



MT2000 Multichannel Bitstream Analyzer User Guide

MT2000 version 0.0.42 and later
User Guide version 1.0

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Contents

Chapter 1: Introduction.....	10
1.1. Introduction.....	10
1.2. Registration and Feedback.....	10
Chapter 2: Overview and Connections	11
2.1. Unpacking and Inspection.....	11
2.2. Unit Overview	11
2.2.1. Front panel	11
2.2.2. Bottom.....	12
2.3. Connections.....	13
2.3.1. Rear Panel.....	13
2.3.1.1. Power Connection.....	13
2.3.1.2. AES Input.....	13
2.3.1.3. AES Output.....	13
2.3.1.4. SDI Input.....	14
2.3.1.5. SDI Output.....	14
2.3.1.6. TOSLINK® Input.....	14
2.3.1.7. TOSLINK Output	14
2.3.1.8. VRef Input.....	14
2.3.1.9. HDMI Input	14
2.3.2. Side Panel.....	15
2.3.2.1. Headphone Output.....	15
2.3.2.2. Ethernet Connection	15
2.3.2.3. USB Connector.....	16
Chapter 3: Operation	17
3.1. Interface	17
3.2. Powering On / Off.....	17
3.3. Basic Operation and Navigation.....	17
3.3.1. Joystick Operations (Status / Control Window)	18
3.3.2. Joystick Operations (Loudness / Volume Window)	18
3.4. Display.....	18

3.4.1.	Display Window	18
3.4.2.	Status / Control Window	19
3.4.3.	Loudness / Volume Control Window	21
	Volume Control	22
	Mute / Unmute	22
	Solo Left / Right	22
3.5.	Menu Structure	23
Chapter 4: Top Level and Home Screen Menu Structures		25
4.1.	Top Menu Level	25
4.2.	Home Screen	25
4.3.	Home Screen Menus	26
4.3.1.	Dolby Program / Dolby Digital Plus E substream select	27
4.3.2.	16-chanel SDI/MADI discovery mode	27
Chapter 5: Preset Menu		29
5.1.	Presets	29
5.1.1.	Presets	29
5.1.1.1.	Meter Input Source	30
5.1.1.2.	HDMI Input Channel Pair	30
5.1.1.3.	MADI Input Group	31
5.1.1.4.	MADI Mtr In 1/2 – 7/8	31
5.1.1.5.	SDI Mtr In 1/2 – 7/8	32
5.1.1.6.	Clock Source	32
5.1.1.7.	DVB-ASI PID	33
5.1.1.8.	SRC Bypass	33
5.1.1.9.	Apply DD/+ DRC	34
5.1.1.10.	Apply DE DRC	34
5.1.1.11.	Preset Name	35
5.1.1.12.	Copy Preset	35
Chapter 6: Output and Loudness Measurement Menus		36
6.1.	Output/Loudness Measurement Menu	36
6.2.	Output Configuration Submenu	37

6.2.1.	AES/TOSLINK Output submenu	37
6.2.1.1.	Output Source	37
6.2.1.2.	Downmix Type	38
6.2.2.	SDI Output submenu	38
6.2.2.1.	SDI Embed Audio	39
6.2.2.2.	SDI Output 1/2 Source – SDI Output 15/16 Source	39
6.2.2.3.	SDI Embed Audio	39
6.2.2.4.	SDI Audio Bit.....	39
6.2.3.	MADI Output submenu.....	40
6.2.3.1.	Enable MADI Output	40
6.2.3.2.	MADI Output 1/2 Source – MADI Output 15/16 Source	40
6.3.	Signal Generation Menu	41
6.3.1.	Signal Generator Submenu	42
6.3.1.1.	PCM Tone Gen.....	43
6.3.1.2.	PCM Generator Frequency – Left channel	44
6.3.1.3.	PCM Generator Frequency – Right channel	44
6.3.1.4.	PCM Generator Amplitude – Left channel	44
6.3.1.5.	PCM Generator Amplitude – Right channel	45
6.3.1.6.	PCM Channel Select	45
6.3.1.7.	PCM Frequency Sweep – Minimum Frequency	45
6.3.1.8.	PCM Frequency Sweep – Maximum Frequency	46
6.3.1.9.	PCM Frequency Sweep Time	46
6.3.2.	File Payout Submenu	46
6.3.2.1.	File Type.....	47
6.3.2.2.	PCM File Stream.....	47
6.3.2.3.	File Playback Amplitude – Left channel.....	47
6.3.2.4.	File Playback Amplitude – Right channel.....	48
6.3.2.5.	DD File Stream.....	48
6.3.2.6.	Dolby E File Stream	49
6.3.2.7.	Dolby Digital Plus File Stream	51
6.3.3.	Video Generator Submenu.....	52
6.3.3.1.	SDI Video Generator Enable.....	52
6.3.3.2.	SDI Video Standard.....	53
6.3.3.3.	Ignore Dolby E Guard band Video (Ignore DE GB Vid).....	53

