RMU1ER

Installation and Configuration Guide



RMU1ER-I



RMU1ER-G

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1 Introduction

The RMU1ER 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 RMU1ER is a low cost, high reliability device intended to monitor electrical resistance (ER) probes. The device is available in a satellite (RMU1ER-I) and a cellular (RMU1ER-G) communication configurations. The field hardware consists of a single component that is usually mounted inside a plastic test station. The device operates for 5+ years from internal, low cost, field replaceable batteries. This self-powered solution can be used to monitor ER probes without the requirement for nearby line or solar power sources. The RMU1ER has integral high-energy surge suppression and provides unprecedented lightning immunity because there are no connections to electrical ground.

The RMU1ER monitors and transmits five channels of information. An integral IR proximity sensor can be used as a cap open sensor or tamper detection alarm. The RMU1ER measures temperature and internal battery voltage. A user accessible magnetic switch allows the transmission of uniquely identified messages that can be used to record site visit information.

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.

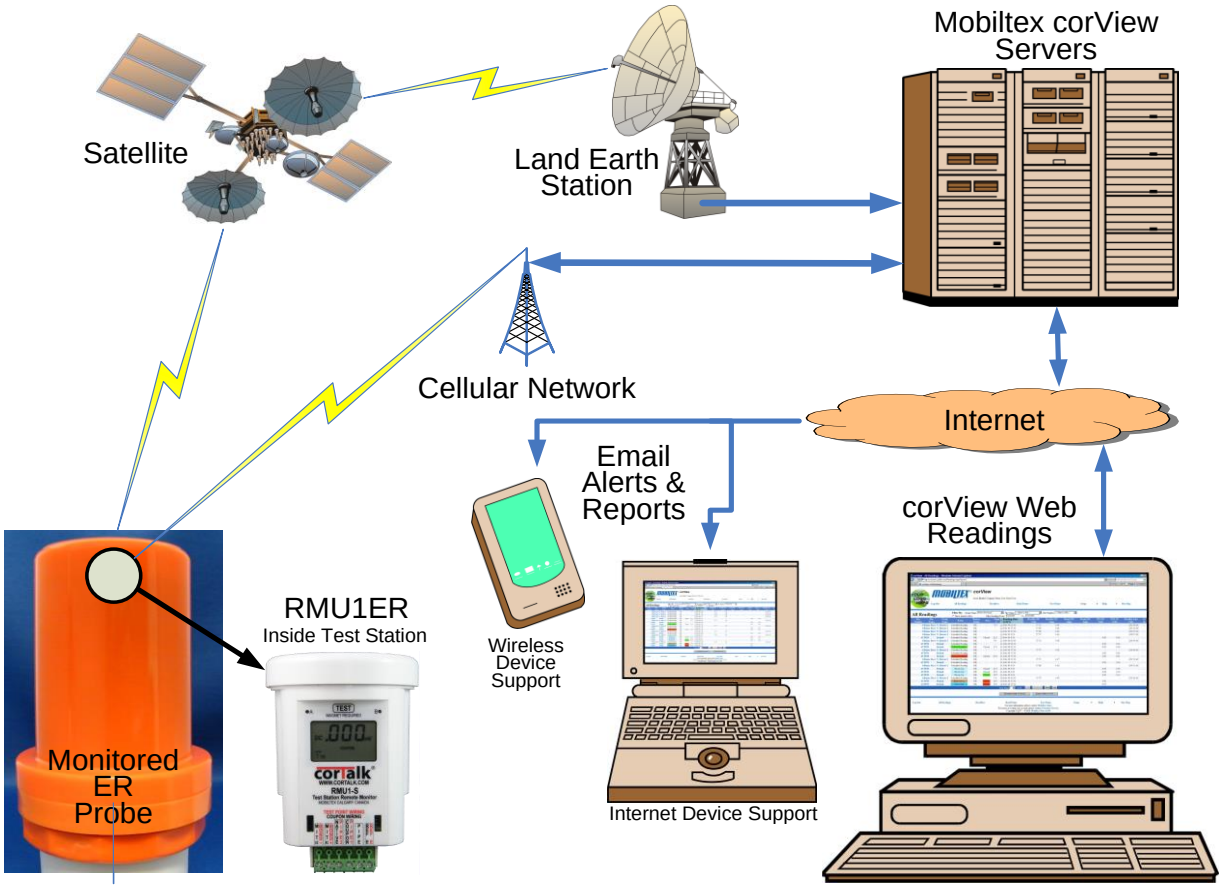


Figure 1 RMU1 Communications Block Diagram

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

3 Kit Contents

3.1 RMU1ER-I (Iridium SBD Satellite) Kit A20A0332801

 s	1 pc – RMU1ER-I remote monitoring unit. Typically installed inside a test station. Mobiltex Part Number A1506032801
	1 pc – ½" #6-32 screw This item comes pre-attached to a mating nut in the RMU1ER unit. Mobiltex Part Number H013120500S

Table 1 RMU1ER-I Kit Contents

3.2 RMU1ER-G (LTE Cellular) Kit A20A0332802 (USA), A20A0332803 (Canada)

	1 pc – RMU1ER-G remote monitoring unit. Typically installed inside a test station. Mobiltex Part Number A1506032802 (USA) Mobiltex Part Number A1506032803 (Canada)
	1 pc – ½" #6-32 screw This item comes pre-attached to a mating nut in the RMU1ER unit. Mobiltex Part Number H013120500S

Table 2 RMU1ER-G Kit Contents

3.3 RMU1ER Optional Installation Items

	RMU1ER MS Adapter Cable 90 cm (36 in.) wiring harness with factory installed circular connector. Allows use with Metal Samples and other similar ER probes. Mobiltex Part Number A022001ER01
	RMU1ER Measurement Prover Used to validate RMU1ER metal loss measurements. Simulates a 40mil ER wire probe with a fixed metal loss. Mobiltex Part Number A040001ER01
	Replacement Battery Pack Kit of 4 AA batteries for maintenance purposes Mobiltex Part Number B02221RMU10
	RMU1PGM-BT Programming Interface Kit Mobiltex Part Number A20A0332701 Capable of Bluetooth communications with a phone/tablet. Can also be used with a PC through the USB connection. Black USB cable. Kit includes a carrying case and portable USB battery pack.
	RMU1ADP RMU2/3 Programmer Adapter Mobiltex P/N A1506033001 Allows an existing RMU2/3 Programming Interface to be used with RMU1 and RMU1ER devices.
	RMU1/2/3-BT Programmer Kit Mobiltex P/N A20A0333101 Universal programming kit for RMU1, RMU1ER, 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.

	
	Test Magnet Mobiltex Part Number H00000MAG04
	Modified RMU1 Replacement Lid For Direct Installation In 3” Pipe Mobiltex Part Number H23390RMU02 Only for RMU1ER-G.
	Spacer Ring For 3” Test Stations Mobiltex Part Number H23510RMU01 (Black) Mobiltex Part Number H23530RMU01 (Orange) Mobiltex Part Number H23540RMU01 (Yellow) Mobiltex Part Number H23550RMU01 (Green) Mobiltex Part Number H23590RMU01 (White) Mobiltex Part Number H23560RMU01 (Blue) Mobiltex Part Number H235A0RMU01 (Red)
	Test Station with 5 plated screws and top cover (Pro-Mark) Mobiltex Part Number A20A03RMU10 (Orange) Mobiltex Part Number A20A03RMU11 (Yellow) Mobiltex Part Number A20A03RMU12 (Green) Mobiltex Part Number A20A03RMU13 (White) Mobiltex Part Number A20A03RMU17 (Blue) Mobiltex Part Number A20A03RMU16 (Red)
	Lockable bracket for Pro-Mark test station. (Padlock & test station not included) Mobiltex Part Number A20B03RMU10 Only for RMU1ER-G.

