



Protection System

**A System Designed To Facilitate
Cable Location While Protecting
Personnel and Buried Cable**

Technical Practice Issue 2, January 2010

ACT Communications Inc. Cable Protection Products

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1.0 DESCRIPTION

ACT Communications Inc. is a company, dedicated to manufacturing high quality telecom equipment solutions that includes both electrical and mechanical designed products. This Technical Practice is focused on the **ACT 44X Cable Location Protection systems**, which includes a wide range of cable location surge protector solutions.

1.1 Specifications & Descriptions

1.1.2 ACT 442 Indoor Protector - The ACT ACT442 Indoor Cable Locating Protection Device is a solid-state hybrid surge protection system installed between the cable sheath and earth ground. Its primary function is to increase the cable locating tone range and efficiency and protect buried cable from high-energy surges. The ACT442 is either mounted in a pedestal to allow easy access during testing or inside a Fiber Closure.

1.1.2.2 ACT442 Physical & Electrical Specifications

Physical

The ACT442 Indoor Cable Locating Protection Device comes standard in a 3" x 2" x 1.5" plastic enclosure. There are two #10 stainless steel studs mounted on the unit for connection purposes. The designated ground lug is marked with green ink for clarification, even though the protector is not polarity sensitive. Each unit has a 1/4" mounting hole and weighs 7 ounces.

Electrical

Voltage Applications:	150V, 350V
Clamping Voltage(@ 1mA DC):	(+/-10% voltage variance) 180V,430V
Peak Current (8x20µS):	40,000 Amps
Energy Dissipation (10x1000µS):	1600 joules
Response Time:	1.5 Nanoseconds
Capacitance @ 5KHz:	4004pf

1.1.3 ACT444 Outdoor Protector - The ACT444 Cable Locating Protection Device is an indoor/outdoor solid-state hybrid surge protection system installed between the cable sheath and earth ground. Its primary function is to increase the cable locating tone range and efficiency and protect buried cable and personnel from high-energy surges. This unit may be installed either underground or aboveground. Proper installation and location of these devices allows greater than 75 miles of cable location from one transmitter.

1.1.3.1 ACT444 Physical & Electrical Specifications

Physical

The ACT444-30X or 40X units are 4"x4"x2" waterproof closures. There are (2) #6AWG stranded wires feeding through the box that connect (green) to ground and (black) to the cable sheath.

Electrical

Voltage Applications:	150V, 350V
Clamping Voltage (@ 1mA DC):	(+10% voltage variance) 180V,430V
Peak Current (8x20µS):	40,000 Amps
Energy Dissipation (10x1000µS):	1600 joules
Response Time:	1.5 Nanoseconds
Capacitance @ 5KHz:	4004pf

1.1.4 ACT445 Switch Box (part of ACT 4454 & 4456 systems)- The ACT445 Cable Locating Protection Device is a remote switching device controlled by a Cable Location Transmitter System. In addition the ACT445 unit is built with a high-energy surge protector. The surge protector provides a low impedance path to ground for high-energy transients (Lightning, temporary over voltage TOV, etc.); and a high impedance path for low energy signals (cable locating tones). A heavy-duty relay is installed in this unit allowing the cable sheath to remain grounded while de-energized. When a 48 volt D.C. signal is applied from the transmitter, it lifts the earth ground off the cable and connects the transmitter to the cable sheath and also connects the protector from the sheath to ground.

1.1.4.1 ACT445 Physical & Electrical Specifications

Physical

The ACT445 is available for two, four or sixteen switch cable access in one box. For dual and Quad cable access (labeled 1, 2, 3,& 4) a 12"x10"x6" box is used. Both boxes provide an internal screw terminal block for use with trace wires. Both units are sold with the control cable harness (ACT445-S04-040) for connection to the tone transmitter. For sixteen-cable access a 16"x14"x6" wall or rack mountable box is used. This unit is sold with control cable harness ACT445-S16- 040. (See fig. 8.3)

Electrical

Voltage Applications:	150V, 350V
Clamping Voltage (@ 1mA DC):	(+10% voltage variance) 180V, 430V
Peak Current (8x20µS):	40,000 Amps
Energy Dissipation (10x1000µS):	1600 joules
Response Time:	1.5 Nanoseconds
Capacitance @ 5KHz:	4004pf
Relay Coil Voltage:	-48 Volts DC
Relay Coil Rating:	5 Amp continuous
Signal Connector:	DB24

1.1.5 ACT446 - The ACT446 Dual Cable Locating Protection Device is an indoor /outdoor, dual protection unit designed to protect two wires against high-energy surges while providing isolation between the East and West cable sheath or Backbone and Spur connection. The ACT 446 has two key purposes: Isolating the East and West cable sheath, allowing technicians to be able to test individual cable sections in the field and pin-point problems quickly and second for providing an electrical connection between backbone cable and a spur cable connection. During isolation tests, its own hybrid surge arrestor individually protects each direction. This ensures maximum safety to personnel and equipment.

The **ACT446-150-210 series** outdoor protector is WEATHERPROOF enclosure with shorting bar between two cable connection posts that provides a technician a capability to easily isolate the fiber backbone or pull off a Spur electrical connection. 6' 6 AWG cable lengths options are available.

The **ACT446-150-312 series** outdoor protector is WATERPROOF enclosure with shorting bar, normally used to bond Backbone and Spur cables together in a waterproof environment. Waterproof enclosure comes standard with Black, Red and Green 6 Awg wire.

The **ACT446-150-410 Series** protector is designed specifically for Pedestal and Indoor applications. This protector comes with shorting bar between two cable connection posts that provide a technician a capability to easily isolate the fiber backbone or pull off a Spur electrical connection.

1.1.5.1 ACT446 Physical & Electrical Specifications

Physical

The ACT446-200 & 300 Series Dual Cable Locating Protection Device comes standard in a 4" x 4" x 2" waterproof enclosure. There are three cable stubs mounted on the unit for connection purposes. The designated ground lug is marked with green cable for clarification, even though the protector is not polarity sensitive.

The ACT 446-400 Series is Indoor or pedestal mounted product in a 3"x3"x2" plastic enclosure.

Electrical

Voltage Applications:	150V, 350V
Clamping Voltage (@ 1mA DC):	(+10% voltage variance) 180V,430V
Peak Current (8x20μS):	40,000 Amps
Energy Dissipation (10x1000μS):	1600 joules
Response Time:	1.5 Nanoseconds
Capacitance @ 5KHz:	4004pf

1.1.6 ACT447 Outdoor Filter Protector – The ACT447 Band Reject Filtering System is a two stage protection system installed between the cable sheath and earth ground. The ACT447 is designed to increase cable locating or cable monitoring range while protecting buried cable from high energy surges and any induced voltage.

The first stage uses an ACT444 cable surge protection technology and the second stage utilizes a band reject filter. The ACT447 increases cable-locating efficiency and allows more than 50 miles of cable to be located with one transmitter.

