



GE Digital Energy
Power Quality

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

GE TR5000 Series Wall Mounted Low and Medium Exposure
Surge Protective Devices (SPDs)



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IMPORTANT NOTICE

THE ENTIRE CONTENT OF THIS MANUAL MUST BE READ AND FULLY UNDERSTOOD BEFORE ATTEMPTING ANY INSTALLATION OR ENERGIZATION OF THE SPD.

If there are any questions about the operational status, or integrity of the electrical system prior to installation of the SPD, please consult a qualified trained electrician before attempting to continue.

If the minimum requirements of this manual are not followed, the SPD could become irreversibly damaged, and/or the electrical system and connected loads could be left unprotected.

Choosing the right product for the application, along with correct installation methods, as defined within this manual, will allow the GE TR5000 SPD to provide the best possible protection for many years.

Failure to comply with the applicable requirements of this manual can void the SPD warranty.



WARNING

SPECIAL ATTENTION MUST BE GIVEN TO VERIFY THAT A PROPER NEUTRAL-GROUND (XO) BOND HAS BEEN MADE WHEN POWER IS SUPPLIED FROM AN UPSTREAM TRANSFORMER OR ANY OTHER TYPE OF SEPARATELY DERIVED POWER SOURCE.

FAILURE TO PROVIDE THIS BOND, AS REQUIRED PER ARTICLE 250.30 OF THE NATIONAL ELECTRICAL CODE, CAN RESULT IN ELEVATED PHASE TO GROUND SOURCE VOLTAGE POTENTIALS. THESE VOLTAGES CAN CAUSE DAMAGE TO ELECTRICAL EQUIPMENT AS WELL AS SAFETY HAZARDS INCLUDING FIRE, ELECTRICAL SHOCK, SERIOUS INJURY, OR DEATH.

PRODUCT DESCRIPTION:

GE TR5000 Series Type 2 Surge Protective Devices (formerly called TVSS), are for installation on low voltage electrical distribution systems. GE SPDs are designed to protect electrical equipment loads against the damaging effects of transient voltages that can be induced or generated as a result of remote lightning, power equipment switching or high frequency disturbances.

The TR5000 Series SPD incorporate Metal Oxide Varistor (MOV) technology to achieve superior transient suppression performance. Integral to the SPD is a patented thermal fusing system that offers SPD circuit interruption in the event of a limited current abnormal overvoltage condition. Other standard features include protection status indicating lights and form C alarm contacts for remote monitoring. TR5 65KA - 100KA RATED models also include surge rated fuses and built in EMI filtering.

The GE TR5000 SPD units described in this manual are enclosed, wall mounted styles that are UL/cUL Listed, conforming to UL 1283 and UL 1449 3rd Edition where applicable. All published ratings are in accordance with ANSI / IEEE C62.41.1-2002, C62.41.2-2002 and NEMA LS1-1992 (R2000) recommended guidelines.

Model covered by this manual are:

TR5000 model types ending with the part number suffix WM, WMF, or WM4
(Examples: TR5120Y050WM, TR5277Y100WMF, TR5240D025WM4)

APPLICATION GUIDELINES:

Determining the surge protection to be provided in a facility or for a particular system or equipment can be a complex task that should be addressed as early as possible. This is typically when a new facility is constructed or sensitive electronic equipment has been installed. The following guidelines are offered for application assistance:

- Prior to installing any SPD, ensure that your facility electric supply system is properly installed and connected in accordance with all applicable national and local codes and safety procedures. All equipment and systems should be installed in accordance with manufacturer's instructions.
- Utilize the personnel from your local utility, your engineering department, GE application or service engineering, or a professional consulting engineering firm for technical guidance or troubleshooting.
- Understand your system, and the capabilities and limitations of SPD and other power conditioning equipment.
- Select the proper GE TR5000 Series SPD unit for your system voltage, configuration, and the anticipated surge environment. Some of the key parameters for selection are defined below:
 - **SPD TYPE**
The SPDs covered in this document are rated and marked accordingly for use on Type 2 applications. Type 2 SPDs can be installed only on the load side of the electrical distribution system's main breaker or fuse.

- **MAXIMUM CONTINUOUS OPERATING VOLTAGE (MCOV)**
This value defines the maximum line-to-line or line-to-neutral continuous AC voltage that can be safely applied to the protector. MCOV levels for GE TR5000 Series SPDs are set at 115% of nominal system voltage. For 120-volt AC systems, the MCOV is 125%. If there is a risk that the electrical system voltage could exceed MCOV, or if any unusually high power frequencies, Temporary Over Voltages (TOV), or phase swells are anticipated, contact your GE Sales Engineer for further assistance.
 - **ELECTRICAL SYSTEM CONFIGURATION**
Protectors are available for single (split) phase with neutral and ground, three-phase grounded WYE, three-phase ungrounded WYE, three-phase high-leg delta, and for three-phase ungrounded delta systems. (See page 7 for power source configurations)
 - **PEAK IMPULSE RATING**
Peak surge current capability is an important characteristic for a SPD. The rating per mode should equal or exceed the maximum surge expected in service. GE TR5000 LE and ME wall mount SPDs are available in maximum surge ratings of 25kA, 50kA, 65kA, 80kA, 100kA,
 - **UL 1449 NOMINAL DISCHARGE CURRENT (In)**
The UL Nominal Discharge Current (In) rating should be considered when an SPD is selected for use within a UL96A Lightning Protection System. UL96A requires a Nominal Discharge Current (In) rating of 20kA for Type 1 or Type 2 SPDs.
 - **SHORT CIRCUIT CURRENT RATING**
GE TR5000 Wall Mounted SPD units are UL certified for use on electrical systems with rated ampacities up to 65,000 symmetrical amperes when installed behind a circuit breaker rated 60A.
 - **ENVIRONMENTAL RATINGS**
NEMA Ratings of 1, 4, 4x, and 12 are available. Please refer to the model number suffix to verify the correct enclosure for the application. The SPD is designed to operate within an ambient temperature range of -40°C to 65°C (-40°F to 149°F) with a relative humidity level between 0-95% non-condensing.
- A direct lightning strike, that occurs within close proximity of an installed SPD, can result in surge currents that exceed the SPD's energy handling capability. This can result in reduced life expectancy or pre-mature failure of the SPD. Electrical power system supply voltages in excess of the SPD MCOV rating, can also cause SPD failure.
 - Should a condition occur that results in premature failure of the SPD, the suppression circuitry will short, allowing the integral fusing to interrupt current flow through the SPD without disrupting power to the protected equipment. In the event of limited available fault currents, the 30A breaker will operate to remove the SPD. Fault currents of less than 30A will be interrupted by the integral thermal fusing. In each case the SPD will be removed from the power system and the load equipment will remain unprotected from subsequent surge activity until the SPD is replaced.
 - Increased rate of rise or higher surge current magnitudes can result in increased surge let-thru levels due to the non-linear clamping characteristics of SPDs. Conditions can occur where the surge withstand capability of the protected equipment is exceeded even though the SPD is functioning properly. In such cases, additional SPDs may be required, located closer to the sensitive load(s). (For additional information, refer to Standard IEEE 1100-2005, Section 3.4.3)
 - GE TR5000 Series WYE-connected units have both **normal mode** (L-N, L-L) and **common mode** (L-G, N-G) protection. Protection between neutral and ground is provided on units designed for WYE-connected applications.



