INSTALLATION INSTRUCTIONS

Original Issue Date: **1/98**
Model: **135-750 kW**
Market: **Industrial**
Subject: **Remote Radiator Cooling**

The following paragraphs provide general guidelines to consider when designing a remote radiator system. See Figure 1 for generator set model and radiator application data.

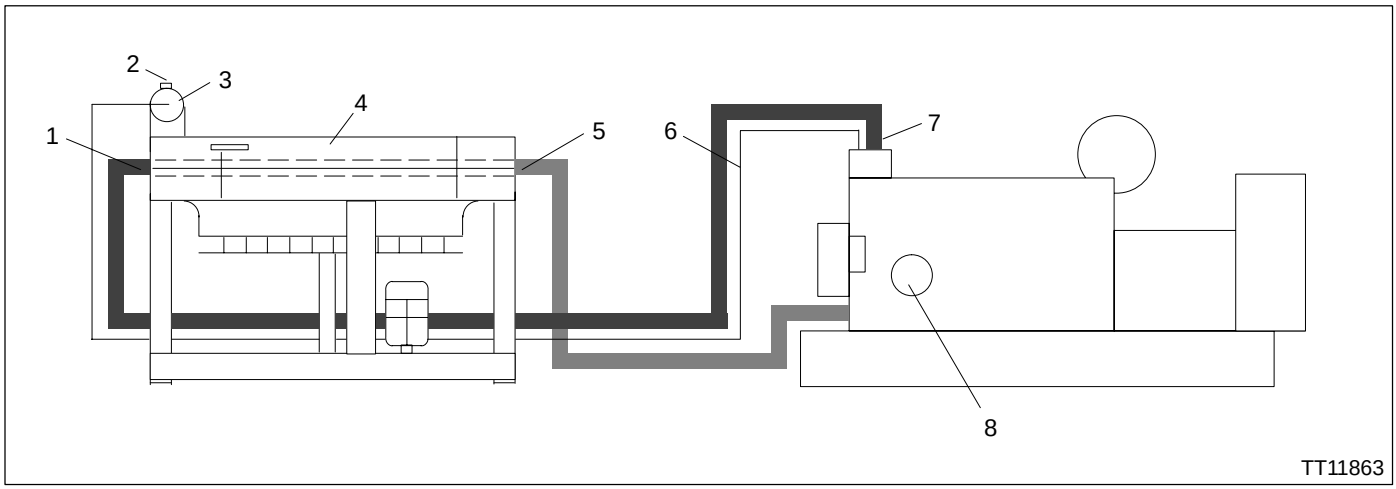
General

Use a remote radiator system for generator sets located in areas into which it is difficult to bring the volume of air required to cool a unit mounted radiator. An electric motor-driven fan mounted on the radiator circulates air across the radiators cooling fins. The cooling fan, wired to the generator output, operates whenever the generator set does. There is no need for thermostatic control of the fan motor because the engine thermostat prevents overcooling as it does on generator set mounted radiator systems.

Cooling systems are limited by radiator cap rated at 7 psi (48 kPa). Maximum radiator operating pressure is 20 psi (138 kPa) and maximum operating temperature is 250°F (121°C). Radiators are available for either vertical (Figure 3) or horizontal (Figure 2) discharge.