6.3.3.4.	Dolby E Guard Band Video Reference (DE GB Video Ref)	53
6.3.3.5.	Dolby E Line Position – NTSC (DE GB Line NTSC).....	54
6.3.3.6.	Dolby E Line Position – PAL (DE GB Line PAL)	54
6.3.3.7.	Dolby E Line Position – 720p (DE GB Line 720p).....	54
6.3.3.8.	Dolby E Line Position – 1080 (DE GB Line 1080).....	55
6.3.4.	Tests Submenu	55
6.3.4.1.	Activate Test.....	56
6.3.4.2.	Beep Flash Test	56
6.3.4.3.	Audio Latency Test	56
6.3.4.4.	Audio Latency Status	56
6.4.	Loudness Meter Menu.....	57
6.4.1.	Loudness Format.....	58
6.4.2.	Metering Type.....	58
6.4.3.	10 seconds Speech Gate	59
6.4.4.	Main Loudness Meter Integration (Main Loud Type).....	59
6.4.5.	Secondary Loudness Meter Integration (Sec Loud Type)	59
6.4.6.	Floating Bar Graphical Loudness Meter (Graph Loud Type)	60
Chapter 7: System Menu		61
7.1.	System Menu Overview.....	61
7.2.	Statistics submenu	62
7.2.1.	Version Number	62
7.2.2.	Firmware Version	62
7.2.3.	Package Version.....	63
7.2.4.	Device Options.....	63
7.2.5.	CAT1100 Data.....	63
7.2.6.	CAT1100 Errors	63
7.2.7.	Timing.....	63
7.3.	Alerts submenu.....	63
7.3.1.	Alerts Status Display	64
7.3.2.	Alert When	64
7.3.3.	Alert Threshold (1-4).....	64
7.3.4.	Alert On Delay (1-4)	65
7.3.5.	Alert Off Delay (1-4).....	65

7.4.	Communication submenu.....	65
7.4.1.	Communication Status Display	66
7.4.2.	Use DHCP	66
7.4.3.	Static IP Address	67
7.4.4.	Static Netmask.....	67
7.4.5.	Static Gateway	67
7.4.6.	MAC Address	67
7.5.	Maintenance submenu.....	67
7.5.1.	Set to Defaults.....	68
7.5.2.	Maintenance File Upload	68
7.5.3.	Device Options File Upload.....	68
7.5.4.	Idle Screen Dim	68
8.	Problems and Possible Causes	70
8.1	Unit won't power on.....	70
8.2	Volume Control does not work	70
8.3	Unit does not recognize the input signal.....	70
8.4	Cannot change test generator or file playback settings.	70
8.5	SDI output stream does not contain signals generated by the MT2000	70
Chapter 9:	Specifications	71
9.1.	Physical.....	71
9.2.	Electrical.....	71
9.3.	Audio.....	72
9.4.	Other	73

