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AP20 Audio Processor

Installation and Operating Guide

Version 1.2

Effective Date: November 2010
Document # 9301H39200

Datasat Digital Entertainment
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Record of Changes

Manual Version / Date	Description
1.0 April, 2010	Preliminary version
1.1 June 2010	Version 1.1 release
1.2 November 2010	Version 1.2 release. Includes H338 film card, 8-channel version and V1.02.00 software feature updates.

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Introduction

This manual explains the AP20 Audio Processor setup and operation. It contains full instructions for installing hardware and software, setting up audio playback, configuring the system, performing maintenance and troubleshooting, and setting up and operating optional functions.

How to Use this Guide

The guide is divided into three parts. The first part covers operations for the projectionist or "operator". The second part covers the installation, setup and other technical functions. The third part consists of appendices with technical details such as connector and wiring diagrams.

> **NOTE:** Technical adjustments should only be performed by a qualified theater technician. The appendices provide detailed information for the theater technician.

Part 1: Operation

- Operating the AP20 Audio Processor
- How-To Procedures
- Troubleshooting – Operations

Part 2: Installation and Setup

- Hardware Installation
- System Software Setup and Menus
- Maintenance and Troubleshooting

Part 3: Appendices

A. Connector Pin-outs

B. Interface Wiring Diagrams

C. AP20 Wiring and Block Diagrams

D. Specifications

E. Dolby® Digital Operation

F. Optical Film Card (H338) - Option

G. 8-Channel AP20 (Includes 16-Channel upgrade instructions)

About AP20 Audio Processor

The AP20 audio processor has been engineered to deliver precise reproduction of both analog and digital sources, using the power of 6 Analog Devices 400MHz DSPs. The standard AP20 offers 16 channels of digital and 8 channels of analog inputs coupled to the 16 digital and 16 analog outputs. In addition to 1 S/PDIF and 2 TOSLINK inputs, the AP20 features 4 HDMI 1.3b inputs with Blu-Ray HD decoding and active loudspeaker crossovers.

☑ An 8 channel version of the AP20 is also available. Please see appendix G, in this manual, for more information.

Each of the 16 channels include:

- 31 bands of 1/3 octave equalization
- 3 bands of parametric equalization
- Channel gain & phase inversion control
- Individual Bass & Treble controls
- Variable delay line adjustable from 0ms to 1000ms

One of the most compelling features of the AP20 is the inclusion of Dirac Live® room optimization technology. Dirac Live® is a state-of-the-art digital room correction technology that improves the listener experience by correcting for room modes and anomalies using high-resolution filter technology. Configure once and never touch again. The result - improved musical staging, clarity of dialogue and an enhanced listener experience.

For even greater flexibility, the AP20 Audio Processor has three product expansion slots that are removable from the back of the unit while racked. All internal control and data lines are available to expansion cards to service future user needs.

To get the most out of your AP20, we suggest that you review this manual and keep it available during system installation and initial operation.

Limited Warranty

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FACTORY WARRANTY INFORMATION

Please fill in the necessary information for every location where the AP20 system is installed.

THEATER NAME/CIRCUIT:			
THEATER LOCATION:			
SCREEN NUMBER:			
THEATER CONTACT/TELE No.:			
LOCAL TECH/TELE No.:			
AP20 SERIAL NUMBER:			
CROSSOVERS:	☐ External	☐ Internal	ohms

SPEAKER SYSTEMS SOUND AMPLIFIERS
Screen (model):
Screen Amp (model):
Surrounds (model):
Surrounds Amp (model):
Subwoofer (model):
Subwoofer Amp (model):
Surrounds:

Subwoofer: self-powered?	☐ Yes	☐ No

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Unpacking

The packaging is designed to handle normal shipping and handling. Upon receipt of shipment, check for signs of damage before opening and report all damage to the carrier. All shipments made from DDE are customer responsibility once they leave our premises.

Before installation begins, we suggest that a complete inventory be taken to minimize problems or questions during installation. Additionally, save all packing material until installation is complete in the unlikely event that a component(s) requires return to the factory. Use the packing slip that came with your unit to verify received inventory.

The following is a standard packing list for the AP20 Audio Processor:

Table 1. AP20 Standard Packing Kit

ITEM KEY	ITEM DESCRIPTION	QTY
2501000100	Power cord, straight detachable, (17250) standard Volex 17250 10 B1 blk	1
9003E11901	Screw Kit, Rack, Truss head screw & Washer (E119-01)	1
9003H40200	Hardware Kit, AP20 connector (H402)	1
9306H40900	Legal notice, AP20 Software License	1
9306F42200	Legal notice, WEEE Compliance	1
9331H39200	Disc, Manual, AP20 Installation and Operation	1
9303H41000	Release notes, AP20 software	1

Table 2. 9003H40200 Hardware Kit, AP20 connector

ITEM KEY	ITEM DESCRIPTION	QTY
2007000905	Connector, 9-pin M D", solder cup	2
2007002510	Conn,25-pin M D", solder cup	4
2007002511	Conn,25-pin F D", solder cup	4
2022000100	Connector back-shell,9-pin D	2
2022000300	Connector backshell,25-pin D	8

Caution Notices

⚠ **Power Cord to the AP20 rear panel:** The power cord is the main disconnect device. It should be plugged into an easily accessible outlet with surge protection. The power cord is to be used in a minimum type SVT 18/3 rated 250 Volts AC, 10 Amps with a maximum length of 4.5 M, with one end terminated in an IEC 320 attachment plug and the other end terminated in a NEMA 5-15P Plug.

⚠ **Battery:** The AP20 contains a battery on the front panel PC board that is not field replaceable.

Part 1: Operation

This part of this manual contains information the user needs to operate the AP20 Audio Processor on a day-to-day basis.

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1.0 Operating AP20

1.1 How-To Procedures – Operations

ACTIVITY	INSTRUCTIONS
Turn Power ON	Press and release the power button on the front panel. If the unit will not power up, be sure the rear panel power switch is ON and the unit is plugged into a working AC outlet protected by a surge protector. See *Powering ON the AP20 Processor*, page 16.
Turn Power OFF	Press and release the power button on the front panel.
Adjust volume	Turn the master fader knob on the front panel to adjust volume on all channels. Turn clockwise to increase volume. See *Adjusting the Fader*, page 18.
Select a format	Touch the desired format in the bottom row of the AP20 display. If the format you want is not shown, then that format is not available. See *The Home Screen,* page 18.
Identify the selected format	The current format is highlighted in the bottom row of the AP20 display.
Mute the AP20	Touch the MUTE button. If successful, fader level number will be outlined in red, the MUTE button will changed to “MUTED” and its background color will change to red. See *Adjusting the Fader*, page 18.
Unmute the AP20	Touch the red MUTED button. If successful, the button will change to “MUTE” and its background color will be white.
Identify muted mode	When the AP20 is muted, the MUTE button will turn red and changed to “MUTED”. Also, the fader level number directly above it will be outlined in red.
View monitor settings	Touch the MONITOR button. The Monitor window will display. It will automatically disappear after 10 seconds. See *Booth Monitor Volume*, page 19.
Select monitor channel(s)	Touch the MONITOR button. The Monitor window will display. Then touch the MIX button and select the channel(s) you want to hear in the monitor. When finished, touch the CLOSE button. See *Booth Monitor Volume*, page 19.
Change monitor volume	Touch the MONITOR button. The Monitor window will display. Then touch the + or – button until the desired volume is set. The window will automatically disappear after 10 seconds. See *Booth Monitor Volume*, page 19
Mute the monitor	Touch the MONITOR button. The Monitor window will display. Then touch the MUTE button in the monitor window. The MUTE button will change to “MUTED” and turn red. Note that the Monitor button to the left of the window also turns red to indicate a muted state. The window will automatically disappear after 10 seconds.
Unmute the monitor	Touch the MONITOR button. The Monitor window will display. Then touch the MUTED button in the monitor window. The MUTED button will change to “MUTE” and turn white. Note that the Monitor button to the left of the window also turns white to indicate the unmuted state. The window will automatically disappear after 10 seconds

1.2 Front Panel Controls and Indicators

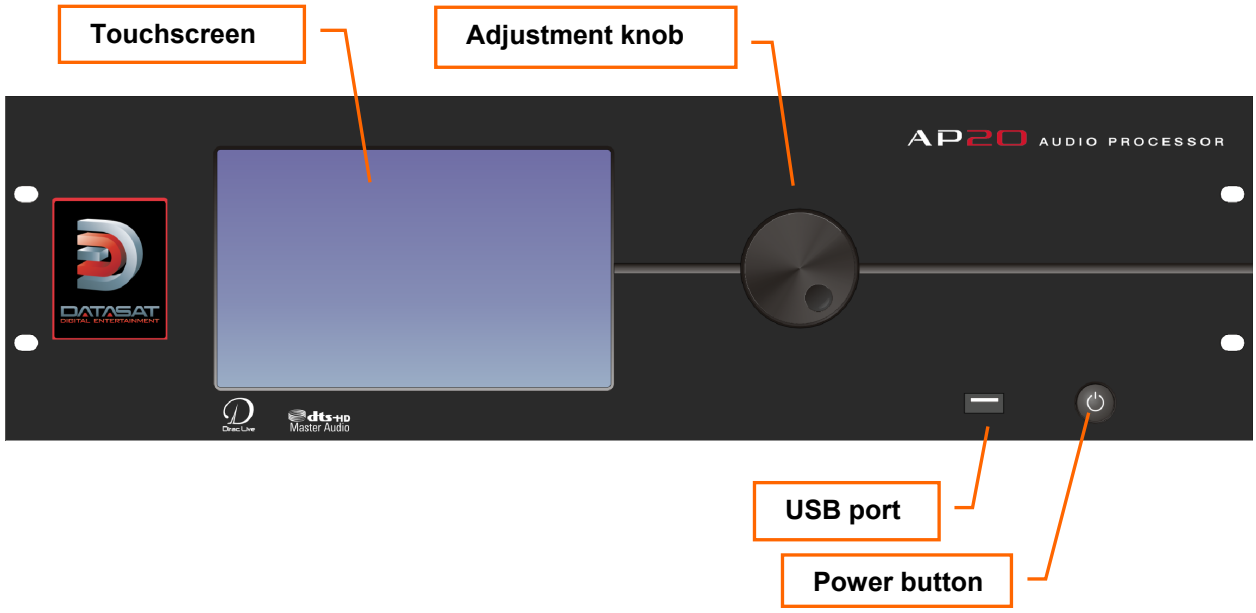

Figure 1: Front Panel Controls and Indicators

The front panel contains the following controls and indicators for operating AP20.

- **Power button**: Turns the unit on and off
- **LCD/Touch Screen**: Displays theater system configuration and status and allows configuration changes. Most selections can be made by touching the screen with your finger or by using a stylus.

  The LCD screen operates in two modes:

  - **Home screen**. The projectionist can select formats and mute volume from this screen. They can also change the monitor volume and execute manual automation commands via the popup windows. During playback, the screen displays information about the content currently being played.
  - **Menu (Setup) mode**. In menu mode, the screen displays menus for viewing and adjusting operational settings by the cinema technician. The projectionist does not need to enter these menus.
- **Adjustment knob**: Used for fader control and parameter adjustments. On the Home screen, this knob adjusts the fader level. However, it is used within the setup screens to adjust values, EQ filter faders, and other values. When the setup screen contains many controls, first set the focus by touching the control on the display. Then move the knob clockwise to increase the value, or counterclockwise to decrease the value.
- **USB port**: Use for software updates and loading and saving of configurations. See topic *Update System Software From USB Device* on page 55 for more details.

1.3 Powering ON the AP20 Processor

Turn ON the main power switch on the rear panel, then press the front panel power button. A “hard boot” (cycling the power at the power entry module on the rear panel) typically takes the system one minute and 15 seconds to initialize. A “soft boot” (pressing the power button on the front panel when power has not been cycled) typically takes about 20 seconds.

While the system is initializing, the following messages will appear on the AP20 touch screen.

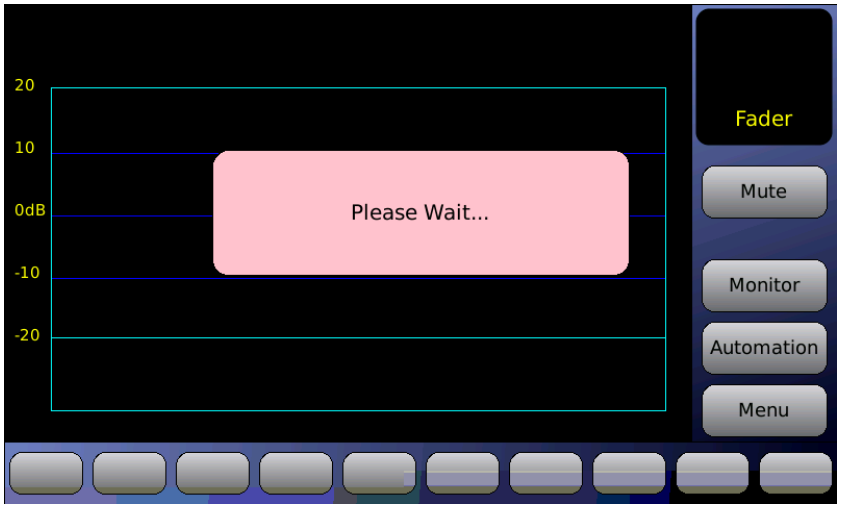

Figure 2. Initial screen

Figure 3. Loading Coefficients...

When the screen messages in the box disappear and the fader value appears, the AP20 is ready.

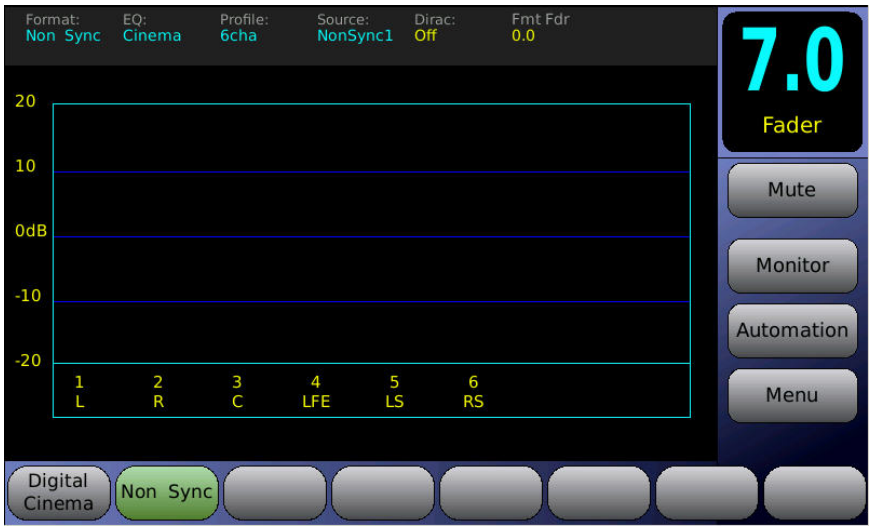

Figure 4. Home Screen

☑ If no messages appear on the touch screen after you have turned on the power switch, check the following:

- Is the power to the sound rack on? Has the circuit breaker to the audio rack been tripped?
- Is the power cable connected?
- Is the front panel power switch lighted?

Navigating through the Menus

Since the AP20 is equipped with a touch screen display, you can navigate easily through the menus by touching any button with your finger. A non-abrasive stylus that won't scratch the screen can also be used if you prefer.

In all screens but the Home screen, you will be presented with a button menu along the bottom of the screen. This menu will take you to any other screen within the menu structure with a few touches of your finger.

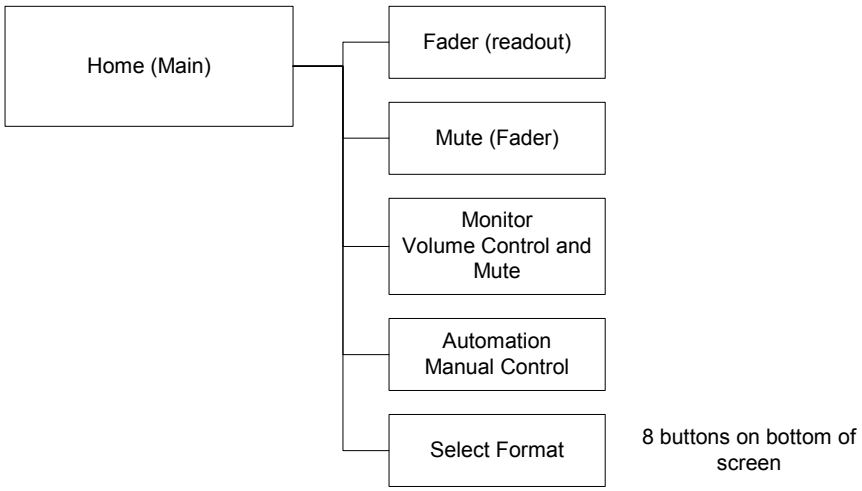

Figure 5. Operations Menus

1.4 The Home Screen

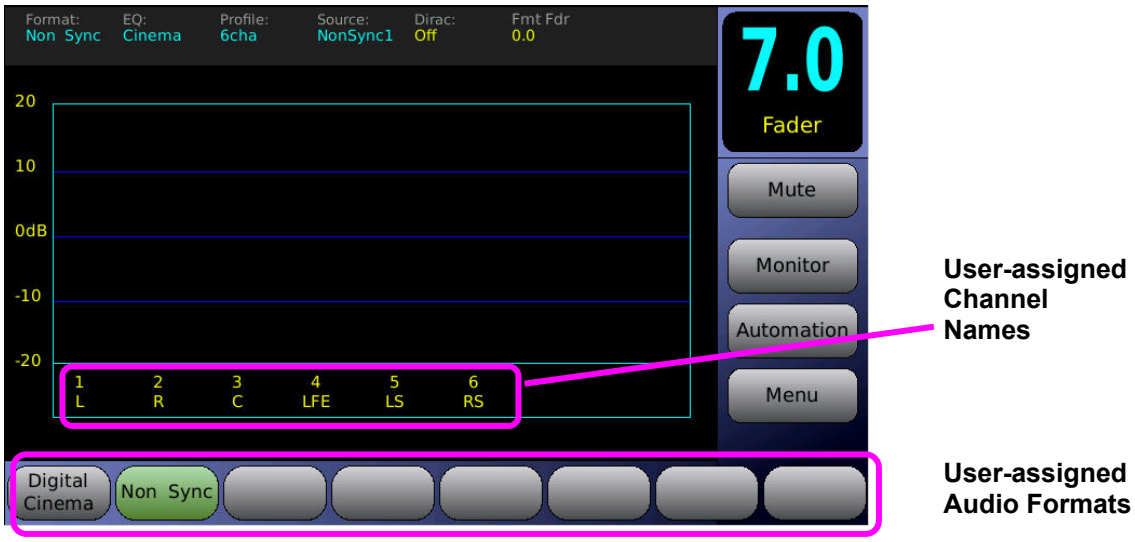

Figure 6. Home Screen

When the system has finished booting up, the Home Screen will appear, as shown in the above example. Your Home Screen may look somewhat different, due to user-configurable channel names and audio formats.

The Home Screen of the AP20 provides one-touch access to the following features:

- Fader Volume/Mute
- Audio Formats
- Booth Monitor Volume/Mute
- Manual Automation Control
- Setup Menu
- VU bars for all output channels associated with the current audio format.

1.4.1 Adjusting the Fader

Adjust the fader volume by using the control knob on the front panel. To mute the fader, touch the **Mute** button. The button label and fader display will turn red. The button label will also change to “Muted”.

Unmute the AP20 by touching the mute button again, changing format level, or changing formats.

Touch it again to un-mute the fader.

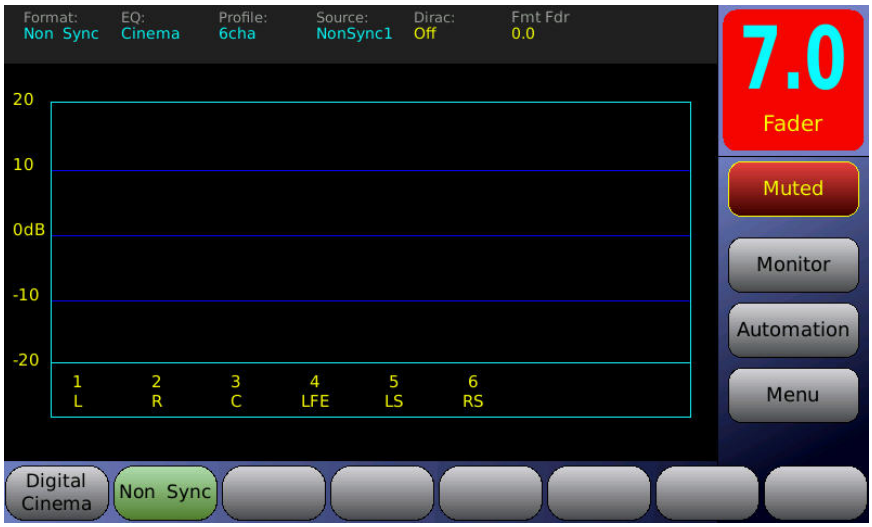

Figure 7. Fader Muted

1.4.2 Booth Monitor Volume

When an external powered speaker is connected to the AP20, the level can be controlled using the monitor volume. To adjust the booth monitor volume, touch the **Monitor** button. The screen shown in Figure 7 will appear. Touch the + or – buttons or the control knob to raise or lower the volume.

- Touch the **Mute** button to mute/un-mute the booth monitor.
- Touch the **Mix** button to select a channel and adjust the volume from 0 to 10. See Figure 9, below.
- Touching the **Close** button will close this screen. The Monitor Volume window will close if not used within 5 seconds.

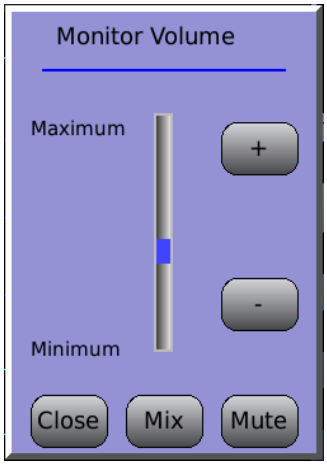

Figure 8. Monitor Volume

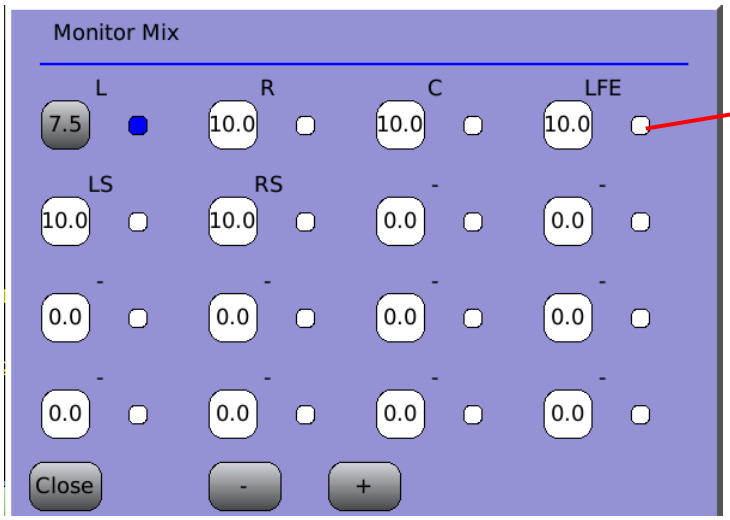

Figure 9. Monitor Mix

- Select channel(s), then touch the + or – button to adjust volume from 0 to 10.
- Touch the small button next to a channel to select it for monitoring.
- Touch Close to close the Mix window. It also closes automatically after 5 seconds of inactivity.

1.4.3 Manual Automation

The **Automation** button opens the automation manual control screen.

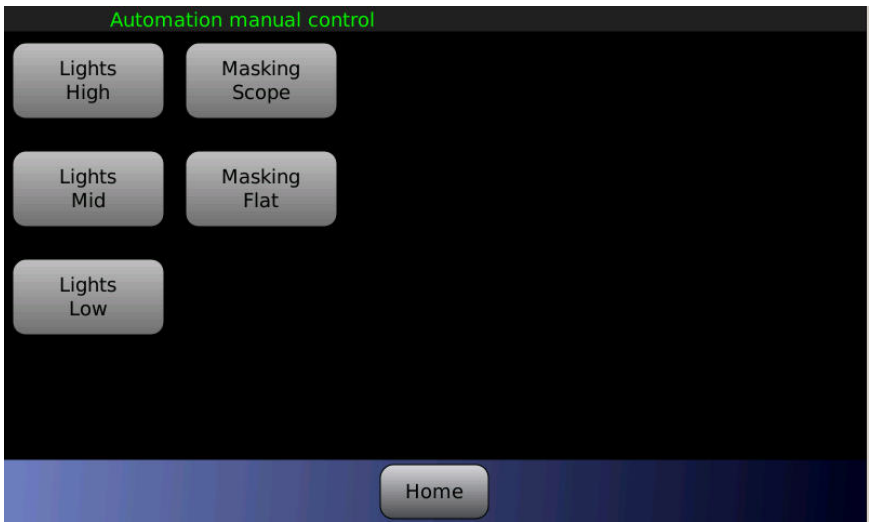

Figure 10. Automation Manual Control screen

This screen allows for direct control of automation events in any order, at any time. Once your theater technician has linked automation events to macros, and macros have been assigned to buttons, you can trigger any macro by pressing its button on this screen. A maximum of twenty buttons can be assigned. If no buttons are visible, or there is a need for additional buttons, please contact your theater service technician.

For details about using macros see the topic *Macros*, page 84.

1.5 Troubleshooting (Operation)

The following table provides troubleshooting data for the AP20.

PROBLEM	SOLUTION
AP20 will not power ON	Press and release the power button on the front panel. If the unit will not power up, be sure the rear panel power switch is ON and the unit is plugged into a working AC outlet protected by a surge protector. See *Powering ON the AP20 Processor*, page 16. If the AP20 is mounted in a rack and a breaker is used for the rack, make sure the breaker is ON. Verify the surge protector is powered and is working. Try changing the AP20 power cord. If power is getting to the AP20 but it still will not power ON, maybe the fuse above the AC In connector (on the rear panel) is blown. Call a theater technician to check it.
AP20 front panel display is too dim	The front panel display automatically dims when not touched for a few seconds. Gently touch the display screen to brighten it.
No sound in auditorium	On the front panel display, verify the Mute button is not muted. If it is muted, touch it to unmute it. Be sure the fader level is not zero (0) or red. If it is zero, then turn the knob to increase the volume. If it is red, then unmute the AP20 by touching the Muted button. Verify the AP20 is in the correct format.
Volume is too low or high in the auditorium	Turn the fader knob to achieve proper volume.
Volume is too low or high in the booth	Touch the Monitor button to open the Monitor window, then touch the + or – to adjust the monitor volume.
No sound in booth	Verify the Monitor is not muted (red). To unmute, touch the Monitor button, then touch the red Muted button. Verify a powered speaker is connected to the AP20 rear panel. Verify the speaker's power is ON. Adjust the monitor volume (see previous entry).
Wrong sound in auditorium	Verify the AP20 is in correct format. (The current format is highlighted in the bottom row of the display.) Touch a different format to select. If the format you want is not listed, it has not been set up – contact your theater technician.

Part 2: Installation and Setup

This part of this manual contains information the theater technician needs to set up and configure the AP20 Audio Processor.

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2.0 Installation and Set Up

2.1 Installation Checklist

This checklist summarizes the installation and setup procedures for the AP20.

Table 3: AP20 Installation and Setup

Completed	Task Description	Refer to:
☐	Install AP20 in Equipment Rack	Chassis Rack Mounting and Connection, pg. 27
	CONNECT CABLING:	
☐	Power Cable	
☐	Audio input cables to AP20	(Depends on audio sources)
☐	Audio output cable from AP20 Analog Out to Audio Power Amps	Appendix B, Interface Wiring Diagrams.
☐	Automation cabling	Appendix B, Interface Wiring Diagrams.
	ADJUST AND TEST	
☐	Theater Equipment Check	Check speakers, amplifiers, auditorium conditions Theater Equipment Check, pg. 32
☐	Assign channels	On AP20: Menu (System) > Format > Channel Profile > Channel Names Assign Channels on AP20, pg. 33
☐	Verify channel assignments	Listen in auditorium Verify Channel Assignments in Auditorium, pg. 35
☐	Set levels to establish a baseline	Set levels to establish a baseline, pg. 37
☐	Perform the EQ	Perform the EQ, pg. 38
☐	Perform Subwoofer Parametric EQ	Subwoofer EQ – Parametric EQ, pg. 40
☐	Final Adjustments (fine tuning)	Final Adjustments, pg. 42
☐	Verify Sound Performance	Listen in auditorium
☐	Set up macros for automation	Creating a Macro, pg. 84
	SYSTEM SECURITY	
☐	Save AP20 configuration to USB flash drive	Saving and Restoring Configuration Files, pg. 55
☐	Set Password to Prevent Unauthorized Access, if Appropriate.	Access Control, pg. 57

2.2 Unpacking System Components

See the list of standard components for an AP20 shipment, on page 11. The exact contents may vary, depending on the options you have ordered.

☑ **Note:** Refer to the actual packing slip from your order to verify the contents of your shipment. Contact Datasat Digital Entertainment immediately if items listed on your packing slip are missing.

2.2.1 Preliminary Inspection

Note: Before installing the AP20 unit, take a complete inventory of system components to minimize problems or questions during installation. Additionally, save all packing materials until installation is complete in case you need to return parts to the factory.

2.3 Installation Overview

The AP20 chassis is the main component of the AP20 system. Installation procedures include:

- Mounting the AP20 chassis in a rack
- Connecting the AP20 unit to other equipment
- Connecting the AP20 unit to a power supply

⚠ **Device Disconnect:** The power outlet shall be installed near the equipment and shall be easily accessible, in order to quickly disconnect power.

2.4 AP20 Rear Panel Connections

Figure 11 shows the rear panel of the AP20. Table 4 gives a description of each connector shown in the figure. For specific information on the pin-outs of each connector, please see Appendix A of this manual.

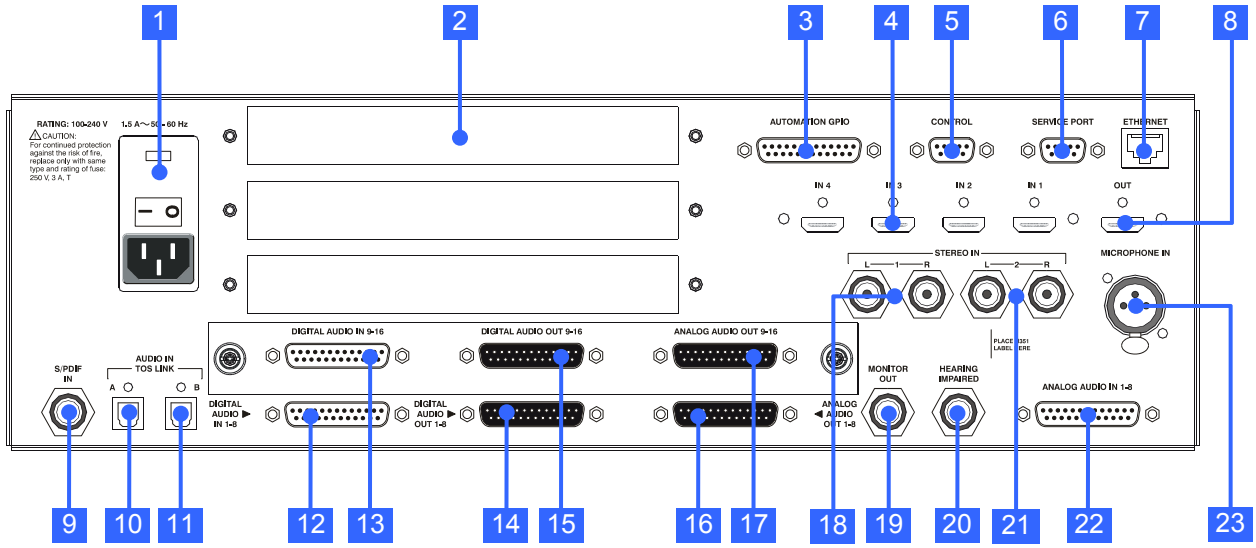


Figure 11. AP20 Rear Panel

Table 4. AP20 Rear Panel Connections

ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	Power Entry Module/Power Switch	**12**	Digital Audio In (CH 1 – 8) – DB25F
2	Option Card Slots (3)	**13**	Digital Audio In (CH 9 – 16) – DB25F
3	Automation GPIO – DB25F (sends/receives pulses to/from automation system)	**14**	Digital Audio Out (CH 1 – 8) – DB25M (for use in environments with amplifiers that can handle digital out – see note below this table)
4	HDMI In (4)	**15**	Digital Audio Out (CH 9 – 16) – DB25M (for use in environments with amplifiers that can handle digital out – see note below this table)
5	Control (RS232) – DB9F (serial automation control)	**16**	Analog Audio Out (CH 1 – 8) – DB25M (connect to amplifiers)
6	Service Port (RS232)– DB9F (used for production tests)	**17**	Analog Audio Out (CH 9 – 16) – DB25M (connect to amplifiers)
7	Ethernet – RJ45F (Network connection for VNC and software updates when connected to the internet)	**18**	Stereo Input 1 – RCA (could be used for pre-show, intermission music, etc.)
8	HDMI Out (1)	**19**	Monitor Out – RCA (connect to externally-powered amplified speaker in projection booth)
9	S/PDIF In - RCA Female (connect a DVD player or play station, etc. in a home theater environment)	**20**	Hearing Impaired Audio Out – RCA
10	Audio In (A) – Optical TOS Link (connect a DVD player or play station, etc. in a home theater environment)	**21**	Stereo Input 2 – RCA same as 18
11	Audio In (B) – Optical TOS Link(connect a DVD player or play station, etc. in a home theater environment)	**22**	Analog Audio In – DB25F
		23	Microphone In – XLR F (connect microphone for auditorium audio output tuning during setup or for public address announcements)

A note about Digital Out

☑ Most theaters use ANALOG OUT because there are no amplifiers (at this time) that take digital audio inputs. It is possible to have DIGITAL IN to the AP20 and ANALOG OUT. DIGITAL OUT capability may be implemented only in some high-tech recording studios, mixing stages, etc.

2.5 Chassis Rack Mounting and Connection

The AP20 chassis requires 3U of standard rack space for proper mounting.

⚠ **Caution:** Because power line surges can damage the AP20, we require the use of a properly functioning computer-grade surge /spike suppressor. We also recommend using an uninterruptible power supply (UPS).

1. Install the AP20 into the audio rack, securing it properly with rack screws.
2. Connect the AP20 to other equipment (see appendices: A Connector Pin-outs, B Interface Wiring Diagrams, and C AP20 Wiring and Block Diagrams).
3. Connect the supplied power cable between the AP20 unit and the AC mains source.

2.5.1 Rack Mount Recommendations

Follow these recommendations if the AP20 unit will be installed in a closed or multi-unit rack assembly.

- Determine the maximum and ambient temperatures within the rack, since they may be greater than the maximum and ambient temperatures in the room. The maximum temperature for the equipment in a closed or multi-rack assembly is 40°C (104F°)
- Ensure adequate airflow for cooling purposes on all sides of rack-mounted equipment. Make sure that the ventilation fan is not blocked.
- Check nameplate ratings to ensure there is no overloading of supply circuits that could have an effect on over-current protection and supply wiring.
- Maintain reliable grounding of the equipment. Give particular attention to supply connections when connecting to power strips, rather than direct connections to the branch circuit.
- Using a properly functioning quality surge protector is required to protect the unit. Using an uninterruptible power supply is also recommended.

2.5.2 Power Supply

The AP20 power supply automatically switches itself to accommodate AC input between 110 VAC and 220 VAC.

2.6 Navigating the Menus

When the AP20 is first powered up, the home screen (main operator menu) will appear. Selecting the "Menu" button from the home screen will access the "System Setup" screen. Once you have navigated through sub-menus, selecting the "System" button always returns you to the "System Setup" screen.

Selecting "Home" from a sub-menu returns you directly to the home screen. If "Menu" is then selected, the AP20 returns to the last selected sub-menu.

The "Back" button works like the back button of an internet browser, and may be used to return through the history of previously selected sub-menus.

If the following symbol appears on the screen, it indicates that the front panel adjustment knob may be used as a navigation tool (usually to scroll through a list or to increase/decrease values):

☑ Note: When using a laptop to VNC into the AP20, use the up and down arrows to mimic the scrolling action of the front panel adjustment knob.

2.7 About Formats

The AP20 facilitates the process of creating customized audio formats, in addition to providing a set of pre-built formats that are ready to use.

The buttons along the bottom of the AP20 Home screen are the default formats or formats that have been created by the installation technician for a particular application. Each format consists of a set of discrete settings: an Input Source, Format Options, EQ settings, and Channel Profile, as illustrated below (Figure 12).

System setup, **Network** and **Automation** are global settings that affect all formats.

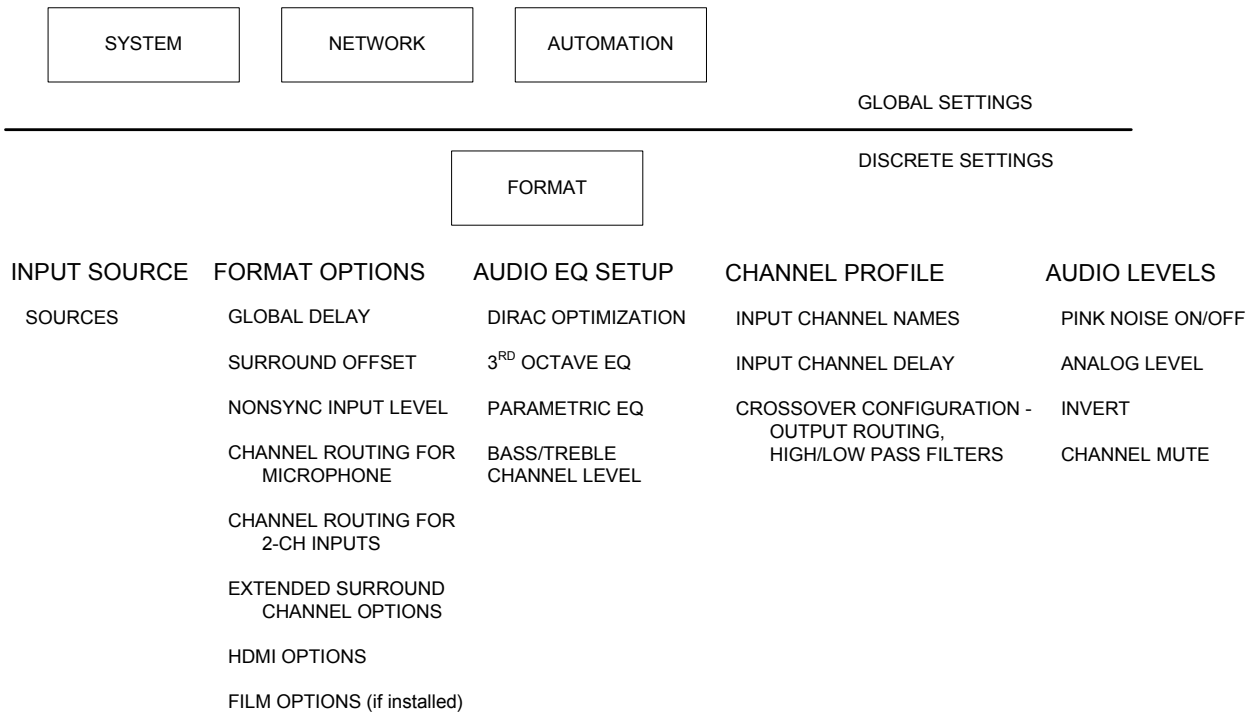


Figure 12. Global Settings and Format Discrete Settings

Menu (System) > Formats

In the Audio Format Setup screen, five options appear along the bottom: Input Source, Format Options, Audio EQ Setup, Channel Profile, and Audio Levels.

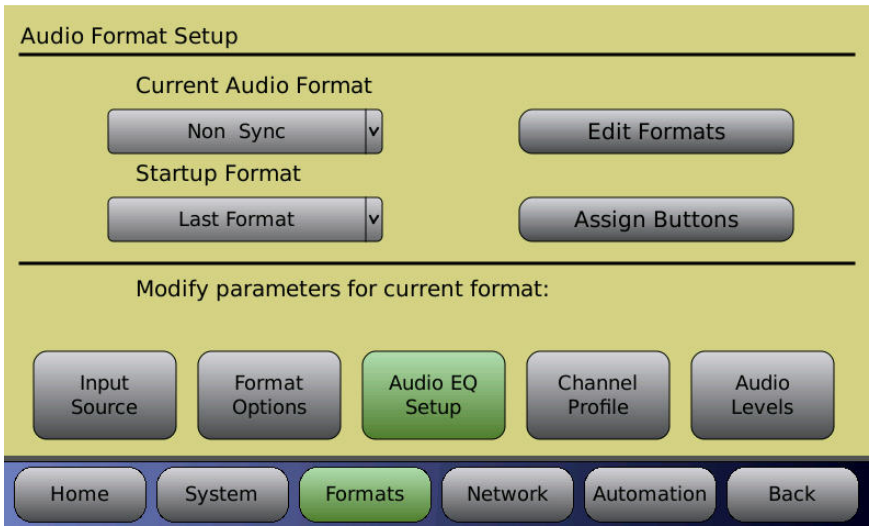


Figure 13. Audio Format Setup Screen

2.7.1 Creating an Audio Format

This is an overall summary of the procedure for creating an audio format.

- Under Audio Format Setup screen: assign the format to a button.
- Input Source screen: select the audio input.
- Format Options screen: set global delay and other options, depending on format.
- Channel Profile screen: set channel names, audio levels, and crossover settings.
- EQ Setup screen: set up Third Octave EQ, Dirac, or Parametric EQ.

The following is an example of a format configuration.

Audio Format:

- Home screen button name: Digital Cinema
- Audio format name: Digital Cinema
- Input source: Digital Ch: 1 – 16
- Options: Global Delay, setting 000ms, Extended Surrounds, setting Ls, Rs

Audio Profile:

- Channel Names: Ch1 L, Ch2 R, Ch3 C, Ch4 LFE, Ch5 Ls, Ch 6 Rs
- Crossover: Ch1 – Ch 6 settings done during setup – calibration, if needed

Audio EQ:

- Dirac: Enabled or disabled depending on setup and calibration
- Audio Levels: Ch1 – Ch6 settings done during setup – calibration, if needed

- Third Octave EQ: Calibrated adjustment made by qualified technician
- Parametric Equalization: Calibrated adjustment made by qualified technician

2.8 Factory Presets

The AP20 factory settings include formats for Digital Cinema and Nonsync as described in the table below.

Table 5. AP20 Factory Presets

Format Name	Assigned Button	Signal Source	EQ Set	Channel Profile
Digital Cinema	1	Digital In (1-16)	EQ1	Profile1
Nonsync	2	Nonsync 1	EQ1	Profile1

The default EQ set is named **EQ1** and includes all EQ settings flat and all filters off. This EQ set may be used and altered during the theater setup process. The default channel profile is **Profile1** which includes the default 6 channel assignments and trim values flat.

2.8.1 Preset Formats

The default formats appear in the Audio Format Edit screen for Copy Preset to Format. (See a sample screen at 2.14 *Copy Format,* page 42.)

Use this format as a starting point to create a format with the name and source shown in the table, using the current EQ and Channel Profile. Any of the format settings may be changed after the format is created.

Table 6. AP20 Preset Formats

Name	Source
Digital Cinema	Digital In (1-16)
HDMI 1	HDMI Port 1
HDMI 2	HDMI Port 2
HDMI 3	HDMI Port 3
HDMI 4	HDMI Port 4
Nonsync1	Nonsync1
Nonsync2	Nonsync2
SPDIF	S/PDIF 3 Dig
TOS 1	S/PDIF 1 Optical
TOS 2	S/PDIF 2 Optical
XD20 A	Analog 8Chan
XD20 D	Digital In (1-16)

2.8.2 Default EQ

The Default EQ appear in the Audio EQ Edit screen for Copy Preset to EQ. See a sample screen at 4.3.7.2 *Edit EQs*, page 70.

There is only one option for Default EQ (Flat), which has EQ filters flat, parametric filters disabled, and Dirac optimization off. Use this format as a starting point to create a new EQ set.

2.8.3 Default Channel Profiles

The Default Channel profile appears in the Audio Profile Edit screen for the **Copy Default to Profile** option. See a sample screen at 4.3.8.2 Edit Profiles, page 77.

There are two default channel profiles: 6-channel and 8-channel.

The 6-channel profile assigns 6 channels as named in the table below and enables the VU meters for 6 channels.

Table 7. Default 6-Channel Profiles

Channel	Name
1	L
2	R
3	C
4	LFE
5	Ls
6	Rs

The 8-channel profile assigns 8 channels as named in the table below and enables the VU meters for 8 channels.

Table 8. Default 8-Channel Profiles

Channel	Name
1	L
2	R
3	C
4	LFE
5	Ls
6	Rs
7	Bsl
8	Bsr

2.9 AP20 Configuration and Setup

This section describes procedures for AP20 audio level adjustment and sound performance verification.

B-Chain alignment will be performed differently depending on whether the (optional) Dirac Live®Theater Setup application or the AP20 1/3 Octave EQ room tuning function is used. In fact, Dirac Live® can be used in conjunction with 1/3 Octave EQ, in a case where Dirac Live® is used to tune the room and then the 1/3 Octave EQ is used afterwards to make some changes to specific frequencies.

2.9.1 Equipment Requirements

Complete checkout and adjustment of the AP20 unit requires the following equipment (not provided by Datasat Digital Entertainment unless otherwise noted):

- a single microphone or multiplexed microphones, connected to an RTA
- SPL meter
- Real Time Analyzer (RTA)
- Laptop computer running VNC for wireless communication with AP20
- (Optional) Datasat AP20 Dirac Live® configuration software
- (Optional) Wireless router such as the Linksys WRT54GL or similar installed on AP20 Ethernet port (if connecting to laptop in auditorium). NOTE: Wired connection to the network will work as well, if the physical connection can be made.