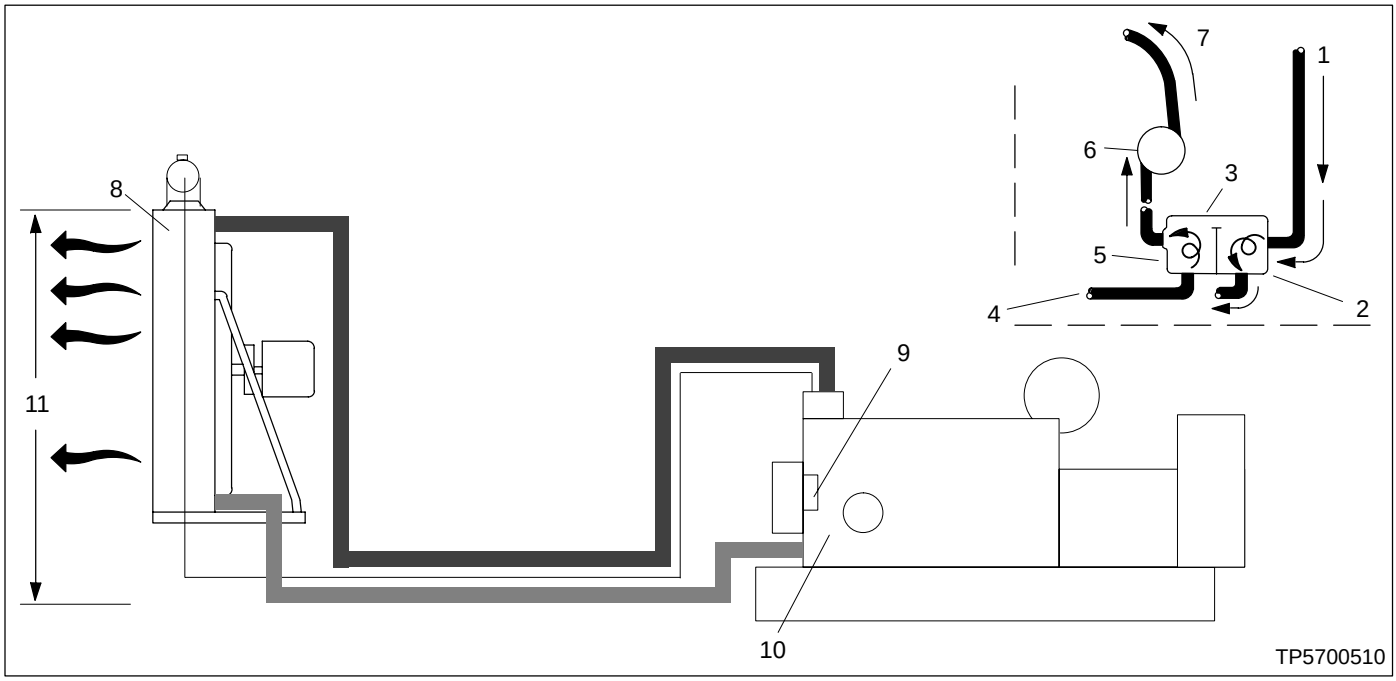
FAA CLIN	Generator Set Model	Remote Radiator Model	Voltage	Remote Radiator Kit	Remote Radiator
14.4	135ROZJ	M-5-HR-2	208	PA-354768	354777
15.4	135ROZJ	M-5-HR-2	208	PA-354768	354777
16.4	150ROZJ	M-7-HR-2	208	PA-354769	354778
17.4	150ROZJ	M-7-HR-2	208	PA-354769	354778
18.4	150ROZJ	M-7-HR-2	480	PA-354770	354779
19.4	150ROZJ	M-7-HR-2	480	PA-354770	354779
20.4	200ROZD	M-12-HR-5	480	PA-354771	354780
21.4	200ROZD	M-12-HR-5	480	PA-354771	354780
22.4	200ROZD	M-12-HR-5	208	PA-354772	354781
23.4	200ROZD	M-12-HR-5	208	PA-354772	354781
24.4	230ROZD	M-12-HR-5	480	PA-354771	354780
25.4	230ROZD	M-12-HR-5	480	PA-354771	354780
26.4	230ROZD	M-12-HR-5	208	PA-354772	354781
27.4	230ROZD	M-12-HR-5	208	PA-354772	354781
28.4	300ROZD	M-20-HR-10	480	PA-354773	354782
29.4	300ROZD	M-20-HR-10	208	PA-354774	354783
30.4	350ROZD	M-20-HR-10	480	PA-354773	354782
31.4	350ROZD	M-20-HR-10	480	PA-354773	354782
32.4	350ROZD	M-20-HR-10	208	PA-354774	354783
33.4	350ROZD	M-20-HR-10	208	PA-354774	354783
34.4	450ROZD	M-30-HR-20	480	PA-354775	354784
35.4	450ROZD	M-30-HR-20	480	PA-354775	354784
36.4	450ROZD	M-30-HR-20	208	PA-354776	354785
37.4	450ROZD	M-30-HR-20	208	PA-354776	354785
38.4	750ROZD	M-30-HR-20	480	PA-354775	354784
39.4	750ROZD	M-30-HR-20	480	PA-354775	354784

Figure 1. Remote Radiator Kits



1. Radiator inlet
2. Pressure cap 7 psi (48 kPa)
3. Surge tank
4. Horizontal radiator
5. Radiator outlet
6. 3/8 in. vent line
7. Engine outlet
8. Engine inlet

Figure 2. Schematic Diagram of Remote Horizontal Radiator System



1. From radiator
2. Cool side
3. Hot well
4. From engine
5. Hot side
6. Auxiliary pump
7. To radiator
8. Remote radiator
9. Engine water pump
10. Suction side
11. Maximum allowable vertical head (varies with engine)

Figure 3. Schematic Diagram of Remote Vertical Radiator System

Horizontal Discharge Radiator

When using a remote horizontal radiator it is recommended to use a surge tank. Locate the surge tank at the highest point in the cooling system. The surge tanks provides venting, surge protection, and filling/makeup functions. Equip the surge tank with gauge glass, overflow tube, and pressure cap.

Connect the main line from the surge tank bottom to the engine pump inlet. The surge tank elevation must be great enough to overcome radiator core and line restrictions between the radiator and the pump. The setup in the Figure 2 illustration provides for radiator and engine deaeration and a positive pressure at the pump suction inlet. For system protection use a strainer to filter dirt, scale, and core sand from the coolant line.

Sizing

Determine radiator size and air requirements by checking the generator set specification sheet. The amount of air required to ventilate the generator set room or enclosure determines the size of the air inlet and outlet—a ventilating fan is usually necessary as generator heat loss as well as engine heat loss must be dissipated.

