# INSTALLATION INSTRUCTIONS

Original Issue Date: **9/02**
Model: **20–2000 kW**
Market: **Industrial Generator Sets with the 550 Controller**
Subject: **Ten-Relay Dry Contact Kits: 365569-KP10 (Primary), 365569-KP11 (Secondary), 365569-KP12 (Switchgear), GM17069-KP1, and GM17069-KP2**

## Introduction

The ten-relay dry contact kit provides normally open and normally closed contacts in a form C configuration to activate warning devices and other customer-provided accessories allowing remote monitoring of the generator set. Connect any controller fault output to the ten-relay dry contact kit. Typically, lamps, audible alarms, or other devices signal the fault conditions. See Figure 1 for an illustration of the ten-relay dry contact kit.

**Note:** A maximum of three kits may be connected to a single relay driver output. Kits include dry contacts, remote annunciator, common failure alarm, A/V alarm, and shunt trip line circuit breaker.

The 450–2000 kW generator sets have three kits available: 365569-KP10 is the primary 10-relay kit with the controller connection assembly, 365569-KP11 is the secondary 10-relay kit without the controller connection assembly, and 365569-KP12 is the switchgear 10-relay kit with the controller connection assembly. The controller connection assembly (included with the 365569-KP10 primary dry contact kit) must be installed before using the 365569-KP11 secondary dry contact kit.

Check the electrical requirements of the customer-provided accessories prior to installation of the ten-relay dry contact kit. Customer-provided accessories require their own electrical source and must not exceed the relay contact ratings that follow.

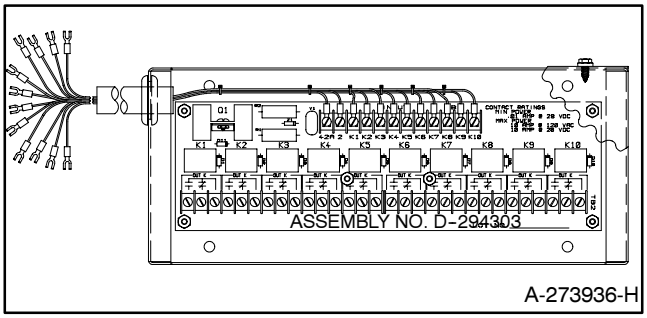



**Figure 1** Ten-Relay Dry Contact Kit (20–400 kW Model kit shown)

Do not use terminals 42A or N on the controller connection kit terminal strip to supply voltage to customer-provided accessories. Customer-provided DC accessories require separate leads connected directly to the battery for the voltage supply. Attach customer-supplied 12/24-volt DC accessories to the battery positive (+) connection at the starter solenoid and to the battery negative (–) connection at the engine ground. The 120 VAC accessories require a customer-supplied voltage source.

### Relay Contact Rating

| | |
|---|---|
| Maximum Switching Current | 10 amps |
| Minimum Switching Current | 10 milliamps |
| Maximum Switching Voltage | 120 volts AC or 28 volts DC |

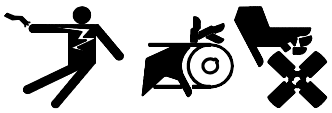
Read the entire installation procedure and compare the kit parts with the parts list in this publication before beginning installation. Perform the steps in the order shown.

Observe applicable local and national electrical codes when installing the wiring system.

## Safety Precautions

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.

## Installation Procedure

### 1. Remove the generator set from service.

1.1 Place the generator set master switch in the OFF position.

1.2 Disconnect the power to the battery charger, if equipped.

1.3 Disconnect the generator set engine starting battery(ies), negative (-) lead first.

### 2. Mount and connect the controller connection assembly.

2.1 **GM17069-KP1 kit (20-300 kW)**

2.1.1 Remove the junction box rear panel and hardware.

2.1.2 Attach the controller connection assembly (GM13984) to the junction box using six screws (X-51-3), spacers (X-712-9), and nuts (X-6210-4). Place the spacers between the controller connection assembly and the junction box bracket. See Figure 2 for the mounting location.

2.1.3 Plug the wiring connection harness (GM17033) into the controller connection assembly's P25 connector.

2.1.4 Proceed to step 3.

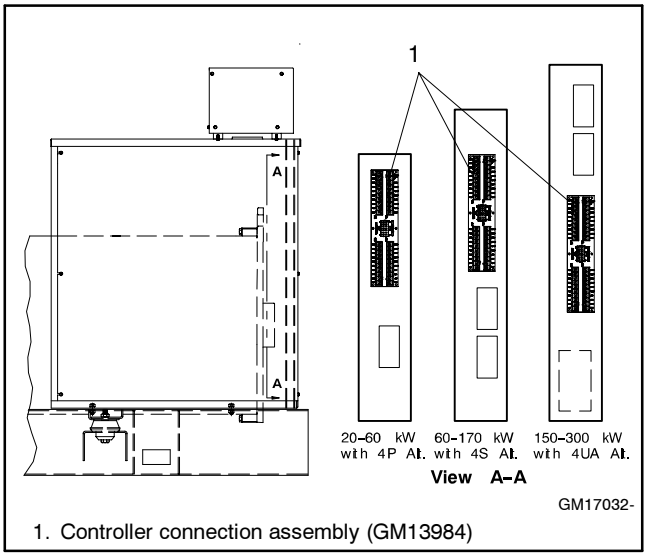
2.2 **GM17069-KP2 kit (350/400 kW)**

2.2.1 Remove the junction box rear panel and hardware.

2.2.2 Remove the four screws attaching the controller to the junction box. See Figure 3.

2.2.3 Mark the drill hole locations where the terminal block bracket (347292) mounts to the junction box top panel using the dimensions given in Figure 3.

2.2.4 Move the controller away from the rear of the junction box in order to provide enough clearance to drill two 9 mm (0.344 in.) diameter holes in the top of the junction box.




