SureReach 2000 Field Units

Installation Manual

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Revision History

Revision	Date	Change
0.0.1	June 1, 2008	First release for Draft review
1.0.0	August 2, 2008	Updated photos
1.1.0	April 3, 2009	Improved description of bonding and grounding
1.1.1	April 20, 2009	Improved label and label description
2.0.0	November 9, 2009	Changes for SureReach 2000 series
2.0.1	November 17, 2009	Added safety warning to turn off power before servicing
2.0.2	October, 19, 2012	Clarified grounding procedure

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1. Introduction

SureReach 2000 Overview

The *SureReach* 2000 field unit is an environmentally hardened device that is designed to provide power to field mounted devices such as fiber to the home (FTTH) optical network terminals (ONT). The unit can provide 50 watts of DC power over standard twisted pair copper wire. The SR2000 is packaged in an aluminum enclosure with a slide-able cover that is secured with a hex-"security" bolt. Optional, a hole is provided for a tamper-proof seal or small lock. It is offered with a variety of input-output VDC options, and a special version (SR2-12190S) that can "switch" between an external "emergency" Network Line Power (NLP) +/- 190 VDC and a local 12 VDC power source fed off commercial power.

Figure 1: SR2-12190 with ONT

Applications

The *SureReach* 2000 field unit is designed to be placed adjacent to field mounted electronic systems such as a FTTH ONT. It is a line-powered system that uses the copper telephone network and eliminates the need for commercial power and back-up batteries. It operates most optimally when powered by a Lineage Power CPS3200U with +/- 190 volts in the central office.

Web Site

For further information about the *SureReach 2000* field unit visit the Generonix Web site at http://www.generonix.com/.

Customer Service Contacts

For customers in the United States, Canada, Puerto Rico, and the US Virgin Islands, call toll free 1-866-464-4693. This number is staffed from 7:00 am to 5:00 pm Eastern Time Zone, Monday through Friday, on normal business days. At other times this number is still available, but for emergencies only. Services provided through this contact include initiating the spare parts procurement process, ordering documents, product warranty administration, and providing other product and service information.

For other customers worldwide the toll free number may be accessed after first dialing the AT&T Direct country code for the country where the call is originating, or you may contact your local field support center or your sales representative to discuss your specific needs. You may also contact support@generonix.com .

2. Product Description

Product Configuration

There are three product configurations:

1. SR2-12190 (providing 12VDC/55Watts max. steady state always-on NLP powered)
2. SR2-48190 (providing 48VDC/55Watts max. steady state always-on NLP powered)
3. SR2-12190S (providing 12VDC/55Watts max. steady state switchable with local alternative power source)

Physical Description

The *SureReach* 2000 field unit is compact (Width: 3.94 in. (100 mm), Height: 4.72 in. (120 mm), Depth: 1.5 in. (38 mm), Weight .8 lbs. (.373 kg)) and designed to be easily incorporated into the telephone outside plant network. The *SureReach* field unit can be mounted on a wall using three #8 x 1 ½" pan head screws with RTV sealing compound. A detailed label is provided on the inside of the cover identifying each of the connections to the *SureReach 2000* field unit (see Figure 2). The SR2-12190 and SR2-48190 use 6 pin molex connectors; the SR12190S uses a 10 pin connector, with additional connections to support the external 12VDC source and power status circuit.

