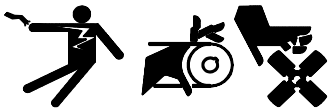
INSTALLATION INSTRUCTIONS

Original Issue Date: **7/98**
Model: **2000 kW (Detroit Diesel 20V-149TIB)**
Market: **Industrial**
Subject: **Radiator Kit 347646**

Use the following instructions to finalize assembly of the radiator to the generator set. The factory ships the generator partially assembled. The partial assembly may vary from these instructions. The illustrations and parts list included in the instructions cover all radiator kit components. The installation procedure provides instruction only for radiator components requiring final assembly.

Observe the following safety precautions while installing the kit.

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

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

Disabling the 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) Move the generator set master switch to the OFF position. (2) Disconnect the power to the battery charger. (3) Remove the battery cables, negative (–) lead first. Reconnect the negative (–) lead last when reconnecting the battery. Follow these precautions to prevent starting of the generator set by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer.

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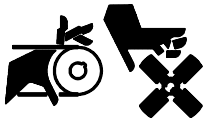


Rotating parts.
Can cause severe injury or death.

Operate the generator set only when all guards, screens, and covers are in place.

Servicing the generator set when it is operating. Exposed moving parts can cause severe injury or death. Keep hands, feet, hair, clothing, and test leads away from the belts and pulleys when the generator set is running. Replace guards, screens, and covers before operating the generator set.

Installation

1. Place the generator set master switch in the OFF position.
2. Disconnect the power to the battery charger, if equipped.
3. Disconnect the generator set engine starting battery(ies), negative (–) lead first.
4. Remove the radiator components (innercooler tubes, fan bearing support braces, etc.) secured to the radiator assembly.

NOTE

The factory ships the radiator subassembly horizontally. Rotate the radiator subassembly to the vertical position prior to installation.

5. Attach lifting devices to the top radiator lifting holes. See Figure 1 for the lifting hole locations.

NOTE

Securely support the radiator at all times. Never leave the radiator subassembly standing upright unless the subassembly is braced or stabilized.

6. Disconnect and remove the shipping straps and supports from the radiator and shipping skid.
7. Slowly lift the radiator subassembly and rotate the subassembly to a vertical position. See Figure 1.
8. Connect the lifting device to the four radiator lifting holes and lift the radiator subassembly from the shipping skid. See Figure 1.
9. Lower the radiator subassembly onto a solid flat surface.

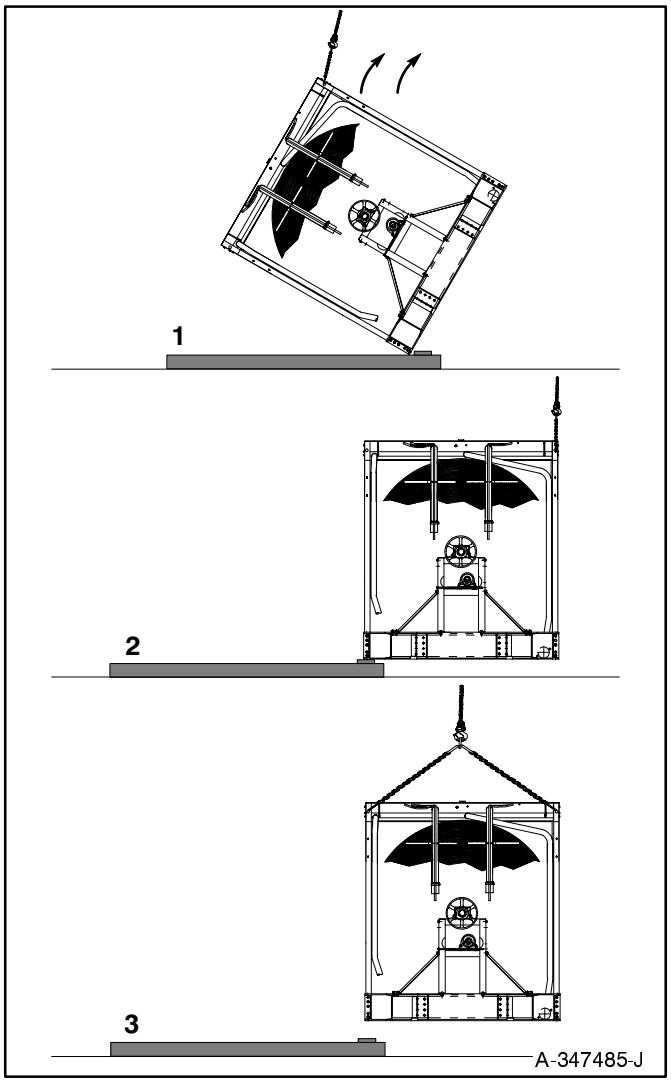
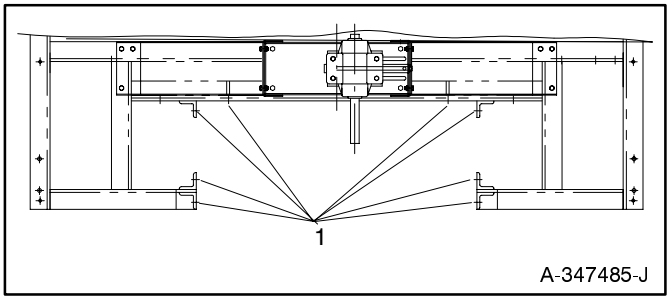