1. Controller connection assembly (GM13984)

**Figure 2** Controller Connection Assembly Mounting Locations in Junction Box (20-300 kW)

2.2.5 Remove burrs from the drilled holes and clean up all metal chips in the junction box.

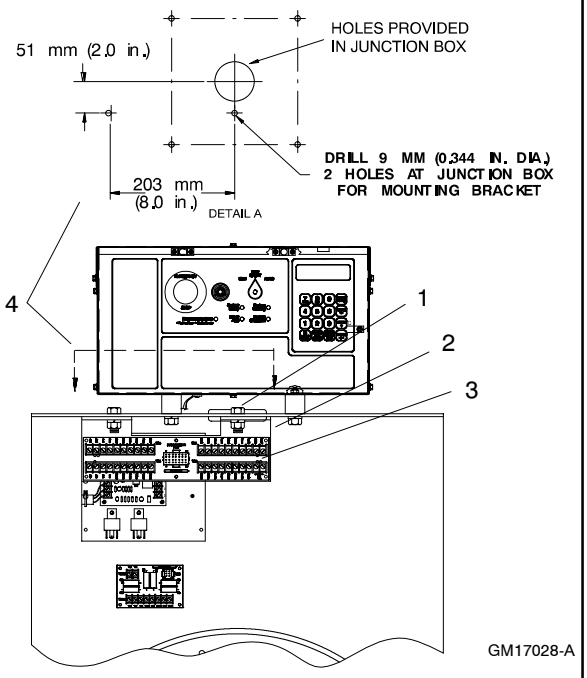
2.2.6 Place the terminal block bracket (347292) on the underside of the junction box top panel with the bracket mounting holes visible from the rear of the junction box and mount using two screws (X-125-3) and nuts (X-6210-7). See Figure 3.

2.2.7 Reposition the controller over the junction box holes and install the four screws.

2.2.8 Attach the controller connection assembly (GM13984) to the terminal block bracket using six screws (X-51-3), spacers (X-712-9), and nuts (X-70-12). Place the spacers between the controller connection assembly and the mounting bracket.

2.2.9 Plug the wiring connection harness (GM17029) into the controller connection assembly's P25 connector.

2.2.10 Proceed to step 3.




1. Terminal block bracket screws (X-125-3) and nuts (X-6210-7)
2. Terminal block bracket (347292)
3. Controller connection assembly (GM13984)
4. Detail A, mounting hole dimensions (top panel)

**Figure 3** Terminal Block Bracket and Controller Connection Assembly Mounting (350/400 kW)

2.3 **365569-KP10 and 365569-KP12 kits only (450–2000 kW).**

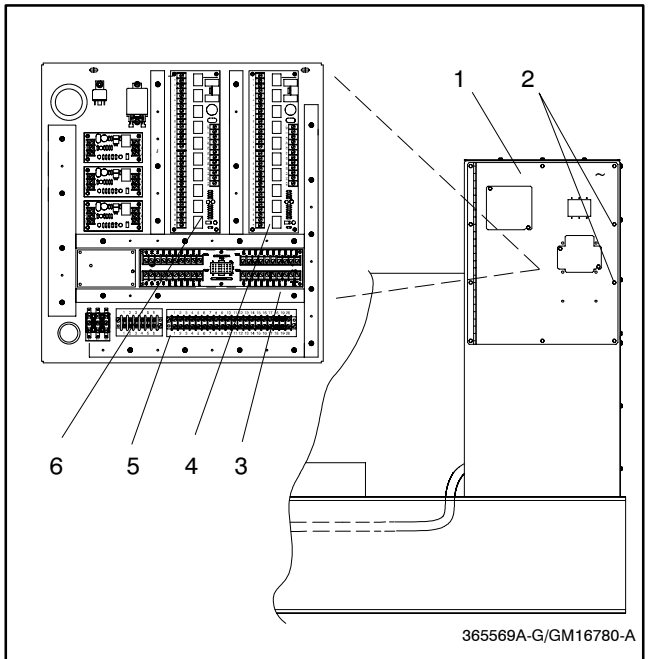
2.3.1 Remove the junction box upper rear panel and hardware.

2.3.2 Remove the inner panel access door screws and swing open the access door.

2.3.3 Attach the controller connection assembly (GM13984) to the junction box bracket studs using six spacers (X-712-9) and nuts (X-70-12). Place the spacers between the controller connection assembly and the mounting bracket. See Figure 4 for the mounting location.

2.3.4 Plug the wiring connection harness (GM16753) into the controller connection assembly's P25 connector.

2.3.5 Proceed to step 3.




1. Inner panel access door
2. Inner panel access door screws
3. Controller connection assembly (GM13984)
4. Secondary location for the dry contact circuit board (D-294303)
5. TX2 terminal block (273769)
6. Primary location for the ten-relay dry contact circuit board (D-294303)

**Figure 4** Terminal Block Bracket Mounting in Junction Box (450–2000 kW)

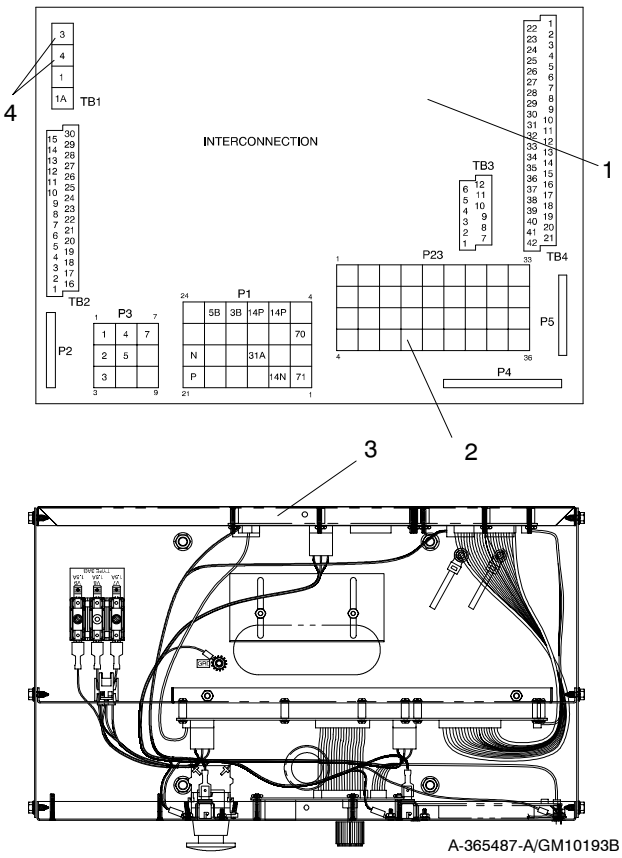
## 3. Attach the wiring connection harness to the interconnection circuit board.

3.1 Remove the controller cover and hardware.

3.2 Route the other end of the wiring connection harness (GM17029, GM17033, or GM16753) through the junction box port to the controller interconnection circuit board.

3.3 Plug the wiring harness connector into the interconnection circuit board's P23 connector. Connect lead ES3 to TB-1 terminal 3 and connect lead ES4 to TB-1 terminal 4. See Figure 5. If access to the interconnection circuit board is difficult, remove the two rear controller panel top screws and loosen the bottom screws to swing the rear controller panel down.

3.4 Swing the rear controller panel up and replace the screws, if previously removed. Replace the controller cover and hardware. Tighten all controller screws.




