corTalk® by MOBILTEX® DATA LTD

RMU5 Generic

Installation and Configuration Guide



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1 Introduction

The RMU5 is a powerful remote monitoring unit with an optional precision GPS interruption controller for use with cathodic protection rectifiers. Precise timing accuracy and repeatability is attained with GPS and microprocessor technology. A small physical size and wide operating temperature range make this device ideally suited for use in a variety of rectifier cabinets.

The basic RMU5 has the following feature set:

- High-performance 200MHz ARM9-based processing platform
- 64MB RAM
- 32MB Flash storage for OS and applications
- Windows Embedded CE 6.0 operating system
- Integral health monitoring of internal voltages and temperature
- 20x4 character wide-temperature range LCD screen for local status monitoring with no additional equipment
- 10/100Base-T Ethernet for communications backhaul over various data networks
- RS-232 MODBUS interface port for attachment to other SCADA RTUs
- USB peripheral with RNDIS characteristics for configuration from a PC
- USB host for additional USB flash drive or communications expansion
- One digital input capable of dry contact or voltage input (optically isolated)
- One ground switched digital output with 750mA sinking capability and 12V power
- Four galvanically isolated bi-polar analog input channels configurable for +/-158mV, +/-7.5V, and +/-150VDC ranges
- 24VAC/DC main power input, used with external Class 2 power transformer or external DC-DC converter
- Battery backup allowing up to 8 hours of operation during main power fail conditions
- Easy configuration through a PC-based graphical user interface
- Remote configuration through available communications channels
- Remote firmware updates over appropriate communications channels
- Scheduler for future rectifier interruption cycles
- Scheduler for input datalogging
- Programmable alarm window capability on all input channels
- NEMA 4X, IEC529 Type IP65 enclosure for harsh environments
- CSA and UL approvals
- Operation in -40°C to +60°C ambient temperatures

The base product can be augmented through the following optional components:

- Optional GPS time synchronized rectifier interruption
- Internal Flash drive for datalogging storage (128MB to 8GB, factory installed)
- Bluetooth communications for configuration and data retrieval
- RS-232 communications expansion interface (same physical connector as MODBUS interface listed above)
    - Iridium SBD satellite modem
    - Skywave Inmarsat D satellite modem
    - V.34 PSTN modem
    - 1200/2400 MSK VHF/UHF terrestrial radio modem
    - Third-party radio modems
- Sensor expansion bus
    - Galvanically isolated 4 channel analog input module
    - Galvanically isolated 4 channel input + 4 channel output module
    - Isolated DC current sensor
    - High voltage 500V AC analog input module
    - External temperature sensor
    - High impedance analog inputs for reference half-cell measurements
    - Additional modules added in the future as required

This document details the installation and operation of the Mobiltex® RMU5 remote monitoring unit product.

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 components' manuals for warnings and cautions related to operating the system.

To Avoid Fire or Personal Injury

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

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

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

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

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

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

Do Not Operate in Wet/Damp Conditions.

Keep Internal Product Surfaces Clean and Dry.

Symbols and Terms

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

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

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

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

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

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

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

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

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

3 Component Identification and Descriptions

Figure 1 shows the front and right side of the RMU5 enclosure. The important features shown here are the latch and lock attachment points. To open the RMU5 enclosure, lift the plastic latch arms away from the enclosure body, then swing the metal straps away from the door. The door should then swing open freely. To close the enclosure, reverse the procedure.

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



Figure 1 RMU5 Front/Side View

Figure 2 shows the back and hinge side of the RMU5. The RMU5 may be mounted against a flat surface by driving screws through the mounting hole locations shown in the picture. The RMU5 may also be mounted to a pipe using pipe clamp bands through the slots shown in the picture.



Figure 2 RMU5 Back/Side View

Figure 3 shows the inside of the RMU5, which includes the front panel and bottom connectors. The front panel contains the following features:

1. Power/Fault LED Indicator. The green indicator shows when the RMU5 is powered, and if flashing red, a fault condition is present. If main input power is interrupted, the green indicator will flash.
2. GPS/Interrupter Status LED Indicator. This bi-color indicator shows status for the optional GPS Timing Control Module (TCM) board and also the rectifier interruption relay status. When green, the GPS TCM board

has successfully attained a time lock to the NAVSTAR GPS network. When red, the rectifier output is switched off (interrupted).

3. Reset/Power Down Button. The reset button may be held down for 10s to force a reset of the hardware on the RMU5. The button may also be used to disengage the backup UPS battery when main power is removed.
4. Local Configuration USB Slave Port. This port is used for configuration of the RMU5 from a PC running Microsoft Windows XP SP2 or higher. Further information on its use is located farther in this document.
5. 20 x 4 LCD Display With Backlight. The LCD display shows the current status of the RMU5 through a paged display system.
6. Up/Down Control Buttons. These buttons control the page being displayed on the 20 x 4 LCD display.
7. Main I/O Connector. This connector is the principle connector for the built-in analog inputs, digital input, interrupter relay control, and RS-485 MODBUS connections. The functions of each pin are labeled on the faceplate.

The bottom panel contains the following features:

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

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

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



Figure 3 RMU5 Inside View

4 Installation

4.1 Mounting

The RMU5 is housed in a weather-proof compact enclosure with a versatile mounting plate. Installation of the device can be made inside a rectifier cabinet, or externally on a flat surface or pole. Figure 4 shows the dimensions of the mounting plate, including the location and size of the mounting holes. Any of the available mounting holes may be used to secure the RMU5 to a flat surface. The RMU5 may also be secured to a pole by utilizing pipe clamps through the two slots on the top of the mounting plate and the two slots on the bottom of the mounting plate.

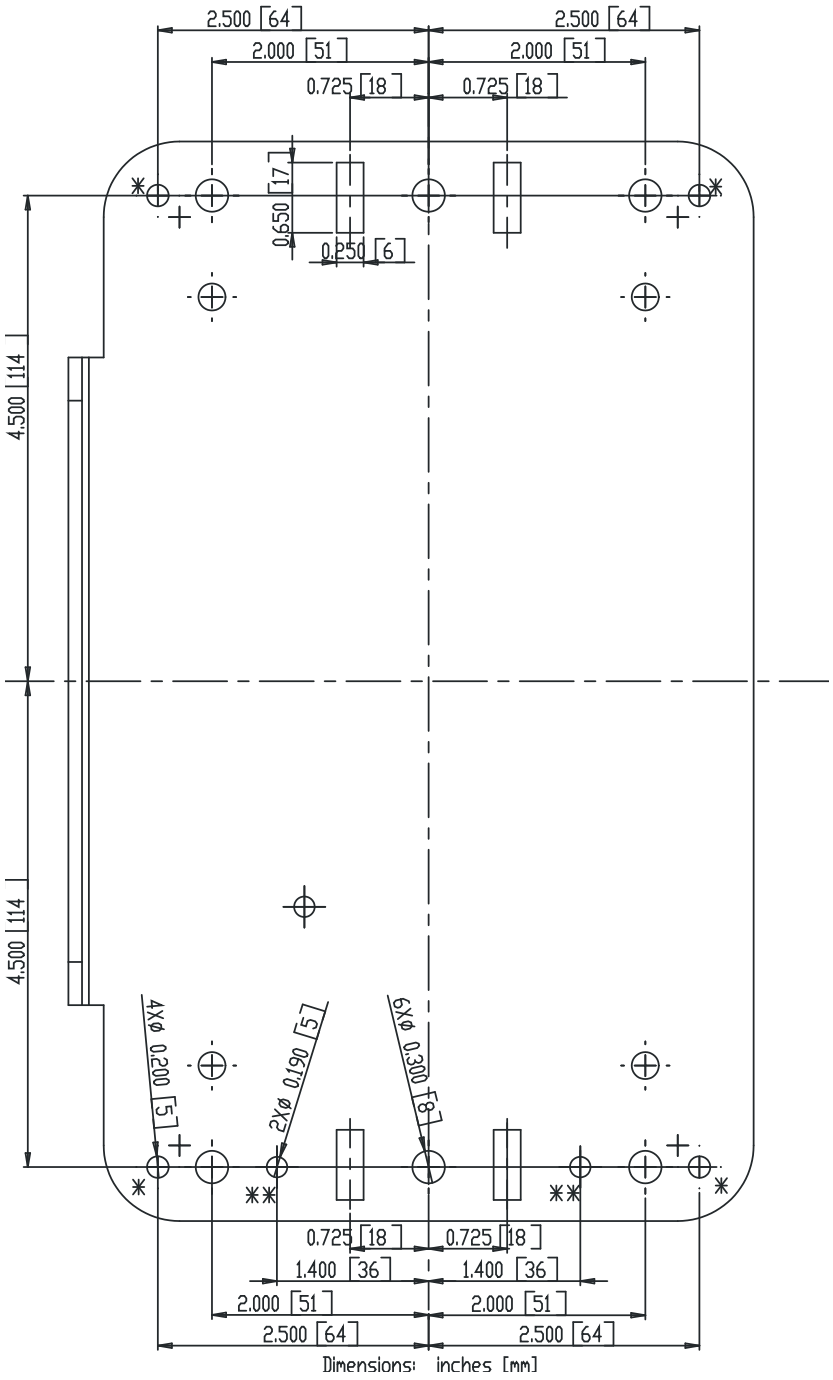


Figure 4 RMU5 Mounting Plate Dimensions

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

4.2 Wiring

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

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

4.2.1 Protective Earthing

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

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

4.2.2 Power Transformer

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

Figure 5 shows various Class 2 transformers that may be supplied by Mobiltex with the RMU5. Mobiltex P/N T01A42BE5DG can be used with 208V or 240VAC line voltages. Mobiltex P/N T01A420BE2G can be used with 120VAC line voltage. Mobiltex P/N T01A42TR401 can be used with 120V, 208V, or 240VAC lines voltages. Finally, Mobiltex P/N T01A42TR501 can be used with 120V, 240V, 277V, or 480VAC line voltages.

Many different types of Class 2 transformers are available which are compatible with the RMU5. A transformer with a 20-24VAC/40VA nominal output winding rating should be used with the RMU5. The primary input voltage is determined by the power system available at the RMU5 installation site. Install the transformer according to the manufacturer's instructions and connect the secondary windings to the RMU5 main power input.

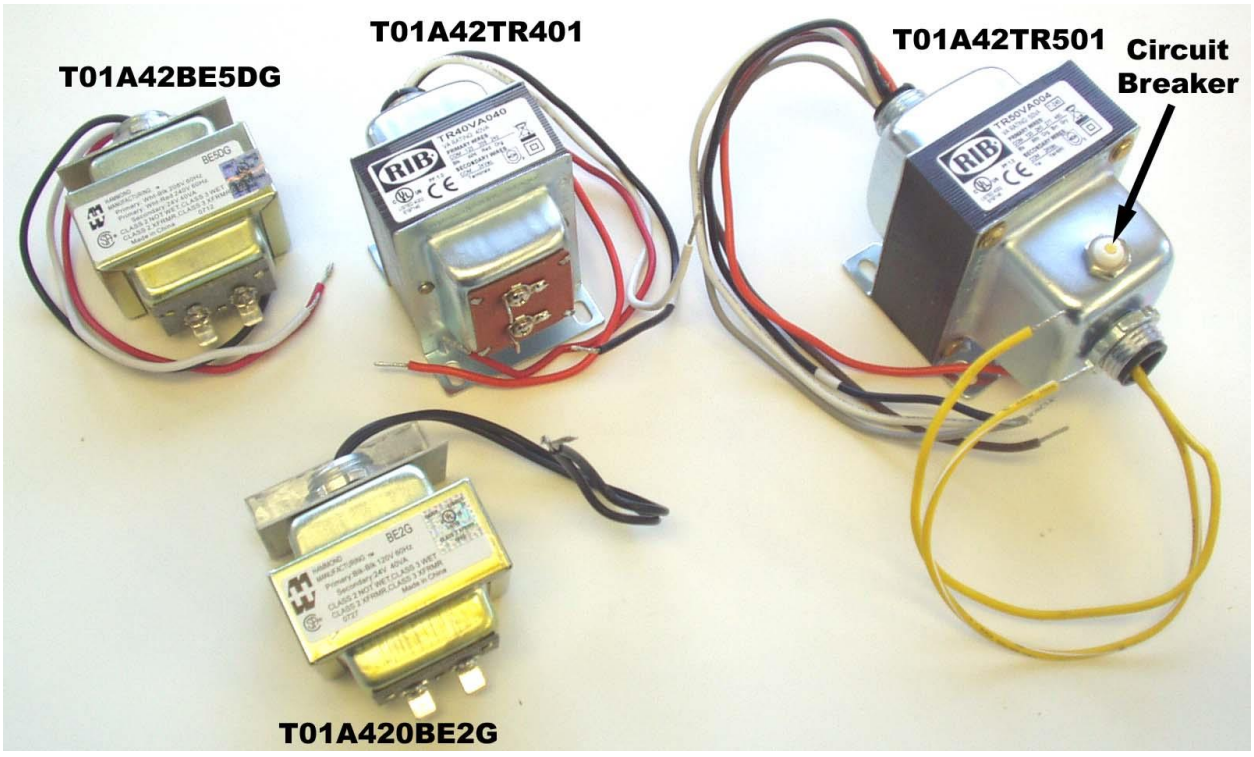


Figure 5 Class 2 Transformers Available From Mobiltex

Connect the appropriate primary side taps of the transformer to the L1 and L2/N line input connection points on the device being monitored. An external switch or circuit-breaker and external overcurrent protection device (sized to the transformer specifications) should be installed on the primary connections of the transformer and be located near the RMU5. Consult the documentation provided by the transformer manufacturer to determine the correct primary tap wires required for a particular input voltage.

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

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

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

Shut off primary power to the transformer before continuing. Plug the orange terminal block back into the receptacle on the RMU5. The connection to the RMU5 should be as shown in Figure 6.

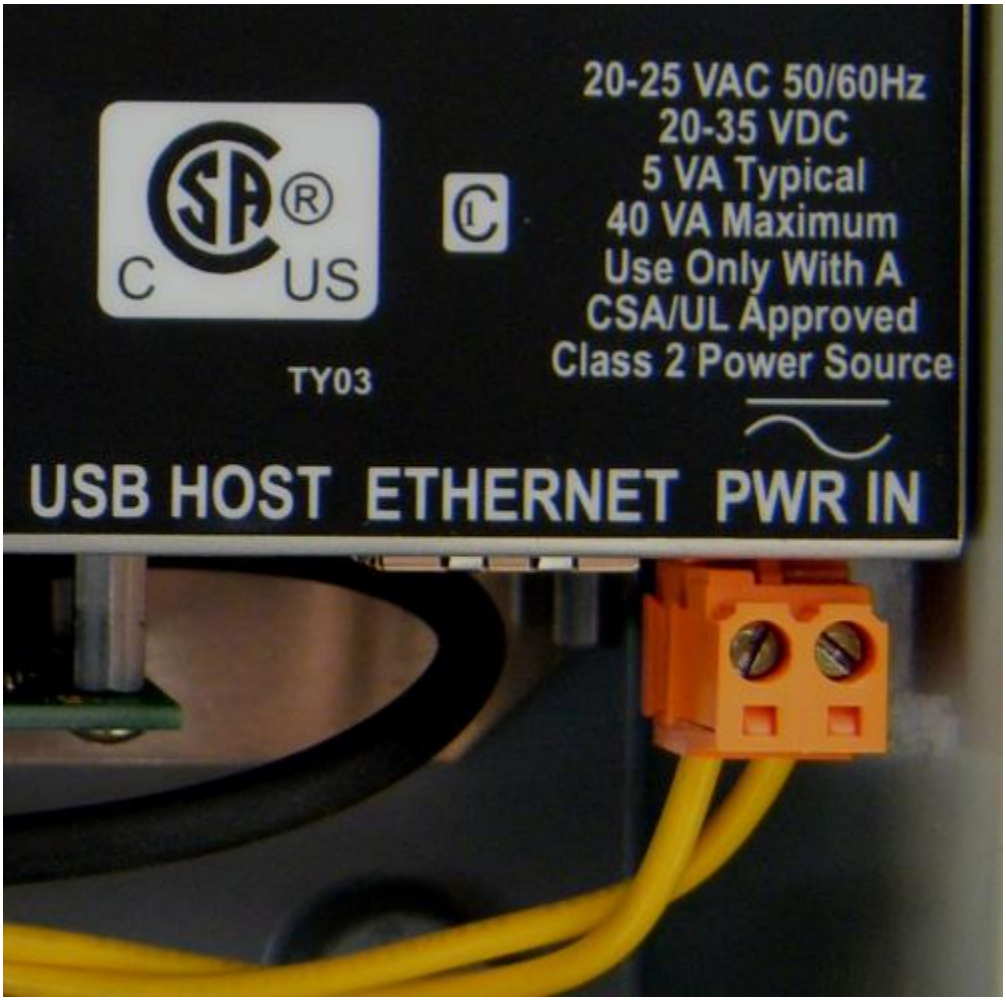


Figure 6 RMU5 Power Connection

4.2.3 GPS Antenna

The RMU5 GPS kit (P/N A20A03GPS01) is shown in Figure 7. This kit is ordered as a factory installed item. The GPS board shown is installed inside the RMU5 at time of manufacturing. Included in the kit is a pre-terminated 10 meter (33') RF cable and a GPS antenna.



Figure 7 GPS Synchronization Kit

The RMU5 may be equipped with a GPS receiver to allow for precision synchronized interruption of the rectifier output. If the RMU5 is equipped with this option, an additional cable for the GPS antenna must be brought into the RMU5 enclosure or attached to the external GPS antenna connector (if conduit is not required). If the external GPS antenna connector is used, apply self-annealing tape and electrical tape over the GPS antenna connector to seal it against moisture entry. The GPS antenna must be mounted in an area that has reasonable view of the sky with minimal blockage.

4.2.4 Measurement Wiring

Figure 8 shows a typical wiring installation for the RMU5. If the rectifier interruption feature is utilized, a solid-state relay should be installed on the primaries of the rectifier transformer to allow the RMU5 to interrupt current flow to the protected structure. The exact model of relay will be installation dependent and must be appropriately sized to allow for the power consumption of the rectifier.

The RMU5 may be used to monitor the status of the primary circuit breaker in the rectifier if the circuit breaker is equipped with monitoring contacts. These contacts may be attached to the DIN pins on the main I/O connector as shown in the typical installation diagram.

Ensure that main rectifier power is off while performing any wiring on the RMU5.

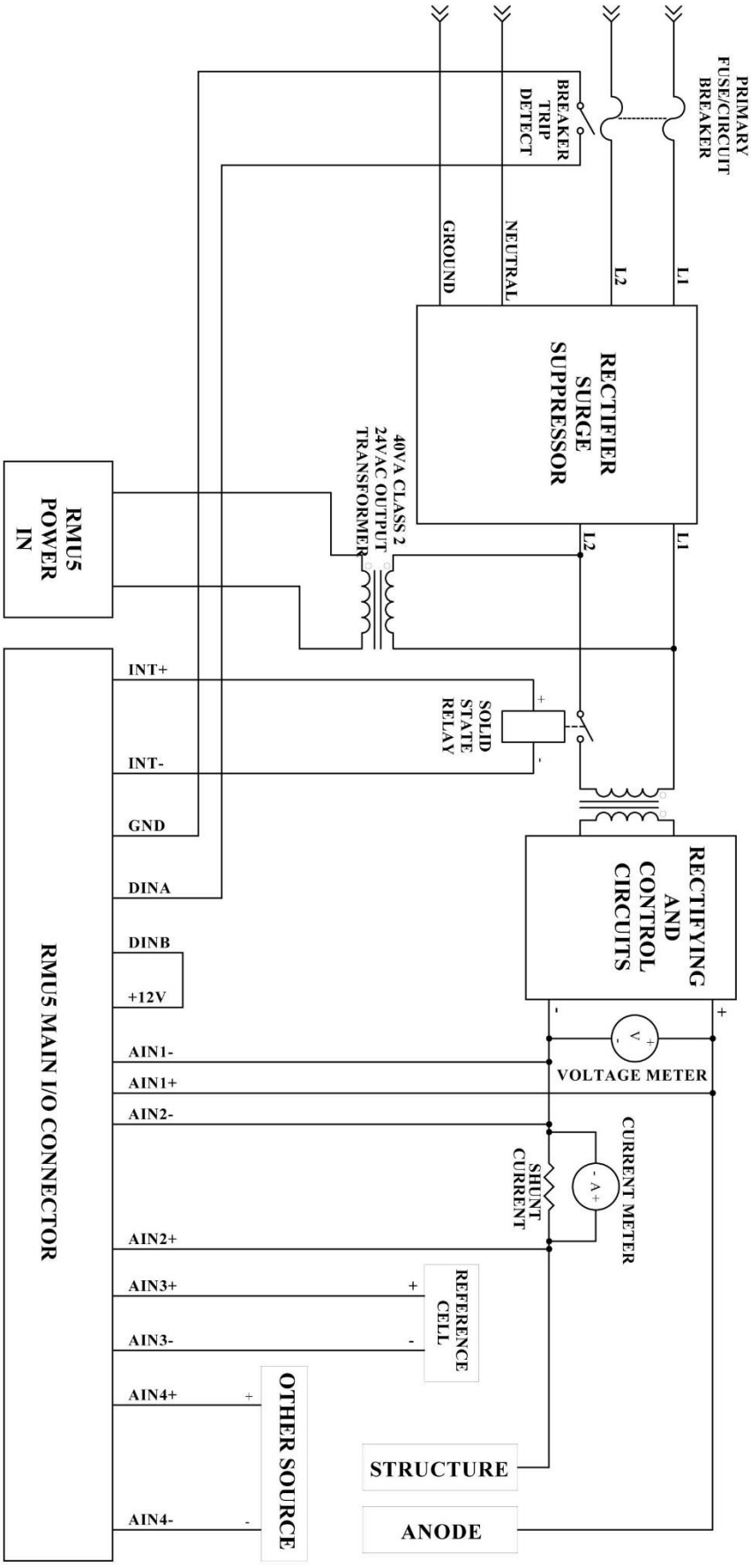


Figure 8 RMU5 Typical Rectifier Installation

4.2.5 Interruption Relay Wiring

Wiring of the interruption relay requires some consideration for the type and size of rectifier being interrupted. Consideration for lightning immunity is another issue that will affect relay type and installation point. Table 1 lists the most common relay types along with their associated pros and cons.