WARNING

THE EQUIPMENT COVERED BY THESE INSTRUCTIONS SHOULD BE INSTALLED AND SERVICED ONLY BY COMPETENT, QUALIFIED PERSONNEL UTILIZING PROPER SAFETY PRACTICES AND PROCEDURES THESE INSTRUCTIONS ARE WRITTEN FOR SUCH PERSONNEL AND ARE NOT INTENDED AS A SUBSTITUTE FOR ADEQUATE TRAINING AND EXPERIENCE IN SAFE PROCEDURES FOR THIS TYPE OF EQUIPMENT.

PRE-INSTALLATION REQUIREMENTS:

Prior to energization of the GE TR5000 SPD, it is critical that the following items have been addressed.

DO NOT ATTEMPT TO ENERGIZE THE SPD OR CONTINUE WITH THE INSTALLATION IF ALL OF THESE CONDITIONS HAVE NOT BEEN MET, OR ARE UNKNOWN.

1. SYSTEM CONFIGURATION AND VOLTAGE

Check the configuration and voltage supply ratings to ensure that the proper SPD model number has been selected for your system. The SPD model number can be found on the UL label affixed to the SPD NEMA Enclosure. The SPD selection can be verified by comparing the Model Number to the correct electrical system described in the "VOLTAGE RATINGS & POWER SOURCE CONFIGURATIONS" chart shown on [page 7](#).

2. SYSTEM GROUNDING AND BONDING

Verify that a NEC (National Electrical Code) compliant X0 bond has been made at the upstream transformer or other separately derived system that feeds the SPD. Per NEC Article 250.30, this bond must be in place on all 3-Phase WYE, 3-Phase Hi-Leg Delta, and Single Phase Split-Systems. Refer to [page 8](#) for an example of an installation that complies with these NEC recommendations.



WARNING

FAILURE TO PROVIDE THE X0 BOND WILL DAMAGE THE SPD AND VOID THE PRODUCT WARRANTY.

Verify that there have not been multiple instances of Neutral to Ground bonds on the electrical system. These bonds, while either intentional or accidental, result in Ground currents that can create differential voltage potentials between Neutral and Ground. Redundant Neutral to Ground connections can result in damage to the SPD and are in violation of NEC.

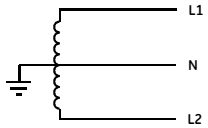
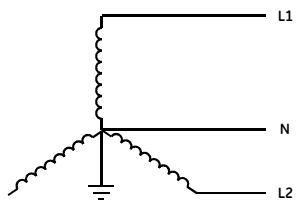
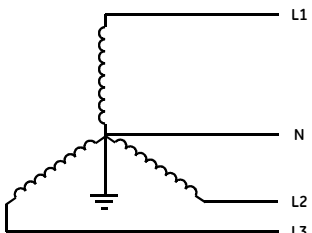
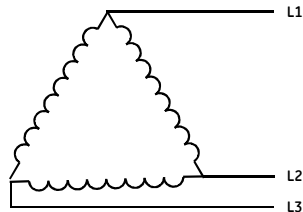
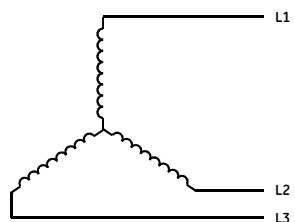
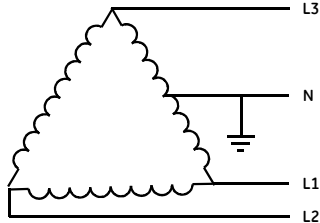
3. SPD INSTALLATION ON UNGROUNDED POWER SYSTEMS

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.

