

On the stud mounted rocker arms, remove the rocker arm stud nut, fulcrum seat, oil deflector and rocker arm. Use the adapter for ball-end push rods.

3. Make sure the push rod is in the valve lifter socket. Install a dial indicator in such a manner as to have the ball socket adapter of the indicator on the end of the push rod and in the same plane as the push rod movement (Fig. 4 or 5).
4. Connect an auxiliary starter switch in the starting circuit. Crank the engine with the ignition switch OFF. "Bump" the crankshaft over until the tappet is on the base circle of the camshaft lobe. At this point, the push rod will be in its lowest position.
5. Zero the dial indicator. Continue to rotate the crankshaft slowly until the push rod is in the fully raised position (highest indicator reading).
6. Compare the total lift recorded on the indicator with specifications.
7. To check the accuracy of the original indicator reading, continue to rotate the crankshaft until the indicator reads zero. **If the lift on any lobe is below specified service limits, the camshaft and the tappets operating on the worn lobe(s) must be replaced, as well as any tappet that shows pitting or having contact face worn flat or concave.**
8. Remove the dial indicator and auxiliary starter switch.

On the rocker shaft type mounted rocker arms, install the rocker arm shaft assembly(ies) as detailed in the applicable engine Part.

Install the stud mounted or pedestal mounted rocker arms as detailed in the applicable engine Part. Adjust the valve clearance as detailed in the pertinent Part.

After installing the rocker arms, do not rotate the crankshaft until the tappets have had sufficient time to bleed down. To do otherwise may cause serious valve damage. Manually bleeding down will reduce the waiting time.

9. Install the valve rocker arm cover(s) and the air cleaner.

2.3L I-4 Engine

Check the lift of each lobe in consecutive order and make a note of the readings.

1. Remove the air cleaner and the valve rocker arm cover.
2. Measure the distance between the major (A—A) and minor (B—B) diameters (Fig. 7) of each cam lobe with a Vernier caliper and record the readings. The difference in the readings on each cam diameter is the lobe lift.
3. If the readings do not meet specifications, replace the camshaft and all rocker arms.
4. Install the valve rocker arm cover and the air cleaner.

HYDRAULIC TAPPET AND HYDRAULIC LASH ADJUSTER

The hydraulic lash adjusters used in the overhead cam 2.3L I-4 engine are a zero-lash hydraulic device,

