

# Surge Protective Devices



## SPD200K/300K Series

## Safety Information

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### Important Information

**Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.**



The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

### **DANGER**

**DANGER** indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

### **WARNING**

**WARNING** indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

### **CAUTION**

**CAUTION** indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

### **NOTICE**

NOTICE is used to address practices not related to physical injury. The safety alert symbol shall not be used with this signal word.

### Please Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Appleton Grp LLC d/b/a Appleton Group for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction, installation, and operation of electrical equipment and has received safety training to recognize and avoid the hazards involved.

## Precautions

### **DANGER**

#### **HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Apply appropriate personal protective equipment (PPE) and follow safe electrical work practices. See NFPA 70E, NOM-029-STPS or CSA Z462.
- 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.
- This equipment must be effectively grounded per all applicable codes. Use an equipment-grounding conductor to connect this equipment to the power system ground.

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



**WARNING:** This product can expose you to chemicals including DINP, which is known to the State of California to cause cancer, and DIDP which is known to the State of California to cause birth defects or other reproductive harm. For more information go to: [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

### **NOTICE**

#### **LOSS OF BRANCH CIRCUIT POWER / LOSS OF SURGE SUPPRESSION**

- Perform periodic inspection of the surge protective device status indicator lights as part of the preventative maintenance schedule.
- Promptly replace the surge protective device when an alarm state exists.
- Use dry contacts to signal an alarm state to the central supervisory system for unmanned, inaccessible, or critical installations.
- Use multiple surge protective devices to achieve redundancy for critical applications.

**Failure to follow these instructions can result in equipment damage.**

At end-of-life conditions, Surge Protective Devices (SPDs) can lose their ability to suppress power system voltage and attempt to draw excessive current from the line. This SPD is equipped with overcurrent and overtemperature components that will automatically disconnect the surge suppression elements from the mains should the surge suppression elements reach end of life. Tripping of the branch circuit breaker or fuse feeding the SPD can occur when the surge suppression elements reach end of life.

# SPD200K/300K

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## **⚠ DANGER**

### **HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Do not energize the surge protective device until the electrical system is completely installed, inspected and tested.
- Ensure all conductors are connected.
- Verify the voltage rating of the device and system prior to energizing.
- Perform high-potential insulation testing, or any other tests where surge protective device components will be subjected to voltages higher than their rated turn-on voltage, with the neutral and surge protective device disconnected from the power source

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

## Introduction

## **⚠ DANGER**

### **HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

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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.
- This equipment must be effectively grounded per all applicable codes. Use an equipment-grounding conductor to connect this equipment to the power system ground.

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

Proper installation is imperative to maximize the SolaHD SPD200K/300K's effectiveness and performance. Follow the steps outlined in this instruction manual to ensure proper installation. Read the entire instruction manual 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 these surge suppressors must only be performed by qualified electrical personnel.

## Unpacking and Preliminary Inspection

Inspect the shipping container for damage before unpacking the device. Remove the packing material and further inspect the device for shipping damage. If any damage is found, immediately file a claim with the shipping company.

## Storage

The device should be stored in a clean, dry environment. Storage temperature is -40°F (-40°C) to +140°F (+60°C). All of the packaging materials should be left intact until the device is ready for installation.

# Surge Protective Device (SPD) Location Considerations

## Environment

The device is designed to operate in an ambient temperature range of -25° C (-13° F) to +60° C (140° F) with a relative humidity of 0 to 95% non- condensing.

## Audible Noise

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

## Mounting

The device is designed to be surface mounted. Refer to the device submittal drawings or the product catalog for typical mounting dimensions and weight.

## Service Clearance

The service clearance must meet all applicable code requirements.

## Equipment Performance

To obtain the maximum system performance, locate the device as close to the circuit being addressed as possible to minimize the interconnecting wiring length. For every foot of wire length, approximately 160 Volts (6 kV / 3 kA, 8/20 microsecond) is added to the suppressed voltage. The Voltage Protection Rating (VPR) is located on the device nameplate and is measured six inches from the enclosure sidewall, according to UL® 1449 test standards.

## Electrical

### Voltage Rating

<b>⚠ DANGER</b>
<b>HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH</b>
<ul style="list-style-type: none"><li>• Confirm the SPD voltage rating on the module or nameplate label is not less than operating voltage the operating voltage.</li></ul>
<b>Failure to follow these instructions will result in death or serious injury.</b>

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

The specifier or user of the device must 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 ground 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.

