ACT 471 Modular Surge and Power Protection Device

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

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Power Quality Equipment including SPD and Advanced Filter

ACT 471 MODULAR WALL MOUNTED SPD

INSTALLATION, OPERATION AND MAINTENANCE MANUAL
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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 ACT 471 SURGE PROTECTION DEVICE (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 or factory 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 could be left unprotected.
Choosing the right product for the application, along with correct installation methods, as defined within this manual, will allow the ACT 471 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:

ACT 471 Series are Surge Protective Devices (SPD), designed for installation on low voltage electrical distribution systems. ACT 471 is 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 ACT 471 Series SPD incorporates Metal Oxide Varistor (MOV) technology to achieve superior transient suppression performance. Integral to the MOV is a patented Thermal Protection system that offers best in class SPD circuit interruption in the event of an abnormal overvoltage condition. Other standard features include protection status indicating lights, an audible alarm with test and disable features, form C alarm contacts for remote monitoring, a surge event counter, and two types of built in EMI filtering. A surge rated disconnect switch is comes standard on select models.

The ACT 471 SPD units described in this manual are self-contained wall mounted style and are Dual ETL Listed (a Nationally Recognized Testing Lab (NRTL)), conforming to both UL 1283 and 1449 4th Edition, March. 202016.

All published ratings are in accordance with:

- ANSI / IEEE C62.41.1-2002, C62.41.2-2002
- NEMA LS1-1992 (R2000) recommended practices.

Model covered by this manual are:

ACT 471 model types.

APPLICATION GUIDELINES:

Determining the surge protection to be provided in a facility or for a particular system or equipment can be a complex problem 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, ACT application or service engineering, or a competent 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 ACT 471 Series unit for your system voltage, configuration, and the anticipated surge environment. Some of the key parameters for selection are defined as:

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 ACT 471 Series SPD 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 ACT Sales Engineer for further information.

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 transformer wiring schemes)

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. ACT wall mount SPD's are available in maximum surge ratings of 80kA, 160kA, 240kA and 320kA.

SHORT CIRCUIT CURRENT RATING

ACT 471 Modular SPD is dual ETL listed for use on electrical systems with rated ampacities up to 200,000 symmetrical amperes maximum.

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 +60C (+140F) with a relative humidity level between 0-95% non-condensing.

No electronic device can survive a direct lightning strike, including all surge protection devices on the market. A strike close enough to any protector, which subjects the device to surge current or energy duty in excess of its designed capability can fail the protector. This is why that surge protectors mounted on switch gear or high risk facilities should have no less than a 160kA/mode (320kA/ Phase) protection capability.

Power companies providing voltages in excess of the MCOV capability, can also fail the unit. This should be an extremely rare event.

Should a condition occur that results in premature failure of the SPD, the suppression circuitry is designed to provide the least path to ground saving downstream equipment, however when specifications are exceeded, the SPD will fail in a save short mode. If at least one MOV was to short, this allows two levels of protection to potentially happen. First the integrated fuse on the MOV itself will blow safe open

and if more than one MOV has failed the combined short will cause the internal phase fuse to interrupt current flow through the SPD without disrupting power to the downstream protected equipment.

Increased rate of rise and higher surge current magnitudes both result in some increase in discharge voltage. Conditions can occur where the withstand capability of the protected equipment is exceeded even though the surge protector is doing its job and clamping the surge. In these cases Selenium Hybrid Power Filters should be considered and located as close as possible to the sensitive equipment.

ACT 471 Series WYE-connected units have both **normal mode** (L-N, L-L) and **common mode** (L-G, N-G) protection built into each unit. Discrete Protection between phase and neutral and phase and ground is provided on units designed for WYE-connected applications. On grounded neutral systems, **common mode** protection is needed if the neutral-to-ground bond is made more than 10 feet from the surge protector.

This will minimize neutral-to-ground potential during a transient surge, avoiding high transient voltages, which could reduce protection and cause possible damage to the system or to the downstream equipment. **Common mode** protection may also be used when the neutral-to-ground bond is within 10 feet.

ACT 471 Delta-connected units have **common mode** (line-to-ground and Line-to-Line) protection.

PRE-INSTALLATION REQUIREMENTS:

Prior to energization of the ACT 471 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 regulatory 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 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 NEC recommendations.

