



Active SPOI User Manual V1.1

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Revision History

Date	Version	Description
11/10/15	1.0	Initial
9/12/15	1.1	Updated: Alarm Enhancement Quick Installation Feature Enhancement Auto Level Clamping Description S2600 TDD RF Card Description

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1. ABOUT THIS GUIDE

This purpose of this document is to explain installation, setup and operation of the *Active SPOI DAS interface Tray* by SYM Technology, Inc. It is intended to provide all the necessary information and guidance needed to use the system.

The installation guidelines are of a general nature due to the wide variety of installation-specific requirements within individual sites. SYM Technology prides itself on ensuring that installation is successful. Please contact SYM Technology directly if additional installation information is required (see section 3.3 for contact information).

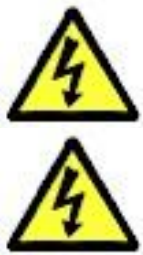
1.1. WHO SHOULD USE THIS GUIDE?

This guide is intended for use by trained telecommunication professionals responsible for base station (BTS)/Distributed Antenna Systems (DAS) performance, including:

- RF Performance Engineers
- Operations Engineers
- BTS & DAS Site Technicians

SYM Technology assumes installation personnel will have an advanced understanding of RF engineering principles and typical BTS and DAS site architecture and installation procedures.

It is the operator's responsibility to ensure that this equipment is properly installed and operated within SYM Technology operating specifications in order to obtain proper performance of the Active SPOI and to comply with regulatory requirements.



Warning: Failure to follow the installation and configuration recommendations contained herein may result in service interruptions and/or damage to the unit.

Warning: This equipment may be installed in close proximity to cables, connectors, or components carrying high RF power. Installation and operation must be completed by qualified personnel.

2. GENERAL

2.1. WARNINGS, CAUTIONS, AND SAFETY

There are several simple guidelines to operating the Active SPOI properly and safely.

- Avoid exposing the Active SPOI to extreme temperatures, either hot or cold. The Active SPOI is for indoor use only.
- Keep the unit in a clean, well-ventilated and dust-free location.
- Avoid exposing the Active SPOI to rain or liquid spills. If the Active SPOI gets wet, immediately turn off the power and dry the unit completely.
- Treat the Active SPOI with care. Avoid dropping, throwing, or sitting on it. Rough treatment may damage the unit and void the warranty.
- Do not attempt to disassemble your unit. If the warranty seal has been broken, the warranty is no longer valid.
- Any changes or modifications to your unit not expressly approved in this document could void your warranty.

2.2. HUMAN EXPOSURE TO RF RADIATION

This system complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This system may cause harmful interference.

(2) This system must accept any interference received, including interference that may cause undesirable operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note !

This system has been tested and found to comply with the limits for a Class A digital device, pursuant to the FCC Rules.



2.3. MANUFACTURER'S LIMITED WARRANTY

SYM Technology Inc. ("SYM Technology") offers a limited warranty that the enclosed unit ("Product") will be free from defects in material or workmanship as follows:

ONE (1) YEAR LIMITED WARRANTY: For a period of one (1) year from the date of original purchase, SYM Technology will, at its option, either repair or replace a defective Product (with new or rebuilt parts/replacement).

LIMITED WARRANTY ON REPAIRED/REPLACED PRODUCTS: After SYM Technology repairs or replaces the Product, the repaired or replaced Product shall be covered by warranty for the remaining time of the original warranty period or for ninety (90) days from the date of repair, whichever is longer. Repair or replacement may include the use of functionally equivalent reconditioned units. Replaced faulty parts or components will become the property of SYM Technology.

This limited warranty does not cover and is void with respect to the following: (i) Products which have been improperly installed, maintained, modified, or repaired; (ii) Products which have been subject to outdoor use, misuse, physical damage, abnormal use or operation, improper handling or storage, exposure to fire, water, excessive moisture, or extreme temperature; (iii) Products operated outside published maximum ratings; (iv) Products on which warranty seals or Product serial numbers have been removed, broken, or altered; (v) cost of installation, set up, removal, or reinstallation; (vi) signal reception problems or network problems (unless caused by defect in material or workmanship); (vii) damage as a result of fire, flood, power surge, lightening, acts of God, or other acts which are not the fault of SYM Technology and which the Product is not specified to tolerate; (viii) any Products which have been opened, modified, or repaired by anyone other than SYM Technology or a SYM Technology authorized service center.

REPAIR OR REPLACEMENT, AS HEREINABOVE PROVIDED, IS YOUR SOLE AND EXCLUSIVE REMEDY FOR BREACH OF THE LIMITED WARRANTY. SYM Technology SHALL HAVE NO LIABILITY FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING, BUT NOT LIMITED TO, LOSS OF PROFITS, LOSS OF SALES, OR LOSS OF USE OF THE PRODUCT. SYM Technology MAKES NO OTHER EXPRESS WARRANTY, EITHER WRITTEN OR ORAL, WITH RESPECT TO THE PRODUCTS. THE DURATION OF IMPLIED WARRANTIES, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, IS LIMITED TO THE DURATION OF THIS EXPRESS WARRANTY.

SYM Technology Inc.

Attention: Customer Service

Phone: (626) 394-6630, Email: support@symtechnology.com



3. PRODUCT OVERVIEW

3.1. INTRODUCTION

The Active SPOI is an innovative approach to remotely managing the power levels of DAS systems. The modular design allows the user to mix and match cards with different frequencies for complete customization. A fully loaded chassis with all eight line cards installed will support four sectors with a MIMO configuration for one frequency band. The innovative GUI design is very intuitive and was developed to be so simple to reduce training requirements and ease the use of operation. This unit also handles both high and low power radios, up to 48 dBm on High Power Mode and 38 dBm on Low Power mode with insertion loss of 13.5 dB and 3.5 dB respectively. In case of a power failure, the active SPOI bypasses to safe mode to ensure continuous service.

Up to 15 shelves (units) can be daisy chained together in a Host-Remote configuration. The design has been engineered to make remote access as user friendly as possible with a single connection to the Host unit allowing the user to control all of the Remote units from the single connection.

Users have 24/7 access to the system once it is properly installed. Multiple personnel can access the Active SPOI simply by using an Internet connection to log on to the Web-based graphical user interface (GUI). Users can view and adjust power levels, modify configuration settings, and set alarm threshold levels as well as many other actions found in this manual.

The Active SPOI monitors the downlink input power changes and displays the values in a user friendly graphical chart. The power level is measured hourly and recorded in the log file where the results are analyzed and displayed for one year's worth of data providing a useful tool for trending and analysis reporting. This product has been engineered to integrate seamlessly with the SYM iSpectrum which provides a live spectral view of the gain changes made in the active SPOI.

The Active SPOI sends out SNMP V2c and V3 based alarm notifications. There are 7 alarm parameters including DL input overpower, UL input overpower, DL input low power, LNA, FAN, PLL and Temperature. The alarming feature generates alarm reports over a user-specified time period based on alarm counts.

More information on these features as well as all information necessary to properly use the Active SPOI will be described in the following chapters. The steps required to install and configure the Active SPOI will be described in detail. However if information or assistance is required, please contact:

SYM Technology, Inc.

Attention: Customer Service

Phone: (626) 394-6630, Email: support@symtechnology.com



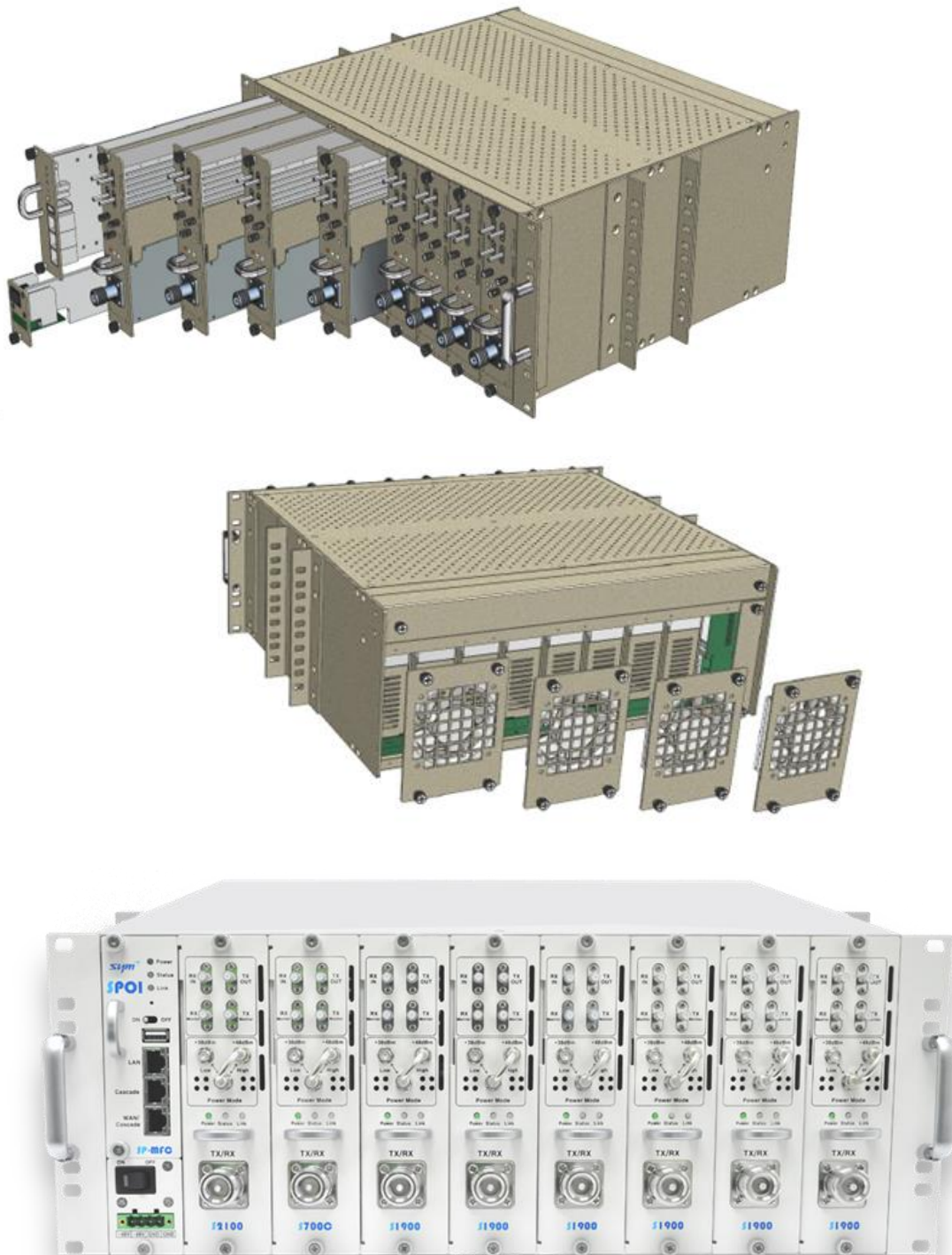


Figure 3.1a. Active SPOI View

Parts List:

No	Item	Description	Qty.
1	SP-MFC	Main Frame Chassis and Controller	1
2	DC Power Cable	-48VDC Power Cable 6 ft	1
3	Ethernet Cable (RJ-45)	Straight Cable 3 ft	1
4	RF Card*	RF Interface Card	8

*RF Card: RF Cards are separately packed.

Table 3.1a. Part List

PART NO.	RF CARD DESCRIPTION	DL FREQ.	UL FREQ.
S700L	700 MHz Lower ABC Band	728-746 MHz	698-716 MHz
S700C	700 MHz Upper C band	746-757 MHz	776-787 MHz
S800S	800 MHz SMR band (Sprint)	862-869 MHz	817-824 MHz
S800N	800 MHz SMR band	851-869 MHz	806-824 MHz
S850	850 MHz Cellular band	869-894 MHz	824-849 MHz
S1900	1900 MHz PCS band	1930-1995 MHz	1850-1915 MHz
S2100	2100/1700 MHz AWS 1 band	2110-2155 MHz	1710-1755 MHz
S2100N	2100/1700 MHz AWS 1 + AWS 3 band	2110-2180 MHz	1710-1780 MHz
S2600	2600 MHz BRS BAND	2496-2690 MHz	2496-2690 MHz

Table 3.1b. RF Band Cards

3.2. ACTIVE SPOI AT A GLANCE

The Active SPOI is a system designed to provide complete RF power control with advanced active features for manual or automatic power level adjustments. The unit consists of a chassis with a control module and up to 8 plug and play, hot swappable line cards that can be mix and matched between line cards with different frequencies.

