

Receive Systems Module (RSM)



What is the RSM?



Receive Systems Module - Rear View



Receive Systems Module – Fitted to ASM

The RSM and the ASM

The Receive Systems Module (RSM) is an option to the Antenna Systems Monitor (ASM). The RSM adds additional functionality to the ASM configuration, enhancing the ASM's own features.

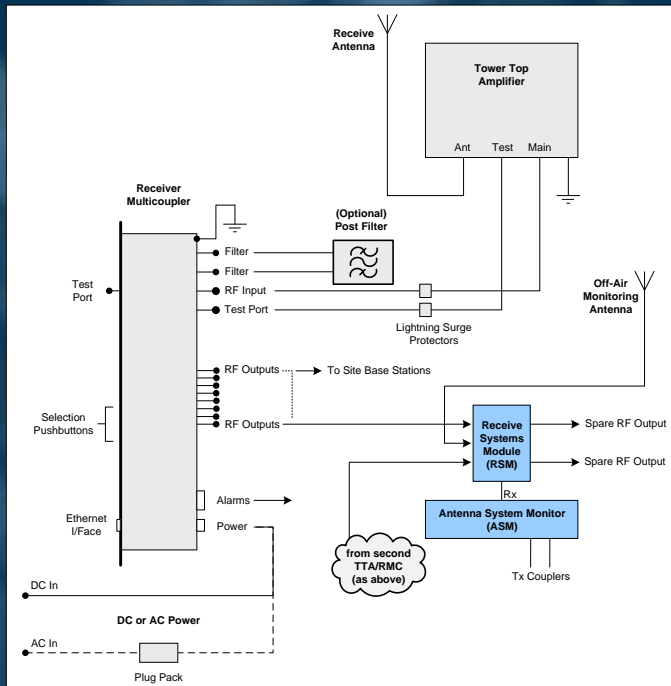


What can it do?

The RSM may be used to;

- monitor two separate Rx paths of a Dual Diversity Receiver system (as is used in APCOP25 Phase 2, DMR, MotoTrbo™, TETRA, and other wireless technologies)
- monitor two separate Rx antennas on a site (i.e. a site's redundant receiver antennas or hot/standby antennas)
- provide enhanced 'off-air' monitoring of adjacent network sites' coverage performance
- Improve the receive sensitivity of the ASM
(such as newer digital technologies are capable of operating)
- Measure, monitor and alarm all three Rx paths for the presence of any high level signals that can cause overloading of base station receivers (called 'blocking') that can result in degraded network performance
- Measure, monitor and alarm the ASM System Tests for any or all of the 3 Rx paths (Ant Isolation, Rx System Gain/Loss, Tx Rejection)

What can it do?

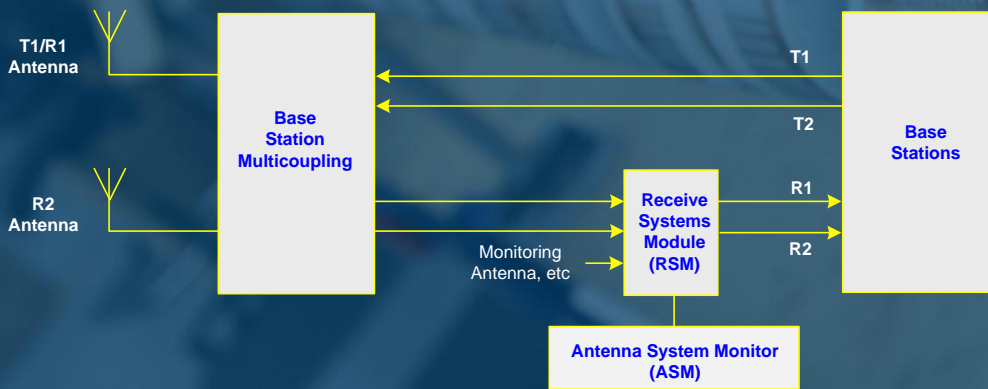


Rx Diversity or Dual Rx Monitoring

The RSM may be used to monitor Rx Diversity systems as are commonly used in APCOP25 P2 and DMR radio systems.

In this example, separate Tower Top Amplifiers and Receiver Multicouplers for each of the two Rx paths.

What can it do?



