



ACT 471 Filter/Surge Protection Device



INSTALLATION, OPERATION AND MAINTENANCE MANUAL

Power Quality Equipment including SPD and Advanced Filter

ACT 471 SERIES WALL MOUNTED TVSS

INSTALLATION, OPERATION AND MAINTENANCE MANUAL TABLE OF CONTENTS

IMPORTANT NOTICE.....	3
Transformer X0 Bond Warning Statement.....	3
PRODUCT DESCRIPTION.....	4
APPLICATION GUIDELINES.....	4
Maximum Continuous Operating Voltage.....	4
Electrical System Configuration.....	5
Peak Impulse Rating.....	5
Short Circuit Current Rating.....	5
Environmental Ratings.....	5
PRE-INSTALLATION REQUIREMENTS.....	6
System Configuration and Voltage.....	6
System Grounding and Bonding.....	6
Primary Overcurrent Disconnect.....	6
VOLTAGE RATINGS AND POWER SOURCE CONFIGURATIONS.....	7
NEC COMPLIANT GROUNDING AND BONDING EXAMPLE.....	8
INSTALLATION.....	9
Mounting.....	9
Dimensions and Recommended Conduit Entry Locations.....	9
INSTALLATION (cont.).....	12
Power Connections	12
Wire Routing	12
Circuit Breaker	12
Remote Alarm Contacts.....	12
TVSS Disconnect Switch.....	12
Pre-Energization Check.....	12
POWER TERMINALS AND REMOTE ALARM LOCATION DIAGRAM.....	13
INSTALLATION EXAMPLE DIAGRAM.....	14
OPERATION.....	15
Line Status Indicators.....	15
Alarm Status Indicators.....	15
Remote Alarm Contacts.....	15
Test / Enable / Disable Switch.....	15
Surge Counter LCD.....	15
MAINTENANCE.....	16
SERVICING / TROUBLESHOOTING.....	16

IMPORTANT NOTICE

THE ENTIRE CONTENT OF THIS MANUAL MUST BE READ AND FULLY UNDERSTOOD BEFORE ATTEMPTING ANY INSTALLATION OR ENERGIZATION OF THE ACT 471 SERIES TVSS.

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

If the minimum requirements of this manual are not followed, the TVSS 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 TVSS to provide the best possible protection for many years.

Failure to comply with the applicable requirements of this manual can void the TVSS 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 TVSS are Surge Protective Devices (SPD), designed for installation on low voltage electrical distribution systems. ACT 471 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 ACT 471 ETP Series TVSS 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 TVSS 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 built in EMI filtering. A surge rated disconnect switch is comes standard on select models.

The ACT 471 TVSS units described in this manual are self contained wall mounted style and are ETL Listed (a Nationally Recognized Testing Lab (NRTL)), conforming to UL 1283 and 1449 Third Edition, Sept. 2009.

All published ratings are in accordance with ANSI / IEEE C62.41.1-2002, C62.41.2-2002 and NEMA LS1-1992 (R2000) recommended practices.

Model covered by this manual are:

ACT 471 and ACT 46X 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 TVSS, 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 TVSS 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 TVSS 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 TVSS. The rating per mode should equal or exceed the maximum surge expected in service. ACT wall mount TVSS are available in maximum surge ratings of 80kA, 160kA, 240kA and 320kA.

SHORT CIRCUIT CURRENT RATING

ACT 471 Wall Mounted TVSS units are UL certified 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 TVSS 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 protector can survive a direct lightning strike. A strike close to any protector, which subjects the device to surge current or energy duty in excess of its capability, can fail the protector. Electrical System Supply voltages in excess of the MCOV capability, can also fail the unit.

Should a condition occur that results in premature failure of the TVSS, the suppression circuitry will short, allowing the integral fusing to interrupt current flow through the TVSS without disrupting power to the 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 additional low voltage protection may be required, 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. 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, avoiding high transient voltages, which could reduce protection and cause possible damage to the system or to the equipment. **Common mode** protection may also be used when the neutral-to-ground bond is within 10 feet.

ACT 471 Series delta-connected units have **common mode** (line-to-ground) protection.

PRE-INSTALLATION REQUIREMENTS:

Prior to energization of the ACT 471 TVSS, it is critical that the following items have been addressed.