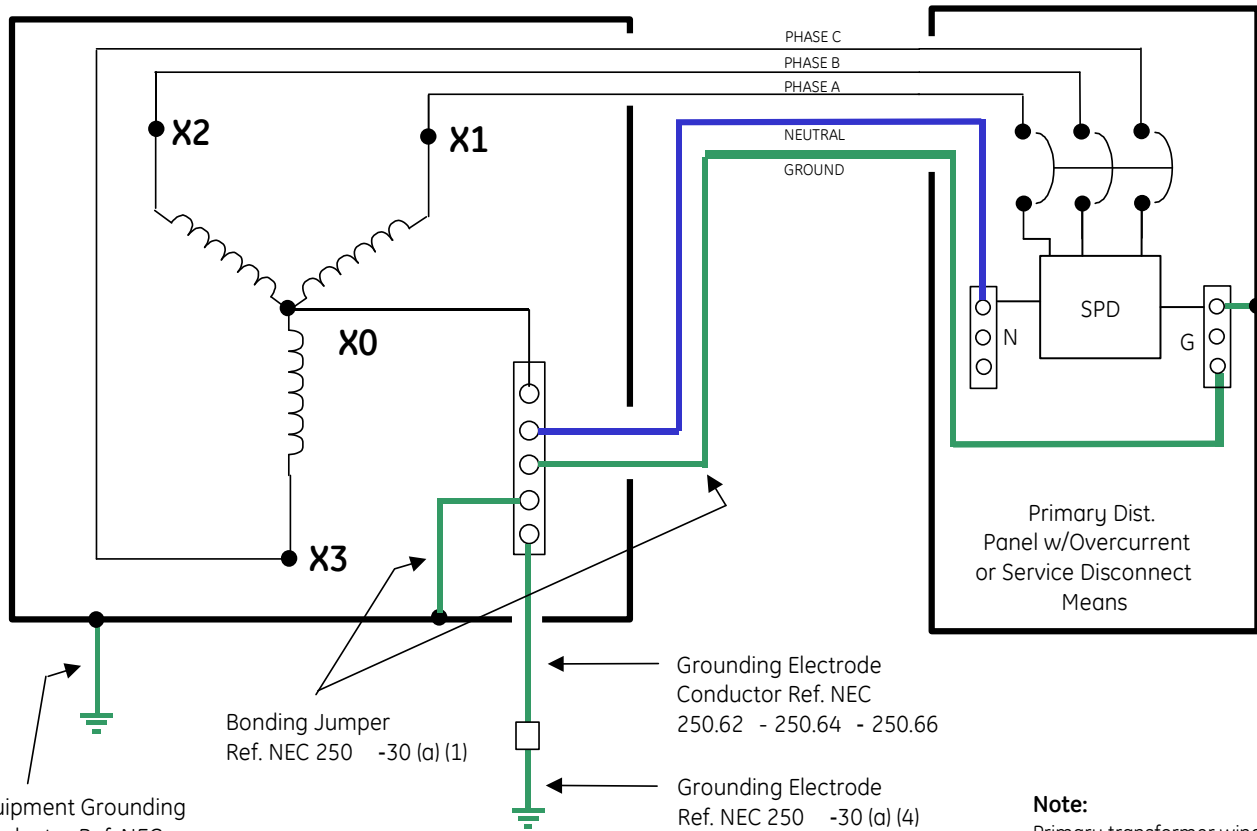
4. SPD LOCATION / PRIMARY OVERCURRENT PROTECTION

Per the National Electrical Code (NEC Article 285), Type 2 SPDs may be placed only on the load side of the main service breaker or fuse at each utility service entrance or separately derived power system.

VOLTAGE RATINGS & POWER SOURCE CONFIGURATIONS

| TR 5000 MODEL | NOMINAL VOLTAGE (50/60Hz) | MAXIMUM CONTINUOUS OPERATING VOLTAGE (MCOV) | SYSTEM TYPE | SOURCE CONFIGURATION |
|---------------|---------------------------|--|---|---|
| TR5 120S | 120 / 208-240V | 150V (L-N / L-G) | Single Phase 3 Wire + Ground |  |
| | | | Dual Phase 3 Wire + Ground |  |
| TR5 120Y | 120 / 208V | 150V (L-N / L-G) | Three Phase WYE, 4 Wire + Ground |  |
| TR5 220Y | 220 / 380V | 320V (L-N / L-G) | | |
| TR5 240Y | 240 / 415V | 320V (L-N / L-G) | | |
| TR5 277Y | 277 / 480V | 320V (L-N / L-G) | | |
| TR5 240D | 240V | 270V (L-G) | Three Phase Delta, 3 Wire |  |
| TR5 480D | 480V | 550V (L-G) | Three Phase WYE, 3 Wire |  |
| TR5 240H | 120 / 240V | 150V (L-N / L-G) Phase A & C 270V (L-N / L-G) Phase B | Three Phase Delta Hi-Leg, 4 Wire + Ground |  |

Example of an NEC Compliant Grounding Arrangement for a Separately Derived System



Note:
Primary transformer windings not shown for simplicity

The illustration shown above, provides a recommended method for grounding a separately derived power system, per the National Electrical Code, Article 250.30. Please check with the local municipality or governing authority for additional codes or other approved regulatory requirements before attempting to configure any electrical power distribution system.



WARNING

POWER MUST BE PROVEN DISCONNECTED BEFORE STARTING INSTALLATION, INSPECTION OR MAINTENANCE. FAILURE TO DO SO MAY CAUSE SERIOUS INJURY, DEATH AND/OR PROPERTY DAMAGE.

INSTALLATION:

Before attempting installation, make sure that the pre-installation requirements of this manual have been satisfied. If the status of the pre-installation requirements are not known, do not attempt to continue.

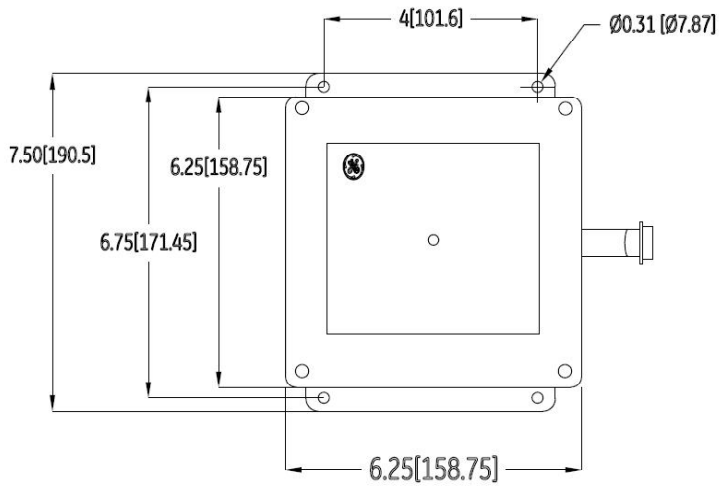
1. MOUNTING

The GE TR5000 Wall Mounted SPD must be installed as close to the protected circuit as possible. Long power cable runs between the SPD and protected circuit will result in significantly reduced performance.

Select a mounting location that will allow for a minimum length of wire between the SPD and the power terminals of the electrical service panel. The SPD can be mounted in any orientation, however special consideration should be given to allow for periodic inspection of the diagnostic display panel. The SPD should be mounted to a secure structure or surface.