# SPD200K/300K

**Table 1: Part Number Construction**

<p><b>SPD</b> Surge Protective Device</p>	<p><b>200K or 300K</b> 200kA or 300kA Rating Per Phase</p>	<p><b>□□□RC</b> Voltage Codes 10Y – 208Y/120V 27Y – 480Y/277V 24D – 240V Delta 48D – 480V Delta 34Y – 600Y/347V</p>
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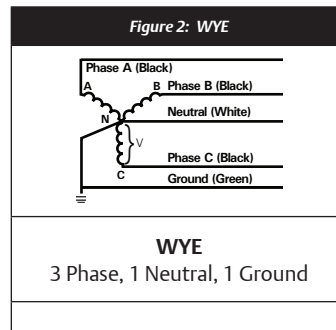
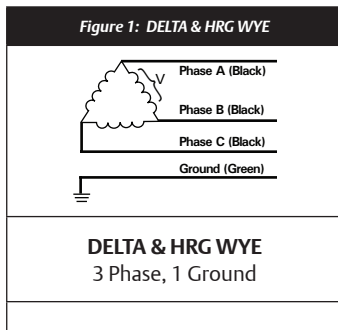
R = Internal Rotary Disconnect

C = LED(s)/Audible Alarm/Relay/ Surge Counter

**Example:** Part no. **SPD200K10YRC** is a 200kA, 120/208V Internal Rotary Disconnect and LED(s)/Audible Alarm/Relay/Surge Counter

## Available Part Number Combinations:

PARALLEL SPDs	PARALLEL SPDs
SPD200K10YRC	SPD300K10YRC
SPD200K27YRC	SPD300K27YRC
SPD200K48DRC	SPD300K24DRC
	SPD300K48DRC
	SPD300K34YRC



# Terminals, Wire Size and Installation Torque

Terminals are provided for phase (line), neutral, and equipment ground connections.

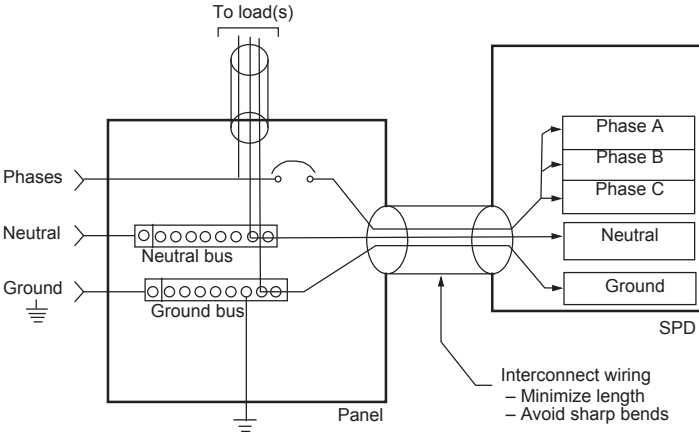
**Table 2: Terminal Torque**

Connection Torque	
Power Connection	Torque
AØ, BØ, CØ, N and Ground	40–50 lb-in. ( 4.5–5.6 N • m)
<b>Wire Size:</b> 8 AWG to 1/0 AWG Copper	

# Location of Surge Protective Device (SPD)

Locate the SPD as close as possible to the circuit being addressed to minimize the wire length and optimize SPD performance. Avoid long wire runs so that the device will perform as intended. To reduce wire impedance from 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 3.

*Figure 3: Surge Protective Device Wiring Practice*



# Grounding

## ⚠ DANGER

**HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Connect the Surge Protective Device ground terminal to the building grounding grid structure.
- Use an appropriately sized equipment grounding conductor.
- Do not use isolated bushings to interrupt the metallic raceway or conduit.
- Maintain electrical continuity at all raceway and conduit connections using appropriate bonding devices.
- Do not use a separate isolated ground for this Surge Protective Device.
- Verify proper equipment connection to the grounding system.
- Verify ground grid continuity by performing regularly scheduled inspections and testing as part of a comprehensive electrical maintenance program.

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

# SPD200K/300K

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## **⚠ CAUTION**

### **SPD DAMAGE AND POWER SYSTEM OVERVOLTAGE**

- Ungrounded power systems are inherently unstable and can produce excessively high line-to-ground voltages during certain fault conditions. During these fault conditions any electrical equipment, including an SPD, may be subjected to voltages which exceed their designed ratings. This information is being provided to the user so that an informed decision can be made before installing any electrical equipment on an ungrounded power system.
- Resistance-grounded power systems must be maintained in a over-damped state to limit voltage overshoot and duration during operation.
- Verification and adjustment of correct power system damping should be done following power system modifications and periodically, as part normal system maintenance.

