



MRD 2600 Modular Receiver

User Manual



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3200 Sencore Drive, Sioux Falls, SD USA
www.sencore.com

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About Sencore

Sencore is an engineering leader in the development of high-quality signal transmission solutions for the broadcast, cable, satellite, IPTV, telecommunications, and professional audio/video markets. The company's world-class portfolio includes video delivery products, system monitoring and analysis solutions, and test and measurement equipment, all designed to support system interoperability and backed by best-in-class customer support. Sencore meets the rapidly changing needs of modern media by ensuring the efficient delivery of high-quality video from the source to the home. For more information, visit www.sencore.com.

Revision History

Date	Version	Description	Author
06/10/2013	1.0	Initial Release (1.2.0 software)	NDM
08/30/2013	1.1	Update for ver. 1.2.0 Release	NGJ
11/21/2013	1.2	Update for ver. 1.3.0 Release	NGJ
3/11/2014	1.3	Update for ver. 1.4.0 Release	CDP
5/14/2014	1.4	Update for ver. 2.0.0 Release	CDP
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3/1/2015	1.6	Update for ver. 2.2.2	JDF
3/12/2015	1.7	Update for ver. 2.3.0	CDP
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10/21/2015	1.9	Update for ver. 2.5.0	CDP
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6/6/2016	1.11	Update for ver. 3.1.0	CDP
9/28/2016	1.12	Update for ver. 3.2.0	CDP
4/07/17	1.13	Update for 3.3.0	ACD

Safety Instructions

- Read these instructions
- Keep these instructions
- Heed all warnings
- Follow all instructions
- Do not use this apparatus near water
- Clean only with dry cloth
- Do not block any ventilation openings. Install in accordance with the manufacturer's instructions
- Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat
- Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
- Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
- Only use attachments/accessories specified by the manufacturer.
- Unplug this apparatus during lightning storms or when unused for long periods of time.
- Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
- Do not expose this apparatus to dripping or splashing and ensure that no objects filled with liquids, such as vases, are placed on the apparatus.
- To completely disconnect this apparatus from the AC Mains, disconnect the power supply cord plug from the AC receptacle.
- The mains plug of the power supply cord shall remain readily operable.
- **Damage Requiring Service:** Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:
 - When the power-supply cord or plug is damaged.
 - If liquid has been spilled, or objects have fallen into the product.
 - If the product has been exposed to rain or water.
 - If the product does not operate normally by following the operating instructions. Adjust only those controls that are covered by the operating instructions as an improper adjustment of the controls may result in damage and will often require extensive work by a qualified technician to restore the product to its normal operation.
 - If the product has been dropped or damaged in any way.
 - The product exhibits a distinct change in performance.
- **Replacement Parts:** When replacement parts are required, be sure the service technician uses replacement parts specified by Sencore, or parts having the same operating characteristics as the original parts. Unauthorized part substitutions made may result in fire, electric shock or other hazards.

SAFETY PRECAUTIONS

There is always a danger present when using electronic equipment.

Unexpected high voltages can be present at unusual locations in defective equipment and signal distribution systems. Become familiar with the equipment that you are working with and observe the following safety precautions.

- Every precaution has been taken in the design of your MRD 2600 to ensure that it is as safe as possible. However, safe operation depends on you the operator.
- Always be sure your equipment is in good working order. Ensure that all points of connection are secure to the chassis and that protective covers are in place and secured with fasteners.
- Never work alone when working in hazardous conditions. Always have another person close by in case of an accident.
- Always refer to the manual for safe operation. If you have a question about the application or operation call Sencore for assistance.
- **WARNING** – To reduce the risk of fire or electrical shock never allow your equipment to be exposed to water, rain or high moisture environments. If exposed to a liquid, remove power safely (at the breaker) and send your equipment to be serviced by a qualified technician.
- To reduce the risk of shock the MRD 2600 must be connected to a mains socket outlet with a protective earthing connection.
- For the MRD 2600 the mains plug is the main disconnect and should remain readily accessible and operable at all times.
The MRD 2600 is equipped with an internal system battery. The MRD 2600 must be sent to Sencore service for replacement of this battery.
- When installing the MRD 2600 utilizing the DC power supply, the power supply **MUST** be used in conjunction with an over-current protective device rated at 50 V, 5 A, type: Slow-blo, as part of battery-supply circuit.
- To reduce the risk of shock and damage to equipment, it is recommended that the chassis grounding screw located on the rear of the MRD 2600 – be connected to the installation's rack, the vehicle's chassis, the battery's negative terminal, and/or earth ground.

CAUTION – Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type.

FCC Class A Information

The MRD 2600 has been tested and found to comply with the limits for a Class A digital 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 instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his or her own expense.

Shielded cables must be used with this unit to ensure compliance with the Class A FCC limits.

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

Package Contents

The following is a list of the items that are included along with the MRD 2600:

1. Declaration of Conformity
2. AC Power Cable
3. Quick Start Guide

Note: If any option cables were ordered with the MRD 2600 they will be included in the box as well.

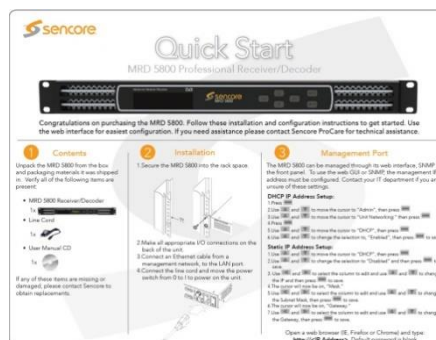
If any of these items were omitted from the packaging of the MRD 2600 please call 1-800-SENCORE to obtain a replacement. Manuals for Sencore products can be downloaded at www.sencore.com



1) Declaration of Conformity



2) AC Power Cable



3) Quick Start Guide

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Section 1 Overview



Introduction

This section includes the following topics:

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1.1 Product Introduction

The MRD 2600 is a Modular Receiver used as a turnaround product capable of receiving a transport stream from the following interface types:

- 1) ASI
- 2) IP
- 3) DVB-S/S2
- 4) 8VSB

and converting it to ASI and/or IP out.

The MRD2600 also has the ability to descramble BISS and DVB-CI scrambling (a CAM module needs to be purchased to descramble DVB-CI). This manual describes how to install, configure, and operate the MRD 2600 Modular Receiver. It is written for professional operators of video distribution systems and assumes a prerequisite level of technical knowledge.

The MRD 2600 is controllable through the web interface, front panel, or SNMP to perform tasks such as setup, monitoring, and troubleshooting.

Supported WEB interface browsers include:

- Internet Explorer 7 & above
- Mozilla Firefox 3.5 & above

1.2 Front Panel Overview

The MRD 2600 can be controlled from the front panel using the LCD screen and buttons that are shown below. A detailed description of using the front panel can be found in Section 3.1. All hardware listed below comes standard except for the DVB-CI slots which are a factory installed option.



1. LCD screen
2. Input Indicator
3. Error Indicator
4. Up, Down, Left, Right buttons
5. Back and Enter Buttons
6. 2x DVB-CI Slots (Factory Option)

1.3 Rear Panel Overview

The MRD 2600 comes standard with all of the hardware listed below except where noted as a factory installed option. The three option cards available for the MRD 2600 are the Quad Input DVB-S/S2 card, dual port MPEG/IP Input/Output card, and VSB/QAM receive card. ASI is the standard input on all MRD 2600 units.





1. RJ45 Management Port
2. Relay Output Connector
3. ASI I/O Connectors
4. Option Card Slot #1 (factory installed)
5. Option Card Slot #2 (factory Installed)
6. Chassis ground
7. Optional Dual Power Supply

1.4 Cooling

The MRD 2600 is cooled via forced induction through the front of the unit and exhausted through the vents in the rear of the chassis. The MRD 2600 is equipped with a temperature controlled status indicator. If the temperature in the inside of the unit exceeds 60° C the red “Error” text will illuminate on the front panel and a description of the error will appear in the “Error List.”

1.5 Rack Information

The MRD 2600 is intended to be mounted in a standard 19” rack. It occupies 1RU of rack space and the connections are all on the rear of the unit.

Section 2 Installation



Introduction

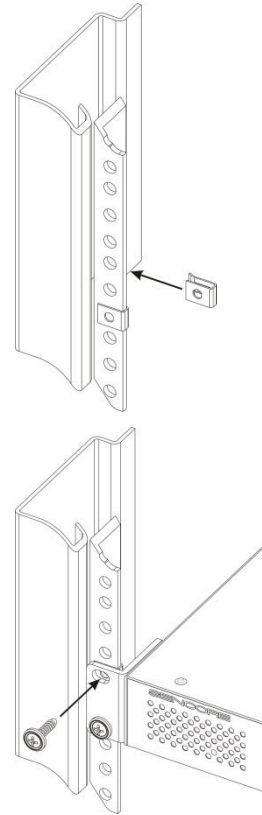
This section includes the following topics:

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2.1 Rack Installation

To install the MRD 2600 into a rack use the following steps:

1. Determine the desired position in the rack for the MRD 2600 making sure that the air intake on the front of the unit and the exhausts on the sides of the unit will not be obstructed.
2. Insert the rack mount clips into place over the mounting holes in the rack.
3. Slide the MRD 2600 into position in the rack.
4. Secure the MRD 2600 to the rack by installing the four supplied screws through the front mounting holes and tightening.
5. If needed, secure a grounding wire use the grounding location on the rear panel of the MRD 2600. See Section 1.3 for grounding location.



2.2 Power Connection

Using the proper power connections is vital to the safe operation of the MRD 2600. Only use the supplied 3-prong power connector or one with equal specifications. NEVER tamper with or remove the 3rd – prong grounding pin. This could cause damage to the MRD 2600, personnel, or property.

2.3 AC Power Connection

The MRD 2600 is intended for use on either 120V or 240V systems. The power supply will automatically detect the system it is connected to. To hook up the power use the following steps:

1. Locate the AC power cord that was included with the MRD 2600.
2. Plug the female end of the power cord (end with no prongs) into the back of the unit.
3. Locate a protected outlet (usually inside of the rack) to plug the male end of the power cable into.

2.4 AC Dual Redundant Power Connection (optional)

The Dual Redundant option allows the MRD 2600 to be powered by two separate supplies either operating 120V or 240V systems. The power supply will automatically detect the system it is connected to. To hook up the power use the following steps:

1. Locate the AC power cord that was included with the MRD 2600.
2. Plug the female end of the power cord (end with no prongs) into the back of the unit.
3. Locate a protected outlet (usually inside of the rack) to plug the male end of the power cable into.

2.5 DC Power Connection

The MRD 2600 with the DC chassis option is intended for use on 48V DC systems. A power cable is not included for this option. In order to apply power to the unit in this configuration, simply connect the screw terminals on rear of the unit to the rack's DC power rails.

Be sure that the power source and cable is used in conjunction with an over-current protective device rated at 50 V, 5 A, type: Slow-blo fuse as part of battery-supply circuit. Also, to reduce the risk of shock and damage to equipment, it is recommended that the chassis grounding screw (1.3) located on the rear of the MRD 2600 – be connected to the installation's rack, battery negative terminal, and/or earth ground.

2.6 Maintenance





The MRD 2600 is virtually a maintenance-free piece of equipment. There are no user serviceable parts on the inside of the unit

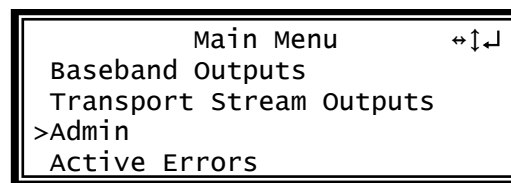
2.7 Network Setup via Front Panel




The MRD 2600 can be setup on a network connection to allow remote management and SNMP configuration. For these features to work, the network settings for the MRD 2600 must first be configured properly for the network it is connected to.

Static IP Address

To setup the MRD 2600 with a static IP address, use the following steps:

1. Press the  button.
2. Use the  and  buttons to move the cursor to "Admin", then press the  button.







3. Use the  and  buttons to move the cursor to “Unit Networking”, then press the  button.

```

Admin                                     ↕↔↵
>Unit Networking
System Time
About System
Voltage Levels

```




Note: The first menu displayed is status menu. In order to begin making changes to networking settings press the  button.

4. Use the  and  buttons to move the cursor to “DHCP”, then press the  button.




```

Configure Network                       ↕↔↵
Host Name: .....
>DHCP: Disabled

```

5. Use the  and  buttons to change the selection to “Disabled” then press the  button.






IP Address/Subnet Mask/Gateway

1. Use the  and  buttons to move the cursor to “IP”, then press the  button.

```

Configure Network                       ↕↔↵
Host Name: .....
DHCP: Disabled
>IP: 0.0.0.0
Mask: 0.0.0.0






```

2. Use the  and  buttons to select the column to edit and use the  and  buttons to change the IP, then press the  button to save the selection.

```

Configure Network                       ↕↔↵
Host Name: .....
DHCP: Disabled
>IP: 000.000.000.000
Mask: 0.0.0.0






```

3. The cursor will now be on “Mask”.
4. Use the  and  buttons to select the column to edit and use the  and  buttons to change the Subnet Mask, then press the  button to save the selection.

```

Configure Network                       ↕↔↵
Host Name: .....
DHCP: Disabled
IP: 0.0.0.0
>Mask: 000.000.000.000

```

5. The cursor will now be on “Gateway”.
6. Use the  and  buttons to select the column to edit and use the  and  buttons to change the Gateway, then press the  button to save the selection.







```

Configure Network  +↕↔
DHCP: Disabled
IP: 0.0.0.0
Mask: 0.0.0.0
>Gateway: 000.000.000.000

```

DHCP

The MRD 2600 can be configured to use DHCP to obtain an IP address/Subnet Mask/Gateway.

1. Use the  and  buttons to move the cursor to “DHCP:” then press the  button.
2. Use the  and  buttons to change the selection to “Enabled” then press the  button to save the selection.

```

Configure Network  +↕↔
Host Name: -----
>DHCP: Enabled

```

Note: It may take up to a minute for the MRD 2600 to obtain an IP address. During this time the unit will display a “busy” message next to DHCP.

Section 3 Operating the Front Panel



Introduction

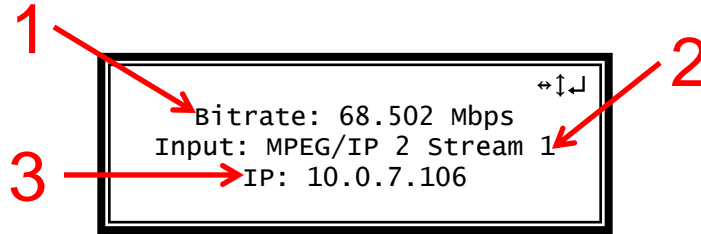
This section includes the following topics:

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3.1 MRD 2600 Front Panel Overview

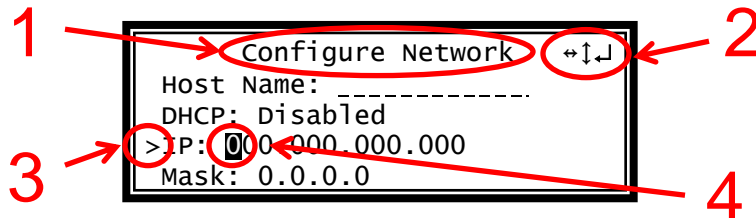


The MRD 2600 front panel allows the user to configure all settings that are present in the web interface using the buttons located on the front of the unit. The screen below is the idle screen of the MRD 2600. This idle screen allows the user to view the incoming bitrate of the active input, which input is set to active, and the management IP address of the unit.



1. Bitrate of incoming stream displayed in Mbps.
2. Current active input.
3. IP address of management port.

The following figure shows a typical screen on the front panel. Several important features have been circled and noted below. These features are common to all screens and assist when navigating, viewing and editing unit information. The **BACK** button allows the user to return to the home screen, cancel settings and go back a menu. In order to edit a selected parameter the **ENTER** button must be pressed. Once a parameter has been changed the **ENTER** button must be pressed again before the change takes effect on the unit.