	Lockable NEMA4X Enclosure 6.75”W x 7.5”H x 5.5”D (171mm x 190mm x 140mm) Comes with RMU1 bracket. Mobiltex Part Number A03700RMU10

Table 3 RMU1 Accessories

4 Quick Bench Test

1. For the RMU1ER-I, locate the RMU1ER outdoors with a clear view (120 degrees in all directions is optimum) of the sky and with the top dome with the molded CorTalk® logo of the device facing upwards towards the sky. RMU1ER-I battery life will be significantly impacted by poor sky views since communication with the satellite constellation is attempted and re-attempted until the satellite system acknowledges the transmission. The RMU1ER-G cellular antenna, located in the top dome area, requires a clear communications path to a cellular tower; optimal orientation will be site dependent.

2. Power on the RMU1ER by twisting the lid clockwise until a switch click is heard. The LCD display will display "Init" (if programmer is attached) briefly followed by "bSY" for several seconds. The lid should be rotated an additional 1/2 turn after the switch click is heard in order to fully engage the sealing gasket.

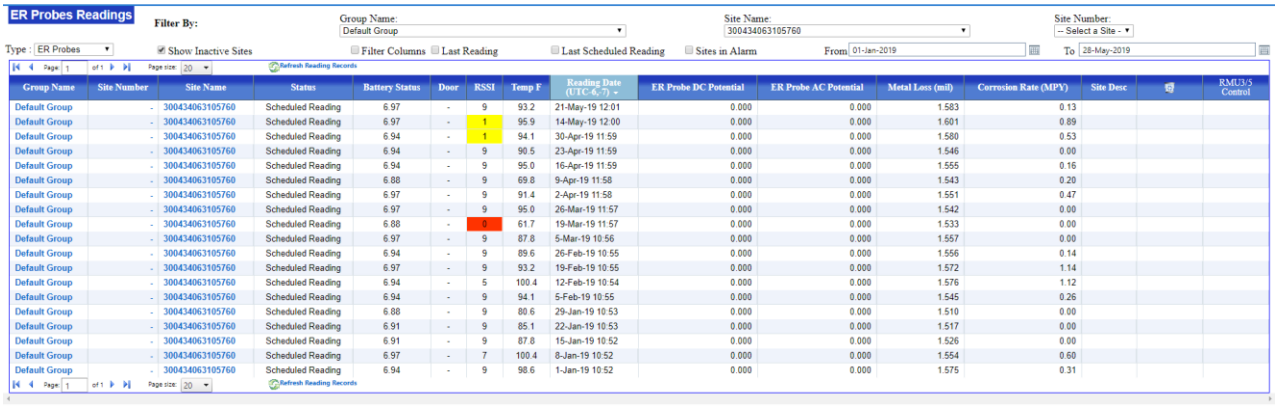
3. If the GPS receiver is enabled in the configuration, the RMU1ER will display the 'GPS' icon on the LCD display and also show a number in the format of 'X.YY' where X is the number of satellites being received and YY is the average signal strength of those satellites. The RMU1ER will not send a power-up message or display measurements on the LCD screen until GPS signal acquisition is complete.

4. 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.

5. 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 click on the refresh button (typically F5) in your browser.

   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.



Group Name	Site Number	Site Name	Status	Battery Status	Door	RSSI	Temp F	Reading Date (UTC-6:7)	ER Probe DC Potential	ER Probe AC Potential	Metal Loss (mil)	Corrosion Rate (MPY)	Site Desc	RMU3/5 Control
Default Group	-	300434063105760	Scheduled Reading	6.97	-	9	93.2	21-May-19 12:01	0.000	0.000	1.583	0.13		
Default Group	-	300434063105760	Scheduled Reading	6.97	-	1	95.9	14-May-19 12:00	0.000	0.000	1.601	0.89		
Default Group	-	300434063105760	Scheduled Reading	6.94	-	1	94.1	30-Apr-19 11:59	0.000	0.000	1.580	0.53		
Default Group	-	300434063105760	Scheduled Reading	6.94	-	9	90.5	23-Apr-19 11:59	0.000	0.000	1.546	0.00		
Default Group	-	300434063105760	Scheduled Reading	6.94	-	9	95.0	16-Apr-19 11:59	0.000	0.000	1.555	0.16		
Default Group	-	300434063105760	Scheduled Reading	6.88	-	9	69.8	9-Apr-19 11:58	0.000	0.000	1.543	0.20		
Default Group	-	300434063105760	Scheduled Reading	6.97	-	9	91.4	2-Apr-19 11:58	0.000	0.000	1.551	0.47		
Default Group	-	300434063105760	Scheduled Reading	6.97	-	9	95.0	26-Mar-19 11:57	0.000	0.000	1.542	0.00		
Default Group	-	300434063105760	Scheduled Reading	6.88	-	0	61.7	19-Mar-19 11:57	0.000	0.000	1.533	0.00		
Default Group	-	300434063105760	Scheduled Reading	6.97	-	9	87.8	5-Mar-19 10:56	0.000	0.000	1.557	0.00		
Default Group	-	300434063105760	Scheduled Reading	6.94	-	9	89.6	26-Feb-19 10:55	0.000	0.000	1.556	0.14		
Default Group	-	300434063105760	Scheduled Reading	6.97	-	9	93.2	19-Feb-19 10:55	0.000	0.000	1.572	1.14		
Default Group	-	300434063105760	Scheduled Reading	6.94	-	5	100.4	12-Feb-19 10:54	0.000	0.000	1.576	1.12		
Default Group	-	300434063105760	Scheduled Reading	6.94	-	9	94.1	5-Feb-19 10:55	0.000	0.000	1.545	0.26		
Default Group	-	300434063105760	Scheduled Reading	6.88	-	9	80.6	29-Jan-19 10:53	0.000	0.000	1.510	0.00		
Default Group	-	300434063105760	Scheduled Reading	6.91	-	9	85.1	22-Jan-19 10:53	0.000	0.000	1.517	0.00		
Default Group	-	300434063105760	Scheduled Reading	6.91	-	9	87.8	15-Jan-19 10:52	0.000	0.000	1.526	0.00		
Default Group	-	300434063105760	Scheduled Reading	6.97	-	7	100.4	8-Jan-19 10:52	0.000	0.000	1.554	0.60		
Default Group	-	300434063105760	Scheduled Reading	6.94	-	9	98.6	1-Jan-19 10:52	0.000	0.000	1.575	0.31		

Figure 2 CorView Readings Page

6. Pressing a magnet against the area marked "TEST" on the RMU1ER for 1-5seconds will force an immediate analog measurement and data transmission.

7. 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.

8. When the bench test is completed, simply loosen the cap on the RMU1ER by twisting counter-clockwise until a switch click is again heard. This action forces the RMU1ER device to power down. Rotate the lid an additional ½ turn to ensure the device remains powered down.

5 Installation

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

Installation consists of three steps: unit installation, wiring, and device configuration.

5.1 Unit Installation



Figure 3 RMU1ER Installation Hardware

The RMU1ER may be installed inside an industry standard test station, or with an optional cap, directly onto a 3" PVC pipe. To accommodate a standard test station, a spacer ring is required to raise the test station cap enough to allow the RMU1ER-G to fit; for the RMU1ER-I, two spacer rings are needed. The spacer ring attaches to the threaded portion of the lower test station mount. With specialized cover locking systems or for other special test station installations, it may also be possible to cut off part of the test station terminal board to make room for the RMU1ER; in that case the spacer ring would not be needed.



