

Inverting Fault Circuit Breaker Kit for FlexPak 3000 DC Drives 400 HP to 600 HP @ 460 VAC

Model Number 906FK3101

Instruction Manual D2-3421



ATTENTION: Only qualified personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, and/or service this equipment. Read and understand this instruction manual in its entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The user is responsible for conforming with all applicable local, national, and international codes. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

Product Description

This instruction manual describes how to install the optional Inverting Fault Circuit Breaker kit on regenerative FlexPak™ 3000 drives rated at 400 HP to 600 HP @ 460 VAC. Use this kit when applying regenerative FlexPak 3000 drives to high inertia loads. High inertia loads are those in which the reflected load inertia to the motor is equal to or greater than the motor's own inertia, or in which the drive is frequently regenerating power to the AC line, such as in unwind and pay-off applications.

An inverting fault typically occurs as a result of a loss of the AC line. If this happens, the AC input transformer becomes a short circuit across the motor. Since the SCRs in the bridge no longer turn off, the motor's stored mechanical energy is regenerated into the short circuit. The Inverting Fault Circuit Breaker interrupts the generator action, protecting the SCR bridge and the motor.

The Inverting Fault Circuit Breaker is a magnetic-only breaker with an adjustable instantaneous magnetic trip unit. The trip settings are adjusted by a sliding control on the front of the breaker. The standard interrupt rating is 30,000 amperes symmetrical at 480 VAC.

Table 1 lists the parts contained in the Inverting Fault Circuit Breaker kit. The installed location of each item is shown in figures 8 and 9. In addition to the parts included in the kit, you must supply an appropriate mounting panel for the breaker kit and provide breaker wiring. If any other interlocks are required for your application, they must be connected in series to the FlexPak 3000 Regulator board's customer interlock input (control signal terminal strip terminals 9 and 11) along with the Inverting Fault Circuit Breaker.

Important: Before beginning the installation procedure, make sure that you have the correct kit. M/N 906FK3101 can be used only with FlexPak 3000 DC drives rated 400 HP to 600 HP @ 460 VAC.



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Table 1 – Contents of the Inverting Fault Circuit Breaker Kit

Item Number	Description	Quantity	Reliance Part Number
1	Inverting Fault Circuit Breaker Assembly	1	802276-918R
2	M6 x 12 mm Self-Tapping Screw	6	419062-100PJH
3	Wire Assembly	1	610273-68X
4	1/4" Spade Terminal, Male	1	411066-19A
5	1/2" Ring Lug, 22-16 ga.	1	68321-6CH
6	Twisted Pair Wire Assembly	1	610273-68S
7	Shield, Top and Bottom	2	802276-914A

Installing the Inverting Fault Circuit Breaker Kit



ATTENTION: The drive is at line voltage when connected to incoming AC power. Disconnect, tag, and lock out all incoming power to the drive before performing the following procedures. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: The user is responsible for conforming with all applicable local, national, and international codes. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

Installing the Inverting Fault Circuit Breaker kit involves the following processes:

- Mounting the Inverting Fault Circuit Breaker
- Wiring the Inverting Fault Circuit Breaker
- Connecting the wire assemblies
- Checking the circuit breaker settings and installing the safety shields

Mounting the Inverting Fault Circuit Breaker

Step 1. Disconnect, tag, and lock out power to the drive.

Step 2. Verify that the Inverting Fault Circuit Breaker switch is in the OFF position.

Step 3. Choose an appropriate location for mounting the Inverting Fault Circuit Breaker. Note that wire assemblies shipped with the kit are 152.4 cm (60 inches) in length.

Step 4. Drill the holes (5.4 mm diameter) for the six (6) M6 self-tapping screws [Item 2] provided for the Inverting Fault Circuit Breaker assembly [Item 1]. Use the mounting hole pattern shown in figure 1.

Step 5. Mount the Inverting Fault Circuit Breaker assembly.

- a. Drive the top two (2) M6 self-tapping screws half way into the holes drilled in step 3.
- b. Lift the Inverting Fault Circuit Breaker assembly and mount it so that the keyholes fit over the screw heads.
- c. Slide the assembly down so the screws are in the keyhole slots.
- d. Install the four (4) remaining M6 screws.
- e. Tighten all screws to 5.1 Nm (45 in-lb) $\pm 10\%$.

