User's Manual

APM1317
APM3852
APM7487
APM8796

Advanced Power Monitor

Base Line 2.50

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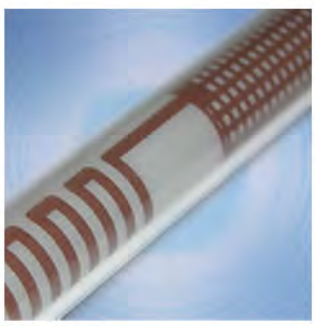

Company Overview

RFI has been serving the needs of the wireless communications market for over 30 years. First founded as a manufacturer of antenna systems, RFI has grown to be a key player in the development, manufacturing and distribution of wireless technology and energy products. Through our extensive network of resellers, systems integrators and retail outlets, RFI is a key supplier to both industry and Government.

Our research and manufacturing facilities have talented people, sophisticated test equipment, state of the art software with class leading manufacturing systems and techniques. Additionally, we have in place a quality management program which is certified to ISO9001, environmental management system certification to ISO14001 and occupational health and safety standard AS4801 giving you complete confidence in everything we do.

RFI's products are truly innovative and as a result we are active around the globe taking our Australian designed and manufactured products to key markets in Asia Pacific, the Americas and EMEA regions via offices 'In-region' in addition to exporting directly to in excess of 50 countries.

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Disclaimer

Product part numbering in photographs and drawings is accurate at the time of printing. Part number labels on RFI products supersede part numbers given within this manual. Information is subject to change without notice.

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Note:

This device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions;

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

The user is cautioned that changes and/or modifications not approved by the responsible party could void the user's authority to operate the equipment.

Note:

This equipment has been tested and found to comply with the limits for a Class B device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area may cause harmful interference in which case the user will be required to correct the interference at their own expense.

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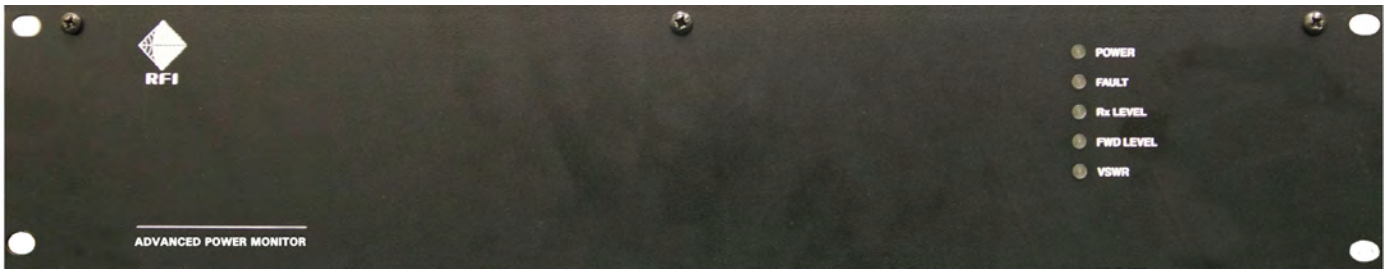
APMxxxx Series

Front View



APMxxxxK1 Series

Rear View

APMxxxxK2 Series

Rear View

SP1318-2440-DFF1RU (132-174MHz)

Front View

Top View

SP3855-4440-DFF1RU (380-520MHz)

Front View

Top View

SP7496-4440-DFF1RU (746-960MHz)

Front View

Top View

CAM0000 Series

Channel Alarm Module (CAM) Front Panel Layout

Channel Alarm Module (CAM) Rear Panel Layout

SAM0000 Series

Site Alarm Module (SAM) Front Panel Layout

1. General Description

The Advanced Power Monitor (APM) is used to measure and monitor channel-specific Tx Forward and Reflected power and combiner insertion losses between transmitter combiners their associated antenna(s) for up to 80 channels. Rx Channel and/or adjacent site Tx Channel monitoring is also available for up to 80 channels, and the capability to perform a full Tx-to-Rx system isolation (loop back) test is also provided.

Four pairs of Forward (FWD) & Reverse (RFL) coaxial inputs fed from non-intrusive in-line directional couplers give the APM the capability of monitoring the output of up to four separate transmitter combiner/antenna systems.

A Receive coaxial input port fed from either the receiver multicoupler system and/or an external "off-air" antenna gives the APM the capability of monitoring receiver system signal levels, transmitter-to-receiver system isolation, or the propagation of transmitter channels located on other sites.

In addition to measuring and monitoring transmitter forward and reflected power in analogue and digital radio communication systems, the APM can also be configured to monitor and measure insertion loss in the network transmitter combiner(s).

For each combiner/antenna system being monitored, a 4-port coupler is inserted after the transmitter combiner on the antenna feeder cable. These couplers have a low insertion loss (<0.2dB) and each is capable of handling up to 750Watts of RF power. The excellent PIM (<-150dBc) and PIP ratings of the coupler are maintained using 7/16 DIN (F) connectors on the input "From Combiner" and output "To Antenna" ports, with N (F) termination connectors used on the "FWD" and "RFL" coupling ports.

Designed for rack mounting, the APM and the coupler units are intended for mounting into 19" rack mount equipment cabinets or open frames. As standard, the APM is supplied with one coupler for connection to the first combiner/antenna system - with additional couplers available separately for applications requiring more than one combiner/antenna system to be monitored.

RFI can also supply PIM-rated 7/16 DIN right-angle adapters if required to assist in rack cabinet layout and installation of the coupler(s).

The APM communicates via an Ethernet port mounted on the rear of the unit. This facilitates configuration and monitoring using a Graphical User Interface (GUI) via an integral web server. Access to the GUI is protected by a User Name and Password that is progressively checked for security strength.

All transmitter frequencies, channel bandwidths (12.5KHz and 25KHz), alarm level thresholds, and other relevant parameters are user-programmable.

A DB15 rear mounted connector provides summary alarm reporting outputs that can be hardwired into most alarm reporting facilities. LED's on the front panel of the APM allow visual confirmation of the hardwired alarm outputs.

The APM models cover two DC voltage input power ranges, 9-36V and 36-60V. The AC mains voltage model uses a 100-240VAC to 12V DC power pack.

Channel Alarm Modules (CAMs) / Site Alarm Modules (SAMs)

If desired, optional Channel Alarm Modules (CAMs) or Site Alarm Modules (SAMs) may be added to the APM at any time. CAMs/SAMs are connected using a daisy chained cabling approach using two cables - "DC power" and "Comms".

Any mixture of up to ten (10) Channel Alarm Modules (CAMs) or Site Alarm Modules (SAMs) may be added to a single APM unit.

When connected, CAMs/SAMs are automatically recognised by an APM, and menu selections for them will then automatically appear in the APM GUI. Each CAM/SAM has an "ID address" which is easily set via the rotary switch on the rear of each CAM/SAM unit. Each CAM/SAM connected to an APM should have a different ID address selected to prevent address contention in the APM GUI.

Each CAM/SAM provides ten (10) separate alarm output relays which may be individually user-assigned, on an ad-hoc basis, to specific monitored channels alarms in the APM. This capability allows specific channels' alarm conditions to be accessible via discrete alarm outputs – allowing faulty equipment to be individually identified, reported, and action to be initiated as required.

A logic input on each of the CAM's/SAM's channels allows additional monitoring functionality – such as monitoring base station PTT lines – to enable the determination of "conditional" repeater RF output failure states. Various equipment operational configurations can be monitored using these logic inputs – such as hot/standby conditions (and the change-over actioned), using this functionality.

In addition to the ten (10) separate alarm channels, each CAM also has four (4) user-programmable and configurable general-purpose logic inputs that may be used for monitoring external equipment – such as site or cabinet door opening, generator fuel level low, UPS, solar, or other alarm conditions. This functionality has been further enhanced in the SAM, with Input #1 being able to be configured to measure temperature, an analogue voltage range, or a digital logic input level – and inputs #2, #3, and #4 being able to be configured to measure an analogue voltage range, or a digital logic input level respectively.

The CAM and the SAM modules provide enhanced monitoring functionality for the APM, allowing a range of PTT, temperature, voltages and digital inputs to be monitored as part of Antenna Change-Over (ACO), base station hot/standby, equipment and site monitoring, and auxiliary control capabilities.

Hardware Versions

There are several hardware variants of the APM. These can be identified by the communications ports on the rear of the unit. The earlier "K1" variant has one USB and one TCPIP port. The memory capacity of the K1 may restrict its compatibility with future firmware features. Where this occurs, the webserver GUI and/or CLI interface may not display incompatible features to prevent uncertainty in unit capabilities. The K1 unit's memory capacity may also limit the available storage space for data such as alarm history and log files.

The later variant of APM is identified as the "K2". The K2 has deleted the USB port and substituted a second TCPIP port in its place. Communications with the APM via a USB interface is still possible utilising a (user-supplied) USB-to-TCPIP adapter.

2. Application Diagram

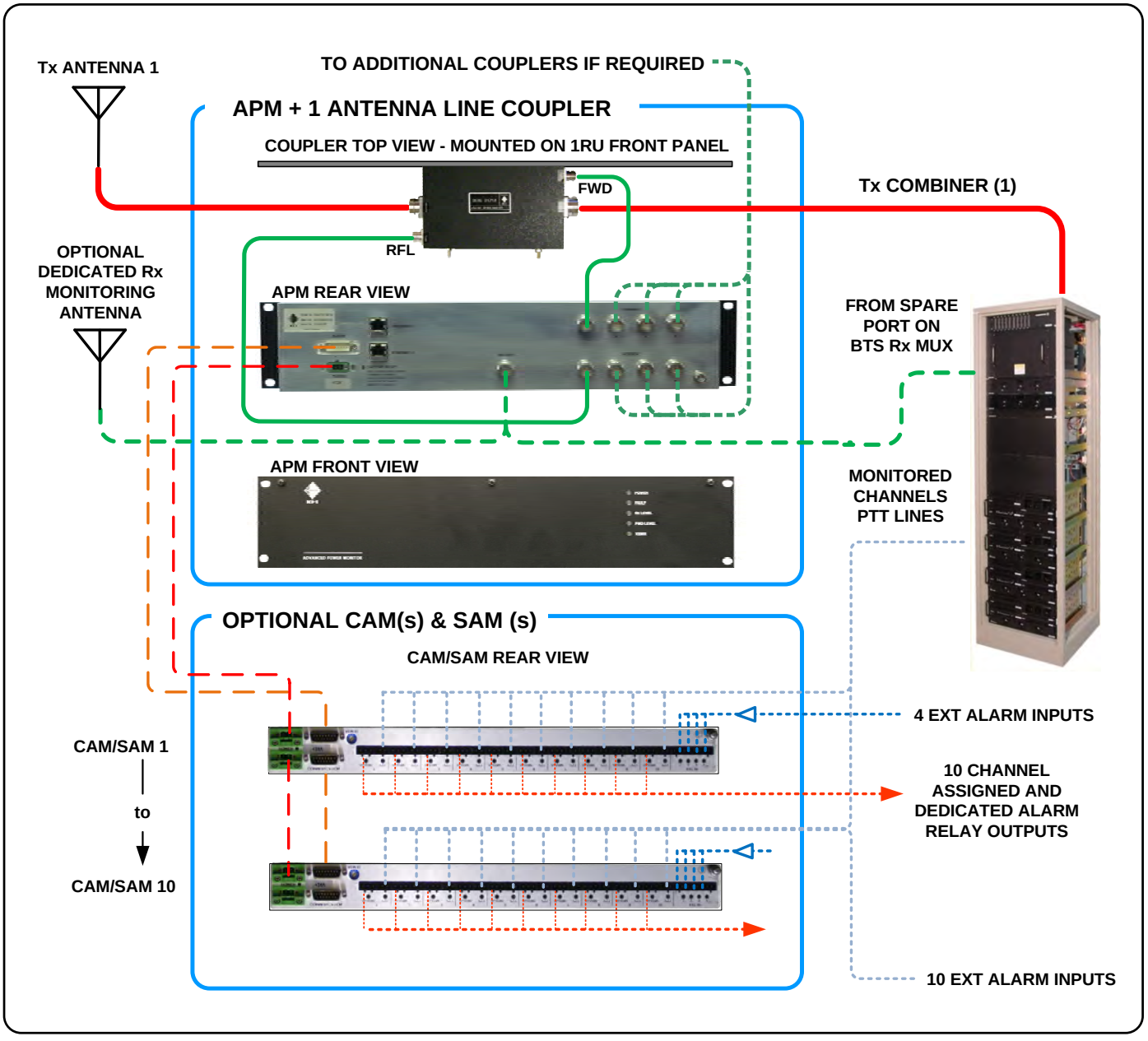


Diagram1

3. APM - Electrical and Mechanical Specifications

APM Model Number	APMxxxx Series
Frequency range (Tx power and Rx level monitoring)	APM1317 132-174MHz APM3852 380-520MHz APM7487 746-870MHz APM8796 870-960MHz
Maximum number of monitored channels	Tx = 80 Rx = 80
Maximum number of Tx networks (Tx ant's)	4 (can be externally expanded)
Maximum number of Rx networks (Rx ant's)	1 (can be externally expanded)
Frequency channel step size	6.25kHz
Channel measurement bandwidths	12.5, and 25kHz
Max spurious or IM products level	-30dBm
Measurable Tx input power level	-50dBm to +20dBm (i.e. -10dBm to +60dBm into 40dB coupler)
Conducted emissions	Complies with CISPR22 Part B & FCC Part 15 (15.207)
Radiated emissions	Complies with CISPR22 Part B & FCC Part 15 (15.209)
RF Termination connectors	All N (F) on rear
Communication interface ports "K1" hardware variant "K2" hardware variant	 1 x USB Type B, 1 x TCPIP RJ45 Ethernet port on rear 2 x TCP/IP RJ45 Ethernet ports on rear
Internal alarm relay contacts output connector	1 x DB15 (M) on rear
Visual alarm notification	Front panel LED's
Configurable alarms	Summary Fault / Tx FWD min. power Tx FWD max. power / Tx Combiner I.L. max. VSWR max. / Rx RSSI min. level / RSSI max. level Tx-to-Rx System Isolation min/max.
Alarm Outputs	Summary Alarms – APM Relay Outputs Detailed Alarms – CAM Module Relay Outputs (optional) SMTP Email (up to 4 Addresses) SNMPv2c (Northbound Traps) or via Genesis Software GenWatch™ APM Applet
Power supply options	9-36VDC, 36-60VDC, or 100-240VAC
Power consumption	10W (typical)
DC power connector	1 x Polarized 2-pin Phoenix-style connector on rear
Mounting	2RU 19" rack mounting
Dimensions	W 19 x H 3.5 x D 1.6in (W 483 x H 89 x D 40mm) (incl. connectors)
Weight	< 4.4lbs / 2kgs
Operational temperature range	-30°C to +60°C / -22°F to 140°F

Table 1

4. Coupler - Electrical and Mechanical Specifications

Coupler Model Number	SPxxxx-2440-DFF1RU / SPxxxx-4440-DFF1RU
Frequency range	SP1318-2440-DFF1RU 130-180MHz SP3855-4440-DFF1RU 380-550MHz SP7496-4440-DFF1RU 746-960MHz
Insertion Loss	< 0.2dB
Input and Output Port Return Loss	> 20dB
Coupling Loss	40dB (+/- 0.7)
Maximum input power	750W
Maximum PIP	16kW (+72dBm)
PIM 3rd OIP (2 x 43dBm carriers)	>150dBc
Connectors – "To ANT" & "From COMBINER" ports	2 x 7/16 DIN (F)
Connectors – "FWD" and "RFL" coupling ports	2 x N (F)
Mounting	1RU 19" rack mounting
Dimensions	W 19 x H 1.75 x D 3" / W 483 x H 45 x D 77mm (inc connectors)
Weight	SP1318-2440-DFF1RU < 4.4lbs / 2kgs SP3855-4440-DFF1RU < 2.2lbs / 1kg SP7496-4440-DFF1RU < 2.2lbs / 1kg
Operational temperature range	-30°C to +60°C / -22°F to 140°F

Table 2

5. CAM/SAM - Electrical and Mechanical Specifications

CAM Model Number	CAM0000
Alarm Outputs	10
Alarm Contact Type	Dry Relay N.O./Common/N.C.
Alarm Inputs	10 (configurable - one per alarm output) 4 (configurable – general purpose)
Alarm Input Logic	"0" = <2.5V DC "1" = >2.5V DC
Visual alarm notification	Front and Rear panel mounted LEDs
Power Supply options	9-36VDC or 36-60VDC
Power Consumption	10W (max)
Connectors External Alarm Inputs Channel Alarms Outputs Channel Alarms Inputs Power Supply Comms Interface to/from APM	(Note: All connectors on rear) 1 x Polarized 8-pin Phoenix connector 10 x Polarized 3-pin Phoenix connectors 10 x Polarized 2-pin Phoenix connectors 1 x Polarized 2-pin Phoenix connector 1 x DB15 (M)
Mounting	1RU 19" rack mounting
Dimensions	W 19 x H 1.75 x D 3" / W 483 x H 45 x D 77mm
Weight	< 2.2lbs / 1kg
Operational temperature range	-30°C to +60°C / -22°F to 140°F

Table 3

SAM Model Number	SAM0000 SAM0000-48
Alarm Outputs	10
Alarm Contact Type	Dry Relay N.O./Common/N.C.
Alarm Inputs	10 (configurable) digital (general purpose/one per alarm output) 4 (configurable) temperature/analogue/digital (general purpose)
Alarm Input Logic	temperature RFI temperature sensor analogue -60V DC to +60V DC analogue -60V DC to +5V DC digital "0" = <2.5V DC "1" = >2.5V DC (+5VDC max.)
Temperature Sensor (optional)	SAM0000-TS (ordered separately)
Visual alarm notification	Front and Rear panel mounted LEDs
Power Supply options	9-36VDC (SAM0000) or 36-60VDC (SAM0000-48)
Power Consumption	10W (max)
Connectors External Alarm Inputs Channel Alarms Outputs Channel Alarms Inputs Power Supply Comms Interface to/from APM	(Note: All connectors on rear) 1 x Polarized 8-pin Phoenix connector 10 x Polarized 3-pin Phoenix connectors 10 x Polarized 2-pin Phoenix connectors 1 x Polarized 2-pin Phoenix connector 1 x DB15 (M)
Mounting	1RU 19" rack mounting
Dimensions	W 19 x H 1.75 x D 3" / W 483 x H 45 x D 77mm
Weight	< 2.2lbs / 1kg
Operational temperature range	-30°C to +60°C / -22°F to 140°F

Table 4

6. Ordering Information

Ordering Information		
Motorola E-CAT Model Number	**RFI Model Number**	**Description**
DSAPM1317	APM1317	Advanced Power Monitor 132-174MHz 80 Ch / 4 Tx Fwd / 4 Tx Rfl / 1 Rx Port / 9-36VDC
DSAPM131748	APM1317-48	Advanced Power Monitor 132-174MHz 80 Ch / 4 Tx Fwd / 4 Tx Rfl / 1 Rx Port / 36-60VDC
DSAPM1317AC	APM1317-AC	Advanced Power Monitor 132-174MHz 80 Ch / 4 Tx Fwd / 4 Tx Rfl / 1 Rx Port / 100-240V AC (external)
DSAPM3852	APM3852	Advanced Power Monitor 380-520MHz 80 Ch / 4 Tx Fwd / 4 Tx Rfl / 1 Rx Port / 9-36VDC
DSAPM385248	APM3852-48	Advanced Power Monitor 380-520MHz 80 Ch / 4 Tx Fwd / 4 Tx Rfl / 1 Rx Port / 36-60VDC
DSAPM3852AC	APM3852-AC	Advanced Power Monitor 380-520MHz 80 Ch / 4 Tx Fwd / 4 Tx Rfl / 1 Rx Port / 100-240V AC (external)
DSAPM7487	APM7487	Advanced Power Monitor 746-870MHz 80 Ch / 4 Tx Fwd / 4 Tx Rfl / 1 Rx Port / 9-36VDC
DSAPM748748	APM7487-48	Advanced Power Monitor 746-870MHz 80 Ch / 4 Tx Fwd / 4 Tx Rfl / 1 Rx Port / 36-60VDC
DSAPM7487AC	APM7487-AC	Advanced Power Monitor 746-870MHz 80 Ch / 4 Tx Fwd / 4 Tx Rfl / 1 Rx Port / 100-240V AC (external)
DSAPM8796	APM8796	Advanced Power Monitor 870-960MHz 80 Ch / 4 Tx Fwd / 4 Tx Rfl / 1 Rx Port / 9-36VDC
DSAPM879648	APM8796-48	Advanced Power Monitor 870-960MHz 80 Ch / 4 Tx Fwd / 4 Tx Rfl / 1 Rx Port / 36-60VDC
DSAPM8796AC	APM8796-AC	Advanced Power Monitor 870-960MHz 80 Ch / 4 Tx Fwd / 4 Tx Rfl / 1 Rx Port / 100-240V AC (external)
Additional Couplers		**Description**
DSSP13182440DFF1RU	SP1318-2440-DFF1RU	Directional Coupler 130-180MHz 40dB 4-Port 19in Rack Mount 1RU Input /Output Ports DIN (F) Coupling Ports N (F)
DSSP38554440DFF1RU	SP3855-4440-DFF1RU	Dual Directional Coupler 380-550MHz 40dB 4-Port 19in Rack Mount 1RU Input /Output Ports DIN (F) Coupling Ports N (F)
DSSP74964440DFF1RU	SP7496-4440-DFF1RU	Dual Directional Coupler 746-960MHz 40dB 4-Port 19in Rack Mount 1RU Input /Output Ports DIN (F) Coupling Ports N (F)
Channel Alarm Module		**Description**
DSCAM0000	CAM0000	Channel Alarm Module 9-36V DC
DSCAM000048	CAM0000-48	Channel Alarm Module 36-60V DC
Site Alarm Module		**Description**
DSSAM0000	SAM0000	Site Alarm Module 9-36V DC
DSSAM000048	SAM0000-48	Site Alarm Module 36-60V DC
DSSAM0000-TS	SAM0000-TS	Site Alarm Monitor Temperature Sensor

Table 5

7. Unpacking

The APM (and optional CAM/SAM) is packed into a custom designed cardboard insert, box container and sleeve together with a single Coupler and AC to DC power pack if the AC option has been ordered.

Packed with the APM and Coupler will be the Factory Test Sheet (FTS) and Quick Start Guide (QSG). The User's Manual will have been loaded onto either a CD or USB memory stick packed together with the QSG. It is recommended to retain the Factory Test Sheet for future reference.

An Ethernet jumper cable is included in the packaging, provided for your convenience to connect and configure the APM via an onboard Graphical User Interface (GUI) from the browser located on your laptop/notebook.

Although the packing box has been designed to provide a significant amount of protection, it is important to report any visible damage to the carrier immediately. It is the customers' responsibility in the event of product damage, to lodge a damage claim with the carrier within a short period of time after receipt of the package. The time window for lodging the claim should be ascertained from the specific carrier as this may vary between carriers (typically 1 to 5 days).

Please dispose of the packing material responsibly.

8. Firmware License Agreement

This statement must be read in its entirety prior to the loading or use of the Firmware provided by RFI.

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9. Installation

The APM, (optional) CAM/SAMs, and Coupler(s) are designed to be mounted into a standard EIA 19" rack frame using industry standard 19" rack fasteners. The Application Diagram (Diagram 1) illustrates the APM/CAM/SAM/Coupler connectivity.

The system should be installed into a dry, vibration and corrosive free environment avoiding areas of high heat or humidity and direct sunlight.

The Coupler 1RU panel/s may be mounted either above or below the APM. However consideration should be given to the requirement for the low loss cables from the Tx combiners to be routed via the Coupler panel to the antenna. This may influence the mounting position of the Coupler panel in the respective 19" rack frame.

No RF coaxial interconnect cables are provided with the APM. This is because the optimal length for these cables may vary for each installation. These cables should be made up on site once the APM and respective coupler units have been mounted into the 19" rack frame.

Typically 50 Ohm double-shielded or solid jacket coaxial cables terminated with N (M) connectors terminated on each end are used to connect the "FWD" and "RFL" ports of the Coupler to the nominated input ports of the APM. Although there is no specific restriction on the length of these cables between the Coupler and the APM, it is recommended to keep the cable losses below 3dB, which in effect adds to the coupling loss. This loss can be calibrated out, however the end result of high cabling losses in these cables will be to marginally reduce the effective lower level measurement dynamic range of the APM. Lower loss coaxial cables should be used to reduce this effect when using longer cable runs exceeding a calculated coaxial line loss of 3dB.

The input "From Combiner" and output "To Antenna" ports of the Coupler are 7/16DIN (F) and will require low Inter-Modulation (IM) 7/16DIN (M) cable connectors to terminate onto the Coupler. The use of correct cable cutting and connector preparation tools to terminate the 7/16DIN (M) connectors is strongly recommended to reduce the possibility of Passive Inter-Modulation (PIM) products. The 7/16DIN connectors should always be correctly torqued to the manufacturers recommended values.

NOTE: Final torqueing of the termination connectors onto the Coupler should be done after the calibration procedure as described under section 10.32 of this document is completed.

To protect the transmitter combiner and transmitters from any possible damage, ensure that each transmitter coupled to the respective transmitter combiner is powered down prior to disconnection and reconnection onto the respective coupler units.

Although it is not necessary to terminate the unused Tx FWD, Tx RFL and Rx ports on the APM with a 50 Ohm low power resistive termination load, it is often considered good RF engineering practice to terminate any spare or unused port.

For DC power supply, a cable from the DC source should be terminated into the supplied 2-pin plug, observing the correct polarity, and then plugged into the polarized 2-pin Phoenix (F) socket on the rear of the APM. For AC Mains versions, an AC-to-DC plug pack is provided with a terminated 2-Pin plug already terminated onto the end of the plug pack's DC cable. This should be fitted into the power socket on the rear of the APM.

A M6 earth stud is located on the rear of the APM, (optional) CAM/SAM(s), and Coupler(s) for earthing the units to a suitable earthing point within the 19" rack cabinet or rack frame.

10. Operation

When the power source to the APM has been switched on, check that the green "Power" LED light on the front panel is illuminated. Any other illuminated LEDs will be reflecting the current state of the various alarms - based on the current programmed configuration.

If one or more optional Channel Alarm Modules (CAMs) and/or Site Alarm Modules (SAMs) are fitted, the green "Power" LED light on their front panel is illuminated. This LED will "pulse" at regular intervals to indicate comms activity between them and the host APM. Any other illuminated LEDs will be reflecting the current state of the various inputs/outputs - based on the current programmed configuration.

A CD or USB memory stick is provided with the APM and contains copies of the QSG (Quick Start Guide) and APM User's Manual.

In addition to using the integral Web Browser GUI, the APM (and any connected CAM/SAMs) can also be communicated with via the CLI (Command Line Interface) using plain text format via a Telnet IP session. For information on the CLI format please contact the RFI Technical Support team.

10.1 Ethernet Connection Set-up

Web Browser GUI (Graphical User Interface)

The APM utilizes an on board web server to provide web browser access to the GUI. This can be accessed connecting to the APM via a short Ethernet cable jumper from a laptop/notebook directly to the APM or remotely via a TCP/IP network.

A standard Ethernet CAT5e jumper cable terminated with RJ45 connectors at either end is provided for convenience in the packing box with the APM. Plug one end of this Ethernet jumper cable into the APM and the other end into your computer Ethernet socket.

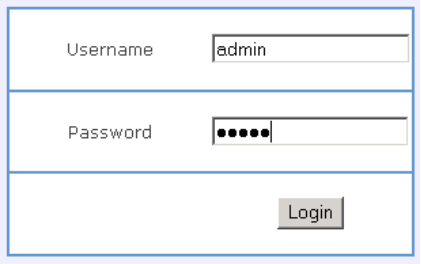
The following web browsers are compatible with the APM GUI;

- Internet Explorer 8
- Firefox V3.6
- Chrome V9
- Safari V5.

IP Address

Initiate your web browser and type in the address field the following default address; http://192.168.1.200 (APM factory default address).

Connectivity to the APM is successful when the following "Log In" page appears.



Should the web browser be unable to open this session, it may be necessary to set the IP address of your computer to an address in the same IP range (i.e. 192.168.1.180).

This is done for example in Windows XP™ in the following manner;

1. Select "Start" from status menu
2. Single click – "Control Panel"
3. Double click – " Network Connections"
4. Double click - "Local Area Connection"
5. In Local Area Connections Status box, single click the "Properties" button.
6. When the Local Area Connection Properties box opens, select only the "Internet Protocol (TCP/IP)" choice.
7. Click "Properties" button.
8. Click "Use the following IP address.
9. Enter next to *IP address* 192.168.1.180
10. Enter next to *Subnet mask* 255.255.255.0
11. Enter next to *Default gateway* 192.168.1.254
12. Click "OK" to initiate changes.

This is done for example in Windows 7™ in the following manner;

1. Select "Start" from status menu
2. Single click – "Control Panel"
3. Single click – " Network and Sharing Center"
4. Single click - "Change Adapter Settings" on the left hand side menu
5. Single Click – "Local Area Connection" box
6. Single Click – "Change Settings of this Connection"
6. When the Local Area Connection Properties box opens, select only the "Internet Protocol 4 (TCP/IPv4)" choice.
7. Click "Properties" button.
8. Click "Use the following IP address".
9. Enter next to *IP address* 192.168.1.180
10. Enter next to *Subnet mask* 255.255.255.0
11. Enter next to *Default gateway* 192.168.1.254
12. Click "OK" to initiate changes.

Should you still be unable to successfully connect to the APM via the default IP address then the IP address may have already been changed. If there is no possibility of recovering the changed IP address, then it will be necessary to reset the APM to the factory default settings.

Reset Factory Default Ethernet Addresses and Access.

To reset the APM back to the Factory Default settings will mean a complete reset of all RF configuration settings and alarm threshold parameters as well as the IP address parameters. To do this, simply switch the APM off by removing the DC power cable connector. Press the factory reset button on the rear of the APM, reconnect the DC power while continuing to hold the reset button down until the green power LED light flashes, the Factory reset has started and the reset button may be released. Wait for the APM to complete its default re-configuration and to restart.

NOTE: This will cause the IP address, subnet and gateway addresses and all other configuration data to be reset back to factory default address.

Factory Default settings

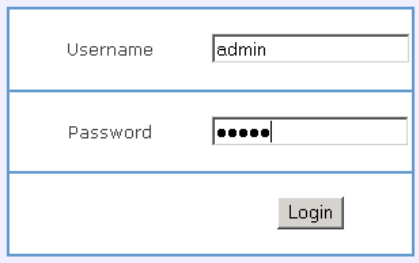
DHCP - Disabled
IP Address - 192.168.1.200
Subnet Mask - 255.255.255.0
Gateway - 192.168.1.254
Level 1 User Name: user
Level 1 Password: user
Level 2 User Name: admin
Level 2 Password: admin

Reset RF Default settings.

To reset the APM back to the RF Default settings will mean a complete reset of all RF configuration settings and alarm threshold parameters. The above Factory Default Ethernet and Access settings will remain unchanged.

Should you wish to only reset the RF configuration settings, simply press the factory reset button (without disrupting power) until the green power LED light flashes, the RF reset has started and the reset button may be released.

10.2 Log In Page



The default User Name is "admin" and Password is "admin". This default user name and password provides complete and unrestricted access to the APM (level 2). Once logged in, this can be changed via the User Management screen under the Maintenance menu tab.

User Name and Password Levels

Level 1: User name and password access via the web browser GUI interface displays only status screens.

Level 2: User name and password access via the web browser GUI interface facilitates status, configure and maintenance screens.

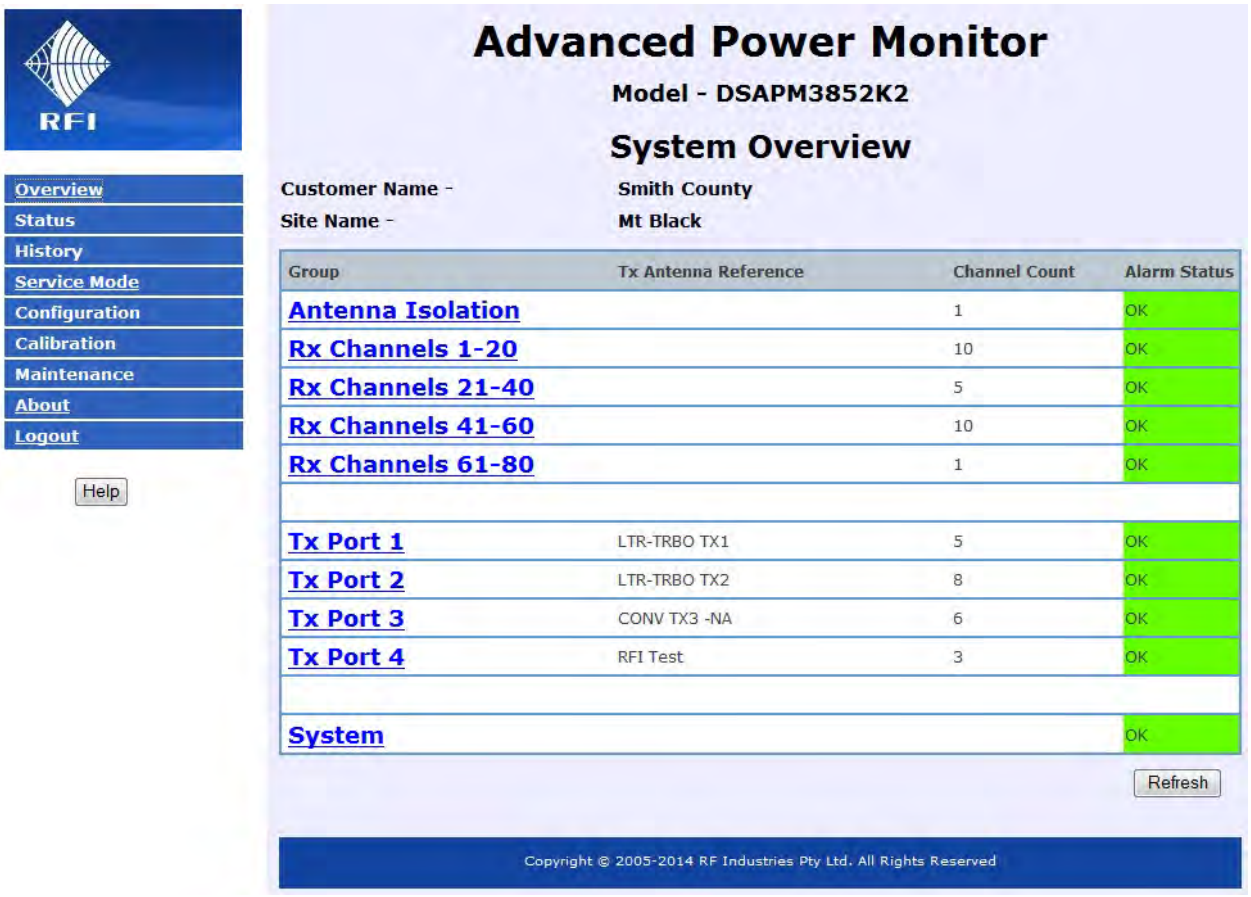
Once the correct User Name and Password is entered the GUI will open to the first page of the GUI.

GUI Page Headers

The first page that appears in the GUI is the "System Overview" page.

This page is headed with the name of the product and the model reference. The "Customer Name" and "Site Name" will display either the factory default fields (as "Not Defined") or the names allocated to each under the "Configuration – User Data" menu item which allows the user to define the customer name, respective site name, and the names allocated to the respective Tx Ports (Groups) 1 to 4.

10.3 System Overview



This page displays an overview of the unit status.

For the System, the overall summary alarm status is displayed, for each Port, the following items are displayed:

Group:

The group of parameters relevant to each title.

Tx Antenna Reference:

The user-defined description for the Port.

Channel Count:

The number of channels that have been configured for the Port.

Alarm Status:

The "Fail" or "OK" summary status for the Group.

The "Refresh" button reloads the page, updating the status information.

Clicking the title of a "Group" will navigate to the nominated port's details page.

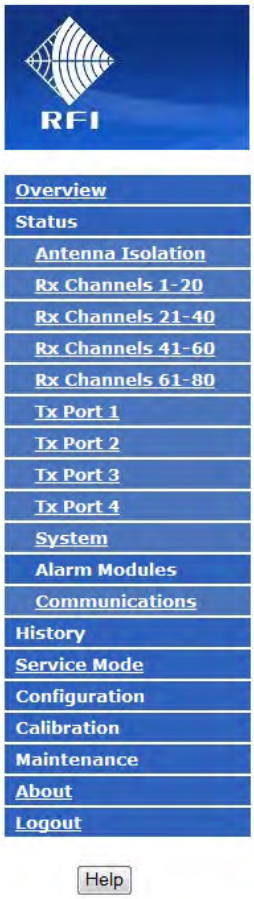
Refresh:

Click this button to manually trigger a page refresh.

10.4 Status Menu

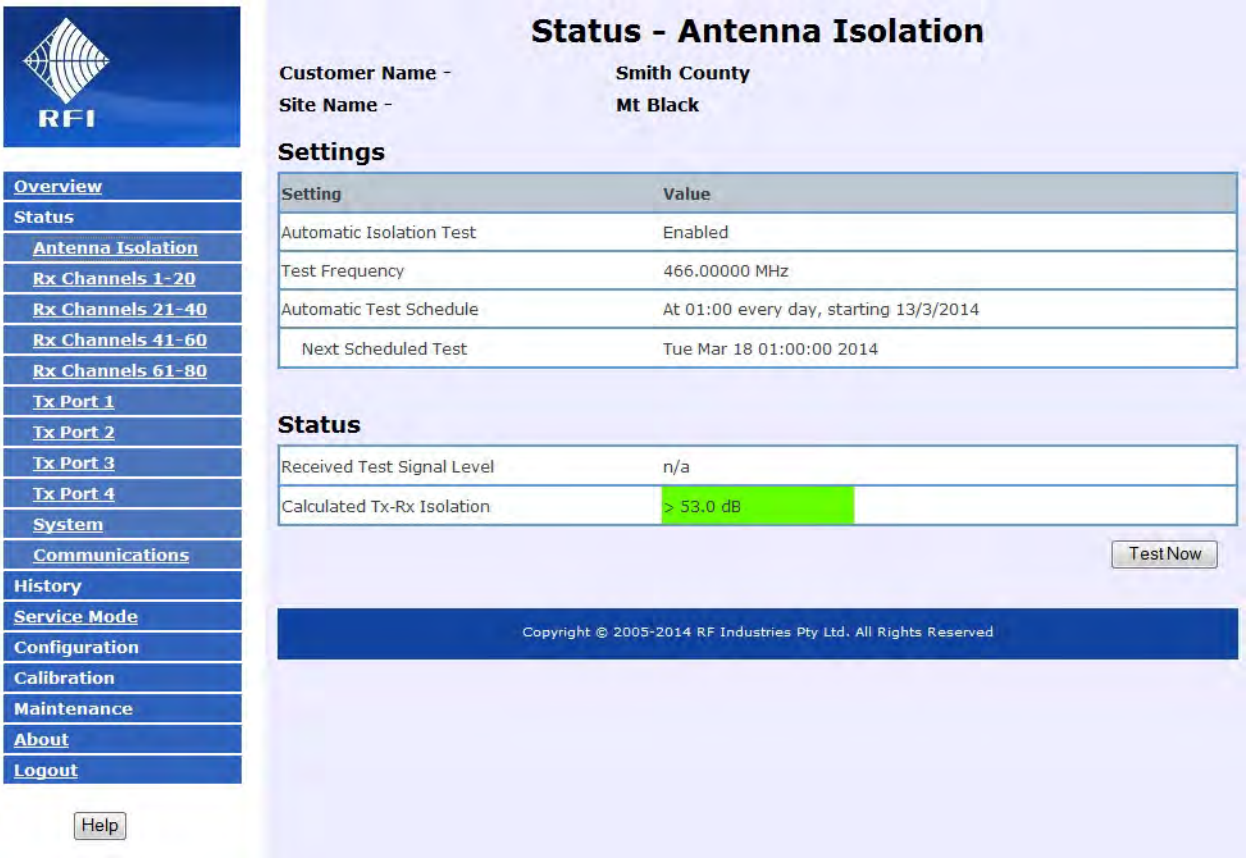
The "Status" menu allows all of the APMs measurement parameters to be viewed.

