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## INSTALLATION INSTRUCTIONS

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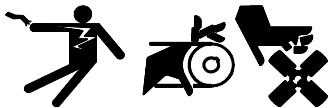
Model: 230–300 kW (Detroit Diesel Series 60)

Market: Industrial

Subject: Engine Block Heater Kits PA-354954, PA-354954-SD,  
PA-354955, PA-354955-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.

### ⚠ 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.

### ⚠ WARNING



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

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

**Checking the coolant level. Hot coolant can cause severe injury or death.** Allow the engine to cool. Release pressure from the cooling system before opening the pressure cap. To release pressure, cover the pressure cap with a thick cloth and then slowly turn the cap counterclockwise to the first stop. Remove the cap after pressure has been completely released and the engine has cooled. Check the coolant level at the tank if the generator set has 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 the power to the battery charger, if equipped.
3. Disconnect the generator set engine starting battery(ies), negative (–) lead first.
4. With the engine and the 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

The coolant drain valve is located on the radiator bottom and/or on side of the engine crankcase.

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5. **380/480 V:** Install the fuse block (X-6129-8) in the block heater control box (354316). Use the fuse block as a template and drill the mounting hole. Secure the fuse block to the control box with the screws (X-51-15), washers (X-25-48), and nuts (X-6210-4). See Figure 1 for the mounting location.

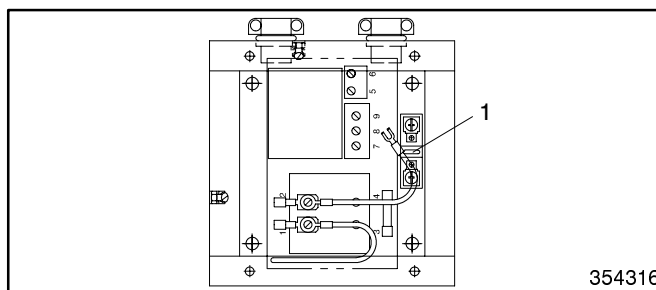
**120–240 V:** Control box 354315 uses an inline fuse holder (269216). Install the inline fuse and fuse holder at the time the block heater is wired.

6. **380/480 V:** Install the fuse (X-6135-6) in the fuse block installed in step 5.
7. Secure the vibration isolators (259632) with lock washers (X-22-12) to the control box mounting bracket. See Figure 2.
8. Secure the control box to the vibration isolators with hex cap bolts (X-465-6 and X-465-17), plain washers (X-25-40), and lock washers (X-22-12). See Figure 2. Secure the ground strap (223033) between the control box and vibration isolator. Use the 1/4-20 x 0.5 in. hex cap bolt (X-465-6) on the vibration isolator with the ground strap.
9. Mount the control box assembly to the generator set skid using four 3/8-16 x 1.0 in. hex cap bolts (X-6238-11) and plain washers (X-25-37). See Figure 3.
10. Bolt the control box ground strap to the generator set skid with one 1/4-20 x 1.0 in. hex cap bolt (X-465-7), lock washer (X-22-12), and 1/4-20 whiz nut (X-6210-2). See Figure 5.
11. Secure the block heater (279814 or 279815) to the block heater bracket (274431) with screws (X-465-7) and elastic stop nuts (X-101-8). Position the block heater as shown in Figure 4.
12. Secure the block heater assembly to the skid crossmember using 3/8-16 x 1.0 in. hex cap bolts (X-6238-11) and 3/8-16 spirallock nuts (X-6210-9). See Figure 5 for the mounting location.

#### NOTE

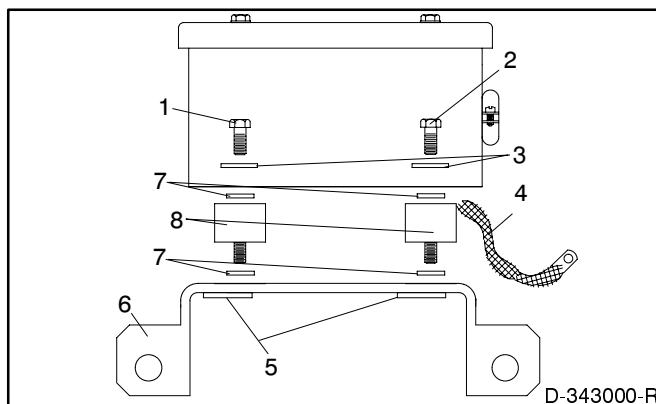
Apply pipe sealant to the male threads of all components before installing.

