

**INSTALLATION INSTRUCTIONS**

Original Issue Date: **11/93**

Model: **4-32 kW Diesel-Powered, Single- and Three-Phase Generator Sets**

Market: **Marine and Mobile**

Subject: **Preheat Kits PA-229240 (12 Volt), PA-344748 (24 Volt), and GM24334-KP1 (24-volt)**

**Introduction**

Installation of the preheat kit provides improved starting in cold climates. The kit includes a relay and wiring to make the preheat feature functional. See Figure 1 for kit selection. Models indicated with an asterisk (\*) in Figure 1 use glow plugs located at each fuel injector. All other models use an air-intake heater located on the intake manifold. Observe the following safety precaution while installing this kit.

Market	Model	Gen. Set Voltage	Kit Number
Marine	5EOZ/4EFOZ *	12-volt	PA-229240
	8EOZ/6.5EFOZ *		
	8.5EFOZ	12-volt 24-volt	PA-229240 PA-344748
	10EOZ/9EFOZ		
	13EOZ/11EFOZ		
	14EOZ/11.5EFOZ		
	15.5EOZ/13EFOZ		
	20EOZ/16EFOZ		
	20EOZ/17.5EFOZ		
	23EOZ/19EFOZ		
24EOZ/20EFOZ			
28EOZ/23EFOZ	12-volt 24-volt	PA-229240 GM24334-KP1	
32EOZ/27EFOZ			
Mobile	7.5EOR/6EFOR *	12-volt	PA-229240
	7.5EORZ/6EFORZ *		
	10EOR/9EFOR		
	10EORZ/9EFORZ		
* These models use glow plugs. All other models use an air-intake heater.			

**Figure 1** Preheat Kit Selection

**⚠ 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.

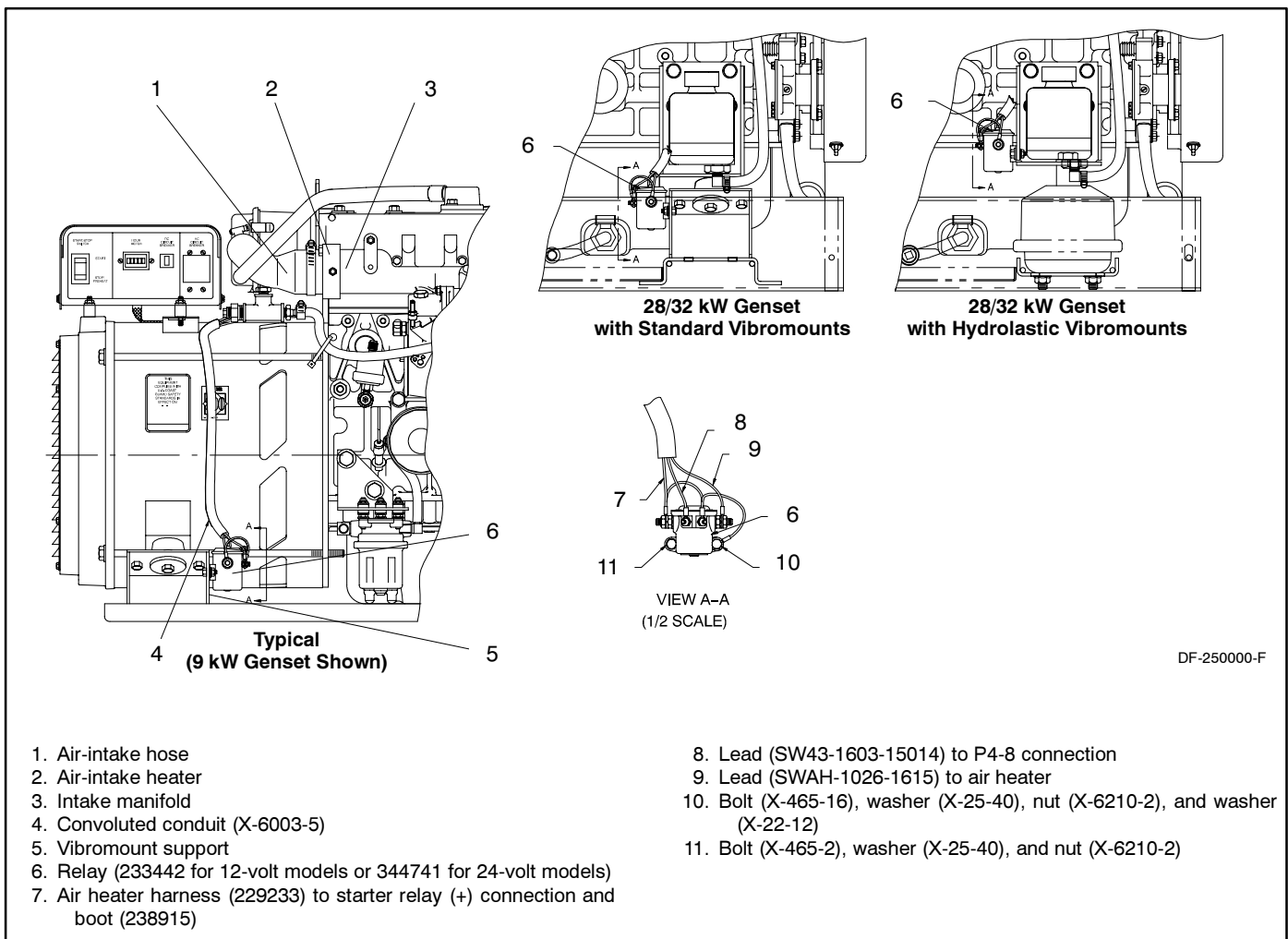
**Disabling the generator set. Accidental starting can cause severe injury or death.** Before working on the generator set or equipment connected to the set, disable the generator set as follows: (1) Place the generator set start/stop switch in the STOP position. (2) Disconnect the power to the battery charger, if equipped. (3) Remove the battery cables, negative (-) lead first. Reconnect the negative (-) lead last when reconnecting the battery. Follow these precautions to prevent the starting of the generator set by the remote start/stop switch.