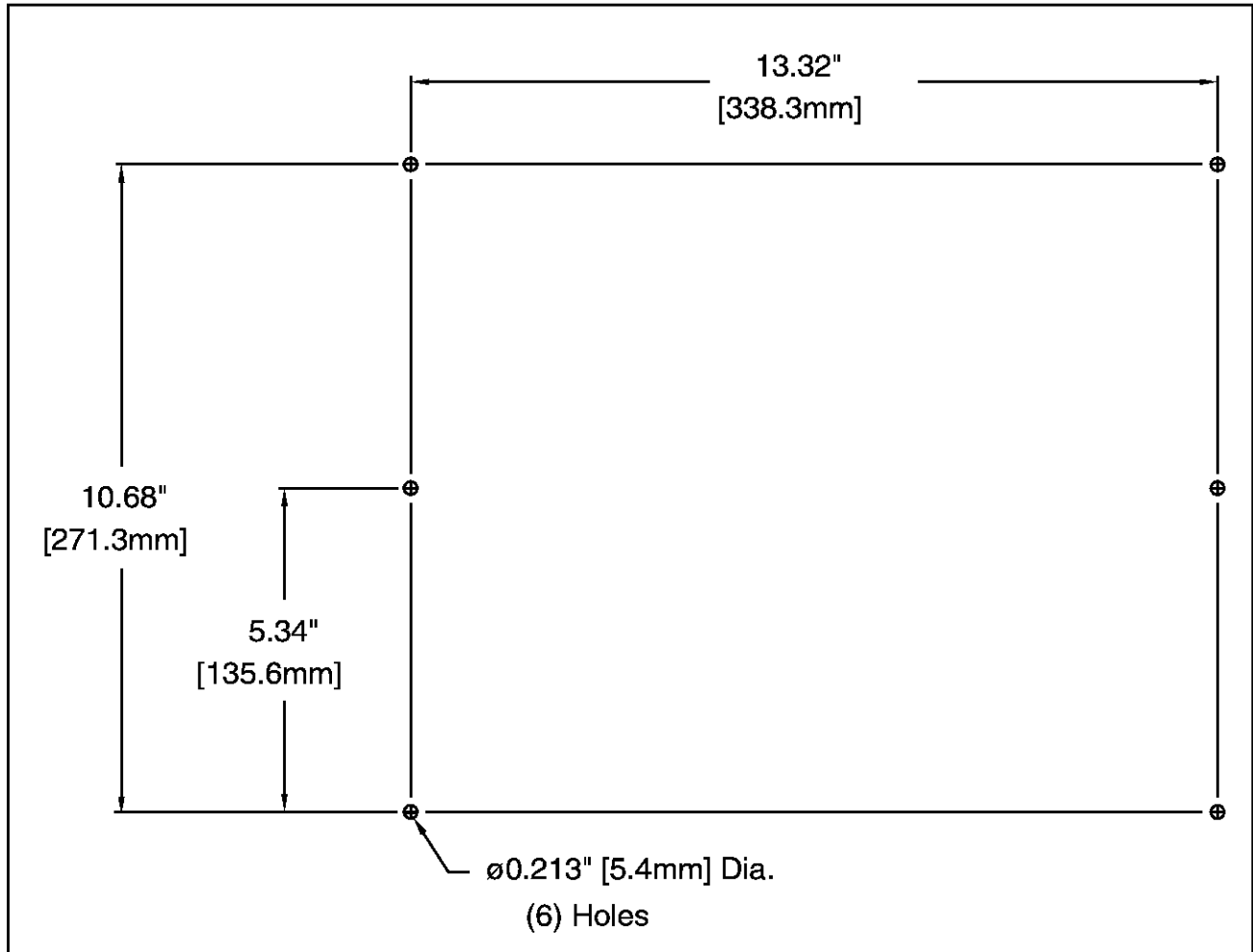


Figure 1 – Mounting Hole Pattern for the Inverting Fault Circuit Breaker Assembly

Wiring the Inverting Fault Circuit Breaker

There are several ways to wire the Inverting Fault Circuit Breaker, depending on whether the drive is equipped with dynamic braking and/or a motor series field. Use the appropriate one of the following procedures to wire the Inverting Fault Circuit Breaker.

If you are using the Inverting Fault Circuit Breaker only (no dynamic braking and no motor series field):

- Step 1. Refer to figure 2. Connect motor armature lead A2 to Inverting Fault Circuit Breaker terminal MOT. (See figure 9 for the location of the breaker's MOT terminal.) Terminate the breaker side of the leads with lugs of the appropriate gauge.
- Step 2. Using wire of the same gauge as the motor leads, connect Inverting Fault Circuit Breaker terminal DRV to drive output terminal S2. (See figure 9 for the location of the breaker's DRV terminal.) Terminate the breaker side of the wires with lugs of the appropriate gauge.
- Step 3. Connect motor armature lead A1 to drive terminal A1.

Proceed to "Connecting the Wire Assemblies."

If you are using the Inverting Fault Circuit Breaker with Dynamic Braking:

- Step 1. Refer to figure 7. Remove the removable link (bus section connected to drive output terminal A2/S1) by removing the four nuts and bolts that hold it in place. You may need to dismount the drive in order to gain access to the removable link. If so, re-mount the drive after the link has been removed.
- Step 2. Refer to figure 3. Connect motor armature lead A2 to Inverting Fault Circuit Breaker terminal MOT. (See figure 9 for the location of the breaker's MOT terminal.) Terminate the breaker side of the leads with lugs of the appropriate gauge.
- Step 3. Using wire of the same gauge as the motor leads, connect Inverting Fault Circuit Breaker terminal DRV to drive output terminal S2. (See figure 9 for the location of the breaker's DRV terminal.) Terminate the breaker side of the wires with lugs of the appropriate gauge.
- Step 4. Using wire the same gauge as the DB kit leads, connect Inverting Fault Circuit Breaker terminal MOT to drive output terminal A2/S1.
- Step 5. Connect motor armature lead A1 to drive terminal A1.

