ARD 3100/3400
ATSC 3.0 Receiver Decoder

User Manual

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 (MM/DD/YYYY)	Version	Description	Author
08/17/2020	1.0	Initial Release	JDN
05/14/2021	1.1	1.10.0 Feature Release	JDN
05/09/2022	1.2	1.13.0 Feature Release	JDN
10/12/2022	1.3	1.14.0 and 1.15.0 Feature Release	BCR
12/22/2023	1.4	1.17.0 Feature Release	GAK

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 product 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 email ProCare@Sencore.com
- 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 power supply must be connected to a mains socket outlet with a protective earthing connection.
- For the mains plug the main disconnect and should remain readily accessible and operable at all times.
- When utilizing 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 to ground the unit to the installation's rack, the vehicle's chassis, the battery's negative terminal, and/or earth ground.

⚠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

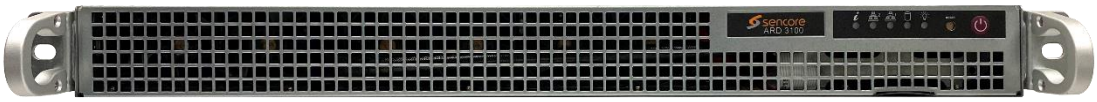
The following is a list of the items that are included:

1. ARD 3100/3400 Chassis
2. ARD 3100/3400 Software
3. AC Power Cable
4. 5 x HD-BNC Cables
5. Quick Start Guide

If any of these items were omitted from the packaging please email ProCare@Sencore.com to obtain a replacement.

Table of Contents

Section 1 Overview



Introduction

This section includes the following topics:

1.1 Product Introduction

Sencore's ARD 3000 series of the ATSC 3.0 receiver decoders enables users to decode 1-channel (ARD 3100) or 4-channels (ARD 3400) in a 1RU platform. This decoder is perfectly suited for the re-encode or confidence monitoring applications in existing distribution systems.

The ARD 3000 series includes an ATSC 3.0 RF input for receiving next-generation RF signals. Tune to a single PLP and decode up to 4 services. Decoded services are output via 4x3G-SDI for UHD services or 3G/HD/SD-SDI for HD and SD services. The configuration is done using the intuitive web GUI or through APIs like Rest and SNMP.

Every ARD 3100/3400 ships with the software suite pre-loaded on appropriate hardware. There are optional output configurations that will change the physical connectors available on the back of the chassis.

Input Capabilites:

- ✓ 1x ATSC 3.0 RF tuner
  - Single Channel/PLP receive and decode for the 3100
  - Multi Channel/PLP receive and decode for the 3400

Supported Video/Audio Codecs:

- ✓ HEVC/H.265
- ✓ Dolby AC4 and AAC

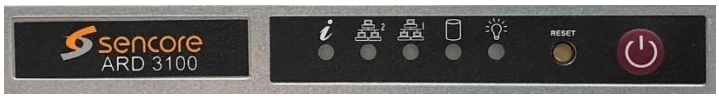
Output Options:

- ✓ Quad 3G-SDI for UHD outputs
- ✓ Single-Link
  - SD-SDI 480i29.97 & 576i25
  - HD-SDI up to 1080i60
  - 3G-SDI up to 1080p60

Power Supply:

- ✓ 120/240V Switching Power Supplies
- ✓ Redundant power design utilizing two independent cables

1.2 Front Panel Overview



The ARD 3100/3400 product is a software-based solution; designed to run on a PC server chassis. Initial network configuration is done with keyboard, monitor, and mouse. Once the IP is configured all operation and setup is via web-interface over a network.

To obtain the associated documentation from the server manufacturer or detailed information regarding front of chassis indicator lights email ProCare@Sencore.com

1.3 Rear Panel Overview

The ARD 3100/3400 servers include dual network ports on the motherboard. Either port can be used to access the web-interface.

1. SD/HD/3G-SDI w/embedded audio. Outputs labeled 1 through 4
2. Bi-level and tri-level genlock input port
3. Eth0: One of two available RJ45 Ethernet ports for management
4. Eth1: One of two available RJ45 Ethernet ports for management
5. Local monitor output uses VGA (D-SUB) connector
6. Redundant power supplies (120/240 AC Switching PS)
   VGA and keyboard are only used for setting the network configuration; operation of the device is performed through the web interface
7. ATSC 3.0 input port

Section 2 Installation

Introduction

This section includes the following topics:

2.1 Rack Installation

The ARD 3100/3400 software product runs on Supermicro brand hardware. Please consult the Supermicro SC514 Series Revision 1.0 user manual for complete detail on the rack installation and power cable connections.

https://www.supermicro.com/manuals/chassis/1U/SC514.pdf

2.2 AC Dual Redundant Power Connections

The Dual Redundant option allows the ARD 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 cords that are included.
2. Plug the female end of the power cords (end with no prongs) into the back of the unit.
3. Locate a protected outlet (usually inside of the rack) to plug the male ends of the power cables into.

2.3 Maintenance

Refer to the server manufacturer documentation for detailed information regarding server hardware maintenance.

To request a copy of the latest ARD software or release notes from Sencore email ProCare@Sencore.com

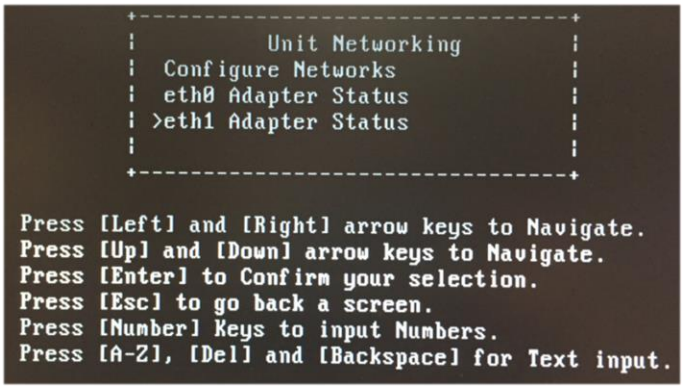
2.4 Network Setup via KVM

Connect the VGA (D-SUB) cable to a monitor and a USB keyboard.

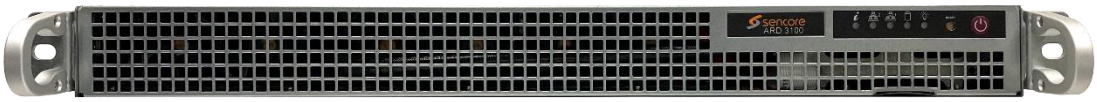
The VGA will display the current ethernet settings and provide a text-based menu to configure IP addressing, Subnet Mask, Gateway, and DNS settings.

Sencore recommends configuring the Eth0 port (Leftmost NIC when facing the rear of the unit) be set to a static IP for web-interface access. Ensure the user machine is also on the same network.

For additional information on initial network configuration menu see the Sencore ARD 3100/3400 Quick-Guide documentation.



Section 3 Web-Interface Operation



Introduction

This section includes the following topics:

3.1 ARD 3100/3400 Web Interface Overview

3.1.1 Logging into the ARD Web Interface

To open the ARD 3100/3400 web interface, use one of the following supported browsers and navigate to the unit's IP address:

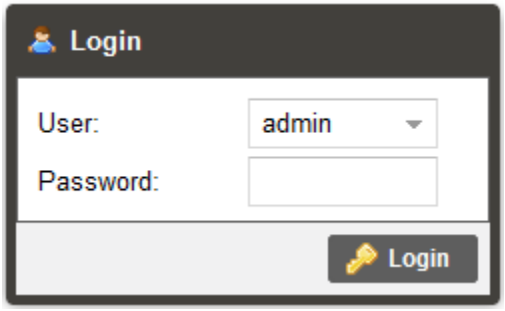
- Internet Explorer 7 & above
- Firefox 3.5 & above
- Google Chrome
- Microsoft Edge

The user will need to login to the web interface. By default, the admin user account is available with the password below. Press the login button in order to login to the web interface.

Default Credentials

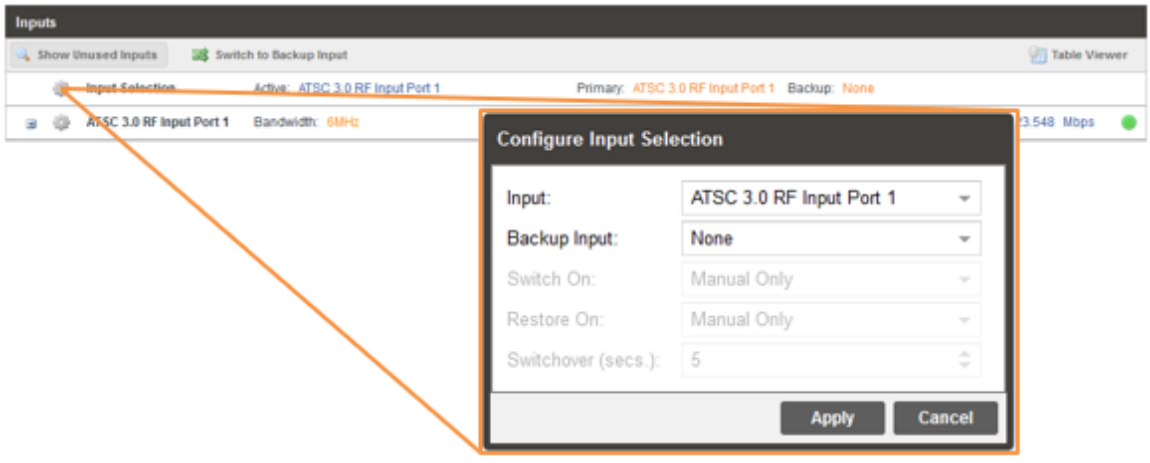
Username: admin

Password: mpeg101



3.1.2 Buttons and Status Indicators

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



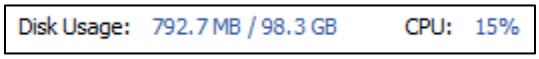
When the ⊞ icon is shown, additional status information can be viewed. Click this button will expand the menu to display the additional status information. All text in status menus shown in **ORANGE** are user configurable settings. Text shown in **BLUE** is not user configurable and is strictly a status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

Status in the ARD 3100/3400 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.

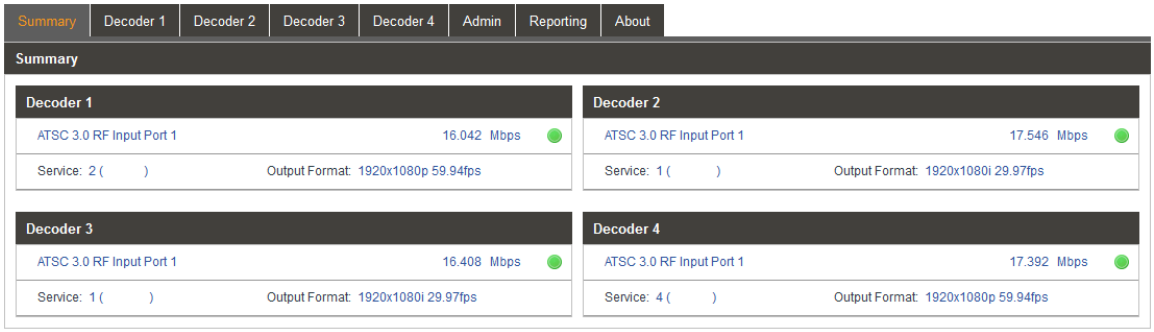
3.1.3 Disk Usage and CPU Statistics

The current available and used disk space of the server is shown throughout the user-interface on the top right corner of the unit web page.



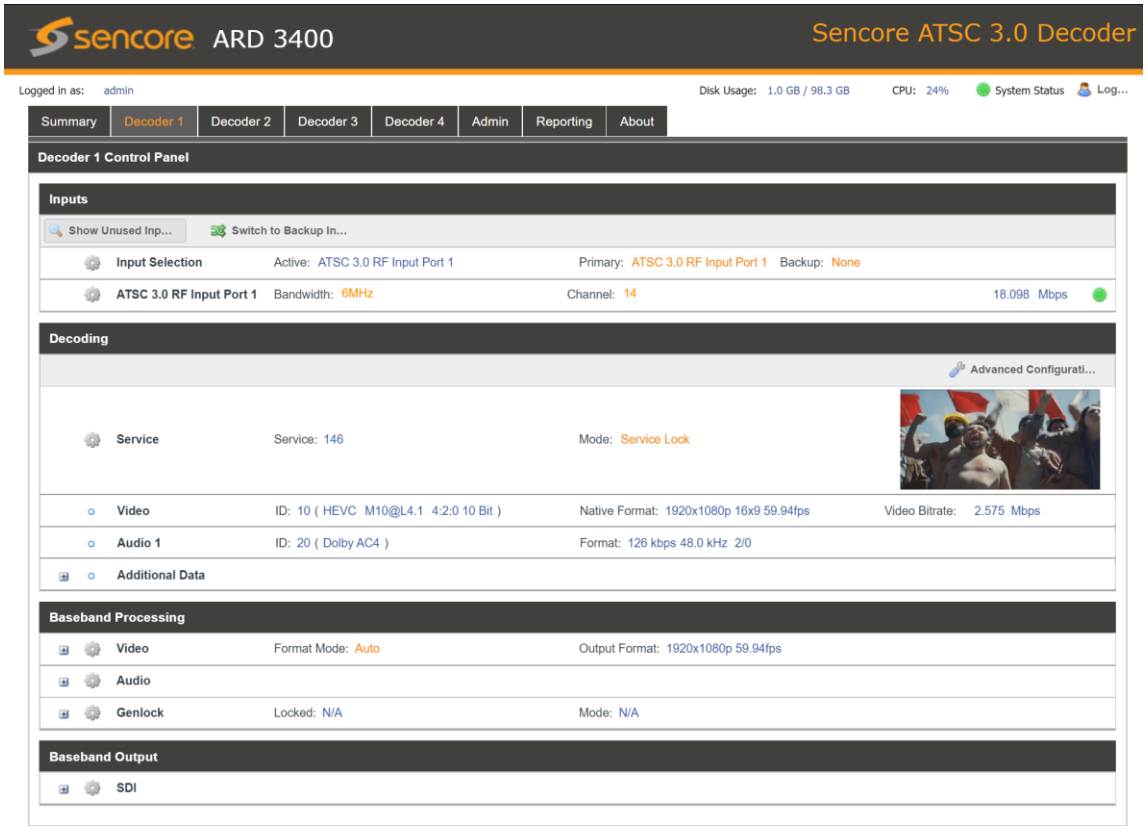
3.2 Summary Panel

This tab is specific to the ARD 3400, and only when the ARD 3400 is configured configured for “Independent (HD/SD)” mode as described in Section 3.4.3. When the ARD 3400 is configured for four separate FHD decodes, the “Summary” page will show pertinent information on the configured inputs and general status for all four decoders in one view.



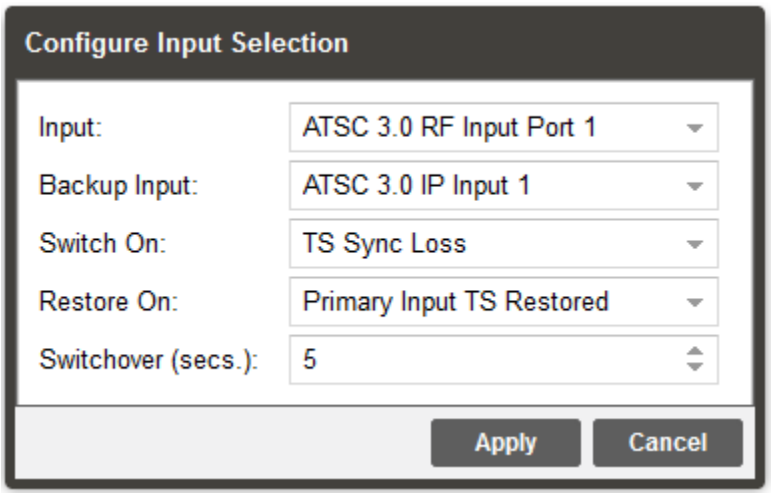
3.3 Decoder Panel

The Decoder panel of the ARD 3100/3400 web interface is used to configure the input, decoding and output settings. Each functional piece has a heading: Inputs, Decoding, Baseband Processing and Baseband Output sections are listed from the top down.