13. Remove the pipe plug from the upper right side of the engine block for the block heater outlet hose connection. See Figure 3.
14. Apply pipe sealant to the male threads on one end of the 3/4 x 4 in. pipe (A-107) and install the pipe where the pipe plug was removed from the engine block.



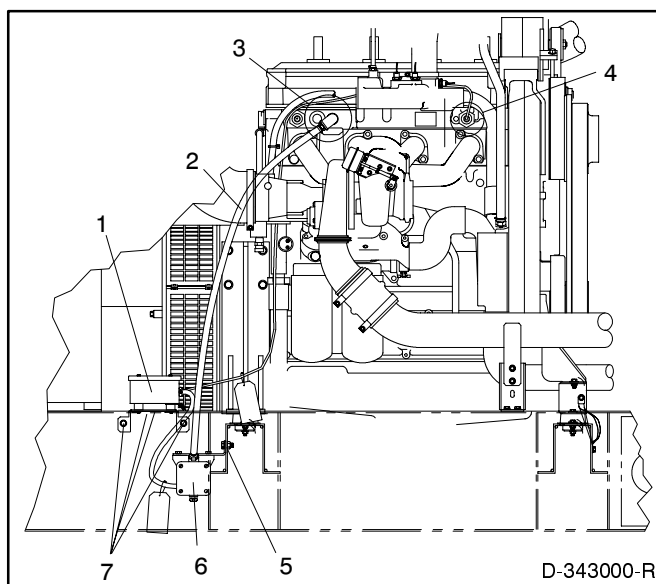
1. Fuse block mounting location

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



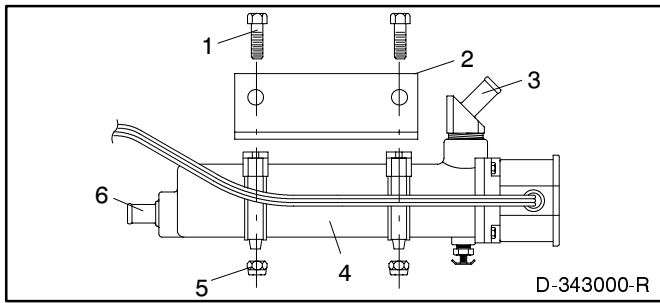
1. Hex cap bolt, 1/4-20 x 0.375 in. (X-465-17) (qty. 3)
2. Hex cap bolt, 1/4-20 x 0.5 in. (X-465-6) (qty 1)
3. Plain washer (X-25-40)
4. Ground strap (223033)
5. Mounting bracket weld nuts
6. Control box mounting bracket (343100)
7. Lock washer, internal/external tooth (X-22-12) (qty. 8)
8. Vibration isolator (259632)

**Figure 2. Block Heater Control Box Mounting**



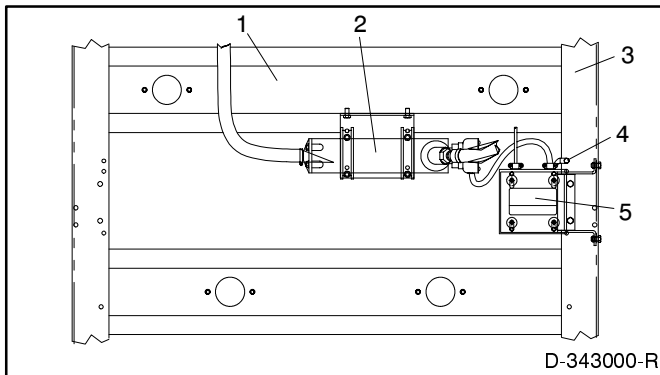
1. Block heater control box
2. Hose, 3.7 ft. (1.1 m) (X-691-37) and hose clamps (X-426-12)
3. Block heater outlet hose connection, see Figure 6
4. Block heater thermostat, see Figure 7
5. Hex cap bolt, 3/8-16 x 1.0 (X-6238-11) and spirallock nut (X-6210-9)
6. Block heater (279814 or 274815)
7. Hex cap bolt, 3/8-16 x 1.0 in. (X-6238-11) and plain washer (X-25-37)