Selecting each indented topic under "Status" will display that item as a separate display page.



Note: The "Alarm Modules" menu item appears only if one or more (optional) Channel Alarm Module (CAM) or Site Alarm Module (SAM) is installed. Up to ten (10) CAM/SAM units may be fitted to each APM as required.

10.5 Status - Antenna Isolation



The Antenna Isolation "Status" page reports the current status of the Antenna Isolation settings.

Automatic Isolation Test:

Indicates if the Antenna Isolation Test function is currently enabled/disabled in the APM.

Test Frequency:

The frequency upon which the Antenna Isolation Test will be performed.

Note: Depending on local licensing and regulatory requirements this frequency will normally be one of the sites existing Base Station receive frequencies.

Automatic Test Repetition Period:

The regularity that the Antenna Isolation Test will be performed.

Next Scheduled Test:

The time/date of the next scheduled Antenna Isolation Test.

Received Test Signal Level

The measured level of the Antenna Isolation test signal at the APM Receive port.

Calculated Tx-Rx Isolation:

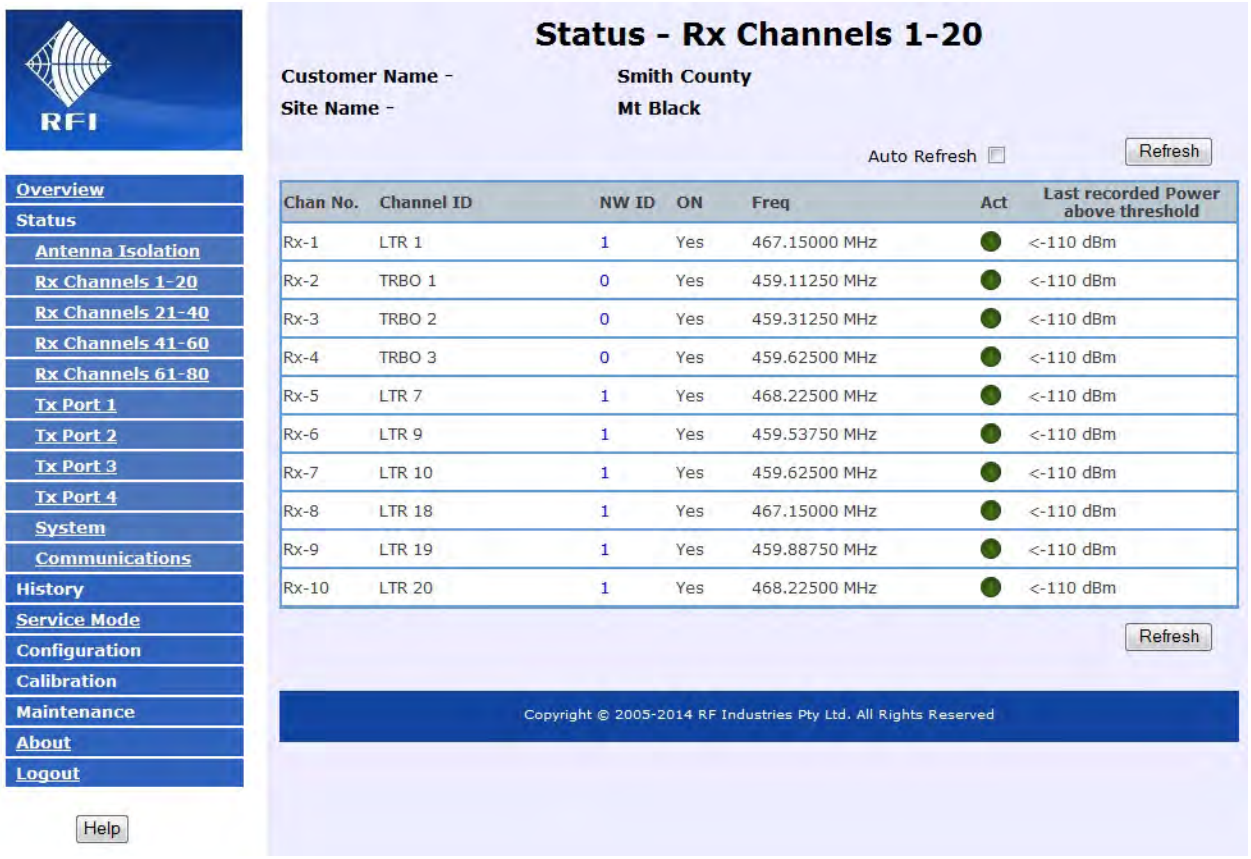
The calculated Tx-Rx antenna isolation value based on various parameters configured into the APM (i.e. Coupler coupling values, Tx Feeder Loss, Rx System Gain, etc).

Test Now:

The "Test Now" button can be selected at any time to manually initiate a measurement.

Note: The maximum isolation value that can be measured will be a function of the test frequency's level, coupler and receiver system values, and the APM unit's Rx Level sensitivity.

10.6 Status - Rx Channels 1-20



The Rx Port "Status" page reports the current status of all Rx channels. To prevent display clutter, Rx channels are displayed with 20 channels shown per page.

Chan No:

Indicates the configured sequential channel number.

Channel ID:

The user configured description for the channel.

NW ID:

Allows channels to be affiliated with a network (i.e. "1" is Police Network, "2" is Fire Network), to an antenna system ("1" is Tx Antenna #1, "2" is Tx Antenna #2), or to another label (i.e. "1" is 24x7 Maintenance, "2" is Normal Hours Maintenance) and this label will appear in Alarm Messages to allow faster determination of response priority and or actions.

Note: The NW ID column is only displayed if this feature is enabled in the *Configuration – User Data* screen.

ON:

The configured channel scanning On/Off status. If this is "OFF", the measurements for this channel will not be performed. This field may be used if channels have been disabled or temporarily removed from the site.

Freq:

The configured frequency of the channel.

Act:

An "active" indicator that shows the status of the *Last recorded power above threshold* value being display.

The three states that may appear are;

1. The indicator symbol is displayed but is dull – the value shown was not measured in the last measurement cycle.
2. The indicator symbol is displayed and is lit – the value shown was measured in the last measurement cycle.
3. The indicator symbol is not displayed – the channel is currently disabled and is not being measured.

Power:

The result of the last valid received signal power level measurement in dBm. This will only be updated if the Rx power is above the programmed minimum threshold level.

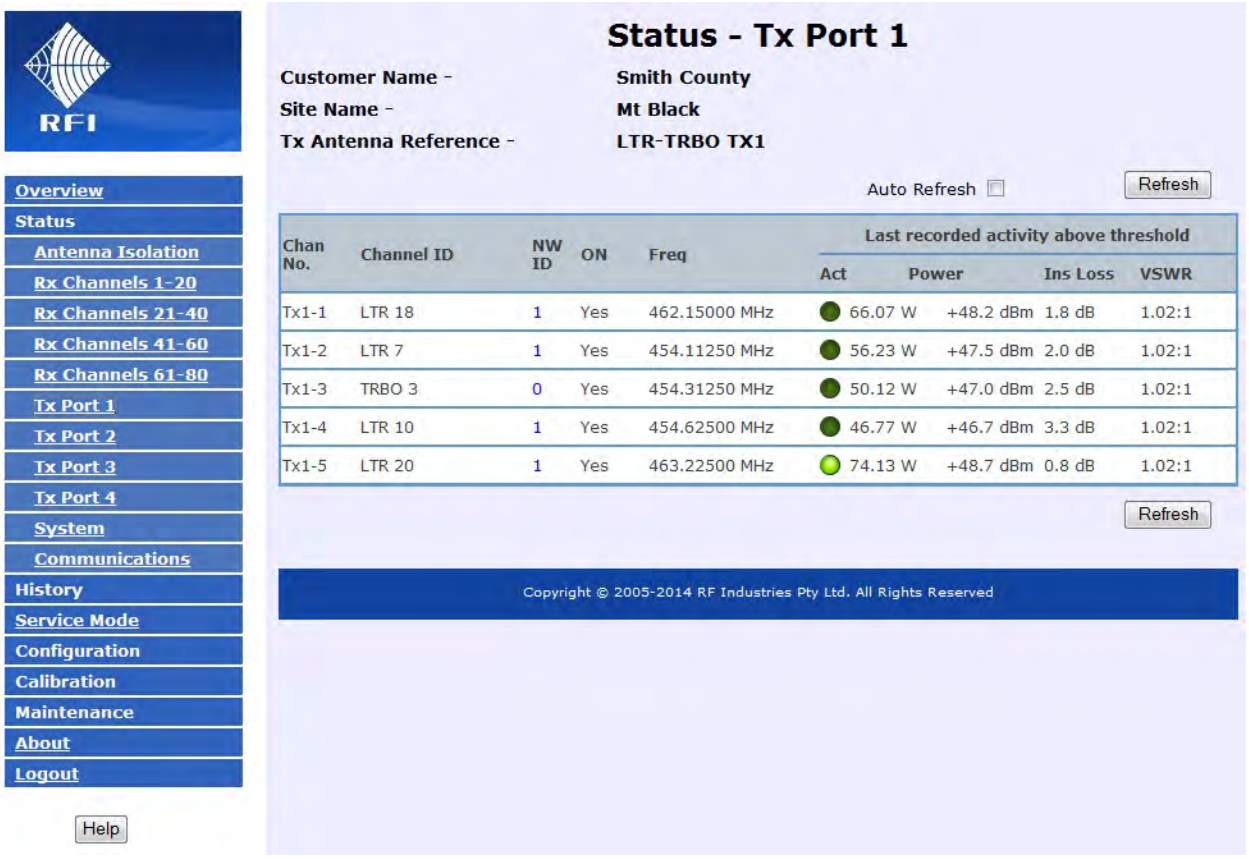
Auto Refresh:

Check this box to enable continuously repeated measurement and status updates. Updates will refresh every 5 seconds. Uncheck this box to cease continuously repeated updates.

Refresh:

Click this button to manually trigger one measurement and status update cycle.

10.7 Status – Tx Port 1



The Tx Port "Status" page reports the current status of all Tx channels allocated to the selected Tx Port.

Chan No:

Indicates the Tx Group followed by the configured sequential channel number within the Group i.e. Tx1-3 is the 3rd monitored channel within Tx Group 1.

Channel ID:

The user configured description for the channel.

NW ID:

Allows channels to be affiliated with a network (i.e. "1" is Police Network, "2" is Fire Network), to an antenna system ("1" is Tx Antenna #1, "2" is Tx Antenna #2), or to another label (i.e. "1" is 24x7 Maintenance, "2" is Normal Hours Maintenance) and this label will appear in Alarm Messages to allow faster determination of response priority and or actions.

Note: The NW ID column is only displayed if this feature is enabled in the *Configuration – User Data* screen.

ON:

The configured channel scanning On/Off status. If this is "OFF", the measurements for this channel will not be performed. This field may be used if channels have been disabled or temporarily removed from the site.

Freq:

The configured frequency of the channel.

Act:

An "active" indicator that shows the status of the *Last recorded power above threshold* value being display.

The three states that may appear are;

1. The indicator symbol is displayed but is dull – the value shown was not measured in the last measurement cycle.
2. The indicator symbol is displayed and is lit – the value shown was measured in the last measurement cycle.
3. The indicator symbol is not displayed – the channel is currently disabled and is not being measured.

Power:

The result of the last valid signal power level measurement in Watts and dBm. This will only be updated if the Tx power is above the programmed minimum threshold level.

Ins Loss:

The last measured Combiner Insertion Loss value. This value is the difference between the current Power level (as above) and the stored BTx Power level.

VSWR:

This is the VSWR recorded when the last valid power level measurement occurred.

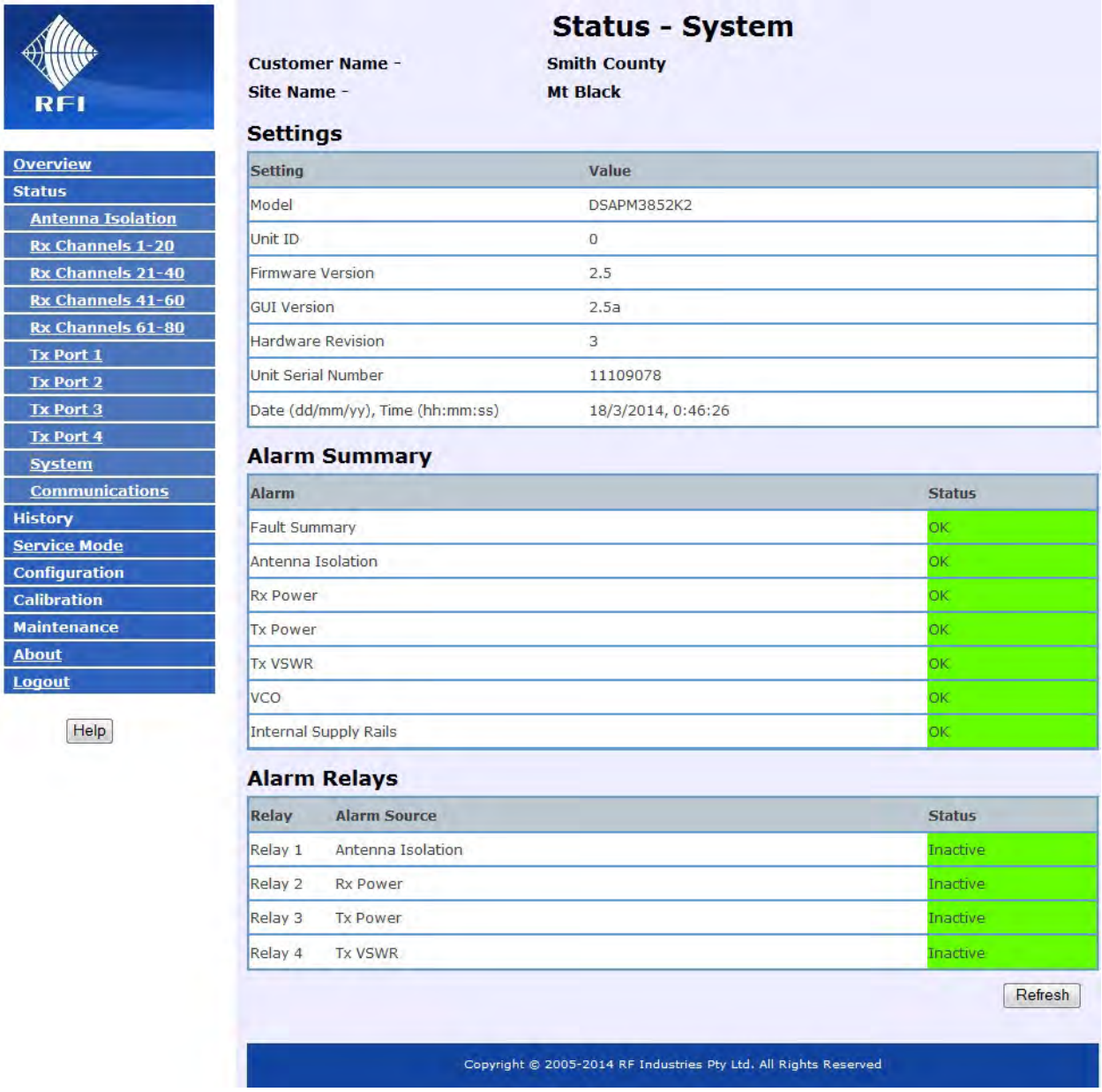
Auto Refresh:

Check this box to enable continuously repeated measurement and status updates. Updates will refresh every 5 seconds. Uncheck this box to cease continuously repeated updates.

Refresh:

Click this button to manually trigger one measurement and status update cycle.

10.8 Status – System



This System Status" page reports the current system settings and alarm summary**.**

Model:

The model designator of this unit.

Unit ID:

This field reports the unique ID number that has been assigned by the remote Manager application (If being used). If the unit is not managed through a Manager application, this will normally be 0.

Firmware version:

The version of the firmware.

Hardware Revision:

The hardware revision status of the unit. Future hardware revision levels may add additional capabilities.

Unit Serial Number:

The serial number of this unit.

Date, Time:

The date and time as maintained by the on-board real time clock. Refreshing the page will update this information.

Alarm Summary:

Fault Summary:

This is the overall system alarm summary status. It will be active if any of the alarms below it are active.

Antenna Isolation:

This alarm will activate if the Antenna Isolation test calculates an isolation value outside the min. or max. value entered.

Rx Power:

This alarm will activate if any of the Rx channels are detecting a received signal level outside the programmed min/max threshold levels.

Tx Power:

This alarm will activate if any of the Tx channels are detecting a forward power level outside the programmed min/max threshold levels.

Tx VSWR:

This alarm will activate if any of the Tx channels is detecting a VSWR level above its configured max VSWR level.

VCO:

If any of the unit's VCOs is experiencing lock failures, this alarm will activate.

Internal Supply Rails:

If any of the unit's internal supply rail voltages goes out of limits, this alarm will activate.

Alarm Module External Alarms:

If any CAM or SAM units' External Inputs has an alarm state present, this alarm will activate.

Note: This line appears only if one or more (optional) Channel Alarm Module (CAM) or Site Alarm Module (SAM) is installed. Up to ten (10) CAM/SAM units may be fitted to each APM as required.

Alarm Relays:

Relay 1:

Displays the Alarm Source currently allocated to this relay output, and its status.

Relay 2:

Displays the Alarm Source currently allocated to this relay output, and its status.

Relay 3:

Displays the Alarm Source currently allocated to this relay output, and its status.

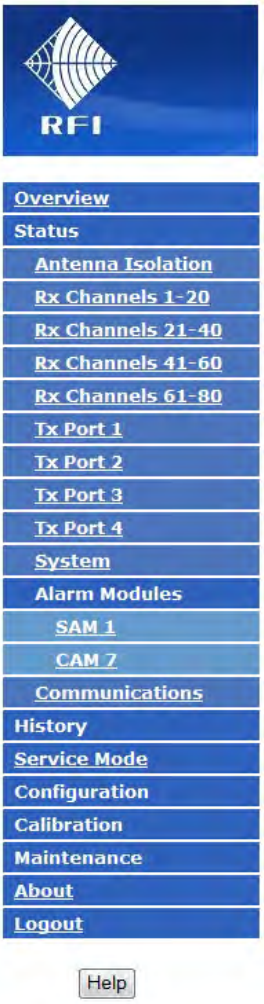
Relay 4:

Displays the Alarm Source currently allocated to this relay output, and its status.

Refresh:

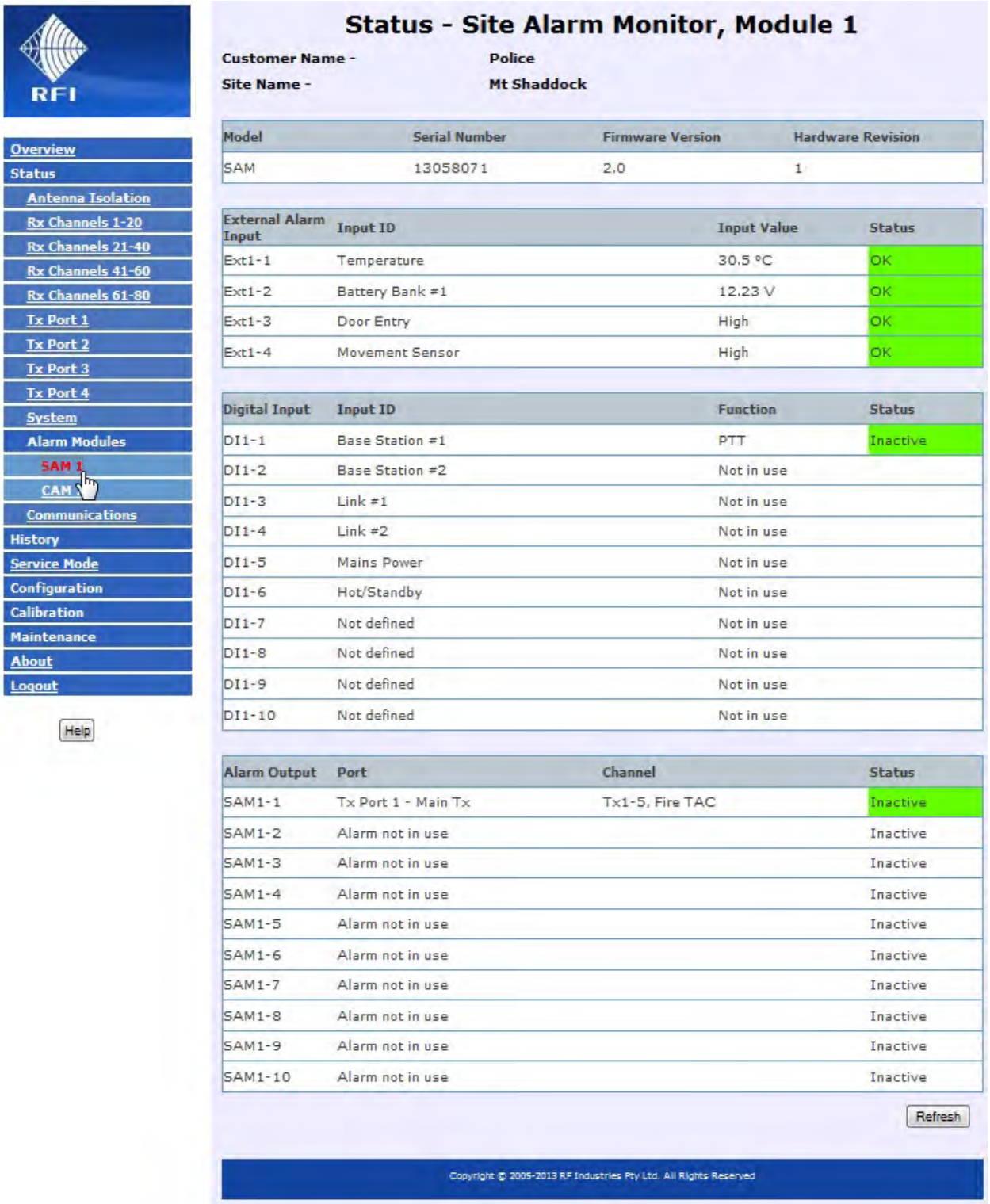
Reloads the page, updating the status information.

10.9 Status – Alarm Modules - Menu



Note: The "Status - Alarm Modules" menu item under the Status menu appears only if one or more (optional) Channel Alarm Module (CAM) or Site Alarm Module (SAM) is installed. Up to ten (10) CAM/SAM units may be fitted to each APM as required.

10.10 Status – Alarm Modules - SAM



This page reports the status of the selected Site Alarm Module (SAM) if fitted.

Model:

Displays the type of Alarm Module.

Serial Number:

Displays the Alarm Module's Serial Number.

Firmware Version:

Displays the Alarm Module's Firmware Version.

Hardware Revision:

Displays the Alarm Module's Hardware Revision.

External Alarm Input:

Displays the four (4) configurable external temperature/analogue/digital inputs.

Input ID:

The name assigned for the respective External Input.

Status:

Indicates the current status of the four (4) External Alarm Inputs.

Digital Input:

Displays the ten (10) configurable digital inputs.

Input ID:

A label for the respective Digital Input.

Function:

Indicates the selected input mode for each of the ten (10) Digital Inputs.

Status:

Indicates the current status of the four (4) External Alarm Inputs.

Alarm Output:

Displays the ten (10) configurable relay outputs.

Port:

Displays the Tx Port that the Alarm Output is currently associated to.

Channel:

Displays the Tx Channel that the Alarm Output is currently associated to.

Status:

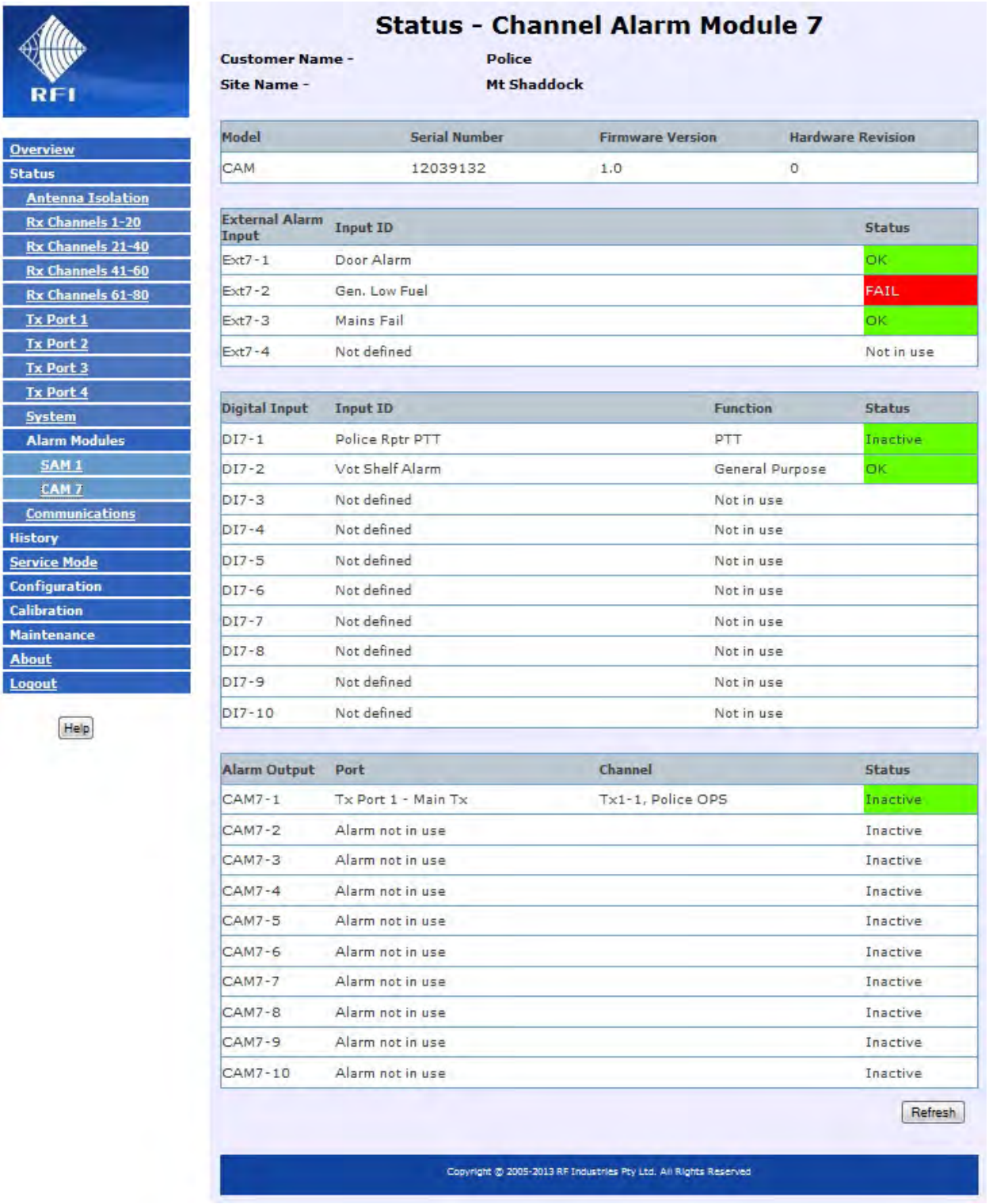
Indicates the current status of the ten (10) Alarm Outputs.

Refresh:

Reloads the page, updating the status information.

Note: The "*Status – Alarm Modules*" menu item under the Status menu appears only if one or more (optional) Channel Alarm Modules (CAM) or Site Alarm Modules (SAM) are installed. Up to ten (10) CAM/SAM units may be fitted to each APM as required.

10.11 Status – Alarm Modules - CAM



This page reports the status of the selected Channel Alarm Module (CAM) if fitted.

Model:

Displays the type of Alarm Module.

Serial Number:

Displays the Alarm Module's Serial Number.

Firmware Version:

Displays the Alarm Module's Firmware Version.

Hardware Revision:

Displays the Alarm Module's Hardware Revision.

External Alarm Input:

Displays the four (4) configurable external digital inputs.

Input ID:

The name assigned for the respective External Input.

Status:

Indicates the current status of the four (4) External Alarm Inputs.

Digital Input:

Displays the ten (10) configurable digital inputs.

Input ID:

A label for the respective Digital Input.

Function:

Indicates the selected input mode for each of the ten (10) Digital Inputs.

Status:

Indicates the current status of the four (4) External Alarm Inputs.

Alarm Output:

Displays the ten (10) configurable relay outputs.

Port:

Displays the Tx Port that the Alarm Output is currently associated to.

Channel:

Displays the Tx Channel that the Alarm Output is currently associated to.

Status:

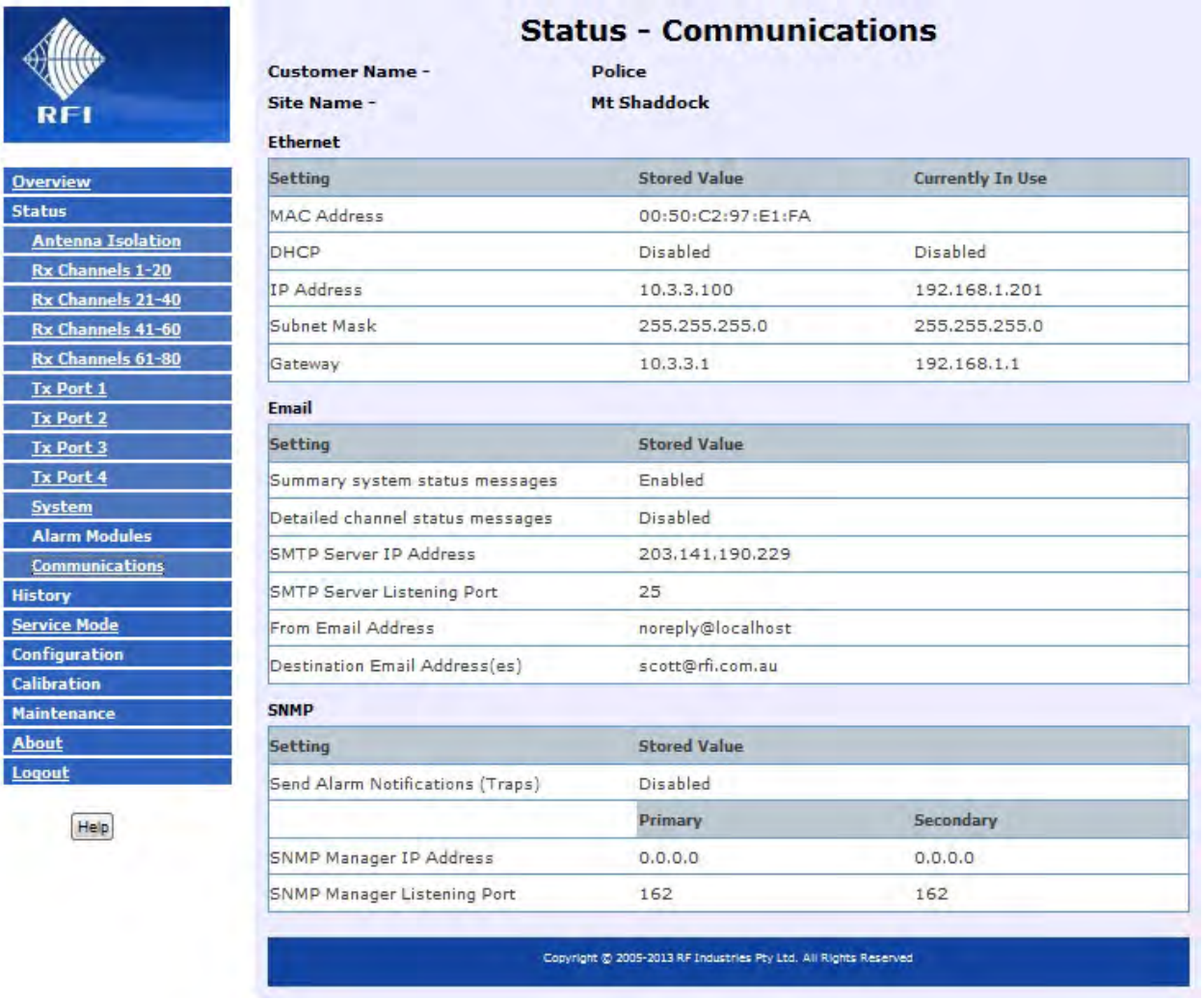
Indicates the current status of the ten (10) Alarm Outputs.

Refresh:

Reloads the page, updating the status information.

Note: The "*Status – Alarm Modules*" menu item under the Status menu appears only if one or more (optional) Channel Alarm Modules (CAM) or Site Alarm Modules (SAM) are installed. Up to ten (10) CAM/SAM units may be fitted to each APM as required.

10.12 Status – Communications



This page reports the current Communications settings.

Ethernet

MAC Address:

The physical MAC address of the unit.

DHCP:

If the stored value is enabled, the unit will attempt to get its IP Address, Subnet Mask and Gateway settings from a DHCP server. If a DHCP server cannot be found, the stored settings will be used and the Currently In Use status will show as disabled.

If disabled**,** the stored values will be used unconditionally.

IP Address:

The Stored and Currently In Use IP address values.

Subnet Mask:

The Stored and Currently In Use network Subnet Mask addresses.

Gateway:

The Stored and Currently In Use network Gateway addresses.

Email

Summary system status messages:

Indicates if *System summary status messages* will be sent via email.

Detailed channel status messages:

Indicates if *Detailed channel status messages* will be sent by email.

SMTP Server IP Address:

The IP address that email messages will be sent to.

SMTP Server Listening Port:

The port number used by the SMTP server.

From Email Address:

The email address that this unit will appear as in email messages.

Destination Email Address(es):

The email address(es) that this unit will send email messages to. (up to 4 addresses may be used)

SNMP

Send Alarm Notifications (Traps):

Indicates if sending SNMP Traps are enabled or disabled.

SNMP Manager IP Address:

The IP address that SNMP notifications (Traps) will be sent to. Both a Primary and Secondary address may be used if required for redundant SNMP server configurations.

SNMP Manager Listening Port:

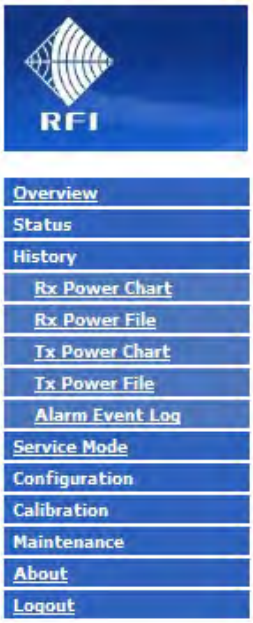
The port number used by the SNMP Manager. Both a Primary and Secondary address may be used if required for redundant SNMP server configurations.

Note: SNMP MIB files for the APM are available from RFI.

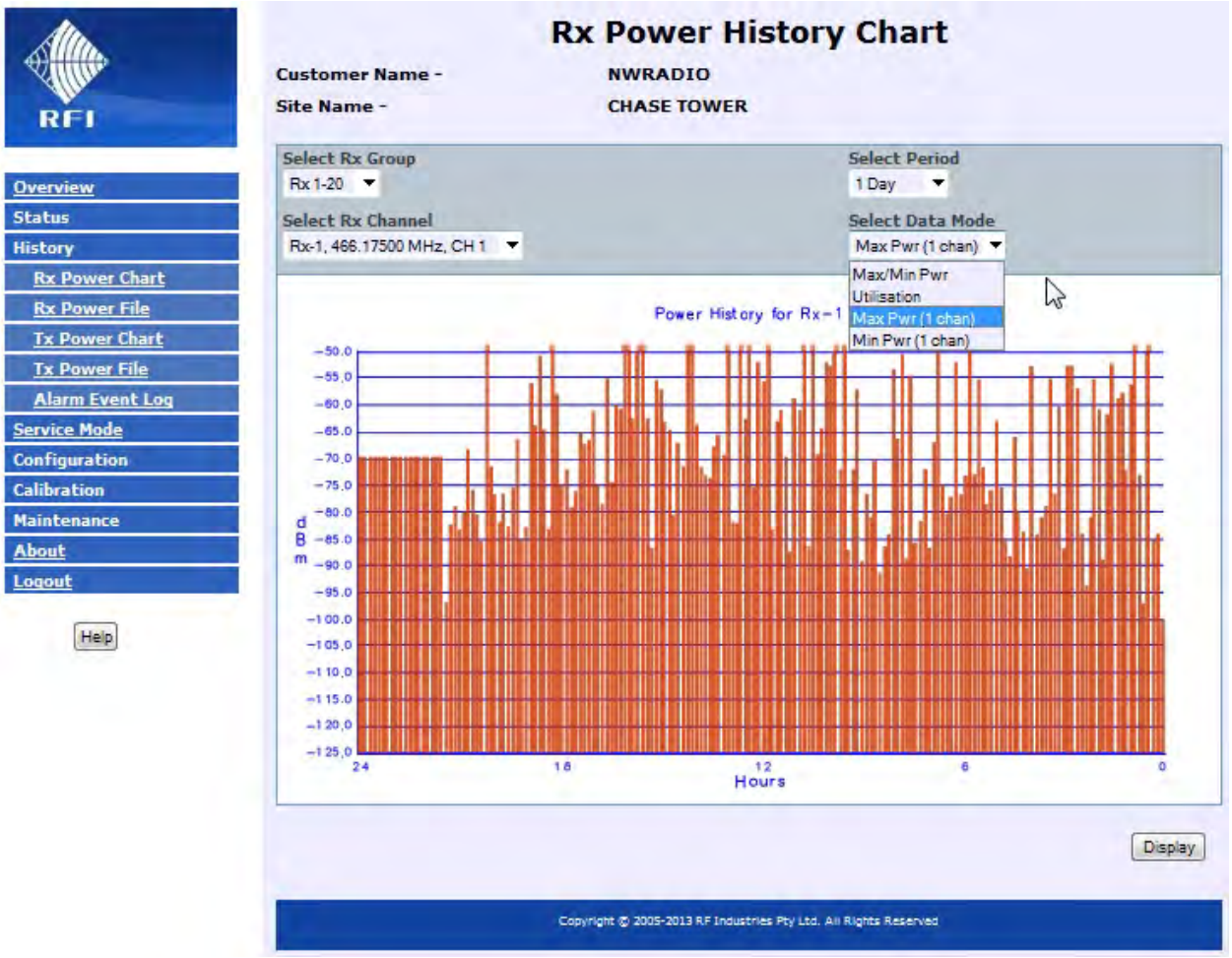
10.13 History Menu

The "History" menu allows the APMs logged data to be viewed.

Selecting each indented topic under "History" will display that item as a separate display page.



10.14 History – Rx Power Chart



Example of Max Pwr (1 Chan) Chart

This page displays the logged Rx Power values for a nominated channel.