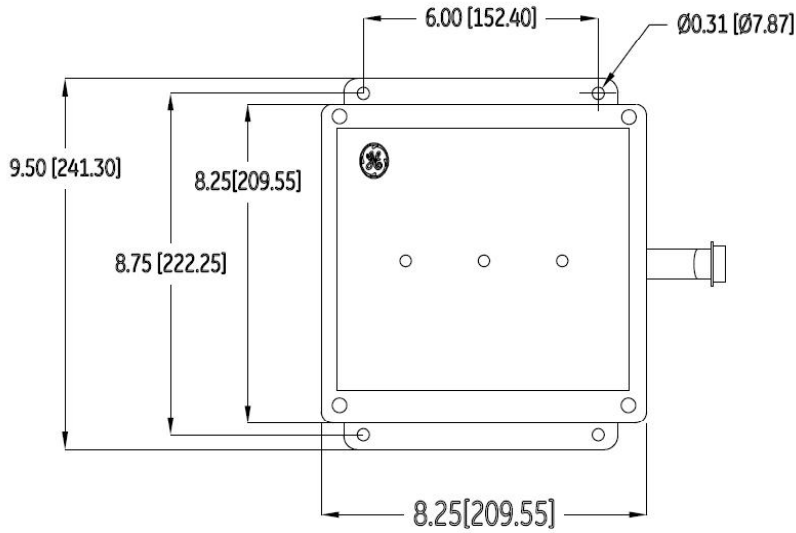
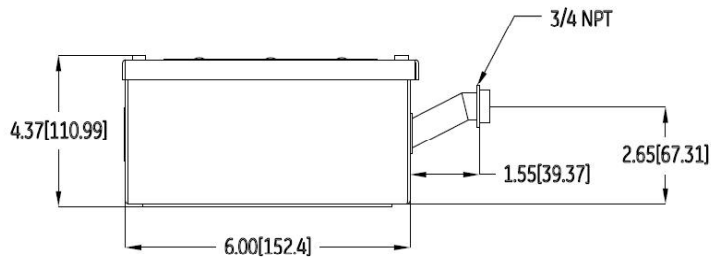
On Flush-mount installations, reinforcement of drywall-and-stud wall construction may be necessary to provide a secure mounting surface for the SPD unit. An example of a typical flush-mount mounting arrangement is shown on page 16.

2. DIMENSIONS AND RECOMMENDED CONDUIT ENTRANCE LOCATIONS



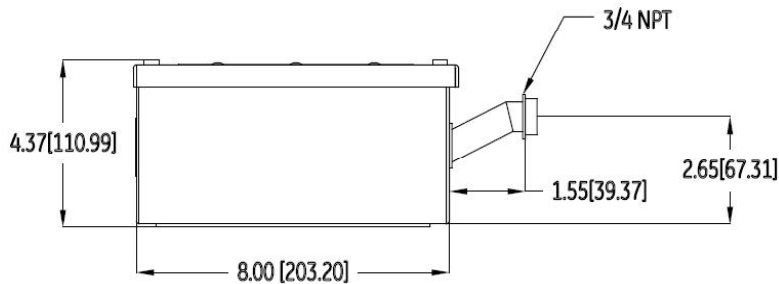
SPD Model Type:
TR5-WM (25kA - 50kA)

NOTE: UNITS ARE IN INCH[MM]

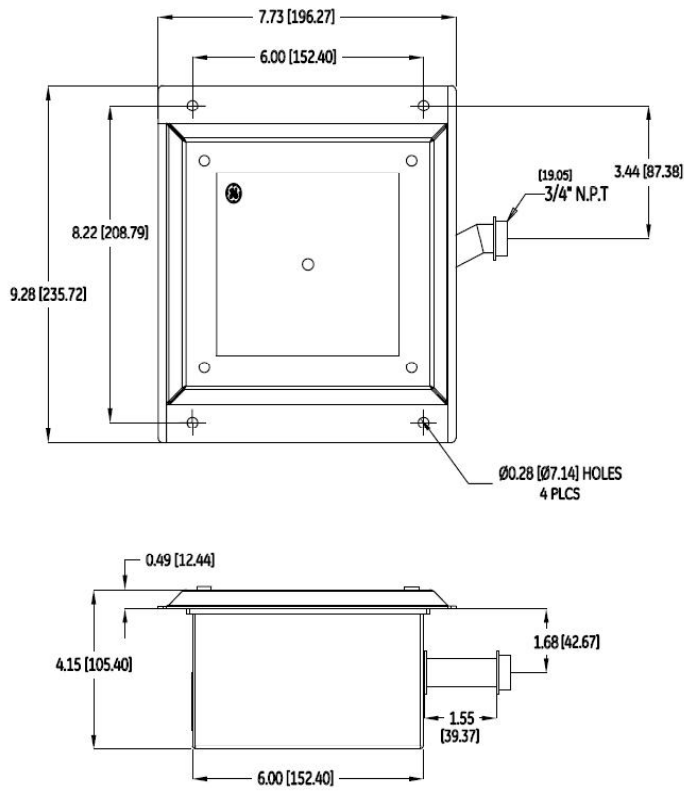


SPD Model Type:
TR5-WM (65kA - 100kA)

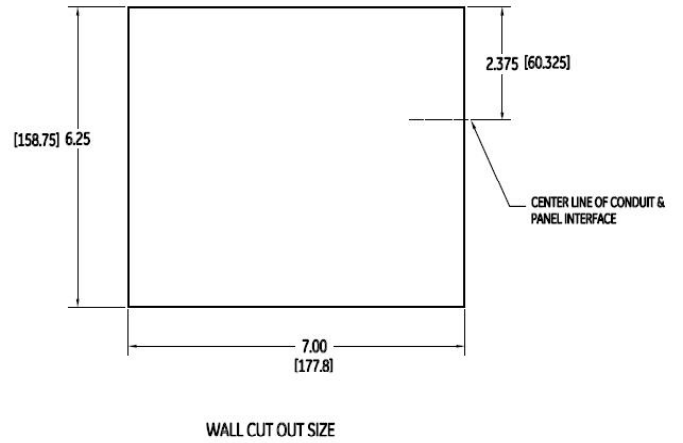
NOTE: UNITS ARE IN INCH[MM]