**Failure to follow these instructions can result in injury or equipment damage.**

## **General**

The SolaHD SPD200K/300K has SPD elements connected from phase to ground. It is critical that there be a robust and effective connection to the building grounding structure. The grounding connection must utilize an equipment grounding conductor run with the phase and neutral (if present) connection of the power system.

For proper over-voltage suppression by this SPD, 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 142-2007). The ground impedance measurement of the electrical system should be as low as possible, and in compliance with all applicable codes.

## **Solidly Grounded Power Systems**

## **⚠ DANGER**

### **HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

- Do not connect devices rated for use on solidly-grounded power systems to resistance-grounded (for example, High Resistance Ground) or ungrounded power systems.
- Verify that the service entrance equipment is bonded to ground in accordance with all applicable codes.
- Verify that the neutral terminal of the power system transformer feeding the device is bonded to system ground in accordance with all applicable codes.

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

SPDs rated for use on solidly-grounded power systems must not be connected to resistance-grounded or ungrounded power systems. Such a connection can result in damage to the SPD.

Always verify the power system grounding configuration prior to application of power to the device. Confirm that all ground bonds are installed at both the service entrance equipment and power system transformer prior to application of power.



## Delta and Resistance-Grounded Power Systems

### DANGER

#### HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- For resistance-grounded system maintain an over-damped state to limit voltage overshoot and duration during operation.
- Verification and adjustment of correct power system damping should be done following power system modifications and periodically, as part normal system maintenance.

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

This product is intended for use on resistance-grounded power systems where the power system has been set for, and is maintained in, an over-damped state. For the power system to be over-damped, the current through the grounding resistor during a bolted phase-to-ground fault must be significantly greater than the total charging current of the system.

Periodic engineering evaluation of the power system is required to determine the worst-case charging current of the system and to adjust the grounding resistance accordingly. As the power system is modified, the value of the grounding resistor must be evaluated and adjusted to maintain the system in the over-damped state.

## 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, CSA Z462 or NOM-029-STPS.
- 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.
- This equipment must be effectively grounded per all applicable codes. Use an equipment-grounding conductor to connect this equipment to the power system ground.

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

## Conduit Location and Recommendations

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

# SPD200K/300K

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## Module Rotation Feature

Installation lead wire length must be minimized because longer leads hurt performance. Lead length may be reduced by rotating the module inside the enclosure. SPD ships with terminals pointing down. If installation lends itself toward other orientation, the module's aluminum backplane can be unscrewed and reoriented. For example, if leads enter from top, rotate module assembly such that leads are shortest. Be careful with ribbon cable connector and take care to retighten screws and secure ribbon cable. Mounting screws are in four corners. Rectangular enclosures may be rotated up or down only.

## Wiring

### **⚠ 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.
- This equipment must be effectively grounded per all applicable codes. Use an equipment-grounding conductor to connect this equipment to the power system ground.
- Confirm the SPD voltage rating on the module or nameplate label is not less than the operating voltage.

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

## The SPD200K/300K Series

Follow steps 1 through 7 to make wiring connections to units with rotary disconnect switch:

1. Turn off all power supplying this equipment before working on or inside any enclosure containing this equipment.
2. Confirm SPD is rated for your system by comparing voltage measurements to the Line Voltage (L-L, L-N) on the product label.
3. Identify proper location for surge protective device. Locate as close as possible to the panel being addressed so the wires are as short as possible. Mount unit securely.

*Note: The surge protective device must be installed in an accessible location as described in the NEC.*

- 4. Install in accordance with national and local electrical codes for overcurrent protection recommendations and wire ampacity considerations.