T1/R2 Diversity Monitoring

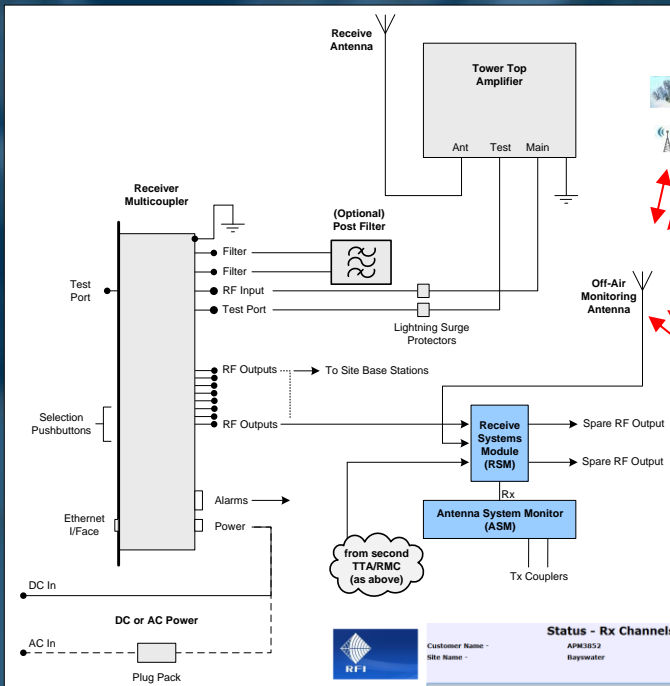
The RSM may be used to monitor 'T1/R2' Diversity systems as are commonly used in TETRA radio systems.


In this example, the Tx Combiner and Rx Multicoupler are integrated inside the radio equipment rack (shown here as the Base Station Multicoupling).

What can it do?

Monitoring other signals

A third monitoring path is also provided on the RSM, allowing other signals outside or separate to the network site's two Rx signal paths to also be monitored - i.e. the off-air monitoring of adjacent network sites' coverage propagation.





Customer Name -

APW3852

Site Name -

Baywater

Auto Refresh ☐

Refresh

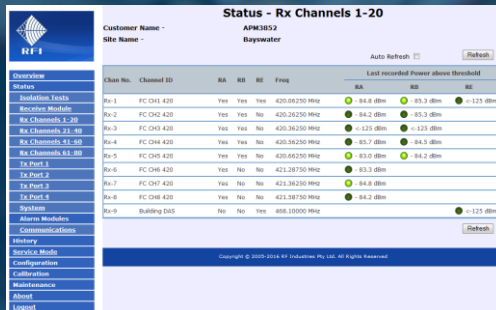
Status - Rx Channels 1-20									
Chan No.		Channel ID	RA	RB	RE	Freq	RA	RB	RE
Last recorded Power above threshold									
rx-1	PC DM4 420	Yes	Yes	Yes	420.58250 MHz	● 84.8 dbm	● 85.3 dbm	● 85.3 dbm	● > 125 dbm
rx-2	PC DM4 420	Yes	Yes	No	420.58250 MHz	● 84.2 dbm	● 85.3 dbm	● 85.3 dbm	
rx-3	PC DM4 420	Yes	No	No	420.58250 MHz	● 82.5 dbm	● 85.3 dbm	● 85.3 dbm	
Rx Channels 41-60									
rx-4	PC DM4 420	Yes	Yes	No	420.58250 MHz	● 85.7 dbm	● 85.3 dbm	● 84.5 dbm	
rx-5	PC DM4 420	Yes	Yes	No	420.58250 MHz	● 85.0 dbm	● 85.3 dbm	● 84.2 dbm	
rx-6	PC DM4 420	Yes	No	No	421.28750 MHz	● 85.3 dbm	● 85.3 dbm	● 85.3 dbm	
rx-7	PC DM4 420	Yes	No	No	421.28750 MHz	● 84.8 dbm	● 85.3 dbm	● 85.3 dbm	
rx-8	PC DM4 420	Yes	No	No	421.58750 MHz	● 84.2 dbm	● 85.3 dbm	● 85.3 dbm	
System									
rx-9	Building DAS	No	No	No	420.58250 MHz	● 84.2 dbm	● 85.3 dbm	● 85.3 dbm	● < 125 dbm

Refresh

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What can it do?

