



Remote Monitoring and Control

Remote Telemetry Module (RTM-GPRS)TM

Users' Guide

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Introduction

Telemetric monitoring and control devices provide a low cost wireless system for remote monitoring, measurement, data collection, and control of equipment or machinery anywhere in the North American cellular coverage area.

The Telemetric system provides two-way communications using digital GPRS public cellular network. The low cost of this proprietary method makes remote monitoring and control very affordable.

RTM Overview

Most newer generation Remote Terminal Units (RTUs) and Intelligent Electronic Devices (IEDs) use the DNP3 communication protocol to communicate with utility SCADA systems. Communications with these IEDs has always been problematic if the device is located outside of the substation fence. Telemetric's DNP-Remote Telemetry Module™ (DNP-RTM GPRS) provides an attractive solution for remote communications with DNP enabled devices.

Telemetric's RTM uses the cellular data network to enable communications between IEDs with supported protocols and the Telemetric Network Operations Center (NOC). When it receives data from the RTM, the Telemetric NOC immediately displays the data on the customer's secure web page. Alternatively, the customer can use Telemetric's DNP Scada-Xchange™ software, which uses a secure TCP/IP connection to transfer the DNP3 data directly to the utility's SCADA system.

The Telemetric RTM connects to an IED such as a digital protective relay, voltage regulator, or capacitor bank controller via an RS-232 serial port. The RTM can either be installed as a communications board within the IED enclosure, or externally in its own weatherproof enclosure.

The new digital RTM line now offers support for multiple protocols:

- Distributed Network Protocol (DNP3)
- Multiple Address DNP3
- 2179
- Joslyn Smartlink

Configurations

Pre-configured RTM devices are currently available for a number of IEDs. Visit the following Web site to see the most recent list of supported IEDs:

<http://www.telemetric.net/ied/>

More configurations are being added all the time, so watch the web site for updates.

How it Works

The RTM constantly polls the IED to get the most current data. When it discovers a reportable event, for example a binary input that has changed state, it initiates a call over the GPRS network to the Telemetric NOC. The cellular network automatically passes the module's identification numbers and data to the central cellular hub. This technique allows the transmission of an identification number, the time, the date, and all of the call data at a very low cost. At the

Telemetric NOC, the data is validated and processed for distribution to the end user. In addition, control and configuration information can be sent from the end user to the Telemetric NOC, and then back to the RTM.

Getting Started

Setting up an RTM is a three-step process.

1. Attach the Telemetric unit to the IED via the serial port and apply power (+12 VDC). The Integration Guide gives complete instructions for installing the RTM.
2. Use the Telemetric RTM Configurator application to program the Telemetric unit with your specific IED communication parameters.
3. Set up the device information on the Telemetric web site (www.telemetric.net).

This manual provides the information you need to get started. It is divided into two sections:

- Programming and installing the Telemetric device, and
- Using the Telemetric web site.

Programming and Installing the RTM-GPRS

Programming the RTM

The Telemetric RTM arrives from the factory programmed with some default settings for your application. To change those settings, and to program the correct communication settings for your IED, you need to locally program the device by connecting it to a PC with a serial cable and using the Windows-based program that comes with the RTM. The two settings that most often need to be changed are the **Baud Rate** setting and the **Master/Slave Address Settings**. If these do not match the settings in the IED, communication between the two will be impossible.

The Integration Guide that came with this user manual contains a list of all of the factory default settings and provides programming instructions for your specific application.

Appendix A contains detailed instructions on using the local programming application to program the RTM.

Installing the RTM

The RTM can be purchased either as a communications module that is installed within the IED enclosure or pre-installed in its own weatherproof enclosure. Follow the instructions in the **Integration Guide** to install the RTM in your specific IED.

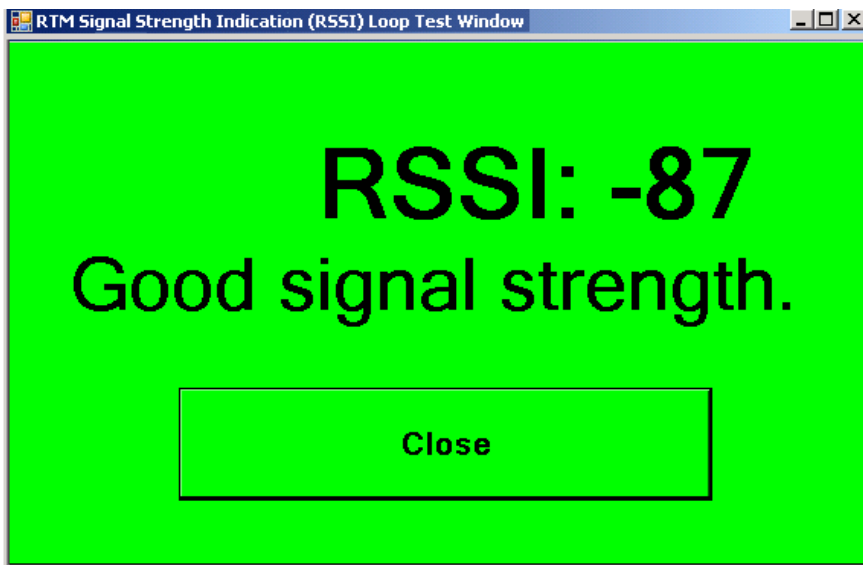
Testing the receiver strength (RSSI)

After selecting an installation location, it is a good idea to test the device's ability to transmit and receive. (The device must be connected to power and an antenna attached in order to carry out this test.) You can check the RSSI using the local configuration software, or by viewing an LED indication on the side of the RTM enclosure.

Testing the receiver strength using the Configuration software

1. If you have not already done so, run the setup for the Telemetric RTM Configuration Program. This software was shipped to you on a CD along with your Telemetric device(s). It can also be downloaded from the www.telemetric.net web site.
2. Connect the RTM to your computer with a straight-through serial cable.
3. Run the RTM Configurator program.
4. When the program opens, go to View -> RSSI Test Loop Window. After a few seconds, you will see a negative number displayed in the new window. This is the RSSI reading. The blinking background color also indicates signal strength for ease of use when standing away from the PC.

Screen Appearance	Meaning
Solid red	Inadequate signal strength
Slow red blink	Marginal or weak signal strength
Slow green blink	Acceptable signal strength
Fast green blink	Good signal strength
Solid green	Excellent signal strength



Testing the receiver strength using the LEDs

If you do not have a laptop available in the field to view the RSSI in the Configuration software, an LED on the side of the RTM enclosure can indicate a less exact RSSI reading.

The LED next to the push-button on the side of the device indicates RSSI. To test the RSSI, press and hold the test button (see Figure 1). The RTM will then read the RSSI from the radio. The signal strength is displayed using the following patterns:

LED Appearance	Meaning
Solid red	Inadequate signal strength
Slow red blink	Marginal or weak signal strength
Slow green blink	Acceptable signal strength
Fast green blink	Good signal strength
Solid green	Excellent signal strength

In addition to the RSSI, this LED also indicates when pages are received by, and transmitted from, the RTM, as described below.

LED Indications

(See Figure 1)

- **Radio Transmit LED**

Green for 2 seconds	The RTM is sending out a page to the web server.
Red for 2 seconds	The RTM is receiving a page from the web server.

Just below the RSSI LED there are three other LEDs that provide information about RTM functions. In order, from top to bottom, they are:

- **RTM Status LED**

Blinking Green	The RTM is functioning normally. This is a “heartbeat” LED.
Off or On	There is a serious internal problem with the RTM. Try disconnecting it from power and then powering it back up. If this LED remains off, contact Telemetric Technical Support.

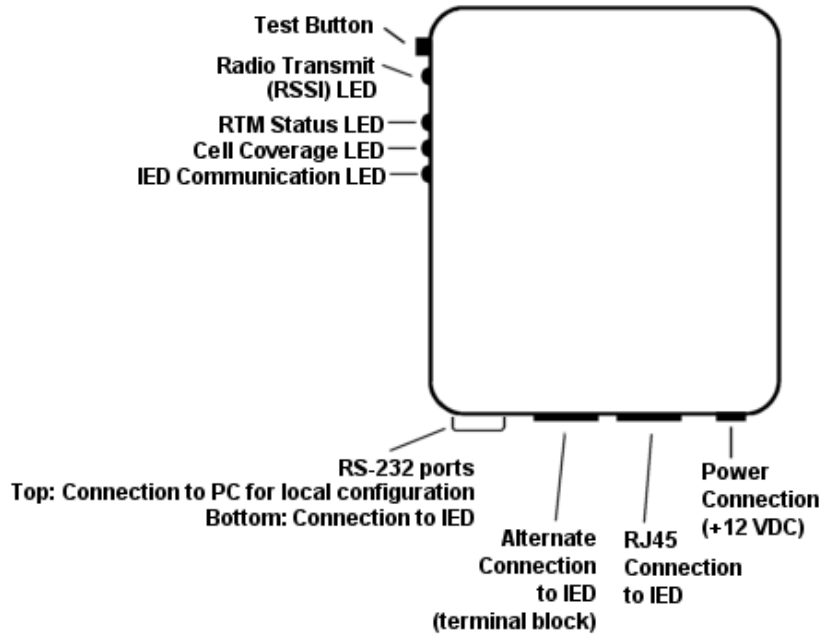
- **Cell Coverage**

Solid Green	The RTM radio has a stable connection with the cellular network.
Blinking Green	The RTM has reached its daily call limit. The call limit can be reset from the web page.
Off	The RTM has lost (or not yet established) its cellular connection.

- **IED Communications**

Green	Packets are being sent to the IED.
Red	A response is being received from the IED.

Figure 1: RTM



Note: This equipment contains components that can be damaged by electrostatic discharge. To prevent unexpected operation or permanent damage, be sure to connect the ground lug to an earth ground and always touch the ground lug before touching any components inside the enclosure.