**Figure 3. Block Heater Installation**



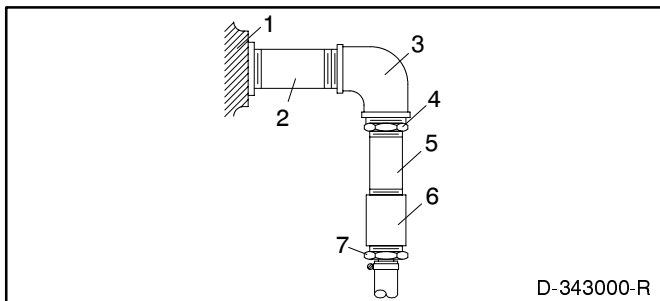
1. Hex cap bolt, 1/4-20 x 1.0 in. (X-465-7)
2. Mounting plate (274431)
3. Block heater outlet
4. Block heater (279814 or 279815)
5. Elastic stop nut, 1/4-20 (X-101-8)
6. Block heater inlet

**Figure 4. Block Heater**



1. Generator set skid crossmember
2. Block heater assembly
3. Skid rail
4. Ground strap
5. Block heater control box

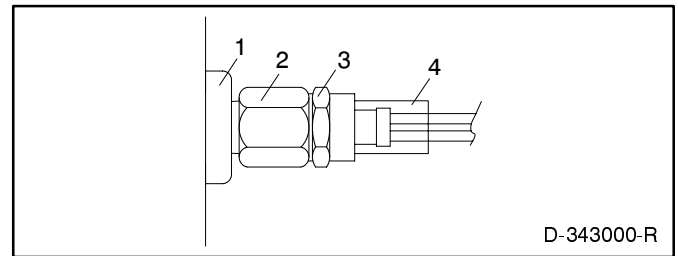
**Figure 5. Block Heater Mounting—Top View of Skid**



1. Engine block
2. Pipe, 3/4 x 4 in. (A-107)
3. Pipe elbow, 3/4 in. (X-215-2)
4. Reducer bushing, 1/2 x 3/4 in. (X-202-41)
5. Pipe, 1/2 x 4 1/2 in. (X-209-21)
6. Pipe coupling, 1/2 in. (X-216-20)
7. Hose connector, 1/2 in. (X-582-7)

**Figure 6. Engine Block Outlet Hose Connections—Side View**

15. Apply pipe sealant to the exposed male threads of the pipe installed in step 14 and install the 3/4 in. pipe elbow (X-215-2). Position the pipe elbow as shown in Figure 6.



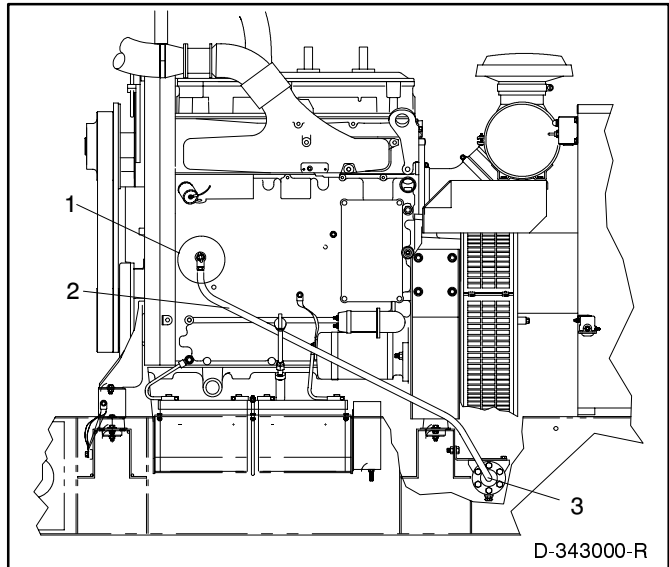
1. Freeze plug adapter
2. Thermostat housing
3. Sending unit
4. Heat shield

