efi ELECTRONICS

TITAN

SURGE PROTECTIVE DEVICES

TITAN Brick Panel Products Surge Protective Devices (SPD)

E120BPF

E160BPF

E200BPF

The TITAN Brick Panel Product Surge Protective Devices (SPD) are designed to provide protection at the service entrance, branch panels or other critical locations for today's electrical equipment. The TITAN Brick Panel Product series units have a Maximum Surge Current Rating Range of 120kA - 200kA per phase, (depending on model), and provide options such as: NEMA 1 or NEMA 3R/12 enclosures, Integral Switch and Remote Monitoring with a selection of wiring configurations including Delta.

Compliant with UL 1449 4th Edition

Retain for future use.

8232-0024A
Salt Lake City, UT, USA

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

⚠ CAUTION

LOSS OF BRANCH CIRCUIT POWER AND SURGE PROTECTION

In the event that the surge protective elements of the TITAN Brick Panel SPD have been damaged (i.e. excessive surge energy, power system anomaly, etc.), the surge protective elements can lose their ability to block power system voltage and attempt to draw excessive current from the line. This SPD is equipped with overcurrent and overtemperature protection that will automatically disconnect the surge protective elements from the mains should the surge protective elements be damaged.

The effects of damaged surge protective elements and the subsequent operation of the automatic overcurrent and overtemperature protection must be considered when applying an SPD, particularly when critical loads requiring continuity of power or continuity of surge protection are present on the power system. The following items should be considered when applying a SPD:

- Tripping of the branch circuit breaker feeding the SPD can occur when the surge protective elements are damaged. Do not connect the SPD to a branch circuit feeding a load requiring continuity of power (i.e. central computer or control systems, safety-critical equipment, critical processes or systems, etc.) unless the branch circuit breaker trip characteristic has been coordinated with the overcurrent protection inside the SPD. For the purposes of coordination, the SPD is equipped with overcurrent protection that will limit the per phase I^2t, $I_{apparent}$, I_p, and I_{th} values to 20 kA^2 seconds, 7000 A, 16,000 A peak, and 80 A rms respectively, when connected to a power system with a short-circuit current rating not exceeding 200,000 A.
- Periodic inspection of the state of the status indicator lights on the SPD should be made as part of the preventive maintenance schedule. The SPD should be promptly serviced when an alarm state exists.
- For unmanned, inaccessible, or critical installations, the dry contacts should be used to signal an alarm state to the central supervisory system.
- In addition to the preceding items, the use of multiple SPDs to achieve redundancy should be considered for critical applications.

Failure to follow these instructions can result in loss of power or loss of surge protection that can cause injury or equipment damage.

⚠ CAUTION

LOSS OF SURGE PROTECTION

- During installation into an electrical system, SPDs must not be energized until the electrical system is completely installed, inspected, and tested. All conductors must be connected and functional, including the neutral. The voltage rating of the device and system must always be verified before energizing the surge protective device.
- Any factory or on-site testing of power distribution equipment that exceeds the normal operating voltage, such as high-potential insulation testing, or any other tests where the suppression components will be subjected to voltages higher than their rated turn-on voltage must be performed with the suppressor disconnected from the power source. The neutral connection at the SPD must also be disconnected prior to performing high-potential testing and then reconnected upon completion of the test.

Failure to follow these instructions can result in equipment damage.

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INTRODUCTION

⚠ DANGER

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- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
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Failure to follow these instructions will result in death or serious injury.

UNPACKING AND PRELIMINARY INSPECTION

Proper installation is imperative to maximize the TITAN Brick Panel SPD's effectiveness and performance. The installer should follow the steps outlined in this instruction bulletin to ensure proper installation. Read the entire instruction bulletin before beginning the installation. These instructions are not intended to replace national or local electrical codes. Check all applicable electrical codes to verify compliance. Installation of surge suppressors should only be performed by qualified electrical personnel.

NOTE: SPDs are designed for use on the load side of the service entrance disconnect only.

Inspect the entire shipping container for damage or signs of mishandling before unpacking the device. Remove the packing material and further inspect the device for any obvious shipping damage. If any damage is found and is a result of shipping or handling, immediately file a claim with the shipping company.

STORAGE

The device should be stored in a clean, dry environment. Storage temperature is -40 to +65 °C (-40 to +149 °F). All of the packaging materials should be left intact until the device is ready for installation.

SAFETY LABELS English versions of all safety labels (danger, warning, caution) are provided.

SPD LOCATION CONSIDERATIONS

Environment The device is designed to operate in an ambient temperature range of 0 to +50 °C (-32 to +122 °F) with a relative humidity of 0 to 95% non-condensing. Refer to the product catalog for further details on enclosures. All SPDs operate normally without reduction in performance when subjected to shock and vibrations described in IEC 60721-3-3, Class 3M4.

Audible Noise The device background noise is negligible and does not restrict the location of the installation.

Mounting This device is designed to be surface or flush mounted. Refer to the device submittal drawings or the product catalog for typical mounting dimensions and weight. Install the TITAN Brick Panel SPD in a restricted access area.

Service Clearance The service clearance should meet all applicable code requirements.

Equipment Performance To obtain the maximum system performance, locate the device as close as possible to the circuit breaker to minimize the interconnecting wiring length. For every foot in length of wire, approximately 175 volts per foot (6 kV/ 3 kA, 8/20 microsecond) is added to the suppressed voltage. The suppressed voltage rating is located on the device nameplate and is measured 6 inches from the device terminals, according to UL ® 1449 Edition Four.

ELECTRICAL

Voltage Rating Prior to mounting the SPD, verify that the device has the same voltage rating as the power distribution system in which it is installed by comparing the nameplate voltage or model number on the SPD with the nameplate of the electrical distribution equipment.

The specifier or user of the device should be familiar with the configuration and arrangement of the power distribution system in which any SPD is to be installed. The system configuration of any power distribution system is based strictly on how the secondary windings of the transformer supplying the service entrance main or load are configured. This includes whether or not the transformer windings are referenced to earth via a grounding conductor. The system configuration is not based on how any specific load or equipment is connected to a particular power distribution system. See Table 1 for the service voltage of each SPD.