Proceed to "Connecting the Wire Assemblies."

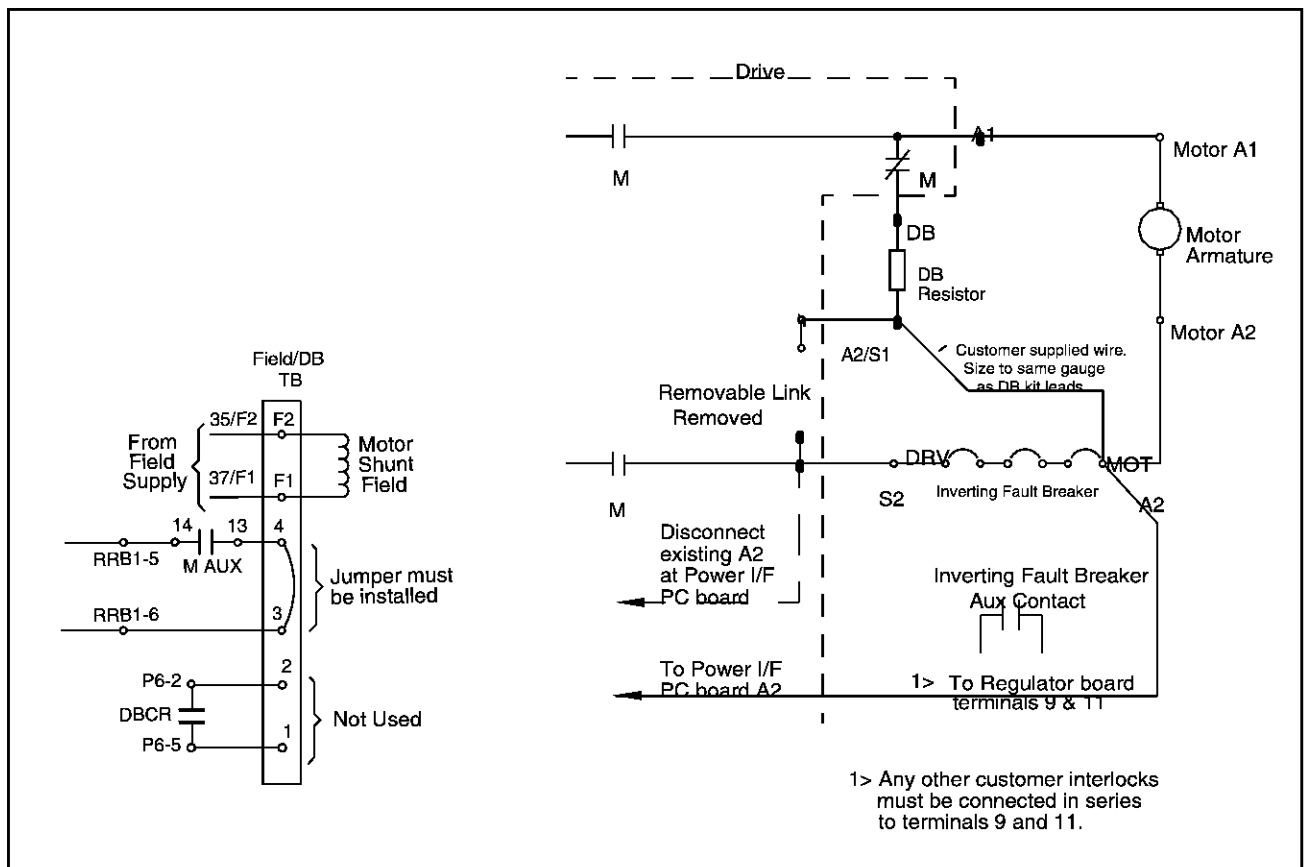


Figure 3 – Inverting Fault Circuit Breaker with Dynamic Braking

If you are using the Inverting Fault Circuit Breaker with a Series Field (S1 to A2):

- Step 1. Refer to figure 4. Connect motor series field lead S2 to Inverting Fault Circuit Breaker terminal MOT. (See figure 9 for the location of the breaker's MOT terminal.) Terminate the breaker side of the leads with lugs of the appropriate gauge.
- Step 2. Using wire of the same gauge as the motor leads, connect Inverting Fault Circuit Breaker terminal DRV to drive output terminal S2. (See figure 9 for the location of the breaker's DRV terminal.) Terminate the breaker side of the wires with lugs of the appropriate gauge.
- Step 3. Connect motor armature lead A1 to drive terminal A1.

Proceed to "Connecting the Wire Assemblies."