**Figure 7. Block Heater Thermostat Assembly**

16. Apply pipe sealant to the male threads of the 3/4 x 1/2 in. reducer bushing (X-202-41) and install the reducer bushing in the open end of the pipe elbow installed in step 15. See Figure 6.
17. Apply pipe sealant to the male threads on one end of the 1/2 x 4 1/2 in. pipe (X-209-21) and install the pipe in the reducer bushing installed in step 16. See Figure 6.
18. Apply pipe sealant to the exposed male threads of the pipe installed in step 17 and install the 1/2 in. pipe coupling (X-216-20). See Figure 6.
19. Apply pipe sealant to the male threads of the 1/2 in. hose connector (X-582-7) and install the hose connector in the end of the pipe coupling installed in step 18.
20. Remove the freeze plug from the right front side of the engine with a freeze plug puller, or puncture the center of the freeze plug and pry the plug out of the engine block. See Figure 3.
21. Clean and de-burr the hole where the freeze plug was removed.
22. Apply Loctite® threadlocker 272 (red) or equivalent material to the freeze plug adapter (324094) and the freeze plug hole.
23. Drive the freeze plug adapter into the engine block with a hardwood dowel and hammer. Keep the adapter flush with the outside surface of the engine block. Do not force the freeze plug adapter beyond the outside surface of the engine block into the engine water jacket.
24. Apply pipe sealant to the male threads of the thermostat housing and install the housing in the freeze plug adapter installed in step 23. Torque the housing to 15 ft. lbs. (20.3 Nm). See Figure 7.
25. Install the thermostat sending unit into the thermostat housing and torque the sending unit to 25 in. lbs. (2.8 Nm) and hold in place for 3 seconds. See Figure 7.

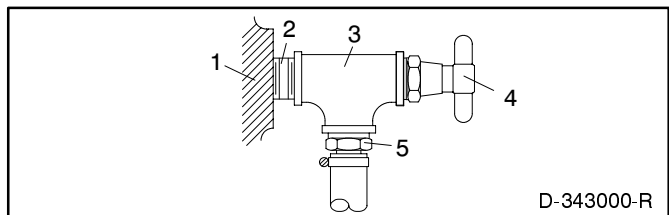
26. Route the thermostat leads along the engine wiring harness to the block heater control box. Use cable ties as necessary to protect and secure the wiring from sharp objects, exhaust system and moving parts.
27. Remove the drain valve from the left side of the engine block for the block heater inlet hose connection. See Figure 8.
28. Apply pipe sealant to the male threads on one end of the 1/2 x 1 1/2 in. pipe nipple (X-209-5) and install the pipe nipple in the engine block where the drain valve was removed in step 27. See Figure 9.
29. Apply pipe sealant to the exposed male threads of the pipe nipple installed in step 28 and install the 1/2 in. pipe tee (X-203-13). Position the pipe tee as shown in Figure 9.
30. Apply pipe sealant to the male threads of the drain valve and install the drain valve in the pipe tee. See Figure 9 for the installation location.
31. Apply pipe sealant to the male threads of the 1/2 in. hose connector and install the hose connector in the bottom of the pipe tee. See Figure 9.
32. Connect one end of the 3.7 ft. (1.1 m) hose (X-691-37) to the block heater outlet. Secure the hose to the block heater outlet with a hose clamp (X-426-12). Place the hose clamp 0.25 in. (6 mm) from the end of the hose and tighten the clamp.
33. Connect the free end of the hose connected to the block heater outlet to the hose connector on the right side of the engine. See Figure 3. Secure the hose to the hose connector with a hose clamp (X-426-12). Place the hose clamp 0.25 in. (6 mm) from the end of the hose and tighten the clamp.
34. Connect one end of the 5.4 ft. (1.6 m) hose (X-691-19) to the block heater inlet. Secure the hose to the block heater inlet with a hose clamp (X-426-12). Place the hose clamp 0.25 in. (6 mm) from the end of the hose and tighten the clamp.
35. Connect the free end of the hose connected to the block heater inlet to the hose connector on the left side of the engine. See Figure 8. Secure the hose to the hose connector with a hose clamp (X-426-12). Place the hose clamp 0.25 in. (6 mm) from the end of the hose and tighten the clamp.
36. Route the block heater and thermostat leads into the control box.

37. Use the wiring diagrams in Figure 10 to make the block heater control box electrical connections.
38. Remove the adhesive backing from the control box cover gasket (354318) and install the gasket on the inside surface of the control box cover (354317).