3.3.1 Configuring Input Selection

This menu is used to configure a primary and backup input for the Decoder. When the ARD detects a failed state on the primary input, it will automatically switch to the backup input to provide a continuous decode and output.

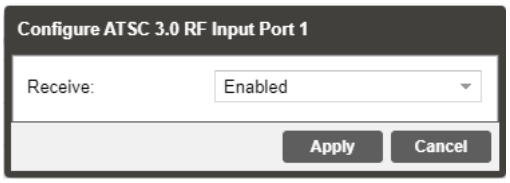


Setting	Range	Description
Input	ATSC 3.0 RF Input Port 1~4 ATSC 3.0 IP Input 1~2 None	Primary input, used as the active input during normal operation.
Backup Input	ATSC 3.0 RF Input Port 1~4 ATSC 3.0 IP Input 1~2 None	Backup input, used as the active input during failover operation.
Switch On	Manual Only	*Manual Only*: the user must manually switch inputs using the icon.
	TS Sync Loss	*TS Sync Loss*: the ARD will automatically switch from the primary to the backup input if the primary stream loses synchronization for the duration of the Switchover Interval.
	Decode Failure	*Decode Failure*: the unit will switch to the backup input when it encounters decoding errors on the primary input.
Restore On	Manual Only	*Manual Only*: the user must manually switch inputs using the icon.
	Primary Input TS Restored	*Primary Input TS Restored*: the ARD 3400 restores to primary when the Primary input is present for the full switchover interval.

	Backup Input TS Sync Loss	*Backup Input TS Sync Loss*: the unit will switch from backup to primary when the backup stream loses synchronization for the duration of the Switchover interval.
	Decode Failure	*Decode Failure*: the unit restores to the Primary Input when the Backup Input experiences a decoding error.

3.3.2 Configuring ATSC 3.0 over RF Input

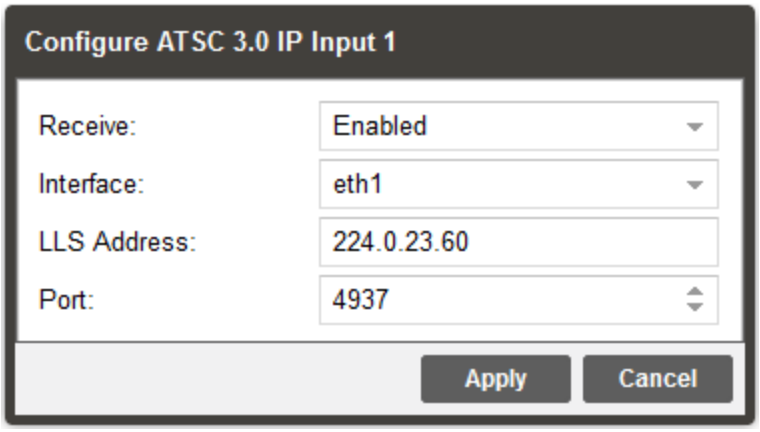
This menu on the “Decode” tab is used to disable and enable the decoder’s reception of the configured ATSC 3.0 RF input. To configure the tuner itself, please review the ATSC 3.0 RF Port options under the “Admin” tab described in Section 3.4.4.



Setting	Range	Description
Receive	Enabled Disabled	This setting allows the user to enable or disable this reception port

3.3.3 Configuring ATSC 3.0 over IP Input

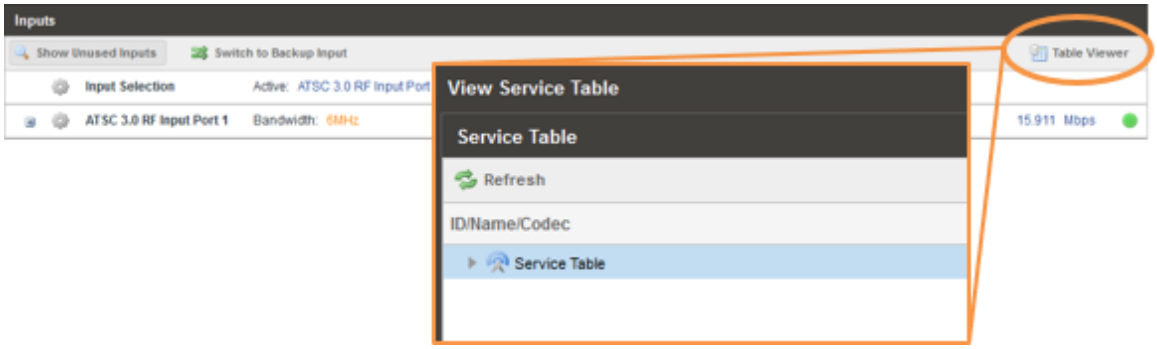
This menu is used to configure the ATSC 3.0 over IP input. Up to two separate IP inputs maybe be configured per decoder.



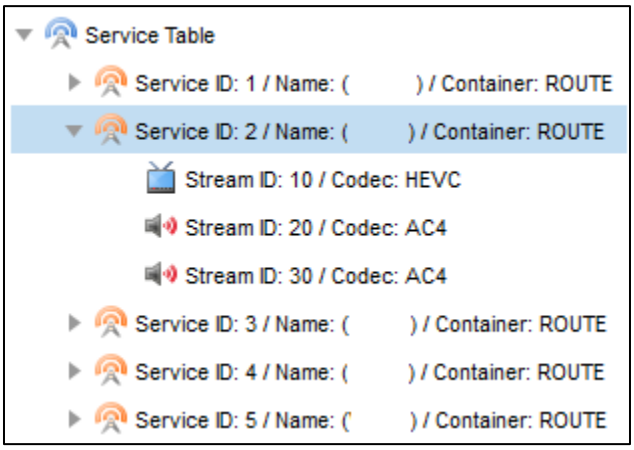
Setting	Range	Description
Receive	Enabled Disabled	This setting allows the user to enable or disable this reception port
Interface	eth0 eth1	Choose the IP interface port to receive the ALP IP stream
LLS Address	0.0.0.0 ~ 255.255.255.255	The Low Level Signal address to tune the IP input for receive
Port	1025 ~ 65535	The network port for the ALP IP stream

3.3.4 Viewing Available Services On Table Viewer

When the active input has been configured and is receiving incoming bitrate with a green status, the “Table Viewer” is used to view the incoming available services that can be selected for decode.



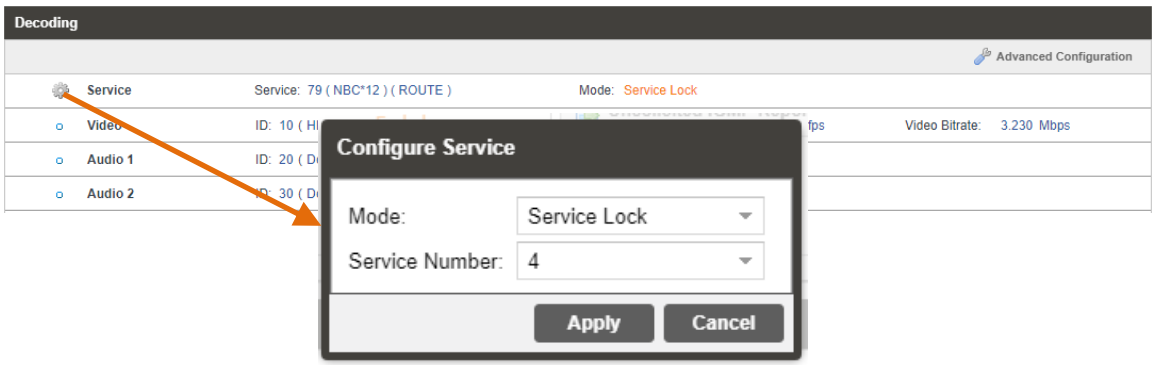
Use the dropdown icons by “Service Table” to expand the contents. This menu can be used to view the Service ID, Name, Container (ROUTE or MMTP) as well as Video and Audio Stream ID numbers and CODECs.



Any Service IDs from the ROUTE or MMTP containers may be selected for decode as shown in Section 3.3.5.

3.3.5 Configuring Decoding and Service Selection

This menu allows the user to configure which service the ARD 3100/3400 will decode. There are two editable fields in this menu.



Setting	Range	Description
Mode	Auto Seek	The ARD will decode the first service found
	Service Lock	Locks the decoder to defined service number
Service Number	#	Click the drop-down to select a service number . This list will be populated by all services in the incoming transport stream.

When the ARD 3100/3400 begins decoding a service, the Additional Data status can be viewed or hidden using the ⊞ and ⊟ icons. The status section reports relevant decoding data such as HDR, wide color gamut metadata, and Closed Captioning presence.

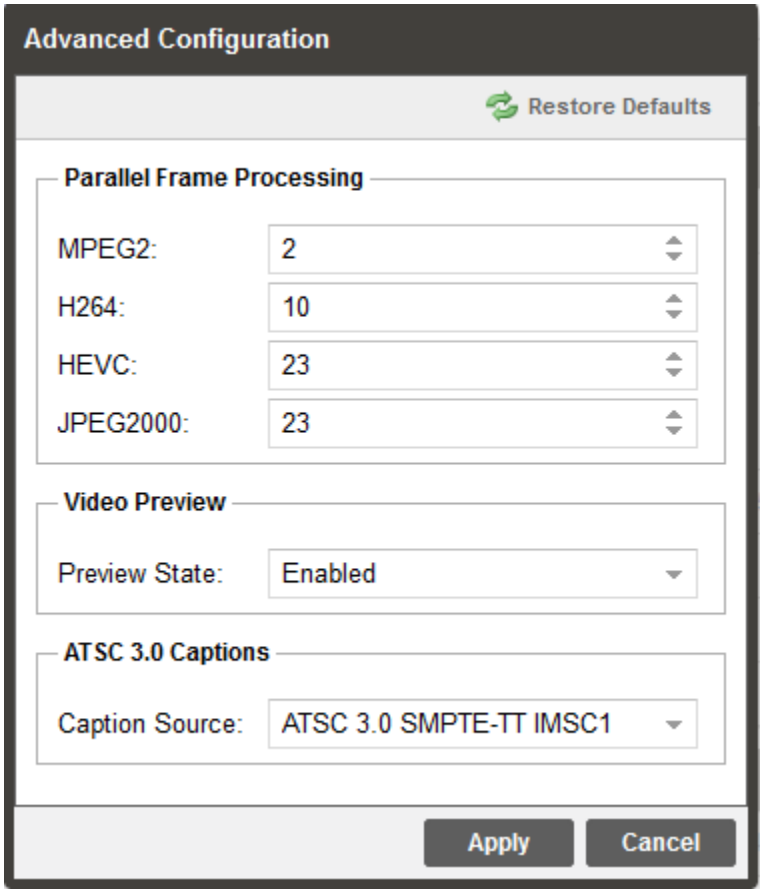
The Additional Data menu has an A3SA Descrambling section. It indicates if the selected service is encrypted. When descrambling it indicates if the ARD has found CDM provisioning, confirmed A3SA certification, and achieved key server communication so as to be able to decode an encrypted service.. Unencrypted services show all fields as False while encrypted services should show all fields as True.

3.3.6 Advanced Configuration

This section allows the user to configure advanced settings of the ARD 3100/3400.

Parallel Frame Processing allows the user to tune the decode latency of the ARD 3100/3400. Lower Parallel Frames results in lower latency. Setting these values too low can result in dropped video frames. Default settings are recommended unless minimal latency is crucial to the application.

Clicking the Restore Defaults button will reset all values to the default values.



Setting	Range	Description
MPEG2	1-50	This setting changes the parallel frames processed when decoding MPEG2 video.
H264	1-50	This setting changes the parallel frames processed when decoding H264 video.
HEVC	1-50	This setting changes the parallel frames processed when decoding HEVC video.

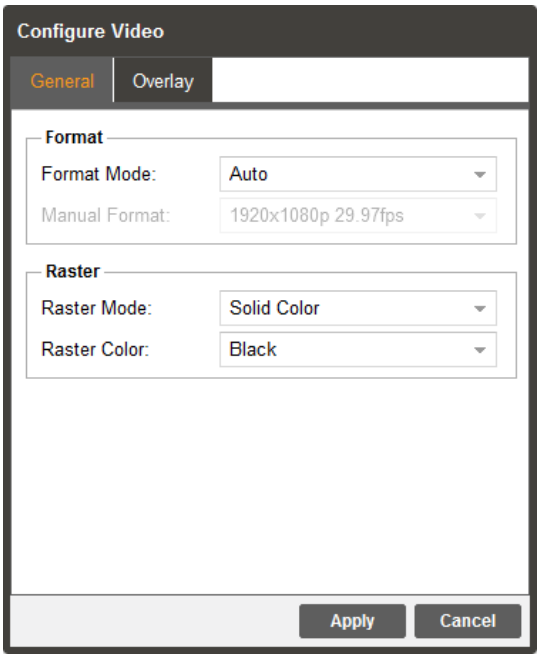
JPEG2000	1-50	This setting changes the parallel frames processed when decoding HEVC video.
Preview State	Enabled/Disabled	This section allows the user to view a thumbnail preview of the video being decode by the ARD 3100/3400. Enabling the Preview State will cause the ARD 3100/3400 to display a thumbnail in the Decoding section.
Caption Source	ATSC 3.0 SMPTE-TT IMSC1 Legacy Video Header	The user chooses which caption data the decoder will reference when overlaying or embedding onto SDI

3.3.7 Configuring Baseband Processing

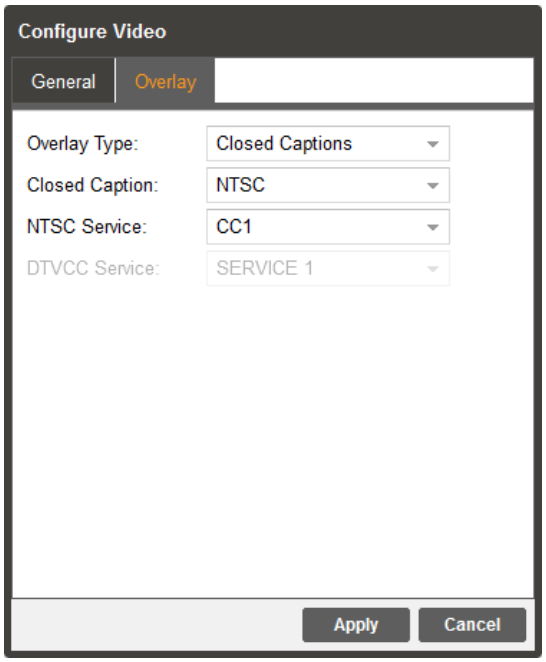
The section of the main tab allows the user to configure the video, audio, and genlock baseband processing.

3.3.7.1 Configuring Video

The Configure Video menu is opened by clicking on the gear icon just under the Baseband Processing section title. There are two tabs on this menu, one for “General” purpose configuration, and another for “Overlay” to select burn-in caption settings.

