RMU2

Installation and Configuration Guide



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Name	Location	Job Function	Signature	Date
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1 Introduction

The RMU2 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 RMU2 is a low cost, high reliability device intended to monitor rectifiers, bonds and test points. The device is available in two satellite variants (RMU2-S Globalstar and RMU2-SI Iridium) or GSM Cellular (RMU2-G) communication configurations. The field hardware consists of two primary components: a small measurement terminal block (RMU2-B) that is usually mounted inside the rectifier, and the satellite or cellular antenna transmitter that is typically externally mounted. The device operates for 7+ years from internal, low cost, field replaceable batteries. This self-powered solution can be used to monitor non-powered sites such as test points and bonds, in addition to conventional rectifiers, TEG and solar applications. The RMU2 has integral high-energy surge suppression and provides unprecedented lightning immunity because there are no connections to electrical ground.

The RMU2 monitors and transmits nine 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. An integral non-contact AC Line presence sensor can be used to determine if AC line voltage is present. An integral magnetic sensor can be used as a rectifier door sensor or tamper detection alarm. The RMU2 measures temperature and internal battery voltage. A user accessible switch allows the transmission of uniquely identified messages that can be used to record site visit information. The RMU2 is available with an optional "Measurement Recorder" which will measure and save all the analog readings every 6 hours. One year and eight year memory storage options are available.

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 an Internet Explorer web browser. The measurement data is presented in an intuitive tabular format or graphical mapping display 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.

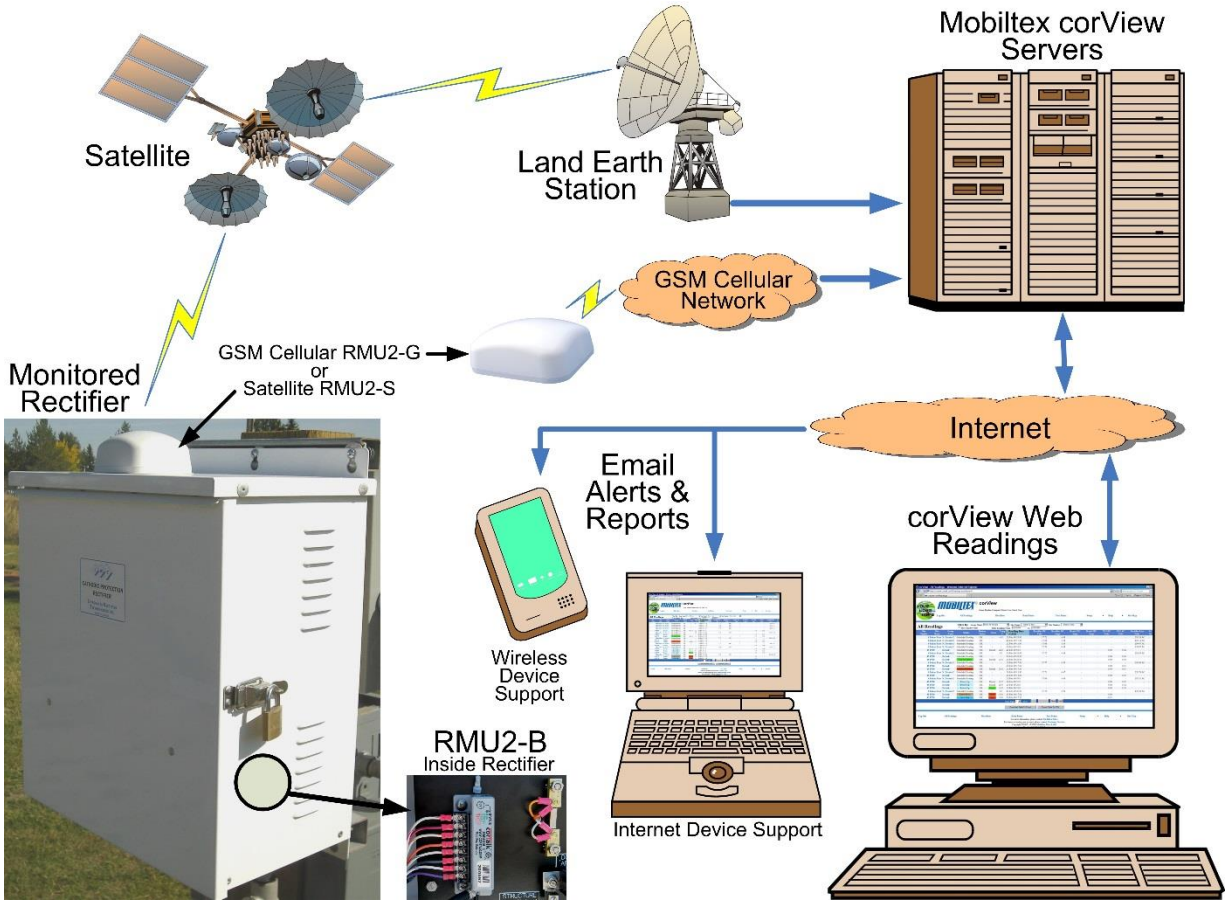


Figure 1 RMU2 Communications Block Diagram

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.

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 RMU2 Theory of Operation

The RMU2 field hardware consists of two components, the RMU2-B – a measurement terminal block that is typically mounted inside the rectifier or inside a weather protected enclosure and the RMU2-S/SI – satellite antenna or RMU2-G – cellular antenna which is mounted outside the rectifier with a clear view of the sky. Both components are environmentally sealed type 3 enclosures and are electrically isolated from earth ground to provide exceptional lightning immunity. A molded M8 instrumentation cable connects the devices together.

The device is powered from five AA 1.5V Lithium cells located in the RMU2-S/SI/G that provide a nominal operational life of 7+ years based on readings every 2 days / transmission every 8 days. Low battery warning conditions are automatically transmitted and displayed on the CorView web monitoring site. Replacement batteries are low cost, readily available and field replaceable.

The RMU2-B has an environmentally sealed "Test" button to allow field personnel to manually initiate a measurement cycle and near immediate satellite or cellular transmission. This transmission is uniquely identified on the CorView web site so this feature can be used to record site visits or inspection activities. The RMU2-B has a dual color LED indicator that provides the installer with device status information. The LED is used to indicate when the device is actively making measurements, the state of the inductive AC line voltage presence sensor (if enabled), measurement limit violations, low battery alarm and error conditions. The device can be field configured using the optional RMU2/3-PGM configuration interface and a PC computer with an available USB port.

A power-up message containing device configuration information and readings is transmitted shortly after the RMU2-S/SI/G and RMU2-B devices are connected together. The device will enter a low power sleep state after it completes the measurements and will wake up every 6 hours there-after and take another set of measurements. The device can also be immediately wakened by opening or closing the magnetic door switch (if enabled) or by pressing the "Test" push button on the RMU2-B. The magnetic door switch has a 5 second debounce timer and software logic to limit satellite or cellular transmissions in the case of intermittent door sensing.

The device measures 4 external analog channels, an inductively coupled AC line voltage presence sensor (if enabled), a digital magnetic door sensor (if enabled), internal RMU2-B temperature, and internal battery voltage. The four external analog channels are high impedance and galvanically isolated with multistage lightning protection. Each of these four analog channels is capable of measuring DC (bipolar) or AC (true RMS) signals up to 150 VDC / 105 VRMS. A >65dB 50/60Hz AC rejection filter is utilized for DC measurements to provide maximum DC accuracy. Each channel supports several voltage ranges (150mVDC, 20VDC, 150VDC, 14VAC, 105VAC FS) to accommodate a wide range of sensors (current shunts, reference cells, and direct voltage measurement). The measurement application (rectifier, bond, test point), channel mapping, range selection and AC / DC selection is defined by the "measurement type" configuration parameter that is factory or field programmed into the RMU2-B. An optional external AC Line Voltage Divider is required for applications that measure 110/120 or 220/240 VAC line voltages.

For special applications, any of the 4 analog channels can be field configured for use with 4-20mA current transducers. An external 7.5 or 250 ohm precision resistor is required across each measurement channel that is used for 4-20mA current loop sensing. The desired readings at the 4mA and 20mA levels for each analog channel must be programmed into the RMU2-B using the RMU2/3-PGM configuration interface.

To minimize airtime costs, the device stores four sets of periodic readings and then transmits all four sets of readings in a satellite or cellular transmission. The device can be factory configured for one of four types of data reporting plans: readings every 6 hours / Tx every 24 hours, readings every 24 hours / Tx every 4 days, readings every 48 hours / Tx every 8 days, and readings every 7 days / Tx every 28 days. The device can also be factory configured to monitor the magnetic door switch and provide near immediate transmissions when the rectifier door has been opened or closed.

Irrespective of the data plan, the device wakes up every 6 hours and takes a set of measurements. The measurements are compared with optional (field configured) alarm high limit and alarm low limit values. The device will immediately initiate a transmission if a new alarm or cleared alarm condition(s) is detected. If no alarm or alarm clear conditions are present the device will automatically store the readings in memory at the interval determined by the reporting plan and transmit the readings after the fourth reading is stored. The device suppresses alarm limit exception transmissions during interruption (interruption done by external equipment) providing the interrupt "off" time is less than 10 seconds and the "on" time is more than 250mS.

The report by exception scheme allows timely (i.e. sample every 6 hours) reporting of out of limit measurements while maintaining a low messaging cost due to infrequent periodic transmissions. All data communications for this product are one way (field to CorView) so there is no method to send commands to a field device via satellite or cellular. The CorView web site has a watchdog feature that monitors the periodic transmissions and alarms sites that have not reported within the expected time window. CorView can be user configured to automatically email alarms, alarm clears and system fault information to the appropriate field personnel.

As an optional feature, the RMU2 can be factory equipped with a measurement data recorder. This feature allows the RMU2 to automatically record the measurements on all active analog channels, the temperature, the AC sensor state, the door switch state, that battery status, and the channel limit alarm status every six hours. The measurements are locally stored in non-volatile memory, allowing the RMU2 to retain the data without power attached. Memory storage options of one year and eight years of measurements are available. Data is extracted using the RMU2/3-PGM configuration interface tool and RMU2 configuration software. The data is then saved to a file on a PC in a common comma separated value format.

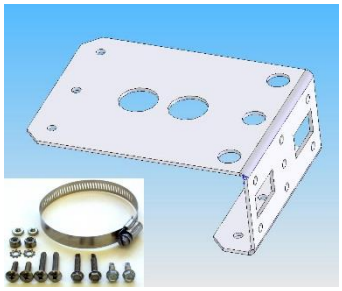
4 Kit Contents

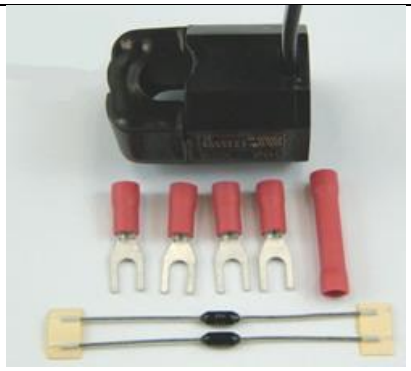
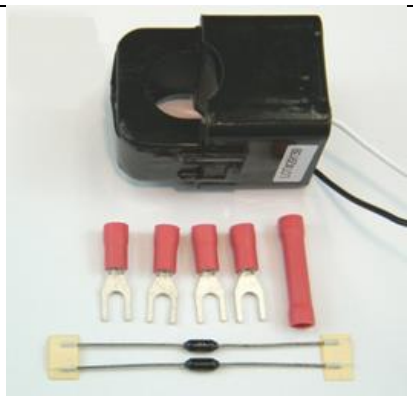
4.1 RMU2-S (Globalstar Satellite) Kit A20A00RMU20 or RMU2-SI (Iridium Satellite) Kit A20A0333201 or RMU2-G (Cellular) Kit A20A00RMU2

	1 pc - RMU2-B Measurement Terminal Block. Installed inside the rectifier enclosure and connects to the RMU2-S. Mobiltex Part Number A15000RMU20
	1 pc - RMU2-S Globalstar Satellite Antenna Transmitter Part Number A15000STX20. OR 1 pc – RMU2-SI Iridium Satellite Antenna Transmitter Part Number A1506033201. OR 1pc – RMU2-G Cellular Antenna Transmitter Part Number A15000GTX20. Externally installed with the dome requiring a clear view of the sky.
	1 pc - Silicone Sealing Gasket. **Remove protective covering (including adhesive) from both sides before use.** Fits between RMU2-S and rectifier lid. Mobiltex Part Number Z04841RMU20
	1 pc – ½" Plastic Male Conduit Fitting. Secures the base of the RMU2-S to the rectifier enclosure. Mobiltex Part Number H355210TA05
	1 pc – RMU2 Interconnection Cable. Length 1 meter (3.2 feet). Interconnects RMU2-B and RMU2-S. Mobiltex Part Number W16400RMU03
	1 pc – AC Line Presence Sense Fused Cable. Length 1 meter (3.2 feet). Fits into bottom cavity of RMU2-B. Mobiltex Part Number A01160RMU20
	1 pc – Magnet For Door Switch Alarm. Used for optional door switch alarm with labelled side of RMU2-B. Mobiltex Part Number H00000MAG01
	1 pc – Field Installable User Label Set. Can be installed on the RMU2-B to indicate electrical connections for selected Measurement Type. Mobiltex Part Number S17600RMU27
	1 kit – RMU2-B Mounting Hardware. 2x #10 1.25" Tek Screws, 2x 10-32 1.25" Screws, 2x #10 Lock Nut. Mobiltex Part Number A20100RMU20

Table 1 RMU2 Kit Contents

4.2 RMU2 Optional Installation Items

 	RMU1/2/3-BT Programmer Kit Mobiltex P/N A20A0333101 Universal programming kit for RMU1, RMU2, and RMU3 devices. Includes RMU1/2/3 base programmer (A1506033101), RMU1ADP (A1506033001), LiIon battery pack, soft case and USB stick with programming software. Capable of Bluetooth communications with a phone/tablet. Can also be used with a PC through the USB connection.
	RBT1 Bluetooth Interface Cable Allows programming of RMU2 using a Bluetooth Smart equipped smart phone or tablet. Mobiltex Part Number A1506032101
	RMU2 Wiring Kit 1 meter (3.2 ft) wiring harness, assorted crimp terminals, cable ties, adhesive tie mounts. The components of this kit are typically used to interconnect the measurement signals from the rectifier, test point or bond to the RMU2-B. Mobiltex Part Number A20103RMU20
	RMU2 Universal Mounting Bracket Aluminium bracket, pipe clamp, and bracket mounting screws. This kit can be used for installations that require the RMU2-S or RMU2-G to be mounted in a configuration other than the top of the rectifier lid or applications using standard ½" NPT electrical fittings. This kit allows mounting on either vertical or horizontal surfaces as well as vertical pipe or pole installations. Mobiltex Part Number A20103RMU21
	Interconnect Cable 1 meter (3.2 ft) long interconnection / extension cable c/w molded waterproof connectors. Mobiltex Part Number W16400RMU03
	Interconnect Cable 3 meter (9.8 ft) long interconnection / extension cable c/w molded waterproof connectors. Mobiltex Part Number W16400RMU01

	Interconnect Cable 8 meter (26.2 ft) long interconnection / extension cable c/w molded waterproof connectors. Mobiltex Part Number W16400RMU02
	External 3:1 Voltage Divider Required for applications that measure greater than 150VDC or 105VAC. Typically used when actual AC line voltage (110/120 or 220/230 VAC) measurement is desired. Mobiltex Part Number A01160RMU21
	4-20mA Transducer Shunt Kit Kit of 4 precision 250 ohm resistors for installations using 4-20mA measurement transducers. Mobiltex Part Number A20003RMU21
	Replacement Battery Pack Kit of 5 AA batteries for maintenance purposes Mobiltex Part Number B02221RMU20
	Lockable RMU2 NEMA 4X enclosure 6.75”W 7.5”H 5.5”D c/w short M8 cable Mobiltex Part Number A03700RMU21
	AC Mitigation Measurement 1 to 40 Amp Current Transformer for RMU2. Max wire size 0.4". Size 1.5x1x.9" Mobiltex Part Number A20A00XFM02
	AC Mitigation Measurement 1 to 60 Amp Current Transformer for RMU2. Max wire size 0.58". Size 1.7x1.2x1.2" Mobiltex Part Number A20A00XFM01

	AC Mitigation Measurement 2 to 80 Amp Current Transformer for RMU2. Max wire size 0.94". Size 2.6x2.0x1.3" Mobiltex Part Number A20A00XFM07
	PRF1 Four channel low-pass analog filter for use with pulse rectifiers Mobiltex Part Number A15000FLTR1
	LCT2A Low Current AC sense transformer 1mA to 50mA. In potted enclosure Mobiltex Part Number A15000LCT02

Table 2 RMU2 Accessories

5 Quick Bench Test

1. For the RMU2-S, locate the RMU2-S (satellite antenna) outdoors with a clear view (120 degrees in all directions is optimum) of the sky and with the curved dome of the device facing upwards towards the sky.

   For the RMU2-G, locate the RMU2-G (cellular antenna) in an area with cellular coverage for the provider associated with the subscriber identity module (SIM) card installed in the device. Devices are normally provided from the factory with the SIM card already installed. Orient the curved dome of the device upward.

2. Connect the 4-pin male cable connector to the RMU2-S/SI/G antenna. Connect the 4-pin female cable connector to the RMU2-B (measurement terminal block). The "Status" LED on the RMU2-B should illuminate within 5 seconds of connecting the two devices. The "Status" LED will flash green (250ms on / 250 ms off) if the AC line sense function is enabled and line AC is not detected. The LED will also flash green, but faster (100ms on / 100 ms off) if an out-of-limits measurement condition is detected. A steady state green LED indicates all measurements are within the predefined limits and that AC sense (if enabled) is present.

   Note: The cable connection should be made only after the antenna has been properly positioned, as the device will transmit a data message to the CorView host within a few seconds of the two devices being connected. If you wish to send an actual voltage measurement you can connect a DC voltage source (typically a battery) to "CH1".

3. The CorTalk host is accessed using a web browser at https://corview.cortalk.com. Enter the User Name and Password that were provided to you when your CorView account was setup.

4. Upon successful login to CorView you will be presented with an "All Readings" screen that will display the readings for all your RMU device(s). You should see a status of "New Unit" or "Power Up" along with the readings from the device that you just connected.

   Note that transmissions from field devices typically require from <1 minute (good antenna view of the sky) to 30 minutes (poor antenna view of the sky) to arrive at CorView. The displayed measurement screen on CorView will refresh automatically every 5 minutes. If you wish to see more immediate readings, simply press on one of the "All Readings", "Rectifiers", "Bond Points" or "Test Points" buttons.

   CorView can be configured to automatically send emails containing the measurement readings to an individual or group of email users. Because these emails are short and wireless-friendly, many clients send the readings directly to their field installer's wireless email device(s) for near immediate end-to-end operation confirmation and verification of measurement values.

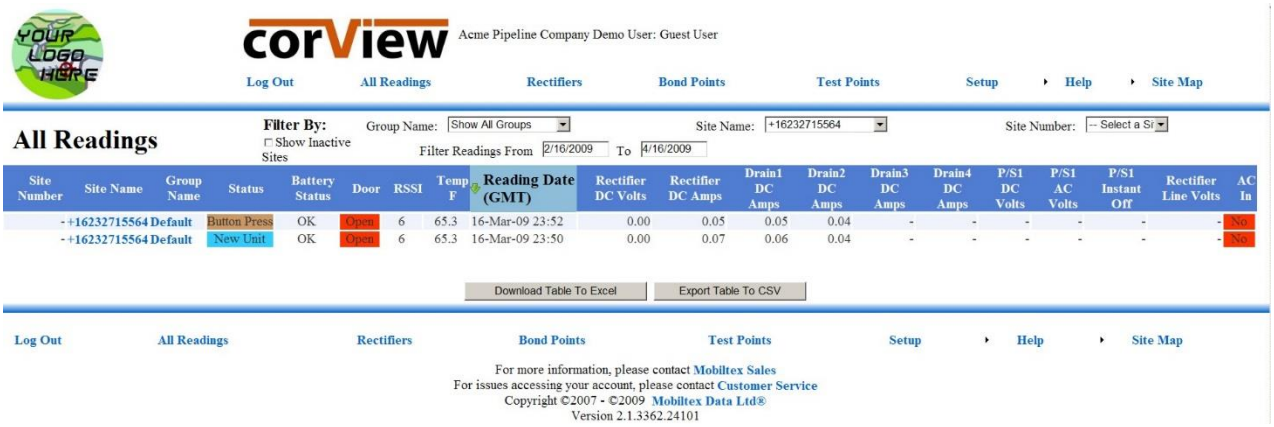


Figure 2 CorView All Readings Page

5. Pressing the "Test" button on the RMU2-B measurement terminal block will force an immediate analog measurement and data transmission. The green LED Status indicator will illuminate for 8 – 15 seconds for the RMU2-S and 30 – 40 seconds for the RMU2-G while the device is taking the measurements and transmitting data.

6. After the device has transmitted the measurements, CorView should display a new status of "Button Press" along with the associated analog readings for the device.

7. When the bench test is completed, simply disconnect the cable that interconnects the two devices. This action forces the RMU2 devices to power down.

6 Installation

Warning: Only properly qualified personnel should work on installation of this equipment. Company and industry safety procedures must be followed.

Disconnect rectifier AC line power (with proper breaker safety lockouts) before starting the installation.

Installation consists of four steps: transmitter installation, base installation, wiring, and device configuration.

6.1 Transmitter Installation

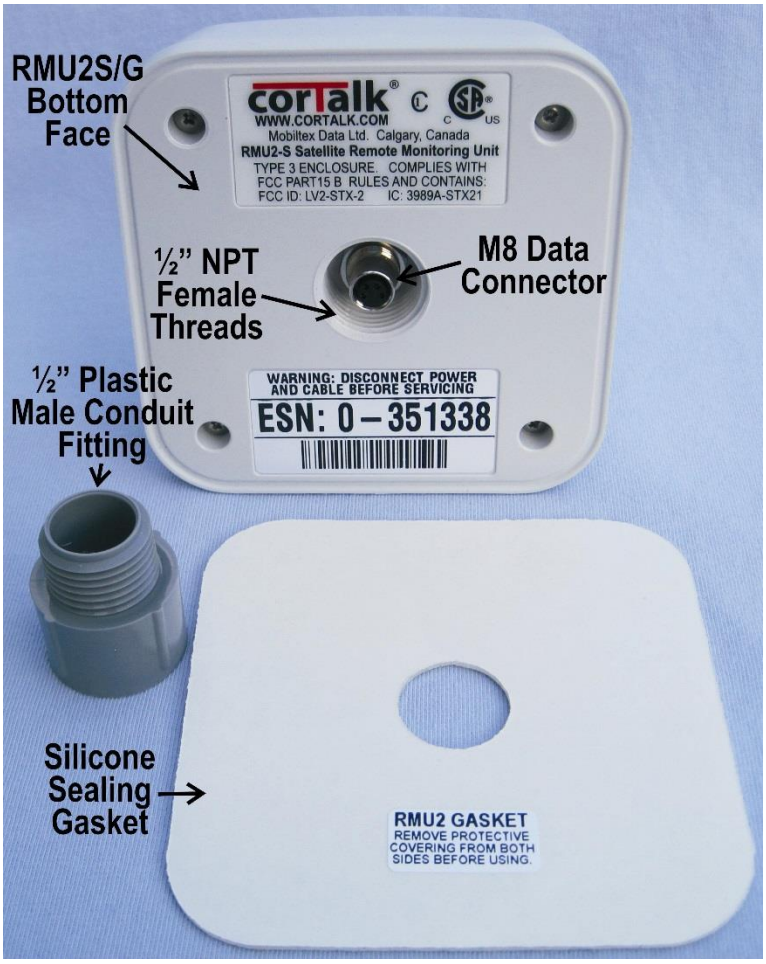


Figure 3 RMU2S/G Installation Hardware

The RMU2-S or RMU2-G transmitter 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.

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 RMU2-S/SI/G 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 RMU2-S/SI/G transmitter 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 RMU2-S/SI/G. 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 RMU2 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 RMU2 transmitter has the domed portion pointing straight up into the sky. The RMU2-S/SI transmitter should always have as much view of the entire sky as possible for best satellite coverage. The following pictures illustrate various mounting schemes for the RMU2-S/SI/G. Appendix B contains a global coverage map for the RMU2-S Globalstar Simplex satellite service. Installation of the RMU2-S should be within the orange or yellow areas indicated on the map. The RMU2-SI has complete global coverage with Iridium SBD satellite service.



Figure 4 RMU2-S/SI/G 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.

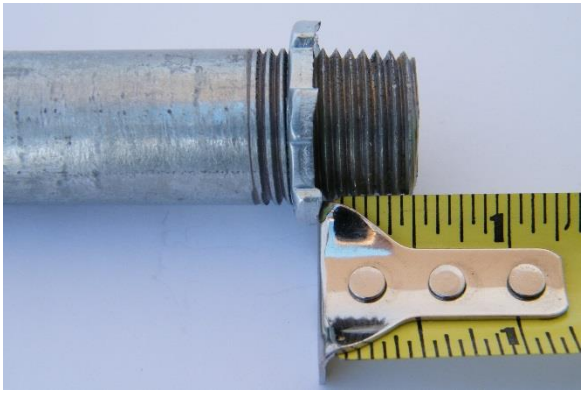


Figure 5 RMU2S/G Conduit Nut Spacing



Figure 6 RMU2S/G 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.

6.2 Base Unit Installation

The RMU2-B base unit is environmentally sealed, but it must be mounted in an enclosure (e.g. rectifier cabinet) to satisfy electrical safety requirements. The RMU2-B can be installed on any flat surface using the supplied hardware. When choosing the installation location, consideration must be made if the door switch feature of the RMU2 is used—refer to section 6.2.2. Also, the top "Test" button on the RMU2-B should be user accessible. If the non-contact AC presence sensor is to be used, it should be installed prior to mounting the RMU2-B—refer to section 6.2.1. The RMU2-B should be separated from strong magnetic sources (i.e. rectifier transformer) by a minimum of 4 inches (106mm).

If the supplied bolts and nuts are used, a pair of 13/64" (0.2", 5.08mm) holes with 3.25" between centers must be drilled in the installation surface to match the two mounting holes in the RMU2-B. Pass the bolts through the RMU2-B mounting holes and apply the nuts from below the mounting surface.

If mounting to a thin sheet metal or wooden surface, the supplied self-drilling #10 Tek screws may be used to attach the unit without pre-drilling.