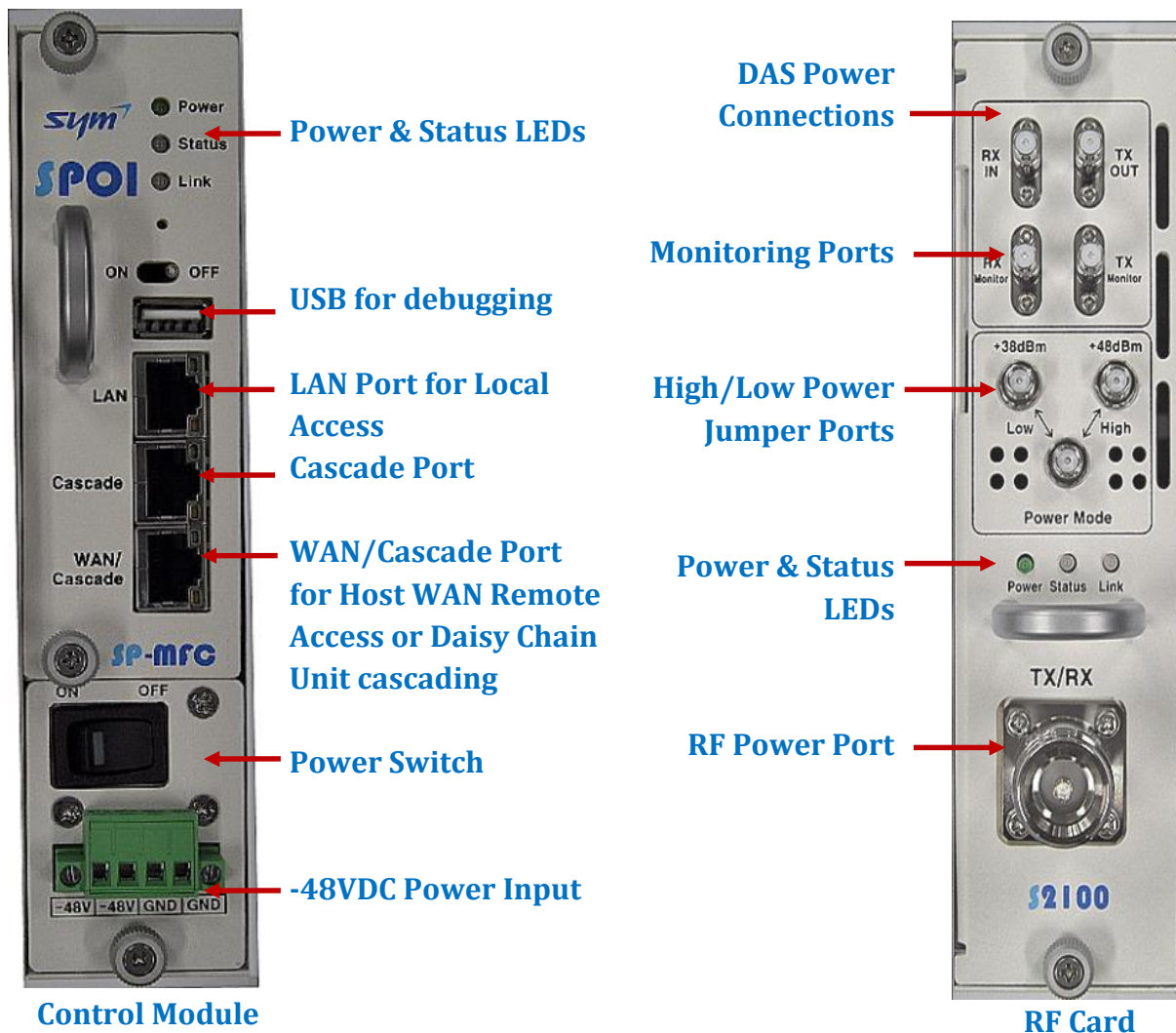


Figure 3.2a. Active SPOI Control Module and Line Card External View



4. INSTALLATION

4.1. MOUNTING

The Active SPOI is a 19 inch rack mountable unit. It can be mounted into a 2 post rack utilizing faceplate mounting. The faceplate with side-securing elements can be placed at the front, rear, or both ends of the unit.

a. 2 Post Mounting

When the Active SPOI is installed in a 2 post rack system, a 19 inch supporting shelf will not be required. A detachable side mounting bracket can be mounted at the middle of the Active SPOI as shown below. Mounting brackets at the middle of the unit will allow for 2 post rack mounting.

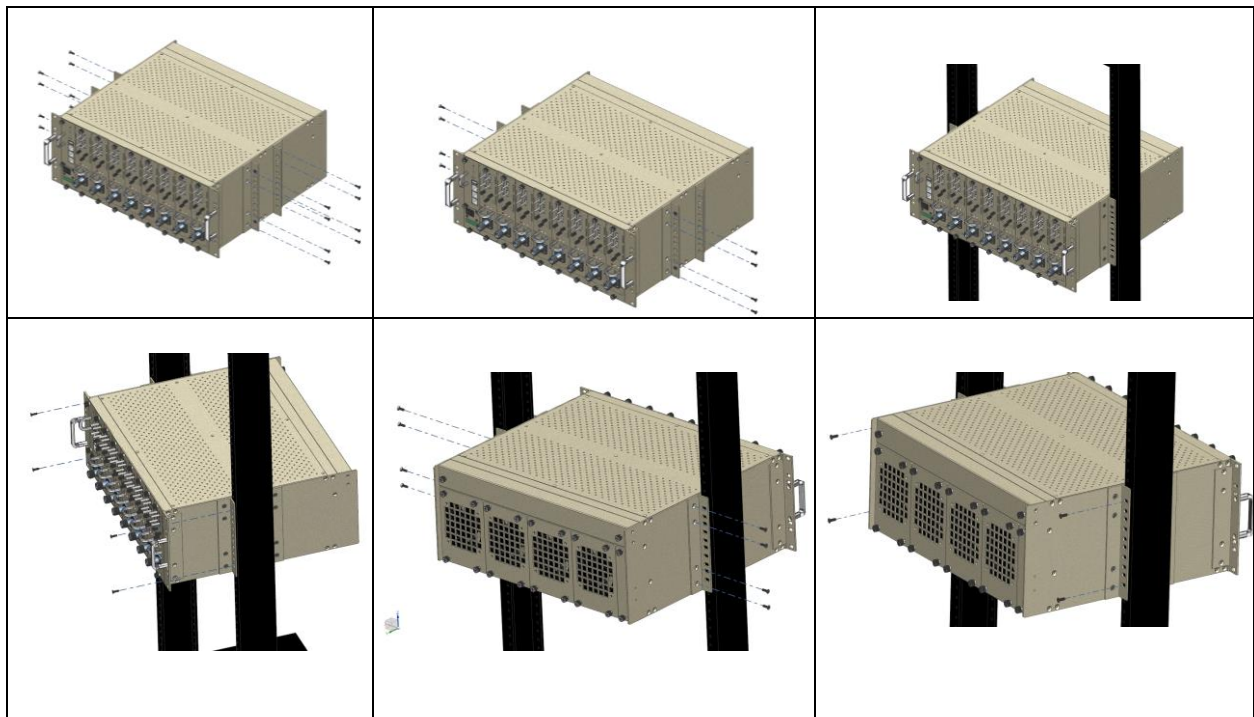


Figure 4.1a. Active SPOI Mounting on 2 Post Rack

4.2. CONTROL MODULE AND LINE CARD CONNECTIONS

4.2.1. Control Module: Host/Remote Designation

Daisy chain mode is selectable through local web GUI connection only. When connected remotely, the "SET" button will not be viewable to prevent accidental mode changes. The Node information is configured on the main controller unit (MCU) of each individual chassis by selecting either Host or Remote (1 to 14) for daisy chain connections.

Host Unit Mode: This designates the unit as the Host Controller and all Remote units that are connected to the host will be controlled via the Host GUI which allows for a single point of interface and ease of use. By default, all units are set as Host.

Host Controller is assigned the IP address of: 192.168.169.100.

Node Information

Daisy Chain Mode :	Host	SET
ID (Cascade Code) :		SET
Serial Number :	SPMFC01001	
SW Version :	1.0.1	
Operating Time :	0 Day 5 Hours 19 Minutes 1 Second	
System Log :	GET	

Remote Unit Mode: This designates the unit to the Remote Controller (1 to 14). The IP addresses are automatically assigned from 1 to 15 in order of the daisy chain for easier operation and maintenance. (See Section 5.2.2)

Node Information

Daisy Chain Mode :	Host	SET
ID (Cascade Code) :		SET
Serial Number :	SPMFC01001	
SW Version :	1.0.1	
Operating Time :	37 Seconds	
System Log :	GET	

Figure 4.2.1a. Control Module Host/Remote Settings

4.2.2. Control Module: Ethernet Connection

The Ethernet ports are located on the front panel of the Active SPOI as shown in section 3.2.

LAN Ethernet Port (for laptop connection)

The Active SPOI can be configured locally with the built-in web-based graphical user interface (GUI). Using a standard Ethernet cable, connect your laptop to the “LAN” port on the Active SPOI. The LAN connection is simple to set up. The LAN connection should be used for initial setup and whenever the operator is on location.

Before you connect your laptop to the LAN port, verify your laptop’s Local Area Connection setting. For more detailed information, please refer to Section 4.2.7 “Laptop Network Setting”.

After a proper connection is made, the red and green LEDs near the Active SPOI Ethernet connector will flash. The network hardware will determine the highest speed supported by both devices. With most PCs, the operating system will automatically establish the hardware and software network connection.

WAN-Cascade & Cascade Ports (for Daisy Chain Connection)

Mode	Daisy Chain IP address	Mode	Daisy Chain IP address
Remote 1	192.168.169.101	Remote 8	192.168.169.108
Remote 2	192.168.169.102	Remote 9	192.168.169.109
Remote 3	192.168.169.103	Remote 10	192.168.169.110
Remote 4	192.168.169.104	Remote 11	192.168.169.111
Remote 5	192.168.169.105	Remote 12	192.168.169.112
Remote 6	192.168.169.106	Remote 13	192.168.169.113
Remote 7	192.168.169.107	Remote 14	192.168.169.114

Table 4.2.2a. Remote Cascade IP Address Table



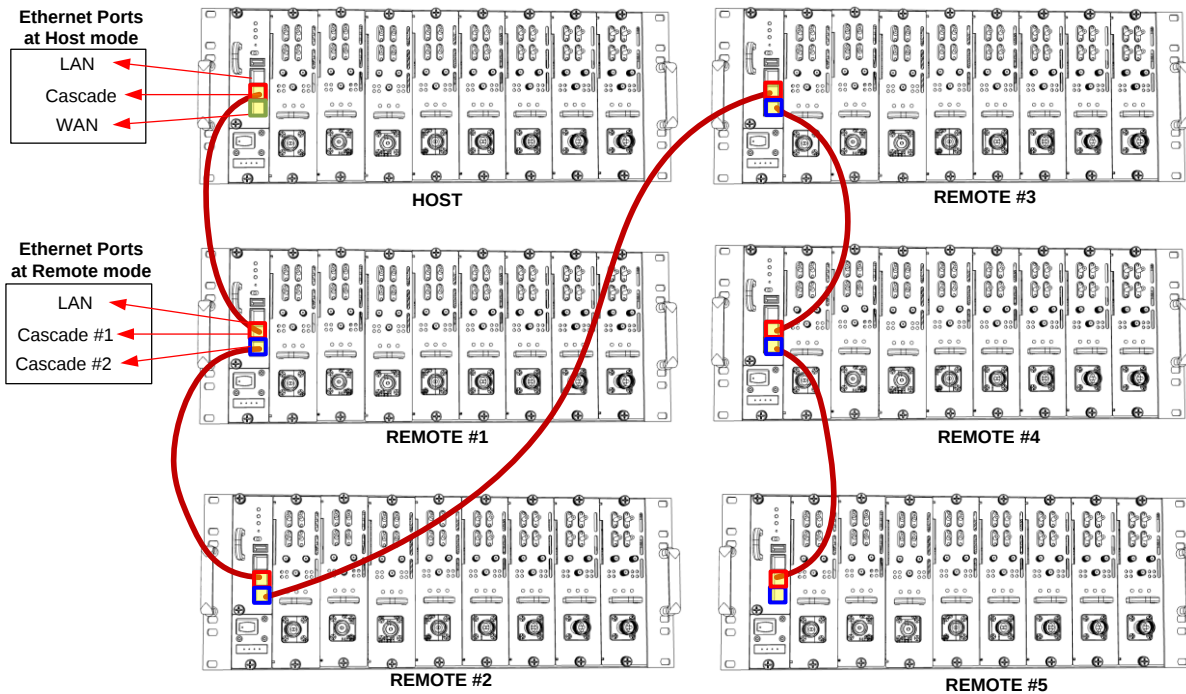


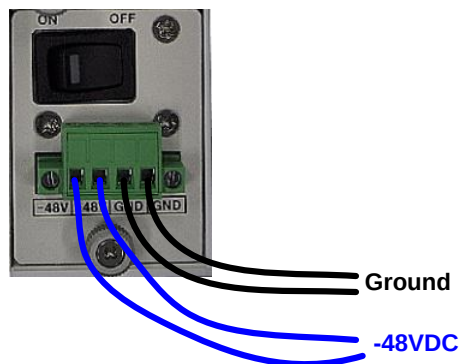
Figure 4.2.2a. Control Module Host/Remote Settings

4.2.3. Control Module: Power Connection

The Active SPOI requires -48 VDC power.



WARNINGS: This unit uses dangerous voltages. Loss of life, severe personal injury, or property damage can occur if the instructions contained in this manual are not followed. It is compulsory to ground the unit before connecting power.



4.2.4. Line Card: RF Cable Connection

The Active SPOI needs to be installed between the BTS and the DAS head-end unit.

RF input signal level should be within the normal operating range: up to +48dBm on High Power Mode and up to +38dBm for Low Power Mode. Connect the signal from the BTS to the TX/RX RF Power port and connect to the DAS using the TX Out and RX In ports.

4.2.5. Line Card: Power Selection Mode

The user must determine if the Active SPOI will be operating in the High or Low power mode and install the jumpers (supplied) in the correct position. The High (H) and Low (L) power mode configurations are shown below in figure 5.2.5. Based on input signal power, the unit will automatically detect the High or Low operating mode.