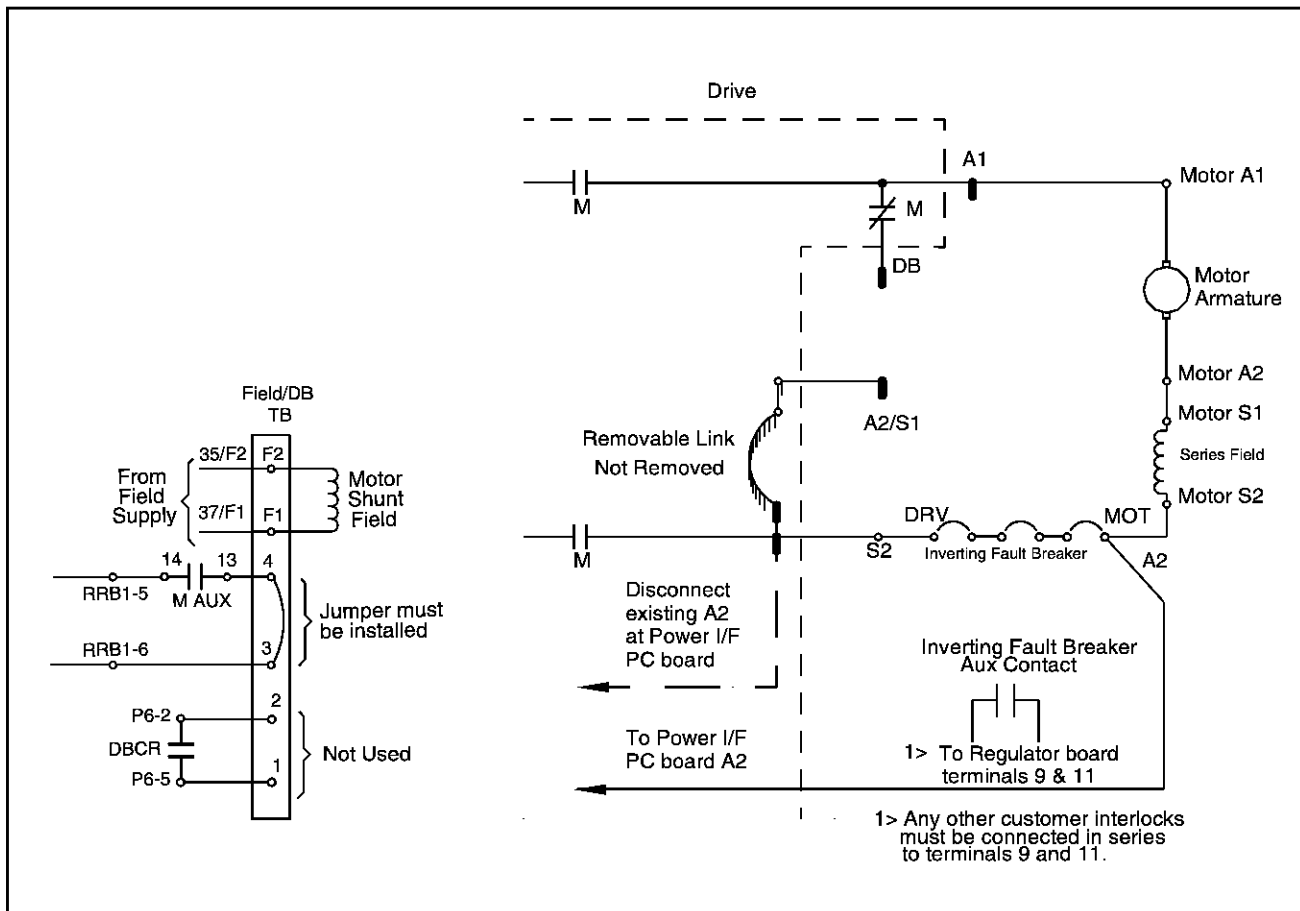


Figure 4 – Inverting Fault Circuit Breaker with Series Field (S1 to A2)

If you are using the Inverting Fault Circuit Breaker with a Series Field (S1 to A2/S1) and Dynamic Braking:

- Step 1. Refer to figure 7. Remove the removable link (bus section connected to drive output terminal A2/S1) by removing the four nuts and bolts that hold it in place. You may need to dismount the drive in order to gain access to the removable link. If so, re-mount the drive after the link has been removed.
- Step 2. Refer to figure 6. Connect motor series field lead S2 to Inverting Fault Circuit Breaker terminal MOT. (See figure 9 for the location of the breaker's MOT terminal.) Terminate the breaker side of the leads with lugs of the appropriate gauge.
- Step 3. Using wire of the same gauge as the motor leads, connect Inverting Fault Circuit Breaker terminal DRV to drive output terminal S2. (See figure 9 for the location of the breaker's DRV terminal.) Terminate the breaker side of the wires with lugs of the appropriate gauge.
- Step 4. Using wire the same gauge as the motor leads, connect motor series field lead S1 to drive output terminal A2/S1.
- Step 5. Using wire of the same gauge as the motor leads, connect motor armature lead A2 to drive output terminal A2/S1.
- Step 6. Connect motor armature lead A1 to drive terminal A1.

Proceed to "Connecting the Wire Assemblies."