Select Rx Group:

Select the Port which you desire to display.

Select Period:

Select the past period (working back from the current date and time) for which logged data will be displayed.

Select Data Mode:

Select the data set that you wish to display for the selected Rx Group's channels.
Note that only channels that have a frequency configured, and which have been enabled will be displayed.

Four display modes are available:

- **Max/Min Pwr**
- **Utilisation**
- **Max Pwr (1 Chan)**
- **Min Pwr (1 Chan)**

Since the graph is only able to display approximately 200 data points, each point will normally represent multiple captured level samples. The selection of the Data Mode controls how the multiple samples are combined to present the plotted data value.

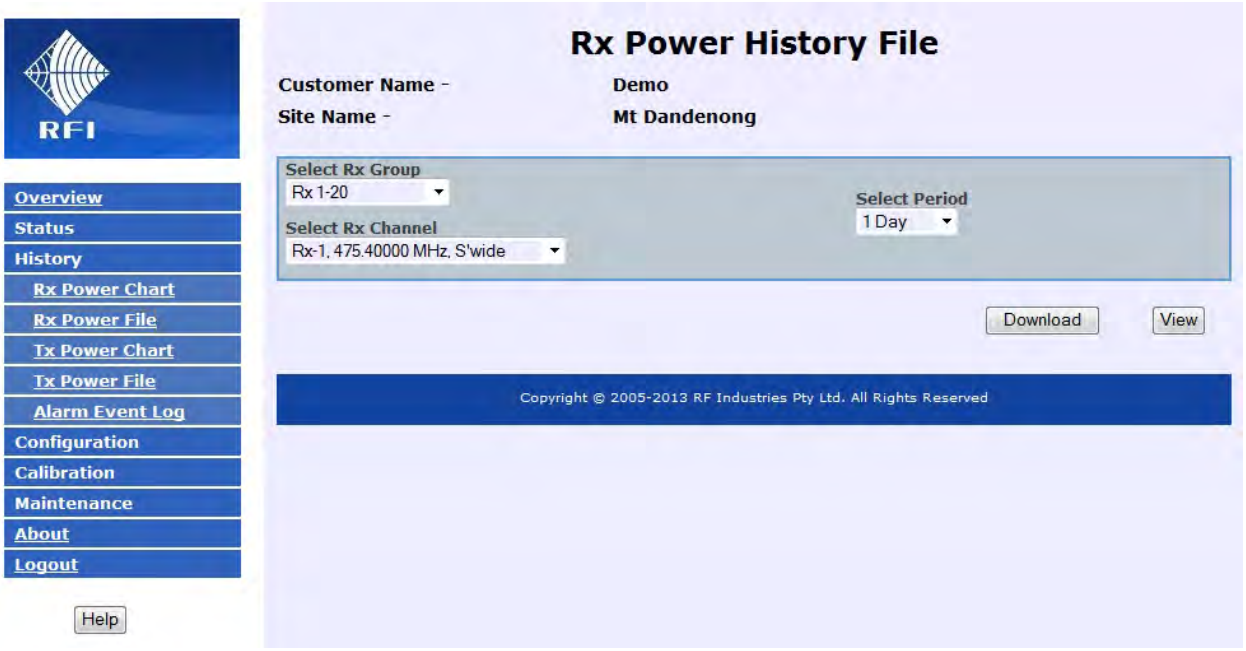
In Max/Min mode, only the maximum and minimum sampled values are used, irrespective of when or how often they occurred in the selected period. If no value reading (above programmed threshold) has been recorded during the period represented by a data point then no data will be displayed on the graph.

In Utilisation mode, the displayed data is created from all measurements recorded above the threshold value. If this threshold value is set too low, all measurements (including site noise) may register a recorded value. As a result, a 100% Utilisation can be displayed on this graph.

All captured level samples are included in the associated data file, in CSV format, which may be downloaded and processed independently (i.e. using other software) if desired.

Note: During calculations, the processing of all of the recorded data to create the graph may result in delays to the display of the data. If a significant amount of data has been logged, displaying periods back in time may also result in delays while this data is retrieved from memory, processed, and then sent to the viewer's computer.

10.15 History – Rx Power File



This page allows logged data to be downloaded, saved or displayed for a nominated channel. Data is provided in a CSV file format for ease of import and manipulation.

Select Rx Group:

Select the Group on which the desired Rx Channel is located.

Select Rx Channel:

Select the Rx Channel that is desired to be viewed.
Note that only channels that have a frequency configured, and which have been enabled will be selectable.

Select Period:

Select the past period (working back from the current date and time) for which logged data will be displayed.

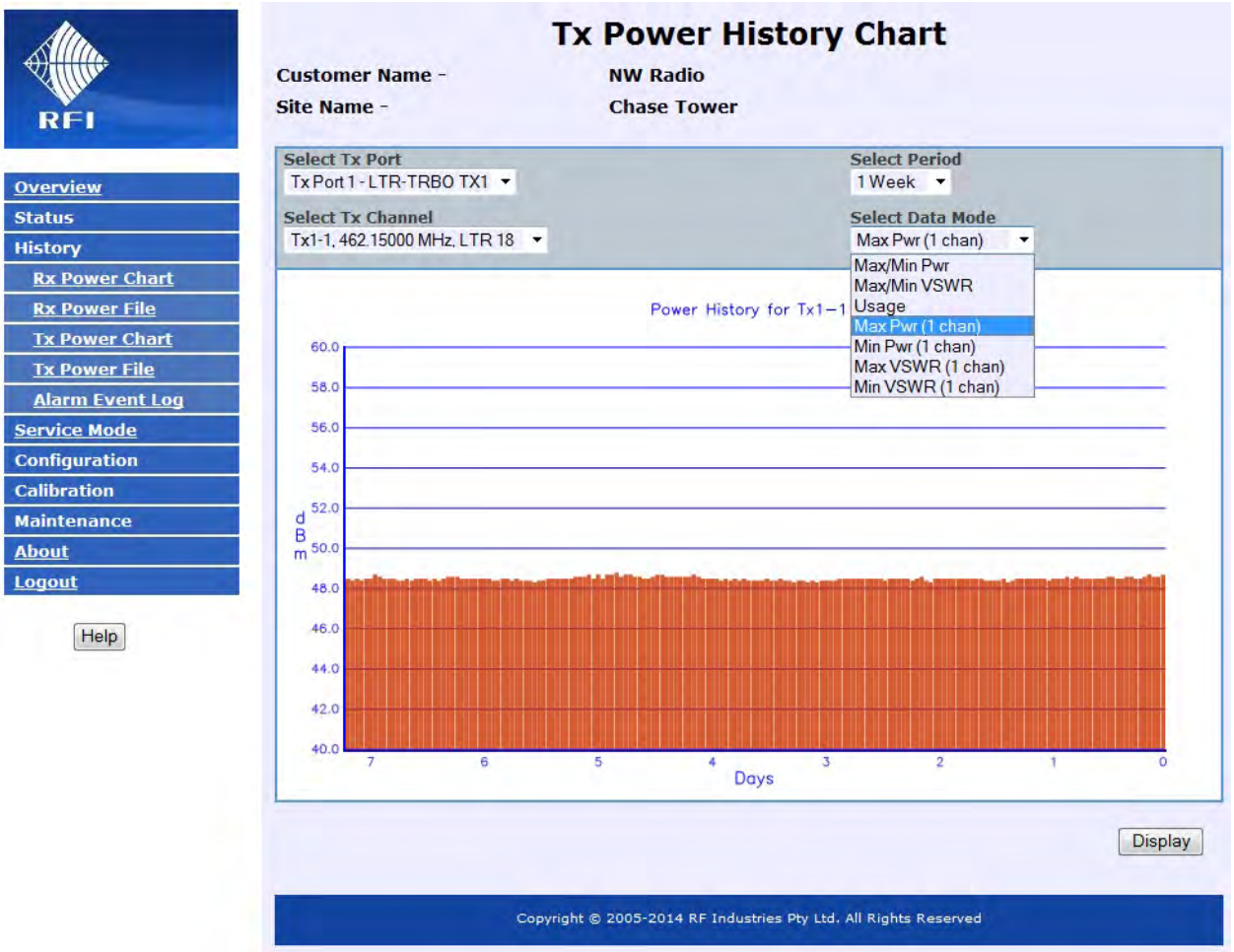
Download:

Use this button to open a "File Download" or "Save As" dialog for saving the CSV data file.

View:

Use this button to open the CSV data file for viewing.

10.16 History – Tx Power Chart



This page displays the logged Tx Power values for a nominated channel.

Select Tx Port:

Select the Port on which the desired Tx Channel is located.

Select Tx Channel:

Select the Tx Channel that is desired to be monitored.
Note that only channels that have a frequency configured, and which have been enabled, will be selectable.

Select Period:

Select the past period (working back from the current date and time) for which logged data will be displayed.

Select Data Mode:

Select the display parameter against which logged data will be displayed.

Seven display modes are available:

- **Max/Min Pwr**
- **Max/Min VSWR**
- **Usage**
- **Max Pwr (1 Chan)**
- **Min Pwr (1 Chan)**
- **Max VSWR (1 Chan)**
- **Min VSWR (1 Chan)**

Since the graph is only able to display approximately 200 data points, each of those points may represent multiple captured level samples. The selection of the Data Mode controls how the multiple samples are combined to present the plotted data value.

In *Max/Min* mode, only the maximum and minimum sampled values are used, irrespective of when or how often they occurred in the selected period. If no value reading (above programmed threshold) has been recorded during the period represented by a data point then a "minimum value" will be displayed on the graph.

In *Usage* mode, the measured occurrence of channel activity (above programmed threshold) during the selected period is displayed as a percentage. Depending on the number of channels being monitored in each measurement cycle, and the random sporadic nature of channel activity, this display may some inaccuracy. Practically, it may be used to conveniently indicate "general" channel (and network) loading, and allows activity to be correlated against specific time/day by viewing the logged data that has been recorded. This capability is useful for identifying co-incidental channel(s) activity during periods of interference – a likely indicator of intermodulation (IM) occurrence.

In *Maximum (1 channel)* mode, only the stored sample with the maximum value during the selected period is used, and;

In *Minimum (1 channel)* mode only the sample with the minimum value is used. If no value reading (above programmed threshold) has been recorded during the period represented by a data point then a "minimum value" will be displayed on the graph.

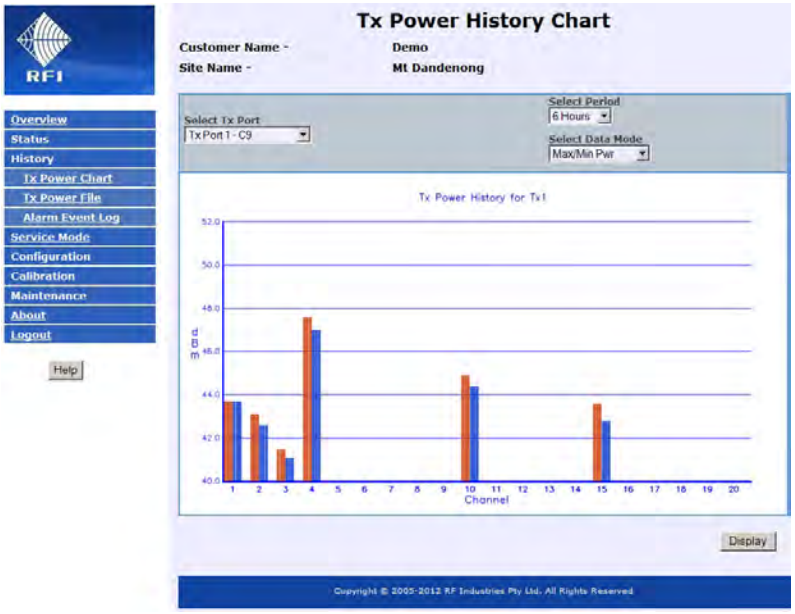
All captured level samples are included in the History File, in CSV format, which may be processed independently (i.e. using other software) if desired.

Note: During averaging calculations, the processing of all of the data to create the graph may result in delays to the display of the data. If a significant amount of data has been logged, displaying periods back in time may also result in delays while this data is retrieve and then processed.

Display:

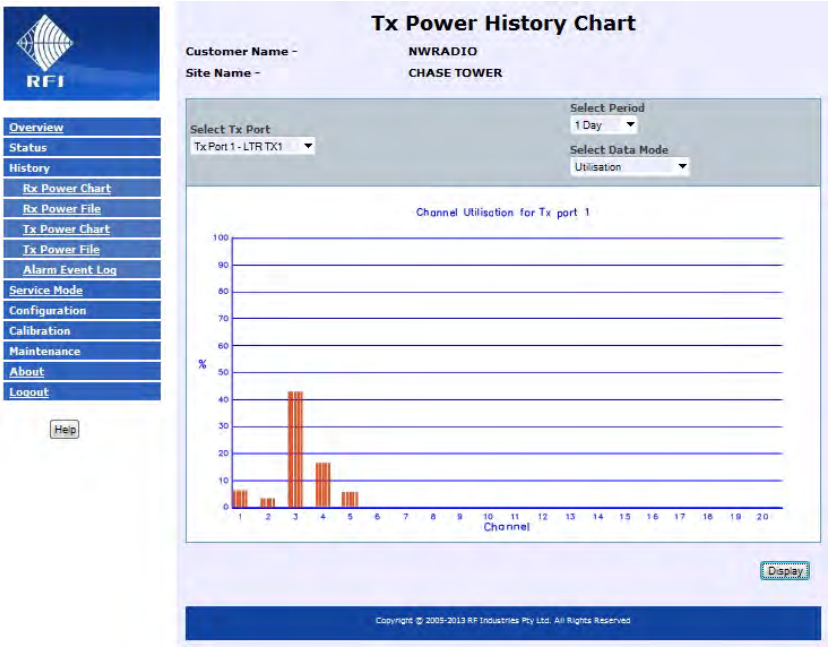
This will refresh the display using the selected settings. Some delay may be experienced while data collates.

Examples of Data Mode displays:



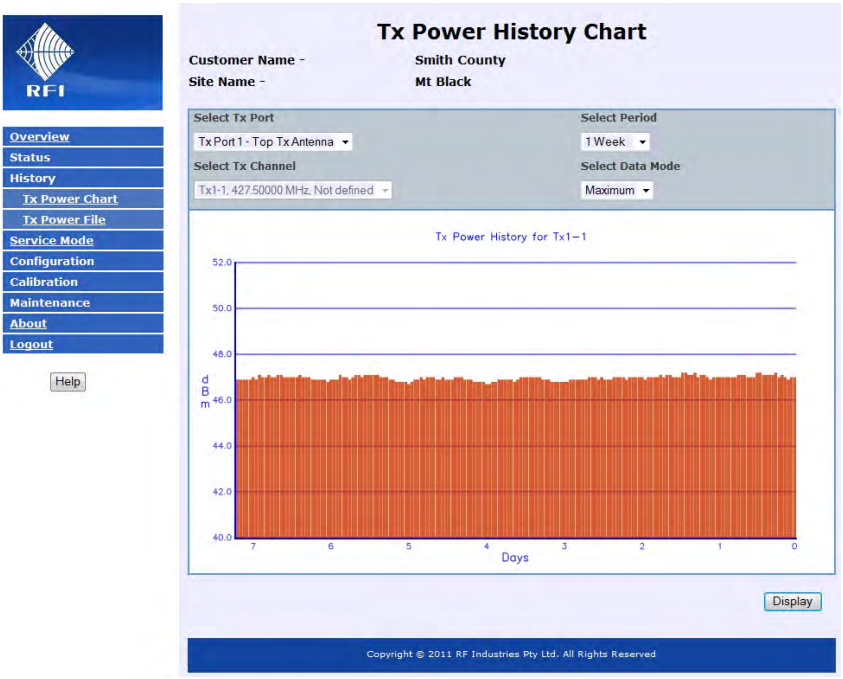
"Max/Min Pwr" Data Mode selected

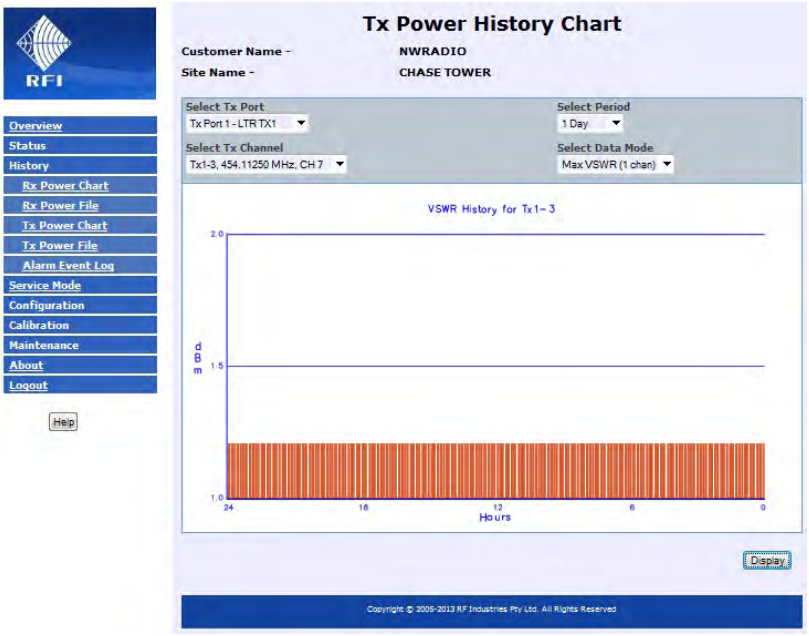
"Utilisation" Data Mode Selected



Note: Hovering the mouse cursor over the upper portion of a displayed bar in the above two charts will return the actual displayed value (refer example above).

"Maximum Pwr 1 Chan"
Data Mode selected



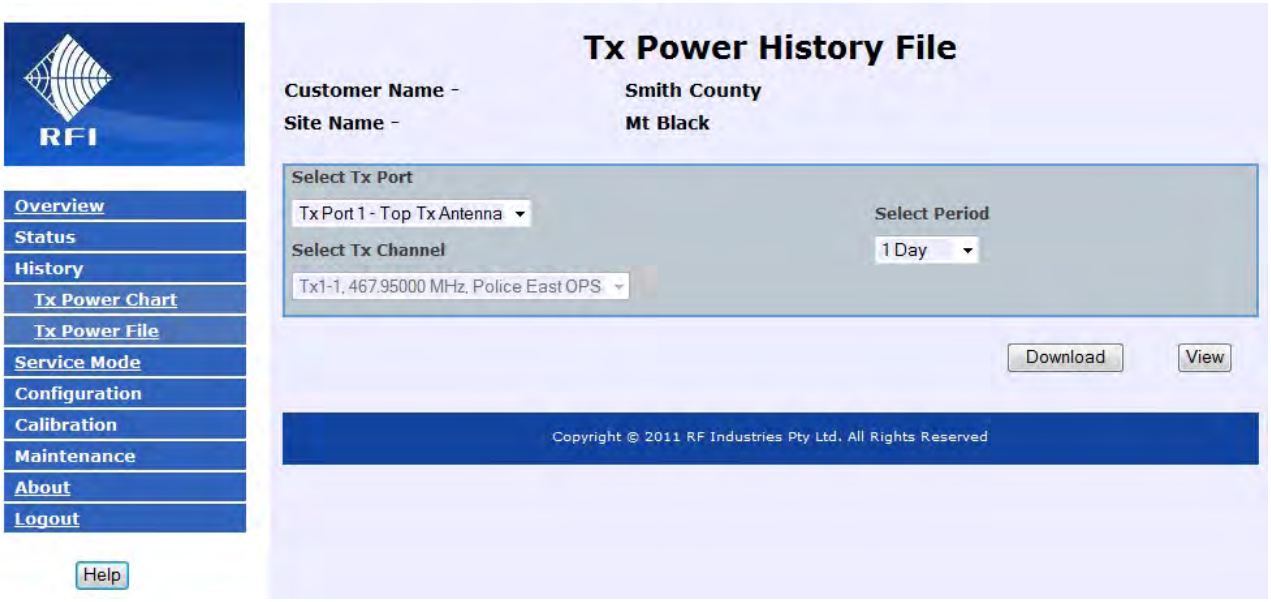


"Max VSWR 1 Chan" Data Mode selected

Note: In a K1 hardware model, approx. 2.5Mb of data storage is available for all log files' data. Depending on the number of Alarm Events recorded, the period of history that can be stored can vary significantly. The available data storage area operates as a FIFO (first-in-first-out) buffer. That is, once full, the oldest stored alarm event is removed to make room for the newest measurement.

In a K2 hardware model, approx. 4Gb of data storage is available for all log files' data. This data area also operates as a FIFO buffer.

10.17 History – Tx Power File



This page allows logged data to be downloaded, saved or displayed for a nominated channel. Data is provided in a CSV file format for ease of import and manipulation.

Select Tx Port:

Select the Port on which the desired Tx Channel is located.

Select Tx Channel:

Select the Tx Channel that is desired to be monitored.
Note that only channels that have a frequency configured, and which have been enabled will be selectable.

Select Period:

Select the past period (working back from the current date and time) for which logged data will be displayed.

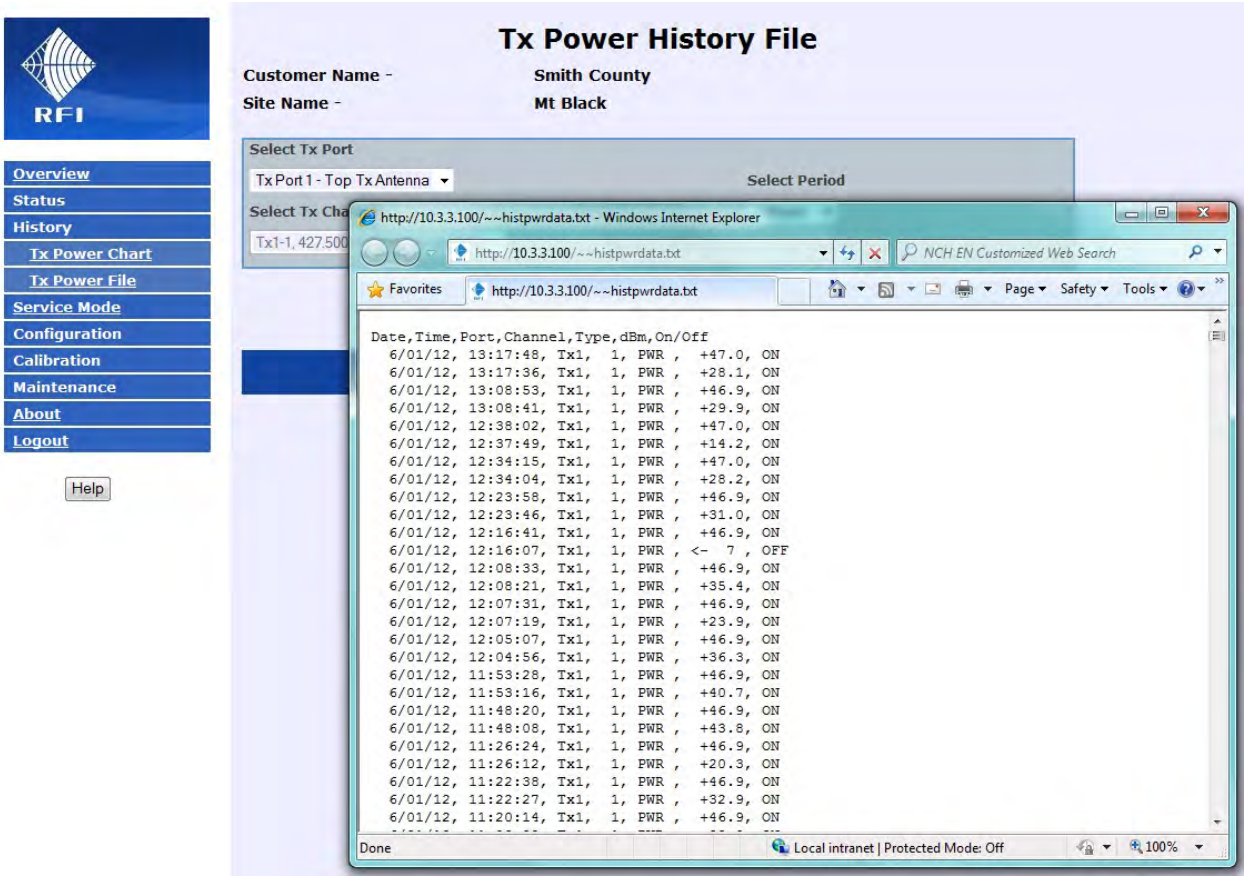
Download:

Use this button to open a "File Download" or "Save As" dialog for saving the CSV data file.

View:

Opens a new window in which the data records will be displayed.

Due to the potential size of some data logs, and the time to download it into the viewer, using View is not recommended for displaying a large amount of data.



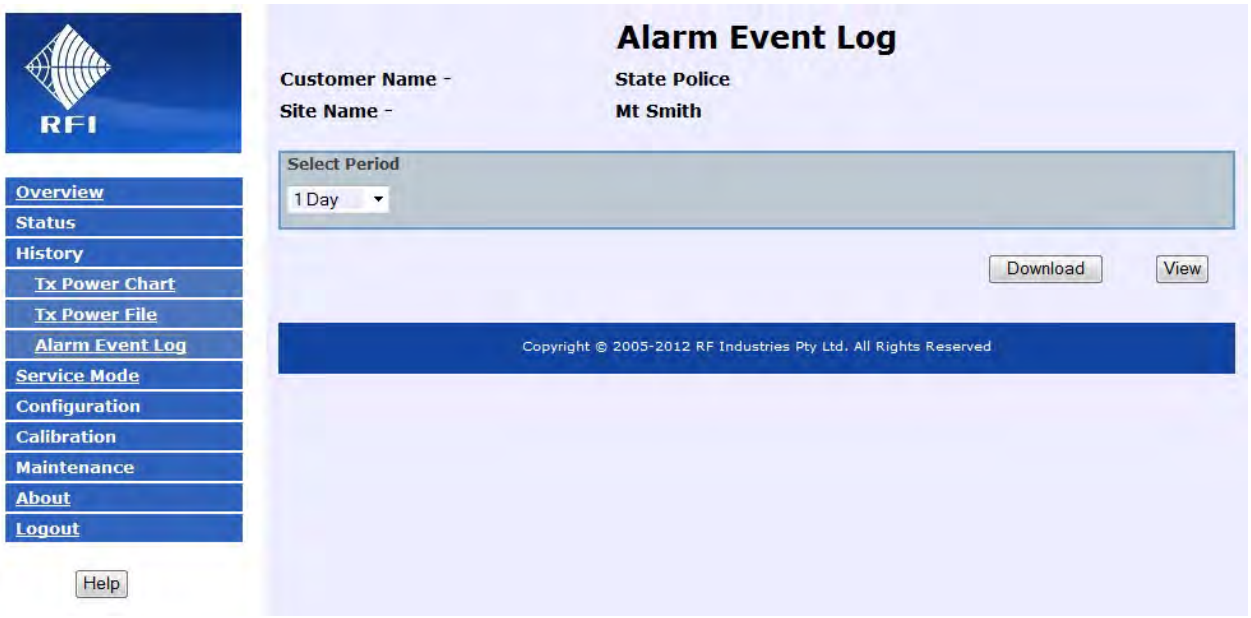
Example Tx Power History log opened in "View"

Note: It is important to remember that the data represented in the History file logs a "change of event" when the measured value has changed by an amount exceeding the parameters set in the "Configuration – History" screen. For storage memory space consumption efficiency, repeated values are not recorded at each measurement interval if they have not changed outside these settings.

Note: In a K1 hardware model, approx. 2.5Mb of data storage is available for all log files' data. Depending on the number of Tx Power measurements recorded, the period of history that can be stored can vary significantly. The available data storage area operates as a FIFO (first-in-first-out) buffer. That is, once full, the oldest stored measurement is removed to make room for the newest measurement.

In a K2 hardware model, approx. 4Gb of data storage is available for all log files' data. This data area also operates as a FIFO buffer.

10.18 History – Alarm Event Log



This page allows logged data to be downloaded, saved or displayed for a alarms in the current Alarm Event Log. Data is provided in a CSV file format for ease of import and manipulation.

Select Period:

Select the past period (working back from the current date and time) for which logged data will be displayed.

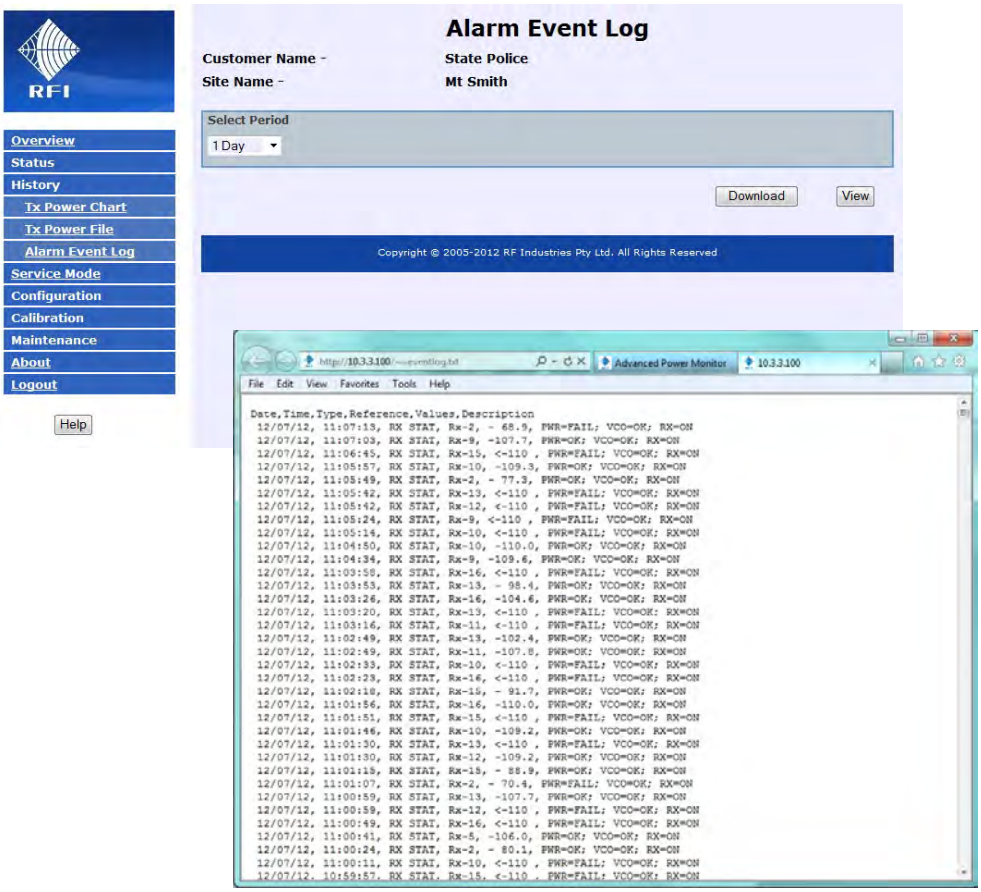
Download:

Use this button to open a "File Download" or "Save As" dialog for saving the CSV data file.

View:

Opens a new window in which the data records will be displayed.

Due to the potential size of some data logs, using View is not recommended for displaying a large amount of data.

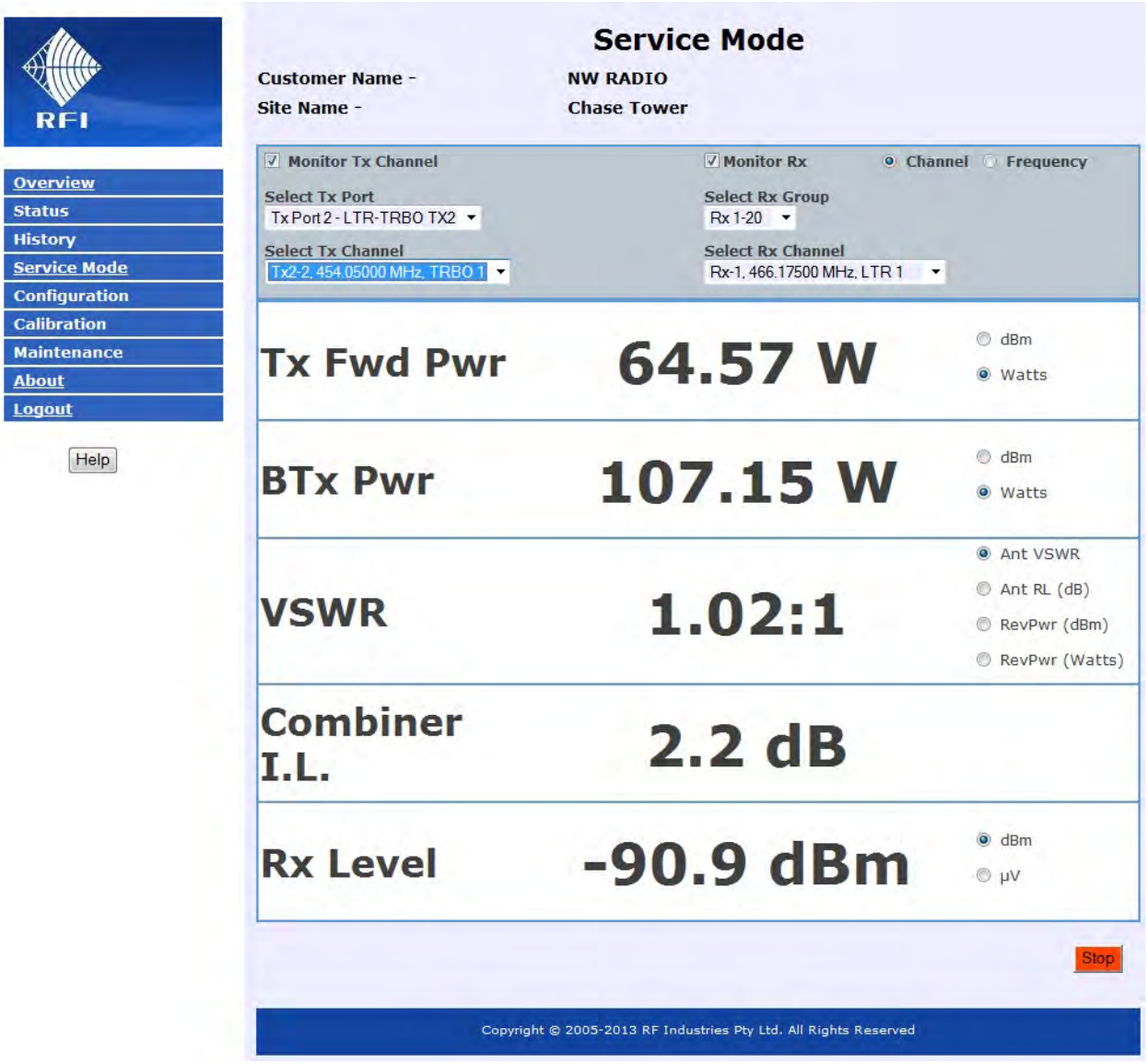


Example Alarm Event log opened in "View"

Note: In a K1 hardware model, approx. 2.5Mb of data storage is available for all log files' data. Depending on the number of Alarm Events recorded, the period of history that can be stored can vary significantly. The available data storage area operates as a FIFO (first-in-first-out) buffer. That is, once full, the oldest stored alarm event is removed to make room for the newest measurement.

Note: In a K2 hardware model, approx. 4Gb of data storage is available for all log files' data. This data area also operates as a FIFO buffer.

10.19 Service Mode



The Service Mode page presents a real time Tx Power and Rx Level Meter. The current Tx Power, Tx VSWR, Combiner Insertion Loss and Rx Level for the selected Tx and Rx channels are continuously updated once the Start/Stop button has been activated.

The increased font size of the values displayed on this page assist viewing them from a distance.

Note: The Service Mode screen is only visible from the Administrator login level, it is not visible from the User login level.

Monitor Tx Channel:

Selects if a Tx frequency will be measured and displayed during each measurement cycle.

Select Tx Port:

Select the Port on which the desired Tx Channel is located.

Select Tx Channel:

Select the Tx Channel that is desired to be monitored.

Note: Only channels that have a frequency configured, and which have been "enabled", will be selectable.

Monitor Rx Channel:

Selects if a Rx frequency will be measured and displayed during each measurement cycle.

Channel:

Select the Rx Channel that is desired to be monitored.

Note: Only channels that have a frequency configured, and which have been "enabled", will be selectable.

Frequency:

Select or Enter the Rx Frequency that is desired to be monitored.

Note: The frequency may be entered by selecting the field and typing in a value, which may be changed by using the up/down keys on your keyboard, or by selecting the drop down arrow next to the field and scrolling through and selecting the desired frequency values.

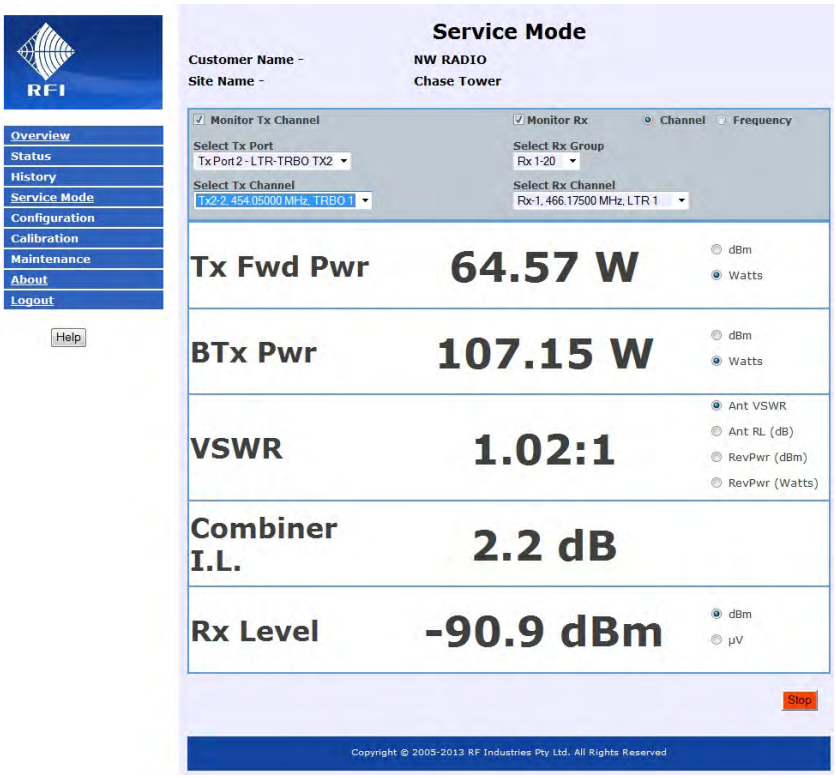
Select Rx Group:

Select the Group in which the desired Rx Channel is located.

Select Rx Channel:

Select the Rx Channel that is desired to be monitored.

Note: Only channels that have a frequency configured and which have been "enabled", will be selectable.



Displayed Values:

The units of measurement and display for the various values may be changed by clicking on the desired selections.

Start/Stop:

This starts or stops the continuously updating measurements.

The Power and Insertion Loss measurements assume that the Port Coupling losses and the Channel BTx Power have been previously calibrated (refer elsewhere in this manual).

Note: When Service Mode is running, the unit will not be monitoring or measuring any other programmed channels. Clicking the Stop button, navigating to another page within the site, or closing the browser window/tab will restore the unit's normal operation.

Note: The Service Mode screen is only visible from the Administrator login level, it is not visible from the User login level.