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. PRIMARY OVERCURRENT DISCONNECT

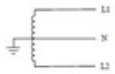
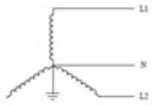
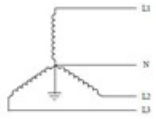
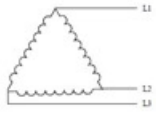
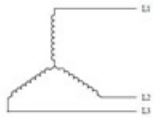
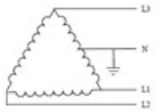
Confirm that the SPD will be installed on an electrical power system that has an upstream service disconnect breaker or fuse. Per NEC 285, installation of a SPD on the line (service) side of the main breaker is not allowed.

WARNING !

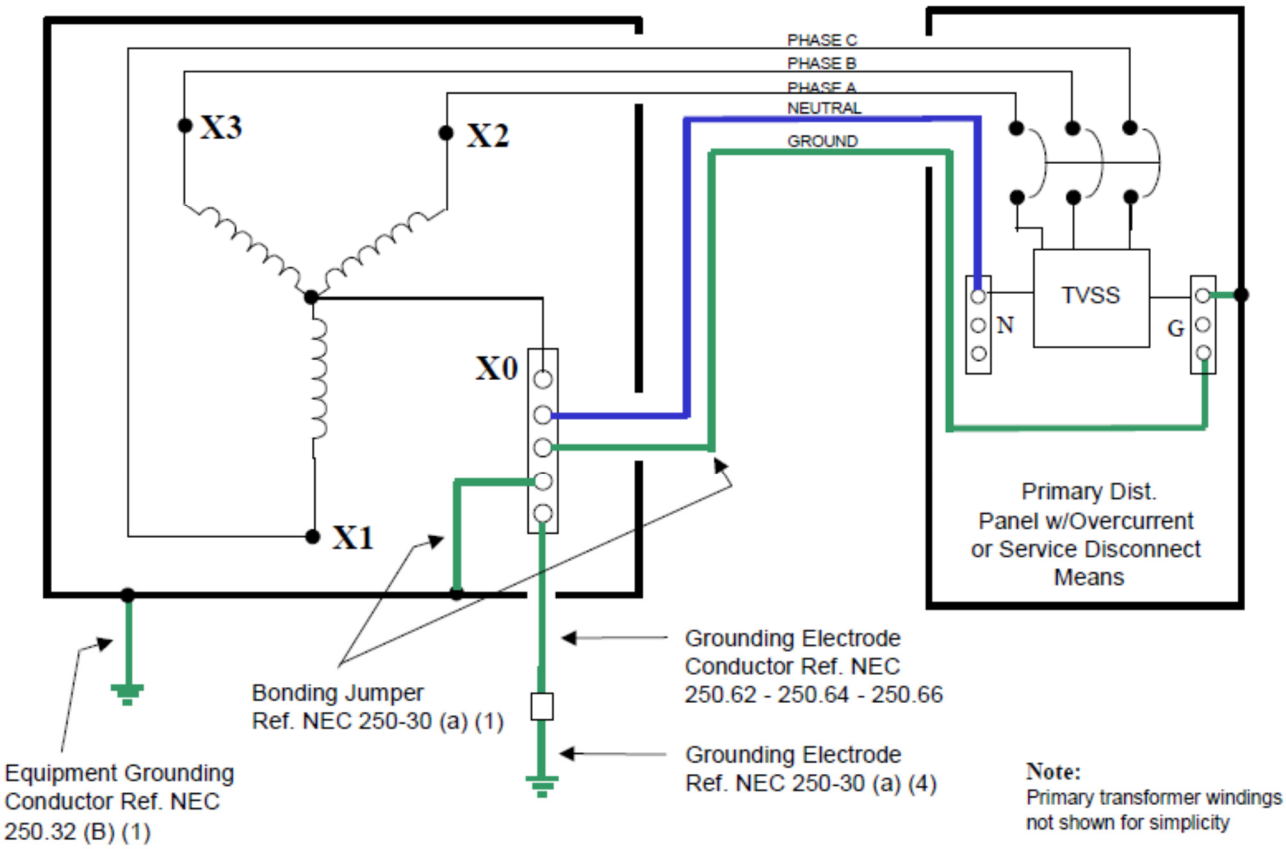
THE EQUIPMENT COVERED BY THESE INSTRUCTIONS SHOULD BE INSTALLED AND SERVICED ONLY BY COMPETENT, QUALIFIED PERSONNEL UTILIZING PROPER SAFETY PRACTICES AND PROCEDURES.