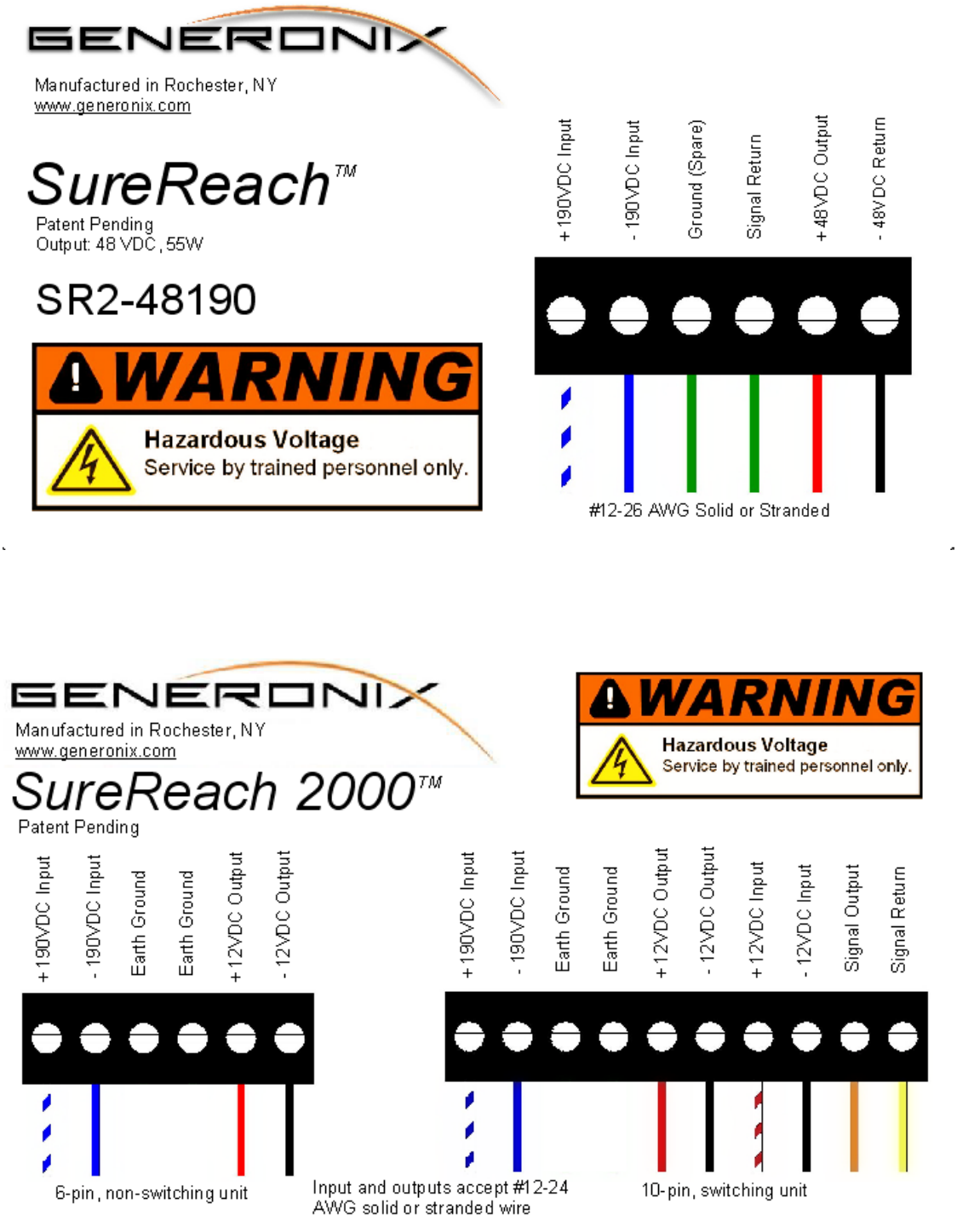

Figure 2: *SureReach* 2000 field unit Customer Access Compartment Labels

Operation

Power for the *SureReach 2000* field unit is provided over standard 19-26 gauge copper cable pairs found in the telephone outside plant network. Each power circuit may be connected to the central office power unit using one copper pair or multiple pairs depending on the loop resistance between the central office and the field unit, and the power required at the *SureReach 2000* field unit. A single power circuit can provide up to 50 watts of power. A central office power unit converts normal –48v DC central office voltage to +/-190V for delivery to the *SureReach* 2000 field unit. Power terminates into the *SureReach* 2000 field unit on one 100VA +/- 190V circuit. Input connections to the *SureReach* 2000 field unit are made through a Molex connector located in the customer access compartment (See figure 3).

The SR12190S has an advanced "switch-able" feature. The ONT is normally powered off a local 12VDC source that is powered from 115VAC; if the commercial AC power fails, SR2000 will automatically switchover to the NLP +/- 190 VDC source; it will also activate a power status circuit which can signal the ONT to the loss of local power and the ONT can generate an alert.

