corTalk® by MOBILTEX® DATA LTD

RMU5 corView

Installation and Configuration Guide



Print Date:
December 15, 2016

MOBILTEX® DATA LTD. Calgary, Alberta	TITLE: **RMU5 corView Installation and Configuration Guide**		
	DOCUMENT NO.: **RMU5-MAN-002**	SHEET: **1 of 88**	REV: **1.11**

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CURRENT REVISION APPROVALS (Revision 1.11)

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REVISION HISTORY

Rev	Start Date	Approval Date	Description	Prepared By
Draft 0.01	Mar 12, 2009		First Draft	Tony da Costa
1.00	Apr 16, 2009		Initial Release	Tony da Costa
1.01	Apr 17, 2009		Minor corrections.	Tony da Costa
1.02	Apr 21, 2009		Updates for new driver/application installer. Added LCD display section.	Tony da Costa
1.03	May 13, 2009		Additional information for CSA requirements.	Tony da Costa
1.04	Oct 23, 2009		Added RECT13 type information. Updated installation diagrams for pipe-to-soil to give negative readings on measurements.	Tony da Costa
1.05	Jan 28, 2010		Added GSM communicator information.	Tony da Costa
1.06	March 29, 2010		Added specifications as per CSA Findings Letter (first draft)	Brian Dewald
1.07	Nov 7, 2011		Updated pictures. Added descriptions of new communications modes. Added TP18, TP19, BOND29, and BOND30 measurement type diagrams.	Jennifer Scott Tony da Costa
1.08	Nov 2, 2012		Added GTX3 update. Added TT3027 and DRI3 information.	Tony da Costa
1.09	June 24, 2014		Added IsatDataPro information.	Tony da Costa
1.10	Jan 20, 2015		Updated specifications. Updated relay part numbers.	Tony da Costa
1.11	Dec 7, 2016		Added GTX3-LTE transceiver capability description. Added table of cellular host phone numbers for various SIM cards.	Tony da Costa

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1 Introduction

The RMU5 Remote Monitoring Unit is part of the Mobiltex Data Ltd. corTalk® family of cathodic monitoring and control products. Mobiltex Data Ltd. was formed in 1985 and specializes in the design and manufacture of high reliability, industrial mobile data systems for the communications, transportation and utility markets. Mobiltex has been providing solutions for the cathodic monitoring industry since 1991.

The RMU5 is an expandable, high reliability device intended to monitor rectifiers, bonds and test points. The device is available in satellite (IsatM2M, IsatDataPro, Iridium, or Inmarsat-C), cellular (GSM) or other communication configurations. The field hardware consists of two primary components: a small NEMA-4X box (RMU5) that is mounted inside or outside the rectifier, and a satellite antenna or cellular transceiver that is externally mounted. The device operates from 24VAC using a separate Class 2 transformer to step down various line voltages. The RMU5 has integral high-energy surge suppression and provides high lightning immunity.

The RMU5 monitors and transmits ten channels of information. Four high accuracy, galvanically isolated, AC/DC capable analog inputs are typically used to monitor volts, amps and / or 4-20mA signals from external equipment. AC line voltage presence is inferred from the 24VAC power input. An optically-isolated digital input can be used as a rectifier door sensor or as a tamper detection alarm. The RMU5 measures temperature and internal battery voltage. Instant-off pipe-to-soil measurements can also be measured.

Measurement data is wirelessly transmitted to the Mobiltex corView servers. CorView manages all field data communications, maintains three years of measurement data, sends alarm exception and system performance emails, and provides password protected remote customer access. With the proper credentials, corView can be accessed using any web browser. The measurement data is presented in an intuitive manner that color-codes abnormal measurement or site conditions for quick user interpretation. CorView can also provide near real-time email notification of abnormal measurement and alarm conditions.

The RMU5 also allows the rectifier to be interrupted by sending commands from the corView server. With the GPS option, the RMU5 provides high-accuracy synchronized interruption capability.

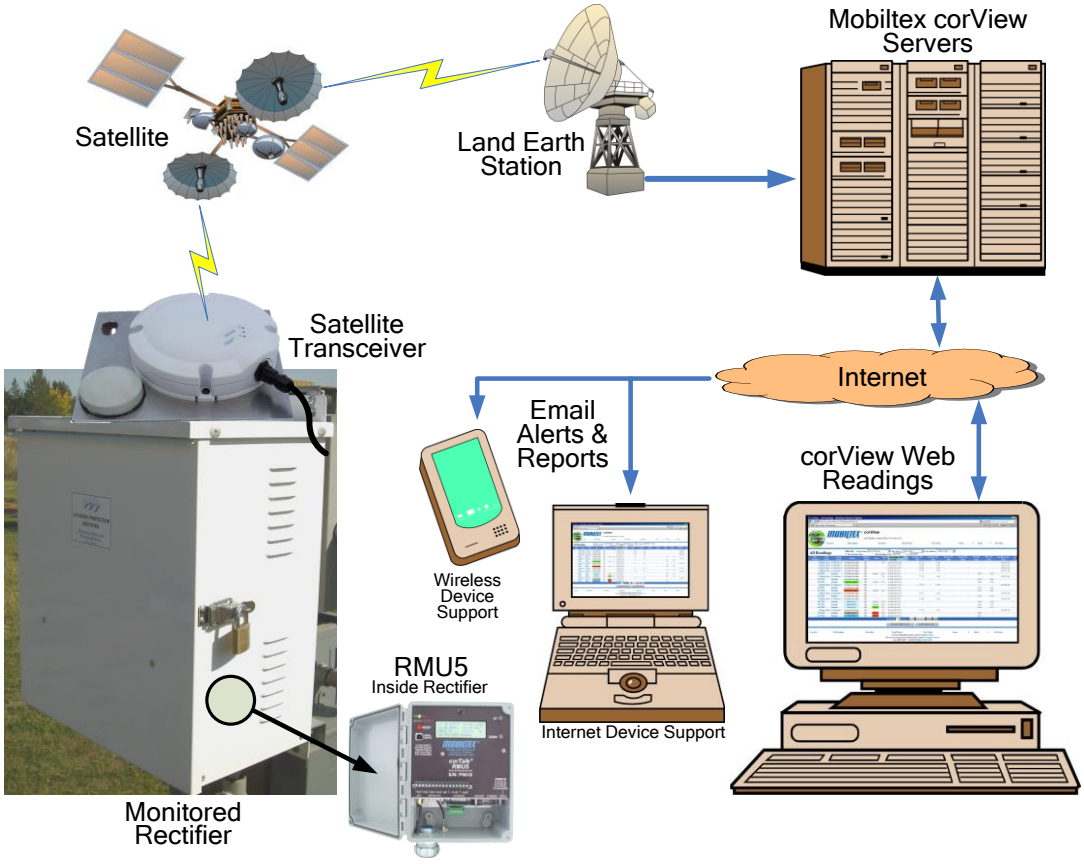


Figure 1 RMU5 Satellite Communications Block Diagram

Figure 2 RMU5 GSM Communications Block Diagram

2 General Safety Information

The following safety precautions must be reviewed to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, use this product only as specified. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Only qualified personnel should perform service procedures.

While using this product, you may need to access other parts of a larger system. Read the safety sections of the other component's manuals for warnings and cautions related to operating the system.

To Avoid Fire or Personal Injury

Connect and Disconnect Properly. Do not connect or disconnect terminal wiring while the wires are connected to a voltage source.

Ground the Product. To avoid electric shock, the protective earth terminal must be connected to earth ground. Before making connection to the input or output terminals of the product, ensure that the product is properly grounded.

Observe All Terminal Ratings. To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product. Do not use an input marked with measurement category I for measurements within measurement categories II, III or IV. Do not connect category II inputs directly to mains--a Class 2 CSA/UL transformer must be used for isolation.

Do Not Operate Without Covers. Do not operate this product with covers or panels removed.

Avoid Exposed Circuitry. Do not touch exposed connections and components when power is present.

Do Not Operate With Suspected Failures. If you suspect there is damage to this product, have it inspected by qualified service personnel.

Do Not Operate in Wet/Damp Conditions.

Keep Internal Product Surfaces Clean and Dry.

Symbols and Terms

Terms in this Manual. These terms may appear in this manual:

WARNING. Warning statements identify conditions or practices that could result in injury or loss of life.

CAUTION. Caution statements identify conditions or practices that could result in damage to this product or other property.

Terms on the Product. These terms may appear on the product:

DANGER. Danger indicates an injury hazard immediately accessible as you read the marking.

WARNING. Warning indicates an injury hazard not immediately accessible as you read the marking.

CAUTION. Caution indicates a hazard to property including the product.

Symbols on the Product. The following symbols may appear on the product:

				
CAUTION Refer to Manual	Protective Ground (Earth) Terminal	Functional Ground Terminal	AC or DC Input	This product has been tested to the requirements of CAN/CSA-C22.2 No. 61010-1, second edition, including Amendment 1, or a later version of the same standard incorporating the same level of testing requirements.

3 Component Identification and Descriptions

Figure 3 shows the front and right side of the RMU5 enclosure. The important features shown here are the latch and lock attachment points. To open the RMU5 enclosure, lift the plastic latch arms away from the enclosure body, then swing the metal straps away from the door. The door should then swing open freely. To close the enclosure, reverse the procedure.

When the enclosure is mounted external to a rectifier cabinet, it may be desirable or even necessary for satisfying regulatory requirements, to install a standard padlock on the latches to keep unauthorized users out of the enclosure. To apply the padlock, knock out the two round plastic pieces on the plastic latch arms. Then, while the latches are in a closed position, pass the padlock shackle through the new opening.



Figure 3 RMU5 Front/Side View

Figure 4 shows the back and hinge side of the RMU5. The RMU5 may be mounted against a flat surface by driving screws through the mounting hole locations shown in Figure 4. The RMU5 may also be mounted to a pipe using pipe clamp bands through the slots shown in Figure 4.



Figure 4 RMU5 Back/Side View

Figure 5 shows the inside of the RMU5, which includes the front panel and bottom connectors. The front panel contains the following features:

1. Power/Fault LED Indicator. The green indicator shows when the RMU5 is powered. If the indicator is flashing red, a fault condition is present.
2. GPS/Interrupter Status LED Indicator. This bi-color indicator shows status for the optional GPS Timing Control Module (TCM) board and also the rectifier interruption relay status. When green, the GPS TCM board has successfully attained a time lock to the NAVSTAR GPS network. When red, the rectifier output is switched off (interrupted).
3. Reset/Power Down Button. The reset button may be held down for 10s to force a reset of the hardware on the RMU5. The button may also be used to disengage the backup UPS battery when main power is removed.

4. Local Configuration USB Device Port. This port is used for configuration of the RMU5 from a PC running Microsoft Windows XP SP2 or higher. Further information on its use is located in section 5 of this document.
5. 20 x 4 LCD Display With Backlight. The LCD display shows the current status of the RMU5 through a paged display system.
6. Up/Down Control Buttons. These buttons control the page being displayed on the 20 x 4 LCD display.
7. Main I/O Connector. This connector is the principle connector for the built-in analog inputs, digital input, interrupter relay control, and RS-485 MODBUS connections. The functions of each pin are labeled on the faceplate.

The bottom panel contains the following features:

1. GPS Antenna Connector. This connector is only present if the RMU5 is equipped with the optional internal GPS Timing Control Module board. A 3V LNA 18dB gain GPS antenna with an SMA male connector-terminated cable is connected to this port.
2. Sensor Bus Expansion Connector. This port is used to attach additional analog and digital I/O modules to the RMU5.
3. Communications Expansion Connector. This connector is used to attach RS-232 communications devices such as digital radios, MODBUS RTUs, PSTN modems, etc. Usually an adapter board will be present according to the communications device in use.
4. USB Host Expansion Connector. Future use connector.
5. 10/100Base-T Ethernet Connector. Allows attachment to a standard twisted pair Ethernet network.
6. Main Power Input Connector. Attach a DC power source with a voltage rating of 20 to 35V, or an AC power source with a voltage rating of 20 to 25V to this port. When connecting a DC power source, the connections to the main power input connector are polarity insensitive. When using an AC power source, ensure that **neither** connection to the main power input connector is grounded, otherwise overheating of the RMU5 internal power supply may result. The power source should be able to deliver at least 40VA to an RMU5 that is equipped with additional options modules. The basic RMU5 requires approximately 5VA to operate once the internal battery is charged, and approximately 15VA while the battery is charging (with no external loads).

Wiring may be brought into the RMU5 by drilling a hole in the lower box edge and installing water tight glands or water proof flexible conduit connectors. When drilling the holes for the feed-through connectors, avoid drilling into the RMU aluminum chassis.

Any Interconnection wires used must be rated to 75°C or greater.



Figure 5 RMU5 Inside View

4 Installation

4.1 Mounting

The RMU5 is housed in a weather-proof compact enclosure with a versatile mounting plate. Installation of the device can be made inside a rectifier cabinet, or externally on a flat surface or pole. Figure 6 shows the dimensions of the mounting plate, including the location and size of the mounting holes. Any of the available mounting holes may be used to secure the RMU5 to a flat surface. The RMU5 may also be secured to a pole by utilizing pipe clamps through the two slots on the top of the mounting plate and the two slots on the bottom of the mounting plate.

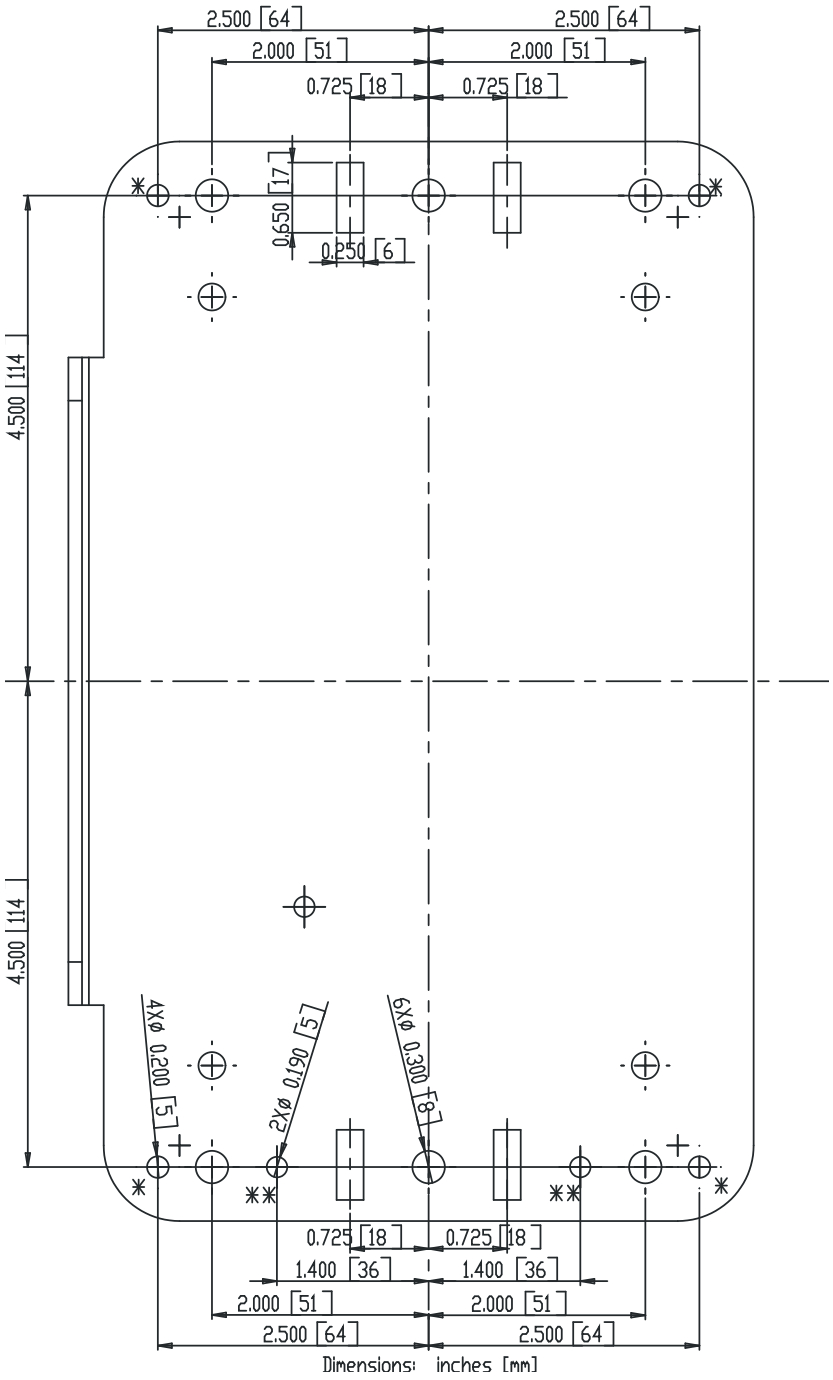


Figure 6 RMU5 Mounting Plate Dimensions

Once the RMU5 is attached to its final mounting location, cabling must be brought into the box through waterproof conduit, or through sealing glands. Installation of the cabling feed-through must be made in such a manner that does not degrade the environmental sealing characteristics of the RMU5.

4.2 Wiring

WARNING: Ensure that any power sources supplying the RMU5 are off while performing any wiring on the RMU5.

WARNING: Ensure that all wire used for interconnections meets the voltage, current and temperature requirements for the particular installation site.

4.2.1 Protective Earthing

To avoid electric shock, the protective earth terminal must be connected to earth ground. Before making connection to the input or output terminals of the product, ensure that the product is properly grounded.

A ring lug pre-terminated #10 green/yellow cable is supplied with the RMU5 for earth ground attachment purposes. Remove the #10 nut and star washer from the protective earth terminal, place the ring lug of the cable over the stud, then re-install the star washer and #10 nut. Connect the other end of the cable to a suitable earth ground point.

4.2.2 Power Transformer

An external Class 2 transformer must be installed in the rectifier to provide 24VAC/40VA to the RMU5 for power. The exact model of transformer is installation dependent due to varying supply voltages feeding rectifiers.

Figure 7 shows various Class 2 transformers that may be supplied by Mobiltex with the RMU5. Mobiltex P/N T01A42BE5DG can be used with 208V or 240VAC line voltages. Mobiltex P/N T01A420BE2G can be used with 120VAC line voltage. Mobiltex P/N T01A42TR401 can be used with 120V, 208V, or 240VAC lines voltages. Finally, Mobiltex P/N T01A42TR501 can be used with 120V, 240V, 277V, or 480VAC line voltages.

Many different types of Class 2 transformers are available which are compatible with the RMU5. A transformer with a 20 to 25VAC/40VA nominal output winding rating should be used with the RMU5. The primary input voltage is determined by the power system available at the RMU5 installation site. Install the transformer according to the manufacturer's instructions and connect the secondary windings to the RMU5 main power input.

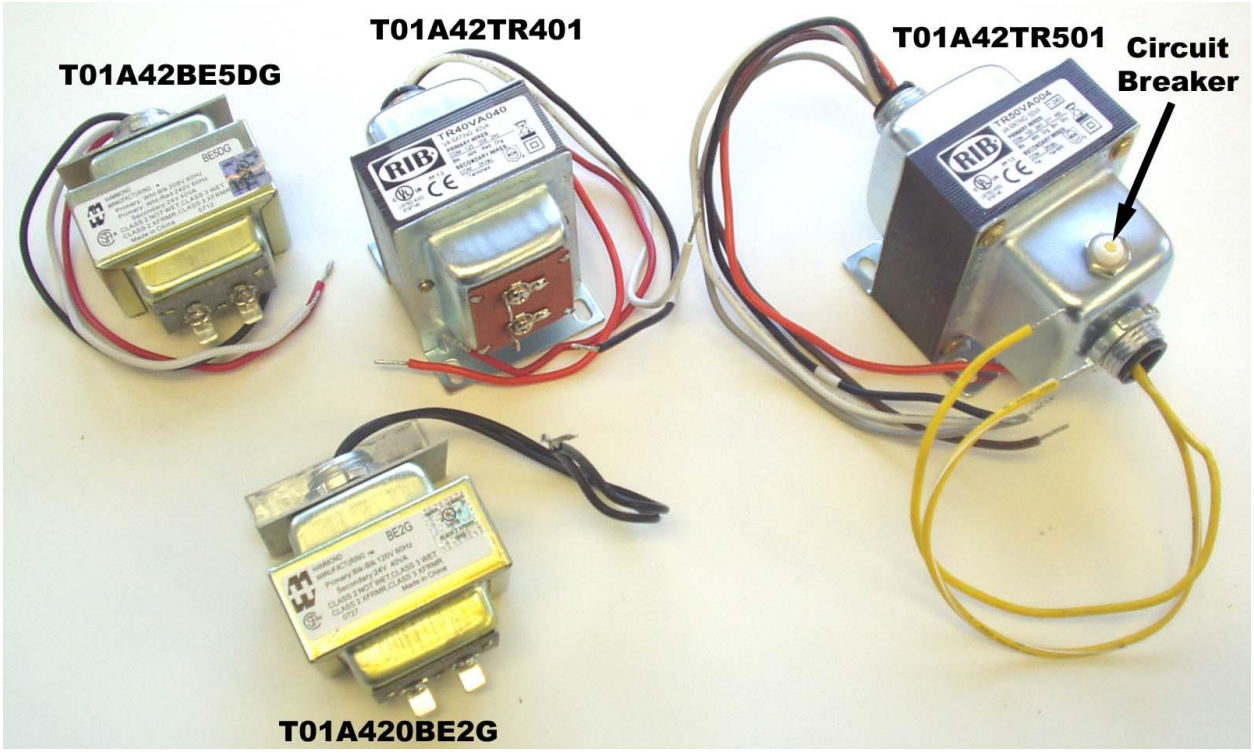


Figure 7 Class 2 Transformers Available From Mobiltex

Connect the appropriate primary side taps of the transformer to the L1 and L2/N line input connection points on the device being monitored. An external switch or circuit-breaker and external overcurrent protection device (sized to the

transformer specifications) should be installed on the primary connections of the transformer and be located near the RMU5. Consult the documentation provided by the transformer manufacturer to determine the correct primary tap wires required for a particular input voltage.

Note: When installing transformers with multiple primary taps, ensure that un-used tap wires are properly capped!

Next, extend the transformer 24VAC secondary wires with additional wire (as needed) to reach the RMU5 power input. Remove the orange pluggable terminal block from the RMU5, and connect the transformer secondary wires to the terminal block. Before plugging the terminal block back into the RMU5, enable primary power to the transformer, and by using a multimeter, verify that the transformer output is within the range of 20 to 28VAC.

If the transformer output voltage is below or above that range, re-verification of the transformer primary tap selection will be necessary.

Shut off primary power to the transformer before continuing. Plug the orange terminal block back into the receptacle on the RMU5. The connection to the RMU5 should be as shown in Figure 8.

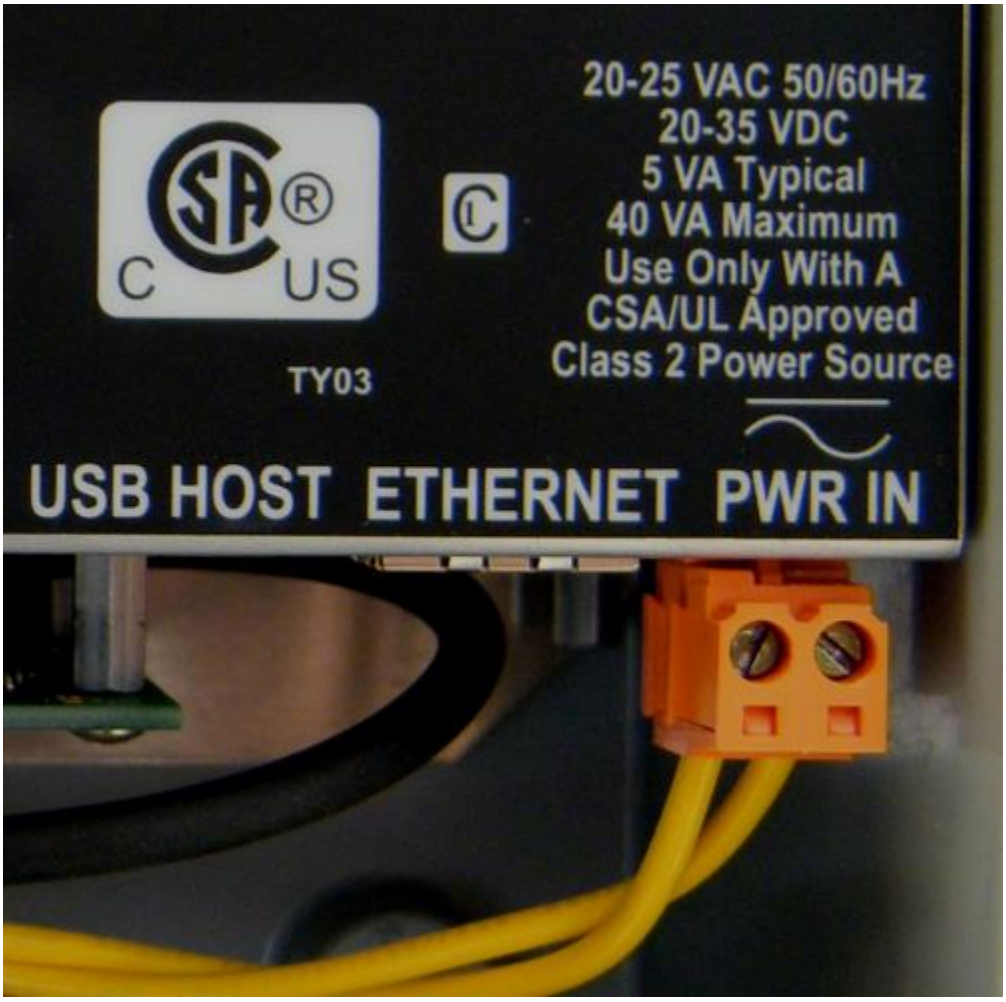


Figure 8 RMU5 Power Connection

4.2.3 GPS Satellite Antenna

The RMU5 GPS kit (P/N A20A03GPS01) is shown in Figure 9. This kit is ordered as a factory installed item. The GPS board shown is installed inside the RMU5 at time of manufacturing. Included, in the kit, is a pre-terminated 10 meter (33') RF cable and a GPS antenna.

The GPS antenna can be installed directly on top of a rectifier by drilling a 3/4" (19mm) hole in the top of the rectifier. An optional universal mounting bracket kit (Mobiltex part number A20103RMU21) is also available for mounting to other surfaces or poles. The selected location requires a minimum of 2" (51mm) of clearance in the area of the drilled

hole between the rectifier lid and internal rectifier components. Debur the drilled hole so there are no sharp edges. Clean and wipe the top surface around the drilled hole.

Remove the nut and metal washer from the back of the GPS antenna, leaving the rubber washer on the antenna. Install the antenna in the ¾" hole, then re-attach the nut and metal washer to secure the antenna

Next, attach the GPS cable to the GPS antenna. Route the cable back to the RMU5 installation location. Connect the male SMA connector on the GPS cable to the female SMA connector on the RMU5 enclosure. Using self-annealing tape and electrical tape, seal the GPS cable-antenna connection to prevent moisture damage.



Figure 9 GPS Synchronization Kit

4.2.4 DMR-800 Satellite Antenna (RMU5-ISAT)

The IsatM2M satellite communications portion of the RMU5-ISAT kit (P/N A20A03ISAT1) is shown in Figure 10. Missing from the picture is the DRI1 interface board, which is factory installed in the RMU5 chassis at time of manufacturing. Included in the kit is a Skywave DMR-800 IsatM2M satellite transceiver, a mounting bracket, and various mounting hardware. The interconnect cable shown in the picture is separate from the main kit items, and can be ordered in either a 1 meter (3.2') length (P/N W16400ISAT1) or a 10 meter (32') length (P/N W16400ISAT2).

For installation, mount the GPS antenna (see 4.2.3) and the DMR-800 transceiver to the mounting bracket as shown in Figure 11. Use the four #8-32 screws and four #8 internal tooth washers to attach the DMR-800 transceiver. Remove the nut and metal washer from the back of the GPS antenna, leaving the rubber washer on the antenna. Install the antenna, then re-attach the nut and metal washer to secure the antenna.

Next, attach the GPS cable to the GPS antenna. Also, attach the DMR-800 interconnect cable to the DMR-800 transceiver. Using the provided wire ties, clamp the cables to the bracket to provide strain-relief for the cables. Using self-annealing tape and electrical tape, seal the GPS cable-antenna connection to prevent moisture damage.

Select the installation location with an unobstructed view of the southern sky for northern hemisphere installations or the northern sky for southern hemisphere installations. Ideally, the DMR-800 domed face should be pointing up at a 45 degree angle in an azimuth direction that matches the location of the geostationary satellite being used for

communications. Refer to section 5.2.5.1 in the software configuration to determine the correct azimuth direction. After determining the pointing direction of the DMR-800 transceiver, attach the mounting bracket to a suitable surface using the provided #10 Tek screws. Optionally, the bracket may be attached to a pole by using a pair of hose band clamps or a pair of U-bolts. It is left up to the installer to source these optional items.



Figure 10 IsatM2M Installation Items



Figure 11 DMR-800 and GPS Antenna Installed on Bracket

After installing the mounting bracket, run the two cables back to the RMU5 installation area. If flexible conduit (optional kit P/N A20103RMU50 or A20103RMU51) is used to protect the cables, pass the cables through the flexible conduit

back into the RMU5 enclosure. Ensure that the entry point into the flexible conduit is adequately sealed against moisture incursion by using a proper gland and silicone sealant. Remove the GPS jumper cable inside the RMU5 enclosure to allow the GPS cable to be plugged directly into the internal GPS connector.

If the cables are run straight back to the RMU5 without flexible conduit, remove the center ½" flexible conduit connector on the RMU5 and replace it with the cable gland (see Figure 12) that is provided in the IsatM2M installation kit. Re-use the sealing ring and nut from the original conduit connector. Pass the DMR-800 interconnect cable through the gland. When wiring of the cable is complete, tighten the gland nut until it is no long possible to move the cable back and forth in the gland. Attach the GPS connector to the external GPS connector on the RMU5. Apply self-annealing tape and electrical tape over the GPS antenna connector to seal it against moisture entry.

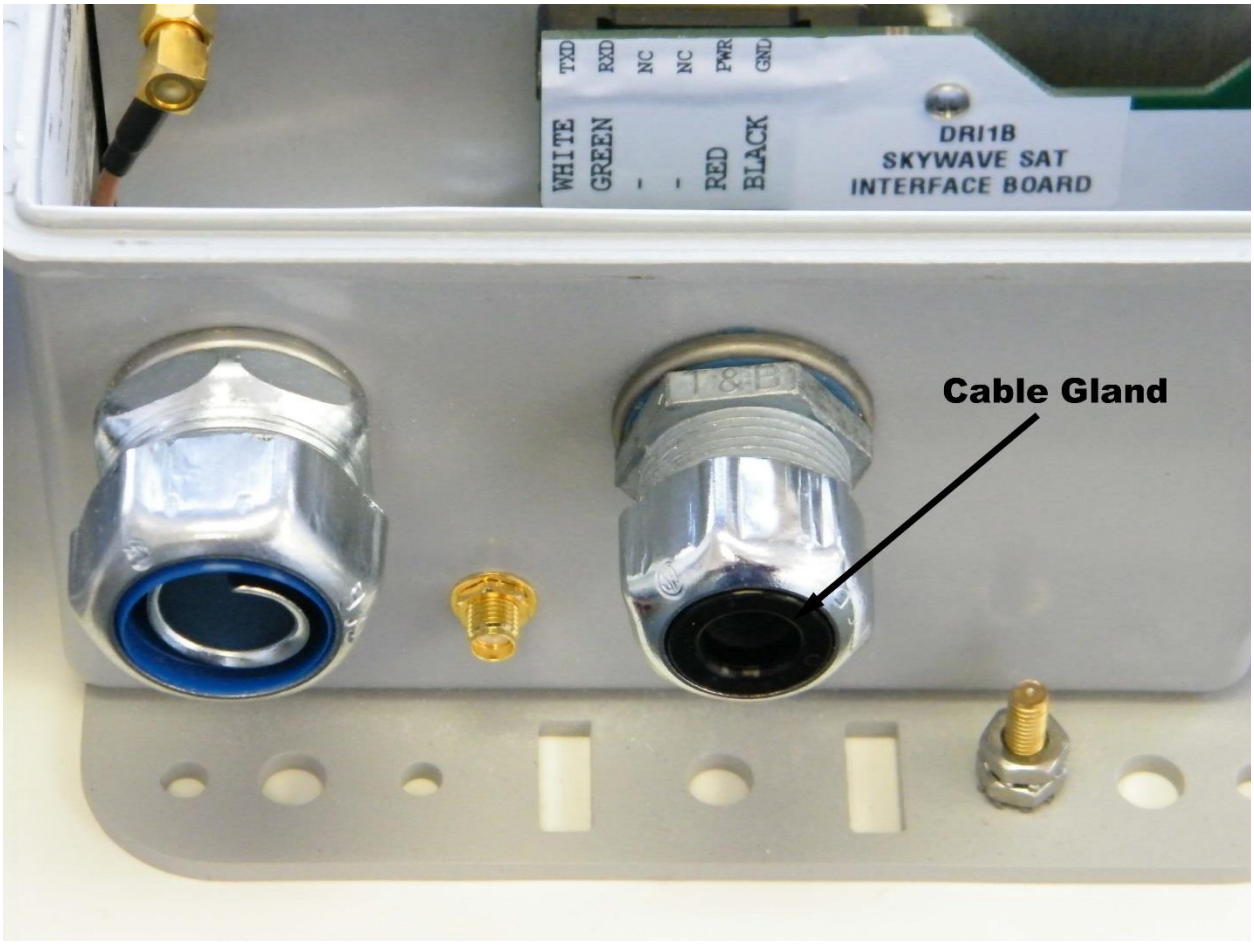


Figure 12 Cable Gland For DMR-800 Interconnect Cable

Strip back 10cm (4") of the jacket on the DMR-800 interconnect cable, as shown in Figure 13. Cut back the shield wire to where the jacket ends.

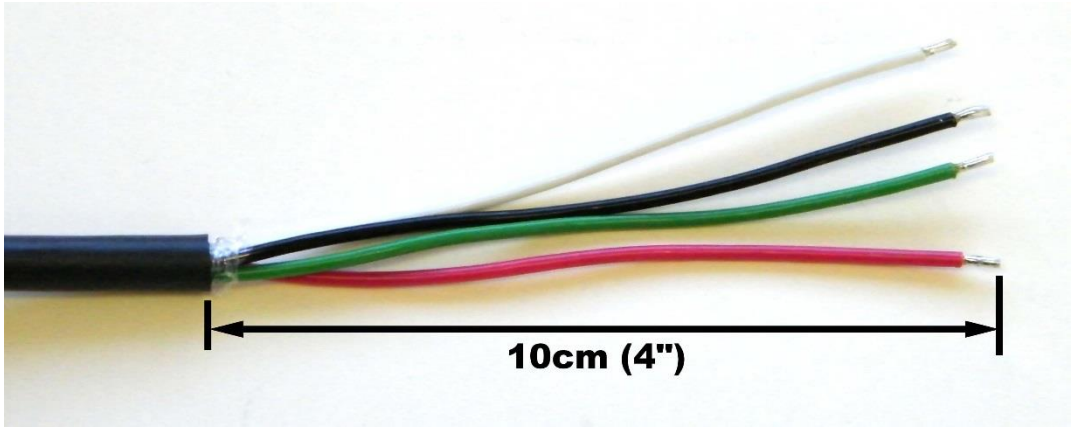


Figure 13 DMR-800 Interconnect Cable Stripped

Remove the pluggable six pin terminal block from the DRI1 board. Screw the wires into the terminal block as shown in Figure 14. Apply a wire tie as shown to provide strain relief to the wires. Finally, plug the terminal block back into the mating socket on the DRI1 board, seen in Figure 15.