1.1.6.1 Each ACT447 connected from the Fiber Cable Sheath to ground will attenuate the unwanted induced signal by providing impedance as low as 50 ohms at the frequency rejected.

1.1.6.2 Most all Cable Locating Transmitters are designed for transmitting signals above 250Hz at which frequency there is minimal loss. Therefore the ACT447 Filter Protector will not interfere with the transmitted Cable Locating Signal.

1.1.6.3 The D.C. resistance characteristic of the ACT447 Filter Isolator is greater than one Meg ohm; therefore the ACT447 does not contribute to cable sheath leakage to ground. For more detailed information request the ACT447 engineering specification document.

1.1.6.4 ACT447 Physical & Electrical Specifications

Physical

The ACT447-112 Series comes in a 6" x 6" x 4" The unit weighs approximately 14 pounds. The ACT447-132 Series comes in a 6"x6"x4" enclosure. The unit weighs approximately 21 pounds.

Electrical

Voltage Applications:	50V
Clamping Voltage (@ 1mA DC):	(+10% voltage variance) 430V
Power Rating:	Unlimited
Peak Current (8x20μS):	* 70,000 Amps
Energy Dissipation (10x1000μS):	1600 joules
Response Time:	1.5 Nanoseconds
Capacitance @ 5KHz:	4004pf
Operating Temperature:	-40°C to +60°C
Frequency Rejection Level:	>60db @ 60Hz

ACT447- 112 1 Amp Series

Impedance at 60Hz 1 Amp: <100 ohms typical

Impedance at 60Hz .5Amp: <50 ohms typical

Note: Filter is designed for continuous operation up to 110vrms, 1A current.

ACT447- 132 3 AmpSeries

Impedance at 60Hz 3 Amp: <36 ohms typical

Impedance at 60Hz .5 Amps: <50 ohms typical

1.2 Configurations

1.2.1 It is possible to configure the ACT Cable Locating Protection System with any type of Fiber Optic Cable System that has a metallic sheath or trace wire. The system is normally connected to the cable sheath to provide either an isolated or filtered path to ground for unwanted induced energy. If non metallic sheath is used, the ACT Cable Protection System can be connected to any wire that is buried in the trench with the Fiber Cable or connected to copper wire which is used in a composite cable design. As long as there is some metallic path for the tone to be sent the system can be configured. This manual and its associated application drawings see section 4.0.

1.3 Wire / Cabling

1.3.1 All wire connections to the ACT Cable Locating Protection Devices use only U.L. approved #6AWG stranded copper wire, except in the ACT447 Filter Protection Device where #6AWG solid copper wire is used. All wire is rated for direct burial. Wires are colored for their particular function:

Green – Indicates Earth Ground

Black – Sheath connection for West Cable Sheath

Blue – Sheath connection for East Cable Sheath

Yellow – Spur Cable Sheath connection

Note: In some configurations a color band may be used on black cable to identify these color codes.

1.4 Environmental Considerations

1.4.1 Since outside plant products are exposed to the harshest environments, care should be taken to specify and install the correct product for the application.

1.4.2 ACT44442 units are constructed of moisture proof enclosures with stainless steel studs exposed for technician access. These units are designed for above ground installations such as pedestals or cabinets. The ACT44442 can also be mounted inside most fiber optic closure systems.

1.4.3 ACT444 units come completely potted with external wire stubs and are designed to be either direct buried, mounted in Hand Holds or Vaults. These units can withstand complete submersion in water without degrading their performance.

1.4.4 ACT446 units are available in a waterproof package (30X versions) which are used for underground/ pedestal applications and indoor units (40X versions),
Note: ACT446 outdoor version is normally sold as part of a full system that includes cables and ACT440 switch box.

1.4.5 ACT447 units are fully potted with cable stubs and are designed to mount underground in Hand Holds or Vaults. They are completely waterproof and submersible.

1.4.6 ACT445 units are designed for mounting in Central Telephone Offices or Fiber Regen Huts. These are not waterproof products and should not be exposed to moisture.

1.5 Voltage Considerations

1.5.1 When specifying protection voltage for Cable Locating Protection Systems please consider what affect the following factors have: A.C. Voltage Induced on Sheath and Voltage Level of Transmitted Tone

1.5.2. A.C. Voltage Induced on Sheath

1.5.2.1 Exposure of the Fiber Cable to High Voltage Power Lines (sharing of right of way) can cause A.C. voltage to be induced onto the cable sheath. It is possible to measure several hundred volts present on a floating cable sheath. Grounding the cable sheath can minimize the induced voltage, however, this practice also grounds the cable locating transmitter signal and essentially eliminates its use. By utilizing the ACT447 Filter and Protector Device induced A.C. voltage is effectively removed from the Cable Sheath and signal tones are passed unimpeded down the sheath. This method of treating the cable has proven to be effective, time saving and safe plant practice.

ACT Communications, Inc. Recommends using no less than 2 ACT447's on any fiber run and continue to add ACT447's throughout the fiber line until the induced voltage is decreased to less than 50 volts.

1.5.3 Plant Practices and Policies

1.5.3.1 Standard Plant practice for copper cable is to limit AC voltage to less than 50V rms present on the cable sheath. When selecting a Transmitter for the Cable Locating System, be aware that the output voltage may be as high as 100 volts A.C. rms on self-regulating systems during operation.

1.5.3.2 The ACT Cable Protectors type products will provide excellent protection and at the same time be compatible with the higher voltage transmitters available. Make sure all protector devices used on the system have either 150 volt or 350 volt D.C. clamp voltage.

1.5.3.3 350 volt D.C. clamping is always specified where an ACT447 Filter Protector is used.

1.5.4 **SAFETY OF PERSONNEL**

1.5.4.1 ACT Recommends that all plant safety practices for handling Fiber Cables be followed. Before any personnel physically touch a cable sheath, that sheath must be tested to see if foreign or induced voltages are present. During installation of the protection device, a temporary ground should be placed on the cable sheath and only removed once the Cable Locating Protector unit is installed.

1.6 Fail Safe Protection

1.6.1 Each Protector Isolator or Filter Device manufactured by ACT Provides a Fail Safe Protection. If the device fails, it will provide a hard ground to the cable sheath and thereby be easily located with the test and analytical capability inherent to the modern transmitter maintenance systems. This Fail Safe Protection provides added safety to the personnel working on the cable.