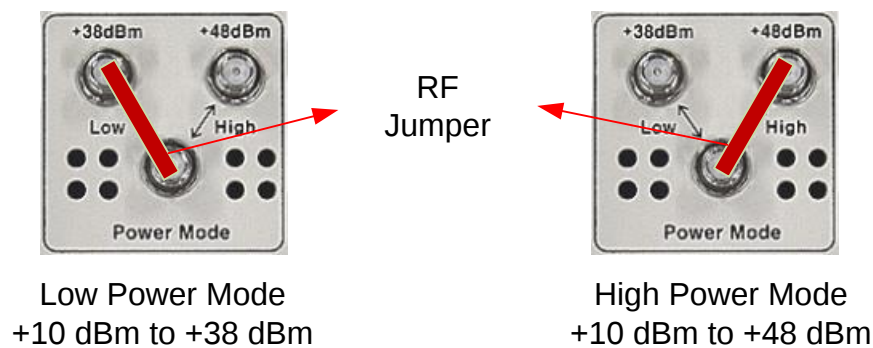


Figure 4.2.5 RF Jumper Cable connection for Low and High Power Mode

4.2.6. Line Card: Monitor Ports

The TX and RX Monitor ports can be used as spectrum monitoring ports. Both the downlink and uplink ports are available with a minimum insertion loss of 31 dB(Low)/41(High)dB for downlink and 8dB for uplink. These ports are ideally engineered to interoperate seamlessly with the SYM iSpectrum 24 port virtual spectrum analyzer.

With the iSpectrum, it's a match made in heaven. You can watch live RF performance of your system via the iSpectrum and the user can adjust the system gain remotely through the active SPOI without having to visit the site.

The iSpectrum link is integrated into the Active SPOI GUI, and with one click, the user will be redirected automatically from the Active SPOI to the iSpectrum RF view screen. For example, when a user changes



the gain setting on the Active SPOI, with a click of a button, the user will be able to see the live RF signals to see how the gain change affects the signal in real-time. Please refer to the section 6.1.8 for more detail for the iSpectrum connection.

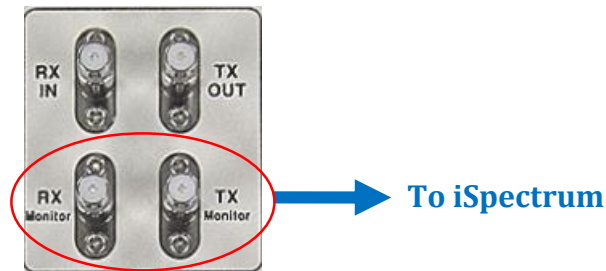


Figure 4.2.6a. Active SPOI Monitoring Ports

4.2.7. Laptop Network Settings (PC)

Before using the Web GUI, make sure the Ethernet connection between the user's laptop (or PC) LAN port and the LAN port of the Active SPOI is established.

To begin network connection, proceed as follows:

- 1) Connect the Active SPOI LAN port to Laptop (or PC) using the Ethernet Cable (RJ-45).
- 2) Select TCP/IP in Local Network Properties.

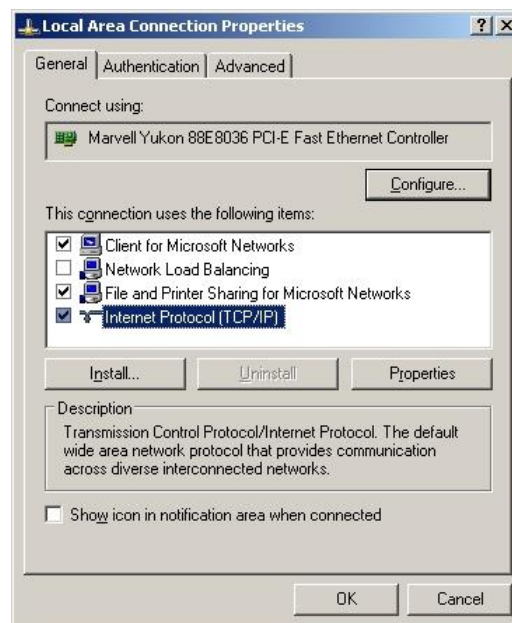


Figure 4.2.7a. Local Area Connection Properties

3) IP Setting

Under Internet Protocol (TCP/IP) properties, select “Obtain an IP address automatically.” Or, you can select “Use the following IP address”, and input 192.168.2.XXX, for which the recommended IP address is 192.168.2.200.

Assign the IP address as follows:

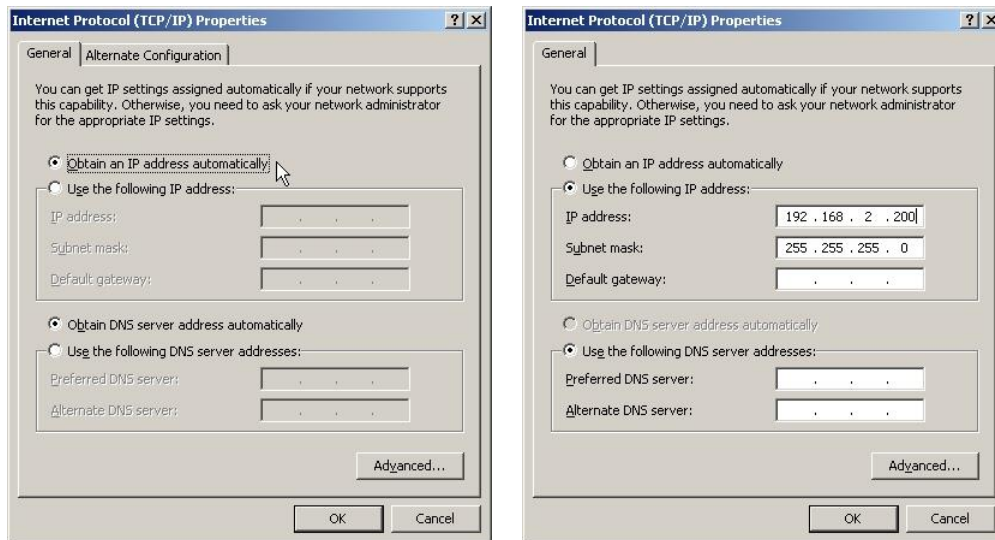
IP address: 192.168.2.200

Subnet mask: 255.255.255.0

Default gateway: Leave it blank

4) Open Internet Explorer and type in http://192.168.2.1

5) Once the login screen appears, login to the Active SPOI.



Automatic (Dynamic) IP assignment

Manual (Static) IP assignment

Figure 4.2.7b. Internet Protocol (TCP/IP) Properties



Connect the laptop to the LAN port on the Controller card

Laptop LAN Setting:

1. Obtain an IP address automatically

Or

2. Use the following IP address

IP: 192.168.2.200

Subnet Mask: 255.255.255.0

Gateway: Leave it blank

Active SPOI Login Address

Http://192.168.2.1

ID: admin

PW: spoi

Figure 4.2.7c. LAN Connectivity Diagram

5. WEB GUI

For security purposes, only authorized users can log into the Web GUI.

Local (LAN) Web GUI Login:

- 1) Connect the laptop or PC to the LAN port of the Active SPOI.
- 2) Open a web browser.
 - Recommended browsers include: Internet Explorer, Google Chrome, or Firefox
- 3) Type in the IP address for the Active SPOI unit: http://192.168.2.1

Note !

For remote access, there is no need to connect the PC to the Active SPOI.

For remote (WAN) access, type in the WAN IP address which was assigned to the Active SPOI.

- 4) Enter the User ID and Password assigned by the administrator. The default accounts and access levels are listed below:

Control Level:	Access:	User ID:	Password:
Administrator	Full Access	admin	spoi
Moderate	Read/Write	user	control
Minimum	Read Only	guest	monitor

Note: Only the Administrator can utilize the account setup



- 5) Click Login button.

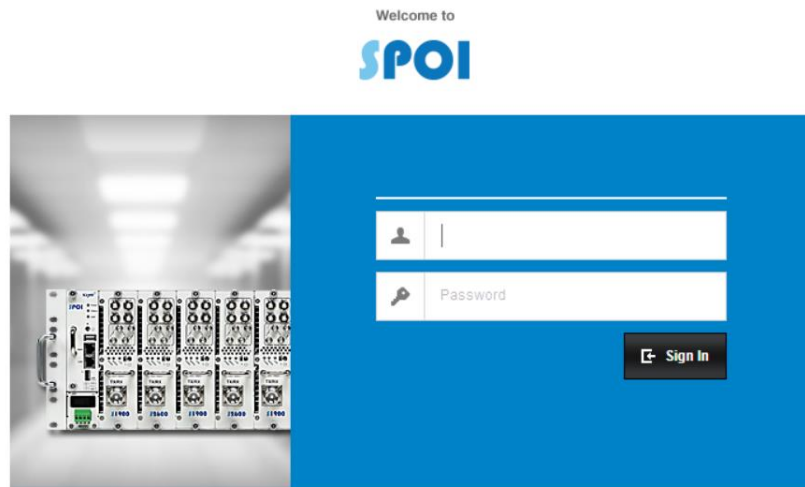


Figure 5a. Login Screen

GUI Layered Access Rights:

There are three types of access rights listed in the left column. Each access right allows for viewing the tab and/or viewing and setting values on the tab. See the table below.

TYPES OF ACCESS	Status	Setup	Alarm History	Statistics
Read	View	View	View	View
Read/Write*	View	View/Set	View/Set	View/Set
Administrative	View	View/Set	View/Set	View/Set

*Note: Read/Write user can utilize Active SPOI functions like the administrator with the exception of the account setup.

Table 5a. GUI Access Rights

Tabs:

The Active SPOI has 4 main menu tabs as shown in the figure below: Status & Configuration, Setup, Alarm History, and Statistics. The “Account” sub-tab on the Setup tab will only be visible to the administrator. All other menus are visible to read/write user. Each menu can be accessed by clicking directly on to the tab.

Login name will be displayed in the upper right corner.



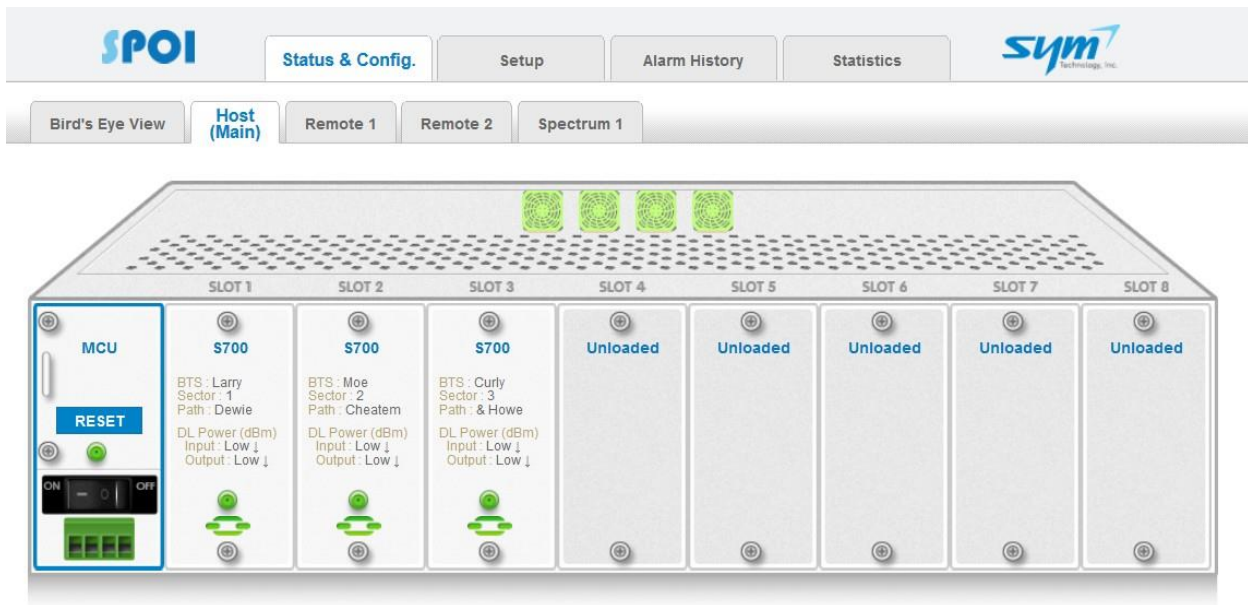
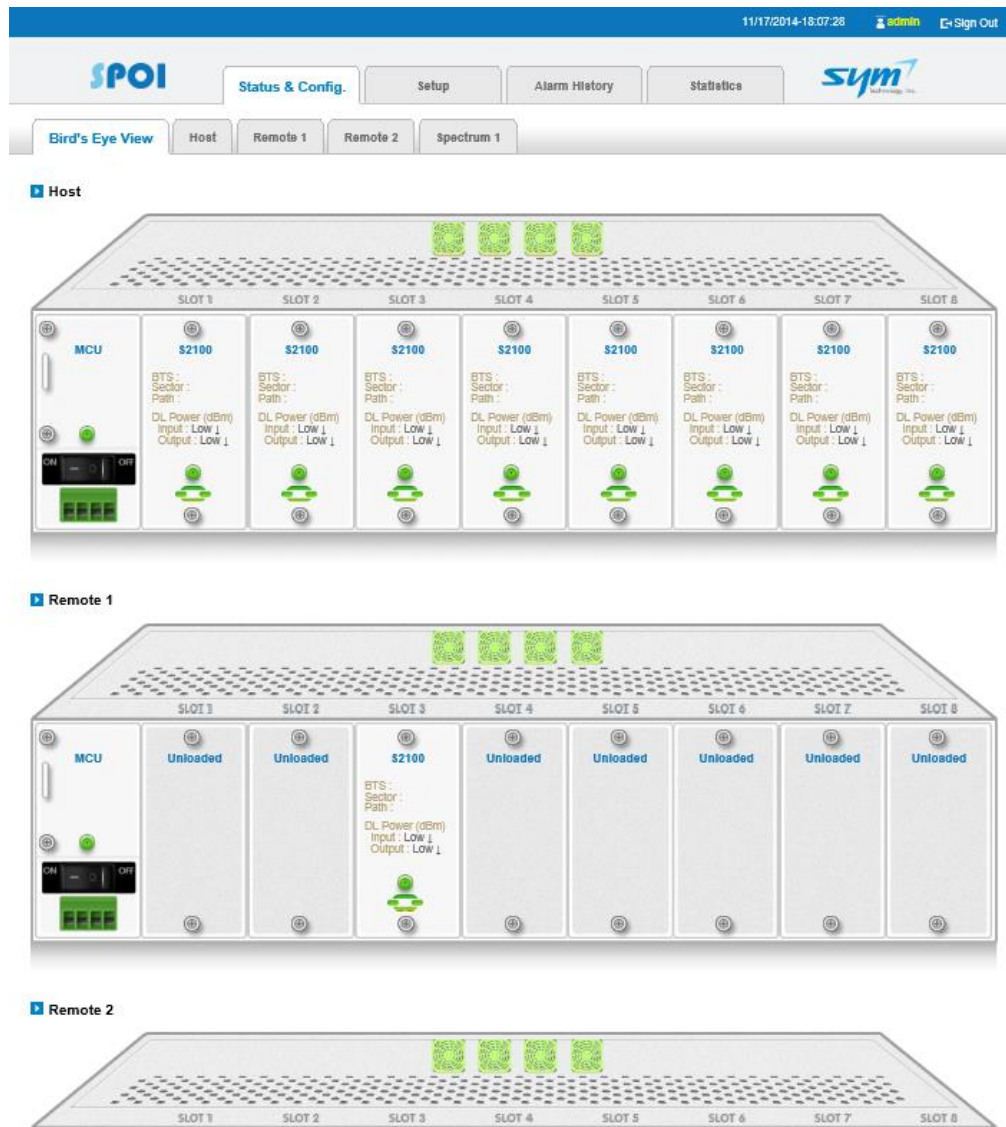