Monitoring other signals



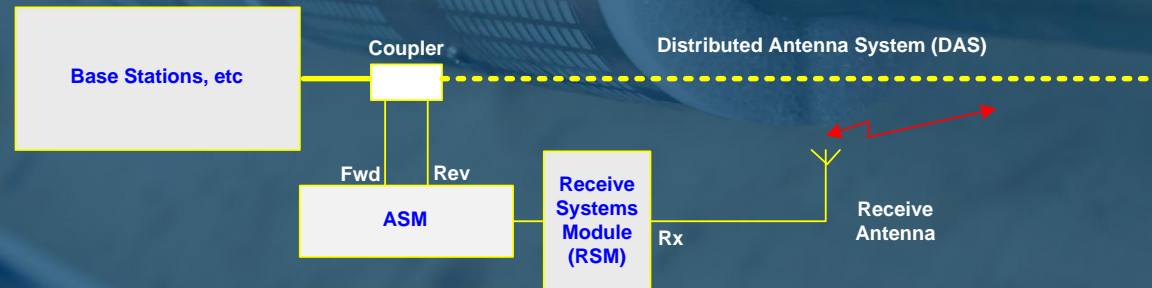
Customer Name - APM3052
Site Name - Baywater

Auto Refresh ☐ Refresh

Channel	Chan No.	Channel ID	RA	RB	RE	Freq	RA	RB	RE
Channel 1	Rx-1	FC DMS 420	Yes	Yes	Yes	420.36250 MHz	● -84.6 dBm	● -83.3 dBm	● < -125 dBm
Channel 2	Rx-2	FC DMS 420	Yes	Yes	Yes	420.36250 MHz	● -84.2 dBm	● -83.3 dBm	● < -125 dBm
Channel 3	Rx-3	FC DMS 420	Yes	Yes	No	420.36250 MHz	● < -125 dBm	● < -125 dBm	● < -125 dBm
Channel 4	Rx-4	FC DMS 420	Yes	Yes	No	420.36250 MHz	● < -125 dBm	● < -125 dBm	● < -125 dBm
Channel 5	Rx-5	FC DMS 420	Yes	Yes	No	420.36250 MHz	● -83.0 dBm	● -84.3 dBm	● < -125 dBm
Channel 6	Rx-6	FC DMS 420	Yes	No	No	421.28750 MHz	● -83.3 dBm	● -84.2 dBm	● < -125 dBm
Channel 7	Rx-7	FC DMS 420	Yes	No	No	421.36250 MHz	● -84.8 dBm	● -84.2 dBm	● < -125 dBm
Channel 8	Rx-8	FC DMS 420	Yes	No	No	421.38750 MHz	● -84.2 dBm	● -84.2 dBm	● < -125 dBm
Channel 9	Rx-9	Building DAS	No	No	Yes	400.10000 MHz	● < -125 dBm	● < -125 dBm	● < -125 dBm

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The RSM can also be used with the ASM to monitor the coverage performance of a Distributed Antenna System (DAS), etc.



What can it do?

Improving ASM Rx Level Sensitivity

The RSM incorporates an adjustable gain setting that can be set to increase the ASM's effective sensitivity capability – allowing the measurement of Rx signals from the ASM's own -110dBm, down to as low as -125dBm. Newer digital technologies (APCO P25, etc) are capable of operation down at such low signal levels.



Configuration - Rx 1-20, Channels


Customer Name - APM3852
Site Name - Bayswater

Defaults Discard Changes Apply

Chan No.	Channel ID	RA	RB	RE	Frequency	Modulation	Threshold Pwr
<input type="checkbox"/> Rx-1	FC CH1 420	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	420.06250 MHz	P25P1	-90.0 dBm
<input type="checkbox"/> Rx-2	FC CH2 420	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	420.26250 MHz	P25P1	-90.0 dBm
<input type="checkbox"/> Rx-3	FC CH3 420	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	420.36250 MHz	P25P1	-90.0 dBm
<input type="checkbox"/> Rx-4	FC CH4 420	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	420.56250 MHz	P25P1	-90.0 dBm
<input type="checkbox"/> Rx-5	FC CH5 420	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	420.66250 MHz	P25P1	-90.0 dBm
<input type="checkbox"/> Rx-6	FC CH6 420	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	421.28750 MHz	DMR	-90.0 dBm
<input type="checkbox"/> Rx-7	FC CH7 420	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	421.36250 MHz	DMR	-90.0 dBm
<input type="checkbox"/> Rx-8	FC CH8 420	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	421.58750 MHz	DMR	-90.0 dBm
<input type="checkbox"/> Rx-9	Building DAS	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	468.10000 MHz	P25P1	-120.0 dBm