2.9.2 Setting and Adjusting Audio Output Levels

The AP20 Audio Processor is designed to accommodate remote operation. For this reason, we highly recommend the use of a laptop computer for adjusting room EQ. The laptop computer must be equipped with a wireless network card in order to take advantage of the remote operation feature. You will also need a wireless router (not supplied by Datasat) such as the Linksys WRT54GL or similar. This device should be connected to the Ethernet connector on the AP20.

The laptop computer uses a Virtual Network Connection (VNC) to communicate with the AP20. The front panel touch-screen display of the AP20 will appear on the laptop screen, but will not function as a touch-screen. Use the laptop's cursor and arrow keys to make selections.

2.9.3 Theater Equipment Check

Prior to adjusting the EQ, please check all of the components in the audio system for proper installation and operation.

2.9.3.1 Speakers

- Check that all speakers are properly mounted and secured. Ensure there are no loose parts or mounting hardware left around the speakers that could be a source of noise or rattles.
- Check the aiming of all speakers. Verify there are no obstructions in front of the speakers. For stage channels, ensure that the masking, screen frame, and sound wall do not block the speakers.
- Speaker cables are correctly secured to the speakers and are of a suitable gauge.
- Verify each speaker has no missing or open drivers.
- Check that all speakers are connected to the correct channel.
- Verify the high and low frequency drivers for each channel are in phase. Also, check each channel is in phase with the others.

2.9.3.2 Amplifiers

- The gain settings of all of the screen channel amplifiers and surround amplifiers should be the same. If a particular amplifier requires a vastly different gain setting or operates differently than the others, then it should be checked and repaired.
- Check all of the amplifiers for distortion or noise.
- Verify that the cooling fans are operating correctly and that the air vents are clean and free from obstructions.

2.9.3.3 Auditorium

The auditorium should have all of the acoustic treatments installed prior to setting the EQ. Any excessive noise from air conditioners, hallways or other sources should be minimized. All theater seats must be installed. Remove any plastic coverings from chairs or speakers prior to any EQ (B-chain) alignment.

2.9.4 Assign Channels on AP20

After installing the AP20 into the rack and connecting the cabling for inputs and outputs, the next step is to assign channels.

The AP20 allows for custom defined channel names for the input channels. The input channels are named through the Channel Names screen.

Menu (System) > Formats > Channel Profile > Channel Names

In general the default assignments must be preserved for the first 6 channels in order to maintain compatibility with the HDMI input channel assignments, and with the Hearing Impaired output channel. Default channel names are indicated in Table 9 below.

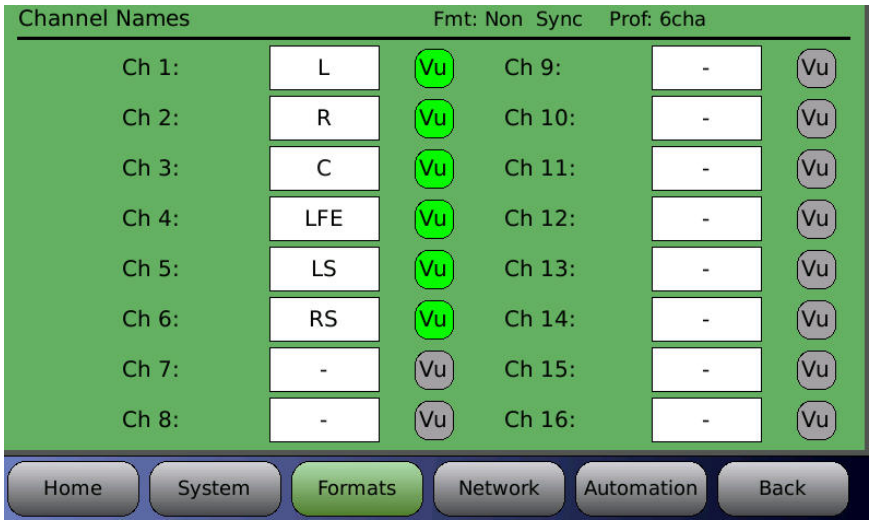


Figure 14. Channel Names Screen

When channel assignments are complete, you can eliminate the unassigned channels so they do not appear on the main screen. Turn off the Vu indicator for unused channels.

Do this by simply clicking the cursor on the VU button. When the button is green that channel will be displayed in the Home screen; when it is grey the channel is off and will not be displayed on the Home screen.

Changing Channel Names

To change or assign a name, touch a channel name button to open the names keyboard

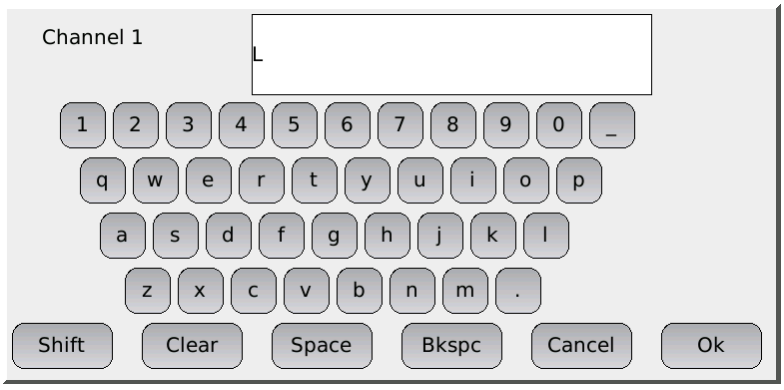


Figure 15. Channel Names Keyboard

There are buttons for **Shift** (upper case / lower case shift), **Clear** (clears the name field), **Space**, **Backspace**, as well as **Cancel** and **OK**.

The factory default channel configuration for the AP20 is 6 channels.

Table 9: Default Channel Configuration

Channel	Default 6-channel names	Default 8-channel names
1	L	L
2	R	R
3	C	C
4	LFE	LFE
5	Ls	Ls
6	Rs	Rs
7	-	Bsl
8	-	Bsr
9	-	
10	-	
11	-	
12	-	
13	-	
14	-	
15	-	
16	-	

2.9.5 Hearing Impaired Output

The first 3 input channels (L,R,C) are mixed to create the Hearing Impaired output channel. The hearing impaired mix is 50% Center channel, 25% Left and 25% Right channels.

2.9.6 Verify Channel Assignments in Auditorium

On the AP20, select a channel and turn on Pink Noise. In the auditorium, verify that the Pink Noise output is coming from the correct loudspeaker(s). Do this for all channels. For details, see *Audio Levels*, page 81.

Menu > Formats > Channel Profile > Audio Levels

- Select a channel.
- Turn on Pink Noise.
- In auditorium, listen to confirm audio is coming from correct speaker(s).
- Repeat for all channels.

2.10 B Chain Alignment using 1/3 Octave EQ

Adjust the alignment of each individual channel. There are various approaches to B-chain alignment, and the procedure presented below is offered as an example, not a requirement. The intent is to show the AP20 functions that are relevant to B-chain alignment.

Caution: Before proceeding with the room equalization, it is imperative that the loudspeaker and crossover systems be properly aligned. Issues like speaker phasing and horn tilt need to be checked. When using crossovers the low, mid and high frequency drivers must be balanced to produce a relatively even response from 100 Hz to 5 Hz. See *Theater Equipment Check*, page 32.

SUGGESTED MICROPHONE PLACEMENT

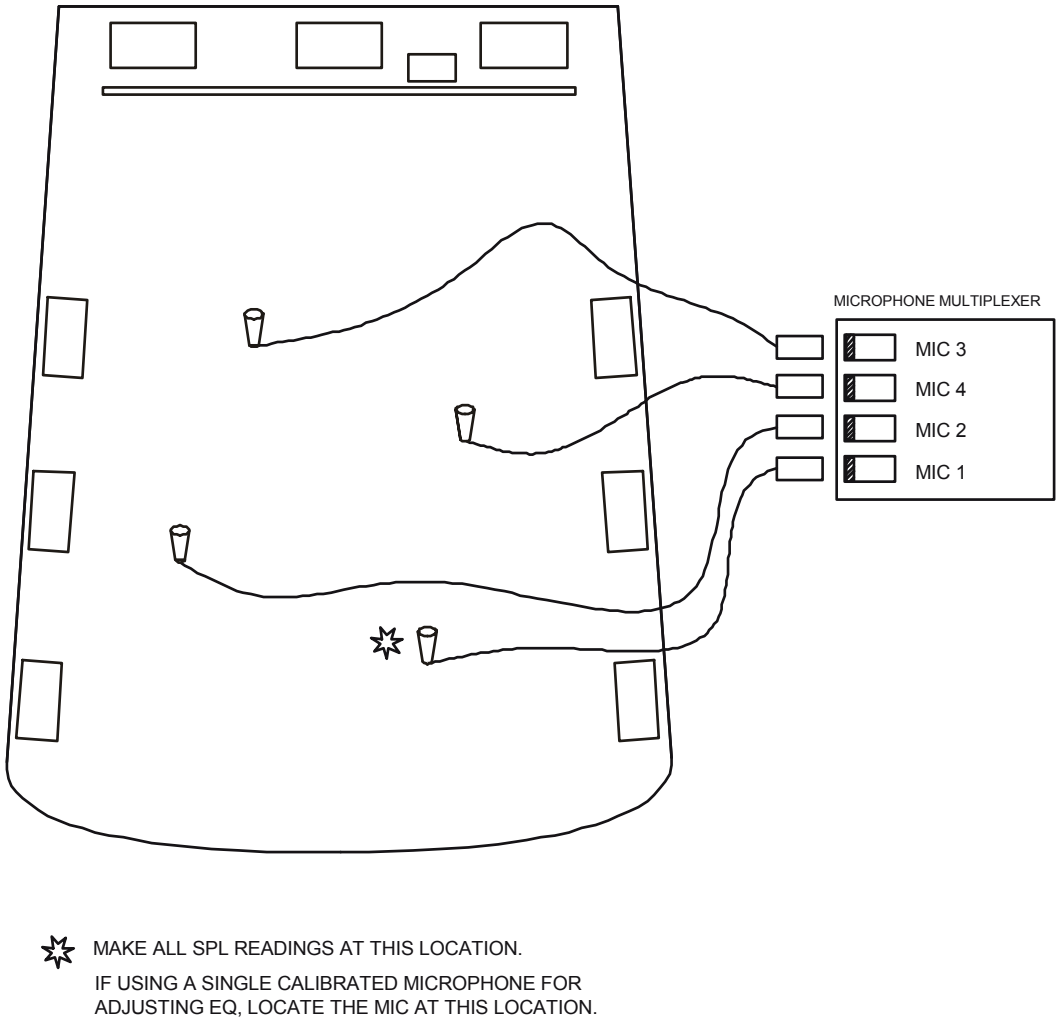


Figure 16. Suggested Microphone Placement in Theater

- Using a single microphone is not recommended, but if necessary, the best location would be two-thirds (2/3) of the way back and one-third (1/3) of the way in from the side of the auditorium (that is, slightly off-center). This position is also best for final SPL readings.
- If using a multiplexed microphone system, set up the microphones according to the instructions provided with that system.

Note: Be sure to open the curtains (if any) at the front of the auditorium.

2.10.1 Set levels to establish a baseline

- In the auditorium, confirm that all amplifiers are ON, mute is OFF, and masking and curtains are opened.
- Use a high-quality, calibrated SPL meter in the auditorium.

Menu (System) > Formats > Audio Levels

- Set the Fader to 7.0. That's the standard reference level.
- Run Pink Noise on each channel, one by one.
- First, by adjusting the amplifiers, try to achieve the baseline levels. Set the SPL levels according to the chart below.
  Note that SPL readings for screen and surroundings should be measured un-weighted, or C-weighted, with the meter set to slow.
  Use an RTA to calibrate the proper level setting of the subwoofer.

Table 10: SPL levels

Channel	Description	SPL
1	Left	85 dB
2	Right	85 dB
3	Center	85 dB
4	Sub bass	91 dB*
5	Left Surround	82 dB
6	Right Surround	82 dB
7	Back Surround	82 dB
8	Left Center	85 dB
9	Right Center	85 dB

* Subwoofer should be set to 10 dB of in-band gain
(see SMPTE RP-200), which equates to approximately 91 dBC (slow).

- If not possible to achieve the baseline, use the AP20 (Analog Output Levels) to make minor adjustments.

2.10.2 Perform the EQ

If using Dirac Live, please refer to the Dirac Live Theater Setup manual. For an overview, see *Using Dirac Live® to Tune the Auditorium*, page 42.

The AP20 contains a full suite of 1/3 Octave EQ filters that are “traditional” cinema processor filters. If using AP20 1/3 Octave EQ, complete the following steps.

Menu > Formats > Audio EQ Setup > Third Octave EQ

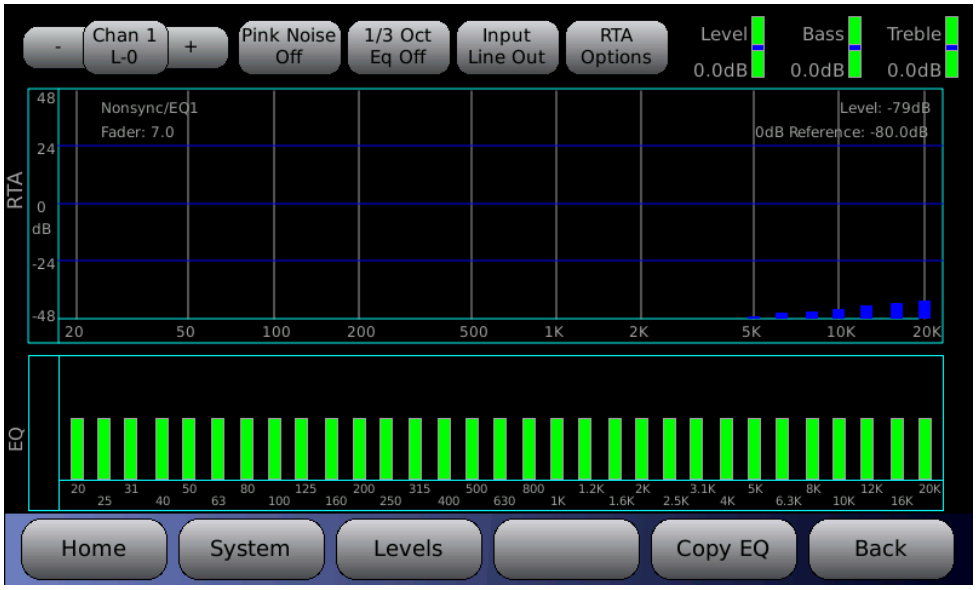


Figure 17. Third Octave EQ Screen

NOTE: Touching a green bar in the EQ section (lower panel) will select that frequency and allow you to adjust the dB level of that frequency by rotating the fader knob. (On the laptop running AP20 Proxy, use the up/down arrow keys.)

- Use a single or multiplex microphone arrangement in the auditorium. A typical scenario is four mics feeding into a multiplexer.
- Use the RTA on the AP20 (Third Octave EQ screen) with the mic or multiplexer plugged into the AP20 rear panel, or use a separate RTA (in the auditorium) with the mic or multiplexer plugged into the RTA, which plugs into your laptop.

☑ Using a separate RTA in the auditorium avoids the necessity of running cables through the projection booth port and down into the theater. Use a third-party VNC software application on your laptop to establish a wireless connection with the AP20, and perform the EQ as described in the steps below.

- If the microphone is connected to the AP20, select **Input Mic** in the Third Octave EQ screen. If the microphone is connected to the RTA in the auditorium, select **Input LineIn.**

1. Select a channel to start with (for example: the L channel).
2. Turn ON **Pink Noise**.
3. Turn ON 1/3 Octave EQ.

4. Examine the response on the RTA (whichever RTA the microphone is attached to).
5. Turn on **XCurve Display**. Try to tune the frequency pattern to the XCurve. If the pattern does not conform – there is a hole or a peak or other variance – then select the frequency that needs adjusting, and push it down or pull it up.
6. Select a frequency in the lower panel by touching the yellow bar for the specific frequency.
7. Use the adjustment knob to adjust the frequency up or down.
8. Repeat the above for each channel except the subwoofer (LFE).

2.10.2.1A note about XCurve

XCurve is the roll-off; it is how theaters are supposed to be tuned. The XCurve is flat all the way out to 2K, and then there is a 3dB roll-off per octave. The **Third Octave EQ** screen offers three ways to look at the XCurve. XCurve is appropriate for both film playback and digital cinema.

- **XCurve Off** is just the natural display that gives you a flat response.
- **XCurve Offset** adds the 3dB per octave roll off starting at 2K. When in this mode you should adjust the response flat.
- **XCurve Display** (shown below) shows the guidelines. The two narrow lines are the plus and minus range of 3dB that is allowable. The heavier center line is the optimal level.

The scale (y-axis) on the left edge of the RTA is adjustable. Touch the scale and it will cycle through several different scales. You can also adjust the scale by touching the **RTA Options** button, which displays a control dialog.

Menu (System) > Formats > EQ Setup > Third Octave EQ > RTA Options > XCurve Display

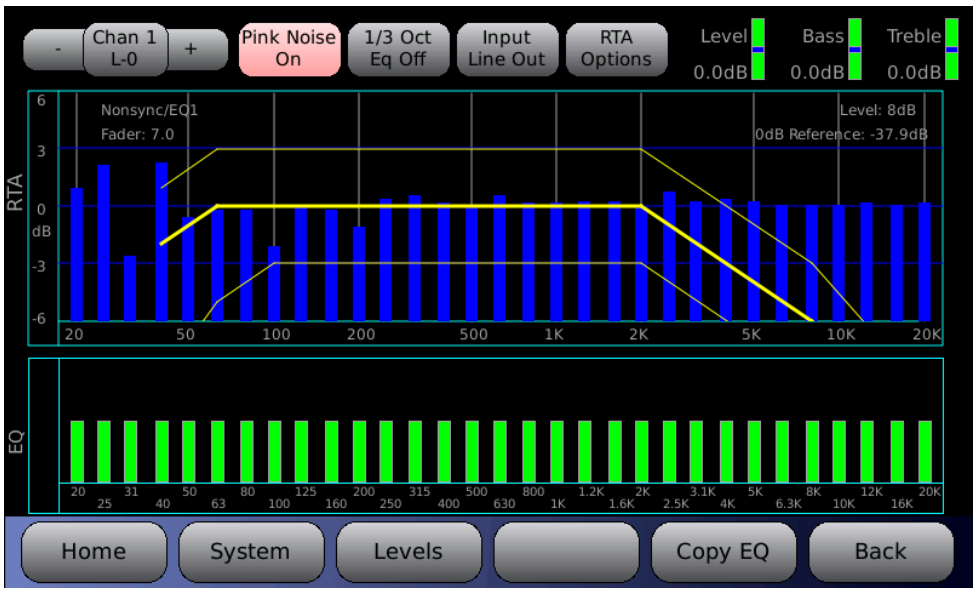


Figure 18. XCurve Display at +/- 6dB Scale

2.10.2.2A note about Third Octave EQ

Third Octave EQ is also a useful tool if you examine Input LineOut (shown below). It shows the Pink Noise output with any/all filters piled on top. You can see the result of all equalization adjustments – the Dirac, the 1/3 Octave – that will show up on the RTA as distortions.

Menu > Formats > EQ Setup > Third Octave EQ > Input LineOut

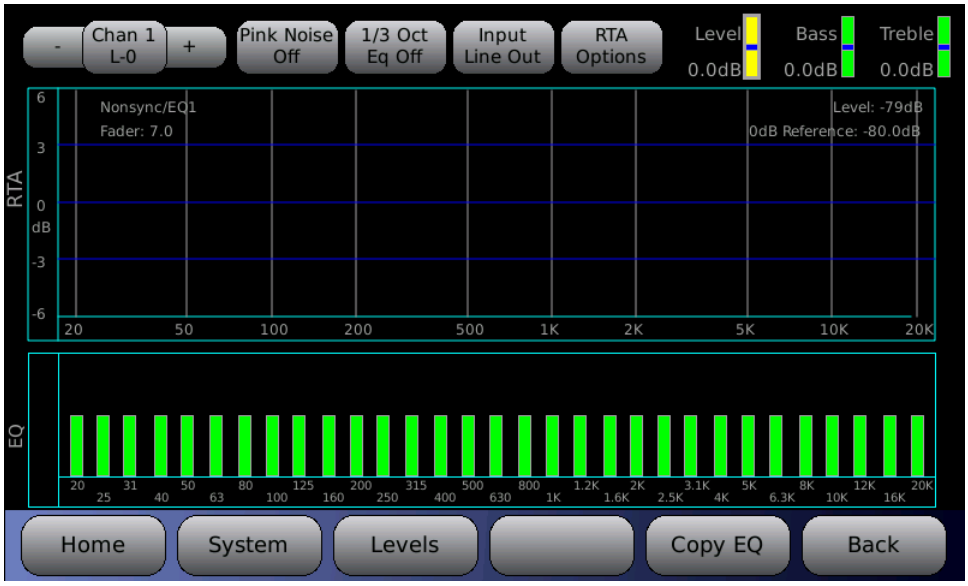


Figure 19. Input LineOut Selected

2.11 Subwoofer EQ – Parametric EQ

The AP20 features Parametric EQ on every channel. Parametric EQ is an optional adjustment and is in addition to 1/3 Octave EQ. It is only available with low frequencies and offers more control than 1/3 Octave EQ. The Parametric EQ screen looks similar to the 1/3 Octave EQ screen but displays a frequency range from 20 to 200Hz only. The screen has the same selections (Channel select, etc.) but also has controls for three filters.

Menu (System) > Formats > Audio EQ Setup > Parametric Equalization

The three filters can be configured regarding Q and Frequency, and are either enabled or disabled.

- To select a filter, highlight the **Filter** button and rotate the adjustment knob to select from the three filters.
- To adjust **Q**, **Freq**, or to **enable/disable**, select the control and rotate the adjustment knob.

Filter disabled in effect turns off Parametric EQ.

Figure 20. Parametric EQ Screen, Filter Enabled

2.12 Copy EQ Set to Another EQ Set

This screen is used to copy the EQ settings for all channels to a new EQ set under a new name. After equalizing all the channels, copy these settings to create another EQ (with a new name).

Menu (System) > Formats > Audio EQ Setup > Edit EQs

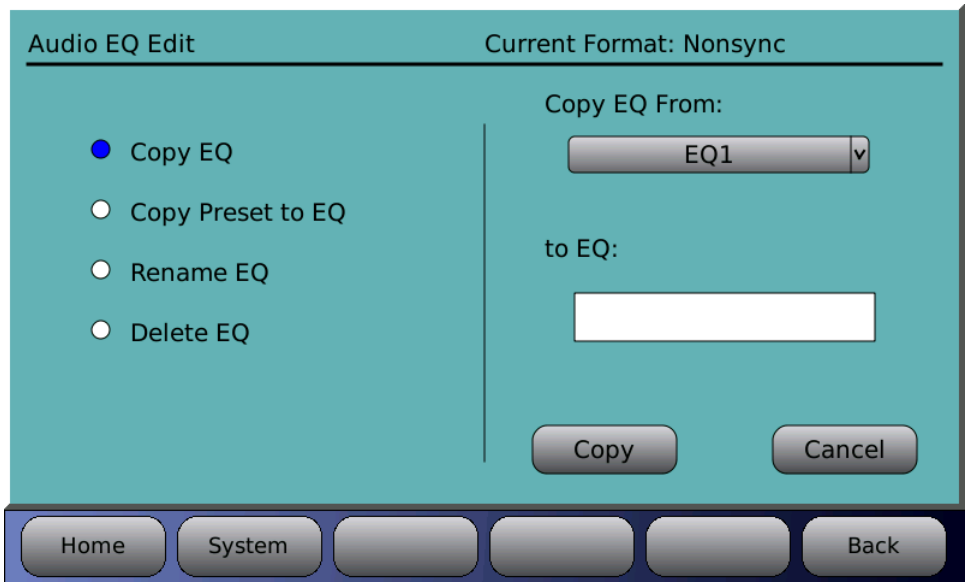


Figure 21. Copy EQ Settings

Use the **Copy EQ** function, accessible from the **Edit EQs** menu to copy the EQ set. Select the **Copy EQ From** set (select from the pulldown), then in the **to EQ** field**,** enter a new name for the EQ set, then click the **Copy** button.

2.13 Final Adjustments

After performing the EQ, take another SPL level reading. If the SPL reading has changed, use the Level control (Third Octave EQ screen) to raise or lower to the proper SPL level for each channel (see Table 10 on page 37).

2.14 Copy Format

When a format has been configured, you may want to copy it to the next format, as a starting point, to save time in configuring the next format. For details, see *Edit Formats,* page 62.

Menu (System) > Formats > Edit Formats > Copy Format

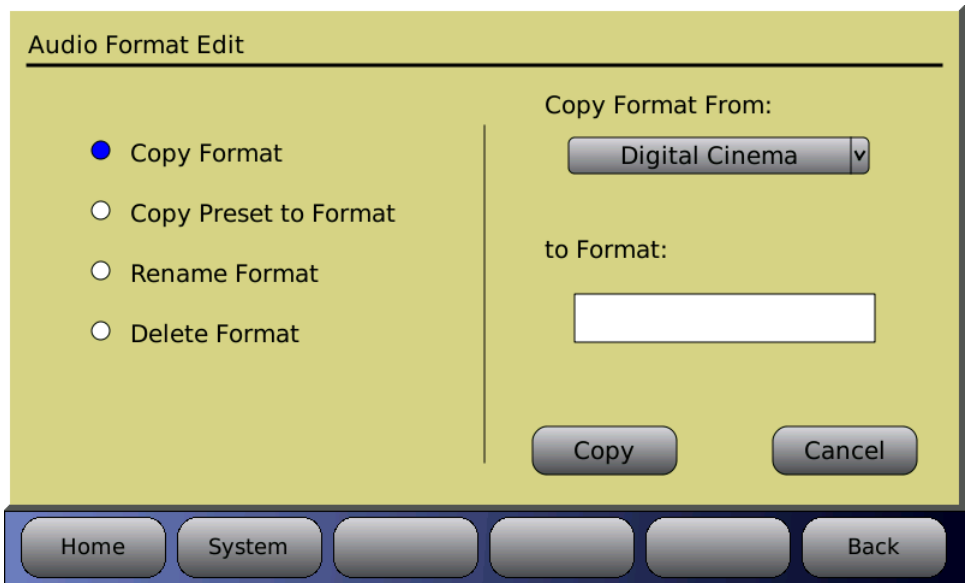


Figure 22. Audio Format Edit, Copy Format

For details about Copy Preset to Format, see 2.8.1 *Preset Formats*, page 30.

2.15 Setting up Multiple Screens

After setting up one screen (auditorium) you can copy the setup parameters including format names, channel assignments and EQ settings to other screens. This minimizes the time required for installing similar theaters since many of the values may be the same.

To do this, save the setup configuration on a memory stick (USB Flash drive), then use the saved setup to copy to the AP20 for the next screen, since many or all the values will be the same.

Menu (System) > System Setup > USB Save/Restore > Save on USB > Master Configuration

See Saving and Restoring Configuration Files, page 55 for more details.

2.16 Using Dirac Live® to Tune the Auditorium

See the *Dirac Live® Theater Setup Guide* for detailed instructions. The Dirac Live® application is a separate tool, available from Datasat Digital Entertainment but not supplied with the AP20 processor.

2.17 AP20 Playback Sound Check

After installing and setting up the unit—or doing a maintenance check—it is a good idea to play content and stand in the theater while listening to the first few minutes of the movie. Check for the following

- The overall sound level is comfortable and balanced.
- The soundtrack quality is excellent and does not include extraneous noise.
- The dialog is in sync with the picture being projected.
- The surround speakers are heard at the correct level. (Please note that not all scenes will have surround material.)

To adjust the overall sound level in the theater, adjust the main fader on the audio processor.

3.0 How-To Procedures for Setup

This table provides a list of setup activities and provides instructions or a link to instructions elsewhere in this manual.

Table 11. Setup Procedures

ACTIVITY	INSTRUCTIONS
Assign a Format button	See 4.3.4 Assign Format Buttons, page 63.
Unassign / delete a Format button	See 4.3.4 Assign Format Buttons, page 63 – select the button and assign a “blank” format to it.
Configure power-on Format (Startup Format)	See 4.3.2 Startup Format, page 62.
Assign fader level to a Format or set global fader for all Formats	See 4.2 System Setup Screen, page 50 topic “Fader Control”, and see 4.2.1 Assign Fader Level to a Format, page 51.
Create a Format	See 3.1 Example: Creating a Format, below. For detailed information about Formats, see 2.7 About Formats, page 28.
Assign Channel Names and Vu meters	See 4.3.8.3 Channel Names, page 78.
Set Non-sync Level and Non-sync Routing	See 4.3.6.3 NonSync Level and Routing, page 67. See also 4.2.1 Assign Fader Level to a Format, page 51.
USB Save / Restore / Load	See 4.2.3 Saving and Restoring Configuration Files, page 55.
Load a personalized screen saver	See 4.2.3 Saving and Restoring Configuration Files, page 55. To set screensaver time and mode, see 4.2 System Setup Screen, page 50.
Set up Global Audio Delay for a format	See 4.3.6.1 Global Delay, page 66.
Set up Multiple Surround Channels	For digital cinema format, see 4.3.6.2 Extended Surround Options, page 66.

Set up HDMI option	For digital cinema format, see HDMI Options, page 69
View AP20 System information	See 4.2.6 System Info, page 60.
Update AP20 software	See 4.2.2 Updating Your AP20 Software, page 53.

3.1 Example: Creating a Format

Prior to creating a format, it is necessary to identify the following:

- Input source
- Format option
- EQ set up
- Output channel profile name

The following example describes how to create "non-sync 2" format, with stereo input, global delay of 0 ms, assignment of eq and audio profile.

1. Open the Audio Format Setup screen.

   Menu (System) > Formats

2. Next select **Edit Formats**. The Audio Format Edit screen displays.
3. On the left side choose the Copy Format radio button.
4. Under **Copy Format From** select **Nonsync**.
5. Touch the blank box under **to Format**. A keyboard will appear.
   Type in *Nonsync 2*, then select **OK**. The Audio Format Edit screen will return.
6. Touch the **Copy** button.

The screen will now change to Audio Format Setup.

7. Select **Assign Buttons** and the Format Button Assignments screen will display. Select an unused button number from the **Buttons** drop down menu. In this example select button 3.
8. Next from the **Assign** drop down list, select **Nonsync 2**. Then touch the **Assign** button on the right side of the screen. In the Current Assignments listing on the screen, Button 3 will now be assigned to **Nonsync 2**.
9. At the bottom of the screen, touch the **Formats** button to return to the Audio Format Setup screen.
10. Select the **Input Source** button. This will open the Input Select screen.
    The right side of the screen should display "**Current Format: Nonsync2**".
    If it is not displayed, return to the Audio Format Setup screen by selecting the **Format** button and selecting **Nonsync 2** in the **Current Audio Format** drop down menu. Return to the Input Select screen by touching the **Input Source** button.
11. In the Analog input section, touch the **NonSync1 L/R** option to change it to **NonSync2 L/R**. Then touch the **Formats** button to return to the Audio Format Setup screen.
12. In the Audio Format Setup screen, select the **Format Options** button to go to the Format Options screen.

13. In the Format Options screen, you can (if necessary) set the **Global Delay** for the selected format.
    Select the **Nonsync Level and Routing** button to change input gain and routing of the Nonsync signal.
    Touch the **Formats** button to return to the Audio Format Setup screen.

4.0 Setup Menus

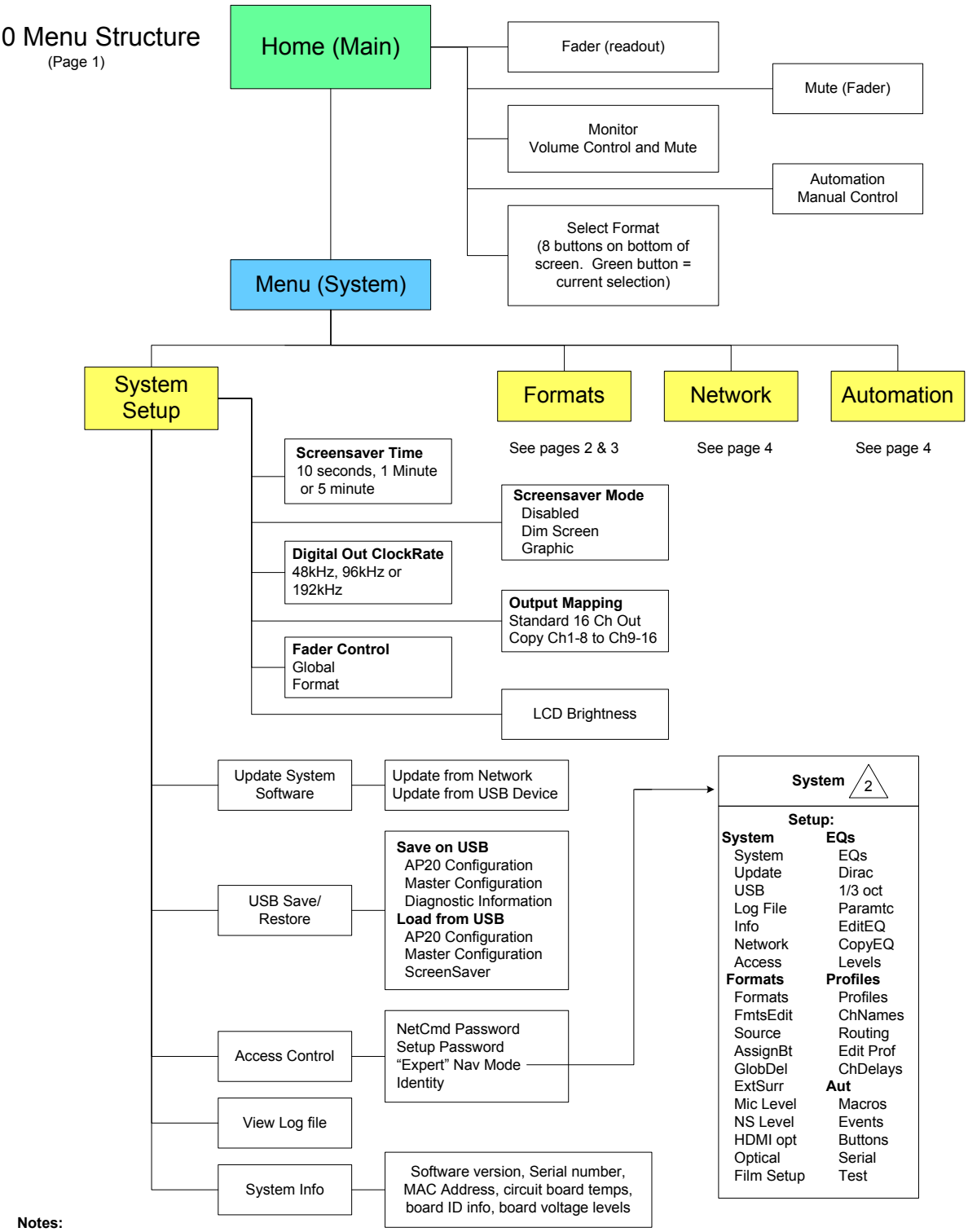
On the next three pages, you will find a menu diagram for the AP20. This chapter contains a detailed of all the screens under the "Menu" selection of the home page. Refer to section 1.4 for all operations under the "Home" screen.

For information on AP20 System Setup configurations, see section 4.2.
For information on Audio Format setup and changes, see section 4.3.
For information on Network connections and changes, see section 4.4.
For information on Automation events, cues, macros and assigning buttons, see section 4.5.

The full menu structure of the AP20 is shown on the next four pages.

AP20 Menu Structure

(Page 1)



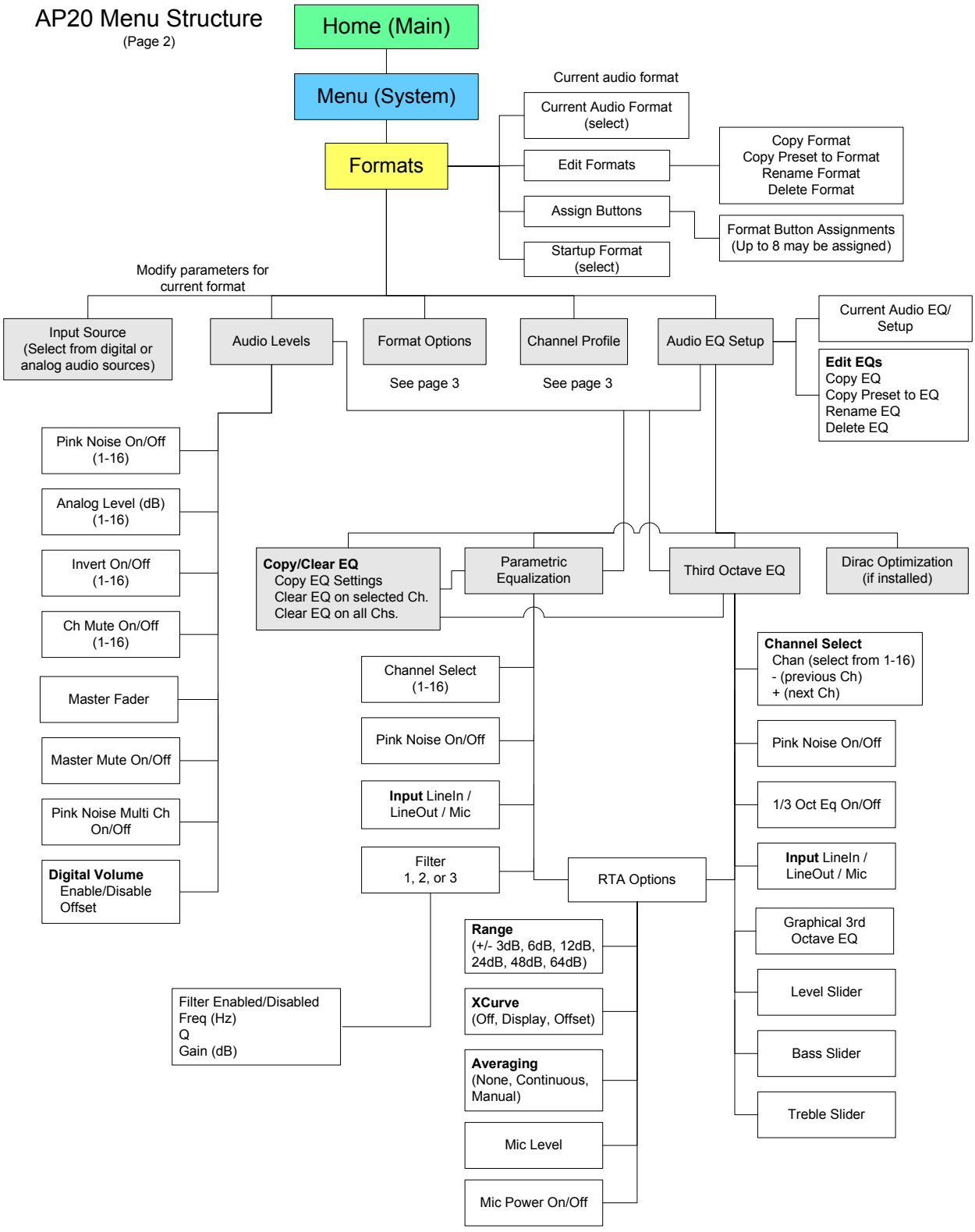
Notes:

1. Navigating the menus: When AP20 is first powered the home screen will appear. The "Menu" button will access the "System Setup" screen. After navigating through sub-menus, selecting the "System" button will return you to the "System Setup" screen.
   Selecting "Home" from a sub-menu will return to the home screen. If "Menu" is then selected, the AP20 will return to the last selected sub-menu.
   The "Back" button works like an internet browser, and may be used to return through the history of previously selected sub-menus.

2 When "Expert" navigation mode is enabled, the normal menu structure is replaced with a setup screen providing quick access to main menu buttons. Disable to return to normal menu structure.

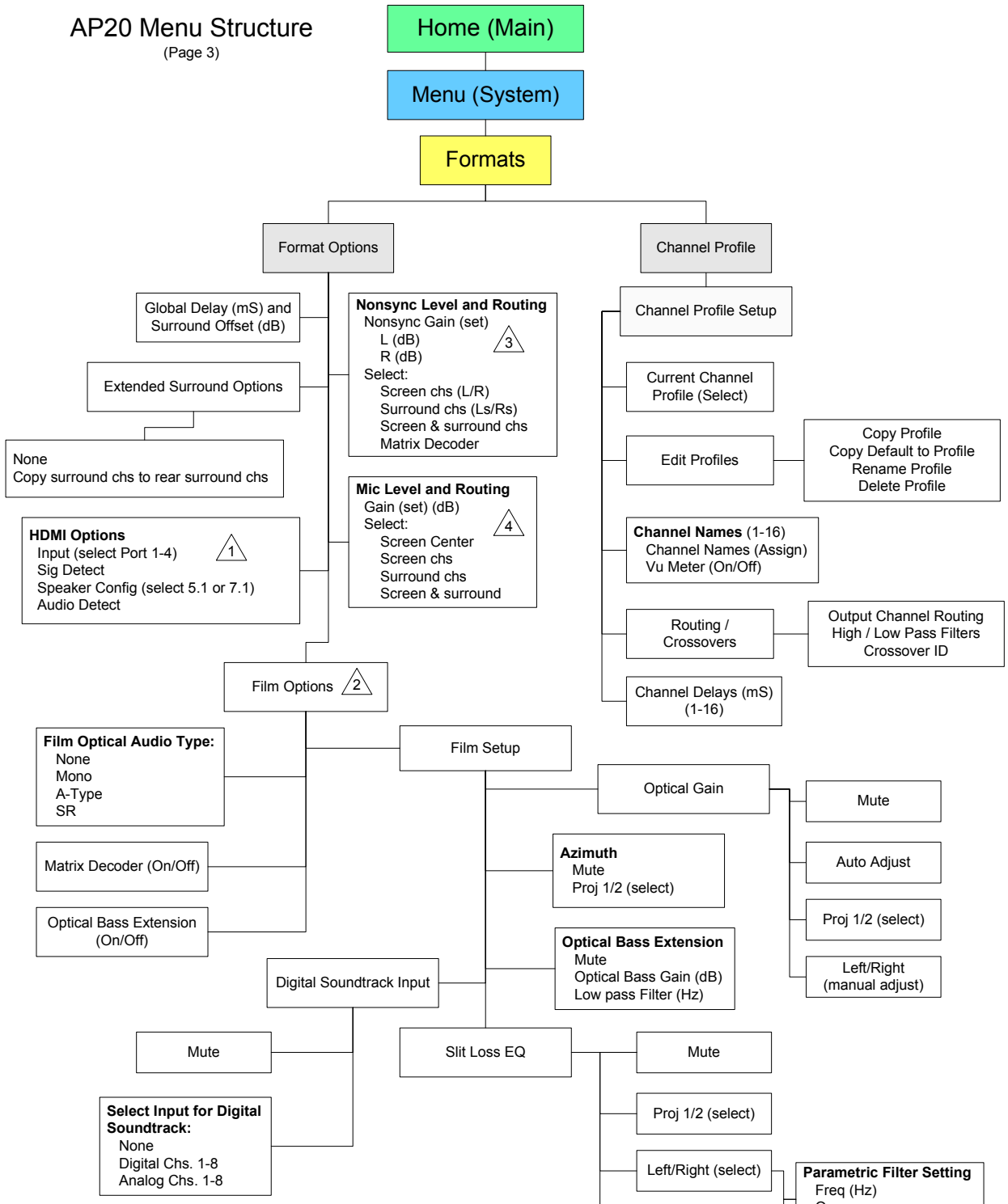
AP20 Menu Structure

(Page 2)



AP20 Menu Structure

(Page 3)

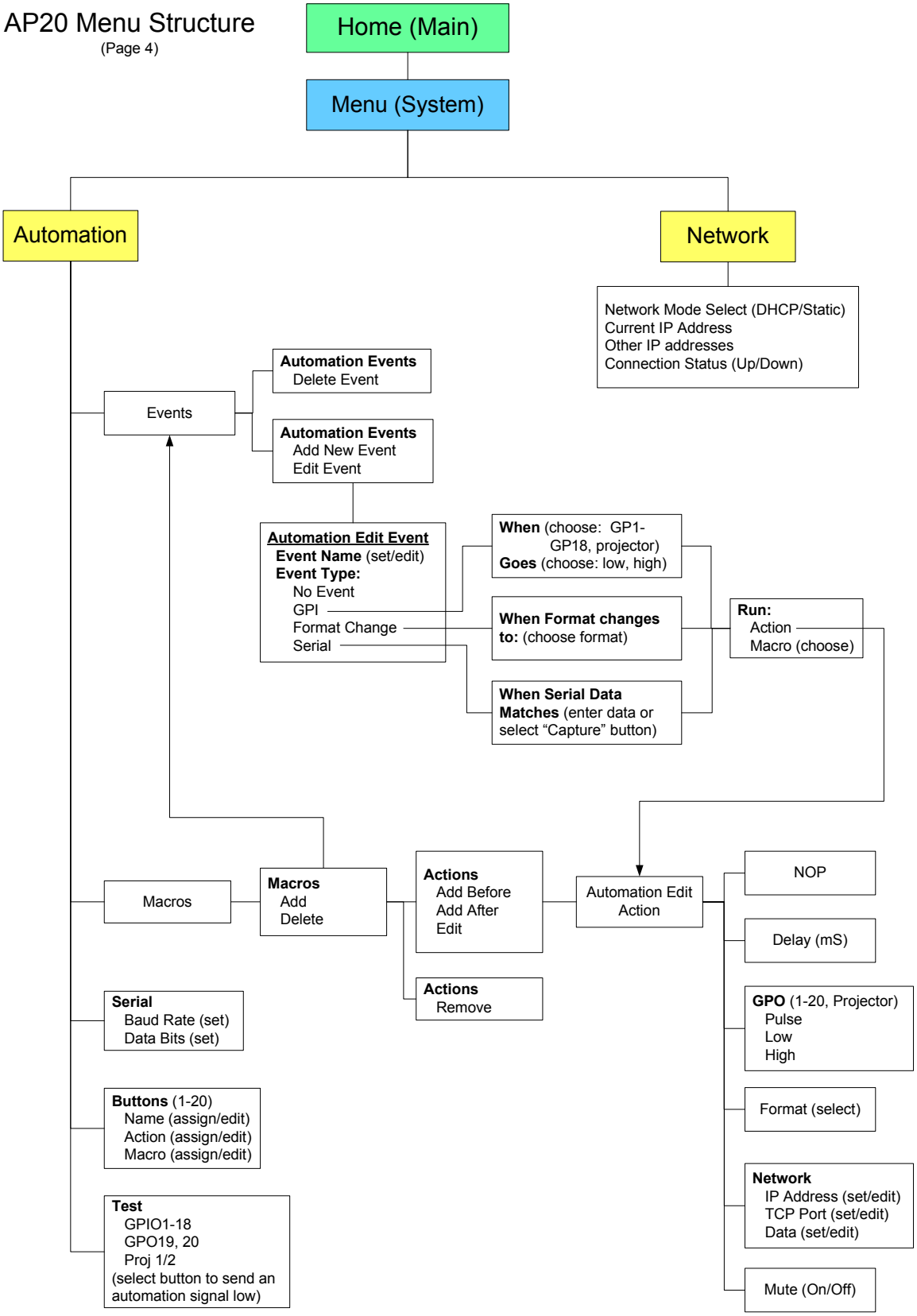


Notes:

1. HDMI Options menus only appear if "HDMI" is selected as the input.
2. Film Options menus only appear if the optional Optical Film Card (H338) is installed and "Optical" is selected as the input.
3. Nonsync Level and Routing Options menus only appear if "nonsync" is selected as the input.
4. Mic Level and Routing Options menus only appear if "mic pre" is selected as the input.

