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## INSTALLATION INSTRUCTIONS

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Original Issue Date: **12/97**

Model: **450-800 kW**

Market: **Industrial**

Subject: **Engine Block Heater Kits (Tank-Type) PA-354720, PA-354720-SD, PA-354721, PA-354721-SD**

The engine block heater kit heats engine coolant, making starting easier and warm-up quicker. The thermostat automatically turns off the heater when coolant temperature reaches 120°F (49°C). Observe the following safety precautions while installing the kit.



**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 the generator set master switch to OFF position. 2) Disconnect power to battery charger. 3) Remove battery cables (remove negative (–) lead first). Reconnect negative (–) lead last when reconnecting battery. Follow these precautions to prevent starting of generator set by an automatic transfer switch 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.

#### NOTE

Pay special attention to the coolant level. After draining the coolant, allow time for complete refill of the engine water jacket. Check coolant level as prescribed in the Prestart Checklist of the Operation Manual.

#### NOTE

Do not turn on block heater before filling cooling system. Run engine until warm and refill radiator to purge air from the system before energizing block heater. If heater element is not immersed in water, block heater will fail.

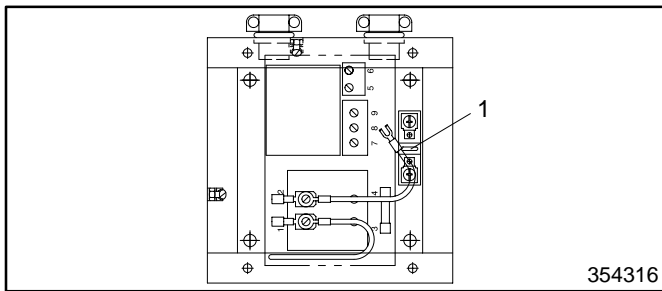
## Installation

1. Place the generator set master switch in the OFF position.
2. Disconnect power to battery charger, if equipped.
3. Disconnect the generator set engine starting battery(ies), negative (–) lead first.
4. With engine and radiator cool, drain the coolant into a suitable container. Dispose of all waste materials (engine oil, fuel, coolant, etc.) in an environmentally safe manner. Contact your local authority for procedures and location.

#### NOTE

Drain valve is located on radiator bottom and/or on side of engine crankcase.

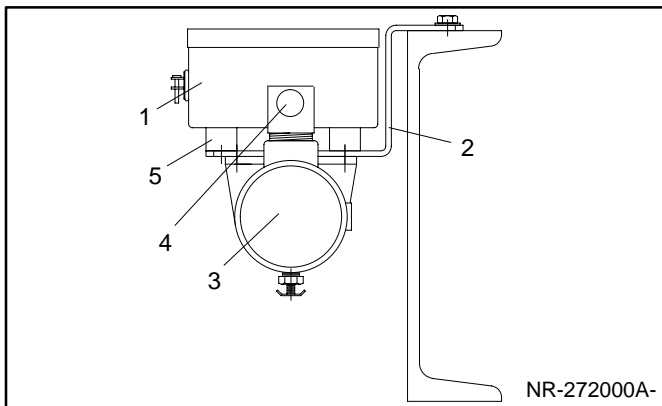
5. Install fuse block (X-6129-8) in block heater control box (354316). Use the fuse block as a template and drill mounting hole. Secure fuse block to control box with screw (X-51-15), washer (X-25-48), and nut (X-6210-4). See Figure 1 for mounting location.



1. Fuse block mounting location

**Figure 1. Block Heater Control Box—Top View**

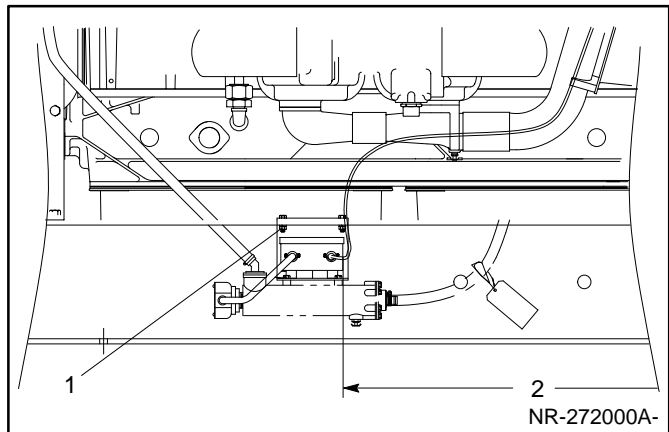
6. Install fuse (X-6135-6) in fuse block installed in step 5.
7. Secure rubber bumpers (259632) to the bottom outside of the block heater control box with lock washers (X-22-12) and whiz nuts (X-6210-2). Secure ground strap (223033) and one lock washer (X-22-12) between one of the bumpers and the control box.
8. Secure block heater control box (354316) to block heater bracket (354687) using screws (X-465-8), plain washers (X-25-40), and lock washers (X-22-12). See Figure 2. Secure free end of ground strap installed in step 7 to one of the screws securing control box to bracket.
9. Secure block heater to block heater bracket with screws (X-465-7) and whiz nuts (X-6210-2). Position block heater as shown in Figure 2.



