THE TWO CYCLE PRINCIPLE FOR DIESEL ENGINES

In the two-cycle engine, intake and exhaust take place during part of the compression and power strokes respectively. See Figure 1.

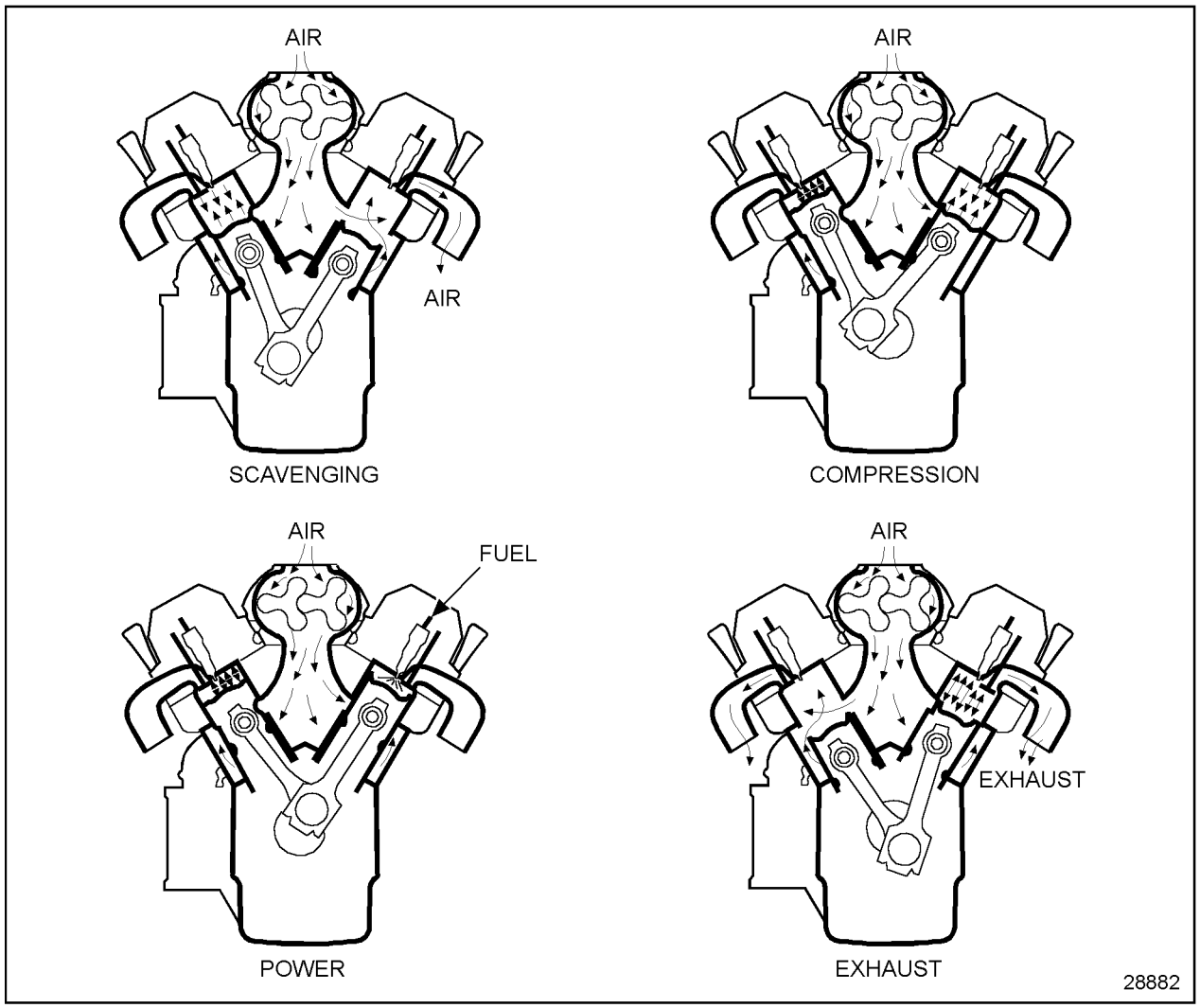


Figure 1 The Two-Stroke Cylinder Engine

Scavenging

A blower forces air into the cylinders to expel the exhaust gases and to supply the cylinders with fresh air for combustion. The cylinder wall contains a row of ports which are above the piston when it is at the bottom of its stroke. These ports admit air from the blower into the cylinder as soon as the rim of the piston uncovers the ports.

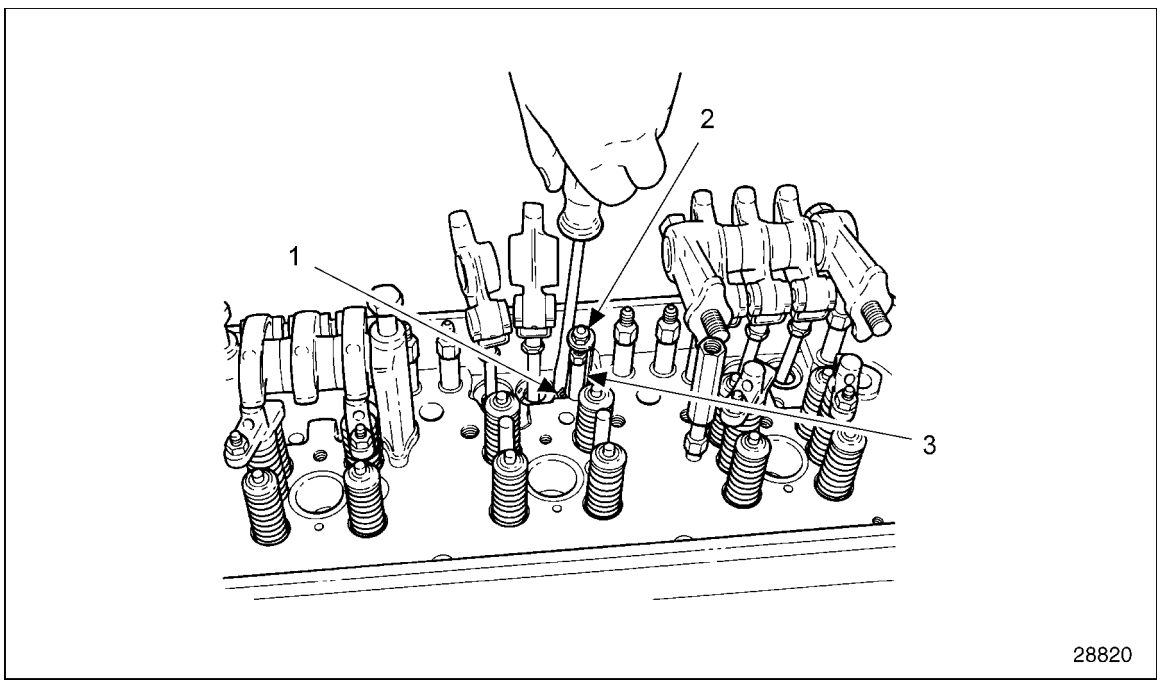
The unidirectional air flow toward the exhaust valves produces a scavenging effect, leaving the cylinders full of clean air when the piston again covers the inlet ports.