Use the engine water pump to circulate water through the remote radiator providing that the vertical distance from the engine water pump does not exceed the engine manufacturer's recommendations. The allowable static head may range from 17-50 ft. (5.2-15.2 m). Consult the generator set specification sheet. The allowable static head is important because greater height results in excessive head pressure on engine components, causing problems such as leaking water pump seals. Size the piping between the engine and the remote radiator for a maximum of 2 psi (14 kPa) pressure drop at the rated flow of the engine water pump. A vent line from the engine to the radiator may be necessary to purge air from the cooling system.

When either horizontal or vertical distances exceed the above limitations use a hot well tank or heat exchanger and auxiliary circulating pump as shown in Figure 3. Always wire the circulating pump in parallel with the remote radiator fan so that both operate whenever the generator set operates.

A hot well tank is divided into two or more compartments by a partial baffle. Heated water is forced by the engine pump into the hot side and is then drawn off by the auxiliary pump and forced into the radiator. After circulating through the radiator, coolant drains back to the cold side of the well where it is removed by the engine water pump. Head pressures are thus isolated from the engine. Pressure can also be isolated by installing a heat exchanger between the engine and remote radiator.

NOTE

The water in the hot well tank drains into the radiator when the generator set is not running.

System piping should be of ample size, and with as few bends or elbows as possible. Use long sweep elbows or long bends.

Location

For economical installation and operation locate the radiator as close as practical to the engine and on the same level/elevation. This reduces piping, coolant, and wiring costs.

Allow adequate space around the unit for cooling air entry and future service access. Plan the installation to ensure a free flow of air to and from the radiator, and also to prevent recirculation of the heated exhaust air from the radiator back into the intake stream. It is also important to locate the radiator no closer than one fan diameter from a wall, another radiator, or any other obstruction which would restrict air movement.

Unit should be bolted to a level, solid foundation. Use vibration isolators when excessive vibration is possible. For rooftop installation, avoid location near critical sound areas and near ventilation or hood exhausts.

Installation

Listed below are some basic recommendations that apply to most installations. Use these items as a guide for installing a remote radiator system and to assure correct operation and long life.

- Design/size radiator for nothing connected to either side of the radiator. Resize radiator if adding louvers or duct work to the radiator.
- Level radiator assembly on a firm, solid foundation
- Securely bolt assembly to foundation
- Follow wiring diagram on motor. Motor rotation must match fan blade design. Most units supplied with counterclockwise fan rotation as viewed from motor side. The fan is a blower type, blowing air from the fan side of the radiator, through the core and out the front side.
- Brace unit as needed especially in areas with strong winds.
- Consider weather conditions (possible deep snow or ice accumulation, flooding from heavy rain, etc.)

- Seasonal and environmental conditions (accumulation of leaves, industrial fallout, dusty areas, etc.)
- Use vibration isolators, where needed, to keep vibration from radiator or radiator vibration from other areas
- Install remote radiator setup kit. See Figure 4 through Figure 9.

Piping

Support piping externally, not from the radiator. Piping should be of ample size and with as few bends or elbows as possible. Use long sweep elbows or long bends if required

Connect radiator bottom outlets only to suction side of pump

Plumb lines so as to prevent air from becoming trapped in the lines.

Provide flexible connections when connecting piping to the radiator assembly. Use hose clamps at all connections

Locate shutoff valves between the engine and cooling system to allow for isolation of both the radiator and the engine. A shutoff valve eliminates the need to drain the entire cooling system during service.

Coolant

Reliable engine operation depends upon coolant maintenance. Use only clean, non-acid coolant (ethylene glycol and clean, softened water mixture)

The coolant should contain corrosion and scale inhibitors as required by the engine manufacturer. The coolant inhibitors must be compatible with the coolant. Generally, the coolant mixture should be neutral or slightly akaline with a PH of 8 or more at all times.

Install a strainer or sediment trap to eliminate foreign matter in coolant

Filling with Deaeration

For radiators designed for full deaeration, connect and fill the radiator according to the following procedure:

1. Connect the 1-1 1/2 in. (25-38 mm) bypass connector to the suction side of the radiator outlet.
2. Fill radiator at the filler neck.
3. Initially, fill radiator through one of the top tank inlets before final hose connection for faster and more positive fill-up.
4. Fill the system to cover the filler neck bottom (until coolant appears in the sight glass located in the radiator top tank).

Filling without Deaeration

For radiators designed without deaeration, connect and fill the radiator according to the following procedure:

1. Initially, fill radiator through one of the top tank inlets before final hose connection for faster and more positive fill-up.
2. Fill the system to cover the filler neck bottom (until coolant appears in the sight glass located in the radiator top tank).

Startup Checklist

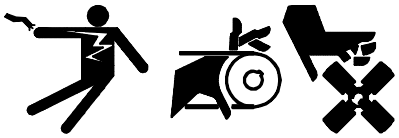
If any problems arise during startup immediately shut down generator set. Even if everything seems okay, shut down generator set after a brief period and recheck belt tension to make sure hardware has not loosened during startup operation. Perform another recheck after 8-12 hours of operation.