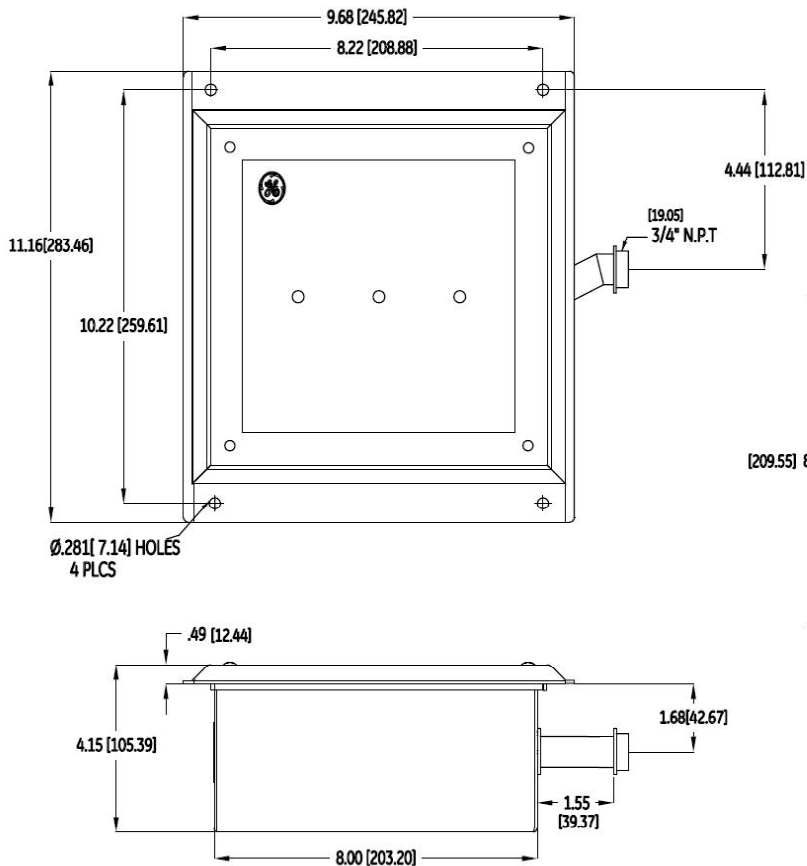
SPD Model Type:
TR5-WMF (25kA - 50kA)



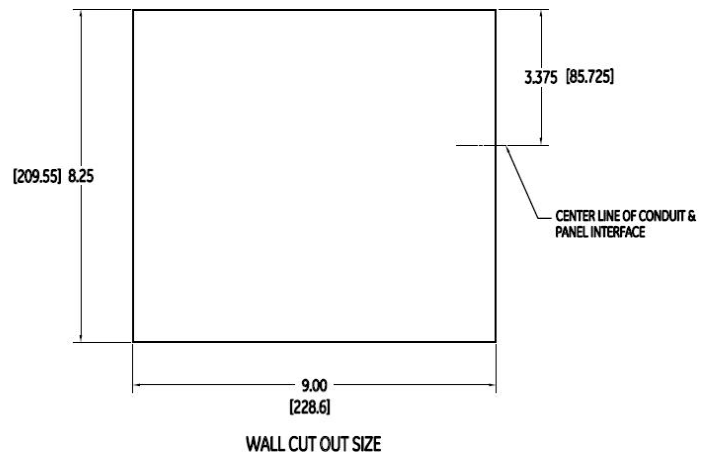
NOTE : DIMENSIONS ARE IN INCH [MM]



SPD Model Type:
TR5-WMF (65kA - 100kA)

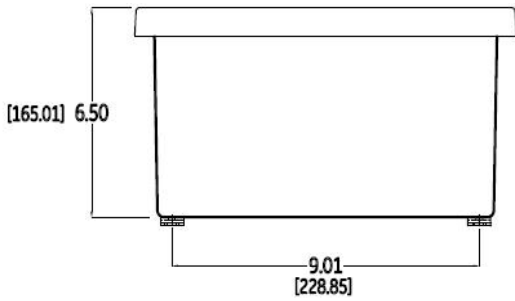
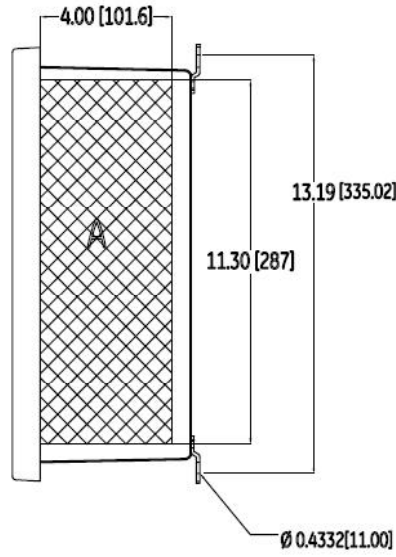
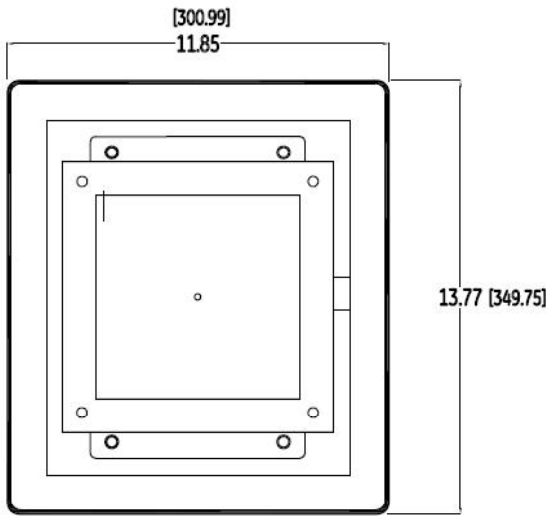


NOTE : DIMENSIONS ARE IN INCH [MM]



SPD Model Type:
TR5-WM4 (25kA - 50kA)

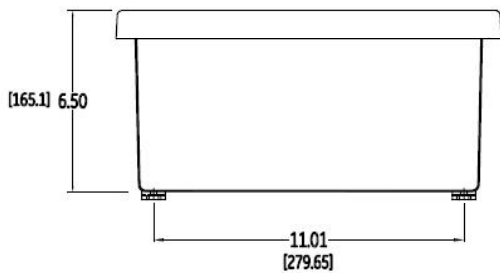
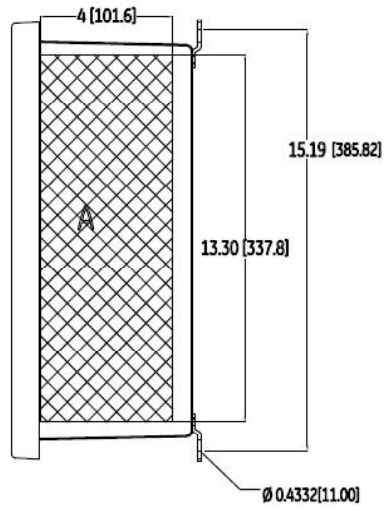
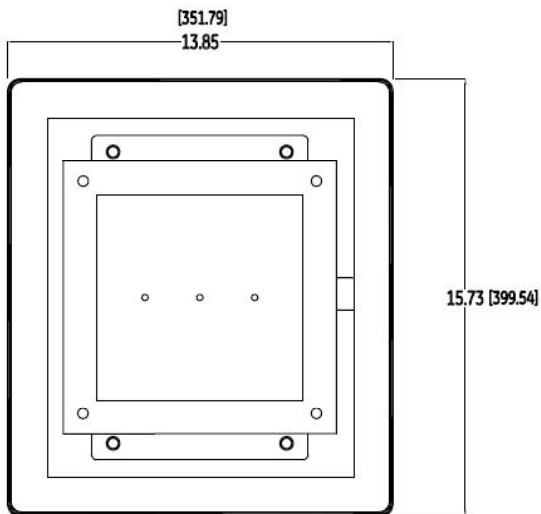
NOTE: DIMENSIONS ARE IN INCH [MM]