Remove Selected Rows Add Row Defaults Discard Changes Apply

Configuration - Receive Systems Module




Customer Name - APM3852
Site Name - Bayswater

Setting	Value
RxA-IN to Rx-OUT Gain	0 dB
Rob-IN to Rx-OUT Gain	0 dB
Antenna (RxE) to Rx-OUT Gain	0 dB
RxA-IN to RxA-OUT	<input checked="" type="checkbox"/> Enabled
Rob-IN to Rob-OUT	<input checked="" type="checkbox"/> Enabled

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Status - Rx Channels 1-20



Customer Name - APM3852
Site Name - Bayswater

Auto Refresh ☐ Refresh

Chan No.	Channel ID	RA	RB	RE	Freq	Last recorded Power above threshold		
						RA	RB	RE
Rx-1	FC CH1 420	Yes	Yes	Yes	420.06250 MHz	● -83.3 dBm	● -86.3 dBm	● <-125 dBm
Rx-2	FC CH2 420	Yes	Yes	No	420.26250 MHz	● -86.0 dBm	● -84.3 dBm	
Rx-3	FC CH3 420	Yes	Yes	No	420.36250 MHz	● <-125 dBm	● <-125 dBm	
Rx-4	FC CH4 420	Yes	Yes	No	420.56250 MHz	● -83.9 dBm	● -84.9 dBm	
Rx-5	FC CH5 420	Yes	Yes	No	420.66250 MHz	● -83.9 dBm	● -84.7 dBm	
Rx-6	FC CH6 420	Yes	No	No	421.28750 MHz	● -83.2 dBm		
Rx-7	FC CH7 420	Yes	No	No	421.36250 MHz	● -83.0 dBm		
Rx-8	FC CH8 420	Yes	No	No	421.58750 MHz	● -83.1 dBm		
Rx-9	Building DAS	No	No	Yes	468.10000 MHz			● <-125 dBm

Refresh

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What can it do?

Peak Level Detector


The RSM also monitors all RF signal levels seen on each of its 3 inputs, across the range ~50-1000MHz, and detects the presence of any signals greater than base station receivers specifications (i.e. -35dBm for any momentary signal, or -50dBm for any continuous signal).

Status	
Item	Status
Alarm Status	OK
RxA Peak Level	- 53.4 dBm
RxA Current Level	- 57.7 dBm
RxB Peak Level	- 54.0 dBm
RxB Current Level	- 58.5 dBm
Antenna (RxE) Peak Level	- 50.0 dBm
Antenna (RxE) Current Level	< - 65.0 dBm
Power Supply	OK

Reset Peak Levels Refresh

- Such high level signals can overload base station receivers, causing performance degradation. Yellow 'Warning' and Red 'Alarm' indicators in the ASM GUI and entries in the Alarm Event Log file indicate any presence of such signals within the configured alarm thresholds.

What can it do?


RFI

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Status - System Isolation Tests

Customer Name -
Site Name -

APM3852
Bayswater

Settings

Setting	Value
Automatic System Isolation Tests	Enabled
Automatic Test Schedule	Every Hour, starting at 19:30
Next Scheduled Test	Wed Mar 2 11:30:00 2016

Parameters Used

Item	Value
Internal Test Signal Level	- 15.0 dBm
Tx Reverse Coupling Loss (Nominal)	39.2 dB
Tx Feeder Loss (Nominal)	3.0 dB
	RARBRE
Rx Subsystem Gain(Loss)	0.0 dB0.0 dB0.0 dB
Rx Post Gain(Loss)	0.0 dB0.0 dB0.0 dB