2.0 INSTALLATION CONSIDERATIONS & PROCEDURES

2.1 Tools and Materials Required

Flat blade screwdriver (medium)
Phillips head screwdriver (medium)
CAD welding machine
Screw hex nut wrench 1/2" socket
Utility knife
Heavy-duty pliers
Heavy-duty wire cutters
Crimp Tool
Die set

2.1.2 Test Equipment

Volt-ohmmeter (Multimeter)
Megger

2.2 Cable Preparation & Sheath Connection

2.2.1 The ACT Cable Locating Protection products are designed to be connected by approved plant practices directly to the fiber cable sheath. Access to the sheath is normally provided: (a) within the fiber closures (b) by external terminal connection on the fiber closures (c) inside a cable vault or (d) within the Fiber Regen Hut where the fiber cable is broke out to the distribution panel.

2.2.2 ACT Recommends that a 3M type bullet sheath connection bond clamp be used when connecting either the blue or black #6AWG stranded wire to the cable sheath (see fig. 2.2).

2.3 External Ground Connection

2.3.1 It is recommended that a ground rod be driven in or adjacent to the Hand Hold, or Vault, when field installing the ACT Cable Locating Protection Unit. Field cable grounds should be installed and meet local practices. A 25ohm or less ground is preferred. Although the system will operate with higher resistance, the higher resistance grounds will raise the D.C. clamping voltage and possibly cause unsafe conditions to exist. An Exothermic welded bond of the wire to the ground rod is the preferred method of connection since it will insure against resistance build up at the connection or subsequent corrosion and ultimate high resistance ground which is always a possibility with clamp or grip type connectors.

2.4 Pre-installation Tests

2.4.1 It is imperative that a Fiber Cable Sheath has continuity to properly insure operation of the Cable Locating Tone Transmission. If the cable is installed and spliced through and Cable Locating Protectors or Filters are to be added, the following tests are recommended.

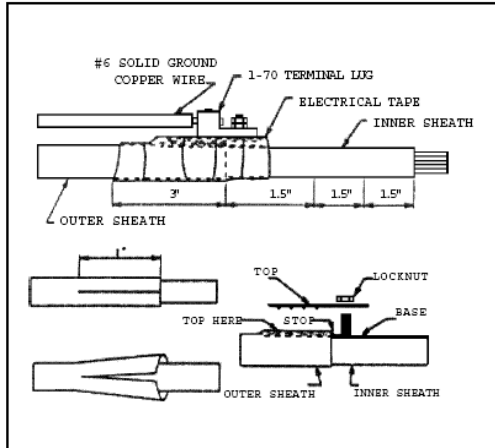


Figure 2.2
Recommended I-70 GND & Bonding Connection

2.4.2 A.C. Induction Voltage Test

2.4.2.1 With an A.C. voltmeter, either digital or analog type, measure between cable sheath and ground at each Central Office and Fiber Regen Location. Be sure direct ground is removed from sheath for this test. There should be no A.C. voltage present. If the tests show above 50 volt A.C. rms present, an ACT447 Filter Protector should be located at strategic points where A.C. voltage is induced onto the cable.

2.4.3 Ground Megger Test

2.4.3.1 This test should be performed where grounds are known to be difficult to obtain 25 ohm or less resistance. Where high resistance grounds exist, the installer should try driving multiple ground rods and connecting them in a circle. The ground rods should be spaced no more than twice the length of the ground rod. All ground rod connections should be exothermally bonded or use a U.L. approved compression connector.

2.4.4 Voltage Breakdown Test

2.4.4.1 The individual protector units can be tested for proper voltage breakdown by using the Joslyn Breakdown Tester. This test set generates a 1000Vdc low current impulse, which will activate the ACT protector and verify the D.C. clamping characteristics of the device. A good module will breakdown 150-200Vdc (150V rating) or 350-450 volts (350-volt rating).

2.5 Hand Holds

2.5.1 Hand Holds are a commonly used housing in the telecommunications industry, which can protect buried outside plant terminations and splices yet give ready access to installers and maintenance craftsmen. Install all Hand Holds according to the manufacturer's recommendation. When the Protector Isolator needs to be submersible, without shorting to ground, an ACT444 type Protector Isolator is used which has a submersible rating. ACT MFG LLC. Cable Locating Protector units should be mounted towards the upper portion of the sidewall. Mount the respective ACT444, ACT446 or ACT447 unit with two 1/4"x1 1/2" hex screws.

2.5.2 Connect the #6AWG stranded cable sheath wire to the fiber cable sheath either at the fiber closure external ground terminal lug or to the inside ground terminal. (See fig. 4.4 or 4.7) Note: It

is important that all sheath connections remain waterproof to prevent accidental shorting of the cable sheaths.

2.5.3 Maintain East-West sheath separation when using the ACT4464 Cable Locating Protection System. Blue Banded wire is connected to the East Cable Sheath, Black wire is connected to the West Cable Sheath. This configuration is usually installed as a special system or ACT446 unit. (See fig. 4.5 or 4.9).

2.6 Cable Vault

2.6.1 At Central Office locations the fiber cable normally enters the building through an underground cable vault. When the cable is being treated to filter A.C. voltage off the sheath, the ACT447 should be mounted in the cable vault. A ground bus is normally available in the vault, which the green wire will connect to. The cable sheath would be connected to the black wire via the use of a Bullet Bond Clamp and screw lug. (See fig. 2.2)

2.7 Pedestal

2.7.1 Certain ACT442 products are designed to mount in above ground or Pedestal applications. (See figures 4.6 – 4.9)

2.7.2 Standard Telephone Company Pedestals can be used to house the ACT Cable Locating Protector. The protectors are either single hole or dual hole mounted. See part-numbering matrix – section 4.0.

2.7.3 When using the Pedestal mount, the #6AWG wire is routed underground to a Hand Hold or direct buried with the closure. When connecting to the cable sheath, the connecting point should be enclosed within the closure.

*If the ground connector on the Fiber Closure is external to the closure, once the connection is made, the complete terminal and all exposed copper should be completely coated with silicon lubricant or other similar non-corrosive material. **A WEATHERPROOF CONNECTION IS REQUIRED.***

2.7.4 Pedestal mounting of the ACT Cable Locating Protector or Cable Locating Switch Device provides above ground access to the installer or craft technician for connecting field Tone Transmitters or separating EAST-WEST CABLE SHEATH.

2.7.5 Long Distance Carriers quite often place a Pedestal at the mid-point of a particular cable run for their craft people's access when making cable location test.

2.8 Wall Mount (Hut)

2.8.1 The ACT4454 & ACT4456 system units are designed with external tabs for wall mounting. The units should be affixed to a plywood board using ¼" screws or mounted to masonry with proper masonry screws. The weight of these units requires that they be firmly attached to the wall. (See fig. 8.3)

2.8.1.2 The ACT445 unit in the ACT445X system is connected to the Tone Transmitter via a control cable supplied by ACT. The cable sheath and ground wires use #6AWG stranded wire.

2.8.1.3 Always connect ground (green) wire first to the Office or Regen Local Earth ground bus. Next connect Black #6AWG

wire to the West Cable Sheath and Blue #6AWG wire to the East Cable Sheath. The final connection is the Tone Transmitter which is connected by the appropriate connectorized cable supplied by ACT MFG. Please see Part Ordering Guide, Section 4.0, for proper cable selection. The connectorized cables use male & female DB24 connectors. The ACT445 unit always requires the male end and the transmitter the female end.