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

Table 1 Relay Types Pros/Cons

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

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

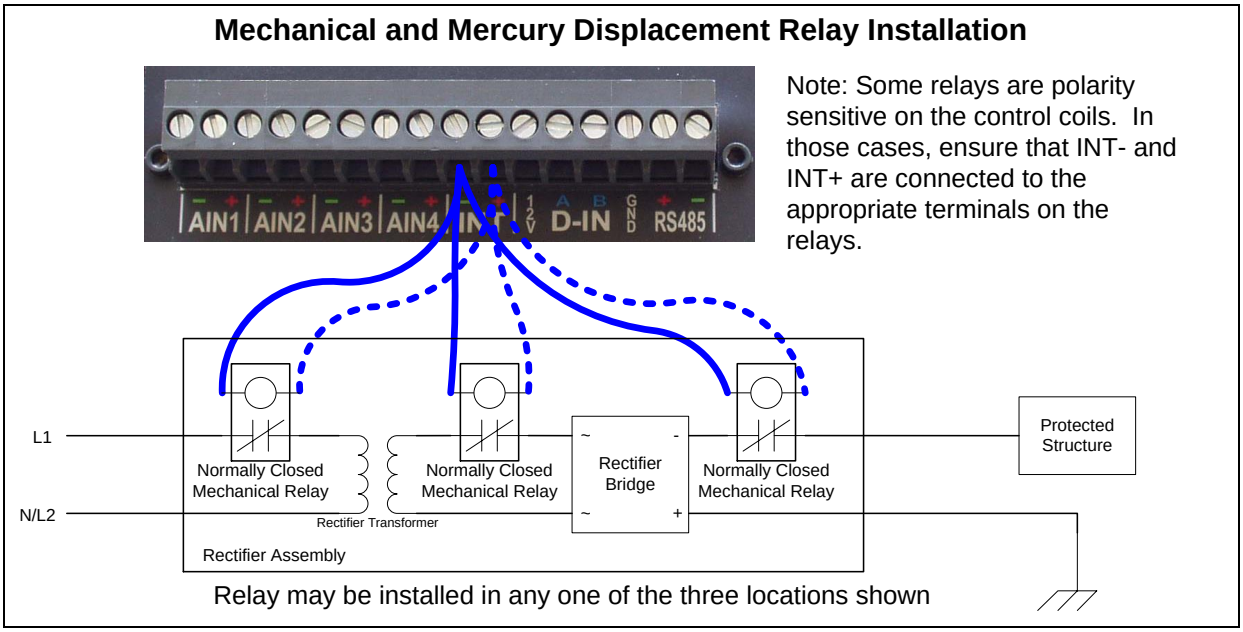


Figure 9 Mechanical and Mercury Displacement Relay Installation

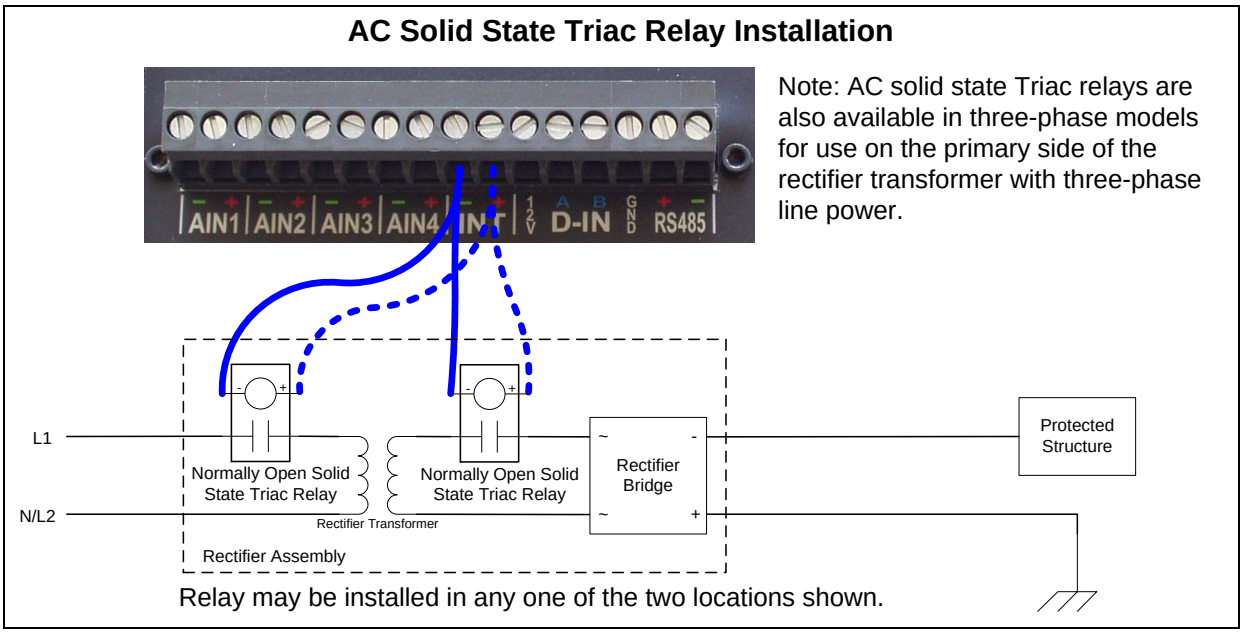


Figure 10 AC Solid State Triac Relay Installation

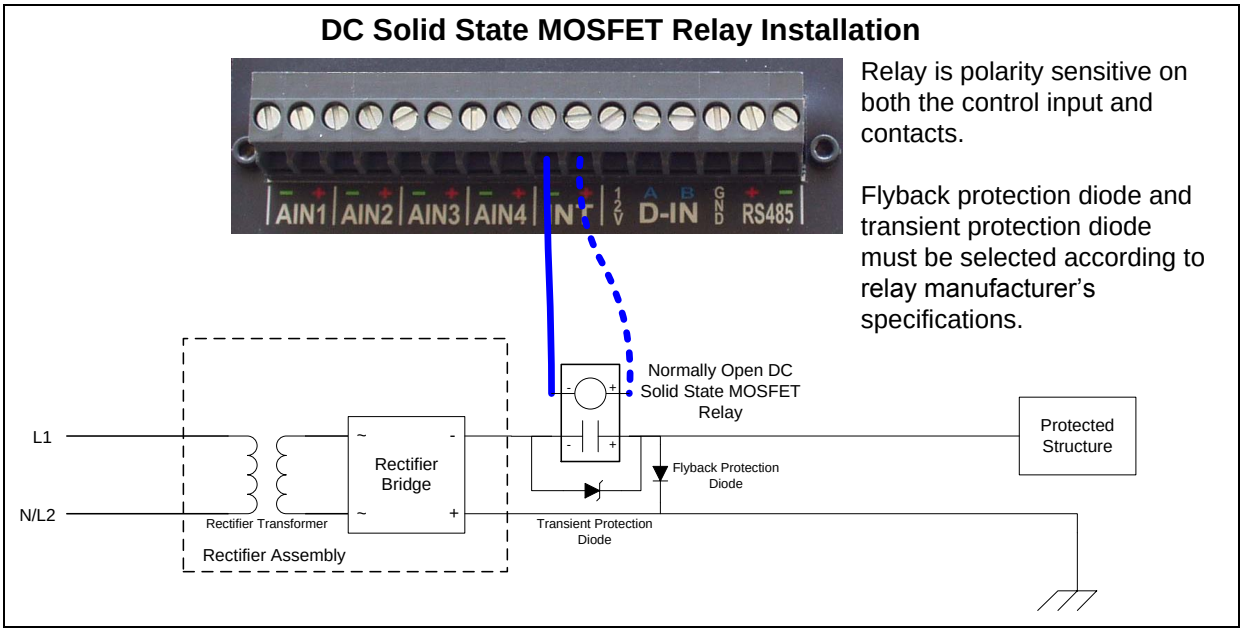


Figure 11 DC Solid State MOSFET Relay Installation

4.2.5.1 AC Solid State Relays

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

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



Figure 12 Mobiltex Standard Single Phase Solid State AC Relays

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

K05232R5016 AC Relay - 3 phase, 48-530 VAC RMS 50 Amps max. 0-4A=No Heatsink, 4-30A=HE-90

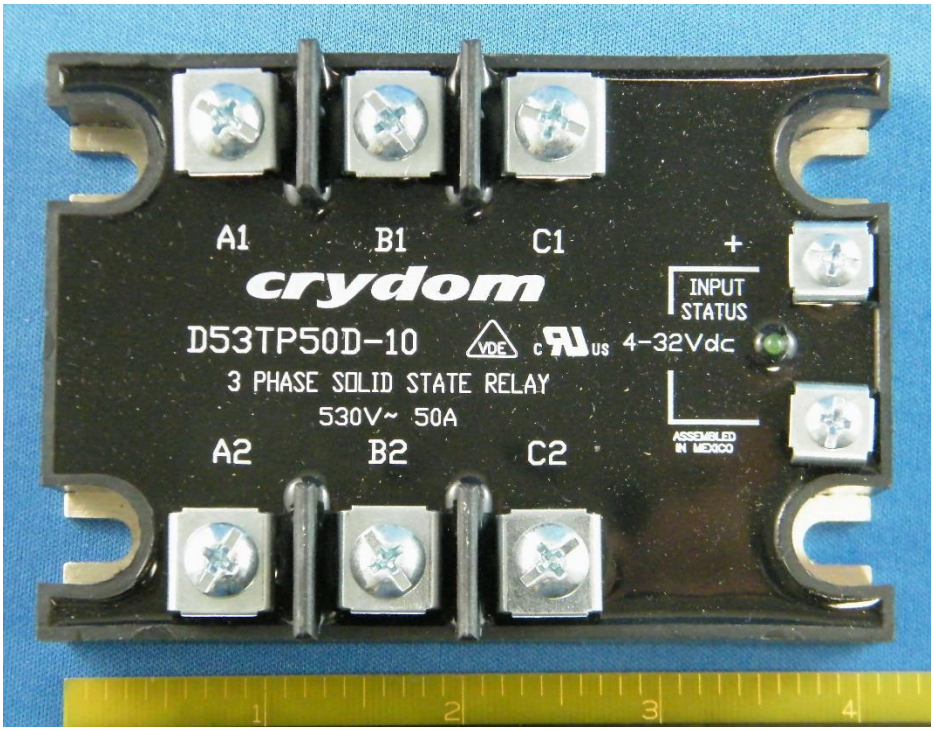
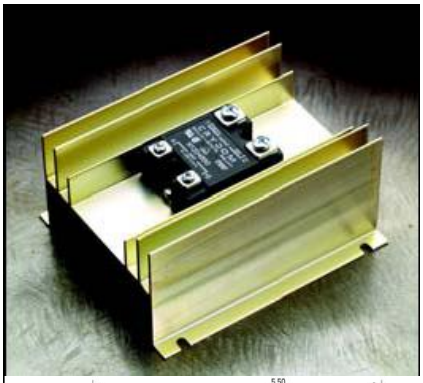


Figure 13 Mobiltex Standard Three Phase AC Solid State Relay

The relay shown in Figure 13 is used to interrupt the primary AC of 3-phase rectifiers.

4.2.5.2 AC Solid State Relay Heatsinks

X030120HE54 Medium Heatsink for Solid State Relay - HE-54



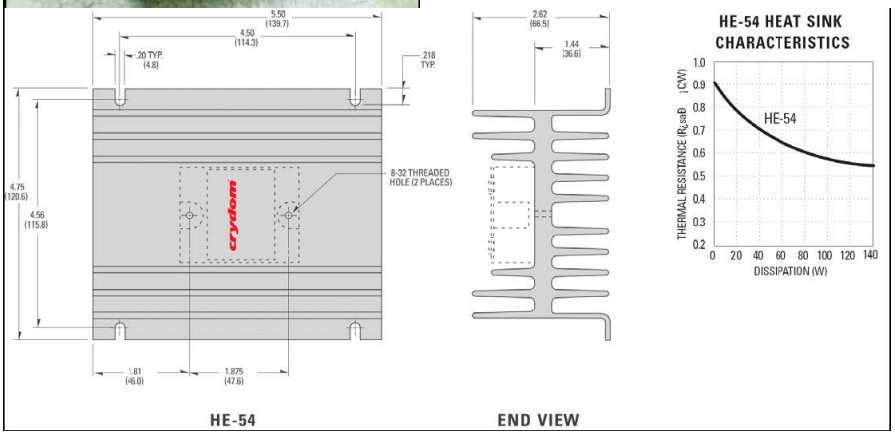


Figure 14 X030120HE54 Medium Heatsink

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

X030320HE90 Large Heatsink for Solid State Relay - HE-90

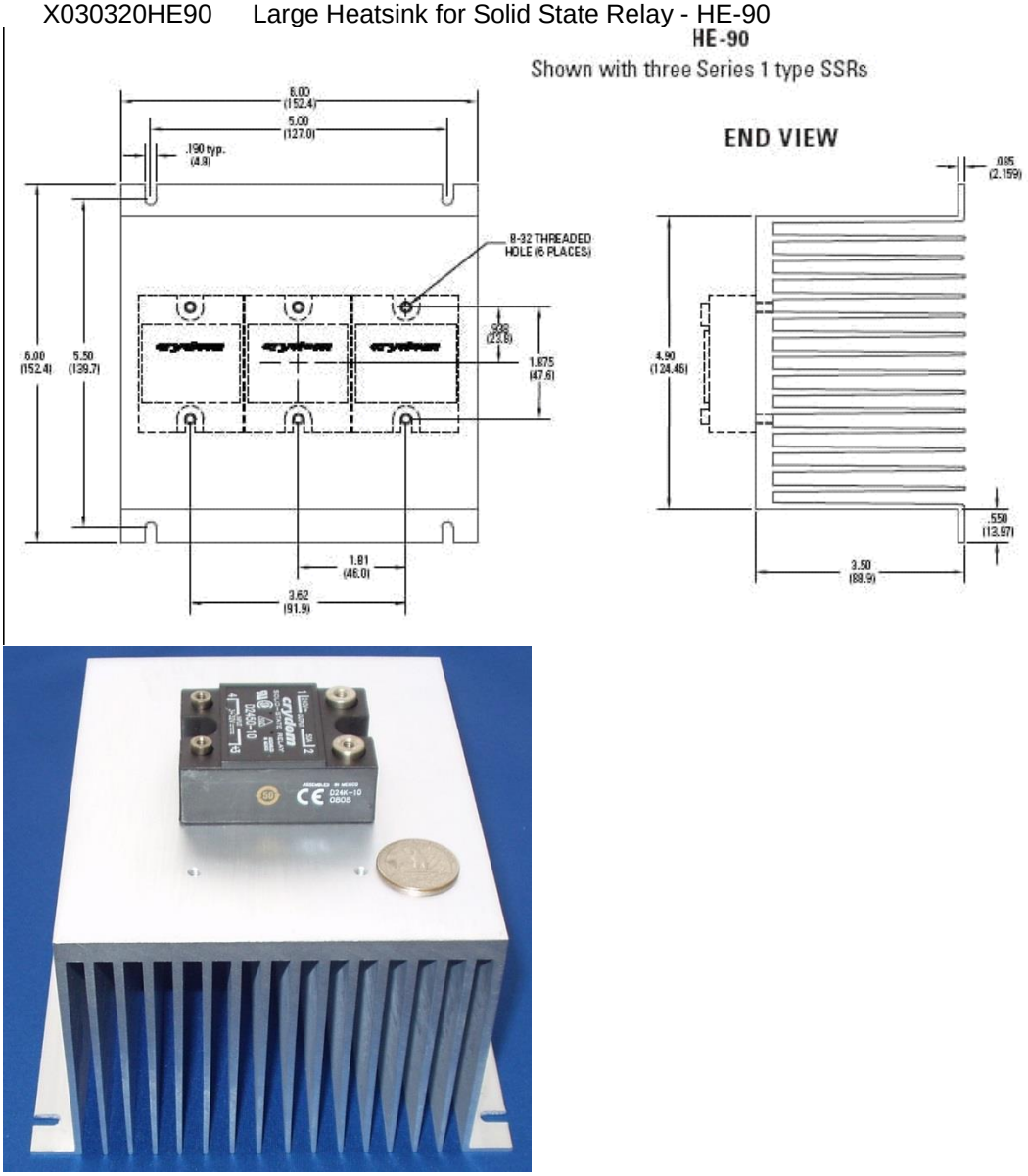


Figure 15 X030320HE90 Large Heatsink

Figure 15 shows the AC Relay - 24-280 VAC RMS 110 Amps max (K0513211010) on the HE-90 heatsink. This heatsink will directly accept all standard Mobiltex AC solid-state relays.

4.2.5.3 Mercury Displacement Relays

Mobiltex provides, as an option for the RMU5, a 100A/240VAC normally-closed mercury displacement relay (K07111NC12D). This relay is shown in Figure 16. The relay must be mounted with the UP arrow within +/-10 degrees of vertical for the relay to operate properly. Contact de-rating is shown in Table 2.

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

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

Table 2 Mercury Displacement Relay Contact De-rating

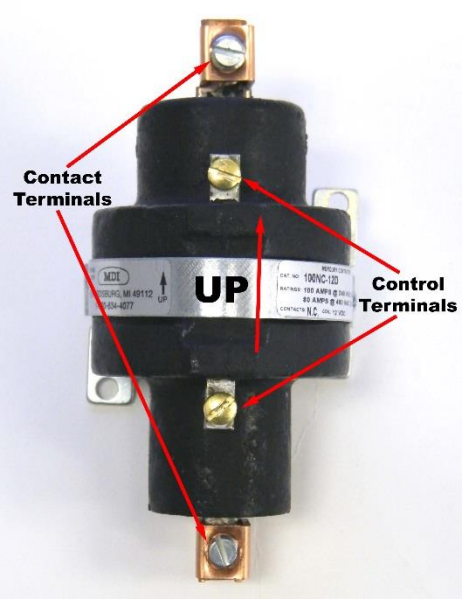


Figure 16 K07111NC12D 100A Mercury Displacement Relay

4.2.6 Door Switch Wiring

The RMU5 may be used to monitor the state of an installer-provided door switch contact. The contacts are debounced for a programmable period. Any mechanical contact switch may be used. The door switch is wired as shown in Figure 17. Ensure that the wire jumper from the 12V terminal to the D-IN A terminal is not omitted.

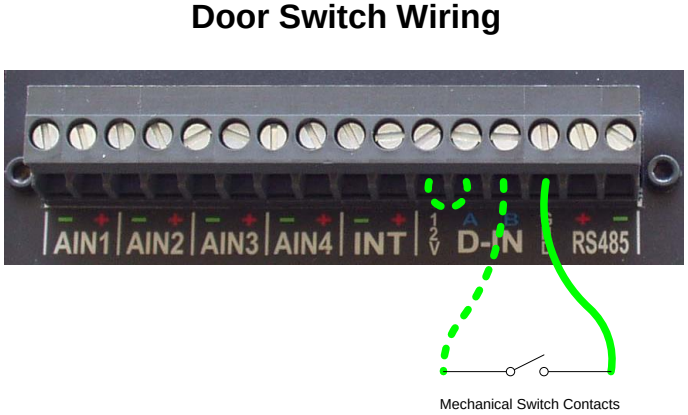


Figure 17 Door Switch Wiring

The digital input may also be used to monitor other types of contacts and for other purposes. The digital input may be used to sense breaker trips for breakers that provide isolated trip detection contacts.

For active digital sensors, such as hall effect sensors, a 3 to 32VDC source attached between D-INA and D-INB will result in an active input for sensing an enabled voltage source. If a voltage source is used, the 12V source from the RMU5 is not connected to D-INA.

5 Configuration

5.1 Software Installation

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

To install the configuration application and driver software, insert the CD that came with the configuration interface into the CD drive on the PC. If "autorun" is enabled on the PC, the following screen in Figure 18 will appear.

If "autorun" is not enabled, or the contents of the CD have been copied to a local directory, use Windows Explorer to navigate to the CD drive or the directory containing the installation software. Double-click on the "RMU5INSTALLER.exe" application. The dialog on Figure 18 will appear.

