	Hyd.	Hyd.	1
<i>Fair idle, Street high performance. 2200+ stall, aftermarket intake, headers.</i>												
180245-10	CL180245-10	278 1600-5400	284	225	231	.500	.510	110	106	Hyd.	Hyd.	1
<i>Fair idle, Street/Strip. Auto OK with 2500+ stall.</i>												
180245-10S	CL180245-10S	278 1600-5400	284	225	231	.500	.510	110	106	Hyd.	Hyd.	1
<i>Small Base Circle, Fair idle, Street/Strip. Auto OK with 2500+ stall.</i>												
180245-12	CL180245-12	278 1800-5400	284	225	231	.500	.510	112	108	Hyd.	Hyd.	1
<i>Fair idle, Street & mild Performance usage. Crisp throttle.</i>												
180245-14	CL180245-14	278 1800-5600	284	225	231	.500	.510	114	110	Hyd.	Hyd.	1
<i>Mild idle, Street Performance, great with small blower or NOS.</i>												
180325-08	CL180325-08	278 2000-5800	286	225	233	.525	.530	108	104	Hyd.	Hyd.	1
<i>Choppy idle, Street performance usage. 2500+ stall.</i>												
180325-10	CL180325-10	278 2200-5800	286	225	233	.525	.530	110	106	Hyd.	Hyd.	1
<i>Rough idle, Street/Strip performance. Strong mid-range. 2500+ stall.</i>												
180325-12	CL180325-12	278 2200-5800	286	225	233	.525	.530	112	108	Hyd.	Hyd.	1
<i>Fair idle, Street/Strip performance. Strong mid-range. 2500+ stall.</i>												
186685-14	CL186685-14	278 2800-6700	288	225	235	.525	.530	114	110	Hyd.	Hyd.	1
<i>Upper mid-range & top end power. Needs 10.0:1+ CR.</i>												
180525-10	CL180525-10	280 2300-6100	286	227	233	.560	.560	110	106	Hyd.	Hyd.	1
<i>Choppy idle, Saturday nite special, Street/Strip. Needs good intake, headers & 2500+.</i>												
180525-12	CL180525-12	280 2300-6200	286	227	233	.560	.560	112	108	Hyd.	Hyd.	1
<i>Good idle & vacuum. Good all around mid range performance. 2500+ stall.</i>												
180305-08	CL180305-08	282 2000-5500	282	229	229	.480	.480	108	104	Hyd.	Hyd.	1
<i>Choppy idle, strong low & mid range performance. 2500+ stall.</i>												
180255-10	CL180255-10	284 2200-5800	288	231	235	.510	.530	110	106	Hyd.	Hyd.	1
<i>Rough idle, Street/Strip performance. Great low to mid-range torque & power.</i>												
180255-12	CL180255-12	284 2000-5600	288	231	235	.510	.530	112	108	Hyd.	Hyd.	1
<i>Fair idle, performance usage. Great mid-range torque & horsepower.</i>												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET SMALL BLOCK - 305/350 1987-1998 w/STEPED NOSE (CARBURETED)

Hydraulic Roller Camshafts for OE Roller Application Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
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91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
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91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
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91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.



CHEVROLET SMALL BLOCK • 305/350 1987-1998 w/STEPED NOSE (CARBURETED)

Hydraulic Roller Camshafts for OE Roller Applications *Firing Order: 1•8•4•3•6•5•7•2*

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
180265-10	CL180265-10	286	294	233	241	.530	.545	110	106	Hyd.	Hyd.	1
		<i>2400-5800 Rough idle, Hot Street & Bracket Racing. 10.0:1-up CR advised. 2800+ stall</i>										
180265-10S	CL180265-10S	286	294	233	241	.530	.545	110	106	Hyd.	Hyd.	1
		<i>2400-5800 Small Base Circle, Rough idle, Hot Street & Bracket Racing. 10.0:1-up CR advised. 2800+ stall</i>										
180265-12	CL180265-12	286	294	233	241	.530	.545	112	108	Hyd.	Hyd.	1
		<i>2400-6000 Lopey idle, Hot Street & Bracket Racing. 10.0:1-up CR advised.</i>										
180265-14	CL180265-14	286	294	233	241	.530	.545	114	110	Hyd.	Hyd.	1
		<i>2400-6200 Good idle, great mid range performance. 10.0:1+ CR, 2600+ stall & 3.73 or lower gears.</i>										
186115-10	CL186115-14	287	291	235	239	.600	.580	110	106	Hyd.	Hyd.	1
		<i>2400-6400 Rough idle, Street/Strip, strong mid range. 10.0:1 CR, 2500+ stall.</i>										
186115-12	CL186115-14	287	291	235	239	.600	.580	112	108	Hyd.	Hyd.	1
		<i>2400-6400 Lopey idle, Street/Strip, strong mid range. 10.0:1 CR, 2500+ stall.</i>										
186115-14	CL186115-14	287	291	235	239	.600	.580	114	110	Hyd.	Hyd.	1
		<i>2400-6400 Fair idle, Street/Strip, strong mid range. 10.0:1 CR, 2500+ stall.</i>										
186615-08	CL186615-08	262	268	235	241	.475	.480	108	104	Hyd.	Hyd.	1
		<i>2400-6400 Rough idle, Street/Strip, strong mid range. 10.0:1 CR, 2500+ stall.</i>										
186615-10	CL186615-10	262	268	235	241	.475	.480	110	106	Hyd.	Hyd.	1
		<i>2400-6400 Lopey idle, Street/Strip, strong mid range. 10.0:1 CR, 2500+ stall.</i>										
186615-12	CL186615-12	262	268	235	241	.475	.480	112	108	Hyd.	Hyd.	1
		<i>2400-6400 Fair idle, Street/Strip, strong mid range. 10.0:1 CR, 2500+ stall.</i>										
180635-10	CL180635-10	290	290	237	237	.560	.560	110	106	Hyd.	Hyd.	1
		<i>2400-6400 Rough idle, Street/Strip, strong mid range. 10.0:1 CR, 2500+ stall.</i>										
181815-10	CL181815-10	290	298	237	245	.560	.560	110	106	Hyd.	Hyd.	1
		<i>2400-6400 Rough idle, Street/Strip applications. 10.0:1 CR, good exhaust, 3000+ stall.</i>										
181815-12	CL181815-12	290	298	237	245	.560	.560	112	108	Hyd.	Hyd.	1
		<i>2400-6500 Lopey idle, Hot Street & Bracket Racing, great mid range. 10.0:1+ CR, 3000+ stall.</i>										
180275-10	CL180275-10	294	300	241	247	.545	.565	110	106	Hyd.	Hyd.	1
		<i>2600-6400 Rough idle, Hot Street & Bracket Racing. 10.5:1-up CR advised.</i>										
180275-12	CL180275-12	294	300	241	247	.545	.565	112	108	Hyd.	Hyd.	1
		<i>2600-6500 Rough idle, Bracket Race with excellent mid & upper end horsepower.</i>										
181655-10	CL181655-10	296	302	243	249	.600	.600	110	106	Hyd.	Hyd.	1
		<i>2800-6500 Rough idle, Hot Street/Strip, good mid-range torque.</i>										
181655-12	CL181655-12	296	302	243	249	.600	.600	112	108	Hyd.	Hyd.	1
		<i>2800-6600 Rough idle, Hot Street/Strip, great with aftermarket EFI systems.</i>										
183365-10	CL183365-10	298	298	245	245	.560	.560	110	106	Hyd.	Hyd.	1
		<i>2600-6600 Rough idle, Street/Strip, Needs 3000+ stall, headers & good intake.</i>										
180335-10	CL180335-10	300	304	247	251	.550	.540	110	106	Hyd.	Hyd.	1
		<i>2600-6400 Hot Street/Brackets. Requires aftermarket heads, 3500+ stall.</i>										
180345-08	CL180345-08	300	306	247	253	.565	.580	108	104	Hyd.	Hyd.	1
		<i>2800-6600 Rough idle, needs good heads. Good upper mid-range. Needs 3500+ stall.</i>										
180345-10	CL180345-10	300	306	247	253	.565	.580	110	106	Hyd.	Hyd.	1
		<i>2800-6600 Rough idle, needs good heads. Good upper mid-range. Needs 3500+ stall.</i>										
180345-10S	CL180345-10S	300	306	247	253	.565	.580	110	106	Hyd.	Hyd.	1
		<i>2800-6600 Small Base Circle, Rough idle, needs good heads. Good upper mid-range. Needs 3500+ stall.</i>										
180345-12	CL180345-12	300	306	247	253	.565	.580	112	108	Hyd.	Hyd.	1
		<i>2800-6600 Lopey idle, broad mid to upper mid range power. 3500+ stall.</i>										
183155-10	CL183155-10	300	308	247	255	.600	.600	110	106	Hyd.	Hyd.	1
		<i>3000-6600 Hot Street/Brackets. Requires aftermarket heads, 3500+ stall.</i>										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

Some items are not legal for sale or use on any pollution controlled motor vehicle

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CHEVROLET SMALL BLOCK - 305/350 1987-1998 w/STEPED NOSE (CARBURETED)

Hydraulic Roller Camshafts for OE Roller Application Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
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91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.



CHEVROLET SMALL BLOCK • 305/350 1987-1998 w/STEPED NOSE (CARBURETED)

Hydraulic Roller Camshafts for OE Roller Applications *Firing Order: 1•8•4•3•6•5•7•2*

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
183155-12	CL183155-12	300	308	247	255	.600	.600	112	108	Hyd.	Hyd.	1
<i>3000-6800 Pro Street/Bracket, good top end horsepower. Needs compression & 3500+ stall.</i>												
186755-10	CL186755-10	304	308	251	255	.600	.580	110	106	Hyd.	Hyd.	1
<i>2800-6700 Upper mid-range & top end power. Needs 11.0:1+ CR.</i>												
186755-10S	CL186755-10S	304	308	251	255	.600	.580	110	106	Hyd.	Hyd.	1
<i>2800-6700 Small Base Circle, Upper mid-range & top end power. Needs 11.0:1+ CR.</i>												
186755-12	CL186755-12	304	308	251	255	.600	.580	112	108	Hyd.	Hyd.	1
<i>2800-6700 Upper mid-range & top end power. Needs 11.0:1+ CR.</i>												
180355-10	CL180355-10	304	310	251	257	.555	.555	110	106	Hyd.	Hyd.	1
<i>2800-6700 Upper mid-range & top end power. Needs 11.0:1+ CR.</i>												
181335-10	CL181335-10	304	312	251	259	.600	.600	110	106	Hyd.	Hyd.	1
<i>2800-6400 Rough idle, best in large 420+ ci. engine. Great upper mid to top end performance.</i>												
181335-12	CL181335-12	304	312	251	259	.600	.600	112	108	Hyd.	Hyd.	1
<i>2800-6400 Rough idle, Broad mid to top end performance in 420+ ci.</i>												
186675-08	CL186675-08	312	320	259	267	.600	.600	108	104	Hyd.	Hyd.	1
<i>3000-6800 Rough idle, upper mid-range & top end power. Needs 11.0:1+ CR.</i>												
186675-10	CL186675-10	312	320	259	267	.600	.600	110	106	Hyd.	Hyd.	1
<i>3000-6800 Rough idle, upper mid-range & top end power. Needs 11.0:1+ CR.</i>												
189995	NA	Custom Grind Camshaft <i>Hydraulic Roller Special Order Camshaft.</i>								Hyd.	Hyd.	1
189995-S	NA	Custom Grind Camshaft, Small Base Circle <i>Hydraulic Roller Special Order Camshaft.</i>								Hyd.	Hyd.	1



CHEVROLET SMALL BLOCK • 262-400 1955-1998

American Muscle™ Mechanical Flat Tappet Camshafts *Firing Order: 1•8•4•3•6•5•7•2*

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX					
117492-10	CL117492-10 CL117492-10DL ⁴	287	287	227	229	.395	.400	110	108	.012	.018	34
<i>2200-5800 Near duplicate of the Chev 290HP/283, 360HP/327, cam (GM #3736097).</i>												
117222-16	CL117222-16 CL117222-16DL ⁴	279	291	241	253	.460	.488	116	112	.020	.025	1
<i>2800-6600 Near duplicate of the Chev Z28/LT1 370HP/350, cam (GM #3972178).</i>												
112192-14	CL112192-14 CL112192-14DL ⁴	294	294	254	254	.485	.485	114	110	.030	.030	1
<i>3800-7000 Rough idle, near duplicate of the famous Duntov 30-30 cam (GM #3849346)</i>												
117422-12	CL117422-12 CL117422-12DL ⁴	295	307	257	269	.495	.515	112	108	.022	.022	1
<i>4200-7200 Near duplicate of the Chev Off Road (1st design) cam (GM #3927140).</i>												
117692-12	CL117692-12 CL117692-12DL ⁴	299	311	261	273	.515	.535	112	108	.022	.022	1
<i>4400-7800 Near duplicate of the Chev Off Road (2nd design) cam (GM #3965754).</i>												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

4 Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.

34 Provisions for increased oiling recommended.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET SMALL BLOCK • 305/350 1987-1998 w/STEPED NOSE (CARBURETED)

Hydraulic Roller Camshafts for OE Roller Application Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91113 ³ 91113FB	NA	98213-K12 ¹⁰ 98113-K12 ¹⁰	98213 98113	97132 ¹⁰ 97174 ¹⁰	97165 ¹⁰	93017 ¹⁰	93316 ²⁵	90084	90100	95201 95022	92150 94475	94402	94301
91113 91113FB	--	--	--	--	--	--	--	--	--	--	--	94402	94301
91113 91113FB	--	--	--	--	--	--	--	--	--	--	--	94402	94301

CHEVROLET SMALL BLOCK • 262-400 1955-1998

American Muscle™ Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91115 ³ 91118 ⁴	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

⁴ Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



CHEVROLET SMALL BLOCK • 262-400 1955-1998

305ci Sprint Car Mechanical Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
116842-07	CL116842-07 CL116842-07DL ⁴	266	268	238	240	.510	.531	107	102	.016	.016	1
3000-6200 305 Sprint Car, Best on tighter short tracks. Strong out of the corners.												
116822-07	CL116822-07 CL116822-07DL ⁴	268	272	240	244	.510	.531	107	102	.016	.016	1
3000-6200 305 Sprint Car, Short track with high banked turns. Strong upper end power.												



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Oval Track Lift Rule Mechanical Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
116772-06	CL116772-06 CL116772-06DL ⁴	264	270	236	242	.450	.450	106	102	.016	.016	1
2800-6200 Oval Track, .450" Lift Rule, Best on tight short tracks. Stong off corner.												
111632-06	CL111632-06 CL111632-06DL ⁴	272	278	244	250	.500	.500	106	102	.016	.016	1
3200-6600 Oval Track, .500" Lift Rule, Best on tight short tracks. Stong off corner. Low vacuum.												
110432-06	CL110432-06 CL110432-06DL ⁴	280	286	252	258	.515	.515	106	102	.016	.016	1,34
3400-7200 Oval Track, .500" Lift Rule, 1/4 to 3/8 mile, also great open wheel with 1.8/1.7 rockers.												
110832-06	CL110832-06 CL110832-06DL ⁴	283	289	254	260	.515	.515	106	102	.016	.016	1,34
3200-7200 Late Model Stock, .500" Lift Rule (.550" w/1.6 rocker) best on 3/8 to 1/2 mile with limited intake.												
110792-06	CL110792-06 CL110792-06DL ⁴	284	294	256	266	.515	.515	106	102	.016	.016	1,34
3000-7000 Oval Track, .500" Lift Rule (.550" w/1.6 rocker), fast banked 1/4 to 3/8 mile.												



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Mechanical Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
110102-06	CL110102-06 CL110102-06DL ⁴	275	281	240	246	.505	.520	106	102	.022	.022	1
3000-6200 Hot Street/Brackets. Lopey idle. Needs higher CR & gears.												
110102-08	CL110102-08 CL110102-08DL ⁴	275	281	240	246	.505	.520	108	104	.022	.022	1
3000-6200 Hot Street/Bracket. Needs 10.0+ CR, 3200+ stall & gears.												
110102-12	CL110102-12 CL110102-12DL ⁴	275	281	240	246	.505	.520	112	108	.022	.022	1
3000-6400 Fair idle, high torque, all purpose grind. 10.0+ CR, 3200+ stall & gears.												
112062-06	CL112062-06 CL112062-06DL ⁴	275	285	240	250	.525	.525	106	104	.022	.022	1
3000-6400 Super throttle response. Stump pulling low & mid-range power.												
112062-6S	CL112062-06S CL112062-06SDL ⁴	275	285	240	250	.525	.525	106	104	.022	.022	1
3000-6400 Small Base Circle, Super throttle response. Stump pulling. Low & mid-range power.												

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 4 Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.
- 34 Provisions for increased oiling recommended.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300

CHEVROLET SMALL BLOCK • 262-400 1955-1998

Oval Track Lift Rule Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰	98212	97132 ¹⁰	97165 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300

CHEVROLET SMALL BLOCK • 262-400 1955-1998

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300

Components Notes: master note list on page 260

- ³ Included in Cam & Lifter Sets.
- ⁴ Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.
- ¹⁰ 10° Valve lock Angle, must use matching retainers/locks.
- ²⁵ Machining Required.

CAMSHAFTS



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Mechanical Flat Tappet Camshafts (cont.)

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
112062-10	CL112062-10 CL112062-10DL ⁴	275	285	240	250	.525	.525	110	106	.022	.022	1
<i>3000-6200 Rough idle, Street/Strip. Broad mid-range power. Needs 10.0:1 CR, 3000+ stall.</i>												
111002-06	CL111002-06 CL111002-06DL ⁴	279	279	244	244	.510	.510	106	102	.022	.022	1
<i>3200-6400 Oval track 2bbl. applications. Tight 1/4 to 3/8 mile. Needs good intake & exhaust.</i>												
111002-08	CL111002-08 CL111002-08DL ⁴	279	279	244	244	.510	.510	108	104	.022	.022	1
<i>3200-6200 Rough idle, super mid-range performance. Needs 11.0:1 CR-up.</i>												
112072-06	CL112072-06 CL112072-06DL ⁴	281	281	246	246	.515	.515	106	102	.022	.022	1
<i>3200-6700 Oval Track, high torque, short track. Strong off corner.</i>												
112072-08	CL112072-08 CL112072-08DL ⁴	281	281	246	246	.515	.515	108	104	.022	.022	1
<i>2500-6200 Hot Street/Bracket, good mid-range performance.</i>												
110892-06	CL110892-06 CL110892-06DL ⁴	274	278	246	250	.515	.525	106	102	.016	.016	1
<i>2600-6500 Short Track profile, best on 1/4 to 3/8 mile tracks. 2 barrel OK.</i>												
112652-06	CL112652-06 CL112652-06DL ⁴	281	287	246	252	.520	.530	106	102	.022	.022	1
<i>2600-6500 Short Track profile, best on 1/4 to 3/8 mile tracks. 2 barrel OK.</i>												
111012-08	CL111012-08 CL111012-08DL ⁴	283	283	248	248	.510	.510	108	104	.022	.022	1
<i>3000-6200 Street/Strip, powerful through entire rpm range.</i>												
110812-06	CL110812-06 CL110812-06DL ⁴	276	280	248	252	.535	.540	106	102	.016	.016	1,34
<i>2500-6500 Tight Lash Oval Track profile, great power coming off corners.</i>												
110912-06S	CL110912-06S CL110912-06SDL ⁴	276	280	248	252	.535	.540	106	102	.016	.016	1,34
<i>2500-6500 Small Base Circle, Tight Lash Oval Track profile, great power coming off corners.</i>												
112352-06	CL112352-06 CL112352-06DL ⁴	283	291	248	256	.510	.505	106	102	.022	.022	1
<i>3000-7000 1/4 to 3/8 mile tracks. Great all-around short track cam.</i>												
112352-10	CL112352-10 CL112352-10DL ⁴	283	291	248	256	.510	.505	110	106	.022	.022	1
<i>3000-7000 383+ Street/Strip. Needs 10.0:1 CR, 2800+ stall.</i>												
112672-06	CL112672-06 CL112672-06DL ⁴	285	285	250	250	.525	.525	106	102	.022	.022	1
<i>2800-6500 Best on 1/4 to 3/8 mile tight tracks. Big torque out of the corners. Needs headers.</i>												
112312-08	CL112312-08 CL112312-08DL ⁴	287	291	252	256	.530	.535	108	104	.022	.022	1
<i>2600-6600 Hot Street/Strip, 10.0:1, 3000+ stall & single plane intake.</i>												
112312-08S	CL112312-08S CL112312-08SDL ⁴	287	291	252	256	.530	.535	108	104	.022	.022	1
<i>2600-6600 Small Base Circle, Hot Street/Strip, 10.0:1, 3000+ stall & single plane intake.</i>												
112312-10	CL112312-10 CL112312-10DL ⁴	287	291	252	256	.530	.535	110	106	.022	.022	1
<i>2800-6800 Hot Street/Strip, 383+ cubic inch, 10.0:1, 2800+ stall.</i>												
112312-10S	CL112312-10S CL112312-10SDL ⁴	287	291	252	256	.530	.535	110	106	.022	.022	1
<i>2800-6800 Small Base Circle, Hot Street/Strip, 383+ cubic inch, 10.0:1, 2800+ stall.</i>												
112452-04	CL112452-04 CL112452-04DL ⁴	287	295	252	260	.530	.555	104	100	.022	.022	1
<i>2600-6800 383+ Street/Strip. Needs 10.0:1 CR, 2800+ stall.</i>												
110822-06	CL110822-06 CL110822-06DL ⁴	280	288	252	260	.540	.560	106	102	.016	.016	1,34
<i>3000-7200 Great mid & top end Oval Track tight lash cam. Good on dirt or asphalt.</i>												
110922-06S	CL110922-06S CL110922-06SDL ⁴	280	288	252	260	.540	.560	106	102	.016	.016	1,34
<i>3000-7200 Small Base Circle, Great mid & top end OT tight lash cam. Good on dirt or asphalt.</i>												
111752-06	CL111752-06 CL111752-06DL ⁴	287	299	252	261	.530	.525	106	102	.022	.022	1
<i>3000-6800 Best on 3/8 to 1/2 mile fast tracks. Super mid & upper RPM cam.</i>												
111752-06S	CL111752-06S CL111752-06SDL ⁴	287	299	252	261	.530	.525	106	102	.022	.022	1
<i>3000-6800 Small Base Circle, Best on 3/8 to 1/2 mile fast tracks. Super mid & upper RPM cam.</i>												
112662-06	CL112662-06 CL112662-06DL ⁴	287	299	252	264	.545	.555	106	102	.022	.022	1
<i>3000-7000 Best on fast 1/4 to 3/8 mile. Larger cubic inch 383+ recommended. 11.0:1+.</i>												
111982-06	CL111982-06 CL111982-06DL ⁴	289	285	254	250	.550	.525	106	102	.022	.022	1
<i>3200-7000 Oval Track with 2bbl. carb. 1/4-3/8 banked track. Needs 9.5:1+ CR, good exhaust.</i>												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

4 Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.

34 Provisions for increased oiling recommended.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98213-K12 ¹⁰ 98445-K12 ²⁵	98213 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98213-K12 ¹⁰ 98445-K12 ²⁵	98213 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300

Components Notes: master note list on page 260

- 3 Included in Cam & Lifter Sets.
- 4 Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.
- 10 10° Valve lock Angle, must use matching retainers/locks.
- 25 Machining Required.

CAMSHAFTS



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Mechanical Flat Tappet Camshafts (cont.)

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
112092-05	CL112092-05 CL112092-05DL ⁴	291	299	256	264	.535	.555	105	99	.022	.022	1
		<i>3000-7400 Rough idle, works well in Pro-Street or heavy Bracket car.</i>										
112082-05	CL112082-05 CL112082-05DL ⁴	291	301	256	266	.505	.505	105	99	.022	.022	1
		<i>2800-7000 Great power, torque & throttle response. Great Sportsman cam.</i>										
112542-06	CL112542-06 CL112542-06DL ⁴	295	289	260	254	.555	.550	106	102	.022	.022	1
		<i>3200-7200 Rough idle, Oval Track. Banked 3/8 to 1/2 mile tracks. 11.5:1+ CR.</i>										
112542-06S	CL112542-06S CL112542-06SDL ⁴	295	289	260	254	.555	.550	106	102	.022	.022	1
		<i>3200-7200 Small Base Circle, Rough idle, Oval Track. Banked 3/8 to 1/2 mile tracks. 11.5:1+ CR.</i>										
112532-06	CL112532-06 CL112532-06DL ⁴	295	299	260	264	.555	.555	106	102	.022	.022	1
		<i>3200-7200 Bracket Race or 3/8 to 1/2 mile Oval Track with fast comers. 350-383.</i>										
112322-08	CL112322-08 CL112322-08DL ⁴	295	303	260	268	.555	.574	108	104	.022	.022	1
		<i>3200-7400 Bracket Race 350-383, or 3/8 to 1/2 mile 383-400. Needs 12.0:1+ CR.</i>										
112102-12	CL112102-12 CL112102-12DL ⁴	297	309	262	274	.510	.535	112	108	.022	.022	1
		<i>3400-7400 Hot Pro-Street & Bracket Racing. Works well with NOS.</i>										
118302-06	CL118302-06 CL118302-06DL ⁴	292	296	264	268	.555	.550	106	102	.016	.016	1,34
		<i>3400-7200 Oval track, Dirt or asphalt, 3/8 to 1/2 mile with fast comers</i>										
118302-06S	CL118302-06S CL118302-06SDL ⁴	292	296	264	268	.555	.550	106	102	.016	.016	1,34
		<i>3400-7200 Small Base Circle, Oval track, Dirt or asphalt, 3/8 to 1/2 mile with fast comers.</i>										
112512-06	CL112512-06 CL112512-06DL ⁴	303	309	268	274	.550	.535	106	102	.022	.022	1
		<i>3200-7200 Rough idle, Drag Race. Higher CR, stall speed & lower gears.</i>										
112262-06	CL112262-06 CL112262-06DL ⁴	303	313	268	278	.574	.550	106	102	.022	.022	1
		<i>4000-7500 Serious Competition only. Needs the best of everything.</i>										
112332-08	CL112332-08 CL112332-08DL ⁴	303	313	268	278	.574	.574	108	104	.022	.022	1
		<i>3600-7400 Bracket Racer special. Super strong mid-range & top end.</i>										
112642-10	CL112642-10 CL112642-10DL ⁴	322	322	276	276	.591	.591	110	106	.022	.022	1
		<i>3500-7500 Serious Competition 383-406, Requires 12.0:1+ CR, good single plane intake.</i>										
112552-06	CL112552-06 CL112552-06DL ⁴	313	321	278	286	.550	.570	106	102	.022	.022	1
		<i>4200-7800 Rough idle, Large 400+ Bracket/Class cam. Needs good heads & intake.</i>										
112552-06S	CL112552-06 CL112552-06DL ⁴	313	321	278	286	.550	.570	106	102	.022	.022	1
		<i>4200-7800 Small Base Circle, Rough idle, Large 400+ Bracket/Class cam. Needs good heads & intake.</i>										
112552-10	CL112552-10 CL112552-10DL ⁴	313	321	278	286	.550	.570	110	106	.022	.022	1
		<i>4200-8000 Large 400+ Bracket, broad upper mid range & top end power. Needs good heads.</i>										
112552-10S	CL112552-10 CL112552-10DL ⁴	313	321	278	286	.550	.570	110	106	.022	.022	1
		<i>4200-8000 Small Base Circle, Large 400+ Broad upper mid range & top end power. Needs good heads.</i>										
119992	NA	Custom Grind Camshaft <i>Mechanical Flat Tappet Special Order Camshaft.</i>										1
119992-S	NA	Custom Grind Camshaft, Small Base Circle <i>Mechanical Flat Tappet Special Order Camshaft.</i>										1
119992-P55	NA	Custom Grind Camshaft, Special Core <i>Mechanical Flat Tappet Special Order Camshaft.</i>										1
119996	NA	Custom Grind Camshaft <i>4/7 Swap Mechanical Flat Tappet Special Order Camshaft.</i>										1,22
119996-S	NA	Custom Grind Camshaft, Small Base Circle <i>4/7 Swap Mechanical Flat Tappet Special Order Camshaft.</i>										1,22

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

4 Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.

22 Ignition firing order must be changed to 1-8-7-3-6-5-4-2.

34 Provisions for increased oiling recommended.

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CHEVROLET SMALL BLOCK • 262-400 1955-1998

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98212-K12 ¹⁰ 98445-K12 ²⁵	98212 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98213-K12 ¹⁰ 98445-K12 ²⁵	98213 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98213-K12 ¹⁰ 98445-K12 ²⁵	98213 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98213-K12 ¹⁰ 98445-K12 ²⁵	98213 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98213-K12 ¹⁰ 98445-K12 ²⁵	98213 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98213-K12 ¹⁰ 98445-K12 ²⁵	98213 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98213-K12 ¹⁰ 98445-K12 ²⁵	98213 98445 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 91118	--	--	--	--	--	--	--	--	--	--	92150 94475	94402	94200 94300
91115 91118	--	--	--	--	--	--	--	--	--	--	92150 94475	94402	94200 94300
91115 91118	--	--	--	--	--	--	--	--	--	--	92150 94475	94402	94200 94300
91115 91118	--	--	--	--	--	--	--	--	--	--	92150 94475	94402	94200 94300
91115 91118	--	--	--	--	--	--	--	--	--	--	92150 94475	94402	94200 94300

Components Notes: master note list on page 260

- ³ Included in Cam & Lifter Sets.
- ⁴ Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.
- ¹⁰ 10° Valve lock Angle, must use matching retainers/locks.
- ²⁵ Machining Required.

CAMSHAFTS



CHEVROLET SMALL BLOCK • 262-400 1955-1998

4/7 Swap Mechanical Flat Tappet Camshafts

Firing Order: 1•8•7•3•6•5•4•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
114032-06	CL114032-06 CL114032-06DL ⁴	283	287	248	252	.535	.530	106	102	.022	.022	1,22
		3000-6800 Oval Track, 2bbl 1/4 to 3/8 tight, with good intake & exhaust.										
114032-06S	CL114032-06S CL114032-06SDL ⁴	283	287	248	252	.535	.530	106	102	.022	.022	1,22
		3000-6800 Small Base Circle, Oval Track, 2bbl 1/4 to 3/8 tight, with good intake & exhaust.										
114042-06	CL114042-06 CL114042-06DL ⁴	287	295	252	260	.545	.535	106	102	.022	.022	1,22
		3200-6800 Oval Track, 4bbl 1/4 to 3/8 tight, with good intake, exhaust, 12.0:1+ CR.										
114042-06S	CL114042-06S CL114042-06SDL ⁴	287	295	252	260	.545	.535	106	102	.022	.022	1,22
		3200-6800 Small Base Circle, Oval Track, 4bbl 1/4 to 3/8 tight, with good intake, exhaust, 12.0:1+ .										
114822-06	CL114822-06 CL114822-06DL ⁴	280	288	252	260	.540	.560	106	102	.016	.016	1,22,34
		3200-6800 Oval Track, tight 1/4 to 3/8 mile. 12.0:1+ CR, single plane intake, headers.										
114822-06S	CL114822-06S CL114822-06SDL ⁴	280	288	252	260	.540	.560	106	102	.016	.016	1,22,34
		3200-6800 Small Base Circle, Oval Track, tight 1/4 to 3/8 mile. 12.0:1+ CR, headers.										
114012-06	CL114012-06 CL114012-06DL ⁴	291	301	256	266	.535	.555	106	102	.022	.022	1,22
		3800-7200 Drag Race with 4000+ stall, 11.0:1+ CR. Best with 1.6 intake rockers.										
114012-06S	CL114012-06S CL114012-06SDL ⁴	291	301	256	266	.535	.555	106	102	.022	.022	1,22
		3800-7200 Small Base Circle, Drag Race with 4000+ stall, 11.0:1+ CR. Best with 1.6 intake rockers.										
114532-06	CL114532-06 CL114532-06DL ⁴	295	299	260	264	.555	.555	106	102	.022	.022	1,22
		3200-7200 Bracket Race or 3/8 to 1/2 mile Oval Track with fast comers. 350-383.										
114532-06S	CL114532-06S CL114532-06SDL ⁴	295	299	260	264	.555	.555	106	102	.022	.022	1,22
		3200-7200 Small Base Circle, Bracket Race or 3/8 to 1/2 mile Oval Track with fast comers. 350-383.										
114052-06	CL114052-06 CL114052-06DL ⁴	295	301	260	266	.565	.555	106	102	.022	.022	1,22
		3400-7200 Oval Track, 360ci+, 1/4 to 3/8 tight, with good intake, exhaust, 12.0:1+ CR.										
114052-06S	CL114052-06S CL114052-06SDL ⁴	295	301	260	266	.565	.555	106	102	.022	.022	1,22
		3400-7200 Small Base Circle, Oval Track, 360ci+, 1/4 to 3/8 tight, with good intake, exhaust, 12.0:1+.										
114022-06	CL114022-06 CL114022-06DL ⁴	301	309	266	274	.555	.555	106	102	.022	.022	1,22
		4200-7400 Drag Race with 12.0:1+ CR, 4800+ stall. Needs good heads & intake.										
114022-06S	CL114022-06S CL114022-06SDL ⁴	301	309	266	274	.555	.555	106	102	.022	.022	1,22
		4200-7400 Small Base Circle, Drag Race with 12.0:1+ CR, 4800+ stall.										
114542-06	CL114542-06 CL114542-06DL ⁴	303	309	268	274	.550	.535	106	102	.022	.022	1,22
		3200-7200 Rough idle, Drag Race. Higher CR, stall speed & lower gears.										
114542-06S	CL114542-06S CL114542-06SDL ⁴	303	309	268	274	.550	.535	106	102	.022	.022	1,22
		3200-7200 Small Base Circle, Rough idle, Drag Race. Higher CR, stall speed & lower gears.										
114552-06	CL114552-06 CL114552-06DL ⁴	313	321	278	286	.550	.570	106	102	.022	.022	1,22
		4500-8000 Large 400+ Bracket/Class cam. Needs good heads & intake.										
114552-06S	CL114552-06S CL114552-06SDL ⁴	313	321	278	286	.550	.570	106	102	.022	.022	1,22
		4500-8000 Small Base Circle, Large 400+ Bracket/Class cam. Needs good heads & intake.										
119996	NA	Custom Grind Camshaft										1,22
		4/7 Swap Mechanical Flat Tappet Special Order Camshaft.										
119996-S	NA	Custom Grind Camshaft, Small Base Circle										1,22
		4/7 Swap Mechanical Flat Tappet Special Order Camshaft.										

Cam Notes: master note list on page 260

¹ Stock (O.E.) valve springs cannot be used.

²² Ignition firing order must be changed to 1-8-7-3-6-5-4-2.

³⁴ Provisions for increased oiling recommended.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET SMALL BLOCK • 262-400 1955-1998

4/7 Swap Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91115 ³ 91118 ⁴	NA	98445-K12 ²⁵ 98632-K12 ²⁵	98445 ²⁵ 98632 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98445-K12 ²⁵ 98632-K12 ²⁵	98445 ²⁵ 98632 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98445-K12 ²⁵ 98632-K12 ²⁵	98445 ²⁵ 98632 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98445-K12 ²⁵ 98632-K12 ²⁵	98445 ²⁵ 98632 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98445-K12 ²⁵ 98632-K12 ²⁵	98445 ²⁵ 98632 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98445-K12 ²⁵ 98632-K12 ²⁵	98445 ²⁵ 98632 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98445-K12 ²⁵ 98632-K12 ²⁵	98445 ²⁵ 98632 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98445-K12 ²⁵ 98632-K12 ²⁵	98445 ²⁵ 98632 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98445-K12 ²⁵ 98632-K12 ²⁵	98445 ²⁵ 98632 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98445-K12 ²⁵ 98632-K12 ²⁵	98445 ²⁵ 98632 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98445-K12 ²⁵ 98632-K12 ²⁵	98445 ²⁵ 98632 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98445-K12 ²⁵ 98632-K12 ²⁵	98445 ²⁵ 98632 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98445-K12 ²⁵ 98632-K12 ²⁵	98445 ²⁵ 98632 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98445-K12 ²⁵ 98632-K12 ²⁵	98445 ²⁵ 98632 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98445-K12 ²⁵ 98632-K12 ²⁵	98445 ²⁵ 98632 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 ³ 91118 ⁴	NA	98445-K12 ²⁵ 98632-K12 ²⁵	98445 ²⁵ 98632 ²⁵	97132 ¹⁰ 97128 ¹⁰	97165 ¹⁰ 97216 ¹⁰	93017 ¹⁰	93350 93316 ²⁵	90005 90070	90100	95205 95010	92150 94475	94402	94200 94300
91115 91118	--	--	--	--	--	--	--	--	--	--	92150 94475	94402	94200 94300
91115 91118	--	--	--	--	--	--	--	--	--	--	92150 94475	94402	94200 94300

Components Notes: master note list on page 260

- ³ Included in Cam & Lifter Sets.
- ⁴ Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.
- ¹⁰ 10° Valve lock Angle, must use matching retainers/locks.
- ²⁵ Machining Required.

CAMSHAFTS



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Big Bottle Cams™ - Nitrous Oxide Mechanical Roller Cams Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
111133-12	NA	289	299	257	267	.600	.600	112	108	.022	.022	1,2,5
		3400-7400 Mid & upper RPM torque, 150+ plate systems.										
111133-12S	NA	289	299	257	267	.600	.600	112	108	.022	.022	1,2,5
		3400-7400 Small Base Circle, mid & upper RPM torque, 150+ plate systems.										
110613-12	NA	291	307	259	275	.640	.630	112	108	.022	.022	1,2,5
		3600-7600 Mid & upper RPM horsepower, 250+ plate systems.										
110613-12S	NA	291	307	259	275	.640	.630	112	108	.022	.022	1,2,5
		3600-7600 Small Base Circle, Mid & upper RPM horsepower, 250+ plate systems.										
111113-12	NA	295	305	263	273	.640	.645	112	108	.022	.022	1,2,5
		3800-7800 Mid & upper end torque & horsepower. Needs 12.5:1 CR-up.										
111113-12S	NA	295	305	263	273	.640	.645	112	108	.022	.022	1,2,5
		3800-7800 Small Base Circle, mid & upper end torque & power. Needs 12.5:1 CR-up.										
110673-12	NA	299	311	267	279	.645	.640	112	108	.022	.022	1,2,5
		4000-8000 Competition, 383+ ci. Mid to upper end power. Multi-stage nitrous system.										
110673-12S	NA	299	311	267	279	.645	.640	112	108	.022	.022	1,2,5
		4000-8000 Small Base Circle, Competition, 383+ ci. Mid to upper end power. Multi-stage system.										
110513-12	NA	305	319	273	287	.680	.650	112	108	.022	.022	1,2,5
		4400-8200 Competition, 400+ ci. Mid to upper end power. Multi-stage nitrous system.										
110513-12S	NA	305	319	273	287	.680	.650	112	108	.022	.022	1,2,5
		4400-8200 Small Base Circle, Competition, 400+ ci. Mid to upper end power. Multi-stage system.										
110513-14	NA	305	319	273	287	.680	.650	114	110	.022	.022	1,2,5
		4400-8600 Competition, 400+ cubic inch with pro heads. Multi-stage system.										
110513-14S	NA	305	319	273	287	.680	.650	114	110	.022	.022	1,2,5
		4400-8600 Small Base Circle, Competition, 400+ cubic inch with pro heads. Multi-stage system.										
111083-12	NA	307	317	275	285	.630	.630	112	108	.022	.022	1,2,5
		4400-8600 Competition, 383+ cubic inch. Good top end. Multi-stage system.										
111083-12S	NA	307	317	275	285	.630	.630	112	108	.022	.022	1,2,5
		4400-8600 Small Base Circle, Competition, 383+ cubic inch. Good top end. Multi-stage system.										
111083-14	NA	307	317	275	285	.630	.630	114	110	.022	.022	1,2,5
		4400-8800 Competition profile, good top end power. Plate or plumbed.										
111083-14S	NA	307	317	275	285	.630	.630	114	110	.022	.022	1,2,5
		4400-8800 Small Base Circle, Competition profile, good top end power. Plate or plumbed.										
110393-14	NA	309	323	277	291	.675	.675	114	110	.022	.022	1,2,5
		4600-9000 Competition, 400+ cubic inch with big heads. Multi-stage system.										
110393-14S	NA	309	323	277	291	.675	.675	114	110	.022	.022	1,2,5
		4600-9000 Small Base Circle, Competition, 400+ cubic inch with big heads. Multi-stage system.										
111073-14S	NA	313	327	281	295	.730	.715	114	110	.022	.022	1,2,5
		5000-9000 Small Base Circle, all out Competition, Multi-stage nitrous systems.										
119993	NA	Custom Grind Camshaft										1,2,5
		Mechanical Roller Special Order Camshaft.										
119993-S	NA	Custom Grind Camshaft, Small Base Circle										1,2,5
		Mechanical Roller Special Order Camshaft.										
119999	NA	Custom Grind Camshaft, with Cast Distributor Gear										1,2,5
		Mechanical Roller Special Order Camshaft.										
119997	NA	Custom Grind Camshaft, with 50-55mm Bearing										1,2,5
		Mechanical Roller Special Order Camshaft.										
118997	NA	Custom Grind Camshaft, with 50-55mm Bearing, LS (C) Firing Order										1,2,5,24
		Mechanical Roller Special Order Camshaft.										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

2 Requires Thrust Button.

5 Requires upgraded distributor gear/fuel pump pushrod.

24 Ignition firing order must be changed to 1-8-7-2-6-5-4-3.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET SMALL BLOCK - 262-400 1955-1998

Big Bottle Cams™ - Nitrous Oxide Mechanical Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91117 91121	90135	NA	98637 ²⁵ 98543 ²⁵	97130 ¹⁰	97220 ¹⁰ 97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91117 91121	90135	NA	98637 ²⁵ 98543 ²⁵	97130 ¹⁰	97220 ¹⁰ 97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98738-A ²⁵ 98825 ²⁵	NA 97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
--	--	--	--	--	--	--	--	--	--	--	92151 94475	94400 94402	94300
--	--	--	--	--	--	--	--	--	--	--	92151 94475	94400 94402	94300
--	--	--	--	--	--	--	--	--	--	--	92151 94475	94400 94402	94300
--	--	--	--	--	--	--	--	--	--	--	92151 94475	94400 94402	94300
--	--	--	--	--	--	--	--	--	--	--	92151 94475	94400 94402	94300

Components Notes: master note list on page 260

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.



Big Bottle Cams™ - 4/7 Swap Mechanical Roller Cams Firing Order: 1•8•7•3•6•5•4•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
114143-12	NA	289	299	257	267	.600	.600	112	108	.022	.022	1,2,5,22
		<i>4000-7800 Mid & upper RPM torque, great with 1.6 rockers. Best with plate systems.</i>										
114143-12S	NA	289	299	257	267	.600	.600	112	108	.022	.022	1,2,5,22
		<i>4000-7800 Small Base Circle, mid & upper RPM torque, great with 1.6 rockers. Best with plate systems.</i>										
114613-12	NA	291	307	259	275	.640	.630	112	108	.022	.022	1,2,5,22
		<i>3600-7600 Mid & upper RPM horsepower, 250+ plate systems.</i>										
114613-12S	NA	291	307	259	275	.640	.630	112	108	.022	.022	1,2,5,22
		<i>3600-7600 Small Base Circle, Mid & upper RPM horsepower, 250+ plate systems.</i>										
114413-12	NA	295	305	263	273	.640	.645	112	108	.022	.022	1,2,5,22
		<i>3800-7800 Mid & upper end torque & horsepower. Needs 12.5:1 CR-up.</i>										
114413-12S	NA	295	305	263	273	.640	.645	112	108	.022	.022	1,2,5,22
		<i>3800-7800 Small Base Circle, mid & upper end torque & power. Needs 12.5:1 CR-up.</i>										
114673-12	NA	299	311	267	279	.645	.640	112	108	.022	.022	1,2,5,22
		<i>4000-8000 Competition, 383+ ci. Mid to upper end power. Multi-stage nitrous system.</i>										
114673-12S	NA	299	311	267	279	.645	.640	112	108	.022	.022	1,2,5,22
		<i>4000-8000 Small Base Circle, Competition, 383+ ci. Mid to upper end power. Multi-stage system.</i>										
114673-14	NA	299	311	267	279	.645	.640	114	110	.022	.022	1,2,5,22
		<i>4000-8000 Competition, 383+ ci. Mid to upper end power. Multi-stage nitrous system.</i>										
114673-14S	NA	299	311	267	279	.645	.640	114	110	.022	.022	1,2,5,22
		<i>4000-8000 Small Base Circle, Competition, 383+ ci. Mid to upper end power. Multi-stage system.</i>										
114513-12	NA	305	319	273	287	.680	.650	112	108	.022	.022	1,2,5,22
		<i>4400-8200 Competition, 400+ ci. Mid to upper end power. Multi-stage nitrous system.</i>										
114513-12S	NA	305	319	273	287	.680	.650	112	108	.022	.022	1,2,5,22
		<i>4400-8200 Small Base Circle, Competition, 400+ ci. Mid to upper end power. Multi-stage system.</i>										
114513-14	NA	305	319	273	287	.680	.650	114	110	.022	.022	1,2,5,22
		<i>4400-8600 Competition, 400+ cubic inch with pro heads. Multi-stage system.</i>										
114513-14S	NA	305	319	273	287	.680	.650	114	110	.022	.022	1,2,5,22
		<i>4400-8600 Small Base Circle, Competition, 400+ cubic inch with pro heads. Multi-stage system.</i>										
114083-12	NA	307	317	275	285	.630	.630	112	108	.022	.022	1,2,5,22
		<i>4400-8600 Competition, 383+ cubic inch. Good top end. Multi-stage system.</i>										
114083-12S	NA	307	317	275	285	.630	.630	112	108	.022	.022	1,2,5,22
		<i>4400-8600 Small Base Circle, Competition, 383+ cubic inch. Good top end. Multi-stage system.</i>										
114083-14	NA	307	317	275	285	.630	.630	114	110	.022	.022	1,2,5,22
		<i>4400-8800 Competition profile, good top end power. Plate or plumbed.</i>										
114083-14S	NA	307	317	275	285	.630	.630	114	110	.022	.022	1,2,5,22
		<i>4400-8800 Small Base Circle, Competition profile, good top end power. Plate or plumbed.</i>										
114393-14	NA	309	323	277	291	.675	.675	114	110	.022	.022	1,2,5,22
		<i>4600-9000 Competition, 400+ cubic inch with big heads. Multi-stage system.</i>										
114393-14S	NA	309	323	277	291	.675	.675	114	110	.022	.022	1,2,5,22
		<i>5000-9000 Small Base Circle, all out Competition, Multi-stage nitrous systems.</i>										
114073-14S	NA	313	327	281	295	.730	.715	114	110	.022	.022	1,2,5,22
		<i>5000-7800 Small Base Circle, all out Competition, Multi-stage nitrous systems.</i>										
114113-14S	NA	313	329	281	297	.705	.716	114	110	.022	.022	1,2,5,22
		<i>5000-7800 Small Base Circle, Big cubic inch, all out Competition, Multi-stage nitrous systems.</i>										
119994	NA	Custom Grind Camshaft										1,2,5,22
		<i>4/7 Swap Mechanical Roller Special Order Camshaft.</i>										
119994-S	NA	Custom Grind Camshaft, Small Base Circle										1,2,5,22
		<i>4/7 Swap Mechanical Roller Special Order Camshaft.</i>										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

2 Requires Thrust Button.

5 Requires upgraded distributor gear/fuel pump pushrod.

22 Ignition firing order must be changed to 1-8-7-3-6-5-4-2.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Big Bottle Cams™ - 4/7 Swap Mechanical Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98738-A ²⁵	--	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98825 ²⁵	97130 ¹⁰	97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98738-A ²⁵	--	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98825 ²⁵	97130 ¹⁰	97220 ¹⁰				90105 ⁷		94475	94402	
--	--	--	--	--	--	--	--	--	--	--	92151	94400	94300
											94475	94402	
--	--	--	--	--	--	--	--	--	--	--	92151	94400	94300
											94475	94402	

Components Notes: master note list on page 260
⁷ Requires 7/16" rocker studs.
¹⁰ 10° Valve lock Angle, must use matching retainers/locks.
²⁵ Machining Required.

CAMSHAFTS



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Steel Billet Mechanical Roller Camshafts (cont.)

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
111213-10	NA	261	269	229	237	.555	.555	110	106	.022	.022	1,2,5
<i>2000-6000 Noticeable idle, good for Weekend Street Cruiser. Should have 9.0:1 CR, 2000+ stall.</i>												
111213-10S	NA	261	269	229	237	.555	.555	110	106	.022	.022	1,2,5
<i>2000-6000 Small Base Circle, Noticeable idle, Weekend Street Cruiser. 9.0:1 CR, 2000+ stall.</i>												
111203-10	NA	269	269	237	237	.555	.555	110	106	.022	.022	1,2,5
<i>2500-6500 Fair idle, Street Performance/mild Strip. Recommend 9.5:1 CR, 2500+ stall.</i>												
111203-10S	NA	269	269	237	237	.555	.555	110	106	.022	.022	1,2,5
<i>2500-6500 Small Base Circle, Street Performance/mild Strip. Recommend 9.5:1, 2500+ stall.</i>												
110183-08	NA	269	275	237	243	.555	.555	108	104	.022	.022	1,2,5
<i>2500-6500 Fair idle, Weekend Cruiser/mild Strip. 2500+ stall recommended.</i>												
110183-08S	NA	269	275	237	243	.555	.555	108	104	.022	.022	1,2,5
<i>2500-6500 Small Base Circle, Fair idle, Weekend Cruiser/mild Strip. 2500+ stall recommended.</i>												
110183-10	NA	269	275	237	243	.555	.555	110	106	.022	.022	1,2,5
<i>2500-6500 Fair idle, Weekend Cruiser/Power Tour favorite. 2500+ stall recommended.</i>												
110183-10S	NA	269	275	237	243	.555	.555	110	106	.022	.022	1,2,5
<i>2500-6500 Small Base Circle, Fair idle, Weekend Cruiser/Power Tour favorite. 2500+ stall.</i>												
110173-08	NA	273	279	241	247	.570	.570	108	104	.022	.022	1,2,5
<i>2800-6800 Fair idle, Street/Strip. Great mid-range. Should have 10.0:1 CR, 2500+ stall.</i>												
110173-08S	NA	273	279	241	247	.570	.570	108	104	.022	.022	1,2,5
<i>2800-6800 Small Base Circle, Fair idle, Street/Strip. Great mid-range. 10.0:1 CR, 2500+ stall.</i>												
110173-10	NA	273	279	241	247	.570	.570	110	106	.022	.022	1,2,5
<i>2800-7000 Fair idle, High performance Street/Mild Bracket. Should have 10.0:1 CR, 2800+ stall.</i>												
110173-10S	NA	273	279	241	247	.570	.570	110	106	.022	.022	1,2,5
<i>2800-7000 Small Base Circle, Fair idle, High performance Street/Mild Bracket. 10.0:1 CR, 2800+.</i>												
110753-06	NA	277	287	245	255	.600	.600	106	102	.022	.022	1,2,5
<i>3200-7400 Rough idle, Great mid-range torque & power. Needs good intake & exhaust.</i>												
110753-06S	NA	277	287	245	255	.600	.600	106	102	.022	.022	1,2,5
<i>3200-7400 Small Base Circle, Rough idle, Great mid-range torque & power. Needs good intake.</i>												
110753-08S	NA	277	287	245	255	.600	.600	108	104	.022	.022	1,2,5
<i>3200-7400 Small Base Circle, Rough idle, Great mid-range torque & power. Needs good intake.</i>												
110753-10	NA	277	287	245	255	.600	.600	110	106	.022	.022	1,2,5
<i>3200-7400 Mid range torque with top end horsepower. Needs 10.0:1 CR, good intake & exhaust..</i>												
110753-10S	NA	277	287	245	255	.600	.600	110	106	.022	.022	1,2,5
<i>3200-7400 Small Base Circle, Mid range torque with top end horsepower. 10.0:1 CR.</i>												
111313-06	NA	279	279	247	247	.585	.585	106	102	.022	.022	1,2,5
<i>3000-7200 Fair idle, Street performance mild Oval Track use.</i>												
111313-06S	NA	279	279	247	247	.585	.585	106	102	.022	.022	1,2,5
<i>3000-7200 Small Base Circle, Fair idle, Street performance mild Oval Track use.</i>												
111313-08	NA	279	279	247	247	.585	.585	108	104	.022	.022	1,2,5
<i>3000-7400 Fair idle, Hot Street/Strip. Good mid-range power. 10.0:1 CR, 3400+ stall.</i>												
111313-08S	NA	279	279	247	247	.585	.585	108	104	.022	.022	1,2,5
<i>3000-7400 Small Base Circle, fair idle, Hot Street/Strip. Good mid-range power. 10.0:1 CR, 3400+.</i>												
111313-10	NA	279	279	247	247	.585	.585	110	106	.022	.022	1,2,5
<i>3000-7400 Fair idle, Pro-Street cam. Works well with small NOS system.</i>												
111313-10S	NA	279	279	247	247	.585	.585	110	106	.022	.022	1,2,5
<i>3000-7400 Small Base Circle, fair idle, Pro-Street cam. Works well with small NOS system.</i>												
111313-12	NA	279	279	247	247	.585	.585	112	108	.022	.022	1,2,5
<i>2800-7400 Fair idle, Pro-Street cam. Works well with small NOS system.</i>												

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 2 Requires Thrust Button.
- 5 Requires upgraded distributor gear/fuel pump pushrod.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET SMALL BLOCK - 262-400 1955-1998

Steel Billet Mechanical Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91150	90132	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90070	90100	95010	92151	94400	94300
91152	90135							90072 ⁷	90101 ⁷		94475	94402	
91150	90132	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90070	90100	95010	92151	94400	94300
91152	90135							90072 ⁷	90101 ⁷		94475	94402	
91150	90132	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90070	90100	95010	92151	94400	94300
91152	90135							90072 ⁷	90101 ⁷		94475	94402	
91150	90132	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90070	90100	95010	92151	94400	94300
91152	90135							90072 ⁷	90101 ⁷		94475	94402	
91150	90132	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90070	90100	95010	92151	94400	94300
91152	90135							90072 ⁷	90101 ⁷		94475	94402	
91150	90132	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90070	90100	95010	92151	94400	94300
91152	90135							90072 ⁷	90101 ⁷		94475	94402	
91150	90132	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90070	90100	95010	92151	94400	94300
91152	90135							90072 ⁷	90101 ⁷		94475	94402	
91150	90132	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90070	90100	95010	92151	94400	94300
91152	90135							90072 ⁷	90101 ⁷		94475	94402	
91150	90132	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90070	90100	95010	92151	94400	94300
91152	90135							90072 ⁷	90101 ⁷		94475	94402	
91150	90132	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90070	90100	95010	92151	94400	94300
91152	90135							90072 ⁷	90101 ⁷		94475	94402	
91150	90132	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90070	90100	95010	92151	94400	94300
91152	90135							90072 ⁷	90101 ⁷		94475	94402	
91150	90132	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90070	90100	95010	92151	94400	94300
91152	90135							90072 ⁷	90101 ⁷		94475	94402	
91150	90132	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90070	90100	95010	92151	94400	94300
91152	90135							90072 ⁷	90101 ⁷		94475	94402	
91150	90132	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90070	90100	95010	92151	94400	94300
91152	90135							90072 ⁷	90101 ⁷		94475	94402	

Components Notes: master note list on page 260

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Steel Billet Mechanical Roller Camshafts (cont.)

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
111313-12S	NA	279	279	247	247	.585	.585	112	108	.022	.022	1,2,5 <i>Small Base Circle, fair idle, Pro-Street cam. Works well with small NOS system.</i>
111153-06	NA	279	281	247	249	.585	.585	106	102	.022	.022	1,2,5 <i>Lopey idle, great Oval Track & heavy Drag car.</i>
111153-06S	NA	279	281	247	249	.585	.585	106	102	.022	.022	1,2,5 <i>Small Base Circle, lopey idle, great Oval Track & heavy Drag car.</i>
111153-08	NA	279	281	247	249	.585	.585	108	104	.022	.022	1,2,5 <i>Choppy idle, Should have 10.0:1+ CR, single plane intake, 2800+ stall.</i>
111153-08S	NA	279	281	247	249	.585	.585	108	104	.022	.022	1,2,5 <i>Small Base Circle, choppy idle, Should have 10.0:1+ CR, single plane intake, 2800+ stall.</i>
111013-06	NA	283	289	251	257	.640	.640	106	102	.022	.022	1,2,5 <i>Strong mid-range torque, rough idle. Oval Track & Bracket cars.</i>
111013-06S	NA	283	289	251	257	.640	.640	106	102	.022	.022	1,2,5 <i>Small Base Circle, strong mid-range torque, rough idle. Oval Track & Bracket cars.</i>
111013-10	NA	283	289	251	257	.640	.640	110	106	.022	.022	1,2,5 <i>Strong mid-range horsepower, rough idle. Oval Track & Bracket cars.</i>
111163-06	NA	287	293	255	261	.600	.620	106	102	.022	.022	1,2,5 <i>Good mid-range horsepower, rough idle. Needs 11.0:1 CR-up.</i>
111163-06S	NA	287	293	255	261	.600	.620	106	102	.022	.022	1,2,5 <i>Small Base Circle, good mid-range horsepower, rough idle. Needs 11.0:1 CR-up.</i>
111163-08	NA	287	293	255	261	.600	.620	108	104	.022	.022	1,2,5 <i>Good mid-range power, rough idle. Needs 11.0:1 CR-up. Brackets.</i>
111163-08S	NA	287	293	255	261	.600	.620	108	104	.022	.022	1,2,5 <i>Small Base Circle, good mid-range HP, rough idle. Needs 11.0:1 CR-up. Brackets.</i>
111163-10	NA	287	293	255	261	.600	.620	110	106	.022	.022	1,2,5 <i>Good mid-range power, rough idle. Needs 11.0:1 CR-up. Brackets.</i>
111633-06	NA	289	295	257	263	.615	.615	106	102	.022	.022	1,2,5 <i>Oval Track/Mild Bracket, mid range torque & top end power. 10.5-11.0:1 CR.</i>
111633-06S	NA	289	295	257	263	.615	.615	106	102	.022	.022	1,2,5 <i>Small Base Circle, Oval Track/Mild Bracket, mid range torque & top end power.</i>
111633-08	NA	289	295	257	263	.615	.615	108	104	.022	.022	1,2,5 <i>Bracket/Oval Track, Broad mid-range power. Needs good intake & exhaust.</i>
111633-08S	NA	289	295	257	263	.615	.615	108	104	.022	.022	1,2,5 <i>Small Base Circle, Bracket/Oval Track, Broad mid-range power. Good intake & exhaust.</i>
110773-06	NA	289	295	257	263	.640	.640	106	102	.022	.022	1,2,5 <i>Strong mid-range torque & top end power. Needs 10.5-11.5:1 CR, good intake.</i>
110773-06S	NA	289	295	257	263	.640	.640	106	102	.022	.022	1,2,5 <i>Small Base Circle, Strong mid-range torque & top end power. Needs 10.5-11.5:1 CR.</i>
110773-08	NA	289	295	257	263	.640	.640	108	104	.022	.022	1,2,5 <i>Strong mid range. Needs good single plane intake, 10.5:1+ CR.</i>
110773-08S	NA	289	295	257	263	.640	.640	108	104	.022	.022	1,2,5 <i>Small Base Circle, Strong mid range. Needs good single plane intake, 10.5:1+ CR.</i>
110773-14S	NA	289	295	257	263	.640	.640	114	110	.022	.022	1,2,5 <i>Small Base Circle, Strong mid range. Needs good single plane intake, 10.5:1+ CR.</i>
111133-06	NA	289	299	257	267	.600	.600	106	102	.022	.022	1,2,5 <i>Strong mid & upper rpm, banked Oval Track & Brackets w/auto trans.</i>
111133-06S	NA	289	299	257	267	.600	.600	106	102	.022	.022	1,2,5 <i>Small Base Circle, strong mid & upper rpm, banked Oval Track & Brackets w/auto trans.</i>

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 2 Requires Thrust Button.
- 5 Requires upgraded distributor gear/fuel pump pushrod.

Some items are not legal for sale or use on any pollution controlled motor vehicle

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CHEVROLET SMALL BLOCK - 262-400 1955-1998

Steel Billet Mechanical Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91150 91152	90132 90135	NA	98541 ²⁵ 98223	97128 ¹⁰ 97113	97220 ¹⁰ NA	93017 ¹⁰ 93005	93316 ²⁵	90070 90072 ⁷	90100 90101 ⁷	95010	92151 94475	94400 94402	94300
91150 91152	90132 90135	NA	98541 ²⁵ 98223	97128 ¹⁰ 97113	97220 ¹⁰ NA	93017 ¹⁰ 93005	93316 ²⁵	90070 90072 ⁷	90100 90101 ⁷	95010	92151 94475	94400 94402	94300
91150 91152	90132 90135	NA	98541 ²⁵ 98223	97128 ¹⁰ 97113	97220 ¹⁰ NA	93017 ¹⁰ 93005	93316 ²⁵	90070 90072 ⁷	90100 90101 ⁷	95010	92151 94475	94400 94402	94300
91150 91152	90132 90135	NA	98541 ²⁵ 98223	97128 ¹⁰ 97113	97220 ¹⁰ NA	93017 ¹⁰ 93005	93316 ²⁵	90070 90072 ⁷	90100 90101 ⁷	95010	92151 94475	94400 94402	94300
91150 91152	90132 90135	NA	98541 ²⁵ 98223	97128 ¹⁰ 97113	97220 ¹⁰ NA	93017 ¹⁰ 93005	93316 ²⁵	90070 90072 ⁷	90100 90101 ⁷	95010	92151 94475	94400 94402	94300
91117 91121	90135	NA	98637 ²⁵ 98543 ²⁵	97130 ¹⁰	97220 ¹⁰ 97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91117 91121	90135	NA	98637 ²⁵ 98543 ²⁵	97130 ¹⁰	97220 ¹⁰ 97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91117 91121	90135	NA	98637 ²⁵ 98543 ²⁵	97130 ¹⁰	97220 ¹⁰ 97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91117 91121	90135	NA	98637 ²⁵ 98543 ²⁵	97130 ¹⁰	97220 ¹⁰ 97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91117 91121	90135	NA	98637 ²⁵ 98543 ²⁵	97130 ¹⁰	97220 ¹⁰ 97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91117 91121	90135	NA	98637 ²⁵ 98543 ²⁵	97130 ¹⁰	97220 ¹⁰ 97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91117 91121	90135	NA	98637 ²⁵ 98543 ²⁵	97130 ¹⁰	97220 ¹⁰ 97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91117 91121	90135	NA	98637 ²⁵ 98543 ²⁵	97130 ¹⁰	97220 ¹⁰ 97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91117 91121	90135	NA	98637 ²⁵ 98543 ²⁵	97130 ¹⁰	97220 ¹⁰ 97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91117 91121	90135	NA	98637 ²⁵ 98543 ²⁵	97130 ¹⁰	97220 ¹⁰ 97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91117 91121	90135	NA	98637 ²⁵ 98543 ²⁵	97130 ¹⁰	97220 ¹⁰ 97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91117 91121	90135	NA	98637 ²⁵ 98543 ²⁵	97130 ¹⁰	97220 ¹⁰ 97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91117 91121	90135	NA	98637 ²⁵ 98543 ²⁵	97130 ¹⁰	97220 ¹⁰ 97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91117 91121	90135	NA	98637 ²⁵ 98543 ²⁵	97130 ¹⁰	97220 ¹⁰ 97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91117 91121	90135	NA	98637 ²⁵ 98543 ²⁵	97130 ¹⁰	97220 ¹⁰ 97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300

Components Notes: master note list on page 260

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Steel Billet Mechanical Roller Camshafts (cont.)

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
111133-08	NA	289	299	257	267	.600	.600	108	104	.022	.022	1,2,5
<i>4000-7800 Mid & upper RPM torque, good in banked Oval Track & Bracket.</i>												
111133-08S	NA	289	299	257	267	.600	.600	108	104	.022	.022	1,2,5
<i>4000-7800 Small Base Circle, mid & upper RPM torque, good in banked Oval Track & Bracket.</i>												
111133-10	NA	289	299	257	267	.600	.600	110	106	.022	.022	1,2,5
<i>4000-7800 Mid & upper RPM torque, OK w/NOS.</i>												
111133-10S	NA	289	299	257	267	.600	.600	110	106	.022	.022	1,2,5
<i>4000-7800 Small Base Circle, mid & upper RPM torque, OK w/NOS up to 250HP.</i>												
111133-12	NA	289	299	257	267	.600	.600	112	108	.022	.022	1,2,5
<i>4000-8000 Mid & upper RPM torque. Heavier car OK. Great w/NOS.</i>												
111133-12S	NA	289	299	257	267	.600	.600	112	108	.022	.022	1,2,5
<i>4000-8000 Small Base Circle, mid & upper RPM torque. Heavier car OK. Great w/NOS.</i>												
112323-06	NA	291	295	259	263	.640	.640	106	102	.022	.022	1,2,5
<i>4200-8000 Great mid to upper range torque. Requires good heads, intake & exhaust.</i>												
112323-06S	NA	291	295	259	263	.640	.640	106	102	.022	.022	1,2,5
<i>4200-8000 Small Base Circle, Great mid to upper range torque. Requires good heads & intake.</i>												
112323-08	NA	291	295	259	263	.640	.640	108	104	.022	.022	1,2,5
<i>4200-8000 Oval Track/Drag, mid range torque with top end power. Needs good heads.</i>												
112323-08S	NA	291	295	259	263	.640	.640	108	104	.022	.022	1,2,5
<i>4200-8000 Small Base Circle, Oval Track/Drag, mid range torque & top end power.</i>												
110713-06	NA	291	299	259	267	.675	.645	106	102	.022	.022	1,2,5
<i>4200-8000 360-383ci Sprint, Modified. Super fast tracks.</i>												
110713-06S	NA	291	299	259	267	.675	.645	106	102	.022	.022	1,2,5
<i>4200-8000 Small Base Circle, 360-383ci Sprint, Modified. Super fast tracks.</i>												
110713-08	NA	291	299	259	267	.675	.645	108	104	.022	.022	1,2,5
<i>4200-8000 410ci Sprint, Modified. Super fast tracks. Requires good heads & intake.</i>												
110713-08S	NA	291	299	259	267	.675	.645	108	104	.022	.022	1,2,5
<i>4200-8000 Small Base Circle, 410ci Sprint, Modified. Super fast tracks. Requires good heads.</i>												
112313-06	NA	293	297	261	265	.620	.620	106	102	.022	.022	1,2,5
<i>4200-8000 Circle Track, high torque. Great 360 Sprint on tacky tracks.</i>												
112313-06S	NA	293	297	261	265	.620	.620	106	102	.022	.022	1,2,5
<i>4200-8000 Small Base Circle, Circle Track, high torque. Great 360 Sprint on tacky tracks.</i>												
112313-08	NA	293	297	261	265	.620	.620	108	104	.022	.022	1,2,5
<i>4200-8000 Broad range power with mid to upper end torque. 360 Sprint dry slick or Bracket.</i>												
112313-08S	NA	293	297	261	265	.620	.620	108	104	.022	.022	1,2,5
<i>4200-8000 Small Base Circle, Broad range power with mid to upper end torque.</i>												
110013-06	NA	295	301	263	269	.630	.620	106	102	.022	.022	1,2,5
<i>4000-7800 355-383ci Drag, 1/8 or 1/4 mile, heavy car. 11.0:1+ CR, 4000+ stall.</i>												
110013-06S	NA	295	301	263	269	.630	.620	106	102	.022	.022	1,2,5
<i>4000-7800 Small Base Circle, 355-383ci Drag, 1/8 or 1/4 mile, heavy car. 11.0:1+ CR, 4000+ stall.</i>												
110013-08	NA	295	301	263	269	.630	.620	108	104	.022	.022	1,2,5
<i>4000-8000 410 Sprint or big inch Bracket. Strong upper mid-range.</i>												
110013-08S	NA	295	301	263	269	.630	.620	108	104	.022	.022	1,2,5
<i>4000-8000 Small Base Circle, 410 Sprint or big inch Bracket. Strong upper mid-range.</i>												
110013-10	NA	295	301	263	269	.630	.620	110	106	.022	.022	1,2,5
<i>4000-8000 410 Sprint or big inch Bracket. Upper mid-range & top end.</i>												
110013-10S	NA	295	301	263	269	.630	.620	110	106	.022	.022	1,2,5
<i>4000-8000 Small Base Circle, 410 Sprint or big inch Bracket. Upper mid-range & top end.</i>												

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 2 Requires Thrust Button.
- 5 Requires upgraded distributor gear/fuel pump pushrod.

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Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
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91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300

Components Notes: master note list on page 260

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Steel Billet Mechanical Roller Camshafts (cont.)

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
111223-06	NA	295	303	263	271	.675	.625	106	102	.022	.022	1,2,5
<i>4200-8200 Great in large cubic inch small block Oval Track late models.</i>												
111223-06S	NA	295	303	263	271	.675	.625	106	102	.022	.022	1,2,5
<i>4200-8200 Small Base Circle, great in large cubic inch small block Oval Track late models.</i>												
111223-08	NA	295	303	263	271	.675	.625	108	104	.022	.022	1,2,5
<i>4200-8200 Great in large cubic inch small block Oval Track late models, Bracket.</i>												
111113-06	NA	295	305	263	273	.640	.645	106	102	.022	.022	1,2,5
<i>4200-8200 Strong mid & upper end torque & power. Needs 12.5:1 CR-up.</i>												
111113-06S	NA	295	305	263	273	.640	.645	106	102	.022	.022	1,2,5
<i>4200-8200 Small Base Circle, strong mid & upper end torque & HP. Needs 12.5:1 CR-up.</i>												
111113-08	NA	295	305	263	273	.640	.645	108	104	.022	.022	1,2,5
<i>4200-8200 Great mid & upper end torque & horsepower. Needs 12.5:1 CR-up.</i>												
111113-08S	NA	295	305	263	273	.640	.645	108	104	.022	.022	1,2,5
<i>4200-8200 Small Base Circle, great mid & upper end torque & HP. Needs 12.5:1 CR-up.</i>												
111113-10	NA	295	305	263	273	.640	.645	110	106	.022	.022	1,2,5
<i>4200-8200 Great mid & upper end torque & horsepower. Needs 12.5:1 CR-up.</i>												
111113-10S	NA	295	305	263	273	.640	.645	110	106	.022	.022	1,2,5
<i>4200-8200 Small Base Circle, great mid & upper end torque & HP. Needs 12.5:1 CR-up.</i>												
111113-12	NA	295	305	263	273	.640	.645	112	108	.022	.022	1,2,5
<i>4200-8200 Good all around mid-range power. Needs 11.0:1+ CR, 4000+ stall. Good with NOS.</i>												
111113-12S	NA	295	305	263	273	.640	.645	112	108	.022	.022	1,2,5
<i>4200-8200 Small Base Circle, good all around mid-range power. Needs 11.0:1+ CR, 4000+ stall.</i>												
111103-06	NA	295	307	263	275	.640	.630	106	102	.022	.022	1,2,5
<i>4200-8200 Strong mid & upper end torque & HP. Needs 12.5:1 CR-up.</i>												
111103-06S	NA	295	307	263	275	.640	.630	106	102	.022	.022	1,2,5
<i>4200-8200 Small Base Circle, strong mid & upper end torque & HP. Needs 12.5:1 CR-up.</i>												
111103-08	NA	295	307	263	275	.640	.630	108	104	.022	.022	1,2,5
<i>4200-8200 Strong mid & upper end torque & horsepower. Needs 12.5:1 CR-up.</i>												
111103-08S	NA	295	307	263	275	.640	.630	108	104	.022	.022	1,2,5
<i>4200-8200 Small Base Circle, strong mid & upper end torque & HP. Needs 12.5:1 CR-up.</i>												
111123-06	NA	299	307	267	275	.645	.645	106	102	.022	.022	1,2,5
<i>4400-8200 Competition use, good mid & upper HP, medium to high bank Oval Track.</i>												
111123-06S	NA	299	307	267	275	.645	.645	106	102	.022	.022	1,2,5
<i>4400-8200 Small Base Circle, Competition, mid & upper HP, medium to high bank Oval Track.</i>												
111123-08	NA	299	307	267	275	.645	.645	108	104	.022	.022	1,2,5
<i>4400-8200 Competition use, good mid & upper power, medium to high bank Oval Track.</i>												
111123-08S	NA	299	307	267	275	.645	.645	108	104	.022	.022	1,2,5
<i>4400-8200 Small Base Circle, Competition, mid & upper HP, medium to high bank Oval Track.</i>												
111123-10	NA	299	307	267	275	.645	.645	110	106	.022	.022	1,2,5
<i>4400-8400 Competition use, good mid & upper power, bracket, OK w/NOS.</i>												
111123-10S	NA	299	307	267	275	.645	.645	110	106	.022	.022	1,2,5
<i>4400-8400 Small Base Circle, Competition use, good mid & upper power, bracket, OK w/NOS.</i>												
112183-06	NA	301	309	269	277	.650	.650	106	102	.022	.022	1,2,5
<i>4400-8400 Competition/Bracket E.T. Mid to upper rpm horsepower. Good heads, 12.5:1+ CR.</i>												
112183-06S	NA	301	309	269	277	.650	.650	106	102	.022	.022	1,2,5
<i>4400-8400 Small Base Circle, Competition/Bracket E.T. Mid to upper rpm horsepower. 12.5:1+ CR.</i>												
112183-08	NA	301	309	269	277	.650	.650	108	104	.022	.022	1,2,5
<i>4400-8400 Competition/Bracket E.T. Mid to upper end performance. 12.5:1+ CR, 4500+ stall.</i>												

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 2 Requires Thrust Button.
- 5 Requires upgraded distributor gear/fuel pump pushrod.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Steel Billet Mechanical Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	

Components Notes: master note list on page 260

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Steel Billet Mechanical Roller Camshafts (cont.)

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
112183-08S	NA	301	309	269	277	.650	.650	108	104	.022	.022	1,2,5
		4400-8400	Small Base Circle, Competition/Bracket E.T. Mid to upper end performance. 12.5:1+ CR									
111863-06	NA	301	309	269	277	.675	.650	106	102	.022	.022	1,2,5
		4400-8400	Competition/Bracket E.T. Mid to upper rpm horsepower. Good heads, 12.5:1+ CR.									
111863-06S	NA	301	309	269	277	.675	.650	106	102	.022	.022	1,2,5
		4400-8400	Small Base Circle, Competition/Bracket E.T. Mid to upper rpm horsepower. Good heads.									
111863-08	NA	301	309	269	277	.675	.650	108	104	.022	.022	1,2,5
		4400-8400	Competition/Bracket E.T. Mid to upper end performance. 12.5:1+ CR.									
111863-08S	NA	301	309	269	277	.675	.650	108	104	.022	.022	1,2,5
		4400-8400	Small Base Circle, Competition/Bracket E.T. Mid to upper end performance. 12.5:1+ CR.									
111863-10	NA	301	309	269	277	.675	.650	110	106	.022	.022	1,2,5
		4400-8400	Competition, Good mid to upper rpm. 12.5:1+ CR. Mild NOS OK.									
111863-10S	NA	301	309	269	277	.675	.650	110	106	.022	.022	1,2,5
		4400-8400	Small Base Circle, Competition, Good mid to upper rpm. 12.5:1+ CR. Mild NOS OK.									
110503-08	NA	305	311	273	279	.645	.640	108	104	.022	.022	1,2,5
		4600-8400	Competition, Upper mid to top end power. 12.5:1+ CR, good heads a must.									
110503-08S	NA	305	311	273	279	.645	.640	108	104	.022	.022	1,2,5
		4600-8400	Small Base Circle, Competition, Upper mid to top end power. 12.5:1+ CR, good heads.									
110503-10	NA	305	311	273	279	.645	.640	110	106	.022	.022	1,2,5
		4600-8400	Broad power range. Best in larger engine. 12.5:1+ CR a must.									
110503-10S	NA	305	311	273	279	.645	.640	110	106	.022	.022	1,2,5
		4600-8400	Small Base Circle, Broad power range. Best in larger engine. 12.5:1+ CR a must.									
110563-08	NA	305	311	273	279	.680	.640	108	104	.022	.022	1,2,5
		4600-8400	Competition, Upper mid to top end power. 12.5:1+ CR, good heads a must.									
110563-08S	NA	305	311	273	279	.680	.640	108	104	.022	.022	1,2,5
		4600-8400	Small Base Circle, Competition, Upper mid to top end power. 12.5:1+ CR, good heads.									
110563-10	NA	305	311	273	279	.680	.640	110	106	.022	.022	1,2,5
		4600-8400	Broad power range. Best in larger engine. 12.5:1+ CR, good heads a must.									
110563-10S	NA	305	311	273	279	.680	.640	110	106	.022	.022	1,2,5
		4600-8400	Small Base Circle, Broad power range. Best in larger engine. 12.5:1+ CR, good heads.									
111083-06	NA	307	317	275	285	.630	.630	106	102	.022	.022	1,2,5
		5000-8800	Competition profile, good top end power. Needs good parts.									
111083-06S	NA	307	317	275	285	.630	.630	106	102	.022	.022	1,2,5
		5000-8800	Small Base Circle, Competition profile, good top end power. Needs good parts.									
111083-08	NA	307	317	275	285	.630	.630	108	104	.022	.022	1,2,5
		5000-8800	Competition profile, good top end power. Needs good parts.									
111083-08S	NA	307	317	275	285	.630	.630	108	104	.022	.022	1,2,5
		5000-8800	Small Base Circle, Competition profile, good top end power. Needs good parts.									
111083-10	NA	307	317	275	285	.630	.630	110	106	.022	.022	1,2,5
		5000-8800	Competition profile, good top end power. Works good w/NOS.									
111083-10S	NA	307	317	275	285	.630	.630	110	106	.022	.022	1,2,5
		5000-8800	Small Base Circle, Competition profile, good top end power. Works good w/NOS.									
111083-12	NA	307	317	275	285	.630	.630	112	108	.022	.022	1,2,5
		5000-8800	Competition profile, good top end power. Works good w/NOS.									
111083-12S	NA	307	317	275	285	.630	.630	112	108	.022	.022	1,2,5
		5000-8800	Small Base Circle, Competition profile, good top end power. Works good w/NOS.									
111083-14	NA	307	317	275	285	.630	.630	114	110	.022	.022	1,2,5
		5000-8800	Competition profile, good top end power. Works good w/NOS.									

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 2 Requires Thrust Button.
- 5 Requires upgraded distributor gear/fuel pump pushrod.

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CHEVROLET SMALL BLOCK - 262-400 1955-1998

Steel Billet Mechanical Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300

Components Notes: master note list on page 260

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.



CHEVROLET SMALL BLOCK • 262-400 1955-1998

Steel Billet Mechanical Roller Camshafts (cont.)

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
111083-14S	NA	307	317	275	285	.630	.630	114	110	.022	.022	1,2,5
5000-8800 Small Base Circle, Competition profile, good top end power. Works good w/NOS.												
111233-06	NA	309	317	277	285	.675	.645	106	102	.022	.022	1,2,5
5200-8800 All out Competition big cylinder head & compression.												
111233-06S	NA	309	317	277	285	.675	.645	106	102	.022	.022	1,2,5
5200-8800 Small Base Circle, all out Competition big cylinder head & compression.												
111233-10	NA	309	317	277	285	.675	.645	110	106	.022	.022	1,2,5
5200-8800 Works great in big cubic inch small blocks. OK with NOS.												
111233-10S	NA	309	317	277	285	.675	.645	110	106	.022	.022	1,2,5
5200-8800 Small Base Circle, works great in big cubic inch small blocks. OK with NOS.												
110393-14	NA	309	323	277	291	.675	.675	114	110	.022	.022	1,2,5
5200-8800 Works great in big cubic inch small blocks. Works well with multi-stage NOS.												
110393-14S	NA	309	323	277	291	.675	.675	114	110	.022	.022	1,2,5
5200-8800 Small Base Circle, Works great in big cubic inch small blocks. Works with multi-stage NOS.												
111093-06	NA	313	323	281	291	.675	.645	106	102	.022	.022	1,2,5
5600-9000 All out Competition only. Best of everything.												
111093-06S	NA	313	323	281	291	.675	.645	106	102	.022	.022	1,2,5
5600-9000 Small Base Circle, all out Competition only. Best of everything.												
111093-08	NA	313	323	281	291	.675	.645	108	104	.022	.022	1,2,5
5600-9000 All out Competition only. Best of everything.												
119993	NA	Custom Grind Camshaft										1,2,5
Mechanical Roller Special Order Camshaft.												
119993-S	NA	Custom Grind Camshaft, Small Base Circle										1,2,5
Mechanical Roller Special Order Camshaft.												
119999	NA	Custom Grind Camshaft, with Cast Distributor Gear										1,2,5
Mechanical Roller Special Order Camshaft.												
119993-RD	NA	Custom Grind Camshaft, with Rear Drive										1,2,5
Mechanical Roller Special Order Camshaft.												
119997	NA	Custom Grind Camshaft, with 50-55mm Bearing										1,2,5
Mechanical Roller Special Order Camshaft.												
118997	NA	Custom Grind Camshaft, with 50-55mm Bearing, LS (C) Firing Order										1,2,5,24
Mechanical Roller Special Order Camshaft.												



CHEVROLET SMALL BLOCK • 262-400 1955-1998

4/7 Swap Steel Billet Mechanical Roller Camshafts (cont.)

Firing Order: 1•8•7•3•6•5•4•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
114013-06	NA	283	289	251	257	.640	.640	106	102	.022	.022	1,2,5,22
3600-7600 Strong mid-range horsepower, rough idle. Oval Track & Bracket cars.												
114013-06S	NA	283	289	251	257	.640	.640	106	102	.022	.022	1,2,5,22
3600-7600 Small Base Circle, strong mid-range HP, rough idle. Oval Track & Bracket cars.												

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 2 Requires Thrust Button.
- 5 Requires upgraded distributor gear/fuel pump pushrod.
- 24 Ignition firing order must be changed to 1-8-7-2-6-5-4-3.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.

CHEVROLET SMALL BLOCK • 262-400 1955-1998

Steel Billet Mechanical Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
--	--	--	--	--	--	--	--	--	--	--	92151 94475	94400 94402	94300
--	--	--	--	--	--	--	--	--	--	--	92151 94475	94400 94402	94300
--	--	--	--	--	--	--	--	--	--	--	92151 94475	94400 94402	94300
--	--	--	--	--	--	--	--	--	--	--	92151 94475	94400 94402	94300
--	--	--	--	--	--	--	--	--	--	--	92151 94475	94400 94402	94300
--	--	--	--	--	--	--	--	--	--	--	92151 94475	94400 94402	94300

CHEVROLET SMALL BLOCK • 262-400 1955-1998

4/7 Swap Steel Billet Mechanical Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91117 91121	90135	NA	98637 ²⁵ 98543 ²⁵	97130 ¹⁰	97220 ¹⁰ 97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91117 91121	90135	NA	98637 ²⁵ 98543 ²⁵	97130 ¹⁰	97220 ¹⁰ 97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300

Components Notes: master note list on page 260

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



CHEVROLET SMALL BLOCK • 262-400 1955-1998

4/7 Swap Steel Billet Mechanical Roller Camshafts

Firing Order: 1•8•7•3•6•5•4•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
114163-06	NA	287	293	255	261	.600	.620	106	102	.022	.022	1,2,5,22
		3800-7800 Good mid-range horsepower, rough idle. Needs 11.0:1 CR-up.										
114163-06S	NA	287	293	255	261	.600	.620	106	102	.022	.022	1,2,5,22
		3800-7800 Small Base Circle, good mid-range horsepower, rough idle. Needs 11.0:1 CR-up.										
114633-06	NA	289	295	257	263	.615	.615	106	102	.022	.022	1,2,5,22
		4000-7800 Oval Track/Mild Bracket, mid range torque & top end power. 10.5-11.0:1 CR.										
114633-06S	NA	289	295	257	263	.615	.615	106	102	.022	.022	1,2,5,22
		4000-7800 Small Base Circle, Oval Track/Mild Bracket, mid range torque & top end power.										
114173-06	NA	289	295	257	263	.640	.640	106	102	.022	.022	1,2,5,22
		4000-7800 Strong mid-range torque & top end power. Needs 10.5-11.5:1 CR.										
114173-06S	NA	289	295	257	263	.640	.640	106	102	.022	.022	1,2,5,22
		4000-7800 Small Base Circle, Strong mid-range torque & top end power. Needs 10.5-11.5:1 CR.										
114173-08	NA	289	295	257	263	.640	.640	108	104	.022	.022	1,2,5,22
		4000-7800 Strong mid range. Needs good single plane intake, 10.5:1+ CR.										
114173-08S	NA	289	295	257	263	.640	.640	108	104	.022	.022	1,2,5,22
		4000-7800 Small Base Circle, Strong mid range. Needs good single plane intake, 10.5:1+ CR.										
114143-06	NA	289	299	257	267	.600	.600	106	102	.022	.022	1,2,5,22
		4000-7800 Strong mid & upper rpm, banked Oval Track & Brackets w/auto trans.										
114143-06S	NA	289	299	257	267	.600	.600	106	102	.022	.022	1,2,5,22
		4000-7800 Small Base Circle, strong mid & upper rpm, banked Oval Track & Brackets w/auto trans.										
114143-08	NA	289	299	257	267	.600	.600	108	104	.022	.022	1,2,5,22
		4000-7800 Mid & upper RPM torque, good in banked Oval Track & Bracket.										
114143-08S	NA	289	299	257	267	.600	.600	108	104	.022	.022	1,2,5,22
		4000-7800 Small Base Circle, mid & upper RPM torque, good in banked Oval Track & Bracket.										
114053-06	NA	291	295	259	263	.640	.630	106	102	.022	.022	1,2,5,22
		4200-8000 Strong Modified or Limited Sprint winner.										
114053-06S	NA	291	295	259	263	.640	.630	106	102	.022	.022	1,2,5,22
		4200-8000 Small Base Circle, Strong Modified or Limited Sprint winner.										
114323-08	NA	291	295	259	263	.640	.640	108	104	.022	.022	1,2,5,22
		4200-8000 Oval Track/Drag, mid range torque with top end power. Needs good heads.										
114323-08S	NA	291	295	259	263	.640	.640	108	104	.022	.022	1,2,5,22
		4200-8000 Small Base Circle, Oval Track/Drag, mid range torque & top end power.										
114713-06	NA	291	299	259	267	.675	.645	106	102	.022	.022	1,2,5,22
		4200-8000 360-383ci Sprint, Modified. Super fast tracks.										
114713-06S	NA	291	299	259	267	.675	.645	106	102	.022	.022	1,2,5,22
		4200-8000 Small Base Circle, 360-383ci Sprint, Modified. Tacky Track.										
114713-08	NA	291	299	259	267	.675	.645	108	104	.022	.022	1,2,5,22
		4200-8000 360-383ci Sprint, Modified. Super fast or Dry Slick Track										
114713-08S	NA	291	299	259	267	.675	.645	108	104	.022	.022	1,2,5,22
		4200-8000 Small Base Circle, 360-383ci Sprint, Modified. Super fast or Dry Slick Track.										
114023-06	NA	295	301	263	269	.640	.620	106	102	.022	.022	1,2,5,22
		4000-8000 1/4-3/8, Good heads. Dirt Late Model.										
114023-06S	NA	295	301	263	269	.640	.620	106	102	.022	.022	1,2,5,22
		4000-8000 Small Base Circle, 1/4-3/8, Good heads. Dirt Late Model										
114913-08	NA	295	303	263	271	.630	.625	108	104	.022	.022	1,2,5,22
		4000-8000 410 Sprint or big inch Bracket. Strong upper mid-range.										
114913-08S	NA	295	303	263	271	.630	.625	108	104	.022	.022	1,2,5,22
		4000-8000 Small Base Circle, 410 Sprint or big inch Bracket. Strong upper mid-range.										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

2 Requires Thrust Button.

5 Requires upgraded distributor gear/fuel pump pushrod.

22 Ignition firing order must be changed to 1-8-7-3-6-5-4-2.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET SMALL BLOCK • 262-400 1955-1998

4/7 Swap Steel Billet Mechanical Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91117	90135	NA	98637 ²⁵	97130 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91121			98543 ²⁵		97222 ¹⁰				90105 ⁷		94475	94402	
91117	90135	NA	98637 ²⁵	97130 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91121			98543 ²⁵		97222 ¹⁰				90105 ⁷		94475	94402	
91117	90135	NA	98637 ²⁵	97130 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91121			98543 ²⁵		97222 ¹⁰				90105 ⁷		94475	94402	
91117	90135	NA	98637 ²⁵	97130 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91121			98543 ²⁵		97222 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	
91121	90135	NA	98543 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷	95010	92151	94400	94300
91134			98843 ²⁵		97220 ¹⁰				90105 ⁷		94475	94402	

Components Notes: master note list on page 260
⁷ Requires 7/16" rocker studs.
¹⁰ 10° Valve lock Angle, must use matching retainers/locks.
²⁵ Machining Required.

CAMSHAFTS



CHEVROLET SMALL BLOCK • 262-400 1955-1998

4/7 Swap Steel Billet Mechanical Roller Camshafts (cont.) Firing Order: 1•8•7•3•6•5•4•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
114123-06	NA	299	307	267	275	.645	.645	106	102	.022	.022	1,2,5,22
		<i>4400-8200 Competition use, good mid & upper HP, medium to high bank Oval Track.</i>										
114123-06S	NA	299	307	267	275	.645	.645	106	102	.022	.022	1,2,5,22
		<i>4400-8200 Small Base Circle, Competition, mid & upper HP, medium to high bank Oval Track.</i>										
114123-08	NA	299	307	267	275	.645	.645	108	104	.022	.022	1,2,5,22
		<i>4400-8200 Competition use, good mid & upper power, medium to high bank Oval Track.</i>										
114123-08S	NA	299	307	267	275	.645	.645	108	104	.022	.022	1,2,5,22
		<i>4400-8200 Small Base Circle, Competition, mid & upper HP, medium to high bank Oval Track.</i>										
114983-06	NA	301	309	269	277	.650	.650	106	102	.022	.022	1,2,5,22
		<i>4400-8400 Competition/Bracket E.T. Mid to upper rpm horsepower. Good heads, 12.5:1+ CR.</i>										
114983-06S	NA	301	309	269	277	.650	.650	106	102	.022	.022	1,2,5,22
		<i>4400-8400 Small Base Circle, Competition/Bracket E.T. Mid to upper rpm horsepower. 12.5:1+ CR.</i>										
114863-06	NA	301	309	269	277	.675	.650	106	102	.022	.022	1,2,5,22
		<i>4400-8400 Competition/Bracket E.T. Mid to upper rpm horsepower. Good heads, 12.5:1+ CR.</i>										
114863-06S	NA	301	309	269	277	.675	.650	106	102	.022	.022	1,2,5,22
		<i>4400-8400 Small Base Circle, Competition/Bracket E.T. Mid to upper rpm horsepower. Good heads.</i>										
114863-08	NA	301	309	269	277	.675	.650	108	104	.022	.022	1,2,5,22
		<i>4400-8400 Competition/Bracket E.T. Mid to upper end performance. 12.5:1+ CR.</i>										
114863-08S	NA	301	309	269	277	.675	.650	108	104	.022	.022	1,2,5,22
		<i>4400-8400 Small Base Circle, Competition/Bracket E.T. Mid to upper end performance. 12.5:1+ CR.</i>										
114563-08	NA	305	311	273	279	.680	.640	108	104	.022	.022	1,2,5,22
		<i>4600-8400 Competition, Upper mid to top end power. 12.5:1+ CR, good heads a must.</i>										
114563-08S	NA	305	311	273	279	.680	.640	108	104	.022	.022	1,2,5,22
		<i>4600-8400 Small Base Circle, Competition, Upper mid to top end power. 12.5:1+ CR, good heads.</i>										
114033-06	NA	305	315	273	283	.645	.630	106	102	.022	.022	1,2,5,22
		<i>4800-8400 377-400 O.D. 3/8-1/2. Good heads.</i>										
114033-06S	NA	305	315	273	283	.645	.630	106	102	.022	.022	1,2,5,22
		<i>4800-8400 Small Base Circle, 377-400 O.D. 3/8-1/2. Good heads.</i>										
114083-08	NA	307	317	275	285	.630	.630	108	104	.022	.022	1,2,5,22
		<i>5000-8800 Competition profile, good top end power. Needs good parts.</i>										
114083-08S	NA	307	317	275	285	.630	.630	108	104	.022	.022	1,2,5,22
		<i>5000-8800 Small Base Circle, Competition profile, good top end power. Needs good parts.</i>										
114043-08	NA	309	315	277	283	.675	.645	108	104	.022	.022	1,2,5,22
		<i>5200-8600 377+, lighter car. Fast track, Drag w/auto.</i>										
114043-08S	NA	309	315	277	283	.675	.645	108	104	.022	.022	1,2,5,22
		<i>5200-8600 Small Base Circle, 377+, lighter car. Fast track, Drag w/auto.</i>										
114233-06	NA	309	317	277	285	.675	.645	106	102	.022	.022	1,2,5,22
		<i>5200-8800 All out Competition big cylinder head & compression.</i>										
114233-06S	NA	309	317	277	285	.675	.645	106	102	.022	.022	1,2,5,22
		<i>5200-8800 Small Base Circle, all out Competition big cylinder head & compression.</i>										
114073-14S	NA	313	327	281	295	.730	.715	114	110	.022	.022	1,2,5,22
		<i>5600-9000 Small Base Circle, all out Competition only. Needs good valvetrain. Works good w/NOS.</i>										
119994	NA	Custom Grind Camshaft										1,2,5,22
		<i>4/7 Swap Mechanical Roller Special Order Camshaft.</i>										
119994-S	NA	Custom Grind Camshaft, Small Base Circle										1,2,5,22
		<i>4/7 Swap Mechanical Roller Special Order Camshaft.</i>										

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 2 Requires Thrust Button.
- 5 Requires upgraded distributor gear/fuel pump pushrod.
- 22 Ignition firing order must be changed to 1-8-7-3-6-5-4-2.

Some items are not legal for sale or use on any pollution controlled motor vehicle



CHEVROLET SMALL BLOCK • 262-400 1955-1998

4/7 Swap *Steel Billet Mechanical Roller Camshaft Components*

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98543 ²⁵ 98843 ²⁵	97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
91121 91134	90135	NA	98738-A ²⁵ 98825 ²⁵	-- 97130 ¹⁰	97222 ¹⁰ 97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90072 ⁷	90101 ⁷ 90105 ⁷	95010	92151 94475	94400 94402	94300
--	--	--	--	--	--	--	--	--	--	--	92151 94475	94400 94402	94300
--	--	--	--	--	--	--	--	--	--	--	92151 94475	94400 94402	94300

Components Notes: master note list on page 260

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



CHEVROLET GEN III / IV • LS-SERIES 3-BOLT 1997-PRESENT

American Muscle™ Hydraulic Roller Camshafts

Firing Order: 1•8•7•2•6•5•4•3

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
199265-16	CL199265-16	263	269	196	207	.466	.477	116	115	Hyd.	Hyd.	12
		<i>1700-6700 Our version of the GM #12561721. Advanced lobe design for increased performance.</i>										
197245-12	CL197245-12	267	276	219	228	.525	.525	112	108	Hyd.	Hyd.	12
		<i>1700-6700 Our version of the GM Hot cam. Advanced lobe design for increased performance.</i>										
197715-10	CL197715-10	274	285	226	236	.525	.525	110	106	Hyd.	Hyd.	12
		<i>2000-7400 Our version of the GM ASA cam. Advanced lobe design for increased performance.</i>										
197715-13	CL197715-13	274	285	226	236	.525	.525	113	109	Hyd.	Hyd.	12
		<i>1900-7300 Same as #197715-10 w/wider separation for easier tunability & smoother power band.</i>										



CHEVROLET GEN III / IV • LS-SERIES 3-BOLT 1997-PRESENT

Rattler Cams™ Hydraulic Roller Camshafts

Firing Order: 1•8•7•2•6•5•4•3

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
198035-09	CL198035-09	275	282	226	234	.525	.525	109	103	Hyd.	Hyd.	
		<i>2200-6500 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.</i>										
198075-09	CL198075-09	282	290	234	242	.625	.625	109	103	Hyd.	Hyd.	1
		<i>2500-6600 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.</i>										
198135-09	CL198135-09	290	297	242	250	.625	.625	109	103	Hyd.	Hyd.	1
		<i>2400-6800 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.</i>										



CHEVROLET GEN III / IV • LS-SERIES 3-BOLT 1997-PRESENT

BOOST™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•7•2•6•5•4•3

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
190235-14	CL190235-14	269	278	216	224	.551	.551	114	110	Hyd.	Hyd.	1
		<i>1200-6200 Blower, Aggressive Street/Strip, upper torque & horsepower.</i>										
192105-15	CL192105-15	264	277	218	230	.525	.525	115	111	Hyd.	Hyd.	12
		<i>1600-6400 Blower, Best in Street Rod with 5.3 to 5.7L (10+ psi). Great mid range.</i>										
190285-15	CL190285-15	274	274	224	224	.612	.612	115	111	Hyd.	Hyd.	1,12
		<i>1800-6800 Turbo, Street/Strip performance, Good mid range power.</i>										
190385-15	CL190385-15	274	286	224	234	.612	.638	115	111	Hyd.	Hyd.	1,12
		<i>1800-7000 Blower Aggressive Street/Strip, ideal for supercharged or NOS applications.</i>										
190915-16	CL190915-16	284	280	236	232	.625	.625	116	114	Hyd.	Hyd.	1,12
		<i>2600-7200 Turbo, Street/Strip Turbo'd (remote) applications. Strong mid & upper rpm performance.</i>										
193865-15	CL193865-15	274	286	236	244	.625	.625	115	111	Hyd.	Hyd.	1,12
		<i>1800-7000 Blower, Aggressive Street/Strip, ideal for supercharged or NOS applications.</i>										
190305-15	CL190305-15	290	290	242	242	.625	.625	115	111	Hyd.	Hyd.	1,12
		<i>2800-7400 Turbo, Competition, large cubic inch. Needs aftermarket heads & intake, plus higher CR.</i>										

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 12 Requires custom programmer/tuning.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET GEN III / IV • LS-SERIES 3-BOLT 1997-PRESENT

American Muscle™ Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91113 ³ 91166 ³³	NA	98113-K1 98116-K1	98113 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98113-K1 98116-K1	98113 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98113-K1 98116-K1	98113 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98113-K1 98116-K1	98113 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷

CHEVROLET GEN III / IV • LS-SERIES 3-BOLT 1997-PRESENT

Rattler Cams™ Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91113 ³ 91166 ³³	NA	98113-K1 98116-K1	98113 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷

CHEVROLET GEN III / IV • LS-SERIES 3-BOLT 1997-PRESENT

BOOST™ Hydraulic Flat Tappet Camshafts

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91113 ³ 91166 ³³	NA	98113-K1 98116-K1	98113 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91156 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91156 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91156 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷

Components Notes: master note list on page 260

- ³ Included in Cam & Lifter Sets.
- ¹⁰ 10° Valve lock Angle, must use matching retainers/locks.
- ²⁵ Machining Required.
- ²⁶ LS-Series 3-Bolt '97-'05.