DO NOT ATTEMPT TO ENERGIZE THE TVSS 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 TVSS model number has been selected for your system. The TVSS model number can be found on the UL label affixed to the TVSS NEMA Enclosure. The TVSS 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 TVSS. 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 TVSS and are in violation of NEC.

3. PRIMARY OVERCURRENT DISCONNECT

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

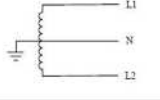
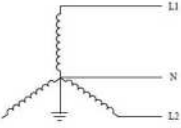
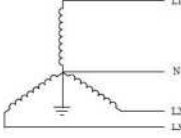
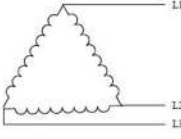
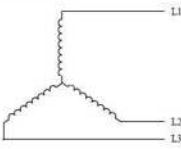
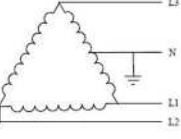
! WARNING

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

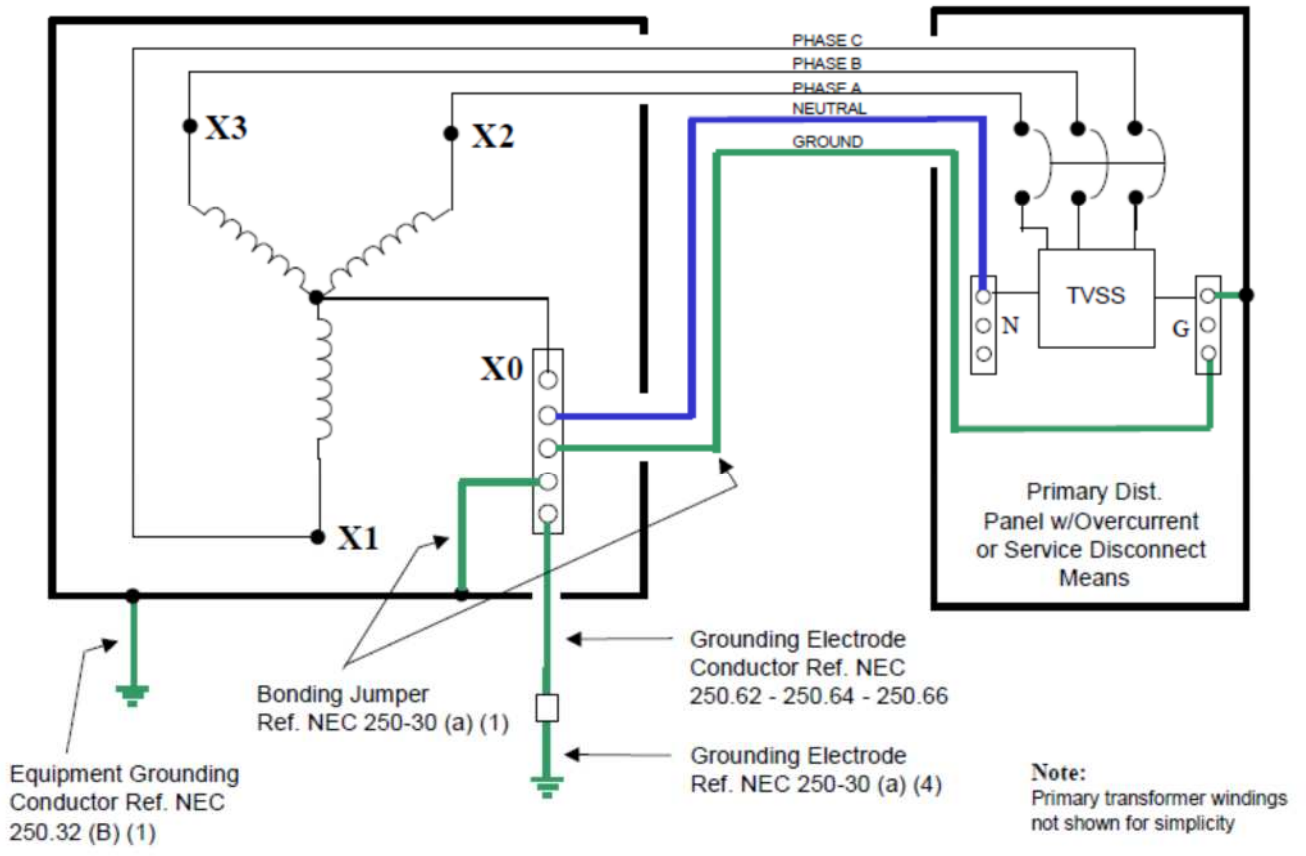
THESE INSTRUCTIONS ARE WRITTEN FOR SUCH PERSONNEL AND ARE NOT INTENDED AS A SUBSTITUTE FOR ADEQUATE TRAINING AND EXPERIENCE IN SAFE PROCEDURES FOR THIS TYPE OF EQUIPMENT.