AP20 Menu Structure

(Page 4)



4.1 The Menu Button

The Menu Button is intended to be used by theater technicians only. Password protection is highly recommended.

Selecting the

button, after first powering up the AP20, will display the System Setup screen. This will provide access to the Setup menus.

In the next section, we will discuss in detail the options available through the menu bar. Pressing the **Home** button will take you back to the Home or Main screen.

4.2 System Setup Screen

Menu (System) > System Setup

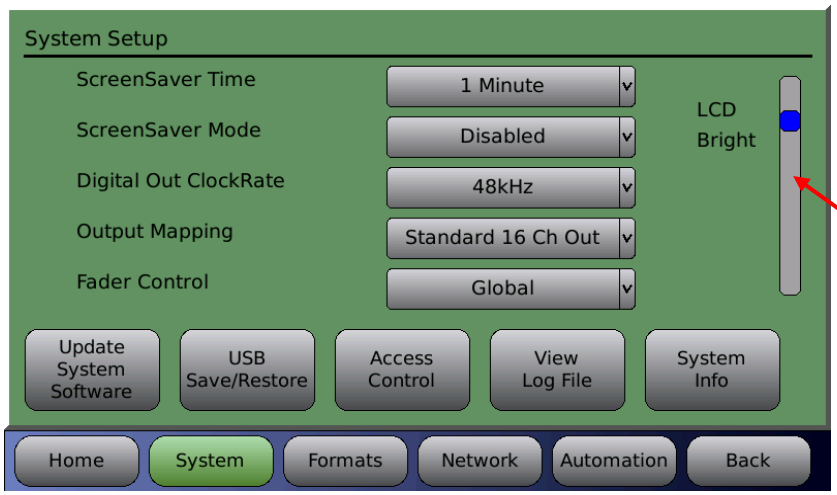


Figure 23. System Setup Screen

The following options are available directly from this screen.

ScreenSaver Time - Options include a 10 second delay, 1 minute delay, or 5 minute delay before screen saver initiates.

ScreenSaver Mode - Disabled, Dim Screen, or Graphic.

- Disabled will turn off the screen saver.
- Dim Screen will reduce the LCD brightness after the time specified in the ScreenSaver Time drop-down menu. Touching the screen or turning the adjustment knob will restore the brightness.
- Graphic mode uses the stored screen saver graphic. Touching the screen or turning the adjustment knob will restore the Home screen.

LCD Brightness -Use the on-screen slider or the adjustment knob to adjust the brightness of your LCD screen.

Using the buttons along the bottom of the System Setup screen, you can update the processor software via the internet, save and restore configurations through the USB interface, assign password protections, view a log file of system status messages, and check the status of the hardware in real time.

Digital Out ClockRate – Select a clock rate from one of the following options:

- 48 kHz
- 96 kHz
- 192 kHz

Output Mapping – Option to duplicate channels 1-8 on channels 9-16:

- **Standard 16 Ch Out** – Standard output channel assignments.
- **Copy Ch 1-8 to Ch 9-16** – The output of channels 1 through 8 will be *copied* to output channels 9 through 16 for both the Analog output connector and Digital output connector. Output channels 9-16 are not available if this option is used.

Fader Control – The Fader knob controls the playback level in the auditorium/theater. It can be set in either of two modes. (Note: This setting will not affect the main fader display on the Home screen.) Two options are available for controlling fader level behavior:

- **Global**: The fader level setting will affect all audio formats and will not be displayed in the Home screen. Example: while in a format the fader is adjusted from 5.0 to 6.0; when another format is selected the fader will remain at 6.0.
- **Format**: Fader level settings can be assigned to each audio format button on an individual basis. The fader level setting for the format will display at the top of the Home screen below the text "Fmt Fader". In this mode, if a fader level is adjusted for a specific format, it will not affect other formats. See next topic.

☑ **Note**: If the operator needs to preset the level for each audio format, then set up Fader Control to be in Format mode.

4.2.1 Assign Fader Level to a Format

To assign a specific fader level to a format button, do the following:

1. Select **Menu (System) > System Setup**, then in the **Fader Control** pulldown menu select **format**. Return to the main screen by selecting **Home** button.

2. Next, select the desired format button, in this example we will use Dig_In.

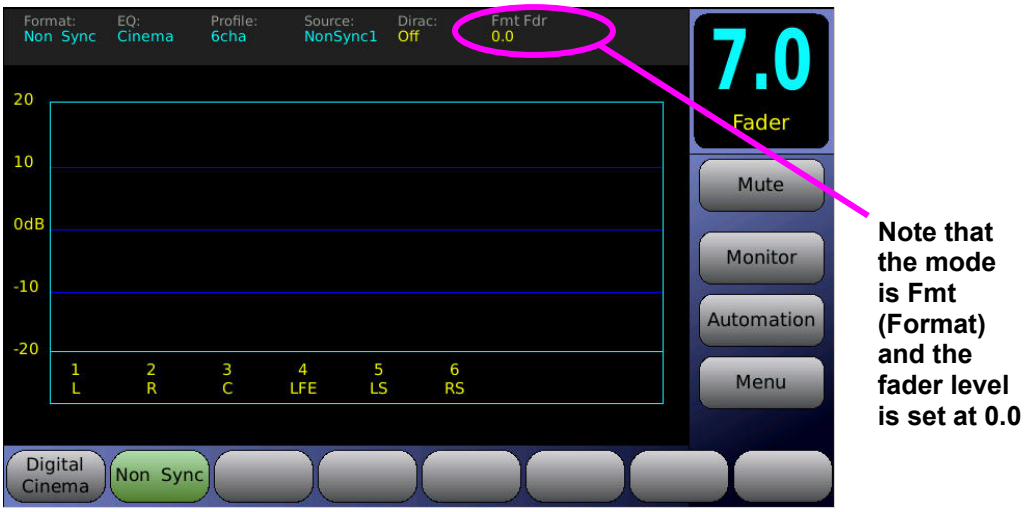


Figure 24. Setting Fader Level for a Format (1/3)

3. Next, adjust the fader volume to the desired level using the fader knob. The screen should appear as shown below.

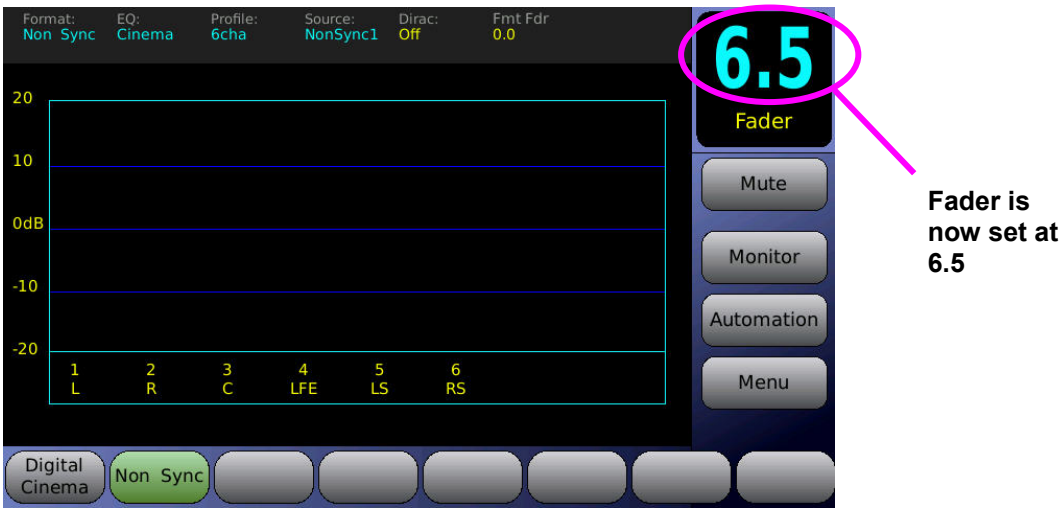


Figure 25. Setting Fader Level for a Format (2/3)

4. Finally, hold down the current format button (shown in green, Dig_In in this example) for about 5 seconds, until **Fmt Fader** (in yellow) matches the fader setting (6.7 in our example).

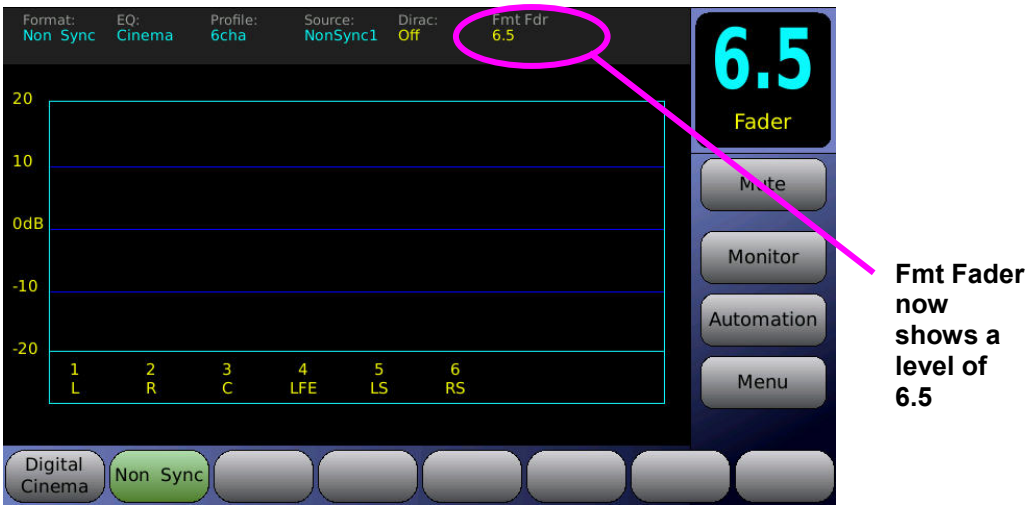


Figure 26. Setting Fader Level for a Format (3/3)

The **Digital In** audio format button is now set at 6.7 and will remain so until changed.

☑ **Note**: If you adjust the fader up/down for a selected format but do not do step 4 above (to change the Fmt Fader assignment), then when you leave and return to this format, it will assume the previously set Fmt Fader setting.

4.2.2 Updating Your AP20 Software

There are two ways you can update your software. The first way, is to connect to the servers at Datasat Digital Entertainment by selecting **Update From Network** and selecting the default update server. This requires that the AP20 be connected to the Internet.

The second way is by selecting the **Update From USB Device** option and pressing the Update button. This method requires you already to have a newer version of the software stored on a USB memory stick. Both methods are described in more detail below.

Menu (System) > System Setup > Update System Software

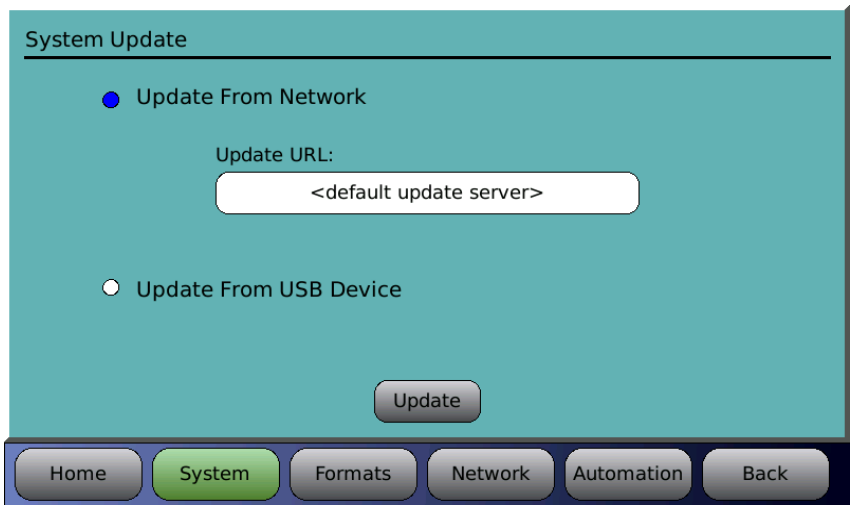


Figure 27. System Software Update Screen

4.2.2.1 Update System Software from Network

The following steps describe how to update your AP20 software automatically through the internet.

- Touching the button labeled **Update From Network** will display the screen shown in Figure 27.
- **Do not** change the field "Update URL" unless instructed by Datasat Customer Support.
- To log in to the servers at Datasat Digital Entertainment and download the latest version of the AP20 software, just touch the **Update** button.

☑ Note: Your AP20 must already have an active internet connection in order to update software through the internet.

Connection will take place automatically, and the following screen will appear.

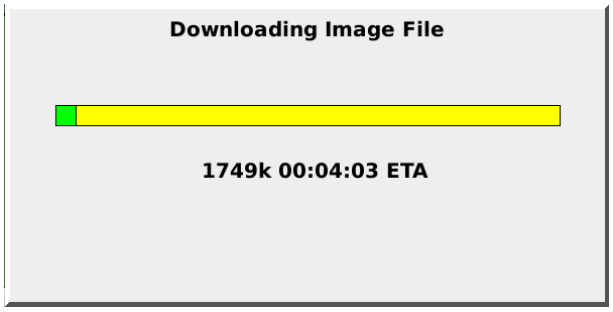


Figure 28. Downloading Software Update via Internet

Depending upon your connection speed, downloading, decompressing, and installing files could take anywhere from 10 minutes to less than a few minutes to complete. When it has finished with the installation process you will be prompted to reboot the AP20 by cycling the rear panel power switch. If you already have the latest version of software, the system will display a message stating: "System does not require update".

4.2.2.2 Update System Software from USB Device

If the AP20 is not connected to the Internet, you may update the software through a USB Flash drive.

1. First, obtain the software update file from the Datasat Digital Entertainment web page at http://www.datasatdigital.com. The update will be listed in the Support page.
2. Download the update file and copy to the root directory of the USB device. Be sure to leave the name as ap20.upd (no capital letters).
3. Then insert the Flash drive into the USB slot on the front panel, select the **Update From USB Device** option in Figure 26, and press the **Update** button.

☑ To roll back to a previous version, you must have the older version on a USB memory device. Insert the USB device and load the file just as you would if it were a new upgrade. Previous software revisions cannot be obtained through network upgrades from Datasat Digital Entertainment.

4.2.3 Saving and Restoring Configuration Files

You can save and restore standard configurations and master configurations to a USB Flash drive (memory stick). You can also save Diagnostic information (the system log file) for use in troubleshooting the system.

A *master configuration* is intended to be a template used to configure similar AP20s in a system. Copy the master configuration file from one AP20 and load it via USB into all AP20s.

☑ **Note**: Always be careful that any existing Master Configuration file on the USB will be overwritten when you save another one.

The *standard configuration* is specific to one AP20. This contains the unique third octave EQ, DiracEQ, formats, profile, automation, and global configurations needed for that AP20. The standard configuration file can only be loaded back onto the same AP20.

You can also load a screensaver of your choice via the USB port.

To perform any of these options, insert the USB Flash drive into the front panel and then press the **USB Save/Restore** button on the System Setup screen. (If no Flash drive is present, a message will appear prompting you to insert a USB device.)

Menu (System) > System Setup > USB Save/Restore

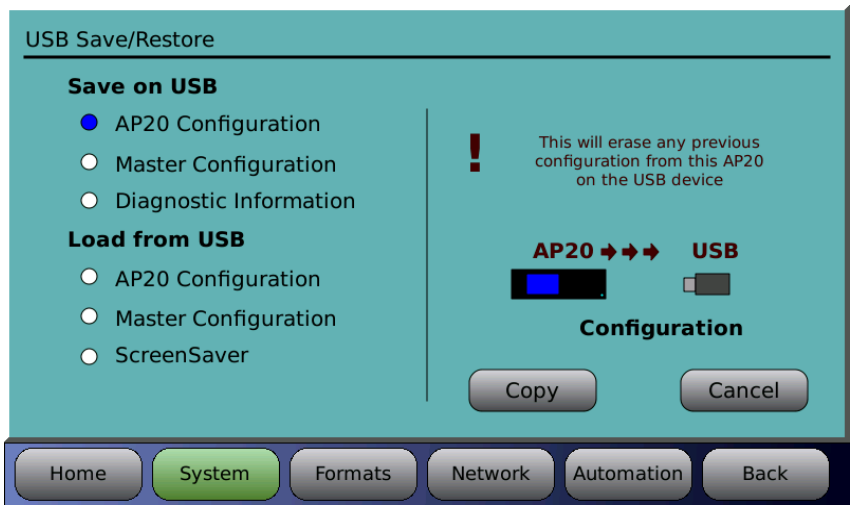


Figure 29. USB Save/Restore Screen

- Select an activity on the left, then touch **Copy** on the right.

The following options are available when using a USB Flash drive:

Table 12. USB Flash Drive Options

OPTION	RESULT
Save AP20 Config	Save AP20 configuration to USB device. This will erase from the USB device any previous configuration stored for this unit.
Save Master Config	Save AP20 configuration to USB device as MASTER configuration, which may be loaded onto other AP20 units. This will erase from the USB device any existing MASTER configuration.
Save Diagnostic Info	Save AP20 Diagnostic information to the USB device to facilitate troubleshooting.
Load AP20 Config	Copy AP20 configuration from USB device to system. This will ERASE the existing configuration on the AP20 and cause a system restart after loading the new configuration.
Load Master Config	Copy AP20 MASTER configuration from USB device to system. This will ERASE the existing configuration and cause a system restart after loading the new configuration.
Load ScreenSaver	Load a graphic image (ap20.jpg) from the USB device and use it as the ScreenSaver. The screensaver image is a 800 wide x 480 high jpeg image. The file must be named “ap20.jpg" and placed in the root directory of the USB device.

4.2.4 Access Control

Menu (System) > System Setup > Access Control

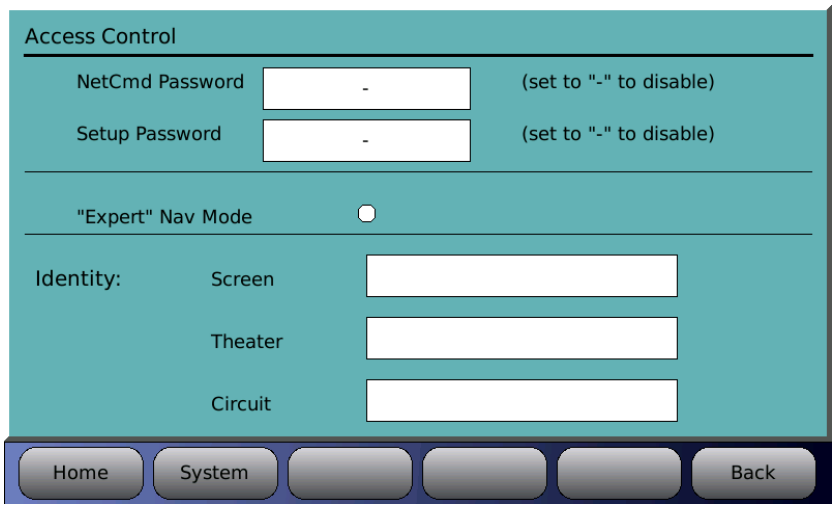


Figure 30. Access Control Screen

4.2.4.1 Passwords

By creating passwords, you can control user access to certain functions of the AP20.

The Netcmd password is the password used to control access to operator-level commands from remote network automation device or theater management system.

A Setup password will restrict users from access to the **System Setup** menu. A user without the correct password will not be able to make any changes to the system, formats, network, or automation. The same Setup password also allows VNC connection to the AP20.

The setup password needs to be entered only once after entering the setup menus. The AP20 must be turned off and back on again to reset the restriction to the setup menus.

If the password is lost and you cannot access the AP20, contact Datasat Digital Entertainment technical support.

Password restrictions take place as soon as the password is entered.

Passwords are case sensitive. You can enter upper case characters by using the shift button on the virtual keyboard displayed on the LCD. To remove password protection, clear the password by pressing the Clear button, then enter a hyphen “-“ and press “OK”.

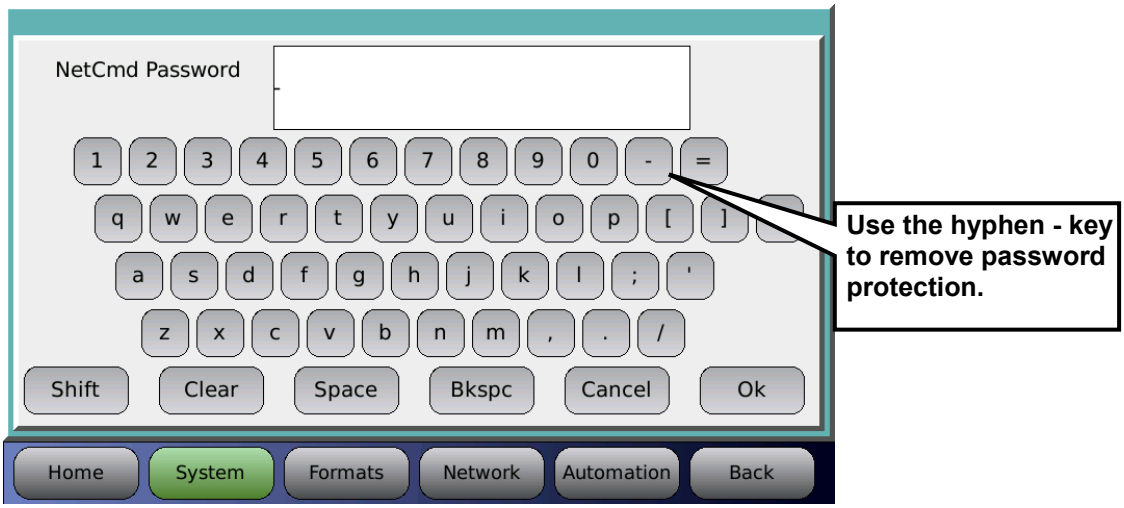


Figure 31. Net Command Virtual Keyboard

4.2.4.2 "Expert" Nav Mode

When "Expert" Navigation Mode is enabled, the normal AP20 menu structure is replaced with a setup screen that provides quick access to the main menu buttons. After enabling, the new screen appears when the "System" button is pressed. It must be disabled to return to the normal menu structure. Note: The "Home" screen function is not changed.

Figure 32. "Expert" Nav Mode

4.2.4.3 Identity

There are three text fields that can be entered into the AP20 to be used for identification of the AP20. These are labeled "Screen", "Theater", and "Circuit".

The text entered in the "Screen" field will be displayed in the bottom left corner of the home screen above the navigation menu. This information can be useful for verification of the correct AP20 when connecting through VNC.

The Screen, Theater, and Circuit information may be used by a remote theater management system or other custom application software.

4.2.5 View Log File

The log file (shown in Figure 32, below) is a complete listing of all software events that have taken place since the AP20 was last powered on. The listing includes changes made internally by the AP20 software, as well as user initiated system changes through the touch screen interface. You may scroll through the log file using the front panel adjustment knob.

The log file is helpful for debugging by DDE staff. You may be asked by the Datasat staff to save the log files on the USB Flash drive, to send for troubleshooting purposes.

Select **Save Diagnostic Info** in the section *Update System Software From USB Device* on page 55.

Menu (System) > System Setup > View Log File

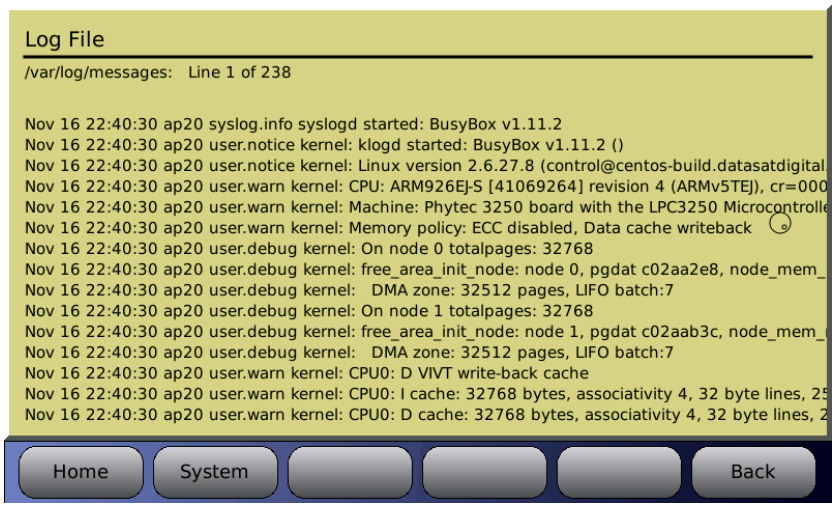


Figure 33. Log File Screen

4.2.6 System Info

From the system Setup screen, touch the System Info button. The **System Info** screen is shown below.

Menu (System) > System Setup > System Info

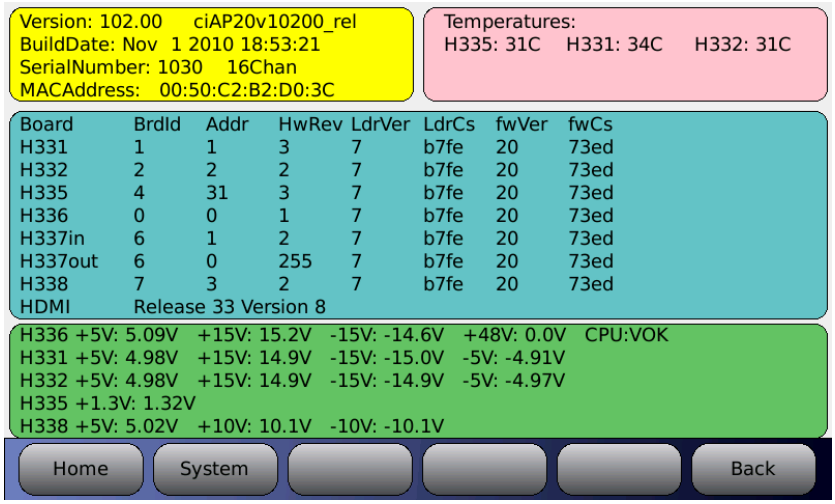


Figure 34. System Info Screen

4.2.7 Version, Serial Number, and MAC address

- The yellow portion displays software version and build date, unit serial number, and MAC address.

4.2.8 System Monitor

- The pink portion displays the internal board temperatures.
- The blue portion displays board information such as board ID, Address, hardware revision level, loader version, loader check-sum, firmware version, and firmware check-sum.
- The green portion displays the expected and actual bus voltages for each board. It is normal for the actual level to vary slightly from the expected. The background color for the expected and actual values will turn red should the actual voltage be out of the acceptable range.

4.3 Formats

Menu (System) > Formats

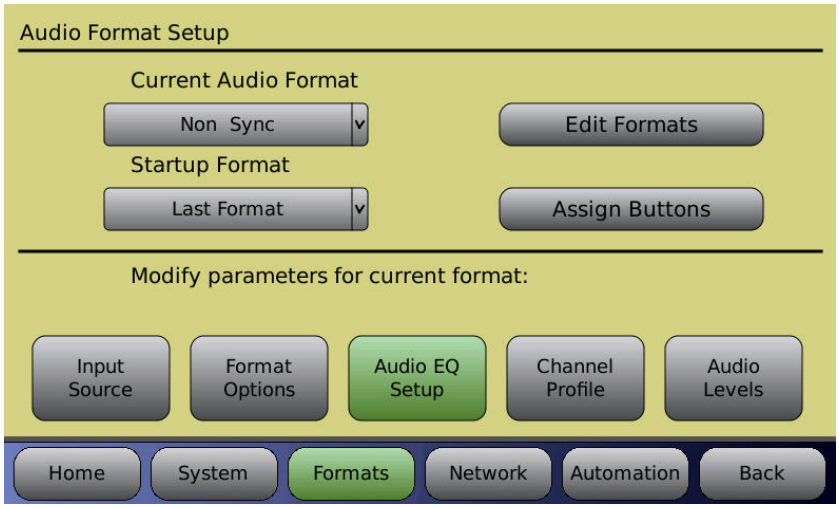


Figure 35. Audio Format Setup Screen

4.3.1 Current Audio Format

Select the format you wish to modify from the drop-down list of installed formats. Touch the drop down list to open it, then use the adjustment knob to scroll the list in cases where there are several formats. Touch the format name to select it. This will become the current format.

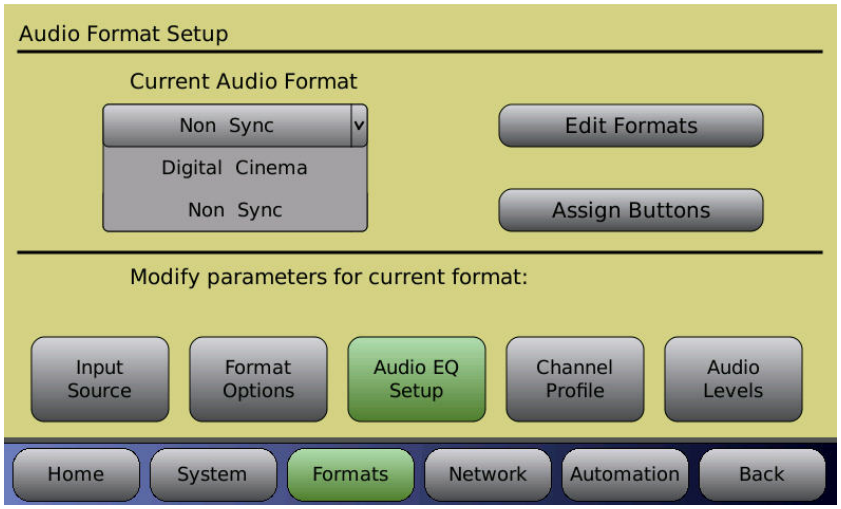


Figure 36. Select Current Audio Format

4.3.2 Startup Format

The Startup format is the default format selection when the AP20 is powered up. Select any defined format or **Last Format**. Touch the drop down list to open it, then select the format.

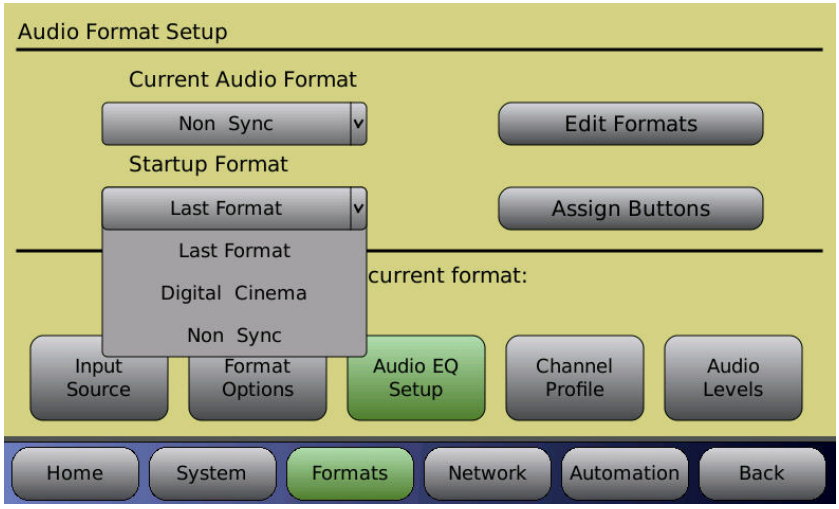


Figure 37. Select Startup Audio Format

4.3.3 Edit Formats

Menu (System) > Formats > Edit Formats

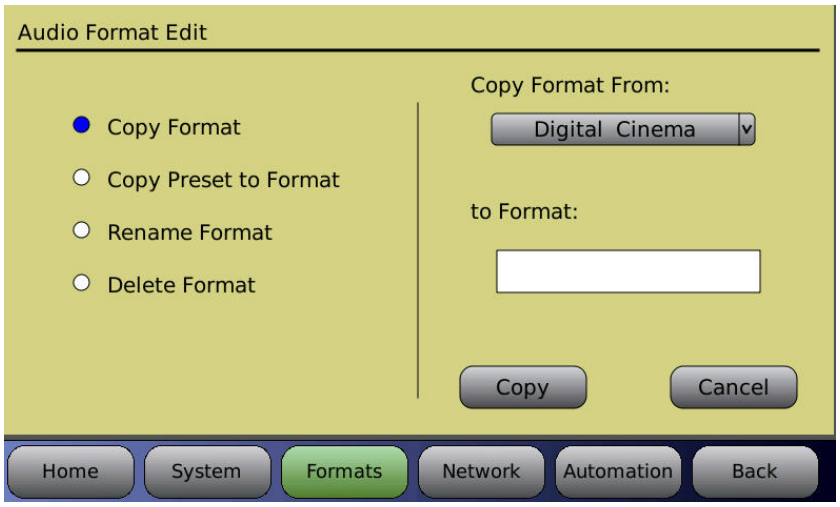


Figure 38. Audio Format Edit Screen

- **Copy Format** – Use an existing audio format as a template for a new one.
  Select the audio format you wish to copy from by selecting it from the **Copy Format From** drop down list. Then, touch the **to Format** box to bring up the virtual keyboard and enter a name for the new format.
  Press the **Copy** button to complete the process, or press **Cancel** to quit.
- **Copy Preset to Format** – Select one of the pre-installed audio formats in your AP20 and use it as a template for a new one. Select the format you wish to copy from by selecting it from the drop down box. Then, touch the "to Format" box to bring up the virtual keyboard

and enter a name for the new format. Press the **Copy** button to complete the process, or press **Cancel** to quit.

- **Rename Format** – Give an existing audio format a new name. Select an existing format from the drop-down list on the right side of the screen. Touch the "To" box to bring up the virtual keyboard and enter a new name for the format. Press the **Rename** button to complete the process, or press **Cancel** to quit.
  Note: Renaming the format will change any references, such as the button name or the format on **Macros** and **Events**.
- **Delete Format** – Select an existing audio format from the drop-down list on the right side of the screen. Press the **Delete** button to complete the process, or press **Cancel** to quit.

4.3.4 Assign Format Buttons

Menu (System) > Formats > Assign Buttons

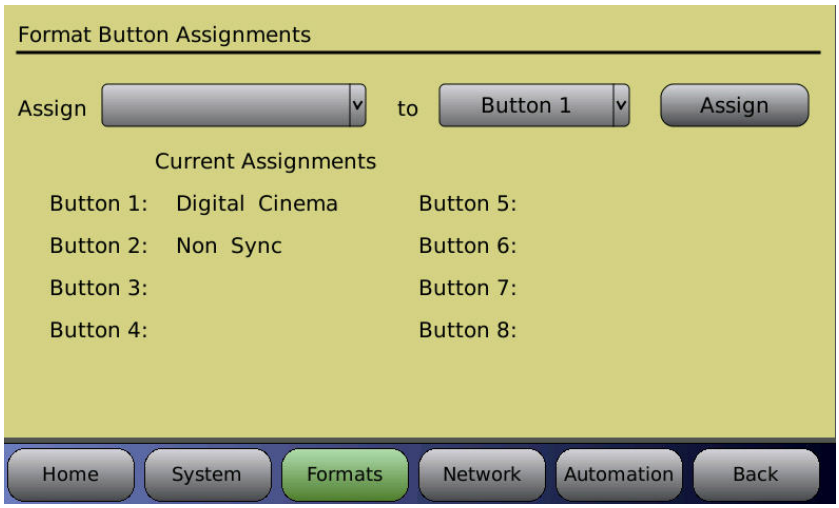


Figure 39. Format Button Assignments Screen

- Touch the **Assign** drop down list to open it, then select a format.
- Touch the **Button** drop down list to open it, then select a button number.
- Touch the **Assign** button.

The button assignment will now be listed in the **Current Assignments** listing in the screen above. Additionally, the audio format will now be assigned to the corresponding button location along the bottom of the Home screen as shown in Figure 40.

☑ **Note**: If the format name you wish to assign to a button does not appear in the Assign drop down list, you can add it using the **Edit Formats > Copy Format** function. See 2.14 *Copy Format*, page 42.

☑ **Note**: To unassign or delete a button assignment, select the button from the drop down list, then select the *blank* option from the **Assign** drop down list, then touch **Assign**. The Current Assignments listing will no longer show the button assignment.

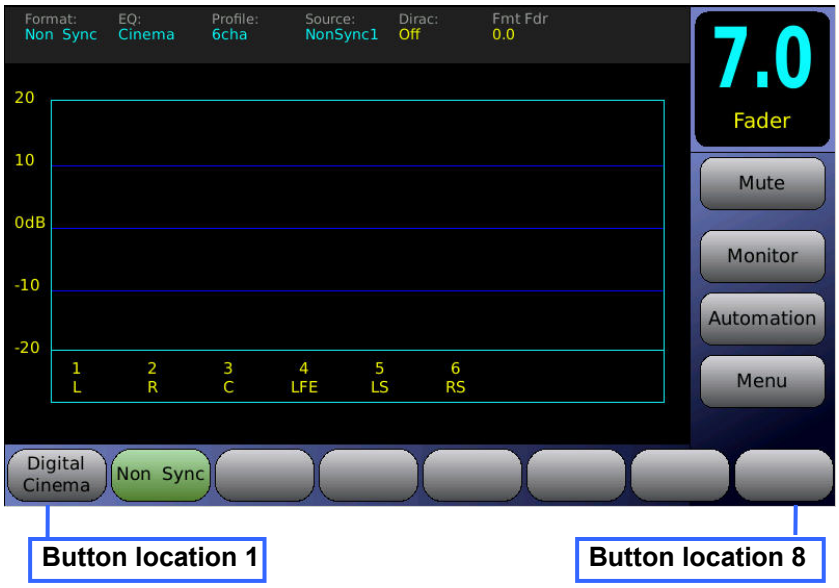


Figure 40. Format Button Locations

4.3.5 Input Source

Menu (System) > Formats > Input Source

Touch any of the button options below to select the Input source. There are Analog Input options and Digital Input options.

- If Nonsync is selected, touching the button again toggles the selection between Nonsync1 and Nonsync2.
- If Digital is selected, touching the button again toggles the selection between Digital Ch: 1 > 8, Digital Ch 9 > 16 and Digital Ch: 1 > 16.
- If HDMI is selected, touching the button again cycles the selection from HDMI-1 to HDMI-4.

See Table 13 (below) for a description of where input channels will be routed within the AP20.

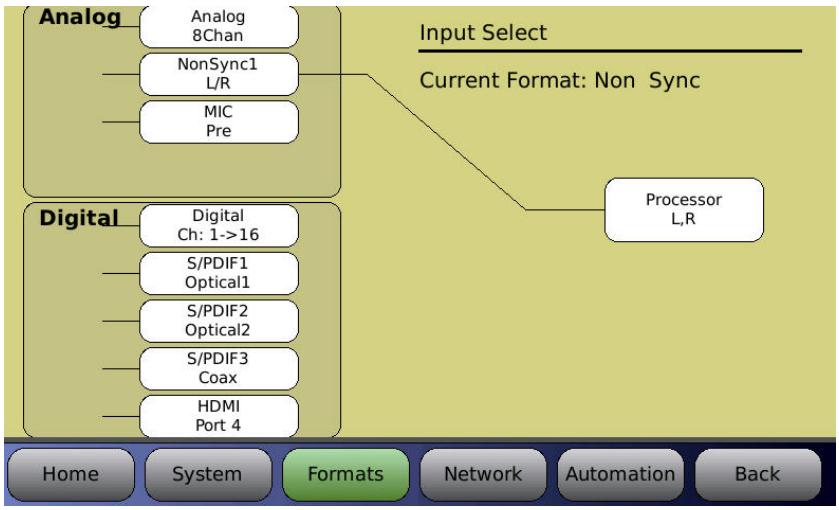


Figure 41. Input Source Screen

Table 13. Input Source Mapping

INPUT		OUTPUT
Analog 8 Channel		Processor Channel 1 → 8
NonSync1 L/R		Processor Channel 1 → 2
MIC Pre		Processor Channel 3 (Mic power off)
Optical (option, see appendix F)		Processor Channel 1 → 8
Digital Channel 1 → 16	**Maps to…**	Processor Channel 1 → 16
Digital Channel 9 → 16		Processor Channel 1 → 8
S/PDIF 1 Optical 1		Processor Channel 1 → 2
S/PDIF 2 Optical 2		Processor Channel 1 → 2
S/PDIF 3 Coax		Processor Channel 1 → 2
HDMI Port 4		Processor Channel 1 → 8

4.3.6 Format Options

The Format Options screen allows changes to Global Delay, Extended Surround Options, Nonsync levels and Routing, Mic level and routing, and Film options (if the optional Optical Film card (H338) is installed – see appendix F). It also provides feedback on the current Audio format.

The options on this screen will change according to the currently selected format, which will display in the upper right area of the screen.

Menu (System) > Formats > Format Options

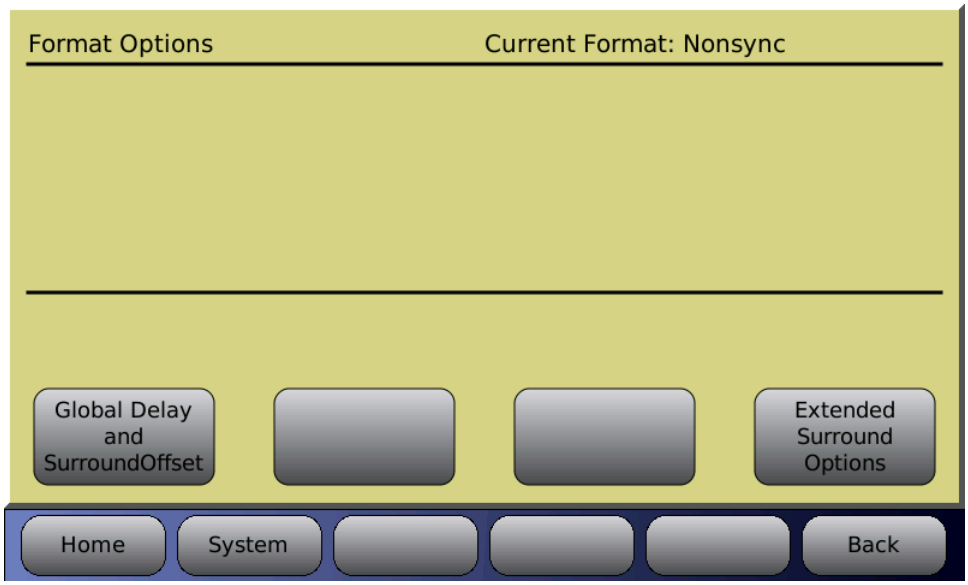


Figure 42. Format Options Screen

4.3.6.1 Global Delay and Surround Offset

Menu (System) > Formats > Format Options > Global Delay and Surround Offset

Global Delay: Audio can be delayed for a selected format, if necessary, to synchronize with a digital video projector. Use the adjustment knob to adjust the audio delay. Delay values increase by 1 ms increments up to a maximum of 999 ms.

Surround Offset: Use the adjustment knob to adjust between -10dB to +10dB offset.

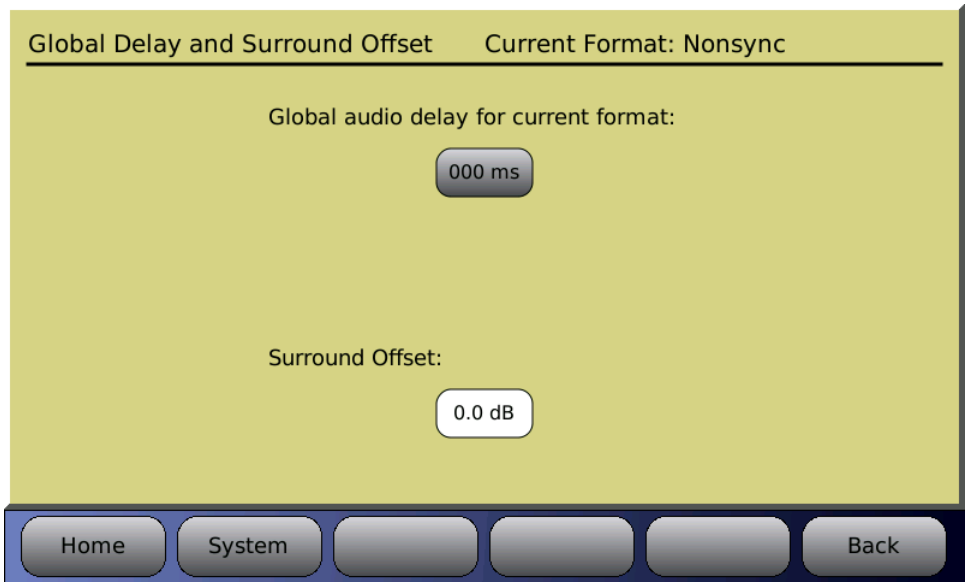


Figure 43. Global Delay and Surround Offset

Changes happen real-time. To discard a changed setting, you must set it back to where it was prior to the change.