- ²⁷ LS-Series 3-Bolt '06-present.
- ³⁰ LS-Series Gen III.
- ³¹ LS-Series Gen IV.
- ³³ Tie bar style lifters.



CHEVROLET GEN III / IV • LS-SERIES 3-BOLT 1997-PRESENT

LS-SERIES 3-BOLT '97-PRESENT WITH CATHEDRAL PORT HEADS

Part No.	Displacement	Year Range	Applications
LS1	5.7L	1997-2004	'97-'04 Corvette, '98-'02 Camaro/Trans Am, '04 Pontiac GTO
LS2	6.0L	2005-2009	'05-'07 Buick Rainer, '05-'06 Pontiac GTO, '06-'07 Cadillac CTS-V, '05-'07 Corvette, '05-'09 SSR, '06-'09 Trailblazer SS
LS6	5.7L	2001-2005	'01-'04 Corvette Z06, '04-'05 Cadillac CTS-V
LM4	4.8L	2003-2004	'03-'04 Trailblazer EXT, '04 Envoy XL, '03-'04 SSR, '04 Buick Rainer
LM7	5.3L	1999-2007	'99-'06 Tahoe/Yukon, '99-'06 Suburban/Yukon XL, '99-'07 Silverado/Sierra, '02-'05 Escalade 2WD, '02-'06 Avalanche, '03-'07 Express, '03-'07 Savana
LR4	4.8L	1999-2007	'99-'06 Tahoe/Yukon, '99-'07 Silverado/Sierra, '03-'07 Express 2500-3500, '03-'07 Savana 2500-3500
LQ4	6.0L	1999-2007	'99-'01 Silverado/Sierra 2500-3500, '99-'01 Express, '99-'01 Savana, '99-'01 Suburban/Yukon XL, '03-'07 Hummer H2
LQ9	6.0L	2002-2007	'02-'06 Escalade, '02-'06 Escalade EXT & ESV, '03-'07 Silverado SS, '04-'05 Silverado/Sierra HO, '06-'07 Silverado/Sierra MAX Option
L33	5.3L	2005-2007	'05-'07 Silverado/Sierra 4WD
L59	5.3L	2002-2007	'02-'07 Silverado/Sierra, '02-'06 Tahoe/Yukon, '02-'06 Suburban/Yukon XL

Note: If using Rectangular Port heads (OE or aftermarket) on any of above engines, please use cams from LS-Series with Rectangular Port Heads.

Hydraulic Roller Camshafts (w/Cathedral Port Heads)

Firing Order: 1•8•7•2•6•5•4•3

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
194545-14	CL194545-14	250	256	204	210	.525	.525	114	110	Hyd.	Hyd.	
<i>800-5000 Good increase over stock in mid to upper end. May need programmer for best results.</i>												
195815-14	CL195815-14	259	265	207	213	.556	.566	114	110	Hyd.	Hyd.	12
<i>1000-5800 Big torque in 4.8L, 5.3L or 5.7L Hi Lift Version 192705-14</i>												
192705-14	CL192705-14	255	261	208	214	.525	.525	114	110	Hyd.	Hyd.	12
<i>1000-5600 Big torque in 4.8L, 5.3L or 5.7L. Needs good intake and exhaust.</i>												
190315-14	CL190315-14	260	264	210	214	.595	.598	114	110	Hyd.	Hyd.	1
<i>1000-5800 High lift short duration design. Great throttle response.</i>												
192005-12	CL192005-12	261	267	214	220	.525	.525	112	108	Hyd.	Hyd.	
<i>1400-6000 Great for Street Rod transplant with 5-3-5.7L. Good all around performance.</i>												
190235-14	CL190235-14	269	278	216	224	.551	.551	114	110	Hyd.	Hyd.	1
<i>1200-6200 Aggressive Street/Strip, upper torque & horsepower.</i>												
190275-17	CL190275-17	272	278	216	224	.553	.553	117	113	Hyd.	Hyd.	1
<i>1400-6400 Street/Strip, Great mid to upper end power. 9.5:1+ CR. Best with minor tune.</i>												
190255-13	CL190255-13	270	270	218	218	.604	.604	113	109	Hyd.	Hyd.	1,12
<i>1500-6500 Good drivability with great mid range power. Also good in turbocharged applications.</i>												
190395-13	CL190395-13	270	274	218	224	.604	.612	113	109	Hyd.	Hyd.	1,12
<i>1600-6600 Great mid range performance with top end power.</i>												
190295-12	CL190295-12	270	275	218	224	.604	.604	112	108	Hyd.	Hyd.	1,12
<i>1600-6600 Mid range to top end power & torque. Nice throttle response.</i>												
190225-13	CL190225-13	272	272	222	222	.561	.561	113	109	Hyd.	Hyd.	1,12
<i>1800-6500 Street/Strip power. Great mid range with top end performance. OK with turbocharger.</i>												
190245-12	CL190245-12	272	281	222	225	.561	.578	112	108	Hyd.	Hyd.	1,12
<i>1800-6600 Street/Strip applications, mid-range torque & horsepower.</i>												
190285-13	CL190285-13	274	274	224	224	.612	.612	113	109	Hyd.	Hyd.	1,12
<i>1800-6800 Street/Strip performance, Good mid range power. Needs good heads.</i>												
190285-15	CL190285-15	274	274	224	224	.612	.612	115	111	Hyd.	Hyd.	1,12
<i>1800-6800 Street/Strip performance, Good mid range power.</i>												
190375-12	CL190375-12	274	280	224	230	.609	.604	112	108	Hyd.	Hyd.	1,12
<i>1800-6800 Broad power range. Best with Cathedral Port heads & aftermarket intake.</i>												
190375-15	CL190375-15	274	280	224	230	.609	.604	115	111	Hyd.	Hyd.	1,12
<i>1800-6800 Broad power range. Best with Cathedral Port heads & aftermarket intake.</i>												
190385-10	CL190385-10	274	286	224	234	.612	.638	110	106	Hyd.	Hyd.	1,12
<i>1800-7000 Aggressive Street/Strip, Good mid range horsepower.</i>												
190385-12	CL190385-12	274	286	224	234	.612	.638	112	108	Hyd.	Hyd.	1,12
<i>1800-7000 Aggressive Street/Strip, also great with small blower or NOS.</i>												

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 12 Requires custom programmer/tuning.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET GEN III / IV • LS-SERIES 3-BOLT 1997-PRESENT

Hydraulic Roller Camshaft (w/Cathedral Port Heads) Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91113 ³ 91166 ³³	NA	98113-K1 98116-K1	98113 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98113-K1 98116-K1	98113 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98113-K1 98116-K1	98113 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98113-K1 98116-K1	98113 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98113-K1 98116-K1	98113 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98113-K1 98116-K1	98113 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98113-K1 98116-K1	98113 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98113-K1 98116-K1	98113 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98113-K1 98116-K1	98113 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷

Components Notes: master note list on page 260

- 3 Included in Cam & Lifter Sets.
- 10 10° Valve lock Angle, must use matching retainers/locks.
- 25 Machining Required.
- 26 LS-Series 3-Bolt '97-'05.

- 27 LS-Series 3-Bolt '06-present.
- 30 LS-Series Gen III.
- 31 LS-Series Gen IV.
- 33 Tie bar style lifters.

CAMSHAFTS



CHEVROLET GEN III / IV • LS-SERIES 3-BOLT 1997-PRESENT

Hydraulic Roller Camshafts (w/Cathedral Port Heads) (cont.)

Firing Order: 1•8•7•2•6•5•4•3

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes	
		IN	EX	IN	EX	IN	EX			IN	EX		
190735-13	CL190735-13	274	274	226	226	.525	.525	113	109	Hyd.	Hyd.	12	
		1900-7100 Street/Strip, Good mid & upper range torque & performance. OK with turbocharger.											
190325-12	CL190325-12	281	284	226	232	.578	.587	112	108	Hyd.	Hyd.	1,12	
		2000-7200 Aggressive Street/Strip, upper torque & horsepower. Needs good heads.											
190325-15	CL190325-15	281	284	226	232	.578	.587	115	111	Hyd.	Hyd.	1,12	
		2000-7200 Aggressive Street/Strip, upper torque & horsepower.											
196765-10	CL196765-10	275	282	228	234	.604	.609	110	106	Hyd.	Hyd.	1,12	
		2400-7000 Hot Street applications. Engine Swap w/Carb.											
196765-12	CL196765-12	275	282	228	234	.604	.609	112	108	Hyd.	Hyd.	1,12	
		2400-7000 Hot Street applications. Needs aftermarket heads & intake, higher CR.											
190965-13	CL190965-13	278	280	230	232	.625	.625	113	109	Hyd.	Hyd.	1,12	
		2400-7200 Competition, Great mid range torque and power. Good heads, 2500+ stall											
190335-13	CL190335-13	278	294	230	246	.625	.625	113	109	Hyd.	Hyd.	1,12	
		2000-7000 Hot Street/Strip. Great mid range performance. Best with aftermarket heads.											
196025-12	CL196025-12	283	284	232	234	.598	.598	112	108	Hyd.	Hyd.	1,12	
		2200-7000 Street/Strip performance, Good throttle response. Best with aftermarket heads.											
196915-10	CL196915-10	283	287	232	236	.598	.604	110	106	Hyd.	Hyd.	1,12	
		2200-7000 Street/Strip performance, Good mid range power. Needs good heads.											
196915-12	CL196915-12	283	287	232	236	.598	.604	112	108	Hyd.	Hyd.	1,12	
		2300-7100 Street/Strip performance, Good mid range power. Needs good heads.											
196915-14	CL196915-14	283	287	232	236	.598	.604	114	110	Hyd.	Hyd.	1,12	
		2300-7100 Street/Strip performance, Good mid range power. Needs good heads. Turbo											
190355-12	CL190355-12	280	284	232	236	.625	.625	112	108	Hyd.	Hyd.	1,12	
		2200-7200 Fair idle, Excellent mid range performance. 2500+ stall, 10.5:1 CR, 3.70-4.20 gear											
190365-15	CL190365-15	282	278	234	230	.625	.625	115	111	Hyd.	Hyd.	1,12	
		2400-7200 Street/Strip performance, Good mid range power. Needs good heads. Great with turbo.											
190265-10	CL190265-10	287	290	236	242	.612	.612	110	106	Hyd.	Hyd.	1,12	
		2600-7200 Hot Street/Strip. Great mid range torque. 2800+ stall, 11.0:1+ CR, better heads/intake.											
190265-13	CL190265-13	287	290	236	242	.612	.612	113	109	Hyd.	Hyd.	1,12	
		2600-7200 Large cubic inch, Race only applications. Needs aftermarket heads & intake, higher CR.											
190265-15	C190265-15	287	290	236	242	.612	.612	115	111	Hyd.	Hyd.	1,12	
		2600-7200 Large cubic inch, Race only applications. Needs aftermarket heads & intake, higher CR.											
190405-13	CL190405-13	288	295	240	248	.625	.625	113	109	Hyd.	Hyd.	1,12	
		2800-7200 Broad top end power. Needs aftermarket heads & intake, plus higher CR. Good w/turbo.											
190305-15	CL190305-15	290	290	242	242	.625	.625	115	111	Hyd.	Hyd.	1,12	
		2800-7400 Competition, large cubic inch. Needs aftermarket heads & intake, plus higher CR.											
199995	NA	Custom Grind Camshaft									Hyd.	Hyd.	1,12
		Hydraulic Roller Special Order Camshaft.											

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 12 Requires custom programmer/tuning.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET GEN III / IV • LS-SERIES 3-BOLT 1997-PRESENT

Hydraulic Roller Camshaft (w/Cathedral Port Heads) Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91113 ³ 91166 ³³	NA	98113-K1 98116-K1	98113 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵ 90095 ³¹	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98113-K1 98116-K1	98113 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵ 90095 ³¹	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98113-K1 98116-K1	98113 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵ 90095 ³¹	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵ 90095 ³¹	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵ 90095 ³¹	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵ 90095 ³¹	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵ 90095 ³¹	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵ 90095 ³¹	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵ 90095 ³¹	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵ 90095 ³¹	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵ 90095 ³¹	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵ 90095 ³¹	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵ 90095 ³¹	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵ 90095 ³¹	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵ 90095 ³¹	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵ 90095 ³¹	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵ 90095 ³¹	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	--	--	--	--	--	--	--	NA	--	NA	NA	94308 ²⁶ 94307 ²⁷

Components Notes: master note list on page 260

- 3 Included in Cam & Lifter Sets.
- 10 10° Valve lock Angle, must use matching retainers/locks.
- 25 Machining Required.
- 26 LS-Series 3-Bolt '97-'05.

- 27 LS-Series 3-Bolt '06-present.
- 30 LS-Series Gen III.
- 31 LS-Series Gen IV.
- 33 Tie bar style lifters.

CAMSHAFTS



CHEVROLET GEN III / IV • LS-SERIES 3-BOLT 1997-PRESENT

LS-SERIES 3-BOLT '97-PRESENT WITH RECTANGULAR PORT HEADS

LS7	7.0L	2006-Present	'06-Present Corvette Z06
LS9	6.2L	2009	'09 Corvette ZR1

Hydraulic Roller Camshafts (w/Rectangular Port Heads)

Firing Order: 1•8•7•2•6•5•4•3

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes	
		IN	EX	IN	EX	IN	EX			IN	EX		
190385-12	CL190385-12	274	286	224	234	.612	.638	112	108	Hyd.	Hyd.	1,12	
		<i>1800-7000 Aggressive Street/Strip, also great with small blower or NOS.</i>											
190735-13	CL190735-13	274	274	226	226	.525	.525	113	109	Hyd.	Hyd.	12	
		<i>1900-7100 Street/Strip, Good mid & mid range torque & performance. Ok with turbocharger.</i>											
190325-12	CL190325-12	281	284	226	232	.578	.587	112	108	Hyd.	Hyd.	1,12	
		<i>2000-7200 Aggressive Street/Strip, mid torque & horsepower. Needs good heads.</i>											
190325-15	CL190325-15	281	284	226	232	.578	.587	115	111	Hyd.	Hyd.	1,12	
		<i>2000-7200 Aggressive Street/Strip, upper torque & horsepower.</i>											
192865-13	CL192865-13	275	291	227	243	.607	.618	113	109	Hyd.	Hyd.	1,12	
		<i>2200-6800 Street/Strip, broad power & torque range. Good heads a plus.</i>											
196765-12	CL196765-12	275	282	228	234	.604	.609	112	108	Hyd.	Hyd.	1,12	
		<i>2600-7200 Street/Strip performance. Needs aftermarket heads & intake, higher CR.</i>											
190345-13	CL190345-13	278	297	230	250	.625	.625	113	109	Hyd.	Hyd.	1,12	
		<i>2200-7200 Hot Street/Strip with blower or large NOS system. Big mid range power.</i>											
196915-10	CL196915-10	283	287	232	236	.598	.604	110	106	Hyd.	Hyd.	1,12	
		<i>2400-7200 Hot Street/Strip performance, Good mid range power. Needs good heads & gears.</i>											
196915-12	CL196915-12	283	287	232	236	.598	.604	112	108	Hyd.	Hyd.	1,12	
		<i>2400-7200 Hot Street/Strip performance, Good mid range power. Needs good heads & gears.</i>											
196915-14	CL196915-14	283	287	232	236	.598	.604	114	110	Hyd.	Hyd.	1,12	
		<i>2400-7200 Hot Street/Strip performance, Better idle than 12</i>											
190365-15	CL190365-15	282	278	234	230	.625	.625	115	111	Hyd.	Hyd.	1,12	
		<i>2400-7000 Street/Strip performance, Good mid range power. Needs good heads. Turbo applications OK.</i>											
190915-16	CL190915-16	284	280	236	232	.625	.625	116	114	Hyd.	Hyd.	1,12	
		<i>2400-7200 Hot Street/Strip performance, Aggressive Turbo Power</i>											
190905-12	CL190905-12	287	290	236	238	.612	.604	112	108	Hyd.	Hyd.	1,12	
		<i>2400-7400 Large cubic inch, Race only applications. Needs aftermarket intake, 2500+ stall.</i>											
190805-12	CL190805-12	284	297	236	250	.625	.625	112	108	Hyd.	Hyd.	1,12	
		<i>2600-7200 Large cubic inch, Race only applications. Needs aftermarket heads & intake, higher CR.</i>											
190805-15	CL190805-15	284	297	236	250	.625	.625	115	111	Hyd.	Hyd.	1,12	
		<i>2600-7200 Large cubic inch, Race only applications. Needs aftermarket heads. Great with NOS.</i>											
190865-13	CL190865-13	288	304	240	256	.625	.625	113	109	Hyd.	Hyd.	1,12	
		<i>2600-7200 Large cubic inch, Race only applications. Needs aftermarket heads & intake, higher CR.</i>											
190305-15	CL190305-15	290	290	242	242	.625	.625	115	111	Hyd.	Hyd.	1,12	
		<i>2800-7400 Competition, large cubic inch. Needs aftermarket heads & intake, plus higher CR. Turbo OK.</i>											
199995	NA	Custom Grind Camshaft									Hyd.	Hyd.	1,12
		<i>Hydraulic Roller Special Order Camshaft.</i>											

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 12 Requires custom programmer/tuning.

Some items are not legal for sale or use on any pollution controlled motor vehicle



CHEVROLET GEN III / IV • LS-SERIES 3-BOLT 1997-PRESENT

Hydraulic Roller Camshaft (w/Rectangular Port Heads) Components

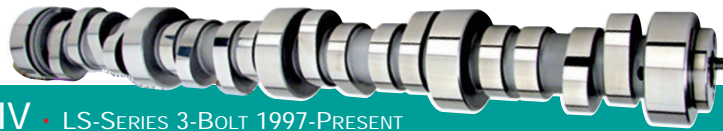
Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98113-K1 98116-K1	98113 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98113-K1 98116-K1	98113 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98113-K1 98116-K1	98113 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	--	--	--	--	--	--	--	NA	--	NA	NA	94308 ²⁶ 94307 ²⁷

Components Notes: master note list on page 260

- ³ Included in Cam & Lifter Sets.
- ¹⁰ 10° Valve lock Angle, must use matching retainers/locks.
- ²⁵ Machining Required.
- ²⁶ LS-Series 3-Bolt '97-'05.

- ²⁷ LS-Series 3-Bolt '06-present.
- ³⁰ LS-Series Gen III.
- ³¹ LS-Series Gen IV.
- ³³ Tie bar style lifters.

CAMSHAFTS



CHEVROLET GEN III / IV • LS-SERIES 3-BOLT 1997-PRESENT

Hydraulic Roller Camshafts For Carbureted Applications

Firing Order: 1•8•7•2•6•5•4•3

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
190315-08	CL190315-08	260	264	210	214	.595	.598	108	104	Hyd.	Hyd.	1
		<i>1000-5800 High lift short duration design. Great throttle response.</i>										
190395-10	CL190395-10	270	274	218	224	.604	.612	110	106	Hyd.	Hyd.	1,12
		<i>1600-6600 Great mid range performance with top end power.</i>										
190375-10	CL190375-10	274	280	224	230	.609	.604	110	106	Hyd.	Hyd.	1,12
		<i>1800-6800 Broad power range. Best with Cathedral Port heads.</i>										
190325-10	CL190325-10	281	284	226	232	.578	.587	110	106	Hyd.	Hyd.	1,12
		<i>2000-7200 Aggressive Street/Strip, upper torque & horsepower. Needs good heads.</i>										
192435-10	CL192435-10	280	290	230	238	.604	.604	110	106	Hyd.	Hyd.	1,12
		<i>2200-7200 Street/Strip performance, Good mid range power. Needs good heads.</i>										
193865-10	CL193865-10	284	292	236	244	.625	.625	110	106	Hyd.	Hyd.	1,12
		<i>2600-7200 Large cubic inch. Needs aftermarket heads & intake, higher CR.</i>										
190405-10	CL190405-10	288	295	240	248	.625	.625	110	106	Hyd.	Hyd.	1,12
		<i>2700-7200 Hot Street/Strip Rod. Good Heads & Intake Higher Compression Ratio</i>										
192965-10	CL192965-10	292	300	244	252	.651	.625	110	106	Hyd.	Hyd.	1,12
		<i>2600-7200 Large cubic inch, Race only applications. Needs aftermarket heads & intake, higher CR.</i>										
199995	NA	Custom Grind Camshaft								Hyd.	Hyd.	1,12
		<i>Hydraulic Roller Special Order Camshaft.</i>										



CHEVROLET GEN III / IV • LS-SERIES 3-BOLT 1997-PRESENT

Mechanical Roller Camshafts

Firing Order: 1•8•7•2•6•5•4•3

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
199993	NA	Custom Grind Camshaft								Hyd.	Hyd.	1,12
		<i>Mechanical Roller Special Order Camshaft.</i>										

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 12 Requires custom programmer/tuning.

Some items are not legal for sale or use on any pollution controlled motor vehicle



CHEVROLET GEN III / IV • LS-SERIES 3-BOLT 1997-PRESENT

Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵ 90095 ³¹	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵ 90095 ³¹	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵ 90095 ³¹	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵ 90095 ³¹	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵ 90095 ³¹	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵ 90095 ³¹	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 ³ 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵ 90095 ³¹	90097 ³⁰ 90095 ³¹	NA	95018	NA	NA	94308 ²⁶ 94307 ²⁷
91113 91166 ³³	NA	--	--	--	--	--	--	--	NA	--	NA	NA	94308 ²⁶ 94307 ²⁷

CHEVROLET GEN III / IV • LS-SERIES 3-BOLT 1997-PRESENT

Mechanical Roller Camshaft Components

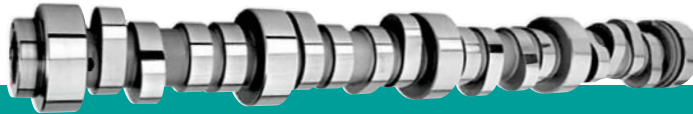
Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91177 91179	NA	--	--	--	--	--	--	--	NA	--	NA	NA	94308 ²⁶ 94307 ²⁷

Components Notes: master note list on page 260

- ³ Included in Cam & Lifter Sets.
- ¹⁰ 10° Valve lock Angle, must use matching retainers/locks.
- ²⁵ Machining Required.
- ²⁶ LS-Series 3-Bolt '97-'05.

- ²⁷ LS-Series 3-Bolt '06-present.
- ³⁰ LS-Series Gen III.
- ³¹ LS-Series Gen IV.
- ³³ Tie bar style lifters.

CAMSHAFTS



CHEVROLET GEN IV • LS-SERIES SINGLE-BOLT 2005-PRESENT WITHOUT VVT

Hydraulic Roller Camshafts

Firing Order: 1•8•7•2•6•5•4•3

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
190226-13	NA	272	272	222	222	.561	.561	113	109	Hyd.	Hyd.	1,12
1800-6500 Street/Strip power. Great mid range with top end performance. OK with turbocharger.												
190976-12	NA	272	284	222	232	.561	.587	112	108	Hyd.	Hyd.	1,12
1800-6800 Street/Strip applications, mid-range torque & horsepower.												
190536-16	NA	275	274	228	224	.625	.612	116	112	Hyd.	Hyd.	1,12
2000-6800 Street, Street/Strip Turbo'd (remote) applications. Strong mid range torque. 2000+ stall.												
190496-12	NA	279	289	228	238	.588	.604	112	108	Hyd.	Hyd.	1,12
2200-7000 Street/Mild Race, Broad torque range. Great mid range performance.												
197096-12	NA	278	290	230	242	.625	.625	112	108	Hyd.	Hyd.	1,12
2000-7000 Street/Strip performance, Good mid range power. Needs good heads.												
190916-16	NA	284	280	236	232	.625	.625	116	114	Hyd.	Hyd.	1,12
2600-7200 Street/Strip Turbo'd (remote) applications. Strong mid & upper rpm performance.												
190806-12	NA	284	297	236	250	.625	.625	112	108	Hyd.	Hyd.	1,12
2400-7200 Aggressive Street/Competition, Good mid to upper end horsepower. 2500+ stall.												
190866-13	NA	288	304	240	256	.625	.625	113	109	Hyd.	Hyd.	1,12
2600-7200 Competition, Great top end power. 2800+ stall, aftermarket intake & better heads.												
190926-13	NA	292	307	244	260	.625	.625	113	109	Hyd.	Hyd.	1,12
2800-7400 Competition, large cubic inch. Great high rpm power. 3000+ stall.												
199996	NA	Custom Grind Camshaft Hydraulic Roller Special Order Camshaft.										1,12



CHEVROLET GEN IV • LS-SERIES SINGLE-BOLT 2005-PRESENT WITHOUT VVT

Mechanical Roller Camshafts

Firing Order: 1•8•7•2•6•5•4•3

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
199996	NA	Custom Grind Camshaft Mechanical Roller Special Order Camshaft.										1,12

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 12 Requires custom programmer/tuning.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET GEN III / IV • LS-SERIES 3-BOLT 1997-PRESENT

Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91113 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90095	NA	95018	NA	NA	94304 ²⁸ 94306 ²⁹
91113 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90095	NA	95018	NA	NA	94304 ²⁸ 94306 ²⁹
91113 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90095	NA	95018	NA	NA	94304 ²⁸ 94306 ²⁹
91113 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90095	NA	95018	NA	NA	94304 ²⁸ 94306 ²⁹
91113 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90095	NA	95018	NA	NA	94304 ²⁸ 94306 ²⁹
91113 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90095	NA	95018	NA	NA	94304 ²⁸ 94306 ²⁹
91113 91166 ³³	NA	98112-K1 98116-K1	98112 98116	97161 97162	-- 97212 ¹⁰	93001 93092 ¹⁰	93385 ²⁵	90095	NA	95018	NA	NA	94304 ²⁸ 94306 ²⁹
91113 91166 ³³	NA	--	--	--	--	--	--	--	NA	--	NA	NA	94304 ²⁸ 94306 ²⁹

CHEVROLET GEN III • LS-SERIES 3-BOLT 1997-PRESENT

Mechanical Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91177 91179	NA	--	--	--	--	--	--	--	NA	--	NA	NA	94304 ²⁸ 94306 ²⁹

Components Notes: master note list on page 260

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

²⁸ LS-Series Single-Bolt 05-present, LS2/LSR/LR4.

²⁹ LS-Series Single-Bolt 07-10 LS3 6.0L, 08-10 6.2L.

³³ Tie bar style lifters.

CAMSHAFTS



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

Max Certified™ Hydraulic Flat Tappet Cam & Lifter Sets - 5 Year No Fault Warranty (see page 3 for details)

Cam & Lifter Set Part No.	Cam & Direct Lube Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
MC122501-12	MC122501-12DL ⁴	259	263	205	209	.476	.476	112	108	Hyd.	Hyd.	1
		<i>800-4000 Great low end torque replacement cam, good fuel economy.</i>										
MC120021-12	MC120021-12DL ⁴	259	269	205	215	.476	.516	112	108	Hyd.	Hyd.	1
		<i>800-4000 Exceptional low end torque. Good in PUs, 4x4s & RVs.</i>										
MC120931-12	MC120931-12DL ⁴	267	267	213	213	.510	.510	112	108	Hyd.	Hyd.	1
		<i>1500-5000 Good idle, Street, Off-Road, Towing. Good fuel efficiency.</i>										
MC120031-12	MC120031-12DL ⁴	269	279	215	225	.516	.527	112	108	Hyd.	Hyd.	1
		<i>1600-5200 Great low & mid-range torque. OK in heavy vehicle.</i>										
MC122521-15	MC122521-15DL ⁴	275	289	221	235	.504	.504	115	111	Hyd.	Hyd.	1
		<i>1800-5400 Fair idle. Excellent in Performance & Marine applications.</i>										
MC120941-11	MC120941-11DL ⁴	279	279	225	225	.527	.527	111	107	Hyd.	Hyd.	1
		<i>1800-5400 Fair idle. Strong mid-range. Needs 4 barrel & headers.</i>										



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

American Muscle™ Hydraulic Flat Tappet Camshafts Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
127641-14	CL127641-14	286	286	196	196	.412	.412	114	110	Hyd.	Hyd.	
		<i>1000-4500 Smooth idle, near duplicate of the Chev LS1 335HP/427 cam (GM #3874872).</i>										
127061-13	CL127061-13	346	348	210	213	.473	.473	113	109	Hyd.	Hyd.	1
		<i>1200-4600 Near duplicate of the Chev L78 425HP/427 cam (GM #3883986).</i>										



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

Street Force™ Hydraulic Flat Tappet Camshafts Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
120021-12	CL120021-12	259	269	205	215	.476	.516	112	108	Hyd.	Hyd.	1
		<i>800-4000 Street Force™ 1, Good idle, Mild Street performance, strong low end torque.</i>										
120031-12	CL120031-12	269	279	215	225	.516	.527	112	108	Hyd.	Hyd.	1
		<i>1200-5200 Street Force™ 2, Good idle & throttle response. Needs 4 barrel & good exhaust.</i>										
122121-12	CL122121-12	279	289	225	235	.527	.533	112	108	Hyd.	Hyd.	1
		<i>1600-6000 Street Force™ 3, Noticeable idle, Hot Street & mild Bracket Racing.</i>										
122441-12	CL122441-12	289	295	235	241	.553	.533	112	108	Hyd.	Hyd.	1
		<i>2400-6600 Street Force™ 4, Lopey idle, good mid-range power. Needs 2800+ stall.</i>										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

4 Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

Max Certified™ Hydraulic Flat Tappet Cam & Lifter Set Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111 ³ 91116 ⁴	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91116 ⁴	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91116 ⁴	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91116 ⁴	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91116 ⁴	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91116 ⁴	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305

CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

American Muscle™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305

CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

Street Force™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305

Components Notes: master note list on page 260

- ³ Included in Cam & Lifter Sets.
- ⁴ Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.
- ¹⁰ 10° Valve lock Angle, must use matching retainers/locks.
- ²⁵ Machining Required.

CAMSHAFTS



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

Rattler Cams™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
128001-09	CL128001-09	281	289	227	235	.545	.553	109	103	Hyd.	Hyd.	1
<i>1800-5600 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.</i>												
128041-09	CL128041-09	289	297	235	243	.553	.545	109	103	Hyd.	Hyd.	1
<i>2000-5900 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.</i>												
128101-09	CL128101-09	297	305	243	251	.545	.561	109	103	Hyd.	Hyd.	1
<i>2400-6200 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.</i>												



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

BOOST™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
129141-14	CL129141-14	279	289	225	235	.555	.553	114	110	Hyd.	Hyd.	1
<i>1800-5600 Blower, Fair idle. High Performance Street, stock converter ok, best with 1800+ and gears.</i>												
129261-14	CL129261-14	289	299	235	245	.553	.553	114	110	Hyd.	Hyd.	1
<i>2200-5900 Blower, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.</i>												
129421-14	CL129421-14	303	313	243	251	.595	.595	114	110	Hyd.	Hyd.	1
<i>2500-6400 Blower, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.</i>												



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
122501-12	CL122501-12	259	263	205	209	.476	.476	112	108	Hyd.	Hyd.	1
<i>800-4000 Great low end torque replacement cam, good fuel economy.</i>												
122511-11	CL122511-11	263	263	209	209	.476	.476	111	107	Hyd.	Hyd.	1
<i>800-4200 Low end performer, smooth idle. Good fuel efficiency.</i>												
120931-12	CL120931-12	267	267	213	213	.510	.510	112	108	Hyd.	Hyd.	1
<i>1200-5000 Good idle, Street, Off-Road, Towing. Good fuel efficiency.</i>												
120991-10	CL120991-10	275	275	221	221	.533	.533	110	106	Hyd.	Hyd.	1
<i>1400-5600 Good low & mid-range horsepower. Needs 4 barrel & headers.</i>												
120951-10	CL120951-10	275	285	221	231	.533	.533	110	106	Hyd.	Hyd.	1
<i>1500-5800 Street & Strip. Needs 4 barrel, headers & lower gears.</i>												
120951-12	CL120951-12	275	285	221	231	.533	.533	112	108	Hyd.	Hyd.	1
<i>1500-5800 Hot Street, Improved carburetion, exhaust & lower gears needed.</i>												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

Some items are not legal for sale or use on any pollution controlled motor vehicle



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

Rattler Cams™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305

CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

BOOST™ Hydraulic Flat Tappet Camshafts

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91112 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91112 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91112 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305

CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.



Hydraulic Flat Tappet Camshafts (cont.)

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
120951-14	CL120951-14	275	285	221	231	.533	.533	114	110	Hyd.	Hyd.	1
		<i>1500-5800 Hot Street, Improved carburetion, exhaust & lower gears needed.</i>										
122521-15	CL122521-15	275	289	221	235	.504	.504	115	111	Hyd.	Hyd.	1
		<i>1600-5600 Fair idle. Excellent in Performance & Marine applications.</i>										
120941-11	CL120941-11	279	279	225	225	.527	.527	111	107	Hyd.	Hyd.	1
		<i>1500-5800 Fair idle. Strong mid-range. Needs 4 barrel & headers.</i>										
120241-09	CL120241-09	279	285	225	231	.527	.533	109	105	Hyd.	Hyd.	1
		<i>1600-5800 Fair idle, Nice mid range torque. 4bbl., headers & 2500+ stall suggested.</i>										
122121-10	CL122121-10	279	289	225	235	.527	.533	110	106	Hyd.	Hyd.	1
		<i>1600-6000 Hot Marine, Performance MerCruisers. Fair idle.</i>										
122121-14	CL122121-14	279	289	225	235	.527	.533	114	110	Hyd.	Hyd.	1
		<i>1600-6000 Hot Marine, Performance MerCruisers. Fair idle.</i>										
120051-10	CL120051-10	285	285	231	231	.510	.510	110	106	Hyd.	Hyd.	1
		<i>2000-6400 Noticeable idle, great with oval port heads.</i>										
120961-11	CL120961-11	285	285	231	231	.533	.533	111	107	Hyd.	Hyd.	1
		<i>2000-6400 Street/Strip, lots of torque. Auto OK with 3.55+ gears.</i>										
120761-10	CL120761-10	285	289	231	235	.544	.553	110	106	Hyd.	Hyd.	1
		<i>2000-6500 Lopey idle, Strong mid range. Good throttle response. 2400+ stall</i>										
122441-08	CL122441-08	289	295	235	241	.553	.533	108	104	Hyd.	Hyd.	1
		<i>2400-6400 Lopey idle. Moderate Performance & Bracket Racing.</i>										
122441-10	CL122441-10	289	295	235	241	.553	.533	110	106	Hyd.	Hyd.	1
		<i>2400-6500 Lopey idle. Moderate Performance & Bracket Racing.</i>										
121181-08	CL121181-08	291	291	237	237	.553	.553	108	104	Hyd.	Hyd.	1
		<i>2400-6500 Lopey idle, Street/Bracket, Strong mid to upper end performance.</i>										
121181-10	CL121181-10	291	291	237	237	.553	.553	110	106	Hyd.	Hyd.	1
		<i>2400-6600 Mild rough idle, Hot Street, good mid range. 9.5:1+ CR, 2800+ stall & headers.</i>										
121181-12	CL121181-12	291	291	237	237	.553	.553	112	108	Hyd.	Hyd.	1
		<i>2400-6800 Good idle, Street/Strip. Broad mid range to upper end performance. 9.5:1+ CR.</i>										
121721-08	CL121721-08	294	301	241	247	.570	.578	108	104	Hyd.	Hyd.	1
		<i>2500-6500 Rough idle, Hot Street/Strip, big mid range torque. 11.0:1 CR, 3000+ stall.</i>										
121721-10	CL121721-10	294	301	241	247	.570	.578	110	106	Hyd.	Hyd.	1
		<i>2500-6600 Rough idle, Street/Strip, strong mid range power. 9.5:1+ CR, 2800+ stall.</i>										
121721-12	CL121721-12	294	301	241	247	.570	.578	112	108	Hyd.	Hyd.	1
		<i>2500-6800 Good idle, Street/Strip. Broad mid range to upper end performance. 9.5:1+ CR.</i>										
122531-10	CL122531-10	297	307	243	253	.575	.595	110	105	Hyd.	Hyd.	1
		<i>2800-6800 Super mid-range & top end horsepower. Minimum 11.0:1 CR.</i>										
120061-10	CL120061-10	299	299	245	245	.578	.578	110	106	Hyd.	Hyd.	1
		<i>2800-6900 Hot Street & Bracket Racing. Big torque. 10.0:+ CR, 3000+ stall, lower gears.</i>										
120741-10	CL120741-10	299	303	245	249	.578	.578	110	106	Hyd.	Hyd.	1
		<i>2800-6800 Rough idle, Hot Street/Strip. Strong mid range torque. 10.0:1+ CR, 3000+ stall.</i>										
120741-12	CL120741-12	299	303	245	249	.578	.578	112	108	Hyd.	Hyd.	1
		<i>2800-7000 Fair idle, Hot Street/Strip. Big mid range torque. 10.0:1+ CR, 3000+ stall.</i>										
121271-10	CL121271-10	303	309	249	255	.595	.595	110	106	Hyd.	Hyd.	1
		<i>3000-7000 Rough idle, Pro Street/Bracket, strong mid to top end. 10.5:1+ CR, 3200+ stall.</i>										
121271-12	CL121271-12	303	309	249	255	.595	.595	112	108	Hyd.	Hyd.	1
		<i>3000-7200 Fair idle, Pro Street/Bracket. Strong mid range with good upper end power.</i>										
121861-10	CL121861-10	305	313	251	259	.612	.595	110	106	Hyd.	Hyd.	1
		<i>3200-7400 Rough idle, Very aggressive Street/Bracket. Strong upper mid range. 11.0:1+ CR.</i>										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91116	NA	98529-K31 98636-K31	98529 98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91112	NA	98636-K31	98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91112	NA	98636-K31	98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91112	NA	98636-K31	98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91112	NA	98636-K31	98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91112	NA	98636-K31	98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91112	NA	98636-K31	98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91112	NA	98636-K31	98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91112	NA	98636-K31	98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 ³ 91112	NA	98636-K31	98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

Hydraulic Flat Tappet Camshafts (cont.)

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes	
		IN	EX	IN	EX	IN	EX			IN	EX		
121861-12	CL121861-12	305	313	251	259	.612	.595	112	108	Hyd.	Hyd.	1	
3200-7400 Performance/Bracket for 500+. 10.5-12.0:1 CR. Also good with large roots blower.													
129991	NA	Custom Grind Camshaft									Hyd.	Hyd.	1
Hydraulic Flat Tappet Special Order Camshaft.													
129997	NA	Custom Grind Camshaft											1,22
4/7 Swap Hydraulic Flat Tappet Special Order Camshaft.													



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

Rattler Cams™ Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
128025-09	CL128025-09	280	288	227	235	.555	.555	109	103	Hyd.	Hyd.	1,2
1800-5600 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.												
128045-09	CL128045-09	288	296	235	243	.600	.600	109	103	Hyd.	Hyd.	1,2
2000-5900 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.												
128085-09	CL128085-09	296	304	243	251	.600	.583	109	103	Hyd.	Hyd.	1,2
2400-6200 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

BOOST™ Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
129165-14	CL129165-14	273	273	221	221	.578	.578	114	110	Hyd.	Hyd.	1,2
1800-5600 Turbo, Good idle. High Performance Street, stock converter ok, best with 1800+ and gears.												
129275-16	CL129275-16	287	285	235	233	.617	.612	116	112	Hyd.	Hyd.	1,2
2400-6200 Turbo, Fair idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												
129225-14	CL129225-14	287	297	235	245	.646	.635	114	110	Hyd.	Hyd.	1,2
2400-6200 Blower, Fair idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												
129425-14	CL129425-14	307	317	255	265	.680	.680	114	110	Hyd.	Hyd.	1,2
2400-6200 Blower, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												
129485-14	CL129485-14	322	329	267	277	.680	.680	114	110	Hyd.	Hyd.	1,2
2400-6200 Blower, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

2 Requires Thrust Button.

22 Ignition firing order must be changed to 1-8-7-3-6-5-4-2.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111 ³ 91112	NA	98636-K31	98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91111 91112	NA	--	--	--	--	--	--	--	--	--	92150 94475	94402	94205 94305
91111 91112	NA	--	--	--	--	--	--	--	--	--	92150 94475	94402	94205 94305

CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

Rattler Cams™ Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91167 ³ 91161	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305
91167 ³ 91161	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305
91167 ³ 91161	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305

CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

BOOST™ Retro-Fit Hydraulic Roller Camshafts Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91167 ³ 91161	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305
91167 ³ 91161	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305
91161 ³	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305
91161 ³	NA	98652-K32 98652-K12	98636	97128 ¹⁰	97220	93018 ¹⁰ 93017	93720	90075	90120	95220	92150	94402	94205
91161 ³	NA	98652-K32 ¹⁰ 98652-K12 ¹⁰	98636	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰ 93017	93720 ²⁵	90075	90120	95220	92150	94402	94205

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve IN	Lash EX	Cam Notes
		IN	EX	IN	EX	IN	EX					
120225-12	CL120225-12	262	266	209	213	.510	.527	112	108	Hyd.	Hyd.	1,2
		<i>1200-4400 Great daily usage, smooth idle, great fuel economy.</i>										
120235-10	CL120235-10	266	274	213	221	.510	.538	110	106	Hyd.	Hyd.	1,2
		<i>1200-5000 Good idle, Off-Road & Street Performance. 9.0:1 CR advised.</i>										
120235-12	CL120235-12	266	274	213	221	.510	.538	112	108	Hyd.	Hyd.	1,2
		<i>1400-4600 Good idle, Off-Road & Street Performance. 9.0:1 CR advised.</i>										
123515-10	CL123515-10	272	280	219	227	.555	.555	110	106	Hyd.	Hyd.	1,2
		<i>1600-5000 Good idle, Performance Street, great low to mid range. Headers suggested.</i>										
120245-10	CL120245-10	278	284	225	231	.567	.578	110	106	Hyd.	Hyd.	1,2
		<i>1800-5400 Noticeable idle, Street Performance. Should have 2000+ stall, 9.5:1+ CR.</i>										
120245-12	CL120245-12	278	284	225	231	.567	.578	112	108	Hyd.	Hyd.	1,2
		<i>1800-5400 Fair idle, Street & mild Performance usage. Crisp throttle.</i>										
122115-12	CL122115-12	278	288	225	235	.595	.601	112	108	Hyd.	Hyd.	1,2
		<i>1800-5600 Mild idle, Street Performance, Great mid range torque. Headers suggested</i>										
122115-14	CL122115-14	278	288	225	235	.595	.601	114	110	Hyd.	Hyd.	1,2
		<i>1800-5600 Fair idle, excellent mid range power. 2500+ stall. Also good w/roots blower, 10psi max.</i>										
123315-08	CL123315-08	280	280	227	227	.555	.555	108	104	Hyd.	Hyd.	1,2
		<i>2000-5600 Mild rough idle, Hot Street. Should have good exhaust, 2500+ stall & 9.5:1 CR.</i>										
123315-10	CL123315-10	280	280	227	227	.555	.555	110	106	Hyd.	Hyd.	1,2
		<i>2000-5600 Mild rough idle, Hot Street. Should have good exhaust, 2500+ stall & 9.5:1 CR.</i>										
120325-08	CL120325-08	282	288	229	235	.589	.601	108	104	Hyd.	Hyd.	1,2
		<i>2000-5700 Street/Strip, 10.0:1+ CR, aftermarket dual plane intake recommended.</i>										
120325-10	CL120325-10	282	288	229	235	.589	.601	110	106	Hyd.	Hyd.	1,2
		<i>2000-5800 Fair idle, Performance usage. Mid-range torque & horsepower.</i>										
120325-12	CL120325-12	282	288	229	235	.589	.601	112	108	Hyd.	Hyd.	1,2
		<i>2000-5800 Fair idle, Moderate Street/Mild Bracket. Good mid range. 10.0-11.5:1, 2500+ stall.</i>										
120255-08	CL120255-08	284	288	231	235	.578	.618	108	104	Hyd.	Hyd.	1,2
		<i>2400-6000 Fair idle, Performance usage. Great mid-range torque & power.</i>										
120255-12	CL120255-12	284	288	231	235	.578	.618	112	108	Hyd.	Hyd.	1,2
		<i>2400-6000 Fair idle, Performance usage. Great mid-range torque & power.</i>										
121905-08	CL121905-08	286	286	233	233	.601	.601	108	104	Hyd.	Hyd.	1,2
		<i>2500-6100 Rough idle, Performance Street/Mild Strip. Nice mid range. 9.5:1+ CR, 2500+ stall.</i>										
121905-11	CL121905-11	286	286	233	233	.601	.601	111	107	Hyd.	Hyd.	1,2
		<i>2500-6200 Rough idle, Hot Street. Good usable mid range power band. 9.5:1+ CR, 2500+ stall.</i>										
120605-12	CL120605-12	286	300	233	247	.601	.612	112	108	Hyd.	Hyd.	1,2
		<i>2500-6200 Mild idle, Hot Street. Great mid range performance. 9.5:1+ CR, 2500+ stall.</i>										
120605-14	CL120605-14	286	300	233	247	.601	.612	114	110	Hyd.	Hyd.	1,2
		<i>2500-6500 Mild idle, Hot Street. Great mid range performance. Small blower or NOS OK.</i>										
120205-12	CL120205-12	286	298	233	245	.635	.635	112	108	Hyd.	Hyd.	1,2
		<i>2500-6300 Fair idle, Aggressive Street. Big mid range torque. 9.5:1+ CR, 2500+ stall.</i>										
120205-14	CL120205-14	286	298	233	245	.635	.635	114	110	Hyd.	Hyd.	1,2
		<i>2500-6300 Fair idle, Aggressive Street. Big mid range torque. Good with 150+ NOS or blower.</i>										
120405-08	CL120405-08	288	294	235	241	.618	.618	108	104	Hyd.	Hyd.	1,2
		<i>2600-6400 Rough idle, Hot Street/Strip. Great mid range. Needs good heads, 10.0:1+ CR.</i>										
120405-10	CL120405-10	288	294	235	241	.618	.618	110	106	Hyd.	Hyd.	1,2
		<i>2600-6400 Fair idle, Street/Strip, best in 496-540ci. Nice mid range power. 2600+ stall.</i>										
120405-12	CL120405-12	288	294	235	241	.618	.618	112	108	Hyd.	Hyd.	1,2
		<i>2600-6400 Rough idle, strong mid-range torque & horsepower.</i>										

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 2 Requires Thrust Button.

Some items are not legal for sale or use on any pollution controlled motor vehicle

CAMSHAFTS



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

Retro-Fit Hydraulic Roller Camshafts (cont.)

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
120265-10	CL120265-10	290 2600-6500	296	237	243	.635	.640	110	106	Hyd.	Hyd.	1,2
<i>Decent idle, Performance Street. Needs 10.0:1+ CR, 2800+ stall.</i>												
120265-12	CL120265-12	290 2600-6500	296	237	243	.635	.640	112	108	Hyd.	Hyd.	1,2
<i>Lopely idle, Hot Street & Bracket Racing. 10.0:1+ CR advised.</i>												
120265-14	CL120265-14	290 2600-6500	296	237	243	.635	.640	114	110	Hyd.	Hyd.	1,2
<i>Lopely idle, Hot Street & Bracket Racing. 10.0:1+ CR advised.</i>												
120275-10	CL120275-10	294 2800-6500	294	241	241	.618	.618	110	106	Hyd.	Hyd.	1,2
<i>Rough idle, Bracket Race with excellent mid & upper end horsepower.</i>												
120665-10	CL120665-10	296 2900-6500	302	243	249	.640	.640	110	106	Hyd.	Hyd.	1,2
<i>Rough idle, Street/Strip, great upper mid range power. 10.0:1+ CR, 3000+ stall.</i>												
120665-12	CL120665-12	296 3000-6500	302	243	249	.640	.640	112	108	Hyd.	Hyd.	1,2
<i>Lopely idle, broad mid range power. 10.0:1 CR, 3000+ stall.</i>												
121615-12	CL121615-12	296 3000-6600	308	243	255	.640	.640	112	108	Hyd.	Hyd.	1,2
<i>Lopely idle, Excellent mid to top end power. 10.0:1+ CR, 3200+ stall.</i>												
121615-14	CL121615-14	296 3000-6600	308	243	255	.640	.640	114	110	Hyd.	Hyd.	1,2
<i>Fair idle. Good mid range with top end power. Good with blower or NOS.</i>												
123505-10	CL123505-10	300 3200-6600	308	247	255	.680	.680	110	106	Hyd.	Hyd.	1,2
<i>Rough lopey idle, Pro Street/Bracket. 3500+ stall, 10.5:1+ CR, good intake & exhaust.</i>												
123505-12	CL123505-12	300 3000-6600	308	247	255	.680	.680	112	108	Hyd.	Hyd.	1,2
<i>Rough idle, Pro Street/Strip. Best in larger cubic inch, broad power. 10.5:1+ CR.</i>												
120145-10	CL120145-10	302 3400-6700	302	249	249	.640	.640	110	106	Hyd.	Hyd.	1,2
<i>Rough idle, Hot Street/Bracket. Needs 10.5:1 CR, 3500+ stall, headers, good intake.</i>												
120345-08	CL120345-08	302 3400-6800	308	249	255	.640	.640	108	104	Hyd.	Hyd.	1,2
<i>Lopely idle, Pro Street/Bracket. 10.5:1+ CR advised.</i>												
120345-10	CL120345-10	302 3400-6800	308	249	255	.640	.640	110	106	Hyd.	Hyd.	1,2
<i>Lopely idle, Pro Street/Bracket. 10.5:1+ CR advised.</i>												
120345-12	CL120345-12	302 3400-6800	308	249	255	.640	.640	112	108	Hyd.	Hyd.	1,2
<i>Fair idle, Pro Street/Bracket. 10.5:1+ CR advised. OK with NOS.</i>												
120345-14	CL120345-14	302 3400-6800	308	249	255	.640	.640	114	110	Hyd.	Hyd.	1,2
<i>Lopely idle, Pro-Street/Bracket. 10.5:1+ CR advised. OK with NOS.</i>												
120335-10	CL120335-10	304 3500-6800	308	251	255	.612	.612	110	106	Hyd.	Hyd.	1,2
<i>Lopely idle, Pro Street/Bracket. Single plane intake, 10.5:1+ CR advised.</i>												
120335-12	CL120335-12	304 3500-6800	308	251	255	.612	.612	112	108	Hyd.	Hyd.	1,2
<i>Lopely idle, broad power band. Single plane intake, 10.5:1+ CR advised.</i>												
120355-10	CL120355-10	304 3500-6800	310	251	257	.629	.629	110	106	Hyd.	Hyd.	1,2
<i>Lopely idle, Hot Street/Bracket. Single plane intake, 10.5:1+ CR advised.</i>												
120285-12	CL120285-12	306 3600-6900	308	253	255	.640	.640	112	108	Hyd.	Hyd.	1,2
<i>Lopely idle, Hot Street/Bracket. Single plane intake, 10.5:1+ CR advised. OK with NOS.</i>												
123335-10	CL123335-10	306 3600-6900	312	253	259	.657	.640	110	106	Hyd.	Hyd.	1,2
<i>Lopely idle, Hot Street/Bracket in larger cubic inch. 11.0+ CR, good heads.</i>												
123335-12	CL123335-12	306 3600-6900	312	253	259	.657	.640	112	108	Hyd.	Hyd.	1,2
<i>Lopely idle, Best in large cubic inch. 11.0+ CR, good heads, 3500+ stall. NOS OK.</i>												
122455-10	CL122455-10	306 3600-6900	312	253	259	.680	.680	110	106	Hyd.	Hyd.	1,2
<i>Strip/Bracket. 540+ cubic inch with good heads. Great upper mid range.</i>												
122455-12	CL122455-12	306 3600-6900	312	253	259	.680	.680	112	108	Hyd.	Hyd.	1,2
<i>Strip/Bracket. 540+ cubic inch with good heads. Great upper mid range.</i>												
122455-14	CL122455-14	306 3600-6900	312	253	259	.680	.680	114	110	Hyd.	Hyd.	1,2
<i>HP/Bracket, best for 540+. Good upper rpm torque. 11.5:1 CR, 3500+ stall.</i>												

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 2 Requires Thrust Button.

Some items are not legal for sale or use on any pollution controlled motor vehicle



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91167 ³ 91161	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305
91167 ³ 91161	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305
91167 ³ 91161	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305
91167 ³ 91161	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305
91167 ³ 91161	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305
91167 ³ 91161	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305
91167 ³ 91161	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305
91167 ³ 91161	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305
91167 ³ 91161	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305
91167 ³ 91161	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305
91167 ³ 91161	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305
91167 ³ 91161	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305
91167 ³ 91161	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305
91167 ³ 91161	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305
91167 ³ 91161	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305
91161 ³	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305
91161 ³	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305
91161 ³	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305
91161 ³	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305
91161 ³	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305
91161 ³	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305
91161 ³	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305
91161 ³	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

Retro-Fit Hydraulic Roller Camshafts (cont.)

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
128525-12	CL128525-12	312	322	259	269	.680	.680	112	108	Hyd.	Hyd.	1,2
3800-7000 HP/Bracket, best for 540+. Good upper rpm torque. 11.5:1 CR, 3500+ stall.												
128525-14	CL128525-14	312	322	259	269	.680	.680	114	110	Hyd.	Hyd.	1,2
3800-7000 HP/Bracket, best for 540+. Good upper rpm torque. 11.5:1 CR, 3500+ stall.												
129995	NA	Custom Grind Camshaft Retro-Fit Hydraulic Roller Special Order Camshaft.								Hyd.	Hyd.	1,2
129999	NA	Custom Grind Camshaft, with Cast Distributor Gear Retro-Fit Hydraulic Roller Special Order Camshaft.								Hyd.	Hyd.	1,2
124995	NA	Custom Grind Camshaft, 4/7 Swap Retro-Fit Hydraulic Roller Special Order Camshaft.								Hyd.	Hyd.	1,2
124998	NA	Custom Grind Camshaft, LS (C) Firing Order Retro-Fit Hydraulic Roller Special Order Camshaft.								Hyd.	Hyd.	1,2



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

American Muscle™ Mechanical Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
127192-14	CL127192-14 CL127192-14DL ⁴	336	316	242	242	.539	.539	114	108	.022	.025	
1800-6500 Smooth idle, near duplicate of the Chev LS6 465HP/454 cam (GM #3904362).												
127522-12	CL127522-12 CL127522-12DL ⁴	342	333	264	270	.579	.600	112	108	.022	.026	1
2800-6800 Near duplicate of the Chev L88 430HP/427 cam (GM #3928911).												



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

Mechanical Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
121052-10	CL121052-10 CL121052-10DL ⁴	283	283	248	248	.578	.578	110	106	.022	.022	1
2500-6400 Rough idle, Street/Strip, best with 10.0+ CR, 3000+ stall.												
121742-08	CL121742-08 CL121742-08DL ⁴	283	289	248	254	.578	.623	108	104	.022	.022	1
2600-6500 Lopey idle, Street High Performance/Strip. Best with 3200 stall, 10.5:1 CR & 800+ cfm..												
122312-10	CL122312-10 CL122312-10DL ⁴	285	291	250	256	.595	.606	110	106	.022	.022	1
2800-6600 Increased mid-range torque & horsepower. Can be used with NOS.												
122142-12	CL122142-12 CL122142-12DL ⁴	285	295	250	260	.595	.629	112	108	.022	.022	1
3000-6800 Fair idle, excellent Bracket cam. Increased CR required.												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

2 Requires Thrust Button.

4 Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91161 ³	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305
91161 ³	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	92150 94475	94402	94205 94305
--	--	--	--	--	--	--	--	--	--	--	--	94402	94205 94305
--	--	--	--	--	--	--	--	--	--	--	--	94402	94205 94305
--	--	--	--	--	--	--	--	--	--	--	--	94402	94205 94305
--	--	--	--	--	--	--	--	--	--	--	--	94402	94205 94305

CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

American Muscle™ Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91115 ³ 91118 ⁴	NA	98636-K31 98636-K32 ¹⁰	98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91115 ³ 91118 ⁴	NA	98636-K31 98636-K32 ¹⁰	98636	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305

CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91115 ³ 91118 ⁴	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91115 ³ 91118 ⁴	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91115 ³ 91118 ⁴	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91115 ³ 91118 ⁴	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

⁴ Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

Mechanical Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
120902-08	CL120902-08 CL120902-08DL ⁴	287	295	252	260	.618	.640	108	104	.022	.022	1
<i>3000-6800 Rough idle, Hot Street/Bracket/Short Track Oval, high torque grind. 3000+ stall.</i>												
120902-10	CL120902-10 CL120902-10DL ⁴	287	295	252	260	.618	.640	110	106	.022	.022	1
<i>3000-6800 Rough idle, good mid to upper range performance. 3000+ stall, 11.5:1+ CR.</i>												
120902-12	CL120902-12 CL120902-12DL ⁴	287	295	252	260	.618	.640	112	108	.022	.022	1
<i>3000-7000 Fair idle, good mid range power. 11.5-12.5:1 CR, 3000+ stall. Roots blower 8.0:1 max.</i>												
121932-08	CL121932-08 CL121932-08DL ⁴	289	295	254	260	.623	.629	108	104	.022	.022	1
<i>3200-7000 Rough idle, Bracket/Oval Track, great high torque, good mid range power.</i>												
121932-10	CL121932-10 CL121932-10DL ⁴	289	295	254	260	.623	.629	110	106	.022	.022	1
<i>3200-7000 Fair idle, Bracket E.T. Nice mid range torque & power. 11.5:1+ CR, 3400+ stall.</i>												
122322-08	CL122322-08 CL122322-08DL ⁴	295	303	260	268	.629	.623	108	104	.022	.022	1
<i>3600-7200 Rough idle, good mid-range torque & power. Needs good heads & intake.</i>												
122132-08	CL122132-08 CL122132-08DL ⁴	299	305	264	270	.561	.580	108	104	.022	.022	1
<i>3500-7000 Rough idle, Drag Race. Higher CR, stall speed & lower gears.</i>												
122132-12	CL122132-12 CL122132-12DL ⁴	299	305	264	270	.561	.580	112	108	.022	.022	1
<i>3600-7200 Increased mid-range torque & horsepower. Can be used with NOS.</i>												
122152-12	CL122152-12 CL122152-12DL ⁴	303	311	268	276	.650	.670	112	108	.022	.022	1
<i>4000-7400 Competition use, great mid & upper RPM horsepower. 12.5-1-up needed.</i>												
122332-08	CL122332-08 CL122332-08DL ⁴	303	313	268	278	.623	.650	108	104	.022	.022	1
<i>4000-7600 Moderate competition, excellent mid & upper RPM power. 12.0-1 CR.</i>												
120802-10	CL120802-10 CL120802-10DL ⁴	309	317	274	282	.680	.680	110	106	.022	.022	1
<i>4400-7800 Drag or Modified. Best in big cubic inch. Aggressive upper rpm. 12.5:1+ CR.</i>												
129992	NA	Custom Grind Camshaft Mechanical Flat Tappet Special Order Camshaft.										1



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

4/7 Swap Mechanical Flat Tappet Camshafts

Firing Order: 1•8•7•3•6•5•4•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
124902-08	CL124902-08 CL124902-08DL ⁴	287	295	252	260	.618	.640	108	104	.022	.022	1,22
<i>3000-6800 Rough idle, good mid to upper range performance. 3000+ stall, 11.5:1+ CR.</i>												
124902-10	CL124902-10 CL124902-10DL ⁴	287	295	252	260	.618	.640	110	106	.022	.022	1,22
<i>3000-6800 Rough idle, good mid to upper range performance. 3000+ stall, 11.5:1+ CR.</i>												
124902-12	CL124902-12 CL124902-12DL ⁴	287	295	252	260	.618	.640	112	108	.022	.022	1,22
<i>3000-6800 Lopey idle, good mid to upper range performance. 3000+ stall, 11.5:1+ CR.</i>												
124322-08	CL124322-08 CL124322-08DL ⁴	295	303	260	268	.629	.623	108	104	.022	.022	1,22
<i>3200-7000 Rough idle, good mid-range torque & power. Needs good heads & intake.</i>												
124332-08	CL124332-08 CL124332-08DL ⁴	303	313	268	278	.623	.650	108	104	.022	.022	1,22
<i>3800-7600 Moderate competition, excellent mid & upper RPM power. 12.0-1 CR.</i>												
129997	NA	Custom Grind Camshaft 4/7 Swap Mechanical Flat Tappet Special Order Camshaft.										1,22

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

4 Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.

Some items are not legal for sale or use on any pollution controlled motor vehicle



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91115 ³ 91118 ⁴	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91115 ³ 91118 ⁴	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91115 ³ 91118 ⁴	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91115 ³ 91118 ⁴	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91115 ³ 91118 ⁴	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91115 ³ 91118 ⁴	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91115 ³ 91118 ⁴	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91115 ³ 91118 ⁴	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91115 ³ 91118 ⁴	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91115 ³ 91118 ⁴	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91115 ³ 91118 ⁴	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91115 ³ 91118 ⁴	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91115 ³ 91118 ⁴	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91115 91118	--	--	--	--	--	--	--	--	--	--	92150 94475	94402	94205 94305

CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

4/7 Swap Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91115 ³ 91118 ⁴	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91115 ³ 91118 ⁴	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91115 ³ 91118 ⁴	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91115 ³ 91118 ⁴	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91115 ³ 91118 ⁴	NA	98636-K32 ¹⁰	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95222 95110/95115	92150 94475	94402	94205 94305
91115 91118	--	--	--	--	--	--	--	--	--	--	92150 94475	94402	94205 94305

Components Notes: master note list on page 260

- ³ Included in Cam & Lifter Sets.
- ⁴ Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.
- ¹⁰ 10° Valve lock Angle, must use matching retainers/locks.
- ²⁵ Machining Required.



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996



Big Bottle Cams™ - Nitrous Oxide Mechanical Roller Cams Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
121663-12	NA	297	309	265	277	.703	.703	112	108	.022	.022	1,2,5
		4000-7000 Rough idle. Good upper rpm horsepower. Auto w/4000 stall. 11.0:1+.										
120453-12	NA	299	311	267	279	.714	.725	112	108	.022	.022	1,2,5
		4000-7000 Rough idle, aggressive upper rpm performance. 250+ plate systems, 11.0:1+ CR.										
120823-12	NA	307	317	275	285	.714	.714	112	108	.022	.022	1,2,5
		4300-7200 Good upper mid to top end for 500+. Use with large manifold systems.										
120973-12	NA	309	323	277	291	.737	.731	112	108	.022	.022	1,2,5
		4500-7500 Rough idle, great upper mid to top end performer. Needs good heads, 250+ systems.										
121043-12	NA	309	323	277	291	.810	.810	112	108	.022	.022	1,2,5
		4600-7800 13.0:1+ compression. Good Heads, 5000+ stall. Good with large manifold systems.										
121043-14	NA	309	323	277	291	.810	.810	114	110	.022	.022	1,2,5
		4600-8000 13.0:1+ compression. Good Heads, 5000+ stall. Multi stage systems.										
121093-14	NA	315	327	283	295	.765	.725	114	110	.022	.022	1,2,5
		4800-8500 Very large cubic inch with big multi-stage nitrous.										
129993	NA	Custom Grind Camshaft										1,2,5
		Mechanical Roller Special Order Camshaft.										



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996



Big Bottle Cams™ - 4/7 Swap Mechanical Roller Cams Firing Order: 1•8•7•3•6•5•4•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
124453-12	NA	299	311	267	279	.714	.725	112	108	.022	.022	1,2,5,22
		4000-7000 Rough idle, aggressive upper rpm performance. 250+ plate systems, 11.0:1+ CR.										
124823-12	NA	307	317	275	285	.714	.714	112	108	.022	.022	1,2,5,22
		4300-7200 Good upper mid to top end for 500+. Use with large manifold systems.										
124043-12	NA	309	323	277	291	.810	.810	112	108	.022	.022	1,2,5,22
		4600-7800 Quick 16. Needs good heads. Multi-stage systems.										
124043-14	NA	309	323	277	291	.810	.810	114	110	.022	.022	1,2,5,22
		4600-8000 13.0:1+ compression. Good Heads, 5000+ stall. Multi stage systems.										
124073-15	NA	313	331	281	299	.873	.810	115	111	.022	.022	1,2,5,22
		4600-8800 Large cubic inch w/multi-stage nitrous. Needs good heads & CR.										
124803-16	NA	317	343	285	311	.850	.810	116	112	.022	.022	1,2,5,22
		5400-8600 500+ cubic inch, high compression. Multi stage systems.										
124793-12	NA	319	331	287	299	.765	.731	112	108	.022	.022	1,2,5,22
		5000-8200 Competition only, strong upper range for 540+. Good with large manifold systems.										
124093-18	NA	323	351	291	319	.873	.867	118	114	.022	.022	1,2,5,22
		4800-8500 Very large cubic inch with big multi-stage nitrous.										
129994	NA	Custom Grind Camshaft										1,2,5,22
		4/7 Swap Mechanical Roller Special Order Camshaft.										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

2 Requires Thrust Button.

4 Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.

5 Requires upgraded distributor gear/fuel pump pushrod.

22 Ignition firing order must be changed to 1-8-7-3-6-5-4-2.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

Big Bottle Cams™ - Nitrous Oxide Mechanical Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98824 ²⁵	NA	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98824 ²⁵	NA	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98824 ²⁵	NA	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
--	--	--	--	--	--	--	--	--	--	--	92151 94475	94400 94402	94305

CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

Big Bottle Cams™ - 4/7 Swap Mechanical Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98824 ²⁵	NA	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98824 ²⁵	NA	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98824 ²⁵	NA	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98824 ²⁵	NA	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
--	--	--	--	--	--	--	--	--	--	--	92151 94475	94400 94402	94305

Components Notes: master note list on page 260
¹⁰ 10° Valve lock Angle, must use matching retainers/locks.
²⁵ Machining Required.



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

Steel Billet Mechanical Roller Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
121213-08	NA	261	269	229	237	.629	.629	108	104	.022	.022	1,2,5
		2000-6200	Lopey idle, great for Power Touring. Easy on parts. Needs 2000+ stall.									
121213-10	NA	261	269	229	237	.629	.629	110	106	.022	.022	1,2,5
		2000-6200	Lopey idle, great for Power Touring. Easy on parts. Needs 2000+ stall.									
121203-08	NA	269	269	237	237	.629	.629	108	104	.022	.022	1,2,5
		2600-6800	Rough idle, Street/Mild Strip. Low to mid range torque & power. 9.5:1+ CR									
121203-10	NA	269	269	237	237	.629	.629	110	106	.022	.022	1,2,5
		2600-6800	Rough idle, Street Performance/Mild Strip. Recommend 9.5:1 CR, 2500+ stall.									
120183-08	NA	269	275	237	243	.629	.629	108	104	.022	.022	1,2,5
		2600-6600	Fair idle, Weekend Cruiser/mild Strip. 2500+ stall recommended.									
120183-10	NA	269	275	237	243	.629	.629	110	106	.022	.022	1,2,5
		2600-6600	Mild rough idle, Street Performance/Power Touring. Reliable low to mid range power.									
120183-12	NA	269	275	237	243	.629	.629	112	108	.022	.022	1,2,5
		2600-6700	Nice idle, Street Performance/Mild Strip. Low to mid range performance. NOS OK.									
120173-08	NA	273	279	241	247	.646	.646	108	104	.022	.022	1,2,5
		2800-6800	Lopey idle, Street/Mild Bracket. Good lower mid range. 10.0:1+ CR, 2800+ stall.									
120173-10	NA	273	279	241	247	.646	.646	110	106	.022	.022	1,2,5
		2800-6800	Fair idle, High performance Street/Mild Bracket. Should have 10.0:1 CR, 2800+ stall.									
120173-12	NA	273	279	241	247	.646	.646	112	108	.022	.022	1,2,5
		2800-6900	Fair idle, Street/Strip, strong mid range torque. 10.0:1 CR, 2800+ stall.									
121313-10	NA	281	281	249	249	.663	.663	110	106	.022	.022	1,2,5
		3000-7000	Lopey idle, Pro-Street cam. Works well with small NOS system.									
121313-12	NA	281	281	249	249	.663	.663	112	108	.022	.022	1,2,5
		3000-7000	Hot street, Marine. Good low end performance.									
121153-10	NA	281	287	249	255	.663	.680	110	106	.022	.022	1,2,5
		3000-7000	Good mid-range horsepower, rough idle. Needs 11.0:1 CR-up.									
120043-08	NA	285	291	253	259	.680	.663	108	104	.022	.022	1,2,5
		3200-7000	Lopey idle, Pro Street/Bracket. Great mid range torque. 10.5-12.0:1 CR, 3400+ stall.									
120043-10	NA	285	291	253	259	.680	.663	110	106	.022	.022	1,2,5
		3200-7000	Bracket/Pro, good mid range torque & horsepower. 10.5-12.0:1 CR, 3500+ stall.									
120893-08	NA	287	293	255	261	.680	.703	108	104	.022	.022	1,2,5
		3300-7200	Lopey idle, Pro/Street/Bracket. High torque mid range power. Needs 11.0:1+ CR.									
120893-10	NA	287	293	255	261	.680	.703	110	106	.022	.022	1,2,5
		3300-7200	Good mid-range power, rough idle. Needs 11.0:1+ CR. Brackets.									
121633-08	NA	289	295	257	263	.725	.725	108	104	.022	.022	1,2,5
		3400-7300	Lopey idle, Bracket E.T., high torque mid range power. 3500+ stall, 11.5:1+ CR.									
121633-10	NA	289	295	257	263	.725	.725	110	106	.022	.022	1,2,5
		3400-7300	Fair idle, Pro Street/Strip. Good mid range power. 3500+ stall, 11.5:1+ CR.									
121633-12	NA	289	295	257	263	.725	.725	112	108	.022	.022	1,2,5
		3400-7300	Moderate idle, Pro Street/Strip. Good mid range power. 3500+ stall, 11.5:1+ CR.									
121163-08	NA	291	299	259	267	.663	.680	108	104	.022	.022	1,2,5
		3400-7200	Lopey idle, Bracket E.T. Good mid range torque. Needs 11.5:1+ CR.									
121163-10	NA	291	299	259	267	.663	.680	110	106	.022	.022	1,2,5
		3400-7200	Lopey idle, Bracket E.T. Mid range torque & power. 11.5:1+ CR, 3500+ stall.									
120473-08	NA	291	301	259	269	.765	.765	108	104	.022	.022	1,2,5
		3400-7400	Rough idle, Bracket Race. Best in 454ci or smaller. 4000+ stall, 11.5:1 CR.									
120473-10	NA	291	301	259	269	.765	.765	110	106	.022	.022	1,2,5
		3400-7500	Bracket/Pro/Super Pro, good mid to upper rpm torque/power. 12.0:1+ CR.									

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 2 Requires Thrust Button.
- 5 Requires upgraded distributor gear/fuel pump pushrod.

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

Steel Billet Mechanical Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91151 91158	NA	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91151 91158	NA	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91151 91158	NA	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91151 91158	NA	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91151 91158	NA	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91151 91158	NA	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91151 91158	NA	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91151 91158	NA	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91151 91158	NA	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91151 91158	NA	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91151 91158	NA	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91151 91158	NA	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305

Components Notes: master note list on page 260
¹⁰ 10° Valve lock Angle, must use matching retainers/locks.
²⁵ Machining Required.

CAMSHAFTS



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

Steel Billet Mechanical Roller Camshafts (cont.)

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
121133-08	NA	293	301	261	269	.680	.680	108	104	.022	.022	1,2,5
		3400-7200 Nice Bracket cam, lopey idle, needs higher stall & lower gear.										
121133-10	NA	293	301	261	269	.680	.680	110	106	.022	.022	1,2,5
		3400-7300 Nice Bracket cam, lopey idle, needs higher stall & lower gear.										
121133-12	NA	293	301	261	269	.680	.680	112	108	.022	.022	1,2,5
		3400-7400 Nice Bracket cam, lopey idle, needs higher stall. NOS OK.										
121133-14	NA	293	301	261	269	.680	.680	114	110	.022	.022	1,2,5
		3400-7500 Pro-Street, great blower cam. Multiple carb suggested.										
121173-08	NA	293	303	261	271	.703	.708	108	104	.022	.022	1,2,5
		3500-7500 Good mid-range torque & horsepower. 12.0:1 minimum.										
121173-10	NA	293	303	261	271	.703	.708	110	106	.022	.022	1,2,5
		3500-7600 Good mid-range torque & horsepower. 12.0:1 minimum.										
121663-08	NA	297	309	265	277	.703	.703	108	104	.022	.022	1,2,5
		3800-7600 Rough idle. Good upper rpm horsepower. Auto w/4000 stall. 11.0:1+.										
121663-10	NA	297	309	265	277	.703	.703	110	106	.022	.022	1,2,5
		3800-7700 Rough idle. Good upper rpm horsepower. Auto w/4000 stall. 11.0:1+.										
121663-12	NA	297	309	265	277	.703	.703	112	108	.022	.022	1,2,5
		3800-7800 Rough idle. Good upper rpm horsepower. Auto w/4000 stall. 11.0:1+. OK with NOS.										
121053-08	NA	299	309	267	277	.731	.737	108	104	.022	.022	1,2,5
		3800-7600 Good mid to upper rpm torque & horsepower. Minimum 4500-stall.										
121253-08	NA	301	307	269	275	.765	.714	108	104	.022	.022	1,2,5
		4000-7800 Good mid-range to upper rpm torque & power. Heavy cars OK.										
121253-10	NA	301	307	269	275	.765	.714	110	106	.022	.022	1,2,5
		4000-7900 Competition use, good mid & upper power, bracket. 11.0:1+ CR.										
121143-08	NA	301	309	269	277	.680	.680	108	104	.022	.022	1,2,5
		4000-8000 Moderate Competition. Super mid & upper rpm torque & power.										
121143-10	NA	301	309	269	277	.680	.680	110	106	.022	.022	1,2,5
		4000-8000 Bracket/Super Pro, good upper rpm torque & power. 12.5:1 CR & race converter.										
121143-12	NA	301	309	269	277	.680	.680	112	108	.022	.022	1,2,5
		4000-8000 Competition, good mid & upper horsepower, bracket cars, OK w/NOS.										
121123-08	NA	301	309	269	277	.703	.703	108	104	.022	.022	1,2,5
		4000-8000 Competition use, good mid & upper horsepower, bracket cars.										
121123-10	NA	301	309	269	277	.703	.703	110	106	.022	.022	1,2,5
		4000-8000 Competition, good mid & upper horsepower, bracket cars, OK w/NOS.										
121123-12	NA	301	309	269	277	.703	.703	112	108	.022	.022	1,2,5
		4000-8000 Competition, good mid & upper horsepower, bracket cars, OK w/ small NOS.										
121123-14	NA	301	309	269	277	.703	.703	114	110	.022	.022	1,2,5
		4000-8000 Competition use, good mid & upper horsepower, Multi-Stage NOS.										
121673-08	NA	305	309	273	277	.731	.737	108	104	.022	.022	1,2,5
		4200-8000 Competition use. 13.0:1 minimum. Good mid & upper range power.										
121673-10	NA	305	309	273	277	.731	.737	110	106	.022	.022	1,2,5
		4200-8000 Super Gas, Great mid range. Needs good intake, 13.0:1+, 4500 stall.										
121023-08	NA	309	315	277	283	.765	.714	108	104	.022	.022	1,2,5
		4400-8200 Competition use, good mid & upper horsepower.										
121023-10	NA	309	315	277	283	.765	.714	110	106	.022	.022	1,2,5
		4400-8200 Competition use, good mid & upper horsepower.										
121693-08	NA	309	317	277	285	.737	.714	108	104	.022	.022	1,2,5
		4300-8000 Bracket/ Super Gas, heavier car. Needs race converter.										

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 2 Requires Thrust Button.
- 5 Requires upgraded distributor gear/fuel pump pushrod.

Some items are not legal for sale or use on any pollution controlled motor vehicle



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

Steel Billet Mechanical Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98825 ²⁵	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98825 ²⁵	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98825 ²⁵	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305

Components Notes: master note list on page 260

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

Steel Billet Mechanical Roller Camshafts (cont.)

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
121083-08	NA	309	317	277	285	.714	.714	108	104	.022	.022	1,2,5
		<i>4300-8000 Great Super-Comp. cam. 468+CID with 12.5:1 CR-up.</i>										
121083-10	NA	309	317	277	285	.714	.714	110	106	.022	.022	1,2,5
		<i>4300-8000 Great Super-Comp. cam. 468+ with 12.5:1 CR-up. OK with NOS.</i>										
121083-14	NA	309	317	277	285	.714	.714	114	110	.022	.022	1,2,5
		<i>4300-8000 Great Super-Comp. cam. 468+ with 12.5:1 CR-up. OK with NOS.</i>										
121233-08	NA	309	319	277	287	.737	.737	108	104	.022	.022	1,2,5
		<i>4400-8000 Good upper RPM cam in big cubic inch engine with 13.0:1+ CR.</i>										
121233-10	NA	309	319	277	287	.737	.737	110	106	.022	.022	1,2,5
		<i>4200-7800 Works great in 496+CID with high stall. Will work with NOS.</i>										
121233-12	NA	309	319	277	287	.737	.737	112	108	.022	.022	1,2,5
		<i>4000-7600 Great Super Class cam. Best in 540+ cubic inch. Easy on valvetrain.</i>										
121233-14	NA	309	319	277	287	.737	.737	114	110	.022	.022	1,2,5
		<i>4000-7600 Great Super Class cam. Best in 540+ cubic inch. Easy on valvetrain.</i>										
121043-12	NA	309	323	277	291	.810	.810	112	108	.022	.022	1,2,5
		<i>4400-7800 509-540 ci with good heads. Works good with plate style NOS systems.</i>										
121043-14	NA	309	323	277	291	.810	.810	114	110	.022	.022	1,2,5
		<i>4200-8000 509-540 ci with good heads. Works good 250+ HP NOS.</i>										
121683-08	NA	311	319	279	287	.771	.737	108	104	.022	.022	1,2,5
		<i>4400-8000 Competition only, needs cubic inch, high CR, stall & gears.</i>										
121683-10	NA	311	319	279	287	.771	.737	110	106	.022	.022	1,2,5
		<i>4500-8000 Works great in 496+CID with high stall. Will work with NOS.</i>										
121623-08	NA	315	319	283	287	.765	.737	108	104	.022	.022	1,2,5
		<i>4600-8200 Competition only, needs cubic inch, high CR, stall & gears.</i>										
121623-10	NA	315	319	283	287	.765	.737	110	106	.022	.022	1,2,5
		<i>4500-8200 Competition only in 500+CID, needs high CR, stall & gears.</i>										
121623-12	NA	315	319	283	287	.765	.737	112	108	.022	.022	1,2,5
		<i>4400-8200 Competition only in 500+CID, needs high CR, stall & gears.</i>										
121623-14	NA	315	319	283	287	.765	.737	114	110	.022	.022	1,2,5
		<i>4800-8000 Competition only in 500+CID, needs high CR, stall & gears. Good with NOS.</i>										
121093-08	NA	315	327	283	295	.765	.725	108	104	.022	.022	1,2,5
		<i>4800-8500 540+ ci Bracket. Needs good heads, 13.0:1+ CR & high stall.</i>										
121093-10	NA	315	327	283	295	.765	.725	110	106	.022	.022	1,2,5
		<i>4800-8400 All out Competition in big inch engine. Needs the best parts.</i>										
121093-14	NA	315	327	283	295	.765	.725	114	110	.022	.022	1,2,5
		<i>4800-8500 All out Competition in big inch engine. Needs the best parts.</i>										
121033-12	NA	317	327	285	295	.810	.765	112	108	.022	.022	1,2,5
		<i>5200-8200 550+ ci Competition with big heads & intake.</i>										
121803-14	NA	317	343	285	311	.850	.810	114	110	.022	.022	1,2,5
		<i>5000-8000 550+ ci with Big Chief style heads. Needs high compression & big carburetion.</i>										
121803-16	NA	317	343	285	311	.850	.810	116	112	.022	.022	1,2,5
		<i>5000-8200 550+ ci with Big Chief style heads. Great with big NOS systems.</i>										
129993	NA	Custom Grind Camshaft <i>Mechanical Roller Special Order Camshaft.</i>										1,2,5
129998	NA	Custom Grind Camshaft, with 50-55mm Bearing <i>Mechanical Roller Special Order Camshaft.</i>										1,2,5
128997	NA	Custom Grind Camshaft, with 50-55mm Bearing, LS (C) Firing Order <i>Mechanical Roller Special Order Camshaft.</i>										1,2,5,24

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 2 Requires Thrust Button.
- 5 Requires upgraded distributor gear/fuel pump pushrod.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

Steel Billet Mechanical Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91135 91198	NA	NA	98825 ²⁵	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98825 ²⁵	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98825 ²⁵	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98825 ²⁵	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98825 ²⁵	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98825 ²⁵	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98825 ²⁵	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98738-A ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98738-A ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98825 ²⁵	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98825 ²⁵	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98825 ²⁵	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98825 ²⁵	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98825 ²⁵	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98738-A ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98738-A ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98738-A ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98738-A ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98738-A ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98738-A ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98738-A ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98738-A ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
--	--	--	--	--	--	--	--	--	--	--	92151 94475	94400 94402	94305
--	--	--	--	--	--	--	--	--	--	--	92151 94475	94400 94402	94305
--	--	--	--	--	--	--	--	--	--	--	92151 94475	94400 94402	94305

Components Notes: master note list on page 260
¹⁰ 10° Valve lock Angle, must use matching retainers/locks.
²⁵ Machining Required.

CAMSHAFTS



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

4/7 Swap Steel Billet Roller Camshafts

Firing Order: 1•8•7•3•6•5•4•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
124193-08	NA	293	299	261	267	.703	.714	108	104	.022	.022	1,2,5,22
		<i>3800-7000 Good mid-range torque & horsepower. Great for brackets.</i>										
124133-08	NA	293	301	261	269	.680	.680	108	104	.022	.022	1,2,5,22
		<i>3400-7200 Nice Bracket cam, lopey idle, needs higher stall & lower gear.</i>										
124133-10	NA	293	301	261	269	.680	.680	110	106	.022	.022	1,2,5,22
		<i>3800-7300 Nice Bracket cam, lopey idle, needs higher stall & lower gear.</i>										
124203-08	NA	299	305	267	273	.731	.731	108	104	.022	.022	1,2,5,22
		<i>3800-7400 Good mid-range torque & horsepower. 11.0:1+ CR.</i>										
124203-10	NA	299	305	267	273	.731	.731	110	106	.022	.022	1,2,5,22
		<i>3800-7600 Competition use, good mid & upper power, bracket. 11.0:1+ CR.</i>										
124123-08	NA	301	309	269	277	.703	.703	108	104	.022	.022	1,2,5,22
		<i>4000-8000 Good Bracket Race cam. 11.0:1+ compression.</i>										
124123-10	NA	301	309	269	277	.703	.703	110	106	.022	.022	1,2,5,22
		<i>4000-8000 Good Bracket Race cam. 11.0:1+ compression.</i>										
124213-08	NA	301	309	269	277	.765	.737	108	104	.022	.022	1,2,5,22
		<i>3800-7800 Good Bracket Race cam. 11.0:1+ compression.</i>										
124223-08	NA	305	309	273	277	.771	.737	108	104	.022	.022	1,2,5,22
		<i>4200-7800 Competition use. 12.0:1 minimum.</i>										
124013-10	NA	309	315	277	283	.703	.714	110	106	.022	.022	1,2,5,22
		<i>4400-8000 468+ CID. 12.0:1+ Strong mid-range.</i>										
124023-08	NA	309	315	277	283	.765	.714	108	104	.022	.022	1,2,5,22
		<i>4400-8200 11.0:1+ CR, 4500+ Stall. Good in 427-496.</i>										
124023-10	NA	309	315	277	283	.765	.714	110	106	.022	.022	1,2,5,22
		<i>4400-8200 11.0:1+ CR, 4500+ Stall. Good in super gas.</i>										
124243-10	NA	309	315	277	283	.810	.765	110	106	.022	.022	1,2,5,22
		<i>4500-8200 13.0:1+ CR, Good heads. Strong mid & top end.</i>										
124183-08	NA	309	317	277	285	.703	.714	108	104	.022	.022	1,2,5,22
		<i>4300-8000 Good upper rpm torque & horsepower. 12.5:1+ CR. 5000+ stall.</i>										
124183-10	NA	309	317	277	285	.703	.714	110	106	.022	.022	1,2,5,22
		<i>4300-8000 Great Super-Comp. cam. 468+ with 12.5:1 CR-up. OK with NOS.</i>										
124583-08	NA	311	317	279	285	.771	.731	108	104	.022	.022	1,2,5,22
		<i>4500-7800 540 Bracket special. 13.0:1 CR, 5000+ stall.</i>										
124043-12	NA	309	323	277	291	.810	.810	112	108	.022	.022	1,2,5,22
		<i>4600-7800 Good in Super Gas. Up to 14.5:1 compression. 5000+ stall.</i>										
124043-14	NA	309	323	277	291	.810	.810	114	110	.022	.022	1,2,5,22
		<i>4200-8000 Quick 16. Needs good heads.</i>										
124263-10	NA	313	319	281	287	.799	.765	110	106	.022	.022	1,2,5,22
		<i>4400-8000 540+, Strong torque. Also good tractor pull.</i>										
124053-14	NA	313	327	281	295	.873	.810	114	110	.022	.022	1,2,5,22
		<i>4600-8200 540+ cubic inch. 12.5:1 minimum. Race converter & NOS.</i>										
124623-10	NA	315	319	283	287	.765	.737	110	106	.022	.022	1,2,5,22
		<i>4400-8200 Quick 16. Needs good heads. Needs 13.0:1+ CR.</i>										
124623-12	NA	315	319	283	287	.765	.737	112	108	.022	.022	1,2,5,22
		<i>4400-8200 Quick 16. Needs good heads. Needs 13.0:1+ CR.</i>										
124803-14	NA	317	343	285	311	.850	.810	114	110	.022	.022	1,2,5,22
		<i>5000-8000 550+ ci with Big Chief style heads. Needs high compression & big carburetion.</i>										
124803-16	NA	317	343	285	311	.850	.810	116	112	.022	.022	1,2,5,22
		<i>5000-8200 550+ ci with Big Chief style heads. Great with big NOS systems.</i>										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

2 Requires Thrust Button.

5 Requires upgraded distributor gear/fuel pump pushrod.

22 Ignition firing order must be changed to 1-8-7-3-6-5-4-2.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

4/7 Swap *Steel Billet Mechanical Roller Camshaft Components*

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98738-A ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98738-A ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98738-A ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98738-A ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98738-A ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98738-A ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98738-A ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98738-A ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98738-A ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98738-A ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98738-A ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305

Components Notes: master note list on page 260
¹⁰ 10° Valve lock Angle, must use matching retainers/locks.
²⁵ Machining Required.

CAMSHAFTS



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

4/7 Swap Steel Billet Roller Camshafts (cont.)

Firing Order: 1•8•7•3•6•5•4•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
124303-08	NA	317	327	285	295	.731	.725	108	104	.022	.022	1,2,5,22
5400-8000 Super Gas/Super Comp. Needs good heads.												
124303-12	NA	317	327	285	295	.731	.725	112	108	.022	.022	1,2,5,22
5200-8000 Good upper mid to top end for 540+, Strongly suggest 13.0:1+ CR & good race converter.												
124033-12	NA	317	327	285	295	.810	.765	112	108	.022	.022	1,2,5,22
5500-8200 480+. Good heads 13.0:1+ CR. Some nitrous OK.												
124313-10	NA	319	327	287	295	.765	.725	110	106	.022	.022	1,2,5,22
5000-8000 Big cubic inch Super-Bracket.												
124063-14	NA	317	331	285	299	.873	.810	114	110	.022	.022	1,2,5,22
5200-8200 540+. Comp. & Quick 16.												
124093-14	NA	323	351	291	319	.873	.867	114	110	.022	.022	1,2,5,22
4800-8000 600+ CID, Pro Heads												
124093-16	NA	323	351	291	319	.873	.867	116	112	.022	.022	1,2,5,22
4800-8000 Big cubic inch only. Requires huge heads.												
124093-18	NA	323	351	291	319	.873	.867	118	114	.022	.022	1,2,5,22
4600-8000 Very large cubic inch with multi-stage nitrous.												
129994	NA	Custom Grind Camshaft										1,2,5,22
4/7 Swap Mechanical Roller Special Order Camshaft.												



CHEVROLET BIG BLOCK GEN 6 • 454-502 1996-1999

Rattler Cams™ Hydraulic Roller Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
128026-09	CL128026-09	280	288	227	235	.555	.555	109	103	Hyd.	Hyd.	1
1800-5600 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.												
128046-09	CL128046-09	288	296	235	243	.600	.600	109	103	Hyd.	Hyd.	1
2000-5900 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.												
128086-09	CL128086-09	296	304	243	251	.600	.583	109	103	Hyd.	Hyd.	1
2400-6200 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

2 Requires Thrust Button.

5 Requires upgraded distributor gear/fuel pump pushrod.

22 Ignition firing order must be changed to 1-8-7-3-6-5-4-2.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET BIG BLOCK MARK IV • 396-502 1965-1996

4/7 Swap Steel Billet Mechanical Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91158 91135	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98738-A ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98738-A ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91135 91198	NA	NA	98738-A ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98824 ²⁵	NA	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98824 ²⁵	NA	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98824 ²⁵	NA	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
91158 91135	NA	NA	98824 ²⁵	NA	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	92151 94475	94400 94402	94305
--	--	--	--	--	--	--	--	--	--	--	92151 94475	94400 94402	94305

CHEVROLET BIG BLOCK GEN 6 • 454-502 1996-1999

Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91123 ³ 91167 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91167 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91167 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

³³ Tie bar style lifters.



Hydraulic Roller Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
120226-12	CL120226-12	262	266	209	213	.510	.527	112	108	Hyd.	Hyd.	1
		<i>1200-4400 Great daily usage, smooth idle, great fuel economy.</i>										
120236-12	CL120236-12	266	274	213	221	.510	.538	112	108	Hyd.	Hyd.	1
		<i>1400-4600 Good idle, Off-Road & Street Performance. 9.0:1 CR advised.</i>										
123516-10	CL123516-10	272	280	219	227	.555	.555	110	106	Hyd.	Hyd.	1
		<i>1600-5000 Good idle, Performance Street, great low to mid range. Headers suggested.</i>										
120246-10	CL120246-10	278	284	225	231	.567	.578	110	106	Hyd.	Hyd.	1
		<i>1800-5400 Noticeable idle, Street Performance. Should have 2000+ stall, 9.5:1 CR.</i>										
120246-12	CL120246-12	278	284	225	231	.567	.578	112	108	Hyd.	Hyd.	1
		<i>1800-5400 Fair idle, Street & mild Performance usage. Crisp throttle.</i>										
122116-12	CL122116-12	278	288	225	235	.595	.601	112	108	Hyd.	Hyd.	1
		<i>1800-5600 Mild idle, Street Performance, Great mid range torque. Headers suggested</i>										
122116-14	CL122116-14	278	288	225	235	.595	.601	114	110	Hyd.	Hyd.	1
		<i>1800-5600 Fair idle, excellent mid range power. 2500+ stall. Also good w/roots blower, 10psi max.</i>										
123316-10	CL123316-10	280	280	227	227	.555	.555	110	106	Hyd.	Hyd.	1
		<i>2000-5600 Mild rough idle, Hot Street. Should have good exhaust, 2500+ stall & 9.5:1 CR.</i>										
120326-08	CL120326-08	282	288	229	235	.589	.601	108	104	Hyd.	Hyd.	1
		<i>2000-5700 Street/Strip, 10.0:1+ CR, aftermarket dual plane intake recommended.</i>										
120326-10	CL120326-10	282	288	229	235	.589	.601	110	106	Hyd.	Hyd.	1
		<i>2000-5800 Fair idle, Performance usage. Mid-range torque & horsepower.</i>										
120326-12	CL120326-12	282	288	229	235	.589	.601	112	108	Hyd.	Hyd.	1
		<i>2000-5800 Fair idle, Moderate Street/Mild Bracket. Good mid range. 10.0-11.5:1, 2500+ stall.</i>										
120256-08	CL120256-08	284	288	231	235	.578	.618	108	104	Hyd.	Hyd.	1
		<i>2400-6000 Fair idle, Performance usage. Great mid-range torque & power.</i>										
120256-12	CL120256-12	284	288	231	235	.578	.618	112	108	Hyd.	Hyd.	1
		<i>2400-6000 Fair idle, Performance usage. Great mid-range torque & power.</i>										
121906-08	CL121906-08	286	286	233	233	.601	.601	108	104	Hyd.	Hyd.	1
		<i>2500-6100 Rough idle, Performance Street/Mild Strip. Nice mid range. 9.5:1+ CR, 2500+ stall.</i>										
121906-11	CL121906-11	286	286	233	233	.601	.601	111	107	Hyd.	Hyd.	1
		<i>2500-6200 Rough idle, Hot Street. Good usable mid range power band. 9.5:1+ CR, 2500+ stall.</i>										
120606-12	CL120606-12	286	300	233	247	.601	.612	112	108	Hyd.	Hyd.	1
		<i>2500-6200 Mild idle, Hot Street. Great mid range performance. 9.5:1+ CR, 2500+ stall.</i>										
120606-14	CL120606-14	286	300	233	247	.601	.612	114	110	Hyd.	Hyd.	1
		<i>2500-6500 Mild idle, Hot Street. Great mid range performance. Small blower or NOS OK.</i>										
120206-12	CL120206-12	286	298	233	245	.635	.635	112	108	Hyd.	Hyd.	1
		<i>2500-6300 Fair idle, Aggressive Street. Big mid range torque. 9.5:1+ CR, 2500+ stall.</i>										
120206-14	CL120206-14	286	298	233	245	.635	.635	114	110	Hyd.	Hyd.	1
		<i>2500-6300 Fair idle, Aggressive Street. Big mid range torque. Good with 150+ NOS or blower.</i>										
120406-08	CL120406-08	288	294	235	241	.618	.618	108	104	Hyd.	Hyd.	1
		<i>2600-6400 Rough idle, Hot Street/Strip. Great mid range. Needs good heads, 10.0:1+ CR.</i>										
120406-10	CL120406-10	288	294	235	241	.618	.618	110	106	Hyd.	Hyd.	1
		<i>2600-6400 Fair idle, Street/Strip, best in 496-540ci. Nice mid range power. 2600+ stall.</i>										
120406-12	CL120406-12	288	294	235	241	.618	.618	112	108	Hyd.	Hyd.	1
		<i>2600-6400 Rough idle, strong mid-range torque & horsepower.</i>										
120266-10	CL120266-10	290	296	237	243	.635	.640	110	106	Hyd.	Hyd.	1
		<i>2600-6500 Decent idle, Performance Street. Needs 10.0:1+.</i>										
120266-12	CL120266-12	290	296	237	243	.635	.640	112	108	Hyd.	Hyd.	1
		<i>2600-6500 Lopey idle, Hot Street & Bracket Racing. 10.0:1-up CR advised.</i>										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

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CHEVROLET BIG BLOCK GEN 6 • 454-502 1996-1999

Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91123 ³ 91167 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91167 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91167 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91167 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91167 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91167 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91167 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91167 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91167 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91167 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91167 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91167 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91167 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91167 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91167 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91167 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91167 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91167 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91167 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91167 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91167 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91167 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91167 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91167 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309

Components Notes: master note list on page 260

- ³ Included in Cam & Lifter Sets.
- ¹⁰ 10° Valve lock Angle, must use matching retainers/locks.
- ²⁵ Machining Required.
- ³³ Tie bar style lifters.

CAMSHAFTS



CHEVROLET BIG BLOCK GEN 6 • 454-502 1996-1999

Hydraulic Roller Camshafts (cont.)

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
120666-10	CL120666-10	296	302	243	249	.640	.640	110	106	Hyd.	Hyd.	1
2800-6200 Rough idle, Street/Strip, great upper mid range power. 10.0:1 CR, 3000+ stall												
120666-12	CL120666-12	296	302	243	249	.640	.640	112	108	Hyd.	Hyd.	1
2800-6300 Lopey idle, broad mid range power. 10.0:1 CR, 3000+ stall												
121616-12	CL121616-12	296	308	243	255	.640	.640	112	108	Hyd.	Hyd.	1
3000-6600 Lopey idle, Excellent mid to top end power. 10.0:1+ CR, 3200+ stall												
121616-14	CL121616-14	296	308	243	255	.640	.640	114	110	Hyd.	Hyd.	1
3000-6600 Rough idle, Bracket/Marine Performance. 540+, 12.5:1+ CR. Auto w/3500+. Blower OK.												
126736-10	CL126736-10	300	308	247	255	.612	.612	110	106	Hyd.	Hyd.	1
3000-6600 Rough idle, Bracket 540+ with 12.5:1 minimum. Auto w/3500+ stahl.												
126736-14	CL126736-14	300	308	247	255	.612	.612	114	110	Hyd.	Hyd.	1
3000-6600 Fair Idle, Bracket 540+ with 12.5-1 Auto w/7500+, Blower OK												
128526-12	CL128526-12	312	322	259	269	.680	.680	112	108	Hyd.	Hyd.	1
3200-6600 Most Popular 632 CID Hot Start												
129996	NA	Custom Grind Camshaft								Hyd.	Hyd.	1
Hydraulic Roller Special Order Camshaft.												