Table 1: TITAN Brick Panel SPD Voltage Ratings

SERVICE VOLTAGE		CONFIGURATION	MODEL NUMBER
120KA (PER/PHASE)	120/240 wye (Single Phase)	1Ph. Wye 3-wire +G	E120BPF120/240Y *
	120/208 wye	3Ph. Wye 4-wire +G	E120BPF120/208Y *
	208 Delta High Resistance Ground	3Ph. Delta 3-wire HRG	E120BPF208HRG
	208 Delta Ungrounded	3Ph. Delta 3-wire Ungrounded	E120BPF208U
	220/380 wye	3Ph. Wye 4-wire +G	E120BPF220/380Y *
	240/120 Delta split phase	3Ph. Delta 4-wire +G 'High Leg'	E120BPF240/120D
	240/120 Delta split phase	3Ph. Delta 4-wire +G 'High Leg'	E120BPF240/120D-R
	240/120 Delta split phase	3Ph. Delta 4-wire +G 'High Leg'	E120BPF240/120D-RD
	240 Delta corner ground	3Ph. Delta 3-wire +G	E120BPF240D
	240 Delta Ungrounded	3Ph. Delta 3-wire Ungrounded	E120BPF240U
	240 Delta corner ground	3Ph. Delta 3-wire +G	E120BPF240D-R
	240 Delta corner ground	3Ph. Delta 3-wire +G	E120BPF240D-RD
	277/480 wye	3Ph. Wye 4-wire +G	E120BPF277/480Y *
	480 Delta High Resistance Ground	3Ph. Delta 3-wire HRG	E120BPF480HRG
	480 Delta corner ground	3Ph. Delta 3-wire +G	E120BPF480D
	480 Delta Ungrounded	3Ph. Delta 3-wire Ungrounded	E120BPF480U
	480 Delta corner ground	3Ph. Delta 3-wire +G	E120BPF480D-R
	480 Delta corner ground	3Ph. Delta 3-wire +G	E120BPF480D-RD
	347/600 wye	3Ph. Wye 4-wire +G	E120BPF347/600Y *
	600 Delta High Resistance Ground	3Ph. Delta 3-wire +G	E120BPF600HRG
	600 Delta corner ground	3Ph. Delta 3-wire +G	E120BPF600D
	600 Delta corner ground	3Ph. Delta 3-wire +G	E120BPF600D-R
	600 Delta corner ground	3Ph. Delta 3-wire +G	E120BPF600D-RD
	600 Delta Ungrounded	3Ph. Delta 3-wire Ungrounded	E120BPF600U
160kA (Per/Phase)	120/240 wye (Single Phase)	1Ph. Wye 3-wire +G	E160BPF120/240Y *
	120/208 wye	3Ph. Wye 4-wire +G	E160BPF120/208Y *
	208 Delta High Resistance Ground	3Ph. Delta 3-wire HRG	E160BPF208HRG
	208 Delta Ungrounded	3Ph. Delta 3-wire Ungrounded	E160BPF208U
	220/380 wye	3Ph. Wye 4-wire +G	E160BPF220/380Y *
	240/120 Delta split phase	3Ph. Delta 4-wire +G 'High Leg'	E160BPF240/120D
	240/120 Delta split phase	3Ph. Delta 4-wire +G 'High Leg'	E160BPF240/120D-R
	240/120 Delta split phase	3Ph. Delta 4-wire +G 'High Leg'	E160BPF240/120D-RD
	240 Delta corner ground	3Ph. Delta 3-wire +G	E160BPF240D
	240 Delta Ungrounded	3Ph. Delta 3-wire Ungrounded	E160BPF240U
	240 Delta corner ground	3Ph. Delta 3-wire +G	E160BPF240D-R
	240 Delta corner ground	3Ph. Delta 3-wire +G	E160BPF240D-RD
	277/480 wye	3Ph. Wye 4-wire +G	E160BPF277/480Y *
	480 Delta High Resistance Ground	3Ph. Delta 3-wire HRG	E160BPF480HRG
	480 Delta corner ground	3Ph. Delta 3-wire +G	E160BPF480D
	480 Delta Ungrounded	3Ph. Delta 3-wire Ungrounded	E160BPF480U
	480 Delta corner ground	3Ph. Delta 3-wire +G	E160BPF480D-R
	480 Delta corner ground	3Ph. Delta 3-wire +G	E160BPF480D-RD
	347/600 wye	3Ph. Wye 4-wire +G	E160BPF347/600Y *
	600 Delta High Resistance Ground	3Ph. Delta 3-wire +G	E160BPF600HRG
	600 Delta corner ground	3Ph. Delta 3-wire +G	E160BPF600D
	600 Delta corner ground	3Ph. Delta 3-wire +G	E160BPF600D-R
	600 Delta corner ground	3Ph. Delta 3-wire +G	E160BPF600D-RD
	600 Delta Ungrounded	3Ph. Delta 3-wire Ungrounded	E160BPF600U

Standard enclosure is NEMA 1.

* All Configuration Wye units are available with a NEMA 3R/12 option. (Add suffix -R to part number. (Ex.E120BPF120/240Y-R))

* All Configuration Wye units are also available with an Integral Disconnect option. (Add suffix D to part number. (Ex.E120BPF120/240Y-RD))

Delta unit options are listed with Model Number. NEMA 3R/12 option has suffix designator R, Integral Disconnect option has suffix designator D.

(Table 1 continued on next page)

Table 1: TITAN Brick Panel SPD Voltage Ratings (continued from previous page)

SERVICE VOLTAGE		CONFIGURATION	MODEL NUMBER
200kA (Per/Phase)	120/240 wye (Single Phase)	1Ph. Wye 3-wire +G	E200BPF120/240Y *
	120/208 wye	3Ph. Wye 4-wire +G	E200BPF120/208Y *
	208 Delta High Resistance Ground	3Ph. Delta 3-wire HRG	E200BPF208HRG
	208 Delta Ungrounded	3Ph. Delta 3-wire Ungrounded	E200BPF208U
	220/380 wye	3Ph. Wye 4-wire +G	E200BPF220/380Y *
	240/120 Delta split phase	3Ph. Delta 4-wire +G 'High Leg'	E200BPF240/120D
	240/120 Delta split phase	3Ph. Delta 4-wire +G 'High Leg'	E200BPF240/120D-R
	240/120 Delta split phase	3Ph. Delta 4-wire +G 'High Leg'	E200BPF240/120D-RD
	240 Delta corner ground	3Ph. Delta 3-wire +G	E200BPF240D
	240 Delta Ungrounded	3Ph. Delta 3-wire Ungrounded	E200BPF240U
	240 Delta corner ground	3Ph. Delta 3-wire +G	E200BPF240D-R
	240 Delta corner ground	3Ph. Delta 3-wire +G	E200BPF240D-RD
	277/480 wye	3Ph. Wye 4-wire +G	E200BPF277/480Y *
	480 Delta High Resistance Ground	3Ph. Delta 3-wire HRG	E200BPF480HRG
	480 Delta corner ground	3Ph. Delta 3-wire +G	E200BPF480D
	480 Delta Ungrounded	3Ph. Delta 3-wire Ungrounded	E200BPF480U
	480 Delta corner ground	3Ph. Delta 3-wire +G	E200BPF480D-R
	480 Delta corner ground	3Ph. Delta 3-wire +G	E200BPF480D-RD
	347/600 wye	3Ph. Wye 4-wire +G	E200BPF347/600Y *
	600 Delta High Resistance Ground	3Ph. Delta 3-wire +G	E2000BPF600HRG
	600 Delta corner ground	3Ph. Delta 3-wire +G	E200BPF600D
	600 Delta corner ground	3Ph. Delta 3-wire +G	E200BPF600D-R
	600 Delta corner ground	3Ph. Delta 3-wire +G	E200BPF600D-RD
	600 Delta Ungrounded	3Ph. Delta 3-wire Ungrounded	E200BPF600U

Standard enclosure is NEMA 1.

* All Configuration Wye units are available with a NEMA 3R/12 option. (Add suffix -R to part number. (Ex.E120BPF120/240Y-R))

* All Configuration Wye units are also available with an Integral Disconnect option. (Add suffix D to part number. (Ex.E120BPF120/240Y-RD))

Delta unit options are listed with Model Number. NEMA 3R/12 option has suffix designator R, Integral Disconnect option has suffix designator D.

Terminals, Wire Size and Installation Torque

Terminals are provided for phase (line), neutral, and equipment ground connections. The SPD terminals accept a range of #12 to #2 AWG (34 mm^2) copper wire for phase, neutral, and ground connectors. Torque connections to the following values.

Table 2: Installation Torque

Power Connection	Terminal Torque	
	W/O Disconnect	W/ Disconnect
AØ, BØ, CØ & N	35 lb-in (4N·M)	50 lb-in (5.7N·M)
Ground	50 lb-in (5.7N·M)	

Disconnect Means (External)

The use of fusible disconnects requires a fuse with a melting characteristic greater than the per phase (Clearing) I^2t of the SPD to prevent nuisance operation of the disconnect fuses during a surge. (Refer to caution statement "LOSS OF BRANCH CIRCUIT POWER/LOSS OF SURGE PROTECTION" on page 2 for further information.).