1. Screen title.
2. Icons indicate which control buttons are currently valid for entry.
3. Cursor shows which line is active.

4. When editing, active character or item is highlighted.

Section 4 Operating the Web Interface



Introduction

This section includes the following topics:

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4.1 MRD 2600 Web Interface Overview

4.1.1 Logging into the MRD 2600 Web Interface

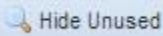
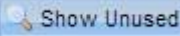
To open the MRD 2600 web interface use one of the following supported browsers and navigate to the unit's IP address:

- Internet Explorer 7 & above
- Firefox 3.5 & above
- Google Chrome


The user will need to login to the web interface. By default the admin user account is available without a password. Press the login button in order to login to the web interface.

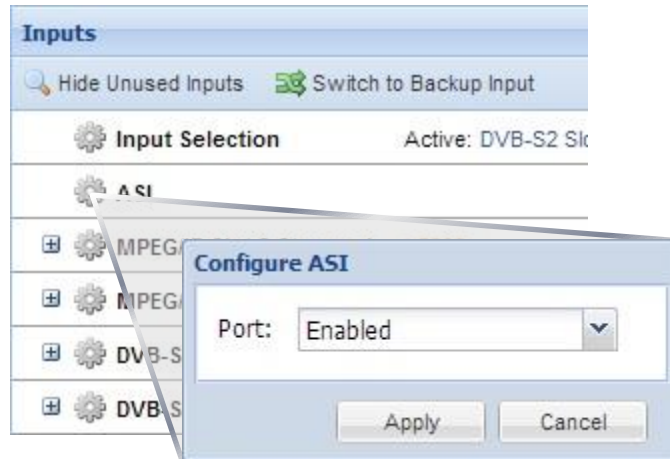
A screenshot of the MRD 2600 web interface login form. The form is titled "Login" and features a user selection dropdown menu with "admin" selected, a password input field, and a "Login" button with a key icon.



4.1.2 Hiding Unused Inputs

The MRD 2600 web interface allows the user to hide inactive inputs using the  button or show all available inputs by click the  button. Only the inputs configured as the Primary Input and Backup Input (see Section 4.2.1) in the will be displayed when unused inputs are hidden.




4.1.3 Buttons and Status Indicators

When the  icon is shown user configuration is available. Clicking this button will open menus where settings can be changed by the user.



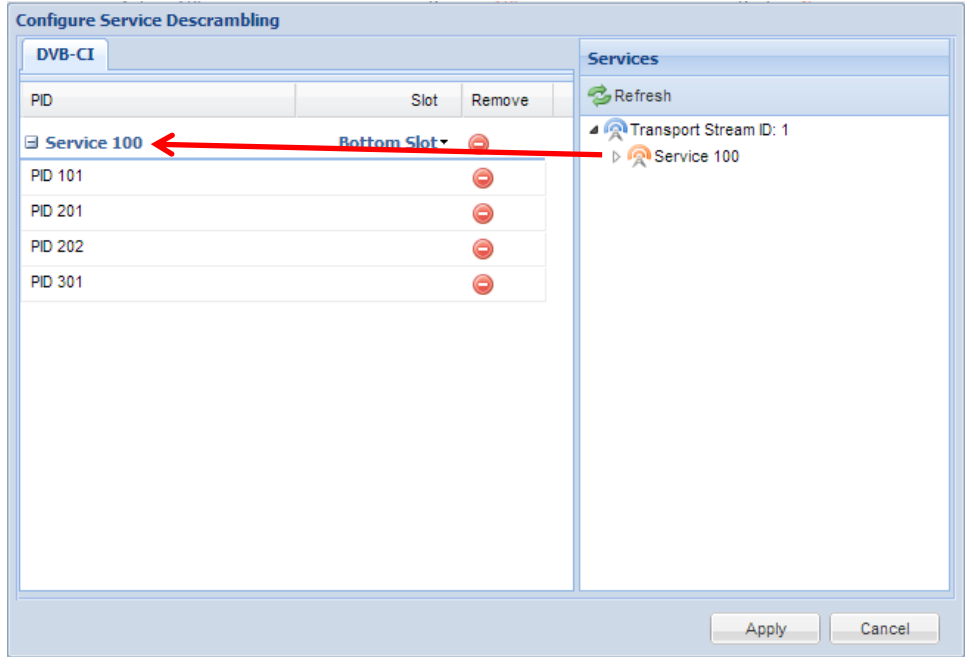
When the  icon is shown additional status information can be viewed. Click this button will expand the menu to display the additional status information. All text in status menus shown in **ORANGE** are user configurable settings. Text shown in **BLUE** is not user configurable and is strictly a status or value. To minimize the status windows again click the  icon.

Status in the MRD 2600 web interface is shown with LED status indicators:

Green LED		Status is good. No errors are present and function is operating normally.
Red LED		Status indicates function is affected by active error. To view the errors navigate to Alarms panel to view Active Errors.
Grey LED		Status is inactive. Function is currently disabled or unavailable.

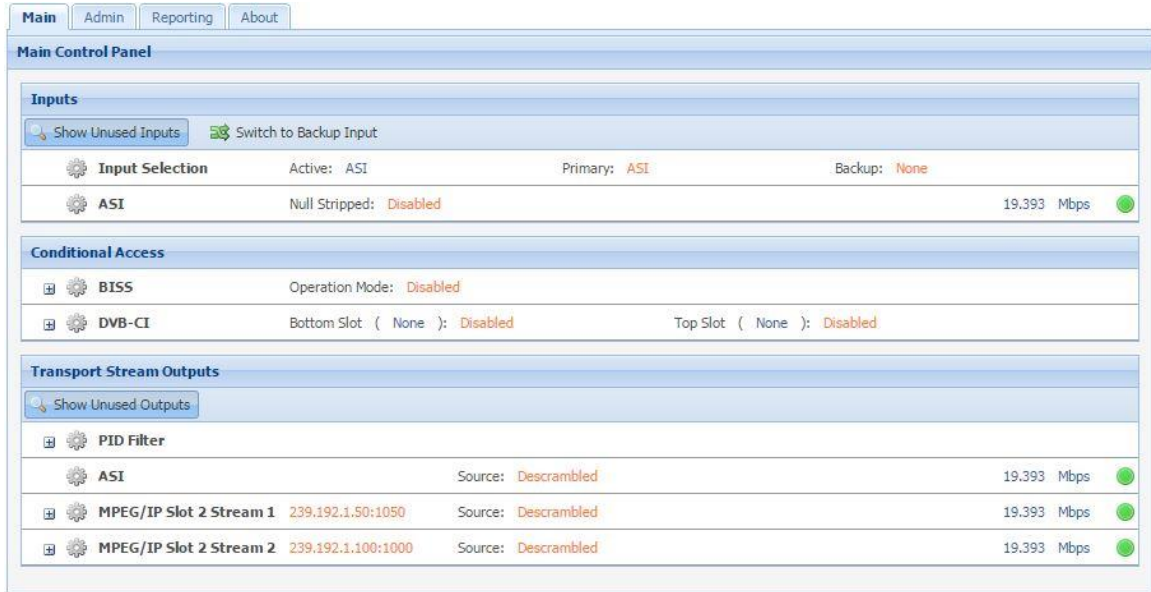
4.1.4 Drag and Drop Menus

Certain menus in the MRD 2600 allow the user to drag and drop items to auto populate fields. Conditional Access is an example of a menu that drag and drop can be used. In the example below a service in the transport stream view on the right hand side of the window is selected and dragged over to auto populate the Service and PIDs in the Conditional Access section.



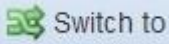

4.2 Main Panel

The Main panel of the MRD 2600 web interface is used to configure the unit to route an input to an output. When configuring the MRD 2600 the user begins at the top of the menu and works down. The inputs are configured, then descrambling (if present), then outputs are configured. Pictured below is a fully populated unit with all options licensed.



4.2.1 Configuring Active Inputs

This menu allows the user to configure a primary and backup input. In case there is a TS sync loss on the primary input the MRD 2600 is capable of detecting the failed state and

switching to a secondary backup input in order to provide a continuous output. Which input is primary and backup, how the inputs switchover and restore and switchover timing is all user configurable. The user can force the MRD 2600 to switch between the Primary and Backup Inputs by clicking the  button. To change the active input and failover settings click the  icon next to Input Selection.

Inputs				
 Hide Unused Inputs		 Switch to Primary Input		
 Input Selection	Active: ASI	Primary: DVB-S2 Slot 1 Port A	Backup: ASI	
 ASI				
  MPEG/IP Slot 2 Stream 1	*:5000	Packet Status: Not Present	FEC: Not Present	
  MPEG/IP Slot 2 Stream 2	239.192.0.200:10000	Packet Status: Not Present	FEC: Not Present	
  DVB-S2 Slot 1 Port A	4140.0 MHz	Level: -55 dBm	C/N: 16.7 dB	Link Margin:

Active Input Indicator

Configure Inputs

Primary Input:

Backup Input:

Switch On:

Restore On:

Switchover (secs.):

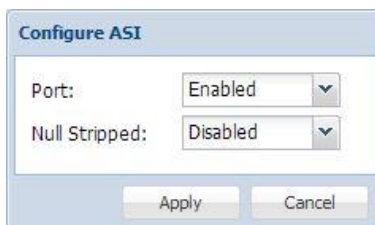
Active Input and Failover Configuration Menu

Setting	Range	Description
Primary Input	ASI MPEG/IP Slot X Stream X DVB-S2 Slot X Port X DVB-S2X Slot X Stream X 8VSB/QAM Slot X Turbo PSK Slot X DVB-T2/C2/ISDB-T Slot X None	Used for both normal operation and input failover settings. During normal operation this input will be the active input.
Backup Input	ASI	During failover operation this input will become the active input. The catalyst for

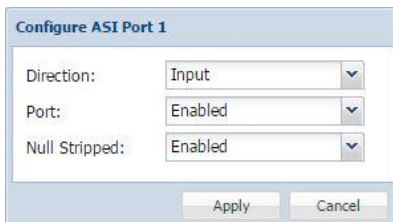
	<p>MPEG/IP Slot X Stream X</p> <p>DVB-S2 Slot X Port X</p> <p>DVB-S2X Slot X Stream X</p> <p>8VSB/QAM Slot X</p> <p>Turbo PSK Slot X</p> <p>DVB-T2/C2/ISDB-T Slot X</p> <p>None</p>	<p>what causes the unit to switch to this input is configured in the following setting.</p>
Switch On	<p>Manual Only</p> <p>TS Sync Loss</p>	<p><i>Manual Only:</i> the unit will not switch inputs automatically. The user must manually switch inputs.</p> <p><i>TS Sync Loss:</i> the MRD 2600 will switch from the primary to the backup input if the primary stream loses synchronization for the duration of the Switchover Interval.</p>
Restore On	<p>Manual Only</p> <p>Primary Input TS Restored</p> <p>Backup Input TS Sync Loss</p>	<p><i>Manual Only:</i> the unit will not restore to the primary input automatically. The user must manually switch inputs.</p> <p><i>Primary Input TS Restored:</i> the MRD 2600 restores to primary when the Primary input regains transport stream synchronization.</p> <p><i>Backup Input TS Sync Loss:</i> the unit will switch from backup to primary when the backup stream loses synchronization for the duration of the Switchover interval.</p>
Switchover	<p>1-20 seconds</p>	<p>The time in seconds which <i>Switch On</i> or <i>Restore On</i> value must remain in the configured state before the MRD 2600 switches between the Primary Input and Backup Input or vice versa.</p>

4.2.2 Configuring ASI Input

This menu allows the user to either Enable or Disable the ASI Input on the MRD 2600. Beginning with revision J main boards the ASI ports can be configured as either an input or output. Earlier revision remain configured as 1 input and 1 output port. Main board version can be located on the About tab under the Options section.



Rev I and earlier main board ASI options



Rev J and later main board ASI options

Setting	Range	Description
Direction	Input Output	Configure the ASI port to either an input or an output. Applies only to main board revision J or later. Main board version can be located on the about tab under the Options section.
Port	Enabled Disabled	This setting allows the user to enable or disable the ASI Input to the MRD 2600.
Null Stripped	Disabled Enabled	Enabling Null Stripped allows the MRD 2600 to receive streams that do not contain null packets. (i.e. VBR Transport Streams)

4.2.3 Configuring MPEG/IP Input

If the MPEG/IP Input card was selected as a factory installed option, the following menus and options will be available for configuration. This menu allows the user to configure the MPEG/IP inputs. Each MPEG/IP card has two ports that can be set to receive and/or transmit. This menu is for setting up the reception of MPEG/IP unicast or multicast transport streams. The menu for Stream 1 and 2 have the same settings. IGMPv2 is used to join/leave multicast streams by default if no IGMP Filter addresses are entered. If IGMP Filter Mode addresses are specified then IGMPv3 is used.

General and Advanced options for IP input

Setting	Range	Description
Receive	Enabled Disabled	This setting allows the user to enable or disable these input stream settings.
Physical Connector	Port 1 Port 2	The physical connector on the MPEG/IP card that will be used to receive the input.
Mode	Multicast Unicast	<i>Multicast</i> setting allows the unit to receive multicast streams. Multicast streams originate from the IP range 224.0.0.0 – 239.255.255.255. <i>Unicast</i> allows the unit to receive unicast streams. Unicast streams originate directly from a source device.
Destination IP	224.0.0.0 – 239.255.255.255	This setting is only available when receiving a multicast stream. This address is the IP address the source device is sending to.

Destination Port	0 - 65535	This is the UDP port the source device is sending to. This is the only setting required to receive a unicast stream.
FEC	Enabled Disabled	Enabling FEC (Forward Error Correction) tells the MRD 2600 to look at Destination Port +2 and Destination Port +4 for a SMPTE 2022 FEC Matrix.
Internal Source Filter	Enabled Disabled	Enabling Source filtering disables IGMP V3 filtering and allows a user to whitelist a single IP address for a given multicast and block all other source IP's
Internal Source Filter IP	0.0.0.0 – 255.255.255.255	Source IP for whitelist. All other source IP addresses are blocked
IGMP Filter Mode	Exclude Include	Used on networks supporting IGMPv3. If this setting is set to <i>Exclude</i> any streams originating from the user defined IP addresses will be rejected. If this setting is set to <i>Include</i> any streams originating from the user defined IP addresses will be received.
Null Stripped	Enabled Disabled	Enabling Null Stripped allows the MRD 2600 to receive streams that do not contain null packets. (i.e. VBR TS Streams)
RTP SSRC	Enabled Disabled	Enabling RTP SSRC allows the MRD 2600 to filter the input by the user defined value. Only streams containing the user defined value will be received by the MRD 2600.
SSRC Filter Value	0 - 4294967295	The Filter Value the MRD 2600 checks for before receiving a stream with RTP SSRC.
Buffer Mode	Size (KB) Delay (ms)	This setting allows the user to specify the delay buffer by either the size in KiloBytes or delay in milliseconds.
Buffer Size	1 – 4000 KB	This setting determines how much data is received before the MRD 2600 starts decoding. Increasing this value will allow the MRD 2600 to receive streams on networks with high network jitter. Increasing this value also increases the latency of the unit. This setting is only configurable if Buffer Mode is set to Size (KB).
Buffer Delay	1 – 4000 ms	This setting determines how long the input receives signal before the MRD 2600 starts decoding. Increasing this value will allow the MRD 2600 to receive streams on networks with high network jitter. Increasing this value also increases the latency of the unit. This setting is only configurable if Buffer Mode is set to Delay (ms).

