# INSTALLATION INSTRUCTIONS

Original Issue Date: **9/02**
Model: **450–2000 kW**
Market: **Industrial Generator Sets with the 550 Controller**
Subject: **Twenty-Relay Dry Contact Kits 365569-KP13 and 365569-KP20**

## Introduction

The twenty-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. Typically, lamps, audible alarms, or other devices signal faults or status conditions. Connect any generator set fault output to the dry contact kit. See Figure 1 for an illustration of the twenty-relay dry contact kit.

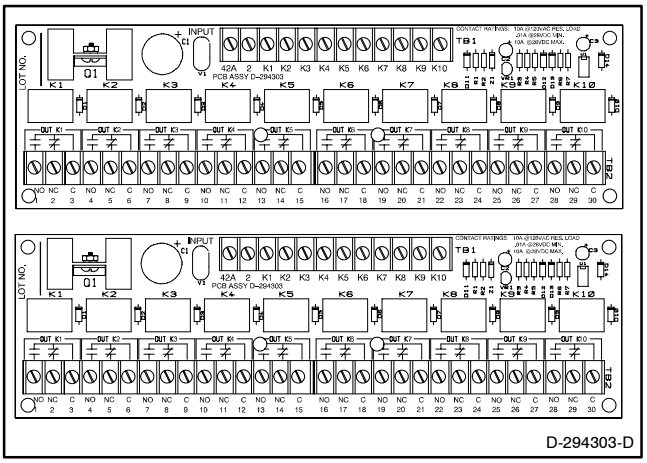



**Figure 1** Twenty-Relay Dry Contact Kits

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

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

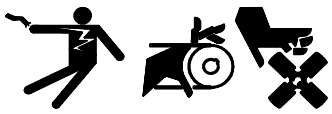
Read the entire installation procedure and compare the kit parts with the parts list in this publication before beginning installation. Perform the steps in the order shown.

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, negative (-) lead first.

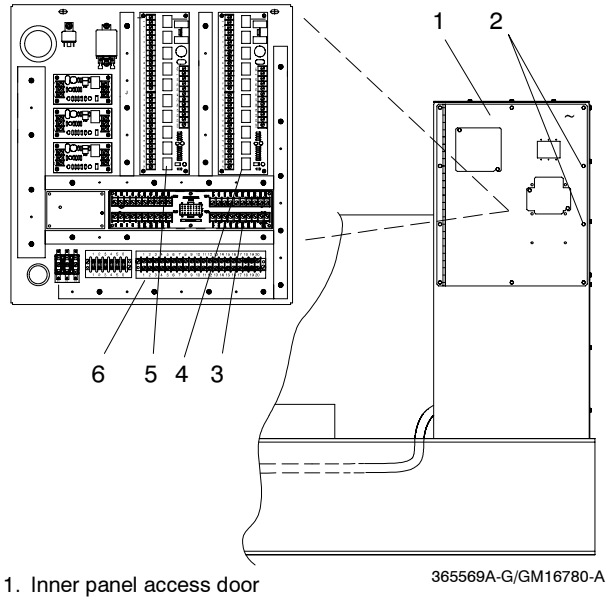
## 2. Mount and connect the controller connection assembly.

2.1 **365569-KP13 kit**

2.1.1 Remove the junction box upper rear panel and hardware.

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

2.1.3 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 2 for the mounting location.




1. Inner panel access door
2. Inner panel access door screws (6)
3. Controller connection assembly (GM13984)
4. Ten-relay dry contact circuit board (D-294303) (right side)
5. Ten-relay dry contact circuit board (D-294303) (left side)
6. TX2 terminal block