1. Block heater inlet hose connection, see Figure 9
2. Hose, 5.4 ft. (1.6 m) (X-691-19) and hose clamps (X-426-12)
3. Block heater inlet connection

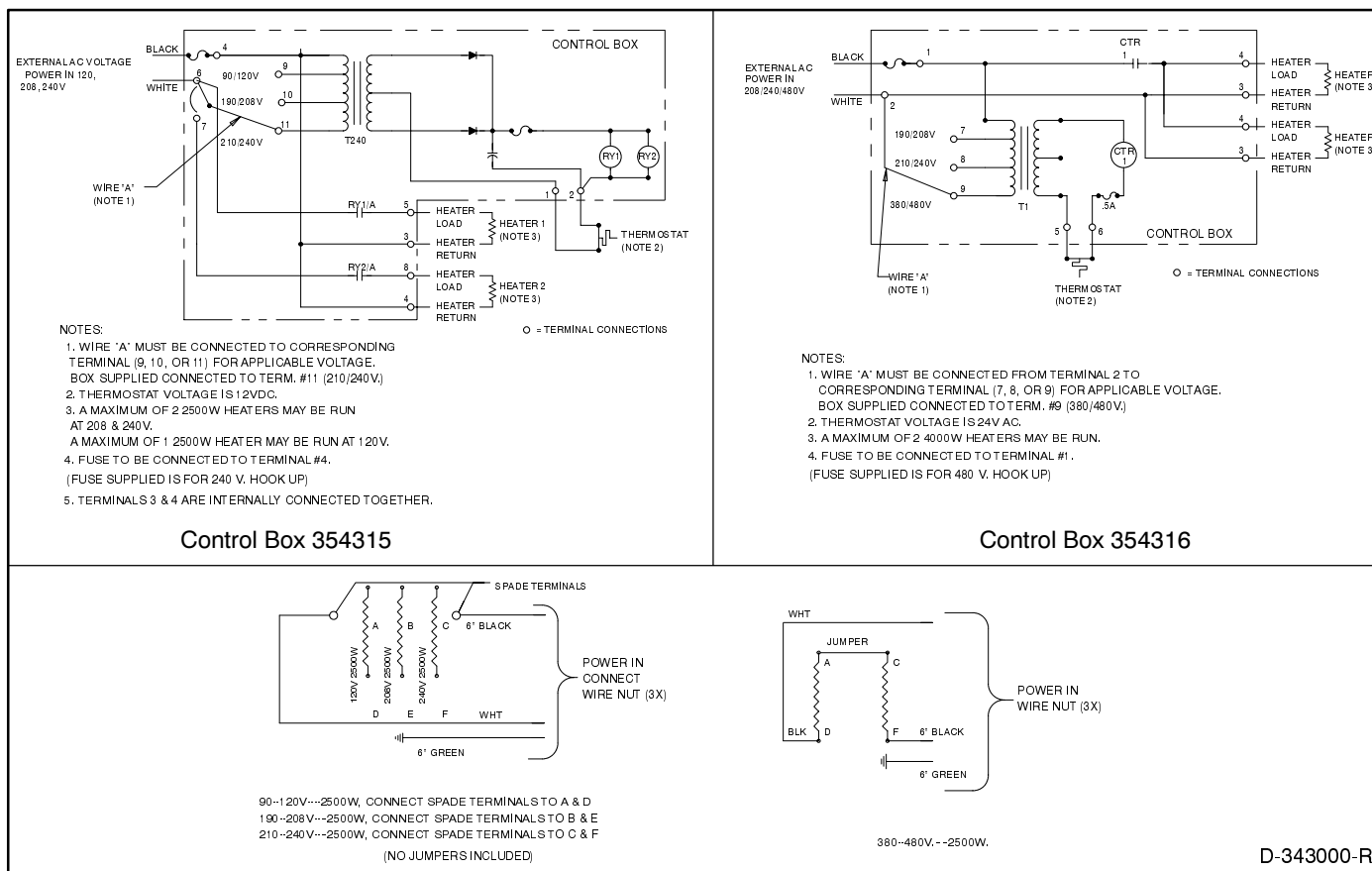
**Figure 8. Engine—Left Side View**



1. Engine block
2. Pipe nipple, 1/2 x 1 1/2 in. (X-209-5)
3. Pipe tee, 1/2 in. (X-203-13)
4. Drain valve
5. Hose connector, 1/2 in. (X-582-7)

**Figure 9. Engine Block Inlet Hose Connections—Side View**

39. Remove the adhesive backing from the wiring diagram label (354327 or 354328) and install the label on the backside of the control box cover.
40. Install the control box cover. Secure the cover to the control box with four screws (X-6216-1) and washers gaskets (297001).
41. Remove the adhesive backing from the warning decal (354325 or 354326) and install the decal on the top center of the control box cover.