Statistics Reset Mode	Manual Auto	Statistics can be viewed by hitting the + symbol next to the MPEG/IP option card on the main window. Selecting Auto will reset the statistics on a chosen interval. When the reset occurs, statistical information for that period will be logged. Selecting Manual will only clear the statistics by hitting the refresh button.
Reset Interval (min)	5-65535	Interval in which the Auto option will reset and log the statistics displayed on the main window

MPEG/IP Slot 2 Stream 1 224.0.211.101:5000 Packet Status: Not Present

Status		Statistics	
Buffer Delay:	0 ms	Out of Order Packets:	0
Sync Status:	Unlocked	Duplicate Packets:	0
Packets Per Frame:	0	Lost Packets:	0
Encapsulation:	UNKNOWN	Corrected Packets:	0
FEC Columns (L):	0	Uncorrected Packets:	0
FEC Rows (D):	0	IAT (ms):	0.000
Corrected Packets /	0	Max IAT (ms):	0.000
FEC Period:		Statistics Reset Mode:	Manual
		Reset Interval:	10 min
		Last Reset:	01/01/1970 00:00:00

IP statistics menu

4.2.4 Configuring DVB-S/S2/S2X Input

If the DVB-S/S2/S2X input card was selected as a factory installed option, the following menus and options will be available for configuration. This menu allows the user to configure the DVB-S/S2/S2X inputs. The input card is equipped with dual demodulators and four ports (labeled A, B, C and D). This configuration allows the card to receive two signals simultaneously for fast switching between primary and backup inputs. The menu for both demodulators have the same settings. The input card will automatically detect modulation and symbol rate during signal acquisition. LNB Power configuration for this input card is done in the Admin tab.

Receive	Enabled Disabled	This setting allows the user to enable or disable this input stream.
Physical Connector	Port A Port B Port C Port D	This setting allows the user to select which physical RF connector will be used to receive the stream.
Satellite Frequency	C-Band: 4GHz – 8GHz Ku Band: 11.2Ghz – 14.5Ghz L-Band: 950MHz – 2150MHz Dependent on LO Offset	If LO Offset is set to 0 then L-Band frequency is entered into the Satellite Frequency dialog box. If LO Offset is set to a pre-defined option then enter C-band or Ku-Band frequency.
LO Offset	5150 9750 10600 10750 11250	The offset in MHz that the local oscillator is operating.
PL Scrambling Code	0 – 262141	The MRD has the ability to receive satellite signals scrambled using PL Scrambling. In order to receive the stream, enter the value of the incoming signals PL Scrambling code.

4.2.5 Configuring DVB-S/S2 Input

If the DVB-S/S2 Input card was selected as a factory installed option, the following menus and options will be available for configuration. This menu allows the user to configure the DVB-S/S2 inputs. Each DVB-S/S2 input card has four ports (labeled A, B, C and D) which only one port can be active at a time. This menu is for setting up the reception of DVB-S/S2 satellite signals. The menu for Port A, B, C and D have the same settings.

Setting	Range	Description
Port	Enabled Disabled	This setting allows the user to enable or disable this reception port.
Mode	DVB-S DVB-S2 Auto	This setting allows the user to choose between <i>DVB-S</i> or <i>DVB-S2</i> modulation schemes. Setting to Auto will have the unit automatically detect whether the input is DVB-S or DVB-S2.
Satellite Frequency	C-Band: 4GHz – 8GHz Ku Band: 11.2Ghz – 14.5Ghz L-Band: 950MHz – 2150MHz Dependent on LO Offset	If LO Offset is set to 0 then L-Band frequency is entered into the Satellite Frequency dialog box. If LO Offset to set to a pre-defined option then enter C-band or Ku-Band frequency.

Wide Search	Enabled Disabled	When Enabled the search range may be extended depending on the symbol rate. See appendix C for more information.
LO Offset	5150 9750 10600 10750 11250	The offset in MHz that the local oscillator is operating.
Symbol Rate Mode	Manual Auto	The Manual option allows the user to choose the symbol rate. The Auto option automatically detects the incoming symbol rate. Note: Acquisition time may be longer in auto mode, especially when the symbol rate is below 1MSps or above 55MSps.
Symbol Rate	0.5 - 60	The symbol rate of incoming satellite signal in MSps. Accurate to one decimal place (kSps).
PLS Code	0 – 262141	The MRD 2600 has the ability to receive satellite signals scrambled using PL Scrambling. In order to receive the stream, enter the value of the incoming signals PL Scrambling code.
LNB Power	Off 13 VDC 14 VDC 18 VDC 19 VDC	The MRD 2600 has the ability to provide the necessary voltage to power an LNB. Select the correct voltage to supply to the LNB.
22kHz Tone	Enabled Disabled	Enabling or disabling the 22kHz tone allows the MRD 2600 to trigger the LNB to switch polarities.
Multistream State	Enabled Disabled	The MRD 2600 has the ability to receive multistream satellite signals. If the signal is multistream capable, enable this setting. This option is only available in DVB-S2 Mode. <i>NOTE: This is a licensed feature.</i>
ISI	0-255	This setting is the ISI (Input Stream Identifier) the MRD 2600 uses to filter multistream input. This option is only available if Multistream is licensed and enabled.

4.2.6 Configuring 8VSB/QAM Input

If the VSB/QAM Input card was selected as a factory installed option, the following menus and options will be available for configuration. This menu allows the user to configure the 8VSB/QAM input. This menu is for setting up the reception of 8VSB off air signals or QAM cable signals.

The screenshot shows a dialog box titled "Configure 8VSB/QAM Slot 2". It contains the following settings:

- Receive: Enabled
- Mode: 8VSB
- Channel Plan: Off Air
- Channel: 31
- Low RF Level (dBmV): -10
- Low MER (dB): 20

Buttons for "Apply" and "Cancel" are located at the bottom right of the dialog.

Setting	Range	Description
Receive	Enabled Disabled	This setting allows the user to enable or disable reception.
Mode	8VSB 64-QAMB 256-QAMB	This setting allows the user to choose between 8VSB or QAM modulation schemes..
Channel Plan:	Off Air FCC Cable HRC Cable IRC Cable	If 8 VSB is the selected Mode, the only available option is <i>Off Air</i> . If either 64-QAMB or 256-QAMB is the selected Mode, this setting allows the user to choose which Cable scheme is used.
Channel	Off Air: 2-69 FCC, HRC, or IRC Cable: 2-158	This setting is for the desired channel to be received.
Low RF Level (dBmV)	-34 - +40	This is the Low RF Level threshold when the <i>Low Level Alarm</i> will be triggered in dBmV
Low MER (dB)	0 - 40	This is the Low MER threshold when the <i>Low MER Alarm</i> will be triggered in dB.

4.2.7 Configuring Turbo PSK Input

If the Turbo PSK Input card was selected as a factory installed option, the following menus and options will be available for configuration. This menu allows the user to configure the Turbo PSK input. This menu is for setting up the reception of DVB-S and Turbo PSK satellite signals.

Setting	Range	Description
Receive	Enabled Disabled	This setting allows the user to enable or disable this reception port.
Mode	DVB-S TurboPSK	This setting allows the user to choose between <i>DVB-S</i> or <i>TurboPSK</i> modulation schemes.
Modulation	QPSK 1/2 QPSK 2/3 QPSK 3/4 QPSK 5/6 QPSK 7/8 8PSK 2/3 8PSK 3/4 (2.05) 8PSK 3/4 (2.10) 8PSK 3/4 (2.20) 8PSK 5/6 8PSK 8/9	This setting allows the user to select which modulation parameters are used for the incoming signal and the dropdown list is dependent on the mode that is selected.

LO Offset	5150 9750 10600 10750 11250	The offset in MHz that the local oscillator is operating.
Satellite Frequency	C-Band: 4GHz – 8GHz Ku Band: 11.2Ghz – 14.5Ghz L-Band: 950MHz – 2150MHz Dependent on LO Offset	If LO Offset is set to 0 then L-Band frequency is entered into the Satellite Frequency dialog box. If LO Offset to set to a pre-defined option then enter C-band or Ku-Band frequency.
Symbol Rate	0.256 - 30	The symbol rate of incoming satellite signal in MSps. Accurate to one decimal place (kSps).

Note: Reception may not be possible at rates less than 1MSps

4.2.8 Configuring DVB-T2/C2/ISDB-T Input

If the DVB-T2/C2/ISDB-T Input card was selected as a factory installed option, the following menus and options will be available for configuration. This menu allows the user to configure a DVB-T/T2/C/C2 or ISDB-T input.

Configure DVB-T2/C2/ISDB-T Slot 2

General

Receive: Enabled

Mode: DVB-T

Channel Plan: Eur-Asia-Afr

Channel: 21

Advanced

Frequency (MHz): 474

Bandwidth: 8 MHz

PLP ID: 0

Profile: Auto

Low RF Level (dBmV): -10

Low MER (dB): 20

Apply Cancel

Setting	Range	Description
Receive	Enabled Disabled	This setting allows the user to enable or disable this reception port.
Mode	DVB-T DVB-T2 DVB-C DVB-C2 ISDB-T	This setting allows the user to choose between <i>DVB-T/T2/C/C2</i> or <i>ISDB-T</i> modulation schemes.
Channel Plan	Australia Eur-Asia-Afr Ireland New Zealand Taiwan South Africa	This setting allows the user to select which channel plan they would like to use. Channel Plan options are tied to which modulation mode is selected.

South America
 United Kingdom
 European Cable
 Japan
 Philippines



Channel		Select a channel from the channels available in the dropdown. The list of available channels will be based on which channel plan is selected
Frequency (MHz)	42-1002	Selecting a channel from the channel dropdown will populate this field automatically based on the user selected channel. A user can manually select a frequency if desired
Bandwidth	1.7 MHz 5 MHz 6 MHz 7 MHz 8 MHz	Selecting a channel from the channel dropdown will populate this field automatically based on the user selected channel plan. A user can manually select channel bandwidth if desired.
PLP ID		Unique PLP ID used to select a particular stream within the DVB-T2 or DVB-C2 input signal
Profile	Auto Base Lite	Select the DVB-T2 profile to use
Low RF Level (dBmV)	-34 - +40	This is the Low RF Level threshold when the <i>Low Level Alarm</i> will be triggered in dBmV
Low MER (dB)	0 - 40	This is the Low MER threshold when the <i>Low MER Alarm</i> will be triggered in dB.

4.2.9 Configuring DVB-CI Descrambling

This section will describe how to configure DVB-CI descrambling in the MRD 2600. First, the user will need to configure the CAM slots. Once this is complete the user can configure which services or PIDs to descramble.

4.2.9.1 Configuring DVB-CI Slots

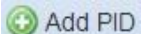
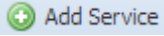



This menu allows the user configure the DVB-CI slots in the MRD 2600. The MRD 2600 has two DVB-CI slots, a top and bottom, where CAM Modules can be inserted. Both


slots are individually configurable using the Bottom Slot and Top Slot tabs. CAM Modules can be reset manually using the  button. The  button opens the MMI (Man Machine Interface) for the CAM in the respective slot. MMI support is dependent on what is supported by the CAM.

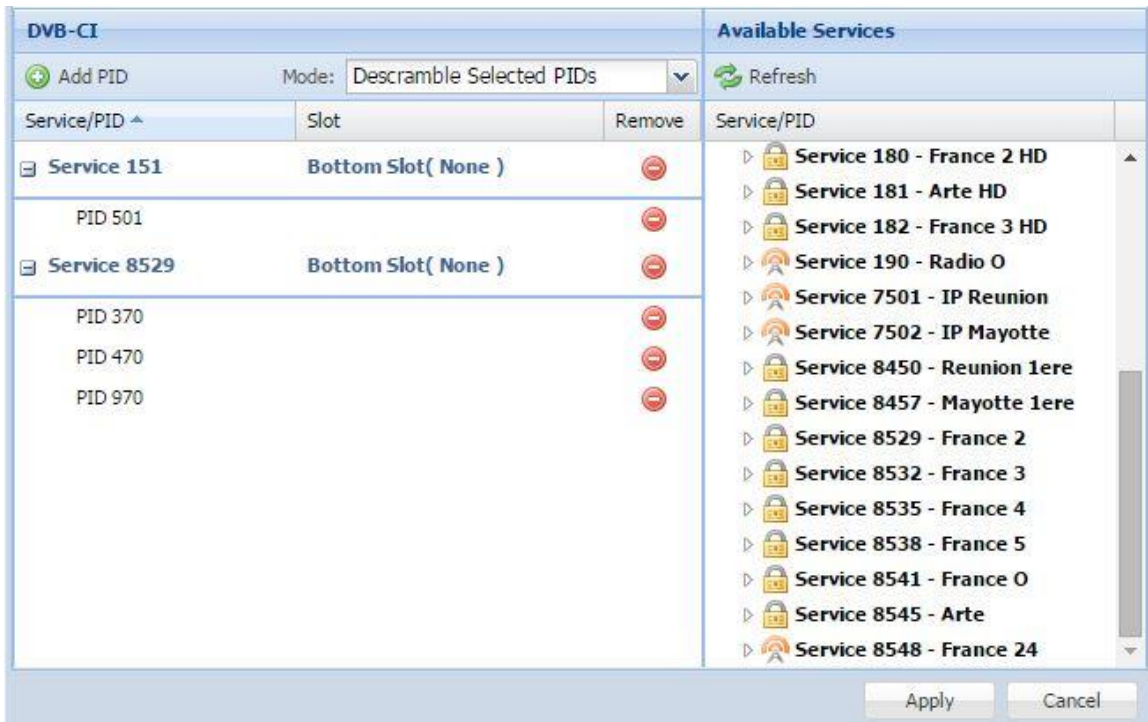


Setting	Range	Description
Mode	Descramble Selected PIDs Descramble Selected Services	<i>Selected PIDs</i> sets the MRD to descramble PIDs set in the Descramble Services window (Refer to Section 4.2.9.2). If the PIDs change in the incoming stream the MRD will not adapt to these changes and will not be able to descramble. <i>Selected Services</i> sets the MRD to descramble Services set in the Descramble Services window (Refer to Section 4.2.9.2). If the Services change in the incoming stream the MRD will not be able to descramble.
Top Slot	Enabled	This setting allows the user to enable or disable the DVB-CI slot.
Bottom Slot	Disabled	

4.2.9.2 Configuring Service Descrambling

When the Multiservice Descrambling License is purchased, this menu allows the user to select the services the MRD 2600 will descramble using the CAM Modules and Smart Cards inserted into the DVB-CI slots. See Section 4.2.9.1 to configure these slots. The drag and drop method can be used to drag services from the right column to the left column. The drop down menu next to each selected service allows the user to choose either the bottom or top slot to descramble the service. If in Selected PIDs mode, PIDs to descramble can be added manually by clicking  button. If in Selected Services mode, Services to descramble can be added manually by clicking the  button. The icons next to each service indicate whether the service is scrambled or not scrambled. Scrambled services will show the  icon next to them while services that are not scrambled will show the  icon. Clicking the  button forces the MRD 2600 to rescan the transport stream for changes.

When NOT licensed for Multiservice Descrambling, this menu will only allow the user to drag over one service for descrambling (regardless of the number of CAMs present in the unit). The  Add PID button will also not be present.