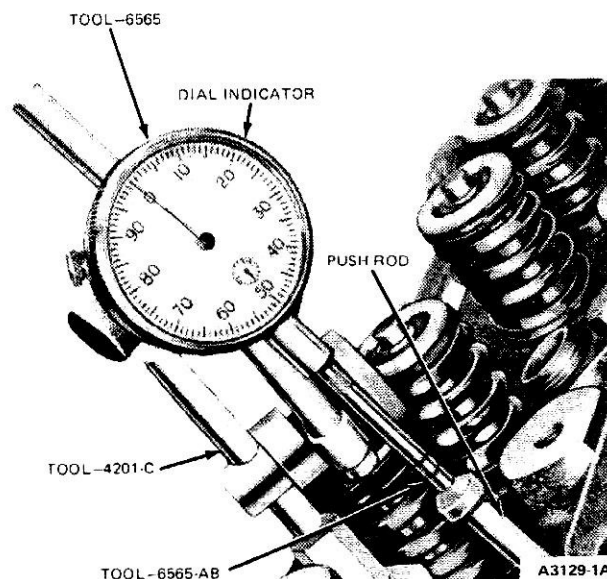


FIG. 4 Testing Camshaft Lobe Lift—Rocker Shaft Mounted Rocker Arms

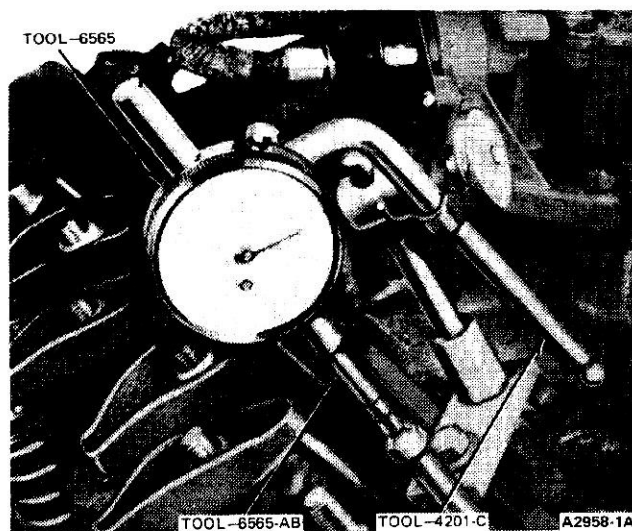


FIG. 5 Testing Camshaft Lobe Lift—Stud Mounted Rocker Arms

similar in construction and operation to the hydraulic tappets used on push-rod engines. They are cleaned, inspected and checked in the same manner. The instructions below apply equally to the lash adjuster and the tappet. Leak-down rates for the lash adjuster and hydraulic tappet are covered in the Specifications Section of the engine Part.

Hydraulic tappet noise may be caused by any of the following:

1. Excessive collapsed tappet gap.
2. Sticking tappet plunger.
3. Tappet check valve not functioning properly.
4. Air in lubrication system.
5. Leakdown rate too rapid.
6. Excessive valve guide wear.

Excessive collapsed tappet gap may be caused by loose rocker arm nuts, incorrect initial adjustment, or wear of tappet face, pushrod, rocker arm, rocker arm fulcrum or valve tip. With tappet

collapsed (Part 21-01) check gap between valve tip and rocker arm to determine if any other valve train parts are damaged, worn, or out of adjustment.

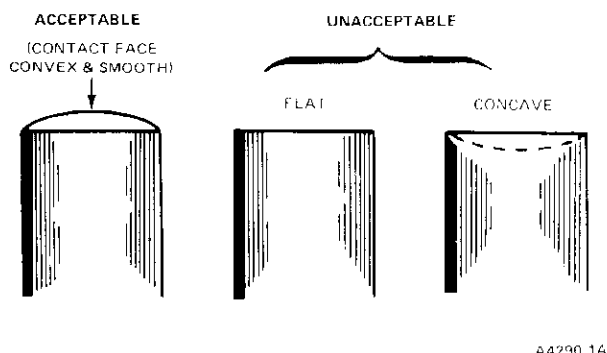


FIG. 6 Tappet Inspection (Exaggerated Contours Shown)

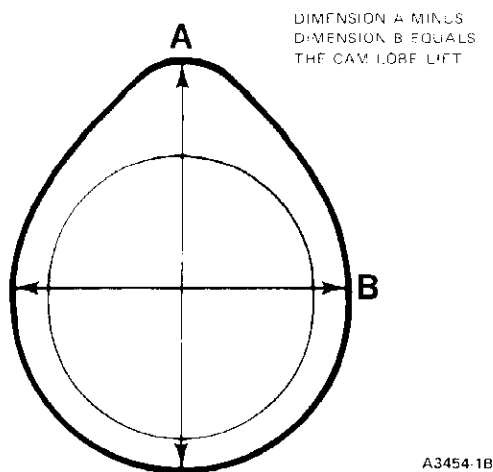


FIG. 7 Measuring Camshaft Lobe Lift

A sticking tappet plunger may be caused by dirt, chips, or varnish inside the lifter. The sticking condition can be corrected by disassembling the tappet and removing the dirt, chips or varnish that is causing the condition.

A tappet check valve that is not functional may be caused by an obstruction such as dirt or chips preventing it from closing when the cam lobe is lifting the tappet, or it may be caused by a broken check valve spring.

Air bubbles in the lubrication system will prevent the tappet from supporting the valve spring load and may be caused by too high or too low an oil level in the oil pan, or by air being drawn into the system through a hole, crack, or leaking gasket on the oil pump pickup tube.