Test Results

Frequency	Ant Iso (dB)			Rx System (dB)			Tx Rejection (dB)			Measured (dBm)		
	RA	RB	RE	RA	RB	RE	RA	RB	RE	RA	RB	RE
Rx 421.00000 MHz	61.6	62.3	44.6							-118.8	-119.5	-101.8
Rx 418.00000 MHz				-0.7	-0.2	-0.2				-119.5	-119.7	-102.0
Rx 419.00000 MHz				-0.3	-0.7	+0.5				-119.1	-120.2	-101.3
Rx 420.00000 MHz				+1.1	-0.3	-0.6				-117.7	-119.8	-102.4
Rx 420.50000 MHz				+0.1	-0.2	+0.2				-118.7	-119.7	-101.6
Rx 421.00000 MHz				0.0	0.0	0.0				-118.8	-119.5	-101.8
Rx 421.50000 MHz				-0.3	0.0	+0.1				-119.1	-119.5	-101.7
Rx 422.00000 MHz				-0.5	-0.3	---				-119.3	-119.8	---
Rx 423.00000 MHz				-0.2	-0.9	---				-119.0	-120.4	---
Tx 420.06250 MHz - Port 1	61.7	61.7	61.7	67.1	66.4	80.0	131.8	131.1	144.7	-85.9	-85.2	-98.8
Tx 500.06250 MHz - Port 2	61.7	61.7	61.7	67.3	67.8	95.3	132.0	132.5	160.0	-85.0	-85.5	-113.0

Test Now

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System Isolation Tests

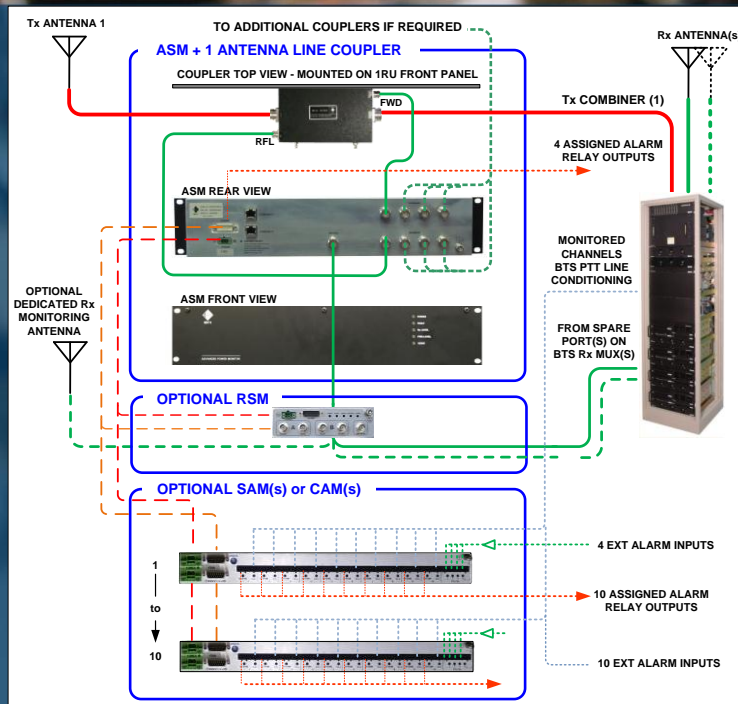
The RSM can perform the Antenna Isolation, Rx System and Tx Rejection tests across all three (3) Rx paths, testing the site's averaged Antenna Isolation, Rx Systems Gain, Selectivity and Ripple, and the Tx Carrier Rejection through both monitored Rx systems - and on the 3rd monitored Rx antenna.

Installation

The RSM is fitted to the rear of an ASM. It can be added at any time, providing a technology upgrade path for customers who may move to a dual diversity, dual Rx antennas, or hot/standby Rx system at a future date (i.e. a future migration from APCOP25 Phase 1 to APCOP25 Phase 2).