2.9 Relay Rack Mount (C.O. or Hut)

2.9.1 Where the fiber cable is cabled directly to the relay rack the ACT445 can be mounted using the mounting brackets provided. Cabling will be identical to the Hut mounted instruction.

2.10 Filter & Protector (See Fig. 4.13)

2.10.1 The ACT447 series provides both A.C. filtering and surge protection in one unit. The ACT447 can be either wall mounted at Regeneration or Central Office or Vault wall mounted in the field.

A ¼" x 1/1/2" hex screw is recommended for mounting this unit.

2.10.1.2 Connect # 6AWG Earth Ground (green) wire to ground rod. Use an Exothermic CAD weld or U.L. approved Compression connector.

2.10.1.3 Connect the #6AWG EAST/WEST Cable wire to cable sheath via the isolated ground connection on the Fiber Closure.

2.10.1.4 At Regen or Central Office locations, the ACT447 can be connected to the Fiber Cable Sheath with a 3M Bullet Bond connector where the sheath terminates in the building.

2.11 Protector Isolator

2.11.1 The basic protector isolator used in all of the ACT family is a Hybrid Protective Device which uses a maximum duty 3 element gas tube in parallel with heavy duty MOV's. The MOV's provide fast clamping (1.5 nanoseconds) protection and limits the surge voltage to the rated voltage unless a very high voltage surge is experienced. When this happens the Gas Tube ionizes and crow bar shorts the cable sheath to ground. Thus the protector provides faster clamping re and heavier surge rating, 1600 joules, as compared to normal telecommunications protectors.

2.12 Ground Rod Connections

2.12.1 A ground rod is only a part of the total grounding and protection system. To be totally effective, the grounding system must do the following:

- a.) Provide a low impedance path to ground
- b.) Withstand and dissipate repeated fault and surge currents.
- c.) Provide corrosion resistance to various soil chemistry for the life of the equipment being protected.
- d.) Provide rugged mechanical properties for easy driving with minimum effort and rod damage.

2.12.2 Depending upon soil conditions the ground rod should be driven at least 3 feet from the bottom of the ditch or Hand Hold. Preferably the rod should be driven to a point where the soil remains moist year around.

2.12.3 Where ground rods have to be driven below 8 feet a sectional type ground rod should be used.

2.12.4 In corrosive soils it is recommended that copper bonded ground rods be used. These rods have a 99.9% pure copper sheath metallurgically bonded to a cold drawn carbon steel core. The uniform layer of permanently bonded copper assures an extended life in even corrosive soils.

2.12.5 An exothermic weld is recommended for connecting the ground wire from the protection isolator to the ground rod.

If user plant practices permit, a compression connector can also be used.

2.13 All Dielectric Cable & Use of Tone Wire

2.13.1 Where plant practices dictate the use of all Dielectric Fiber Cable, a common practice is to bury a trace wire in the trench with the fiber cable. This wire must be for direct burial and adequately gauged to transmit a tone signal, which is not attenuated, to a point that it cannot be detected with the location receiver.

2.13.1.2 The tone wire is terminated to the Protector Isolator in the same way a Fiber Sheath would be connected.

2.14 Spur Cable (side leg)

2.14.1 Whenever a smaller fiber cable is branched off of the main backbone cable the cable locating tone must be balanced. If untreated the short route will bleed most of the energy because of its low impedance path to ground. At these locations a spur termination unit is used which provides impedance to the signal allowing most energy to remain on the backbone sheath and extends a weaker signal to the spur cable. This is adequate to allow detection up to **5** miles.

2.14.1.2 Whenever a spur cable length is similar to the backbone it is recommended that the far end of both backbone and spur cables be grounded.

2.14.1.3 If more than 3 spur cables are to be connected to the backbone please contact us so we can have one of our Application Representatives in your area contact you for direct support.

2.15 Location of Protectors

2.15.1 Ideally protector isolators should be placed at every Fiber Closure location. The only grounding a fiber cable will get is provided by the protector isolator; therefore a protector isolator should be located at every personnel access point. This will then provide maximum safety and convenience for personnel handling the fiber cable or closure systems.

2.15.1.2 Frequent spacing of protector isolators will reduce the possibility of multiple surges being transmitted along the cable and entering buildings.

2.15.1.3 Any deviation from this practice should be done only after all safety considerations are made and preventative measures have been taken to reduce the risk to personnel handling cable at intermediate untreated locations.

3.0 ACT PROTECTION PART NUMBERING MATRIX

3.1 ACT440 Manual Switch

ACT440-000-XY0

X- Enclosure

- 1 – 3”x 2”x1” pedestal mount
- 2 – 4” x 4” x 1.7” weather proof enclosure

Y-Unit Type

- 1 e/w 2 #8 terminals with shorting bar
- Example: ACT44441-110-000

3.2 ACT442 Pedestal / Indoor Protector

ACT442 –ZZZ- X0Y

ZZZ – Protection Voltage

- 150 DC clamp voltage
- 350 DC clamp voltage

X – Indoor or Pedestal Mounting Type

- 2 3”x2”x1” Pedestal mount

Y – Termination

- 0 e/w ¼” terminals
- 1 e/w 6 awg crimp lugs on terminal

Example: ACT442-150-200

3.3 ACT444 Buried Protector (Single Sheath Connection)

ACT444 – ZZZ – XOY

ZZZ – Protection Voltage

- 150 DC clamp voltage
- 350 DC clamp voltage

XOY-Mounting Type

- 302** Waterproof, for LONG HAUL and METRO in-line grounds, E/W two 6ft #6 AWG color coded stubs
- 352** Waterproof, for LONG HAUL spur and , E/W two 6ft #6AWG color-coded stubs
- 402** Waterproof, for METRO end of line grounds only, E/W two 6ft #6AWG color coded stubs

Example: ACT444-150-302

3.4 ACT 445X Electronic Switch Box System – (only used in ACT4454 /ACT4456 /ACT4457 systems – typically not sold by itself)

ACT4454-ZZZ SYSTEM Dual direction, consists of:

ACT445-500-ZZZ & (1) ACT4454-S12-040 cable.

- Where ZZZ = 150v or 350v protection level

Part Number Example: ACT4454-150

ACT4456-ZZZ SYSTEM Quad direction, consists of:

ACT445-600-ZZZ, (1) ACT4454-S12-040 cable.

- Where ZZZ = 150v or 350v protection level

Example: ACT4456-150

ACT4457-ZZZ SYSTEM Sixteen direction, consists of:

ACT445-700-ZZZ, (1) ACT4457-S18-040 cable.

