SERIAL NUMBERS

3304: 78P
3306: 3N
The only part in the alternator which has movement is the rotor. The rotor is held in position by a ball bearing at the drive end and a roller bearing at the rectifier end.

The compartment for the regulator is sealed. The regulator controls the alternator output according to the needs of the battery and the other components in the electrical system.

Generator

The generator is belt driven by the diesel engine. The generator keeps the battery charged and supplies current to operate the electrical components.

Generator Regulator

The generator regulator controls the output of the generator. The regulator incorporates three controls: the cutout relay, the voltage regulator and the current regulator. Each control has contact points which are operated by electromagnets.

Springs hold the cutout relay points open and the voltage regulator and current regulator contact points closed. The spring tension for each unit is a force opposing the force of the electromagnets.

The cutout relay prevents the battery from motorizing a generator that is not producing enough voltage. Generator voltage approximately equal to battery voltage will close the cutout relay points. This closes the circuit between the generator and the battery. The generator can now supply the battery and the components of the electrical system with power.

The voltage regulator prevents the generator from producing damaging high voltage. Generator voltage slightly higher than battery voltage opens the regulator points causing the generator output voltage to lower. Low generator voltage allows the spring to close the regulator points and generator voltage is again high. The action of the voltage regulator points, opening and closing, controls the output voltage of the generator. The points can open and close as often as 200 times per second.

The current regulator limits the current produced by the generator to allow the generator to continue producing voltage equal to battery voltage. When the generator produces current equal to the current regulator setting, the regulator contact points open. Open points lower the generator current. Low current allows the spring to close the points and generator current is again high. The opening and closing of the current regulator points, limits the current produced by the generator. The points can open and close as often as 200 times per second.

When generator electric loads are low and the battery requires very little charging, the VOLTAGE REGULATOR contact points are operating. When electric loads are high, the CURRENT REGULATOR contact points are operating. The contact points of the two units, will never open at the same time.
3306 VEHICULAR ENGINE

**CYLINDER LINER**

1. **Bore in liner**
   - New: 4.751 ± 0.001 in. (120.68 ± 0.025 mm)
   - Use again maximum bore when measured near upper end of the wear surface of the cylinder liner (4.755 in. (120.78 mm))

2. **Thickness of flange on liner**
   - .4048 ± 0.0008 in. (10.282 ± 0.020 mm)

3. **Put filler band in diesel fuel, then immediately install on the cylinder liner.**
   - Put a thin layer of SAE 30W oil on the band then immediately install the cylinder liner in the cylinder block before expansion of the band.

**NOTE:** Make reference to **GUIDELINE FOR REUSABLE PARTS: PISTONS AND CYLINDER LINERS,** Form No. SEBF8001.

**CYLINDER LINER PROJECTION**

Make reference to **CYLINDER LINER PROJECTION** in Testing and Adjusting for the complete procedure.

1. Install tooling as shown. Tighten bolts (1) evenly in four steps:
   - **1st step** ................................ 5 lb. ft. (7 N·m)
   - **2nd step** ................................ 15 lb. ft. (20 N·m)
   - **3rd step** ................................ 25 lb. ft. (35 N·m)
   - **4th step** ................................ 50 lb. ft. (70 N·m)

2. Measure cylinder liner projection with dial indicator (7) clamped in 1P2402 Block (6) as shown. Measure at four places around each cylinder liner near the clamped area.
   - Average of four projection measurements from any cylinder liner must be ............ .0020 to .0056 in. (0.051 to 0.141 mm)
   - Maximum permissible difference between all four measurements ...................... .001 in. (0.03 mm)
   - Maximum permissible difference between average projection of any two cylinders next to each other .......................................................... .001 in. (0.03 mm)

**NOTE:** If liner projection is not correct, turn the liner to a new position within the bore. If projection can not be corrected this way, move the liner to a different bore. If the projection can not be corrected this way, make reference to **Special Instruction,** Form No. FM038228 for complete instructions on the use of 8S3140 Counterboring Tool Arrangement.

