

Hydraulic Roller Lifter Installation Instructions

Retrofit and Performance OE Upgrade

Pre-installation Considerations

Since the valve train in a typical overhead valve engine contains numerous components which may or may not be matched, care must be taken to avoid potential issues which may affect the overall performance of the lifters and the engine. These considerations can be best described in two categories: Mechanical Interference and Valve Train Geometry.

Mechanical Interference - Mechanical interference can occur between the various components which may lead to engine damage and failure. These potential problem areas must be checked prior to final adjustment of the lifters and operation of the engine. The following is a list of areas to consider:

- Piston to valve clearance
- Rocker arm slot to stud clearance
- Rocker arm to valve spring retainer clearance
- Valve spring retainer to guide/seal clearance
- Valve spring coil bind height

Valve Train Geometry - Proper overall valve train geometry must be maintained in order to optimize valve motion. The following can affect the geometry of the valve train:

- Deck height of block
- Cylinder head heights
- Camshaft lobe base circle diameter
- Seat height in lifter
- Pushrod length
- Rocker arm configuration
- Valve length

The simplest way to achieve the correct geometry and compensate for un-matched parts in the valve train is by using proper pushrod length. Table 1 provides lengths for some common applications. If you are unsure of the required pushrod length, refer to the *Pushrod Length Procedure*, otherwise, proceed to *Installation Procedure*.

Table 1 - Recommended Pushrod Lengths (inches)
(Lengths Shown are Theoretical Ball over Ball Dimensions)

<u>Engine Group</u>	<u>Intake</u>	<u>Exhaust</u>
1966-1991 AMC 290-401 V8	7.050	7.050
1957-1987 Chevrolet 262-400 V8	7.100	7.100
1958-1965 Chevrolet 348-409 V8	8.100	8.100
1965-1995 Chevrolet 396-502 V8	7.550	8.550
1965-1995 Chevrolet 396-502 V8 Tall Deck (+.400")	7.950	8.950
1962-1987 Ford 221-302 V8 with Stock Rocker Arms	6.500	6.500
1977-1987 Ford 221-302 V8 with Adjustable Rocker Arms	6.700	6.700
1982-Up Ford 302 and 5.0L. H.O. V8 with Performance Upgrade Lifters and Stock Rocker Arms	6.320 (Stock)	6.320 (Stock)
1994-UP Ford 351W V8 with Performance Upgrade Lifters and Stock Rocker Arms	7.640	7.640
1969-1993 Ford 351W V8 with Stock Rocker Arms	7.800	7.800
1977-1993 Ford 351W V8 with Adjustable Rocker Arms	8.000	8.000
1970-1974 Ford 351C V8 with Adjustable Rocker Arms	7.800	7.800
1971-1982 Ford 351M-400 V8 with Pedestal Mount Rocker Arms	8.700	8.700
1963-1976 Ford 352-428 V8	<i>See Pushrod Length Procedure</i>	
1968-1997 Ford 370-460 V8	<i>See Pushrod Length Procedure</i>	
1997-Up GM Gen III, LS Series V8 with Performance Upgrade Lifters and Stock Rocker Arms	7.400 (Stock)	7.400 (Stock)
1964-1987 Chrysler 273-360 "LA" V8 with Adjustable Rocker Arms	6.580	6.580
1958-1978 Chrysler 350-400 "B" V8 Low Block with Adjustable Rocker Arms	7.500	7.500
1958-1978 Chrysler 413-440 "B" V8 High Block with Adjustable Rocker Arms	8.375	8.375
1964-1971 Chrysler Hemi V8	9.906	10.687

Pushrod Length Procedure

1. You will first need to obtain an adjustable length checking pushrod from your pushrod supplier.
2. 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.
3. Install a pair of lifters in the bores of the cylinder which has the light checking springs on the valves. The lifter tie bar must face toward the center of the engine, except on the LA Chrysler. On big block Chevrolet, the arrow on the bar must point upward.
4. 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.
5. Adjust the adjustable pushrod's length to the length shown on Table 1 for your engine application as a starting point.
6. 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 pushrod seat with the screw adjuster of the pushrod up.
7. 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 further as this will collapse the lifter.
8. Rotate the engine by hand at least twice and verify there is no lash in the system.
9. 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.
10. 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.
11. 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.
12. After the lengths have been verified, replace the checking springs with the intended valve, obtain the correct length pushrods from your pushrod supplier, and proceed to the installation procedure.

Installation Procedure

1. The camshaft must be fully installed before this procedure is started.
2. Wipe lifters clean with a lint-free shop rag. Cleaning with solvents is not required or recommended.
3. Soak lifters in clean motor oil.
4. Install lifters in lifter bores. Lifter tie bars and rivet heads must be toward the center of the engine. On big block Chevrolet, the arrow on the bar must point upward. On Chrysler LA engines, the large diameter of the rivet heads must face the block. Performance upgrade lifters use stock anti-rotation systems and do not require orientation.
5. 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.
6. After putting a light coating of assembly lube on both ball ends of the pushrods, install pushrods in lifters.
7. Install rocker arms and adjusting nuts/bolts, but do not tighten.
8. 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.
9. 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 turn more (~.030")** and secure. This is the lifter preload. For performance upgrade lifter 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 pre-load of ~.030". For some GM applications, a bleed down procedure is required. Refer to service manual.
10. 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.
11. Snug down adjuster on the exhaust 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 turn more (~.030")** and secure. For performance upgrade lifter applications, follow aforementioned procedure outlined in step 9.
12. Repeat this process with the remaining cylinders. Be sure all the pushrods are properly seated in all the rocker arms and the lifters.
13. **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.

Note:

All hydraulic roller lifter applications require the proper lifter pre-load. While many valve trains are non-adjustable from the factory, it is imperative the pre-load of ~.030" is verified for proper operation and service life in all applications.