10.20 Configuration Menu

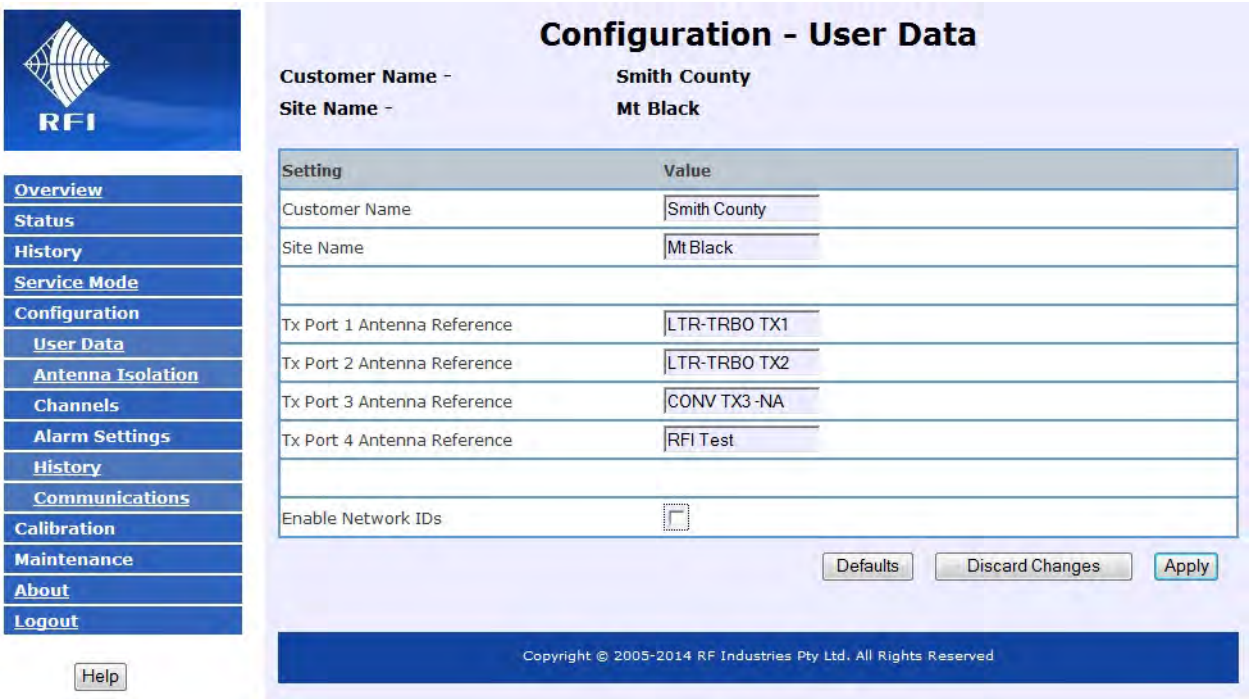
The "Configuration" menu allows all of the APMs configurable parameters to be programmed.

Selecting each indented topic under "Configuration" will display that item as a separate display page.

Note: The "*Configuration"* menu and screens are only visible from the Administrator login level, and are not visible from the User login level.

Note: The "*Configuration - Alarm Modules*" menu item appears only if one or more (optional) Channel Alarm Modules (CAM) or Site Alarm Modules (SAM) are installed. Up to ten (10) CAM/SAM units may be fitted to each APM as required.

10.21 Configuration – User Data



On this page you can enter descriptive texts for Customer Name**,** Site Name and each of the Ports

Customer Name:

The name of the network or the customer equipment being monitored by the APM.

Site Name:

The name of the site on which the network or the customer equipment is located.

Tx Port Antenna References:

The names or other unique identifier for each of the Tx Antennas being monitored by the APM.

Enable Network IDs:

Select if Network IDs are to be used in the APM Status and Configuration screens.

Defaults:

Clicking this sets all of the descriptions to "Not Defined".

Discard Changes:

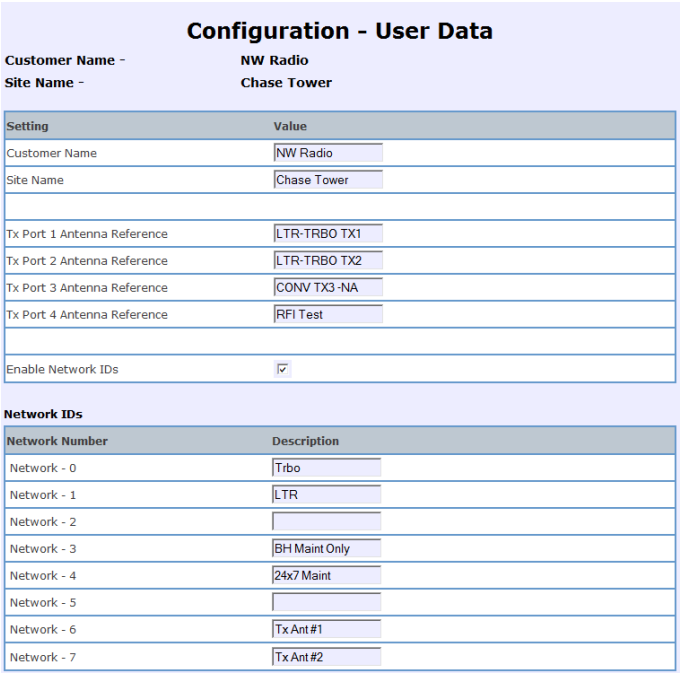
Click this button to restore the values to those present when the page was last re-displayed.
Note that if invalid values are being displayed after an Apply attempt, these values may not match the current system configuration. In this case, just select the Configure/User Data menu item again to re-display the current configuration.

Apply:

This will attempt to save and activate the values entered. If any out of range values are present, nothing will be saved and the problem settings will be highlighted with a red background.

Enable Network IDs

If Network IDs are desired to be used, then this item should be selected. When selected, an additional field will appear;



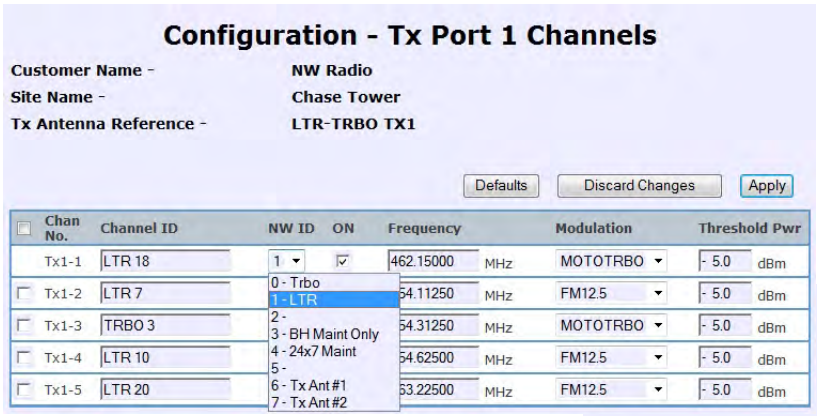
The eight Network IDs allow monitored channels to be nominated as being affiliated together in the *Channels – Status* screens.

The inclusion of the Network IDs 'label' allows channels to be conveniently 'bundled' into their respective groupings.

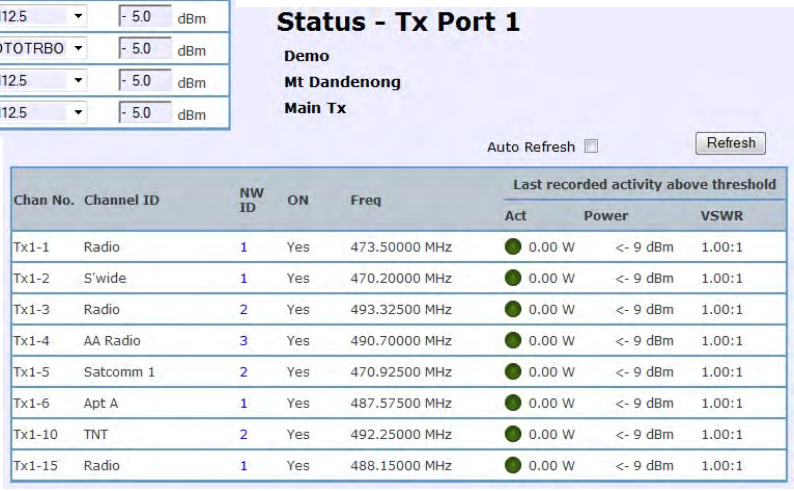
For example, if channels from one network are randomly distributed on shared combiners, the Network ID text label may use the network's name i.e. ID #1 = "Police", ID #2 = "Fire Dept", etc.

Alternatively, the Network ID could be used to identify different maintenance service levels i.e. ID #1 = B.H. Maintenance, ID #2 = 24x7 Maintenance, etc.

The Networks ID could also be used to identify which antenna is used for the network channels. i.e. ID #1 = TxAnt1, ID #2 = TxAnt2, etc.



The eight Network IDs allow monitored Channels to be nominated as being affiliated together in the *Configuration – Tx Port* screens.



The Network ID affiliations are then displayed In the Status – Tx Ports screens.

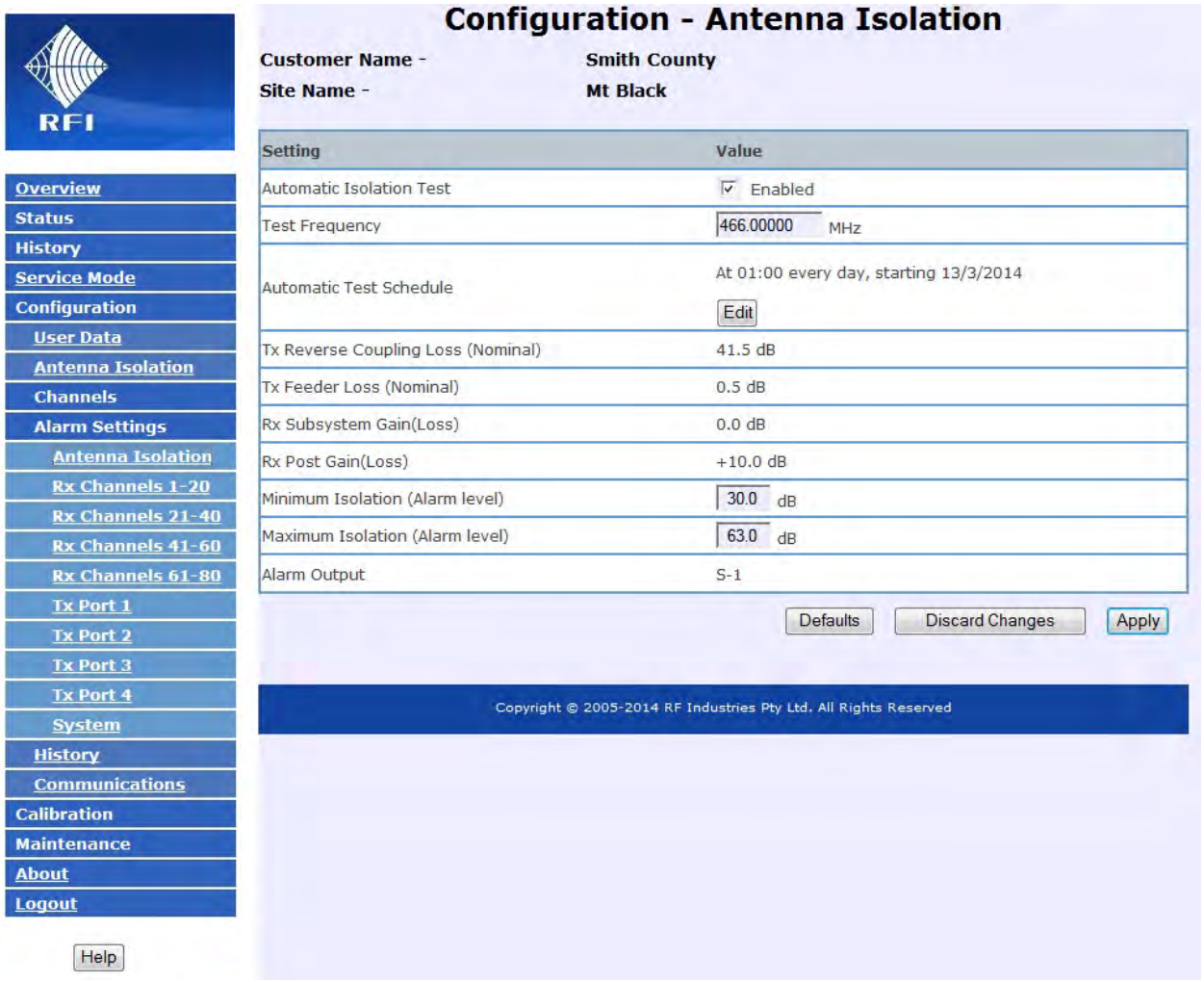
The Network ID text is included in SMTP (email) and SNMP messages, and the Network ID number (only) is included in Manager Messages status Messages.

3/13/14, 3:52:49,
Customer=Mobile Comms
Site=Mt Morgan
Tx Port 2 - LTR-TRBO TX2, Chan 2 - TRBO 1 (Network 4 - DMR Rentals), PWR=FAIL(+48.6), VSWR=OK(1.00)

Example SMTP (Email) Alarm showing Network ID label ('Network 4 - DMR Rentals')

The Networks ID label allows additional descriptive information about a channel to be communicated in an alarm message, allowing appropriate response activities to be actioned.

10.22 Configuration – Antenna Isolation



The Antenna Isolation "Configuration" page allows this test's parameters to be entered.

Automatic Isolation Test:

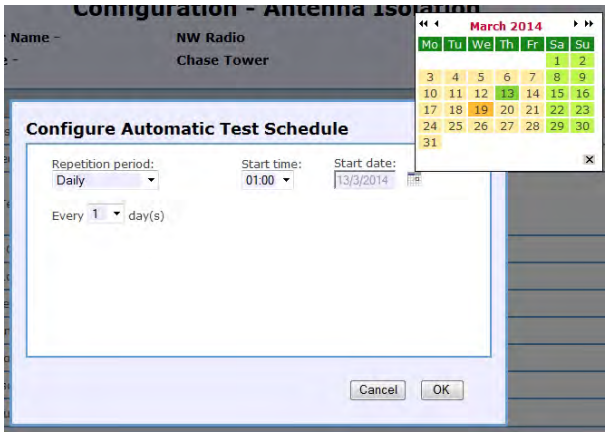
This determines whether the Antenna Isolation Test will be performed.

Test Frequency:

The frequency upon which the Antenna Isolation Test will be performed.

Note: Depending on local licensing and regulatory requirements this frequency will normally be one of the sites existing Base Station receive frequencies.

Automatic Test Schedule:



This determines when the *Antenna Isolation Test* will be performed when Automatic Isolation test is selected. Clicking *Edit* selects a calendar menu that allows a wide range of minute/hour/day/week/month selections to be chosen, enabling specific times to be allocated for the Antenna Isolation Test.

Tx Reverse Coupling Loss:

The value of coupling loss that has been entered in the Tx Port Calibration page. This value is used in the calculation of the Antenna Isolation value.

Tx Feeder Loss:

The value of Tx Antenna Feeder loss that has been entered in the Tx Port Calibration page. This value is used in the calculation of the Antenna Isolation value.

Rx Subsystem Gain(Loss):

This field is now populated from the *Calibration – Rx Port* page.

Rx Post Gain(Loss):

This field is now populated from the *Calibration – Rx Port* page.

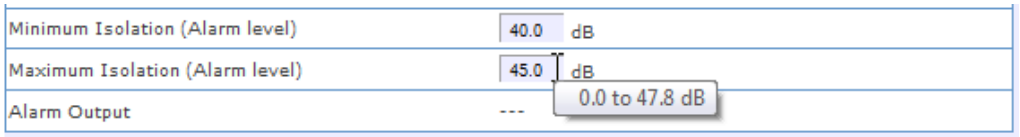
Minimum Isolation (Alarm Level):

The Antenna Isolation value below which an alarm will be generated when the Antenna Isolation measurement is carried out.

Maximum Isolation (Alarm Level):

The Antenna Isolation value above which an alarm will be generated when the Antenna Isolation measurement is carried out. This value is limited by the Antenna Isolation signal generator output level, antenna feeder losses, and the APM's receive sensitivity capabilities.

Hovering the mouse over the Minimum and Maximum Isolation (Alarm Level) fields will show the range of values that may be entered based on the current Tx coupler, Rx subsystem gain, feeder losses, and APM sensitivity parameters within the system.



Alarm Output:

If the Antenna Isolation alarm status is assigned as the source for an Alarm Module Alarm Output, or for one of the System Alarm relays, this displays the associated alarm output. For example;

"1-4" indicates Alarm Module 1, Alarm Output 4
"S-2" indicates System Alarm relay 2

Defaults:

Clicking this resets all data fields to the factory defaults.

Discard Changes:

Click this button to restore the values to those current saved. Note that if invalid values are being displayed after an Apply attempt, these values may not match the current system configuration. In this case, just select the Configure/User Data menu item again to re-display the current configuration.

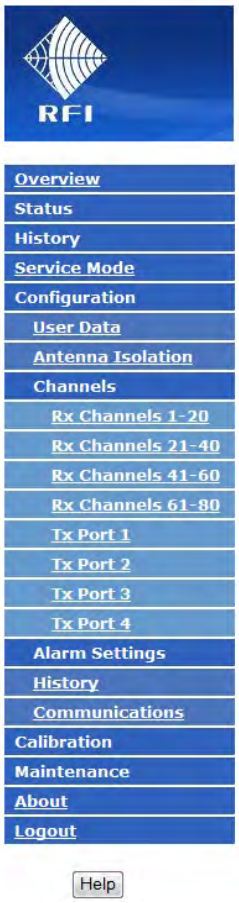
Save:

This will attempt to save and activate the values entered. If any out of range values are present, nothing will be saved and the problem settings will be highlighted with a red background.

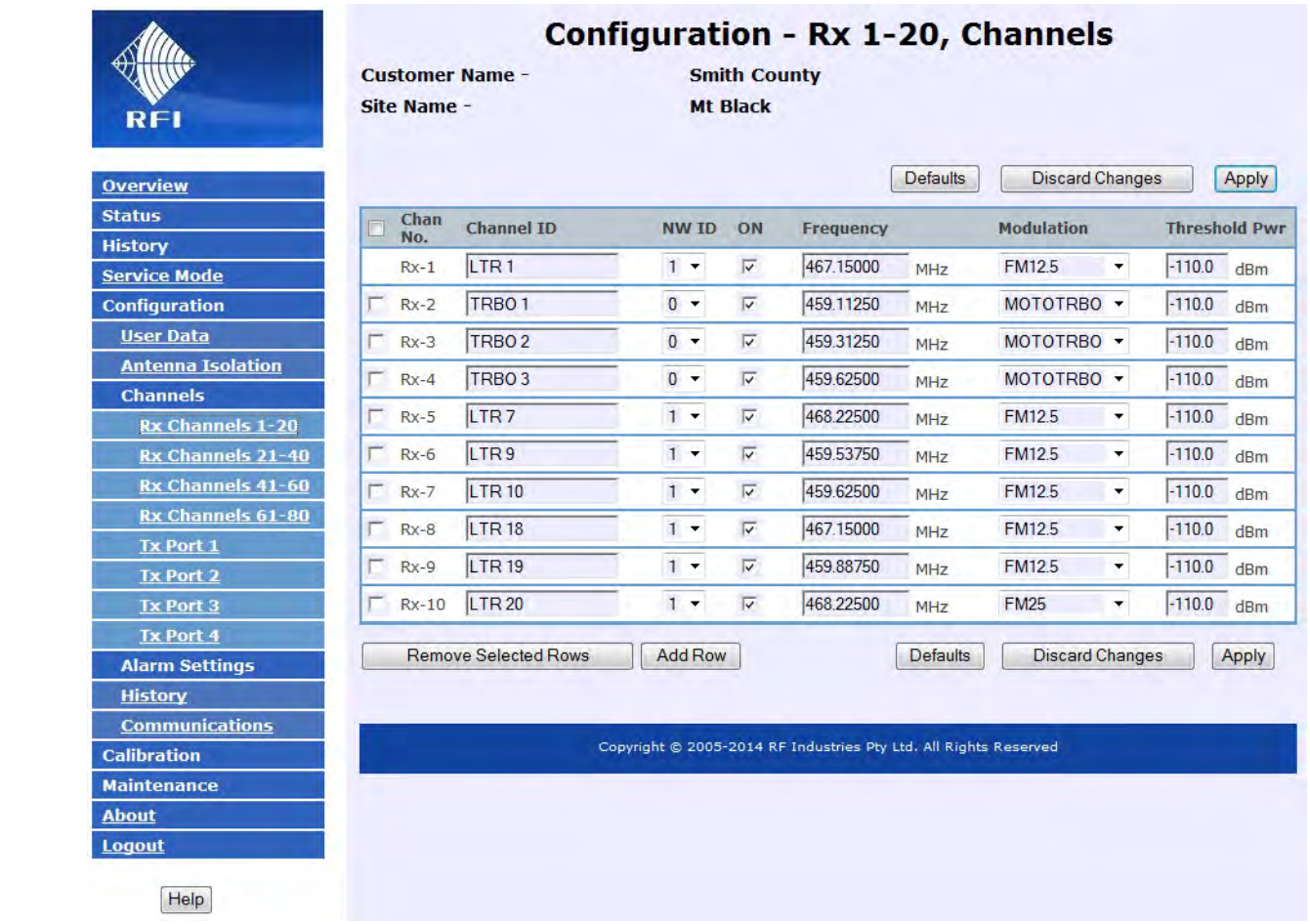
10.23 Configuration – Channels - Menu

The "Configuration - Channels" menu allows all of the APMs channel specific parameters to be programmed.

Selecting each indented topic under "Configure - Channels" will display that item as a separate display page.



10.24 Configuration – Rx Channels 1-20



Each of the Rx channels (Groups), displayed 20 per page, is configurable as illustrated in this Rx Channel page.

Chan No:

The system channel designator.

Channel ID:

A description for the channel. Up to 16 characters may be entered.

NW ID:

Allows channels to be affiliated with a network (i.e. "1" is Police Network, "2" is Fire Network), to an antenna system ("1" is Tx Antenna #1, "2" is Tx Antenna #2), or to another label (i.e. "1" is 24x7 Maintenance, "2" is Normal Hours Maintenance) and this label will appear in Alarm Messages to allow faster determination of response priority and or actions.

Note: The NW ID column is only displayed if this feature is enabled in the *Configuration – User Data* screen.

ON:

This controls the scanning of the channel. If checked, the channel is included in the measurement cycle, otherwise it is not included. This allows the channel to remain configured, but to be removed from the measurement cycle if desired (i.e. if the channel has been disabled or temporarily removed).

Frequency:

The center frequency for the channel. The frequency must be a multiple of 0.00625 MHz.

Modulation:

Selects the modulation type to be measured.

Note: The channel measurement bandwidth is also selected in this field. Some modulation selections default the channel measurement bandwidth (i.e. "TETRA" defaults to a 25KHz setting), but if multiple selections are available, then this is easily identified by the modulation label (i.e. "FM12.5" is 12.5KHz, and "FM25" is 25KHz).

Threshold Pwr:

The minimum forward power level for which channel measurements and alarm status will be updated. If the detected power level is below this value the signal will be considered as not present.

Add Row:

When the configuration page is loaded, only configured channels are displayed. To configure a new channel, click the Add Row button to display the next available un-configured channel. Up to 20 channels may be configured for each Tx port.

Remove Selected Rows:

Clicking this button will return the selected rows to their default settings and remove them from the display. Rows are selected by clicking the checkbox at the left of the row. Clicking the checkbox in the title bar will select all the rows. Note that the first row is always displayed.

Note: For any text field, the allowable limits for that field (Model dependent) are displayed when the cursor is hovered over it.

Defaults:

Clicking this button reduces the display to only the first channel and enters the factory default values. for the Channel configuration settings. To only restore specific channels to defaults, select them, and then use the Remove Selected Rows button followed by the Add Row button. The default settings are;

Channel ID	"Not Defined"
ON	Not selected
Frequency	OFF
BW	25 kHz
Threshold Pwr	-120 dBm

Discard Changes:

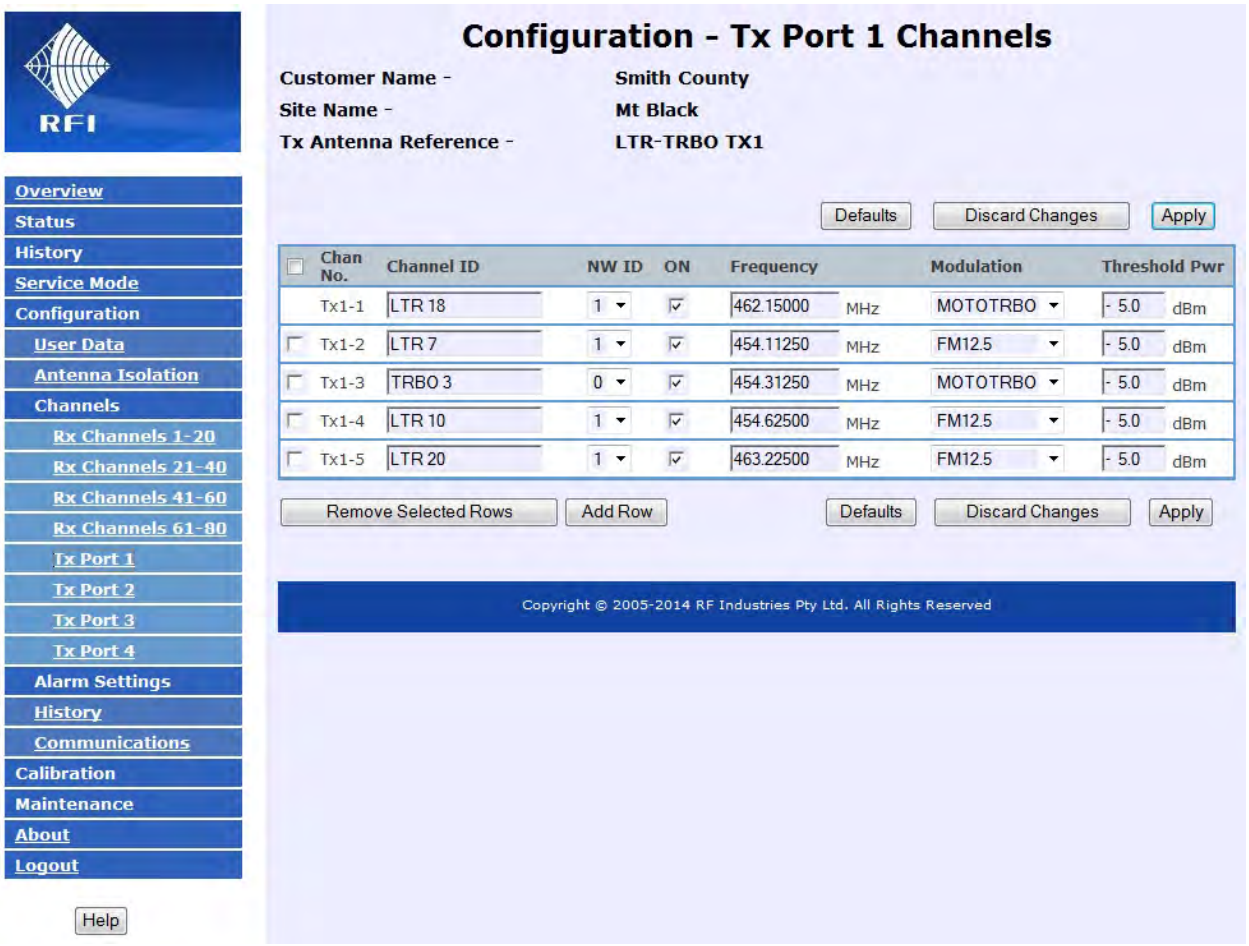
Click this button to restore the values to those current saved. Note that if invalid values are being displayed after an Apply attempt, these values may not match the current system configuration. In this case, just select the Configure/User Data menu item again to re-display the current configuration.

Apply:

This will attempt to save and activate the values entered. If any out of range values are present, nothing will be saved and the problem settings will be highlighted with a red background.

Note: Whenever programming changes are applied, the alarm status for affected channels is re-initialized.

10.25 Configuration – Tx Port 1 Channels



Each of the Tx port channels (Groups), 1 through to 4 is configurable as illustrated in this Tx Port 1 Channel page.

Chan No:

The system channel designator.

Channel ID:

A description for the channel. Up to 16 characters may be entered.

NW ID:

Allows channels to be affiliated with a network (i.e. "1" is Police Network, "2" is Fire Network), to an antenna system ("1" is Tx Antenna #1, "2" is Tx Antenna #2), or to another label (i.e. "1" is 24x7 Maintenance, "2" is Normal Hours Maintenance) and this label will appear in Alarm Messages to allow faster determination of response priority and or actions.

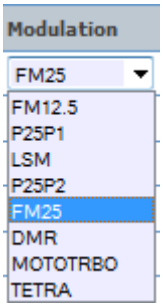
Note: The NW ID column is only displayed if this feature is enabled in the *Configuration – User Data* screen.

ON:

This controls the scanning of the channel. If checked, scanning is enabled, otherwise it is not included in the scanning cycle. This allows the channel to remain configured, but to be temporarily removed from the scanning cycle.

Frequency:

The center frequency for the channel. The frequency must be a multiple of 0.00625 MHz.



Modulation:

Selects the modulation type to be measured.

Note: The channel measurement bandwidth is also selected in this field. Some modulation selections default the channel measurement bandwidth (i.e. "TETRA" defaults to a 25KHz setting), but if multiple selections are available, then this is easily identified by the modulation label (i.e. "FM12.5" is 12.5KHz, and "FM25" is 25KHz).

Threshold Pwr:

The minimum forward power level for which channel measurements and alarm status will be updated. If the detected power level is below this value the signal will be considered as not present.

Note: The default value for this field is "35dBm" which caters for most applications. Alternate values to suit special applications should be entered against specific channels as required.

Add Row:

When the configuration page is loaded, only configured channels are displayed. To configure a new channel, click the Add Row button to display the next available un-configured channel. Up to 20 channels may be configured for each Tx port.

Remove Selected Rows:

Clicking this button will return the selected rows to their default settings and remove them from the display. Rows are selected by clicking the checkbox at the left of the row. Clicking the checkbox in the title bar will select all the rows. Note that the first row is always displayed.

Note: For any text field, the allowable limits for that field (Model dependent) are displayed when the cursor is hovered over it.

Defaults:

Clicking this button reduces the display to only the first channel and enters the factory default values. for the Channel configuration settings. To only restore specific channels to defaults, select them, and then use the Remove Selected Rows button followed by the Add Row button. The default settings are;

Channel ID	"Not Defined"
ON	Not selected
Frequency	OFF
BW	25 kHz
Threshold Pwr	-5 dBm

Discard Changes:

Click this button to restore the values to those present when the page was last re-displayed.

Note that if invalid values are being displayed after an Apply attempt, these values may not match the current system configuration. In this case, just select the relevant Configuration/Channels/Tx Port menu item again to re-display the current configuration.

Apply:

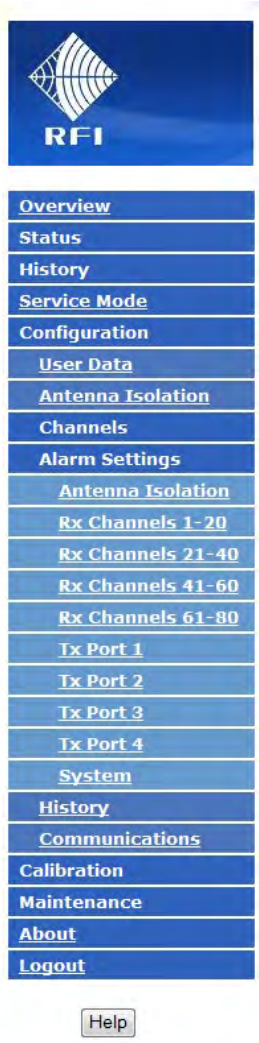
This will attempt to save and activate the values entered. If any out-of-range values are present, nothing will be saved and the problem settings will be highlighted with a red background.

Note: Whenever programming changes are applied, the alarm status for affected channels is re-initialized.

10.26 Configuration – Alarms Menu

The "Configuration - Alarms" menu allows all of the APMs alarm parameters to be programmed.

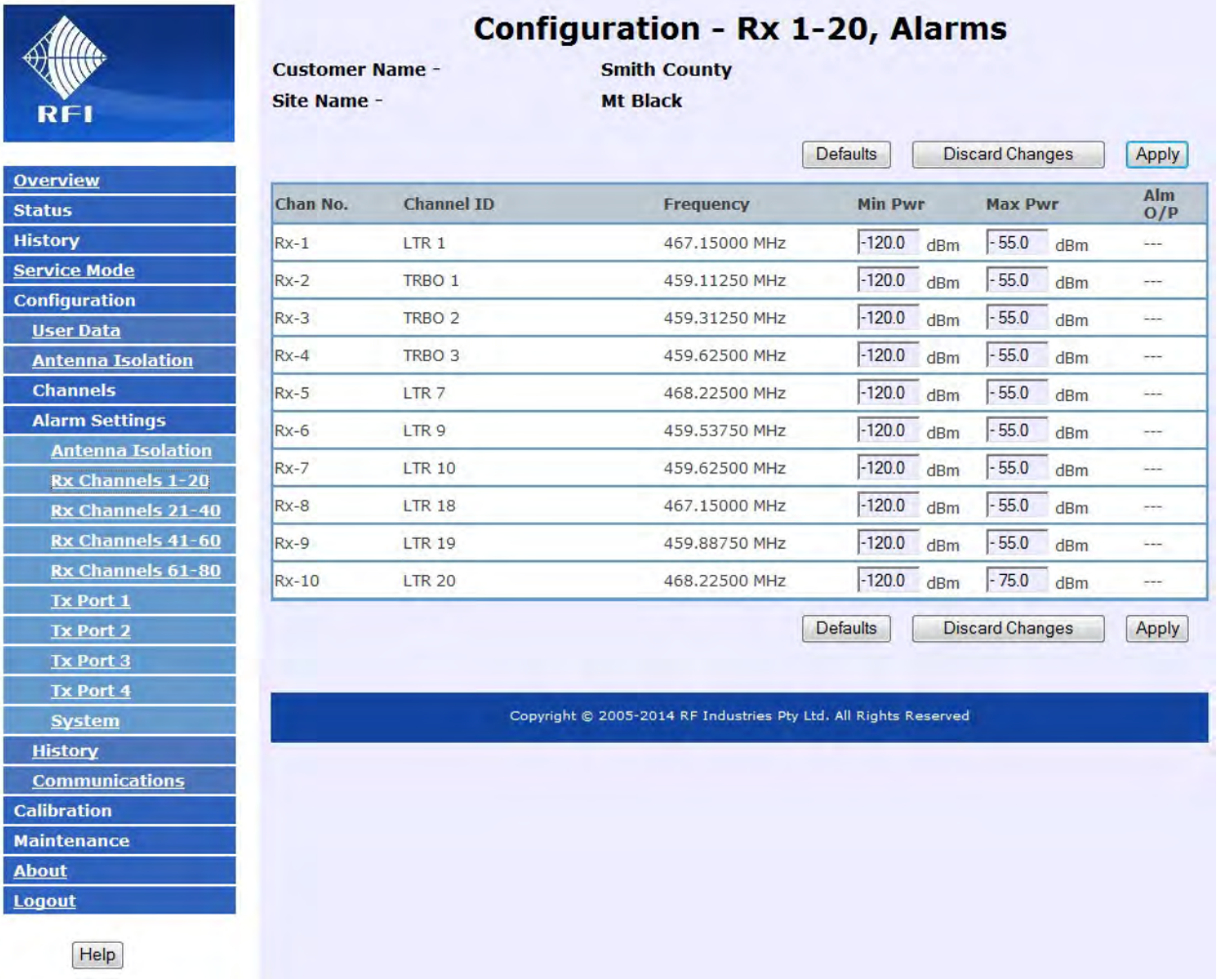
Selecting each indented topic under "Alarm Settings" will display that item as a separate display page.



10.27 Configuration – Alarm Settings - Antenna Isolation

The *Configuration – Alarm Settings – Antenna Isolation* page is the same as the *Configuration – Antenna Isolation* page. Refer Section 10.22 of this manual for detailed information on this page.

10.28 Configuration – Alarm Settings – Rx Channels



Each of the Rx channel alarms is configurable as illustrated in this Rx Channels 1-20 Alarms page.

Min Pwr and Max Pwr:

Sets the power level limits for alarming of the monitored Rx channels. A signal detected outside these limits will result in an alarm.

Note: Setting the Min Pwr to -120dBm will disable low level alarms. However, setting Min Pwr between -120dBm and the APMs minimum sensitivity measurement level (-110dBm) may result in unpredictable alarm behavior for Rx levels within this range.

Note: For any text field, the allowable limits for that field (model dependent) are displayed when the cursor is hovered over it. Alarms will only be raised for signals where the Received Power level exceeds the Threshold Power set on the Channel Configuration pages.

ALM O/P:

The Alarm Output that this channel's Min. Pwr or Max. Pwr alarm has been assigned to.

Note: This is configured in the Configuration – Alarm Settings – System or Configuration – Alarm Modules screens as required.

Defaults:

Clicking this button enters the factory default values for the Channel alarm settings, which are;

Min Power	-110dBm
Max Pwr	-75dBm

Discard Changes:

Click this button to restore the values to those present when the page was last displayed.

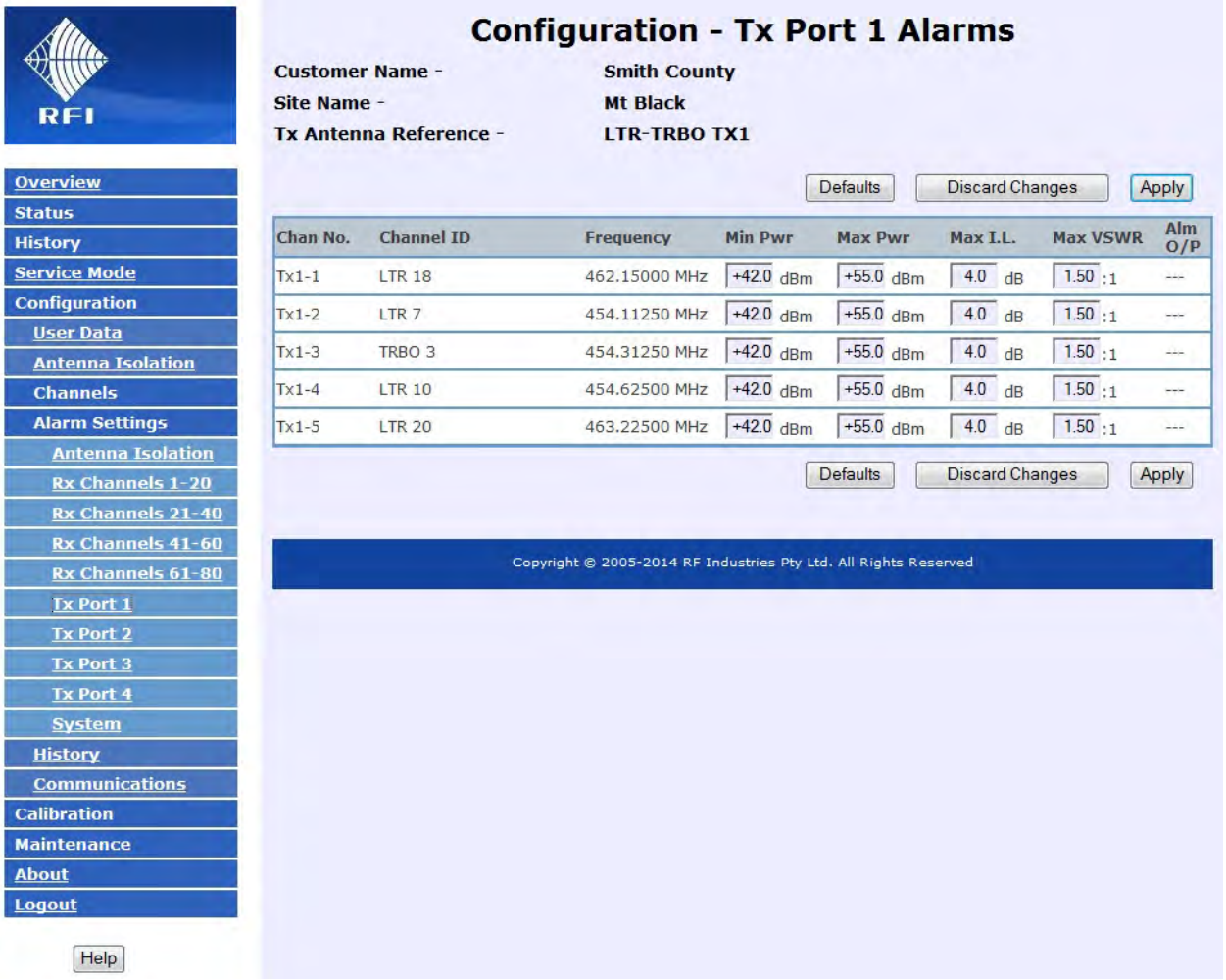
Note: If invalid values are being displayed after an Apply attempt, these values may not match the current system configuration. In this case, just select the relevant *Configuration/Alarms/Rx Channels* menu item again to re-display the current configuration.