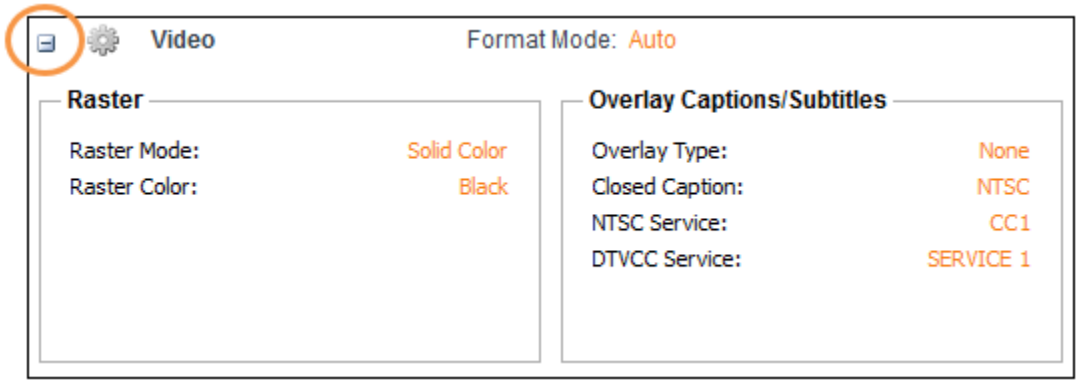


Setting	Range	Description
Format Mode	Auto	The ARD will match output format to input
	Manual	ARD uses specified Manual Format value
Manual Format	3840x2160p 60fps 1280x720p 59.94fps	Refer to Appendix C in Section 4 for complete list
Raster Mode	Solid Color	Selected color outputs if no input is locked
	Last Frame	Last decoded frame is shown when no input
Raster Color	Black White Yellow Cyan Magenta Red Blue Green Gray	Choose color to display when raster mode is set to Solid Color



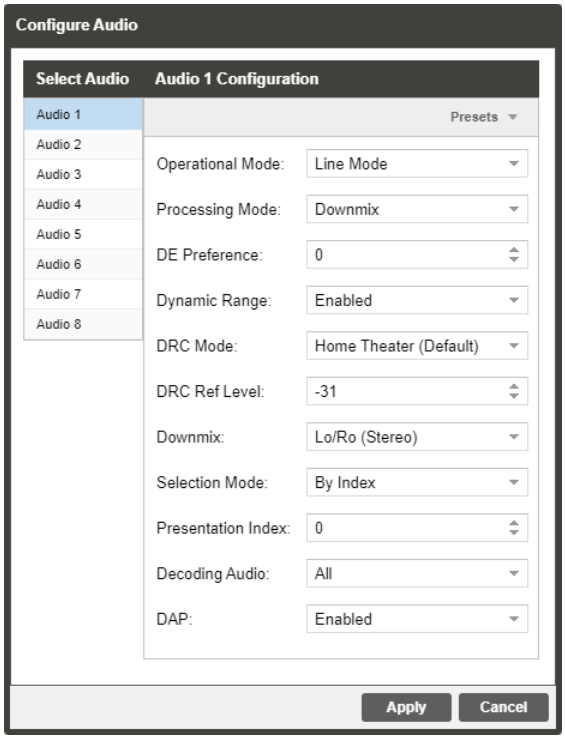
Setting	Range	Description
Overlay Type	None Closed Caption	Select subtitle overlay type
Closed Caption	NTSC DTVCC	Select subtitle overlay CC type
NTSC Service	CC1 CC2 CC3 CC4	Select subtitle overlay NTSC type
DTVCC Service	SERVICE 1 SERVICE 2 SERVICE 3 SERVICE 4 SERVICE 5 SERVICE 6	Select subtitle overlay DTVCC type

Once configured, video settings are easily viewed or hidden using the ⊞ and ⊟ icons.

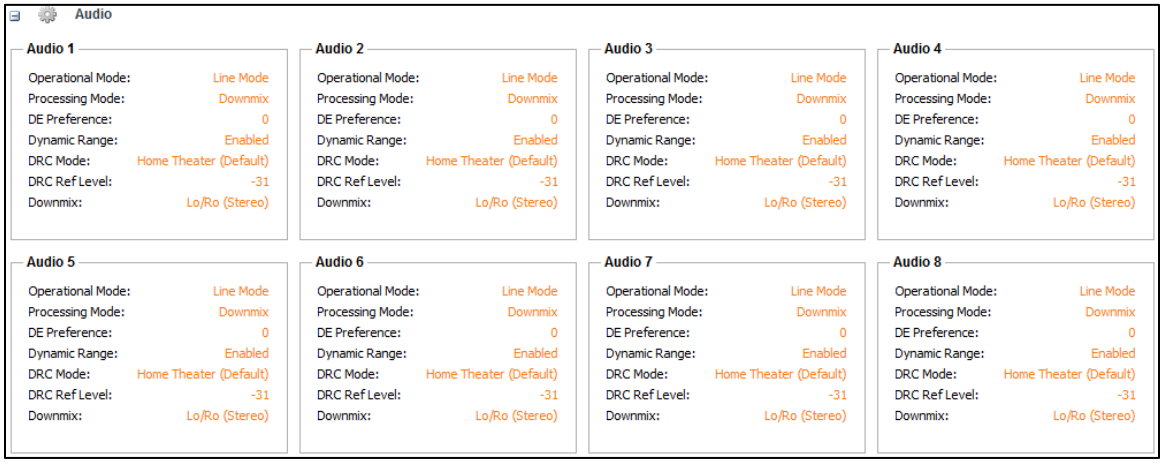


3.3.7.2 Configuring Audio

The audio menu allows the user to configure the audio processing mode (decode / discrete) settings of the ARD 3100/3400. Up to 8 audio PID's inside of the decoded service can be processed.



Once configured, audio settings are easily viewed or hidden using the ⊞ and ⊟ icons.

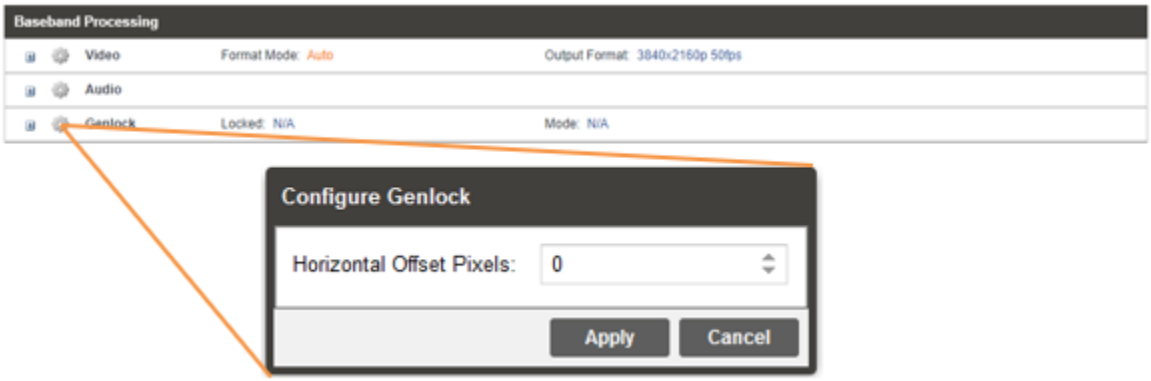


Setting	Range	Description
Operational Mode	Line Mode RF Mode Custom 1 Custom 0	This setting allows the user to select the audio compression Monitor mode
Processing Mode	Downmix Discrete	Please refer to Configuring SDI Audio under Section 3.3.8.2
DE Preference		Set the gain in dB to be applied to the dialog components in the signal
Dynamic Range	Enabled Disabled	Use dynamic range for AC-3 and AC-4 downmix.
DRC Mode	Home Theater (Default) Flat Panel Portable – Headphones Portable – Speakers	AC-4 audio mode of Dynamic Range Control. The different modes allow for different levels of audio.
DRC Ref Level	-31 to -27 -26 to -17 -16 to -7 -16 to -7	Dynamic Range Control referene level for AC-4 audio. This following audio level ranges correlate to the mode of AC-4 audio selected.
Downmix	Lo/Ro (Stereo) Lt/Rt (Dolby Surround) Lt/Rt (Auto) Dual Mono/Stereo Dual Left Dual Right Head Phone Speaker Virt	When the audio is downmixed in the ARD 3100/3400 two audio channels are created. The channels can be configured using the settings available in the drop-down menu.
Selection Mode	Preference Based By Index	The AC-4 audio presentation stream mode can be set to Preference Based or By Index. Preference Based selects the first available audio presentation stream and By Index allows the user to select which audio presentation stream to begin decoding.
Presentation Index	0-100	The first decoded AC-4 audio presentation stream can by selected by entering the index number of that particular stream.
Decoding Audio	All	The type of AC-4 audio can be set to All, Main, or Associate. Main and Associate

	Main Associate	audio contain different content such as music, effects, scene descriptions or director's comments.
DAP	Enabled Disabled	Dolby Audio Processing can be enabled or disabled with this setting.

3.3.7.3 Configuring Genlock

The Genlock menu allows the user to configure Horizontal Offset Pixels. The configure menu is opened by clicking on the gear icon.



Genlock status is reported as Locked/Unlocked (reference source enabled) or N/A (refence source disabled) and Mode status.

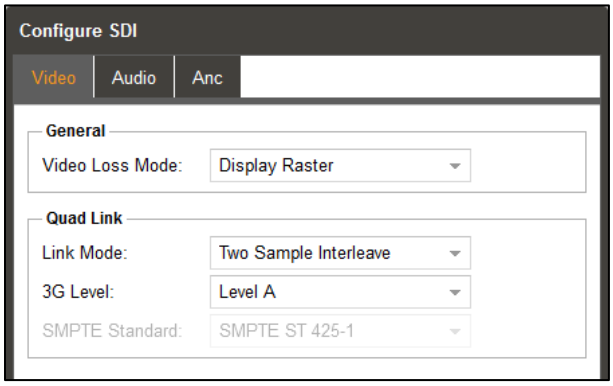
For more settings to enable and select the Genlock reference, use the SDI Module settings found in the "Admin" tab under Section __.__.__.

3.3.8 Configuring Baseband Output

This menu allows the user to configure the SDI output settings for the ARD SDI output card.

3.3.8.1 Configuring SDI video

The ARD 3100/3400 comes with the ability to decode SDI Level A or SDI Level B. The SDI outupt module will be preset for SMPTE ST 425-5 Two Sample when it's configured for UHD (SDI Quad Link Mode -> Enabled). Picture below displays how SDI video can be configured.



General

Setting	Range	Description
Video Loss Mode	Disable SDI Display Raster	Setting to *Disable SDI* disables the SDI output of the ARD in case of an error state. Setting to *Display Raster* the ARD will display the raster color selected in Section 3.3.7.1

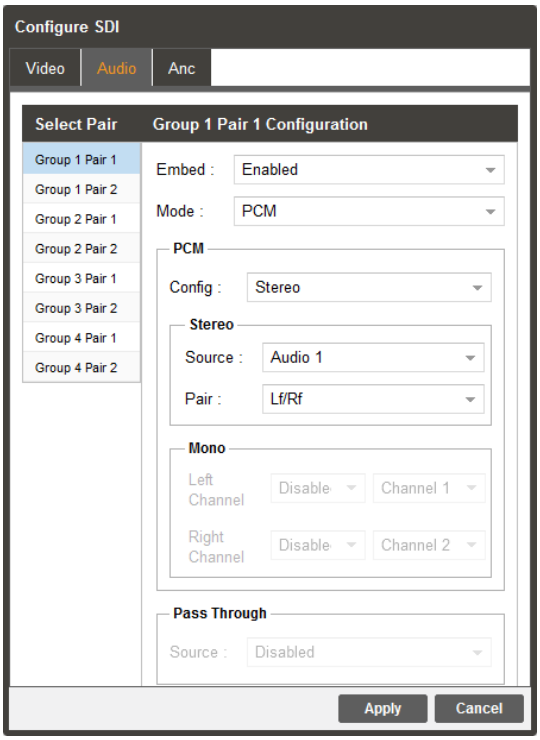
Quad Link

Setting	Range	Description
3G Level	A or B	This setting changes the SDI output level.
SMPTE Standard	SMPTE ST 425-1 SMPTE ST 425-5	*SMPTE ST 425-1:* The Quad Link SDI output will follow SMPTE ST 425-1 aka "legacy" mapping. *SMPTE ST 425-5:* The Quad Link SDI output will follow SMPTE ST 425-5 aka "standard" mapping.

3.3.8.2 Configuring SDI Audio

This menu allows the user to configure the SDI embedded audio settings. The ARD 3100/3400 comes standard with the ability to handle up to eight audio services. Eight audio pairs can be embedded into four Group Pairs. Each Group Pair can contain a PCM (either downmixed or discrete decode) or passthrough audio.

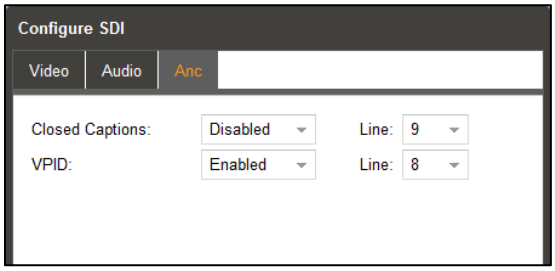
In the case where a discrete audio pair is being embedded, the channel pair in the column must be selected. For audio services that indicate the specific channels (Lf, Rf, C, Ls, Rs, LFE) the user can select the audio channels to assign to a output using the named discrete options. The following audio formats identify specific channels: Dolby AC-4, AAC-LC, HE-AAC. If the specific channels are not identified (LPCM Audio for example) than the user can use the multi-channel audio service to select the channel pair of the audio service to output. When the user has selected a named discrete option but the audio channels are not identified in the service the unit will output Ch1/Ch2 (if present) if Lf/Rf is chosen, Ch3/Ch4 (if present) if C/LFE is chosen and Ch5/Ch6 (if present) if Ls/Rs is chosen.



Advanced Audio embedding allows to embed mono audio channels from multiple audio PIDs in the same group/pair, i.e. a user can use mono audio left from audio PID 1 and mono audio right from audio PID 2 and embed them as Group 1 Pair 1.

3.3.8.3 Configuring SDI ANC

The Configure SDI menu also allows for the ability to enable or disable ANC data.



Setting	Range	Description
Closed Captions	Enabled Disabled	This setting enables SMPTE-TT Closed Captions embedding on a selected line.
VPID	Enabled Disabled	This setting enables VPID embedding on a selected line

Closed Captions VANC Embedding

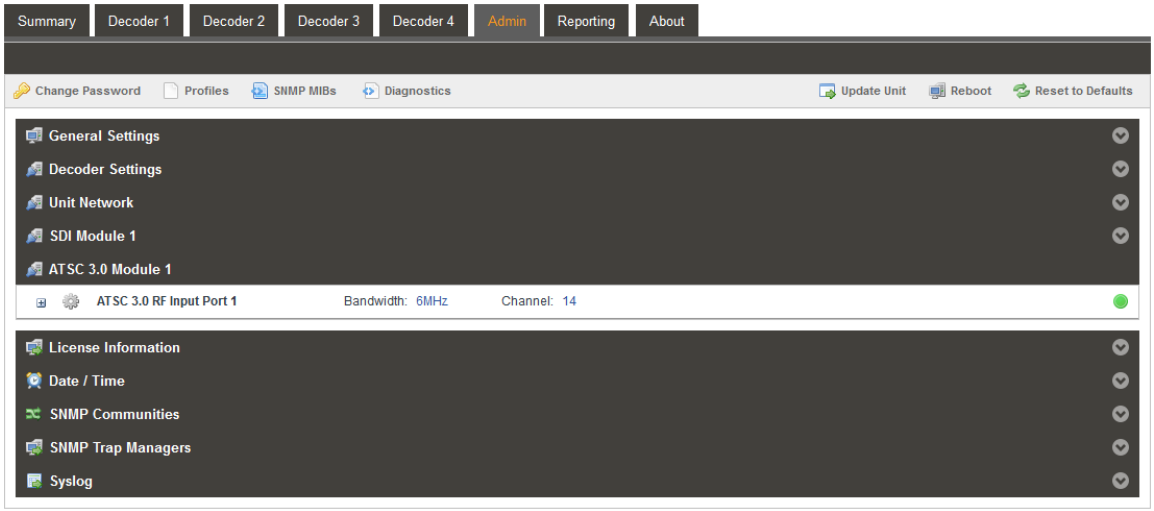
The ARD 3100/3400 supports extraction of SMPTE ST 2052-1 (SMPTE-TT) from the input PID and embedding in SDI. User configuration is needed for enabling Closed Captioning data to be embedded in SDI. Presence of the incoming Closed Captioning data is reported in the Additional Data status in the Decoding section

VPID VANC Embedding

The ARD 3100/3400 supports extraction of VPID metadata from the input video PID and embedding in SDI. User configuration is needed for enabling VPID data to be embedded in SDI.