Connector pin specifications

RS-232 Ports

Pin	Description
1	Not Used
2	Tx
3	Rx
4	Tied to 6
5	Ground
6	Tied to 4
7	Tied to 8
8	Tied to 7
9	Not Used

RJ-45 Port

Pin	Description
1	Not Used
2	Not Used
3	Rx
4	Tx
5	Not Used
6	Not Used
7	Not Used
8	Ground

Terminal Block

Pin	Description
1	Tx
2	Rx
3	Ground

Using the Telemetric Web Site

The Telemetric web site, www.telemetric.net, provides access to the data from your Telemetric units 24 hours a day, seven days a week, from any computer that has access to the Internet. Use the site to set up all monitoring and control functions, to set up automatic event notifications, and to remotely control the equipment connected to the RTM.

Setting up Your Account on the Web Site

Logging In

To log in to your secure account on the web site, click on the **Customer Login** link on the web site (www.telemetric.net). On the login screen, enter the user name and password that were sent to you with your Telemetric device(s).

When you click the Enter button the customer **Welcome** screen will be displayed. This screen displays the most recent critical events for your devices, and the navigation panel on the left side has links to all of the device data and device configuration screens.

Entering Customer Information

After logging in for the first time click on the **Customer Information** link. This will take you to the Customer Information page where you can fill in your name and address and change your password to one that is easier for you to remember.

While on the Customer Information page, take note of the following fields:

- **Time Zone Offset:** This should be set to the number of hours difference between your local time zone and Eastern Standard Time. For example, if you're on the east coast of the United States set it to zero, and if you're in California set it to -3. After setting the Time Zone Offset, all device report times will be displayed for your local time zone. If you have devices that are in a different time zone, you also have the ability to set device time zones individually on the **Device Info** page.
- **Status Call Interval:** This is the default interval in hours between status calls for your devices (a number between 1 and 240). The Status Call Interval allows the Missing Device Report to list any devices that did not call in when they should have. You should set the interval equal to or longer than the longest report interval being used by the RTM's digital or analog inputs. If you have programmed your device not to make status calls, or if you do not plan to make use of the Missing Device Report, do not fill in this field. If you have some devices making status calls at different intervals, set up their call intervals individually in the **Device Info** screen (reached from the device Status page).
- **Additional Info field:** Use this text box to enter a custom name for the device "Additional Info" field. The Additional Info field is a customer specified data field. It appears as the name of a column on the Device List. It can be used to categorize any device-specific data. For example, it could be used to save GPS coordinates for the device, or to record the device's location on the power grid. This data can then be used to sort the devices in the Device List.

If you do not want to use this extra field, you do not need to edit this text box.

Entering Device-Specific Information

After installing a new Telemetric device, you can enter that device's configuration information on the web site. To do this, go to the Welcome screen and click on the **Device List** link. In the Device List table that is displayed, click on the Device ID of the new RTM. The **Status** screen for that device is displayed.

[History](#) [Request Data](#) [Edit Device Info](#) [Advanced Commands](#) [Refresh](#)

Status

Device: **DNP-RTM Test Unit 3032** Data as of 5/14/2003 10:05:01 AM **EnergyLine 1000 Series - Standard**

Address: BOISE, ID

Note: Bold text indicates the latest change. Select the Refresh link to update the data.

Digital Input Status Points

Status Point	Status	Date/Time
Cap Bank Close	Closed	5/14/2003 10:05:01 AM
Cap Bank Open	Inactive	5/14/2003 10:05:01 AM
Auto/Manual Faceplate Switch	Manual Disabled	5/14/2003 10:05:01 AM
Remote/Local Faceplate Switch	Remote	5/14/2003 10:05:01 AM
Voltage Override Alarm	Normal	5/14/2003 10:05:01 AM
Software Auto/Manual State	Manual	5/14/2003 10:05:01 AM
Automatic Control State	Closed	5/14/2003 10:05:01 AM
Reclose Delay Block	Normal	5/14/2003 10:05:01 AM

Close Cap Bank

Analog Input Points

Input Point	Value	Date/Time
Temperature Reading		
Line Voltage		

Edit Device Info

At the top of the Status screen, click on the **Edit Device Info** link. This brings up a screen that allows you to enter a customized description for this device and the device's location information.

Edit Device Information

Description:	<input type="text" value="DNP-RTM Test Unit"/>
Time Zone:	<input type="text" value="Mountain"/> more information
Address:	<input type="text"/>
City:	<input type="text" value="Boise"/>
State:	<input type="text" value="ID"/>
Zip:	<input type="text"/>
Time Zone Offset:	<input type="text" value="-2 (Mountain Time)"/> more information
Status Call Interval:	<input type="text" value="5"/> hours more information

Fill in the appropriate information for this device. The **Additional Info** field can be used for any additional device data that may need to be saved for this device. For example, it could be used to save GPS coordinates for the device, or to record the device's location on the power grid. As explained previously, the title of this field can be changed by filling in the field on the Customer Information page. If this field has been named in the Customer Information page, the new name will be displayed here, in place of "Additional Info."

To set up the device for a specific time zone, enter the **Time Zone Offset**. This is used if the device is reporting from a different time zone than the default setting on the Customer Information page (see above). If the device is not in a different time zone, you do not need to change this setting.

The **Status Call Interval** field should be filled in only if this device has a different status call interval from the default interval entered on the Customer Information page. This is the device's programmed interval between status calls (a number of hours between 1 and 240). The Status Call Interval allows the Missing Device Report to accurately list any devices that do not call in when they should.

Click the **Save Changes** button after completing the Device Info information. You will return to the Status screen.

Viewing, Monitoring and Controlling Data

Once the Telemetric RTM is installed and turned on, it immediately begins to monitor the IED. Within a few seconds of an input changes state, the device makes a call over the cellular network and reports the change. This data is immediately available on the Telemetric web site. (Click the Refresh link to update your screen with any new data.)

The control output points are also ready to be remotely controlled via the web site.

To view the current status of the device inputs and outputs, choose the **Device List** link from the navigation panel. The Device List gives a quick overview of the status of each device. It shows the date and time of the last call, and what that call reported.

For complete information on a specific device, click on the Device ID in the Device List to go to the **Status** page for that device.

The Status page shows the status of each enabled digital and analog input status point at the time of the last report. It also displays the control output commands.

Request Data

From the Status screen you can request an updated status report from the device at any time. To request a report, click the **Request Data** link at the top of the screen. On the Request Data screen, select the report that you want to receive, such as **All Analog and Digital Data**, the time that you want to receive it (either now or at some point in the future), and click the **Send** button. A status request will be sent to the RTM, either immediately or at the requested time, and it will respond by sending back the requested information. To see the updated data on the Status screen, click the **Refresh** link at the top of the page. You can also go to the History screen and see that the Status Report has been received.

Configuration and Maintenance reports do not contain any point data.

History Report

Another tool provided by the Status screen is the **History** report. All calls made by the RTM are saved in the database. The call type and date filters on the History report can be used to display all of these calls, only a certain type of call, or calls from a certain time period. When you click the **History** link, the history screen displays all calls for the past two months. Select an option from the **Display History for** drop-down list to display only a certain type of call. Select a **Date Range** to choose a different time period to view.

For GPRS units, if a point has not changed since the last time it was reported, the data for that point will not be listed in that call. This is to save space on the history report. This is needed because of the increased data throughput available with this device.

Control Outputs

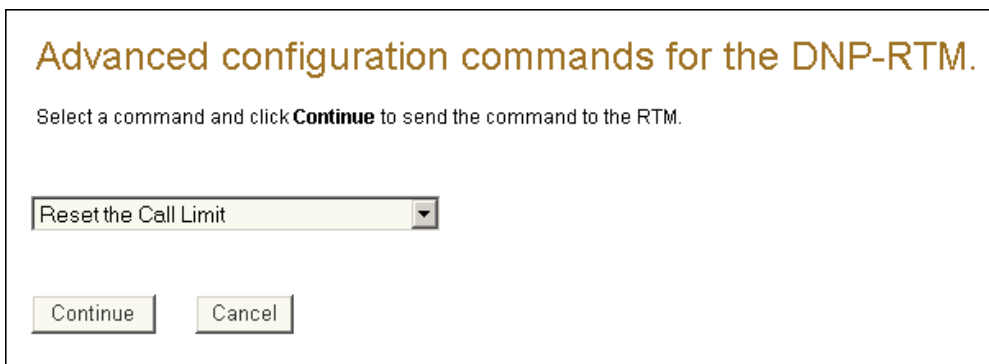
Select a command from the drop-down box on the Status screen (below the Digital Inputs table) and then click the **Send Command** button to remotely control the IED's output points. All commands will result in an acknowledgement being sent from the RTM. You will be able to see any state change(s) in the points list on the Status screen, and in the call record on the History screen. A state change will only be reported if there is a change event rule setup for that point.

Advanced Commands

The Advanced Commands screen gives you access to some RTM configuration commands. The five commands are:

- Reset the call limit
- Reset the device
- Enable or disable a DNP point
- Enable the Analog stair step feature
- Disable the Analog stair step feature

When you select the **Advanced Commands** link at the top of the Status page, you will see the following screen.



Advanced configuration commands for the DNP-RTM.

Select a command and click **Continue** to send the command to the RTM.

Reset the Call Limit

Continue Cancel

Select one of the commands from the drop-down list and click **Continue**.

Reset the Call Limit

Resetting the call limit resets the RTM's internal count of how many calls it has made today. By resetting this counter, you allow the RTM to continue making calls after its call limit has been reached. This may be useful for testing purposes when the RTM is making a large number of test calls.

After you choose to reset the call limit, you will see a confirmation screen. Once you confirm the command, it will be immediately sent to the RTM and the call limit will be reset.

Reset the Device

The Reset command results in a warm restart of the RTM. After the reset, the RTM makes a Power On call to the web site. The call count will be reset and status will be verified and refreshed. This command causes no configuration changes or resets.