✓	Operation
	Verify cooling fan position in the fan shroud
	Check mounting hardware
	Check fan motor for free rotation
	Check V-belts for alignment and tension
	Fill system with coolant and check all connections for tightness and leaks
	Verify all electrical connections are secure and that power source matches motor nameplate
	Verify no foreign material is loose in fan air stream
	With unit running check for:
	fan clearance
	excessive vibration
	excessive noise
	coolant leaks

Servicing

With the radiator at a remote location, it is easily overlooked each time the generator set is serviced. For this reason, low water alarms, or automatic “make-up” controls are often included in these systems. Use an antifreeze mixture suitable to freezing temperatures.

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

Disconnect battery cables before working on generator set. (Remove negative (–) lead first when disconnecting battery. Reconnect negative (–) lead last when reconnecting battery.)

Disabling generator set. Accidental starting can cause severe injury or death. Before working on the generator set or connected equipment, disable the generator set as follows: 1) Turn power conditioner generator set master switch to OFF position. 2) Turn main output breaker OFF. 3) Disconnect power to battery charger. 4) Remove battery cables (remove negative (–) lead first). Reconnect negative (–) lead last when reconnecting battery. Follow these precautions to prevent starting of generator set by site power system or remote start/stop switch.

⚠ WARNING

Hot coolant and steam.
Can cause severe injury or death.

Before removing pressure cap, stop generator set and allow it to cool. Then loosen pressure cap to relieve pressure.

Checking coolant level. Hot coolant can cause severe injury or death. Allow engine to cool. Release pressure from cooling system before opening pressure cap. To release pressure, cover the pressure cap with a thick cloth; then slowly turn it counterclockwise to the first stop. Remove cap after pressure has been completely released and the engine has cooled. Check coolant level at tank if generator set is equipped with a coolant recovery tank.

Checking Coolant Level

Check coolant level at the sight glass located in the center of the top tank. Fill cooling system as required according to procedure given in this instruction. Use coolant mixture of ethylene glycol and clean, softened water as described in the engine operation manual.

Coolant Replacement

Drain the radiator twice a year and flush with a reputable radiator cleaner, and refill. Keep exterior surfaces of the cooling core clean at all times. If the cooling core becomes clogged with dirt and debris, blow dirt and debris out with compressed air. If oil is involved in the clogging of the cooling core clean core using steam.

Inclement Weather Inspection

Adverse weather conditions may require additional maintenance for snow remove or ice buildup preventing fan rotation or sufficient air flow. Inspect radiator system during and after storms. Remove any snow or ice buildup which may cause inadequate cooling system function.

V-Belt Tension

Make periodic V-belt checks for tension and condition. Never use belt dressing for belt slippage prevention. The dressing material causes the fabrics and rubber components in the belts to physically deteriorate.

In general, belt tension can be checked by using a tension gauge. Apply a force large enough to deflect the belt 1/64 in. (0.4 mm) for every inch of belt span between two sheaves. Most belt manufacturer's recommend that belt tension be checked at least twice during the first day of operation. A periodic check of belt tension is then recommended.