Figure 5b. Menu Tabs

5.1. STATUS & CONFIGURATION TAB

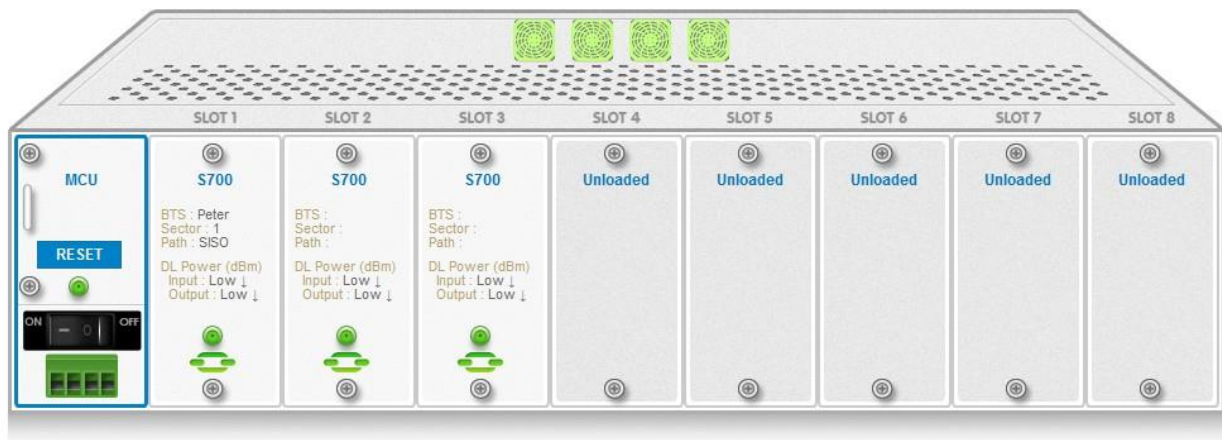
The Status and Configuration tab is all that is needed to operate the unit once it is properly configured and is the first display upon successful login. From this page, a virtual display of all the configured units are represented in a "Bird's Eye View." The front side of all units and all active line cards are displayed as well as the cooling fans. From this single connection, both the Host unit and all of the Remote units can be accessed by either selecting the desired unit from the sub tabs or simply clicking on the desired unit/line card giving the user full system control with a single connection. The fans and the line card status and link icons are color coded as follows:

- Grey: Inactive (Not Connected)
- Green: Active and Good
- Red: Active Alarm



5.1.1. Master Controller Unit

The ASPOI is configured as the Host or a Remote Unit by selecting the appropriate mode on the Master Controller Unit (MCU). By selecting the MCU, the Node Information is displayed where the user can select the Host/Remote selection and enter in the unit ID (Cascade Code). This should be done individually prior to Daisy-chaining the Host/Remote units together.



Node Information

Daisy Chain Mode : Host SET

ID (Cascade Code) : Host SET

Serial Number :

SW Version :

Operating Time : 39 Seconds

System Log :

Registered Device List

No.	Type	Node No.	IP Address	Delete
1	SPOI	Host	192.168.169.15	-
2	SPOI	Remote 1	192.168.169.1	-
3	SPOI	Remote 2	192.168.169.2	-
4	iSpectrum	Spectrum 1	192.168.169.16	-

Device List

☒ Auto Registration

Figure 5.1.1a MCU Settings for Host/Remote

5.1.2. Slot Card Settings

Once a unit/card is selected, an innovative visual block diagram with user configurable settings is displayed which is very intuitive to maintain the power levels. The Power levels and total insertion loss values are automatically measured and calculated as changes are being made.

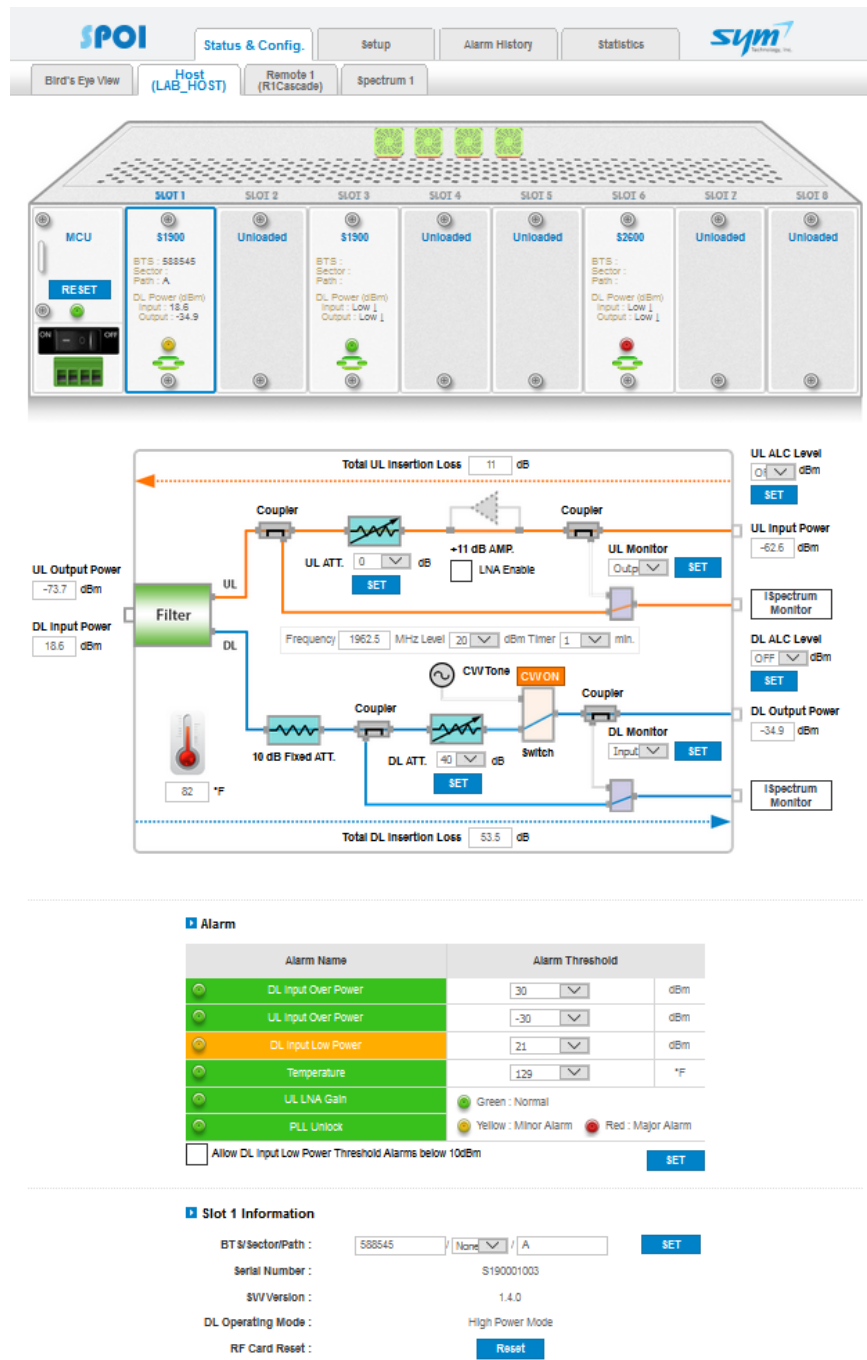


Figure 5.1.2a RF Card Slot

5.1.3. Active SPOI Block Diagram

FDD Block Diagram: The Block diagram contains all the information needed to manage the power levels. The graphic below identifies all of the features of this visual display:

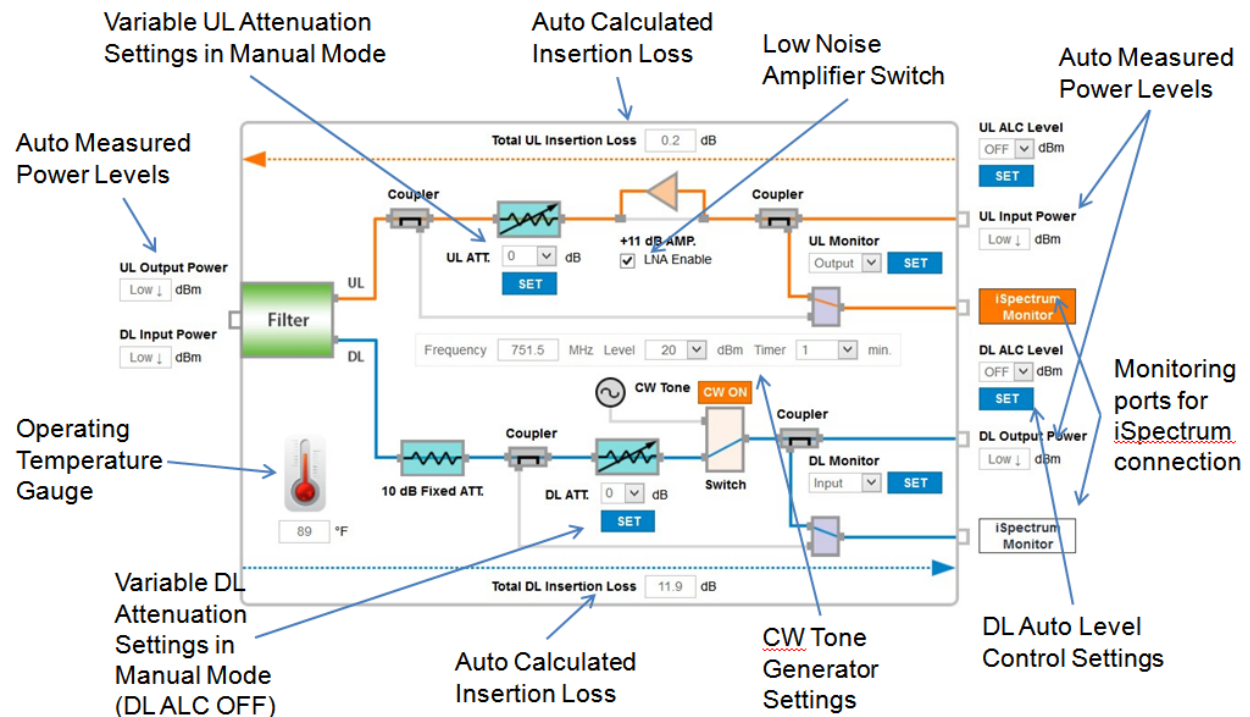


Figure 5.1.3a FDD Active SPOI Block Diagram

TDD Block Diagram: The TDD RF Card is very similar to FDD card with the exception of adding the TDD Synchronization functionality. During installation, testing, optimization, etc.. the TDD Mode can be set to DL (Down Link) or UL (Up Link) as necessary.

Note !

To return to normal operation, the TDD Mode must be set to "Auto" by selecting "Auto" in the dropdown selection and clicking the "SET" button.