Figure 1 - MT2000 Front Panel	12
Figure 2 - MT2000 Rear Panel	13
Figure 3 - MT2000 Side View	15
Figure 4 - Home Screen	17
Figure 5 - Main Display Screen	19
Figure 6 - Status/Control Window	19
Figure 7 - Loudness/Volume Window	21
Figure 8 - Volume Control Display	22
Figure 9 - Speaker Mute/Unmute Display	22
Figure 10 - Complete Menu Tree	24
Figure 11 - Top Level Menu	25
Figure 12 - Home Screen	26
Figure 13 - Home screen and menu	26
Figure 14 - SDI Discovery Mode	27
Figure 15 - Preset Menu	29
Figure 16 - Output / Loudness Menus	36
Figure 17 - Output Configuration Submenu	37
Figure 18 - SDI Output Submenu	38
Figure 19 - MADI Output Submenu	40
Figure 20 - Signal Generation Mmenu	42
Figure 21 - PCM Tone Generator Submenu	43
Figure 22 - File Playback Submenu	47
Figure 23 - Video Generator Submenu	52
Figure 24 - Tests Submenu	56
Figure 25 - Loudness Meter Submenu	58
Figure 26 - System Menu	61
Figure 27 - Statistics Submenu	62
Figure 28 - Alerts Menu	64
Figure 29 - Communications Menu	66
Figure 30 - Maintenance Submenu	68

Chapter 1: Introduction

1.1. Introduction

Congratulations on your purchase of the Linear Acoustic MT2000 bitstream analyzer!

The MT2000 is capable of analyzing, monitoring, and measuring the loudness of audio signals carried in many commonly used broadcast interfaces such as AES-3, SDI (both HD- and SD-), TOSLINK® optical, and optionally DVB-ASI transport streams, MADI, and HDMI. Audio formats including PCM, Dolby® E, Dolby Digital (also called AC-3), and Dolby Digital Plus (also called E-AC-3) are supported. The MT2000 is capable of measuring the loudness of audio input signals following the ITU BS.1770 standard and using Dolby Dialogue Intelligence where applicable.

The MT2000 is also capable of generating audio test signals, playing back pre-encoded Dolby bitstreams, performing certain audio tests such as audio latency, and generating A/V sync Flash-Beep signals. A built in video signal generator is available for generating SDI output test streams.

Utility functions such as SDI de-embedding, embedding, pair shuffling, Dolby decoding and downmixing are also supported by the MT2000.

You will quickly see that this unit is as useful to any audio engineer as a digital multimeter is to an electrician!

1.2. Registration and Feedback

Please take a moment to register your product. This will enable us to contact you if there are any software or documentation issues or updates.

Additionally, if this is your first Linear Acoustic product or you have not already registered for a user account on our website, please do so. Software updates and the latest documentation are always available there, at your convenience, 24/7/365. Please visit www.linearacoustic.com and click on the “register” button at the top

Also, we are very interested in your feedback. This unit was designed based on input gathered from many broadcast engineers and it will evolve further thanks to ongoing suggestions and comments from users.

We look forward to hearing from you!

Chapter 2: Overview and Connections

2.1. Unpacking and Inspection

Before unpacking the unit, inspect the outer carton for shipping damage. If the carton shows damage, inspect the unit in those areas. Please save the carefully designed shipping carton and packing materials. In the unlikely event that the unit needs to be returned to the factory, alternate cartons or packing materials may not be adequate and can cause damage not covered by warranty.

The following essential items are provided with the unit:

- Shipping/Carrying case
- Power supply with an IEC power cord (style matches country of order)
- Quick-start sheet to get you up and running
- USB memory stick containing documentation including this manual
- USB to RS-485 adapter
- micro BNC to standard BNC adapter
- a handy black pen.
- Warranty information: Please fill out and return the warranty card to Linear Acoustic to ensure your software and documentation are kept up to date.

2.2. Unit Overview

This section introduces you to MT2000 and its views:

2.2.1. Front panel

On the front panel of the MT2000, you will find from the top down:

- OLED display
- backlit Linear Acoustic logo and power indicator
- joystick/encoder
- internal speaker

The OLED display provides the user with visual feedback and interaction as to what the MT2000 is doing, parameter settings, and input signal status.