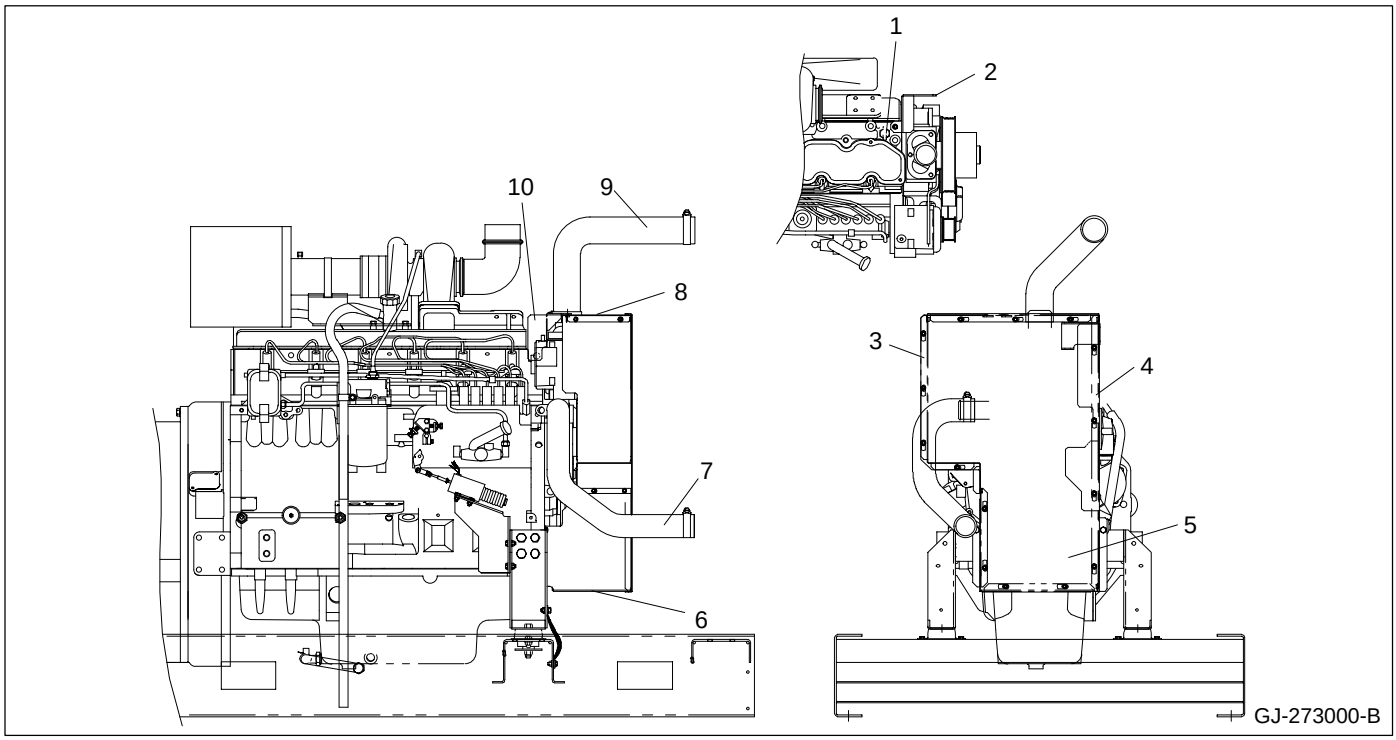
Electric Fan Motor Service

The electric motor bearings are prelubricated and require periodic lubrication. Use the following lubrication schedule:

Hours of Service per Year	**Suggested Lubrication Interval**
5000	Every 5 years
Continuous—Normal Application	Once a year
Continuous—In high ambient, or dirty or moist location; or where motor is idle for more than 6 months, and applications with high vibration	Every 6 months

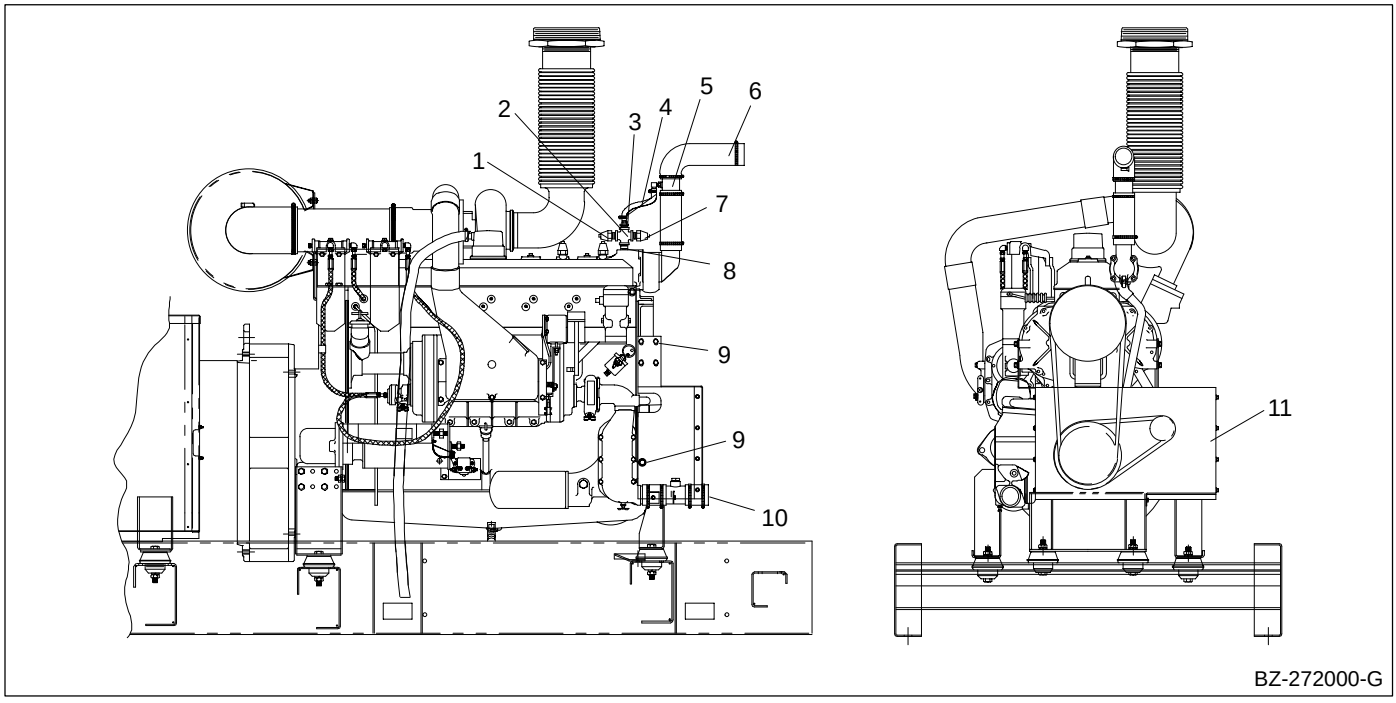
Use high grade lithium-based ball bearing grease. Use consistency of grease suitable for class of insulation stamped on motor nameplate.