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.

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

VOLTAGE RATINGS & POWER SOURCE CONFIGURATIONS				
ACT MODEL	NOMINAL VOLTAGE (50/60hZ)	MAXIMUM CONTINOUS RMS OPERATING VOLTAGE	SYSTEM TYPE	SOURCE CONFIGURATION
ACT 120S	120 / 240V	150V (L-N / L-G)	Single Phase 3 Wire + Ground	
			Dual Phase 3 Wire + Ground	
ACT 120Y ACT 220Y ACT 240Y ACT 277Y ACT 347Y	120 / 208V 220 / 380V 240 / 415V 277 / 480V 347 / 600V	150V (L-N / L-G) 320V (L-N / L-G) 320V (L-N / L-G) 320V (L-N / L-G) 420V (L-N / L-G)	Three Phase WYE, 4 Wire + Ground	
ACT 240D ACT 480D	240V 480V	270V (L-G) 550V (L-G)	Three Phase Delta, 3 Wire	
			Three Phase WYE, 3 Wir3	
ACT 240H	120 / 240V	150V (L-N / L-G) Phase A & C 320V (L-N / L-G) Phase B	Three Phase Delta Hi-Leg, 4 Wire + Ground	

For other voltages or configurations please consult with an ACT Factory Representative before specifying or attempting to install SPD.



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

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 is not known, do not attempt to continue.

1. MOUNTING

The ACT 471 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.

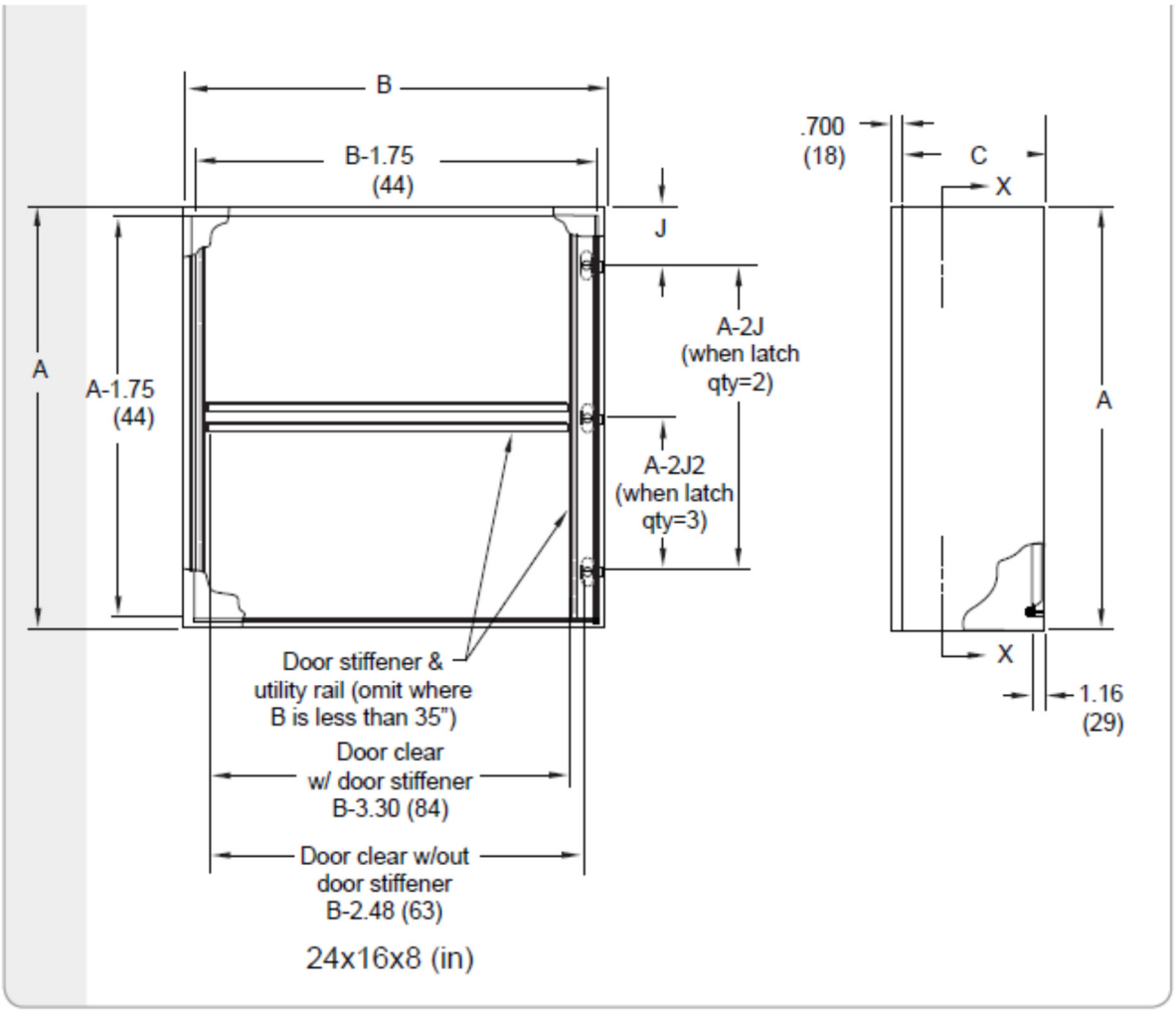
Select a mounting location that will allow for a minimum length of wire between the SPD and the power terminals of the electrical service panel. The SPD can be mounted in any orientation; however special consideration should be given to allow for periodic inspection of the diagnostic display panel. The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

