



GE Digital Energy  
Power Quality

## INSTALLATION, OPERATION AND MAINTENANCE MANUAL

GE TR7000 Series Wall Mounted Medium and High 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 TR7000 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 TR7000 Series are Type 2 Surge Protective Devices (formerly called TVSS), designed 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 TR7000 Series SPDs 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 an abnormal phase overvoltage condition. Other standard features include surge rated fuses, protection status indicating lights, an audible alarm with test and disable features, form C alarm contacts for remote monitoring, a surge event counter, and built in EMI filtering. A surge rated disconnect switch is comes standard on select models.

The GE TR7000 SPD units described in this manual are enclosed, wall mounted styles that are UL/cUL Listed, conforming to UL 1283 and UL 1449 3<sup>rd</sup> 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:**

TR7000 model types ending with the part number suffix of WMN1D, WMN12S, WMN12F, WMN4D, WMN4S and WMN4X. (Example: TR7277Y200WMN12S)

## **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 TR7000 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 TR7000 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 TR7000 wall mount SPDs are available in maximum surge ratings of 65kA, 80kA, 100kA, 125kA, 150kA, 200kA and 300kA.
  - **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 TR7000 Wall Mounted SPD units are UL certified for use on electrical systems with rated ampacities up to 200,000 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 -40C (-40F) to +65C (+149F) 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 60A breaker will operate to remove the SPD. Fault currents of less than 60A 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 TR7000 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 TR7000 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.

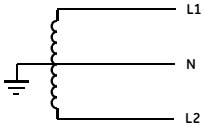
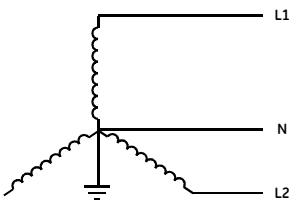
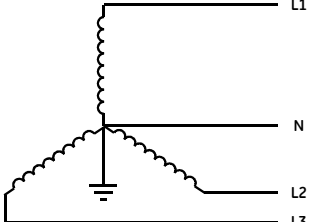
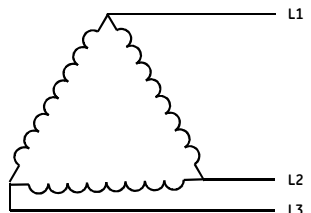
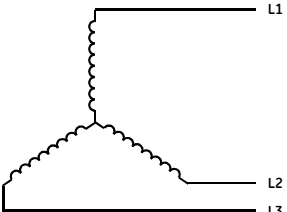
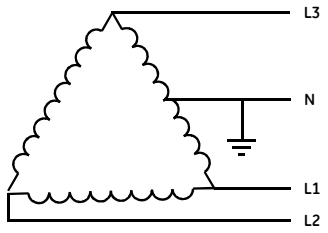
**3. SPD INSTALLATION ON UNGROUNDED POWER SYSTEMS**

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.

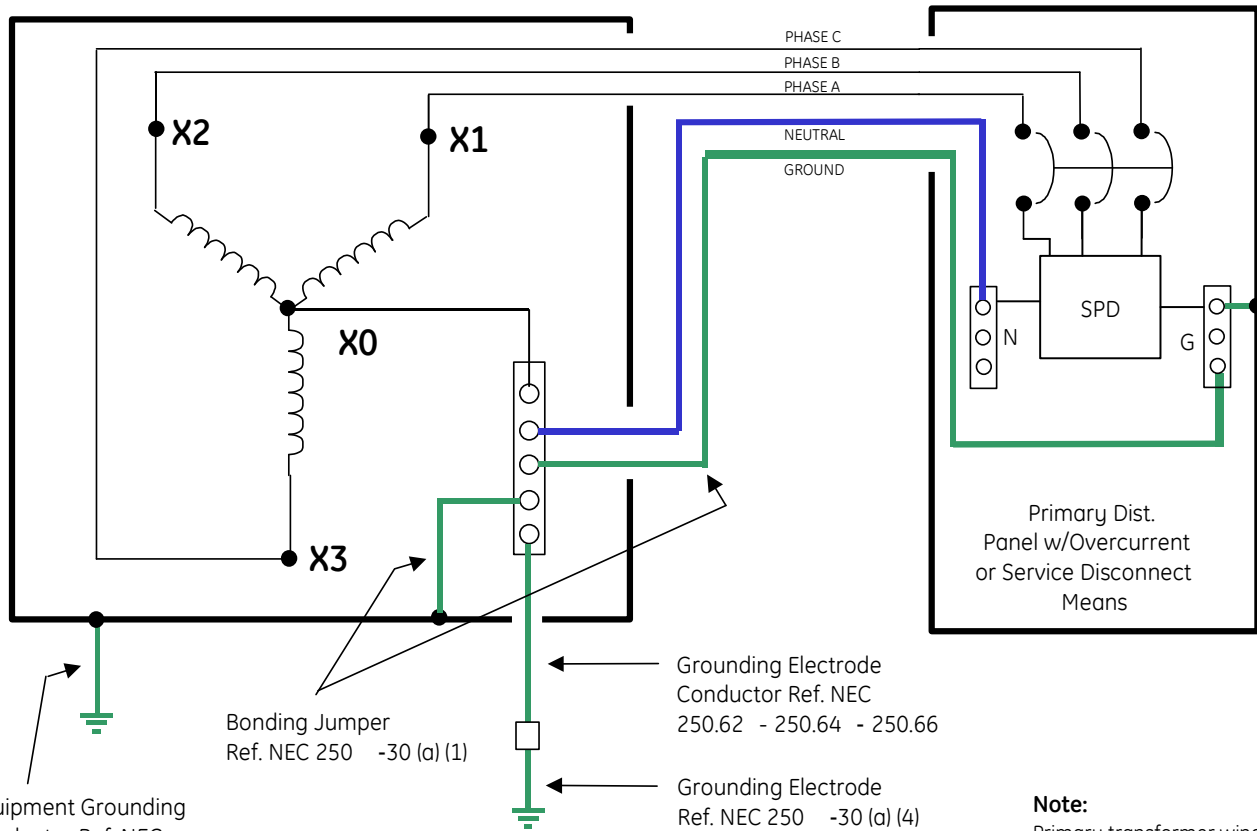
**4. SPD LOCATION / PRIMARY OVERCURRENT PROTECTION**

