



Zipper's Adjustable Pushrods Preparation and Adjustment

Introduction

Thank you for purchasing a set of Zipper's Adjustable Pushrods. Please review these recommendations and procedures before installation. The following document will explain in detail the pushrod adjustment procedure, which sets the allowable hydraulic lash in the lifter.

The Zipper's adjustment procedure may seem to be on the tight side, but this procedure anticipates the growth of the engine components and limits the hydraulic plunger travel at normal operating temperatures. This creates a "semi-solid" hydraulic lifter, which through extensive testing has proven to provide more valve train control over the other adjustment procedures. Too much allowable hydraulic lash hurts proper valve train control.



Pushrod Preparation

- Remove the adjusters from the pushrods and inspect the internal oil passages for the presence of any foreign debris from the manufacturing process. Clean the inside of the pushrod and the adjuster, since the pushrods are a critical part of the oiling system. All of the oil that feeds the top end will travel through these pushrods.
- Make certain that the lower jam nut is tight to the lower pushrod tip, as shown on the right. This jam nut prevents the lower pushrod tip from coming loose from the threaded portion of the adjuster. The top jam nut should be left loose; it will lock the final adjustment of the pushrod length when you are complete.
- Fill the pushrod adjuster with oil, and reassemble the pushrods.
- Lubricate both pushrod tips with assembly lube.



Zipper's adjustable pushrods are designed to be as rigid as possible. To maximize rigidity, the adjuster section is made as long as possible. Because of this rigid design, it is not possible to shorten the pushrod enough to install them without removing the rocker assemblies. Although this does add time to the installation, it allows you to inspect the rocker arms and stands for wear and oiling issues, which are very common in today's engines.

If you're adding a performance camshaft or building a new engine combination, now is the time to inspect and correct the rocker arm assemblies. Although this step is overlooked by many people, we highly advise you to take the time to check and repair your rocker arm assemblies at this point. Not only will this lengthen the lifespan of all of your valve train components, it will lower your chances of valve train noise and wear issues in your new engine setup.



Rocker Arm Bushing / Stand Inspection

While the rocker arms and stands are removed, inspect your rocker arm bushings, shafts, and stands for wear. There are established factory wear tolerances on these items, and it is very common to find them out of the factory's specs. It is extremely common to find the rocker arm bushings out of tolerance! The pushrod side bushings are one of the highest pressure points in the valve train, where linear motion is translated into rotational movement.

It is common for the pushrod side bushings to take a beating if they don't have proper lubrication. Lack of oil flow to the top end at any RPM will cause the pushrod side bushings to ovalize in a short amount of time. The following chart asks you to measure in both the X and Y axis's, to show how out of round the bushings are.

Fill out the following chart to see if your rocker assembly is in spec, and repair if needed. It is very important to blue print your rocker assembly for proper valve train control and lifespan. Please note that OEM replacement rocker arms with new bushings installed are inexpensive at your local dealership, and a complete rocker arm replacement may be a cheaper than replacing the individual bushings. If you have to replace both bushings on the same rocker arm, it's usually cheaper to buy a new rocker arm with new bushings already installed.



Head	Valve	Rocker Arm Endplay Repair if greater than 0.025"	Rocker Arm Shaft Diameter		Rocker Assembly Stand Clearance (0.0035" or less)				Rocker Arm Bushing Clearance (0.0035" or less)				
			Pushrod Side Contact Patch	Valve Side Contact Patch	Pushrod Side "X" axis	Pushrod Side "Y" axis	Valve Side "X" axis	Valve Side "Y" axis	Pushrod Side "X" axis	Pushrod Side "Y" axis	Valve Side "X"	Valve Side "Y"	
FRONT	INTAKE												
	EXHAUST												
REAR	INTAKE												
	EXHAUST												