Figure 4 RMU1ER Installed In Test Station

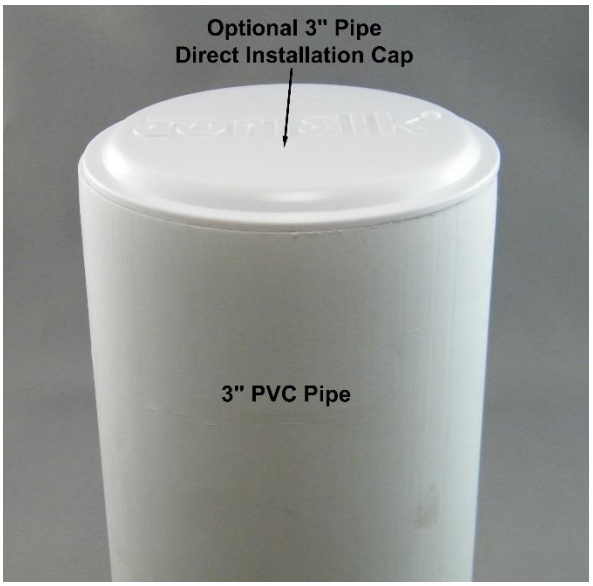


Figure 5 Three Inch Pipe Direct Installation



Figure 6 Installation Inside NEMA4X Box

5.2 ER Probe Installation and Connection

The CorTalk RMU1ER enables corrosion measurements through the use of sacrificial electrical resistance (ER) probes. While Mobiltex does not manufacture ER probes, the RMU1ER is designed to be compatible with a wide range of ER probes from vendors specializing in the manufacturing and design of those probes.

The RMU1ER requires an adapter cable that connects to the selected ER probe connector. One of the ER probe industry standard connectors is a large 6-pin circular connector (Amphenol MILSPEC 97-14S-6P). This connector style is accommodated by cable P/N A022001ER01 (see Appendix D for a wiring schematic). For other connector types, consult with your Mobiltex sales representative. The RMU1ER has the capability to measure ER probes constructed with the following geometries: Tubular, wire, cylindrical, flush, spiral and strip. Any ER probe with separate reference and corrosion coupon portions can, in theory, be accommodated.



Figure 7 RMU1ER Large Circular Connector Adapter Cable (P/N A022001ER01)



Figure 8 Cylindrical ER Probe Example



Figure 9 Flush ER Probe Example

Selection of the probe type and thickness should be made in consultation with the ER probe manufacturer as the required geometry, metallurgy and thickness are determined by environmental conditions at the installation site. Installation of the ER probe should be per the manufacturer's instructions. For in-ground probes, pay attention to any requirements for electrically connecting the probe to the protected structure being monitored. The ER probe cable connector must be within 1m (3') of the intended RMU1ER installation point.

Plug the adapter cable (see Figure 7) into the 6-pin straight connector on the RMU1ER. Plug the other end of cable into the mating ER probe connector and tighten the threaded ring to lock the connector together.

In addition to metal loss, the RMU1ER can also measure the ER probe potential when a reference cell is connected to the REF CELL terminal on the RMU1ER. As the ER probe is typically electrically connected to the protected structure, the structure potential can be measured. The REF CELL terminal is the unused connection on the adapter cable green connector (see Figure 10). Connect a wire between the reference cell and the terminal on the green connector. Structure potential (pipe-to-soil) measurements will typically be negative for CuCuSO4 reference cells with a protected structure. The allowable range for potential signals is +/-34VDC/24VAC. If a reference cell is not attached, the potential slots in the RMU1ER configuration should be set to disabled.



Figure 10 Reference Cell Connection to RMU1ER

5.3 Configuration

Once the ER probe is wired, the ER probe characteristics, scaling factors (if used), and alarm limits (if used) should be programmed into the RMU1ER using the RMU1PGM configuration tool (see section 6).

5.4 Startup and Verification

All wiring should be secured and inspected before the RMU1ER is powered on. The RMU1ER will start operation when the lid is screwed down. The lid should be turned an additional ½ turn after the switch click is heard in order to fully engage the sealing gasket.

After the RMU1ER is powered, observe that the RMU1ER "Status" LCD indicator turns on (refer to section 5.5 for detailed LCD operation descriptions). If the GPS receiver is enabled in the configuration, the RMU1ER will display the 'GPS' icon on the LCD display and also show a number in the format of 'X.YY' where X is the number of satellites being received and YY is the average signal strength of those satellites. The RMU1ER will not send a power-up message or display measurements on the LCD screen until GPS signal acquisition is complete.

Transmissions from RMU1ER-I and RMU1ER-G devices should be received usually in less than one minute. If the RMU1ER programming interface is attached to the RMU1ER at power-up, the power-up message will be delayed by 5 minutes.

Place a magnet at the point labelled "TEST" on the RMU1ER for between 1s and 5s to initiate an immediate measurement cycle and "Button Press" exception transmission to the CorView web host. Note that a maximum of 6 "Test" transmissions are allowed during a 12-hour period. Test transmissions are only possible after the initial RMU power-up message has been sent to CorView.

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 RMU1PGM configuration tool. 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.

5.5 Status Display

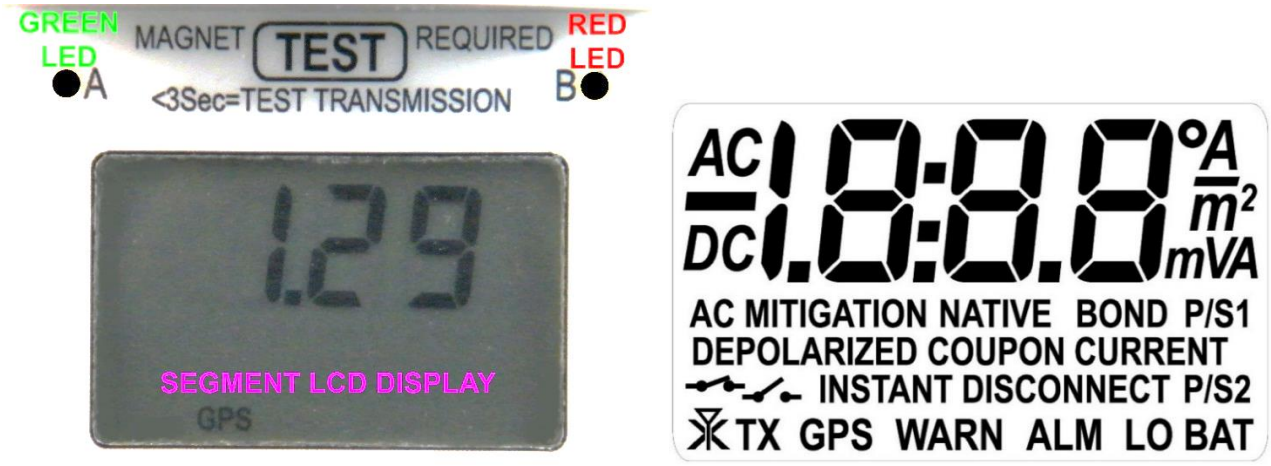


Figure 11 RMU1ER Segment LCD and LED Status Indicators

The RMU1ER has a segmented LCD display and two LED indicators (A and B, see Figure 11) that provide status information to the user. The LCD and LEDs function as follows:

- The LED indicators are currently only used by the firmware loader function. They should remain off during normal operation.
- The LCD display is used to convey measurement value data and other status information. Additional icons indicate operation of the internal GPS receiver, transmitter activity, battery low status, and fault status. The numeric display will cycle through all enabled measurement slots with a new slot shown approximately every three seconds. The LCD display is active when the proximity sensor detects that the test station cap has been removed or when the

programming interface is attached to the unit. If the proximity sensor is not enabled, the LCD will only display for the first minute after the unit is powered on. To enable the LCD display in this case, place the test magnet in the location shown in Figure 12.