Figure 1. Radiator Removal From Shipping Skid

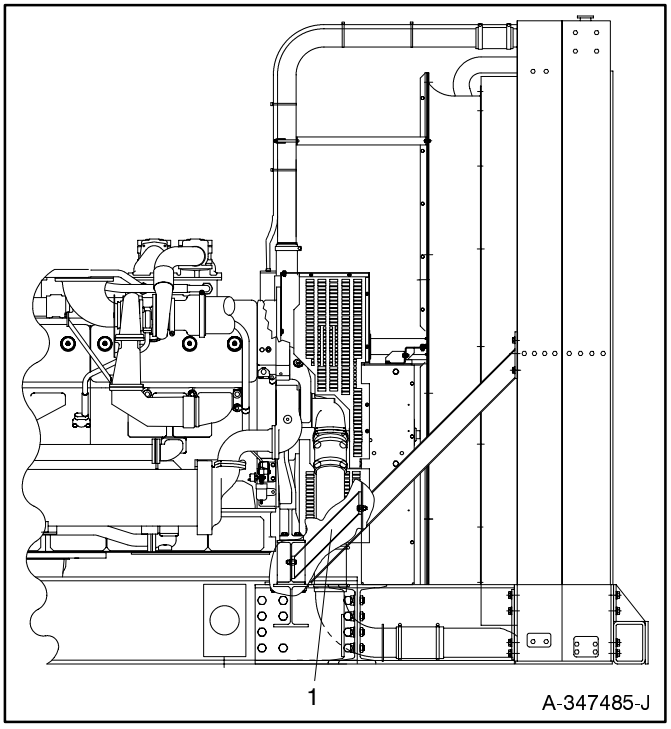
10. Remove the 1”-8 mounting hardware from the radiator subassembly. See Figure 2.
11. Align the radiator skid subassembly with the generator set skid.
12. Bolt the radiator subassembly skid to the generator set skid using the 1”-8 hardware removed in step 10. Torque the mounting bolts to 532 ft. lbs. (721 Nm). See Figure 2 for the mounting locations.



1. Radiator subassembly mounting locations

Figure 2. Radiator Subassembly—Top View

13. Install the left (347728) and right (347721) bearing support braces. Secure the braces to the bearing support and generator set skid with the 1/2-13 hardware. Torque the mounting bolts to 68 ft. lbs. (92 Nm). See Figure 3 for location of the bearing support braces.



1. Bearing support brace

Figure 3. Radiator Assembly—Right Side

14. Align the fan pulley with the engine drive pulley. **The first groove of the engine drive pulley must align with the first groove of the fan pulley.**

    a. Place a straight edge on the left side, as viewed from the radiator end, of the fan shaft along the face of the fan pulley and adjust the fan shaft so that the measurement between the straight edge and the engine drive pulley is 0.20 in. (5.08 mm).

    Adjust the front to back pulley alignment by loosening the fan shaft set screws. See Figure 5. Adjust the left to right pulley alignment by loosening the fan shaft pillow block mounting hardware. See Figure 4.

    b. Place the straight edge on the right side, as viewed from the radiator end, of the fan shaft along the face of the fan pulley and adjust the fan shaft so that the measurement between the straight edge and the engine drive pulley is 0.20 in. (5.08 mm).