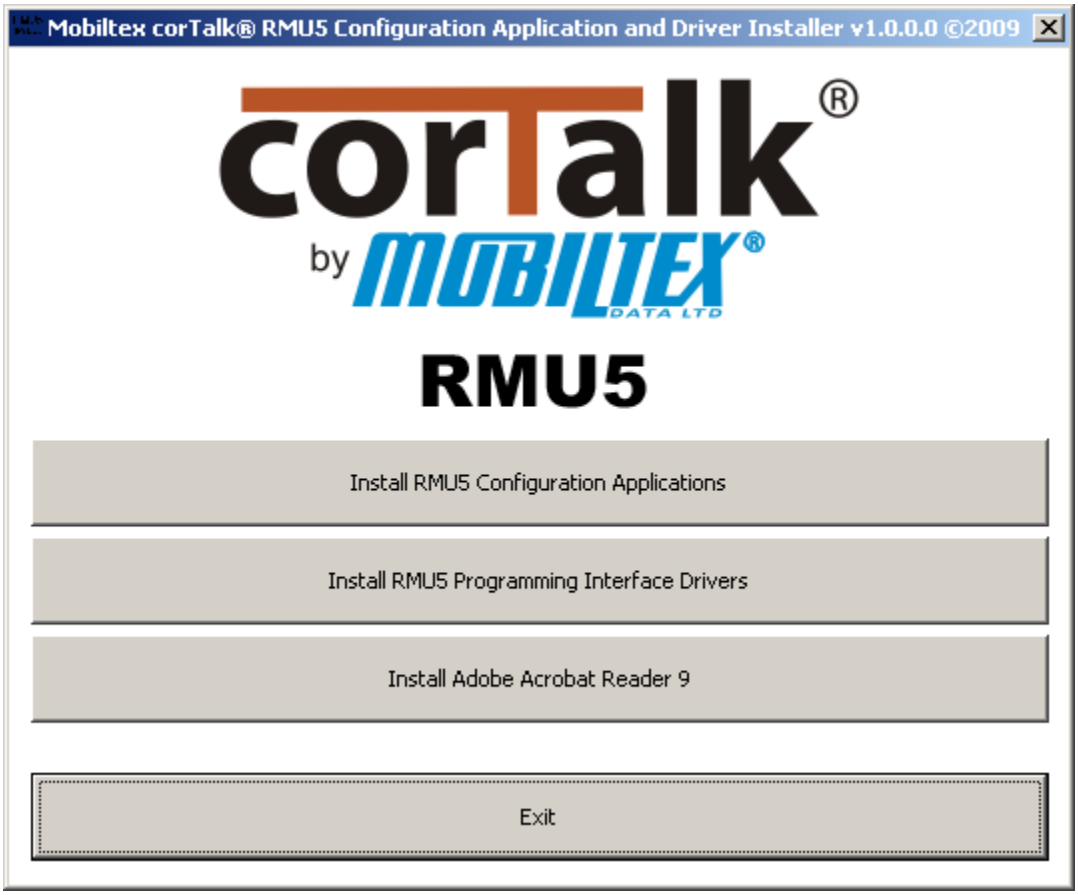


Figure 18 RMU2Installer Dialog

5.1.1 Configuration Application Software

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



Figure 19 RMU5ConfigSetup.msi Security Warning Dialog

The following dialog should now appear:



Figure 20 RMU5 Configuration Applications Installation Dialog

Follow the instructions presented in the installation screens, clicking "Next" to move to the next screen each time. Some screens may pause for tens of seconds as the Windows installation procedure is processing. The final screen should show the screen in Figure 22. Click "Close" to complete the installation.

When presented with the dialog shown in Figure 21, ensure that the "RMU5-corView and RMU5-Generic (Advanced Users)" radio button is selected!

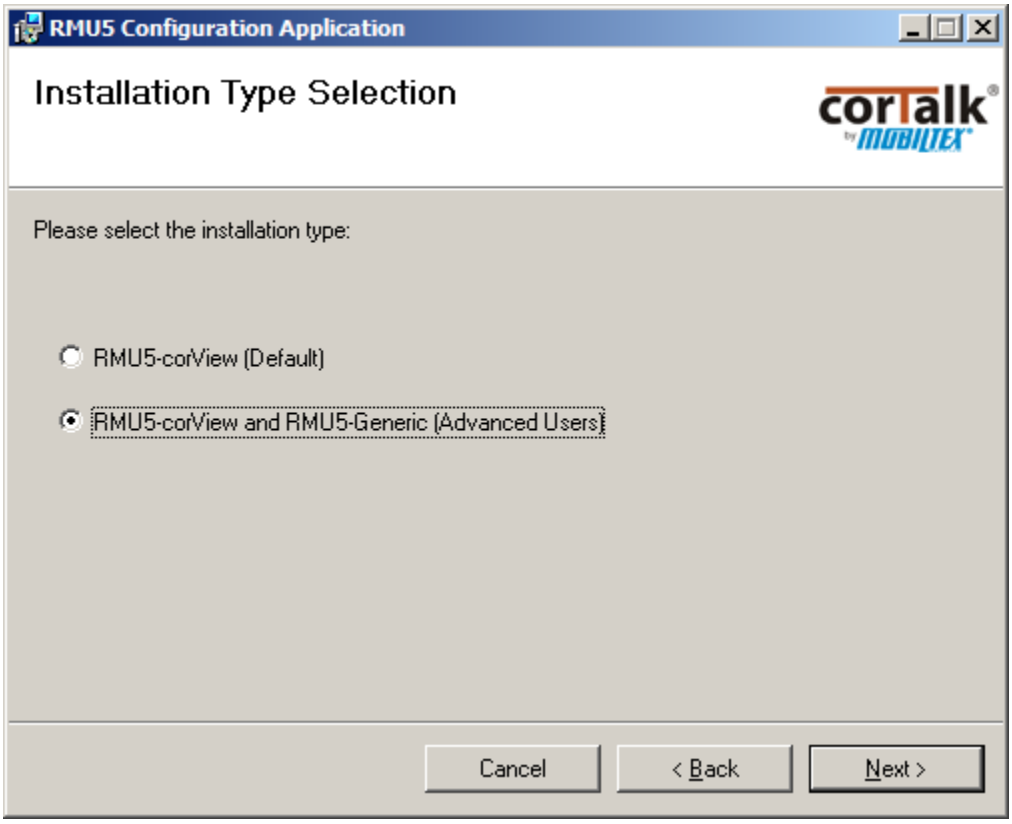


Figure 21 RMU5 Configuration Installation Option Selection

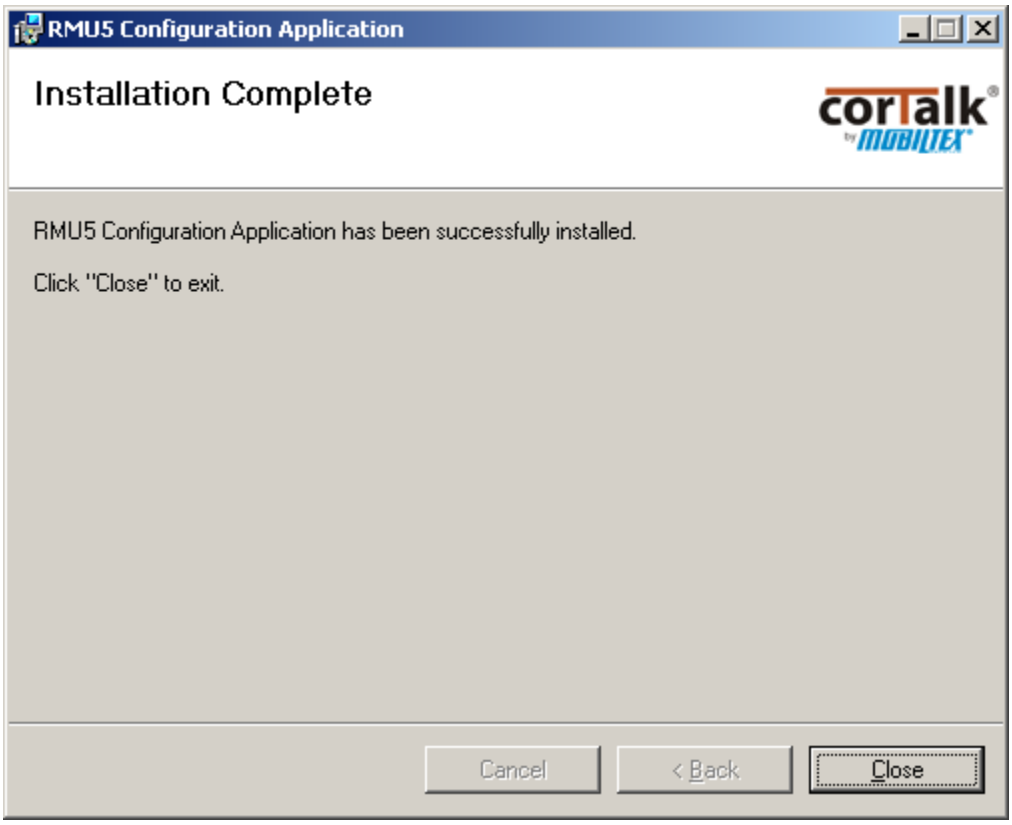


Figure 22 RMU5 Configuration Applications Installation Complete

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

5.1.2 USB Driver

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

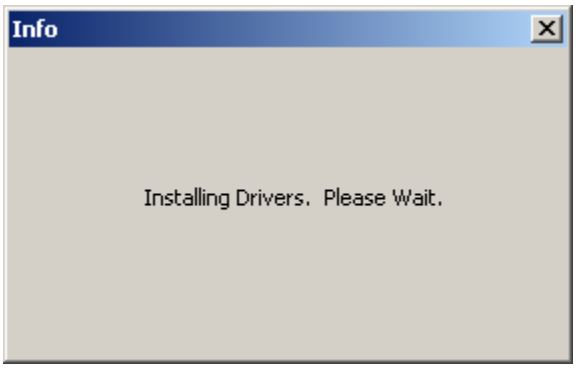


Figure 23 Driver Installation Wait Dialog

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

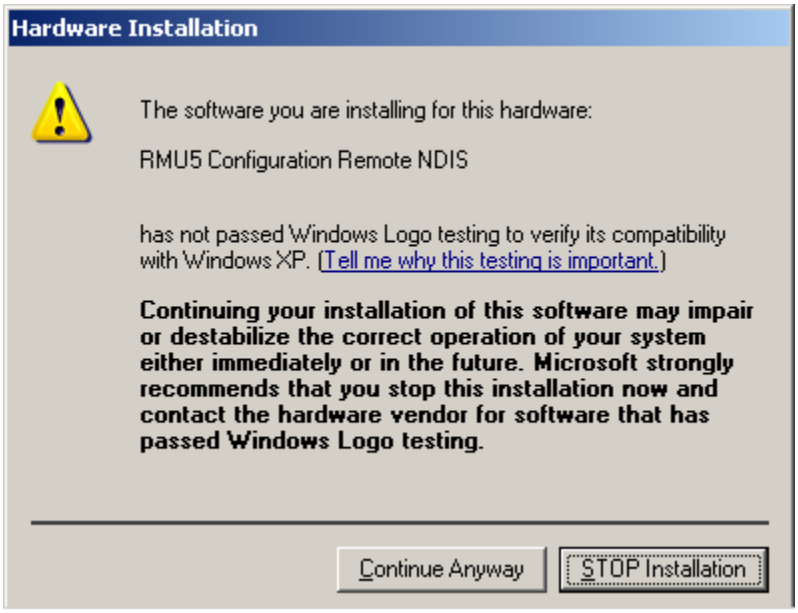


Figure 24RMU5 Driver Code Signing Warning Dialog

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

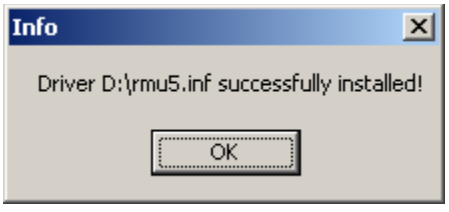


Figure 25 RMU5 Driver Installation Complete Dialog

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



Figure 26 Windows XP Found New Hardware Dialog #1

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

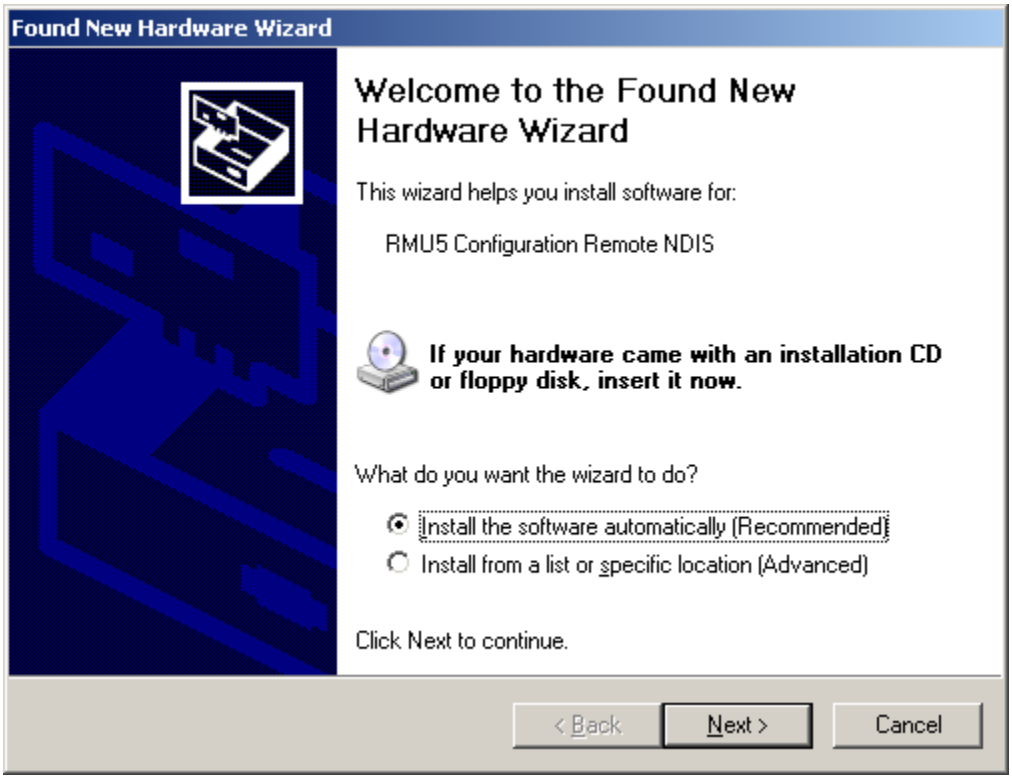


Figure 27 Windows XP Found New Hardware Dialog #2

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

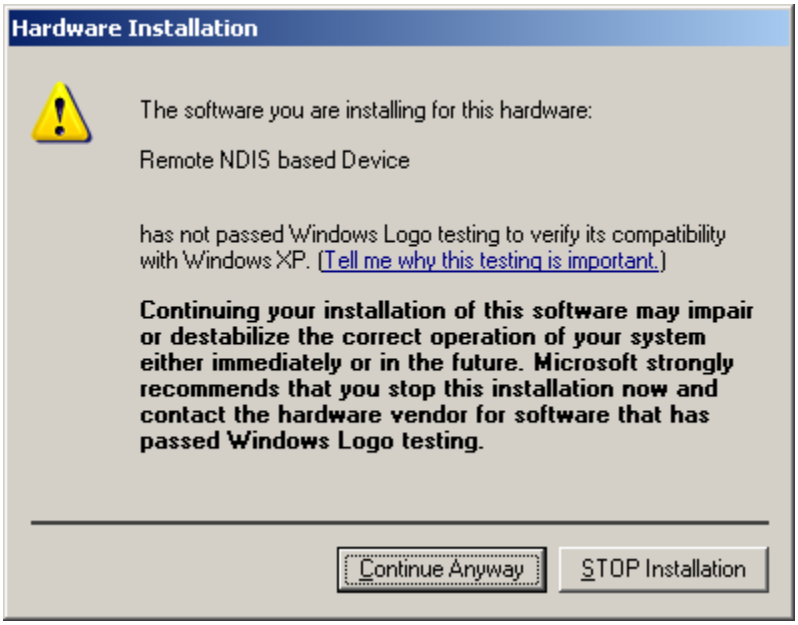


Figure 28 Windows XP Found New Hardware Dialog #3

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

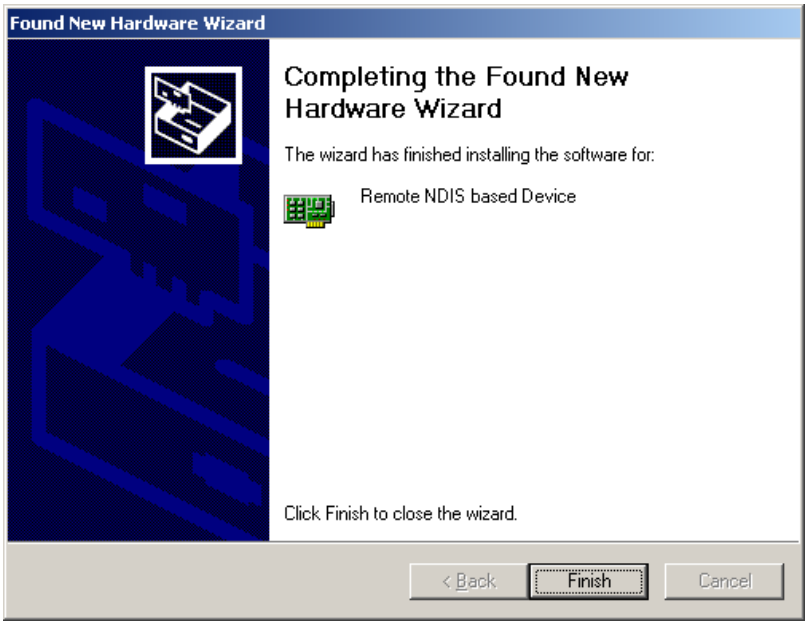


Figure 29 Windows XP Found New Hardware Dialog #4

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

5.2 RMUSetup Application

Configuration of the RMU5 is performed using an application, RMU5Setup.exe, provided by Mobiltex on the same CD that contained the USB driver file. After completing the installation process from the CD, start the application from the Windows start menu using the "RMU5-Generic Setup" shortcut located in the "RMU5 Configuration Application" subfolder.

The following dialog will appear:

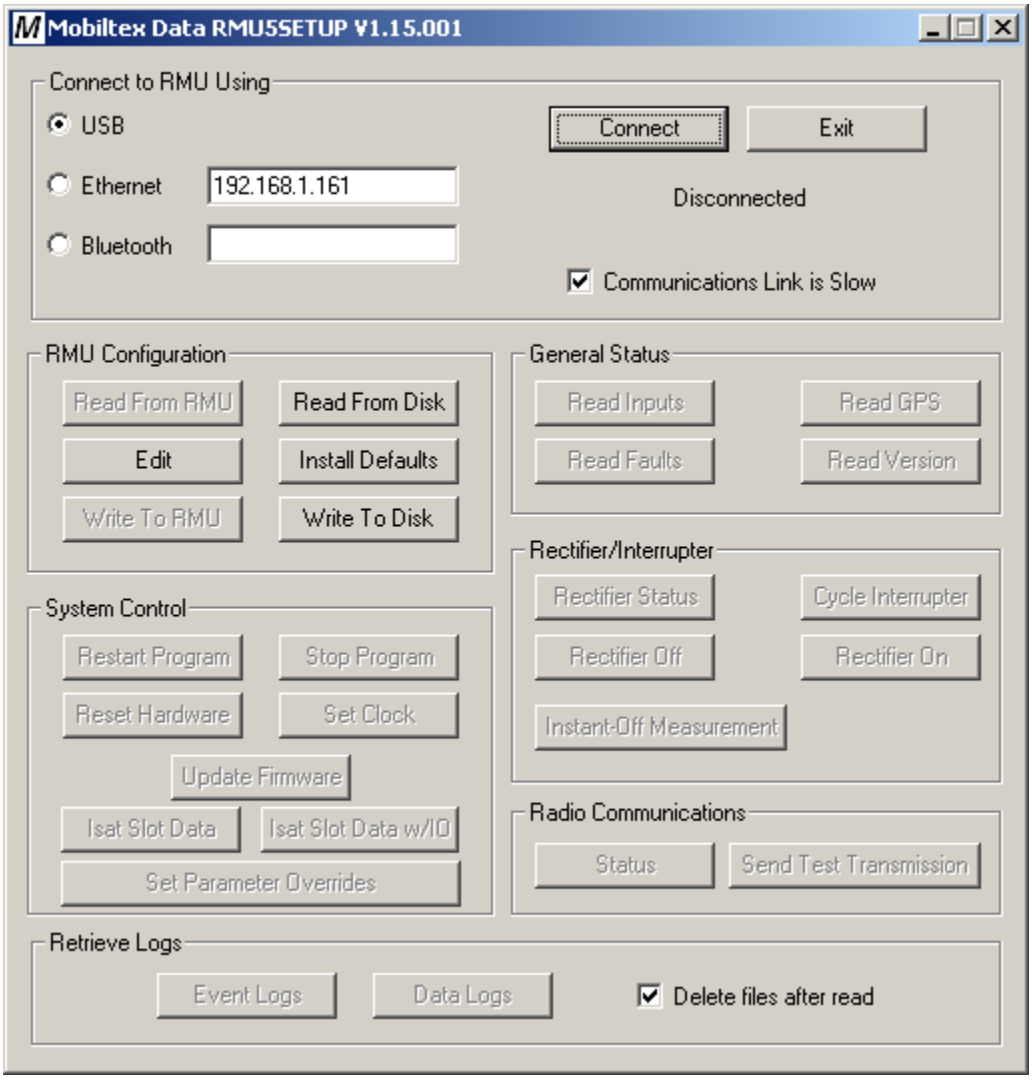


Figure 30 Configuration Application Main Screen At Startup

The first step in using RMUSetup is to connect to the RMU5. Ensure that the USB driver has been installed as outlined in section 5.1.2, and that the USB cable is attached between the PC and the RMU5. Select the 'USB' radio button in the dialog, and then click on "Connect". The following dialog will appear:



Figure 31 Connect Password Dialog

Enter the RMUSetup default username of "admin" and the default password of "admin" and click on "OK".

Important Note: The minor and major version numbers of the RMU5Setup application must match the version of the connected RMU5 firmware. If it does not match, RMU5Setup will present a warning box indicating that the RMU5 firmware or the configuration application must be updated. If the RMU firmware version is higher than the configuration application version, then the configuration application must be updated to match. If the RMU firmware version is lower than the configuration application version, then the "Update Firmware" function may be used to update the RMU firmware to a compatible level.