**Figure 2** Terminal Block Bracket Mounting in Junction Box (450–2000 kW)

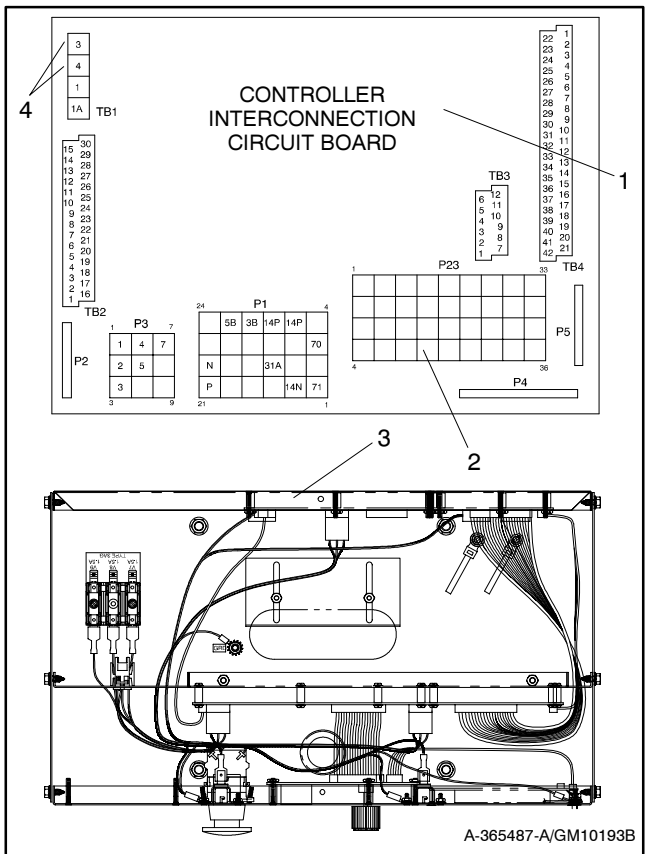
2.1.4 Plug the wiring connection harness (GM16753) into the controller connection assembly's P25 connector.

2.1.5 Remove the controller cover and hardware.

2.1.6 Route the other end of the wiring connection harness (GM16753) through the junction box port to the controller interconnection circuit board.

2.1.7 Plug the wiring harness connector into the controller interconnection circuit board's P23 connector. Connect lead ES3 to TB1 terminal 3 and connect lead ES4 to TB1 terminal 4. See Figure 3. If access to the controller interconnection circuit board is difficult, remove the two controller panel top screws and center bottom screw and then loosen the bottom screws to swing the rear controller panel down.

2.1.8 Proceed to step 3.




1. Interconnection circuit board
2. P23 connector
3. Interconnection circuit board mounted on the controller rear panel (top view)
4. Connect lead ES3 to TB1 terminal 3 and connect lead ES4 to TB1 terminal 4

**Figure 3** Attaching Wiring Connection Harness to the Interconnection Circuit Board

2.2 **365569-KP20 kit**

2.2.1 Proceed to step 3.

## 3. Mount and connect the TX2 terminal block (for switchgear applications).

3.1 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 2 for the mounting location.

3.1.1 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 4.