1. Interconnection circuit board (top view)
2. P23 connector
3. Interconnection circuit board mounted on the controller rear panel
4. Connect lead ES3 to TB-1 terminal 3 and connect lead ES4 to TB-1 terminal 4

**Figure 5** Attaching Wiring Connection Harness to Controller Circuit Board

**4. 365569-KP11 kit only (450–2000 kW). Mount and connect the TX2 terminal block (for switchgear applications).**

4.1 Remove the junction box upper rear panel and hardware.

4.2 Remove the inner panel access door screws and swing open the access door.

4.3 Attach the TX2 terminal block (273769) and strip marker (279271) to the junction box bracket using two screws (X-49-6) and whiz nuts (X-6210-3). See Figure 4 for the mounting location.

4.4 Disconnect lead 1A from TB1-1A. Cut the existing terminal from lead 1A and attach the 1/4 in. push-on terminal (X-431-29) to lead 1A. See Figure 6.

4.5 Connect the wiring harness (GM16754) to the TX2 terminal block and to terminal strips TB1 and TB4 on the controller interconnection circuit board.

4.6 Connect the optional line circuit breaker auxiliary switch and overcurrent trip switch, if required.

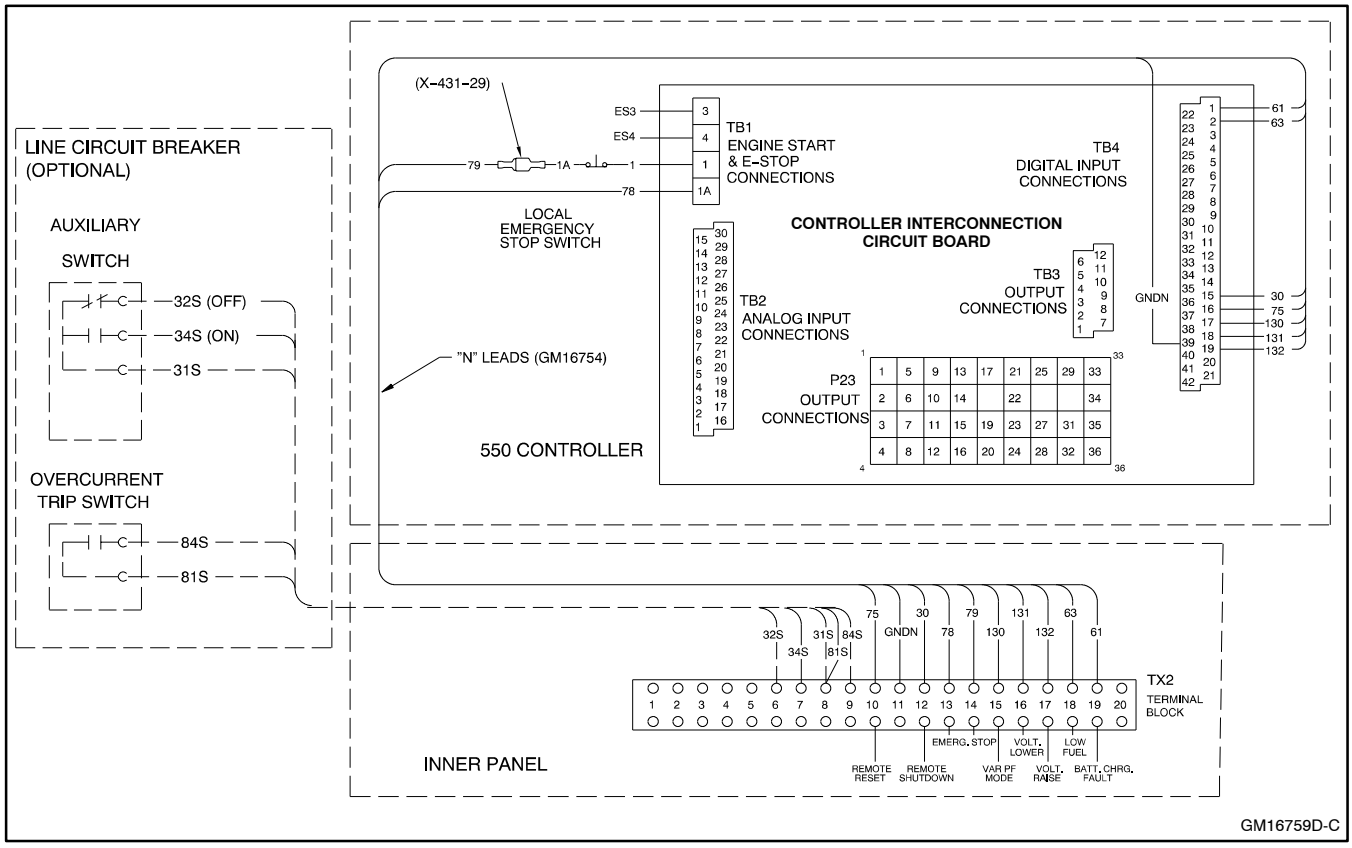



**Figure 6** Attaching Wiring Connection Harness to TX2 Terminal Block

## 5. Mount the ten-relay dry contact assembly.

### 5.1 GM17069-KP1 kit (20–300 kW)

5.1.1 Drill four 7.1 mm (0.281 in.) diameter holes in the junction box as shown in Figure 7. The ten-relay dry contact kit mounts behind the controller.