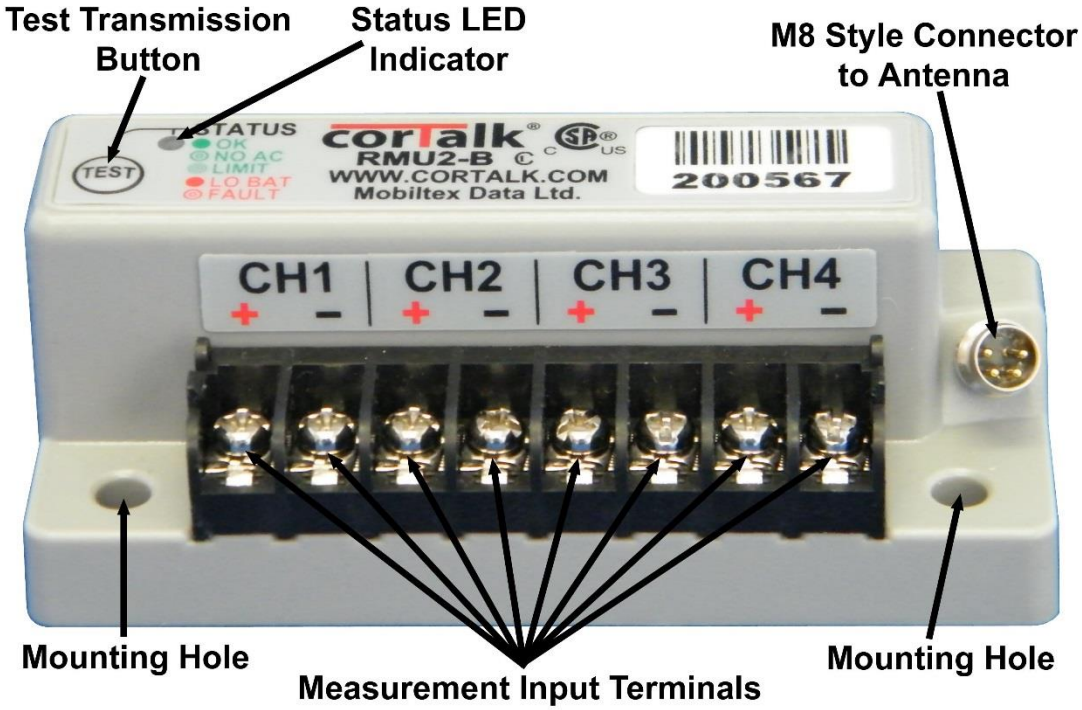


Figure 7 RMU2-B Base Unit Features



Figure 8 RMU2-B Installation Hardware

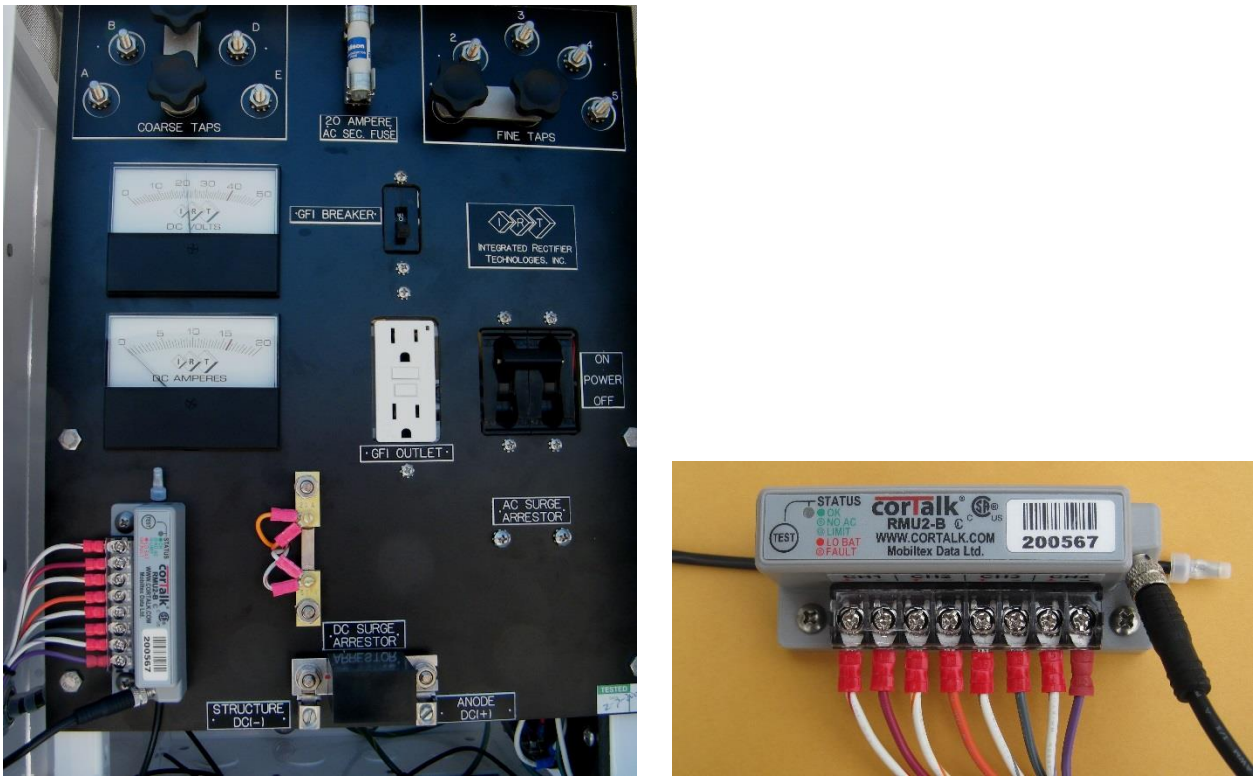


Figure 9 RMU2-B Installation Examples

6.2.1 Non-contact AC Presence Sensor

The RMU2 contains a 50Hz/60Hz AC field sensor which can be used to detect the presence of AC line voltage. To utilize this feature, a fused cable assembly is wired to the hot AC line terminal, usually after the main utility breaker, in the rectifier. For multi-phase power installations, connection is only required to one of the AC input lines.

The capped end of the wire is passed under the RMU2-B unit in the molded groove. Figure 10 shows how the wire should look after it is installed in the RMU2-B groove. The wire must be installed prior to the RMU2-B being attached to its final mounting surface.

Installation of the AC presence sense wire is optional. The RMU2 will operate without it installed. If it is not installed, the RMU2 software should be configured to not report AC presence. For proper operation, the closed termination end of this cable assembly must remain open circuited and electrically insulated.



Figure 10 Non-contact AC Presence Sensor

6.2.2 Door Switch

The RMU2 contains an internal magnetically activated switch that can be used to report rectifier cabinet door openings. Supplied with the RMU2 is a magnet with a self-adhesive mounting pad and mounting screws. The magnet must be mounted such that it aligns with the white area on the left side of the RMU2-B labelled "DOOR SWITCH SENSOR AREA". See Figure 11. When the door is closed, the magnet should not be separated by more than 0.15" (3.81mm) from the sensor area. If the non-contact AC presence sensor is used in conjunction with the magnetic door switch sensor, ensure that the AC sense wire is bent sharply, looped around the RMU2, and secured with a cable tie (see Figure 12) to give enough clearance for installation of the door switch magnet.

If using only the self-adhesive pad on the magnet for attachment, ensure that the surface being attached to is clean—dirt and oil free. For wooden surfaces, the provided screws may also be used for attachment.

Additional custom brackets, spacers, or bolts/nuts may be needed depending on the rectifier construction. It will be up to the installer to determine and source the additional parts.

Installation of the door switch magnet is optional. The RMU2 will operate without it installed. If it is not installed, the RMU2 software should be configured to not report door switch state.



Figure 11 Door Switch Magnet Installation

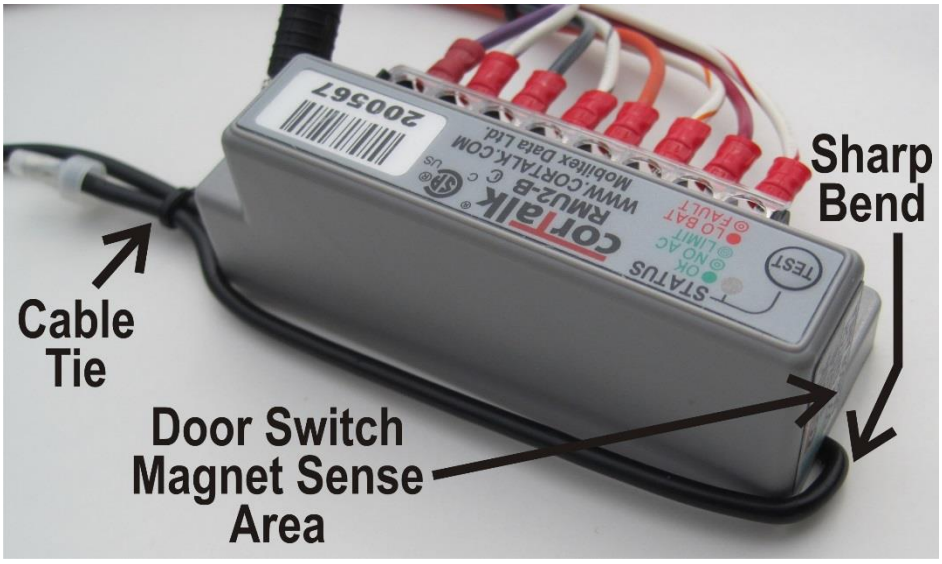


Figure 12 AC Sense Wire Installation for Simultaneous Door Switch Installation

6.2.3 Measurement Type Wiring

The RMU2 can be wired in several different pre-defined configurations for rectifier, test point, and bond monitoring. Table 3 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 measurement points (Slots) that are transmitted to the CorView server.

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. Also note that the RMU2 measurement inputs must not be directly connected to mains.

RMU2 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
RECT15	**Rect Volts & Rect Amps & AC Line Amps & AC Line Volts**	DC Volts 1 - Rect V	DC Amps 2 - Total	AC Amps 3 - Line	AC Volts 4 - Line

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	AC 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
16	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.
AC Line Current	14 VAC	Requires external current transformer with internal protection
TEG DC Volts In	119 VDC	
AC Mitigation Current	14 VAC	Requires External Current Transformer with internal protection

Table 3 Measurement Types

6.2.3.1 Rectifier Measurement Type Diagrams

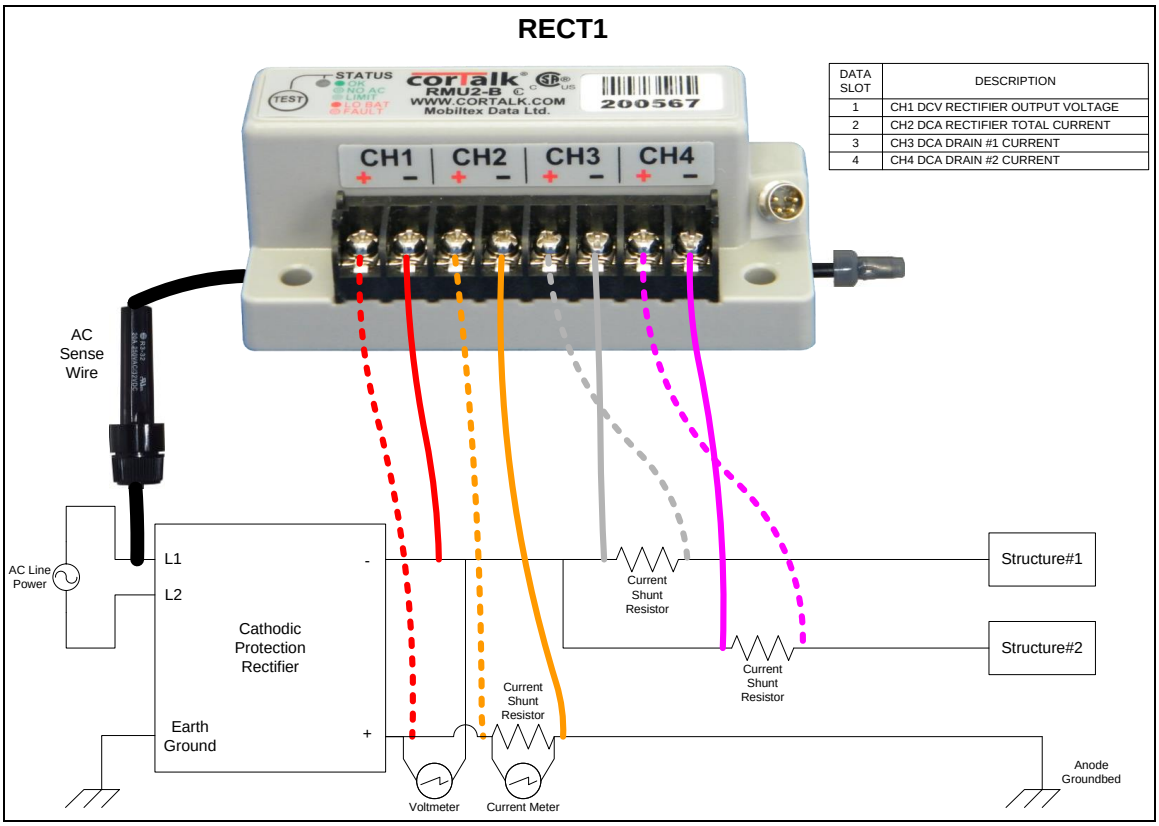


Figure 13 RECT1 Rectifier – Output Volts, Total Amps, and 2 Drains

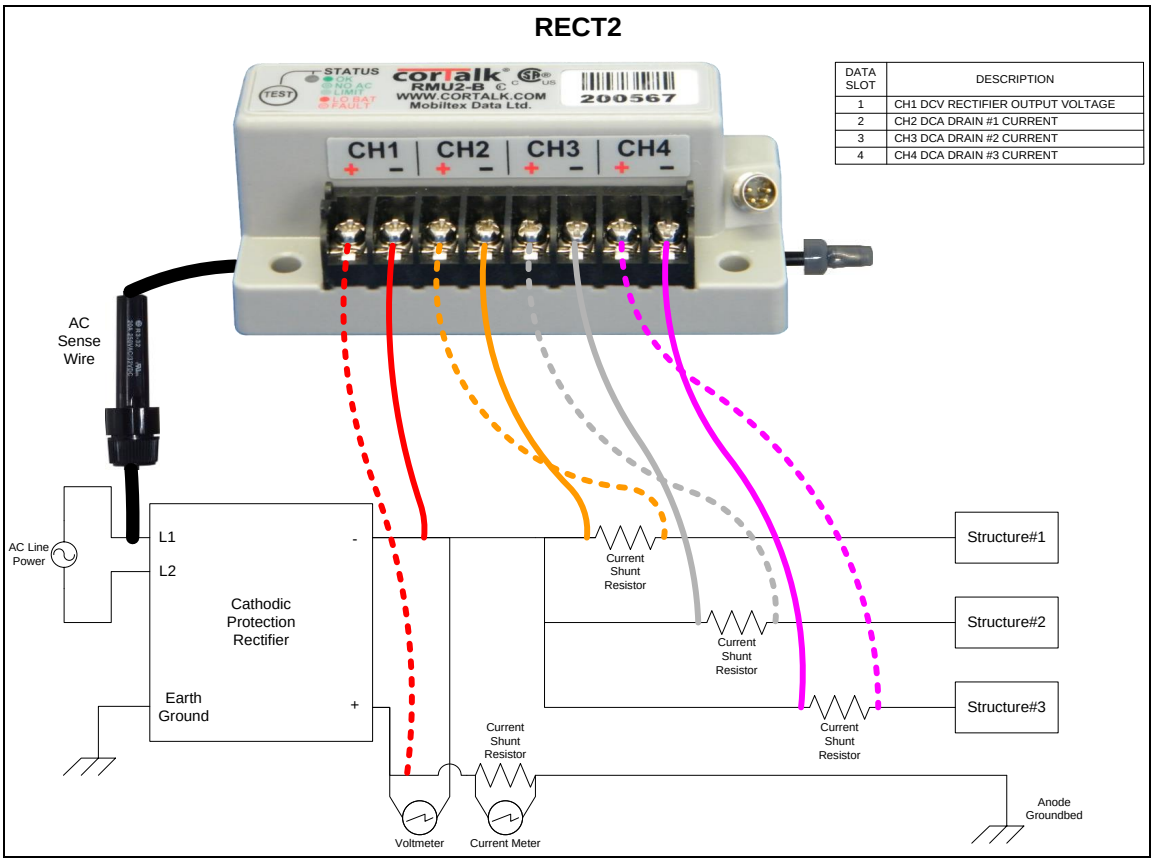


Figure 14 RECT2 Rectifier – Output Volts and 3 Drains

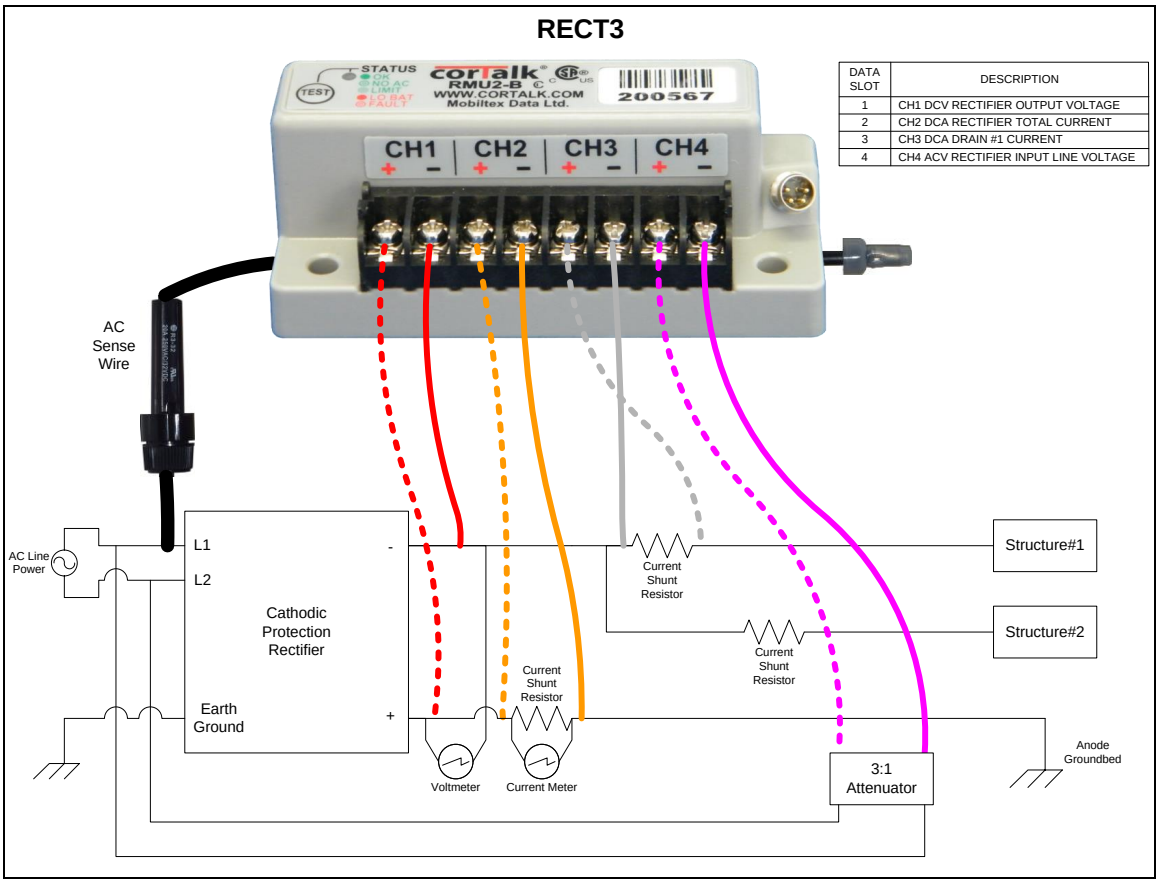


Figure 15 RECT3 Rectifier – Output Volts, Total Amps, Drain, and Input AC Volts

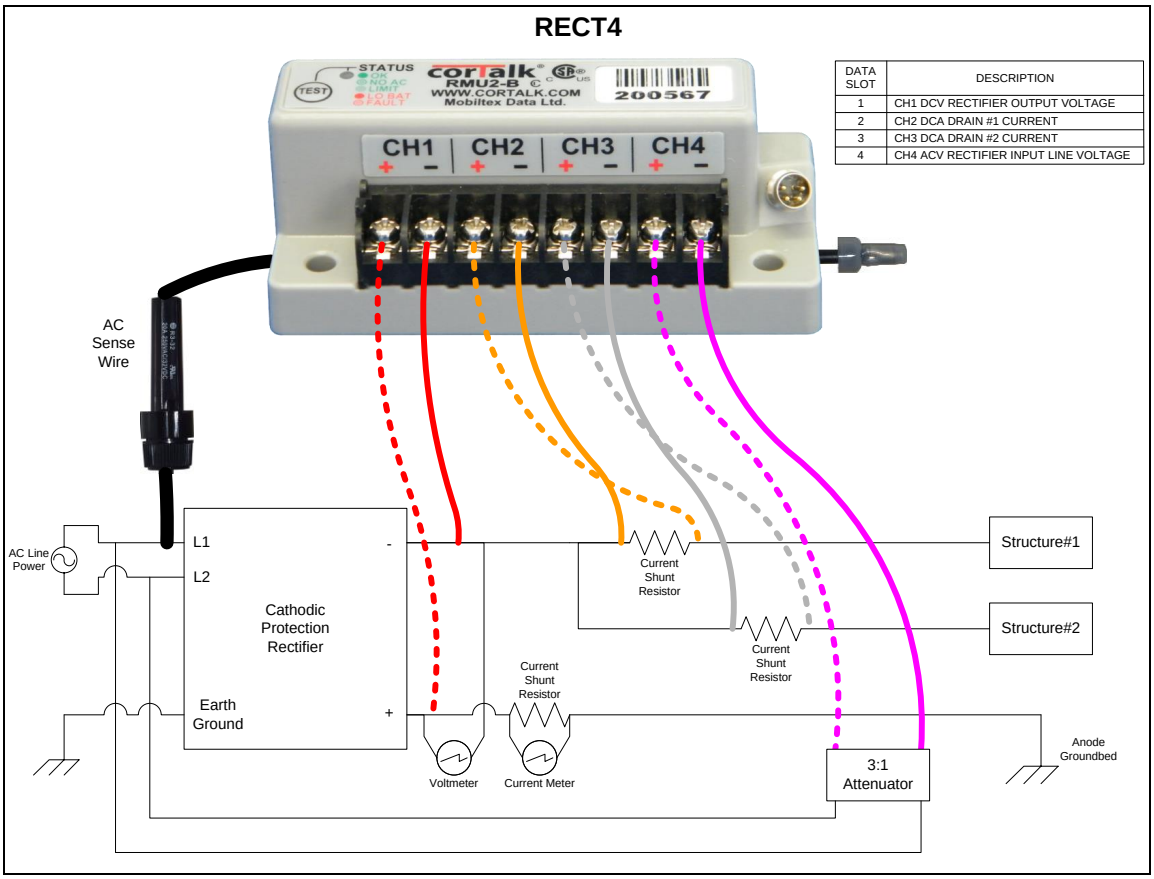


Figure 16 RECT4 Rectifier - Output Volts, 2 Drains, and Input AC Volts

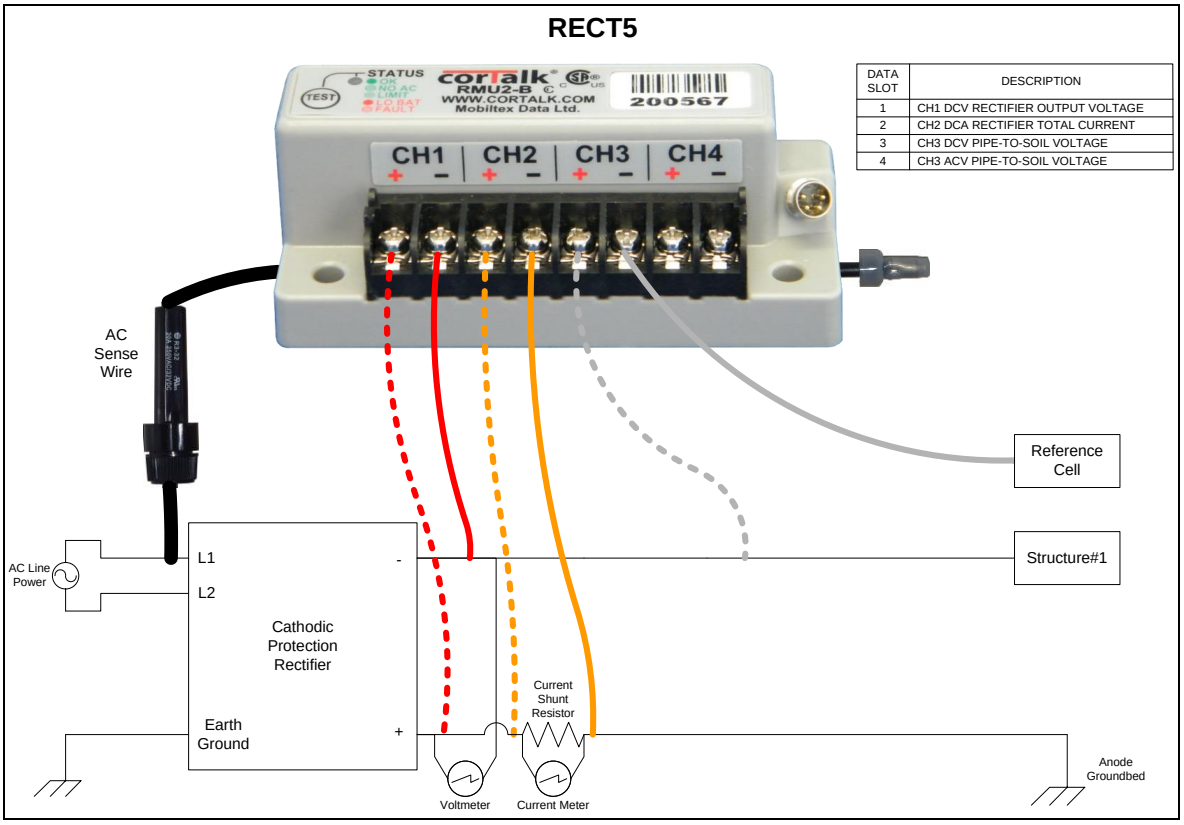


Figure 17 RECT5 Rectifier – Output Volts, Total Current, and Pipe-To-Soil AC/DC

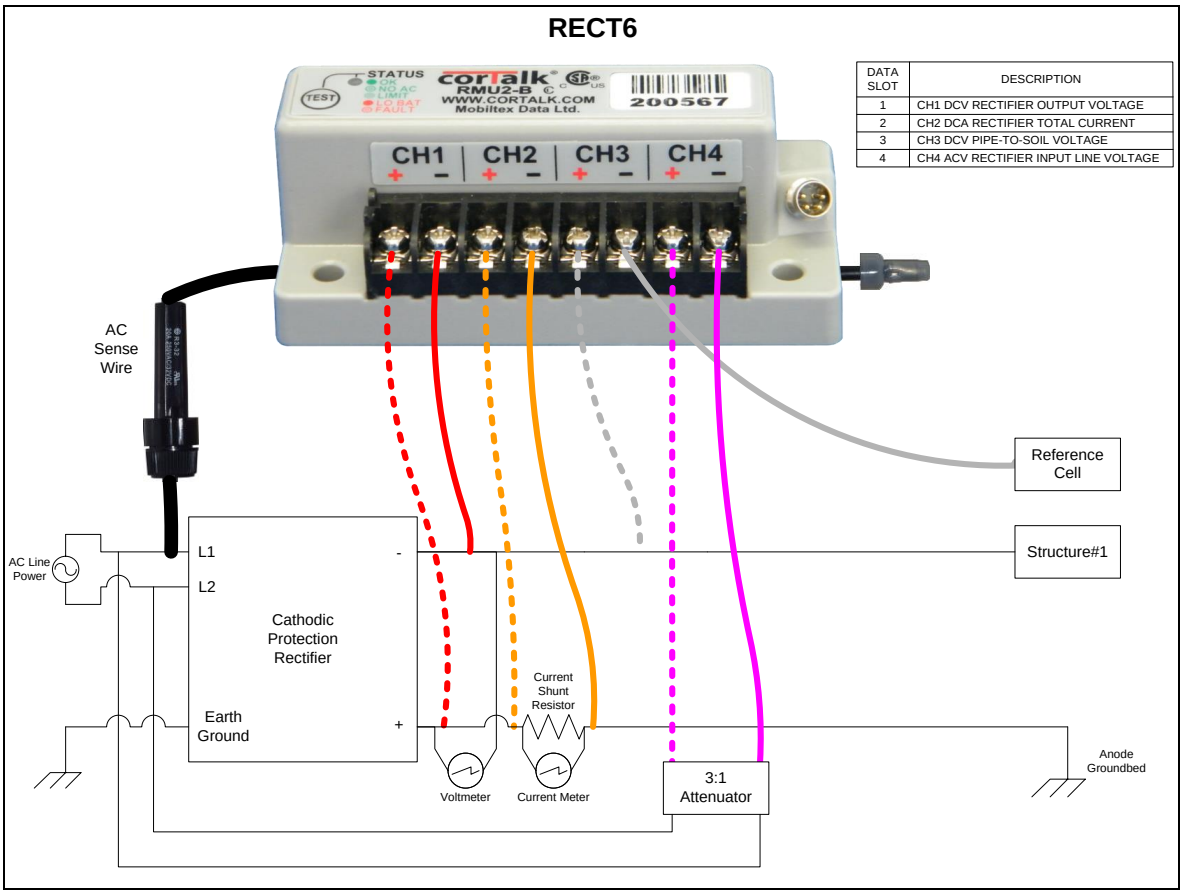


Figure 18 RECT6 Rectifier – Output Volts, Total Current, Pipe-To-Soil and Input AC Volts