⚠ WARNING

UNDERSIZED WIRING
(USE ONLY CONDUCTORS RATED 30 A OR GREATER.)

- The TITAN series SPD is designed for connection to a 30 A (or greater) circuit breaker.
- The circuit breaker is the intended disconnect means for the SPD without integral disconnect option and provides overcurrent protection for the connecting conductors.
- The circuit breaker maximum rating should not exceed the ampacity of the connecting conductors.

Failure to follow these instructions will result in death or serious injury.

INTEGRAL SWITCH

Turn off all power supplying this equipment through the Panel Circuit Breaker or Primary Disconnect before working on or inside the equipment. The integral switch is a second mechanical means for qualified maintenance personnel to isolate the entire surge suppressor to service the device's components. The integral switch opens the phase and neutral connections to the SPD for additional protection.

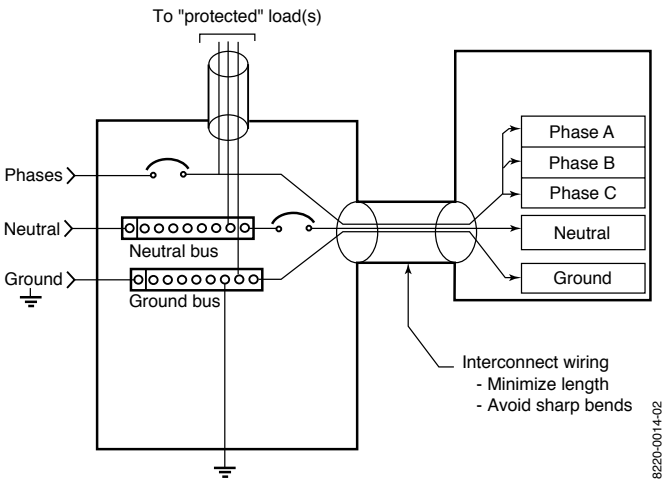
Turn disconnect handle to the OFF position prior to opening the door of the unit. With the handle in the OFF position, the SPD will be disconnected from the circuit and the circuit will not be protected from surges. Maintenance may now be performed on the TITAN module and associated parts. Upon completion of repairs, close the door of the unit and turn the handle to the ON position. Close the Panel Circuit Breaker or Primary Disconnect to power SPD.

LOCATION OF SPD

Install SPDs on the load side of the main overcurrent protection to comply with UL 1449 and the NEC.

Locate the SPD as close as possible to the circuit breaker being protected to minimize the wire length and optimize SPD performance. Avoid long wire runs so that the device will perform as intended. To reduce the impedance that the wire displays to surge currents, the phase, neutral, and ground conductors must be routed within the same conduit and tightly bundled or twisted together to optimize device performance. Avoid sharp bends in the conductors. See Figure 1.

Figure 1: Wiring Practice



SYSTEM GROUNDING

CAUTION

SYSTEM GROUNDING

- SPD must be installed on solidly grounded power systems.
- Verify that the service entrance equipment is bonded to ground in accordance with all applicable codes.
- Verify that the neutral terminals are grounded to system ground in accordance with all applicable codes.

Failure to follow these instructions can result in equipment damage.

An equipment ground conductor must be used on all electrical circuits connected to the SPD. For the best performance, use a single-point ground system where the service entrance grounding electrode system is connected to and bonded to all other available electrodes, building steel, metal water pipes, driven rods, etc. (for reference, see IEEE STD 142-1991). The ground impedance measurement of the electrical system should be as low as possible, and in compliance with all applicable codes, for electronics and computer systems.

When metallic raceway is used as an additional grounding conductor, an insulated grounding conductor should be run inside the raceway and sized in accordance with all applicable codes.

⚠ WARNING

INADEQUATE RACEWAY ELECTRICAL CONTINUITY

- Ground impedance must be as low as possible and in compliance with all applicable codes for electronic and computer systems.
- Install an insulated grounding conductor inside a metallic raceway when the raceway is used as an additional grounding conductor. Size the conductor in accordance with all applicable codes.
- Maintain adequate electrical continuity at all raceway connections.
- Do not use isolating bushings to interrupt a metallic raceway run.
- Do not use a separate isolated ground for the SPD.
- Verify proper equipment connections to the grounding system.
- Verify ground grid continuity by inspections and testing as part of a comprehensive electrical maintenance program.

Failure to follow these instructions can result in death or serious injury.

INSTALLATION

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

CONDUIT LOCATION AND RECOMMENDATIONS

The recommended conduit entry is at the bottom of the device enclosure. Use a conduit seal that is appropriate for the enclosure rating.

SPECIAL ENCLOSURE CONSIDERATIONS

Removing and Reconnecting the Diagnostic Patch Cables

The diagnostic patch cables are marked with matching phase connections. If any of the cables are removed, reconnect the cables as marked.

NEMA 3R Applications

Remove screws from the bottom of the enclosure to create drain holes.

Optional Flush Mounting

The flush mount collar option provides a mechanical means to install the surge suppressor flush to the surface of sheetrock or firewall construction. Not available on all models. (See data sheets for additional information).

⚠ DANGER

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- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

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WIRING **Follow steps 1–5 to make wiring connections.**

1. Turn off all power supplying this equipment through the Panel Circuit Breaker or Primary Disconnect before working on or inside the equipment. (For additional protection, an integral switch may be used)
2. Mount the SPD as close as possible to the panelboard being protected.
3. Connect the SPD to the panelboard using an approved wiring method. The connecting wires should be twisted together and kept as short as possible to enhance the performance of the device. See page 8 for the recommended wire size and installation torque. For wiring diagrams, see figures 2 thru 13.
   a. Connect the wire to the ground bus of the distribution panel and to the ground connection of the SPD.
   b. Connect the wire to the NEUTRAL bus of the panel and to the NEUTRAL connection of the SPD.
   c. Be sure the circuit breaker is open (OFF) prior to making any connections of any kind. If a circuit breaker or circuit breaker space is not available, connect to the electrical panel bus and then to an integral disconnect utilizing the 3M or 10ft tap rule. (See NEC 240.21(B)(1)(4)). Be sure the disconnect is open (OFF) and the circuit is
   de-energized before making any connections. Connect a wire (in conduit) to each phase (HOT) terminal on the LOAD side of a circuit breaker. Refer to the markings on the device when connecting the phase, neutral, and ground conductors. Fuses are not recommended for protection unless the fuses are specifically designed for use in an SPD application.

   NOTE: On a high-leg delta installation, the high-leg of the power system must be connected to phase B of the SPD.
4. After all connections have been made, reinstall any barriers that have been removed, close the door or replace the cover.
5. Restore power to the equipment as required. If the SPD is properly installed and functioning, the green LED indicators on the display will be lit.

If you have any questions pertaining to the installation, contact your EFI representative.

NOTE: Always install the SPD on the LOAD side of the main disconnect.