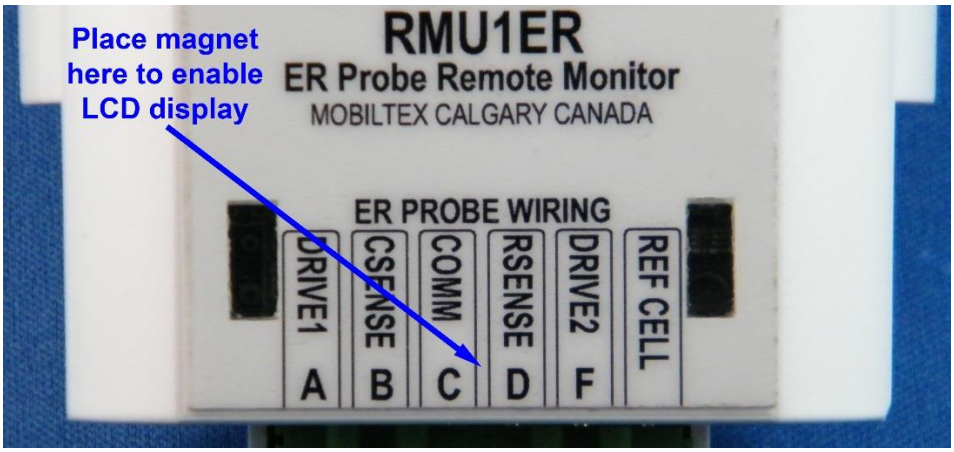


Figure 12 LCD Enable Magnet Location

- A maximum magnitude of 1999 can be shown by the 3.5 digit display. Any values larger will be shown as 'OVR'.
- The following special icons are shown:

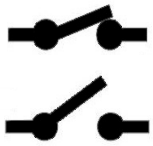
Icon	Description
	Not used on the RMU1ER product.
	Communications antenna is enabled. For the cellular version of the RMU1ER, an 'X' is shown through the antenna symbol if there is no cellular coverage available. For the RMU1ER-I, an 'X' is shown through the antenna symbol if the satellite network is not currently visible.
TX	Communications antenna is transmitting.
GPS	GPS receiver is powered on and acquiring position and time information.
WARN	Currently unused. Reserved for use in future firmware updates.
ALM	A fault condition exists. Use the RMU1ER configuration software to retrieve further details.
LO BAT	The RMU1ER batteries are low in capacity and should be changed at first opportunity.

Table 4 Description of Special LCD Icons

6 Configuration Using a PC

6.1 Configuration Equipment Requirements

The following items will be needed when configuring an RMU1ER.

1. RMU1 Programming Interface (A15000RMU1P or A20A0332701) or RMU1/2/3 Programming Interface with RMU1ADP (Kit A20A0333101)

   The RMU1 programming interface is shown in Figure 13. It has one cable exiting, a USB cable that attaches to a PC. The interface is powered from the PC USB port, so an external power supply in not required. USB cable color may be either white (A15000RMU1P) or black (A20A0332701).

   The RMU1/2/3 programming interface and RMU1ADP adapter are shown in Figure 14. The RMU1ADP cable is plugged into circular connector on the RMU1/2/3 programming interface labelled 'TO RMU1/2/3 BASE". The interface is powered from the PC USB port, so an external power supply in not required.

2. Programming Application and Driver CD or USB Key

   To use the programming interface, you will require the CD or USB key that shipped with the programming interface box. The CD/USB key contains drivers and an application for the RMU1 programming interface. If you do not have the media, the contents can be downloaded from the Mobiltex support site. Contact your Mobiltex representative for download instructions.

3. Personal Computer (PC)

   The application software and drivers require that the PC be running Windows 7 or higher for an operating system. The PC must have an available USB port.



Figure 13 RMU1 Programming Interface



Figure 14 RMU1/2/3 Programmer With RMU1ADP

6.2 Software Installation

To install the configuration application and driver software, insert the media that came with the programming interface into the CD drive or USB port on the PC. If "autorun" is enabled on the PC, the following screen in Figure 15 will appear.

If "autorun" is not enabled, or the contents of the media have been copied to a local directory, use Windows Explorer to navigate to the drive and directory containing the installation software. Double-click on the "RMUINSTALLER.exe" application. The dialog on Figure 15 will appear.

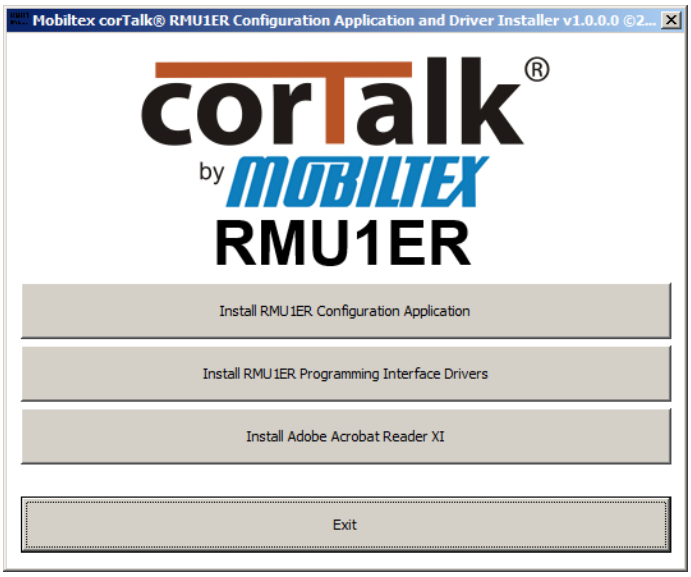


Figure 15 RMU1ER-Installer Dialog

6.2.1 Driver Installation

From the RMU1ER Installer screen, click the "Install RMU 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.

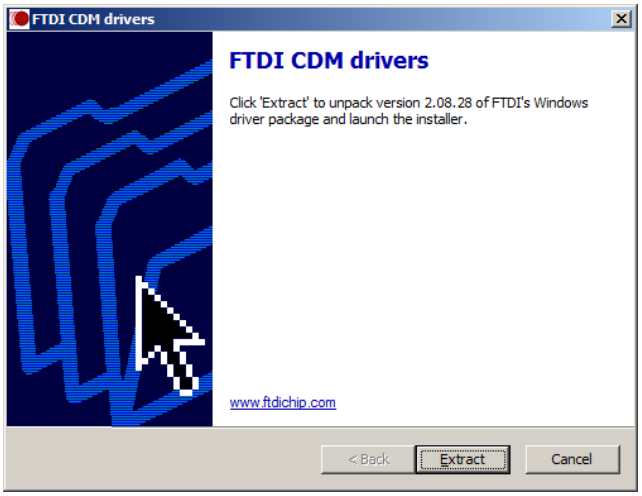


Figure 16 Driver Installation Screen

Once the driver installer completes, you may then plug in the RMU1 programming 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 RMU1 programming 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 17 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.

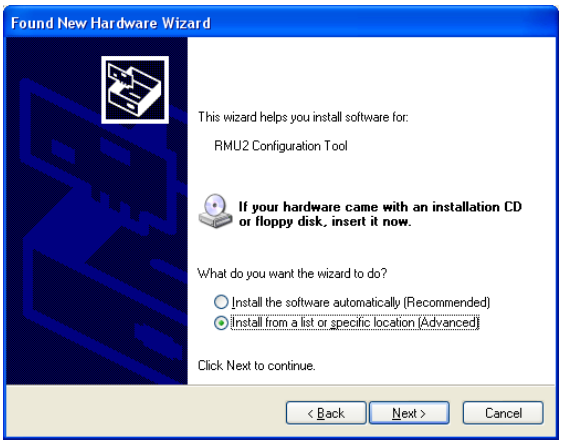


Figure 18 Driver Installation - Install From Specific Location

Choose to install from a specific location since you have the installation CD, USB key 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 19.

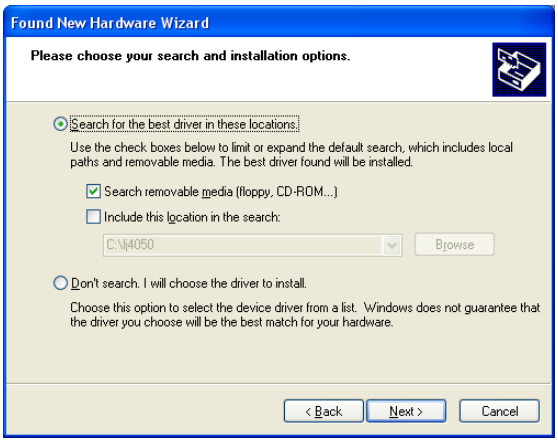


Figure 19 Driver Installation - Driver Location Selection

Insert the CD or USB key that came with the programming interface.