DVB-CI Service Descrambling Menu

4.2.10 Configuring BISS Descrambling

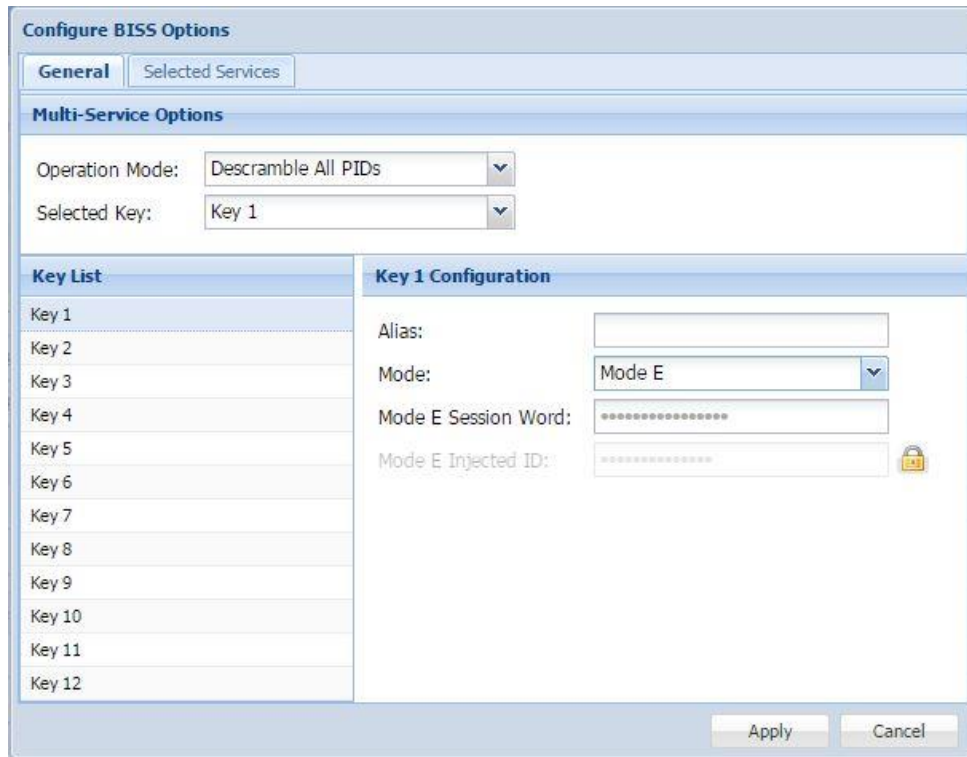
This section will describe how to configure BISS descrambling in the MRD 2600. There are two types of BISS descrambling.

In “Descramble All PIDs” mode, the user simply configures a BISS key set and selects it from the drop down.

For streams with multiple, per-service keys the user must first configure the key sets, and then assign them to services.

4.2.10.1 Configuring BISS Keys

This menu allows the user to configure BISS descrambling. 12 unique BISS keys can be entered. If the BISS mode is set to Mode E a  icon will appear next to Mode E Injected ID. This icon allows the user to unlock and modify the Injected ID.

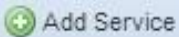
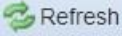


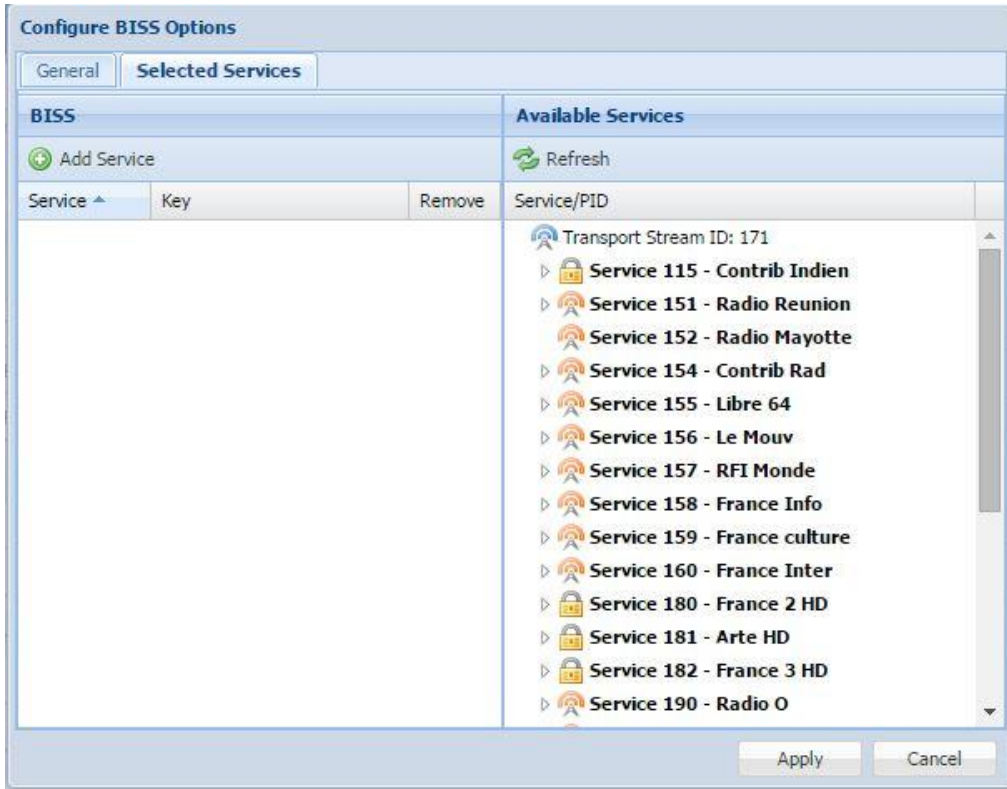
BISS Menu

Setting	Range	Description
Operation Mode	Disabled	Descramble Selected Services will allow the user to select service(s) to be descrambled on the Selected Services tab.

	Descramble Selected Services	Descramble All PIDs will apply the selected key to the entire transport stream.
	Descramble All PIDs	
Selected Key	Key 1-12	Select a key to configure
Alias	16 characters	Set an Alias for the selected key.
Mode	Mode 1 Mode E	This setting sets the Mode of the BISS key that has scrambled the transport stream.
Mode 1 Session Word	N/A	If Mode 1 is selected the user enters the BISS session word here.
Mode E Session Word	N/A	If Mode E is selected the user enters the BISS session word here.
Mode E Injected ID	N/A	If Mode E is selected the user enters the BISS injected ID here.

4.2.10.2 Configuring Per-Service Descrambling

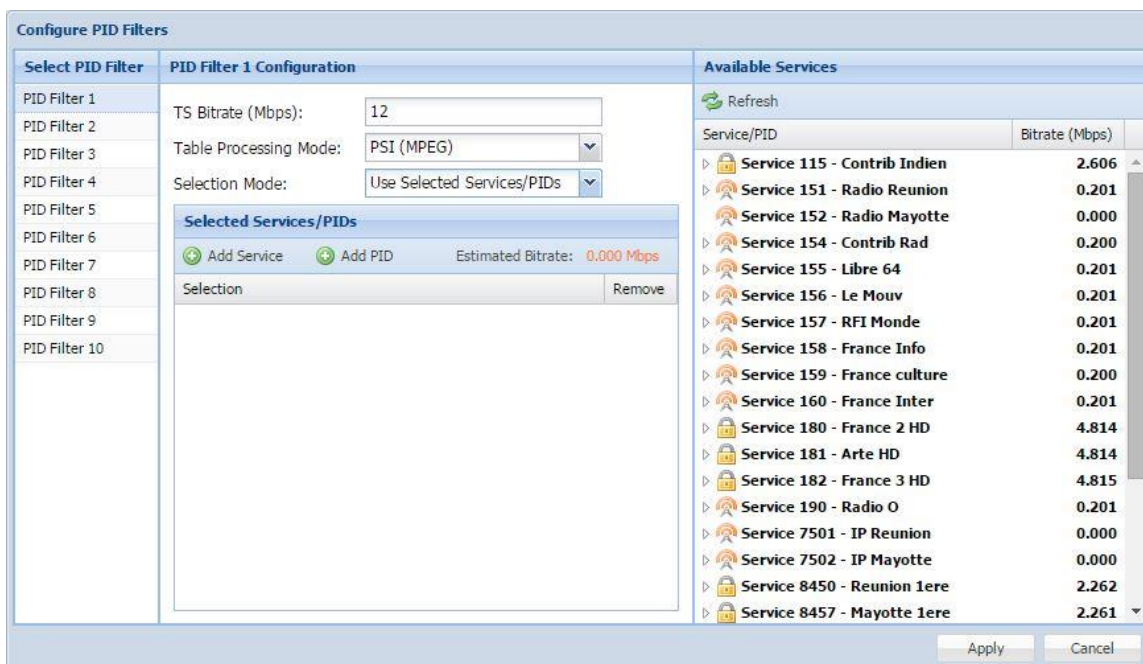
This menu allows the user to select the services the MRD 2600 will descramble using the BISS keys configured in Section 4.2.10.1. These options are applicable only if Operation Mode in the BISS settings is set to Descramble Selected Services (Refer to Section 4.2.10.1). The drag and drop method can be used to drag services from the right column to the left column. The BISS key to descramble services can be selected using the drop down menu next to each service. Services can be added manually by clicking  button. Clicking the  button forces the MRD 2600 to rescan the transport stream for changes.



BISS Service Descrambling Menu

4.2.11 PID Filter

If the PID/Service Filter license is enabled, the following menus and options will be available for configuration. PID filtering will allow the user to create a new output TS by selecting and dragging one or more services/PIDs from the incoming transport stream into the Selected Services/Pids box or use the currently decoded stream. The user can also configure a TS bitrate for each PID filtered stream and select different table inclusion options.



Setting	Range	Description
Select PID Filter	PID filter 1-10	Select which PID filter to configure
TS Bitrate (Mbps)	.25 to 160	Configure the TS Bitrate for the PID filter stream selected
Table Processing Mode	PSI (MPEG)	Adjusted tables: PAT, PMT Passed tables: CAT, NIT Discarded tables: all remaining
Table Processing Mode	SI (DVB)	Adjusted tables: PAT, PMT, SDT Passed tables: CAT, NIT, EIT, RST, TDT, TOT Discarded tables: TSDT, BAT

Selection Mode	Use Selected Services/PIDs	Use Selected Services/PIDs will allow the user to select which services are in the new TS.
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4.2.12 Configuring ASI Output

This menu allows the user to configure the ASI output of the MRD 2600. When enabled this output acts as an active loop output of the active input. For example, if the DVB-S/S2 input card is the current active input the ASI output port will output a demodulated signal of the satellite input.



Setting	Range	Description
Port	Enabled	Enable or disable the ASI output port.
	Disabled	
Source	Descrambled	Unmodified Input will pass the incoming TS to the output without applying any BISS or DVB-CI decryption Descrambled will output the TS with any applied BISS or DVB-CI decryption. PID Filter will output the TS from the PID filter menu option.
	Unmodified Input	
	Pid Filter 1-10	

4.2.13 Configuring the MPEG/IP Outputs

This menu allows the user to configure the MPEG/IP outputs. Each MPEG/IP card has two ports that can be set to receive and/or transmit. This menu is for setting up the transmission of MPEG/IP unicast or multicast transport streams. The menu for Stream 1 and 2 have the same settings. The menu for Streams 3 through 10 will contain the same options as Transmit 1 and Transmit 2 with one exception: Forward Error Correction is only available (if licensed) on Transmit 1 and 2.

Configure MPEG/IP Slot 2 Stream 1

General Settings

Transmit: Enabled

Source: Unmodified Input

Physical Connector: Port 2

Destination IP: 232.50.50.52

Destination Port: 10000

Source Port: 2333

TS Packets Per IP Packet: 7

Differentiated Services: Default

Encapsulation: UDP

Advanced Settings

FEC: Off

FEC Columns: 4

FEC Rows: 4

Apply Cancel

Setting	Range	Description
Transmit	Enabled Disabled	Enable or disable the MPEG/IP transmit group.
Source	Descrambled Unmodified Input Pid Filter 1-10	Unmodified Input will pass the incoming TS to the output without applying any BISS or DVB-CI decryption. Descrambled will output the TS with any applied BISS or DVB-CI decryption. PID Filter will output the TS from the PID filter menu option.
Physical Connector	Port 1 Port 2	The physical connector on the MPEG/IP card that will be used to transmit the output.
Destination IP	Multicast - 224.0.0.0 - 239.255.255.255	When sending to a unicast address the destination IP address must match the receiving device's IP address. When sending a multicast

		the address must be sent within the multicast IP range.
Destination Port	0 - 65535	When sending to a unicast address, the destination port must match the receiving device's port. When sending a multicast, any port within the accepted range can be used, but it is good practice to always choose a port >1030 and an even number
Source Port	0 - 65535	This is the port used by the MRD 2600 to transmit the MPEG/IP stream.
TS Packets Per IP Packet	1-7	The number of TS packets that are contained with a single IP packet. Default is 7. Lowering this value below default increases network overhead.
Differentiated Services	Default Assured Forwarding 1-1 to 4-3 Expedited Forwarding	Define the quality of service (QoS) classification the packets carry when transmitted.
Encapsulation	UDP RTP	Sets the Encapsulation to UDP or RTP.
FEC	Off Columns Columns/Rows	Sets the FEC Type or disables FEC.
FEC Columns	1-20 (Columns) 4-20 (Columns/Rows)	Defines the number of Columns used to construct the FEC Matrix. (Columns * Rows must be ≤ 100.)
FEC Rows	4-20	Defines the number of Rows used to construct the FEC Matrix. (Columns * Rows must be ≤ 100.)

4.2.14 Configuring the MPEG/IP MPE Outputs

This menu allows the user to configure the MPEG/IP Multi-Protocol Encapsulation (MPE) outputs. Each MPE Output allows the user to select an MPE data PID from the transport stream to be output.

Configure MPEG/IP Slot 1 MPE 1

Settings	Available Services
Transmit: <input type="text" value="Disabled"/>	Refresh
Physical Connector: <input type="text" value="Port 1"/>	Service/PID
PID: <input type="text" value="0"/>	▶ Service 3
MAC Filter State: <input type="text" value="Disabled"/>	▶ Service 4
MAC Address: <input type="text" value="00:00:00:00:00:00"/>	▶ Service 5
	<input type="button" value="Apply"/> <input type="button" value="Cancel"/>

Setting	Range	Description
Transmit	Enabled Disabled	Enable or disable transmission of de-encapsulated MPE data.
Physical Connector	Port 1 Port 2	The physical connector on the MPEG/IP card that will be used to transmit the MPE data.
PID		Selected MPE PID from the transport stream to use for MPE output
MAC Filter State	Enabled Disabled	Enable or Disable the filtering of output data based on a MAC address in the selected MPE PID
MAC Address	00:00:00:00:00:00 FF:FF:FF:FF:FF:FF	Filtered MAC address that will be transmitted in the MPE output. All data with other MAC addresses in the selected MPE PID will be discarded

4.2.15 Viewing PSIP Information

To view the PSIP information for the applied TS, select the View PSI Tables button located on the right hand side of the Inputs section. This will open a new window that displays all of the PSIP information for the applied TS. The tables displayed will include PAT, PMT and CAT and tables associated with the stream type (DVB,ATSC). SDT tables will be displayed for DVB streams and MGT,TVCT,EIT, ETT, STT tables will be displayed for ATSC streams.

The screenshot shows a window titled "View PSI Tables" with a tree view on the left and a details pane on the right. The tree view shows "PSI Tables" expanded, with "0 PAT" and "17 SDT" listed. The details pane shows "PAT Details" with the following information:

PAT Details	PID:	0
	Version:	0
	TS ID:	1
	Program Count:	1

Below the PAT details is a table for "PMTs":

PID	Version	Program Number	ES Count
101	0	2	4

A "Close" button is located in the bottom right corner of the window.

Clicking the Refresh button in the upper left corner will update the tables displayed.

4.3 Admin Panel

The screenshot displays the Admin Control Panel for the MRD 2600. The interface includes a navigation bar with tabs for Main, Admin, Reporting, and About. The Admin tab is active, showing a sub-menu with options like Change Password, Profiles, SNMP MIBs, and Diagnostics. The main content area is divided into several sections:

- General Settings:** Includes fields for Unit Alias (No Alias) and Protect BISS-E Injected ID (Yes).
- Unit Network Configuration:** A table showing network settings for a DHCP mode.

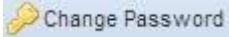
Mode	IP Address	Subnet Mask	Gateway	Hostname	MAC
DHCP	10.0.16.49	255.255.0.0	10.0.1.3	(none)	00:06:4D:01:96:99
- MPEG/IP Network Configuration:** Shows configuration for Slot 2 with Default Gateway: Port 1 and ICMP Response: Enabled. It includes a table for MPEG/IP settings.