**Figure 10. Block Heater Control Box Terminal Connections and Wiring Diagrams**

42. Close the drain valve(s) on the radiator and/or engine block.
43. Fill the 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 the generator set spec sheet for cooling system capacities.

#### NOTE

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

47. Test run the generator set for a few minutes to check for coolant leaks and to purge air from the system.
48. Stop the generator set. After allowing the engine and radiator to cool, correct any leakage.

#### NOTE

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

44. Check that the generator set master switch is in the OFF position.
45. Reconnect the generator set engine starting battery, negative (-) lead last.
46. Reconnect the power to the battery charger, if equipped.

49. Recheck the coolant level. After draining the cooling system, allow some time for all air cavities to refill in the system. Add coolant as necessary.
50. Tie hang tag (279047 and 279280) as noted in Figure 8.
51. Connect the block heater electrical plug to the correct voltage outlet.

## Block Heater

Parts List				
Kits: PA-354954, PA-354954-SD, PA-354955, PA-354955-SD			Unique Parts	
Qty.	Description	Common Parts	PA-354954 PA-354954-SD	PA-354955 PA-354955-SD
1	Pipe, 3/4 x 4 in.	A-107		
9	Washer, lock, 1/4 in. i/e tooth	X-22-12		
4	Washer, plain, i.d. = 0.406 in.	X-25-37		
4	Washer, plain, i.d. = 0.281 in.	X-25-40		
1	Washer, plain, i.d. = 0.188 in.			X-25-48
1	Screw, r.h.m., 8-32 x 1/2 in.			X-51-15
1	Plug, pipe, 1/2 in.	X-75-28		
4	Nut, elastic stop, 1/4-20	X-101-8		
1	Bushing, reducer, 1/2 x 3/4 in.	X-202-41		
1	Tee, pipe, 1/2 in.	X-203-13		
1	Nipple, pipe, 1/2 x 1 1/2 in.	X-209-5		
1	Pipe, 1/2 x 4 1/2 in.	X-209-21		
1	Elbow, pipe, 3/4 in.	X-215-2		
1	Coupling, pipe, 1/2 in.	X-216-20		
4	Clamp, hose, 1.25 in. max.	X-426-12		
1	Bolt, hex cap, 1/4-20 x 0.5 in.	X-465-6		
5	Bolt, hex cap, 1/4-20 x 1.0 in.	X-465-7		
3	Bolt, hex cap, 1/4-20 x 0.375 in.	X-465-17		
2	Connector, hose	X-582-7		
1	Hose, 5.4 ft. (1.6 m)	X-691-19		
1	Hose, 3.7 ft. (1.1 m)	X-691-37		
1	Block, fuse			X-6129-8
1	Fuse, 0.40 x 1.5, 600 V 10 A			X-6135-6
1	Nut, whiz, 1/4-20	X-6210-2		
1	Nut, whiz, 8-32			X-6210-4
	Nut, spiralock, 3/8-16		(2) X-6210-9	(1) X-6210-9
4	Screw, phillips hex crimpite, 10-24	X-6216-1		
6	Bolt, hex cap, 3/8-16 x 1.0 in.	X-6238-11		
1	Strap, ground, 3/8 x 5 in.	223033		
4	Isolator, vibration	259632		
1	Holder, inline fuse		269216	
1	Bracket, support	274431		
1	Tag, hang	279047		
1	Tag, instruction	279280		
1	Heater, block		279814	279815
1	Fuse, 0.25 x 1.25, 250 V 20 A		292937	
4	Gasket, washer	297001		
1	Adapter, freeze plug	324094		
1	Bracket, block heater	343100		
1	Thermostat, block heater	343222		
1	Box, block heater control		354315	354316
1	Cover, block heater control box	354317		
1	Gasket, control box	354318		
1	Decal, warning		354325	354326
1	Label, wiring diagram		354327	354328