If you do not have the installation CD or USB key 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.

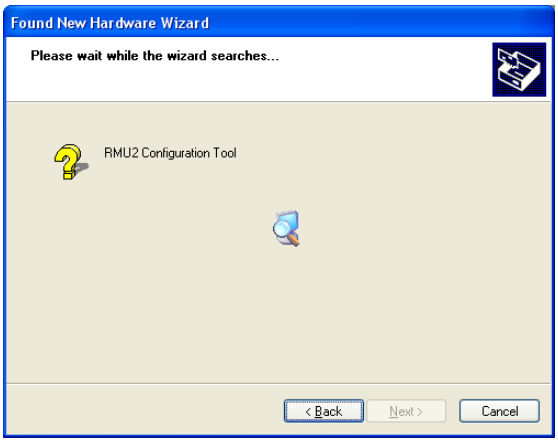


Figure 20 Driver Installation - Driver File Search

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.

6.2.2 Configuration Application Installation

Click on the “Install RMU1ER Configuration Application” button to start the application installer. A security warning dialog may appear. Click the “Run” button to continue.

The following dialog should now appear:

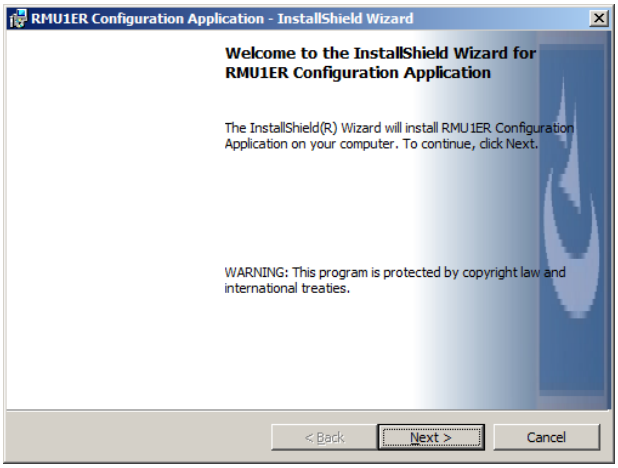


Figure 21 RMU1ER Configuration Application Installation Dialog

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 22. Click “Close” to complete the installation.

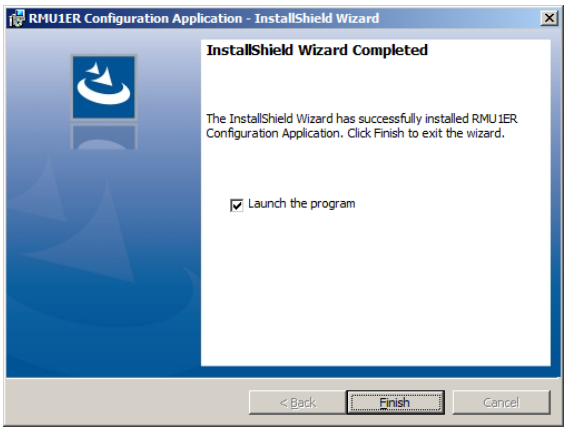


Figure 22 RMU1ER Configuration Application Installation Complete

A shortcut to the configuration application and the RMU1ER manual are created in the Windows start menu under the "RMU1ER Configuration Application" folder.

6.2.3 Adobe Acrobat Reader XI

Adobe Acrobat Reader XI is provided on the CD/USB stick to allow viewing of the PDF version of the RMU1ER 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 RMU1ER Installer dialog, and follow the instructions provided by the Acrobat Reader installation application.

6.3 RMU1ER Configuration

Attach the supplied USB cable between the PC and the programming interface. Place the programming interface on the RMU1ER unit as shown in Figure 23. The programmer alignment plate will wedge between the green terminal block and the body of the RMU1ER.



Figure 23 RMU1 Programming Interface Installation

Start the configuration software by clicking on "RMU1ER Configuration" shortcut in Windows start menu, under the "RMU1ER 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.

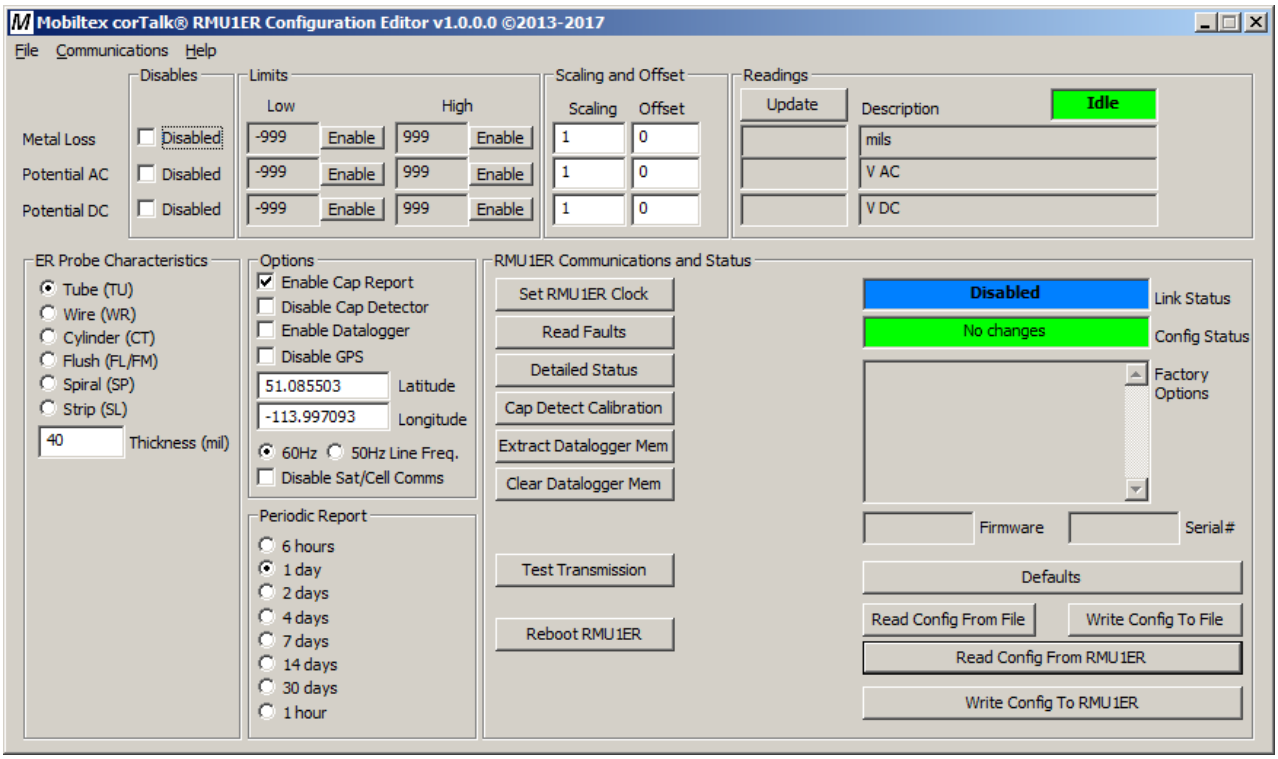


Figure 24 RMU1ERCONFIG Main Screen

Next, attach the programming interface to the RMU1ER that requires programming.

The first step in configuring a device is to read in the current settings from the unit. Click on "Read Config From RMU1ER". The "Link Status" field will briefly show "Busy" as the current configuration parameters are read from the RMU1ER. After the link status returns to "Idle", you will see the configuration settings currently in the RMU1ER. If the RMU1ER is not responding or not connected, an error dialog will pop up.

Once communications have been established with the RMU1ER, the RMU1ER parameters can be configured for the requirements of a particular installation site.

6.3.1 RMU1ER Communications and Status

"RMU1ER Communications and Status" is used for reading and programming the RMU1ER. It also displays some status information.