If fan motor is equipped with grease fitting, wipe tip clean and apply grease with a grease gun, approximately 2-3 full strokes. Keep grease clean. Do not mix petroleum grease and silicone grease in motor bearings. Add grease slowly. Use a sufficient grease volume to purge the bearing seals of old lubricant. It is recommended to rotate bearing during lubrication.



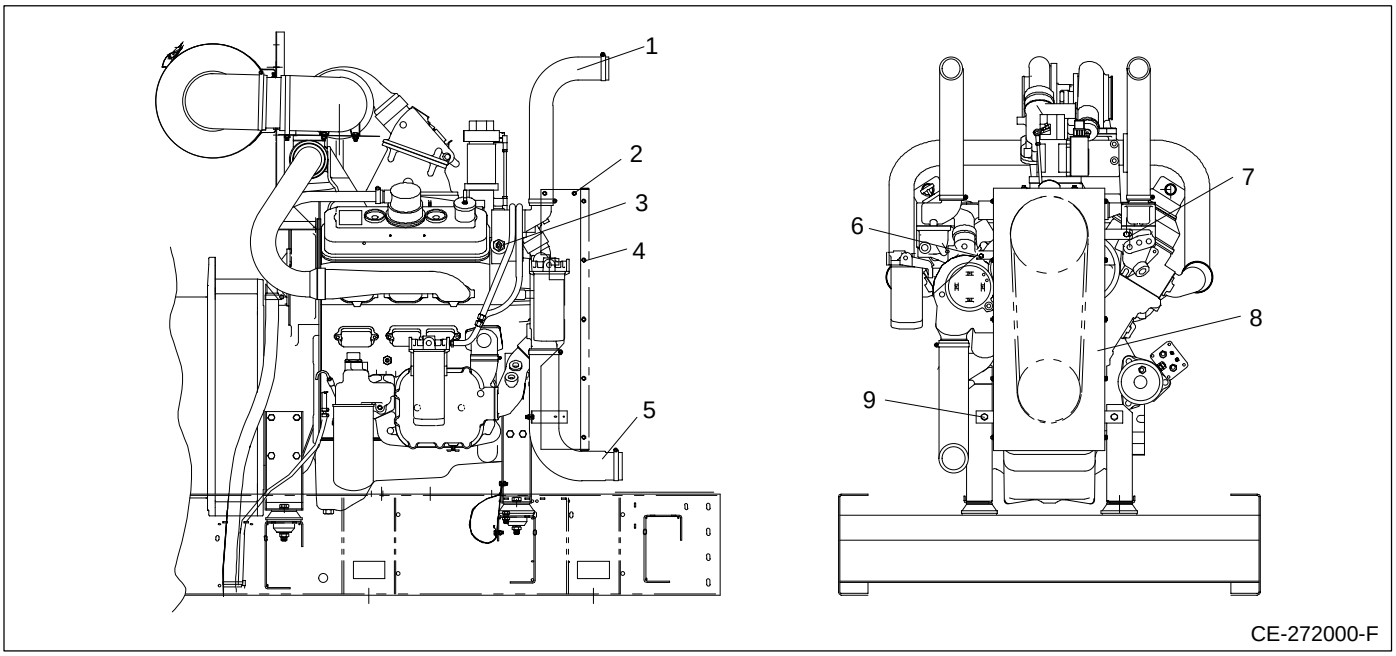
1. Drain valve
2. Belt guard bracket
3. Right hand belt guard
4. Left hand belt guard
5. Front belt guard
6. Bottom belt guard
7. Lower radiator hose
8. Top belt guard
9. Upper radiator hose
10. Top mounting bracket