Apply:

This will attempt to save and activate the values entered. If any out of range values are present, nothing will be saved and the problem settings will be highlighted with a red background.

Note: Whenever any configuration changes are applied, the alarm status for affected channels is re-initialised.

10.29 Configuration – Alarm Settings - Tx Port 1



Each of the Tx port (Groups) channel alarms, 1 through to 4 is configurable as illustrated in this Tx Port 1 Alarms page.

Min & Max Power:

Sets the power level limits for alarming of the monitored Tx channels. A signal detected outside these limits will result in an alarm.

Max Insertion Loss:

Sets the Maximum allowable Combiner Insertion Loss calculated using the Forward Power level and the stored BTx Power level.

Max VSWR:

Sets the VSWR alarm limit.

ALM O/P:

The Alarm Output that this channel's Min. Pwr or Max. Pwr alarm has been assigned to.

Note: This is configured in the Configuration – Alarm Settings – System or Configuration – Alarm Modules screens as required.

Note: For any text field, the allowable limits for that field (Model dependent) are displayed when the cursor is hovered over it.

Note: Alarms will only be raised for signals where the Forward Power level exceeds the Threshold Power set on the Channel Configuration pages.

Defaults:

Clicking this button enters the factory default values for the Channel alarm settings, which are:

Min Power	+42 dBm
Max Power	+49 dBm
Max Ins Loss	1.0 dB
Max VSWR	1.50:1

Discard Changes:

Click this button to restore the values to those present when the page was last re-displayed.

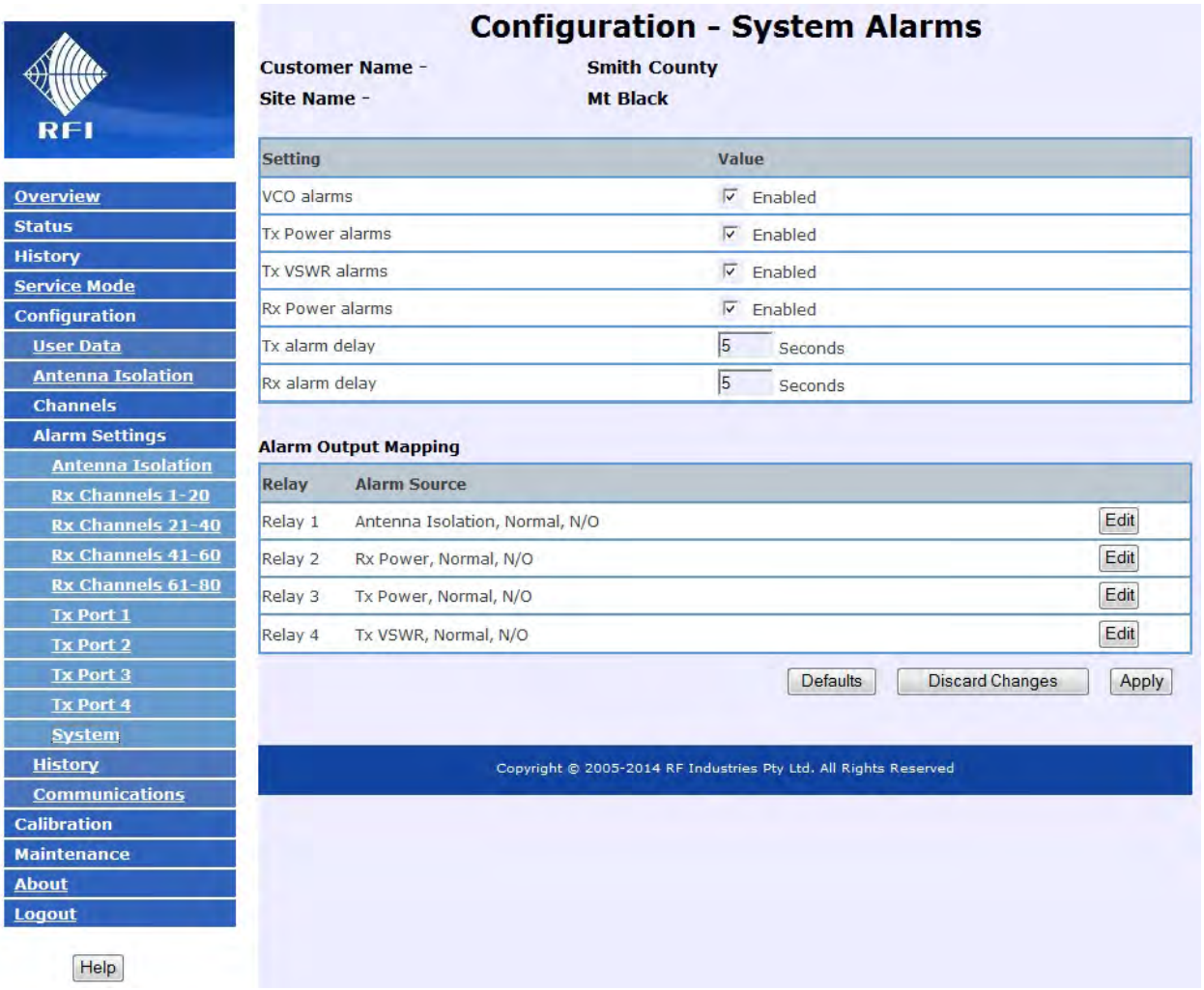
Note that if invalid values are being displayed after an Apply attempt, these values may not match the current system configuration. In this case, just select the relevant Configuration/Alarms/Tx Port menu item again to re-display the current configuration.

Apply:

This will attempt to save and activate the values entered. If any out of range values are present, nothing will be saved and the problem settings will be highlighted with a red background.

Note: Whenever programming changes are applied, the alarm status for affected channels is re-initialized.

10.30 Configuration – Alarm Settings – System



These settings allow various alarm categories to be disabled. Note that disabling an alarm category only suppresses activation of the relevant alarm relays. For example if Tx Power alarms are disabled, the Tx Power alarm relay, and the Summary alarm relay will not activate when the Tx Forward power level is outside the configured limits. However, the alarm status LEDS will continue to operate normally, and the user interface will still display the relevant alarms.

VCO alarms:

When selected, a VCO alarm is raised when either of the APM unit's VCOs fail to frequency lock.

Tx Power alarms:

When selected, this alarm occurs when the Forward Power level for a Tx channel is outside the configured Min & Max power alarm limits or when the Combiner Insertion Loss exceeds the configured alarm limit.

Tx VSWR alarms:

When selected, this alarm occurs when the VSWR for a Tx channel is greater than the configured limit.

Rx Power alarms:

When selected, this alarm occurs when the Forward Power level for a Tx channel is outside the configured Min & Max power alarm limits or when the Combiner Insertion Loss exceeds the configured alarm limit.

Tx alarm delay:

This setting defines the length of time (in seconds) for which the alarm must be continuously present or restored before the change in alarm status is recognized.

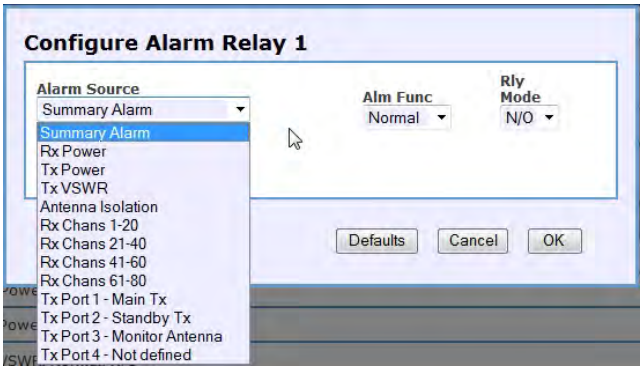
Rx alarm delay:

This setting defines the length of time (in seconds) for which the alarm must be continuously present or restored before the change in alarm status is recognized.

Alarm Output Mapping

These selections allow the four relays available on the APM's rear panel DB15 connect to be mapped to a choice selectable from the System's Summary, Antenna Isolation, Rx Channel or Tx Channel alarms.

For each alarm selected and assigned, the relay can be configured for Normal, Inactive, Active or Latching actions, with either a Normally Operated or or Normally Released state selectable.



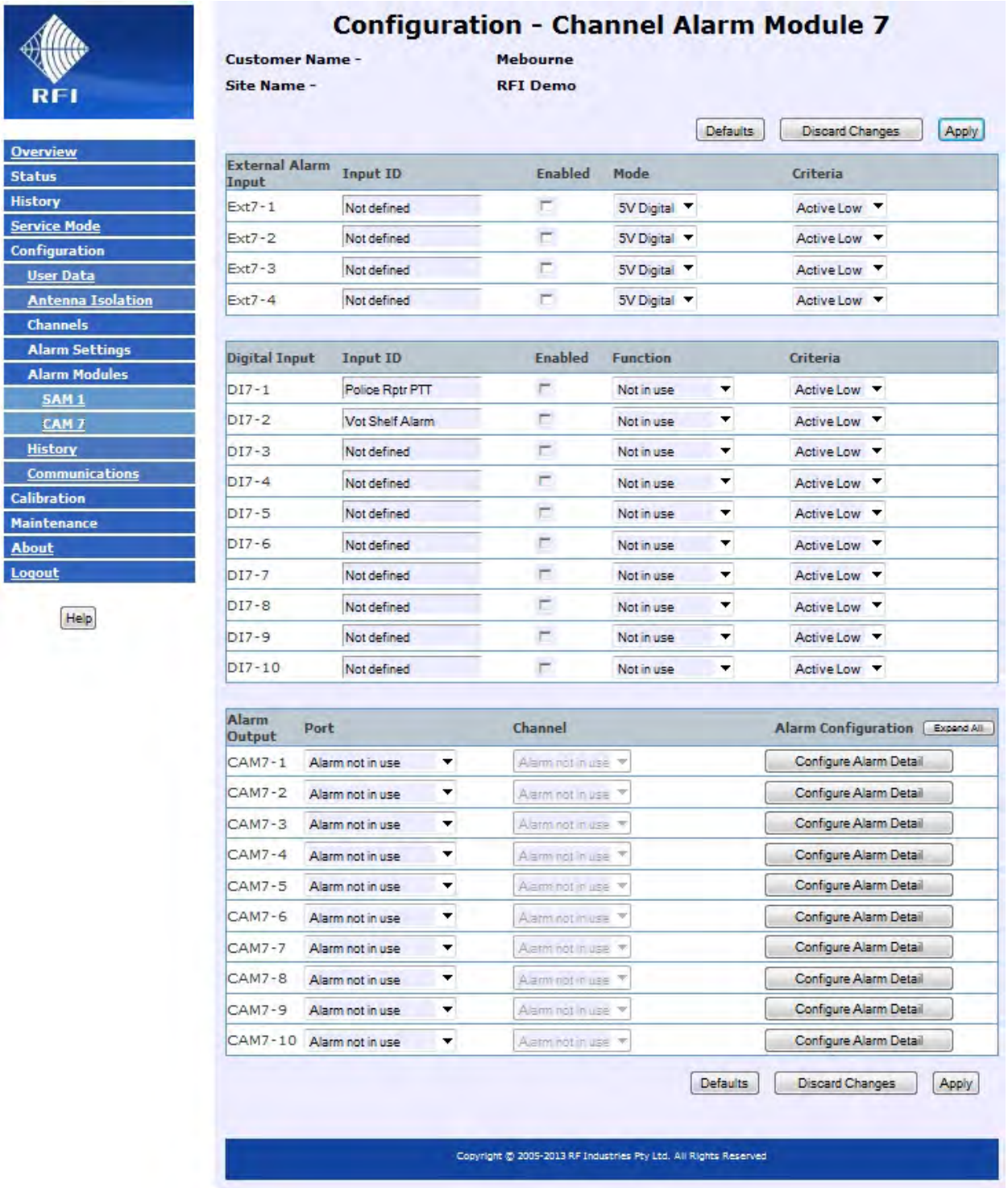
Defaults:

This will enable all alarm categories. The Tx alarm and Rx alarm delays will be set to 15 Seconds, and the four relay outputs will be set to the respective System Summary selections.

10.31 Configuration – Alarm Modules - Menu

Note: The "*Configuration - Alarm Modules*" menu item appears only if one or more (optional) Channel Alarm Module (CAM) or Site Alarm Module (SAM) is installed. Up to ten (10) CAM/SAM units may be fitted to each APM as required.

10.32 Configuration – Alarm Modules – Channel Alarm Module



Each of the (optional) Channel Alarm Module (CAM) units fitted to the APM is configurable as illustrated in this Channel Alarm Module page.

External Alarm Input	Input ID	Enabled	Mode	Criteria
Ext4-1	Site Door	☑	5V Digital	Active Low
Ext4-2	Fuel Tank Low	☑	5V Digital	Active High
Ext4-3	Not defined	☐	Not in use	Active Low
Ext4-4	Not defined	☐	Not in use	Active Low

External Alarm Input:

Displays the four (4) configurable external digital inputs.

Input ID:

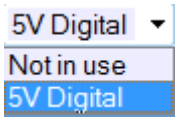
Enter a description for the External Alarm input signals. Up to 16 characters may be entered.

Enabled:

If the input is Enabled, an alarm condition will result in a System Fault summary alarm, together with an indication on the System Status page. Its status will also be displayed on the associated CAM Status page.

Mode:

Select the input mode for the external input.



Criteria:

Select the input state (LOW or HIGH) that signals an alarm condition for each External Input.

Digital Input	Input ID	Enabled	Function	Criteria
DI4-1	Police Base PTT	☑	CAM4-1 PTT	Active Low
DI4-2	Not defined	☐	Not in use	Active Low
DI4-3	Not defined	☐	Not in use	Active Low
DI4-4	Not defined	☐	Not in use	Active Low
DI4-5	Microwave Alarm	☑	General Purpose	Active Low
DI4-6	Solar Low Volts	☑	General Purpose	Active Low
DI4-7	Mains Fail	☑	General Purpose	Active Low
DI4-8	Batt. Low Volts	☑	General Purpose	Active Low
DI4-9	Not defined	☐	Not in use	Active Low
DI4-10	Not defined	☐	Not in use	Active Low

Digital Input:

Displays the ten (10) configurable digital inputs.

Input ID:

Enter a description for the digital alarm signal. Up to 16 characters may be entered.

Enabled:

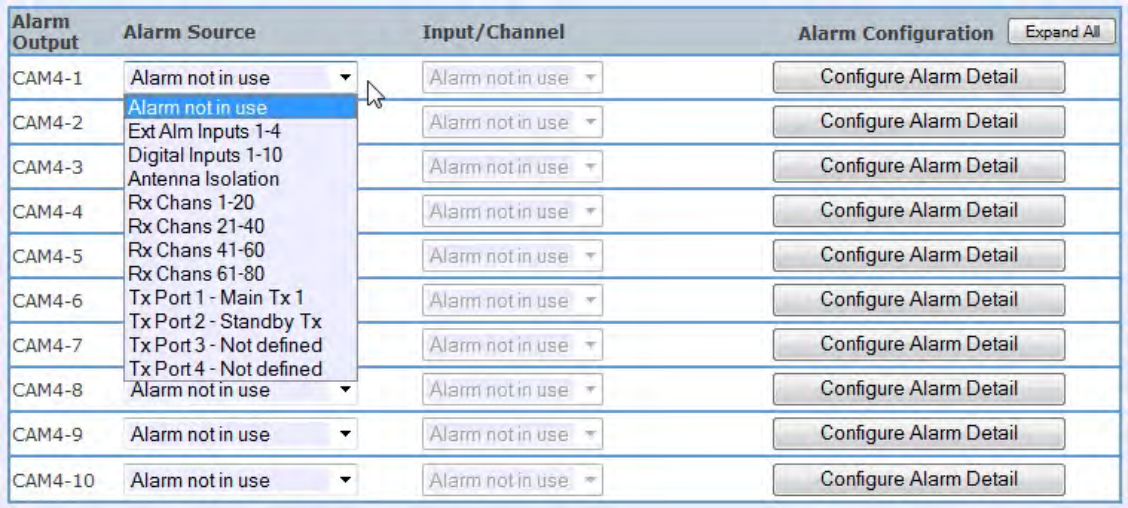
Selects if this input is enabled.

Function:

Select the input mode for each of the Digital Inputs.
A "CAMX-X PTT" selection affiliates the digital input as a base station PTT monitoring line for the base station assigned to that CAM Alarm Relay Output (see below). A "General Purpose" selection identifies the Digital Input as an independent digital input for monitoring external equipment, etc

Criteria:

Select the input state (LOW or HIGH) that signals an alarm condition.



Alarm Output:

These 10 rows configure the individual channel alarm outputs and PTT input settings. Selecting the *Configure Alarm Detail* button on each row expands its display (refer above example). Selecting the *Collapse* button minimises the row display.

Alarm Source:

Either select the source of the alarm for each channel, or select "Alarm not in use" to disable the alarm.

Input/Channel:

Having selected the source, select the desired input/channel to be assigned to the SAM alarm.

Alarm Configuration:

Alarm Func:

The following options are available:

Normal – The alarm relay is controlled by the channel alarm status.

Inactive – The alarm relay is forced to the "no alarm" state for testing.

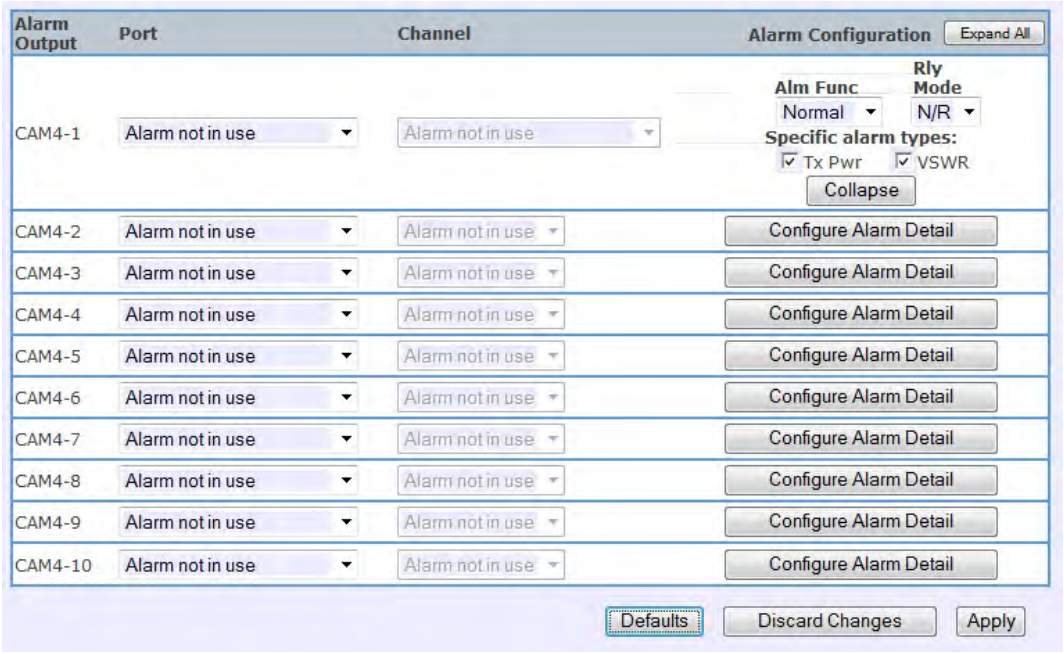
Active – The alarm relay is forced to its "alarm" state for testing.

Latching – The alarm relay is "latched" by an instance of the alarm state, and remains in this position until unlatched by manually selecting the adjacent *Clr* box.

Note: When an alarm is current, the border of the *Configure Alarm Detail* button will be red, and when the Channel is expanded, the *Alm Func* box will also be red (refer above example).

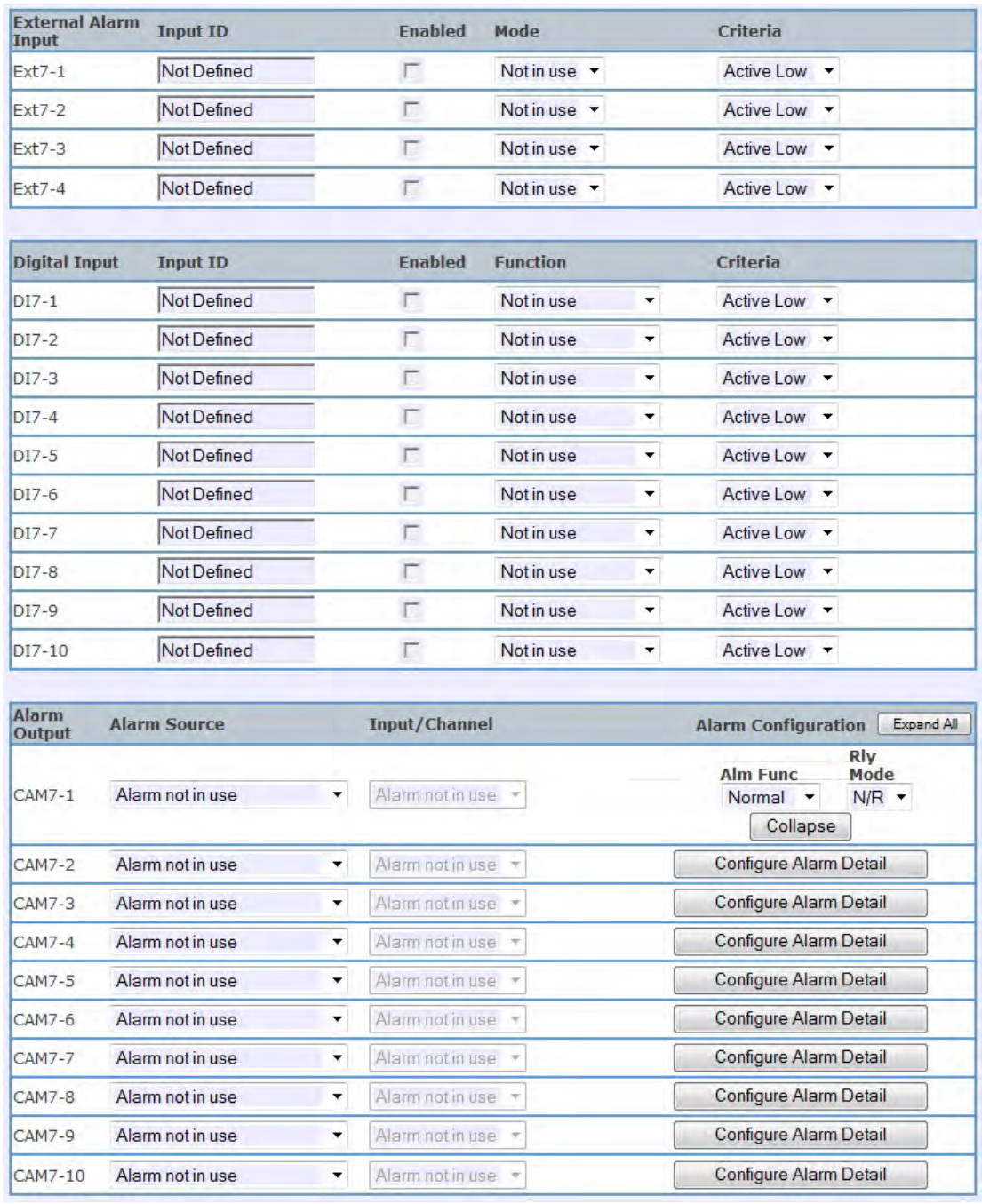
Rly Mode:

The Relay Mode may be either Normally Released (N/R), i.e. it "operates" when an alarm is present, or Normally Operated (N/O), i.e. it "releases" when an alarm is present.



Defaults:

Clicking this button restores the factory default values which are:



External Alarm Input	Input ID	Enabled	Mode	Criteria
Ext7-1	Not Defined	☐	Not in use	Active Low
Ext7-2	Not Defined	☐	Not in use	Active Low
Ext7-3	Not Defined	☐	Not in use	Active Low
Ext7-4	Not Defined	☐	Not in use	Active Low

Digital Input	Input ID	Enabled	Function	Criteria
DI7-1	Not Defined	☐	Not in use	Active Low
DI7-2	Not Defined	☐	Not in use	Active Low
DI7-3	Not Defined	☐	Not in use	Active Low
DI7-4	Not Defined	☐	Not in use	Active Low
DI7-5	Not Defined	☐	Not in use	Active Low
DI7-6	Not Defined	☐	Not in use	Active Low
DI7-7	Not Defined	☐	Not in use	Active Low
DI7-8	Not Defined	☐	Not in use	Active Low
DI7-9	Not Defined	☐	Not in use	Active Low
DI7-10	Not Defined	☐	Not in use	Active Low

Alarm Output	Alarm Source	Input/Channel	Alarm Configuration (Expand All)
CAM7-1	Alarm not in use	Alarm not in use	Alm Func: Normal; Rly Mode: N/R; Collapse
CAM7-2	Alarm not in use	Alarm not in use	Configure Alarm Detail
CAM7-3	Alarm not in use	Alarm not in use	Configure Alarm Detail
CAM7-4	Alarm not in use	Alarm not in use	Configure Alarm Detail
CAM7-5	Alarm not in use	Alarm not in use	Configure Alarm Detail
CAM7-6	Alarm not in use	Alarm not in use	Configure Alarm Detail
CAM7-7	Alarm not in use	Alarm not in use	Configure Alarm Detail
CAM7-8	Alarm not in use	Alarm not in use	Configure Alarm Detail
CAM7-9	Alarm not in use	Alarm not in use	Configure Alarm Detail
CAM7-10	Alarm not in use	Alarm not in use	Configure Alarm Detail

Clicking *Apply* then saves these values into the APM, or *Discard Changes* restores these values to their previous settings.

Discard Changes:

Click this button to restore the values to those present when the page was last re-displayed.

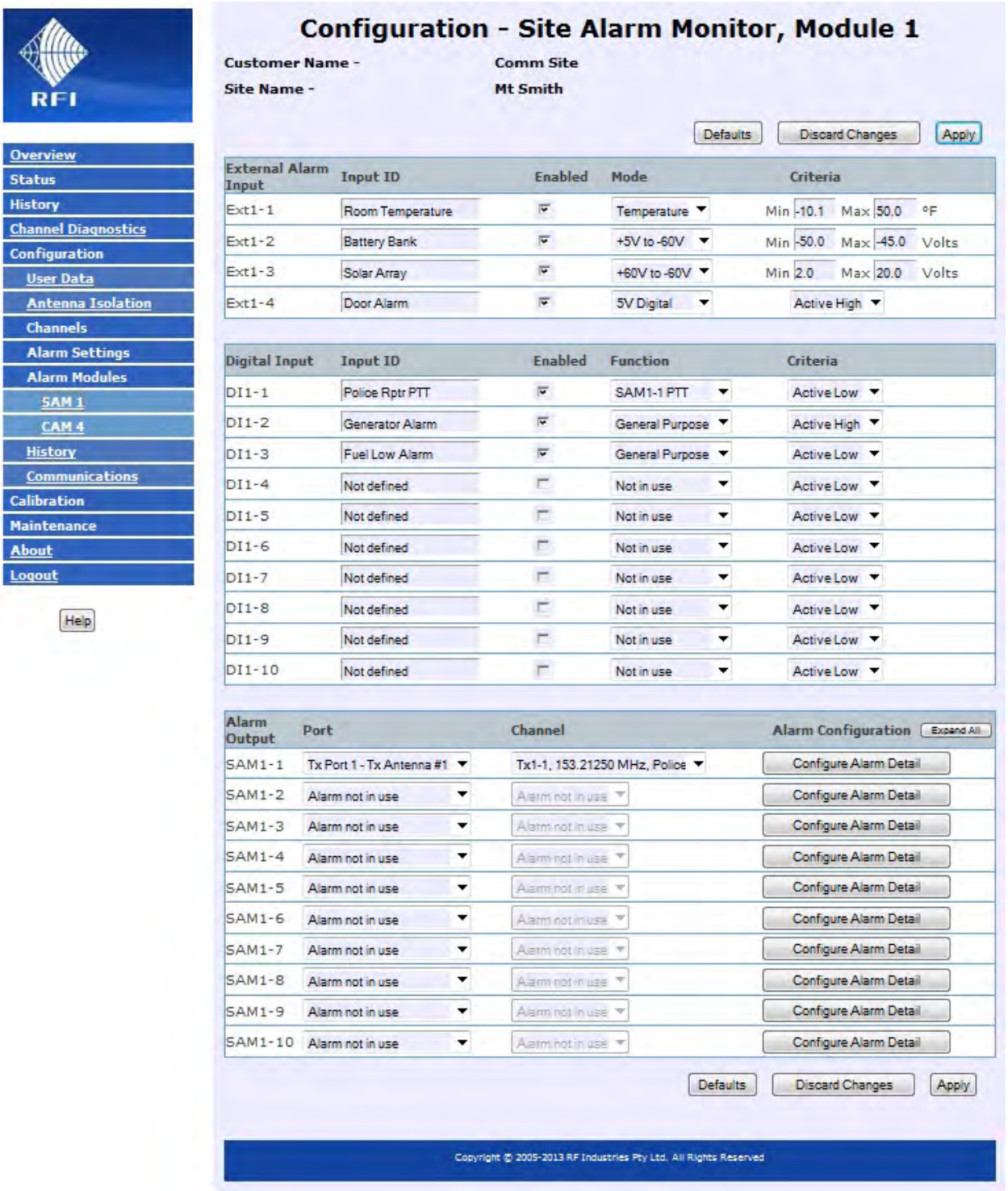
Note that if invalid values are being displayed after an Apply attempt, these values may not match the current system configuration. In this case, just select the relevant Configuration/Alarms/Tx Port menu item again to re-display the current configuration.

Apply:

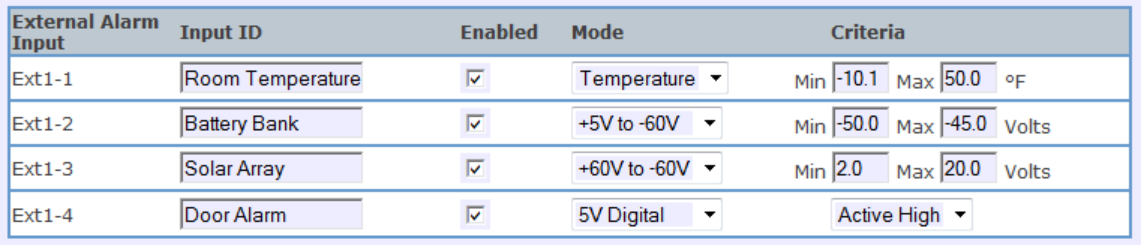
This will attempt to save and activate the values entered. If any out of range values are present, nothing will be saved and the problem settings will be highlighted with a red background.

Note: Whenever programming changes are applied, the alarm status for affected channels is re-initialized.

10.33 Configuration – Alarm Modules – Site Alarm Module



Each of the (optional) Site Alarm Module (SAM) units fitted to the APM is configurable as illustrated in this "*Configuration - Site Alarm Module*" page.



External Alarm Input:

Displays the four (4) configurable external temperature/analogue/digital inputs.

Input ID:

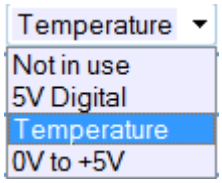
Enter a description for the External Alarm input signals. Up to 16 characters may be entered.

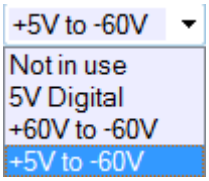
Enabled:

If the input is Enabled, an alarm condition will result in a System Fault summary alarm, together with an indication on the System Status page. Its status will also be displayed on the associated SAM Status page.

Mode:

Select the input mode for the external input. Ext1 may select from temperature/analogue/digital, and Ext2, Ext3 and Ext 4 may be selected from analogue/digital





Criteria:

Set the alarm threshold limits or input state (LOW or HIGH) that signals an alarm condition for each External Input.

Digital Input	Input ID	Enabled	Function	Criteria
DI1-1	Police #1 PTT	☑	SAM1-1 PTT	Active Low
DI1-2	Door Entry	☑	General Purpose	Active Low
DI1-3	Not defined	☐	Not in use	Active Low
DI1-4	Not defined	☐	Not in use	Active Low
DI1-5	Not defined	☐	Not in use	Active Low
DI1-6	Not defined	☐	Not in use	Active Low
DI1-7	Not defined	☐	Not in use	Active Low
DI1-8	Not defined	☐	Not in use	Active Low
DI1-9	Not defined	☐	Not in use	Active Low
DI1-10	Not defined	☐	Not in use	Active Low

Digital Input:

Displays the ten (10) configurable digital inputs.

Input ID:

Enter a description for the digital alarm signal. Up to 16 characters may be entered.

Enabled:

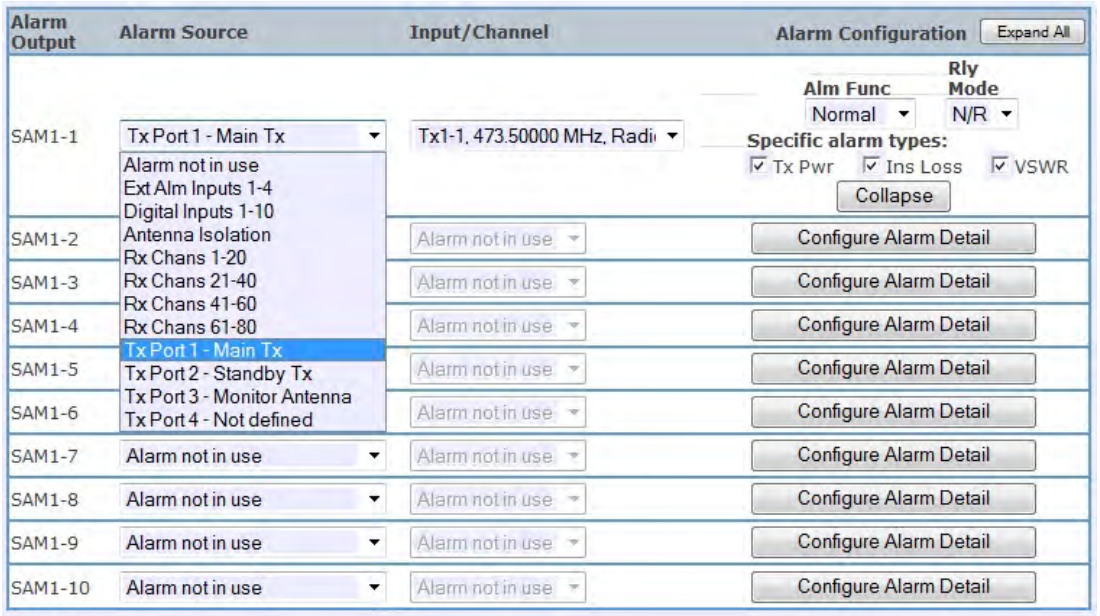
Selects if this input is enabled.

Function:

Select the input mode for each of the Digital Inputs.
A "SAMX-X PTT" selection affiliates the digital input as a base station PTT monitoring line for the base station assigned to that SAM Alarm Relay Output (see below). A "General Purpose" selection identifies the Digital Input as an independent digital input for monitoring external equipment, etc

Criteria:

Select the input state (LOW or HIGH) that signals an alarm condition.



Alarm Output:

These 10 rows configure the individual channel alarm outputs and PTT input settings. Selecting the *Configure Alarm Detail* button on each row expands its display (refer above example). Selecting the *Collapse* button minimises the row display.

Alarm Source:

Either select the source of the alarm for each channel, or select "Alarm not in use" to disable the alarm.

Input/Channel:

Having selected the source, select the desired input/channel to be assigned to the SAM alarm.

Alarm Configuration:

Alarm Func:

The following options are available:

Normal – The alarm relay is controlled by the channel alarm status.

Inactive – The alarm relay is forced to the "no alarm" state for testing.

Active – The alarm relay is forced to its "alarm" state for testing.

Latching – The alarm relay is "latched" by an instance of the alarm state, and remains in this position until unlatched by manually selecting the adjacent *Clr* box.

Note: When an alarm is current, the border of the *Configure Alarm Detail* button will be red, and when the Channel is expanded, the *Alm Func* box will also be red (refer above example).

Rly Mode:

The Relay Mode may be either Normally Released (N/R), i.e. it "operates" when an alarm is present, or Normally Operated (N/O), i.e. it "releases" when an alarm is present.

I/P Func:

This selects the channel specific input function. An application for this feature is to use it with a PTT signal from the transmitter. The following options are available;

Disabled – The input is not used.