WIRING DIAGRAMS WITHOUT INTEGRAL DISCONNECT

Figure 2: Single-Phase, 3-Wire, Grounded Installation

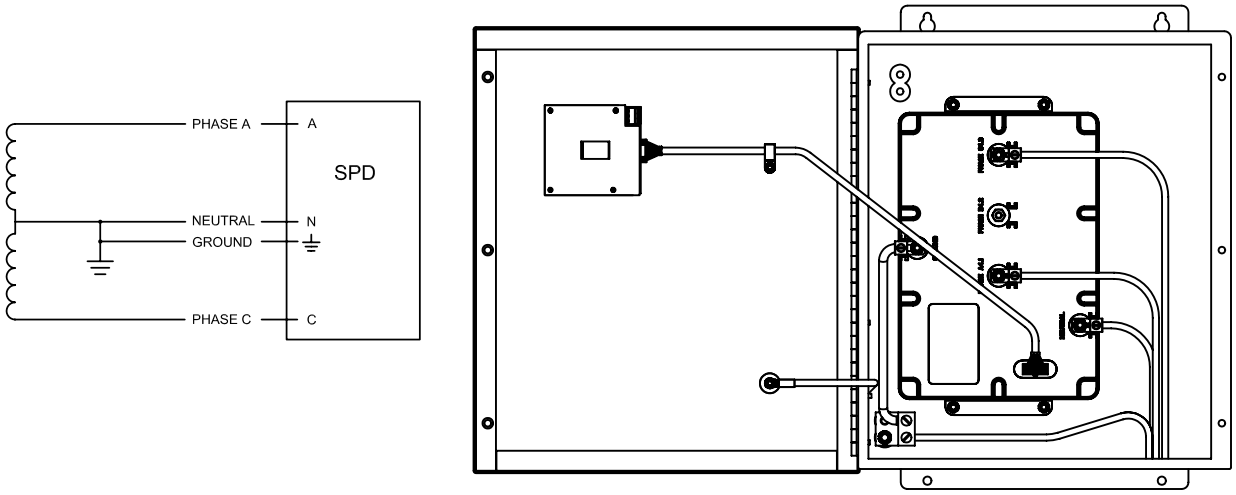
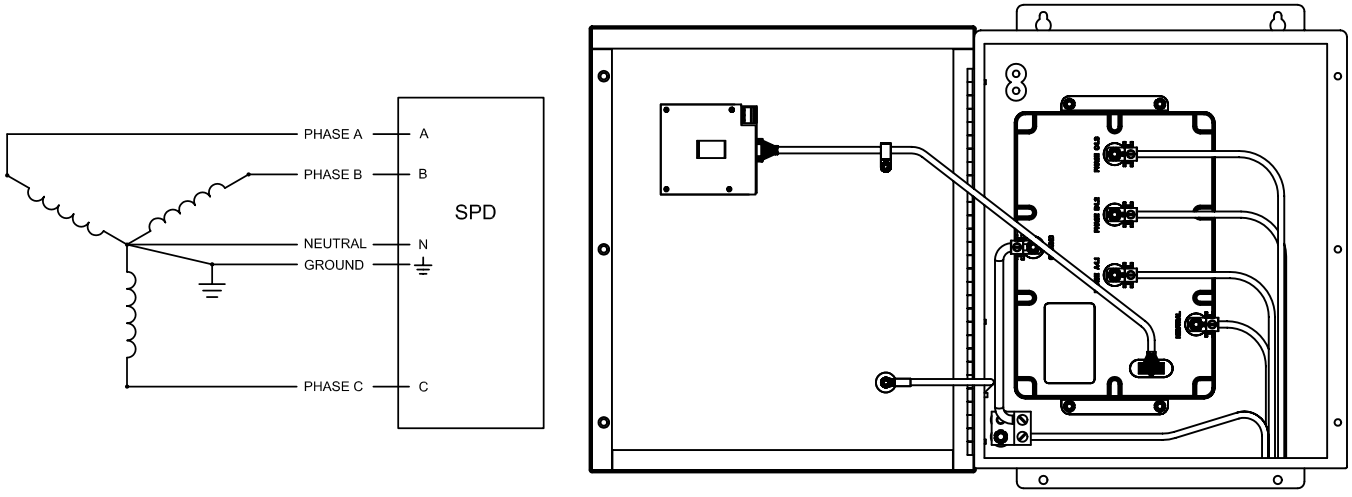


Figure 3: Three-Phase, 3- or 4-Wire, Grounded Wye Installation

NOTE: The neutral conductor is not present on 3-wire, grounded neutral power systems. For these systems tie the neutral and ground lugs together.



WIRING DIAGRAM WITHOUT INTEGRAL DISCONNECT

Figure 4: Three-Phase, 3- or 4- Wire, High-Leg Delta Installation

NOTE: The high-leg of the power system must connect to phase B of the SPD. The neutral conductor is not present on 3-wire, grounded neutral power systems. For these systems tie the neutral and ground lugs together.

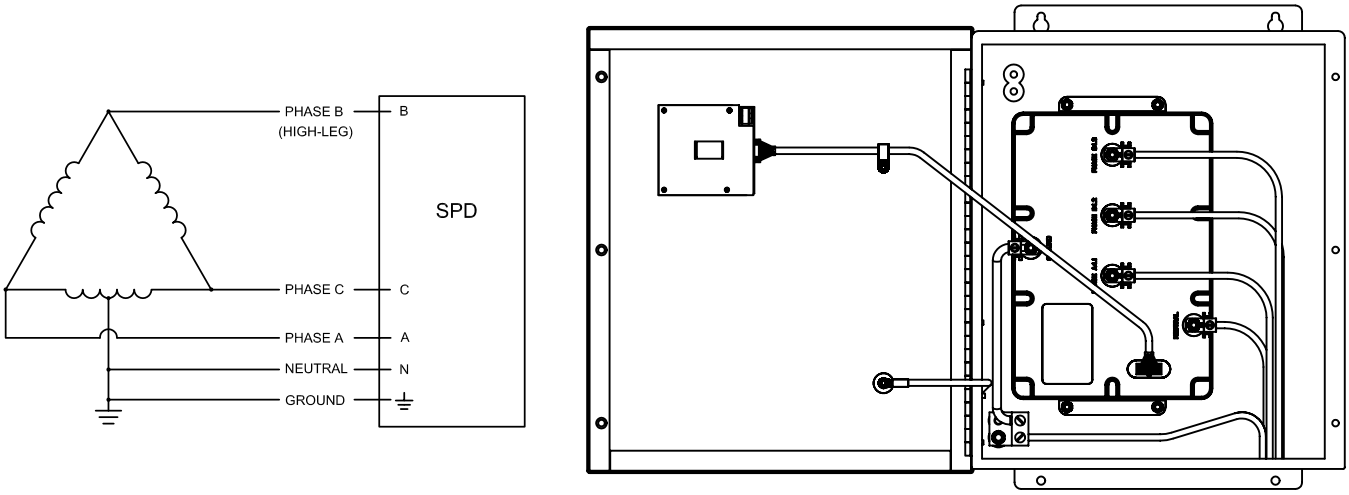
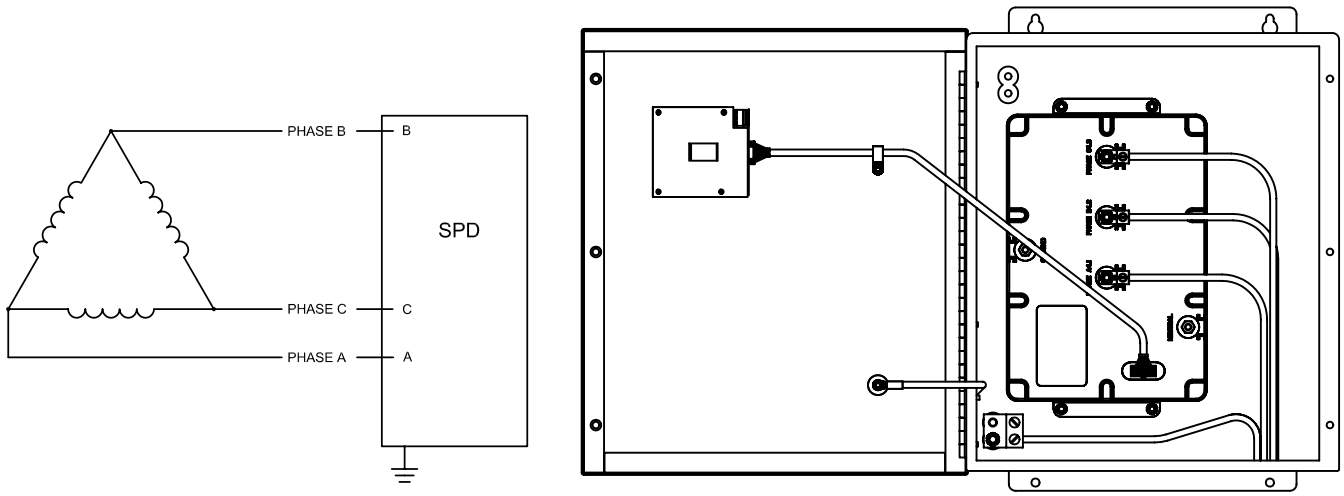