*Note: Use on solidly grounded systems unless the SPD model is designed for installation on ungrounded /HRG systems.*

*Note: See “Terminals, Wire Size, and Installation Torque” and Table 2 on page 5 for acceptable wire size and installation torque.*

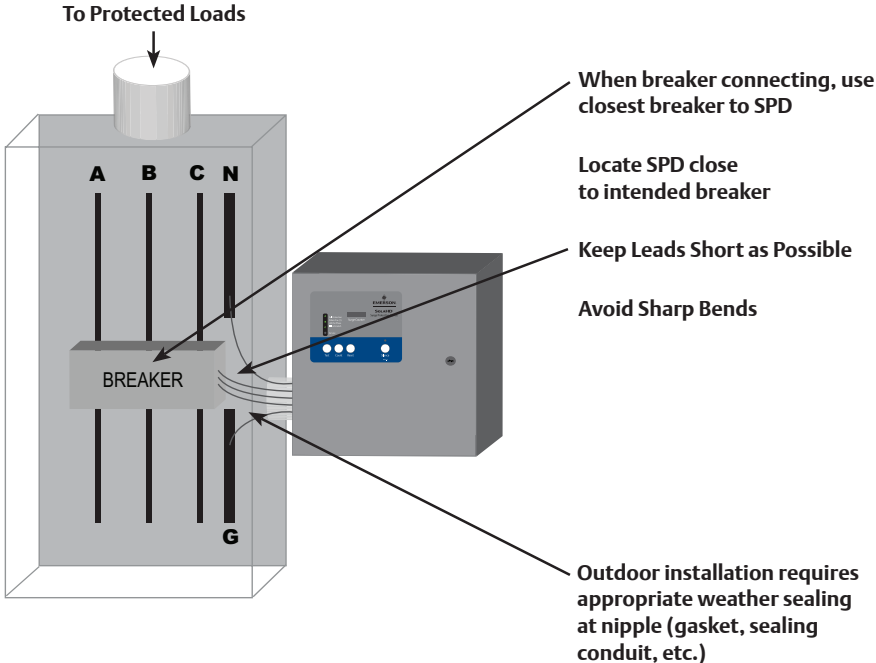
- 5. Twist conductors 1/2 turn or more for every twelve inches of length. Do not loop or coil wires. Be sure to maintain adequate wire bending space per NEC.
- 6. If the remote signaling contacts of the diagnostic display panel are to be used, refer to the section, “Dry Contacts,” on page 14 for wiring instructions.
- 7. Replace all devices, doors, and covers before turning on power to the equipment. If the SPD is properly installed and functioning, the green LED indicators on the display will be lit and the service LED extinguished.

If you have any questions pertaining to the installation of this device, contact us at 1-800-377-4384 or [solahd.technicalservices@emerson.com](mailto:solahd.technicalservices@emerson.com).

## Dimensions and Weights

Model	H/W/D (in. / mm.)	Weight
SPD200K / SPD300K	12" x 12" x 6.7" (305 x 305 x 170)	23 lbs (10.4 kg)

**Figure 8: Typical Panel Installation**



## Wiring Diagrams With Disconnect Switch

### NOTICE

#### HAZARD OF LOSS OF PROPERLY FUNCTIONING LED/ALARM/STATUS

- Bond the ground and neutral lugs with a 10 AWG wire when connected to no-neutral power sources only.

Failure to follow these instructions can result in equipment damage.

Figure 4: Three-Phase, Three- or Four-Wire, Grounded Wye Installation with Integral Switch

If the neutral conductor is not present on three-wire grounded power systems (Wye, no neutral), bond the neutral and ground lugs together inside the SPD using 10 AWG wire.