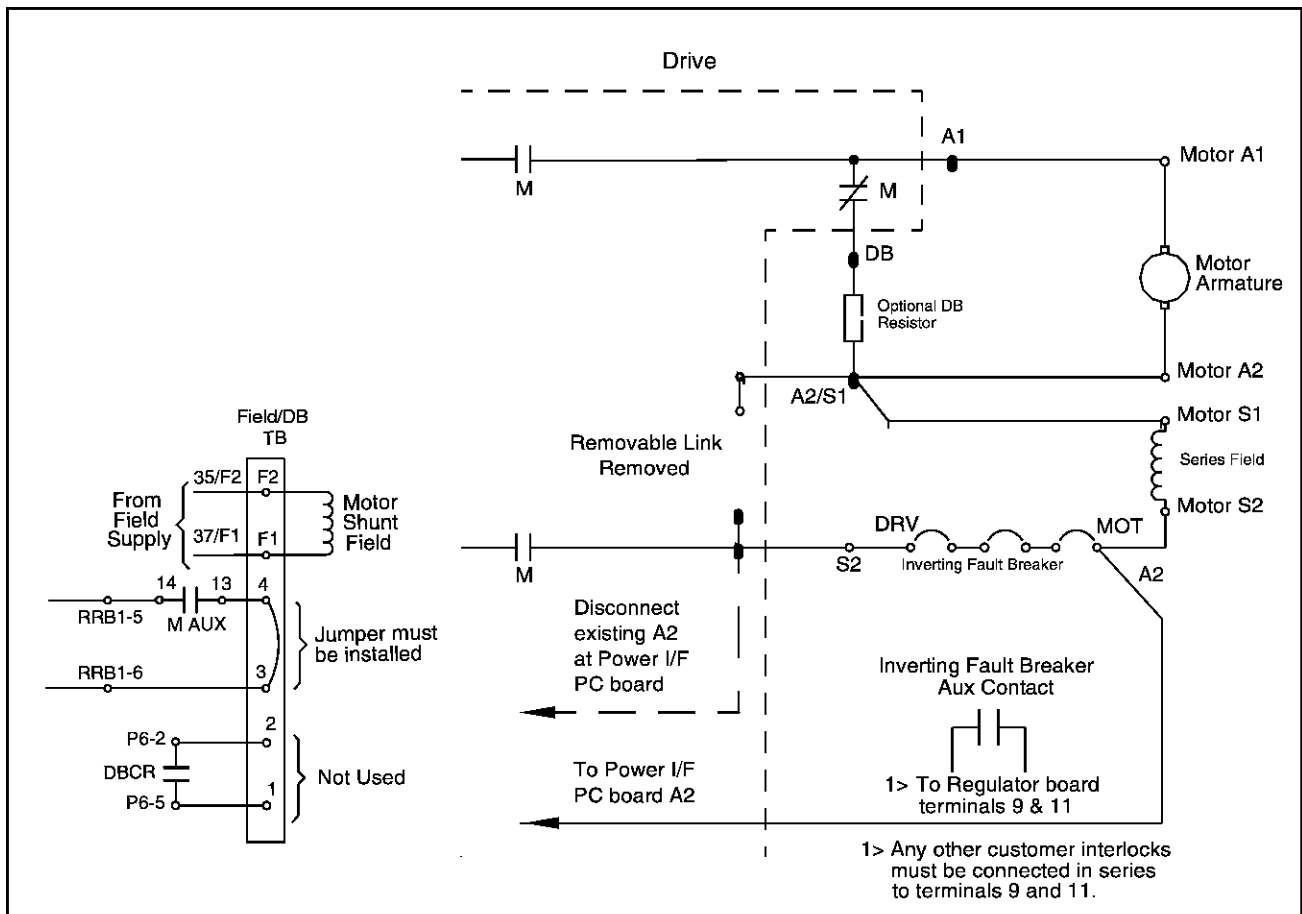


Figure 6 – Inverting Fault Circuit Breaker with Series Field (S1 to A2/S1) and Dynamic Braking