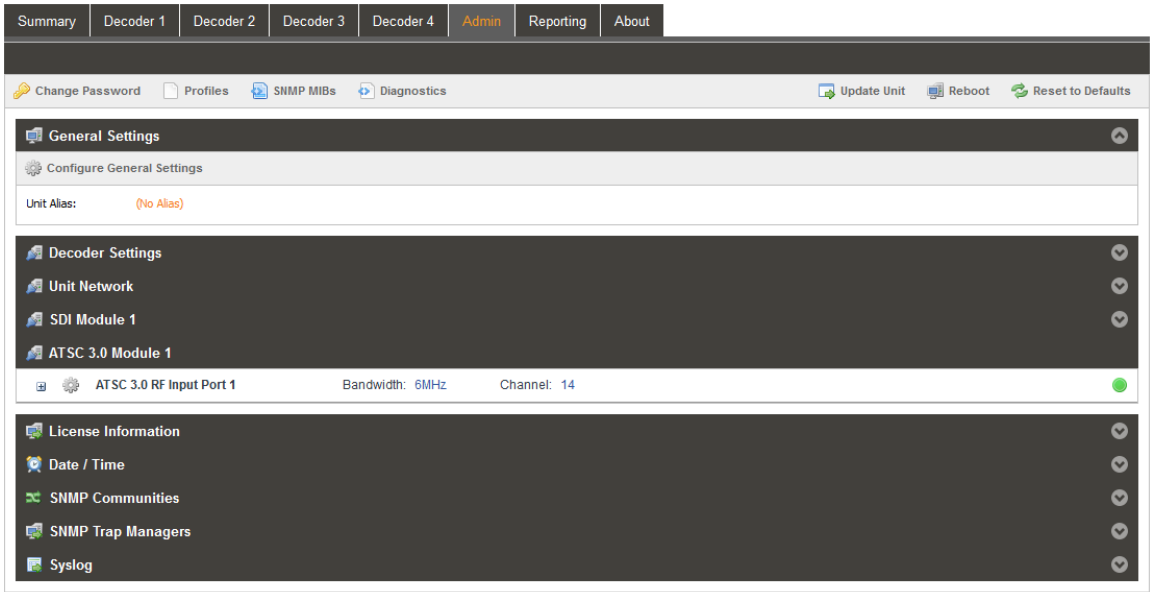
3.4 Admin Panel

To access the Admin Control Panel, click on the “Admin” tab. This menu controls many global settings and maintenance tasks on the ARD 3100/3400.



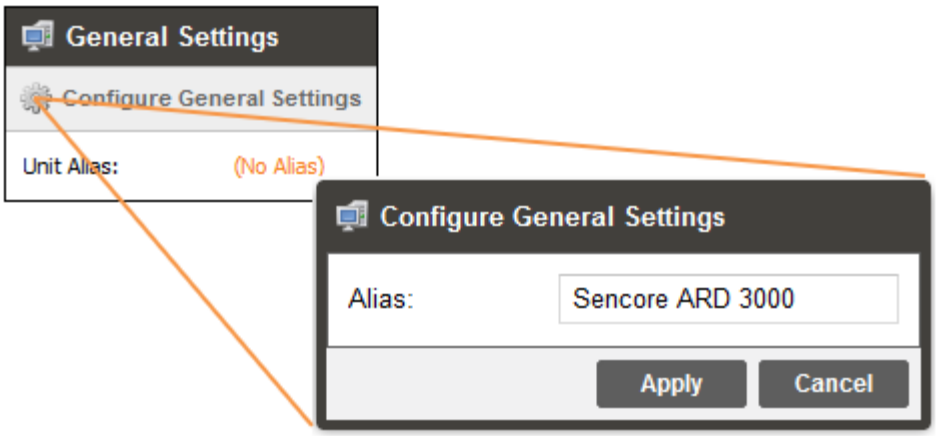
Admin Tab

The  and  icons on the far right may be used to expand and hide panes on the Admin tab (expanded “General Settings” pane below for example). The next sections describe how to interact with each of these panes in sequential order.

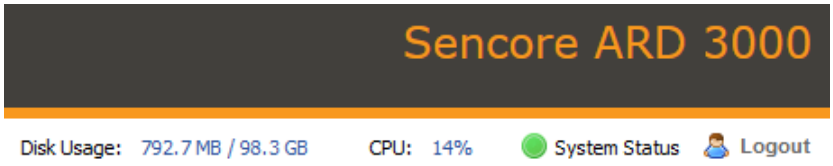


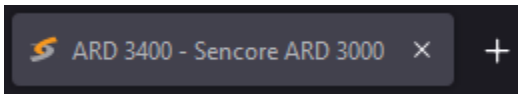
3.4.1 General Settings Pane

On the Admin tab, uise the “Configure General Settings” icon to assign a user entered Unit Alias.



After entering the name and pressing the apply button (or the “Enter” key), this alias will be shown on the browser’s web interface title pane as well as the top right-most corner of the Web UI.

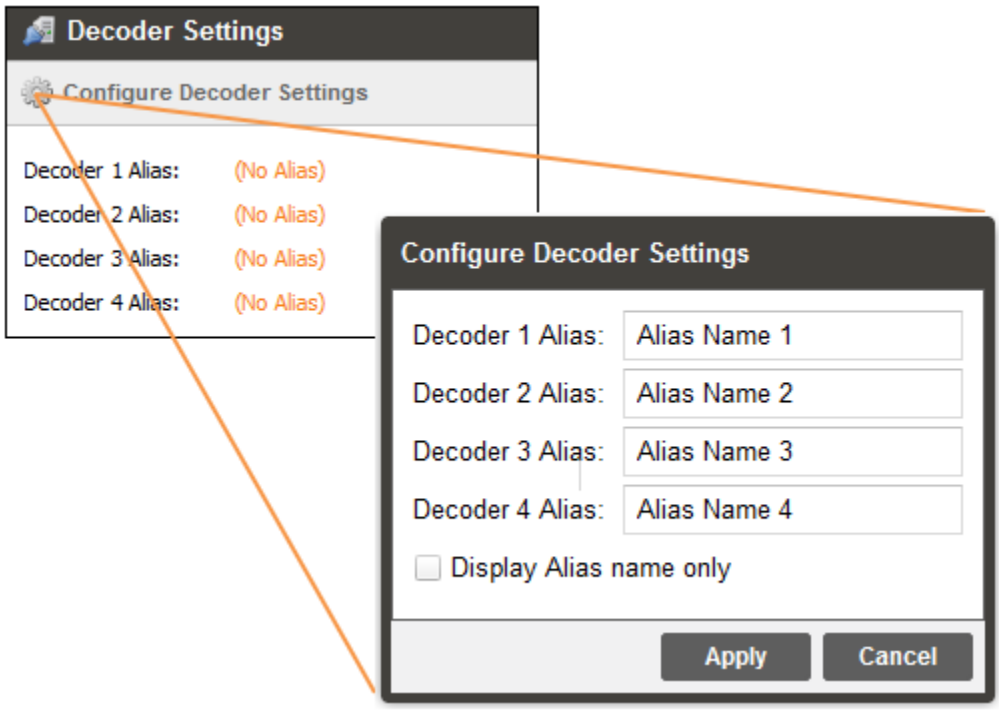




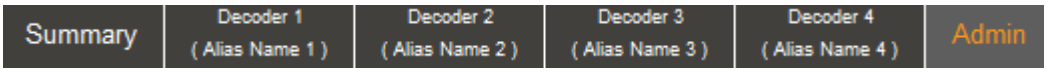
Use Unit Aliasing to track unit purpose and location when deploying multiple Sencore products.

3.4.1 Decoder Settings Pane

On the Decoder Settings pane of the Admin tab, use the “Configure Decoder Settings” menu to assign aliases to the Decoder tab(s). ARD 3400’s configured for “Independent (HD/SD)” will have four fields, one for each Decoder. ARD’s configured for “Quad 3G-SDI (UHD) will only have one Decoder to set the alias for (see Section 3.4.4.1 for details).



After entering names and then clicking the Apply button (or pressing “Enter” key), changes made here will be reflected on the “Decoder” tabs along the top of the GUI.



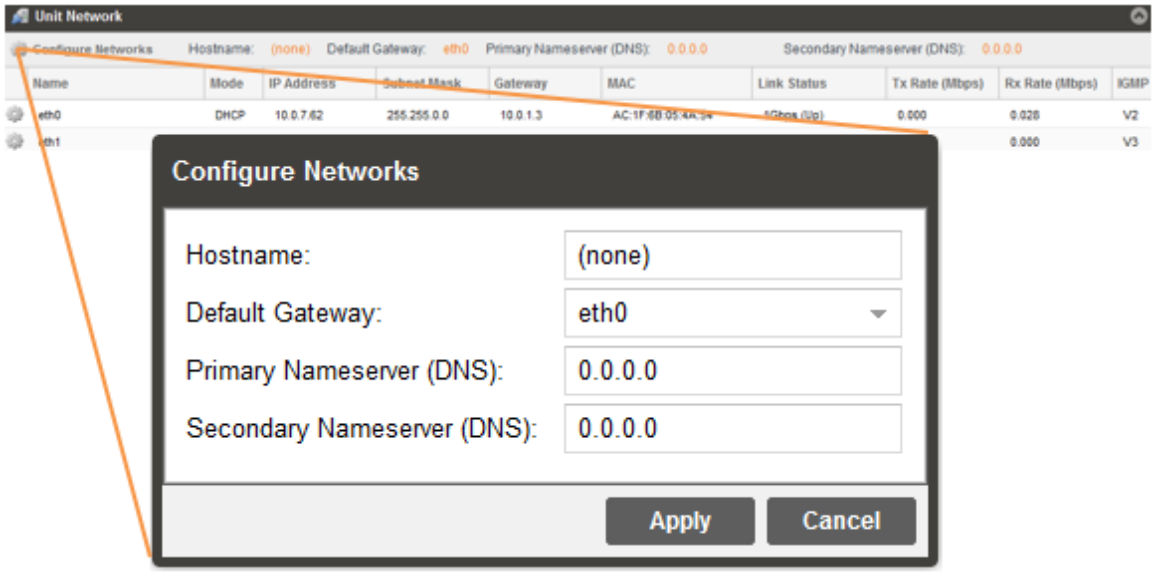
When the “Display Alias name only” box is checked, only the user entered aliases will be displayed (blank entries will default to “Decoder N” where N is 1, 2, 3 or 4).

3.4.2 Unit Network Pane

On the Admin tab, the unit network pane is for network settings across the server and NICs. Each ARD comes with two IP ports. Both ports can be used for management access or video reception, they are interchangeable.

3.4.2.1 Server Level Network Configuration

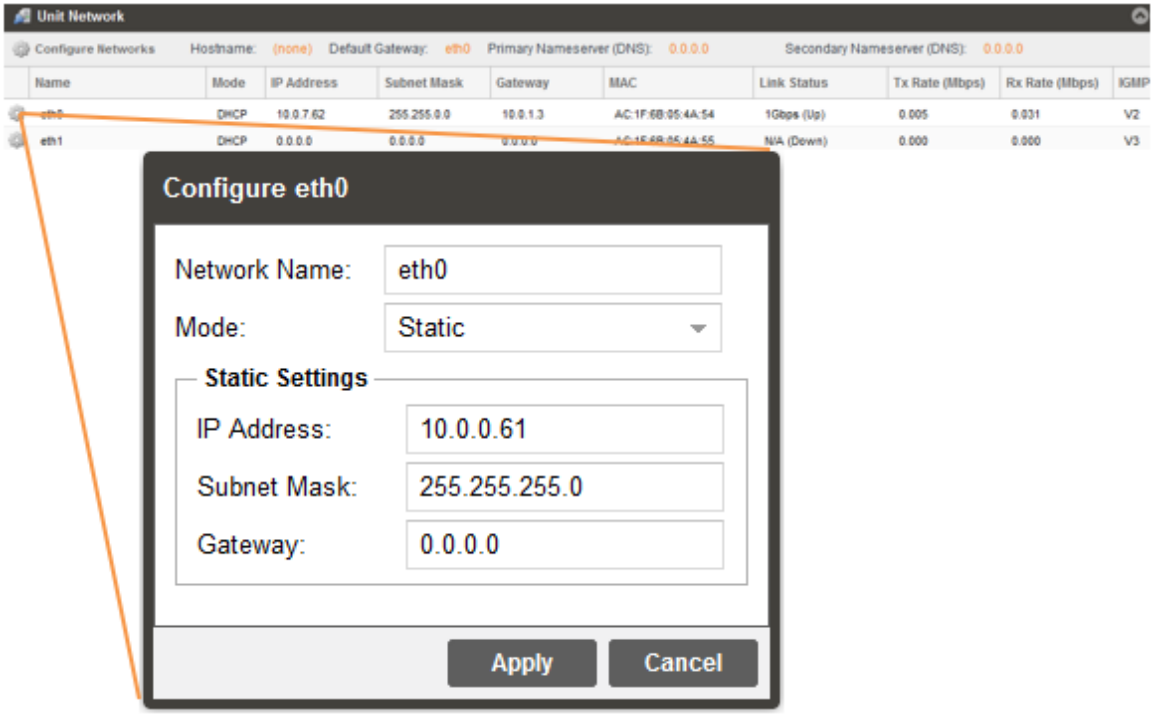
Use the “Configure Networks” icon to choose server level network settings.



Setting	Range	Description
Hostname	User Entry	Specify the hostname for the server
Default Gateway	eth0 or eth1	Choose which IP interface’s gateway will be used for networking purposes.
Primary Nameserver (DNS)	0.0.0.0 ~ 255.255.255.255	Enter the IPv4 address for the primary doman server
Secondary Nameserver (DNS)	0.0.0.0 ~ 255.255.255.255	Enter the IPv4 address for the backup doman server

3.4.2.2 Interface Level Network Configuration

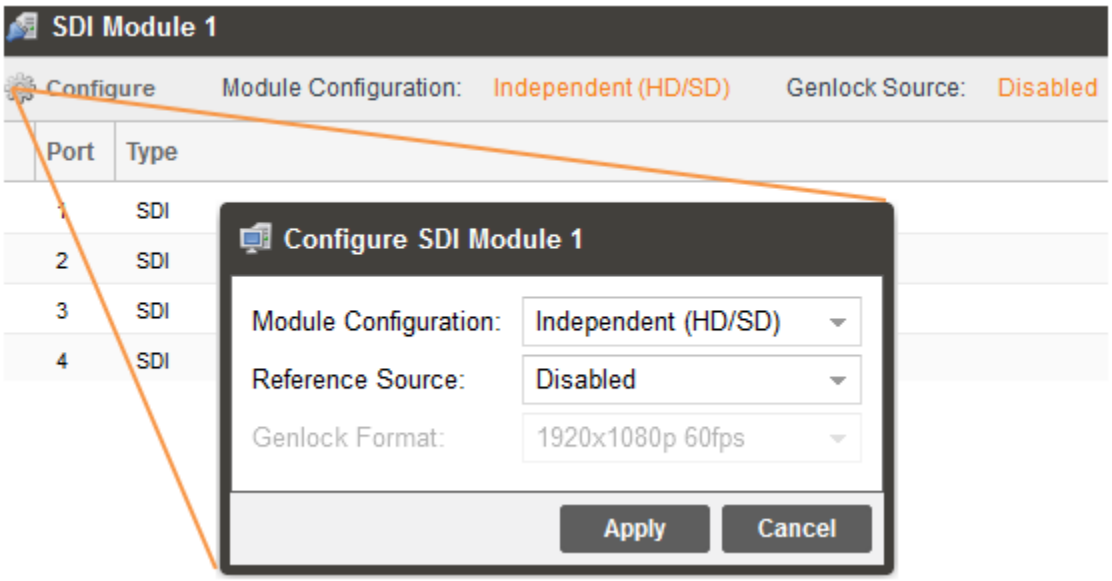
The Network Settings for each NIC will be configured by clicking the gear cog next to eth0 or eth1.