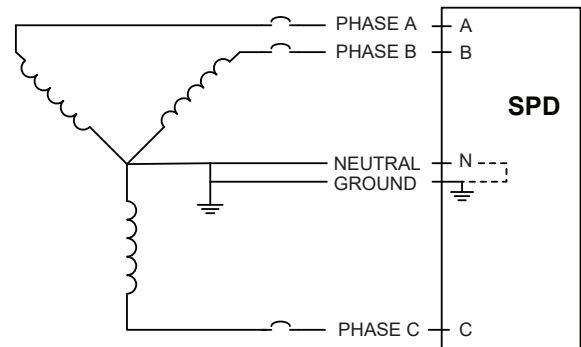
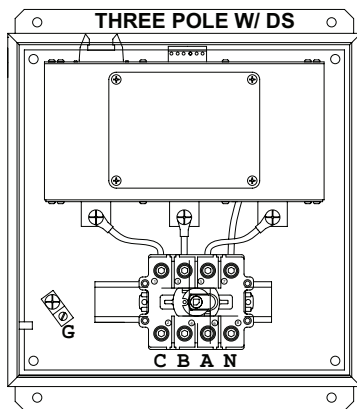
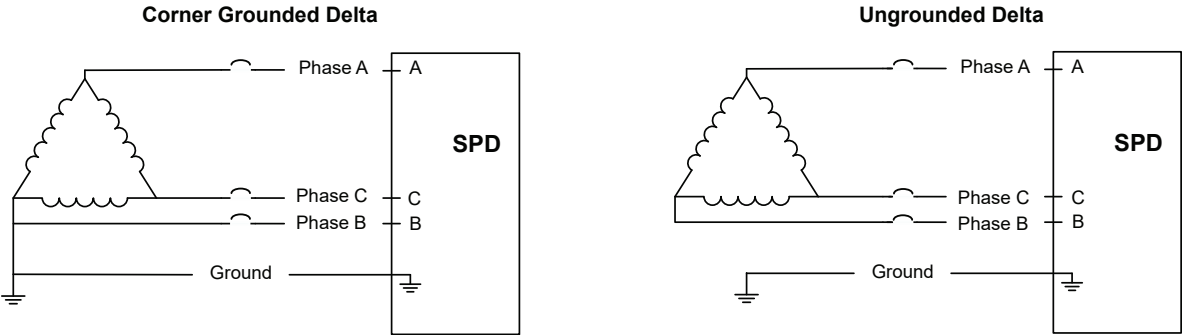
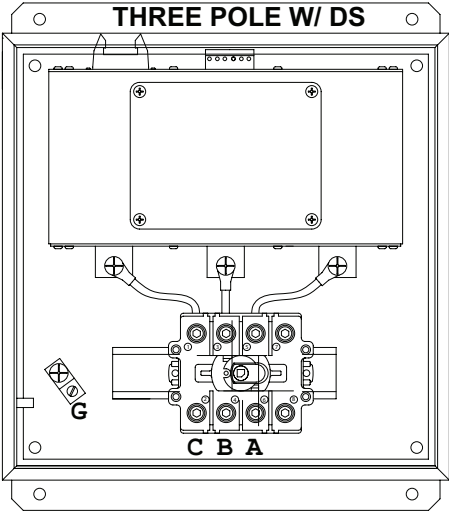


Figure 5: Three-Phase, Three-Wire + Ground, Delta Installation

The ground connection of the Delta SPD shall be connected to the system ground conductor. The neutral conductor is not present on Delta systems.



Phase B of the electrical system is typically the grounded phase



## UL 1283 Required Language Concerning the Installation of EMI Filters (Standard on SPD200K/300K)

- A. An insulated grounding conductor that is identical in size and insulation material and thickness to the grounded and ungrounded circuit supply conductors, except that it is green with or without one or more yellow stripes, is to be installed as part of the circuit that supplies the filter. Reference should be made to Table 250-122 of the National Electrical Code regarding the appropriate size of the grounding conductor.
- B. The grounding conductor mentioned in item a is to be grounded at the service equipment or other acceptable building ground such as the building frame in the case of a high-rise steel frame structure.
- C. Any attachment-plug receptacles in the vicinity of the filter are to be of a grounding type, and the grounding conductors serving these receptacles are to be connected to ground at the service equipment or other acceptable building ground such as the building frame in the case of a high-rise steel-frame structure.
- D. Pressure terminal or pressure splicing connectors and soldering lugs used in the installation of the filter shall be identified as being suitable for the material of the conductors. Conductors of dissimilar metals shall not be intermixed in a terminal or splicing connector where physical contact occurs between dissimilar conductors unless the device is identified for the purpose and conditions of use.

## 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, CSA Z462 or NOM-029-STPS.
- 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.
- This equipment must be effectively grounded per all applicable codes. Use an equipment-grounding conductor to connect this equipment to the power system ground.

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

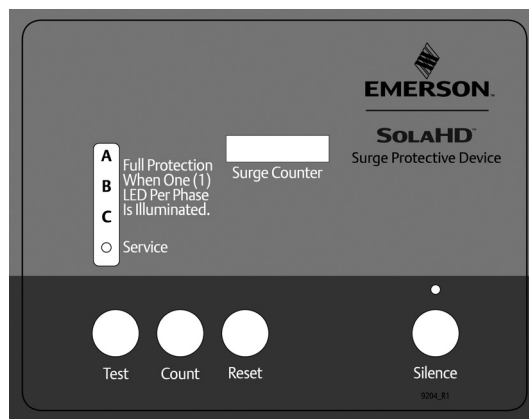
## LED Status Indicators

The SPD diagnostic display panel shows the status of each phase of the SPD with diagnostically controlled green/red LEDs). If a unit is operating correctly, all of 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 panel. 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 extinguished and the service light will illuminate. 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 silence button. The alarm will silence and the LED above the button will be lit. The red service LED will continue to be illuminated until the inoperative condition had been cleared.