    Adjust the front to back pulley alignment by loosening the fan shaft set screws. See Figure 5. Adjust the left to right pulley alignment by loosening the fan shaft pillow block mounting hardware. See Figure 4.

NOTE

The pulley alignment measurement on both the left and the right side of the fan pulley must be 0.20 in. (5 mm) as viewed from the radiator end. Adjust the fan shaft pillow block as required so that both the left and right measurements are 0.20 in. (5 mm).

NOTE

Make sure the fan shaft pillow block mounting hardware is tight. Hold the bolts while tightening the nuts. Torque the mounting hardware to 240 ft. lbs. (325.4 Nm).

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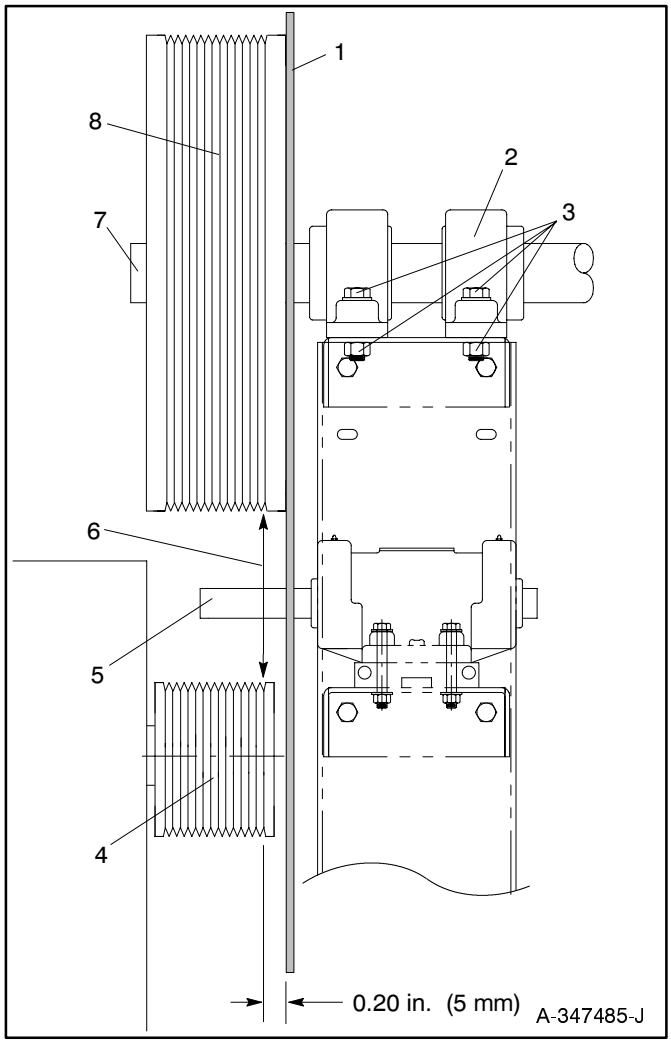
    c. Verify the pulley alignment by measuring the distance from the straight edge to the first groove on the fan pulley and from the straight edge to the first groove on the engine drive pulley. Measure the distance on both the left and right sides of the fan shaft. **The measurement from the straight edge to the first groove on the fan pulley and the measurement from the straight edge to the first groove on the engine drive pulley MUST be 0.2 in. (5 mm) on both sides.** If the measurements are not 0.2 in. (5 mm), adjust the fan shaft as required to achieve the 0.2 in. (5 mm) measurement. See Figure 4.



1. Straight edge
2. Fan shaft pillow block
3. Fan shaft pillow block mounting hardware
4. Engine drive pulley
5. Idler pulley shaft
6. Groove alignment
7. Fan shaft
8. Fan pulley

Figure 4. Pulley Alignment—Side View

NOTE

The fan pulley and the engine drive pulley must be parallel with the first groove aligned.