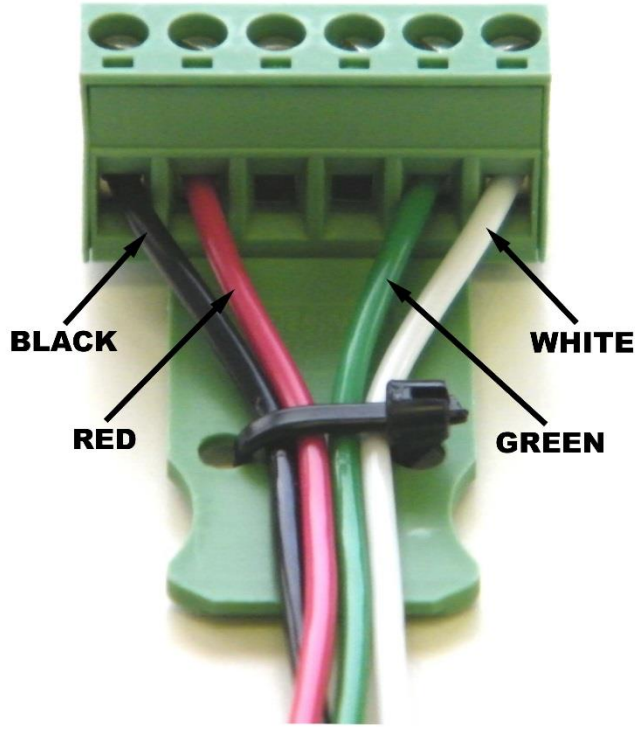


Figure 14 DMR-800 Interconnect Cable Terminated

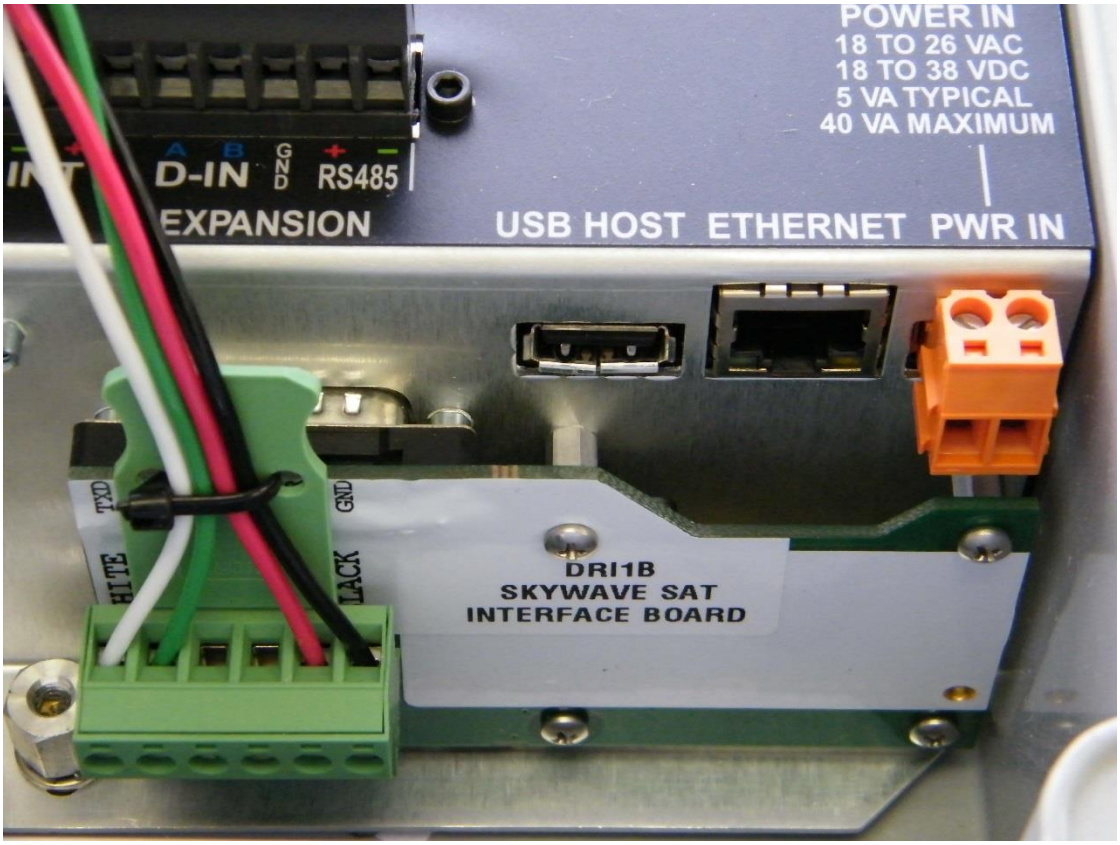


Figure 15 DRI1B Interface Board With DMR-800 Interface Cable Installed

4.2.5 IDP-680 Satellite Antenna (RMU5-IDP)

The IsatDataPro satellite communications portion of the RMU5-IDP kit (P/N A20A03ISAT1) is shown in Figure 16. Missing from the picture is the DRI1 interface board, which is factory installed in the RMU5 chassis at time of manufacturing. Included in the kit is a Skywave IDP-680 IsatM2M satellite transceiver, an adapter cable, a mounting bracket, and various mounting hardware. The interconnect cable shown in the picture is separate from the main kit items, and can be ordered in either a 2 meter (6.4') length (P/N W16400ISAT3) or a 10 meter (32') length (P/N W16400ISAT2).

For installation, mount the GPS antenna (see 4.2.3) and the IDP-680 transceiver to the mounting bracket as shown in Figure 17. Use the four #8-32 screws and four #8 internal tooth washers to attach the IDP-680 transceiver. Note that the vent hole (see Figure 18) on the IDP-680 transceiver **must** face down in its final installation location. Remove the nut and metal washer from the back of the GPS antenna, leaving the rubber washer on the antenna. Install the antenna, then re-attach the nut and metal washer to secure the antenna.

Next, attach the GPS cable to the GPS antenna. Also, attach the IDP-680 interconnect cable to the IDP-680 transceiver adapter cable and the adapter cable to the IDP-680 transceiver. Using the provided wire ties, clamp the cables to the bracket to provide strain-relief for the cables. Using self-annealing tape and electrical tape, seal the GPS cable-antenna connection to prevent moisture damage.

Select the installation location with an unobstructed view of the southern sky for northern hemisphere installations or the northern sky for southern hemisphere installations. Ideally, the IDP-680 domed face should be pointing up at a 45 degree angle in an azimuth direction that matches the location of the geostationary satellite being used for communications. Refer to section 5.2.5.5 in the software configuration section to determine the correct azimuth direction. After determining the pointing direction of the IDP-680 transceiver, attach the mounting bracket to a suitable surface using the provided #10 Tek screws. Optionally, the bracket may be attached to a pole by using a pair of hose band clamps or a pair of U-bolts. It is left up to the installer to source these optional items.



Figure 16 IsatDataPro Installation Items



Figure 17 IDP-680 and GPS Antenna Installed on Bracket

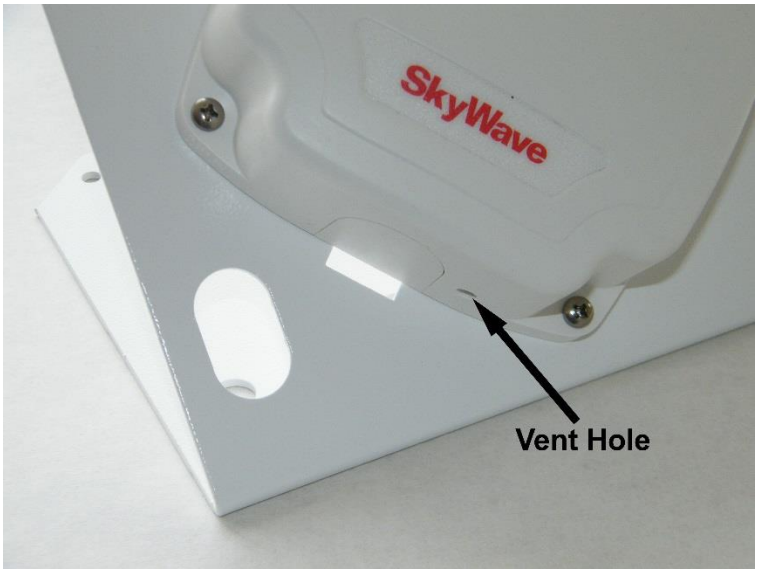


Figure 18 IDP-680 Vent Hole

After installing the mounting bracket, run the data and GPS cables back to the RMU5 installation area. If flexible conduit (optional kit P/N A20103RMU50 or A20103RMU51) is used to protect the cables, pass the cables through the flexible conduit back into the RMU5 enclosure. Ensure that the entry point into the flexible conduit is adequately sealed against moisture incursion by using a proper gland and silicone sealant. Remove the GPS jumper cable inside the RMU5 enclosure to allow the GPS cable to be plugged directly into the internal GPS connector.

If the cables are run straight back to the RMU5 without flexible conduit, remove the center ½" flexible conduit connector on the RMU5 and replace it with the cable gland (see Figure 12) that is provided in the IsatDataPro installation kit. Re-use the sealing ring and nut from the original conduit connector. Pass the IDP-680 interconnect cable through the gland. When wiring of the cable is complete, tighten the gland nut until it is no long possible to move the cable back and forth in the gland. Attach the GPS connector to the external GPS connector on the RMU5. Apply self-annealing tape and electrical tape over the GPS antenna connector to seal it against moisture entry.

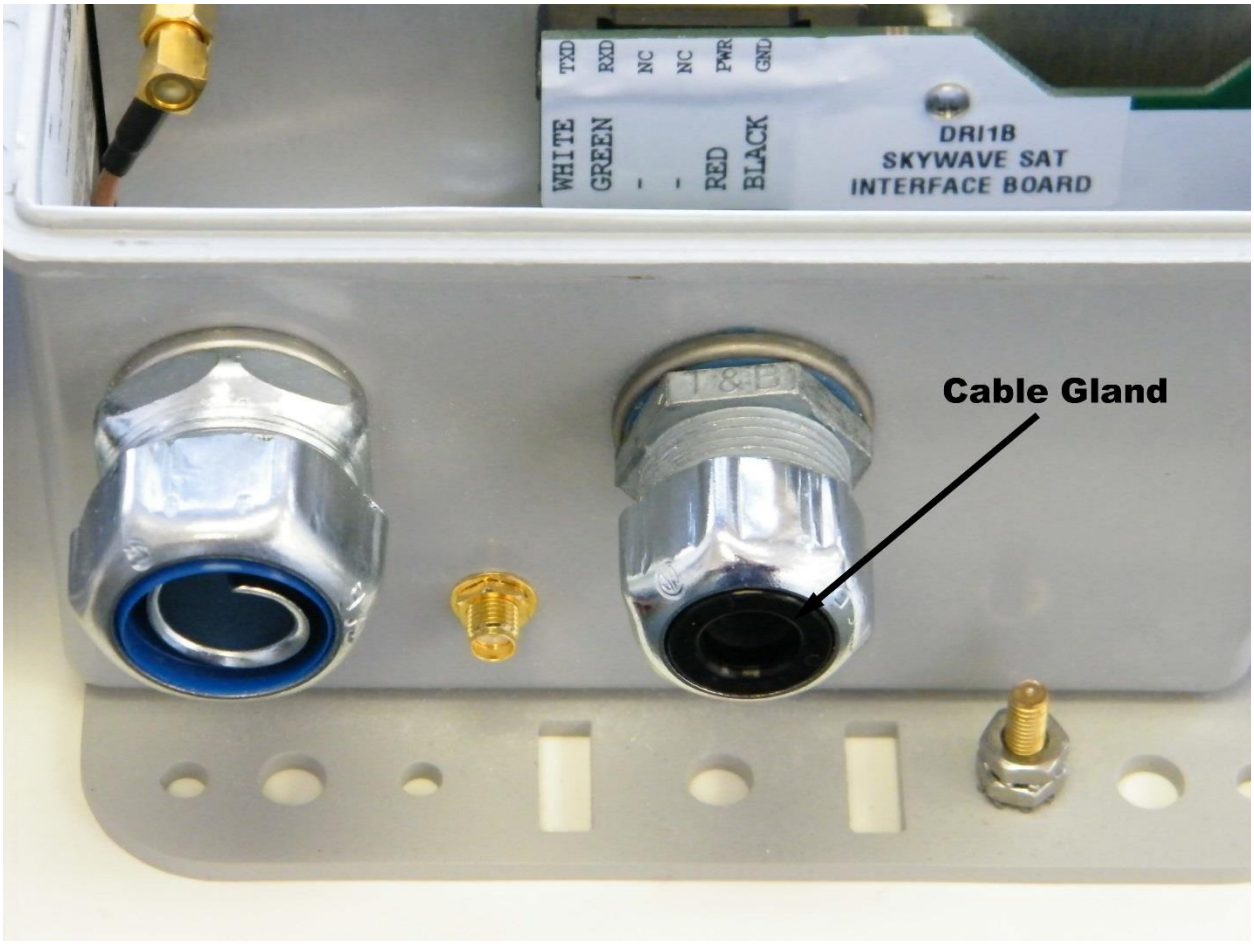


Figure 19 Cable Gland For IDP-680 Interconnect Cable

Strip back 10cm (4") of the jacket on the IDP-680 interconnect cable, as shown in Figure 13. Cut back the shield wire to where the jacket ends.

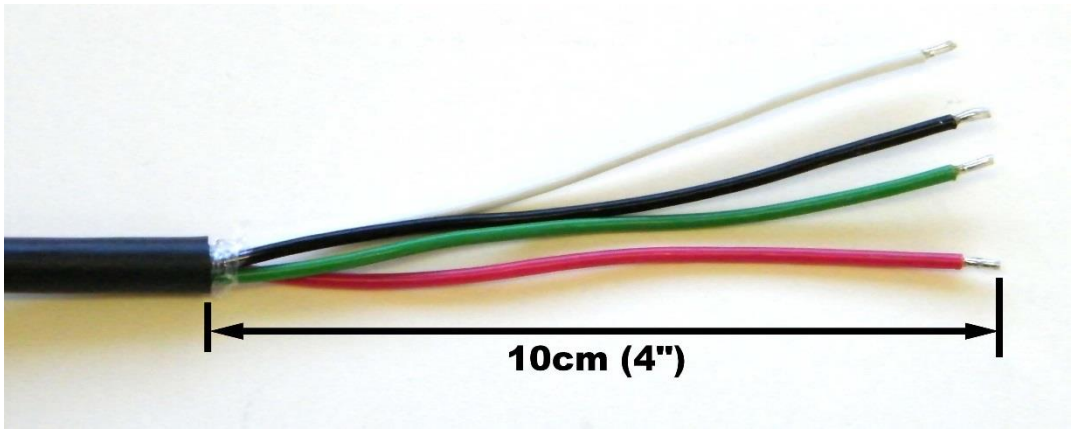


Figure 20 IDP-680 Interconnect Cable Stripped

Remove the pluggable six pin terminal block from the DRI1 board. Screw the wires into the terminal block as shown in Figure 14. Apply a wire tie as shown to provide strain relief to the wires. Finally, plug the terminal block back into the mating socket on the DRI1 board, seen in Figure 15.

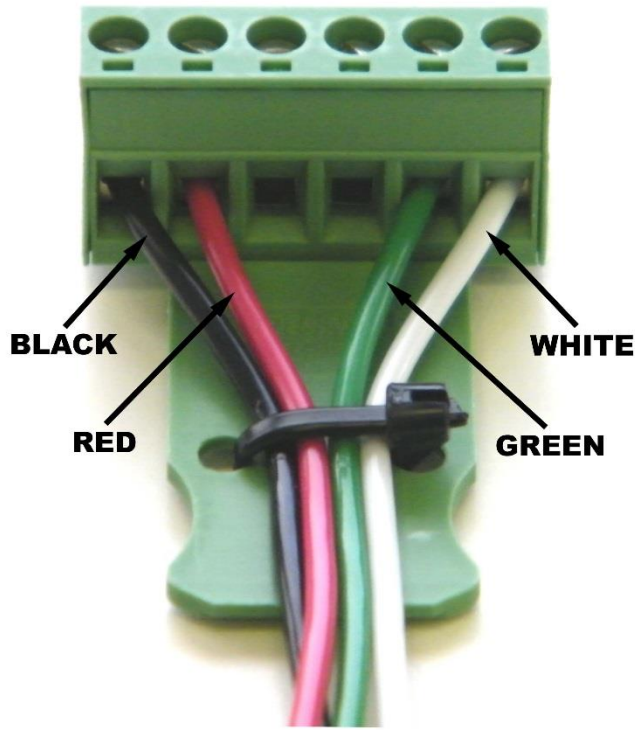


Figure 21 IDP-680 Interconnect Cable Terminated

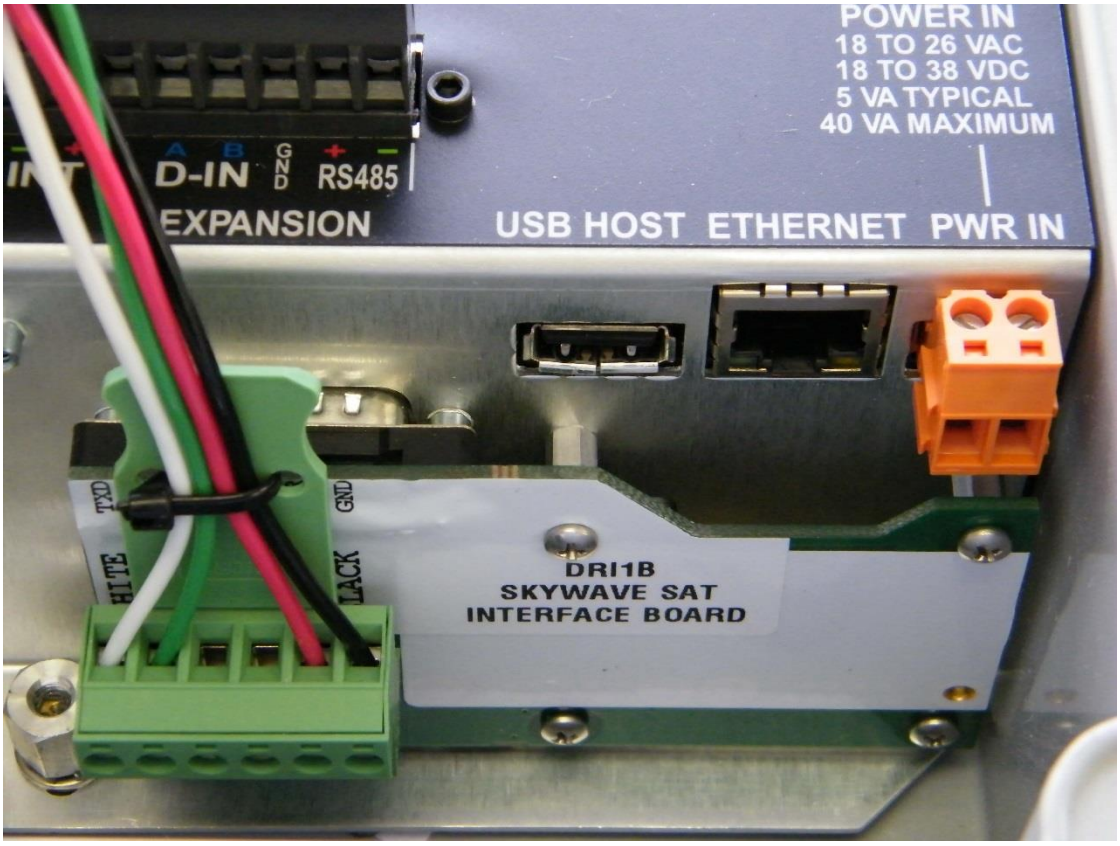


Figure 22 DRI1B Interface Board With IDP-680 Interface Cable Installed

4.2.6 GTX2/3/3-LTE/3-LTE Cellular Transceiver (RMU5-GSM)



Figure 23 GTX2/3/3-LTE Installation Hardware

The GTX2, GTX3, and GTX3-LTE are all cellular transceiver units. The GTX2 cellular unit supports 2G GSM operation while the GTX3 unit additionally supports 3G UMTS operation and the GTX3-LTE supports 3G UMTS and LTE operation. The GTX2/3/3-LTE units can be installed directly on top of a rectifier by drilling a 7/8" (0.875", 22mm) hole in the top of the rectifier. The selected location requires a minimum of 1.5" (38mm) of clearance in the area of the drilled hole between the rectifier lid and internal rectifier components. Debur the drilled hole so there are no sharp edges. Clean and wipe the top surface around the drilled hole.

Remove the protective coverings (including adhesive film) from both sides of the supplied silicone sealing gasket; place the gasket hole over the 7/8" hole drilled in the rectifier. Carefully mate the cable male connector with the female M8-style receptacle located on the bottom of the GTX2/3/3-LTE device. Hand tighten the connector by rotating the knurled connector nut clockwise. Do not over tighten. Pass the un-attached female end of the interconnection cable through the silicone sealing gasket and the hole in the rectifier lid. Place the bottom face of the GTX2/3/3-LTE transceiver over the silicone sealing gasket.

From inside the rectifier, pass the threaded end of the supplied ½" plastic male conduit fitting over the un-attached female end of the interconnect cable. Slide the fitting all the way up to the 7/8" hole in the rectifier and thread it into the mating threads on the GTX2/3/3-LTE. Hand tighten the conduit fitting adequately to ensure compression of the silicone sealing gasket. Do not over tighten.

If direct attachment to the top of the rectifier is not desirable, the GTX2/3/3-LTE may also be attached directly to a plastic or metal conduit that has ½" NPT fittings. An optional universal mounting bracket kit (Mobiltex part number A20103RMU21) is also available for mounting to other surfaces or poles. Optional additional length interconnect cables may be required for these alternate mounting types. When using alternate mounting methods, ensure that the GTX2/3/3-LTE transmitter has the domed portion pointing straight up into the sky. The following pictures illustrate various mounting schemes for the GTX2/3/3-LTE.



Figure 2 Mobiltex GTX2/3/3-LTE Cellular Transceiver Installation Examples

In the case of rigid conduit mounting, a conduit nut must be used to limit the thread depth to ½" maximum. Otherwise, the conduit can punch through the plastics and damage the antenna.



Figure 24 GTX2/3/3-LTE Conduit Nut Spacing



Figure 25 GTX2/3/3-LTE Conduit Punch Though Example

When mounting the antenna to the conduit, hold the nut on the conduit at the required maximum ½" thread depth while threading the antenna onto the conduit threads. Stop threading once the antenna base is resting firmly against the nut.



Figure 26 GTX2/3/3-LTE Tightening on Conduit

After installing the GTX2/3/3-LTE, run the cable back to the RMU5 installation area. If flexible conduit (optional kit P/N A20103RMU50 or A20103RMU51) is used to protect the cable, pass the cables through the flexible conduit back into the RMU5 enclosure. Ensure that the entry point into the flexible conduit is adequately sealed against moisture incursion by using a proper gland and silicone sealant.

If the cable is run straight back to the RMU5 without flexible conduit, remove the center ½" flexible conduit connector on the RMU5 and replace it with the cable gland (see Figure 27) that is provided in the GSM installation kit. Re-use the sealing ring and nut from the original conduit connector.

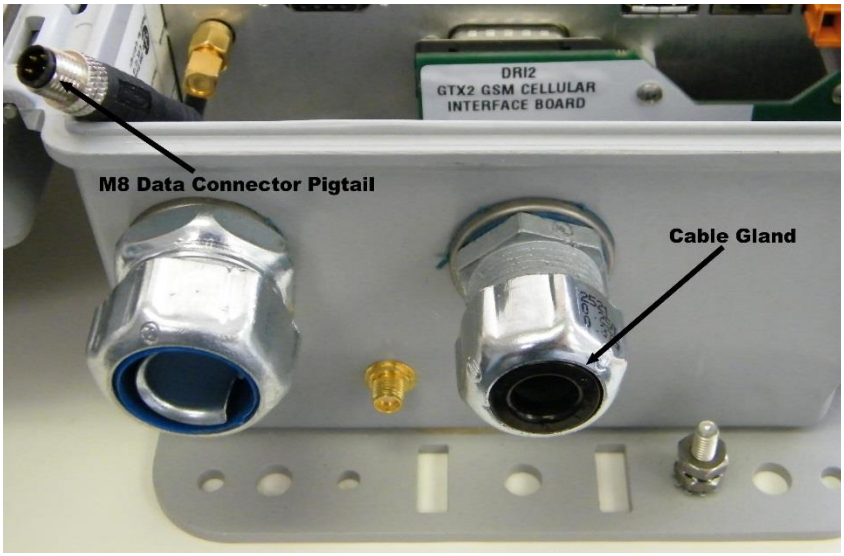


Figure 27 Cable Gland For GTX2/3/3-LTE Interconnect Cable

Remove the nut, plastic washer, and compression grommet from the cable gland. Pass the M8 data connector pigtail from the DRI2 board through the base of the gland. Pass the mating end of the GTX2/3/3-LTE interconnect cable through the nut, plastic washer and compression grommet as shown in Figure 28. Connect the GTX2/3/3-LTE interconnect cable connector to the mating connector on the pigtail from the DRI2 board. Thread together the locking rings on each connector to ensure a reliable connection. Re-attach the gland nut to gland base and tighten the gland nut until it is no long possible to move the cable back and forth in the gland.

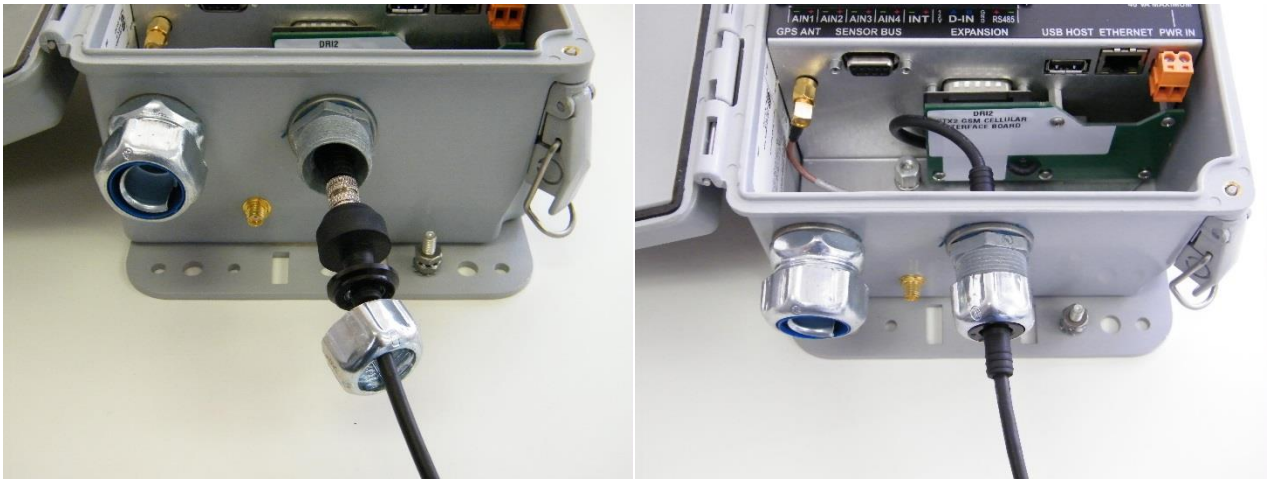


Figure 28 GTX2/3/3-LTE Interconnect Cable Installed Through Cable Gland

4.2.7 Inmarsat-C Satellite (RMU5-Easytrack)

The RMU5 is capable of sending data to corView over the Inmarsat-C satellite system using a Thrane&Thrane TT-3026 Easytrack or TT-3027 Sailor satellite communicator.

4.2.7.1 TT-3026 Easytrack Antenna

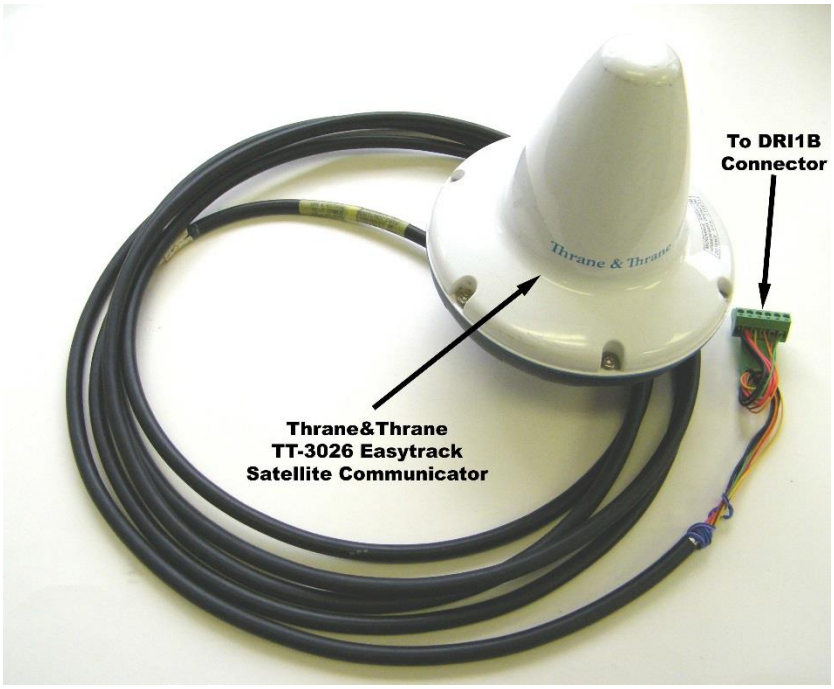


Figure 29 Thrane&Thrane TT-3026 Easytrack Communicator and Cable

4.2.7.1.1 Installation

The TT-3026 transceiver is provided with an adjustable pole/railing mount kit shown in Figure 30.



Figure 30 TT-3026 Adjustable Pole/Railing Mount Kit

For installation of the TT-3026 transceiver, refer to the Thrane&Thrane TT-3026L/M/S easyTrack Transceiver Installation Manual, which is included with the transceiver.

4.2.7.1.2 Wiring

The TT-3026 modem attaches to the DRI1 communications expansion adapter board. The adapter provides power to the TT-3026 unit. Before terminating the cable, feed the cable through the cable gland on the bottom of the RMU5. Strip the cable sheathing back approximately 15cm (6") on the un-terminated end of the cable. The cable from the TT-3026 unit is then wired into the provided 6-contact Phoenix-style connector as shown in Figure 31. Apply cable-ties to reduce strain on individual conductors. After completing wiring, plug the green 6-contact connector into the mating socket on the DRI1 Easytrack Sat Interface Board (see Figure 32).

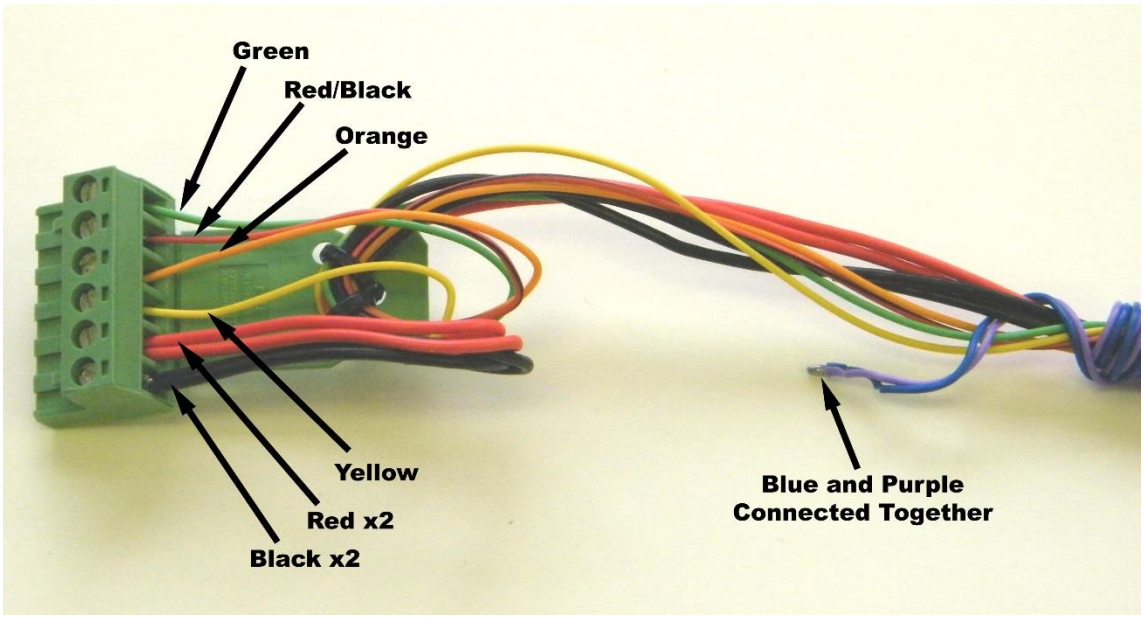


Figure 31 TT-3026 Cable Termination

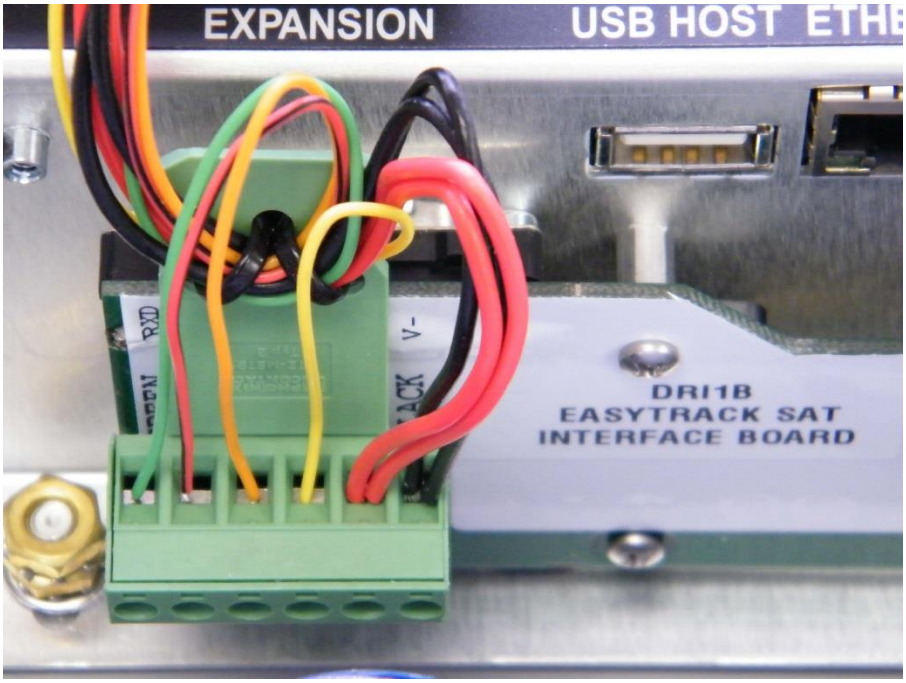


Figure 32 TT-3026 Cable Plugged Into DRI1

4.2.7.2 TT-3027 Sailor Antenna



Figure 33 Thrane&Thrane TT-3027 Sailor Communicator and Cable

4.2.7.2.1 Installation

The TT-3027 transceiver is provided with an adjustable pole/railing mount kit shown in Figure 34.

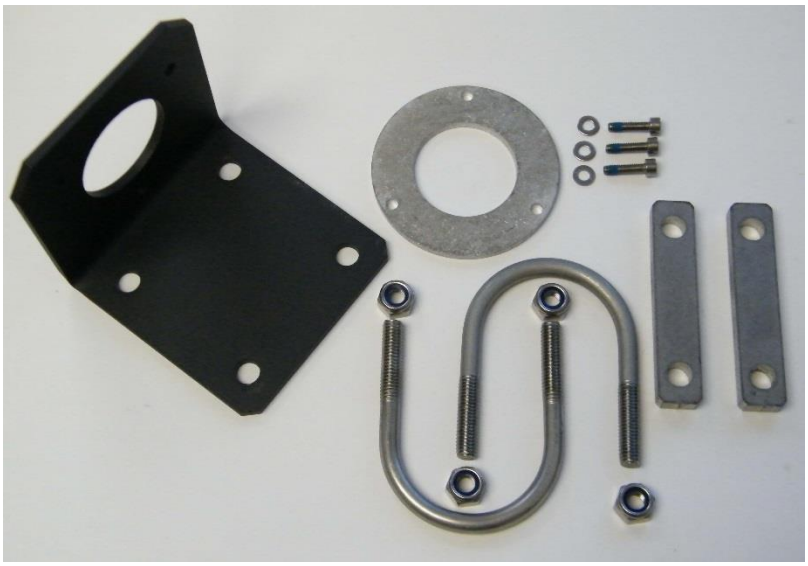


Figure 34 TT-3027 Adjustable Pole/Railing Mount Kit

For installation of the TT-3027 transceiver, refer to the Thrane&Thrane TT-3027 Sailor Transceiver Installation Manual, which is included with the transceiver.