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

VOLTAGE RATINGS & POWER SOURCE CONFIGURATIONS

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

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



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

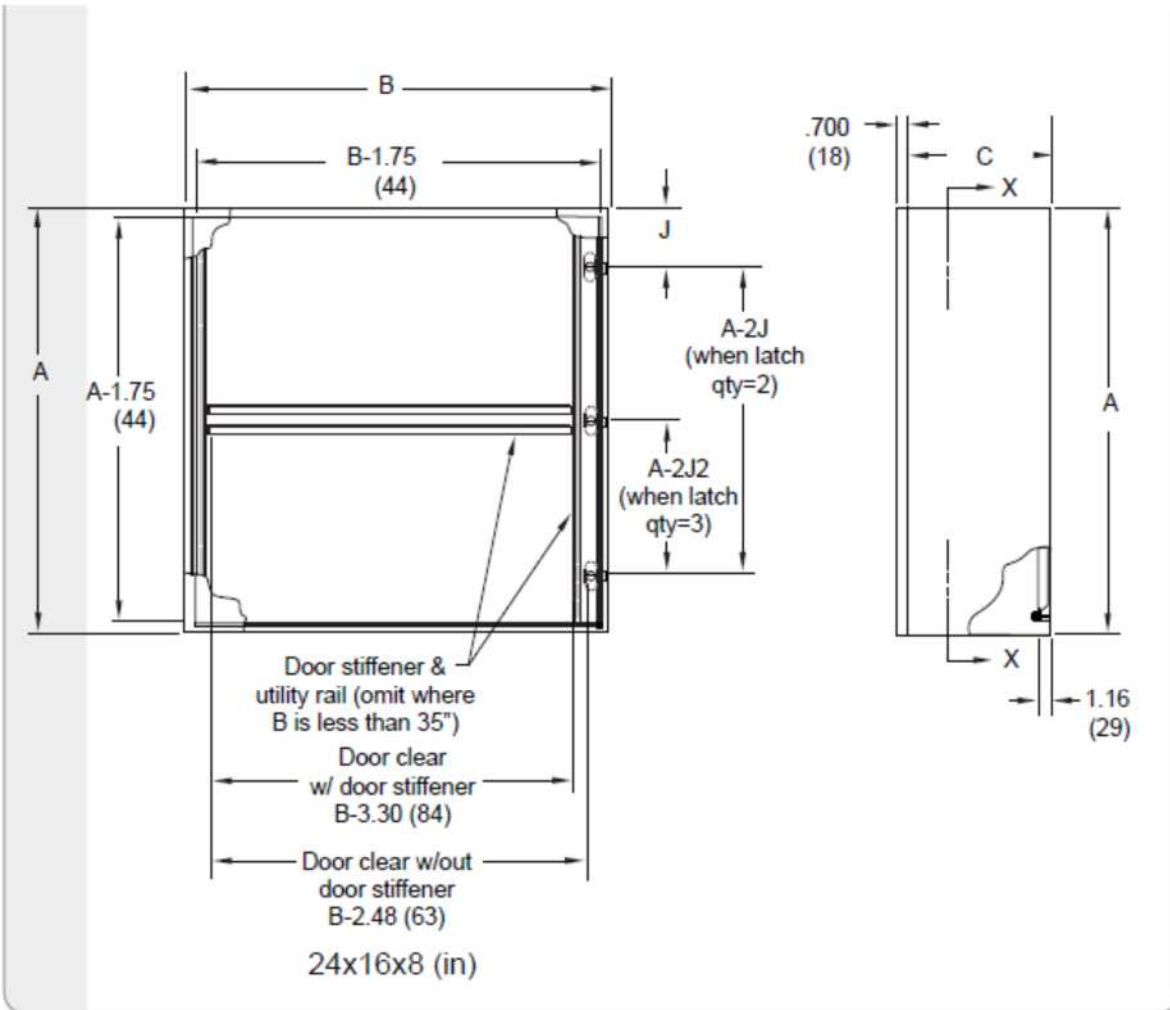
The ACT 471Wall Mounted TVSS must be installed as close to the protected circuit as possible. Long power cable runs between the TVSS and protected circuit will result in significantly reduced performance. Select a mounting location that will allow for a minimum length of wire between the TVSS and the power terminals of the electrical service panel. The TVSS can be mounted in any orientation; however special consideration should be given to allow for periodic inspection of the diagnostic display panel. The TVSS 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 TVSS 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 TVSS must be kept at a minimum for the best performance. Wire lengths should be short, straight runs between the TVSS 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 TVSS conductors.