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

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

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

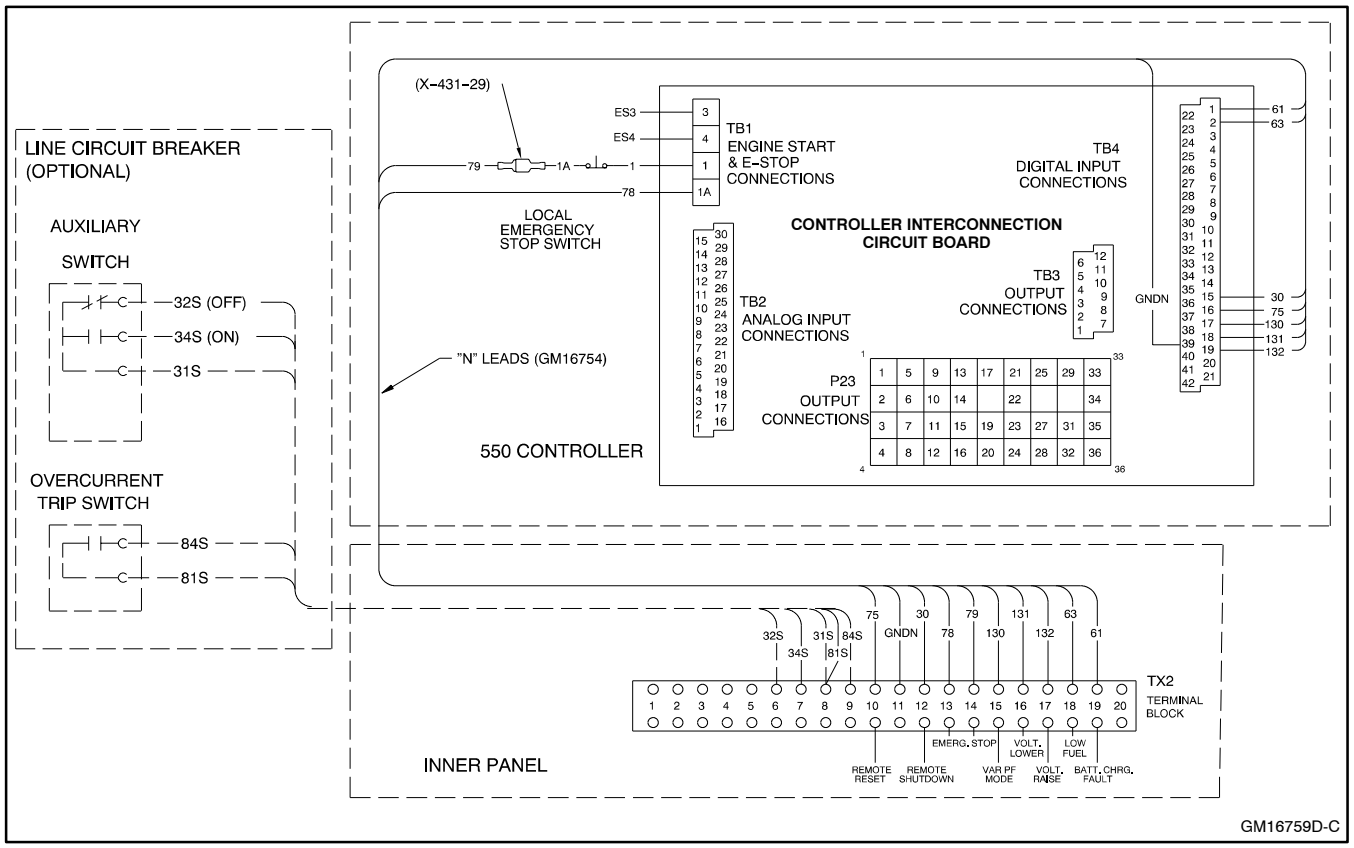



**Figure 4** Attaching Wiring Connection Harness to TX2 Terminal Block

## 4. Mount the two ten-relay dry contact assemblies.

4.1 Mount the two ten-relay dry contact circuit boards (D-294303) to the junction box bracket studs using 12 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 2 for the mounting location.

4.2 Connect the 12-lead dry contact relay wiring harness (GM16755) to the left side ten-relay dry contact kit relay input terminals. See Figure 5 for connection information.

4.3 Connect the 12-lead dry contact relay wiring harness (GM16756) to the right side ten-relay dry contact kit relay input terminals. See Figure 5 for connection information.

## 5. Connect the two ten-relay dry contact assemblies to the controller connection assembly.

5.1 Connect the left side ten-relay dry contact wiring harness to the controller connection assembly in the junction box. See Figure 5. Leads 42A and N provide power to the relays. The user can select up to ten fault terminals for connecting the K1–K10 signal leads. See Figure 6 and Figure 7 for terminal connections.

**Note:** Factory default settings are shown. To customize, select fault terminals using descriptions and terminals shown in Figure 6 and Figure 7.