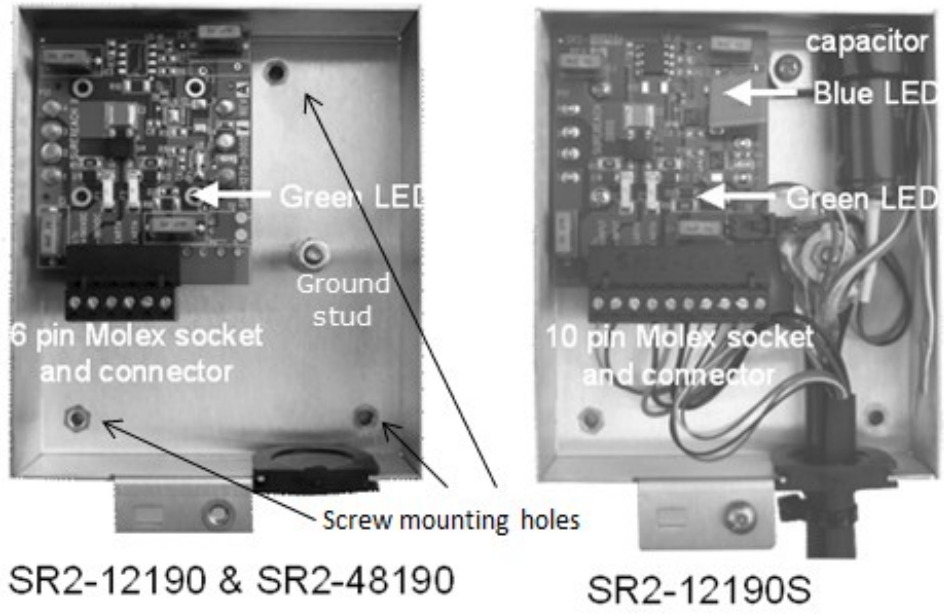

Figure 3: Customer Access Compartment.

Switch able units also have an optional capacitor that stores power to support a "hitless" switchover between NLP and local AC commercial power.

3. Engineering

The *SureReach* 2000 field unit will provide sufficient 12V DC or 48V DC power (model dependant) to power most industry ONTs. Two variables determine the output power of the *SureReach* field unit: 1.) the voltage available from the Central Office, and 2.) the loop resistance of the Outside Cable Plant pairs feeding the *SureReach* 2000 field unit. SureReach 2000 requires a minimum input voltage of 250V DC for normal operation.

Table 1 provides the loop resistance for most commonly available copper conductors found in the telephone Outside Plant network. The length by gauge between the central office and the *SureReach* field unit and the loop resistance allows the engineer to calculate the total loop resistance. Note: Values are taken from *Outside Plant Engineering Handbook, Bell System Practice, 1983.*

Loop Resistance of Telephone Cable	
AWG Gauge and Material	**Ohms/KF at 68 degrees F**
19 Copper	**16.3**
22 Copper	**32.8**
24 Copper	**51.9**
26 Copper	**83.3**

Table 1: Loop Resistance of Telephone Cable

As all copper has some resistance, and the resistance depends on the radius of the copper cable, some power will be dissipated. The larger the diameter of the copper wire (and the lower the gauge), the lower the resistance. The resistance is proportional to the "reach" or loop. The available power decreases as loop resistance increases. If ONT or other devices require lower power, then the "reach" may be longer. Where loops are over 500 ohms, two pairs may be used to half the resistance.

The calculation of reach vs. power required vs. distance vs. cable-gauge is a complex algorithm. Generonix has provided a spreadsheet based tool titled *Network Line Power Calculator*, which may be found at www.generonix,com, Note that these are calculations based on laboratory conditions: actual field values may be different due to a variety of environmental, configuration, installation, and other factors.

Depending on the power requirements of devices attached to the SureReach, it may be possible to run multiple SureReach units off of one upstream line port over one or more copper line pairs. It may also be possible to run multiple local devices off of one SureReach unit at the house or building. However, care must be taken not to exceed the 55 watt steady state or 75 watts transient peak power limits of the unit. In particular, when using ONTs connected to local phones, the peak power for ringing and off-hook of these devices draw much more power, and the peak usage should be assumed, or else you may have restart or other failures. In general, it is

best to put one SureReach for one ONT; that way, if you lose a single line pair only one ONT customer is affected. See the Network Line Power Calculator on the Generonix web site for more details on handling power and peak transients.

4. Safety

Safety Statements

Please read and follow all safety instructions and warnings before installing, maintaining, replacing, or rewiring access to the system:

The main output voltage (12V or 48V) meets Separated Extra-low Voltage (SELV) requirements of EC 61140.

WARNING Indicates the presence of a hazard that can cause death or severe personal injury if the hazard is not avoided.

CAUTION Indicates the presence of a hazard that will or can cause minor personal injury or property damage if the hazard is not avoided. This symbol identifies the need to refer to the equipment instructions for important information.

When working on or using this type of equipment, the following precautions should be noted:

This unit must be installed, serviced, and operated only by skilled and qualified personnel who have the necessary knowledge and practical experience with electrical equipment and who understand the hazards that can arise when working on this type of equipment. Always turn off the high voltage central office power circuit when servicing or replacing a *SureReach* 2000 field unit.