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

TR7000 MODEL	NOMINAL VOLTAGE (50/60Hz)	MAXIMUM CONTINUOUS OPERATING VOLTAGE (MCOV)	SYSTEM TYPE	SOURCE CONFIGURATION
TR7 120S	120 / 208-240V	150V (L-N / L-G)	Single Phase 3 Wire + Ground	
			Dual Phase 3 Wire + Ground	
TR7 120Y	120 / 208V	150V (L-N / L-G)	Three Phase WYE, 4 Wire + Ground	
TR7 220Y	220 / 380V	320V (L-N / L-G)		
TR7 240Y	240 / 415V	320V (L-N / L-G)		
TR7 277Y	277 / 480V	320V (L-N / L-G)		
TR7 347Y	347 / 600V	420V (L-N / L-G)		
TR7 240D	240V	270V (L-G)	Three Phase Delta, 3 Wire	
TR7 480D	480V	550V (L-G)	Three Phase WYE, 3 Wire	
TR7 600D	600V	625V (L-G)		
TR7 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



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.

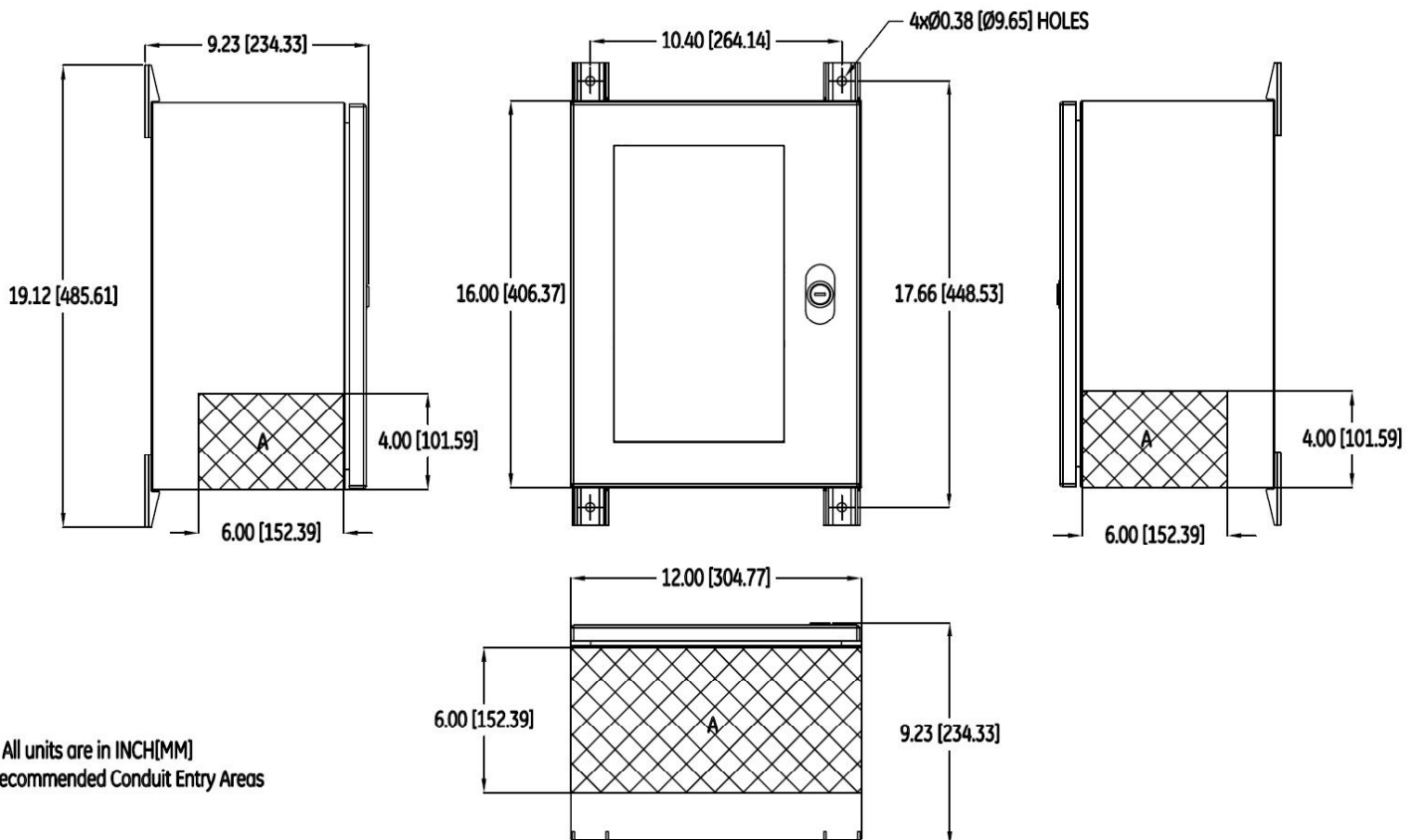
#### 1. MOUNTING

The GE TR7000 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.

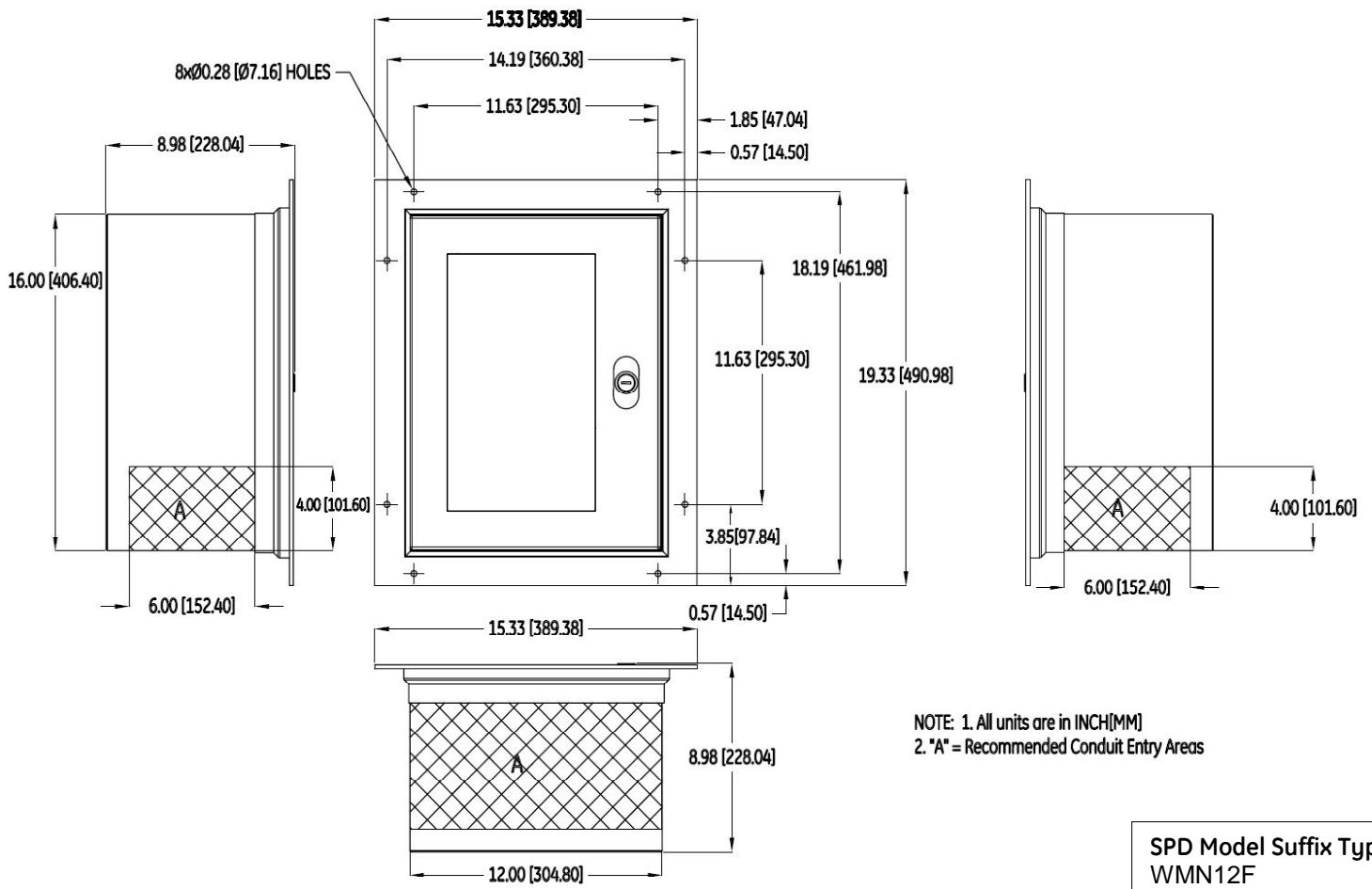
Select a mounting location that will allow for a minimum length of wire between the SPD and the power terminals of the electrical service panel. The SPD can be mounted in any orientation, however special consideration should be given to allow for periodic inspection of the diagnostic display panel. The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