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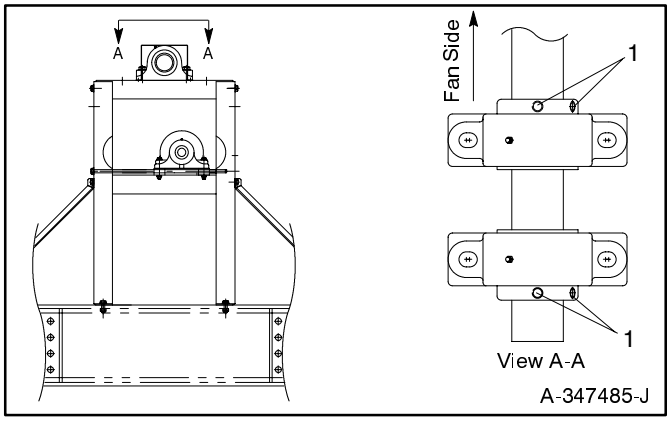
15. Verify that the fan pulley key way set screw is torqued to 24 ft. lbs. (32 Nm).

16. Verify that the fan shaft set screws are torqued to 31 ft. lbs. (42 Nm). See Figure 5.

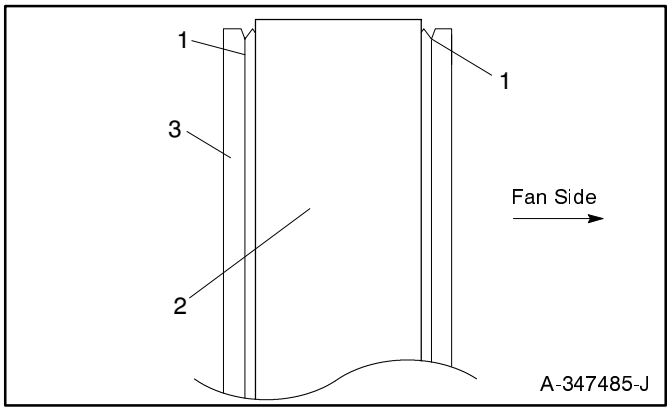


1. Set screws

Figure 5. Fan Shaft Set Screws

17. Recheck the alignment of the fan and engine pulleys as described in step 14.

18. Install the fan drive belt (347429). Align the fan belt with the second groove in the fan and engine pulleys from the fan side. See Figure 4 and Figure 6.



1. Pulley grooves
2. Belt
3. Pulley

Figure 6. Belt Installation

19. Center the idler pulley on the belt.

20. Loosen the nuts securing the idler pulley pillow block to the fan-bearing support. See Figure 7.

21. Adjust the idler pulley by turning the two adjusting bolts located on the side of the fan-bearing support. See Figure 7.

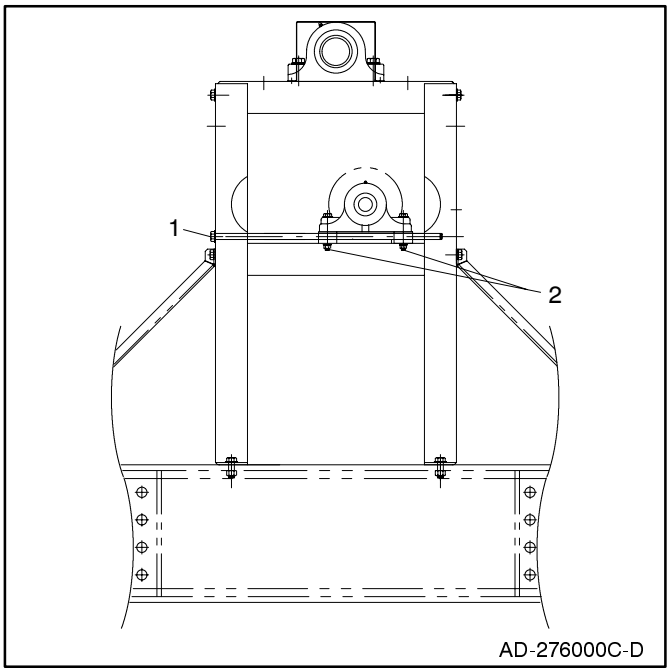
22. Verify that the fan belt is seated in the second groove on the fan and engine drive pulleys.

23. Adjust the belt tension to 600 lbs. (2640 N) on 60 Hz models and 500 lbs. (2200 N) on 50 Hz models by turning the two idler pulley adjusting bolts. See Figure 7.

24. Tighten the nuts securing the idler pulley pillow block to the fan-bearing support after reaching the specified belt tension.