5.1.2 Remove burrs from the drilled holes and clean up all metal chips in the junction box.

5.1.3 Remove the cover from the ten-relay dry contact assembly (A-273936) by removing four screws.

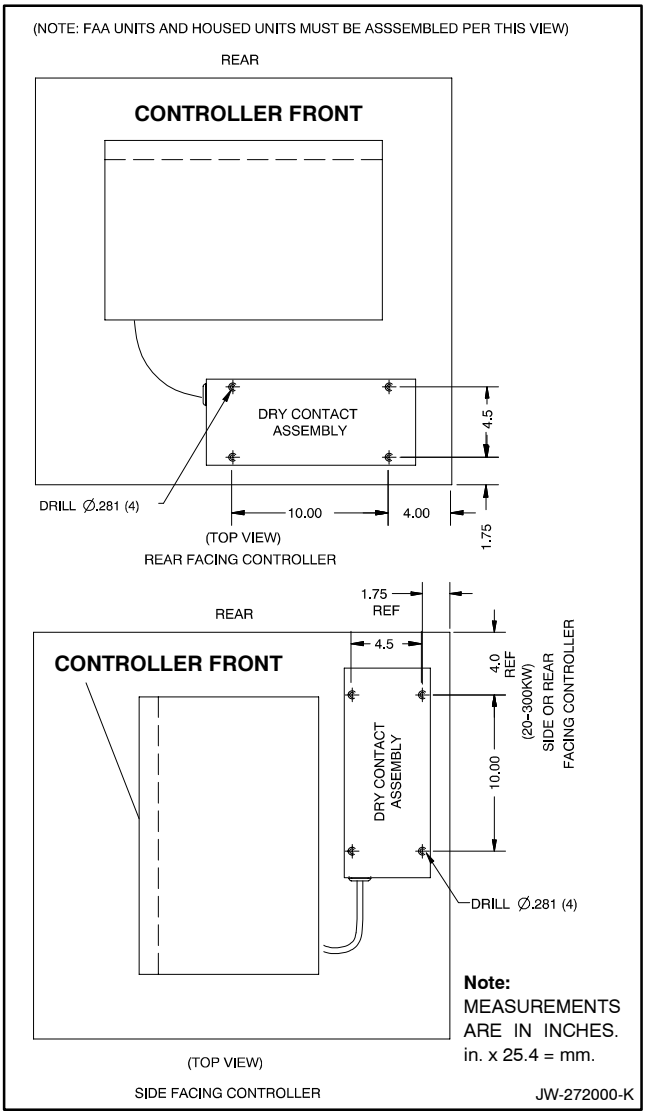



**Figure 7** Junction Box Drilling Information (20–300 kW)

5.1.4 Mount the ten-relay dry contact box (A-273936) to the junction box using four screws (X-465-7), spacers (X-400-28), and nuts (X-6210-2). See Figure 7 for the mounting position.

5.1.5 Proceed to step 6.

### 5.2 GM17069-KP2 kit (350/400 kW)

5.2.1 Drill four 7.1 mm (0.281 in.) diameter holes in the junction box as shown in Figure 8.

5.2.2 Remove burrs from the drilled holes and clean up all metal chips in the junction box.

5.2.3 Remove the cover from the ten-relay dry contact assembly (A-273936) by removing four screws.

5.2.4 Mount the ten-relay dry contact box (A-273936) to the junction box using four screws (X-465-7), spacers (X-400-28), and nuts (X-6210-2). See Figure 8 for the mounting position.

5.2.5 Proceed to step 6.

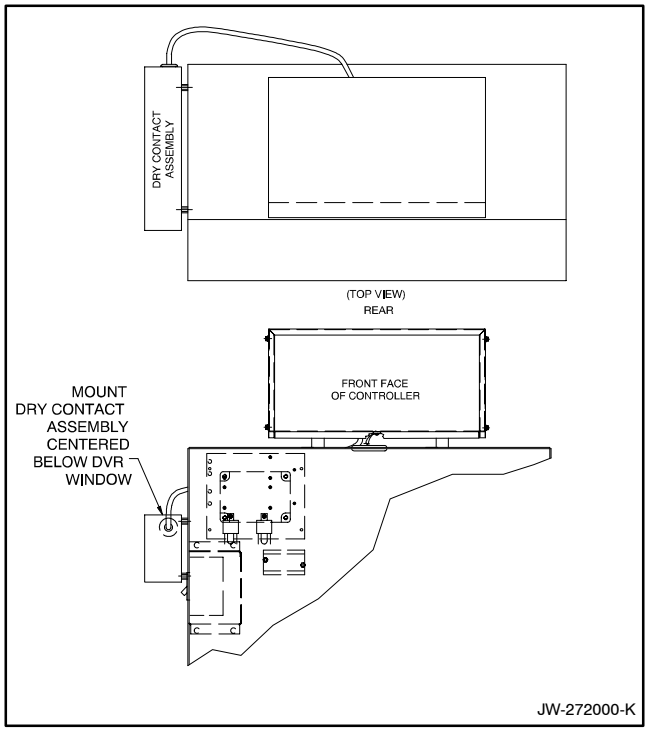



**Figure 8** Junction Box Drilling Information (350/400 kW)

5.3 **365569-KP10 and 365569-KP12 kits (450–2000 kW)**

5.3.1 Mount the ten-relay dry contact circuit board (D-294303) in the primary location on the junction box bracket studs using six spacers (X-712-9) and nuts (X-70-12). Place the spacers between the ten-relay dry contact circuit board and the mounting bracket. See Figure 4 for the mounting location.

5.3.2 Connect the 12-lead dry contact relay wiring harness (GM16755) to the ten-relay dry contact kit relay input terminals. See Figure 9 for connection information.

5.3.3 Proceed to step 6.

5.4 **365569-KP11 kit (450–2000 kW)**

5.4.1 Mount the ten-relay dry contact circuit board (D-294303) in the secondary location on the junction box bracket studs using six spacers (X-712-9) and nuts (X-70-12). Place the spacers between the ten-relay dry contact circuit board and the mounting bracket. See Figure 4 for the mounting location.

5.4.2 Connect the 12-lead dry contact relay wiring harness (GM16756) to the ten-relay dry contact kit relay input terminals. See Figure 9 for connection information.

5.4.3 Proceed to step 6.

## 6. Connect the ten-relay dry contact kit to the controller connection kit.

Connect the ten-relay dry contact wiring harness to the controller connection assembly in the junction box. See Figure 9. Leads 42A and N provide power to the relay. The user must select up to ten fault terminals for connecting the K1–K10 signal leads. See Figure 10 and Figure 11 for terminal connections.