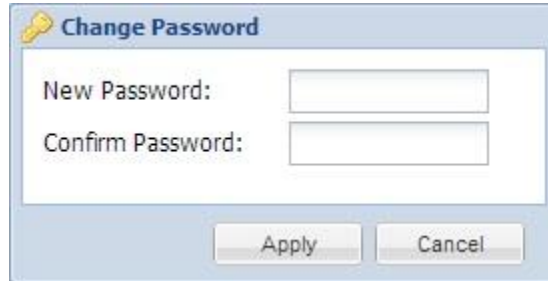
MPEG/IP	IP Address	Subnet Mask	Gateway	MAC	Link Status	Tx Rate (Mbps)	Rx Rate (Mbps)	IGMP
Slot 2 - 1	10.0.0.71	255.255.255.0	0.0.0.0	00:06:4D:01:95:E9	N/A (Down)	0.000	0.000	V3
Slot 2 - 2	10.0.0.72	255.255.255.0	0.0.0.0	00:06:4D:01:95:EA	N/A (Down)	0.000	0.000	V3
- License Information:** A table listing licensed features.

Option	Supported	State	Instances
MRD 26916 - DVB-S2 Advanced Feature	Yes	Licensed	1
MRD 26921 - BISS Descrambling	Yes	Licensed	1
MRD 26925 - IP FEC Output	Yes	Licensed	1
MRD 26991 - Multi-service Descrambling	Yes	Licensed	1
- Date / Time:** Shows Update Mode (Manual), Current Date (01/01/2020), Current Time (00:04:09), and NTP Server (0.0.0.0).
- SNMP Communities:** Shows Read-Only Community (public) and Read-Write Community (private).
- SNMP Trap Managers:** A section for configuring SNMP managers, currently empty.

To access the Admin Control Panel, click on the **Admin** tab. This menu allows the user to control many aspects of the MRD 2600.

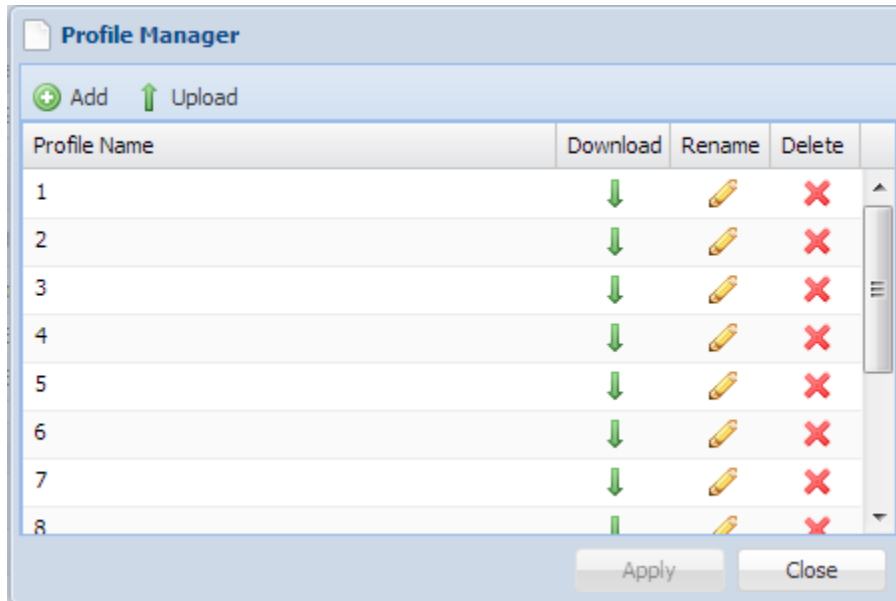
4.3.1 Changing Unit Password


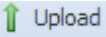
The MRD 2600 can be assigned an access password and the current access password can be changed. In order to make changes to passwords, click the  button. A window will appear to enter the new password and re-enter the new password to confirm it.







4.3.2 Profiles


The MRD 2600 has the ability to save all configured settings to multiple profiles. Profiles can be saved locally, renamed and saved to external storage to be used on other MRD 2600s with the same hardware, licensing, and software version. Profiles can be used to quickly and easily change the configuration of an MRD 2600 to suit different inputs and decoding requirements.

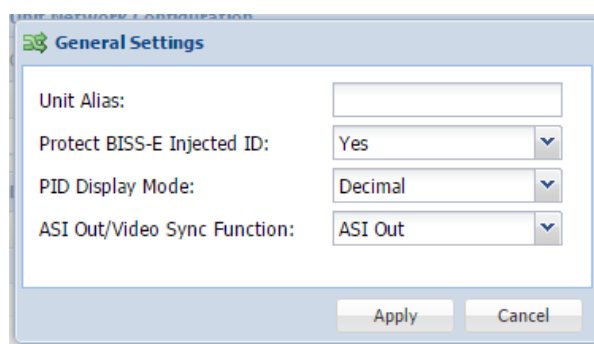


Action	Button	Description
Add New Profile	 Add	Adds a new profile from current settings. User must name profile before creation is complete.
Upload Profile	 Upload	Allows the user to browse to external storage or workstation to upload profile to MRD 2600.



Apply Profile		Select a profile from the drop down menu and click this button. The MRD 2600 will apply all settings contained in the profile selected.
Rename Profile		Select a profile from the drop down menu and click this button. The user will be prompted for a new name for the profile.
Delete Profile		Select a profile from the drop down menu and click this button. The user will be prompted to confirm deletion of the profile.
Download Profile		Select a profile from the drop down menu and click this button. The user will be prompted to select a directory to download the profile.

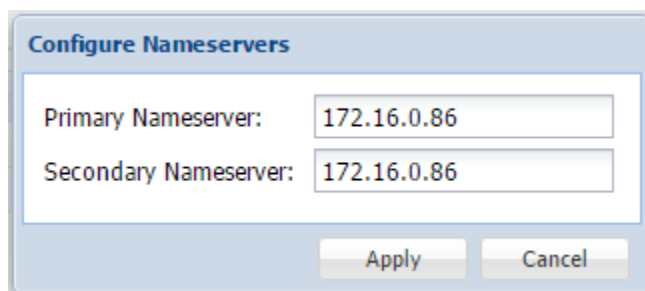
4.3.3 General Settings

The MRD 2600 can be assigned an alias which is displayed in the upper right hand corner of the web interface. The alias can help define which MRD 2600 the operator is currently logged into. The BISS-E Injected ID for BISS Mode E can also be protected from being accidentally changed. Setting the Protect BISS-E Injected ID to Yes will force the user to unlock the dialog box in the BISS Descrambling configuration menu before allowing any changes to be made. To edit the Unit Alias or protect the BISS-E Injected ID click on the  **Configure General Settings** button. The PID Display mode changes how PID values are displayed in the web interface. The values can either be displayed in decimal or HEX values. The ASI Out/Video Sync Function is for special applications purposes. This should remain set to ASI Out.



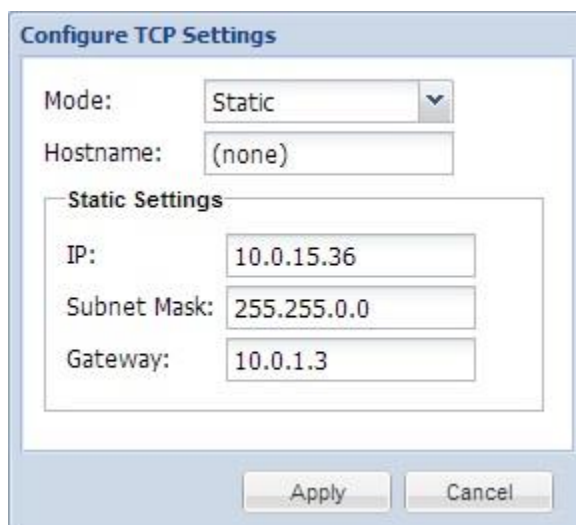
4.3.4 Unit Network Configuration

The management port of the MRD 2600 can be configured from the web interface. To make changes to the management port, click the  button under the Unit Network Configuration section. Domain name servers can be configured on the MRD clicking the  **Configure Nameservers** button. IP address and web address entries are accepted as Nameserver addresses.




If the MRD 2600 contains a 26127 option card the unit can be configured to have an optional 2nd control port.

NOTE: Exercise extreme caution when performing changes to this menu as network communication can be lost with the MRD 2600.




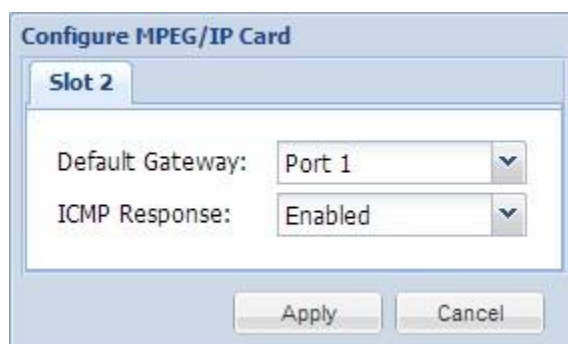
Setting	Range	Description
Mode	DHCP Static	Setting to <i>DHCP</i> will allow the network to assign an IP address automatically to the MRD 2600 (if supported). Setting to <i>Static</i> allows the user to manually define all TCP/IP settings for the management port.

Hostname	Valid characters: A through Z 0 through 9 - (hyphen)	This setting allows the user to define an optional unit Hostname.
IP	Four decimal octets: XXX.XXX.XXX.XXX	This option is only available if Static Mode is set. This is the IP address assigned to the management port.
Subnet Mask	255.0.0.0 – 255.255.255.254	This option is only available if Static Mode is set. This is the Subnet Mask assigned to the management port.
Gateway	Four decimal octets: XXX.XXX.XXX.XXX	This option is only available if Static Mode is set. This is the Gateway address assigned to the management port.

The 2nd management port of the MRD 2600 can be configured from the web interface. To make changes to which port is the 2nd management port click, the configure control ports  button under the Unit Network Configuration section.

4.3.5 MPEG/IP Network Configuration

The MPEG/IP card is used to receive MPEG over IP transport streams. The MPEG/IP card supports unicast, multicast, UDP and RTP. The ports of the MPEG/IP card on the MRD 2600 can be configured from the web interface. To configure the Default Gateway and ICMP Response settings click the  **Configure Card** button.



Configure MPEG/IP Card


Slot 2

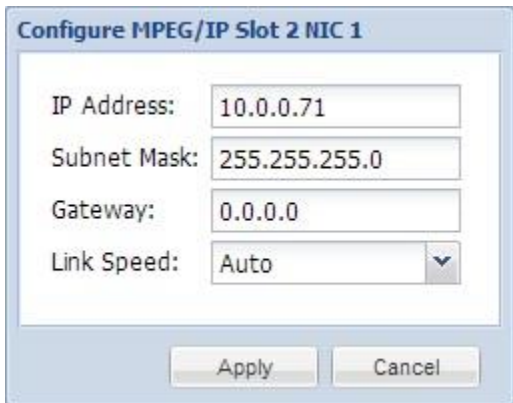
Default Gateway: Port 1

ICMP Response: Enabled

Apply Cancel

Setting	Range	Description
Default Gateway	Port 1 Port 2	Setting to <i>Port 1</i> uses the gateway address of port 1 as the default gateway. Setting to <i>Port 2</i> uses the gateway address of port 2 as the default gateway.
ICMP Response	Enabled Disabled	Setting to enabled allows the MRD 2600 to respond to ICMP requests (ping). If disabled the MRD 2600 will not respond to these requests.

To configure the TCP/IP settings of the MPEG/IP ports click the  button under the MPEG/IP Network Configuration section next to the corresponding port. The settings for both ports are the same.

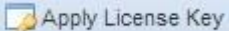


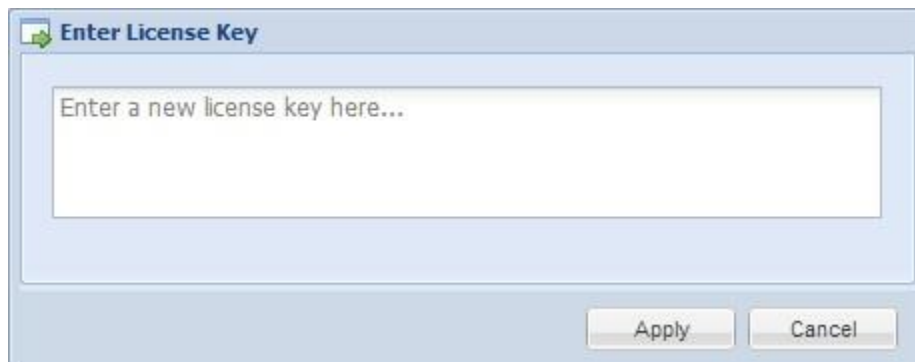
Setting	Range	Description
IP Address	1.0.0.0 - 126.0.0.0 128.0.0.0 - 191.255.0.0 192.0.1.0 - 223.255.255.0	This setting is the TCP/IP address assigned to the port.
Subnet Mask	255.0.0.0 – 255.255.255.254	This setting is the subnet mask assigned to the port.
Gateway	1.0.0.0 - 126.0.0.0 128.0.0.0 - 191.255.0.0 192.0.1.0 - 223.255.255.0	This setting is the gateway address assigned to the port.
Link Speed	Auto 1000Mbps/Full 1000Mbps/Half 100Mbps/Full 100Mbps/Half 10Mbps/Full 10Mbps/Half	Setting Link Speed to Auto allows the MRD 2600 to determine the link speed of the network. If this is not possible or the user wants to define a link speed select one of the other values available.

4.3.6 Licensing

Certain features of the MRD 2600 require licenses in order to be functional. The interface displays all licenses available as well as the following status:

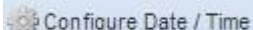
- License Locked or Unlocked
- License is Supported or Unsupported by the installed hardware

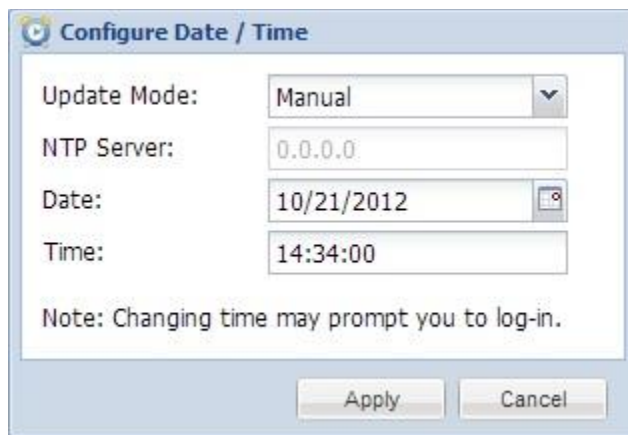
If licenses need to be applied to the MRD 2600 click  button. The menu below will appear where the user can copy and paste the provided license key from Sencore.



The dialog box titled "Enter License Key" features a large text input field with the placeholder text "Enter a new license key here...". At the bottom right, there are two buttons: "Apply" and "Cancel".

4.3.7 Date/Time

The MRD 2600 can be set to synchronize with an NTP server or a manual data and time can be defined by the user. Click the  button to configure the date and time. These values are used to timestamp entries in the Alarm and Event logs under the Reporting tab.




The dialog box titled "Configure Date / Time" contains the following fields:

- Update Mode:** A dropdown menu currently set to "Manual".
- NTP Server:** A text input field containing "0.0.0.0".
- Date:** A date picker field showing "10/21/2012".
- Time:** A time input field showing "14:34:00".

Below the fields is a note: "Note: Changing time may prompt you to log-in." At the bottom right, there are "Apply" and "Cancel" buttons.

Setting	Range	Description
Update Mode	NTP Manual	Setting to <i>NTP</i> uses the local network's NTP server to synchronize date and time. <i>Manual</i> allows the user to define a date and time.
NTP Server	Four decimal octets: XXX.XXX.XXX.XXX Domain Name	This is the IP Address or Domain Name of the local NTP Server on the network. This setting is only available if Update Mode is set to NTP.