Installation

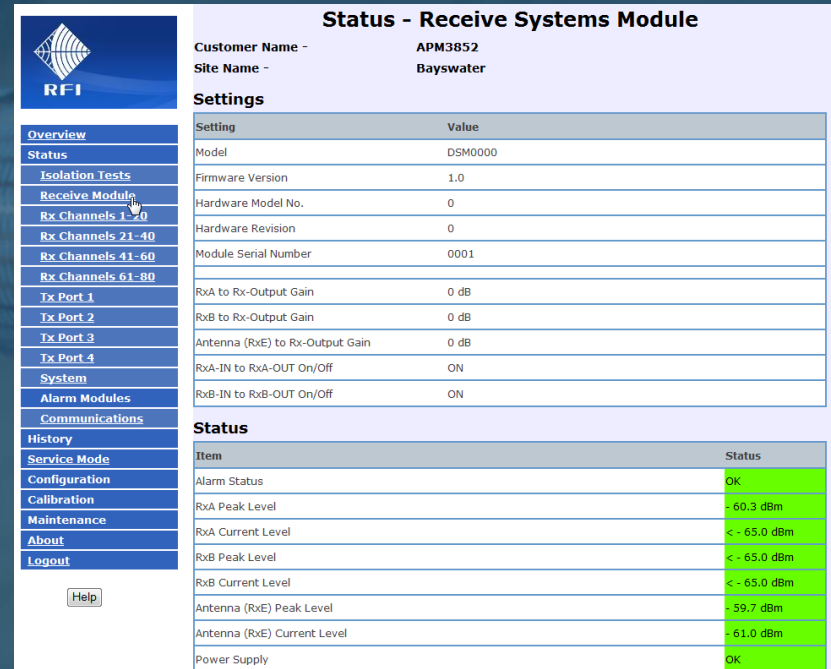


The RSM conveniently connects into the Rx signal path(s) of the network site's base station equipment, prior to the ASM's Rx port.

It may be added to any existing ASM installation, quickly and conveniently.

Configuration

The RSM appears automatically in the Antenna Systems Monitor (ASM) Graphical User Interface (GUI) menu structure when they are connected.



The screenshot displays the RFI Antenna Systems Monitor (ASM) GUI. On the left is a vertical menu with options: Overview, Status, Isolation Tests, Receive Module (highlighted with a mouse cursor), Rx Channels 1-20, Rx Channels 21-40, Rx Channels 41-60, Rx Channels 61-80, Tx Port 1, Tx Port 2, Tx Port 3, Tx Port 4, System, Alarm Modules, Communications, History, Service Mode, Configuration, Calibration, Maintenance, About, Logout, and a Help button. The main area is titled 'Status - Receive Systems Module' and contains customer information, settings, and a status table.

Customer Name - APM3852
Site Name - Bayswater

Settings

Setting	Value
Model	DSM0000
Firmware Version	1.0
Hardware Model No.	0
Hardware Revision	0
Module Serial Number	0001
RxA to Rx-Output Gain	0 dB
RxB to Rx-Output Gain	0 dB
Antenna (Rx) to Rx-Output Gain	0 dB
RxA-IN to RxA-OUT On/Off	ON
RxB-IN to RxB-OUT On/Off	ON

Status

Item	Status
Alarm Status	OK
RxA Peak Level	< -60.3 dBm
RxA Current Level	< -65.0 dBm
RxB Peak Level	< -65.0 dBm
RxB Current Level	< -65.0 dBm
Antenna (Rx) Peak Level	-59.7 dBm
Antenna (Rx) Current Level	-61.0 dBm
Power Supply	OK

Configuration

The ASM Graphic User Interface (GUI) allows each of the RSM's inputs and alarm thresholds to be configured, measured, monitored, alarmed, and viewed independently.

The screenshot displays the RFI ASM GUI for the Receive Systems Module. The interface is divided into several sections:

- Left Sidebar:** Contains navigation links for Overview, Status, Isolation Tests, Receive Modules, Rx Channels 1-40, Rx Channels 21-40, Rx Channels 41-60, Rx Channels 61-80, Tx Port 1, Tx Port 2, Tx Port 3, Tx Port 4, System, Alarm Modules, Communications, History, Service Mode, Configuration, Calibration, Maintenance, About, and Logout.
- Top Section:** Displays the Customer Name (APM3852) and Site Name (Bayswater).
- Status - Receive Systems Module:** A table showing the current status of various components. The 'Status' column uses color-coded indicators: green for OK and red for error/warning.
- Configuration - Receive Systems Module:** A table for configuring various settings, including Rx-IN to Rx-OUT Gain, Rx-B-IN to Rx-OUT Gain, Antenna (Rx/E) to Rx-OUT Gain, Rx-A-IN to Rx-A-OUT, and Rx-B-IN to Rx-B-OUT. Each setting has a dropdown menu for the value and a checkbox for enabling/disabling the feature.
- Isolation Tests History Chart:** A line graph showing the history of isolation tests over time. The x-axis represents time in hours, and the y-axis represents the isolation level in dB. The chart includes a legend for different test types (RA, RB, RE) and a 'Select Period' dropdown menu.