# Installation Procedure

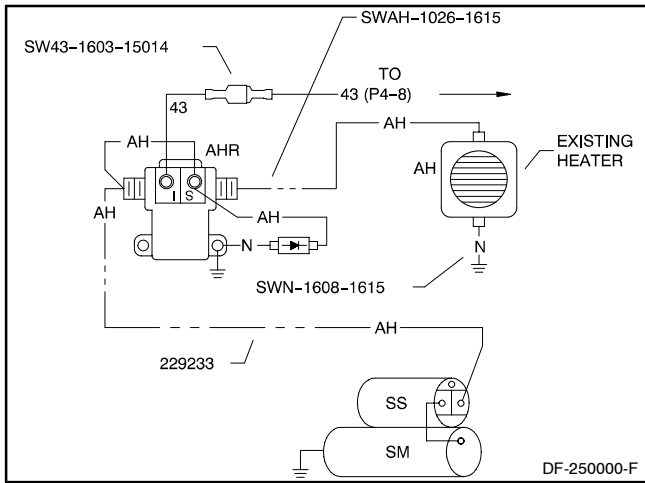
1. Place the generator set start/stop switch in the STOP position.
2. Disconnect the generator set engine starting battery, negative (-) lead first.

3. Perform step 3 for kits PA-344748 and GM24334-KP1. Proceed to step 4 for kit PA-229240.

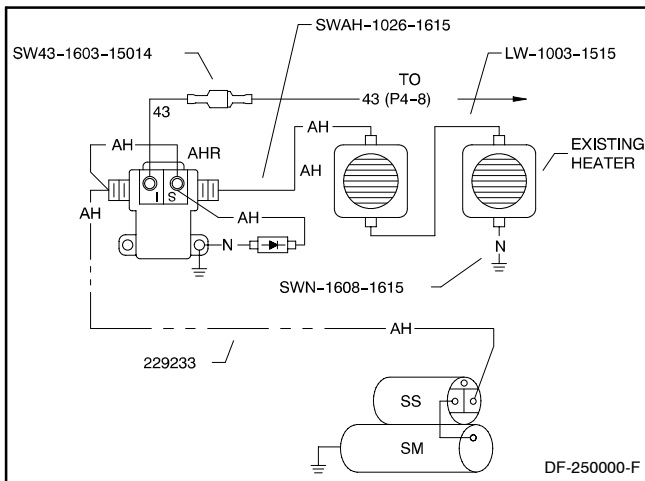
- a. Disconnect the air heater from the air-intake hose and intake manifold. See Figure 2.
- b. Install the gasket (344904 or GM24333), the air heater (344903 or GM24332), and the second gasket (344904 or GM24333) next to the existing air heater using screws (M931-08060-60) and washers (M125A-08-80). See Figure 3, Figure 4, and Figure 5.
- c. Connect the lead (LW-1003-1515) to the two negative (uninsulated) terminals on the air heaters. See Figure 3, Figure 4, and Figure 5.