4.3.6.2 Extended Surround Options

Menu (System) > Formats > Format Options > Extended Surround Options

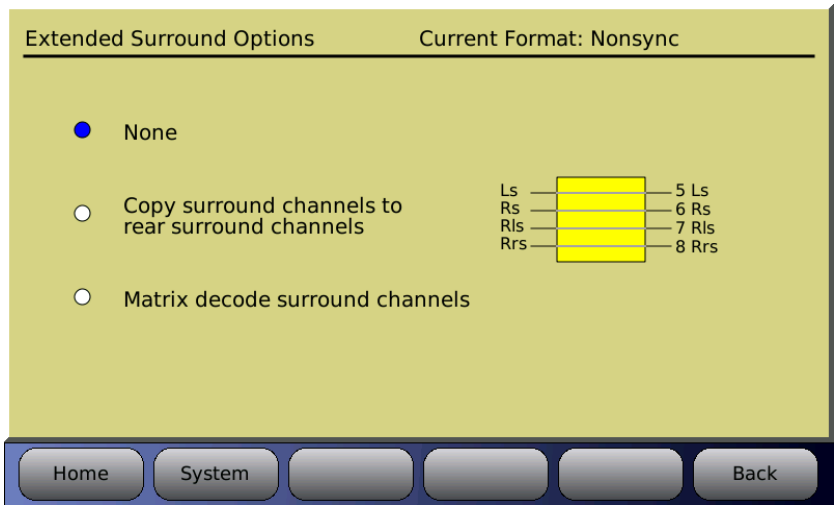


Figure 44. Extended Surround Options

Extended Surround options work with Nonsync, Mic, and Optical Film option. Options are:

- None – No surround option, signals are not re-routed.
- Copy surround channels to rear surround channels – Allows the surround channels to be copied to the Rear Surround channels (Ch7 and Ch8)
- Matrix decode surround channels – The option to matrix decode the surround channels to the Rear Surround channels is available for 8-channel analog input and 8/16 channel digital inputs.

4.3.6.3 NonSync Level and Routing

This screen is available for Nonsync input source only.

Menu (System) > Formats > Format Options > NonSync Level and Routing

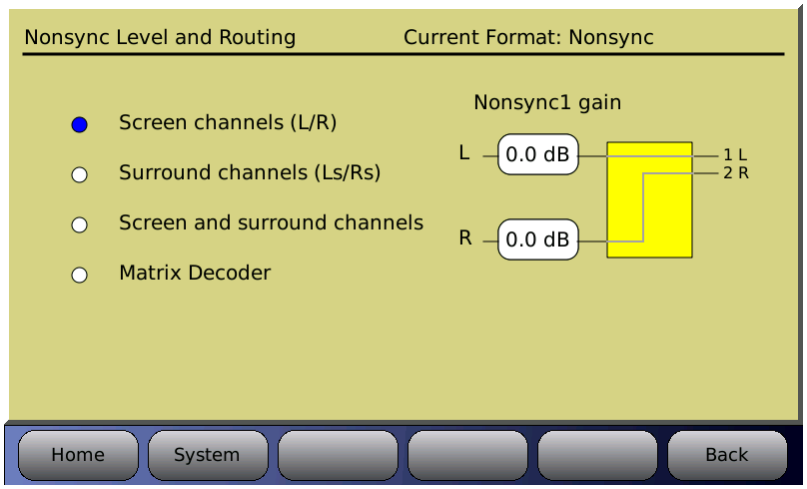


Figure 45. Nonsync Level & Routing

Adjust the input levels of Nonsync1 and Nonsync2 by selecting the box under L or R and turning the fader knob.

Inputs can be sent to:

- The Left and Right outputs
- The Left Surround and Right Surround outputs
- Left and Left Surround, plus Right and Right Surround
- Matrix Decoder

4.3.6.4 Mic Level and Routing

This screen is available for Mic Pre input source only.

Menu (System) > Formats > Format Options > Mic Level and Routing

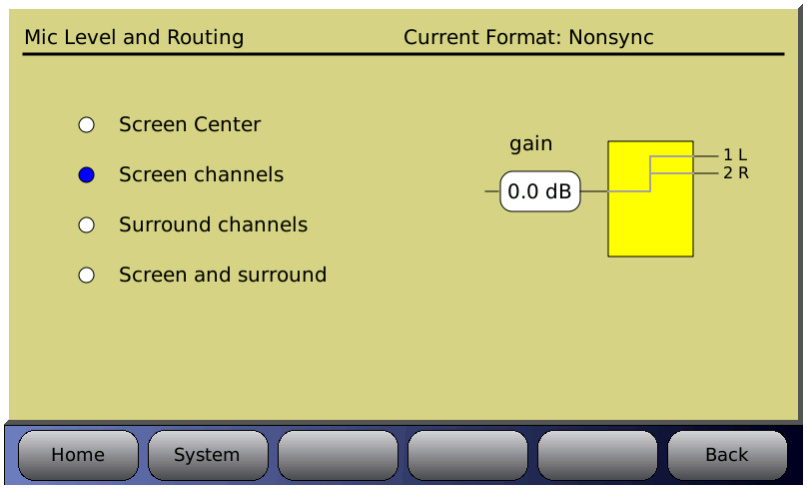


Figure 46. Mic Level & Routing

Adjust the Mic gain by selecting the box under gain and turning the fader knob.

Mic Input can be sent to:

- Screen Center
- Screen channels
- Surround channels
- Screen and surround

4.3.6.5 HDMI Options

This screen is available for HDMI input sources only.

Menu (System) > Formats > Format Options > HDMI Options

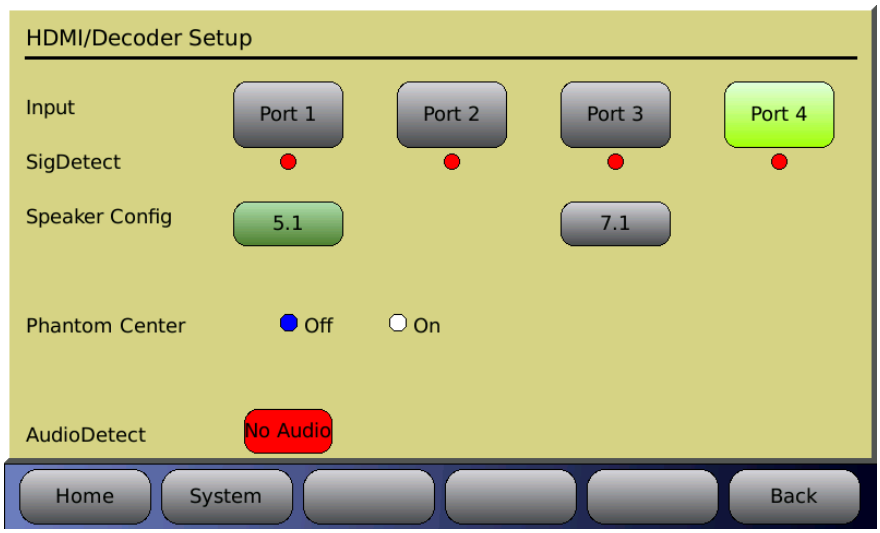


Figure 47. HDMI Options Screen

Select an input port for the HDMI signal and a speaker configuration. All ports will have the same speaker configuration.

4.3.7 EQ Setup

Menu (System) > Formats > Audio EQ Setup

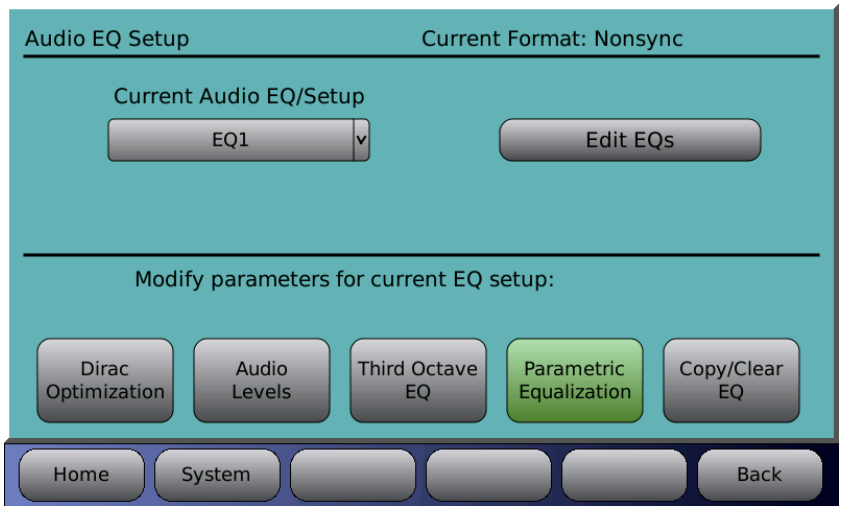


Figure 48. Audio EQ Setup Screen

4.3.7.1 Current Audio EQ

This drop-down list allows you to select from the list of available EQ setups. The selection will become the current audio equalization setup.

4.3.7.2 Edit EQs

Selecting the Edit EQs button from the Audio EQ Setup screen will open the screen below.

Menu (System) > Formats > Audio EQ > Edit EQs

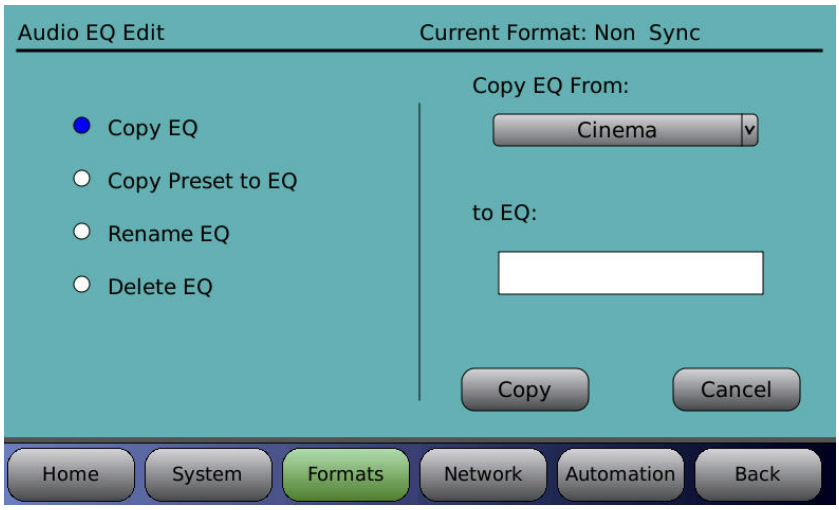


Figure 49. Audio EQ Edit Screen

Available options are:

- **Copy EQ** – Use an existing EQ setup as a template for a new one. Select the EQ you wish to copy from by selecting it from the drop down box. Then, touch the "to EQ" box to bring up the virtual keyboard and enter a name for the new EQ. Press the **Copy** button to complete the process, or press **Cancel** to quit.
- **Copy Preset to EQ** – Select a preset EQ setup and use it as a template for a new one. Press the **Copy** button to complete the process, or press **Cancel** to quit.
- **Rename EQ** – Give an existing EQ setup a new name. Select an existing EQ setup from the drop-down list on the right side of the screen. Touch the "To" box to bring up the virtual keyboard and enter a new name for the EQ setup. Press the **Rename** button to complete the process, or press **Cancel** to quit.
  Note: The EQ name is changed for all formats that use the EQ.
- **Delete EQ** – Select an existing EQ setup from the drop-down list on the right side of the screen. Press the **Delete** button to complete the process, or press **Cancel** to quit.

4.3.7.3 Dirac Optimization

The Dirac Live setup procedure must be used to copy Dirac configuration setup files to the AP20 before this screen becomes functional. Ignore this screen if you are not using Dirac Live software to setup the AP20.

Menu (System) > Formats > Audio EQ Setup > Dirac Optimization

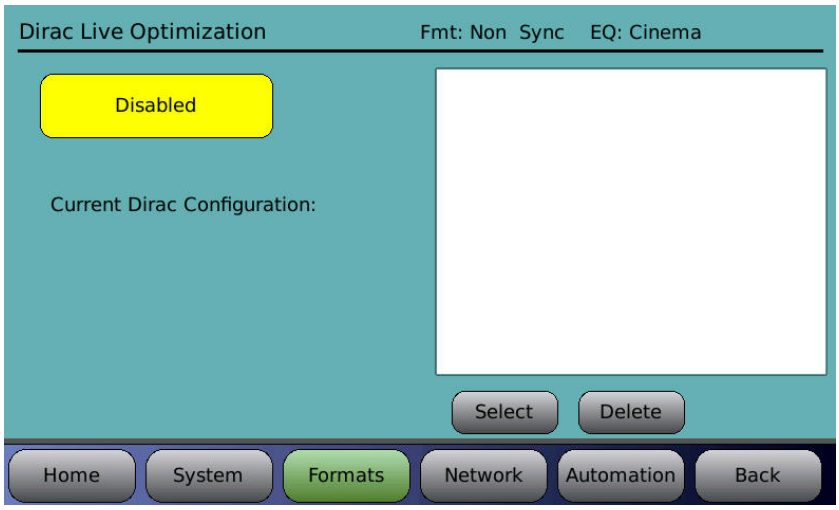


Figure 50. Dirac Optimization Screen

- Dirac Room Optimization Enabled/Disabled – Touching the button will toggle between enabling and disabling the Dirac Optimization.
- Current Dirac Configuration – Displays the name of the current Dirac configuration.
- Select – Select a configuration from the list of saved configurations in the box above, then touch the **Select** button. This configuration will now become the current Dirac configuration.
- Delete – Select a configuration from the list of saved configurations in the box above, then touch the **Delete** button. The configuration will be deleted from the list and from the memory of the AP20.

4.3.7.4 Third Octave EQ

Selecting the **Third Octave EQ** button from the **EQ Setup** screen will bring up a screen similar to that shown below. See the topic *A note about Third Octave EQ* in section 2.10 for a usage example.

Menu (System) > Formats > Audio EQ Setup > Third Octave EQ

In the upper left-hand portion of the RTA section, the current Format and current master fader value are shown. In the upper right-hand portion, the current audio level and the 0 dB reference are displayed.

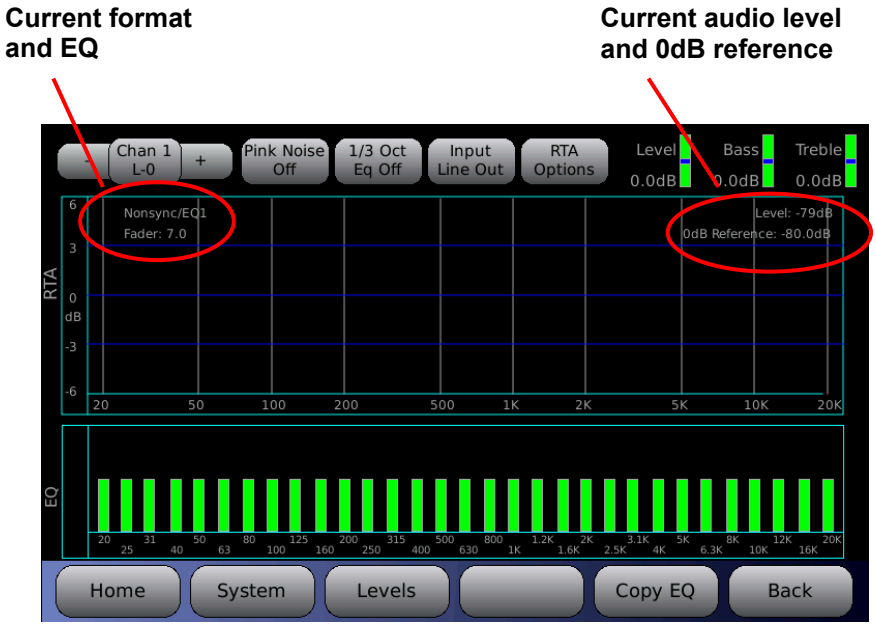


Figure 51. 1/3 Octave EQ Screen

- Channel Number Selection – Touch the **Chan** button to bring up a display of all sixteen channels. Select the channel you would like to equalize. You may also select the next channel by touching the "+" sign button to the right of the Chan button, or select the previous channel by touching the "-" sign button left of the Chan button.

Figure 52. Channel Number Selection Screen

- **Pink Noise** On/Off – Turns Pink Noise on or off.
- **1/3 Octave Eq**. On/Off – Turns 1/3 octave equalization on or off. This affects all channels.
- **Input** LineIn/LineOut/Mic – LineIn means that the signal source for the RTA is from the current input channel and does not have any processing (Dirac, EQ, etc). LineOut means that the signal source for the RTA is from the current output channel, so you would see the effects of the Dirac, EQ, etc. If you are using the internal RTA to check the room tune, then you would select LineIn.

☑ **Note**: When the Input field is **Mic** or **LineIn**, the RTA selects the input channel. The controls for EQ, bass, treble, and trim represent what is applied to input channel.
When the Input field is **LineOut** the RTA displays the output channel. Channel tuning should not be modified while the RTA input is in Line Out.

- RTA Options:

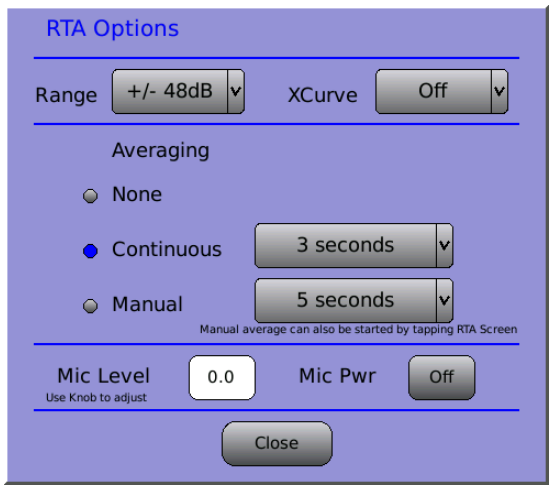


Figure 53. RTA Options Screen

  - **Range** – select a range for the RTA. Touch to open the drop down list, then use the adjustment knob to select. Choices begin at ±3dB, doubling each time to a maximum of ±64dB
  - **XCurve** Off/Display/Offset – See *A note about XCurve* in section 2.10.2.1 for details on the XCurve function.
  - **Averaging** – select None, Continuous (1 to 30 seconds), or Manual (5 to 30 seconds). Select times from drop down lists.
    - ☑ The averaging settings (for continuous or manual times) are persistent – the values are retained when the AP20 is cycled off/on.
    - ☑ Manual averaging can also be started by touching the RTA screen.
  - **Mic Level** – use the adjustment knob to change the microphone level
  - **Mic Pwr** On/Off
    - ☑ If Mic Power is ON, it remains ON when you leave this screen and go to other screens. However, Mic Power is automatically disabled when the AP20 resets. This Mic Power setting is independent of the Mic power that is part of Format.
- **Trim/Bass/Treble** adjustments – Touch the Trim, Bass, or Treble bar and adjust it using the adjustment knob.
- **Levels –** a button linking to the Audio Levels screen is provided on the menu bar. See 4.3.9 Audio Levels below.
- **Copy EQ -** a button linking to the Copy/Clear EQ screen is provided on the menu bar. See 0 Copy/Clear EQ below.

4.3.7.5 Parametric Equalization

Parametric filters allow you to adjust not only the gain or cut, but also the center frequency, and how wide or narrow the filter is. This allows you to tune in on room modes that show up in a spectrum analysis. Parametric filters allow you to add subjective bumps or dips to the filter.

Parametric EQ allows you to adjust the three (per channel) 20Hz to 200Hz parametric filters. Please see the topic *Subwoofer EQ – Parametric EQ* in section 2.11 for a detailed explanation of this function.

4.3.7.6 Copy/Clear EQ

Depending on the selection, the screen content will change.

- **Copy EQ Settings** (1/3 octave EQ bass, treble, and parametric filters) from one channel to another channel. Select the channel you wish to copy from by selecting it from the drop down list. Then, select the destination channel from the "To Channel" drop down list. Press the Copy button to complete the process, or press Cancel to quit.

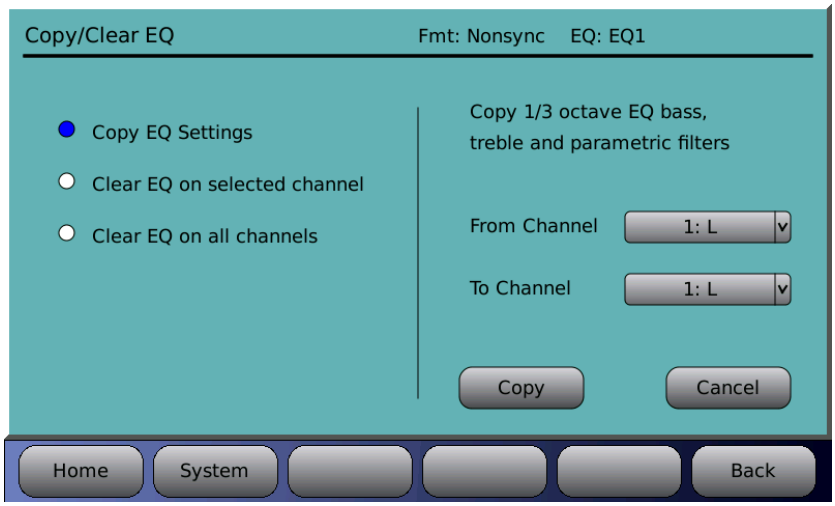


Figure 54. Copy EQ Settings

- **Clear EQ on selected channel** includes the options (1) third octave EQ including bass and treble and/or (2) parametric filters. The text on the right will reflect the selection on the left. Select the channel using the drop down list, then touch **Clear** to complete the process.

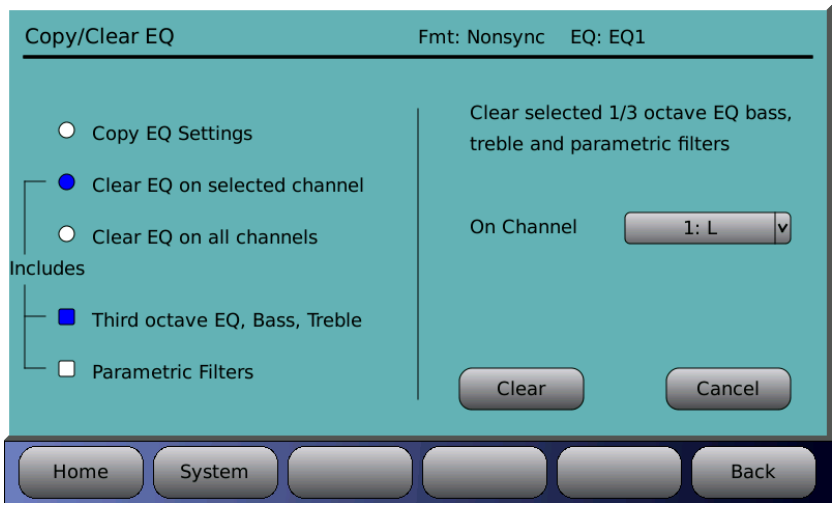


Figure 55. Clear EQ on selected channel

- **Clear EQ on all channels** clears third octave, bass, treble and parametric filters on all channels.

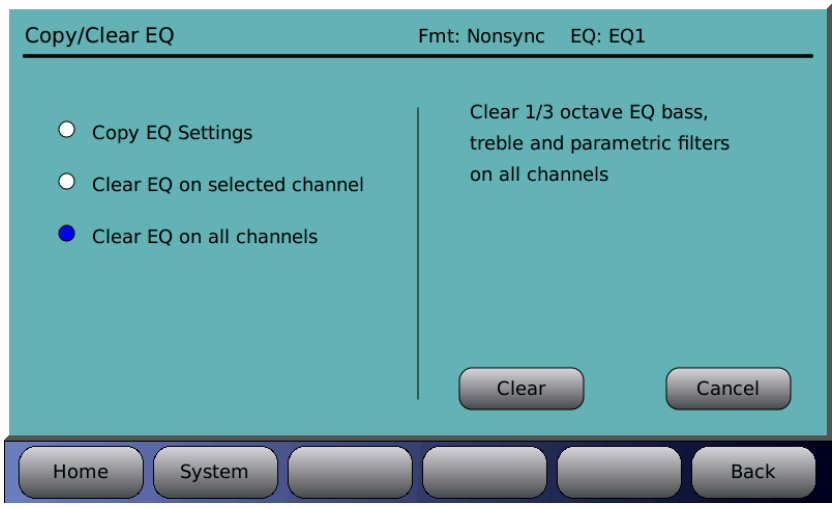


Figure 56. Clear EQ on all channels

4.3.8 Channel Profile

Menu (System) > Formats > Channel Profile

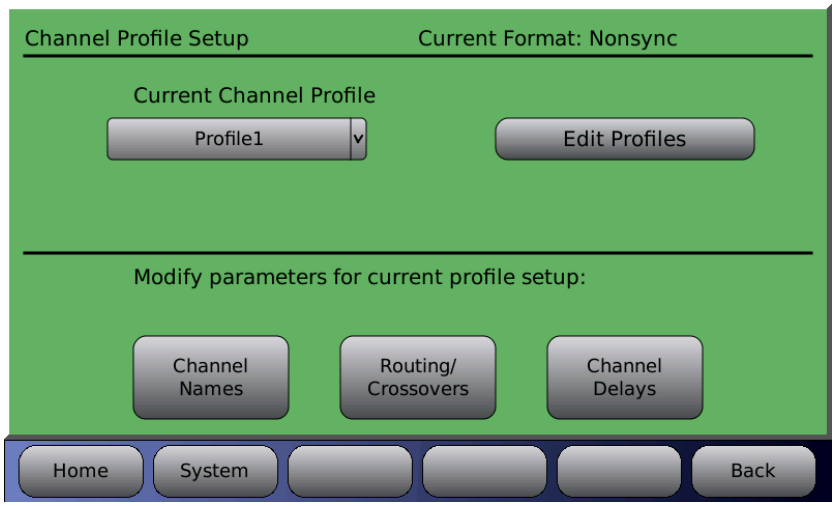


Figure 57. Channel Profile Setup Screen

4.3.8.1 Current Channel Profile

The current channel profile is displayed in the drop-down box under the label “Current Channel Profile”. Before making changes to the profile, always verify that you are in the desired format (check the upper right corner of the Channel Profiles screen).

To select a different profile, touch the down arrow and select a profile from the list. Any changes made to the Channel Names, Routing/Crossovers and Channel Delays will be for this profile only.

4.3.8.2 Edit Profiles

Menu (System) > Formats > Channel Profile > Edit Profiles

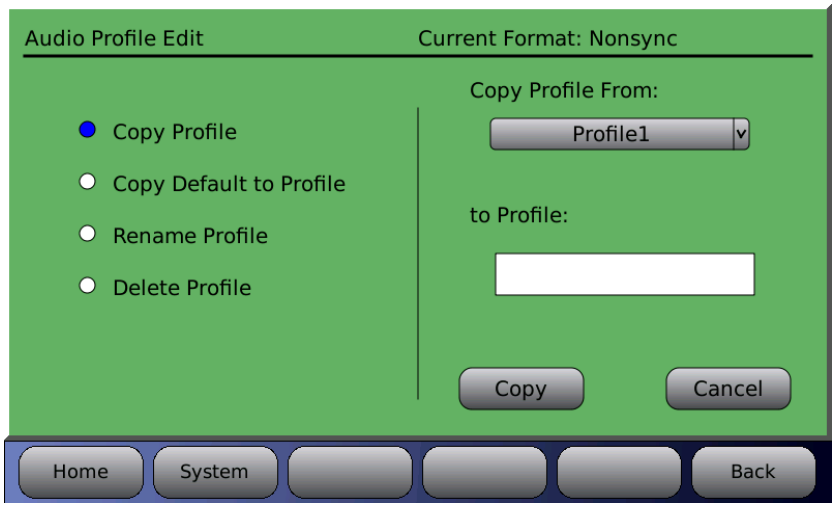


Figure 58. Audio Profile Edit

- **Copy Profile** – Use an existing audio profile as a template for a new one. Select the audio profile you wish to copy from by selecting it from the drop down box. Then, touch the "to Profile" box to bring up the virtual keyboard and enter a name for the new profile. Press the **Copy** button to complete the process, or press **Cancel** to quit.
- **Copy Default to Profile** – Select the default audio profile and use it as a template for a new one. Select the profile you wish to copy from by selecting it from the drop down box. Then, touch the "to Profile" box to bring up the virtual keyboard and enter a name for the new profile. Press the **Copy** button to complete the process, or press **Cancel** to quit.
- **Rename Profile** – Give an existing audio profile a new name. Select an existing profile from the drop-down list on the right side of the screen. Touch the "To" box to bring up the virtual keyboard and enter a new name for the profile. Press the **Rename** button to complete the process, or press **Cancel** to quit.
  Note: The Channel Profile name is changed for all Formats that use the Channel Profile.
- **Delete Profile** – Select an existing audio profile from the drop-down list on the right side of the screen. Press the **Delete** button to complete the process, or press **Cancel** to quit.

4.3.8.3 Channel Names

Depending how the AP20 is connected, sixteen channels are available. Channel assignments can be different in other profiles. The top title bar displays the current format and profile.

☑ **Note**: In general, the **default assignments** must be preserved for the first 6 channels in order to maintain compatibility with the HDMI input channel assignments, and with the Hearing Impaired output channel. Default channel names are indicated in Table 9 page 34.

The profile channel name refers to the input channel only. The channel name for the output channel (if used) will be a combination of the corresponding input and the crossover letter (for example, Left-H).

Menu (System) > Formats > Channel Profile > Channel Names

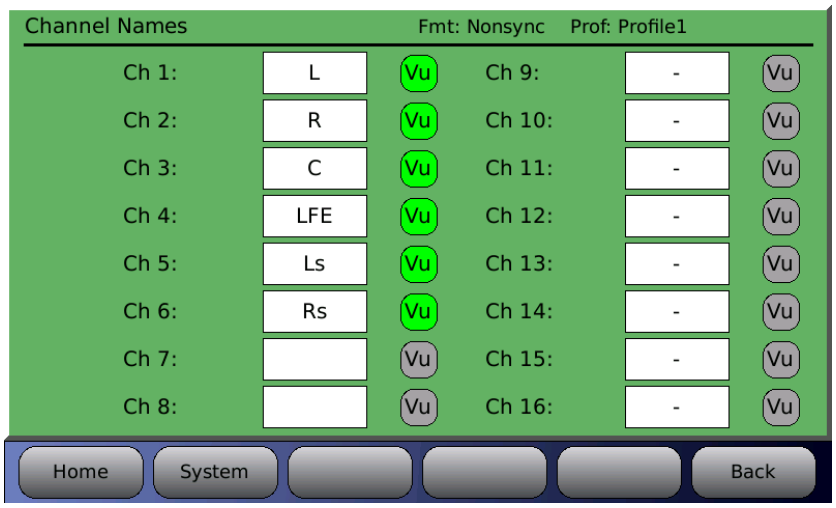


Figure 59. Assign Channel Names Screen (with Presets)

To change or enter a new channel name select the white field next to the desired channel. A keyboard will appear allowing you to enter text. Type in the channel name then select **OK**. The channel name will now appear in the field and in the Home Screen (in yellow text just below the channel numbers).

When a Vu button is highlighted green, that channel will display Vu bars on the Home screen.

To turn off the VU meter in the Home Screen simply touch the green VU symbol next to the channel name. It will change to grey color and will no longer be displayed on the Home Screen.

4.3.8.4 Routing Crossovers

Menu (System) > Formats > Channel Profile > Routing/Crossovers

Signal flow

When implementing crossovers or implementing different internal routing on the AP20, the input channel numbers do not match the output channel numbers. The following explanation clarifies how the menus operate regarding the channel numbers.

1. From a user perspective, the channel mapping occurs near the last stage of the signal processing. Only high pass and low pass filters are applied after the signal routing occurs. This is illustrated in the diagram below.

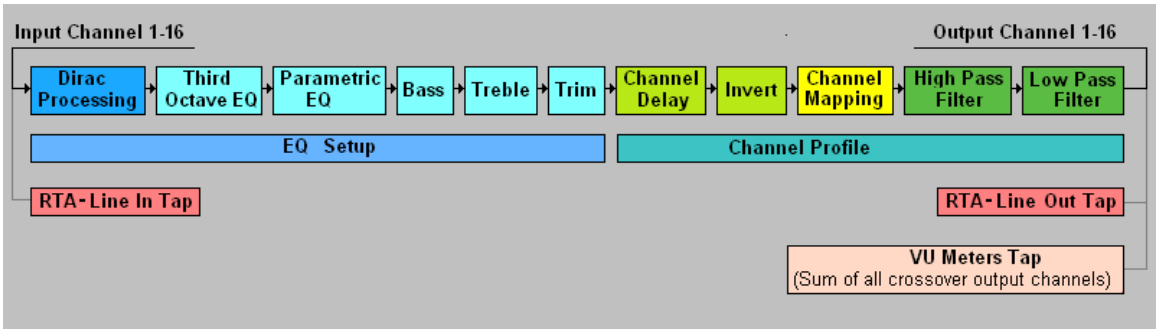


Figure 60. Signal Processing Flow Diagram

2. VU meters on the Home page show the input channel name while showing the VU level of the sum of the outputs for that crossover channel.

High Pass and Low Pass Shelf

The High Pass and Low Pass Shelves are for active crossover systems. The High Pass is the portion of the sound spectrum that is going to find its way to the top-end compression driver. The Low Pass is the portion of the sound spectrum that is going to find its way to the mid-woofer.
Since there are 16 output channels available, you have the option to use them any way you like. Suppose you actually have six channels of incoming sound, then you have 10 other D/A converted outputs that can be used as crossovers. All you need to do is identify which channels will be used as crossovers. Setting up your system in this way, lets you do away with passive crossovers. Although you would need more amplifiers, it does give you much tighter control of your system.
You can also decide how steep the High Pass or Low Pass cut-off is. The conventional values are 6, 12, 18, and 24 dB. As the numbers go up, the cut-off is steeper.

☑ **Note:** Set up the crossovers before you run the Dirac software. The Dirac software will fine-tune the characteristics of the crossover point. If a driver has issues with time alignment, or encounters an aberration of some sort that can be measured, it will do its best to correct for it. It will also adjust all the amplitudes to their appropriate values to get a smooth response within that range.

Routing/Crossover setup screen

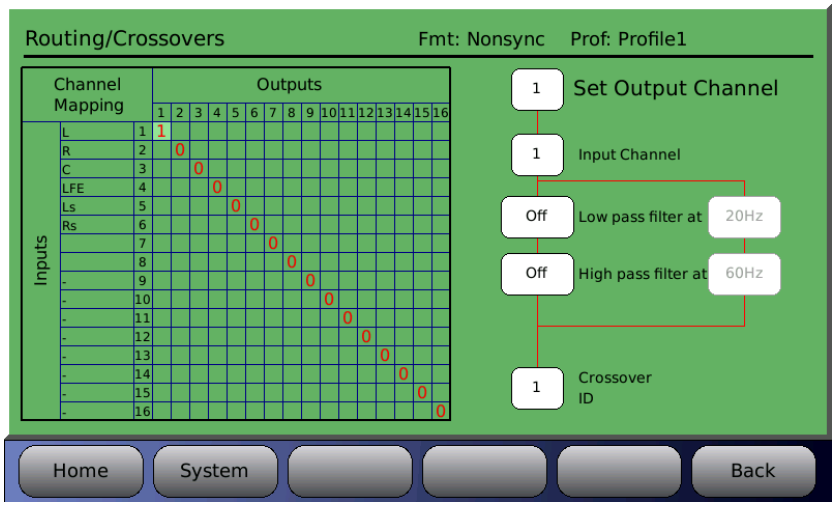


Figure 61. Crossover Setup Screen

The matrix on the left displays the input channel – to – output channel mapping.
To make assignments, first dial in the output channel, then edit the input channel and other options.

1. Dial in the output channel number. Touch the field and use the adjustment knob to change the setting.
2. Then edit the input channel. Input channel may be assigned 1-16. Output channels may share the same input.
3. Set Low pass filter. Options are Off, 6, 12, 18, and 24 dB/octave and from 20Hz to 20KHz. Low pass filters can be used even if crossover is not selected.
4. Set High pass filter. Options are Off, 6, 12, 18, and 24 dB/octave and from 20Hz to 20KHz. High pass filters can be used even if crossover is not selected.

☑ **Note**: The output channels are assigned one of the following letter IDs (**Crossover ID**): W, L, M, H, and 0-9. This is used for reference for the output channel and has no functional purpose at this time.

4.3.8.5 Channel Delays

Menu (System) > Formats > Channel Profile > Channel Delays

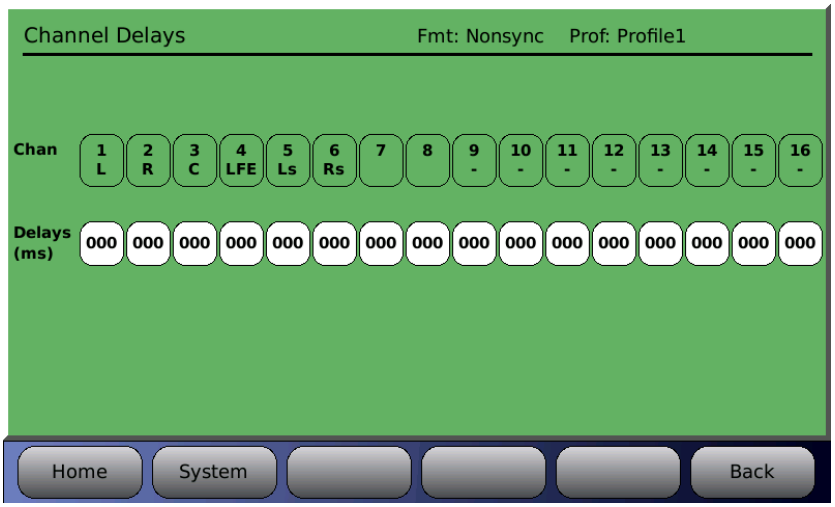


Figure 62. Channel Delays

Delays can be set for each of the 16 channels. The delay is set in milliseconds (000-999ms). Touch the Delays box under the desired channel. Enter the delay by dialing in the correct value using the front panel adjustment knob.

4.3.9 Audio Levels

Menu (System) > Formats > Audio Levels

The Audio Levels screen is used for these functions:

- **Set the levels**. You can turn on the pink noise on any single channel to check and adjust the level. This assumes that you have a SPL meter. The adjustment must be made when the Master Fader is set to 7.0.
- **Set surround delays**. This is usually a known quantity based on the room size or speaker locations.
- **Check channel phase**. This is done by enabling the pink noise on more than one channel and checking the difference in sound level with an SPL meter or RTA.
- **General testing or troubleshooting**. The technician may diagnose a problem by muting selected channels while playing content, or playing pink noise on selected channels.
- **Setting digital volume level**.

☑ Note: The lighter blue areas contain settings that are saved in the configuration file. The darker areas contain settings that are not saved.

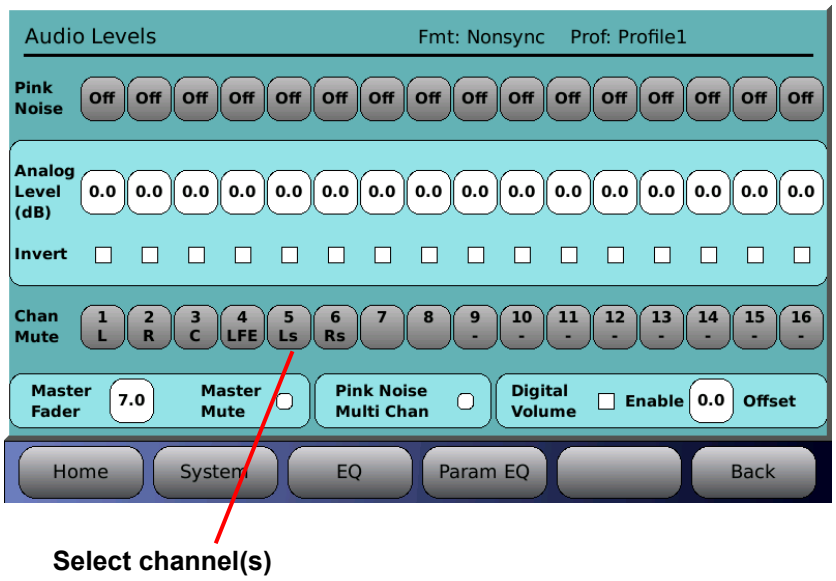


Figure 63. Audio Levels

At the top right of the screen, the current Format and current Profile are displayed.

- **Pink Noise** – Select to turn pink noise on for a selected channel (1-16). Pink noise is cleared when exiting the screen.

  When operating with Pink Noise Multi Chan selected you can enable pink noise on multiple channels.
  When operating with Pink Noise Multi Chan unselected, only one channel may be selected for pink noise, and any previous selection is cleared. Also, the analog level button for the pink noise channel is automatically selected to simplify adjusting the gain after selecting the pink noise.

- **Analog Level** for channels 1-16 – This affects only the analog output signal, not the digital output. The value is the same as that shown in the EQ screen. Range is from -20dB to +10dB in .5 dB increments. To change, first select the control, then use the front panel adjustment knob to adjust up or down.

- **Invert** – Select control to enable/disable channel invert. Box turns blue when invert is enabled. (Invert is used primarily for test purposes.)

- **Chan Mute** for channels 1-16 – Select the control to mute or unmute the selected channel. Multiple channels may be muted. Channels remain mute when exiting the screen. The mute will reset after a power cycle.

- **Master Fader** – Select control and use the knob to change the master fader setting. Normally SPL meter readings are taken with the fader set to 7.0. This fader is the same as the one in the home page.

- **Master Mute** on/off control will mute/unmute all channels. This mute enable is the same as that on the home page. Use it in case of accidental loud noise.

- **Pink Noise Multi Chan –** Enabling allows multiple channels of pink noise to be chosen. When multi-channel pink noise is disabled, selecting pink noise on one channel automatically disables pink noise from the other channels.

- **Digital Volume Enable** and **Offset** controls are present. **Offset** can be adjusted by touching it and using the adjustment knob. The volume level is in effect only if the enable/disable box is enabled (blue). Digital volume should be enabled only if the system is using the digital output on the AP20.
  Once Digital Volume is Enabled, the Digital Volume Offset, which may be set between 0.0 and 10.0, should be set to the fader level that is considered to be maximum. For example, if the Digital Volume Offset is set to 7.0, then the digital signal attenuates as expected when the master fader is set below 7.0. The digital signal volume will not increase if the fader goes above the Digital Volume Offset.

  ☑ **Note**: Channels 1 through 16 on this screen refer to the input channels. In cases where the input is routed to a different output channel, the control represents only the input channel path. The same is true if the channel is routed to more than one output in a crossover configuration. For example, if L (Ch1) is routed to output channels 1 (Left-H) and 2 (Left-L), then if Ch1 is inverted the signal will be inverted on both output channels 1 and 2.
- **EQ –** a button linking to the Third Octave EQ screen is provided on the menu bar.
- **Param EQ –** a button linking to the Parmetric EQ screen is provided on the menu bar.

4.4 Network

Menu (System) > Network

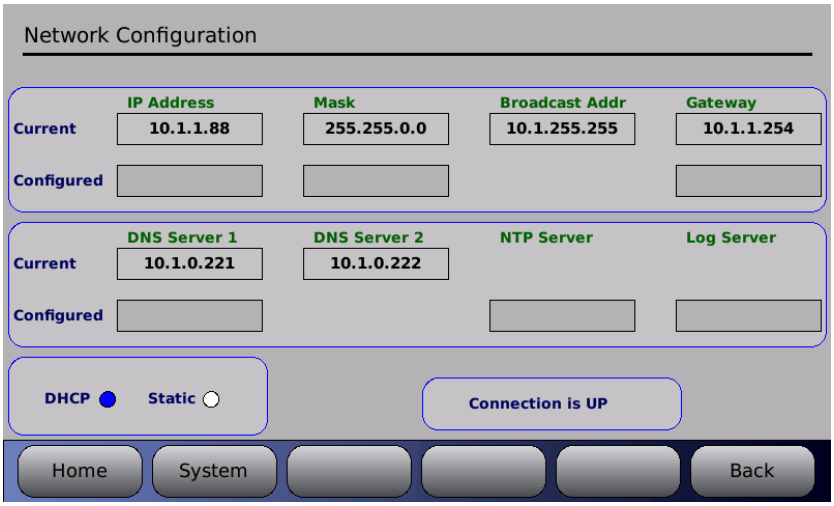


Figure 64. Network Screen

The Network screen displays the current network mode and IP address. It also displays whether or not the network connection is currently up or down. Use it to change between dynamic and static IP addressing.

- In static IP mode, you can enter values for the IP address, Netmask, and Gateway.
- To change or enter a value, touch the white box under the appropriate label.
- The DNS Server, NTP server and log file server can be entered whether using DHCP or Static modes.