Enable or Disable a DNP Data Point

Enabling or disabling a DNP point determines whether or not the RTM should report data on that point. If you are receiving data that you do not need, you can disable the DNP point. Once it is disabled, the point will no longer appear on the Status screen, and the RTM will no longer report any data on the point. Conversely, enabling a DNP point will cause the RTM to begin reporting data on that point, and the new point will be displayed on the Status page.


If you have chosen to enable or disable a DNP point, you will see something similar to the following example screen.

Enable or Disable a DNP Point

Use this screen to configure which DNP point the DNP-RTM is using. To disable a point, uncheck the check box. When a point is disabled, it will no longer be displayed on the Current Status page and the RTM will no longer report any data on that point.

Digital Inputs	Analog Inputs
<input checked="" type="checkbox"/> Status Input #1 (1)	<input checked="" type="checkbox"/> Voltage L1-L12 (4)
<input checked="" type="checkbox"/> Status Input #2 (2)	<input checked="" type="checkbox"/> Voltage L2-L23 (5)
<input checked="" type="checkbox"/> Battery Status (3)	<input checked="" type="checkbox"/> Voltage L3-L31 (6)
	<input checked="" type="checkbox"/> Current L1 (7)
	<input checked="" type="checkbox"/> Current L2 (8)
	<input checked="" type="checkbox"/> Current L3 (9)
	<input checked="" type="checkbox"/> KW L1 (10)
	<input checked="" type="checkbox"/> KW L2 (11)
	<input checked="" type="checkbox"/> KW L3 (12)
	<input type="checkbox"/> KVAR L1 (13)
	<input type="checkbox"/> KVAR L2 (14)
	<input type="checkbox"/> KVAR L3 (15)
	<input checked="" type="checkbox"/> Maximum Sliding Window kW Demand (28)
	<input checked="" type="checkbox"/> Accumulated kW Demand (29)
	<input checked="" type="checkbox"/> Maximum Sliding Window kVA Demand (30)
	<input checked="" type="checkbox"/> Accumulated kVA Demand (31)
	<input checked="" type="checkbox"/> Present Sliding Window kW Demand (32)

Select the points you want to enable and un-select the points that you want to disable. When you click **Save Changes** you will see a confirmation page. Once the change has been confirmed, the configuration commands will be sent to the device.

 **Note:** When you enable a point, it will use the factory default settings for that point, or the default settings that have been programmed into it using the local configuration program. For example, if you enable an Analog input point and want to use the three Analog limits to trigger reports, you must set the values of those limits using the local configuration utility. See Appendix A for details on using the local configuration program. See the Integration Guide that came with your RTM for a list of all factory default settings.

Enable or Disable the Analog Stair Step Feature

This command turns on or off the use of Analog “stair step” set points. By default, the RTM has three set points available for each Analog input. When the analog value crosses one of those set points, the RTM calls in to report an analog range change. The stair step feature allows a “stair step” dead band interval to be used for the Analog set points. For example, if the interval is set to 25, the Analog point will have to change by 25 or more to trigger an event.

The stair step interval must be set in local programming for the individual Analog point. See Appendix A for instructions on locally programming the RTM. Once that interval has been programmed into the RTM, the stair step feature can then be remotely turned on or off from the web site (it can also be enabled locally in local programming). When the stair step feature is enabled, the stair step set points are used for any of the Analog inputs that have been programmed to use them. If no stair step interval has been programmed (i.e. the stair step interval is set to zero), the Analog input will continue using the normal Analog limit set points (if

any have been set up). When the stair step feature is disabled, all Analog inputs revert to using the normal Analog limit set points, if set, and any stair step intervals are ignored.

Analog Data Graphing

From the Status screen you can go to a graphing tool to graph all historically logged analog data for this RTM type. To setup a template for this graph, look under **Advanced Programming - Historic Graph Template Setup (RTM Only)**. There are instructions for this later in the manual.

To create a graph, click on **Analog Graphs** link. Up to three Analog points can be selected and a date range specified. The graph will display all of the data values that were reported by the RTM for these points. Scaling is handled automatically.

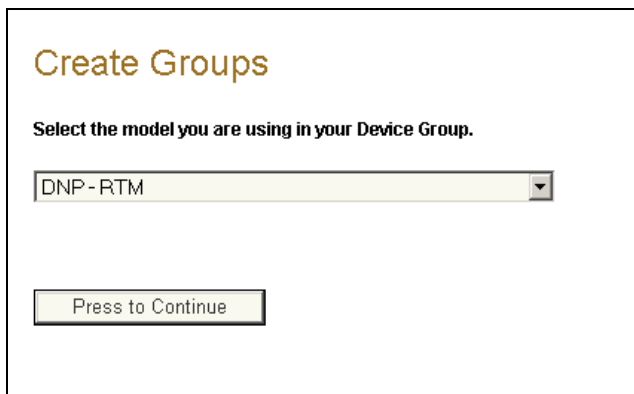
Device Groups

In order to manage a number of similar devices, Device Groups can be created. Groups can be used to:

- Filter the device list for specific devices.
- Assign to a sub-user to give them access to a limited group of devices.
- Assign to an Event Based Action to apply that action to every device in the group.
- Send report requests to multiple devices at once.
- Send control actions to multiple devices at once.

Group Setup

To create a Group, select the **Device Groups** link in the navigation panel. Choose **Create New Group** from the menu on top of the Device Groups list.



Create Groups

Select the model you are using in your Device Group.

DNP-RTM

Press to Continue

Only similar devices can be grouped for control and report requests (DNP-RTM, T646, etc.) Choose the model type and click "Press to Continue". If DNP-RTM is chosen, the next screen will ask you to choose which DNP-RTM model the group is intended for (Cooper Form 6, SEL 351, etc.)

Create Device Groups

Select the DNP-RTM profile for your group:

National Grid Form 6

Press to Continue Cancel

The next screen will show all Devices that match the model type. Select which devices should go in the Group. Give the Device Group a name and click "Save Changes".

Create Device Groups

Use this screen to create your device groups.

Group Name: Save Changes

Device	Description	Model
<input checked="" type="checkbox"/>	4968 Satec 172E Demo	TVM1 - Rev 8
<input type="checkbox"/>	5078 TVM Test Unit 1	TVM1 - Rev 8
<input checked="" type="checkbox"/>	5088 TVM Test Unit 2	TVM1 - Rev 8
<input type="checkbox"/>	5123 TVM Test Unit 3	TVM1 - Rev 8
<input type="checkbox"/>	5846 Connected to Satec and Office 3-phase	TVM3
<input type="checkbox"/>	5880 Cascade Test 1.2W 7D09 4/27/04 N shield	TVM1 - Rev 8
<input checked="" type="checkbox"/>	5881 Cascade Test 3W 7D09 4/27/04 N shield	TVM1 - Rev 8

Requesting Group Reports

To request a report from all of the devices in a Group at once, go to the Device Groups page. Select the desired group and click on the **Request Status** link. Choose the desired report to request from the drop down list. All reports that are available to request from a device's Status Page are available to request here. Click on Request Report and the request will go out to all devices simultaneously.

Sending Group Commands

To send a command to all of the devices in a Group at once, go to the Device Groups page. Select the desired group and click on the **Send Command** link. Choose the desired command to send from the drop down list. All output commands that you can send from the device's Status Page are available to send here. It is also possible to send a group command to Reset the Call Limit, Enable/Disable RTM Points and Enable/Disable the Stairstep feature. Click on Send Command and the command will go out to all devices simultaneously.

Display Only Groups

Display Only groups can be used to create a group of multiple types of devices, such as TVM3s and TC012s or RTMs with different model types. The group cannot be used to send commands or requests, but can be used to filter the device list and to assign to a sub-user to limit their access to specific devices. To create a Display Only group, click **Create New Group** and Select Display Only Group from the drop down list of available models.

All devices on the account will be available for adding to the list. Select which devices should go in the Group. Give the Device Group a name and click "Save Changes".

Event Based Actions

The Telemetric web software allows the user to create scenarios that will automatically carry out a control action or send out a user notification. For example, a rule might be created to specify "If Neutral Current reports 'high' then set Cap Bank to 'Off'." Or a notification rule might be created so that "If Neutral Current reports 'high', then send a notification to the Regional Supervisor." These rules can also be more complex so that up to five conditions must be met before the action takes place. For example, "If temperature is over 80° and Fan 1 is on, turn on Fan 2."

To create these rules, the Telemetric Intelligent Web Server has a step-by-step interface that walks through the process. Messages and recipients or recipient distribution lists must be set up prior to setting up new user notifications. After logging in to the web site, select the **Event Based Actions** link from the navigation panel.

On the **Event Based Actions** screen there will be a list of Control Actions or User Notifications that have already been created. These can be edited at any time by clicking on the Description.

Creating a new control action

To create a new Control Action, click the **Create New Control Action** button.

1. The first step of the process is the selection of a Device ID. Select an ID number from the top drop-down list box. This is the Telemetric device that will be triggering the Control Action. If you would like to trigger an action for the same device, leave the next box at "Same as Trigger Device", otherwise choose the desired device for the action to be directed at. Time based actions are not available for the RTM.

Select Device ID

Please select a device ID to create a new Control Action.

1378 ▾

Select the device that will carry out the Control Action.

Same as Trigger Device ▾

Event-triggered action Time-triggered action

Proceed

- Click the **Proceed** button to view the Control Action setup page. The screen shot below shows the setup page for event-triggered actions.

Setup Control Action

Set up a control action to be carried out by the selected MicroRTU. You can create up to five triggers for the control action.