Figure 5: Three-Phase, 3-Wire, Delta Installation



WIRING DIAGRAM WITHOUT INTEGRAL DISCONNECT

Figure 6: Three-Phase, 3-Wire, Corner-Grounded Delta Installation

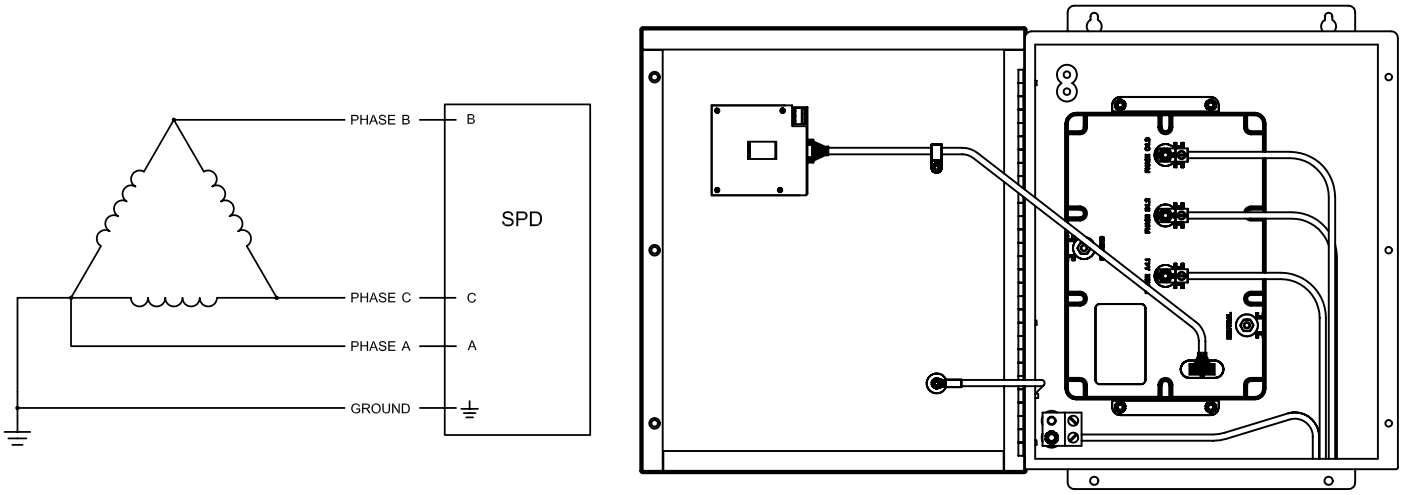
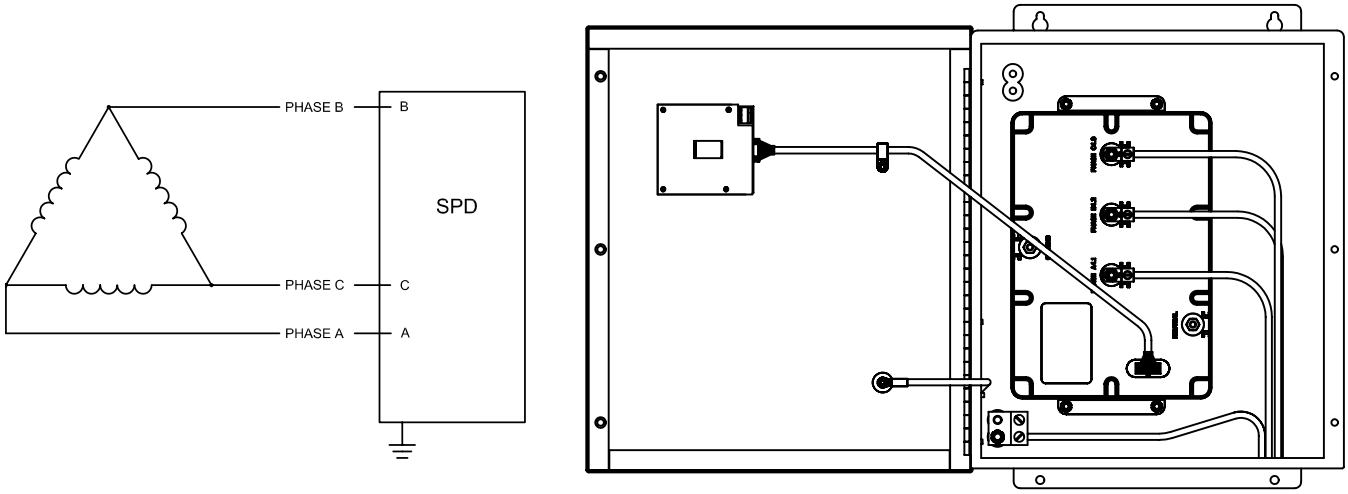