Hydraulic Lifter Adjustment

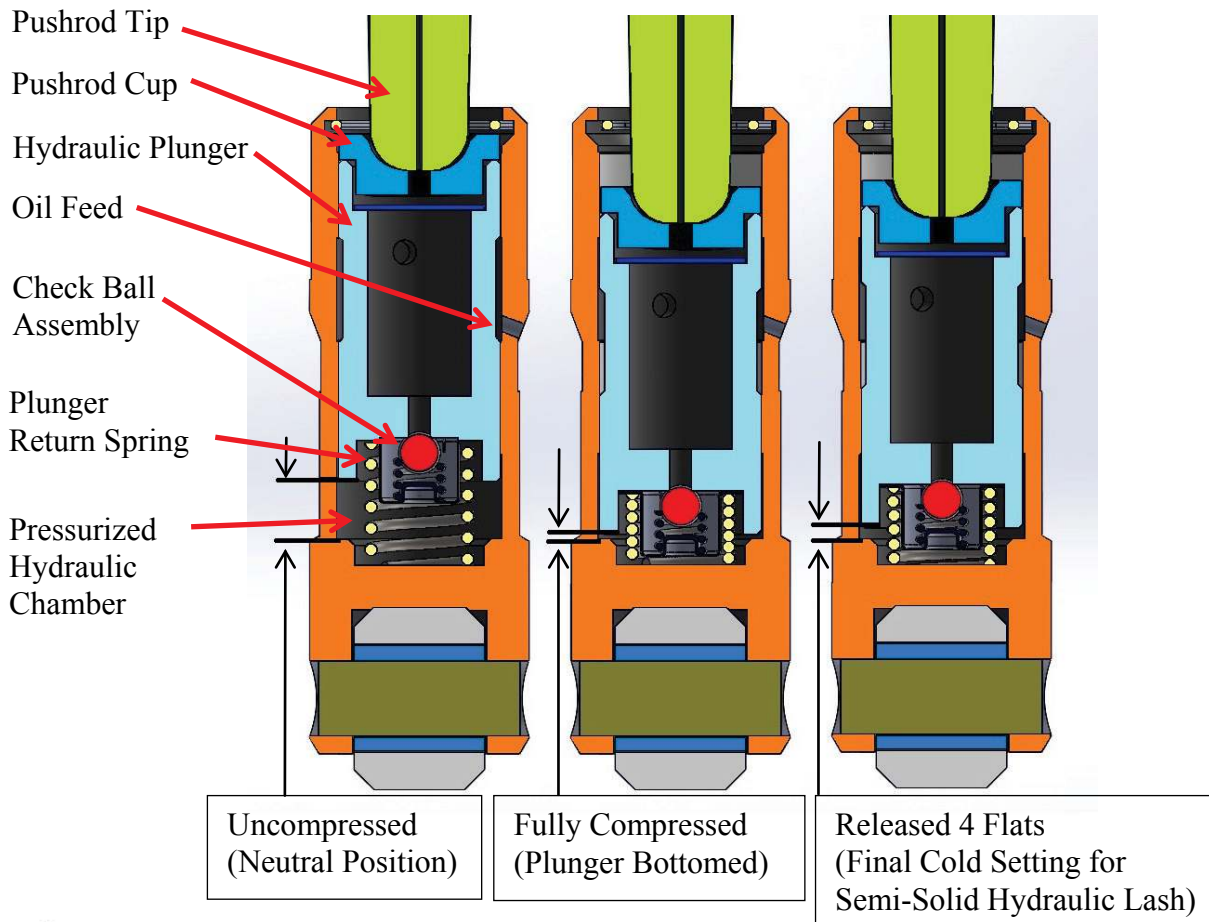
Adjustable pushrods allow you to set the hydraulic lash inside the lifter body by varying the preload on the plunger return spring. Since there's no lash adjustment at the valve, all valve train adjustments must take place at the lifter, by changing the length of the pushrod. The factory system does not have any valve train lash adjustment; the hydraulic lash is set by the factory designed length of the pushrod. Their fixed designed system works well until various parts of the engine are replaced or modified.

The following 3 cut-away views of the hydraulic lifter show the pushrods set at various points of adjustment.