#### 2. DIMENSIONS AND RECOMMENDED CONDUIT ENTRANCE LOCATIONS

SPD Model Suffix  
Types:  
WMN12S  
WMN4S  
WMN4X

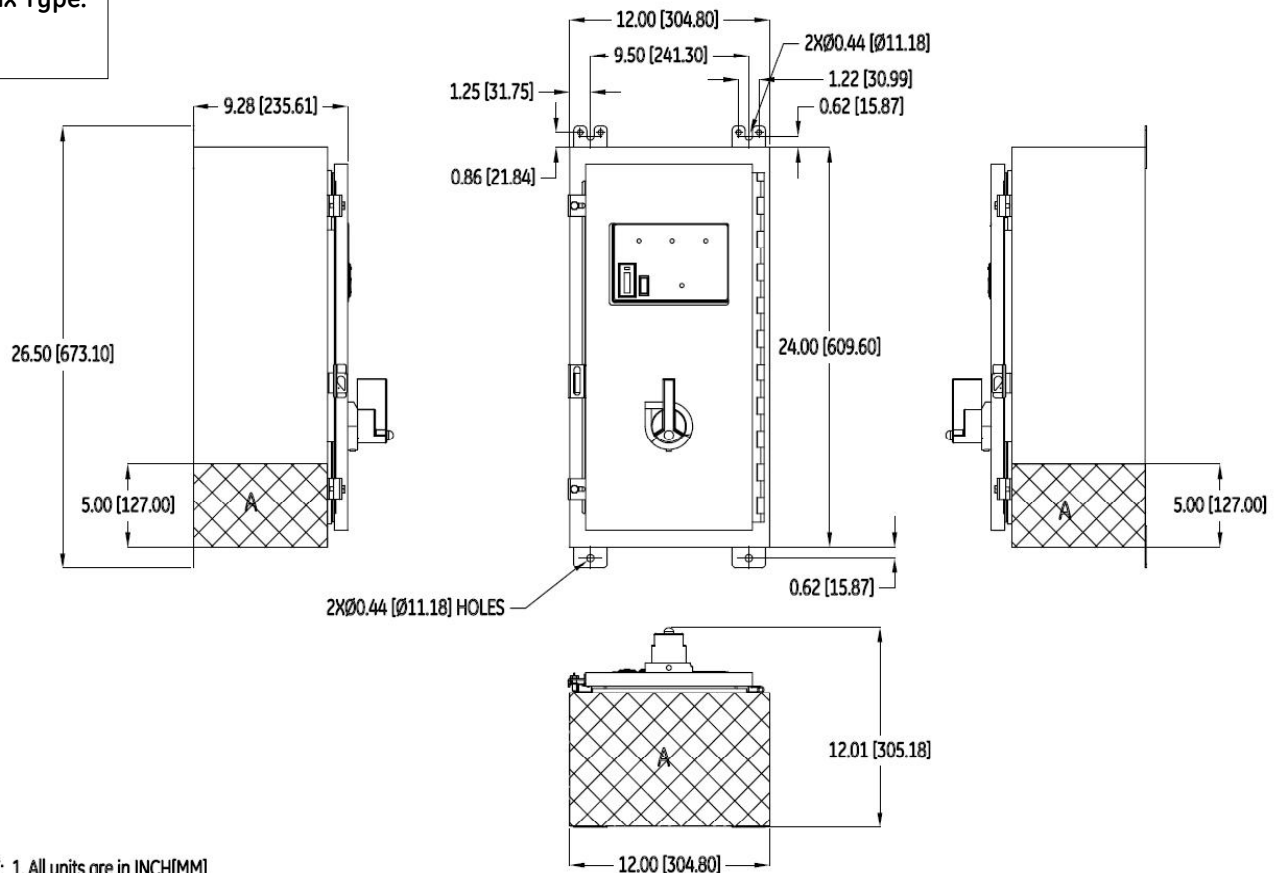


NOTE: 1. All units are in INCH[MM]  
2. "A" = Recommended Conduit Entry Areas

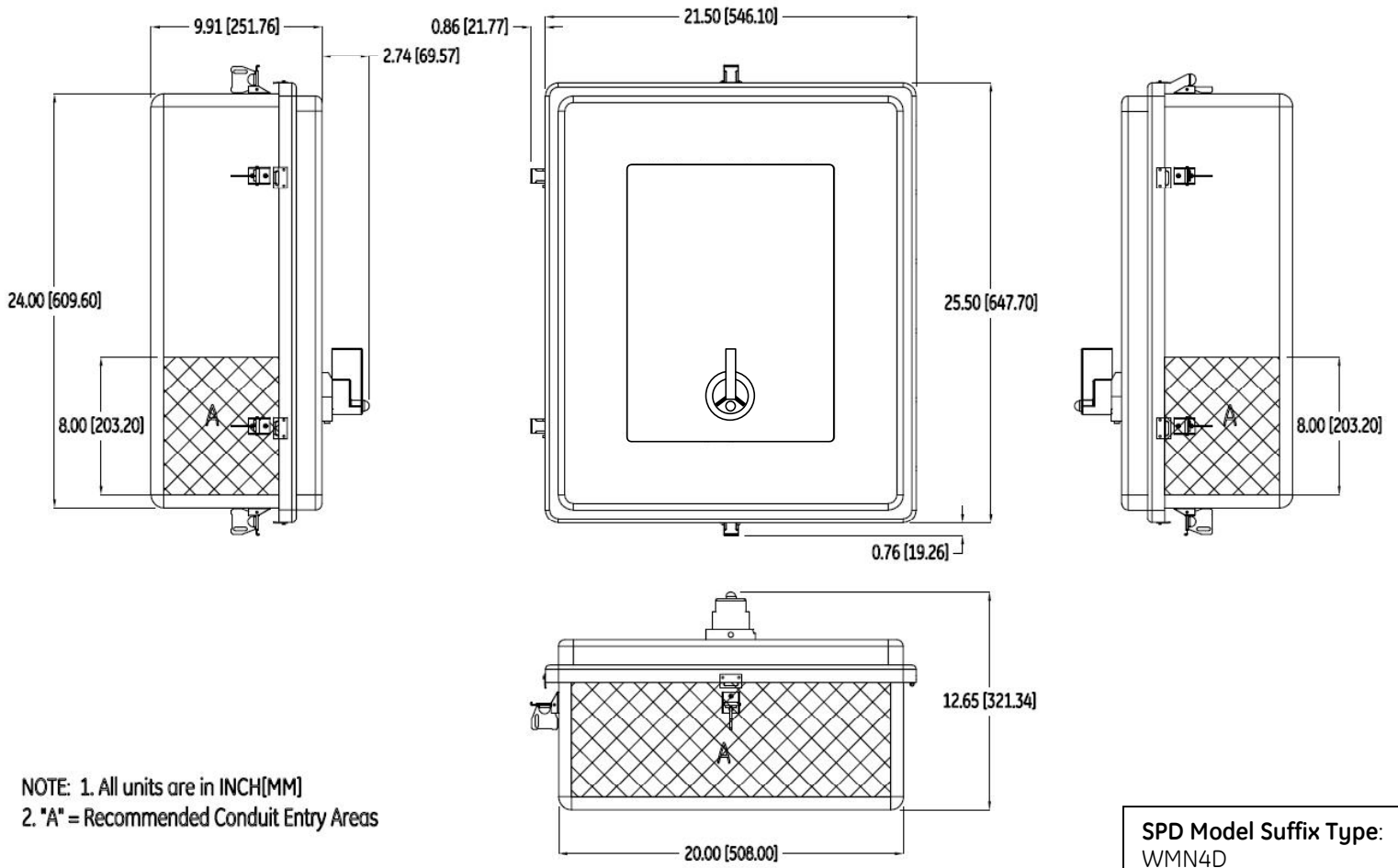


SPD Model Suffix Type:  
WMN12F

SPD Model Suffix Type:  
WMN1D



NOTE: 1. All units are in INCH[MM]  
2. "A" = Recommended Conduit Entry Areas



SPD Model Suffix Type:  
 WMN4D

## **INSTALLATION (CONT.):**

### **3. POWER CONNECTIONS**

Mechanical terminals are provided on the SPD for connection to the electrical power system. These terminals will accommodate #14 to 2/0 AWG stranded copper conductors. The minimum recommended wire size for the GE TR7000 SPD is # 6 AWG. See [page 13](#) for terminal location and identification.

### **4. 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. Wiring impedance can be further reduced by twisting the phase, neutral and ground conductors together and routed in the same raceway or channel. Always avoid sharp bends when routing SPD connecting conductors.

### **5. CIRCUIT BREAKER**

A dedicated 60 A or lower rated circuit breaker (not included) is required to connect the SPD to the power system.