CHEVROLET BIG BLOCK GEN 6 • 454-502 1996-1999

Mechanical Roller Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
121166-12	NA	291	299	259	267	.663	.680	112	108	.022	.022	1
3400-7200 Lopey idle, Bracket E.T. Mid range torque & power. 11.5:1+ CR, 3500+ stall												
121126-10	NA	301	309	269	277	.703	.703	110	106	.022	.022	1
4000-8000 Competition, good mid & upper horsepower, bracket cars, OK w/NOS.												
128996	NA	Custom Grind Camshaft										1
Hydraulic Roller Special Order Camshaft.												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET BIG BLOCK GEN 6 • 454-502 1996-1999

Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91123 ³ 91161 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91161 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91161 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91161 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91161 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91161 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
91123 ³ 91161 ³³	NA	98636-K32	98636	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95220 95108/95121	NA	94402	94309
--	--	--	--	--	--	--	--	--	--	--	NA	94402	94309

CHEVROLET BIG BLOCK GEN 6 • 454-502 1996-1999

Mechanical Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91167 ³³ 91135 ³³	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	NA	94402	94309
91167 ³³ 91135 ³³	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	90120	95110/95115	NA	94402	94309
--	--	--	--	--	--	--	--	--	--	--	NA	94402	94309

Components Notes: master note list on page 260

- ³ Included in Cam & Lifter Sets.
- ¹⁰ 10° Valve lock Angle, must use matching retainers/locks.
- ²⁵ Machining Required.
- ³³ Tie bar style lifters.

CAMSHAFTS



CHEVROLET W-SERIES • 348-409 1958-1965

American Muscle™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.75 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
137651-13	CL137651-13	266	274	190	198	.401	.411	113	110	Hyd.	Hyd.	1

800-4400 Near duplicate of the Chev 340HP/409 cam (GM #3744901).



CHEVROLET W-SERIES • 348-409 1958-1965

Street Force™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.75 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
130101-12	CL130101-12	259	269	205	215	.490	.519	112	108	Hyd.	Hyd.	1
1000-5000 Street Force™ 1, Good idle, Mild Street performance, strong low end torque.												
131101-12	CL131101-12	269	279	215	225	.519	.543	112	108	Hyd.	Hyd.	1
1400-5400 Street Force™ 2, Good idle & throttle response. Needs 4 barrel & good exhaust.												
132121-12	CL132121-12	279	289	225	235	.543	.548	112	108	Hyd.	Hyd.	1
1500-5800 Street Force™ 3, Noticeable idle, Hot Street & mild Bracket Racing.												



CHEVROLET W-SERIES • 348-409 1958-1965

Rattler Cams™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.75 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
138021-09	CL138021-09	281	289	227	235	.548	.548	109	103	Hyd.	Hyd.	1
1500-5400 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.												
138051-09	CL138051-09	289	297	235	243	.548	.548	109	103	Hyd.	Hyd.	1
1800-5600 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.												
138111-09	CL138111-09	297	305	243	251	.548	.548	109	103	Hyd.	Hyd.	1
2400-6000 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET W-SERIES • 348-409 1958-1965

American Muscle™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111 ³ 91116	NA	98511-K31 ²⁵	98511 ²⁵	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	NA	NA	NA	NA	NA

CHEVROLET W-SERIES • 348-409 1958-1965

Street Force™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111 ³ 91116	NA	98511-K31 ²⁵	98511 ²⁵	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	NA	NA	NA	NA	NA
91111 ³ 91116	NA	98511-K31 ²⁵	98511 ²⁵	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	NA	NA	NA	NA	NA
91111 ³ 91116	NA	98511-K31 ²⁵	98511 ²⁵	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	NA	NA	NA	NA	NA

CHEVROLET W-SERIES • 348-409 1958-1965

Rattler Cams™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111 ³ 91112	NA	98511-K31 ²⁵	98511 ²⁵	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	NA	NA	NA	NA	NA
91111 ³ 91112	NA	98511-K31 ²⁵	98511 ²⁵	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	NA	NA	NA	NA	NA
91111 ³ 91112	NA	98511-K31 ²⁵	98511 ²⁵	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	NA	NA	NA	NA	NA

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



CHEVROLET W-SERIES • 348-409 1958-1965

Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.75 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
130821-10	CL130821-10	267	267	213	213	.502	.502	110	106	Hyd.	Hyd.	1
		<i>1600-5200 Good idle, Strong low & mid-range torque & horsepower.</i>										
130991-10	CL130991-10	275	275	221	221	.548	.548	110	106	Hyd.	Hyd.	1
		<i>1800-5600 Nice idle, Great mid range with good throttle response.</i>										
130501-12	CL130501-12	277	289	223	235	.543	.519	112	108	Hyd.	Hyd.	1
		<i>2000-5800 Fair idle, Hot Street & mild Bracket Racing. Good mid range torque. 9.5-11.0: CR.</i>										
130331-10	CL130331-10	291	297	237	243	.525	.525	110	106	Hyd.	Hyd.	1
		<i>2800-6200 Lopey idle, Street/Strip or nostalgia. Likes headers & gears.</i>										
139991	NA	Custom Grind Camshaft								Hyd.	Hyd.	1
		<i>Hydraulic Flat Tappet Special Order Camshaft.</i>										



CHEVROLET W-SERIES • 348-409 1958-1965

Rattler Cams™ Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•8•7•3•6•5•4•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.75 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
138025-09	CL138025-09	280	288	227	235	.571	.571	109	103	Hyd.	Hyd.	1
		<i>1500-5400 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.</i>										
138045-09	CL138045-09	288	296	235	243	.618	.618	109	103	Hyd.	Hyd.	1
		<i>1800-5600 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.</i>										
138085-09	CL138085-09	296	304	243	251	.618	.600	109	103	Hyd.	Hyd.	1
		<i>2400-6000 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.</i>										



CHEVROLET W-SERIES • 348-409 1958-1965

Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•8•7•3•6•5•4•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.75 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
130445-12	CL130445-12	266	278	213	225	.525	.525	112	108	Hyd.	Hyd.	1
		<i>1400-5600 Good idle, Street Performance/Daily Driver. 9.0:1+ CR.</i>										
131125-10	CL131125-10	282	286	229	233	.560	.572	110	106	Hyd.	Hyd.	1
		<i>1800-6000 Nice idle, Performance Street. Best with improved intake & exhaust, 2000+ stall.</i>										
133305-12	CL133305-12	286	294	233	241	.601	.618	112	108	Hyd.	Hyd.	1
		<i>2000-6400 Fair idle, Hot Street Rod/Strip. 10.0:1+, good intake & exhaust, 2400+ stall.</i>										
139995	NA	Custom Grind Camshaft								Hyd.	Hyd.	1
		<i>Retro-Fit Hydraulic Roller Special Order Camshaft.</i>										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

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CHEVROLET W-SERIES • 348-409 1958-1965

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111 ³ 91112	NA	98511-K31 ²⁵	98511 ²⁵	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	NA	NA	NA	NA	NA
91111 ³ 91112	NA	98511-K31 ²⁵	98511 ²⁵	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	NA	NA	NA	NA	NA
91111 ³ 91112	NA	98511-K31 ²⁵	98511 ²⁵	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	NA	NA	NA	NA	NA
91111 ³ 91112	NA	98511-K31 ²⁵	98511 ²⁵	97110 97128 ¹⁰	-- 97216 ¹⁰	93015 93018 ¹⁰	93321 ²⁵	90075	NA	NA	NA	NA	NA
91111 91112	NA	--	--	--	--	--	--	90075	NA	--	NA	NA	NA

CHEVROLET W-SERIES • 348-409 1958-1965

Rattler Cams™ Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91364 ³ 91360	NA	NA	98511 ²⁵	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	NA	NA	NA	NA	NA
91364 ³ 91360	NA	NA	98511 ²⁵	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	NA	NA	NA	NA	NA
91364 ³ 91360	NA	NA	98511 ²⁵	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	NA	NA	NA	NA	NA

CHEVROLET W-SERIES • 348-409 1958-1965

Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91364 ³ 91360	NA	NA	98511 ²⁵	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	NA	NA	NA	NA	NA
91364 ³ 91360	NA	NA	98511 ²⁵	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	NA	NA	NA	NA	NA
91364 ³ 91360	NA	NA	98511 ²⁵	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	NA	NA	NA	NA	NA
91364 91360	NA	--	--	--	--	--	--	90075	NA	--	NA	NA	NA

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



CHEVROLET W-SERIES • 348-409 1958-1965

Mechanical Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.75 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
131672-10	CL131672-10 CL131672-10DL ⁴	275	275	240	240	.589	.589	110	106	.022	.022	1
<i>2800-6400 Fair idle, Street/Strip. Nice mid range torque & performance.</i>												
131742-10	CL131742-10 CL131742-10DL ⁴	283	289	248	254	.624	.642	110	106	.022	.022	1
<i>3200-6800 Rough idle, Serious Street Rod/Bracket. Need good intake & exhaust.</i>												
132322-10	CL132322-10 CL132322-10DL ⁴	295	303	260	268	.648	.642	110	106	.022	.022	1
<i>3800-7200 Rough idle, Great for stroker combinations. Best in light car, 11.5:1+ CR.</i>												
139992	NA	Custom Grind Camshaft										1
<i>Mechanical Flat Tappet Special Order Camshaft.</i>												



CHEVROLET W-SERIES • 348-409 1958-1965

Mechanical Roller Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.75 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
139993	NA	Custom Grind Camshaft										1,5
<i>Mechanical Roller Special Order Camshaft.</i>												



CHRYSLER SLANT 6 • 170-225 1960-1987

Mechanical Flat Tappet Camshafts

Firing Order: 1•5•3•6•2•4

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
751082-12	CL751082-12	249	249	214	214	.450	.450	112	108	.022	.022	1
<i>1200-5000 Smooth idle, High torque, low rpm power band.</i>												
752002-10	CL752002-10	255	255	220	220	.473	.473	110	106	.022	.022	1
<i>1800-5600 Smooth idle, good low to mid range torque & power. Excellent for trucks & towing.</i>												
759992	NA	Custom Grind Camshaft										1
<i>Mechanical Flat Tappet Special Order Camshaft.</i>												

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 4 Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.
- 5 Requires upgraded distributor gear/fuel pump pushrod.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHEVROLET W-SERIES • 348-409 1958-1965

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91115 ³ 91118 ⁴	NA	NA	98511 ²⁵	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	NA	NA	NA	NA	NA
91115 ³ 91118 ⁴	NA	NA	98511 ²⁵	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	NA	NA	NA	NA	NA
91115 ³ 91118 ⁴	NA	NA	98511 ²⁵	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	90075	NA	NA	NA	NA	NA
91115 91118	NA	--	--	--	--	--	--	90075	NA	--	NA	NA	NA

CHEVROLET W-SERIES • 348-409 1958-1965

Mechanical Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
--	NA	--	--	--	--	--	--	90075	NA	--	NA	NA	NA

CHRYSLER SLANT 6 • 170-225 1960-1987

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91715-12 ³	NA	NA	98341-12 ²⁵	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
91715-12 ³	NA	NA	98341-12 ²⁵	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
91715-12	NA	NA	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Components Notes: master note list on page 260

- ³ Included in Cam & Lifter Sets.
- ⁴ Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.
- ¹⁰ 10° Valve lock Angle, must use matching retainers/locks.
- ²⁵ Machining Required.

CAMSHAFTS



CHRYSLER SMALL BLOCK LA • 273, 340, 360 1964-2003 • 318 1967-1991

Street Force™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
710011-12	CL710011-12	259	267	205	213	.420	.430	112	108	Hyd.	Hyd.	
1200-4600 Street Force™ 1, Good idle, Mild Street performance, strong low end torque.												
710031-12	CL710031-12	267	277	213	223	.450	.465	112	108	Hyd.	Hyd.	1
1500-5000 Street Force™ 2, Good idle & throttle response. Needs 4 barrel & good exhaust.												
712121-12	CL712121-12	279	289	225	235	.465	.470	112	108	Hyd.	Hyd.	1
1600-5800 Street Force™ 3, Noticeable idle, Hot Street & mild Bracket Racing.												



CHRYSLER SMALL BLOCK LA • 273, 340, 360 1964-2003 • 318 1967-1991

Rattler Cams™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
718001-09	CL718001-09	281	289	227	235	.480	.488	109	103	Hyd.	Hyd.	1
2000-5800 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.												
718041-09	CL718041-09	289	297	235	243	.488	.480	109	103	Hyd.	Hyd.	1
2300-6000 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.												
718081-09	CL718081-09	297	305	243	251	.507	.495	109	103	Hyd.	Hyd.	1
2500-6400 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												



CHRYSLER SMALL BLOCK LA • 273, 340, 360 1964-2003 • 318 1967-1991

Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
710021-11	CL710021-11	263	263	209	209	.420	.420	111	107	Hyd.	Hyd.	
1200-4600 Fair idle. Great for Street Performance. Car or truck, good torque.												
711381-10	CL711381-10	255	261	208	214	.479	.494	110	106	Hyd.	Hyd.	1,15
1400-4800 Fair idle, very strong torque. Best in 273-318.												
711021-10	CL711021-10	267	267	213	213	.450	.450	110	106	Hyd.	Hyd.	
1500-4800 Strong mid-range torque. Needs 4 barrel & good flowing exhaust. 1800+ stall.												
710931-12	CL710931-12	269	269	215	215	.455	.455	112	108	Hyd.	Hyd.	
1500-5200 Great cam for use in Performance Street cars & PUs.												
711651-10	CL711651-10	265	273	218	226	.502	.525	110	106	Hyd.	Hyd.	1,15
1800-5600 Mild idle, Street/Street Performance. Excellent throttle response.												
711451-08	CL711451-08	267	267	220	220	.506	.506	108	104	Hyd.	Hyd.	1,15
1800-5800 Good low & mid-range horsepower. Needs 4 barrel & headers.												
710991-08	CL710991-08	275	275	221	221	.470	.470	108	104	Hyd.	Hyd.	1
1800-5800 Good low & mid-range horsepower. Needs 4 barrel & headers.												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

15 Lobes designed to take maximum advantage of .904" dia. lifter.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHRYSLER SMALL BLOCK LA • 273, 340, 360 1964-2003 • 318 1967-1991

Street Force™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91711 ³ 91712	NA	-- 98438-K34 ²⁵	98412 98438 ²⁵	-- 97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330
91711 ³ 91712	NA	-- 98438-K34 ²⁵	98412 98438 ²⁵	-- 97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330
91711 ³ 91712	NA	-- 98438-K34 ²⁵	98412 98438 ²⁵	-- 97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330

CHRYSLER SMALL BLOCK LA • 273, 340, 360 1964-2003 • 318 1967-1991

Rattler Cams™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91711 ³ 91712	NA	98438-K34 ²⁵	98438 ²⁵	97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330
91711 ³ 91712	NA	98438-K34 ²⁵	98438 ²⁵	97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330
91711 ³ 91712	NA	98438-K34 ²⁵	98438 ²⁵	97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330

CHRYSLER SMALL BLOCK LA • 273, 340, 360 1964-2003 • 318 1967-1991

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91711 ³ 91712	NA	-- 98438-K34 ²⁵	98412 98438 ²⁵	-- 97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330
91711 ³ 91712	NA	98438-K34 ²⁵	98438 ²⁵	97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330
91711 ³ 91712	NA	-- 98438-K34 ²⁵	98412 98438 ²⁵	-- 97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330
91711 ³ 91712	NA	-- 98438-K34 ²⁵	98412 98438 ²⁵	-- 97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330
91711 ³ 91712	NA	98438-K34 ²⁵	98438 ²⁵	97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330
91711 ³ 91712	NA	98438-K34 ²⁵	98438 ²⁵	97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

²⁵ Machining Required.

CAMSHAFTS



CHRYSLER SMALL BLOCK LA • 273, 340, 360 1964-2003 • 318 1967-1991

Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
712221-08	CL712221-08	279	279	225	225	.465	.465	108	104	Hyd.	Hyd.	1
		<i>2200-5500 Mid-range & top end horsepower & torque. Needs 4bbl., gears, headers.</i>										
710461-10	CL710461-10	273	277	226	230	.525	.531	110	106	Hyd.	Hyd.	1,15
		<i>2200-6000 Fair idle, Hot Street & mild Bracket Racing.</i>										
710581-10	CL710581-10	277	283	230	236	.531	.547	110	106	Hyd.	Hyd.	1,15
		<i>2600-6200 Lopey idle, Strong mid range. Good throttle response. 2400+ stall</i>										
712231-09	CL712231-09	285	285	231	231	.480	.480	109	105	Hyd.	Hyd.	1
		<i>2600-6000 Runs strong 3,500 & up. 9.5+ comp., auto OK with gears.</i>										
711791-08	CL711791-08	283	287	236	240	.547	.559	108	104	Hyd.	Hyd.	1,15
		<i>2800-6400 Lopey idle, good mid-range power. Needs 3200+ stall.</i>										
712901-12	CL712901-12	294	300	241	247	.390	.410	112	108	Hyd.	Hyd.	
		<i>2300-6500 Fair idle, Circle Track Lift Rule Only. Strong mid-range.</i>										
710831-08	CL710831-08	289	289	242	242	.562	.562	108	104	Hyd.	Hyd.	1,15
		<i>2800-6400 Fair idle, Street/Strip. Nice mid range power. Needs at least 9.5:1 CR, 3200+ stall.</i>										
711351-08	CL711351-08	291	295	244	248	.566	.578	108	104	Hyd.	Hyd.	1,15
		<i>2800-6500 Hot Street/Bracket, strong mid range performance.</i>										
716771-08	CL716771-08	301	301	247	247	.510	.510	108	104	Hyd.	Hyd.	1,15
		<i>3000-6500 Rough idle. Hot Street/Strip, strong mid range performance.</i>										
710881-08	CL710881-08	295	301	248	254	.578	.590	108	104	Hyd.	Hyd.	1,15
		<i>4200-7000 Rough idle, Pro Street/Brackets, Strong mid & upper end power. 10.0:1+ CR.</i>										
719991	NA	Custom Grind Camshaft								Hyd.	Hyd.	1
		<i>Hydraulic Flat Tappet Special Order Camshaft.</i>										



CHRYSLER SMALL BLOCK LA • 273, 340, 360 1964-2003 • 318 1967-1991

Rattler Cams™ Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
718005-09	CL718005-09	280	288	227	235	.525	.530	109	103	Hyd.	Hyd.	1
		<i>1800-5500 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.</i>										
718045-09	CL718045-09	288	296	235	243	.530	.530	109	103	Hyd.	Hyd.	1
		<i>2000-5700 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.</i>										
718085-09	CL718085-09	296	304	243	251	.530	.515	109	103	Hyd.	Hyd.	1
		<i>2400-6000 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.</i>										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

15 Lobes designed to take maximum advantage of .904" dia. lifter.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHRYSLER SMALL BLOCK LA • 273, 340, 360 1964-2003 • 318 1967-1991

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91711 ³ 91712	NA	-- 98438-K34 ²⁵	98412 98438 ²⁵	-- 97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330
91711 ³ 91712	NA	98438-K34 ²⁵	98438 ²⁵	97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330
91711 ³ 91712	NA	98438-K34 ²⁵	98438 ²⁵	97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330
91711 ³ 91712	NA	98438-K34 ²⁵	98438 ²⁵	97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330
91711 ³ 91712	NA	98438-K34 ²⁵	98438 ²⁵	97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330
91711 ³ 91712	NA	98438-K34 ²⁵	98438 ²⁵	97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330
91711 ³ 91712	NA	98438-K34 ²⁵	98438 ²⁵	97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330
91711 ³ 91712	NA	98438-K34 ²⁵	98438 ²⁵	97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330
91711 ³ 91712	NA	98438-K34 ²⁵	98438 ²⁵	97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330
91711 ³ 91712	NA	98438-K34 ²⁵	98438 ²⁵	97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330
91711 ³ 91712	NA	98438-K34 ²⁵	98438 ²⁵	97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330
91711 ³ 91712	NA	--	--	--	--	--	--	NA	NA	--	NA	NA	94330

CHRYSLER SMALL BLOCK LA • 273, 340, 360 1964-2003 • 318 1967-1991

Rattler Cams™ Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91764 ³	NA	98438-K34 ²⁵	98438 ²⁵	97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330
91764 ³	NA	98438-K34 ²⁵	98438 ²⁵	97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330
91764 ³	NA	98438-K34 ²⁵	98438 ²⁵	97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

²⁵ Machining Required.

CAMSHAFTS



CHRYSLER SMALL BLOCK LA • 273, 340, 360 1964-2003 • 318 1967-1991

Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
713175-10	CL713175-10	272	278	219	225	.525	.525	110	106	Hyd.	Hyd.	1
		1600-5600 Good idle, Performance Street, good low to mid range torque. 9.0:1+ CR, 2200+ stall.										
711915-12	CL711915-12	274	278	221	225	.475	.500	112	108	Hyd.	Hyd.	1
		1200-5700 Mild idle, Street Performance, big low end torque. Should have 9.0:1+ CR, 1800+ stall.										
710525-10	CL710525-10	282	286	229	233	.520	.515	110	106	Hyd.	Hyd.	1
		2000-6000 Lopey idle, Hot Street, great mid range acceleration & torque. 9.5:1 CR, 2500+ stall.										
712105-10	CL712105-10	288	294	235	241	.530	.530	110	106	Hyd.	Hyd.	1
		2400-6300 Rough idle, Street/Strip, great mid range. 9.5:1+ CR, 2800+ stall & good intake.										
710665-10	CL710665-10	294	300	241	247	.545	.550	110	106	Hyd.	Hyd.	1
		2800-6500 Rough idle, Pro Street/Strip. Needs 10.0:1+ CR, 2800+ stall & at least 4.10 gears.										
719995	NA	Custom Grind Camshaft								Hyd.	Hyd.	1
		Retro-Fit Hydraulic Roller Special Order Camshaft.										



CHRYSLER SMALL BLOCK LA • 273, 340, 360 1964-2003 • 318 1967-1991

Mechanical Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
710862-08	CL710862-08 CL710862-08DL ⁴	266	266	238	238	.558	.558	108	104	.018	.018	1,15,34
		2400-6200 Street/Strip & mild Bracket. Strong low to mid range. 9.5:1 CR, 2500+ stall.										
711262-08	CL711262-08 CL711262-08DL ⁴	281	281	246	246	.536	.536	108	104	.022	.022	1
		3000-6600 Rough idle, Pro Street/Bracket, strong mid range power. 3000+ stall, 9.5:1 CR.										
712382-08	CL712382-08 CL712382-08DL ⁴	281	285	246	250	.520	.525	108	104	.022	.022	1
		3000-6800 Street/Strip, good Oval Track cam for limited induction systems.										
712392-06	CL712392-06 CL712392-06DL ⁴	285	291	250	256	.525	.535	106	102	.022	.022	1
		3200-7000 Street/Strip, good Oval Track cam for limited induction systems.										
712362-08	CL712362-08 CL712362-08DL ⁴	289	295	254	260	.550	.555	108	104	.022	.022	1
		3400-7400 Lopey idle. Oval Track, Street/Strip with 10.0:1+ CR. Auto needs 3500+ stall.										
712712-08	CL712712-08 CL712712-08DL ⁴	282	288	254	260	.599	.616	108	104	.022	.022	1,15
		3400-7400 Lopey idle. Oval Track, Street/Strip with 10.0:1+ CR. Auto needs 3500+ stall.										
712532-06	CL712532-06 CL712532-06DL ⁴	295	299	260	264	.565	.565	106	102	.022	.022	1
		3600-7400 Strong mid range & upper end power. Needs good intake & exhaust.										
712322-08	CL712322-08 CL712322-08DL ⁴	295	305	260	270	.555	.566	108	104	.022	.022	1
		3600-7600 Hot Street/Bracket. Must have 11.0:1+ CR & 4000+ stall.										
710782-06	CL710782-06 CL710782-06DL ⁴	296	302	268	274	.632	.643	106	102	.018	.018	1,15,34
		4000-7600 Bracket/Super Street, Nice top end power. Should have 12.0:1 CR, 4500+ stall.										
710782-08	CL710782-08 CL710782-08DL ⁴	296	302	268	274	.632	.643	108	104	.018	.018	1,15,34
		4000-7600 Bracket/Super Street, Nice top end power. Should have 12.0:1 CR, 4500+ stall.										
719992	NA	Custom Grind Camshaft										1
		Mechanical Flat Tappet Special Order Camshaft.										

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 4 Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.
- 15 Lobes designed to take maximum advantage of .904" dia. lifter.
- 34 Provisions for increased oiling recommended.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHRYSLER SMALL BLOCK LA • 273, 340, 360 1964-2003 • 318 1967-1991

Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91764 ³	NA	98438-K34 ²⁵	98438 ²⁵	97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330
91764 ³	NA	98438-K34 ²⁵	98438 ²⁵	97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330
91764 ³	NA	98438-K34 ²⁵	98438 ²⁵	97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330
91764 ³	NA	98438-K34 ²⁵	98438 ²⁵	97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330
91764 ³	NA	98438-K34 ²⁵	98438 ²⁵	97110	NA	93066	93321 ²⁵	NA	NA	NA	NA	NA	94330
91764	NA	--	--	--	--	--	--	NA	NA	--	NA	NA	94330

CHRYSLER SMALL BLOCK LA • 273, 340, 360 1964-2003 • 318 1967-1991

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91715 ³ 91718 ⁴	NA	NA	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	NA	NA	94330
91715 ³ 91718 ⁴	NA	NA	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	NA	NA	94330
91715 ³ 91718 ⁴	NA	NA	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	NA	NA	94330
91715 ³ 91718 ⁴	NA	NA	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	NA	NA	94330
91715 ³ 91718 ⁴	NA	NA	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	NA	NA	94330
91715 ³ 91718 ⁴	NA	NA	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	NA	NA	94330
91715 ³ 91718 ⁴	NA	NA	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	NA	NA	94330
91715 ³ 91718 ⁴	NA	NA	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	NA	NA	94330
91715 ³ 91718 ⁴	NA	NA	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	NA	NA	94330
91715 ³ 91718 ⁴	NA	NA	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	NA	NA	94330
91715 91718	NA	--	--	--	--	--	--	NA	NA	--	NA	NA	94330

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

⁴ Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

³⁵ 10° Multi-Groove for OE style valves not available (93018 single-groove).

CAMSHAFTS



CHRYSLER SMALL BLOCK LA • 273, 340, 360 1964-2003 • 318 1967-1991

Steel Billet Mechanical Roller Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
711213-10	NA	261	269	229	237	.555	.555	110	106	.022	.022	1,5
		2400-6000 Fair idle, Street Performance/Mild Bracket. 2500+ stall, 9.5:1 CR.										
711313-08	NA	277	277	245	245	.585	.585	108	104	.022	.022	1,5
		2800-6200 Fair idle, Street/Strip, good mid range torque. 10.0:1 stall, 3500+ stall & good intake.										
711153-06	NA	277	281	245	249	.585	.585	106	102	.022	.022	1,5
		2800-6400 Lopey idle, great oval track & heavy drag car										
712113-08	NA	277	285	245	253	.600	.600	108	104	.022	.022	1,5
		2800-6800 340-360 ci. Hot Street & mild Bracket.										
711013-06	NA	283	289	251	257	.640	.640	106	102	.022	.022	1,5
		3000-6800 Good mid & upper horsepower, Great for Brackets.										
711133-08	NA	289	299	257	267	.640	.645	108	104	.022	.022	1,5
		3400-7000 Strong mid-range & upper end horsepower, 12.0:1+ CR.										
712123-06	NA	291	299	259	267	.640	.645	106	102	.022	.022	1,5
		3800-7600 11.5:1+ Comp. Good heads. Strong mid & upper horsepower.										
711113-08	NA	295	305	263	273	.640	.645	108	104	.022	.022	1,5
		4000-7800 12.5:1+ Comp. Good heads. Strong mid to top end.										
710563-06	NA	305	311	273	279	.680	.640	106	102	.022	.022	1,5
		4200-8000 Rough idle, Bracket/Super Gas. Needs high compression & 5000+ stall.										
710563-08	NA	305	311	273	279	.680	.640	108	104	.022	.022	1,5
		4200-8000 Rough idle, Bracket/Super Gas. Needs high compression & 5000+ stall.										
719993	NA	Custom Grind Camshaft										1,5
		Mechanical Roller Special Order Camshaft.										
719994	NA	Custom Grind Camshaft, "R" Block										1,5
		Mechanical Roller Special Order Camshaft.										



CHRYSLER 5.2L • 5.9L MAGNUM • 1992-2002

Hydraulic Roller Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
770225-14	CL770225-14	254	262	201	209	.480	.480	114	110	Hyd.	Hyd.	1
		800-5000 Good idle, Performance Street, good low to mid range torque. 8.5:1+ CR.										
770055-12	CL770055-12	262	270	209	217	.496	.496	112	108	Hyd.	Hyd.	1
		1000-5200 Good idle, Performance Street, good low to mid range torque. 9.0:1+ CR.										
771915-12	CL771915-12	274	278	221	225	.507	.533	112	108	Hyd.	Hyd.	1
		1200-5700 Mild idle, Street Performance, big low end torque. Should have 9.0:1+ CR, 1800+ stall.										
770525-10	CL770525-10	282	286	229	233	.555	.549	110	106	Hyd.	Hyd.	1
		2000-6000 Lopey idle, Hot Street, great mid range acceleration & torque. 9.5:1 CR, 2500+ stall.										
772105-10	CL772105-10	288	294	235	241	.565	.565	110	106	Hyd.	Hyd.	1
		2400-6300 Rough idle, Street/Strip, great mid range. 9.5:1+ CR, 2800+ stall & good intake.										
770665-10	CL770665-10	294	300	241	247	.581	.587	110	106	Hyd.	Hyd.	1
		2800-6500 Rough idle, Pro Street/Strip. Needs 10.0:1+ CR, 2800+ stall & at least 4.10 gears.										
779995	NA	Custom Grind Camshaft										1
		Retro-Fit Hydraulic Roller Special Order Camshaft.										

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 5 Requires upgraded distributor gear/fuel pump pushrod.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHRYSLER SMALL BLOCK LA • 273, 340, 360 1964-2003 • 318 1967-1991

Steel Billet Mechanical Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91750 91717	NA	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	NA	94415	94330
91750 91717	NA	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	NA	94415	94330
91750 91717	NA	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	NA	94415	94330
91750 91717	NA	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	NA	94415	94330
91717 91734	NA	NA	98637 ²⁵	NA	97220 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	NA	94415	94330
91717 91734	NA	NA	98543 ²⁵	97130 ¹⁰	97220 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	NA	94415	94330
91717 91734	NA	NA	98543 ²⁵	97130 ¹⁰	97220 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	NA	94415	94330
91717 91734	NA	NA	98543 ²⁵	97130 ¹⁰	97220 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	NA	94415	94330
91717 91734	NA	NA	98543 ²⁵	97130 ¹⁰	97220 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	NA	94415	94330
91717 91734	NA	NA	98543 ²⁵	97130 ¹⁰	97220 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	NA	94415	94330
--	NA	--	--	--	--	--	--	NA	NA	--	NA	NA	94330
--	NA	--	--	--	--	--	--	NA	NA	--	NA	NA	94330

CHRYSLER 5.2L • 5.9L MAGNUM • 273, 340, 360 1964-2003 • 318 1967-1991

Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91764 ^{3,33}	NA	NA	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	NA	NA	94330
91764 ^{3,33}	NA	NA	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	NA	NA	94330
91764 ^{3,33}	NA	NA	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	NA	NA	94330
91764 ^{3,33}	NA	NA	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	NA	NA	94330
91764 ^{3,33}	NA	NA	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	NA	NA	94330
91764 ^{3,33}	NA	NA	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	NA	NA	94330
91764 ³³	NA	--	--	--	--	--	--	NA	NA	--	NA	NA	94330

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

³³ Tie bar style lifters.

³⁵ 10° Multi-Groove for OE style valves not available (93018 single-groove).

CAMSHAFTS



CHRYSLER BIG BLOCK B/RB • 383-440 1959-1980

Max Certified™ Hydraulic Flat Tappet Cam & Lifter Sets - 5 Year No Fault Warranty (see page 3 for details)

Cam & Lifter Set Part No.	Cam & Direct Lube Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
MC720931-11	NA	267	267	213	213	.450	.450	111	107	Hyd.	Hyd.	1
		<i>1000-5000 Super low & mid-range performance. Good idle.</i>										
MC720031-12	NA	269	277	215	223	.445	.465	112	108	Hyd.	Hyd.	1
		<i>1400-5200 Good idle & throttle response. Needs 4 barrel & good exhaust.</i>										
MC722241-08	NA	289	289	235	235	.488	.488	108	104	Hyd.	Hyd.	1
		<i>2600-6400 Runs strong 3,500 & up. 9.5+ comp., auto OK with gears.</i>										



CHRYSLER BIG BLOCK B/RB • 383-440 1959-1980

American Muscle™ Hydraulic Flat Tappet Camshafts (Single Bolt)

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
727511-13	CL727511-13	260	268	206	208	.434	.434	113	110	Hyd.	Hyd.	1
		<i>1400-5000 Near duplicate of the Chrysler 365HP/440 cam (#2532190).</i>										



CHRYSLER BIG BLOCK B/RB • 383-440 1959-1980

Street Force™ Hydraulic Flat Tappet Camshafts (Single Bolt) Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
720031-12	CL720031-12	269	277	215	223	.445	.465	112	108	Hyd.	Hyd.	1
		<i>1400-5200 Street Force™ 2, Good idle & throttle response. Needs 4 barrel & good exhaust.</i>										
720141-12	CL720141-12	279	289	225	235	.490	.488	112	108	Hyd.	Hyd.	1
		<i>1600-5600 Street Force™ 3, Noticeable idle, Hot Street & mild Bracket Racing.</i>										
721161-12	CL721161-12	289	299	235	245	.488	.488	112	108	Hyd.	Hyd.	1
		<i>2600-6400 Street Force™ 4, Lopey idle, good mid-range power. Needs 2800+ stall.</i>										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

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CHRYSLER BIG BLOCK B/RB • 383-440 1959-1980

Max Certified™ Hydraulic Flat Tappet Cam & Lifter Set Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91711 ³ 91712	NA	98515-K33	98515	97110	--	93065	93321 ²⁵	NA	NA	NA	92152	NA	94335
91711 ³ 91712	NA	98515-K33	98515	97110	--	93065	93321 ²⁵	NA	NA	NA	92152	NA	94335
91711 ³ 91712	NA	98515-K33	98515	97110	--	93065	93321 ²⁵	NA	NA	NA	92152	NA	94335

CHRYSLER BIG BLOCK B/RB • 383-440 1959-1980

American Muscle™ Hydraulic Flat Tappet Cam & Lifter Set Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91711 ³ 91712	NA	98515-K33	98515	97110	--	93065	93321 ²⁵	NA	NA	NA	92152	NA	94335

CHRYSLER BIG BLOCK B/RB • 383-440 1959-1980

Street Force™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91711 ³ 91712	NA	98515-K33	98515	97110	--	93065	93321 ²⁵	NA	NA	NA	92152	NA	94335
91711 ³ 91712	NA	98515-K33	98515	97110	--	93065	93321 ²⁵	NA	NA	NA	92152	NA	94335
91711 ³ 91712	NA	98515-K33	98515	97110	--	93065	93321 ²⁵	NA	NA	NA	92152	NA	94335

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

²⁵ Machining Required.

CAMSHAFTS



CHRYSLER BIG BLOCK B/RB • 383-440 1959-1980

Rattler Cams™ Hydraulic Flat Tappet Camshafts (Single Bolt) Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
728001-09	CL728001-09	281	289	227	235	.480	.488	109	103	Hyd.	Hyd.	1
<i>1800-5600 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.</i>												
728041-09	CL728041-09	289	297	235	243	.488	.480	109	103	Hyd.	Hyd.	1
<i>2000-6000 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.</i>												
728081-09	CL728081-09	297	305	243	251	.507	.495	109	103	Hyd.	Hyd.	1
<i>2400-6400 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.</i>												



CHRYSLER BIG BLOCK B/RB • 383-440 1959-1980

Hydraulic Flat Tappet Camshafts (Single Bolt) Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
720021-11	CL720021-11	263	263	209	209	.420	.420	111	107	Hyd.	Hyd.	
<i>800-4800 Smooth idle, strong low end. High vacuum, good fuel economy.</i>												
720931-11	CL720931-11	267	267	213	213	.450	.450	111	107	Hyd.	Hyd.	1
<i>1000-5000 Super low & mid-range performance. Good idle.</i>												
721141-08	CL721141-08	267	267	220	220	.506	.506	108	104	Hyd.	Hyd.	1,15
<i>1600-5400 Good low & mid-range horsepower. Needs 4 barrel & headers.</i>												
721941-12	CL721941-12	271	281	224	234	.518	.543	112	108	Hyd.	Hyd.	1,15
<i>1800-5400 Fair idle, Hot Street & mild Bracket Racing. Strong mid range.</i>												
720581-10	CL720581-10	277	283	230	236	.531	.547	110	106	Hyd.	Hyd.	1,15
<i>2400-6200 Lopey idle, Strong mid range. Good throttle response. 2400+ stall.</i>												
722241-08	CL722241-08	289	289	235	235	.488	.488	108	104	Hyd.	Hyd.	1
<i>2600-6400 Runs strong 3,500 & up. 9.5+ comp., auto OK with gears.</i>												
721201-08	CL721201-08	285	289	238	242	.555	.562	108	104	Hyd.	Hyd.	1,15
<i>2800-6600 Lopey idle, Hot Street/Bracket. Good mid range power band.</i>												
722251-09	CL722251-09	297	305	243	251	.519	.540	109	105	Hyd.	Hyd.	1
<i>3000-6800 Hot Pro-Street/Bracket. Strong mid-range, needs 11.0-1 CR-up.</i>												
720881-08	CL720881-08	295	301	248	254	.578	.590	108	104	Hyd.	Hyd.	1,15
<i>3400-7200 Rough idle, Hot Street/Bracket, strong mid & top end performance.</i>												
729991	NA	Custom Grind Camshaft (Single-Bolt)								Hyd.	Hyd.	1
<i>Hydraulic Flat Tappet Special Order Camshaft.</i>												
729994	NA	Custom Grind Camshaft (3-Bolt)								Hyd.	Hyd.	1
<i>Hydraulic Flat Tappet Special Order Camshaft.</i>												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

15 Lobes designed to take maximum advantage of .904" dia. lifter.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHRYSLER BIG BLOCK B/RB • 383-440 1959-1980

Rattler Cams™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91711 ³ 91712	NA	98529-K33	98529	97110	--	93065	93321 ²⁵	NA	NA	NA	92152	NA	94335
91711 ³ 91712	NA	98529-K33	98529	97110	--	93065	93321 ²⁵	NA	NA	NA	92152	NA	94335
91711 ³ 91712	NA	98529-K33	98529	97110	--	93065	93321 ²⁵	NA	NA	NA	92152	NA	94335

CHRYSLER BIG BLOCK B/RB • 383-440 1959-1980

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91711 ³ 91712	NA	98515-K33	98515	97110	--	93065	93321 ²⁵	NA	NA	NA	92152	NA	94335
91711 ³ 91712	NA	98515-K33	98515	97110	--	93065	93321 ²⁵	NA	NA	NA	92152	NA	94335
91711 ³ 91712	NA	98515-K33	98515	97110	--	93065	93321 ²⁵	NA	NA	NA	92152	NA	94335
91711 ³ 91712	NA	98529-K33	98529	97110	--	93065	93321 ²⁵	NA	NA	NA	92152	NA	94335
91711 ³ 91712	NA	98529-K33	98529	97110	--	93065	93321 ²⁵	NA	NA	NA	92152	NA	94335
91711 ³ 91712	NA	98529-K33	98529	97110	--	93065	93321 ²⁵	NA	NA	NA	92152	NA	94335
91711 ³ 91712	NA	98529-K33	98529	97110	--	93065	93321 ²⁵	NA	NA	NA	92152	NA	94335
91711 ³ 91712	NA	98529-K33	98529	97110	--	93065	93321 ²⁵	NA	NA	NA	92152	NA	94335
91711 ³ 91712	NA	--	--	--	--	--	--	NA	NA	--	92152	NA	94330
91711 ³ 91712	NA	--	--	--	--	--	--	NA	NA	--	92152	NA	94330

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

²⁵ Machining Required.

CAMSHAFTS



CHRYSLER BIG BLOCK B/RB • 383-440 1959-1980

Rattler Cams™ Retro-Fit Hydraulic Roller Camshafts (3 Bolt) Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
728005-09	CL728005-09	280	288	227	235	.525	.530	109	103	Hyd.	Hyd.	1,6
1800-5400 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.												
728045-09	CL728045-09	288	296	235	243	.530	.530	109	103	Hyd.	Hyd.	1,6
2000-5600 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.												
728085-09	CL728085-09	296	304	243	251	.530	.515	109	103	Hyd.	Hyd.	1,6
2400-6200 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												



CHRYSLER BIG BLOCK B/RB • 383-440 1959-1980

Retro-Fit Hydraulic Roller Camshafts (3 Bolt) Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes	
		IN	EX	IN	EX	IN	EX			IN	EX		
723515-12	CL723515-12	272	278	219	225	.510	.500	112	108	Hyd.	Hyd.	1,6	
1600-5600 Fair idle, Street/Mild Bracket, good low to mid range. 2500+ stall, 9.5:1+ CR.													
720555-10	CL720555-10	282	288	229	235	.520	.530	110	106	Hyd.	Hyd.	1,6	
2000-6000 Fair idle, Street Performance/Mild Bracket. 2500+ stall, 9.5:1 CR & aftermarket intake.													
720555-12	CL720555-12	282	288	229	235	.520	.530	112	108	Hyd.	Hyd.	1,6	
2000-6200 Mild lopey idle, Street/Mild Bracket, good low to mid range performance. 2500+ stall.													
723445-08	CL723445-08	288	294	235	241	.545	.545	108	104	Hyd.	Hyd.	1,6	
2500-6300 Rough idle, Street/Strip, good mid-range power. Needs 3000+ stall, 9.5:1 CR & headers.													
723445-10	CL723445-10	288	294	235	241	.545	.545	110	106	Hyd.	Hyd.	1,6	
2500-6400 Lopey idle, Street/Strip, good mid-range performance. Needs 2800+ stall, headers.													
723235-08	CL723235-08	296	300	243	247	.600	.600	108	104	Hyd.	Hyd.	1,6	
2800-6600 Rough idle, Pro Street/Bracket, strong mid range. 10.0:1+ CR, 3000+ stall & gears.													
723235-10	CL723235-10	296	300	243	247	.600	.600	110	106	Hyd.	Hyd.	1,6	
2800-6600 Lopey idle, Pro Street/Bracket, strong mid range. 10.0:1+ CR, 3000+ stall & gears.													
723235-12	CL723235-12	296	300	243	247	.600	.600	112	108	Hyd.	Hyd.	1,6	
2800-6600 Fair idle, Pro Street/Bracket, strong mid range. 10.0:1+ CR, 3000+ stall & gears.													
729995	NA	Custom Grind Camshaft									Hyd.	Hyd.	1,6
Retro-Fit Hydraulic Roller Special Order Camshaft.													

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 6 Requires 3-bolt timing Set.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHRYSLER BIG BLOCK B/RB • 383-440 1959-1980

Rattler Cams™ Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91767 ³ 91774	NA	98445-K33	98445 ²⁵	97110	NA	93065	93321 ²⁵	NA	NA	NA	92152	NA	94340
91767 ³ 91774	NA	98445-K33	98445 ²⁵	97110	NA	93065	93321 ²⁵	NA	NA	NA	92152	NA	94340
91767 ³ 91774	NA	98445-K33	98445 ²⁵	97110	NA	93065	93321 ²⁵	NA	NA	NA	92152	NA	94340

CHRYSLER BIG BLOCK B/RB • 383-440 1959-1980

Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91767 ³ 91774	NA	98445-K33	98445 ²⁵	97110	NA	93065	93321 ²⁵	NA	NA	NA	92152	NA	94340
91767 ³ 91774	NA	98445-K33	98445 ²⁵	97110	NA	93065	93321 ²⁵	NA	NA	NA	92152	NA	94340
91767 ³ 91774	NA	98445-K33	98445 ²⁵	97110	NA	93065	93321 ²⁵	NA	NA	NA	92152	NA	94340
91767 ³ 91774	NA	98445-K33	98445 ²⁵	97110	NA	93065	93321 ²⁵	NA	NA	NA	92152	NA	94340
91767 ³ 91774	NA	98445-K33	98445 ²⁵	97110	NA	93065	93321 ²⁵	NA	NA	NA	92152	NA	94340
91767 ³ 91774	NA	98445-K33	98445 ²⁵	97110	NA	93065	93321 ²⁵	NA	NA	NA	92152	NA	94340
91767 ³ 91774	NA	98445-K33	98445 ²⁵	97110	NA	93065	93321 ²⁵	NA	NA	NA	92152	NA	94340
91767 ³ 91774	NA	--	--	--	--	--	--	NA	NA	--	92152	NA	94330

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

²⁵ Machining Required.

CAMSHAFTS



CHRYSLER BIG BLOCK B/RB • 383-440 1959-1980

Mechanical Flat Tappet Camshafts (3 Bolt)

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
720862-08	CL720862-08 CL720862-08DL ⁴	266	266	238	238	.558	.558	108	104	.018	.018	1,6,15,34
		<i>2200-5600 Hot Street/Bracket. Needs 10.0+ CR, 3200+ stall & gears.</i>										
721262-08	CL721262-08 CL721262-08DL ⁴	274	274	246	246	.576	.576	108	104	.018	.018	1,6,15,34
		<i>2500-5800 Fair idle, super mid-range performance. Needs 11.0:1 CR-up.</i>										
722402-10	CL722402-10 CL722402-10DL ⁴	281	287	246	252	.515	.530	110	106	.022	.022	1,6
		<i>2500-6200 Good Street Machine cam. Best with 3000+ stall.</i>										
722362-08	CL722362-08 CL722362-08DL ⁴	289	295	254	260	.550	.555	108	104	.022	.022	1,6
		<i>3000-6500 Rough idle, Street/Strip. Should have 10.5:1+ CR & 3500+ stall.</i>										
721602-08	CL721602-08 CL721602-08DL ⁴	288	288	260	260	.616	.616	108	104	.018	.018	1,6,15,34
		<i>3400-7200 Rough idle, Hot Street/Strip, good mid range power. 10.5:1+ CR, 3500+ stall & headers.</i>										
720152-08	CL720152-08 CL720152-08DL ⁴	288	292	260	264	.616	.620	108	104	.018	.018	1,6,15,34
		<i>3400-7400 Good throttle response, nice mid range. Needs 10.5:1+ CR, 3500+ stall.</i>										
722322-08	CL722322-08 CL722322-08DL ⁴	295	303	260	268	.555	.574	108	104	.022	.022	1,6
		<i>3600-7600 Hot Street/Bracket. Needs 10.5:1+ CR, good heads & intake.</i>										
722422-08	CL722422-08 CL722422-08DL ⁴	292	300	264	272	.620	.639	108	104	.018	.018	1,6,15,34
		<i>4000-7600 Pro-Street/Bracket. Needs 11.0:1+ CR, 4000+ stall.</i>										
720782-08	CL720782-08 CL720782-08DL ⁴	292	302	264	274	.620	.643	108	104	.018	.018	1,6,15,34
		<i>4400-7800 Rough idle, Drag Race. Higher CR, stall speed & lower gears.</i>										
722412-08	CL722412-08 CL722412-08DL ⁴	300	300	272	272	.639	.639	108	104	.018	.018	1,6,15,34
		<i>4600-7800 Lopey idle, 440+ ci Bracket cam. 4200+ stall advised.</i>										
720212-08	CL720212-08 CL720212-08DL ⁴	302	308	274	280	.643	.659	108	104	.018	.018	1,6,15,34
		<i>4600-8200 Bracket Racer special. Super strong mid-range & top end.</i>										
720162-08	CL720162-08 CL720162-08DL ⁴	308	312	280	284	.659	.667	108	104	.018	.018	1,6,15,34
		<i>4800-8400 Serious Competition, Requires good heads, 12.0:1+ CR, good single plane intake.</i>										
729992	NA	Custom Grind Camshaft										1,6
		<i>Mechanical Flat Tappet Special Order Camshaft.</i>										

Cam Notes: master note list on page 260

¹ Stock (O.E.) valve springs cannot be used.

⁴ Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.

⁶ Requires 3-bolt timing Set.

¹⁵ Lobes designed to take maximum advantage of .904" dia. lifter.

³⁴ Provisions for increased oiling recommended.

Some items are not legal for sale or use on any pollution controlled motor vehicle

CAMSHAFTS



CHRYSLER BIG BLOCK B/RB • 383-440 1959-1980

Steel Billet Mechanical Roller Camshafts (3 Bolt)

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
721203-10	NA	269	269	237	237	.555	.555	110	106	.022	.022	1,5,6
		2400-6000 Fair idle, Street/Strip, strong useable low end torque. 10.5:1, 3500+ stall suggested.										
721313-08	NA	277	277	245	245	.585	.585	108	104	.022	.022	1,5,6
		2800-6200 Hot Street/Strip, excellent mid range torque. Needs 3500+ stall, good exhaust, 800+ cfm.										
722113-08	NA	277	285	245	253	.600	.600	108	104	.022	.022	1,5,6
		2800-6300 Lopey idle, Hot Street/Strip, Serious mid range performance. 3200+ stall, 10.0:1 CR.										
722113-12	NA	277	285	245	253	.600	.600	112	108	.022	.022	1,5,6
		2800-6300 Fair idle, Hot Street/Strip, Serious mid range performance. 3200+ stall, 10.0:1 CR.										
721743-08	NA	285	291	253	259	.600	.585	108	104	.022	.022	1,5,6
		3000-6400 Rough idle, Hot Street/Bracket. Strong mid-range horsepower.										
722133-08	NA	289	299	257	267	.600	.600	108	104	.022	.022	1,5,6
		3000-6700 Good Bracket cam. Good mid range torque. Needs 3500+ stall & good intake.										
722323-08	NA	291	295	259	263	.640	.640	108	104	.022	.022	1,5,6
		3200-6800 Rough idle, Pro Street/Bracket, strong mid range. 11.0:1+ CR, 3500+ stall & good intake.										
721883-08	NA	295	301	263	269	.675	.650	108	104	.022	.022	1,5,6
		3600-7000 Rough idle, Bracket/Super Street, light to mid weight car. 4500+ stall, 11.5:1 CR.										
722103-08	NA	295	307	263	275	.640	.630	108	104	.022	.022	1,5,6
		3600-7200 Strong mid & upper end torque & horsepower. Needs 12.5:1 CR-up.										
721293-08	NA	303	307	271	275	.625	.630	108	104	.022	.022	1,5,6
		3800-7400 Good mid to upper end power. Needs 12.0:1+ CR, 4500+ stall.										
722773-06	NA	307	307	275	275	.630	.630	106	102	.022	.022	1,5,6
		4000-7600 440 CID. Bracket special. Strong mid-range. 12.0:1+ CR, 4500+ stall.										
722773-08	NA	307	307	275	275	.630	.630	108	104	.022	.022	1,5,6
		4000-7600 Super Gas/Super Street in 383ci. Strong mid-range. 12.5:1+ CR, 4500+ stall.										
720253-08	NA	313	315	281	283	.675	.645	108	104	.022	.022	1,5,6
		4200-7800 Super Gas/Super Comp. Needs 4500+ stall, 12.5:1+ CR., good intake.										
722793-06	NA	315	315	283	283	.645	.645	106	102	.022	.022	1,5,6
		4600-8200 11:1+ upper mid-range & top end power. 440+CID.										
722783-08	NA	315	315	283	283	.675	.675	108	104	.022	.022	1,5,6
		4600-8000 11:1+ upper mid-range & top end power. 440+CID.										
729993	NA	Custom Grind Camshaft Mechanical Roller Special Order Camshaft.										1,5,6

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 5 Requires upgraded distributor gear/fuel pump pushrod.
- 6 Requires 3-bolt timing Set.

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IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHRYSLER BIG BLOCK B/RB - 383-440 1959-1980

Mechanical Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91751 91727 ³²	NA	NA	98630 ²⁵	97128 ¹⁰	97220 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	92153	94420	94340
91751 91727 ³²	NA	NA	98630 ²⁵	97128 ¹⁰	97220 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	92153	94420	94340
91751 91727 ³²	NA	NA	98630 ²⁵	97128 ¹⁰	97220 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	92153	94420	94340
91751 91727 ³²	NA	NA	98630 ²⁵	97128 ¹⁰	97220 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	92153	94420	94340
91751 91727 ³²	NA	NA	98630 ²⁵	97128 ¹⁰	97220 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	92153	94420	94340
91727 91735	NA	NA	98543 ²⁵	97130 ¹⁰	97220 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	92153	94420	94340
91727 91735	NA	NA	98543 ²⁵	97130 ¹⁰	97220 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	92153	94420	94340
91735 91798	NA	NA	98543 ²⁵	97130 ¹⁰	97220 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	92153	94420	94340
91735 91798	NA	NA	98543 ²⁵	97130 ¹⁰	97220 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	92153	94420	94340
91735 91798	NA	NA	98543 ²⁵	97130 ¹⁰	97220 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	92153	94420	94340
91735 91798	NA	NA	98543 ²⁵	97130 ¹⁰	97220 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	92153	94420	94340
91735 91798	NA	NA	98543 ²⁵	97130 ¹⁰	97220 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	92153	94420	94340
91735 91798	NA	NA	98543 ²⁵	97130 ¹⁰	97220 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	92153	94420	94340
91735 91798	NA	NA	98543 ²⁵	97130 ¹⁰	97220 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	92153	94420	94340
91735 91798	NA	NA	98543 ²⁵	97130 ¹⁰	97220 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	92153	94420	94340
91735 91798	NA	NA	98543 ²⁵	97130 ¹⁰	97220 ¹⁰	NA ³⁵	93321 ²⁵	NA	NA	NA	92153	94420	94340
--	NA	--	--	--	--	--	--	NA	NA	--	92153	94420	94330

Components Notes: master note list on page 260

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

³² These lifters are not recommended for street use.

³⁵ 10° Multi-Groove for OE style valves not available (93018 single-groove).

CAMSHAFTS



CHRYSLER HEMI • 5.7L-6.1L 2003-2010 (WITHOUT VARIABLE CAM TIMING)

Hydraulic Roller Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.70 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
786845-14	NA	264	268	211	215	.520	.520	114	110	Hyd.	Hyd.	1
		<i>1000-5000 Street Performance, Designed for 5.7L with MDS. Nice low to mid range performance.</i>										
786155-14	NA	266	272	213	219	.575	.575	114	110	Hyd.	Hyd.	1
		<i>1200-5200 Street Performance, Best in 6.1L. Great all-around torque & horsepower.</i>										
786875-12	NA	269	277	219	227	.600	.575	112	108	Hyd.	Hyd.	1,12
		<i>1600-5600 Hot Street, Best in 6.1L with modified heads. Very nice low to mid range.</i>										
786045-14	NA	277	283	227	233	.600	.600	114	110	Hyd.	Hyd.	1,12,21
		<i>2200-6200 Hot Street, Strong mid range. Needs better exhaust. Best with modified heads.</i>										
786965-13	NA	281	287	231	237	.626	.600	113	109	Hyd.	Hyd.	1,12,21
		<i>2400-6400 Hot Street, A favorite in 426 stroker combinations. Awesome power band.</i>										
789995	NA	Custom Grind Camshaft										1,12
		<i>Hydraulic Roller Tappet Special Order Camshaft.</i>										



CHRYSLER HEMI • 331-354 1951-1956

Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
769991	NA	Custom Grind Camshaft										1
		<i>Hydraulic Flat Tappet Special Order Camshaft.</i>										



CHRYSLER HEMI • 331-354 1951-1956

Mechanical Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
769992	NA	Custom Grind Camshaft										1
		<i>Mechanical Flat Tappet Special Order Camshaft.</i>										

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 12 Requires custom programmer/tuning.
- 21 Requires custom programmer/tuning.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHRYSLER HEMI • 5.7L-6.1L 2003-2010 (WITHOUT VARIABLE CAM TIMING)

Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
NA	NA	NA	98110	NA	NA	NA	NA	NA	NA	95081	NA	NA	94332
NA	NA	NA	98110	NA	NA	NA	NA	NA	NA	95081	NA	NA	94332
NA	NA	NA	98110	NA	NA	NA	NA	NA	NA	95081	NA	NA	94332
NA	NA	NA	98110	NA	NA	NA	NA	NA	NA	95081	NA	NA	94332
NA	NA	NA	98110	NA	NA	NA	NA	NA	NA	95081	NA	NA	94332
NA	NA	--	--	--	--	--	--	NA	NA	--	NA	NA	94332

CHRYSLER HEMI • 331-354 1951-1956

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91731	NA	--	--	--	--	--	--	NA	NA	--	NA	NA	94330

CHRYSLER HEMI • 331-354 1951-1956

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91725-16	NA	--	--	--	--	--	--	NA	NA	--	NA	NA	94330

Components Notes: master note list on page 260

CAMSHAFTS



CHRYSLER HEMI • 392 1957-1958

Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
737511-10	CL737511-10	252	255	206	208	.475	.479	110	106	Hyd.	Hyd.	1,15
		<i>800-4800 Good idle, Strong low end torque & power.</i>										
731231-08	CL731231-08	257	257	210	210	.483	.483	108	104	Hyd.	Hyd.	1,15
		<i>1000-5000 Good idle, Super low & mid-range performance.</i>										
731141-10	CL731141-10	267	267	220	220	.506	.506	110	106	Hyd.	Hyd.	1,15
		<i>1600-5400 Fair idle, Strong mid-range power. Needs headers.</i>										
730991-10	CL730991-10	275	275	221	221	.470	.470	110	106	Hyd.	Hyd.	1,15
		<i>1800-5600 Fair idle, Strong mid-range power. Needs headers.</i>										
730831-10	CL730831-10	289	289	242	242	.562	.562	110	106	Hyd.	Hyd.	1,15
		<i>2600-6000 Rough idle, Street/Strip. Nice mid range power. 10.5:1 CR, headers, good intake.</i>										
739991	NA	Custom Grind Camshaft								Hyd.	Hyd.	1
		<i>Hydraulic Flat Tappet Special Order Camshaft.</i>										



CHRYSLER HEMI • 392 1957-1958

Hydraulic Roller Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
739995	NA	Custom Grind Camshaft								Hyd.	Hyd.	1
		<i>Hydraulic Roller Tappet Special Order Camshaft.</i>										



CHRYSLER HEMI • 392 1957-1958

Mechanical Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
739992	NA	Custom Grind Camshaft								Hyd.	Hyd.	1
		<i>Mechanical Flat Tappet Special Order Camshaft.</i>										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

15 Lobes designed to take maximum advantage of .904" dia. lifter.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHRYSLER HEMI • 392 1957-1958

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91731 ³	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	94330
91731 ³	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	94330
91731 ³	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	94330
91731 ³	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	94330
91731 ³	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	94330
91731 ³	NA	--	--	--	--	--	--	NA	NA	--	NA	NA	94330

CHRYSLER HEMI • 392 1957-1958

Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91767 91774	NA	--	--	--	--	--	--	NA	NA	--	NA	NA	94330

CHRYSLER HEMI • 392 1957-1958

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91725-16	NA	--	--	--	--	--	--	NA	NA	--	NA	NA	94330

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

CAMSHAFTS



CHRYSLER HEMI • 392 1957-1958

Steel Billet Mechanical Roller Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.57/1.52 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
739993	NA	Custom Grind Camshaft								Hyd.	Hyd.	1
<i>Mechanical Roller Special Order Camshaft.</i>												



CHRYSLER HEMI • 426 1966-1971

Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.57/1.52 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
748291-10	CL748291-10	277	277	230	230	.556	.538	110	106	Hyd.	Hyd.	1,15
<i>2200-5800 Fair idle, Street machines with headers, gears & 2500+ stall.</i>												
740001-10	CL740001-10	285	285	231	231	.502	.486	110	106	Hyd.	Hyd.	1
<i>2000-5200 Fair idle, Lower lift version of 740001-10, best with headers, gears & 2500+ stall.</i>												
740841-08	CL740841-08	291	291	237	237	.529	.512	108	104	Hyd.	Hyd.	1
<i>2400-5800 Lopey idle. Pro-Street & Bracket Racing profile.</i>												
743471-08	CL743471-08	285	285	238	238	.580	.562	108	104	Hyd.	Hyd.	1,15
<i>2500-5800 Lopey idle. Pro-Street & Bracket Racing profile.</i>												
749641-08	CL749641-08	295	295	248	248	.604	.585	108	104	Hyd.	Hyd.	1,15
<i>3000-6400 Hot Street/Brackets. Needs 10.0:1+ CR, good heads & exhaust. 3500+ stall.</i>												
742401-08	CL742401-08	303	303	249	249	.534	.517	108	104	Hyd.	Hyd.	1
<i>3000-6200 Hot Street/Brackets. Needs 10.0:1+ CR, good heads & exhaust. 3500+ stall.</i>												
749991	NA	Custom Grind Camshaft								Hyd.	Hyd.	1
<i>Hydraulic Flat Tappet Special Order Camshaft.</i>												



CHRYSLER HEMI • 426 1966-1971

Steel Billet Mechanical Roller Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.57/1.52 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
740223-10	NA	303	303	271	271	.654	.633	110	106	.022	.022	1,5
<i>4200-7800 Strong Bracket in full body car. Best with single 4bbl., 12.0:1+ CR, 4000+ stall.</i>												
740743-08	NA	313	313	281	281	.764	.740	108	104	.022	.022	1,5
<i>4800-8200 Rough idle, Bracket & Quick 16, Altered/Dragster. Needs good heads, 12.5:1 CR.</i>												
729319-16	NA	327	327	295	295	.749	.725	116	112	.022	.022	1,5
<i>6000-9600 Blown Alcohol or Pro Mod 500+ ci., with high boost. 2.125" 48° bank angle.</i>												
749993	NA	Custom Grind Camshaft										1,5
<i>Mechanical Roller Special Order Camshaft.</i>												
729999	NA	Custom Grind Camshaft, Aftermarket Block										1,5
<i>2.125" Journal 9310 Mechanical Roller Special Order Camshaft.</i>												

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 5 Requires upgraded distributor gear/fuel pump pushrod.
- 15 Lobes designed to take maximum advantage of .904" dia. lifter.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



CHRYSLER HEMI • 392 1957-1958

Steel Billet Mechanical Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
--	NA	--	--	--	--	--	--	NA	NA	--	NA	NA	94330

CHRYSLER HEMI • 426 1966-1971

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91711 ³ 91712	NA	NA	98445	97128 ¹⁰	97216 ¹⁰	93070 ¹⁰	NA	NA	NA	NA	92152	NA	94340
91711 ³ 91712	NA	NA	98445	97128 ¹⁰	97216 ¹⁰	93070 ¹⁰	NA	NA	NA	NA	92152	NA	94340
91711 ³ 91712	NA	NA	98445	97128 ¹⁰	97216 ¹⁰	93070 ¹⁰	NA	NA	NA	NA	92152	NA	94340
91711 ³ 91712	NA	NA	98445	97128 ¹⁰	97216 ¹⁰	93070 ¹⁰	NA	NA	NA	NA	92152	NA	94340
91711 ³ 91712	NA	NA	98445	97128 ¹⁰	97216 ¹⁰	93070 ¹⁰	NA	NA	NA	NA	92152	NA	94340
91711 ³ 91712	NA	NA	98445	97128 ¹⁰	97216 ¹⁰	93070 ¹⁰	NA	NA	NA	NA	92152	NA	94340
91711 91712	NA	--	--	--	--	--	NA	NA	NA	NA	92152	NA	94340

CHRYSLER HEMI • 426 1966-1971

Steel Billet Mechanical Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91735 91798	NA	NA	98738-A ²⁵	NA	97222	93075	NA	NA	NA	NA	92153	94420	94340
91798	NA	NA	98048 ²⁵ 98049 ²⁵	NA	97224	93075	NA	NA	NA	NA	92153	94420	94340
91744	NA	NA	98048 ²⁵ 98049 ²⁵	NA	97224	93075	NA	NA	NA	NA	92153	94420	94340
--	NA	--	--	--	--	--	NA	NA	NA	NA	92152	NA	94340
--	NA	--	--	--	--	--	NA	NA	NA	NA	92152	NA	94340

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



FORD STRAIGHT 6 • 140-250 1963-1983 (7.808" DECK)

Street Force™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•5•3•6•2•4

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
280108-12	CL280108-12	259	269	205	215	.420	.445	112	108	Hyd.	Hyd.	
600-4500 Street Force™ 1, Good idle, Mild Street performance, strong low end torque.												



FORD STRAIGHT 6 • 140-250 1963-1983 (7.808" DECK)

Hydraulic Flat Tappet Camshafts

Firing Order: 1•5•3•6•2•4

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes	
		IN	EX	IN	EX	IN	EX			IN	EX		
280028-08	CL280028-08	263	263	209	209	.420	.420	108	104	Hyd.	Hyd.		
1200-4800 Good idle, Street, Off-Road, Towing. Good torque.													
280938-10	CL280938-10	267	267	213	213	.450	.450	110	106	Hyd.	Hyd.	1	
1600-5000 Strong low & mid-range torque & horsepower.													
280998-10	CL280998-10	275	275	221	221	.470	.470	110	106	Hyd.	Hyd.	1	
2000-5600 Nice idle, good low & mid range horsepower. Needs good exhaust.													
289998	NA	Custom Grind Camshaft									Hyd.	Hyd.	1
Hydraulic Flat Tappet Special Order Camshaft.													



FORD STRAIGHT 6 • 240-300 1964-1996 (10.0" DECK)

Street Force™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•5•3•6•2•4

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
280106-12	CL280106-12	259	269	205	215	.448	.475	112	108	Hyd.	Hyd.	1
600-4500 Street Force™ 1, Good idle, Mild Street performance, strong low end torque.												

CAMSHAFTS



FORD STRAIGHT 6 • 240-300 1964-1996 (10.0" DECK)

Hydraulic Flat Tappet Camshafts

Firing Order: 1•5•3•6•2•4

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes	
		IN	EX	IN	EX	IN	EX			IN	EX		
280026-08	CL280026-08	263	263	209	209	.448	.448	108	104	Hyd.	Hyd.		
1200-4800 Good idle, Street, Off-Road, Towing. Good torque.													
280936-10	CL280936-10	267	267	213	213	.480	.480	110	106	Hyd.	Hyd.	1	
1600-5000 Strong low & mid-range torque & horsepower.													
280996-10	CL280996-10	275	275	221	221	.501	.501	110	106	Hyd.	Hyd.	1	
2000-5800 Nice idle, good low & mid range horsepower. Needs good exhaust.													
289996	NA	Custom Grind Camshaft									Hyd.	Hyd.	1
Hydraulic Flat Tappet Special Order Camshaft.													

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

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FORD STRAIGHT 6 • 140-250 1963-1983 (7.808" DECK)

Street Force™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91251-12 ³	NA	NA	98341-12	97118-12	NA	93040	93316 ²⁵	NA	NA	NA	NA	NA	NA

FORD STRAIGHT 6 • 140-250 1963-1983 (7.808" DECK)

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91251-12 ³	NA	NA	98341-12	97118-12	NA	93040-12	93316 ²⁵	NA	NA	NA	NA	NA	NA
91251-12 ³	NA	NA	98341-12	97118-12	NA	93040-12	93316 ²⁵	NA	NA	NA	NA	NA	NA
91251-12 ³	NA	NA	98341-12	97118-12	NA	93040-12	93316 ²⁵	NA	NA	NA	NA	NA	NA
91251-12	NA	--	--	--	--	--	--	NA	NA	--	NA	NA	NA

FORD STRAIGHT 6 • 240-300 1964-1996 (10.0" DECK)

Street Force™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91211-12 ³ 91212-12	NA	NA	98411-12	97118-12	NA	93040	93316 ²⁵	NA	NA	NA	NA	NA	NA



FORD STRAIGHT 6 • 240-300 1964-1996 (10.0" DECK)

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91211-12 ³ 91212-12	NA	NA	98411-12	97118-12	NA	93040	93316 ²⁵	NA	NA	NA	NA	NA	NA
91211-12 ³ 91212-12	NA	NA	98411-12	97118-12	NA	93040	93316 ²⁵	NA	NA	NA	NA	NA	NA
91211-12 ³ 91212-12	NA	NA	98411-12	97118-12	NA	93040	93316 ²⁵	NA	NA	NA	NA	NA	NA
91211-12 91212-12	NA	--	--	--	--	--	--	NA	NA	--	NA	NA	NA

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

²⁵ Machining Required.



FORD MODULAR V8 • 4.6L-5.4L SOHC 2-VALVE 1991-2005 WITH PERF. IMPROVEMENT HEADS

Hydraulic Roller Camshafts

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.825 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
276063-16	NA	260	265	220	224	.548	.548	116	112	Hyd.	Hyd.	1,8,12
		<i>800-4800 Everyday Street, good all around performance with increase in power.</i>										
276823-14	NA	265	268	224	228	.548	.548	114	110	Hyd.	Hyd.	1,8,12
		<i>1200-5200 Street performance, Increase in low to mid range torque and more power.</i>										
276363-16	NA	273	280	232	240	.548	.548	116	112	Hyd.	Hyd.	1,8,12
		<i>1500-5500 Street/Strip with supercharger. Need good parts all around. 2500+ Stall.</i>										
276393-14	NA	275	275	234	234	.548	.548	114	110	Hyd.	Hyd.	1,8,12
		<i>1600-5600 High Performance Street, good low to mid range torque. Needs 1800+ stall & gears.</i>										
276623-14	NA	275	278	234	236	.593	.593	114	110	Hyd.	Hyd.	1,8,12
		<i>1800-6600 Nice idle, Hot Street, nice increase in mid range performance. Needs 2000+ stall & gears.</i>										
276263-13	NA	277	280	236	240	.548	.548	113	109	Hyd.	Hyd.	1,8,12
		<i>2000-6200 Fair idle, Street/Strip, Nice mid range. 2200+ stall, better intake & exhaust.</i>										
276203-14	NA	278	283	238	242	.593	.593	114	110	Hyd.	Hyd.	1,8,12
		<i>2000-6600 Fair idle, Street/Strip, Good mid range. 2200+ stall, better intake & exhaust.</i>										
276883-14	NA	283	288	242	246	.593	.593	114	110	Hyd.	Hyd.	1,8,12
		<i>2200-6800 Rough idle Hot Street/Strip, Needs better intake, exhaust, 2500+ stall & gears.</i>										
276733-14	NA	288	288	246	246	.593	.593	114	110	Hyd.	Hyd.	1,8,12
		<i>2400-7000 Rough idle Pro Street/Brackets, Needs better intake, exhaust, 2800+ stall & gears.</i>										
279993	NA	Custom Grind Camshaft								Hyd.	Hyd.	1,8,12
		<i>Hydraulic Roller Special Order Camshaft.</i>										

CAMSHAFTS



FORD MODULAR V8 • 4.6L DOHC 4-VALVE 1993-PRESENT

Hydraulic Roller Camshafts

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.825 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
276244-14	NA	247	254	210	216	.450	.450	114	112	Hyd.	Hyd.	1,9,12
		<i>800-6400 Smooth idle, High low end torque. Can use stock converter.</i>										
276584-14	NA	259	259	222	222	.450	.450	114	112	Hyd.	Hyd.	1,9,12
		<i>1200-6600 Mild idle, Street Performance, Excellent low to mid range torque.</i>										
276414-14	NA	265	265	228	228	.475	.475	114	112	Hyd.	Hyd.	1,9,12
		<i>1500-6800 Lopey idle, Hot Street, Strong mid range with top end increase. 2000+ stall & gears.</i>										
276074-14	NA	265	270	236	234	.475	.475	114	112	Hyd.	Hyd.	1,9,12
		<i>1800-7000 Rough idle, Street/Strip. Needs 2400+ stall, larger throttle body & better exhaust.</i>										
276814-14	NA	274	281	236	242	.475	.475	114	112	Hyd.	Hyd.	1,9,12
		<i>2000-7000 Pro Street/Strip with supercharger. Need good parts all around. 2500+ Stall.</i>										
279994	NA	Custom Grind Camshaft								Hyd.	Hyd.	1,9,12
		<i>Hydraulic Roller Special Order Camshaft.</i>										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

8 Includes 2 camshafts.

12 Requires custom programmer/tuning.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.

FORD MODULAR V8 • 4.6L-5.4L SOHC 2-VALVE 1991-2005 WITH PERF. IMPROVEMENT HEADS

Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA



FORD MODULAR V8 • 4.6L DOHC 4-VALVE 1993-PRESENT

Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
NA	NA	NA	98105	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	98105	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	98105	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	98105	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	98105	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA



FORD MODULAR V8 • 4.6L-5.4L SOHC 3-VALVE 1995-PRESENT

Hydraulic Roller Camshafts

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.825 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
276745-14	NA	269	282	216	228	.450	.450	114	100	Hyd.	Hyd.	8,12
		<i>2200-5400 Street Performance. Good power gains over stock. Good mid range torque.</i>										
276095-14	NA	269	285	216	232	.475	.475	114	100	Hyd.	Hyd.	1,8,12
		<i>2200-5600 Hot Street, Great mid range torque. Supercharger/NOS OK.</i>										
276935-14	NA	273	289	220	236	.450	.450	114	100	Hyd.	Hyd.	8,12
		<i>2400-5800 High Performance Street, good power gains above 4500 rpm. Best with 2500+ stall.</i>										
276175-14	NA	273	289	220	236	.475	.475	114	100	Hyd.	Hyd.	1,8,12
		<i>2400-5800 High Performance Street, good power gains above 4500 rpm. Best with 2500+ stall.</i>										
276855-14	NA	275	289	222	236	.490	.490	114	100	Hyd.	Hyd.	1,8,12
		<i>2500-6000 Mild idle, Hot Street, good all around performance with power gains over 4800 rpm.</i>										
276475-15	NA	275	301	222	248	.475	.475	115	101	Hyd.	Hyd.	1,8,12
		<i>2500-6200 Street/Strip, good mid to top end power. 2500+ stall recommended.</i>										
279995	NA	Custom Grind Camshaft								Hyd.	Hyd.	1,8,12
		<i>Hydraulic Roller Special Order Camshaft.</i>										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

8 Includes 2 camshafts.

12 Requires custom programmer/tuning.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.

FORD MODULAR V8 • 4.6L-5.4L SOHC 3-VALVE 1995-PRESENT

Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Components Notes: master note list on page 260

CAMSHAFTS



FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

Max Certified™ Hydraulic Flat Tappet Cam & Lifter Sets - 5 Year No Fault Warranty (see page 3 for details)

Cam & Lifter Set Part No.	Cam & Direct Lube Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
MC210021-12	MC210021-12DL ⁴	259	267	205	215	.448	.480	112	108	Hyd.	Hyd.	1
		<i>1000-4500 Great low & mid-range. Smooth idle. Good in PUs & RVs.</i>										
MC210031-12	MC210031-12DL ⁴	267	277	213	223	.475	.496	112	108	Hyd.	Hyd.	1
		<i>1500-5400 Broad power band. Excellent in Hot Street & Marine.</i>										
MC210931-10	MC210931-10DL ⁴	269	269	215	215	.475	.475	110	106	Hyd.	Hyd.	1
		<i>1500-5200 Strong low & mid-range, fuel efficiency & driveability.</i>										
MC210951-10	MC210951-10DL ⁴	275	285	221	231	.501	.501	110	106	Hyd.	Hyd.	1
		<i>2000-6000 Street & Strip. Needs 4 barrel, headers & low gears.</i>										
MC210041-12	MC210041-12DL ⁴	279	285	225	231	.496	.512	112	108	Hyd.	Hyd.	1
		<i>2500-6200 Strong mid-range. Great E.T. Bracket cam. OK w/NOS.</i>										
MC210961-08	MC210961-08DL ⁴	285	285	231	231	.501	.501	108	104	Hyd.	Hyd.	1
		<i>2600-6300 Broad power range, extra performance in smaller engine.</i>										



FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

American Muscle™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•5•4•2•6•3•7•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
217751-08	CL217751-08	252	252	187	187	.381	.381	108	103	Hyd.	Hyd.	
		<i>800-4200 Near duplicate of the Ford 210HP/289 cam (FMC #C30Z-6250-B).</i>										
217311-09	CL217311-09	270	298	184	189	.368	.381	109	104	Hyd.	Hyd.	
		<i>800-4300 Near duplicate of the Ford 230HP/302 cam (FMC #C3AZ-6250-V).</i>										
217081-13	CL217081-13	288	288	218	218	.461	.461	113	107	Hyd.	Hyd.	1
		<i>1600-5200 Near duplicate of the Ford Cobra Kit cam (FMC #C90Z-6250-C).</i>										



FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

Street Force™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•5•4•2•6•3•7•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
210021-12	CL210021-12	259	267	205	215	.448	.480	112	108	Hyd.	Hyd.	1
		<i>1000-4500 Street Force™ 1, Good idle, Mild Street performance, strong low end torque.</i>										
210031-12	CL210031-12	269	277	215	223	.475	.496	112	108	Hyd.	Hyd.	1
		<i>1500-5400 Street Force™ 2, Good idle & throttle response. Needs 4 barrel & good exhaust.</i>										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

4 Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

Max Certified™ Hydraulic Flat Tappet Cam & Lifter Set Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91211 ³ 91216 ⁴	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91216 ⁴	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91216 ⁴	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91216 ⁴	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91216 ⁴	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91216 ⁴	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹

FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

American Muscle™ Hydraulic Flat Tappet Cam & Lifter Set Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91211 ³ 91216 ⁴	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91216 ⁴	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91216 ⁴	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹

FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

Street Force™ Hydraulic Flat Tappet Cam & Lifter Set Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91211 ³ 91216 ⁴	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91216 ⁴	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

⁴ Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

¹⁹ Fits factory 1-pc eccentric. For 2-pc eccentric use 94212 or 94312.

²⁵ Machining Required.

CAMSHAFTS



FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

Rattler Cams™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•5•4•2•6•3•7•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
218021-09	CL218021-09	281	289	227	235	.501	.501	109	103	Hyd.	Hyd.	1
1800-5600 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.												
218061-09	CL218061-09	289	297	235	243	.501	.480	109	103	Hyd.	Hyd.	1
2000-5900 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.												
218101-09	CL218101-09	297	305	243	251	.512	.528	109	103	Hyd.	Hyd.	1
2400-6400 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												



FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

Hydraulic Flat Tappet Camshafts

Firing Order: 1•5•4•2•6•3•7•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
212001-14	CL212001-14	255	261	201	207	.437	.448	114	110	Hyd.	Hyd.	
600-4800 Smooth idle, stong low end. High vacuum, good fuel economy.												
212161-11	CL212161-11	263	263	209	209	.448	.448	111	107	Hyd.	Hyd.	
800-4400 Smooth idle, strong low end. High vacuum, good fuel economy.												
211031-11	CL211031-11	267	267	213	213	.459	.459	111	107	Hyd.	Hyd.	1
1200-4700 Good idle, Street, Off-Road, Towing. Good fuel efficiency.												
210931-10	CL210931-10	269	269	215	215	.475	.475	110	106	Hyd.	Hyd.	1
1500-5200 Strong low & mid-range, fuel efficiency & driveability.												
210991-08	CL210991-08	267	267	220	220	.543	.543	108	104	Hyd.	Hyd.	1,16
1700-5700 Good low & mid-range horsepower. Needs 4 barrel & headers.												
212021-08	CL212021-08	267	277	220	230	.543	.563	108	104	Hyd.	Hyd.	1,16
1600-5800 High lift, dual pattern. Need 4 barrel, low gears & 2500+ stall.												
210951-10	CL210951-10	275	285	221	231	.501	.501	110	106	Hyd.	Hyd.	1
2000-6000 Street & Strip. Needs 4 barrel, headers & low gears.												
212431-06	CL212431-06	272	272	224	224	.551	.551	106	102	Hyd.	Hyd.	1,16
2500-6400 Lopey idle, good low end & mid-range horsepower & torque.												
212431-08	CL212431-08	272	272	224	224	.551	.551	108	104	Hyd.	Hyd.	1,16
2400-6600 Hot Street cam. 4 barrel & headers recommended.												
212431-12	CL212431-12	272	272	224	224	.551	.551	112	108	Hyd.	Hyd.	1,16
2400-6600 Good idle, good mid range torque & horsepower. Needs 2400+ stall.												
210941-10	CL210941-10	279	279	225	225	.496	.496	110	106	Hyd.	Hyd.	1
2400-5700 Needs good intake, 4bbl. & headers. Best with 9.5+ CR.												
210041-08	CL210041-08	279	285	225	231	.496	.512	108	104	Hyd.	Hyd.	1
2000-6400 Hot Street performance in 385-418. 9.5:1, 2400 stall suggested.												
210041-12	CL210041-12	279	285	225	231	.496	.512	112	107	Hyd.	Hyd.	1
2500-6200 Strong mid-range. Great E.T. Bracket cam. OK w/NOS.												
212141-08	CL212141-08	277	282	230	234	.563	.572	108	104	Hyd.	Hyd.	1,16
2600-6500 Lopey idle, broad power band, strong top end power.												
212141-10	CL212141-10	277	282	230	234	.563	.572	110	106	Hyd.	Hyd.	1,16
2600-6600 Lopey idle, Strong mid range. Good throttle response. 2400+ stall.												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

16 Lobes designed to take maximum advantage of .875" dia. lifter.

Some items are not legal for sale or use on any pollution controlled motor vehicle

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FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

Rattler Cams™ Hydraulic Flat Tappet Cam & Lifter Set Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91211 ³ 91212	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91212	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91212	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹

FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

Hydraulic Flat Tappet Cam & Lifter Set Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91211 ³ 91212	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91212	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91212	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91212	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91212	NA	-- 98438-K12 ²⁵	98438 ²⁵	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91212	NA	-- 98438-K12 ²⁵	98438 ²⁵	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91212	NA	-- 98438-K12 ²⁵	98438 ²⁵	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91212	NA	-- 98438-K12 ²⁵	98438 ²⁵	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91212	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91212	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91212	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91212	NA	-- 98438-K12 ²⁵	98438 ²⁵	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91212	NA	-- 98438-K12 ²⁵	98438 ²⁵	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

¹⁹ Fits factory 1-pc eccentric. For 2-pc eccentric use 94212 or 94312.

²⁵ Machining Required.

CAMSHAFTS



FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

Hydraulic Flat Tappet Camshafts

Firing Order: 1•5•4•2•6•3•7•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes	
		IN	EX	IN	EX	IN	EX			IN	EX		
212591-08	CL212591-08	277	287	230	240	.563	.592	108	104	Hyd.	Hyd.	1,16	
		<i>2800-6200 Lopey idle, Hot Street/Brackets. 2500+ stall, 9.0:1+ CR.</i>											
212591-12	CL212591-12	277	287	230	240	.563	.592	112	108	Hyd.	Hyd.	1,16	
		<i>2800-6400 Hot Street & mild Bracket Racing.</i>											
210961-08	CL210961-08	285	285	231	231	.501	.501	108	104	Hyd.	Hyd.	1	
		<i>2600-6300 Broad power range, extra performance in smaller engine.</i>											
210051-08	CL210051-08	285	285	231	231	.512	.512	108	104	Hyd.	Hyd.	1	
		<i>3000-6500 Fair idle, Broad power band. Works well in heavy vehicles.</i>											
210051-10	CL210051-10	285	285	231	231	.512	.512	110	106	Hyd.	Hyd.	1	
		<i>3000-6600 Strong power range from 3,500 up. Needs 4bbl, header & stall.</i>											
211701-08	CL211701-08	282	291	234	244	.572	.596	108	104	Hyd.	Hyd.	1,16	
		<i>3000-6800 Rough idle, Hot Street/Strip, Big mid range torque and acceleration.</i>											
211701-12	CL211701-12	282	291	234	244	.572	.596	112	108	Hyd.	Hyd.	1,16	
		<i>3000-6000 Lopey idle, Street/Strip or nostalgia. Likes headers & gears.</i>											
212601-06	CL212601-06	282	287	234	240	.572	.592	106	102	Hyd.	Hyd.	1,16	
		<i>3000-6400 Bracket or 1/4 to 3/8 mile 4bbl. Oval Track. Proven winner.</i>											
212601-08	CL212601-08	282	287	234	240	.572	.592	108	104	Hyd.	Hyd.	1,16	
		<i>3000-6400 Lopey idle, good mid-range power. Needs 3200+ stall.</i>											
210971-08	CL210971-08	283	283	236	236	.583	.583	108	104	Hyd.	Hyd.	1,16	
		<i>3000-6600 Lopey idle, Pro-Street & Bracket Racing profile.</i>											
210891-08	CL210891-08	287	293	240	246	.592	.601	108	104	Hyd.	Hyd.	1,16	
		<i>3000-6600 Rough idle, Hot Street/Bracket, great mid range & top end power. 3500+ stall.</i>											
210891-10	CL210891-10	287	293	240	246	.592	.601	110	106	Hyd.	Hyd.	1,16	
		<i>3000-6600 Rough idle, Street/Strip, good mid range performance. 3200+ stall, good intake.</i>											
210891-12	CL210891-12	287	293	240	246	.592	.601	112	108	Hyd.	Hyd.	1,16	
		<i>2800-6400 Fair idle, Hot Street/Bracket, broad mid range performance. 3000+ stall.</i>											
210061-08	CL210061-08	291	301	244	254	.596	.625	108	104	Hyd.	Hyd.	1,16	
		<i>3000-6600 Pro Street/Brackets, Strong mid & upper end power. 10.0:1+ CR.</i>											
210061-12	CL210061-12	291	301	244	254	.596	.625	112	107	Hyd.	Hyd.	1,16	
		<i>3000-6600 Performance/Competition. Works well with small blower or NOS.</i>											
212041-08	CL212041-08	293	293	246	246	.601	.601	108	104	Hyd.	Hyd.	1,16	
		<i>3200-6800 Hot Street/Brackets. Needs 10.0:1+ CR, good heads & exhaust. 3500+ stall.</i>											
212401-10	CL212401-10	295	295	248	248	.605	.605	110	106	Hyd.	Hyd.	1,16	
		<i>3200-6800 E.T. Brackets. Strong mid & upper end power range.</i>											
211541-08	CL211541-08	295	301	248	254	.605	.625	108	104	Hyd.	Hyd.	1,16	
		<i>3400-7000 Rough idle, Pro Street/Strip. Strong upper end power. Needs good heads, 3500+ stall.</i>											
211541-10	CL211541-10	295	301	248	254	.605	.625	110	106	Hyd.	Hyd.	1,16	
		<i>3400-7000 Rough idle, Pro Street/Bracket. Broad upper end power. Needs good heads, 3500+.</i>											
219991	NA	Custom Grind Camshaft									Hyd.	Hyd.	1
		<i>Hydraulic Flat Tappet Special Order Camshaft.</i>											

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

16 Lobes designed to take maximum advantage of .875" dia. lifter.

Some items are not legal for sale or use on any pollution controlled motor vehicle

CAMSHAFTS



FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

Rattler Cams™ Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•3•7•2•6•5•4•8

Small Base - for Use With **OE Style** Hydraulic Roller Lifters & Spider

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
228005-09S	CL228005-09S ³⁶	280	288	227	235	.560	.565	109	103	Hyd.	Hyd.	1,23
1800-5500 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.												
228045-09S	CL228045-09S ³⁶	288	296	235	243	.565	.565	109	103	Hyd.	Hyd.	1,23
2000-5700 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.												
228085-09S	CL228085-09S ³⁶	296	304	243	251	.565	.549	109	103	Hyd.	Hyd.	1,23
2400-6100 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												



FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

BOOST™ Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•3•7•2•6•5•4•8

Small Base - for Use With **OE Style** Hydraulic Roller Lifters & Spider

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
229165-14S	CL229165-14S ³⁶	273	273	221	221	.544	.544	114	110	Hyd.	Hyd.	1,2
2000-5800 Turbo, Good idle. High Performance Street, stock converter ok, best with 2000+ and gears.												
229135-14S	CL229135-14S ³⁶	277	287	225	235	.560	.571	114	110	Hyd.	Hyd.	1,2
2200-6400 Blower, Good idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.												
229275-16S	CL229275-16S ³⁶	287	285	235	233	.580	.576	116	112	Hyd.	Hyd.	1,2
2600-6800 Turbo, Fair idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												
229225-14S	CL229225-14S ³⁶	287	297	235	245	.608	.597	114	110	Hyd.	Hyd.	1,2
2800-6800 Blower, Fair idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												
229425-14S	CL229425-14S ³⁶	307	317	255	265	.640	.640	114	110	Hyd.	Hyd.	1,2
2400-6200 Blower, Fair idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												



FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•3•7•2•6•5•4•8

Small Base - for Use With **OE Style** Hydraulic Roller Lifters & Spider

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
220225-12S	CL220225-12S ³⁶	260	266	207	213	.480	.496	112	108	Hyd.	Hyd.	1,23
800-4200 Great daily usage, smooth idle, great fuel economy.												
220315-10S	CL220315-10S ³⁶	262	268	209	215	.496	.501	110	106	Hyd.	Hyd.	1,23
1000-4400 Improved throttle response & low end torque.												
220315-12S	CL220315-12S ³⁶	262	268	209	215	.496	.501	112	108	Hyd.	Hyd.	1,23
1000-4400 Improved throttle response & low end torque.												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

23 Ignition firing order must be changed to 1-3-7-2-6-5-4-8.

36 Includes Lifter "Spider" Kit.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

Rattler Cams™ Retro-Fit Hydraulic Roller Small Base Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹

FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

BOOST™ Retro-Fit Hydraulic Roller Camshafts Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹

Retro-Fit Hydraulic Roller Small Base Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

¹⁹ Fits factory 1-pc eccentric. For 2-pc eccentric use 94212 or 94312.

²⁵ Machining Required.

CAMSHAFTS



FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•3•7•2•6•5•4•8

Small Base - for Use With **OE Style** Hydraulic Roller Lifters & Spider

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
220235-10S	CL220235-10S ³⁶	266	272	213	219	.517	.517	110	106	Hyd.	Hyd.	1,23
		1000-4800	Fair idle, good low & mid-range performance increase.									
220235-12S	CL220235-12S ³⁶	266	272	213	219	.517	.517	112	108	Hyd.	Hyd.	1,23
		1000-5000	Good idle, Off-Road & Street Performance. 9.0:1 CR advised.									
222765-13S	CL222765-13S ³⁶	270	270	217	217	.496	.496	113	109	Hyd.	Hyd.	1,23
		1500-5500	Good idle, strong low end & mid-range performance. Needs 2800+ stall.									
221275-08S	CL221275-08S ³⁶	270	278	217	225	.528	.533	108	104	Hyd.	Hyd.	1,23
		1200-5600	Fair idle. Good torque & power. 1800+ stall.									
221275-10S	CL221275-10S ³⁶	270	278	217	225	.528	.533	110	106	Hyd.	Hyd.	1,23
		1200-5600	Good idle. Good torque & power. 1800+ stall.									
221275-12S	CL221275-12S ³⁶	270	278	217	225	.528	.533	112	108	Hyd.	Hyd.	1,23
		1200-5600	Good idle. Good torque & power. 1800+ stall.									
221275-14S	CL221275-14S ³⁶	270	278	217	225	.528	.533	114	110	Hyd.	Hyd.	1,23
		1200-5600	Fair idle. Good torque & power. 1800+ stall.									
222725-10S	CL222725-10S ³⁶	272	272	219	219	.544	.544	110	106	Hyd.	Hyd.	1,23
		1800-5800	Fair idle, strong Street Performance. Requires 9.0+ CR, 5-speed or 2800+ stall.									
221145-10S	CL221145-10S ³⁶	272	278	219	225	.544	.533	110	106	Hyd.	Hyd.	1,23
		2000-6000	Performance Street, best used with aftermarket heads. 2500+ stall, better intake/exhaust.									
221145-12S	CL221145-12S ³⁶	272	278	219	225	.544	.533	112	108	Hyd.	Hyd.	1,23
		2000-6000	Good idle, good mid range power. Good vacuum. 9.5-10.5:1 CR, 2500+ stall.									
222745-12S	CL222745-12S ³⁶	278	278	225	225	.533	.533	112	108	Hyd.	Hyd.	1,23
		2000-6000	Best with 5-speed or 2200-2500 stall.									
220245-10S	CL220245-10S ³⁶	278	282	225	229	.533	.512	110	106	Hyd.	Hyd.	1,23
		2000-6100	Fair idle, Street/Strip. Auto OK with 2500+ stall.									
220245-12S	CL220245-12S ³⁶	278	282	225	229	.533	.512	112	108	Hyd.	Hyd.	1,23
		2000-6100	Fair idle, Street & mild Performance usage. Crisp throttle.									
222755-08S	CL222755-08S ³⁶	278	284	225	231	.533	.544	108	104	Hyd.	Hyd.	1,23
		2000-6200	Fair idle, Street & Mild Performance usage. Crisp throttle.									
222755-12S	CL222755-12S ³⁶	278	284	225	231	.533	.544	112	108	Hyd.	Hyd.	1,23
		2000-6200	Fair idle, Street & Mild Performance usage. Crisp throttle.									
220325-08S	CL220325-08S ³⁶	278	286	225	233	.560	.565	108	104	Hyd.	Hyd.	1,23
		1800-6200	Choppy idle, Street performance usage. 2500+ stall.									
220325-10S	CL220325-10S ³⁶	278	286	225	233	.560	.565	110	106	Hyd.	Hyd.	1,23
		2000-6200	Rough idle, Street/Strip performance. Strong mid-range. 2500+ stall.									
220325-12S	CL220325-12S ³⁶	278	286	225	233	.560	.565	112	108	Hyd.	Hyd.	1,23
		2000-6200	Fair idle, Street/Strip performance. Strong mid-range. 2500+ stall.									
220525-10S	CL220525-10S ³⁶	280	286	227	233	.597	.597	110	106	Hyd.	Hyd.	1,23
		2200-6400	Rough idle, Hot Street/Strip, excellent mid range performance. 2500+ stall, gears, intake.									
220525-12S	CL220525-12S ³⁶	280	286	227	233	.597	.597	112	108	Hyd.	Hyd.	1,23
		2200-6400	Good idle, good all around performance. Good vacuum. 9.5:1+ CR, 2500+ stall & gears.									
220305-08S	CL220305-08S ³⁶	284	284	231	231	.544	.544	108	104	Hyd.	Hyd.	1,23
		2400-6000	Choppy idle, strong low & mid range performance. 2500+ stall.									
220255-08S	CL220255-08S ³⁶	284	288	231	235	.544	.565	108	104	Hyd.	Hyd.	1,23
		2200-6000	Rough idle, Street/Strip performance. Great low to mid-range torque & power.									
220255-10S	CL220255-10S ³⁶	284	288	231	235	.544	.565	110	106	Hyd.	Hyd.	1,23
		2200-6000	Rough idle, Street/Strip performance. Great low to mid-range torque & power.									

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

23 Ignition firing order must be changed to 1-3-7-2-6-5-4-8.

36 Includes Lifter "Spider" Kit.

Some items are not legal for sale or use on any pollution controlled motor vehicle



FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

Retro-Fit Hydraulic Roller Small Base Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹

Components Notes: master note list on page 260

- 3 Included in Cam & Lifter Sets.
- 7 Requires 7/16" rocker studs.
- 10 10° Valve lock Angle, must use matching retainers/locks.
- 19 Fits factory 1-pc eccentric. For 2-pc eccentric use 94212 or 94312.

25 Machining Required.

CAMSHAFTS



FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•3•7•2•6•5•4•8

Small Base - for Use With **OE Style** Hydraulic Roller Lifters & Spider

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve IN	Lash EX	Cam Notes	
		IN	EX	IN	EX	IN	EX						
220255-12S	CL220255-12S ³⁶	284	288	231	235	.544	.565	112	108	Hyd.	Hyd.	1,23	
		2200-6200 Fair idle, performance usage. Great mid-range torque & horsepower.											
222735-10S	CL222735-10S ³⁶	288	294	235	241	.581	.581	110	106	Hyd.	Hyd.	1,23	
		2400-6400 Lopey idle, Hot Street & Bracket Racing. 10.0:1-up CR advised.											
222735-12S	CL222735-12S ³⁶	288	294	235	241	.581	.581	112	108	Hyd.	Hyd.	1,23	
		2400-6400 Lopey idle, Hot Street & Bracket Racing. 10.0:1-up CR advised.											
221815-10S	CL221815-10S ³⁶	290	298	237	245	.597	.597	110	106	Hyd.	Hyd.	1,23	
		2500-6500 Lopey idle, Hot Street/Bracket, good mid range. 9.5-10.5:1 CR, 2800+ stall.											
220275-10S	CL220275-10S ³⁶	294	300	241	247	.581	.603	110	106	Hyd.	Hyd.	1,23	
		2600-6600 Rough idle, Hot Street & Bracket Racing. 10.5:1-up CR advised.											
220275-12S	CL220275-12S ³⁶	294	300	241	247	.581	.603	112	108	Hyd.	Hyd.	1,23	
		2600-6600 Rough idle, Hot Street & Bracket Racing. 10.5:1-up CR advised.											
223365-10S	CL223365-10S ³⁶	300	300	247	247	.603	.603	110	106	Hyd.	Hyd.	1,23	
		2600-6600 Rough idle, Street/Strip, good mid range performance. 3200+ stall, good intake.											
220335-10S	CL220335-10S ³⁶	300	304	247	251	.576	.576	110	106	Hyd.	Hyd.	1,23	
		2800-6700 Hot Street/Brackets. Requires aftermarket heads, 3500+ stall.											
220335-12S	CL220335-12S ³⁶	300	304	247	251	.576	.576	112	108	Hyd.	Hyd.	1,23	
		2800-6700 Lopey idle, Hot Street & Bracket Racing. 10.5:1-up CR advised.											
220355-10S	CL220355-10S ³⁶	304	310	251	257	.592	.592	110	106	Hyd.	Hyd.	1,23	
		3000-7000 Upper mid-range & top end power. Needs 11.0:1+ CR.											
220355-12S	CL220355-12S ³⁶	304	310	251	257	.592	.592	112	108	Hyd.	Hyd.	1,23	
		3000-7000 Upper mid-range & top end power. Needs 11.0:1+ CR.											
224455-12S	CL224455-12S ³⁶	306	312	253	259	.640	.640	112	108	Hyd.	Hyd.	1,23	
		3200-7200 Best with big cubic inch. Needs 11.0:1+ CR. good heads.											
229994	NA	Custom Grind Camshaft, Small Base Circle									Hyd.	Hyd.	1,23
		Retro-Fit Hydraulic Roller Special Order Camshaft.											