Figure 4. 135/150ROZJ Remote Radiator Setup Kit



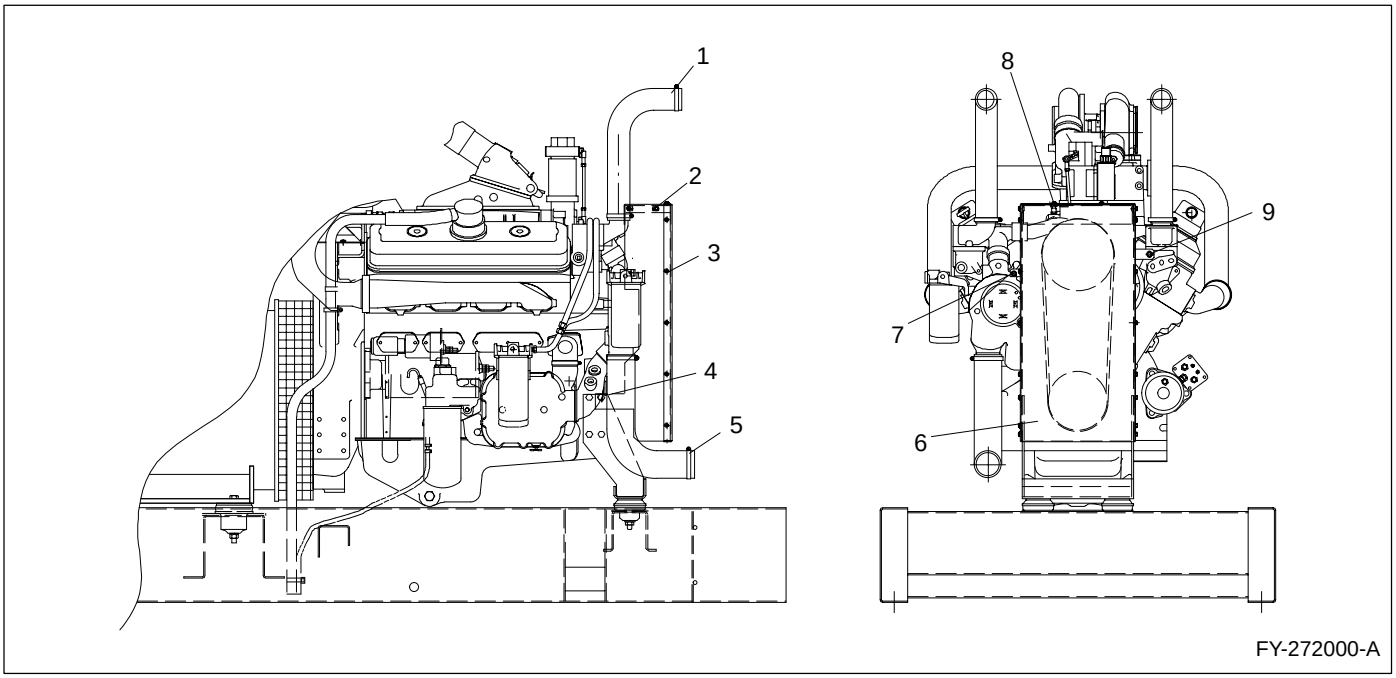
1. Water temperature sender
2. Pipe cross
3. Reducer bushing
4. Rubber hose
5. Hose connector
6. Upper radiator hose
7. High water temperature switch
8. Pipe
9. Hex cap bolt
10. Hose connector and hose
11. Belt guard

Figure 5. 200ROZD Remote Radiator Setup Kit



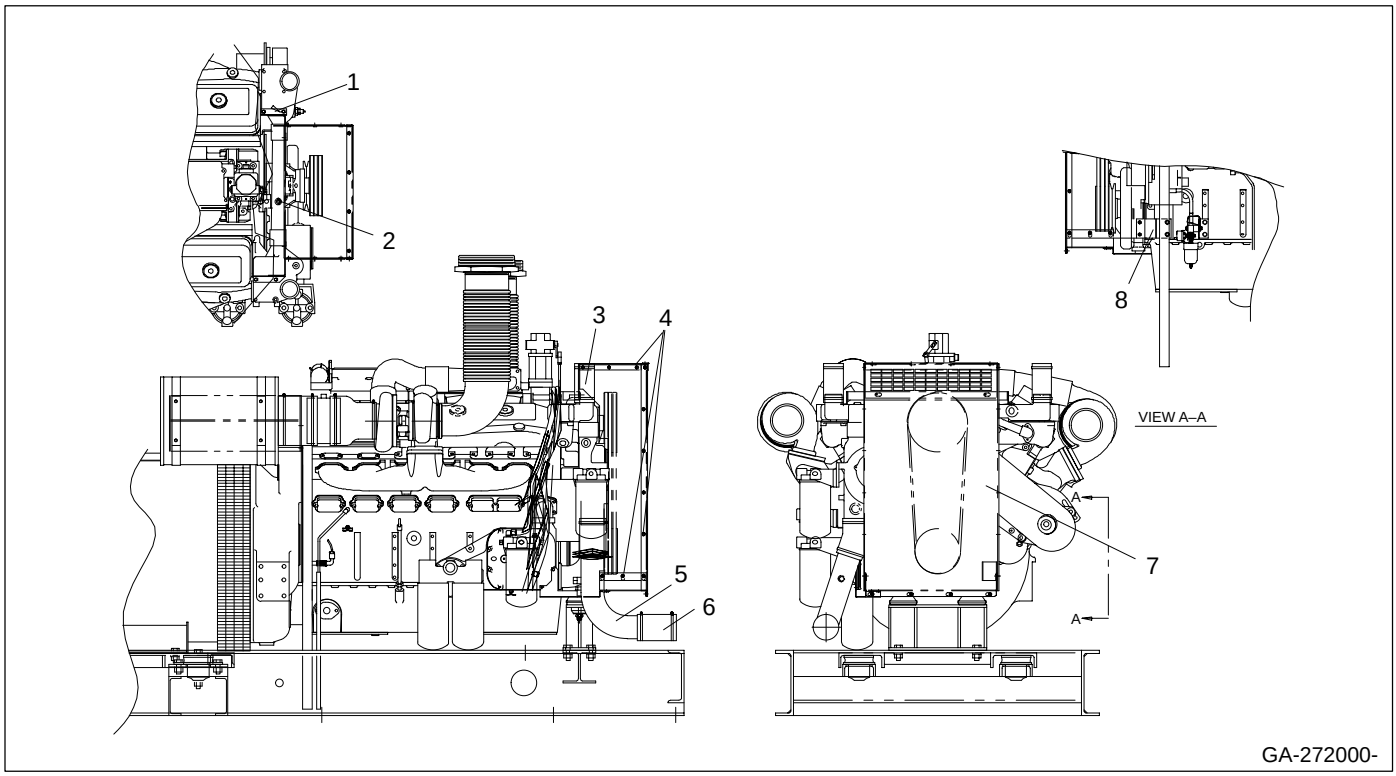
1. Upper radiator hose and clamps
2. 1/4-20 screws
3. Reducer bushing and drain valve
4. Drill screws
5. Lower radiator hose
6. 7/16 washer
7. Hex cap bolt and 3/8 washer
8. Belt guard
9. 5/16-18 hardware