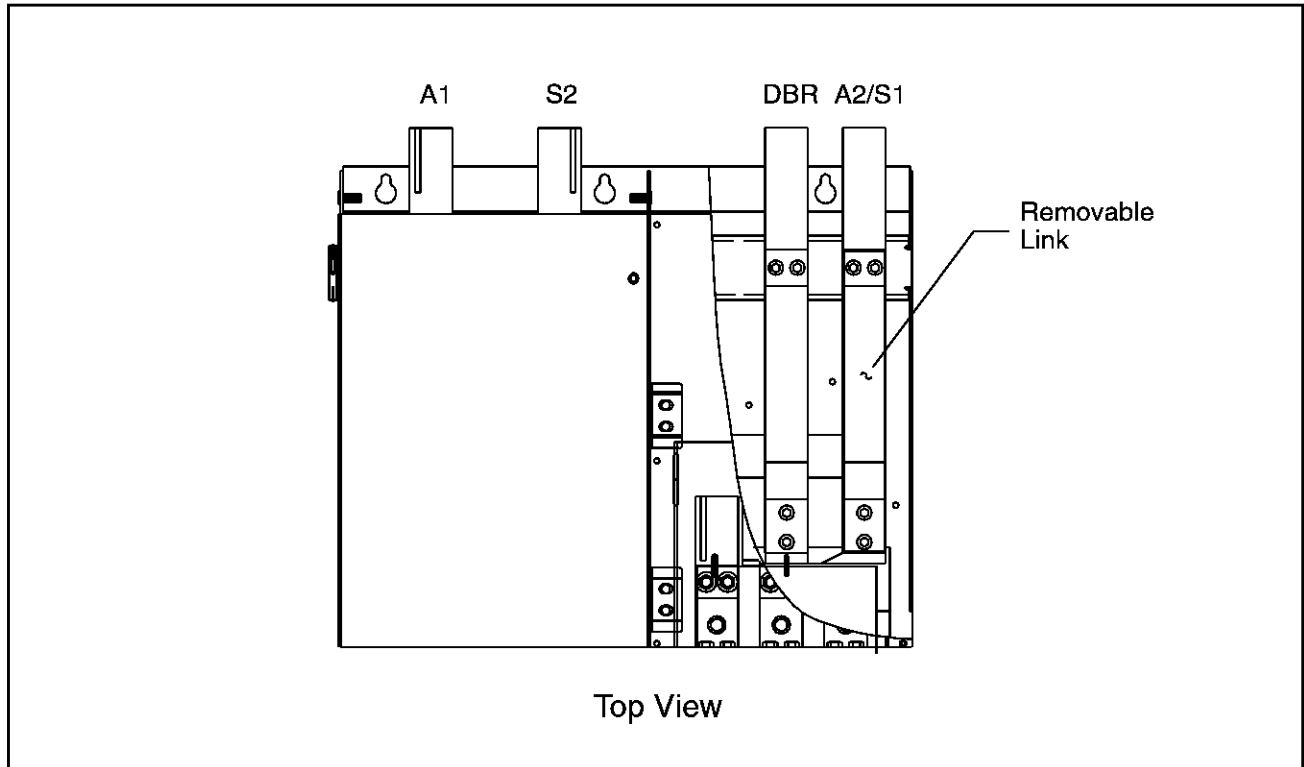
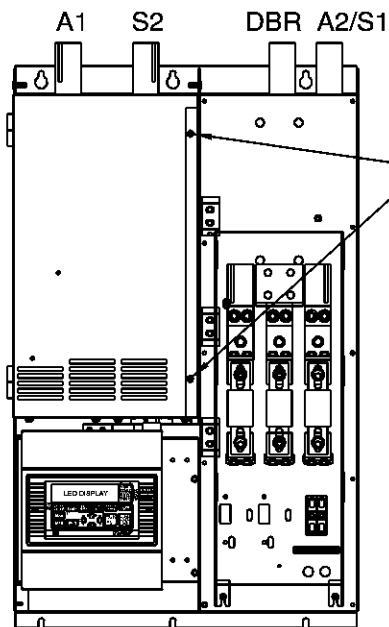