The LED backlit Linear Acoustic logo acts as a power indicator. The LEDs glow red as the unit initializes, and then turn to blue as the unit operates normally.

MT2000 includes a joystick/encoder on the front panel. All adjustments and parameter settings are made with this control. It is capable of being pressed up

(towards the connectors), down (towards the speaker), left, right, and in. It is also capable of being rotated left and right. The function that is controlled by joystick presses and encoder turns may vary depending on the menu or mode the MT2000 is in.



Figure 1 - MT2000 Front Panel

An internal speaker is included in the MT2000. This allows the user to listen to the signal being monitored.

2.2.2. Bottom

A retractable kickstand is designed in to the bottom of the unit.

To extend the kickstand, gently pull up on the end of the kickstand that connects to the hinge, and lift the other end up.

To retract the kickstand, simply push the end back towards the chassis.

2.3. Connections

This section covers all connections

2.3.1. Rear Panel

The rear panel of the MT2000 contains the majority of the connections which will be used.



Figure 2 - MT2000 Rear Panel

2.3.1.1. Power Connection

A DC power input with weatherproof plug is provided. This accepts a 12 V DC input, and is used to power the unit and charge the internal battery. The center post is the positive terminal and the sleeve is ground. The sleeve is threaded and the provided power supply includes a locking ring to ensure that the power connection does not accidentally become undone.

2.3.1.2. AES Input

AES-3id or MADI signals are accepted via the 75-ohm BNC connector. Consumer formatted signals (IEC 60958 or S/PDIF) signals are also accepted at this input.

2.3.1.3. AES Output

Audio signals formatted to the AES-3id standard or MADI signals are output via the AES output.

2.3.1.4. SDI Input

An autosensing SD/HD-SDI input is included on the MT2000. It allows access to all 16 audio channels in the SDI stream for analysis, monitoring, decoding, de-embedding, and pair shuffling. The SDI input is also used for DVB-ASI input streams, when the DVB-ASI option is enabled.

2.3.1.5. SDI Output

An SD/HD-SDI output is included on the MT2000. All 16 audio channels in the SDI stream are available for embedding and channel shuffling. The SDI output is also used for outputting DVB-ASI streams, when the DVB-ASI option is enabled.

2.3.1.6. TOSLINK® Input

Consumer formatted signals (IEC 60958 or S/PDIF) signals are accepted at this optical input. PCM and Dolby® Digital streams are accepted at this input.

Note!

ADAT streams are not supported via the TOSLINK connections.

2.3.1.7. TOSLINK Output

PCM and Dolby Digital consumer formatted signals (IEC 60958 or S/PDIF) signals are capable of being output from this optical output.

2.3.1.8. VRef Input

Analog Vertical Reference (VRef) is accepted via the micro BNC connector. This input allows for guard band measurement of Dolby E streams.

2.3.1.9. HDMI Input

An optional HDMI input is available to aid in the testing of complete broadcast systems, allowing connection to consumer devices such as Set Top Boxes and digital televisions.

Note!

Only PCM, Dolby Digital (AC-3) and Dolby Digital Plus (E-AC-3) streams are supported via the HDMI connection.

2.3.2. Side Panel

The right side panel of the UPMAX v4 includes several connections.



Figure 3 - MT2000 Side View

2.3.2.1. Headphone Output

A stereo 1/8" (~3.5 mm) "mini" headphone jack is included. This tip/ring/sleeve connector accepts most headphones, and is wired tip = left, ring = right, sleeve = shield. When headphones are plugged in to this connector, the internal speaker is muted.

2.3.2.2. Ethernet Connection

A standard Ethernet connector is included. The function of this connector is reserved for future use.

2.3.2.3. USB Connector

A USB input is included. This is used for software upgrades and option key installation.