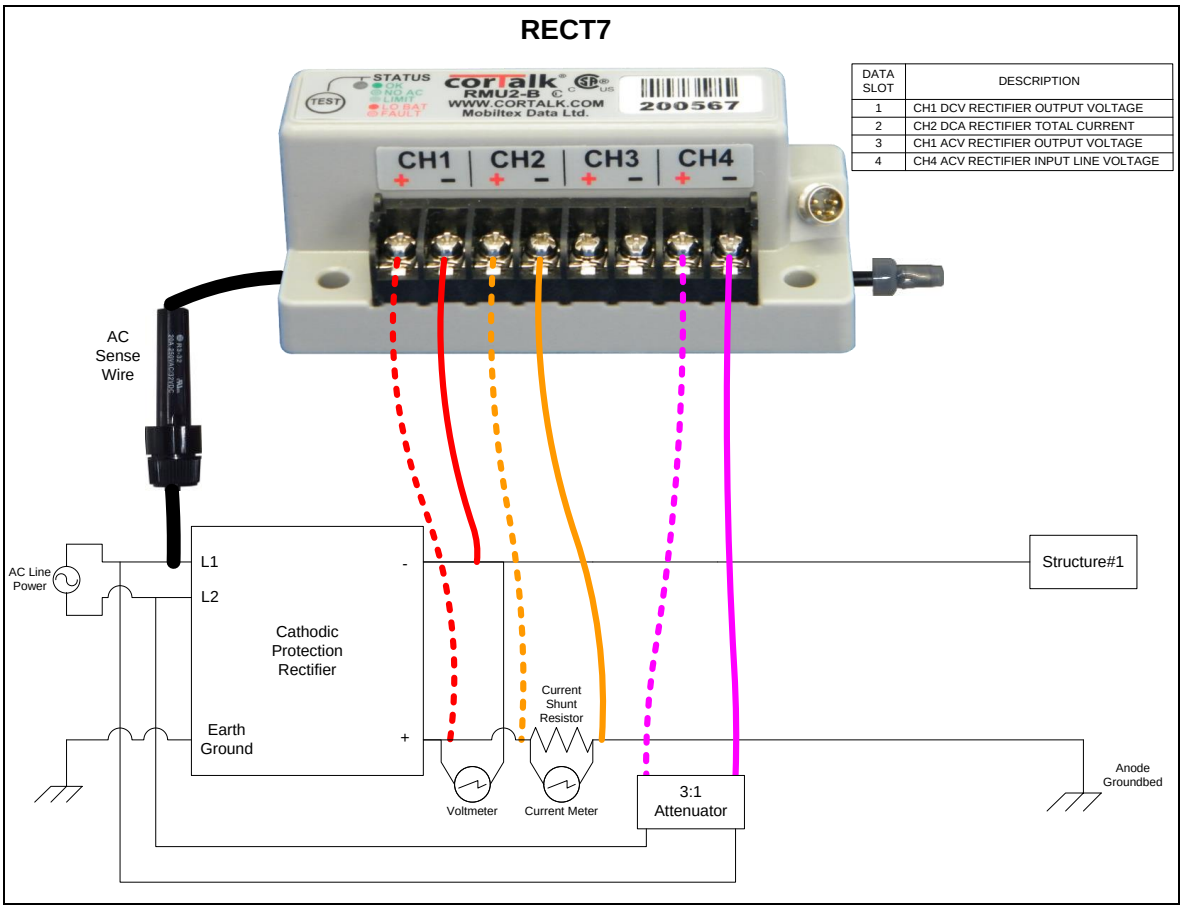


Figure 19 RECT7 Rectifier – Output Volts AC/DC, Total Current, and Input AC Volts

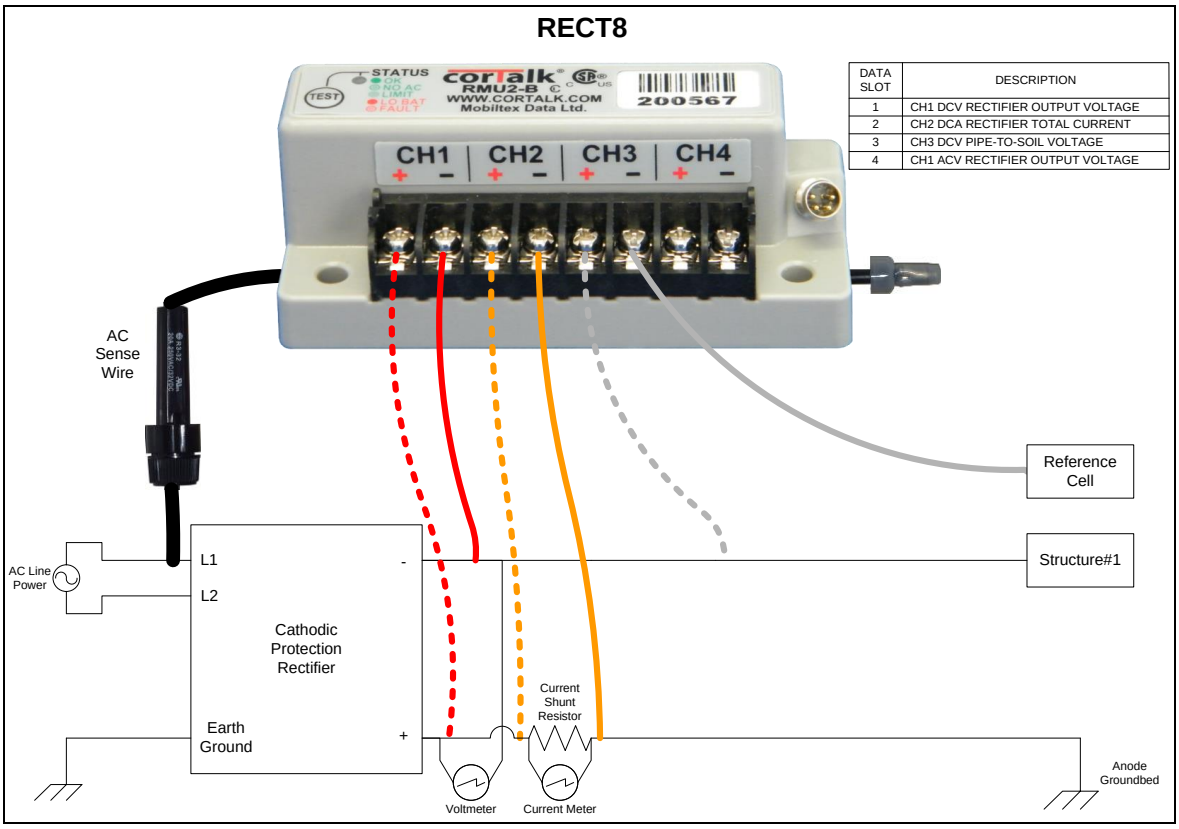


Figure 20 RECT8 Rectifier – Output Volts AC/DC, Total Current, and Pipe-To-Soil

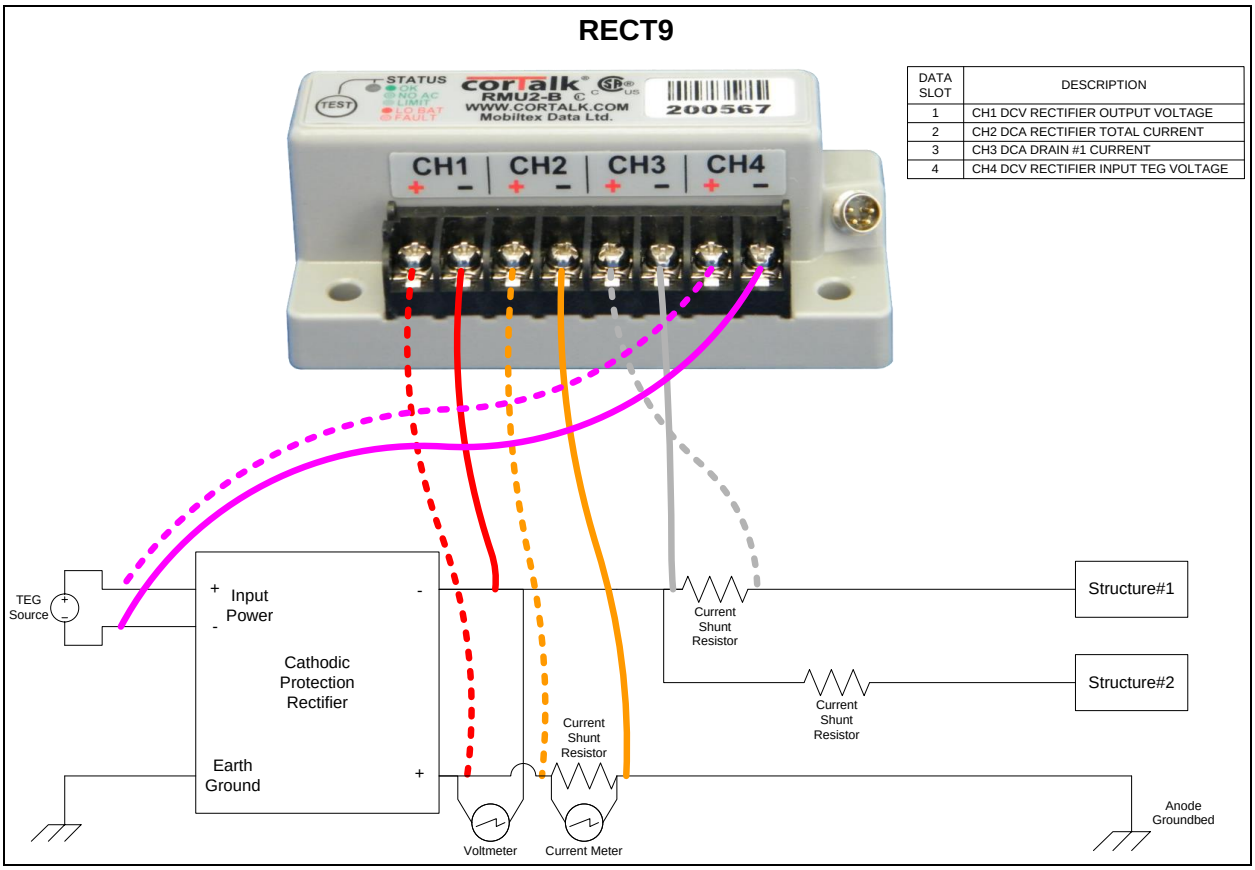


Figure 21 RECT9 TEG or Solar – Output Volts, Total Current, Drain, and Input DC Volts

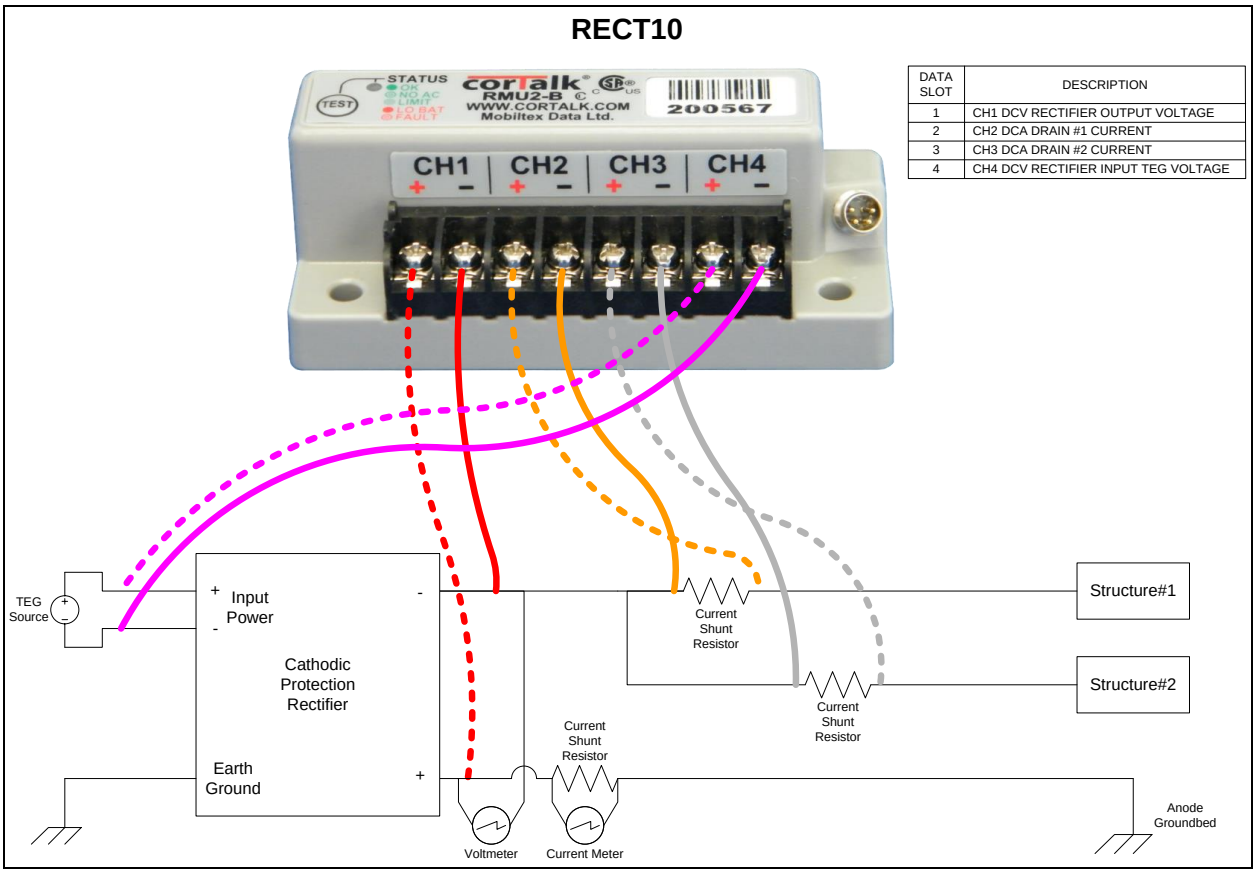


Figure 22 RECT10 TEG or Solar – Output Volts, 2 Drains, and Input DC Volts

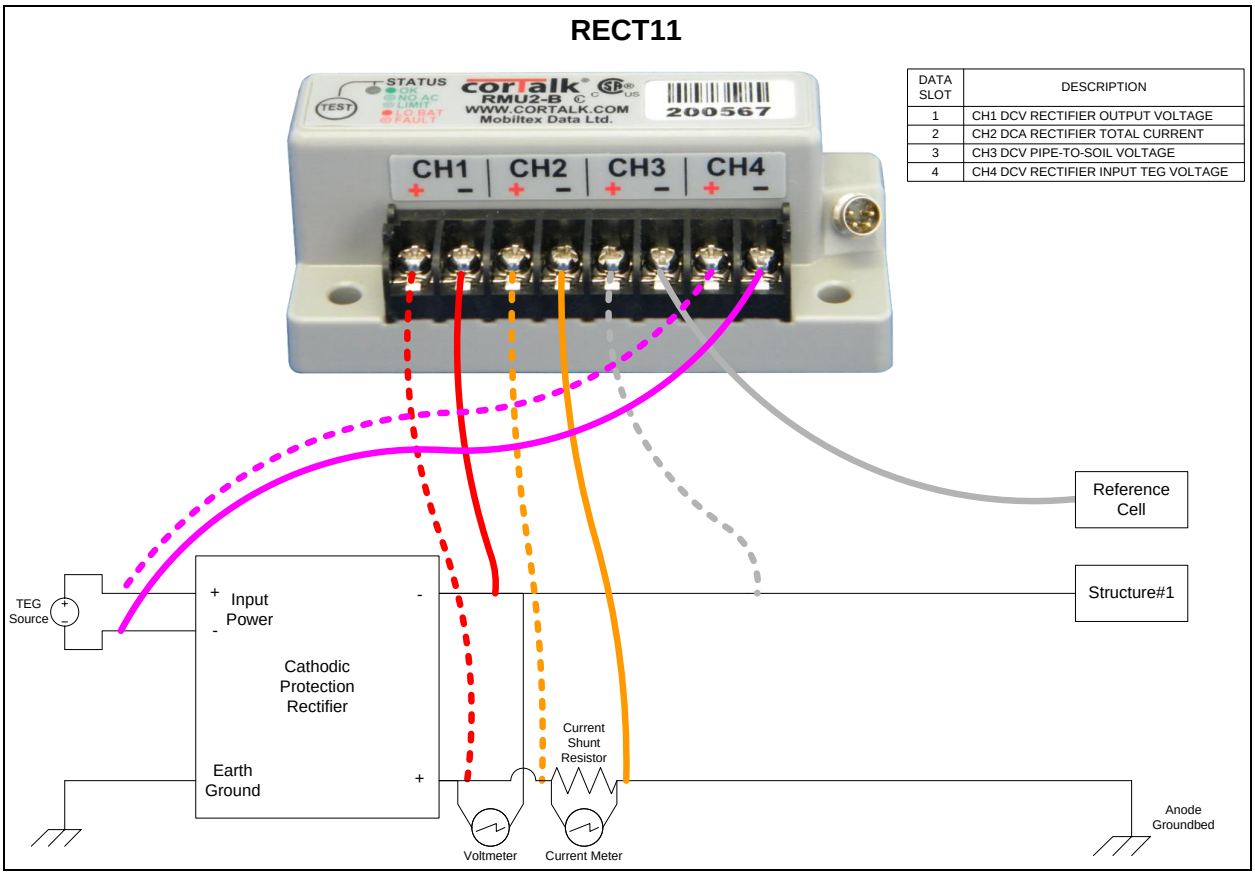


Figure 23 RECT11 TEG or Solar – Output Volts, Total Current, Pipe-To-Soil, and Input DC Volt

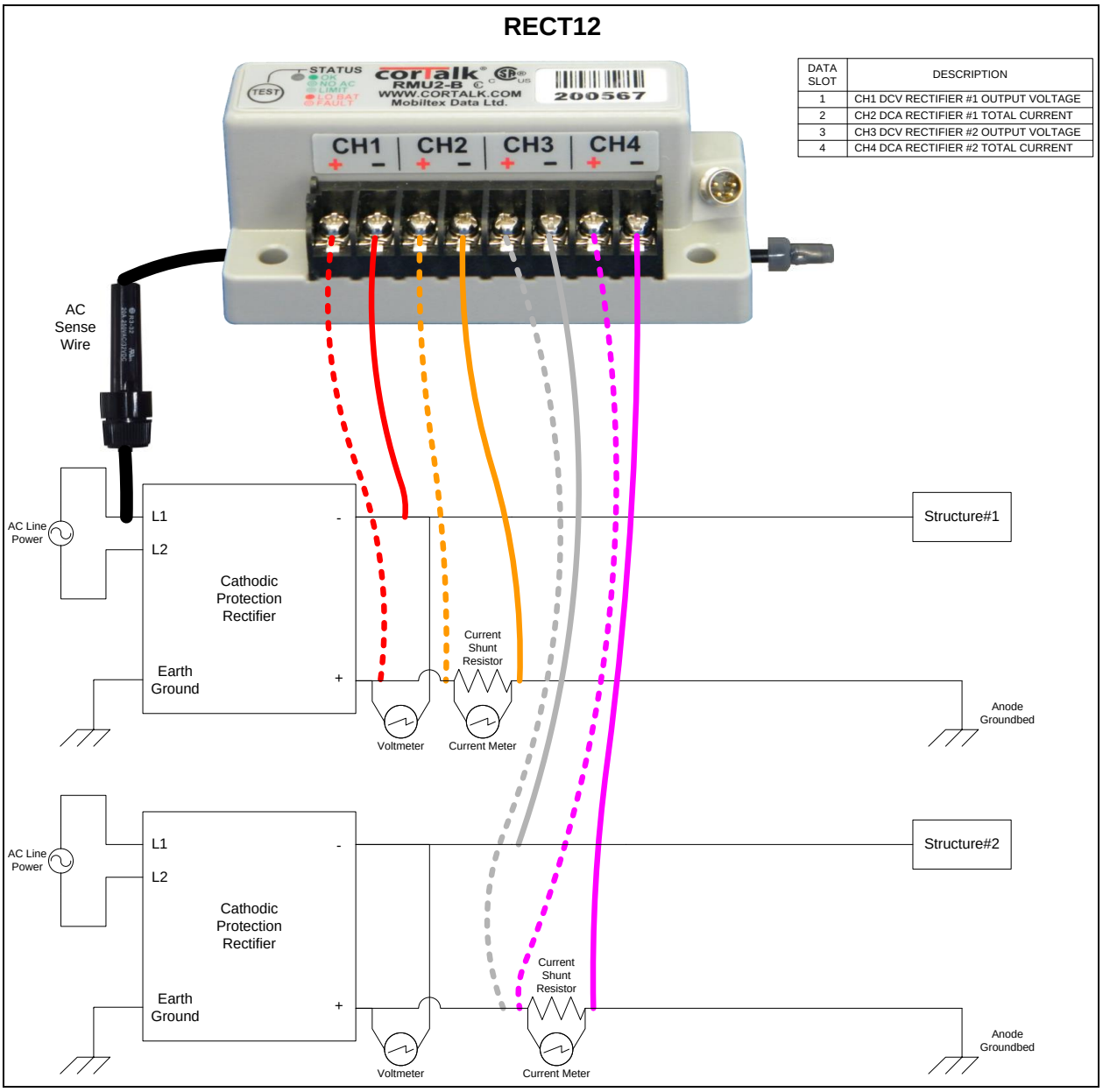


Figure 24 RECT12 Two Co-located Rectifiers – Rect #1/2 Output Volts, and Rect #1/2 Current

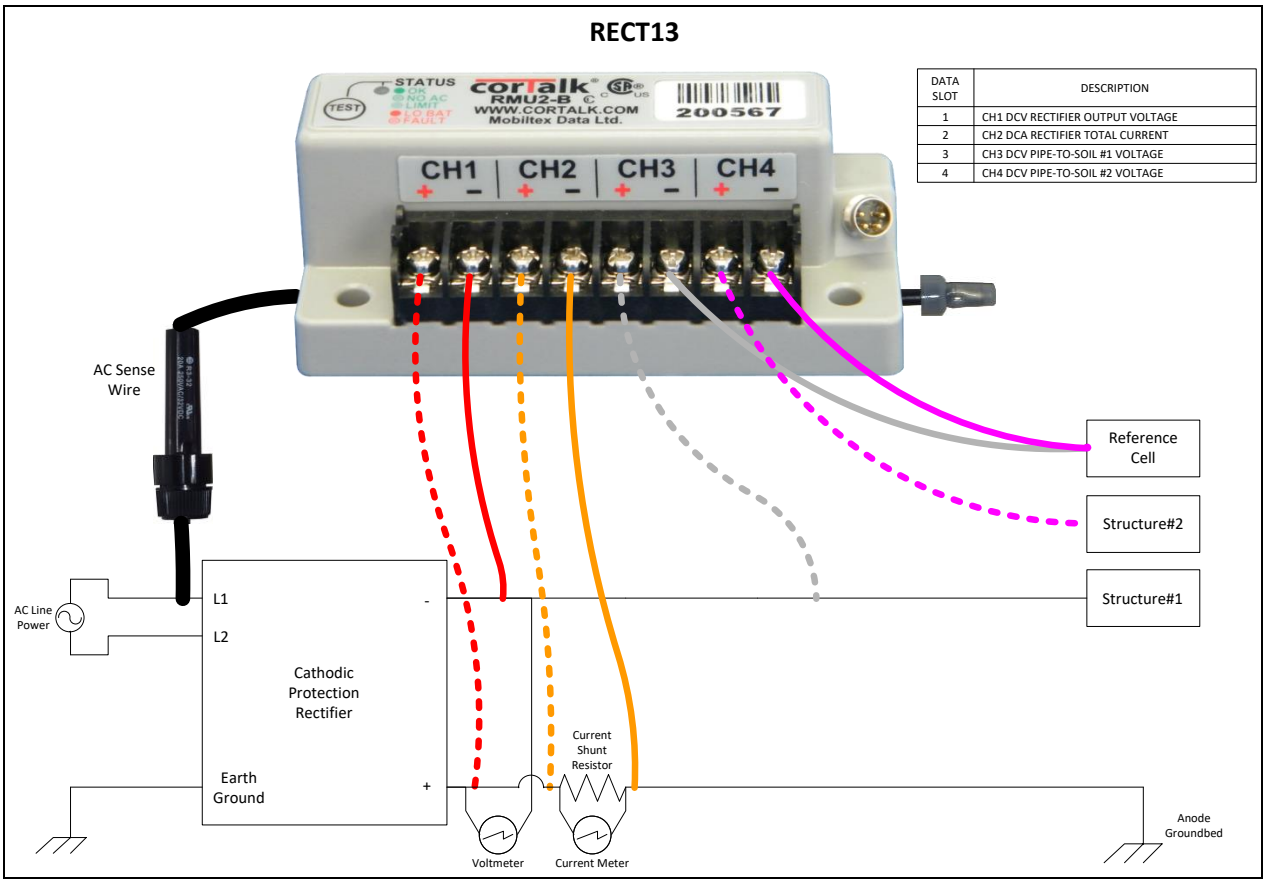


Figure 25 RECT13 Rectifier – Output Volts, Total Current, and 2 Pipe-To-Soil DC

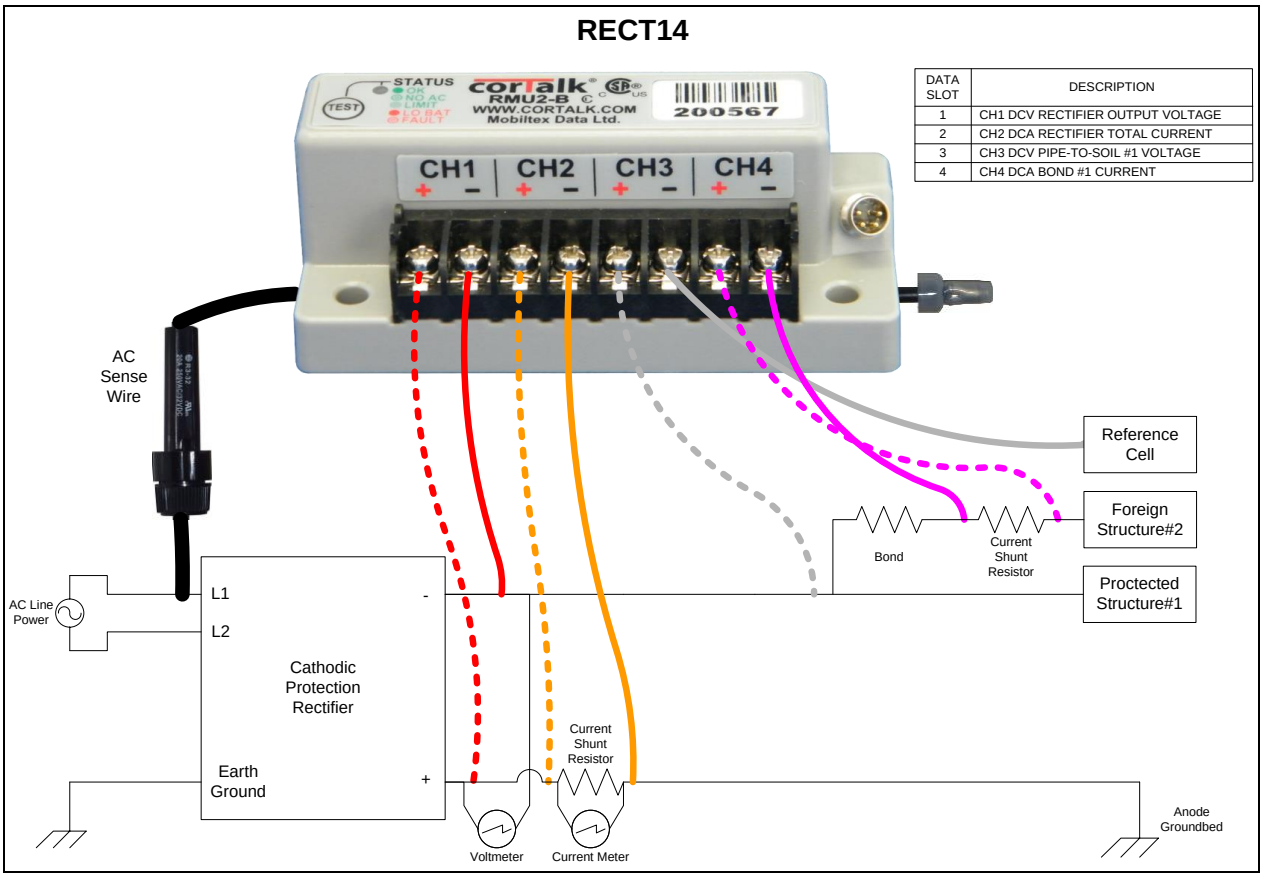


Figure 26 RECT14 Rectifier – Output Volts, Total Current, 1 Pipe-To-Soil DC, and 1 Bond Current DC