Setting	Range	Description
Network Name	User Entry	eth0 or eth1 by default, can be renamed by user. Changes made to this field we reflect on the Unit Network Pane (Section 3.4.2) and the ATSC 3.0 over IP Input Settings (Section 3.3.3).
Mode	Static DHCP	*Static* will enable user defined IP settings. *DHCP* will provide the interface MAC address to a DHCP server to acquire IP settings. When using DHCP, the NIC address may change upon reboot (view the KVM Front Panel as per Section 2.4)
IP Address	0.0.0.1 ~ 223.255.255.255	Enter a valid unicast IPv4 address for the given NIC
Subnet Mask	0.0.0.0 ~ 255.255.255.254	Specify the list of available IP's for the subnet range
Gateway	0.0.0.1 ~ 223.255.255.254	The gateway the NIC will reference based on IP and Subnet Mask settings

3.4.3 SDI Module Pane

Located on the Admin tab, this pane is used to configure the decoder and Genlock orientation for the ARD 3400. The ARD 3400 allows a user to enable or disable SDI Quad Link Mode, while the ARD 3100 will always be Quad-3G (UHD). A reboot must be applied for any changes to the SDI Quad Link Mode to be applied.



Setting	Range	Description
Module Configuration	Independent (HD/SD) Quad 3G-SDI (UHD)	*Quad 3G-SDI* will set the ARD 3400 to decode a single UHD service. The UHD will output in quadrants across the four SDI output ports. *Independent* will split the ARD 3400 to decode up to four separate FHD services independently. Each of the four services will be output on their own corresponding SDI output port.
Reference Source	External Disabled	Used to enable or disable the External Genlock Reference physical connection on Port 5, shown in Section 1.3.
Genlock Format	NTSC Black Burst PAL Black Burst HD (720p50 ~ 1080p30) FHD (1080p50 to 1080p60)	When the “Reference Source” field is configured as External, the Genlock Format must be manually defined in order for the card to lock to the Genlock signal. In multi-channel decode applications, the same Genlock reference is used for all SDI outputs.

3.4.3.1 Module Configuration for ARD 3400

The ARD 3400 is able to decode either a single UHD channel or up to four Full HD channels.

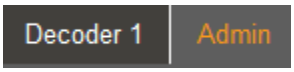
To change the ARD 3400 between UHD mode and multichannel mode, toggle the SDI Quad Link Mode setting in the “Configure SDI Module” menu, then click Apply (or press “Enter” key). Upon so doing, the system will prompt the user for a reboot.

Clicking “Yes” here will reboot the system; if the unit is in production, please plan this operation during a scheduled maintenance window to minimize service impact.

When the unit finishes rebooting, clear the browser cache by pressing CTRL+F5 to remove any stored cache from the previous module configuration. Then log back into the ARD 3400 and return to the “Admin” page.

If the reboot was prompted after toggling the Module Configuration field to “Independent (HD/SD)”, then there will now be four separate “Decoder” tabs along the top of the web page to choose from, and the SDI module will indicate four ports. The Summary panel to view all four decoders will also be present as described in Section 3.2. Each of the four decoders will have their own separate “Decoder” tab (Section 3.3), and each decoder’s SDI output will correspond accordingly to the SDI ports on the module. (Decoder 1 goes to SDI Port 1, Decoder 2 goes to SDI Port 2, and so on).

If the reboot was prompted after toggling the Module Configuration field to “Quad 3G-SDI (FHD), then there will only be one Decoder Tab. This enables the unit to code UHD signals ranging up to 2160p60 and output Quad 3G-SDI as configured on the SDI output menu in Section 3.3.8.1. There will be no summary page on this orientation; input configuration and status will be referenced through the “Decoder” tab.

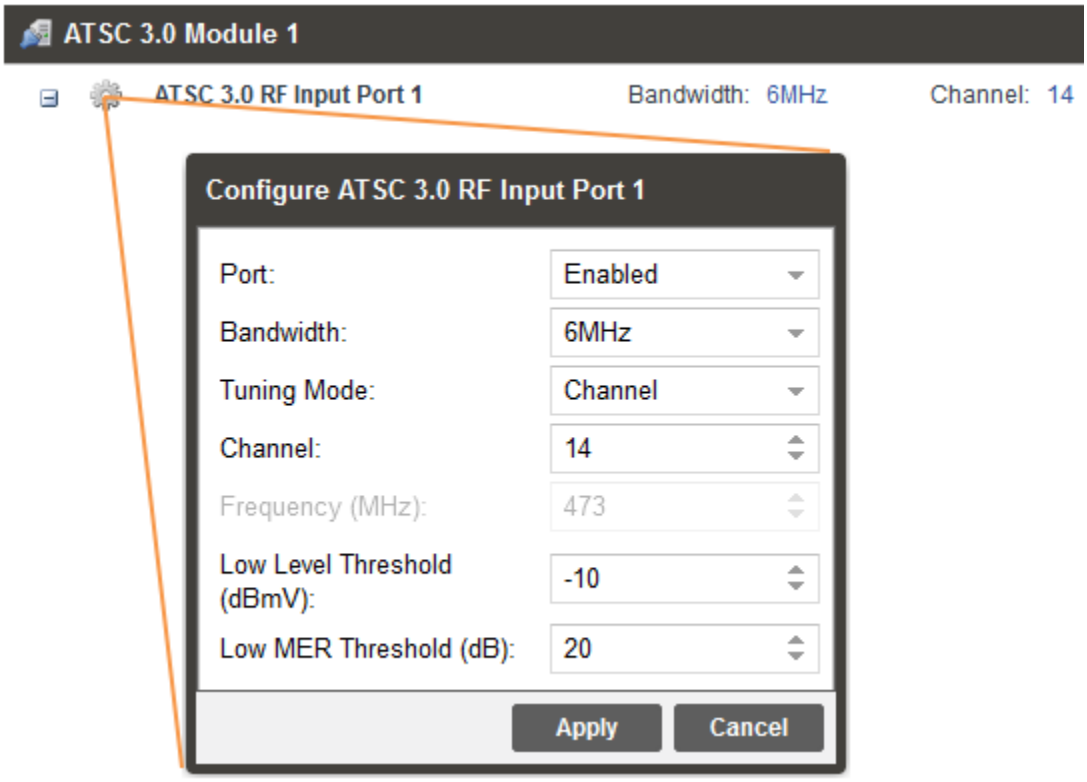


3.4.4 ATSC 3.0 Module Pane

This menu is located on the Admin tab and used to configure the ATSC 3.0 Module's RF input tuning and alarm thresholds. ARD 3100's will only have one of these Input Ports, while ARD 3400's will either have one or four of these Input Ports depending on hardware. These RF inputs may be selected by any decoder on-board the system as per Section 3.3.1.

3.4.4.1 Configuring the RF Input Port

Click on the cog by the Input Port intended for configuration to enter its settings page.



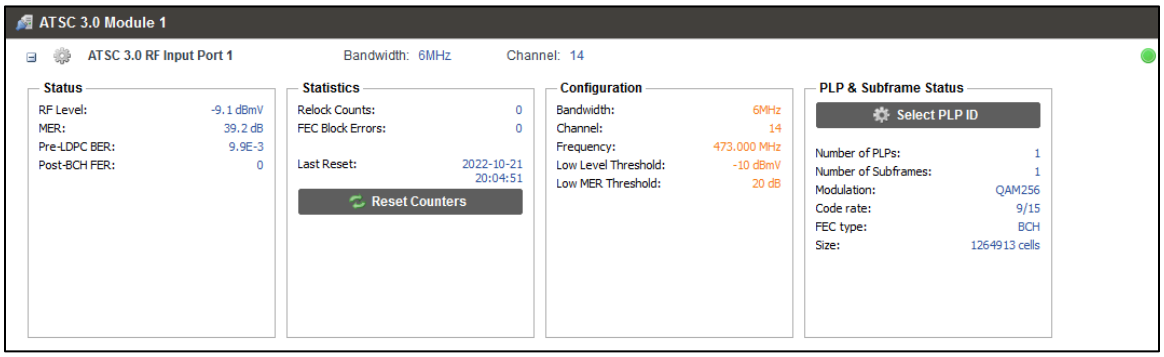
Setting	Range	Description
Port	Enabled Disabled	This setting allows the user to enable or disable this reception port.
Bandwidth	6, 7, 8 Mhz	A user can manually select channel bandwidth
Tuning Mode	Channel Frequency	Choose whether to specify the tuning by Channel Number or Frequency (MHz). The non-selected option will be grayed out.

Channel	2-69	This setting is for the desired channel to be received.
Frequency (MHz)	57 ~ 803	This setting indicates the exact frequency to receive the input on.
Low Level Threshold (dBmV)	-90 ~ +20	Specify the lowest signal level reading that will trigger an alarm and log message
Low MER Threshold (dB)	10 ~ 42	Specify the lowest MER reading that will trigger an alarm and log message

After specifying the input settings, the bubble icon on the far right of the ATSC 3.0 Module pane will become green to indicate signal lock is achieved.

3.4.4.2 RF Input Metrics and PLP Settings

Once lock is achieved on the RF Input port, click the ⊞ and ⊟ icons to expand additional options, and there will be more details on the input status and configurations, and the PLP field will be populated.



Status

Setting	Range	Description
RF Level	Read Only (dBmV)	Indicates the incoming RF Level. If this falls below the user specified Low Level Threshold, the ARD will trigger an alarm
MER	Read Only (dB)	Indicates the incoming MER. If this falls below the user specified Low MER Threshold, the ARD will trigger an alarm

Pre-LDPC BER	Read Only	Returns low-density parity-check inner code
Post-BCH FER	Read Only	Returns Bose, Chaudhuri, Hocquenghem outer code

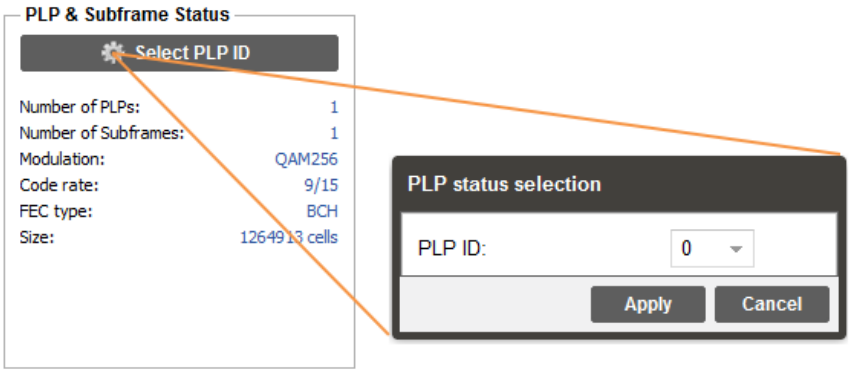
Statistics

Setting	Range	Description
Relock Counts	Read Only	The number of times the card has relocked to the signal
FEC Block Errors	Read Only	The number of Block errors during Forward Error Correction
Last Reset	Read Only yyyy-mm-dd hh:mm:ss	This shows the last date and time the statistics were manually reverted to zero using the Reset Counters icon. Reset Counters

Configuration

Setting	Range	Description
Input Port Settings	User Defined	This reflects the user settings entered as defined in Section 3.4.4.1.

Under the PLP & Subframe status menu, so long as the number of available PLPs is greater than zero, the user may select a PLP ID for receive from the locked RF input.



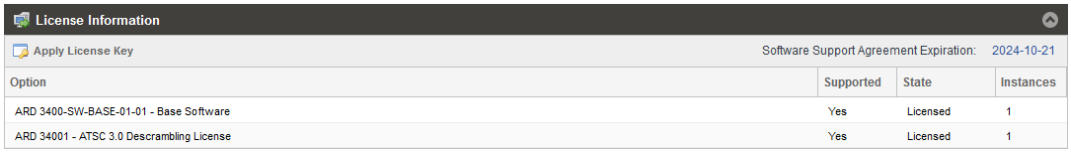
The PLP ID dropdown is an index value and shows the available detected PLPs. By default the unit will choose PLP 0 as this is standard across ATSC 3.0 inputs. If there are multiple PLPs, many of the PLP statistics will change upon choosing a different PLP.

PLP & Subframe Status

Setting	Range	Description
Number of PLPs	Read Only	This shows the number of PLPs available for selection in the ATSC 3.0 RF Input
Number of Subframes	Read Only	Indicates how many subframes are present in the RF input
Modulation	Read Only	Indicates the modulation schema for the selected PLP
Code rate	Read Only	Shows the code rate of the selected PLP
FEC Type	Read Only	Indiates what type of FEC is detected on the selected PLP
Size	Read Only	Shows the size in cells of the selected PLP

3.4.5 License Information Pane

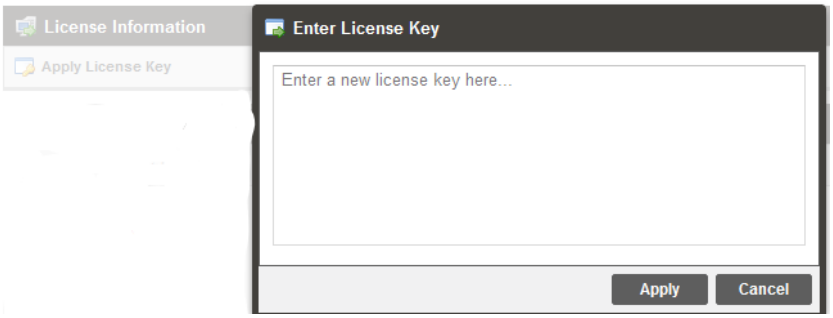
The License Information pane can be found under the Admin tab.



Certain features of the ARD require licenses to become functional. The License Information section 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 provided from Sencore require installation, click the Apply License Key button. The Enter License Key menu appears. Click in the Enter a new license key field. Copy and paste the provided license key from Sencore into this field. Click the Apply button to enter the license. A reboot of the ARD is required to fully apply the license features.

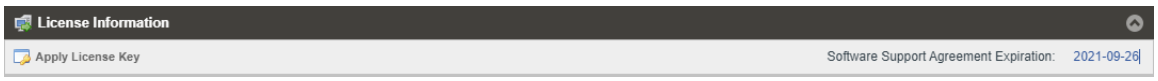


All ARD units come with one year of free software support/upgrade access. This provides access to the latest software versions throughout that one-year period. These software versions include:

- Bug fixes
- General updates
- Maintenance releases

The ARD 3100/3400 only accepts software updates released during the active SSA (Software Subscription Agreement) period. Software updates released following the expiration of the SSA will be rejected on upload, until the product's SSA has been re-activated. The actual SSA information is maintained on the product itself and can be updated by applying a license key via the web user interface.

The product's user interface displays the end date to ensure the user is always informed of their SSA status.



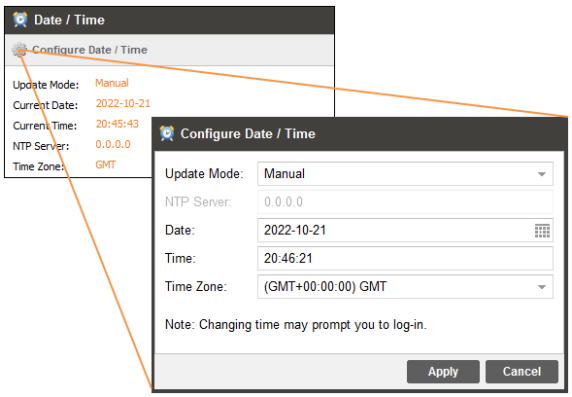
Once the SSA period has expired, customers are free to keep using the software version they already have or other versions from before the expiration date but applying newer versions for access to newer features will require an extended SSA. To extend the SSA, please submit a request on the Sencore website at this link:

https://www.sencore.com/company/contact-us/

Regardless of the status of the software subscription agreement, Sencore offers phone and email technical support during regular business hours for all products.

