

SECTION 6

EXHAUST SYSTEM

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EXHAUST SYSTEM

Fan and radiator cooled engines are equipped with an air-cooled exhaust manifold. A water-cooled exhaust manifold is provided for engines incorporating a heat exchanger or keel cooling system.

The outlet flange may be located at the end or at the mid-section of the exhaust manifold, depending upon the

installation requirements. A flexible exhaust connection or a muffler may be attached to the outlet flange.

The exhaust manifold is attached to studs located between the exhaust ports and the outer side of the two end ports in the cylinder head. Special washers and nuts secure the manifold to the cylinder head.

EXHAUST MANIFOLD (Air-Cooled)

The cast air-cooled manifold (Fig. 1) has a uniform circular cross-section and tapers upward from each end toward the center where a flange is provided for the attachment of the exhaust piping or muffler.

A new exhaust manifold hold-down crab is now being used. The new hold-down crab is made of a hardened steel and is heavier than the former hold-down crab. This will minimize wear and gouging of the manifold, crab and cylinder head mating surfaces, which results in a loss in the torque on the hold-down crab nut. The former and the new hold-down crab are interchangeable on an engine however only the new crab will be serviced.

Also a new special washer is now used at the center portions of the exhaust manifolds. This new washer will more accurately control the seating area for the 7/16" nut or bolt. Only the new special washer will be serviced.

Remove Exhaust Manifold

Usually, the exhaust manifold will be removed with the cylinder head. However, when the exhaust manifold gaskets only need to be replaced, the manifold may be removed in the following manner without removing the cylinder head:

1. Loosen the flange seal connecting the exhaust manifold at the outlet tube.
2. Disconnect the exhaust pipe or muffler from the exhaust manifold flange.
3. Loosen and remove the nuts and bevel washers which secure the exhaust manifold to the cylinder head. It is suggested that, as a safeguard, one nut and washer be loosened and left on one of the center studs until all other nuts and washers have been removed.
4. Support the manifold and remove the nut and washer from the center stud.

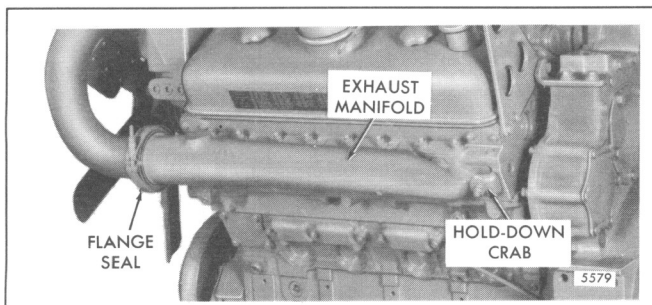


Fig. 1 – Typical Cast Air-Cooled Exhaust Manifold Mounting

5. Lift the manifold away from cylinder head.
6. Remove the manifold gaskets.

Inspection

Remove the loose scale and carbon that may have accumulated on the internal walls of the exhaust manifold. It is especially important to clean the manifold used on a turbocharged unit to eliminate the possibility of loose scale entering and damaging the turbocharger.

Examine the exhaust manifold studs for damage. If necessary, replace the studs. New studs are driven in to 25–40 lb-ft (34–54 N•m) torque.

Install Exhaust Manifold

With all traces of the old gaskets removed from the cylinder head and bolting flanges of the exhaust manifold, install it as follows:

1. Make sure the internal walls of the manifold are clean to eliminate possible damage to the turbocharger, if used.
2. Place new gaskets over the studs and up against the cylinder head. Metal-clad gaskets may look reusable, but once they've been used and taken a "set" they cannot be reused.

NOTICE: When installing the metal clad exhaust manifold gasket(s) be sure the crimped side of the gasket (Fig. 2) faces the cylinder head.

3. Position the exhaust manifold over the studs and up against the gasket.

NOTICE: Be sure the locating pads on the exhaust manifold rests on the cylinder block locating pads.

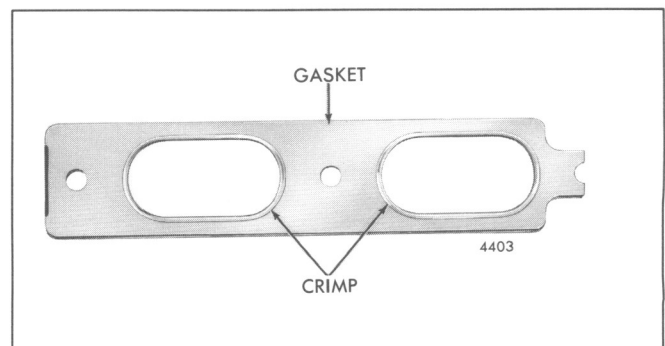


Fig. 2 – Metal Clad Exhaust Manifold Gasket

4. Install the bevel washers and nuts on the studs and draw the exhaust manifold up against the gasket. Set the bevel washers in position so that outer diameter will rest on the manifold and the crown at the center is next to the nut. Tighten the exhaust manifold stud nuts from the center of the exhaust manifold outward, alternating toward either end. Torque the nuts to 30–35 lb–ft (41–47 N•m).
5. Connect the exhaust pipe or muffler to the exhaust manifold flange.