4.2.7.2.2 Wiring

The TT-3027 modem attaches to the DRI3 communications expansion adapter board. The adapter provides power to the TT-3027 unit. Before terminating the cable, feed the cable through the cable gland on the bottom of the RMU5. Strip the cable sheathing back approximately 15cm (6") on the un-terminated end of the cable. The cable from the TT-3027 unit is then wired into the provided 4-contact Phoenix-style connector as shown in Figure 35. Apply cable-ties to reduce strain on individual conductors. After completing wiring, plug the green 4-contact connector into the mating socket on the DRI3 TT-3027 Sat Interface Board (see Figure 36).

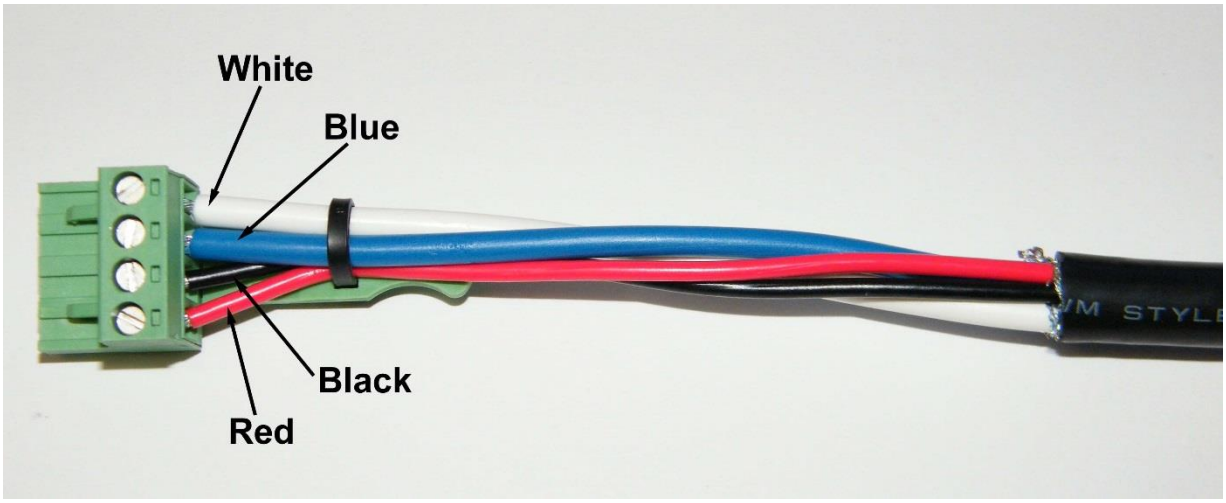


Figure 35 TT-3027 Cable Termination

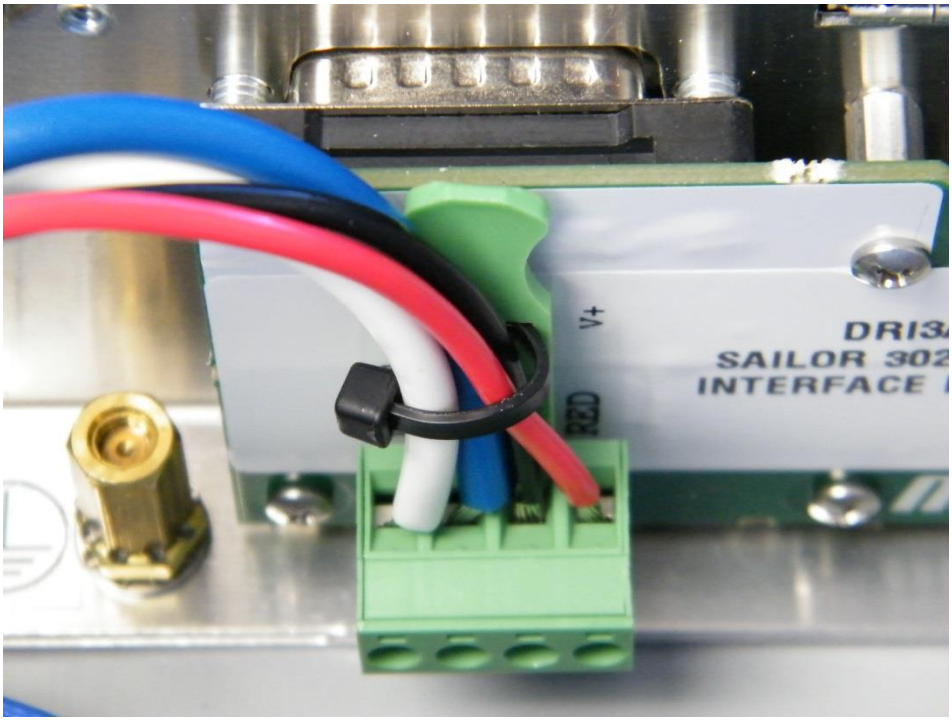


Figure 36 TT-3027 Cable Plugged Into DRI3

4.2.8 Iridium Satellite (RMU5-Iridium)

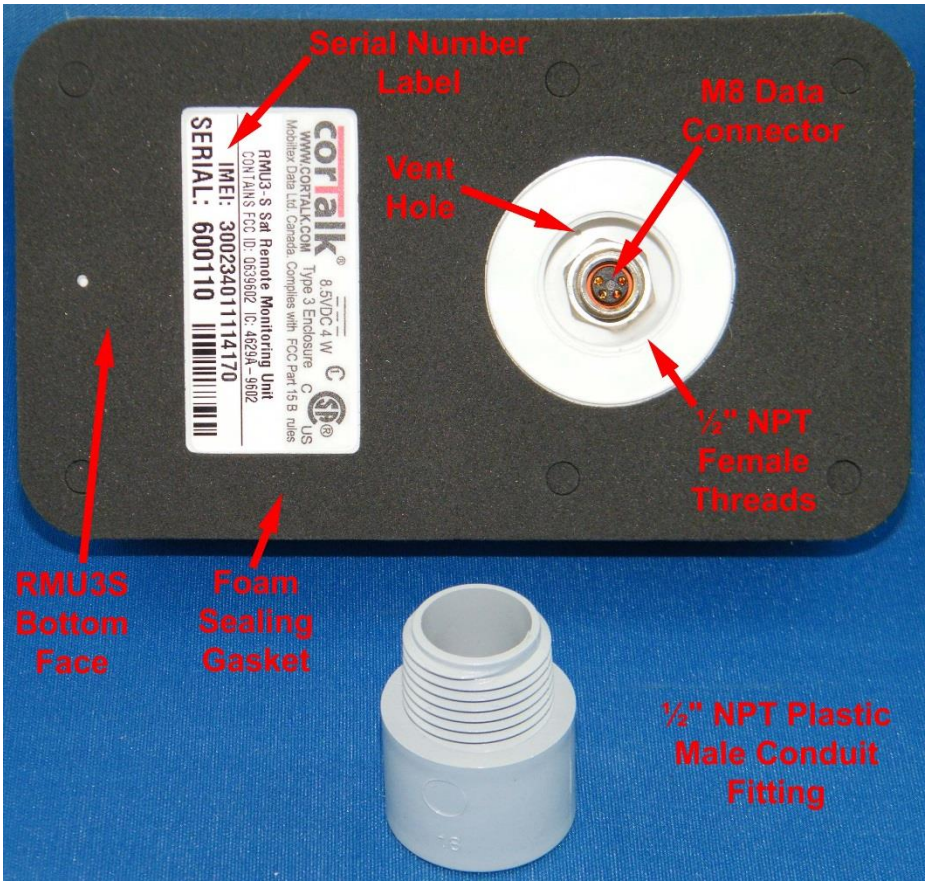


Figure 37 RMU3-S Iridium Satellite Transceiver Installation Hardware

The RMU3-S Iridium satellite transceiver module can be installed directly on top of a rectifier by drilling a 7/8" (0.875", 22mm) hole in the top of the rectifier. The selected location requires a minimum of 1.5" (38mm) of clearance in the area

of the drilled hole between the rectifier lid and internal rectifier components. Debur the drilled hole so there are no sharp edges. Clean and wipe the top surface around the drilled hole.

Carefully mate the cable male connector with the female M8-style receptacle located on the bottom of the RMU3-S device. Hand tighten the connector by rotating the knurled connector nut clockwise. Do not over tighten. Pass the un-attached female end of the interconnection cable through the hole in the rectifier lid. Place the bottom face of the RMU3-S transmitter on the rectifier lid.

From inside the rectifier, pass the threaded end of the supplied ½" plastic male conduit fitting over the un-attached female end of the interconnect cable. Slide the fitting all the way up to the 7/8" hole in the rectifier and thread it into the mating threads on the RMU3-S. Hand tighten the conduit fitting adequately to ensure compression of the integral foam sealing gasket. Do not over tighten.

If direct attachment to the top of the rectifier is not desirable, the RMU3 may also be attached directly to a plastic or metal conduit that has ½" NPT fittings. An optional universal mounting bracket kit (Mobiltex part number A20103RMU31) is also available for mounting to other surfaces or poles. Optional additional length interconnect cables may be required for these alternate mounting types. When using alternate mounting methods, ensure that the RMU3 transmitter has the corTalk® logo pointing straight up into the sky. The RMU3-S transceiver should always have as much view of the entire sky as possible for best Iridium satellite coverage. The following pictures illustrate various mounting schemes for the RMU3-S.



Figure 38 RMU3-S Transceiver Installation Examples

In the case of **rigid conduit mounting, a conduit nut must be used to limit the thread depth to ½" maximum.** Otherwise, the conduit can punch through the plastics and damage the antenna.

When mounting the antenna to the conduit, hold the nut on the conduit at the required maximum ½" thread depth while threading the antenna onto the conduit threads. Stop threading once the antenna base is resting firmly against the nut.

After installing the RMU3-S transceiver, run the cable back to the RMU5 installation area. If flexible conduit (optional kit P/N A20103RMU50 or A20103RMU51) is used to protect the cable, pass the cables through the flexible conduit back into the RMU5 enclosure. Ensure that the entry point into the flexible conduit is adequately sealed against moisture incursion by using a proper gland and silicone sealant.

If the cable is run straight back to the RMU5 without flexible conduit, remove the center ½" flexible conduit connector on the RMU5 and replace it with the cable gland (see Figure 27) that is provided in the Iridium installation kit. Re-use the sealing ring and nut from the original conduit connector.

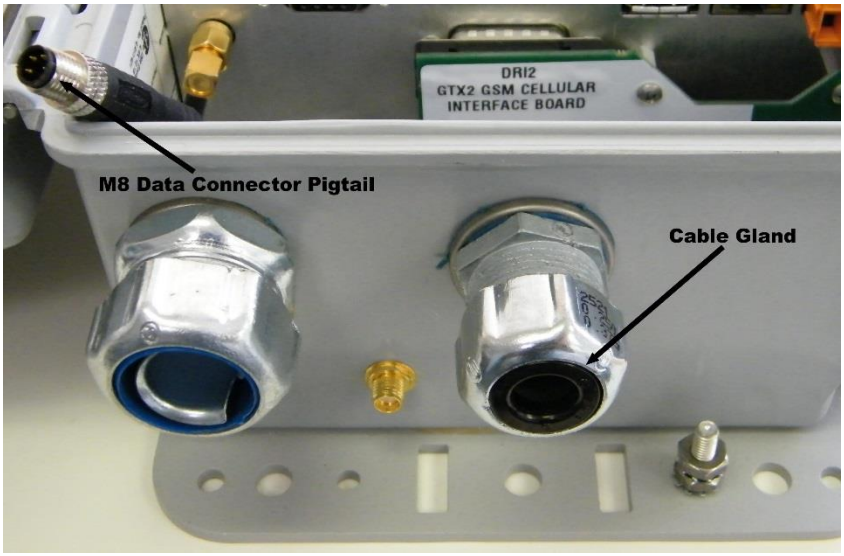


Figure 39 Cable Gland For RMU3-S Interconnect Cable

Remove the nut, plastic washer, and compression grommet from the cable gland. Pass the M8 data connector pigtail from the DRI2 board through the base of the gland. Pass the mating end of the RMU3-S interconnect cable through the nut, plastic washer and compression grommet as shown in Figure 28. Connect the RMU3-S interconnect cable connector to the mating connector on the pigtail from the DRI2 board. Thread together the locking rings on each connector to ensure a reliable connection. Re-attach the gland nut to gland base and tighten the gland nut until it is no long possible to move the cable back and forth in the gland.

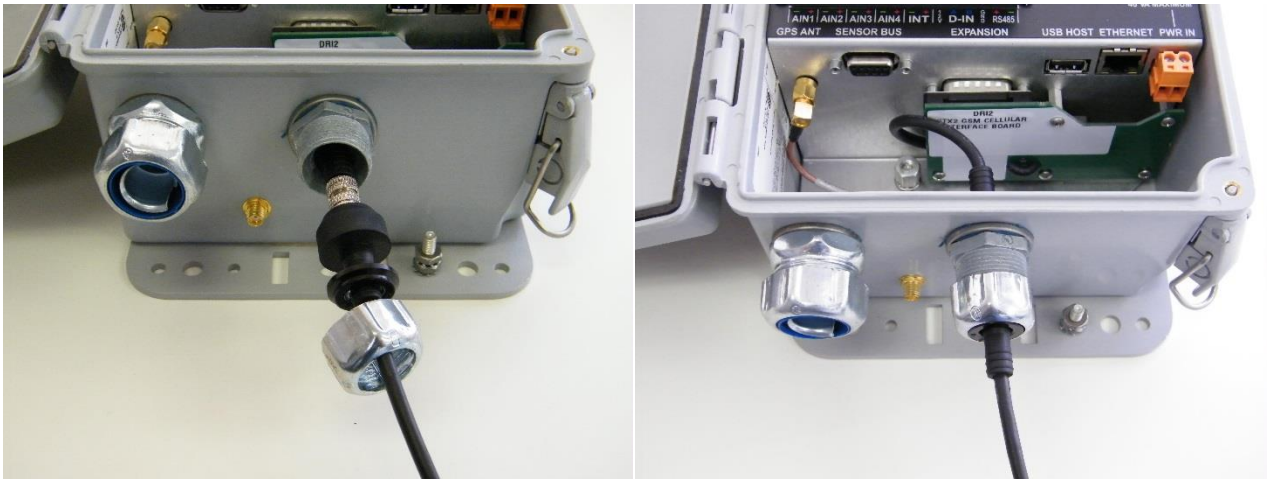


Figure 40 RMU3-S Interconnect Cable Installed Through Cable Gland

4.2.9 Measurement Type Wiring

The RMU5 can be wired in several different pre-defined configurations for rectifier, test point, and bond monitoring. Table 1 summarizes all currently available measurement types. The diagrams in the following pages illustrate typical installations for each measurement type. Each measurement type diagram contains a table indicating the four main data points (slots) that are transmitted to the corView server.

RMU5 Measurement Types:

Type	Rectifier - Detail	Slot #1	Slot #2	Slot #3	Slot #4
RECT1	**Rect Volts & Rect Amps & 2 Drains**	DC Volts 1 - Rect V	DC Amps 2 - Total	DC Amps 3 - Drain 1	DC Amps 4 - Drain 2
RECT2	**Rect Volts & 3 Drains**	DC Volts 1 - Rect V	DC Amps 2 - Drain 1	DC Amps 3 - Drain 2	DC Amps 4 - Drain 3
RECT3	**Rect Volts & Rect Amps & 1 Drain & AC Line Volts**	DC Volts 1 - Rect V	DC Amps 2 - Total	DC Amps 3 - Drain 1	AC Volts 4 - Line
RECT4	**Rect Volts & 2 drains & AC Line Volts**	DC Volts 1 - Rect V	DC Amps 2 - Drain 1	DC Amps 3 - Drain 2	AC Volts 4 - Line
RECT5	**Rect Volts & Rect Amps & PS c/w induced AC**	DC Volts 1 - Rect V	DC Amps 2 - Total	DC Volts 3 - P/S	AC Volts 3 - P/S
RECT6	**Rect Volts & Rect Amps & PS DC only & AC Line Volts**	DC Volts 1 - Rect V	DC Amps 2 - Total	DC Volts 3 - P/S	AC Volts 4 - Line
RECT7	**Rect Volts AC/DC & Rect Amps & AC Line Volts**	DC Volts 1 - Rect V	DC Amps 2 - Total	AC Volts 1 - Rect AC	AC Volts 4 - Line
RECT8	**Rect Volts AC/DC & Rect Amps & PS DC only**	DC Volts 1 - Rect V	DC Amps 2 - Total	DC Volts 3 - P/S	AC Volts 1 - Rect AC
RECT9	**Rect Volts & Rect Amps & 1 Drain & TEG DC Volts In**	DC Volts 1 - Rect V	DC Amps 2 - Total	DC Amps 3 - Drain 1	DC Volts 4 - TEG In
RECT10	**Rect Volts & 2 drains & TEG DC Volts In**	DC Volts 1 - Rect V	DC Amps 2 - Drain 1	DC Amps 3 - Drain 2	DC Volts 4 - TEG In
RECT11	**Rect Volts & Rect Amps & PS DC only & TEG DC Volts In**	DC Volts 1 - Rect V	DC Amps 2 - Total	DC Volts 3 - P/S	DC Volts 4 - TEG In
RECT12	**Rect1 Volts & Amps + Rect2 Volts & Amps**	DC Volts 1 - Rect1 V	DC Amps 2 - Total1	DC Volts 3 - Rect2 V	DC Amps 4 - Total2
RECT13	**Rect Volts & Rect Amps & 2 PS DC only**	DC Volts 1 - Rect V	DC Amps 2 - Total	DC Volts 3 - P/S 1	DC Volts 4 - P/S 2
RECT14	**Rect1 Volts & Amps + PS DC + Amps**	DC Volts 1 - Rect1 V	DC Amps 2 - Total1	DC Volts 3 - P/S 1	DC Amps 4 – Bond1

Type	TEST POINT - Detail	Slot #1	Slot #2	Slot #3	Slot #4
TP17	**One P/S AC/DC, AC Mitigation Current, Current Density AC**	DC Volts 1 - P/S 1	AC Volts 1 - P/S 1	DC Amps 2 – AC Mitigation Current	AC Amps 4 – AC Current Density
TP18	**One P/S AC/DC, Current Density AC/DC**	DC Volts 1 - P/S 1	AC Volts 1 - P/S 1	DC Amps 2 – DC Current Density	AC Amps 4 – AC Current Density
TP19	**One P/S c/w Induced AC, 1 Point Bond, Current Density AC**	DC Volts 1 - P/S 1	AC Volts 1 - P/S 1	DC Volts 2 – P/S 2	AC Amps 4 – AC Current Density
TP20	**Four P/S DC, Test Point**	DC Volts 1 - P/S 1	DC Volts 2 - P/S 2	DC Volts 3 - P/S 3	DC Volts 4 - P/S 4
TP21	**Two P/S c/w Induced AC, Test Point**	DC Volts 1 - P/S 1	AC Volts 1 - P/S 1	DC Volts 2 - P/S 2	AC Volts 2 - P/S 2

Type	BONDS - Detail	Slot #1	Slot #2	Slot #3	Slot #4
BOND22	**Two P/S DC Only, 2 Point Bond**	DC Volts 1 - P/S 1	DC Volts 2 - P/S 2	DC Amps 3 - Bond 1	DC Amps 4 - Bond 2
BOND23	**One P/S DC Only, 3 Point Bond**	DC Volts 1 - P/S 1	DC Amps 2 - Bond 1	DC Amps 3 - Bond 2	DC Amps 4 - Bond 3
BOND24	**One P/S c/w Induced AC, 2 Point Bond**	DC Volts 1 - P/S 1	AC Volts 1 - P/S 1	DC Amps 2 - Bond 1	DC Amps 3 - Bond 2
BOND25	**Two P/S c/w Induced AC, 0 Point Bond**	DC Volts 1 - P/S 1	AC Volts 1 - P/S 1	DC Volts 2 - P/S 2	AC Volts 2 - P/S 2
BOND26	**No P/S, 4 Point Bond**	DC Amps 1 - Bond 1	DC Amps 2 - Bond 2	DC Amps 3 - Bond 3	DC Amps 4 - Bond 4
BOND27	**One P/S c/w Induced AC, 1 Point Bond, AC Mitigation Current**	DC Volts 1 - P/S 1	AC Volts 1 - P/S 1	DC Amps 2 - Bond 1	AC Amps 4 – AC Mitigation Current
BOND28	**One P/S DC Only, 2 Point Bond, AC Mitigation Current**	DC Volts 1 - P/S 1	DC Amps 2 - Bond 1	DC Amps 3 - Bond 2	AC Amps 4 – AC Mitigation Current
BOND29	**Three P/S DC, 1 Point Bond**	DC Volts 1 - P/S 1	DC Volts 2 - P/S 2	DC Volts 3 - P/S 3	DC Amps 4 - Bond 1
BOND30	**One P/S AC/DC, 1 P/S DC, AC Mitigation Current**	DC Volts 1 - P/S 1	AC Volts 1 - P/S 1	DC Volts 2 – P/S 2	AC Amps 4 – AC Mitigation Current

Type	RESERVED - Future Use
15-17	Future use - determined by factory
31-32	Future use - determined by factory

Range	Max	Comment
Rect Volts DC	150 VDC	
Rect Volts AC	105 VAC	
Rect DC Amps	150 mV DC	50mV or 100mV shunt
Rect DC Amps Drain	150 mV DC	50mV or 100mV shunt
P/S DC	20 VDC Hi Z	
P/S AC	14 VAC Hi Z	
AC Line Volts	115 VAC	Using the AC sense wire channel.
TEG DC Volts In	119 VDC	
AC Mitigation Current	14 VAC	Requires external current transformer with internal protection

Table 1 Measurement Types

A fifth slot is also transmitted to corView, which under most configurations will transmit the AC reading for the measurement in slot #1. Slot #5 may also be used to transmit Instant-off pipe-to-soil measurements for measurement types that support that type of measurement.

Select the measurement type appropriate for the installation, and wire the input channels according to the matching diagram in the following pages. Note that for pipe-to-soil measurements, as shown in the installation diagrams, the readings sent to corView will be negative. If positive pipe-to-soil measurements are desired, switch the positive and negative wires on the physical input channel.

4.2.9.1 Rectifier Measurement Type Diagrams

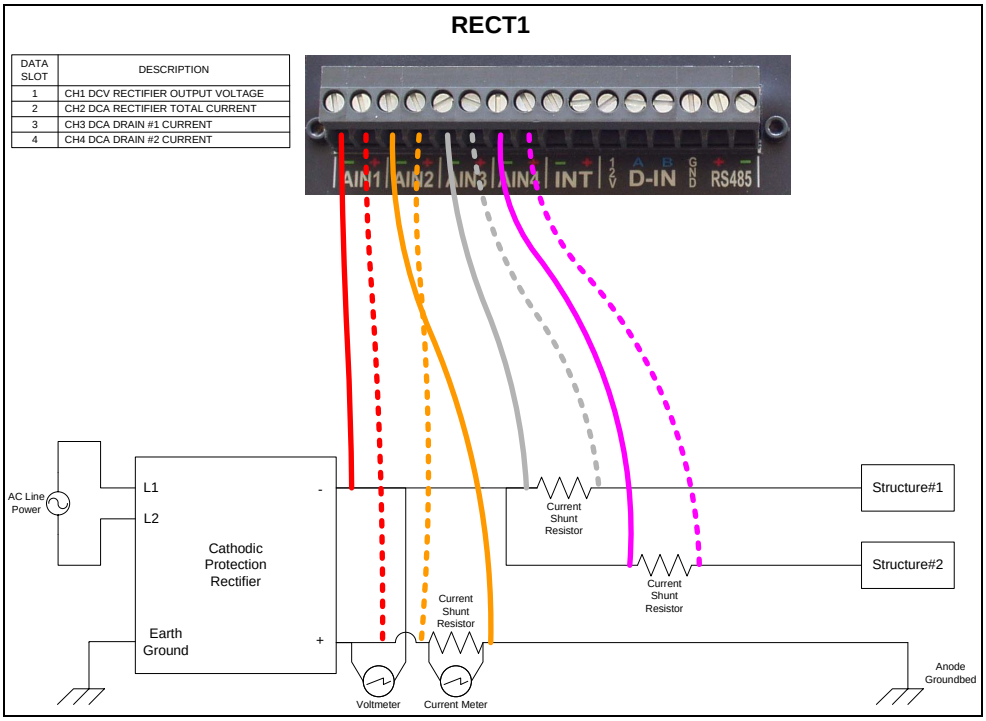


Figure 41 RECT1 Rectifier – Output Volts, Total Amps, and 2 Drains

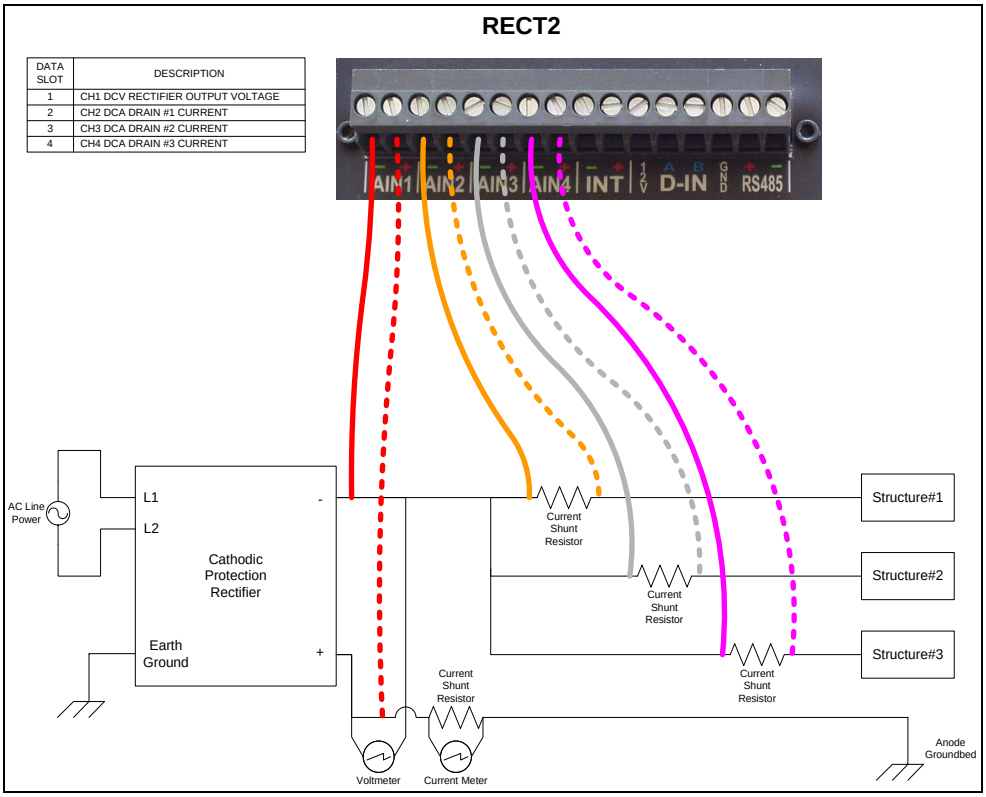


Figure 42 RECT2 Rectifier – Output Volts and 3 Drains

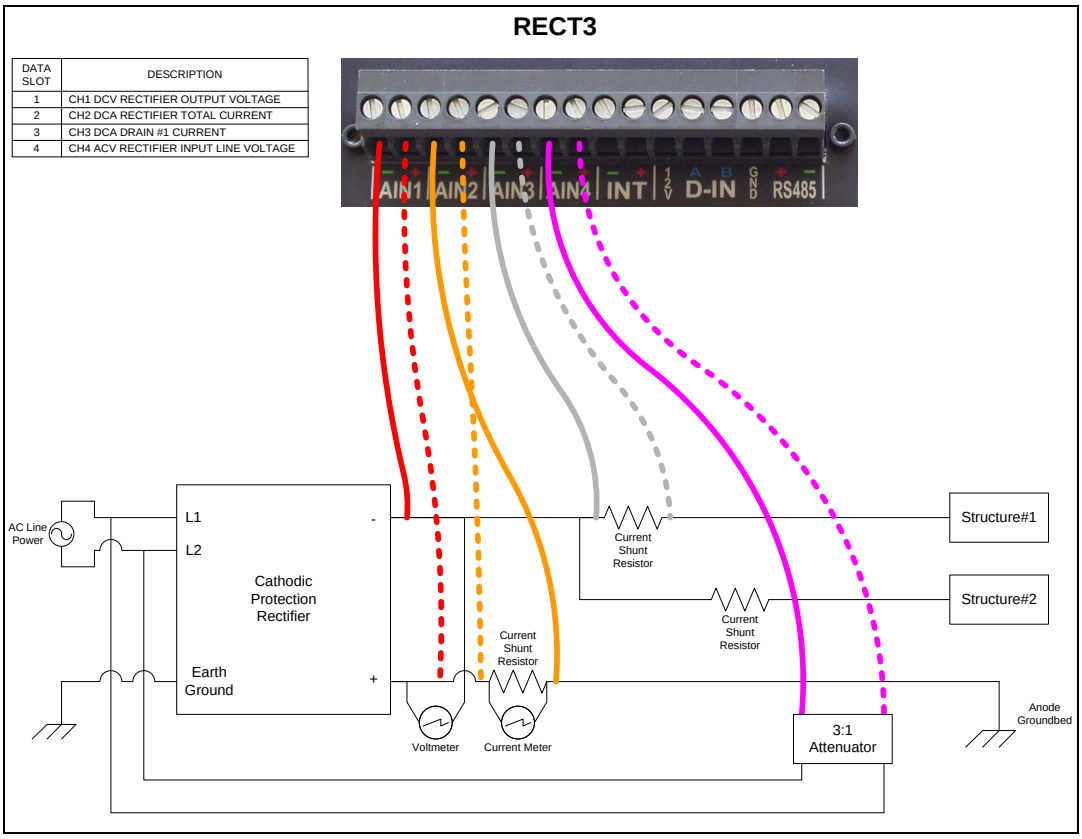


Figure 43 RECT3 Rectifier – Output Volts, Total Amps, Drain, and Input AC Volts

Note: Do not connect input channels directly to AC mains. A 3:1 CSA Class 2 transformer is required.

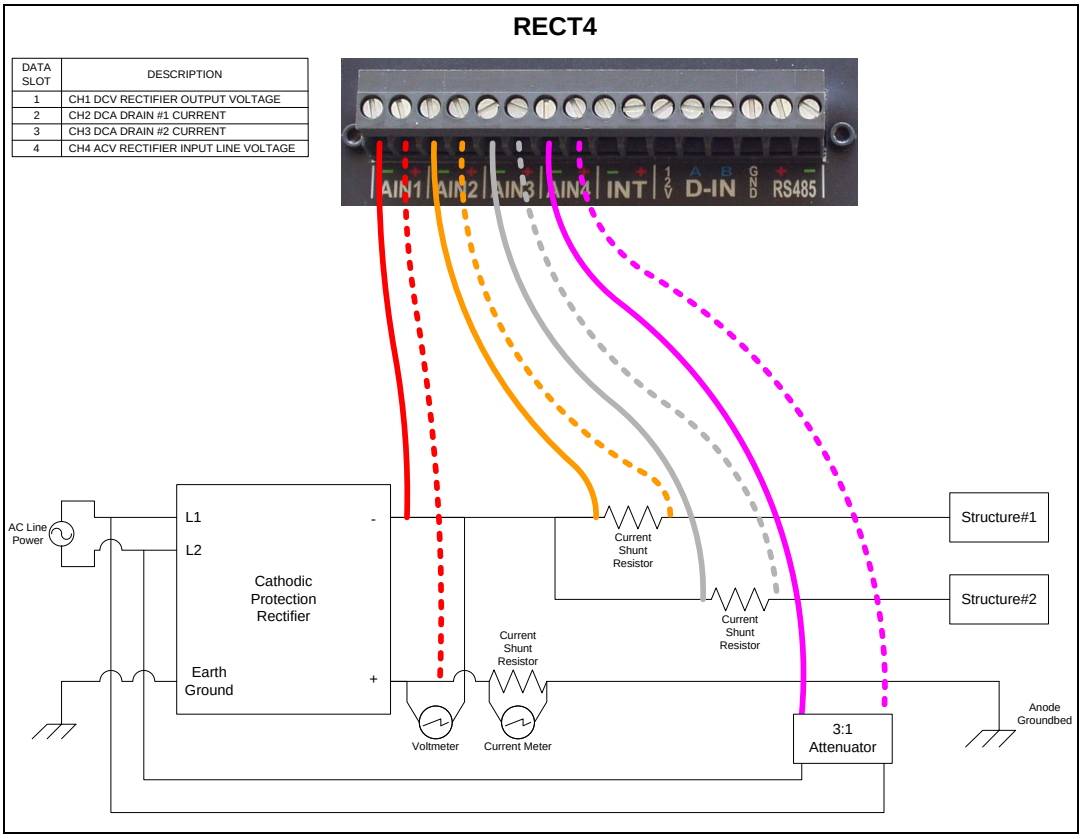


Figure 44 RECT4 Rectifier - Output Volts, 2 Drains, and Input AC Volts

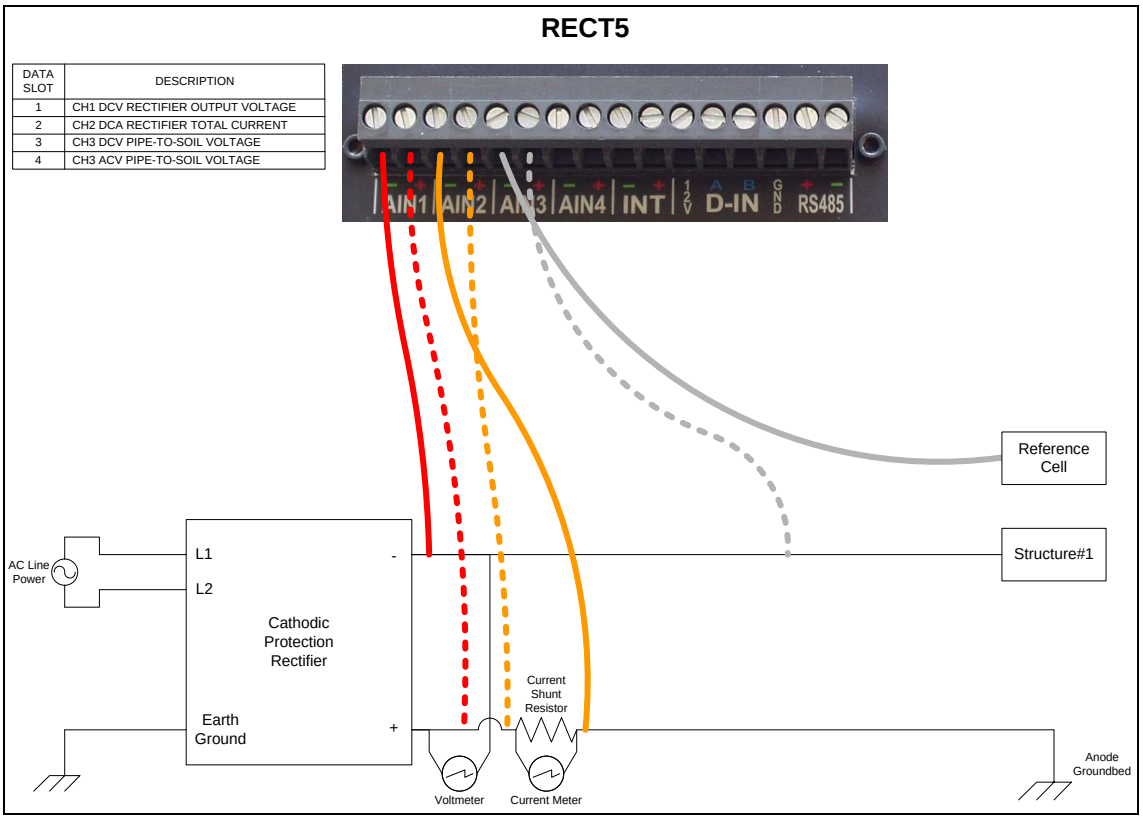


Figure 45 RECT5 Rectifier – Output Volts, Total Current, and Pipe-To-Soil AC/DC

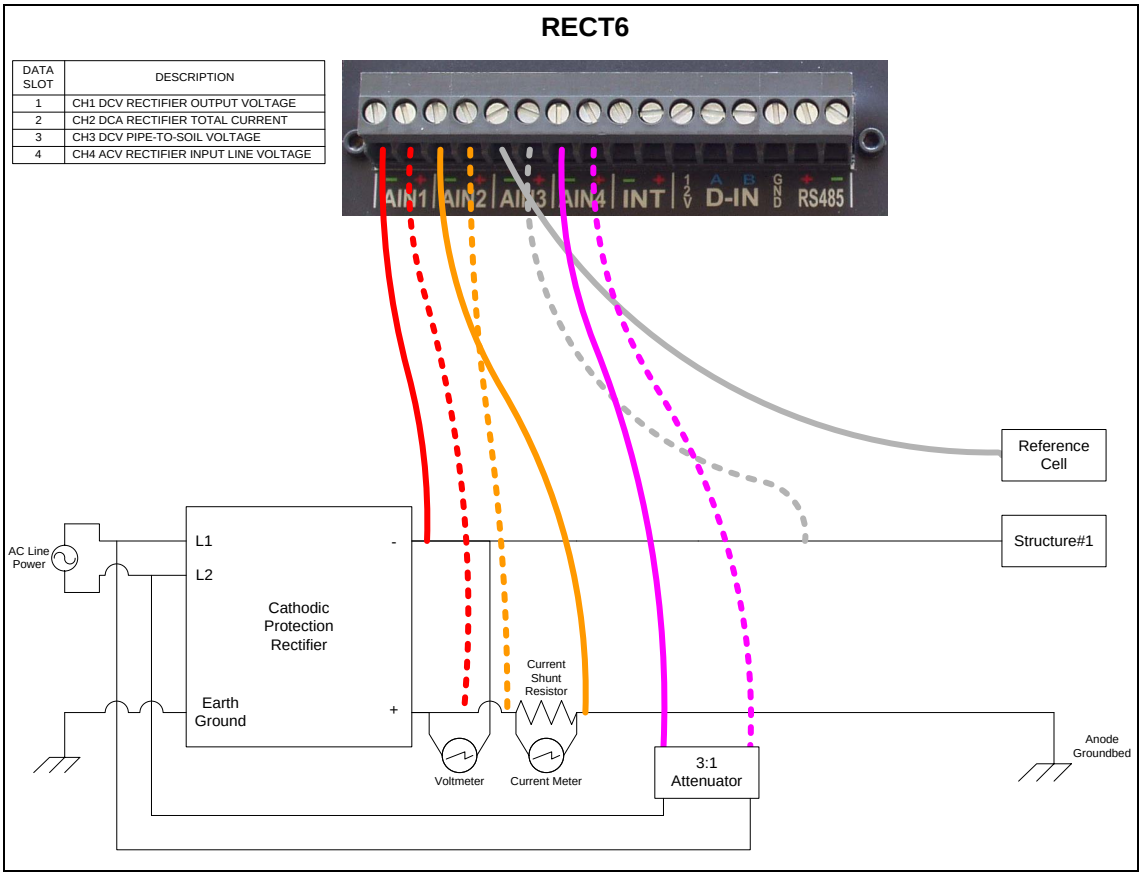


Figure 46 RECT6 Rectifier – Output Volts, Total Current, Pipe-To-Soil and Input AC Volts

Note: Do not connect input channels directly to AC mains. A 3:1 CSA Class 2 transformer is required.