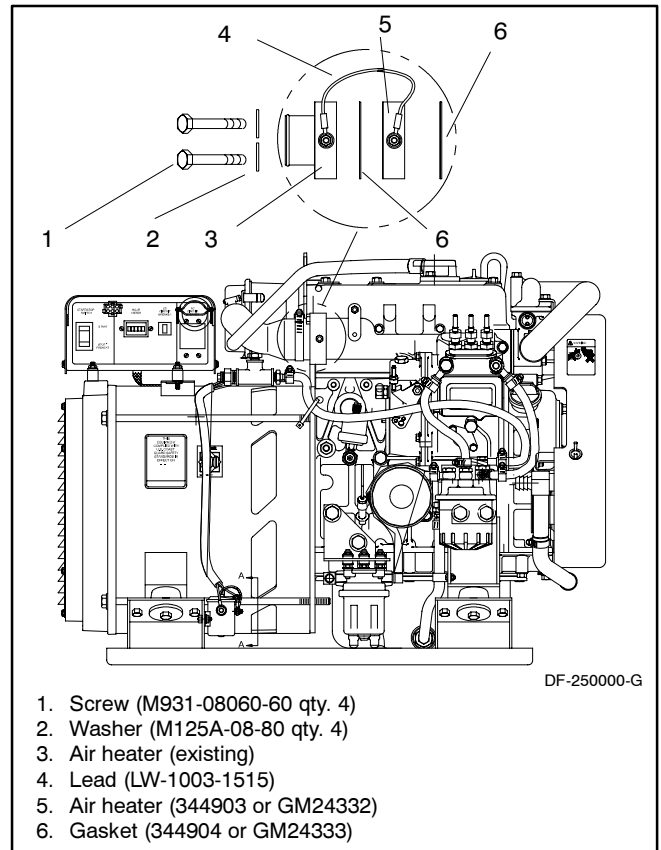
**Figure 2** Kit Components



**Figure 3** 12-Volt Wiring

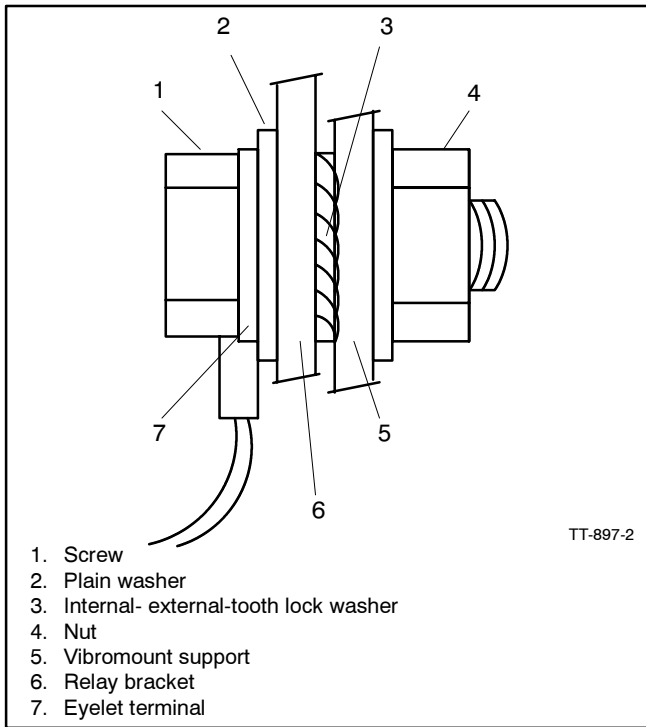


**Figure 4** 24-Volt Wiring



**Figure 5** Air Heater Installation  
(Kits PA-344748 and GM24334-KP1,  
24 Volt Only)

4. Mount the relay 233442 (12 volt) or 344741 (24 volt) to the vibromount support. See Figure 2. Use the shorter screw (X-465-2), plain washer (X-25-40), and nut (X-6210-2) to mount the relay on the outer mounting tab. Place the plain washer between the screw head and the relay bracket.
5. Use the longer screw (X-465-16), plain washer (X-25-40), internal- external-tooth lock washer (X-22-12), and nut (X-6210-2) to mount the relay on the inner mounting tab. Locate the internal-external-tooth lock