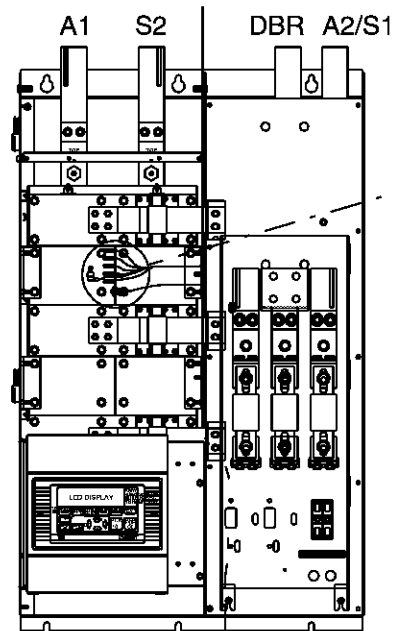
Figure 7 – Location of Removable Link

Connecting the Wire Assemblies

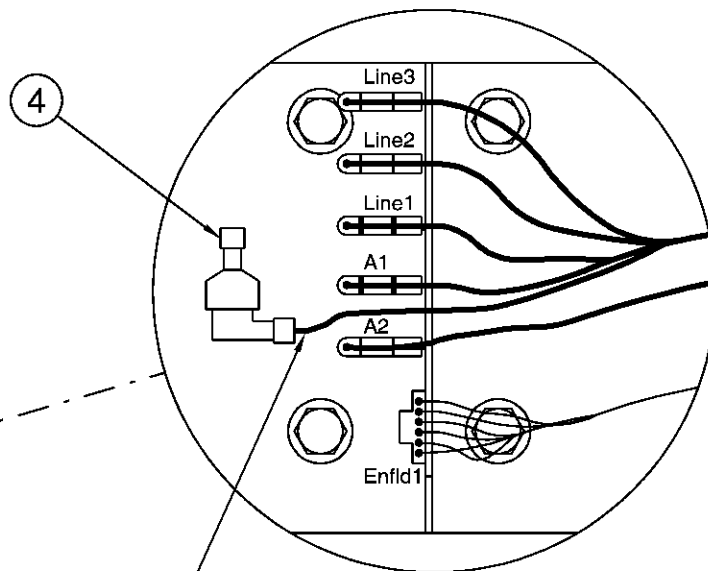
- Step 1. Remove the two screws and open the drive cover (see figure 8).
 - Step 2. Locate and remove the spade connector from terminal A2 on the Power Interface board, located in the center of the drive. Cap this lead with the male spade connector [Item 4]. (See figure 8 for the location of the Power Interface board and for the location of terminal A2.)
 - Step 3. Attach the spade connector on the A2 FDBK wire lead [Item 3] to terminal A2 on the Power Interface board. Route this wire to Inverting Fault Circuit Breaker terminal MOT. Cut the wire to length as required and terminate the end with the ring lug [Item 5].
 - Step 4. Connect the ring lug to terminal MOT of the Inverting Fault Circuit Breaker as shown in figure 9.
 - Step 5. Connect the spade connectors of the twisted pair harness [Item 6] to the male connectors on the yellow lead and the blue/yellow striped lead coming out of the Inverting Fault Circuit Breaker (see figure 9). Route this harness to the bottom of the drive. Cut the wires to length as required, and connect them to terminals 9 and 11 on the Regulator board control terminal strip. See figure 10.
- If any other interlocks are required for your application, they must be connected in series to the Customer Interlock Input (terminals 9 and 11) along with the circuit breaker.