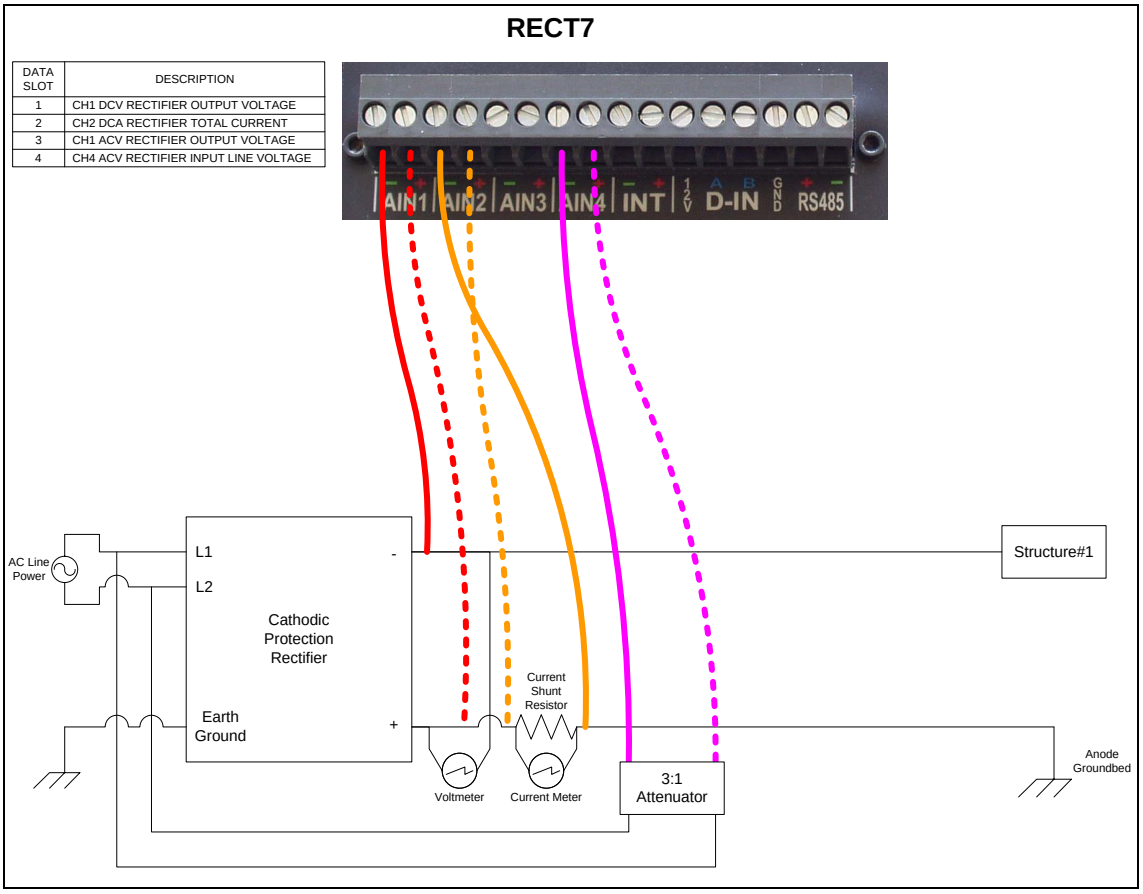


Figure 47 RECT7 Rectifier – Output Volts AC/DC, Total Current, and Input AC Volts

Note: Do not connect input channels directly to AC mains. A 3:1 CSA Class 2 transformer is required.

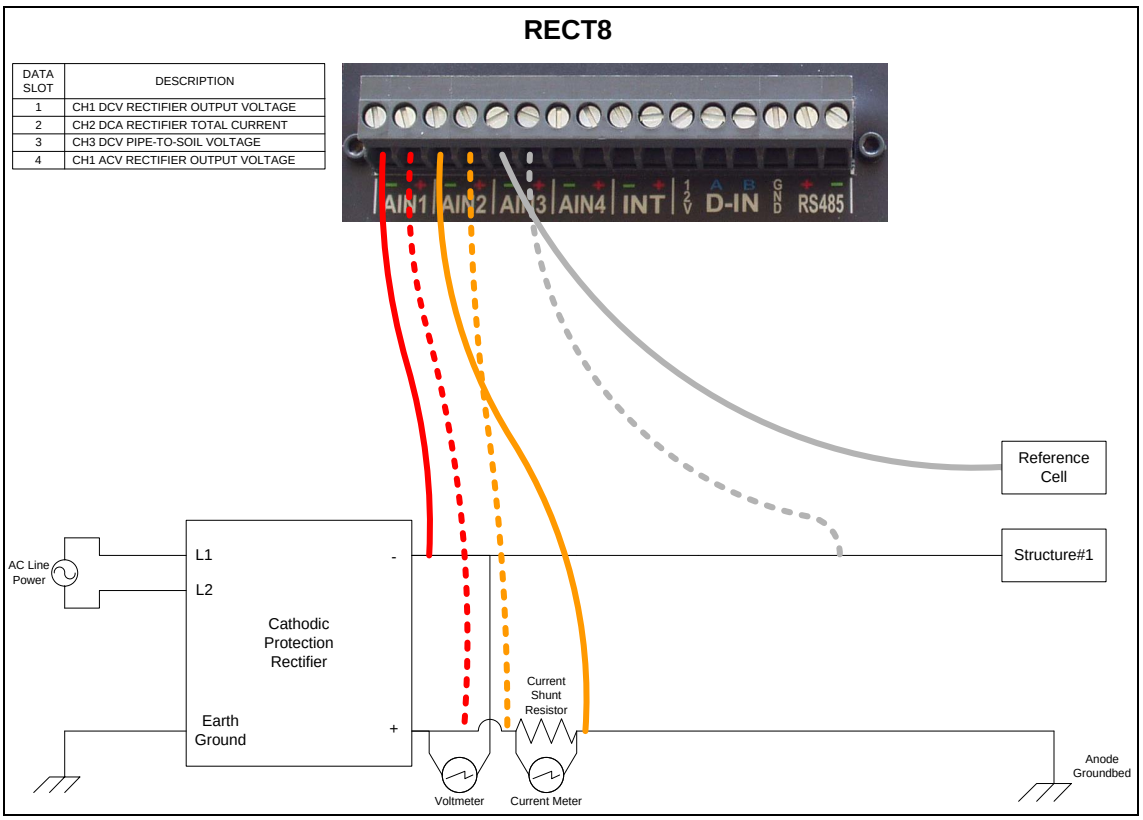


Figure 48 RECT8 Rectifier – Output Volts AC/DC, Total Current, and Pipe-To-Soil

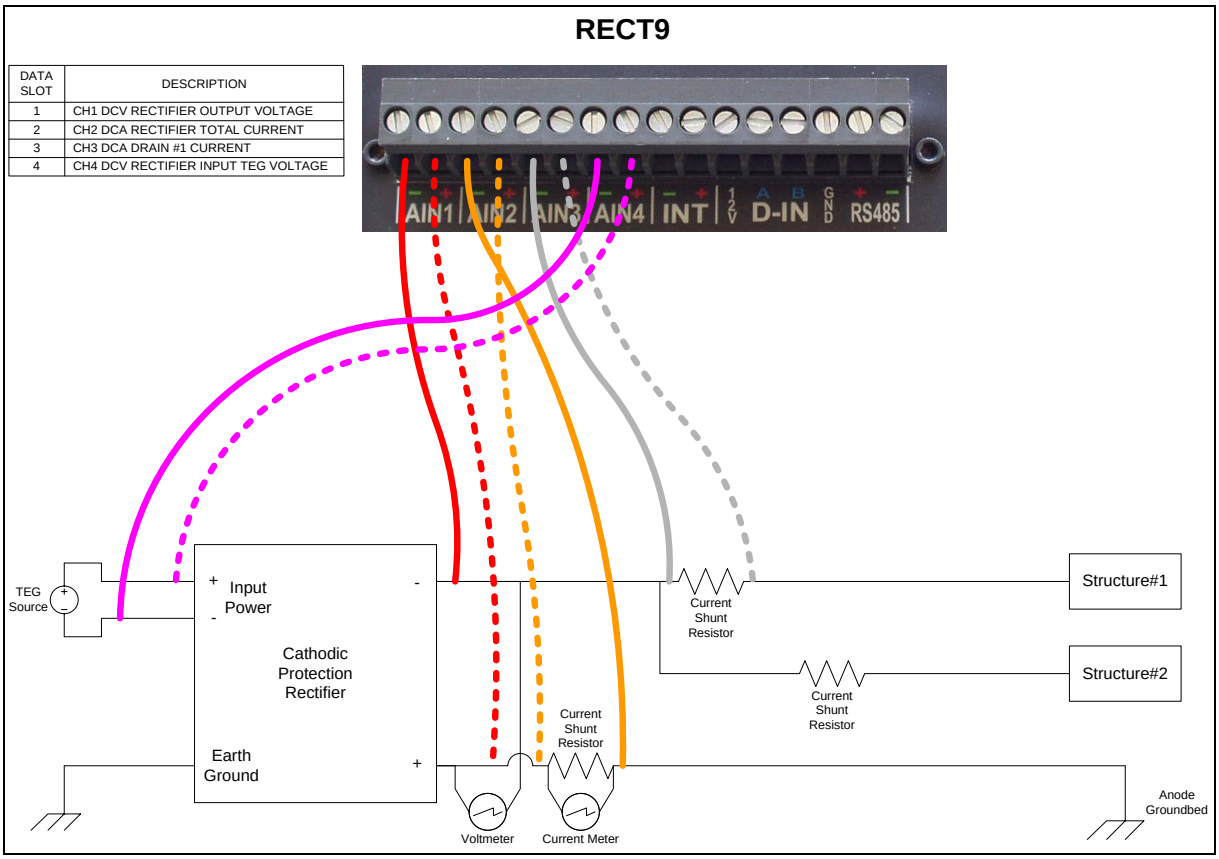


Figure 49 RECT9 TEG or Solar – Output Volts, Total Current, Drain, and Input DC Volts

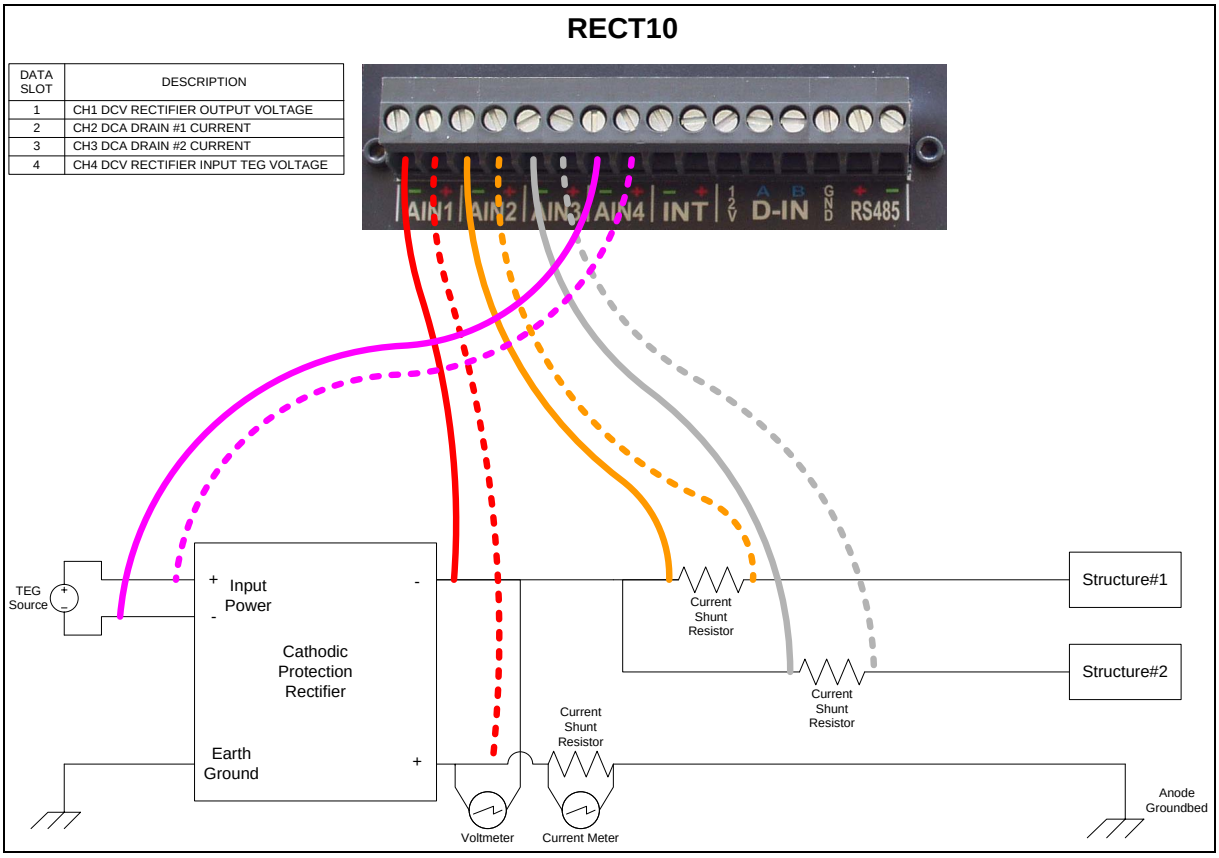


Figure 50 RECT10 TEG or Solar – Output Volts, 2 Drains, and Input DC Volts

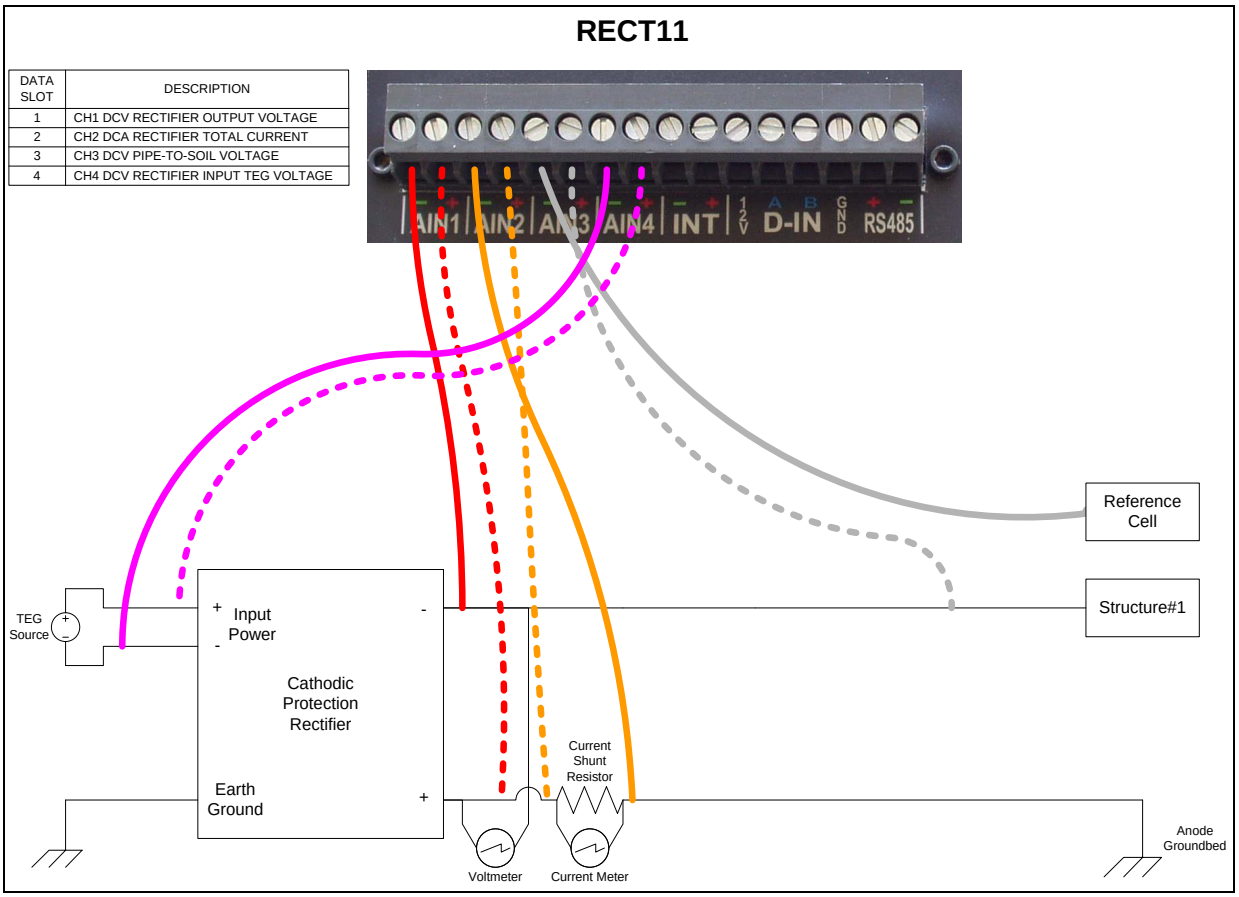


Figure 51 RECT11 TEG or Solar – Output Volts, Total Current, Pipe-To-Soil, and Input DC Volt

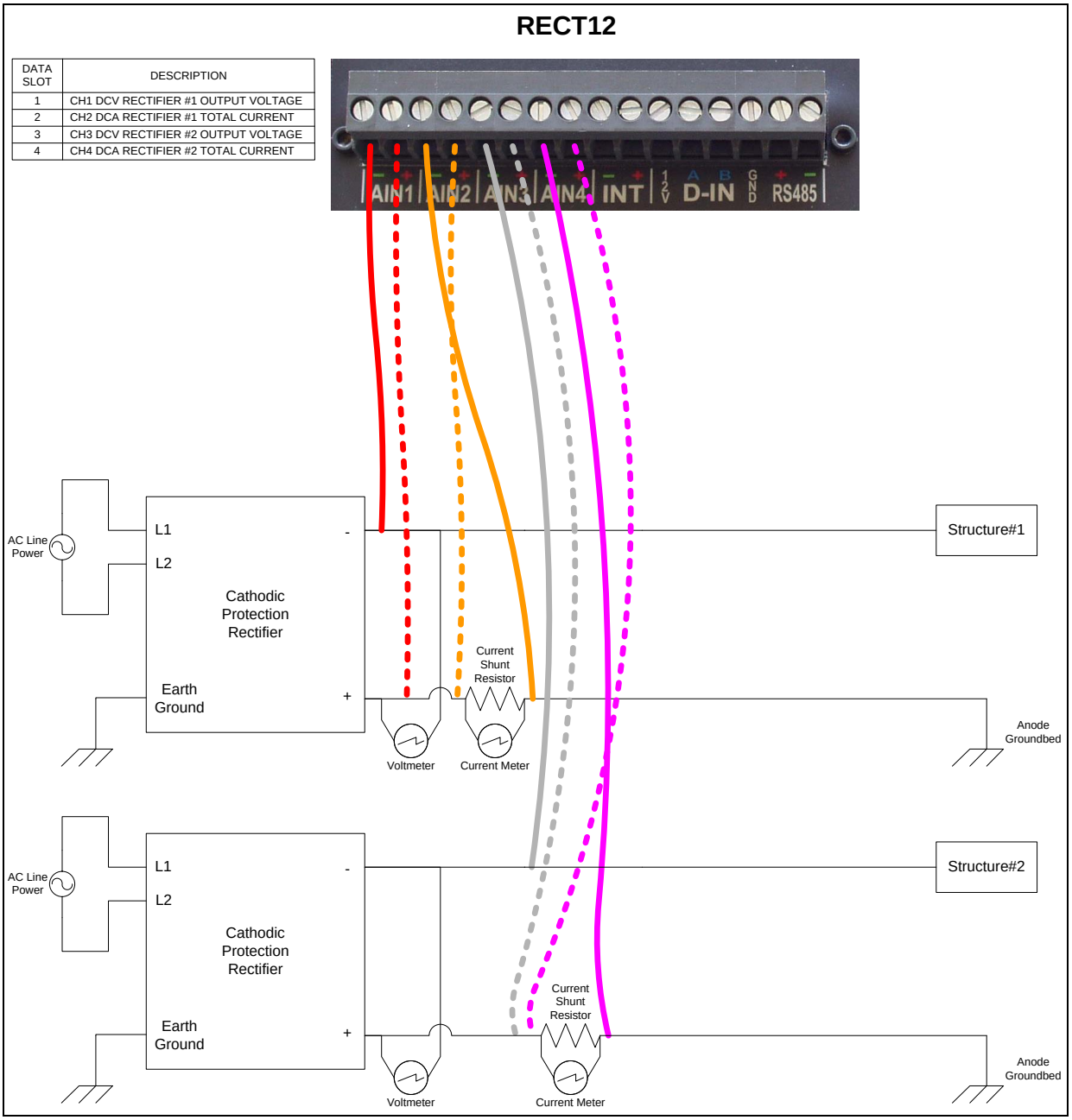


Figure 52 RECT12 Two Co-located Rectifiers – Rect #1/2 Output Volts, and Rect #1/2 Current

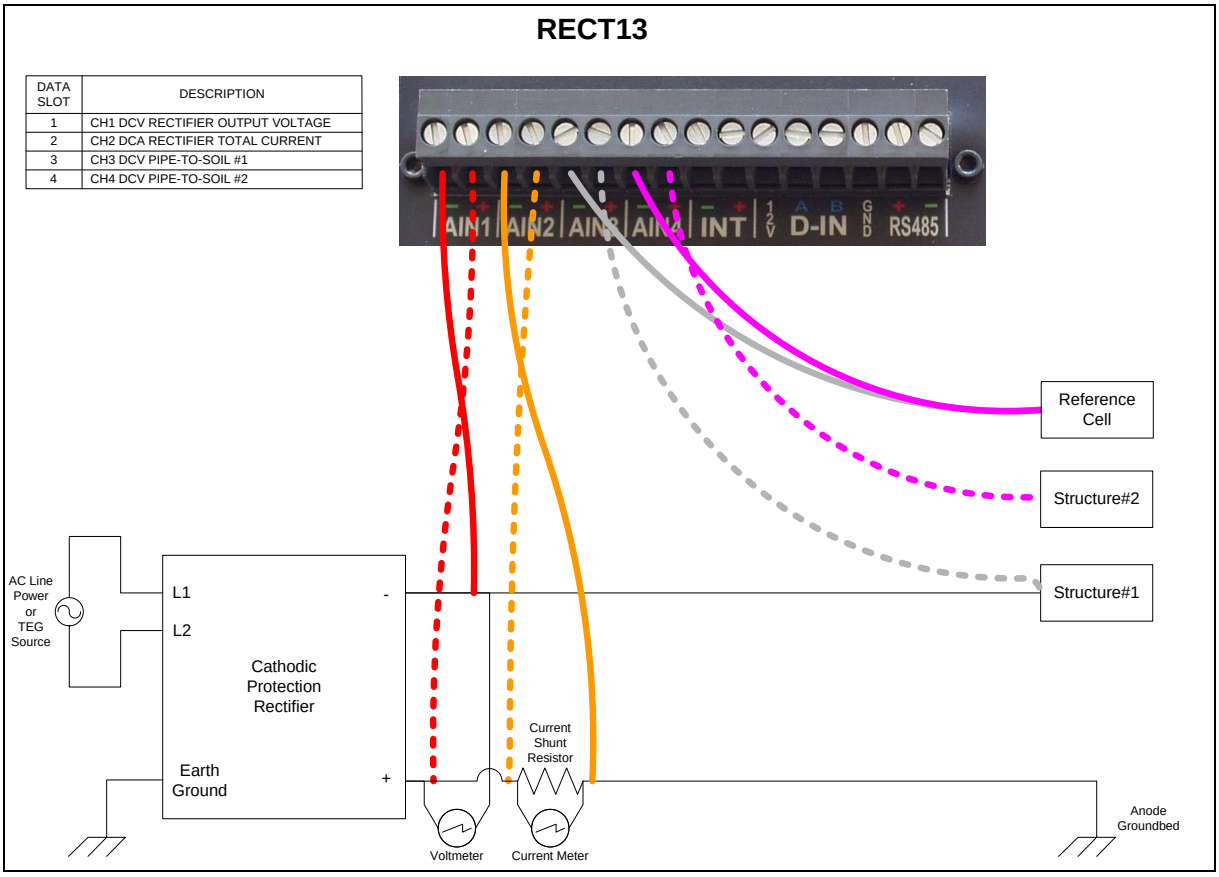


Figure 53 RECT13 Rectifier – Output Volts, Total Amps, and 2 Pipe-To-Soil DC

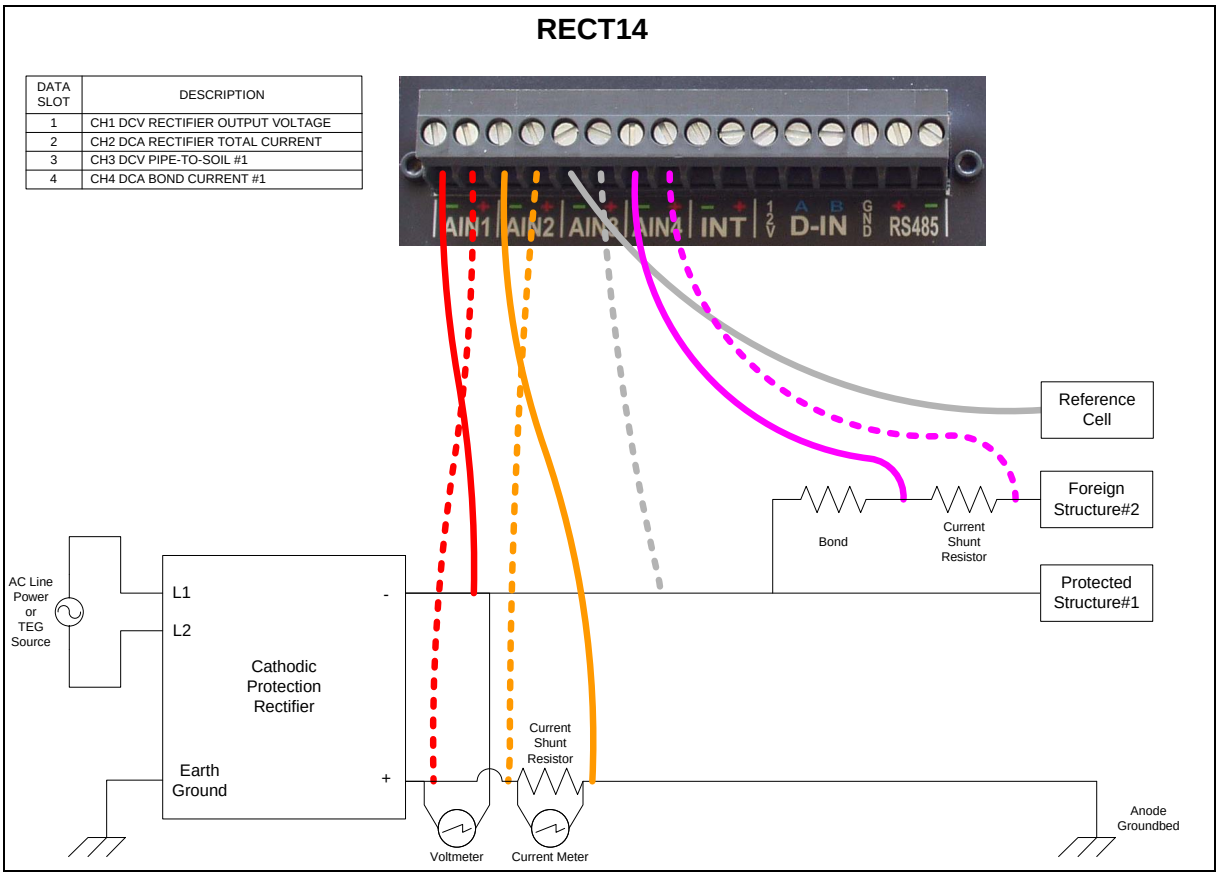


Figure 54 RECT14 Rectifier – Output Volts, Total Amps, 1 Pipe-To-Soil DC, and 1 Bond DC Current

4.2.9.2 Test Point Measurement Type Diagram

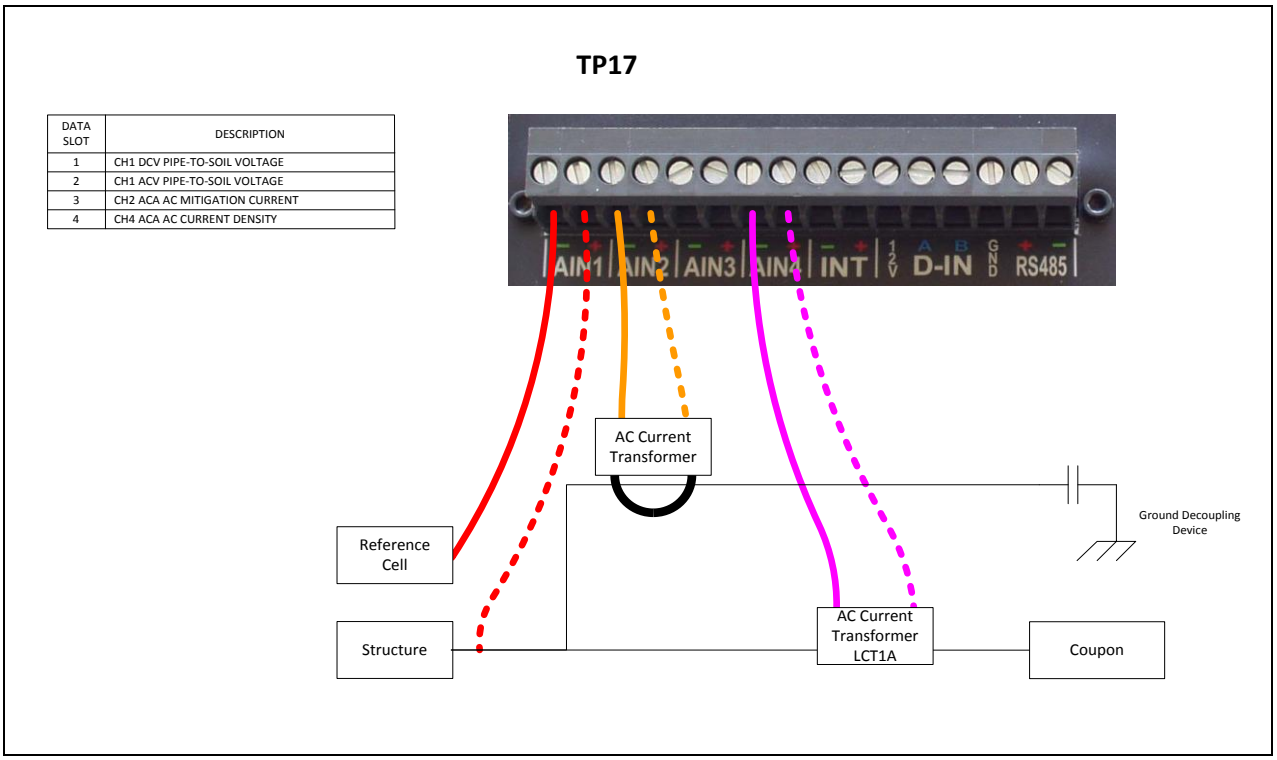


Figure 55 TP17 Testpoint – Pipe-To-Soil DC/AC, AC Mitigation Current, and AC Current Density

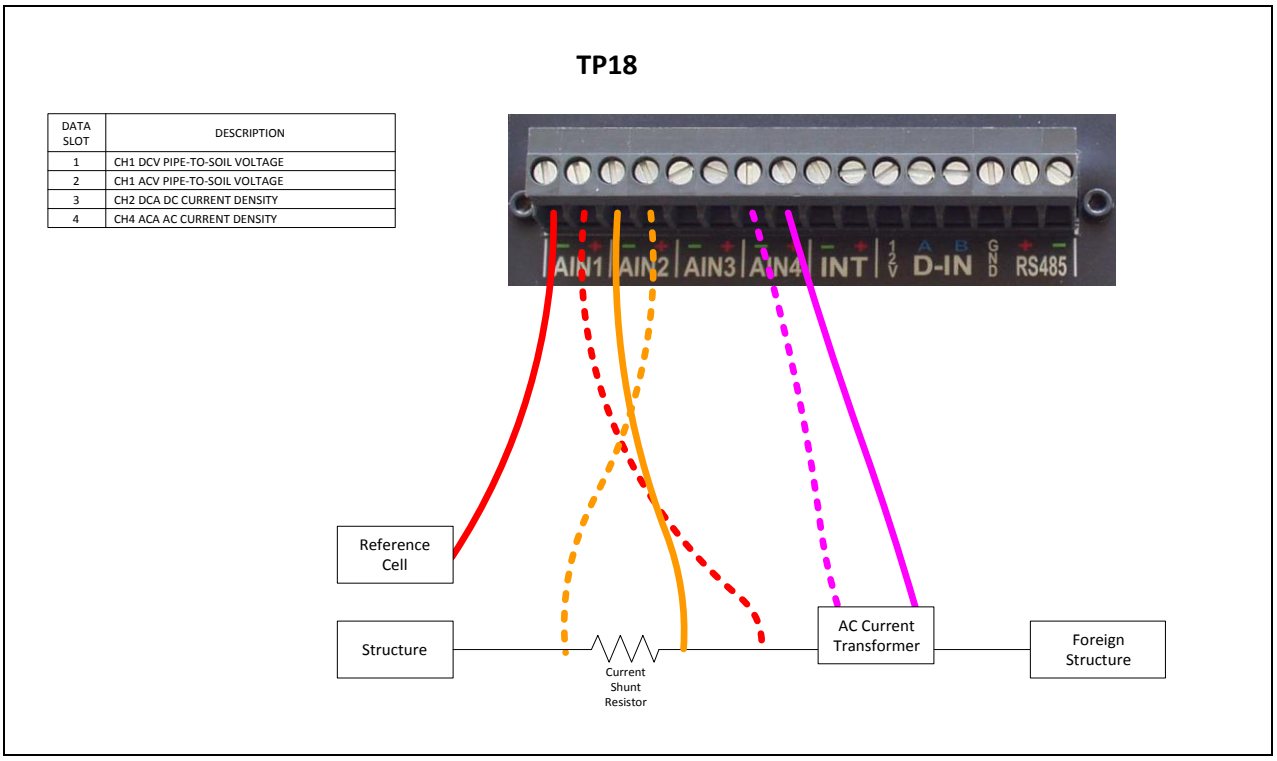


Figure 56 TP18 Testpoint – Pipe-To-Soil DC/AC, DC Current Density, and AC Current Density