PTT Low – An active LOW or "0" input signal is required. (A LOW is defined as <2.5vdc)

PTT High – An active HIGH or "1" input signal is required. (A HIGH is defined as >2.5vdc)

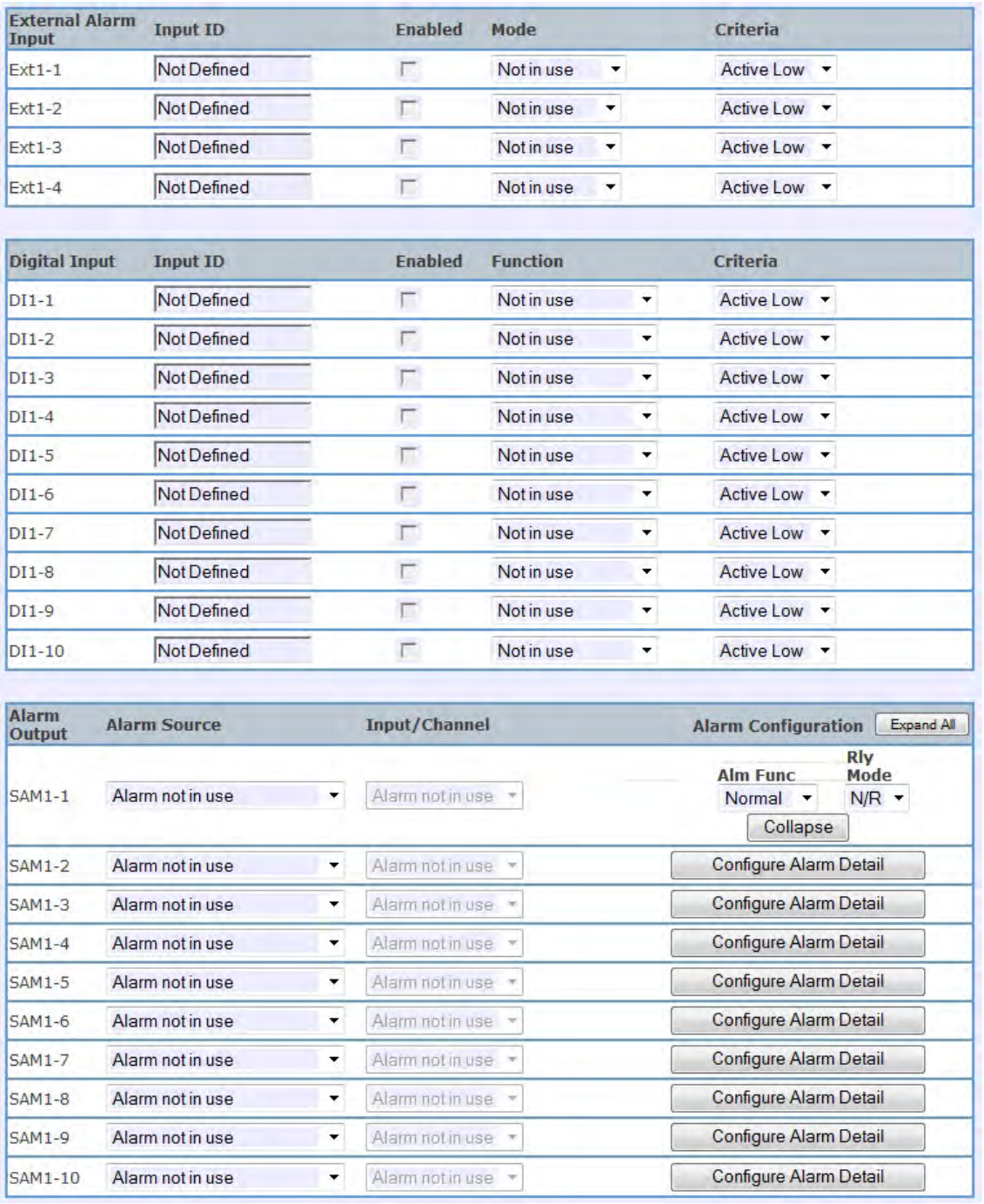
When the I/P Func input is enabled, it is used instead of the Threshold Power Level (configured on the Tx Port Channel Configuration page) to determine if the alarmed parameter should be measured. If used with the transmitter's PTT line, even if the transmitter produces no RF output, but the PTT line activation is present, an alarm condition can be determined. If the Threshold Power Level value was used instead, no RF level would be detected above the threshold level, so no measurements (or resulting alarm states) would occur.

Specific Alarm Types:

When selected, either Tx Power, Tx I.L. or VSWR (or any combination thereof) alarm conditions on the affiliated APM Tx channel will initiate an alarm output condition on this CAM channel.

Defaults:

Clicking this button restores the factory default values which are:



External Alarm Input	Input ID	Enabled	Mode	Criteria
Ext1-1	Not Defined	☐	Not in use	Active Low
Ext1-2	Not Defined	☐	Not in use	Active Low
Ext1-3	Not Defined	☐	Not in use	Active Low
Ext1-4	Not Defined	☐	Not in use	Active Low

Digital Input	Input ID	Enabled	Function	Criteria
DI1-1	Not Defined	☐	Not in use	Active Low
DI1-2	Not Defined	☐	Not in use	Active Low
DI1-3	Not Defined	☐	Not in use	Active Low
DI1-4	Not Defined	☐	Not in use	Active Low
DI1-5	Not Defined	☐	Not in use	Active Low
DI1-6	Not Defined	☐	Not in use	Active Low
DI1-7	Not Defined	☐	Not in use	Active Low
DI1-8	Not Defined	☐	Not in use	Active Low
DI1-9	Not Defined	☐	Not in use	Active Low
DI1-10	Not Defined	☐	Not in use	Active Low

Alarm Output	Alarm Source	Input/Channel	Alarm Configuration (Expand All)
SAM1-1	Alarm not in use	Alarm not in use	Alm Func: Normal; Rly Mode: N/R; Collapse
SAM1-2	Alarm not in use	Alarm not in use	Configure Alarm Detail
SAM1-3	Alarm not in use	Alarm not in use	Configure Alarm Detail
SAM1-4	Alarm not in use	Alarm not in use	Configure Alarm Detail
SAM1-5	Alarm not in use	Alarm not in use	Configure Alarm Detail
SAM1-6	Alarm not in use	Alarm not in use	Configure Alarm Detail
SAM1-7	Alarm not in use	Alarm not in use	Configure Alarm Detail
SAM1-8	Alarm not in use	Alarm not in use	Configure Alarm Detail
SAM1-9	Alarm not in use	Alarm not in use	Configure Alarm Detail
SAM1-10	Alarm not in use	Alarm not in use	Configure Alarm Detail

Clicking *Apply* then saves these values into the APM, or *Discard Changes* restores these values to their previous settings.

Discard Changes:

Click this button to restore the values to those present when the page was last re-displayed.

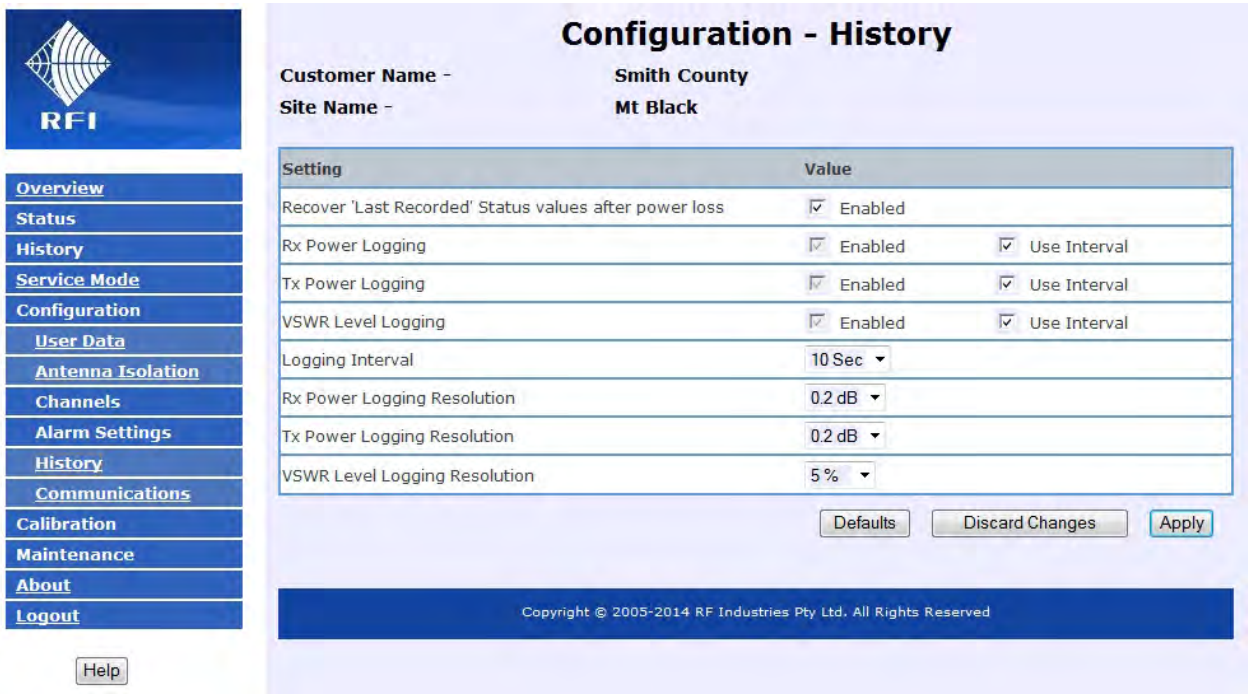
Note that if invalid values are being displayed after an Apply attempt, these values may not match the current system configuration. In this case, just select the relevant Configuration/Alarms/Tx Port menu item again to re-display the current configuration.

Apply:

This will attempt to save and activate the values entered. If any out of range values are present, nothing will be saved and the problem settings will be highlighted with a red background.

Note: Whenever programming changes are applied, the alarm status for affected channels is re-initialized.

10.34 Configuration – History



This page determines if measurements are logged into the APM's data memory and the period at which these values are logged.

Recover "Last Recorded" Status values after power loss:

This Enables or Disables whether "last recorded values" are restored after a power outage, or whether values remain at their power on defaults until a valid measurement is made for each field.

Rx Power Logging:

This setting Enables or Disables the Rx power level logging. Disabling the logging at any time will not affect any data already captured.

Tx Power Logging:

This setting Enables or Disables the Tx power level logging. Disabling the logging at any time will not affect any data already captured.

VSWR Level Logging:

This setting Enables or Disables the VSWR power level logging. Disabling the logging at any time will not affect any data already captured.

Logging Interval:

This sets the interval between the logging snapshots. For example, if set to "10 sec", a snapshot of all the current levels is taken and saved every 10 seconds.

Use Interval:

After each of the *RX Power Logging*, *Tx Power Logging* and *VSWR Level Logging* fields there is a *Use Interval* selection box. If selected, each of the Logging activities will use the displayed *Logging Interval* value between log entries. If not selected, logging of the respective data will occur for every measurement cycle.

Rx Power Logging Resolution:

If the difference between the current Rx level and the last level logged is less than this value, a new record will not be written to the history data files. Higher values will make it less likely that a new data record will be required. This may greatly increase the total period of time for which data can be stored in the available data memory space.

Tx Power Logging Resolution:

If the difference between the current Tx power level and the last level logged is less than this value, a new record will not be written to the history data files. Higher values will make it less likely that a new data record will be required. This may greatly increase the total period of time for which data can be stored in the available data memory space.

VSWR Logging Resolution:

If the difference between the current VSWR value and the last level logged is less than this value, a new record will not be written to the history data files. Higher values will make it less likely that a new data record will be required. This may greatly increase the total period of time for which data can be stored in the available data memory space.

Defaults:

Clicking this button selects the factory default values which are:

Setting	Value	
Recover 'Last Recorded' Status values after power loss	☑ Enabled	
Rx Power Logging	☑ Enabled	☑ Use Interval
Tx Power Logging	☑ Enabled	☑ Use Interval
VSWR Level Logging	☑ Enabled	☑ Use Interval
Logging Interval	10 Sec	
Rx Power Logging Resolution	0.5 dB	
Tx Power Logging Resolution	0.5 dB	
VSWR Level Logging Resolution	10 %	

Clicking *Apply* then saves these values into the APM, or *Discard Changes* restores these values to their previous settings.

Discard Channels:

Click this button to restore the values to those present when the page was last re-displayed.

Apply:

This will apply the values entered.

10.35 Configuration – Communications

Ethernet

DHCP:

If enabled, the unit will attempt to get its IP Address, Subnet Mask and Gateway settings from a DHCP server. If no DHCP server is found, the configured settings will be used. If not enabled, the configured settings will always be used.

IP Address:

The IP address for this unit.

Subnet Mask:

The network address mask to be used.

Gateway:

The address of the network gateway to be used.

Email

Summary system status messages:

Selects if *System summary status messages* are to be sent via email.

Detailed channel status messages:

Selects if *Detailed channel status messages* are to be sent by email.

SMTP Server IP Address:

Sets the IP address that email messages will be sent to. This must be the IP address of the email server that will send the email. DNS look-up is not supported, so the email server name (i.e. "smtp.live.com") is not a valid entry.

SMTP Server Listening Port:

Sets the port number used by the SMTP server. Commonly this will be Port 25, 2525 or 587. The IP connection to the APM must support access to the required IP Port. Email service providers can provide their email server Listening Port address if it is not already known.

SMTP Server Login Username:

When the email service being used to handle emails required login authentication, enter the account Username in this field. The entry should be the same as would otherwise be used if logging into that email service directly (i.e. "scott@gmail.com" for Gmail™ or "rfiAPMalarms" for Jango™).

SMTP Server Login Password:

When the email service being used to handle emails required login authentication, enter the account Password in this field. The entry should be the same as would otherwise be used if logging into that email service directly (i.e. "scott123!" for Gmail™ or "rfiAPMalarms" for Jango™). Ticking the *Reveal* box will display the password entered.

From Email Address:

Sets the email address that this unit will appear as in email messages. This must be a name in a valid email address format (i.e. xxxx@yyyyy.com etc).

Destination Email Address(es):

Sets the email address(es) that this unit will send email messages to. (up to 4 addresses may be used)

Note: Access to certain email addresses may be restricted by the SMTP Server being used. Emails to outside email addresses are generally not allowed by organisations' own email servers. At this time, this SMTP Email Alarms feature does not support the SSH authentication or encryption requirements that some email servers may require.

SNMP

Send Alarm Notifications (Traps):

Selects if sending SNMP Traps are enabled or disabled.

SNMP Manager IP Address:

Selects the IP address that SNMP notifications (Traps) will be sent to. Both a Primary and Secondary address may be used if required for redundant SNMP server configurations.

SNMP Manager Listening Port:

Selects the port number used by the SNMP Manager. Both a Primary and Secondary address may be used if required for redundant SNMP server configurations.

Note: SNMP MIB files for the APM are available from RFI.

Defaults:

Clicking this button enters the factory default values for the Communications settings, which are:

DHCP	Disabled
IP Address	192.168.1.200
Subnet Mask	255.255.255.0
Gateway	192.168.1.254

Discard Changes:

Click this button to restore the values to those present when the page was last re-displayed.

Note that if invalid values are being displayed after a Save attempt, these values may not match the current repeater configuration. In this case, just select the Configure/Communications menu item again to re-display the current configuration.

Save:

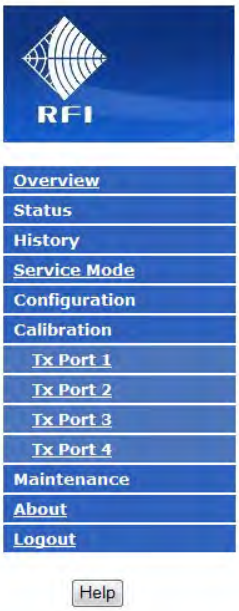
This will attempt to save the values entered. If any out of range values are present, nothing will be saved and the problem settings will be highlighted with a red background.

Note: Unlike the other configuration pages, this will not Activate (or "apply") the Ethernet settings if they have been changed. Ethernet changes can only be activated by restarting the APM unit, either by cycling the power, or through the Maintenance/Restart menu item.

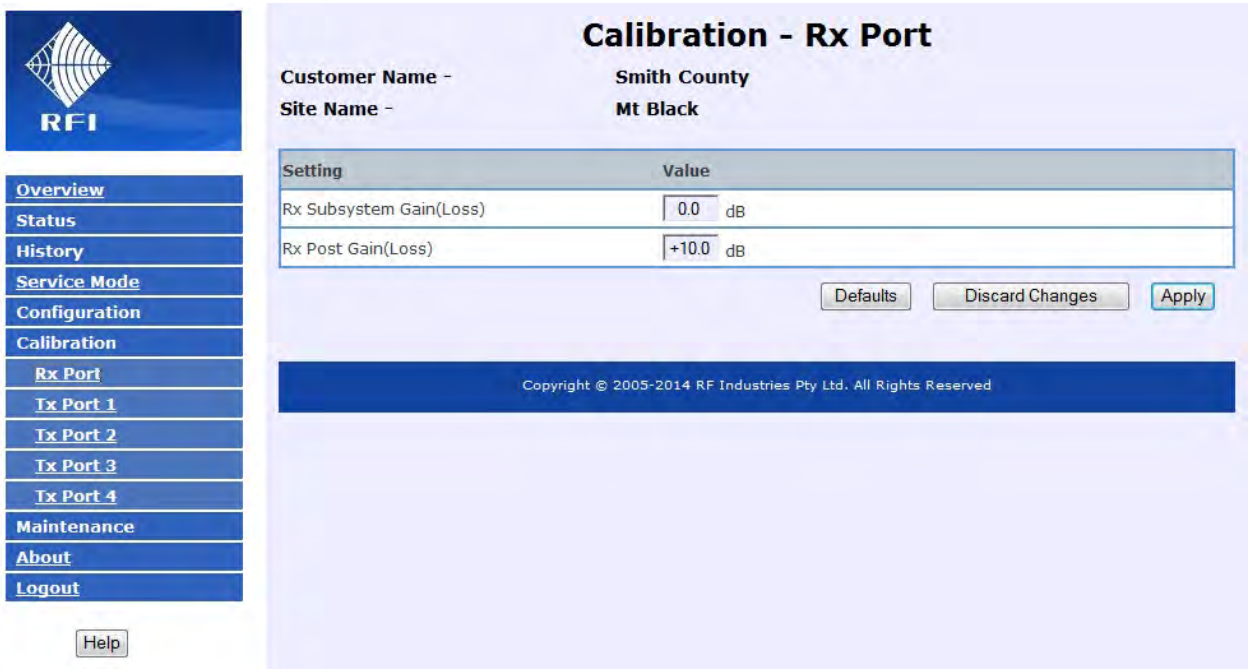
10.36 Calibration Menu

The "Calibration" menu allows the APMs associated system components' (couplers, feeders) values to be programmed.

Selecting each indented topic under "Calibration" will display that item as a separate display page.



10.37 Calibration – Rx Port



Rx Subsystem Gain (Loss):

This field previously appeared under *Configuration – Antenna Isolation* in earlier firmware versions.

The combined value of the receive antenna coaxial cable feeder insertion loss, TTA or Receiver Multicoupler gain (or loss) and an separate preselector or post-filter.

The value of the nett gain (or loss) of the Receiver subsystem should be entered here. This value represents the sum of the insertion losses of the various elements of the receiver subsystem and the gain of its amplifier elements (if any).

Examples of this may be;

Receiver Feeder loss	-3.0 dB
Receiver Preselector loss	-1.0 dB
Receiver Multicoupler gain	+7.0 dB
Rx Subsystem Nett Gain	+3.0 dB

or;

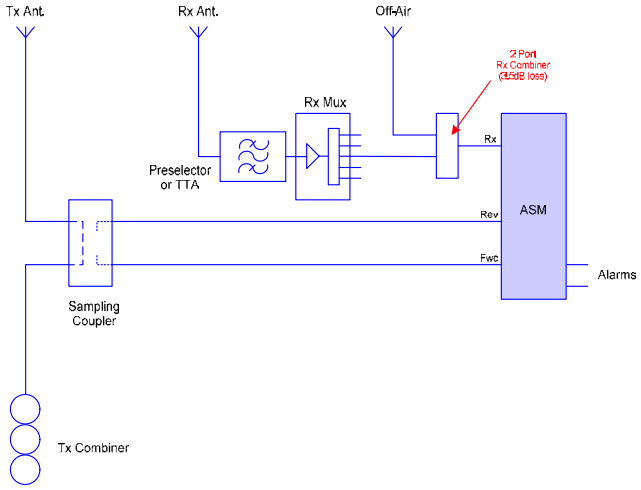
TTA Preselector loss	-1.0 dB
TTA Amplifier gain	+20.0 dB
Receiver Feeder loss	-3.0 dB
Receiver Multicoupler Divider loss	-10.0 dB
Rx Subsystem Nett Gain	+6.0 dB

The Rx Subsystem loss considers all of the Rx subsystem components that determine the Rx signal level as seen by the base station receivers on the site.

Rx Post Gain (Loss):

The value of any splitter/coupler loss that may be added into the system when multiple receiver paths are being combined for monitoring by an APM.

Example: a two port receiver combiner may add 3.5dB of additional loss into the APM receiver monitoring configuration (shown above as "-3.5").



Example Installation – Rx Post Gain (Loss) shown

The Rx Post Gain(Loss) value considers the additional loss/gain in the Rx subsystem that is seen by the APM – compared to that seen by the base station receivers on the site.

Defaults:

Clicking this button enters the factory default values for the Rx Port page, which are:

Rx System Gain(Loss)	0dB
Rx Post Gain (Loss)	0dB

Discard Changes:

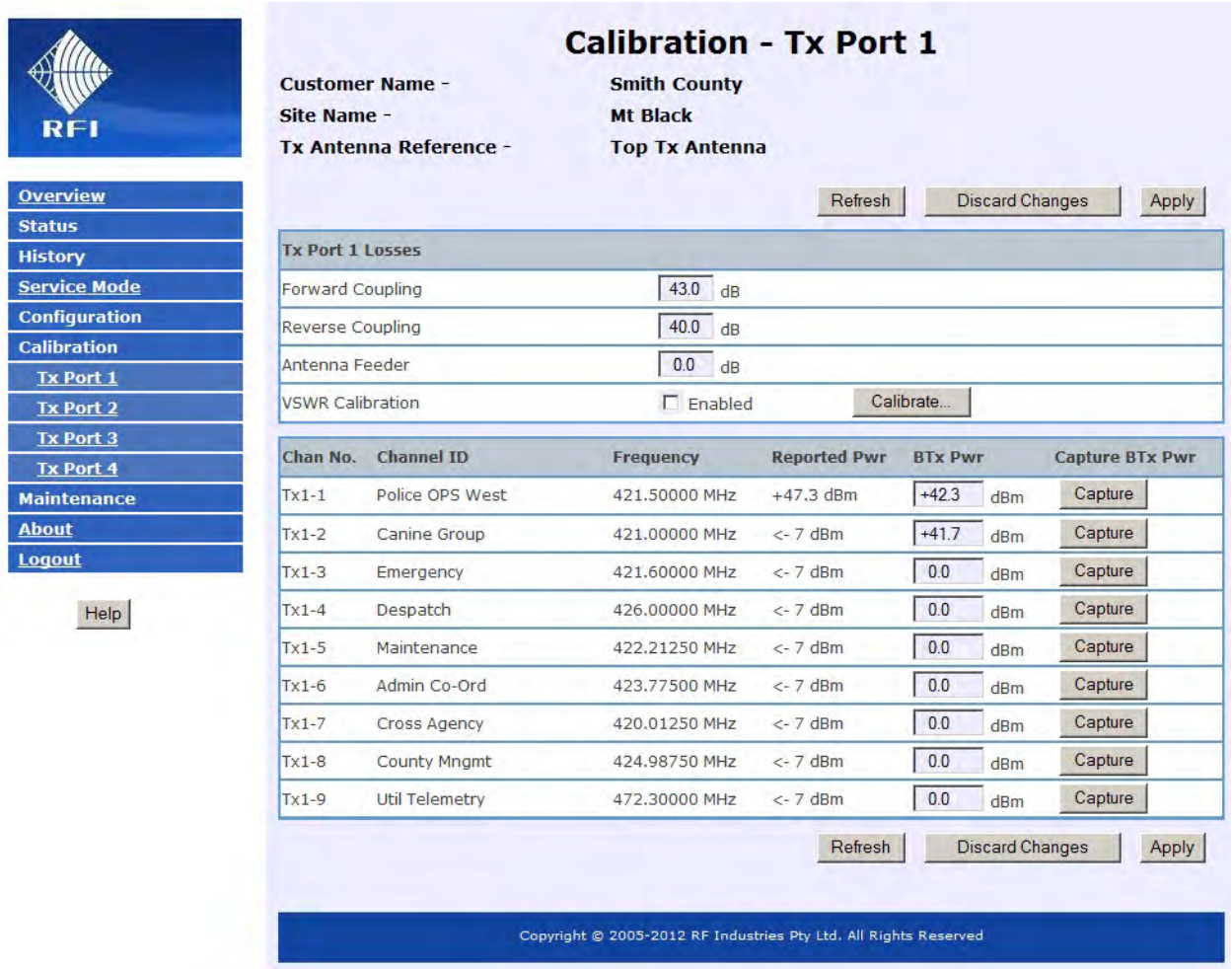
Click this button to restore the values to those present when the page was last re-displayed.

Note that if invalid values are being displayed after an Apply attempt, these values may not match the current repeater configuration. In this case, just select the Configure/Rx Port menu item again to re-display the current configuration.

Apply:

This will attempt to apply the values entered. If any out of range values are present, nothing will be saved and the problem settings will be highlighted with a red background.

10.38 Calibration – Tx Port 1



This page is used for calibrating the Coupler coupling loss settings and the Channel BTx Power levels.

Note: Only channels that have a frequency programmed, and which have been enabled will be displayed.

Tx Port Losses:

Forward Coupling:

The combined value of the Coupler forward coupling loss and the connecting cable insertion loss for this Tx Port. This value is used to calculate the reported power level for channels on this Port.

Reverse Coupling:

The combined value of the Coupler forward coupling loss and the connecting cable insertion loss for this Tx Port. This value is used to calculate the reflected power level for channels on this port and contributes to the reported VSWR figure.

Antenna Feeder:

The loss of the Antenna Feeder cable for this Port. This value is used to compensate the calculated Fwd and Rev Power levels so that the reported VSWR figure represents the VSWR value as seen at the Antenna. The value entered in this field should represent the insertion loss in one direction of the feeder only (i.e. from the Coupler "to" the antenna).

Reported Pwr:

The result of the last valid signal power level measurement in dBm. This will only be updated if the Tx power is above the programmed threshold level.

BTx Pwr:

This is the Base Tx Output Power that will be used to calculate Combiner Insertion Loss. It should indicate the Power Level expected at the input of the Combiner.

You can either manually enter a value (if known) or use the Capture button to copy the current Reported Pwr value to this field.

Capture BTx Pwr:

Copies the Reported Pwr value to the BTx Pwr field.

Refresh:

Click this button to update the Reported Pwr status information with the most recent measurements.

Discard Changes:

Click this button to restore the values to those present when the page was last re-displayed.

Note that if invalid values are being displayed after an Apply attempt, these values may not match the current saved settings. In this case, just click on the relevant "Calibration/Tx Port" menu item to re-display the current settings.

Apply:

This will attempt save and activate the values entered. If any out of range values are present, nothing will be saved and the problem settings will be highlighted with a red background. If successfully saved, the Reported Pwr values are adjusted to current values.

Note: Whenever programming changes are applied, the alarm status for affected channels is re-initialized.

RECOMMENDED CALIBRATION PROCEDURE

Calibration of the APM allows system parameters such as coupling values, interconnecting cable losses and system feeder losses to be programmed into the APM for optimum measurement accuracy.

Motorola has approved three methods of APM calibration;

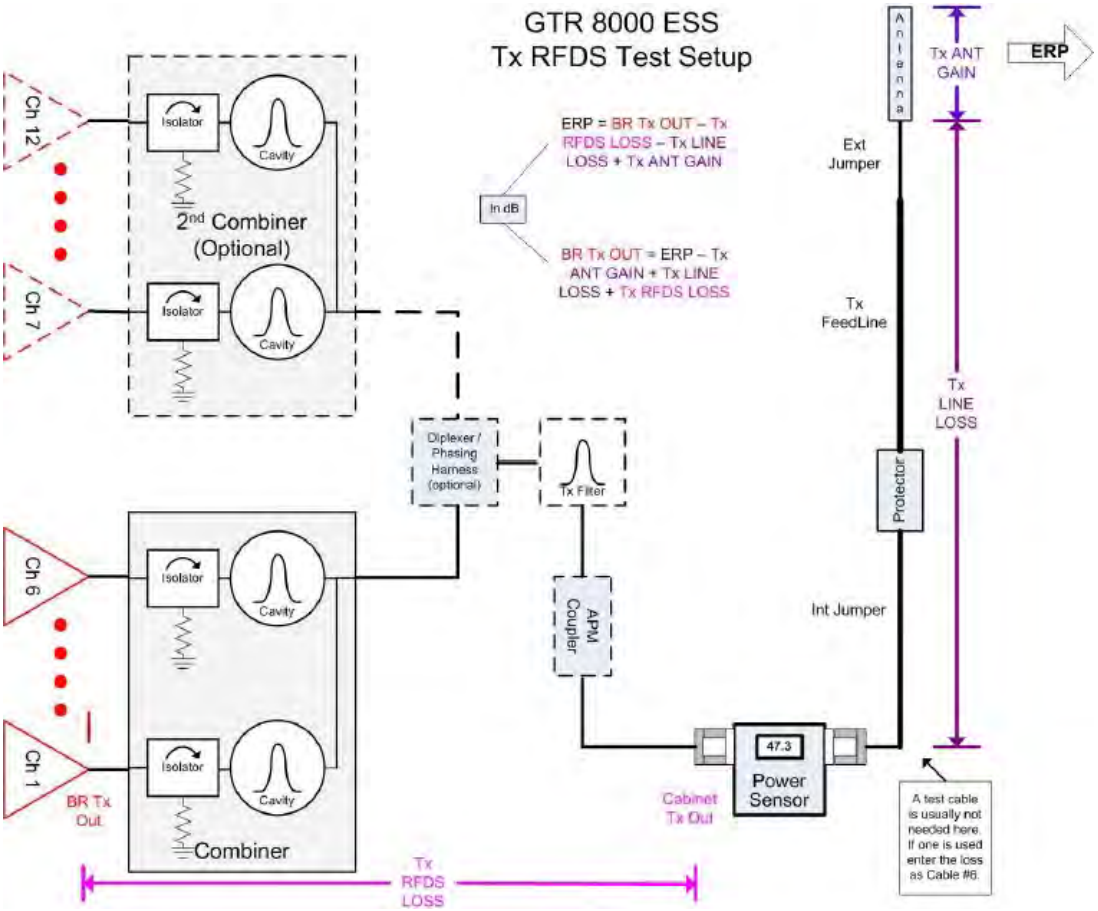
- Option 1 (preferred method) – utilizes high accuracy digital power meter as a reference.
- Option 2 (alternate to Option 1) - also utilizes high accuracy digital power measurement.
- Option 3 – utilizes a Service Monitor for APM calibration.

The first two options require an accurate power measurement device capable of measuring digital signals. The third option requires a Service Monitor capable of generating a 0dBm RF output signal utilizing the modulation scheme of the system being optimized. Test equipment requirements for each option are;

TEST EQUIPMENT REQUIREMENTS			
OPTION	**EQUIPMENT TYPE**	**VENDOR AND MODEL # (or equivalent)**	**COMMENTS**
1, 2	**Digital Power Meter**	**R&S NRT-Z14**	
1, 2, 3	**50Ω Termination**	**-**	**Capable of handling base station TX power**
3	**Service Monitor**	**-**	**Capable of generating system modulation @ 0 dBm**
3	**RF Cable for Svc Monitor**	**-**	**With known insertion loss**

For Motorola systems, there are two reference points for power measurement:

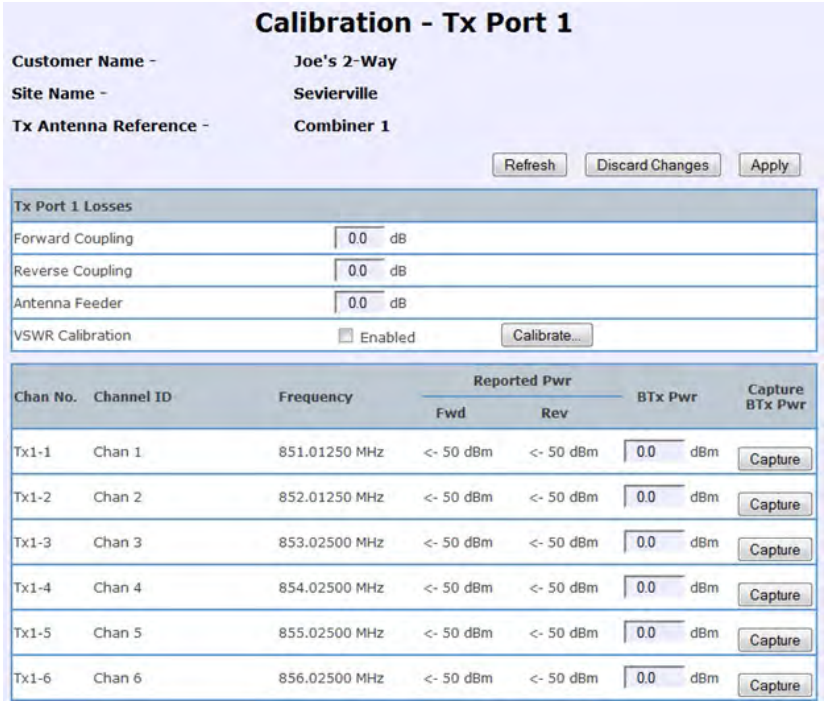
1. The TX output port of each repeater: "BR Tx Out", and
2. The TX output of the cabinet / rack: "Cabinet Tx Out"



NOTE: ***With this alignment procedure, the APM GUI's display of "Combiner I.L." actually will reflect the total "Tx RFDS LOSS" shown in the above drawing.***

Selecting each indented topic under the "Calibration" screen in the GUI will display that item as a separate page.

The following discusses the calibration of the APM "TX Port 1" and its associated hybrid coupler. The procedure for TX Ports 2, 3 and 4 is identical.



The above screen shot contains all the necessary fields for the calibration process.

CALIBRATION PROCEDURES

The only difference between Options 1 and 2 are the way in which the BTx power levels are entered into the APM. These steps will be performed first and then the remainder of the calibration procedure will apply to both options. Option 3 will be listed following the Option 1 / 2 procedure.

BTx POWER LEVEL SETTING:

OPTION 1 (Preferred)

1. Measure the output power, in dBm, of each repeater at the repeater TX connector using the Rohde & Schwarz (or equivalent) power sensor. The output of the sensor should connect to the cable which connects the repeater under test to the combiner input.

2. On the APM GUI, enter the measured power into the "BTx Pwr" field and then click the "Apply" button at the top right section of the screen.

3. Repeat Step 2 for each repeater associated with the APM TX Port being calibrated.

OPTION 2 *(Assumes all repeaters are set at the same power level. If not, use Option 1 procedure)*

1. Measure the output power, in dBm, of a repeater in the middle of the frequency range used by the system. Make the measurement at the repeater TX connector using the Rohde & Schwarz (or equivalent) power sensor. The output of the sensor should connect to the cable which connects the repeater under test to the combiner input.

2. On the APM GUI, enter this measured power into the "BTx Pwr" field for each of the repeater channels in the system associated with the TX Port being calibrated.

3. Click on the "Apply" button at the top right section of the screen.

The following procedures apply to both Option 1 and Option 2:

FORWARD COUPLING:

1. Preset the "Forward Coupling" and "Reverse Coupling" values on the screen to "40.0" dB.

2. Preset the "Antenna Feeder" to "0.0" dB

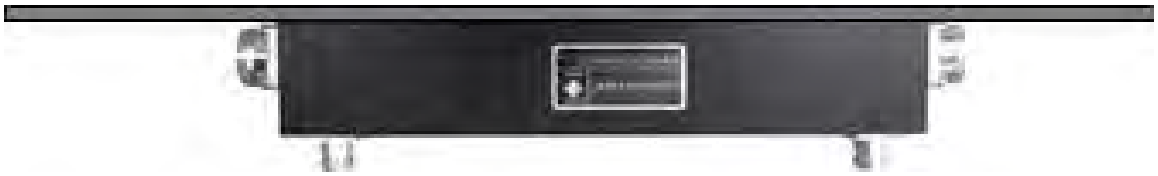
3. Connect the Rohde & Schwarz (or equivalent) power meter to the "Cabinet TX Out" port (see drawing on Page 2) and terminate the output of the sensor into the site antenna network. Key a repeater, near the center of the frequency range of the system, and note the forward power (in dBm).

4. Adjust the "Forward Coupling" value as needed until the "Reported Pwr – Fwd" matches the power measured in Step 4. ***NOTE: You must click on "Apply" after each change in the coupling value for the new value to take effect.*** Click the "Refresh" button several times to ensure a stable power reading on the APM.

5. Set the "Reverse Coupling" value to the same as the "Forward Coupling" value and click "Apply"

COUPLER TYPES (LEGACY or CURRENT)

Confirm that the coupler, for UHF and 700/800 MHz, is the latest model. The latest models will have the "FWD" and "REV" Type N connectors at either end of the coupler, next to the DIN connectors. For reference, here are photos of both types of couplers:



"Legacy" Bi-Directional Coupler (VHF shown, UHF and 700/800/900 MHz are similar in appearance but shorter)

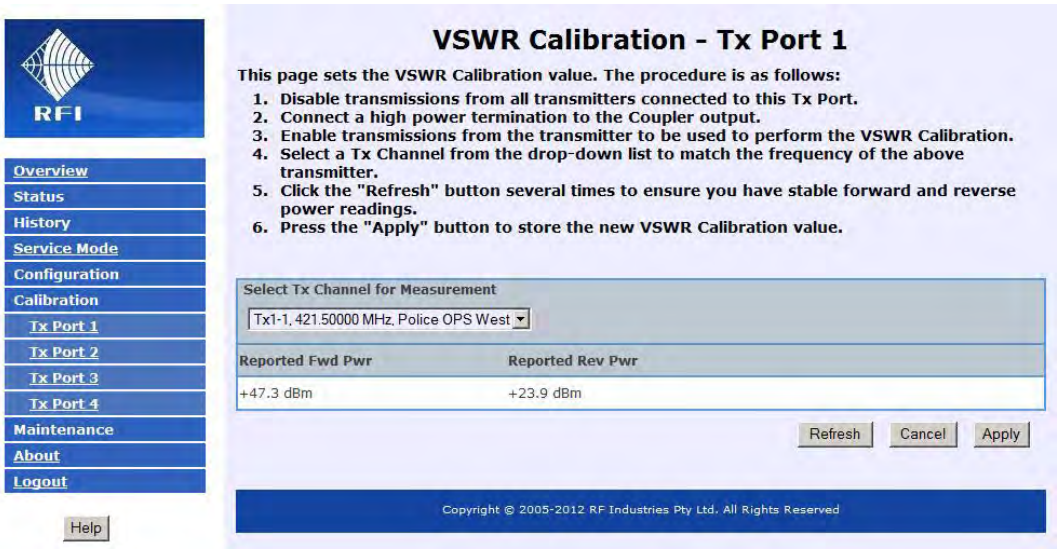
"Current" Dual-Directional Coupler (used for UHF, 700/800/900 MHz only)

Note: If your couplers are VHF, legacy UHF or legacy 700/800 MHz, perform the *VSWR Calibration* described on the following pages, otherwise proceed to the Calibration Confirmation section

VSWR CALIBRATION:

1. On the Calibration Screen, check the "Enabled" box next to "VSWR Calibration"
2. Click "Apply"
3. Click on the "Calibrate" button

The following screen will appear:



Follow the calibration steps listed on the screen.

Note: You can connect the termination to the "Cabinet TX Out" port rather than directly to the APM coupler as mentioned in Step 2 as described on the screen.