Triggering Device: 5013

Select the first trigger for the control action Current Phase A - Mid-High ▼

Additional Triggers

2nd Trigger	<input type="radio"/> And <input type="radio"/> Or <input checked="" type="radio"/> None	Mechanism Closed Status -- ▼
3rd Trigger	<input type="radio"/> And <input type="radio"/> Or <input checked="" type="radio"/> None	Mechanism Closed Status -- ▼
4th Trigger	<input type="radio"/> And <input type="radio"/> Or <input checked="" type="radio"/> None	Mechanism Closed Status -- ▼
5th Trigger	<input type="radio"/> And <input type="radio"/> Or <input checked="" type="radio"/> None	Mechanism Closed Status -- ▼

Select the action to be carried out by device 5013

Action: Trip ▼

Description*: Control Action Name Save Control Action

- The first step of the Control Action creation process is to select from the drop-down box the initial input trigger for the Control Action. Triggers available for the RTM include all digital input changes, analog input range change calls (could be and range or staircase) or specific ranges.
- Next, decide whether multiple inputs are needed to define this rule.

Specify the **"And"** radio button and select the second condition to specify that both conditions must be true in order for the action to be carried out. For example, "If temperature is greater than 80° is True AND Air Conditioner is Off, then perform action."

Specify the **"Or"** radio button and select the second condition if only one of the conditions needs to be true in order for the action to take place. For example, "If Alarm 1 is On OR Alarm 2 is On, then perform action."

Continue adding conditions as needed, up to a total of five.

If no other conditions need to be added to the rule, leave the remaining selections in the **Additional Triggers** table checked as none.

- Next, select the action to be carried out, for example, Open Cap Bank. All available output commands are selectable as the action. In addition, reports can be requested.
- Finally, type a name for the control action into the text box at the bottom of the page and then click the **Save Control Action** button to complete the process.

When the Control Action has been saved, it will appear in the Event Based Actions table. Control Actions can be edited at any time by clicking on the description. As soon as it has been created it is active. Control Action can be disabled by unchecking the actions enabled checkbox.

Event-based user notifications

User Notifications are created by selecting a Message to be sent to a Recipient when selected criteria are met.

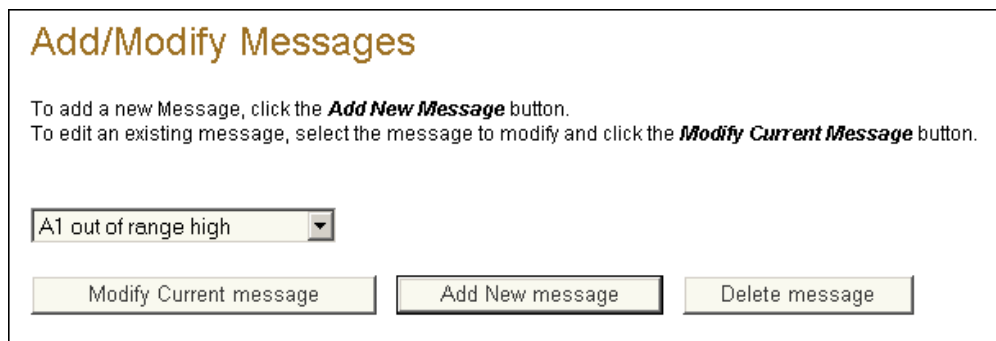
Before building your first User Notification you must create a Message and Recipient, or Recipients and a Recipient Distribution List, for use in your notification.

To set up new Recipients and Messages, select the **Messages & Recipients** link from the navigation panel. Select the **Messages** link to create a new message or the **Recipients** link to create a new recipient. The **Recipient Distribution List** link will create a list of Recipients so that a single User Notification can send the same message to multiple recipients.

✿ **Note:** All notification messages are sent using e-mail addresses. An Internet e-mail address can be used to send a regular e-mail message that will be sent to an e-mail inbox, or as a message to a pager or cell phone with the ability to receive text messages.

Create a Message

When you click the **Messages** link the Add/Modify Messages screen is displayed.



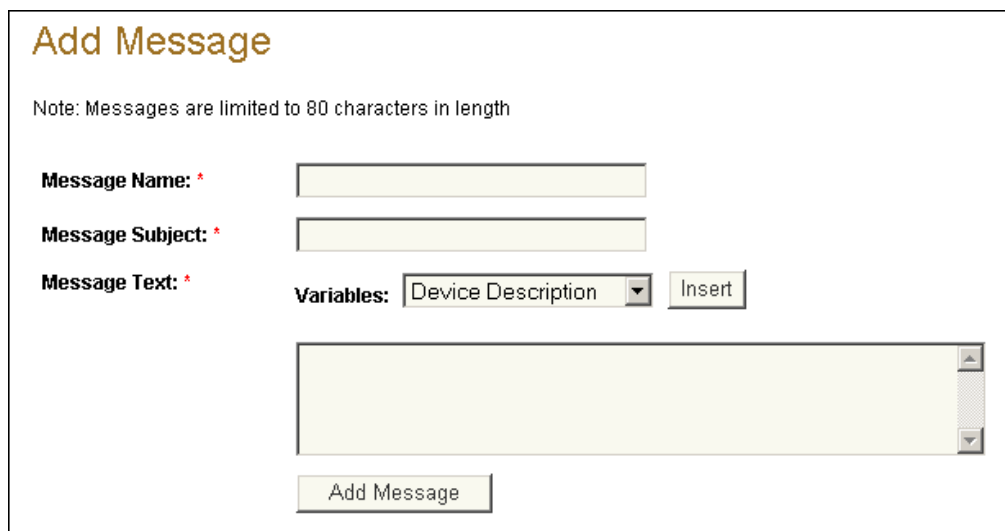
Add/Modify Messages

To add a new Message, click the **Add New Message** button.
To edit an existing message, select the message to modify and click the **Modify Current Message** button.

A1 out of range high

Modify Current message Add New message Delete message

To create a new message, select the **Add New Message** button.



Add Message

Note: Messages are limited to 80 characters in length

Message Name: *

Message Subject: *

Message Text: * Variables: Device Description

It is required that you fill in all three fields in this screen to create a message. Type in a name for the new message in the **Message Name** field. This is the name that will appear in the list of

previously created messages. Fill in the **Message Subject**. This will appear in the Subject line if the message is sent via Internet e-mail. Type a message of 80 characters or less into the **Message Text** field. You can also insert one or multiple variables into the message by putting your cursor in the appropriate spot and selecting a variable from the drop-down box. The variable is a placeholder that tells the software to insert the requested data from the NOC database into the message before it is sent. Using variables, one message can be created and used for a multiple devices, instead of having to make a separate message for each device. The variables currently available for RTMs are:

- Unit ID
- Device Description
- Device Address
- Event Date/Time
- Additional Information field
- Trigger Point Label
- Trigger Point Value
- Trigger Point Range

A **Trigger Point** is the point that triggered the notification. For instance, if a notification was triggered off of "Current Phase A – Range Change" then the trigger point is Current Phase A. The Trigger Point Label is "Current Phase A", the Trigger Point Value is the present value of Current Phase A and the Trigger Point Range is the present range of Current Phase A. The trigger points can also be used for digital input points. If Trigger Point Range is used for a digital input point it will show up as a blank.

A sample message:

Subj: Device 5013 Status //Uses the variable Unit ID
Body: Device 5013 reports a point change. //Uses the variable Unit ID
Current Phase A: 9.2 Range: Low //Uses the Trigger Points Label: Value Range

When finished with the new message, click the **Add Message** button to save it.

Add a Recipient

To add a new message recipient, click on the **Recipients** button on the Messages and Recipients page.

Add/Modify Recipient

To add a new Recipient, click the **Add New Recipient** button.
To edit an existing Recipient, select the name and click the **Modify Current Recipient** button.

caiyun 3 ▾

Modify Current Recipient Add New Recipient Delete Recipient

The drop-down box on this page lists previously created recipients. Click the **Add New Recipient** button to add a new recipient to the list or select a Recipient from the drop down list and hit **Modify Current Recipient** to edit the entry.

Add Recipient

Recipient Name: *

Email Address: *

Enter a name and an email address for this recipient. As mentioned before, this e-mail address can be either an Internet e-mail address or a text pager or cell phone e-mail address.

After entering the recipient information, click the **Add Recipient** button. You will be returned to the setup page.

Recipient Distribution Lists

If you want to send email to more than one recipient, enter all of the recipients on the Recipients screen, and then select the **Recipient Distribution List** link from the Messages & Recipients menu. This allows you to select a number of recipients and group them together for notifications.

Modify Recipient Distribution List: Michele

<input type="checkbox"/> cai pager	<input type="checkbox"/> caiyun@work	<input type="checkbox"/> Cindy
<input type="checkbox"/> Dispatch	<input type="checkbox"/> Joe	<input type="checkbox"/> Jon Glauser
<input type="checkbox"/> Ken Cell	<input type="checkbox"/> Mark@Work	<input checked="" type="checkbox"/> Michele Wolf
<input type="checkbox"/> Petes Cell Phone	<input type="checkbox"/> Sumpter Joe	<input type="checkbox"/> Support
<input checked="" type="checkbox"/> Telemetric Support	<input type="checkbox"/> Tom L	

Save the list as: *

Click on Add Distribution List. Select the desired Recipients and name save the list. The above list example will now be added to the bottom of available recipients as "List: Support".

Setting Up a User Notification

To create an event-based User Notification, select the **Event Based Actions** link from the navigation panel.

On the Event Based Actions page, there is a list of previously created Control Actions and User Notifications. Click the **New User Notification** link at the top of the page to create a new event-based user notification rule.

1. The first step in the process is to select the Telemetric device ID number for the module that will trigger the User Notification. (You also have the option of creating a Global user notification. See the instructions below.)

Select Device ID

Please select a device ID to create a new User Notification.

3597

Proceed

After selecting the device, click **Proceed** to display the Setup User Notifications page.

Setup User Notification

Set up a user notification to be carried out by the selected MicroRTU. You can create up to five triggers for the user notification.