washer between the relay bracket and the vibromount support. Attach the wiring harness (229233) to the inner screw.
6. Place the single-end eyelet-terminal lead from the diode between the screw head and the plain washer. See Figure 6, Figure 7, and the wiring diagram supplied in the generator set's operation manual for electrical connections.



**Figure 6** Relay Hardware Sequence  
 (Cross-Section View)

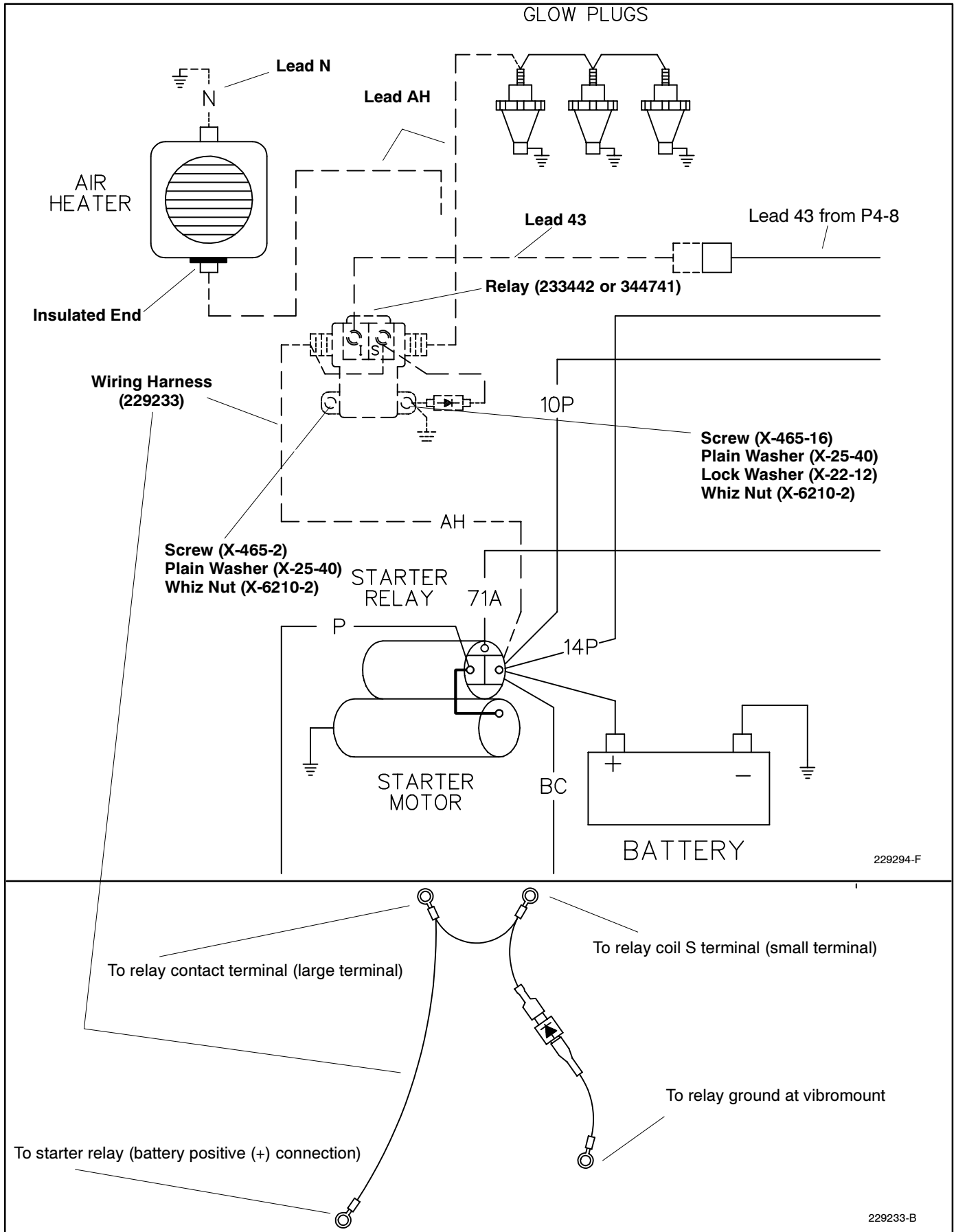
7. Connect the remaining terminals of the wiring harness. Connect the first eyelet terminal from the diode to the small terminal (S) on the relay. Connect the second eyelet terminal to the large terminal on the relay. Connect the third eyelet terminal to the starter relay where the battery positive (+) connects.