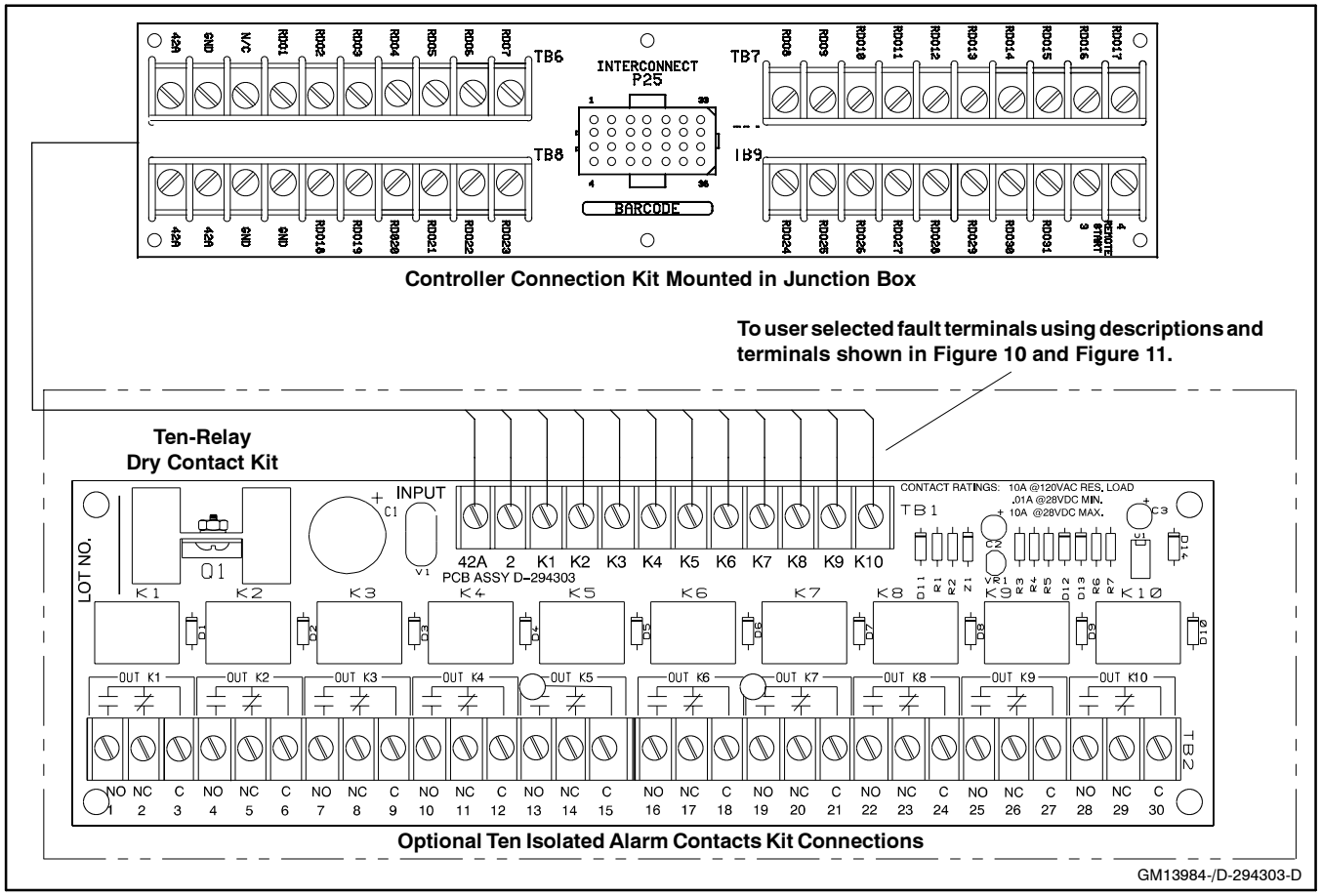



**Figure 9** Ten-Relay Dry Contact Relay Kit Connections

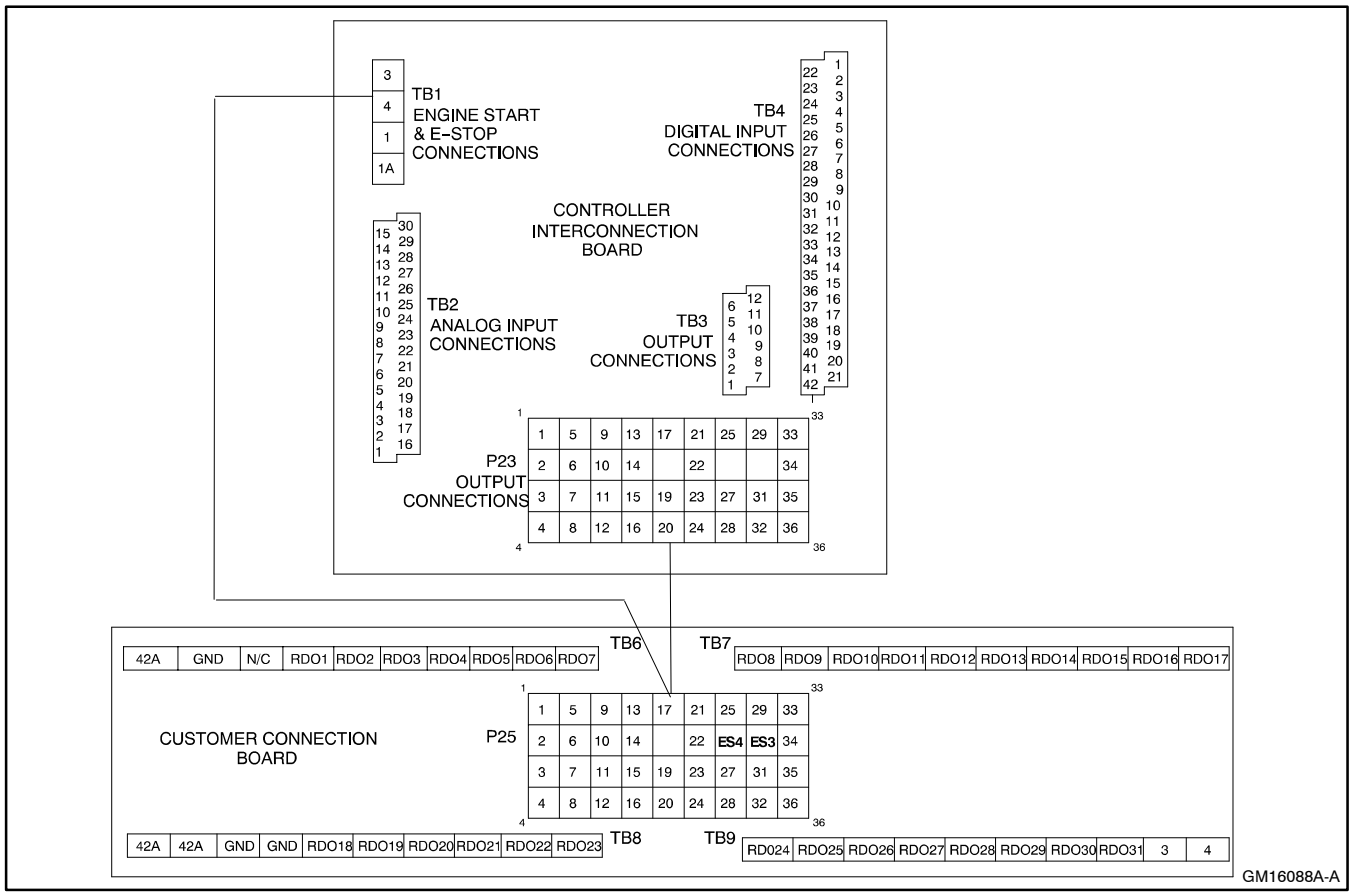



**Figure 10** Controller Connection Assembly

### TB6 Terminal Strip—RDOs 1-7

| Term. | Description |
|---|---|
| 42A | Battery (+) |
| GND | Battery (-) |
| N/C | |
| RDO1 | Overspeed (lead 39) |
| RDO2 | Overcrank (lead 12) |
| RDO3 | High coolant temperature shutdown (lead 36) |
| RDO4 | Low oil pressure shutdown (lead 38) |
| RDO5 | Low coolant temperature (lead 35) |
| RDO6 | High coolant temperature warning (lead 40) |
| RDO7 | Low oil pressure warning (lead 41) |