Cam Notes: master note list on page 260

¹ Stock (O.E.) valve springs cannot be used.

²³ Ignition firing order must be changed to 1-3-7-2-6-5-4-8.

³⁶ Includes Lifter "Spider" Kit.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

Retro-Fit Hydraulic Roller Small Base Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 91213FB	NA	--	--	--	--	--	--	--	--	--	NA	94427	94210 ¹⁹ 94310 ¹⁹

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

¹⁹ Fits factory 1-pc eccentric. For 2-pc eccentric use 94212 or 94312.

²⁵ Machining Required.

CAMSHAFTS



FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

Rattler Cams™ Retro-Fit Hydraulic Roller Camshafts for Use With Tie-Bar Style Hydraulic Roller Lifters

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
228005-09	CL228005-09	280	288	227	235	.560	.565	109	103	Hyd.	Hyd.	1,23
1800-5500 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.												
228045-09	CL228045-09	288	296	235	243	.565	.565	109	103	Hyd.	Hyd.	1,23
2000-5700 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.												
228085-09	CL228085-09	296	304	243	251	.565	.549	109	103	Hyd.	Hyd.	1,23
2400-6100 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												



FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

BOOST™ Retro-Fit Hydraulic Roller Camshafts for Use With Tie-Bar Style Hydraulic Roller Lifters

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
229165-14	CL229165-14	273	273	221	221	.544	.544	114	110	Hyd.	Hyd.	1,2
2000-5800 Turbo, Good idle. High Performance Street, stock converter ok, best with 2000+ and gears.												
229135-14	CL229135-14	277	287	225	235	.560	.571	114	110	Hyd.	Hyd.	1,2
2200-6400 Blower, Good idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.												
229275-16	CL229275-16	287	285	235	233	.580	.576	116	112	Hyd.	Hyd.	1,2
2600-6800 Turbo, Fair idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												
229225-14	CL229225-14	287	297	235	245	.608	.597	114	110	Hyd.	Hyd.	1,2
2800-6800 Blower, Fair idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												
229425-14	CL229425-14	307	317	255	265	.640	.640	114	110	Hyd.	Hyd.	1,2
2400-6200 Blower, Fair idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												



FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

Retro-Fit Hydraulic Roller Camshafts for Use With Tie-Bar Style Hydraulic Roller Lifters

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
220225-12	CL220225-12	260	266	207	213	.480	.496	112	108	Hyd.	Hyd.	1,23
800-4200 Great daily usage, smooth idle, great fuel economy.												
220315-10	CL220315-10	262	268	209	215	.496	.501	110	106	Hyd.	Hyd.	1,23
1000-4400 Improved throttle response & low end torque.												
220315-12	CL220315-12	262	268	209	215	.496	.501	112	108	Hyd.	Hyd.	1,23
1000-4400 Improved throttle response & low end torque.												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

23 Ignition firing order must be changed to 1-3-7-2-6-5-4-8.

Some items are not legal for sale or use on any pollution controlled motor vehicle



FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

Rattler Cams™ Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹

FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

BOOST™ Retro-Fit Hydraulic Roller Camshafts Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹

Retro-Fit Hydraulic Roller Camshafts

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

¹⁹ Fits factory 1-pc eccentric. For 2-pc eccentric use 94212 or 94312.

²⁵ Machining Required.

CAMSHAFTS



FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

Retro-Fit Hydraulic Roller Camshafts

for Use With **Tie-Bar** Style Hydraulic Roller Lifters

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve IN	Lash EX	Cam Notes
		IN	EX	IN	EX	IN	EX					
220235-10	CL220235-10	266	272	213	219	.517	.517	110	106	Hyd.	Hyd.	1,23
		1000-4800	<i>Fair idle, good low & mid-range performance increase.</i>									
220235-12	CL220235-12	266	272	213	219	.517	.517	112	108	Hyd.	Hyd.	1,23
		1000-5000	<i>Good idle, Off-Road & Street Performance. 9.0:1 CR advised.</i>									
222765-13	CL222765-13	270	270	217	217	.496	.496	113	109	Hyd.	Hyd.	1,23
		1500-5500	<i>Good idle, strong low end & mid-range performance. Needs 2800+ stall.</i>									
221275-08	CL221275-08	270	278	217	225	.528	.533	108	104	Hyd.	Hyd.	1,23
		1200-5600	<i>Fair idle. Good torque & power. 1800+ stall.</i>									
221275-10	CL221275-10	270	278	217	225	.528	.533	110	106	Hyd.	Hyd.	1,23
		1200-5600	<i>Good idle. Good torque & power. 1800+ stall.</i>									
221275-12	CL221275-12	270	278	217	225	.528	.533	112	108	Hyd.	Hyd.	1,23
		1200-5600	<i>Good idle. Good torque & power. 1800+ stall.</i>									
221275-14	CL221275-14	270	278	217	225	.528	.533	114	110	Hyd.	Hyd.	1,23
		1200-5600	<i>Good idle. Good torque & power. 1800+ stall.</i>									
222725-10	CL222725-10	272	272	219	219	.544	.544	110	106	Hyd.	Hyd.	1,23
		1800-5800	<i>Fair idle, strong Street Performance. Requires 9.0+ CR, 5-speed or 2800+ stall.</i>									
221145-10	CL221145-10	272	278	219	225	.544	.533	110	106	Hyd.	Hyd.	1,23
		2000-6000	<i>Performance Street, best used with aftermarket heads. 2500+ stall, better intake/exhaust.</i>									
221145-12	CL221145-12	272	278	219	225	.544	.533	112	108	Hyd.	Hyd.	1,23
		2000-6000	<i>Good idle, good mid range power. Good vacuum. 9.5-10.5:1 CR, 2500+ stall.</i>									
222745-12	CL222745-12	278	278	225	225	.533	.533	112	108	Hyd.	Hyd.	1,23
		2000-6000	<i>Best with 5-speed or 2200-2500 stall.</i>									
220245-10	CL220245-10	278	282	225	229	.533	.512	110	106	Hyd.	Hyd.	1,23
		2000-6100	<i>Fair idle, Street/Strip. Auto OK with 2500+ stall.</i>									
220245-12	CL220245-12	278	282	225	229	.533	.512	112	108	Hyd.	Hyd.	1,23
		2000-6100	<i>Fair idle, Street & mild Performance usage. Crisp throttle.</i>									
222755-08	CL222755-08	278	284	225	231	.533	.544	108	104	Hyd.	Hyd.	1,23
		2000-6200	<i>Loppy idle, Street & Mild Performance usage. Crisp throttle.</i>									
222755-12	CL222755-12	278	284	225	231	.533	.544	112	108	Hyd.	Hyd.	1,23
		2000-6200	<i>Fair idle, Street & Mild Performance usage. Crisp throttle.</i>									
220325-08	CL220325-08	278	286	225	233	.560	.565	108	104	Hyd.	Hyd.	1,23
		1800-6200	<i>Choppy idle, Street performance usage. 2500+ stall.</i>									
220325-10	CL220325-10	278	286	225	233	.560	.565	110	106	Hyd.	Hyd.	1,23
		2000-6200	<i>Rough idle, Street/Strip performance. Strong mid-range. 2500+ stall.</i>									
220325-12	CL220325-12	278	286	225	233	.560	.565	112	108	Hyd.	Hyd.	1,23
		2000-6200	<i>Fair idle, Street/Strip performance. Strong mid-range. 2500+ stall.</i>									
220525-10	CL220525-10	280	286	227	233	.597	.597	110	106	Hyd.	Hyd.	1,23
		2200-6400	<i>Rough idle, Hot Street/Strip, excellent mid range performance. 2500+ stall, gears, intake.</i>									
220525-12	CL220525-12	280	286	227	233	.597	.597	112	108	Hyd.	Hyd.	1,23
		2200-6400	<i>Good idle, good all around performance. Good vacuum. 9.5:1+ CR, 2500+ stall & gears.</i>									
220305-08	CL220305-08	284	284	231	231	.544	.544	108	104	Hyd.	Hyd.	1,23
		2400-6000	<i>Choppy idle, strong low & mid range performance. 2500+ stall.</i>									
220255-08	CL220255-08	284	288	231	235	.544	.565	108	104	Hyd.	Hyd.	1,23
		2200-6000	<i>Rough idle, Street/Strip performance. Great low to mid-range torque & power.</i>									
220255-10	CL220255-10	284	288	231	235	.544	.565	110	106	Hyd.	Hyd.	1,23
		2200-6000	<i>Rough idle, Street/Strip performance. Great low to mid-range torque & power.</i>									

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

23 Ignition firing order must be changed to 1-3-7-2-6-5-4-8.

Some items are not legal for sale or use on any pollution controlled motor vehicle

CAMSHAFTS



FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

Retro-Fit Hydraulic Roller Camshafts

for Use With **Tie-Bar** Style Hydraulic Roller Lifters

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve IN	Lash EX	Cam Notes	
		IN	EX	IN	EX	IN	EX						
220255-12	CL220255-12	284	288	231	235	.544	.565	112	108	Hyd.	Hyd.	1,23	
		<i>2200-6200 Fair idle, performance usage. Great mid-range torque & horsepower.</i>											
222735-10	CL222735-10	288	294	235	241	.581	.581	110	106	Hyd.	Hyd.	1,23	
		<i>2400-6400 Lopey idle, Hot Street & Bracket Racing. 10.0:1-up CR advised.</i>											
222735-12	CL222735-12	288	294	235	241	.581	.581	112	108	Hyd.	Hyd.	1,23	
		<i>2400-6400 Lopey idle, Hot Street & Bracket Racing. 10.0:1-up CR advised.</i>											
221815-10	CL221815-10	290	298	237	245	.597	.597	110	106	Hyd.	Hyd.	1,23	
		<i>2500-6500 Lopey idle, Hot Street/Bracket, good mid range. 9.5-10.5:1 CR, 2800+ stall.</i>											
220275-10	CL220275-10	294	300	241	247	.581	.603	110	106	Hyd.	Hyd.	1,23	
		<i>2600-6600 Rough idle, Hot Street & Bracket Racing. 10.5:1-up CR advised.</i>											
220275-12	CL220275-12	294	300	241	247	.581	.603	112	108	Hyd.	Hyd.	1,23	
		<i>2600-6600 Rough idle, Hot Street & Bracket Racing. 10.5:1-up CR advised.</i>											
223365-10	CL223365-10	300	300	247	247	.603	.603	110	106	Hyd.	Hyd.	1,23	
		<i>2600-6600 Rough idle, Street/Strip, good mid range performance. 3200+ stall, good intake.</i>											
220335-10	CL220335-10	300	304	247	251	.576	.576	110	106	Hyd.	Hyd.	1,23	
		<i>2800-6700 Hot Street/Brackets. Requires aftermarket heads, 3500+ stall.</i>											
220335-12	CL220335-12	300	304	247	251	.576	.576	112	108	Hyd.	Hyd.	1,23	
		<i>2800-6700 Lopey idle, Hot Street & Bracket Racing. 10.5:1-up CR advised.</i>											
220355-10	CL220355-10	304	310	251	257	.592	.592	110	106	Hyd.	Hyd.	1,23	
		<i>3000-7000 Upper mid-range & top end power. Needs 11.0:1+ CR.</i>											
220355-12	CL220355-12	304	310	251	257	.592	.592	112	108	Hyd.	Hyd.	1,23	
		<i>3000-7000 Upper mid-range & top end power. Needs 11.0:1+ CR.</i>											
224455-12	CL224455-12	306	312	253	259	.640	.640	112	108	Hyd.	Hyd.	1,23	
		<i>3200-7200 Best with big cubic inch. Needs 11.0:1+ CR. good heads.</i>											
229995	NA	Custom Grind Camshaft									Hyd.	Hyd.	1,23
		<i>Retro-Fit Hydraulic Roller Special Order Camshaft.</i>											

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

23 Ignition firing order must be changed to 1-3-7-2-6-5-4-8.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91260 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91260 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91260 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91260 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91260 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91260 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91260 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91260 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91260 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91260 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 91260	NA	--	--	--	--	--	--	--	--	--	NA	94427	94210 ¹⁹ 94310 ¹⁹

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

¹⁹ Fits factory 1-pc eccentric. For 2-pc eccentric use 94212 or 94312.

²⁵ Machining Required.

CAMSHAFTS



FORD SMALL BLOCK • 5.0L/302 H.O. 1985-2002

Rattler Cams™ Hydraulic Roller Camshafts for OE Roller Applications

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
228005-09	CL228005-09E ¹⁷ CL228005-09 ¹⁸	280	288	227	235	.560	.565	109	103	Hyd.	Hyd.	1,17,18
		1800-5500	<i>Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.</i>									
228045-09	CL228045-09E ¹⁷ CL228045-09 ¹⁸	288	296	235	243	.565	.565	109	103	Hyd.	Hyd.	1,17,18
		2000-5700	<i>Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.</i>									
228085-09	CL228085-09E ¹⁷ CL228085-09 ¹⁸	296	304	243	251	.565	.549	109	103	Hyd.	Hyd.	1,17,18
		2400-6100	<i>Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.</i>									



FORD SMALL BLOCK • 5.0L/302 H.O. 1985-2002

BOOST™ Hydraulic Roller Camshafts for OE Roller Applications

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
229165-14	CL229165-14E ¹⁷ CL229165-14 ¹⁸	273	273	221	221	.544	.544	114	110	Hyd.	Hyd.	1,17,18
		2000-5800	<i>Turbo, Good idle. High Performance Street, stock converter ok, best with 2000+ and gears.</i>									
229135-14	CL229135-14E ¹⁷ CL229135-14 ¹⁸	277	287	225	235	.560	.571	114	110	Hyd.	Hyd.	1,17,18
		2200-6400	<i>Blower, Good idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.</i>									
229275-16	CL229275-16E ¹⁷ CL229275-16 ¹⁸	287	285	235	233	.580	.576	116	112	Hyd.	Hyd.	1,17,18
		2600-6800	<i>Turbo, Fair idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.</i>									
229225-14	CL229225-14E ¹⁷ CL229225-14 ¹⁸	287	297	235	245	.608	.597	114	110	Hyd.	Hyd.	1,17,18
		2800-6800	<i>Blower, Fair idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.</i>									
229425-14	CL229425-14E ¹⁷ CL229425-14 ¹⁸	307	317	255	265	.640	.640	114	110	Hyd.	Hyd.	1,17,18
		2400-6200	<i>Blower, Fair idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.</i>									



FORD SMALL BLOCK • 5.0L/302 H.O. 1985-2002

Hydraulic Roller Camshafts for OE Roller Applications

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
220225-12	CL220225-12E ¹⁷ CL220225-12 ¹⁸	260	266	207	213	.480	.496	112	108	Hyd.	Hyd.	1,17,18
		800-4200	<i>Great daily usage, smooth idle, great fuel economy.</i>									
220315-10	CL220315-10E ¹⁷ CL220315-10 ¹⁸	262	268	209	215	.496	.501	110	106	Hyd.	Hyd.	1,17,18
		1000-4400	<i>Improved throttle response & low end torque.</i>									
220315-12	CL220315-12E ¹⁷ CL220315-12 ¹⁸	262	268	209	215	.496	.501	112	108	Hyd.	Hyd.	1,17,18
		1000-4400	<i>Improved throttle response & low end torque.</i>									

Cam Notes: master note list on page 260

- ¹ Stock (O.E.) valve springs cannot be used.
- ¹⁷ Cam & Lifter Sets with "E" suffix feature OE style (91213) lifters.
- ¹⁸ Cam & Lifter Sets without suffix feature tie bar lifters.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



FORD SMALL BLOCK • 5.0L/302 H.O. 1985-2002

Rattler Cams™ Hydraulic Roller Camshafts for OE Roller Applications Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹

FORD SMALL BLOCK • 5.0L/302 H.O. 1985-2002

BOOST™ Hydraulic Roller Camshafts for OE Roller Applications Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91260 ³ 91263 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91260 ³ 91263 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹

Hydraulic Roller Camshafts for OE Roller Applications Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

¹⁹ Fits factory 1-pc eccentric. For 2-pc eccentric use 94212 or 94312.

²⁵ Machining Required.

³³ Tie bar style lifters.

CAMSHAFTS



FORD SMALL BLOCK • 5.0L/302 H.O. 1985-2002

Hydraulic Roller Camshafts for OE Roller Applications

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
220235-10	CL220235-10E ¹⁷ CL220235-10 ¹⁸	266	272	213	219	.517	.517	110	106	Hyd.	Hyd.	1,17,18
		1200-4800 Fair idle, good low & mid-range performance increase.										
220235-12	CL220235-12E ¹⁷ CL220235-12 ¹⁸	266	272	213	219	.517	.517	112	108	Hyd.	Hyd.	1,17,18
		1200-5000 Good idle, Off-Road & Street Performance. 9.0:1 CR advised.										
222765-13	CL222765-13E ¹⁷ CL222765-13 ¹⁸	270	270	217	217	.496	.496	113	109	Hyd.	Hyd.	1,17,18
		1500-5500 Good idle, strong low end & mid-range performance. Needs 2800+ stall.										
221275-08	CL221275-08E ¹⁷ CL221275-08 ¹⁸	270	278	217	225	.528	.533	108	104	Hyd.	Hyd.	1,17,18
		1600-5600 Lopey to fair idle. Good torque & power. 1800+ stall.										
221275-10	CL221275-10E ¹⁷ CL221275-10 ¹⁸	270	278	217	225	.528	.533	110	106	Hyd.	Hyd.	1,17,18
		1600-5600 Fair idle. Good torque & power. 1800+ stall.										
221275-12	CL221275-12E ¹⁷ CL221275-12 ¹⁸	270	278	217	225	.528	.533	112	108	Hyd.	Hyd.	1,17,18
		1600-5600 Good idle. Good torque & power. 1800+ stall.										
221275-14	CL221275-14E ¹⁷ CL221275-14 ¹⁸	270	278	217	225	.528	.533	114	110	Hyd.	Hyd.	1,17,18
		1600-5600 Good idle. Good torque & power. 1800+ stall.										
222725-10	CL222725-10E ¹⁷ CL222725-10 ¹⁸	272	272	219	219	.544	.544	110	106	Hyd.	Hyd.	1,17,18
		1800-5800 Fair idle, strong Street Performance. Requires 9.0+ CR, 5-speed or 2800+ stall.										
221145-10	CL221145-10E ¹⁷ CL221145-10 ¹⁸	272	278	219	225	.544	.533	110	106	Hyd.	Hyd.	1,17,18
		1800-6000 Performance Street, best used with aftermarket heads. 2500+ stall, better intake/exhaust.										
221145-12	CL221145-12E ¹⁷ CL221145-12 ¹⁸	272	278	219	225	.544	.533	112	108	Hyd.	Hyd.	1,17,18
		1800-6000 Good idle, good mid range power. Good vacuum. 9.5-10.5:1 CR, 2500+ stall.										
222745-12	CL222745-12E ¹⁷ CL222745-12 ¹⁸	278	278	225	225	.533	.533	112	108	Hyd.	Hyd.	1,17,18
		2000-6000 Best with 5-speed or 2200-2500 stall.										
220245-10	CL220245-10E ¹⁷ CL220245-10 ¹⁸	278	282	225	229	.533	.512	110	106	Hyd.	Hyd.	1,17,18
		2000-6100 Fair idle, Street/Strip. Auto OK with 2500+ stall.										
220245-12	CL220245-12E ¹⁷ CL220245-12 ¹⁸	278	282	225	229	.533	.512	112	108	Hyd.	Hyd.	1,17,18
		2000-6100 Fair idle, Street & mild Performance usage. Crisp throttle.										
222755-08	CL222755-08E ¹⁷ CL222755-08 ¹⁸	278	284	225	231	.533	.544	108	104	Hyd.	Hyd.	1,17,18
		2000-6200 Fair idle, Street & Mild Performance usage. Crisp throttle.										
222755-12	CL222755-12E ¹⁷ CL222755-12 ¹⁸	278	284	225	231	.533	.544	112	108	Hyd.	Hyd.	1,17,18
		2000-6200 Fair idle, Street & Mild Performance usage. Crisp throttle.										
220325-08	CL220325-08E ¹⁷ CL220325-08 ¹⁸	278	286	225	233	.560	.565	108	104	Hyd.	Hyd.	1,17,18
		1800-6200 Choppy idle, Street performance usage. 2500+ stall.										
220325-10	CL220325-10E ¹⁷ CL220325-10 ¹⁸	278	286	225	233	.560	.565	110	106	Hyd.	Hyd.	1,17,18
		2000-6200 Rough idle, Street/Strip performance. Strong mid-range. 2500+ stall.										
220325-12	CL220325-12E ¹⁷ CL220325-12 ¹⁸	278	286	225	233	.560	.565	112	108	Hyd.	Hyd.	1,17,18
		2000-6200 Choppy idle, Street/Strip performance. Strong mid-range. 2500+ stall.										
220525-10	CL220525-10E ¹⁷ CL220525-10 ¹⁸	280	286	227	233	.597	.597	110	106	Hyd.	Hyd.	1,17,18
		2200-6400 Rough idle, Hot Street/Strip, excellent mid range performance. 2500+ stall, gears, intake.										
220525-12	CL220525-12E ¹⁷ CL220525-12 ¹⁸	280	286	227	233	.597	.597	112	108	Hyd.	Hyd.	1,17,18
		2200-6400 Choppy idle, good all around performance. Good vacuum. 9.5:1+ CR, 2500+ stall & gears.										
220305-08	CL220305-08E ¹⁷ CL220305-08 ¹⁸	284	284	231	231	.544	.544	108	104	Hyd.	Hyd.	1,17,18
		2400-6000 Choppy idle, strong low & mid range performance. 2500+ stall.										
220255-08	CL220255-08E ¹⁷ CL220255-08 ¹⁸	284	288	231	235	.544	.565	108	104	Hyd.	Hyd.	1,17,18
		2200-6000 Rough idle, Street/Strip performance. Great low to mid-range torque & power.										
220255-10	CL220255-10E ¹⁷ CL220255-10 ¹⁸	284	288	231	235	.544	.565	110	106	Hyd.	Hyd.	1,17,18
		2200-6000 Rough idle, Street/Strip performance. Great low to mid-range torque & power.										
220255-12	CL220255-12E ¹⁷ CL220255-12 ¹⁸	284	288	231	235	.544	.565	112	108	Hyd.	Hyd.	1,17,18
		2200-6200 Fair idle, performance usage. Great mid-range torque & horsepower.										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

17 Cam & Lifter Sets with "E" suffix feature OE style (91213) lifters.

18 Cam & Lifter Sets without suffix feature tie bar lifters.

Some items are not legal for sale or use on any pollution controlled motor vehicle



FORD SMALL BLOCK • 5.0L/302 H.O. 1985-2002

Hydraulic Roller Camshafts for OE Roller Applications Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹

Components Notes: master note list on page 260

- ³ Included in Cam & Lifter Sets.
- ⁷ Requires 7/16" rocker studs.
- ¹⁰ 10° Valve lock Angle, must use matching retainers/locks.
- ¹⁹ Fits factory 1-pc eccentric. For 2-pc eccentric use 94212 or 94312.

- ²⁵ Machining Required.
- ³³ Tie bar style lifters.

CAMSHAFTS



FORD SMALL BLOCK • 5.0L/302 H.O. 1985-2002

Hydraulic Roller Camshafts for OE Roller Applications (cont.) Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
222735-10	CL222735-10E ¹⁷ CL222735-10 ¹⁸	288	294	235	241	.581	.581	110	106	Hyd.	Hyd.	1,17,18
		2400-6400 <i>Loppy idle, Hot Street & Bracket Racing. 10.0:1-up CR advised.</i>										
222735-12	CL222735-12E ¹⁷ CL222735-12 ¹⁸	288	294	235	241	.581	.581	112	108	Hyd.	Hyd.	1,17,18
		2400-6400 <i>Loppy idle, Hot Street & Bracket Racing. 10.0:1-up CR advised.</i>										
221815-10	CL221815-10E ¹⁷ CL221815-10 ¹⁸	290	298	237	245	.597	.597	110	106	Hyd.	Hyd.	1,17,18
		2500-6500 <i>Loppy idle, Hot Street/Bracket, good mid range. 9.5-10.5:1 CR, 2800+ stall.</i>										
220275-10	CL220275-10E ¹⁷ CL220275-10 ¹⁸	294	300	241	247	.581	.603	110	106	Hyd.	Hyd.	1,17,18
		2600-6600 <i>Rough idle, Hot Street & Bracket Racing. 10.5:1-up CR advised.</i>										
220275-12	CL220275-12E ¹⁷ CL220275-12 ¹⁸	294	300	241	247	.581	.603	112	108	Hyd.	Hyd.	1,17,18
		2600-6600 <i>Rough idle, Hot Street & Bracket Racing. 10.5:1-up CR advised.</i>										
223365-10	CL223365-10E ¹⁷ CL223365-10 ¹⁸	300	300	247	247	.603	.603	110	106	Hyd.	Hyd.	1,17,18
		2600-6600 <i>Rough idle, Street/Strip, good mid range performance. 3200+ stall, good intake.</i>										
220335-10	CL220335-10E ¹⁷ CL220335-10 ¹⁸	300	304	247	251	.576	.576	110	106	Hyd.	Hyd.	1,17,18
		2800-6700 <i>Hot Street/Brackets. Requires aftermarket heads, 3500+ stall.</i>										
220335-12	CL220335-12E ¹⁷ CL220335-12 ¹⁸	300	304	247	251	.576	.576	112	108	Hyd.	Hyd.	1,17,18
		2800-6800 <i>Loppy idle, Hot Street & Bracket Racing. 10.5:1-up CR advised.</i>										
220355-10	CL220355-10E ¹⁷ CL220355-10 ¹⁸	304	310	251	257	.592	.592	110	106	Hyd.	Hyd.	1,17,18
		3200-7000 <i>Upper mid-range & top end power. Needs 11.0:1+ CR.</i>										
220355-12	CL220355-12E ¹⁷ CL220355-12 ¹⁸	304	310	251	257	.592	.592	112	108	Hyd.	Hyd.	1,17,18
		3200-7000 <i>Upper mid-range & top end power. Needs 11.0:1+ CR.</i>										
224455-12	CL224455-12E ¹⁷ CL224455-12 ¹⁸	306	312	253	259	.640	.640	112	108	Hyd.	Hyd.	1,17,18
		3400-7200 <i>Best with big cubic inch. Needs 11.0:1+ CR. good heads.</i>										
229995	NA	Custom Grind Camshaft								Hyd.	Hyd.	1
		<i>Retro-Fit Hydraulic Roller Special Order Camshaft.</i>										

Cam Notes: master note list on page 260

¹ Stock (O.E.) valve springs cannot be used.

¹⁷ Cam & Lifter Sets with "E" suffix feature OE style (91213) lifters.

¹⁸ Cam & Lifter Sets without suffix feature tie bar lifters.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



FORD SMALL BLOCK • 5.0L/302 H.O. 1985-2002

Hydraulic Roller Camshafts for OE Roller Applications Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
--	NA	--	--	--	--	--	--	--	--	--	NA	94427	94210 ¹⁹ 94310 ¹⁹

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

¹⁹ Fits factory 1-pc eccentric. For 2-pc eccentric use 94212 or 94312.

²⁵ Machining Required.

³³ Tie bar style lifters.

CAMSHAFTS



FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

American Muscle™ Mechanical Flat Tappet Camshafts

Firing Order: 1•5•4•2•6•3•7•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
217322-14	CL217322-14 CL217322-14DL ⁴	310	310	227	227	.477	.477	114	108	.018	.018	1,34
<i>Near duplicate of the Ford 271HP/289 (FMC #C3OZ-6250-C) & 290HP/302 (C9ZZ-6250-A).</i>												
217272-07	CL217272-07 CL217272-07DL ⁴	318	320	251	252	.528	.528	107	102	.020	.020	1
<i>Near duplicate of the Ford LeMans cam (FMC #C7FE-6250-A).</i>												



FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

Mechanical Flat Tappet Camshafts

Firing Order: 1•5•4•2•6•3•7•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
212342-10	CL212342-10 CL212342-10DL ⁴	265	265	230	230	.512	.512	110	106	.022	.022	1
<i>Good Street cam, broad power range. 2200+ stall recommended.</i>												
210542-08	CL210542-08 CL210542-08DL ⁴	258	264	230	236	.561	.574	108	104	.018	.018	1,16,34
<i>Hot Street/Mild Strip. Good mid range torque & power. 2000+ stall.</i>												
211332-08	CL211332-08 CL211332-08DL ⁴	264	268	236	240	.574	.590	108	104	.018	.018	1,16,34
<i>Street/Strip, high torque with mid range & top end power. 2500+ stall.</i>												
210102-06	CL210102-06 CL210102-06DL ⁴	275	281	240	246	.539	.555	106	102	.022	.022	1
<i>Hot Street/Brackets. Lopey idle. Needs higher CR & gears.</i>												
210102-08	CL210102-08 CL210102-08DL ⁴	275	281	240	246	.539	.555	108	104	.022	.022	1
<i>Hot Street/Bracket. Needs 10.0+ CR, 3200+ stall & gears.</i>												
210102-12	CL210102-12 CL210102-12DL ⁴	275	281	240	246	.539	.555	112	108	.022	.022	1
<i>Fair idle, Moderate Street/Bracket, good low & mid range torque. 10.5-11.5:1, 3000+ stall.</i>												
211002-08	CL211002-08 CL211002-08DL ⁴	279	279	244	244	.544	.544	108	104	.022	.022	1
<i>Rough idle, super mid-range performance. Needs 11.0:1 CR-up.</i>												
212352-06	CL212352-06 CL212352-06DL ⁴	281	287	246	252	.549	.565	106	102	.022	.022	1
<i>Fair idle, Street/Strip in light car. 10.0:1 CR, 4.10 or lower gears.</i>												
211052-08	CL211052-08 CL211052-08DL ⁴	294	294	248	248	.544	.544	108	104	.022	.022	1
<i>Street/Strip, powerful through entire rpm range.</i>												
212372-08	CL212372-08 CL212372-08DL ⁴	285	291	250	256	.560	.571	108	104	.022	.022	1
<i>Rough idle, needs good induction system. Good Oval Track cam.</i>												
212362-08	CL212362-08 CL212362-08DL ⁴	289	295	254	260	.587	.592	108	104	.022	.022	1
<i>Rough idle, Bracket cam. Best with 11.0:1+ CR & 4000+ stall.</i>												
212532-06	CL212532-06 CL212532-06DL ⁴	295	299	260	264	.592	.592	106	102	.022	.022	1
<i>Bracket Race or 3/8 to 1/2 mile Oval Track with fast comers. 331-363.</i>												
212322-08	CL212322-08 CL212322-08DL ⁴	295	303	260	268	.592	.587	108	104	.022	.022	1
<i>Rough idle, Bracket favorite. Needs 11.0:1 CR & 4000+ stall.</i>												
219992	NA	Custom Grind Camshaft										1
<i>Mechanical Flat Tappet Special Order Camshaft.</i>												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

4 Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.

16 Lobes designed to take maximum advantage of .875" dia. lifter.

34 Provisions for increased oiling recommended.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

American Muscle™ Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91215 ³ 91218 ⁴	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹

FORD SMALL BLOCK • 221-302 1963-1995 (EXCEPT 302 H.O.)

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91215 ³ 91218 ⁴	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95198 95007	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	--	--	--	--	--	--	--	--	--	NA	94427	94210 ¹⁹ 94310 ¹⁹

Components Notes: master note list on page 260

- ³ Included in Cam & Lifter Sets.
- ⁴ Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.
- ⁷ Requires 7/16" rocker studs.
- ¹⁰ 10° Valve lock Angle, must use matching retainers/locks.
- ¹⁹ Fits factory 1-pc eccentric. For 2-pc eccentric use 94212 or 94312.
- ²⁵ Machining Required.

CAMSHAFTS



FORD SMALL BLOCK • 221-302 1963-1995

Big Bottle Cams™ - Nitrous Oxide Mechanical Roller Cams Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
221133-12	NA	287	299	255	267	.640	.640	112	108	.022	.022	1,5,23
		3000-6800 Fair idle, Performance/Strip with plate system. Great mid range. 11.5:1+ CR, 3500+ stall.										
220373-12	NA	295	305	263	273	.672	.688	112	108	.022	.022	1,5,23
		3800-7200 Rough idle, Street/Bracket with manifold system. Good upper rpm. 11.5:1+ CR, 4000+.										
220673-12	NA	299	309	267	277	.688	.693	112	108	.022	.022	1,5,23
		4200-8000 Competition with large plate system. Good mid to upper range. 12.0:1+ CR.										
220793-12	NA	305	319	273	287	.725	.693	112	108	.022	.022	1,5,23
		4400-8400 Best with larger cubic inch, large plate or plumbed system. 12.0:1+ CR, 4500+ stall.										
220793-14	NA	305	319	273	287	.725	.693	114	110	.022	.022	1,5,23
		4400-8400 Large stroker with multi stage system. 12.0:1+ CR, 4500+ stall.										
220393-14	NA	309	323	277	291	.720	.720	114	110	.022	.022	1,5,23
		4600-8600 Great with big stroke combinations. Large multi stage system. 12.5:1+ CR.										
221073-14	NA	313	327	281	295	.779	.763	114	110	.022	.022	1,5,23
		4600-8600 Big stroker, big heads, big multi stage system.										
221093-12	NA	313	331	281	299	.779	.763	112	108	.022	.022	1,5,23
		5000-8400 Large cubic inch, all out Competition. Best of everything. Works good w/NOS.										
229993	NA	Custom Grind Camshaft										1,5,23
		Mechanical Roller Special Order Camshaft.										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

5 Requires upgraded distributor gear.

23 Ignition firing order must be changed to 1-3-7-2-6-5-4-8.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.

FORD SMALL BLOCK • 221-302 1963-1995

Steel Billet Mechanical Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91234 91288	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91288 91240	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91288 91240	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
--	NA	--	--	--	--	--	--	--	--	--	NA	94427	94310 ¹⁹

Components Notes: master note list on page 260

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

¹⁹ Fits factory 1-pc eccentric. For 2-pc eccentric use 94212 or 94312.

³² These lifters are not recommended for street use.

CAMSHAFTS



FORD SMALL BLOCK • 221-302 1963-1995

Steel Billet Mechanical Roller Camshafts

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
221213-08	NA	261	269	229	237	.592	.592	108	104	.022	.022	1,5,23
		2000-6000	Noticeable idle, Street Rod Cruiser. Should have 9.0:1 CR, 2000+ stall.									
221213-10	NA	261	269	229	237	.592	.592	110	106	.022	.022	1,5,23
		2000-6000	Noticeable idle, good for Weekend Street Cruiser. Should have 9.0:1 CR, 2000+ stall.									
221203-08	NA	269	269	237	237	.592	.592	108	104	.022	.022	1,5,23
		2200-6400	Rough idle, Street/mild Strip. Good lower mid range. 9.5:1 CR, 2500+ stall.									
221203-10	NA	269	269	237	237	.592	.592	110	106	.022	.022	1,5,23
		2200-6400	Rough idle, Street Performance/mild Strip. Recommend 9.5:1 CR, 2500+ stall.									
220183-08	NA	269	275	237	243	.592	.592	108	104	.022	.022	1,5,23
		2200-6200	Mild rough idle, Weekend Cruiser/mild Strip. 2500+ stall recommended.									
220183-10	NA	269	275	237	243	.592	.592	110	106	.022	.022	1,5,23
		2200-6200	Mild rough idle, Weekend Cruiser/Power Tour favorite. 2500+ stall recommended.									
220173-06	NA	275	281	243	249	.592	.600	106	102	.022	.022	1,5,23
		2400-6500	Lopey idle, Strong low to mid range torque. 10.0:1+ CR, 2500+ stall.									
220173-08	NA	275	281	243	249	.592	.600	108	104	.022	.022	1,5,23
		2400-6400	Rough idle, Strong low to mid range power band. 10.0:1+ CR, 2500+ stall.									
221313-10	NA	277	277	245	245	.624	.624	110	106	.022	.022	1,5,23
		2600-6200	Nice idle. Strong low & mid-range.									
221113-08	NA	277	285	245	253	.624	.624	108	104	.022	.022	1,5,23
		2600-6500	Lopey idle. Strong mid-range. 10.0:1+ CR.									
221013-06	NA	285	291	253	259	.624	.624	106	102	.022	.022	1,5,23
		2800-6600	Heavy Bracket or 1/4-3/8 mile Oval Track, Good mid range torque. 11.0-12.5:1 CR.									
221013-08	NA	285	291	253	259	.624	.624	108	104	.022	.022	1,5,23
		2800-6600	Lopey idle. Strong mid-range with top end increase.									
220593-06	NA	285	291	253	259	.683	.683	106	102	.022	.022	1,5,23
		2800-6600	Good mid-range horsepower, rough idle. Needs 11.0:1 CR-up.									
221133-06	NA	287	299	255	267	.640	.640	106	102	.022	.022	1,5,23
		2900-6800	Strong mid & upper rpm, banked Oval Track & Brackets w/auto trans.									
221133-08	NA	287	299	255	267	.640	.640	108	104	.022	.022	1,5,23
		2900-6800	Mid to upper range horsepower & torque. 11.0:1+ Good heads.									
222313-06	NA	291	295	259	263	.624	.656	106	102	.022	.022	1,5,23
		3400-7200	Oval Track 1/4-3/8 mile. Good mid to upper torque & power. 2bbl. or 4bbl. carb.									
222313-08	NA	291	295	259	263	.624	.656	108	104	.022	.022	1,5,23
		3400-7200	Rough idle, Bracket E.T., good mid range. 11.5:1+ CR, 3500+ stall.									
222123-06	NA	291	299	259	267	.683	.672	106	102	.022	.022	1,5,23
		3400-7400	Oval Track 3/8-1/2 mile. Good mid to upper torque & power. Best with 4bbl. carb.									
222123-08	NA	291	299	259	267	.683	.672	108	104	.022	.022	1,5,23
		3400-7400	Bracket/Pro/Super Pro, good mid to upper range power. 12.0:1+, 3800+ stall.									
221173-06	NA	295	299	263	267	.683	.672	106	102	.022	.022	1,5,23
		3800-7600	Strong mid & upper range horsepower. 11.0:1+ Good heads.									
221613-06	NA	299	303	267	271	.672	.667	106	102	.022	.022	1,5,23
		4200-7800	Competition use, good mid & upper HP, needs good heads & compression.									
221613-08	NA	299	303	267	271	.672	.667	108	104	.022	.022	1,5,23
		4200-7800	Long Oval Track or Bracket E.T. Drag, good upper rpm horsepower. 12.5:1 CR.									
221223-08	NA	301	305	269	273	.720	.688	108	104	.022	.022	1,5,23
		4200-8000	Competition use, good mid & upper power.									
221223-10	NA	301	305	269	273	.720	.688	110	106	.022	.022	1,5,23
		4200-8000	Bracket/Competition, good upper end torque & power. 12.0:1+ CR, race converter.									

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

5 Requires upgraded distributor gear.

23 Ignition firing order must be changed to 1-3-7-2-6-5-4-8.

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FORD SMALL BLOCK - 221-302 1963-1995

Steel Billet Mechanical Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91250 91217 ³²	NA	NA	98630 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91250 91217 ³²	NA	NA	98630 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91250 91217 ³²	NA	NA	98630 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91250 91217 ³²	NA	NA	98630 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91250 91217 ³²	NA	NA	98630 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91250 91217 ³²	NA	NA	98630 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91217 91234	NA	NA	98630 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91217 91234	NA	NA	98630 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91217 91234	NA	NA	98732 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91217 91234	NA	NA	98732 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91217 91234	NA	NA	98732 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91217 91234	NA	NA	98732 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹

Components Notes: master note list on page 260

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

¹⁹ Fits factory 1-pc eccentric. For 2-pc eccentric use 94212 or 94312.

³² These lifters are not recommended for street use.

CAMSHAFTS



FORD SMALL BLOCK • 221-302 1963-1995

Steel Billet Mechanical Roller Camshafts (cont.)

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
221123-08	NA	299	307	267	275	.672	.661	108	104	.022	.022	1,5,23
		<i>4200-8000 Strong upper horsepower. 11.5:1+ Good heads & induction, 4500+ stall.</i>										
221813-06	NA	301	309	269	277	.693	.661	106	102	.022	.022	1,5,23
		<i>4400-8400 Rough idle, Competition, Great upper rpm torque. 12.0:1+ CR, 4500+ stall.</i>										
221813-08	NA	301	309	269	277	.693	.661	108	104	.022	.022	1,5,23
		<i>4400-8600 Competition, good upper rpm torque & horsepower. 12.0:1+ CR & race converter.</i>										
221863-06	NA	301	309	269	277	.720	.693	106	102	.022	.022	1,5,23
		<i>4400-8400 Competition, good upper mid to top end torque. 12.0:1+ CR & race converter.</i>										
221863-08	NA	301	309	269	277	.720	.693	108	104	.022	.022	1,5,23
		<i>4400-8600 Super Pro/Bracket, good upper rpm torque & horsepower. 12.0:1+ CR & race converter.</i>										
221863-10	NA	301	309	269	277	.720	.693	110	106	.022	.022	1,5,23
		<i>4500-8800 Good mid range power with top end pull. 12.0:1+ CR & race converter.</i>										
221083-08	NA	307	315	275	283	.688	.672	108	104	.022	.022	1,5,23
		<i>4800-8600 Strong upper horsepower. 11.5:1+ Good heads.</i>										
221083-10	NA	307	315	275	283	.688	.672	110	106	.022	.022	1,5,23
		<i>4800-8600 Competition profile, good top end power. Needs good parts.</i>										
221093-12	NA	313	331	281	299	.779	.763	112	108	.022	.022	1,5,23
		<i>5000-8400 Large cubic inch, all out Competition. Best of everything. Works good w/NOS.</i>										
229993	NA	Custom Grind Camshaft										1,5,23
		<i>Mechanical Roller Special Order Camshaft.</i>										



FORD SMALL BLOCK • 351W 1969-1996

Max Certified™ Hydraulic Flat Tappet Cam & Lifter Sets - 5 Year No Fault Warranty (see page 3 for details)

Cam & Lifter Set Part No.	Cam & Direct Lube Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift a/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
MC220021-12	MC220021-12DL ⁴	259	267	205	213	.448	.480	112	108	Hyd.	Hyd.	1
		<i>1000-5000 Great low & mid-range. Smooth idle. Good in PUs & RVs.</i>										
MC220931-10	MC220931-10DL ⁴	269	269	215	215	.475	.475	110	106	Hyd.	Hyd.	1
		<i>1400-5200 Lopey idle. Excellent Street Performance cam.</i>										
MC220041-12	MC220041-12DL ⁴	275	275	221	221	.475	.475	112	108	Hyd.	Hyd.	1
		<i>1200-5400 Good idle & throttle response. Ok with small blower.</i>										
MC220951-10	MC220951-10DL ⁴	275	285	221	231	.501	.501	110	106	Hyd.	Hyd.	1
		<i>2000-6000 Street & Strip. Needs 4 barrel, headers & low gears.</i>										
MC220051-12	MC220051-12DL ⁴	277	289	223	235	.496	.520	112	108	Hyd.	Hyd.	1
		<i>2400-6600 Strong mid-range. Great E.T. Bracket cam. OK w/NOS.</i>										
MC220961-08	MC220961-08DL ⁴	285	285	231	231	.501	.501	108	104	Hyd.	Hyd.	1
		<i>2600-6800 Broad power range, extra performance in smaller engine.</i>										

Cam Notes: master note list on page 260

¹ Stock (O.E.) valve springs cannot be used.

⁴ Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.

⁵ Requires upgraded distributor gear.

²³ Ignition firing order must be changed to 1-3-7-2-6-5-4-8.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



FORD SMALL BLOCK • 221-302 1963-1995

Steel Billet Mechanical Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91234 91288	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91288 91240	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
--	NA	--	--	--	--	--	--	--	--	--	NA	94427	94310 ¹⁹

FORD SMALL BLOCK • 351W 1969-1996

Max Certified™ Hydraulic Flat Tappet Cam & Lifter Set Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91211 ³ 91216 ⁴	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91216 ⁴	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91216 ⁴	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91216 ⁴	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91216 ⁴	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91216 ⁴	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

⁴ Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

¹⁹ Fits factory 1-pc eccentric. For 2-pc eccentric use 94212 or 94312.

CAMSHAFTS



FORD SMALL BLOCK • 351W 1969-1996

American Muscle™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
227571-14	CL227571-14	260	270	198	208	.416	.445	114	115	Hyd.	Hyd.	1
800-4500 Near duplicate of the Ford 290HP/351W cam (FMC #C90Z-6250-A).												



FORD SMALL BLOCK • 351W 1969-1996

Street Force™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
220021-12	CL220021-12	259	267	205	213	.448	.480	112	108	Hyd.	Hyd.	1
1000-5000 Street Force™ 1, Good idle, Mild Street performance, strong low end torque.												
220031-12	CL220031-12	269	277	215	223	.475	.496	112	108	Hyd.	Hyd.	1
1500-5400 Street Force™ 2, Good idle & throttle response. Needs 4 barrel & good exhaust.												
222121-12	CL222121-12	279	289	225	235	.496	.501	112	108	Hyd.	Hyd.	1
1600-5800 Street Force™ 3, Noticeable idle, Hot Street & mild Bracket Racing.												



FORD SMALL BLOCK • 351W 1969-1996

Rattler Cams™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
228021-09	CL228021-09	281	289	227	235	.501	.501	109	103	Hyd.	Hyd.	1
1800-5500 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.												
228061-09	CL228061-09	289	297	235	243	.501	.480	109	103	Hyd.	Hyd.	1
2000-5700 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.												
228101-09	CL228101-09	297	305	243	251	.512	.528	109	103	Hyd.	Hyd.	1
2400-6100 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



FORD SMALL BLOCK • 351W 1969-1996

American Muscle™ Hydraulic Flat Tappet Cam & Lifter Set Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91211 ³ 91216	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹

FORD SMALL BLOCK • 351W 1969-1996

Street Force™ Hydraulic Flat Tappet Cam & Lifter Set Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91211 ³ 91216	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91216	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91216	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹

FORD SMALL BLOCK • 351W 1969-1996

Rattler Cams™ Hydraulic Flat Tappet Cam & Lifter Set Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91211 ³ 91212	NA	98436-K11	98436	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91212	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
91211 ³ 91212	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

¹⁹ Fits factory 1-pc eccentric. For 2-pc eccentric use 94212 or 94312.

²⁵ Machining Required.

CAMSHAFTS



FORD SMALL BLOCK • 351W 1969-1996

BOOST™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
229141-14	CL229141-14	279	289	225	235	.523	.520	114	110	Hyd.	Hyd.	1
		<i>2400-6400 Blower, Good idle. 5-8lbs Boost 2200 Conv</i>										
229261-14	CL229261-14	289	299	235	245	.520	.520	114	110	Hyd.	Hyd.	1
		<i>3200-6800 Blower, Fair idle. Hot Street 10+ Boost 2800+ Conv. Gears</i>										
229421-14	CL229421-14	297	305	243	251	.555	.560	114	110	Hyd.	Hyd.	1
		<i>3800-7200 Blower, Fair idle. Series Street Rod. 12-15lbs Boost 3500+ Conv.</i>										



FORD SMALL BLOCK • 351W 1969-1996

Hydraulic Flat Tappet Camshafts

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
220011-14	CL220011-14	255	263	201	209	.437	.448	114	110	Hyd.	Hyd.	
		<i>800-4500 Smooth idle, strong low end. High vacuum, good fuel economy.</i>										
220931-10	CL220931-10	269	269	215	215	.475	.475	110	106	Hyd.	Hyd.	1
		<i>1400-5200 Lopey idle. Excellent Street Performance cam.</i>										
220991-08	CL220991-08	267	267	220	220	.543	.543	108	104	Hyd.	Hyd.	1,16
		<i>1700-5700 Good low & mid-range horsepower. Needs 4 barrel & headers.</i>										
222021-08	CL222021-08	267	277	220	230	.543	.563	108	104	Hyd.	Hyd.	1,16
		<i>2200-6000 High lift, dual pattern. Need 4 barrel, low gears & 2500+ stall.</i>										
220041-08	CL220041-08	275	275	221	221	.475	.475	108	104	Hyd.	Hyd.	1
		<i>1700-5700 Good low & mid-range horsepower. Needs 4 barrel & headers.</i>										
220041-10	CL220041-10	275	275	221	221	.475	.475	110	106	Hyd.	Hyd.	1
		<i>1700-5800 Good low & mid-range horsepower. Needs 4 barrel & headers.</i>										
220041-12	CL220041-12	275	275	221	221	.475	.475	112	108	Hyd.	Hyd.	1
		<i>1200-5400 Good idle & throttle response. Ok with small blower.</i>										
220951-10	CL220951-10	275	285	221	231	.501	.501	110	106	Hyd.	Hyd.	1
		<i>2000-6000 Street & Strip. Needs 4 barrel, headers & low gears.</i>										
220051-08	CL220051-08	277	289	223	235	.496	.520	108	104	Hyd.	Hyd.	1
		<i>2400-6600 Hot Street performance in 385-418. 9.5:1, 2400 stall suggested.</i>										
220051-10	CL220051-10	277	289	223	235	.496	.520	110	106	Hyd.	Hyd.	1
		<i>2400-6600 Good idle, Street/Strip Good mid range torque. 9.5:1, 2400 stall suggested.</i>										
220051-12	CL220051-12	277	289	223	235	.496	.520	112	108	Hyd.	Hyd.	1
		<i>2400-6600 Strong mid-range. Great E.T. Bracket cam. OK w/NOS.</i>										
222431-06	CL222431-06	272	272	224	224	.551	.551	106	102	Hyd.	Hyd.	1,16
		<i>2400-6400 Lopey idle, good low end & mid-range horsepower & torque.</i>										
222431-08	CL222431-08	272	272	224	224	.551	.551	108	104	Hyd.	Hyd.	1,16
		<i>2400-6600 Hot Street cam. 4 barrel & headers recommended.</i>										
222431-12	CL222431-12	272	272	224	224	.551	.551	112	108	Hyd.	Hyd.	1,16
		<i>2400-6600 Good idle, good mid range torque & horsepower. Needs 2400+ stall.</i>										
222051-08	CL222051-08	277	277	230	230	.563	.563	108	104	Hyd.	Hyd.	1,16
		<i>2800-7000 Fair idle, Broad power band. Works well in heavy vehicles.</i>										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

16 Lobes designed to take maximum advantage of .875" dia. lifter.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



FORD SMALL BLOCK • 351W 1969-1996

BOOST™ Hydraulic Flat Tappet Camshafts

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91212 ³	NA	98436-K11	98436	97118	--	93005	93316 ²⁵	90080	90200	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
					97216 ¹⁰	93017 ¹⁰		90081 ⁷	90201 ⁷				
91212 ³	NA	98412-K11	98412	97118	--	93005	93316 ²⁵	90080	90200	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
					97216 ¹⁰	93017 ¹⁰		90081 ⁷	90201 ⁷				
91212 ³	NA	98412-K11	98412	97118	--	93005	93316 ²⁵	90080	90200	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
					97216 ¹⁰	93017 ¹⁰		90081 ⁷	90201 ⁷				

FORD SMALL BLOCK • 351W 1969-1996

Hydraulic Flat Tappet Cam & Lifter Set Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91211 ³ 91212	NA	98412-K11	98412	97118	--	93005	93316 ²⁵	90080	90200	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
					97216 ¹⁰	93017 ¹⁰		90081 ⁷	90201 ⁷				
91211 ³ 91212	NA	98412-K11	98412	97118	--	93005	93316 ²⁵	90080	90200	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
					97216 ¹⁰	93017 ¹⁰		90081 ⁷	90201 ⁷				
91211 ³ 91212	NA	98412-K11	98412	97118	--	93005	93316 ²⁵	90080	90200	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
					97216 ¹⁰	93017 ¹⁰		90081 ⁷	90201 ⁷				
91211 ³ 91212	NA	98412-K11	98412	97118	--	93005	93316 ²⁵	90080	90200	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
					97216 ¹⁰	93017 ¹⁰		90081 ⁷	90201 ⁷				
91211 ³ 91212	NA	98412-K11	98412	97118	--	93005	93316 ²⁵	90080	90200	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
					97216 ¹⁰	93017 ¹⁰		90081 ⁷	90201 ⁷				
91211 ³ 91212	NA	98412-K11	98412	97118	--	93005	93316 ²⁵	90080	90200	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
					97216 ¹⁰	93017 ¹⁰		90081 ⁷	90201 ⁷				
91211 ³ 91212	NA	98412-K11	98412	97118	--	93005	93316 ²⁵	90080	90200	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
					97216 ¹⁰	93017 ¹⁰		90081 ⁷	90201 ⁷				
91211 ³ 91212	NA	--	98438 ²⁵	97118	--	93005	93316 ²⁵	90080	90200	95198	NA	94427	94210 ¹⁹ 94310 ¹⁹
		98438-K12 ²⁵		97128 ¹⁰	97216 ¹⁰	93017 ¹⁰		90081 ⁷	90201 ⁷	95007			
91211 ³ 91212	NA	--	98438 ²⁵	97118	--	93005	93316 ²⁵	90080	90200	95198	NA	94427	94210 ¹⁹ 94310 ¹⁹
		98438-K12 ²⁵		97128 ¹⁰	97216 ¹⁰	93017 ¹⁰		90081 ⁷	90201 ⁷	95007			
91211 ³ 91212	NA	--	98438 ²⁵	97118	--	93005	93316 ²⁵	90080	90200	95198	NA	94427	94210 ¹⁹ 94310 ¹⁹
		98438-K12 ²⁵		97128 ¹⁰	97216 ¹⁰	93017 ¹⁰		90081 ⁷	90201 ⁷	95007			
91211 ³ 91212	NA	--	98438 ²⁵	97118	--	93005	93316 ²⁵	90080	90200	95198	NA	94427	94210 ¹⁹ 94310 ¹⁹
		98438-K12 ²⁵		97128 ¹⁰	97216 ¹⁰	93017 ¹⁰		90081 ⁷	90201 ⁷	95007			

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

¹⁹ Fits factory 1-pc eccentric. For 2-pc eccentric use 94212 or 94312.

²⁵ Machining Required.

CAMSHAFTS



FORD SMALL BLOCK • 351W 1969-1996

Hydraulic Flat Tappet Camshafts

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes	
		IN	EX	IN	EX	IN	EX			IN	EX		
222051-10	CL222051-10	277	277	230	230	.563	.563	110	106	Hyd.	Hyd.	1,16	
		<i>2800-7000 Strong power range from 3,500 up. Needs 4bbl, header & stall.</i>											
222141-08	CL222141-08	277	282	230	234	.563	.572	108	104	Hyd.	Hyd.	1,16	
		<i>2500-6800 Lopey idle, broad power band, strong top end power.</i>											
222141-10	CL222141-10	277	282	230	234	.563	.572	110	106	Hyd.	Hyd.	1,16	
		<i>2500-6800 Lopey idle, Strong mid range. Good throttle response. 2400+ stall.</i>											
222591-08	CL222591-08	277	287	230	240	.563	.592	108	104	Hyd.	Hyd.	1,16	
		<i>2500-6800 Lopey idle, Hot Street/Brackets. 2500+ stall, 9.0:1+ CR.</i>											
222591-12	CL222591-12	277	287	230	240	.563	.592	112	108	Hyd.	Hyd.	1,16	
		<i>2600-6800 Hot Street & mild Bracket Racing.</i>											
220961-08	CL220961-08	285	285	231	231	.501	.501	108	104	Hyd.	Hyd.	1	
		<i>2600-6800 Broad power range, extra performance in smaller engine.</i>											
220961-08	CL220961-08	285	285	231	231	.501	.501	108	104	Hyd.	Hyd.	1	
		<i>2600-6800 Broad power range, extra performance in smaller engine.</i>											
226461-10	CL226461-10	280	288	233	241	.544	.565	110	106	Hyd.	Hyd.	1	
		<i>3000-7000 Very aggressive ramp speeds, Oval track USMTS and IMCA modifieds.</i>											
221701-12	CL221701-12	282	291	234	244	.572	.596	112	108	Hyd.	Hyd.	1,16	
		<i>3000-7000 Lopey idle, Street/Strip or nostalgia. Likes headers & gears.</i>											
220971-08	CL220971-08	283	283	236	236	.583	.583	108	104	Hyd.	Hyd.	1,16	
		<i>3000-6800 Lopey idle, Pro-Street & Bracket Racing profile. Needs 3200+ stall, good exhaust.</i>											
222601-06	CL222601-06	283	287	236	240	.583	.592	106	102	Hyd.	Hyd.	1,16	
		<i>3000-6800 Bracket or 1/4 to 3/8 mile 4bbl. Oval Track. Proven winner.</i>											
222601-08	CL222601-08	283	287	236	240	.583	.592	108	104	Hyd.	Hyd.	1,16	
		<i>3000-6800 Lopey idle, good mid-range power. Needs 3200+ stall.</i>											
220891-08	CL220891-08	287	293	240	246	.592	.601	108	104	Hyd.	Hyd.	1,16	
		<i>3200-7000 Rough idle, Hot Street/Bracket, great mid range & top end power. 3500+ stall.</i>											
220891-10	CL220891-10	287	293	240	246	.592	.601	110	106	Hyd.	Hyd.	1,16	
		<i>3200-7000 Lopey idle, Hot Street/Bracket, good mid range. 10.0-11.5:1 CR, 3500+ stall.</i>											
220891-12	CL220891-12	287	293	240	246	.592	.601	112	108	Hyd.	Hyd.	1,16	
		<i>3200-7000 Hot Street/Brackets. Needs 10.0:1+ CR, good heads & exhaust. 3500+ stall.</i>											
222901-12	CL222901-12	294	300	241	247	.416	.437	112	108	Hyd.	Hyd.	1	
		<i>2300-6500 Fair idle, Circle Track Lift Rule Only. Strong mid-range.</i>											
220061-08	CL220061-08	291	301	244	254	.596	.625	108	104	Hyd.	Hyd.	1,16	
		<i>3200-7200 Pro Street/Brackets, Strong mid & upper end power. 10.0:1+ CR.</i>											
220061-12	CL220061-12	291	301	244	254	.596	.625	112	108	Hyd.	Hyd.	1,16	
		<i>2600-6600 Performance/Competition. Works well with small blower or NOS.</i>											
222041-08	CL222041-08	293	293	246	246	.601	.601	108	104	Hyd.	Hyd.	1,16	
		<i>3400-6700 Hot Street/Brackets. Needs 10.0:1+ CR, good heads & exhaust. 3500+ stall.</i>											
222401-10	CL222401-10	295	295	248	248	.605	.605	110	106	Hyd.	Hyd.	1,16	
		<i>3200-6800 E.T. Brackets. Strong mid & upper end power range.</i>											
221541-08	CL221541-08	295	301	248	254	.605	.625	108	104	Hyd.	Hyd.	1,16	
		<i>3400-7000 Rough idle, Serious Street/Strip. 10.5:1+ CR, good heads & exhaust. 3500+ stall.</i>											
221541-10	CL221541-10	295	301	248	254	.605	.625	110	106	Hyd.	Hyd.	1,16	
		<i>3400-7200 Serious Street/Strip. A favorite for 408+ ci. strokers. 10.5:1+ CR, 3500+ stall.</i>											
229991	NA	Custom Grind Camshaft									Hyd.	Hyd.	1
		<i>Hydraulic Flat Tappet Special Order Camshaft.</i>											

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

16 Lobes designed to take maximum advantage of .875" dia. lifter.

Some items are not legal for sale or use on any pollution controlled motor vehicle

CAMSHAFTS



FORD SMALL BLOCK • 351W 1969-1996

Rattler Cams™ Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•3•7•2•6•5•4•8

Small Base - for Use With **OE Style** Hydraulic Roller Lifters & Spider

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
228005-09S	CL228005-09S ³⁶	280	288	227	235	.560	.565	109	103	Hyd.	Hyd.	1
1800-5500 Rattler™, Chippy idle. High Performance Street, stock converter ok, best with 1800+ and gears.												
228045-09S	CL228045-09S ³⁶	288	296	235	243	.565	.565	109	103	Hyd.	Hyd.	1
2000-5700 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.												
228085-09S	CL228085-09S ³⁶	296	304	243	251	.565	.549	109	103	Hyd.	Hyd.	1
2400-6100 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												



FORD SMALL BLOCK • 351W 1969-1996

BOOST™ Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•3•7•2•6•5•4•8

Small Base - for Use With **OE Style** Hydraulic Roller Lifters & Spider

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
229165-14S	CL229165-14S ³⁶	273	273	221	221	.544	.544	114	110	Hyd.	Hyd.	1
2000-5800 Turbo, Good idle. High Performance Street, stock converter ok, best with 2000+ and gears.												
229135-14S	CL229135-14S ³⁶	277	287	225	235	.560	.571	114	110	Hyd.	Hyd.	1
2200-6400 Blower, Good idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.												
229275-16S	CL229275-16S ³⁶	287	285	235	233	.580	.576	116	112	Hyd.	Hyd.	1
2600-6800 Turbo, Fair idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												
229225-14S	CL229225-14S ³⁶	287	297	235	245	.608	.597	114	110	Hyd.	Hyd.	1
2800-6800 Blower, Fair idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												
229425-14S	CL229425-14S ³⁶	307	317	255	265	.640	.640	114	110	Hyd.	Hyd.	1
2400-6200 Blower, Fair idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

36 Includes Lifter "Spider" Kit.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



FORD SMALL BLOCK • 351W 1969-1996

Rattler Cams™ Retro-Fit Hydraulic Roller Small Base Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95203 95008	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95203 95008	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95203 95008	NA	94427	94210 ¹⁹ 94310 ¹⁹

FORD SMALL BLOCK • 351W 1969-1996

BOOST™ Retro-Fit Hydraulic Roller Camshafts Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

¹⁹ Fits factory 1-pc eccentric. For 2-pc eccentric use 94212 or 94312.

²⁵ Machining Required.

CAMSHAFTS



FORD SMALL BLOCK • 351W 1969-1996

Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•3•7•2•6•5•4•8

Small Base - for Use With **OE Style** Hydraulic Roller Lifters & Spider

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve IN	Lash EX	Cam Notes
		IN	EX	IN	EX	IN	EX					
220225-12S	CL220225-12S ³⁶	260	266	207	213	.480	.496	112	108	Hyd.	Hyd.	1,23
		800-4200 Great daily usage, smooth idle, great fuel economy.										
220315-10S	CL220315-10S ³⁶	262	268	209	215	.496	.501	110	106	Hyd.	Hyd.	1,23
		1000-4400 Improved throttle response & low end torque.										
220315-12S	CL220315-12S ³⁶	262	268	209	215	.496	.501	112	108	Hyd.	Hyd.	1,23
		1000-4400 Improved throttle response & low end torque.										
220235-10S	CL220235-10S ³⁶	266	272	213	219	.517	.517	110	106	Hyd.	Hyd.	1,23
		1000-4800 Fair idle, good low & mid-range performance increase.										
220235-12S	CL220235-12S ³⁶	266	272	213	219	.517	.517	112	108	Hyd.	Hyd.	1,23
		1000-5000 Good idle, Off-Road & Street Performance. 9.0:1 CR advised.										
222765-13S	CL222765-13S ³⁶	270	270	217	217	.496	.496	113	109	Hyd.	Hyd.	1,23
		1500-5500 Good idle, strong low end & mid-range performance. Needs 2800+ stall.										
221275-08S	CL221275-08S ³⁶	270	278	217	225	.528	.533	108	104	Hyd.	Hyd.	1,23
		1200-5600 Fair idle. Good torque & power. 1800+ stall.										
221275-10S	CL221275-10S ³⁶	270	278	217	225	.528	.533	110	106	Hyd.	Hyd.	1,23
		1200-5600 Fair dle. Good torque & power. 1800+ stall.										
221275-12S	CL221275-12S ³⁶	270	278	217	225	.528	.533	112	108	Hyd.	Hyd.	1,23
		1200-5600 Good idle. Good torque & power. 1800+ stall.										
221275-14S	CL221275-14S ³⁶	270	278	217	225	.528	.533	114	110	Hyd.	Hyd.	1,23
		1200-5600 Good idle. Good torque & power. 1800+ stall.										
222725-10S	CL222725-10S ³⁶	272	272	219	219	.544	.544	110	106	Hyd.	Hyd.	1,23
		1800-5800 Fair idle, strong Street Performance. Requires 9.0+ CR, 5-speed or 2800+ stall.										
221145-10S	CL221145-10S ³⁶	272	278	219	225	.544	.533	110	106	Hyd.	Hyd.	1,23
		2000-6000 Performance Street, best used with aftermarket heads. 2500+ stall, better intake/exhaust.										
221145-12S	CL221145-12S ³⁶	272	278	219	225	.544	.533	112	108	Hyd.	Hyd.	1,23
		2000-6000 Good idle, good mid range power. Good vacuum. 9.5-10.5:1 CR, 2500+ stall.										
222745-12S	CL222745-12S ³⁶	278	278	225	225	.533	.533	112	108	Hyd.	Hyd.	1,23
		2000-6000 Best with 5-speed or 2200-2500 stall.										
220245-10S	CL220245-10S ³⁶	278	282	225	229	.533	.512	110	106	Hyd.	Hyd.	1,23
		2000-6100 Fair idle, Street/Strip. Auto OK with 2500+ stall.										
220245-12S	CL220245-12S ³⁶	278	282	225	229	.533	.512	112	108	Hyd.	Hyd.	1,23
		2000-6100 Fair idle, Street & mild Performance usage. Crisp throttle.										
222755-08S	CL222755-08S ³⁶	278	284	225	231	.533	.544	108	104	Hyd.	Hyd.	1,23
		2000-6200 Fair idle, Street & Mild Performance usage. Crisp throttle.										
222755-12S	CL222755-12S ³⁶	278	284	225	231	.533	.544	112	108	Hyd.	Hyd.	1,23
		2000-6200 Fair idle, Street & Mild Performance usage. Crisp throttle.										
220325-08S	CL220325-08S ³⁶	278	286	225	233	.560	.565	108	104	Hyd.	Hyd.	1,23
		1800-6200 Choppy idle, Street performance usage. 2500+ stall.										
220325-10S	CL220325-10S ³⁶	278	286	225	233	.560	.565	110	106	Hyd.	Hyd.	1,23
		2000-6200 Rough idle, Street/Strip performance. Strong mid-range. 2500+ stall.										
220325-12S	CL220325-12S ³⁶	278	286	225	233	.560	.565	112	108	Hyd.	Hyd.	1,23
		2000-6200 Fair idle, Street/Strip performance. Strong mid-range. 2500+ stall.										
220525-10S	CL220525-10S ³⁶	280	286	227	233	.597	.597	110	106	Hyd.	Hyd.	1,23
		2200-6400 Rough idle, Hot Street/Strip, excellent mid range performance. 2500+ stall, gears, intake.										
220525-12S	CL220525-12S ³⁶	280	286	227	233	.597	.597	112	108	Hyd.	Hyd.	1,23
		2200-6400 Good idle, good all around performance. Good vacuum. 9.5:1+ CR, 2500+ stall & gears.										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

36 Includes Lifter "Spider" Kit.

Some items are not legal for sale or use on any pollution controlled motor vehicle



FORD SMALL BLOCK • 351W 1969-1996

Retro-Fit Hydraulic Roller Small Base Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91213FB	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95004	NA	94427	94210 ¹⁹ 94310 ¹⁹

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

¹⁹ Fits factory 1-pc eccentric. For 2-pc eccentric use 94212 or 94312.

²⁵ Machining Required.

CAMSHAFTS



FORD SMALL BLOCK • 351W 1969-1996

Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•3•7•2•6•5•4•8

Small Base - for Use With **OE Style** Hydraulic Roller Lifters & Spider

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve IN	Lash EX	Cam Notes	
		IN	EX	IN	EX	IN	EX						
220305-08S	CL220305-08S ³⁶	284	284	231	231	.544	.544	108	104	Hyd.	Hyd.	1	
		<i>2400-6000 Choppy idle, strong low & mid range performance. 2500+ stall.</i>											
220255-08S	CL220255-08S ³⁶	284	288	231	235	.544	.565	108	104	Hyd.	Hyd.	1	
		<i>2400-6000 Rough idle, Street/Strip performance. Great low to mid-range torque & power.</i>											
220255-10S	CL220255-10S ³⁶	284	288	231	235	.544	.565	110	106	Hyd.	Hyd.	1	
		<i>2400-6000 Rough idle, Street/Strip performance. Great low to mid-range torque & power.</i>											
220255-12S	CL220255-12S ³⁶	284	288	231	235	.544	.565	112	108	Hyd.	Hyd.	1	
		<i>2400-6200 Fair idle, performance usage. Great mid-range torque & horsepower.</i>											
222735-10S	CL222735-10S ³⁶	288	294	235	241	.581	.581	110	106	Hyd.	Hyd.	1	
		<i>2400-6400 Lopey idle, Hot Street & Bracket Racing. 10.0:1-up CR advised.</i>											
222735-12S	CL222735-12S ³⁶	288	294	235	241	.581	.581	112	108	Hyd.	Hyd.	1	
		<i>2400-6400 Lopey idle, Hot Street & Bracket Racing. 10.0:1-up CR advised.</i>											
221815-10S	CL221815-10S ³⁶	290	298	237	245	.597	.597	110	106	Hyd.	Hyd.	1	
		<i>2500-6500 Lopey idle, Hot Street/Bracket, good mid range. 9.5-10.5:1 CR, 2800+ stall.</i>											
220275-10S	CL220275-10S ³⁶	294	300	241	247	.581	.603	110	106	Hyd.	Hyd.	1	
		<i>2600-6600 Rough idle, Hot Street & Bracket Racing. 10.5:1-up CR advised.</i>											
220275-12S	CL220275-12S ³⁶	294	300	241	247	.581	.603	112	108	Hyd.	Hyd.	1	
		<i>2600-6600 Rough idle, Hot Street & Bracket Racing. 10.5:1-up CR advised.</i>											
223365-10S	CL223365-10S ³⁶	300	300	247	247	.603	.603	110	106	Hyd.	Hyd.	1	
		<i>2600-6600 Rough idle, Street/Strip, good mid range performance. 3200+ stall, good intake.</i>											
220335-10S	CL220335-10S ³⁶	300	304	247	251	.576	.576	110	106	Hyd.	Hyd.	1	
		<i>2800-6700 Hot Street/Brackets. Requires aftermarket heads, 3500+ stall.</i>											
220335-12S	CL220335-12S ³⁶	300	304	247	251	.576	.576	112	108	Hyd.	Hyd.	1	
		<i>2800-6700 Lopey idle, Hot Street & Bracket Racing. 10.5:1-up CR advised.</i>											
220355-10S	CL220355-10S ³⁶	304	310	251	257	.592	.592	110	106	Hyd.	Hyd.	1	
		<i>3000-7000 Upper mid-range & top end power. Needs 11.0:1+ CR.</i>											
220355-12S	CL220355-12S ³⁶	304	310	251	257	.592	.592	112	108	Hyd.	Hyd.	1	
		<i>3000-7000 Upper mid-range & top end power. Needs 11.0:1+ CR.</i>											
224455-12S	CL224455-12S ³⁶	306	312	253	259	.640	.640	112	108	Hyd.	Hyd.	1	
		<i>3200-7200 Best with big cubic inch. Needs 11.0:1+ CR. good heads.</i>											
229994	NA	Custom Grind Camshaft, Small Base Circle									Hyd.	Hyd.	1
		<i>Retro-Fit Hydraulic Roller Special Order Camshaft.</i>											

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

36 Includes Lifter "Spider" Kit.

Some items are not legal for sale or use on any pollution controlled motor vehicle

CAMSHAFTS



FORD SMALL BLOCK • 351W 1969-1996

Rattler Cams™ Retro-Fit Hydraulic Roller Camshafts for Use With Tie-Bar Style Hydraulic Roller Lifters

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
228005-09	CL228005-09	280	288	227	235	.560	.565	109	103	Hyd.	Hyd.	1
1800-5500 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.												
228045-09	CL228045-09	288	296	235	243	.565	.565	109	103	Hyd.	Hyd.	1
2000-5700 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.												
228085-09	CL228085-09	296	304	243	251	.565	.549	109	103	Hyd.	Hyd.	1
2400-6100 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												



FORD SMALL BLOCK • 351W 1969-1996

BOOST™ Retro-Fit Hydraulic Roller Camshafts for Use With Tie-Bar Style Hydraulic Roller Lifters

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
229165-14	CL229165-14	273	273	221	221	.544	.544	114	110	Hyd.	Hyd.	1
2000-5800 Turbo, Good idle. High Performance Street, stock converter ok, best with 2000+ and gears.												
229135-14	CL229135-14	277	287	225	235	.560	.571	114	110	Hyd.	Hyd.	1
2200-6400 Blower, Good idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.												
229275-16	CL229275-16	287	285	235	233	.580	.576	116	112	Hyd.	Hyd.	1
2600-6800 Turbo, Fair idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												
229225-14	CL229225-14	287	297	235	245	.608	.597	114	110	Hyd.	Hyd.	1
2800-6800 Blower, Fair idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												
229425-14	CL229425-14	307	317	255	265	.640	.640	114	110	Hyd.	Hyd.	1
2400-6200 Blower, Fair idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



FORD SMALL BLOCK • 351W 1969-1996

Rattler Cams™ Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95205 95010	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95205 95010	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95205 95010	NA	94427	94210 ¹⁹ 94310 ¹⁹

FORD SMALL BLOCK • 351W 1969-1996

BOOST™ Retro-Fit Hydraulic Roller Camshafts Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91260 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91260 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

¹⁹ Fits factory 1-pc eccentric. For 2-pc eccentric use 94212 or 94312.

²⁵ Machining Required.

CAMSHAFTS



FORD SMALL BLOCK • 351W 1969-1996

Retro-Fit Hydraulic Roller Camshafts

for Use With **Tie-Bar** Style Hydraulic Roller Lifters

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
220225-12	CL220225-12	260	266	207	213	.480	.496	112	108	Hyd.	Hyd.	1
		<i>800-4200 Great daily usage, smooth idle, great fuel economy.</i>										
220315-10	CL220315-10	262	268	209	215	.496	.501	110	106	Hyd.	Hyd.	1
		<i>1000-4400 Improved throttle response & low end torque.</i>										
220315-12	CL220315-12	262	268	209	215	.496	.501	112	108	Hyd.	Hyd.	1
		<i>1000-4400 Improved throttle response & low end torque.</i>										
220235-10	CL220235-10	266	272	213	219	.517	.517	110	106	Hyd.	Hyd.	1
		<i>1000-4800 Fair idle, good low & mid-range performance increase.</i>										
220235-12	CL220235-12	266	272	213	219	.517	.517	112	108	Hyd.	Hyd.	1
		<i>1000-5000 Good idle, Off-Road & Street Performance. 9.0:1 CR advised.</i>										
222765-13	CL222765-13	270	270	217	217	.496	.496	113	109	Hyd.	Hyd.	1
		<i>1500-5500 Good idle, strong low end & mid-range performance. Needs 2800+ stall.</i>										
221275-08	CL221275-08	270	278	217	225	.528	.533	108	104	Hyd.	Hyd.	1
		<i>1200-5600 Rough idle. Good torque & power. 1800+ stall.</i>										
221275-10	CL221275-10	270	278	217	225	.528	.533	110	106	Hyd.	Hyd.	1
		<i>1200-5600 Fair idle. Good torque & power. 1800+ stall.</i>										
221275-12	CL221275-12	270	278	217	225	.528	.533	112	108	Hyd.	Hyd.	1
		<i>1200-5600 Good idle. Good torque & power. 1800+ stall.</i>										
221275-14	CL221275-14	270	278	217	225	.528	.533	114	110	Hyd.	Hyd.	1
		<i>1200-5600 Good idle. Good torque & power. 1800+ stall.</i>										
222725-10	CL222725-10	272	272	219	219	.544	.544	110	106	Hyd.	Hyd.	1
		<i>1800-5800 Fair idle, strong Street Performance. Requires 9.0+ CR, 5-speed or 2800+ stall.</i>										
221145-10	CL221145-10	272	278	219	225	.544	.533	110	106	Hyd.	Hyd.	1
		<i>2000-6000 Performance Street, best used with aftermarket heads. 2500+ stall, better intake/exhaust.</i>										
221145-12	CL221145-12	272	278	219	225	.544	.533	112	108	Hyd.	Hyd.	1
		<i>2000-6000 Good idle, good mid range power. Good vacuum. 9.5-10.5:1 CR, 2500+ stall.</i>										
222745-12	CL222745-12	278	278	225	225	.533	.533	112	108	Hyd.	Hyd.	1
		<i>2000-6000 Best with 5-speed or 2200-2500 stall.</i>										
220245-10	CL220245-10	278	282	225	229	.533	.512	110	106	Hyd.	Hyd.	1
		<i>2000-6100 Fair idle, Street/Strip. Auto OK with 2500+ stall.</i>										
220245-12	CL220245-12	278	282	225	229	.533	.512	112	108	Hyd.	Hyd.	1
		<i>2000-6100 Fair idle, Street & mild Performance usage. Crisp throttle.</i>										
222755-08	CL222755-08	278	284	225	231	.533	.544	108	104	Hyd.	Hyd.	1
		<i>2000-6200 Lopey idle, Street & Mild Performance usage. Crisp throttle.</i>										
222755-12	CL222755-12	278	284	225	231	.533	.544	112	108	Hyd.	Hyd.	1
		<i>2000-6200 Fair idle, Street & Mild Performance usage. Crisp throttle.</i>										
220325-08	CL220325-08	278	286	225	233	.560	.565	108	104	Hyd.	Hyd.	1
		<i>1800-6200 Choppy idle, Street performance usage. 2500+ stall.</i>										
220325-10	CL220325-10	278	286	225	233	.560	.565	110	106	Hyd.	Hyd.	1
		<i>2000-6200 Rough idle, Street/Strip performance. Strong mid-range. 2500+ stall.</i>										
220325-12	CL220325-12	278	286	225	233	.560	.565	112	108	Hyd.	Hyd.	1
		<i>2000-6200 Fair idle, Street/Strip performance. Strong mid-range. 2500+ stall.</i>										
220525-10	CL220525-10	280	286	227	233	.597	.597	110	106	Hyd.	Hyd.	1
		<i>2200-6400 Rough idle, Hot Street/Strip, excellent mid range performance. 2500+ stall, gears, intake.</i>										
220525-12	CL220525-12	280	286	227	233	.597	.597	112	108	Hyd.	Hyd.	1
		<i>2200-6400 Good idle, good all around performance. Good vacuum. 9.5:1+ CR, 2500+ stall & gears.</i>										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

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IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



FORD SMALL BLOCK • 351W 1969-1996

Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91260 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91260 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

¹⁹ Fits factory 1-pc eccentric. For 2-pc eccentric use 94212 or 94312.

²⁵ Machining Required.

CAMSHAFTS



FORD SMALL BLOCK • 351W 1969-1996

Retro-Fit Hydraulic Roller Camshafts

for Use With **Tie-Bar** Style Hydraulic Roller Lifters

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve IN	Lash EX	Cam Notes	
		IN	EX	IN	EX	IN	EX						
220305-08	CL220305-08	284	284	231	231	.544	.544	108	104	Hyd.	Hyd.	1	
		<i>2400-6000 Choppy idle, strong low & mid range performance. 2500+ stall.</i>											
220255-08	CL220255-08	284	288	231	235	.544	.565	108	104	Hyd.	Hyd.	1	
		<i>2200-6000 Rough idle, Street/Strip performance. Great low to mid-range torque & power.</i>											
220255-10	CL220255-10	284	288	231	235	.544	.565	110	106	Hyd.	Hyd.	1	
		<i>2200-6000 Rough idle, Street/Strip performance. Great low to mid-range torque & power.</i>											
220255-12	CL220255-12	284	288	231	235	.544	.565	112	108	Hyd.	Hyd.	1	
		<i>2200-6200 Fair idle, performance usage. Great mid-range torque & horsepower.</i>											
222735-10	CL222735-10	288	294	235	241	.581	.581	110	106	Hyd.	Hyd.	1	
		<i>2400-6400 Lopey idle, Hot Street & Bracket Racing. 10.0:1-up CR advised.</i>											
222735-12	CL222735-12	288	294	235	241	.581	.581	112	108	Hyd.	Hyd.	1	
		<i>2400-6400 Lopey idle, Hot Street & Bracket Racing. 10.0:1-up CR advised.</i>											
221815-10	CL221815-10	290	298	237	245	.597	.597	110	106	Hyd.	Hyd.	1	
		<i>2500-6500 Lopey idle, Hot Street/Bracket, good mid range. 9.5-10.5:1 CR, 2800+ stall.</i>											
220275-10	CL220275-10	294	300	241	247	.581	.603	110	106	Hyd.	Hyd.	1	
		<i>2600-6600 Rough idle, Hot Street & Bracket Racing. 10.5:1-up CR advised.</i>											
220275-12	CL220275-12	294	300	241	247	.581	.603	112	108	Hyd.	Hyd.	1	
		<i>2600-6600 Rough idle, Hot Street & Bracket Racing. 10.5:1-up CR advised.</i>											
223365-10	CL223365-10	300	300	247	247	.603	.603	110	106	Hyd.	Hyd.	1	
		<i>2600-6600 Rough idle, Street/Strip, good mid range performance. 3200+ stall, good intake.</i>											
220335-10	CL220335-10	300	304	247	251	.576	.576	110	106	Hyd.	Hyd.	1	
		<i>2800-6700 Hot Street/Brackets. Requires aftermarket heads, 3500+ stall.</i>											
220335-12	CL220335-12	300	304	247	251	.576	.576	112	108	Hyd.	Hyd.	1	
		<i>2800-6700 Lopey idle, Hot Street & Bracket Racing. 10.5:1-up CR advised.</i>											
220355-10	CL220355-10	304	310	251	257	.592	.592	110	106	Hyd.	Hyd.	1	
		<i>3000-7000 Upper mid-range & top end power. Needs 11.0:1+ CR.</i>											
220355-12	CL220355-12	304	310	251	257	.592	.592	112	108	Hyd.	Hyd.	1	
		<i>3000-7000 Upper mid-range & top end power. Needs 11.0:1+ CR.</i>											
224455-12	CL224455-12	306	312	253	259	.640	.640	112	108	Hyd.	Hyd.	1	
		<i>3200-7200 Best with big cubic inch. Needs 11.0:1+ CR. good heads.</i>											
229995	NA	Custom Grind Camshaft									Hyd.	Hyd.	1
		<i>Retro-Fit Hydraulic Roller Special Order Camshaft.</i>											

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



FORD SMALL BLOCK • 351W 1969-1996

Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 ³ 91260	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91260 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91260 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91260 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91260 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91260 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91260 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91260 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91260 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91260 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91260 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91260 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95003	NA	94427	94210 ¹⁹ 94310 ¹⁹
91168 91260	NA	--	--	--	--	--	--	--	--	--	NA	94427	94210 ¹⁹ 94310 ¹⁹

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

¹⁹ Fits factory 1-pc eccentric. For 2-pc eccentric use 94212 or 94312.

²⁵ Machining Required.

CAMSHAFTS



FORD SMALL BLOCK • 351W 1985-1996

Rattler Cams™ Hydraulic Roller Camshafts for OE Roller Applications

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
228005-09	CL228005-09E ¹⁷ CL228005-09 ¹⁸	280	288	227	235	.560	.565	109	103	Hyd.	Hyd.	1,17,18
		1800-5500 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.										
228045-09	CL228045-09E ¹⁷ CL228045-09 ¹⁸	288	296	235	243	.565	.565	109	103	Hyd.	Hyd.	1,17,18
		2000-5700 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.										
228085-09	CL228085-09E ¹⁷ CL228085-09 ¹⁸	296	304	243	251	.565	.549	109	103	Hyd.	Hyd.	1,17,18
		2400-6100 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.										



FORD SMALL BLOCK • 351W 1985-1996

BOOST™ Hydraulic Roller Camshafts for OE Roller Applications

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
229165-14	CL229165-14E ¹⁷ CL229165-14 ¹⁸	273	273	221	221	.544	.544	114	110	Hyd.	Hyd.	1,17,18
		2000-5800 Turbo, Good idle. High Performance Street, stock converter ok, best with 2000+ and gears.										
229135-14	CL229135-14E ¹⁷ CL229135-14 ¹⁸	277	287	225	235	.560	.571	114	110	Hyd.	Hyd.	1,17,18
		2200-6400 Blower, Good idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.										
229275-16	CL229275-16E ¹⁷ CL229275-16 ¹⁸	287	285	235	233	.580	.576	116	112	Hyd.	Hyd.	1,17,18
		2600-6800 Turbo, Fair idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.										
229225-14	CL229225-14E ¹⁷ CL229225-14 ¹⁸	287	297	235	245	.608	.597	114	110	Hyd.	Hyd.	1,17,18
		2800-6800 Blower, Fair idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.										
229425-14	CL229425-14E ¹⁷ CL229425-14 ¹⁸	307	317	255	265	.640	.640	114	110	Hyd.	Hyd.	1,17,18
		2400-6200 Blower, Fair idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.										

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 17 Cam & Lifter Sets with "E" suffix feature OE style (91213) lifters.
- 18 Cam & Lifter Sets without suffix feature tie bar lifters.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



FORD SMALL BLOCK • 351W 1985-1996

Rattler Cams™ Hydraulic Roller Camshafts for OE Roller Applications Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95203 95008	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95203 95008	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95203 95008	NA	94427	94210 ¹⁹ 94310 ¹⁹

FORD SMALL BLOCK • 351W 1985-1996

BOOST™ Hydraulic Roller Camshafts for OE Roller Applications

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91260 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91260 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

¹⁹ Fits factory 1-pc eccentric. For 2-pc eccentric use 94212 or 94312.

²⁵ Machining Required.

³³ Tie bar style lifters.

CAMSHAFTS



FORD SMALL BLOCK • 351W 1985-1996

Hydraulic Roller Camshafts for OE Roller Applications

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
220225-12	CL220225-12E ¹⁷ CL220225-12 ¹⁸	260	266	207	213	.480	.496	112	108	Hyd.	Hyd.	1,17,18
		800-4200		<i>Great daily usage, smooth idle, great fuel economy.</i>								
220315-10	CL220315-10E ¹⁷ CL220315-10 ¹⁸	262	268	209	215	.496	.501	110	106	Hyd.	Hyd.	1,17,18
		1000-4400		<i>Improved throttle response & low end torque.</i>								
220315-12	CL220315-12E ¹⁷ CL220315-12 ¹⁸	262	268	209	215	.496	.501	112	108	Hyd.	Hyd.	1,17,18
		1000-4400		<i>Improved throttle response & low end torque.</i>								
220235-10	CL220235-10E ¹⁷ CL220235-10 ¹⁸	266	272	213	219	.517	.517	110	106	Hyd.	Hyd.	1,17,18
		1200-4800		<i>Fair idle, good low & mid-range performance increase.</i>								
220235-12	CL220235-12E ¹⁷ CL220235-12 ¹⁸	266	272	213	219	.517	.517	112	108	Hyd.	Hyd.	1,17,18
		1200-5000		<i>Good idle, Off-Road & Street Performance. 9.0:1 CR advised.</i>								
222765-13	CL222765-13E ¹⁷ CL222765-13 ¹⁸	270	270	217	217	.496	.496	113	109	Hyd.	Hyd.	1,17,18
		1500-5500		<i>Good idle, strong low end & mid-range performance. Needs 2800+ stall.</i>								
221275-08	CL221275-08E ¹⁷ CL221275-08 ¹⁸	270	278	217	225	.528	.533	108	104	Hyd.	Hyd.	1,17,18
		1600-5600		<i>Loppy to fair idle. Good torque & power. 1800+ stall.</i>								
221275-10	CL221275-10E ¹⁷ CL221275-10 ¹⁸	270	278	217	225	.528	.533	110	106	Hyd.	Hyd.	1,17,18
		1600-5600		<i>Fair idle. Good torque & power. 1800+ stall.</i>								
221275-12	CL221275-12E ¹⁷ CL221275-12 ¹⁸	270	278	217	225	.528	.533	112	108	Hyd.	Hyd.	1,17,18
		1600-5600		<i>Good idle. Good torque & power. 1800+ stall.</i>								
221275-14	CL221275-14E ¹⁷ CL221275-14 ¹⁸	270	278	217	225	.528	.533	114	110	Hyd.	Hyd.	1,17,18
		1600-5600		<i>Fair idle. Good torque & power. 1800+ stall.</i>								
222725-10	CL222725-10E ¹⁷ CL222725-10 ¹⁸	272	272	219	219	.544	.544	110	106	Hyd.	Hyd.	1,17,18
		1800-5800		<i>Fair idle, strong Street Performance. Requires 9.0+ CR, 5-speed or 2800+ stall.</i>								
221145-10	CL221145-10E ¹⁷ CL221145-10 ¹⁸	272	278	219	225	.544	.533	110	106	Hyd.	Hyd.	1,17,18
		1800-6000		<i>Performance Street, best used with aftermarket heads. 2500+ stall, better intake/exhaust.</i>								
221145-12	CL221145-12E ¹⁷ CL221145-12 ¹⁸	272	278	219	225	.544	.533	112	108	Hyd.	Hyd.	1,17,18
		1800-6000		<i>Good idle, good mid range power. Good vacuum. 9.5-10.5:1 CR, 2500+ stall.</i>								
222745-12	CL222745-12E ¹⁷ CL222745-12 ¹⁸	278	278	225	225	.533	.533	112	108	Hyd.	Hyd.	1,17,18
		2000-6000		<i>Best with 5-speed or 2200-2500 stall.</i>								
220245-10	CL220245-10E ¹⁷ CL220245-10 ¹⁸	278	282	225	229	.533	.512	110	106	Hyd.	Hyd.	1,17,18
		2000-6100		<i>Fair idle, Street/Strip. Auto OK with 2500+ stall.</i>								
220245-12	CL220245-12E ¹⁷ CL220245-12 ¹⁸	278	282	225	229	.533	.512	112	108	Hyd.	Hyd.	1,17,18
		2000-6100		<i>Fair idle, Street & mild Performance usage. Crisp throttle.</i>								
222755-08	CL222755-08E ¹⁷ CL222755-08 ¹⁸	278	284	225	231	.533	.544	108	104	Hyd.	Hyd.	1,17,18
		2000-6200		<i>Fair idle, Street & Mild Performance usage. Crisp throttle.</i>								
222755-12	CL222755-12E ¹⁷ CL222755-12 ¹⁸	278	284	225	231	.533	.544	112	108	Hyd.	Hyd.	1,17,18
		2000-6200		<i>Fair idle, Street & Mild Performance usage. Crisp throttle.</i>								
220325-08	CL220325-08E ¹⁷ CL220325-08 ¹⁸	278	286	225	233	.560	.565	108	104	Hyd.	Hyd.	1,17,18
		1800-6200		<i>Choppy idle, Street performance usage. 2500+ stall.</i>								
220325-10	CL220325-10E ¹⁷ CL220325-10 ¹⁸	278	286	225	233	.560	.565	110	106	Hyd.	Hyd.	1,17,18
		2000-6200		<i>Rough idle, Street/Strip performance. Strong mid-range. 2500+ stall.</i>								
220325-12	CL220325-12E ¹⁷ CL220325-12 ¹⁸	278	286	225	233	.560	.565	112	108	Hyd.	Hyd.	1,17,18
		2000-6200		<i>Fair idle, Street/Strip performance. Strong mid-range. 2500+ stall.</i>								
220525-10	CL220525-10E ¹⁷ CL220525-10 ¹⁸	280	286	227	233	.597	.597	110	106	Hyd.	Hyd.	1,17,18
		2200-6400		<i>Rough idle, Hot Street/Strip, excellent mid range performance. 2500+ stall, gears, intake.</i>								
220525-12	CL220525-12E ¹⁷ CL220525-12 ¹⁸	280	286	227	233	.597	.597	112	108	Hyd.	Hyd.	1,17,18
		2200-6400		<i>Good idle, good all around performance. Good vacuum. 9.5:1+ CR, 2500+ stall & gears.</i>								
220305-08	CL220305-08E ¹⁷ CL220305-08 ¹⁸	284	284	231	231	.544	.544	108	104	Hyd.	Hyd.	1,17,18
		2400-6000		<i>Choppy idle, strong low & mid range performance. 2500+ stall.</i>								

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

17 Cam & Lifter Sets with "E" suffix feature OE style (91213) lifters.

18 Cam & Lifter Sets without suffix feature tie bar lifters.

Some items are not legal for sale or use on any pollution controlled motor vehicle



FORD SMALL BLOCK • 351W 1985-1996

Hydraulic Roller Camshafts for OE Roller Applications Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

¹⁹ Fits factory 1-pc eccentric. For 2-pc eccentric use 94212 or 94312.

²⁵ Machining Required.

³³ Tie bar style lifters.

CAMSHAFTS



FORD SMALL BLOCK • 351W 1985-1996

Hydraulic Roller Camshafts for OE Roller Applications (cont.) Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
220255-08	CL220255-08E ¹⁷ CL220255-08 ¹⁸	284	288	231	235	.544	.565	108	104	Hyd.	Hyd.	1,17,18
		<i>2200-6000 Rough idle, Street/Strip performance. Great low to mid-range torque & power.</i>										
220255-10	CL220255-10E ¹⁷ CL220255-10 ¹⁸	284	288	231	235	.544	.565	110	106	Hyd.	Hyd.	1,17,18
		<i>2200-6000 Rough idle, Street/Strip performance. Great low to mid-range torque & power.</i>										
220255-12	CL220255-12E ¹⁷ CL220255-12 ¹⁸	284	288	231	235	.544	.565	112	108	Hyd.	Hyd.	1,17,18
		<i>2200-6200 Fair idle, performance usage. Great mid-range torque & horsepower.</i>										
222735-10	CL222735-10E ¹⁷ CL222735-10 ¹⁸	288	294	235	241	.581	.581	110	106	Hyd.	Hyd.	1,17,18
		<i>2400-6400 Lopey idle, Hot Street & Bracket Racing. 10.0:1-up CR advised.</i>										
222735-12	CL222735-12E ¹⁷ CL222735-12 ¹⁸	288	294	235	241	.581	.581	112	108	Hyd.	Hyd.	1,17,18
		<i>2400-6400 Lopey idle, Hot Street & Bracket Racing. 10.0:1-up CR advised.</i>										
221815-10	CL221815-10E ¹⁷ CL221815-10 ¹⁸	290	298	237	245	.597	.597	110	106	Hyd.	Hyd.	1,17,18
		<i>2500-6500 Lopey idle, Hot Street/Bracket, good mid range. 9.5-10.5:1 CR, 2800+ stall.</i>										
220275-10	CL220275-10E ¹⁷ CL220275-10 ¹⁸	294	300	241	247	.581	.603	110	106	Hyd.	Hyd.	1,17,18
		<i>2600-6600 Rough idle, Hot Street & Bracket Racing. 10.5:1-up CR advised.</i>										
220275-12	CL220275-12E ¹⁷ CL220275-12 ¹⁸	294	300	241	247	.581	.603	112	108	Hyd.	Hyd.	1,17,18
		<i>2600-6600 Rough idle, Hot Street & Bracket Racing. 10.5:1-up CR advised.</i>										
223365-10	CL223365-10E ¹⁷ CL223365-10 ¹⁸	300	300	247	247	.603	.603	110	106	Hyd.	Hyd.	1,17,18
		<i>2600-6600 Rough idle, Street/Strip, good mid range performance. 3200+ stall, good intake.</i>										
220335-10	CL220335-10E ¹⁷ CL220335-10 ¹⁸	300	304	247	251	.576	.576	110	106	Hyd.	Hyd.	1,17,18
		<i>2800-6700 Hot Street/Brackets. Requires aftermarket heads, 3500+ stall.</i>										
220335-12	CL220335-12E ¹⁷ CL220335-12 ¹⁸	300	304	247	251	.576	.576	112	108	Hyd.	Hyd.	1,17,18
		<i>2800-6800 Lopey idle, Hot Street & Bracket Racing. 10.5:1-up CR advised.</i>										
220355-10	CL220355-10E ¹⁷ CL220355-10 ¹⁸	304	310	251	257	.592	.592	110	106	Hyd.	Hyd.	1,17,18
		<i>3200-7000 Upper mid-range & top end power. Needs 11.0:1+ CR.</i>										
220355-12	CL220355-12E ¹⁷ CL220355-12 ¹⁸	304	310	251	257	.592	.592	112	108	Hyd.	Hyd.	1,17,18
		<i>3200-7000 Upper mid-range & top end power. Needs 11.0:1+ CR.</i>										
224455-12	CL224455-12E ¹⁷ CL224455-12 ¹⁸	306	312	253	259	.640	.640	112	108	Hyd.	Hyd.	1,17,18
		<i>3400-7200 Best with big cubic inch. Needs 11.0:1+ CR. good heads.</i>										
229995	NA	Custom Grind Camshaft								Hyd.	Hyd.	1
		<i>Retro-Fit Hydraulic Roller Special Order Camshaft.</i>										

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 17 Cam & Lifter Sets with "E" suffix feature OE style (91213) lifters.
- 18 Cam & Lifter Sets without suffix feature tie bar lifters.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



FORD SMALL BLOCK • 351W 1985-1996

Hydraulic Roller Camshafts for OE Roller Applications Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
91213 ³ 91168 ^{3,33}	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95302-16	NA	94427	94210 ¹⁹ 94310 ¹⁹
--	NA	--	--	--	--	--	--	--	--	--	NA	94427	94210 ¹⁹ 94310 ¹⁹

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

¹⁹ Fits factory 1-pc eccentric. For 2-pc eccentric use 94212 or 94312.