- Where ZZZ = 150v or 350v protection level

Example: ACT4457-150

ZZZ – Protection Voltage

150 DC clamp voltage

350 DC clamp voltage

3.5 ACT446 Dual Direction Protector and ACT4464 Dual Direction System

ACT446 – ZZZ– XXX

XXX-Mounting Type

210 Weather proof Dual Direction Cable with Sealed shorting Bar , without leads

214 Weather proof Dual Direction Cable with Sealed shorting Bar , with wire compression lugs

212 Weather proof Dual Direction Cable with Sealed shorting Bar , with (3) 6ft 6AWG cable stubs (connects to cable sheaths and ground), Black, Red and Green (Ground)

312 Waterproof Dual Direction Cable with (3) 6ft 6AWG cable stubs (connects to cable sheaths and ground), Black, Red and Green (Ground)

410 Pedestal Mount e/w shorting bar (Indoor or pedestal mount)

Note: Various cable lengths available upon request

ZZZ – Protection Voltage

150 DC clamp voltage

350 DC clamp voltage

Typical Example:

ACT 446-150-210

ACT446-150-312

ACT 446-150-410

3.6 ACT447 MATRIX

ACT447 – XXX – ZZZ

XXX-Filter Type

112 1 Amp Band Reject Filter*(60Hz)

312 3 Amp Band Reject Filter*(60 Hz)

ZZZ – Protection Voltage

350 DC clamp voltage

4.0 **SAFETY**

4.1.1 Installation

4.1.1 All Outside Plant practices for safety must be followed while installing the Cable Locating Protection System. Of particular importance is Electrical Hazard Safety.

4.1.2 DO NOT TOUCH the cable sheath or wire terminals connected to the sheath with a bare hand.

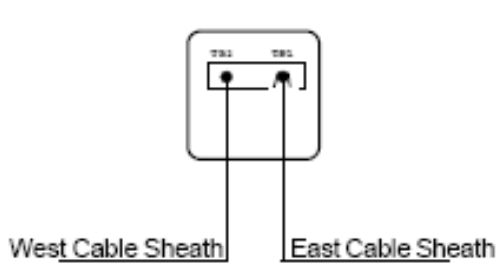
4.1.3 Use Dielectric Insulated Gloves when handling any cable sheath and grounding system.

4.1.4 Use only tools that have Dielectric Insulated handles.

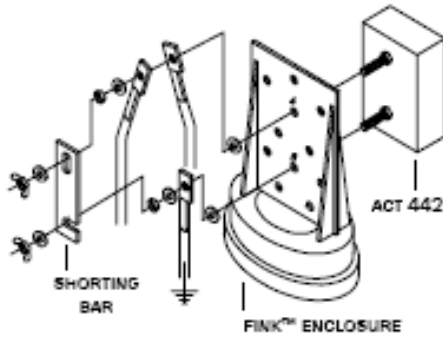
4.2 Testing

5.2.1 Pretest cable sheaths at each location to determine if AC voltage exists. Install the ACT447 Filter Isolators at any location where induced AC voltage exceed 50 volts.