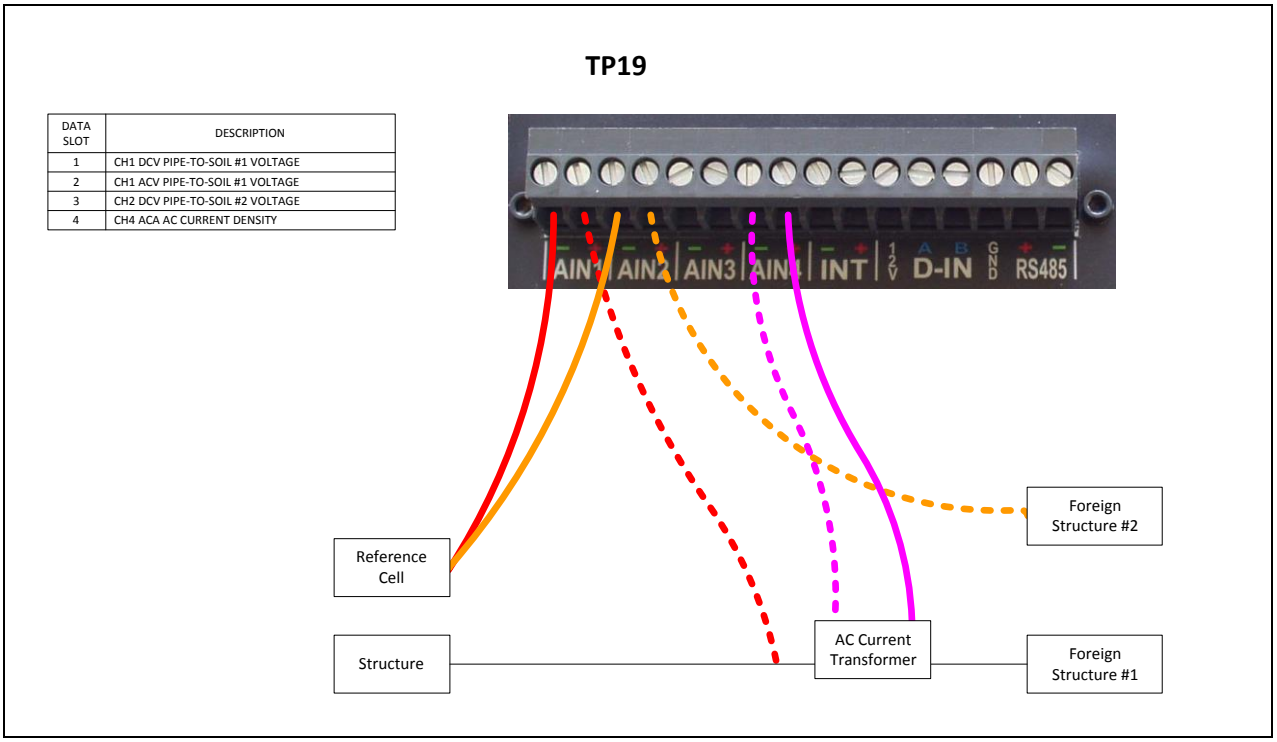


Figure 57 TP19 Testpoint – Pipe-To-Soil 1 DC/AC, Pipe-To-Soil 2 DC, and AC Current Density

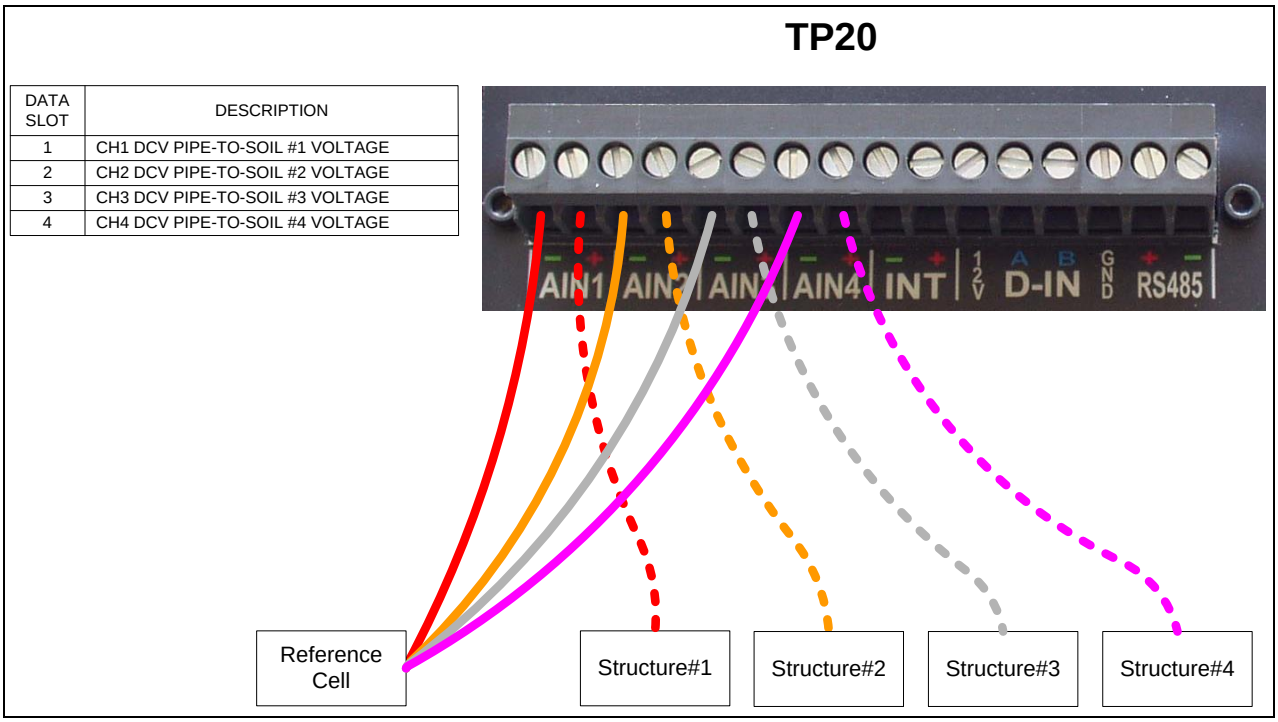


Figure 58 TP20 Testpoint – 4 Pipe-To-Soil DC

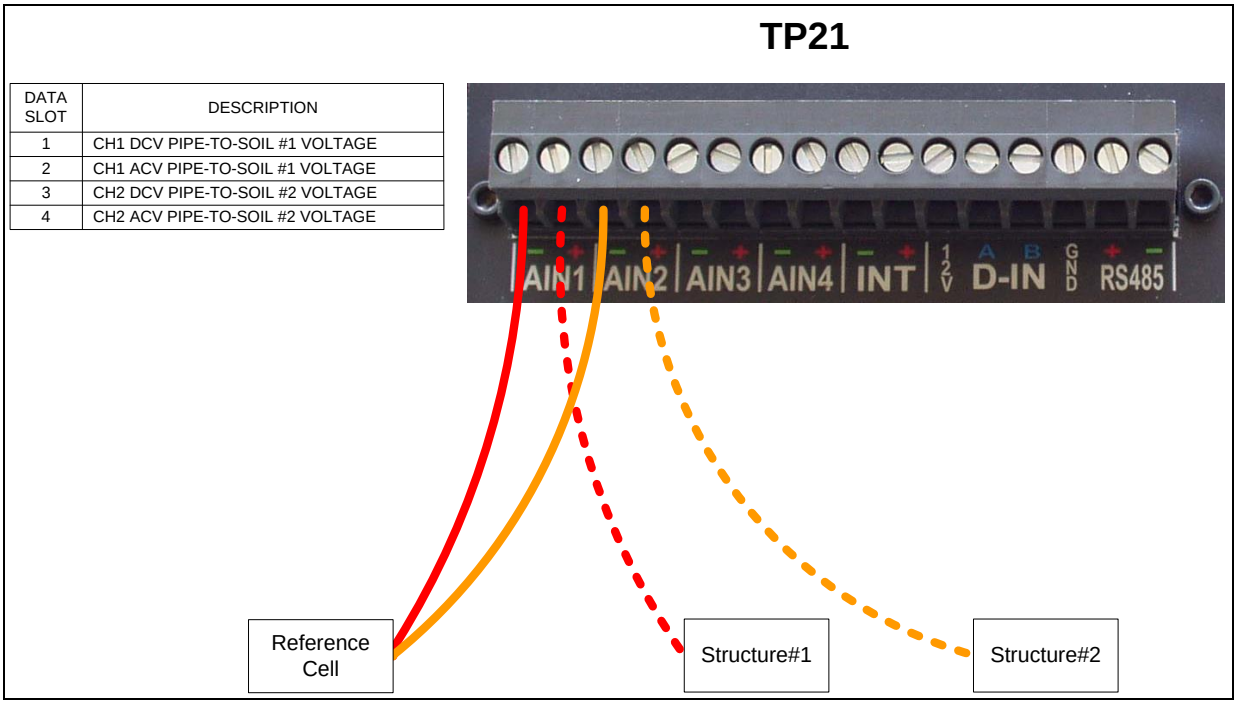


Figure 59 TP21 Testpoint – 2 Pipe-To-Soil AC/DC

4.2.9.3 Bond Measurement Type Diagrams

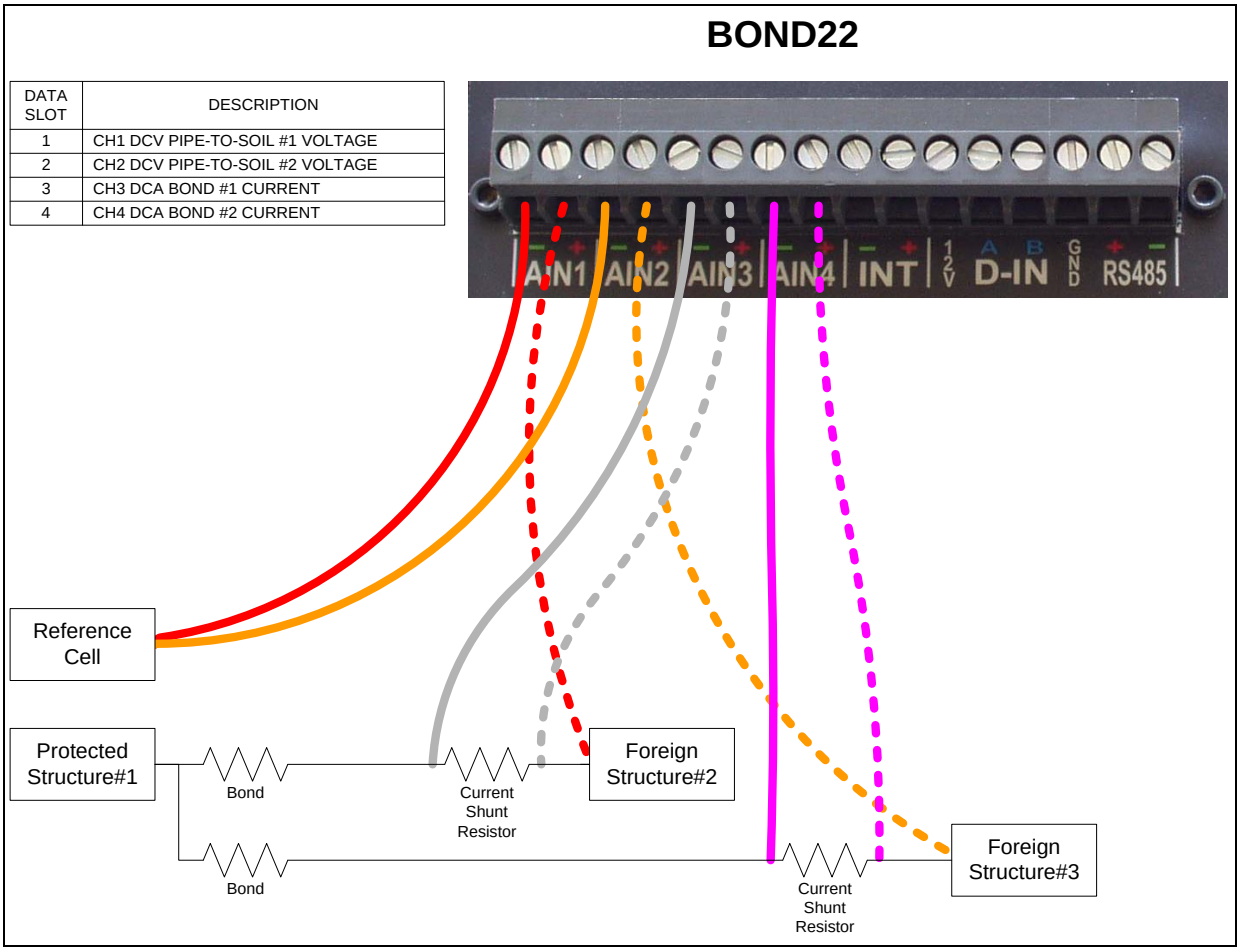


Figure 60 BOND22 Bond – 2 Pipe-To-Soil, and 2 Bond Currents

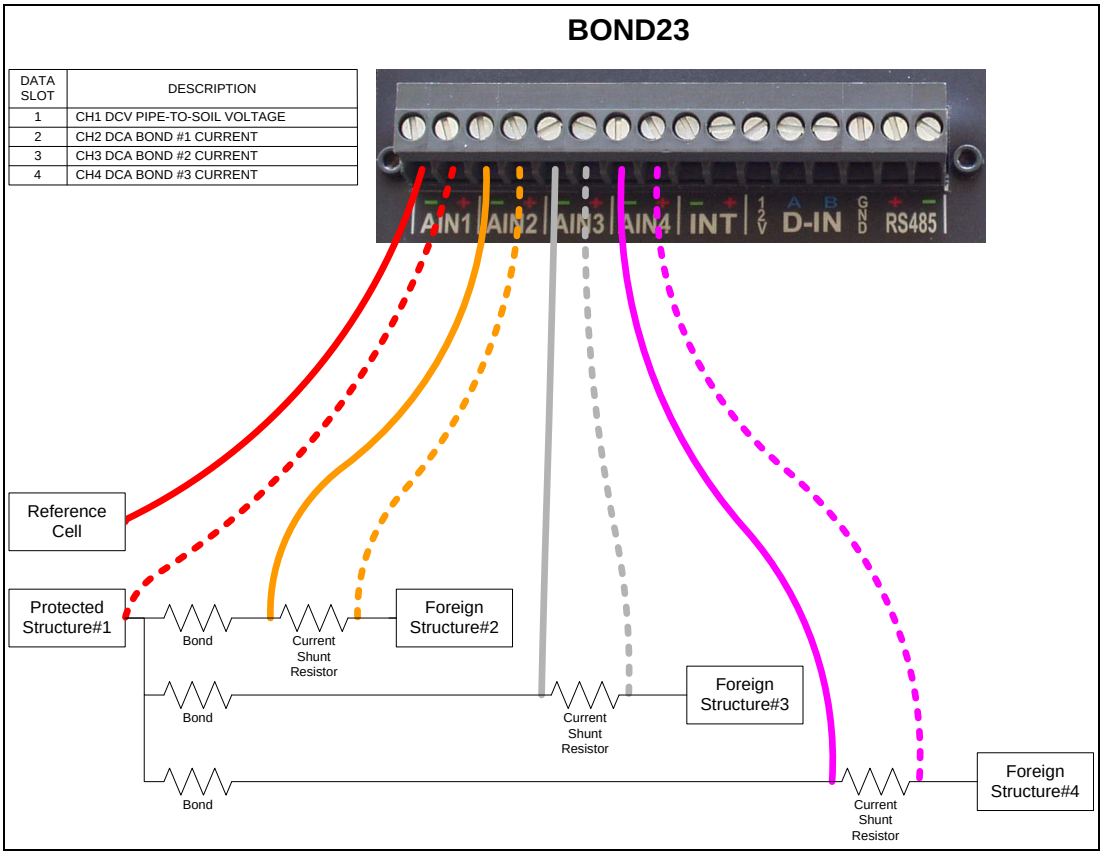


Figure 61 BOND23 Bond – Pipe-To-Soil, and 3 Bond Currents

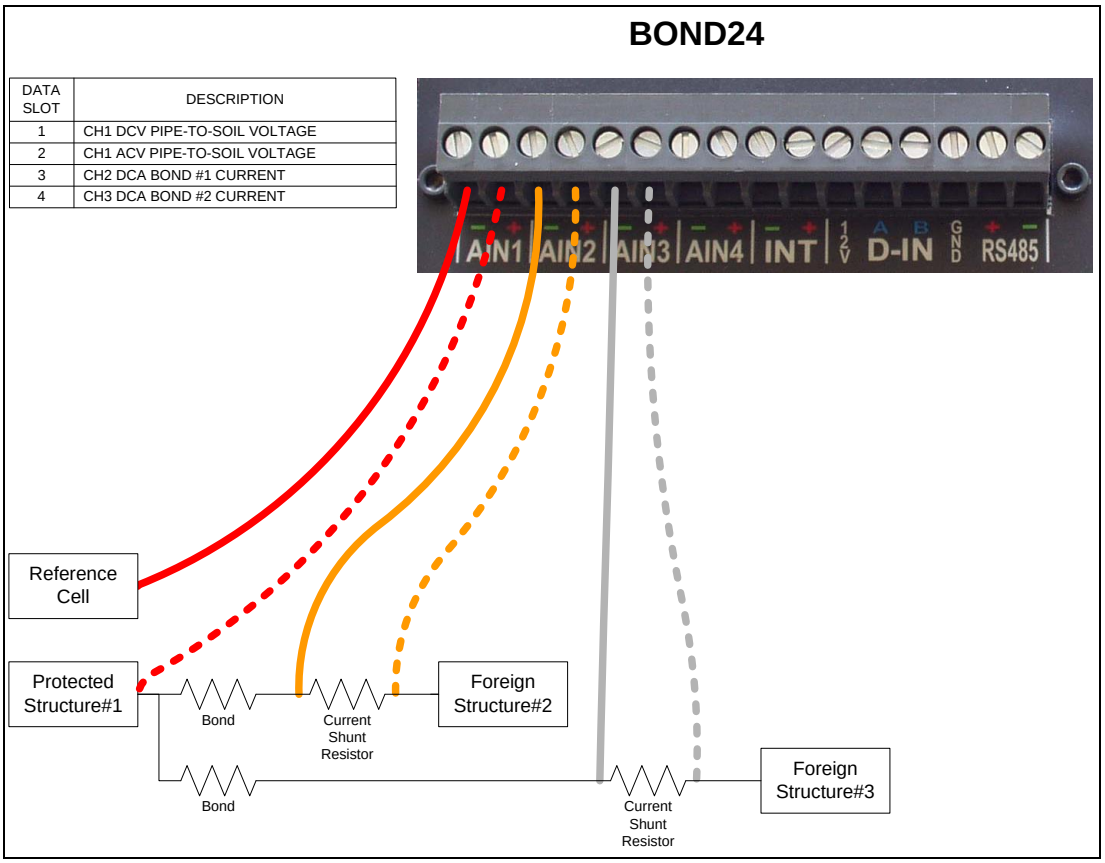


Figure 62 BOND24 Bond – Pipe-To-Soil AC/DC, and 2 Bond Currents

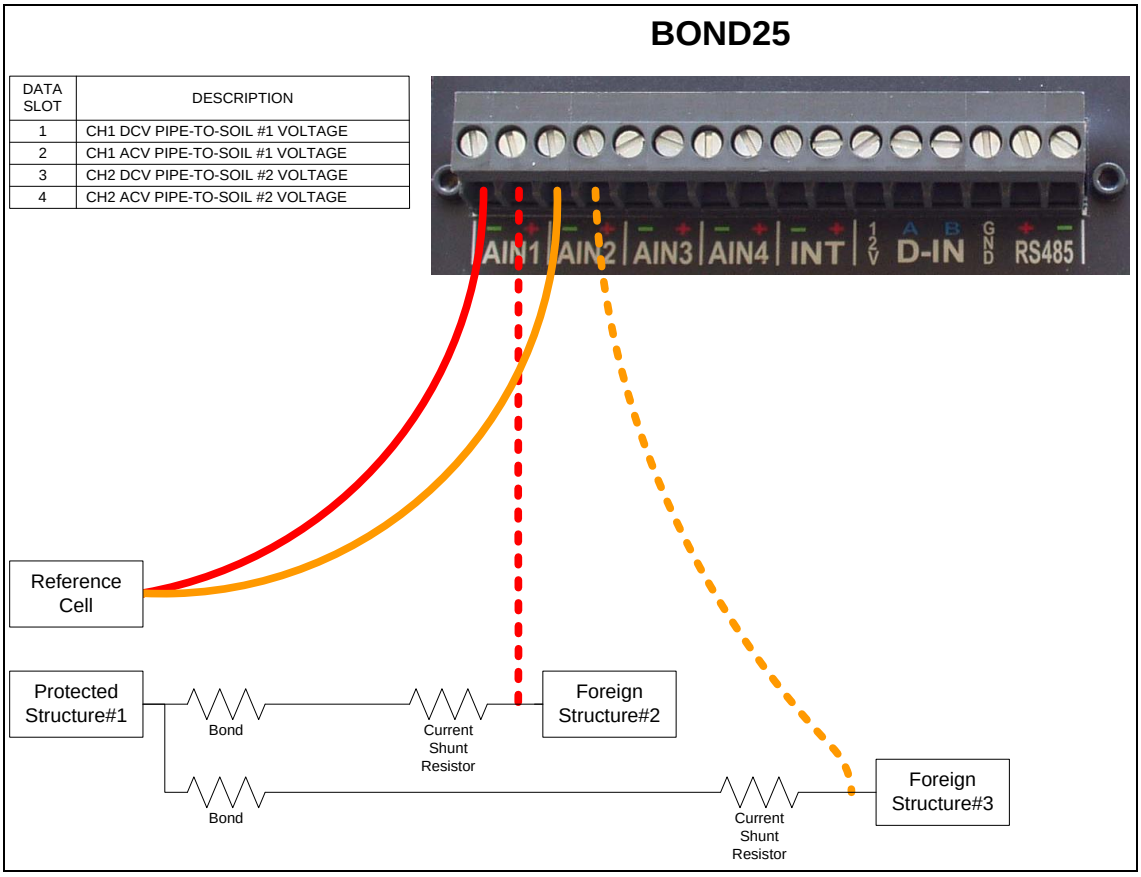


Figure 63 BOND25 Bond – 2 Pipe-To-Soil AC/DC

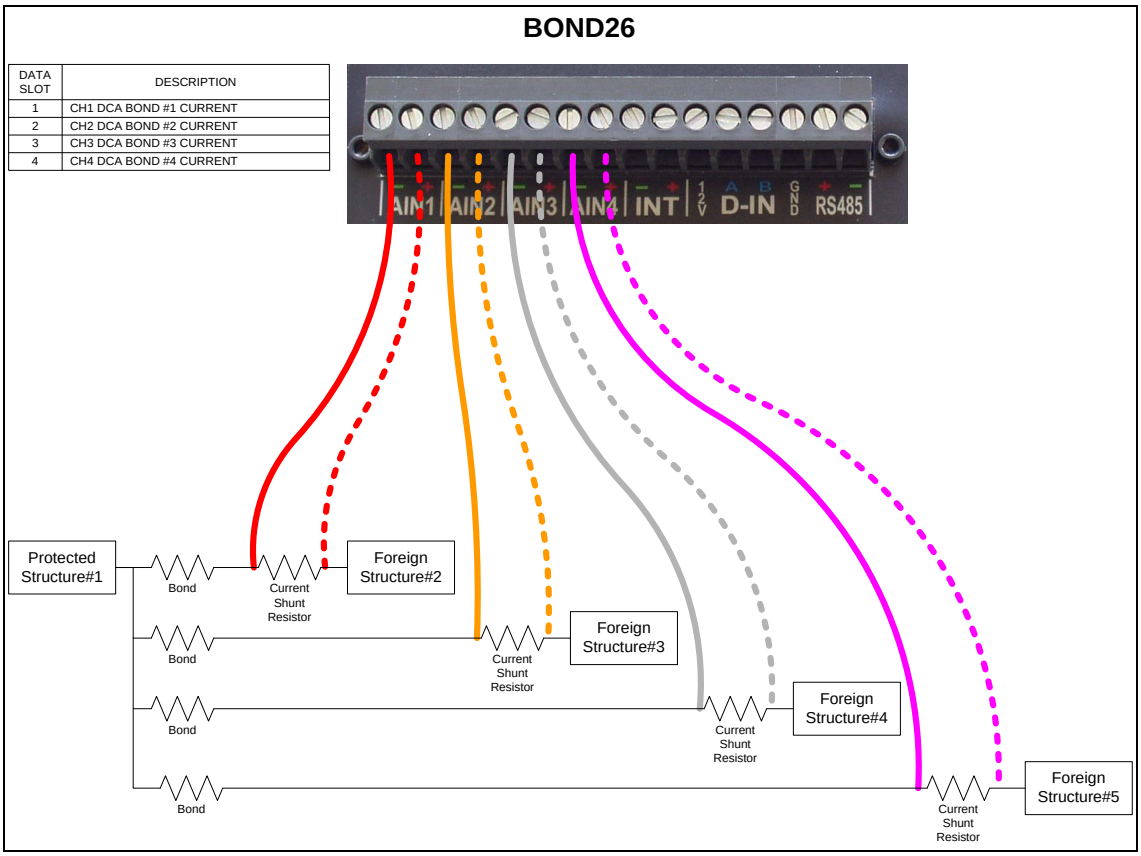


Figure 64 BOND26 Bond – 4 Bond Currents

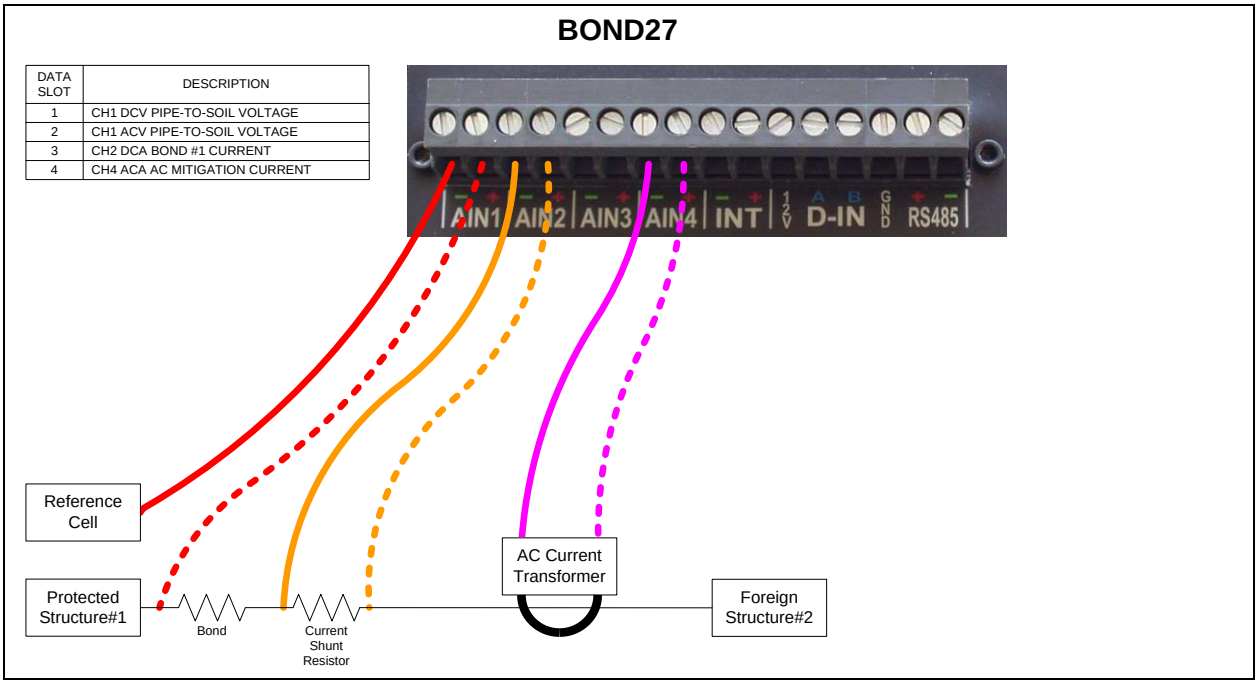


Figure 65 BOND27 Bond – Pipe-To-Soil DC/AC, 1 Bond Current, and AC Mitigation Current

Note: AC current transformer requires internal protection

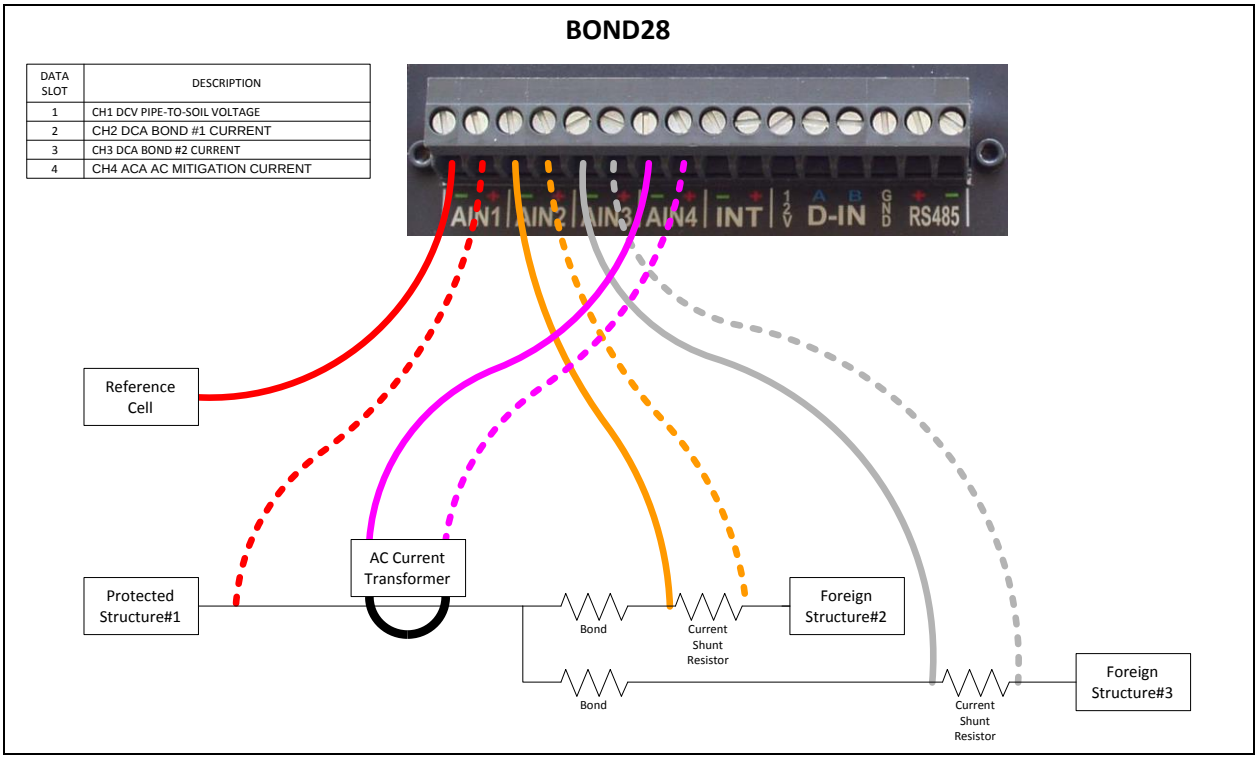


Figure 66 BOND28 Bond – Pipe-To-Soil DC, 2 Bond Currents, and AC Mitigation Current

Note: AC current transformer requires internal protection

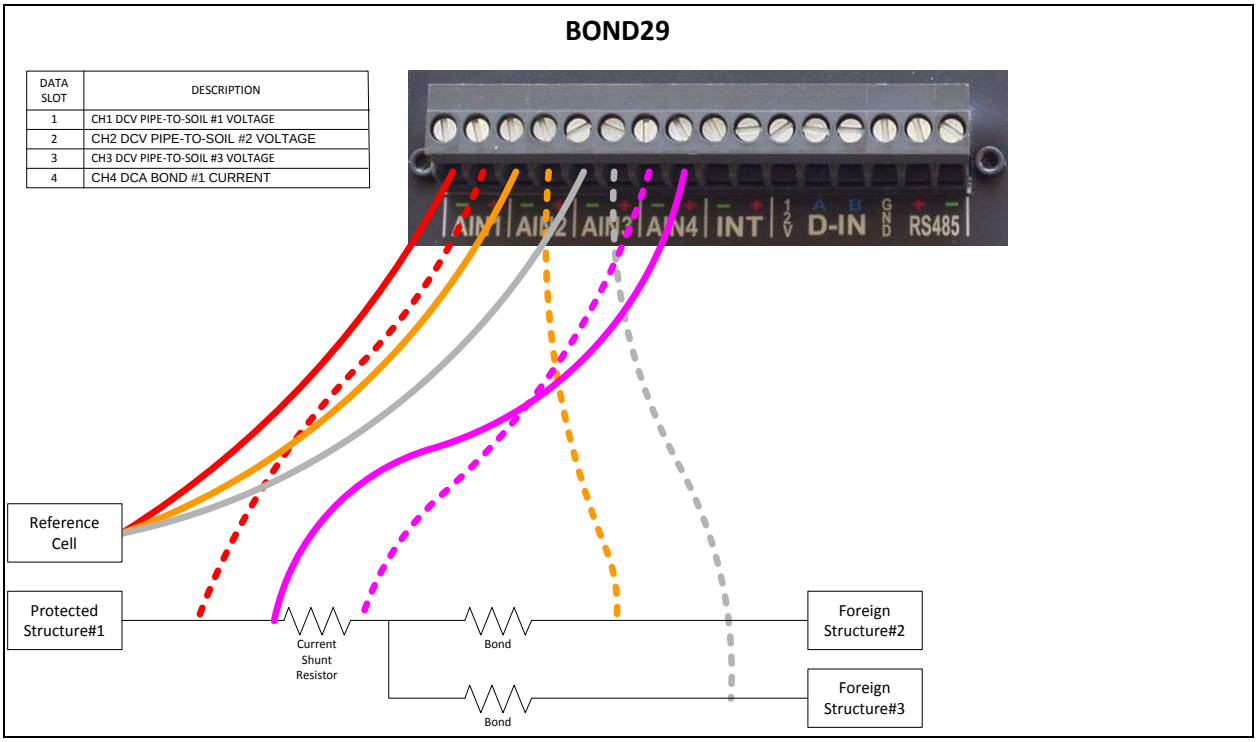


Figure 67 BOND29 Bond – Three Pipe-To-Soil DC, 1 Bond Current

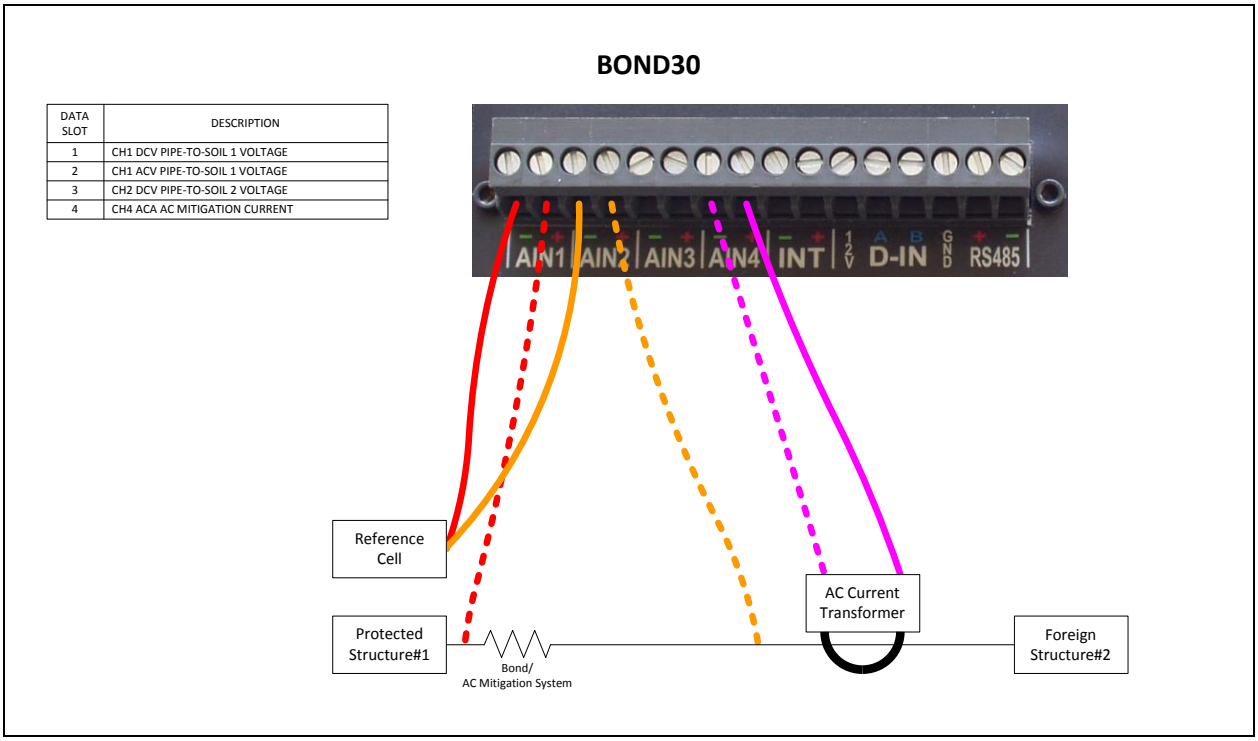


Figure 68 BOND30 Bond – Pipe-To-Soil 1 DC/AC, Pipe-To-Soil 2 DC, and AC Mitigation Current

4.2.10 Interruption Relay Wiring

Wiring of the interruption relay requires some consideration for the type and size of rectifier being interrupted. Consideration for lightning immunity is another issue that will affect relay type and installation point. Table 2 lists the most common relay types along with their associated pros and cons.