4.5 Automation

Menu (System) > Automation

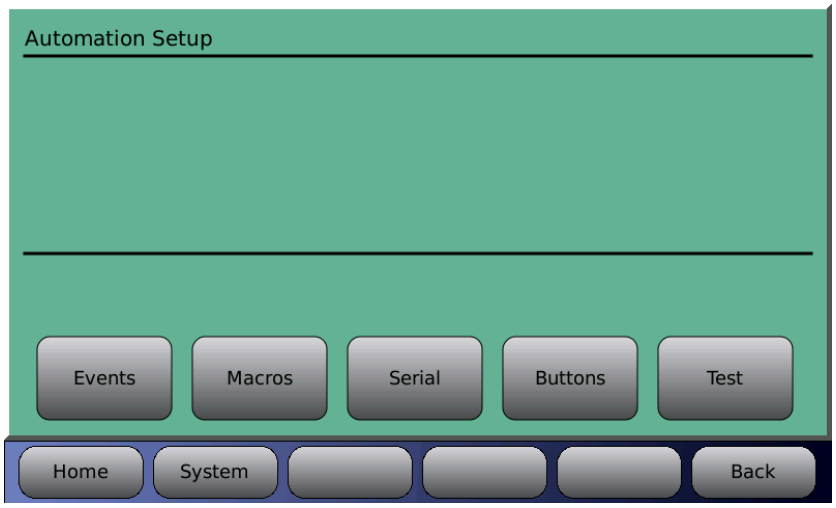


Figure 65. Automation Screen

The Automation menus provide the ability to add, edit and delete automation events. Automation events may be single actions, or may be linked to a macro. Events may then be associated with an automation button. Menus to allow the creation of macros are provided. A Macro is a script used to perform multiple actions (see 4.5.2 Macros, page 88).

4.5.1 Events

Menu (System) > Automation > Events

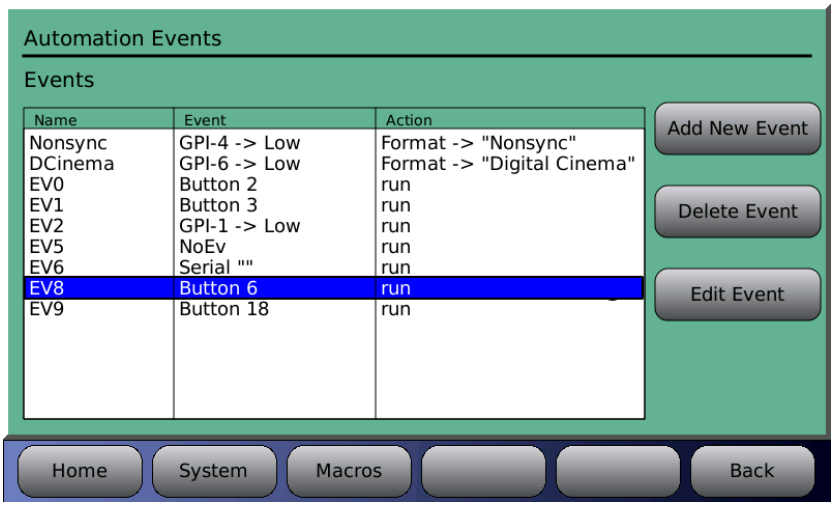


Figure 66. Automation Events Screen

Existing events will be displayed in the Automation Events screen. The front panel adjustment knob must be used to move the selection bar to an existing event for editing. The list will scroll when needed going past the end when there are more events in the list. The menu bar contains a “Macros” button to allow easy navigation between the Events screen and the Macros screen when building Macros.

4.5.1.1 Add New Event

Selecting the Add New Event button takes you into the "Automation Edit Event" screen and automatically assigns a temporary event name, which is added to the event list.

Menu (System) > Automation > Events > Add New Event

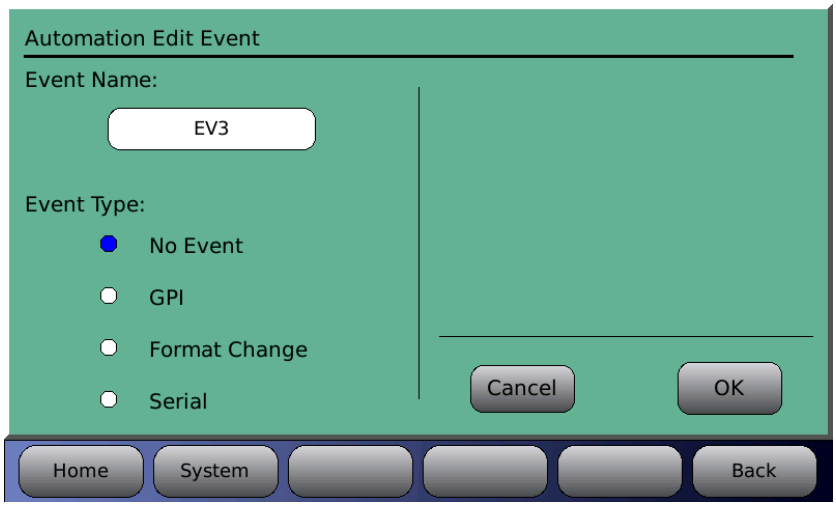


Figure 67. Automation Edit Event Screen

Event Name - Touching the Event Name box will bring up the keyboard screen and allow editing of the event name. Choose a name that is meaningful.

Event Type – When an event is first added the event type defaults to "No Event", this means the event type is not configured and should be replaced with one of the other event types.

- **GPI –** Configure an input event

When GPI is selected, an input may be configured to run either a single action or a macro when it receives a signal.

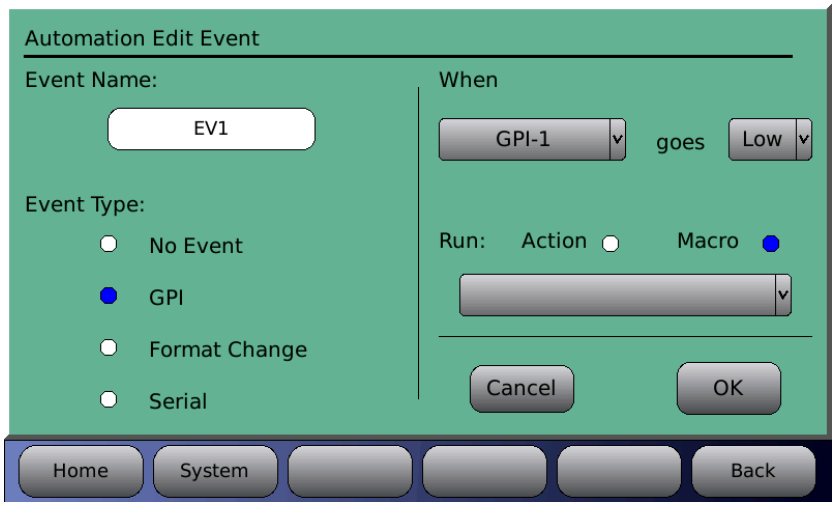


Figure 68. Automation Edit Event Screen - GPI

Select an input (GPI-1 thru 18 or Projector) from the dropdown list. Select the signal (Low or High). Select an Action or a Macro to run. If Macro is selected, choose a macro from the

dropdown list. If Action is selected, touch the white box that appears below it. This will bring up the Automation Edit Action screen.

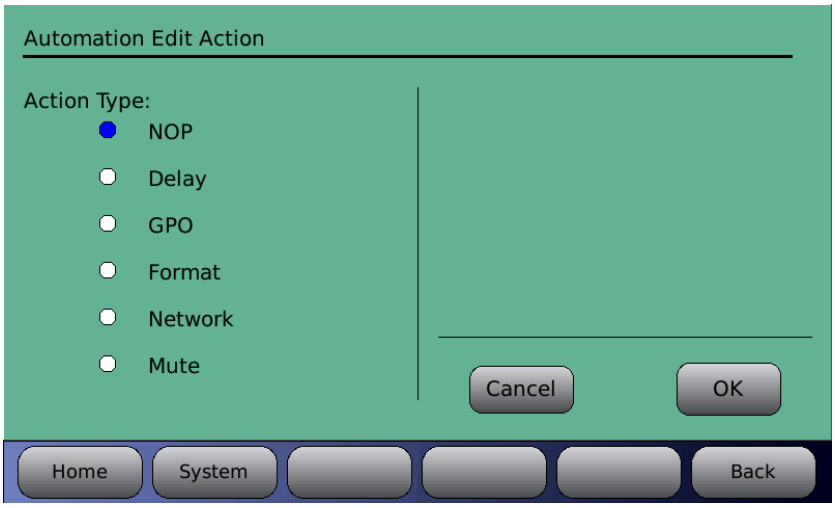


Figure 69. Automation Edit Action screen

- NOP (no operation) is a default that appears until an action is assigned.
- Delay – Delay is set in milliseconds with a range of 0-10000ms (10 seconds)
- GPO – Select a GPO to set (GPO 1-20 or Projector) by touching the dropdown menu next to "Set". Then select an action for that GPO from the dropdown menu next to "To". Selections are Pulse, Low, and High.
- Format – Select from the "Change Format To:" drop down menu.
- Network – Type in the IP Address, TCP Port and Data information by touching the associated box to bring up the keyboard screen.
- Mute – Select between on and off.

Touch OK when finished, or touch Cancel to cancel this task.

- **Format Change –** Configure an event when a format is changed.

  When Format Change is selected, an action or macro is run when the format changes to one selected from the dropdown list. Select an Action or a Macro to run. If Macro is selected, choose a macro from the dropdown list. If Action is selected, touch the white box that appears below it. This will bring up the Automation Edit Action screen (for a description of options available, see Figure 69, and text following it, above). In figure Figure 70 below, when the format changes to "Digital Cinema" the Digital_Cinema macro is run.

  Touch OK when finished, or touch Cancel to cancel this task.

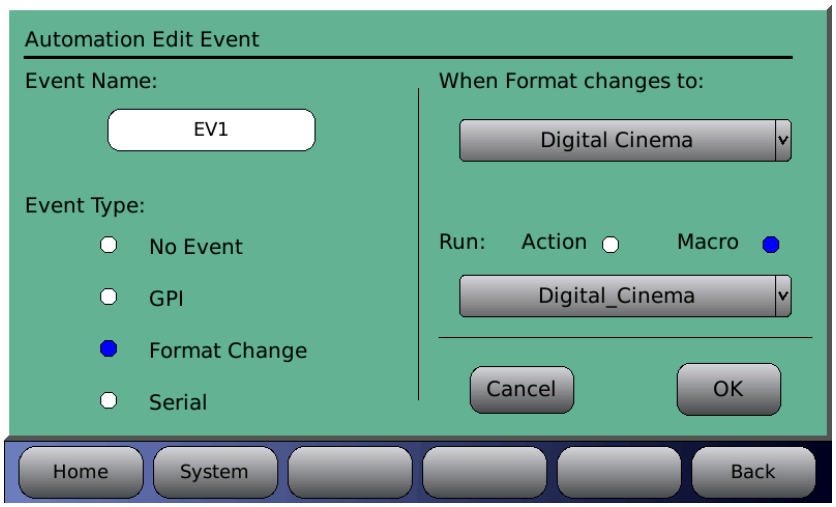


Figure 70. Automation Edit Event screen – Format Change

- **Serial**

The AP20 can be configured to allow an external device to send an RS232 command to the AP20, which, when receiving the specified serial command, will then execute any predefined action or macro.

- The baud rate and number of stop bits must be set in the Automation Serial page to match the settings used by the external RS232 device. See 4.5.5 Automation Serial Port Setup below.
- The RS232 device must be connected to the Control port on the back of the AP20.

In the example below a serial command named "Test<cr>" is created to switch the AP20 to the Digital Cinema format. In this example the macro named Digital_Cinema already exists to switch the AP20 to the Digital Cinema format.

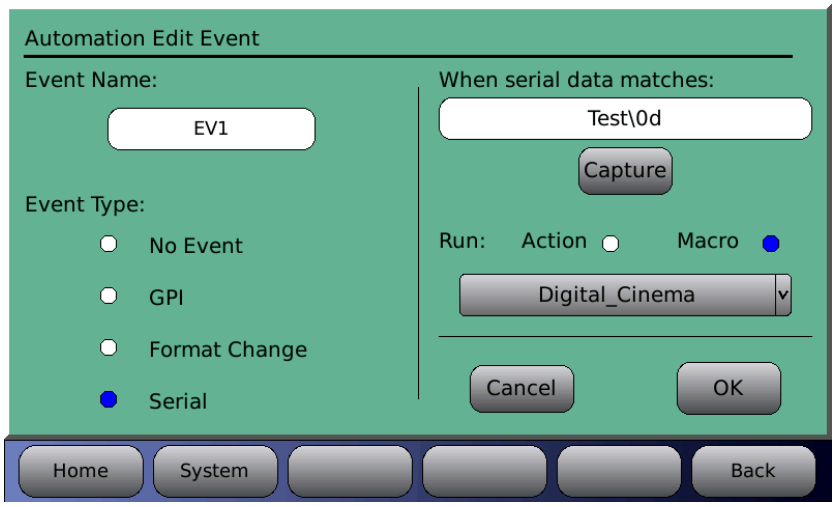


Figure 71. Automation Edit Event screen – Serial

Enter the serial command that will trigger the macro. The maximum size of the serial command is 36 characters.

- **Option 1**: Select the text box and the keyboard screen will appear. Type in the serial command.
- **Option 2**: Select the **Capture** button to automatically capture a command received from the serial port. This assumes that there is an external serial control device connected that can be manually triggered to send a single command.

Press the green **StopCap** button to complete the capture of the serial command. All serial data that has been received between **Capture** and **Stop Cap** will be displayed in the text bar. If more than the maximum characters have been received, then the data is truncated.

☑ **Note**: Non-ASCII characters may be entered by a back slash (\) followed by their hex value. For example, a CR character is 0D hex and can be included in the string as "\0d".

Touch OK when finished, or touch Cancel to cancel this task.

4.5.1.2 Delete Event

To delete an existing event, highlight the event on the list and select Delete Event.

4.5.1.3 Edit Event

To edit an existing event, highlight the event on the list and select Edit Event. This will bring up the Automation Edit Event screen. Editing choices are the same as those described above in 4.5.1.1 Add New Event.

4.5.2 Macros

The Macros menus allow you to create a script of multiple actions. A Macro may then be assigned to an Event. The menu bar contains an "Events" button to allow easy navigation between the Events screen and the Macros screen when building Macros and assigning them to Events.

When the Macros menu is selected, a list of existing Macros are displayed. Scroll through the list of Macros using the front panel adjustment knob. When an existing Macro is highlighted the actions making up that Macro are displayed. The example in Figure 72 shows the "Digital_Cinema" Macro.

Menu (System) > Automation > Macros

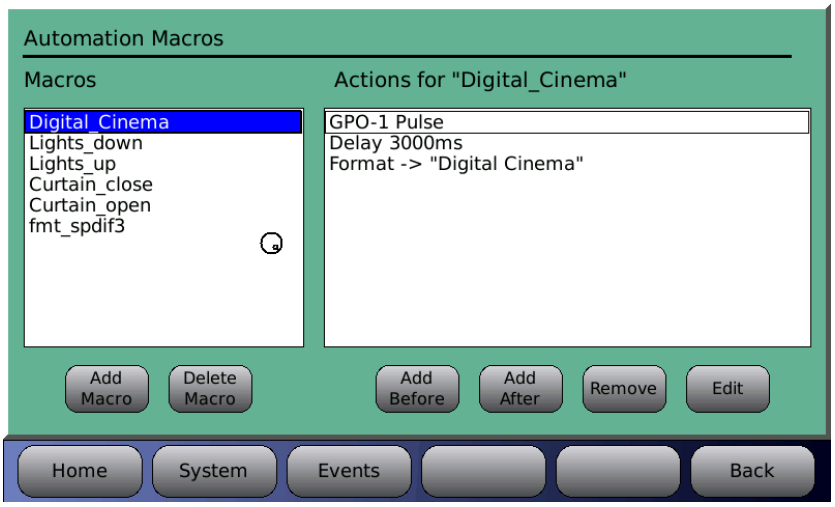


Figure 72. Automation Macros screen

4.5.2.1 Add Macro

To add a Macro, select the "Add Macro" button. The keyboard screen will appear allowing a Macro name to be typed in. Choose a name that is meaningful. A name of up to 15 characters will be displayed. The new Macro name will appear on the list and its "Actions" list will be blank.

Touch the box under "Actions for <macro name>. Actions may now be added. Select "Add After" to enter the first action. This will bring up the Automation Edit Action screen (for a description of options available, see Figure 69, and text following it, above).

Continue to define the Macro script by adding Actions before or after existing Actions (highlight existing actions using the front panel adjustment knob). Existing Actions may also be highlighted and edited (select the "Edit" button) or removed (select the "Remove" button).

4.5.2.2 Delete Macro

To delete a macro, highlight it on the list and select the "Delete Macro" button.

☑ Any actions contained in the Macro script must be removed before it can be deleted. Highlight the actions on the list and select the "Remove" button.

⚠ Caution. A macro may be deleted even if it is associated with an Event and assigned to an Automation button.

4.5.3 Automation Buttons

The Automation Buttons screen shows existing buttons assigned to an Event. Information on the associated event appears below each configured button.

Menu (System) > Automation > Buttons

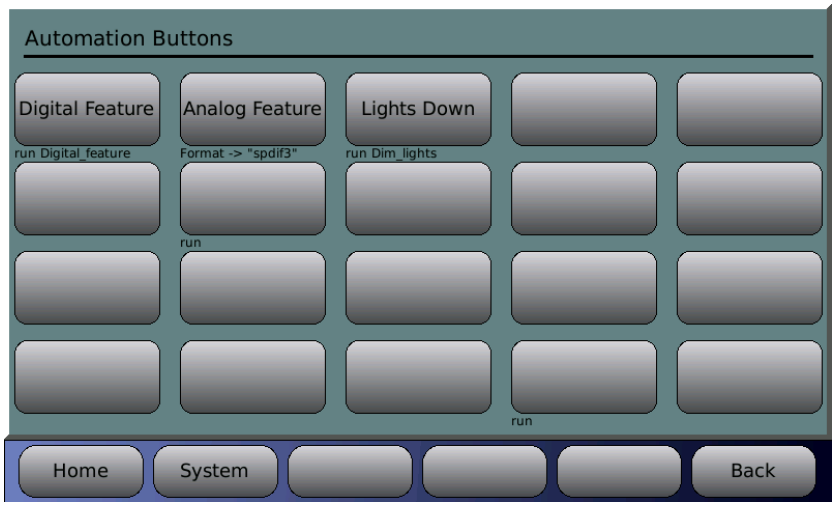


Figure 73. Automation Buttons

To configure a button, touch the button to select it.

A screen will open that allows both the button title and the event assignment to be configured.

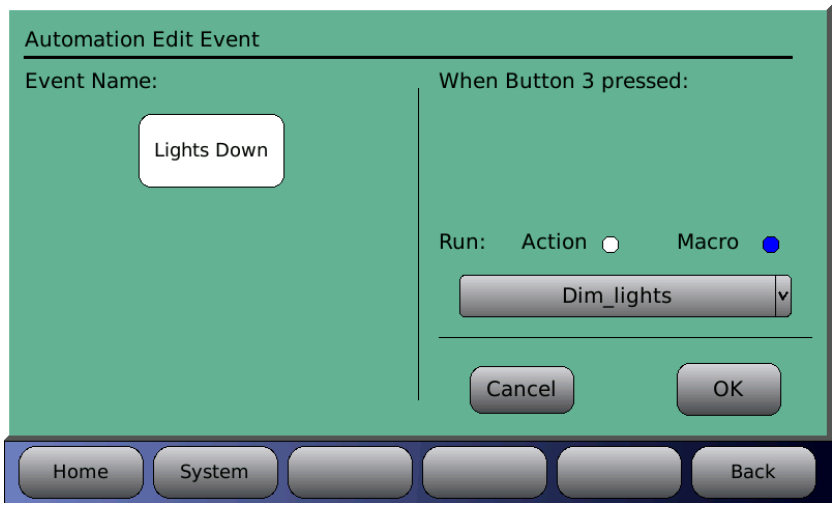


Figure 74. Button Assignment

- To enter or change the button title, touch the Event Name box to select. A keyboard screen will open allowing you to type in a new title for this button.
- To assign a macro to the button, select the Macro button, touch the Macro drop down list and select from the listing. Touch OK when finished, or touch Cancel to cancel this task.
- To assign an Action to the button, select the Action button and touch the white box that appears below it. This will bring up the Automation Edit Action screen. See page 86 above.
- Touch OK when finished, or touch Cancel to cancel this task.

4.5.4 Automation Test Screen

The Automation Test Screen provides an easy way to test that the automation signals to and from the AP20 are correctly wired and operational.

Menu (System) > Automation > Test

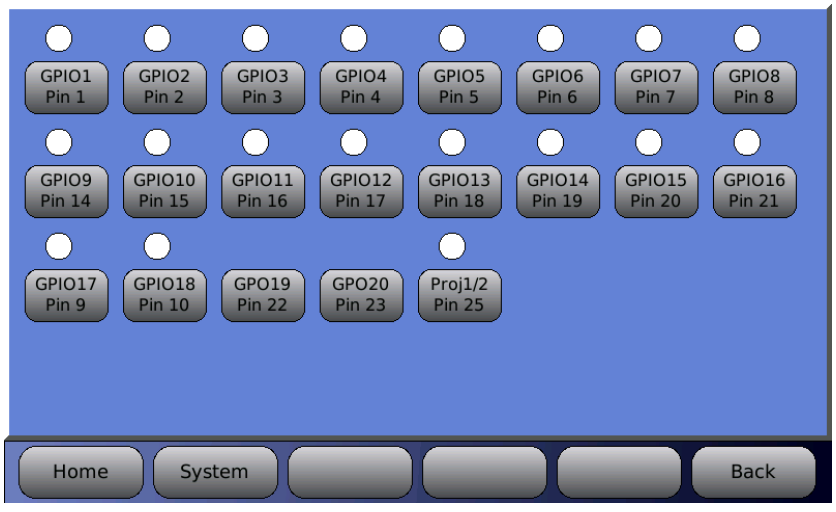
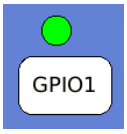


Figure 75. Automation Test

The screen displays a series of automation buttons, one for each automation output signal (GPO), and a circle above it that represents the signal input (GPI) state (GPO19 and 20 are outputs only and do not have an input indicator circle). The input indicator is white when the signal is high or just unconnected. The input indicator turns green when there is a low signal applied to the pin.

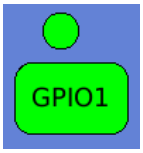
- To verify that the AP20 is properly receiving an input from an external source you would need to make the external device send a low signal on that pin. Then confirm that the signal is received by the AP20 by checking if the corresponding circle turns green.

  Example: The button at right illustrates when receiving an input signal on GPIO1.



- To test an output signal, press the automation button. It creates a low pulse on the corresponding output pin. The button turns green in conjunction with the output signal being low.

  Example: The button at right when GPIO1 has been selected. Note that the circle will also turn green after pressing the button, indicating that it is reading the low signal on the same pin.



4.5.5 Automation Serial Port Setup

On the Serial tab, select the Baud rate and data bits settings for the automation interface. Touch the drop down list to open it, then use the adjustment knob to select.

Menu (System) > Automation > Serial

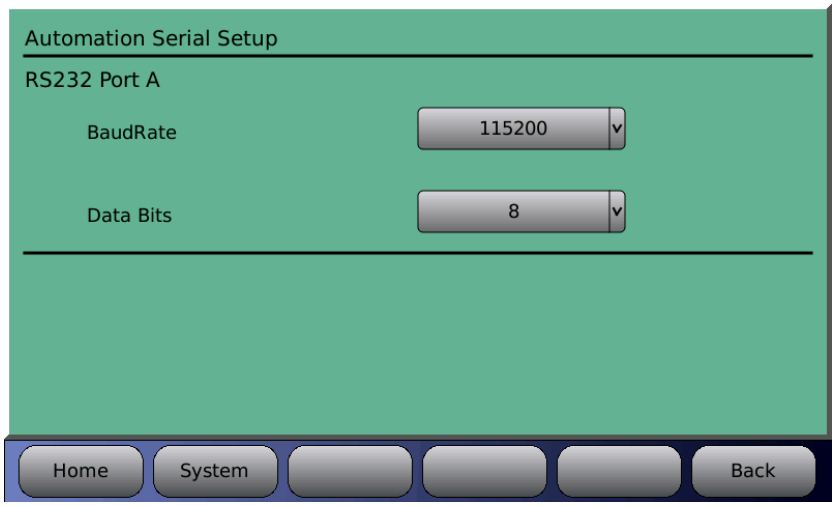


Figure 76. Automation Serial Port Setup

5.0 Maintenance and Troubleshooting

Check the Datasat Digital Entertainment Online Support site for the latest technical information at www.datasatdigital.com for the latest information on maintenance, troubleshooting, and AP20 software versions.

5.1 Routine Maintenance

We recommend that every six months you vacuum the outside of the unit to remove dust, especially around ventilation holes.

Clean the touch screen as needed with a soft cloth and non-abrasive cleaning solution suitable for cleaning LCD screens.

5.2 Troubleshooting

The following table provides troubleshooting data for the AP20.

PROBLEM	SOLUTION
The touchscreen display is off-centered	See Touchscreen Positioning, below
The Home screen displays NoLock	See NoLock below

Touchscreen Positioning

The AP20 LCD display position has been configured at the factory. If, for some reason, you should need to recalibrate the location of the screen, follow the steps outlined below (these steps are much like opening a combination padlock):

1. From the Home screen, rotate the control knob counter-clockwise at least one full revolution.
2. Rotate the knob clockwise one click. (You will feel and hear the click and see the fader level increase by one decimal value.)
3. Rotate the knob counter-clockwise eight clicks, listening for the clicks as you turn.
4. Rotate the knob clockwise one click.
5. Rotate the knob counter-clockwise two clicks. (You are now in calibration mode.)
6. The display will go black, and a small crosshair in a box will appear in the upper corner. Using a fine-tipped stylus, touch as close as you can to the center of the crosshair. The cross hair will move to a new corner. Do not use a pencil or pen tip as this may cause damage to the touch screen surface. Use a non metallic stylus or similar tool for calibration.
7. Touch the center of the crosshair again. Repeat this process as each new crosshair appears.
8. The last crosshair will appear in the center of the screen. Once you have touched this one, the process of repositioning your display is complete. The system will immediately perform a “soft boot” to save the new position values.

NoLock

If the source is a digital input and there is no clock signal, then the display will show “No Lock” as shown below.

Figure 77. NoLock

5.3 Error Messages

5.3.1 Software Installation

Figure 78. USB Device Not Found

If you encounter this error message, be sure you have inserted a USB device into the AP20. If a device is present, it may be malfunctioning. Replace the USB device with another to see if the problem is resolved.

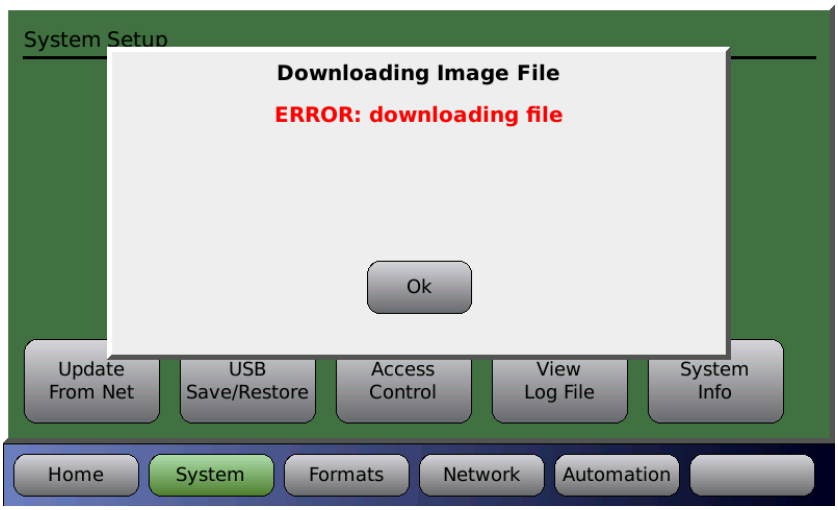


Figure 79. Downloading Error

You may encounter this message when attempting to upgrade the AP20 operating system software through an internet connection. This message indicates there is a problem with the physical connection between your processor and the outside world. Check your cables, router, modem, or IP addressing scheme, as applicable, to make sure all is in order.

5.3.2 Error Booting the AP20

If, during boot up, an object (such as your finger) is in contact with the touch screen, the software will fail to load. The message below will appear, and continues to scroll past until power is recycled at the power entry module (hard boot).

```
************************************************************
mount: mounting /dev/sda1 on /tmp/usb failed: No such device or address
mount: mounting /dev/sda on /tmp/usb failed: No such device or address
************************************************************
insert USB memory stick with ap20 image
************************************************************
```

To solve this problem, reboot the AP20, making sure nothing is in contact with the touch screen during the boot-up process.

Appendix A. Connector Pin-outs

This appendix lists the pin-out of all of the connectors on the back panel of the AP20 Audio Processor.

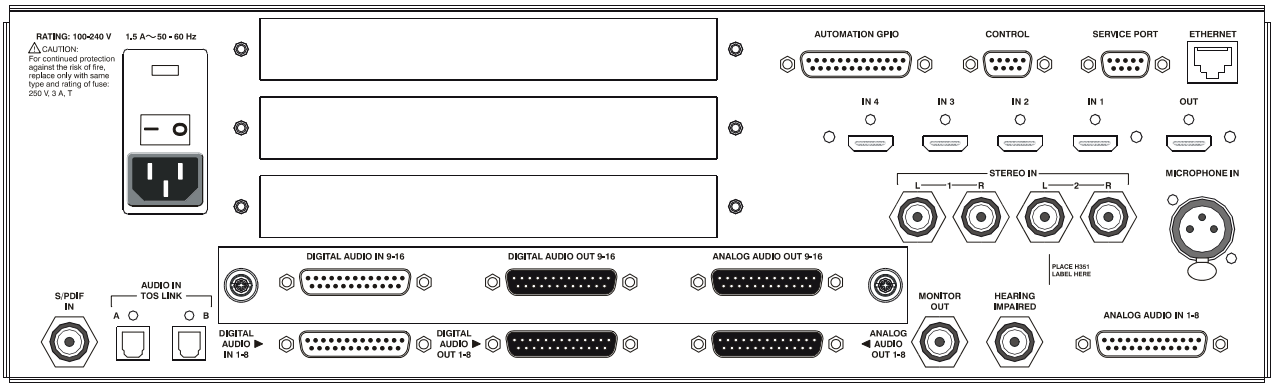
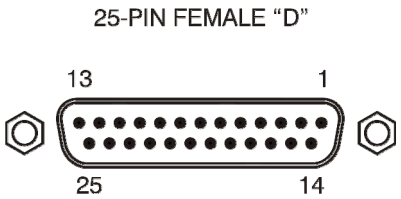


Figure 1. AP20 Rear Panel

AUTOMATION GPIO – DB25F	
Pin	**Description**
1	GPIO 1 (Format 0)
2	GPIO 2 (Format 1)
3	GPIO 3 (Format 2)
4	GPIO 4 (Format 3)
5	GPIO 5 (Format 4)
6	GPIO 6 (Format 5)
7	GPIO 7 (Format 6)
8	GPIO 8 (Format 7)
9	GPIO 17 (Format Remote Fader Enable)
10	GPIO 18 (Format MUTE Enable)
11	N/C
12	AP20 GND
13	AP20 Ext. 5 volts (14a. max)
14	GPIO 9 (Format ID 0)
15	GPIO 10 (Format ID 1)
16	GPIO 11 (Format ID 2)
17	GPIO 12 (Format ID 3)
18	GPIO 13 (Format ID 4)
19	GPIO 14 (Format ID 5)
20	GPIO 15 (Format ID 6)
21	GPIO 16 (Format ID 7)
22	GPO 19 (Remote Fader Talley)
23	GPO 20 (MUTE Talley)
24	N/C
25	PROJECTOR C/O (1 / 2)

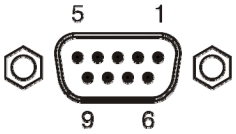
N/C = No connection



CONTROL (RS232)– DB9F	
Pin	**Description**
1	N/C
2	Data out - TXD
3	Data in - RXD
4	Connected to pin 6
5	Chassis GND
6	Connected to pin 4
7	Connected to pin 8
8	Connected to pin 7
9	N/C

N/C = No connection

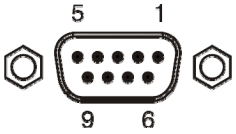
9-PIN FEMALE "D"



SERVICE PORT (RS232)– DB9F	
Pin	**Description**
1	N/C
2	Data out - TXD
3	Data in - RXD
4	Connected to pin 6
5	Chassis GND
6	Connected to pin 4
7	Connected to pin 8
8	Connected to pin 7
9	N/C

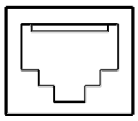
N/C = No connection

9-PIN FEMALE "D"



ETHERNET – RJ45F	
Pin	**Description**
1	TX_D1 (+)
2	TX_D1 (-)
3	RX_D2 (+)
4	Not used
5	Not used
6	RX_D2 (-)
7	Not used
8	Not used

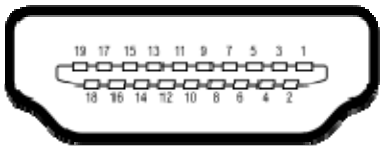
8-PIN FEMALE RJ45



HDMI IN 1-4, OUT – HDMI	
Pin	**Description**
1	TMDS Data 2 (+)
2	TMDS Data 2 (Shield)
3	TMDS Data 2 (-)
4	TMDS Data 1 (+)
5	TMDS Data 1 (Shield)
6	TMDS Data 1 (-)
7	TMDS Data 0 (+)
8	TMDS Data 0 (Shield)
9	TMDS Data 0 (-)
10	TMDS Clock (+)
11	TMDS Clock (Shield)
12	TMDS Clock (-)
13	CEC
14	N/C
15	DDC Clock
16	DDC Data
17	Ground
18	+5 V
19	Hot Plug Direct

N/C = No connection

HDMI



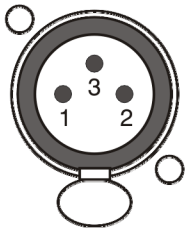
Hearing Impaired, Monitor Out, Stereo Inputs 1&2, S/PDIF In – RCA

RCA FEMALE	
Pin	**Description**
Center	Signal
Outer	Ground

RCA FEMALE

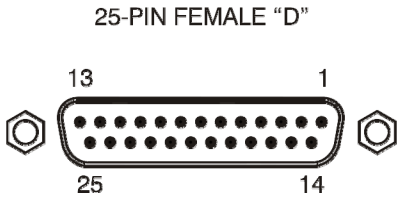
MICROPHONE IN – XLR F	
Pin	**Description**
1	Microphone Ground
2	Microphone In (+)
3	Microphone In (-)

3-PIN XLR FEMALE



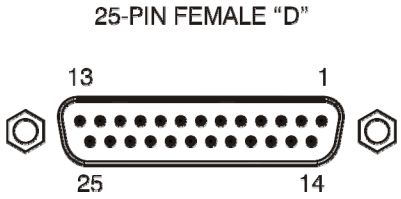
DIGITAL AUDIO IN (CH 1 – 8) – DB25F		
Pin	**Description**	**Standard Ch Assignment**
1	Chassis Ground	
2	AES 1/2 -	L/R
3	AES 3/4 +	C/LFE
4	Chassis Ground	
5	AES 5/6 -	LS/RS
6	AES 7/8 +	LC/RC
7	Chassis Ground	
8	N/C	
9	Chassis Ground	
10	N/C	
11	N/C	
12	Chassis Ground	
13	N/C	
14	AES 1/2 +	L/R
15	Chassis Ground	
16	AES 3/4 -	C/LFE
17	AES 5/6 +	LS/RS
18	Chassis Ground	
19	AES 7/8 -	LC/RC
20	Chassis Ground	
21	N/C	
22	N/C	
23	Chassis Ground	
24	N/C	
25	N/C	

N/C = No connection



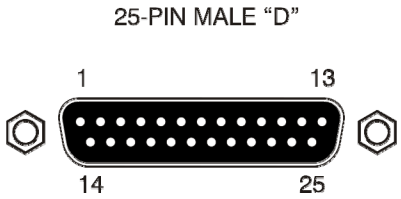
DIGITAL AUDIO IN (CH 9 – 16) – DB25F		
Pin	**Description**	**Standard Ch Assignment**
1	Chassis Ground	
2	AES 9/10 -	
3	AES 11/12 +	
4	Chassis Ground	
5	AES 13/14 -	
6	AES 15/16 +	
7	Chassis Ground	
8	N/C	
9	Chassis Ground	
10	N/C	
11	N/C	
12	Chassis Ground	
13	N/C	
14	AES 9/10 +	
15	Chassis Ground	
16	AES 11/12 -	
17	AES 13/14 +	
18	Chassis Ground	
19	AES 15/16 -	
20	Chassis Ground	
21	N/C	
22	N/C	
23	Chassis Ground	
24	N/C	
25	N/C	

N/C = No connection



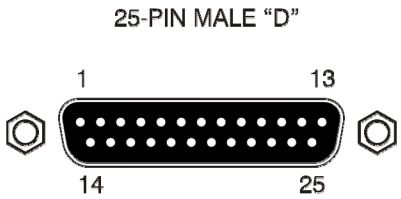
DIGITAL AUDIO OUT (CH 1 – 8) – DB25M		
Pin	**Description**	**Standard Ch Assignment**
1	Chassis Ground	
2	AES 1/2 -	L/R
3	AES 3/4 +	C/LFE
4	Chassis Ground	
5	AES 5/6 -	LS/RS
6	AES 7/8 +	LC/RC
7	Chassis Ground	
8	N/C	
9	Chassis Ground	
10	N/C	
11	N/C	
12	Chassis Ground	
13	Word Clock Out	
14	AES 1/2 +	L/R
15	Chassis Ground	
16	AES 3/4 -	C/LFE
17	AES 5/6 +	LS/RS
18	Chassis Ground	
19	AES 7/8 -	LC/RC
20	Chassis Ground	
21	N/C	
22	N/C	
23	Chassis Ground	
24	N/C	
25	N/C	

N/C = No connection



DIGITAL AUDIO OUT (CH 9 – 16) – DB25M		
Pin	**Description**	**Standard Ch Assignment**
1	Chassis Ground	
2	AES 9/10 -	
3	AES 11/12 +	
4	Chassis Ground	
5	AES 13/14 -	
6	AES 15/16 +	
7	Chassis Ground	
8	N/C	
9	Chassis Ground	
10	N/C	
11	N/C	
12	Chassis Ground	
13	Word Clock Out	
14	AES 9/10 +	
15	Chassis Ground	
16	AES 11/12 -	
17	AES 13/14 +	
18	Chassis Ground	
19	AES 15/16 -	
20	Chassis Ground	
21	N/C	
22	N/C	
23	Chassis Ground	
24	N/C	
25	N/C	

N/C = No connection



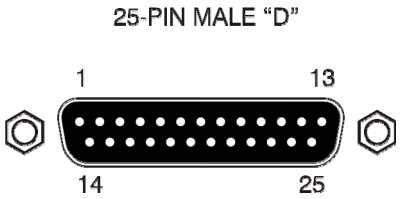
The digital audio output pinout is compatible with the XD10P Cinema Audio Processor as well as with the Ultra Stereo JSD-80 cinema processor. The pin-out also matches the Dolby DMA8.

Datasat Digital Entertainment offers a DB25 male to female cable, 3-feet long, for hook-up (DDE P/N 2503004100). If wiring your own cable, the following criteria must be met:

1. Cable must be double shielded to conform to FCC\CE RF radiation emission limits.
2. Cable length should be no longer than 1 meter.
3. Conductors must be no smaller than 28-AWG

ANALOG AUDIO OUT (CH 1 – 8) DB25M	
Pin	**Description**
1	ANALOG GND
2	CHANNEL 1 (+)
3	CHANNEL 7 (-)
4	ANALOG GND
5	CHANNEL 3 (+)
6	CHANNEL 8 (-)
7	ANALOG GND
8	CHANNEL 2 (+)
9	ANALOG GND
10	CHANNEL 5 (-)
11	CHANNEL 6 (-)
12	CHANNEL 4 (-)
13	ANALOG GND
14	CHANNEL 1 (-)
15	ANALOG GND
16	CHANNEL 7 (+)
17	CHANNEL 3 (-)
18	ANALOG GND
19	CHANNEL 8 (+)
20	CHANNEL 2 (-)
21	N/C
22	ANALOG GND
23	CHANNEL 5 (+)
24	CHANNEL 6 (+)
25	CHANNEL 4 (+)

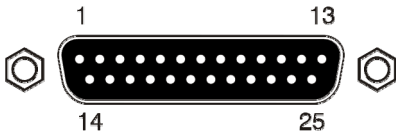
N/C = No connection



ANALOG AUDIO OUT (CH 9 – 16) DB25M	
Pin	**Description**
1	ANALOG GND
2	CHANNEL 9 (+)
3	CHANNEL 15 (-)
4	ANALOG GND
5	CHANNEL 11 (+)
6	CHANNEL 16 (-)
7	ANALOG GND
8	CHANNEL 10 (+)
9	ANALOG GND
10	CHANNEL 13 (-)
11	CHANNEL 14 (-)
12	CHANNEL 12 (-)
13	ANALOG GND
14	CHANNEL 9 (-)
15	ANALOG GND
16	CHANNEL 15 (+)
17	CHANNEL 11 (-)
18	ANALOG GND
19	CHANNEL 16 (+)
20	CHANNEL 10 (-)
21	N/C
22	ANALOG GND
23	CHANNEL 13 (+)
24	CHANNEL 14 (+)
25	CHANNEL 12 (+)

N/C = No connection

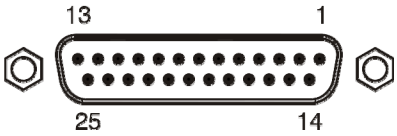
25-PIN MALE "D"



ANALOG AUDIO IN – DB25F	
Pin	**Description**
1	Left (-)
2	R/S (+)
3	R/S (-)
4	L/S (-)
5	R/E (-)
6	Right (-)
7	L/E (-)
8	Center (-)
9	GND
10	GND
11	GND
12	Sub (-)
13	GND
14	Left (+)
15	L/S (+)
16	R/E (+)
17	Right (+)
18	L/E (+)
19	GND
20	Center (+)
21	N/C
22	GND
23	GND
24	Sub (+)
25	N/C

N/C = No connection

25-PIN FEMALE "D"

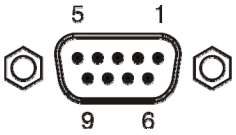


H338 Optical Film Card Option (Rear panel plug in board).