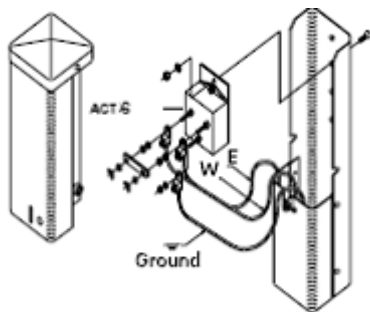
APPLICAION DRAWINGS



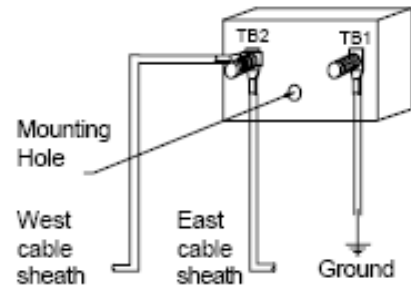
ACT440 Manual Switch



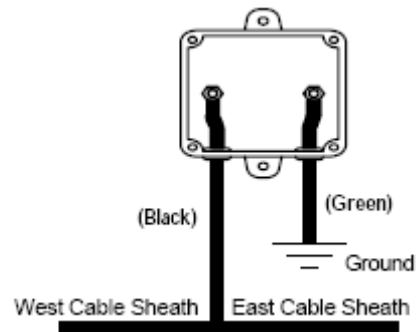
ACT442 in Fink type Pedestal



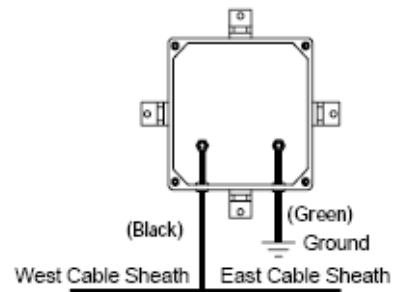
ACT446-150-410 Pedestal Mount



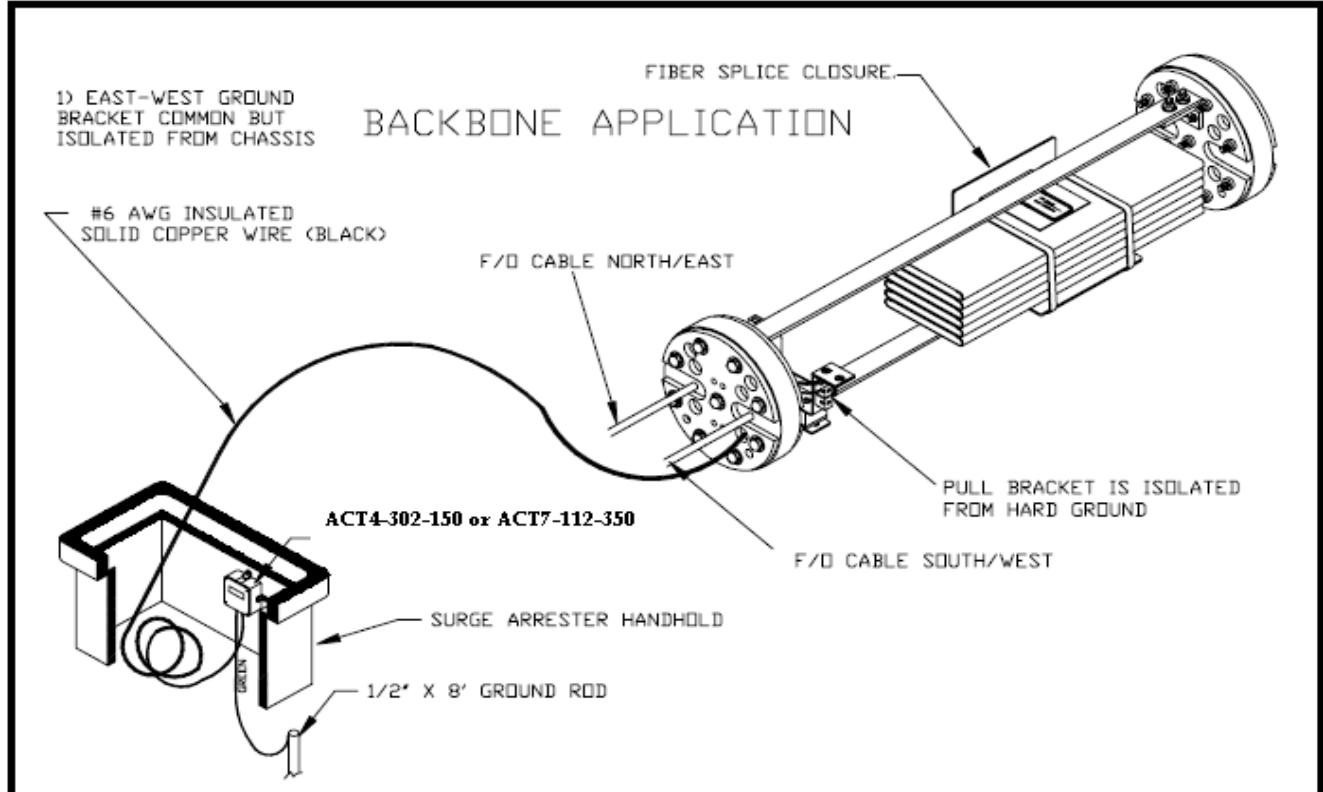
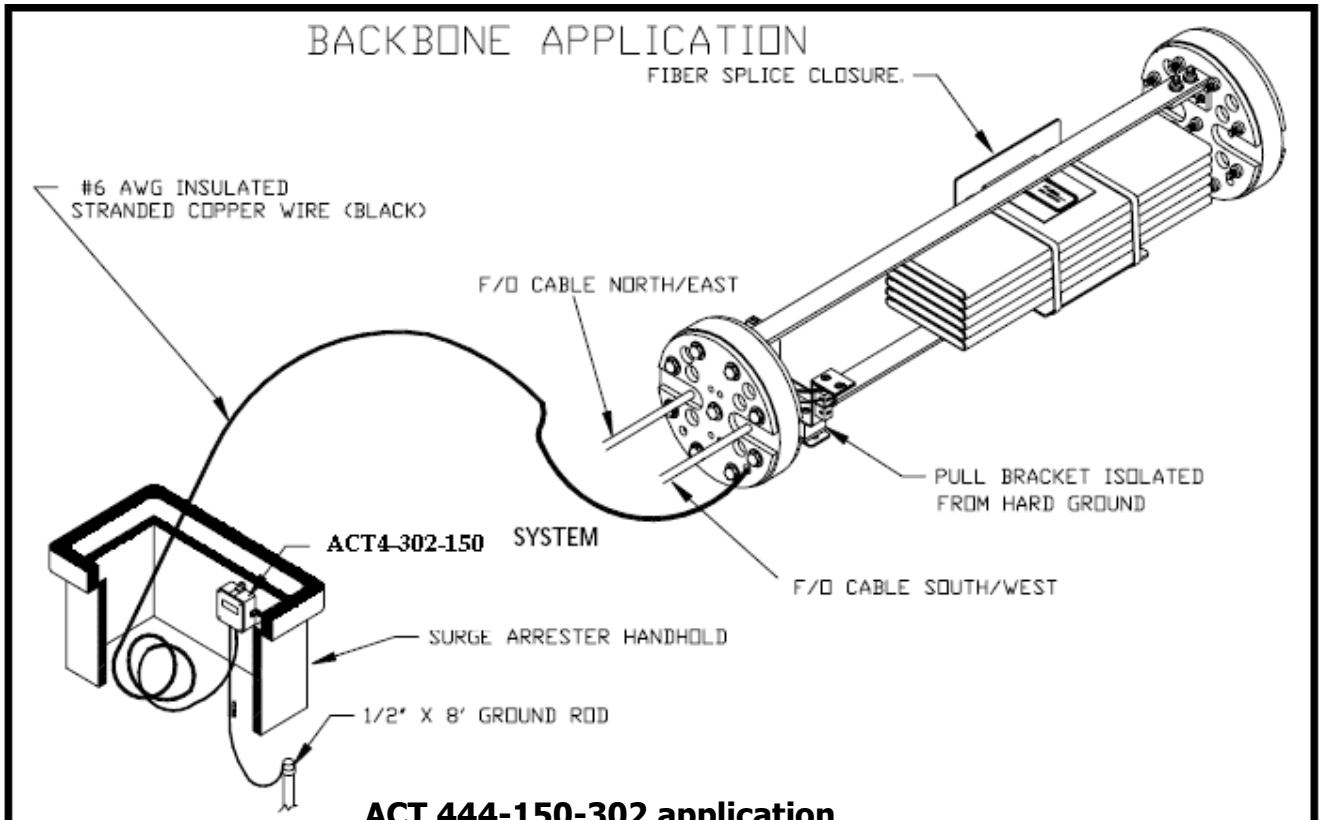
ACT 442 Pedestal Protector