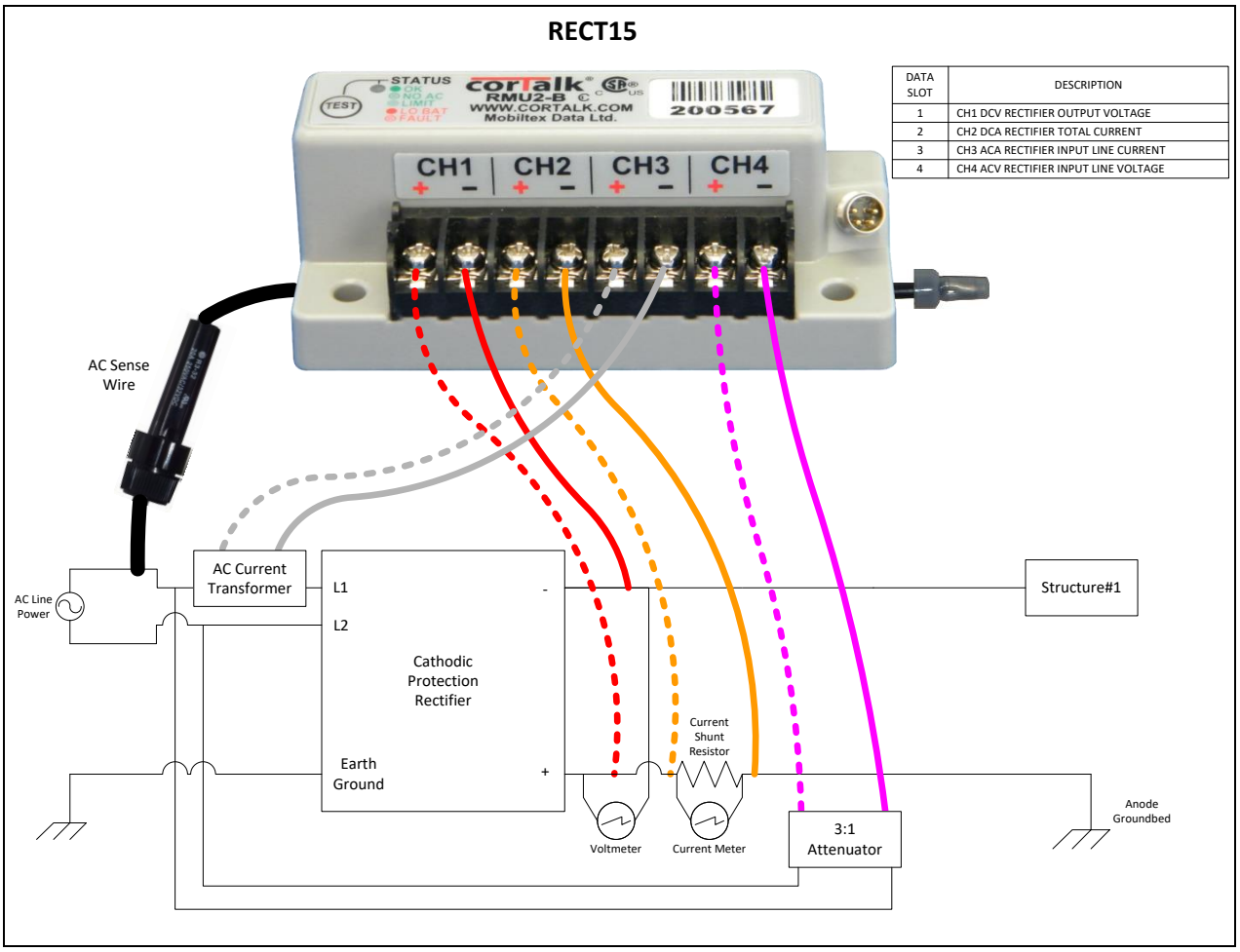
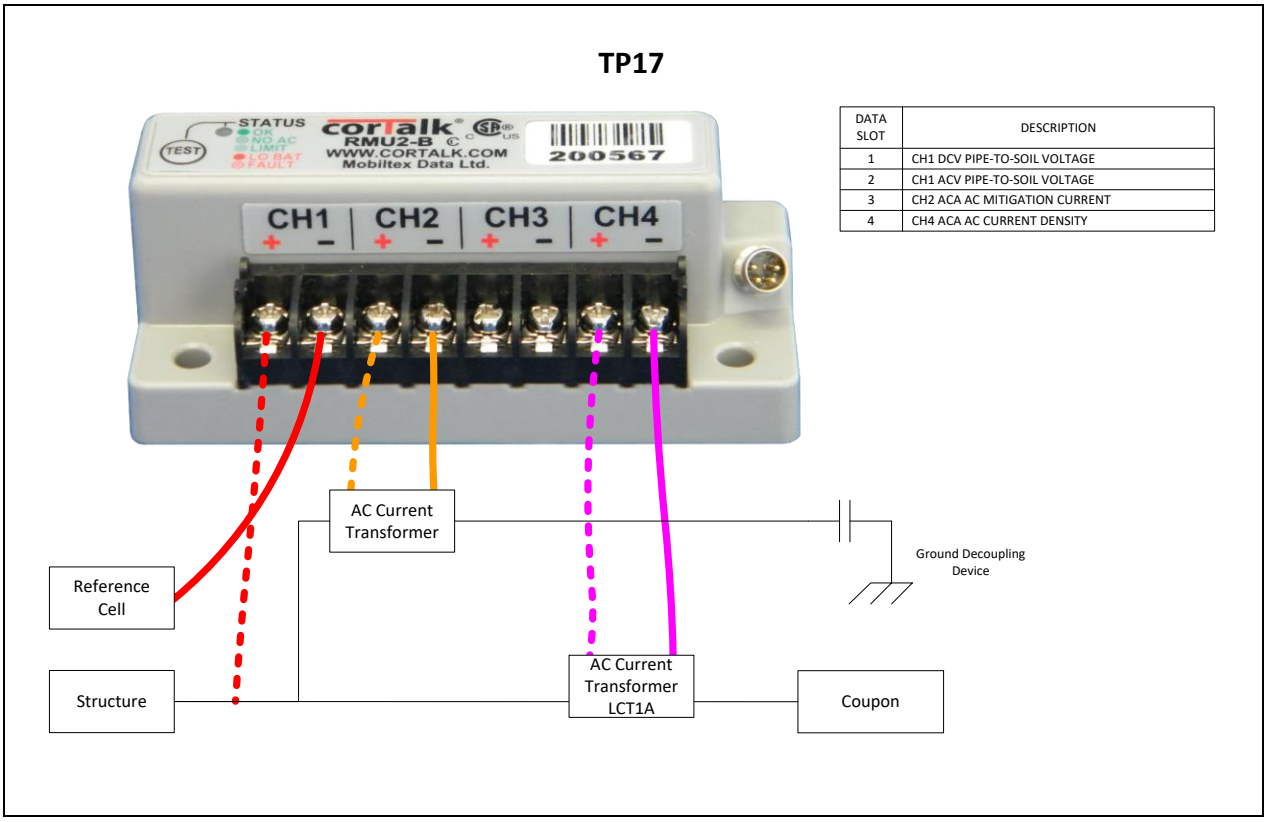


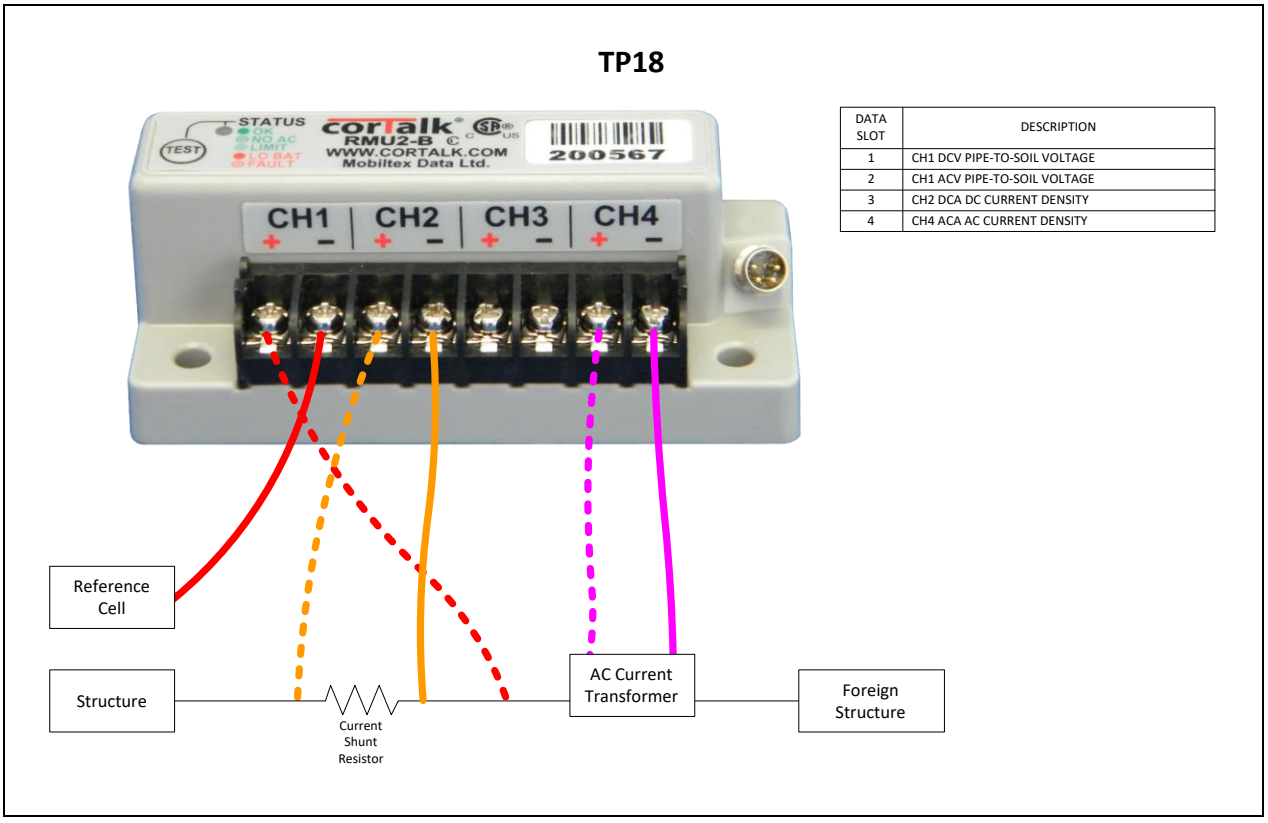
Figure 27 RECT15 Rectifier – Output Volts, Total Current, Input AC Amps and Input AC Volts (V25+)

6.2.3.2 Test Point Measurement Type Diagram



DATA SLOT	DESCRIPTION
1	CH1 DCV PIPE-TO-SOIL VOLTAGE
2	CH1 ACV PIPE-TO-SOIL VOLTAGE
3	CH2 ACA AC MITIGATION CURRENT
4	CH4 ACA AC CURRENT DENSITY

Figure 28 TP17 Testpoint – Pipe-To-Soil DC/AC, AC Mitigation Current, and AC Current Density



DATA SLOT	DESCRIPTION
1	CH1 DCV PIPE-TO-SOIL VOLTAGE
2	CH1 ACV PIPE-TO-SOIL VOLTAGE
3	CH2 DCA DC CURRENT DENSITY
4	CH4 ACA AC CURRENT DENSITY

Figure 29 TP18 Testpoint – Pipe-To-Soil DC/AC, DC Current Density, and AC Current Density

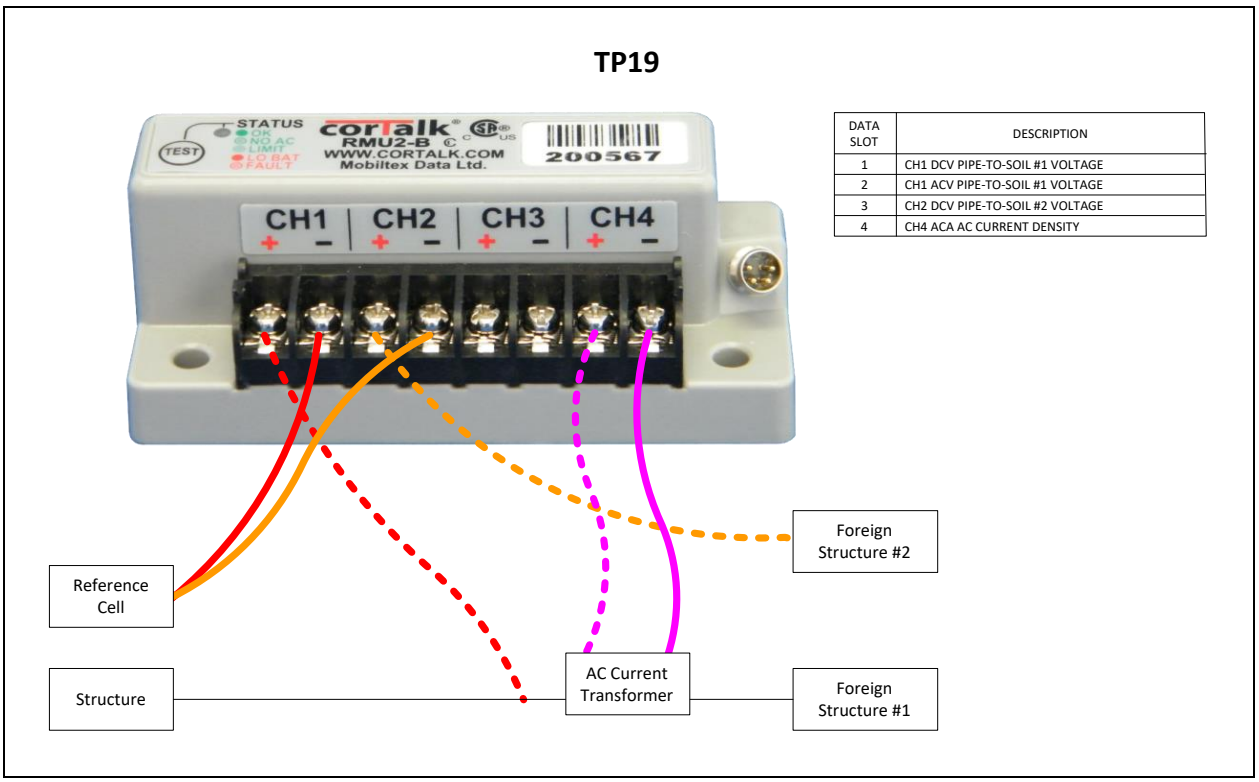


Figure 30 TP19 Testpoint – Pipe-To-Soil 1 DC/AC, Pipe-To-Soil 2 DC, and AC Current Density

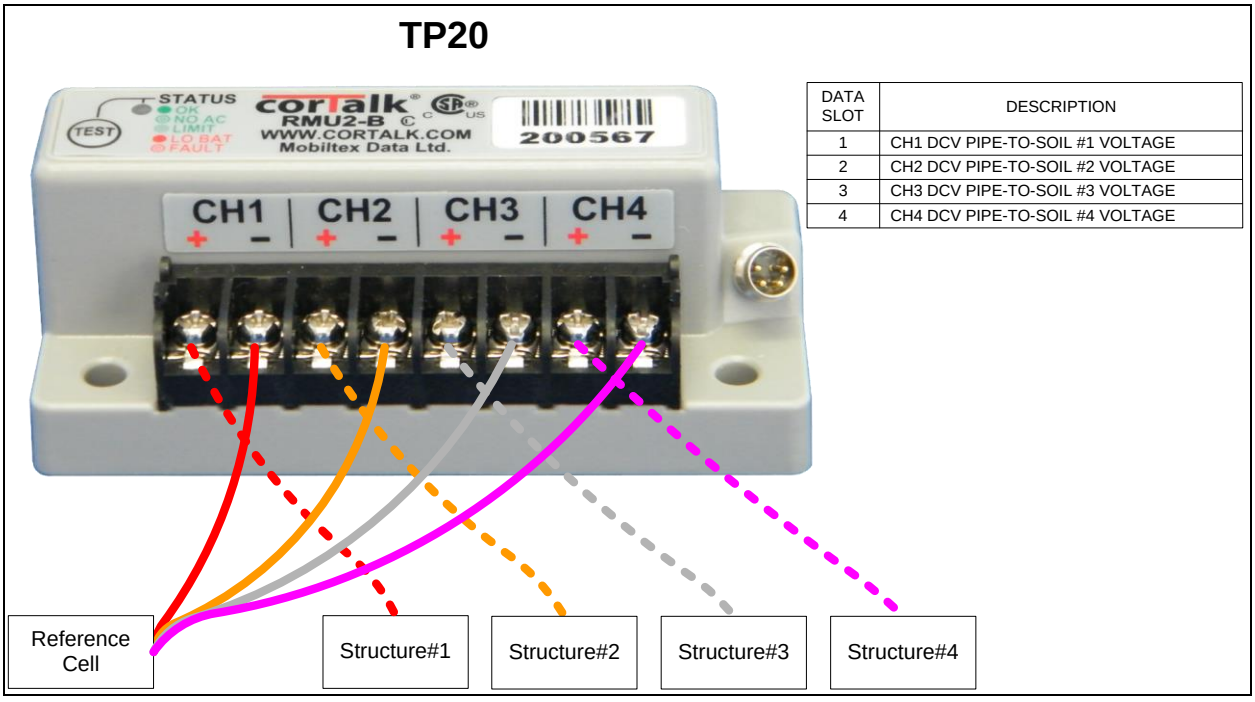
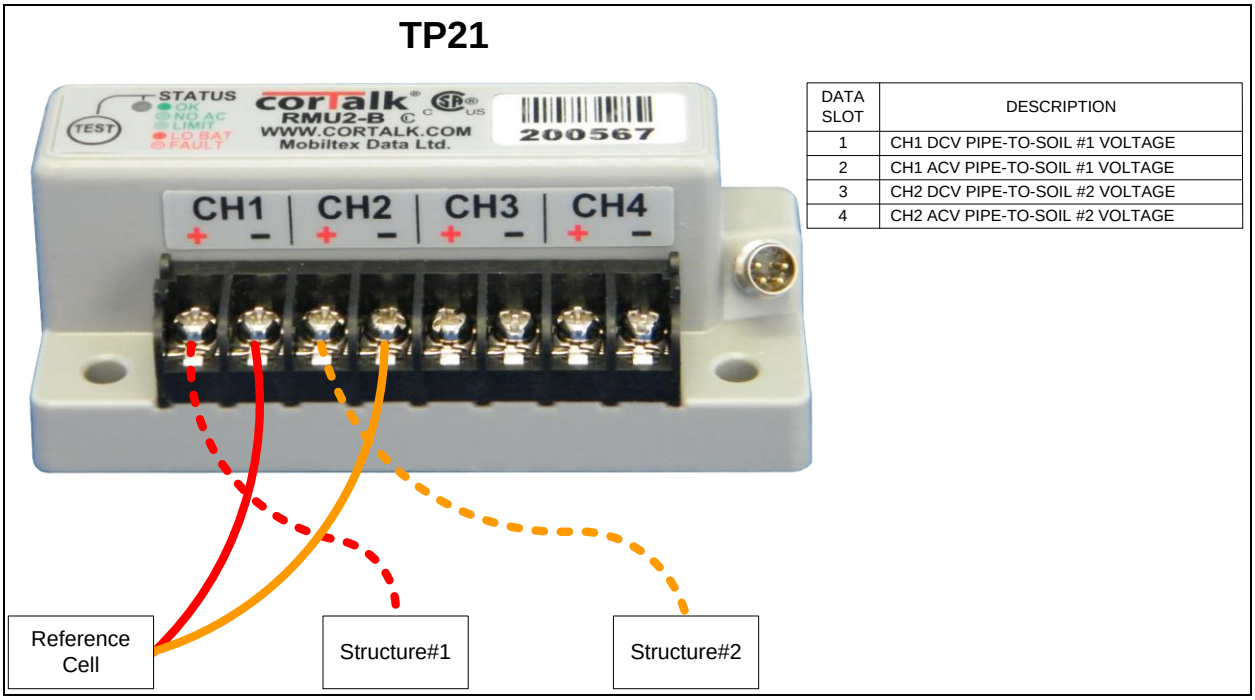


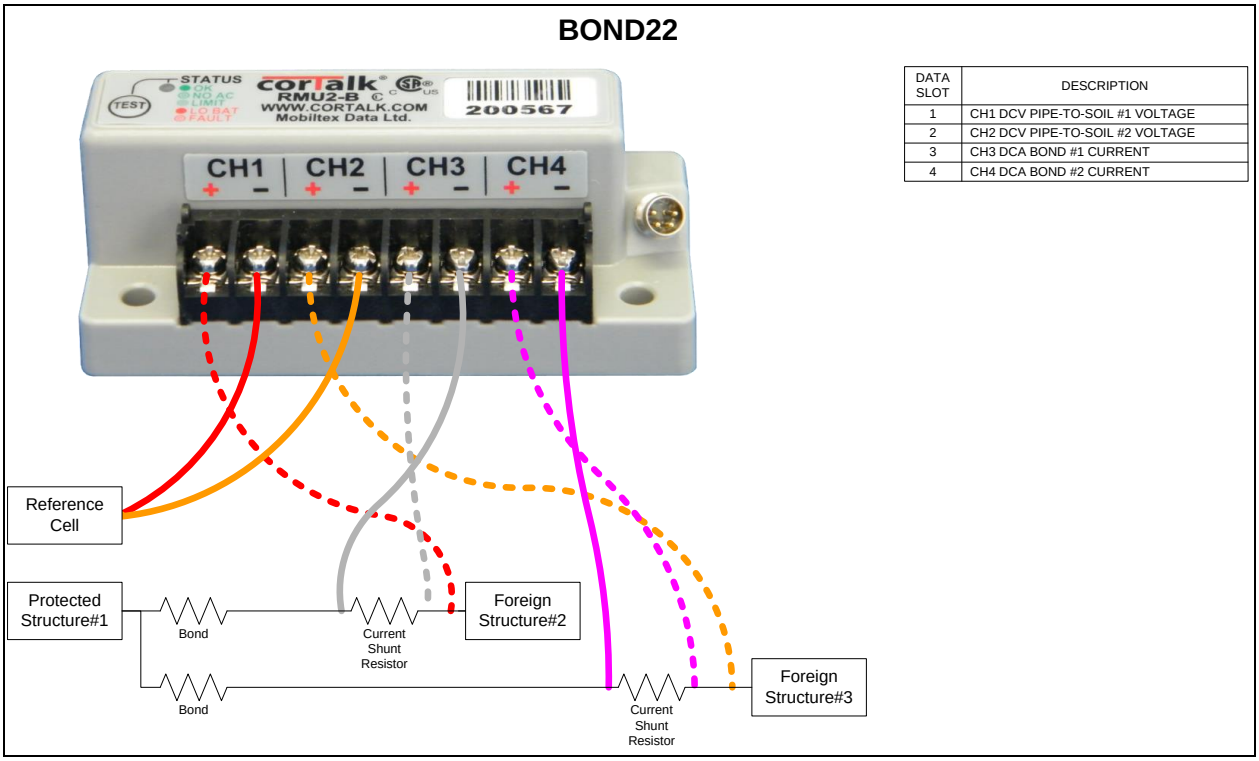
Figure 31 TP20 Testpoint – 4 Pipe-To-Soil DC



DATA SLOT	DESCRIPTION
1	CH1 DCV PIPE-TO-SOIL #1 VOLTAGE
2	CH1 ACV PIPE-TO-SOIL #1 VOLTAGE
3	CH2 DCV PIPE-TO-SOIL #2 VOLTAGE
4	CH2 ACV PIPE-TO-SOIL #2 VOLTAGE

Figure 32 TP21 Testpoint – 2 Pipe-To-Soil AC/DC

6.2.3.3 Bond Measurement Type Diagrams



DATA SLOT	DESCRIPTION
1	CH1 DCV PIPE-TO-SOIL #1 VOLTAGE
2	CH2 DCV PIPE-TO-SOIL #2 VOLTAGE
3	CH3 DCA BOND #1 CURRENT
4	CH4 DCA BOND #2 CURRENT