Status - Receive Systems Module

Setting	Value
Model	DSM0000
Firmware Version	1.0
Hardware Model No.	0
Hardware Revision	0
Module Serial Number	0001
RxA to Rx-Output Gain	0 dB
RxB to Rx-Output Gain	0 dB
Antenna (Rx/E) to Rx-Output Gain	0 dB
RxA-IN to RxA-OUT On/Off	ON
RxB-IN to RxB-OUT On/Off	ON

Status

Item	Status
Alarm Status	OK
RxA Peak Level	- 60.3 dBm
RxA Current Level	< - 65.0 dBm
RxB Peak Level	< - 65.0 dBm
RxB Current Level	< - 65.0 dBm
Antenna (Rx/E) Peak Level	- 59.7 dBm
Antenna (Rx/E) Current Level	- 61.0 dBm
Power Supply	OK

Configuration - Receive Systems Module

Setting	Value
RxA-IN to Rx-OUT Gain	0 dB
RxB-IN to Rx-OUT Gain	0 dB
Antenna (Rx/E) to Rx-OUT Gain	0 dB
RxA-IN to RxA-OUT	<input checked="" type="checkbox"/> Enabled
RxB-IN to RxB-OUT	<input checked="" type="checkbox"/> Enabled

Isolation Tests History Chart

Legend: RA - 421.00000 MHz [1], RB - 421.00000 MHz [2], RE - 421.00000 MHz [3]


Select Period: 6 Hours

Select Date: 1/3/2016

Antenna Isolation

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Monitoring


RFI

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Status - Diversity Signal Monitor

Customer Name - **APM3852**
Site Name - **Bayswater**

Settings

Setting	Value
Model	DSM0000
Firmware Version	1.0
Hardware Model No.	0
Hardware Revision	0
Module Serial Number	0001
RxA to Rx-Output Gain	0 dB
RxB to Rx-Output Gain	0 dB
Antenna (Rx/E) to Rx-Output Gain	0 dB
RxA-IN to RxA-OUT On/Off	ON
RxB-IN to RxB-OUT On/Off	ON

Status

Item	Status
Alarm Status	OK
RxA Peak Level	< - 65.0 dBm
RxA Current Level	< - 65.0 dBm
RxB Peak Level	< - 65.0 dBm
RxB Current Level	< - 65.0 dBm
Antenna (Rx/E) Peak Level	< - 65.0 dBm
Antenna (Rx/E) Current Level	< - 65.0 dBm
Power Supply	OK

[Reset Peak Levels](#) [Refresh](#)

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The RSM's status is presented in the ASM's GUI, and any conditions outside the configured alarm thresholds are available as alarm relay outputs via the ASM/SAM/CAM, SNMP Traps, SNMP GET, SMTP (Email) messages, and as Manager Messages data packets.

Connectivity

To access and use the RSM (via the ASM), a web browser such as Internet Explorer, Mozilla, or Firefox is used. Connection to the ASM may be;

- “locally” via a computer using an Ethernet cable
- “locally” via a wireless router connected to the ASM and the computer’s wireless modem (i.e. WiFi)
- “remotely” via a customer’s Local Area Network (LAN)
- “remotely” via a site linking backbone (such as microwave links, fibre, or other link technologies)
- “remotely” via a cellular modem if the ASM site is within coverage of a cellular network
- “remotely” via a satellite link (ideal for *very* remote sites)

Summary



The Receive Systems Module (RSM) enhances the capabilities of the Antenna Systems Monitor (ASM), and provides a convenient way to measure, monitor and alarm multiple Rx signal paths on a network site.

More Information

For more information on the Receive Systems Module (RSM) and its use please refer to;

- Receive Systems Module Product Brief
- Antenna Systems Monitor Product Brief
- Antenna Systems Monitor Manual
- Antenna System Monitor Service Bulletins
- Antenna & Systems Monitoring Application Note