⚠ WARNING:

EYE INJURY

To avoid injury from flying parts when working with components under spring tension, wear adequate eye protection (face shield or safety goggles).

6. Remove the spring seat retainer from the groove in the cylinder head. See Figure 1-40.



1. Retainer
2. Washer
3. Remover

Figure 1-40 Removing Push Rod from Upper Side of Cylinder Head using Tool J 3092-01

7. Unscrew the locknut to release the spring. Remove the nut, flat washer, and tool from the push rod.
8. Pull the push rod, spring, spring seats, and cam followers out of the cylinder head.

1.13 CRANKSHAFT REAR OUTBOARD BEARING SUPPORT

A rear outboard bearing support is provided on certain current 16V engines for generator set applications. See Figure 1-109. The support assembly is mounted in the flywheel housing to improve the ability of the engine rear crankshaft main bearing to sustain loads and bending forces externally induced by drive components.

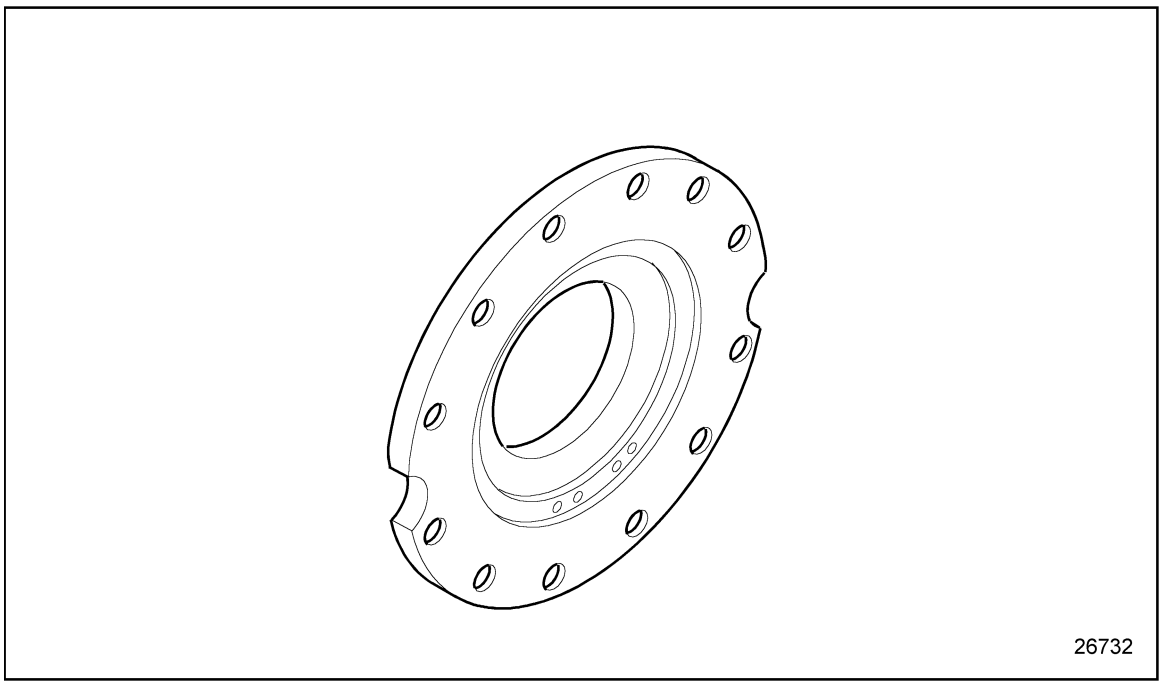
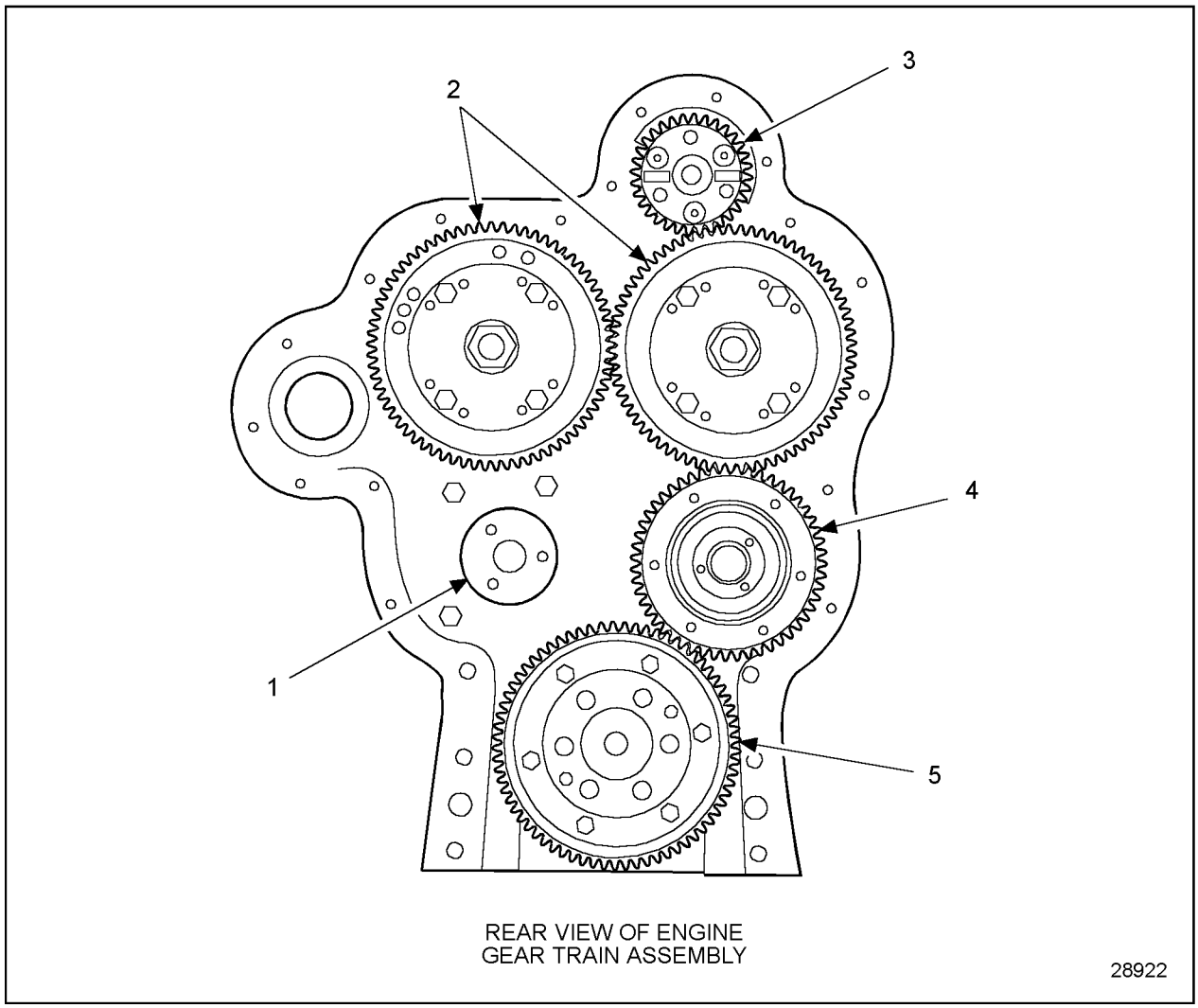