3.4.6 Date/Time Pane

Through the Date/Time pane on the Admin tab, the ARD can be set to synchronize with an NTP server or a manual data and time can be defined by the user. Click the Configure Date / Time button to configure the date and time. These values are used to timestamp entries in the Alarm and Event logs under the Reporting tab.



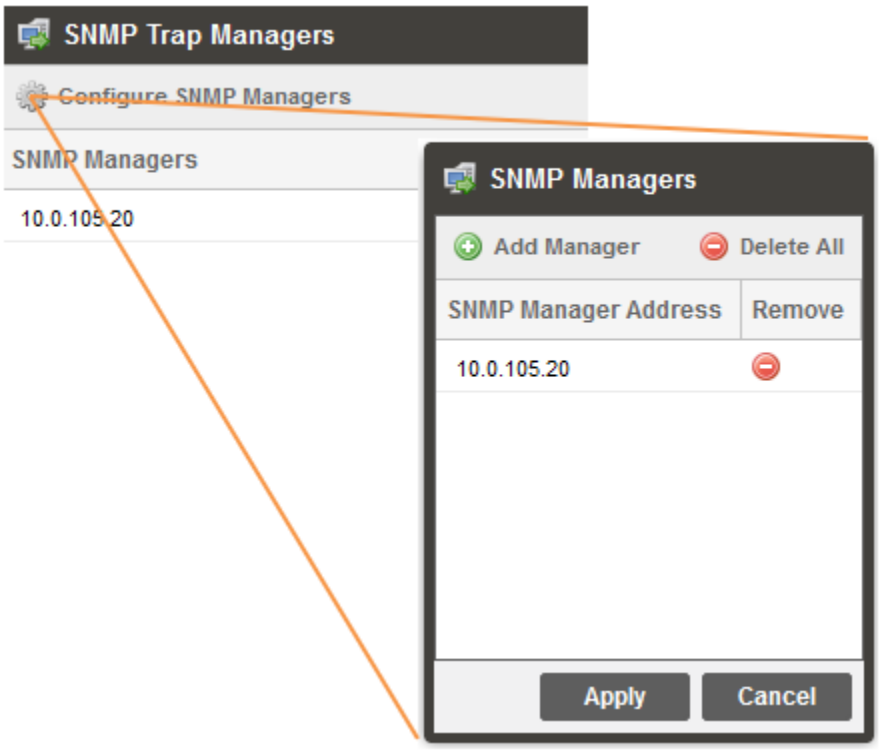
Setting	Range	Description
Update Mode	NTP Manual	Setting to *NTP* uses the local network's NTP server to synchronize date and time. *Manual* allows the user to define a date and time.
NTP Server	Four decimal octets: XXX.XXX.XXX.XXX Domain Name	This is the IP Address or Domain Name of the local NTP Server 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.
Time Zone	-12 ~ +14 GMT	Apply an off-set to the acquired time to account for time zones.

3.4.7 SNMP Communities Pane

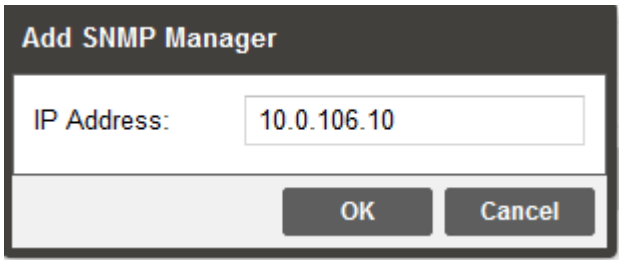
Found on the Admin tab, the ARD 3000 Platform supports SNMP automation GET and SET requests. To change the Read-Only and Read-Write communities, click on the "Configure SNMP Communities" icon, and then manually enter the SNMP Community Strings.

3.4.8 SNMP Trap Managers Pane

The ARD 3000 platform also supports the sending of SNMP traps to one or more user specified trap receivers. Located on the Admin Tab, click on the “Configure SNMP Managers” icon to add or remove the SNMP trap destinations.



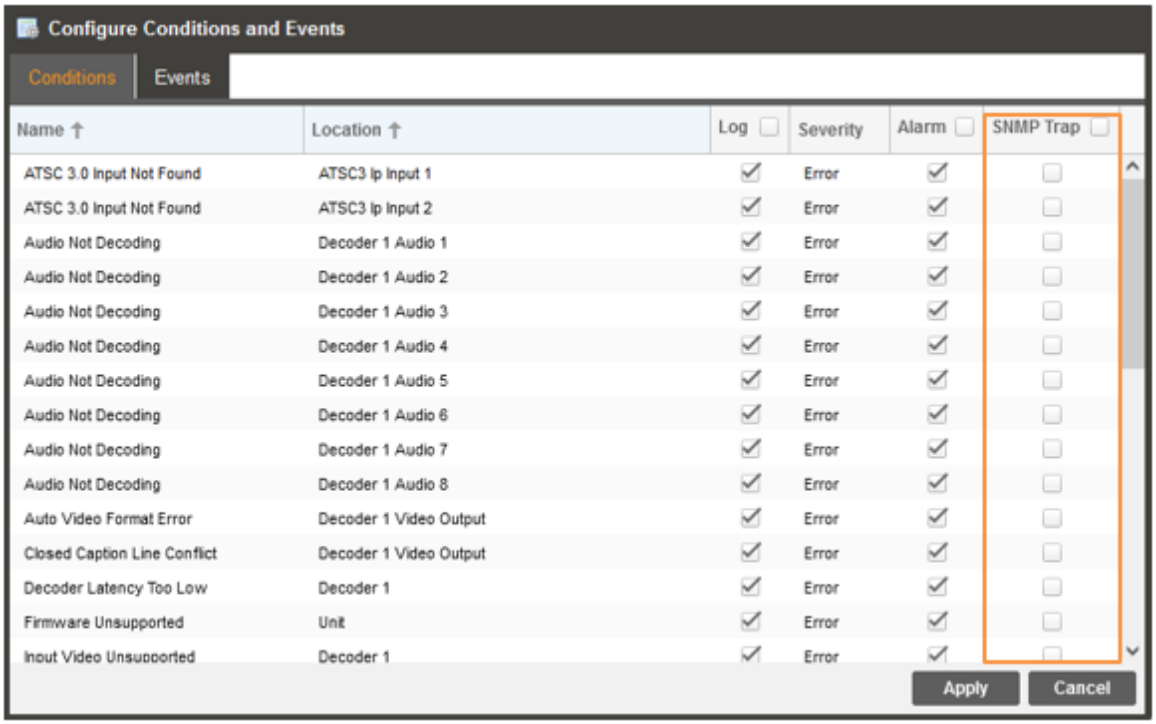
Use the  icon to add IP’s to the list. Type in the IP address when the prompt arrives and click OK or press the “Enter” key.



After adding an IP address, it will now be present in the list under SNMP Managers. After an IP address is added, it can be removed using the icon in its corresponding row. To remove all IP addresses, use the Delete All icon.

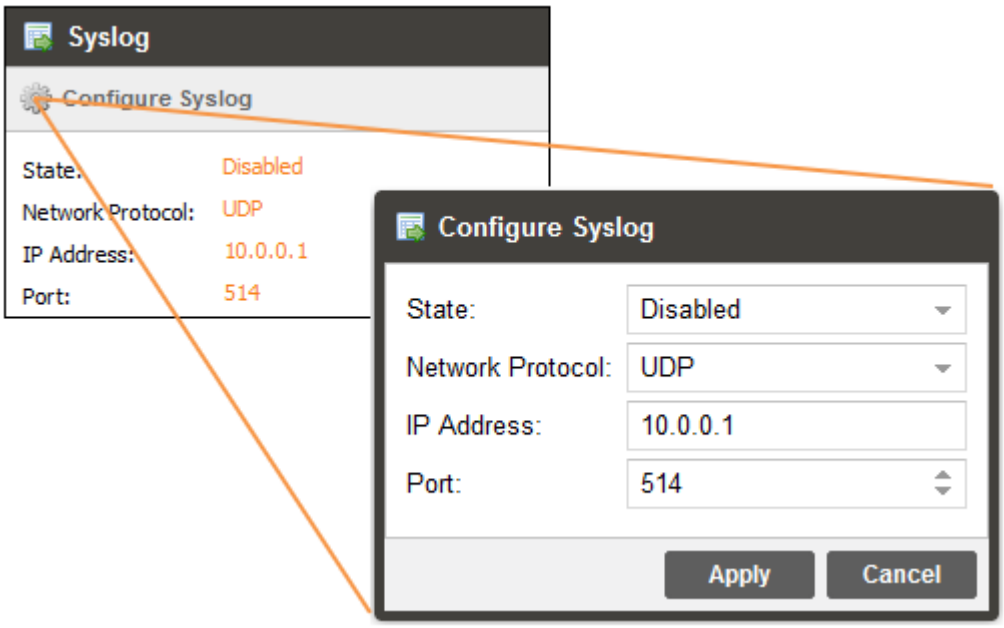
Remember to click Apply when finished editing the SNMP Manager list.

After configuring the SNMP managers, to send SNMP traps, use the SNMP Trap column of the “Configure Conditions and Events” menu described in Section 3.5.3 (found under the Reporting tab), to choose which alarms and events will be sent out. By default all fields in this column are all disabled.



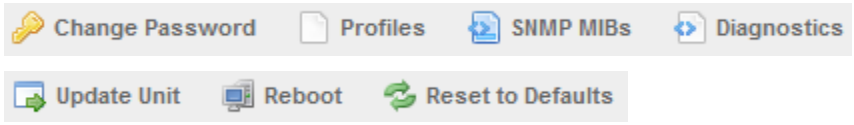
3.4.9 Syslog Pane

The ARD 3100/3400's can be configured to send error and event logs formatted in the syslog protocol to a remote user specified Syslog server. Use the "Configure Syslog" icon on the "Admin" tab to open the menu and enter Syslog destination settings.



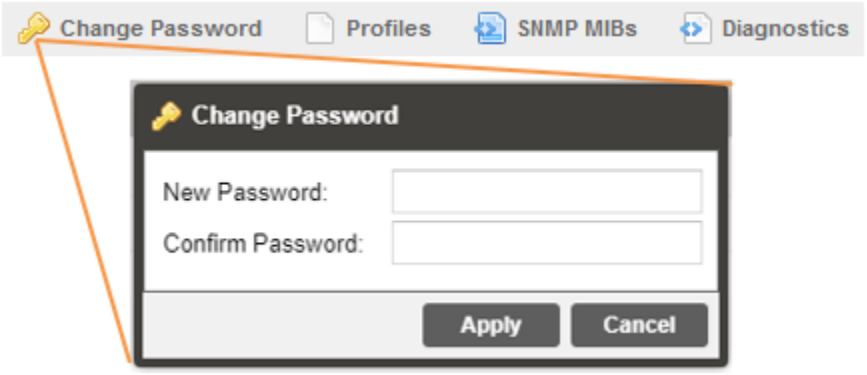
Action	Range	Description
State	Enabled Disabled	Enable or Disable sending messages to Syslog server.
Network Protocol	UDP TCP	Select which network protocol used to transmit to the Syslog server
IP Address	Four decimal octets: XXX.XXX.XXX.XXX	IP of the Syslog server. 0.0.0.0 and 255.255.255.255 are not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

The next sections in 3.4 will describe each of the utility features found along the top of the "Admin" page.



3.4.10 Changing Unit Password

Using the Admin tab, the ARD's default password when logging in will be 'mpeg101'. After successfully logging into the unit, the ARD access password can be changed using the  icon.



A blank entry here remove the password, otherwise any user specified password can be entered here. The password change will take effect immediately after clicking the "Apply" button and will be required upon the next login attempt.

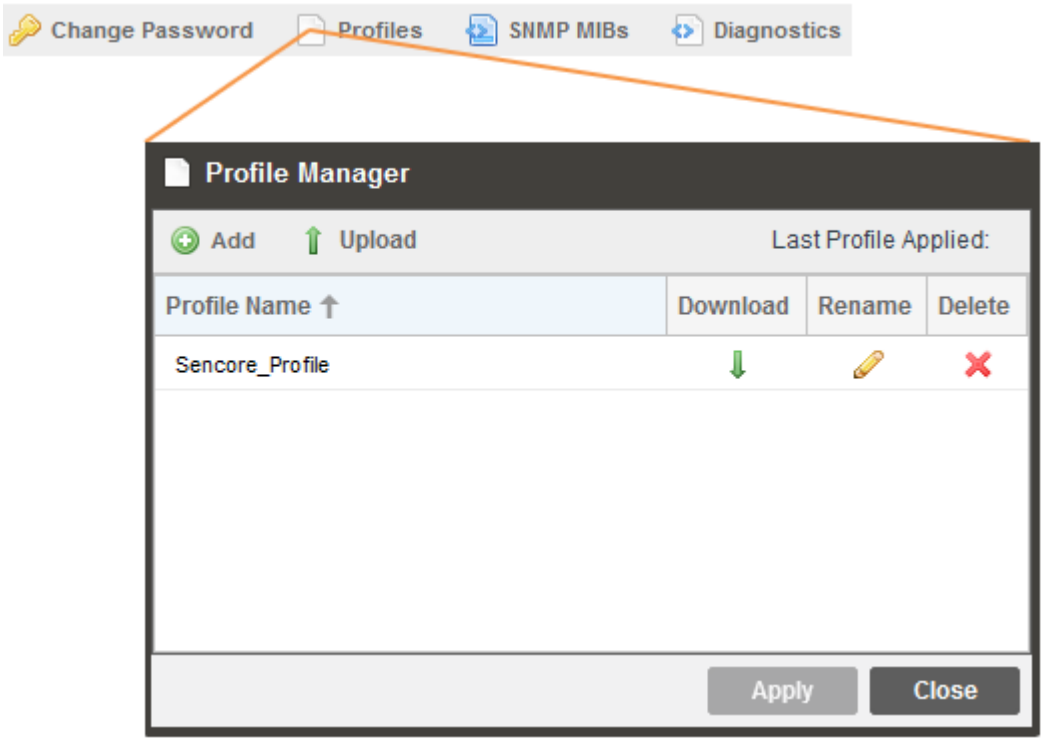
The username for ARD web-login will always be **admin**. Should the configured admin password be lost, please contact ProCare@Sencore.com for assistance.

3.4.11 Profiles

The ARD 3000 platform can save all configured settings to multiple profiles on the "Admin" tab. Profiles can be saved, applied, deleted or renamed locally on the unit.

Profiles may also be downloaded and uploaded to/from external storage to be used as a backup or for quickly configuring on other equivalent ARD units (an ARD 3400 profile would not apply to an ARD 3100 or vice-versa). Profiles can be used to easily change the configuration of an ARD to suit different inputs and decoding requirements.

Click the "Profiles" icon to enter the Profile Manager menu.