Chapter 3: Operation

3.1. Interface

The MT2000 includes a Joystick/Encoder and an OLED display on the front panel. All user adjustments are made, and all values, statuses, and parameters are displayed from the front panel. The display provides the primary user interface, and all adjustments and parameter settings are made with the joystick/encoder.

The encoder is capable of being pressed up (towards the connector panel), down (towards the speaker), left, right, and in. It is also capable of being rotated left and right.

3.2. Powering On / Off

To power the MT2000 on, press the encoder knob in and hold it. Within a couple of seconds, the LEDs behind the Linear Acoustic logo will briefly light up red, and then change to blue as the unit continues to boot. It takes several seconds for the unit to run through its boot up routine, self-diagnostics, and be ready to accept audio. Once the OLED display shows the home screen, the unit is ready for use.

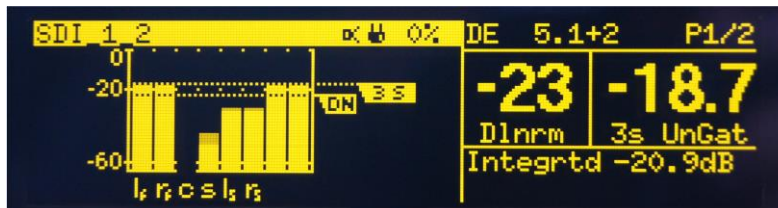


Figure 4 - Home Screen

The process to turn the MT2000 off is similar. Press the encoder in and hold it until the unit shuts off.

3.3. Basic Operation and Navigation

The function that is controlled by joystick presses and encoder turns may vary depending on the menu or mode the MT2000 is in. To start with, the display is divided into two windows:

- The Status / Control Window occupies the left half of the display.

- The Loudness / Volume Control Window occupies the right.

Only one of these windows may be controlled at a time. The active window is highlighted with a yellow bar at the top.

3.3.1. Joystick Operations (Status / Control Window)

- Pressing the joystick to the left acts as an escape key and backs you out towards the main menu.
- Pressing the joystick to the right navigates through the menu or submenu categories. It also acts as an Enter control when adjusting parameters
- Pressing the joystick up or down navigates through a particular menu or submenu category.
- Turning the joystick allows adjustment of parameters and control settings.
- Pressing the joystick in and holding it acts as the power on/off switch
- Pressing the joystick in twice quickly (“double-click”) changes the active display/control window.

3.3.2. Joystick Operations (Loudness / Volume Window)

- Pressing the joystick to the left “solos” the left channel and mutes the right (for listening only).
- Pressing the joystick to the right “solos” the right channel and mutes the left (for listening only).
- Pressing the joystick up resets the loudness measurement
- Pressing the joystick down mutes or unmutes the speaker and headphones.
- Turning the joystick adjusts the listening volume.
- Pressing the joystick in and holding it acts as the power on/off switch
- Pressing the joystick in twice quickly (“double-click”) changes the active display/control window.

3.4. Display

3.4.1. Display Window

The MT2000 includes an OLED display on the front panel. This display provides the primary user interface

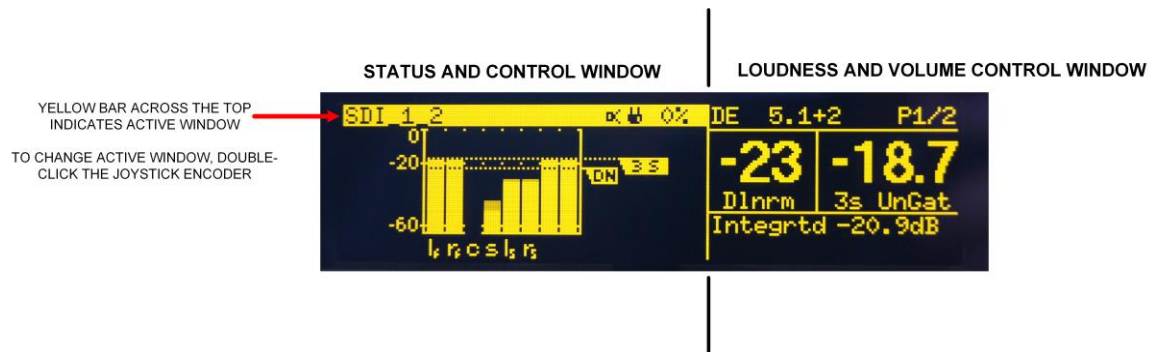


Figure 5 - Main Display Screen

The display is divided into two windows:

- The Status / Control Window occupies the left half of the display.
- The Loudness / Volume Control Window occupies the right.