Front View



Front View with Cover Removed



Remove existing A2 connection

Figure 8 – Power Interface Board and Terminal A2 Locations

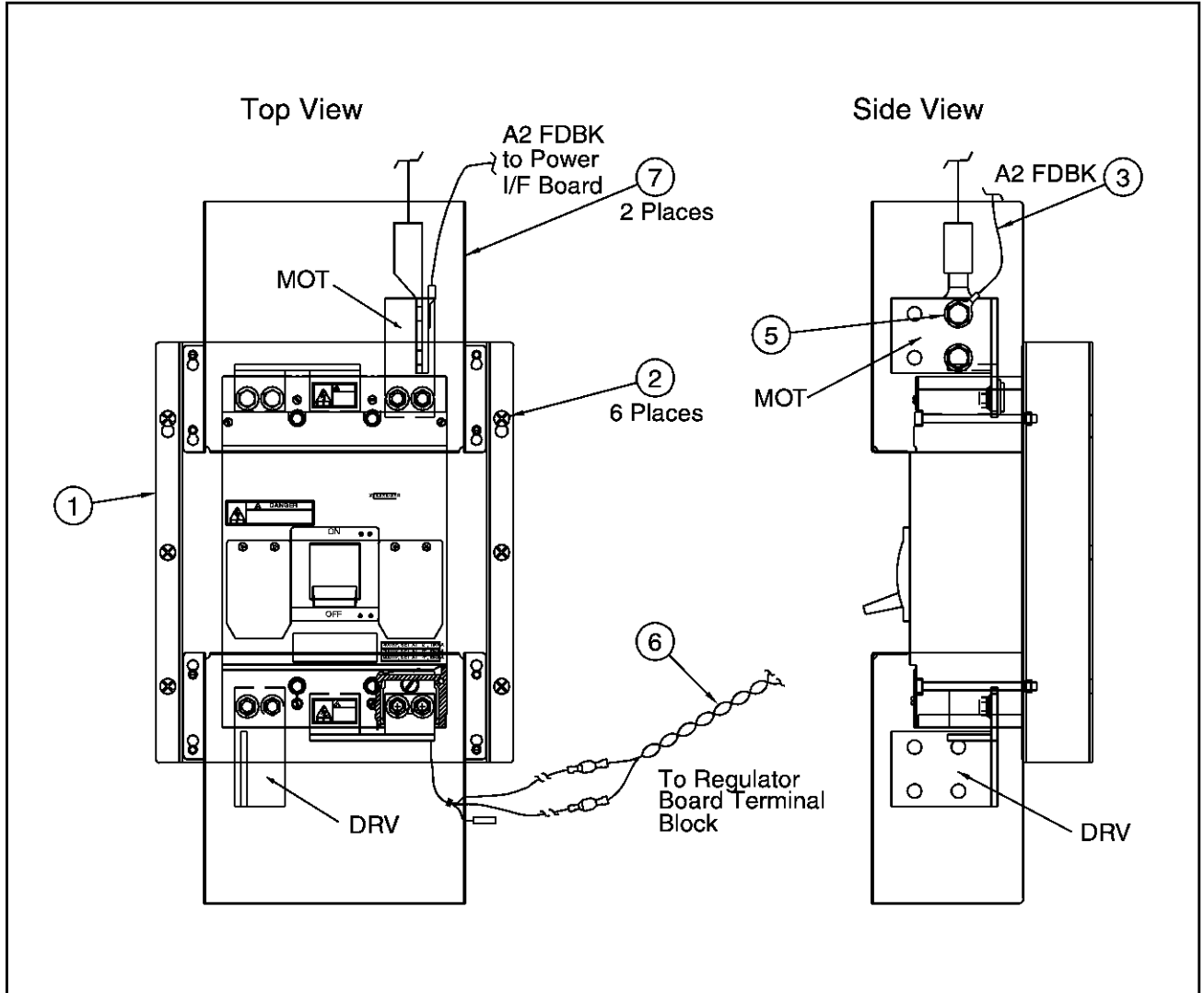


Figure 9 – Inverting Fault Circuit Breaker Terminal Locations

Standard Cover Removed

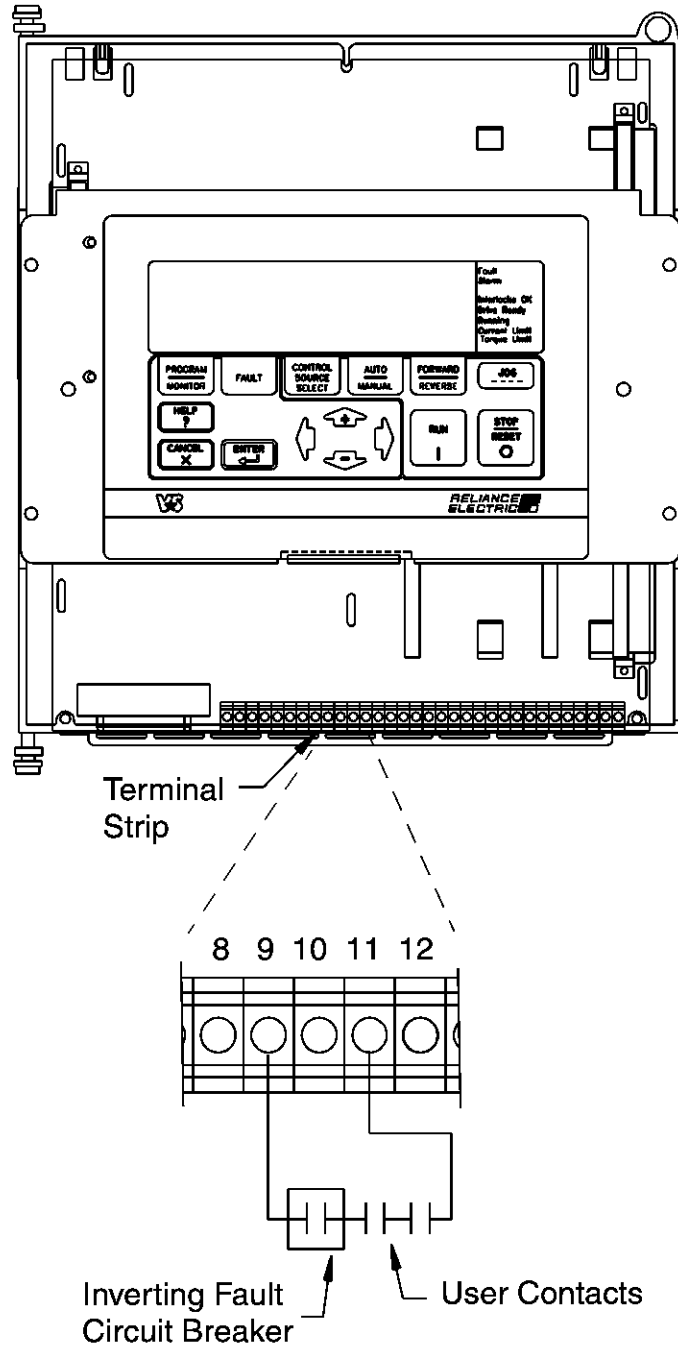


Figure 10 – Control Terminal Strip

Checking the Circuit Breaker Settings and Installing the Safety Shields

Step 1. Adjust the circuit breaker setting, if necessary. Use only the settings listed in table 2.

Table 2 – Inverting Fault Circuit Breaker Settings

Drive Rated HP @ 460 VAC	Required Setting
400 HP	Set at 2 (1900 A)
500 HP	Set at 3 (2300 A)
600 HP	Set at 4 (2600 A)

Step 2. Check and verify all wiring before applying power. Ensure that wires are not in contact with hot components or sharp metal edges.

Step 3. Install the top and bottom shields [Item 7] (refer to figure 9).

- a. Loosen the screws on the Inverting Fault Circuit Breaker assembly.
- b. Insert the shield keyholes onto the screws and slide each shield into place.
- c. Tighten the screws to hold the shields in place. Do not overtighten.

Step 4. Set the Inverting Fault Circuit Breaker to the ON position.

Step 5. Remove the lockout and tag and reconnect power to the drive.

Step 6. Turn on power to the drive and check for proper drive operation.

Kit installation is now complete.

Circuit Breaker Technical Specifications

Reliance Part Number: 419035-600QSA

Dimensions (HxWxD): 355.6 mm x 227.58 mm x 166.37 mm (14.0 in x 8.96 in x 6.55 in)

Weight: 15.14 kg (33.64 lb)

Current Rating @ 40° C: 1200 A

Trip Amps: 1500 A to 3000 A

Max AC Volts @ 50/60 Hz: 600 VAC

Max DC Volts: 600 VDC

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