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

http://www.mobiltex.com/cathodic/rmu5generic

Once connected, the status information below the "Connect" button will indicate that the RMU is connected, and the version number of the software on the RMU5. The "Connect" button label will also change to "Disconnect", as shown in the following screen shot:

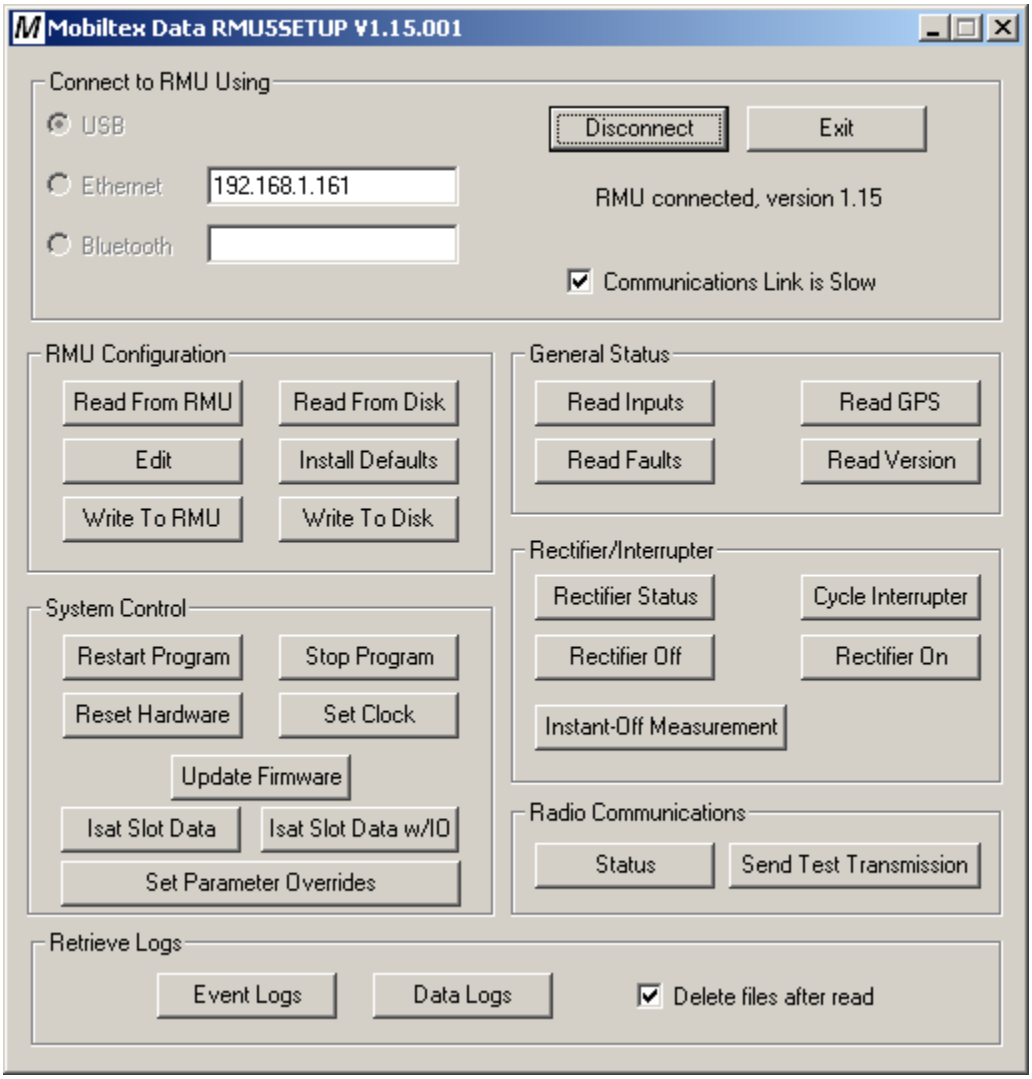


Figure 32 Configuration Application Main Screen Connected

RMUSetup is now connected to the RMU5 and the RMU5 can now be configured.

5.2.1 RMU Configuration

Configuration editing is always performed on a local copy of the configuration file. If the RMU5 has never been configured, click the "Install Defaults" button for a default configuration. If the RMU5 has already been configured and some changes are required to the configuration, read the configuration back from the RMU5 using the "Read From RMU" button.

Click on the “Edit” button to edit the local copy of the RMU5 configuration

After completion of parameter edits, click on the “Write To RMU” button to install the configuration in the RMU5. The configuration will not immediately become active. To make the new configuration active, click the “Restart Program” button under the “System Control” group.

Copies of the configuration may also be stored locally on the PC by clicking the “Write To Disk” button.

5.2.1.1 System Configuration Properties

The following dialog with multiple edit tabs is presented, with the first page containing global system parameters:

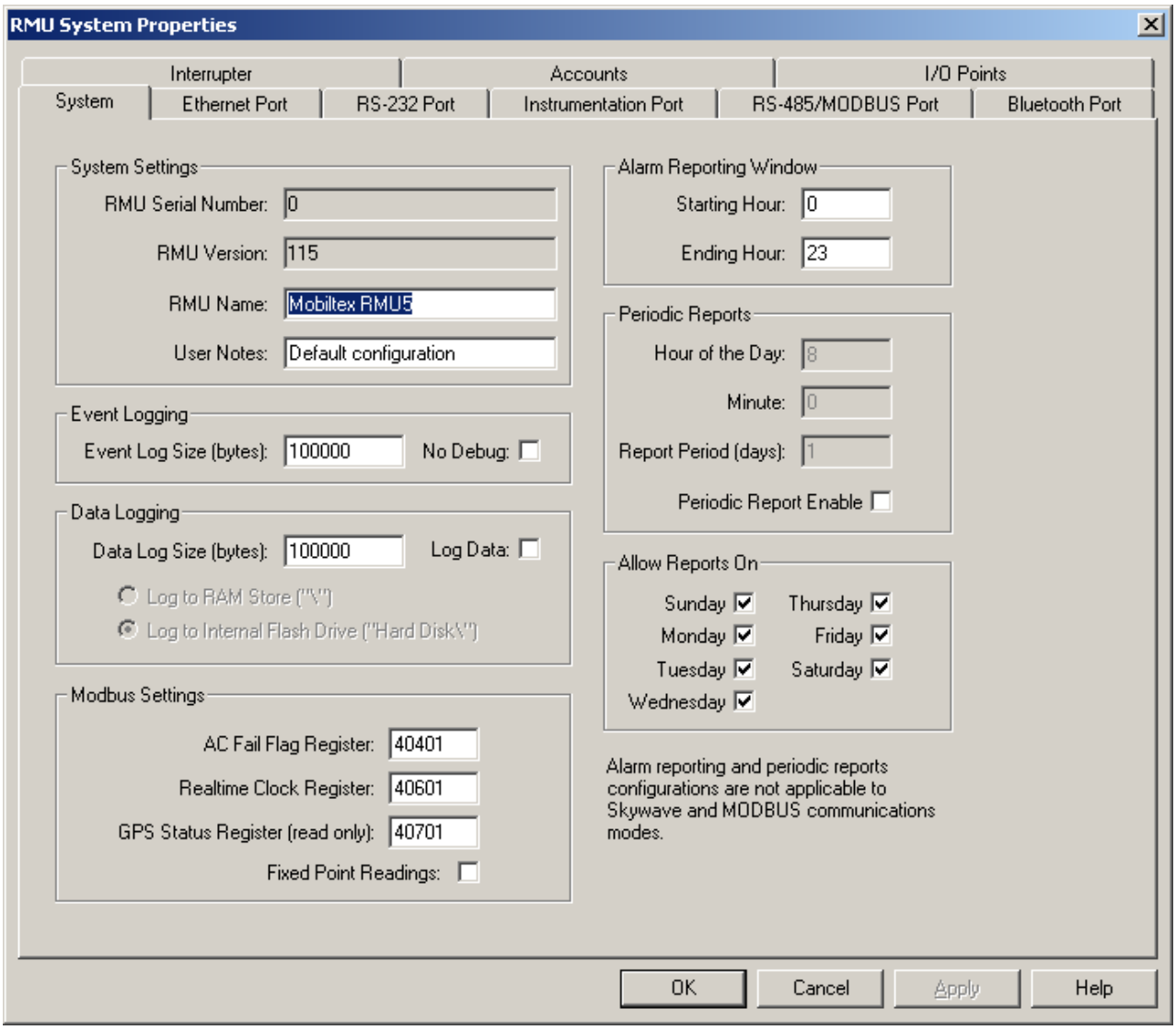


Figure 33 RMU5 Configuration -- System Properties

The "System" properties page contains the following fields:

1. RMU Serial Number. This is a read-only field with the 32-bit unique electronic serial number that is hard coded into the system microprocessor. This field is only valid when the configuration has been read back from the RMU5.
2. RMU Version. This read-only field contains the version number of the RMU5 application. An implied decimal point is not shown. For example, a value of 102 indicates an application version of 1.02.
3. RMU Name. This is a free form text field that can be set to whatever the user desires, but typically it should be some meaningful name related to the site where the RMU5 is installed. This information is printed into the RMU5 log files on startup. The information is also used on web page displays.
4. User Notes. This is a free form text field that can be set to whatever the user desires. The information is printed into the RMU5 log files on startup.
5. Event Log Size. This field is used to limit the maximum size of individual log files on the RMU5. Once a log file exceeds this size, it is closed and a new file is started.
6. Data Log Size. This field is used to limit the maximum size of individual data log files on the RMU5. Once a data log file exceeds this size, it is closed and a new file is started.

7. Log to USB Drive. This check box field is used to indicate to the RMU5 that it should use the internal optional USB drive card for storage of log files and data log files. If the internal optional flash drive is not installed, this check box should be un-checked.

8. No Debug Events. The RMU5 system log can output very detailed logging messages to aid in diagnosing potential problems. This verbose logging can create large files quite quickly. To reduce the amount of information that is logged, so that only critical events and information events are shown, uncheck this box.

9. Log File Path. This field is used to select the destination directory for the log files. With the internal optional USB drive card installed, this field should be set to "Hard Disk\".

10. AC Fail Flag Register. When the RMU5 is used in MODBUS slave mode, failure of AC input power may be polled by requesting the data from the holding register indicated by this field. The AC failure indicated in the MODBUS register is latching and requires the host to reset the flag. This field sets the start of the MODBUS register block used for accessing this function.

11. Realtime Clock Registers. When the RMU5 is used in MODBUS slave mode, the internal real time clock may be queried or set by a remote master. This field sets the start of the MODBUS register block used for accessing this function.

12. GPS Status Registers. When the RMU5 is used in MODBUS slave mode, the optional GPS timing control module may be queried by a remote master. This field sets the start of the MODBUS register block used for accessing this function.

13. Fixed Point Readings. When the RMU5 is used in MODBUS slave mode, it is possible to switch the readings representation format from IEEE 754 floating point to 16-bit fixed point. In 16-bit fixed point mode, the range of readings values is from -327.67 to 327.67. This option would be set if the RMU5 is used with a MODBUS master that is incapable of utilizing floating point representations for data.

14. Alarm Reporting Window Starting/Ending Hour. In communications modes other than MODBUS, the RMU5 will autonomously report alarms to the host. These two fields determine at which times the RMU5 can report alarms to the host. The alarm allowable times are inclusive of the limits values entered. Note that all times on the RMU5 are UTC times—local time zone is not taken into account. Note that this setting is not applicable to Skywave IsatM2M and MODBUS communications modes.

15. Periodic Reports. In communications modes other than MODBUS, the RMU5 can be programmed to periodically send data reports to the host. The fields in the group allow the hour and minute time of day of the reports to be selected. The number of days between reports can also be selected. To enable this feature, check the "Periodic Enable" check box. . Note that this setting is not applicable to Skywave IsatM2M and MODBUS communications modes.

16. Allow Reports On. In communications modes other than MODBUS, the RMU5 can be programmed to periodically send data reports and alarm reports to the host. The check boxes in this group can be used to limit the days of the week when reports will be sent. . Note that this setting is not applicable to Skywave IsatM2M and MODBUS communications modes.

5.2.1.2 Ethernet Configuration Properties

The next tab in the configuration dialog is the "Ethernet Port" settings:

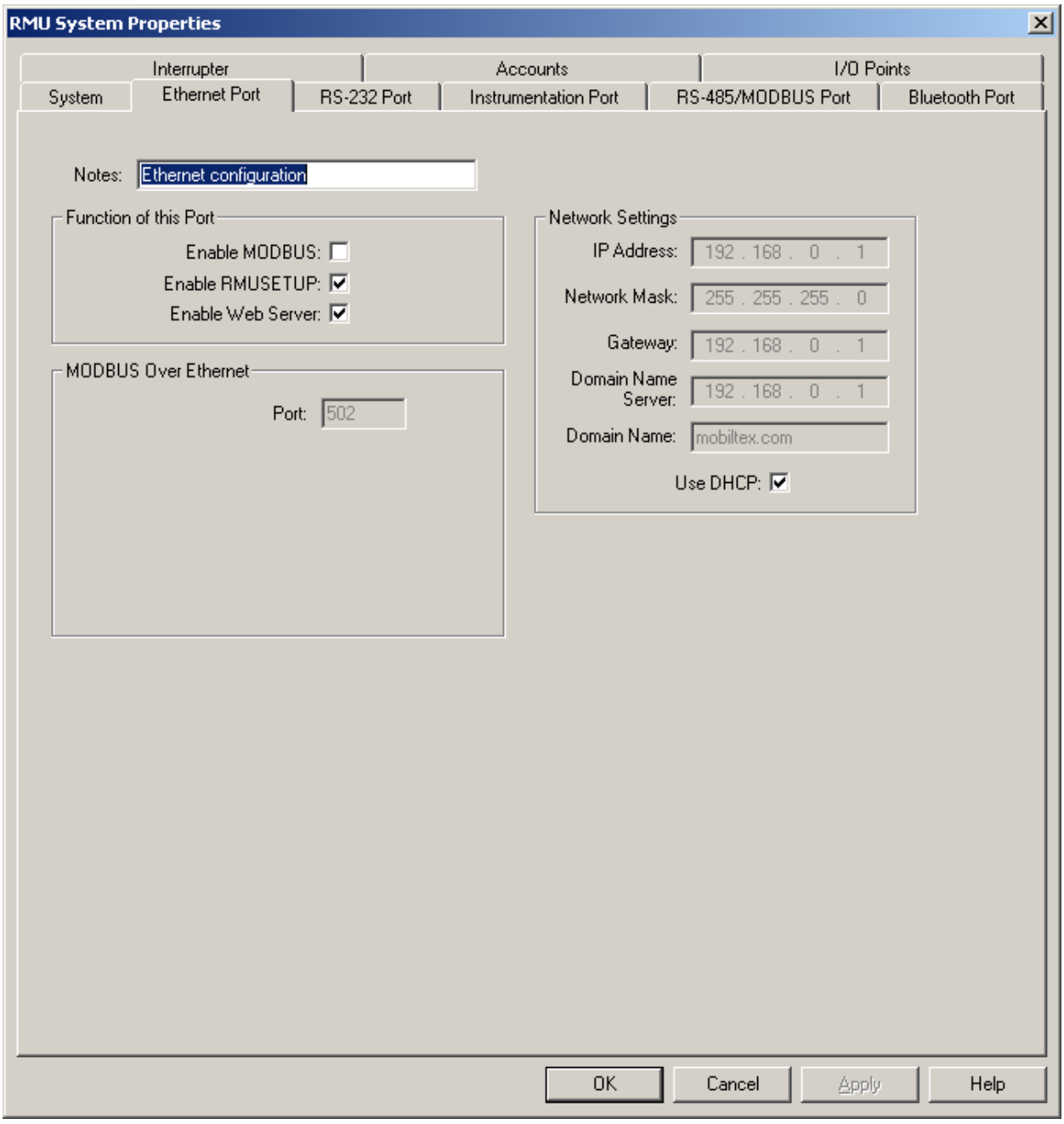


Figure 34 RMU5 Configuration -- Ethernet Properties

The "System" properties page contains the following fields:

1. Notes. This is a free form text field where the user can enter any pertinent information about the configuration in the page. This field is purely informational and has no effect on the operation of the RMU5.
2. Function of this Port. Several features may be enabled over Ethernet. The first is the MODBUS slave mode. This enables a MODBUS TCP server on port 502. The second is RMUSETUP, which allows remote configuration from RMUSetup via an Ethernet connection. The final option is the "Web Server" that enables a web server page on TCP port 80 which contains the current RMU5 status information. In addition to the three options listed, the Ethernet port also supports an FTP server and Telnet server that are always enabled. Access to these features requires authentication based on the parameters in the "Accounts" settings tab.

3. MODBUS Over Ethernet. This group of settings is used to set the parameters for the MODBUS TCP mode. The MODBUS TCP server should always be located on port 502 as per MODBUS specifications.

4. Network Settings. This group of settings is used to configure the TCP/IP stack for the Ethernet interface. Default is DHCP, which causes the RMU5 to attempt to obtain its settings from a DHCP server on the local network segment. If "Use DHCP" is unchecked, then the individual parameters may be changed. Network settings parameters should be obtained from the administrator of the LAN segment to which the RMU5 is being attached.

5.2.1.3 RS-232 Port Properties

The "RS-232 Port" properties page is used to configure the operation of the RS-232 port on the communications expansion port. This port may be used to support a variety of communications protocols, depending on the expansion board/cable attached to the communications expansion connector.

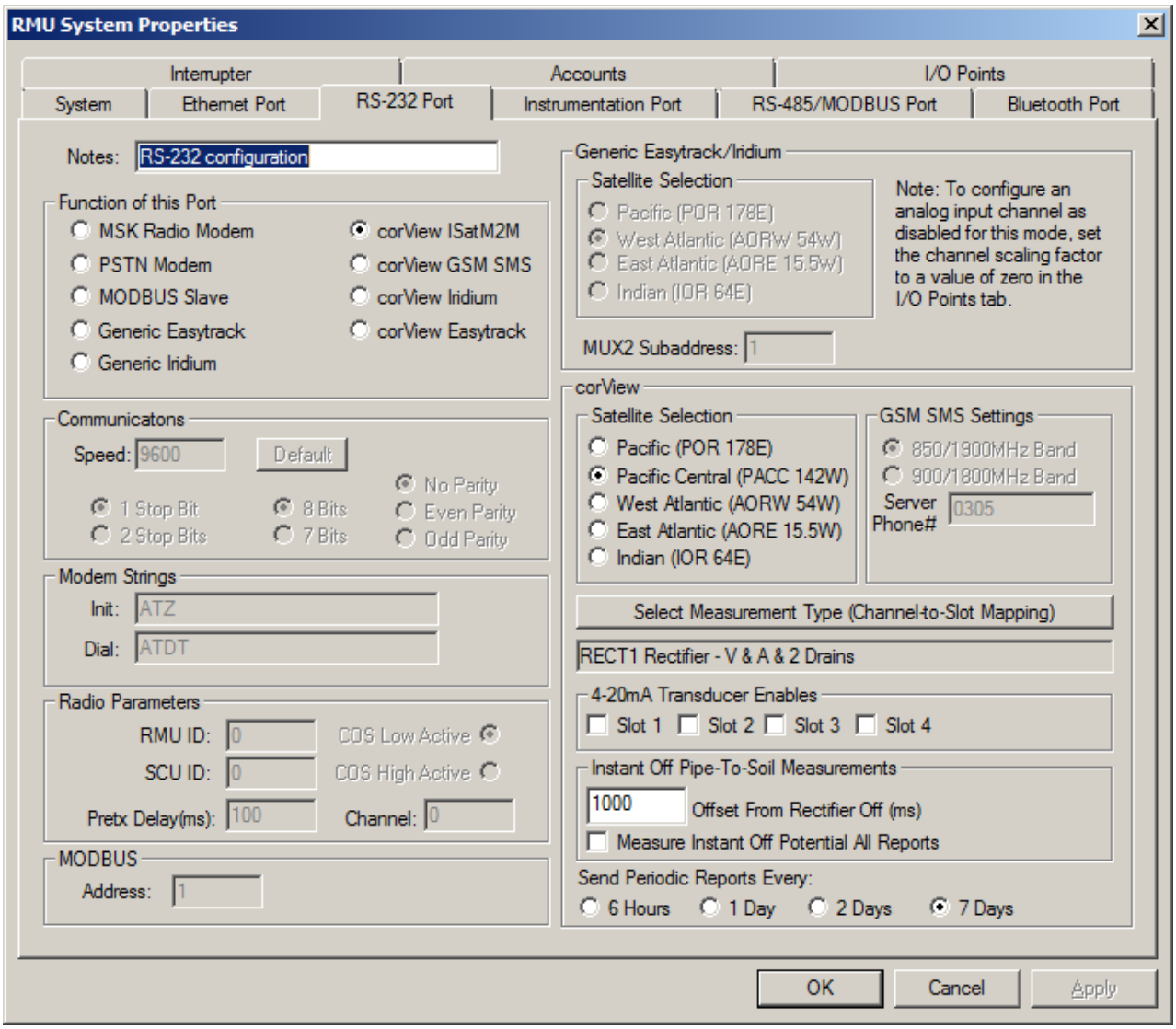


Figure 35 RMU5 Configuration -- Communications Expansion Port Properties

The "RS-232 Port" properties page contains the following fields:

1. Notes. This is a free form text field where the user can enter any pertinent information about the configuration in the page. This field is purely informational and has no effect on the operation of the RMU5.

2. Function of this Port. The RS-232 port on the communications expansion port may be used for one of several purposes. The radio buttons in this grouping allow selection of the device type that is attached to the RS-232 port.