5. CIRCUIT BREAKER

A dedicated circuit breaker is not required as long as the TVSS 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.

6. REMOTE ALARM CONTACTS

Remote Alarm Monitoring Contacts are provided on all ACT 471 TVSS models. 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 TVSS has been energized and is found to be operating normally, the alarm contacts will only change if there is a failure within the TVSS suppression circuitry, or if power has been disconnected from the TVSS. Leaving the Remote Alarm Contacts unconnected will not affect the performance of the TVSS.

7. TVSS DISCONNECT SWITCH

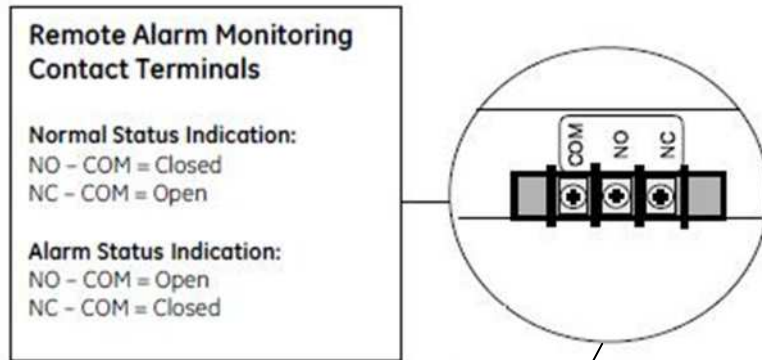
A manually operated disconnect switch is provided as a standard feature on WMN1D and WMN4D suffix TVSS models. It can be used to remove power from the TVSS in the event of failure or for servicing.

8. PRE-ENERGIZATION CHECK

Once all of the pre-installation conditions have been met and the ACT 471 TVSS has been installed, the TVSS can now be energized. For TVSS Operational Status, refer to Operation and Maintenance Sections . pages 15 & 16.