If the leakdown time is below the specified time for used tappets, noisy operation may result. If no other cause for noisy tappets can be found, the leakdown rate should be checked and any outside the specification should be replaced.

Assembled tappets can be tested with Tool 6500-E to check the leak down rate. The leak down rate specification is the time in seconds for the plunger to move a specified distance of its travel while under a 50 lb load. Test the tappets as follows:

1. Disassemble and clean the tappet to remove all traces of engine oil. **NOTE:** Do not mix parts from different tappets. Parts are select-fitted and are not interchangeable.
2. Place the tappet in the tester, with the plunger facing upward. Pour hydraulic tester fluid into the cup to a level that will cover the tappet assembly. The fluid can be purchased from the manufacturer of the tester. Using kerosene or any other fluid will not provide an accurate test.
3. Place the 5/16-inch steel ball provided with the tester in the plunger cap (Fig. 8).
4. Adjust the length of the ram (Fig. 9) so that the pointer is 1/16 inch below the starting mark when the ram contacts the tappet plunger, to facilitate timing as the pointer passes the Start Timing mark.

Use the center mark on the pointer scale as the Stop Timing point instead of the original Stop Timing mark at the top of the scale.

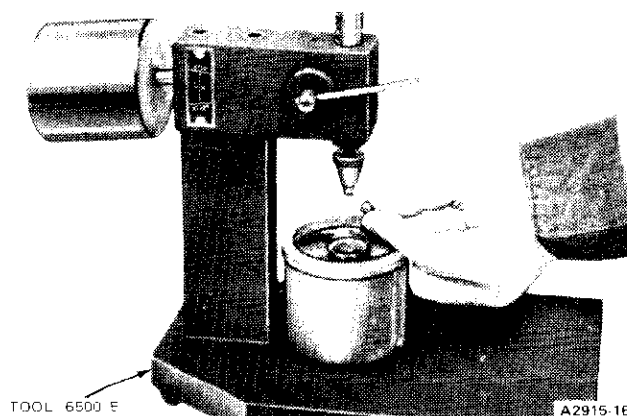


FIG. 8 Placing Steel Ball in Valve Tappet Plunger

5. Work the tappet plunger up and down until the tappet fills with fluid and all traces of air bubbles have disappeared.
6. Allow the ram and weight to force the valve lifter plunger downward. Measure the exact time it takes for the pointer to travel from the Start Timing to the Stop Timing marks of the tester.
7. A tappet that is satisfactory must have a lead-down rate (time in seconds) within the minimum and maximum limits specified.
8. If the tappet is not within specifications, replace it with a new tappet. It is not necessary to disassemble and clean new tappets before testing, because the oil contained in new tappets is test fluid.

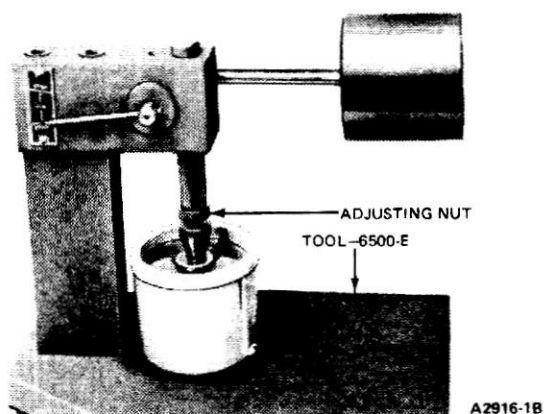


FIG. 9 Adjusting the Ram Length

9. Remove the fluid from the cup and bleed the fluid from the tappet by working the plunger up and down. This step will aid in depressing the tappet plungers when checking the valve clearance.