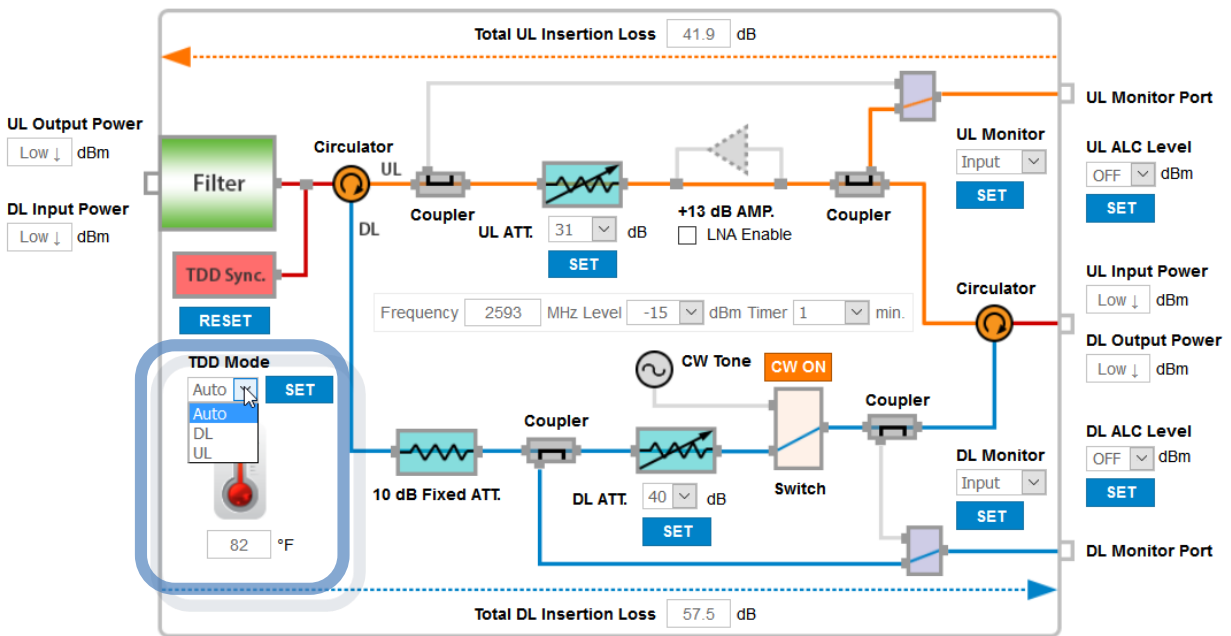


Figure 5.1.3b TDD S2600 Active SPOI Block Diagram

5.1.4. Active SPOI Manual Operation

To operate the Active SPOI in Manual Operation Mode, the steps are very straight forward:

1. Select Uplink Attenuation Value
2. Select Downlink Attenuation Value
3. Enable the Low Noise Amplifier if necessary

Monitor the Power Level and Insertion Loss measurements to ensure correct settings

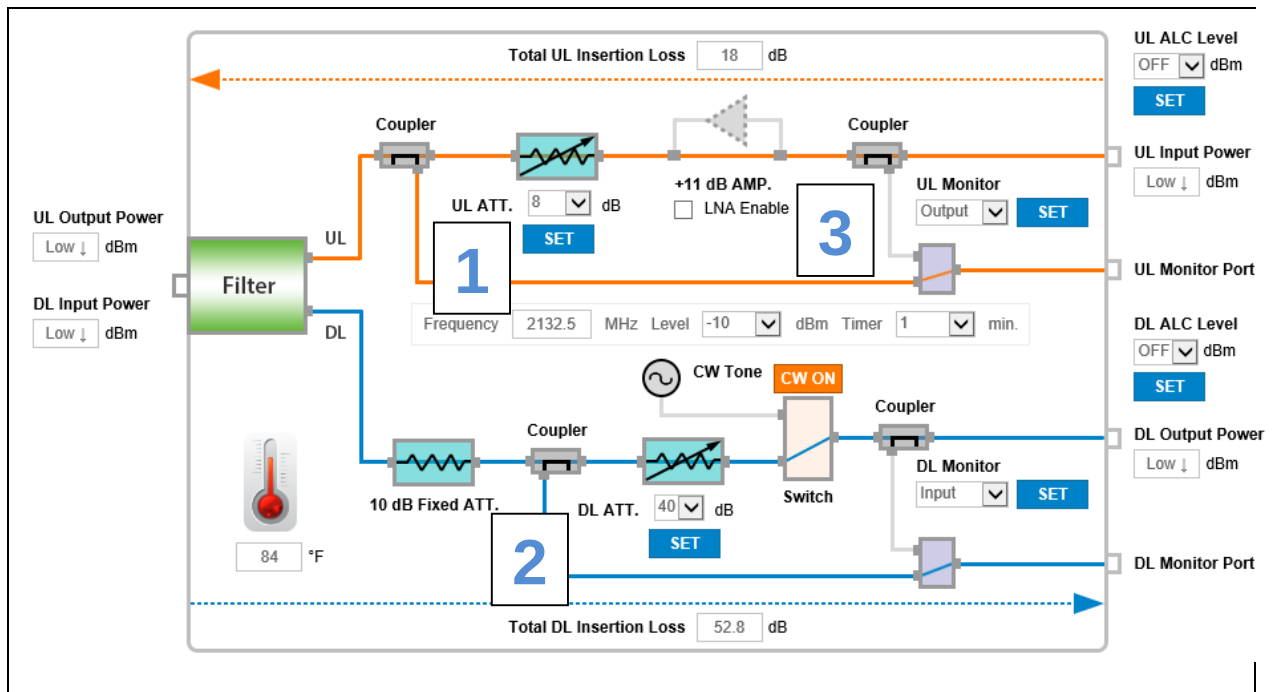


Figure 5.1.4a Active SPOI Block Diagram: Manual Mode

5.1.5. Active SPOI Auto Level Clamping Operation

To operate the Active SPOI in Auto Mode, the steps are very straight forward:

1. Select Uplink Attenuation Value
2. Select the Uplink or Downlink Auto Level Clamping Value and click "set" to enable ALC
3. Enable the Low Noise Amplifier if necessary

Automatic Level Clamping (ALC) Power Clamping Function:

When ALC is enabled, if the DL Output Power exceeds the ALC value, the variable attenuation will automatically increase to maintain the ALC Output Power setting. If the Output Power is equal or less than the ALC setting, the attenuation will maintain the selected attenuation value and will not change. This allows the power to be "clamped" to the desired value.

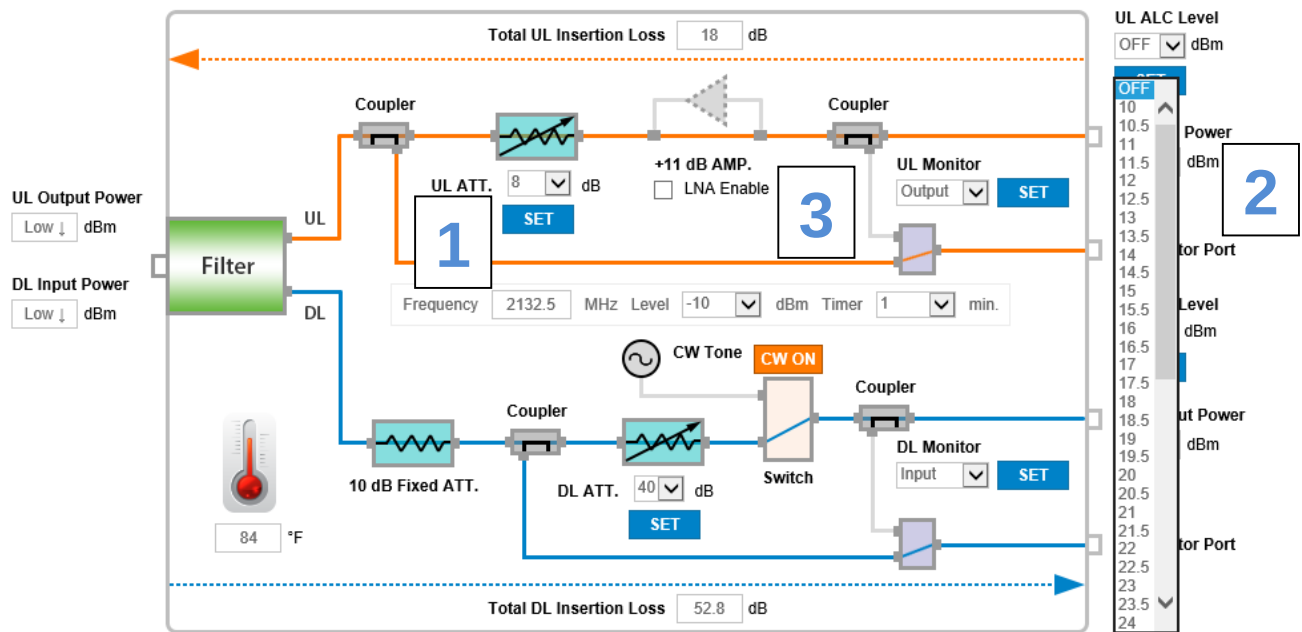


Figure 5.1.5a Active SPOI Block Diagram: Auto Level Control Mode

5.1.6. Active SPOI High Power & Low Power Differences

When the Active SPOI is connected to the High Power mode via jumper cable, a 10dB internal fixed attenuator is activated. The block diagrams below depict the differences between the two modes of operation:

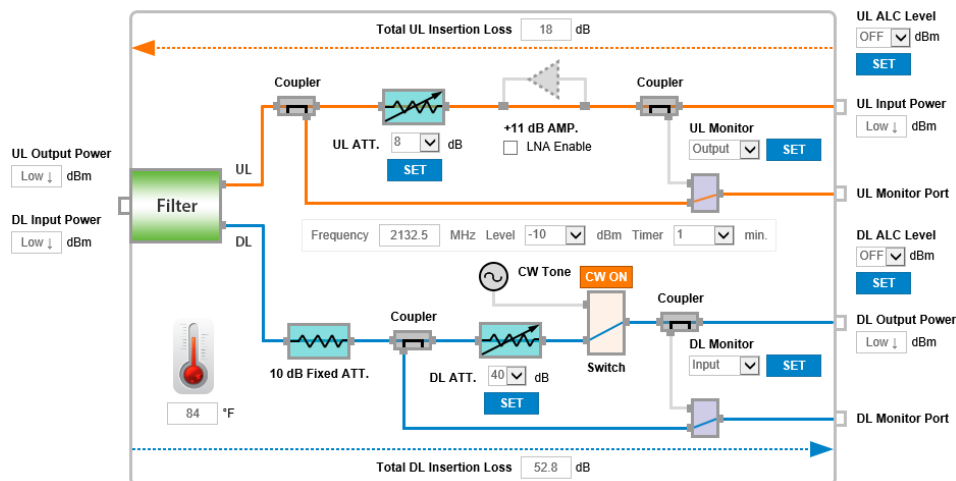


Figure 5.1.6a Active SPOI Block Diagram: Low Power Mode

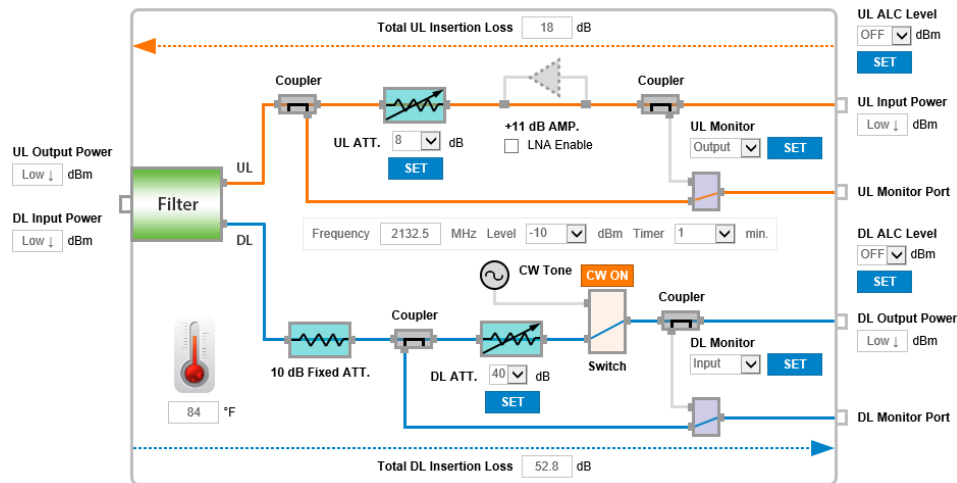


Figure 5.1.6b Active SPOI Block Diagram: High Power Mode

5.1.7. CW Tone Generation

The integrated CW tone generation features is a powerful tool that streamlines CW test procedures and significantly reduces DAS commissioning time as well as optimization and troubleshooting. The CW tone is injected in the Tx path and is activated by selecting the desired values for the frequency, level, and the duration. The CW Tone is controlled by a timer that automatically turns the CW tone off after the desired time to prevent unintended continual tone generation. Once the timer cycle is complete, the unit will resume normal operation automatically.