Relay Type	Pros	Cons
Mechanical Normally closed contact type	Inexpensive	Short contact life (thousands of cycles) Low current capacity (<25A) Contact migration with DC loads On/off activation times High control current consumption
Mercury Displacement Normally closed contact type	Moderate cost High current capacity Low power loss (<10W w/100A load) No heatsink required Long contact life (millions of cycles) Good lightning damage-immunity	Environmental concerns Transportation regulations Disposal regulations On/off activation times High control current consumption
Solid State Triac (AC-only) Installed on transformer primary or Installed on transformer sec. tap	Moderate cost Good lightning damage-immunity Fast switching Low control current High voltage switching(<=690VAC) High current switching (<=125A) Does not require external clamp diodes No contact degradation over time	Requires heatsink Large current surge (primary side)
Solid State MOSFET (DC-only) Installed after rectifier diodes	Least impact on pipeline waveforms Fast switching Lower switching surge Low control current consumption No contact degradation over time	Expensive Poor lightning damage-immunity Requires large heatsink Requires external clamp diodes Limited installation points Maximum voltage/current tradeoff

Table 2 Relay Types Pros/Cons

The following figures show the most common connection methods for each of the relay types when installed on an AC rectifier. The selected relay must be sized according to specifications from the relay manufacturer.

When using an alternate DC power source, such as thermo-electric generation or solar, only DC capable relays such as mechanical, mercury displacement, or DC solid state MOSFET can be used on the output to the protected structure.

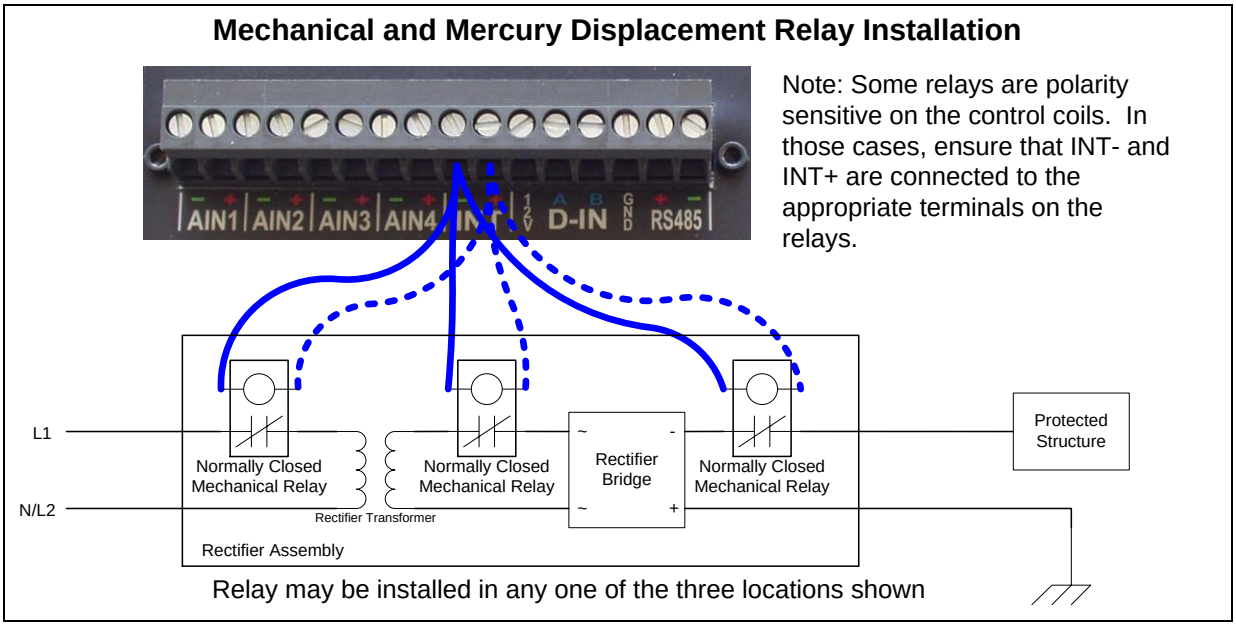


Figure 69 Mechanical and Mercury Displacement Relay Installation

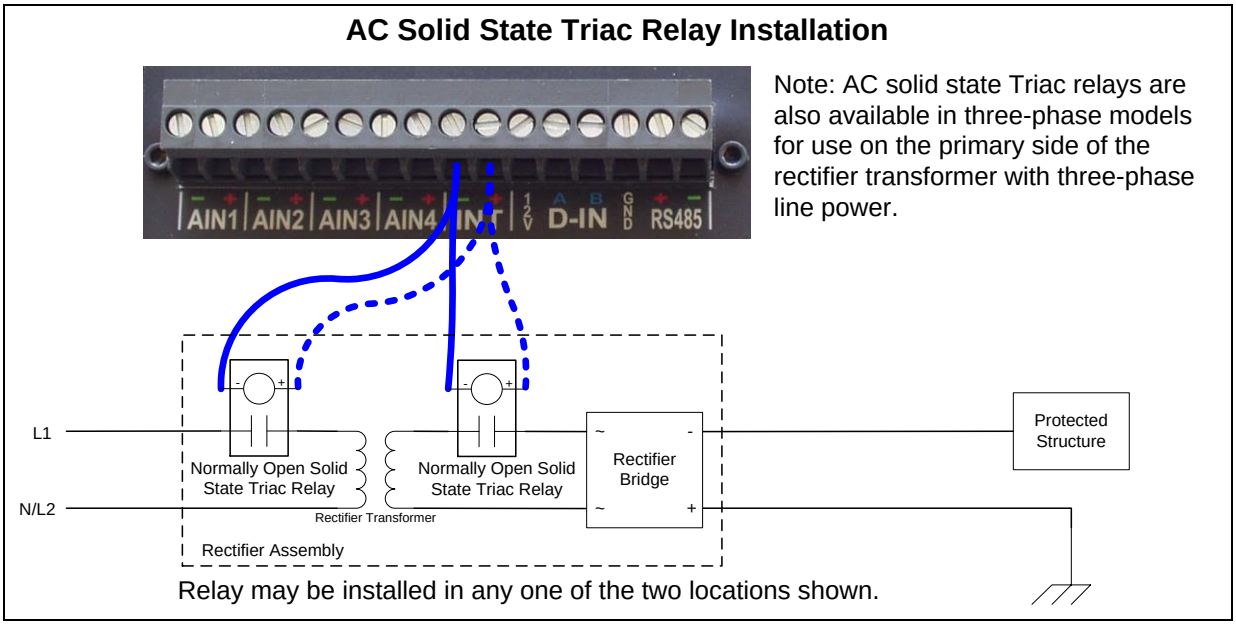


Figure 70 AC Solid State Triac Relay Installation

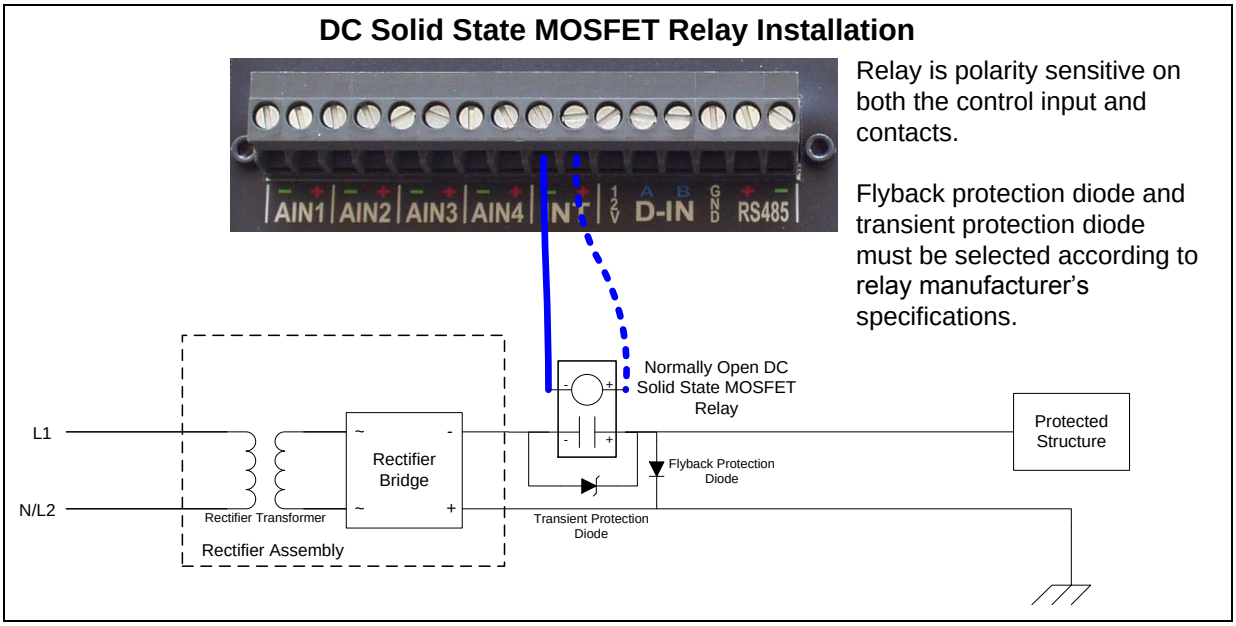


Figure 71 DC Solid State MOSFET Relay Installation

4.2.10.1 AC Solid State Relays

The preferred relay to use in most cases is the AC solid state TRIAC relay on the primary-side of the rectifier transformer. Mobiltex has several standard AC relays and heatsinks available as optional components for the RMU5.

K0513245010 AC Relay - 24-280 VAC RMS 50 Amps max. 0-8A=No Heatsink, 8-50A=HE-54
K0513211010 AC Relay - 24-280 VAC RMS 110 Amps max. 0-8A=No Heatsink, 8-60A=HE-54, 60-110A=HE-90
K0513285010 AC Relay - 48-530 VAC RMS 50 Amps max. 0-8A=No Heatsink, 8-50A=HE-54



Figure 72 Mobiltex Standard Single Phase Solid State AC Relays

All 3 different relays are about the same physical size and look very similar. The heatsink requirements are listed above. These relays can be used to either interrupt the primary line AC (for 120 & 230 volt rectifiers) or the secondary AC of the rectifier.
a



Figure 73 Mobiltex Standard Three Phase AC Solid State Relay

The relay shown in Figure 73 is used to interrupt the primary AC of 3-phase rectifiers.

4.2.10.2 AC Solid State Relay Heatsinks

X030120HE54 Medium Heatsink for Solid State Relay - HE-54

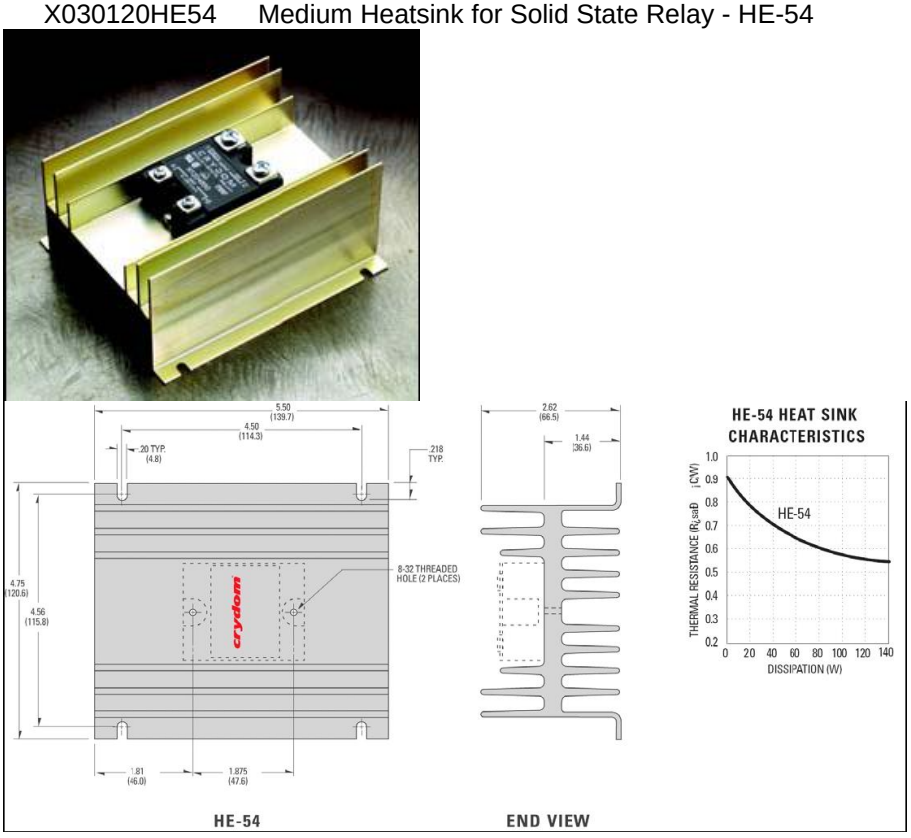


Figure 74 X030120HE54 Medium Heatsink

Note that there needs to be physical space inside the rectifier to mount the solid-state relay and heatsink.

X030320HE90 Large Heatsink for Solid State Relay - HE-90

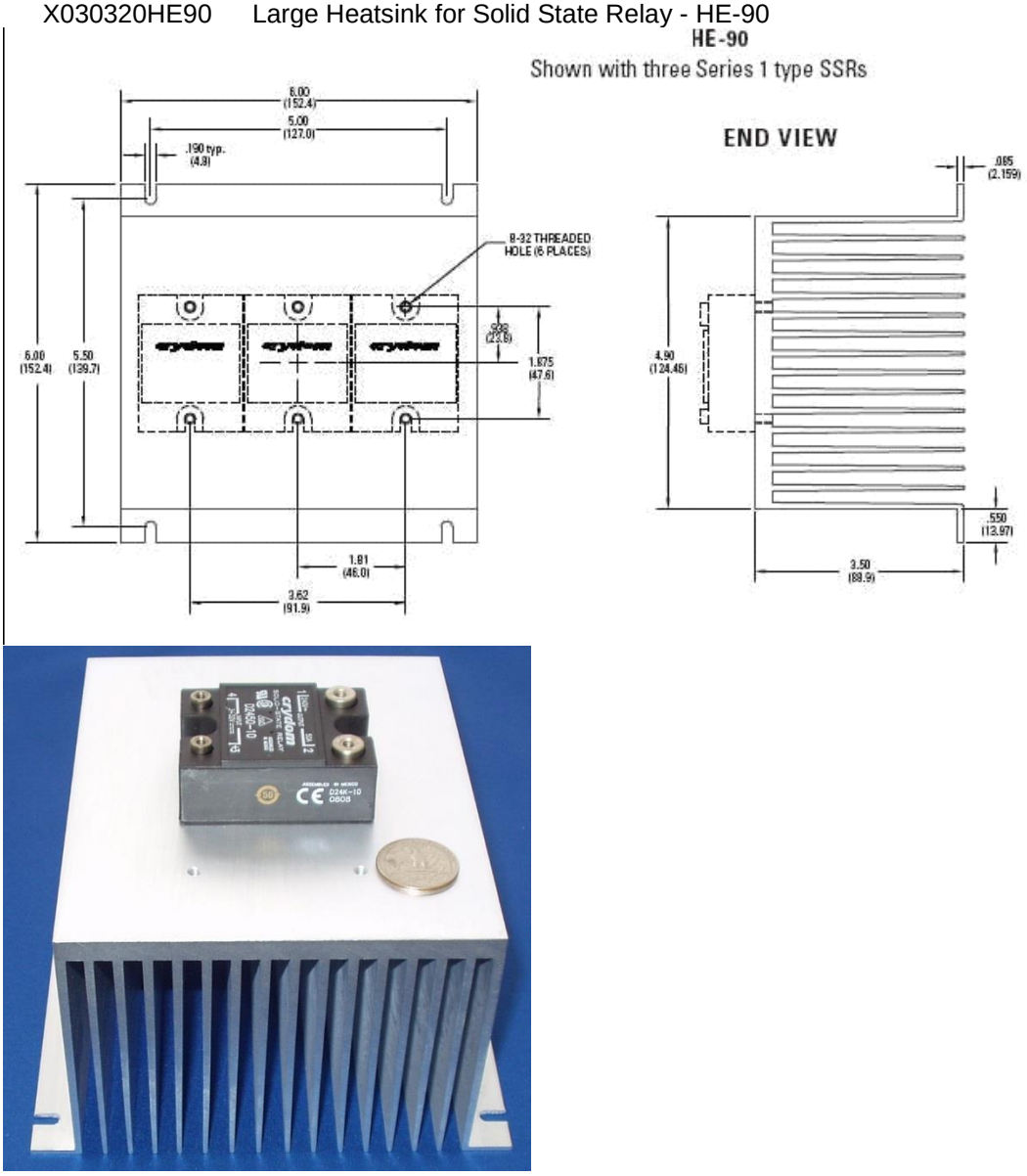


Figure 75 X030320HE90 Large Heatsink

Figure 75 shows the AC Relay - 24-280 VAC RMS 110 Amps max (K0513211010) on the HE-90 heatsink. This heatsink will directly accept all standard Mobiltex AC solid-state relays.

4.2.10.3 Mercury Displacement Relays

Mobiltex provides, as an option for the RMU5, a 100A/240VAC normally-closed mercury displacement relay (K07111NC12D). This relay is shown in Figure 76. The relay must be mounted with the UP arrow within +/-10 degrees of vertical for the relay to operate properly. Contact de-rating is shown in Table 3.

When working with mercury relays, all locally applicable transport and disposal regulations must be followed.

Source Voltage	Maximum Load Current
240V AC	100A
480V AC	80A
600V AC	70A
48V DC	100A
125V DC	50A
250V DC	30A

Table 3 Mercury Displacement Relay Contact De-rating

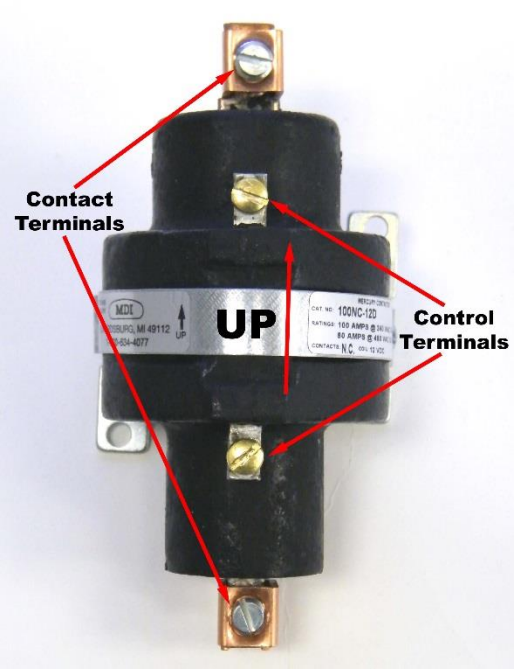


Figure 76 K07111NC12D 100A Mercury Displacement Relay

4.2.11 Door Switch Wiring

The RMU5 may be used to monitor the state of an installer-provided door switch contact. The contacts are debounced for a period of 10s. If a state transition is detected after debouncing, an exception message is immediately sent to corView with current measurements and door switch state.

Any mechanical contact switch may be used. The door switch is wired as shown in Figure 77. Ensure that the wire jumper from the 12V terminal to the D-IN A terminal is not omitted.

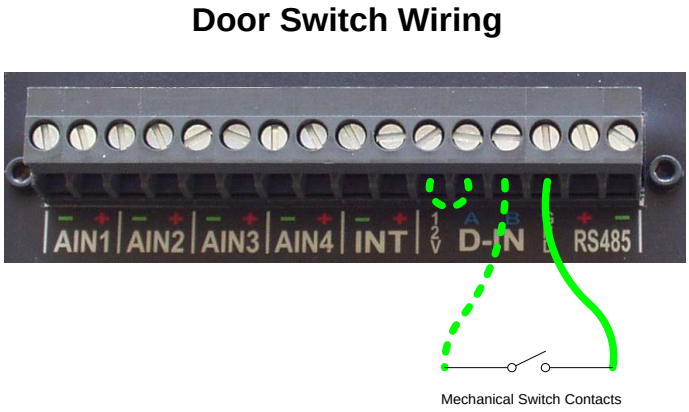


Figure 77 Door Switch Wiring

5 Configuration

5.1 Software Installation

Initial configuration of the RMU5 is performed by attaching the RMU5 to a suitably equipped PC via a USB connection. The PC must be running Windows XP SP3 or higher. A driver CD, containing "rmu5.inf", is provided by Mobiltex for the USB function. Ensure that this driver CD is available prior to attaching the USB cable between the PC and the RMU5. **Before starting this process, log into the PC using an account with administrator privileges, otherwise the driver install will fail.**

To install the configuration application and driver software, insert the CD that came with the configuration interface into the CD drive on the PC. If "autorun" is enabled on the PC, the following screen in Figure 78 will appear.

If "autorun" is not enabled, or the contents of the CD have been copied to a local directory, use Windows Explorer to navigate to the CD drive or the directory containing the installation software. Double-click on the "RMU5INSTALLER.exe" application. The dialog on Figure 78 will appear.

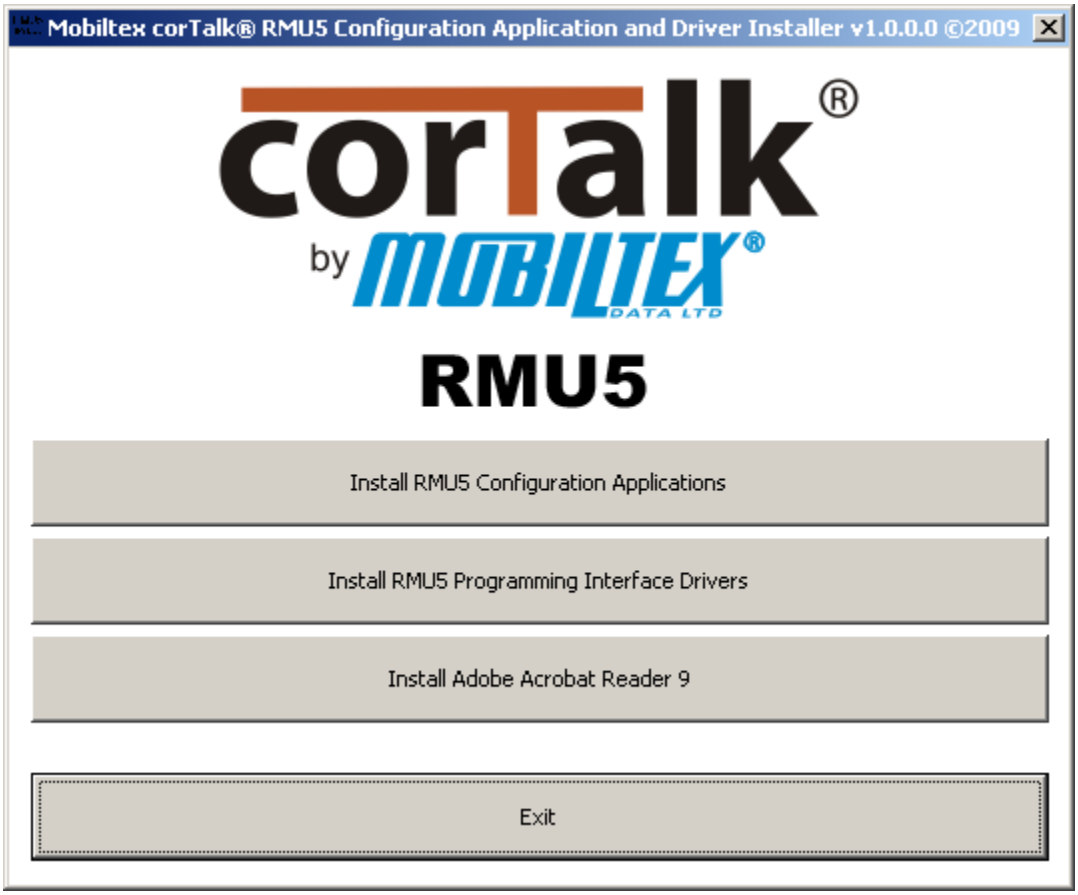


Figure 78 RMU2Installer Dialog

5.1.1 Configuration Application Software

Click on the "Install RMU5 Configuration Applications" button to start the application installer. The following dialog may appear. Click the "Run" button to continue.



Figure 79 RMU5ConfigSetup.msi Security Warning Dialog

The following dialog should now appear:



Figure 80 RMU5 Configuration Applications Installation Dialog

Follow the instructions presented in the installation screens, clicking "Next" to move to the next screen each time. Some screens may pause for tens of seconds as the Windows installation procedure is processing. The final screen should show the screen in Figure 81. Click "Close" to complete the installation.

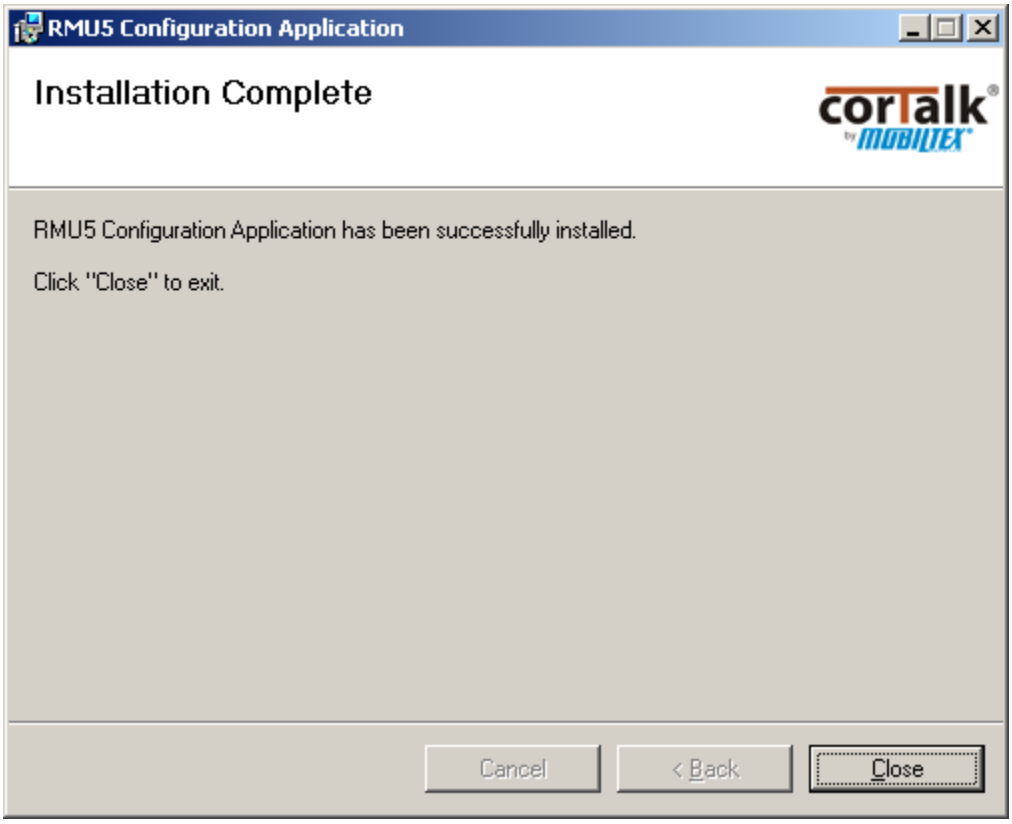


Figure 81 RMU5 Configuration Applications Installation Complete

A shortcut to the configuration application and the RMU5 manual are created in the Windows start menu under the "RMU5 Configuration Application" folder.

5.1.2 USB Driver

From the RMU5 Installer screen, click the "Install RMU5 Programming Interface Drivers" button. **Note that to install drivers, you must be logged into the PC with an account that has administrative privileges.** The following screen should display while the driver is installing:

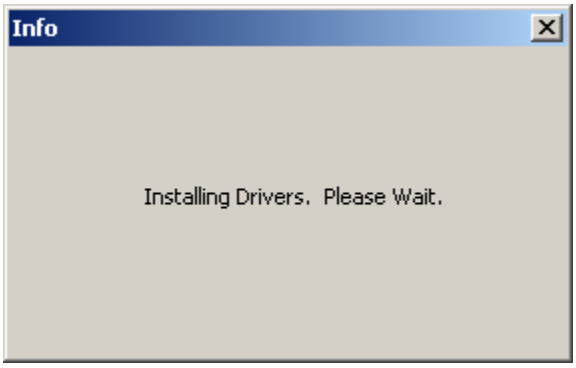


Figure 82 Driver Installation Wait Dialog

The following dialog may also appear depending on the code signing requirement setting on the PC. Click "Continue Anyway" to complete the installation.

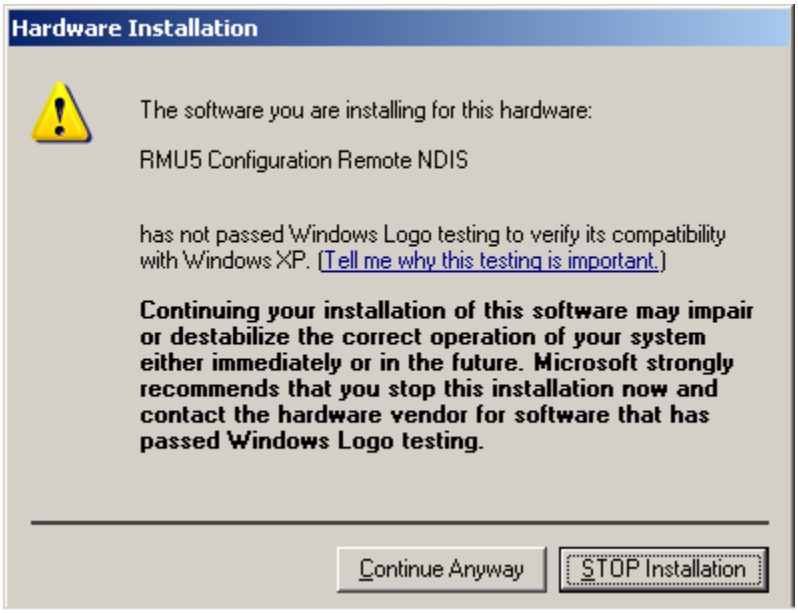


Figure 83RMU5 Driver Code Signing Warning Dialog

The following dialog will appear when driver install is complete. Click "OK" to continue.



Figure 84 RMU5 Driver Installation Complete Dialog

To complete installing the driver, ensure that the RMU5 is powered, then attach a USB A-B cable between the USB host port on the PC and the USB slave port on the RMU5 (labeled "Local Config"). The following dialog may appear on the PC:



Figure 85 Windows XP Found New Hardware Dialog #1

Select "No, not this time" and click on the "Next >" button. The following dialog will then appear:

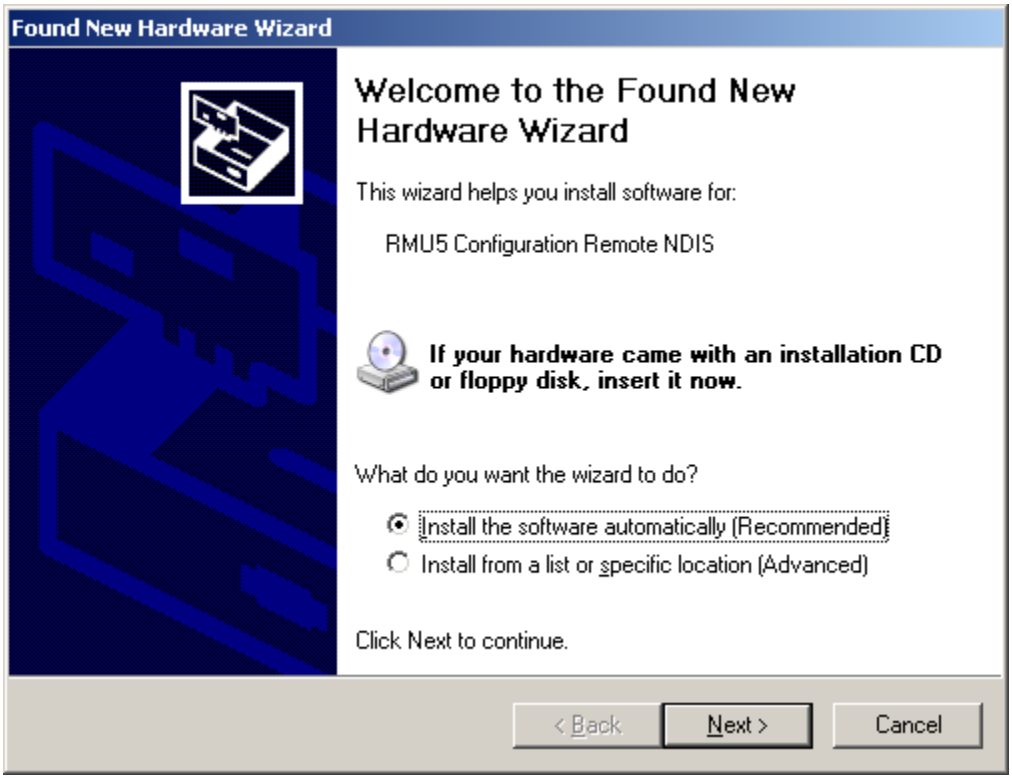


Figure 86 Windows XP Found New Hardware Dialog #2

The following dialog may then appear depending on the code signing settings for the PC.