5.2 Repeat step 5.1 for the right side dry contact wiring harness.

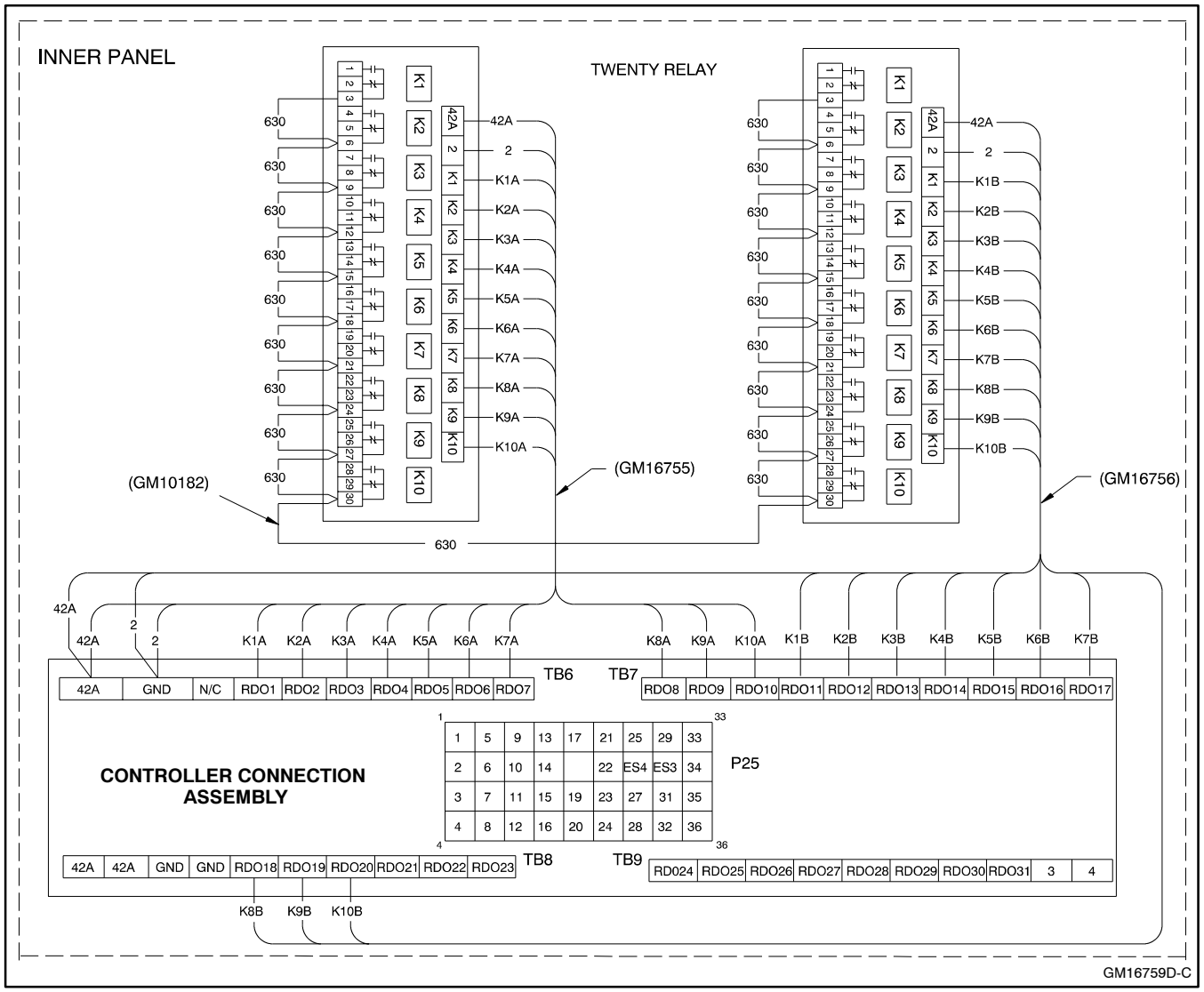



**Figure 5** Twenty-Relay Dry Contact Relay Kit Connections

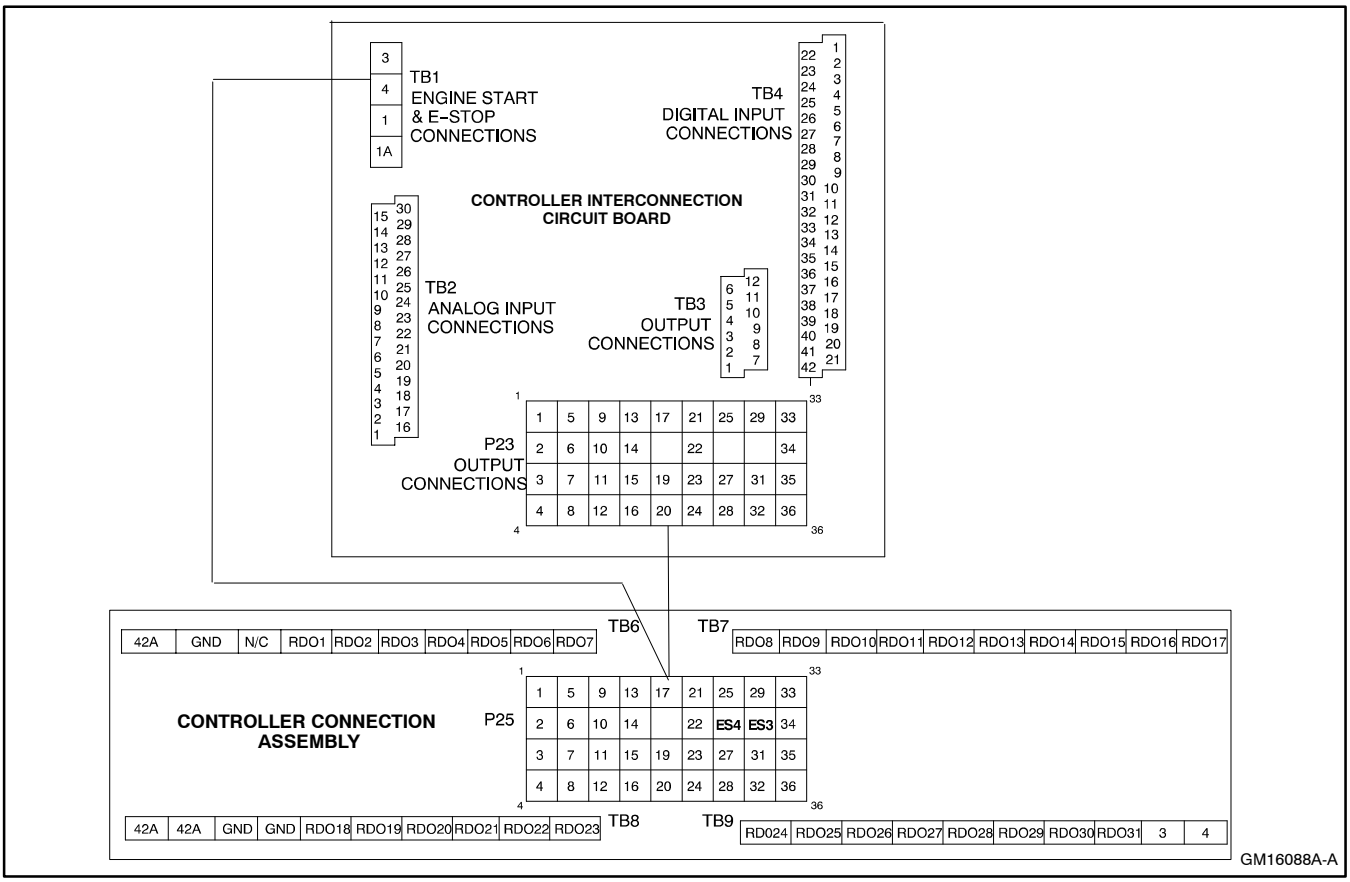



**Figure 6** Controller Connection Assembly Terminal Connections

### TB6 Terminal Strip—RDOs 1-7

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

### TB7 Terminal Strip—RDOs 8-17

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

### TB8 Terminal Strip—RDOs 18-23

| Term. | Description |
|---|---|
| 42A | Battery (+) |
| 42A | Battery (+) |
| 2 | Battery (-) |
| 2 | Battery (-) |
| RDO18 | Defined common fault (32A) |
| RDO19 | Low coolant level |
| RDO20 | Overvoltage (26) |
| RDO21 | Idle mode |
| RDO22 | EPS supplying load |
| RDO23 | Air damper indicator (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:** RDO-1 though RDO-31 are customer definable with the following factory defaults: emergency stop, high coolant temperature, low oil pressure, overcrank, and overspeed. RDO numbers in parentheses are the factory wire designations.

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

Air damper indicator
Battery charger fault
EPS supplying load
High battery voltage
High coolant temperature warning
High coolant temperature shutdown
Low battery voltage
Low coolant level
Low coolant temperature warning
Low fuel (level or pressure)
Low oil pressure warning
Low oil pressure shutdown
Master switch not in auto
Overcrank
Overspeed

**NOTE:** RDO numbers in parentheses are the factory wire designations.

**Figure 7** Controller Connection Terminal Strip Identification with Relay Driver Outputs (RDOs)

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

Select the normally open (NO) and/or normally closed (NC) contacts of the 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.

6.1 Supply two or three lengths of stranded wire to make leads long enough to connect the customer-supplied device to the 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 dry contact wiring.

6.2 **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 connected directly to the battery for the supply voltage. The circuit must include fuse or circuit breaker protection.

Install the 18-lead dry contact wiring harness (GM10182) to electrically connect the relay common (C) terminals together when using a DC power supply. See Figure 8. Remove the 18-lead dry contact wiring harness (GM10182) when applying an AC power supply.

6.3 **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.

6.4 Connect the customer-supplied device per the installations and/or schematic supplied with the device to a power source and to the 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 relay dry contact wiring away from the generator set output leads.