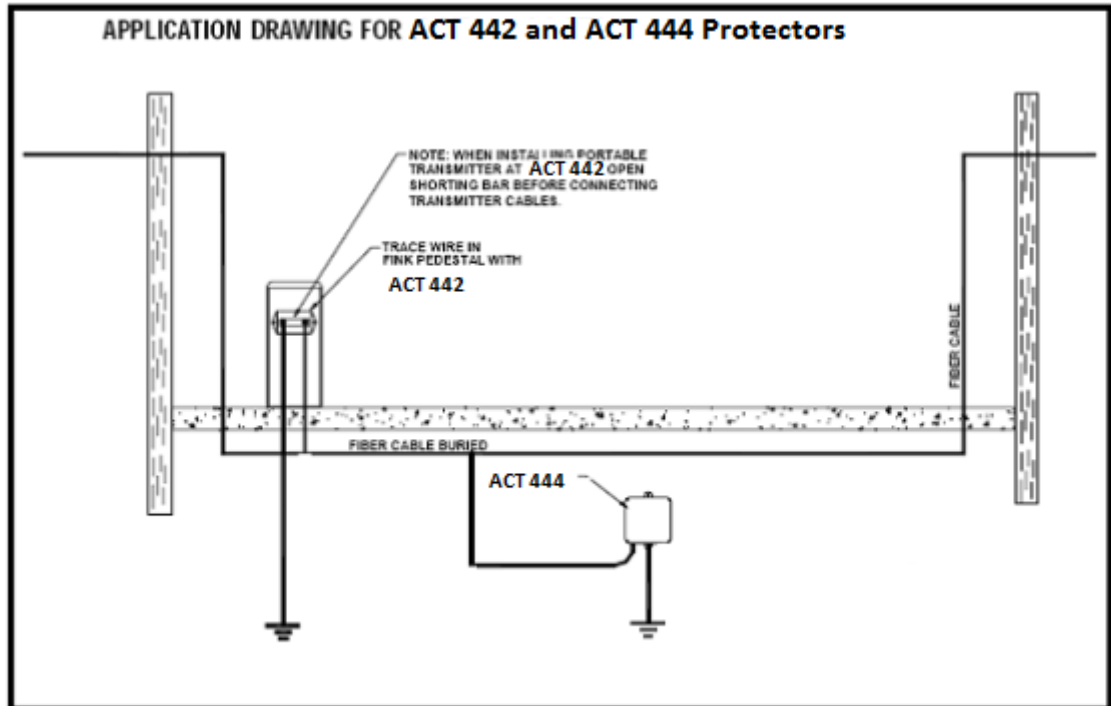
ACT444 Waterproof Protector



ACT447 Filter Waterproof Protector

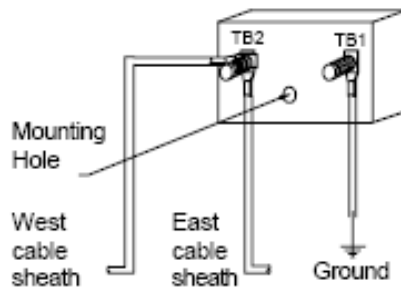
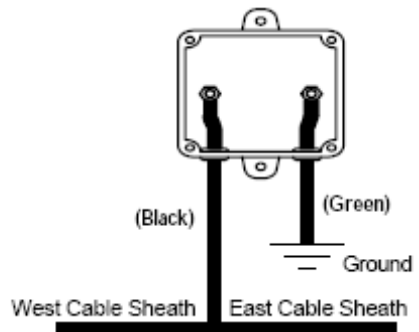


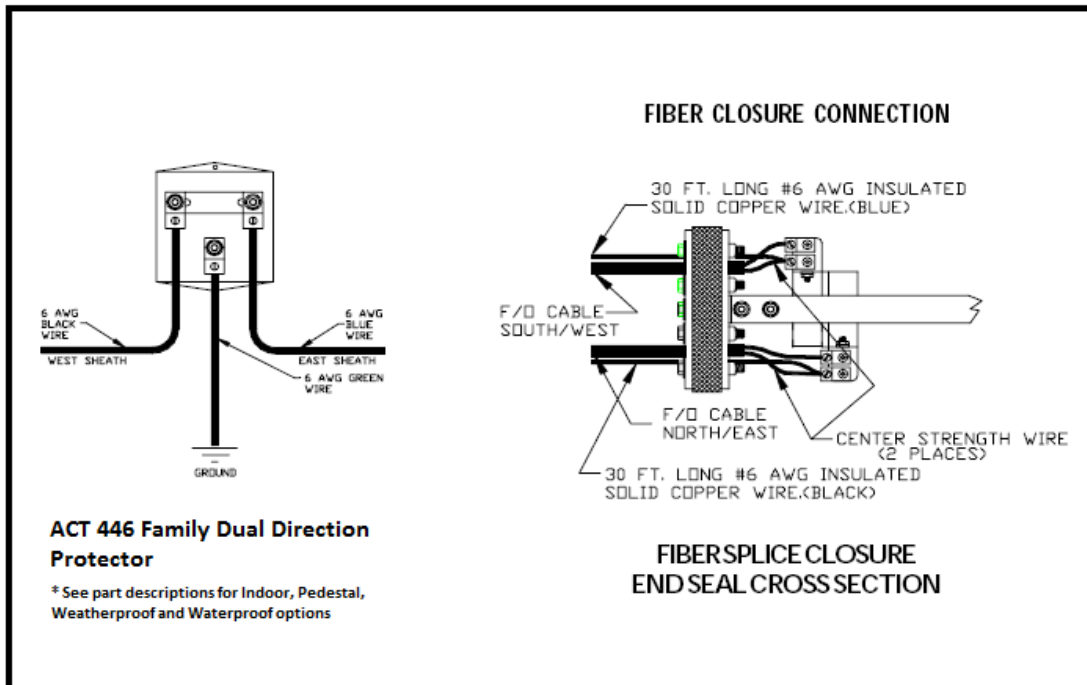
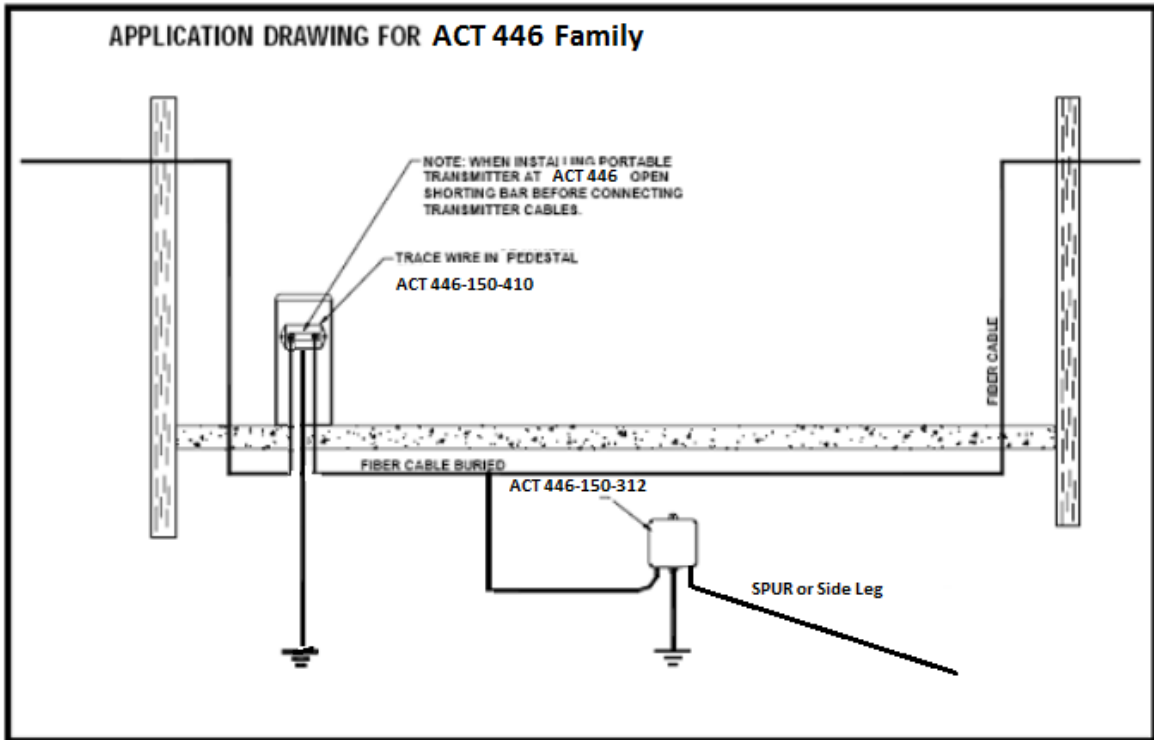
ACT 442 and ACT 444 Cable protector Application