Hazardous energy and voltages are present in the unit and on the interface cables that can shock or cause serious injury. Follow all safety warnings and practices when servicing this equipment.

High voltage DC can be dangerous. It is recommended that upstream Central Office voltage converter units support current limit and ground fault safety circuitry to enhance craft safety. All upstream central-office and outside-plant and downstream premises-based units should comply with the provisions of NEC Article 830 and UL 60950-1, and IEC, Telecordia, and all other relevant product standards, including recommendations for power-passing components, cable listing, marking, voltage and flame-spread requirements, electrical protection, grounding and installation practices. Appropriate craft and installation safety precautions should be followed on installation of all components and the cabling of network line powered elements.

5. Installation

CPE Installation

Purpose

- To install the *SureReach* field unit in field location.

Precautions

- Observe personal protection while installing.

Safety

- Always consider personal safety.
- Make sure the system is properly grounded per the National Electrical Code and local building codes.
- Remove all metal jewelry before beginning the installation.

Installation Tools

- Torque wrench (0-240 inch-lb or 28 Nm)
- Wire Cutters and Strippers
- 3/8” or 10 mm hex driver
- 12 and 48 Volt test load
- Digital meter with an accuracy of +/- 0.02%
- Screw Drivers (flat-blade and hex for security bold)

Unpack the *SureReach* 2000 field unit

The box contains:

- One *SureReach* 2000 field unit
- Product Documentation
- Parts kit

SureReach 2000 Unpack

1. Unpack the box. Inspect the shipping container for any signs of damage. If damage exists, have the carrier's representative sign a note acknowledging the damage.
2. Carefully cut the sealing tape and remove the unit.
3. Save the shipping package until all parts are operating within specifications.

Installing the *SureReach* 2000 Optional Capacitor

Some models of the SureReach come with a large storage capacitor that must be installed as part of the field installation. The capacitor is plugged into the SureReach circuit board by pushing the connector on the ends of the capacitor leads into the mating connector on the lower right hand corner of the circuit board. Route the leads as shown and install the clamp around the end of the capacitor and secure by placing the mounting screw through the clamp and mounting hole into the mounting surface. (See figure 4 for details)

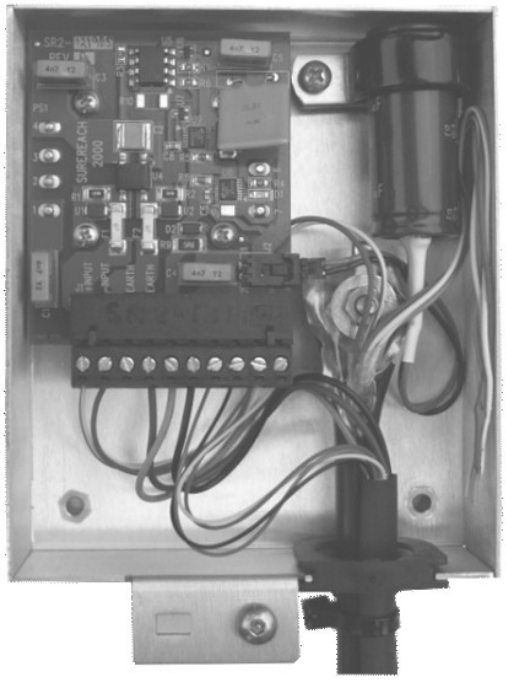

Figure 4: Intalling Optional Capacitor

Mounting the *SureReach* 2000 field unit

SureReach 2000 Wall Install

Use the following procedure to mount the *SureReach* 2000 field unit to an exterior wall:

1. Attach the *SureReach* 2000 field unit using three #8 x 1 1/2" pan head screws with RTV sealing compound under the head.
2. Self-tapping screws or sheetrock anchors may be used to mount the unit to a variety of surfaces.

CAUTION Do not connect the central office power unit to the cable pairs that will power the SureReach field unit until all input and output connections are complete and secure.