A = RECOMMENDED CONDUIT
ENTRY AREA

SPD Model Type:
TR5-WM4 (65kA - 100kA)

NOTE: DIMENSIONS ARE IN INCH [MM]



A = RECOMMENDED CONDUIT
ENTRY AREA

INSTALLATION (CONT.):

3. CONDUIT FITTINGS

A ¾" NPT Offset style conduit nipple is provided as an integral part of the SPD on WM and WMF models for routing the wiring pigtails into the electrical panel. **Caution: Do not attempt to remove, twist, turn or alter the integral conduit nipple. This will cause irreversible damage to the SPD internal wiring and will void the warranty.** An additional conduit spacer, adapter or fitting should be used only when necessary to facilitate installation.

For WM4 models, a dimensioned drawing is provided on page 12 showing the recommended conduit entrance location. A UL-listed nonmetallic ½" liquid tight conduit fitting is recommended to maintain the NEMA 4X rating of the enclosure. Note that the SPD unit may be temporarily removed from the NEMA 4X enclosure to facilitate conduit installation.

4. POWER CONNECTIONS

Wiring pigtails are provided on the SPD for connection to the electrical power system. These wires are #10 gauge stranded copper. Color coded black for phase connections, white for neutral and green for ground. See [page 14](#) for power connection location and identification.

5. WIRE ROUTING

The length of wiring to the SPD must be kept at a minimum for the best performance. Wire lengths should be short, straight runs between the SPD and power source. Do not attempt to splice into or lengthen the provided pigtails as this will result in reduced performance. Wiring impedance can be further minimized by twisting the phase, neutral and ground conductors together and routed in the same conduit, raceway or channel. Always avoid sharp bends when routing SPD conductors.

6. CIRCUIT BREAKER

A dedicated 30 A circuit breaker (not included) is required to connect the SPD to the power system.

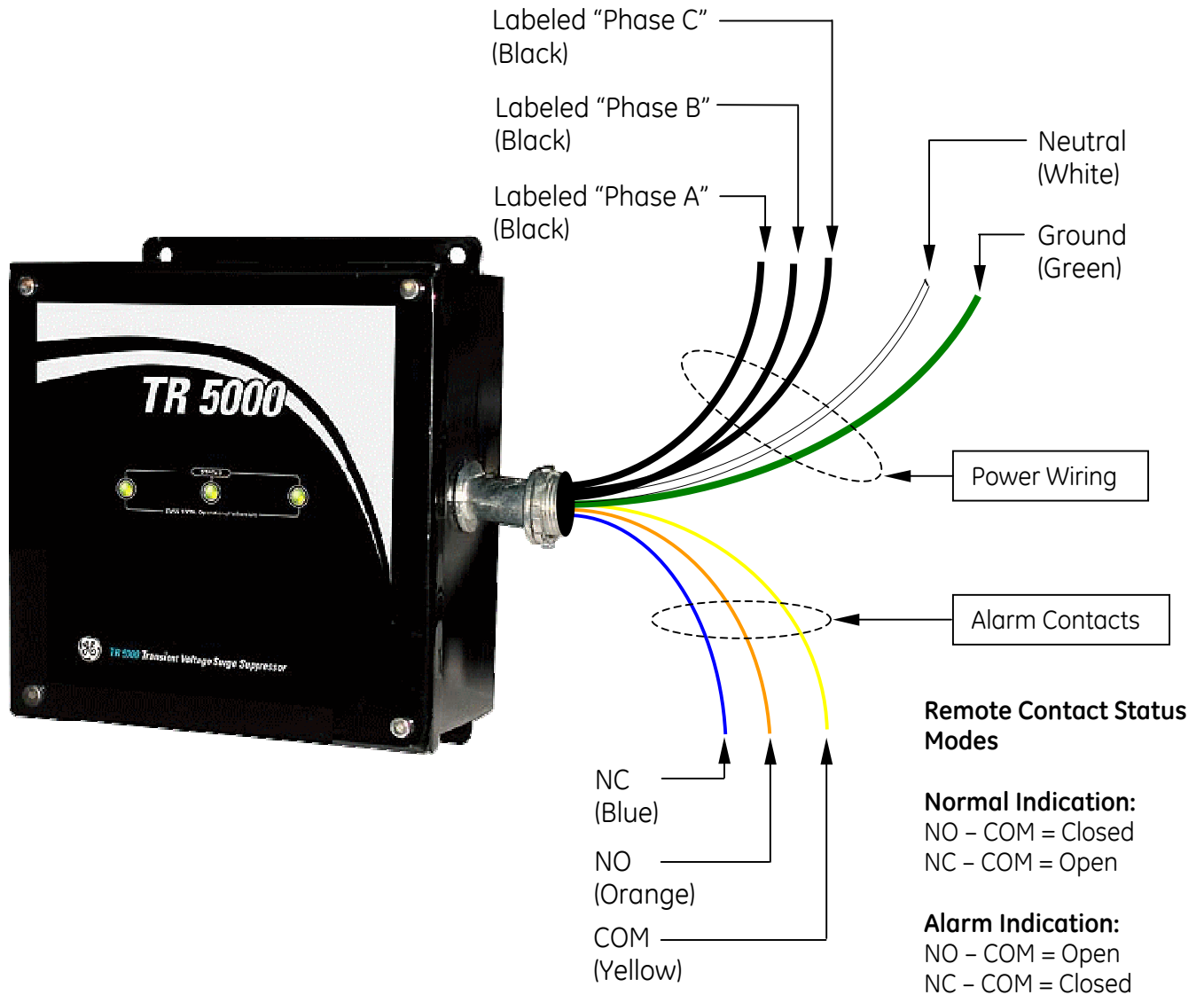
7. REMOTE ALARM CONTACTS

Remote Alarm Monitoring Contacts are provided on all TR5000 SPD models. If this type of monitoring is desired, refer to [page 14](#) for the location configuration of these contacts. The contacts are dry, 1 form C type, rated 125 VAC, 2 Amps maximum. Once the SPD has been energized and is found to be operating normally, the alarm contacts will only change if there is a failure within the SPD suppression circuitry, or if power has been disconnected from the SPD. Leaving the Remote Alarm Contacts unconnected will not affect the performance of the SPD. Alarm Cables can be spliced and lengthened to facilitate installations without concern of reduced SPD performance.