Figure 7: Three-Phase, 3-Wire, High-Resistance Grounded Delta Installation



WIRING DIAGRAM WITH INTEGRAL DISCONNECT

Figure 8: Single-Phase, 3-Wire, Grounded Installation with Integral Disconnect

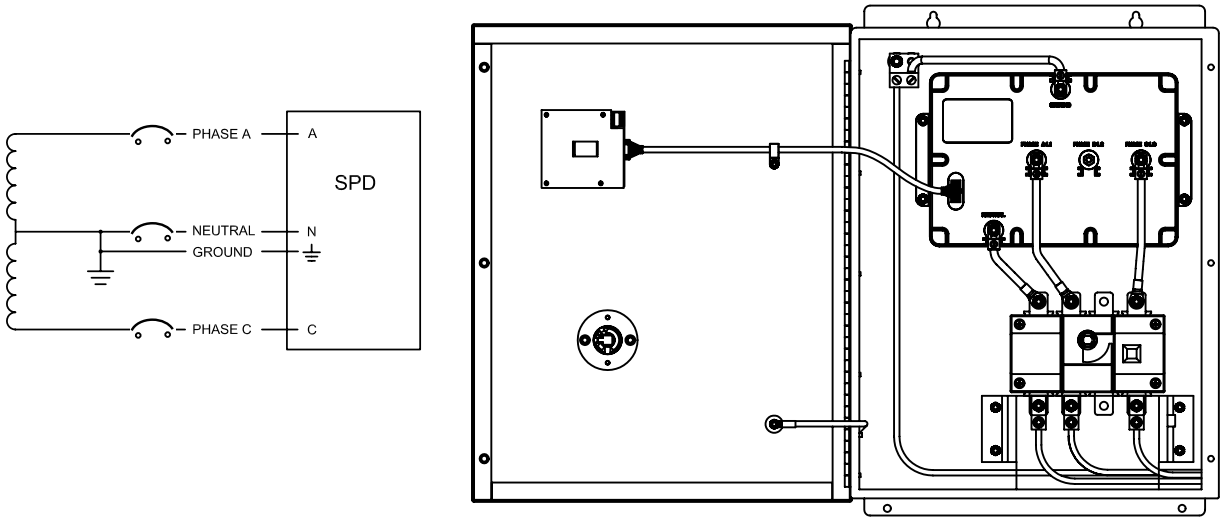
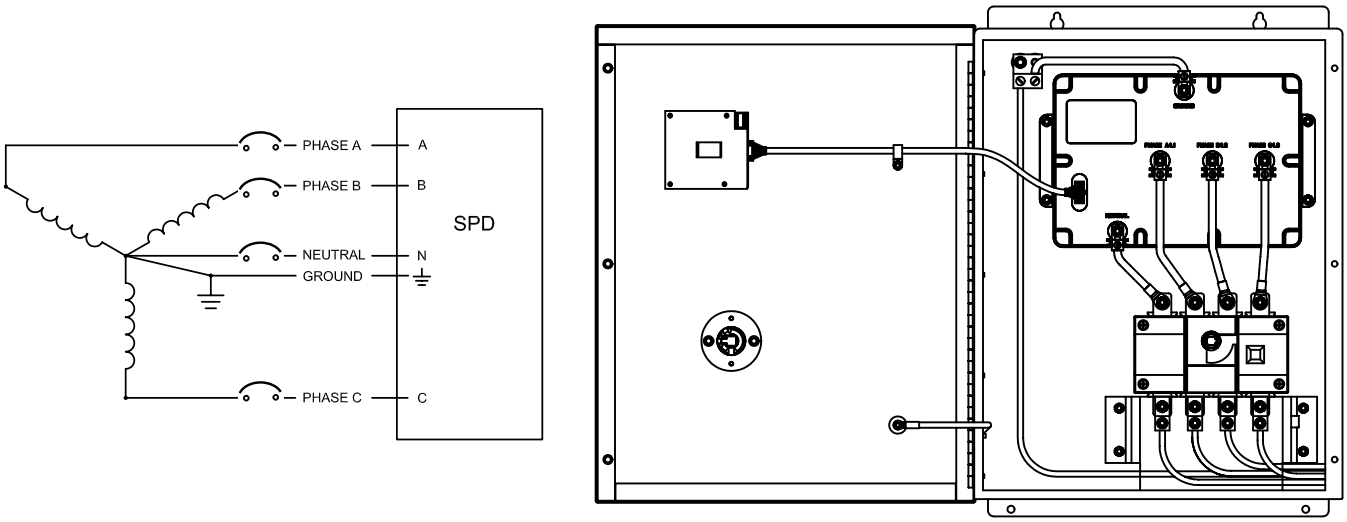


Figure 9: Three-Phase, 3- or 4-Wire, Grounded Wye Installation with Integral Disconnect

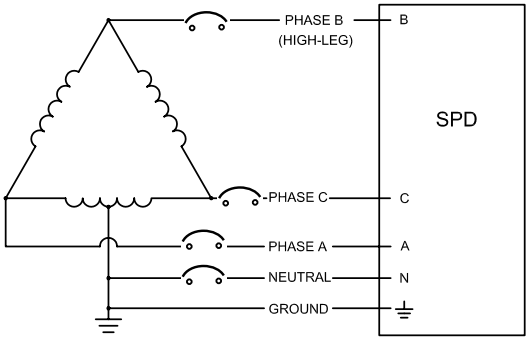
NOTE: The neutral conductor is not present on 3-wire, grounded neutral power systems. For these systems tie the neutral and ground lugs together.



WIRING DIAGRAM WITH INTEGRAL DISCONNECT

Figure 10: Three-Phase, 3- or 4- Wire, High-Leg Delta Installation with Integral Disconnect

NOTE: The high-leg of the power system must connect to phase B of the SPD. The neutral conductor is not present on 3-wire, grounded neutral power systems. For these systems tie the neutral and ground lugs together.



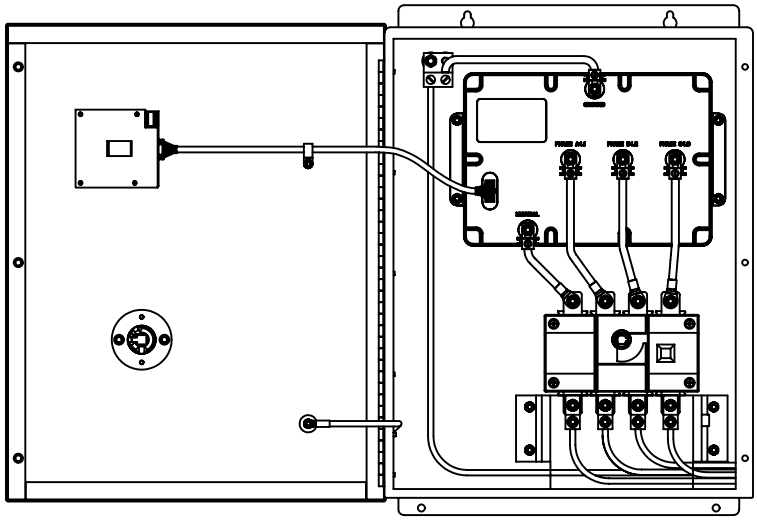
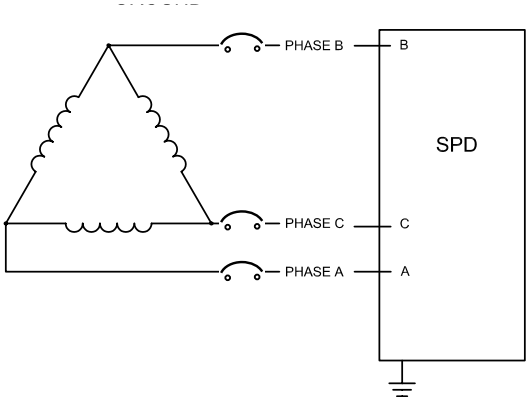
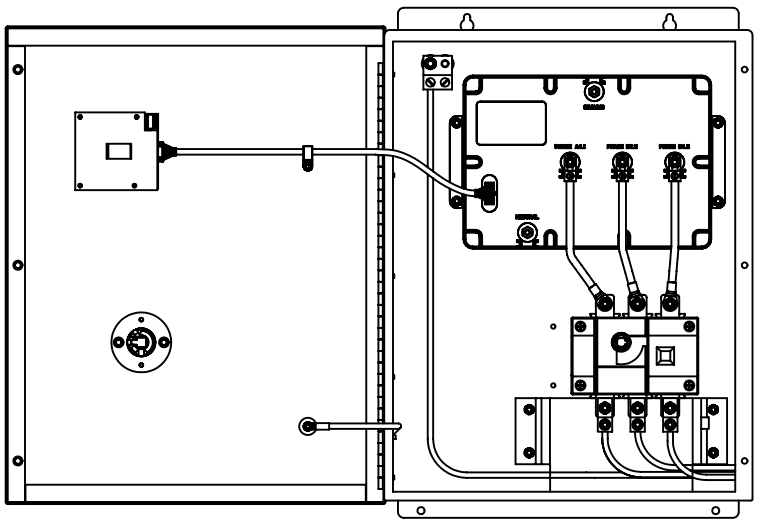