Figure 33 BOND22 Bond – 2 Pipe-To-Soil, and 2 Bond Currents

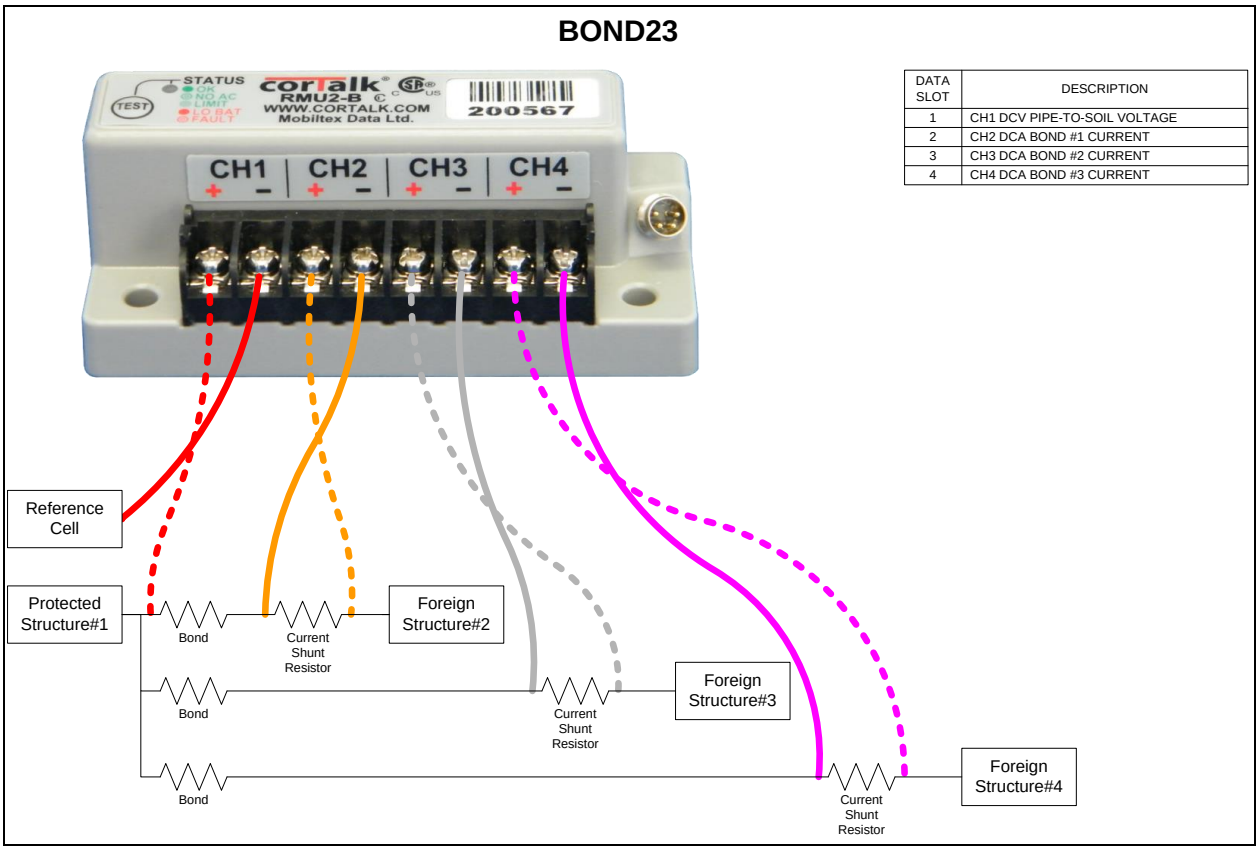


Figure 34 BOND23 Bond – Pipe-To-Soil, and 3 Bond Currents

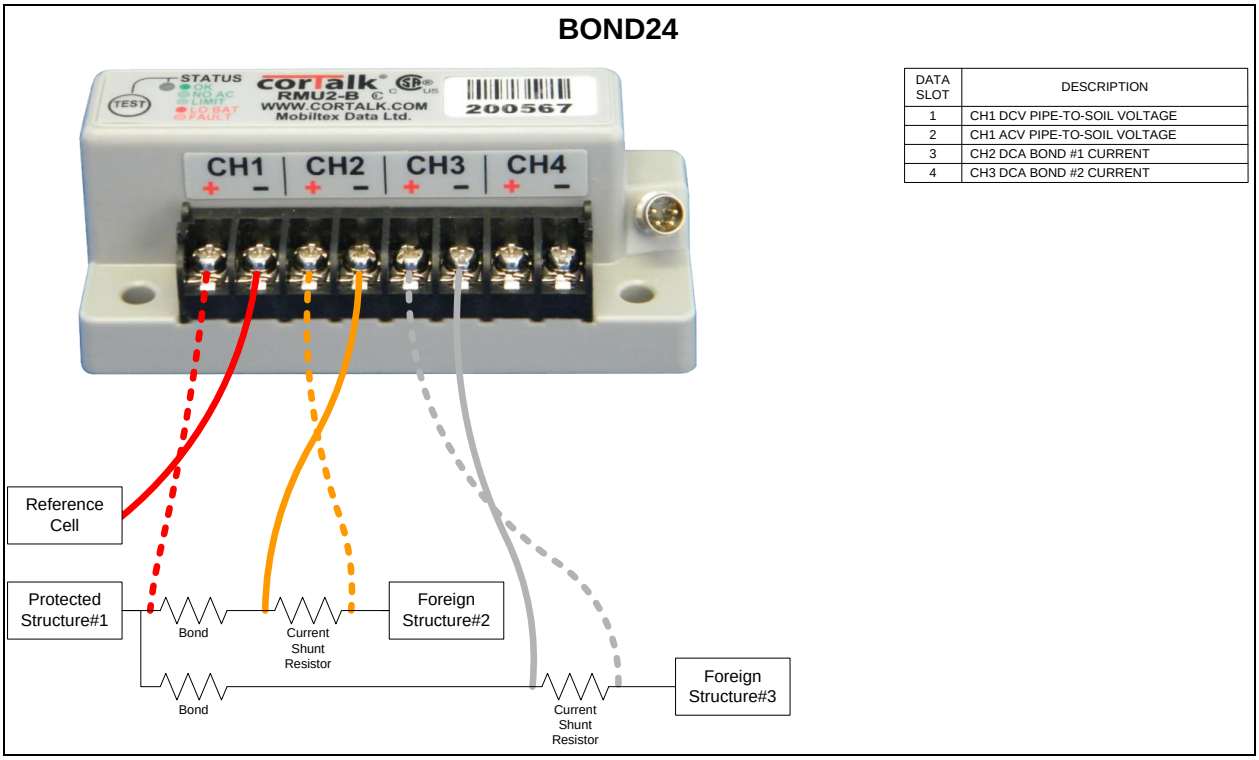


Figure 35 BOND24 Bond – Pipe-To-Soil AC/DC, and 2 Bond Currents

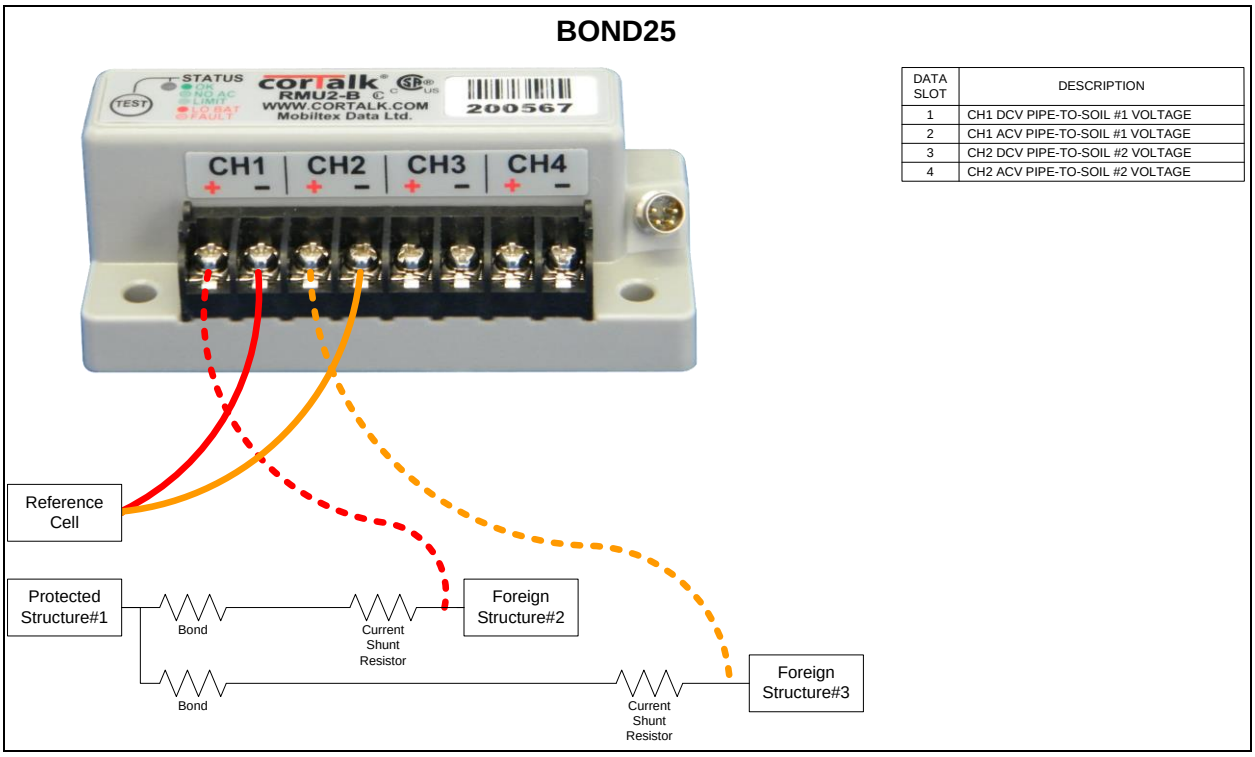


Figure 36 BOND25 Bond – 2 Pipe-To-Soil AC/DC

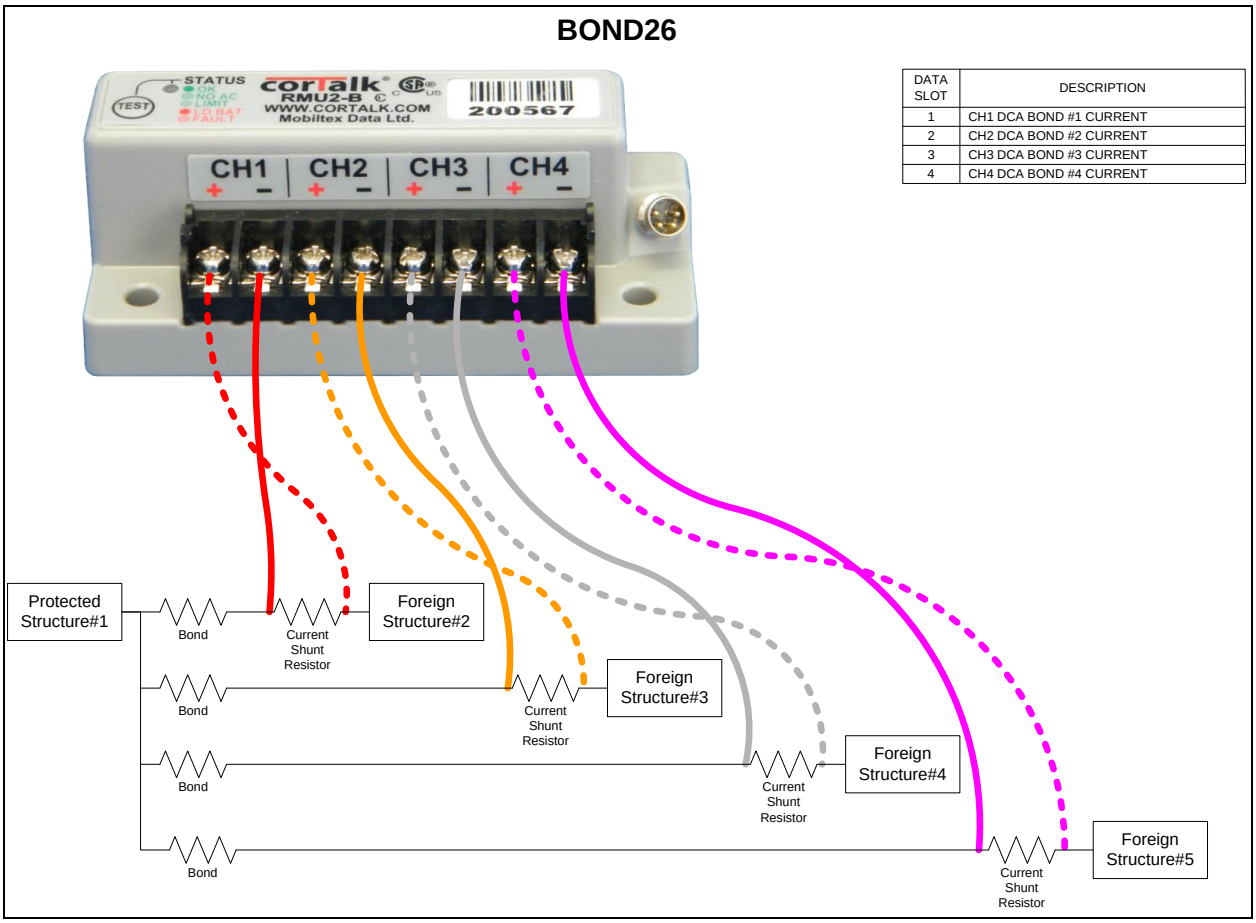


Figure 37 BOND26 Bond – 4 Bond Currents

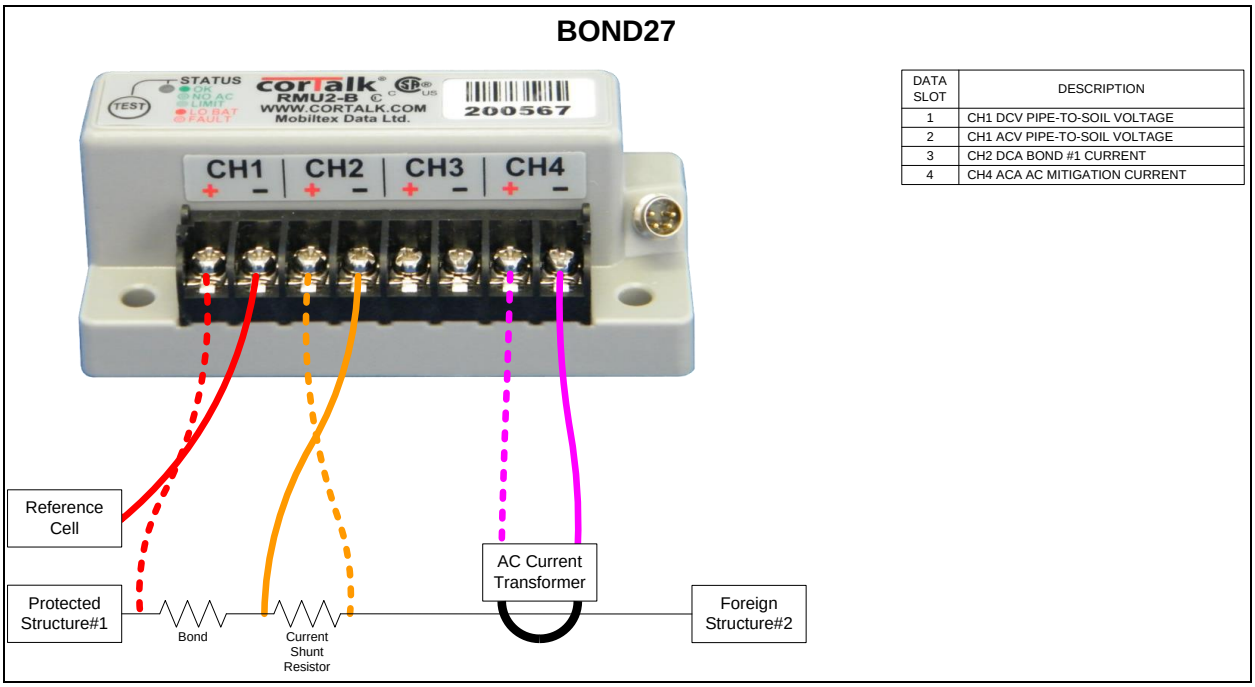


Figure 38 BOND27 Bond – Pipe-To-Soil DC/AC, 1 Bond Current, and AC Mitigation Current

Note: AC Current transformers require internal protection

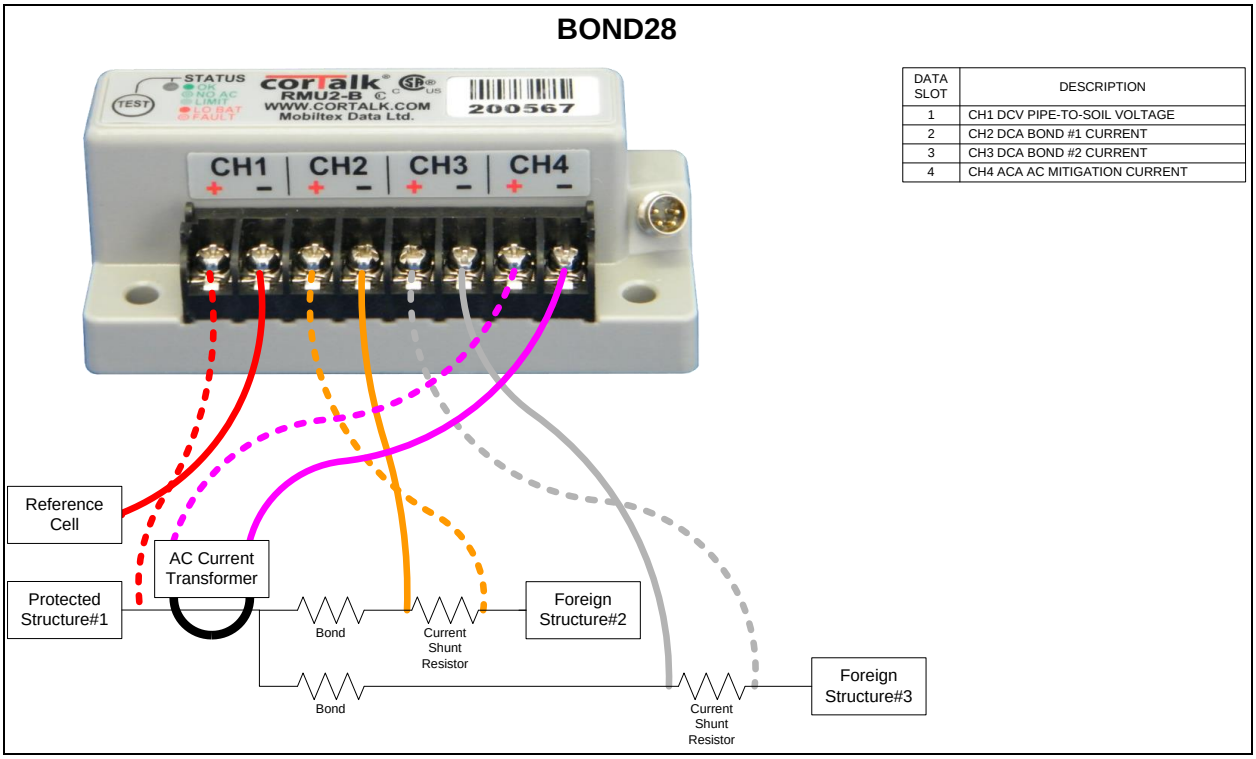


Figure 39 BOND28 Bond – Pipe-To-Soil DC, 2 Bond Currents, and AC Mitigation Current

Note: AC current transformer require internal protection.

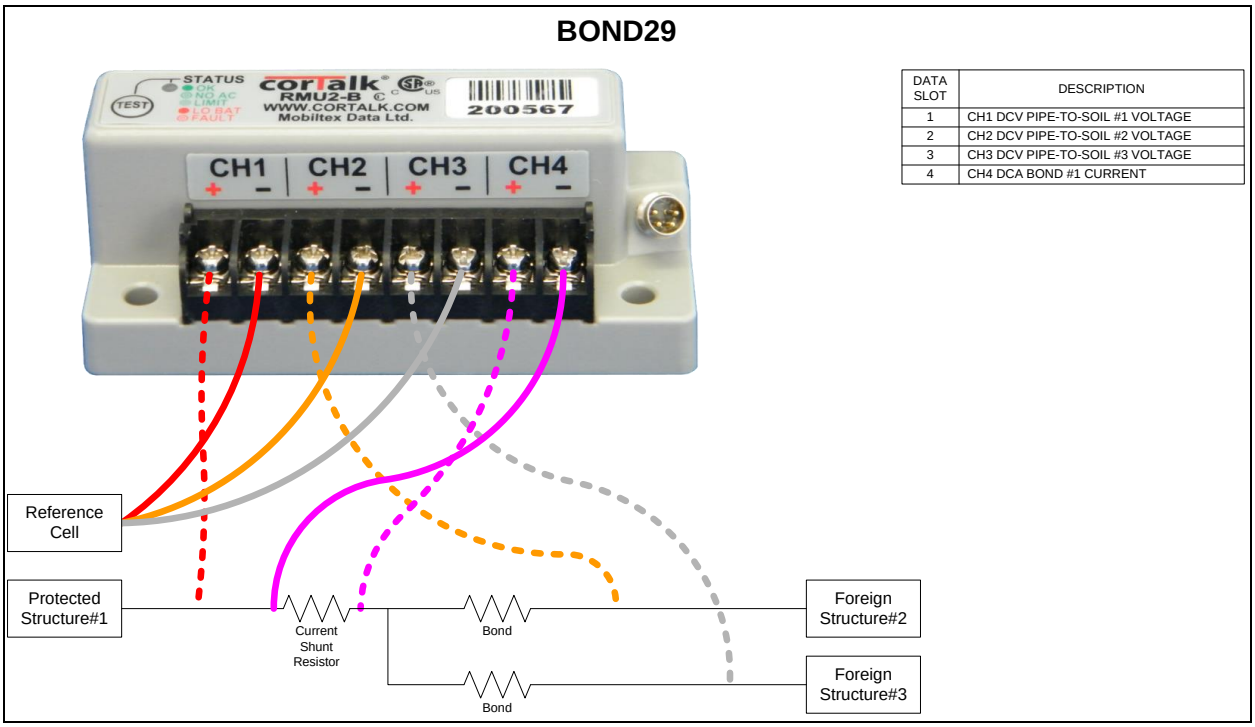


Figure 40 BOND29 Bond – Three Pipe-To-Soil DC, 1 Bond Current

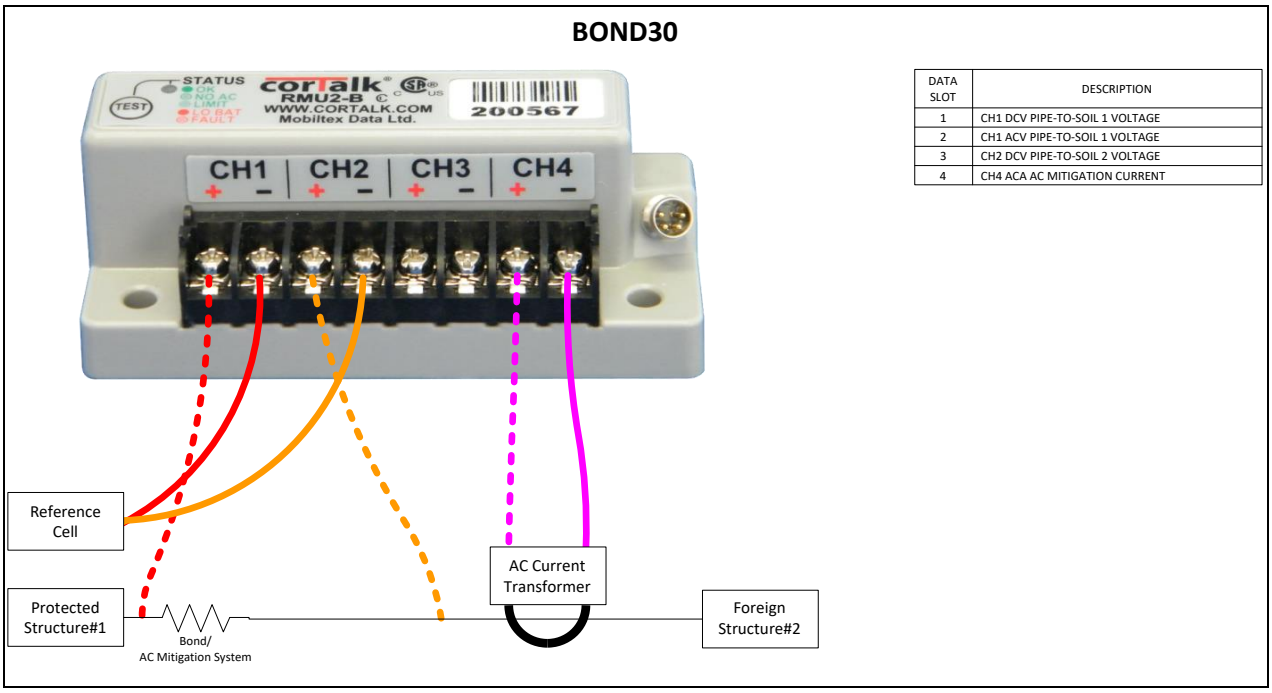


Figure 41 BOND30 Bond – Pipe-To-Soil 1 DC/AC, Pipe-To-Soil 2 DC, and AC Mitigation Current

6.2.3.4 Field Installable User Label Set

The standard RMU2 kit includes a "Field Installable User Label Set" that contains pre-printed labels for the different measurement configuration types. The installer can optionally apply the proper label to either the bottom or top of the terminal block on the RMU2-B to indicate actual wiring connections associated with that specific measurement type. The red number located at the bottom-center of each label indicates the actual measurement type.