Date	MM/DD/YYYY	This setting is the user defined date. A calendar widget can be used to select the data by clicking the  button. This setting is only available if Update Mode is set to Manual.
Time	00:00:00 – 24:00:00	This setting is the user defined time. The time is based on a 24 hour clock. This setting is only available if the Update Mode is set to Manual.

4.3.8 Configuring SNMP

4.3.8.1 SNMP Communities


SNMP Communities define whether users have read-only or read-write SNMP rights. These two communities are given unique names. The default names for these communities are:

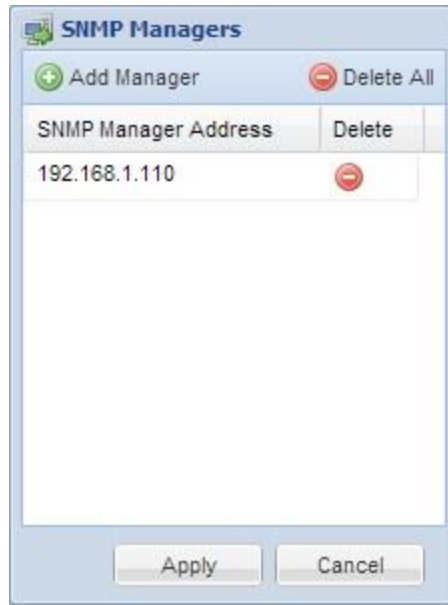
- Read –Only Community: public
- Read- Write Community: private

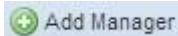


To modify the names of these communities click on the  **Configure SNMP Communities** button.




4.3.8.2 SNMP Trap Managers

The SNMP trap managers are recipients of SNMP traps sent from the MRD 2600. The following menu allows the user to configure the recipient's IP addresses. To add and remove recipients of the SNMP traps click the  **Configure SNMP Managers** button.



Action	Button	Description
Add Manager		Clicking this button prompts the user for the IP address of the SNMP trap manager.
Delete All		Clicking this button prompts the user to confirm the deletion of all SNMP trap manager IP addresses. If the user confirms deletion all SNMP trap manager IP addresses will be removed.
Delete Single Entry		Highlight a single SNMP trap manager IP address and click this button to delete the entry. A prompt will appear confirming the deletion of IP address.

4.3.8.3 Download SNMP MIB Files

The MRD 2600 stores the SNMP MIB files for the currently installed version of software on the unit. These files can be downloaded directly from the MRD 2600 by clicking on the  button. The screen below will appear where the files can be downloaded and saved off of the unit.

Index of /mibs/				
Name	Last Modified	Size	Type	
Parent Directory/		-	Directory	
INET-ADDRESS-MIB.MIB	2013-Jul-10 21:45:17	16.3K	application/octet-stream	
SENCORE-CSP-MIB.MIB	2013-Jul-10 21:45:17	61.4K	application/octet-stream	
SENCORE-GLOBAL-REG.MIB	2013-Jul-10 21:45:17	2.3K	application/octet-stream	
SENCORE-MRD2600-MIB.mib	2013-Jul-10 21:06:44	87.7K	application/octet-stream	
SNMP-COMMUNITY-MIB.MIB	2013-Jul-10 21:45:17	15.1K	application/octet-stream	
SNMP-FRAMEWORK-MIB.MIB	2013-Jul-10 21:45:17	21.8K	application/octet-stream	
SNMP-MPD-MIB.MIB	2013-Jul-10 21:45:17	5.3K	application/octet-stream	
SNMP-TARGET-MIB.MIB	2013-Jul-10 21:45:17	22.2K	application/octet-stream	
SNMP-USER-BASED-SM-MIB.MIB	2013-Jul-10 21:45:17	38.2K	application/octet-stream	
SNMP-VIEW-BASED-ACM-MIB.MIB	2013-Jul-10 21:45:17	33.3K	application/octet-stream	
SNMPv2-MIB.MIB	2013-Jul-10 21:45:17	28.6K	application/octet-stream	
SNMPv2-SMI.MIB	2013-Jul-10 21:45:17	8.7K	application/octet-stream	
SNMPv2-TC.MIB	2013-Jul-10 21:45:17	37.1K	application/octet-stream	

To Download: Right-Click, Save Link As or Save Target As

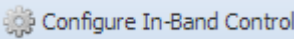
4.3.9 Syslog

The MRD 2600 can be configured to send error and event logs formatted in the syslog protocol to a remote user specified Syslog server.

Action	Range	Description
State	Enabled Disabled	Enable or Disable sending messages to Syslog server.
Network Protocol	UDP TCP	Select which network protocol used to transmit to the Syslog server
IP Address	Four decimal octets: XXX.XXX.XXX.XXX	IP of the Syslog server. 0.0.0.0 and 255.255.255.255 are not permitted
Port	0 - 65535	Destination port of the Syslog server

4.3.10 In-Band Control

The In-Band Control is used to change settings and receive updates from data within a PID in the incoming TS, as injected by the Sencore CMD 4000 In-band Control Server. The following menu allows the user to configure the In-Band Control settings. To

configure the In-Band Control settings click the  button.

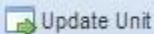


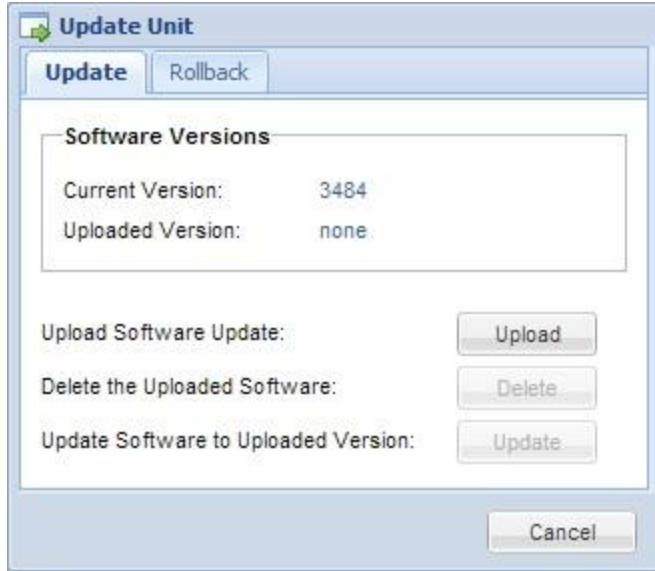
Action	Range	Description
State	Enabled	Enable or Disable the In-Band Control.
	Disabled	
PID	1-8190	Sets the unit to look for commands on the PID that is set.
Group	None	This setting assigns the unit to a corresponding Group or No Group.
	1-128	



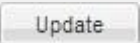
4.3.11 Updating the MRD 2600

4.3.11.1 Applying Software Updates

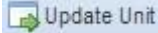
Updates to the MRD 2600 are performed through the web interface. A software update file is provided by Sencore and then uploaded to the unit. Once uploaded, the software update is applied to the unit. To upload software updates to the unit click on the

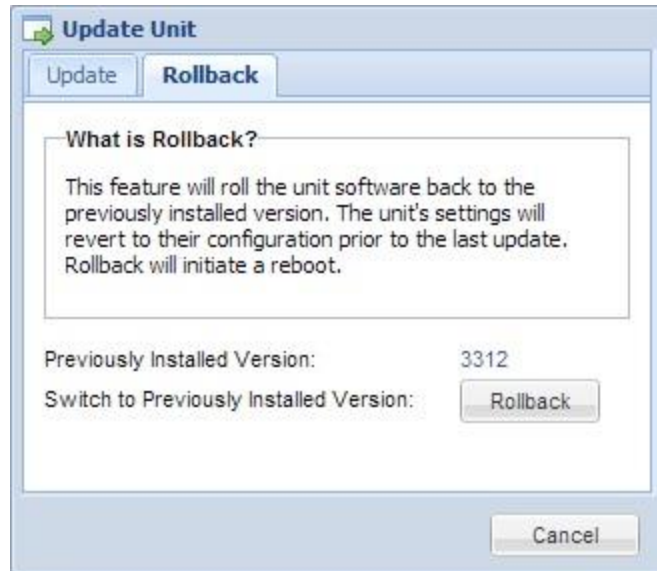
 button. The current version and uploaded version are displayed in the Software Versions section. The MRD 2600 will reboot after a software update is complete.



Action	Button	Description
Upload Software Update		To upload software updates to the MRD 2600 click this button. The user will be prompted to navigate to an update file. The file will then upload to the MRD 2600. When complete the MRD 2600 will prompt the user to either apply the update or cancel
Delete the Uploaded Software		Clicking this button prompts the user to confirm the deletion of the software upload from the MRD 2600. This will also clear the Uploaded Version status of the Software Versions section.
Update Software to Uploaded Version		Clicking the button starts the software update process. The MRD 2600 will prompt the user to confirm the update. Click Yes to continue or No to cancel.


4.3.11.2 Rollback Software Updates

The MRD 2600 is capable of reverting back to a previous version of software using the Rollback feature. The MRD 2600 maintains two separate software images; one is the most current version of software with all current settings and the other is the previous version of software with all settings. To perform a rollback click the  button and then click the **Rollback** tab. The MRD 2600 will reboot after the rollback process is complete.




Action	Button	Description
Rollback Software	<input type="button" value="Rollback"/>	Clicking this button starts the Rollback process. The MRD 2600 will prompt the user to confirm the rollback or click cancel to stop the process.

4.3.12 Reboot Unit

The MRD 2600 can be rebooted from the web interface. In order to perform a reboot click the  **Reset** button. The MRD 2600 will prompt the user to confirm the reboot. Once the reboot is complete the login screen will appear allowing the web interface to be logged into.

4.3.13 Reset Defaults

The MRD 2600 settings can be reset to factory defaults. All settings will be returned to the factory defaults except the network management ports TCP/IP settings. All event logs will be cleared. To reset all settings to default click the  **Reset to Defaults** button. The MRD 2600 will prompt the user to confirm the reset. The unit will reboot once the reset is confirmed.

4.4 Reporting Panel








The screenshot shows the 'Reporting Control Panel' with tabs for 'Main', 'Admin', 'Reporting', and 'About'. The 'Reporting' tab is active, and the 'Alarms' sub-tab is selected. A table lists active alarms with columns for State, Name, Location, and Last Changed. A 'Configure' button is visible in the top right corner of the panel.

State	Name	Location	Last Changed
	Transport Stream Not Present	Unit	07/14/2013 06:20:45
	Link Loss Error	MPEG/IP Slot 2 Port 1	07/14/2013 06:20:44
	IP Loss Error	Input MPEG/IP Slot 2 Stream 1	07/14/2013 06:20:44
	TS Sync Loss	Input MPEG/IP Slot 2 Stream 1	07/14/2013 06:20:44
	CAM Not Present	Cam Bottom Slot	07/14/2013 06:20:22
	TS Sync Loss	Input DVB-S2 Slot 1 Port A	07/14/2013 06:20:44
	Loss of Carrier Lock	Input DVB-S2 Slot 1 Port A	07/14/2013 06:20:44



The **Reporting** tab in the MRD 2600 contains logs for active alarms currently affecting the unit and an event log. The active alarms are updated periodically in order to reflect the real-time state of the unit. Once an error is cleared it will be cleared from the active alarms window. The event log can be used to view alarm and event history. Both the active alarm and event logs can be configured to hide or change the behavior of alarms and events.

4.4.1 Active Alarms

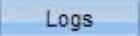

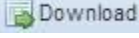
Clicking on the **Alarms** button displays the Active Alarms menu. This list displays all of the active alarms currently affecting the unit. There are four columns in the log that display different types of information.

Reporting Control Panel			
Alarms		Logs	
State	Name	Location	Last Changed
	Transport Stream Not Present	Unit	07/14/2013 06:20:45
	Link Loss Error	MPEG/IP Slot 2 Port 1	07/14/2013 06:20:44
	IP Loss Error	Input MPEG/IP Slot 2 Stream 1	07/14/2013 06:20:44
	TS Sync Loss	Input MPEG/IP Slot 2 Stream 1	07/14/2013 06:20:44
	CAM Not Present	Cam Bottom Slot	07/14/2013 06:20:22
	TS Sync Loss	Input DVB-S2 Slot 1 Port A	07/14/2013 06:20:44
	Loss of Carrier Lock	Input DVB-S2 Slot 1 Port A	07/14/2013 06:20:44

Title Description

State	This column displays the nature of the alarm. The  icon means the log entry is informational and is not an error. The  icon means the log entry is an active alarm.
Name	This column displays the description of the error. The function that is experiencing an error condition is described here.
Location	This column displays the hardware or function that is experiencing the active error.
Last Changed	This column displays the date and time the error was raised. This date and time correlates with the Date and Time settings configured in Section 4.3.7.

4.4.2 Event Logs

Clicking on the  button displays the Event Log menu. This list displays all of the events and alarms that have affected the unit. The MRD 2600 stores up to four days' worth of logs. The logs can be cleared manually by clicking the  button. The logs can be downloaded as a .tsv file and saved to an external location by clicking the  button. There are five columns in the log that display different types of information.

Reporting Control Panel				
Alarms Logs Configure				
Clear Download				
Severity	Timestamp	Transition	Message	Location
	07/14/2013 22:58:40		Link Loss OK	MPEG/IP Slot 2 Port 2
	07/14/2013 22:58:40		Link Loss OK	MPEG/IP Slot 2 Port 1
	07/14/2013 22:58:34		BISS Selected Services found.	Unit
	07/14/2013 22:58:34		BISS Group PID conflict cleared.	Unit
	07/14/2013 22:58:32		Unit Booted on Sun Jul 14 22:58:32 2013	Unit
	07/14/2013 22:58:32		Unit Was Last Shutdown on Sun Jul 14 22:57:50 2013	Unit
	07/14/2013 06:20:45		Transport Stream Not Present	Unit
	07/14/2013 06:20:44		Link Loss Error	MPEG/IP Slot 2 Port 1
	07/14/2013 06:20:44		Ts Sync Loss Error	Input MPEG/IP Slot 2 Stream 1
	07/14/2013 06:20:44		IP Loss Error	Input MPEG/IP Slot 2 Stream 1
	07/14/2013 06:20:44		TS Sync Loss Error	Input DVB-S2 Slot 1 Port A
	07/14/2013 06:20:44		Carrier Unlocked	Input DVB-S2 Slot 1 Port A
	07/14/2013 06:20:22		Enabled CAM Not Present	Cam Bottom Slot
	07/12/2013 20:55:12		Unicast Receiver Found	Output MPEG/IP Slot 2 Stream :
	07/12/2013 20:55:12		Unicast Receiver Found	Output MPEG/IP Slot 2 Stream :
	07/12/2013 20:55:08		Clear ISI Not Found	Input DVB-S2 Slot 1 Port D
	07/12/2013 20:55:07		LNB Power OK	Input DVB-S2 Slot 1 Port D

Page 2 of 2 Severity: Info Error Transition: Event Went Good Went Bad

Title**Description****Severity**

This column displays the nature of the alarm. The icon means the log entry is informational and is not an error. The icon means the log entry is an active alarm.

Timestamp

This column displays the date and time the error was raised or cleared. This date and time correlates with the Date and Time settings configured in Section 4.3.7.

Transition

This column indicates the type of alarm transition that took place. When an error is raised the icon is displayed. When an error is cleared the icon is displayed. When an event takes place the icon is displayed.

Message


This column displays the description of the error or event. The function or hardware that experienced the event or error is described here.