6.3.1.1 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 RMU1ER

6.3.1.2 Firmware

This field contains the version number of the application code installed in the main processor of the RMU1ER.

6.3.1.3 Serial#

The manufacturing serial number of the RMU1ER is indicated in this field.

6.3.1.4 Read Config From RMU1ER

This is used to get the current values configured in the RMU1ER. Note, if you have changed the values in any of the configuration groups, the changes will be over written by pressing this button.

6.3.1.5 Write Config To RMU1ER

Once all the configuration settings are set to the appropriate specifications, the unit can be configured by pressing the "Write Config to RMU1ER" button. The write can be confirmed by pressing the "Read From RMU1ER" button to ensure the values are the same.

6.3.1.6 Defaults

The RMU1ER contains factory defaults that can be loaded using this button. This allows for easy return of a unit to a known state. "Write Config to RMU1ER" must be pressed to write the parameters to the active configuration in the RMU1ER.

6.3.1.7 Set RMU1ER Clock

When the GPS receiver is disabled in the configuration, the clock on the RMU1ER may be updated from the PC using this button. Note that the RMU1ER clock setting is lost whenever the RMU1ER is powered down by unscrewing the lid.

6.3.1.8 Read Faults

If the RMU1ER detects an operational fault, it will record the event in memory. Clicking the 'Read Faults' button will retrieve this history for display. The fault history may be cleared by clicking the 'Clear Fault History' button in the displayed dialog.

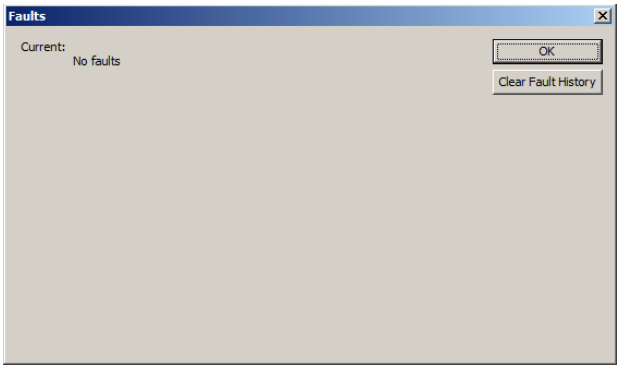


Figure 25 Faults Dialog

6.3.1.9 Detailed Status

Clicking the 'Detailed Status' button will display a dialog (see Figure 26) with detailed RMU1ER information. The display is broken into several areas including GPS, communications, battery, faults, real time clock, and calibration. In the event that a problem is encountered with the operation of the RMU1ER, Mobiltex may request a screen shot of this dialog to aid in diagnostics.

The IMEI (RMU1ER-I) or IMSI (RMU1ER-G) value shown in the comms status area is the identifier used by CorView to track communications with the device.

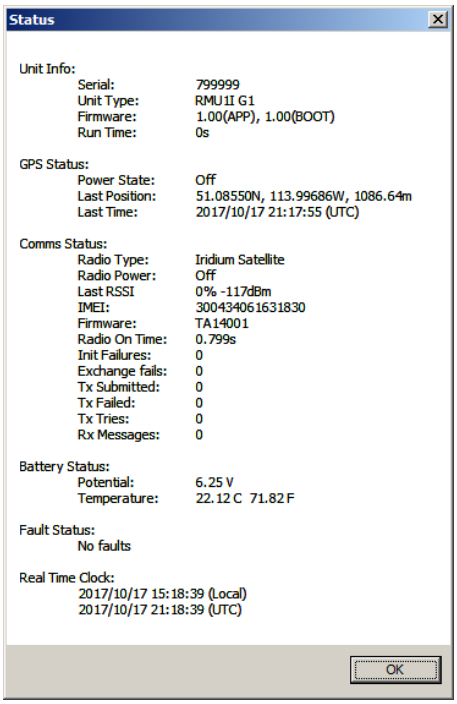


Figure 26 Detailed Status Dialog

6.3.1.10 Cap Detect Calibration

The RMU1ER is equipped with a non-contact sensor (see Figure 28) that can detect when a test station cap is installed over the RMU1ER. This sensor may require calibration to operate correctly. In the event that a cap is not detected properly, click the 'Cap Detect Calibration' button. The following dialog will pop up.



Figure 27 Cap Detect Sensor Calibration Dialog

Click the 'Auto-Set Threshold' button while the test station cap is not installed. Ensure that nothing is obscuring the proximity sensor window on the RMU1ER. A new threshold value will be determined based on the current sense levels. The new threshold will become active immediately after clicking the 'OK' button on the dialog. Pressing 'Cancel' will revert to the prior threshold levels.

During normal operation, ensure that no wiring or any other objects are blocking the proximity sensor window from being able to 'see' the test station cap when it is installed.



Figure 28 RMU1ER Cap Proximity Sensor

6.3.1.11 Extract Datalogger Mem

The 'Extract Datalogger Mem' button allows readings stored in the internal memory to be extracted to a comma-separated-value (CSV) file format that can be used with a spreadsheet application. This function requires the factory-enabled datalogger option be present on the RMU1ER.

After clicking the button, the contents of the datalogger memory will be transferred from the RMU1ER. After the transfer is completed, a prompt will appear for the target file name. The resulting file may be opened for analysis in various applications that support the CSV format.

6.3.1.12 Clear Datalogger Mem

The 'Clear Datalogger Mem' button allows the RMU1ER datalogger memory to be reset back to a blank state. This function requires the factory-enabled datalogger option be present on the RMU1ER.

After clicking the button, a confirmation prompt will appear. If confirmation is given, then a progress display will be shown as the RMU1ER memory is erased.

6.3.1.13 Test Transmission

A test message can be sent to CorView by clicking on the 'Test Transmission' button. The RMU limits the number of test transmissions possible to six in a 12 hour period. Subsequent test transmission attempts will be ignored.

There is a 5 minute delay on the test transmission if initiated from the configuration application with the programmer attached.

6.3.1.14 Reboot RMU1ER

Click the 'Reboot RMU1ER' button to restart the RMU1ER.

6.3.2 Measurement Slots Configuration

The RMU1ER is capable of transmitting 3 slots of analog information to CorView. The three slots of information are metal loss, potential AC, and potential DC.

Each data slot may have the following attributes modified:

- The slot may be disabled if the measurement is not needed
- Low and high limit alarms may be set
- The reading taken at the physical inputs may be scaled and offset for transmission

6.3.3 ER Probe Characteristics

Two parameters need to be entered for the ER probe. First, the probe geometry type must be selected. Currently, the following ER probe geometries are supported:

- Tube Loop (TU)
- Wire Loop (WR)
- Cylindrical Tube (CT)
- Flush Mount Strip (FL/FM)
- Spiral Strip (SP)
- Strip Loop (SL)

Finally, the initial probe thickness must be entered in 1/1000 inch (mil) units.

Typically, the information needed for configuration is stamped on a tag plate that is included with the ER probe from the manufacturer. Figure 29 shows an example of a typical ER probe information tag. The element type field describes the probe geometry and initial thickness. For this example, the RMU1ER would be configured for use with a flush mount probe that is 10mil thick.

In addition, the multiplier field indicates the usable probe thickness. Here, the probe usable life is 5 mil. The usable probe thickness could be entered in the metal loss slot high alarm to provide automated feedback through CorView when it is time to change the probe.

Probes, even when new, will not show a zero metal loss reading; this is not an issue as it is the metal loss rate (corrosion rate) that is most important, not the absolute metal loss reading. The initial field is stated in probe units (1/1000 of the usable probe life). Dividing the initial field by 1000 and then multiplying that result by the multiplier field will yield the expected initial metal loss reading in mil units. For this example, an initial reading of approximately 0.39 mil is expected.