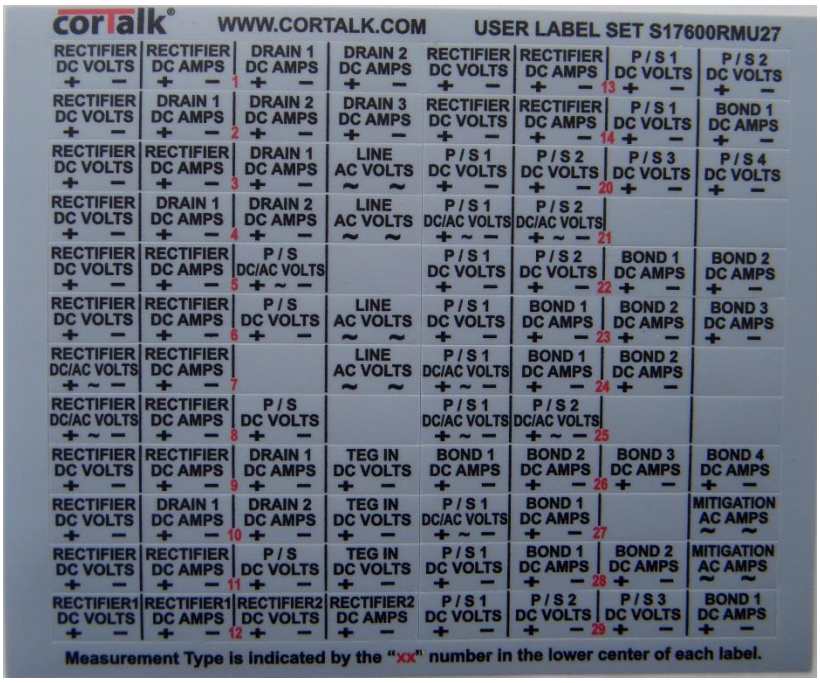


Figure 42 Field Installable User Label Set



Figure 43 Example of Label on Bottom of Terminal Block



Figure 44 Example of Label on Top of Terminal Block

6.2.3.5 Measurement Wiring Connections

The programmed "Measurement Type" will determine the signals monitored and the associated wiring connection requirements. Wire the appropriate measurement signals from the rectifier, test point or bond to the terminal block on the RMU2-B. In most applications, it is convenient to parallel tap the analog signals from the existing rectifier meters. Unused analog input channels should be disabled using the RMU3PGM programming interface or alternatively, a shorting wire should be installed between the two terminals of the unused channel. An optional wiring kit (A20103RMU20), containing a variety of crimp terminals, wiring, cable ties and cable tie mounts, is optionally available. Electrical connections to the RMU2-B can be made using either direct wire connections (22 to 14 AWG wire size) or crimped spade lug terminal connectors (0.275" or 7mm maximum spade lug width). Lightning immunity is enhanced by utilizing 600 volt, 105C rated wiring (as supplied with the optional wiring kit) which has a thicker insulation system and higher voltage breakdown rating as compared to more common 300 volt rated wiring systems.

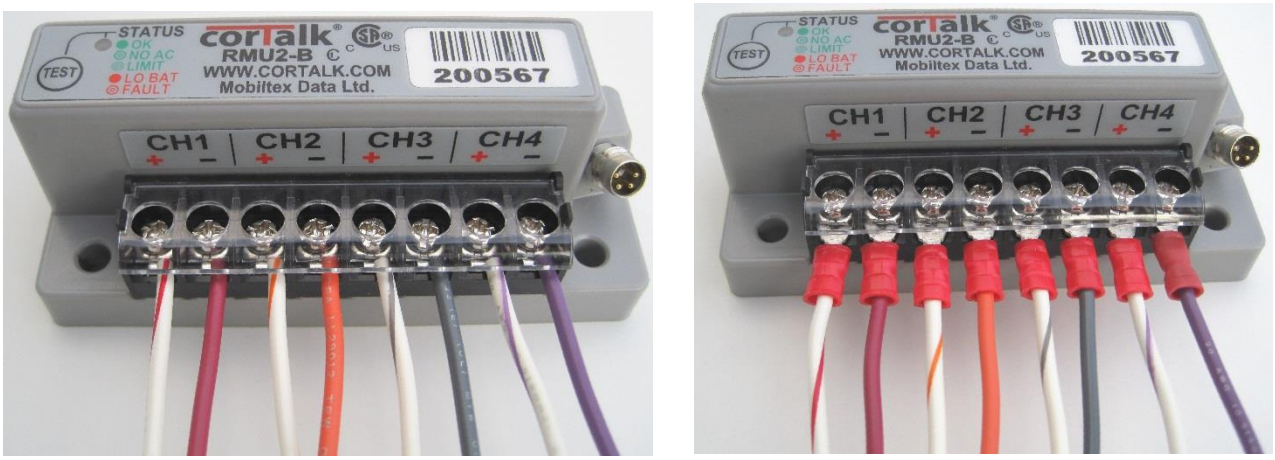


Figure 45 RMU2 Measurement Wiring Connections

6.2.3.6 AC Mitigation Transformer Wiring

Measuring AC mitigation currents requires the use of an external current sense transformer with the RMU2. Following are installation instructions for various models available from Mobiltex.

6.2.3.6.1 A20A00XFM01 AC Mitigation Measurement 1 to 60 Amp CT

The Mobiltex RMU2 remote monitoring unit can be used to monitor AC mitigation systems. This configuration requires use of a special AC current transformer to measure the actual AC current being mitigated. Mobiltex has several different types of current measurement transformers available for this type of application. The A20A00XFM01 will measure a maximum AC mitigation current of 60 Amps and will accept a maximum wire size of 0.58". This transformer is good for applications with as low as 1 amp of mitigation current. The Mobiltex kit includes range selection resistors to allow the installer to configure the desired measurement range to best suit the installation requirements.

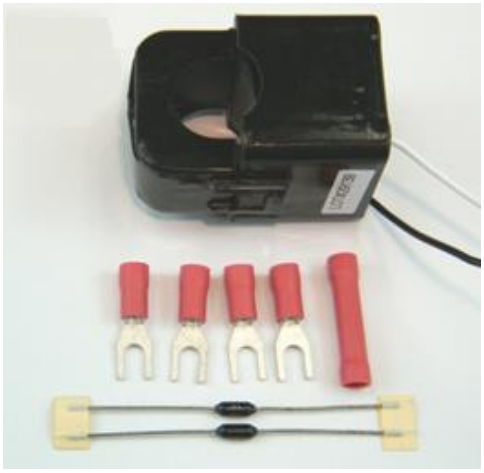


Figure 46 A20A00XFM01 Kit Contents

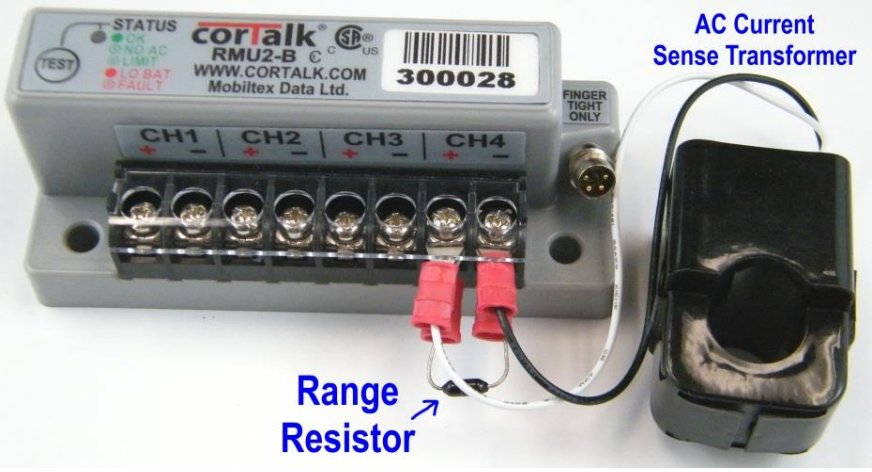
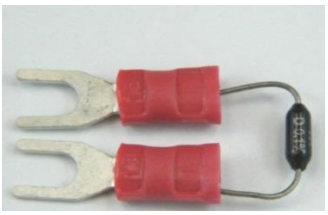


Figure 47 A20A00XFM01 Connection of Transformer and Range Selection Resistor

User provided wires can be used to extend the wiring from the current transformer to the RMU2 terminal block. Because the transformer provides an AC signal output, the transformer wiring is not polarity sensitive. The range selection resistor(s) needs to be physically located at the RMU2 terminal block location. The RMU will need to be configured for the correct measurement type and with the "AC Current Transformer Output Type" selected as "AC". The current transformer should be physically clamped over the wire that it is measuring the AC current from.

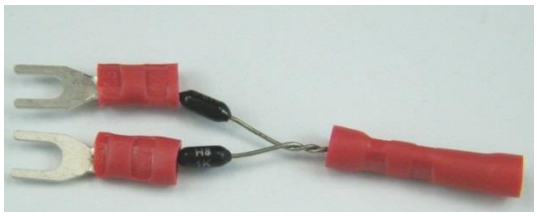
For the best measurement resolution we suggest that the installer select a measurement range appropriate for the specific installation. The range is determined by the maximum AC current that will be measured at the specific installation. Most common AC Mitigation systems operate at a maximum of 35 Amps so the "Medium Range" configuration is the most common type. Range selection is attainted by using the provided range selection resistors. Both resistors are the same in value and can be wired individually (a single resistor, medium range), in series (low range) or in parallel (high range). Please contact Mobiltex for instructions on ranges greater than 60 Amps.



Medium Range

40 Amps Full Scale

RMU Slot Scaling = 3.15



Low Range

20 Amps Full Scale

RMU Slot Scaling = 1.575



High Range

60 Amps Full Scale

RMU Slot Scaling = 6.3

Figure 48 A20A00XFM01 Range Selection Resistors

6.2.3.6.2 A20A00XFM02 AC Mitigation Measurement 1 to 40 Amp CT

The Mobiltex RMU2 remote monitoring unit can be used to monitor AC mitigation systems. This configuration requires use of a special AC current transformer to measure the actual AC current being mitigated. Mobiltex has several different types of current measurement transformers available for this application. The A20A00XFM02 will measure a maximum AC mitigation current of 40 Amps and will accept a maximum wire size of 0.40". This transformer is good for applications with as low as 1 amp of mitigation current. The Mobiltex kit includes range selection resistors to allow the installer to configure the desired measurement range to best suit the installation requirements.

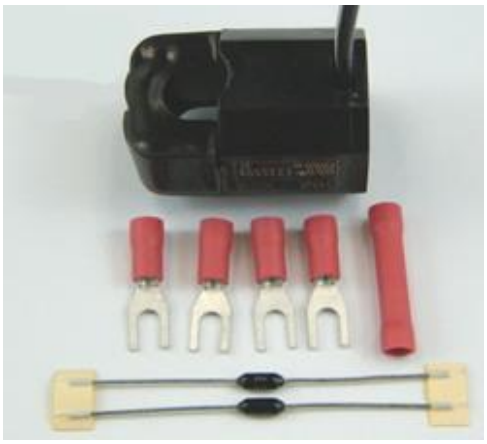


Figure 49 A20A00XFM02 Kit Contents

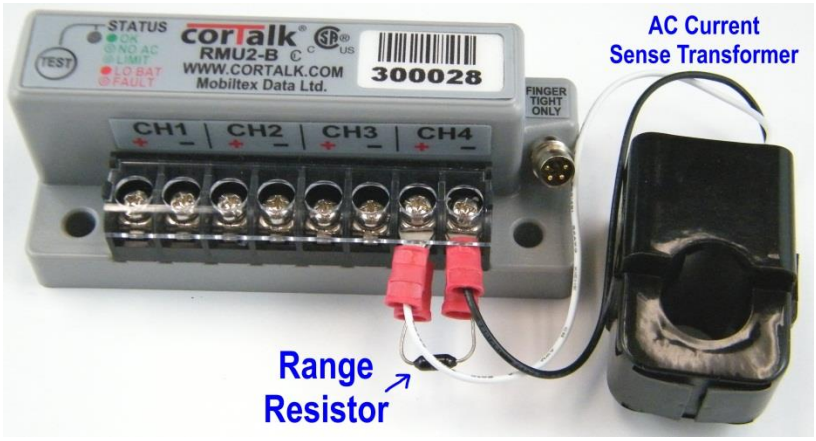
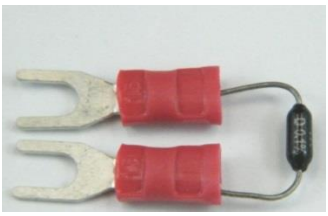


Figure 50 A20A00XFM02 Connection of Transformer and Range Selection Resistor

User provided wires can be used to extend the wiring from the current transformer to the RMU2 terminal block. Because the transformer provides an AC signal output, the transformer wiring is not polarity sensitive. The range selection resistor(s) needs to be physically located at the RMU2 terminal block location. The RMU will need to be configured for the correct measurement type and with the "AC Current Transformer Output Type" selected as "AC". The current transformer should be physically clamped over the wire that it is measuring the AC current from.

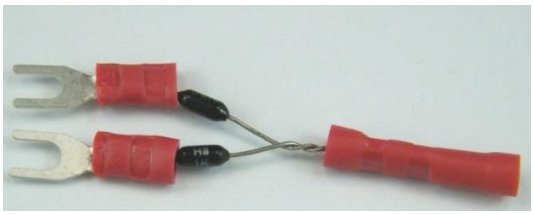
For the best measurement resolution we suggest that the installer select a measurement range appropriate for the specific installation. The range is determined by the maximum AC current that will be measured at the specific installation. Most common AC Mitigation systems operate at a maximum of 35 Amps so the "High Range" configuration is the most common type. Range selection is attainted by using the provided range selection resistors. Both resistors are the same in value and can be wired individually (a single resistor), in series (low range) or in parallel (high range). Please contact Mobiltex for instructions on ranges greater than 40 Amps.



Medium Range

28 Amps Full Scale

RMU Slot Scaling = 3.1



Low Range

15 Amps Full Scale

RMU Slot Scaling = 1.55



High Range

40 Amps Full Scale

RMU Slot Scaling = 6.2

Figure 51 A20A00XFM02 Range Selection Resistors

6.2.3.6.3 A20A00XFM07 AC Mitigation Measurement 2 to 80 Amp CT

The Mobiltex RMU2 remote monitoring unit can be used to monitor AC mitigation systems. This configuration requires use of a special AC current transformer to measure the actual AC current being mitigated. Mobiltex has several different types of current measurement transformers available for this application. The A20A00XFM07 will measure a maximum AC mitigation current of 80 Amps and will accept a maximum wire size of 0.94". This transformer is good for applications with as low as 2 amps of mitigation current. This transformer includes an integral burden resistor so the transformer does not require an external range resistor.



Figure 52 A20A00XFM07 Kit Contents



Figure 53 A20A00XFM07 Connection of Transformer

User provided wires can be used to extend the wiring from the current transformer to the RMU2 terminal block. Because the transformer provides an AC signal output, the transformer wiring is not polarity sensitive. The RMU will need to be configured for the correct measurement type and with the "AC Current Transformer Output Type" selected as "AC". The current transformer should be physically clamped over the wire that it is measuring the AC current from.

A20A00XFM07 has a single measurement range:

80 Amps Full Scale

RMU Slot Scaling = 6.0

6.3 Interconnection Cable

Route the previously installed interconnection cable from the RMU2-S/SI/G to the RMU2-B. For maximum lightning immunity this cable should be physically routed away from other wiring, especially AC line level connections. The un-terminated M8-style female connector going to the RMU2-B should remain disconnected until the RMU2 has been configured. The **interconnect cable** may be extended up to a **maximum length of 24 meters (78 feet)** by screwing together extension cables.

6.4 Startup and Verification

Once the rectifier, test point, or bond is wired according to one of the diagrams, the measurement type, current shunt scaling factors (if used), and alarm limits (if used) should be programmed into the RMU2-B using the configuration software tool, (see section 7 and section 8).

All wiring should be secured and inspected before the RMU2S/G and RMU2-B are connected together. The RMU2 will start operation when the interconnection cable coming from the RMU2S/G is connected to the M8-style connector on the RMU2-B.

After the interconnect cable is attached between the RMU2-B and the RMU2-S/SI/G transmitter, observe that the RMU2-B "Status" LED indicator turns on (refer to section 0 for detailed LED operation descriptions). When the LED turns off, the RMU2 has completed transmitting its power-on message to CorView. Note that transmissions from RMU2-S field devices typically require from <1 minute (good antenna view of the sky) to 30 minutes (poor antenna view of the sky) to arrive at CorView. The delivery variability is because the RMU2-S transmits the message a total of three times to help insure a high message delivery success rate, even under partially degraded sky view conditions. The first transmission occurs within seconds of the measurement cycle. Each of the two retransmissions occurs between 5 and 10 minutes of the prior transmission.

Transmissions from RMU2-SI/G field devices typically require from about 1 minute to 5 minutes to arrive at CorView. With the RMU2-SI/G, the status LED will flash red (error) a few seconds before the LED turns off if there is no cellular (RMU2-G) or satellite(RMU2-SI) coverage or there is a problem with the device SIM card.

After inspecting the installation, re-apply power to the rectifier and verify proper rectifier operation.

Once the rectifier is operating, press the "Test" button on the RMU2-B to initiate an immediate measurement cycle and "Button Press" exception transmission to the CorView web host. The "Status" LED on the RMU2-B should illuminate steady state green for 8 to 15 seconds (RMU2-S) or 30 to 40 seconds (RMU2-G) during the measurement and transmission cycle. If the "Status" LED flashes green, then turn off the rectifier main power and check the fuse and connection of the "AC Line Sense Fused Cable".

If the installation utilizes the door switch function, then the rectifier door should be closed to verify operation. Wait a minimum of 1 minute after closing the door to allow the measurement and "door closed" transmission to occur. Five seconds after the door has been opened the LED "Status" indicator should automatically illuminate steady state green indicating a measurement cycle and transmission of a "door open" event. Note that a maximum of 6 door switch or "Test" button transmissions are allowed during a 6-hour period.

The actual measurement readings from the site should appear on CorView shortly after the message was transmitted. CorView can be configured to automatically send emails containing the measurement readings to an individual or group of email users. Because these emails are short and wireless-friendly, many clients send the readings directly to their field installers wireless email device(s) for near immediate end-to-end operation confirmation and verification of measurement values.

Alternatively, the measurement readings can be locally retrieved and displayed using the RMU3PGM configuration tool or the RBT1 Bluetooth interface. It is good practice to confirm that all the measurements are as expected and that they are not too close to any programmed alarm limits (if utilized).

The installation and site should be inspected a final time before properly securing the equipment and leaving the site.

6.5 Status LED

The RMU2-B has a dual color "Status" LED (see Figure 54) that provides status information to the user. The LED functions as follows:

- Power-up, "Test" switch press, door switch state change: If the battery voltage is OK, AC sense is present or not enabled, and readings are within the configured limits, the green LED turns on when the RMU2-B powers up and stays on solid until message transmission has completed. If AC sense is enabled and there is no AC sense signal, the green LED will flash at a rate of 250ms on, 250ms off. If limits are enabled and there is a reading that is outside the limits, the green LED will flash at a rate of 100ms on, 100ms off. The LED is not active during periodic measurements.
- Low battery: The red LED will turn on steady state for the duration the RMU2-B is on as a result of power-up, "Test" switch press, door switch state change. The LED is not active during periodic measurements.
- Fault: The red LED will blink with a cadence of 500ms on, 500ms off. The flashing will start as soon as the fault is detected. Specific fault information may then be retrieved and reset from the RMU2-B using the configuration tool.
- Exception limit exceeded: The red LED will blink with a cadence of 250 ms on, 250 ms off. The flashing will start immediately after the test button is pressed, or the door switch state is changed. The RMU2 will allow a maximum of 6 exception messages in a 6 hour period. If this limit is exceeded, test button and door switch exceptions are ignored until the next 6 hour period starts. For every 6 hour period after the limit is exceeded, the exception counter decrements by 1.
- Configuration mode: The LED will alternatively blink between red and green to provide a unique indication to the user. The LED will blink off when a command is sent to the RMU2-B from the configuration tool. The LED will stay off until the current command has finished processing, then return to an on state.

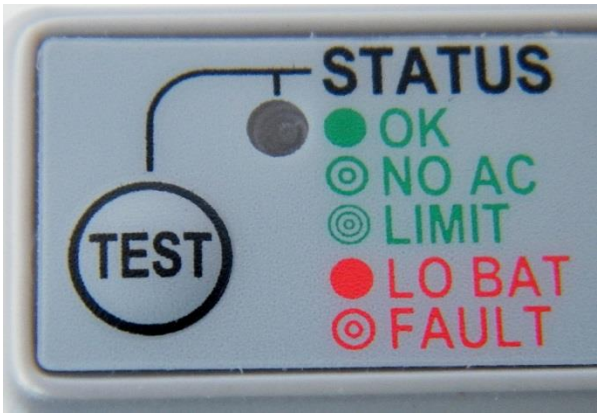


Figure 54 RMU2 LED Status Indicator

7 Configuration

7.1 Configuration Equipment Requirements

The following items will be needed when configuring an RMU2.

1. RMU1/2/3 Programming Interface (Kit A20A0333101)

   The configuration interface is housed in a grey plastic enclosure (see Figure 55). It has three cables exiting from the enclosure: a USB cable that attaches to a PC, an M8 female (round 4-pin connector) cable that attaches to the RMU2-B base unit, and an M8 male cable that is only used when programming an RMU3. All three cables are field replaceable.

   The interface is powered from the PC USB port, so an external power supply in not required.

   The configuration interface has a strong magnet located on the bottom of the case (see Figure 56) that allows the configuration interface to be temporarily attached to a ferrous surface. The magnet is covered by a non-marring label to prevent damage to the surface to which it is being attached.

   Two LED indicators on the side of the configuration interface show the current state of the device. The green PWR LED lights up when power is being delivered to the RMU2 device that is being programmed. The red DATA LED flashes when information is transferred over the USB connection to the PC.

   The configuration interface contains a GPS receiver that is used to set the location information for an RMU2 installation. During RMU2 programming, it is important to place the RMU1/2/3 configuration interface in an area that has an open sky view so that a GPS position fix may be acquired. The domed top of the configuration interface should face up with a good view of the sky for best signal acquisition.

2. Programming Application and Driver USB Stick

   To use the configuration interface, you will require USB stick that shipped with the configuration interface box. The USB stick contains drivers and an application for the RMU3 configuration interface. If you do not have the USB stick, the contents of this USB stick can be downloaded from the Mobiltex FTP site. Contact your Mobiltex representative for download instructions.

3. Personal Computer (PC)

   The application software and drivers require that the PC be running Windows XP SP2 or higher for an operating system. The PC must have an available USB port.



Figure 55 RMU1/2/3 Configuration Interface

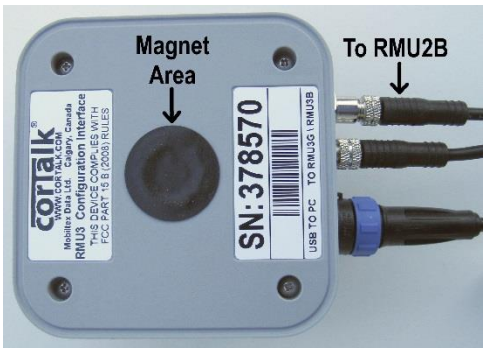


Figure 56 RMU1/2/3 Configuration Interface Bottom View

7.2 Software Installation

To install the configuration application and driver software, insert the USB stick that came with the configuration interface into an available USB port on the PC. If "autorun" is enabled on the PC, the following screen in Figure 57 will appear.

If "autorun" is not enabled, or the contents of the USB stick 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 "RMUINSTALLER.exe" application. The dialog on Figure 57 will appear.

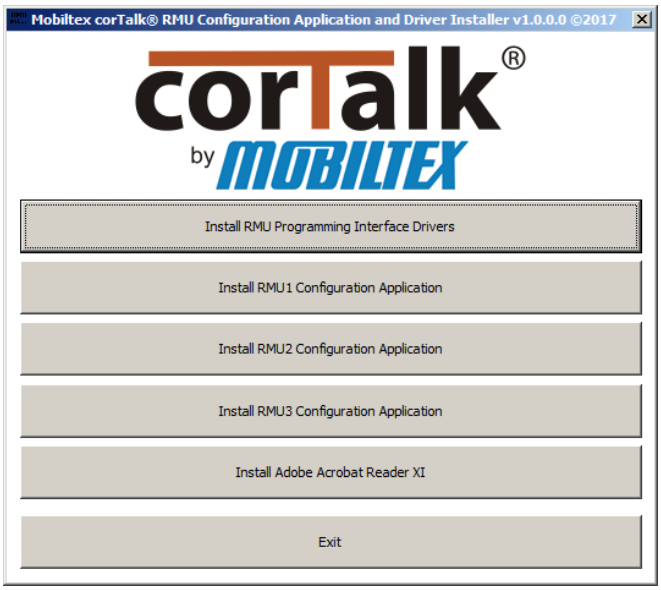


Figure 57 RMU2Installer Dialog

7.2.1 Configuration Application Installation

Click on the "Install RMU2 Configuration Application" button to start the application installer. The following dialog may appear. Click the "Run" button to continue.



Figure 58 RMU2ConfigSetup.msi Security Warning Dialog

The following dialog should now appear:

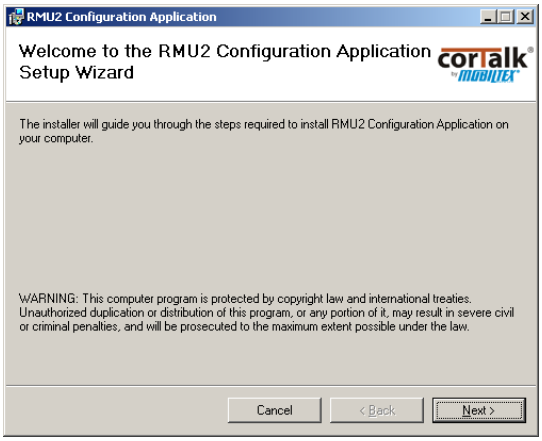


Figure 59 RMU2 Configuration Application Installation Dialog

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 60. Click "Close" to complete the installation.

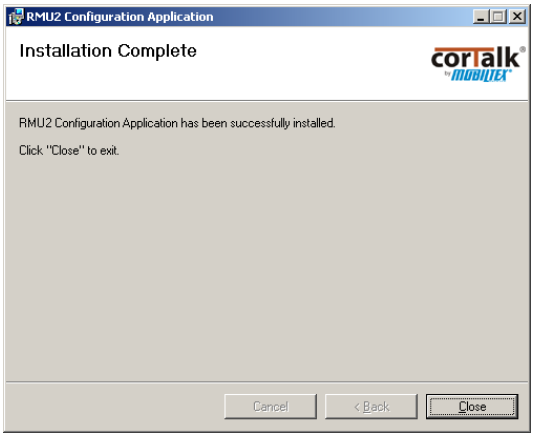


Figure 60 RMU2 Configuration Application Installation Complete

A shortcut to the configuration application and the RMU2 manual are created in the Windows start menu under the "RMU2 Configuration Application" folder.

7.2.2 Driver Installation

From the RMU2 Installer screen, click the "Install RMU2 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. Follow the installation instructions presented by the driver installer application.

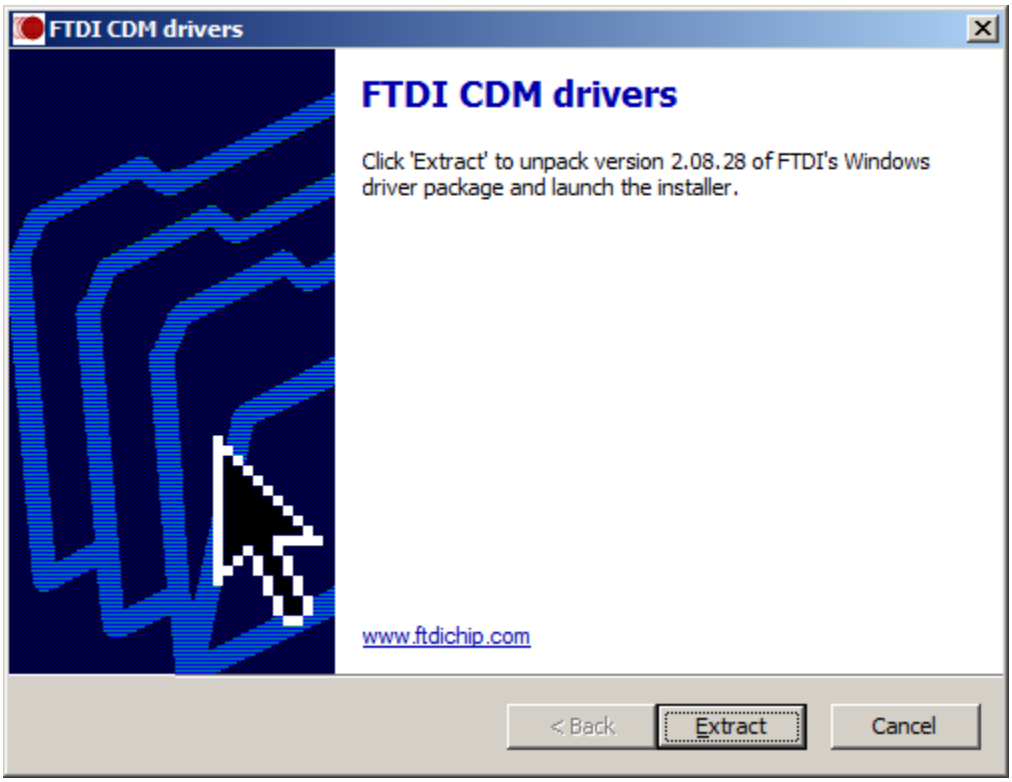


Figure 61 Driver Installation Screen

Once the driver installer completes, you may then plug in the RMU2 configuration interface hardware into an available USB port on the PC.