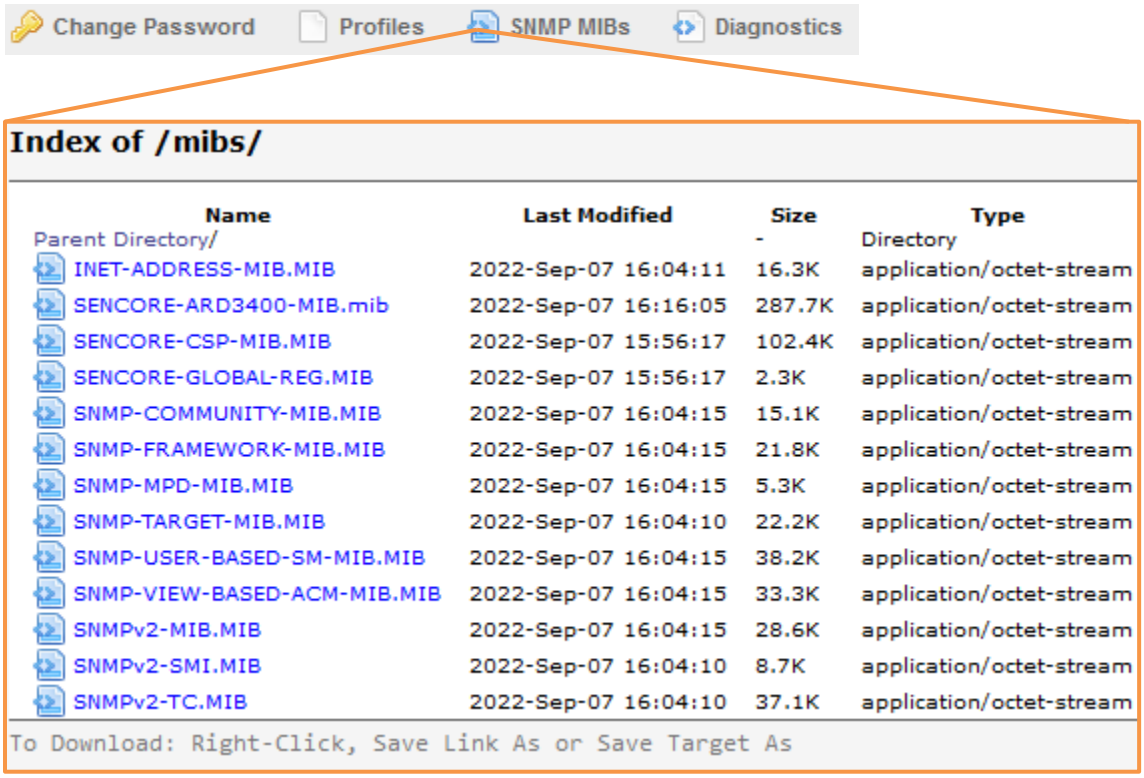


Action	Button	Description
Add New Profile	Add	Adds a new profile from current settings. User must name profile before creation is complete.
Upload Profile	Upload	Allows the user to browse to external storage or workstation to upload profile to ARD.
Apply Profile	Apply	Select a profile from the drop-down menu and click this button. The ARD 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.

3.4.12 Downloading SNMP MIBs

SNMP MIBs are useful to identify the OIDs for the SNMP GET and SET commands for the system. The SNMP MIBs can be obtained by reaching out to ProCare@sencore.com or locally from the unit using the “SNMP MIBs” icon on the “Admin” tab..

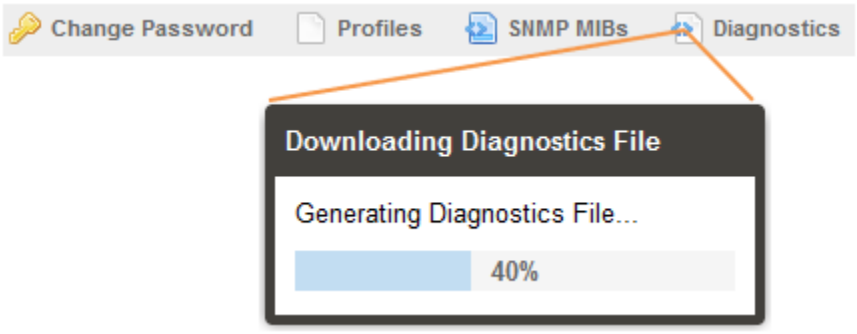


Each MIB is its own download link and can be downloaded separately. Please contact ProCare for any questions regarding SNMP.

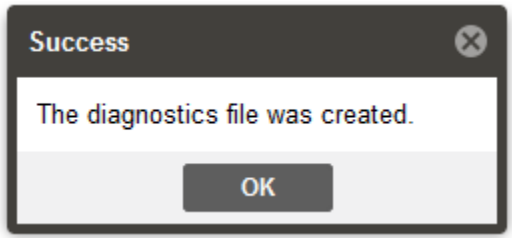
3.4.13 Diagnostics

The ARD 3100/3400 provides the user the ability to take a snapshot of ALL current unit settings, reported values, active alarms, and the alarm and log file history. This snapshot will be downloaded as a .XML format file that can be sent to Procare at Sencore for analysis.

The “Diagnostics” icon on the “Admin” tab is a download link that will prompt the unit to generate the diagnostics file before saving it into the requesting local PC’s downloads folder. When clicked, a window will open showing the diagnostic file creation progress.



When finished, a success prompt will appear, indicating that the diagnostics file has finished.



If no prompt occurs on the local PC to open the diagnostics file, check the downloads folder as well as the downloads queue for the browser to find the newly generated diagnostics file.

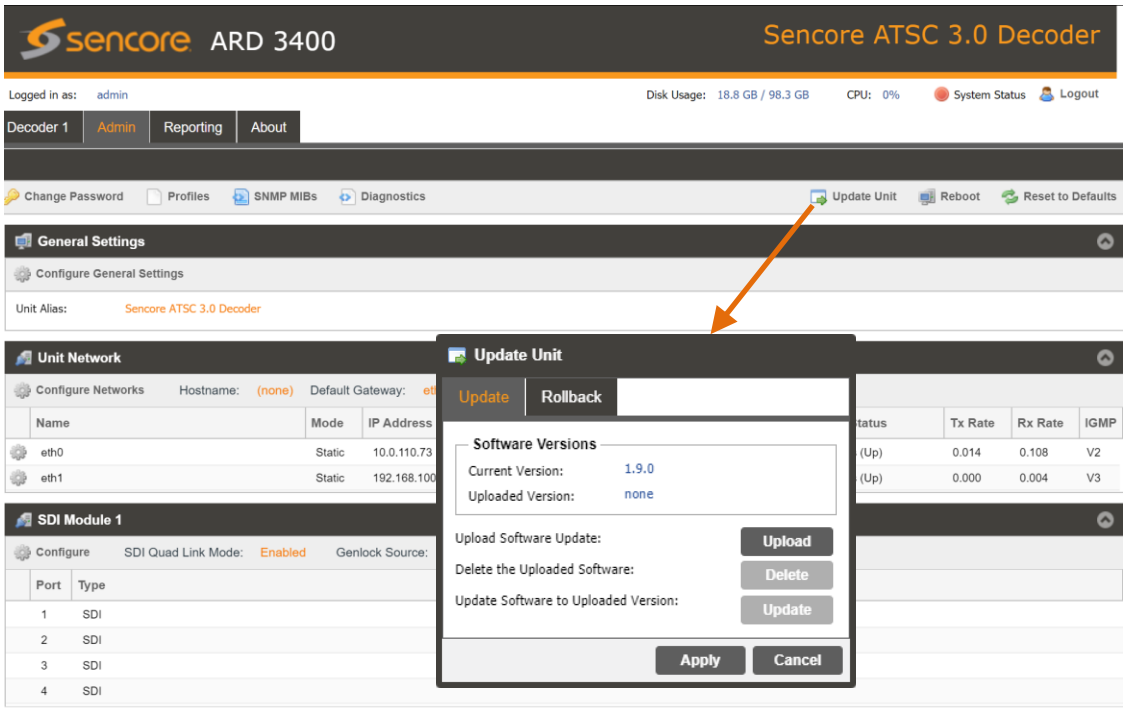
3.4.14 Updating the ARD 3100/3400

Updates to the ARD are performed through the web interface. A software update file is provided by Sencore and then uploaded to the unit.

To request the latest software version or a copy of the release notes email ProCare@Sencore.com

3.4.15 Applying Software Updates

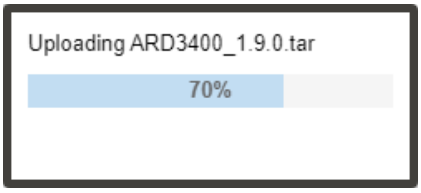
Once the software file is downloaded the update can be performed under the Admin tab of the ARD 3100/3400 Web-Interface. Click on the Update Unit button in the top right of the page.

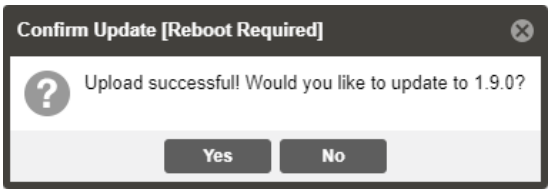


The current version and uploaded version is displayed in the Software Versions section.

Update Procedure:

1. Click Upload button and browse to the appropriate software file
2. A progress bar will show uploading status
3. Once the file is uploaded click on Yes when prompted to update
4. The ARD will reboot after a software update is complete.



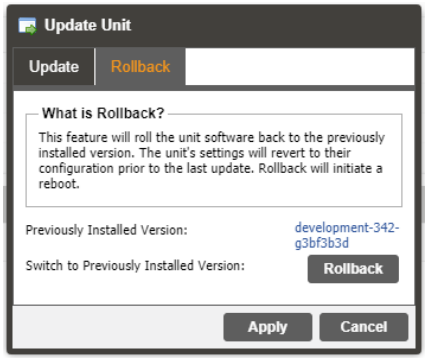


Action	Button	Description
Upload	Upload	To upload software updates to the ARD click this button. The user will be prompted to navigate to an update file. The file will then upload to the ARD. When complete the Update Unit menu will show the Update button available.
Delete	Delete	Clicking this button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

3.4.16 Rollback Software Updates

The ARD is capable of reverting back to a previous version of software using the Rollback feature. The ARD accomplishes this by maintaining 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 of the previous settings.

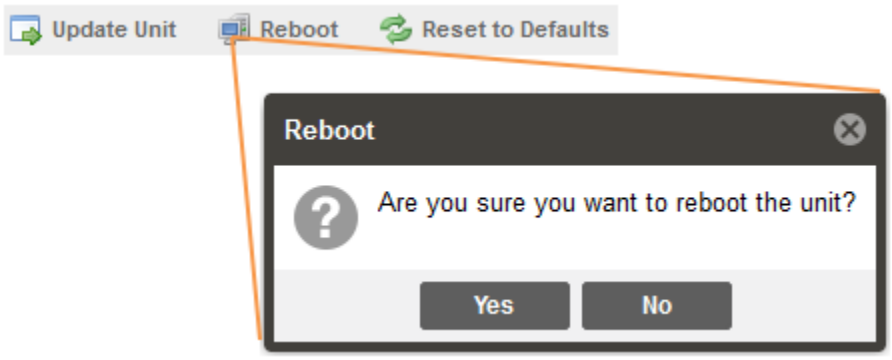
To perform a rollback, click the Update Unit button and then click the Rollback tab. The ARD will reboot after the rollback process is complete.



Action	Button	Description
Rollback	Rollback	Clicking this button starts the Rollback process. The ARD will prompt the user to confirm the rollback or click cancel to stop the process.

3.4.17 Rebooting the Unit

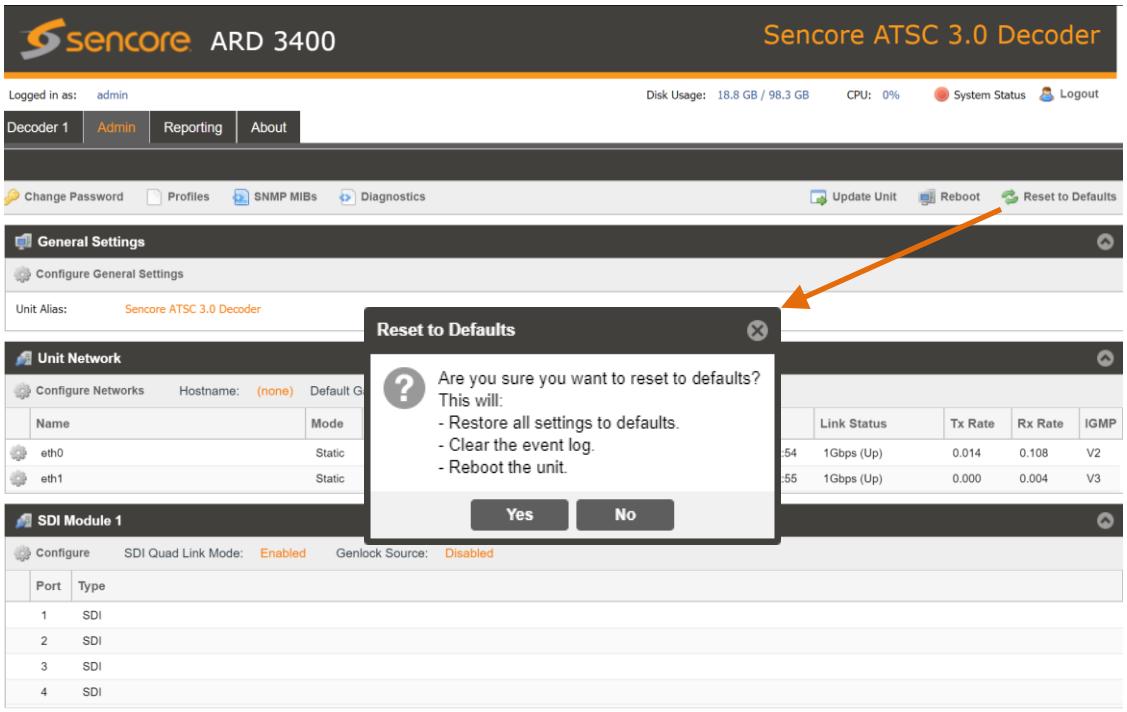
The ARD can be rebooted from the web interface Admin page. In order to perform a reboot, click the reboot button on the “Admin” tab. The ARD will prompt the user to confirm the reboot.



Once the reboot is complete the login screen will appear allowing the web interface to be logged into.

3.4.18 Resetting to Defaults

The ARD 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 on the Admin page. The ARD will prompt the user to confirm the reset.



3.5 Reporting Panel

The Reporting tab in the ARD 3100/3400 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.

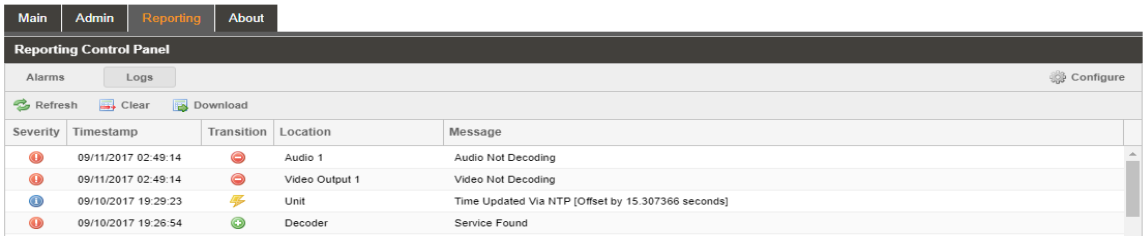
3.5.1 Active Alarms

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.

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 data and time the error was raised. This data and time correlates with the Date and Time settings configured in Section 0.

3.5.2 Event Logs

Clicking on the Logs button displays all of the events and alarms that have affected the unit. If the unit is rebooted or powered off and on the event logs are cleared. The logs can be cleared manually by clicking the Clear button. The logs can be downloaded as a ".csv" file and saved to an external location by clicking the Download button.