8. PRE-ENERGIZATION CHECK

Once all of the pre-installation conditions have been met and the TR5000 SPD has been installed, the SPD can now be energized. For SPD Operational Status, refer to Operation and Maintenance Sections – [pages 17 & 18](#).

POWER WIRING AND REMOTE ALARM LOCATIONS



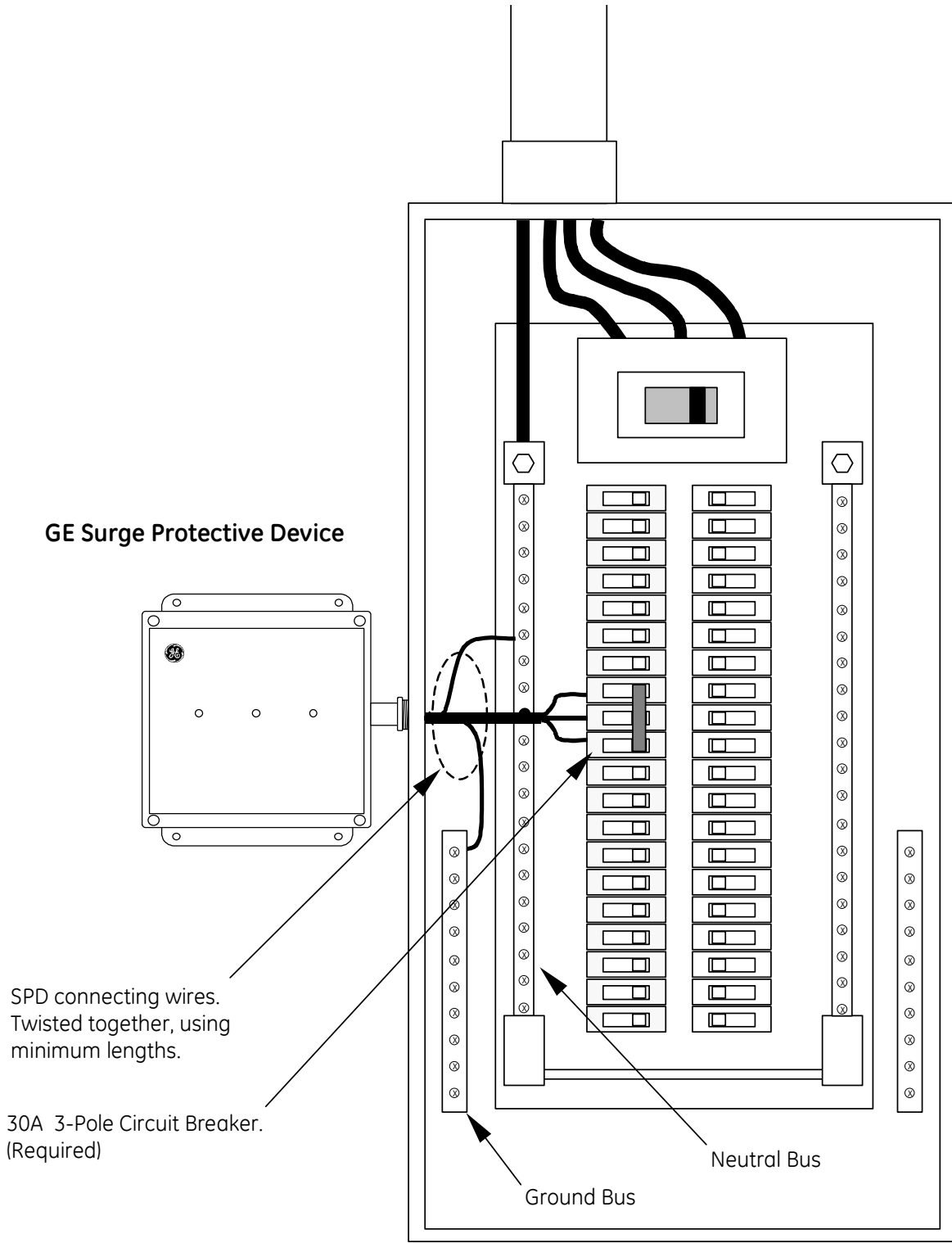
The above illustration represents the wiring and alarm contacts for all TR5 Wall Mounted SPD for 3 phase applications. (Split/Single phase versions will have only 2 black power wires for connection.) Black Wires are marked and identified as Phase A, Phase B, Phase C.

Various mounting orientations are possible and will not affect the performance of the SPD if wire connections and cable length are kept to a minimum.

Notice For High Leg Delta Power Systems:

SPD model types that are intended for High Leg Delta applications are configured and marked with Phase B as the intended High Leg connection point. Attempting to connect the SPD Phase C or Phase A conductor to the system High Leg will result in immediate SPD failure.