PROJECTOR 1 INPUT (Optional)– DB9F	
Pin	**Description**
1	LT (+)
2	LT / RT (-)
3	LT/ RT (-)
4	RT (+)
5	LT / RT (-)
6	LT / RT Analog GND
7	N/C
8	N/C
9	LT / RT Analog GND

N/C = No connection

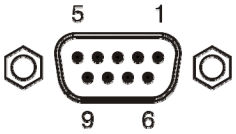
9-PIN FEMALE "D"



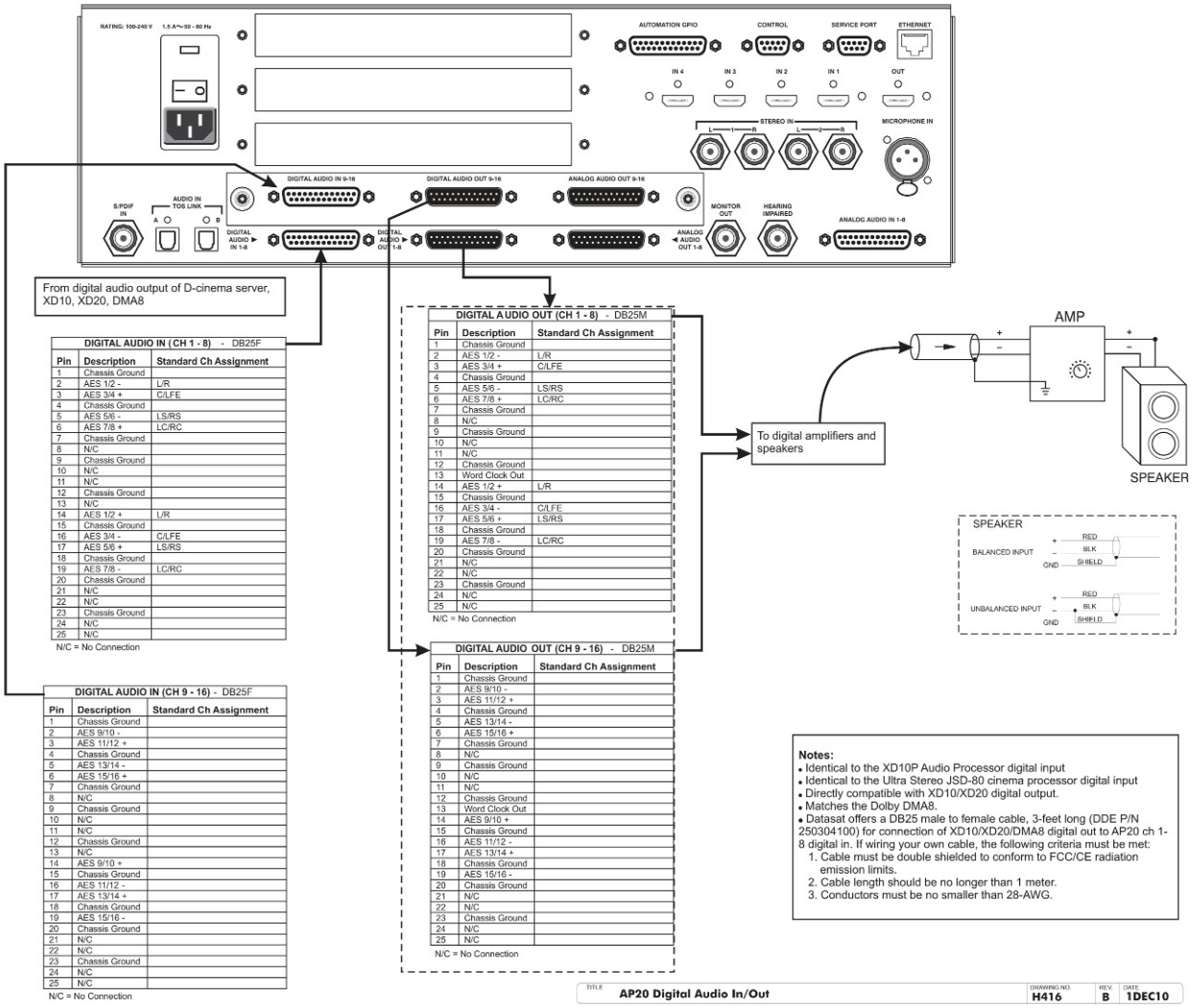
PROJECTOR 2 INPUT (Optional)– DB9F	
Pin	**Description**
1	LT (+)
2	LT / RT (-)
3	LT / RT (-)
4	RT (+)
5	LT / RT (-)
6	LT / RT Analog GND
7	N/C
8	N/C
9	LT / RT Analog GND

N/C = No connection

9-PIN FEMALE "D"



Appendix B: Interface Wiring Diagrams



DIGITAL AUDIO IN (CH 1 - 8) - DB25F

Pin	Description	Standard Ch Assignment
1	Chassis Ground	
2	AES 1/2 -	L/R
3	AES 3/4 +	C/LFE
4	Chassis Ground	
5	AES 5/6 -	LS/RS
6	AES 7/8 +	LC/RC
7	Chassis Ground	
8	N/C	
9	Chassis Ground	
10	N/C	
11	N/C	
12	Chassis Ground	
13	N/C	
14	AES 1/2 +	L/R
15	Chassis Ground	
16	AES 3/4 -	C/LFE
17	AES 5/6 +	LS/RS
18	Chassis Ground	
19	AES 7/8 -	LC/RC
20	Chassis Ground	
21	N/C	
22	N/C	
23	Chassis Ground	
24	N/C	
25	N/C	

N/C = No Connection

DIGITAL AUDIO IN (CH 9 - 16) - DB25F

Pin	Description	Standard Ch Assignment
1	Chassis Ground	
2	AES 9/10 -	
3	AES 11/12 +	
4	Chassis Ground	
5	AES 13/14 -	
6	AES 15/16 +	
7	Chassis Ground	
8	N/C	
9	Chassis Ground	
10	N/C	
11	N/C	
12	Chassis Ground	
13	N/C	
14	AES 9/10 +	
15	Chassis Ground	
16	AES 11/12 -	
17	AES 13/14 +	
18	Chassis Ground	
19	AES 15/16 -	
20	Chassis Ground	
21	N/C	
22	N/C	
23	Chassis Ground	
24	N/C	
25	N/C	

N/C = No Connection

DIGITAL AUDIO OUT (CH 1 - 8) - DB25M

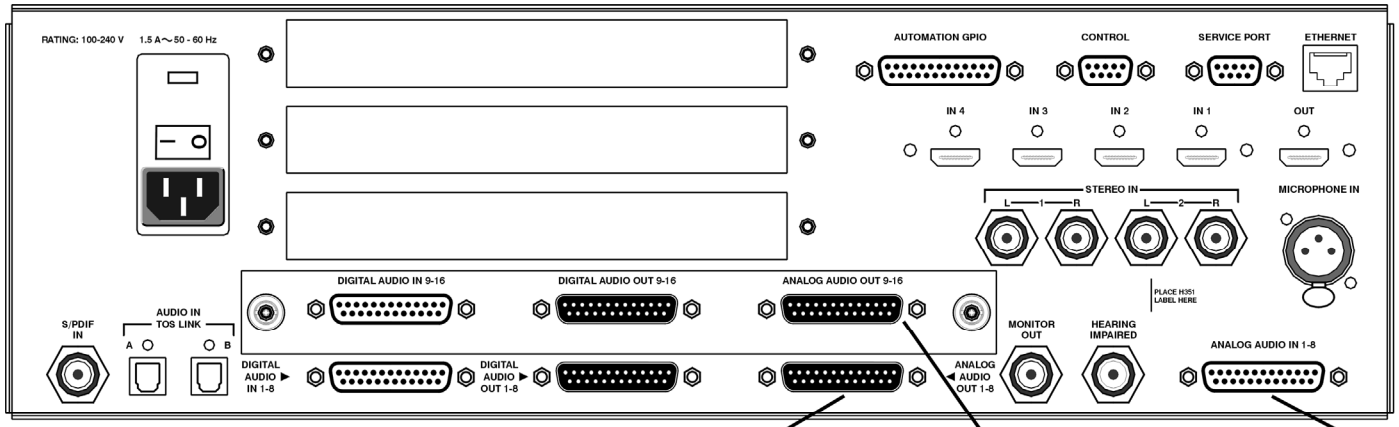
Pin	Description	Standard Ch Assignment
1	Chassis Ground	
2	AES 1/2 -	L/R
3	AES 3/4 +	C/LFE
4	Chassis Ground	
5	AES 5/6 -	LS/RS
6	AES 7/8 +	LC/RC
7	Chassis Ground	
8	N/C	
9	Chassis Ground	
10	N/C	
11	N/C	
12	Chassis Ground	
13	Word Clock Out	
14	AES 1/2 +	L/R
15	Chassis Ground	
16	AES 3/4 -	C/LFE
17	AES 5/6 +	LS/RS
18	Chassis Ground	
19	AES 7/8 -	LC/RC
20	Chassis Ground	
21	N/C	
22	N/C	
23	Chassis Ground	
24	N/C	
25	N/C	

N/C = No Connection

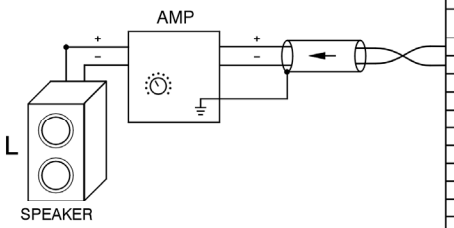
DIGITAL AUDIO OUT (CH 9 - 16) - DB25M

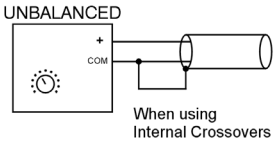
Pin	Description	Standard Ch Assignment
1	Chassis Ground	
2	AES 9/10 -	
3	AES 11/12 +	
4	Chassis Ground	
5	AES 13/14 -	
6	AES 15/16 +	
7	Chassis Ground	
8	N/C	
9	Chassis Ground	
10	N/C	
11	N/C	
12	Chassis Ground	
13	Word Clock Out	
14	AES 9/10 +	
15	Chassis Ground	
16	AES 11/12 -	
17	AES 13/14 +	
18	Chassis Ground	
19	AES 15/16 -	
20	Chassis Ground	
21	N/C	
22	N/C	
23	Chassis Ground	
24	N/C	
25	N/C	

N/C = No Connection



From Analog Out of DC20, XD20, XD10, DTS-6, DTS-6D, or DA10/20





The Analog Audio channels are assigned output pins during the AP20 Setup. Example shown is if channel 1 was defined as "Left".

ANALOG AUDIO OUT (CH 1 - 8)
DB25M

Pin	Description
1	ANALOG GND
2	CHANNEL 1 (+)
3	CHANNEL 7 (-)
4	ANALOG GND
5	CHANNEL 3 (+)
6	CHANNEL 8 (-)
7	ANALOG GND
8	CHANNEL 2 (+)
9	ANALOG GND
10	CHANNEL 5 (-)
11	CHANNEL 6 (-)
12	CHANNEL 4 (-)
13	ANALOG GND
14	CHANNEL 1 (-)
15	ANALOG GND
16	CHANNEL 7 (+)
17	CHANNEL 3 (-)
18	ANALOG GND
19	CHANNEL 8 (+)
20	CHANNEL 2 (-)
21	N/C
22	ANALOG GND
23	CHANNEL 5 (+)
24	CHANNEL 6 (+)
25	CHANNEL 4 (+)

N/C = No Connection

ANALOG AUDIO OUT (CH 9 - 16)
DB25M

Pin	Description
1	ANALOG GND
2	CHANNEL 9 (+)
3	CHANNEL 15 (-)
4	ANALOG GND
5	CHANNEL 11 (+)
6	CHANNEL 16 (-)
7	ANALOG GND
8	CHANNEL 10 (+)
9	ANALOG GND
10	CHANNEL 13 (-)
11	CHANNEL 14 (-)
12	CHANNEL 12 (-)
13	ANALOG GND
14	CHANNEL 9 (-)
15	ANALOG GND
16	CHANNEL 15 (+)
17	CHANNEL 11 (-)
18	ANALOG GND
19	CHANNEL 16 (+)
20	CHANNEL 10 (-)
21	N/C
22	ANALOG GND
23	CHANNEL 13 (+)
24	CHANNEL 14 (+)
25	CHANNEL 12 (+)

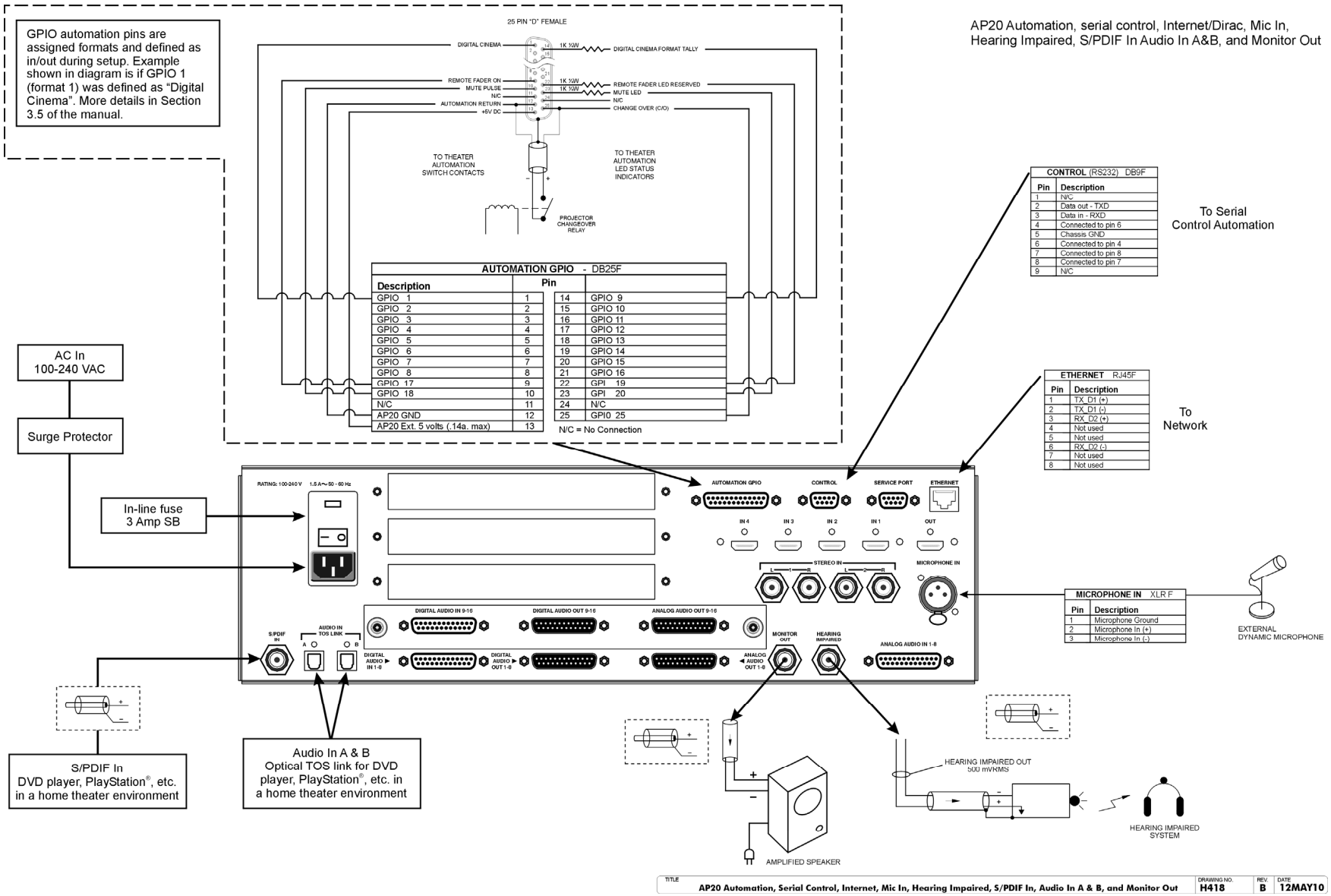
N/C = No Connection

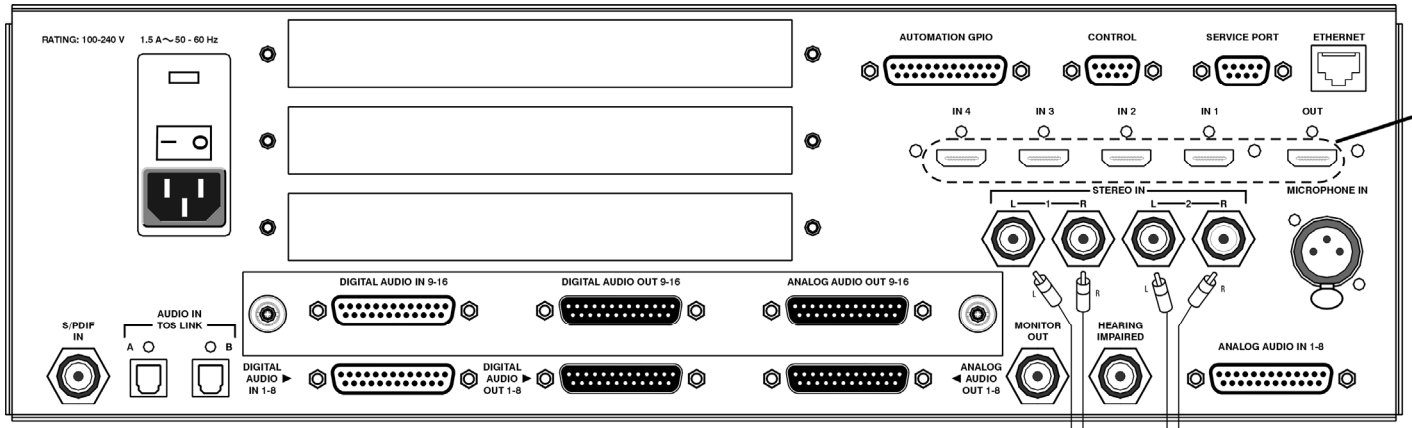
ANALOG AUDIO IN DB25F

Pin	Description
1	Left (-)
2	R/S (+)
3	R/S (-)
4	L/S (-)
5	R/E (-)
6	Right (-)
7	L/E (-)
8	Center (-)
9	GND
10	GND
11	GND
12	Sub (-)
13	GND
14	Left (+)
15	L/S (+)
16	R/E (+)
17	Right (+)
18	L/E (+)
19	GND
20	Center (+)
21	N/C
22	GND
23	GND
24	Sub (+)
25	N/C

N/C = No Connection

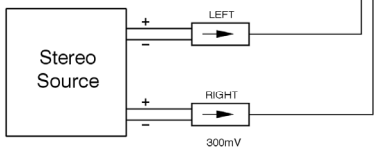
TITLE	DRAWING NO.	REV.	DATE
AP20 Analog Audio In/Out	H417	B	12MAY10

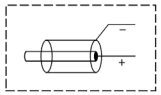

GPIO automation pins are assigned formats and defined as in/out during setup. Example shown in diagram is if GPIO 1 (format 1) was defined as "Digital Cinema". More details in Section 3.5 of the manual.
AP20 Automation, serial control, Internet/Dirac, Mic In, Hearing Impaired, S/PDIF In Audio In A&B, and Monitor Out
25 PIN "D" FEMALE
DIGITAL CINEMA
1K ¼W
DIGITAL CINEMA FORMAT TALLY
REMOTE FADER ON
MUTE PULSE
N/C
AUTOMATION RETURN
+5V DC
1K ¼W
1K ¼W
REMOTE FADER LED RESERVED
MUTE LED
N/C
CHANGE OVER (C/O)
TO THEATER AUTOMATION SWITCH CONTACTS
TO THEATER AUTOMATION LED STATUS INDICATORS
PROJECTOR CHANGEOVER RELAY
AUTOMATION GPIO - DB25F
Description | Pin | | Pin | Description
GPIO 1 | 1 | | 14 | GPIO 9
GPIO 2 | 2 | | 15 | GPIO 10
GPIO 3 | 3 | | 16 | GPIO 11
GPIO 4 | 4 | | 17 | GPIO 12
GPIO 5 | 5 | | 18 | GPIO 13
GPIO 6 | 6 | | 19 | GPIO 14
GPIO 7 | 7 | | 20 | GPIO 15
GPIO 8 | 8 | | 21 | GPIO 16
GPIO 17 | 9 | | 22 | GPI 19
GPIO 18 | 10 | | 23 | GPI 20
N/C | 11 | | 24 | N/C
AP20 GND | 12 | | 25 | GPIO 25
AP20 Ext. 5 volts (.14a. max) | 13 |
N/C = No Connection
CONTROL (RS232) DB9F
Pin | Description
1 | N/C
2 | Data out - TXD
3 | Data in - RXD
4 | Connected to pin 6
5 | Chassis GND
6 | Connected to pin 4
7 | Connected to pin 8
8 | Connected to pin 7
9 | N/C
To Serial Control Automation
ETHERNET RJ45F
Pin | Description
1 | TX_D1 (+)
2 | TX_D1 (-)
3 | RX_D2 (+)
4 | Not used
5 | Not used
6 | RX_D2 (-)
7 | Not used
8 | Not used
To Network
AC In 100-240 VAC
Surge Protector
In-line fuse 3 Amp SB
RATING: 100-240 V 1.5 A~50 - 60 Hz
AUTOMATION GPIO
CONTROL
SERVICE PORT
ETHERNET
IN 4
IN 3
IN 2
IN 1
OUT
STEREO IN
MICROPHONE IN
DIGITAL AUDIO IN 9-16
DIGITAL AUDIO OUT 9-16
ANALOG AUDIO OUT 9-16
S/PDIF IN
AUDIO IN TOS LINK
A
B
DIGITAL AUDIO IN 1-8
DIGITAL AUDIO OUT 1-8
ANALOG AUDIO OUT 1-8
MONITOR OUT
HEARING IMPAIRED
ANALOG AUDIO IN 1-8
MICROPHONE IN XLR F
Pin | Description
1 | Microphone Ground
2 | Microphone In (+)
3 | Microphone In (-)
EXTERNAL DYNAMIC MICROPHONE
S/PDIF In
DVD player, PlayStation®, etc. in a home theater environment
Audio In A & B
Optical TOS link for DVD player, PlayStation®, etc. in a home theater environment
AMPLIFIED SPEAKER
HEARING IMPAIRED OUT
500 mVRMS
HEARING IMPAIRED SYSTEM
TITLE
AP20 Automation, Serial Control, Internet, Mic In, Hearing Impaired, S/PDIF In, Audio In A & B, and Monitor Out
DRAWING NO.
H418
REV.
B
DATE
12MAY10



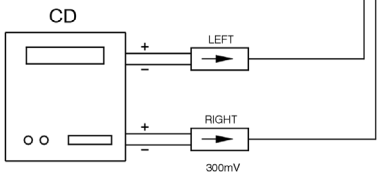
HDMI IN 1-4, OUT HDMI	
Pin	**Description**
1	TMDS Data 2 (+)
2	TMDS Data 2 (Shield)
3	TMDS Data 2 (-)
4	TMDS Data 1 (+)
5	TMDS Data 1 (Shield)
6	TMDS Data 1 (-)
7	TMDS Data 0 (+)
8	TMDS Data 0 (Shield)
9	TMDS Data 0 (-)
10	TMDS Clock (+)
11	TMDS Clock (Shield)
12	TMDS Clock (-)
13	CEC
14	N/C
15	DDC Clock
16	DDC Data
17	Ground
18	+5 V
19	Hot Plug Direct

N/C = No Connection

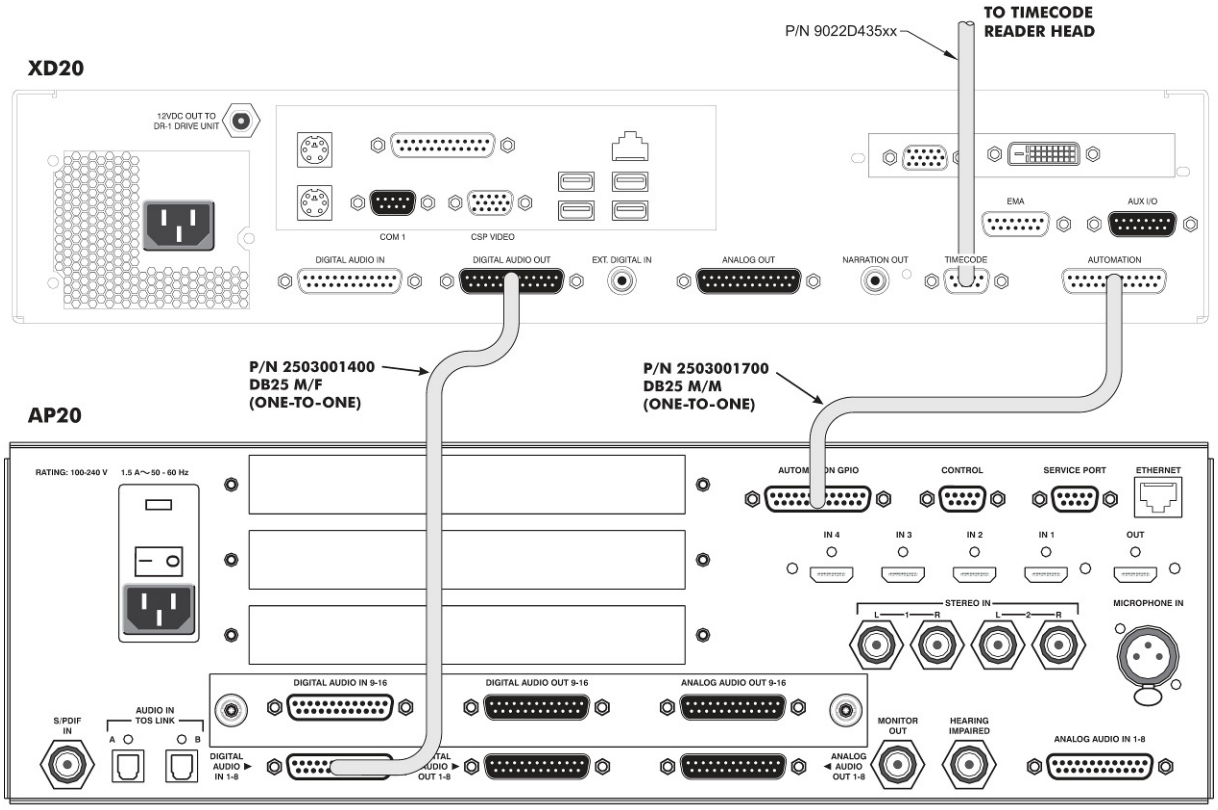




RCA FEMALE	
Pin	**Description**
Center	Signal
Outer	Ground



TITLE	DRAWING NO.	REV.	DATE
AP20 Stereo 1 & 2 In, HDMI In/Out	**H419**	**A**	**12MAY10**



TO PROGRAM THE XD20 AUTOMATION CONNECTOR, CHOOSE THE XD10P DIGITAL AUTOMATION PRESET VIA THE FOLLOWING MENU SEQUENCE:

- MAIN MENU → SETUP (ENTER)
- SYSTEM SETUP MENU → AUTOMATION (ENTER)
- AUTOMATION\CONTROL → FORMAT (ENTER)
- FORMAT AUTOMATION → PIN DEFINITIONS (ENTER)
- FORMAT PIN DEFS → PREDEFINED FORMATS (ENTER)
- AUTOMATION PRESET → (*) XD10P ANALOG (ENTER)

XD20 DIGITAL OUT CONNECTOR (CH1-10)

PIN	FUNCTION
1	AES GND
2	AES 1/2 -
3	AES 3/4 +
4	AES GND
5	AES 5/6 -
6	AES 7/8 +
7	AES GND
8	
9	AES GND
10	
11	
12	AES GND
13	
14	AES 1/2 +
15	AES GND
16	AES 3/4 -
17	AES 5/6 +
18	AES GND
19	AES 7/8 -
20	AES GND
21	
22	
23	AES GND
24	
25	

AP20 DIGITAL AUDIO IN (CH 1 - 8)

Pin	Description	Standard Ch Assignment
1	Chassis Ground	
2	AES 1/2 -	L/R
3	AES 3/4 +	C/LFE
4	Chassis Ground	
5	AES 5/6 -	LS/RS
6	AES 7/8 +	LC/RC
7	Chassis Ground	
8	N/C	
9	Chassis Ground	
10	N/C	
11	N/C	
12	Chassis Ground	
13	N/C	
14	AES 1/2 +	L/R
15	Chassis Ground	
16	AES 3/4 -	C/LFE
17	AES 5/6 +	LS/RS
18	Chassis Ground	
19	AES 7/8 -	LC/RC
20	Chassis Ground	
21	N/C	
22	N/C	
23	Chassis Ground	
24	N/C	
25	N/C	

△1

AUTOMATION GPIO - DB25F	
PIN	DESCRIPTION
1	GPIO (Format 0)
2	GPIO (Format 1)
3	GPIO (Format 2)
4	GPIO (Format 3)
5	GPIO (Format 4)
6	GPIO (Format 5)
7	GPIO (Format 6)
8	GPIO (Format 7)
12	AP20 GND

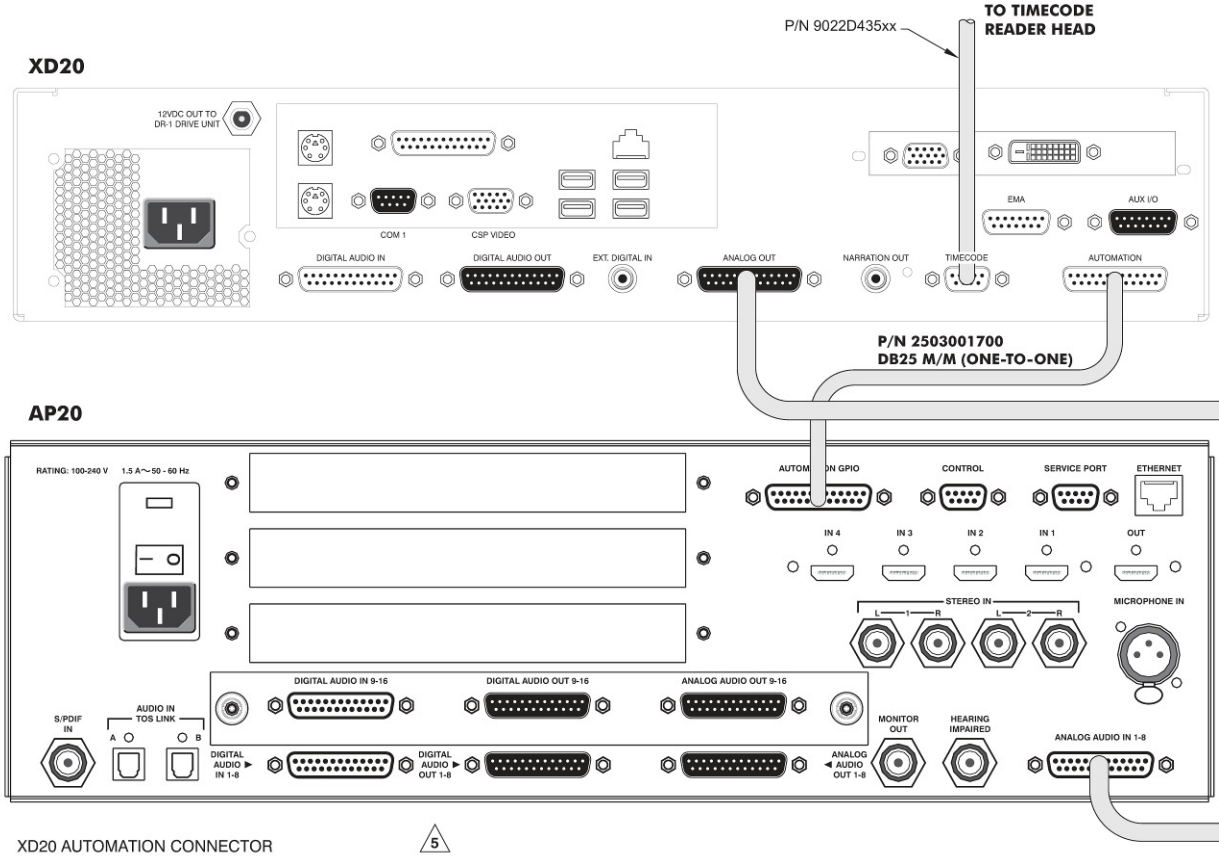
XD20 AUTOMATION CONNECTOR

PIN	FUNCTION	PRESET (6D EMULATION)
1	FORMAT 0	MONO
2	FORMAT 1	A-TYPE
3	FORMAT 2	SR
4	FORMAT 3	N/C
5	FORMAT 4	DTS
6	FORMAT 5	N/C
7	FORMAT 6	NON-SYNC
8	FORMAT 7	N/C
9-11	N/C	N/C
12	USER GND	DTS COMMON
13	USER SUPPLY	N/C
14-25	N/C	N/C

NOTES:

△1 **Refer to TM-H392 section 4.5 for information on programming the AP20 automation.**

TITLE	DRAWING NO.	REV.	DATE
XD20 "DIGITAL" AUDIO OUT TO AP20 "DIGITAL" AUDIO IN	H420	C	12MAY10



TO PROGRAM THE XD20 AUTOMATION CONNECTOR, CHOOSE THE XD10P ANALOG AUTOMATION PRESET VIA THE FOLLOWING MENU SEQUENCE:

- MAIN MENU → SETUP (ENTER)
- SYSTEM SETUP MENU → AUTOMATION (ENTER)
- AUTOMATION\CONTROL → FORMAT (ENTER)
- FORMAT AUTOMATION → PIN DEFINITIONS (ENTER)
- FORMAT PIN DEFS → PREDEFINED FORMATS (ENTER)
- AUTOMATION PRESET → (*) XD10P ANALOG (ENTER)

XD20 AUTOMATION CONNECTOR

PIN	FUNCTION	PRESET (6D EMULATION)
1	FORMAT 0	MONO
2	FORMAT 1	A-TYPE
3	FORMAT 2	SR
4	FORMAT 3	N/C
5	FORMAT 4	DTS
6	FORMAT 5	N/C
7	FORMAT 6	NON-SYNC
8	FORMAT 7	N/C
9-11	N/C	N/C
12	USER GND	DTS COMMON
13	USER SUPPLY	N/C
14-25	N/C	N/C

△5

AP20 AUTOMATION GPIO
DB25F

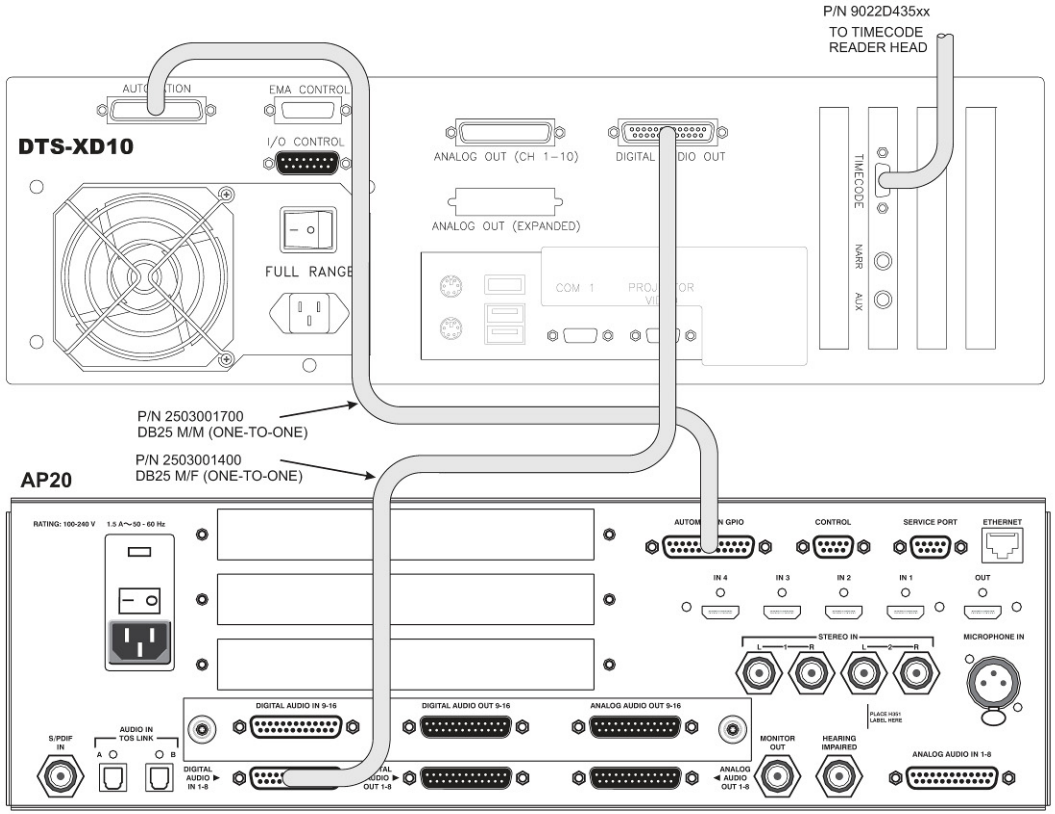
PIN	DESCRIPTION
1	GPIO (Format 0)
2	GPIO (Format 1)
3	GPIO (Format 2)
4	GPIO (Format 3)
5	GPIO (Format 4)
6	GPIO (Format 5)
7	GPIO (Format 6)
8	GPIO (Format 7)
12	AP20 GND

For optimum playback sound, the XD20 digital output should be used to the AP20 digital in.

Notes:
1. NC = No Connecton
2. GND = Ground
3. Cable must be shielded and the shield should be connected to the connector's shell (chassis/earth ground)
4. Connectors shown are type used on the unit.

△5 Refer to TM-H392 section 4.5 for information on programming the AP20 automation.

TITLE	DRAWING NO.	REV.	DATE
XD20 ANALOG AUDIO OUT TO AP20 ANALOG AUDIO IN, CH 1-8	H421	C	12MAY10



NOTES:
1. THE XD10 MUST HAVE THE DIGITAL OPTION INSTALLED WHEN CONNECTING TO THE AP20 DIGITAL CONNECTOR.
2. REFER TO TM-H392 SECTION 4.5 FOR INFORMATION ON PROGRAMMING THE AP20 AUTOMATION.

TITLE	DRAWING NO.	REV.	DATE
XD10 "DIGITAL" AUDIO OUT TO AP20 "DIGITAL" AUDIO IN, CH 1-8	H422	C	16MAY10

TO PROGRAM THE XD10 AUTOMATION CONNECTOR, CHOOSE THE XD10P DIGITAL AUTOMATION PRESET VIA THE FOLLOWING MENU SEQUENCE:

MAIN MENU → SETUP (ENTER)
↓
SYSTEM SETUP MENU → AUTOMATION SETUP (ENTER)
↓
AUTOMATION\CONTROL → FORMAT (ENTER)
↓
FORMAT AUTOMATION → PIN DEFINITIONS (ENTER)
↓
FORMAT PIN DEFS → PREDEFINED FORMATS (ENTER)
↓
AUTOMATION PRESET → (*) XD10P ANALOG (ENTER)

AP20 DIGITAL AUDIO IN (CH 1 - 8) DB25F

Pin	Description	Standard Ch Assignment
1	Chassis Ground	
2	AES 1/2 -	L/R
3	AES 3/4 +	C/LFE
4	Chassis Ground	
5	AES 5/6 -	LS/RS
6	AES 7/8 +	LC/RC
7	Chassis Ground	
8	N/C	
9	Chassis Ground	
10	N/C	
11	N/C	
12	Chassis Ground	
13	N/C	
14	AES 1/2 +	L/R
15	Chassis Ground	
16	AES 3/4 -	C/LFE
17	AES 5/6 +	LS/RS
18	Chassis Ground	
19	AES 7/8 -	LC/RC
20	Chassis Ground	
21	N/C	
22	N/C	
23	Chassis Ground	
24	N/C	
25	N/C	

XD10 DIGITAL OUT CONNECTOR (CH1-10)

PIN	FUNCTION
1	AES GND
2	AES 1/2 -
3	AES 3/4 +
4	AES GND
5	AES 5/6 -
6	AES 7/8 +
7	AES GND
8	
9	AES GND
10	
11	
12	AES GND
13	
14	AES 1/2 +
15	AES GND
16	AES 3/4 -
17	AES 5/6 +
18	AES GND
19	AES 7/8 -
20	AES GND
21	
22	
23	AES GND
24	
25	

2

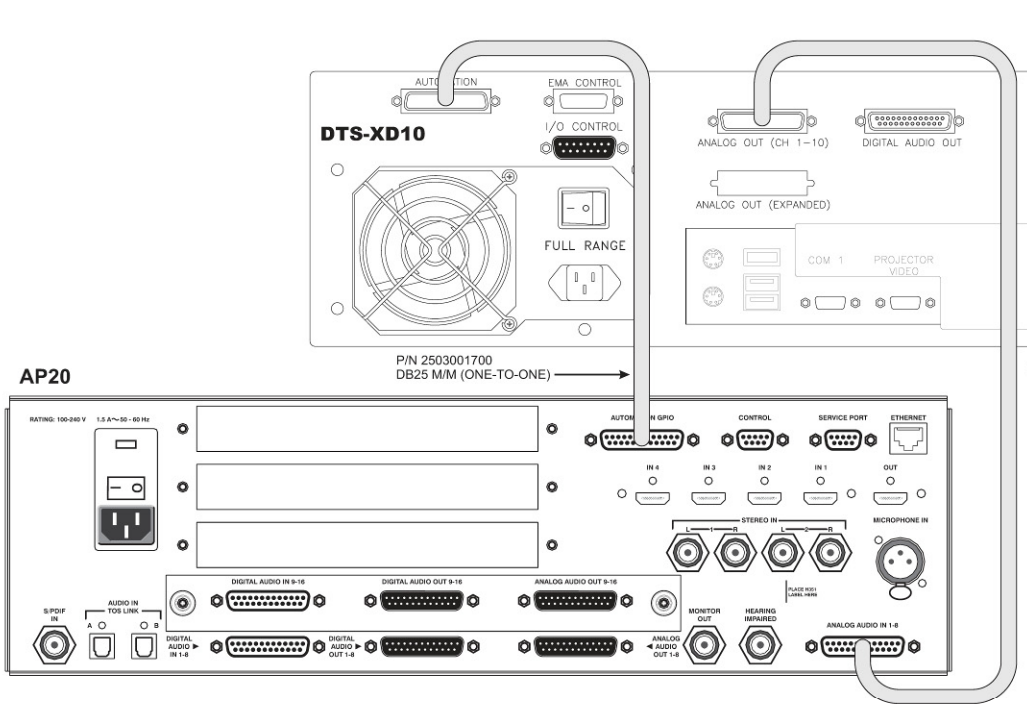
AP20 AUTOMATION GPIO - DB25F

Pin	Description
1	GPIO 1 (Format 0)
2	GPIO 2 (Format 1)
3	GPIO 3 (Format 2)
4	GPIO 4 (Format 3)
5	GPIO 5 (Format 4)
6	GPIO 6 (Format 5)
7	GPIO 7 (Format 6)
8	GPIO 8 (Format 7)
12	AP20 GND

N/C = No Connection

XD10 AUTOMATION CONNECTOR - DB25F

PIN	FUNCTION	PRESET (6D EMULATION)
1	FORMAT 0	MONO
2	FORMAT 1	A-TYPE
3	FORMAT 2	SR
4	FORMAT 3	NC
5	FORMAT 4	DIGITAL
6	FORMAT 5	NC
7	FORMAT 6	NON-SYNC
8	FORMAT 7	NC
9-11	N/C	
12	USER GND	DTS COMMON
13	USER SUPPLY	
14-25	N/C	



TO PROGRAM THE XD10 AUTOMATION CONNECTOR, CHOOSE THE XD10P ANALOG AUTOMATION PRESET VIA THE FOLLOWING MENU SEQUENCE:

- MAIN MENU → SETUP (ENTER)
- SYSTEM SETUP MENU → AUTOMATION SETUP (ENTER)
- AUTOMATION\CONTROL → FORMAT (ENTER)
- FORMAT AUTOMATION → PIN DEFINITIONS (ENTER)
- FORMAT PIN DEFS → PREDEFINED FORMATS (ENTER)
- AUTOMATION PRESET → (*) XD10P ANALOG (ENTER)

5

AP20 AUTOMATION GPIO - DB25F

Pin	Description
1	GPIO 1
2	GPIO 2
3	GPIO 3
4	GPIO 4
5	GPIO 5
6	GPIO 6
7	GPIO 7
8	GPIO 8
9	GPIO 17
10	GPIO 18
11	N/C
12	AP20 GND
13	AP20 Ext. 5 volts (.14a. max)
14	GPIO 9
15	GPIO 10
16	GPIO 11
17	GPIO 12
18	GPIO 13
19	GPIO 14
20	GPIO 15
21	GPIO 16
22	GPI 19
23	GPI 20
24	N/C
25	Proj. 1 / Proj. 2

N/C = No Connection

XD10 AUTOMATION CONNECTOR - DB25F

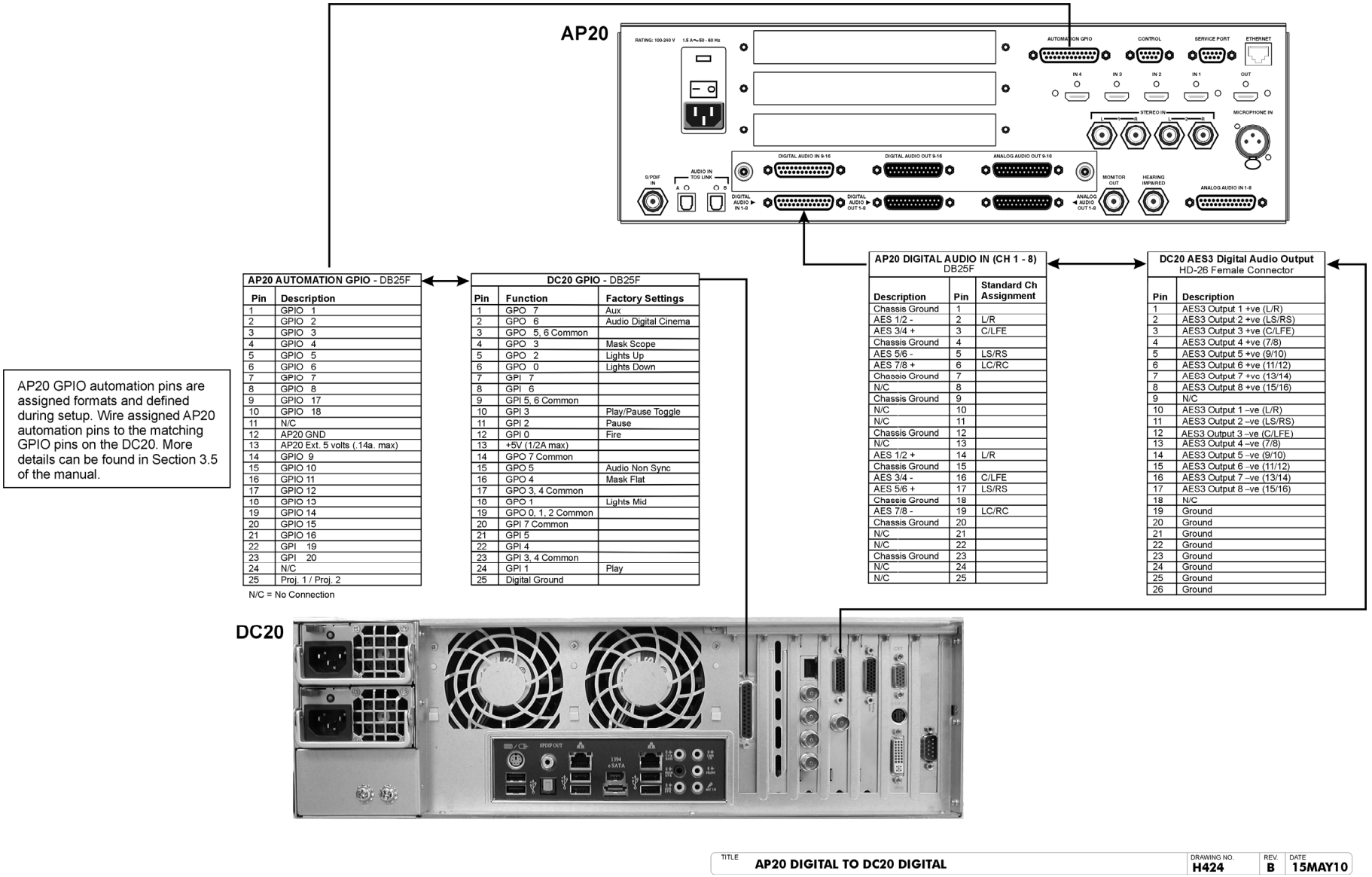
PIN	FUNCTION	PRESET (6D EMULATION)
1	FORMAT 0	MONO
2	FORMAT 1	A-TYPE
3	FORMAT 2	SR
4	FORMAT 3	NC
5	FORMAT 4	DIGITAL
6	FORMAT 5	NC
7	FORMAT 6	NON-SYNC
8	FORMAT 7	NC
9-11	N/C	
12	USER GND	DTS COMMON
13	USER SUPPLY	
14-25	N/C	

Notes:
1. NC = No Connecton
2. GND = Ground
3. Cable must be shielded and the shield should be connected to the connector's shell (chassis/earth ground)
4. Connectors shown are type used on the unit.

5 Refer to TM-H392 section 4.5 for information on programming the AP20 automation.

For optimum playback sound, the XD10 digital output should be used to the AP20 digital in.