As an alternative method, the drivers may be installed using the Windows "Found New Hardware Wizard" by plugging the RMU2 configuration interface into the PC first. If the "Found New Hardware Wizard" does not appear, it is possible that drivers for the programming interface are already installed. Complete the following steps:



Figure 62 Driver Installation - Found New Hardware

From the three choices, select the "No, not this time" radio button and click "Next >".

The following screen will ask you if you would like to install the software automatically or from a specific location.

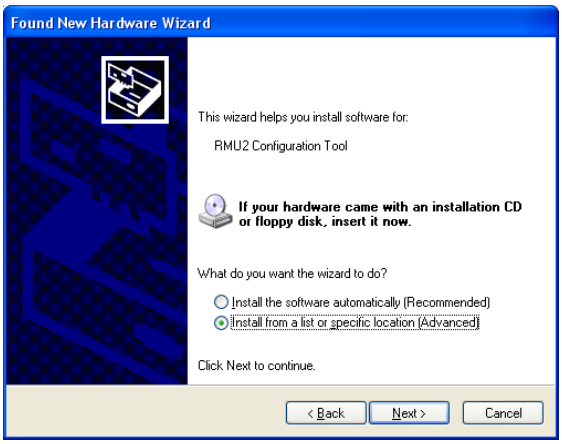


Figure 63 Driver Installation - Install From Specific Location

Choose to install from a specific location since you have the installation USB stick or downloaded files. Click the "Next >" button.

The next window will appear and ask you where to search for the drivers. The default selection is shown in Figure 64.

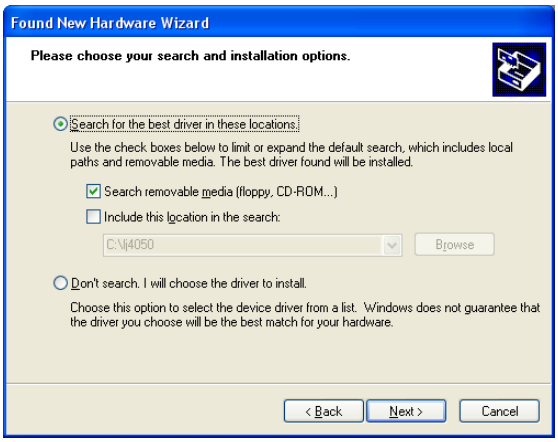


Figure 64 Driver Installation - Driver Location Selection

Insert the USB stick that came with the configuration interface.

If you do not have the installation USB stick and know where to find the drivers, check off "Include this location in the search:" and browse for the driver on your computer or network. You can uncheck "Search removable media (floppy, CD-ROM…)" to save time in this case.

Once you click "Next" the following screen will appear until the operating system has found the appropriate driver.

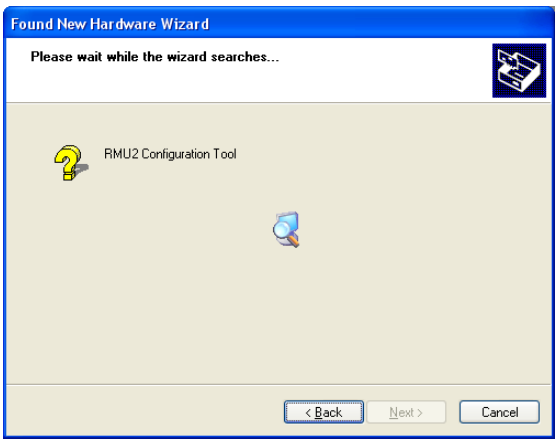


Figure 65 Driver Installation - Driver File Search

Once the correct driver has been found, it will install automatically and the completed screen should appear. Simply click the "Finish" button to complete the driver installation.

7.2.3 Adobe Acrobat Reader XI

Adobe Acrobat Reader XI is provided on the USB stick to allow viewing of the PDF version of the RMU2 manual. If Acrobat Reader is already installed on the PC, it is not necessary to re-install it. To install Acrobat Reader, click on the "Install Adobe Acrobat Reader XI" button on the RMU2 Installer dialog, and follow the instructions provided by the Acrobat Reader installation application.

7.3 RMU2 Configuration

Attach the supplied USB cable between the PC and the RMU3 configuration interface. **Make sure that the locking ring on the RMU3 configuration interface side is securely tightened, otherwise adequate electrical contact may not be assured.**

Start the configuration software by clicking on "RMU2 Configuration" shortcut in Windows start menu, under the "RMU2 Configuration Application" folder. If the programmer is not connected to one of your USB ports, you will get an error message. Simply connect the USB cable to the computer and try again. The following screen will appear.

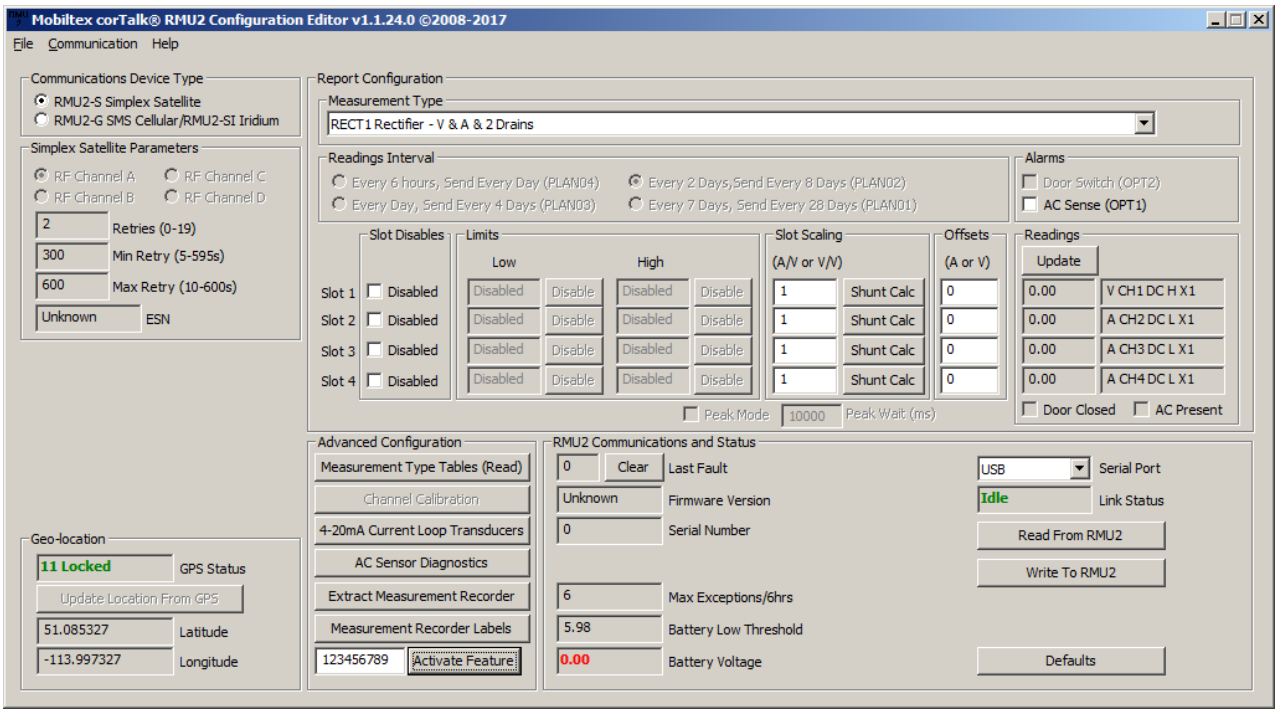


Figure 66 RMU2CONFIG Main Screen - RMU2-S

If "RMU2-G SMS Cellular/RMU2-SI Iridium" is selected in the "Communications Device Type", the following screen is shown.

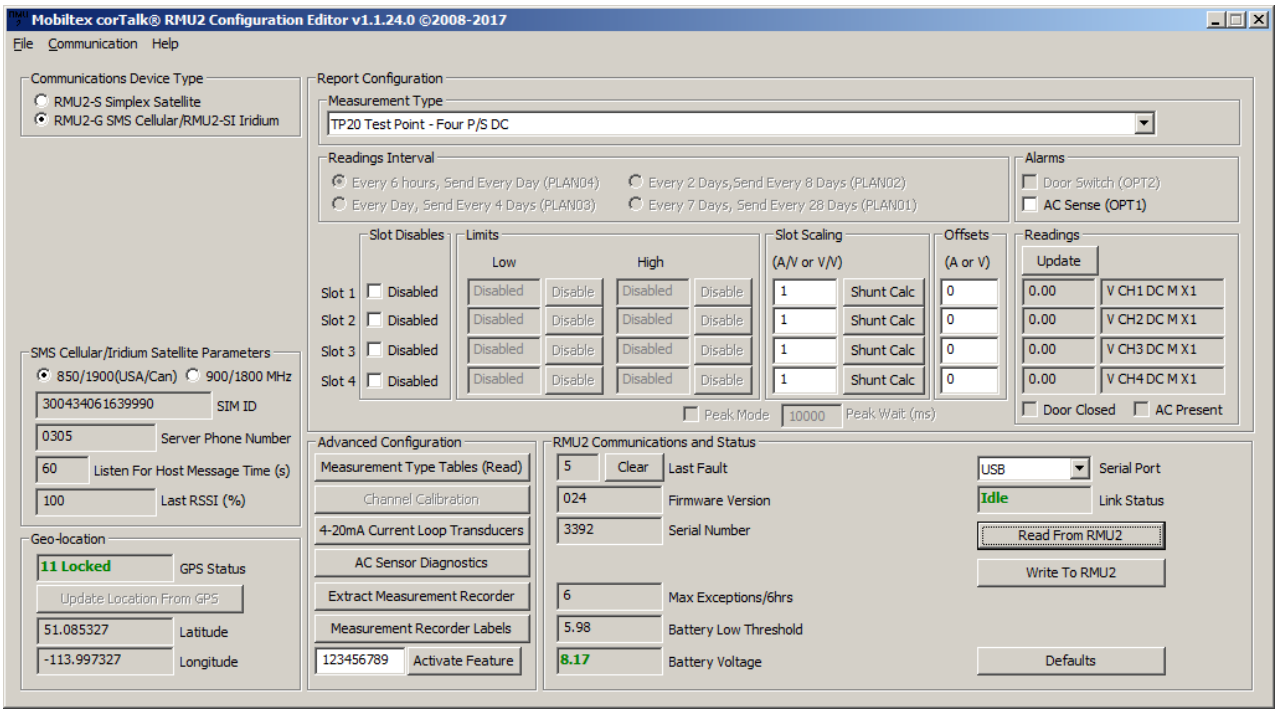


Figure 67 RMU2CONFIG Main Screen - RMU2-G/RMU2-SI

Next, attach the M8 female connector cable from the configuration interface to the RMU2-B that requires programming.

In the configuration application under "RMU2 Communications and Status" grouping, there is a drop down box labeled "Serial Port". If the configuration interface was attached to the computer after the application was started, set this to "USB" instead of "Disabled". If the programmer is not connected to one of your USB ports, you will get an error message. Simply connect the USB cable to the computer and try again.

The first step in configuring a device is to read in the current settings from the unit. Click on "Read From RMU2". The "Link Status" field will briefly show "Busy" as the current configuration parameters are read from the RMU2. After the link status returns to "Idle", you will see the configuration settings currently in the RMU2. If the RMU2 is not responding or not connected, an error dialog will pop up.

Once communications have been established with the RMU2-B base, the RMU2 parameters can be configured for the requirements of a particular installation site.

7.3.1 Communications Device Type

The first grouping in the top left corner, "Communications Device Type", selects the type of RMU2 transmitter that you will be using.

7.3.2 Satellite Parameters (RMU2-S)

The next grouping down, "Satellite Parameters", displays the transmission characteristics of the RMU2-S satellite antenna. The application does not allow the user to edit these parameters. This grouping will only be visible if the "RMU2-S Simplex Satellite" is selected in the Communications Device Type area.

7.3.3 SMS Cellular/Iridium Satellite Parameters (RMU2-G/RMU2-SI)

The next grouping down is the "SMS Cellular/Iridium Satellite Parameters" which displays parameters associated with the RMU2-G cellular or RMU2-SI Iridium satellite antenna. The application does not allow the user to edit these parameters, except for the RF band.

The RF band should be set to 850/1900MHz for use in North American installations, and 900/1800MHz for use in most other locations. The RMU2-G is configured for use with Mobiltex provided service in North America. If non-Mobiltex SIM cards are to be used, please contact Mobiltex for further configuration information. This parameter is not applicable to the RMU2-SI.

The "Last RSSI (%)" field shows the cellular signal strength at the time the RMU2 last transmitted a message. This field can be used to diagnose antenna installation or cellular network coverage issues. This grouping will only be visible if the "RMU2-G SMS Cellular/RMU2-SI Iridium" is selected in the Communications Device Type area.

7.3.4 Geo-Location

The frame on the bottom left corner, "Geo-Location", will read from the GPS receiver included in the configuration interface. If it has satellite lock it will record the GPS data in the "Latitude" and "Longitude" fields. This tells the host software where the RMU2 is located in the field. The geo-location information is required for the RMU2-S to properly set its RF transmission channel (normally 'A'). In North America, if the RMU2-S is installed inside a radio astronomy zone, a secondary channel ('C') must be used. The software will auto-detect if the RMU2 is inside one of these zones and automatically select the appropriate channel. The RF channel will also change to the alternate channel ('C') if the unit is installed outside of North America.

Note: The Geo-Location should be done at the actual site where the RMU2 will be installed.

If manual editing of the geo-location is not enabled, the application will continuously update the latitude and longitude boxes as long as GPS satellite lock is present. If manual editing is enabled, then the user must type in the co-ordinates manually into the latitude and longitude boxes, or manually update them from the GPS receiver by clicking the "Update Location From GPS" button. When manually entering co-ordinates be sure to enter in a decimal degree format (e.g. Lat. 33.767711 Long. -84.41819).

If the configuration interface GPS receiver does not have a GPS lock, the pop-up shown in Figure 68 will appear when the "Update Location From GPS" button is clicked.



Figure 68 GPS Receiver Not Locked

Re-orient the configuration interface and wait for the "GPS Status" field to indicate 3 or more locked satellites before attempting again to update the location information. With a good view of the sky, the GPS receiver in the configuration interface should lock in less than two minutes.

7.3.5 Report Configuration

7.3.5.1 Measurement Type

Within the "Report Configuration" grouping, there are several other groupings. The one at the top called "Measurement Type" specifies the channel map which defines the measured equipment type (Rectifier, Bond or Test Point) by defining the voltage/current, range, and physical channel for each of the four data slots.

The installer must first determine if the RMU2 is going to be used with a Rectifier, Bond or Test Point. Currently there are 14 different types (RECT1 to RECT14) of Rectifier measurement configurations that can be selected. Currently there are 8 different types (BOND22 to BOND29) of Bond measurement configurations that can be selected. Currently there two Test Point (TP20 and TP21) configurations available. Each different type within a Rectifier or Bond determines a specific measurement configuration. For example, if the application was to measure Rectifier Output DC Volts, Rectifier Total Output DC Current and the DC current on two drains, then "RECT1" would be selected. Refer back to section 6.2.3 for typical installation diagrams for each type.

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 the CorView server. In this way, one physical channel can be used to read both AC and DC volts or AC and DC current. Because there are only 4 slots, if a single physical channel is used for both AC and DC, another physical channel must go unused.

The channel mapping between physical channels and slots can be viewed in detail by clicking on the "Measurement Type Editor" button under the "Advance Configuration" grouping. Note that this is a read only screen so these settings can be changed but they will not be saved.

7.3.5.2 Readings Interval

The next group in the "Report Configuration" section is "Readings Interval". This parameter determines how often the RMU2 will record and report the measurement data. Scheduled data is always sent in groups of four. Therefore, if factory programmed to report daily, a reading is taken every 6 hours (24 / 4 = 6). If factory programmed for every 4 days the reading is taken once a day and so on. The readings are taken starting from the time that the unit was powered up. This parameter is set at the factory to match the "AirTime Package" that the client has selected for the unit.

7.3.5.3 Alarms

The RMU2 is capable of sending exception reports based on the state of two internal sensors.

The first is a magnetically actuated switch that is normally used to determine the state of a door on an enclosure surrounding the RMU2. This can be used as a means of tamper detection. If the "Door Switch" alarm check box is enabled, the RMU2 will send a message to the CorView each time the magnetic switch changes states. The door switch magnetic contacts are debounced 5 seconds before a state transition is registered. The RMU2 continuously monitors the state of the door switch contact. The door switch function is factory defined based on the "AirTime Package" that is purchased for the unit. This function is factory defined at time of equipment order.

The second sensor detects the presence of AC line voltage using a non-contact method. A non-current carrying wire is run from the hot lead (L1 or L2) of the AC service and routed under the RMU2 in the groove molded into the base of the RMU2. This allows the RMU2 to sense the presence of line power. When the "AC Sense" alarm check box is enabled, an alarm is sent to CorView on 6 hour boundaries if the state of AC presence has changed from the last sample taken in the previous 6 hour sampling. During the RMU2 product promotion period, Mobiltex is including this function at no additional cost.

7.3.5.4 Slot Disables

Each data slot may be individually disabled if it is not being used on a particular installation. The RMU2 will communicate a measurement value of zero for any slot that is disabled. Operation of the slot disable function requires V9 or higher firmware on the RMU2. Unused slots should be disabled to prevent alarms and transmissions due to stray noise pickup.

7.3.5.5 Limits

"Limits" defines what the minimum or maximum reading can be before the RMU2 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 (RMU2-S) "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 "Disabled" in the field.

7.3.5.6 Slot Scaling

"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:

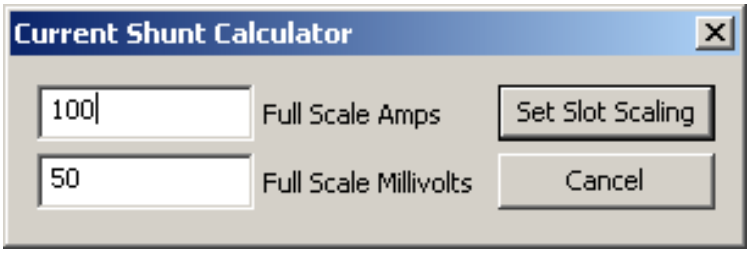


Figure 69 Current Shunt Calculator Dialog

Entering the two parameters for the shunt and pressing "Set Slot Scaling" will update the slot scaling value in the RMU2 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.

7.3.5.7 Offsets (requires v19+ RMU firmware)

The offset feature allows a measured reading to be offset by a fixed value. As an example, a zinc half-cell pipe-to-soil measurement could be converted to an equivalent copper half-cell by setting the offset value to -1.1, the difference in electrode potentials. In this example, a potential measured at -0.3V at the RMU terminals would be reported as -1.4V to CorView.

Normally, the offset value should remain set to the default of zero.

7.3.5.8 Readings

The grouping labeled "Readings" contains the current readings of the RMU2 device. This can be updated by pressing the "Update" button. The measurement process will require 8 to 12 seconds to complete before the updated readings are displayed. 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.

If limits or alarming are enabled for a particular reading, the reading value or label will be colored to indicate normal conditions in green, and out-of-limit or alarm conditions in red.

Ensure that any changes to the configuration of the unit have been written to the RMU2 prior to using the "Update" button, otherwise the parameters in the RMU2 will be used to compute these reading values.

7.3.6 Advanced Configuration

The grouping labeled "Advanced Configuration" is mostly beyond the scope of this document and will not be discussed in great detail.

7.3.6.1 4-20mA Current Loop Transducers

The RMU2 may be used to monitor 4-20mA current loop transducers by enabling a special mode in the configuration, and by adding a precision 7.5 or 250 ohm resistor externally to the applicable sense terminals.

Click the "4-20mA Current Loop Transducers" button in the Advanced Configuration grouping. The following dialog should then appear:

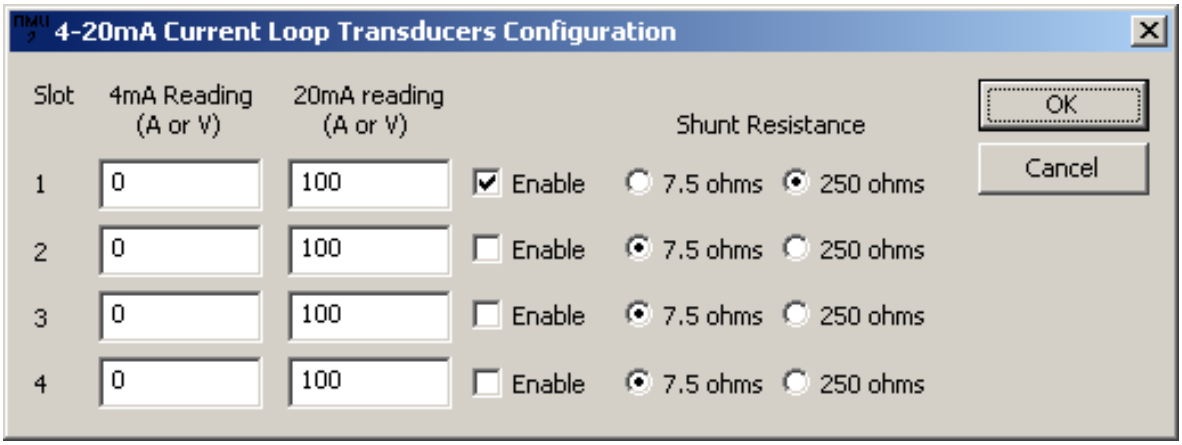


Figure 70 4-20mA Transducer Configuration Dialog

Referring to the "Measurement Type" and the "Readings" grouping on the main dialog box, determine the slot and physical channel that is to be configured for 4-20mA transducer operation. For example, if rectifier volts are to be measured on a measurement type 1 configuration, slot 1 is used to measure the rectifier volts on RMU2 physical channel 1. Check off the "Enable" check box for the appropriate slot.

Next, refer to the specifications for the 4-20mA transducer that is being used to perform the measurements. Make note of the measured value when the transducer is outputting 4mA and also the measured value when the transducer is outputting 20mA. Enter these values into the configuration for the appropriate slot. The 20mA reading must be greater

than the 4mA reading. In the sample dialog above, the transducer outputs 4mA when the input measurement is 0V and outputs 20mA when the input measurement is 100V.

For each 4-20mA configured slot, select the external shunt type, 7.5 ohm or 250 ohm.

Click on "OK" to return to the main configuration dialog. The Slot Scaling configuration box for the slot configured for 4-20mA transducer operation should now appear grey. Finally, click on the "Write to RMU2" button to commit the changes to the RMU2.

Next, the hardware must be installed. An external 7.5 ohm or 250 ohm precision (better than +/-0.5%) shunt resistor must be installed across the channel measurement terminals of the RMU2-B when a channel is configured for 4-20mA transducer operation. Because of the low drop voltage present when using the low resistance 7.5 ohm shunt, the RMU2 may be used in series with another 4-20mA measurement device using the same transducer. When a 250 ohm shunt resistor is used, ensure that the isolated supply feeding the current loop is capable of producing a 5V drop across the shunt resistor, when the loop is outputting 20mA.

The current flow from the transducer should be as shown in the following picture. When current is flowing from the transducer, if a multimeter is placed across the two channel input terminals, the + terminal should have a higher potential than the – terminal. If the RMU2 contains firmware version 10 or higher, the current direction is automatically detected in software and the measurement value is computed accordingly.

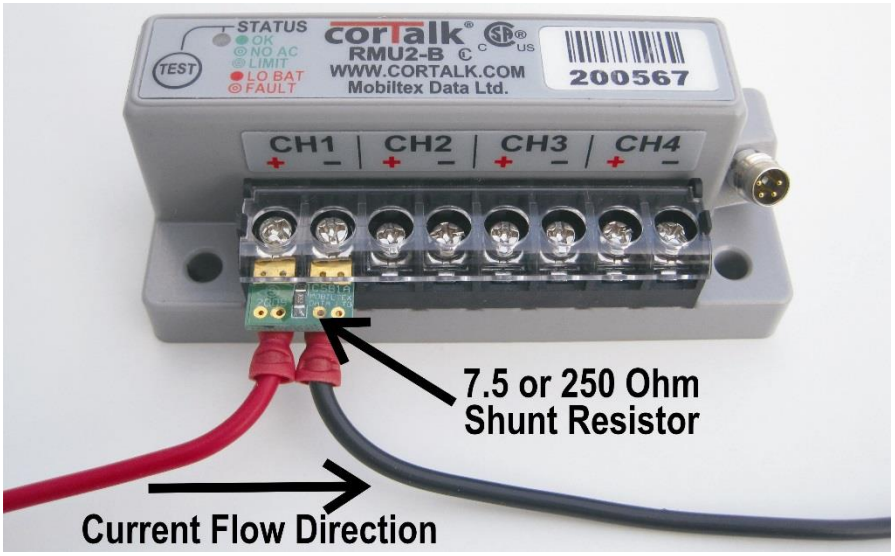


Figure 71 4-20mA Transducer Shunt Resistor Installation

There are several types of 4-20mA transducers—some have integral isolated power supplies, and others rely on external isolated power supplies to drive the current loop. The RMU2 will work with any of these types of transducers. The RMU2 does not provide the loop power supply function. Loop power must be supply by another device. Wiring should be installed as instructed by the 4-20mA transducer manufacturer. The following diagram shows a typical transducer installation:

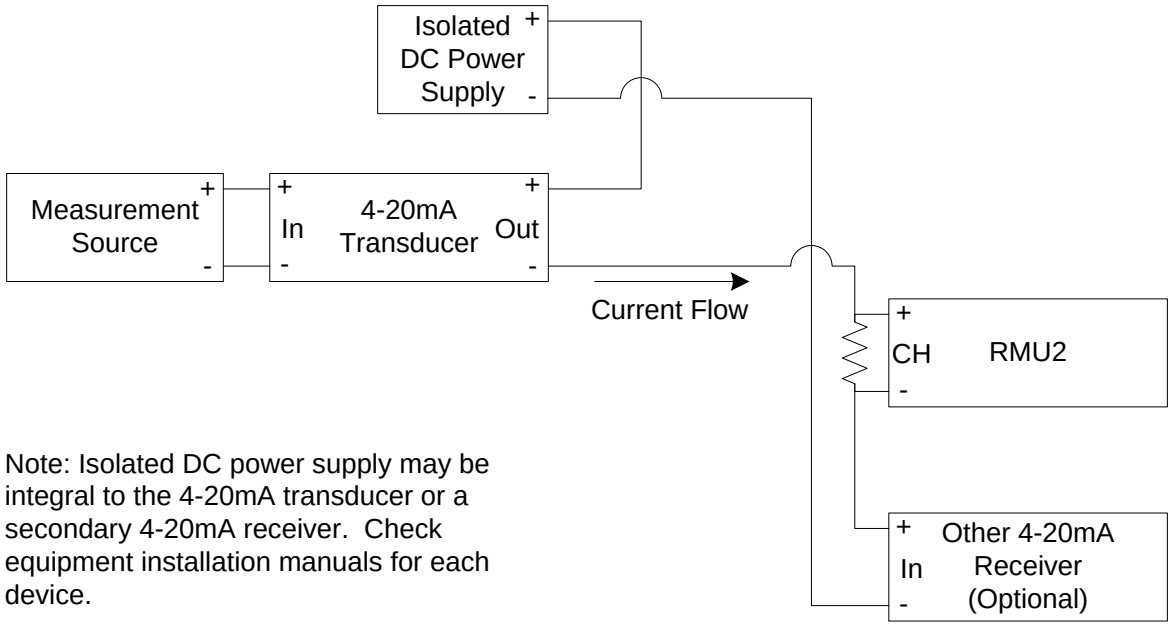


Figure 72 4-20mA Transducer Typical Installation

After completing the wiring, use the "Update" button in the RMU2CONFIG "Reading" grouping to verify the reading from the 4-20mA transducer.