Figure 11: Three-Phase, 3-Wire, Delta Installation with Integral Disconnect





WIRING DIAGRAM WITH INTEGRAL DISCONNECT

Figure 12: Three-Phase, 3-Wire, Corner-Grounded Delta Installation with Integral Disconnect

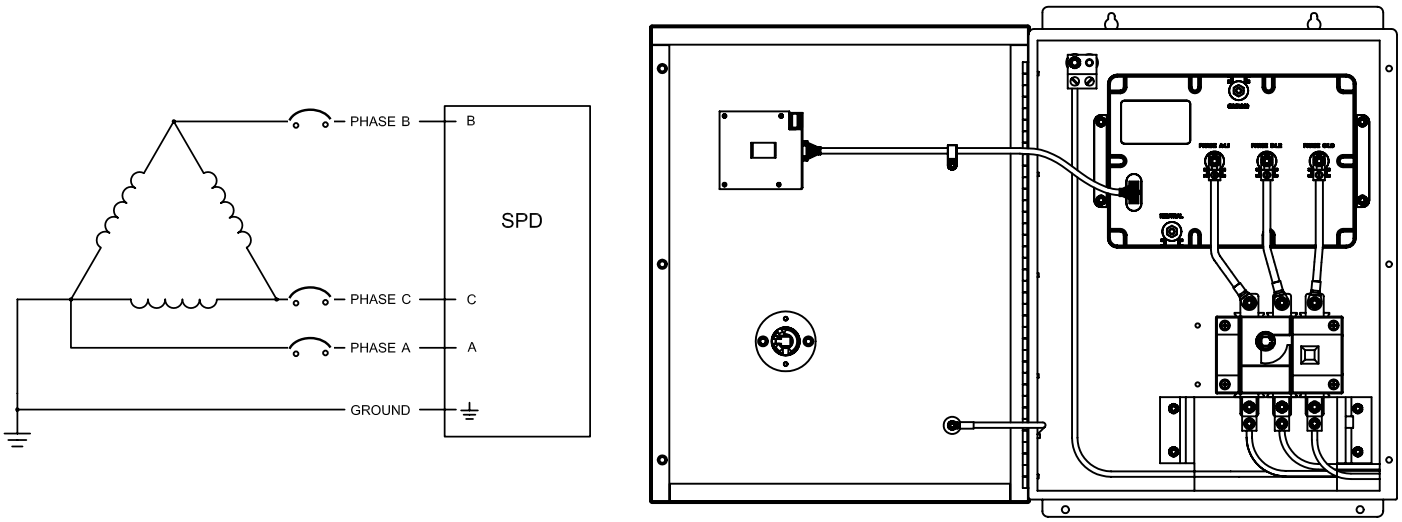
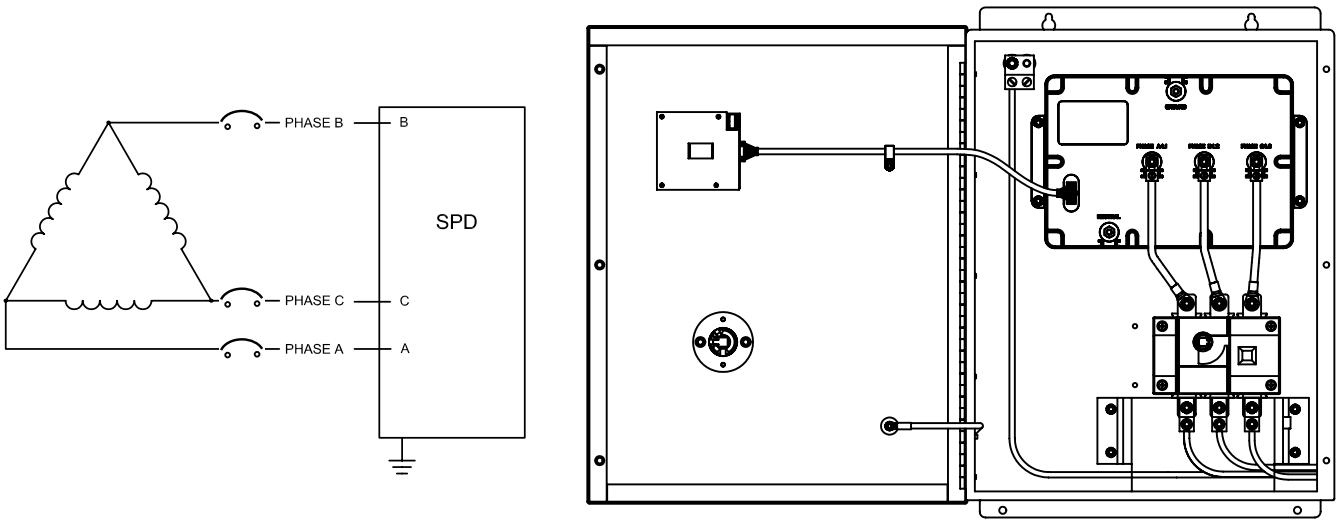


Figure 13: Three-Phase, 3-Wire, High-Resistance Grounded Delta Installation with Integral Disconnect



OPERATION

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

LED STATUS INDICATORS

The SPD display panel shows the status of the TITAN module with diagnostically controlled green/red LEDs. If a unit is operating correctly, all the phase LEDs will be illuminated green. To test the integrity of the diagnostics for each phase, push the button below the phase LEDs on the diagnostic display. The green LED will turn red and the alarm will sound, if the alarm is enabled. Releasing the test button will complete the test; the red LED will turn green and the alarm will shut off.

If an inoperable condition occurs on any phase, the audible alarm sounds and the corresponding phase LED on the diagnostic display panel is illuminated red. This indicates that the device needs service by qualified electrical personnel. The audible alarm can be silenced, until a qualified person is able to evaluate and service the SPD by pressing the alarm enable/disable button. The alarm will silence and the green alarm LED will not be lit. The red phase LED will continue to be illuminated until the inoperative condition had been cleared.

When power is applied to the SPD and one or more of the display LEDs are red, and one or more TITAN module LEDs are out, the TITAN module should be replaced. Refer to “Maintenance and Troubleshooting” on page 22-23 for proper troubleshooting procedures.

AUDIBLE ALARM

Push the alarm enable/disable button to enable or disable the alarm. If the green alarm LED is lit the alarm is enabled. If the green alarm LED is not lit the alarm is disabled.

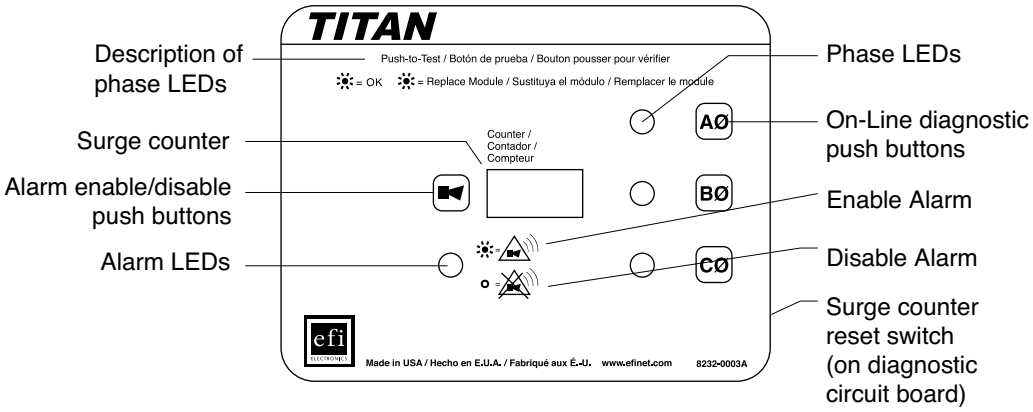
SURGE COUNTER

The surge counter displays the number of transient voltage surges since the counter was last reset. The counter is battery powered to retain memory in the event of a power loss to the diagnostic display panel.