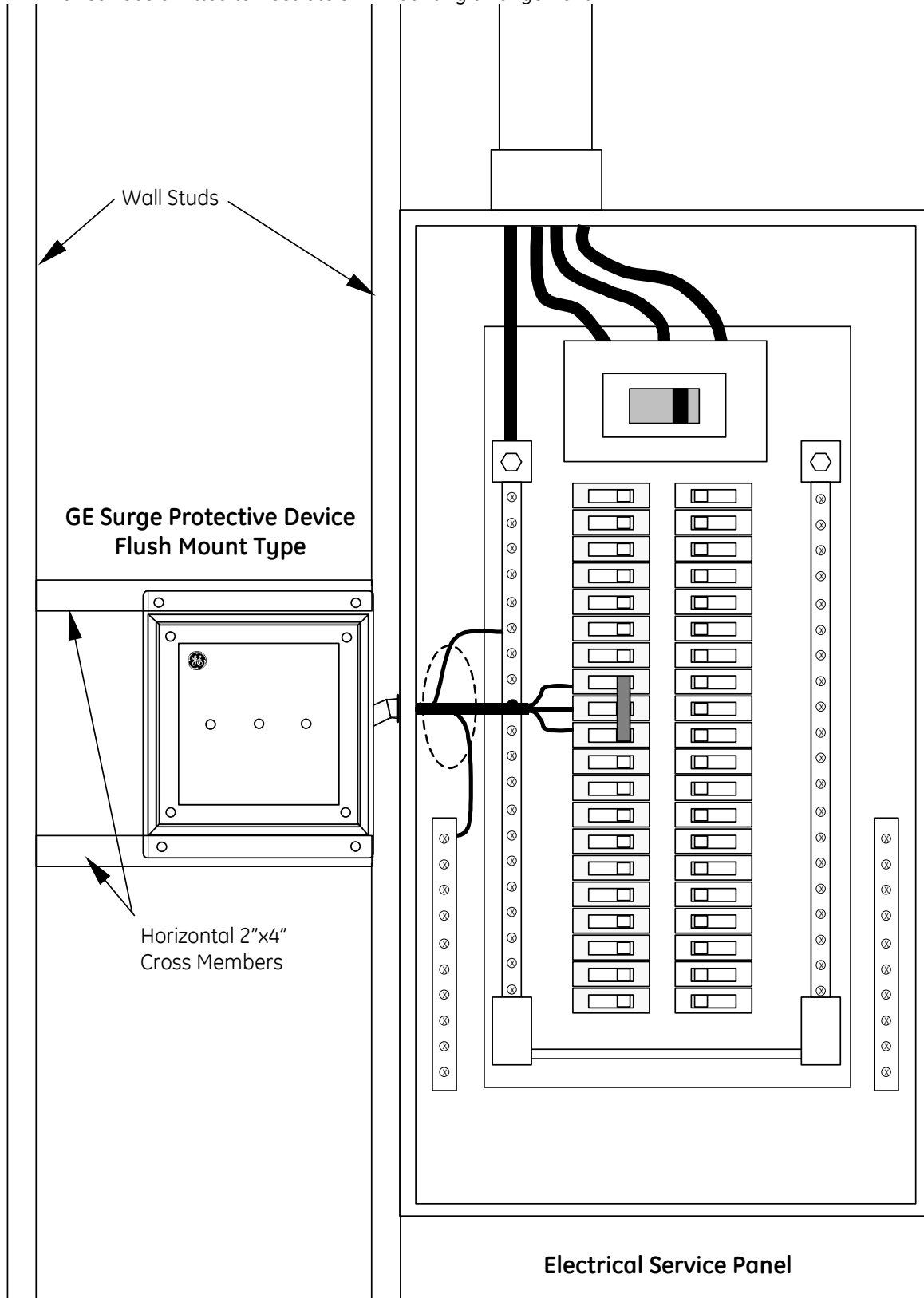
INSTALLATION EXAMPLE



Electrical Service Panel

INSTALLATION EXAMPLE (FLUSH-MOUNT MODELS)

Wall surface omitted to illustrate SPD mounting arrangement





WARNING

UPON ENERGIZATION OF THE SPD, IF ANY OF THE LAMPS OR ALARMS INDICATES AN ABNORMAL CONDITION, POWER SHOULD PROMPTLY BE DISCONNECTED FROM THE SPD. THE ELECTRICAL SYSTEM SHOULD BE INSPECTED AND THE PRE-INSTALLATION REQUIREMENTS SHOULD BE VALIDATED. DO NOT ATTEMPT TO LEAVE POWER APPLIED TO THE SPD, OR RE-ENERGIZE THE SPD IN THE EVENT OF AN ALARM CONDITION. PLEASE CONTACT YOUR LOCAL GE REPRESENTATIVE FOR FURTHER ASSISTANCE.

OPERATION:

After applying power to the SPD, verify that the protection monitoring circuits are functioning correctly. If all status alarms indicate "normal", the SPD has been successfully installed and is operational.

1. LINE STATUS INDICATOR LEDs

The green line status LED's provide visual indication of SPD health status. As long as the SPD is connected to the electrical system supply voltage and the SPD suppression circuitry is functional, the line status indicators will be illuminated green. There is one green indicator per each protected phase on TR5 65KA - 100KA RATED Models. TR5 25KA - 50KA RATED Models have 1 green status indicator to monitor the health of the entire SPD.

2. REMOTE ALARM CONTACTS

Remote Alarm Contacts are available to remotely monitor the health status of the SPD. An alarm condition will result in a status change of the contacts. These contacts do not affect the performance of the SPD and are not required to be connected for the SPD to function as intended.

MAINTENANCE:

GE does not provide a specific schedule for preventative maintenance as conditions will vary based on location and the environmental factors presented at each installation site. However, periodic inspections should be scheduled to verify that the SPD does not indicate a failure mode.


Inspections should also be made to check the integrity of the electrical supply connections to the SPD to ensure continued reliable performance.

SERVICING / TROUBLESHOOTING:

The GE TR5000 Series SPD contains no user serviceable parts and requires no calibration. The rugged design of the SPD should provide many years of service.

Should a condition occur that results in premature failure of the GE TR5000 SPD, the integral fusing or required circuit breaker will safely interrupt current flow through the SPD without disrupting power to the protected equipment. **This will remove the SPD from the power system and the load equipment will remain unprotected from subsequent surge activity until the SPD is replaced.**

If a change in operational status/alarm indication occurs, a qualified (licensed) electrician should inspect the electrical system to verify electrical system integrity. If the SPD remains in alarm after system inspection/corrections have been made, the SPD should be replaced. For further assistance, contact your local sales representative or call GE Power Quality at 1-800-637-1738.

| | |
|---|---|
|  | <p>WARNING</p> <p>IN THE EVENT OF AN SPD ALARM CONDITION, DO NOT ATTEMPT TO DIS-ASSEMBLE THE SPD TO REPLACE FUSING OR OTHER COMPONENTS. THE SPD CONTAINS FUSING COMPONENTS THAT WILL ONLY OPEN WHEN THE SPD HAS FAILED IN A NON-SERVICEABLE CONDITION. THE ENTIRE SPD MUST BE REPLACED.</p> <p>CONTACT GE POWER QUALITY AT 1-800-637-1738</p> |
|---|---|

NOTICE

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation, or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the GE Company.



imagination at work

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800 637 1738 www.gepowerquality.com
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