3. Communications. The RS-232 UART communications properties are set in this group. The default button, if enabled for a particular communications type, when clicked, will set the nominal values based on the currently selected function of the port. This group is not enabled for communications modes that use fixed parameters.
4. Radio Parameters. The selections in this group relate to the Mobiltex proprietary terrestrial radio modem. Settings for this group will be specified in the manual for the radio modem.
5. MODBUS Address. This parameter sets the MODBUS slave address.
6. Modem Strings. These parameters set the initialization strings required for an attached AT-compatible PSTN dial-up modem. Exact settings will be installation dependent.
7. Generic Easytrack/Iridium. These parameters specify information required to communicate over an attached Easytrack satellite communicator. The parameters are dependent on how the Easytrack/Iridium satellite communicator was configured by the satellite service provider, and the geographical installation location of the RMU5 and communicator.
8. corView. These parameters specify information necessary for the corView IsatM2M, Iridium, Easytrack and GSM SMS modes of communications. An RMU3-S Iridium transceiver is required for Iridium mode. A Thrane&Thrane TT3026 Inmarsat C Easytrack satellite transceiver is required for Easytrack mode. A Skywave DMR 800 satellite transceiver must be attached to the RMU5 for corView IsatM2M operation. A GTX2 GSM transceiver must be attached to the RMU5 for corView GSM SMS operation. Several parameters must be configured in this area for proper operation. For corView installations, it is advisable to use the simplified RMU5SetupCorView application for configuration.

5.2.1.4 Instrumentation Port (Sensor Bus) Properties

The "Instrumentation Port" properties page is used to configure the sensor expansion bus parameters. Only the UART communications parameters are currently adjustable. The exact settings will be dependent on the modules attached to the sensor bus.

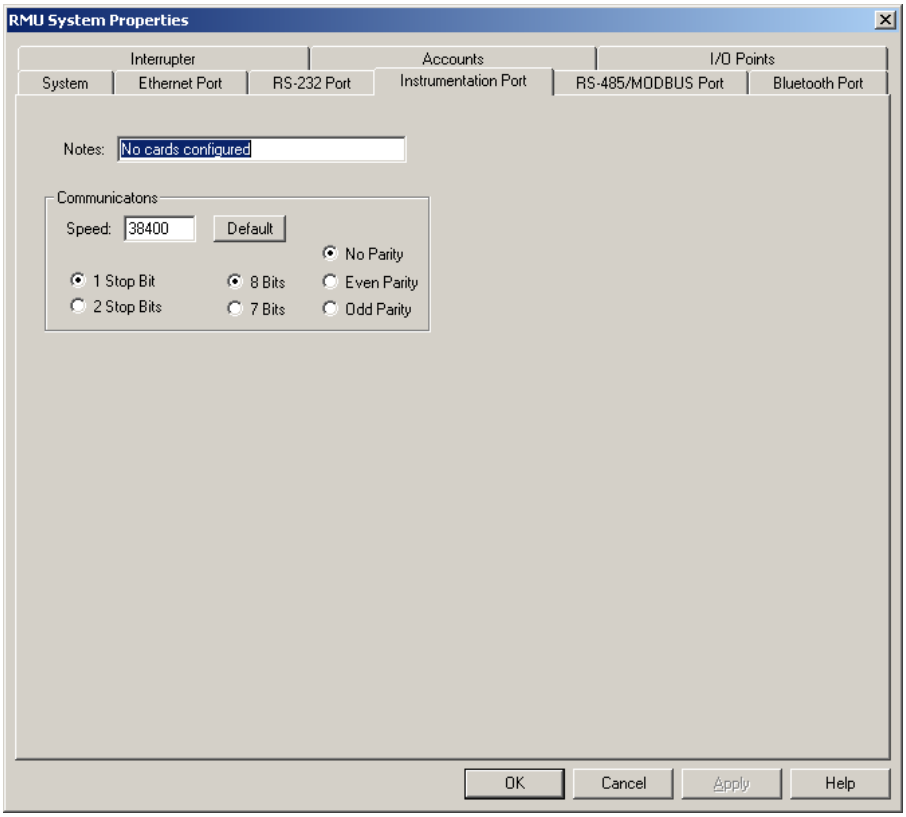


Figure 36 RMU5 Configuration – Instrumentation Sensor Expansion Bus Properties

5.2.1.5 RS-485/MODBUS Port Properties

The "RS-485/MODBUS Port" properties page is used to configure the serial MODBUS slave that can be accessed via the RS-485 port on the main I/O connector.

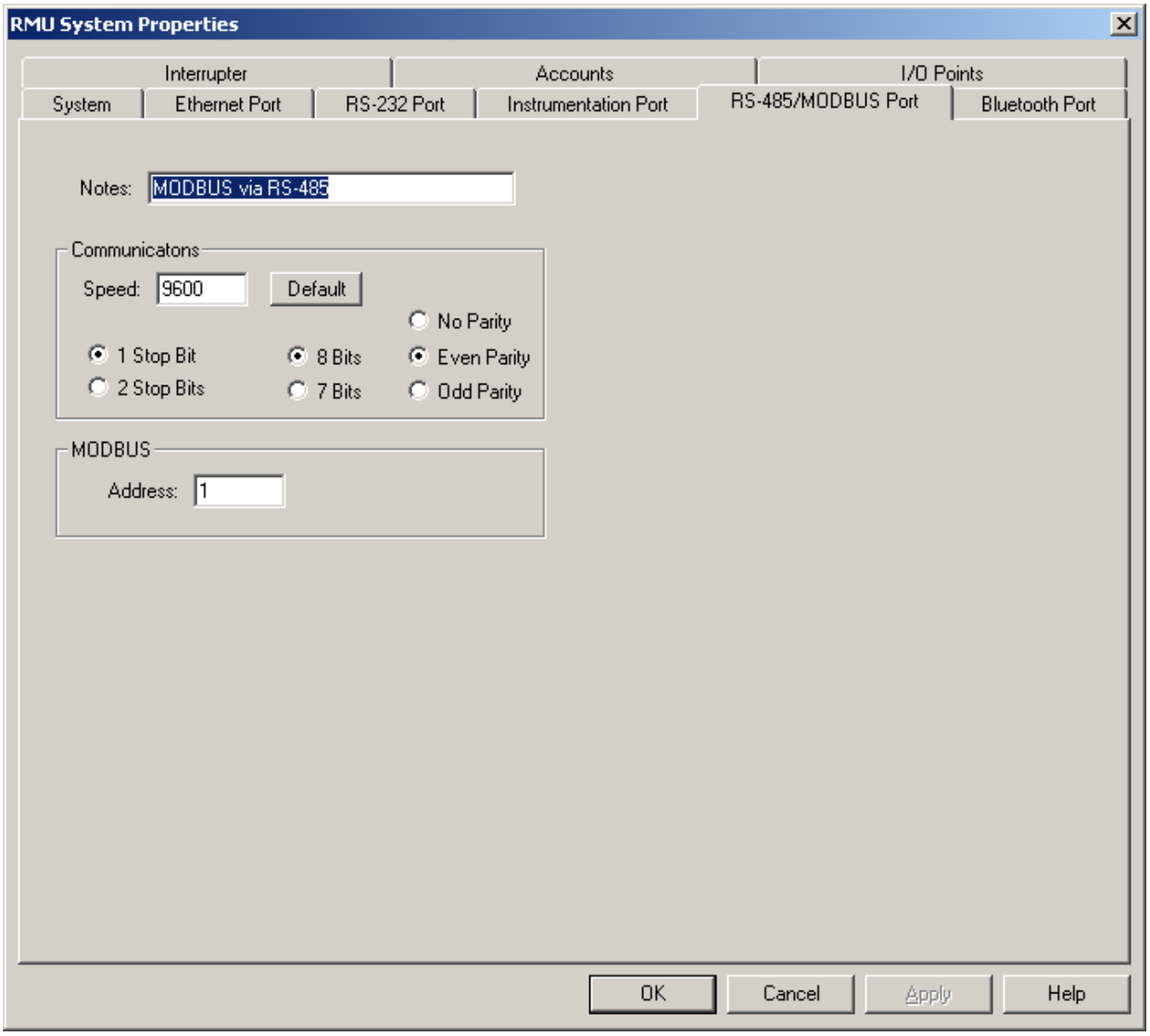


Figure 37 RMU5 Configuration – RS-485/MODBUS Port Properties

The "RS-485/MODBUS Port" properties page contains the following fields:

1. Notes. This is a free form text field where the user can enter any pertinent information about the configuration in the page. This field is purely informational and has no effect on the operation of the RMU5.
2. Communications. The RS-232 UART communications properties are set in this group. The default button, when clicked, will set the parameters to nominal values used with the MODBUS protocol.
3. MODBUS Address. This parameter sets the MODBUS slave address.

5.2.1.6 Bluetooth Port Properties

The "Bluetooth Port" properties page allows setting parameters associated with the optional internal Bluetooth communications module.

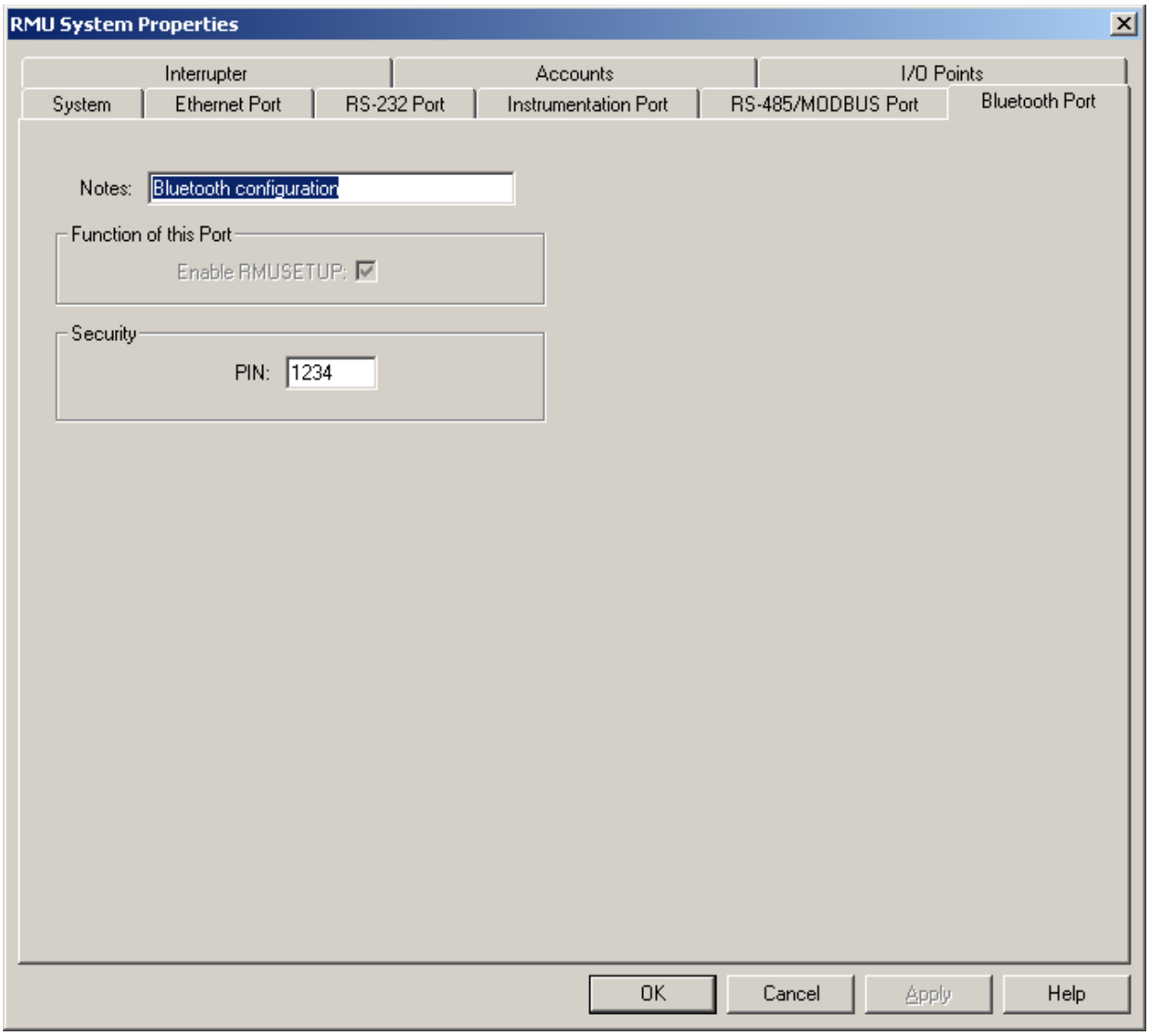


Figure 38 RMU5 Configuration – Bluetooth Properties

The "Bluetooth Port" properties page contains the following fields:

1. Notes. This is a free form text field where the user can enter any pertinent information about the configuration in the page. This field is purely informational and has no effect on the operation of the RMU5.
2. Function of this Port. The RMU will allow access to various services over Bluetooth. Currently, only execution of RMUSETUP over Bluetooth is supported.
3. Security PIN. This parameter allows setting the PIN code associated with Bluetooth pairing. Refer to your PDA or laptop manual for the exact pairing procedure for the host device.

5.2.1.7 Interrupter Properties

The "Interrupter" properties page allows configuring the operation of the rectifier interrupter relay. This function is normally used when pipeline surveys are performed. When the RMU5 is equipped with a GPS-based timing control board, the output can be very precisely synchronized to other equipment that is located remotely. Without the GPS timing control board, the RMU5 can still interrupt the rectifier, but the timing accuracy and precision will be far more lax. Without the GPS timing control board, synchronization to remote devices will not be possible.

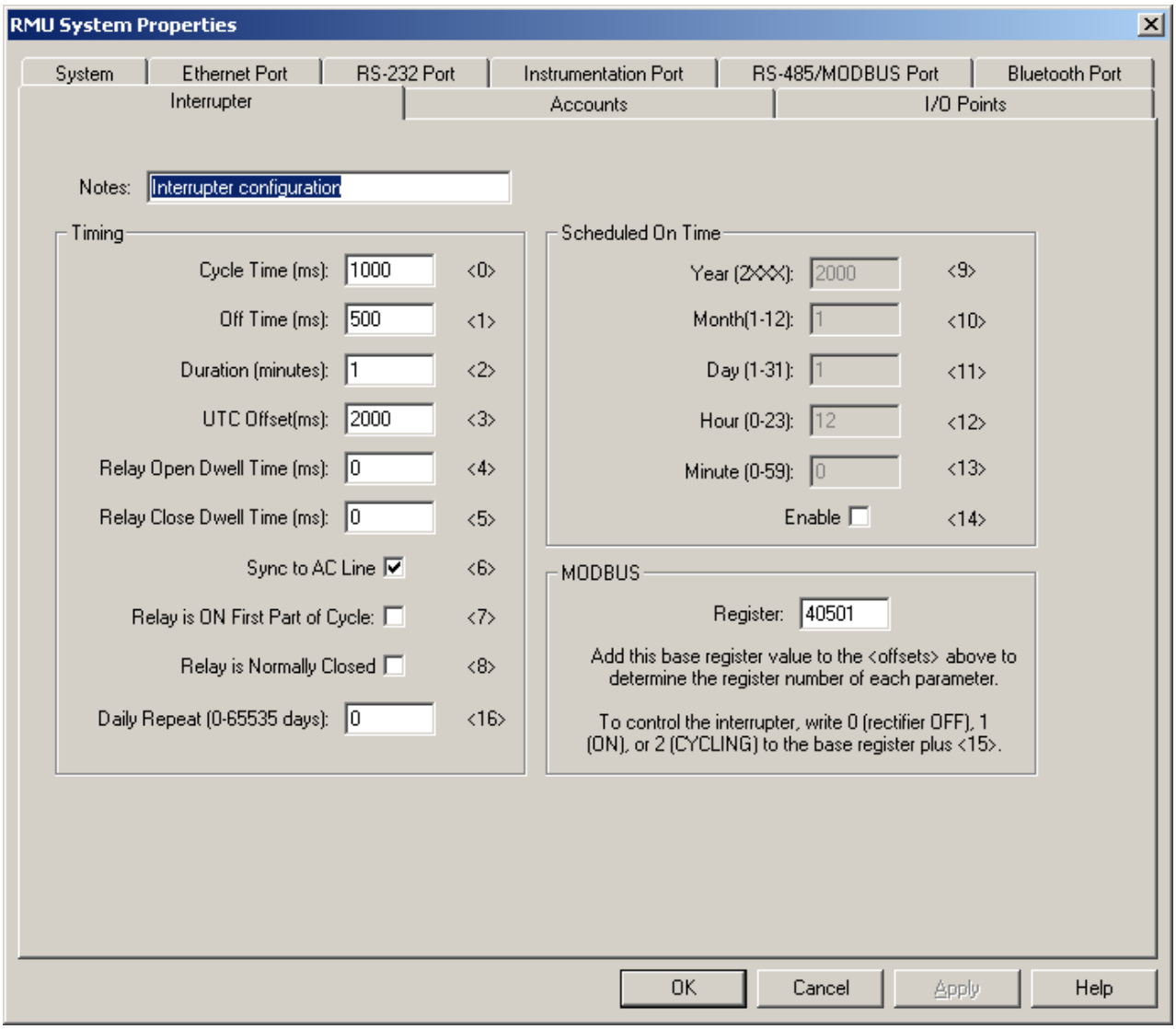


Figure 39 RMU5 Configuration – Rectifier Interrupter Properties

The "Interrupter" properties page contains the following fields:

1. Notes. This is a free form text field where the user can enter any pertinent information about the configuration in the page. This field is purely informational and has no effect on the operation of the RMU5.
2. Cycle Time. This is the number of milliseconds in an interruption cycle (off time + on time). The maximum cycle time is 60000ms.
3. Off Time. This is the number of milliseconds that the rectifier will be off during the interruption cycle. This field has a maximum of the lesser of 60000ms or the cycle time.
4. Duration. This is the number of minutes that the interruption cycles will occur for. The rectifier will revert to an on state after interruption duration has expired.
5. UTC Offset. This parameter is used to synchronize the RMU5 to other manufacturers' equipment. A value of 2000 causes exact alignment of the cycle start to the UTC time mark. This parameter may be set between 0 and 5000ms. Use of this parameter only applies to units equipped with the GPS timing control module board.

6. Relay Open Dwell Time. This parameter is used to compensate for mechanical relays which have a lag time when transitioning from a closed to an open state. The parameter can be set from 0 to 255ms. Use of this parameter only applies to units equipped with the GPS timing control module board.

7. Relay Close Dwell Time. This parameter is used to compensate for mechanical relays which have a lag time when transitioning from an open to a closed state. The parameter can be set from 0 to 255ms. Use of this parameter only applies to units equipped with the GPS timing control module board.

8. Sync to AC Line. To minimize surge current at rectifier turn on, the relay drive signal may be synchronized to the AC waveform. Enabling this checkbox engages this functionality. Note that the relay drive signal will vary by up to 10 milliseconds from where it would normally occur. Use of this parameter only applies to units equipped with the GPS timing control module board.

9. Relay is ON First Part of Cycle. The start of an interruption cycle is synchronized with the top of the minute. This setting allows the first part of the cycle to have the rectifier enabled, followed by the off portion of the cycle. Normally, the off portion is first in the cycle. Use of this parameter only applies to units equipped with the GPS timing control module board.

10. Relay is Normally Closed. Relays are available with normally open or normally closed contacts. For a solid state relay, the contacts are usually normally open meaning that power has to be applied to the coil input on the relay to close the contacts. In the case of a mechanical relay, either normally open or normally closed contacts are available. For a mechanical relay though, it is usually preferred to use a normally closed relay to save power, as the relay coil does not have to be energized to maintain the contacts in a closed state. Set this field according to the type of relay that is used in the rectifier.

11. Daily Repeat. An interruption event (whether it be immediate or scheduled to happen at a later date/time) may be set to repeat daily for a set number of days by setting this parameter to the number of additional days to repeat. When daily repeat is used, the duration parameter must be less than 24 hours (1440 minutes).

12. MODBUS Register. This parameter specifies the base register address for the interrupter control register block. Each field on this page has a number associated with it which is added to this base address to determine the register address for an individual control/status field.

13. Schedules On Time. The RMU5 may be programmed with a specific date and time and the interruption output will operate in a cycling mode for the specified duration. This date and time may be enabled by selecting the enable check box.

5.2.1.8 Accounts Parameters

The "Accounts" parameters page allows the RMU5 security parameters to be updated. Three levels of access are available, normal, supervisor, and administrator.

The normal user has access only to reading of status--configuration reads/writes, rectifier control, and system control functions are all disallowed. The supervisor user has access to everything except configuration writes to the RMU5. The administrator user has access to all functions.