²⁵ Machining Required.

³³ Tie bar style lifters.

CAMSHAFTS



FORD SMALL BLOCK • 351W 1969-1996

Mechanical Flat Tappet Camshafts

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
222342-10	CL222342-10 CL222342-10DL ⁴	265	265	230	230	.512	.512	110	106	.022	.022	1
		2200-5800 Good Street cam, broad power range. 2200+ stall recommended.										
220542-08	CL220542-08 CL220542-08DL ⁴	258	264	230	236	.561	.574	108	104	.018	.018	1,16,34
		2000-5600 Fair idle, good low to mid range performance. 9.5:1+ CR, 2500+ stall.										
221332-08	CL221332-08 CL221332-08DL ⁴	264	268	236	240	.574	.590	108	104	.018	.018	1,16,34
		2400-6000 Street/Strip, high torque with mid range & top end power. 2500+ stall.										
220102-06	CL220102-06 CL220102-06DL ⁴	275	281	240	246	.539	.555	106	102	.022	.022	1
		2600-6200 Hot Street/Brackets. Lopey idle. Needs higher CR & gears.										
220102-08	CL220102-08 CL220102-08DL ⁴	275	281	240	246	.539	.555	108	104	.022	.022	1
		2600-6200 Hot Street/Bracket. Needs 10.0+ CR, 3200+ stall & gears.										
220102-12	CL220102-12 CL220102-12DL ⁴	275	281	240	246	.539	.555	112	108	.022	.022	1
		2500-6300 Fair idle, Bracket E.T., good mid range torque & power. 11.0:1+ CR, 3500+ stall.										
221002-08	CL221002-08 CL221002-08DL ⁴	279	279	244	244	.544	.544	108	104	.022	.022	1
		2600-6400 Rough idle, super mid-range performance. Needs 11.0:1 CR-up.										
221362-06	CL221362-06 CL221362-06DL ⁴	272	280	244	252	.501	.501	106	102	.016	.016	1,34
		2800-6800 Oval Track, .500" Lift Rule, Best on tight short tracks. Low vacuum.										
222352-06	CL222352-06 CL222352-06DL ⁴	281	287	246	252	.549	.565	106	102	.022	.022	1
		2800-6800 Fair idle, Street/Strip in light car. 10.0:1 CR, 4.10 or lower gears.										
221052-08	CL221052-08 CL221052-08DL ⁴	283	283	248	248	.544	.544	108	104	.022	.022	1
		3000-7000 Street/Strip, powerful through entire rpm range.										
220642-06	CL220642-06 CL220642-06DL ⁴	278	284	250	256	.501	.501	106	102	.016	.016	1,16,34
		3200-7200 Oval Track, .500" Lift Rule, 1/4 to 3/8 mile.										
220642-08	CL220642-08 CL220642-08DL ⁴	278	284	250	256	.501	.501	108	104	.016	.016	1,16,34
		3200-7200 Oval Track, .500" Lift Rule, 1/4-3/8 mile 4bbl. Good mid range torque. 11.0-12.5:1 CR.										
222372-08	CL222372-08 CL222372-08DL ⁴	285	291	250	256	.560	.571	108	104	.022	.022	1
		3400-7400 Rough idle, needs good induction system. Good Oval Track cam.										
222372-10	CL222372-10 CL222372-10DL ⁴	285	291	250	256	.560	.571	110	106	.022	.022	1
		3600-7600 Rough idle, excellent mid-range. Needs 11.0:1+ CR, 2500+ stall & good heads.										
222362-08	CL222362-08 CL222362-08DL ⁴	289	295	254	260	.587	.592	108	104	.022	.022	1
		3600-7400 Rough idle, Bracket cam. Best with 11.0:1+ CR & 4000+ stall.										
221792-06	CL221792-06 CL221792-06DL ⁴	284	292	256	264	.501	.501	106	102	.016	.016	1,34
		3800-7600 Oval Track, .500" Lift Rule, fast banked 1/4 to 3/8 mile.										
222532-06	CL222532-06 CL222532-06DL ⁴	295	299	260	264	.592	.592	106	102	.022	.022	1
		4000-7800 Bracket Race or 3/8 to 1/2 mile Oval Track with fast corners.										
222322-08	CL222322-08 CL222322-08DL ⁴	295	303	260	268	.592	.587	108	104	.022	.022	1
		4000-8000 Rough idle, Bracket favorite. Needs 11.0:1 CR & 4000+ stall.										
222332-10	CL222332-10 CL222332-10DL ⁴	303	313	268	278	.587	.612	110	106	.022	.022	1
		4400-8200 Bracket Racer special. Super strong mid-range & top end. Great in big cubic inch.										
229992	NA	Custom Grind Camshaft										1
		Mechanical Flat Tappet Special Order Camshaft.										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

4 Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.

16 Lobes designed to take maximum advantage of .875" dia. lifter.

34 Provisions for increased oiling recommended.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



FORD SMALL BLOCK • 351W 1985-1996

Mechanical Flat Tappet Camshafts Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91215 ³ 91218 ⁴	NA	98436-K11	98436	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	98437-K12	98437	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	98437-K12	98437	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	98437-K12	98437	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	98437-K12	98437	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	98437-K12	98437	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	98437-K12	98437	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	98437-K12	98437	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	98437-K12	98437	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	98437-K12	98437	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	98437-K12	98437	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	98437-K12	98437	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	98445-K12	98445	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	98437-K12	98437	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	98445-K12	98445	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	98445-K12	98445	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	98445-K12	98445	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95015	NA	94427	94210 ¹⁹ 94310 ¹⁹
91215 ³ 91218 ⁴	NA	--	--	--	--	--	--	--	--	--	NA	94427	94210 ¹⁹ 94310 ¹⁹

Components Notes: master note list on page 260

- ³ Included in Cam & Lifter Sets.
- ⁴ Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.
- ⁷ Requires 7/16" rocker studs.
- ¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

- ¹⁹ Fits factory 1-pc eccentric. For 2-pc eccentric use 94212 or 94312.
- ²⁵ Machining Required.

CAMSHAFTS



FORD SMALL BLOCK • 351W 1969-1996

Big Bottle Cams™ - Nitrous Oxide Mechanical Roller Cams Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
221133-12	NA	287	299	255	267	.640	.640	112	108	.022	.022	1,5
		3000-6800 Fair idle, Performance/Strip with plate system. Great mid range. 11.5:1+ CR, 3500+ stall.										
220373-12	NA	295	305	263	273	.672	.688	112	108	.022	.022	1,5
		3800-7200 Rough idle, Street/Bracket with manifold system. Good upper rpm. 11.5:1+ CR, 4000+.										
220673-12	NA	299	309	267	277	.688	.693	112	108	.022	.022	1,5
		4200-8000 Competition with large plate system. Good mid to upper range. 12.0:1+ CR.										
220793-12	NA	305	319	273	287	.725	.693	112	108	.022	.022	1,5
		4400-8400 Best with larger cubic inch, large plate or plumbed system. 12.0:1+ CR, 4500+ stall.										
220793-14	NA	305	319	273	287	.725	.693	114	110	.022	.022	1,5
		4400-8400 Large stroker with multi stage system. 12.0:1+ CR, 4500+ stall.										
220393-14	NA	309	323	277	291	.720	.720	114	110	.022	.022	1,5
		4600-8600 Great with big stroke combinations. Large multi stage system. 12.5:1+ CR.										
221073-14	NA	313	327	281	295	.779	.763	114	110	.022	.022	1,5
		4600-8600 Big stroker, big heads, big multi stage system.										
221093-12	NA	313	331	281	299	.779	.763	112	108	.022	.022	1,5
		5000-8400 Large cubic inch, all out Competition. Best of everything. Works good w/NOS.										
229993	NA	Custom Grind Camshaft										1,5
		Mechanical Roller Special Order Camshaft.										

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 5 Requires upgraded distributor gear.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.

FORD SMALL BLOCK • 351W 1985-1996

Steel Billet Mechanical Roller Camshafts Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91217 91234	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91217 91234	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91288 91240	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91288 91240	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91288 91240	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91288 91240	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91288 91240	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
--	NA	--	--	--	--	--	--	--	--	--	NA	94425 94427	94310 ¹⁹

Components Notes: master note list on page 260

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

¹⁹ Fits factory 1-pc eccentric. For 2-pc eccentric use 94212 or 94312.

²⁵ Machining Required.

CAMSHAFTS



FORD SMALL BLOCK - 351W 1969-1996

Steel Billet Mechanical Roller Camshafts

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
221213-08	NA	261	269	229	237	.592	.592	108	104	.022	.022	1,5
		2000-6000	Noticeable idle, Street Rod Cruiser. Should have 9.0:1 CR, 2000+ stall.									
221213-10	NA	261	269	229	237	.592	.592	110	106	.022	.022	1,5
		2000-6000	Noticeable idle, good for Weekend Street Cruiser. Should have 9.0:1 CR, 2000+ stall.									
221203-08	NA	269	269	237	237	.592	.592	108	104	.022	.022	1,5
		2200-6400	Rough idle, Street/mild Strip. Good lower mid range. 9.5:1 CR, 2500+ stall.									
221203-10	NA	269	269	237	237	.592	.592	110	106	.022	.022	1,5
		2200-6400	Rough idle, Street Performance/mild Strip. Recommend 9.5:1 CR, 2500+ stall.									
220183-08	NA	269	275	237	243	.592	.592	108	104	.022	.022	1,5
		2200-6200	Mild rough idle, Weekend Cruiser/mild Strip. 2500+ stall recommended.									
220183-10	NA	269	275	237	243	.592	.592	110	106	.022	.022	1,5
		2200-6200	Mild rough idle, Weekend Cruiser/Power Tour favorite. 2500+ stall recommended.									
220173-06	NA	275	281	243	249	.592	.600	106	102	.022	.022	1,5
		2400-6500	Lopey idle, Strong low to mid range torque. 10.0:1+ CR, 2500+ stall.									
220173-08	NA	275	281	243	249	.592	.600	108	104	.022	.022	1,5
		2400-6400	Rough idle, Strong low to mid range power band. 10.0:1+ CR, 2500+ stall.									
221313-10	NA	277	277	245	245	.624	.624	110	106	.022	.022	1,5
		2600-6200	Nice idle. Strong low & mid-range.									
221113-08	NA	277	285	245	253	.624	.624	108	104	.022	.022	1,5
		2600-6500	Lopey idle. Strong mid-range. 10.0:1+ CR.									
221013-06	NA	285	291	253	259	.624	.624	106	102	.022	.022	1,5
		2800-6600	Heavy Bracket or 1/4-3/8 mile Oval Track, Good mid range torque. 11.0-12.5:1 CR.									
221013-08	NA	285	291	253	259	.624	.624	108	104	.022	.022	1,5
		2800-6600	Lopey idle. Strong mid-range with top end increase.									
220593-06	NA	285	291	253	259	.683	.683	106	102	.022	.022	1,5
		2800-6600	Good mid-range horsepower, rough idle. Needs 11.0:1 CR-up.									
221133-06	NA	287	299	255	267	.640	.640	106	102	.022	.022	1,5
		2900-6800	Strong mid & upper rpm, banked Oval Track & Brackets w/auto trans.									
221133-08	NA	287	299	255	267	.640	.640	108	104	.022	.022	1,5
		2900-6800	Mid to upper range horsepower & torque. 11.0:1+ Good heads.									
222313-06	NA	291	295	259	263	.624	.656	106	102	.022	.022	1,5
		3400-7200	Oval Track 1/4-3/8 mile. Good mid to upper torque & power. 2bbl. or 4bbl. carb.									
222313-08	NA	291	295	259	263	.624	.656	108	104	.022	.022	1,5
		3400-7200	Rough idle, Bracket E.T., good mid range. 11.5:1+ CR, 3500+ stall.									
222123-06	NA	291	299	259	267	.683	.672	106	102	.022	.022	1,5
		3400-7400	Oval Track 3/8-1/2 mile. Good mid to upper torque & power. Best with 4bbl. carb.									
222123-08	NA	291	299	259	267	.683	.672	108	104	.022	.022	1,5
		3400-7400	Bracket/Pro/Super Pro, good mid to upper range power. 12.0:1+, 3800+ stall.									
221173-06	NA	295	299	263	267	.683	.672	106	102	.022	.022	1,5
		3800-7600	Strong mid & upper range horsepower. 11.0:1+ Good heads.									
221613-06	NA	299	303	267	271	.672	.667	106	102	.022	.022	1,5
		4200-7800	Competition use, good mid & upper HP, needs good heads & compression.									
221613-08	NA	299	303	267	271	.672	.667	108	104	.022	.022	1,5
		4200-7800	Long Oval Track or Bracket E.T. Drag, good upper rpm horsepower. 12.5:1 CR.									
221223-08	NA	301	305	269	273	.720	.688	108	104	.022	.022	1,5
		4200-8000	Competition use, good mid & upper power.									
221223-10	NA	301	305	269	273	.720	.688	110	106	.022	.022	1,5
		4200-8000	Bracket/Competition, good upper end torque & power. 12.0:1+ CR, race converter.									

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 5 Requires upgraded distributor gear.

Some items are not legal for sale or use on any pollution controlled motor vehicle



FORD SMALL BLOCK - 351W 1985-1996

Steel Billet Mechanical Roller Camshafts Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91250 91217 ³²	NA	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91250 91217 ³²	NA	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91250 91217 ³²	NA	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91250 91217 ³²	NA	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91250 91217 ³²	NA	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91250 91217 ³²	NA	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91250 91217 ³²	NA	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91217 91234	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91217 91234	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91217 91234	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91217 91234	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91217 91234	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91217 91234	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91217 91234	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹

Components Notes: master note list on page 260

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

¹⁹ Fits factory 1-pc eccentric. For 2-pc eccentric use 94212 or 94312.

²⁵ Machining Required.

³² These lifters are not recommended for street use.

CAMSHAFTS



FORD SMALL BLOCK - 351W 1969-1996

Steel Billet Mechanical Roller Camshafts (cont.)

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
221123-08	NA	299	307	267	275	.672	.661	108	104	.022	.022	1,5
		4200-8000 Strong upper horsepower. 11.5:1+ Good heads & induction, 4500+ stall.										
221813-06	NA	301	309	269	277	.693	.661	106	102	.022	.022	1,5
		4400-8400 Rough idle, Competition, Great upper rpm torque. 12.0:1+ CR, 4500+ stall.										
221813-08	NA	301	309	269	277	.693	.661	108	104	.022	.022	1,5
		4400-8600 Competition, good upper rpm torque & horsepower. 12.0:1+ CR & race converter.										
221863-06	NA	301	309	269	277	.720	.693	106	102	.022	.022	1,5
		4400-8400 Competition, good upper mid to top end torque. 12.0:1+ CR & race converter.										
221863-08	NA	301	309	269	277	.720	.693	108	104	.022	.022	1,5
		4400-8600 Super Pro/Bracket, good upper rpm torque & horsepower. 12.0:1+ CR & race converter.										
221863-10	NA	301	309	269	277	.720	.693	110	106	.022	.022	1,5
		4500-8800 Good mid range power with top end pull. 12.0:1+ CR & race converter.										
221083-08	NA	307	315	275	283	.688	.672	108	104	.022	.022	1,5
		4800-8600 Strong upper horsepower. 11.5:1+ Good heads.										
221083-10	NA	307	315	275	283	.688	.672	110	106	.022	.022	1,5
		4800-8600 Competition profile, good top end power. Needs good parts.										
221093-12	NA	313	331	281	299	.779	.763	112	108	.022	.022	1,5
		5000-8400 Large cubic inch, all out Competition. Best of everything. Works good w/NOS.										
229993	NA	Custom Grind Camshaft										1,5
		Mechanical Roller Special Order Camshaft.										



FORD SMALL BLOCK CLEVER - 351W WITH CLEVELAND HEADS 1969-1996

Steel Billet Mechanical Roller Camshafts

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.73 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
223133-08	NA	289	299	257	267	.692	.692	108	104	.022	.022	1,5
		3000-7200 Rough idle, good mid range to upper rpm. 10.0:1+ CR, 3500+ stall.										
223403-10	NA	295	303	263	271	.727	.721	110	106	.022	.022	1,5
		3600-7400 Rough idle, good upper rpm. 11.5:1+ CR, 4000+ stall.										
223123-08	NA	299	307	267	275	.727	.715	108	104	.022	.022	1,5
		3800-7600 Rough idle, good mid range to upper rpm. 11.0:1+ CR, 4500+ stall.										
223283-10	NA	307	315	275	283	.744	.727	110	106	.022	.022	1,5
		4200-8000 Rough idle, strong upper mid range to top end power. 12.5:1+ CR, good exhaust.										
223283-12	NA	307	315	275	283	.744	.727	112	108	.022	.022	1,5
		4200-8000 Rough idle, best in large cubic inch, great top end. 12.0:1+ CR, good exhaust.										
229993	NA	Custom Grind Camshaft										1,5
		Mechanical Roller Special Order Camshaft.										

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 5 Requires upgraded distributor gear.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



FORD SMALL BLOCK - 351W 1985-1996

Steel Billet Mechanical Roller Camshafts Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91217 91234	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91234 91288	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
91288 91240	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90080 90081 ⁷	90200 90201 ⁷	95007	NA	94425 94427	94310 ¹⁹
--	NA	--	--	--	--	--	--	--	--	--	NA	94425 94427	94310 ¹⁹

FORD SMALL BLOCK CLEVER - 351W WITH CLEVELAND HEADS 1969-1996

Steel Billet Mechanical Roller Camshafts Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91217 91234	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90083	NA	NA	NA	NA	94310 ¹⁹
91234 91288	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90083	NA	NA	NA	NA	94310 ¹⁹
91234 91288	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90083	NA	NA	NA	NA	94310 ¹⁹
91234 91288	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90083	NA	NA	NA	NA	94310 ¹⁹
91234 91288	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90083	NA	NA	NA	NA	94310 ¹⁹
--	NA	--	--	--	--	--	--	--	--	--	NA	94425 94427	94310 ¹⁹

Components Notes: master note list on page 260

⁷ Requires 7/16" rocker studs.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

¹⁹ Fits factory 1-pc eccentric. For 2-pc eccentric use 94212 or 94312.

²⁵ Machining Required.

CAMSHAFTS



FORD CLEVELAND/M • 351C-351M-400 1970-1983

Max Certified™ Hydraulic Flat Tappet Cam & Lifter Sets - 5 Year No Fault Warranty (see page 3 for details)

Cam & Lifter Set Part No.	Cam & Direct Lube Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.73 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
MC231031-10	MC231031-10DL ⁴	267	267	213	213	.496	.496	110	106	Hyd.	Hyd.	1
		1600-5000 Fair idle, good low & mid-range torque. Needs 4 bbl. & headers.										
MC230041-12	MC230041-12DL ⁴	279	289	225	235	.536	.542	112	108	Hyd.	Hyd.	1
		2400-6400 Lopey idle, moderate performance. Higher CR is recommended.										



FORD CLEVELAND/M • 351C-351M-400 1970-1983

American Muscle™ Hydraulic Flat Tappet Camshafts Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.73 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
237211-15	CL237211-15	270	290	206	221	.481	.490	115	120	Hyd.	Hyd.	1
		1000-4800 Near duplicate of the Ford 300HP/351C cam (FMC #D2ZZ-6250-B).										



FORD CLEVELAND/M • 351C-351M-400 1970-1983

Street Force™ Hydraulic Flat Tappet Camshafts Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.73 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
230011-12	CL230011-12	259	269	205	215	.484	.513	112	108	Hyd.	Hyd.	1
		1200-4600 Street Force™ 1, Good idle, Mild Street performance, strong low end torque.										
230021-12	CL230021-12	269	279	215	225	.513	.536	112	106	Hyd.	Hyd.	1
		1600-5400 Street Force™ 2, Good idle & throttle response. Needs 4 barrel & good exhaust.										
230041-12	CL230041-12	279	289	225	235	.536	.542	112	108	Hyd.	Hyd.	1
		2200-5800 Street Force™ 3, Noticeable idle, Hot Street & mild Bracket Racing.										



FORD CLEVELAND/M • 351C-351M-400 1970-1983

Rattler Cams™ Hydraulic Flat Tappet Camshafts Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.73 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
238001-09	CL238001-09	281	289	227	235	.554	.562	109	103	Hyd.	Hyd.	1
		1800-5600 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.										
238041-09	CL238041-09	289	297	235	243	.562	.554	109	103	Hyd.	Hyd.	1
		2000-5900 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.										
238101-09	CL238101-09	297	305	243	251	.553	.571	109	103	Hyd.	Hyd.	1
		2400-6200 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

4 Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



FORD CLEVELAND/M • 351C-351M-400 1970-1983

Max Certified™ Hydraulic Flat Tappet Cam & Lifter Set Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91211 ³ 91216 ⁴	NA	98515-K11	98515	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90083	NA	95016	NA	NA	94320
91211 ³ 91216 ⁴	NA	98515-K11	98515	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90083	NA	95016	NA	NA	94320

FORD CLEVELAND/M • 351C-351M-400 1970-1983

American Muscle™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91211 ³ 91216 ⁴	NA	98515-K11	98515	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90083	NA	95016	NA	NA	94320

FORD CLEVELAND/M • 351C-351M-400 1970-1983

Street Force™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91211 ³ 91216	NA	98515-K11	98515	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90083	NA	95016	NA	NA	94320
91211 ³ 91216	NA	98636-K11	98636	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90083	NA	95016	NA	NA	94320
91211 ³ 91216	NA	98636-K11	98636	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90083	NA	95016	NA	NA	94320

FORD CLEVELAND/M • 351C-351M-400 1970-1983

Rattler Cams™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91211 ³ 91212	NA	98636-K11	98636	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90083	NA	95016	NA	NA	94320
91211 ³ 91212	NA	98636-K11	98636	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90083	NA	95016	NA	NA	94320
91211 ³ 91212	NA	98636-K11	98636	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90083	NA	95016	NA	NA	94320

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

⁴ Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

¹⁹ Fits factory 1-pc eccentric. For 2-pc eccentric use 94212 or 94312.

²⁵ Machining Required.

CAMSHAFTS



FORD CLEVELAND/M • 351C-351M-400 1970-1983

Hydraulic Flat Tappet Camshafts

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.73 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes	
		IN	EX	IN	EX	IN	EX			IN	EX		
232171-11	CL232171-11	263	263	209	209	.484	.484	111	107	Hyd.	Hyd.	1	
		<i>1400-4800 Smooth idle, good fuel economy. Great RV & Towing cam.</i>											
231031-10	CL231031-10	267	267	213	213	.496	.496	110	106	Hyd.	Hyd.	1	
		<i>1600-5000 Fair idle, good low & mid-range torque. Needs 4 bbl. & headers.</i>											
230931-10	CL230931-10	269	269	215	215	.513	.513	110	105	Hyd.	Hyd.	1	
		<i>1800-5200 Strong low & mid-range, fuel efficiency & driveability.</i>											
230991-08	CL230991-08	267	267	220	220	.587	.587	108	104	Hyd.	Hyd.	1,16	
		<i>2000-5600 Good low & mid-range horsepower. Needs 4 barrel & headers.</i>											
230961-08	CL230961-08	281	281	227	227	.542	.542	108	104	Hyd.	Hyd.	1	
		<i>2400-6000 Fair idle, strong mid-range, works best w/aftermarket dual plane.</i>											
232141-10	CL232141-10	285	289	231	235	.554	.542	110	106	Hyd.	Hyd.	1	
		<i>2600-6200 Lopey idle, strong mid range. Good throttle response. 2400+ stall.</i>											
232601-08	CL232601-08	283	287	236	240	.631	.640	108	104	Hyd.	Hyd.	1,16	
		<i>2800-6400 Lopey idle, good mid-range power. Needs 3200+ stall.</i>											
231721-08	CL231721-08	287	293	240	246	.640	.649	108	104	Hyd.	Hyd.	1,16	
		<i>3000-6600 Hot Street/Mild Brackets. Needs 10.0:1+ CR, headers & 3000+ stall.</i>											
231721-10	CL231721-10	287	293	240	246	.640	.649	110	106	Hyd.	Hyd.	1,16	
		<i>3000-6600 Lopey idle, Street/Strip, broad mid range power. 9.5:1+ CR, 2800+ stall, headers & gears.</i>											
232531-08	CL232531-08	297	307	243	253	.585	.606	108	104	Hyd.	Hyd.	1	
		<i>3200-6800 Pro Street/Brackets, Strong mid & upper end power. 10.0:1+ CR, 3200+ stall.</i>											
232531-10	CL232531-10	297	307	243	253	.585	.606	110	106	Hyd.	Hyd.	1	
		<i>3200-6800 Hot Street/Brackets, Strong mid & upper end power. 10.0:1+ CR, 3200+ stall.</i>											
231541-08	CL231541-08	295	301	248	254	.655	.675	108	104	Hyd.	Hyd.	1,16	
		<i>3400-7000 Rough idle, great mid range acceleration and power. 3500+ CR, 10.5:1 CR.</i>											
231541-10	CL231541-10	295	301	248	254	.655	.675	110	106	Hyd.	Hyd.	1,16	
		<i>3400-7000 Lopey idle, Hot Street/Strip, strong mid range & top end torque & horsepower.</i>											
239991	NA	Custom Grind Camshaft									Hyd.	Hyd.	1
		<i>Hydraulic Flat Tappet Special Order Camshaft.</i>											

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

16 Lobes designed to take maximum advantage of .875" dia. lifter.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



FORD CLEVELAND/M - 351C-351M-400 1970-1983

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91211 ³ 91212	NA	98515-K11	98515	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90083	NA	95016	NA	NA	94320
91211 ³ 91212	NA	98515-K11	98515	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90083	NA	95016	NA	NA	94320
91211 ³ 91212	NA	98515-K11	98515	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90083	NA	95016	NA	NA	94320
91211 ³ 91212	NA	98636-K11	98636	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90083	NA	95016	NA	NA	94320
91211 ³ 91212	NA	98636-K11	98636	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90083	NA	95016	NA	NA	94320
91211 ³ 91212	NA	98636-K11	98636	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90083	NA	95016	NA	NA	94320
91211 ³ 91212	NA	98636-K11	98636	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90083	NA	95016	NA	NA	94320
91211 ³ 91212	NA	98636-K11	98636	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90083	NA	95016	NA	NA	94320
91211 ³ 91212	NA	98636-K11	98636	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90083	NA	95016	NA	NA	94320
91211 ³ 91212	NA	98636-K11	98636	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90083	NA	95016	NA	NA	94320
91211 ³ 91212	NA	98636-K11	98636	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90083	NA	95016	NA	NA	94320
91211 ³ 91212	NA	--	--	--	--	--	--	--	--	--	NA	NA	94320

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



FORD CLEVELAND/M • 351C-351M-400 1970-1983

Rattler Cams™ Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.73 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
238025-09	CL238025-09	280	288	227	235	.565	.565	109	103	Hyd.	Hyd.	1
1800-5600 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.												
238045-09	CL238045-09	288	296	235	243	.611	.611	109	103	Hyd.	Hyd.	1
2000-5900 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.												
238085-09	CL238085-09	296	304	243	251	.611	.594	109	103	Hyd.	Hyd.	1
2400-6200 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												



FORD CLEVELAND/M • 351C-351M-400 1970-1983

Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.73 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
233215-10	CL233215-10	270	278	217	225	.571	.577	110	106	Hyd.	Hyd.	1
1600-5600 Mild idle, great all around Street, good low end torque & horsepower.												
230245-10	CL230245-10	278	282	225	229	.576	.600	110	106	Hyd.	Hyd.	1
2000-6000 Mild lopey idle, Street/Mild Bracket, good low to mid range power. 9.5:1+ CR.												
230245-12	CL230245-12	278	282	225	229	.576	.600	112	108	Hyd.	Hyd.	1
2000-6000 Fair idle, Street High Performance, good low to mid range torque. 9.5:1+ CR, 2000+ stall.												
231175-10	CL231175-10	286	294	233	241	.594	.611	110	106	Hyd.	Hyd.	1
2800-6400 Fair idle, Street/Strip, great power range. 3000+ stall, 10.0:1+ CR.												
231175-12	CL231175-12	286	294	233	241	.594	.611	112	108	Hyd.	Hyd.	1
2800-6400 Rough idle, Street/Bracket, good mid range torque & upper end horsepower. 3200+ stall.												
230335-10	CL230335-10	300	304	247	251	.623	.623	110	106	Hyd.	Hyd.	1
3400-7000 Fair idle, Street/Strip, good mid range power. 11.5:1+ CR, 3500+ stall.												
239995	NA	Custom Grind Camshaft								Hyd.	Hyd.	1
Retro-Fit Hydraulic Roller Special Order Camshaft.												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



FORD CLEVELAND/M • 351C-351M-400 1970-1983

Rattler Cams™ Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91168 ³ 91260	NA	98636-K11	98636	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90083	NA	95205	NA	NA	94320
91168 ³ 91260	NA	98636-K11	98636	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90083	NA	95205	NA	NA	94320
91168 ³ 91260	NA	98636-K11	98636	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90083	NA	95205	NA	NA	94320

FORD CLEVELAND/M • 351C-351M-400 1970-1983

Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91168 ³ 91260	NA	98636-K11	98636	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90083	NA	95205	NA	NA	94320
91168 ³ 91260	NA	98636-K11	98636	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90083	NA	95205	NA	NA	94320
91168 ³ 91260	NA	98636-K11	98636	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90083	NA	95205	NA	NA	94320
91168 ³ 91260	NA	98636-K11	98636	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90083	NA	95205	NA	NA	94320
91168 ³ 91260	NA	98636-K11	98636	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90083	NA	95205	NA	NA	94320
91168 ³ 91260	NA	98636-K11	98636	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90083	NA	95205	NA	NA	94320
--	NA	--	--	--	--	--	--	--	--	--	NA	NA	94320

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



FORD CLEVELAND/M • 351C-351M-400 1970-1983

Mechanical Flat Tappet Camshafts

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.73 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
232342-08	CL232342-08 CL232342-08DL ⁴	265	265	230	230	.554	.554	108	104	.022	.022	1
		2000-6000 Fair idle, Street/Strip, excellent mid range performance. 3000+ stall.										
232342-10	CL232342-10 CL232342-10DL ⁴	265	265	230	230	.554	.554	110	106	.022	.022	1
		2000-6200 Good Street cam, broad power range. 2200+ stall recommended.										
231332-08	CL231332-08 CL231332-08DL ⁴	264	268	236	240	.621	.638	108	104	.022	.022	1,16
		2400-6400 Mild lopey idle, Street/Strip, great mid range. 9.5:1+ CR, 2800+ stall & headers.										
232182-06	CL232182-06 CL232182-06DL ⁴	279	287	244	252	.588	.611	106	104	.022	.022	1
		2800-6800 Rough idle, super mid-range performance. Needs 10.5:1+ CR.										
232372-10	CL232372-10 CL232372-10DL ⁴	285	291	250	256	.606	.617	110	106	.022	.022	1
		3200-7200 Pro Street/Bracket cam. Requires 3500+ stall, 10.5:1+ CR.										
232362-08	CL232362-08 CL232362-08DL ⁴	287	295	252	260	.629	.640	108	104	.022	.022	1
		3400-7500 Rough idle, strong mid-range performance.										
232192-08	CL232192-08 CL232192-08DL ⁴	295	295	260	260	.640	.640	108	104	.022	.022	1
		3600-7600 Pro Street/Bracket, strong top end, 3500+ stall, 11.0:1+ CR.										
232322-08	CL232322-08 CL232322-08DL ⁴	295	303	260	268	.640	.634	108	104	.022	.022	1
		3800-7800 Lopey idle, Pro Street/Bracket, 4000+ stall, 11.0:1+ CR.										
232332-10	CL232332-10 CL232332-10DL ⁴	303	313	268	278	.634	.661	110	106	.022	.022	1
		4400-8000 Rough idle, E.T. Brackets, strong mid to top end. 4500+ stall.										
239992	NA	Custom Grind Camshaft										1
		Mechanical Flat Tappet Special Order Camshaft.										



FORD CLEVELAND/M • 351C-351M-400 1970-1983

Mechanical Roller Camshafts

Firing Order: 1•3•7•2•6•5•4•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.73 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
230173-08	NA	275	279	243	247	.640	.657	108	104	.022	.022	1,5
		2600-6600 Mild rough idle, Street/Strip, low to mid range performance. 3000+ stall.										
231313-08	NA	277	277	245	245	.675	.675	108	104	.022	.022	1,5
		2800-6700 Lopey idle. Excellent mid range power band. Needs low gears, 3200+ stall.										
231733-08	NA	281	289	249	257	.675	.692	108	104	.022	.022	1,5
		3000-6800 Rough idle, Hot Street/Bracket, good mid range torque & horsepower. 3500+ stall.										
231133-08	NA	289	299	257	267	.692	.692	108	104	.022	.022	1,5
		3400-7000 Rough idle, Mid to upper range horsepower & torque. 11.0:1+ Good heads.										
230073-08	NA	295	295	263	263	.709	.709	108	104	.022	.022	1,5
		3800-7400 Rough idle, E.T. Brackets, strong mid to top end. 4000+ stall, headers & good intake.										
231123-08	NA	299	307	267	275	.727	.715	108	104	.022	.022	1,5
		4000-7800 Rough idle, Good mid to upper range horsepower. 4000+ stall, headers & good intake.										
231193-06	NA	305	315	273	283	.744	.727	106	102	.022	.022	1,5
		4200-8000 Rough idle, Super Gas, Great top end. 12.0:1+ CR, 4500+ stall & good exhaust.										
239993	NA	Custom Grind Camshaft										1,5
		Mechanical Roller Special Order Camshaft.										

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 4 Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.
- 5 Requires upgraded distributor gear.
- 16 Lobes designed to take maximum advantage of .875" dia. lifter.

Some items are not legal for sale or use on any pollution controlled motor vehicle



FORD CLEVELAND/M • 351C-351M-400 1970-1983

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91215 ³ 91218 ⁴	NA	98636-K11	98636	97118	--	93005	93316 ²⁵	90083	NA	95016	NA	NA	94320
91215 ³ 91218 ⁴	NA	98636-K11	98636	97118	--	93005	93316 ²⁵	90083	NA	95016	NA	NA	94320
91215 ³ 91218 ⁴	NA	98636-K11	98636	97118	--	93005	93316 ²⁵	90083	NA	95016	NA	NA	94320
91215 ³ 91218 ⁴	NA	98636-K11	98636	97118	--	93005	93316 ²⁵	90083	NA	95016	NA	NA	94320
91215 ³ 91218 ⁴	NA	98636-K11	98636	97118	--	93005	93316 ²⁵	90083	NA	95016	NA	NA	94320
91215 ³ 91218 ⁴	NA	98636-K11	98636	97118	--	93005	93316 ²⁵	90083	NA	95016	NA	NA	94320
91215 ³ 91218 ⁴	NA	98636-K11	98636	97118	--	93005	93316 ²⁵	90083	NA	95016	NA	NA	94320
91215 ³ 91218 ⁴	NA	98636-K11	98636	97118	--	93005	93316 ²⁵	90083	NA	95016	NA	NA	94320
91215 ³ 91218 ⁴	NA	98636-K11	98636	97118	--	93005	93316 ²⁵	90083	NA	95016	NA	NA	94320
91215 ³ 91218 ⁴	NA	98636-K11	98636	97118	--	93005	93316 ²⁵	90083	NA	95016	NA	NA	94320
91215 91218	NA	--	--	--	--	--	--	--	NA	--	NA	NA	94320

FORD CLEVELAND/M • 351C-351M-400 1970-1983

Mechanical Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91250 91219	NA	NA	98732 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90083	NA	95016	NA	NA	94320
91219 91234	NA	NA	98732 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90083	NA	95016	NA	NA	94320
91219 91234	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90083	NA	95016	NA	NA	94320
91219 91234	NA	NA	98732 ²⁵ 98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90083	NA	95016	NA	NA	94320
91234 91278	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90083	NA	95016	NA	NA	94320
91234 91278	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90083	NA	95016	NA	NA	94320
91278 91245	NA	NA	98844 ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93316 ²⁵	90083	NA	95016	NA	NA	94320
--	NA	--	--	--	--	--	--	--	NA	--	NA	NA	94320

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

⁴ Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



FORD FE • 352-428 1963-1977

Max Certified™ Hydraulic Flat Tappet Cam & Lifter Sets - 5 Year No Fault Warranty (see page 3 for details)

Cam & Lifter Set Part No.	Cam & Direct Lube Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.75 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
MC250021-11	NA	263	263	209	209	.490	.490	111	107	Hyd.	Hyd.	1
		<i>1000-4400 Smooth idle, increased low end torque. Great in PUs or other heavy vehicles.</i>										
MC250031-12	NA	267	277	213	223	.525	.525	112	108	Hyd.	Hyd.	1
		<i>1400-5200 Good idle. Excellent Street Performance dual pattern cam.</i>										



FORD FE • 352-428 1963-1977

American Muscle™ Hydraulic Flat Tappet Camshafts Firing Order: 1•5•4•2•6•3•7•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.75 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
257951-10	CL257951-10	270	270	186	186	.406	.406	110	108	Hyd.	Hyd.	1
		<i>800-4000 Near duplicate of the Ford 300HP/390 cam (FMC #C0AZ-6250-A).</i>										
257611-10	CL257611-10	256	256	200	200	.438	.438	110	108	Hyd.	Hyd.	1
		<i>1000-4400 Near duplicate of the Ford 345HP/428 cam (FMC #C6AZ-6250-A).</i>										
257711-15	CL257711-15	288	308	206	220	.487	.496	115	105	Hyd.	Hyd.	1
		<i>1100-4800 Near duplicate of the Ford 390 GT 335HP/390 cam (FMC #C6OZ-6250-B).</i>										



FORD FE • 352-428 1963-1977

Street Force™ Hydraulic Flat Tappet Camshafts Firing Order: 1•5•4•2•6•3•7•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.75 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
250011-12	CL250011-12	259	269	205	215	.490	.519	112	107	Hyd.	Hyd.	1
		<i>1000-4400 Street Force™ 1, Good idle, Mild Street performance, strong low end torque.</i>										
252461-12	CL252461-12	269	279	215	225	.519	.543	112	108	Hyd.	Hyd.	1,13
		<i>1600-5400 Street Force™ 2, Good idle & throttle response. Needs 4 barrel & good exhaust.</i>										
250041-12	CL250041-12	277	289	223	235	.543	.548	112	108	Hyd.	Hyd.	1,13
		<i>2000-5400 Street Force™ 3, Noticeable idle, Hot Street & mild Bracket Racing.</i>										

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 13 Requires adjustable valvetrain.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



FORD FE • 352-428 1963-1977

Max Certified™ Hydraulic Flat Tappet Cam & Lifter Set Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91251 ³	NA	98511-K31	98511	97110	NA	93015	93321 ²⁵	NA	NA	NA	NA	NA	94325
91251 ³	NA	98511-K31	98511	97110	NA	93015	93321 ²⁵	NA	NA	NA	NA	NA	94325

FORD FE • 352-428 1963-1977

American Muscle™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91251 ³	NA	98511-K31	98511	97110	NA	93015	93321 ²⁵	NA	NA	NA	NA	NA	94325
91251 ³	NA	98511-K31	98511	97110	NA	93015	93321 ²⁵	NA	NA	NA	NA	NA	94325
91251 ³	NA	98511-K31	98511	97110	NA	93015	93321 ²⁵	NA	NA	NA	NA	NA	94325

FORD FE • 352-428 1963-1977

Street Force™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91251 ³	NA	98511-K31	98511	97110	NA	93015	93321 ²⁵	NA	NA	NA	NA	NA	94325
91251 ³	NA	98511-K31	98511	97110	NA	93015	93321 ²⁵	NA	NA	NA	NA	NA	94325
91251 ³	NA	98511-K31	98511	97110	NA	93015	93321 ²⁵	NA	NA	NA	NA	NA	94325

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

²⁵ Machining Required.

CAMSHAFTS



FORD FE • 352-428 1963-1977

Rattler Cams™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•5•4•2•6•3•7•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.75 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
258021-09	CL258021-09	281	289	227	235	.548	.548	109	103	Hyd.	Hyd.	1,13
1800-5200 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.												
258051-09	CL258051-09	289	297	235	243	.548	.548	109	103	Hyd.	Hyd.	1,13
2000-5400 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.												
258111-09	CL258111-09	297	305	243	251	.548	.548	109	103	Hyd.	Hyd.	1,13
2400-5600 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												



FORD FE • 352-428 1963-1977

Hydraulic Flat Tappet Camshafts

Firing Order: 1•5•4•2•6•3•7•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.75 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
250021-11	CL250021-11	263	263	209	209	.490	.490	111	107	Hyd.	Hyd.	1
1200-4600 Smooth idle, increased low end torque. Great in PUs.												
251021-11	CL251021-11	267	267	213	213	.502	.502	111	107	Hyd.	Hyd.	1
1400-4600 Fair idle, good all-around performance. Good torque.												
250931-10	CL250931-10	269	269	215	215	.519	.519	110	106	Hyd.	Hyd.	1,13
1400-5000 Good idle, increased torque. Great all around performance.												
250031-12	CL250031-12	267	277	213	223	.525	.525	112	108	Hyd.	Hyd.	1
1400-5200 Good idle. Excellent Street Performance dual pattem cam.												
252201-10	CL252201-10	273	273	219	219	.502	.502	110	106	Hyd.	Hyd.	1
1800-5200 Good low & mid-range horsepower. Needs 4 barrel & headers.												
250051-10	CL250051-10	289	289	235	235	.548	.548	110	106	Hyd.	Hyd.	1,13
2400-6000 Rough idle, Hot Street/Bracket. Big mid-range torque. Needs 2500+ stall.												
252441-10	CL252441-10	291	295	237	241	.569	.548	110	106	Hyd.	Hyd.	1,13
2600-6200 Dual purpose Street/Strip, strong mid range to top end torque & horsepower.												
252441-12	CL252441-12	291	295	237	241	.569	.548	112	108	Hyd.	Hyd.	1,13
2600-6200 Fair idle, Street Performance, good mid range horsepower. 10.0-11.5:1 suggested.												
250981-10	CL250981-10	295	295	241	241	.548	.548	110	106	Hyd.	Hyd.	1,13
3000-6400 Rough idle, runs strong 3,500 rpm up, needs compression. Needs headers.												
252531-10	CL252531-10	297	307	243	253	.592	.618	110	106	Hyd.	Hyd.	1,13
3400-6600 Lopey idle, good mid-range power. Needs 3200+ stall.												
250061-10	CL250061-10	301	301	247	247	.595	.595	110	106	Hyd.	Hyd.	1,13
3400-6700 Pro Street/Brackets, Strong mid & upper end power. 10.0:1+ CR.												
259991	NA	Custom Grind Camshaft								Hyd.	Hyd.	1,13
Hydraulic Flat Tappet Special Order Camshaft.												

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 13 Requires adjustable valvetrain.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



FORD FE • 352-428 1963-1977

Rattler Cams™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91251 ³	NA	98511-K31	98511	97110	NA	93015	93321 ²⁵	NA	NA	NA	NA	NA	94325
91251 ³	NA	98511-K31	98511	97110	NA	93015	93321 ²⁵	NA	NA	NA	NA	NA	94325
91251 ³	NA	98511-K31	98511	97110	NA	93015	93321 ²⁵	NA	NA	NA	NA	NA	94325

FORD FE • 352-428 1963-1977

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91251 ³	NA	98511-K31	98511	97110	NA	93015	93321 ²⁵	NA	NA	NA	NA	NA	94325
91251 ³	NA	98511-K31	98511	97110	NA	93015	93321 ²⁵	NA	NA	NA	NA	NA	94325
91251 ³	NA	98511-K31	98511	97110	NA	93015	93321 ²⁵	NA	NA	NA	NA	NA	94325
91251 ³	NA	98511-K31	98511	97110	NA	93015	93321 ²⁵	NA	NA	NA	NA	NA	94325
91251 ³	NA	98511-K31	98511	97110	NA	93015	93321 ²⁵	NA	NA	NA	NA	NA	94325
91251 ³	NA	98511-K31	98511	97110	NA	93015	93321 ²⁵	NA	NA	NA	NA	NA	94325
91251 ³	NA	98511-K31	98511	97110	NA	93015	93321 ²⁵	NA	NA	NA	NA	NA	94325
91251 ³	NA	98511-K31	98511	97110	NA	93015	93321 ²⁵	NA	NA	NA	NA	NA	94325
91251 ³	NA	98511-K31	98511	97110	NA	93015	93321 ²⁵	NA	NA	NA	NA	NA	94325
91251 ³	NA	98511-K31	98511	97110	NA	93015	93321 ²⁵	NA	NA	NA	NA	NA	94325
91251 ³	NA	98511-K31	98511	97110	NA	93015	93321 ²⁵	NA	NA	NA	NA	NA	94325
91251	NA	--	--	--	--	--	--	NA	NA	NA	NA	NA	94325

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

²⁵ Machining Required.

CAMSHAFTS



FORD FE • 352-428 1963-1977

Rattler Cams™ Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•5•4•2•6•3•7•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.75 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
258025-09	CL258025-09	280	288	227	235	.572	.572	109	103	Hyd.	Hyd.	1,13
1800-5200 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.												
258045-09	CL258045-09	288	296	235	243	.618	.618	109	103	Hyd.	Hyd.	1,13
2000-5400 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.												
258085-09	CL258085-09	296	304	243	251	.618	.601	109	103	Hyd.	Hyd.	1,13
2400-5600 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												



FORD FE • 352-428 1963-1977

Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•5•4•2•6•3•7•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.75 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
250705-10	CL250705-10	272	278	219	225	.525	.525	110	106	Hyd.	Hyd.	1,13
1800-5400 Fair idle, High Performance Street, good mid range torque.												
253745-10	CL253745-10	280	286	227	233	.525	.525	110	106	Hyd.	Hyd.	1,13
2000-5600 Mild lopey idle, Street/Strip, strong mid range horsepower.												
253745-12	CL253745-12	280	286	227	233	.525	.525	112	108	Hyd.	Hyd.	1,13
2000-5600 Mild lopey idle, Street/Strip, strong mid range horsepower.												
253385-10	CL253385-10	288	294	235	241	.560	.560	110	106	Hyd.	Hyd.	1,13
2400-5800 Rough idle, Excellent mid range & upper end power. Best with good heads, 2500+ stall.												
253655-10	CL253655-10	299	299	245	245	.586	.586	110	106	Hyd.	Hyd.	1,13
2800-6000 Lopey idle, Street/Strip, good mid range horsepower. Best with 3000+ stall.												
253545-10	CL253545-10	300	304	247	251	.630	.630	110	106	Hyd.	Hyd.	1,13
3000-6400 Rough idle, Hot Street/Bracket, good torque & upper mid range. 11.5:1+, 3400+ stall.												
259995	NA	Custom Grind Camshaft								Hyd.	Hyd.	1,13
Retro-Fit Hydraulic Roller Special Order Camshaft.												

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 13 Requires adjustable valvetrain.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



FORD FE • 352-428 1963-1977

Rattler Cams™ Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91169 ³ 91261	NA	98611-K31 ²⁵	98611 ²⁵	97110	NA	93015	93321 ²⁵	NA	NA	NA	NA	NA	94325
91169 ³ 91261	NA	98611-K31 ²⁵	98611 ²⁵	97110	NA	93015	93321 ²⁵	NA	NA	NA	NA	NA	94325
91169 ³ 91261	NA	98611-K31 ²⁵	98611 ²⁵	97110	NA	93015	93321 ²⁵	NA	NA	NA	NA	NA	94325

FORD FE • 352-428 1963-1977

Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91169 ³ 91261	NA	98611-K31 ²⁵	98611 ²⁵	97110	NA	93015	93321 ²⁵	NA	NA	NA	NA	NA	94325
91169 ³ 91261	NA	98611-K31 ²⁵	98611 ²⁵	97110	NA	93015	93321 ²⁵	NA	NA	NA	NA	NA	94325
91169 ³ 91261	NA	98611-K31 ²⁵	98611 ²⁵	97110	NA	93015	93321 ²⁵	NA	NA	NA	NA	NA	94325
91169 ³ 91261	NA	98611-K31 ²⁵	98611 ²⁵	97110	NA	93015	93321 ²⁵	NA	NA	NA	NA	NA	94325
91169 ³ 91261	NA	98611-K31 ²⁵	98611 ²⁵	97110	NA	93015	93321 ²⁵	NA	NA	NA	NA	NA	94325
91169 ³ 91261	NA	--	--	--	--	--	--	NA	NA	NA	NA	NA	94325

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

²⁵ Machining Required.

CAMSHAFTS



FORD FE • 352-428 1963-1977

Mechanical Flat Tappet Camshafts

Firing Order: 1•5•4•2•6•3•7•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.75 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
252342-10	CL252342-10	265	265	230	230	.560	.560	110	106	.022	.022	1,13
		<i>1800-5800 Good Street cam, broad power range. 2200+ stall recommended.</i>										
251672-08	CL251672-08	275	275	240	240	.589	.589	108	104	.022	.022	1,13
		<i>2000-6000 Lopey idle, strong mid range power & torque. 10.5:1 CR, 2500+ stall & 3.70-4.30 gear.</i>										
251262-08	CL251262-08	281	281	246	246	.607	.607	108	104	.022	.022	1,13
		<i>2400-6400 Hot Street/Bracket, good mid-range performance. 10.5-12.0:1 recommended.</i>										
251882-10	CL251882-10	287	295	252	260	.618	.624	110	106	.022	.022	1,13
		<i>2800-6800 Hot Street/Bracket, good mid & upper rpm torque & power. 11.5:1 CR, 3500+ stall.</i>										
252192-08	CL252192-08	295	295	260	260	.648	.648	108	104	.022	.022	1,13
		<i>3000-7000 Pro Street/Bracket, strong top end, 3500+ stall, 11.0:1+ CR.</i>										
259992	NA	Custom Grind Camshaft										1,13
		<i>Mechanical Flat Tappet Special Order Camshaft.</i>										



FORD FE • 352-428 1963-1977

Mechanical Roller Camshafts

Firing Order: 1•5•4•2•6•3•7•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.75 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
252193-08	NA	281	287	249	255	.656	.656	108	104	.022	.022	1,5,13
		<i>3200-6800 Rough idle, Pro Street/Bracket, good mid range torque. 11.0:1+ CR, 3500+ stall.</i>										
252243-08	NA	291	295	259	263	.648	.648	108	104	.022	.022	1,5,13
		<i>3600-7200 Rough idle, Bracket E.T., good mid range horsepower. 12.0:1+ CR, 3800+ stall.</i>										
252363-10	NA	299	299	267	267	.700	.700	110	106	.022	.022	1,5,13
		<i>4000-7600 Rough idle, good mid range performance. 12.0:1+ CR, 4000+ stall.</i>										
259993	NA	Custom Grind Camshaft										1,5,13
		<i>Mechanical Roller Special Order Camshaft.</i>										



FORD BIG BLOCK • 429-460 1968-1995

Max Certified™ Hydraulic Flat Tappet Cam & Lifter Sets - 5 Year No Fault Warranty (see page 3 for details)

Cam & Lifter Set Part No.	Cam & Direct Lube Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift a/1.73 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
MC240931-11	MC240931-11DL ⁴	269	269	215	215	.514	.514	111	107	Hyd.	Hyd.	1
		<i>1600-5000 Good idle & throttle response with 4bbl & good exhaust.</i>										
MC242201-10	MC242201-10DL ⁴	273	273	219	219	.496	.496	110	106	Hyd.	Hyd.	1
		<i>1500-5400 Good idle, strong bottom end. Great daily usage cam.</i>										
MC240041-12	MC240041-12DL ⁴	279	289	225	235	.536	.562	112	107	Hyd.	Hyd.	1
		<i>1800-5600 Strong mid-range. Needs 4bbl, headers & medium stall.</i>										

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 4 Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.
- 5 Requires upgraded distributor gear.
- 13 Requires adjustable valvetrain.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



FORD FE • 352-428 1963-1977

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91255 ³	NA	98445-K32 ¹⁰	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	NA	NA	NA	NA	NA	94325
91255 ³	NA	98445-K32 ¹⁰	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	NA	NA	NA	NA	NA	94325
91255 ³	NA	98445-K32 ¹⁰	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	NA	NA	NA	NA	NA	94325
91255 ³	NA	98445-K32 ¹⁰	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	NA	NA	NA	NA	NA	94325
91255 ³	NA	98445-K32 ¹⁰	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93018 ¹⁰	93321 ²⁵	NA	NA	NA	NA	NA	94325
91255	NA	--	--	--	--	--	--	NA	NA	NA	NA	NA	94325

FORD FE • 352-428 1963-1977

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91254 91234	NA	NA	98650 ²⁵	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰	93321 ²⁵	NA	NA	NA	NA	94450	94325
91234	NA	NA	98650 ²⁵	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰	93321 ²⁵	NA	NA	NA	NA	94450	94325
91234	NA	NA	98650 ²⁵	97128 ¹⁰	97220 ¹⁰	93018 ¹⁰	93321 ²⁵	NA	NA	NA	NA	94450	94325
--	NA	--	--	--	--	--	--	NA	NA	NA	NA	NA	94325

FORD BIG BLOCK • 429-460 1968-1995

Max Certified™ Hydraulic Flat Tappet Cam & Lifter Set Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91211 ³ 91216 ⁴	NA	98511-K12	98511	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	NA	94315
91211 ³ 91216 ⁴	NA	98511-K12	98511	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	NA	94315
91211 ³ 91216 ⁴	NA	98511-K12	98511	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	NA	94315

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

⁴ Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



FORD BIG BLOCK • 429-460 1968-1995

American Muscle™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•5•4•2•6•3•7•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.73 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
247161-13	CL247161-13	256	270	192	206	.442	.487	113	110	Hyd.	Hyd.	1
800-4400 Near duplicate of the Ford 360HP/429 cam (FMC #C8SZ-6250-A).												



FORD BIG BLOCK • 429-460 1968-1995

Street Force™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•5•4•2•6•3•7•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.73 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
241101-12	CL241101-12	269	279	215	225	.513	.536	112	108	Hyd.	Hyd.	1
1000-5200 Street Force™ 2, Good idle & throttle response. Needs 4 barrel & good exhaust.												
240041-12	CL240041-12	279	289	225	235	.536	.541	112	108	Hyd.	Hyd.	1
1500-5400 Street Force™ 3, Noticeable idle, Hot Street & mild Bracket Racing.												
241301-12	CL241301-12	289	299	235	245	.542	.554	112	108	Hyd.	Hyd.	1
2000-5600 Street Force™ 4, Lopey idle, good mid-range power. Needs 3200+ stall.												



FORD BIG BLOCK • 429-460 1968-1995

Rattler Cams™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•5•4•2•6•3•7•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.73 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
248001-09	CL248001-09	281	289	227	235	.554	.562	109	103	Hyd.	Hyd.	1
1800-5200 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.												
248041-09	CL248041-09	289	297	235	243	.562	.554	109	103	Hyd.	Hyd.	1
2000-5400 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.												
248101-09	CL248101-09	297	305	243	251	.554	.571	109	103	Hyd.	Hyd.	1
2400-5600 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

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IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



FORD BIG BLOCK • 429-460 1968-1995

American Muscle™ Hydraulic Flat Tappet Cam & Lifter Set Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91211 ³ 91216	NA	98511-K12	98511	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	NA	94315

FORD BIG BLOCK • 429-460 1968-1995

Street Force™ Hydraulic Flat Tappet Cam & Lifter Set Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91211 ³ 91216	NA	98511-K12	98511	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	NA	94315
91211 ³ 91216	NA	98511-K12	98511	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	NA	94315
91211 ³ 91216	NA	98511-K12	98511	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	NA	94315

FORD BIG BLOCK • 429-460 1968-1995

Rattler Cams™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91211 ³ 91212	NA	98511-K12	98511	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	NA	94315
91211 ³ 91212	NA	98511-K12	98511	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	NA	94315
91211 ³ 91212	NA	98511-K12	98511	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	NA	94315

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

²⁵ Machining Required.

CAMSHAFTS



FORD BIG BLOCK • 429-460 1968-1995

Hydraulic Flat Tappet Camshafts

Firing Order: 1•5•4•2•6•3•7•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.73 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
240021-11	CL240021-11	263	263	209	209	.484	.484	111	107	Hyd.	Hyd.	1
<i>1000-4200 Smooth idle, increased torque. Good for economy, Towing.</i>												
241021-11	CL241021-11	267	267	213	213	.497	.497	111	107	Hyd.	Hyd.	1
<i>1000-4400 Smooth idle. Great for Off-Road & Towing. Good fuel economy.</i>												
240931-11	CL240931-11	269	269	215	215	.514	.514	111	107	Hyd.	Hyd.	1
<i>1600-5000 Good idle & throttle response with 4bbl & good exhaust.</i>												
240031-12	CL240031-12	269	277	215	223	.513	.519	112	108	Hyd.	Hyd.	1
<i>1500-4800 Fair idle, Hot Performance Street & Marine.</i>												
242201-10	CL242201-10	273	273	219	219	.496	.496	110	106	Hyd.	Hyd.	1
<i>1500-5400 Good idle, strong bottom end. Great daily usage cam.</i>												
240991-08	CL240991-08	267	267	220	220	.587	.587	108	104	Hyd.	Hyd.	1,16
<i>1800-5600 Good low & mid-range horsepower. Needs 4 barrel & headers.</i>												
240961-10	CL240961-10	277	277	230	230	.609	.609	110	106	Hyd.	Hyd.	1,16
<i>2000-6000 Hot Street/Brackets, broad power range, strong top end.</i>												
241491-10	CL241491-10	279	285	232	238	.614	.635	110	106	Hyd.	Hyd.	1,16
<i>2400-6200 Fair idle, Street/Bracket, good mid range. 3000+ stall, 10.0-11.5:1 suggested.</i>												
241731-10	CL241731-10	285	291	238	244	.635	.645	110	106	Hyd.	Hyd.	1,16
<i>2800-6600 Fair idle, Street/Strip, strong mid-range torque & horsepower.</i>												
241541-10	CL241541-10	303	309	249	255	.606	.606	110	106	Hyd.	Hyd.	1
<i>3400-7000 Rough idle, Hot Street/Strip, great mid range to top end performance. 10.5:1+ CR, 3500+.</i>												
249991	NA	Custom Grind Camshaft								Hyd.	Hyd.	1
<i>Hydraulic Flat Tappet Special Order Camshaft.</i>												



FORD BIG BLOCK • 429-460 1968-1995

Rattler Cams™ Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•5•4•2•6•3•7•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.73 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
248025-09	CL248025-09	280	288	227	235	.565	.565	109	103	Hyd.	Hyd.	1
<i>1800-5200 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.</i>												
248045-09	CL248045-09	288	296	235	243	.611	.611	109	103	Hyd.	Hyd.	1
<i>2000-5400 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.</i>												
248085-09	CL248085-09	296	304	243	251	.611	.594	109	103	Hyd.	Hyd.	1
<i>2400-5600 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.</i>												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

16 Lobes designed to take maximum advantage of .875" dia. lifter.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



FORD BIG BLOCK • 429-460 1968-1995

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91211 ³ 91212	NA	98511-K12	98511	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	NA	94315
91211 ³ 91212	NA	98511-K12	98511	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	NA	94315
91211 ³ 91212	NA	98511-K12	98511	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	NA	94315
91211 ³ 91212	NA	98511-K12	98511	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	NA	94315
91211 ³ 91212	NA	98511-K12	98511	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	NA	94315
91211 ³ 91212	NA	98445-K12 ²⁵	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	NA	94315
91211 ³ 91212	NA	98445-K12 ²⁵	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	NA	94315
91211 ³ 91212	NA	98445-K12 ²⁵	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	NA	94315
91211 ³ 91212	NA	98445-K12 ²⁵	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	NA	94315
91211 ³ 91212	NA	98445-K12 ²⁵	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	NA	94315
91211 ³ 91212	NA	--	--	--	--	--	--	NA	NA	NA	NA	NA	94315

FORD BIG BLOCK • 429-460 1968-1995

Rattler Cams™ Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91169 ³ 91261	NA	98445-K12 ²⁵	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017 95010	NA	NA	94315
91169 ³ 91261	NA	98445-K12 ²⁵	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017 95010	NA	NA	94315
91169 ³ 91261	NA	98445-K12 ²⁵	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017 95010	NA	NA	94315

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

²⁵ Machining Required.

CAMSHAFTS



FORD BIG BLOCK • 429-460 1968-1995

Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•5•4•2•6•3•7•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.73 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
240705-10	CL240705-10	272	278	219	225	.588	.577	110	106	Hyd.	Hyd.	1
<i>1600-5600 Mild idle, Street Performance, good low to mid range torque & power.</i>												
240705-12	CL240705-12	272	278	219	225	.588	.577	112	108	Hyd.	Hyd.	1
<i>1600-5600 Mild idle, Street Performance, good low to mid range torque & power.</i>												
243745-10	CL243745-10	282	286	229	233	.600	.594	110	106	Hyd.	Hyd.	1
<i>2200-6200 Choppy idle, High Performance Street. Needs good intake, headers 9.0:1 CR & 2200+.</i>												
243745-12	CL243745-12	282	286	229	233	.600	.594	112	108	Hyd.	Hyd.	1
<i>2200-6200 Good idle, High Performance Street. Needs good intake, headers 9.0:1 CR & 2200+.</i>												
243385-10	CL243385-10	288	294	235	241	.611	.611	110	106	Hyd.	Hyd.	1
<i>2400-6400 Good idle, great mid range performance. 9.0:1+ CR, 2400+ stall & 3.73 or lower gears.</i>												
243655-10	CL243655-10	300	300	247	247	.623	.623	110	106	Hyd.	Hyd.	1
<i>3000-6800 Lopey idle, Street/Strip, good mid range horsepower. Best with 3500+ stall.</i>												
243545-10	CL243545-10	302	308	249	255	.652	.652	110	106	Hyd.	Hyd.	1
<i>3200-7000 Rough idle, Hot Street/Bracket, good torque & upper mid range. 11.5:1+, 3800+ stall.</i>												
249995	NA	Custom Grind Camshaft								Hyd.	Hyd.	1
<i>Retro-Fit Hydraulic Roller Special Order Camshaft.</i>												



FORD BIG BLOCK • 429-460 1968-1995

Mechanical Flat Tappet Camshafts

Firing Order: 1•5•4•2•6•3•7•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.73 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
242212-12	CL242212-12 CL242212-12DL ⁴	279	287	244	252	.588	.611	112	107	.022	.022	1
<i>3600-7000 Rough idle, excellent Bracket cam. Increased CR required.</i>												
241262-08	CL241262-08 CL241262-08DL ⁴	274	274	246	246	.659	.659	108	104	.018	.018	1,16,34
<i>3400-7400 Hot Street/Bracket, good mid-range performance.</i>												
242372-10	CL242372-10 CL242372-10DL ⁴	285	291	250	256	.606	.617	110	106	.022	.022	1
<i>3800-7800 Rough idle, Street/Strip. Best with 10.0:1+ CR, 3000+ stall.</i>												
242362-08	CL242362-08 CL242362-08DL ⁴	289	295	254	260	.635	.640	108	104	.022	.022	1
<i>4000-7800 Rough idle, Hot Street/Bracket. Needs 10.5:1+ CR & 3200+ stall.</i>												
242322-08	CL242322-08 CL242322-08DL ⁴	295	303	260	268	.640	.635	108	104	.022	.022	1
<i>4200-7800 Pro-Street/Strip, radical idle. Needs good aftermarket heads & intake.</i>												
240782-08	CL240782-08 CL240782-08DL ⁴	296	302	268	274	.717	.731	108	104	.022	.022	1,16
<i>4400-8000 Bracket Racer special. Super strong mid-range & top end.</i>												
249992	NA	Custom Grind Camshaft										1
<i>Mechanical Flat Tappet Special Order Camshaft.</i>												

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 4 Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.
- 16 Lobes designed to take maximum advantage of .875" dia. lifter.
- 34 Provisions for increased oiling recommended.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



FORD BIG BLOCK • 429-460 1968-1995

Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91169 ³ 91261	NA	98445-K12 ²⁵	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017 95010	NA	NA	94315
91169 ³ 91261	NA	98445-K12 ²⁵	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017 95010	NA	NA	94315
91169 ³ 91261	NA	98445-K12 ²⁵	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017 95010	NA	NA	94315
91169 ³ 91261	NA	98445-K12 ²⁵	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017 95010	NA	NA	94315
91169 ³ 91261	NA	98445-K12 ²⁵	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017 95010	NA	NA	94315
91169 ³ 91261	NA	98445-K12 ²⁵	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017 95010	NA	NA	94315
91169 ³ 91261	NA	98445-K12 ²⁵	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017 95010	NA	NA	94315
--	NA	--	--	--	--	--	--	--	NA	--	NA	NA	94315

FORD BIG BLOCK • 429-460 1968-1995

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91215 ³ 91218 ⁴	NA	98445-K12 ²⁵	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	NA	94315
91215 ³ 91218 ⁴	NA	98445-K12 ²⁵	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	NA	94315
91215 ³ 91218 ⁴	NA	98445-K12 ²⁵	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	NA	94315
91215 ³ 91218 ⁴	NA	98445-K12 ²⁵	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	NA	94315
91215 ³ 91218 ⁴	NA	98445-K12 ²⁵	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	NA	94315
91215 ³ 91218 ⁴	NA	98445-K12 ²⁵	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	NA	94315
91215 91218	NA	--	--	--	--	--	--	--	NA	--	NA	NA	94315

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

⁴ Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.

²⁵ Machining Required.

CAMSHAFTS



FORD BIG BLOCK • 429-460 1968-1995

Steel Billet Mechanical Roller Cams

Firing Order: 1•5•4•2•6•3•7•8

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.73 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
241593-08	NA	281	287	249	255	.649	.649	108	104	.022	.022	1,5
		<i>2800-6800 Choppy idle, Street/Strip, high torque with great mid range. Best with 3000+ stall.</i>										
241593-12	NA	281	287	249	255	.649	.649	112	108	.022	.022	1,5
		<i>3000-6800 Good idle, Broad mid-range power. Small supercharger or NOS kit OK.</i>										
240283-08	NA	285	291	253	259	.738	.738	108	104	.022	.022	1,5
		<i>3200-7000 Lopey idle, Street/Strip, good low to mid range torque & power. 3500+ stall.</i>										
241133-08	NA	289	299	257	267	.692	.692	108	104	.022	.022	1,5
		<i>3400-7200 Moderate idle. Good in strong Street or Bracket car.</i>										
241133-10	NA	289	299	257	267	.692	.692	110	106	.022	.022	1,5
		<i>3400-7400 Good in strong Street or Bracket car. OK w/NOS.</i>										
241263-08	NA	293	297	261	265	.715	.715	108	104	.022	.022	1,5
		<i>3600-7600 Rough idle, Bracket E.T., strong mid range design. 12.0:1 CR, 4000+ stall.</i>										
240203-08	NA	299	305	267	273	.744	.744	108	104	.022	.022	1,5
		<i>3800-7800 Rough idle, Bracket killer for big inch (500+). 12.5:1+ CR, 4000+ stall.</i>										
240203-10	NA	299	305	267	273	.744	.744	110	106	.022	.022	1,5
		<i>3800-7600 Rough idle, good mid range performance. 12.5:1+ CR, 4000+ stall.</i>										
241123-10	NA	301	303	269	271	.714	.721	110	106	.022	.022	1,5
		<i>3800-7600 460+CID. 11.0:1 Comp. Strong mid range horsepower.</i>										
241713-08	NA	301	309	269	277	.715	.715	108	104	.022	.022	1,5
		<i>4000-7800 460+CID. 12.0:1 Comp. Strong mid to upper horsepower.</i>										
241693-08	NA	305	311	273	279	.744	.739	108	104	.022	.022	1,5
		<i>4200-7800 460+ ci, Great mid-range & upper end. Needs 5000+ stall, 12.5:1 CR.</i>										
241693-10	NA	305	311	273	279	.744	.739	110	106	.022	.022	1,5
		<i>4200-8000 460+ ci, Great mid-range & top end. Needs 5000+ stall.</i>										
241083-10	NA	309	317	277	285	.714	.727	110	106	.022	.022	1,5
		<i>4400-8200 460+ ci. 12.0:1 Comp. Strong mid-upper horsepower.</i>										
241723-10	NA	311	315	279	283	.784	.727	110	106	.022	.022	1,5
		<i>4800-8600 12.0:1 min. Modified heads. Strong upper rpm.</i>										
241363-10	NA	315	323	283	291	.779	.744	110	106	.022	.022	1,5
		<i>5200-7500 Big cubic inch 500+ motors. Best with 13.5:1+. Needs true race converter.</i>										
249993	NA	Custom Grind Camshaft										1,5
		<i>Mechanical Roller Special Order Camshaft.</i>										

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 5 Requires upgraded distributor gear.

Some items are not legal for sale or use on any pollution controlled motor vehicle

Steel Billet Mechanical Roller Cams

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91254 91247 ³²	NA	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	94435	94315
91254 91247 ³²	NA	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	94435	94315
91234 91288	NA	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	94435	94315
91247 91234	NA	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	94435	94315
91247 91234	NA	NA	98541 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	94435	94315
91234 91288	NA	NA	98738A ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	94435	94315
91234 91288	NA	NA	98738A ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	94435	94315
91234 91288	NA	NA	98738A ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	94435	94315
91234 91288	NA	NA	98738A ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	94435	94315
91234 91288	NA	NA	98738A ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	94435	94315
91234 91288	NA	NA	98738A ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	94435	94315
91234 91288	NA	NA	98738A ²⁵	97130 ¹⁰	97222 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	94435	94315
91234 91288	NA	NA	98825 ²⁵	NA	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	94435	94315
91234 91288	NA	NA	98825 ²⁵	NA	97216 ¹⁰	93017 ¹⁰	93311 ²⁵	90083	NA	95017	NA	94435	94315
--	NA	--	--	--	--	--	--	--	NA	--	NA	NA	94315

Components Notes: master note list on page 260

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

³² These lifters are not recommended for street use.

CAMSHAFTS



FORD FLAT HEAD • 239-255 (SINGLE-GEAR) 1938-1948

Mechanical Flat Tappet Camshafts

Firing Order: 1•5•4•8•6•3•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
263356-12	NA	264	264	210	210	.335	.335	112	110	.012	.012	1,20
		1000-4800 Good idle, 239-276 or larger ci. Great in heavy car. Stock heads & auto trans OK.										
263656-09	NA	280	280	226	226	.365	.365	109	105	.012	.012	1,20
		1500-5200 Good idle, good low to mid range power. Needs valve clearance or aftermarket heads.										
263726-16	NA	284	284	230	230	.372	.372	116	112	.012	.012	1,20
		1500-5800 Good idle, Supercharged Street applications. Needs valve clearance or aftermarket heads.										
263056-11	NA	297	304	244	250	.405	.415	111	109	.012	.012	1,20
		2300-6000 Rougher loping idle, upper mid & top end power: 296+ ci. Modified or aftermarket heads.										
269996	NA	Custom Grind Camshaft										1
		Mechanical Flat Tappet Special Order Camshaft.										



FORD FLAT HEAD • 239-255 (2-GEAR) 1949-1953

Mechanical Flat Tappet Camshafts

Firing Order: 1•5•4•8•6•3•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
263352-12	NA	264	264	210	210	.335	.335	112	110	.012	.012	1,20
		1000-4800 Good idle, 239-276 or larger ci. Great in heavy car. Stock heads & auto trans OK.										
263652-09	NA	280	280	226	226	.365	.365	109	105	.012	.012	1,20
		1500-5200 Good idle, good low to mid range power. Needs valve clearance or aftermarket heads.										
263722-16	NA	284	284	230	230	.372	.372	116	115	.012	.012	1,20
		1500-5800 Good idle, Supercharged Street applications. Needs valve clearance or aftermarket heads.										
263952-11	NA	293	297	240	244	.395	.405	111	109	.012	.012	1,20
		2000-5800 Rough idle, good mid range power: 276-296+ ci. Needs high CR, 2000+ stall.										
263052-11	NA	297	304	244	250	.405	.415	111	109	.012	.012	1,20
		2300-6000 Rougher loping idle, upper mid & top end power: 296+ ci. Modified or aftermarket heads.										
269992	NA	Custom Grind Camshaft										1
		Mechanical Flat Tappet Special Order Camshaft.										



FORD Y-BLOCK • 292-312 1955-1962

Mechanical Flat Tappet Camshafts

Firing Order: 1•5•4•8•6•3•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.47 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
292002-10	NA	255	255	220	220	.463	.463	110	106	.022	.022	1
		1800-5000 Street Performance, good power range. Suggest improved carburetion & exhaust.										
290862-10	NA	265	265	238	238	.515	.515	110	106	.022	.022	1
		2800-5400 Hot Street/Strip, Best for 312+ cubic inch. Needs 10.0:1+ CR, good carb, exhaust.										
290262-10	NA	276	276	248	248	.544	.544	110	106	.018	.018	1
		3200-6000 Bracket/Nostalgia Race. Great power range. Requires improved induction & exhaust.										
299992	NA	Custom Grind Camshaft										1
		Mechanical Flat Tappet Special Order Camshaft.										

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 20 Advertising duration read @.010".

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



FORD FLAT HEAD • 239-255 (SINGLE-GEAR) 1938-1948

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91265	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
91265	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
91265	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
91265	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
91265	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

FORD FLAT HEAD • 239-255 (2-GEAR) 1949-1953

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91265	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
91265	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
91265	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
91265	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
91265	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
91265	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

FORD Y-BLOCK • 292-312 1955-1962

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91214	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
91214	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
91214	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
91214	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Components Notes: master note list on page 260

CAMSHAFTS



HOLDEN V8 • 252-308 1970-1988

Rattler Cams™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•2•7•8•4•5•6•3

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
668021-09	CL668021-09	281	289	227	235	.501	.501	109	103	Hyd.	Hyd.	1
2000-5700 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.												
668061-09	CL668061-09	289	297	235	243	.501	.480	109	103	Hyd.	Hyd.	1
2200-5900 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.												
668101-09	CL668101-09	297	305	243	251	.512	.528	109	103	Hyd.	Hyd.	1
2600-6200 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												



HOLDEN V8 • 252-308 1970-1988

Hydraulic Flat Tappet Camshafts

Firing Order: 1•2•7•8•4•5•6•3

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes	
		IN	EX	IN	EX	IN	EX			IN	EX		
660931-10	CL660931-10	267	267	213	213	.480	.480	110	106	Hyd.	Hyd.	1	
2000-4800 Smooth idle, Street Performance, Towing, fuel economy.													
661211-12	CL661211-12	269	275	215	221	.485	.475	112	108	Hyd.	Hyd.	1	
2000-5000 Strong low & mid-range torque & horsepower.													
660991-08	CL660991-08	275	275	221	221	.501	.501	108	104	Hyd.	Hyd.	1	
2200-5600 Mild idle, Good low & mid-range horsepower. 9.5:1 CR, good exhaust & intake.													
660651-10	CL660651-10	277	285	223	231	.496	.501	110	106	Hyd.	Hyd.	1	
2600-5700 Fair idle, Strong mid range & top end. 9.5-10.5:1, 2800+ stall & gears.													
660011-10	CL660011-10	279	279	225	225	.496	.496	110	106	Hyd.	Hyd.	1	
2600-5800 Fair idle, Nice single pattern cam. Hot Street/Strip performance.													
660961-10	CL660961-10	285	285	231	231	.501	.501	110	106	Hyd.	Hyd.	1	
2800-5800 Fair idle, Street/Strip, strong mid-range torque & horsepower.													
661751-08	CL661751-08	289	299	235	245	.520	.544	108	104	Hyd.	Hyd.	1	
2800-6000 Lopey idle, Serious Street/Strip. Needs 3200+ stall, header & gears.													
660971-10	CL660971-10	289	289	235	235	.501	.501	110	106	Hyd.	Hyd.	1	
3000-6100 Lopey idle, Hot Street/Strip, strong mid-range torque & horsepower. 3200+ stall.													
660841-10	CL660841-10	291	291	237	237	.520	.520	110	106	Hyd.	Hyd.	1	
3000-6400 Rough idle, Street/Strip, strong mid range & top end power. 3500+ stall, 10.0:1+ CR.													
661731-08	CL661731-08	291	297	237	243	.520	.541	108	104	Hyd.	Hyd.	1	
3000-6600 Rough idle, Hot Street/Strip. Good mid range & top end performance. 10.5:1+ CR.													
661811-08	CL661811-08	297	297	243	243	.541	.541	108	104	Hyd.	Hyd.	1	
3400-6700 Rough idle, Hot Street/Bracket, Nice upper mid range & top end.													
661951-08	CL661951-08	307	307	253	253	.565	.565	108	104	Hyd.	Hyd.	1	
3600-6800 Rough idle, Hot Street/Strip, great mid range to top end performance. 11.0:1+ CR, 3500+.													
669991	NA	Custom Grind Camshaft									Hyd.	Hyd.	1
Hydraulic Flat Tappet Special Order Camshaft.													

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

Some items are not legal for sale or use on any pollution controlled motor vehicle



HOLDEN V8 • 252-308 1970-1988

Rattler Cams™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90090	NA	95028	NA	NA	NA
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90090	NA	95028	NA	NA	NA
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90090	NA	95028	NA	NA	NA

HOLDEN V8 • 252-308 1970-1988

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90090	NA	95028	NA	NA	NA
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90090	NA	95028	NA	NA	NA
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90090	NA	95028	NA	NA	NA
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90090	NA	95028	NA	NA	NA
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90090	NA	95028	NA	NA	NA
91111 ³ 91112	NA	98212-K11 98438-K12 ¹⁰	98212 98438 ²⁵	97112 97128 ¹⁰	97214 97216 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90090	NA	95028	NA	NA	NA
91111 ³ 91112	NA	98212-K11 98438-K12 ¹⁰	98212 98438 ²⁵	97112 97128 ¹⁰	97214 97216 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90090	NA	95028	NA	NA	NA
91111 ³ 91112	NA	98438-K12 ¹⁰	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90090	NA	95028	NA	NA	NA
91111 ³ 91112	NA	98438-K12 ¹⁰	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90090	NA	95028	NA	NA	NA
91111 91112	NA	--	--	--	--	--	--	--	NA	--	NA	NA	NA

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



HOLDEN V8 • 252-308 1970-1988

Mechanical Flat Tappet Camshafts

Firing Order: 1•2•7•8•4•5•6•3

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
661442-10	CL661442-10	272	280	236	244	.512	.512	110	106	.022	.022	1
		<i>2600-5600 Mild lopey idle, Street Performance, broad mid range power band. 3200+ stall, 9.5:1 CR.</i>										
660102-09	CL660102-09	275	281	240	246	.539	.549	109	105	.022	.022	1
		<i>2800-5800 Hot Street/Bracket. Needs 10.0+ CR, 3200+ stall & gears.</i>										
662352-08	CL662352-08	281	287	246	252	.555	.565	108	104	.022	.022	1
		<i>3200-6100 Hot Street/Bracket, good mid-range performance.</i>										
660822-06	CL660822-06	287	295	252	260	.581	.592	106	102	.022	.022	1
		<i>3400-6500 Rough idle, Pro Street/Strip. Great mid range torque & power. 10.0:1+ CR.</i>										
660822-08	CL660822-08	287	295	252	260	.581	.592	108	104	.022	.022	1
		<i>3400-6600 Rough idle, Street/Strip, good mid range with strong top end performance. 10.0:1+ CR.</i>										
661772-06	CL661772-06	295	301	260	266	.603	.592	106	102	.022	.022	1
		<i>3800-7000 Pro Street/Serious Competition. Great mid range to top end power.</i>										
661772-08	CL661772-08	295	301	260	266	.603	.592	108	104	.022	.022	1
		<i>3800-7000 Pro Street/Competition. Good mid & upper end performance. 4000+ stall.</i>										
669992	NA	Custom Grind Camshaft										1
		<i>Mechanical Flat Tappet Special Order Camshaft.</i>										



HOLDEN V8 PFI • 304-345 1988-1997 NON ROLLER CAM ENGINES

Rattler Cams™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•2•7•8•4•5•6•3

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
678021-09	CL678021-09	281	289	227	235	.501	.501	109	103	Hyd.	Hyd.	1
		<i>2000-5700 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.</i>										
678061-09	CL678061-09	289	297	235	243	.501	.480	109	103	Hyd.	Hyd.	1
		<i>2200-5900 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.</i>										
678101-09	CL678101-09	297	305	243	251	.512	.528	109	103	Hyd.	Hyd.	1
		<i>2600-6200 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.</i>										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



HOLDEN V8 • 252-308 1970-1988

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91615 ³	NA	98445-K12 ¹⁰	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹	93316 ²⁵	90090	NA	95028	NA	NA	NA
91615 ³	NA	98445-K12 ¹⁰	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹	93316 ²⁵	90090	NA	95028	NA	NA	NA
91615 ³	NA	98445-K12 ¹⁰	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹	93316 ²⁵	90090	NA	95028	NA	NA	NA
91615 ³	NA	98445-K12 ¹⁰	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹	93316 ²⁵	90090	NA	95028	NA	NA	NA
91615 ³	NA	98445-K12 ¹⁰	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹	93316 ²⁵	90090	NA	95028	NA	NA	NA
91615 ³	NA	98445-K12 ¹⁰	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹	93316 ²⁵	90090	NA	95028	NA	NA	NA
91615 ³	NA	98445-K12 ¹⁰	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹	93316 ²⁵	90090	NA	95028	NA	NA	NA
91615	NA	--	--	--	--	--	--	--	NA	--	NA	NA	NA

HOLDEN V8 PFI • 304-345 1988-1997 NON ROLLER CAM ENGINES

Rattler Cams™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90090	NA	95028	NA	NA	NA
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90090	NA	95028	NA	NA	NA
91111 ³ 91112	NA	98212-K11 98438-K12 ¹⁰	98212 98438 ²⁵	97112 97128 ¹⁰	97214 97216 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90090	NA	95028	NA	NA	NA

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



HOLDEN V8 PFI • 304-345 1988-1997 NON ROLLER CAM ENGINES

Hydraulic Flat Tappet Camshafts

Firing Order: 1•2•7•8•4•5•6•3

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
672011-12	CL672011-12	261	261	207	207	.448	.448	112	108	Hyd.	Hyd.	1
		<i>1200-4200 Smooth idle, Street, Off-Road, Towing. Good torque.</i>										
670931-10	CL670931-10	267	267	213	213	.480	.480	110	106	Hyd.	Hyd.	1
		<i>1600-4600 Slight idle, Street Performance, Towing, fuel economy. Excellent low to mid range.</i>										
672301-12	CL672301-12	267	277	213	223	.480	.480	112	108	Hyd.	Hyd.	1
		<i>1600-4600 Good idle, strong low & mid-range torque & horsepower.</i>										
671581-12	CL671581-12	277	289	223	235	.496	.501	112	108	Hyd.	Hyd.	1
		<i>2400-4800 Fair idle, Hot Street & Mild Bracket Racing. Good mid range performance.</i>										
670011-10	CL670011-10	279	279	225	225	.496	.496	110	106	Hyd.	Hyd.	1
		<i>2400-5000 Single pattern cam for EFI applications. Hot Street/Strip performance.</i>										
670961-10	CL670961-10	285	285	231	231	.512	.512	110	106	Hyd.	Hyd.	1
		<i>2600-5400 Fair idle, Street/Strip, strong mid-range torque & horsepower. 9.5-10.5:1 CR, 3000+ stall.</i>										
670971-10	CL670971-10	289	289	235	235	.501	.501	110	106	Hyd.	Hyd.	1
		<i>3000-6000 Rough idle, Hot Street/Strip, strong mid-range torque & horsepower. 3200+ stall.</i>										
671161-08	CL671161-08	289	299	235	245	.520	.520	108	104	Hyd.	Hyd.	1
		<i>2800-5600 Lopey idle, Serious Street/Strip. Needs 3200+ stall, header & gears.</i>										
679991	NA	Custom Grind Camshaft								Hyd.	Hyd.	1
		<i>Hydraulic Flat Tappet Special Order Camshaft.</i>										



HOLDEN V8 PFI • 304-345 1988-1997 NON ROLLER CAM ENGINES

Rattler Cams™ Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•2•7•8•4•5•6•3

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
678005-09	CL678005-09	280	288	227	235	.560	.565	109	103	Hyd.	Hyd.	1
		<i>1800-5200 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.</i>										
678045-09	CL678045-09	288	296	235	243	.565	.565	109	103	Hyd.	Hyd.	1
		<i>2000-5400 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.</i>										
678085-09	CL678085-09	296	304	243	251	.565	.549	109	103	Hyd.	Hyd.	1
		<i>2400-5600 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.</i>										



HOLDEN V8 PFI • 304-345 1988-1997 NON ROLLER CAM ENGINES

Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•2•7•8•4•5•6•3

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
677125-10	CL677125-10	266	272	213	219	.480	.480	110	106	Hyd.	Hyd.	1
		<i>1400-5200 Fair idle, Mild Street performance, strong low end torque.</i>										
677125-12	CL677125-12	266	272	213	219	.480	.480	110	106	Hyd.	Hyd.	1
		<i>1400-5200 Fair idle, Mild Street performance, strong low end torque.</i>										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



HOLDEN V8 PFI - 304-345 1988-1997 NON ROLLER CAM ENGINES

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90090	NA	95028	NA	NA	NA
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90090	NA	95028	NA	NA	NA
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90090	NA	95028	NA	NA	NA
91111 ³ 91112	NA	98212-K11 98212-K12 ¹⁰	98212	97112 97132 ¹⁰	97214 97165 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90090	NA	95028	NA	NA	NA
91111 ³ 91112	NA	98212-K11 98438-K12 ¹⁰	98212 98438 ²⁵	97112 97128 ¹⁰	97214 97216 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90090	NA	95028	NA	NA	NA
91111 ³ 91112	NA	98212-K11 98438-K12 ¹⁰	98212 98438 ²⁵	97112 97128 ¹⁰	97214 97216 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90090	NA	95028	NA	NA	NA
91111 ³ 91112	NA	98212-K11 98438-K12 ¹⁰	98212 98438 ²⁵	97112 97128 ¹⁰	97214 97216 ¹⁰	93005 93017 ¹⁰	93350 93316 ²⁵	90090	NA	95028	NA	NA	NA
91111 91112	NA	--	--	--	--	--	--	--	NA	--	NA	NA	NA

HOLDEN V8 PFI - 304-345 1988-1997 NON ROLLER CAM ENGINES

Rattler Cams™ Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91466H ³	NA	98438-K12 ¹⁰	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90090	NA	NA	NA	NA	NA
91466H ³	NA	98438-K12 ¹⁰	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90090	NA	NA	NA	NA	NA
91466H ³	NA	98438-K12 ¹⁰	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90090	NA	NA	NA	NA	NA

HOLDEN V8 PFI - 304-345 1988-1997 NON ROLLER CAM ENGINES

Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91466H ³	NA	98438-K12 ¹⁰	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90090	NA	NA	NA	NA	NA
91466H ³	NA	98438-K12 ¹⁰	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90090	NA	NA	NA	NA	NA

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



HOLDEN V8 PFI • 304-345 1988-1997 NON ROLLER CAM ENGINES

Retro-Fit Hydraulic Roller Camshafts (cont.)

Firing Order: 1•2•7•8•4•5•6•3

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
675685-12	CL675685-12	272	278	219	225	.544	.533	112	108	Hyd.	Hyd.	1
1800-5600 Fair idle, Performance Street, Strong torque curve.												
676545-14	CL676545-14	280	280	227	227	.560	.560	114	110	Hyd.	Hyd.	1
2400-6000 Fair idle, Turbocharged Performance Street, Strong torque curve.												
677625-10	CL677625-10	280	286	227	233	.560	.549	110	106	Hyd.	Hyd.	1
2800-6200 Fair idle, Hot Street, needs modified intake & exhaust. Needs 2800+ conv.												
676955-10	CL676955-10	286	290	233	237	.597	.597	110	106	Hyd.	Hyd.	1
3000-6800 Lopey idle, Hot Street, needs modified intake & exhaust. Needs 3000+ conv.												
675825-10	CL675825-10	290	296	237	245	.597	.597	110	106	Hyd.	Hyd.	1
3200-7000 Rough idle, Hot Street, needs modified intake & exhaust. Needs 3500+ conv.												
675825-12	CL675825-12	290	296	237	245	.597	.597	112	108	Hyd.	Hyd.	1
3200-7000 Lopey idle, Hot Street, needs modified intake & exhaust. Needs 3500+ conv.												
679995	NA	Custom Grind Camshaft										1
Mechanical Roller Special Order Camshaft.												



HOLDEN V8 PFI • 304-345 1988-1997 NON ROLLER CAM ENGINES

Mechanical Flat Tappet Camshafts

Firing Order: 1•2•7•8•4•5•6•3

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
670102-09	CL670102-09	275	281	240	246	.539	.549	109	105	.022	.022	1
2800-5800 Fair idle, Hot Street/Bracket. Needs 10.0:1+ CR, 3200+ stall & gears.												
671372-08	CL671372-08	283	289	248	254	.571	.587	108	104	.022	.022	1
3000-6000 Rough idle, Hot Street/Strip. Good mid range to top end. 10.0:1+ CR., 3200+ stall.												
670822-08	CL670822-08	280	288	252	260	.576	.597	108	104	.016	.016	1,34
3200-6400 Rough idle, Street/Strip, good mid range & top end. 10.0:1 CR & high stall.												
679992	NA	Custom Grind Camshaft										1
Mechanical Flat Tappet Special Order Camshaft.												



HOLDEN V8 PFI • 304-345 1988-1997 NON ROLLER CAM ENGINES

Mechanical Roller Camshafts

Firing Order: 1•2•7•8•4•5•6•3

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
679993	NA	Custom Grind Camshaft										1,5
Mechanical Roller Special Order Camshaft.												

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 5 Requires upgraded distributor gear/fuel pump pushrod.
- 34 Provisions for increased oiling recommended.

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IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



HOLDEN V8 PFI • 304-345 1988-1997 NON ROLLER CAM ENGINES

Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91466H ³	NA	98438-K12 ¹⁰	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90090	NA	NA	NA	NA	NA
91466H ³	NA	98438-K12 ¹⁰	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90090	NA	NA	NA	NA	NA
91466H ³	NA	98438-K12 ¹⁰	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90090	NA	NA	NA	NA	NA
91466H ³	NA	98438-K12 ¹⁰	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90090	NA	NA	NA	NA	NA
91466H ³	NA	98438-K12 ¹⁰	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90090	NA	NA	NA	NA	NA
91466H ³	NA	98438-K12 ¹⁰	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90090	NA	NA	NA	NA	NA
91466H	NA	--	--	--	--	--	--	--	NA	--	NA	NA	NA

HOLDEN V8 PFI • 304-345 1988-1997 NON ROLLER CAM ENGINES

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91615 ³	NA	98445-K12 ¹⁰	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹	93316 ²⁵	90090	NA	95028	NA	NA	NA
91615 ³	NA	98445-K12 ¹⁰	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹	93316 ²⁵	90090	NA	95028	NA	NA	NA
91615 ³	NA	98445-K12 ¹⁰	98445 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹	93316 ²⁵	90090	NA	95028	NA	NA	NA
91615	NA	--	--	--	--	--	--	--	NA	--	NA	NA	NA

HOLDEN V8 PFI • 304-345 1988-1997 NON ROLLER CAM ENGINES

Mechanical Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
--	NA	--	--	--	--	--	--	--	NA	--	NA	NA	NA

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



OLDSMOBILE 39° V8 • 260-455 1967-1990

Max Certified™ Hydraulic Flat Tappet Cam & Lifter Sets - 5 Year No Fault Warranty (see page 3 for details)

Cam & Lifter Set Part No.	Cam & Direct Lube Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
MC510931-11	NA	267	267	213	213	.480	.480	111	107	Hyd.	Hyd.	1
<i>1200-5500 Good low end & mid-range. Will work well in jet boats.</i>												
MC510991-08	NA	275	275	221	221	.501	.501	108	104	Hyd.	Hyd.	1
<i>1500-5800 Good low & mid-range horsepower. Needs 4 barrel & headers.</i>												



OLDSMOBILE 39° V8 • 260-455 1967-1990

American Muscle™ Hydraulic Flat Tappet Camshafts Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
517771-09	CL517771-09	250	256	187	200	.400	.400	109	106	Hyd.	Hyd.	1
<i>800-4200 Near duplicate of the Olds 310HP/350 cam (GM #400084).</i>												
517441-10	CL517441-10	272	294	196	208	.413	.414	110	111	Hyd.	Hyd.	1
<i>1000-4400 Near duplicate of the Hurst/Olds 375HP/455 cam (GM #400117).</i>												
517241-13	CL517241-13	308	308	232	232	.474	.474	113	112	Hyd.	Hyd.	1
<i>2400-6000 Near duplicate of the Olds W-31 325HP/350 cam (GM #402194).</i>												



OLDSMOBILE 39° V8 • 260-455 1967-1990

Street Force™ Hydraulic Flat Tappet Camshafts Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
510011-12	CL510011-12	259	269	205	215	.448	.475	112	108	Hyd.	Hyd.	1
<i>800-4800 Street Force™ 1, Good idle, Mild Street performance, strong low end torque.</i>												
510021-12	CL510021-12	267	277	213	223	.480	.480	112	108	Hyd.	Hyd.	1
<i>1200-5800 Street Force™ 2, Good idle & throttle response. Needs 4 barrel & good exhaust.</i>												
512121-12	CL512121-12	279	289	225	235	.496	.501	112	108	Hyd.	Hyd.	1
<i>1800-6000 Street Force™ 3, Noticeable idle, Hot Street & mild Bracket Racing.</i>												
510041-12	CL510041-12	289	299	235	245	.520	.544	112	108	Hyd.	Hyd.	1
<i>2400-6400 Street Force™ 4, Lopey idle, good mid-range power. Needs 2800+ stall.</i>												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

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IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



OLDSMOBILE 39° V8 • 260-455 1967-1990

Max Certified™ Hydraulic Flat Tappet Cam & Lifter Set Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91411 ³	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA
91411 ³	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA

OLDSMOBILE 39° V8 • 260-455 1967-1990

American Muscle™ Hydraulic Flat Tappet Cam & Lifter Set Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91411 ³	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA
91411 ³	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA
91411 ³	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA

OLDSMOBILE 39° V8 • 260-455 1967-1990

Street Force™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91411 ³	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA
91411 ³	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA
91411 ³	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA
91411 ³	NA	98436-K11 ²⁵	98436 ²⁵	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



OLDSMOBILE 39° V8 • 260-455 1967-1990

Rattler Cams™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
518021-09	CL518021-09	281	289	227	235	.501	.501	109	103	Hyd.	Hyd.	1
<i>1800-5200 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.</i>												
518061-09	CL518061-09	289	297	235	243	.501	.480	109	103	Hyd.	Hyd.	1
<i>2000-5400 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.</i>												
518101-09	CL518101-09	297	305	243	251	.512	.528	109	103	Hyd.	Hyd.	1
<i>2400-5600 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.</i>												



OLDSMOBILE 39° V8 • 260-455 1967-1990

Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
510931-11	CL510931-11	267	267	213	213	.480	.480	111	107	Hyd.	Hyd.	1
<i>1200-5500 Good low end & mid-range. Will work well in jet boats.</i>												
510991-08	CL510991-08	275	275	221	221	.501	.501	108	104	Hyd.	Hyd.	1
<i>1500-5800 Good low & mid-range horsepower. Needs 4 barrel & headers.</i>												
511431-10	CL511431-10	281	287	227	233	.512	.512	110	106	Hyd.	Hyd.	1
<i>2400-6000 Lopey idle, Strong mid range. Good throttle response. 2400+ stall.</i>												
511431-12	CL511431-12	281	287	227	233	.512	.512	112	108	Hyd.	Hyd.	1
<i>2400-6200 Fair idle, Street/Strip, broad mid range power. Needs 4 barrel & headers.</i>												
510041-10	CL510041-10	289	299	235	245	.520	.544	110	106	Hyd.	Hyd.	1
<i>2600-6400 Lopey idle, Street/Strip or nostalgia. Likes headers & gears.</i>												
511251-08	CL511251-08	299	307	245	253	.544	.560	108	104	Hyd.	Hyd.	1
<i>3200-6800 Pro Street/Brackets, Strong mid & upper end power. 10.0:1+ CR.</i>												
519991	NA	Custom Grind Camshaft								Hyd.	Hyd.	1
<i>Hydraulic Flat Tappet Special Order Camshaft.</i>												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



OLDSMOBILE 39° V8 - 260-455 1967-1990

Rattler Cams™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91411 ³	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA
91411 ³	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA
91411 ³	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA

OLDSMOBILE 39° V8 - 260-455 1967-1990

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91411 ³	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA
91411 ³	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA
91411 ³	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA
91411 ³	NA	98412-K11	98412	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA
91411 ³	NA	-- 98438-K12 ²⁵	98438 ²⁵	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA
91411	NA	--	--	--	--	--	--	NA	NA	--	NA	NA	NA

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



OLDSMOBILE 39° V8 • 260-455 1967-1990

Rattler Cams™ Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•8•7•3•6•5•4•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
518005-09	CL518005-09	280	288	227	235	.560	.565	109	103	Hyd.	Hyd.	1,22
1800-5200 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.												
518045-09	CL518045-09	288	296	235	243	.565	.565	109	103	Hyd.	Hyd.	1,22
2000-5400 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.												
518085-09	CL518085-09	296	304	243	251	.565	.549	109	103	Hyd.	Hyd.	1,22
2400-5600 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												



OLDSMOBILE 39° V8 • 260-455 1967-1990

4/7 Swap Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•8•7•3•6•5•4•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
514245-10	CL514245-10	272	282	219	229	.523	.512	110	106	Hyd.	Hyd.	1,22
1600-5400 Good idle, Street, broad low to mid range performance.												
514825-10	CL514825-10	278	282	225	229	.560	.555	110	106	Hyd.	Hyd.	1,22
1800-5600 Fair idle, Performance Street, broad usable power range.												
514155-10	CL514155-10	286	286	233	233	.549	.549	110	106	Hyd.	Hyd.	1,22
2000-5800 Choppy idle, strong low & mid range performance. 2500+ stall.												
514635-10	CL514635-10	288	294	235	241	.581	.581	110	106	Hyd.	Hyd.	1,22
2200-6600 Rough idle, strong mid-range torque & horsepower.												
519995	NA	Custom Grind Camshaft								Hyd.	Hyd.	1,22
Retro-Fit Hydraulic Roller Special Order Camshaft.												