NOTE

Hold the idler pulley pillow block bolts while torquing the nuts to 68 ft. lbs. (92.2 Nm).



1. Adjusting bolt
2. Nuts

Figure 7. Fan-Bearing Support—Rear View

25. Remove the protective tape from the ends of the radiator hoses.

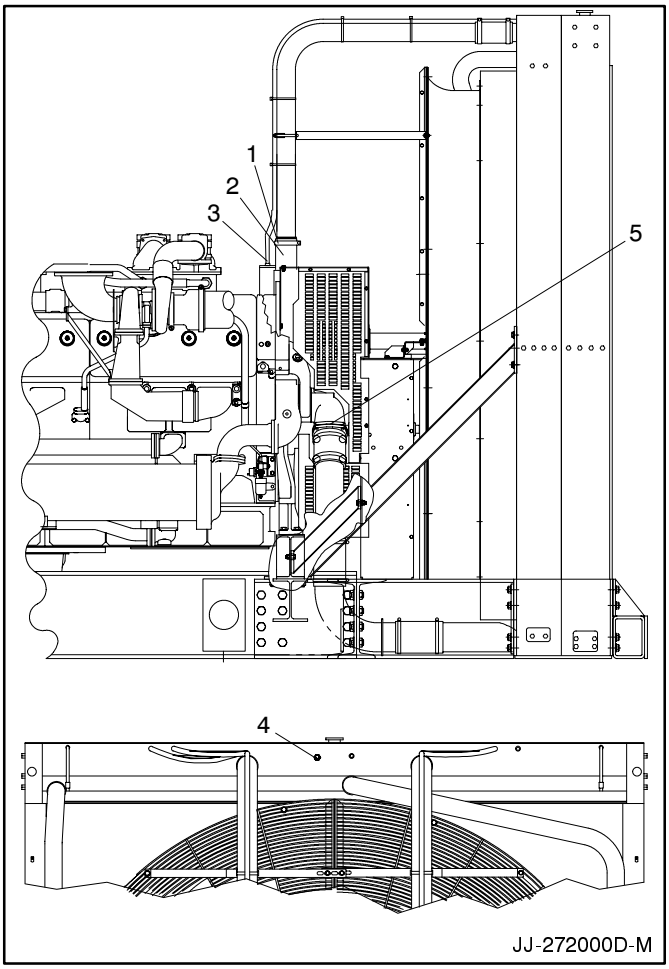
26. Connect the two upper radiator hoses to the engine. Secure the hoses to the engine with hose clamps. See Figure 8.

27. Connect the two radiator vent lines tied to the upper radiator hoses to the engine. Secure the vent lines to the engine with hose clamps. See Figure 8.

28. Connect the wiring harness connector for the low water level sensor to the sensor in the top of the radiator. Secure the wiring harness lead with cable ties. See Figure 8.

29. Apply a coating of Loctite® 515 adhesive to the inlet tube gasket surfaces.

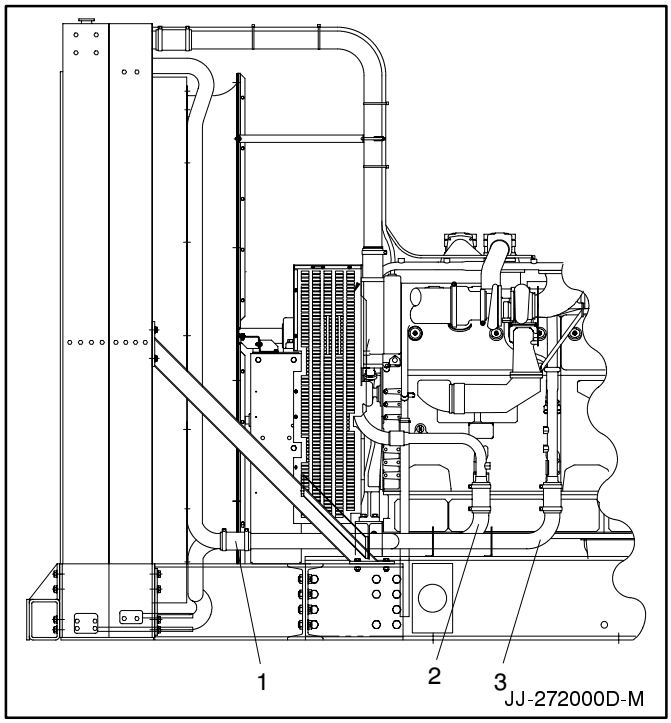
30. Install the gasket, and bolt the inlet tube flanged fittings together with 3/8 in. hardware. Torque the mounting hardware to 28 ft. lbs. (38 Nm). See Figure 8.