7.3.6.2 Extract Measurement Recorder

For units equipped with RMU2OPTION3 or RMU2OPTION4 features, this button allows the recorded measurement data to be extracted into a comma separate value file that can be easily imported into most spreadsheet applications for analysis.

Click on the "Extract Measurement Recorder" button to start the process. If the RMU2 does not have the measurement recorder option available, a dialog box will pop-up indicating that. Otherwise, a target file selection dialog box will be shown. Select the destination file name and click the "Ok" button. A progress bar dialog will then be shown as the data is transferred from the RMU2. For RMU2OPTION3, this will take approximately 10-15s to complete, and for RMU2OPTION4, it may take 45-60s to complete.

The resultant file may then be opened using a text editor or a spreadsheet application. Note that since the RMU2 does not have a real-time clock in it, sample times are computed using the extraction time and the fixed interval between samples. For the most accurate time stamps, it is best to extract the data at the field location where the unit is operating. This will give a time stamp accuracy of less than 6 hours.

Only data samples taken since the last time the RMU2 was powered up will be time stamped with date/time values. All data samples are stamped with an offset time since the RMU2 was powered on.

The measurement recorder option is a factory configured option which must be selected when purchasing the RMU2:

RMU2OPTION3 – 1 year of readings, taken every 6 hours.

RMU2OPTION4 – 8 years of readings, taken every 6 hours.

An excerpt sample of the output file format is shown here:

```
Extraction Date/Time (UTC):, 06/04/2009 15:14:08

RMU2-B Serial Number:, 100999
RMU2-B Firmware:, 013
RMU2-S ESN:, 0-353867
Latitude:, 51.085541
Longitude:, -113.996826
```

```
Approximate Date/Time (UTC), Rectifier DC Volts, Rectifier DC Amps, Drain1 DC Amps, Drain2 DC
Amps, Temp (C), Temp (F), Measurement Type, Approximate Date/Time (Excel), Time From Powerup
(s), Powerup, AC Enabled, AC Present, Door Enabled, Door Open, Battery Low, In Limit Alarm
06/04/2009 15:14:08, 24.69, DISABLED, DISABLED, DISABLED, 24.5, 76.1, RECT1,
39968.6348078241, 230850, 0, 0, 0, 0, 1, 0, 0
06/04/2009 15:06:38, 24.52, DISABLED, DISABLED, DISABLED, 24.5, 76.1, RECT1,
39968.6295994907, 230400, 0, 0, 0, 0, 1, 0, 0
06/04/2009 14:59:08, 24.49, DISABLED, DISABLED, DISABLED, 24.5, 76.1, RECT1,
39968.6243911574, 229950, 0, 0, 0, 0, 1, 0, 0
...
...
```

7.3.6.3 Measurement Recorder Labels

When extracting the measurement recorder data, it is possible to customize the column headings for each of the data slots. Click on the "Measurement Recorder Labels" button to bring up an editor dialog for the slot labels. After clicking 'OK', the modified labels will be stored on the PC. Each time RMU2Config is started, the customized labels will be used.

7.3.6.4 Activate Feature

The RMU2 configuration application, by default, will limit access to certain features. If it is desired to allow field installers access to these features, then activation codes must be entered into the application. These feature activation codes act as toggles, enabling and disabling the feature. Once a code is entered, the activation state is stored and used each time the application is run.

The following feature activation code(s) may be supplied to end installers if required:

316446389 Manual editing of the latitude and longitude in the Geo-location grouping

7.3.7 RMU2 Communications and Status

"RMU2 Communications and Status" is used for reading and programming the RMU2. It also displays some status information.

7.3.7.1 Serial Port

This drop down only has two settings being "Disabled" and "USB". This must be set to "USB" before any communications with the RMU2 is attempted.

7.3.7.2 Link Status

This field has three settings:

Disabled – Serial port is not connected to the programmer
Idle – Programmer is connected but there is no activity
Busy – Programmer is trying to communicate with the RMU2

7.3.7.3 Last Fault

This field is used by Mobiltex Data to analyze any problem the unit may be having. If you are having problems with the unit, this value should be given to Mobiltex Data Ltd. This number is persistent and will remain unless cleared using the "Clear" button. Once this is done, you must press the "Write to RMU2" button. **Note: All values changed in any of the groupings will be written to the RMU2 (see section Write to RMU2).**

7.3.7.4 Firmware Version

This field contains the version number of the application code installed in the main processor of the RMU2-B.

7.3.7.5 Max Exceptions/6hrs

To save transmission costs in the case of a bad magnetic door switch or user pushbutton, the RMU2 limits the number of these types of exceptions that are sent to CorView during a given 6 hour window. This value is the maximum number of such transmissions that can occur in a 6 hour window. If more than this number of exceptions has occurred, the RMU2 will refuse to send more exceptions in that 6 hour window. At the end of the 6 hour window and at each subsequent 6 hour window, the recorded number of exceptions sent is decremented by one. If the antenna unit is removed from the base for two minutes, and then re-attached, the exception counter is reset to zero.

7.3.7.6 Battery Voltage

This field is the last read battery level from the RMU2S/G antenna.

7.3.7.7 Battery Low Threshold

This field determines at what battery voltage the RMU2 will start indicating a low battery on the LED display indicator.

7.3.7.8 Read From RMU2

This is used to get the current values configured in the RMU2. Note, if you have changed the values in any of the configuration groups, the changes will be over written by pressing this button.

7.3.7.9 Write to RMU2

Once all the configuration settings are set to the appropriate specifications, the unit can be configured by pressing the "Write to RMU2" button. The write can be confirmed by pressing the "Read From RMU2" button to ensure the values are the same.

Note that it is not possible to write the configuration file from an RMU2 into a second RMU2. Because the configuration information contains calibration parameters, the configuration application will not allow this type of operation.

7.3.7.10 Defaults

The RMU2 contains factory defaults that can be loaded using this button. This allows for easy return of a unit to a known state. "Write to RMU2" must be pressed to write the parameters to the active configuration in the RMU2. The configuration interface must be attached to the RMU2 for this function to operate.

8 Mobile Device Configuration

The RMU2 may also be programmed with a compatible iOS or Android-based mobile device when an RBT1 Bluetooth Interface cable or RMU1/2/3 Programming Interface is used. The RBT1 cable (shown in Figure 73) uses Bluetooth Smart (BLE) to enable a wireless connection to a compatible mobile device.



Figure 73 RBT1 Bluetooth Interface Cable

An RMU1/2/3 Programming Interface (Kit A20A0333101) is shown in Figure 74.



Figure 74 RMU1/2/3 Programming Interface

The mobile device must have the RMU2 Config mobile app loaded from either the Apple App Store or the Google Play store, as applicable.

Direct links:

Download on the App Store

GET IT ON Google Play

The iOS app is compatible with any Apple device that has Bluetooth Smart (BLE) capabilities—for the iPhone, model 4S or higher. A list of compatible devices is on the App Store.

The Android app is compatible with any Android device that has Bluetooth Smart (BLE) capabilities and is running Android 4.4.2 or higher. Refer to your device specifications to determine Bluetooth capabilities.

With the RBT1 or RMU1/2/3 programming interface and the app, the need for a PC is eliminated. All configuration functions can be performed with the iPhone/iPad through the RBT1 cable or RMU1/2/3 programming interface via a wireless Bluetooth connection. One limitation with the app is that the datalogger on the RMU2 cannot be extracted; this is due to a bandwidth limitation over the Bluetooth Smart connection.

The RBT1 cable looks like a standard M8 interconnect cable that is used to connect the RMU2 antenna to the RMU2-B base. The cable is waterproof. However, it should NOT be left attached between the RMU2 antenna and base as it will

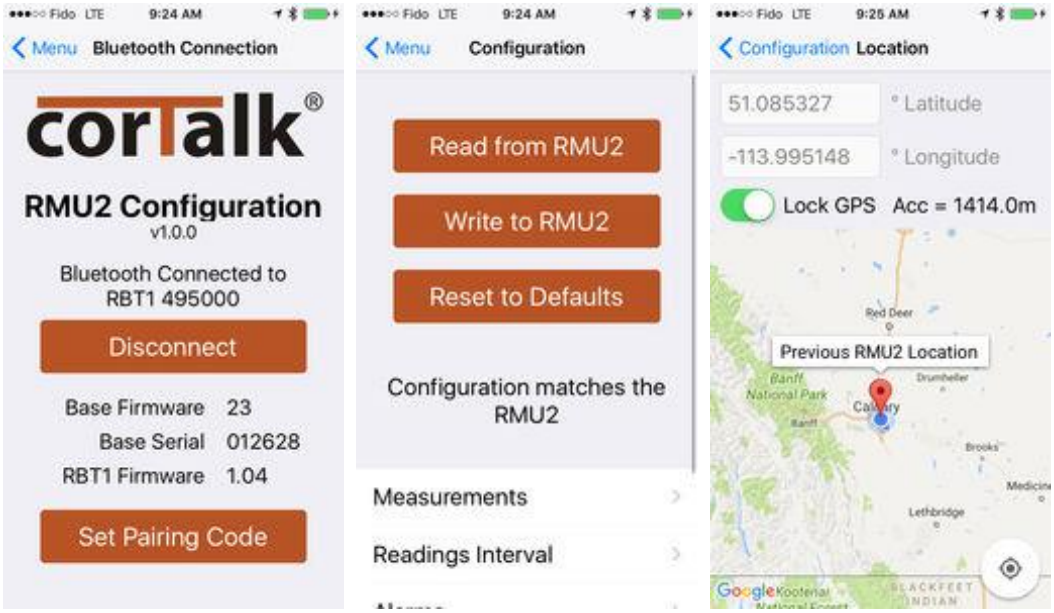
drain the battery if left attached. Instead, the existing M8 cable can be disconnected from the base and the RBT1 temporarily connected between the base and existing M8 cable and then removed once programming is complete. Minimize the length of time it is connected as much as possible or use a sacrificial RMU antenna as a power source, replacing batteries in the sacrificial antenna as needed.

IMPORTANT NOTE: LEAVING THE RBT1 PROGRAMMING CABLE CONNECTED TO THE RMU2 ANTENNA FOR LONG DURATIONS WILL REDUCE THE BATTERY LIFE OF THE RMU2. DISCONNECT THE CABLE IMMEDIATELY AFTER COMPLETION OF CONFIGURATION TASKS.

Once the cable is attached between the base and the antenna (when using an RMU1/2/3 Programming Interface, do not connect to the RMU2 antenna) and the base, the app on the mobile device is started. A connect button in the app initiates the process to connect with the RBT1. A list of active RBT1 cables and RMU1/2/3 Programming Interfaces in the area is brought up; each RBT1 and each RMU1/2/3 Programming Interface has a serial number cable on it to identify the unit. Once the unit is selected, if it is the first connection attempt between the portable device and that programming tool, a pop-up will show up requesting a pairing code. The default pairing code is '123456' (this can be changed).

After the connection is established, capabilities are similar to the PC application, the configuration can be read, modified and written and status information can be polled. Figure 75 shows some sample screenshots from the iOS app; the Android app is similar in appearance.

Since the RMU2 does not have GPS capabilities, the location of the RMU2 is normally set to the phone or tablet's location after connecting. This automatic operation can be disabled in "Application Settings" page of the app. When using a phone, the location is almost always set by an internal GPS having very good (<10m) accuracy. Tablets may have GPS capabilities, but many do not, so their location can be difficult or impossible to determine. In this case, users can manually set the RMU2 location under Configuration options. Loading the map view requires data to visualize similar to Google Maps. By unchecking "Lock GPS", panning around the map sets the new RMU2 location. Alternatively, the latitude and longitude can be typed in similar to the PC RMU2 Configuration Application. It is important that the location of the RMU2 get correctly set in the configuration, as this will be the location shown when viewing the installation site on the CorView map display.



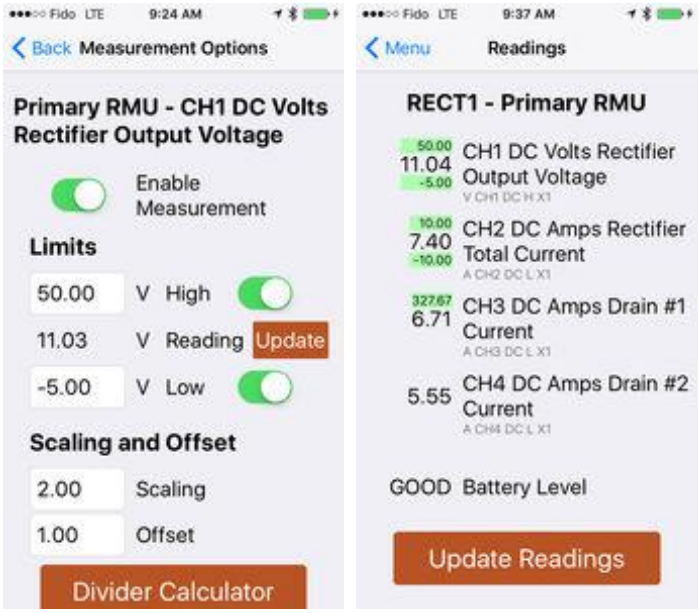


Figure 75 iOS App Sample Screenshots

9 Battery Replacement

1. Remove the RMU2-S/SI/G from its mounting location.
2. If still attached, remove the silicone gasket from the base of the RMU2.
3. Remove the four screws on the base of the RMU2 unit as indicated in the picture below. Each of the screws has an orange rubber o-ring that is used for environmental sealing. Be sure not to lose or damage the o-rings. Set aside the four screws and plastic lid for re-assembly after the batteries have been changed.



Figure 76 RMU2-S/SI/G Assembly Screws

4. Remove the screw securing the battery securing the BHC2 battery retainer board over the batteries. To remove the BHC2B board, slide the board as shown.



Figure 77 Battery Retainer Board Removal

5. Remove the old batteries by popping them out of the battery clips. Install five new AA batteries from the replacement battery kit (Mobiltex P/N B02221RMU20). The batteries are oriented as shown in the picture below.

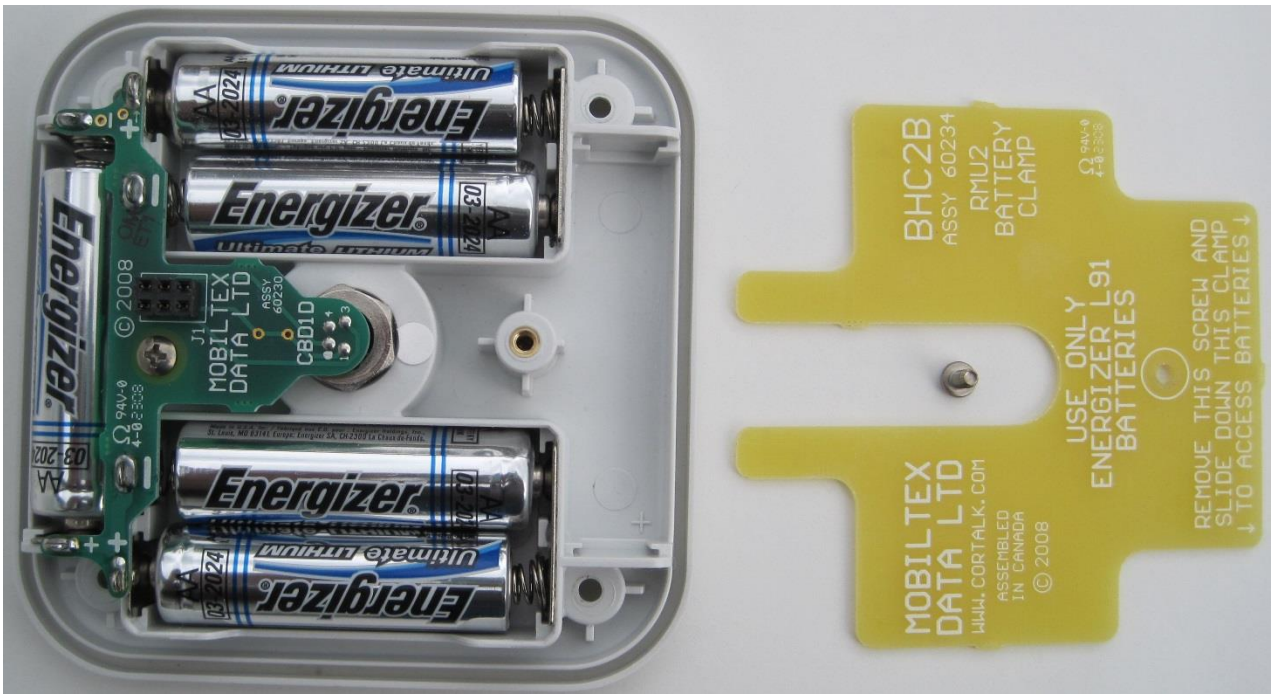


Figure 78 RMU2-S/SI/G Battery Orientation

6. Replace the BHC2B battery retainer board and secure with the previously removed screw.
7. Replace the plastic lid in an orientation such that connector J1 will properly mate between the circuit boards. Ensure that the four assembly screws still have o-ring gaskets attached. Re-install the assembly screws.
8. Re-install the RMU2-S/SI/G as instructed in section 6.1.

No other maintenance or cleaning is 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.cortalk.com

A. Equipment Specifications

RMU2-B (Base Unit)

Operating Temperature	-40° to +60° C (-40° to +140° F), not including batteries
Storage Temperature	-45° to +80° C (-49° to +176° F), not including batteries
Humidity	0 to 100% RH non-condensing
Pollution Degree	1
Measurement Type	Category 2 (as per CSA C22.2 – 61010)
Maximum Altitude	5000 meters above sea level
RMU2-B Size	100mm x 38mm x 38mm (4.0” x 1.5” x 1.5”)
Analog Ranges (DC & AC)	+/- 150mVDC only +/- 20VDC, 14.1V true RMS, +/-20Vpeak +/-150VDC(+/- 119VDC for TEG sources), 105V true RMS, +/-150Vpeak 4-20mA (with external precision shunt resistor)
AC Rejection on DC Readings	>65dB @ 50/60Hz
RMU2-B Weight	135 grams (4.8 oz)
RMU2-B Enclosure	UV stable, wide temperature polycarbonate
External Analog Channels	4 galvanically isolated, high impedance
Lightning Immunity	Survives multiple 20KV 10mS surges
DC Measurement Accuracy	+/- 0.5% of full-scale over -40° to +60° C (-40° to +140° F)
AC Measurement Accuracy	+/- 1.0% of full-scale over -40° to +60° C (-40° to +140° F)
ADC Resolution	16 bits
Temp. Measurement Accuracy	+/-4° C (+/-7° F) over -40° to +60° C (-40° to +140° F)
Door / Tamper Switch	Activated by external magnet (included with device kit)
AC Line Presence Detector	Active on at > 80VAC RMS, 50/60Hz

RMU2-S (Globalstar Simplex Satellite Version)

Operating Temperature	-40° to +60° C (-40° to +140° F), not including batteries
Storage Temperature	-45° to +80° C (-49° to +176° F), not including batteries
Humidity	0 to 100% RH non-condensing
Pollution Degree	2
RMU2-S Size	97mm x 97mm x 52mm (3.8” x 3.8” x 2.0”)
RMU2-S Weight	275 grams (9.7 oz)
RMU2-S Enclosure	Watertight, UV stable, wide temperature polycarbonate
RMU2-S Internal Batteries	5 AA 1V5 Energizer L91 Lithium Batteries (7V5 total)
RMU2-S Battery Life	>7 years based on readings every 2 days, sent every 8 days
Internal Battery Measurement	OK, Warning and Low conditions displayed on CorView
Communications	Globalstar Simplex Satellite
Mounting	Suitable for outdoor use

RMU2-SI (Iridium SBD Satellite Version)

Operating Temperature	-40° to +60° C (-40° to +140° F), not including batteries
Storage Temperature	-45° to +80° C (-49° to +176° F), not including batteries
Humidity	0 to 100% RH non-condensing
Pollution Degree	2
RMU2-S Size	97mm x 97mm x 52mm (3.8” x 3.8” x 2.0”)
RMU2-S Weight	275 grams (9.7 oz)
RMU2-S Enclosure	Watertight, UV stable, wide temperature polycarbonate
RMU2-S Internal Batteries	5 AA 1V5 Energizer L91 Lithium Batteries (7V5 total)
RMU2-S Battery Life	>7 years based on readings every 2 days, sent every 8 days
Internal Battery Measurement	OK, Warning and Low conditions displayed on CorView
Communications	Iridium SBD Satellite
Mounting	Suitable for outdoor use

RMU2-G (Cellular Versions)

Operating Temperature	-40° to +60° C (-40° to +140° F), not including batteries
Storage Temperature	-45° to +80° C (-49° to +176° F), not including batteries
Humidity	0 to 100% RH non-condensing
Pollution Degree	2
RMU2-G Size	97mm x 97mm x 52mm (3.8” x 3.8” x 2.0”)
RMU2-G Weight	275 grams (9.7 oz)
RMU2-G Enclosure	Watertight, UV stable, wide temperature polycarbonate
RMU2-G Internal Batteries	5 AA 1V5 Energizer L91 Lithium Batteries (7V5 total)
RMU2-G Battery Life	>7 years based on readings every 2 days, sent every 8 days
Internal Battery Measurement	OK, Warning and Low conditions displayed on CorView
Lightning Immunity	Survives multiple 20KV 10mS surges
Communications:	Quad-band GSM Cellular (850/900/1800/1900MHz) (GSM Model)
	Quad-band GSM Cellular (850/900/1800/1900MHz) and Tri-band UMTS+ Cellular (850/1700/1900) (UMTS Model)
	Dual-band UMTS+ (850/1900MHz) and Penta-band LTE (850/1900/B4/B12/B13)(LTE Model)
Mounting	Suitable for indoor/outdoor use

B. RMU2-S Satellite Coverage Map

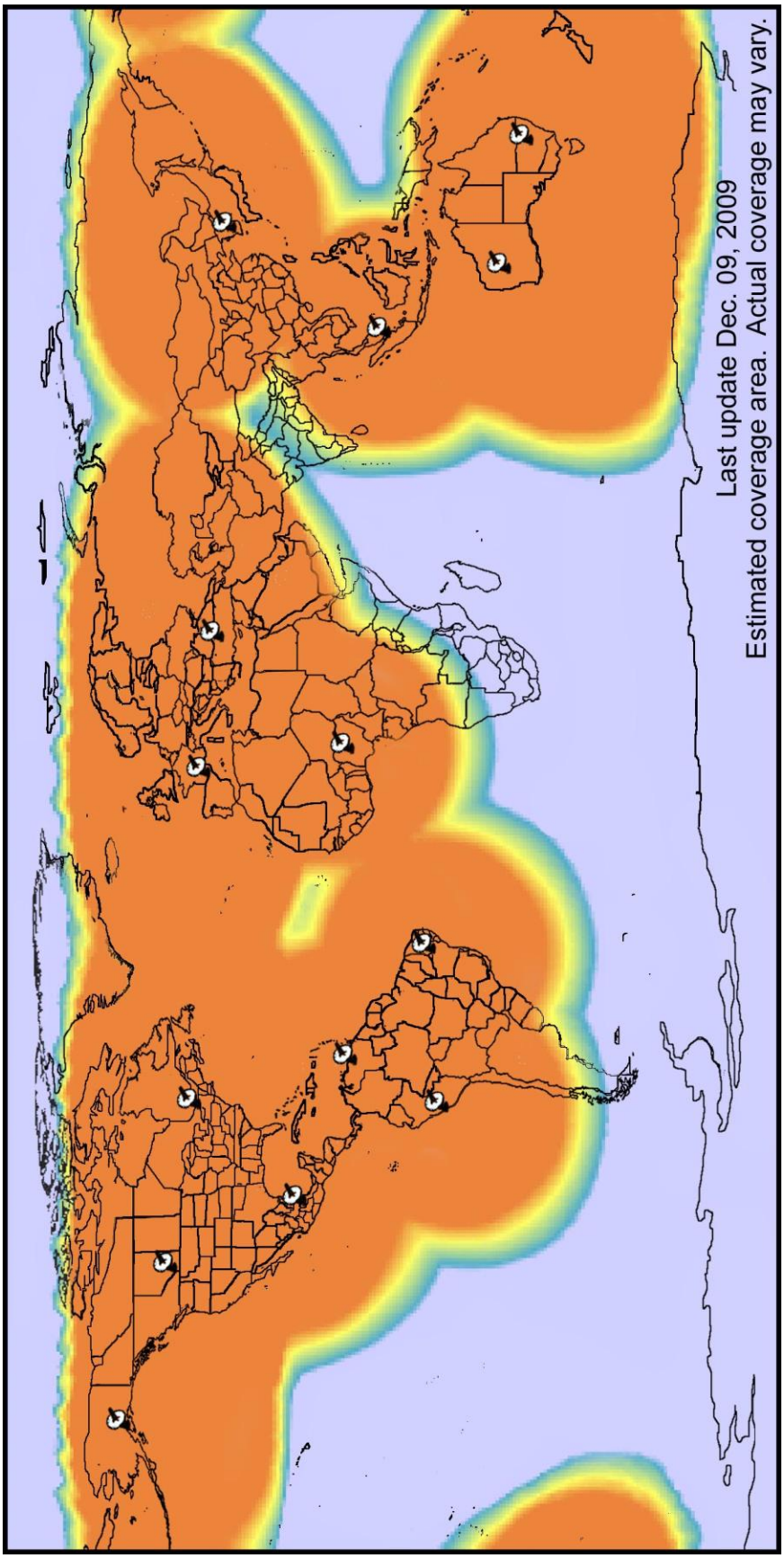


Figure 79 Globalstar Simplex Satellite Coverage Map

C. RMU2-SI Iridium SBD Satellite Coverage Map



Iridium offers complete pole-to-pole coverage in all areas of the Earth due to its cross-linked polar orbiting constellation.