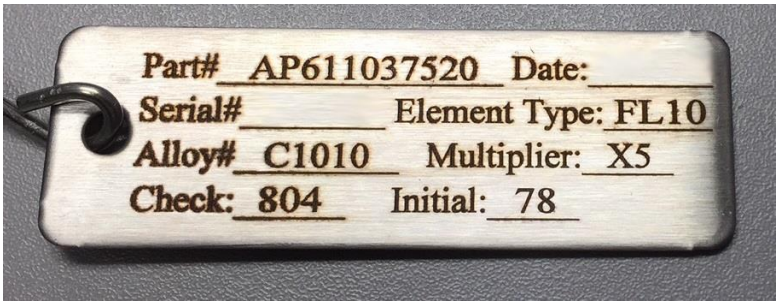


Figure 29 ER Probe Information Tag

6.3.4 Periodic Report Interval

The periodic report interval determines how often the RMU1ER will send scheduled readings to CorView. This parameter is normally locked down at the factory according to the purchased airtime plan.

If satellite/cellular coverage is inadequate for successful data transmission at the scheduled time, the unit will continue to accumulate readings and try to send the data at a later periodic reading interval. The RMU1ER-I/G is able to buffer up to 16 readings for transmission; if the unit is unsuccessful at sending the readings to CorView at that point, the oldest reading in the buffer will be discarded to make room for the next periodic reading measurement.

6.3.5 Options

Several options are available that affect the operation of the RMU1ER.

The 'Enable Cap Report' option allows the RMU1ER to send an exception report to CorView whenever a transition is detected on the cap detection sensor. The cap detection sensor is an infrared proximity sensor unit that detects an installed cap by the amount of infrared light reflected by the cap. If this option is enabled, every time the cap is removed or installed, a reading set will be taken and sent to CorView. As with other exception messages, a maximum of 6 messages can be sent in a given 12 hour window; any additional transitions will be ignored. This feature requires airtime Option 2 – "Add cover removal exception reports to any plan" (RMU1OPTION2).

The 'Disable Cap Detector' option disables the cap infrared proximity sensor. This option is typically used to increase battery life on the RMU1ER. When cap detector is disabled, the LCD display will not turn on if the test station cap is removed. To temporarily turn on the LCD when this option is checked, apply a magnet near the green measurement terminal block.

'Enable Datalogger' allows readings to be stored to local non-volatile memory. This option is usable only if the factory datalogger option (Option 3) is enabled on the RMU1ER. The stored readings can be extracted by using the 'Extract Datalogger Mem' button under the 'RMU1ER Communications and Status' area. The datalogger memory will hold approximately 174,000 readings sets before filling. At a 1 hour measurement rate, approximately 20 years of measurement data can be stored locally.

The 'Disable GPS' option turns off the RMU1ER automatic location determination and real-time clock synchronization. The GPS receiver could be disabled for several reasons. The first reason is to maximize battery life. The second use would be if the RMU1ER is installed in a location that does not have sufficient GPS coverage to attain a position lock. An example would be if the RMU1ER is installed in a metal box or other challenging RF environment.

When the 'Disable GPS' option is checked, the latitude and longitude co-ordinates of the RMU1ER should be entered into the appropriate boxes below the option check mark. This will allow the location of the RMU1ER to still be transferred to CorView for use with mapping functions. In addition, the 'Set RMU1ER Clock' button should be clicked after configuration is complete to set the internal real time clock.

The 'Line Freq.' parameter is used to optimize the rejection of AC utility line interference on measurements. Set value to match the power system used in the installation country. For North America, this should be set to 60Hz.

'Disable Sat/Cell Comms' is used to turn off transmissions of readings to CorView. This would typically be used if the datalogger option (OPT3) has been purchased without a communications plan. Normally, this option should be left unchecked.

6.3.6 Readings

The 'Readings' group provides for the ability to validate the configuration of RMU1ER. Clicking the 'Update' button will request that the RMU1 perform a new conversion cycle on all of the readings slots. A reading update will typically take under 15 seconds to complete.

7 Mobile Device Configuration

The RMU1ER may also be programmed with a compatible iOS or Android-based mobile device when an RMU1PGM-BT Bluetooth Interface cable is used. The RMU1PGM-BT cable (Mobiltex P/N A1506032701 shown in Figure 30) uses Bluetooth Smart (BLE) to enable a wireless connection to a compatible mobile device. The programming cable is also available as part of a kit (Mobiltex P/N A20A0332701) that includes a carrying case and a USB battery pack. Note that only RMU1PGM cables with a black USB cable have Bluetooth capability; RMU1PGM cables with a white USB cable are not Bluetooth capable.



Figure 30 RMU1PGM-BT Bluetooth Interface Cable

An RMU1/2/3 Programming Interface with the RMU1ADP cable (Kit A20A0333101) attached may also be used.





Figure 31 RMU1/2/3 Programming Interface With RMU1ADP

The mobile device must have the RMU1ER Config mobile app loaded from either the Apple App store or the Google Play store, as applicable. Simply search for 'RMU1ER' on either site to locate the download.

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 RMU1PGM-BT or RMU1/2/3 Programming Interface and the app, the need for a PC is eliminated. All configuration functions can be performed with a compatible phone/tablet through the RMU1PGM-BT cable via a wireless Bluetooth connection. One limitation with the mobile app is that the datalogger on the RMU1ER cannot be extracted; this is due to a speed limitation over the Bluetooth Smart connection.

For use with the Bluetooth connection, a portable USB battery pack is needed to power the RMU1PGM-BT interface cable or RMU1/2/3 Programming Interface. Prior to using the USB battery pack, charge the pack using a micro-USB to USB-A cable and a USB power source (see Figure 32, actual battery pack form factor and dimensions may differ from picture). Before use, charge for 10 hours or until the pack charge indicator shows full. A fully charged 3000mAh pack should allow over 60 hours of continuous operation for the RMU1PGM-BT cable or RMU1/2/3 Programming Interface.



Figure 32 RMU1PGM-BT USB Battery Pack Charging

Connect the RMU1PGM-BT or RMU1/2/3 Programming Interface USB connector into the matching connector on the battery pack. Some battery pack models may have a button that needs to be pressed to activate the power output. The 'PGM POWER' LED on the RMU1PGM-BT or 'PWR' LED on the RMU1/2/3 Programming Interface should light green when power is being delivered to the device. Place the RMU1PGM-BT on the RMU1 as shown in the Figure 33. The RMU1/2/3 Programming Interface with RMU1ADP cable attaches in a similar fashion.



Figure 33 RMU1PGM-BT Connected To Battery Pack and RMU1

Once the cable is attached between the portable USB battery pack and the RMU1ER, the app on the mobile device is started. A connect button in the app initiates the process to connect with the programming interface. A list of active interface cables in the area is brought up; each interface cable has a serial number label on it to identify the unit. Once the unit is selected, if it is the first connection attempt between the portable device and that interface cable, 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.

Upon completion of configuration, disconnect the RMU1PGM-BT cable or RMU1/2/3 Programming Interface from the battery pack to conserve charge in the pack.

8 Battery Replacement

1. Remove the RMU1ER from its mounting location.
2. Unscrew and remove the top plastic circular lid from the RMU1ER.
3. Remove the three screws that secure the transmitter board assembly to the unit as indicated in the pictures below. Set aside the three screws and transmitter board for re-assembly after the batteries have been changed.