Figure 1-109 Rear Outboard Bearing Support Assembly

The outboard bearing support assembly incorporates the bearing support and a crankshaft outboard bushing.

The support assembly also serves as a retainer for the crankshaft rear oil seal. This seal is not supplied with the support assembly but is serviced as a separate item. A seal ring is used on the back of the support assembly that fits between the support assembly and the flywheel housing.

To minimize oil leakage into the flywheel housing, the current idler gear spacer (dummy hub) is used in engines not equipped with an integral idler gear spacer type flywheel housing. See Figure 1-214.



1. Dummy Hub
2. Camshaft
3. Blower Drive
4. Idler Gear Assembly
5. Crankshaft Drive Gear

Figure 1-214 Location of Idler Gear and Dummy Hub

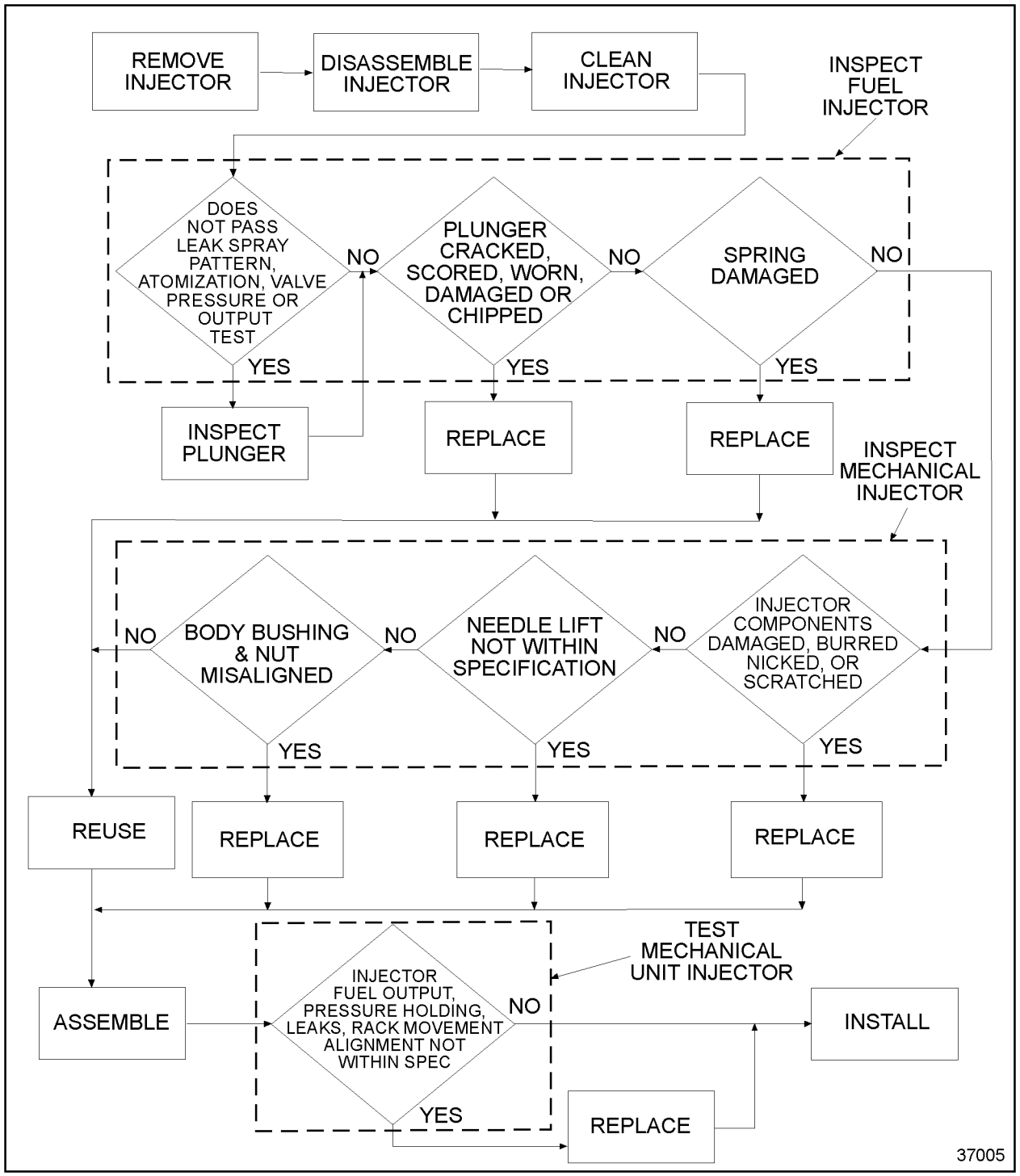


Figure 2-8 Flowchart Repair or Replacement of Mechanical Unit Injector

2.2.2 Removal of Mechanical Unit Injector

Remove the injector as follows:

1. Clean and remove the valve rocker cover. Discard the gasket.

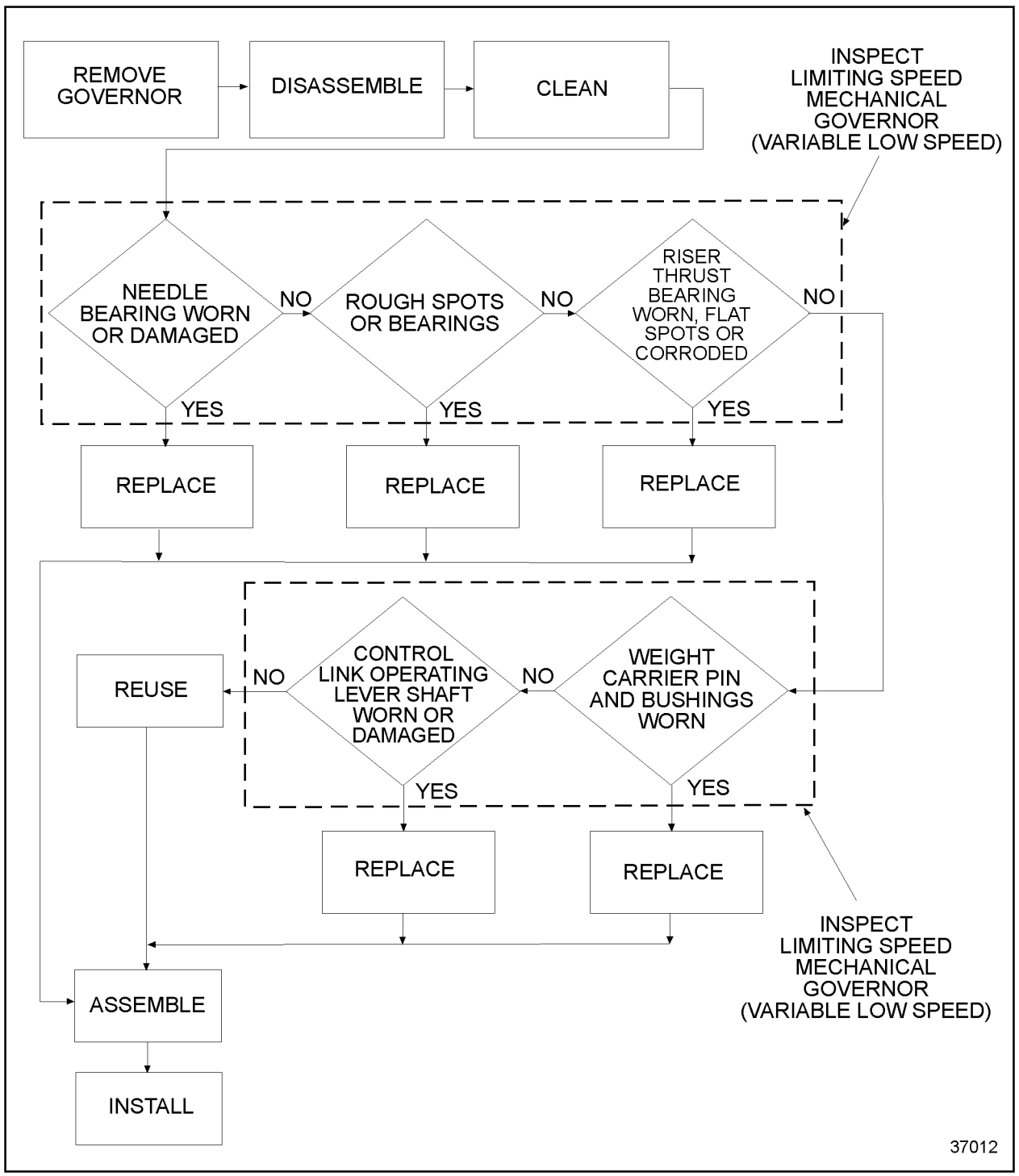


Figure 2-158 Flowchart for Repair or Replacement of Limiting Speed Mechanical Governor (Variable High-Speed)

2.26.2 Removal of Limiting Speed Mechanical Governor (Variable High-Speed)

To remove the governor, refer to section 2.24.2.

the drill end of the spray tip cleaner tool J 24838, and hold the tip body against the buffing wheel. Rotate the spray tip while it is being buffed.

6. When the spray tip body is clean, lightly buff the end of the tip to clean the spray tip orifice area.

⚠ WARNING:

EYE INJURY

To avoid injury from flying debris when using compressed air, wear adequate eye protection (face shield or safety goggles) and do not exceed 276 kPa (40 psi) air pressure.

7. Wash the spray tip in clean solvent, and dry it with compressed air.

⚠ WARNING:

EYE INJURY

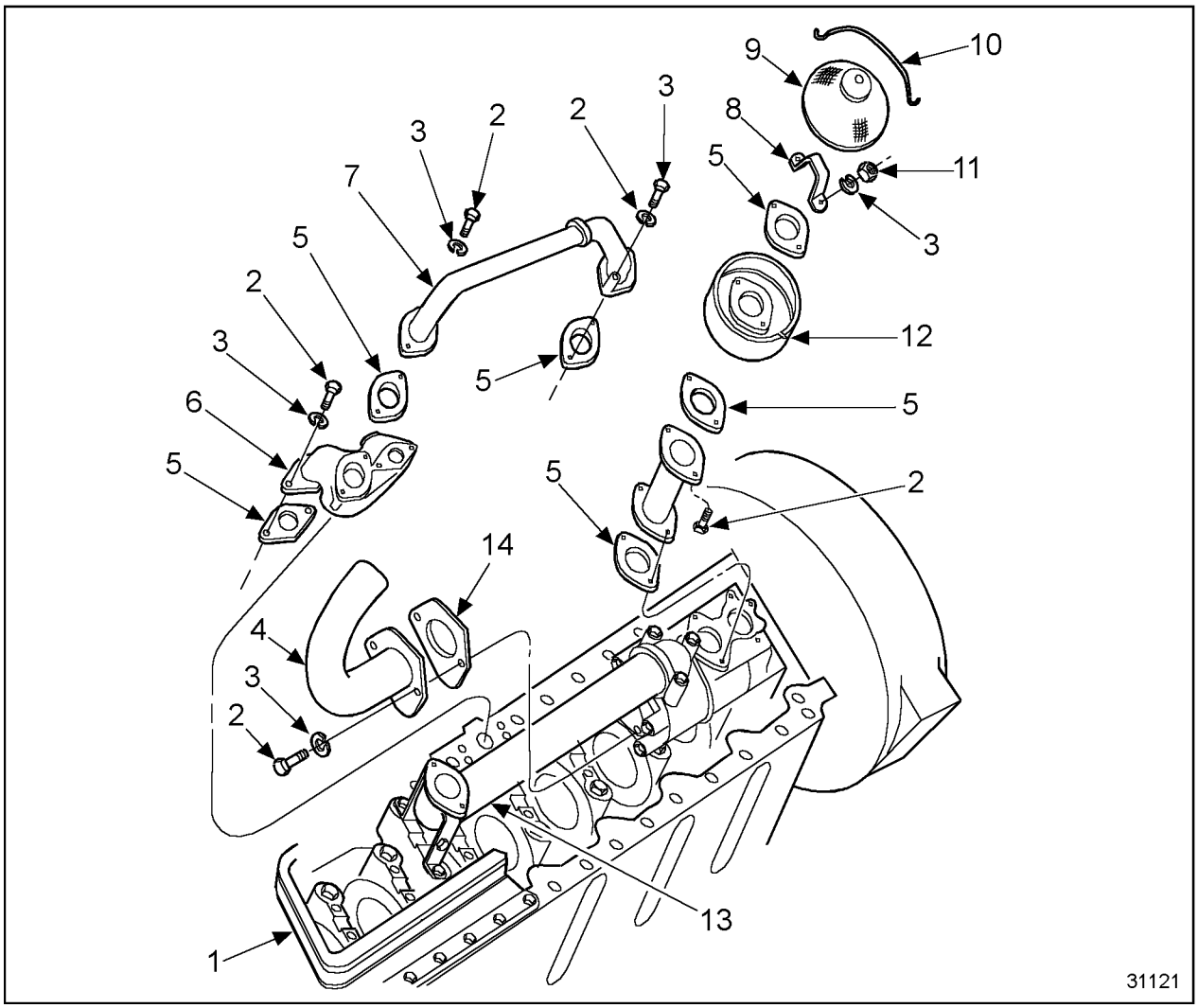
To avoid injury from flying debris when using compressed air, wear adequate eye protection (face shield or safety goggles) and do not exceed 276 kPa (40 psi) air pressure.