8. Connect lead AH (10-gauge, 26-inch, SWAH-1026-1615) between the unused large terminal of the relay and to either the glow plug or the air-intake heater insulated terminal.
9. Connect lead 43 (SW43-1603-15014) between the unused small terminal of the relay and to lead 43 of the engine wiring harness from connector P4-8. Find this lead inside the plastic conduit of the engine wiring harness near the relay.
10. **Models with Air-Intake Heater only:**  
 Connect lead N (SWN-1608-1615) to either of the air-intake heater negative (uninsulated) terminals and to any convenient engine block screw such as the fuel solenoid bracket or the lifting eye. Do *not* remove a cylinder head bolt. Remove any paint from the threads of the air-intake heater terminal studs before removing the nut.

**Note:** If the nut cannot be easily separated from the stud, remove the four screws securing the air-intake heater to the intake manifold. Use a wrench on the bolt head and on the nut. Do not damage the heating coil. Install the lead and reassemble.

**Note:** Do *not* use Lead N (SWN-1608-1615) with glow plug models.

11. Place the convoluted conduit (X-6003-5) over the leads from the relay to the glow plug or the air-intake heater. See Figure 2.
12. Reconnect the generator set starting battery, negative (-) lead last.



**Figure 7** Electrical Connections

## Operation

Portions of the starting and stopping procedures are included here for reference. Find the complete starting and stopping procedures in the respective operation manual and/or service manual.

### Starting the Generator Set

The following table describes the actions required to start the generator set.

Step	Action
1	<p><b>Preheat/cold weather starts</b>            During cold weather starts** place the controller's start/stop switch in the STOP/PREHEAT position for 15–20 seconds before attempting to start the generator set. This energizes the air heater coil or glow plugs. Do not energize the preheat feature for more than 30 seconds or damage to the heaters may occur.</p> <p><b>NOTE:</b> All controller start/stop switches indicate preheat; however, an optional preheat kit is required to make the preheat feature functional.</p>
2	<p><b>Fuel shutoff valve</b>            Open the manual fuel shutoff valve, if equipped.</p>
3	<p><b>Starting</b>            Hold the generator set controller start/stop switch or the remote start/stop switch in the START position until the generator set starts.</p>

\*\*Below -5°C (23°F) 4/9/23/27EFOZ, 5/10/28/32EOZ marine models and 7.5/10EOR/EORZ, 6/9EFOR/EFORZ mobile models.  
 Below 5°C (41°F) 6.5EFOZ/8EOZ marine models  
 Below 4°C (40°F) 11–20EFOZ and 13–24EOZ marine models

### Stopping the Generator Set

The following table describes the actions required to stop the generator set.

Step	Action
1	<p><b>Cooldown</b>            Run the generator set at no load for 5 minutes to ensure adequate engine cooldown.</p>
2	<p><b>Stopping</b>            Place the controller start/stop switch or remote start/stop switch in the STOP position.</p> <p><b>NOTE:</b> Do not place the start/stop-preheat switch, if equipped, in the STOP-PREHEAT position for more than 30 seconds or damage to the preheaters may occur.</p>
3	<p><b>Fuel shutoff valve</b>            Close the manual fuel shutoff valve, if equipped.</p>