CAMSHAFT END PLAY

2.3L I-4 Engine

Remove the camshaft drive belt cover. Push the camshaft toward the rear of the engine. Install a dial indicator so that the indicator point is on the camshaft sprocket attaching screw or gear hub. Zero the dial indicator. Position a large screwdriver between the camshaft sprocket or gear and the cylinder head. Pull the camshaft forward and release it. Compare the dial indicator reading with specifications. If the end play is excessive, replace the thrust plate at the rear of the cylinder head (Fig. 10). Remove the dial indicator and install the camshaft drive belt cover.

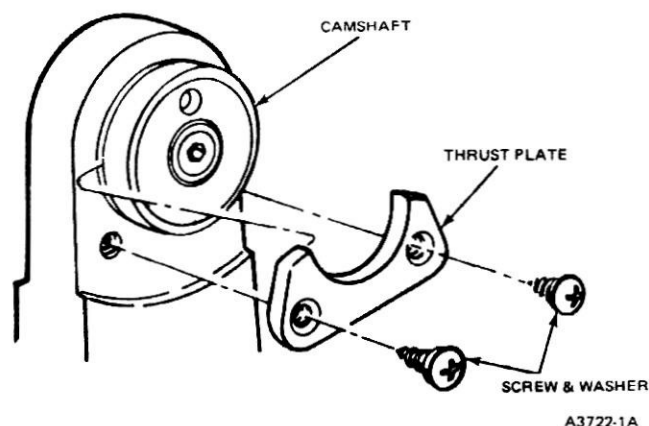


FIG. 10 Cam Shaft Thrust Plate Installation—2.3L I-4

All Except 2.3L I-4 Engine

On all V-8 engines, prying against the aluminum-nylon camshaft sprocket, **with the valve train load on the camshaft**, can break or damage the sprocket. Therefore, the rocker arm adjusting nuts must be backed off, or the rocker arm and shaft assembly must be loosened sufficiently to free the camshaft. After checking the camshaft end play, adjust the valve clearance.

Push the camshaft toward the rear of the engine. Install a dial indicator so that the indicator point is on the camshaft sprocket attaching screw (Figs. 11, 12 and 13). Zero the dial indicator. Position a large screwdriver between the camshaft sprocket or gear and the block. Pull the camshaft forward and release it. Compare the dial indicator reading with specifications. If the end play is excessive, replace the thrust plate.

Remove the dial indicator.

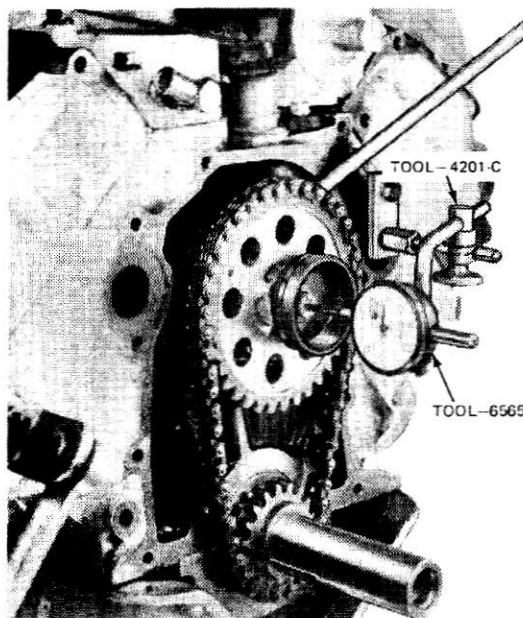


FIG. 11 Checking Camshaft End Play—Typical V-8 Engine

TIMING GEAR BACKLASH—2.8L V-6 ENGINE

Remove the valve spring load on the camshaft by backing off the adjusting screws. Install a dial indicator on the cylinder block (Fig. 14). Check the backlash between the camshaft gear and the crankshaft gear with a dial indicator.

Hold the gear firmly against the block while making the check. Refer to the specifications for the backlash limits. If backlash exceeds specifications, replace both gears.

Readjust valve clearance according to procedure.

TIMING GEAR RUNOUT

NOTE: Valve spring load must not be on camshaft when making this check.