8. Using compressed air clean and blow out all injector body passages.

CHECK INJECTOR FUEL OUTPUT

Perform the injector fuel output test in calibrator. See Figure 2-252.

NOTE:
If calibrator J 22410 is not available use updated calibrator J 39300. Tools used on these machines ***are not interchangeable***. Refer to OEM.



1. Cylinder Block
2. Bolt
3. Lock Washer
4. Scavenging Outlet Pipe
5. Gasket
6. Junction Block
7. Oil Pump Outlet Tube Assembly
8. Oil Pump Screen Support
9. Screen
10. Oil Pump Inlet Retainer
11. Nut
12. Screen Housing
13. Scavenging Inlet Tube
14. Outlet Gasket

Figure 3-19 Disassembly of Oil Pump for 12V and 16V Engines

1. Remove the five bolts, and lift the scavenging pump body from the pump body.
2. Withdraw the scavenging pump drive and driven gears from the pump shafts.
3. Remove the Woodruff keys from the drive shaft.
4. Remove the spacer.
5. Withdraw the driven shaft and gear as an assembly from the pump body.

⚠ WARNING:

EYE INJURY

To avoid injury from flying debris when using compressed air, wear adequate eye protection (face shield or safety goggles) and do not exceed 276 kPa (40 psi) air pressure.

5. Dry them with compressed air.
6. Reassemble the screen, cover, and oil intake pipe.

3.3.3.2 Inspection of Oil Pump (12V and 16V Engines)

Inspect the oil pump as follows:

1. Visually inspect the internal gear cavity of the pump body and scavenger pump (if used) for wear or scoring.
   [a] If the pump body is excessively worn or scored, it must be replaced.
   [b] If not excessively worn or scored, continue inspection.
2. Inspect the pump cover and spacer between the pump and scavenger pump bodies for wear.
   [a] If worn, replace the pump cover and spacer. Refer to section 3.3.5.
   [b] If not worn, reuse the parts.
3. Inspect the bushings in the pump body (or scavenging body) and cover.

5.2.1.9 The Use of High Sulfur Fuels

Although diesel fuels containing more than 0.5% sulfur are considered high sulfur fuels, piston ring wear studies have shown that the combustion of fuels containing more than 0.3% sulfur significantly increases ring face wear rates. See Figure 5-2.

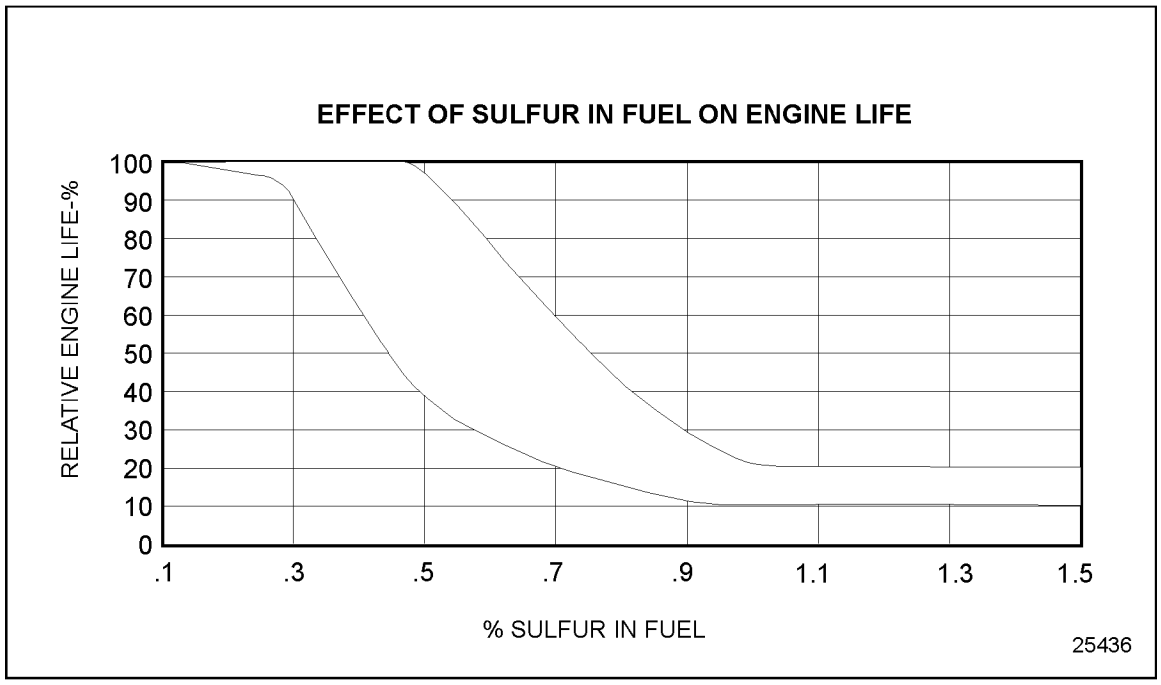


Figure 5-2 Effect of Sulfur in Fuel on Engine Life

High fuel sulfur forms acids during combustion, particularly during idling and low temperature operation. The best defense against the effects of high sulfur fuel is to shorten oil drain intervals. The proper drain interval may be determined by oil analysis or by using the drain intervals listed in Table 5-19.