6.5 Swing the access door closed and install the screws.

6.6 Replace the junction box panel and hardware.

## 7. Restore the generator set to service.

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

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

7.3 Reconnect power to the battery charger, if equipped.

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

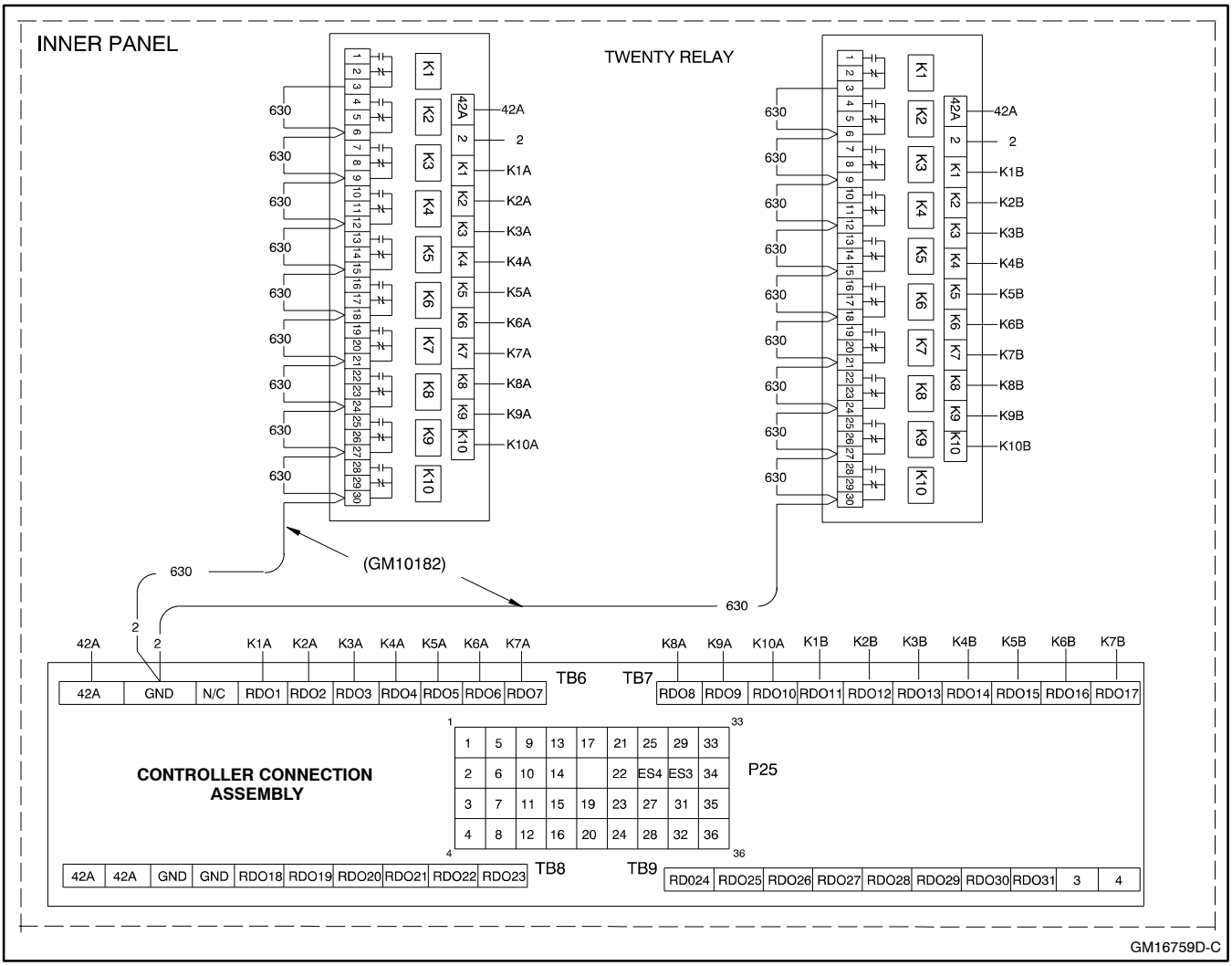



**Figure 8** Wiring Harness GM10182 Connections for DC Power Supply

## Test the Dry Contact Relays

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

### Test Procedure

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

## Parts List

### Twenty-Relay Dry Contact Kits

| Kit: 365569-KP13 | | |
|---|---|---|
| **Qty.** | **Description** | **Part Number** |
| 2 | Circuit board, ten-relay dry contact | D-294303 |
| 1 | Wiring harness, dry contact relay, 12 lead (left side) | GM16755 |
| 1 | Wiring harness, dry contact relay, 12 lead (right side) | GM16756 |
| 1 | Wiring harness, dry contact, (relay common terminal) | GM10182 |
| 18 | Lead, 18 gauge, 4 in. | SW02-1804-2222 |
| 1 | Lead, 18 gauge, 20 in. | SW02-1820-2222 |
| 12 | Nut, 8-32 hex | X-70-12 |
| 12 | Spacer, 0.25 in OD x 0.5 in. | X-712-9 |
| 1 | Connection device and hardware includes: | GM16759-1 |
| 6 | Nut, 8-32 hex | 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 |

| Kit: 365569-KP20 | | |
|---|---|---|
| **Qty.** | **Description** | **Part Number** |
| 2 | Circuit board, ten-relay dry contact | D-294303 |
| 1 | Wiring harness, dry contact relay, 12 lead (left side) | GM16755 |
| 1 | Wiring harness, dry contact relay, 12 lead (right side) | GM16756 |
| 1 | Wiring harness, dry contact, (relay common terminal) | GM10182 |
| 18 | Lead, 18 gauge, 4 in. | SW02-1804-2222 |
| 1 | Lead, 18 gauge, 20 in. | SW02-1820-2222 |
| 12 | Nut, 8-32 hex | X-70-12 |
| 12 | Spacer, 0.25 in OD x 0.5 in. | X-712-9 |
| 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 |