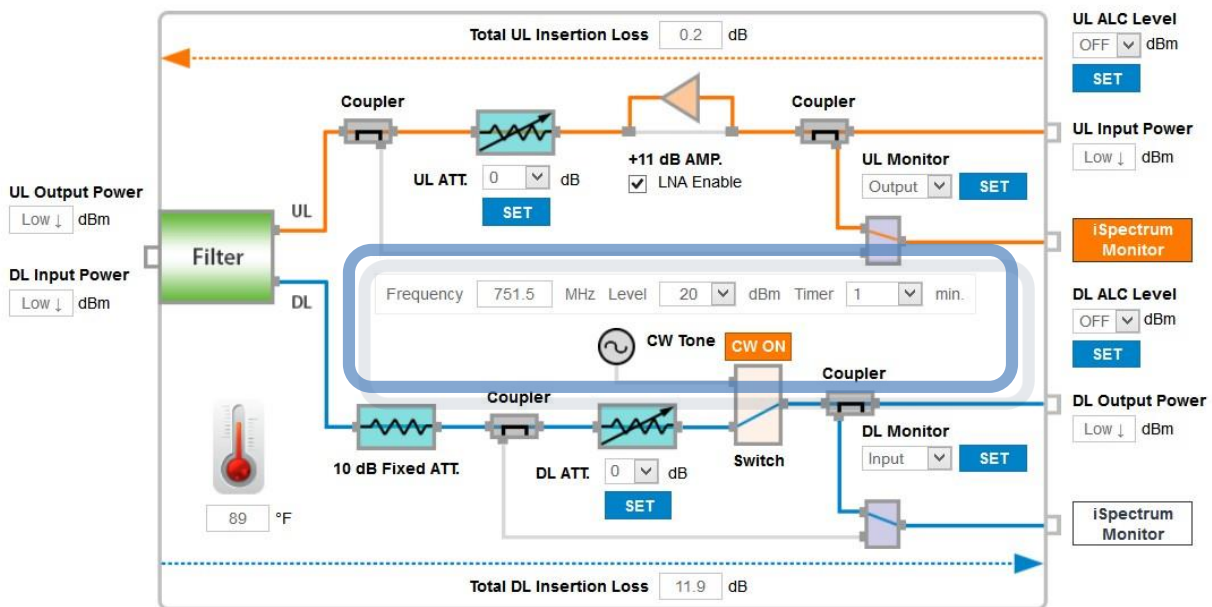


Figure 5.1.7a CW Tone Generator Function

5.1.8. iSpectrum Integration

The iSpectrum integration allows an extremely useful system to be able to control the DAS environment by simultaneously controlling the power levels and seeing the live spectrum view through the integrated SYM iSpectrum units allowing the user total control and visibility in a single location. The iSpectrum is first registered by the Host unit's MCU. Once the iSpectrum(s) are registered, they will be displayed on the sub menu bar after the last Remote Unit.

Node Information

Daisy Chain Mode :

ID (Cascade Code) :

Serial Number : SPMFC01001

SW Version : 1.0.1

Operating Time : 0 Day 19 Hours 42 Minutes 46 Seconds

System Log :

Registered Device List

No.	Type	Node No.	IP Address	Delete
1	SPOI	Host	192.168.169.15	-
2	SPOI	Remote 1	192.168.169.1	-
3	SPOI	Remote 2	192.168.169.2	-
4	iSpectrum	Spectrum 1	192.168.169.16	-

Unregistered Device List

☒ Auto Registration

No.	Type	Node No.	IP Address	Activation
-----	------	----------	------------	------------

Figure 5.1.8a iSpectrum Integration

Under the iSpectrum tab, each port will need to be mapped to the Active SPOI node, slot, and path. This will allow the user to click on the "iSpectrum Monitor" button in the block diagram and display the live spectrum for the selected Active SPOI port. To map an iSpectrum port:

1. Register the iSpectrum from the Host/MCU menu
2. Select the iSpectrum tab to map
3. Activate the iSpectrum port
4. Select the Active SPOI the iSpectrum is connected to (Node)
5. Select the Active SPOI Slot number the iSpectrum port is connected to (Slot No.)
6. Select the path the iSpectrum is connected to, either Uplink (UL) or Downlink (DL)
7. Click the "set" button to save the settings

iSpectrum RF Ports Mapping (Spectrum ID :)

Port	☒	Node No.	Slot No.	Path
1	☒	Host	1	DL
2	☒	Host	1	UL
3	☒	Host	2	DL
4	☒	Host	2	UL
5	☒	Remote 1	3	DL
6	☒	Remote 1	3	UL
7	☐	Host	1	DL
8	☐	Host	1	DL
9	☐	Host	1	DL
10	☐	Host	1	DL
11	☐	Host	1	DL
12	☐	Host	1	DL

Port	☐	Node No.	Slot No.	Path
13	☐	Host	1	DL
14	☐	Host	1	DL
15	☐	Host	1	DL
16	☐	Host	1	DL
17	☐	Host	1	DL
18	☐	Host	1	DL
19	☐	Host	1	DL
20	☐	Host	1	DL
21	☐	Host	1	DL
22	☐	Host	1	DL
23	☐	Host	1	DL
24	☐	Host	1	DL

SET

Figure 5.1.8b iSpectrum Port Mapping

Once the iSpectrum port mapping is complete, the user can now view the live spectrum by selecting the Unit/Slot to monitor. The GUI also has a very unique feature, the ability to switch the monitoring port to either an input or output port.

This feature is clearly depicted in the GUI and is user selected by the drop down menu for both the Uplink and Downlink monitoring ports. This allows spectrum monitoring either pre or post attenuation on either path which is an extremely valuable tool to provide maximum functionality.



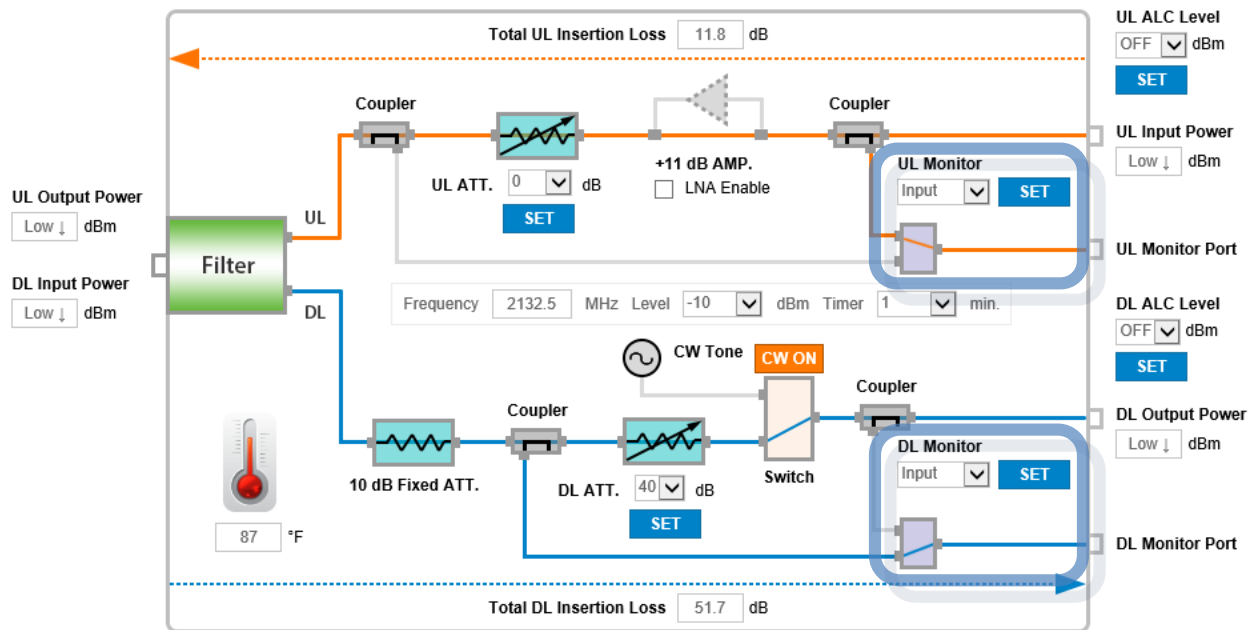
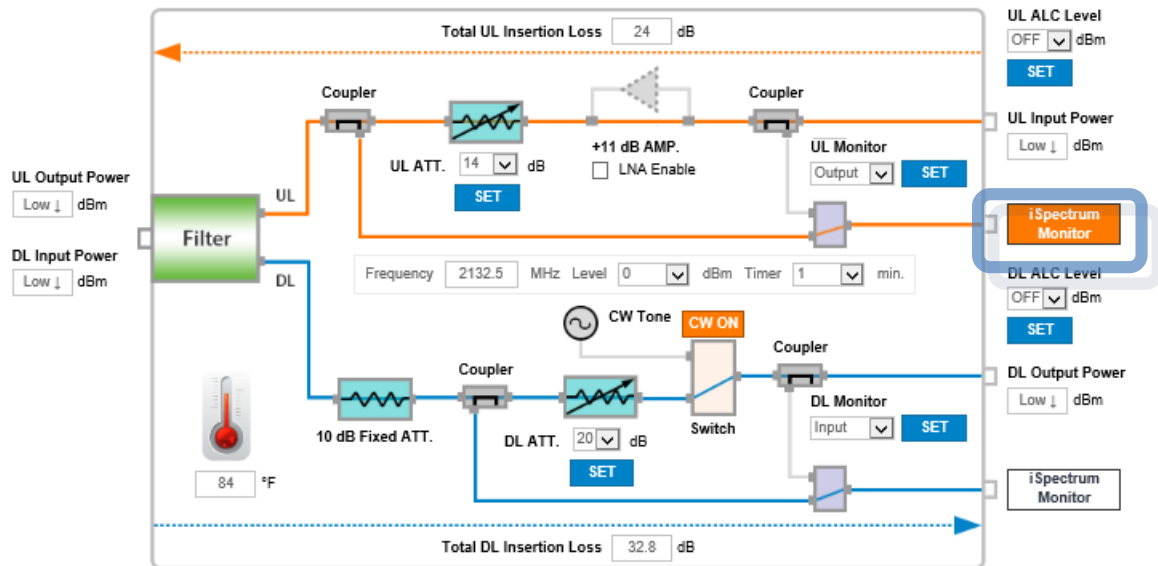
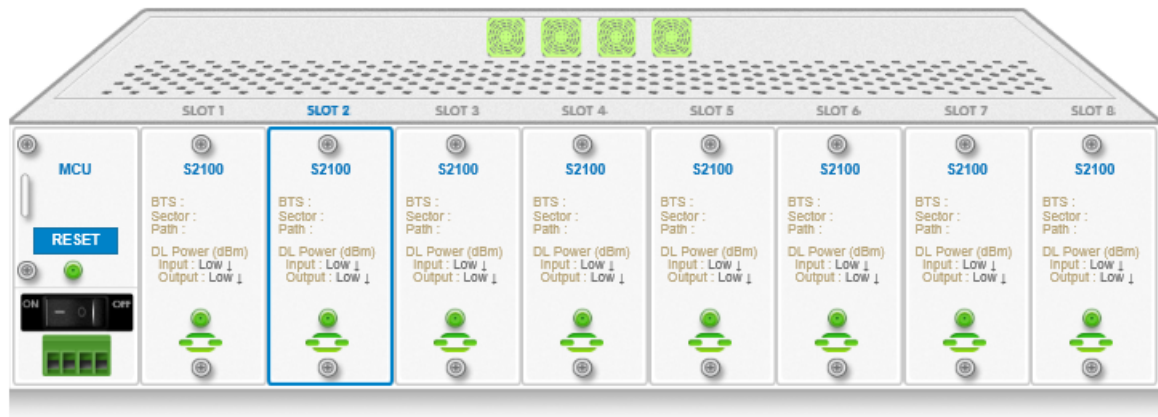
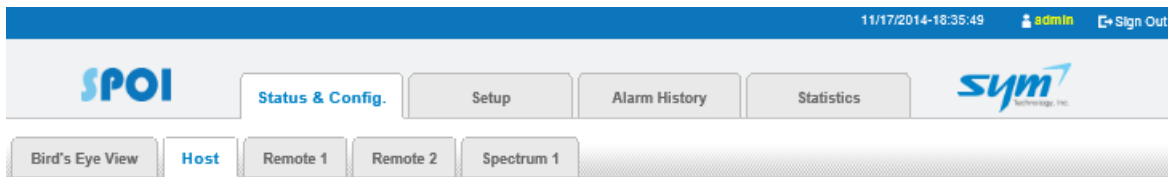
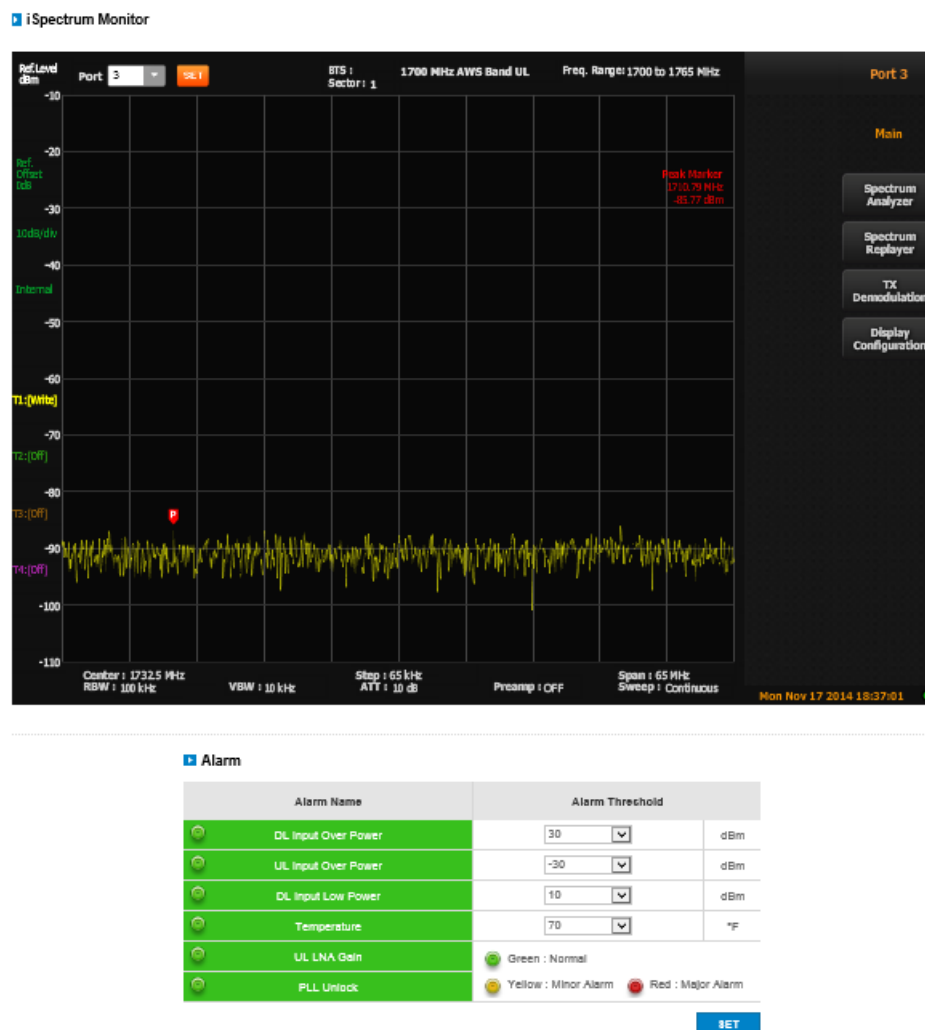


Figure 5.1.8c iSpectrum Input/Output Settings



**Slot 2 Information**

BT #/Sector/Path : / None / **SET**

Serial Number : 82100

8W Version : 3.3.0

DL Operating Mode : High Power Mode

Figure 5.1.8d iSpectrum Live Monitoring

5.1.9. Alarm Settings

The alarm settings are also located in this view beneath the block diagram. The operation of the alarms is also very intuitive.