(1) Bolts [5/8” NC, 5.5 in. (140 mm) long]
(2) Crossbar (from 887548 Push-Puller)
(3) 4824281 Washers
(4) 1P2394 Adapter Plates
(5) 3H465 Plates
(6) 1P2402 Block
(7) 1P2403 Dial Indicator

**SHIM THICKNESS, COLOR CODE, AND PART NUMBER**

<table>
<thead>
<tr>
<th>SHIM THICKNESS, COLOR CODE, AND PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLACK</td>
</tr>
<tr>
<td>8S6045</td>
</tr>
<tr>
<td>.007 in.</td>
</tr>
<tr>
<td>0.18 mm</td>
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</table>
4. Put timing pin (1) in hole (3). Turn the flywheel slowly in a counterclockwise direction, as seen from the flywheel end, until timing pin (1) goes into the notch in the camshaft.

CAUTION: The flywheel must be turned slowly so that damage is not done to the fuel system when the timing pin goes into the notch in the camshaft.

5. Put a 3/8"—16 NC bolt in the timing hole in the flywheel housing. If the bolt can be installed in the hole in the flywheel, the timing of the fuel injection pump is correct.

6. If the bolt does not go into the hole in the flywheel, remove cover (4) from the front housing.

7. Loosen bolt (5) holding the drive gear for the fuel injection pump to the drive sleeve for fuel injection pump.

8. Install tools as shown and loosen the drive gear for the fuel injection pump from the drive sleeve for the fuel injection pump.
11. Install a 3/8 in.–24 NF bolt, 1/2 in. (12.7 mm) long in one of the holes in the drive gear. Put a torque wrench on this bolt with the wrench in a line with the center of the drive gear, and give it a torque of 45 to 50 lb. ft. (60 to 70 N·m) in a clockwise direction as seen from the front of the engine. While holding this torque, tighten bolt (5) for the drive gear to a torque of 110 ± 5 lb. ft. (149 ± 7 N·m). Remove timing pin (1) from the fuel pump and the 3/8 in.–16 NC bolt from the flywheel.

9. Remove the 3/8”-16 NC bolt (10) from the flywheel. Turn the flywheel clockwise at least 60° beyond the point where the 3/8”-16 bolt (10) can be installed.

10. Tighten the bolt (5) finger tight. Be sure that the timing pin (1) is in the notch in the camshaft. Turn the flywheel counterclockwise until the 3/8”-16 bolt (10) can be installed in the flywheel.

12. Turn the engine flywheel two complete revolutions. If the 3/8”-16 bolt goes in the hole in the flywheel when the timing pin is installed in the notch in the camshaft, the timing is correct.

13. If the 3/8”-16 bolt cannot be installed in the hole in the flywheel, do steps 4 through 11 again.

Checking Timing by Fuel Flow Method

Tools Needed: 1P540 Flow Checking Tool Group
5P6524 Engine Timing Indicator Group.

See Special Instruction Form No. SMHS7083 for complete instructions for the fuel flow method of engine timing (injection sequence).
INSTALL CYLINDER HEAD

1100—12

1. Thoroughly clean the spacer plate and bottom surface of the cylinder head. Install a new head gasket (2), water ferrules (1) and O-ring seal (3) on the hollow dowel.

NOTE: Be sure a new gasket has been installed between spacer plate and cylinder block. See INSTALL SPACER PLATE.

2. Fasten a hoist and install the cylinder head assembly (4) on the cylinder block.

3. Install the push rods and put the rocker shaft in position on the cylinder head. Put SP3931 Anti-Seize Compound on the threads of the cylinder head and rocker shaft bolts. Install the bolts and washers and tighten the bolts as follows:

   Step 1. Tighten all bolts in number sequence to a torque of 115 lb. ft. (155 N·m).
   Step 2. Again tighten all bolts in number sequence to a torque of 185 ± 13 lb. ft. (250 ± 17 N·m).
   Step 3. Again tighten all bolts in number sequence (hand torque only) to a torque of 185 ± 13 lb. ft. (250 ± 17 N·m).
   Step 4. Tighten all bolts in letter sequence to a torque of 22 lb. ft. (30 N·m).
   Step 5. Again tighten all bolts in letter sequence to a torque of 32 ± 5 lb. ft. (43 ± 7 N·m).
   Step 6. Again tighten all bolts in letter sequence to a torque of 32 ± 5 lb. ft. (43 ± 7 N·m).

4. Make adjustment of valves to have a clearance of .015 in. (0.38 mm) for intake and .025 in. (0.64 mm) for exhaust.

5. Install oil return line (6) on the turbocharger.

6. Install oil supply line (5) on the turbocharger.

7. Tighten the two bolts (8) in the water pump.

8. Install the two bolts (7) that hold the water pump to the cylinder head.

end by:
   a) install fuel injection lines