Triggering Device: 6148

Select the first trigger for the user notification: Cap Bank Close - On

Additional Triggers

2nd Trigger	<input type="radio"/> And	<input checked="" type="radio"/> Or	<input type="radio"/> None	Alarm Summary - Alarm
3rd Trigger	<input type="radio"/> And	<input type="radio"/> Or	<input checked="" type="radio"/> None	Cap Bank Close - Off
4th Trigger	<input type="radio"/> And	<input type="radio"/> Or	<input checked="" type="radio"/> None	Cap Bank Close - Off
5th Trigger	<input type="radio"/> And	<input type="radio"/> Or	<input checked="" type="radio"/> None	Cap Bank Close - Off

Select a message and a recipient:

Select the message that should be sent to the recipient: Capacitor Bank

Select the recipient: List - curt

User Notification Name*: CB On or Alarm

Save User Notification

2. Select the first trigger to initiate a User Notification. (If you select Missing Device or Command Failure, the appearance of this page will change. See specific instructions for these options below.)
3. Choose whether multiple inputs are needed to define this rule in the Additional Triggers table.

Specify the **And** radio button and select the second condition to specify that both conditions must be true in order for the user notification to be sent. For example, "If Cap Bank is Open AND SCADA Control is Local, then send Status Message to Joe."

Specify the **Or** radio button and select the second condition if only one of the conditions needs to be true in order for the action to take place. For example, "If Alarm 1 is On OR Alarm 2 is On, send Alarm Message to Margaret."

Continue adding conditions as needed, up to a total of five.

If no other conditions need to be added to the rule, leave the remaining selections in the **Additional Triggers** table checked as none.

4. Select the message that will be sent. The messages in this drop down list box are those that were created on the Create Messages page.
5. Select the message recipient or recipient distribution list. The names that appear in this drop-down box are the Recipients defined on the New Recipient page. Any Recipient Distribution Lists you have created will be at the bottom of the drop down list. Each Recipient is associated with an email address – either for Internet email or a text messaging.
6. In the final step, give the User Notification a name and click the **Save User Notification** button to save it.

The new User Notification will appear in the Event Based Actions list. As soon as it has been created it is active. User Notifications can be disabled by unchecking the actions enabled checkbox. User Notifications can be edited at any time by clicking on the description. The notification message will be sent to the recipient whenever the trigger event takes place.

Global User Notifications

You can create a global user notification that applies to all of your devices. Presently there are only three possible triggers for global user notifications: Missing Device, Command Failure and DNP Session Offline. These triggers are explained when selected.

When the Global Notification option is selected, the User Notification screen that is displayed is slightly different.

Setup User Notification

Triggering Device: Global

Select the first trigger for the user notification:

"Missing" Device Notification
 If a device does not make its time-scheduled call within the time period indicated below, it will be classified as "missing" and an email will be sent out.

Status Call Interval: hour(s)

Note: The value entered here will override the value entered on the Customer Information page.

Select a message and a recipient:

Select the message that should be sent to the recipient:

Select the recipient:

User Notification Name*:

Select a global trigger from the drop down list and then fill in any necessary data. As with a normal user notification, you must select a message and a recipient or recipient list. Then give the user notification a name and save it. Once created, the global notification will be triggered by any of your devices, and new devices that are added to your web site will also be included in the global notification.

Command Failure Notification

The command failure user notification will be triggered every time a command or data request is sent to a device and an acknowledgement is not received. If the device is set up to use Acknowledgement Retries (see the Advanced Programming menu), the command failure notification will not be sent out until all of the retries have failed. The software waits five minutes after the command is sent, or after the final retry is sent, before it sends out the command failure notification.

Commands include any output change or programming command that is sent to a device. For the purposes of this notification, commands do NOT include report requests.

Missing Device Notification

The missing device user notification will be triggered when a device has not called in within a set period of time. This time period is specified when the user notification is set up. The time period used should be slightly longer than the period between Time Scheduled calls. When a device does not call in by the expected time, the user notification is sent out and the device also appears on the Missing Device Report, which can be reached from the navigation panel.

If a global notification is created it will override any individual missing device user notifications that are created.

Groups in Event Based Actions

If there are multiple devices that require the same Control Action(s) or User Notification(s), the simplest way to do this is to use the Grouping function.

Applying Device Groups

Device Groups can be applied to User Notifications and Control Actions. Setup the Event Based Action(s) desired for one of the devices. A Group should be setup to include all of the devices intended to have the same Event Based Action(s), *including* the device used for the initial Event Based Action(s) setup. On the Event Based Actions summary screen click on the "Assign" link for the action or notification to assign that action to a group.

Mark for Assignment	Group Name
<input type="checkbox"/>	Mark's Cascade TVM's
<input type="checkbox"/>	testing

The Assign User Notification/Control Action to Group(s) page will be displayed. All groups that the Device for which the Action was defined is a part of will be shown. Any number of groups can be chosen. Clicking "Assign to Group" will then apply that Event Based Action to any other devices in the groups assigned. To unassign from a group, simply hit the "Assign" link again and unselect the group. If no groups are selected, the Action reverts to its original Device Number.

Setting Up Data Export

To export the data from one or more Telemetric devices for use in another data management program, set up the automated data export function. Currently the data export takes place in the form of machine-readable e-mail messages or CSV files (available for the TVM1 only). Other data export methods will be available in the future.

To set up one or more devices for data export, select the **Data Export Setup** link in the navigation panel.

Choose **Global Export via E-Mail** or **Device-Specific Export via E-Mail**. Global exporting exports all data for all devices that call in. Device Specific data exporting specifies one or more devices for data export.

Global data exporting

To use Global exporting, check the **Enable Global Exporting** check box and enter an email address into the **Recipient Address** text box. If you want data export email sent to more than one recipient, you can enter multiple email addresses separated by semicolons. Click the **Update Global Settings** button to save the changes. Once Global exporting has been enabled, each call from each device will generate an email message, which will be sent to the assigned email address. See the Email Data Export Format section, below, for details on how the data is formatted within the email.

Device specific exporting

To export data only for specific devices, select **Device Specific Export via E-mail** and click the **Add Devices** button. On the Add Devices screen, select a device from the drop down list, and then select an email recipient. The recipients in the drop down list are the Recipients and Recipient Lists that have been added on the Recipients page (reached by following the "Messages & Recipients" link in the navigation panel).

After selecting a device and an email address, click the **Save Selection** button. A confirmation page will confirm the addition of the device, and the selected device and the e-mail address will be displayed in the Device Specific Exporting table. Follow this procedure for each device to be added. As soon as the device has been added to the table, each call from that device will generate an email containing the data from that call. See the Email Data Export Format section, below, for details on how the data is formatted within the email.

Email data export format

The export data within each email message is in a specific comma-delimited format, so that it can be imported directly into a database. The format is shown below, with the actual export data represented in brackets. Only the data that has been reported in the specific call will be sent in the e-mail, so only a small part of this list will be received each time.

Unit, [Unit ID],

Call Reason, [event that triggered the call], [date and time – mm/dd/yy hh:mm:ss]

Serial Number, [Unit Serial No.],

Input1, [current state], [date and time – mm/dd/yy hh:mm:ss]

Input2, [current state], [date and time – mm/dd/yy hh:mm:ss]

Input3, [current state], [date and time – mm/dd/yy hh:mm:ss]

And so on, for all digital input points...

Output1, [current state], [date and time – mm/dd/yy hh:mm:ss]

Output2, [current state], [date and time – mm/dd/yy hh:mm:ss]

Output3, [current state], [date and time – mm/dd/yy hh:mm:ss]

And so on, for all output points...

Analog1, [current reading], [date and time – mm/dd/yy hh:mm:ss]

Analog2, [current reading], [date and time – mm/dd/yy hh:mm:ss]

Analog3, [current reading], [date and time – mm/dd/yy hh:mm:ss]

And so on for all analog input points...

Advanced Programming

The Telemetric web site has an Advanced Programming section that gives you access to some of the more advanced features of the web site. Follow the **Advanced Programming** link on the navigation panel to find these tools.

Acknowledgement Retries

The Acknowledgement Retries feature allows you to set the number of retries used by the Telemetric software when a command is sent to a device. Whenever the device is sent a command, such as a command to open or close one of its outputs, it always sends back an acknowledgement so that the user knows that the command was successfully completed. By default, the Telemetric software does not re-send the command if it does not receive an acknowledgement from the device. By enabling automatic retries, the user is able to ensure that the device receives and responds to the command.

To set Acknowledgement Retries:

1. Select **Acknowledgement Retries** from the Advanced Programming screen.
2. Select the device to program from the **Device ID** drop down list and click **Continue**.
3. Select the number of retries (from 1 to 5) from the **Number of times to Retry** drop down list.
4. Select the minutes and seconds for the system to wait before considering the call to have failed and to try again.
5. Click the **Continue** button to save the new Acknowledgement Retries setting. You will see a screen telling you that the change has been made. From this point forward, the software will use the specified number of retries whenever it does not receive a command acknowledgement from the device.

Note: With the use of retries, a very high level of reliability can be achieved for carrying out supervisory control commands. There are factors inherent in cellular communications, however, which prevent the system from being 100% reliable. If the device is having serious problems receiving messages, it may be unable to receive the command, no matter how many times it is retried. If the device receives and carries out the command, it may then have problems communicating the acknowledgement back to the web software. In this case, the software will send the command again. Receiving multiple commands may cause undesirable operation in some applications. The user should be aware of these limitations when using the Telemetric device for supervisory control applications. In addition, bear in mind that increasing the number of retries will increase the overall call volume.

Create/Edit User IDs

This option allows a “master user” to create new user IDs that allow access to the Telemetric web site without having the ability to make edits or control the Telemetric devices. The “master user” is the initial user ID and password that is granted to you by Telemetric. Only the master user will see this item in the Advanced Programming menu.

Creating a new User ID

1. Select **Create/Edit User ID** from the Advanced Programming menu.
2. Click the **Add User ID** button.
3. Fill in the User ID and Password for the new user. For the User ID you must use alphanumeric characters only with no spaces or punctuation. The Password must be eight or more alphanumeric characters.
4. Select either **Operator**, **View and Report** or **View Only** option.