Only one of these windows may be controlled at a time. The active window is highlighted with a yellow bar at the top. In the image shown above, the Status and Control Window is the active window.

To change which window is active, press the joystick encoder in rapidly two times (double-click).

3.4.2. Status / Control Window

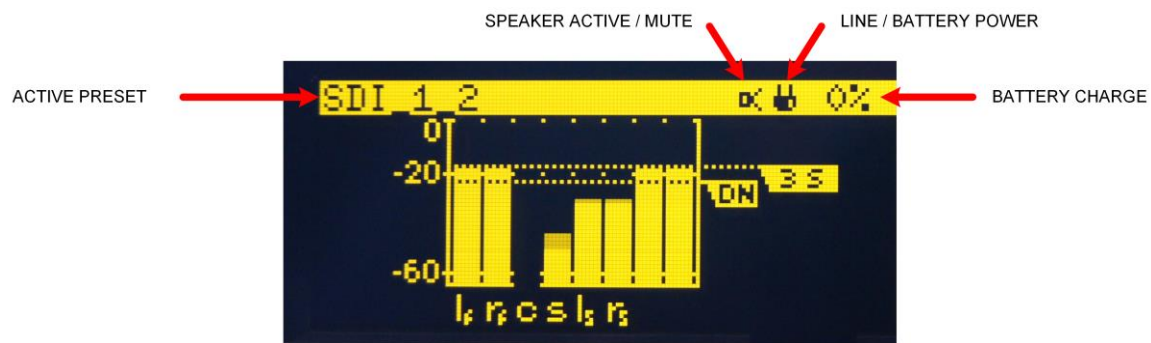


Figure 6 - Status/Control Window

The Status / Control Window display changes depending on which menu, submenu, or display is currently chosen. At the top of this window, there is some information that is always displayed regardless of which menu is in use.

The name of the active preset is always displayed in the top left corner.

To the right of the Active Preset display is an icon which displays the status of the speaker and headphone output.

- An icon which looks like a speaker is displayed when the speaker/headphone outputs are active.



- when the speaker/headphone outputs are muted, the following icon is displayed:



- when the left channel of an audio pair is soloed and the right channel is muted, the following icon is displayed:



- when the right channel of an audio pair is soloed and the left channel is muted, the following icon is displayed:



To the left of the Speaker and Headphone status, a [!] symbol will appear if a system notification / alarm is present.



To the right of the speaker status is an icon which indicates whether the MT2000 is being operated from AC Power (Mains Line) or from the internal battery.

- An icon which looks like a battery is displayed when the unit is being powered from its internal battery.



- when the unit is being run from the AC Line Power (Mains input), the following icon is displayed:



To the right of the power source indicator is the battery charge display. This displays the charge level of the internal battery in percentage.

3.4.3. Loudness / Volume Control Window

The right half of the OLED display always displays the loudness of the audio program,