Service Application	Oil Drain Interval
Highway Truck & Motor Coach	10,000 Miles (16,000 km)
City Transit Coaches	4,000 Miles (6,400 km) or 3 Months Maximum*
Pick-up & Delivery Stop & Go, Short Trip	8,000 Miles (12,500 km)
Industrial, Agricultural and Marine	150 Hours or 1 Year*
Stationary Units, Continuous	200 Hours or 2 Months*
Stationary Units, Standby	100 Hours or 8 Months*

* Whichever comes first

Table 5-19 Maximum Allowable Oil Drain Intervals - Normal Operation with High Sulfur Fuel (Above 0.5%) Use Oil Analysis to Determine Optimum Drain Intervals

4. Place the turbocharger assembly into position on the mounting bracket. Use a new gasket between the exhaust manifold adaptor and the turbine housing flange.

NOTE:
When attaching the exhaust flange or adaptor to the turbine housing, ensure that the inner diameter of the flange or adaptor is the same as the turbine housing inner diameter. The turbine opening in the T18A40 turbocharger is 97.79 mm (3.850 in.), the T18A90 turbocharger is 107.95 mm (4.250 in.), the TV71 turbocharger is 88.392 mm (3.480 in.), the TV81 turbocharger is 98.8568 mm (3.892 in.).

5. Secure the turbocharger to the mounting bracket with bolts, lock washers, and nuts. Tighten the nuts enough to hold the turbocharger tightly against the bracket.

NOTE:
When self-locking nuts are used to secure the turbocharger to the mounting bracket, ensure that the thread fully engages the bolts.

6. Slide the blower air inlet hose over the compressor housing outlet opening. Center the hose between the turbocharger and the blower air inlet housing.
7. Secure the clamps with the "T" section positioned away from the parting line on the air inlet housing.

NOTICE:
When installing the left-bank exhaust manifold-to-turbocharger tube on a blower mounted turbocharger, it is important to install the tube correctly. If the tube is installed incorrectly, the flange area can crack and adversely affect performance.

NOTE:
Ensure the exhaust manifold remains seated on the locating pads on the cylinder head.

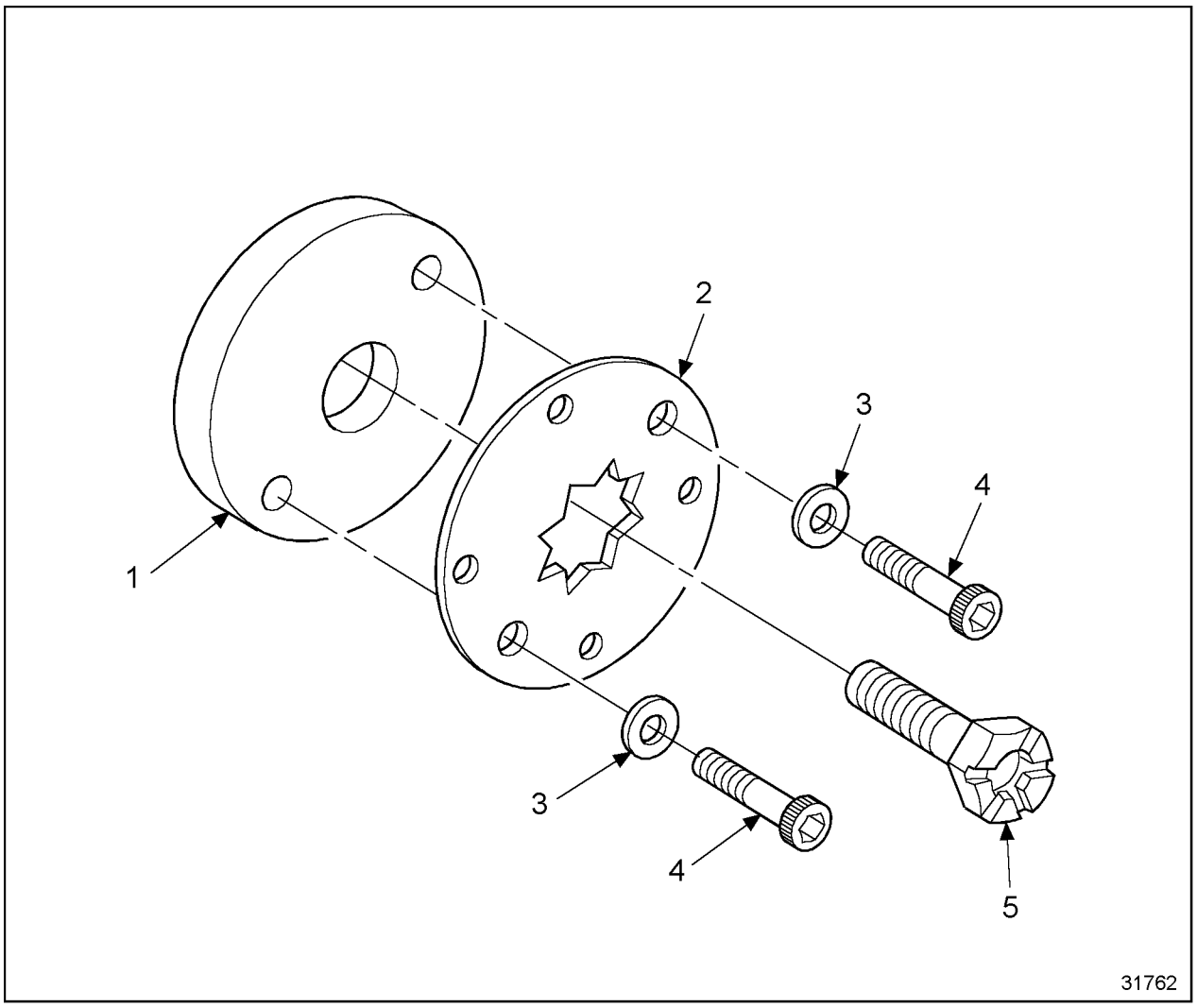
NOTE:
The solid left-bank tube is almost symmetrical. Thus, it is difficult to identify which end goes where. Position the tube between the exhaust manifold and the turbocharger and determine that the conical seat at each end of the tube is a flush fit with the openings. If not, reverse the tube and check to ensure that each end of the tube fits flush with the openings.

NOTE:
To help in tube installation, loosen the exhaust manifold mounting bolts and tighten them alternately while tightening the tube clamps.

8. Tighten the turbocharger to exhaust manifold adaptor bolts securely.

CAMSHAFT GEAR RETAINING BOLT LOCKING PLATE (COACH ENGINES WITH 50DN ALTERNATORS)

Because of the positive torque retention provided by this kit. Detroit Diesel recommends installing it on these units whenever the alternator is removed for any reason. See Figure 8-28.