1. Hose clamp
2. Connector hose
3. Vent line
4. Low water level sensor
5. Inlet tube flange connection

Figure 8. Radiator Assembly—Right Side

31. Connect innercooler tubes to the engine and radiator. Secure tubes using hose clamps. See Figure 9.



1. Connector hose
2. Innercooler supply tube
3. Innercooler return tube

Figure 9. Radiator Assembly—Left Side

32. Install belt guards. Secure the left, right, and top belt guards using 1/4-20 hardware.

NOTE

Transportation and handling processes expose the generator set to stress. Check the alignment of the radiator and its supports and the tightness of mounting hardware prior to generator set operation.

Radiator Scheduled Maintenance

This section covers radiator scheduled maintenance. Refer to the generator set operation manual and engine operation manual for periodic servicing of the generator set cooling system.

Lubricate the fan shaft and idler shaft bearings regularly to avoid bearing damage. Lubricate the bearings every 200 hours of operation in ambient temperatures less than 85°F (29°C). Lubricate the bearings every 100 hours of operation in ambient temperatures greater than 85°F (29°C) or if the generator set operates in a dusty or humid environment. Lubricate the bearings at the specified interval according to the following procedure.

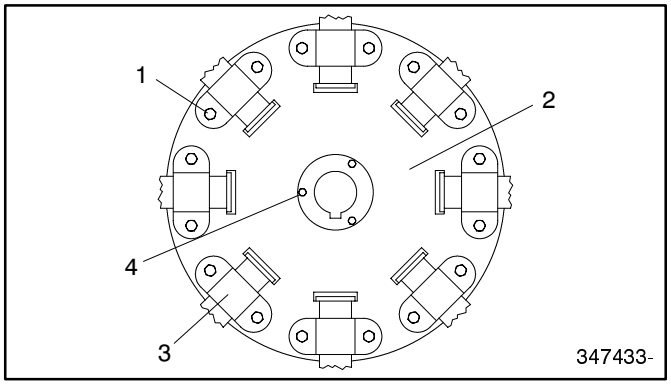
Check the fan shaft pulley and fan shaft pillow block set screws at the same interval as bearing lubrication.

NOTE

Lubricate the radiator fan shaft and idler shaft bearings at the time of engine oil change.

Check the fan blade cap bolt and hub bushing bolt torque. See Figure 10 and the following table for bolt torques.

Bolt Size	Torque
3/8 in.	35 ft. lbs. (47.5 Nm)
1/2 in.	45 ft. lbs. (61.0 Nm)
5/8 in.	75 ft. lbs. (102 Nm)
3/4 in.	90 ft. lbs. (122 Nm)

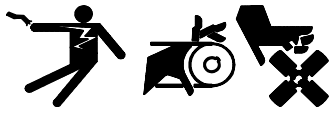


1. Blade cap bolts
2. Fan hub
3. Blade cap
4. Hub bushing bolt

Figure 10. Radiator Fan Hub

Check the torque of the fan shaft and idler pulley pillow blocks mounting hardware. See Figure 4. Check the torque of the fan shaft set screws. See Figure 5.

⚠ WARNING



Accidental starting.
Can cause severe injury or death.

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

Disabling the 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) Move the generator set master switch to the OFF position. (2) Disconnect the power to the battery charger. (3) Remove the battery cables, negative (–) lead first. Reconnect the negative (–) lead last when reconnecting the battery. Follow these precautions to prevent starting of the generator set by an automatic transfer switch, remote start/stop switch, or engine start command from a remote computer.

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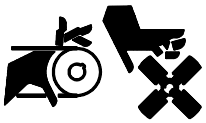

Rotating parts.
Can cause severe injury or death.

Operate the generator set only when all guards, screens, and covers are in place.