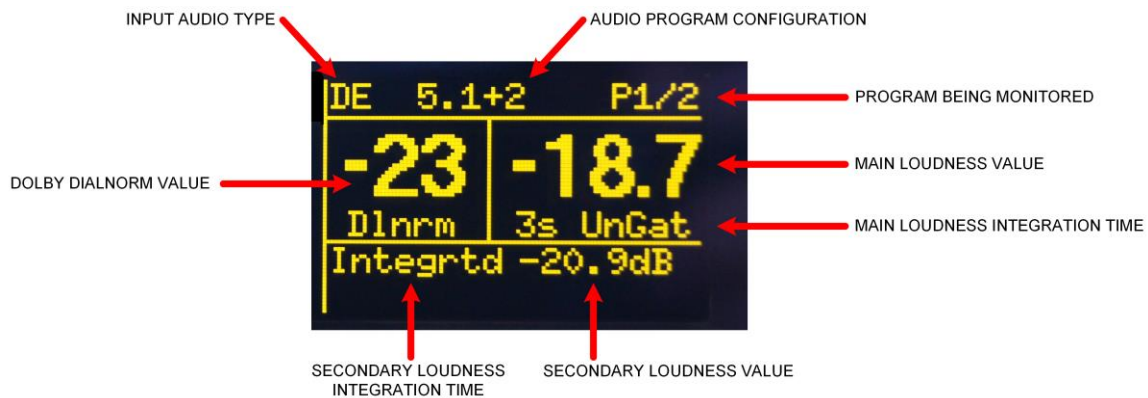


Figure 7 - Loudness/Volume Window

This window displays information regarding the:

- Input audio type
 - PCM
 - Dolby E (DE)
 - Dolby Digital (DD)
 - Dolby Digital Plus (DD+)
- Audio program configuration (Dolby E)
- Program being monitored (Dolby E)
- Dolby dialog normalization (*dialnorm*) value
- Main loudness level and integration time
- Secondary loudness level and integration time

Volume Control

Since the volume control determines the loudness level of the signal being applied directly to your ears, it's only logical that in the loudness window is where you would be allowed to control this function, right? Our development team thought so as well, so this is where we decided to put it.

When the Loudness Window is active, the joystick encoder adjusts the volume of the internal speaker or headphone outputs, as well as mute/unmute of those outputs.

To adjust the volume of the speaker or headphones, rotate the joystick encoder left or right. A pop-up window appears and displays the level of the volume control:



Figure 8 - Volume Control Display

Mute / Unmute

To mute or unmute the speaker / headphones, press the encoder down (towards the speaker). The icon in the Status / Control Menu will change accordingly, and a Mute or Unmute message will temporarily be displayed.



Figure 9 - Speaker Mute/Unmute Display

Solo Left / Right

To listen only to the left channel (a "solo" function), press the encoder to the left. Press it left a second time to release the solo and return to monitoring both channels of an audio pair.

Similarly, to solo the right channel, press the encoder to the right, and press it to the right a second time to release the solo.

3.5. Menu Structure

The menu structure for the MT2000 is very straight forward and simple to navigate even though there are many options and parameters able to be adjusted. The menu structure is organized into logical submenus, which will be discussed in the following chapters.

The entire menu tree is shown below:

Chapter 4: Top Level and Home Screen Menu Structures

4.1. Top Menu Level

The top menu allows for the display of important information about the input stream in a very quick and easy to find manner. From within the top level menu, it is also possible to get to statistics and setup menus, along with determining the software release version of the MT2000.

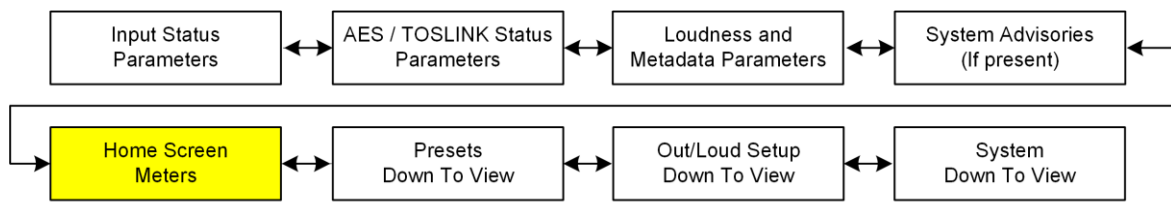


Figure 11 - Top Level Menu

The top menu level includes selections for:

- Audio Meters (home screen)
- Input status
- AES and TOSLINK stream parameter status
- Loudness measurement and Dolby metadata parameters
- System advisories (when present)
- Presets menu
- Output and loudness measurement setup menus
- System setup and status menus

Many of the menu options include sub-menus or sub-displays.