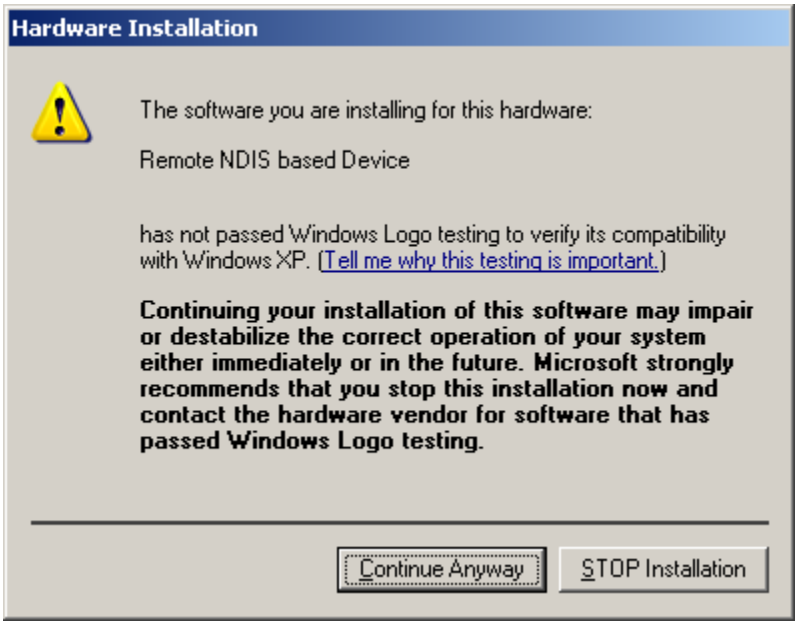


Figure 87 Windows XP Found New Hardware Dialog #3

Click the "Continue Anyway" button. A final dialog box will appear:

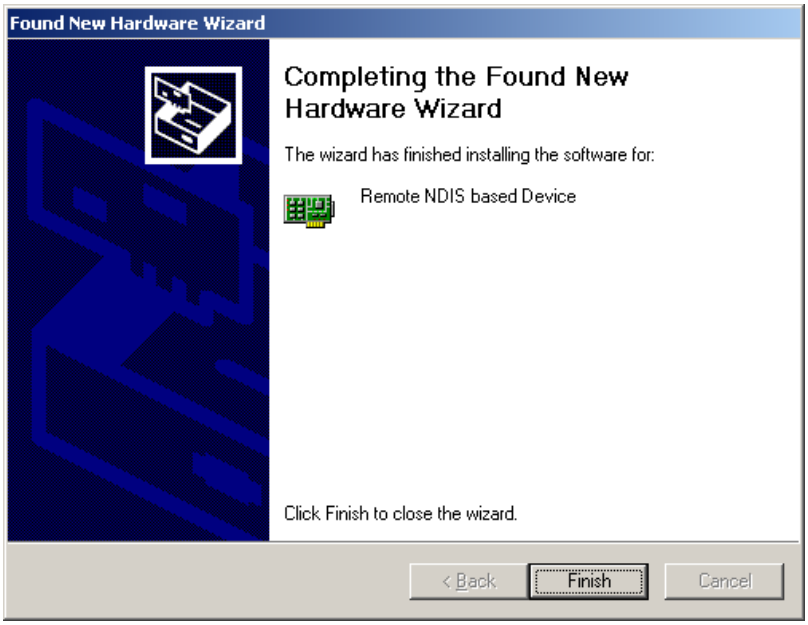


Figure 88 Windows XP Found New Hardware Dialog #4

Click the "Finish" button to complete the process. The RMU5 should appear as a new network connection in the Network Connections applet in the Windows XP control panel. The device name will be "RMU5 Configuration Remote NDIS", and may be followed by a number.

5.2 RMU5 corView Configuration Application

A simplified configuration application is provided to configure RMU5 devices that use IsatM2M or GSM for communications to the Mobiltex corView web site. Ensure that the USB cable is attached between the RMU5 and PC before running the application. Start the 'RMU5 corView Setup" application from the start menu "RMU5 Configuration Application" folder. The application will automatically connect to the RMU5 and load the current parameter set.

The most current manual, firmware, and configuration applications can also be downloaded from the following URL:

http://www.mobiltex.com/cathodic/rmu5

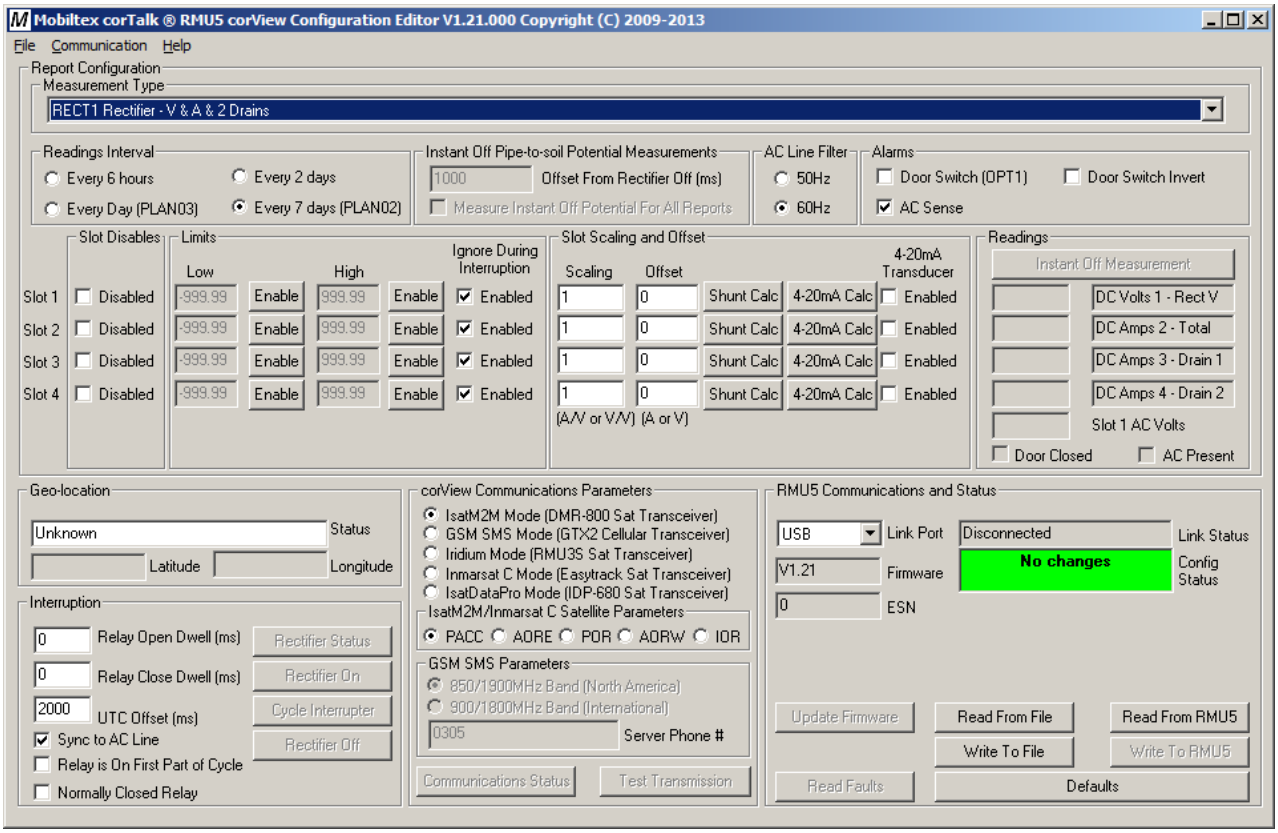


Figure 89 RMU5 corView Configuration Application Dialog

5.2.1 Report Configuration

5.2.1.1 Measurement Type

Based on the measurement type determined during wiring, select the same measurement type from the pull-down field. This will map the physical channels to the data slots that corView expects. To minimize satellite service transport costs, this mode of communications only transports 5 slots of data readings. To select the data being transported, the slot-to-channel mapping must be selected. Table 4 shows the various mappings that are applicable to the corView web site.

Note that a slot and a channel are not the same. "Slot 1" does not have to be equated to the physical "CH1". Slot merely defines which data slot of the over-the-air communications protocol the information will be placed into when being sent to the corView server. In this way, one physical channel can be used to read both AC and DC volts or AC and DC current.

Type	Detail	Slot #1	Slot #2	Slot #3	Slot #4	Slot #5
RECT1 (Rectifier)	V & A & 2 Drains	DC Volts 1 - Rect V	DC Amps 2 - Total	DC Amps 3 - Drain 1	DC Amps 4 - Drain 2	AC Volts 1 - Rect V
RECT2 (Rectifier)	V & 3 Drains	DC Volts 1 - Rect V	DC Amps 2 - Drain 1	DC Amps 3 - Drain 2	DC Amps 4 - Drain 3	AC Volts 1 - Rect V
RECT3 (Rectifier)	V & A & 1 Drain & Line	DC Volts 1 - Rect V	DC Amps 2 - Total	DC Amps 3 - Drain 1	AC Volts 4 - Line	AC Volts 1 - Rect V
RECT4 (Rectifier)	V & 2 drains & Line	DC Volts 1 - Rect V	DC Amps 2 - Drain 1	DC Amps 3 - Drain 2	AC Volts 4 - Line	AC Volts 1 - Rect V
RECT5 (Rectifier)	V & A & PS c/w AC	DC Volts 1 - Rect V	DC Amps 2 - Total	DC Volts 3 - P/S	AC Volts 3 - P/S	AC Volts 1 - Rect V or Instant-off DC Volts – P/S
RECT6 (Rectifier)	V & A & PS DC only & Line	DC Volts 1 - Rect V	DC Amps 2 - Total	DC Volts 3 - P/S	AC Volts 4 - Line	AC Volts 1 - Rect V or Instant-off DC Volts – P/S
RECT7 (Rectifier)	VAC/DC & A & Line	DC Volts 1 - Rect V	DC Amps 2 - Total	AC Volts 1 - Rect AC	AC Volts 4 - Line	AC Volts 1 - Rect V
RECT8 (Rectifier)	VAC/DC & A & PS DC only	DC Volts 1 - Rect V	DC Amps 2 - Total	DC Volts 3 - P/S	AC Volts 1 - Rect AC	AC Volts 1 - Rect V or Instant-off DC Volts – P/S
RECT9 (Rectifier)	V & A & 1 Drain & TEG In	DC Volts 1 - Rect V	DC Amps 2 - Total	DC Amps 3 - Drain 1	DC Volts 4 - TEG In	AC Volts 1 - Rect V
RECT10 (Rectifier)	V & 2 Drains & TEG In	DC Volts 1 - Rect V	DC Amps 2 - Drain 1	DC Amps 3 - Drain 2	DC Volts 4 - TEG In	AC Volts 1 - Rect V
RECT11 (Rectifier)	V & A & PS DC only & TEG In	DC Volts 1 - Rect V	DC Amps 2 - Total	DC Volts 3 - P/S	DC Volts 4 - TEG In	AC Volts 1 - Rect V or DC Instant-off Volts – P/S
RECT12 (Rectifier)	Rectifier 1 V & A + Rectifier 2 V & A	DC Volts 1 – Rect1 V	DC Amps 2 – Rect1 A	DC Volts 3 – Rect2 V	DC Amps 4 – Rect2 A	AC Volts 1 – Rect1 V
RECT13 (Rectifier)	V & A & 2 PS DC only	DC Volts 1 - Rect V	DC Amps 2 - Total	DC Volts 3 – P/S 1	DC Volts 4 – P/S 2	AC Volts 1 - Rect V or Instant-off DC Volts – P/S 1
RECT14 (Rectifier)	V & A & PS DC & A	DC Volts 1 - Rect V	DC Amps 2 - Total	DC Volts 3 – P/S 1	DC Amps 4 – Bond 1	AC Volts 1 - Rect V or Instant-off DC Volts – P/S 1
TP21 (Test Point)	Two P/S c/w AC, Test Point	DC Volts 1 - P/S 1	AC Volts 1 - P/S 1	DC Volts 2 - P/S 2	AC Volts 2 - P/S 2	AC Volts 1 - P/S 1 or Instant-off DC Volts – P/S
BOND22 (Bond)	Two P/S DC only, 2 Point Bond	DC Volts 1 - P/S 1	DC Volts 2 - P/S 2	DC Amps 3 - Bond 1	DC Amps 4 - Bond 2	AC Volts 1 - P/S 1 or Instant-off DC Volts – P/S
BOND23 (Bond)	One P/S DC only, 3 Point Bond	DC Volts 1 - P/S 1	DC Amps 2 - Bond 1	DC Amps 3 - Bond 2	DC Amps 4 - Bond 3	AC Volts 1 - P/S 1 or Instant-off DC Volts – P/S
BOND24 (Bond)	One P/S c/w AC, 2 Point Bond	DC Volts 1 - P/S 1	AC Volts 1 - P/S 1	DC Amps 2 - Bond 1	DC Amps 3 - Bond 2	AC Volts 1 - P/S 1 or Instant-off DC Volts – P/S
BOND25 (Bond)	Two P/S c/w AC, 0 Point Bond	DC Volts 1 - P/S 1	AC Volts 1 - P/S 1	DC Volts 2 - P/S 2	AC Volts 2 - P/S 2	AC Volts 1 - P/S 1 or Instant-off DC Volts – P/S
BOND26 (Bond)	No P/S, 4 Point Bond	DC Amps 1 - Bond 1	DC Amps 2 - Bond 2	DC Amps 3 - Bond 3	DC Amps 4 - Bond 4	AC Amps 1 - Bond 1
BOND27 (Bond)	One P/S c/w AC, 1 Point Bond, AC Mitigation	DC Volts 1 - P/S 1	AC Volts 1 - P/S 1	DC Amps 2 - Bond 1	AC Amps 4 - AC Mitigation	AC Volts 1 - P/S 1 or Instant-off DC Volts – P/S
BOND28 (Bond)	One P/S DC only, 2 Point Bond, AC Mitigation	DC Volts 1 - P/S 1	DC Amps 2 - Bond 1	DC Amps 3 - Bond 2	AC Amps 4 - AC Mitigation	AC Volts 1 - P/S 1 or Instant-off DC Volts – P/S

Table 4 corView Channel Mapping Table

5.2.1.2 Readings Interval

The Readings Interval grouping allows the periodic report interval to be set. The setting of the reporting plan here must match the airtime plan subscribed to on corView. This plan is fixed in the RMU5 and can not be changed by the user.

The following airtime plans are currently available:

RMU50PLAN02: One reading every 7 days
RMU50PLAN03: One reading every day

5.2.1.3 Instant Off Pipe-to-soil Potential Measurements

This grouping allows configuration of the operation of instant off pipe-to-soil measurements for types that support the data point.

The "Offset From Rectifier Off (ms)" parameter allows fine tuning of the measurement to compensate for settling times. Ideally, an oscilloscope is used to determine the ideal offset timing, but if one is not available, a value of 600ms usually ensures enough settling time for a reasonable measurement to take place. If instant off measurements are to be made while interrupting, the offset parameter must be less than the off time of the interruption cycle.

The "Measure Instant Off Potential For All Reports" parameter allows the user to select when instant off measurements are performed. If this parameter is enabled, then all reports sent to corView, autonomous or host-side requested, will perform an instant off measurement. If this parameter is not enabled, then only host-side requested instant off measurement reports will perform the instant off measurement.

5.2.1.4 AC Line Filter

The RMU5 can be configured to optimally filter out 50 or 60Hz noise from DC measurements. Select the appropriate value that matches the AC mains line frequency for the installation location.

5.2.1.5 Alarms

In addition to the slot data limit alarms, the RMU5 also supports two other types of autonomous alarm sources. These two alarm sources are the door switch input and the AC input sense. The door switch is debounced 10s and the AC input sense is debounced 1 hour.

The door switch alarm is an option that must be selected when subscribing to the corView airtime plan. The following part number is used for ordering the option:

RMU5OPTION1: Rectifier Door Switch

Setting the check box next to "Door Switch" or "AC Sense" enables the corresponding alarm source. By default, it is assumed that a closed contact on the door switch indicates that the door is closed. If the contact on the door switch is open when the door is closed, check the "Door Switch Invert" box.

5.2.1.6 Slot Disables

Each data slot may be individually disabled if it is not being used on a particular installation. The RMU5 will communicate a measurement value of zero for any slot that is disabled. Unused slots should be disabled to prevent alarms and transmissions due to stray noise pickup.

5.2.1.7 Limits

"Limits" defines what the minimum or maximum reading can be before the RMU5 will send an alarm. These values should be left loose **(~ +/- 50% of actual acceptable operating range)** as the unit will transmit every time an alarm occurs or is cleared. This could result in large transmission costs that could result in higher "AirTime Package" costing. The standard Satellite (RMU5) "AirTime Packages" offered by Mobiltex assume a maximum of two alarm and two clear events per RMU per month, averaged over the customer fleet for the Plan Period.

Alarms do not wait until the scheduled transmission but will send immediately upon detection at a 6 hour boundary. Likewise, a slot that was previously in alarm but is now cleared will send a "Cleared" message. In either case, the scheduled reports will not be affected.

Type the desired numeric value (-327.67 to 327.67) into each of the required limits fields. If a limit is not used, pressing the "Disable" button next to the setting will place a value of "-999.99" or "999.99" in the field. To re-enable a limit, click the "Enable" button next to the setting.

Also, associated with each slot limit is an "Ignore During Interruption" check box. When this box is checked, slot limits are not verified for that slot if the RMU5 is currently cycling the interruption relay output. This prevents false limit alarms from being transmitted when a survey operation is under way.

5.2.1.8 Slot Scaling and Offset

"Slot Scaling" defines the software multiplication that will be given to the reading. This is used in most cases for current readings taken using a shunt resistor. If a shunt is to read 50mV at 100A, the scaling factor would be 100 / 0.05 = 2000.

A slot scaling calculator is provided for use with current shunts. Next to each slot scaling entry is a button labeled "Shunt Calc". Clicking the button for the slot to be configured brings up the following dialog box:

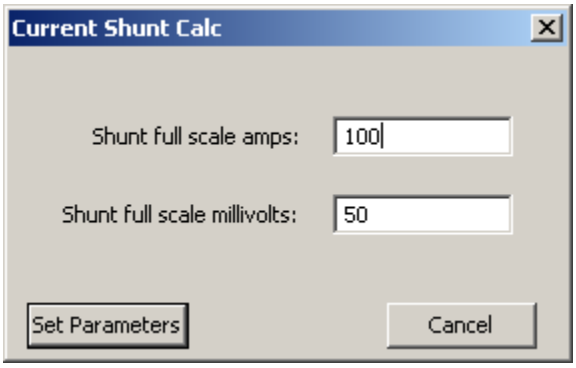


Figure 90 Current Shunt Calculator Dialog

Entering the two parameters for the shunt and pressing "Set Parameters" will update the slot scaling value in the RMU5 configuration with the appropriate value for the shunt.

Scaling is also used when an external attenuator is attached between the measurement source and the RMU2 sense terminals. As an example, reading voltages 115VAC RMS or higher requires that an external 3:1 Voltage Divider is used because the RMU cannot tolerate voltages greater than +/-165V (peak). In that example, the slot scaling would be set to a value of 3.

"Slot Offset" is most commonly used when reading 4-20mA transducers. If an external 4-20mA transducer is used with a particular slot, first check the "4-20mA Transducer" enable box for that slot. Next, click the "4-20mA Calc" button for that slot. This will bring up the following dialog box:

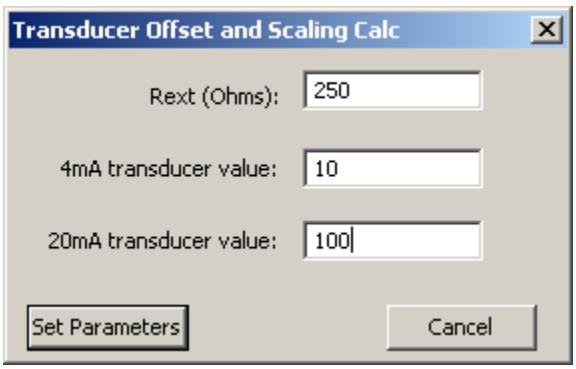


Figure 91 4-20mA Transducer Calculator

Note that an external shunt resistor must be placed across the + and – terminals for the physical channel associated with the data slot transporting the 4-20mA transducer data. This resistor is typically a 250 ohm 0.1% tolerance device. The current from the transducer is passed through this shunt resistor. Enter the value of the resistor into the "Rext (Ohms)" field of the calculator. Attachment and current flow direction should be as shown in Figure 92.

From the transducer specifications, determine the reading value at 4mA loop current, and the reading value at 20mA loop current. Enter these two parameters into the appropriate calculator fields. Press the "Set Parameters" button to set the slot scaling and offset for the affected slot.

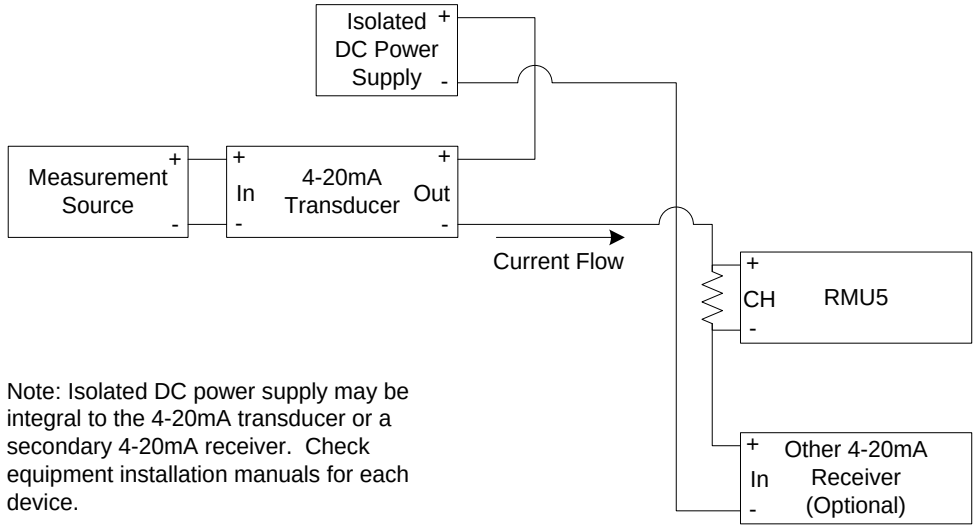


Figure 92 4-20mA Transducer Attachment

5.2.2 Readings

The grouping labeled "Readings" contains the current readings of the RMU5 device. Readings are updated in real time when the configuration application is connected to the RMU5. This grouping is used to validate the RMU5 configuration and connections to the monitored equipment. Note once again that 'slot' does not define the physical channel that is being read. The last column defines what type of reading was taken at what range and from which channel.

Ensure that any changes to the configuration of the unit have been written to the RMU5 prior to using the values from the RMU5, otherwise the parameters in the RMU5 will be used to compute these reading values.

For measurement types that support instant off readings of pipe-to-soil, a button labeled "Instant Off Measurement" is provided. When this button is pressed, the RMU5 will toggle the interruption relay and perform an instant off measurement on the pipe-to-soil measurement channel. The resultant reading will be displayed in a pop-up dialog.

5.2.3 Interruption

The "Interruption" grouping specifies parameters for the rectifier interruption relay operation. Six parameters define the operation.

The "Relay Open Dwell (ms)" parameter should be matched to the relay being installed. This specifies how long it takes for the relay contacts to open from when the control signal transitions. In the case of a solid state relay, this parameter is usually set to a value of 0. For mechanical relays, this value will usually be in the range of 10 to 50ms. For mercury displacement relays, this value will usually be in the range of 50 to 80ms. Check the relay data sheet for the appropriate value. For use with Mobiltex mercury relay K07111NC12D, set this to 70ms.

The "Relay Close Dwell (ms)" parameter should be matched to the relay being installed. This specifies how long it takes for the relay contacts to close from when the control signal transitions. In the case of a solid state relay, this parameter is usually set to a value of 0. For mechanical relays, this value will usually be in the range of 10 to 50ms. For mercury displacement relays, this value will usually be in the range of 50 to 80ms. Check the relay data sheet for the appropriate value. For use with Mobiltex mercury relay K07111NC12D, set this to 50ms.

The "UTC Offset (ms)" parameter is used to synchronize the RMU5 operation to match other vendors' equipment. A value of 2000 is default—at this value, the start of an interruption cycle will begin at exactly the top of the minute referenced to UTC time. A value of zero will lead UTC by two seconds. A value of 5000 will lag UTC by 3 seconds. This parameter should be left at the default of 2000 unless there is some specific requirement due to other vendors' equipment being used in the same survey areas.

The "Sync to AC Line" parameter allows the RMU5 to control when the transition of the relay control signal occurs relative to the line AC waveform. To minimize current inrush when a relay is placed on the primary of a rectifier transformer, it is desirable to have this parameter enabled. The relay will be turned on at the peak of the AC waveform, which is the lower AC current point for a reactive load. When used with an AC solid state TRIAC relay, the relay must

allow for random turn on (i.e. it must not turn on only at zero crossings). For installations using AC solid state three-phase relays, this option should be left un-checked.

The "Relay is On First Part of Cycle" parameter defines the order of the interruption cycle. When this option is not checked, the off portion of the interruption cycle will start at the top of the minute. When this option is checked, the on portion of the interruption cycle will start at the top of the minute.

The "Normally Closed Relay" parameter defines the type of relay contacts being used. If this parameter is not checked, then the RMU5 will output 12V to the relay coil to close the contacts and will output 0V to the relay coil to open the contacts. If this parameter is checked, then the RMU5 will output 0V to the relay coil to close the contacts and will output 12V to the relay coil to open the contacts.

Four buttons are provided to test the operation of the interruption mechanism. Ensure that the parameters have been written to the RMU5 prior to using these buttons.

The "Rectifier Status" button will bring up the current status for the rectifier interruption relay. The following dialog will appear. The status may be on, off, or cycling. When cycling, the timing parameters for the cycle are shown.



Figure 93 Interruption Rectifier Status

The "Rectifier On" button will close the interruption relay contacts, turning on rectifier power to the protected structure.

The "Cycle Interrupter" button will bring up the following dialog. Enter the cycle parameters and press OK. The interruption relay contacts will start opening and closing according to the parameters entered, for the duration entered. The interruption cycle may be terminated earlier by clicking on the "Rectifier On" button.

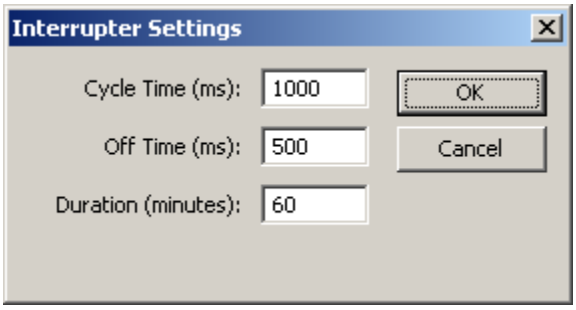


Figure 94 Interruption Cycle Rectifier

The "Rectifier Off" button will open the interruption relay contacts, turning off rectifier power to the protected structure.

5.2.4 Geo-location

The "Geo-location" grouping provides status on the RMU5 Timing Control Module (TCM). The first field indicates the GPS signal lock status. The status box will indicate "Tracking", "Position Lock", or "Time Lock" followed by the number of satellites tracked or in the solution. Interruption operations are only possible when "Time Lock" is indicated.

The two additional boxes indicate the current latitude and longitude location of the RMU5.

5.2.5 corView Communications Parameters

Select 'IsatM2M Mode' when using a DMR-800 satellite transceiver (RMU5-ISAT), 'GSM SMS Mode' when using a Mobiltex GTX2/3/3-LTE GSM cellular transceiver (RMU5-GSM), 'Iridium Mode' when using a Mobiltex RMU3S satellite Transceiver (RMU5-Iridium), 'Inmarsat-C Mode' when using a Thrane&Thrane TT3026L Easytrack satellite transceiver (RMU5-Easytrack), or 'IsatDataPro Mode' when using a Skywave IDP-680 satellite transceiver (RMU5-IDP).

5.2.5.1 IsatM2M Satellite (RMU5-ISAT)

The RMU5-ISAT communicates over the Skywave IsatM2M satellite system. The RMU5 must be configured with one piece of information to allow this mode of operation to work correctly.

The Skywave system uses Inmarsat D+ satellites which are currently divided into 5 different ocean region service areas. These are Pacific Ocean Region (POR, 178°E), Pacific Ocean Region Central (PACC, 142°W), Atlantic Ocean Region West (AORW, 53°W), Atlantic Ocean Region East (AORE, 15.5°W), and Indian Ocean Region (IOR, 64°E). Since the satellites are geostationary, care must be taken during installation of the DMR-800 transceiver to ensure that an open sky view is available to the selected satellite. The DMR-800 should be mounted flat, or slightly inclined to the south for northern hemisphere installations. The DMR-800 should be mounted flat, or slightly inclined to the north for southern hemisphere installations. The ocean region selected in the RMU5 parameters must match the location of installation for the RMU5. Figure 95 shows the coverage attained by each of the 5 satellites. Choose the satellite which is closest to the installation area unless there are obstructions, such as trees or mountains, in line-of-sight view for that satellite. If obstructions are present, an alternative satellite may have to be used if it provides clearer line-of-sight.

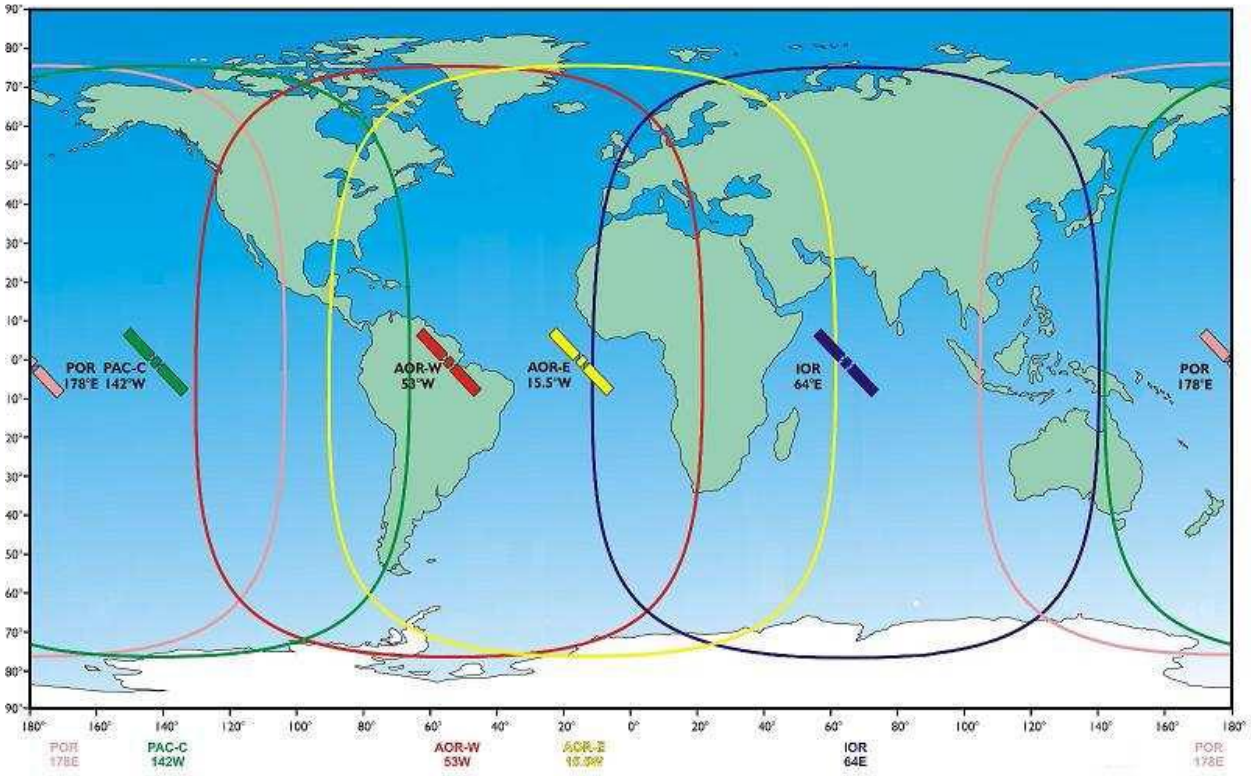


Figure 95 Skywave IsatM2M C Ocean Region Coverage Areas

Example of satellite selection:

Western Canada/USA installation – choose PACC satellite by default.

Eastern Canada/USA installation – choose AORW satellite by default.

Africa/Europe installation – choose AORE satellite by default.

Western/Central Asia installation – choose IOR satellite by default.

Eastern Asia/Australia installation – choose POR satellite by default.

The "Communications Status" button can be used to determine the status of the satellite transceiver connection to the satellite. Click this button to bring up the following dialog.

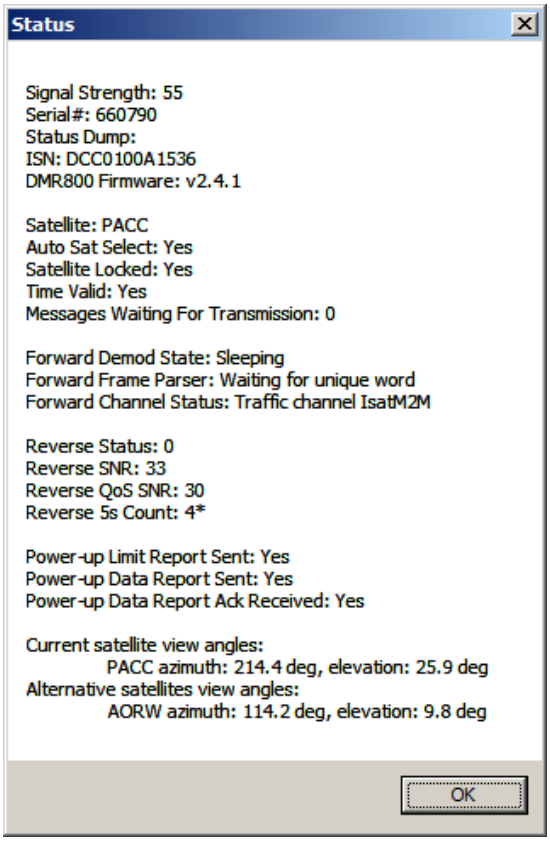


Figure 96 IsatM2M Communications Status

If issues with communications are noted, the information in this dialog should be sent to Mobiltex for analysis.

After power-up, it may take up to 5 minutes for the satellite transceiver to lock onto the configured satellite. In the status screen, the 'Satellite Locked' field should indicate 'Yes'. The "Signal Strength" field should also show a value greater than 30 for optimal communications.

The "Power-up data report ack received" field will show "Yes" if the power-up message from the RMU5 to corView has been acknowledged from corView. This may take up to 10 minutes after power-up to indicate "Yes". If after 10 minutes, this does not indicate "Yes", check corView to see if the power up message was received. The DMR-800 transceiver may have to be re-oriented if communications is marginal.

The "Current satellite view angles" field can be used to aim the DMR-800 transceiver at the currently selected satellite. The RMU5 GPS receiver must have at least position lock for this function to work. Using the azimuth value (referenced to true North) and a compass (compensated for local declination), move the DMR-800 bracket until the center of the domed face of the DMR-800 is pointing at the indicated azimuth direction. Note that DMR-800 transceivers with software versions higher than v2.x.x will automatically find and use the ocean region with the best signal.

The "Alternative satellites view angles" field will show other satellites that are available at the current installation site. The RMU5 GPS receiver must have at least position lock for this function to work. If an alternative satellite is shown with a higher elevation angle than the currently selected satellite, considering selecting the alternate satellite in the configuration. If the selected satellite is changed in the parameters, re-orient the azimuth of the DMR-800 bracket, write the parameters to the RMU5, then check the satellite status again (taking into account the potential 5 minute lock time for the transceiver).

The "Test Transmission" button allows a test message to be sent to the corView system. The RMU5 will automatically send a message to corView at power-up. This test transmission should only be used if there are communications issues suspected some time (i.e. days) after installation has occurred.

5.2.5.2 GSM SMS (RMU5-GSM)

Only two parameters are necessary for operation using the GSM SMS mode.

The first parameter is the band of operation. For North America, select '850/1900MHz Band'. For most of the rest of the world, select '900/1800MHz Band'. If un-sure of the required setting, contact Mobiltex for assistance.

The second parameter is the phone number or SMS short code of the server. The server phone number must be set according to the SIM card installed in the transceiver. For Mobiltex provided SIM cards, find the provider name on the bottom of the cellular transceiver and enter the corresponding value from the following table. For use with other providers' SIM cards, please contact Mobiltex for additional information.

SIM Provider	Server Phone Number
M2MSecureLink	0305
Kore USA Gold	20020431
Kore Canada	720026
m2mair Gold	87194704
m2mair Canada	87194704

Table 5 Cellular SIM Provider Server Phone Numbers

The "Communications Status" button can be used to determine the status of the connection to the cellular provider. Click this button to bring up the following dialog.