Figure 6: Diagnostic Display Panel



**Phase A, B & C:** Green LED indicators—one per phase. Green is good. Out indicates problem. Every suppression element in this SPD is monitored. (N-G indicates on Phase A)

**Service LED (Red):** LED illuminates in the event of problems. This indicator is logic-connected to the Phase LEDs. Should a Phase LED go out the Service LED will illuminate and the Audible Alarm will sound.

**Test:** Tests red Service LED and Audible Alarm, and changes state of Dry Contacts.

**Alarm Silence:** Turns Audible Alarm off. (Alarm is deactivated when the Silence LED is illuminated.)

**Surge Counter Count:** Increments optional surge counter by one. (+1)

**Surge Counter Reset:** Resets optional surge counter to zero. (0)

## Audible Alarm

Push the alarm silence button to enable or disable the alarm (see Figure 6). If the service LED is lit the alarm is enabled. If the service 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 SPD. To reset the surge counter, press the button on the front display. This will reset the counter to zero. To test the surge counter functionality press the count button located on the front panel. This will incrementally increase the surge counter by one.

## Dry Contacts

### **⚠ DANGER**

#### **HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH**

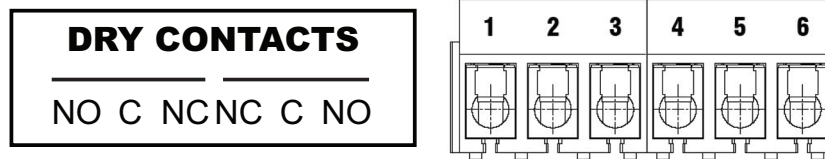
- Use 600 Vac rated dry contact wiring.
- Dry contact wiring must have less than 1/16 in. (1.6 mm) exposed wire from the dry contact block.
- Do not supply more than 24 V dc / 24 V ac and no more than a current of 2 A.

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

The SolaHD 200K/300K series SPD is provided with dry contacts. The connection for the dry contacts is located on the inside of the SPD enclosure and will accept # 22 - 14 AWG stranded or solid wire. The dry contacts are three-position, Form “C” type with Normally Open, Normally Closed, and Common connections.

In the unpowered state the contact is closed between terminals NC and COM. This is also the alarm condition. The opposite state, closed between terminals NO and COM, indicates that power is on to the unit and that no alarm condition exists.

Figure 7: Dry Contact Option



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 in the next section.

**Table 3: Dry Contact Configuration**

Alarm Contact Terminals	Contact State with Power Applied
NO to COM	Closed
NC to COM	Open

The dry contacts are designed for a maximum voltage of 24 Vdc / 24 Vac and a maximum current of 2 A. For application questions, contact us at 1-800-377-4384 or solahd.technicalservices@emerson.com.



## Maintenance and Troubleshooting

### **⚠ DANGER**

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- This equipment must only be installed and serviced by qualified electrical personnel.
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- 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.
- This equipment must be effectively grounded per all applicable codes. Use an equipment-grounding conductor to connect this equipment to the power system ground.

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

### **Preventative Maintenance**

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

### **Troubleshooting**

This surge protector has little to troubleshoot. If a phase LED is extinguished or the service light is on please contact us.

For application questions, contact us at 1-800-377-4384 or [solahd.technicalservices@emerson.com](mailto:solahd.technicalservices@emerson.com).

### **Replacement Parts**

The module is field replaceable. Deenergize SPD, confirm with appropriate measurement equipment and discharge internal capacitance to ground. Mark locations and carefully disconnect diagnostic cables, dry contact connections, phase conductors, unplug parallel connections on SPD200K/300K models, etc. Reinstall in reverse order.

There are no user serviceable parts inside the module. We strongly recommend against disassembly. Modules may be returned to the factory for factory service, qualification and return. Please contact us at 1-800-377-4384 for assistance.



## Technical Support

Website: [www.solahd.com](http://www.solahd.com)

Technical Support E-Mail: [solahd.technicalservices@emerson.com](mailto:solahd.technicalservices@emerson.com)

Toll-Free: (800) 377-4384

USA: (847) 268-6651

## Warranty

Please refer to the “Terms & Conditions of Sale” document.

While every precaution has been taken to ensure accuracy and completeness in this manual, Appleton Grp LLC d/b/a Appleton Group assumes no responsibility, and disclaims all liability for damages resulting from use of this information or for any errors or omissions.

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