WARNING !

2. DIMENSIONS AND RECOMMENDED CONDUIT ENTRANCE LOCATIONS

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

Enclosure Size A x B x C		Door/Body Gauge	Mounting D x E		Window Size F x G		Latch Qty.	J	
in.	mm		in.	mm	in.	mm		in.	mm
20x16x8	508x406x203	16/16	18.50x14.37	470x365	16.25x11.00	413x279	1	10.00	254



3. POWER CONNECTIONS

Compression terminals are provided on the SPD for connection to the electrical power system. These terminals will accommodate up to size 2/0 stranded copper conductors. The minimum required wire size for ACT 471 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, strait 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 conduit, raceway or channel. Always avoid sharp bends when routing SPD conductors.

5. CIRCUIT BREAKER

A dedicated circuit breaker is not required as long as the SPD is installed on the load side of the system main over current disconnect breaker or fuse. However, if a dedicated breaker or fuse is desired as a disconnect means. ACT recommends the use of a integrated disconnect option on all ACT 471 (use –D option code).

6. REMOTE ALARM CONTACTS

Remote Alarm Monitoring Contacts are provided on all ACT 471 SPD models as a standard feature. 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 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.

7. SPD DISCONNECT SWITCH (Option –D)

A manually operated disconnect switch is provided as an optional feature on all ACT 471 SPD models. It can be used to remove power from the SPD in the event of failure or for servicing.