TITLE	DRAWING NO.	REV.	DATE
XD10 "ANALOG" 6 & 8 TRACK OUT TO AP20 ANALOG IN CH 1-8	H423	C	15MAY10



AP20 AUTOMATION GPIO - DB25F

Pin	Description
1	GPIO 1
2	GPIO 2
3	GPIO 3
4	GPIO 4
5	GPIO 5
6	GPIO 6
7	GPIO 7
8	GPIO 8
9	GPIO 17
10	GPIO 18
11	N/C
12	AP20 GND
13	AP20 Ext. 5 volts (.14a. max)
14	GPIO 9
15	GPIO 10
16	GPIO 11
17	GPIO 12
18	GPIO 13
19	GPIO 14
20	GPIO 15
21	GPIO 16
22	GPI 19
23	GPI 20
24	N/C
25	Proj. 1 / Proj. 2

DC20 GPIO - DB25F

Pin	Function	Factory Settings
1	GPO 7	Aux
2	GPO 6	Audio Digital Cinema
3	GPO 5, 6 Common	
4	GPO 3	Mask Scope
5	GPO 2	Lights Up
6	GPO 0	Lights Down
7	GPI 7	
8	GPI 6	
9	GPI 5, 6 Common	
10	GPI 3	Play/Pause Toggle
11	GPI 2	Pause
12	GPI 0	Fire
13	+5V (1/2A max)	
14	GPO 7 Common	
15	GPO 5	Audio Non Sync
16	GPO 4	Mask Flat
17	GPO 3, 4 Common	
18	GPO 1	Lights Mid
19	GPO 0, 1, 2 Common	
20	GPI 7 Common	
21	GPI 5	
22	GPI 4	
23	GPI 3, 4 Common	
24	GPI 1	Play
25	Digital Ground	

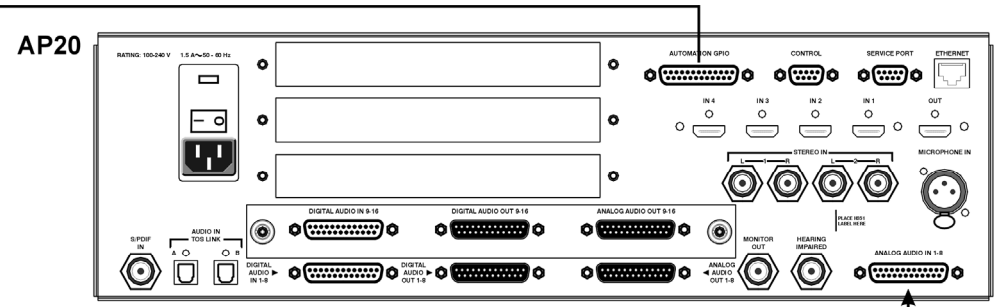
AP20 DIGITAL AUDIO IN (CH 1 - 8)
DB25F

Description	Pin	Standard Ch Assignment
Chassis Ground	1	
AES 1/2 -	2	L/R
AES 3/4 +	3	C/LFE
Chassis Ground	4	
AES 5/6 -	5	LS/RS
AES 7/8 +	6	LC/RC
Chassis Ground	7	
N/C	8	
Chassis Ground	9	
N/C	10	
N/C	11	
Chassis Ground	12	
N/C	13	
AES 1/2 +	14	L/R
Chassis Ground	15	
AES 3/4 -	16	C/LFE
AES 5/6 +	17	LS/RS
Chassis Ground	18	
AES 7/8 -	19	LC/RC
Chassis Ground	20	
N/C	21	
N/C	22	
Chassis Ground	23	
N/C	24	
N/C	25	

DC20 AES3 Digital Audio Output
HD-26 Female Connector

Pin	Description
1	AES3 Output 1 +ve (L/R)
2	AES3 Output 2 +ve (LS/RS)
3	AES3 Output 3 +ve (C/LFE)
4	AES3 Output 4 +ve (7/8)
5	AES3 Output 5 +ve (9/10)
6	AES3 Output 6 +ve (11/12)
7	AES3 Output 7 +vc (13/14)
8	AES3 Output 8 +ve (15/16)
9	N/C
10	AES3 Output 1 –ve (L/R)
11	AES3 Output 2 –ve (LS/RS)
12	AES3 Output 3 –ve (C/LFE)
13	AES3 Output 4 –ve (7/8)
14	AES3 Output 5 –ve (9/10)
15	AES3 Output 6 –ve (11/12)
16	AES3 Output 7 –ve (13/14)
17	AES3 Output 8 –ve (15/16)
18	N/C
19	Ground
20	Ground
21	Ground
22	Ground
23	Ground
24	Ground
25	Ground
26	Ground

TITLE	DRAWING NO.	REV.	DATE
AP20 DIGITAL TO DC20 DIGITAL	H424	B	15MAY10



AP20 GPIO automation pins are assigned formats and defined during setup. Wire assigned AP20 automation pins to the matching GPIO pins on the DC20. More details can be found in Section 3.5 of the manual.

AP20 AUTOMATION GPIO - DB25F

Pin	Description
1	GPIO 1
2	GPIO 2
3	GPIO 3
4	GPIO 4
5	GPIO 5
6	GPIO 6
7	GPIO 7
8	GPIO 8
9	GPIO 17
10	GPIO 18
11	N/C
12	AP20 GND
13	AP20 Ext. 5 volts (.14a. max)
14	GPIO 9
15	GPIO 10
16	GPIO 11
17	GPIO 12
18	GPIO 13
19	GPIO 14
20	GPIO 15
21	GPIO 16
22	GPI 19
23	GPI 20
24	N/C
25	Proj. 1 / Proj. 2

N/C = No Connection

DC20 GPIO - DB25F

Pin	Function	Factory Settings
1	GPO 7	Aux
2	GPO 6	Audio Digital Cinema
3	GPO 5, 6 Common	
4	GPO 3	Mask Scope
5	GPO 2	Lights Up
6	GPO 0	Lights Down
7	GPI 7	
8	GPI 6	
9	GPI 5, 6 Common	
10	GPI 3	Play/Pause Toggle
11	GPI 2	Pause
12	GPI 0	Fire
13	+5V (1/2A max)	
14	GPO 7 Common	
15	GPO 5	Audio Non Sync
16	GPO 4	Mask Flat
17	GPO 3, 4 Common	
18	GPO 1	Lights Mid
19	GPO 0, 1, 2 Common	
20	GPI 7 Common	
21	GPI 5	
22	GPI 4	
23	GPI 3, 4 Common	
24	GPI 1	Play
25	Digital Ground	

DC20 Analog Out HD26F — AP20 Analog In DB25F

PIN	DESC	PIN	DESC
10	Left (–)	1	Left (–)
6	R/S (+)	2	R/S (+)
15	R/S (–)	3	R/S (–)
4	L/S (–)	4	L/S (–)
17	R/C (–)	5	R/E (–)
11	Right (–)	6	Right (–)
16	L/C (–)	7	L/E (–)
12	Center (–)	8	Center (–)
19	GND	9	GND
23	GND	10	GND
24	GND	11	GND
13	Sub (–)	12	Sub (–)
25	GND	13	GND
1	Left (+)	14	Left (+)
5	L/S (+)	15	L/S (+)
8	R/C (+)	16	R/E (+)
2	Right (+)	17	Right (+)
7	L/C (+)	18	L/E (+)
20	GND	19	GND
3	Center (+)	20	Center (+)
18	NC	21	NC
21	GND	22	GND
22	GND	23	GND
4	Sub (+)	24	Sub (+)
26	GND	25	NC
9	NC		

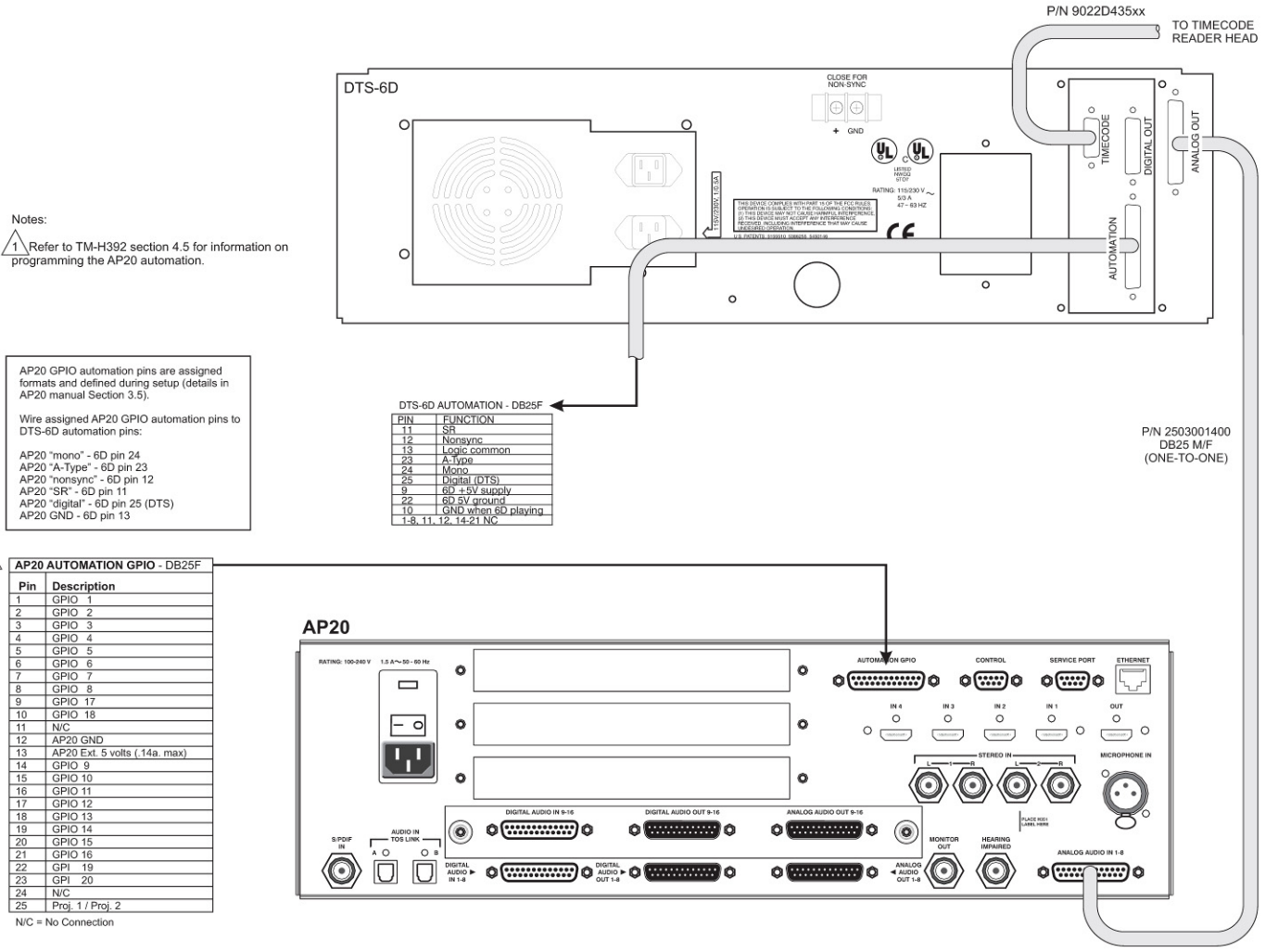
Connector shell

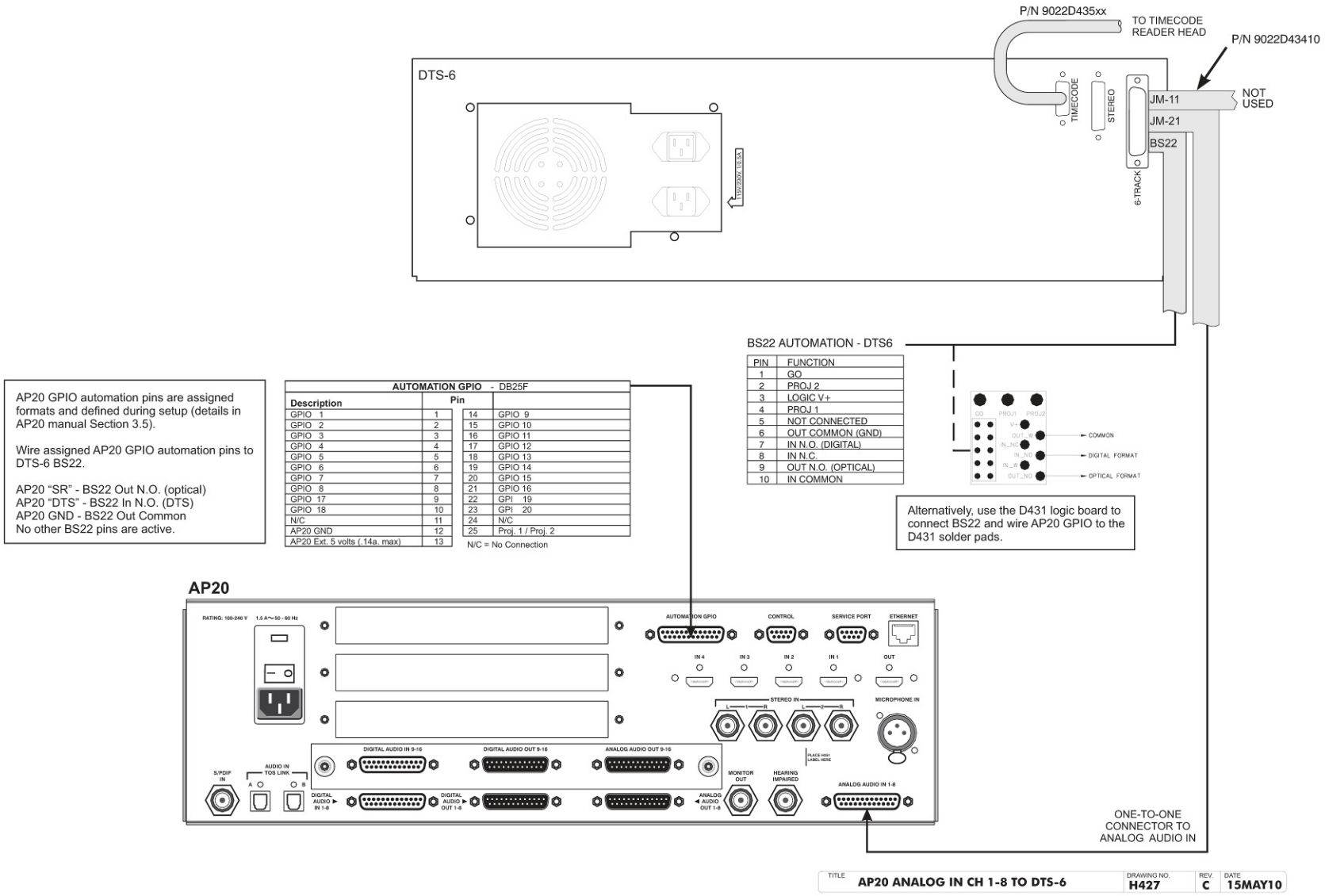
DC20

Notes:
1. NC = No Connecton
2. GND = Ground
3. Cable must be shielded and the shield should be connected to the connector's shell (chassis/earth ground)
4. Connectors shown are type used on the unit.

For optimum playback sound, the DC20 digital output should be used to the AP20 digital in.

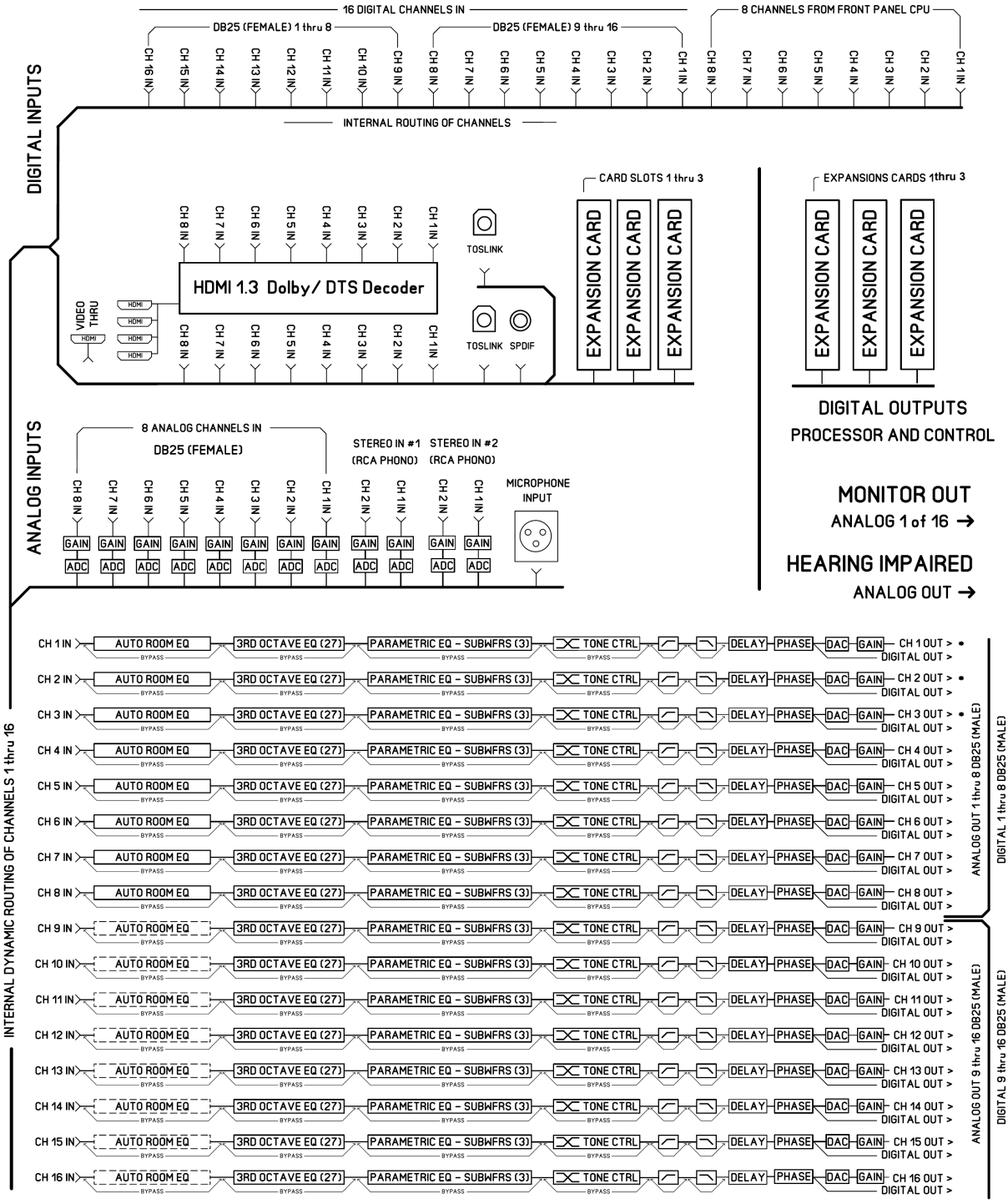
TITLE	DRAWING NO.	REV.	DATE
AP20 ANALOG CH 1-8 TO DC20 ANALOG	H425	B	12MAY10


P/N 9022D435xx
TO TIMECODE READER HEAD
DTS-6D
CLOSE FOR NON-SYNC
+ GND
TIMECODE
DIGITAL OUT
ANALOG OUT
AUTOMATION
Notes:
1 Refer to TM-H392 section 4.5 for information on programming the AP20 automation.
AP20 GPIO automation pins are assigned formats and defined during setup (details in AP20 manual Section 3.5).
Wire assigned AP20 GPIO automation pins to DTS-6D automation pins:
AP20 "mono" - 6D pin 24
AP20 "A-Type" - 6D pin 23
AP20 "nonsync" - 6D pin 12
AP20 "SR" - 6D pin 11
AP20 "digital" - 6D pin 25 (DTS)
AP20 GND - 6D pin 13
DTS-6D AUTOMATION - DB25F
PIN FUNCTION
11 SR
12 Nonsync
13 Logic common
23 A-Type
24 Mono
25 Digital (DTS)
9 6D +5V supply
22 6D 5V ground
10 GND when 6D playing
1-8, 11, 12, 14-21 NC
P/N 2503001400
DB25 M/F
(ONE-TO-ONE)
1
AP20 AUTOMATION GPIO - DB25F
Pin Description
1 GPIO 1
2 GPIO 2
3 GPIO 3
4 GPIO 4
5 GPIO 5
6 GPIO 6
7 GPIO 7
8 GPIO 8
9 GPIO 17
10 GPIO 18
11 N/C
12 AP20 GND
13 AP20 Ext. 5 volts (.14a. max)
14 GPIO 9
15 GPIO 10
16 GPIO 11
17 GPIO 12
18 GPIO 13
19 GPIO 14
20 GPIO 15
21 GPIO 16
22 GPI 19
23 GPI 20
24 N/C
25 Proj. 1 / Proj. 2
N/C = No Connection
AP20
AUTOMATION GPIO
CONTROL
SERVICE PORT
ETHERNET
STEREO IN
MICROPHONE IN
DIGITAL AUDIO IN 9-16
DIGITAL AUDIO OUT 9-16
ANALOG AUDIO OUT 9-16
ANALOG AUDIO IN 1-8
S/PDIF IN
AUDIO IN TOS LINK
MONITOR OUT
HEARING IMPAIRED
TITLE AP20 ANALOG IN CH 1-8 TO DTS-6D
DRAWING NO. H426
REV. C
DATE 15MAY10


P/N 9022D435xx
TO TIMECODE READER HEAD
P/N 9022D43410
DTS-6
TIMECODE
STEREO
6-TRACK
JM-11
JM-21
BS22
NOT USED
BS22 AUTOMATION - DTS6
PIN FUNCTION
1 GO
2 PROJ 2
3 LOGIC V+
4 PROJ 1
5 NOT CONNECTED
6 OUT COMMON (GND)
7 IN N.O. (DIGITAL)
8 IN N.C.
9 OUT N.O. (OPTICAL)
10 IN COMMON
COMMON
DIGITAL FORMAT
OPTICAL FORMAT
Alternatively, use the D431 logic board to connect BS22 and wire AP20 GPIO to the D431 solder pads.
AP20 GPIO automation pins are assigned formats and defined during setup (details in AP20 manual Section 3.5).
Wire assigned AP20 GPIO automation pins to DTS-6 BS22.
AP20 "SR" - BS22 Out N.O. (optical)
AP20 "DTS" - BS22 In N.O. (DTS)
AP20 GND - BS22 Out Common
No other BS22 pins are active.
AUTOMATION GPIO - DB25F
Description Pin
GPIO 1 1 14 GPIO 9
GPIO 2 2 15 GPIO 10
GPIO 3 3 16 GPIO 11
GPIO 4 4 17 GPIO 12
GPIO 5 5 18 GPIO 13
GPIO 6 6 19 GPIO 14
GPIO 7 7 20 GPIO 15
GPIO 8 8 21 GPIO 16
GPIO 17 9 22 GPI 19
GPIO 18 10 23 GPI 20
N/C 11 24 N/C
AP20 GND 12 25 Proj. 1 / Proj. 2
AP20 Ext. 5 volts (.14a. max) 13
N/C = No Connection
AP20
AUTOMATION GPIO
CONTROL
SERVICE PORT
ETHERNET
STEREO IN
MICROPHONE IN
DIGITAL AUDIO IN 9-16
DIGITAL AUDIO OUT 9-16
ANALOG AUDIO OUT 9-16
ANALOG AUDIO IN 1-8
ONE-TO-ONE CONNECTOR TO ANALOG AUDIO IN
TITLE AP20 ANALOG IN CH 1-8 TO DTS-6
DRAWING NO. H427
REV. C
DATE 15MAY10

Appendix C: AP20 Wiring and Block Diagrams

AUDIO PROCESSOR BLOCK DIAGRAM



NOTES:

Appendix D: AP20 Product Specifications

Digital Audio Decoders

Dolby

- Dolby AC3

DTS

- DTS Master Audio (future software upgrade)/ DTS ES (future software upgrade)/ DTS 5.1 / Neo:6

Signal Inputs

Digital Audio Inputs

- Channels: 16
- Connector: Two DB25 (Female) connectors (1-8) and (9-16)
- Digitial Format: AES/EBU
- Sample Rates: 44.1kHz, 48kHz, 96 kHz and 192kHz

Other Digital Audio Inputs

- Connector: Two TOSLINK (optical S/PDIF) and 1 coaxial (S/PDIF)

Analog Audio Inputs

- Channels: 8 balanced that are fully routable as to output, can be connected unbalanced
- Connector: DB25 (Female)
- Impedance: 10k ohms
- Sensitivity: 300mv rms

Other Analog Audio Inputs

- Channels: 2 stereo single ended and routable (non-sync) input pairs
- Connector: 4 RCA jacks
- Impedance: 10k ohms
- Sensitivity Adjustable: -16dBv to -4dBv

Microphone Input

- Single channel -68dBv to -8dBv input (XLR male connector) with switchable +48V phantom power

HDMI Audio & Video Inputs

- Audio Channels: Up to 8 (PCM, DTS-HD Master Audio & Dolby AC3)
- Connectors: 5 HDMI connectors (ie: 4 switched as inputs and 1 as output – Video passed thru)
- HDMI 1.3 compliant digital audio with video pass-thru

Signal Outputs

Digital Audio Outputs

- Channels: 16 (fully routable as to input)
- Connector: Two DB25 (Male) connectors (1-8) and (9-16)
- Digital Format: AES/EBU
- Sample Rates: 48kHz, 96 kHz and 192kHz

Analog Audio Outputs

- Balanced (can be connected unbalanced or single ended)
  - Channels: 16 (fully routable as to input), common mapping with Digital Outputs
  - Connectors: Two DB25 (Male) (1-8) and (9-16)
  - Level: -10dBu with Fader at 7, +26dBu max (balanced)
- Connector: 1 single ended RCA output, channel-selectable to drive an external monitor. Adjustable Levels, to 300mv rms
- Connector: 1 single ended RCA output, summed output for the hearing impaired. - Fixed Level Out, 300mv rms

Audio EQ

Dirac Live® Room Optimization

- 16-Channel Dirac Live® room optimization
- Installer kit required to install Dirac Live®

3rd Octave EQ

- 16 channels - 31 user-adjustable bandpass filters
- Adjustable in 0.5dB steps; total gain or loss of 6dB
- Frequencies range from 20Hz to 20kHz.

Parametric

- 16 channels with 3 user-adjustable parametric filters for shaping Subwoofer response.
- Adjustable from 20 to 200Hz, gain +/-6dB in 0.1dB steps
- Q range from 0.7 to 5.

Hi/Low/Bandpass Active Crossovers

- Adjustable from 20Hz to 20kHz; adjustable slope of 6, 12, 18 or 24dB per octave

Bass/Treble tone control

- Adjustable +/-6dB at 150Hz and 5.5kHz

Audio Delays

Individual Channel Delays

- 0 - 1000ms (ie: 0 to 1 second delay)

Global Delay

- 0 – 250ms

Note: Total delay per channel not to exceed 1000ms (ie: 1 second)

35mm Film Optical Soundtrack Audio Processing (with optional H338 PCB)

- Built-in processing for mono, A-Type and SR noise reduction.
- Matrix decoding LT/RT to left, center, right and surround
- Optical bass extension with adjustable low-pass filter and gain.
- 2 projector inputs for change-over operation.
- Automation control for change-over.
- BNC connectors for external RTA and oscilloscope.
- Graphical user interface for A-chain alignment including optical gain, slit-loss EQ, and azimuth.

Automation Inputs/Outputs

Connector

DB25(GPIO)

Management

Remote Control

- 2 RS232 DB9s
- 10/100 Ethernet
- Updated, controlled, and monitored via TMS using Ethernet
- Remote control (optional) that controls volume, channel mutes, formats and automation (Release TBD).

Setup/Operation Profiles

- Named profiles identifying inputs, output, filter and channel gain settings
- Touchscreen or automation format switching
- Export/Load of user profile to additional cinema processors with identical room setups (via USB)

Power Requirements

100-240 VAC, 50-60Hz, auto-switching

60w power consumption

Hardware Dimensions

3U 19” rackmount standard

Imperial - 5.25”(H) x 19.0”(W) x 15.0”(D) Shipping Weight: 30lbs

Metric - 13.33 cm(H) x 48.25 cm(W) x 38.1 cm(D) Shipping Weight: 13.6kg

E&OE

All product specifications subject to change without notice. All trademarks are properties of their respective owners.

Appendix E. AP20 Dolby® Digital Operation

Introduction

The AP20 accepts a Dolby® Digital audio stream from a DVD, Game Console, Satellite link or other source device. The Dolby® Digital bit stream is automatically detected and decoded internally by the AP20 software. The decoded stream will be routed to the first eight channels internally on the AP20.

☑ This feature is only available with AP20 system software V1.02.00 and above.

Inputs that support Dolby® Digital

The following digital inputs accept and the Dolby® Digital audio stream:

- HDMI (ports 1 – 4)
- S/PDIF1 (TosLink)
- S/PDIF2 (TosLink)
- S/PDIF3 (Coax)

Operation

The AP20 monitors the selected input signal from one of the S/PDIF or HDMI ports to determine the type of audio signal received. If a Dolby® Digital stream is detected, the AP20 decodes the audio and places it on the first 8 channels (see Table 1).

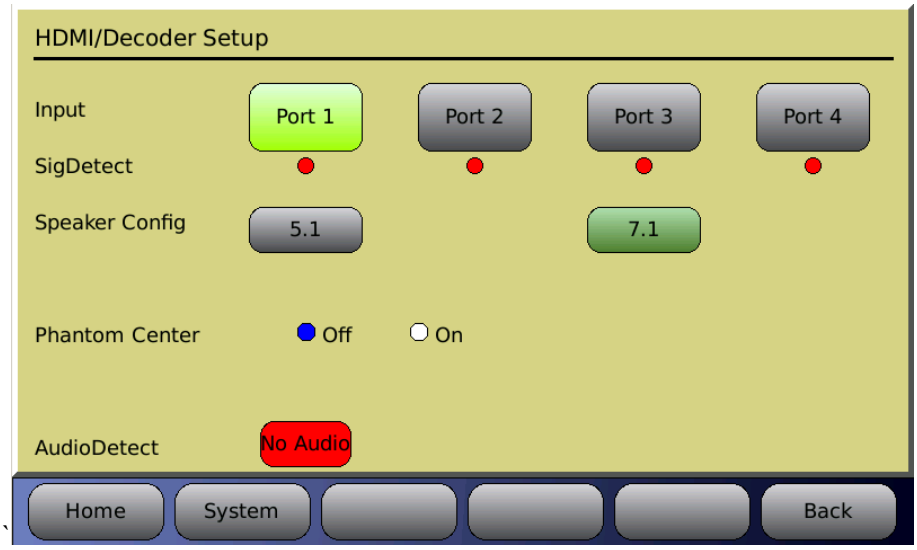
If an un-encoded digital signal is received (i.e. 2-channel PCM), the signal is routed to the first two channels in the AP20 (Left and Right) and the others remain muted. The HDMI also supports 6 or 8 channel un-encoded PCM signal. The AP20 will switch between Dolby® Digital and PCM as the signal type changes. This occurs automatically within the AP20.

Table 1: Dolby® Digital Channel Assignments

CHANNEL NUMBER	CHANNEL NAME
1	Left
2	Right
3	Center
4	LFE
5	Left Surround
6	Right Surround
7	Back Surround (only with 6.1 playback)
8	

HDMI Setup Options

Additional Dolby® Digital options are available to set the speaker configuration and phantom center option. These options are accessed through the menu path Formats → Format Options → HDMI Options. (Note: You must first select a format with HDMI as the source).



Speaker Config

- **5.1 –** When playing Dolby® Digital 6.1 audio the back surround channel information will be mixed into the left surround and right surround channels.
- **7.1 –** When playing Dolby® Digital 6.1 audio the back surround channel information is placed on both back surround channels: 7 and 8. When playing 5.1 audio, the back surround channels are silent.

Phantom Center

- **Off –** Normal operation with a center channel speaker.
- **On –** Use when center channel speaker is not available. The information from the center channel plays on the left and right channels. Note: This is only in effect while playing Dolby® Digital audio.

Appendix F: Optical Film Card Option

F1. Introduction

The Optional Optical Film card (H338) will enable the playback of standard optical film soundtracks including Mono, A, and SR type. After the H338 card is installed, optical formats must be programmed before playing optical sound.

This card offers two inputs (Projector 1 & 2), see **Figure 1** below. Both inputs have an LED to indicate which input is active. The automation in the AP20 must be programmed to switch the inputs at the proper time. In addition to these inputs, there are two Lt/Rt test points. These are BNC type connectors that are used for alignment of the projectors optics.

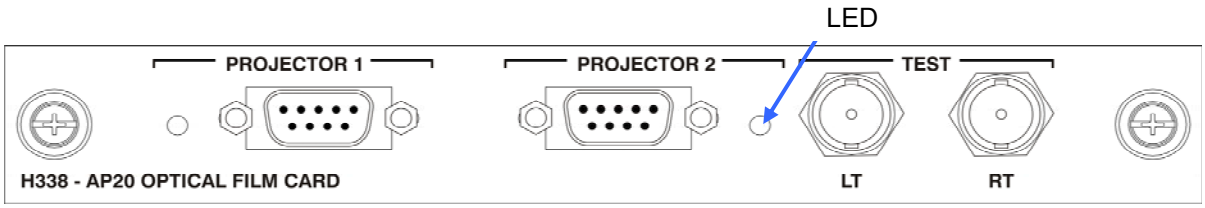


Figure 1 – H338 Optical Film Card

The remainder of this document is organized in 3 sections:

- Section F2: H338 card installation and verification of AP20 software version (this section may be skipped if the AP20 was purchased with the Optical Film Card option from the factory).
- Section F3: Setting up the AP20 menus for Optical formats. If the AP20 was purchased with the Optical Film Card option from the factory, then optical formats have already been added to the configuration and button assignments made. You may skip to Section F4 - Alignment. Note: Factory settings for A-type and SR default to Optical Bass Extension (OBE) set "On". See Section F3.4 for more information on OBE.
- Section F4: Alignment.

F2. H338 Card Installation and Software Update

Note: Skip to section F3 if the AP20 was purchased with the Optical Film Card option installed in the factory

F2.1. Software Update

⚠ Verify that theAP20 system software is at V1.02.00 or above. If an earlier version of software is installed, it must be updated before installing the H338 card. Failure to update software before installing the H338 card will cause the software to malfunction.

The current AP20 software version may be found by selecting **Menu → System → System Info**. The current version is displayed in the yellow box on the upper left of the screen. The example below shows the earliest acceptable software version.

Version: 102.00
BuildDate: Nov 1 2010

The latest software version will be included with the H338 card (if provided as part of the H458 field upgrade kit).

Check with Datasat Digital Entertainment Technical support at www.datasatdigital.com for the latest update that will include fixes for known issues and feature enhancements.

F2.2. H338 Card Installation

Tools required: Phillips head #2 screw driver

⚠ **Caution:** The H338 card contains parts that are static sensitive. Use caution when handling to avoid damage. Keep the card in the anti-static bag until needed. Just before removing the card from the bag, hold the bag and touch the chassis of the player. This will make your body the same electrical potential as the player (and will prevent static discharge). It is a good idea to stand on a linoleum or cement floor (not carpet) when handling the card.

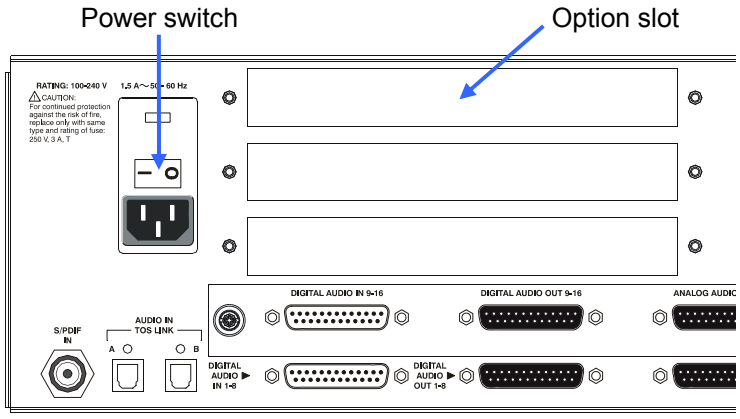


Figure 2 – AP20 Rear Panel

- Turn off the AP20's rear panel power switch and unplug the power cord.
- Remove one of the three cover plates from the AP20 option slots. All slots are identical.
- Slide the H338 card into the card guides of the option slot and gently push the card into its mating connector. Tighten the attached thumbscrews.

F3. AP20 Optical Format and Analog Input Setup

Before the H338 card can be used, Optical formats must be created in the AP20 and the optical format must have the analog input source selected as Optical. The H338 card supports standard optical film soundtrack formats: Mono, A-type and SR-type.

F3.1. Create Optical Formats

To create an optical format, copy an existing format. Go to:

Menu (System) → Formats → Edit Formats

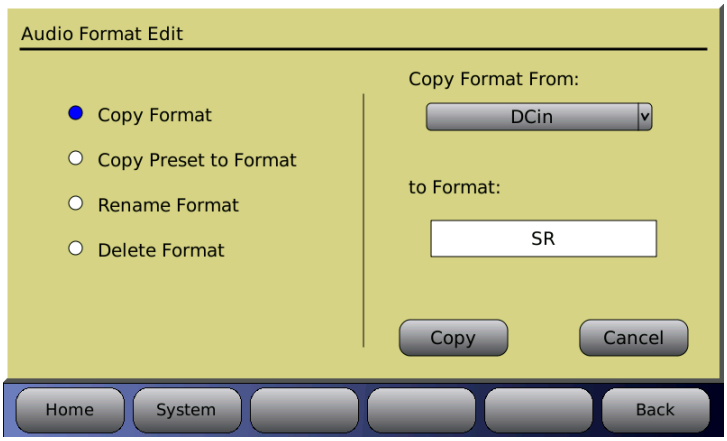


Figure 3– Copy Audio Format

Press the **Copy Format** button.

Select a format from the drop down menu of **Copy Format From** (in **Figure 3**, above, "DCin" is selected to copy)

Press the **to Format** box and type in a new format name: Mono, A-Type, or SR (in **Figure 3**, above, "SR" has been entered).

Press the **Copy** button. Repeat for other desired optical format(s).

F3.2. Assign Optical Formats to Format Buttons

After creating the optical formats, they may be assigned to "Format Buttons". The format buttons will then appear on the Home screen and be available for selection. In **Figure 4** below, SR is selected.

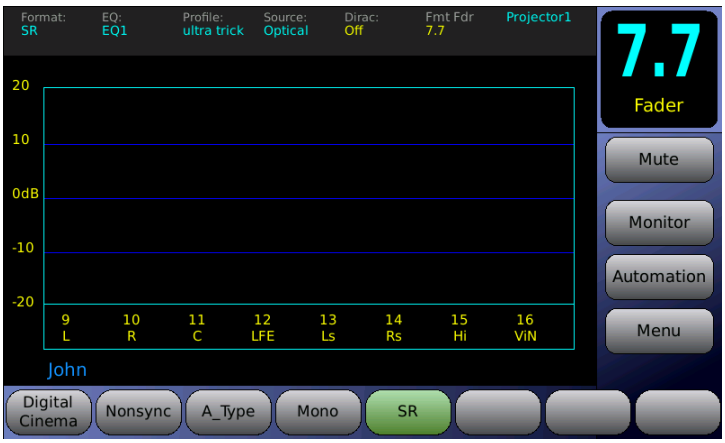


Figure 4 – Home Screen – SR format

To assign a format button, go to:

Menu (System) → Formats → Assign Buttons

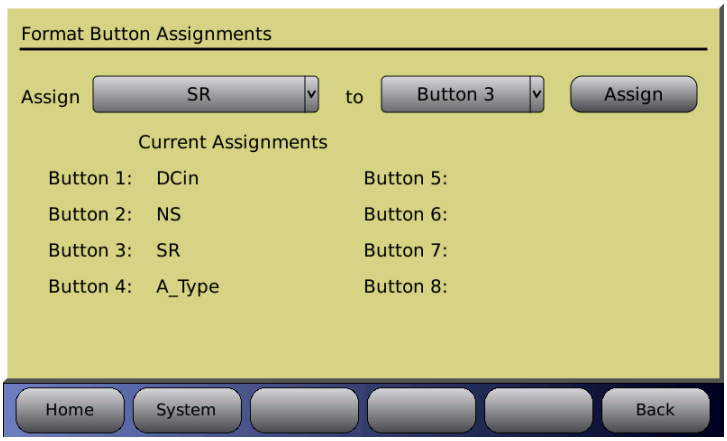


Figure 5 – Format Button Assignment

Select a Format to assign from the **Assign** drop down menu. Select a button to assign the format to from the drop down menu. Press the **Assign** button. In **Figure 5** above, SR has been assigned to Button 3. The current format assignments will be listed next to the button numbers. The newly selected format should now appear on the list.

F3.3. Input Source Selection

Each of the optical formats must be set to have **Optical** selected as their input source. In the example in **Figure 6** below, SR will have its input source set to Optical. Select the **Input Source** button. This will open the **Input Select** screen. The right side of the screen should display "**Current Format: SR**". If it is not displayed, return to the Audio Format Setup screen and select **SR** in the **Current Audio Format** drop down menu. Return to the Input Select screen by pressing the **Input Source** button. Select **Optical** as the **Analog** Input Source. A line should appear from the selected source to the output

Menu (System) → Formats → Input Source

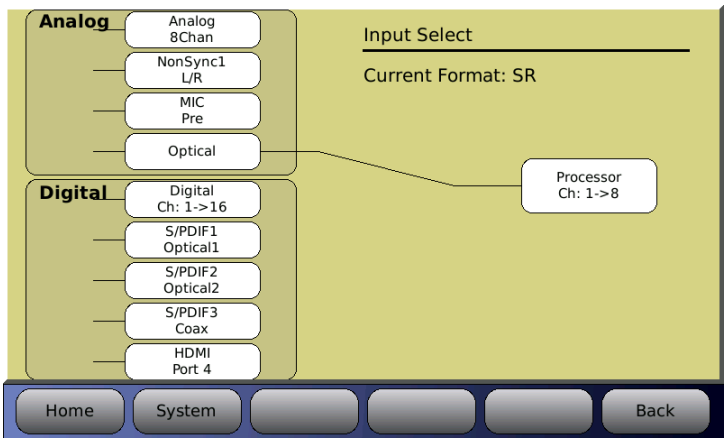


Figure 6 – Select Input Source

F3.4. Film Options Setup

The Optical Film Card Options allows you to setup the optical sound formats. Each format will need to be setup. In **Figure 7** SR is selected for setup.

Go to: **Menu (System) → Formats → Format Options → Film Options**

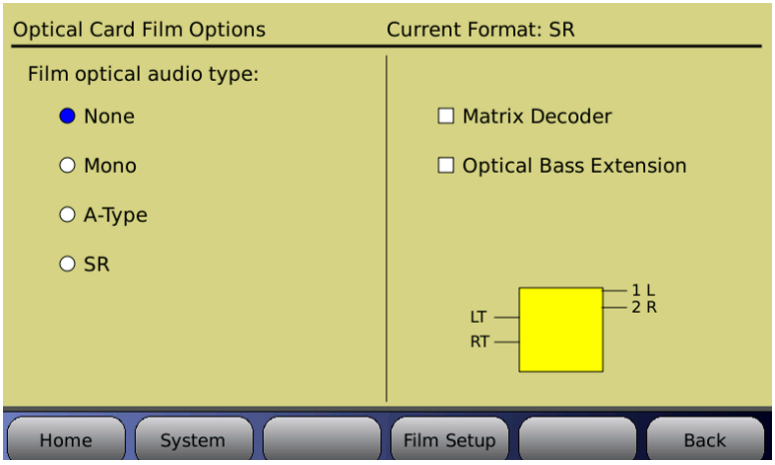


Figure 7 – Film Options Screen

☑ **Note***:* The **Film Options** button only appears for a format with **Optical** selected as the input source. If you do not see the **Film Options** button check that you are in the correct format and that the input source is selected for **Optical**.

Screen left sets the audio processing type for the current format.

• **None** No processing is done. This is not a normal film format.

• **Mono**. This is for processing a mono optical film track. The Academy filter is applied.

• **A-Type** Apply A-type noise reduction. Should be used with the matrix decoder option enabled.

• **SR** Apply SR-type noise reduction . Should be used with the matrix decoder option enabled.

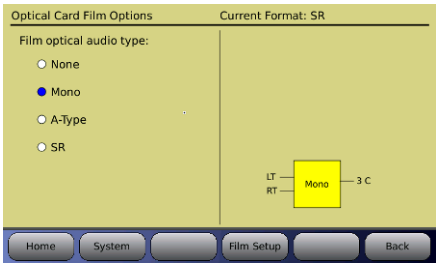
Screen right allows you to enable the matrix decoder or bass extension. The right screen also provides a pictorial of the resulting processing done for that format: Inputs from the film are on the left. The resulting channels are on the right side, and are internal to the AP20. Note that these are not necessarily the output channels as they and may be routed on the AP20 output (see Section **2.9.4 Assign Channels on AP20** in this manual).

• **Matrix decoder** enables matrix decoding for the selected optical sound format. When Matrix is enabled, surround channels (left and right) are added. Note that matrix surround channels are not discrete outputs, instead they are decoded from Lt and Rt.

• **Optical Bass Extension** (OBE) enables bass for the desired format. When selected, **Lfe** will appear as an output in the pictorial discussed above.

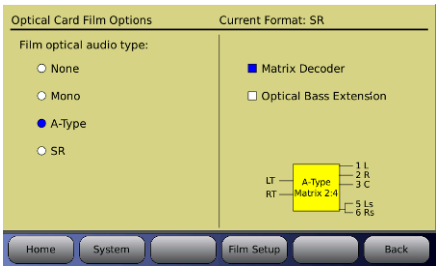
Typical Setups for optical formats are shown below. While other combinations are possible they are not representative of what should be used with standard film formats.