1. Block heater control box (354316)
2. Block heater bracket (354687)
3. Block heater (279816)
4. Block heater outlet
5. Bumpers (259632)

**Figure 2. Block Heater and Block Heater Control Box Assembly—End View**

10. Secure block heater assembly to skid. See Figure 3 for mounting location.



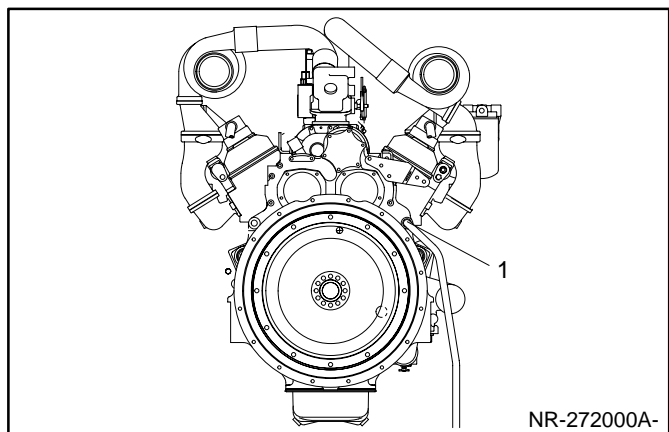
1. Screws (X-6238-4) and nuts (X-6210-9)
2. Bracket mounting location from front of skid: 61.0 in. (1550 mm) (500-600 kW), and 65.9 in. (1674 mm) (750-800 kW)

**Figure 3. Engine—Right Side**

#### NOTE

Apply pipe sealant to male threads of all components before installing.

11. Remove pipe plug from upper right side of engine block. See Figure 4.

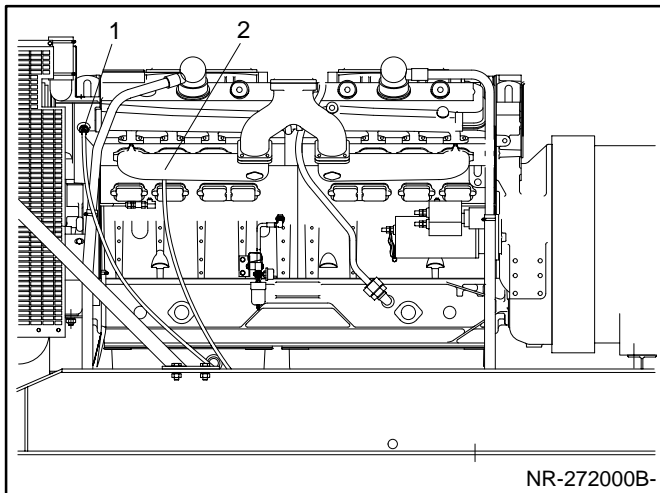


1. Connector (X-582-8)

**Figure 4. Engine—Rear View**

12. Apply pipe sealant to threads of connector (X-582-8) and install where pipe plug was removed in step 11.
13. Connect one end of hose (X-6367-1) to hose connector installed in step 12. Secure hose to connector with hose clamp (X-426-12). Place hose clamp 0.25 in. (6 mm) from hose end and tighten.
14. Secure loose end of hose (X-6367-1) installed in step 13 to outlet side of block heater. Secure hose to block heater outlet with hose clamp (X-426-12). Place hose clamp 0.25 in. (6 mm) from hose end and tighten.