### TB7 Terminal Strip—RDOs 8-17

| Term. | Description |
|---|---|
| RDO8 | Low fuel (lead 63) |
| RDO9 | Master switch not in auto ( lead 80) |
| RDO10 | NFPA 110 common alarm (lead 32)* |
| RDO11 | Battery charger fault (lead 61) |
| RDO12 | Low battery voltage (lead 62) |
| RDO13 | High battery voltage |
| RDO14 | Emergency stop (lead 48) |
| RDO15 | Generator running (lead 70R) |
| RDO16 | Time delay engine cooldown (TDEC) (lead 70C) |
| RDO17 | System ready (lead 60) |

### TB8 Terminal Strip—RDOs 18-23

| Term. | Description |
|---|---|
| 42A | Battery (+) |
| 42A | Battery (+) |
| 2 | Battery (-) |
| 2 | Battery (-) |
| RDO18 | Defined common fault (lead 32A) |
| RDO19 | Low coolant level |
| RDO20 | Overvoltage (lead 26) |
| RDO21 | Idle mode |
| RDO22 | EPS supplying load |
| RDO23 | Air damper indicator (lead 56) |

### TB9 Terminal Strip—RDOs 24-31

| Term. | Description |
|---|---|
| RDO24 | Speed sensor fault |
| RDO25 | Loss of AC sensing |
| RDO26 | ECM loss of communication |
| RDO27 | Undervoltage |
| RDO28 | Overfrequency |
| RDO29 | Underfrequency |
| RDO30 | Load shed kW overload |
| RDO31 | Load shed underfrequency |
| 3 | Remote start |
| 4 | Remote start |

**Note:** Lead numbers shown in parentheses are the factory default wire designations.

**Note:** RDO-1 though RDO-31 are customer definable with the following factory defaults: emergency stop, high coolant temperature, low oil pressure, overcrank, and overspeed

***NFPA-110 common alarm faults include:**

Air damper indicator (RDO-23)
Battery charger fault (RDO-11)
EPS supplying load (RDO-22)
High battery voltage (RDO-13)
High coolant temperature warning (RDO-06)
High coolant temperature shutdown (RDO-03)
Low battery voltage (RDO-012)
Low coolant level (RDO-19)
Low coolant temperature warning (RDO-05)
Low fuel (level or pressure) (RDO-08)
Low oil pressure warning (RDO-07)
Low oil pressure shutdown (RDO-04)
Master switch not in auto (RDO-09)
Overcrank (RDO-02)
Overspeed (RDO-01)

**Figure 11** Controller Connection Assembly Terminal Strip Identification with Relay Driver Outputs (RDOs)

## 7. Connect the ten-relay dry contact to the customer-supplied device.

Select the normally open (NO) and/or normally closed (NC) contacts of the ten-relay, form C dry contact, depending upon the application. Use a two-wire harness for either NO or NC connections. Use a three-wire harness for both NO and NC connections.

7.1 Supply two or three lengths of stranded wire to make leads long enough to connect the customer-supplied device to the ten-relay dry contact terminals and power supply. Use color-coded wire for easy identification. Make leads long enough to allow for walls, ductwork, and other obstructions. Use separate conduit for the ten-relay dry contact wiring.

7.2 **12/24-Volt DC Devices.** Attach the customer-supplied 12/24-volt DC accessories to the starting battery positive (+) connection at the starter solenoid and to the battery negative (–) connection at the engine ground. Otherwise, use a separate 12/24-volt DC supply. Do not use terminals 42A and N on the controller connection kit terminal strip to supply the voltage to the relay contacts. Supply separate leads directly to the battery for the supply voltage. The circuit must include fuse or circuit breaker protection.

**365569-KP10 and 365569-KP12 kits only (450–2000 kW).** Install the 10-lead dry contact wiring harness (GM10180) to electrically connect the relay common (C) terminals together when using a DC power supply. See Figure 12. Remove the 10-lead dry contact wiring harness (GM10180) when applying an AC power supply.