When **Mono** is selected:

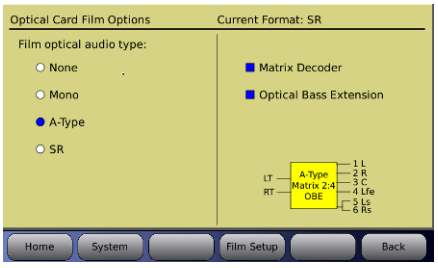


In this example, left total (LT) and right total (RT) are the inputs. Output is: **3C** = channel 3 is center (your only audio out which is the sum of left total and right total). Notice Matrix and OBE are not available for Mono. The Academy curve is applied.

When **A-Type** is selected:

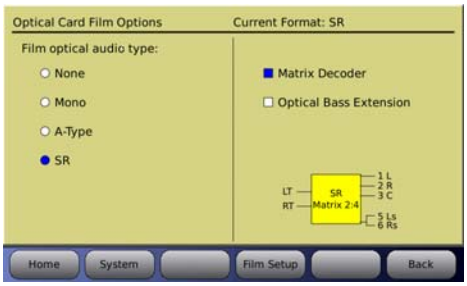


In this example, left total (LT) and right total (RT) are the inputs. Outputs are: **1L** = channel 1 is left, **2R** = channel 2 is right, **3C =** channel 3 is center, **5Ls** = channel 5 is left surround, and **6Rs** = channel 6 is right surround.



In this example, left total (LT) and right total (RT) are the inputs. Outputs are: **1L** = channel 1 is left, **2R** = channel 2 is right, **3C =** channel 3 is center, **4Lfe** = channel 4 is bass**, 5Ls** = channel 5 is left surround, and **6Rs** = channel 6 is right surround.

When **SR** is selected:



In this example, left total (LT) and right total (RT) are the inputs. Outputs are: **1L** = channel 1 is left, **2R** = channel 2 is right, **3C =** channel 3 is center, **5Ls** = channel 5 is left surround, and **6Rs** = channel 6 is right surround.

In this example, left total (LT) and right total (RT) are the inputs. Outputs are: **1L** = channel 1 is left, **2R** = channel 2 is right, **3C =** channel 3 is center, **4Lfe** = channel 4 is bass**, 5Ls** = channel 5 is left surround, and **6Rs** = channel 6 is right surround.

F4. Alignment

A-Chain alignment consists of calibrating the projector(s) optical film path, the solar cell, and the optical preamp. These adjustments consist of both mechanical alignments on the projector(s) and software settings in the AP20. Adjustments on the projector(s) optical heads differ depending on the manufacturer; however the end results are the same. This section describes briefly the projectors optical head adjustment, for detail adjustments refer to that projector manufacturer's recommended procedure.

F4.1. Materials and equipment required

For initial mechanical alignment of the projectors optical head, the following is recommended or required. These items are not supplied by Datasat Digital Entertainment.

- RTA – Real Time Analyzer with Microphone
- Oscilloscope
- Voltage meter
- Cotton swabs
- PC (lap top) connected to the internet to connect into the AP20 using VNC (optional)
- Miscellaneous tools needed to make adjustments on projector optics mechanical alignment.

Test Films (not supplied by Datasat Digital Entertainment):

- 50% tone (Cat 69T)
- Pink noise (Cat 69P)
- Buzz Track (P35-BT)
- L/R (Cat 97)
- Illumination uniformity (Cat 566) optional

F4.2. Inspection and voltage check

Visually inspect the optical film path of the projector. Make sure all components are clean and in good working order. The items that need to be checked are rollers, lateral guides, bearings, dampener, etc. Use a cotton swab, lightly coated with lens cleaner, to wipe the optical lens. Check the LED voltage and adjust it if necessary, as per the manufacturer's recommended procedure.

F4.3. Wiring and Connections

Projector 1 & 2 inputs on the AP20 are 9-pin female D-connectors. See **Figure 8** below for pin assignments. Input from the solar cell is a 9-pin Male D-connector.

PIN NO.	DESCRIPTION
1	LEFT +
2	LEFT -
3	N.C.
4	RIGHT +
5	RIGHT -
6	LEFT ANALOG GND.
7	N.C.
8	N.C.
9	RIGHT ANALOG GND.

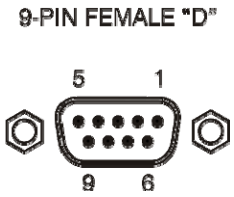


Figure 8 – Solar Cell input pin assignment

Prior to optical alignment, verify all wiring and connections are correct. Shielded cables such as Belden 8451 or similar should be used.

The right channel is nearest the edge of the film. To confirm proper wiring, while observing the projector output on a RTA or the AP20 setup screen, place a business card or similar object to block the side of the cell nearest the edge of the film. You should detect a large drop in the right channel level.

Although white light tungsten type exciter lamps have been replaced in projectors with Red LED readers the adjustment and calibrations remain similar. Making adjustments to the film optics will vary depending on the manufacturer; it is recommended that a review of the manufacturer's recommended alignment adjustments be reviewed prior to making any mechanical changes on the optical head on the projector.

F4.4. Mechanical Optical Alignment

Connect the oscilloscope to the AP20 via the Left and Right BNC test connectors on the H338 optical card located on the back of the AP20. See **Figure 9**.

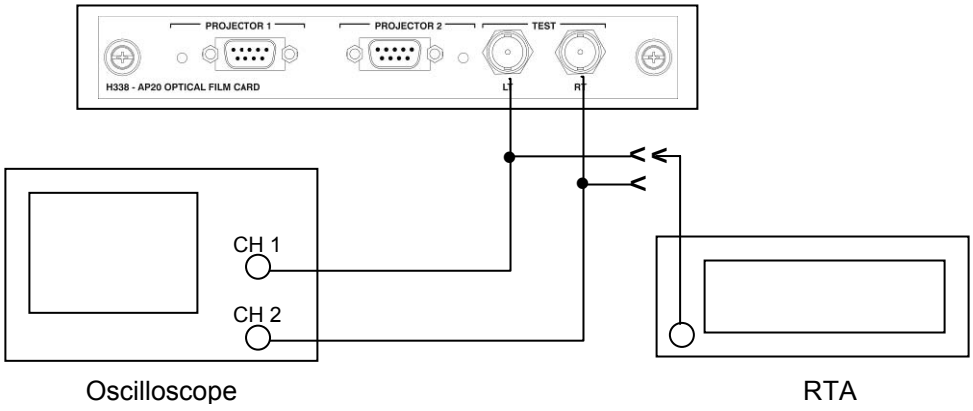


Figure 9 – Test connections

The **Film Setup** screen on the AP20 will be used during the alignment procedure. Go to **Menu (System) → Formats → Format Options → Film Options → Film Setup.**

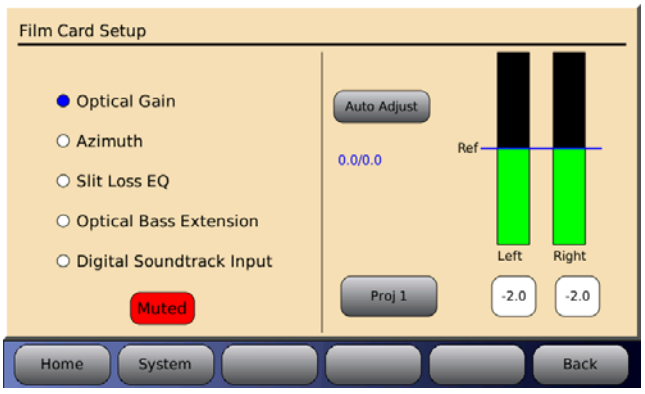


Figure 10 – Film Card Setup Screen

☑ Note: When in the Film Card Setup screen, noise reduction (SR or A) is not active and all audio outputs are muted. Changing to another screen will enable any noise reduction and un-mute the audio. While in this screen you can also select the red **Muted** button to un-mute the audio. When un-muted, the button will turn gray and say **Mute**.

The Film Card Setup screen allows you to make needed adjustments in the selected optical format.

The left screen allows you to choose the adjustment you want to make.

- **Optical Gain** adjusts the optical gain.
- **Azimuth** adjusts the azimuth.
- **Slit Loss EQ** adjusts the slit loss EQ.
- **Optical Bass Extension** adjusts the optical bass.
- **Digital Soundtrack Input** adjusts the Digital Soundtrack Input source.

The right screen has a pictorial of adjustments that can be made and changes with the selections on the left.

F4.4.1. Optical Gain Adjustment

Items needed: 50% tone test film (CAT 69T), oscilloscope, and specific tools required to make adjustments, such as Allen/Hex Wrenches, small screw driver etc.

On the AP20 select one of the optical formats in the home screen, next select **Menu (System) → Formats → Format Options → Film Options → Film Setup**. You should now be in the Film Card Setup screen as shown in **Figure 11**. Select **Optical Gain**.

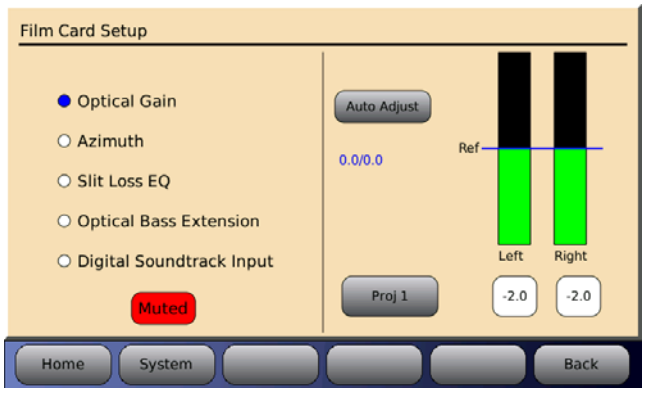


Figure 11 – Film card setup screen, Optical Gain

Thread the 50% tone test film (Cat69T) and run the projector. The signal should now be present on the scope and the AP20 Film Card Setup screen as shown in **Figure 11**.

Two vertical graphs indicate the optical level for the left and right channels. The goal is to adjust each signal to the reference level. The numbers in blue (under Auto Adjust) follow the graph. The numbers are separated into two readings (0.0 / 0.0) where the number on the left is left channel and number on right is the right channel.

A projector select button is provided: Projector 1 = **Proj1** and projector 2 = **Proj2**. Pressing the button makes the selection.

Auto Adjust enables auto (self) adjustment when pressed. When pressed, a count down will appear as adjustments are made. If no signal is present or is out of range, a pop-up message will appear:

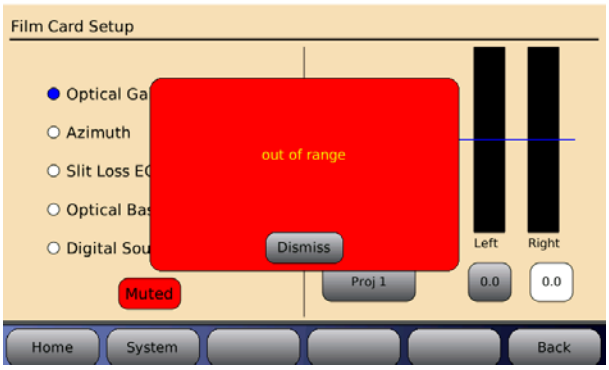


Figure 12 – Auto Adjust "Out of Range"

If this appears then either the signal is too great or (more likely) no signal or a very low signal is present. Be sure the test/alignment film is playing. Also check that projector's optical solar cell is connected and powered. Consult your projector's manual for more information.

To close this window, press **Dismiss**.

To manually adjust levels, select the button below the left input level bar and use the AP20 front panel adjustment knob to increase or decrease this level until it meets the reference line.

☑ Note: When using a laptop to VNC into the AP20, use the up and down arrows to mimic the action of the AP20 adjustment knob.

Repeat this step for the Right channel by selecting the button below that level indicator. The numbers in the buttons indicate the adjustment made to meet the reference level in dB.

F4.4.2. Film path check

Items needed: Buzz Track test film, oscilloscope, and specific tools required to make adjustments, such as Allen/Hex Wrenches, small screw driver etc.

Thread up and play the Buzz Track test film. This test film has modulation beyond the scanned optical areas. If the alignment is off, the error can be seen on the oscilloscope and also heard on a monitor. The goal is to align the film path so that the slit image is centered on the soundtrack area of the film. This results in either a null response or equal level on both tracks. While observing the oscilloscope, make adjustments to the projector's optics to achieve one of the examples shown below in **Figure 13**. Some adjustments are made by moving the projector's film guide laterally, while on others the lens and LED assembly is moved. Refer to the manufacturer's procedure regarding the proper adjustment for your model projector.

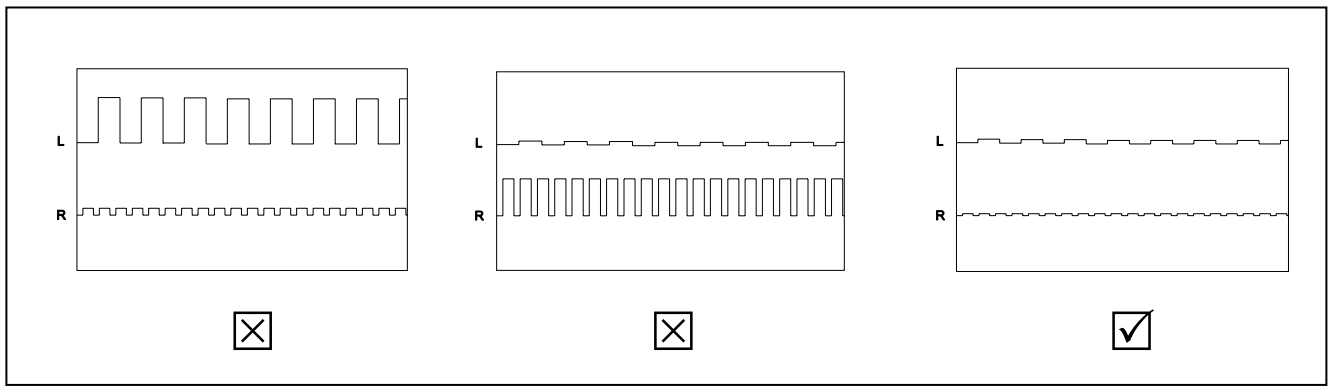


Figure 13 – Cell alignment viewed on Oscilloscope using Buzz Track test film

F4.4.3. Cell Alignment

Items needed: Left/Right test film (CAT 97), oscilloscope and specific tools required to make adjustments, such as Allen/Hex Wrenches, small screw driver etc.

Thread up and play the Left/Right test film (CAT 97). This test checks for crosstalk between the Left and Right channels. The goal is to have both channels at equal level. If necessary, make adjustments to the solar cell by moving it left or right across the film path to achieve results as seen in **Figure 14**. Refer to the projector manufacturer's procedure for this adjustment.

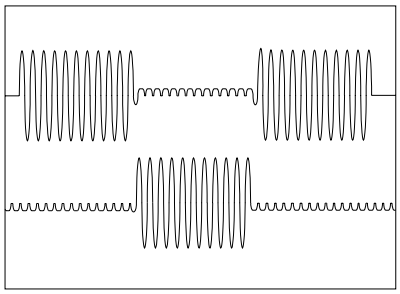


Figure 14 – Crosstalk using Cat 97 test film

☑ Note: while running the CAT 97 test film you can also select Azimuth in the AP20's optical set up screen. If alignment is correct you should be able to observe a cross on the screen as shown in **Figure 15**. The same applies to viewing on the oscilloscope in X/Y mode.

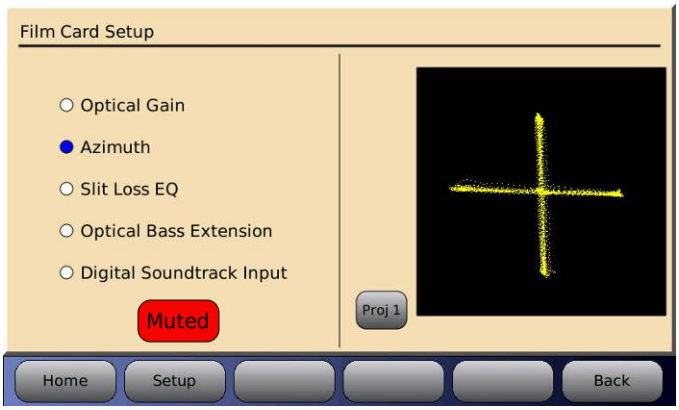


Figure 15 – Optimum LED to lens alignment

F4.4.4. Azimuth and Focus

Items needed: Pink Noise test film (CAT 69P) oscilloscope, RTA, and specific tools required to make adjustments, such as Allen/Hex Wrenches, small screw driver etc.

Thread Pink noise test film (CAT 69P) and start the projector. Using the oscilloscope in the XY mode, adjust the projector's optics (azimuth and focus controls) for the best diagonal trace, see. **Figure 16**

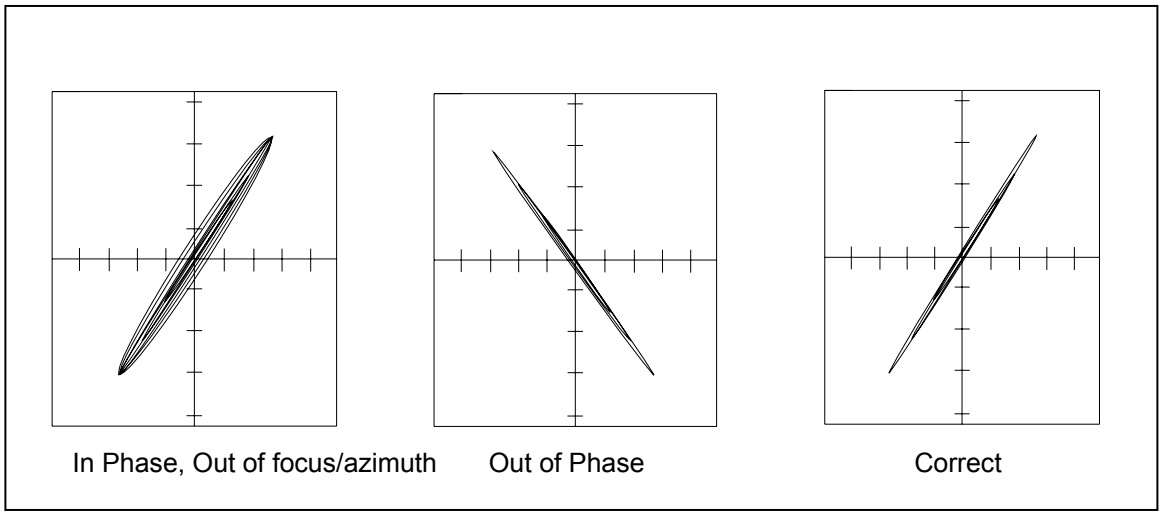


Figure 16 – Azimuth

This can also be viewed on the AP20 screen by going to **Menu (System) → Formats → Format Options → Film Options → Film Setup** and Selecting **Azimuth (**see **Figure 15)**.

When Azimuth is selected, on the right a pictorial of the azimuth adjustment is shown.

A projector select button is provided: Projector 1 = **Proj1** and projector 2 = **Proj2**. Pressing the button makes the selection.

The pattern on the graph shows the azimuth adjustment.

Connect the RTA to one of the test BNC connectors on the H338 preamp card. While observing the response on the RTA, adjust the projector optics for the flattest response. This is achieved by moving the optical lens in or out for the sharpest focus and gently rotating it for straight azimuth, **Figure 16**.

Once set, move the RTA to the other test point and the results should be the same. Final slit loss correction will be done in the next step. Depending on the design of the projector's optics, both focus and azimuth can interact; refer to the projector's manufacturer for proper adjustment procedure of azimuth and focus.

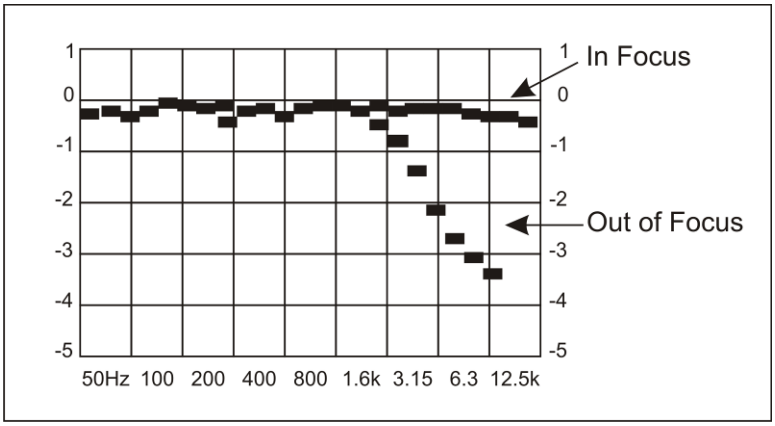


Figure 17 – Focus

After the flattest response is achieved by adjusting the projector optics, the final slit loss correction is made using the Parametric Filter Settings, see

Figure 18.

F4.4.5. Slit Loss EQ

When Slit Loss EQ is selected a graph of the slit loss adjustment is shown on the right of the screen (see

Figure 18 below). The goal is to achieve a flat response. Each frequency level should meet reference ("db" on the graph) as shown. Note the roll-off after 12.5kHz.

Menu (System) → Formats → Format Options → Film Options → Film Setup → Slit Loss EQ

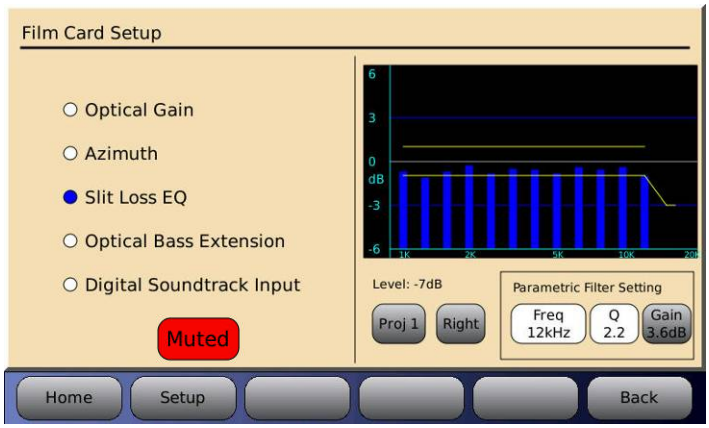


Figure 18 – Slit Loss EQ

A projector select button is located below the graph: Projector 1 = **Proj1** and projector 2 = **Proj2**. Press the button to select.

The **Level** number above the **Proj** button is a general indicator of the input signal level that can be used to confirm there is a valid signal. In

Figure 18 the Level is -7dB, which is typical when playing pink noise.

A button to allow switching between **Right** and **Left** channels is located to the right of the **Proj** button. Press this button to select the channel.

Parametric Filter Setting

The frequency (**Freq**) select button is used to scroll and select the desired frequency. Press the button and turn the fader to make the selection.

The **Q** button is used to select the bandwidth range when making an EQ adjustment. A smaller number adjusts frequencies closest to the Freq selected whereas a large number will expand the adjustment affect. Press the button and turn the main fader to make selection.

The **Gain** button is used to make level adjustments at the filter frequency. Press the gain button and turn the main fader as needed.

F4.4.6. (OBE) Optical Bass Extension

Items needed: Pink Noise test film (CAT 69P), RTA with Microphone

When Optical Bass Extension is selected, the right half of the screen provides settings for the parameters of optical bass gain and low pass filter frequency (see **Figure 19** below).

Menu (System) → Formats → Format Options → Film Options → Film Setup → Optical Bass Extension

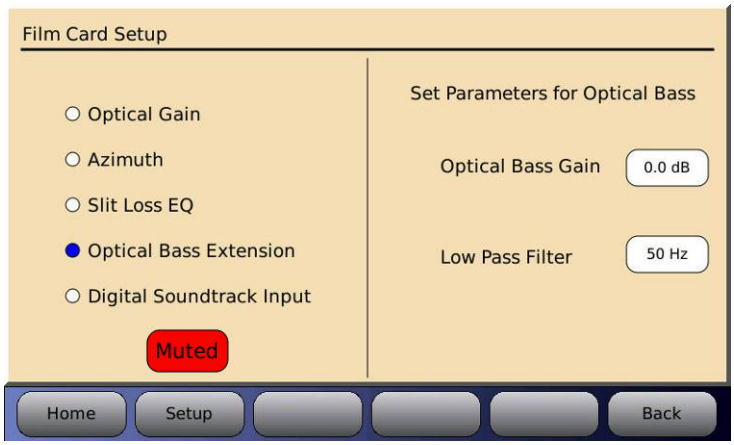


Figure 19 – Optical Bass Extension

Optical Bass Gain allows you to set the gain for the optical bass. Press the button with the number displayed and rotate the main fader to adjust for the desired level.

Low Pass Filter allows you to choose the frequency of the filter. Press the button with the number displayed and rotate the main fader to adjust the desired frequency.

When adjusting the Optical Bass Extension, set up a microphone in the auditorium. It is best to use a single microphone, or if using a multiplexer select single microphone only, and connect it to the RTA.

Thread (Pink noise) Cat 69P test film into the projector. Turn off all amplifiers except the Center channel. Select an optical format on the AP20, start the projector and note the level and low frequency roll off displayed on the RTA. Select the appropriate Low Pass Filter setting by pressing that button and using the fader knob to make any changes required to match the low pass filter to the roll off measured.

Next turn on the subwoofer channel, then select the Optical Bass Gain by pressing the <Gain> button. Use the AP20 fader knob, or up and down keys when using a laptop, to adjust the Optical Bass Gain to match the Center channel level previously noted on the RTA display. The Optical Bass Gain range is 0 to +10dBc. Don't forget to turn on all amplifiers when adjustment is complete.

F4.4.7. Digital Soundtrack Input

Digital Soundtrack Input is used to allow a smooth cross-fade from the optical playback to another analog or digital input source (that is connected to the AP20 rear panel). If digital soundtrack for film is not used then keep the selection at None (factory default).

Menu (System) → Formats → Input Source → Film Options → Film Setup → Digital Soundtrack Input

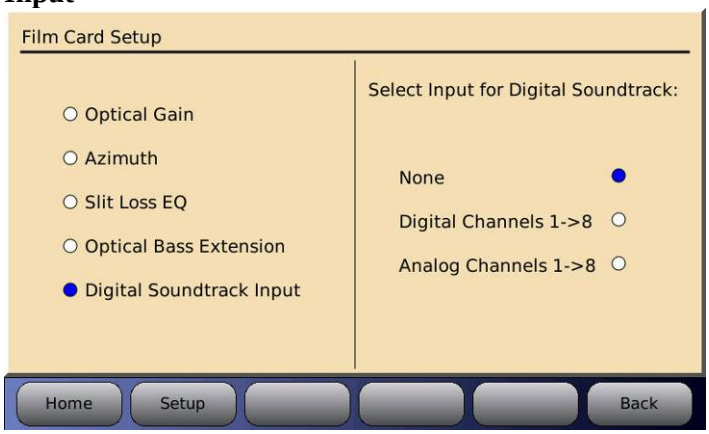


Figure 20 – Digital Soundtrack Input

None is use when the AP20 analog and digital input connectors are not used for the film digital soundtrack.

Digital Channels 1->8 select this if the film digital soundtrack player is connected to the AP20 Digital Input channels 1-8 connector.

Analog Channels 1->8 select this if the film digital soundtrack player is connected to the AP20 Analog Input channels 1-8 connector.

☑ When the Digital Channels input is used for the digital soundtrack you must make sure that the **Input Source** selection is **Digital Ch: 1->8** as shown in **Figure 21** below. The other options, Digital Ch: 1->16 or Digital Ch: 9->16, should not be used because it eliminates the cross-fade function between digital and optical. Pressing the **Digital Ch:** button repeatedly allows you to change the digital channel selection.

Menu (System) → Formats → Input Source

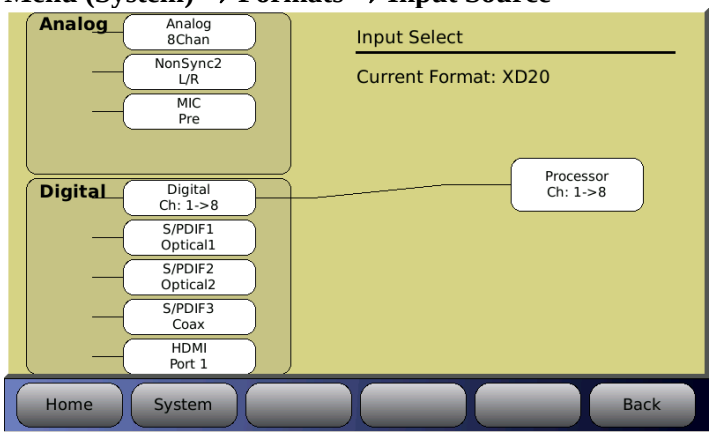


Figure 21 – Input Source Screen

F4.4.8. Optical Surrounds Delay Settings

To set surround delays, for the optical formats, a "Profile" must be created in the AP20 and assigned to the optical formats. Go to **Menu (System) → Formats → Channel Profile → Edit Profiles**

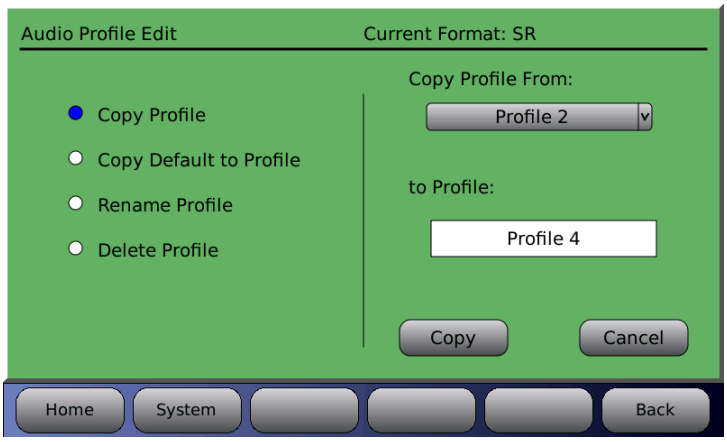


Figure 22 – Audio Profile Edit

Select **Copy Profile** and choose a profile to copy from the drop down menu (in **Figure 22**, "Profile 2" has been selected).

Type a profile name into the **to Profile** box (in **Figure 22**, "Profile 4" has been entered). Press **Copy**.

Select **Channel Delays**. Enter the desired delay (in milliseconds) into the left and right surround channels. The delay is entered by selecting the delay box under the desired channel and then dialing in the correct value using the front panel rotary encoder. In **Figure 23**, below, the left and right surround delays have been set to 40mS.

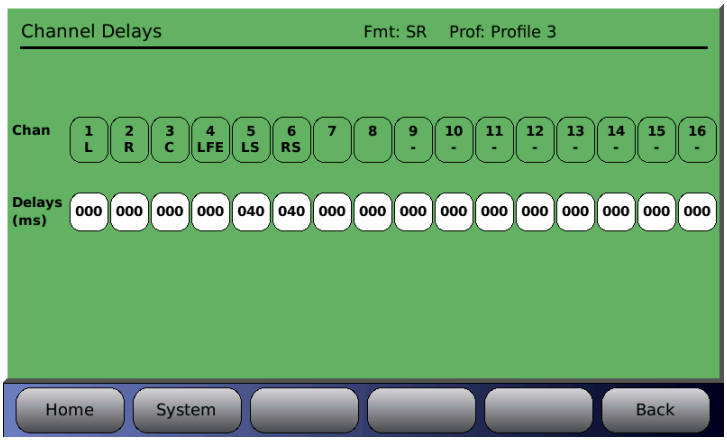


Figure 23 – Channel Delays

F4.4.9. Recheck Optical Gain Levels

See F4.4.1 above: Optical Gain Adjustment. If any adjustments were made it may be necessary to reset these levels. This will complete the optical alignment.

F4.5. Trouble shooting

No activity seen on AP20 Film Card Setup Screen.

Confirm projector optical LED is on, next check connections from Projector to H338 card, confirm which Projector input is being used, and check that LED light is on next to input, if not select an optical format on the home screen.

The AP20 mutes when switching from optical card to digital or analog input source

This may occur if the digital soundtrack input is not set correctly. Go to the Film Card Setup screen and select Digital Soundtrack Input, in this menu choose the input source in use, analog or digital.

Appendix G: 8-Channel AP20

Introduction

The 8-channel version of the AP20 (P/N MD10H33001) contains all features of the standard 16 channel version (P/N MD10H33000) with the exception of Digital Audio channels 9-16 in and out, and Analog Audio channels 9-16 out.

The 8 channel AP20 may be upgraded to 16 channels by adding the H332 circuit card (P/N 9030H33200). See page G5.

AP20 8-Channel Screens

The following screens differ from the standard 16-channel version. All other screens are the same as those in the standard 16-channel version, and are described in the other sections of this manual.

System Information Screen

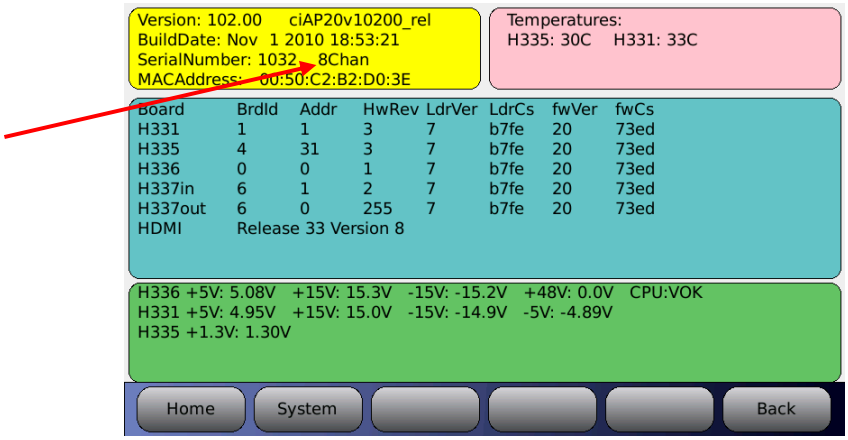


Figure 1 – System Info Screen

Menu (System) → System Info

The System Info screen will display **8Chan.**

Routing/Crossovers

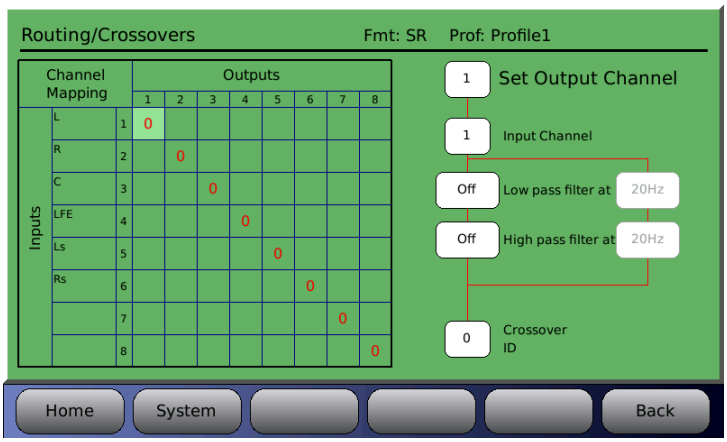


Figure 2 – Routing/Crossovers Screen

Menu (System) → Formats → Channel Profile → Routing/Crossovers

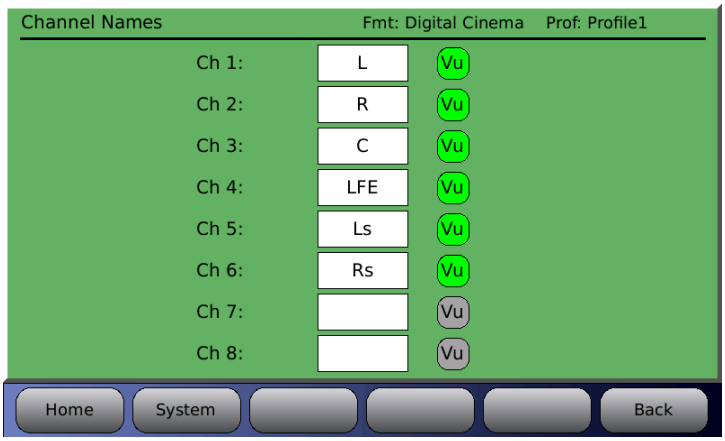


Figure 3 – Channel Names Screen

Menu (System) → Formats → Channel Profile → Channel Names

Channel Delay Screen

Channel selection is limited to 8 channels.

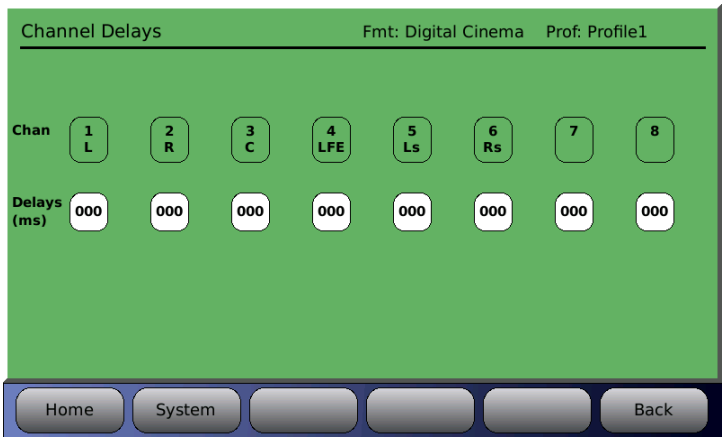


Figure 4 – Channel Delays Screen

Menu (System) → Formats → Channel Profile → Channel Delays

Channel selection is limited to 8 channels.

Format Source Selection Screen

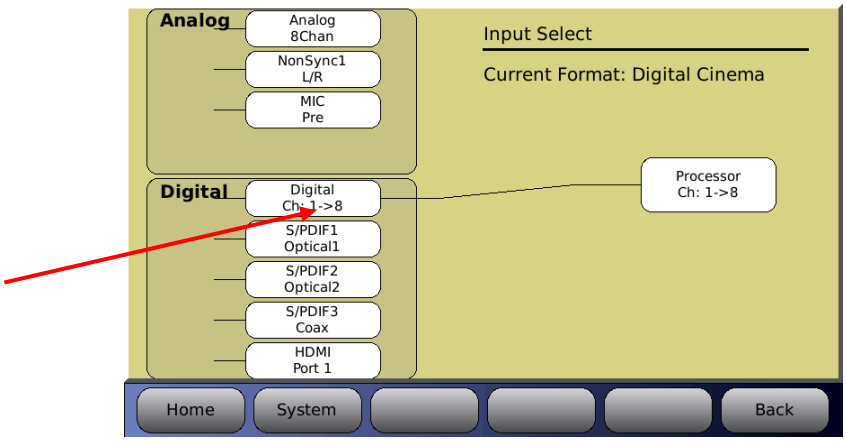


Figure 5 – Input Select Screen

Menu (System) → Formats → Input Source

Only the Digital Ch 1-8 selection is available. Pressing the **Digital** button will not toggle to other choices. The factory default **Digital Cinema** format is 8 channel.

Audio Levels Screen

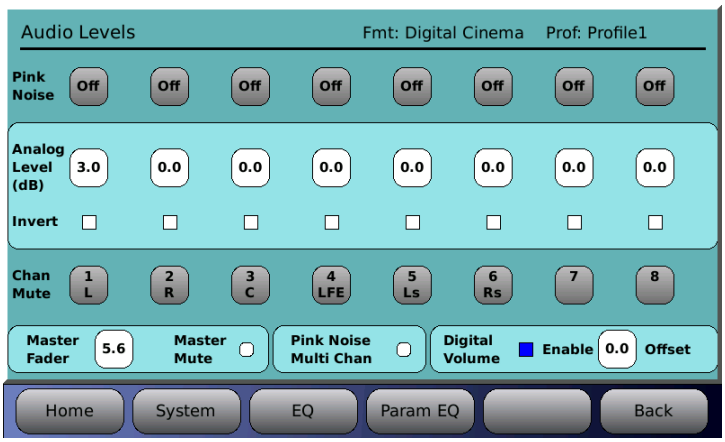


Figure 6 – Audio Levels Screen

Menu (System) → Formats → Audio EQ Setup → Audio Levels

All selections in the Audio Levels Screen are limited to 8 channels.

3rd Octave EQ Screen

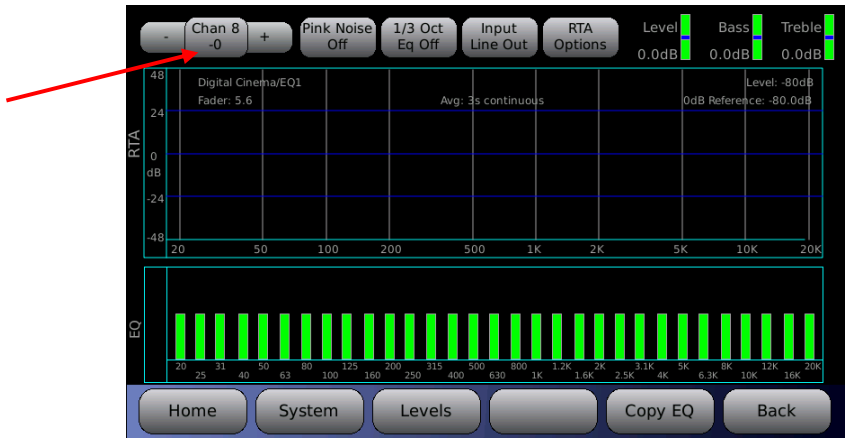


Figure 7 – Third Octave EQ

Menu (System) → Formats → Audio EQ Setup → Third Octave EQ

Channel selection is limited to 8 channels.

Parametric EQ Screen

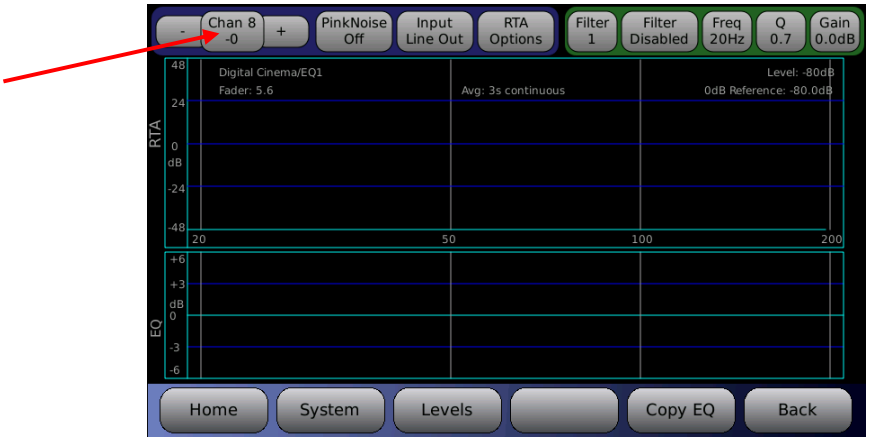


Figure 8 – Parametric EQ

Menu (System) → Formats → Audio EQ Setup → Parametric Equalization

Channel selection is limited to 8 channels.

Notes:

1. The Output Mapping on the System setup screen (**Menu (System) → Output Mapping)** will have no affect on the 8 channel version. This option will be removed in the next software version (V2.1.01 or above).

2. The monitor mix screen (**Home → Monitor → Mix)** on the 8 channel version shows 16 channels. Channels 9-16 should be left at 0 in order to disable. The next software version (V2.1.01 or above) will only display channels 1-8.

16-Channel Upgrade (H332 Card)

The 8 channel AP20 may be upgraded to 16 channels by adding the H332 circuit card. Order P/N 9030H33200 latest version.

H332 Card Installation

Tools required: Phillips head #2 screw driver

⚠ **Caution:** The H332 card contains parts that are static sensitive. Use caution when handling to avoid damage. Keep the card in the anti-static bag until needed. Just before removing the card from the bag, hold the bag and touch the chassis of the player. This will make your body the same electrical potential as the player (and will prevent static discharge). It is a good idea to stand on a linoleum or cement floor (not carpet) when handling the card.

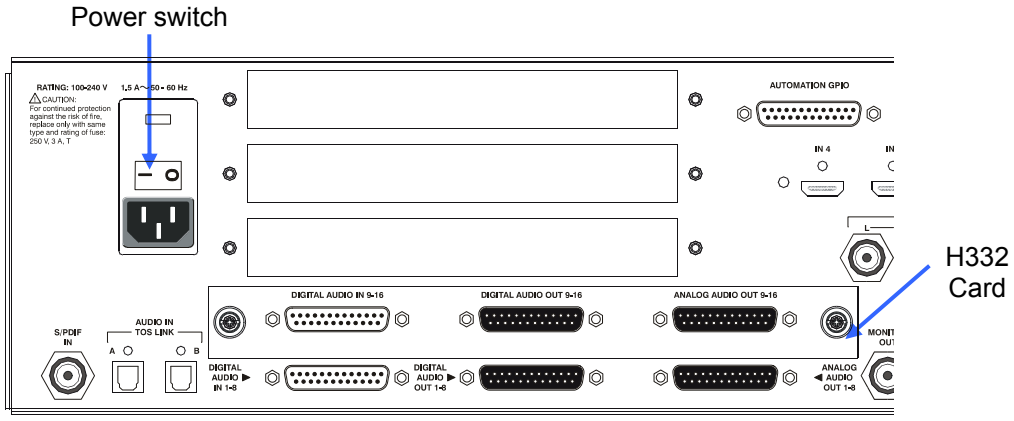


Figure 9 – AP20 Rear Panel – H332 Card Installed

- Turn off the AP20's rear panel power switch and unplug the power cord.
- Remove the large (bottom) cover plate from the AP20 rear panel.
- Slide the H332 card into the card guides of the option slot and gently push the card into its mating connector. Tighten the attached thumbscrews.
- Turn on the AP20's rear panel power switch. It should boot up and display the following message indicating that it has detected the H332 card.

- Press "Dismiss". Channels 9-16 are now available for configuration and use.