1. Set alarm threshold values for each of the settings on the card GUI
2. Ensure proper SNMP or SMTP settings have been configured for alarm delivery under the Setup>Notification Tab
3. Check the box below the table to enable DL Low Power Threshold alarms
 - This feature was added as a customer request to trigger an alarm after commissioning of a low DL input power issue.
 - The default alarm will trigger a low power alarm down to 10 dBm but will not trigger an alarm below 10 dBm. This is useful during commissioning when prior to the RF source being activated and will not generate a visible alarm on the card LED. This allows the installer to check for hardware or other functionality alarms immediately when slotting the card since it is assumed that there is no RF signal.
 - Post commissioning, it is an option to enable the DL Input Power Threshold alarm by checking the box to be notified when there is a total Loss Of Signal.

Alarm

Alarm Name	Alarm Threshold	
 DL Input Over Power	30 	dBm
 UL Input Over Power	-30 	dBm
 DL Input Low Power	21 	dBm
 Temperature	129 	°F
 UL LNA Gain	 Green : Normal	
 PLL Unlock	 Yellow : Minor Alarm  Red : Major Alarm	

☐ Allow DL Input Low Power Threshold Alarms below 10dBm

SET

Figure 5.1.9a Alarm Settings

5.1.10. Safe Mode - Power Loss Bypass Functionality

In the event of a power failure, the Active SPOI automatically bypasses to safe mode to ensure continuous service. The downlink Tx path will retain a constant path loss. The uplink Rx path will default to a 7.5 dB insertion loss and will resume to user selected attenuation when power is restored.

5.2. SETUP TAB

The Setup Tab contains all the information to configure the ASPOI for operation. There are seven sub tabs to easily guide the configuration process to set up local and remote access, alarming destination, ASPOI unit settings, user account settings, and firmware update settings.

The screenshot displays the SPOI Setup Tab interface. At the top, there is a header bar with the date and time (09/17/2015-11:07:02), the user (admin), and links for Sign Out and Manual(V1.0). Below the header, there are several tabs: Status & Config., Setup (selected), Alarm History, and Statistics. The Setup tab is further divided into sub-tabs: Network (selected), Notification, SNMP Agent, Date&Time, Account, Update, and Quick Installation. The main content area shows the IP Version 4 configuration section, which is currently selected. It includes a checkbox for 'Obtain an IP Address Automatically (IPv4)' and a table for configuring IP Address, Subnet Mask, Default Gateway, Preferred DNS Server, and Alternate DNS Server. The IP Version 6 section is also visible but not selected. A 'SET' button is located at the bottom right of the configuration area.

	IP Version 4	IP Version 6
Wide Area Network (WAN-Cascade)		
☐ Obtain an IP Address Automatically (IPv4)		
IP Address	68 . 225 . 17 . 44	
Subnet Mask	255 . 255 . 255 . 240	
Default Gateway	68 . 225 . 17 . 33	
Preferred DNS Server	8 . 8 . 8 . 8	
Alternate DNS Server	8 . 8 . 4 . 4	
Local Area Network (LAN)		
☐ Obtain an IP Address Automatically (IPv4)		
IP Address	192 . 168 . 2 . 1	
Subnet Mask	255 . 255 . 255 . 0	
Default Gateway		

SET

Figure 5.2a Setup Tab

5.2.1. Setup > Network Tab

The WAN Ethernet Configuration will be connected to wired LAN or wireless modem for remote access. If a DHCP server is connected to the WAN port, it should be set at “Obtain an IP Address Automatically”, since this port works as the DHCP client mode. In other words, once a DHCP server is connected to the WAN port, the Active SPOI will be assigned with an IP address automatically from the DHCP server. The assigned IP address should be identified to see if the user can access the Active SPOI remotely.

However, it is highly recommended that users use a static (fixed) IP address rather than “Obtain an IP Address Automatically (IPv4)” as shown below.

Network

Notification

SNMP Agent

Date&Time

Account

Update

Quick Installation

IP Version 4

IP Version 6

Wide Area Network (WAN-Cascade)

☐ Obtain an IP Address Automatically (IPv4)

IP Address

68

225

17

44

Subnet Mask

255

255

255

240

Default Gateway

68

225

17

33

Preferred DNS Server

8

8

8

8

Alternate DNS Server

8

8

4

4

Local Area Network (LAN)

☐ Obtain an IP Address Automatically (IPv4)

IP Address

192

168

2

1

Subnet Mask

255

255

255

0

Default Gateway

SET

Figure 5.2.1a Ethernet Configuration (LAN/WAN Port)

If there is no valid wired internet connection, a wireless modem (ex. SYM's LTE Modem UWMS-05) can be connected to the Active SPOI. By configuring the port forwarding table on the wireless modem, users will be able to access the Active SPOI remotely using the modem's mobile IP address and port forwarding number.

The LAN port IP address cannot be changed. When the user accesses it locally, this port can be always used. The IP address is set to: 192.168.2.1. Please refer to section 4.2.7 for more detail.

5.2.2. Setup > Notification

The Notification features of the Active SPOI allows for both alarms and notifications to be sent via SNMP or email through an SMTP mail server. At the completion of each section, the set button should be clicked to save these settings.

5.2.2.1. Heartbeat

The first sub-tab is for site identification and heartbeat intervals as well as geographical Latitude and Longitude coordinates to be set. This is essential for accurate alarm notifications and history. The Site ID should be labeled, and the rate for receiving the SNMP heartbeat notification of the Active SPOI's status can be selected by from 1 to 60 minutes using the drop down menu. The location section requires the latitude and longitude of the location since it is included in the SNMP heartbeat (Trap) and alarm (Inform).

MIB Selection: Select the Standard MIB for use with Site Portal or select Custom MIB and the correct MIB Manager IP address for functionality with other systems. If you are not sure which one to use, please contact support.

The screenshot displays the 'Notification' setup page with the 'Heartbeat' sub-tab selected. The 'MIB Selection' section has 'Standard MIB' selected. The 'Heartbeat Interval' is set to 20 minutes. The 'Location' section shows 'Coordinates' with Latitude set to N 001 and Longitude set to W 001, both with a range of 100000. A 'SET' button is located at the bottom right.

MIB Selection	
☒ Standard MIB	☐ Custom MIB

Heartbeat Interval: 20 minutes

Location	
Coordinates	Latitude: N 001 - 100000 Longitude: W 001 - 100000

SET

Figure 5.2.2.1a Heartbeat and MIB Selection

5.2.2.2. SNMP Trap & Inform

An SNMP Destination IP address must be entered for alarm notification.

The Active SPOI supports both SNMP V2C and V3 versions.

Network

Notification

SNMP Agent

Date&Time

Account

Update

Quick Installation

Heartbeat

SNMP Trap & Inform

E-mail & SMTP

▶

SNMP Trap & Inform Setup

Destination Address

SNMP Port

SNMP Version

Community :

V2C

SET

▶

SNMP Alarm Destination List

No	Destination Address	SNMP Port	SNMP Version	Delete
----	---------------------	-----------	--------------	--------

Figure 5.2.2.2a SNMP Trap & Inform Settings

5.2.2.3. E-Mail & SMTP

Enter the SMTP Server information to receive alarm notifications. If you are not sure of your email SMTP server settings, please contact your IT department for correct settings.

Enter in the email address of recipients and their user name and click the set button to be added to the E-mail Recipient List. The users in the recipient list will automatically receive email notifications when alarms are generated.

Network **Notification** SNMP Agent Date&Time Account Update Quick Installation

Heartbeat SNMP Trap & Inform **E-mail & SMTP**

E-mail Registration

E-mail Address

User Name

SET

E-mail Recipient List

No.	E-mail Address	User Name	Delete
-----	----------------	-----------	--------

SMTP Server

E-Mail Address

Server Name

Server Port

Over SSL

Server Requires Authentication

User Name

Password

SET

Figure 5.2.2.3a E-Mail & SMTP Settings

5.2.3. Setup > SNMP Agent

The SNMP Agent tab contains the settings for the SNMP V2C and V3 settings and must be completed in order for traps to be successfully sent. Once all the settings are completed, the set button must be clicked to save the settings.

The screenshot displays the 'SNMP Agent' configuration page. At the top, there is a navigation bar with tabs: Network, Notification, **SNMP Agent**, Date&Time, Account, Update, and Quick Installation. Below the tabs, the 'SNMP V2C Configuration' section is active, showing 'Read Community' set to 'public' and 'Write Community' set to 'private'. A horizontal dotted line separates this from the 'SNMP V3 Configuration' section. In the V3 section, 'User Name' is 'spoi', 'Security Level' is 'Use All', 'Auth. Algorithm' is 'MD5', 'Auth. Password' is 'authpasscode', 'Privacy Algorithm' is 'AES', and 'Privacy Password' is 'privpasscode'. A blue 'SET' button is located at the bottom right of the form.

Configuration Section	Field	Value
SNMP V2C Configuration	Read Community	public
	Write Community	private
SNMP V3 Configuration	User Name	spoi
	Security Level	Use All
	Auth. Algorithm	MD5
	Auth. Password	authpasscode
	Privacy Algorithm	AES
	Privacy Password	privpasscode

Figure 5.2.3a SNMP Agent Settings

5.2.4. Setup > Date&Time

The Date and Time can be synchronized by multiple external sources by selecting the desired source in the drop down selection. The Time Zone should be selected based on the local time zone where the Active SPOI is installed for accuracy.

The screenshot shows the 'Date&Time' configuration page. At the top, there is a navigation bar with tabs: Network, Notification, SNMP Agent, Date&Time (selected), Account, Update, and Quick Installation. Below the tabs, the 'Time Setting' section is active, showing 'NTP Server' set to 'time.nist.gov'. A note states: 'This SPOI is set to automatically synchronize on a scheduled basis.' The 'Time Zone' section below shows a dropdown menu set to '(UTC-08:00) Pacific Time (US and Canada)'. There is an unchecked checkbox for 'Automatically adjust clock for Daylight Savings Time'. A blue 'SET' button is located at the bottom right of the settings area.

Time Setting

NTP Server : time.nist.gov

This SPOI is set to automatically synchronize on a scheduled basis.

Time Zone

(UTC-08:00) Pacific Time (US and Canada)

☐ Automatically adjust clock for Daylight Savings Time

SET

Figure 5.2.4a Date & Time Settings

5.2.5. Setup > Account

Only the Administrator can access the Account Tab. Read only and Read/Write members won't see this tab. The Account Tab includes the New Account function and the Account List that displays current accounts and accessibility.

The Account List will show all users and enables the Administrator to add and delete accounts. The New Account sub tab enables the Administrator to designate new accounts and security access.

Account information will be retained even when the Active SPOI is rebooted.

There is a factory reset set hole next to the Ethernet port in the rear side. Once the user pushes and holds it for 5 seconds, all settings will be reset to the factory setting. This means that all band configurations, setup information, including account settings, will be erased and will need to be reconfigured from a backup file.

Multiple accesses are possible for up to 10 (recommended) simultaneous users.

The screenshot displays the 'Account' tab in the settings menu. It features a 'New Account' section with input fields for 'New User Name', 'Password', 'Confirm Password', and a dropdown for 'Accessibility'. A 'SET' button is located to the right of the 'Confirm Password' field. Below this is the 'Account List' section, which contains a table with columns for 'No', 'User Name', 'Accessibility', and 'Delete'.

No	User Name	Accessibility	Delete
1	admin	Administrator	-
2	user	Read/Write	Delete
3	guest	Read Only	Delete
4	epic	Read/Write	Delete
5	Andrew	Read/Write	Delete
6	Dave	Read/Write	Delete

Figure 5.2.5a Account Settings

5.2.6. Setup > Update

- **Software Updates:** If necessary, new firmware can be installed by selecting it through the Browse button and clicking the Update button. The Software packages include updates for all controllers and line cards. Click the update button to load the new software and automatically reboot the system.
- **Software Synchronization:** Once the Software is loaded, all controllers and line cards installed in the chassis (Host mode only) or network (in Daisy Chain mode) can be synchronized with a single click on the Sync. button.