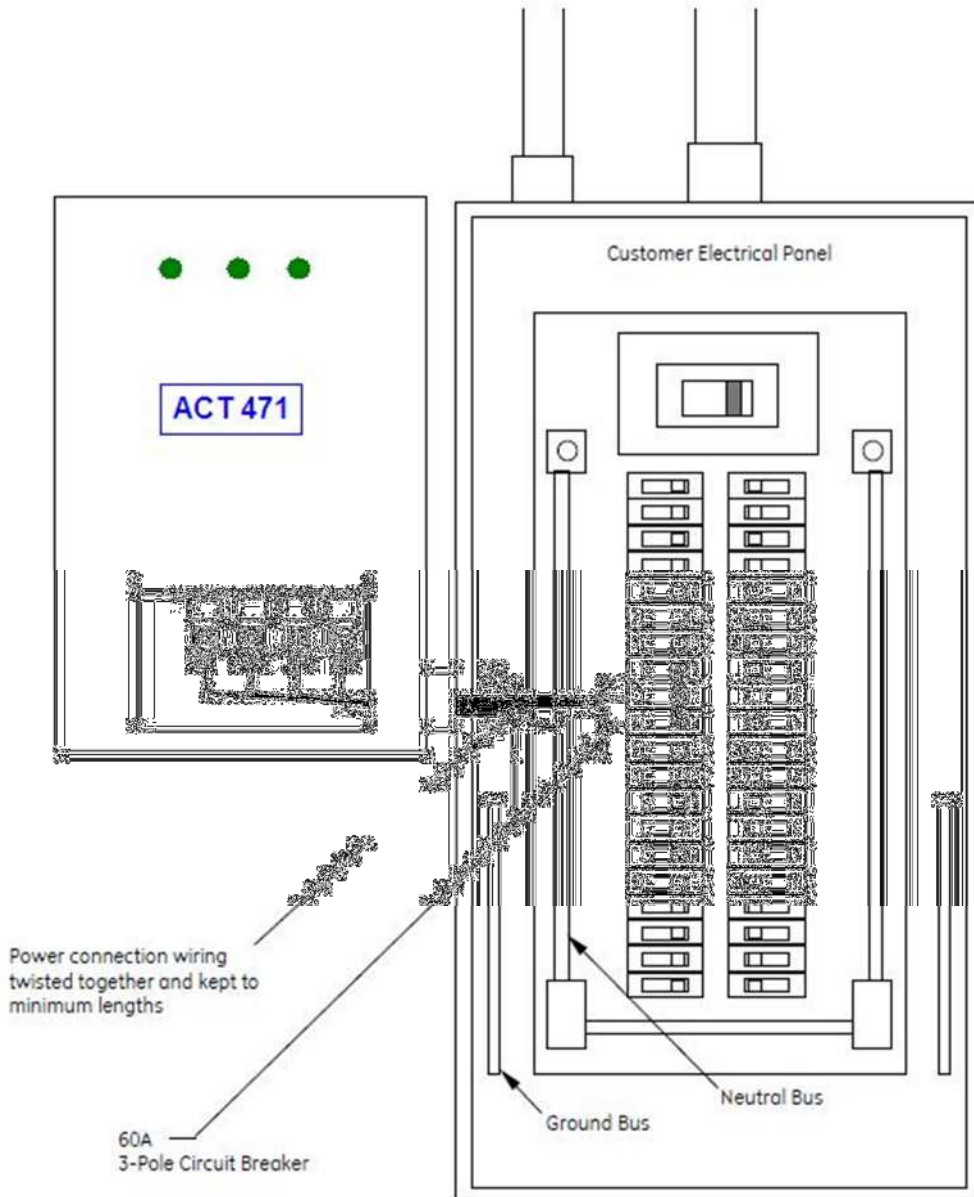
POWER TERMINALS AND REMOTE ALARM LOCATIONS

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



INSTALLATION EXAMPLE

INSTALLATION EXAMPLE



OPERATION:

After applying power to the TVSS, verify that the protection monitoring circuits are functioning correctly. If all status alarms indicate "normal" (Green LED's), the TVSS has been successfully installed and is operational.

1. LINE STATUS INDICATORS

The green line status LED.s provide visual indication of TVSS health status. As long as the TVSS is connected to the electrical system supply voltage and the TVSS 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 TVSS 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 TVSS. An alarm condition will result in a status change of the contacts. These contacts do not affect the performance of the TVSS and are not required to be connected for the TVSS to function as intended.

4. Audible Alarm ENABLE / DISABLE SWITCH

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 TVSS failure mode.

Disable Position. This position will silence the Audible Alarm if desired. The disable switch will not disable or disconnect the TVSS 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 TVSS. 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.

! WARNING

UPON ENERGIZATION OF THE TVSS, IF ANY OF THE LAMPS OR ALARMS INDICATES AN ABNORMAL CONDITION, POWER SHOULD PROMPTLY BE DISCONNECTED FROM THE TVSS. THE ELECTRICAL SYSTEM SHOULD BE INSPECTED AND THE PRE-INSTALLATION REQUIREMENTS SHOULD BE VALIDATED. DO NOT ATTEMPT TO LEAVE POWER APPLIED TO THE TVSS, OR RE-ENERGIZE THE TVSS 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 TVSS does not indicate a failure mode. Inspections should also be made to check the integrity of electrical supply connections / terminations to the TVSS to ensure continued reliable performance.

SERVICING / TROUBLESHOOTING:

The ACT 471 ETP Series TVSS contains no user serviceable parts and requires no calibration. The rugged design of the TVSS should provide many years of service.

Should a condition occur that results in premature failure of the ACT 471 TVSS, the integral TVSS thermal fusing will safely interrupt current flow through the TVSS 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 TVSS remains in alarm after system inspection/corrections have been made, the TVSS 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 the ACT Company.