### **6. REMOTE ALARM CONTACTS**

Remote Alarm Monitoring Contacts are provided on all SPD model types covered by this manual. If this type of monitoring is desired, refer to [page 13](#) for the location and pin configuration of these contacts. The contacts are dry, 1 form C type, rated 120 VAC, 1 A (30 VDC, 2A) maximum. Once the SPD has been energized and is operating as intended, the alarm contacts will switch to "Normal Status". The contacts will only change back to "Alarm Status" if there is a failure within the SPD suppression circuitry, or if power has been disconnected from the SPD. Allowing the Remote Alarm Contacts remain unconnected will not affect the performance or integrity of the SPD.

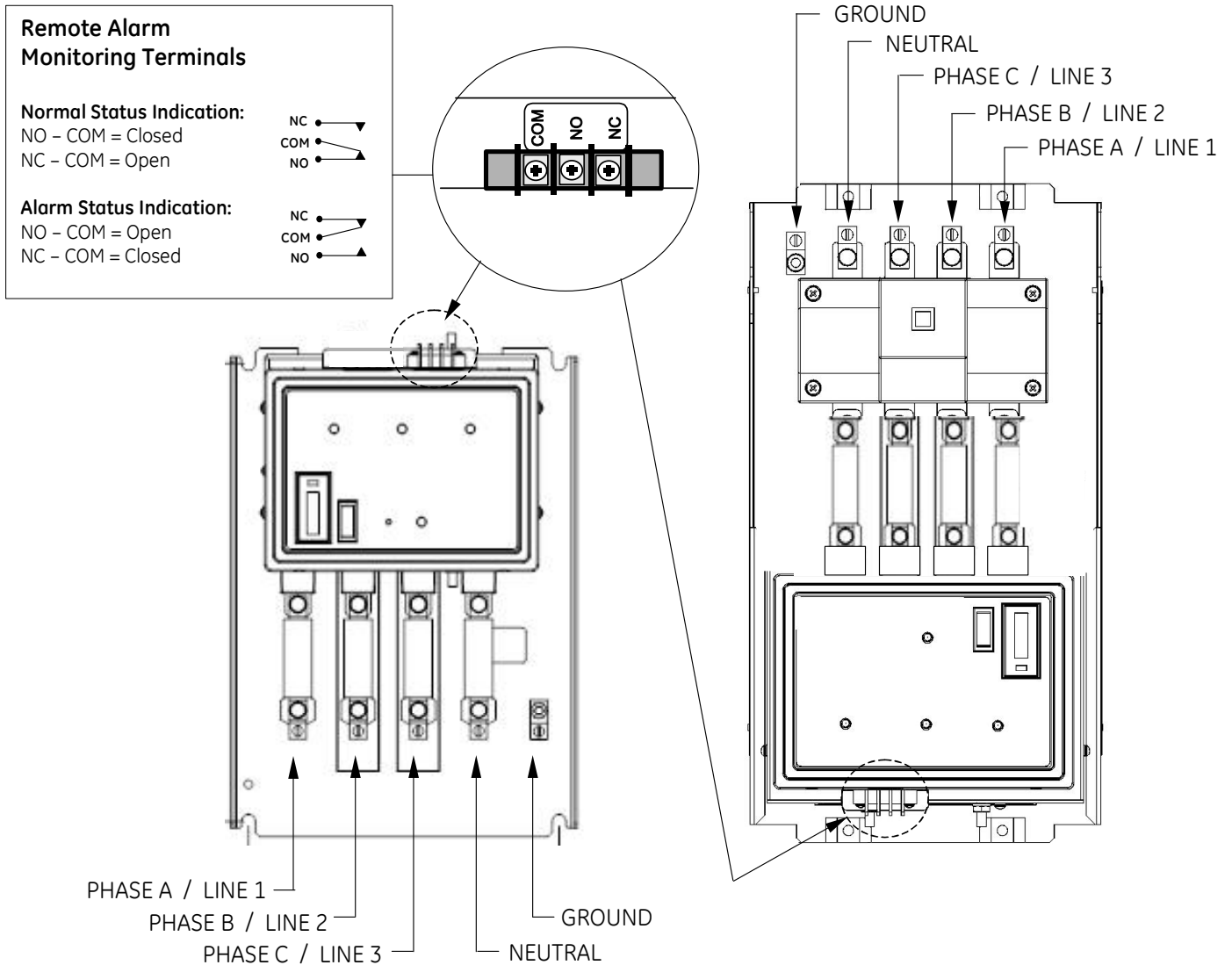
### **7. SPD DISCONNECT SWITCH**

A manually operated disconnect switch is provided as a standard feature on some models. It can be used to disconnect the SPD for servicing.

### **8. PRE-ENERGIZATION CHECK**

Once all of the pre-installation conditions have been met and the GE TR7000 SPD has been installed, the SPD can now be energized. For SPD Operational Status, refer to Operation and Maintenance Sections – [pages 15 & 16](#).