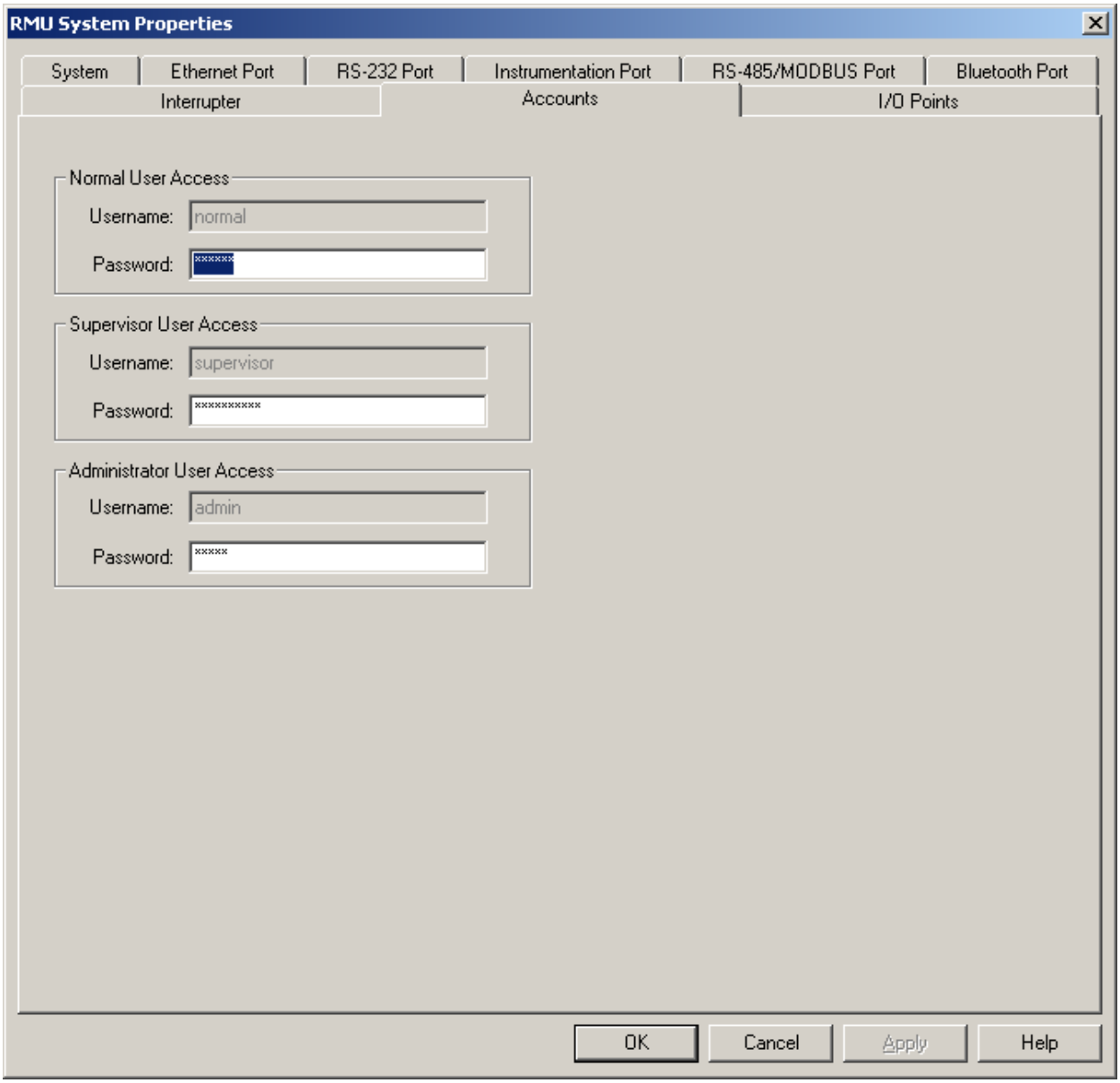


Figure 40 RMU5 Configuration – User Accounts Properties

For each of the three defined users, the following parameters are available:

1. Username. The username for the particular access level. This value is hard coded for each account type.
2. Password. The password for the particular access level. A password with a maximum length of 15 characters may be entered.

5.2.1.9 I/O Points Parameters

The "I/O Points" parameter page contains settings related to each I/O point in the system. The RMU5 has 13 built in I/O points, and is expandable to 50 I/O points using external modules attached to the sensor expansion bus.

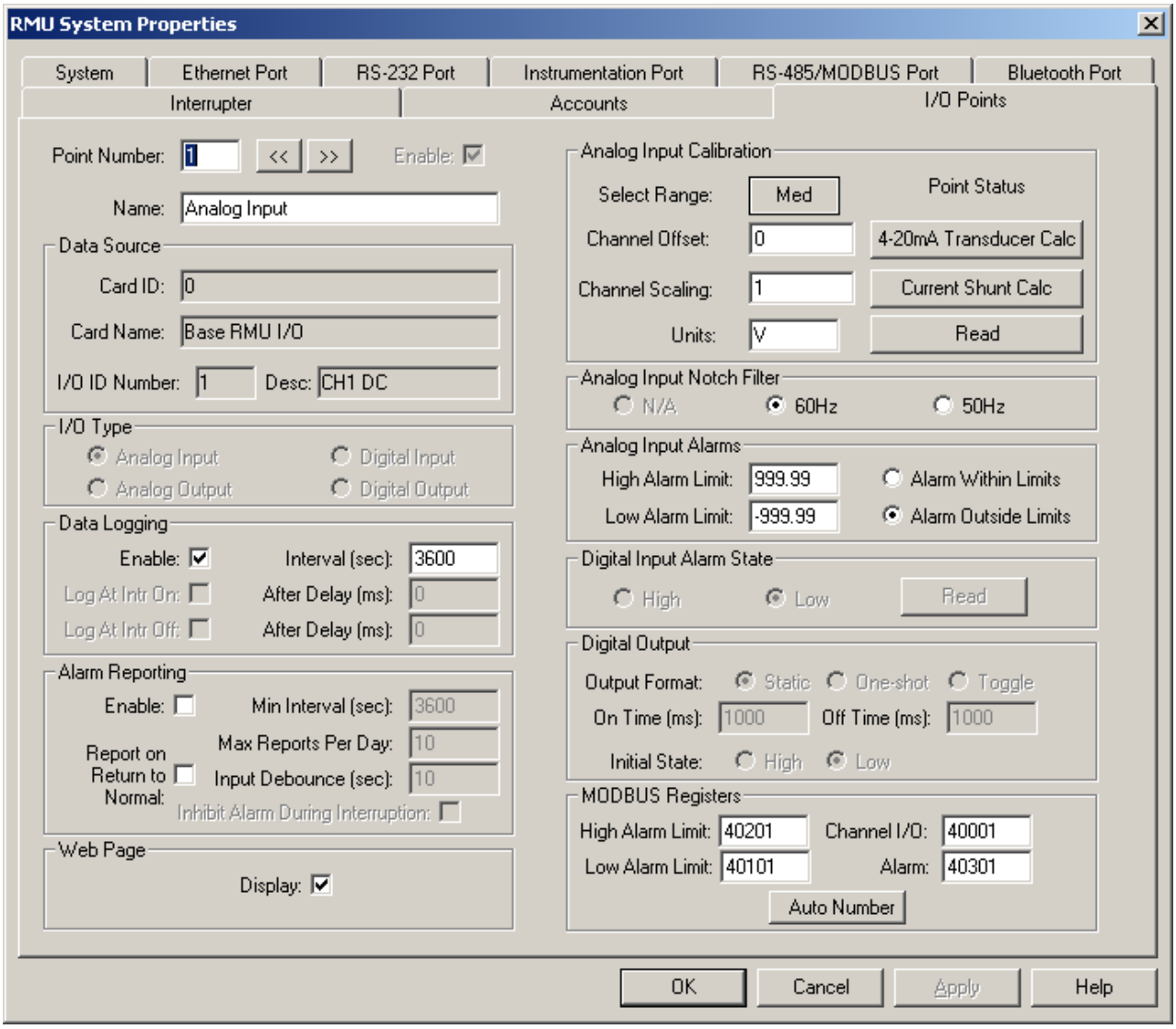


Figure 41 RMU5 Configuration – I/O Points Properties

The current I/O point being operated on is selected by the "<<" and ">>" buttons next to the point number field. The "I/O Points" parameters page contains the following fields for each I/O point:

3. Name. This is a free form text field where the user can enter any pertinent information about the configuration in the page. This field is purely informational and has no effect on the operation of the RMU5.
4. Enable. This check box enables sampling of the selected I/O point.
5. Data Source. This grouping of fields is used to indicate the physical source of data for the I/O point. For the built in 10 I/O points, this information is hard coded. For expansion bus I/O points, these fields will be set according to the I/O modules attached to the sensor expansion bus.
6. I/O Type. This set of radio buttons determines the type for a particular I/O point. For the built in 10 I/O points, this information is hard coded. For expansion bus I/O points, this field will be set according to the I/O modules attached to the sensor expansion bus.
7. Data Logging. The RMU5 is capable of recording measurements from each channel at a pre-determined interval. The data is stored on a flash drive for later retrieval. For internal I/O points, the data may only be taken at periodic intervals. For some sensor bus modules, it is possible to synchronize data sampling and logging to a programmed offset from the edges of the interruption signal.
8. Alarm Reporting. On communications systems where the RMU5 is able to initiate messages to the host, the RMU5 can be configured to send alarm reports when a given channel is outside allowable windows. Checking the Enable checkbox enables a report to be sent when the channel enters the alarm state. Checking the Report on Return to

Normal allows a report to be sent when channel has exited the alarm window. The Min Interval parameter determines how long must pass before a second report occurs—this is used to limit communications in case of oscillating inputs. The Max Reports Per Day field limits the number of autonomous alarm reports that can be sent within a single day, again to limit communications traffic. The Input Debounce field sets the number of seconds a unit is in an alarm window before it is determined to truly be in an alarm state. The "Inhbit Alarm During Interruption" checkbox allows an alarm state to be ignored during interruption cycling. This will prevent alarms from occurring when a rectifier is known to be interrupting.

Note that the Alarm Reporting Enable checkbox must be checked to allow alarm window monitoring via MODBUS. Also note that the alarm timing parameters are not applicable to the Skywave communications mode.

9. Analog Input Alarms. This group of fields sets the parameters for alarming on the I/O point. The low and high limits can be set, and whether the alarm state is between the two values, or outside the two values. This group of fields only applies to I/O points of the analog input type.
10. Digital Input Alarm State. This field sets whether a digital input is considered to be in an alarm state if it is high or low. This field will depend on the device being monitored. Clicking the Read button will read the current state of the digital input. This group only applies to I/O points of the digital input type.
11. Digital Output. This grouping of fields set the parameters for a digital output I/O point. The output may be set to static, one-shot, or toggle. A static output will maintain the output as set by the controlling device. A one-shot output will be set to the commanded state, then revert back to the alternate state after the on time or off time field. A toggle input will continuously toggle between on and off according to the on and off time fields.
12. MODBUS Base Register. This field defines the MODBUS slave register address for reading the current state of an I/O point. The MODBUS slave register addresses for reading and setting the alarm limits/status are also configured in this group.
13. Web Page Display. This checkbox determines if the currently selected I/O point will be displayed in the Web server status page.
14. Analog Input Calibration. This group of fields and control buttons is used to calibrate an analog input I/O point. This grouping differs from other configuration parameters in that it communicates with the RMU5 in real-time to obtain values from the analog input channels. RMUSetup must currently have a connection to the RMU5. Calibration factors are determined from these real-time readings. The Units field is also informational, but it is stored in data log files.
15. Analog Input Notch Filter. The analog to digital converter section of the RMU5 includes a DSP notch filter that is used to eliminate line frequency from DC measurements. This filter must be set to the same frequency as the line power used on the equipment being monitored.

Calibration of voltage type analog inputs requires that the following procedure be performed:

1. For one of the four RMU5 internal analog inputs, set the range selection by pressing the button next to "Select Range" in the "Analog Input Calibration" group until an appropriate range is selected for the measurement source. Low Range signals must be within +/-158mV peak. Medium range signals must be within +/-7V peak. High range signals must be within +/-175V peak.
2. Fill in the Units field with a meaningful value. The Units field will typically be 'V' for volts.
3. Set the Channel Offset to 0.
4. Set the Channel Scaling to 1. If an external divider network is used to feed the RMU5 inputs, enter the value of the external divider here. For example, if a 10:1 divider is used, enter 10 in this field.

A current measurement channel is used to measure the voltage across a current shunt, which through the calibration procedure is converted to a current measurement. A current shunt is usually specified by two values, a voltage and a current, e.g. 50mV@20A, which means that when 50mV is measured across the shunt, 20A is flowing through the shunt. For maximum measurement accuracy, the shunt should be in the circuit leg with the potential closest to ground.

Calibration of current type analog inputs requires the following procedure be performed:

1. For one of the four RMU5 internal analog inputs, set the range selection by pressing the button next to "Select Range" in the "Analog Input Calibration" group until an appropriate range is selected for the measurement

source. Low Range signals must be within +/-125mV peak. Medium range signals must be within +/-7V peak. High range signals must be within +/-175V peak. Typically, the low range is used for measuring a current shunt.

2. Fill in the Range and Units fields with meaningful values. The Units field will typically be 'A' for amps.
3. Press the 'Current Shunt Calc' button. Enter the shunt full scale amps value and the shunt full scale millivolts value. Click 'Set Parameters'. The channel scaling field will be filled in with the appropriate value for the shunt.

A 4-20mA transducer outputs a current proportional to the signal being measured. To measure this type of source, the RMU5 must be fitted with a precision resistor (typically 7.5ohms or 250ohms) between the + and – terminals for the appropriate input channel. The transducer output signal is then attached to the + and – terminals.

Calibration of 4-20mA transducer inputs requires the following procedure be performed:

1. For one of the four RMU5 internal analog inputs, set the range selection by pressing the button next to "Select Range" in the "Analog Input Calibration" group until an appropriate range is selected for the measurement source. Low Range signals must be within +/-125mV peak. Medium range signals must be within +/-7V peak. High range signals must be within +/-175V peak. Typically, the low range is used for measuring a current shunt.
2. Fill in the Range and Units fields with meaningful values. The Units field will typically be 'A' for amps.
3. Press the '4-20mA Transducer Calc' button. Enter the values for the external shunt resistor, the measurement value when the transducer output is 4mA, and the measurement value when the transducer output is 20mA. Click the 'Set Parameters' button. The 'Channel Offset' and 'Channel Scaling' fields will be filled in with the appropriate values for the 4-20mA transducer. The range will also have been automatically set to match the external shunt resistor being used.

Note: When communicating measurements over the Easytrack satellite communicator, it is possible to indicate to the back-end host that a channel is disabled by setting the channel scaling field to a value of 0.

5.2.2 System Control

The system control group allows the RMU5 operation to be affected in several ways.

First, by pressing the "Restart Program" button, the main RMU5 application is restarted. This function is normally used to put newly downloaded configurations or firmware into operation.

Next, the "Reset Hardware" button is used to reset the entire RMU5, including the OS. This is only used if the RMU5 starts behaving in an erratic fashion. Normally, this function will not be necessary.

The "Stop Program" button is used to stop the main RMU5 application. This operation is not normally used. If the main RMU application is stopped, RMUSetup will cease to be able to communicate with the RMU5. In this case, it is necessary to press and hold the front panel reset button for 10s to cause the RMU5 to restart. The RMU5 application will restart automatically in that case.

An additional control is the "Set Clock" button. This allows RMUSetup to adjust the clock on the RMU5 to match the system clock of the PC running RMUSetup. Note that if the RMU5 is equipped with the optional GPS timing control module, the RMU5 clock is continuously adjusted to match the UTC time coming from the NAVSTAR GPS satellite network.

Finally, the "Update Firmware" button is used to update the RMU5 application. After clicking this button, a confirmation dialog will appear. When 'yes' is selected, the RMU5 application matching the configuration application version is then sent to the RMU5. The RMU5 will re-boot after successfully updating the application.

5.2.3 General Status

The general status group allows various information about the RMU5 to be polled in real time. Several functions are available.

First, the RMU5 built in I/O points may be displayed by clicking the "Read Inputs" button. The following dialog is shown with the values:

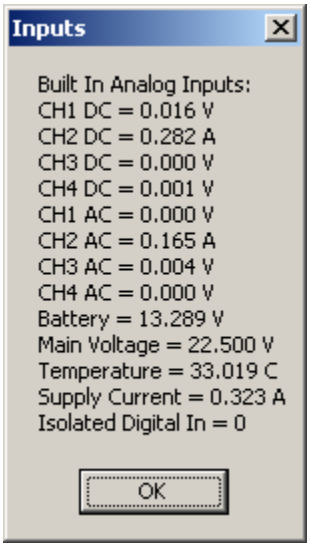


Figure 42 RMUSetup General Status Read Inputs Dialog

Next, the "Read Faults" button may be clicked to retrieve any fault information from the RMU5 application. Normally, the dialog will display "No faults". If there are any problems, a descriptive dialog display is shown identifying the problem.

The "Read GPS" button is used to retrieve the current GPS information if the RMU5 is equipped with the optional GPS Timing Control Module board. Position, time, and lock status, and satellite status are shown.

Finally, the version of the RMU5 application can be retrieved by pressing the "Read Version" button.

5.2.4 Rectifier/Interrupter

The Rectifier/Interrupter control/status group affect operation of the rectifier interrupter relay. The rectifier output may be turned on or off by pressing the "Rectifier Off" or "Rectifier On" buttons, respectively. The rectifier output may be cycled off and on by pressing the "Cycle Interrupter" button and entering the pertinent cycle parameters. Finally, the rectifier output status may be polled by clicking the "Rectifier Status" button.

5.2.5 Radio Communications

The Radio Communications group is used to determine the status of a communications channel that uses wireless communications. Pressing the "Status" button returns a dialog with signal strength information and status information that is dependent on the wireless communication channel in use at the time.

For communications systems that allow a test transmission, press the "Send Test Transmission" to initiate the sending of a test message.

5.2.6 Retrieve Logs

The two buttons in this group are used for retrieving event and data logs from the RMU5. If the "Delete files after read" is checked, the RMU5 will be cleared after the files are retrieved. Clicking either button brings up a file dialog to locate where the files will be placed after retrieval from the RMU5.

6 Operation

This section describes the operation of the RMU5 as it relates to external controlling and monitoring.

6.1 Communications Modes

The RMU5 may use one or more communications methods to exchange data with a monitoring/controlling host. The various hosts are described here.

6.1.1 RS-485 MODBUS Slave

Pins 14, 15 and 16 on the main I/O connector may be used to attach a MODBUS master to the RMU5 via RS-485. Pin 14 is ground, pin 15 is DATA+ and pin 16 is DATA-.

UART parameters and slave address are configured as described in section 5.2.1.5. The MODBUS register addresses default to the values shown in appendix B.

6.1.2 RS-232 MODBUS Slave

Using a DRI1 communications expansion connector adapter board, the RMU5 supports MODBUS over RS-232 signal levels. The DRI1 adapter board converts the signals on the DA-15S communications expansion connector to a standard DE-9 pin out. Both DCE (female DE-9) and DTE (male DE-9) connectors are present on the adapter board—only the pin out and connector are different. The same UART signals are present on both connectors, meaning that only one of the two connectors may be used at any one time. The adapter board also provides a power source that outputs 10.4 to 14V, depending on whether the RMU5 is operating on main power or backup battery, at a current rating of up to 2.5A. This power output may be used to power a radio transceiver directly.

Alternatively, the MODBUS master device may be connected directly to the DA-15S connector through a custom cable with pin outs based on the connector description in Table 4 on page 62. Only TXD, RXD, and GND signals are required.

The UART parameters and slave address are configured as described in section 4. The MODBUS register addresses default to the values shown in appendix B.

6.1.3 Ethernet MODBUS Slave

The RMU5 may be attached to a standard 10/100Base-T Ethernet network via the RJ-45 connector labeled “Ethernet”. Once the TCP/IP parameters are configured and MODBUS over Ethernet is enabled using RMUSetup, the RMU5 will respond to standard MODBUS TCP queries over TCP port 502. The same register addresses as in serial MODBUS are available over Ethernet.

6.1.4 PSTN Dial-up Modem

Through the use of an adapter board (same as the RS-232 MODBUS Slave adapter board mentioned above), it is possible to attach a standard PSTN dial-up modem to the RMU5. Currently, the RMU5 only communicates with the Mobiltex Cathodic Monitoring Host application via PSTN modem when PSTN Dial-up Modem is selected as the RS-232 port function. The specification for the communications is available in a separate document.

Customer requested communications protocols may be added in the future to support other host applications.

MODBUS may be used by configuring the modem to auto-answer, and setting the RS-232 port function to MODBUS slave. The host then calls the RMU5 modem and initiates the necessary queries to retrieve information from the RMU5. When finished querying, the host drops the modem call.

6.1.5 MSK Radio Modem

Through the use of an adapter board (same as the RS-232 MODBUS Slave adapter board mentioned above), it is possible to attach a Mobiltex proprietary digital data radio to the RMU5. Power for the radio is provided from the communications expansion adapter board.

The Mobiltex proprietary digital data radio is capable of operating at 1200/2400 MSK modulation. RF power output is adjustable to 5W maximum. The radio is available in VHF and UHF banding.

The parameters for the RS-232 serial port must be configured in RMU5Setup for this interface type to be operational.

6.1.6 Iridium Satellite

The RMU5 is capable of sending data to a custom host over the Iridium satellite system using an RMU3-S Iridium satellite modem. The data is sent in a proprietary format which is decodable by the Mobiltex Cathodic Monitoring Host

application. The specification for the data format is also available in a separate document for use in custom host applications.

The RMU3-S Iridium modem attaches to a communications expansion adapter board that also provides power to the unit. The RMU3-S Iridium modem is enclosed in a water-tight housing with the appropriate antenna built onto the enclosure.

6.1.7 Skywave IsatM2M Satellite

The RMU5 can communicate to the Mobiltex corView web application over the Skywave IsatM2M satellite system when the RMU5 is equipped with a Skywave DMR-800 satellite transceiver (see Figure 43). The RMU5 must also be fitted with a DRI1-SKYSAT interface board.



Figure 43 Skywave DMR-800 Transceiver

For further information on configuring an RMU5 for use with the Skywave DMR-800, refer to Mobiltex document RMU5-MAN-002, entitled "RMU5-corView Installation and Configuration Guide".

6.1.8 Skywave IsatDataPro Satellite

The RMU5 can communicate to the Mobiltex corView web application over the Skywave IsatDataPro satellite system when the RMU5 is equipped with a Skywave IDP-680 satellite transceiver (see Figure 43). The RMU5 must also be fitted with a DRI1-SKYSAT interface board.