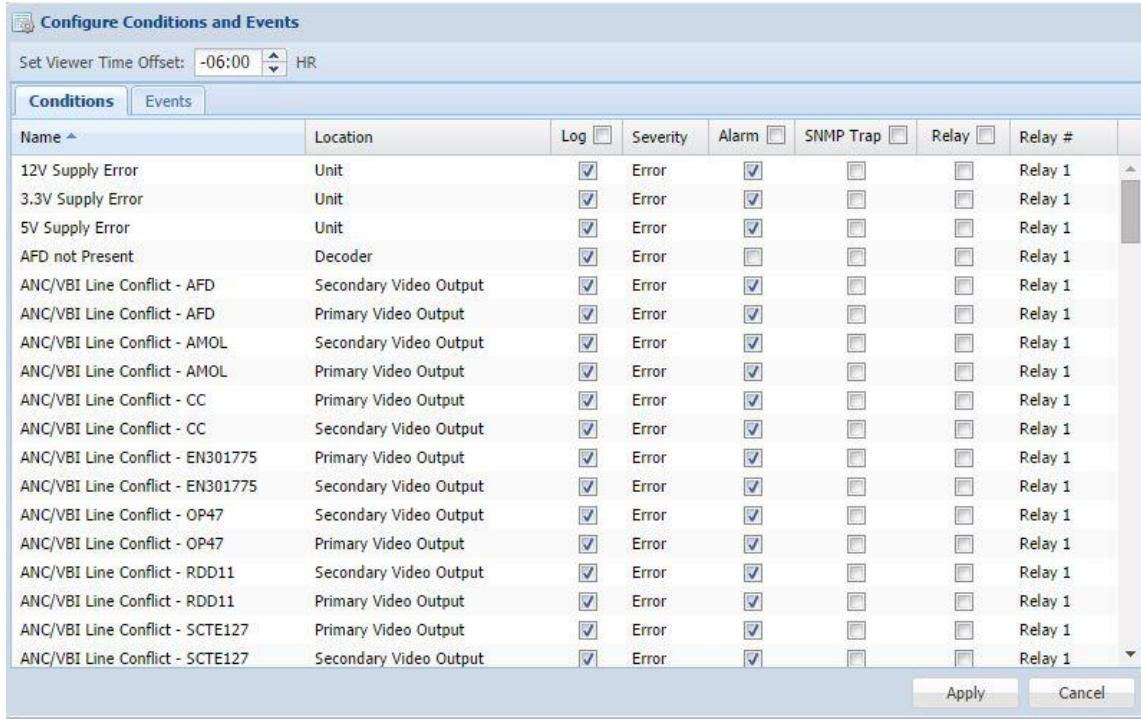
Location



This column displays the hardware or function that experienced the alarm or event.

4.4.3 Configuring the Logs

The MRD 2600 allows the user to configure alarms and events. Events and alarms can be hidden, set to send SNMP traps or close a relay when active. In order to configure

these options click the  button while in the **Reporting** tab. The **Conditions** tab allows the user to configure the alarms reported by the MRD 2600. The **Events** tab allows the user to configure the events reported by the MRD 2600. Each column and its function are described below. A user configured time offset can also be applied to allow viewing the logs in a local time zone.



Title	Description
Name	This column displays the name of the error or condition. This is informational data; no options can be set here.
Location	This column displays the hardware or function that the alarm or event applies to. This is informational data; no options can be set here.
Log	Checking the box in this column creates an entry in the event log in the case this error or event is raised. If this box is unchecked this error or event will be hidden and not logged if raised.
Log Severity	This column is only available in the Conditions tab This option allows the user to set the severity of the error to Info or Error. If Info is selected in the drop down box the  icon will be displayed in the event log. If Error is selected the  icon will be displayed in the event log.
Alarm	This column is only available in the Conditions tab This option allows the user to enable or disable this alarm in the Active Alarms log. If checked

the alarm will be displayed in the Active Alarms log if raised. If this box is unchecked this error will be hidden.

SNMP Trap	This column allows the user to send an SNMP Trap if this alarm is raised. If this box is checked an SNMP Trap is sent when this alarm is raised. If this box is unchecked an SNMP Trap is not sent.
Relay	This column allows the user to set a Relay closure if this alarm is raised. If this box is checked a Relay will be closed. If this box is unchecked a Relay will not be closed. See Appendix D for pinout.
Relay #	This column allows the user to select which of the three relays available on the MRD 2600 will be closed when the alarm is raised.
Relay Duration	This column is only available in the Events tab. This option allows the user to define the length of time in milliseconds the relay will be closed after the event is logged. This setting can be configured from 100-1000 milliseconds.

4.5 About Panel

Under the **About** tab, there are no user definable parameters but there is information about software versions currently installed, which licenses are installed, how to contact Sencore, and third party software information.

Section 5 Appendices



Introduction

This section includes the following appendices:

Appendix A	– Acronyms and Glossary	70
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Appendix A – Acronyms and Glossary

- 8VSB:** Vestigial sideband modulation with 8 discrete amplitude levels.
- 16VSB:** Vestigial sideband modulation with 16 discrete amplitude levels.
- AAC:** Advanced Audio Coding
- AC-3:** Also known as Dolby Digital
- AES:** Audio Engineering Society
- AFD:** Auto Format Descriptor
- ASI:** Asynchronous Serial Interface
- ATSC:** Advanced Television Systems Committee
- AV:** Audio Video
- Bit Rate:** The rate at which the compressed bit stream is delivered from the channel to the input of a decoder.
- BNC:** British Naval Connector
- BPS:** Bits per second.
- CAM:** Conditional Access Module
- CAT:** Conditional Access Table
- CAT6:** Category 6 – Cable standard for gigabit Ethernet
- CC:** Closed Caption
- CI:** Common Interface
- CoP:** Code of Practice
- CRC:** Cyclic Redundancy Check
- CVCT:** Cable Virtual Channel Table
- dB:** Decibel
- DDPlus:** Dolby Digital Plus
- DHCP:** Dynamic Host Configuration Protocol
- DPI:** Digital Program Insertion
- DTVCC:** Digital Television Closed Captioning
- DVB:** Digital Video Broadcasting
- EBU:** European Broadcasting Union
- EIA:** Electronic Industries Alliance
- EIT:** Event Information Table
- EPG:** Electronic Program Guide
- ETM:** Extended Text Message
- ETT:** Extended Text Table
- Event:** An event is defined as a collection of elementary streams with a common time base, an associated start time, and an associated end time.
- FCC:** Federal Communications Commission
- FEC:** Forward Error Correction
- Field:** For an interlaced video signal, a “field” is the assembly of alternate lines of a frame. Therefore, an interlaced frame is composed of two fields, a top field and a bottom field.
- Frame:** A frame contains lines of spatial information of a video signal. For progressive video, these lines contain samples starting from one time instant and continuing through successive lines to the bottom of the frame. For interlaced video a frame consists of two fields, a top field and a bottom field. One of these fields will commence one field later than the other.
- HANC:** Horizontal Ancillary
- HD:** High Definition

High level: A range of allowed picture parameters defined by the MPEG-2 video coding specification which corresponds to high definition television.

I/O: Input/Output

IP: Internet Protocol

Kbps: 1000 bit per second

LED: Light Emitting Diode

LNB: Low-Noise Block

MAC: Medium Access Control

Main level: A range of allowed picture parameters defined by the MPEG-2 video coding specification with maximum resolution equivalent to ITU-R Recommendation 601.

Main profile: A subset of the syntax of the MPEG-2 video coding specification that is expected to be supported over a large range of applications.

Mbps: 1,000,000 bits per second.

MER: Modulation Error Ratio

MGT: Master Guide Table

MIB: Management Information Base

MP@HL: Main profile at high level.

MP@ML: Main profile at main level.

MPEG: Refers to standards developed by the ISO/IEC JTC1/SC29 WG11, *Moving Picture Experts Group*. MPEG may also refer to the Group.

MPEG-2: Refers to ISO/IEC standards 13818-1 (Systems), 13818-2 (Video), 13818-3 (Audio), 13818-4

MPTS: Multiprogram Transport Stream

MRD: Modular Receiver Decoder

NTP: Networking Time Protocol

NTSC: National Television System Committee

OSD: On Screen Display

PAL: Phase-Alternating Line

PAT: Program Association Table

PCM: Pulse-Code Modulation

PCR: Program Clock Reference

PCM: Pulse-code Modulation

PID: Packet Identifier. A unique integer value used to associate elementary streams of a program in a single or multi-program transport stream.

PMT: Program Map Table

Profile: A defined subset of the syntax specified in the MPEG-2 video coding specification

Program specific information (PSI): PSI consists of normative data which is necessary for the demultiplexing of transport streams and the successful regeneration of programs.

Program: A program is a collection of program elements. Program elements may be elementary streams. Program elements need not have any defined time base; those that do have a common time base and are intended for synchronized presentation.

PTS: Presentation Time Stamp

QAM: Quadrature Amplitude Modulation

QPSK: Quadrature Phase-Shift Keying

RDS: Receiver Decoder System

RF: Radio Frequency

RGBHV: Red, Green, Blue, Horizontal, Vertical
RO: Read Only
RPM: Revolutions Per Minute
RRT: Rating Region Table
RS-232: Recommended Standard. A standard for serial binary data interconnection.
RU: Rack Unit
RW: Read/Write
SD: Standard Definition
SDI: Serial Digital Interface
SFP: Small Form-Factor Pluggable
SI: System Information
SMPTE: Society of Motion Pictures and Television Engineers
SNMP: Simple Network Management Protocol
SPTS: Single Program Transport Stream
SSRC: Synchronization Source
STD input buffer: A first-in, first-out buffer at the input of a system target decoder for storage of compressed data from elementary streams before decoding.
STD: System Target Decoder. A hypothetical reference model of a decoding process used to describe the semantics of the Digital Television Standard multiplexed bit stream.
STT: System Time Table
TS: Transport Stream
TVCT: Terrestrial Virtual Channel Table
UTC: Coordinated Universal Time
VANC: Vertical Ancillary
VBI: Video Blanking Interval
VCT: Virtual Channel Table. Used in reference to either TVCT or CVCT.
XLR: Cannon “X” series connector, with a Latch, and Rubber around the contacts.
YPbPr: Component Red, Green, Blue

Appendix B – Error and Event List

Error	Description
12V Supply Error	Voltage on 12V rail has exceeded safe operational range.
3.3V Supply Error	Voltage on 3.3V rail has exceeded safe operational range.
5V Supply Error	Voltage on 5V rail has exceeded safe operational range.
BISS Conflicting PIDs	PIDs selected to be descrambled by one BISS key are already assigned to be descrambled by another BISS key.
BISS Service Not Found	Service that BISS key is assigned to descramble is not present in the incoming stream.
Backup Input Active Condition	Primary input is currently in a failed condition and the MRD 2600 has failed over to the Backup input.
Bitrate Exceeded Error	Total incoming transport stream bitrate has exceeded 213 Mbps.
CAM Descramble Fail	DVB-CI Descrambling is enabled with a CAM installed, but the configured PID to be descrambled remains scrambled.
CAM Not Present	DVB-CI Descrambling is enabled but CAM Module is not installed.
CAM PID Not Found	PID selected to be descrambled by the CAM is not present in the incoming stream.
CAM Reset – Manual	CAM has been reset by the user.
CAM Reset Polling Failure	CAM Reset due to failure to respond to TDPU polling within 300ms
CAM Reset Descrambling Failure	CAM Reset due to failed descrambling of at least one selected PID or Service.
FEC Reception Error	Packets in incoming IP stream cannot be repaired with forward error correction.
Fan Error	Cooling fan in the MRD 2600 has failed.
IP Loss Error	No IP packets have been received by the MPEG/IP card for two seconds.
ISI Not Found	ISI value defined by the user is not found in the incoming multistream signal.
LNB Power Error	LNB Power is enabled but the MRD 2600 is detecting power is being provided by another source, there is excessive current drain or an overvoltage has occurred.
Link Loss Error	Physical IP link is not present on the MPEG/IP card.
Loss of Carrier Lock	Receiver carrier lock source is lost.
Low Level	8VSB/QAM RF Level is below the user settable threshold
Low MER	8VSB/QAM MER is below the user settable threshold

Multistream Mode Input Mismatch	Multistream Mode is enabled and input signal is not multistream capable or Multistream Mode is disabled and input signal is multistream capable.
Pid Filter Overflow Error	Configured PID Filter TS rate is too low.
Pid Filter Selection Not Present	Selected Service or PID is not present for inclusion in the output PID filter TS.
Power Supply Error	Power is lost to one of the Redundant Power Supplies
RF Lock Lost	The VSB/QAM input has lost lock to the digital RF input.
RTP Reception Error	Uncorrectable out of order or duplicate packets are present in incoming IP stream.
Temperature Error	The MRD 2600 has detected the internal temperature is 60 degrees Celsius or above.
Transport Error Indicator	The MRD 2600 has detected that the transport stream error indicator is present on the active input.
Transport Stream Not Present	The MRD 2600 has detected that the transport stream from the active input is no longer present.
TS Sync Loss	Transport stream sync for IP stream is not detected.
Unicast Receiver Not Found Error	The MRD 2600 cannot discover the destination for the unicast IP stream within 10 seconds after the initial ARP is sent.
Unlicensed Modulation	Input stream on active input is either 16APSK or 32APSK and the modulations are not licensed on the MRD 2600.
Unlicensed VCM/Multistream	Input stream on the active input contains a multistream signal and the MRD 2600 is not licensed for multistream.

Appendix C – Specifications

MRD 2600 – Base Unit

Includes –	Display, keypad, embedded controller, chassis/case, power supply/line cord
System –	
Display Type:	LCD
Display Configuration:	240 pixels by 64 pixels
Keypad:	Snap-dome Membrane
Front Panel Lockout:	Password control, up to 8 alpha-numeric characters (no punctuations or spaces allows)
Configurations Allows:	Single video decoder with up to two option cards
Rear Panel:	Fixed inputs and outputs with two option card slots. Option cards not field upgradeable.
Remote Operation/Update Interface –	
Type:	Ethernet, 10/100
Rear Panels indicators:	Link (Green LED), Activity (Amber LED)
Connector:	RJ45
Front Panel Indicators –	
Error LED:	Red indicates error is occurring Off indicates no errors detected
INPUT LED:	Green indicates valid input is present Off indicates no valid input
Monitor and Control Interfaces –	
Web server GUI:	HTTP via web browsing for control & monitoring
Front Panel:	Control & monitoring
SNMP:	Control & monitoring
Operating Altitudes	0 to 10000 feet
AC Power –	
Operating Voltage:	100-240VAC
PSU Max Power:	150W
Current Draw:	Base Unit with no option cards – 38-40W
	Base Unit with active ASI input – 54-55W
	MPEG/IP option card with active input – 2-3W (additional)
	DVB-S/S2 option card with active input and LNB load of 19V @ 500mA – 8-9W (additional)
	DVB-CI Module option with 2 CAM Modules installed – 2-3W (additional)
	8VSB/QAM option card with active input – 2-3W (additional)
Max Power Draw:	70-72W
Frequency:	48-63Hz
Connector:	IEC C14

Line Cord:	Detachable, 3-prong
Dual Redundant AC Power Option–	
Operating Voltage:	100-240VAC
PSU Max Power:	150W
Current Draw:	Base Unit with no option cards – 38-40W
	Base Unit with active ASI input – 54-55W
	MPEG/IP option card with active input – 2-3W (additional)
	DVB-S/S2 option card with active input and LNB load of 19V @ 500mA – 8-9W (additional)
	DVB-CI Module option with 2 CAM Modules installed – 2-3W (additional)
	8VSB/QAM option card with active input – 2-3W (additional)
Max Power Draw:	70-72W
Frequency:	50/60Hz
Connector:	IEC C14
Line Cord:	Detachable, 3-prong
Redundancy:	Load Sharing
DC Power –	
Operating Voltage:	32-72V DC
PSU Max Power:	2000W
Current Draw:	Base Unit with no option cards – 38-40W
	Base Unit with active ASI input – 54-55W
	MPEG/IP option card with active input – 2-3W (additional)
	DVB-S/S2 option card with active input and LNB load of 19V @ 500mA – 8-9W (additional)
	DVB-CI Module option with 2 CAM Modules installed – 2-3W (additional)
	8VSB/QAM option card with active input – 2-3W (additional)
Max Power Draw:	70-72W
Connector:	2 pin terminal block