## POWER TERMINALS AND REMOTE ALARM LOCATIONS

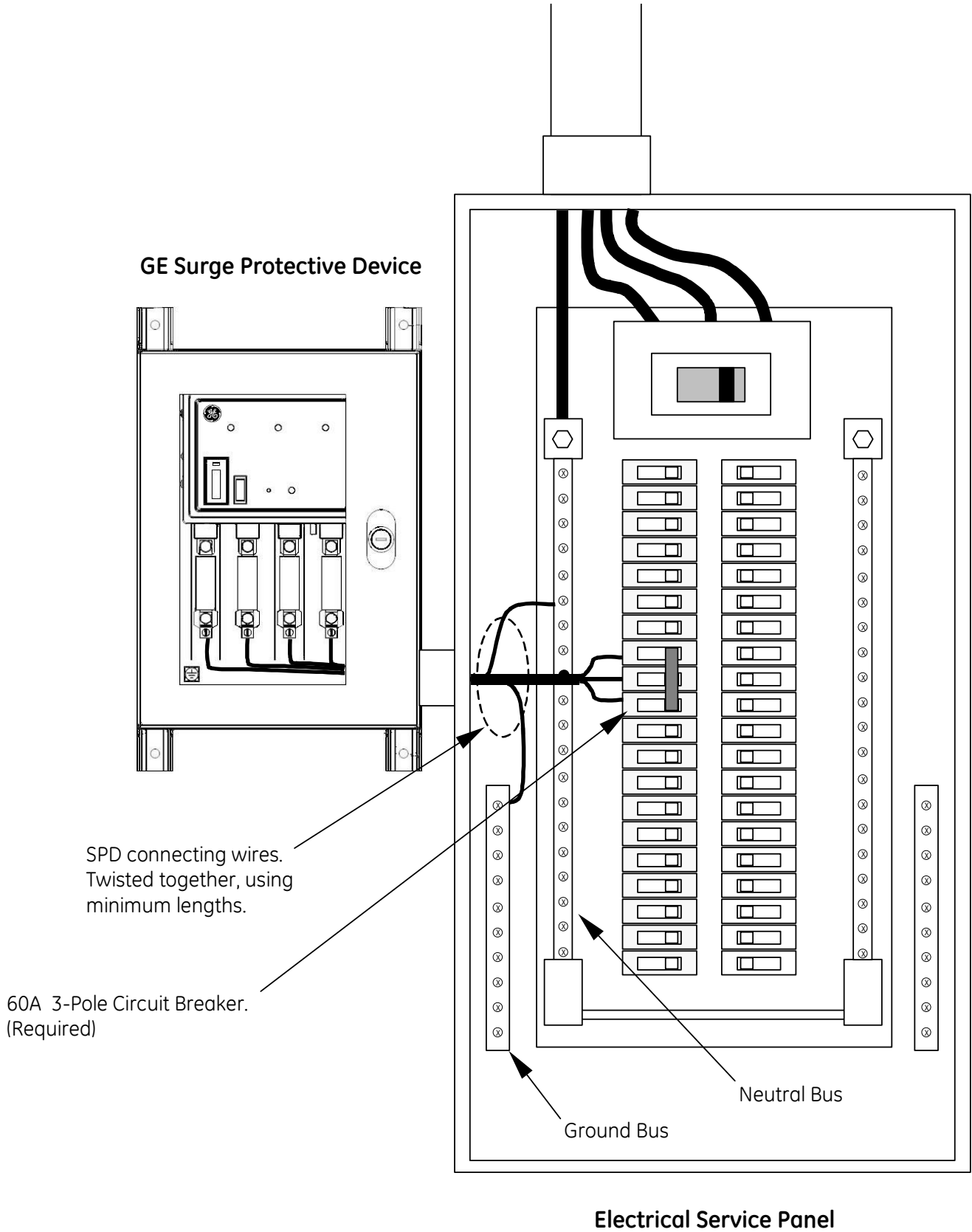


**Interior View of SPD Model  
 Number Suffix Types:**  
 WMN12S  
 WMN12F  
 WMN4S  
 WMN4X

**Interior View of SPD Model  
 Number Suffix Types:**  
 WMN1D  
 WMN4D

The above illustration represents the 2 possible configurations of interior assemblies found on GE Wall Mounted SPD models, depending on whether or not an integral disconnect switch is included. Unlimited mounting orientations of the SPD assembly is possible and will not affect performance as long as SPD connecting wire lengths are kept to a minimum.