Figure 44 Skywave IDP-680 Transceiver

For further information on configuring an RMU5 for use with the Skywave IDP-680, refer to Mobiltex document RMU5-MAN-002, entitled “RMU5-corView Installation and Configuration Guide”.

6.1.9 Cellular GSM SMS

The RMU5 can communicate to the Mobiltex corView web application over the terrestrial cellular GSM system when the RMU5 is equipped with a GTX2 GSM, GTX3 UMTS or GTX3 LTE cellular transceiver (see Figure 45). The RMU5 must also be fitted with a DRI2 interface board.



Figure 45 GTX2 GSM/GTX3 UMTS/GTX3 LTE Cellular Transceiver

For further information on configuring an RMU5 for use with the cellular transceiver, refer to Mobiltex document RMU5-MAN-002, entitled “RMU5-corView Installation and Configuration Guide”.

6.1.10 Inmarsat C (EasyTrack/Sailor) Satellite

The RMU5 is capable of sending data to a custom host over the Inmarsat-C satellite system using a Thrane&Thrane Easytrack TT-3026 or Cobham Sailor 3027 satellite communicator. The data is sent in a proprietary format which is decodable by the Mobiltex Cathodic Monitoring Host application. The specification for the data format is also available in a separate document for use in custom host applications. Inmarsat C operation to corView is also supported.

6.1.10.1 Easytrack TT-3026 Antenna

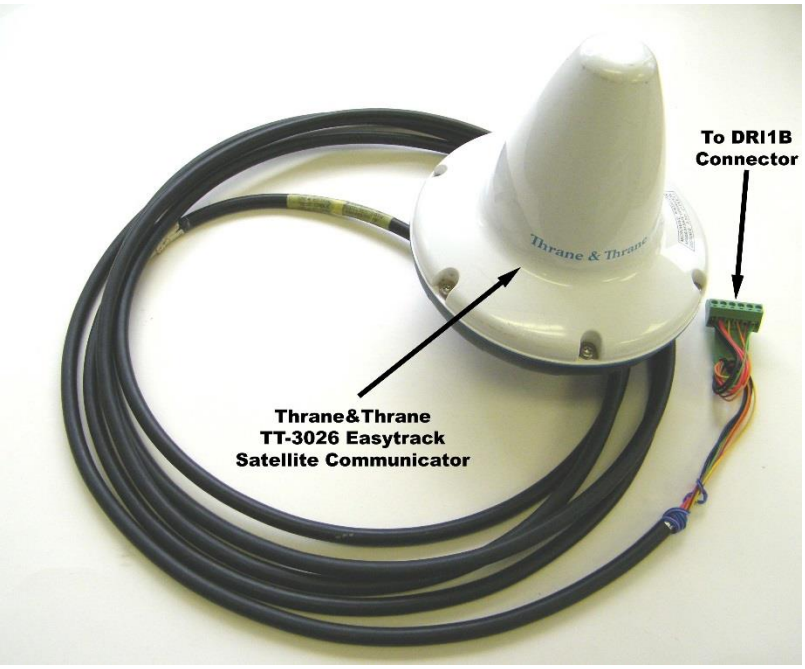


Figure 46 Thrane&Thrane Easytrack TT-3026 Communicator and Cable

6.1.10.1.1 Installation

The TT-3026 transceiver is provided with an adjustable pole/railing mount kit shown in Figure 47.



Figure 47 TT-3026 Adjustable Pole/Railing Mount Kit

For installation of the TT-3026 transceiver, refer to the Thrane&Thrane TT-36026L/M/S easyTrack Transceiver Installation Manual, which is included with the transceiver.

6.1.10.1.2 Wiring

The TT-3026 transceiver attaches to the DRI1 communications expansion adapter board. The adapter provides power to the TT-3026 unit. Before terminating the cable, feed the cable through the cable gland on the bottom of the RMU5. Strip the cable sheathing back approximately 15cm (6") on the un-terminated end of the cable. The cable from the TT-3026 unit is then wired into the provided 6-contact Phoenix-style connector as shown in Figure 48. Apply cable-ties to reduce strain on individual conductors. After completing wiring, plug the green 6-contact connector into the mating socket on the DRI1 Easytrack Sat Interface Board (see Figure 49).

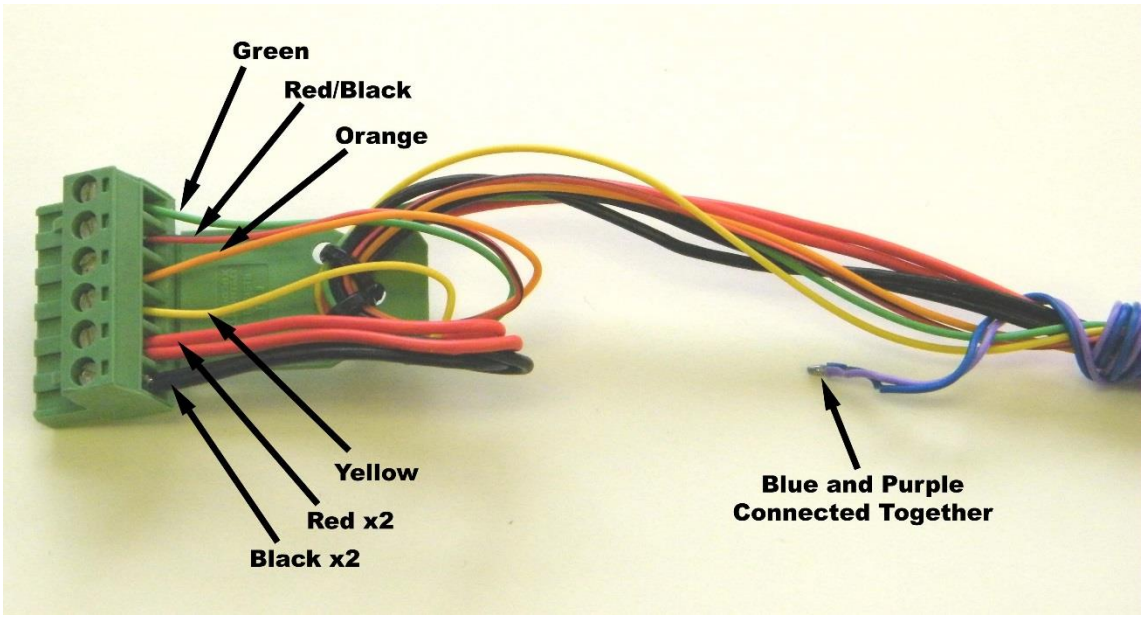


Figure 48 TT-3026 Cable Termination

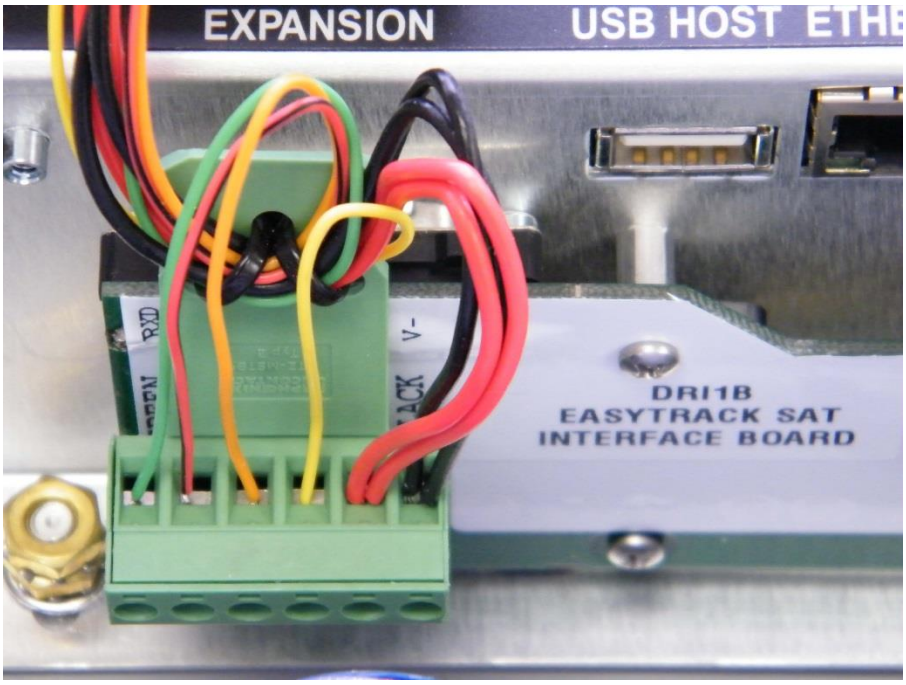


Figure 49 TT-3026 Cable Plugged Into DRI1

6.1.10.2 Sailor 3027 Antenna



Figure 50 Cobham Sailor 3027 Communicator and Cable

6.1.10.2.1 Installation

The Sailor 3027 transceiver is provided with an adjustable pole/railing mount kit shown in Figure 51.

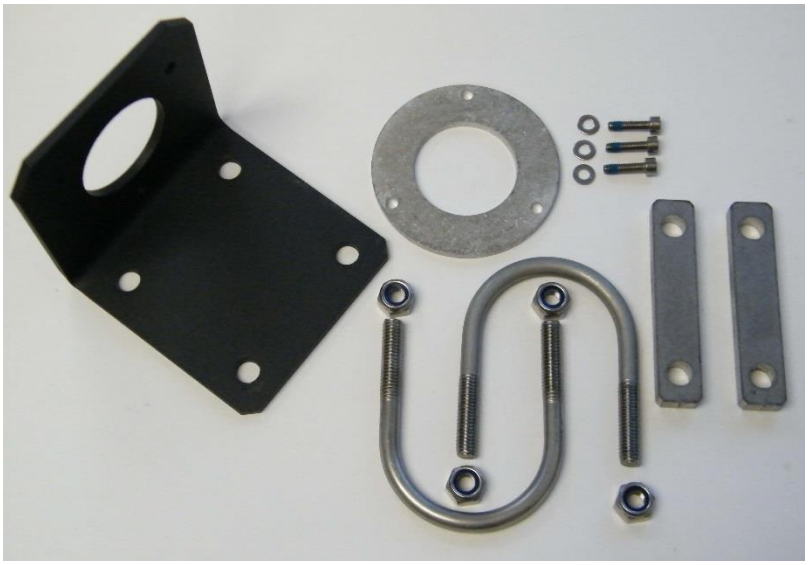


Figure 51 Sailor 3027 Adjustable Pole/Railing Mount Kit

For installation of the Sailor 3027 transceiver, refer to the Cobham/Thrane&Thrane Sailor 6120/30/40/50 System Installation Manual, which is included with the transceiver.

6.1.10.2.2 Wiring

The Sailor 3027 transceiver attaches to the DRI3 communications expansion adapter board. The adapter provides power to the Sailor 3027 unit. Before terminating the cable, feed the cable through the cable gland on the bottom of the RMU5. Strip the cable sheathing back approximately 15cm (6") on the un-terminated end of the cable. The cable from the Sailor 3027 unit is then wired into the provided 4-contact Phoenix-style connector as shown in Figure 52. Apply cable-ties to reduce strain on individual conductors. After completing wiring, plug the green 4-contact connector into the mating socket on the DRI3 Sailor 3027 Sat Interface Board (see Figure 53).

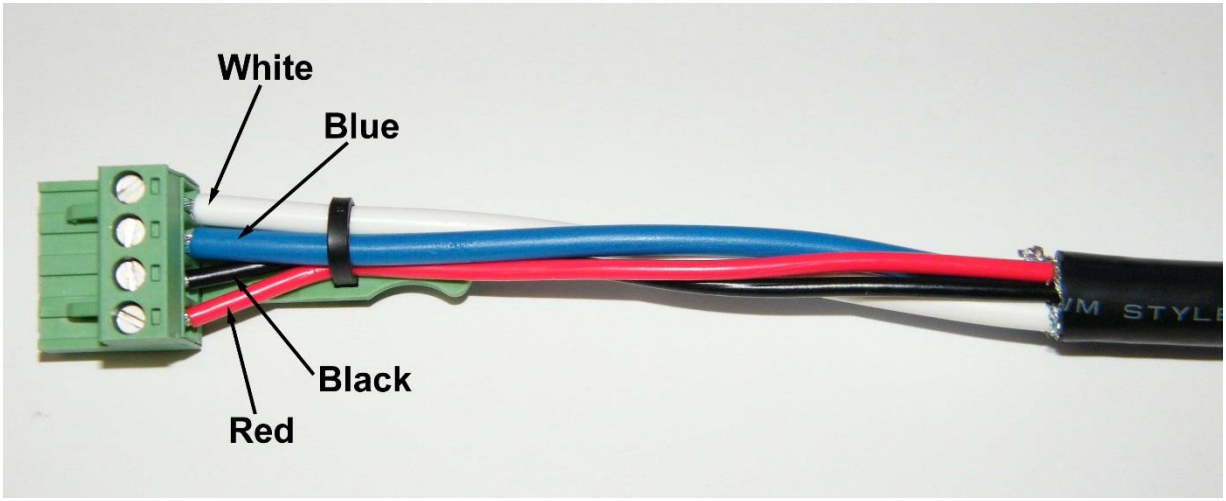


Figure 52 Sailor 3027 Cable Termination

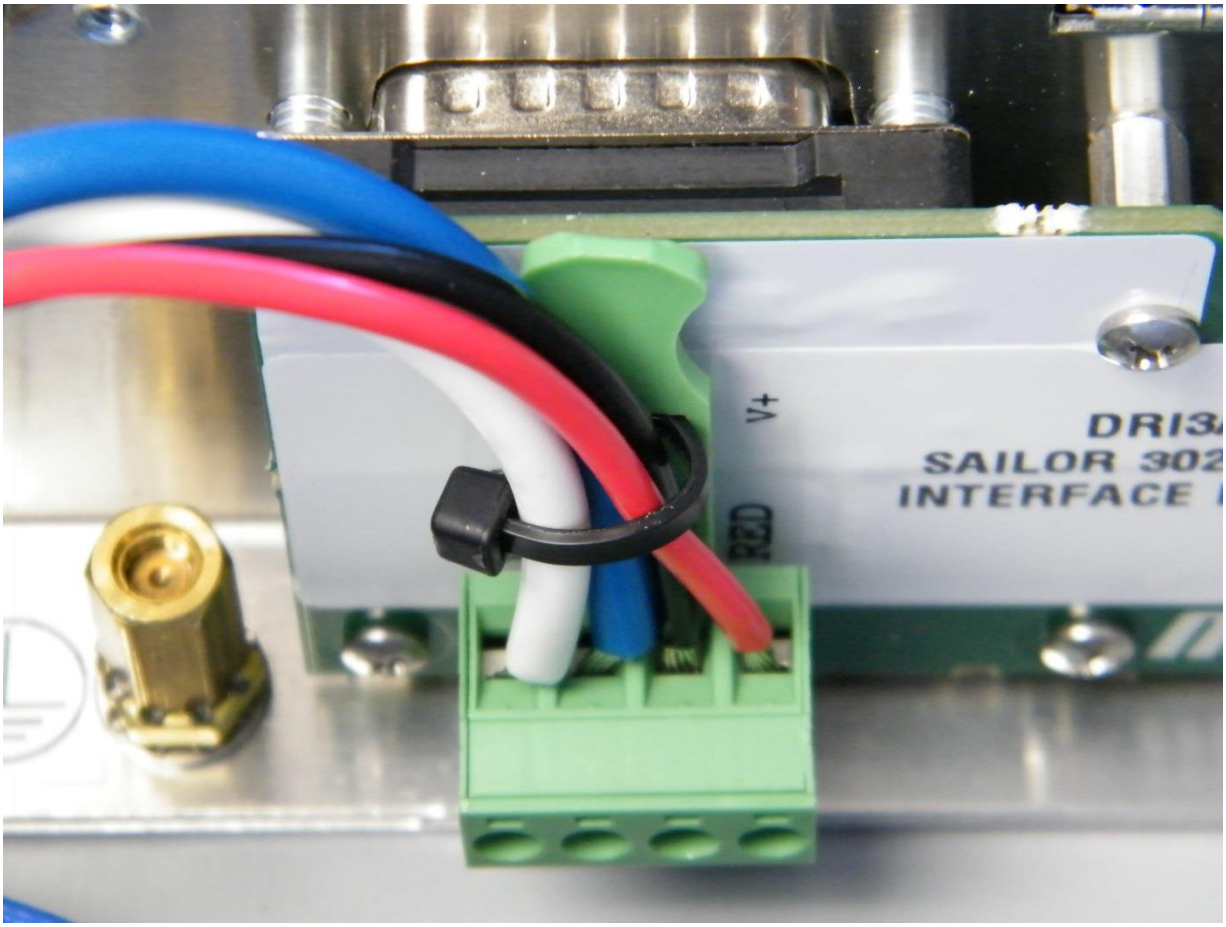


Figure 53 Sailor 3027 Cable Plugged Into DRI3

6.1.10.3 Satellite Service

The RMU5 with Easytrack communicates over a geostationary satellite system. The RMU5 must be configured with two pieces of information to allow this mode of operation to work correctly.

The Easytrack system uses Inmarsat C satellites which are currently divided into 4 different ocean region service areas. These are Pacific Ocean Region (POR, 178°E), Atlantic Ocean Region West (AORW, 53°W), Atlantic Ocean Region East (AORE, 15.5°W), and Indian Ocean Region (IOR, 64°E). Since the satellites are geostationary, care must be taken during installation of the Easytrack transceiver to ensure that an open sky view is available to the selected satellite. The Easytrack should be mounted flat, or slightly inclined to the south for northern hemisphere installations. The Easytrack should be mounted flat, or slightly inclined to the north for southern hemisphere installations. The ocean region selected in the RMU5 parameters must match the location of installation for the RMU5. Figure 54 shows the coverage attained by each of the 4 satellites. Choose the satellite which is closest to the installation area unless there are obstructions, such as trees or mountains, in line-of-sight view for that satellite. If obstructions are present, an alternative satellite may have to be used if it provides clearer line-of-sight.

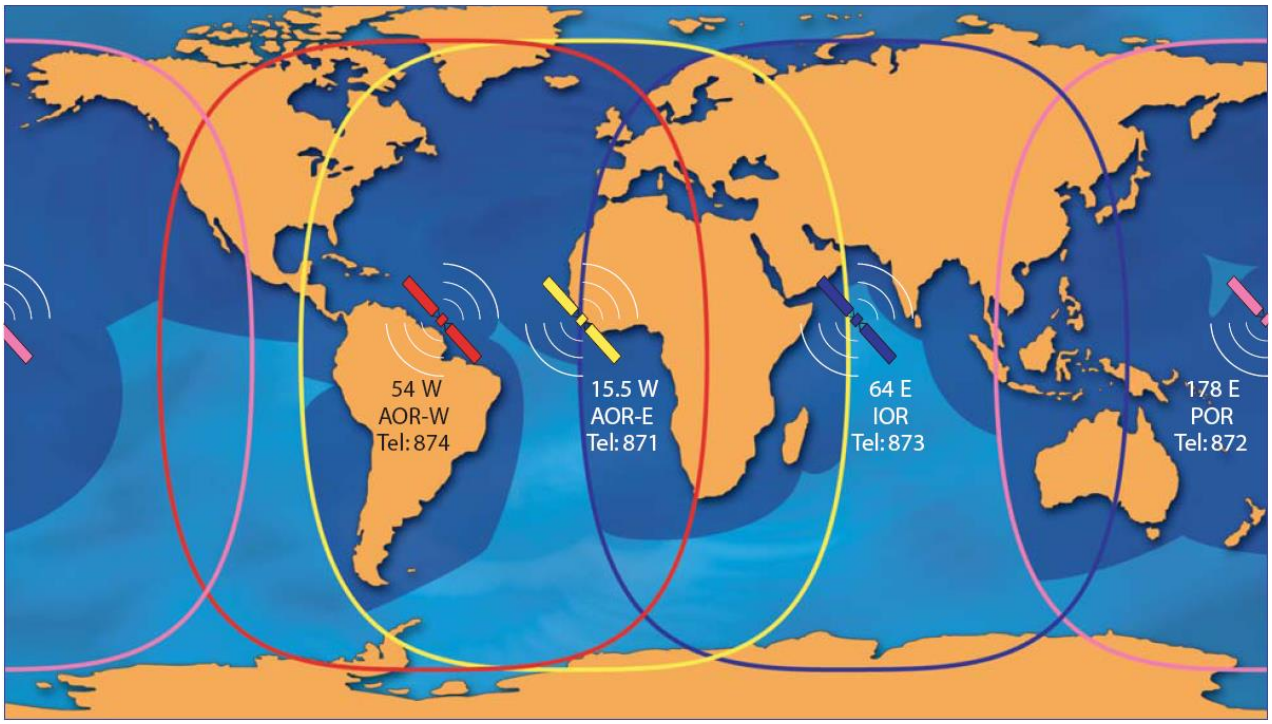


Figure 54 Inmarsat C Satellite Coverage

Example of satellite selection:

West Coast Canada/USA installation – choose POR satellite by default.

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

Africa/Europe installation – choose AORE satellite by default.

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

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

The second piece of configuration information required is the MUX2 subaddress. The Mobiltex MUX2 device allows multiple RMU5 devices to share a single Easytrack transceiver. Each RMU5 attached to the MUX2 must be given a unique subaddress in the grouping. If a MUX2 is not being used, set this parameter to a value of 1 in the RMU5 configuration.

The "Status" button in the RMU5Setup Radio Communications grouping can be used to determine the status of the satellite transceiver connection to the satellite. Click this button to bring up the following dialog.