Network
Notification
SNMP Agent
Date&Time
Account
Update
Quick Installation

Software Update

Click "Browse" to locate new software and click "Update" to upload the selected software.

File Name :

Software Synchronization

Click "Sync" to synchronize the software version of the connected nodes with the software of the host.

Node	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7	Slot 8
Host V1.7.4	V1.4.0	Blank	V1.4.0	Blank	Blank	V1.0.0	Blank	Blank
Remote 1 V1.7.4	V1.4.0	Blank	Blank	Blank	Blank	Blank	V1.4.0	Blank

Figure 5.2.6a Update Settings

5.2.7. Setup > Quick Installation

- Quick Installation: Save a lot of time and configure the ENTIRE Daisy Chain from this one screen on the Host Controller. You can modify the individual values in the table and click "SET" when complete and/or copy and paste values from one chassis to another using the Source/Destination feature at the top of the table. Select your Source data you would like to copy and the Destination values you want to paste into and click the "COPY" button when complete.
- Download As-Built Report: When you are finished with the configuration and want to save a record of all the settings and values for the As-Built report, simply click the "Download As-Built Report" button and save a nicely formatted table for your records.

Network

Notification

SNMP Agent

Date&Time

Account

Update

Quick Installation

Active SPOI Quick Installation

Source

Destination

Node

Host

Slot

All

Item

All

Node

All

Slot

All

Function

Copy All

COPY

Node / Cascade Code	Slot	Band	BTS	Sector	Path	DL Input	DL Atten.	DL Total Loss	DL Output	UL Input	UL Atten.	UL Total Loss	UL Output
Host LAB_HOST	# 1	S1900	588545	None	A	19.3	40	53.5	-34.2	-64.3	0	11	-75.4
	# 2	-	-	-	-	-	-	-	-	-	-	-	-
	# 3	S1900		None		Low	0	12.4	Low	Low	31	40	Low
	# 4	-	-	-	-	-	-	-	-	-	-	-	-
	# 5	-	-	-	-	-	-	-	-	-	-	-	-
	# 6	S2600		None		Low	40	57.5	Low	Low	31	41.9	Low
	# 7	-	-	-	-	-	-	-	-	-	-	-	-
	# 8	-	-	-	-	-	-	-	-	-	-	-	-
Remote #1 R1Cascade	# 1	S850	528394	S1	Smith	Low	0	11.1	Low	Low	31	40.8	Low
	# 2	-	-	-	-	-	-	-	-	-	-	-	-
	# 3	-	-	-	-	-	-	-	-	-	-	-	-
	# 4	-	-	-	-	-	-	-	-	-	-	-	-
	# 5	-	-	-	-	-	-	-	-	-	-	-	-
	# 6	-	-	-	-	-	-	-	-	-	-	-	-
	# 7	S1900		None		Low	40	53.6	Low	Low	31	30	Low
	# 8	-	-	-	-	-	-	-	-	-	-	-	-

Download As-Built Report

SET

Configuration Upload & Download via WEB GUI

Figure 5.2.7a Quick Installation Table

5.3. ALARM HISTORY TAB

The Active SPOI stores both performance and operational alarms. The RF Signal Alarms are port based spectrum alarms. All alarms can be sent via SNMP and/or email and are covered in more detail in the Setup Section.

SPOI

Status & Config.

Setup

Alarm History

Statistics



Node

All

▼

Slot

All

▼

Start



Stop



 SEARCH

Delete All

Alarm ID	Node ID	Slot ID	Alarm Name	Event Time	Cleared Time	Delete
141571654702004	Remote 2	-	Fan 4 Alarm	11/11/2014-05:54:25	11/11/2014-05:55:05	☐
141571644802004	Remote 2	-	Fan 4 Alarm	11/11/2014-05:52:46	11/11/2014-05:53:24	☐
141571627502004	Remote 2	-	Fan 4 Alarm	11/11/2014-05:49:54	11/11/2014-05:50:37	☐
141571623002004	Remote 2	-	Fan 4 Alarm	11/11/2014-05:49:08	11/11/2014-05:49:15	☐
141571613102004	Remote 2	-	Fan 4 Alarm	11/11/2014-05:47:29	11/11/2014-05:48:25	☐
141571602002004	Remote 2	-	Fan 4 Alarm	11/11/2014-05:45:38	11/11/2014-05:46:01	☐
141571594102004	Remote 2	-	Fan 4 Alarm	11/11/2014-05:44:20	11/11/2014-05:44:48	☐
141571568802004	Remote 2	-	Fan 4 Alarm	11/11/2014-05:40:06	11/11/2014-05:40:43	☐
141571560302004	Remote 2	-	Fan 4 Alarm	11/11/2014-05:38:41	11/11/2014-05:39:04	☐
141571556302004	Remote 2	-	Fan 4 Alarm	11/11/2014-05:38:01	11/11/2014-05:38:25	☐

1

2

3

4

5

6

7

8

9

10

>

>>

Figure 5.3a Alarm History Settings

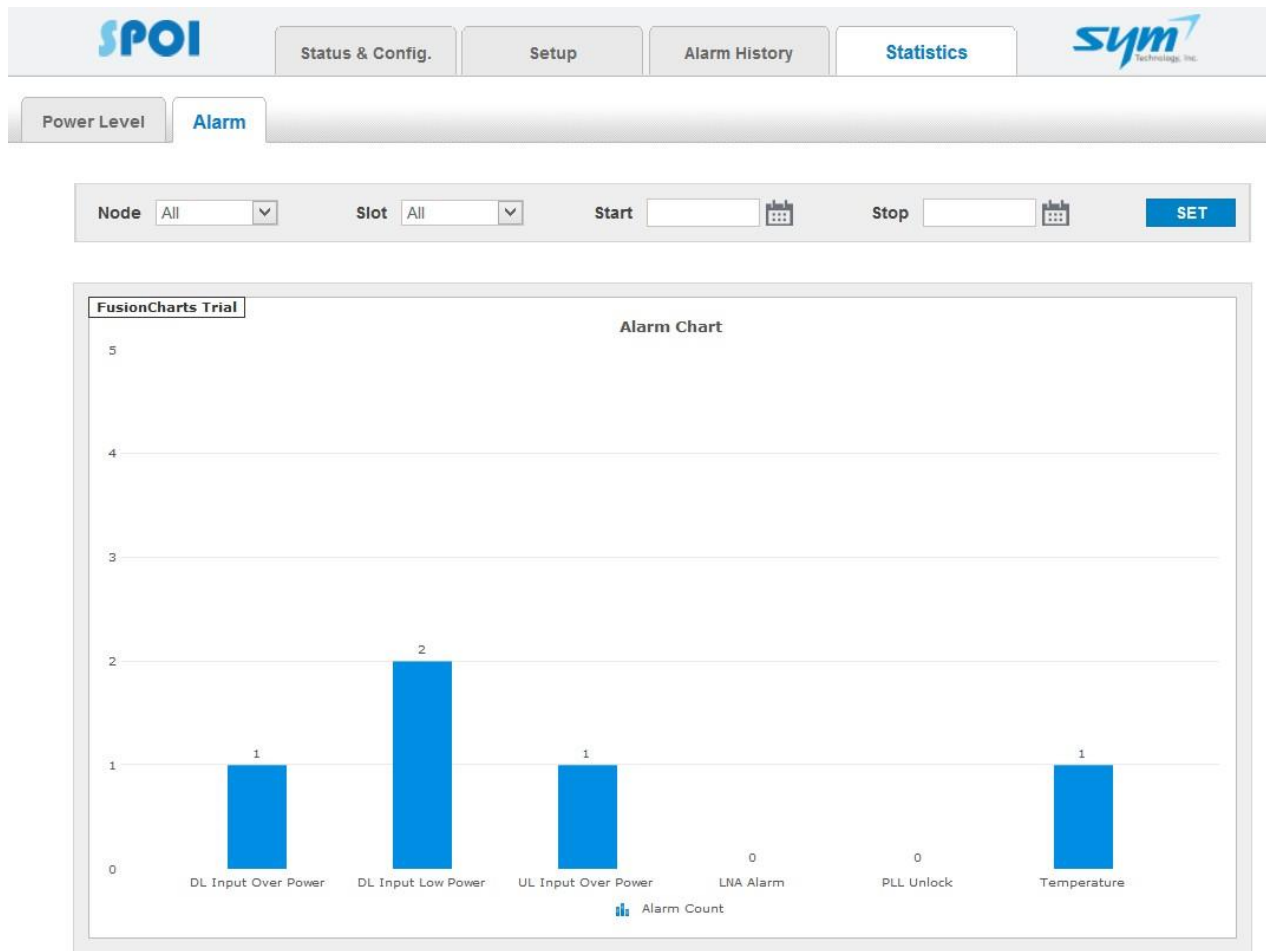
The System Alarms are listed below:

- FAN Alarm
- Remote Link Fail
- PLL Unlock
- UL LNA Gain
- DL Input Over Power
- DL Input Low Power
- UL Input Over Power
- Temperature

5.4. STATISTICS TAB

The statistics tab graphically displays the power level history for both input and output power levels as well as alarm statistics. This feature is a powerful tool to analyze the usage statistics of the system to determine if any adjustments need to be made as well as trending for health status. The power levels are measured every hour and a full year of data is automatically stored for analysis and retrieval for the host and all remote units using the intuitive graphical interface to display the desired user selected data.





6. SPECIFICATIONS

Item		TX (Downlink)		RX (Uplink)	Remark
		High Power Mode	Low Power Mode		
Max. Input Power		48 dBm (60 Watt)	38 dBm (6 Watt)	-10 dBm	Maximum
Insertion Loss @ DC Power ON	700	12.0 ± 1.0 dB	2.0 ± 1.0 dB	0dB $\pm$ 1.0dB @LNA ON 10.5dB $\pm$ 1.0dB @LNA OFF	@ 0dB Attenuation
	850	12.0 ± 1.0 dB	2.0 ± 1.0 dB		
	1900	13.5 ± 1.0 dB	3.5 ± 1.0 dB		
	2100	13.5 ± 1.0 dB	3.5 ± 1.0 dB		
Insertion Loss @ DC Power OFF		I.L @ DC Power ON + DL ATT. Setting		7.5dB $\pm$ 1.0dB	Only FDD
Attenuation Range		0 – 40 dB / 1 dB step		0 – 31 dB/ 0.5 dB Step	
Attenuation accuracy		1dB		1dB	
Ripple		2 dBp-p		2 dBp-p	Peak to peak
Coupling Value		41 $\pm$ 1 dB	31 $\pm$ 1 dB	8 $\pm$ 1 dB	
Return Loss		TX/RX : > 18 dB, TX OUT: > 15 dB		TX/RX: 18 dB, RX IN: > 18 dB	
TX/RX Isolation		> 80 dB			
PIM		> 153 dBc @43 dBm x 2			
BTS or eNB Connector		Mini-DIN (F) – TX/RX			Duplex Port
DAS Head-end Connector		QMA (F) – TX OUT & RX IN			Simplex Port
CW Tone	Level	-10 dBm to +20 dBm at the TX Output port (Level Accuracy : 1 dB)			
	Freq. Range	TX frequency range with 100 kHz Step @each assigned band			

Item	Specifications
Dimensions (W * H * D)	19" x 7" x 15.75" (483 x 177 x 400 mm)
Weight	Shelf : 16.5 lbs, RF Card: 6.6 lbs
Slot	1 Controller & 8 RF Cards
Cooling	FAN x 4 ea
Color	Light Gray (Panton 427C)
DC Power	-48VDC
Operating Temperature	+32 °F to +122 °F (0 °C to +50 °C)
Relative Humidity	5 % to 90 % Non-condensing
Ingress Protection rating	IP 20 minimum
Functionality	Safe Mode, Power Monitoring, Daisy Chain, CW Tone Generation, etc.
Alarming	SNMP V2C & V3, 7 Alarms
Interface between POI Controllers	Ethernet (RJ-45 jack)
Mounting Method	19" Rack Mount

Table 6a. Active SPOI Specifications

Controller Card with FAN	Band Card	
	@ One Card	@ Fully Loaded (8 Cards)
21 Watts	8.4 Watts	67.2 Watts
Total Power Consumption in fully loaded one Chassis: 88.2 Watts (~2A @ -48VDC)		

	Heat Dissipation (Watts)				BTU Calculation	
	Per Card		Total		(1W = 3.14 BTU/HR)	
RF Input Power Level	60W Max.	5W Typical	60W Max.	5W Typical	60W Max.	5W Typical
Controller Card with FAN	21	21	21	21	65.94	65.94
Band Card	68.4	13.4	547.2	107.2	1718.21	336.61
Total			568.2	128.2	1784.15	402.55

Band	DL Input from BTS (dBm)	DL Insertion Loss @ 0 dB ATT. setting (dB)	Variable Attenuation Range/Step (dB)	Total Attenuation (Insertion Loss) Range (dB)	DL Output to DAS (dBm)
700 MHz	37	12	0 to 40/1	12 to 52	25 to -15
850 MHz	33	12	0 to 40/1	12 to 52	21 to -19
1900 MHz	33	13.5	0 to 40/1	13.5 to 53.5	19.5 to -20.5
2100 MHz	37	13.5	0 to 40/1	13.5 to 53.5	23.5 to -16.5

Table 6b. Active SPOI Power Specifications