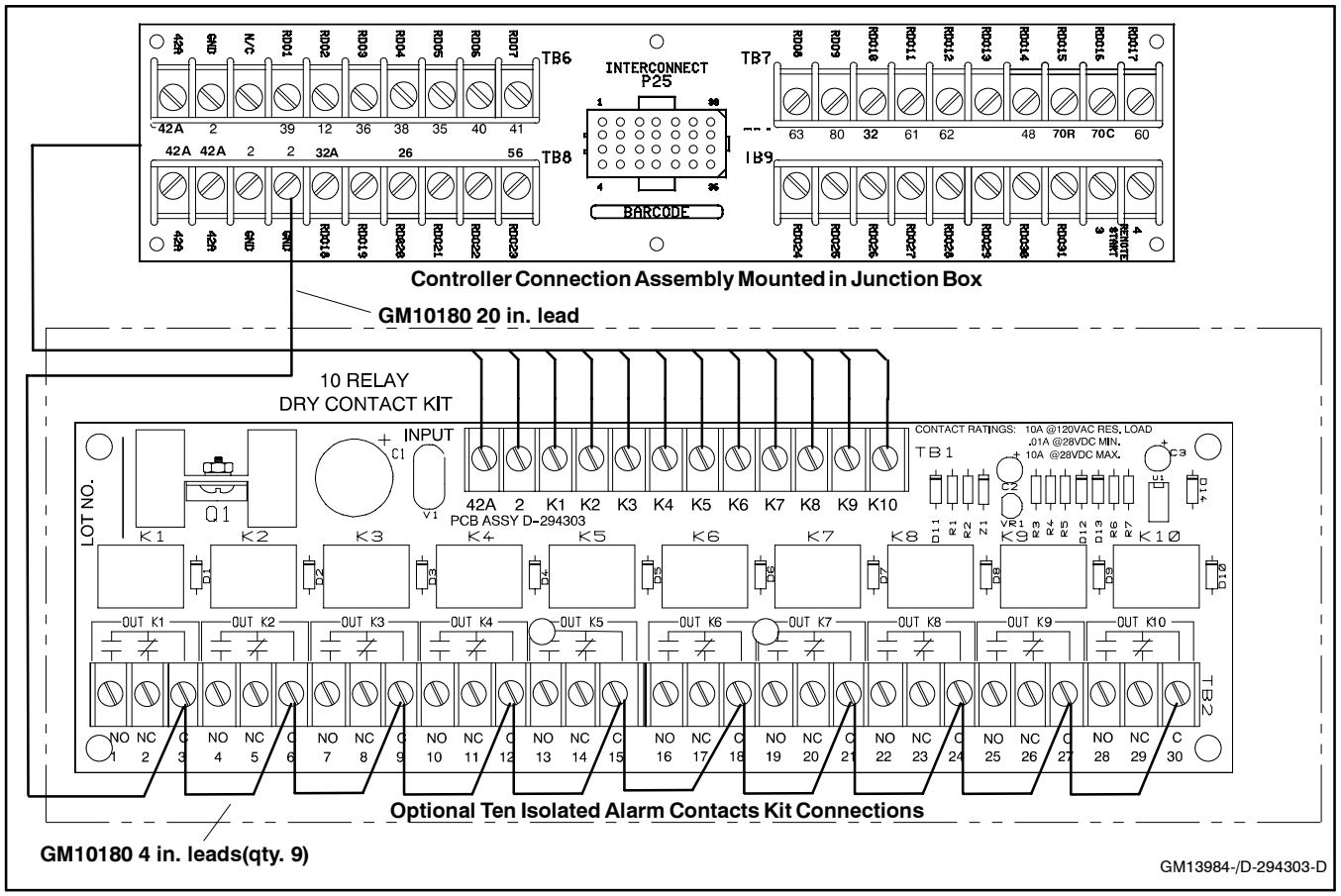



**Figure 12** Wiring Harness GM10180 Connections for DC Power Supply

**365569-KP11 kit only (450–2000 kW).** Install the 9-lead dry contact wiring harness (GM10181) to electrically connect relay common (C) terminals together for switchgear applications. See Figure 13. Remove the 9-lead dry contact wiring harness (GM10181) for non-switchgear applicaitons.

7.3 **120-Volt AC Devices.** Connect the customer-supplied accessories to a separate 120-volt AC power supply. The circuit must include fuse or circuit breaker protection.

7.4 Connect the customer-supplied device per the installations and/or schematic supplied with the device to a power source and to the ten-relay dry contact terminals. Cut the customer-supplied leads to length, strip lead ends, crimp on spade terminals (not supplied), and connect the leads to the relay contact screw terminals. Keep the ten-relay dry contact wiring away from the generator set output leads.

7.5 **GM17069-KP1 and GM17069-KP2 kits only (20–400 kW).** Replace the cover of the ten-relay dry contact assembly (A-273936) and install the four screws.

7.6 **365569-KP10 kit only (450–2000 kW).** Swing the access door closed and install the screws.

7.7 Replace the junction box panel and hardware.

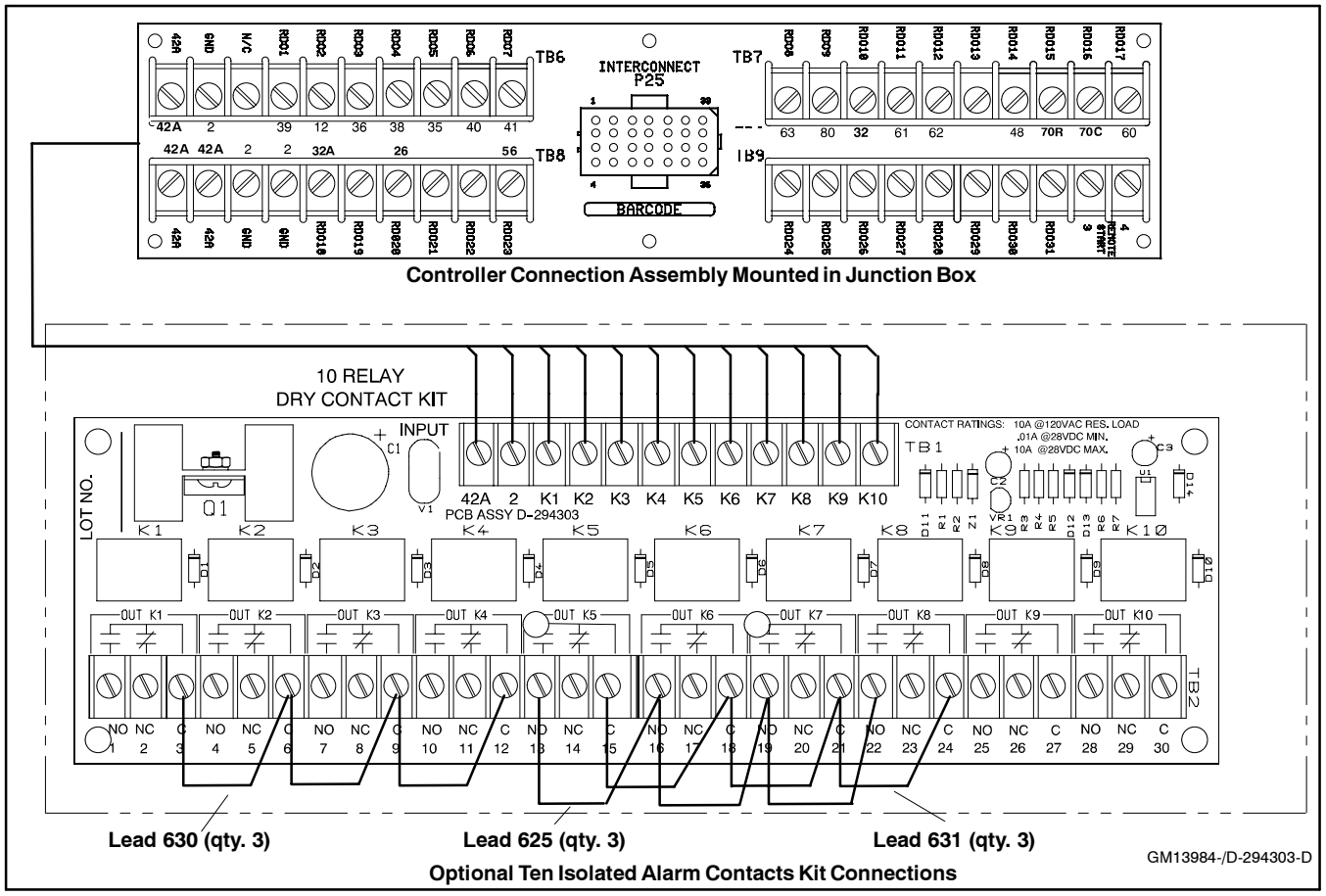



**Figure 13** Wiring Harness GM10181 Connections for Switchgear Applications

**8. Restore the generator set to service.**

8.1 Check that the generator set master switch is in the OFF position.

8.2 Reconnect the generator set engine starting battery, negative (–) lead last.

8.3 Reconnect power to the battery charger, if equipped.

8.4 Move the generator set master switch to AUTO for startup by remote transfer switch or remote start/stop switch.

## Test the Dry Contact Relays

Verify the ten-relay dry contact relay function by using the following procedure when *troubleshooting*.