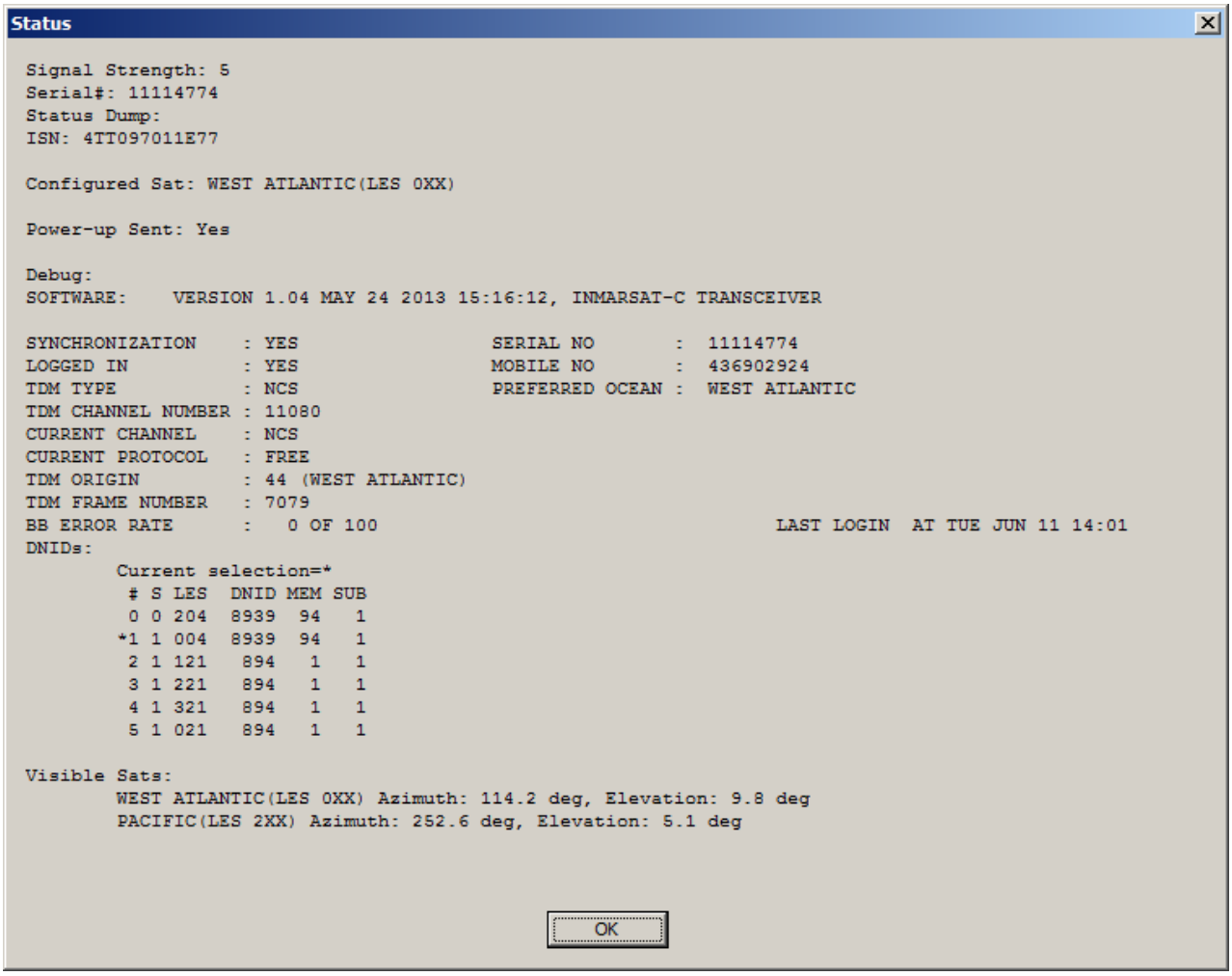


Figure 55 Easytrack Communications Status

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

After power-up, it may take up to 5 minutes for the satellite transceiver to lock onto the configured satellite. In the status screen, the "Synchronization" and "Logged In" fields should show "Yes" if the transceiver is locked onto the satellite. The "Signal Strength" field should also show a value greater than 2 for optimal communications.

The "Current satellite view angles" field can be used to aim the Easytrack transceiver at the currently selected satellite. The RMU5 GPS receiver must have at least position lock for this function to work. Using the azimuth value (referenced to true North) and a compass (compensated for local declination), move the Easytrack bracket until the Easytrack has a clear view pointing at the indicated azimuth direction.

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

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

Some information in this diagnostic panel will be required on the host end to allow communications to the field device to occur. The following information will be required:

- Mobile Number
- Current LES
- Current DNID
- Current Member

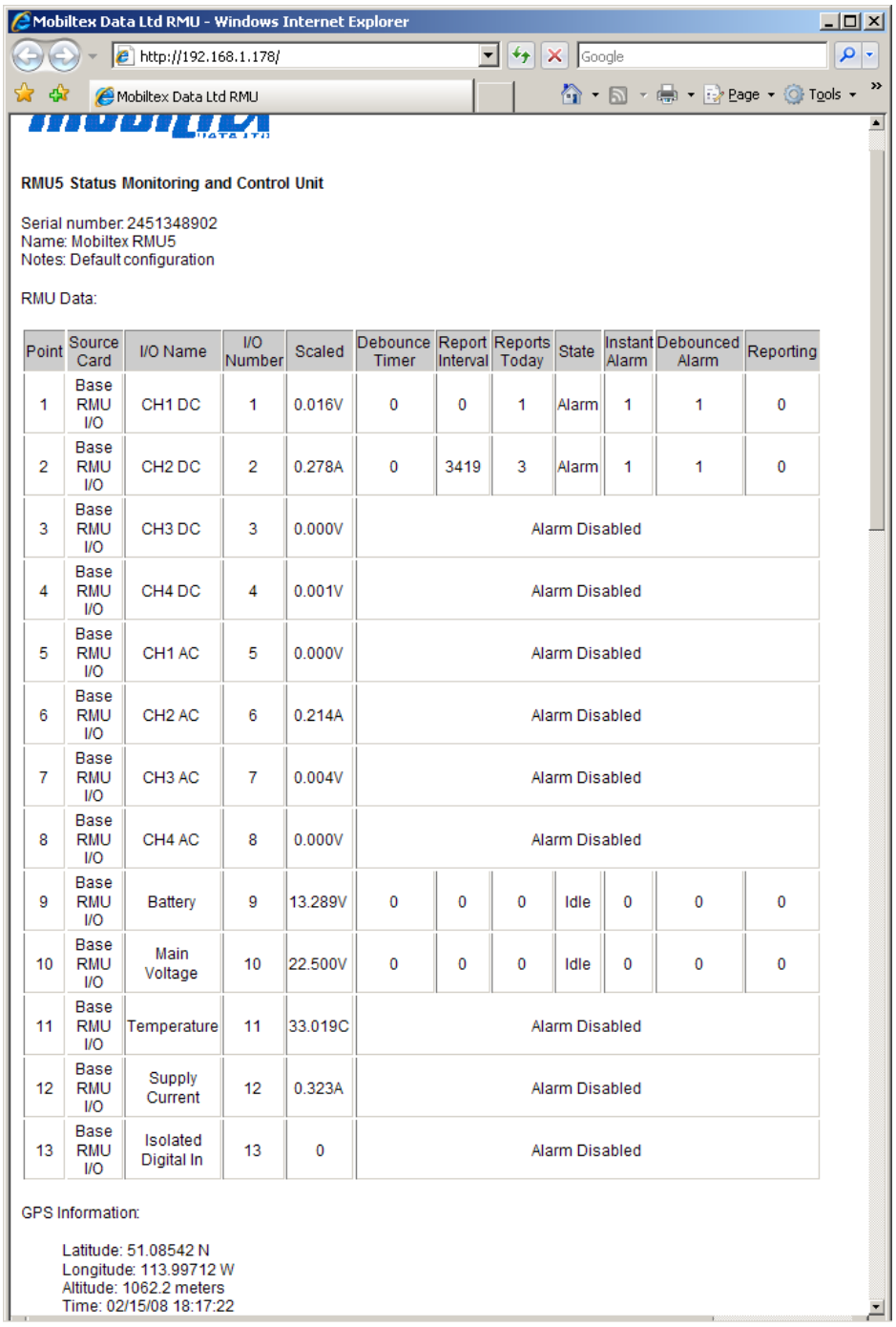
The current LES/DNID/Member are shown in the DNID table area. The entry with the asterisk next to it signifies the currently selected information.

6.2 Ethernet Services

When the RMU5 is attached to a TCP/IP network, several remote control/monitoring options become available as a result. These options are provided via standard Internet server applications as follows.

6.2.1 Web Server

The RMU5 can be configured to run a web server on the standard TCP port 80 for the purposes of status display. Information about the RMU5 I/O points is shown, as well as other status information. To access this information, the user must supply a username and password the first time the page is accessed. The username and password can be anyone of the three system accounts defined in the RMUSetup configuration.



Point	Source Card	I/O Name	I/O Number	Scaled	Debounce Timer	Report Interval	Reports Today	State	Instant Alarm	Debounced Alarm	Reporting
1	Base RMU I/O	CH1 DC	1	0.016V	0	0	1	Alarm	1	1	0
2	Base RMU I/O	CH2 DC	2	0.278A	0	3419	3	Alarm	1	1	0
3	Base RMU I/O	CH3 DC	3	0.000V	Alarm Disabled						
4	Base RMU I/O	CH4 DC	4	0.001V	Alarm Disabled						
5	Base RMU I/O	CH1 AC	5	0.000V	Alarm Disabled						
6	Base RMU I/O	CH2 AC	6	0.214A	Alarm Disabled						
7	Base RMU I/O	CH3 AC	7	0.004V	Alarm Disabled						
8	Base RMU I/O	CH4 AC	8	0.000V	Alarm Disabled						
9	Base RMU I/O	Battery	9	13.289V	0	0	0	Idle	0	0	0
10	Base RMU I/O	Main Voltage	10	22.500V	0	0	0	Idle	0	0	0
11	Base RMU I/O	Temperature	11	33.019C	Alarm Disabled						
12	Base RMU I/O	Supply Current	12	0.323A	Alarm Disabled						
13	Base RMU I/O	Isolated Digital In	13	0	Alarm Disabled						

Figure 56 RMU5 Web Server Page

6.2.2 FTP Server

The FTP server is always enabled. Only the supervisor and administrator users have write access on the FTP server. This gives access to firmware updates and retrieval of data log files. Use a standard FTP client to access this server.

Datalog files are stored in the "\Hard disk" folder if the internal flash drive option board is installed.

Firmware and configuration files are stored in the "\NORFlash" folder. Care must be taken with any changes made in the "\NORFlash" directory, as the RMU5 application may cease to operate if incorrect changes are made to the directory.

6.2.3 Telnet Server

The Telnet server is always enabled. Only the administrator users have access to the Telnet server. The Telnet server allows the user to execute other applications other than the standard RMU application. This will typically only be used for system diagnostics and recovery if the main application is corrupted.

6.2.4 RMUSetup

If enabled in the RMU configuration at installation time, the RMU may be set up remotely over an Ethernet connection. Operation of RMUSetup is identical to local configuration via USB, except for the connection step. Instead of selecting the USB radio button, select the Ethernet button and enter the IP address of the RMU5 in the address box. Press the "Connect" button to complete the connection to the RMU5.

6.3 LCD Display

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

The first page, shown in Figure 57, is a quick glance status page that displays the DC measurements for the first four analog measurement channels. Also displayed is the number of GPS satellites being received, or "NO GPS" if the RMU5 is not equipped with the optional GPS receiver. Next, the signal strength (RSSI) for the satellite transceiver is shown. Finally, the last line displays current status related to the satellite transceiver communications.

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

Figure 57 LCD Display Page 1, Main Status

The next page, shown in Figure 58, displays copyright information, and version information for the RMU5 operating system and application software.

```
Mobiltex Data Ltd.
RMU5 (C)2007-2008
RMU Version 1.12
OS Version 1.06
```

Figure 58 LCD Display Page 2, Copyright and OS/Application Versions

This is followed by the page shown in Figure 59, which displays the real-time clock date/time, the IP address of the Ethernet connection, and the ESN of the RMU5.

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

IP: 244.232.192.555
ESN 123456789
```

Figure 59 LCD Display Page 3, Real Time Clock, IP Address, and ESN

The next page, shown in Figure 60, displays the current reading for a measurement point. Thirteen sequential pages display the present readings for CH1-4 DC, CH1-4 AC, backup battery, main supply voltage, temperature, main supply current, and the isolated digital input. An additional number of readings pages may also be present if an analog channel expansion unit is attached to the RMU5 sensor bus.

```
Base RMU I/O
CH1 DC
```

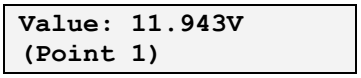


Figure 60 LCD Display Pages 4-17, Readings

This is followed by the page shown in Figure 61, which displays detailed information for the optional timing control module GPS receiver. The first two lines indicate the current latitude and longitude measurements in decimal degrees. The third line is the current UTC time received from the GPS receiver. The forth line shows the number of satellites in the solution, if time lock (TL) has been attained, position lock (PL) has been attained, and whether the timing control module has locked onto the AC wave form from the main power input. If the optional GPS module is not installed, this screen will indicate "GPS module not installed in the RMU".

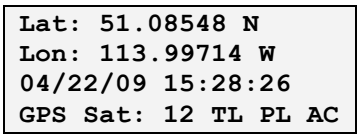


Figure 61 LCD Display Page 18, Timing Control Module Details

Next, the page shown in Figure 62 displays system fault information.

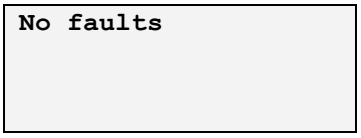


Figure 62 LCD Display Page 19, System Faults

The next page displayed on the LCD, as shown in Figure 63**Error! Reference source not found.**, conveys information on the software versions for various components in the RMU5.

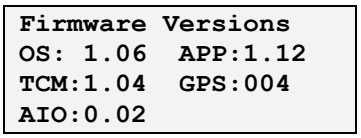


Figure 63 LCD Display Page 20, System Firmware Versions

The final page displayed on the LCD, as shown in Figure 64, provides identification information for the transceiver currently connected to the RS-232 port. The information presented will aid in matching the transceiver to the communications ESN used in corView.

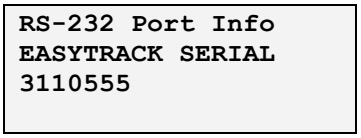


Figure 64 LCD Display Page 21, RS-232 Port Info

6.4 System Shutdown

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

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

7 Servicing

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

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

No cleaning is required.

A. User Accessible Connector Pin Outs

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

Table 3 Main I/O Connector Pinout

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

Table 4 Communications Expansion Connector Pinout

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

Table 5 Instrumentation Sensor Expansion Bus Connector

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

Table 6 Main Power Input Connector

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

Table 7 USB Host Connector

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

Table 8 USB Slave Configuration Connector

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

Table 9 Ethernet 10/100 Connector

B. MODBUS Register Reference

I/O Point Analog Values	40001-40100 (double registers, 50 points, 32-bit IEEE 754 floats, most significant word in first register) or (double registers, 50 points, 16-bit fixed point value in first register, 0 in second register)
Low Alarm Limits	40101-40200 (double registers, 50 points, 32-bit IEEE 754 floats, most significant word in first register) or (double registers, 50 points, 16-bit fixed point value in first register, 0 in second register)
High Alarm Limits	40201-40300 (double registers, 50 points, 32-bit IEEE 754 floats, most significant word in first register) or (double registers, 50 points, 16-bit fixed point value in first register, 0 in second register)
Alarm Registers	40301-40400 (double registers, 50 points)
AC Fail Register	40401 (one register): 0x00: AC power on, no previous failure since last flag clear 0x03: AC power off 0x01: AC power is on, but a failure was recorded Write 0 to clear the flag, 1 to set. Flag is updated continuously.
Interrupter Settings	40501-40516 (single registers): 40501: Cycle Time, milliseconds 40502: Off Time, milliseconds 40503: Duration, minutes 40504: UTC Offset, milliseconds 40505: Relay Open Dwell, milliseconds 40506: Relay Close Dwell, milliseconds 40507: Sync To AC Line, 1=yes, 0=no 40508: Relay On First, 1=yes, 0=no 40509: RelayType, 1=NC, 0=NO 40510: Sched Year, 4 digit year 40511: Sched Month, 1-12 40512: Sched Day, 1-31 40513: Sched Hour, 0-23 40514: Sched Minute, 0-59 40515: Sched Enable, 1=enable, 0=disable 40516: Rectifier State, 0=off, 1=on, 2=cycling 40517: Daily Repeat, 0-65535 days
Realtime Clock	40601: Year (4-digit) 40602: Month, 1-12 40603: Day, 1-31 40604: Hour, 0-23 40605: Minute, 0-59 40606: Second, 0-59 This register block must be read and written as an entire block. A read of the Year register latches the entire time into a temporary variable block. A read of the remaining registers reads from the temporary variable block. Similarly, a write to the block writes into a temporary variable block until the Second register is written. At that point the real time clock is updated with the values from the temporary variable block.

GPS Registers (read-only)	40701: gpsModulePresent, nonzero=yes 40702: acSignalLock, nonzero=yes 40703: interruptMode, 0=on, 1=off, 2=cycling 40704: rectifierStatus, 0=off, 1=on 40705-40708: latitude, four word double precision floating point value, least significant word in first register. For fixed point mode, two word fixed point signed integer with most significant word first. Divide value by 1E7 to obtain final value. 40709-40712: longitude, four word double precision floating point value, least significant word in first register. For fixed point mode, two word fixed point signed integer with most significant word first. Divide value by 1E7 to obtain final value. 40713-40716: altitude, four word double precision floating point value, least significant word in first register. For fixed point mode, two word fixed point signed integer with most significant word first. Divide value by 100 to obtain final value. 40717: Year, 4 digit year 40718: Month, 1-12 40719: Day, 1-31 40720: Day Of Week, 0-6 40721: Hour, 0-23 40722: Minute, 0-59 40723: Second, 0-59 40724: Milliseconds, 0-999 40725: positionLock, nonzero=yes 40726: utcTimeLock, nonzero=yes 40727: satellitesInSolution, integer count of satellites 40728: satellitesTracked, integer count of satellites 32 channels, N=0 to 31: 40729+(N*6): prn, system code 40730+(N*6): snr, signal to noise ratio 40731+(N*6): elevation, two word single precision floating point value, least significant word in first register. For fixed point mode, two word fixed point value with most significant word first. Divide value by 100 to obtain final value. 40733+(N*6): azimuth, two word single precision floating point value, least significant word in first register. For fixed point mode, two word fixed point value with most significant word first. Divide value by 100 to obtain final value. 40921: tcmCodeVersion, the RMU5 GPS driver's version number times 100 (“5.34” = 534) ***Important*** The GPS registers must be read as a block starting with the first register in the block. Reading the first register in the block latches the data into a temporary structure to ensure data does not change between successive reads of the data elements.

Table 10 Default RMU5 I/O Point Modbus Addresses

	Read Register N	Read Register N+1	Write Register N	Write Register N+1
Analog Input (IEEE floating point mode)	Most significant word of IEEE 32-bit floating point value (and stores current value)	Least significant word of IEEE 32-bit floating point value (returns next word of stored value)	No action, success code returned	No action, success code returned
Analog Input (fixed point mode)	16-bit signed fixed point integer. Reading value is equal to integer value divided by 100.	Zero returned	No action, success code returned	No action, success code returned
Analog Output	Error code returned	Error code returned	No action, success code returned	No action, success code returned
Digital Input	Result returned in least significant bit	Zero returned	No action, success code returned	No action, success code returned
Digital Output	Error code returned	Error code returned	No action, success code returned	No action, success code returned
Low or High Alarm Limit, Analog Input Channel (IEEE floating point mode)	Most significant word of IEEE 32-bit floating point value (and stores current value)	Least significant word of IEEE 32-bit floating point value (returns next word of stored value)	Most significant word of IEEE 32-bit floating point value (partial value stored temporarily)	Least significant word of IEEE 32-bit floating point value (entire value saved)
Low or High Alarm Limit, Analog Input Channel (fixed point mode)	16-bit signed fixed point integer. Alarm value is equal to integer value divided by 100.	Zero returned	16-bit signed fixed point integer. Alarm value is equal to integer value divided by 100.	No action, success code returned
Low or High Alarm Limit, Digital Input Channel	Digital alarm state returned in least significant bit	Zero returned	Digital alarm state saved (least significant bit = 1/0)	No action, success code returned
Alarm Limit, Analog or Digital Output Channel	Error code returned	Error code returned	Error code returned	Error code returned
Alarm States	Real time alarm state returned in D0, latched state in D1 Channel units returned in bits D5-D7: 0x00=undefined 0x20=volts 0x40=amps 0x60=Celsius 0x80=Fahrenheit 0xa0=resistance	Real time alarm state returned in D0, latched state in D1 Channel units returned in bits D5-D7: 0x00=undefined 0x20=volts 0x40=amps 0x60=Celsius 0x80=Fahrenheit 0xa0=resistance	Latched alarm state reset to inactive if written with zero, else no action	Latched alarm state reset to inactive if written with zero, else no action
GPS Registers	Data returned per table above	N/A	Error code returned	Error code returned

Table 11 Register Behavior By I/O Point Type For Enabled Points

Disabled points return an error code on any access.

C. Specifications

Environmental:

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

Physical:

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

Power:

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

Processing Core:

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

Ethernet Interface: 10/100 Base-T

PC Configuration Connection:

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

Interruption Output:

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

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

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

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

GPS-Synchronized Interruption Option Board:

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

Datalog Storage Option Board:

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

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

Technical assistance may be obtained from:

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