6. Tighten the flange seal connecting the exhaust manifold to the outlet tube.

NOTICE: Do not allow exhaust piping to impose excessive loads on the turbocharger.

7. Inspect the exhaust outlet piping for dents, holes and potential sources of water infiltration such as loose clamps or deteriorated seals. Repair or replace, if necessary.

EXHAUST MANIFOLD (Water-Cooled)

The one-piece water-cooled manifold (Fig. 1) is cast with an integral water jacket surrounding the exhaust chamber. The diameter of the exhaust chamber increases uniformly from one end to the other where it terminates in a flange to which an elbow and flexible exhaust connection is attached. A portion of the engine coolant is bypassed from the rear of the cylinder block into the rear end of the jacket surrounding the exhaust manifold and is discharged from the forward end through a tube into the thermostat housing. A drain cock is installed in the bottom of the manifold for draining the water jacket. A plug is provided in the bottom of the exhaust manifold elbow for draining moisture condensed from the exhaust gases.

First model 8122-7400 marine engines were built with four-bolt design exhaust manifolds, covers, connectors, gaskets and turbo exhaust inlet elbows. This design was replaced by six-bolt design components after a short production run. The six bolt design is now standard on all 12V-92 TA marine engines.

Only the six-bolt design parts and the four-bolt design connector, cover and gasket will be serviced. When a former manifold or turbo exhaust inlet elbow requires replacement, all four-bolt design parts must be replaced by six-bolt design parts.

Remove Exhaust Manifold

Usually, the exhaust manifold will be removed with the cylinder head. However, when the exhaust manifold gasket only needs to be replaced, the manifold may be removed in the following manner without removing the cylinder head:

1. Drain the cooling system.
2. Disconnect the water inlet and the water outlet tubes from the exhaust manifold.
3. Disconnect the exhaust pipe from the flange so that it will not interfere with removal of the exhaust manifold.
4. Loosen and remove the nuts and bevel washers which secure the exhaust manifold to the cylinder head. It is suggested that, as a safeguard, one nut and washer be loosened and left on one of the center studs until all other nuts and washers have been removed.
5. Support the manifold and remove the nut and washer from the center stud.

6. Lift the manifold off the studs and away from the cylinder head.
7. Remove the manifold gasket.

Inspection

Remove the loose scale and carbon that may have accumulated on the internal walls of the exhaust manifold. It is especially important to clean the manifold used on a turbocharged unit to eliminate the possibility of loose scale entering and damaging the turbocharger.

Examine the exhaust manifold studs for damage. If necessary, replace the studs. New studs are driven in to 25-40 lb-ft (34-54 N•m) torque.

Install Exhaust Manifold

With all traces of the old gasket removed from the cylinder head and bolting flange of the exhaust manifold, it may be installed as follows:

1. Make sure the internal walls of the exhaust manifold are clean to eliminate possible damage to the turbocharger, if used.
2. Place a new gasket over the studs and up against the cylinder head.
3. Position the exhaust manifold over the studs and up against the gasket.

NOTICE: Be sure the locating pads on the exhaust manifold rests on the cylinder block locating pads.

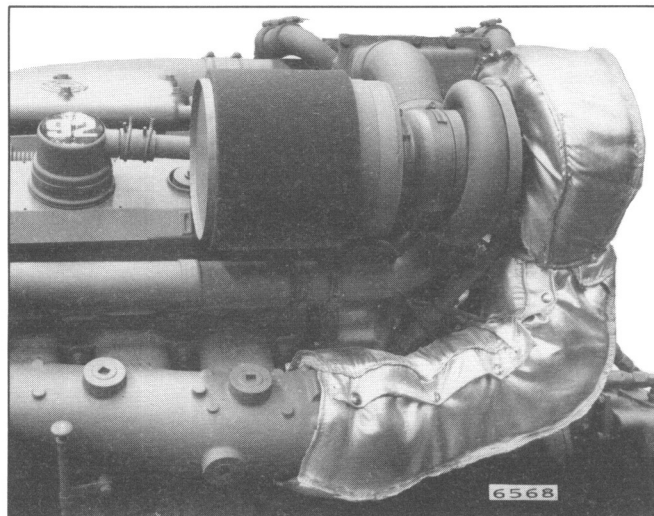


Fig. 1 - Typical Water-Cooled Exhaust Manifold Installation (8V-92 Engine Shown)

4. Install the bevel washers and nuts on the studs and draw the exhaust manifold up against the gasket. Bevel washers should be set in position so that the outer diameter will rest on the manifold and the crown at the center is next to the nut. The exhaust manifold stud nuts should be tightened from the center of the exhaust manifold outward, alternating towards either end. Torque the nuts to 30–35 lb–ft (41–47 Nm).
5. If the exhaust flange was removed from the manifold, install the flange using a new gasket.
6. Connect the exhaust pipe to the flange.

7. Connect the water inlet and outlet tubes to the manifold.

NOTICE: Do not allow exhaust piping to impose excessive loads on the turbocharger.

8. Inspect the exhaust outlet piping for dents, holes and potential sources of water infiltration such as loose clamps or deteriorated seals. Repair or replace, if necessary.
9. Fill the cooling system and check for leaks.