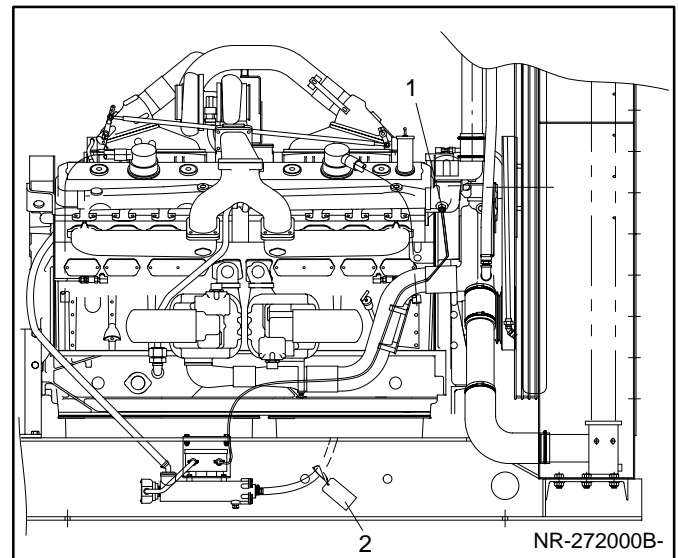
15. Remove pipe plug from left side of engine. See Figure 5 for location.



1. **450 kW:** Elbow (SA-472) and hose connector (X-582-8)  
 2. **500-800 kW:** Hose connector (X-582-8)

**Figure 5. Engine—Left Side View**

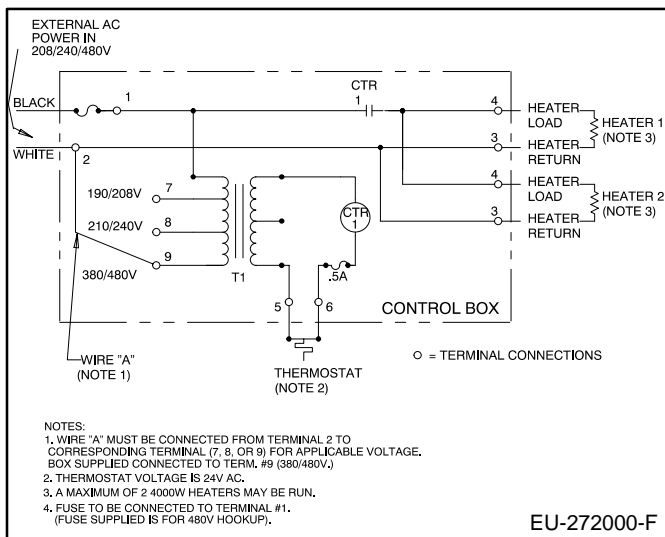
16. **450 kW:** Apply pipe sealant to threads of elbow (SA-472) and install where pipe plug was removed. Apply pipe sealant to threads of hose connector (X-582-8) and install in elbow.
- 500-800 kW:** Apply pipe sealant to threads of hose connector and install where pipe plug was removed.
17. Connect one end of hose (X-6367-3) to hose connector installed in step 16. Secure hose to connector with hose clamp (X-426-12). Place hose clamp 0.25 in. (6 mm) from hose end and tighten.
18. Route hose connected to hose connector in previous step under the engine and connect inlet side of block heater. Use cable ties (X-468-1) as necessary to secure hose. Secure hose to block heater inlet with hose clamp (X-426-12). Place hose clamp 0.25 in. (6 mm) from hose end and tighten.
19. Remove pipe plug from thermostat housing for block heater thermostat installation. See Figure 6.
20. Apply pipe sealant to threads of reducer bushing (153659) and install where pipe plug was removed in step 19.
21. Apply pipe sealant to threads of thermostat (279813) and install in reducer bushing installed in step 20.



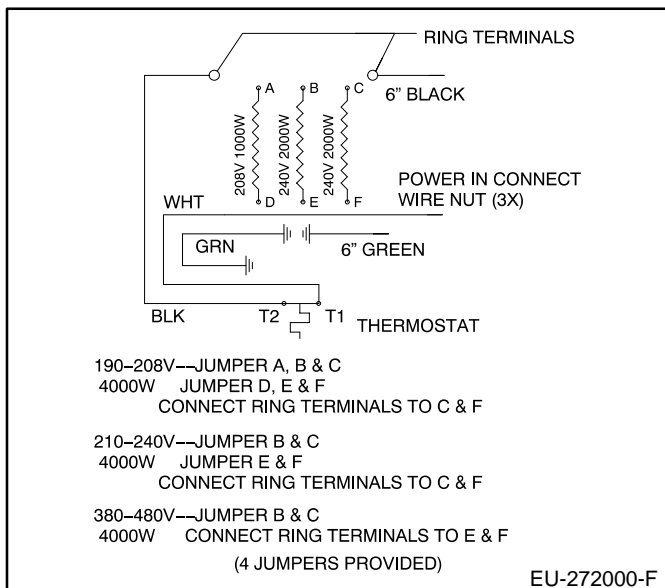
1. Reducer bushing (153659)  
 2. Hang tag (279047)