**INSTALLATION EXAMPLE**





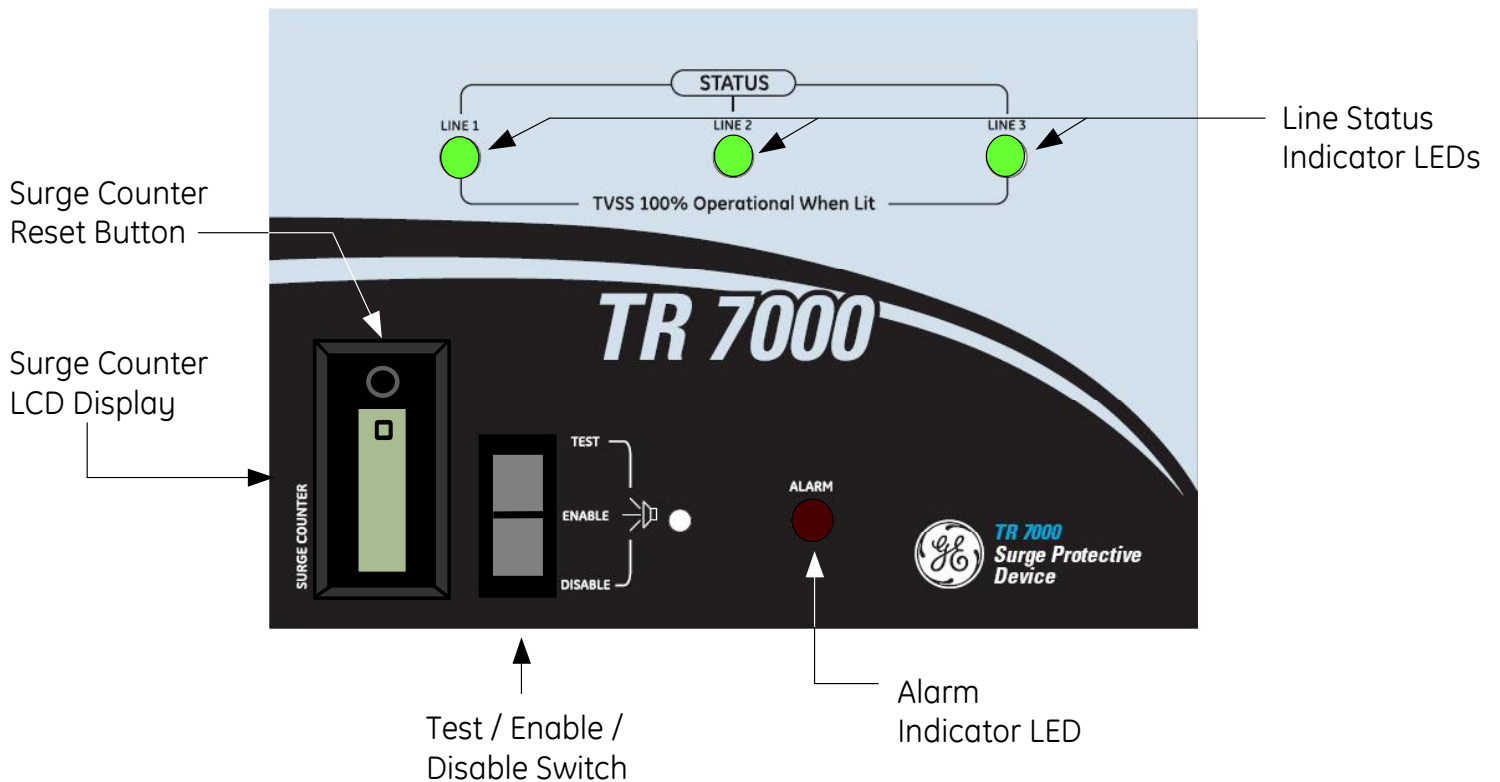
## WARNING

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.

### SPD Display Panel



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.

2. **ALARM STATUS INDICATOR LEDs**

When illuminated, the red Alarm Status Indicator LED will provide notification of a SPD failure condition. Verify the Alarm Status Indicator is not illuminated upon startup.

3. **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. (See pages 9 & 10 for Alarm Contact details)

#### 4. TEST / ENABLE / DISABLE SWITCH

**Enable Position** - This is the normal position for the tri-position switch. In the Enable position, the Audible Alarm will sound in the event of a SPD failure mode.

**Disable Position** - This position will silence the Audible Alarm if desired. The Disable switch will not disable or disconnect the SPD from the electrical power system.

**Test Position** - The Test switch provides a quick diagnostic status of the Audible Alarm, Alarm Status Indicator and Remote Alarm Contacts. When pressed, the Audible Alarm will sound, the Alarm Lamp will illuminate, and the Remote Contacts will change state. The "Test" position is momentary. Once pressed, the switch will automatically reset to the "Enable Position" upon release.

#### 5. SURGE COUNTER LCD

The (optional) Surge Counter will sense and record transient surge events that have been mitigated by the SPD. The counter has been designed to detect transients that exceed the peak sine wave by more than 70%. If desired, the Surge Counter Display can be reset to zero at any time by pressing the reset button located on the LCD display.

### 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 TR7000 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 TR7000 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.



#### **WARNING**

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.

**CONTACT GE POWER QUALITY AT 1-800-637-1738**



## 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.



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### **GE Digital Energy – Power Quality**

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