OLDSMOBILE 39° V8 • 260-455 1967-1990

Mechanical Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.60 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
519992	NA	Custom Grind Camshaft										1
Mechanical Flat Tappet Special Order Camshaft.												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

22 Ignition firing order must be changed to 1-8-7-3-6-5-4-2.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



OLDSMOBILE 39° V8 • 260-455 1967-1990

Rattler Cams™ Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91464 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA
91464 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA
91464 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA

OLDSMOBILE 39° V8 • 260-455 1967-1990

4/7 Swap Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91464 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA
91464 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA
91464 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA
91464 ³	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	NA
91464	NA	--	--	--	--	--	--	NA	NA	--	NA	NA	NA

OLDSMOBILE 39° V8 • 260-455 1967-1990

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91415 91418	NA	--	--	--	--	--	--	NA	NA	--	NA	NA	NA

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



PONTIAC V8 • 265-455 1955-1981

Max Certified™ Hydraulic Flat Tappet Cam & Lifter Sets - 5 Year No Fault Warranty (see page 3 for details)

Cam & Lifter Set Part No.	Cam & Direct Lube Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
MC410931-11	NA	267	267	213	213	.450	.450	111	107	Hyd.	Hyd.	1
		<i>1500-5500 Good idle, Strong low & mid-range torque.</i>										
MC410021-12	NA	267	277	213	223	.450	.450	112	108	Hyd.	Hyd.	1
		<i>1500-5800 Super low & mid-range torque. Excellent driveability.</i>										
MC410961-08	NA	285	285	231	231	.480	.480	108	104	Hyd.	Hyd.	1
		<i>2200-6200 Hot Street, improved mid-range. Best with 9.5:1+ comp., 4-barrel.</i>										



PONTIAC V8 • 265-455 1955-1981

American Muscle™ Hydraulic Flat Tappet Camshafts Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
417561-11	CL417561-11	273	282	198	207	.405	.410	111	106	Hyd.	Hyd.	1
		<i>1600-5000 Near duplicate of the Pontiac 325HP/389 cam (GM #9779066).</i>										
417701-11	CL417701-11	271	280	198	208	.404	.408	111	98	Hyd.	Hyd.	1
		<i>1600-5000 Near duplicate of the Pontiac Ram Air I/II 375HP/400 cam (GM #9779067).</i>										
417131-11	CL417131-11	273	282	200	210	.407	.411	111	106	Hyd.	Hyd.	1
		<i>1700-5200 Near duplicate of the Pontiac Tri-Power 318HP/389 cam (GM #529472).</i>										
417591-15	CL417591-15	288	302	212	225	.408	.408	115	113	Hyd.	Hyd.	1
		<i>1800-5200 Near duplicate of the Pontiac 390HP/428 cam (GM #9779068).</i>										
417251-15	CL417251-15	301	313	224	236	.407	.407	115	112	Hyd.	Hyd.	1
		<i>1800-5400 Near duplicate of the Pontiac Ram Air III 366HP/400 cam (GM #9785744).</i>										



PONTIAC V8 • 265-455 1955-1981

Street Force™ Hydraulic Flat Tappet Camshafts Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
410011-12	CL410011-12	259	269	205	215	.420	.445	112	108	Hyd.	Hyd.	1
		<i>800-4800 Street Force™ 1, Good idle, Mild Street performance, strong low end torque.</i>										
410021-12	CL410021-12	267	277	213	223	.450	.450	112	108	Hyd.	Hyd.	1
		<i>1500-5800 Street Force™ 2, Good idle & throttle response. Needs 4 barrel & good exhaust.</i>										
410141-12	CL410141-12	279	289	225	235	.490	.488	112	108	Hyd.	Hyd.	1
		<i>1800-6000 Street Force™ 3, Noticeable idle, Hot Street & mild Bracket Racing.</i>										

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



PONTIAC V8 • 265-455 1955-1981

Max Certified™ Hydraulic Flat Tappet Cam & Lifter Set Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91411 ³	NA	98412-K11 ²⁵	98412 ²⁵	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	94345
91411 ³	NA	98412-K11 ²⁵	98412 ²⁵	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	94345
91411 ³	NA	98412-K11 ²⁵	98412 ²⁵	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	94345

PONTIAC V8 • 265-455 1955-1981

American Muscle™ Hydraulic Flat Tappet Cam & Lifter Set Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91411 ³	NA	98412-K11 ²⁵	98412 ²⁵	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	94345
91411 ³	NA	98412-K11 ²⁵	98412 ²⁵	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	94345
91411 ³	NA	98412-K11 ²⁵	98412 ²⁵	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	94345
91411 ³	NA	98412-K11 ²⁵	98412 ²⁵	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	94345
91411 ³	NA	98412-K11 ²⁵	98412 ²⁵	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	94345

PONTIAC V8 • 265-455 1955-1981

Street Force™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91411 ³	NA	98412-K11 ²⁵	98412 ²⁵	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	94345
91411 ³	NA	98412-K11 ²⁵	98412 ²⁵	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	94345
91411 ³	NA	98412-K11 ²⁵	98412 ²⁵	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	94345

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



PONTIAC V8 • 265-455 1955-1981

Rattler Cams™ Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
418001-09	CL418001-09	281	289	227	235	.480	.488	109	103	Hyd.	Hyd.	1
<i>1800-5200 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.</i>												
418041-09	CL418041-09	289	297	235	243	.488	.480	109	103	Hyd.	Hyd.	1
<i>2000-5400 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.</i>												
418081-09	CL418081-09	297	305	243	251	.507	.495	109	103	Hyd.	Hyd.	1
<i>2400-5600 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.</i>												



PONTIAC V8 • 265-455 1955-1981

Hydraulic Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
410931-11	CL410931-11	267	267	213	213	.450	.450	111	107	Hyd.	Hyd.	1
<i>1500-5500 Good idle, Strong low & mid-range torque.</i>												
411421-08	CL411421-08	275	275	221	221	.470	.470	108	104	Hyd.	Hyd.	1
<i>1800-5800 Fair idle, Street performance, good low end & mid range torque.</i>												
410991-10	CL410991-10	277	277	223	223	.465	.465	110	106	Hyd.	Hyd.	1
<i>2000-6000 Nice single pattern cam for Hot Street/Strip performance.</i>												
411161-10	CL411161-10	277	289	223	235	.465	.470	110	106	Hyd.	Hyd.	1
<i>2000-6000 Mild rough idle, Street/Strip, Strong mid range performance.</i>												
410961-08	CL410961-08	285	285	231	231	.480	.480	108	104	Hyd.	Hyd.	1
<i>2200-6200 Hot Street, improved mid-range. Best with 9.5:1+ comp., 4-barrel.</i>												
410961-10	CL410961-10	285	285	231	231	.480	.480	110	106	Hyd.	Hyd.	1
<i>2400-6200 Exceptional mid-range & top end with 389 or larger.</i>												
410051-08	CL410051-08	285	295	231	241	.480	.470	108	104	Hyd.	Hyd.	1
<i>2400-6000 Lopey idle, Hot Street/Brackets, very strong mid range. 2500+ stall, 9.0:1 CR.</i>												
410051-14	CL410051-14	285	295	231	241	.480	.470	114	110	Hyd.	Hyd.	1
<i>2600-6400 Excellent RAM Air IV replacement. Will work well with NOS.</i>												
410361-08	CL410361-08	289	294	235	241	.488	.503	108	104	Hyd.	Hyd.	1
<i>2700-6500 Rough idle, Street/Strip. Needs 9.0:1+ CR, 2500+ stall, good intake, gears & headers.</i>												
411391-08	CL411391-08	294	301	241	247	.503	.510	108	104	Hyd.	Hyd.	1
<i>3000-6800 Rough idle, Hot Street/Bracket, Nice upper mid range & top end.</i>												
419991	NA	Custom Grind Camshaft								Hyd.	Hyd.	1
<i>Hydraulic Flat Tappet Special Order Camshaft.</i>												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

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IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



PONTIAC V8 • 265-455 1955-1981

Rattler Cams™ Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91411 ³	NA	98412-K11 ²⁵	98412 ²⁵	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	94345
91411 ³	NA	98412-K11 ²⁵	98412 ²⁵	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	94345
91411 ³	NA	98412-K11 ²⁵	98412 ²⁵	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	94345

PONTIAC V8 • 265-455 1955-1981

Hydraulic Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91411 ³	NA	98412-K11 ²⁵	98412 ²⁵	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	94345
91411 ³	NA	98412-K11 ²⁵	98412 ²⁵	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	94345
91411 ³	NA	98412-K11 ²⁵	98412 ²⁵	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	94345
91411 ³	NA	98412-K11 ²⁵	98412 ²⁵	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	94345
91411 ³	NA	98412-K11 ²⁵	98412 ²⁵	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	94345
91411 ³	NA	98412-K11 ²⁵	98412 ²⁵	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	94345
91411 ³	NA	98412-K11 ²⁵	98412 ²⁵	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	94345
91411 ³	NA	98412-K11 ²⁵	98412 ²⁵	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	94345
91411 ³	NA	98412-K11 ²⁵	98412 ²⁵	97118	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	NA	NA	NA	NA	NA	94345
91411	NA	--	--	--	--	--	--	NA	NA	--	NA	NA	94345

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



PONTIAC V8 • 265-455 1955-1981



Rattler Cams™ Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•8•7•3•6•5•4•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
418005-09	CL418005-09	280	288	227	235	.525	.530	109	103	Hyd.	Hyd.	1
1800-5200 Rattler™, Choppy idle. High Performance Street, stock converter ok, best with 1800+ and gears.												
418045-09	CL418045-09	288	296	235	243	.530	.530	109	103	Hyd.	Hyd.	1
2000-5400 Big Mama Rattler™, Lopey idle. Street or Street/Strip. Needs 9.0:1 compression, 2500+ stall.												
418085-09	CL418085-09	296	304	243	251	.530	.515	109	103	Hyd.	Hyd.	1
2400-5600 Big Daddy Rattler™, Rough idle. Pro Street or Street/Strip. Needs 9.5:1 compression, 2800+.												



PONTIAC V8 • 265-455 1955-1981

4/7 Swap Retro-Fit Hydraulic Roller Camshafts

Firing Order: 1•8•7•3•6•5•4•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
414645-10	CL414645-10	266	274	213	221	.485	.475	110	106	Hyd.	Hyd.	1,22
1400-5600 Noticeable idle, broad low to mid range power band. Needs 2000+ stall.												
414145-10	CL414145-10	272	282	219	229	.525	.520	110	106	Hyd.	Hyd.	1,22
1800-6000 Mild idle, Street Performance, good low to mid range torque & power.												
414145-12	CL414145-12	272	282	219	229	.525	.520	112	108	Hyd.	Hyd.	1,22
1800-6000 Good idle, Street Performance, good low to mid range torque & power.												
414345-10	CL414345-10	280	290	227	237	.560	.560	110	106	Hyd.	Hyd.	1,22
2000-6200 Fair idle, Saturday nite special, Street/Strip. Needs good intake, headers & 2500+.												
414495-08	CL414495-08	290	296	237	243	.560	.565	108	104	Hyd.	Hyd.	1,22
2500-6500 Choppy idle, great mid range performance. 10.0:1+ CR, 2600+ stall & 3.73 or lower gears.												
414495-10	CL414495-10	290	296	237	243	.560	.565	110	106	Hyd.	Hyd.	1,22
2500-6500 Fair idle, great mid range performance. 10.0:1+ CR, 2600+ stall & 3.73 or lower gears.												
414495-12	CL414495-12	290	296	237	243	.560	.565	112	108	Hyd.	Hyd.	1,22
2500-6500 Fair idle, great mid range performance. 10.0:1+ CR, 2600+ stall & 3.73 or lower gears.												
414655-08	CL414655-08	296	302	243	249	.600	.600	108	104	Hyd.	Hyd.	1,22
3000-6800 Rough idle, Hot Street/Strip, good mid range torque & power.												
414455-08	CL414455-08	306	312	253	259	.600	.600	108	104	Hyd.	Hyd.	1,22
3200-7000 Hot Street/Bracket, major mid range & top end performance. 11.0:1+ CR, 3500+ stall.												
419995	NA	Custom Grind Camshaft								Hyd.	Hyd.	1,22
Retro-Fit Hydraulic Roller Special Order Camshaft.												

Cam Notes: master note list on page 260

1 Stock (O.E.) valve springs cannot be used.

22 Ignition firing order must be changed to 1-8-7-3-6-5-4-2.

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IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



PONTIAC V8 • 265-455 1955-1981

Rattler Cams™ Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91466 ³	NA	-- 98438-K12 ²⁵	98438 ²⁵	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90090	NA	NA	NA	NA	94345
91466 ³	NA	-- 98438-K12 ²⁵	98438 ²⁵	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90090	NA	NA	NA	NA	94345
91466 ³	NA	-- 98438-K12 ²⁵	98438 ²⁵	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90090	NA	NA	NA	NA	94345

PONTIAC V8 • 265-455 1955-1981

Rattler Cams™ Retro-Fit Hydraulic Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91466 ³	NA	-- 98438-K12 ²⁵	98438 ²⁵	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90090	NA	NA	NA	NA	94345
91466 ³	NA	-- 98438-K12 ²⁵	98438 ²⁵	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90090	NA	NA	NA	NA	94345
91466 ³	NA	-- 98438-K12 ²⁵	98438 ²⁵	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90090	NA	NA	NA	NA	94345
91466 ³	NA	-- 98438-K12 ²⁵	98438 ²⁵	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90090	NA	NA	NA	NA	94345
91466 ³	NA	-- 98438-K12 ²⁵	98438 ²⁵	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90090	NA	NA	NA	NA	94345
91466 ³	NA	-- 98438-K12 ²⁵	98438 ²⁵	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90090	NA	NA	NA	NA	94345
91466 ³	NA	-- 98438-K12 ²⁵	98438 ²⁵	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90090	NA	NA	NA	NA	94345
91466 ³	NA	-- 98438-K12 ²⁵	98438 ²⁵	97118 97128 ¹⁰	-- 97216 ¹⁰	93005 93017 ¹⁰	93316 ²⁵	90090	NA	NA	NA	NA	94345
91466	NA	--	--	--	--	--	--	--	NA	--	NA	NA	94345

Components Notes: master note list on page 260

³ Included in Cam & Lifter Sets.

¹⁰ 10° Valve lock Angle, must use matching retainers/locks.

²⁵ Machining Required.

CAMSHAFTS



PONTIAC V8 • 265-455 1955-1981

Mechanical Flat Tappet Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
411742-06	CL411742-06 CL411742-06DL ⁴	283	289	248	254	.535	.550	106	102	.022	.022	1
		<i>2500-6500 Street/Strip, powerful through entire rpm range.</i>										
410202-08	CL410202-08 CL410202-08DL ⁴	295	299	260	264	.565	.555	108	104	.022	.022	1
		<i>3000-6800 Hot Pro-Street & Bracket Racing. Great mid-range & top end performer.</i>										
419992	NA	Custom Grind Camshaft										1
		<i>Mechanical Flat Tappet Special Order Camshaft.</i>										

CAMSHAFTS



PONTIAC V8 • 265-455 1955-1981

Mechanical Roller Camshafts

Firing Order: 1•8•4•3•6•5•7•2

Cam Part No.	Cam & Lifter Set Part No.	Duration Advertised		Duration @ .050"		Valve Lift w/1.50 Rockers		Lobe Separation Angle	Intake Centerline	Valve Lash		Cam Notes
		IN	EX	IN	EX	IN	EX			IN	EX	
411123-08	NA	293	301	261	269	.620	.620	108	104	.022	.022	1,5
		<i>3500-6500 400-455. Hot street & bracket race.</i>										
411133-08	NA	307	317	275	285	.630	.630	108	104	.022	.022	1,5
		<i>4000-6600 450+CID. 12:1. Good heads. Best with 1.65 rockers.</i>										
419993	NA	Custom Grind Camshaft										1,5
		<i>Mechanical Roller Special Order Camshaft.</i>										

Cam Notes: master note list on page 260

- 1 Stock (O.E.) valve springs cannot be used.
- 5 Requires upgraded distributor gear/fuel pump pushrod.

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IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



PONTIAC V8 • 265-455 1955-1981

Mechanical Flat Tappet Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91415 ³ 91418 ⁴	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90090	NA	--	NA	NA	94345
91415 ³ 91418 ⁴	NA	98438-K12 ²⁵	98438 ²⁵	97128 ¹⁰	97216 ¹⁰	93017 ¹⁰	93316 ²⁵	90090	NA	--	NA	NA	94345
91415 91418	NA	--	--	--	--	--	--	--	NA	--	NA	NA	94345

PONTIAC V8 • 265-455 1955-1981

Mechanical Roller Camshaft Components

Lifters	Rev Kit	Valve Spring, Retainer & Lock Kit	Valve Springs	Steel Retainers	Titanium Retainers	Valve Locks	Valve Seals	Rocker Arms	Stud Girdles	Pushrods	Fuel Pump Pushrod	Distributor Gear	Timing Set
91457	NA	NA	98650 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90090	NA	--	NA	94460	94345
91457	NA	NA	98650 ²⁵	97128 ¹⁰	97220 ¹⁰	93017 ¹⁰	93316 ²⁵	90090	NA	--	NA	94460	94345
--	NA	--	--	--	--	--	--	90090	NA	--	NA	94460	94345

Components Notes: master note list on page 260

- ³ Included in Cam & Lifter Sets.
- ⁴ Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.
- ¹⁰ 10° Valve lock Angle, must use matching retainers/locks.
- ²⁵ Machining Required.

CUSTOM ORDER · SPECIAL GRIND CAMSHAFTS

AMC L6

199-258/4.0L, '64-'95	Hydraulic Flat Tappet	339991
4.0L FI, '96-'06	Hydraulic Flat Tappet	329991
4.0L FI, '96-'06	Mechanical Flat Tappet	329992

AMC V8

290-401, '66-'93	Hydraulic Flat Tappet	319991
290-401, '66-'93	Mechanical Flat Tappet	319992

BUICK V6

181-252 Even Fire, '77-'89	Hydraulic Flat Tappet	569991
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BUICK/OLDS Aluminum V8

Buick/Olds 215, 300, 340, '61-'67	Hydraulic Flat Tappet	539991
Buick/Olds 215, 300, 340, '61-'67	Mechanical Flat Tappet	539992

BUICK V8

350, '68-'80	Hydraulic Flat Tappet	549991
350, '68-'80	Mechanical Flat Tappet	549992
400, 430, 455, '67-'76	Hydraulic Flat Tappet	559991
400, 430, 455, '67-'76	Mechanical Flat Tappet	559992

CADILLAC V8

365-390, '56-'62	Hydraulic Flat Tappet	529996
390-429, '63-'67	Hydraulic Flat Tappet	529998
366, 425, 472, 500, '68-'84	Hydraulic Flat Tappet	529991
366, 425, 472, 500, '68-'84	Hydraulic Roller	529995
366, 425, 472, 500, '68-'84	Mechanical Flat Tappet	529992

CHEVROLET Straight 6

194, 230, 250, '62-'84	Hydraulic Flat Tappet	169991
194, 230, 250, '62-'84	Mechanical Flat Tappet	169992
216, 235, 261, '57-'63	Hydraulic Flat Tappet	179991
216, 235, 261, '57-'63	Mechanical Flat Tappet	179992
292 '63-'90	Hydraulic Flat Tappet	159991
292 '63-'90	Mechanical Flat Tappet	159992

CHEVROLET V6

200-229, '78-'84	Hydraulic Flat Tappet	149996
2.8L/3.1L/3.4L 60°, '80-'91	Hydraulic Flat Tappet	149998

CHEVROLET SB

262-400, '57-'96 (non-OE hyd. roller)	Hydraulic Flat Tappet	119991
262-400, '57-'96 (non-OE hyd. roller)	Hydraulic Flat Tappet Small Base	119991-S
262-400, '57-'96 (non-OE hyd. roller)	Hydraulic Flat Tappet Special Core	119991-P55
262-400, '57-'96 (non-OE hyd. roller)	Hydraulic Flat Tappet 4/7 Swap	114991
262-400, '57-'96 (non-OE hyd. roller)	Hyd. Flat Tappet 4/7 Swap Sm. Base	114991-S
262-400, '57-'96 (non-OE hyd. roller)	Hydraulic Roller	119995
262-400, '57-'96 (non-OE hyd. roller)	Hydraulic Roller Small Base	119995-S
262-400, '57-'96 (non-OE hyd. roller)	Hyd./Mech. Roller w/Cast Dist. Gear	119999
262-400, '57-'96 (non-OE hyd. roller)	Hydraulic Roller 4/7 Swap	114995
262-400, '57-'96 (non-OE hyd. roller)	Hydraulic Roller 4/7 Swap Sm. Base	114995-S
262-400, '57-'96 (non-OE hyd. roller)	Hydraulic Roller LS (C) Firing Order	114998

CHEVROLET SB (continued)

262-400, '57-'96 (non-OE hyd. roller)	Hyd. Roller LS (C) Firing Order Sm. Base	114998-S
262-400, '57-'96 (non-OE hyd. roller)	Mechanical Flat Tappet	119992
262-400, '57-'96 (non-OE hyd. roller)	Mechanical Flat Tappet Small Base	119992-S
262-400, '57-'96 (non-OE hyd. roller)	Mech. Flat Tappet Special Core	119992-P55
262-400, '57-'96 (non-OE hyd. roller)	Mechanical Flat Tappet 4/7 Swap	119996
262-400, '57-'96 (non-OE hyd. roller)	Mech. Flat Tappet 4/7 Swap Sm. Base	119996-S
262-400, '57-'96 (non-OE hyd. roller)	Mechanical Roller	119993
262-400, '57-'96 (non-OE hyd. roller)	Mechanical Roller Small Base	119993-S
262-400, '57-'96 (non-OE hyd. roller)	Mechanical Roller 8620 1 pc Core	119990
262-400, '57-'96 (non-OE hyd. roller)	Mechanical Roller w/Rear Drive	119993-RD
262-400, '57-'96 (non-OE hyd. roller)	Mechanical Roller 4/7 Swap	119994
262-400, '57-'96 (non-OE hyd. roller)	Mech. Roller 4/7 Swap Sm. Base	119994-S
262-400, '57-'96 (non-OE hyd. roller)	Mechanical Roller 50-55mm Bearing	119997
262-400, '57-'96 (non-OE hyd. roller)	Mech. Roller 50-55mm, LS (C) Firing Order	118997
305-350, '87-'99 (OE hyd. roller)	Hydraulic Roller	189995
305-350, '87-'99 (OE hyd. roller)	Hydraulic Roller Small Base	189995-S
05-350, '87-'99 (OE hyd. roller)	Hyd./Mech. Roller w/Cast Dist. Gear	119999

CHEVROLET GEN III/IV (LS-Series) 3-Bolt

4.8/5.3/5.7/6.0/6.2/7.0L, '97-Present	Hydraulic Roller	199995
4.8/5.3/5.7/6.0/6.2/7.0L, '97-Present	Mechanical Roller	199993

CHEVROLET GEN IV (LS-Series) Single-Bolt w/o VVT

4.8/5.3/6.0/6.2L, '05-Present	Hydraulic Roller	199996
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CHEVROLET BB

396-502, '67-'95 (non-OE hyd. roller)	Hydraulic Flat Tappet	129991
396-502, '67-'95 (non-OE hyd. roller)	Hydraulic Roller	129995
396-502, '67-'95 (non-OE hyd. roller)	Hyd./Mech. Roller w/Cast Dist. Gear	129999
396-502, '67-'95 (non-OE hyd. roller)	Hydraulic Roller 4/7 Swap	124995
396-502, '67-'95 (non-OE hyd. roller)	Hydraulic Roller (C) Firing Order	124998
396-502, '67-'95 (non-OE hyd. roller)	Mechanical Flat Tappet	129992
396-502, '67-'95 (non-OE hyd. roller)	Mechanical Flat Tappet 4/7 Swap	129997
396-502, '67-'95 (non-OE hyd. roller)	Mechanical Roller	129993
396-502, '67-'95 (non-OE hyd. roller)	Mechanical Roller 8620 1 pc Core	129990
396-502, '67-'95 (non-OE hyd. roller)	Mechanical Roller 4/7 Swap	129994
396-502, '67-'95 (non-OE hyd. roller)	Mechanical Roller 50-55mm, 4/7 Swap	129998
396-502, '67-'95 (non-OE hyd. roller)	Mech. Roller 50-55mm, LS (C) Firing Order	128997

CHEVROLET BB GEN 6

454-502, '96-'00 (OE hyd. roller)	Hydraulic Roller	129996
454-502, '96-'00 (OE hyd. roller)	Mechanical Roller	128996
8100/8.1L, '01-Present (OE hyd. roller)	Hydraulic Roller	109996

CHEVROLET W-Series 348/409

348/409, '58-'65	Hydraulic Flat Tappet	139991
348/409, '58-'65	Mechanical Flat Tappet	139992
348/409, '58-'65	Hydraulic Roller	139995
348/409, '58-'65	Mechanical Roller	139993

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CUSTOM ORDER · SPECIAL GRIND CAMSHAFTS

CHRYSLER SLANT 6

170, 198, 225, '60-'80	Hydraulic Flat Tappet	759991
170, 198, 225, '60-'80	Mechanical Flat Tappet	759992

CHRYSLER SB

273-360, '65-'95 (318 - '67-'95)	Hydraulic Flat Tappet	719991
273-360, '65-'95 (318 - '67-'95)	Hydraulic Roller	719995
273-360, '65-'95 (318 - '67-'95)	Mechanical Flat Tappet	719992
273-360, '65-'95 (318 - '67-'95)	Mechanical Roller	719993
5.2L/5.9L Magnum, '92-'03	Hydraulic Roller	779995
"R" Block	Mechanical Roller	719994

CHRYSLER BB/RB

361-440, '58-'79	Hydraulic Flat Tappet, Single Bolt	729991
361-440, '58-'79	Hydraulic Flat Tappet, 3-Bolt	729994
361-440, '58-'79	Hydraulic Roller	729995
361-440, '58-'79	Mechanical Flat Tappet	729992
361-440, '58-'79	Mechanical Roller	729993

CHRYSLER HEMI

354 Hemi, '56-'57	Hydraulic Flat Tappet	769991
354 Hemi, '56-'57	Mechanical Flat Tappet	769992
392 Hemi, '57-'58	Hydraulic Flat Tappet	739991
392 Hemi, '57-'58	Hydraulic Roller	739995
392 Hemi, '57-'58	Mechanical Flat Tappet	739992
392 Hemi, '57-'58	Mechanical Roller	739993
426 Hemi, '66-'71	Hydraulic Flat Tappet	749991
426 Hemi, '66-'71	Mechanical Flat Tappet	749992
426 Hemi, '66-'71	Mechanical Roller	749993
5.7L/6.0L Hemi, '00-Present	Hydraulic Roller	789995

CHRYSLER AFTERMARKET HEMI

(KB Stage VII)	Mechanical Roller, 48° Lifter Angle	749993-48
(2.125 Journal 9310)	Mechanical Roller	729999

FORD Straight 6

144-250, '63-'83	Hydraulic Flat Tappet	289998
240-300, '64-'96	Hydraulic Flat Tappet	289996

FORD 4.6L/5.4L MODULAR V8

4.6L/5.4L SOHC 2 Valve, '91-Present	Hydraulic Roller (2 Cams)	279993
4.6L/5.4L SOHC 3 Valve, '04-Present	Hydraulic Roller (2 Cams)	279995
4.6L DOHC 4 Valve, '93-Present	Hydraulic Roller (4 Cams)	279994

FORD SB 221-302/5.0L

221-302/5.0L (except H.O.), '62-'95	Hydraulic Flat Tappet	219991
221-302/5.0L (except H.O.), '62-'95	Retrofit Hyd. Roller w/351W Firing Order	229995
221-302/5.0L (except H.O.), '62-'95	Mechanical Flat Tappet	219992
221-302/5.0L (except H.O.), '62-'95	Mechanical Roller w/351W Firing Order	229993

FORD SB 351W/5.0L H.O.

351W/5.0L H.O., '69-'95	Hydraulic Flat Tappet	229991
351W, '69-'93	Retrofit Hydraulic Roller	229995
351W, '94-'95/5.0L H.O. '85-'95	Hydraulic Roller (Small Base)	229994
351W/5.0L H.O., '69-'95	Mechanical Flat Tappet	229992
351W/5.0L H.O., '69-'95	Mechanical Roller	229993

FORD 351C, 351M, 400

351C, 351M, 400, '75-'82	Hydraulic Flat Tappet	239991
351C, 351M, 400, '72-'82	Hydraulic Roller	239995
351C, 351M, 400, '75-'82	Mechanical Flat Tappet	239992
351C, 351M, 400, '72-'82	Mechanical Roller	239993

FORD FE

352-428, '63-'76	Hydraulic Flat Tappet	259991
352-428, '63-'76	Hydraulic Roller	259995
352-428, '63-'76	Mechanical Flat Tappet	259992
352-428, '63-'76	Mechanical Roller	259993

FORD 429-460

429-460, '68-'97	Hydraulic Flat Tappet	249991
429-460, '68-'97	Hydraulic Roller	249995
429-460, '68-'97	Mechanical Flat Tappet	249992
429-460, '68-'97	Mechanical Roller	249993

FORD FLAT HEAD

'38-'48	Mechanical Flat Tappet	269996
'49-'53	Mechanical Flat Tappet	269992

FORD Y-BLOCK

272, 292, 312, '55-'62	Mechanical Flat Tappet	299992
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HOLDEN V8

252-308, '70-'88	Hydraulic Flat Tappet	669991
252-308, '70-'88	Mechanical Flat Tappet	669992
304 PFI, '88-'97	Hydraulic Flat Tappet	679991
304 PFI, '88-'97	Hydraulic Roller	679995
304 PFI, '88-'97	Mechanical Flat Tappet	679992
304 PFI, '88-'97	Mechanical Roller	679993

OLDSMOBILE V8 39°

307-455, '66-'84	Hydraulic Flat Tappet	519991
307-455, '66-'84	Hydraulic Roller (4 & 7 Swap)	519995
307-455, '66-'84	Mechanical Flat Tappet	519992

OLDSMOBILE V8 45°

300,400,425, '64-'67	Hydraulic Flat Tappet	579991
300,400,425, '64-'67	Mechanical Flat Tappet	579992

PONTIAC V8

326-455, '55-'81	Hydraulic Flat Tappet	419991
326-455, '55-'81	Hydraulic Roller (4 & 7 Swap)	419995
326-455, '55-'81	Mechanical Flat Tappet	419992
326-455, '55-'81	Mechanical Roller	419993

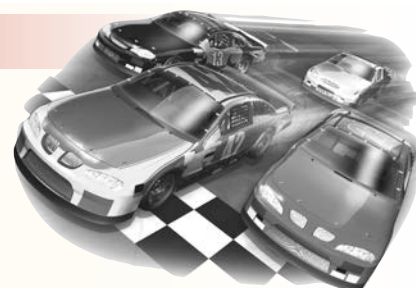
CAMSHAFT & COMPONENTS NOTES MASTER LIST

Camshaft & Components Notes Master List

- 1 Stock (O.E.) valve springs cannot be used.
- 2 Requires Thrust Button.
- 3 Included in Cam & Lifter Sets.
- 4 Direct Lube Lifters Included in Cam & "Direct Lube" Lifter (DL) Sets.
- 5 Requires upgraded distributor gear/fuel pump pushrod.
- 6 Requires 3-bolt timing Set.
- 7 Requires 7/16" rocker studs.
- 8 Includes 2 camshafts.
- 9 Includes 4 camshafts.
- 10 10° Valve lock Angle, must use matching retainers/locks.
- 11 Sets of 8, Requires 2 sets per engine.
- 12 Requires custom programmer/tuning.
- 13 Requires adjustable valvetrain.
- 14 No specific vacuum rating is guaranteed.
- 15 Lobes designed to take maximum advantage of .904" dia. lifter.
- 16 Lobes designed to take maximum advantage of .875" dia. lifter.
- 17 Cam & Lifter Sets with "E" suffix feature OE style (91213) lifters.
- 18 Cam & Lifter Sets without suffix feature tie bar lifters.
- 19 Fits factory 1-pc eccentric. For factory 2-pc eccentric use 94212 or 94312.
- 20 Advertising duration read @.010".
- 21 Aftermarket pistons required.
- 22 Ignition firing order must be changed to 1-8-7-3-6-5-4-2.
- 23 Ignition firing order must be changed to 1-3-7-2-6-5-4-8.
- 24 Ignition firing order must be changed to 1-8-7-2-6-5-4-3.
- 25 Machining Required.
- 26 LS-Series 3-Bolt '97-'05.
- 27 LS-Series 3-Bolt '06-present.
- 28 LS-Series Single-Bolt 05-present, LS2/LSR/LR4.
- 29 LS-Series Single-Bolt 07-10 LS3 6.0L, 08-10 6.2L.
- 30 LS-Series Gen III.
- 31 LS-Series Gen IV.
- 32 These lifters are not recommended for street use.
- 33 Tie bar style lifters.
- 34 Provisions for increased oiling recommended. Please contact your tech representative.
- 35 10° Multi-Groove for OE style valves not available. For single groove use 93018.
- 36 Includes Lifter Retainer "Spider" Kit (90142).

TECH TIP

Hydraulic lifters should never be pumped up with oil before installation. This will cause the valve lifter plunger to "top out" rather than it's normal operating height, giving you incorrect valve adjustment. This incorrect pre-load will cause excessive valve train noise, rough idle and can cause severe engine damage.



CUSTOM CAMSHAFT RECOMMENDATION FORM

Choosing a Custom Grind Camshaft

All of the following variables have to be considered when picking a particular grind. It all boils down to picking a cam that will develop peak power within the rpm range where the engine needs to make it.

Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Phone: _____ Best Time: _____

Fax: _____

e-mail: _____

Type of Vehicle

Car Truck Boat Tractor Other _____

Make: _____ Model: _____ Year: _____ Weight: _____

Drive Tire Type: Radial Slick Other: _____ Drive Tire Size: _____

Transmission: _____ Stall Speed of Torque Converter: _____

Drive Axle Gear Ratio: _____

Engine

Manufacturer: _____ Model: _____ Number of Cylinders: _____

Bore: _____ Stroke: _____ Rod Type: _____ Rod Size: _____

Piston Type: _____ Compression Ratio: _____ Firing Order: _____

Cylinder Heads

Manufacturer: _____ Model: _____ Ported: Yes No

Chamber Size: _____ Runner Size: _____ Intake Valve Size: _____ Exhaust Valve Size: _____

If Ported Please Attach Known Flow Numbers

Induction System

Carbureted EFI-Throttle Body EFI-Tune Port Mechanical FI

Carburetor/Throttle Body Size: _____ EFI Sensor Type: Speed Density Mass Air Other: _____

Intake Manifold Manufacturer: _____ Intake Manifold Series: _____

Intake Type: Dual Plane Single Plane Tunnel Ram Individual Runner Other: _____

Computer Control: None OE OE with Chip or Programmer After Market: _____

Turbocharged: Yes No Blower: Yes No Type: _____ Boost: _____

Nitrous Oxide: Yes No Single Stage Multi Stage 1st Stage HP _____ Total NOS HP: _____

Fuel Type: _____ Octane Rating: _____

Continued on Next Page

Note: Your Custom Cam will only be as good as the information you supply! Please don't guess or "exaggerate" figures.

Cut Here





CUSTOM CAMSHAFT RECOMMENDATION FORM (CONT.)

Exhaust System

OE Manifolds Headers Tube Diameter: _____ Length: _____

Mufflers: Yes No Brand/Type: _____ Exhaust Pipe Diameter: _____

Current Camshaft

Hydraulic Flat Tappet Hydraulic Roller Mechanical Flat Tappet

Mechanical Roller Other (specify): _____

Camshaft Manufacturer: _____ Part Number: _____

Valve Lift Intake: _____ Exhaust: _____ Rocker Ratio Intake: _____ Exhaust: _____

Duration @ .050" Intake: _____ Exhaust: _____ Adv. Duration Intake: _____ Exhaust: _____

Lobe Separation: _____ Intake Lobe Center Line: _____

What Type of Use?

Towing Street Economy Street Performance Street and Strip

Bracket Racing Drag Race-Class: _____ Oval Track-Class: _____

Mud Racing Puller Sand Drag Marine Jet Drive Prop Drive-Class: _____

Trans-Brake Throttle Stop Impeller Type: _____ Prop Size: _____

Track Type: _____ RPM Range: _____

What You Want for a New Cam

Hydraulic Flat Tappet Hydraulic Roller Mechanical Flat Tappet

Mechanical Roller Other (specify): _____

Cam Options Non-Standard Firing Order: _____ Small Base Rear Acc. Drive

Oversized Bearing Diameter: _____ Roller Bearing Two-Piece (Cast Gear) Core

Induction Hardened Core 8620 Carburized Billet Steel Core Other (specify): _____

Considering the performance of your current application, what are you trying to gain from a new cam purchase?

More Low End Torque More Mid-Range Power Higher RPM Capability Overall Horsepower Increase

Fuel Economy Other (specify): _____

Other Is there any other information that you believe should be considered for your application? _____

Note: Your Custom Cam will only be as good as the information you supply! Please don't guess or "exaggerate" figures.

Some items are not legal for sale or use on any pollution controlled motor vehicle



HYDRAULIC FLAT TAPPET



PERFORMANCE HYDRAULIC LIFTERS

Howards™ Cams hydraulic lifters are designed for maximum performance, offering precision oil control. Use as OE replacements as well as in high performance racing applications. Sets of 12 (6cyl.) or 16 (V8).

	Application	Body Diameter	Seat Height	Oil Band Height	Oil Band Width	Weight	
AMC	AMC 6cyl. 199-258/4.0L	.904"	1.892"	1.200"	.218"	109g	91711-12
	AMC V8 304-401	.904"	1.892"	1.200"	.218"	109g	91711
Buick	Buick V6 Even Fire 181-252	.842"	2.068"	.890"	.542"	96g	91311-12
	Buick V8 350 (68-up)	.842"	2.068"	.890"	.542"	96g	91311
	Buick V8 400-455 (67-up)	.842"	2.068"	.890"	.542"	96g	91311
Cadillac	Cadillac V8 365-390, 390-429	.842"	2.068"	.890"	.542"	96g	91311
	Cadillac V8 368, 425, 472, 500	.842"	2.068"	.890"	.542"	96g	91311
Chevrolet	Chevrolet L6 194-292	.842"	1.977"	.890"	.550"	96g	91111-12
	Chevrolet V6 90° 200-262, 4.3L	.842"	1.977"	.890"	.550"	96g	91111-12
	Chevrolet V8 265-454	.842"	1.977"	.890"	.550"	96g	91111
	Chevrolet V8 348-409	.842"	1.977"	.890"	.550"	96g	91111
Chrysler	Chrysler A 273-340-360	.904"	1.892"	1.200"	.218"	109g	91111
	Chrysler A 318 (67-up)	.904"	1.892"	1.200"	.218"	109g	91711
	Chrysler B 383-440	.904"	1.892"	1.200"	.218"	109g	91711
	Chrysler 331-354-392 Hemi	.904"	1.814"	1.419"	.116"	109g	91731
	Chrysler 426 Hemi	.904"	1.892"	1.200"	.218"	109g	91711
Ford	Ford Straight 6 144-250	.874"	1.960"	1.000"	.540"	96g	91251-12
	Ford Straight 6 240-300	.874"	2.018"	1.000"	.540"	105g	91211-12
	Ford V8 221-302, 351W	.874"	2.018"	1.000"	.540"	105g	91211
	Ford V8 351C-400M	.874"	2.018"	1.000"	.540"	105g	91211
	Ford V8 429-460	.874"	2.018"	1.000"	.540"	105g	91211
	Ford "FE" 332-428	.874"	1.960"	1.000"	.540"	96g	91251
Holden	Holden V8 225-345	.842"	1.977"	.890"	.550"	96g	91111
Oldsmobile	Oldsmobile V8 260-455	.842"	2.036"	1.170"	.400"	96g	91411
Pontiac	Pontiac V8 265-455	.842"	2.036"	1.170"	.400"	96g	91411

DIRECT LUBE™ HYDRAULIC LIFTERS

Designed for today's more aggressive lobes. Increases oil supply to the cam lobes is critical. These lifters provide a constant oil supply to the cam lobe, allowing more aggressive profiles and reduced lobe wear. Perfect for daily driven aggressive Street Machines, Street/Strip or hydraulic race applications. Made in the USA! Sets of 16.



	Application	Body Diameter	Seat Height	Oil Band Height	Oil Band Width	Weight	
Chevrolet	Chevrolet V8 265-454	.842"	2.036"	.890"	.550"	96g	91116
Ford	Ford V8 221-302, 351W	.874"	2.018"	1.000"	.540"	105g	91216
	Ford V8 351C-400M	.874"	2.018"	1.000"	.540"	105g	91216
	Ford V8 429-460	.874"	2.018"	1.000"	.540"	105g	91216

HYDRAULIC FLAT TAPPET



MAX EFFORT™ HYDRAULIC LIFTERS

Designed specifically for higher revving applications. Perfect for race applications which require a hydraulic lifter or high performance street applications that need an extra edge. These lifters can show a noticeable increase of power from 5,000 rpm and up. *Important:* pre-load must be set at .002"-.004" (warm) to achieve performance levels. Made in the USA! Sets of 12 (6cyl.) or 16 (V8).

	Application	Body Diameter	Seat Height	Oil Band Height	Oil Band Width	Weight	
AMC	AMC 6cyl. 199-258/4.0L	.904"	1.832"	1.200"	.218"	109g	91712-12
	AMC V8 304-401	.904"	1.832"	1.200"	.218"	109g	91712
Chevrolet	Chevrolet L6 194-292	.842"	1.917"	.890"	.550"	96g	91112-12
	Chevrolet V6 90° 200-262, 4.3L	.842"	1.917"	.890"	.550"	96g	91112-12
	Chevrolet V8 265-454	.842"	1.917"	.890"	.550"	96g	91112
Chrysler	Chevrolet V8 348-409	.842"	1.917"	.890"	.550"	96g	91112
	Chrysler A 273-340-360	.904"	1.832"	1.200"	.218"	109g	91712
	Chrysler A 318 (67-up)	.904"	1.832"	1.200"	.218"	109g	91712
	Chrysler B 383-440	.904"	1.832"	1.200"	.218"	109g	91712
Ford	Chrysler 426 Hemi	.904"	1.832"	1.200"	.218"	109g	91712
	Ford Straight 6 240-300	.874"	1.958"	1.000"	.540"	109g	91212-12
	Ford V8 221-302, 351W	.874"	1.958"	1.000"	.540"	109g	91212
	Ford V8 351C-400M	.874"	1.958"	1.000"	.540"	109g	91212
Holden	Ford V8 429-460	.874"	1.958"	1.000"	.540"	109g	91212
	Holden V8 225-345	.842"	1.917"	.890"	.550"	96g	91112



VARIABLE DURATION HYDRAULIC RACE LIFTERS

All new design. Specifically made for race applications. Features high grade tappet shell and close tolerance valving. This material will work in Dart SHP blocks. Great for all endurance applications including street. Maximum low end torque without sacrifice of mid or top end power. More vacuum (up to 3 in.). Effectively lowers cam duration by approximately 10 degrees, up to 3000 rpm. *Note:* These lifters produce a mild ticking sound (similar to mech. lifters). Pre-load settings for best performance .020"-.040". Made in the USA! Sets of 16.

	Application	Body Diameter	Seat Height	Oil Band Height	Oil Band Width	Weight	
Chevrolet	Chevrolet V8 265-454	.842"	1.917"	.890"	.550"	96g	91002
	Chevrolet V8 348-409	.842"	1.917"	.890"	.550"	96g	91002



SLOW LEAK-DOWN HYDRAULIC RACE LIFTERS

Designed to give you the most lift, duration and RPM from your cam than any other hydraulic flat tappet lifter. Specifically made for race applications. Not recommended for Street applications. Super strict tolerances with tighter body to plunger clearances and special internal valving. Tappet shells are made of a special high grade material. This material will work in Dart SHP blocks. Designed to last in a true race environment. *Note:* Pre-load settings for best performance .020"-.040". Made in the USA! Sets of 16.

	Application	Body Diameter	Seat Height	Oil Band Height	Oil Band Width	Weight	
Chevrolet	Chevrolet V8 265-454	.842"	1.917"	.890"	.550"	96g	91003
	Chevrolet V8 348-409	.842"	1.917"	.890"	.550"	96g	91003

HYDRAULIC ROLLER (O.E. STYLE)



O.E. STYLE PERFORMANCE HYDRAULIC ROLLER LIFTERS

Performance stock replacement for use in OE hydraulic roller blocks. The best combination for the street. Reduce friction, increase torque and horsepower. A great performance upgrade to stock O.E. hydraulic roller lifters. Great for stock, RV and most street performance applications. Made in the USA! Sets of 16.

	Application	Body Diameter	Body Height	Intake Offset	Exhaust Offset	Wheel Diameter	Seat Height	Weight	
Chevrolet	Chevrolet V6 4.3L	.842"	Standard	Center	Center	.700"	2.676"	128g	91113-12
	Chevrolet V8 SB 305-350	.842"	Standard	Center	Center	.700"	2.676"	128g	91113
	Chevrolet/GM Gen III (LS-Series)	.842"	Standard	Center	Center	.700"	2.676"	128g	91113
	Chevrolet V8 BB (Gen 5/6 / Tall Body)	.842"	Standard	Center	Center	.750"	2.676"	139g	91123
Ford	Ford V8 5.0L	.875"	Standard	Center	Center	.700"	2.582"	128g	91213



O.E. STYLE VARIABLE DURATION HYDRAULIC ROLLER LIFTERS

Maximum low end torque without sacrifice of mid or top end power. More vacuum (up to 3 in.) and better fuel economy. Effectively lowers cam duration by approximately 10 degrees, up to 3000 rpm. For use in OE hydraulic roller blocks. *Note:* These lifter produce a mild ticking sound (similar to mech. lifters). Made in the USA! Sets of 16.

	Application	Body Diameter	Body Height	Intake Offset	Exhaust Offset	Wheel Diameter	Seat Height	Weight	
Chevrolet	Chevrolet V8 SB 305-350	.842"	Standard	Center	Center	.700"	2.596"	123g	91113FB
	Chevrolet/GM Gen III (LS-Series)	.842"	Standard	Center	Center	.700"	2.596"	123g	91113FB
Ford	Ford V8 5.0L	.875"	Standard	Center	Center	.700"	2.581"	128g	91213FB

MAXIMUM EFFORT™ O.E. STYLE HYDRAULIC ROLLER LIFTERS

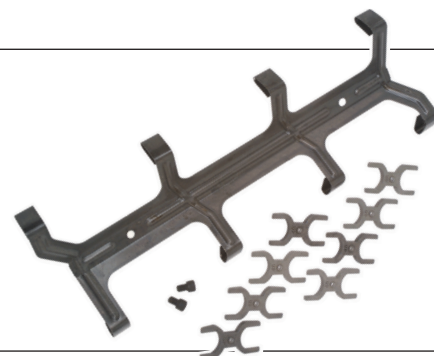
A true high performance street lifter designed for use with O.E. guide bar system. These lifters are known for their ease of maintenance and reliability. Our number one selling hydraulic roller lifter the Gen III engines. CNC machined bodies fitted with a precision check ball internal valving to prevent lifter "pump up". Taller lifter bodies to handle lifts in excess of .650". Great for moderate to high lift street strip and marine applications. Made in the USA! Sets of 16.



	Application	Body Diameter	Body Height	Intake Offset	Exhaust Offset	Wheel Diameter	Seat Height	Weight (pr.)	
Chevrolet	Chevrolet/GM Gen III (LS-Series)	.842"	+ .100"	Center	Center	.700"	2.598"	127	91174

FORD V8 HYDRAULIC ROLLER RETRO-FIT (SPIDER) KIT

Designed for Ford engines that did not come with an OEM hydraulic roller cam. Contains the pieces required to install a hydraulic roller cams with OEM style roller lifters in 302, 351W, 351C or 351M-400. *Note:* When being used in a non-roller block, a small base circle retro-fit cam must be used to ensure the lifters will not expose the oil hole or band out of the lifter bores.



90142 Ford 302-351W, 351C/M/400, Hydraulic Roller Retro-Fit Kit

HYDRAULIC ROLLER (RETRO-FIT)



STREET SERIES RETRO-FIT HYDRAULIC ROLLER LIFTERS

Designed for street performance enthusiast who want to upgrade to a hydraulic roller camshaft. Manufactured to fit early or late model blocks, including blocks with tall lifter bosses. Cold form technology shapes the body for durability. Carbonitride and tempered for hardness. The roller wheel is hardened and tempered steel alloy. Heat-treated stainless steel cross bars. High alloy steel tie bar buttons. **Note:** Specifically designed for street applications to 6500 rpm. Made in the USA! Sets of 8 pr.

	Application	Body Diameter	Body Height	Intake Offset	Exhaust Offset	Wheel Diameter	Seat Height	Weight (pr.)	
Buick	Buick V8 401-425-455	.842"	Standard	Center	Center	.700"	2.661"	314g	91460
Cadillac	Cadillac V8 425-472-500	.842"	Standard	Center	Center	.700"	2.661"	309g	91462
Chevrolet	Chevrolet V6 90° 200-229	.842"	+ .300"	Center	Center	.700"	2.661"	309g	91164N-12
	Chevrolet V8 SB 265-400	.842"	+ .300"	Center	Center	.700"	2.661"	309g	91164N
	Chevrolet/GM Gen III (LS-Series)	.842"	Standard	Center	Center	.700"	2.685"	309g	91166
	Chevrolet V8 BB (Mark IV, Gen 5/6)	.842"	+ .300"	Center	Center	.700"	2.661"	314g	91167
	Chevrolet V8 348/409	.842"	Standard	Center	Center	.700"	2.661"	314g	91364
Chrysler	Chrysler V8 SB LA/Magnum	.903"	Standard	Center	Center	.700"	2.661"	332g	91764
	Chrysler V8 BB B/RB/392-426 Hemi	.903"	Standard	Center	Center	.700"	2.661"	332g	91767
Ford	Ford V8 221-302, 351W	.875"	Standard	Center	Center	.700"	2.661"	332g	91168
	Ford V8 351C-400M	.875"	Standard	Center	Center	.700"	2.661"	332g	91168
	Ford V8 FE 352-428	.875"	Standard	Center	Center	.700"	2.661"	332g	91169
	Ford V8 429-460	.875"	Standard	Center	Center	.700"	2.661"	332g	91169
Holden	Holden V8 252-308	.842"	Standard	Center	Center	.700"	2.661"	314g	91466H
Oldsmobile	Oldsmobile V8 400-403-425-455	.842"	Standard	Center	Center	.700"	2.685"	305g	91464
Pontiac	Pontiac V8 265-455	.842"	Standard	Center	Center	.700"	2.685"	314g	91466

MAXIMUM EFFORT™ RETRO-FIT HYDRAULIC ROLLER LIFTERS

A true high performance street lifter designed primarily for ease of maintenance and reliability. Our number one selling hydraulic roller lifter. CNC machined bodies fitted with a precision check ball internal valving to prevent lifter "pump up". Great for moderate high lift street strip and marine applications. Made in the USA! Sets of 8 pr.



	Application	Body Diameter	Body Height	Intake Offset	Exhaust Offset	Wheel Diameter	Seat Height	Weight (pr.)	
AMC	AMC V8 304-401	.903"	Standard	Center	Center	.700"	2.606"	313g	91774
Chevrolet	Chevrolet V8 SB 265-400	.842"	+ .300"	Center	Center	.700"	2.618"	268g	91160
	Chevrolet V8 BB (Mark IV, Gen 5/6)	.842"	+ .300"	Center	Center	.700"	2.618"	273g	91161
	Chevrolet V8 348/409	.842"	Standard	Center	Center	.700"	2.618"	268g	91360
Chrysler	Chrysler V8 BB B/RB/392-426 Hemi	.903"	Standard	Center	Center	.700"	2.606"	313g	91774
Ford	Ford V8 221-302, 351W	.875"	Standard	Center	Center	.700"	2.606"	286g	91260
	Ford V8 351C-400M	.875"	Standard	Center	Center	.700"	2.606"	286g	91260
	Ford V8 FE 352-428	.875"	Standard	Center	Center	.700"	2.606"	288g	91261
	Ford V8 429-460	.875"	Standard	Center	Center	.700"	2.606"	288g	91261

Some items are not legal for sale or use on any pollution controlled motor vehicle

HYDRAULIC ROLLER (RETRO-FIT)



HIGH ENDURANCE VERTICAL BAR HYDRAULIC ROLLER LIFTERS

Made for all high endurance performance applications including marine. Proprietary hydraulic valving specifically designed for continuous operation to 6600 rpm. With ideal seat pressures between 140-180 lbs. The lifter body is fully machined from alloy steel bar stock and completely micro polished. The nose wheel is machined from 8620 material and case hardened for durability. Made in the USA! Sets of 8 pr.

	Application	Body Diameter	Body Height	Intake Offset	Exhaust Offset	Wheel Diameter	Seat Height	Weight (pr.)	
Chevrolet	Chevrolet V8 SB 265-400	.842"	+.300"	Center	Center	.750"	2.663"	314g	91163
	Chevrolet/GM Gen III (LS-Series)	.842"	Standard	Center	Center	.750"	2.663"	318g	91156
	Chevrolet V8 BB (Mark IV, Gen 5/6)	.842"	+.300"	Center	Center	.750"	2.663"	318g	91162



PRO MAX HIGH RPM HYDRAULIC ROLLER LIFTERS

Designed to operate at rpm ranges over 7000 rpm. All new internal valving for increased rpm, torque and horsepower. The lifter body is fully machined from alloy steel bar stock. The nose wheel is machined from 8620 material and case hardened for durability. *Note:* spring pressure requirements for these lifters are 200-225 lbs. seat pressure, 500-575 lbs. open pressure. Specific lash adjustments are also required. Made in the USA! Sets of 8 pr.

	Application	Body Diameter	Body Height	Intake Offset	Exhaust Offset	Wheel Diameter	Seat Height	Weight (pr.)	
Chevrolet	Chevrolet V8 SB 265-400	.842"	+.300"	Center	Center	.750"	2.663"	318g	91170
	Chevrolet V8 SB 265-400	.903"	+.300"	Center	Center	.810"	2.663"	320g	91172
	Chevrolet/GM Gen III (LS-Series)	.842"	Standard	Center	Center	.750"	2.663"	318g	91175
	Chevrolet/GM Gen III (LS-Series)	.903"	Standard	Center	Center	.810"	2.663"	320g	91176
	Chevrolet V8 BB (Mark IV, Gen 5/6)	.842"	+.300"	Center	Center	.750"	2.663"	318g	91171
	Chevrolet V8 BB (Mark IV, Gen 5/6)	.903"	+.300"	Center	Center	.810"	2.663"	320g	91173
Ford	Ford V8 221-302, 351W	.875"	Standard	Center	Center	.750"	2.667"	325g	91270
	Ford V8 351C-400M	.875"	Standard	Center	Center	.750"	2.667"	325g	91270

HYDRAULIC ROLLER REV KITS

Designed for roller cam applications to increase valve train stability throughout the RPM range. In addition to increasing RPM capability, rev kits will also keep the lifter in the lifter bore in the event of valve train failure. The locator bars and lifter buttons are made of the highest quality aluminum and then anodized for protection. Each kit is complete with a pair of locator bars, springs, and lifter buttons. Made in the USA. *Note:* Will not work on some Pro-Topline or RHS Chev small block cylinder heads.



- 90132 Chevrolet SB 265-400, Retrofit Hydraulic Roller use with 91164N Lifters & Mechanical Roller with 91150
- 90133 Chevrolet SB 265-400, Retrofit Hydraulic Roller use with 91163 Lifters
- 90131 Chevrolet SB 265-400, Retrofit Hydraulic Roller Most Other

MECHANICAL FLAT TAPPET

*PERFORMANCE MECHANICAL LIFTERS*

Designed and manufactured to the closest tolerances in the performance industry. The precision ground crown face insures long life for both cam and lifter in the harsh competition environment. 100% rockwell tested. Made in the USA! Sets of 12 (6cyl.) or 16 (V8).

	Application	Body Diameter	Seat Height	Oil Band Height	Oil Band Width	Weight	
AMC	AMC V8 304-401	.904"	1.795"	1.075"	.343"	100g	91715
Buick	Buick V8 350 (68-up)	.842"	1.875"	.890"	.550"	86g	91415
	Buick V8 400-455 (67-up)	.842"	1.875"	.890"	.550"	86g	91415
Cadillac	Cadillac V8 368, 425, 472, 500	.842"	1.875"	.890"	.550"	86g	91415
Chevrolet	Chevrolet L6 194-292	.842"	1.875"	.890"	.550"	86g	91115-12
	Chevrolet L6 235-261	.989"	2.580"	1.120"	.661"	118g	91125
	Chevrolet V6 90° 200-262, 4.3L	.842"	1.875"	.890"	.550"	86g	91115-12
Chrysler	Chevrolet V8 265-454	.842"	1.875"	.890"	.550"	86g	91115
	Chevrolet V8 348-409	.842"	1.875"	.890"	.550"	86g	91115
	Chrysler 6cyl. 170-225	.904"	1.795"	1.075"	.343"	100g	91715-12
	Chrysler A 273-340-360	.904"	1.795"	1.075"	.343"	100g	91715
	Chrysler A 318 (67-up)	.904"	1.795"	1.075"	.343"	100g	91715
	Chrysler B 383-440	.904"	1.795"	1.075"	.343"	100g	91715
	Chrysler 331-354-392 Hemi	.904"	1.613"	NA	NA	96g	91725-16
Ford	Chrysler 426 Hemi	.904"	1.795"	1.075"	.343"	100g	91715
	Ford V8 221-302, 351W	.874"	1.950"	1.000"	.543"	100g	91215
	Ford V8 351C-400M	.874"	1.950"	1.000"	.543"	100g	91215
	Ford "FE" 332-428	.874"	1.796"	.860"	.500"	100g	91255
	Ford V8 429-460	.874"	1.950"	1.000"	.543"	100g	91215
	Ford V8 Flat Head (32-54)	.999"	1.800"	.245"	.937"	105g	91265
	Ford V8 "Y" Block (54-64)	.499"	2.593"	NA	NA	68g	91214
Holden	Holden V8 225-345 (w/Edge Orifice Oiling)	.842"	1.875"	.900"	.537"	77g	91615
Oldsmobile	Oldsmobile V8 260-455	.842"	1.875"	.890"	.550"	86g	91415
Pontiac	Pontiac V8 265-455	.842"	1.875"	.890"	.550"	86g	91415

DIRECT LUBE™ EXTREME DUTY MECHANICAL FLAT TAPPET



"THE ORIGINAL" DIRECT LUBE™ EXTREME DUTY MECHANICAL LIFTERS

Today's cams have more aggressive lobes. Increasing oil supply to these lobes is critical. A precision "E.D.M." laser burns a .021" hole in the center of the face of the lifter. This allows a constant oil supply to the cam lobe, allowing higher valve spring pressures, more aggressive profiles and reduced lobe wear. Made in the USA! Sets of 16.

	Application	Body Diameter	Seat Height	Oil Band Height	Oil Band Width	Weight	
AMC	AMC V8 304-401	.904"	1.795"	1.075"	.343"	100g	91718
Buick	Buick V8 350 (68-up)	.842"	1.875"	.890"	.550"	86g	91418
	Buick V8 400-455 (67-up)	.842"	1.875"	.890"	.550"	86g	91418
Cadillac	Cadillac V8 368, 425, 472, 500	.842"	1.875"	.890"	.550"	86g	91418
Chevrolet	Chevrolet L6 194-292	.842"	1.875"	.890"	.550"	86g	91118-12
	Chevrolet V6 90° 200-262, 4.3L	.842"	1.875"	.890"	.550"	86g	91118-12
	Chevrolet V8 265-454	.842"	1.875"	.890"	.550"	86g	91118
	Chevrolet V8 348-409	.842"	1.875"	.890"	.550"	86g	91118
Chrysler	Chrysler 6cyl. 170-225	.904"	1.795"	1.075"	.343"	100g	91718-12
	Chrysler A 273-340-360 (all), 318 (67-up)	.904"	1.795"	1.075"	.343"	100g	91718
	Chrysler B 383-440	.904"	1.795"	1.075"	.343"	100g	91718
	Chrysler 331-354-392, 426 Hemi	.904"	1.795"	1.075"	.343"	100g	91718
Ford	Ford V8 221-302, 351W	.874"	1.950"	1.000"	.543"	100g	91218
	Ford V8 351C-400M	.874"	1.950"	1.000"	.543"	100g	91218
	Ford V8 429-460	.874"	1.950"	1.000"	.543"	100g	91218
Oldsmobile	Oldsmobile V8 260-455	.842"	1.875"	.890"	.550"	86g	91418
Pontiac	Pontiac V8 265-455	.842"	1.875"	.890"	.550"	86g	91418



ULTRA-LITE DIRECT LUBE™ MECHANICAL LIFTERS Only 73-78 grams

All the features of Howards Cams famous Direct Lube™ lifters in a lite weight version. Special high grade endurance lifter shell material for reliability. Only 73-78 grams total weight. Approximately 13-25 grams lighter per lifter than the original version. *Note:* No chamfer to ensure maximum effective diameter. Made in the USA! Sets of 16.

	Application	Body Diameter	Seat Height	Oil Band Height	Oil Band Width	Weight	
AMC	AMC V8 304-401	.904"	1.795"	1.000"	.351"	78g	91710
Buick	Buick V8 350 (68-up), 400-455 (67-up)	.842"	1.869"	1.059"	.400"	73g	91410
Cadillac	Cadillac V8 368, 425, 472, 500	.842"	1.869"	1.059"	.400"	73g	91410
Chevrolet	Chevrolet V8 265-454	.842"	1.869"	1.059"	.400"	73g	91110
	Chevrolet V8 348-409	.842"	1.869"	1.059"	.400"	73g	91110
Chrysler	Chrysler A 273-340-360 (all), 318 (67-up)	.904"	1.795"	1.000"	.351"	78g	91710
	Chrysler B 383-440	.904"	1.795"	1.000"	.351"	78g	91710
	Chrysler 331-354-392, 426 Hemi	.904"	1.795"	1.000"	.351"	78g	91710
Ford	Ford V8 221-302, 351W	.874"	1.950"	.910"	.500"	75g	91210
	Ford V8 351C-400M	.874"	1.950"	.910"	.500"	75g	91210
	Ford V8 429-460	.874"	1.950"	1.000"	.543"	75g	91210
Oldsmobile	Oldsmobile V8 260-455	.842"	1.869"	1.059"	.400"	73g	91410
Pontiac	Pontiac V8 265-455	.842"	1.869"	1.059"	.400"	73g	91410

TOOL STEEL MECHANICAL FLAT TAPPET

*TOOL STEEL MECHANICAL LIFTERS*

Intended for use on cast iron camshafts. Ideal for engines turning in excess of 7,000 rpm with higher valve spring pressures. Super fine surface finish of 1-2Ra and built from tool steel for durability and hardness (63-64RC). Lightweight (71+ grams) and are available with an optional "Direct Lube" EDM oil hole (.016in). Compatible with all OE and aftermarket engine blocks. Made in the USA! **Note:** Required for flat tappet applications in Dart SHP blocks. Sets of 16.

	Application	Body Diameter	Seat Height	Oil Band Height	Oil Band Width	Weight	
AMC	AMC V8 304-401	.904"	1.850"	.805"	.564"	91g	91705-16
	AMC V8 304-401 w/EDM Oil Hole	.904"	1.850"	.805"	.564"	91g	91708-16
Buick	Buick V8 350 (68-up)	.842"	1.861"	.890"	.525"	71g	91105-16
	Buick V8 350 (68-up) w/EDM Oil Hole	.842"	1.861"	.890"	.525"	71g	91108-16
	Buick V8 400-455 (67-up)	.842"	1.861"	.890"	.525"	71g	91105-16
	Buick V8 400-455 (67-up) w/EDM Oil Hole	.842"	1.861"	.890"	.525"	71g	91108-16
Cadillac	Cadillac V8 368, 425, 472, 500	.842"	1.861"	.890"	.525"	71g	91105-16
	Cadillac V8 368, 425, 472, 500 w/EDM Oil Hole	.842"	1.861"	.890"	.525"	71g	91108-16
Chevrolet	Chevrolet V8 265-454	.842"	1.861"	.890"	.525"	71g	91105-16
	Chevrolet V8 265-454 w/EDM Oil Hole	.842"	1.861"	.890"	.525"	71g	91108-16
	Chevrolet V8 348-409	.842"	1.861"	.890"	.525"	71g	91105-16
	Chevrolet V8 348-409 w/EDM Oil Hole	.842"	1.861"	.890"	.525"	71g	91108-16
Chrysler	Chrysler A 273-340-360	.904"	1.850"	.805"	.564"	91g	91705-16
	Chrysler A 273-340-360 w/EDM Oil Hole	.904"	1.850"	.805"	.564"	91g	91708-16
	Chrysler A 318 (67-up)	.904"	1.850"	.805"	.564"	91g	91705-16
	Chrysler A 318 (67-up) w/EDM Oil Hole	.904"	1.850"	.805"	.564"	91g	91708-16
	Chrysler B 383-440	.904"	1.850"	.805"	.564"	91g	91705-16
	Chrysler B 383-440 w/EDM Oil Hole	.904"	1.850"	.805"	.564"	91g	91708-16
	Chrysler 331-354-392 Hemi	.904"	1.850"	.805"	.564"	91g	91705-16
	Chrysler 331-354-392 Hemi w/EDM Oil Hole	.904"	1.850"	.805"	.564"	91g	91708-16
	Chrysler 426 Hemi	.904"	1.850"	.805"	.564"	91g	91705-16
	Chrysler 426 Hemi w/EDM Oil Hole	.904"	1.850"	.805"	.564"	91g	91708-16
Ford	Ford V8 221-302, 351W	.875"	1.934"	1.003"	.512"	78g	91205-16
	Ford V8 221-302, 351W w/EDM Oil Hole	.875"	1.934"	1.003"	.512"	78g	91208-16
	Ford V8 351C-400M	.875"	1.934"	1.003"	.512"	78g	91205-16
	Ford V8 351C-400M w/EDM Oil Hole	.875"	1.934"	1.003"	.512"	78g	91208-16
	Ford V8 429-460	.875"	1.934"	1.003"	.512"	78g	91205-16
	Ford V8 429-460 w/EDM Oil Hole	.875"	1.934"	1.003"	.512"	78g	91208-16
Oldsmobile	Oldsmobile V8 260-455	.842"	1.861"	.890"	.525"	71g	91105-16
	Oldsmobile V8 260-455 w/EDM Oil Hole	.842"	1.861"	.890"	.525"	71g	91108-16
Pontiac	Pontiac V8 265-455	.842"	1.861"	.890"	.525"	71g	91105-16
	Pontiac V8 265-455 w/EDM Oil Hole	.842"	1.861"	.890"	.525"	71g	91108-16

MECHANICAL ROLLER



MECHANICAL ROLLER LIFTERS

True street conditions call for on and off the throttle and long periods of idling. Those stop lights just keep getting longer. Most mechanical roller lifters were not designed for these conditions and will not last. Howards Cams StreetMax™ Mechanical Roller Lifters are specifically designed for this type of operation. Features CNC machined alloy bar stock bodies with case hardened 8620 rollers. **Note:** Designed for spring pressures up to 180 psi seat and 450 psi open. Made in the USA! Sets of 8 pr.

	Application	Body Diameter	Body Height	Intake Offset	Exhaust Offset	Wheel Diameter	Seat Height	Weight (pr.)	
Chevrolet	Chevrolet V8 SB 265-400	.842"	+.300"	Center	Center	.700"	2.569"	306g	91150
	Chevrolet V8 BB (Mark IV, Gen 5/6)	.842"	+.300"	Center	Center	.700"	2.569"	310g	91151
Chrysler	Chrysler SB 318-360 (except Magnum)	.903"	Standard	Center	Center	.700"	2.569"	329g	91750
	Chrysler BB 383-440	.903"	Standard	Center	Center	.700"	2.569"	333g	91751
Ford	Ford V8 221-302, 351W	.875"	Standard	Center	Center	.700"	2.569"	327g	91250
	Ford V8 351C-400M	.875"	Standard	Center	Center	.700"	2.569"	327g	91250
	Ford "FE" 332-428	.875"	Standard	Center	Center	.700"	2.569"	329g	91254
	Ford V8 429-460	.875"	Standard	Center	Center	.700"	2.569"	329g	91254
Pontiac	Pontiac V8 265-455	.842"	Standard	Center	Center	.700"	2.569"	306g	91450



VERTICAL BAR MECHANICAL ROLLER LIFTERS

Designed for the entry level sportsman racer. Built with high grade materials. Priced with a budget racer in mind. These lifters start with 8620 heat-treated steel bodies. Black oxidized for protection. They are fitted with 9310 steel rollers and superior high strength bearings. Carefully assembled by hand and checked for fit prior to packaging. Made in the USA! Sets of 8 pr.

	Application	Body Diameter	Body Height	Intake Offset	Exhaust Offset	Wheel Diameter	Seat Height	Weight (pr.)	
Chevrolet	Chevrolet V8 SB 265-400	.842"	Standard	Center	Center	.750"	2.019"	236g	91117
	Chevrolet V8 SB 265-400	.842"	+.300"	Center	Center	.750"	2.019"	241g	91122
	Chevrolet V8 BB (Mark IV)	.842"	Standard	Center	Center	.750"	2.021"	236g	91127
	Chevrolet V8 BB (Mark IV, Gen 5/6)	.842"	+.300"	Center	Center	.750"	2.021"	241g	91128
Chrysler	Chrysler SB 318-360 (except Magnum)	.904"	Standard	Center	Center	.750"	1.781"	255g	91717
	Chrysler BB 383-440, 392-426 Hemi	.904"	Standard	Center	Center	.750"	1.773"	250g	91727
Ford	Ford V8 221-302, 351W	.875"	Standard	Center	Center	.750"	2.078"	259g	91217
	Ford V8 429-460	.875"	Standard	Center	Center	.750"	2.080"	255g	91247
Pontiac	Pontiac V8 265-455	.842"	Standard	Center	Center	.750"	2.052"	250g	91417
Oldsmobile	Oldsmobile V8 260-455	.842"	Standard	Center	Center	.750"	2.052"	250g	91417

SportMax™ with Direct Lube™ Pin Oilers

Chevrolet	Chevrolet V8 SB 265-400	.842"	+.300"	Center	Center	.750"	2.019"	241g	91152
	Chevrolet V8 BB (Mark IV, Gen 5/6)	.842"	+.300"	Center	Center	.750"	2.019"	241g	91158
Pontiac	Pontiac V8 265-455	.842"	Standard	Center	Center	.750"	2.052"	259g	91457
Oldsmobile	Oldsmobile V8 260-455	.842"	Standard	Center	Center	.750"	2.052"	259g	91457



MECHANICAL ROLLER

SPORT MAX™ LITE DIRECT LUBE™ MECHANICAL ROLLER LIFTERS
w/High Pressure Pin Oilers

Up to 20 grams a pair lighter (only 205g Chev SB) than competitor's lightweight vertical bar lifters. PLUS Direct Lube™ High Pressure Pin Oilers at no extra cost. The lightened bodies are still ultra strong because they are made from 8620 steel. They are fitted with 9310 steel rollers on precision sorted needle bearings for reliability. Stainless steel cross bars. Black oxide finish. Made in the USA! Sets of 8 pr.



	Application	Body Diameter	Body Height	Intake Offset	Exhaust Offset	Wheel Diameter	Seat Height	Weight (pr.)	
Chevrolet	Chevrolet V8 SB 265-400	.842"	Standard	Center	Center	.750"	1.922"	205g	91137
	Chevrolet V8 SB 265-400	.842"	+.300"	Center	Center	.750"	1.922"	209g	91132
	Chevrolet V8 BB (Mark IV)	.842"	Standard	Center	Center	.750"	1.915"	205g	91138
	Chevrolet V8 BB (Mark IV, Gen 5/6)	.842"	+.300"	Center	Center	.750"	1.915"	209g	91133



TRACK MAX™ MECHANICAL ROLLER LIFTERS
BY HOWARDS CAMS

For the bracket and sportsman racer who wants a strong and reliable lifter. These lifters feature steel alloy bodies with a special enhanced finish. This smooth finish increases life to the lifter and the lifter bore. Heat-treated stainless steel link bars. Case hardened 8620 rollers fitted with the best bearings and pins. Fully rebuildable. 100% machined and hand assembled in the USA! Sets of 8 pr.

	Application	Body Diameter	Body Height	Intake Offset	Exhaust Offset	Wheel Diameter	Seat Height	Weight (pr.)	
Chevrolet	Chevrolet V8 SB 265-400	.842"	+.300"	Center	Center	.750"	1.890"	241g	91121
	Chevrolet/GM Gen III (LS-Series)	.842"	Standard	Center	Center	.750"	1.890"	241g	91177
	Chevrolet V8 BB (Mark IV, Gen 5/6)	.842"	+.300"	Center	Center	.750"	1.890"	241g	91126
Ford	Ford V8 351C-400M	.875"	Standard	Center	Center	.750"	2.033"	268g	91219

TRACK MAX™ LIGHTWEIGHT HORIZONTAL BAR ROLLER LIFTERS
BY HOWARDS CAMS

All new tooling. Lightweight, almost 20% lighter than most other mechanical roller lifters. Features CNC machined alloy bar stock bodies with case hardened 8620 rollers. Spring loaded, self lifting design for easy cam changes is what make these lifters so popular. Fully rebuildable. Made in the USA! Sets of 8 pr.



	Application	Body Diameter	Body Height	Intake Offset	Exhaust Offset	Wheel Diameter	Seat Height	Weight (pr.)	
Chevrolet	Chevrolet V8 SB 265-400	.842"	Standard	Center	Center	.750"	1.890"	191g	91119
	Chevrolet V8 BB (Mark IV, Gen 5)	.842"	Standard	Center	Center	.750"	1.890"	196g	91129

NOTICE:

Not all lifters are created equal. Correct lifter selection depends on many factors. Valve spring pressures, RPM, type of usage, etc.

MECHANICAL ROLLER



RACE MAX™ VERTICAL BAR MECHANICAL ROLLER LIFTERS

For the racer who wants a lifter they can rely on with added features. Heat-treated 8620 steel billet bodies. Bodies are CNC machined in one process to assure accuracy of all part features. Increased oil ban diameter for maximum rigidity. Precision ground for proper fit in O.E. and +.300" tall aftermarket lifter bores. Heat treated tool steel nitrided axles and precision fitted roller bearings. Pressure fed axle oiling insures longevity and best defense against pre-mature failure. Made in the USA! Sets of 8 pr.

	Application	Body Diameter	Body Height	Intake Offset	Exhaust Offset	Wheel Diameter	Seat Height	Weight (pr.)	
Chevrolet	Chevrolet V8 SB 265-400	.842"	+.300"	Center	Center	.750"	1.887"	235g	91134
	Chevrolet V8 SB 265-400	.842"	+.300"	.180" L/R	Center	.750"	1.887"	234g	91136
	Chevrolet V8 BB (Mark IV, Gen 5/6)	.842"	+.300"	Center	Center	.750"	1.889"	237g	91135
Chrysler	Chrysler SB 318-360 (except Magnum)	.904"	Standard	Center	Center	.750"	1.756"	270g	91734
	Chrysler BB 383-440, 392-426 Hemi	.904"	Standard	Center	Center	.750"	1.756"	269g	91735
Ford	Ford V8 221-302, 351W	.874"	Standard	Center	Center	.750"	2.033"	269g	91234
	Ford V8 351C-400M	.874"	Standard	Center	Center	.750"	2.033"	269g	91234
	Ford "FE" 332-428	.874"	Standard	Center	Center	.750"	2.033"	269g	91234
	Ford V8 429-460	.874"	Standard	Center	Center	.750"	2.033"	269g	91234
Pontiac	Pontiac V8 265-455	.842"	Standard	Center	Center	.750"	2.022"	259g	91434



PRO MAX™ DIRECT LUBE™ MECHANICAL ROLLER LIFTERS w/High Pressure Pin Oilers

The lifters Pro Racers use. "Full Time" high pressure oiling (most other oiling type lifters are timed based) to the roller bearing shafts. This continuous oiling offers higher rpm and high spring pressure capability. The Pro Max™ features lightened, steel alloy bodies with a special enhanced finish. Heat treated stainless steel link bars. Case hardened 8620 rollers fitted with the best alloy bearings and pins. These are the same materials and designs used on most Top Fuel lifters. .300" taller body allows lifter to fit early, late model and after market blocks. Fully Rebuildable. Made in the USA! Sets of 8 pr.

	Application	Body Diameter	Body Height	Intake Offset	Exhaust Offset	Wheel Diameter	Seat Height	Weight (pr.)		
Chevrolet	Chevrolet V8 SB 265-400	.842"	+.300"	Center	Center	.750"	1.890"	232g	91188	
	Chevrolet V8 SB 265-400	.842"	+.300"	.180" L/R	Center	.750"	1.890"	223g	91189	
	Chevrolet V8 SB 265-400	.875"	+.300"	Center	Center	.750"	1.890"	258g	91194	
	Chevrolet V8 SB 265-400	.903"	+.300"	Center	Center	.810"	1.890"	256g	91192	
	Chevrolet V8 SB 265-400	.903"	+.300"	.180" L/R	Center	.810"	1.890"	257g	91193	
	Chevrolet V8 SB 265-400 (Buick Head)	.903"	+.300"	.200" L	Center	.810"	1.890"	261g	91181	
	Chevrolet/GM Gen III (LS-Series)	.842"	+.300"	Center	Center	.750"	1.890"	232g	91179	
	Chevrolet/GM Gen III (LS-Series)	.903"	+.300"	Center	Center	.810"	1.890"	261g	91178	
	Chevrolet V8 BB (Mark IV, Gen 5/6)	.842"	+.300"	Center	Center	.750"	1.890"	232g	91198	
	Chevrolet V8 BB (Mark IV, Gen 5/6)	.842"	+.300"	.180" L/R	Center	.750"	1.890"	227g	91199	
	Chevrolet V8 BB (Mark IV, Gen 5/6)	.903"	+.300"	Center	Center	.810"	1.890"	264g	91190	
	Chevrolet V8 BB (Mark IV, Gen 5/6)	.903"	+.300"	.180" L/R	Center	.810"	1.890"	259g	91191	
	Chrysler	Chrysler BB 383-440	.903"	Standard	Center	Center	.810"	1.890"	261g	91798
	Ford	Ford V8 221-302, 351W	.875"	Standard	Center	Center	.750"	2.033"	264g	91288
Ford V8 SB/SVO		.903"	Standard	Center	Center	.810"	1.890"	263g	91287	
Ford V8 351C-400M		.875"	Standard	Center	Center	.750"	2.033"	264g	91278	
Ford V8 429-460		.875"	Standard	Center	Center	.750"	2.033"	264g	91298	

MECHANICAL ROLLER



ULTRAMAX™ BUSHED MECHANICAL ROLLER LIFTERS with Direct Lube™ High Pressure Pin Oilers

We took the severe application ProMax™ lifters one step further to make the ultimate lifter for severe racing applications. We replaced the needle bearings in the roller tip with solid bushings. These lifters are made for ultra high spring pressures and the most aggressive cam lobes. They also feature “Full Time” high pressure oiling to the bearing axles. This continuous oiling in conjunction with the solid roller bushings offer the highest rpm and high spring pressure capability available. The UltraMax™ features lightened, steel alloy bodies with a special enhanced finish. Heat treated stainless steel link bars. Case hardened 8620 rollers. .300” taller body allows lifter to fit early, late model and after market blocks. Fully Rebuildable. Made in the USA! Sets of 8 pr.

	Application	Body Diameter	Body Height	Intake Offset	Exhaust Offset	Wheel Diameter	Seat Height	Weight (pr.)	
Chevrolet	Chevrolet V8 SB 265-400	.842"	+.300"	Center	Center	.750"	1.890"	230g	91140
	Chevrolet V8 SB 265-400	.842"	+.300"	.180" L/R	Center	.750"	1.890"	230g	91141
	Chevrolet V8 SB 265-400	.903"	+.300"	Center	Center	.810"	1.890"	260g	91142
	Chevrolet V8 SB 265-400	.903"	+.300"	.180" L/R	Center	.810"	1.890"	260g	91143
	Chevrolet/GM Gen III (LS-Series)	.842"	+.300"	Center	Center	.750"	1.890"	235g	91148
	Chevrolet/GM Gen III (LS-Series)	.903"	+.300"	Center	Center	.810"	1.890"	267g	91149
	Chevrolet V8 BB (Mark IV, Gen 5/6)	.842"	+.300"	Center	Center	.750"	1.890"	235g	91144
	Chevrolet V8 BB (Mark IV, Gen 5/6)	.842"	+.300"	.180" L/R	Center	.750"	1.890"	235g	91145
	Chevrolet V8 BB (Mark IV, Gen 5/6)	.903"	+.300"	Center	Center	.810"	1.890"	265g	91146
	Chevrolet V8 BB (Mark IV, Gen 5/6)	.903"	+.300"	.180" L/R	Center	.810"	1.890"	264g	91147
	Chevrolet V8 BB (Mark IV, Gen 5/6)	.936"	+.300"	Center	Center	.850"	1.890"	265g	91046
	Chevrolet V8 BB (Mark IV, Gen 5/6)	.936"	+.300"	.180" L/R	Center	.850"	1.890"	264g	91047
Chrysler	Chrysler BB 383-440	.903"	Standard	Center	Center	.810"	1.890"	265g	91744
	Chrysler BB 383-440	.903"	Standard	.180" L/R	Center	.810"	1.890"	265g	91745
Ford	Ford V8 221-302, 351W	.875"	Standard	Center	Center	.750"	2.033"	264g	91240
	Ford V8 221-302, 351W	.875"	Standard	.180" R	Center	.750"	2.033"	264g	91241
	Ford V8 221-302, 351W	.875"	Standard	.180" R	.180" L	.750"	2.033"	264g	91239
	Ford V8 221-302, 351W	.903"	Standard	Center	Center	.810"	1.890"	260g	91242
	Ford V8 221-302, 351W	.903"	Standard	.180" R	Center	.810"	1.890"	260g	91243
	Ford V8 351C-400M	.875"	Standard	Center	Center	.750"	2.033"	264g	91245
	Ford V8 429-460	.875"	Standard	Center	Center	.750"	2.033"	264g	91248
	Ford V8 429-460	.903"	Standard	Center	Center	.810"	2.033"	264g	91249

REV KITS

Designed for roller cam applications to increase valve train stability throughout the RPM range. In addition to increasing RPM capability, rev kits will also keep the lifter in the lifter bore in the event of valve train failure. The locator bars and lifter buttons are made of the highest quality aluminum and then anodized for protection. Each kit is complete with a pair of locator bars, springs, and lifter buttons. Made in the USA. *Note: Will not work on some Pro-Topline or RHS Chev small block cylinder heads.*



90130 Chevrolet SB 265-400, Mechanical Roller (Flat Top Lifters)

90135 Chevrolet SB 265-400, Mechanical Roller (Cutaway style lifter) (5/16" pushrods only)

MAXIMUM EFFORT™ ALUMINUM STUD GIRDLE KITS

Designed to increase the strength and rigidity of the rocker arm studs by eliminating flex and thereby assuring true rocker arm ratios. Howards™ stud girdles are made from the highest quality aluminum. They are spring-loaded for easy removal and are anodized purple. A must for all competition engines not using shaft rockers. Locking hex head adjusters are included. Made in the USA.



Chev SB
90100 Small Block Chevrolet
3/8" stud Standard Offset

Chev BB
90120 Big Block Chevrolet
7/16" stud Standard Offset

Ford SB
90200 Ford 289-351W
3/8" stud Standard Offset

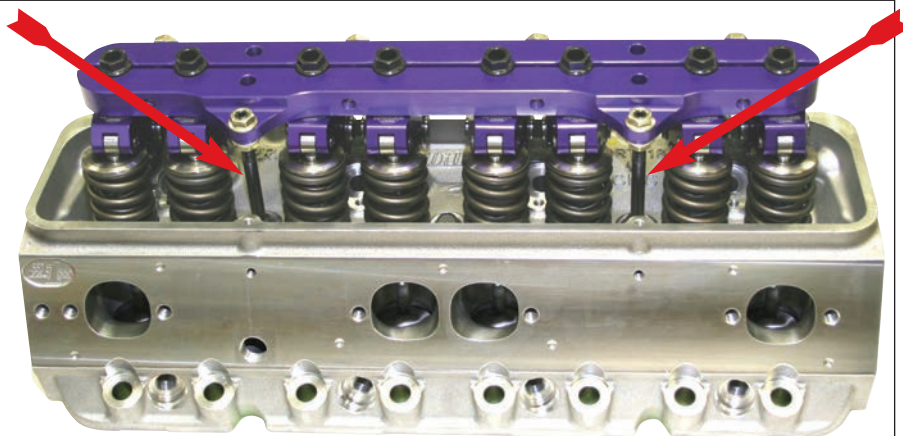
90101 Small Block Chevrolet
7/16" stud Standard Offset

90121 Big Block Chevrolet
Dart, Brodix, AFR & RHS

90201 Ford 289-351W
7/16" stud Standard Offset

PRO MAX™ STUD GIRDLE KITS w/Torsional Stands (Patent Pending)

The features of the best stud girdles available, plus girdle stands. These innovative stands eliminates girdle bar rocking and all associated flex. Dyno test have shown 300 plus rpms over standard stud girdles. 100% CNC machined from premium 3/4" aluminum bar. Purple anodized for protection. The accuracy of shaft rockers with out the additional cost. Locking hex head adjusters are included. Made in the USA.



90105 Small Block Chevrolet, 7/16" stud Standard Offset

REPLACEMENT STUD GIRDLE ADJUSTING NUTS

90125-1 Replacement Adjusting Nut
3/8"-24 Short, Each

90126-1 Replacement Adjusting Nut
7/16"-20 Short, Each

90127-1 Replacement Adjusting Nut
7/16"-20 Long, Each




E-Z ROCKER WRENCH

No more wishing that you had three hands to adjust your valves. Howards™ E-Z Wrench makes it a breeze to adjust roller rocker arms and steel rocker arms with poly locks.

92100 9/16" E-Z Wrench

92105 5/8" E-Z Wrench




LONG SLOT ROCKER ARMS

Howards™ Cams Long Slot Rocker Arms are excellent for stock engines or street performance. They are manufactured from the highest quality steel alloy, and then heat-treated. Rocker sets include anti-gall rocker balls, and locking nuts. Sets of 16. Made in the USA.

90005 Chev 265-400, V6 200-262, 3/8" stud, 1.5 Ratio	90007 Chev 265-400, V6 200-262, 7/16" stud, 1.5 Ratio
90006 Chev 265-400, V6 200-262, 3/8" stud, 1.6 Ratio	90008 Chev 265-400, V6 200-262, 7/16" stud, 1.6 Ratio

TRACK SMART™ NITRO-CARBIDED ROCKER ARMS

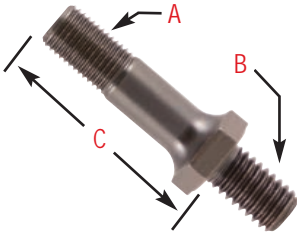
The ultimate race rockers for applications where stock-type rockers are required. Precision die formed for the most accurate ratios of any stamped steel rocker. Nitro-Carbided to give 3-5 times greater resistance to wear, fatigue and fracture in high stress areas. Eliminates pushrod cup and fulcrum failures. Long-slot design for higher lift cam applications. Includes oil-groove pivot balls and adjusting nuts. For all race applications where rules require stock type rockers. This includes oval track, plus NHRA and IHRA "Stock Class" categories where stock-type rockers are required. Made in the USA. *Note: 2 sets required per engine.*



90045-6 Chev V6 200-262, 3/8" stud, 1.5 Ratio, set of 6	90047-8 Chev 265-400, 7/16" stud, 1.5 Ratio, set of 8
90045-8 Chev 265-400, 3/8" stud, 1.5 Ratio, set of 8	
90046-6 Chev V6 200-262, 3/8" stud, 1.6 Ratio, set of 6	
90046-8 Chev 265-400, 3/8" stud, 1.6 Ratio, set of 8	

ROCKER ARM STUDS


Manufactured from tough 8740 steel, featuring a large ground radius fillet to provide increased support to the stud shank, effectively eliminating bending and subsequent breakage. All studs are precision machined with rolled threads and heat treated for tensile strength of 180,000 PSI then finished in black oxide. Each kit contains 16 studs.



	"A"	"B"	"C"
94650 Chev SB and other standard 3/8" applications	3/8"-24	7/16"-14	1.750"
94652 Chev SB 3/8" with Roller Rockers	3/8"-24	7/16"-14	1.895"
94651 Chev SB standard 7/16" applications	7/16"-20	7/16"-14	1.770"
94656 Chev SB 7/16" w/Roller Rockers & Girdles	7/16"-20	7/16"-14	1.900"
94657 Chev BB Mark IV	7/16"-20	7/16"-14	1.750"
94655 Chev BB 7/16" w/Roller Rockers & Girdles	7/16"-20	7/16"-14	1.900"
94650 Ford SB standard 3/8" applications	3/8"-24	7/16"-14	1.750"
94656 Ford SB, C/M standard 7/16" applications	7/16"-20	7/16"-14	1.900"

GUIDE PLATES

Pushrod guide plates reduce the unwanted sideways motion of the pushrod under load. This keeps the rocker arm stabilized, making the valve operation much smoother and more efficient. Made from heat-treated chrome moly steel to reduce wear.



94600 Chev SB, 5/16" Flat	94610 Chev BB, 3/8"	94620 Ford SB, 5/16" Flat
94601 Chev SB, 5/16" Raised	94611 Chev BB, 7/16"	94625 Ford 429-460, 5/16"
94602 Chev SB, 3/8" Raised		

LIFETIME WARRANTY

HOWARDS™ BILLET ALUMINUM ROCKERS "The Purple Rocker"



Unique full body design offers less flex and will withstand 900+ lbs. of spring pressure at over .900" lift. 100% CNC machined. Lightweight for maximum performance. Designed for more retainer and spring clearance than most other manufacturers. They feature needle bearing fulcrums and roller tips, centerless ground trunnions, centerless ground pins and rollers and include thick walled adjusting nuts. Micropolished surface finish for maximum durability. Purple anodized for additional protection. Available in most popular ratios. Unconditional Lifetime Warranty to the original purchaser (with proof of purchase) for life! Made in the USA. Sets of 16.

Chev SB 3/8" Stud

- 90068 Chev. SB, 3/8" 1.30 (break-in)
- 90070 Chev. SB, 3/8" 1.50
- 90071 Chev. SB, 3/8" 1.60
- 90074 Chev. SB, 3/8" 1.60/1.50

Chev SB 3/8" Self-Aligning

- 90084 Chev. SB (Self-Aligning), 3/8" 1.50
- 90085 Chev. SB (Self-Aligning), 3/8" 1.60

Chev SB 7/16" Stud

- 90069 Chev. SB, 7/16" 1.30 (break-in)
- 90072 Chev. SB, 7/16" 1.50
- 90077 Chev. SB, 7/16" 1.55
- 90073 Chev. SB, 7/16" 1.60
- 90087 Chev. SB, 7/16" 1.65
- 90076 Chev. SB, 7/16" 1.60/1.50
- 90088 Chev. SB, 7/16" 1.65/1.50
- 90078 Chev. SB, 7/16" 1.65/1.55

Chev BB 7/16" Stud

- 90075 Chev. BB, 7/16" 1.70
- 90079 Chev. BB, 7/16" 1.80
- 90086 Chev. BB, 7/16" 1.80/1.70

Ford SB 3/8" Stud

- 90080 Ford SB, 3/8 1.60

Ford SB 7/16" Stud

- 90081 Ford SB, 7/16" 1.60
- 90082 Ford SB, 7/16" 1.72

Ford 351C, 429-460 7/16" Stud

- 90083 Ford 351C/429-460, 7/16" 1.73
- 90083F Ford 351C/429-460, 7/16" 1.73 (Recessed for 3/8" Pushrods)

Pontiac/Holden 7/16" Stud

- 90090 Pontiac/Holden 7/16" 1.65

Replacement Adjusting Nuts

- 90034 Adjusting Nut, 3/8", each
- 90036 Adjusting Nut, 7/16", each



GM GEN III/IV DIRECT BOLT-ON ROLLER ROCKERS

These roller rocker kits are a direct bolt-on for the OE rocker arms on most GM Gen III engines. No need to changing of pushrods, guide plates or rocker studs. No need for valve cover spacers. They feature needle bearing fulcrums and roller tips, centerless ground trunnions, centerless ground pins and rollers. Purple anodized for additional protection. Available with stock 1.70 ratio or high lift 1.80. Lifetime Warranty to the original purchaser (with proof of purchase)! Made in the USA. Sets of 16.

Gen III

(LS1, LS2, LS6, LS364/400 & LQ9)

- 90097 GM Gen III 1.70
- 90098 GM Gen III 1.80

Gen IV

(LS3 & L92)

- 90095 GM Gen IV 1.70
- 90096 GM Gen IV 1.80



"EXTREME BLACK™" SEVERE APPLICATION VALVES

Engineered for high rpm and high horsepower applications. Extreme Black™ feature a gloss black nitride and are perfect for high temperatures (they run cooler which improves valve life), nitrous, turbo and supercharger applications. For naturally aspirated motors these valves will give you a much greater cylinder flow for good horsepower gains. They start as a one piece forged, high temperature, high nickel, stainless steel alloy. CNC finished to strict tolerances making these valves the choice for the most demanding race classes. The black nitride micro-hardness is higher than the stainless steel base material. No process can match it for surface hardness. Surface finish is smoother than with chromed stems, having less friction between stem and guide. The black nitride reduces power loss due to less valve-guide friction. Nitriding is not a coating, it is a process where it actually becomes part of the steel. Sold as each.

- High Nickel Stainless Alloy 1pc. Forgings
- Special Black Nitride Process
- Great for Naturally Aspirated Applications
- Great for Nitrous Applications
- Great for Turbo Applications
- Great for Supercharged Applications
- Designed for High Horsepower Applications
- Runs Cooler, Improves Valve Life
- Fully CNC Machined Finished
- Surface Finish is Smoother than Chrome
- Higher Micro-Hardness than Stainless
- Undercut Stems for Increased Flow

Type	Head Diameter	Stem Diameter	Installed Height	Overall Length	Tip Length	Underhead. Angle / Radius	Margin	Seat Width	Top of Head	Weight (Grams)
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Chevrolet SB

19401N	Intake	1.940	11/32 (.3415)	Standard	4.911"	.250"	10° x .375"	.050	.100	6° Dish	111
20201N	Intake	2.020	11/32 (.3415)	Standard	4.911"	.250"	10° x .375"	.050	.100	6° Dish	116
20211N	Intake	2.020	11/32 (.3415)	+ .100"	5.011"	.250"	10° x .375"	.050	.100	6° Dish	124
20501N	Intake	2.055	11/32 (.3415)	Standard	4.911"	.250"	10° x .375"	.050	.100	6° Dish	131
20511N	Intake	2.055	11/32 (.3415)	+ .100"	5.011"	.250"	10° x .375"	.050	.100	6° Dish	119
20811N	Intake	2.080	11/32 (.3415)	+ .100"	5.011"	.250"	10° x .375"	.050	.100	6° Dish	120
15001N	Exhaust	1.500	11/32 (.3415)	Standard	4.911"	.250"	12° x .375"	.060	.100	7° Dish	89
16001N	Exhaust	1.600	11/32 (.3415)	Standard	4.911"	.250"	12° x .375"	.060	.100	7° Dish	94
16011N	Exhaust	1.600	11/32 (.3415)	+ .100"	5.011"	.250"	12° x .375"	.060	.100	7° Dish	95
16211N	Exhaust	1.625	11/32 (.3415)	+ .100"	5.011"	.250"	12° x .375"	.060	.100	7° Dish	105

Chevrolet BB

22521N	Intake	2.250	11/32 (.3415)	+ .250"	5.494"	.250"	12° x .375"	.065	.100	7° Dish	149
23021N	Intake	2.300	11/32 (.3415)	+ .250"	5.494"	.250"	12° x .375"	.065	.100	7° Dish	155
23031N	Intake	2.300	11/32 (.3415)	+ .350"	5.594"	.250"	12° x .375"	.065	.100	7° Dish	160
18801N	Exhaust	1.880	11/32 (.3415)	Standard	5.422"	.250"	10° x .375"	.075	.100	6° Dish	121
18811N	Exhaust	1.880	11/32 (.3415)	+ .100"	5.522"	.250"	10° x .375"	.075	.100	6° Dish	125



LASH CAPS

Today's race engine technology and extreme cam profiles subject the tip of the valve stem to a tremendous amount of pounding. Designed to protect the valve stem under the most harsh conditions. Manufactured from premium quality chrome moly steel. Precision machined and ground perfectly flat to maintain accuracy. Provides a better wear surface for increased valve stem life. Lengthens valve .080" to correct rocker geometry. A must for high rpm engines. Sets of 16.

93200 5/16" x .250" Tip 93205 11/32" x .250" Tip 93210 3/8" x .250" Tip

UMBRELLA VALVE SEALS

High quality umbrella replaces “O” ring seals for better oil control. Not recommended for dual springs. Will fit inside stock springs. Sets of 16.



93350 11/32” Set of 16



Due to valve guide cutter and manufacturing inconsistencies, Hylomar sealant should always be used.

ULTIMATE DUTY™ VALVE SEALS

The Best Seal Made, Period! Howards™ Premium PC type seals are made of a space age material which is tolerant to pump gas, alcohol, and nitromethane. Temperature tolerant to 350°. They are self-lubricating and offer controlled radial tension during changes in operating temperatures. Color Coded. Controls oil while lubricating the valve guide.