1. Locking Washer
2. Locking Plate
3. Washer
4. Bolts
5. Camshaft Gear Bolt

Figure 8-28 Camshaft Gear Retaining Bolt Locking Plate (Coach Engines)

Removal of Camshaft Gear Bolt Locking Plate

Install the camshaft gear bolt locking plate as follows:

1. Remove the alternator, camshaft gear retaining bolt, and washer from the engine.
2. Discard the camshaft gear bolt and washer.

See Figure 12-8 for chart of the 1979 certified automotive engines.

	FEDERAL ENGINES					CALIFORNIA ENGINES				
FAMILIES	6V-92TA COACH	6V-92TA	6V-92TTA	8V-92TA	8V-92TTA	6V-92TAC COACH	6V-92TAC	6V-92TTAC	8V-92TAC	8V-92TTAC
Injectors	9B70 9B75 9B80	9B70, 9B75 9B80, 9B85 9B90	9B90	9A80 9A85 9A90	9A90	9B70 9B75 9B80	9B70, 9B75 9B80, 9B85 9B90	9B90	9A80 9A85 9A90	9A90
Maximum Full Load Speed	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100
Minimum Full Load Speed	1800	1800	1800	1900	1800	1800	1800	1800	1900	1800
Minimum Idle Speed	500	500	500	500	500	500	500	500	500	500
Gear Train Timing	Std.	Std.	Std.	Std.	Std.	Std.	Std.	Std.	Std.	Std.
Injector Timing	1.470	1.470	1.470	1.480	1.480	1.490	1.490	1.490	1.500	1.500
Throttle Delay Setting	.636 ①	§ .504 9B90-.570	§ .570	§ .570 9A90-.636	.636 §	.636 ①	.570 § 9B90-.636	.636 §	.594 § 9A90-.660	.660 §
Liner Port Height	.95	.95	.95	.95	.95	.95	.95	.95	.95	.95
Liner Part Number	5107176	5107176	5107176	5107176	5107176	5107176	5107176	5107176	5107176	5107176
Turbocharger A/R	TV8102 1.23 A/R	TV8102 1.23 A/R	TV8102 1.23 A/R	TV8101 ▲ 1.60 A/R	TV8101 ▲ 1.60 A/R	TV8102 1.23 A/R	TV8102 1.23 A/R	TV8102 1.23 A/R	TV8101 ▲ 1.60 A/R	TV8101 ▲ 1.60 A/R
Turbocharger Part Number	5102353	5102353	5102353	‡ 5101513	‡ 5101513	5102353	5102353	5102353	‡ 5101513	‡ 5101513
Blower Drive Ratio	2.05:1	2.05:1	2.05:1	1.95:1	1.95:1	2.05:1	2.05:1	2.05:1	1.95:1	1.95:1
Blower Part Number	5101528	5101528	5101528	5101483	5101483	5101528	5101528	5101528	5101483	5101483
Compression Ratio	17:1	17:1	17:1	17:1	17:1	17:1	17:1	17:1	17:1	17:1
Exhaust Valve Material	Stellite Face Inconel X	Stellite Face Inconel X	Stellite Face Inconel X	Stellite Face Inconel X	Stellite Face Inconel X	Stellite Face Inconel X	Stellite Face Inconel X	Stellite Face Inconel X	Stellite Face Inconel X	Stellite Face Inconel X
Exhaust Valve Part Number	5100437 †	5100437 †	5100437 †	5100437	5100437	5100437	5100437	5100437	5100437	5100437
Certification Label Number	14B7-270	14B7-270	14B7-270	14B7-272	14B7-272	14B7-271	14B7-271	14B7-271	14B7-273	14B7-273

① Double fill hole (.250) .016 diameter discharge orifice.

† 6V-92TA - Carpenter valve. Available.

‡ Double 0-92 (5107590).

§ Small fill hole (.078 dia.) .016 diameter discharge orifice.

▲ Optional 5LM-864, 6.5 sq. in., 5107687.

PIN GAGE

J-25558 For .069" & .072"

TIMING GAGES

Series 53, 71 & 92

J-1853 For 1.460"
J-26888 For 1.466"
J-24236 For 1.470"
J-29065 For 1.480"
J-1242 For 1.484"
J-29066 For 1.490"
J-9595 For 1.496"
J-25454 For 1.500"
J-8909 For 1.508"
J-25502 For 1.520"

THROTTLE DELAY AND STARTING AID GAGES

J-24889 For .345"
J-28779 For .365"
J-24882 For .385"
J-9509-2 For .404"
J-23190 For .454"
J-29062 For .504"
J-25559 For .570"
J-26927 For .586" & .686"
J-25560 For .636"
J-29064 For .660"

37441

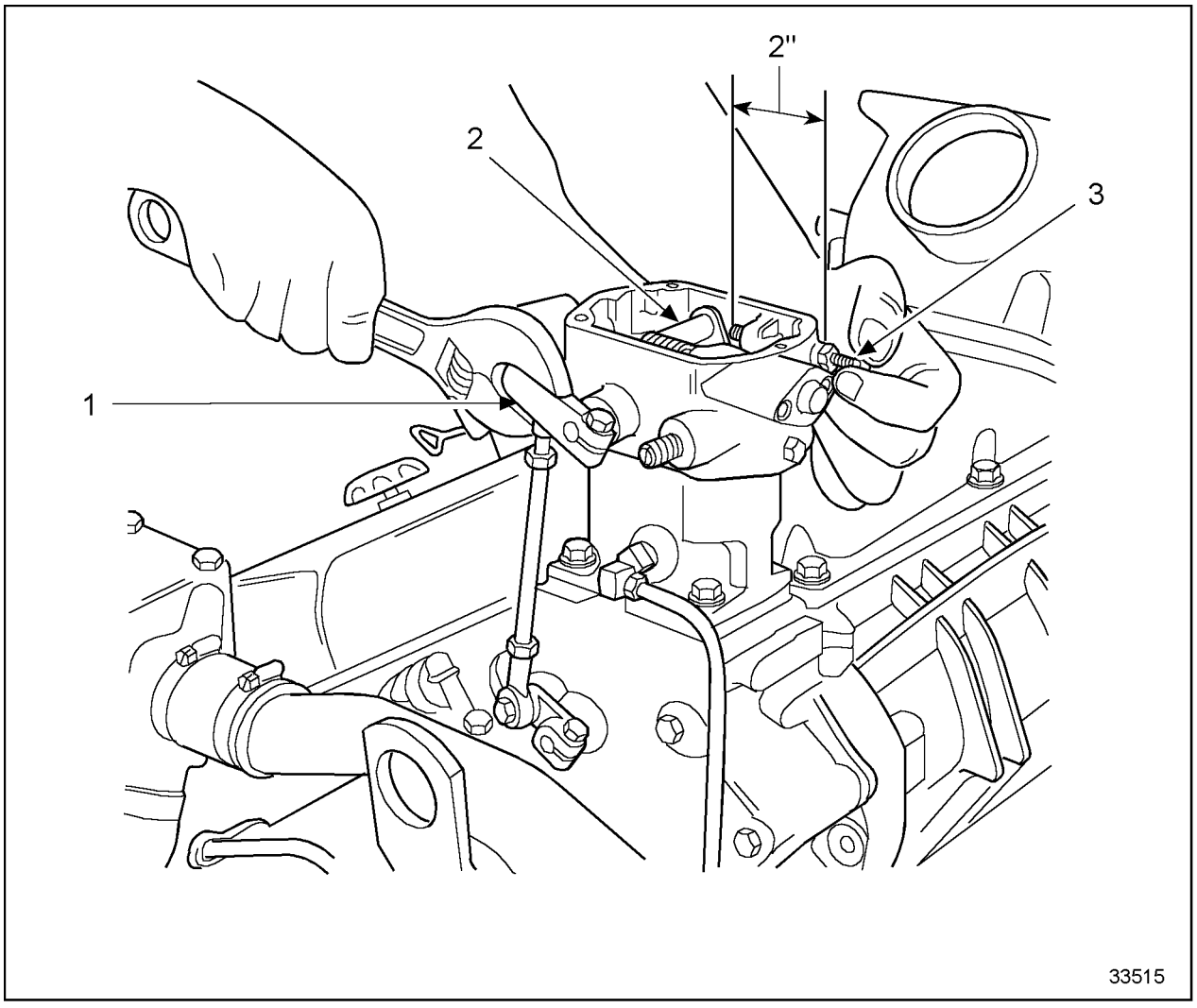
Figure 12-8 1979 Certified Automotive Engines