View Only: This user type can only view the device and system data. This user cannot send any report requests or control commands.

View and Report: This user can view all device data and request reports from devices. They cannot send control commands to devices. This user can also request reports using any groups that they are authorized to use.

Operator: This user can view all device data, request reports from devices and send control commands to devices. This user can also request reports and send commands using any groups that they are authorized to use.

5. It is possible to limit a user to only seeing a particular group or groups of devices. If this is desired, select the checkboxes next to the groups. For a user to be able to see all devices and utilize all groups on the account, leave the groups section unchecked.
6. Click **Save Changes** to save the new User ID. This User ID and password can now be used to access the web site.

After creating a User ID, you can either edit or delete that ID by using the Edit and Delete buttons on the Create/Edit User IDs page.

View Airtime Usage

This option allows the user to view what call plans are setup for various devices, and to see how much of that call plan has been used. To view Airtime usage, select **View Airtime Usage** from the Advanced Programming screen.

Data is available for the current month as well as for previous months. If a device is using a significant amount of its call plan, or is incurring overage bills, it is likely that the unit may need to be reprogrammed or checked out to reduce the number of calls. Click on the unit number to bring up the Status Page for that unit. The History for the device can be used to determine what is causing so many calls.

Digital RTMs are billed by data usage. To view this Airtime Usage, click on the **GPRS Units Airtime Usage** link at the top of the Airtime Usage page.

If a device needs to have its call plan changed, contact Technical Support to check out the options.

Historic Graph Template Setup

This option allows the Administrator to create a template for an RTM model type (i.e. Cooper Form 6) in order to specify which analog points will be logged for graphing.

Creating a New Device Template

1. Click **Historic Graph Template Setup (RTM Only)** from the Advanced Programming screen.
2. Click the **Create Graph Template** link at the top of the screen.
3. Select the Desired Model Type from the drop down list of available RTM Models and click Continue.
4. A screen will come up with all of the analog points defined for that Model. The points are all selected by default. Modify the selection until only the analog points that should be logged are selected.
5. Name the template and click Continue.

Device Profiles

You can customize the labels for all of the IED points and for their open and closed states by creating a Profile. To do this, click on **Device Profiles** in the navigation panel.

Customizing the Input and Output Labels

1. Click on **Create Profile** at the top of the Device Profiles screen.
2. Select the **DNP-RTM** radio button and select the correct IED integration from the drop-down list.
3. On the next page give the profile a name and then click **Continue**.
4. On the following page all of the labels for the IED are displayed. Change any label you would like by just typing the new label into the text box. When you are finished, click **Continue**.
5. The next screen will ask if you want to go ahead and assign devices to this profile. Select **"Yes"** and click **Continue**.
6. You can choose to use this profile for all RTMs with this IED configuration by selecting the first check box. If you would rather assign devices to this profile individually, use the check boxes below under "Unassigned devices." Click **Save this Assignment** to complete the process.

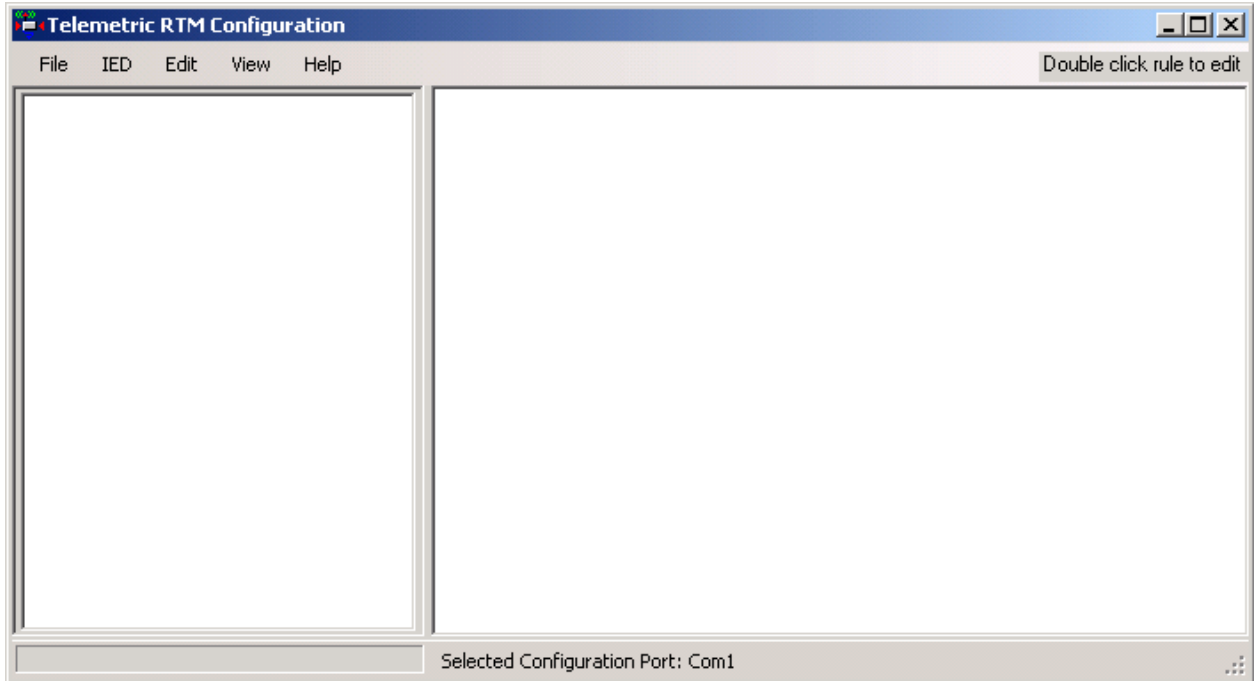
Once the profile has been assigned, it will control all labels for the assigned RTMs. Any change to the profile will change all RTMs assigned to it.

Appendix A: Local Programming

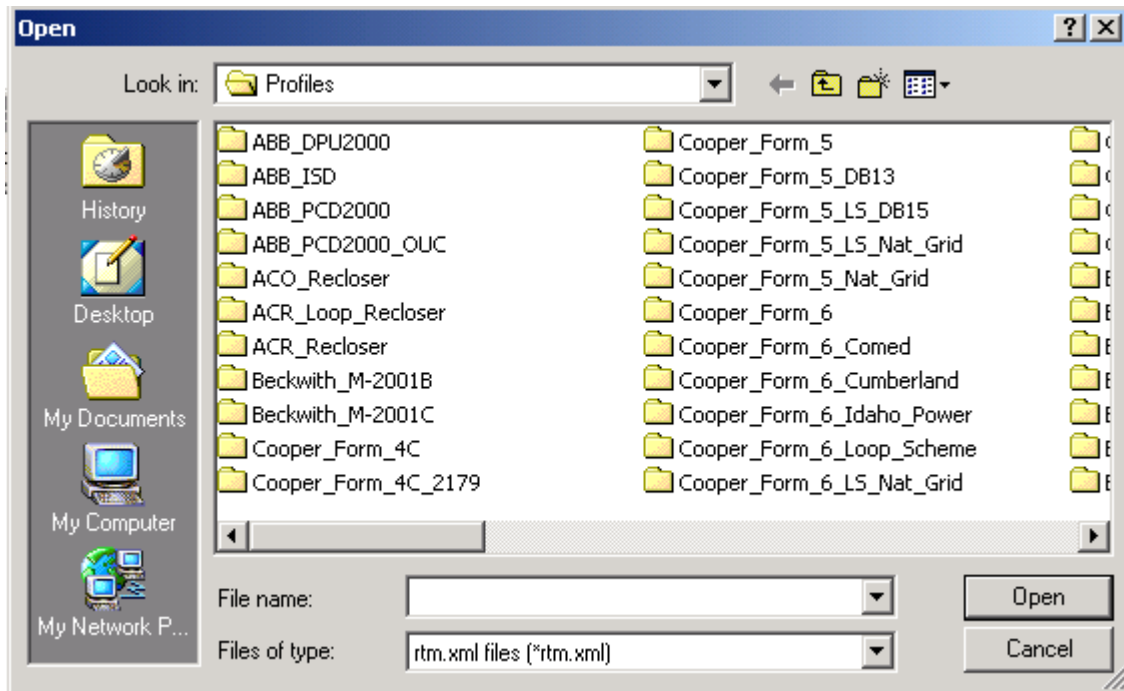
The RTM includes a local programming application that runs on a PC or laptop. This program includes default profiles for each supported application. You can start with the default profile and customize it with your own preferred values. The following instructions tell you how to create a custom programming profile and then connect the RTM to the PC and program it with the new profile.

Creating a Custom Programming Profile

1. If you have not already done so, run the setup for the Telemetric RTM Configurator Program. This software was shipped to you along with your Telemetric device(s). It can also be downloaded from the www.telemetric.net web site.
2. Run the Configurator Program.
3. When the program opens, you will see the following screen.



4. To open a profile for the RTM, select **Open profile** from the **File** menu.



Navigate the Profiles director to select the desired product. Select the “default” profile for an Analog DNP-RTM device and the “default-GPRS” profile for a Digital RTM-GPRS device. Click **Open**. The profile is loaded into the display tabs.

5. To change point settings, select the correct section (Digital Inputs, Digital Outputs or Analog Inputs) and then double-click on the point that you want to change.

Digital Inputs

- Enable or disable the point
- Select whether you want it to report when the point changes state
- Set the trigger time for the report (i.e. how long the state change must last in order to be reported)
- Set the time scheduled report interval. All digital inputs have the same time scheduled report interval, so if you change it for one point, it will change for all points. (For analog devices, the time scheduled reporting interval must be done in hours. For digital devices, the time scheduled reporting interval is in terms of minutes.)

Digital Outputs

- Enable or disable the point.