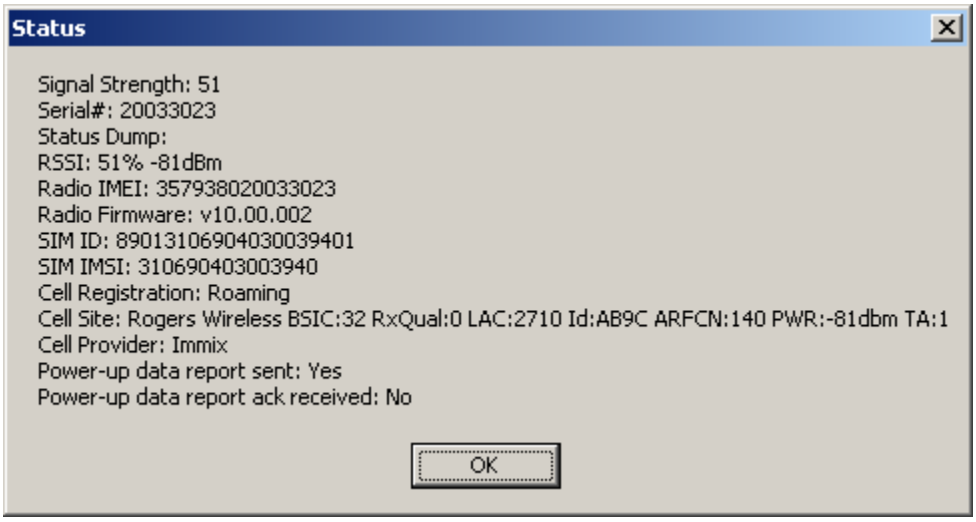


Figure 97 GSM SMS Communications Status

If issues with communications are noted, the information in this dialog should be sent to Mobiltex for analysis.

After power-up, it may take up to 2 minutes for the cellular transceiver to lock onto the service provider. In the status screen, the 'Cell Registration' field should indicate 'Home' or 'Roaming. The "Signal Strength" field should also show a value greater than 30 for optimal communications.

The "Power-up data report ack received" field will show "Yes" if the power-up message from the RMU5 to corView has been acknowledged from corView. This may take up to 5 minutes after power-up to indicate "Yes". If after 5 minutes, this does not indicate "Yes", check corView to see if the power up message was received. The GTX2/3/3-LTE GSM cellular transceiver may have to be re-oriented if communications is marginal.

The "Test Transmission" button allows a test message to be sent to the corView system. The RMU5 will automatically send a message to corView at power-up. This test transmission should only be used if there are communications issues suspected some time (i.e. days) after installation has occurred.

5.2.5.3 Inmarsat-C Satellite (RMU5-Easytrack)

The RMU5-Easytrack communicates over the Inmarsat-C satellite system. The RMU5 must be configured with one piece of information to allow this mode of operation to work correctly.

The Inmarsat-C system uses satellites which are currently divided into 4 different ocean region service areas. These are Pacific Ocean Region (POR, 178°E), Atlantic Ocean Region West (AORW, 53°W), Atlantic Ocean Region East (AORE, 15.5°W), and Indian Ocean Region (IOR, 64°E). Since the satellites are geostationary, care must be taken during installation of the Easytrack transceiver to ensure that an open sky view is available to the selected satellite. The

Easytrack should be mounted flat, or slightly inclined to the south for northern hemisphere installations. The Easytrack should be mounted flat, or slightly inclined to the north for southern hemisphere installations. The ocean region selected in the RMU5 parameters must match the location of installation for the RMU5. The coverage for each Inmarsat-C satellite is shown in Figure 98. Choose the satellite which is closest to the installation area unless there are obstructions, such as trees or mountains, in line-of-sight view for that satellite. If obstructions are present, an alternative satellite may have to be used if it provides clearer line-of-sight.

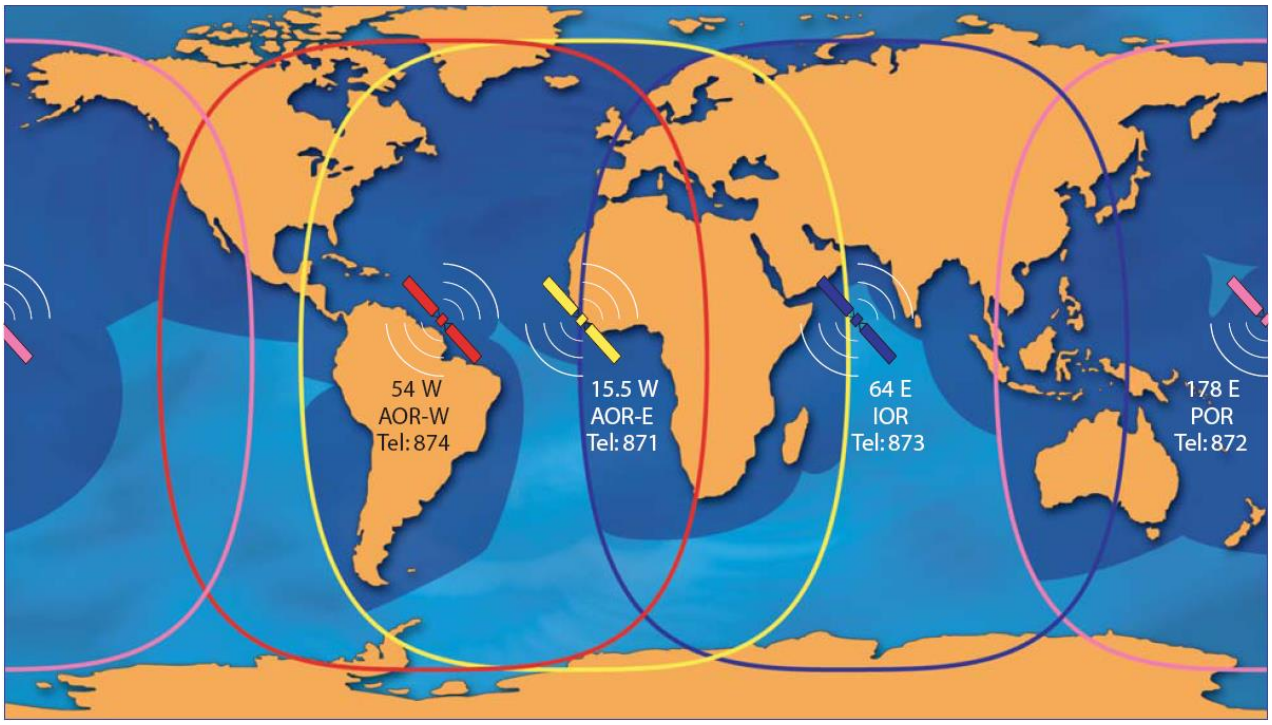


Figure 98 Inmarsat-C Satellite Coverage Areas

Example of satellite selection:

Western Canada/USA installation – choose POR satellite by default.

Eastern Canada/USA installation – choose AORW satellite by default.

Africa/Europe installation – choose AORE satellite by default.

Western/Central Asia installation – choose IOR satellite by default.

Eastern Asia/Australia installation – choose POR satellite by default.

The "Communications Status" button can be used to determine the status of the satellite transceiver connection to the satellite. Click this button to bring up the following dialog.

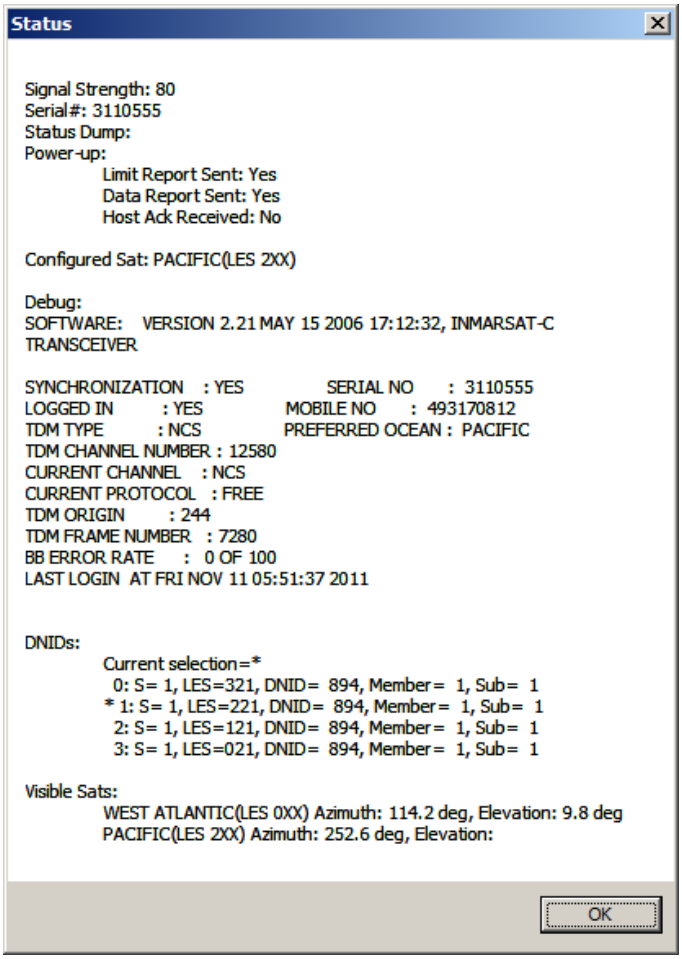


Figure 99 Inmarsat-C Communications Status

If issues with communications are noted, the information in this dialog should be sent to Mobiltex for analysis.

The "Power-up Host Ack Received" field will show "Yes" if the power-up message from the RMU5 to corView has been acknowledged from corView. This may take up to 10 minutes after power-up to indicate "Yes". If after 10 minutes, this does not indicate "Yes", check corView to see if the power up message was received. The Easytrack transceiver may have to be re-oriented if communications is marginal.

The "Visible Sats" field will show satellites that are available at the current installation site. The RMU5 GPS receiver must have at least position lock for this function to work. If an alternative satellite is shown with a higher elevation angle than the currently selected satellite, considering selecting the alternate satellite in the configuration. If the selected satellite is changed in the parameters, re-orient the azimuth of the Easytrack bracket, write the parameters to the RMU5, then check the satellite status again (taking into account the potential 5 minute lock time for the transceiver).

The "Test Transmission" button allows a test message to be sent to the corView system. The RMU5 will automatically send a message to corView at power-up. This test transmission should only be used if there are communications issues suspected some time (i.e. days) after installation has occurred.

5.2.5.4 Iridium (RMU5-Iridium)

No user configurable parameters are needed for RMU5-Iridium operation.

The "Communications Status" button can be used to determine the status of the connection to the satellite provider. Click this button to bring up the following dialog.

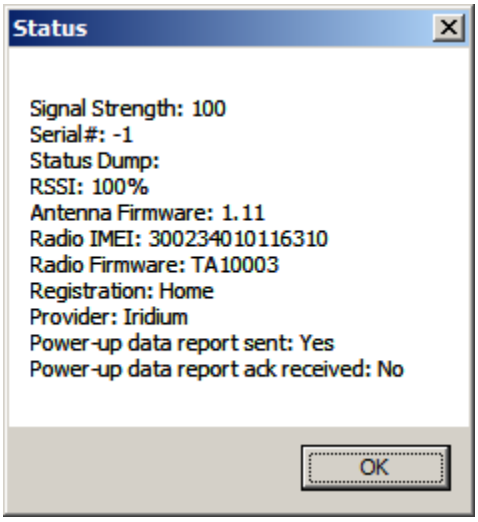


Figure 100 Iridium Communications Status

If issues with communications are noted, the information in this dialog should be sent to Mobiltex for analysis.

After power-up, it may take up to 2 minutes for the satellite transceiver to lock onto the satellite network. The "Signal Strength" field should also show a value greater than 10 for optimal communications. The "Registration" field should indicate "Home" once the satellite network is acquired.

The "Power-up data report ack received" field will show "Yes" if the power-up message from the RMU5 to corView has been acknowledged from corView. This may take up to 5 minutes after power-up to indicate "Yes". If after 5 minutes, this does not indicate "Yes", check corView to see if the power up message was received. The RMU3 Iridium satellite transceiver may have to be re-located if communications is marginal.

The "Test Transmission" button allows a test message to be sent to the corView system. The RMU5 will automatically send a message to corView at power-up. This test transmission should only be used if there are communications issues suspected some time (i.e. days) after installation has occurred.

5.2.5.5 IsatDataPro Satellite (RMU5-IDP)

The RMU5-IDP communicates over the Skywave IsatDataPro satellite system using a Skywave IDP-680 satellite tranceiver.

The Skywave system uses Inmarsat I4 satellites which are currently divided into 3 different service region areas. These are Americas Region (AMER, 98°E), Europe, Middle East and Africa Region (EMEA, 25°E), and Asia Pacific Region (APAC, 143.5°E). Since the satellites are geostationary, care must be taken during installation of the DMR-800 transceiver to ensure that an open sky view is available to the selected satellite. The IDP-680 should be mounted flat, or slightly inclined to the south for northern hemisphere installations. The IDP-680 should be mounted flat, or slightly inclined to the north for southern hemisphere installations. Figure 95 shows the coverage attained by each of the 5 satellites. Choose the satellite which is closest to the installation area unless there are obstructions, such as trees or mountains, in line-of-sight view for that satellite. If obstructions are present, an alternative satellite may have to be used if it provides clearer line-of-sight.

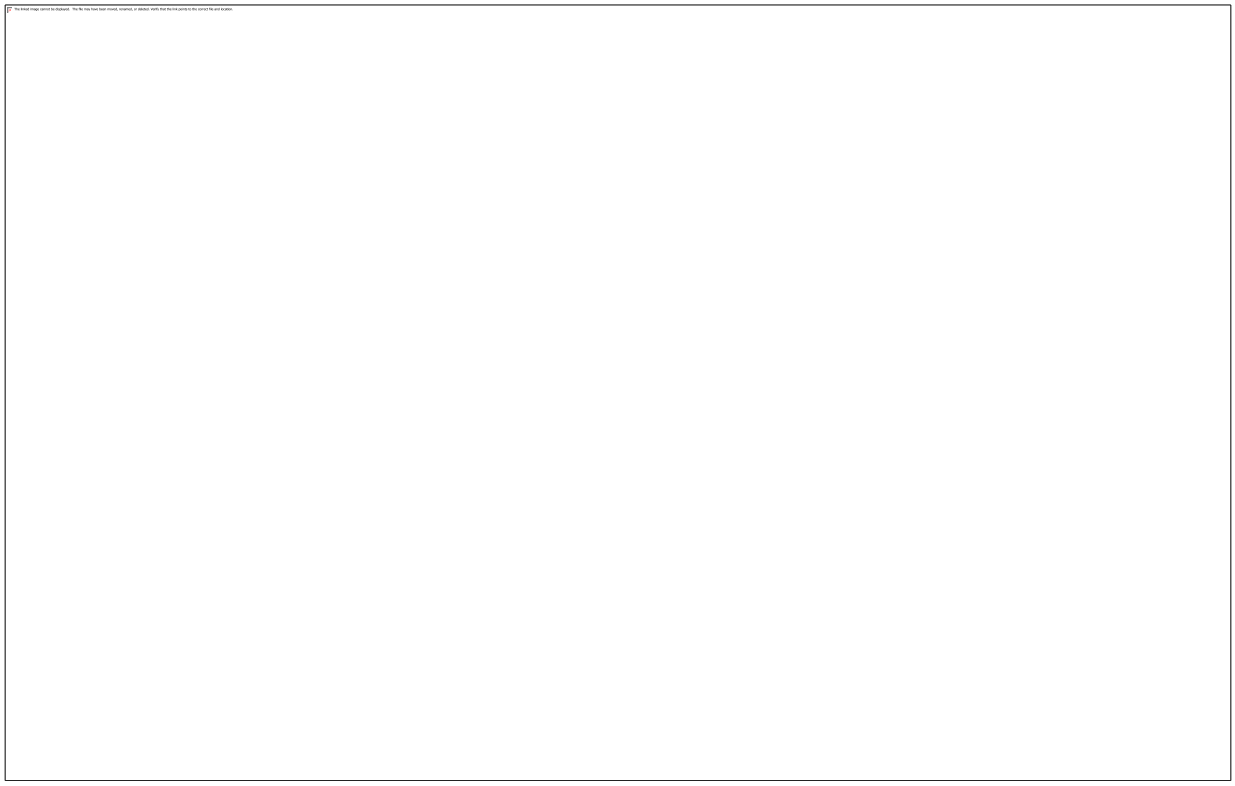


Figure 101 Skywave IsatDataPro Service Region Coverage Areas

Example of satellite selection:

Western Canada/USA installation – choose AMER satellite by default.

Eastern Canada/USA installation – choose AMER satellite by default.

Africa/Europe installation – choose EMEA satellite by default.

Western/Central Asia installation – choose EMEA satellite by default.

Eastern Asia/Australia installation – choose APAC satellite by default.

The "Communications Status" button can be used to determine the status of the satellite transceiver connection to the satellite. Click this button to bring up the following dialog.

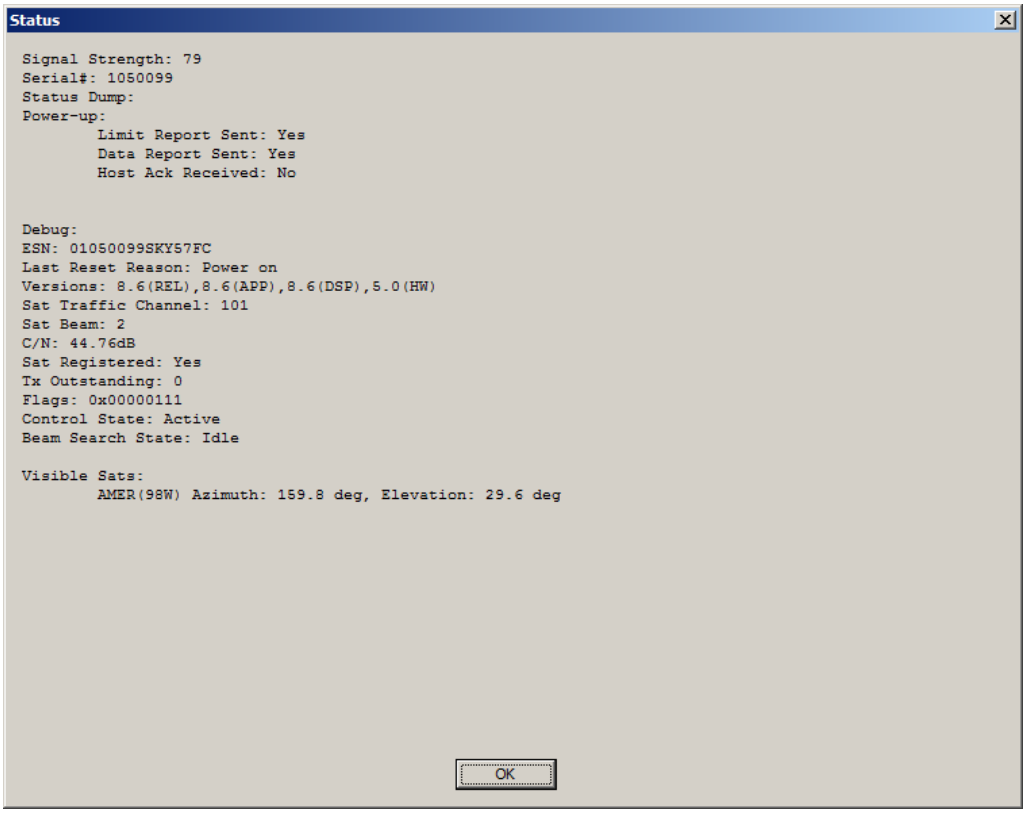


Figure 102 IsatDataPro Communications Status

If issues with communications are noted, the information in this dialog should be sent to Mobiltex for analysis.

After power-up, it may take up to 5 minutes for the satellite transceiver to lock onto the configured satellite. In the status screen, the 'Satellite Registered' field should indicate 'Yes'. The "Signal Strength" field should also show a value greater than 30 for optimal communications.

The "Power-up host ack received" field will show "Yes" if the power-up message from the RMU5 to corView has been acknowledged from corView. This may take up to 10 minutes after power-up to indicate "Yes". If after 10 minutes, this does not indicate "Yes", check corView to see if the power up message was received. The IDP-680 transceiver may have to be re-oriented if communications is marginal.

The "Visible Sats" field can be used to aim the IDP-680 transceiver at a satellite. The RMU5 GPS receiver must have at least position lock for this function to work. Using the azimuth value (referenced to true North) and a compass (compensated for local declination), move the IDP-680 bracket until the center of the domed face of the IDP-680 is pointing at the indicated azimuth direction. Note that IDP-680 transceivers will automatically find and use the satellite region with the best signal.

The "Test Transmission" button allows a test message to be sent to the corView system. The RMU5 will automatically send a message to corView at power-up. This test transmission should only be used if there are communications issues suspected some time (i.e. days) after installation has occurred.

5.2.6 RMU5 Communications and Status

The "RMU5 Communications and Status" grouping provides status information about the currently attached RMU5, and allows reading and writing of the RMU5 parameter set.

The "Firmware Version" field indicates the firmware version of the currently connected RMU5. The firmware version should match the major and minor version of the RMU5SetupCorview application. If it does not, update the firmware in the RMU5 to match.

To update a unit to the version matching the current configuration application, click on the "Updated Firmware" button. A dialog will be presented asking if you wish to perform the action—select yes to update the RMU5. During the firmware load process a progress bar will be shown. The RMU5 will re-boot after successfully updating the application.

The “ESN” indicates the electronic serial number of the RMU5. This value is informational only, it does not affect unit operation.

The box below the ESN field is a status field indicating whether any parameters have been edited. It is green when the configuration in the application matches that of the RMU5. If any of the parameters are edited, it will turn red, indicating that the modified configuration should be written to the RMU5 for those changes to take effect.

The “Link Port” pulldown allows the USB connection to the RMU5 to be disconnected or re-connected. Set to “Disabled” to disconnect, and “USB” to re-connect.

The “Link Status” field indicates the current operation that is occurring between the configuration application and the RMU5.

The “Read Faults” button allows fault information to be retrieved from the RMU5. If the power LED on the RMU5 is blinking red, a fault flag is set. Use this button to retrieve the specific fault detected.

The “Defaults” button sets the parameter set in the configuration application to factory defaults. After using this button, it is still necessary to write the parameter set to the RMU5 to have it become active.

The “Write To File” and “Read From File” buttons allow configurations to be stored on disk or retrieved from disk. Configuration files may be saved as templates for use on multiple RMU5 devices with identical requirements.

The “Write to RMU5” and “Read From RMU5” buttons allow configurations to be saved or read from the RMU5. Upon initial connection to the RMU5, an automatic read of parameters will occur. After making any edits to the parameter set in the configuration application, the “Write to RMU5” button must be pressed to make the changes active on the RMU5 device. After a write to the RMU5, the RMU5 application will re-start, which will terminate the link between the configuration application and the RMU5. Click the “Read From RMU5” button to re-establish the communications link after 10 seconds.

5.3 Post Configuration

After configuring the necessary RMU5 parameters with the RMU5SetupCorView application, disconnect the USB cable from the RMU5. Close and latch the RMU5 enclosure. Log on to the corView web site and validate the data received from the RMU5 installation.

6 Operation

6.1 LCD Display

The RMU5 LCD display allows for quick monitoring of the unit operation in the field, without the need for a PC to be attached. The display can be paged to various display screens using the 'UP' and 'DOWN' push buttons, located next to the LCD display.

The first page, shown in Figure 103, is a quick glance status page that displays the DC measurements for the first four analog measurement channels. Also displayed is the number of GPS satellites being received, or "NO GPS" if the RMU5 is not equipped with the optional GPS receiver. Next, the signal strength (RSSI) for the satellite transceiver is shown. Finally, the last line displays current status related to the satellite transceiver communications.

```
1:+11.95V  2:+0.010A
3:-0.050A  4:-2.560A
GPS:12     RSSI: 70%
RS-232 Comms Working
```

Figure 103 LCD Display Page 1, Main Status

The next page, shown in Figure 104, displays copyright information, and version information for the RMU5 operating system and application software.

```
Mobiltex Data Ltd.
RMU5 (C)2007-2013
RMU Version 1.20
OS Version 1.06
```

Figure 104 LCD Display Page 2, Copyright and OS/Application Versions

This is followed by the page shown in Figure 105, which displays the real-time clock date/time, the IP address of the Ethernet connection, and the ESN of the RMU5.

```
12/31/12 09:02:35

IP: 244.232.192.555
ESN 123456789
```

Figure 105 LCD Display Page 3, Real Time Clock, IP Address, and ESN

The next page, shown in Figure 106, displays the current reading for a measurement point. Thirteen sequential pages display the present readings for CH1-4 DC, CH1-4 AC, backup battery, main supply voltage, temperature, main supply current, and the isolated digital input.

```
Base RMU I/O
CH1 DC
Value: 11.943V
(Point 1)
```

Figure 106 LCD Display Pages 4-17, Readings

This is followed by the page shown in Figure 107, which displays detailed information for the optional timing control module GPS receiver. The first two lines indicate the current latitude and longitude measurements in decimal degrees. The third line is the current UTC time received from the GPS receiver. The fourth line shows the number of satellites in the solution, if time lock (TL) has been attained, position lock (PL) has been attained, and whether the timing control module has locked onto the AC wave form from the main power input. If the optional GPS module is not installed, this screen will indicate "GPS module not installed in the RMU".

```
Lat: 51.08548 N
Lon: 113.99714 W
04/22/09 15:28:26
GPS Sat: 12 TL PL AC
```

Figure 107 LCD Display Page 18, Timing Control Module Details

Next, the page shown in Figure 108 displays system fault information.

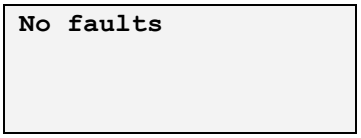


Figure 108 LCD Display Page 19, System Faults

The next page displayed on the LCD, as shown in Figure 109, conveys information on the software versions for various components in the RMU5.

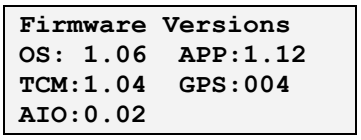


Figure 109 LCD Display Page 20, System Firmware Versions

The final page displayed on the LCD, as shown in Figure 110, provides identification information for the transceiver currently connected to the RS-232 port. The information presented will aid in matching the transceiver to the communications ESN used in corView.

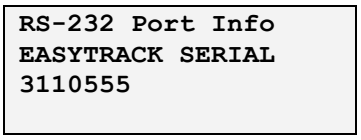


Figure 110 LCD Display Page 21, RS-232 Port Info

6.2 System Shutdown

When shutting down the RMU5 for repair or removal, it is necessary to follow this procedure:

1. For safety, shutdown main power to the RMU5 and the monitored equipment using the master breaker at the installation site.
2. Disconnect the orange 24VAC/DC main power connector from the RMU5.
3. Press and hold the RESET button for 10-15s, until the green PWR LED turns off.

7 Servicing

The RMU5 contains no user serviceable components. In case of failure, return the complete unit to Mobiltex for servicing.

The internal sealed-lead acid backup battery should only be replaced by Mobiltex.

No cleaning is required.

A. User Accessible Connector Pin Outs

Pin Number	Label	Function
1	AIN1-	Analog Input Channel 1 Negative Connection CAT II 105VRMS/150VDC (TEG Source +/- 119VDC max)
2	AIN1+	Analog Input Channel 1 Positive Connection CAT II 105VRMS/150VDC (TEG Source +/- 119VDC max)
3	AIN2-	Analog Input Channel 2 Negative Connection CAT II 105VRMS/150VDC (TEG Source +/- 119VDC max)
4	AIN2+	Analog Input Channel 2 Positive Connection CAT II 105VRMS/150VDC (TEG Source +/- 119VDC max)
5	AIN3-	Analog Input Channel 3 Negative Connection CAT II 105VRMS/150VDC (TEG Source +/- 119VDC max)
6	AIN3+	Analog Input Channel 3 Positive Connection CAT II 105VRMS/150VDC (TEG Source +/- 119VDC max)
7	AIN4-	Analog Input Channel 4 Negative Connection CAT II 105VRMS/150VDC (TEG Source +/- 119VDC max)
8	AIN4+	Analog Input Channel 4 Positive Connection CAT II 105VRMS/150VDC (TEG Source +/- 119VDC max)
9	INT-	Interrupter Relay Drive Output Negative Switched Connection
10	INT+	Interrupter Relay Drive Output Positive 12V Connection (750mA max, combined with +12V) Note: Int+ & Sensor Bus power (Sensor expansion bus connector pin 9) must not exceed 1.25A combined. Do not load the 12V supply unless the battery is fully charged.
11	+12V	+12V Output For Driving Dry Contacts Into Digital Input (750mA max, combined with INT+) Note: Int+ & Sensor Bus power (Sensor expansion bus connector pin 9) must not exceed 1.25A combined. Do not load the 12V supply unless the battery is fully charged.
12	DIN1A	Digital Input 1 Connection A (Input to bi-directional optocoupler through 1K current limiting resistor) < +/-30VDC to DIN1B, <1.5kV to earth ground
13	DIN1B	Digital Input 2 Connection B (Input to bi-directional optocoupler) < +/-30VDC to DIN1A, <1.5kV to earth ground
14	GND	Power/Signal Ground
15	RS485+	RS485 MODBUS Port Positive Connection
16	RS485-	RS485 MODBUS Port Negative Connection

Table 6 Main I/O Connector Pinout

Pin Number	Label	Function
1	COMM_DCD	RS-232 Communications Port Data Carrier Detect (DTE)
2	COMM_RXD_B	RS-232 Communications Port Receive Data (DTE)
3	COMM_TXD_B	RS-232 Communications Port Transmit Data (DTE)
4	COMM_DTR	RS-232 Communications Port Data Terminal Ready (DTE)
5	GND	Power/Signal Ground
6	COMM_RS485+	RS-485 Communications Port Positive Data (Shared With Main I/O RS-485 Connections)
7	COMM+V	Rectified Input Voltage If External Power Is Present, Otherwise Switched Internal Backup Battery (2.5A max)
8	SDA	I2C Bus Data Line
9	COMM_DSR	RS-232 Communications Port Data Set Ready (DTE)
10	COMM_RTS	RS-232 Communications Port Request To Send (DTE)
11	COMM_CTS	RS-232 Communications Port Clear To Send (DTE)
12	COMM_RI	RS-232 Communications Port Ring Indication (DTE)
13	COMM_RS485-	RS-485 Communications Port Negative Data (Shared With Main I/O RS-485 Connections)
14	COMM+5V	+5V Supply For Communication Peripheral (2A max)
15	SCL	I2C Bus Clock Line

Table 7 Communications Expansion Connector Pinout

Pin Number	Label	Function
1	DOUT	Interrupter Relay Synchronization Signal (RS-232 levels)
2	DEBUGRXD	Windows CE Debug RS-232 Serial Port Receive Data (DCE)
3	DEBUGTXD	Windows CE Debug RS-232 Serial Port Transmit Data (DCE)
4	SB_RS485-	Sensor Bus RS-485 Negative Connection
5	GND	Power/Signal Ground
6	GND	Power/Signal Ground
7	SB_RS485+	Sensor Bus RS-485 Positive Connection
8	1PPS	GPS Synchronized One Pulse Per Second
9	SENSOR+12V	Switched Sensor Bus 12V Power (1.25A max, total power limit shared with interrupter relay drive and main I/O +12V) Note: Int+ (Term. Block pins 10 & 11)& Sensor Bus power must not exceed 1.25A combined. Do not load the 12V supply unless the battery is fully charged.

Table 8 Instrumentation Sensor Expansion Bus Connector

Pin Number	Label	Function
1	AC1	24VAC/DC Input #1 (DC, 50/60Hz) (This input feeds one side of a full wave rectifier bridge)
2	AC2	24VAC/DC Input #2 (DC, 50/60Hz) (This input feeds the second side of a full wave rectifier bridge)

Table 9 Main Power Input Connector

Pin Number	Label	Function
1	VBUS	USB +5V Power (500mA max)
2	D-	USB Data Negative Signal
3	D+	USB Data Positive Signal
4	GND	Signal/Power Ground

Table 10 USB Host Connector

Pin Number	Label	Function
1	VBUS	USB VBUS +5V Input
2	D-	USB Data Negative Signal
3	D+	USB Data Positive Signal
4	GND	Signal/Power Ground

Table 11 USB Slave Configuration Connector

Pin Number	Label	Function
1	TX+	Ethernet Transmit Data Positive Signal (HP Auto-Crossover capable)
2	TX-	Ethernet Transmit Data Negative Signal
3	RX+	Ethernet Receive Data Positive Signal
4	TERM1A	Tied directly to pin 5, both pins pass through 75ohm resistor to chassis ground through 1nF capacitor.
5	TERM1B	Tied directly to pin 4, both pins pass through 75ohm resistor to chassis ground through 1nF capacitor.
6	RX-	Ethernet Receive Data Negative Signal
7	TERM2A	Tied directly to pin 8, both pins pass through 75ohm resistor to chassis ground through 1nF capacitor.
8	TERM2B	Tied directly to pin 7, both pins pass through 75ohm resistor to chassis ground through 1nF capacitor.

Table 12 Ethernet 10/100 Connector

B. Specifications

Environmental:

Operating temperature range:	
Standard battery:	-35 to +60C (-31 to +140F)
Extended battery:	-40 to +60C (-40 to +140F)
Storage temperature range:	-40 to +80C (-40 to +176F)
Humidity:	0 to 100% RH non-condensing
Pollution Degree	2
Mounting	Suitable for indoor/outdoor use

Physical:

Enclosure:	Fiberglass waterproof case (IP65, NEMA 4X rated), versatile aluminum mounting plate
Size:	183mm x 255mm x 112mm
Weight:	3.2 kgs

Power:

Operating voltage range:	20 to 25 volts AC (50/60Hz) or 20 to 35 volts DC
Power (less accessories):	5 VA maximum
Power (with accessories):	40 VA maximum
Power Source	Class 2 CSA/UL approved

Processing Core:

CPU:	200MHz ARM9 processor
Memory:	32MB flash/64MB SDRAM
Operating System:	Windows CE 6.0
Display:	4 line by 20 character backlit LCD
Hard Keys:	3: 1 reset/power down, 2 for up/down control

Ethernet Interface: 10/100 Base-T

PC Configuration Connection:

Electrical Connection:	USB 2.0 Peripheral Device
USB Function:	RNDIS
PC OS requirements:	Windows XP SP2 or higher
PC application requirements:	Supplied by Mobiltex

Interruption Output:

Relay drive voltage:	12 volts DC
Relay drive current:	0.75 Amps maximum
Relay contact close dwell:	0-100 ms
Relay contact open dwell:	0-100 ms
Relay contact type:	NO or NC
Relay type:	Solid state or mechanical
Off Time:	100 – 60,000ms in 1ms steps
Cycle Time:	200 – 60,000ms in 1ms steps
Schedules (date and time):	1

Analog Inputs(AIN1, AIN2, AIN3 & AIN4):

Measurement Category	II (as per CSA C22.2 – 61010)
Maximum Operating Altitude	5000 meters above sea level
Isolation:	Full galvanic isolation, +/-230V maximum to earth ground
Ranges:	+/-0.158Vpeak, +/-7.5Vpeak, +/-150Vpeak CAT II 105VRMS/150VDC (TEG Source +/- 119VDC max)
Measurement types:	AC RMS and DC, simultaneous per channel
Input Impedance:	20MOhm minimum
Resolution:	16-bit
Maximum sampling rate:	20 sps

DC channel 50/60Hz rejection:	75dB typical
Digital Input(DIN):	Optically isolated (+/-3 to 30VDC activation)
Sensor Bus:	RS-485 plus 1PPS, interrupt synch, and +12V
Serial Communications:	1 RS-232, 1 RS-485
USB Host:	1 non-dedicated, user accessible port

GPS-Synchronized Interruption Option Board:

Operating temperature range:	-40 to +85C
Installation:	Factory or qualified field technician
UTC Reference offset adjustment:	-2000 to +3000ms in 1ms steps
Timing accuracy (AC line sync disabled):	+/-0.5 ms
Timing accuracy (AC line sync enabled):	+8.8/-0.5 ms
Off Time:	1 – 60,000ms in 1ms steps
Cycle Time:	2 – 60,000ms in 1ms steps
GPS Receiver:	Internal 20 channel
GPS Antenna:	External through-hole mount with SMA

Datalog Storage Option Board:

Storage Memory Type:	USB 2.0 embedded drive card
Storage Memory Size:	Available in 512MB, 1GB, 2GB, 4GB, 8GB

PERMANENTLY CONNECTED EQUIPMENT requires special considerations to satisfy the CEC and the Canadian deviations in the standard, including overcurrent and fault protection as required.

Technical assistance may be obtained from:

Mobiltex Data Ltd.
3640-26th Street NE
Calgary, AB T1Y 4T7
Canada
Tel: (403)291-2770
Web: http://www.mobiltex.com