REVERSE COUPLING: (*Perform these steps regardless of coupler type*)

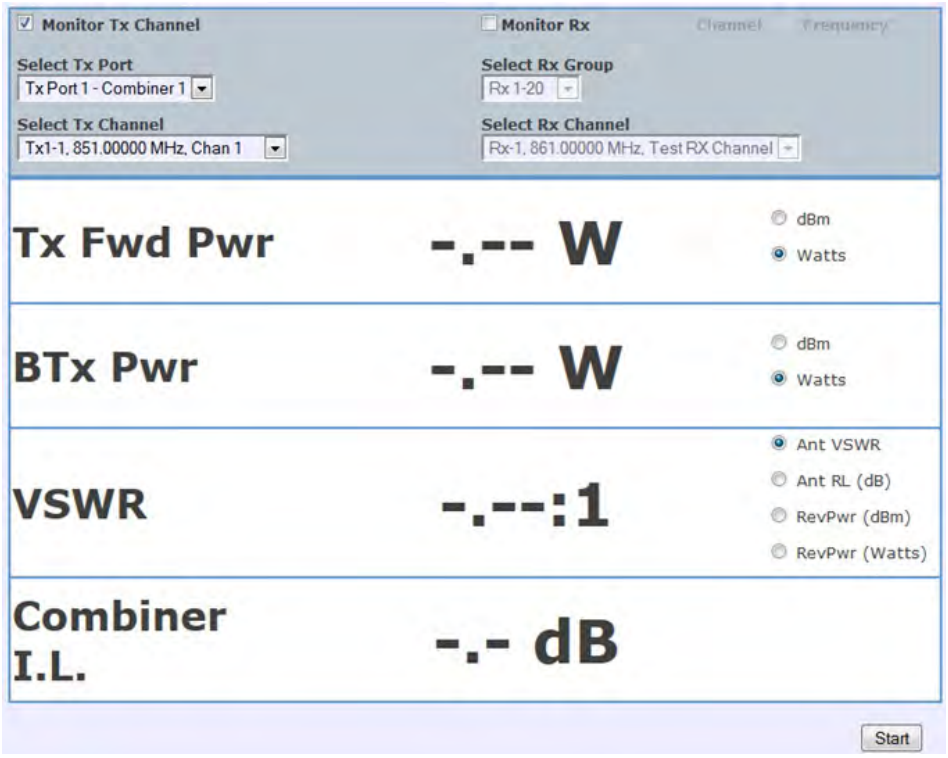
1. Connect the antenna system to the output of the Rohde & Schwarz sensor (the input of the sensor should still be connected to the "Cabinet TX Out" connector. The objective here is to measure some reflected power rather than using the 50Ω termination which would provide minimal reflected power.
2. Key a repeater near the center frequency of the system frequencies and measure the value of the reflected power, in dBm.
3. Adjust the Reverse Coupling value until the APM "Reported Pwr – Rev" matches that read on the R&S meter.

Note: You *must* click on "Apply" after each change in the coupling value for the new value to take effect. Click the "Refresh" button several times to ensure a stable power reading on the APM.

CALIBRATION CONFIRMATION

1. With the antenna system connected, and the R&S sensor still in-line, select "Service Mode" on the APM GUI menu (screen shot on the next page).
2. At the top left of the GUI screen, select the appropriate TX Port and Channel from the drop down menus.
3. At the lower portion of the screen, click on "Start". This will "lock" the APM onto the selected channel and begin sampling the forward and reflected power levels.
4. Key the repeater and compare the forward and reflected power readings with those measured by the R&S meter. The readings should correlate closely. If so, the calibration has been confirmed.
5. De-key the station and click "Stop" at the bottom of the APM screen.
6. From the GUI menu, click on "Calibration" and select the appropriate TX Port.
7. Enter the antenna feeder loss in the upper portion of the screen, below the coupler loss values and then click "Apply".
8. The APM will now display SWR at the antenna rather than at the "Cabinet Tx Out" port.

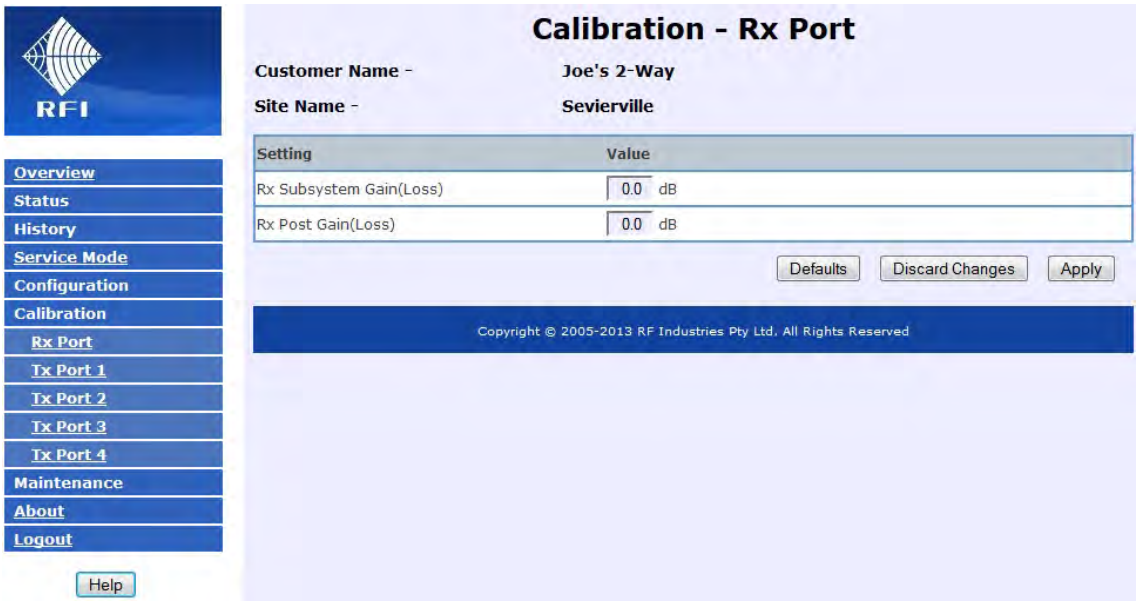
Note: In the future, if the SWR at the "Cabinet Tx Out" port needs to be measured, simply change the feedline loss to 0.0 dB, click "Apply" and then make the measurement. Before leaving the site, return the feedline loss to the previous value and click "Apply" again.



RX PORT CALIBRATION

The following will calibrate the APM Rx levels read from an output port of the receive multicoupler.

At the APM GUI, click on "Calibration" and then "RX Port". The following screen will appear:



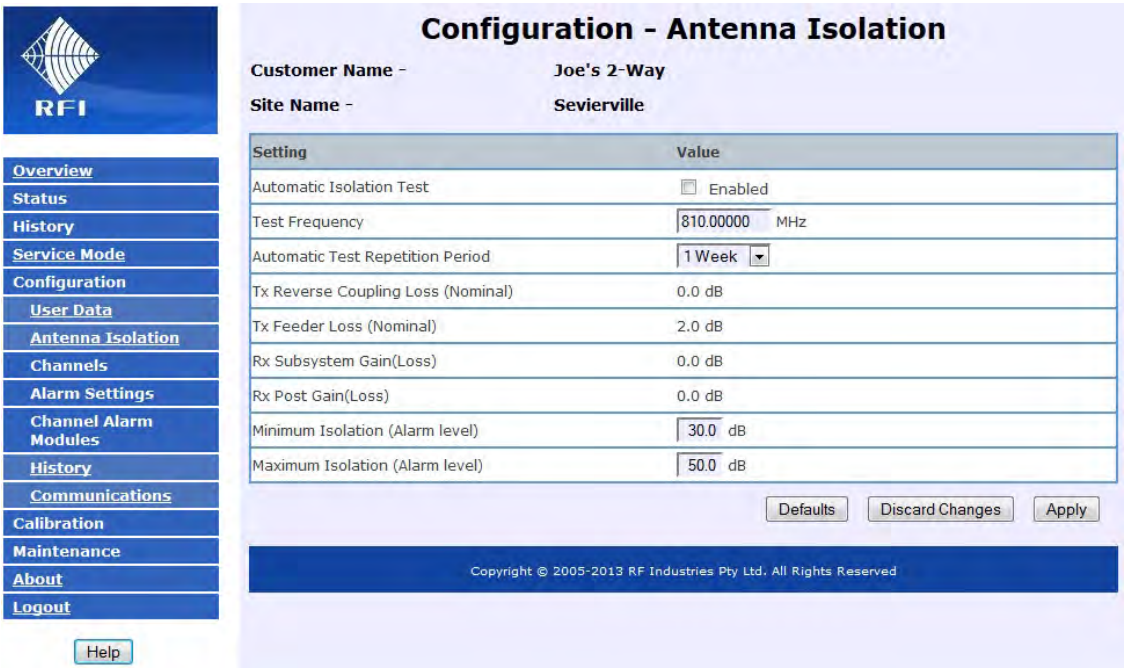
For TTA / RX multicoupler systems, enter the system Reserve Gain in the "RX Subsystem Gain (Loss)" field. For non-TTA systems, enter the net of the RX feedline loss and any multicoupler gain. Gain is entered as a positive number, loss as a negative number.

The "RX Post Gain (Loss)" field is for any gain or loss in line with the APM RX input which is not present in the path to the base receiver(s). Click on the "Help" button shown for further explanations. The objective here is to ensure that the APM is displaying the receive level present at the input of any site receivers.

ANTENNA ISOLATION CONFIGURATION

If antenna isolation testing is not going to be used, this step may be skipped.

At the APM GUI, select "Configuration" and then "Antenna Isolation". The following screen will be displayed:



There are five items which need to be set:

1. Automatic Isolation Test (Enabled or not)
2. Test Frequency
3. Automatic Test Repetition Period (from drop-down menu)
4. Minimum Isolation (Alarm level)
5. Maximum Isolation (Alarm level)

The four fields in the center of the chart are automatically filled in based on previous entries. Be sure to click on "Apply" after completing the screen so that the entered values are saved.

APM CALIBRATION PROCEDURE (Option 3)

1. Connect the service monitor to the "Combiner" port of the APM hybrid coupler and the 50Ω termination to the "Antenna" port of the coupler.

2. Set the generator to the correct modulation type for the channel being measured and adjust its output level for 0 dBm.

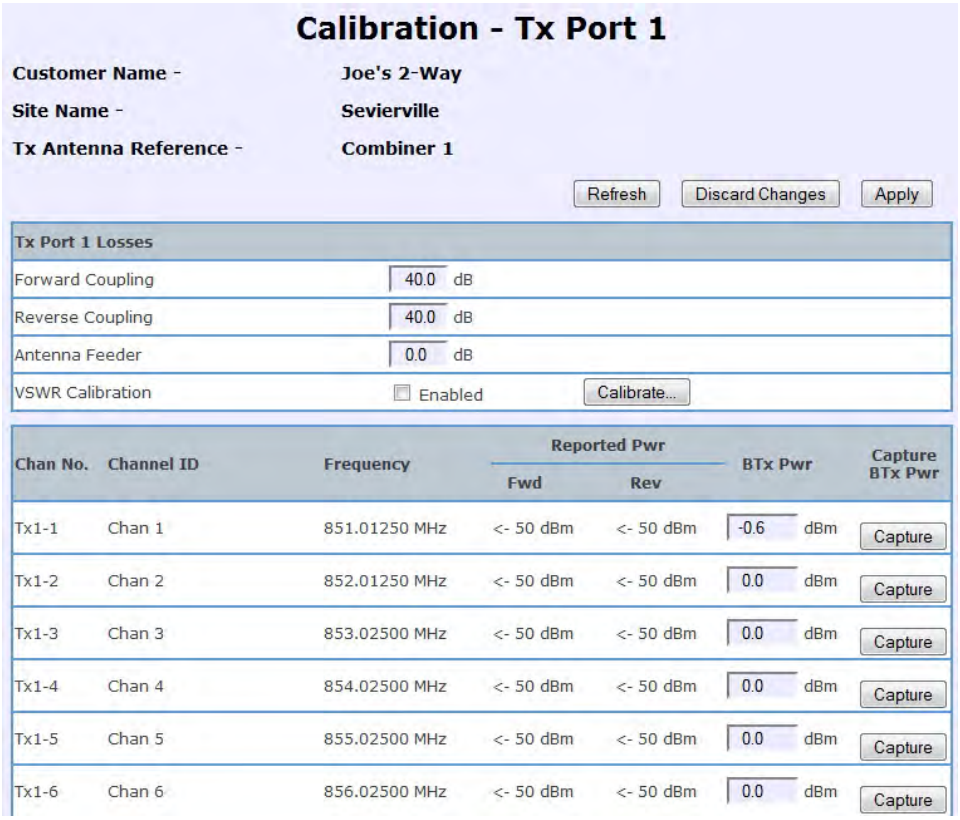
3. Enter 40.0 dB into both the Forward Coupling and Reverse Coupling fields on the GUI.

4. Enter 0 dB into the Antenna Feeder field.

5. Enter the signal level (generator setting minus cable loss) into the BTx Power field. For this example, that is 0dBm – 0.6 dB = -0.6 dBm. This is the level present at the "Combiner" port of the hybrid coupler.

   Note: Do not press the "CAPTURE" button to the right of the BTx Power level field.

6. The GUI should appear as follows:



7. Click the "Apply" button toward the upper right of the screen.

8. Look at the "Reported Pwr - Fwd" field for the channel being used for calibration.

9. "BTx Pwr" field. Click the "Apply" button each time a change is made to "Forward Coupling" value.

10. At this point, disregard the reading in the "Reported Pwr - Rev" field.

11. Once the "Reported Pwr - Fwd" and "BTx Power" fields match, click the "Refresh" button a few times to confirm a stable reading and then click the "Apply" button and make no further changes to the "Forward Coupling" value.

REVERSE COUPLING

1. Keep the generator settings and test cable the same.
2. Move the generator cable to the "Antenna" port of the hybrid coupler and the 50Ω termination to the "Combiner" port of the coupler.
3. Click the "Refresh" button and note the power level shown in the "Reported Pwr - Rev" field.
4. Adjust the "Reverse Coupling" value up or down until the displayed "Rev" power reading matches that in the "BTx Pwr" field. Click the "Apply" button each time a change is made to the "Reverse Coupling" value.
5. At this point, disregard the reading in the "Reported Pwr - Fwd" field.
6. Once the "Reported Pwr - Rev" and "BTx Pwr" fields match, click the "Refresh" button a few times to confirm a stable reading and then click the "Apply" button and make no further changes to the "Reverse Coupling" field.

BTx POWER SETTING

In order to allow an accurate calculation of Combiner Insertion Loss, the value of transmit power applied to the combiner input from each transmitter (in dBm) needs to be entered into the "BTx Power" field. There are two procedures which can be used:

- Motorola Preferred
- Optional

With the "Preferred" procedure, the actual base station input power to the combiner is measured and stored within the APM for each station. With the "Optional" procedure, one station's input power to the combiner is measured and stored. The remaining stations power levels are then simply entered into the APM GUI and saved. In either case, a final check is to verify the combiner insertion loss for each channel. If the optional procedure has been used, any channel exhibiting incorrect combiner loss (factory spec ± 1 dB), the TX power into that channel must be measured and saved into the APM using the preferred procedure before beginning any combiner troubleshooting or retuning.

The APM may be used to measure and store the power for each channel. This is achieved by performing the following procedure:

1. Connect a known good 50Ω load to the "Antenna" port of the APM hybrid coupler.
2. Connect the cable from each station, one at a time, to the "Combiner" port of the APM coupler.
3. Key the base station.
4. Click on the "Refresh" button at the top of the Calibration screen until a stable value is shown in the "BTx Pwr" field of the associated channel.
5. Click the "Capture BTx Pwr" button associated with the channel being measured.
6. Click the "Apply" button after each capture.
7. Repeat for each base station.

The APM will retain the measured power level until such time as it is changed either manually or by a repeating of the above procedure at a later date.

OPTIONAL METHOD:

If the BTx power level is accurately known, simply enter it for each channel and then click the "Apply" button to save all values. The combiner insertion loss is calculated by subtracting the measured forward power at the APM coupler from the value assigned in the "BTx Pwr" field. A table of watts vs dBm is shown below for reference:

TX POWER (WATTS)	TX POWER (dBm)
10	40.0
15	41.8
20	43.0
25	44.0
30	44.8
35	45.4

TX POWER (WATTS)	TX POWER (dBm)
40	46.0
45	46.5
50	47.0
55	47.4
60	47.8
65	48.1

TX POWER (WATTS)	TX POWER (dBm)
70	48.5
75	48.8
80	49.0
85	49.3
90	49.5
95	49.8
100	50.0

VSWR CALIBRATION:

Confirm that the coupler, for UHF and 700/800 MHz, is the latest model. The latest models will have the "FWD" and "REV" Type N connectors at either end of the coupler, next to the DIN connectors. For reference, here are photos of both types of couplers:

For reference, the following photos show the physical difference between the two types of couplers:

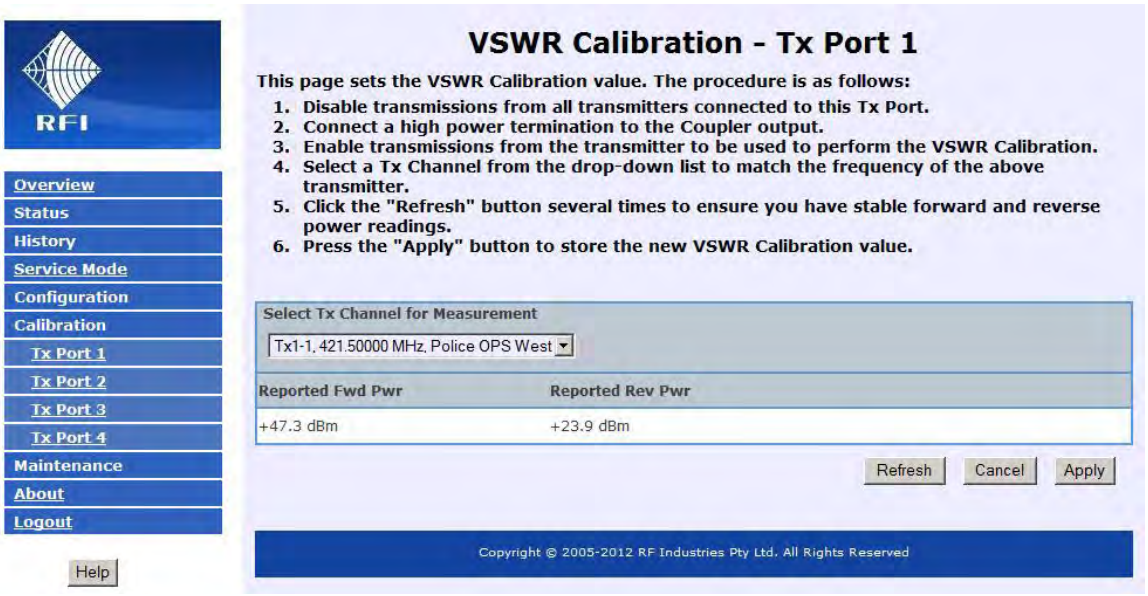
Legacy Bi-Directional Coupler (VHF shown, UHF and 700/800/900 MHz are similar, but shorter)

Current Dual-Directional Coupler (UHF, 700/800/900 MHz only)

The legacy couplers are readily identifiable as they have the "FWD" and "REV" ports (Type N connectors) along the bottom edge. The bi-directional couplers have those ports on the ends of the coupler along with the 7/16 DIN connectors.

Note: If your couplers are VHF, legacy UHF or legacy 700/800 MHz, perform the *VSWR Calibration* described on the following pages, otherwise proceed to the Calibration Confirmation section

To perform the VSWR Calibration, select a channel in the middle of the frequency range and then check the "Enabled" box on the Calibration screen. Click the "Calibrate" button to the right of the box and the following screen will be displayed:

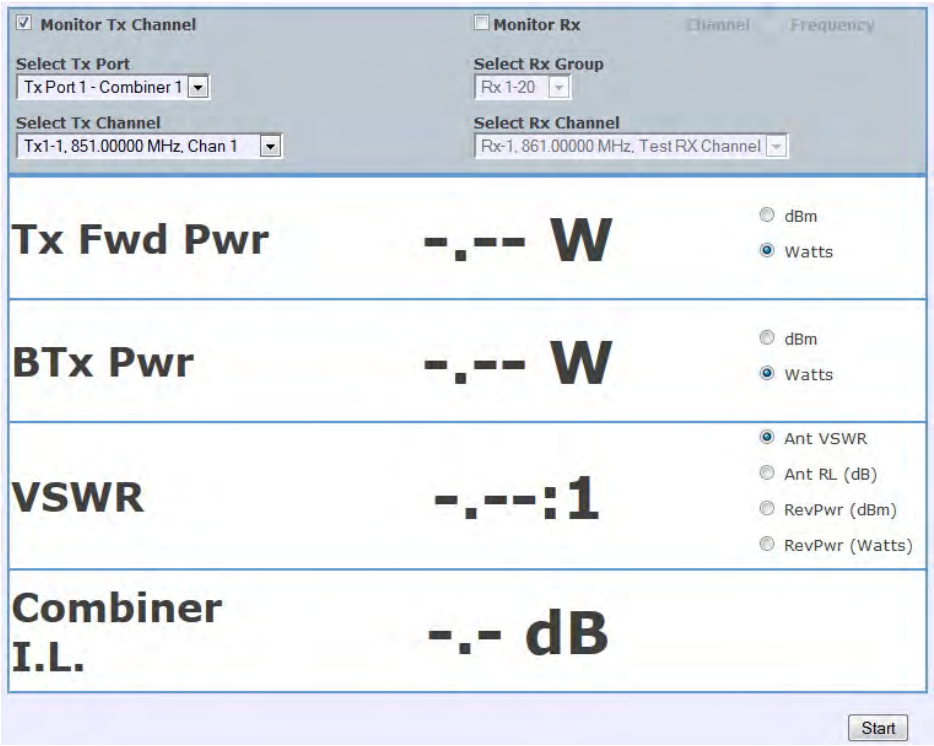


Follow the procedure shown on this screen to complete the VSWR Calibration.

VERIFICATION

Now that the calibration has been completed, a quick check will verify performance.

1. Connect the 50Ω termination to the "Antenna" port on the APM coupler
2. Connect the combiner output to the "Combiner" port on the APM coupler
3. In the GUI menu, select "Service Mode" (screen shot below)
4. In the "Service Mode", select the TX Port and Channel to be tested.



5. Key the base station and note the Forward power and VSWR. The VSWR should be low with the load attached.

6. De-Key the station and connect the antenna system.

7. Repeat Step 5 noting that the VSWR may be a bit higher with the antenna attached.

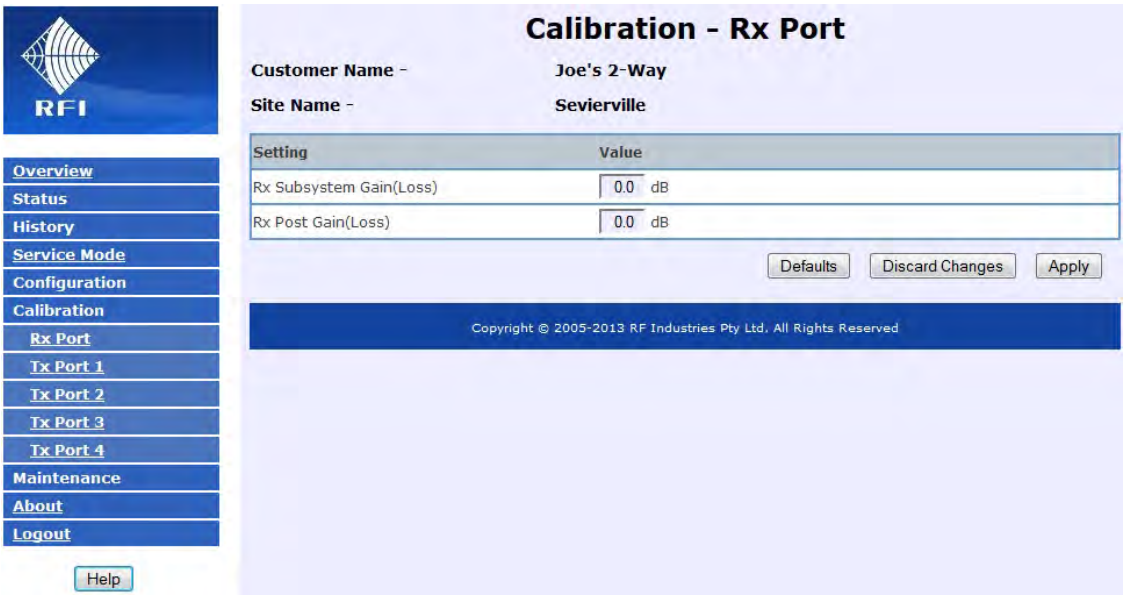
8. Return to the "Calibration" menu, enter the Feed Line loss into the "Antenna Feeder" field and then click "Apply". The APM will now display the VSWR calculated at the antenna rather than the base of the feedline. If you prefer the APM to measure the VSWR at the bottom of the feed line (output port of the coupler), leave the feed line loss at 0 dB.

9. Repeat the above verification for a channel within each of the active "TX Ports"

Rx PORT CALIBRATION

The following will calibrate the APM RX levels read from an output port of the receive multicoupler.

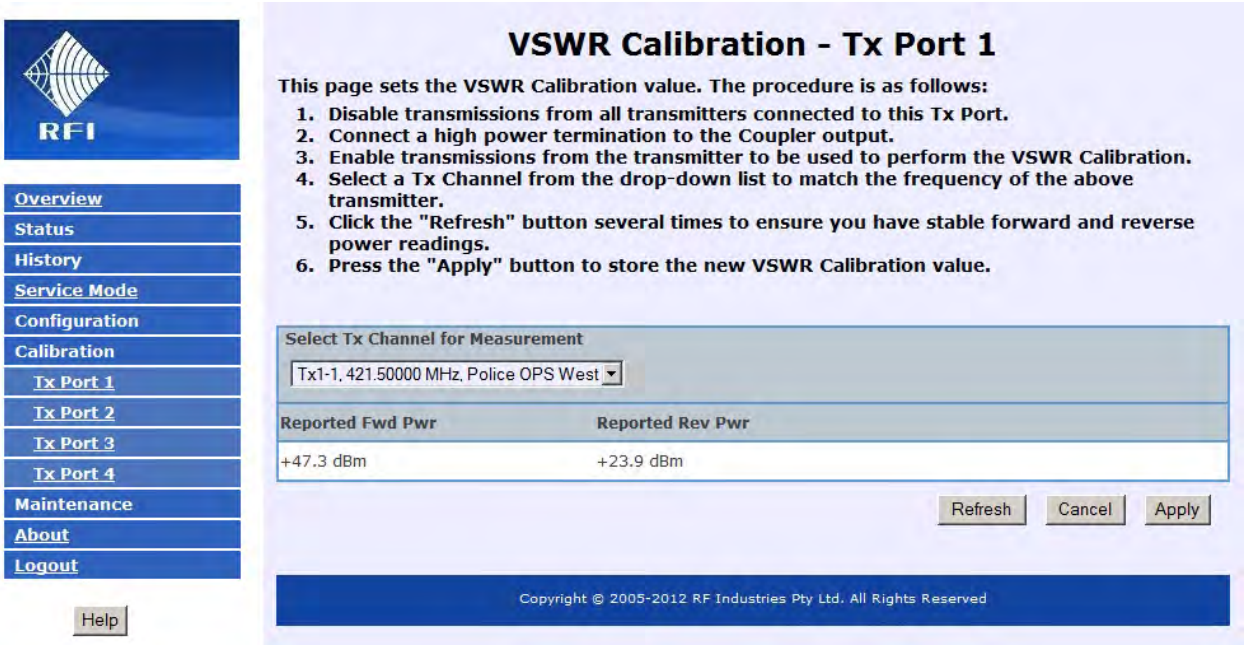
At the APM GUI, click on "Calibration" and then "RX Port". The following screen should appear:



For TTA / RX multicoupler systems, enter the system Reserve Gain in the "RX Subsystem Gain (Loss)" field. For non-TTA systems, enter the net of the RX feedline loss and any multicoupler gain Gain is entered as a positive number, loss as a negative number.

The "RX Post Gain (Loss)" field is for any gain or loss in line with the APM RX input which is not present in the path to the base receiver(s). Click on the "Help" button shown for further explanations. The objective here is to ensure that the APM is displaying the receive level present at the input of any site receivers.

10.39 VSWR Calibration



This page is used to set up the VSWR Calibration algorithm for VHF, UHF and 700/800/900MHz systems utilising "legacy" model bi-directional couplers.

The APM is equipped with an algorithm to improve the "at the antenna" VSWR measurement for installations utilising these "legacy" model couplers. This algorithm compensates for some of the feeder system frequency and phase variables present during VSWR measurement and is not required, and should not be used, for site installations using "current" model dual-directional couplers. For site installations using "current" model couplers, the VSWR Calibration *Enabled* box should remain unchecked, and the *Tx Port VSWR Calibration* process need not be performed.

Reported Fwd Pwr & Reported Rev Pwr:

The result of the last signal power level measurements in dBm.

To update to the latest measurements, click the Refresh button.

Cancel:

Exits the VSWR Calibration page without saving any changes and returns to the Tx Port Calibration page.

Apply:

This applies the VSWR Calibration algorithm. Use the Enable setting on the Tx Port Calibration page to control usage of the algorithm in VSWR calculations.

TX PORT VSWR CALIBRATION:

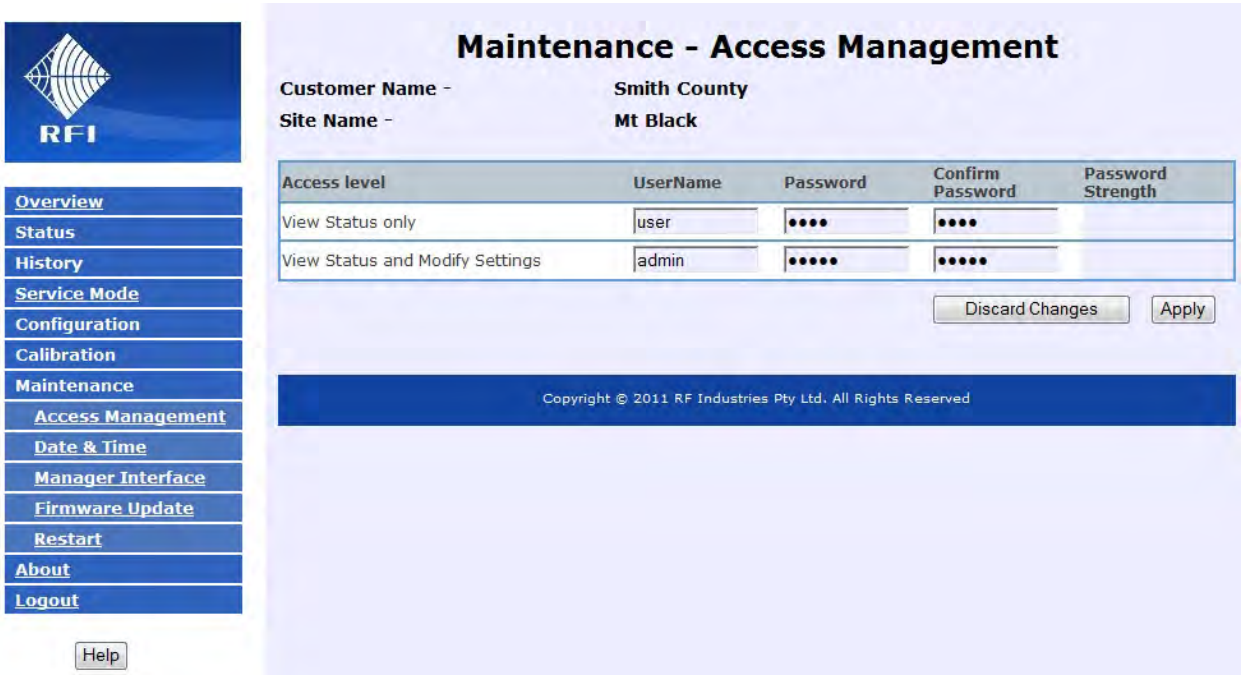
To perform the VSWR Calibration, complete the *RECOMMENDED CALIBRATION PROCEDURE in the* previous section of this manual.

10.40 Maintenance Menu

The "Maintenance" menu allows all of the APMs interface and system-wide formatting parameters to be viewed.

Selecting each indented topic under "Maintenance" will display that item as a separate display page.

10.41 Maintenance – Access Management



This page is used for managing access to the APM. There are two levels of access available to users of the system:

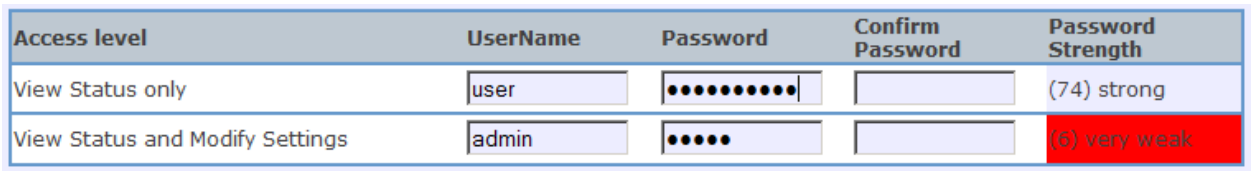
View Status only:

These are the User Name and Password to be used by users that may only view Status pages. Users logged in with these credentials will not be able to view or change any Configuration settings.

View Status and Modify Settings:

The User Name and Password to be used by users that are to have access to the Configuration, Calibration and Maintenance settings as well as the Status pages.

Note: User Names and Passwords may contain up to 16 characters each. Passwords are case sensitive, but User Names are not. Passwords are strength tested, as they are entered, to assist appropriate security integrity is maintained. Passwords must meet a Password Strength value of at least 50 to be accepted.



Tips for strong passwords:

Make your password 8 characters or more in length.
Use mixed case letters (upper and lower case).
Make more than one digit a number.
Use special characters (!,@,#,$,%,^,&,*,?,_,~).

Discard Changes:

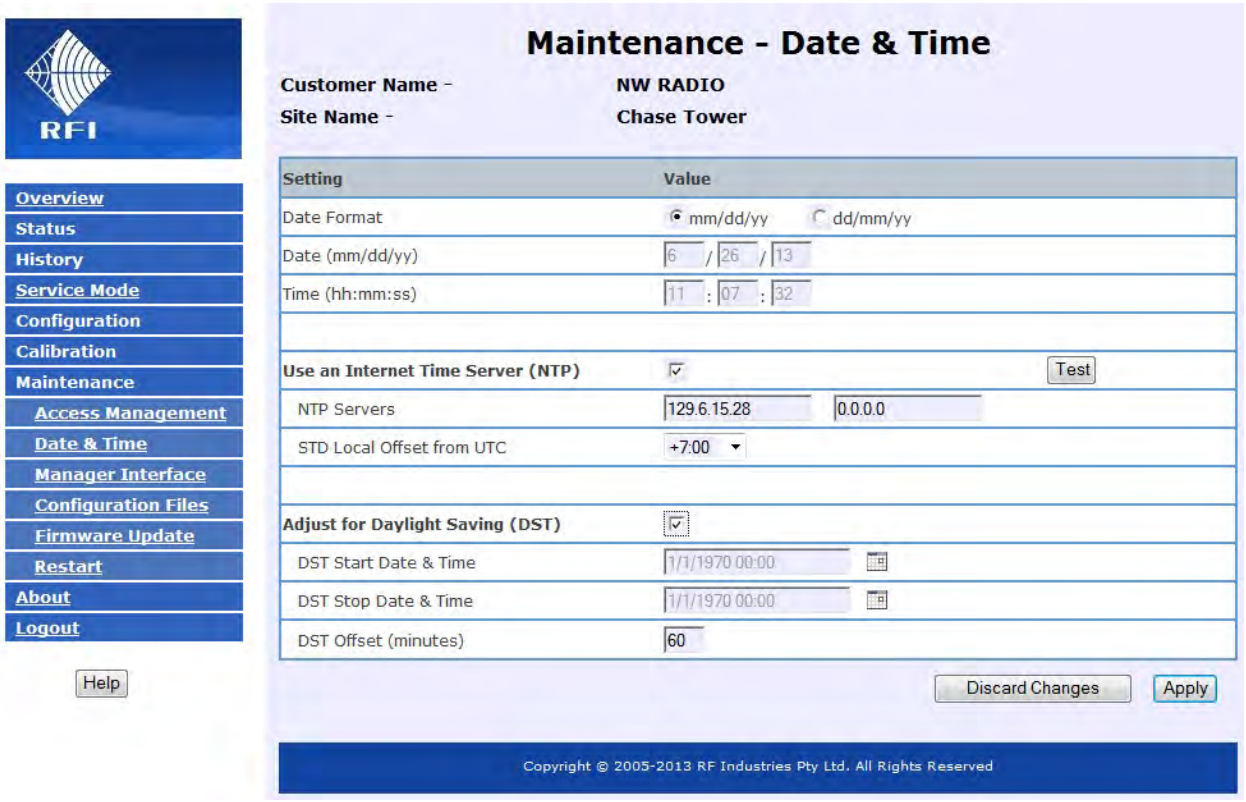
Click this button to restore the values to those present when the page was last redisplayed.

Note that if invalid values are being displayed after an Apply attempt, these values may not match the current unit configuration. In this case, just click on the Maintenance/User Management menu item to re-display the current configuration.

Apply:

This will save and activate the values entered. If any out of range values are present, nothing will be saved and the problem settings will be highlighted with a red background.

10.42 Maintenance – Date & Time



The internally maintained real time clock Date and Time values may be adjusted using these fields.

Date Format:

Two styles of date format can be selected to cater for international format preferences.

Date:

Enter the current date in the displayed mm/dd/yy or dd/mm/yy format.

Time:

Enter the current time in the displayed hh:mm:ss format.

Use an Internet Time Server (NTP)

If selected this feature allows a primary and secondary NTP server address to be nominated for automatic updating of the APM date and time. NTP time is displayed as UTC time.

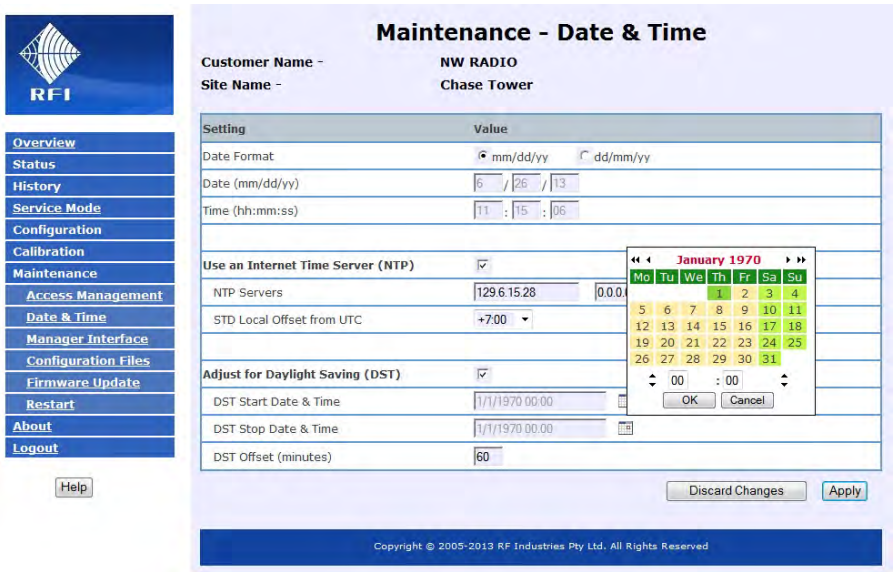
Pressing the Test button confirms connectivity to the nominated primary server. To confirm connectivity to the secondary server, place its address in the primary address field.

A STD Local Offset should be selected to offset local time from the UTC time obtained from the nominated NTP server(s).

Adjust for Daylight Saving (DST)

If selected this feature allows a nominated Daylight Saving Time correction to be applied to the NTP server(s) time.