LEFT - The leftmost example shows the neutral position, which shows the full travel of the Hydraulic Plunger. At this point, the system has **far too much** hydraulic lash, and the engine would not operate correctly.

CENTER - The center lifter shows the hydraulic plunger fully bottomed out, with the Plunger Return Spring at coil bind. This is a necessary step to setting the exact hydraulic lash. Zipper's uses the "Bottom Up" theory of pushrod adjustment to account for any variations in lifters. If you start at the neutral position and adjust downwards a set amount, you do not know exactly how much lash you're actually giving the system.

RIGHT - After the bottom is found, the hydraulic plunger is released by 4 flats, (pushrod shortened) to set the Cold Hydraulic Lash. After the engine heats up and expands, the lash will be more than shown. To provide the most accurate valve train control, you don't want the engine to have an excessive amount of hydraulic lash. This theory has been proven to show slightly more power on the dyno, better throttle response on the road, and an overall improvement to the control and lifespan of your valve train components.



Installing the Adjustable Pushrods

Please follow the factory procedure for removal and reinstallation of the rocker stands, and remember to only adjust one cylinder at a time. It is critical that you have the valve spring pressure off of the rocker arms when you install the valve train. To remove valve spring pressure from the rocker arm, put the engine in top gear, remove the spark plugs, lift the rear tire, and rotate the engine over with the tire. Stop the engine when both lifters are at the lowest position in the case, which represents the base circle of the camshaft lobes. Both valves will be closed at this point, and no pressure will be on the rocker arm assembly. Drop in the pre-lubricated pushrods, which have been adjusted to their shortest positions from above.

Re-install the rocker stand assemblies, being generous with a high-quality assembly lubricant on all moving surfaces. Zipper's also recommends squirting oil into the pushrod cup hole on the rocker arm, until oil flows out of the other end of the assembly. There is a proper crisscross torque sequence in the factory manual that should be followed for installing the rocker stands. It allows the rocker stand to be brought down to the final torque spec (18-22 ft-lbs) without twisting or distorting the rocker stand.

Once the rocker stands and arms are properly installed, extend the pushrod until both tips are contacting their respective cups, with no up and down movement. You will still be able to twirl the pushrods in their cups with your fingers, but feel no up and down movement. This is called the Neutral position of the lifter, with the hydraulic plunger at the very top, with no pre-load on the plunger return spring. We will now begin the adjustment procedure to set the Final Cold Lash. When you are finished, you can move on to the remaining cylinder.

Adjusting the Pushrods

- Starting with the lifter in the neutral position, lengthen the pushrod by 22 flats (3-2/3 full turns) and stop to allow the lifter to bleed down for 10 minutes. You will know the lifter has bled down when you can spin the pushrod freely with your fingers.
- Lengthen the pushrod another 20 flats (3-1/3 turns), or until you feel a positive stop. Do not apply excessive pressure when you reach this point. The lifter plunger should now be bottomed out, and the plunger return spring will be at coil bind.
- After allowing the lifter to bleed down for another 10 minutes, if you can spin the pushrod it is not fully on the bottom. If you need to go further to reach the bottom, **proceed carefully** to avoid damage to the lifter assembly. You want to coil bind the Plunger Return Spring without crushing it.
- From the bottom of the lifter, shorten the pushrod by 4 flats (2/3 of a full turn) of the adjuster and tighten the lock nut. This properly sets the Final Cold Hydraulic Lash on your lifter, which will allow you to maintain proper valve train control through the entire operating range of the engine. You are simply limiting the travel of the Hydraulic Plunger, to keep the allowable hydraulic lash in a set window. This creates a semi-solid hydraulic lifter, which works very well on air cooled engines.
- Proceed to the other cylinder and repeat the process. Re-install the pushrod covers per your service manual. During initial start-up, it is not uncommon to experience some valve train noise until the engine oil reaches full operating temperature (20 miles of riding) and all air has been fully purged from the system.