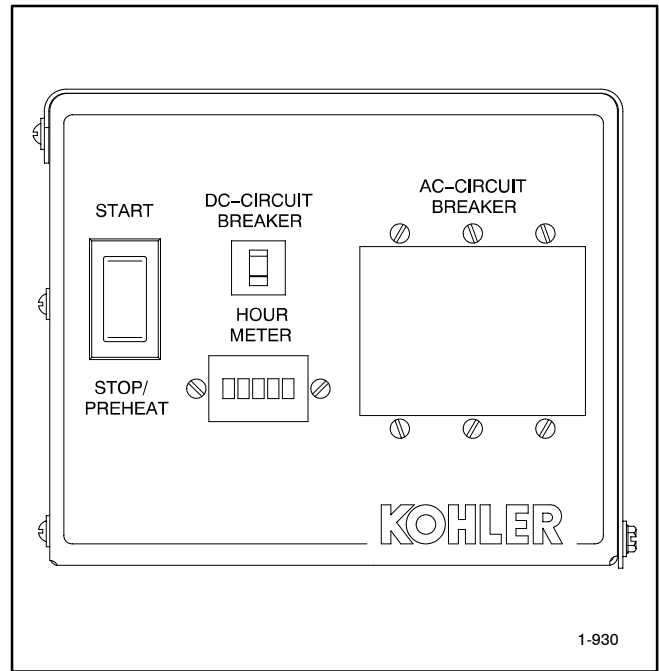


Figure 8 Marine Controller (typical)

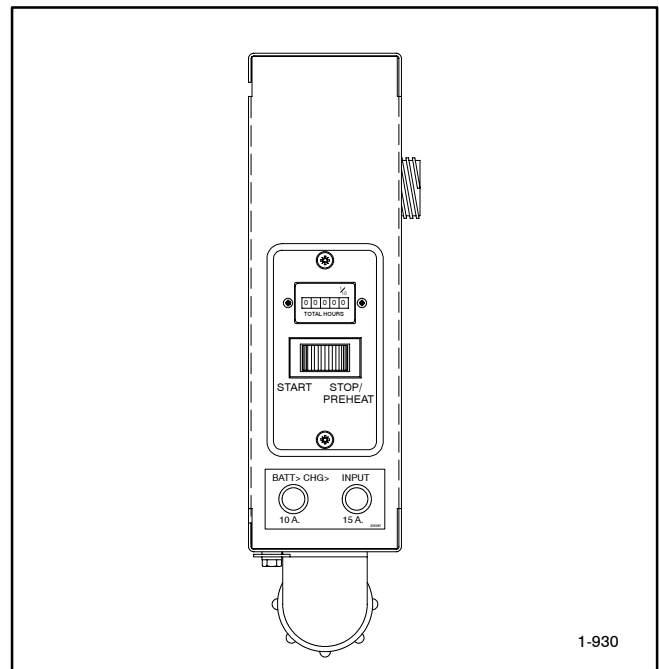


Figure 9 Mobile Controller (typical)

# Parts List

## Preheat Kits

Kits: PA-229240 (12 Volt), PA-344748 (24 Volt), and GM24334-KP1 (24 Volt)					
Qty.	Description	Common Parts	PA-229240	PA-344748	GM24334-KP1
1	Lead, AH (10 ga., 26 in.)	SWAH-1026-1615			
1	Lead, N (10 ga., 3 in.)			LW-1003-1515	LW-1003-1515
1	Lead, N (16 ga., 8 in.)	SWN-1608-1615			
1	Lead, 43 (16 ga., 3 in.)	SW43-1603-15014			
1	Washer, 0.267 x 0.760 x 0.040 in. internal- external-tooth, lock	X-22-12			
2	Washer, 0.281 x 0.625 x 0.06 in. plain	X-25-40			
1	Screw, 1/4-20 x 0.75 in.	X-465-16			
1	Screw, 1/4-20 x 0.625 in.	X-465-2			
1	Conduit, convoluted	X-6003-5			
2	Nut, whiz 1/4-20	X-6210-2			
1	Harness, wiring	229233			
1	Boot	238915			
1	Relay		233442	344741	344741
1	Heater, air			344903	GM24332
2	Gasket, air heater			344904	GM24333
4	Screw, HC (M8 x 60 mm)			M931-08060-60	M931-08060-60
4	Washer, plain (M8)			M125A-08-80	M125A-08-80

# Notes