**Figure 6. Engine—Right Side View**

22. Route thermostat leads to block heater control box. Use cable ties (X-468-9) as necessary to protect and secure wiring from sharp objects, exhaust system and moving parts. See Figure 6.
23. Route block heater and thermostat leads into control box.
24. Use wiring diagrams in Figure 7 and Figure 8 to determine block heater control box electrical connections.
25. Remove adhesive backing from control box cover gasket (354318) and install gasket on backside of control box cover (354317).
26. Remove adhesive backing from wiring diagram label (354328) and install label on backside of control box cover.
27. Install control box cover. Secure cover to control box with four screws (X-97-13) and gasket washers (297001).
28. Remove adhesive backing from warning decal (354326) and install decal on top center of control box cover.



**Figure 7. Terminal Connections for Block Heater Control Box**



**Figure 8. Block Heater Voltage Connections and Jumper Placement**

29. Close drain valves on radiator and/or engine block.
30. Fill cooling system with fresh coolant consisting of a mixture of 50% ethylene glycol and 50% clean, softened water. This mixture provides the necessary freeze protection as well as inhibits corrosion. See specification sheet for cooling system capacities.

**NOTE**

Coolant mixtures exceeding 50% ethylene glycol may cause the block heater heating element to fail.

31. Check that the generator master switch is in the OFF position.
32. Reconnect the generator set engine starting battery, negative (–) lead last. Reconnect power to the battery charger, if equipped.
33. Test run generator set for a few minutes to check for coolant leaks and to purge air from the system.
34. Stop generator set. After allowing engine and radiator to cool, correct any leakage.

**NOTE**

Failure to purge trapped air may cause block heater element to fail.

35. Recheck coolant level. After draining the cooling system, allow some time for all air cavities to refill in the system. Add coolant as necessary.
36. Tie hang tag (279047 and 279280) as noted in Figure 6.
37. Connect block heater electrical plug to correct voltage outlet.

## Block Heater

Parts List				
Kits: PA-354720, PA-354720-SD, PA-354721, PA-354721-SD			Unique Parts	
Qty.	Description	Common Parts	PA-354720 PA-354720-SD	PA-354721 PA-354721-SD
1	Elbow, 1 1/2 in.			SA-472
10	Washer, lock 1/4 internal/external tooth	X-22-12		
4	Washer, plain o.d. 0.625	X-25-40		
1	Washer, plain o.d. 0.438	X-25-48		
1	Screw, r.h.m. 8-32 x 1/2	X-51-15		
4	Screw, hex 10-32 x 0.438	X-97-13		
4	Clamp, hose 1.25 max.	X-426-12		
4	Screw, h.c. 1/4-20 x 1.0	X-465-7		
4	Screw, h.c. 1/4-20 x 1.25	X-465-8		
	Tie, cable 7 in.		(2) X-468-1	(4) X-468-1
3	Tie, cable 14 in.	X-468-9		
2	Connector, hose	X-582-8		
1	Block, fuse	X-6129-8		
1	Fuse	X-6135-6		
8	Nut, whiz 1/4-20	X-6210-2		
1	Nut, whiz 8-32	X-6210-4		
2	Nut, spiralock 3/8-16	X-6210-9		
2	Screw, hex. 3/8-16 x 1.25	X-6238-4		
1	Hose, coolant 0.75" x 44"	X-6367-1		
1	Hose, coolant 0.75" x 70	X-6367-3		
1	Bushing, reducer 3/4 x 1/2	153659		
1	Strap, ground 3/8 x 5	223033		
4	Bumper	259632		
1	Tag, hang	279047		
1	Thermostat, block heater	279813		
1	Heater, block	279816		
4	Washer, gasket	297001		
1	Box, block heater control	354316		
1	Cover, block heater control box	354317		
1	Gasket, control box cover	354318		
1	Decal, warning	354326		
1	Label, wiring diagram	354328		
1	Bracket, block heater	354687		