- **Space age DuPont® fluoropolymer material**
- **Alcohol, Nitromethane tolerant**
- **Controlled radial tension during changing temperatures**
- **Self lubricated material to 350°**
- **Design allows very small amount of oil for guide/stem lubrication**
- **Color coded • Installs with fingers**
- **Lifetime replacement warranty**

93311 (red) Seal

11/32” Stem x .500” Guide
 ID Guide .494”
 ID Valve .337”
 Outer Diameter .630”
 Overall Height .460”
 Inside Height .340”
 Guide Contact .120”

93310-100 Pack of 100
 93310-1000 Box of 1000

93316 (orange) Seal

11/32” Stem x .531” Guide
 ID Guide .524”
 ID Valve .337”
 Outer Diameter .630”
 Overall Height .460”
 Inside Height .340”
 Guide Contact .120”

93315-100 Pack of 100
 93315-1000 Box of 1000

93321 (blue) Seal

3/8” Stem x .531” Guide
 ID Guide .524”
 ID Valve .369”
 Outer Diameter .630”
 Overall Height .460”
 Inside Height .340”
 Guide Contact .120”

93320-100 Pack of 100
 93320-1000 Box of 1000

VITON VALVE SEALS

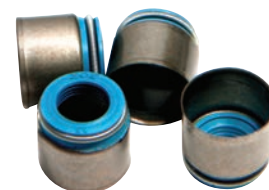
High temperature, high quality posi-stop seals. Stem contact controls oil flow to guide. No machining of guide required. For standard size valve stems only. Sets of 16.



93360 11/32” x .514-.540” Set of 16

SMALL O.D. VALVE SEALS

These high quality valve seals offer a small outside diameter for greater spring clearance. A must for triple springs. Fluoro elastomer hi-temp material. Rigid chimney, metal-clad. Sets of 16.



93370 11/32” x .500” (.550” O.D.) Set of 16
 93375 11/32” x .531” (.575” O.D.) Set of 16

93380 8mm” x .500” (.600” O.D.) Set of 16
 93385 8mm” x .531” (.675” O.D.) Set of 16

PERFORMANCE SERIES C1010 PUSHRODS

Manufactured from .060" wall C1010 material. Over 20% more column strength than OE. Advanced design eliminates ball breakage. Heat treated for use with guide plates. Designed for spring pressures up to 500 lbs.

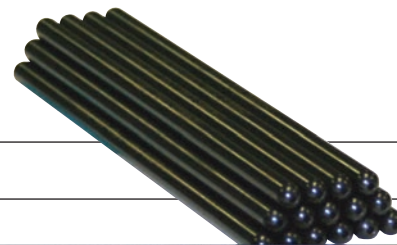


5/16" C1010 Pushrods (sets of 16)

95198	6.804" (Ford 255-302 '62-'69)	95205	7.800" (Chev SB, std. length)
95212	6.886" (Ford 302 '69-'85 non-roller)	95206	7.850"
95200	7.144" (Chev SB HRC Retro-Fit)	95207	7.900" (Chev SB, +.100" length)
95201	7.205" (OE Hyd. Roller)	95208	7.950"
95203	7.700"	95209	8.000" (Ford 351W w/HRC 91260)
95204	7.750"	95210	8.050"

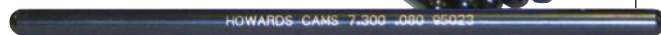
3/8" C1010 Pushrods (sets of 16)

95220	7.640/8.595" (Chev BB, HRC Retro-Fit)
95222	8.280/9.250" (Chev BB, std. length)



.080" WALL SWEDGED END PUSHRODS

Engineered for maximum strength and durability. Produced from seamless SAE 4130 chrome moly aircraft tubing. Each tube is case hardened to Rc 60. Pushrods are mirror polished to eliminate the possibility of stress fractures, and finished in black oxide. Strong, but light, well suited for roller applications. Laser etched with size and part number for easy identification.



5/16" Swedged End Pushrods (sets of 16)

95004	5/16", 6.350" (Ford 302 H.O.)
95003	5/16", 6.500" (Ford 221-302 Retro-Fit)
95081	5/16", 6.625"/7.850" (5.7/6.1L Hemi)
95005	5/16", 6.700" (Ford SB w/HRC 91260)
95007	5/16", 6.800" (Ford SB, std. length)
95020	5/16", 7.100" (Chev SB HRC Retro-Fit)
95021	5/16", 7.150"
95022	5/16", 7.200" (Chev SB OE Hyd. Roller)
95006	5/16", 7.250"
95023	5/16", 7.300"
95018	5/16", 7.400" (LS1, std. length)
95008	5/16", 7.700"
95009	5/16", 7.750"
95010	5/16", 7.800" (Chev SB, std. length/Ford 351C Hyd. Roller)
95011	5/16", 7.850"
95012	5/16", 7.900" (Chev SB, +.100" length)
95013	5/16", 7.950"
95014	5/16", 8.000" (Ford 351W w/HRC 91260)
95015	5/16", 8.150" (Ford 351W, std. length/Chev 348/409 Hyd. Roller)
95024	5/16", 8.250"
95016	5/16", 8.400" (Ford 351C, std. length)
95017	5/16", 8.550" (Ford 429-460, std. lgth)
95028	5/16", 8.670" (Holden V8, std. lgth)
95029	5/16", 8.700" (Ford 351M/400 Retro-Fit)
95099-1	.080" Wall, 5/16", Custom (6.000"-13.000"), each

3/8" Swedged End Pushrods (sets of 8)

95107	3/8", 7.550" (Chev BB, w/HRC 91161 exh.)
95108	3/8", 7.600" (Chev BB, HRC Retro-Fit exh.)
95109	3/8", 7.650"
95104	3/8", 7.700"
95103	3/8", 7.750"
95114	3/8", 7.800" (Chev SB, std. length)
95113	3/8", 7.900" (Chev SB, +.100" length)
95110	3/8", 8.280" (Chev BB, std. length int.)
95111	3/8", 8.380" (Chev BB, +.100" lgth int.)
95118	3/8", 8.500"
95119	3/8", 8.550" (Ford 429-460, std. length/Chev BB w/91161 int.)
95121	3/8", 8.600" (Chev BB, HRC Retro-Fit int.)
95128	3/8", 8.650"
95112	3/8", 8.680" (Chev BB, +.400" lgth int.)
95115	3/8", 9.250" (Chev BB, std. length exh.)
95116	3/8", 9.350" (Chev BB, +.100" lgth exh.)
95124	3/8", 9.400"
95117	3/8", 9.650" (Chev BB, +.400" lgth exh.)
95122-1	.080" Wall, 3/8", Custom (6.000"-13.000"), each



.105 - .165" WALL SINGLE PIECE PUSHRODS

For engine builders wanting a stiffer pushrod. Single Piece seamless SAE 4130 chrome moly aircraft tubing. Precision CNC machined ends for accuracy. Each tube is case hardened to Rc 60. Pushrods are mirror polished to eliminate the possibility of stress fractures, and finished in black oxide. Available in .025" increments.

5/16" Single Piece Pushrods

- 95095-1 .105" Wall 5/16", Custom, each
- 95094-1 .105" Wall 5/16" (Restricted oil), Custom, each

3/8" Single Piece Pushrods

- 95123-1 .135" Wall 3/8", Custom, each

7/16" Single Piece Pushrods

- 95589-1 .165" Wall 7/16", Custom, each

210° TIP .080" WALL SWEDGED END PUSHRODS

A must for all high lift applications. The 210 degree tip gives extra radius clearance to the rocker pushrod cup area. Strongly recommended with all shaft style rocker systems. Formed from SAE 4130 .080" wall centerless ground tubing. Ends are precision swedged to exacting tolerances. Case hardened to Rc 60. Black oxide finish and laser etched with size and part number. Custom pushrods available in 6.000" to 13.000" lengths, in .025" increments. Precision pushrods at affordable shelf stock pricing.



5/16" 210° Tip Pushrods (sets of 16)

- 95302-16 5/16", 6.250"
- 95309-16 5/16", 7.750"
- 95310-16 5/16", 7.800"
- 95311-16 5/16", 7.850"
- 95312-16 5/16", 7.900"
- 95313-16 5/16", 7.950"
- 95314-16 5/16", 8.000"
- 95326-16 5/16", 8.050"
- 95315-16 5/16", 8.150"
- 95399-1 .080" Wall, 5/16", Custom (6.000"-13.000"), each
- 95799-1 .105" Wall, 5/16", Custom (6.000"-13.000"), each

3/8" 210° Tip Pushrods (sets of 8)

- 95427-8 3/8", 7.850"
- 95429-8 3/8", 8.400"
- 95418-8 3/8", 8.500"
- 95419-8 3/8", 8.550"
- 95421-8 3/8", 8.600"
- 95422-8 3/8", 8.700"
- 95432-8 3/8", 9.000"
- 95437-8 3/8", 9.200"
- 95499-1 .080" Wall, 3/8", Custom (6.000"-13.000"), each
- 95498-1 .135" Wall, 3/8", Custom (6.000"-13.000"), each



7/16" DUAL TAPER 210° TIP .165" WALL SWEDGED END PUSHRODS

7/16" diameter .165" wall for extra strength, high pressure applications. Double tapered and 5/16" 210° tips provide additional clearance to cylinder heads, lifter bores and lifters. Available in .025" increments.

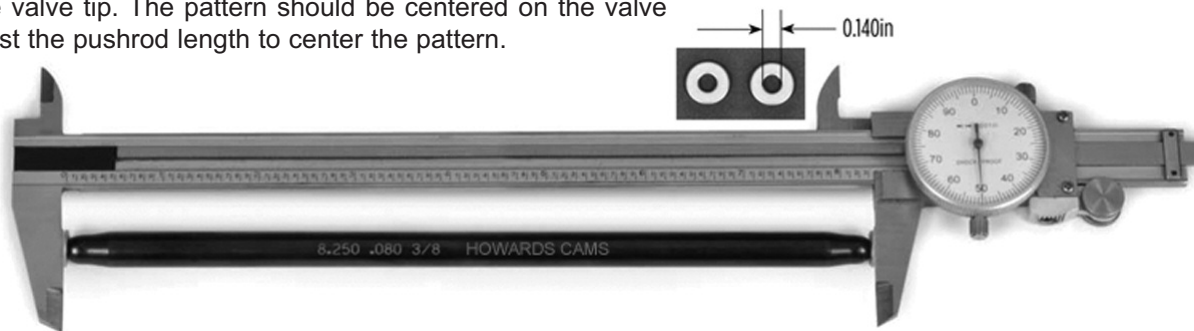
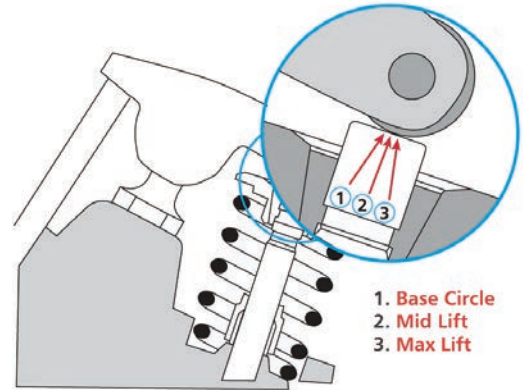
- 95599-1 7/16", Dual Taper Custom (6.000"-13.000")

PUSHROD MEASUREMENT

VALVE TRAIN GEOMETRY

Valve Train geometry is when the rocker arm tip moves from the intake side of the valve stem tip, across the center of the tip (at approximately mid lift), to the exhaust side of the valve stem tip (at full lift) and back. After you have estimated the required pushrod length using a Pushrod Length Checker, use this guide to check for proper alignment.

- 1) The first step is to install a solid lifter and an adjustable pushrod. Mark the tip of the valve with a machinist dye or ink.
- 2) Install your rocker arm and set it up with zero lash.
- 3) Rotate the crankshaft clockwise several times. Take off the rocker arm. The pattern of the rocker tip will be where the ink has been wiped away from the valve tip. The pattern should be centered on the valve tip. If not, adjust the pushrod length to center the pattern.



MEASURING PUSHRODS

Ball-ball pushrods: Because the radiused holes in the ends of pushrods vary in diameter from manufacturer to manufacturer, it is not advisable to measure pushrods by their overall lengths. Instead it is more dependable to measure them at their 0.140in gauge diameter. In other words, simply find two washers each with 0.140in hole, place one washer on each end of the pushrod and measure the overall distance. Finally, subtract the thickness of the washers to calculate the pushrod's correct length.

PUSHROD LENGTH CHECKERS

Easy and economical tool to layout and determine proper pushrod length for proper valve-train geometry. Proper valvetrain geometry is necessary to obtain the desired results from the cam and to ensure damage is not done to the rest of the valvetrain. Made from a 5/16" pushrod that is cut and threaded with over one inch of travel. 5/16" ball tip on both ends.

92129	6.500"-7.500"	92131	8.500"-9.800"	92133	10.200"-11.500"
92130	7.500"-8.700"	92132	9.700"-11.000"		



PUSHROD LENGTH CHECKING TOOLS

Proper pushrod length is absolutely critical for peak performance and horsepower. Using the correct pushrod can eliminate bent or broken pushrods, excessive valve stem/tip wear, valve guide wear, and energy wasting valve side-loading friction.

92137	Chev SB, 3/8" Stud	92138	Chev SB, 7/16" Stud	92139	Chev BB, 7/16" Stud
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DEGREE WHEELS



PROFESSIONAL 2-SIDED 14" DEGREE WHEELS

Not stamped, but CNC machined billet aluminum for accuracy. These oversized degree wheels are precisely etched on both sides with 1° increments. Features easy to read intake valve opens, intake valve closes, exhaust valve opens and exhaust valve closes on one side and intake lobe centerline and exhaust lobe centerline on the other. Purple anodized. Standard 1" center hole for use with most degree wheel sockets. Instructions and laminated reusable specification sheet are included.

92115 14" Professional 2-Sided Degree Wheel



Degree Wheel Mounting Sockets

Provides a great way to attach a degree wheel to the engine. A knurled retaining nut sandwiches the degree wheel and holds it in place. Simply slips on the end of a crankshaft. Works with any degree wheel with a 1" mounting hole. Designed to accept 1/2" drive ratchet or breaker bar. Allows you to easily rotate the engine assembly.

- 92122 Pro Turning Socket, Chev SB
- 92127 Pro Turning Socket, Chev BB
- 92124 Pro Turning Socket, Chrysler V8



ADVANCE AND RETARD CAM BUSHINGS

An easy way to advance or retard your cam timing. These offset bushings come in packs of 5 (4 offset & one 0°). Precision manufactured to offer precise timing of your cam. Color coded. Requires drilling a 13/32" hole in camshaft timing gear.

- | | | | |
|--------------|-------------------------------------|--------------|------------------------------------|
| 94505 | Set of 5, Even (0°, 2°, 4°, 6°, 8°) | 94510 | Set of 5, Odd (0°, 1°, 3°, 5°, 7°) |
| 94505:4505-0 | Each, 0°, Natural | 94505:4505-0 | Each, 0°, Natural |
| 94505:4505-2 | Each, 2°, Black | 94510:4510-1 | Each, 1°, Gold |
| 94505:4505-4 | Each, 4°, Red | 94510:4510-3 | Each, 3°, Brown |
| 94505:4505-6 | Each, 6°, Green | 94510:4510-5 | Each, 5°, Blue |
| 94505:4505-8 | Each, 8°, Grey | 94510:4510-7 | Each, 7°, Purple |



LIFTER VALLEY BREATHER TUBES

Allows crankcase pressure to rise unobstructed, allowing more speedy oil drain back to the oil pan. Sets of 8.

92145 Chev V8

DOUBLE ROLLER TIMING SETS

DOUBLE ROLLER TIMING SETS

These 3 piece timing sets are hand matched for quality and reliability. Features a premium double roller chain for extended life. Cast iron cam sprocket and a 3 key-way crank sprocket offers a +4°, 0°, -4° cam adjustment.

- **Hand Matched for Quality & Reliability**
- **Premium Double Roller Chain**
- **3-Keyway Crank Sprocket for adjustability**



94200 Chevrolet SB 55-96, 265-400, except Factory Roller Cam, 3-Keyway

94205 Chevrolet BB Mark IV 65-98, 396-454, 3-Keyway

94230 Chrysler SB 56-91, 273-360, 3-Keyway

94210 Ford 289-302/351W 65-84 Factory 1pc eccentric, 3-Keyway

94212 Ford 302/351W 72-02 Factory 2pc eccentric, 3-Keyway

DOUBLE ROLLER BILLET STEEL TIMING SETS WITH IWIS SEVERE APPLICATION CHAIN

The IWIS chain, designed and widely known for its strength and durability in the most extreme conditions. This precision made special heat-treated high strength steel chain is the choice of the most serious engine builders. These sets include a CNC machined billet steel cam sprocket with lightening holes, a heat-treated crank sprocket with 9-keyways and a black oxide coating and Torrington thrust bearing.



94700 Chevrolet SB 55-96, 265-400, except Factory Roller Cam, 9-Keyway

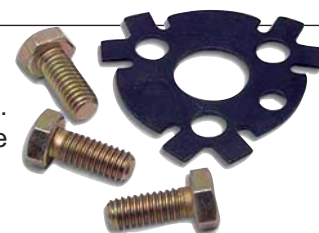
94705 Chevrolet BB Mark IV 65-98, 396-454, 9-Keyway

94712 Ford 302/351W 72-02 Factory 2pc eccentric, 9-Keyway

CAMSHAFT LOCKING PLATE AND BOLT KIT

Howards™ cam bolt lock plate is cheap insurance when changing camshafts or timing sets. The combination of super strength bolts and locking plate with bendable tabs eliminates the possibility of the cam bolts coming loose and possibility of serious engine damage.

94550 Includes Locking Plate and (3) Super Strength Bolts



CAM THRUST BUTTONS

Designed to control cam end play. Excessive cam play can cause inaccurate ignition timing and premature timing chain wear. Simply pushes into front of cam gear.

94582 Chev SB, .600" Long, Aluminum

94580 Chev SB, .800" Long, Aluminum

94560 Chev SB, .810" Long, Nylon

94585 Chev BB, .950" Long, Aluminum



ROLLER CAM THRUST BUTTONS

Full needle bearing design. Maintains proper cam end play that can cause inaccurate timing and premature timing chain stretch. A must for roller cam applications.

94570 Chev SB, .800" Long

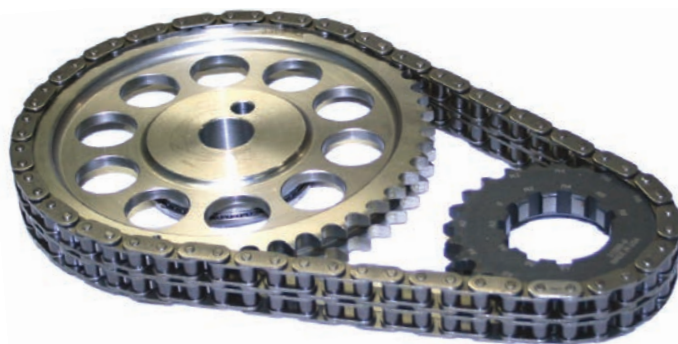
94575 Chev BB, .950" Long



DOUBLE ROLLER BILLET STEEL TIMING SETS

DOUBLE ROLLER BILLET STEEL TIMING SETS

These pro billet competition timing sets are designed for accuracy and long life. Lightweight by design these sets feature a CNC machined billet steel cam sprocket with lightening holes, a heat-treated crank sprocket with 9-keyways and a black oxide coating. The chain is a large .250" diameter seamless roller. Most sets include a press fit roller thrust bearing.



94300	Chevrolet SB 55-96, 265-400, except Factory Roller Cam, with Roller Thrust Bearing, 58 Link Chain
94300-5	Chevrolet SB 55-96, 265-400 .005" Undersize, with Roller Thrust Bearing, 58 Link Chain
94300-10	Chevrolet SB 55-96, 265-400 .010" Undersize, with Roller Thrust Bearing, 58 Link Chain
94301	Chevrolet SB 85-02, 305-350 w/Factory Roller Cam, with Roller Thrust Bearing, 58 Link Chain
94303	Chevrolet SB with Big Block Crank Snout, with Roller Thrust Bearing, 58 Link Chain
94302	Chevrolet SB Rocket Block/Dart Iron Eagle, with Roller Thrust Bearing, 60 Link Chain
94308	Chevrolet Gen III 97-05, LS1/6 3-Bolt, with Roller Thrust Bearing, 60 Link Chain
94304	Chevrolet Gen III 05-present, LS2/LSR/LR4 Single-Bolt, with Roller Thrust Bearing, 60 Link Chain
94306	Chevrolet Gen III 07-10 LS3 6.0L, 08-10 6.2L Single-Bolt, with Roller Thrust Bearing, 60 Link Chain
94307	Chevrolet Gen III 2006 LS3 6.0L, 2007 L92 6.2L 3-Bolt, with Roller Thrust Bearing, 60 Link Chain
94305	Chevrolet BB Mark IV 65-98, 396-454, with Roller Thrust Bearing, 66 Link Chain
94305-5	Chevrolet BB Mark IV 65-98, .005" Undersize, with Roller Thrust Bearing, 66 Link Chain
94305-10	Chevrolet BB Mark IV 65-98, .10' Undersize, with Roller Thrust Bearing, 66 Link Chain
94309	Chevrolet BB Gen 6 96-00, 454-502, with Roller Thrust Bearing, 66 Link Chain <i>Fits under most stock timing covers.</i>
94330	Chrysler SB 56-91, 273-360, 68 Link Chain
94330	Chrysler Hemi 57-58, 392, 68 Link Chain
94332	Chrysler Hemi 03-10, 5.7/6.1L without VCT, with Roller Thrust Bearing, 68 Link Chain, Steel Back Plate
94335	Chrysler BB 58-78, 383-440/426 Hemi, Single bolt, 66 Link Chain
94340	Chrysler BB 58-78, 383-440/426 Hemi, Three bolt, with Roller Thrust Bearing, 66 Link Chain
94310	Ford 289-302/351W 65-84 Factory 1pc eccentric, with Roller Thrust Bearing, 58 Link Chain
94312	Ford 302/351W 72-02 Factory 2pc eccentric, with Roller Thrust Bearing, 58 Link Chain
94312-5	Ford 302/351W 72-02 Factory 2pc eccentric, .005" Undersize, with Roller Thrust Bearing, 58 Link Chain
94320	Ford Cleveland/M 70-82, 351C/M & 400, with Roller Thrust Bearing, 64 Link Chain
94315	Ford BB 68-71, 429-460, with Roller Thrust Bearing, 66 Link Chain
94315-5	Ford BB 68-71, 429-460, .005" Undersize, with Roller Thrust Bearing, 66 Link Chain
94325	Ford FE 63-73, 352-428, with Roller Thrust Bearing, 64 Link Chain
94345	Pontiac V8 55-79, 326-455, with Bronze Thrust Bearing, 60 Link Chain

SINGLE ROLLER BILLET STEEL TIMING SETS FOR GM LS-SERIES APPLICATIONS (No Machining Required)

94354	Chevrolet Gen III 05-present, LS2/LSR/LR4 Single-Bolt, with Roller Thrust Bearing
94356	Chevrolet Gen III 07-10 LS3 6.0L, 08-10 6.2L Single-Bolt, with Roller Thrust Bearing
94357	Chevrolet Gen III 2006 LS3 6.0L, 2007 L92 6.2L 3-Bolt, with Roller Thrust Bearing

Replacement Parts

94010	Thrust Bearing for 94300/94305	94060	Timing Chain, 60 Link
94012	Thrust Bearing for 94310/94312	94064	Timing Chain, 64 Link
94058	Timing Chain, 58 Link	94066	Timing Chain, 66 Link
		94068	Timing Chain, 68 Link



MAX Z.P.M.™ CAMSHAFT BREAK-IN LUBE & OIL CHANGE ADDITIVE

The Highest Levels of ZDDP of All Popular Brands

Not only the most important product for proper camshaft break-in, but also extremely important at each oil change. Replaces the Zinc-Phosphates (ZDDP) removed from today's oils. Use with both hydraulic and mechanical flat tappet camshafts. Virtually eliminates cam and lifter wear at initial break-in. Don't pay for added mineral oil in some competitors bigger bottles. Max ZPM™ has the highest levels of Zinc-Phosphates (ZDDP) of all the popular brands tested, plus the addition of moly for extra protection. Compatible with all petroleum base and synthetic oils. Add to oil at every oil change to extend engine life and enhance performance. Just add one 4 ounce bottle for up to 6 quarts of oil.

- 99000 MAX Z.P.M. Camshaft Break-In Lube, 4oz. Bottle
- 99000-24 MAX Z.P.M. Camshaft Break-In Lube, Case of (24) 4oz. Bottles



PENN-GRADE 1® BREAK-IN OIL

Formulated specifically to meet the critical lubrication needs of new engines during break-in while allowing proper seating of rings and component 'run-in'. Enhanced levels of "zinc" (zinc dialkyl dithiophosphate a.k.a. ZDDP) and superior oil film strength offer complete anti-wear, anti-scuffing protection for even the most demanding of applications such as those presented by break-in of engines with 'flat tappet' cams.

- BPO30WTQT Break-In Oil, 30W, Quart
- BPO30WT Break-In Oil, 30W, Case

PENN-GRADE 1® Racing Oil "The Green Oil"

Specially formulated to meet the stringent lubricating demands of high-performance, highly stressed, street and racing engines. They reduce internal friction allowing for increased horsepower output while maintaining their strong lubricating film protection even under the most demanding torque and extreme temperature conditions.

- BPO10W-30QT Racing Oil, 10W-30, Quart
- BPO10W-30 Racing Oil, 10W-30, Case
- BPO20W-50QT Racing Oil, 20W-50, Quart
- BPO20W-50 Racing Oil, 20W-50, Case
- BPO50WQT Racing Oil, 50W, Quart
- BPO50W Racing Oil, 50W, Case
- BPNITRO70QT "Nitro" 70W, Quart
- BPNITRO70 "Nitro" 70W, 50W, Case



Extreme Pressure Fastener Lube

This specialty fastener lubricant was developed to be more consistent, be more repeatable, be metal free, and to achieve the target preload on the first torque cycle. Prevents seizing and galling of threads.

- 99007 Extreme Pressure Lube, .5 oz.
- 99008 Extreme Pressure Lube, 4 oz.



ASSEMBLY GREASE

Clings to and protects surfaces during initial start-up, delivering protection you can count on. Apply to cams and lifters for break-in protection. Can also be used on distributor gears, rocker shafts, rocker tips, pushrod tips, wrist pins and valve guides. Dissolves completely in oil without clogging oil passageways or plugging oil filters.

- 99005 Assembly Grease, .625 oz.



VALVE SPRING, RETAINER & LOCK KITS

Need a complete Cam Kit? We made it easier. Just chose which Camshaft and Lifters or Cam and Lifter Set and add one of these Valve Spring, Retainer and Lock Kits. Each kit includes a set of Howards Cams performance Valve Springs, match Retainers and heat treated Valve Locks. These kits offer more combinations to suit your needs. Building a Mopar, but with performance single groove valves? Simple just change kits. Chevrolet big block, but with 11/32" valves instead of the stock 3/8"? Just use the correct kit.



- **All you need to upgrade a Cam & Lifter Set into a Complete Cam Kit**
- **More combinations to suit your needs**
- **Includes a set of Performance Valve Springs**
- **Matching Chrome Moly Retainers (unless noted)**
- **Matching Heat-Treated Valve Locks**

11/32" Valve Stem with 7° Locks (Single Groove)

98111-K11	1.240" Single w/Damper	90 @ 1.700	240 @ 1.250
98214-K11	1.250" Single w/Damper	115 @ 1.700	300 @ 1.250
98212-K11	1.265" Single w/Damper	115 @ 1.780	340 @ 1.250
98213-K11	1.265" Single w/Damper	120 @ 1.680	350 @ 1.200
98412-K11	1.445" Single w/Damper	120 @ 1.680	295 @ 1.175
98436-K11	1.435" Dual	105 @ 1.680	320 @ 1.180
98515-K11	1.510" Single w/Damper	100 @ 1.880	275 @ 1.380
98529-K11	1.525" Single w/Damper	125 @ 1.875	350 @ 1.375
98611-K11	1.550" Single w/Damper	145 @ 1.880	350 @ 1.250
98612-K11 ^P	1.550" Single w/Damper	145 @ 1.880	350 @ 1.250
98636-K11	1.514" Dual w/Damper	130 @ 1.875	330 @ 1.300
98656-K11 ^P	1.514" Dual w/Damper	130 @ 1.875	330 @ 1.300

11/32" Valve Stem with 10° Locks (Single Groove)

98113-K12	1.280" Beehive	108 @ 1.800	329 @ 1.265
98114-K12 ^P	1.280" Beehive	108 @ 1.800	329 @ 1.265
98212-K12	1.265" Single w/Damper	115 @ 1.780	340 @ 1.250
98213-K12	1.265" Single w/Damper	120 @ 1.800	350 @ 1.200
98215-K12 ^P	1.265" Single w/Damper	120 @ 1.800	350 @ 1.200
98218-K12	1.265" Single w/Damper	125 @ 1.800	375 @ 1.200
98220-K12	1.260" Single w/Damper	140 @ 1.750	410 @ 1.200
98511-K12	1.485" Single w/Damper	105 @ 1.800	300 @ 1.250
98438-K12	1.465" Dual	122 @ 1.650	353 @ 1.100
98437-K12	1.435" Dual w/Damper	135 @ 1.680	360 @ 1.190
98445-K12	1.470" Dual	150 @ 1.800	425 @ 1.110
98636-K12	1.514" Dual w/Damper	130 @ 1.875	330 @ 1.300
98656-K12 ^P	1.514" Dual w/Damper	130 @ 1.875	330 @ 1.300
98632-K12	1.539" Dual w/Damper	140 @ 1.940	425 @ 1.250
98652-K12 ^P	1.539" Dual w/Damper	140 @ 1.940	425 @ 1.250

3/8" Valve Stem with 7° Locks (Single Groove)

98511-K31	1.485" Single w/Damper	105 @ 1.800	300 @ 1.250
98445-K31	1.470" Dual	150 @ 1.800	425 @ 1.110
98515-K31	1.510" Single w/Damper	100 @ 1.880	275 @ 1.380
98529-K31	1.525" Single w/Damper	125 @ 1.875	350 @ 1.375
98611-K31	1.550" Single w/Damper	145 @ 1.880	350 @ 1.250
98612-K31 ^P	1.550" Single w/Damper	145 @ 1.880	350 @ 1.250

3/8" Valve Stem with 4-Groove (Chrysler) 7° Locks

98438-K34	1.465" Dual	122 @ 1.650	353 @ 1.100
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3/8" Valve Stem with 2 & 4-Groove (Chrysler) 7° Locks

98445-K33	1.470" Dual	150 @ 1.800	425 @ 1.110
98515-K33	1.510" Single w/Damper	100 @ 1.880	275 @ 1.380
98529-K33	1.525" Single w/Damper	125 @ 1.875	350 @ 1.375

3/8" Valve Stem with 10° Locks (Single Groove)

98438-K32	1.465" Dual	122 @ 1.650	353 @ 1.100
98445-K32	1.470" Dual	150 @ 1.800	425 @ 1.110
98636-K32	1.514" Dual w/Damper	130 @ 1.875	330 @ 1.300
98656-K32 ^P	1.514" Dual w/Damper	130 @ 1.875	330 @ 1.300
98632-K32	1.539" Dual w/Damper	140 @ 1.940	425 @ 1.250

8mm (LS) Valve Stem with 7° Locks (Bead Lock)

98112-K1 ^S	1.207" Beehive	135 @ 1.800	348 @ 1.175
98113-K1 ^S	1.280" Beehive	108 @ 1.800	329 @ 1.265
98116-K1 ^{S/L}	1.305" Dual	145 @ 1.800	385 @ 1.150
98118-K1 ^{S/L}	1.305" Dual	152 @ 1.800	413 @ 1.150

8mm (LS) Valve Stem with Super 7 Locks/Titanium Retainers

98116-K5 ^{S/L}	1.305" Dual	145 @ 1.800	385 @ 1.150
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L = Kits Include Spring Locators.

S = Kits Include Premium Small O.D. Valve Seals.

VALVE SPRINGS

STOCK DIAMETER PERFORMANCE VALVE SPRINGS



98212

Delivers increased valve train stability and performance over OEM springs. Premium chrome silicone, coiled and heat-treated in the finest facilities available. Designed for most performance hydraulic and mild mechanical flat tappet applications. *Note:* Some have taller installed heights and may require either longer valves or retainers design for greater installed height. Sets of 16.

Spring Set	Spring, Retainer and Lock Set	Style	Outer O.D.	Outer I.D.	Inner O.D.	Inner I.D.	Damper
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AMC V8

98636	98636-K11,12,31,32	Dual with Damper	1.514	1.125	.937	.697	Y
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Chevrolet SB

98212	98212-K11,12	Single with Damper	1.265	.876	NA	NA	Y
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GM Gen III (LS1/2/6)

98115	NA	Inverted Conical Ovate	1.055/1.280	.670/.875	NA	NA	N
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Chevrolet BB

98636	98636-K11,12,31,32	Dual with Damper	1.514	1.125	.937	.697	Y
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Chrysler SB

98412	NA	Single with Damper	1.445	1.040	NA	NA	Y
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98432	NA	Dual with Damper	1.437	1.080	1.000	.760	Y
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Chrysler BB

98515	98515-K11,31,33	Single with Damper	1.510	1.110	NA	NA	Y
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98611	98611-K11,31	Single with Damper	1.550	1.130	NA	NA	Y
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98636	98636-K11,12,31,32	Dual with Damper	1.514	1.125	.937	.697	Y
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Ford SB

98412	98412-K11	Single with Damper	1.445	1.040	NA	NA	Y
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98432	NA	Dual with Damper	1.437	1.080	1.000	.760	Y
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Ford 351W/C/M/400

98515	98515-K11,31,33	Single with Damper	1.510	1.110	NA	NA	Y
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98636	98636-K11,12,31,32	Dual with Damper	1.514	1.125	.937	.697	Y
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Ford FE

98636	98636-K11,12,31,32	Dual with Damper	1.514	1.125	.937	.697	Y
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Ford 429-460

98636	98636-K11,12,31,32	Dual with Damper	1.514	1.125	.937	.697	Y
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Oldsmobile V8

98412	98412-K11	Single with Damper	1.445	1.040	NA	NA	Y
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98432	NA	Dual with Damper	1.437	1.080	1.000	.760	Y
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Pontiac V8

98341	NA	Dual	1.385	1.060	1.060	.800	N
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98432	NA	Dual with Damper	1.437	1.080	1.000	.760	Y
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K11 = 11/32", 7° (single groove), K12 = 11/32", 10° (single groove), K31 = 3/8", 7° (single groove), K32 = 3/8", 10° (single groove), K33 = 3/8", 7° (2 & 4 groove)



98432



98515



98636

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



Closed Pressure	Open Pressure	Rate	Max Lift	Coil Bind	Titanium Retainer	Steel Retainer	Seat Cup/Locator
130 @ 1.875	330 @ 1.300	348	.670	1.150	97216	97118, 97128	96015/96024
125 @ 1.750	340 @ 1.250	425	.550	1.150	97214	97112, 97132	--
110 @ 1.800	275 @ 1.200	270	.600	1.150	97165	97161	96023
130 @ 1.875	330 @ 1.300	348	.670	1.150	97216	97118, 97128	96015/96024
120 @ 1.680	295 @ 1.175	350	.530	1.100	97216	97118	96005/96034
135 @ 1.750	285 @ 1.250	300	.625	1.125	97216	97118, 97128	96005
100 @ 1.880	275 @ 1.380	350	.520	1.300	97216	97110, 97128	96015/96033
145 @ 1.880	350 @ 1.250	325	.670	1.150	97220	97110, 97130	--
130 @ 1.875	330 @ 1.300	348	.670	1.150	97216	97118, 97128	96015/96024
120 @ 1.680	295 @ 1.175	350	.530	1.100	97216	97118	96005/96034
135 @ 1.750	285 @ 1.250	300	.625	1.125	97216	97118, 97128	96005
100 @ 1.880	275 @ 1.380	350	.520	1.300	97216	97118, 97128	96015/96033
130 @ 1.875	330 @ 1.300	348	.670	1.150	97216	97118, 97128	96015/96024
130 @ 1.875	330 @ 1.300	348	.670	1.150	97216	97118, 97128	96015/96024
130 @ 1.875	330 @ 1.300	348	.670	1.150	97216	97118, 97128	96015/96024
120 @ 1.680	295 @ 1.175	350	.530	1.100	97216	97118	96005/96034
135 @ 1.750	285 @ 1.250	300	.625	1.125	97216	97118, 97128	96005
105 @ 1.625	230 @ 1.150	263	.655	.910	--	--	--
135 @ 1.750	285 @ 1.250	300	.625	1.125	97216	97118, 97128	96005

VALVE SPRINGS

BEEHIVE (INVERTED CONICAL) VALVE SPRINGS



The unique design of the Inverted conical valve springs offer increased harmonic resistance for greater spring stability. This design requires less spring pressure for better valve control. Test have shown more horsepower, high rpm's and longer life expectancy. This design is well known on GM Gen III (LS1/2/6) applications, but is also great for other applications including Chevrolet small blocks, Chrysler 5.7L Hemi, and many other performance applications. Sets of 16.

Spring Set	Spring, Retainer and Lock Set	Style	Outer O.D.	Outer I.D.	Inner O.D.	Inner I.D.	Damper
98112	98112-K1	Ovate Beehive	1.207	1.072	.885	.650	N
98113	98113-K1,12	Beehive	1.280	1.035	.900	.650	N
98115	NA	Ovate Beehive	1.289	1.055	.880	.660	N
98110	NA	Ovate Beehive	1.290	1.055	1.014	.859	N
98117	NA	Beehive	1.450	1.295	1.014	.859	N
98119	NA	Ovate Beehive	1.445	1.186	.990	.731	N
Ford 4.6L 4 Valve (Set of 32)							
98105	NA	Ovate Beehive	1.105	.742	.943	.580	N

K1 = 8mm, 7° (bead lock), K12 = 11/32", 10° (single Groove)

ELECTRO POLISHED BEEHIVE (INVERTED CONICAL) VALVE SPRINGS



The unique design of the Inverted conical valve springs offer increased harmonic resistance for greater spring stability. This design requires less spring pressure for better valve control. Manufactured of aircraft-grade chrome silicone, with advanced heat-treating. Springs then receive an advanced electro polished finish and stress relieved. This enhanced finish increases valve spring life and fatigue resistance, for lap after lap consistency. Designed for racing hydraulic and mechanical flat tappet as well as performance hydraulic roller camshafts. Sets of 16.

Spring Set	Spring, Retainer and Lock Set	Style	Outer O.D.	Outer I.D.	Inner O.D.	Inner I.D.	Damper
98114	98114-K12	Beehive	1.280	1.035	.900	.650	N
98114	98114-K12	Beehive	1.280	1.035	.900	.650	N

K12 = 11/32", 10° (single groove)

"NITRIDED" BEEHIVE (INVERTED CONICAL) VALVE SPRINGS



Offering an industry leading nitriding process that allow for the material to withstand the abusive wear and fatigue of the typical endurance engine environment. These springs come fully prepared for racing conditions with chamfering, polishing, and the latest surface enhancement technology available. Combined with the unique Beehive design equals better valve control, increased stability and longer life. The ultimate Beehive spring is here.

Spring Set	Spring, Retainer and Lock Set	Style	Outer O.D.	Outer I.D.	Inner O.D.	Inner I.D.	Damper
98012	NA	"Nitrided" Ovate Beehive	1.207	1.072	.885	.650	N
98010	NA	"Nitrided" Ovate Beehive	1.290	1.055	1.014	.859	N

Some items are not legal for sale or use on any pollution controlled motor vehicle

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Closed Pressure	Open Pressure	Rate	Max Lift	Coil Bind	Titanium Retainer	Steel Retainer	Seat Cup/Locator
135 @ 1.800	348 @ 1.175	340	.625	1.100	--	97161/97174	96021
115 @ 1.800	332 @ 1.265	412	.600	1.150	--	97161/97174	96021
110 @ 1.800	275 @ 1.200	270	.600	1.150	97165	97161/97174	96021
130 @ 1.800	318 @ 1.200	313	.600	1.140	--	97161	96021
118 @ 1.950	375 @ 1.380	457	.580	1.320	97214	97112/97132	--
160 @ 1.950	425 @ 1.300	408	.700	1.220	--	--	--
90 @ 1.470	252 @ .970	324	.500	.900	--	--	--

Closed Pressure	Open Pressure	Rate	Max Lift	Coil Bind	Titanium Retainer	Steel Retainer	Seat Cup/Locator
115 @ 1.800	332 @ 1.265	412	.600	1.150	--	97161/97174	96021
115 @ 1.800	354 @ 1.225	412	.600	1.150	--	97161/97174	96021

Closed Pressure	Open Pressure	Rate	Max Lift	Coil Bind	Titanium Retainer	Steel Retainer	Seat Cup/Locator
150 @ 1.800	360 @ 1.175	340	.625	1.100	--	97161/97174	96021
130 @ 1.800	318 @ 1.200	313	.600	1.140	--	97161	96021

VALVE SPRINGS

GM GEN III (LS1/2/6) DUAL VALVE SPRINGS



98116

Specifically designed for GM Gen III LS1, LS2 and LS6 performance applications. Hi-tech winding, heat treat and finishing processes make these the ultimate late model performance spring. Use chrome moly steel retainers #97162. .640" max lift. Sets of 16.

Spring Set	Spring, Retainer and Lock Set	Style	Outer O.D.	Outer I.D.	Inner O.D.	Inner I.D.	Damper
98037		Dual	1.274	.900	.900	.630	N
98116	98116-K1,5	Dual	1.305	.955	.950	.676	N
98118	98118-K1	Dual	1.305	.935	.935	.665	N
98122		Dual	1.305	.952	.945	.676	N
98335		Dual	1.300	.900	.900	.616	N

K1 = 8mm, 7° (bead lock), K5 = 8mm, Super 7/Titanium retainers

PERFORMANCE HYDRAULIC FLAT TAPPET VALVE SPRINGS



98341

Howards research and development engineers are constantly updating materials and manufacturing techniques, to provide the best possible valve springs. Coiled and heat-treated in the finest facilities available. Each spring is coiled, stress relieved, deburred, shot-peened and heat treated to our own very specific standards. Sets of 16 (*Also available in sets of 12, add -12 to part number).

Spring Set	Spring, Retainer and Lock Set	Style	Outer O.D.	Outer I.D.	Inner O.D.	Inner I.D.	Damper
98111*	98111-K11	Single with Damper	1.240	.860	NA	NA	Y
98214	98214-K11	Single with Damper	1.250	.870	NA	NA	Y
98212	98212-K11,12	Single with Damper	1.265	.876	NA	NA	Y
98216	NA	Dual	1.250	.910	.910	.684	N
98113	98113-K1,12	Beehive	1.280	1.035	.900	.650	N
98341*	NA	Dual	1.384	1.060	1.060	.804	N
98412	98412-K11	Single with Damper	1.445	1.040	NA	NA	Y
98412	98412-K11	Single with Damper	1.445	1.040	NA	NA	Y
98436	98436-K11	Dual	1.435	1.055	1.055	.775	N
98438*	98438-K12,32,34	Dual	1.465	1.091	1.090	.807	N
98411*	NA	Single with Damper	1.437	1.080	NA	NA	Y
98511*	98511-K11,31	Single with Damper	1.485	1.060	NA	NA	Y
98515	98515-K11,31,33	Single with Damper	1.510	1.110	NA	NA	Y
98529	98529-K11,31,33	Single with Damper	1.525	1.075	NA	NA	Y
98611	98611-K11,31	Single with Damper	1.550	1.130	NA	NA	Y

K11 = 11/32", 7° (single groove), K12 = 11/32", 10° (single groove), K31 = 3/8", 7° (single groove), K32 = 3/8", 10° (single groove), K33 = 3/8", 7° (2 & 4 groove), K34 = 3/8", 7° (4 groove)

ELECTRO POLISHED PERFORMANCE HYDRAULIC FLAT TAPPET VALVE SPRINGS



98114

Manufactured of aircraft-grade chrome silicone, with advanced heat-treating. Outers then receive an advanced electro polished finish and stress relieved. This enhanced finish increases valve spring life and fatigue resistance, for lap after lap consistency. Designed for racing hydraulic and mechanical flat tappet as well as performance hydraulic roller camshafts. Sets of 16.

Spring Set	Spring, Retainer and Lock Set	Style	Outer O.D.	Outer I.D.	Inner O.D.	Inner I.D.	Damper
98114	98114-K12	Beehive	1.280/1.035	.900/.650	NA	NA	N
98415	NA	Single with Damper	1.437	1.080	NA	NA	Y
98612	98612-K11,31	Single with Damper	1.550	1.130	NA	NA	Y

K11 = 11/32", 7° (single groove), K12 = 11/32", 10° (single groove), K31 = 3/8", 7° (single groove)

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



Closed Pressure	Open Pressure	Rate	Max Lift	Coil Bind	Titanium Retainer	Steel Retainer	Seat Cup/Locator
200 @ 1.800	585 @ 1.100	550	.700	1.045	97212	97113	96022
145 @ 1.800	385 @ 1.150	375	.640	1.100	97212	97162	96023
152 @ 1.800	413 @ 1.150	405	.660	1.060	97212	--	96023
155 @ 1.800	436 @ 1.150	433	.700	1.000	97212	--	96023
250 @ 1.800	860 @ 1.050	813	.800	.985	97212	--	96023

Closed Pressure	Open Pressure	Rate	Max Lift	Coil Bind	Titanium Retainer	Steel Retainer	Seat Cup/Locator
90 @ 1.700	230 @ 1.250	305	.520	1.125	97214	97112, 97132	--
115 @ 1.700	300 @ 1.250	411	.500	1.160	97214	97112, 97132	--
125 @ 1.750	340 @ 1.250	425	.550	1.150	97214	97112, 97132	--
110 @ 1.700	250 @ 1.200	265	.600	.950	--	--	96023
115 @ 1.800	332 @ 1.265	412	.600	1.150	--	97161	96021
105 @ 1.625	230 @ 1.150	263	.655	.910	97216	97118	96005/96034
120 @ 1.680	295 @ 1.175	350	.530	1.100	97216	97118	96005/96034
110 @ 1.700	295 @ 1.175	350	.550	1.100	97216	97118	96005/96034
105 @ 1.700	320 @ 1.180	415	.530	1.120	97216	97118	96005/96033
122 @ 1.650	353 @ 1.100	425	.690	.950	97216	97110, 97118, 97128	96005/96033
100 @ 1.750	235 @ 1.100	210	.640	1.050	97216	97118, 97128	96005/96035
115 @ 1.800	310 @ 1.250	355	.590	1.150	97216	97110, 97128	96005
100 @ 1.880	275 @ 1.380	360	.520	1.300	97216	97110, 97128	96015/96033
125 @ 1.875	350 @ 1.375	462	.600	1.200	97216	97110, 97118, 97128	--
145 @ 1.880	350 @ 1.250	325	.700	1.030	97220	97110, 97130	--

Closed Pressure	Open Pressure	Rate	Max Lift	Coil Bind	Titanium Retainer	Steel Retainer	Seat Cup/Locator
108 @ 1.800	329 @ 1.265	412	.600	1.150	--	97161	--
100 @ 1.750	235 @ 1.100	210	.640	1.050	97216	97118, 97128	96005/96035
145 @ 1.880	350 @ 1.250	325	.700	1.030	97220	97110, 97130	--

VALVE SPRINGS

PERFORMANCE HYDRAULIC ROLLER VALVE SPRINGS



Coiled and heat-treated in the finest facilities available. Howards research and development teams are constantly updating materials and manufacturing techniques, to provide the best possible valve springs. Howards Cams pioneered many valve spring developments since the 1950's, and are still working with the best engineers and race teams to be on the cutting edge of valve spring technology. Sets of 16. Sets of 16 (*Also available in sets of 12, add -12 to part number).

Spring Set	Spring, Retainer and Lock Set	Style	Outer O.D.	Outer I.D.	Inner O.D.	Inner I.D.	Damper
98213	98213-K12	Single with Damper	1.265	.875	NA	NA	Y
98218	NA	Single with Damper	1.265	.875	NA	NA	Y
98438*	98438-K12,32,34	Dual	1.465	1.091	1.090	.807	N
98432	NA	Dual with Damper	1.437	1.080	1.000	.760	Y
98442	NA	Dual	1.437	1.080	1.080	.810	N
98443	NA	Dual	1.440	1.085	1.080	.796	N
98445	98445-K12,31,32,33	Dual	1.470	1.080	1.085	.800	N
98542	NA	Dual	1.470	1.095	1.090	.820	N
98512	NA	Dual	1.514	1.135	1.135	.795	N
98611	98611-K11,31	Single with Damper	1.550	1.130	NA	NA	Y
98632	98632-K12	Dual	1.539	1.125	1.000	.760	Y

K11 = 11/32",7° (single groove), K12 = 11/32",10° (single groove), K31 = 3/8",7° (single groove), K32 = 3/8",10° (single groove), K33 = 3/8",7° (2 & 4 groove), K34 = 3/8",7° (4 groove)

ELECTRO POLISHED PERFORMANCE HYDRAULIC ROLLER VALVE SPRINGS



98215

Manufactured of aircraft-grade chrome silicone, with advanced heat-treating. Outers then receive an advanced electro polished finish and stress relieved. This enhanced finish increases valve spring life and fatigue resistance, for lap after lap consistency. Designed for racing hydraulic and mechanical flat tappet as well as performance hydraulic roller camshafts. Sets of 16.

Spring Set	Spring, Retainer and Lock Set	Style	Outer O.D.	Outer I.D.	Inner O.D.	Inner I.D.	Damper
98215	98215-K12	Single with Damper	1.265	.875	NA	NA	Y
98433	NA	Dual with Damper	1.437	1.080	1.000	.760	Y
98447	NA	Dual	1.437	1.080	1.080	.810	N
98513	NA	Dual	1.514	1.135	1.135	.795	N
98612	98612-K11,31	Single with Damper	1.550	1.130	NA	NA	Y
98652	98652-K12	Dual	1.539	1.125	1.000	.760	Y

K11 = 11/32",7° (single groove), K12 = 11/32",10° (single groove), K31 = 3/8",7° (single groove)

Some items are not legal for sale or use on any pollution controlled motor vehicle

IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



Closed Pressure	Open Pressure	Rate	Max Lift	Coil Bind	Titanium Retainer	Steel Retainer	Seat Cup/Locator
120 @ 1.800	350 @ 1.200	430	.640	1.100	97214	97112, 97132	--
125 @ 1.800	375 @ 1.200	415	.600	1.150	97214	97112, 97132	--
122 @ 1.650	353 @ 1.100	425	.690	.950	97216	97110, 97118, 97128	96005/96033
135 @ 1.750	285 @ 1.250	300	.625	1.125	97216	97118, 97128	96005
145 @ 1.750	315 @ 1.150	283	.665	1.025	97216	97118, 97128	96005/96035
145 @ 1.880	325 @ 1.250	286	.670	1.150	97216	97118, 97128	96005
120 @ 1.875	425 @ 1.110	399	.735	1.080	97216	97110, 97118, 97128	96005/96024
110 @ 1.880	350 @ 1.330	436	.550	1.270	97216	97118, 97128	96015/96033
145 @ 1.900	360 @ 1.300	360	.700	1.150	97220	97110, 97118, 97128	96015/96033
145 @ 1.880	350 @ 1.250	325	.700	1.030	97220	97110, 97118, 97130	--
140 @ 1.940	425 @ 1.250	413	.730	1.150	97220	97118, 97130	96015/96035

Closed Pressure	Open Pressure	Rate	Max Lift	Coil Bind	Titanium Retainer	Steel Retainer	Seat Cup/Locator
120 @ 1.800	350 @ 1.200	430	.640	1.100	97214	97112, 97132	--
135 @ 1.750	285 @ 1.250	300	.625	1.125	97216	97118, 97128	96005
145 @ 1.750	315 @ 1.150	283	.665	1.025	97216	97118, 97128	96005/96035
145 @ 1.900	360 @ 1.300	360	.700	1.150	97220	97110, 97118, 97128	96015/96033
145 @ 1.880	350 @ 1.250	325	.700	1.030	97220	97110, 97130	--
140 @ 1.940	425 @ 1.250	413	.730	1.150	97220	97118, 97130	96015/96035

VALVE SPRINGS

PERFORMANCE MECHANICAL FLAT TAPPET VALVE SPRINGS



Manufactured of aircraft chrome silicone material. Coiled and heat-treated in the finest facilities available. Each spring is coiled, stress relieved, deburred, shot-peened and heat treated to our own very specific standards. Howards research and development engineers are constantly updating materials and manufacturing techniques, to provide the best possible valve springs. Sets of 16. Sets of 16 (*Also available in sets of 12, add -12 to part number).



Spring Set	Spring, Retainer and Lock Set	Style	Outer O.D.	Outer I.D.	Inner O.D.	Inner I.D.	Damper
98214	98214-K11	Single with Damper	1.250	.870	NA	NA	Y
98220	NA	"Pacaloy" Single with Damper	1.260	.860	NA	NA	Y
98221	NA	"Nitrided Pacaloy" Single w/Damp	1.260	.860	NA	NA	Y
98223	NA	"Pacaloy" Dual	1.260	.860	NA	NA	N
98212*	98212-K11,12	Single with Damper	1.265	.875	NA	NA	Y
98213	NA	Single with Damper	1.265	.875	NA	NA	Y
98218	NA	Single with Damper	1.265	.875	NA	NA	Y
98374	NA	"Pacaloy" Dual	1.374	1.000	NA	.716	Y
98437	98437-K12	Dual with Damper	1.435	1.035	.937	.697	Y
98438*	98438-K12,32,34	Dual	1.465	1.091	1.090	.807	N
98432	NA	Dual with Damper	1.437	1.080	1.000	.760	Y
98442	NA	Dual	1.437	1.080	1.080	.810	N
98443	NA	Dual	1.440	1.085	1.080	.796	N
98445	98445-K12,31,32,33	Dual	1.470	1.080	1.085	.800	N
98511*	98511-K11,31	Single with Damper	1.485	1.061	NA	NA	Y
98542	NA	Dual	1.470	1.095	1.090	.820	N
98515	98515-K11,31,33	Single with Damper	1.510	1.110	NA	NA	Y
98636	98636-K11,12,31,32	Dual with Damper	1.514	1.125	.937	.697	Y
98512	NA	Dual	1.514	1.135	1.135	.795	N
98611	98611-K11,31	Single with Damper	1.550	1.130	NA	NA	Y
98632	98632-K12	Dual	1.539	1.125	1.000	.760	Y

K11 = 11/32",7° (single groove), K12 = 11/32",10° (single groove), K31 = 3/8",7° (single groove), K32 = 3/8",10° (single groove), K33 = 3/8",7° (2 & 4 groove), K34 = 3/8",7° (4 groove)

ELECTRO POLISHED PERFORMANCE MECHANICAL FLAT TAPPET VALVE SPRINGS



Manufactured of aircraft-grade chrome silicone, with advanced heat-treating. Outers then receive an advanced electro polished finish and stress relieved. This enhanced finish increases valve spring life and fatigue resistance, for lap after lap consistency. Designed for racing hydraulic and mechanical flat tappet as well as performance hydraulic roller camshafts. Sets of 16.

Spring Set	Spring, Retainer and Lock Set	Style	Outer O.D.	Outer I.D.	Inner O.D.	Inner I.D.	Damper
98215	98215-K12	Single with Damper	1.265	.875	NA	NA	Y
98433	NA	Dual with Damper	1.437	1.080	1.000	.760	Y
98447	NA	Dual	1.437	1.080	1.080	.810	N
98656	98656-K11,12,31,32	Dual with Damper	1.514	1.125	.937	.697	Y
98513	NA	Dual	1.514	1.135	1.135	.795	N
98612	98612-K11,31	Single with Damper	1.550	1.130	NA	NA	Y
98652	98652-K12	Dual	1.539	1.125	1.000	.760	Y

K11 = 11/32",7° (single groove), K12 = 11/32",10° (single groove), K31 = 3/8",7° (single groove)

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Closed Pressure	Open Pressure	Rate	Max Lift	Coil Bind	Titanium Retainer	Steel Retainer	Seat Cup/Locator
115 @ 1.700	300 @ 1.250	411	.500	1.160	97214	97112, 97132	--
140 @ 1.750	410 @ 1.200	540	.550	1.115	97220	97112, 97113, 97132	--
140 @ 1.750	410 @ 1.200	540	.550	1.115	97220	97112, 97113, 97132	--
145 @ 1.800	511 @ 1.200	610	.650	1.115	97214	97112, 97113, 97132	96022
125 @ 1.750	340 @ 1.250	425	.550	1.150	97214	97112, 97132	--
120 @ 1.800	350 @ 1.200	430	.640	1.100	97214	97112, 97132	--
125 @ 1.800	375 @ 1.200	415	.600	1.150	97214	97112, 97132	--
150 @ 1.950	455 @ 1.250	436	.700	1.190	97220	97175	96015/96035
135 @ 1.680	390 @ 1.190	455	.575	1.055	97216	97118, 97128	96015/96024
122 @ 1.650	353 @ 1.100	425	.690	.950	97216	97110, 97118	96005/96033
135 @ 1.750	285 @ 1.250	300	.625	1.125	97216	97118, 97128	96005
145 @ 1.750	315 @ 1.150	283	.665	1.025	97216	97118, 97128	96005/96035
145 @ 1.880	325 @ 1.250	286	.670	1.150	97216	97118, 97128	96005
150 @ 1.800	425 @ 1.110	399	.665	1.080	97216	97110, 97118, 97128	96005
115 @ 1.800	310 @ 1.250	355	.590	1.150	97216	97110, 97118, 97128	96005
110 @ 1.880	350 @ 1.330	436	.550	1.270	97216	97118, 97128	96015/96033
100 @ 1.880	275 @ 1.380	350	.520	1.300	97216	97110, 97118, 97128	96015/96033
130 @ 1.875	330 @ 1.300	348	.670	1.150	97216	97118, 97128	96015/96024
145 @ 1.900	360 @ 1.300	360	.700	1.150	97220	97110, 97118, 97128	96015/96033
145 @ 1.880	350 @ 1.250	325	.700	1.030	97220	97110, 97118, 97130	--
140 @ 1.940	425 @ 1.250	413	.730	1.150	97220	97118, 97130	96015/96035

Closed Pressure	Open Pressure	Rate	Max Lift	Coil Bind	Titanium Retainer	Steel Retainer	Seat Cup/Locator
120 @ 1.800	350 @ 1.200	430	.640	1.100	97214	97112, 97132	--
135 @ 1.750	285 @ 1.250	300	.625	1.125	97216	97118, 97128	96005
145 @ 1.750	315 @ 1.150	283	.665	1.025	97216	97118, 97128	96005/96035
130 @ 1.875	330 @ 1.300	348	.670	1.150	97216	97118, 97128	96015
145 @ 1.900	360 @ 1.300	360	.700	1.150	97220	97110, 97118, 97128	96015/96033
145 @ 1.880	350 @ 1.250	325	.700	1.030	97220	97110, 97130	--
140 @ 1.940	425 @ 1.250	413	.730	1.150	97220	97118, 97130	96015/96035

VALVE SPRINGS

MAX EFFORT™ MECHANICAL ROLLER VALVE SPRINGS



Howards™ Cams competition racing valve springs are CNC coiled and heat-treated in the finest facilities available. Using only the highest quality valve spring wire, all Howards™ valve springs are stress relieved, ground and shot-peened to offer our customers some of the very best valve springs on the market. Whether you're running a flat tappet or roller cam in your drag race, circle track, road course, performance marine or other extreme race application, Howards™ offers the perfect valve spring to suit your needs. Sets of 16.

Spring Set	Spring, Retainer and Lock Set	Style	Outer O.D.	Outer I.D.	Inner O.D.	Inner I.D.	Damper
98441	NA	Dual	1.437	1.080	1.080	.796	N
98431	NA	Dual with Damper	1.437	1.080	1.015	.731	Y
98541	NA	Dual	1.500	1.116	1.116	.800	N
98634	NA	Dual with Damper	1.540	1.143	1.000	.750	Y
98633	NA	Dual with Damper	1.557	1.143	1.015	.731	Y
98630	NA	Dual with Damper	1.539	1.125	1.015	.731	Y
98635	NA	Dual with Damper	1.557	1.143	1.033	.749	Y
98732	NA	Dual with Damper	1.625	1.185	1.065	.765	Y

ELECTRO POLISHED MAX EFFORT™ MECHANICAL ROLLER VALVE SPRINGS



Manufactured of aircraft-grade chrome silicone, with advanced heat-treating. Outers then receive an advanced electro polished finish and stress relieved. This enhanced finish increases valve spring life and fatigue resistance, for lap after lap consistency. Designed for mechanical applications. Sets of 16.

Spring Set	Spring, Retainer and Lock Set	Style	Outer O.D.	Outer I.D.	Inner O.D.	Inner I.D.	Damper
98650	NA	Dual with Damper	1.539	1.125	1.015	.731	Y
98655	NA	Dual with Damper	1.557	1.143	1.033	.749	Y

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Closed Pressure	Open Pressure	Rate	Max Lift	Coil Bind	Titanium Retainer	Steel Retainer	Seat Cup/Locator
175 @ 1.750	400 @ 1.150	375	.625	1.050	97220	97128	96005/96033
185 @ 1.750	365 @ 1.250	335	.590	1.100	97220	97128	96005/96031
180 @ 1.800	465 @ 1.250	475	.700	1.040	97220	97118, 97128	96015/96033
175 @ 1.950	440 @ 1.250	380	.740	1.150	97220	97118, 97128	96010/96031
224 @ 1.900	540 @ 1.250	486	.690	1.150	97220	97118, 97128	96010/96031
194 @ 1.920	505 @ 1.200	430	.720	1.150	97220	97118, 97128	96015/96031
225 @ 1.950	555 @ 1.250	471	.740	1.150	97220	97118, 97128	96010/96031
205 @ 1.900	650 @ 1.200	635	.740	1.100	97222	97130	96020/96040

Closed Pressure	Open Pressure	Rate	Max Lift	Coil Bind	Titanium Retainer	Steel Retainer	Seat Cup/Locator
194 @ 1.920	505 @ 1.200	430	.720	1.150	97220	97118, 97128	96015/96031
225 @ 1.950	555 @ 1.250	471	.740	1.150	97220	97130	96010/96031

VALVE SPRINGS

PRO-ALLOY MECHANICAL ROLLER VALVE SPRINGS



Howards Cams™ Pro-Alloy material is specially developed low stress, high endurance material. Howards Cams research and development staff spent many years of development, experience and testing to create a spring you can count on. Low fatigue rate compared to most roller springs on the market. Cycle tested to 12 million cycles with no breakage. Each spring is coiled using the most advance CNC winders in the industry. Each spring is then parallel ground, stress relieved and deburred. They are then shot-peened and heat-treated to our own very specific standards. These high standards are what it takes for a longer spring life, even in rough racing environment. Sets of 16.

Spring Set	Spring, Retainer and Lock Set	Style	Outer O.D.	Outer I.D.	Middle O.D.	Middle I.D.	Inner O.D.	Inner I.D.	Damper
98643	NA	Dual	1.550	1.126			1.126	.815	N
98885	NA	Dual with Damper	1.575	1.150			1.145	.740	Y
98737	NA	Dual with Damper	1.625	1.174			1.060	.770	Y
98738-A	NA	Dual	1.650	1.204			1.204	.877	N
98048	NA	Triple	1.660	1.210	1.205	.885	.855	.635	N
98049	NA	Triple	1.660	1.215	1.190	.875	.875	.635	N

ELECTRO POLISHED PRO-ALLOY MECHANICAL ROLLER VALVE SPRINGS



We took our state-of-the-art Pro-Alloy roller valve springs one step further. Each of these springs are electro polished, which enhances the material even further. By reducing localized stress areas, these springs offer even greater life expectancy. Each spring is coiled using the most advance CNC winders in the industry. Each spring is then parallel ground, stress relieved and deburred. They are then shot-peened and heat-treated to our own very specific standards. These high standards are what it takes for a longer spring life, even in rough racing environments. Unconditionally Guaranteed against breakage for one year! Just return the broken spring and we'll replace it, no questions asked. Sets of 16.

Spring Set	Spring, Retainer and Lock Set	Style	Outer O.D.	Outer I.D.	Middle O.D.	Middle I.D.	Inner O.D.	Inner I.D.	Damper
98644	NA	Dual	1.550	1.126			1.126	.815	N
98637	NA	Dual with Damper	1.540	1.115			1.025	.730	Y
98745	NA	Dual with Damper	1.625	1.174			1.060	.770	Y
98739	NA	Dual	1.640	1.210			.875	.860	N

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Closed Pressure	Open Pressure	Rate	Max Lift	Coil Bind	Titanium Retainer	Steel Retainer	Seat Cup/Locator
230 @ 1.880	550 @ 1.250	508	.750	1.080	97220	97118, 97128	96015/96034
245 @ 2.000	600 @ 1.300	485	.740	1.200	97220	--	96010/96031
240 @ 2.000	685 @ 1.250	593	.800	1.150	97222	97130	96020/96035
250 @ 2.000	800 @ 1.150	645	.880	1.070	97222	97130	96020/96034
350 @ 2.100	1020 @ 1.200	745	.895	1.145	97224	--	--
350 @ 2.200	1075 @ 1.200	725	.995	1.145	97224	--	--

Closed Pressure	Open Pressure	Rate	Max Lift	Coil Bind	Titanium Retainer	Steel Retainer	Seat Cup/Locator
230 @ 1.880	550 @ 1.250	508	.750	1.080	97220	--	96015/96034
205 @ 1.950	575 @ 1.230	510	.700	1.190	97220	--	96015/96031
240 @ 2.000	685 @ 1.250	593	.800	1.150	97222	--	96020/96040
250 @ 2.000	800 @ 1.150	645	.880	1.070	97222	--	96020/96034

VALVE SPRINGS

PACALOY™ MECHANICAL ROLLER VALVE SPRINGS



Pacaloy™ is steel that offers outstanding cleanliness, extreme tensile strength, zero wear, and light weight designs. The Howards/PAC engineering team designs and maintains the manufacturing process for professional racers who see extreme amounts of wear in severe racing applications. Consistent run after run, lap after lap. Specifically designed to last under the toughest racing environments, including Drag Race, Oval Track and Endurance applications. Fully tested to rev higher, live longer and run harder. Sets of 16.

Spring Set	Spring, Retainer and Lock Set	Style	Outer O.D.	Outer I.D.	Middle O.D.	Middle I.D.	Inner O.D.	Inner I.D.	Damper
98543	NA	"Pacaloy" Dual	1.550	1.136				.812	N
98825	NA	"Pacaloy" Dual	1.550	1.100				.788	N
98844	NA	"Pacaloy" Dual	1.570	1.120				.780	N
98826	NA	"Pacaloy" Dual w/Damper	1.570	1.120				.706	Y
98396	NA	"Pacaloy" Triple	1.574	1.150			1.150	.826	N
98824	NA	"Pacaloy" Dual	1.625	1.175				.851	N
98828	NA	"Pacaloy" Dual	1.625	1.175				.851	N
98846	NA	"Pacaloy" Triple	1.645	1.195		.871		.635	N
98847	NA	"Pacaloy" Triple	1.645	1.195		.871		.635	N
98848	NA	"Pacaloy" Triple	1.645	1.195		.871		.635	N

PACALOY™ WITH SPECIAL PROCESSING VALVE SPRINGS



When only the best will do. These Pacaloy™ springs are enhanced with a special Nano-Peen™ spring technology for durability and exotic heat treatment for minimal load loss. These are the favorites of many pro-sportsman and professionals racers. For round after round, race after race consistency, these are the springs pro builders rely on. The ultimate severe application valve spring. Sets of 16.

Spring Set	Spring, Retainer and Lock Set	Style	Outer O.D.	Outer I.D.	Middle O.D.	Middle I.D.	Inner O.D.	Inner I.D.	Damper
98840	NA	"Pacaloy" Dual	1.500	1.085				.790	N
98886	NA	"Pacaloy" Dual	1.500	1.050				.726	N
98857	NA	"Pacaloy" Dual	1.500	1.050				.726	N
98843	NA	"Pacaloy" Dual	1.550	1.136				.812	N
98815	NA	"Pacaloy" Dual	1.550	1.100				.780	N
98816	NA	"Pacaloy" Dual	1.550	1.100				.706	N
98884	NA	"Pacaloy" Dual	1.564	1.150				.744	N
98875	NA	"Pacaloy" Dual	1.574	1.150				.744	Y
98897	NA	"Pacaloy" Dual	1.625	1.175				.851	N
98893	NA	"Pacaloy" Triple	1.681	1.195		.871		.635	N
98894	NA	"Pacaloy" Triple	1.681	1.195		.871		.635	N
98866	NA	"Pacaloy" Triple	1.710	1.210		.871		.635	N

Some items are not legal for sale or use on any pollution controlled motor vehicle

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Closed Pressure	Open Pressure	Rate	Max Lift	Coil Bind	Titanium Retainer	Steel Retainer	Seat Cup/Locator
240 @ 1.900	625 @ 1.200	550	.700	1.100	97220	97130	96015/96034
250 @ 2.000	765 @ 1.200	644	.800	1.150	97220	97128	96015/96031
190 @ 1.950	710 @ 1.250	743	.800	1.035	97220	97130	96020
275 @ 2.000	805 @ 1.200	663	.800	1.150	97220	97130	96020
260 @ 2.000	690 @ 1.200	538	.800	1.130	97222	--	96020
275 @ 2.000	810 @ 1.150	629	.850	1.100	97222	--	96020/96040
280 @ 2.100	847 @ 1.150	629	.900	1.100	97222	--	96020/96040
250 @ 2.050	800 @ 1.250	689	.800	1.130	97224	--	96020
304 @ 2.050	845 @ 1.250	682	.800	1.130	97224	--	96020
330 @ 2.100	950 @ 1.200	687	.900	1.130	97224	--	96020

Closed Pressure	Open Pressure	Rate	Max Lift	Coil Bind	Titanium Retainer	Steel Retainer	Seat Cup/Locator
250 @ 2.030	614 @ 1.250	467	.780	1.180	97216	97128	96033
300 @ 2.100	1002 @ 1.200	780	.900	1.130	97216	--	96030
375 @ 2.150	1116 @ 1.200	780	.950	1.130	97216	--	96030
240 @ 1.900	625 @ 1.200	550	.700	1.100	97220	97130	96015/96034
250 @ 2.000	765 @ 1.200	644	.800	1.150	97220	97128	96015
275 @ 2.000	805 @ 1.200	662	.800	1.150	97220	97128	96015
250 @ 2.000	670 @ 1.200	525	.800	1.140	97220	97130	96010/96031
265 @ 2.000	705 @ 1.200	550	.800	1.150	97220	97130	96031
275 @ 2.000	810 @ 1.150	629	.850	1.100	97222	--	96020
500 @ 2.200	1256 @ 1.300	840	.900	1.100	97224	--	--
525 @ 2.300	1365 @ 1.300	840	1.100	1.100	97224	--	--
380 @ 2.550	1545 @ 1.250	896	1.350	1.140	97224	--	--

VALVE SPRINGS

PRO-SERIES H-11 TOOL STEEL VALVE SPRINGS

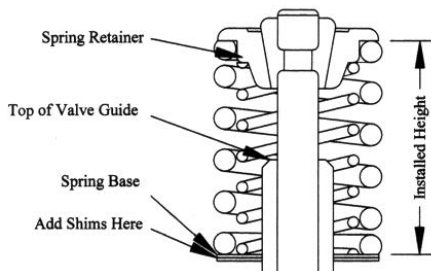


Pro-Series H-11 springs are designed for the serious racer. Manufactured with the latest in laser technology. Each spring is manufactured using the most advanced CNC winders in the industry. Each spring is parallel ground, stress relieved and deburred. They are then shot-peened and heat-treated to very specific standards. Inspected and batched to zero tolerance for the ultimate precision valve spring. This is the next generation tool steel spring! Sets of 16.

Spring Set	Spring, Retainer and Lock Set	Style	Outer O.D.	Outer I.D.	Middle O.D.	Middle I.D.	Inner O.D.	Inner I.D.	Damper
98751	NA	Triple	1.625	1.190	1.185	.890	.880	.670	N

Valve Spring Tech Info

Installation Chart



To avoid coil binding of valve spring, measure your installed height (see chart). Subtract the valve lift. Subtract an additional .060" safety factor. This is measurement A. Install a retainer on your spring. Slowly compress spring until it coil binds. Measure the distance from under outer lip of retainer to bottom of valve spring. This is measurement B. Measurement A must not be less than measurement B.

Note: Valve spring life is greatly affected by many factors. Most problems are heat or coil bind related. If you use oil restrictors your spring life can be decreased by approximately 40%.

Coil bind is a critical factor. Break in new springs by running at low RPM's until warm and then letting them cool back down before hard running. Any questions, call our tech line.

Valve Spring Run-In

Each set of Howards™ valve springs are hand-selected to keep load variations below +/- 10% of the next. However, it is important to "run-in" your new valve springs at low RPM using the following procedure:

1. Start the engine and run the engine between 1500 and 2000 RPM until the engine reaches operating temperature.
2. Shut off the engine and allow the springs to cool.
3. After initial run-in, most springs will lose a slight amount of pressure. Re-check and shim up the valve springs if necessary. After the springs are "run-in", spring pressure should remain constant until the point of replacement.

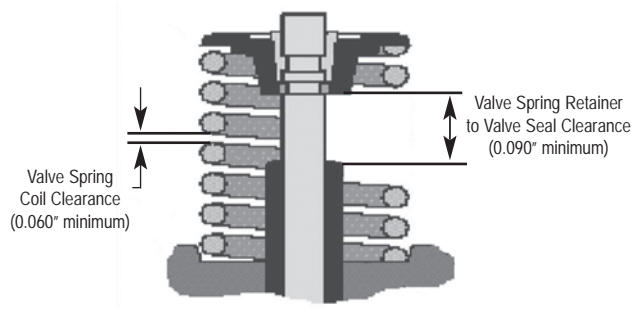
IMPORTANT NOTICE: All valve train components in this catalog are listed as suggestions only. It is the responsibility of the purchaser and the installer to verify that all the components are correct for the their application before installation. Proper assembly requires that the installer measure all tolerances for proper fit and clearances. Howards Cams & Racing Components will assume no liability for any errors in component selection or installation.



Closed Pressure	Open Pressure	Rate	Max Lift	Coil Bind	Titanium Retainer	Steel Retainer	Seat Cup/Locator
250 @ 2.000	680 @ 1.250	570	.850	1.100	97226	--	96020

Valve Spring Coil Clearance

Coil clearance is the distance between the valve spring coils when the valve is at maximum lift (fully open). A minimum of 0.060" must exist between the coils at maximum lift. Coil bind is when the valve spring is compressed fully-to the point that all the coils are "stacked up" on top of each other. .100" is recommended for high RPM applications. Coil bind is a catastrophic condition that will result in valve train failure. Disassemble each spring (if multiple springs are employed at each valve). Check all the springs (both inner and outer springs). If there is not 0.060"-0.100" minimum clearance between the coils, the solutions are: the valve retainer, the valve locks, the valve, or the spring must be changed; the spring pocket must be machined. Keep in mind that these modifications will change the valve spring installed height.



VALVE SPRING RETAINERS

CHROME MOLY STEEL RETAINERS

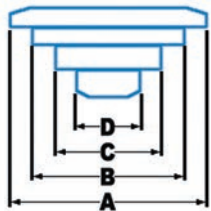
Specifically designed for superior strength and durability. 10° design to eliminate lock pull through. A must for high spring pressure applications. Machined from premium 4140 chrome moly bar stock. Heat-treated and black oxide finish. Sets of 16.

	Lock Angle	Valve Stem	Valve Spring	Dia. A	Dia. B	Dia. C
97161	7°	8mm	1.035-1.095" Beehive	1.040"	.610"	
97162	7°	8mm	1.290" Dual	1.155"	.950"	.675"
97112	7°	11/32"	1.240-1.265" Single/Dual	1.125"	.850"	.645"
97113	7°	11/32"	1.260-1.320" Single/Dual	1.200"	.850"	.600"
97110	7°	3/8"	1.437-1.525" Single/Dual	1.370"	1.065"	.685"
97118	7°	11/32"	1.437-1.540" Single/Dual	1.440"	1.050"	.700"
97173	Mini 8°	All	1.374" (98374)	1.360"	.985"	.690"
97174	10°	All	1.035-1.095" Beehive	1.050"	.640"	
97132	10°	All	1.240-1.265" Single	1.125"	.875"	.740"
97175	10°	All	1.374" (98374)	1.325"	.990"	.700"
97128	10°	All	1.437-1.550" Single/Dual	1.440"	1.070"	.700"
97126	10°	All	1.437-1.550" -.050" Install Hgt.	1.435"	1.070"	.700"
97130	10°	All	1.450-1.580" Single/Dual	1.500"	1.120"	.705"



AMERICAN MADE TITANIUM RETAINERS

The ultimate in lightweight and strength. When you upgrade from steel to titanium valve spring retainers you gain speed and power, because titanium retainers are lighter and stronger than steel. Manufactured to precise tolerances of special 6AL 4V titanium for maximum strength and durability. Up to 50% lighter than steel retainers. Lighter means less chance of valve float. Sets of 16.

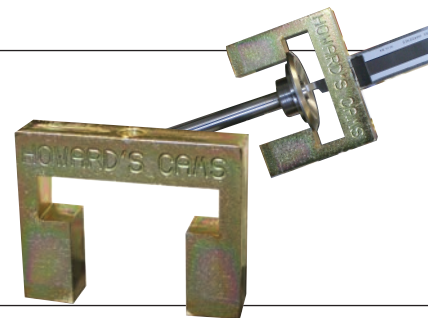


	Lock Angle	Valve Stem	Valve Spring	Dia. A	Dia. B	Dia. C	Dia. D
97165	Super 7	All	1.290" Dual	1.235"	.915"	.660"	
97214	7°	11/32"	1.235-1.290" Single	1.225"	.870"	.650"	
97212	10°	All	1.235"-1.290" Single	1.225"	.870"	.650"	
97216	10°	All	1.437-1.550" Single/Dual	1.440"	1.050"	.700"	
97220	10°	All	1.500-1.580" Single/Dual	1.500"	1.105"	.710"	
97222	10°	All	1.500-1.650" Dual	1.500"	1.175"	.765"	
97224	10°	All	1.500-1.660" Triple	1.500"	1.185"	.860"	.620"
97225	10°	All	1.500-1.660" Triple	1.500"	1.135"	.840"	.635"
97226	10°	All	1.500-1.660" Triple	1.500"	1.185"	.768"	.640"

RETAINER HEIGHT TOOLS

Measures exact differences in retainers and locks for your combinations. Detect differences in same part numbers or different combinations, for your exact valve spring installed height. Simple to use with most calipers (not included).

- 92010 Height Tool, fits 1.250-1.360" Retainers
- 92020 Height Tool, fits 1.400-1.760" Retainers





7° HEAT-TREATED VALVE LOCKS

Stamped from alloy steel and heat-treated for superior wear resistance. Out performs O.E. style keepers. Sets of 32 (16 pair).

- 93001 8mm" Valve Stems, Bead Lock, GM LS, Black Oxide
- 93020 5/16" Valve Stems, Single Groove
- 93040 11/32" Valve Stems, Single Groove, Black Oxided
- 93045 3/8" Valve Stems, Single Groove, Black Oxided
- 93065 3/8" Valve Stems, Chrysler BB 2 & 4 Groove
- 93066 3/8" Valve Stems, Chrysler SB 4 Groove
- 93060 11/32" Valve Stems, Ford 4 Groove



MACHINED STEEL VALVE LOCKS

Precision machined from super-tough, fatigue resistant steel alloy material. Sets of 32 (16 pair).

- 7° Machined Steel
- 93072 11/32" Valve Stems, Single Groove
- Mini 8 Machined Steel
- 93155 11/32" Valve Stems, Single Groove
- 10° Machined Steel
- 93092 8mm Valve Stems, Single Groove
- 93070 5/16" Valve Stems, Single Groove
- 93075 11/32" Valve Stems, Single Groove, w/Lash Cap Recess
- 93085 11/32" Valve Stems, Single Groove, No Recess, +.050" Hght.
- 93080 3/8" Valve Stems, Single Groove, w/Lash Cap Recess
- 93090 3/8" Valve Stems, Single Groove, No Recess, +.050" Hght.
- 93100 3/8" Valve Stems, Single Groove, Chrysler 2 Groove



FORGED STEEL 7° VALVE LOCKS

THE FACTS! The strongest 7° valve lock on the market! Cold forged alloy steel, stronger and more accurate than machined steel locks. The only "true" +.050" 7 degree lock on the market today. At almost 1/2 the cost they obsolete machined locks. Sets of 32 (16 pair). *American Made!*



- 93005 11/32" Valve Stems, Single Groove, Std. Height
- 93010 11/32" Valve Stems, Single Groove, +.050 Hght.
- 93015 3/8" Valve Stems, Single Groove, +.050 Hght.



FORGED STEEL 10° VALVE LOCKS

The **ULTIMATE** 10° Valve Locks!

Forged in Milwaukee from Charter Wire™ material. These forgings are stronger, more precise than machined steel locks. They offer longer life, even under high pressure race environment. Because of being a true forged lock, install heights are accurate! Stronger ... More Consistent ... Longer Life... Why buy any other? Sets of 32 (16 pair). *American Made!*

- 93017 11/32" Valve Stems, Single Groove, +.035" Hgt
- 93017-100 Pack 100 pr., 11/32" Valve Stems, +.035" Hgt
- 93018 3/8" Valve Stems, Single Groove, Std. Height
- 93018-100 Pack 100 pr., 3/8" Valve Stems, Std. Hgt

VALVE SPRING CUPS

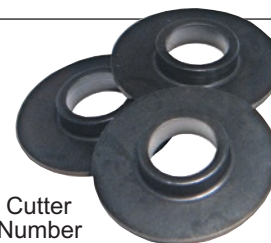
Howards™ valve spring cups are made from specially hardened chrome moly steel and finished in a rich black oxide for maximum durability. Spring cups will prevent unwanted valve spring movement and galling of the cylinder heads. Machining may be required. .060" thick. Sold in sets of 16.



	Max Spring O.D.	Cup O.D.	Cup I.D.	Wall Shoulder Height	Use Cutter Part Number
96005	1.475"	1.570"	.640"	.150"	92075
96010	1.565"	1.670"	.640"	.150"	92075
96015	1.550"	1.680"	.577"	.150"	92075
96020	1.650"	1.780"	.640"	.150"	NA

VALVE SPRING LOCATORS

Spring locators are similar to spring cups, but have the locating shoulder moved from the outside of the spring to the inside. This style requires less head machining than standard cups. Accurate and durable, .060" thick. Sold in sets of 16.



	Max Spring O.D.	Locator O.D.	Locator I.D.	Wall Shoulder Height	Shoulder Diameter	Use Cutter Part Number
96023	1.290"	1.270"	.505"	.145"	.675"	NA
96022	1.290"	1.270"	.520"	.130"	.680"	NA
96021	1.290"	1.270"	.570"	.130"	.875"	NA
96026	1.290"	1.285"	.810"	.130"	.875"	NA
96029	1.470"	1.450"	.570"	.130"	.700"	NA
96024	1.550"	1.550"	.570"	.140"	.715"	92070
96025	1.550"	1.540"	.640"	.180"	.720"	92070
96030	1.550"	1.535"	.570"	.140"	.720"	92070
96031	1.550"	1.550"	.570"	.140"	.730"	92070
96033	1.550"	1.550"	.570"	.140"	.790"	92070
96034	1.550"	1.550"	.570"	.140"	.810"	92070
96035	1.625"	1.625"	.620"	.175"	.760"	92075
96040	1.625"	1.625"	.570"	.175"	.765"	92075



EXHAUST ROTATOR ELIMINATORS

These .300" thick spacers are used to make up the difference when doing away with factory big block Chevy exhaust rotators. No more having to stack shims to take up the difference. These exhaust rotator eliminators also provide a step for the valve spring so it cannot walk around on the cylinder head. For springs up to 1.565" dia. Set of 8.


96045 Rotator Eliminator, Exhaust, Big Block Chevrolet

SPRING HEIGHT MICROMETER

The easiest way to measure valve spring installed height is with a height micrometer. This tool is used between the cylinder head spring seat and valve spring retainer. The tool is adjusted until all components are fully seated. The tool is read just like a micrometer and will provide accurate measurements every time it is used.

92155	Measures from 1.400" - 1.900"	92157	Measures from 1.600" - 2.100" Beehive
92156	Measures from 1.600" - 2.100"		






VALVE SPRING SHIMS

Critical when setting up proper valve spring height and pressures. High quality heat-treated valve spring shims are designed to handle the immense pressures of today's racing valve springs. Must specify thickness. Available in .015", .030" and .060". Sets of 16.

96302-50	1.250" x .570" x .050"	96220-15	1.437" x .765" x .015"
96205-15	1.250" x .812" x .015"	96220-30	1.437" x .765" x .030"
96205-30	1.250" x .812" x .030"	96220-60	1.437" x .765" x .060"
96205-60	1.250" x .812" x .060"	96220-KIT	16 each, .015", .030" & .060"
96205-KIT	16 each, .015", .030" & .060"	96225-15	1.480" x .703" x .015"
96210-15	1.250" x .875" x .015"	96225-30	1.480" x .703" x .030"
96210-30	1.250" x .875" x .030"	96225-60	1.480" x .703" x .060"
96210-60	1.250" x .875" x .060"	96225-KIT	16 each, .015", .030" & .060"
96210-KIT	16 each, .015", .030" & .060"	96230-15	1.500" x 1.031" x .015"
96215-15	1.437" x .645" x .015"	96230-30	1.500" x 1.031" x .030"
96215-30	1.437" x .645" x .030"	96230-60	1.500" x 1.031" x .060"
96215-60	1.437" x .645" x .060"	96230-KIT	16 each, .015", .030" & .060"
96215-KIT	16 each, .015", .030" & .060"	96240-15	1.640" x .635" x .015"
		96240-30	1.640" x .635" x .030"
		96240-60	1.640" x .635" x .060"
		96240-KIT	16 each, .015", .030" & .060"



VALVE SPRING SEAT CUTTERS

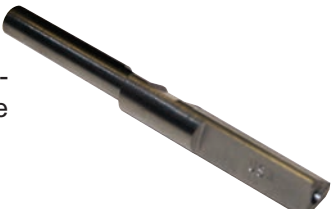
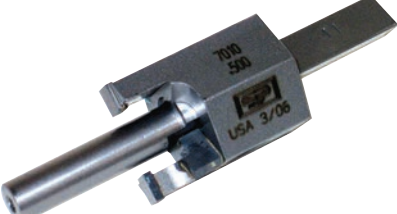
These America made tools from Howards™ will allow the engine builder to modify the cylinder heads to fit the desired valve springs to suit their application. Designed to enlarge the spring pocket for oversized valve springs. Valve guide arbor not included.

92065	1.440" Dia.	92075	1.680" Dia.
92070	1.550" Dia.	92080	1.740" Dia.

VALVE GUIDE ARBORS FOR VALVE SPRING SEAT CUTTERS

These America made tools from Howards™ will allow the engine builder to modify the cylinder heads to fit the desired valve springs to suit their application. Designed to enlarge the spring pocket for oversized valve springs.


92085	5/16"	92090	11/32"	92095	3/8"
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VALVE GUIDE CUTTERS

Designed to cut the valve guide to be used with Teflon, Viton or metal body type seals. Useable with hand tools. These American made tools allow you to do this machine work yourself. Includes cutter and valve guide arbor.

92035	11/32" x .500"	92045	3/8" x .531"
92040	11/32" x .531"	92049	.531" (Cutter Only, Requires Arbor)



"THE CAM TUBE"

- The most protective cam package available
- Great for storage and shipping
- Greatly improves cam survival if dropped
- High impact injected molded plastic

CAM TUBE Cam Tube (Max Journal Size 2.125"), Yellow or Grey



BRONZE DISTRIBUTOR GEARS

Our distributor gears are manufactured in the United States from a premium bronze alloy material machined to exacting tolerances. These gears feature a high-strength tooth design that resists wear even when used with high pressure oil pumps. A must with billet roller cams.

94400	Chev V8, 90° V6 for .491 Shaft (std./Mallory)	94435	Ford 351C/M/400 for .500 Shaft
94405	Chev V8, 90° V6 for .500 (MSD/etc.)	94440	Ford 351C/M/400 for .531 Shaft
94415	Chrysler SB 273-360, 5.2/5.9L for .484 Shaft	94450	Ford FE 332-428 for .467 Shaft
94420	Chrysler BB 350-440 for .484 Shaft	94435	Ford FE 332-428 for .500 Shaft
94420	Chrysler 426 Hemi/KB for .484 Shaft	94435	Ford 429-460 for .500 Shaft
94430	Ford 221-302/351W, 5.0L for .467 Shaft	94440	Ford 429-460 for .531 Shaft
94425	Ford 221-302/351W, 5.0L for .500 Shaft	94455	Oldsmobile V8 for .491 Shaft
94445	Ford 221-302/351W, 5.0L for .531 Shaft	94460	Pontiac V8 for .489 Shaft

COMPOSITE DISTRIBUTOR GEARS

Make bronze distributor gear wear a thing of the past! NASCAR-proven technology yields precise timing and extended durability. Precision manufactured carbon ultra fiber material. 300% more durability versus bronze distributor gears when used with steel camshafts. Can be used with cast or billet cams.

94402	Chev V8, 90° V6 for .491 Shaft (std.)	94427	Ford 221-302/351W, 5.0L for .531 Shaft
94407	Chev V8, 90° V6 for .500 (MSD/etc.)		



LIGHTWEIGHT FUEL PUMP PUSHRODS

Premium grade aerospace chrome moly material. Centerless ground after heat-treating. Hollow for light weight and fast response. Rated 170,000 psi tensile strength.

<i>Chev SB/BB (5.750" o.a.l.)</i>		<i>Chrysler BB/Hemi (3.220" o.a.l.)</i>	
92150	Steel Tip for Cast Cams	92152	Steel Tip for Cast Cams
92151	Bronze Tip for Billet Steel Cams	92153	Bronze Tip for Billet Steel Cams
<i>Chev BB Midwest Racing Block (6.000" o.a.l.)</i>			
92154	Bronze Tip for Billet Steel Cams		

ULTRA LITE BILLET COMPOSITE FUEL PUMP PUSHRODS

Designed for NASCAR, a necessity for any serious racer using a mechanical fuel pump. Proprietary blended carbon reinforced bearing grade polymer. Ultra light weight, only 0.9 ounces (27 grams) to eliminate fuel pump cavitation. Gentle on the cam lobe. Can be used with cast or billet cams. Self lubricating. Super strong. Super long life.

94475	Chev V8, All Application (Cast or Billet), 27 Grams
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HRC EXTREME BILLET MAIN CAPS

Precision CNC machined from superior quality low carbon 1020 billet material. Available as stock replacement (straight bolt) or with splayed outer bolt holes. The splayed caps feature 10 degree angled outer holes to positively reinforce and tie the block together. Main cap set consists of the center 3 caps. Front and rear caps are also available. Use together for ultimate in bottom end stress and flex management. Drill bushings included with caps requiring them. Side notches for easy removal. Proudly 100% manufactured in the U.S.A. Line boring required after installation.

Chev 350 Main (2.450" Journal)

- H350R4-Bolt Replacement, 3 pcs.
- H350C.....Converts 2-Bolt to 4-Bolt, 3 pcs.
- H350SConverts 2-Bolt to 4-Bolt, Splayed Outer Bolts, 3 pcs.
- H350EFlat Bottom, Splayed Outer Bolts, 3 pcs.
- H350FFront Cap (2-Bolt), 1 pc.
- H350RDS.....Rear Cap, Dry-Sump (2-Bolt), 1 pc.
- H350RWS.....Rear Cap, Wet-Sump (2-Bolt), 1 pc.

Chev 400 Main (2.650" Journal)

- H400Converts 2-Bolt to 4-Bolt, Splayed Outer Bolts, 3 pcs.
- H400FFront Cap (2-Bolt), 1 pc.

Chev 454 Main (2.750" Journal)

- H454.....Converts 2-Bolt to 4-Bolt, 3 pcs.
- H454RWS.....Rear Cap, Wet-Sump (4-Bolt), 1 pc.

MAIN CAP SUPPORT STRAPS

Designed to support the front and rear OE style main caps for higher horsepower applications. The best thing to use next to billet replacement caps (see above). Milling top of the caps is necessary, but line bore is usually not affected.



- H350FS.....Front main cap strap, Chev. 350
- H400FS.....Front main cap strap, Chev. 400
- H350RSDSRear main cap strap, dry sump, Chev. 350, 2-pc Seal
- H350RSWSRear main cap strap, wet sump, Chev. 350, 2-pc Seal



SUGGESTED MAIN CAP FASTENERS

Using Howards Billet Main caps will strengthen your block extremely. However, good quality fasteners must be used for full effect. We highly recommend the use of high quality bolt or stud kits with a rating of 180,000psi or higher. ARP's Pro Series fasteners (200,000psi) are a good match with our main cap kits. The following recommended part numbers are for use as a guide only. Certain applications may require different lengths, check with the manufacturer if you are not certain.

H350R or H350C Main Caps

Bolt Kits

- 134-5202.....Hex Head (180,000)
- 234-5201 ..12 pt. Pro Series (200,000)

Stud Kits (200,000psi)

- 134-5601 Hex Head w/o windage tray
- 234-5601Hex Head w/windage tray

H350S Main Caps

Stud Kits (200,000psi)

- 234-5602 ..Hex Head w/splayed bolts

H400 Main Caps

Stud Kits (200,000psi)

- 234-5605Hex Head w/windage tray

Main Cap Support Straps

(w/HRC billet or OE center 3 straps)

Bolt Kits

- 234-5203 ..12 pt. Pro Series (200,000)

Stud Kits (200,000psi)

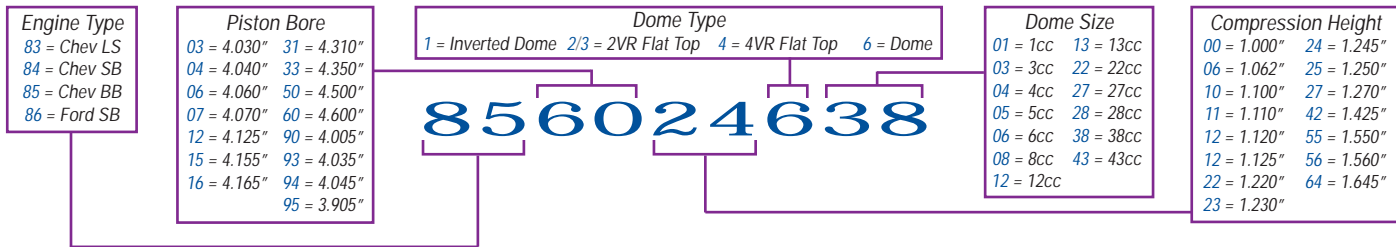
- 234-5603 ..Hex Head w/straight bolt caps
- 234-5604 ..Hex Head w/splayed caps



PRO MAX™ 2618 RACE PISTONS



The forging design produces a stronger piston for the ultimate in performance. All Howards HRC Racing Pistons are forged from 2618 billet bar stock and then heat treated and aged to a T61 condition (2618-T61). This material has less than 1% silicon particulate content. High silicon content pistons (forged from 4032 or MS75) will not stand up to the most extreme stress placed on many racing pistons. Simply stated, adding sand to the aluminum only makes it more brittle. Another advantage of 2618-T61 over the high silicon pistons is the ability to keep its shape under extreme pressure and high RPM's. "Skirt Shrinking" is not a problem with Howards HRC Racing Pistons. All HRC pistons are machined on the most modern CNC equipment in the industry. The design of the CNC turned skirts allows these pistons to work properly under intense heat and severe side loads without scuffing or splitting the cylinder walls. Dome pistons are designed with radiused domes, eliminating sharp edges and "hot spots". The valve pockets are built to handle large cam profiles and oversized valves. Forced pin oilers, accumulator grooves and lock removal indents are standard. Sets include lightweight .150" wall, heat treated aircraft quality wrist pins. Double spirollox are standard.