Servicing the generator set when it is operating. Exposed moving parts can cause severe injury or death. Keep hands, feet, hair, clothing, and test leads away from the belts and pulleys when the generator set is running. Replace guards, screens, and covers before operating the generator set.

Lubrication Procedure

Lubricate the fan shaft and idler shaft bearings with a lithium-complex base, multipurpose grease with antirust, antifoam, extreme pressure additives and a minimum dropping point of 400°F (204°C). Use Mobil Mobilith AW2 NLG1, Grade 2 or equivalent.

1. Place the generator set master switch in the OFF position.
2. Disconnect the power to the battery charger, if equipped.

3. Disconnect the generator set engine starting battery(ies), negative (–) lead first.
4. Remove the belt guards to expose the fan shaft and the idler shaft bearings.
5. Inject grease into the two bearings on the fan shaft block and the two bearings on the idler shaft block using a grease gun filled with specified grease. See Figure 12. Inject grease until a 0.125-0.250 in. (3–6 mm) grease column shows at the bearing pressure relief port.

NOTE

Pressure relief ports on the fan shaft and idler shaft bearings prevent overlubrication.

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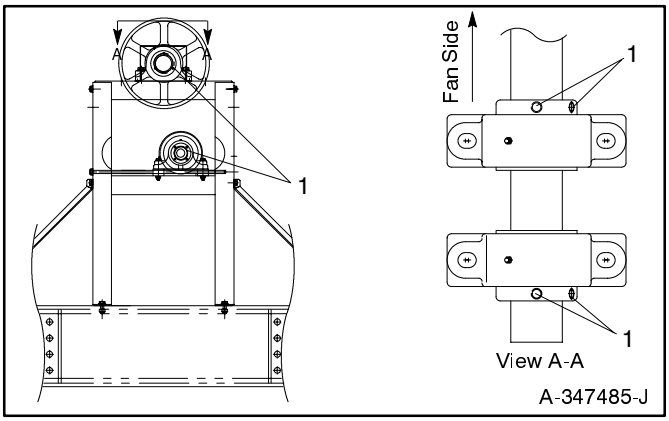
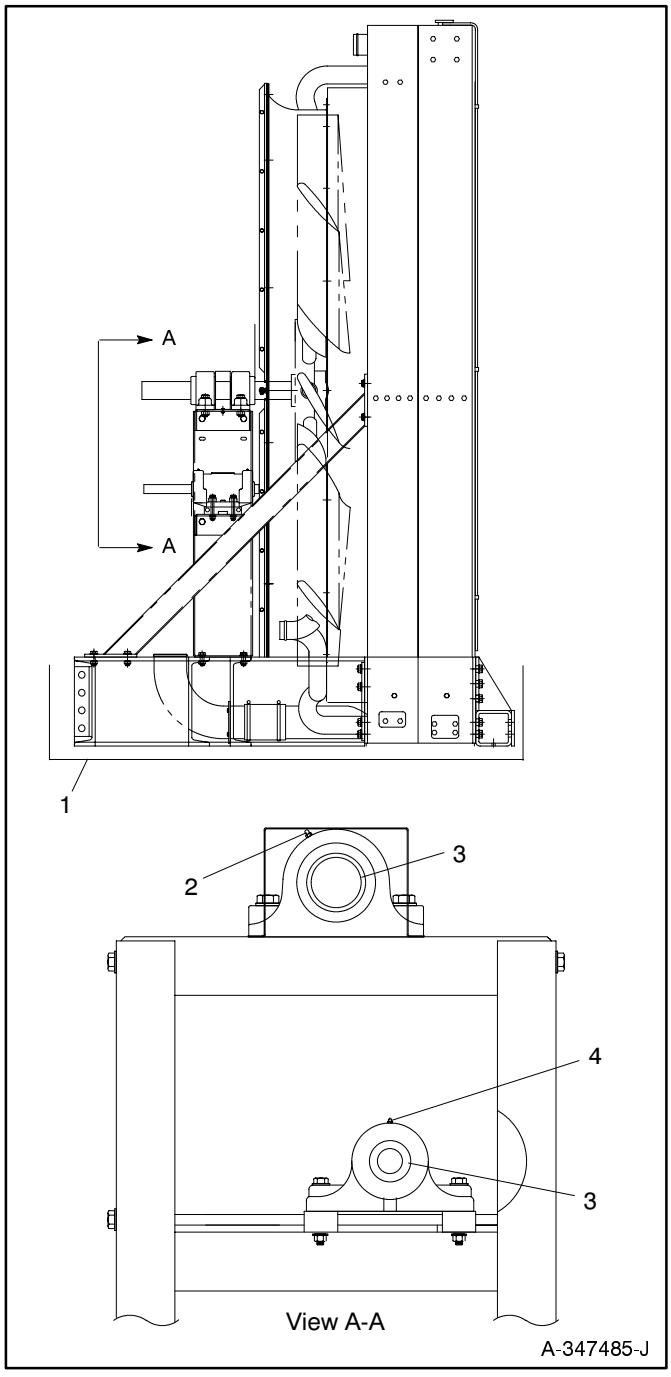
6. Remove excess grease from bearing relief ports with a rag.
7. Verify that the fan pulley key way set screw is torqued to 24 ft. lbs. (33 Nm). See Figure 11.
8. Verify that the fan shaft set screws are torqued to 31 ft. lbs. (42 Nm). See Figure 11.