Analog Inputs

- Enable or disable the point
- Select whether you want it to report when the point crosses a limit
- Set the trigger time for the report (i.e. how long the range change must last in order to be reported)
- Set the time scheduled report interval (For analog devices, the time scheduled reporting interval must be done in hours. For digital devices, the time scheduled reporting interval is in terms of minutes.)
- Enter up to three limits for the analog reporting ranges

- Set up a stair step interval for the analog ranges. Note that you must enable stair step limits on the Configuration tab, or enable them from the web site, in order for this interval to be used. See the explanation below and in the **Advanced Commands** section of this manual.
6. On the **Configuration** tab you need to select the communications settings for the IED and for radio communications. Select the settings that are appropriate for your application. The two settings that most often need to be changed are the **Baud Rate** setting and the **Master/Slave Settings**. If these do not match the settings in the IED, communication between the two will be impossible.

As mentioned above, the Configuration tab also has the **Stair Step Analog Limits** setting. This turns on or off the use of Analog “stair step” setpoints. By default, the RTM has three setpoints available for each Analog input. When the analog value crosses one of those set points, the RTM calls in to report an analog range change. The Stair Step feature allows a dead band interval to be used for Analog setpoints. For example, if the interval is set to 25, the Analog point must change by 25 or more to call in with a Stair Step change. Once that interval has been programmed into the RTM, the Stair Step feature can then be enabled by checking this check box, or remotely turned on or off from the web site. When the Stair Step feature is enabled, the stair step setpoints are used for any of the Analog inputs that have been programmed to use them. If no stair step interval has been programmed (i.e. the stair step interval is set to zero), the Analog input will continue using the normal Analog set points (if any have been set up). When the Stair Step feature is disabled, all Analog inputs revert to using the normal Analog setpoints, if set, and any stair step intervals are ignored.

7. When you have finished configuring all of the values, select **Save profile as** from the **File** menu. You cannot save changes directly to the Default profile, but you can save your profile with a new name. After saving the profile, you can program a RTM with the new profile.

Programming the RTM With the New Profile

Follow the instructions below to upload the profile you have created into the memory of the RTM.

1. Use a serial cable to connect the Telemetric device to the PC COM port. (This must be the PC that is running the RTM Configurator Program.) Plug the serial cable into the top COM port on the RTM.
2. If it is not already running, start up the RTM Configurator program. If it is not already open, open the profile you want to use for programming by selecting **Open profile** from the **File** menu.
3. Select **Send Profile to RTM** from the **File** menu.
4. The interface will switch to the **Transfer Status** tab and will show the progress of the upload. If an error message is displayed, the program is unable to establish communication with the RTM on the selected COM port. Make sure the cable is correctly connected, that you have selected the correct COM port (select **COM Serial Port** from the **File** menu to change the COM port setting), and that no other software programs have the COM port locked.

When the process is complete, you will see a “Transfer Complete” message at the bottom of the Transfer Status tab.

Viewing the Current Profile of a Device

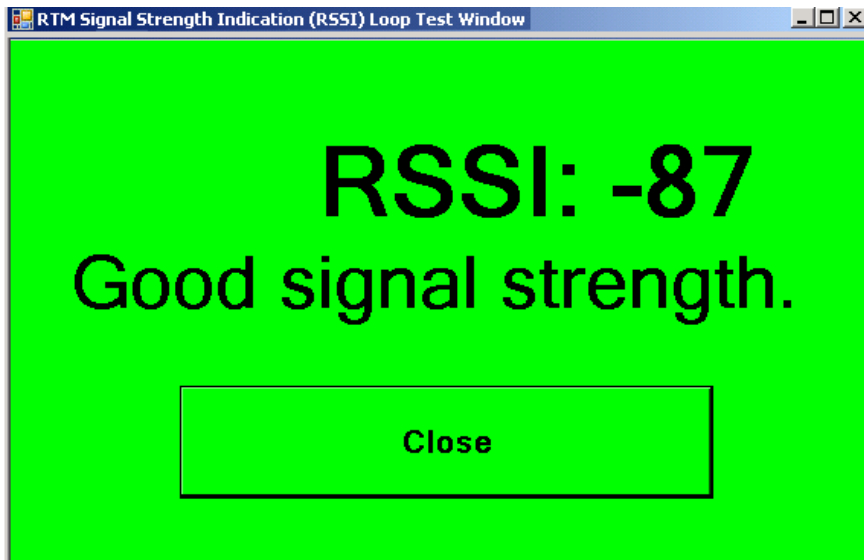
To see the current programming profile of a RTM, you can download and display its current settings. With the RTM connected to the PC, select **Retrieve Profile from RTM** from the **File** menu. The interface will switch to the **Transfer Status** tab and display the progress of the download. When the download is complete, the program will switch back to the **Digital Inputs** tab so that you can view the profile. If you want to save this profile, select **Save profile as** from the **File** menu. You will have the opportunity to give the profile a new name.

Viewing the RSSI Reading

After selecting an installation location, it is a good idea to test the device's ability to transmit and receive. (The device must be connected to power and an antenna attached in order to carry out this test.) You can use the local configuration software to check the RSSI.

1. If you have not already done so, run the setup for the Telemetric DNP-RTM Configuration Program. This software was shipped to you on a CD along with your Telemetric device(s). It can also be downloaded from the www.telemetric.net web site.
2. Connect the RTM to your computer with a straight-through serial cable.
3. Run the Configurator Program.
4. When the program opens, go to View -> RSSI Test Loop Window. After a few seconds, you will see a negative number displayed in the new window. This is the RSSI reading. The blinking background color also indicates signal strength for ease of use when standing away from the PC.

Screen Appearance	Meaning
Solid red	Inadequate signal strength
Slow red blink	Marginal or weak signal strength
Slow green blink	Acceptable signal strength
Fast green blink	Good signal strength
Solid green	Excellent signal strength



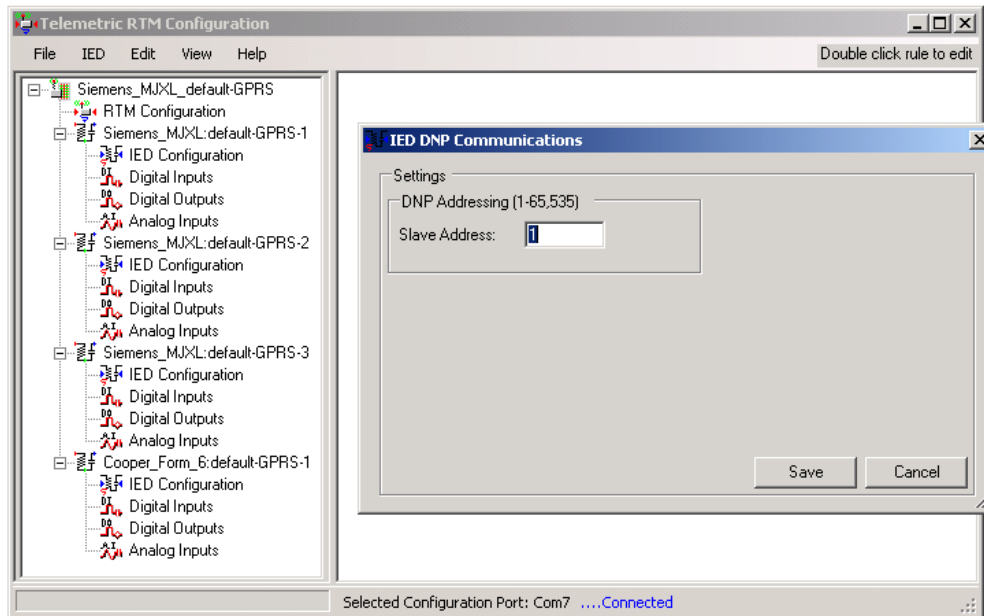
Viewing Present Values

To see the present RTM status points value, select **View Present Point Values** from the **View** menu. On the View Present Values screen that displays, click the **Get Points** button. The current values for all points will be displayed. The digital input point values will be displayed as zero or one with the appropriate value label next to it. The scaled analog point values will be displayed next to their raw values.

Programming Multiple Address RTMs

If you have purchased a Multiple Address RTM, the profile's can be setup using the RTM Configurator software, with the following steps. The order that the models are added to the profile will determine which IED corresponds with which session. Multiple of the same profiles can be used or profiles can be mixed as needed.

1. Go to **File – Open Profile**. Select the folder of the first desired IED. (This will be Session 0.) Inside the folder, select the default-GPRS file and click **Open**.
2. Go to **IED – Add** to add the next desired IED. Expand the appropriate folder and select the default-GPRS file and click **Select**. Continue this step until all desired IEDs have been added. Up to five IEDs can be loaded to an RTM-GPRS MA device.
3. As with standard RTMs, use the **RTM Configuration** window to program Polling Intervals, Call Limit, DNP Master Address, and Baud Rate information. Remember that all devices must be programmed to use the same Baud Rate and DNP Master Address.
4. Go to the **IED Configuration** window for each session and set the correct DNP Slave Address. The unique DNP Slave addresses will link the correct IED with its RTM Session.
5. Setup any desired rule information for the Digital Inputs, Digital Outputs and Analog Inputs of each session. Rule information must be setup for each session. Rules for one session will not transfer to other sessions.
6. Save the profile under **File – Save Profile As**. You may choose where to save this profile. You may wish to create a unique folder for the profile if it is a mixture of multiple IED types.
7. Send the profile to the RTM under **File – Send Profile to RTM**.



Appendix B: Point Specifications

Rules

The RTM is built around the concept of "rules". These rules are used to monitor points and test the data against a set of conditions. If the conditions of the rules match, an action is triggered.

The RTM polls the attached IED using Class 0 and Class 1,2,3,0 polls every N seconds (user configurable).