ASI Input and Output Features

General –	
Connector:	2x BNC, Female
Impedance:	75Ω
Return Loss:	≥15dB, 3.5 to 270 MHz
ASI Serial TS Input / Output –	
Number of ASI Inputs:	1 or 2 (rev j or later)
Number of ASI Outputs:	1 (non loop-through) or 2 (rev j or later)
Standard:	EN50083-9 (V2:3/98) DVB ASI
Data Bit Rate:	270 Mb/s
Maximum TS Rate:	200 Mb/s
Minimum TS Rate:	250 Kb/s
Packet Sizes	Input: 188 and 204 bytes Output: 188 bytes
Modes Supported:	Burst, Byte and Inverted

DVB-CI Descrambling Module Option

CAM Decryption –	
General –	
Compatibility Standard:	DVB-CI EN 50221
Number of CAM Slots:	2
Auto CAM insertion/removal detection:	Yes
CAM Usage:	Selectable, Enable/Disable
CAM Name Display:	Yes
Multicrypt Support:	Yes
Decryption Selection –	
Elementary Stream types:	Video (MPEG2 & H264), Audio
Selection Modes:	Base Unit – Individually selectable elementary streams in a single service Multi-Service Descrambling License (MRD 26991) Adds – Individually selectable elementary streams in multiple services
Maximum TS bitrate	DVB-CI – 100Mb/s
CAS Supported –	All major CA vendors supported

BISS Descrambling Option

Compatibility Standard:	DVB-CSA
Supported Modes:	Base Unit – Mode 1, Mode E, Injected ID No limitation to number of services descrambled per key Multi-key Descrambling License (MRD26921) Adds – Multi-BISS descrambling using up to 12 keys
Maximum TS bitrate:	200 Mb/s

IP Input/Output Module Option

General –	
Connector:	2x 10/100/1000 auto negotiate Base-T RJ-45 Ethernet Ports
Receive –	
Input Format:	UDP, RTP and RTP with extension headers Multicast and Unicast CBR, VBR, Null Stripped
Receiver Capability:	2 simultaneous MPEG over IP transport streams
FEC Receive:	Pro MPEG CoP3 SMPTE2022 Range: $L * D \leq 100$ $1 \leq L \leq 20$ $4 \leq D \leq 20$ Annex B
Multicast Filtering:	Filters based on IP address
Buffer size:	1 - 4000 KB, user configurable
Bitrate Range:	0.25 – 200 Mb/s
Packets/IP Frame:	1-7 MPEG Packets/IP Frame
IGMP Compatibility:	Version 2 and 3
Transmit –	
Output Format:	UDP and RTP
Bitrate Range:	0.25 – 200 Mb/s
Packets/IP Frame:	1-7 MPEG Packets/IP Frame
Number of Outputs:	2 Mirrored TS – Unicast and/or Multicast
IP FEC Output (MRD 26925) Adds –	
FEC:	Off, Columns, Columns/Rows
FEC Transmit:	Pro MPEG CoP3 SMPTE2022 Range: $L * D \leq 100$ $1 \leq L \leq 20$ $4 \leq D \leq 20$

DVB-S/S2/S2X Input Module Option

General –	
Frequency Range:	950 MHz – 2150 MHz
Number of inputs:	4 (A, B, C and D)
Connector:	F-81 Type, Female (4)
Impedance:	75 Ohms
Return Loss:	>9 dB
Separation:	>50 dB adjacent, >60 dB non-adjacent
RF frequency:	950 MHz to 2150 MHz in 100 kHz steps
Tuning:	Difference between Satellite frequency and LO frequency
Satellite frequency:	950 – 14500 MHz
LO frequency:	0 – 12000 MHz, with presets of 0, 5150, 9750, 10600, 10750 and 11250 MHz
Packet size:	188 bytes
Tuning Step Size:	125 kHz, maximum
Nyquist root filter roll-off factors:	.05, .10, .15, .20, .25, .35
RF Input Level:	-65 dBm to -25 dBm
Input RF Spectrum:	Normal/Inverted Auto Detect

PL Scrambling Codes supported:	0-262,141
Image Rejection:	>30dB
Noise Figure:	<15dB, maximum
Max TS Bitrate:	160 Mb/s
LNB Power and 22 kHz Tone –	
LNB Power	Off/13/14/18/19VDC @ >450mA
LNB voltage regulation:	± 4%
22 kHz Tone:	Off/On @ 650 mV (± 250 mV) peak-peak
DVB-S –	
Standard:	EN 300 421
FEC Code:	Conv. + Reed-Solomon
Modulation:	QPSK
Modulation/Coding supported:	CCM
Code rates:	1/2, 2/3, 3/4, 5/6, 7/8
QPSK Symbol rate:	0.5-60 MSym/s
DVB-S2 –	
Standard:	EN 302 307
Decoding type:	LDPC and BCH
Modulation:	QPSK, 8PSK
Modulation/Coding supported:	CCM
FEC Framing Type	Short frame size (16200), Normal frame size (64800)
Supported rates:	QPSK: 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 8PSK: 3/5, 2/3, 3/4, 5/6, 8/9, 9/10
Symbol rate:	0.5-60 MSym/s
Pilot:	On/Off Auto Detect
DVB-S2 Advanced (MRD 26916) Adds –	
Modulation:	16APSK, 32APSK
Modulation/Coding:	VCM
Supported Rates:	16APSK: 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 32APSK: 3/4, 4/5, 5/6, 8/9, 9/10
Symbol Rate:	0.5-60 MSym/s
Multistream reception:	Single ISI (stream specified)
ISSY:	Supported

DVB-S/S2 Input Module Option

General –	
Frequency Range:	950 MHz – 2150 MHz
Number of inputs:	4 (A, B, C and D)
Connector:	F-81 Type, Female (4)
Impedance:	75 Ohms
Return Loss:	>9 dB
Separation:	>50 dB adjacent, >60 dB non-adjacent
RF frequency:	950 MHz to 2150 MHz in 100 kHz steps
Tuning:	Difference between Satellite frequency and LO frequency
Satellite frequency:	950 – 14500 MHz
LO frequency:	0 – 12000 MHz, with presets of 0, 5150, 9750, 10600, 10750 and 11250 MHz
Packet size:	188 bytes
Tuning Step Size:	125 kHz, maximum

Nyquist root filter roll-off factors:	.05, .10, .15, .20, .25, .35
RF Input Level	-65 dBm to -25 dBm
AFC Tuning Range:	± .5 MHz in Standard and Wide mode (with SR $.5 \leq 1$ MSps) ± 1 MHz in Standard and Wide mode (with SR $1 \leq 2$ MSps) ± 1.5 MHz in Standard and Wide mode (with SR $2 \leq 3$ MSps) ± 2 MHz in Standard and Wide mode (with SR $3 \leq 4$ MSps) ± 2.5 MHz in Standard and Wide mode (with SR $4 \leq 5$ MSps) ± 3 MHz in Standard mode (with SR ≥ 5 MSps) ± 4 MHz in Wide mode (with SR $5 \leq 6$ MSps) ± 5 MHz in Wide mode (with SR ≥ 6 MSps) Standard / Wide modes user selectable
Input RF Spectrum:	Normal/Inverted Auto Detect
PL Scrambling Codes supported:	0-262,141
Image Rejection:	>30dB
Noise Figure:	<15 dB Maximum
Max TS Bitrate:	160 Mb/s
LNB Power and 22 kHz Tone –	
LNB Power	Off/13/14/18/19VDC @ >450mA
LNB voltage regulation:	± 4%
22 kHz Tone:	Off/On @ 650 mV (± 250 mV) peak-peak
DVB-S –	
Standard:	EN 300 421
FEC Code:	Conv. + Reed-Solomon
Modulation:	QPSK
Modulation/Coding supported:	CCM
Code rates:	1/2, 2/3, 3/4, 5/6, 7/8
QPSK Symbol rate:	0.5-60 MSym/s
DVB-S2 –	
Standard:	EN 302 307
Decoding type:	LDPC and BCH
Modulation:	QPSK, 8PSK
Modulation/Coding supported:	CCM
FEC Framing Type	Short frame size (16200), Normal frame size (64800)
Supported rates:	QPSK: 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 8PSK: 3/5, 2/3, 3/4, 5/6, 8/9, 9/10
Symbol rate:	0.5-60 MSym/s
Pilot:	On/Off Auto Detect
DVB-S2 Advanced (MRD 44916) Adds –	
Modulation:	16APSK, 32APSK
Modulation/Coding:	VCM
Supported Rates:	16APSK: 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 32APSK: 3/4, 4/5, 5/6, 8/9, 9/10

Symbol Rate:	0.5-60 MSym/s
Multistream reception:	Single ISI (stream specified)
ISSY:	Supported

8VSB/QAM Input Module Option

General –

Frequency Range:	50 MHz – 1000 MHz VHF/UHF (Ch2 – Ch69) CATV (Ch2 – Ch158)
Channel Plans:	Off Air, FCC, IRC, HRC
Number of inputs:	1
Connector:	F-Type, Female
Impedance:	75 Ohms
Sensitivity:	-34dBmV to + 40dBmV (A74 Compliant)
Modulation:	8VSB, QAM-B
MER:	Range: 0dB to 40dB Accuracy: +/- 2dB Low Limit Flag: User Defined
RF Level:	Range: -34dBmV to +40dBmV Accuracy: +/- 5dBmV Low Limit Flag: User Defined

QAM –

Standard:	ITU Annex B/SCTE DVS-031
QAM Mode:	64 and 256
De-interleaver:	I=1-128, J=128/1
Nyquist Roll Off (Alpha):	12%, 18%

8VSB –

Standard:	ATSC A/53E
Decoding Levels:	8
Nyquist Roll Off (Alpha):	11.5%

DVB-T2/C2/ISDB-T Input Module Option

General –

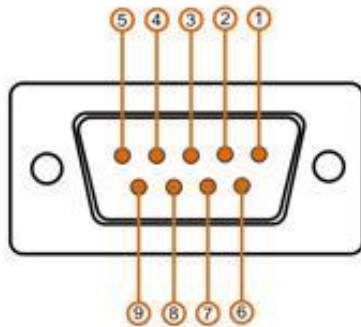
Frequency Range:	42 MHz – 1002 MHz
Number of inputs:	1
Connector:	F-Type, Female
Impedance:	75 Ohms
Sensitivity:	-34dBmV to + 40dBmV (A74 Compliant)
Modulation:	QPSK, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM, 1024QAM, 4096QAM
MER:	Range: 0dB to 40dB Accuracy: +/- 2dB Low Limit Flag: User Defined
RF Level:	Range: -34dBmV to +40dBmV Accuracy: +/- 5dBmV Low Limit Flag: User Defined

Appendix D – Pinouts for Relay Connectors

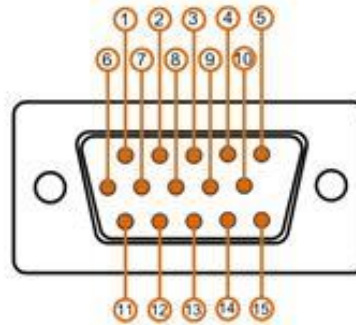
Relay Pinout 9-pin Connector

Pin	Function
1	Relay 1 Normally Open
2	Relay 1 Normally Closed
3	Relay 2 Common
4	Relay 3 Normally Open
5	Relay 3 Normally Closed
6	Relay 1 Common
7	Relay 2 Normally Open
8	Relay 2 Normally Closed
9	Relay 3 Common

**DB-9 Connector
(Female) Pin #'s**



**DB-15 Connector
(Male) Pin #'s**



Note: Relay functions shown represent the MRD in a powered-on state with no active alarms.

Appendix E – Open Source Software

The MRD 2600 includes:

Package	Version	License	Copyright
AT32 UC3B Software Framework	1.7.0	BSD	2009, Atmel Corporation
BaseX4JIT	4.0	GPL Version 3, 29 June 2007	2007-2009, Active Group, Inc
BusyBox	1.20.1	GPL Version 2, June 1991	Erik Anderson, et. al.
Cgicc	3.2.9	LGPL Version 29, June 2007	Stephen F. Booth
dfu-programmer	0.5.2	GPL Version 2, June 1991	Weston Schmidt
Dropbear	2012.55	MIT-like	2002-2008 Matt Johnston, et. al (see license)
E2fsprogs	1.41.9	GPL Version 2, June 1991	Theodore Ts'o
ethtool	2.6.34	GPL Version 2, June 1991	David Miller, et. al.
FamFamFam Silk Icons	013	Creative Commons Attribution 2.5	Mark James
FastDB	3.71	MIT-like	Konstantin Knizhnik
FCGI	2.4.6	FastCGI	Open Market, Inc
Iproute2	3.4.0	GPL Version 2, June 1991	Stephen Hemminger, Alexey Kuznetsov
Libusb	0.1.12	GPL Version 2.1, Feb 1999	Johannes Erdfelt, Thomas Sailer, Brad Hards
Lighttpd	1.4.23	BSD	2004, Jan Kneschke
Linux	2.6.30	GPL Version 2, June 1991	Linus Torvalds, et. Al.
Log4cpp	1.0	GPL Version 2.1 Feb 1999	Bastiann Bakker
Monit	5.1.1	GPL Version 3, 29 June 07	2010 Tildeslash Ltd.
Net-SNMP	5.7.1	BSD	1989, 1991, 1992 by Carnegie Mellon Univsty.
NTP	4.2.4p7	NTP License	1992-2009 David L. Mills
OpenSSL	1.0.1c	BSD-Like	1998-2008 The OpenSSL Project, 1995-1998
OProfile	0.9.7	GPL Version 2, June 1991	John Levon, Philippe Elie, et. al
PCRE	8.00	BSD	1997-2009 University of Cambridge, 2007-2008
POPT	1.14	MIT	1998 Red Hat Software
qDecoder	12.0.2	BSD	200-2012 Seungyoung Kim

Socket-CAN	1171	BSD-like, GPL Version 2, June 1991	2002-2007 Volkswagen Group Electronic Research
Spawn-FCGI	1.6.3	BSD	Jan Kneschke, Stefan Bahler
TCLAP	1.2.0	MIT	2003 Michael E Smoot
U-Boot	2009.11.1	GPL Version 2, June 1991	Wolfgane Denk, et. al.
USB-Utills	0.86	GPL Version 2, June 1991	Thomas Sailer, Johannes Erdfelt, David Brownell,
Zlib	1.2.7	Zlib/libpng License	1995-2005 Jean-loup Gailly and Mark Adler

Appendix F – Warranty

Sencore One-Year Warranty

Sencore warrants this instrument against defects from any cause, except acts of God and abusive use, for a period of 1 (one) year from date of purchase. During this warranty period, Sencore will correct any covered defects without charge for parts, labor, or recalibration.

Appendix G – Support and Contact Information

Returning Products for Service or Calibration

The MRD 2600 is a delicate piece of equipment and needs to be serviced and repaired by Sencore. Periodically it is necessary to return a product for repair or calibration. In order to expedite this process please carefully read the instructions below.

RMA Number

Before any product can be returned for service or calibration, an RMA number must be obtained. In order to obtain a RMA number, use the following steps:

1. Contact the Sencore service department by going online to www.sencore.com and select Support.
2. Select Service and Repair from the options given.
3. Fill in the following required information:
 - a. First & Last Name
 - b. Company
 - c. Email
 - d. Phone Number
 - e. Ship and Bill to Address
 - f. Unit Model and Serial Numbers
4. A RMA number will be emailed to you shortly after completing the form with return instructions.

Shipping the Product

Once an RMA number has been issued, the unit needs to be packaged and shipped back to Sencore. It's best to use the original box and packaging for the product but if this not available, check with the customer service representative for the proper packaging instructions.

Note: DO NOT return any power cables or accessories unless instructed to do so by the customer service representative