1. Set screw

Figure 11. Fan Shaft and Pulley Set Screws

9. Inspect the fan drive belt for damage or wear. Replace the belt if it is damaged or worn. Check the fan belt tension using a serpentine belt tension gauge and adjust the tension if necessary. The correct tension for a new belt is 600 ft. lbs. (813.6 Nm) on 60 Hz models and 500 ft. lbs. (678 Nm) on 50 Hz models.
10. Reinstall the belt guards using the original hardware.
11. Reconnect the generator set engine starting battery(ies), negative (–) lead last.
12. Move the generator set master switch to the RUN position to start the generator set.
13. Listen for a squeaking noise from the fan belt, which indicates a slipping belt. If the fan belt slips, stop the generator set and disconnect the engine starting battery(ies). Increase the belt tension to eliminate slippage.
14. Reconnect the generator set engine starting battery(ies), negative (–) lead last.
15. Reconnect the power to the battery charger, if equipped.



1. Radiator assembly
2. Fan shaft grease fittings
3. Pressure relief port
4. Idler shaft grease fittings

Figure 12. Radiator Fan Bearings and Pressure Relief Ports (typical)

Radiator Kit

Parts List		
	Kit: 347646	
Qty.	**Description**	**Part Number**
1	Assembly, radiator	A-347485
1	Bushing, reducer, 3/8 x 1/2 in.	X-202-28
2	Valve, drain, 3/8 in.	X-256-1
1	Key, square	X-286-22
1	Connector, elbow	X-391-13
2	Line, flexible fuel, 100.0 in.	X-422-32
1	Line, flexible fuel, 135.0 in.	X-422-34
6	Clamp, hose	X-426-10
9	Tie, cable	X-468-7
4	Hose, radiator, 7.0 in.	X-507-6
2	Connector, hose, 1/2 x 3/8 in.	X-582-4
3	Connector, hose, 1/2 x 1/2 in.	X-582-5
2	Clamp, insulated	X-672-19
22	Washer, hardened	X-801-10
4	Hose, radiator, 9.0 in.	X-6006-4
2	Hose, radiator, 6.5 in.	X-6014-86
1	Sensor, low fluid	254832
2	Decal, caution	279748
8	Clamp, hose	291542
2	Clamp, hose	291590
2	Bracket, tube mounting	328021
8	Clamp, hose	336229
4	Clamp, hose	343049
1	Bushing, pulley	347422
1	Pulley	347423
1	Belt, poly v	347429
1	Pulley, idler	365242
2	Tube, radiator upper, 43.0 in.	347437
1	Tube, radiator lower, 28.4 in.	347440
1	Tube, innercooler, 59.9 in.	347441
1	Tube, innercooler, 45.9 in.	347442
1	Bushing, idler	347443
1	Tube, inlet	347474
1	Gasket, inlet	347504
1	Brace, radiator tube LH	347505
1	Brace, radiator tube RH	347506
1	Shim, radiator	347507
1	Guard, belt	347585
1	Guard, belt top	347586
1	Guard, belt RS	347587
1	Guard, belt LS	347588
1	Guard, belt RS	347590
1	Brace, bearing support	347721
1	Brace, bearing support	347728
1	Sensor, liquid level	354113