Select the relevant date and times for the start and finish of daylight saving time at the APM location, and the associated DST offset (in minutes) to be applied during the nominated DST period.



Note: A convenient calendar is available next to the DST Start and Stop fields to allow dates to be selected directly.

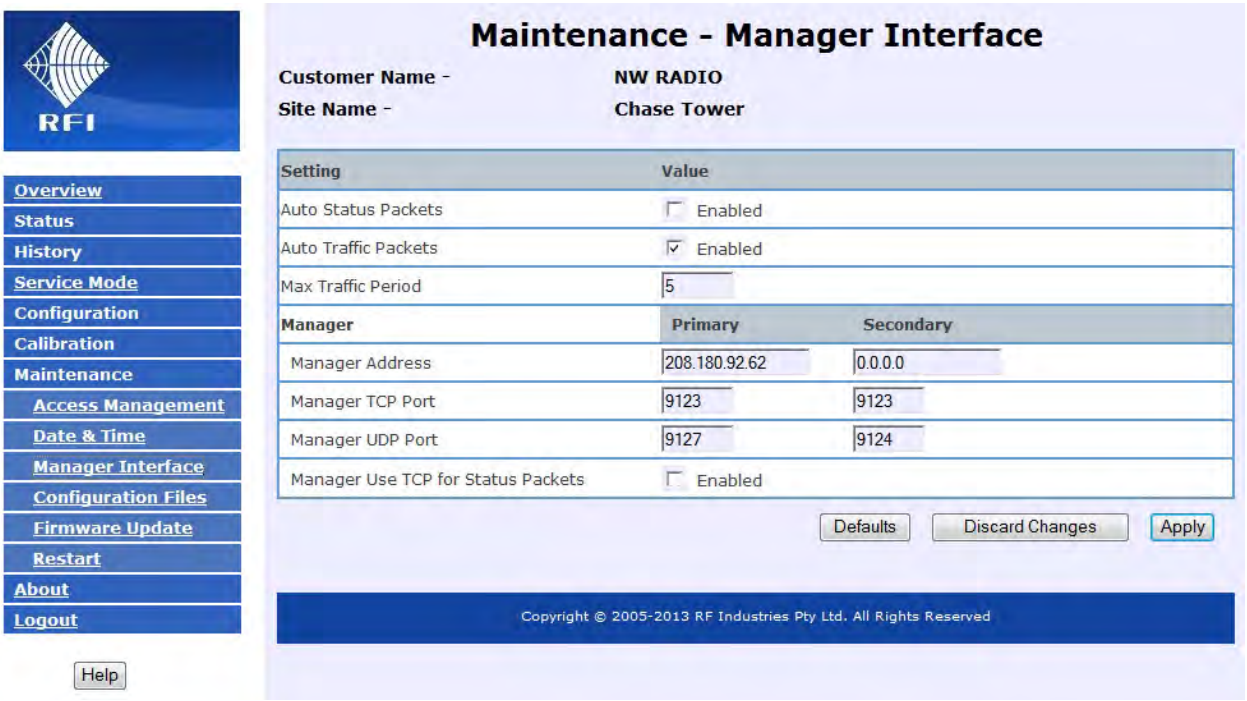
Discard Changes:

Click this button to restore the values to those present when the page was last re-displayed.

Apply:

This will save and activate the values entered. If any out of range values are present, nothing will be saved and the problem settings will be highlighted with a red background.

10.43 Maintenance – Manager Interface



The configuration and status of multiple Advanced Power Monitor units may be remotely managed by a PC based Manager application. Normally the Manager application will control the settings on this page, but, using this page it is possible to manually configure (or override) these settings.

Auto Status Packets:

This controls the automatic sending of Status Change packets to the Manager application. If enabled, any change in alarm status results in a Status Change packet. This setting will be ignored if the Manager Address is set to "0.0.0.0".

Auto Traffic Packets:

This controls the automatic sending of Tx Traffic data packets to the Manager application. If enabled, any change in detected Tx carrier presence results in a Traffic packet. In addition, if any Tx carrier remains ON or OFF for "Max Traffic Period" seconds, a STILL-ON or STILL-OFF Traffic packet is sent. This setting will be ignored if the Manager Address is set to "0.0.0.0".

Max Traffic Period:

This controls the automatic sending of the STILL-ON and STILL-OFF traffic data packets as detailed above.

Manager Address:

The IP address for the Manager application. If a Manager application is not being used this should be 0.0.0.0.

Manager TCP Port:

The port number for TCP communications to the Manager application. Both a primary and a secondary address is provided if Manager Messages are desired to be sent to two applications/destinations.

Manager UDP Port:

The port number for UDP communications to the Manager application. Both a primary and a secondary address is provided if Manager Messages are desired to be sent to two applications/destinations.

Manager Use TCP for Status Packets:

The default communications protocol for Status change and Traffic data packets is UDP. If TCP is required for Status packets, this setting should be enabled.

Note: This option should only be activated if essential for networking reasons. The UDP protocol is strongly preferred, as the protocol and processing overheads are significantly lower and packets can be sent at a higher rate. Note also that Traffic data packets will always use UDP protocol.

Defaults:

Clicking this button enters the factory default values for the Communications settings, which are:

Auto Status Packets	Disabled
Auto Traffic Packets	Disabled
Max Traffic Period	60
Manager Address	0.0.0.0
Manager TCP Port	9123
Manager UDP Port	9124
Manager Use TCP for Status Packets	Disabled

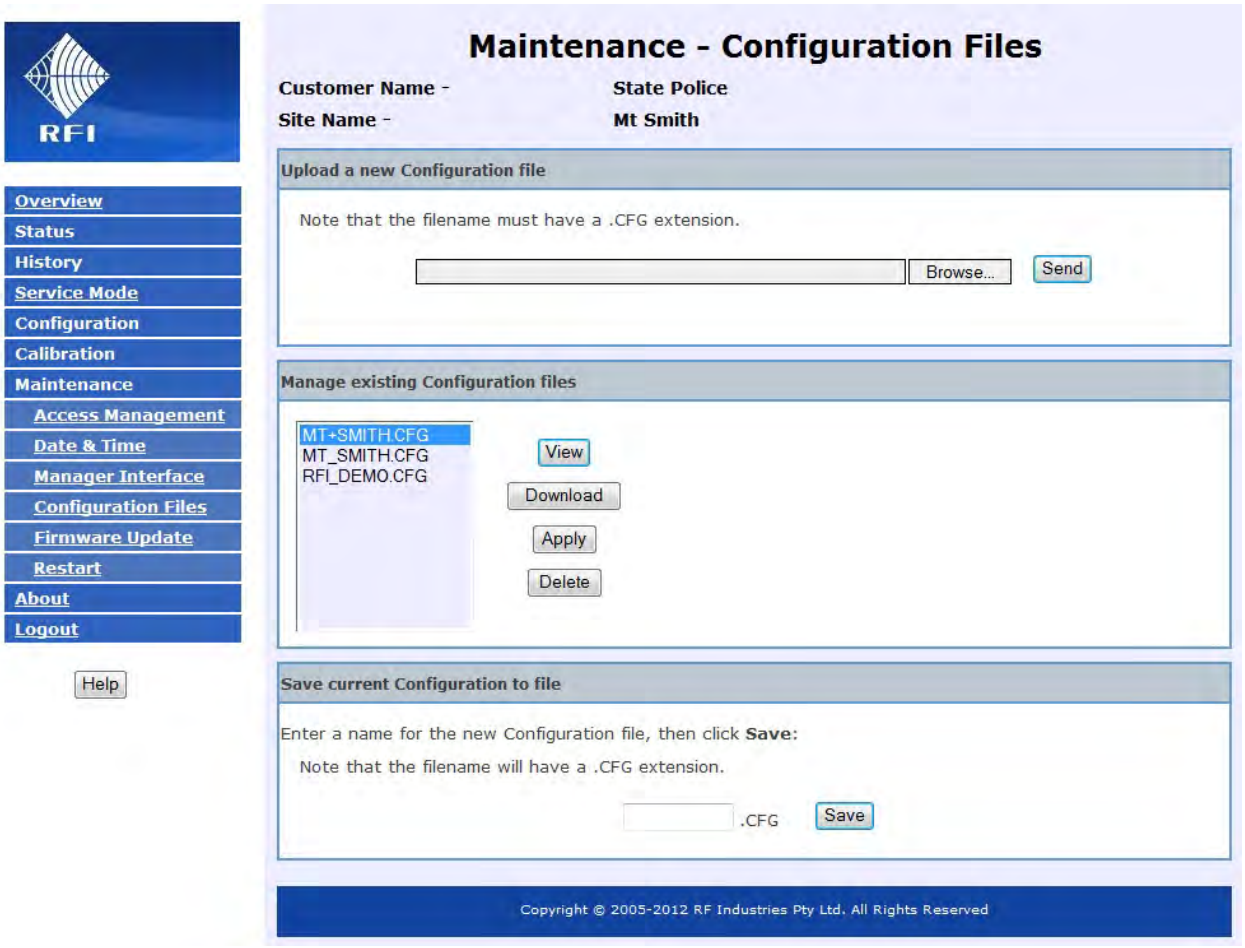
Discard Changes:

Click this button to restore the values to those present when the page was last re-displayed.
Note that if invalid values are being displayed after a Save attempt, these values may not match the current unit configuration. In this case, just select the Maintenance/Manager Interface menu item again to re-display the current configuration.

Save:

This will save the values entered. If any out of range values are present, nothing will be saved and the problem settings will be highlighted with a red background.

10.44 Maintenance – Configuration Files



Configurations for the APM may be stored in a list within the APM and loaded or saved to a nominated computer drive if desired. Due to memory architecture limitations, this feature is not available in "K1" models of the APM.

Upload a new Configuration file:

Click "Browse" to locate the desired APM Configuration file from a chosen drive/directory location. Once the desired drive/directory/name has been selected from the popup box, click "Send" to upload the nominated Configuration file to the list of existing Configuration files.

Note: This Configuration file must be highlighted in the Configuration list and the "Apply" button clicked to activate this uploaded Configuration in the APM.

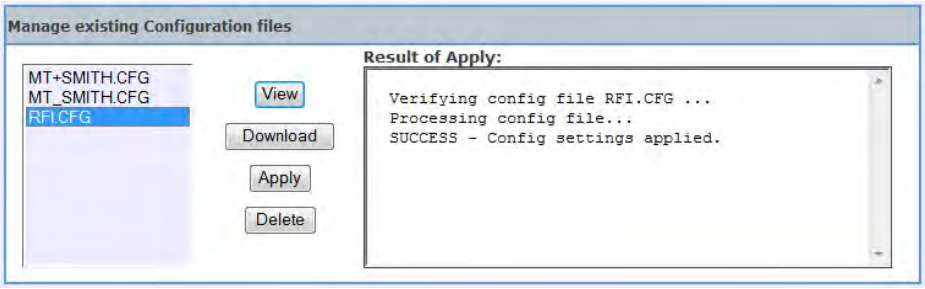
WARNING: If you intend to load a Config file created on another APM, be sure to change the IP address details in the file before Applying it into the unit it is uploaded into. Failure to do so will reconfigure the APM onto the IP address contained in the Config file when the APM next Restarts.

Manage existing Configuration files:

VIEW: To view the text contents of highlighted Configuration in the web browser.

DOWNLOAD: To save the highlighted Configuration file to a nominated computer drive/directory.

APPLY: Activates the highlighted Configuration in the APM.



A progress and completion message will appear in a "Results of Apply" text box (refer above example).

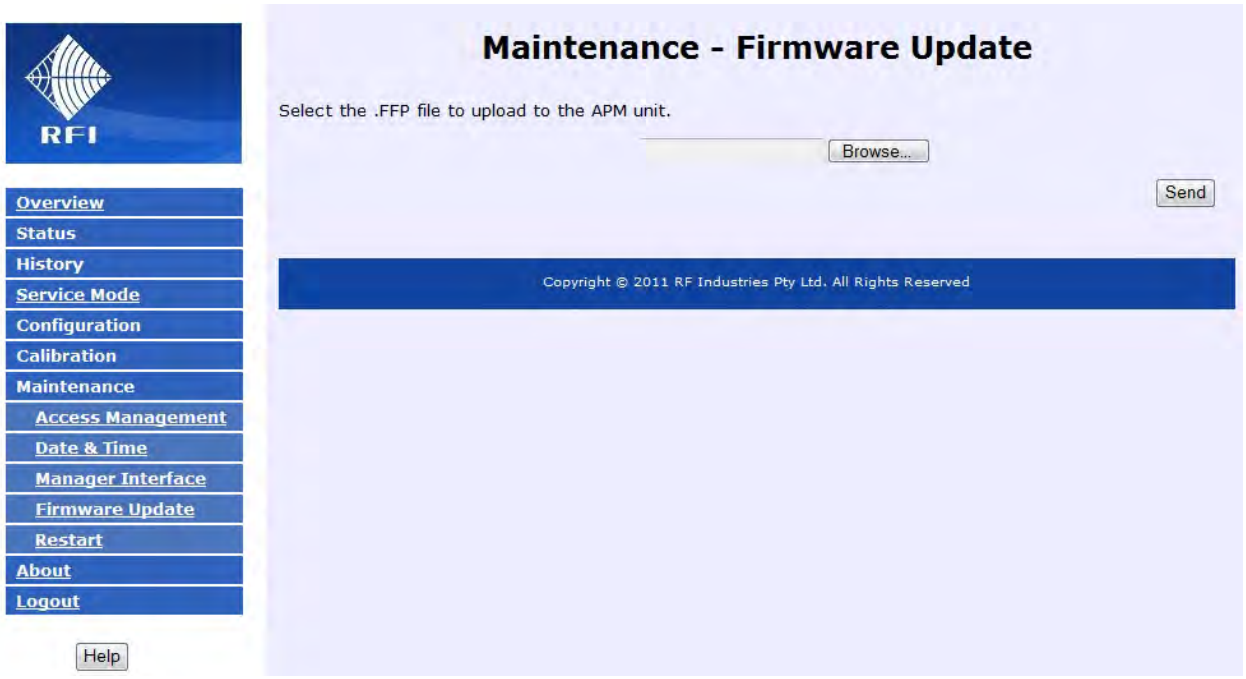
DELETE: To delete the highlighted Configuration file from the list.

Save current Configuration to file:

Enter a file name and click "Save" to save the current APM configuration to the list of stored APM configurations.

Note: The stored APM configurations list is capable of holding many different Configurations. For practical management, it is recommended to limit the number of Configurations kept in this list to less than 10.

10.45 Maintenance – Firmware Update



Firmware upgrades are normally supplied using a "FFP" file extension (Firmware & File system Package).

Enter or Browse the file path of the system firmware update file, then click the Send button to start the update file download process. Depending on the speed of the connection, it can take several minutes for the file upload to complete and be confirmed.

After waiting for about a minute, re-display the System Status page to confirm that the update completed successfully. If the update process is interrupted or unsuccessful for any reason, the unit will restart with the previous firmware.

Note: You may need to clear your browser's cache to view changed pages. If you happen to get a connection timeout message, do not click the retry button**.** Instead, wait for a minute or so and then re-display the System Status page to confirm that the update actually completed satisfactorily.

WARNING: Do not attempt to revert to an older version of firmware as this could corrupt the APM, rendering it inoperable, and the unit's return to the factory may be necessary.

10.46 Maintenance - Restart

Clicking on this selection will initiate an APM system "Restart".

Note: The unit will normally only need to be restarted to activate new Communications settings. If restarted, an APM may take several minutes to reboot and re-initialise itself before it becomes available for a "Log in" and a new session.

10.47 About – Advanced Power Monitor

RFI

- Overview
- Status
- History
- Service Mode
- Configuration
- Calibration
- Maintenance
- About
- Logout

Help

Advanced Power Monitor

The Advanced Power Monitor (APM) monitors channel specific forward and reflected transmitted power for up to 80 channels through four separate transmitter combining systems. Using the high coupling port directivity of an external four port coupler, a wide dynamic range of forward to reflected power (VSWR) can be measured. All frequencies and level thresholds are software definable.

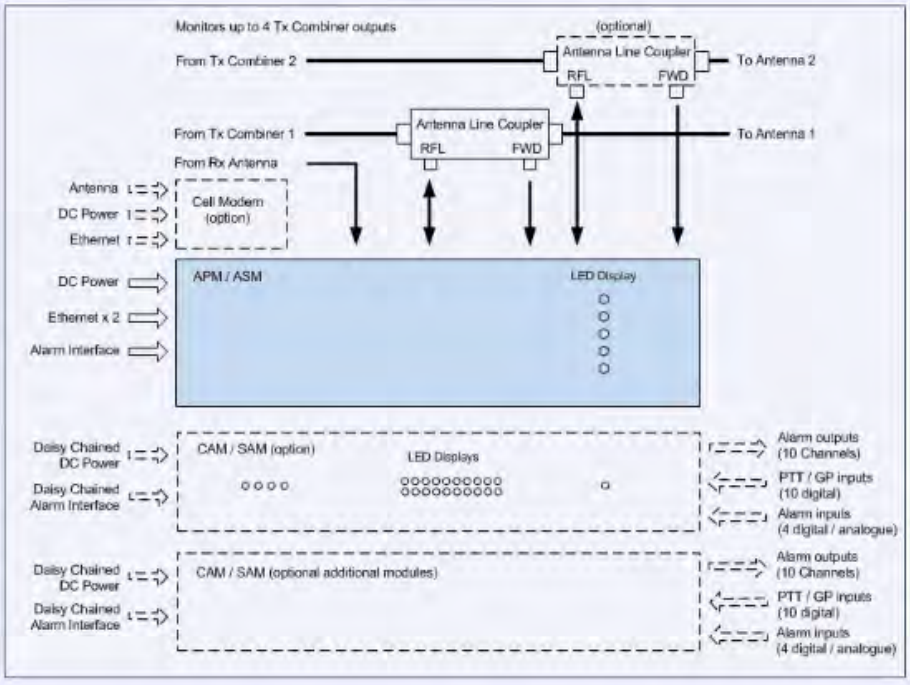
Status, Configuration, Calibration, Alarms, Communication Setup and Maintenance interfaces are managed via the Web GUI interface which is accessed through one of the Ethernet ports. A command line based interface is also available via a TCP/IP Telnet session.

Alarms are communicated using N/O or N/C contact relays interfaced via the DB15 male connector at the rear of the unit. LEDs on the front panel of the unit display DC power presence, an aggregated Summary fault, Rx level, Forward Tx power and VSWR threshold failures.

An optional Channel Alarm Module (CAM) is available for APM users. The CAM provides dry relay alarms contacts for up to ten (10) user-assigned channels being monitored by the APM. Four (4) External Alarm digital inputs are also provided to allow the monitoring of other equipment at a site. Up to ten (10) individual CAM units may be cascaded onto a single APM.

The Advanced Power Monitor is designed and built in Australia by RFI. Please refer to the User Manual for detailed installation and operational Instructions.

The block diagram below provides an overview of the system interfaces.



For further information or help with this product contact your nearest RFI sales Office or through the following:

Region	USA	EMEA	ASIA PACIFIC
Sales email	webmaster@rfi.com.au	sales@rfi.com.au	webmaster@rfi.com.au
Tech Support	support@rfi.com.au	support@rfi.com.au	support@rfi.com.au
Telephone International	+1 (330) 486 0706	+44 1869 255 772	+61 7 3821 9400
Telephone Local	330 486 0706	01869 255 772	1300 000 RF
Fax International	+1 (330) 486 0705	-	+61 2 9830 0844
Web	rfiamericas.com	rfiemea.com	rfi.com.au

This site is best viewed with Internet Explorer 8, Firefox Version 3.6, Chrome Version 9 or Safari Version 5.

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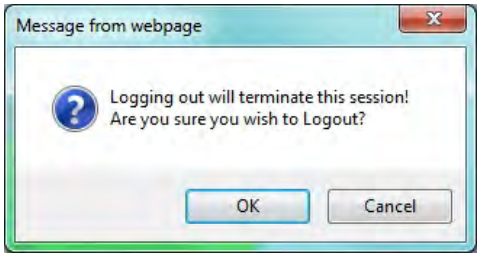
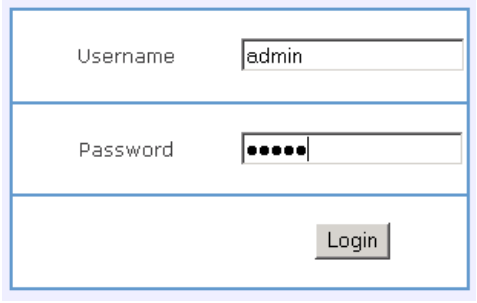
10.48 Logout

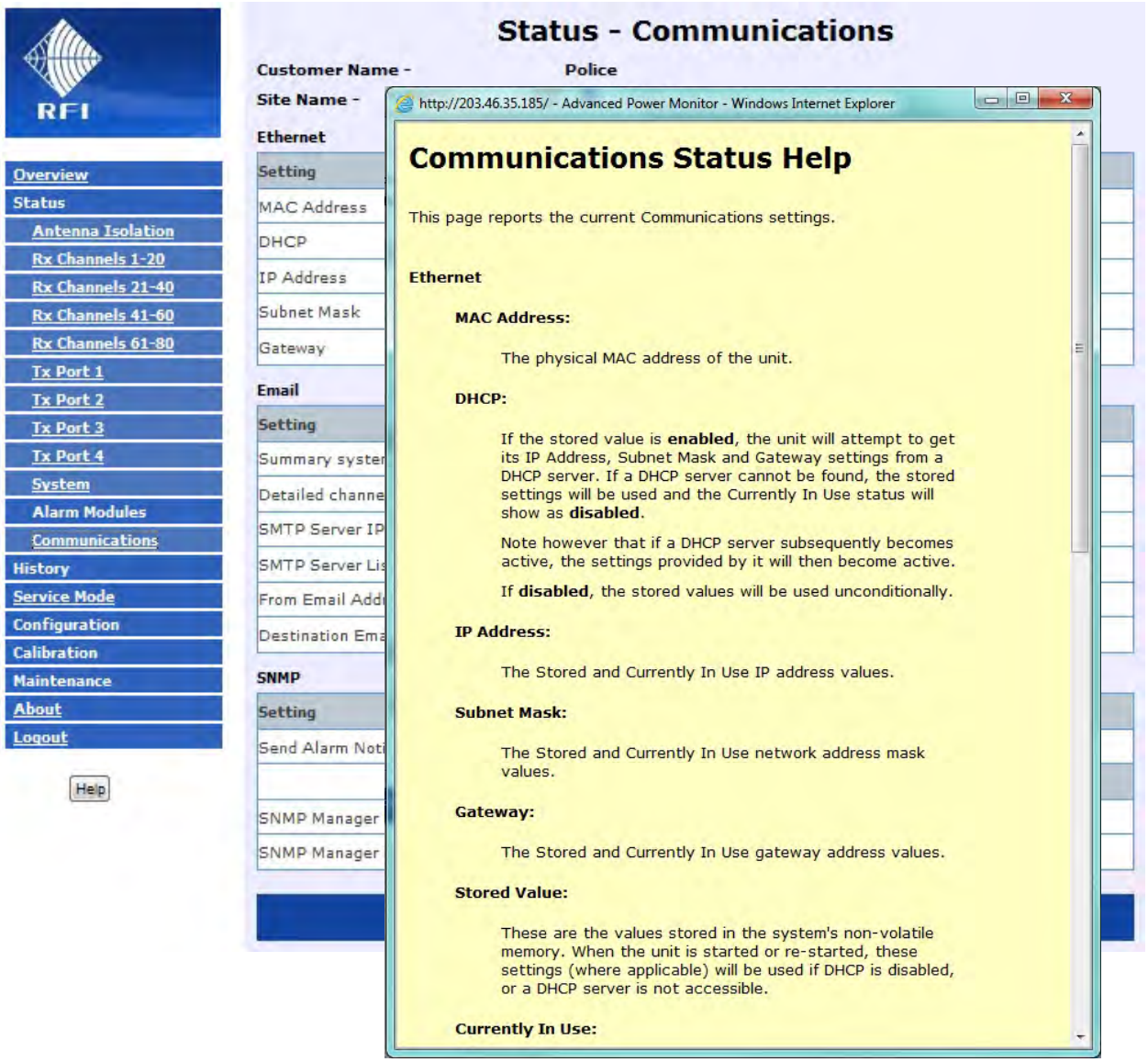
Clicking on this selection will present the "Log out" message box.



If "OK" is selected, the user will be logged out of the current webserver session and the original "Log in" screen will be presented, ready for a new session…..



10.49 HELP Screens



A comprehensive set of Help screens are available throughout the APM GUI. On any page, click the Help button to display the available information.

11. Connectors

APM Front and Rear Panel Layouts:

Advanced Power Monitor (APM) Front Panel Layout

Advanced Power Monitor (APM) Rear Panel Layout

CAM Front and Rear Panel Layouts:

Channel Alarm Module (CAM) Front Panel Layout

Channel Alarm Module (CAM) Rear Panel Layout

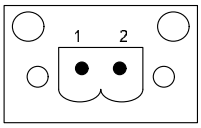
SAM Front and Rear Panel Layouts:

Site Alarm Module (SAM) Front Panel Layout

Site Alarm Module (SAM) Rear Panel Layout

APM/CAM/SAM DC Power connector (Pheonix 2-pin) pin-out:

The pin numbers on the polarized Pheonix 2-pin connector on the rear of the APM (and optional CAM) are illustrated below.



Pinout of DC Connector

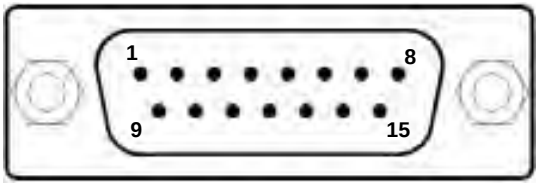
Pin Function Table:

Pin	Function
1	DC Power Input +ve
2	DC Power Input -ve

APM Alarm/Comms connector (Sub D DB-15) pin-out:

The pin numbers on the DB15 (M) at the rear of the APM are illustrated below.

An electrical schematic of the alarm pin-outs to the D-Sub DB15 (M) connector located at the rear of the APM is illustrated on the next page.

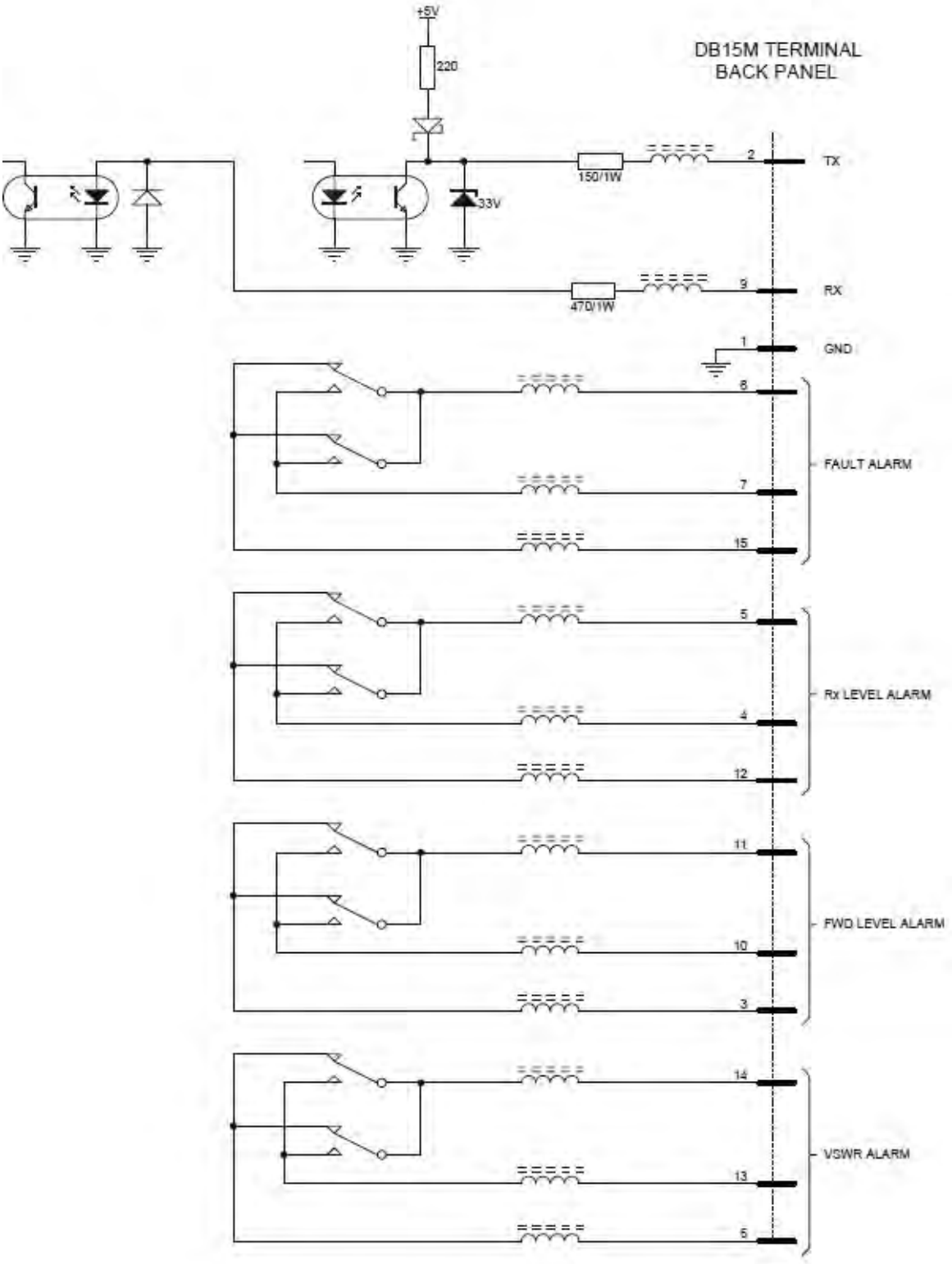


Pinout of DB15 Connector

Pin Function Table:

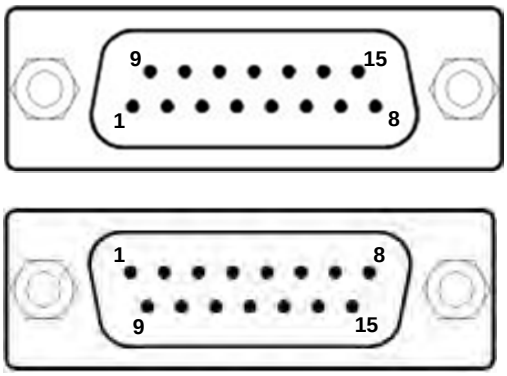
Pin	Function
1	Communications Buss - GND
2	Communications Buss – Tx
3	FWD Level – Closed when an alarm is present
4	Rx Level – Open when an alarm is present
5	Rx Level – Common
6	VSWR – Closed when alarm is present
7	Fault – Open when an alarm is present
8	Fault – Common
9	Communications Buss – Rx
10	FWD Level – Open when an alarm is present
11	FWD Level – Common
12	Rx Level – Closed when an alarm is present
13	VSWR – Open when an alarm is present
14	VSWR – Common
15	Fault – Closed when an alarm is present

APM Alarm/Comms connector (Sub D DB-15) pin-out Electrical Schematic:



CAM/SAM Comms connector (Sub D DB-15) pin-out:

The pin numbers on the DB15 (M) connector at the rear of the (optional) CAM/SAM are illustrated below.



Pinout of DB15 Connectors

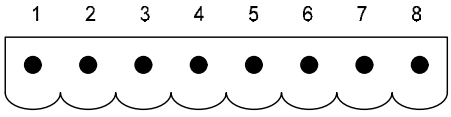
Pin Function Table:

Pin	Function
1	Communications Buss - GND
2	Communications Buss – Rx
3	Not connected
4	Not connected
5	Not connected
6	Not connected
7	Not connected
8	Not connected
9	Communications Buss – Tx
10	Not connected
11	Not connected
12	Not connected
13	Not connected
14	Not connected
15	Not connected

CAM/SAM External Inputs connector (Pheonix 8-pin) pin-out:

The pin numbers on the Pheonix 8-pin connector on the rear of the (optional) CAM/SAM are illustrated below.

To assist in logic level interfacing, an electrical schematic of the External Alarm Inputs pin-outs 8-pin polarized Pheonix connector located on the rear of the CAM/SAM is illustrated on the next page.



Pinout of External I/Ps Connector

Pin Function Table:

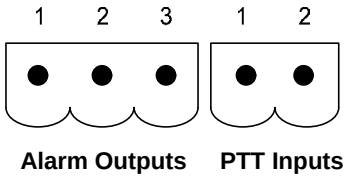
Pin	CAM Function	SAM Function
1	External Alarm Input #1	Temperature / Digital / 0 to +5VDC
2	Ground	Ground
3	External Alarm Input #2	Digital / +5VDC to -60VDC / +60VDC to -60VDC
4	Ground	Ground
5	External Alarm Input #3	Digital / +5VDC to -60VDC / +60VDC to -60VDC
6	Ground	Ground
7	External Alarm Input #4	Digital / +5VDC to -60VDC / +60VDC to -60VDC
8	Ground	Ground

Note: When used as Digital Inputs, the External Inputs of the CAM/SAM are logic "0" = <+2.5VDC, "1" = >+2.5VDC, with a maximum DC input voltage of +60VDC

CAM/SAM Alarm Output and Digital Input connectors (Pheonix 2-pin & 3-pin) pin-outs:

The pin numbers on the Pheonix 3-pin and 2-pin connectors on the rear of the (optional) CAM/SAM are illustrated below.

To assist in logic level interfacing, electrical schematics of the Alarm Output and the PTT Input polarized Pheonix connectors located on the rear of the CAM/SAM are illustrated on the next page.



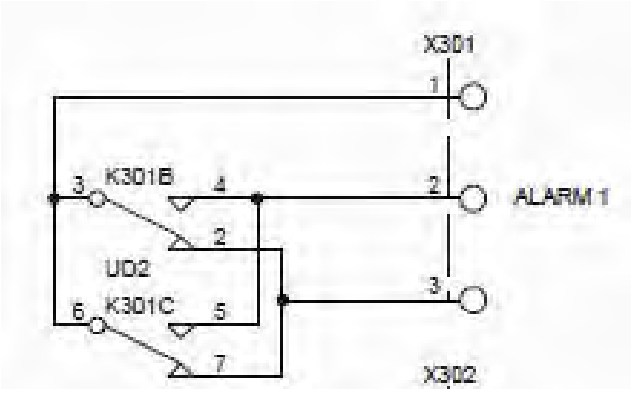
Note: Only one (1) channel of ten (10) is shown

Pin Function Table:

Pin	Function
1	Alarm Output Relay Common
2	Normally Open
3	Normally Closed
1	Digital Input
2	Ground

Note: The ten (10) PTT/Digital Inputs of the CAM/SAM are logic "0" = <+2.5VDC "1" = >+2.5VDC, with a maximum DC input voltage of +5VDC

CAM/SAM Outputs polarized Pheonix connectors' electrical schematics:



12. Maintenance, Inspection and Repair Advice

No special maintenance program is required for the APM, (optional) CAM/SAMs, or frequency banded Couplers.

Firmware upgrades may periodically be made available and may be uploaded into the APM (or optional CAM/SAMs) if desired.

Checking that the 7/16DIN (M) RF connectors on the feeder cables from the combiner and to the antenna are correctly torqued (as per manufacturers recommendations) onto the corresponding Coupler termination connectors is considered good practice. Checking all N Male termination connectors on the RF coaxial connectors on both the APM and Coupler/s is also recommended.

All other DB15 and/or Pheonix connectors must be firmly located and pushed into their corresponding mating sockets, with fastening screws tightened securely.

Neither the APM, optional CAM/SAMs, or the Coupler(s) are considered field repairable. Should it be considered that any unit may be faulty through diagnosis, it should be replaced or returned to RFI for repair.

13. Frequently Asked Questions (FAQ)

Q – Does the APM really evaluate each frequency individually?
A – Yes. Each frequency is broken down individually and the Tx Forward Power, Tx VSWR and Receiver Level is displayed on a Status screen.

Q – Does the VSWR monitor function ignore nearby (12.5 KHz) off-frequency RF energy entering backwards from other transmitting antennas (i.e. horizontally mounted antennas)
A – Yes. The VSWR, like the Tx Forward Power, is measured in a channelised bandwidth. The high directivity of the APM directional coupler prevents forward power from creating a Tx VSWR measurement error also.

Q – What is the minimum channel spacing to maintain true channelisation?
A – The APM can discern and measure 12.5KHz channel separation between Tx channels.

Q – Channel bandwidth is established per channel during setup, and these could be mixed bandwidths (i.e. 25KHz Analogue, APCOP25 Phase1, TETRA, DMR, etc.) in a single combiner, and each can be measured individually?
A – Yes. Modulations and selected channel bandwidths can be mixed within a combiner with no issue as modulation type is programmed by channel in the GUI. Channel bandwidth is automatically selected by the modulation type chosen – except FM where several channel bandwidths are available.

Q – Are alarms logged for future reporting and analysis?
A – Yes. In firmware revision 1.92 and above, alarm events are stored in an Alarm Event Log which can be viewed and downloaded as desired.

Q – Can alarms be sent to remote devices?
A – Yes. Alarm events can be sent via SMTP (Email), SNMP (Northbound) traps, APM relay outputs, or (optional) SAM/CAM relay outputs to remote devices for monitoring.

Q – How is the VSWR calibrated to the antenna?
A – The APM accepts the cable loss of the tx feeder network and uses this to calculate the measured VSWR to the top of the Tx antenna.

Q – Will calibration take into account different lengths, types, and losses of the cable?
A – Yes. The coupling loss, cable loss, and any variable losses will be compensated out during calibration**.**

Q – What is the minimum forward power levels that can the monitored?
A – The APM will measure down to -10 dBm and up to +60 dBm without any changes.

Q – Can a PC file be created and/or saved of the APMs configuration?
A – Yes. A configuration file containing all of the APM's parameters relevant to a site may be prepared beforehand and easily uploaded to an APM (locally or remotely via Ethernet port), simplifying the deployment activities carried at a network site. This file is in easily editable text format for ease of use. In addition, multiple configuration files can be stored within the APM and activated when desired to cater for network re-frequencying transitions, different network operating configurations, or to back up APM configurations for site records, later use, or convenient programming in the event of an APM unit being exchanged.

Q – Can the APM monitor the site's Base Rx frequencies?
A – Yes. Rx Monitoring and Tx-Rx Antenna Isolation testing can be performed and results displayed.

14. Supporting Information

For additional support information on the APM series products including;

APM Marketing Sheet
APM Design Guide
APM Application Note
APM User Manual
APM Firmware File (*.FFP)
APM SNMP MIB Files
CAM Marketing Sheet
SAM Marketing Sheet
SAM Temperature Sensor Marketing Sheet

please visit the RFI website at:

http://rfi-motorola.com/AdvancedPowerMonitors.aspx

Test Drive the APM GUI by visiting: **http://203.46.35.185**

Level 1:	Username:	user
	Password:	user
Level 2:	Username:	admin
	Password:	admin

Please note that this unit is not connected to a "live" network and may be test driven and programmed without impact. This unit may be off-line periodically for maintenance purposes or Internet connectivity outage. If you cannot connect to this unit please contact your nearest RFI Sales office so we can ensure it is available for your test drive.

Contact Information

If you would like more information on the APM product and its applications, please contact your nearest RFI Sales Office.

For more information on RFI products, please visit us at **http://www.rfiwireless.com.au/**

15. User Notes:

RFI

rfi.com.au

1300 000 734