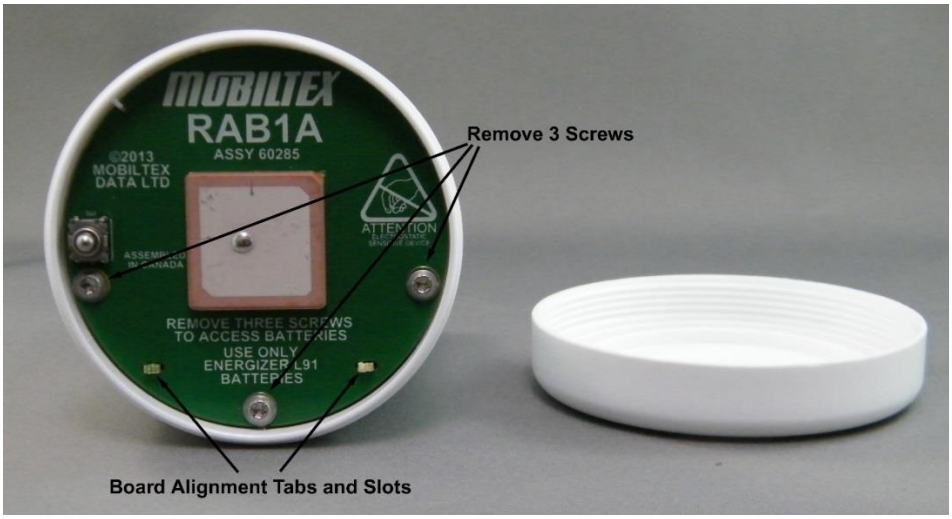


Figure 34 RMU1ER-G Transmitter Board Screws



Figure 35 RMU1ER-I Transmitter Board Screws

4. Remove the old batteries by popping them out of the battery clips. Install four new AA batteries from the replacement battery kit (Mobiltex P/N B02221RMU10). The batteries are oriented according to the polarity markings shown on the main RMU1ER logic circuit board.



Figure 36 Battery Polarity Markers

5. Re-attach the transmitter board. Make sure that the main PCB alignment tabs engage the matching slots in the antenna board. Then, re-install the previously removed three screws. Do not over-tighten the screws.
6. Re-install the plastic circular lid.
7. Re-install the RMU1ER as instructed in section 5.1.

No other maintenance or cleaning is required.

9 Technical Support

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
Service Email: service1@mobiltex.com
Service Website: http://service.mobiltex.com

A. Equipment Specifications

RMU1ER Specifications

Operating Temperature	-40° to +60° C (-40° to +140° F)
Storage Temperature	-45° to +80° C (-49° to +176° F)
Maximum Altitude	5000 meters above sea level
Humidity	0 to 100% RH non-condensing
Weight	225 grams (0.5 lbs)
Size	80mm x 80mm x 110mm (3.15”x3.15”x4.33”)
Enclosure	UV stable, wide temperature polycarbonate
Pollution Degree	1
External Analog Channels	2 potential, 1 bond shunt, 1 coupon current
Measurement Type	Category 1 (as per CSA C22.2 – 61010)
Analog Ranges (DC & AC True RMS)	Potential: +/-31VDC, 22VAC
AC Rejection on DC Readings	>65dB @ 50/60Hz
Lightning Immunity	Survives multiple 20KV 10mS surges
DC Measurement Accuracy (over operational temperature)	Potential: +/-1% + 1mV
AC Measurement Accuracy (over operational temperature)	Potential: +/-1% + 5mV, 20mV floor
ER Probe Measurement Accuracy	+/-1% of useable probe life
Input Impedance	>20 Mohm (potential)
ADC Resolution	16 bits
Temp. Measurement Accuracy	+/-4° C (+/-7° F) over -40° to +60° C (-40° to +140° F)
Battery Life	Typically 10 years based on readings every 7 days
Internal Battery Measurement	OK, Warning and Low conditions displayed on CorView
Communications	Iridium SBD Satellite (RMU1ER-I) Cellular UMTS B2,5 and LTE B2,4,5,12,13 (RMU1ER-G)
GPS Receiver	72-channel u-blox M8
Datalogger Storage (Factory Enabled Option)	1 million reading points

B. RMU1ER-I 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.

C. RMU1ER Regulatory Statements

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment OFF and ON, the user is encouraged to try to correct the interference by one or more of the following measures:

• Reorient or relocate the receiving antenna.

• Increase the separation between the equipment and receiver.

• Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

• Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This ClassA/ClassB digital apparatus complies with Canadian ICES-003.

NOTICE: This equipment complies with the FCC RF Exposure Limits. A minimum of 20 centimeters (8 inches) separation between the device and the user and all other persons should be maintained.

RMU1-I
FCC ID: Q639603N
IC:4629A-9603N

RMU1-G
FCCID: RI7LE910NAV2
IC: 5131A-LE910NAV2



Complies with FCC standards.
FOR HOME OR OFFICE USE

D. RMU1ER Probe Cable Schematic

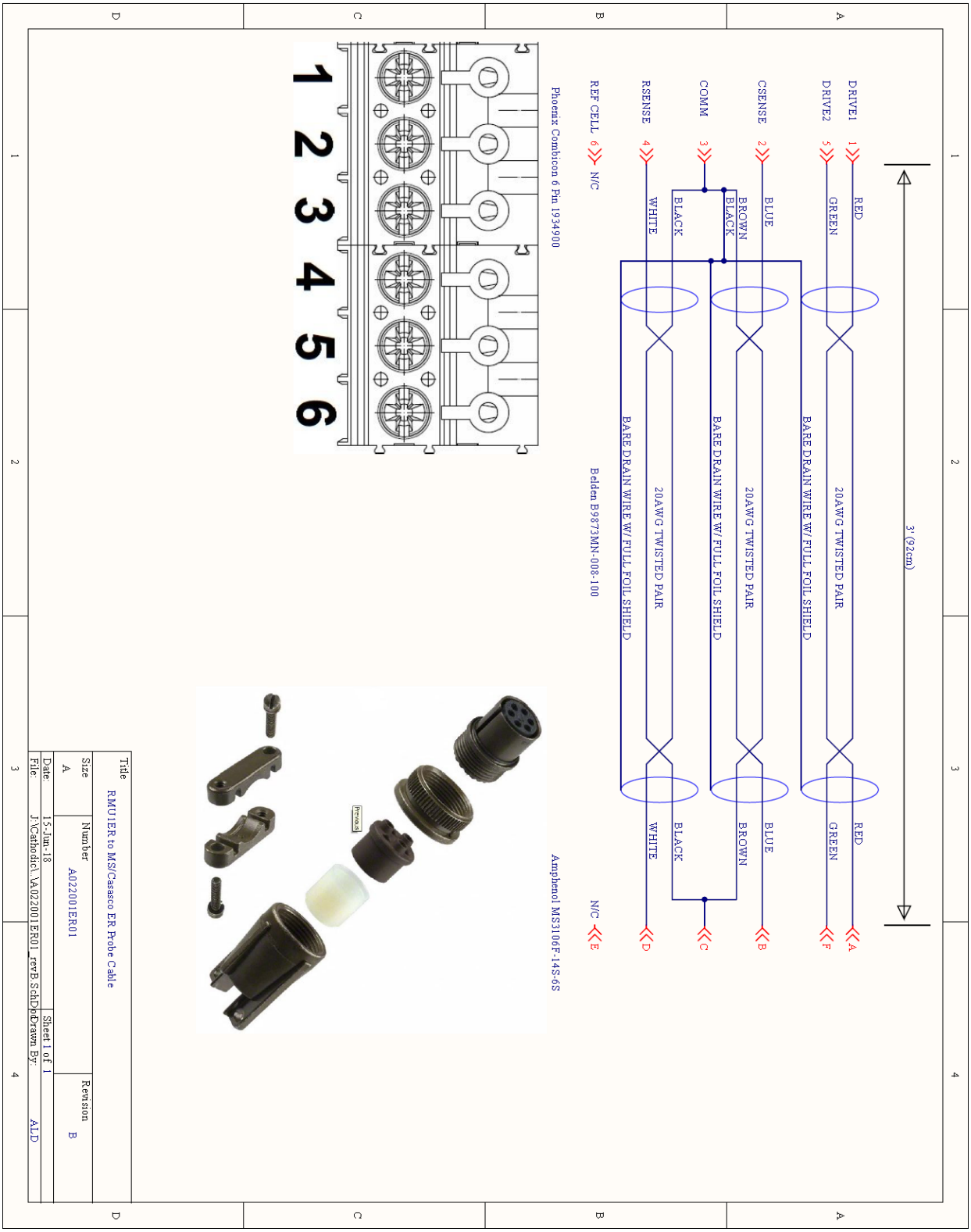


Figure 37 RMU1ER Probe Cable Schematic