**Test Procedure**

1. Remove the customer-supplied device wiring from the single-relay dry contact output terminals.

2. Test the relay operation by connecting an ohmmeter across the NO and C terminals on the relay terminal strip.

3. Use a jumper wire to ground the selected fault terminal on the controller connection terminal strip. The relay contacts should close and the ohmmeter should display a low resistance reading (continuity).

4. Install the customer-supplied device wiring on the ten-relay dry contact output terminals.

# Parts List

## Ten-Relay Dry Contact Kits

| Kit: GM17069-KP1 (20–300 kW) | | |
|---|---|---|
| **Qty.** | **Description** | **Part Number** |
| 1 | Dry contact assembly, ten-relay | A-273936 |
| 1 | Circuit board, ten-relay dry contact | D-294303 |
| 6 | Washer, lock | X-22-18 |
| 1 | Tie, cable | X-468-5 |
| 4 | Screw, Phillips | X-6216-1 |
| 6 | Nut, 8-32 | X-70-12 |
| 1 | Bushing, nylon | X-634-12 |
| 1 | Cover, dry contact | 273934 |
| 1 | Harness, wiring | 273935 |
| 6 | Vibromount | 282829 |
| 4 | Spacer, 0.282 x 0.5 x 0.531 in. | X-400-28 |
| 4 | Screw, 1/4-20 x 1 in. | X-465-7 |
| 6 | Screw, round head mach., 8-32 x 1 in. | X-51-3 |
| 6 | Spacer, 0.25 in OD x 0.5 in. | X-712-9 |
| 4 | Nut, whiz, 1/4-20 | X-6210-2 |
| 6 | Nut, whiz, 8-32 | X-6210-4 |
| 1 | Connection assembly, controller | GM13984 |
| 1 | Harness, controller connection wiring | GM17033 |

| Kit: GM17069-KP2 (350/400 kW) | | |
|---|---|---|
| **Qty.** | **Description** | **Part Number** |
| 1 | Dry contact assembly, ten-relay | A-273936 |
| 1 | Bracket, terminal block | 347292 |
| 4 | Spacer, 0.282 x 0.5 x 0.531 in. | X-400-28 |
| 4 | Screw, 1/4-20 x 1 in. | X-465-7 |
| 6 | Screw, round head mach., 8-32 x 1 in. | X-51-3 |
| 6 | Spacer, 0.25 in OD x 0.5 in. | X-712-9 |
| 4 | Nut, whiz, 1/4-20 | X-6210-2 |
| 6 | Nut, 8-32 | X-70-12 |
| 1 | Connection assembly, controller | GM13984 |
| 1 | Harness, controller connection wiring | GM17029 |
| 2 | Screw, hex head, 5/16-18 x 3/4 in. | X-125-3 |
| 2 | Nut, 5/16-18 | X-6210-7 |

| Kit: 365569-KP10 (Primary Kit) (450–2000 kW) | | |
|---|---|---|
| **Qty.** | **Description** | **Part Number** |
| 1 | Circuit board, ten-relay dry contact | D-294303 |
| 1 | Harness, dry contact relay wiring, 12 lead | GM16755 |
| 1 | Wiring harness, dry contact, relay common terminal, 10 lead | GM10180 |
| 9 | Lead, 18 ga. 4 in. | SW02-1804-2222 |
| 1 | Lead, 18 ga. 20 in. | SW02-1820-2222 |
| 6 | Nut, hex, 8-32 | X-70-12 |
| 6 | Spacer, 0.25 in OD x 0.5 in. | X-712-9 |
| 1 | Connection device and hardware includes: | GM16759-1 |
| 6 | Nut, hex, 8-32 | X-70-12 |
| 6 | Spacer, 0.25 in OD x 0.5 in. | X-712-9 |
| 1 | Connection assembly, controller | GM13984 |
| 1 | Harness, controller connection wiring | GM16753 |

| Kit: 365569-KP11 (Secondary Kit) (450–2000 kW) | | |
|---|---|---|
| **Qty.** | **Description** | **Part Number** |
| 1 | Circuit board, ten-relay dry contact | D-294303 |
| 1 | Harness, dry contact relay wiring, 12 lead | GM16756 |
| 1 | Wiring harness, dry contact, relay common terminal, 10 lead | GM10180 |
| 9 | Lead, 18 ga. 4 in. | SW02-1804-2222 |
| 1 | Lead, 18 ga. 20 in. | SW02-1820-2222 |
| 6 | Nut, hex, 8-32 | X-70-12 |
| 6 | Spacer, 0.25 in OD x 0.5 in. | X-712-9 |

| Kit: 365569-KP12 (Switchgear) (450–2000 kW) | | |
|---|---|---|
| **Qty.** | **Description** | **Part Number** |
| 1 | Circuit board, ten-relay dry contact | D-294303 |
| 1 | Harness, dry contact relay wiring, 12 lead | GM16755 |
| 1 | Wiring harness, dry contact, relay common terminal, 10 lead | GM10181 |
| 3 | Lead, #625 18 ga. 4 in. | T625-1804-2222 |
| 3 | Lead, #630 18 ga. 4 in. | T630-1804-2222 |
| 3 | Lead, #631 18 ga. 4 in. | T631-1804-2222 |
| 6 | Nut, hex, 8-32 | X-70-12 |
| 6 | Spacer, 0.25 in OD x 0.5 in. | X-712-9 |
| 1 | Connection device and hardware includes: | GM16759-1 |
| 6 | Nut, hex, 8-32 | X-70-12 |
| 6 | Spacer, 0.25 in OD x 0.5 in. | X-712-9 |
| 1 | Connection assembly, controller | GM13984 |
| 1 | Harness, controller connection wiring | GM16753 |
| 1 | Block, terminal | 273769 |
| 1 | Strip, marker | 279271 |
| 1 | Harness, wiring dry contact | GM16754 |
| 2 | Screw, pan head | X-49-6 |
| 2 | Nut, whiz | X-6210-3 |
| 1 | Terminal, 1/4 in. male | X-431-29 |