Connecting to the *SureReach* 2000 field unit

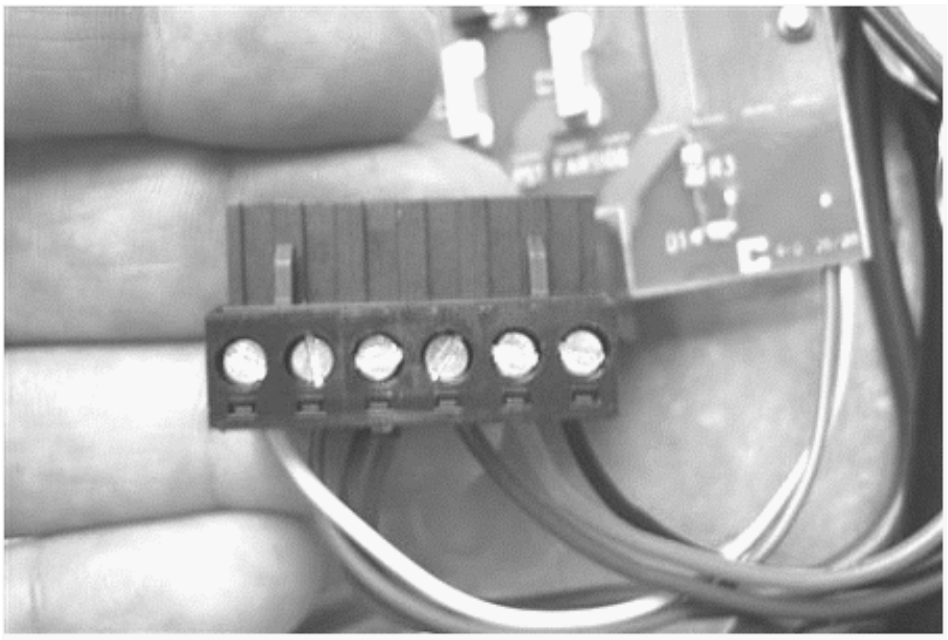

Figure 4: *SureReach* 2000 field unit connections

Figure 5: SureReach 2000 Wire Storage]

Making the Power Input Connections to the *SureReach 2000* field unit

The *SureReach* 2000 field unit is designed to accept a variety of wire types to connect to the outside plant network. Outdoor Cat3 wire or two pair drop wire may be used to connect to the powered device. A minimum of 24 gauge is recommended to connect the *SureReach 2000* field unit to the outside plant network. The Input Molex connector will accommodate any solid or stranded wire from 26 gauge to 12 gauge. Strip ¼" of insulation from the wires prior to

connecting to the Molex connector. Bond the buried service wire metallic sheath to the ground stud located in the wire chamber where applicable.

A #14 copper insulated grounding conductor must be connected from one of the SureReach 2000 Earth Ground connections on pins 3 or 4 of the Molex connector to the nearest accessible location on the structure grounding electrode system per NEC Article 830.100. The grounding electrode system is covered in NEC Article 250.50. It typically consists of an approved metal underground water pipe that is bonded to an 8' driven ground rod that is part of the commercial power installation. Connections to grounding electrodes shall comply with NEC 250.8.

Connect the input line power using pins 1 and 2 of the Molex connector. Multiple *SureReach 2000* field units can be served from one +-190v central office port. For example, referencing Table 2, two 18W ONTs served with 24-gauge wire at approximately 5,000 feet can be served with one +-190v central office port.

Making the DC Input and Power status connections for the SureReach 2000 Switched version

The SureReach 2000 Switched field unit has provisions for a local DC power input located on pins 7 and 8 of a 10 pin Molex connector. The inputs are for a local 12vdc power source that will provide primary power for the ONT. In the event of a commercial power failure the local 12vdc power will be lost and the SureRech 2000 Switched unit will automatically switch to network line power to keep the ONT operational.

The SureReach 2000 Switched field unit also has the ability to provide a power status signal to the ONT indicating weather the SureReach Switch able unit is powering the ONT using local DC power or Network Line Power. Pins 9 and 10 of the Molex connector allow the Telco to send a power status via an ONT. A normally closed (low resistance) indicates commercial power is present and a high resistance indicates loss of local power. Connect the signal leads to the ONT following the manufacturer's directions.

Making the DC Output Connections from the *SureReach 2000* field unit

Output power (12vdc or 48vdc) is provided on pins 5 & 6 of the Molex connector. 24 gauge or larger wire is recommended between the SureReach and the load. Strip ¼" of insulation from the wires prior to connecting to the Molex connector. A maximum of 50w of power is available. The ONT requires two connections; +12vdc, and -12vdc or +48vdc and -48vdc.

Powering the *SureReach 2000* field unit

When all the input and output connections are complete, apply power at the central office to the outside cable plant cable pair(s) that will power the *SureReach 2000* field unit. See manufacture's instructions for the installation and operation of the central office power unit.