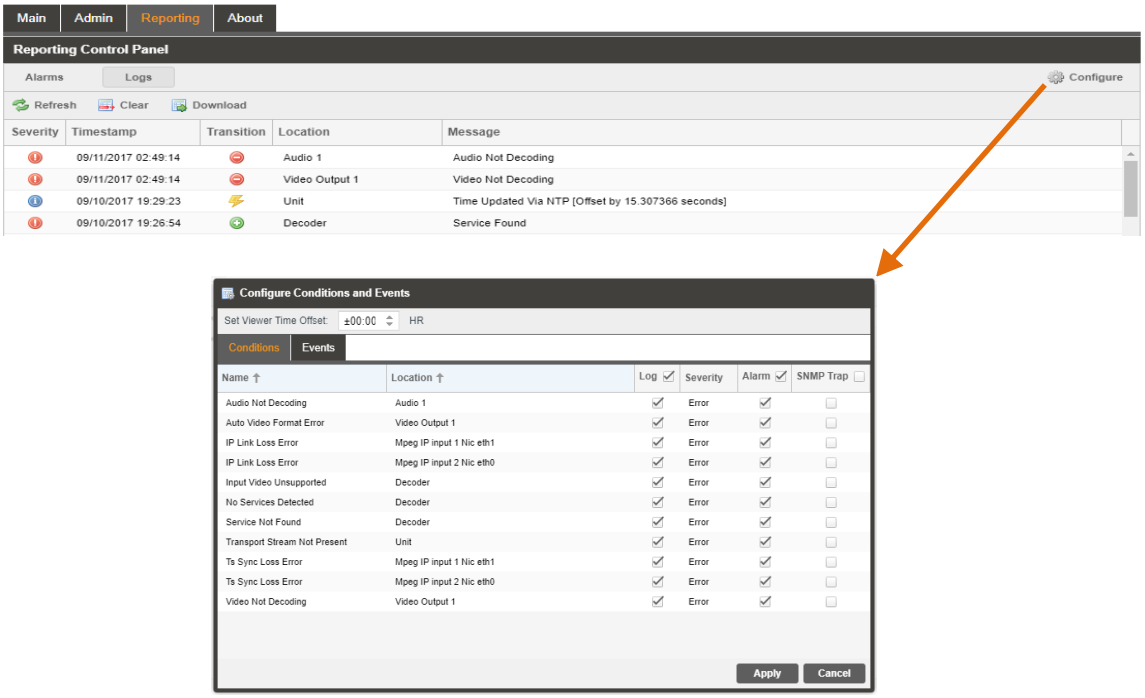


Severity	This column displays the nature of the alarm. The icon means the log entry is informational and is not an error. The icon means the log entry is an active alarm.
Timestamp	This column displays the data and time the error was raised or cleared. This data and time correlates with the Date and Time settings configured in Section 0.
Transition	This column displays when an alarm transition from a bad to good state. 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.

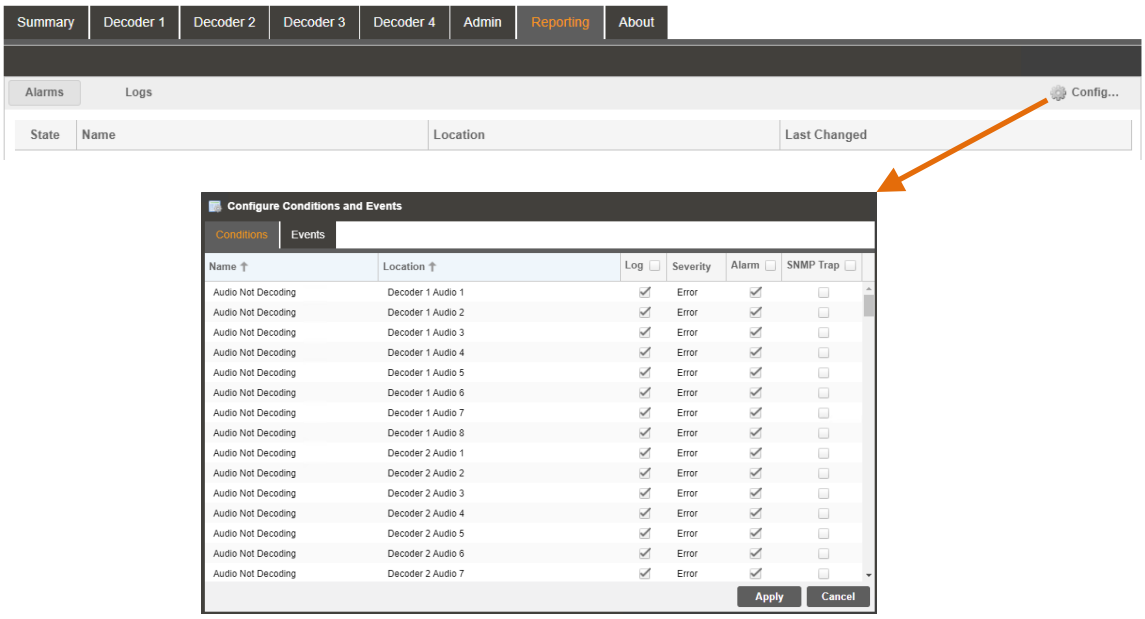
3.5.3 Configuring the Logs

The ARD 3100/3400 allows the user to configure alarms and events. Events and alarms can be Logged, Hidden, or have the Severity adjusted.

In order to configure these options, click the Configure button while in the section of the Reporting tab.



When multi-channel decoder option is enabled then logs and events can be configured separately for every decoder.



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 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.

3.6 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 4 Appendices

Introduction

This section includes the following topics:

Appendix A – Acronyms and Glossary

AAC: Advanced Audio Coding
AC-4: Dolby Audio Compression
AES: Audio Engineering Society
ATSC: Advanced Television Systems Committee
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
dB: Decibel
DHCP: Dynamic Host Configuration Protocol
DVB: Digital Video Broadcasting
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
FHD: Full High Definition
HD: High Definition
HEVC/H.265: High Efficiency Video Coding
I/O: Input/Output
IP: Internet Protocol
Kbps: 1000 bit per second
LED: Light Emitting Diode
Mbps: 1,000,000 bits per second.
NTP: Networking Time Protocol
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.
PLP: Physical Layer Pipes
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.
RU: Rack Unit
SD: Standard Definition
SDI: Serial Digital Interface
SI: System Information
SMPTE: Society of Motion Pictures and Television Engineers
SNMP: Simple Network Management Protocol
SSA: Software Subscription Agreement
UHD: Ultra High Definition

Appendix B – Error and Event List

Error	Description
A3SA Certificate Invalid	A3SA certificate invalid or unable to be validated
ATSC 3.0 Input Not Found	There is no sync on the configured ATSC 3.0 over IP Input
Audio Not Decoding	Indicates selected service is not decoding an audio PID
Auto Video Format Error	The ARD encountered an error when automatically choosing the output format.
Closed Caption Line Conflict	The VANC line chosen for Closed Captions on the embedded SDI output is already in use
Date/Time Changed	The Date/Time setting of the system was changed
Decoder Latency Too Low	The parallel frames processing setting is too low for the decoded video codec. Recommended action is to set parallel frame processing to default or increase the number of frames
Descrambling Failure	A3SA service cannot be descrambled
Firmware Unsupported	The uploaded software is not supported by the ARD 3100/3400
Input Video Unsupported	The video source format or codec is unsupported
Insufficient Decoder Performance	The unit does not have enough processing power to decode the transport stream. Contact ProCare@sencore.com for support
Low Level	RF level is below the user-configured low level threshold
Low MER	MER is below the user-configured low MER threshold
NTP Server Unreachable	The NTP serve was unable to be reached
NTP Updated	The NTP Date/Time was updated
No ATSC 3.0 Descramble License	Unit ATSC 3.0 Descrambling license is not found or valid
No Services Detected	There are no service detected on the active input
Not Access Key Server	System cannot access descrambling key server via internet
Reboot Required for HTTPS Certificate to be Removed	System requires a reboot to remove the existing HTTPS certificate
RF Lock Lost	There is no lock on the configured RF Input Channel
Service Not Found	No services were found on the configured input
Software Update Failed	An attempted software update was unsuccessful
Software Update Succeeded	An attempted software update succeeded
Unit Booted	The system completed a boot process
Video Not Decoding	The video payload in the selected service cannot decode
Vpid Line Conflict	The VANC line chosen for VPID on the embedded SDI output is already in use
Widevine CDM Not Provisioned	System unable to provision the Widevine Content Decryption Module for descrambling A3SA

Appendix C – Specifications

Base Video Decoding Features

General –

Total Input Data Rate:	.25-200 Mbps

Video Decoder –

Video Profiles and Levels:	Base Software – Up to HEVC Main 4:2:2 10 (HD Formats)
Video Bit Rate:	HEVC 1-70Mbps
Video Formats:	Base Software – 1080p x 1920 (16x9) @ 50, 59.94 and 60Hz 1080i x 1920 (16x9) @ 25, 29.97 and 30Hz 1080p x 1920 (16x9) @ 23.97, 24, 25, 29.97 and 30Hz 720p x 1280 (16x9) @ 50, 59.94, and 60Hz 576i x 720 (4x3 or 16x9) @ 25Hz 480i x 720 (4x3 or 16x9) @ 29.97Hz 2160p x 3840 (16x9) @ 23.97, 24, 25, 29.97, 30, 50, 59.94, and 60Hz
Descrambling	ATSC 3.0 DRM A3SA/Widevine

Base Audio Decoding Features

Number of Audio Services:	8 Audio Services per video
Audio Codecs Supported:	Dolby AC-4 AAC-LC, HE-AAC, & HE-AACv2
Output Formats:	Digital Pass-through PCM (Decoded Discrete channels for 5.1 Sources or Downmixed for 5.1 Sources)

Video Overlay Support

Closed Caption Overlays:	ATSC 3.0 SMPTE-TT ISMC1 or CEA-708 (Legacy)

Closed Caption SDI Embedding

Closed Caption Source:	ATSC 3.0 SMPTE-TT ISMC1 or CEA-708 (Legacy)
SDI Embedding:	SMPTE 334M

ARD 3100/3400 Input Features

ATSC 3.0 Input Module (1 slot)

General –

Frequency Range:	42 MHz – 870 MHz
Number of inputs:	1
Connector:	F-Type, Female
Impedance:	75 Ohms
Sensitivity:	-90dBmV to -20dBmV
Bandwidth	6MHz
Simultaneous PLP-ID Tuning:	1
MER:	Range: 10dB to 42dB Accuracy: +/- 2dB
RF Level:	Range: -90dBmV to +20dBmV Accuracy: +/- 3dBmV

ARD 3100/3400 Output Features

ARD Quad 3G-SDI Output Module, Genlock (1 slot)

Ports:	4x 3G-SDI out / ASI in 1x genlock in
Connectors:	5x 75-Ω HD-BNC Shipped with 5x converter cable HD-BNC to BNC
Video Standards:	SD-SDI – SMPTE 259M HD-SDI – SMPTE 292M 3G-SDI – SMPTE 424M
4K multi-link	SMPTE 425-5 Two Sample Interleave
Video Formats:	480i, 576i, 525i, 625i, 720p, 1080i, 1080p, 1080psf, 2160p. All common formats supported.
Audio Output:	Up to 8 pairs of audio streams
ANC Data Support:	Closed Captions VPID
Genlock Interface –	
Genlock Connector:	75-Ω HD-BNC
Input Impedance:	10kΩ
Return Loss:	≥20 dB, 0Mhz to 8 Mhz
Drive Level:	1.0 Vpp ±10%
Supported Genlock References:	Tri-sync and Black Burst 1080i x 1920 @ 25, 29.97 and 30fps 1080p x 1920 @ 23.97, 24, 25, 29.97, 30, 50, 59.94 and 60fps 720p x 1280 @ 50, 59.94 and 60fps

Appendix D – Open Source Software

The ARD 3100/3400 includes:

Package	Version	License	Copyright
avahi	0.8	LGPL Version 2.1, February 1999	1999 Free Software Foundation, Inc.
BusyBox	1.24.2	GPL Version 2, June 1991	Erik Anderson, et. al.
cairo	1.12.0	LGPL Version 2.1, Feb 1999	Josh Aas, et. Al.
ccid	1.5.2	GPL Version 3	Copyright 2001-2011 Ludovic Rousseau
Cison	1.7.15	MIT	Dave Gamble and cJSON contributors
Dropbear	2022.83	MIT-like	2002-20015 Matt Johnston, et. al (see license)
dOpenSSL	3d6c942	MIT-like	Copyright (c) 2013, infinit.io
e2fsprogs	1.45.4	GPL Version 2, June 1991	Theodore Ts'o
ethtool	4.13	GPL Version 2, June 1991	David Miller, et. al.
expat	2.5.0	MIT	2001-2006 Expat maintainers.
FastDB	3.71	MIT-like	Konstantin Knizhnik
FCGI	2.4.6	FastCGI	Open Market, Inc
FFmpeg	5.0.1	LGPL Version 2.1 Feb 1999	Fabrice Bellard
fontconfig	2.10.0	MIT	2001-2003 Keith Packard
freefont	20120503	GPL Version 3, 29 June 2007	Primoz Peterlin
freetype	2.9	GPL Version 2, June 1992	David Turner, et. al.
gptfdisk	1.0.3	GPL Version 2, June 1991	Roderick W. Smith
grub	2.00	GPL Version 3, 29 June 2007	Copyright © 1994 – 2011 Free Software Foundation, Inc.
Heimdal	7.1.0	MIT-like	Copyright (c) 1995 – 2014 Kungliga Tekniska Högskolan
httpparser	2.9.4	MIT	Joyent, Inc. and other Node contributors.

libdvbcsa		GPL Version 2, June 1991	Copyright (C) 1989, 1991 Free Software Foundation, Inc.
libevent	2.1.12	BSD	2007-2012 Niels Provos and Nick Matthewson
LIBPCAP	1.8.1	BSD	Copyright (c) 1993, 1994, 1995, 1996, 1997 The Regents of the University of California
Libp11	0.4.12	GPL Version 2, June 1991	Copyright (c) 1991, 1999 Free Software Foundation
libusb	1.0.19	BSD	Copyright (c) 1994-2002, 2004-2016 Free Software
Lighttpd	1.4.30	BSD	2004, Jan Kneschke
Linux	5.3.5	GPL Version 2, June 1991	Linus Torvalds, et. Al.
Log4cpp	1.1.3	LGPL Version 2.1 Feb 1999	Bastiann Bakker
Monit	5.33.0	GNU AFFERO GENERAL PUBLIC LI…	Copyright (C) 2001-2022 by Tildeslash Ltd.
Net-SNMP	5.7.1	BSD	1989, 1991, 1992 by Carnegie Mellon Univsty.
Nlohmann	3.10.4	MIT	2013-2021 Niels Lohmann
NTP	4.2.4p7	NTP License	1992-2009 David L. Mills
OpenSSL	3.1.1	Apache License 2.0	1998-2008 The OpenSSL Project, 1995-1998 Eric Young and Tim Hudson
Linux-PAM	1.3.1_2020-0…	GPL Version 2, June 1991	Copyright (c) 2005, 2006, 2009 Thorsten Kukuk
TACACS+	Master_2020-…	GPL Version 2, June 1991	Copyright (C) 2010, Pawel Krawczyk and Jeroen Nijhof
Parse-yapp	1.21	GPL Version 2 June 1991	Copyright (c) 2001-2011 Ludovic Rousseau
PCRE	8.30	BSD	1997-2012 University of Cambridge, et. al.
pcsc	2.0.0	GPL Version 3	Copyright (c) 2001-2011 Ludovic Rousseau

JSON	4.10	GPL Version 2, June 1991	Copyright 2005-2013 by Makamaka Hannyaharamitu
pixman	0.30.0	MIT	2004-2010 Red Hat, Inc.
libpng	1.2.59	zlib/libpng.License	2006-2017 Glenn Randers-Pehrson, et. al.
POPT	1.16	MIT	1998 Red Hat Software
pureftpd	1.0.51	BSD	Frank Denis
qDecoder	12.0.4	BSD	2000-2012 Seungyoung Kim
rapidjson	b16cec1a	MIT	2015 THL A29 Limited, a Tencent company, and Milo Yip
samba	4.18.0	GPL Version 3, 29 June 2007	Andrew Tridgell, et. al.
sdptransform	1.2.9	MIT	2017 Inaki Baz Castillo.
FamFamFam Silk Icons	013	Creative Commons Attribution 2.5	Mark James
Spawn-FCGI	1.6.3	BSD	Jan Kneschke, Stefan Bahler
srt	1.4.2	MPLv2.0 License	2018 Haivision Systems Inc.
TCLAP	1.2.0	MIT	2003 Michael E Smoot
uuid	1.0.3	BSD	Robert Boehne
Zlib	1.2.7	Zlib/libpng License	1995-2005 Jean-loup Gailly and Mark Adler

Appendix E – Warranty

Sencore Hardware 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 F – Support and Contact Information

Returning Products for Service or Calibration

The ARD 3100/3400 server 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 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

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Sioux Falls, SD 57107 USA
www.sencore.com
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