12.12.3 Adjust Load Limit

The load limit is set at the factory and adjustment is unnecessary. If the governor has had major repairs or the injector rack control levers have been repositioned, the load limit screw should be adjusted. With the injector rack control levers properly adjusted, set the load limit as follows:

1. Loosen the load limit screw locknut, and adjust the load limit screw to obtain a distance of approximately 51 mm (2 in.) from the outside face of the boss on the governor subcap to the end of the screw.
2. Place and retain the governor operating lever in the full fuel position. See Figure 12-132.

NOTE:
Do not overstress the linkage.



1. Governor Operating Lever
2. Terminal Lever
3. Load Limit Screw

Figure 12-132 Adjusting Load Limit Screw

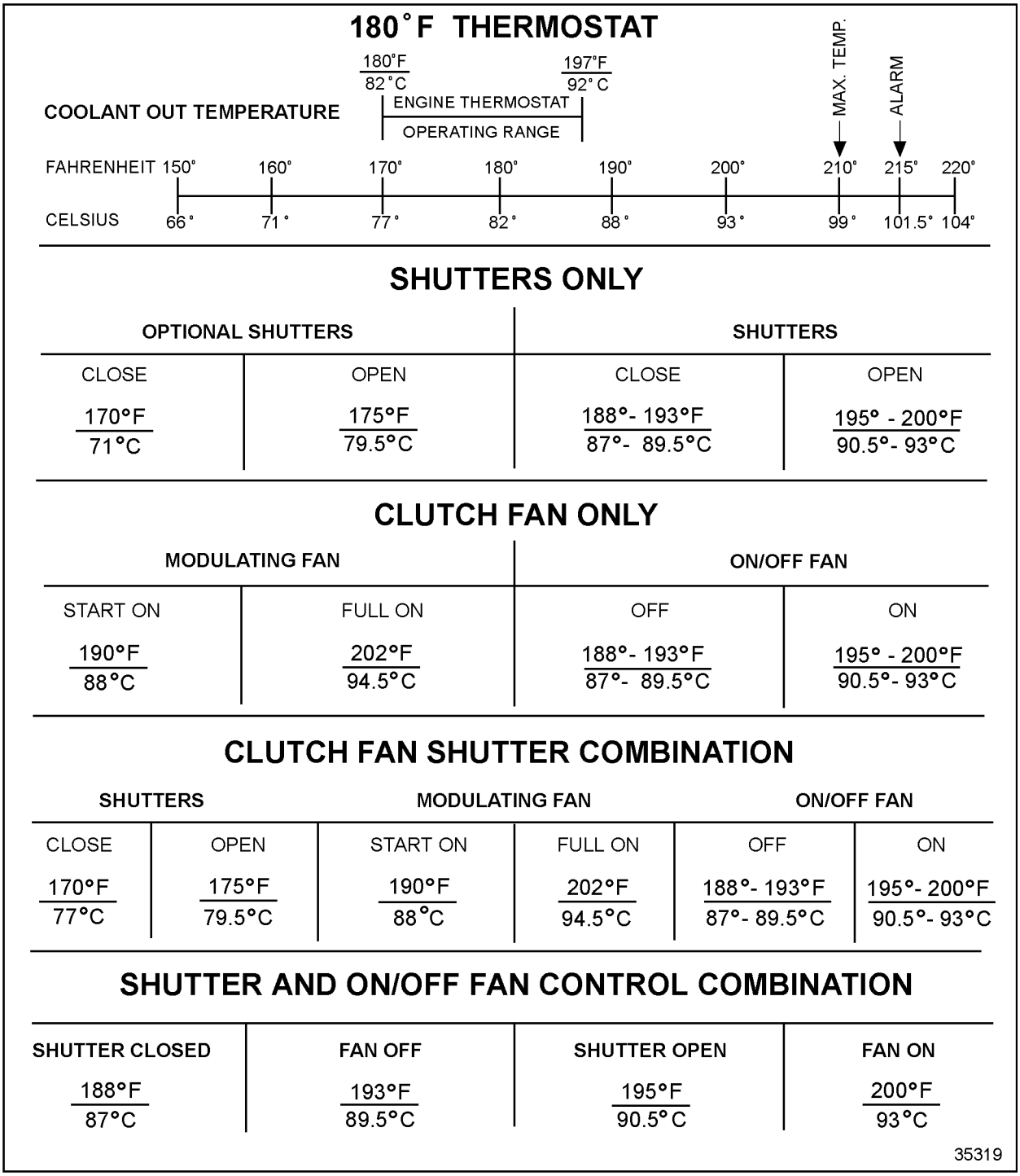


Figure 13-4 Recommended Settings for Coolant Temperature Control Devices (2 of 2)

NOTE:
Coolant temperature instability will result from improper component operating sequence.