Current Rule Types

- **Binary Change Event:** A rule monitoring a binary input point (value 0 or 1). If the monitored point changes, the value is reported. The initial condition is read when the RTM is powered up. The rule may have a trigger time such that if the point changes for N seconds, the value is reported, but if it changes for less than N seconds it is not.
- **Analog Range Change Event:** A rule monitoring an analog input point. If the monitored point crosses one of three possible limits, the value is reported, along with the range that the new value falls in. The initial condition is read when the RTM is powered up. The rule may have a trigger time such that if the point changes for N seconds, the value is reported, but if the change lasts for less than N seconds it is not. An analog point can be setup for range change and/or stairstep change events. If the Stairstep feature is Enabled, either from the local programming utility or from the Advanced Commands link on the RTM's Status page, then a point with both range change and stairstep limits will only report stairstep events.
- **Analog Stairstep Change Event:** A rule monitoring an analog input point. If the monitored point changes by the stairstep (deadband) setting or more, the value is reported. The initial condition is read when the RTM is powered up. The rule may have a trigger time such that if the point changes for N seconds, the value is reported, but if the change lasts for less than N seconds it is not. An analog point can be setup for range change and/or stairstep change events. The stairstep change event will only be processed if the Stairstep feature is Enabled, either from the local programming utility or from the Advanced Commands link on the RTM's Status page.
- **Time Scheduled Report:** Each data point has the option of being reported at an interval of N minutes ($0 \leq N \leq 65535$). The current value of the monitored point will be reported at the specified time interval.

There are currently 99 rules available, numbered 1 through 99 (rule 0 is reserved). Each rule can monitor a single point: DI, DO or AI. When the rule is triggered, the current value of the point is reported. For example, consider a binary input point with an initial value of 0. Assume the RTM (the Master) reads the incoming value for the binary input, which now shows a value of 1. The RTM sees the change and sees that this is a reportable event, based on the defined rule for this point. As a result, the RTM reports the new value for this point to the Telemetric Network Operation Center (NOC).

Rules are used to monitor both binary and analog input points. A rule may also be used to control a binary output. In this case, a command sent from the NOC, or from the local programming utility will cause the RTM to write a 1 or 0 to that binary output point. Analog outputs and counter inputs are not supported in this version of the RTM.

Rule Configuration

The following rule information can be configured into the RTM by using the local programming utility included with the RTM.

- Rule Enable/Disable
- Up to three Analog Limits (analog rules) and/or a Stairstep Interval per analog input
- Time Scheduled Reporting Interval
- Trigger Time

The rule enable/disable configuration can also be carried out from the Telemetric web site. When a rule is disabled, a trigger will not be reported and time scheduled reports will be disabled. The point data will not be included in any All Data requests or shown on the Status page. The customer will be prevented by the web site from requesting the current value of a disabled rule.

If a rule is disabled/enabled via the local configuration utility, the RTM will notify the web site with a configuration call.

Non-Rule Configuration

The following are non-rule related user configurable information. They can be changed using the local programming software application.

- DNP serial port settings (default 9600 N,8,1)
- DNP Master, Slave addresses (default 1, 1)
- Class 0 polling interval (default 30 seconds)
- Class 123 polling interval (default 10 seconds)
- Enable/Disable Stair Step Analog Limits (default Disabled)
- Daily call limit (default 50)
- Cellular Channel (N/A for digital devices)

Serial Port Configuration

The serial port has a number of possible configurations to allow communication between the RTM and the IED.

- Baud Rates (110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 31250, 38400, 115200)
- Parity (even, odd, none)
- Data Bits (8, 7)
- Stop Bits (1, 2)

Call Header Information

All calls include the following information, along with specific information in the triggered report:

- Firmware version
- Hardware version
- RTM Profile loaded

- Cellular IMSI number, for verification
- Cellular Received Signal Strength Indicator (RSSI)
- RTM Status Bits
- Number of cell tower transmission attempts
- Calls Left today

RTM Startup

On startup, the RTM will send a registration call containing all enabled point data, if the session is online, or a maintenance call if the session is offline. The first call from the RTM is labeled a Power On call, regardless of what type of report it contains.

Call Reasons

The RTM will call for the following reasons:

- **Analog Range Change Report:** An analog point has crossed one of the three possible range limits for an amount of time longer than the trigger time. (It is not necessary to use all three analog ranges.) The new value and the new range are reported.
- **Command ACK Report:** A command Acknowledgement will be sent back to the NOC to report the successful completion of a binary output command, or any of the commands on the Advanced Commands menu.
- **Command NAK Report:** A command Not Acknowledged will be sent back to the NOC to report the unsuccessful completion of a binary output command, or any of the commands on the Advanced Commands menu. This command will also be used on any other command that has failed, such as a Point Status request when the session is offline. This report includes an error description.
- **Configuration Report:** Whenever the RTM's configuration has been changed via the local configuration program, the RTM will report the change to the NOC. This report can be requested from the web site.
- **Current Value Report:** This report is in response to an individual point's status request from the website.
- **Maintenance Report:** In the call of the Call Limit being Exceeded or the DNP Session going online or offline, or in response to a Maintenance Report request from the website, the RTM will make a Maintenance call to report the event. Call Limit Reached means that the RTM has exceeded its call limit for the day and will no longer report triggered events (it will still reply to requests). DNP Session Offline means that the RTM is not communicating with the IED. This usually indicates a serial cable problem or an incorrect setting for the IED master/slave addresses or baud rate.
- **Multiple Point Change Report:** If a DNP digital point is set up with a trigger time of zero, and the IED reports a change on that point using DNP Object 2, Variation 2, then the RTM will report any change (or multiple changes) on that point using this call. The call supports multiple changes per point and reports the time of each change. (Only available in firmware 6.2 and above for DNP protocols.)
- **Point Change Report:** On system startup, the RTM will record the first value of each binary and analog point. If a binary point changes for an amount of time longer than the trigger time, the new value will be reported. This report is also used for an analog point that is set up with a Stair Step limit that experiences an event for longer than the trigger time.

- Point Status Report: On power-on, or receipt of an All Analog and/or All Digital request from the website, the RTM will transmit the current status of all enabled digital or analog points.
- Time Scheduled Report: Each data point may have a time scheduled report frequency measured in minutes. Every N minutes, the current value of the point will be reported. Digital Input points will be reported together.

Remote Commands

Remote commands are commands that can be sent from the Web Application.

- Set Output Command: This command will send an enable or disable command to a Digital Output point, as setup in the RTM profile. The RTM will respond with a Command ACK indicating that the IED accepted the command or a Command NAK indicating that there was a problem with the command, and an accompanying error code.
- Request All Analog and All Digital Data: The user may request the current value of all enabled Digital and Analog points. The RTM will respond with a Point Status Report.
- Request individual Analog Point: The user may request the value of a specific analog point. The RTM will respond with a Current Value Report.
- Request a Configuration Report: The user can request this data if the unit failed to call in with a Configuration Report after a new configuration was loaded to the unit.
- Reset the Daily Call Limit: The user may request the RTM to reset its daily call limit when it is exceeded so that events will not be missed. The RTM will respond with a Command ACK report. The call limit automatically resets ever 24 hours.
- Enable/Disable Rule: Each rule may be enabled or disabled by a remote command from the web site. This feature allows the user to create a large rule set containing many contingencies or conditions and then enable or disable those rules after the device has been deployed. A good example would be seasonally affected rules. The RTM will respond with a Command ACK reporting the new status of the rule (on or off).
- Enable/Disable the Analog Stair Step feature: This command turns on or off the use of Analog "stair step" set points. By default, the RTM has three set points available for each Analog input. When the analog value crosses one of those set points, the RTM calls in to report an analog range change. The stair step feature allows a "stair step" dead band interval to be used for Analog set points. For example, if the interval was set to 25, the Analog point would have to change by 25 or more to trigger an event. The stair step interval must be set in local programming for the individual Analog point.
- Reset the Device: The user can send this command that is similar to power cycling the RTM. The RTM will respond with a Power On call.

Appendix C: Hardware Specifications

On-board RS232 serial ports

Serial Port 1

Connects the RTM to an intelligent electronic device (IED).

Serial Port 2

Connects directly with the serial port of a laptop or desktop computer to facilitate system configuration, installation and test.

The specification for this serial cable connection is DB9M to DB9F with pin-outs 2-2, 3-3, 5-5.

Antenna

A dual-band Phantom Low-Profile antenna is included in the RTM integration kit. An external SMA connector provides the connection to this antenna or to a remote antenna if desired. Higher gain antennas including dual-band Yagi or panel models can be used to improve performance in fringe areas.

On-Board Radio Signal Strength Indicator

A pushbutton switch initiates a test in which an LED is used to indicate the radio signal strength being received by the radio. This is used to facilitate installation, antenna selection, orientation, and troubleshooting. The LED also provides a momentary indication for each transmission and other LEDs provide other troubleshooting indications.

Enclosure

If the RTM is ordered with an enclosure, the standard enclosure is a Nema 4 waterproof non-metallic box.

Cellular Radio Operating Specifications

The Multitech MTSMC cellular modem module has the following specifications:

- 0.6 and 1.2 Watt transmit power at 850/1900 MHz.
- Receive frequency: 850/1900 MHz,
- Compatible with the GPRS digital cellular system

Internal AC / DC power supply

The standard DNP-RTM operates from 12 VDC \pm 10%. Ripple must be less than 200 mV. Power consumption is nominally 100 mA and up to 2 Amps for 3 seconds when transmitting.

The optional AC/DC power supply operates from 85-264 VAC, 47-440 Hz.

CPU / Memory

The CPU is a Hitachi H8S series product. Non-volatile memory is used to store configuration and operational data.

Environmental Specifications

The recommended operating temperature range is -40 to +158 degrees F (-40 to +70 C).

The recommended relative humidity range is 5 - 95% non-condensing.

The RTM has been tested to meet the ANSI/IEEE C37.90.1-2002 specification - IEEE Standard Surge Withstand Capability (SWC) Tests for Protective Relays and Relay Systems.

Power Consumption, Nominal

90mA @ 12 VDC

Power Consumption when Transmitting

1.4 Amps @ 12 VDC