A small green LED located on the SureReach 2000 circuit board indicates the presence of network line power provided output voltage (See Figure 3). In bright light conditions it may be necessary to test for the presence of power by using a multi-meter, connecting to pins 5 and 6 of the Molex connector.

In the event the green LED is not lit and expected voltage is not present on pins 5 and 6, test for the presence of more than 250V DC on the input line on pins 1 and 2. If less than 250V DC is measured refer to Section 3.

For the SureReach 2000 Switched version, complete the line power-up steps above and then plug in the local 12VDC power supply. The green LED will extinguish when local power is applied and a blue LED will light. Make sure the powered device is operational.

Secure all of the input and output cables by placing a cable tie around all of the cables approximately 1" below the SureReach housing (See Figure 5).

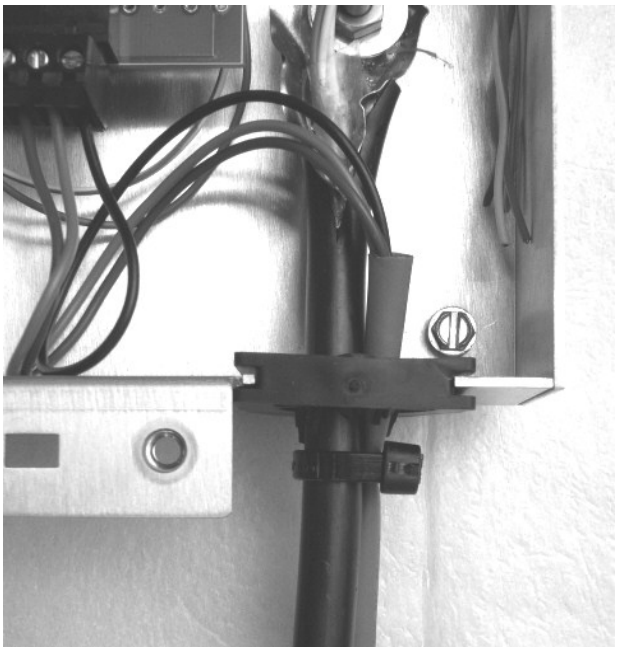

Figure 5 Cable Tie for SureReach

Install and secure the SureReach using the security head bolt provided. An optional seal or cable tie may be placed through the slot to the left of the bolt to provide additional security.

6. SureReach Turn-up and Troubleshooting

The following steps should be followed to assure proper installation and operation of SureReach units. Hazardous energy and voltages are present in the unit and on the interface cables that can shock or cause serious injury. Follow all safety warnings and practices when servicing this equipment. If further assistance is required please contact Generonix Technical Support at 1-866-464-4693.

1. Measure the loop resistance of the circuit feeding the SureReach unit and compare it to the estimated loop resistance from the SureReach Calculator. Check for any resistance between tip and ring and between tip and ring to ground.

2. Verify that the SureReach output voltage matches the input voltage requirements of the ONT.

3. Verify input and output connections are secure and that the insulation was removed prior to insertion into the Molex connector.

4. Verify the polarity of the output connections to the ONT from pins 5 and 6 of the Molex connector.

5. Verify the presence of a ground connection to pin 4 of the Molex connector.

6. Verify that the male Molex connector is fully seated in the female on the SureReach circuit board.

7. Activate the upstream port and observe the LED on the SureReach circuit board (SR4875's do have an LED. Test for the presence of output voltage (12-15 vDC or 48-52 vDC depending on model) on pins 5 and 6).

8. When the SureReach LED turns on verify that the ONT is operational via its status lights.

9. If the LED does not light test for the presence of >250vDC on pins 1 and 2.

10. If the input voltage measured on pins 1 and 2 is >250vDC remove the load from the SureReach output.

11. If the LED turns on the load exceeds the available power from the SureReach.

12. If the voltage measured on pins 1 and 2 is 0 the central office port is shut down.

13. Remove the load from the SureReach and repeat Step 1.

14. If no faults exist on the pair(s) reconnect the SureReach and reset the central office port.

15. If the LED does not light replace the SureReach

16. When the LED lights reattach the load

17. If the LED flickers or goes out the load exceeds the available power from the central office port.

18. An additional pair may be added in parallel between the central office and the SureReach to increase the available power or if the central office port is serving more than 1 SureReach provide each SureReach a dedicated central office port.

19. Repeat steps 14-18

Thank you for choosing Generonix.