To reset the surge counter remove all power and press the small switch located inside the unit on the underside of the diagnostic circuit board (near the diagnostic cable connectors). This will reset the counter to zero.

Figure 14: Three-Phase Display Panel with Surge Counter

Note: Phase B is not present on single-phase applications.



DRY CONTACTS

The TITAN Hardwired series SPD is provided with dry contacts. The connection for the dry contacts is located on the back of the diagnostic display panel (lower right corner). The dry contacts are 3-position, Form "C" type with Normally Open, Normally Closed and Common connections. The unpowered state shall be closed between terminals NO and COM. This is also the alarm condition. The opposite state, closed between terminals NC and COM, indicates that power is on to the unit and that no alarm condition exists (See Table 3). These contacts can be used for remote indication of the SPD's operating status to a computer interface board or emergency management system. Also, these contacts are designed to work with the SPD remote monitor option described below.

The contacts are designed for a Maximum voltage of 120 Vac and a maximum current of 1 A. Higher energy applications may require additional relay implementation outside the SPD. Damage to the SPD's relay caused by use with energy levels in excess of those discussed in this instruction bulletin are not covered by warranty. For application questions, contact your EFI representative.

Care must be taken in installing the dry contact wiring because the terminals are on a moving door. Avoid the door hinge, any disconnect switches, and the high voltage areas of the enclosure when routing the wiring. To avoid the door hinge, tie wrap any dry contact wiring to the existing cable harness which crosses the hinge. Once the dry contact wiring is secured on a non-moving point of the enclosure, it is the user's responsibility to maintain separation between dry contact wiring and the power wiring in the enclosure.

Table 3: Dry Contact Configuration

Alarm Contact Terminals	Contact State with Power Removed
NC	Open
COM	Common
NO	Closed

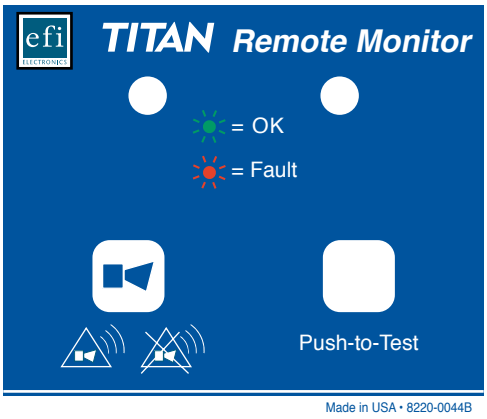
REMOTE MONITOR OPTION

The option has two LEDs, one red and one green, and an audible alarm with an enable/disable switch. Normal status is a lit green LED, and no audible alarm. To test the integrity of the remote monitor, press the push-to-test switch. The green LED will turn off, the red LED will turn on, and the alarm will sound, if the alarm is enabled. Releasing the switch will complete the test; the red LED will turn off, the green LED will turn on and the alarm will shut off.

If protection on any phase is lost, the green LED will turn off, the red LED will turn on and an alarm sounds. The audible alarm can be silenced by moving the alarm enable/disable switch to the disable position. The alarm will silence and the green alarm LED will not be lit. The red LED will continue to be illuminated until the inoperative condition had been cleared.

The remote monitor includes a 120Vac to 12Vdc adapter with a six-foot power cord. Connections are made to the SPD diagnostic panel with Form "C", 3-position dry contacts (provided) and the appropriate length of solid or stranded 22 to 14 AWG wire (not provided).

Figure 15: Remote Monitor Option



MAINTENANCE AND TROUBLESHOOTING

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Turn off all power supplying this equipment before working on or inside equipment.
- Always use a properly rated voltage sensing device to confirm power is off.
- Replace all devices, doors and covers before turning on power to this equipment.

Failure to follow these instructions will result in death or serious injury.

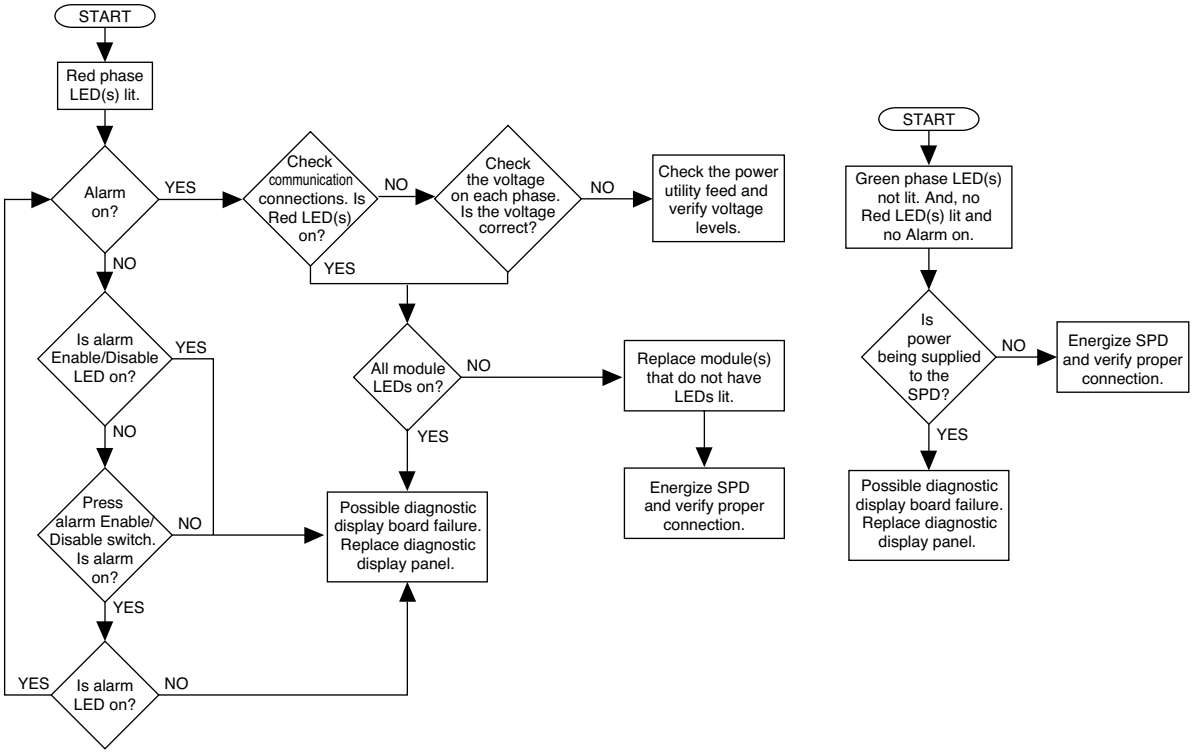
Preventive Maintenance

Inspect the SPD periodically to maintain reliable system performance and continued transient voltage surge protection. Periodically check the state of the display LED status indicators. Routinely use the built-in diagnostics to inspect for inoperative modules.

Troubleshooting

Figure 16: Troubleshooting Flowcharts

Refer to Figure 16 below for troubleshooting procedures.



Replacement Parts

Replacement parts are available. For ordering information, refer to the EFI Technical Assistance Group (TAG) 1-800-577-7353.

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