Figure 6. 230-300ROZD Remote Radiator Setup Kit



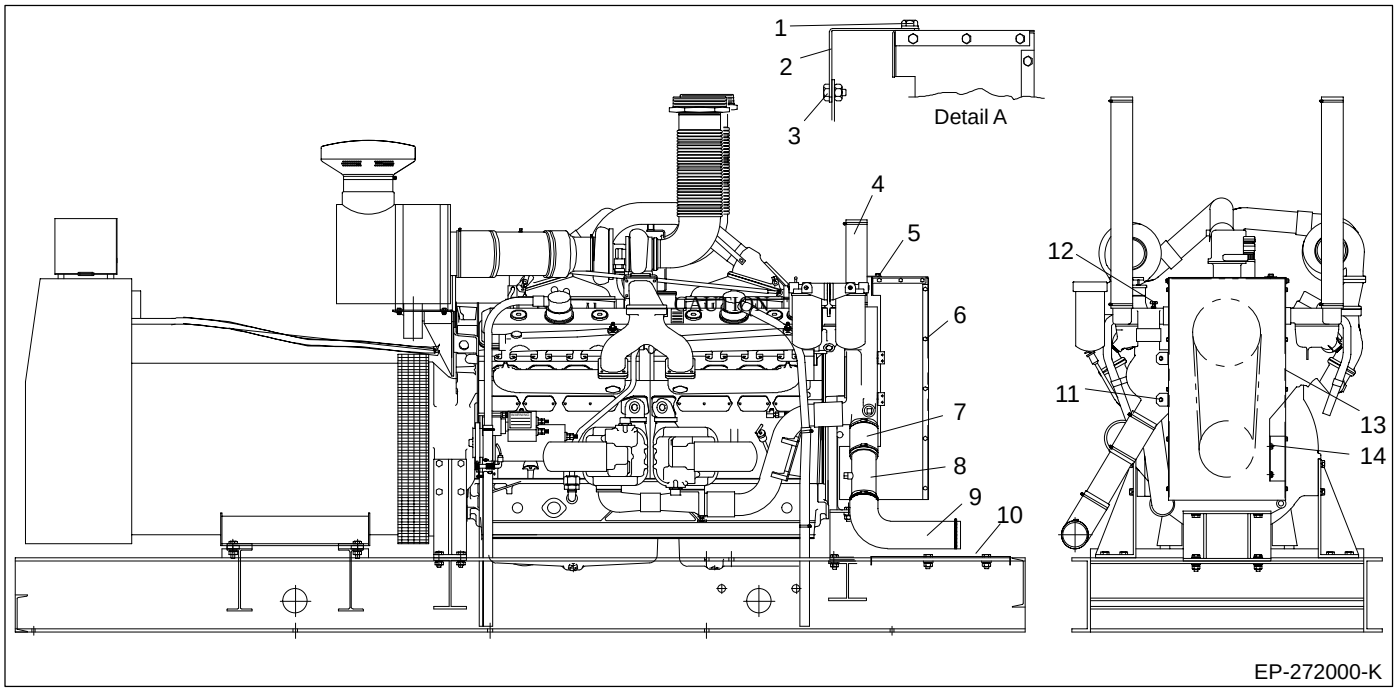
1. Upper radiator hose and clamps
2. 1/4-20 hardware
3. Drill screws
4. Hex cap bolt and washer
5. Lower radiator hose and clamps
6. Belt guard
7. 7/16 washer
8. Drain valve
9. Hex cap screw and 3/8 washer

Figure 7. 350ROZD Remote Radiator Setup Kit



1. Belt guard bracket
2. Drain valve
3. Radiator hose and hose clamp
4. 1/4-20 hardware
5. Lower radiator tube
6. Radiator hose and clamps
7. Belt guard
8. Belt guard bracket

Figure 8. 450ROZD Remote Radiator Setup Kit



1. Hex cap bolt and 1/4 washer
2. Mounting bracket
3. 3/8-16 hardware
4. Radiator hose and clamps
5. See bracket mounting Detail A
6. 1/4-20 hardware
7. Radiator hose and hose clamps
8. Lower radiator tube
9. Lower radiator hose and clamps
10. Cover plate
11. 5/16 washer
12. Drain valve
13. Belt guards
14. Hex cap bolts

Figure 9. 750ROZD Remote Radiator Setup Kit