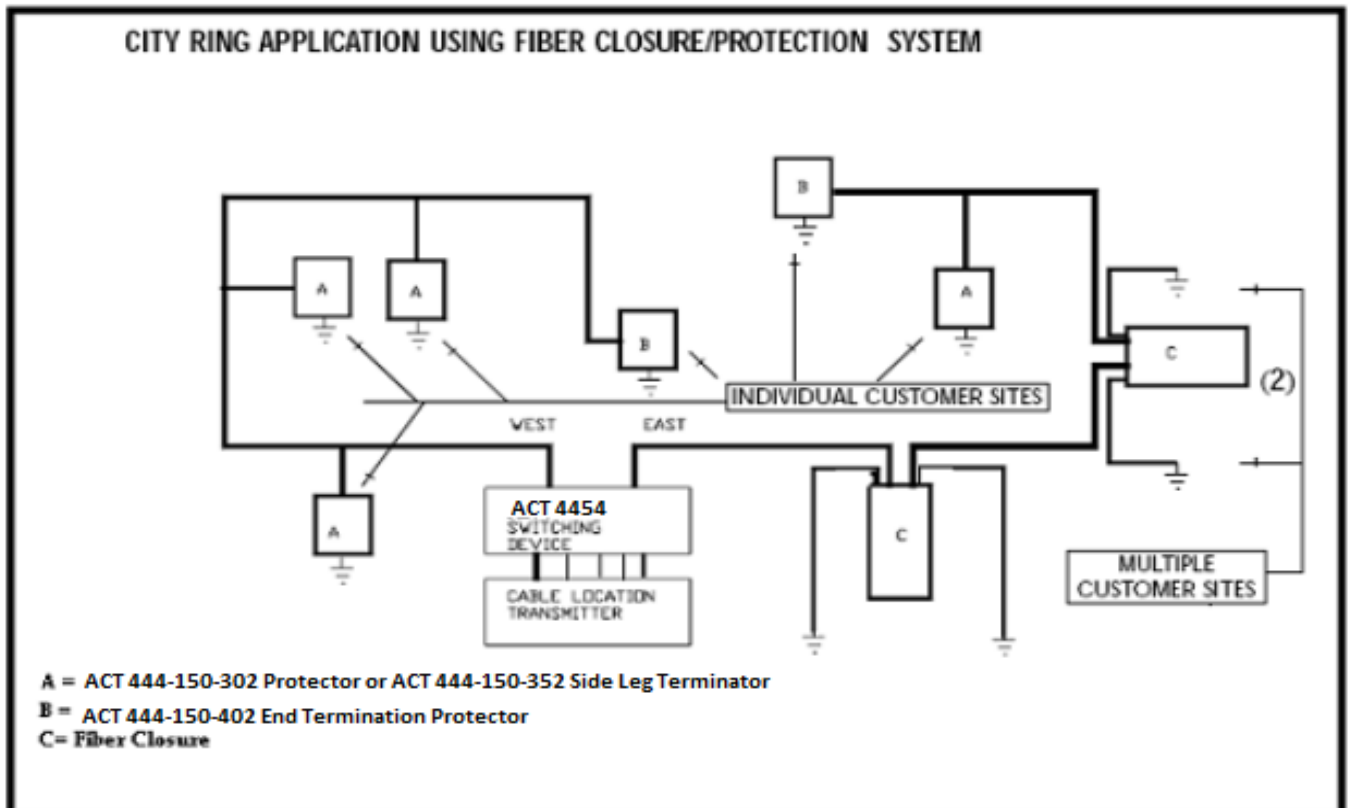


ACT 444 Waterproof Protector

ACT 442 Pedestal Protector








For City Ring and multiple drop system you will need ACT 444-150-302 for the backbone, and the (A) ACT 444-150-352 for each spur drop and for the end of the backbone a (B) ACT 444-150-402 must be installed.

CONTROL HARNESSES

WIRE LIST		
P1 PIN #	CONDUCT COLOR	P3 (ACT)
13	WHT/BLU	13
1	BLU/WHT	1
14	WHT/ORN	14
2	ORN/WHT	2
15	WHT/GRN	15
3	GRN/WHT	3
16	WHT/BRN	16
4	BRN/WHT	4
17	WHT/SLT	17
5	SLT/WHT	5
18	RED/BLU	18
6	BLU/RED	6
19	RED/ORN	19
7	ORN/RED	7
20	RED/GRN	20
8	GRN/RED	8
21	RED/BRN	21
9	BRN/RED	9
	RED/SLT	
	SLT/RED	
	BLK/BLU	
	BLU/BLK	
	BLK/ORG	
	ORG/BLK	



(40 ft. long)

ACT5-S12-040 DB24 connectorized cable, 40 feet in length, connects ACT54 & ACT56 units to Logline Maintenance Systems tone transmitters.

(40 ft. long)

ACT5-S18-040 DB36 connectorized cable, 40 feet in length, connects ACT57 units to Longline Maintenance Systems tone transmitters.
All switch box systems are sold as system numbers when combined with cable harness.

WIRE LIST		
P1, LLTS	CONDUCT COLOR	P3 (ACT)
SIGNAL OUT(BLUE)	BLUE/WHITE	1
2	ORANGE/WHITE	2
3	GREEN/WHITE	3
4	BROWN/WHITE	4
5	SLATE/WHITE	5
6	BLUE/RED	6
7	ORANGE/RED	7
8	GREEN/RED	8
9	BROWN/RED	9
10	SLATE/RED	10
11	BLUE/BLACK	11
12	ORANGE/BLACK	12
13	GREEN/BLACK	13
14	BROWN/BLACK	14
15	SLATE/BLACK	15
16	BLUE/YELLOW	16
17	ORANGE/YELLOW	17
18	GREEN/YELLOW	18
SIGNAL OUT(BLUE)	WHITE/BLUE	19
20	WHITE/ORANGE	20
21	WHITE/GREEN	21
22	WHITE/BROWN	22
23	WHITE/SLATE	23
24	RED/BLUE	24
25	RED/ORANGE	25
26	RED/GREEN	26
27	RED/BROWN	27
28	RED/SLATE	28
29	BLACK/BLUE	29
30	BLACK/ORANGE	30
31	BLACK/GREEN	31
32	BLACK/BROWN	32
33	BLACK/SLATE	33
34	YELLOW/BLUE	34
35	YELLOW/ORANGE	35
SIGNAL RETURN(WHITE)	YELLOW/GREEN	36

*USED ON 32 DIRECTION UNITS ONLY