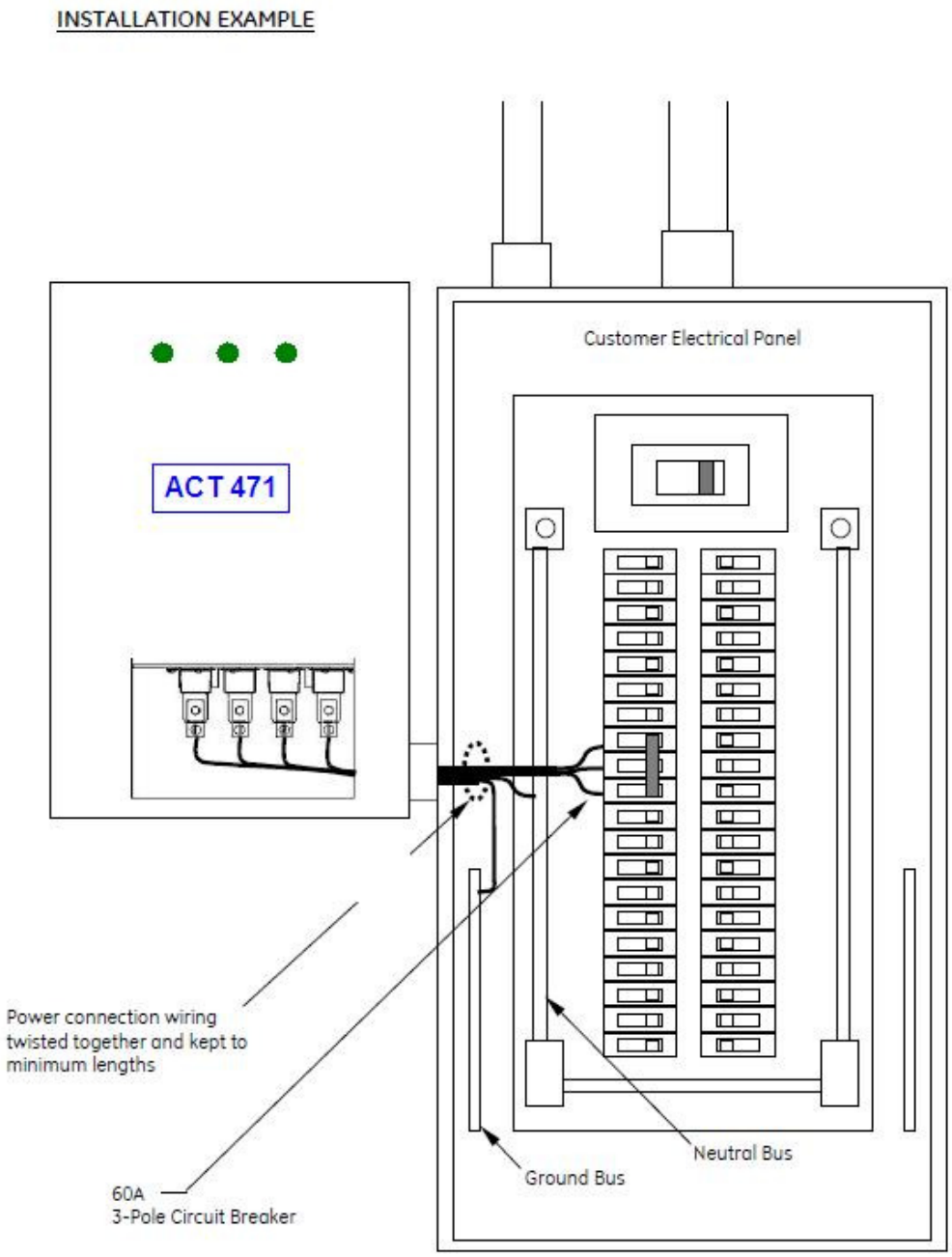
8. PRE-ENERGIZATION CHECK

Once all of the pre-installation conditions have been met and the ACT 471 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

The below illustration represents the interior view of the ACT 471 Wall Mounted SPD models with and without disconnect switch. Various orientations are possible and will not affect the performance of the SPD if wire connections and cable length are kept to a minimum.

INSTALLATION EXAMPLE ON LIGHTING PANEL



OPERATION:

After applying power to the SPD, verify that the protection monitoring circuits are functioning correctly. If all status alarms indicate "normal" (Green LED's), the SPD has been successfully installed and is operational. If Red LED ALARM Status Indicator options are installed ensure that no Red LED is lit.

1. LINE STATUS INDICATORS

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 green indicators will be illuminated. There is one green indicator per each protected phase.

2. ALARM STATUS INDICATOR

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.

4. AUDIBLE ALARM ENABLE / DISABLE SWITCH (ACT 471 Only)

Enable Position - This is the normal position for the 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.

5. SURGE COUNTER LCD

The Surge Counter will sense and record transient surge events that have been mitigated by the SPD. The counter has been calibrated to count any transient surge larger than IEEE C62 200 Amp Ring Wave. The counter has also been designed to detect transients that are suppressed 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.

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 ACT REPRESENTATIVE FOR FURTHER ASSISTANCE.

MAINTENANCE:

ACT 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 electrical supply connections / terminations to the SPD to ensure continued reliable performance.

SERVICING / TROUBLESHOOTING:

The ACT 471/461 SPD contains no user serviceable parts and requires no calibration. The rugged design of the SPD should provide many years of service with no issues.

Should a condition occur that results in premature failure of the ACT 471/461 SPD, the integral SPD thermal fusing will safely interrupt current flow through the SPD without disrupting power to the protected equipment.

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 ACT Resolve at 1-903-583-8097.

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 ACT Communications Technical Support Department at (903) 583-8097.