	Bore Size	Cubic Inch	Stroke	Rod Length	Dome Volume	Compression Ratio	Comp. Distance	Deck Height	Avg. Weight Piston/Pin	Valve Intake	Valve Relief Exhaust	Depth-Dia.	Pin Size	Suggested Ring Set	Notes
Chev LS Gen III 15° Inverted Dome															
Designed for: 1.5, 1.5, 3mm Ring Grooves															
						64cc	66cc	72cc							
839511112	3.905	383	4.000	6.125	-12.0cc	10.3	10.1	9.5	1.110	9.240	.182"-2.200"	.180"-1.720"	.927 x 2.500	HRC4850-3905-5	B
839011112	4.005	403	4.000	6.125	-12.0cc	10.7	10.5	9.9	1.110	9.240	.200"-2.200"	.180"-1.800"	.927 x 2.500	HRC4850-4040-5	B
830311112	4.030	408	4.000	6.125	-12.0cc	10.8	10.6	10.0	1.110	9.240	.200"-2.200"	.180"-1.800"	.927 x 2.500	HRC4850-4030-5	B
830711112	4.070	416	4.000	6.125	-12.0cc	11.0	11.8	10.2	1.110	9.240	.200"-2.200"	.180"-1.800"	.927 x 2.500	HRC4850-4070-5	B
831211112	4.125	427	4.000	6.125	-12.0cc	11.9	11.0	9.8	1.110	9.240	.200"-2.200"	.180"-1.800"	.927 x 2.500	HRC4850-4125-5	B

	Bore Size	Cubic Inch	Stroke	Rod Length	Dome Volume	Compression Ratio	Comp. Distance	Deck Height	Avg. Weight Piston/Pin	Valve Intake	Valve Relief Exhaust	Depth-Dia.	Pin Size	Suggested Ring Set	Notes
Chev LS Gen III 15° Flat Top															
Designed for: 1.5, 1.5, 3mm Ring Grooves															
						64cc	66cc	72cc							
839511304	3.905	383	4.000	6.125	-4.0cc	11.3	11.0	10.3	1.110	9.240	.182"-2.200"	.180"-1.720"	.927 x 2.300	HRC4850-3905-5	B
839011304	4.005	403	4.000	6.125	-4.0cc	11.7	11.5	10.7	1.110	9.240	.200"-2.200"	.180"-1.800"	.927 x 2.300	HRC4850-4005-5	B
830311304	4.030	408	4.000	6.125	-4.0cc	11.9	11.6	10.8	1.110	9.240	.200"-2.200"	.180"-1.800"	.927 x 2.300	HRC4850-4030-5	B
830711304	4.070	416	4.000	6.125	-4.0cc	12.3	11.8	11.0	1.110	9.240	.200"-2.200"	.180"-1.800"	.927 x 2.300	HRC4850-4070-5	B

	Bore Size	Cubic Inch	Stroke	Rod Length	Dome Volume	Compression Ratio	Comp. Distance	Deck Height	Avg. Weight Piston/Pin	Valve Intake	Valve Relief Exhaust	Depth-Dia.	Pin Size	Suggested Ring Set	Notes	
Chevrolet SB 23° Inverted Dome (Dish)																
Designed for: 1/16, 1/16, 3/16 Rings																
						58cc	64cc	76cc								
840342128	4.030	383	3.750	5.700	-28.0cc	9.3	8.8	7.9	1.425	9.000	473/108	.310"-2.200"	.275"-1.800"	.927 x 2.300	HRC4860-4030-5	
840442128	4.040	385	3.750	5.700	-28.0cc	9.3	8.8	8.0	1.425	9.000	478/108	.310"-2.200"	.275"-1.800"	.927 x 2.300	HRC4860-4040-5	
840642128	4.060	388	3.750	5.700	-28.0cc	9.4	8.9	8.0	1.425	9.000	486/108	.310"-2.200"	.275"-1.800"	.927 x 2.300	HRC4860-4060-5	
841200122	4.125	428	4.000	6.000	-22.0cc	10.8	10.2	9.2	1.062	9.000		.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4155-5	B
841500122	4.155	434	4.000	6.000	-22.0cc	10.9	10.3	9.3	1.062	9.000		.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4165-5	B

Bore Size Cubic Inch Stroke Rod Length Dome Volume Compression Ratio Comp. Distance Deck Height Avg. Weight Piston/Pin Valve Intake Relief Exhaust Depth-Dia. Pin Size Suggested Ring Set Notes

Chevrolet SB 4-Valve Relief 23° Flat Top

Designed for: 1/16, 1/16, 3/16 Rings

58cc 64cc 76cc

840356405	4.030	355	3.480	5.700	-5.0cc	11.1	10.4	9.1	1.560	9.000	514/118	.215"-2.100"	.210"-1.700"	.927 x 2.500	HRC4860-4030-5	
840456405	4.040	357	3.480	5.700	-5.0cc	11.2	10.4	9.2	1.560	9.000	514/118	.215"-2.100"	.210"-1.700"	.927 x 2.500	HRC4860-4040-5	
840656405	4.060	361	3.480	5.700	-5.0cc	11.3	10.5	9.2	1.560	9.000	523/118	.215"-2.100"	.210"-1.700"	.927 x 2.500	HRC4860-4060-5	
840342405	4.030	383	3.750	5.700	-5.0cc	11.9	11.1	9.7	1.425	9.000	490/118	.215"-2.100"	.210"-1.700"	.927 x 2.500	HRC4860-4030-5	
840442405	4.040	385	3.750	5.700	-5.0cc	11.9	11.1	9.8	1.425	9.000	492/118	.215"-2.100"	.210"-1.700"	.927 x 2.500	HRC4860-4040-5	
840642405	4.060	388	3.750	5.700	-5.0cc	12.0	11.2	9.8	1.425	9.000	497/118	.215"-2.100"	.210"-1.700"	.927 x 2.500	HRC4860-4060-5	

Chevrolet SB 23° Flat Top (4.000"-4.060" Bore)

Designed for: 1.5mm, 1.5mm, 3mm Rings

58cc 64cc 76cc

840355205	4.030	357	3.480/3.500	5.700	-5.0cc	11.1	10.4	9.1	1.550	9.000	510/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4850-4030-5	A
849355205	4.035	358	3.480/3.500	5.700	-5.0cc	11.2	10.4	9.1	1.550	9.000	513/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4850-4030-5	A
840455205	4.040	359	3.480/3.500	5.700	-5.0cc	11.2	10.4	9.2	1.550	9.000	456/118	.320"-2.200"	.280"-1.800"	.927 x 2.500	HRC4850-4040-5	A
849455205	4.045	360	3.480/3.500	5.700	-5.0cc	11.2	10.4	9.2	1.550	9.000	458/118	.320"-2.200"	.280"-1.800"	.927 x 2.500	HRC4850-4040-5	A
840325205	4.030	357	3.480/3.500	6.000	-5.0cc	11.1	10.4	9.1	1.250	9.000	427/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4850-4030-5	A
849325205	4.035	358	3.480/3.500	6.000	-5.0cc	11.2	10.4	9.1	1.250	9.000	429/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4850-4040-5	A
840425205	4.040	359	3.480/3.500	6.000	-5.0cc	11.2	10.4	9.2	1.250	9.000	430/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4850-4040-5	A
849425205	4.045	360	3.480/3.500	6.000	-5.0cc	11.2	10.4	9.2	1.250	9.000	432/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4850-4040-5	A
840312205	4.030	357	3.480/3.500	6.125	-5.0cc	11.1	10.4	9.1	1.125	9.000	405/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4850-4030-5	A,B
840412205	4.040	359	3.480/3.500	6.125	-5.0cc	11.2	10.4	9.2	1.125	9.000	428/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4850-4040-5	A,B
840312205	4.030	383	3.750	6.000	-5.0cc	11.9	11.1	9.7	1.125	9.000	405/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4850-4030-5	B
840412205	4.040	385	3.750	6.000	-5.0cc	11.9	11.1	9.8	1.125	9.000	428/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4850-4040-5	B

Chevrolet SB 23° Flat Top (4.000"-4.060" Bore)

Designed for: 1/16, 1/16, 3/16 Rings

58cc 64cc 76cc

840355305	4.030	357	3.480/3.500	5.700	-5.0cc	11.1	10.4	9.1	1.550	9.000	510/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4030-5	A
840455305	4.040	359	3.480/3.500	5.700	-5.0cc	11.2	10.4	9.2	1.550	9.000	456/118	.320"-2.200"	.280"-1.800"	.927 x 2.500	HRC4860-4040-5	A
840655305	4.060	362	3.480/3.500	5.700	-5.0cc	11.3	10.5	9.2	1.550	9.000	464/118	.320"-2.200"	.280"-1.800"	.927 x 2.500	HRC4860-4060-5	A
840325305	4.030	357	3.480/3.500	6.000	-5.0cc	11.1	10.4	9.1	1.250	9.000	427/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4030-5	A
840425305	4.040	359	3.480/3.500	6.000	-5.0cc	11.2	10.4	9.2	1.250	9.000	430/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4040-5	A
840625305	4.060	362	3.480/3.500	6.000	-5.0cc	11.3	10.5	9.2	1.250	9.000	433/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4060-5	A
840322305	4.030	363	3.562	6.000	-5.0cc	11.3	10.5	9.3	1.220	9.001	425/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4030-5	
840422305	4.040	365	3.562	6.000	-5.0cc	11.4	10.6	9.3	1.220	9.001	427/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4040-5	
840312305	4.030	357	3.480/3.500	6.125	-5.0cc	11.1	10.4	9.1	1.125	9.000	405/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4030-5	A,B
840412305	4.040	359	3.480/3.500	6.125	-5.0cc	11.2	10.4	9.2	1.125	9.000	428/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4040-5	A,B
840612305	4.060	362	3.480/3.500	6.125	-5.0cc	11.3	10.5	9.2	1.125	9.000	413/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4060-5	A,B
840312305	4.030	383	3.750	6.000	-5.0cc	11.9	11.1	9.7	1.125	9.000	405/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4030-5	B
840412305	4.040	385	3.750	6.000	-5.0cc	11.9	11.1	9.8	1.125	9.000	428/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4040-5	B
840612305	4.060	388	3.750	6.000	-5.0cc	12.0	11.2	9.8	1.125	9.000	413/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4060-5	B
840306305	4.030	395	3.875	6.000	-5.0cc	12.3	11.4	10.0	1.062	9.000	392/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4030-5	B
840406305	4.040	397	3.875	6.000	-5.0cc	12.3	11.4	10.0	1.062	9.000	395/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4040-5	B

Notes

Compression based at zero deck and .040" compressed head gasket.

(A) Fits 3.480" & 3.500" Strokes. Zero deck with 3.480" stroke is 8.990". Cubic inch & compression based on 3.500" stroke.

(B) Oil rail support included.

	Bore Size	Cubic Inch	Stroke	Rod Length	Dome Volume	Compression Ratio			Comp. Distance	Deck Height	Avg. Weight Piston/Pin	Valve Relief Intake	Depth-Dia. Exhaust	Pin Size	Suggested Ring Set	Notes
Chevrolet SB 23° Flat Top (4.125"-4.165" Bore)																
Designed for: 1.5mm, 1.5mm, 3mm Rings																
						58cc	64cc	76cc								
841512206	4.155	380	3.480/3.500	6.125	-6.0cc	11.6	10.8	9.5	1.125	9.000	448/108	.320"-2.200"	.310"-1.800"	.927 x 2.300	HRC4850-4155-5	A,B
841612206	4.165	382	3.480/3.500	6.125	-6.0cc	11.6	10.8	9.5	1.125	9.000	452/108	.320"-2.200"	.310"-1.800"	.927 x 2.300	HRC4850-4165-5	A,B
841512206	4.155	407	3.750	6.000	-6.0cc	12.3	11.5	10.1	1.125	9.000	446/108	.320"-2.200"	.310"-1.800"	.927 x 2.300	HRC4850-4155-5	B
841612206	4.165	409	3.750	6.000	-6.0cc	12.4	11.5	10.1	1.125	9.000	452/108	.320"-2.200"	.310"-1.800"	.927 x 2.300	HRC4850-4165-5	B
841506206	4.155	420	3.875	6.000	-6.0cc	12.7	11.8	10.4	1.062	9.000	434/108	.320"-2.200"	.310"-1.800"	.927 x 2.300	HRC4860-4155-5	B
841606206	4.165	422	3.875	6.000	-6.0cc	12.8	11.9	10.4	1.062	9.000	441/108	.320"-2.200"	.310"-1.800"	.927 x 2.300	HRC4860-4165-5	B

Chevrolet SB 23° Flat Top (4.125"-4.165" Bore) cont.

Designed for: 1/16, 1/16, 3/16 Rings

58cc 64cc 76cc

841542306	4.155	407	3.750	5.700	-6.0cc	12.3	11.5	10.1	1.425	9.000	490/108	.320"-2.200"	.310"-1.800"	.927 x 2.300	HRC4860-4155-5	B
841642306	4.165	409	3.750	5.700	-6.0cc	12.4	11.5	10.1	1.425	9.000	492/108	.320"-2.200"	.310"-1.800"	.927 x 2.300	HRC4860-4155-5	B
841512306	4.155	380	3.480/3.500	6.125	-6.0cc	11.6	10.8	9.5	1.125	9.000	448/108	.320"-2.200"	.310"-1.800"	.927 x 2.300	HRC4860-4155-5	A,B
841612306	4.165	382	3.480/3.500	6.125	-6.0cc	11.6	10.8	9.5	1.125	9.000	452/108	.320"-2.200"	.310"-1.800"	.927 x 2.300	HRC4860-4165-5	A,B
841512306	4.155	407	3.750	6.000	-6.0cc	12.3	11.5	10.1	1.125	9.000	446/108	.320"-2.200"	.310"-1.800"	.927 x 2.300	HRC4860-4155-5	B
841612306	4.165	409	3.750	6.000	-6.0cc	12.4	11.5	10.1	1.125	9.000	452/108	.320"-2.200"	.310"-1.800"	.927 x 2.300	HRC4860-4165-5	B
841206306	4.125	414	3.875	6.000	-6.0cc	12.6	11.7	10.3	1.062	9.000	421/108	.320"-2.200"	.310"-1.800"	.927 x 2.300	HRC4860-4125-5	B
841506306	4.155	420	3.875	6.000	-6.0cc	12.7	11.8	10.4	1.062	9.000	434/108	.320"-2.200"	.310"-1.800"	.927 x 2.300	HRC4860-4155-5	B
841606306	4.165	422	3.875	6.000	-6.0cc	12.8	11.9	10.4	1.062	9.000	441/108	.320"-2.200"	.310"-1.800"	.927 x 2.300	HRC4860-4165-5	B
841200306	4.125	374	3.480/3.500	6.250	-6.0cc	11.4	10.7	9.4	1.000	9.000	415/108	.320"-2.200"	.310"-1.800"	.927 x 2.300	HRC4860-4125-5	A,B
841500306	4.155	380	3.480/3.500	6.250	-6.0cc	11.6	10.8	9.5	1.000	9.000	420/108	.320"-2.200"	.310"-1.800"	.927 x 2.300	HRC4860-4155-5	A,B
841600306	4.165	382	3.480/3.500	6.250	-6.0cc	11.6	10.8	9.5	1.000	9.000	428/108	.320"-2.200"	.310"-1.800"	.927 x 2.300	HRC4860-4165-5	A,B
841200306	4.125	401	3.750	6.125	-6.0cc	12.2	11.3	10.0	1.000	9.000	415/108	.320"-2.200"	.310"-1.800"	.927 x 2.300	HRC4860-4125-5	B
841500306	4.155	407	3.750	6.125	-6.0cc	12.3	11.5	10.1	1.000	9.000	420/108	.320"-2.200"	.310"-1.800"	.927 x 2.300	HRC4860-4155-5	B
841600306	4.165	409	3.750	6.125	-6.0cc	12.4	11.5	10.1	1.000	9.000	428/108	.320"-2.200"	.310"-1.800"	.927 x 2.300	HRC4860-4165-5	B
841200306	4.125	428	4.000	6.000	-6.0cc	12.9	12.0	10.6	1.000	9.000	415/108	.320"-2.200"	.310"-1.800"	.927 x 2.300	HRC4860-4125-5	B
841500306	4.155	434	4.000	6.000	-6.0cc	13.1	12.2	10.7	1.000	9.000	420/108	.320"-2.200"	.310"-1.800"	.927 x 2.300	HRC4860-4155-5	B
841600306	4.165	436	4.000	6.000	-6.0cc	13.1	12.2	10.8	1.000	9.000	428/108	.320"-2.200"	.310"-1.800"	.927 x 2.300	HRC4860-4165-5	B

Chevrolet SB 23° Dome (4.000"-4.060" Bore)

Designed for: 1/16, 1/16, 3/16 Rings

58cc 64cc 76cc

840355613	4.030	357	3.480/3.500	5.700	13.0cc	14.6	13.2	11.2	1.550	9.000	480/118	.280"-2.200"	.260"-1.800"	.927 x 2.500	HRC4860-4030-5	A
840342608	4.030	383	3.750	5.700	8.0cc	14.3	13.1	11.2	1.425	9.000	472/108	.280"-2.200"	.260"-1.800"	.927 x 2.300	HRC4860-4030-5	
840325613	4.030	357	3.480/3.500	6.000	13.0cc	14.6	13.2	11.2	1.250	9.000	464/108	.280"-2.200"	.260"-1.800"	.927 x 2.300	HRC4860-4030-5	A
840425613	4.040	358	3.480/3.500	6.000	13.0cc	14.6	13.3	11.2	1.250	9.000	464/108	.280"-2.200"	.260"-1.800"	.927 x 2.300	HRC4860-4040-5	A
840625613	4.060	362	3.480/3.500	6.000	13.0cc	14.7	13.4	11.3	1.250	9.000	473/108	.280"-2.200"	.260"-1.800"	.927 x 2.300	HRC4860-4060-5	A
840312608	4.030	357	3.480/3.500	6.125	8.0cc	13.4	12.3	10.5	1.125	9.000	432/108	.280"-2.200"	.260"-1.800"	.927 x 2.300	HRC4860-4030-5	A,B
840412608	4.040	358	3.480/3.500	6.125	8.0cc	13.5	12.3	10.5	1.125	9.000	434/108	.280"-2.200"	.260"-1.800"	.927 x 2.300	HRC4860-4040-5	A,B
840612608	4.060	362	3.480/3.500	6.125	8.0cc	13.6	12.4	10.6	1.125	9.000	438/108	.280"-2.200"	.260"-1.800"	.927 x 2.300	HRC4860-4060-5	A,B
840312608	4.030	383	3.750	6.000	8.0cc	14.3	13.1	11.2	1.125	9.000	432/108	.280"-2.200"	.260"-1.800"	.927 x 2.300	HRC4860-4030-5	B
840412608	4.040	385	3.750	6.000	8.0cc	14.3	13.1	11.2	1.125	9.000	434/108	.280"-2.200"	.260"-1.800"	.927 x 2.300	HRC4860-4040-5	B
840612608	4.060	388	3.750	6.000	8.0cc	14.5	13.2	11.3	1.125	9.000	438/108	.280"-2.200"	.260"-1.800"	.927 x 2.300	HRC4860-4060-5	B

Notes

Compression based at zero deck and .040" compressed head gasket.

A Fits 3.480" & 3.500" Strokes. Zero deck with 3.480" stroke is 8.990". Cubic inch & compression based on 3.500" stroke.

B Oil rail support included.

Some items are not legal for sale or use on any pollution controlled motor vehicle

Chevrolet SB 23° Dome (4.125" -4.165" Bore)
 Designed for: 1/16, 1/16, 3/16 Rings 58cc 64cc 76cc

	Bore Size	Cubic Inch	Stroke	Rod Length	Dome Volume	Compression Ratio			Comp. Distance	Deck Height	Avg. Weight Piston/Pin	Valve Relief Intake	Depth-Dia. Exhaust	Pin Size	Suggested Ring Set	Notes
841512608	4.155	380	3.480/3.500	6.125	8.0cc	14.1	12.9	11.0	1.125	9.000	472/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4155-5	A,B
841612608	4.165	382	3.480/3.500	6.125	8.0cc	14.1	12.9	11.0	1.125	9.000	476/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4165-5	A,B
841512608	4.155	380	3.750	6.000	8.0cc	15.0	13.7	11.7	1.125	9.000	472/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4155-5	B
841612608	4.165	382	3.750	6.000	8.0cc	15.1	13.8	11.8	1.125	9.000	476/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4165-5	B
841206603	4.125	414	3.875	6.000	3.0cc	14.2	13.1	11.3	1.062	9.000	436/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4125-5	B
841506603	4.155	420	3.875	6.000	3.0cc	14.3	13.2	11.4	1.062	9.000	448/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4155-5	B
841606603	4.165	422	3.875	6.000	3.0cc	14.4	13.3	11.5	1.062	9.000	441/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4165-5	B
841200603	4.125	374	3.480/3.500	6.250	3.0cc	12.9	11.9	10.3	1.000	9.000	428/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4125-5	A,B
841200608	4.125	374	3.480/3.500	6.250	8.0cc	13.9	12.7	10.9	1.000	9.000	437/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4125-5	A,B
841500603	4.155	380	3.480/3.500	6.250	3.0cc	13.1	12.0	10.4	1.000	9.000	448/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4155-5	A,B
841500608	4.155	380	3.480/3.500	6.250	8.0cc	14.1	12.9	11.0	1.000	9.000	448/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4155-5	A,B
841600608	4.165	382	3.480/3.500	6.250	8.0cc	14.1	12.9	11.1	1.000	9.000	452/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4165-5	A,B
841200603	4.125	401	3.750	6.125	3.0cc	13.8	12.7	11.0	1.000	9.000	428/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4125-5	B
841200608	4.125	401	3.750	6.125	8.0cc	14.8	13.6	11.6	1.000	9.000	437/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4125-5	B
841500603	4.155	407	3.750	6.125	3.0cc	13.9	12.8	11.1	1.000	9.000	448/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4155-5	B
841500608	4.155	407	3.750	6.125	8.0cc	15.0	13.7	11.7	1.000	9.000	448/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4155-5	B
841600608	4.165	409	3.750	6.125	8.0cc	15.1	13.8	11.8	1.000	9.000	452/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4165-5	B
841200603	4.125	428	4.000	6.000	3.0cc	14.6	13.4	11.6	1.000	9.000	428/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4125-5	B
841200608	4.125	428	4.000	6.000	8.0cc	15.8	14.4	12.3	1.000	9.000	437/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4125-5	B
841500603	4.155	434	4.000	6.000	3.0cc	14.8	13.6	11.8	1.000	9.000	448/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4155-5	B
841500608	4.155	434	4.000	6.000	8.0cc	15.9	14.6	12.5	1.000	9.000	448/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4155-5	B
841600608	4.165	436	4.000	6.000	8.0cc	16.0	14.6	12.5	1.000	9.000	452/108	.320"-2.200"	.280"-1.800"	.927 x 2.300	HRC4860-4165-5	B

Chevrolet BB Open Chamber Small Dome - Standard Deck Block

Designed for: 1/16, 1/16, 3/16 Rings 110cc 119cc 124cc

853164618	4.310	468	4.000	6.135	18.0cc	10.4	9.6	9.2	1.645	9.780	629/141	.326"-2.420"	NA	.990 x 2.750	HRC4860-4310-5	
853127612	4.310	496	4.250	6.385	12.0cc	10.4	9.7	9.3	1.270	9.780	567/141	.285"-2.300"	NA	.990 x 2.750	HRC4860-4310-5	
855027610	4.500	540	4.250	6.385	10.0cc	11.0	10.2	9.9	1.270	9.780	593/141	.294"-2.300"	NA	.990 x 2.750	HRC4860-4500-5	
856027610	4.600	565	4.250	6.385	10.0cc	11.4	10.6	10.2	1.270	9.780	639/141	.294"-2.300"	NA	.990 x 2.750	HRC4860-4600-5	

Chevrolet BB Open Chamber Dome - Standard Deck Block

Designed for: 1/16, 1/16, 3/16 Rings 110cc 119cc 124cc

853127643	4.310	496	4.250	6.385	43.0cc	14.2	12.8	12.1	1.270	9.780	625/141	.275"-2.300"	NA	.990 x 2.750	HRC4860-4310-5	
853527643	4.350	505	4.250	6.385	43.0cc	14.4	13.0	12.3	1.270	9.780	643/141	.275"-2.300"	NA	.990 x 2.750	HRC4860-4350-5	
855027638	4.500	540	4.250	6.385	38.0cc	14.3	13.0	12.4	1.270	9.780	589/141	.326"-2.420"	NA	.990 x 2.750	HRC4860-4500-5	
856027638	4.600	565	4.250	6.385	38.0cc	14.8	13.5	12.9	1.270	9.780	631/141	.326"-2.420"	NA	.990 x 2.750	HRC4860-4600-5	
856024638	4.600	532	4.000	6.535	38.0cc	14.0	12.8	12.2	1.245	9.780	629/141	.320"-2.420"	NA	.990 x 2.750	HRC4860-4600-5	
856012627	4.600	565	4.250	6.535	27.0cc	13.2	12.2	11.7	1.120	9.780	673/141	.320"-2.420"	NA	.990 x 2.750	HRC4860-4600-5	

Chevrolet BB Open Chamber Dome - Tall Deck Block

Designed for: 1/16, 1/16, 3/16 Rings 110cc 119cc 124cc

HRC4592	4.350	535	4.500	6.385	43.0cc	15.2	13.7	13.0	1.395	10.180	578/154	.308"-2.300"	NA	.990 x 2.930	HRC4860-4350-5	
856024638	4.600	598	4.500	6.700	38.0cc	15.7	14.2	13.6	1.245	10.195	629/141	.320"-2.420"	NA	.990 x 2.750	HRC4860-4600-5	
856012627	4.600	632	4.750	6.700	27.0cc	14.7	13.5	12.9	1.120	10.195	673/141	.320"-2.420"	NA	.990 x 2.750	HRC4860-4600-5	

Notes

Compression based at zero deck and .040" compressed head gasket.

Ford SB (302) Flat Top
 Designed for: 1/16, 1/16, 3/16 Rings

58cc 60cc 64cc

860310305	4.030	347	3.400	5.400	-5.0cc	10.9	10.6	10.1	1.100	8.200	401/108	.260"-2.200"	.260"-1.800"	.927 x 2.300	HRC4860-4030-5
860410305	4.040	348	3.400	5.400	-5.0cc	10.9	10.6	10.2	1.100	8.200	405/108	.260"-2.200"	.260"-1.800"	.927 x 2.300	HRC4860-4040-5

Ford SB (351W) Inverted Dome (Dish)

Designed for: 1/16, 1/16, 3/16 Rings

58cc 60cc 64cc

860323128	4.030	408	4.000	6.250	-28.0cc	9.8	9.6	9.3	1.230	9.480	438/108	.260"-2.200"	.260"-1.800"	.927 x 2.300	HRC4860-4030-5
860423128	4.040	410	4.000	6.250	-28.0cc	9.8	9.7	9.3	1.230	9.480	438/108	.260"-2.200"	.260"-1.800"	.927 x 2.300	HRC4860-4040-5
860323128	4.030	418	4.100	6.200	-28.0cc	10.0	9.8	9.5	1.230	9.480	442/108	.260"-2.200"	.260"-1.800"	.927 x 2.300	HRC4860-4030-5
860423128	4.040	420	4.100	6.200	-28.0cc	10.0	9.9	9.5	1.230	9.480	442/108	.260"-2.200"	.260"-1.800"	.927 x 2.300	HRC4860-4040-5
861223128	4.125	428	4.000	6.250	-28.0cc	10.2	10.0	9.6	1.230	9.480	468/118	.260"-2.200"	.260"-1.800"	.927 x 2.500	HRC4860-4125-5
861223128	4.125	438	4.100	6.200	-28.0cc	10.4	10.2	9.8	1.230	9.480	468/118	.260"-2.200"	.260"-1.800"	.927 x 2.500	HRC4860-4125-5

Ford SB (351W) Dome

Designed for: 1/16, 1/16, 3/16 Rings

58cc 60cc 64cc

860323601	4.030	408	4.000	6.250	1.0cc	13.7	13.3	12.6	1.230	9.480	422/108	.260"-2.200"	.260"-1.800"	.927 x 2.300	HRC4860-4030-5
860423601	4.040	410	4.000	6.250	1.0cc	13.7	13.4	12.7	1.230	9.480	427/108	.260"-2.200"	.260"-1.800"	.927 x 2.300	HRC4860-4040-5
860323601	4.030	418	4.100	6.200	1.0cc	14.0	13.6	12.9	1.230	9.480	422/108	.260"-2.200"	.260"-1.800"	.927 x 2.300	HRC4860-4030-5
860423601	4.040	420	4.100	6.200	1.0cc	14.0	13.7	13.0	1.230	9.480	427/108	.260"-2.200"	.260"-1.800"	.927 x 2.300	HRC4860-4040-5
861223601	4.125	428	4.000	6.250	1.0cc	14.2	13.8	13.1	1.230	9.480	463/118	.260"-2.200"	.260"-1.800"	.927 x 2.500	HRC4860-4125-5
861223601	4.125	438	4.100	6.200	1.0cc	14.5	14.1	13.4	1.230	9.480	463/118	.260"-2.200"	.260"-1.800"	.927 x 2.500	HRC4860-4125-5

TOOL STEEL WRIST PINS



The most over looked upgrade to a competition engine. Precision machined from solid H-11 bar stock, heat treated and triple tempered, and centerless ground to 0.0001" total tolerance. Inner diameters are honed on Sunnen equipment to precise size and finish requirements, while the outside diameter features a slight O.D. edge break to maintain maximum bearing area. These pins will give you the best strength to weight ratio available. Sets of 8.



TOOL STEEL WRIST PINS

Features

- Machined From Solid H11 Bar Stock
- Heat Treated & Triple Tempered
- Centerless Ground to 0.0001" Total Tolerance
- Best Strength To Weight Ratio
- Inner Diameters Honed to Precise Size

Ford SB .912" x 2.500"

HRC91250..... .912"x 2.500", .090" Wall, 75g
 HRC91252..... .912"x 2.500", .120" Wall, 96g

Chev SB .927" x 2.500"

HRC92250..... .927"x 2.500", .090" Wall, 76g
 HRC92252..... .927"x 2.500", .120" Wall, 98g
 HRC92258 Taper Wall927"x 2.500", .115-.145" Wall, 118g

Chev SB .927" x 2.750"

HRC92272..... .927"x 2.750", .120" Wall, 106g

Chev SB .927" x 2.950"

HRC92298 Taper Wall927"x 2.950", .125-180" Wall, 143g

Chev BB .990" x 2.930"

HRC99292..... .990"x 2.930", .120" Wall, 123g
 HRC99293..... .990"x 2.930", .130" Wall, 130g



SPIRAL LOCKS

High quality replacements for most popular performance pistons. Sold in sets of 32. **Note:** Spiral Locks are not designed to be reusable. You should always use a new set each time you remove and reassemble the piston and rods. 4 required per piston.

HRC4500 for .896"-.945" Pins HRC4501 for .946"-1.005" Pins

Some items are not legal for sale or use on any pollution controlled motor vehicle

TRUE SEAL™ PLASMA MOLY RING SETS

Race winning technology at an affordable price. Superior combustion control in today's extreme engines. Starting with a plasma moly ring that is barrel lapped for quick seating and long life. Second rings are cast iron reverse torsional twist. The oil ring features a stainless steel expander with chrome plated carbon steel rails. Manufactured in the most popular bore sizes. A true seal for more horsepower and longer life. All applications are file fit.



1/16", 1/16", 3/16" Standard Tension

HRC4860-4000-5	.....4.000" Bore +.005" (File Fit)
HRC4860-4020-5	.....4.020" Bore +.005" (File Fit)
HRC4860-4030-5	.....4.030" Bore +.005" (File Fit)
HRC4860-4040-5	.....4.040" Bore +.005" (File Fit)
HRC4860-4060-5	.....4.060" Bore +.005" (File Fit)
HRC4860-4125-5	.....4.125" Bore +.005" (File Fit)
HRC4860-4145-5	.....4.145" Bore +.005" (File Fit)
HRC4860-4155-5	.....4.155" Bore +.005" (File Fit)
HRC4860-4165-5	.....4.165" Bore +.005" (File Fit)
HRC4860-4250-5	.....4.250" Bore +.005" (File Fit)
HRC4860-4280-5	.....4.280" Bore +.005" (File Fit)
HRC4860-4310-5	.....4.310" Bore +.005" (File Fit)
HRC4860-4350-5	.....4.350" Bore +.005" (File Fit)
HRC4860-4500-5	.....4.500" Bore +.005" (File Fit)
HRC4860-4530-5	.....4.530" Bore +.005" (File Fit)
HRC4860-4560-5	.....4.560" Bore +.005" (File Fit)
HRC4860-4600-5	.....4.600" Bore +.005" (File Fit)

1/16", 1/16", 3/16" Low Tension

HRC4862-4030-5	.....4.030" Bore +.005" (File Fit)
HRC4862-4040-5	.....4.040" Bore +.005" (File Fit)
HRC4862-4125-5	.....4.125" Bore +.005" (File Fit)
HRC4862-4155-5	.....4.155" Bore +.005" (File Fit)
HRC4862-4165-5	.....4.165" Bore +.005" (File Fit)
HRC4862-4500-5	.....4.500" Bore +.005" (File Fit)
HRC4862-4600-5	.....4.600" Bore +.005" (File Fit)

1/16", 1/16", 1/8" Standard Tension

HRC4870-4030-5	.....4.030" Bore +.005" (File Fit)
HRC4870-4040-5	.....4.040" Bore +.005" (File Fit)
HRC4870-4155-5	.....4.155" Bore +.005" (File Fit)

1.5mm, 1.5mm, 3mm Standard Tension

HRC4850-3905-5	.....3.905" Bore +.005" (File Fit)
HRC4850-4000-5	.....4.000" Bore +.005" (File Fit)
HRC4850-4030-5	.....4.030" Bore +.005" (File Fit)
HRC4850-4040-5	.....4.040" Bore +.005" (File Fit)
HRC4850-4070-5	.....4.070" Bore +.005" (File Fit)
HRC4850-4125-5	.....4.125" Bore +.005" (File Fit)
HRC4850-4155-5	.....4.155" Bore +.005" (File Fit)
HRC4850-4165-5	.....4.165" Bore +.005" (File Fit)

TRUE SEAL™ PLASMA MOLY RINGS

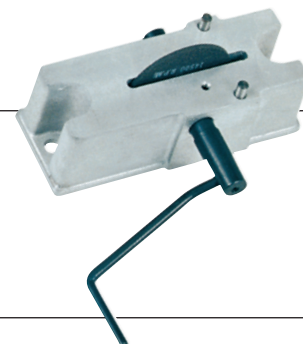
Features

- Plasma Moly Top Ring
- Cast Iron Reverse Torsional Twist Seconds
- Barrel Lapped
- Quick Seating
- Long Life

PISTON RING FILER

To get the most performance and horsepower, you need to set proper ring end gap. Files piston rings quickly and accurately. Simple hand crank design. A must for every engine builder.

92165 Manual Ring Filer





"The Best For Less!"
Made In The USA!

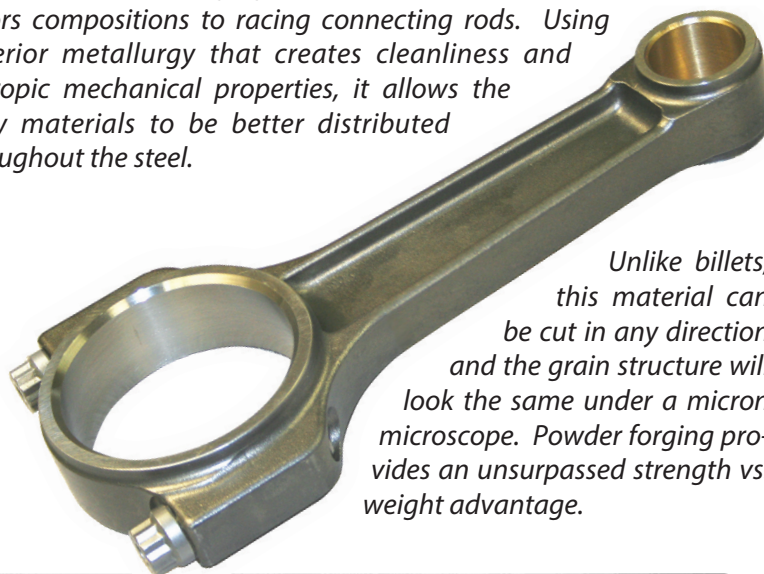


- Dense Forging as Strong as Billets!
- Our #1 Selling Rod!
- 585 Grams (approx.)
- All Rods \pm 2 Grams
- ASTM 4260 Super Steel (Rivals 300M)
- Proprietary Fracture Cap Technology
 - ARP 2000 3/8" Capscrew Fasteners (for applications to 650HP)
- All Rods 100% Magnafluxed

PRECISION DENSE FORGED CONNECTING RODS

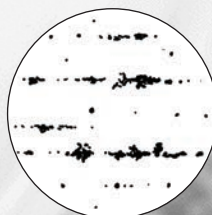
"THE NEXT GENERATION OF RACING RODS"

Howards and the king of powder forged technology, GKN, have teamed up to design and manufacture the most technically advanced and reliable performance rods on the planet! Forged powder metal technology features an extremely dense grain structure when compared to a billet or conventional forging. It uses task oriented steel materials that tailors compositions to racing connecting rods. Using superior metallurgy that creates cleanliness and isotropic mechanical properties, it allows the alloy materials to be better distributed throughout the steel.

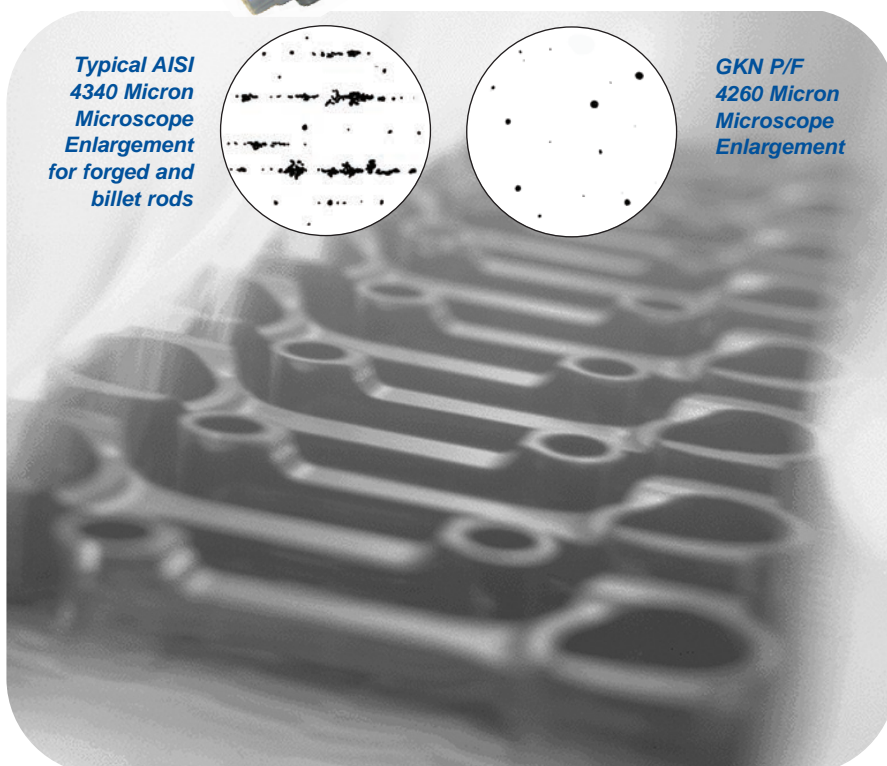
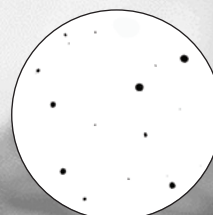


Unlike billets, this material can be cut in any direction and the grain structure will look the same under a micron microscope. Powder forging provides an unsurpassed strength vs. weight advantage.

*Typical AISI
4340 Micron
Microscope
Enlargement
for forged and
billet rods*



*GKN P/F
4260 Micron
Microscope
Enlargement*



THE MANUFACTURING PROCESS



First, superior high-tech base powder is blended with selected alloy elements in a lab style environment. Melting, atomizing and annealing are controlled to exacting standards to then create super fine powders without impurities!



Next, the base powder, lubricants, additives and graphite elements are compacted under tremendous pressure. Sintering or heating to over 1500° alters and refines the structure of the metal. Hot forging with a 750-ton press finalizes the structure of the metal.



We use superior ASTM 4260 blend (see chart). We used CAD solids modeling for proof of concept and machined models from billet. We use Finite Element Analysis, a computer program that accurately simulates stress and reaction to stress, which allows redesigns for better strength and weight reduction in the correct places. This greatly reduces the design cycle time and accurately predicts strength and fatigue resistance before the rod is manufactured and sold to you.

PPF6000.....Chev. SB 6.0 Large Journal (585g approx.)

Connecting Rod Material Performance Comparison				
	AISI 1141 (GM Pink Rod)	GKN P/F 11C60 (GM Gen III)	AISI 4340	GKN ASTM 4260
Ultimate Tensile Strength	660	900	1470	1620
Yield Strength	370	620	1365	1450
Elongation	15%	10%	10%	7%
Hardness (HRC)	20	28	42	42
Fatigue Endurance Limit	240	340	>600	>600

We use superior ASTM 4260 blend (see chart). We used CAD solids modeling for proof of concept and machined models from billet.



Before the rod reaches the market place, it's tested for stress reaction, endurance, tensile strength and grain structure. The final product is lighter, stronger and more reliable than anything on the market!

Fractured Cap Technology

Fracture split surface eliminates fretting and offers superior alignment

Saw cut surface



One of the secondary operations incorporates fractured cap technology. This procedure eliminates fretting which is undesirable cap movement and makes alignment sleeves unnecessary. A fractured cap also provides superior alignment of the cap to the body each and every time. This provides a much better crank bore roundness versus machine caps after assembly. We then use Ampco bushings and 3/8" ARP 2000 capscrews. The results are rods that are easily resizable by simply honing out the crank bore and using oversize o.d. bearings.



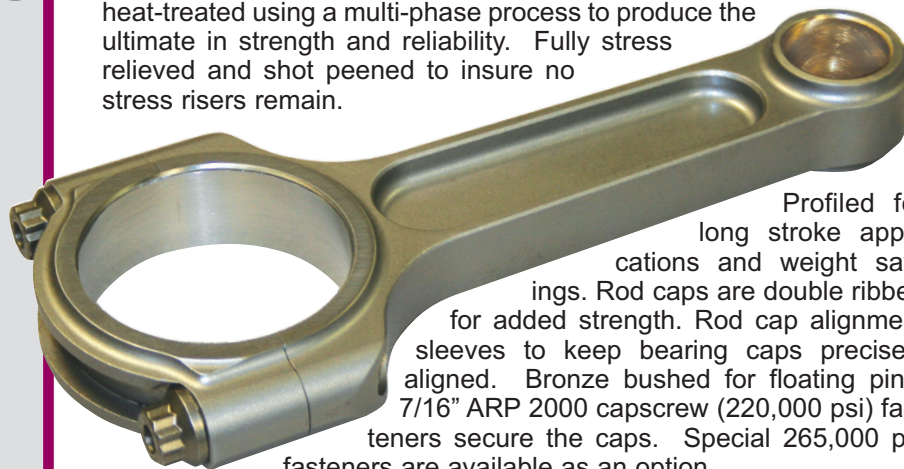
ULTIMATE DUTY™ FORGED BILLET ROD

Features

- Certified High Nickel 4340 Aircraft Quality Steel
- 1000+ Horsepower Rating
- Multi-Phase Heat-Treating and Shot Peening Processes
- Ampco Bronze Bushings
- Precision Bearing Cap Alignment
- 7/16" ARP 2000 Capscrews

ULTIMATE DUTY™ FORGED BILLET RODS

A true American forged billet rod at prices as low as imported billets! These rods start with certified high nickel 4340 aircraft quality steel and are fully CNC machined on the newest generation of equipment to insure the removal of all surface imperfections. They are specially heat-treated using a multi-phase process to produce the ultimate in strength and reliability. Fully stress relieved and shot peened to insure no stress risers remain.



Profiled for long stroke applications and weight savings. Rod caps are double ribbed for added strength. Rod cap alignment sleeves to keep bearing caps precisely aligned. Bronze bushed for floating pins. 7/16" ARP 2000 capscrew (220,000 psi) fasteners secure the caps. Special 265,000 psi fasteners are available as an option.

<i>Chev SB</i>	
BR5850	Chev SB (LJ), 5.850" (664g approx.)
BR6125	Chev SB (LJ), 6.125" (674g approx.)
BR6250	Chev SB (LJ), 6.250" (680g approx.)
BR6300	Chev SB (LJ), 6.300" (670g approx.)
BR6400	Chev SB (LJ), 6.400" (678g approx.)
BR6500	Chev SB (LJ), 6.500" (687g approx.)
<i>Chev/GM Gen III LS-1</i>	
BL6125-LS1	GM Gen III LS-1, 6.125" (625g approx.)
<i>Chev BB</i>	
BR6135	Chev BB, 6.135" (747g approx.)
BR6385	Chev BB, 6.385" (749g approx.)
BR6535	Chev BB, 6.535" (762g approx.)
<i>Chrysler SB</i>	
BR6123	Chrysler SB, 6.123" (672g approx.)
BR6251-HEMI	Chrysler 5.7L Hemi, 6.250" (661g approx.)
BR6251-HEMI-927	5.7L Hemi w/.927" Pin, 6.250" (662g approx.)
<i>Chrysler BB</i>	
BR6760-990	Chrysler BB w/.990" Pin, 6.760" (767g approx.)
<i>Pontiac V8</i>	
BR6625	Pontiac V8, 6.625" (760g approx.)

ULTIMATE DUTY™ FORGED BILLET RODS for Import Applications

<i>Dodge Neon</i>	
BX5945SRT**	Neon SRT 420A 4cyl, 5.945" (668g approx.)
**Ultimate X X-Beam Design, Features ARP 2000 7/16" Capscrews	
<i>Ford BA Turbo Typhoon (Aussie)</i>	
BR6060BA	Ford BA Turbo, 6.060" (640g approx.)
<i>Mitsubishi</i>	
PR5657204E*	Mitsubishi Evo X 4cyl, 5.657"
PR59001771*	Mitsubishi 4G63 4cyl, 5.900"
PR5900177E*	Mitsubishi 4G63 EVO 4cyl, 5.900"
PR6136177E*	Mitsubishi 4G63 4cyl (late), 6.136"
*7 Bolt EVO Crank applications	

<i>Nissan</i>	
BR6001RB30	Nissan RB30 6cyl, 6.000" (610g approx.)

Some items are not legal for sale or use on any pollution controlled motor vehicle



PRO-I

Manufactured By



BILLET STEEL CONNECTING RODS

- Machined to Howards specs using CP-Carrillo's proprietary material.
- Dimensional Integrity is Comparable to None
- Perfect Balance of Weight VS Strength

Manufactured from oversized billet forgings using Carrillo's proprietary chrome, nickel, moly, vanadium alloy, which meets all VAR (vacuum arc re-melt ASTM standards). The oversized forging resulting in the proper grain flow as well as the surface removal of any potential inclusions or surface conversions generated by the forging process. The heat is validated, both by the supplier and an independent metallurgist whom confirm the desired physical and chemical properties of steel. All heat treat processes are via a mar-aged operation, resulting in UTS of 195,000 with a yield of 182,000 while maintaining the critical elements of low notch-sensitivity and ductility. All critical CNC machines at Carrillo are equipped with probing to accurately validate dimensional integrity. Carrillo's dimensional integrity is comparable to none. In the production process each part is magnafluxed at least twice, further each piece is Rockwell tested to validate the heat treat procedure. A final shotpeen operation completes the part. The rods are finished off with Amco 45 bronze bushings and 7/16" ARP 2000 capscrews (220,000psi).

Chev SB

PR60002100.....Chev SB (LJ), 6.000" (629g approx.)

Chev/GM Gen III LS-1

PR612521LSGM Gen III LS-1, 6.125" (649g approx.)

Chev BB

PR63852200Chev BB, 6.385" (743g approx.)

PR65352200Chev BB, 6.535" (749g approx.)

PR67002200Chev BB, 6.700" (758g approx.)

Every Pro-I Rod Set leaves our facility with a specification card. This spec card displays a part number, critical dimensions, weights, bolt size and job number.

Ultimate X X-Beam Billet Rods



GM DURAMAX 6.6L EXTREME DUTY X-BEAM FORGED BILLET RODS

- New X-Beam Extreme Duty Design
- American 4340 Certified Aircraft Quality Steel • American Multi-Phase Heat-Treating

X-beam design for the ultimate in strength and durability. These rods start with certified 4340 aircraft quality steel and are fully CNC machined on the newest generation of equipment to insure the removal of all surface imperfections. A precision "EDM" laser burns a hole from the top of the rod bearing journal to wrist pin bushing for an extra supply of oil to the piston pin. Fully stress relieved and shot peened to insure no stress risers remain. The beam is profiled for weight savings. The cap has been lightened for easier balancing. They are specially heat-treated using a multi-phase process to insure the ultimate in strength and reliability. Rod caps are double ribbed for added strength. Rod cap alignment dowels to keep bearing caps precisely aligned. Bronze bushed for floating pins. 7/16" ARP 2000 capscrew (220,000 psi) fasteners secure the caps. The Ultimate Duramax Rod!

BX6420.....GM Duramax 6.6L

99805Drilled Rod Bearing Set (required for wrist pin oiling)

Note: Standard rod bearings may be used but will not feed the wrist pin with oil unless drilled.



TRACK SMART™ 3 4340 CRANKSHAFTS

All new computer designed premium 4340 steel forgings. Properly placed counterweights that not only improve balance but reduce bearing loads. The forgings are rough machined in a process that includes double stress relief operations that make these crankshafts dimensionally stable. Hardened with a deep nitride for superior wear resistance, ideal for abusive track environments. All rod journals are drilled and counterweights are profiled for piston clearance. Large .125" radii on all journals (chamfered bearings required). Consistent grind and polish, along with precise stroke and index. The new standard in performance crankshafts.

Chev SB, 2-pc Seal, 2.000" (S.J) Rod Pin

[H353485702T](#)350 Main, 3.480" Stroke, 5.700" Rod

Chev SB, 2-pc Seal, 2.100" (LJ) Rod Pin

[H353485712T](#)350 Main, 3.480" Stroke, 5.700" Rod

[H353756012T](#)350 Main, 3.750" Stroke, 6.000" Rod

[H353876012T](#)350 Main, 3.875" Stroke, 6.000" Rod

[H354006012T](#)350 Main, 4.000" Stroke, 6.000" Rod

[H403756012T](#)400 Main, 3.750" Stroke, 6.000" Rod

[H403876012T](#)400 Main, 3.875" Stroke, 6.000" Rod

[H404006012T](#)400 Main, 4.000" Stroke, 6.000" Rod

Chev BB, 2-pc Seal, 2.200 Rod Pin

[H454256322T](#)454 Main, 4.250" Stroke, 6.385" Rod

[H454506522T](#)454 Main, 4.500" Stroke, 6.535" Rod

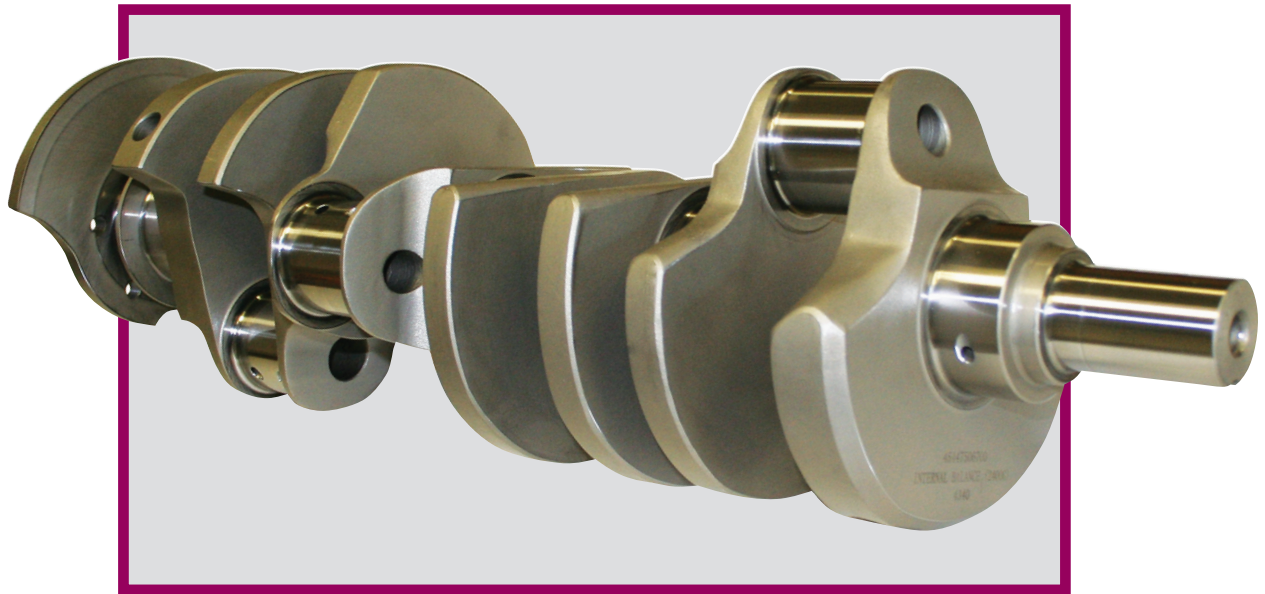
Chev BB, 1-pc Seal, 2.200 Rod Pin

[H454256321T](#)454 Main, 4.250" Stroke, 6.385" Rod



TRACK SMART™ 3 Features

- 4340 Steel
Non-Twist Forgings
- CNC Machined
- Improved Counterweight
Placement
- Deep Nitride Hardened
- All Rod Throws Have
Lightening Holes
- Completely Finished
in the USA!
- 750+ HP



Billet Reaper E4340 Billet Steel Crankshafts

Billet steel crankshafts are stronger because they have a uniform and non-stress grain structure. These cranks start with E4340 AQ bar stock material and are precision CNC machined. Computer designed counter weights for reduce bearing loads and improved balance. They feature large fillet radii (chamfered bearings required) and lightening holes in all rod journals. Fully stress relieved and shot peened. Nitrided for superior wear resistant. Rod and main bearing journal surfaces are micro polished.

- *Manufactured from E4340 Aircraft Quality Bar Stock Material*
- *Computer designed counter weights for reduce bearing loads and improved balance.*
 - *CNC Machined to Exacting Tolerances*
 - *Center Counterweights*
 - *Stress Relieved & Shot Peened*
- *Nitride Hardened for Superior Wear Resistance*
- *Large Fillet Radii on All Bearing Journals*
- *Lightening Holes in All Rod Journals*
 - *Double Keyways for Dampers*

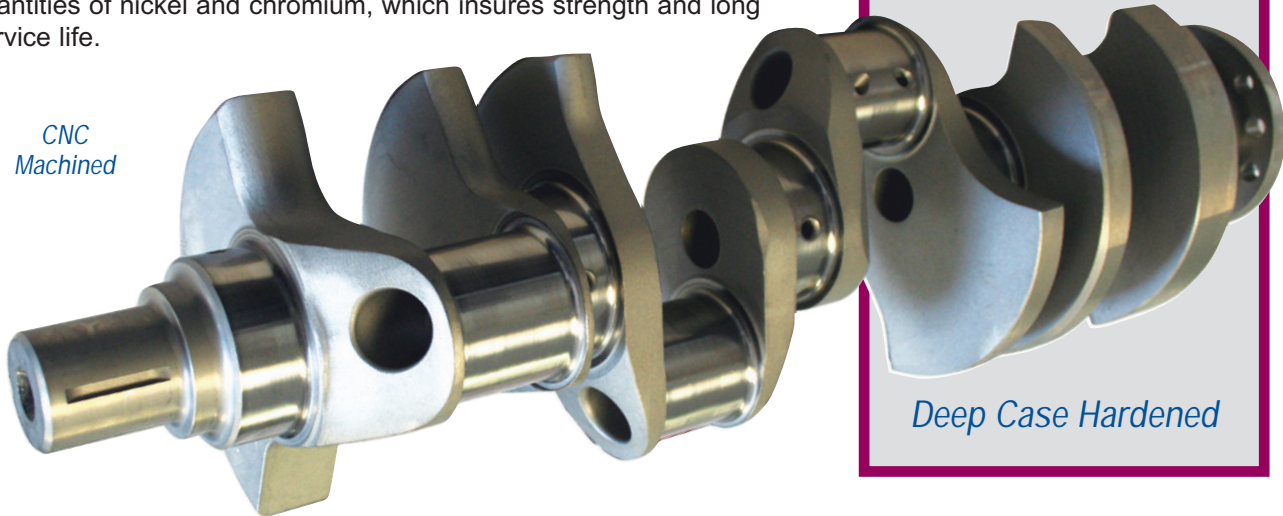
Chev BB

45440006385	454 Main, 4.000" Stroke, 6.385" Rod
45442506385	454 Main, 4.250" Stroke, 6.385" Rod
45443756135	454 Main, 4.375" Stroke, 6.385" Rod
45445006535	454 Main, 4.500" Stroke, 6.535" Rod
45447506700	454 Main, 4.750" Stroke, 6.700" Rod

PRO MAX™ 4340 CRANKSHAFTS

American Made! Starting with the finest high purity 4340 aircraft quality high nickel alloy. Many manufacturers state they use 4340, but very few use the same quality. There is a difference! These forgings have high quantities of nickel and chromium, which insures strength and long service life.

CNC
Machined



"The Best For Less!"
Buy American!



Deep Case Hardened

These forgings are shipped to the leader in high performance crankshaft machining, Callies Performance Products. They are machined to the highest specifications, with roundness within 60 millionths and taper being held to within .0003" on all rod and main dimensions. All journals have .125" Tru-Form radii. 1" Angalite lightening holes in all rod throws. Callies "Deep Case" hardening produces a wear layer that remains intact even if reground .010" under (other cranks have a hardness depth as little as .003"). Journals are micro-finished to 5 microns or better. The *best* forgings, the *best* machining, and *best* hardening. Which crank will you run? Requires chamfered bearings.

Chev SB 350 Main

353457.....350 Main, 3.480" Stroke, 5.700" Rod, 53lbs. avg.

353660.....350 Main, 3.625" Stroke, 6.000" Rod, 55lbs. avg.

353757.....350 Main, 3.750" Stroke, 5.700" Rod, 53lbs. avg.

Chev SB 350 Main Gun Drilled

353860.....350 Main, 3.875" Stroke, 6.000" Rod, 55lbs. avg.

354060.....350 Main, 4.000" Stroke, 6.000" Rod, 55lbs. avg.

Chev SB 350 Main w/BB Snout (Double Keyways)

353760-4.....350 Main, 3.750" Stroke, 6.000" Rod, 56lbs. avg.

Chev SB 400 Main

403457.....400 Main, 3.480" Stroke, 5.700" Rod, 55lbs. avg.

Chev SB 400 Main Gun Drilled

404262.....400 Main, 4.250" Stroke, 6.200" Rod, 56lbs. avg.

Chev SB 400 Main w/BB Snout (Double Keyways)

404060-4.....400 Main, 4.000" Stroke, 6.000" Rod, 57lbs. avg.

Chev SB 400 Main Gun Drilled w/BB Snout (Double Keyways)

403860-6.....400 Main, 3.875" Stroke, 6.000" Rod, 52lbs. avg.

404060-6.....400 Main, 4.000" Stroke, 6.000" Rod, 53lbs. avg.

Chev BB (Added Feature: Double Keyways)

454263.....454 Main, 4.250" Stroke, 6.385" Rod, 75lbs. avg.

454565.....454 Main, 4.500" Stroke, 6.535" Rod, 76lbs. avg.

454767.....454 Main, 4.750" Stroke, 6.700" Rod, 76lbs. avg.

Ford SB (Cleveland/SVO Mains) Gun Drilled

314062.....351C Main, 4.000" Stroke, 6.200" Rod, 51lbs. avg.

314262.....351C Main, 4.250" Stroke, 6.200" Rod, 50lbs. avg.

Profiling and Lightening is available for Pro Max™ Cranks!



**MAXIMUM EFFORT™
BALANCED RACE
ASSEMBLIES**
Features

- Precision Race Balanced
- Track Smart 4340 Forged Steel Crank
- American ASTM 4260 Precision Dense Forged Rods
- American 2618-T61 Maximum Effort Forged Pistons
- Plasma Moly File Fit Rings
- Pro Series Rod & Main Bearings



**HRC MAXIMUM EFFORT™
BALANCED RACE ASSEMBLIES**

These “American” kits feature Howards HRC state-of-the-art Precision Dense Forged Racing Rods w/ARP 2000 capscrew fasteners, HRC Track Smart 4340 forged crank, HRC forged 2618 pistons and a set of HRC True Seal™ plasma moly rings. Howards finishes these kits with a set of race rod and main bearings. Internally race balanced.

- HRC Track Smart 4340 forged steel crankshaft
- HRC forged 2618 pistons
- HRC Precision Dense Forged connecting rods
- Pro-Series rod & main bearings
- HRC True Seal™ Plasma Moly file fit rings.
- Precision Race Balanced.

Chev SB w/Flat Top Pistons (10.4-11.7:1 w/64cc)

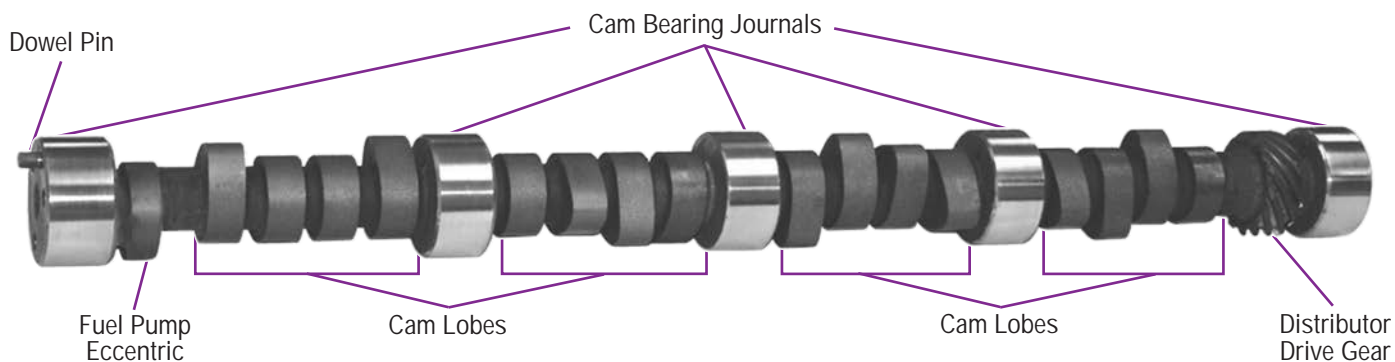
RATP355F	.....(355)	350 Main, 4.030 Bore, 3.480" Stroke
RATP356F	.....(356)	350 Main, 4.040 Bore, 3.480" Stroke
RATP383F	.....(383)	350 Main, 4.030 Bore, 3.750" Stroke
RATP385F	.....(385)	350 Main, 4.040 Bore, 3.750" Stroke
RATP388F	.....(388)	350 Main, 4.060 Bore, 3.750" Stroke
RATP395F	.....(395)	350 Main, 4.030 Bore, 3.875" Stroke
RATP397F	.....(397)	350 Main, 4.040 Bore, 3.875" Stroke
RATP406F	.....(406)	400 Main, 4.155 Bore, 3.750" Stroke
RATP408F	.....(408)	400 Main, 4.165 Bore, 3.750" Stroke

Chev SB w/Dome Pistons (12.6-13.2:1 w/64cc)

RATP355D	.....(355)	350 Main, 4.030 Bore, 3.480" Stroke
RATP356D	.....(356)	350 Main, 4.040 Bore, 3.480" Stroke
RATP360D	.....(360)	350 Main, 4.060 Bore, 3.480" Stroke
RATP383D	.....(383)	350 Main, 4.030 Bore, 3.750" Stroke
RATP385D	.....(385)	350 Main, 4.040 Bore, 3.750" Stroke
RATP388D	.....(388)	350 Main, 4.060 Bore, 3.750" Stroke
RATP406D	.....(406)	400 Main, 4.155 Bore, 3.750" Stroke

Options:

Clevite Bearings (H-Series)

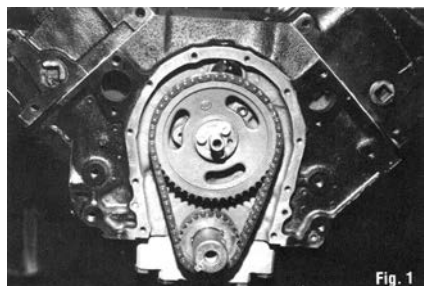


How to Install a Performance Camshaft

Installing a new cam is a relatively easy and straightforward operation that can be performed by anyone who is handy with tools, has a basic understanding of what's inside an engine, and who has the necessary tools and shop manual (Chilton, Motor's, etc.). The cam may be replaced with the engine in the car (by removing the radiator, grill, some braces, etc.), but the job is far easier if you obtain a hoist and remove the engine. Either way, take your time. You can probably do the job in a weekend without a hassle, but the more time and care you take, the better the result.

Following instructions in your shop manual, remove the carburetor/intake manifold, valve covers, radiator, water pump and other engine accessories that interfere (air conditioning, smog pump, etc.). You'll need a special puller to remove the crankshaft harmonic damper (available from most tool rental places). Then remove the timing chain cover. *HINT:* As you unbolt each piece, use a box or plastic bag to store the bolts and other hardware items, adding a note to identify where the pieces go to and anything tricky you'll want to remember during engine reassembly.

With the timing chain and camshaft sprocket and crankshaft sprockets exposed, locate the timing marks on the sprockets. Rotate the engine until these marks are aligned (Fig. 1), at which point the number one piston should be at top dead center (TDC). When installing the new cam, these marks must be aligned or serious engine damage may result.



With the timing marks aligned, remove the distributor cap and make a mark on the distributor body to indicate the position of the rotor; then make a mark on the distributor body and the engine to locate the position of the distributor in the engine. Then remove the distributor.

Remove the timing chain. Unless the engine has a very low mileage (under 10,000 miles) discard the chain as a stretched chain affects cam and ignition timing.

Remove the rocker arms, pushrods and valve lifters. Discard the lifters. New lifters must be installed with a new camshaft. For a complete job and best performance, the cylinder heads can be

removed and disassembled by removing the valve springs and valves (valves and valve seat surfaces may need refacing by a competent machine shop).

In order to obtain maximum potential performance from any camshaft, matching valve springs and special valve stem oil seals should be installed with your new cam.

Replacing The Cam

Remove the camshaft very slowly by pulling on the cam sprocket, being careful not to drag the cam lobes on the bearings inside the block. With the cam out inspect the bearing surfaces for any indication of wear. Corresponding cam bearings should then be replaced. Remove the sprocket from the cam and inspect it closely for worn or broken teeth and inspect the crank sprocket as well. Replace all worn parts as necessary.

Before beginning assembly, compare the part numbers of cam, springs, lifters and other newly purchased products with the listings in this catalog to be certain you have the proper parts. The cam and all components, except hydraulic lifters, should be washed in solvent and dried thoroughly. Coat the cam lobes and distributor drive gear with Camshaft and Engine Assembly Lube or similar moly-disulfide assembly lube. Also coat the bearing surfaces on the cam and in the block with top grade engine oil. Bolt the cam sprocket to the cam, including any thrust plate. Check the thrust plate for proper end clearance.

Gently insert the cam into the engine, taking care not to damage the bearings and rotating the cam slowly as you slide it in. With the cam in place, check that the thrust surface of the sprocket touches the block. If the engine has a thrust plate, bolt the plate to the block. Rotate the cam by hand, it should spin freely without any binding. If there is resistance, cam bearings may need to be replaced.

Lifter Installation

Lifter installation is pretty much the same on all styles of lifters. Flat tappet and roller applications have the same basic installation.

First the camshaft must be fully installed before this procedure is started. Wipe lifters clean with a lint-free shop rag. Cleaning with solvents is not required. Coat lifters in clean motor oil. *Note:* Hydraulic lifters should never be pumped up with oil before installation. This will cause the valve lifter plunger to "top out" rather than it's normal operating height, giving you incorrect valve adjustment.

Install lifters in lifter bores. Roller lifters with tie bars, must have the tie bars and rivet heads installed toward the center of the engine. On big block Chevrolet, the widest distance between the bends on the bar must be up. On Chrysler LA engines, the rivet heads must face the block. Performance upgrade (O.E. style roller) lifters use stock anti-rotation systems and do not require orientation.

With all lifters in place, apply pressure against the cam sprocket making sure the thrust faces are in contact. Rotate the cam to make sure there is no resistance with all lifters in place. If there are hard spots or other rotation interference, check for proper alignment of cam lobes and lifters (Fig. 2).

Identify the intake versus exhaust lifter bores on each side of the engine. This can easily be done by rotating the engine by hand and watching the lifters as they rise and fall. The exhaust lifter always rises before the intake lifter as the engine is rotated in its normal direction. If you are not sure, refer to your service manual.

After putting a light coating of assembly lube on both ball ends of the pushrods, install pushrods in lifters.

Install rocker arms and adjusting nuts/bolts, but do not tighten.

On one cylinder, rotate the engine in its normal direction of rotation until the exhaust lifter is just starting to rise. The intake lifter is now on the base circle.

On hydraulic cam applications, snug down adjuster on the intake rocker arm by hand just until a slight drag is felt on the pushrod as you try to rotate the pushrod by hand. This is zero lash.

Tighten the adjuster 1/2 to 3/4 of a turn more (.030") and secure. This is the lifter preload. For performance O.E. style hydraulic roller applications, tighten the hold-down bolt and torque to factory specifications. Use a feeler gauge to check for clearance between the clip in the lifter and the pushrod socket. If pre-load is incorrect, use shims or other means to achieve the correct preload of .030". For some GM applications, a bleed down procedure is required. Refer to service manual.

Note: All hydraulic lifter applications require the proper lifter preload. While many valve trains are non-adjustable from the factory, it is imperative the correct pre-load is verified for proper operation and service life.

For mechanical cam applications, snug down adjuster on the intake rocker arm by hand just until a slight drag is felt on the pushrod as you try to rotate the pushrod by hand. This is zero lash. Loosen the adjuster until the proper feeler gauge (same size as lash) will fit between the valve and the rocker. Make sure there is a only a slight drag on the feeler gauge, then secure.

Repeat the process on the exhaust lifter. Rotate the engine in its normal direction of rotation until the intake lifter just falls to its base circle. The exhaust lifter is now on the base circle. Then repeat the process listed above.

Repeat this process with the remaining cylinders. Be sure all the pushrods are properly seated in all the rocker arms and the lifters.

Your lifters are now properly adjusted. Please note that as you are rotating the engine, previously adjusted lifters may collapse and recover as the lifter is under valve spring load. While the lifters come from the factory with leakdown fluid in them which was used to verify the bleed rate, some of this fluid may have leaked out during shipment. As soon as the engine is started, the lifters will pump up and the pre-load will self-adjust to the correct height.

Carefully remove the cam sprocket and reinstall with the timing chain. Be sure to use Loc-tite or equivalent on each sprocket bolt. Be sure timing marks on cam and crank sprockets are aligned. Proper torque on sprocket bolts is critical; use a torque wrench and obtain tightening specs from your shop manual. After installation, again check for proper cam lobe/lifter alignment. On three-bolt cam sprockets, we suggest using a safety wire or camshaft lock plate (94550). If the sprocket should come loose, cam lobe and lifter damage will result.

Pushrod Length Procedure

You will need to obtain an adjustable length checking pushrod (92129-92133).

In order to verify the correct pushrod length, it is best to have the intake and exhaust valves of one cylinder fitted with light checking springs in place of the valves springs. This will allow the engine to be rotated by hand with the entire valve train of that cylinder installed without collapsing the hydraulic lifter mechanism.

Install a pair of lifters in the bores of the cylinder which has the light checking springs on the valves. The lifter tie bar (if roller) must be toward the center of the engine and logo on the tie bar must be right side up.

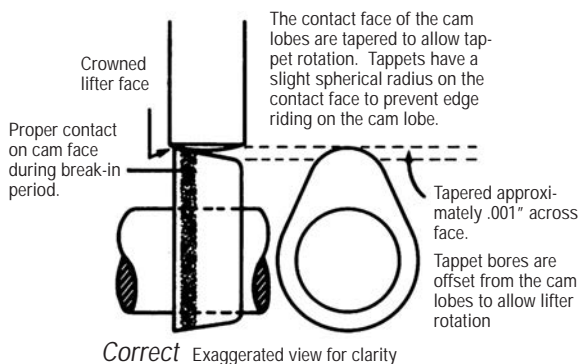
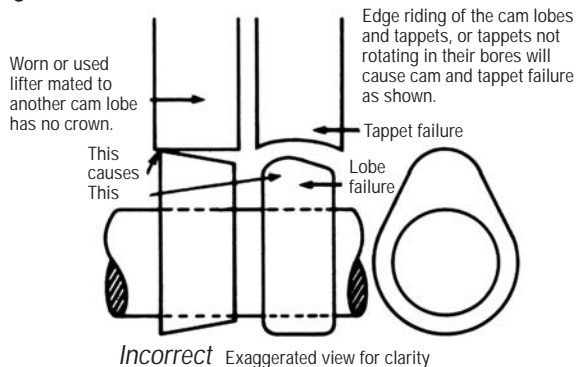


Fig. 2



How to Install a Performance Camshaft



Verify the intake lifter is on the base circle of the cam lobe. To do this, rotate the engine in its normal direction of rotation until the exhaust lifter is just starting to rise. The intake lifter is now on the base circle .

Adjust the adjustable pushrod's length to the proper length for your engine application as a starting point.

Place a light coating of Prussian Blue or equivalent machinist's indicator paste on the tip of the intake valve. Place the adjustable checking pushrod in the lifter seat with the screw adjuster of the pushrod up.

Install the rocker arm and tighten the rocker arm adjuster until the rocker arm tip just barely touches the valve tip and there is no lash on the pushrod side. Do not over tighten the rocker arm adjuster as this will collapse the lifter.

Rotate the engine by hand at least twice and verify there is no lash in the system.

Remove the rocker arm and observe the pattern of the machinist's indicator paste on the valve tip. The pattern should be centered on the valve tip.

If the pattern is too far away from the rocker arm stud, shorten the pushrod, re-adjust the rocker arm and try again. If the pattern is too far toward the rocker arm stud, lengthen the pushrod and try again. Repeat as necessary. Some engines may require the use of shims or other adjustment methods to achieve the correct valve tip pattern.

When you have the proper, centered pattern on the intake valve tip, measure the pushrod length, and repeat the process on the exhaust. To verify the exhaust valve is on the base circle of the cam lobe, rotate the engine in its normal direction of rotation until the intake lifter just falls to its base circle. The exhaust lifter is now on the base circle.

After the lengths have been verified, replace the checking springs with the valve springs intended, obtain the pushrods, and proceed to the installation procedure.

Degreeing a Camshaft

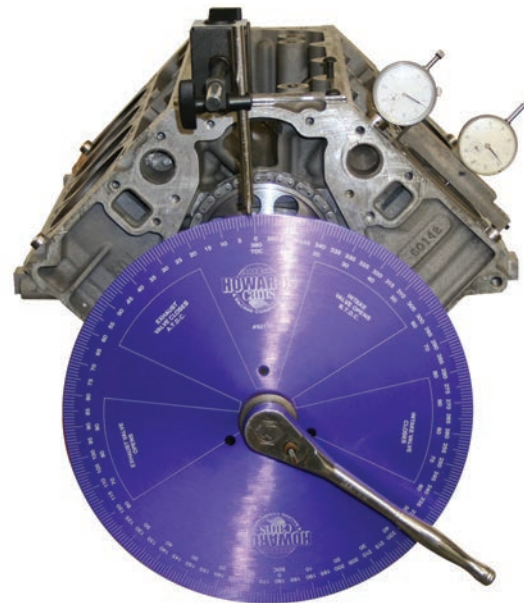
Variables in the engine, including timing chain stretch, crankshaft sprocket keyway location, cam sprocket key or dowel location and other factors can affect timing. The manufacturing tolerances in these parts can accumulate or be self-canceling. The only way to know for certain...and to get maximum performance from your new cam...is to check the timing and phasing of the cam through a process called degreeing.

Equipment Needed

To degree your cam, you'll need three items: a degree wheel calibrated in one-degree increments and at least 6" in diameter, a pointer to be attached to the block aimed at the degree wheel, and a dial indicator with a minimum of 0.500" travel. You'll also need a method of attaching the dial indicator.

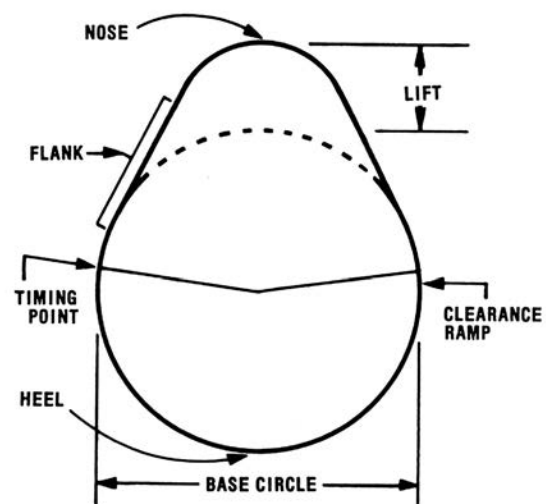
The engine must be sufficiently torn down to allow removal of pushrods and lifters and the cylinder head covering number one cylinder must be removed.

First, attach a degree wheel to the crankshaft. Next, install the



pointer. This must be securely bolted to the engine block and must be rigid to assure accuracy of readings. The pointer's free end should almost touch the degree wheel. A wire pointer is commonly used, but one fashioned from sheet stock (aluminum will do) is best because it is more rigid.

Rotate the crankshaft until number one cylinder's piston is as close to top dead center as possible. (Top dead center is the highest point the piston reaches in number one cylinder). Adjust the degree wheel so the pointer is aimed at the TDC mark.



Cam Lobe Terminology

Finding TDC

A dial indicator is used to determine top dead center. The key to accuracy is in the firmness of the mounting of the dial indicator over cylinder number one. The indicator must securely and positively mount to the head surface of the block.

Place the dial indicator over the cylinder and set the zero mark at roughly the piston's highest point. Rotate the engine

Finding TDC (cont)

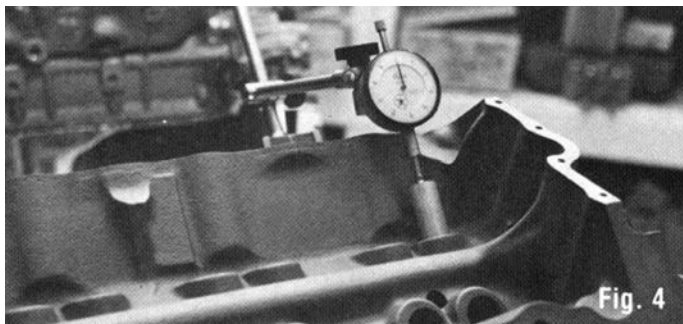
counterclockwise to 0.100 inch down and then rotate the crank clockwise to where the piston is 0.050 inch down in the bore. Record the degree-wheel reading. Then continue to rotate the piston clockwise through TDC to 0.050 inch down on the dial indicator to the opposite side of TDC and read the degree wheel. Top dead center will be halfway between these two temporary marks.

For example, if your first mark was at 35° and the second mark was at 41° (on the other side of the degree wheel's indicated 0° or TDC), add the two figures together (35 plus 41 equal 76), and then divide by two to find true TDC. In this case, 76 divided by 2 equals 38. This true TDC will be obtained by rotating the crankshaft until the pointer is aligned with 38° on the degree wheel.

Without moving the crankshaft, loosen the degree wheel and rotate it until the pointer indicates the figure (in this case 38°). Rotate the crank slowly in the opposite direction from the last time until the noted dial indicator reading. The pointer should indicate the same reading (38° in our example), but on the other side of the 0° or TDC mark.

To check your accuracy, repeat the rotation and counter-rotation process outlined above. This time, the pointer should give the exact same reading each time, except on the opposite sides of the TDC/0° mark.

Finding The Cam Centerline



Depending on the mount you use and the length of the indicator's stem, you may need an extension to link the lifter and the indicator. Use the same type lifter for checking that will be used in the completed engine. You can not use a roller tappet on a flat-tappet cam nor can you use a flat-tappet lifter on a roller cam. Using a cam checking tool such as Proform 66838 with the correct tip is also suggested.

Rotate the crankshaft until the intake lifter for cylinder number one is riding on the base circle. Mount the dial indicator on this lifter. Do not place the tip of the dial indicator in the pushrod cup of the lifter to read lift. The lifter cup radius offers no flat area for repeatability. Instead, use the edge of the lifter or build a dedicated lifter with a flat that will accurately locate the dial-indicator plunger. Make sure the dial indicator travels roughly the same angle as the lifter. If the heads are bolted on the engine, you can use a pushrod to move the dial indicator. **Note:** All other lifters and all pushrods should be removed. The indicator should be

located so that the stem is depressed 0.020" to 0.030" into the operating range, then set the dial to zero.

Rotate the engine slowly in the normal direction of rotation to several revolutions and make certain that the indicator always returns to zero when the lifter contacts the base circle of the lobe. If it doesn't, the lifter is sticking and must be freed prior to any checks being made. Watch any flexing in the indicator mount.

Begin by rotating the engine clockwise until the dial indicator reads max lift. Zero the dial indicator and rotate the engine counterclockwise until the dial indicator reads roughly 0.100 inch down from max lift. Slowly rotate the engine clockwise until the dial indicator reads 0.050 inch from max lift and record the number shown on the degree wheel. Next, continue to rotate the crankshaft clockwise until the dial indicator reads 0.050 inch on the closing side of the intake lobe from max lift and record the number shown on the degree wheel.

Back the engine up to 0.100 inch on the dial indicator before taking the reading at 0.050 on the opening side of the lobe because traveling past the data point and then turning the engine clockwise to approach the 0.050-inch data point removes any slack that may be present in the timing chain that resulted from turning the engine backward. This is why you don't turn the engine counterclockwise to 0.050, but rather go past it and then turn clockwise up to the first checking point. It's a small point, but accuracy is our goal.

Adding these two numbers together and dividing by two will give you the intake centerline. For example, if your first mark was at 65° and the second mark was at 152°, then 65 + 152 equals 217, divided by 2 equals 108.5 degrees ATDC.

Compare this number (in this case 108.5) with the lobe centerline listed on the timing card. Taking the lobe centerline from your timing card and subtracting the centerline you got from your measurements will give you the cam advance. For example, if the cams cam card reads 110° lobe center and your measurements give you 108.5°, then 110° - 108.5° = 1.5°. This is the advance at the crank. Remember for every time your cam rotates once your crankshaft rotates twice. So the advance at the cam gear is half (in this case .75°). This can be corrected with multiple keyway crank gears, offset crank keys or offset cam bushings.

This Data to be used for Degreeing Purposes only.			
GROSS LIFT AT CAM		RUNNING CLEARANCE	
Intake _____		Intake _____	
Exhaust _____		Exhaust _____	
DEGREE OF DURATION @ .050		VALVE LIFT	
Intake _____		Intake _____	
Exhaust _____		Exhaust _____	
RECOMMENDED VALVE SPRING INFORMATION		DEGREES OF DURATION	
SPRING PART # _____		Intake _____	
INSTALLED HT. _____ INS. = _____ LBS. _____		Exhaust _____	
OPEN HT. _____ INS. = _____ LBS. _____		LOBE CENTER _____	
		PROFILE NUMBER _____	
		PART NUMBER _____	

Camshaft Tuning

There are two reasons for altering the phase relationship between the camshaft and the crankshaft. By advancing or retarding the cam in relation to the crankshaft you can:

1) Correct a valve timing error (as above). Minor variations from the cam's specs can be caused by a build-up of tolerances in the engine, which cannot be controlled by the camshaft manufacturer. Included are wear of gears, position of keyways.

2) Alter performance. Effective valve timing is a compromise between efficient performance at low and high engine speeds. One cam cannot give both with maximum efficiency. You know where you want your engine to give maximum performance and advancing or retarding the cam allows you to dial it in to suit your needs and your engine.

Advancing & Retarding

By advancing the cam in relations to the crank, the valves open and close earlier. Duration and overlap remain unchanged. Advancing raises the cylinder pressure (due to earlier valve closing) and improves low-and mid-range torque at the expense of some top-end power. The result is similar to using a shorter-duration cam since the intake valve closing point is more critical than its opening point.

Retarding the cam so valves open and close later has the opposite effect. This should increase top-end power at the expenses of low-and mid-range torque. Thus:

Advance Cam: More low-and mid-range torque.

Retard Cam: More top-end power.

Advancing and retarding are easily accomplished with offset bushings or keys for the cam or crankshaft, depending on the engine. Remember that one crankshaft degree equals to camshaft degrees.

How Much is Enough?

Considerable trial and error is involved in advancing and retarding a cam to alter performance. However, two degrees isn't enough to feel and eight degrees may begin hurting overall performance. Four degrees will usually achieve the desired results and six is probably the maximum you'll need.

Our experience indicates that a cam advance of 2 to 6 should give the best overall performance. These settings have even helped top-end power in many engines.

Retarding the cam is usually restricted to all-out competition engines where low rpm use is not a consideration.

Before attempting to advance a retard or cam, you must know the actual valve timing, not the manufacturer's specifications. See the procedures covered earlier in "Degreeing a Camshaft".

Important notes: Advancing and retarding a cam will move one valve closer to the piston. Valve-to-piston clearance must be checked after advance or retard alterations to prevent possible engine damage. Also, changing the cam timing will also change

engine damage. Also, changing the cam timing will also change ignition timing, which must then be reset.

Changing the Valve Lash

Altering valve lash with mechanical lifter cams is a trick used successfully by many racing mechanics. Because the cam lobe does not start to lift the valve until it rotates far enough to take up all valve lash, the greater the lash, the later the valve opens and the earlier it closes. That shortens duration (as does advancing the cam). Smaller lash opens the valves earlier and closes them later for longer duration.

Greater Lash: Increases low- and mid-range torque at the expense of top-end power.

Smaller Lash: Increase top-end power at the expense of low- and mid range torque. Increased rpm may also result.

A change of 0.001" in valve lash equates to approximately 3° in duration. Increasing lash above manufacturer's specifications should be approached with caution, particularly in high-rpm engines. In such cases, the valve might hit its seat upon closing, without being cushioned by lobe clearance ramp, causing high shock loads in the valve train. Lash should not be increased more than 0.004" above the specified lash. If greater lash produces much better performance you should consider advancing the cam. Decreasing valve lash below engine manufacturer's specs isn't as critical from the standpoint of mechanical problems. The only concern here would be valves running hot because they aren't on the seats long enough to transfer sufficient heat to the cylinder head. This isn't important on drag racing engines, but is on some endurance engines that operate for longer periods of time. Finally, be sure to change intake lash and exhaust lash by the same amount so wider settings can be used on the exhaust. You need extra clearance to allow for heat expansion on the exhaust side.

Valve Train Interference

It is critically important to check four main areas for possible valve train component interference, which can quickly damage a cam, lifters, pistons and other parts. You need to check valve to piston, coil bind, retainer to seal and/or guide, and retainer to rocker arm. When in doubt, check with an experienced mechanic.

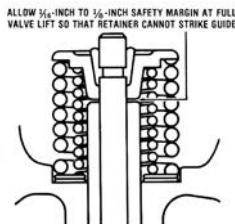
Valve to Piston

The high lift and long duration of a performance cam can cause interference between valves and pistons, quickly leading to bent valves and/or cracked pistons. Clearance between the two should be checked after the cam timing has been set and also after advancing or retarding a cam.

To check for adequate clearance, place a 1/4" thick strip of modeling clay on any piston, covering the valve pocket area. Cover the clay and valve face with engine oil to prevent sticking. Install the head gasket and head, using standard torque specifications for the bolts surrounding the one cylinder where the check is being made.

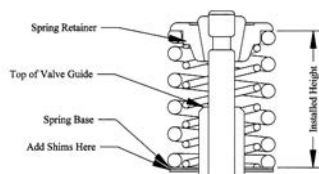
Valve Spring Coil Clearance (Coil Bind)

Coil clearance is the distance between the valve spring coils when the valve is at maximum lift (fully open). A minimum of 0.060" must exist between the coils at maximum lift. Coil bind is when the valve spring is compressed fully—to the point that all the coils are “stacked up” on top of each other. .100" is recommended for high RPM applications. Coil bind is a catastrophic condition that will result in valve train failure. Disassemble each spring (if multiple springs are employed at each valve). Check all the springs (both inner and outer springs). If there is not 0.060"-0.100" minimum clearance between the coils, the solutions are: the valve retainer, the valve locks, the valve, or the spring must be changed; the spring pocket must be machined. Keep in mind that these modifications will change the valve spring installed height.



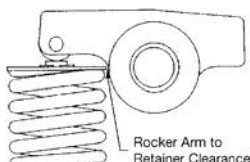
Spring Retainer to Valve Seal or Guide Clearance

The distance between the bottom of the valve spring retainer and the top of the valve guide/seal must be 0.090" larger than the valve lift of the camshaft. If not, you must machine the top of the guide for correct clearance.



Retainer to Rocker Arm Clearance

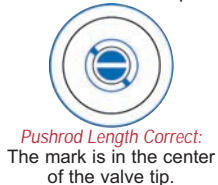
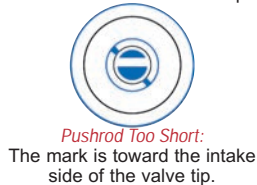
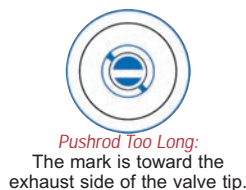
When installing the rocker arms, check to see that the bottom of the rocker arms clear the spring retainers. Many rocker arms have a cut to accommodate large valve spring retainers.



How to Check for Correct Rocker Geometry

After you have estimated the required pushrod length using a Pushrod Length Checker, use this guide to check for proper alignment.

- 1) The first step is to install a solid lifter and an adjustable pushrod. Mark the tip of the valve with a machinist dye or ink.
- 2) Install your rocker arm and set it up with zero lash.
- 3) Rotate the crankshaft clockwise several times. Take off the rocker arm. The pattern of the rocker tip will be where the ink has been wiped away from the valve tip. The pattern should be centered on the valve tip. If not, adjust the pushrod length to center the pattern.



Camshaft Break-in

The first few minutes of engine operation after installing a new cam are critical. It takes time for the engine's oiling system to reach efficiency and while you're waiting for that to happen, metal-to-metal contact can occur. If it does, something is going to fail then or later. Especially critical is the lifter/cam lobe area. If metal touches metal here without benefit of solid lubrication, galling will occur and something (the lifter, the lobe or both) is going to fail.

To prevent these and similar problems not covered by any warranty, please follow the steps outlined here:

- 1) New lifters must be installed with any new cam installation. The surface of a new lifter, which rides on the cam lobe, has a spherical shape with a 0.002" crown, which is almost impossible to detect. Used lifters won't have that crown and will quickly destroy cam lobes (see Fig. 2. "How to Install a Performance Camshaft"). *Note:* that if you later take your engine apart, lifters must be reinstalled in the bore from which they were removed. Each lifter wears in a way that mates it to a given cam lobe; switching lifters is the same as using old lifters with a new cam.
- 2) Install the valve train components (lifters, valves, springs, etc.) recommended by the cam manufacturer. These items have been tested and proven for compatibility with the cam.
- 3) Coat the cam lobes, distributor drive gear, lifter cam faces and other critical components with a moly-disulfide lube like our Camshaft and Engine Assembly Lube for protection against metal-to-metal contact during initial break-in.
- 4) Check the entire valve train for interference and adequate clearance during assembly. The four areas of major concern are covered in "How to Install a Performance Camshaft."
- 5) Fill the oil pan with top-quality MS-DG engine oil meeting the SAE or API specifications set by the engine manufacturer.

A Pennsylvania-based detergent oil is preferred. Use a straight viscosity of 20W or 30W for break-in; do not switch to a multi-viscosity oil until after the break-in period. **For flat tappet applications, a zinc-phosphorous additive must be added, such as MAX Z.P.M. (99000), to the engine oil during break-in.**

- 6) Before starting the engine be sure:

- The valves are correctly adjusted. Set solid lifters 0.003" to 0.005" tighter than specified.
- To prime the oil system by turning the oil pump manually until pressure is indicated on the oil gauge. Be sure crankcase is filled to proper (normal) level.
- To put gas in the carburetor float bowls, prime the accelerator pump and have gas in the tank.
- There's water in the radiator.
- The battery is charged.

NOTICE:

True performance hydraulic roller lifters can make a ticking noise. This is due to the tighter tolerances and high bleed rate in the lifter valving. All Howards Cams hydraulic roller lifters (except ProMax) should have a 1/2 to a full turn preload depending on application.



- Nothing will get caught in the fan, fan belts, and alternator/generator belt or by the crankshaft. Check the entire engine compartment for loose tools or parts.
- Ignition timing is set accurately.

To avoid galling, the engine should start right away. Avoid a long grind on the starter and over cranking the engine before firing. Low oil pressure could damage camshaft and other components.

7) When the engine fires, immediately rev it to 1800-2400 rpm. Do not idle the engine for the first 20 minutes. Much of the oil for lubrication and cooling the camshaft comes from crankshaft splash. Below 1800 rpm, turbulence is probably not enough to lubricate the cam fully. The engine may be run on the road or in the shop, but the shop is best. If adjustments are required during the first 20 minutes, shut the engine off.

8) Vary rpm frequently during this initial break-in period to change oiling within the engine.

9) After completing the break-in period, change the engine oil and filter. Regularly change engine oil and filter and maintain proper valve lash adjustment on solid lifter engines.

Following these steps will extend the trouble-free life of your cam and assure you of an engine that delivers the maximum possible performance.

THE IMPORTANCE OF PROPER ROD BOLT STRETCH/TORQUE...

Whether measured by stretch or by torque, properly preloading a rod bolt is essential for trouble-free performance. If a bolt is installed without sufficient preload (or pre-stretch), every revolution of the crankshaft will cause a separation between the connecting rod and rod cap. This imposes additional stretch in the bolt. The stretch disappears when the load is removed on each revolution, or cycle. Over time, this cycle stretching and relaxing can cause the bolt to fail due to fatigue, just like a paper clip is bent back and forth by hand. To prevent this condition, the bolt's pre-load must be greater than the load caused by engine operation.

A properly installed bolt remains stretched by its preload and isn't exercised by the cyclic loads imposed on the connecting rod. A quality bolt will stay stretched this way for years without failing. The important thing is to prevent the bolt from failing due to fatigue by tightening it to a load greater than the demand of the engine. Protect your bolts and tighten them as recommended. You can easily monitor the condition of the rod bolts through use

of a stretch gauge. Prior to installing the rod, measure the length of the bolt in a "relaxed" (untorqued) state. Write this down. When you tear the engine down for maintenance, again measure the length of each rod bolt - being careful to keep everything in the proper order. If any of the rod bolts have taken a permanent set and have stretched by .001" or longer you should replace the fastener **IMMEDIATELY!** This stretching is a sure indicator that the bolt has been compromised and taken past its yield point.

In other types of bolted joints, this careful attention to tightening is not as important.

A rod bolt stretch gauge is one of the most important tools a serious engine builder can own. It's valuable in properly setting up a rod for resizing, obtaining the proper torque load when installed in the engine, and monitoring the condition of the bolt while in use.



For example, flywheel bolts need only be tightened enough to prevent them from working loose. Flywheel loads are carried either by shear pins or by side loads in the bolts; they don't cause cyclic tension loads in the bolts. Connecting rod bolts, on the other hand, support the primary tension loads caused by engine operation and must be protected from cyclic stretching. That's why proper tightening of connecting rod bolts is so important.

Friction is an extremely challenging problem because it is so variable and difficult to control. The best way to avoid the pitfalls of friction is by using the stretch method. This way preload is controlled and independent of friction. Each time the bolt is torqued and loosened, the friction factor gets smaller. Eventually, the friction levels out and becomes constant for all following repetitions. Therefore, when installing a new bolt where the stretch method cannot be used, the bolt should be tightened and loosened several times before final torque. The number of cycles depends on the lubricant. With moly, five loosening and tightening cycles are sufficient.

TORQUE SPECIFICATIONS

Part # (Size)	Stretch +/- .0002"	Torque (w/extreme Pressure Lube)
MSAMSP05005 (5/16" x 1.450" 235,000)	.0080"	40 ft lbs
ARP4AJ1.500-1SU (3/8" x 1.500" 180,000)	.0047"	50 ft lbs
ARP4AJ1.500-2SU (3/8" x 1.500" 215,000)	.0057"	45 ft lbs
ARP4AJ1.500-6SU (3/8" x 1.500" 260,000) L-19	.0057"	50 ft lbs
ARP4AP1.550-2LU (7/16" x 1.550" 220,000)	.0058"	70 ft lbs
ARP4AP1.600-2LU (7/16" x 1.600" 220,000)	.0062"	70 ft lbs
MSAMSP07004 (7/16" x 1.600" 230,000)	.0088"	78 ft lbs



frequently asked questions

Q. Do I need to degree my cam?

A. Yes. To get the best performance. Due to irregularities in engine block, crankshaft, and timing set tolerances, cam shaft timing can change dramatically. This is the only way to get the performance you should expect.

Q. What Pushrod length do I need?

A. You will need to check for correct geometry to determine proper pushrod length. Howards Cams has tools available for checking.

Q. What Distributer Gear do I use?

A. If you have a cast cam core or a 2 piece core you may use a stock, melonized or composite gear. If you have a steel cam core other than 1050 or 1055 steel you will need a bronze or composite gear. 1050 or 1055 steel cam can use a stock, melonized or composite gear.

Q. When installing Howards roller lifters in my engine, which way should they face?

A. With the exception of the Chrysler LA V8, all of our roller lifters should be installed with the large diameter of the rivet and the tie bar toward the center of the engine. On the Chrysler LA V8 they should be facing the engine block. On the big block Chevy V8, the arrow on the tie bar needs to point up.

Q. Can the hydraulic roller lifters be noisy on startup after the engine has been sitting for a while?

A. Yes, they definitely can. When the engine is shut off, some of the lifters may not be on the cam base circles, but may instead be on the lift portion of the lobes. If that happens, the lifter is under constant load from the valve spring holding the valve open. Eventually, the force will bleed the oil out of the lifter, resulting in clearance during the next engine re-start. The engine will clatter momentarily until the lifter refills with oil to take up the clearance. High ratio rocker arms, strong valve springs, and high lift cam lobes are all contributors to this situation. In reality, the lifter wouldn't function without its ability to bleed down under load. So, there is no way to completely avoid it.

Q. What is meant by "Lifter leakdown"?

A. Leakdown (also known as bleed rate) refers to the rate at which the piston inside the lifter, which controls the travel, is depressed under load. The outside diameter of the piston is precision ground and fitted to the i.d. of the lifter body which is also precision ground. The total clearance between those two diameters is less than 0.00050". It is the rate at which the engine oil leaks by these surfaces that controls how quickly the piston moves in the bore of the lifter body under the force from the valve train. Leakdown is typically measured in time versus distance of the piston under a given amount of force. The test is performed under laboratory conditions using proprietary fixtures and a laboratory grade fluid.

Q. Can I make your hydraulic roller lifters operate like solid roller lifters by bottoming the preload adjustment?

A. No, definitely not. There are oil reliefs inside the lifter body which will properly distribute the oil in the lifter when the lifter is correctly adjusted. Bottoming the components will cause mis-alignment of the passages resulting in excessive engine oil pressure loss.