The home screen and its associated menus are described in the following sections, the other displays and menu options are described in following chapters.

4.2. Home Screen

The Home screen is shown below:

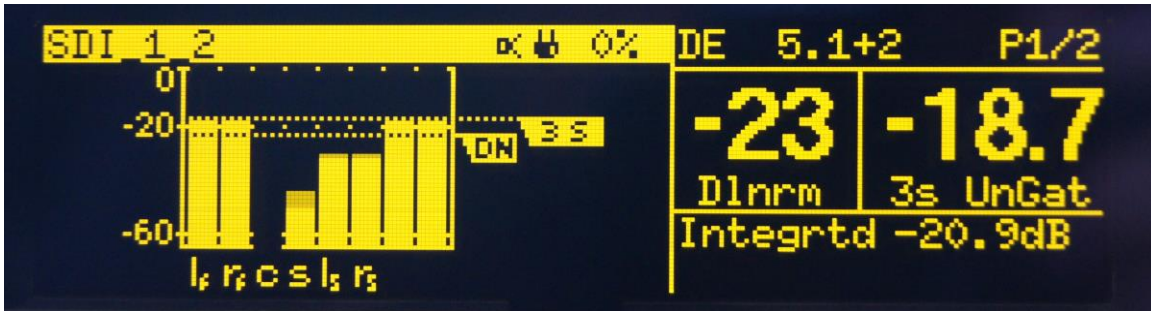


Figure 12 - Home Screen

It includes audio meters showing up to 8-channels of audio. If the input is Dolby coded audio, this screen will display the decoded PCM from that bitstream, program, or substream. Included in this display is a bar indicating a loudness measurement of the audio, as well as the value of dialog normalization (dialnorm) if the input audio is a Dolby coded source.

4.3. Home Screen Menus

Additional controls and displays are available, if conditions permit, directly “above” and “below” the Home Screen, if the input signal is from either the SDI or MADI inputs, or if it is a Dolby coded stream. These menu windows are accessed by clicking “up” or “down” with the joystick:

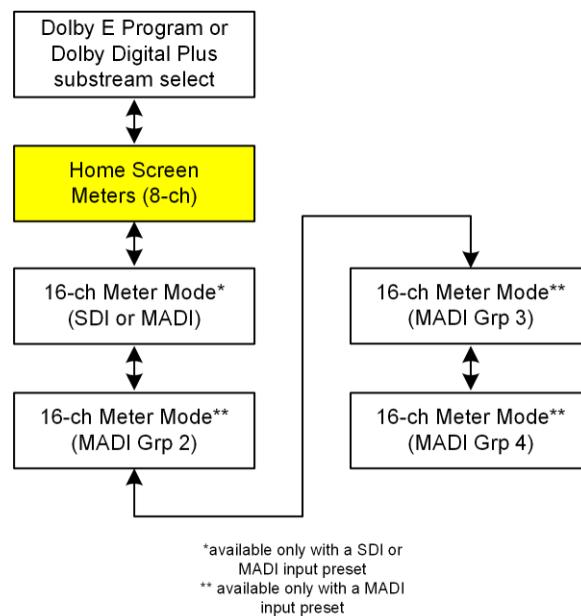


Figure 13 - Home screen and menu

4.3.1. Dolby Program / Dolby Digital Plus E substream select

If the input signal is a Dolby E bitstream the screens above the home window allow selection of which Dolby E program is being monitored and measured.

If the input signal is a Dolby Digital Plus (sometimes referred to as E-AC-3 in broadcast standards) bitstream the screens above the home window allow selection of which substream is being monitored and measured.

Note!

These menu windows will not be available unless the input is a Dolby E or Dolby Digital Plus bitstream.

4.3.2. 16-chanel SDI/MADI discovery mode

When the input source is either SDI or MADI input, a 16-channel meter display is available in order to quickly determine how the stream is populated.

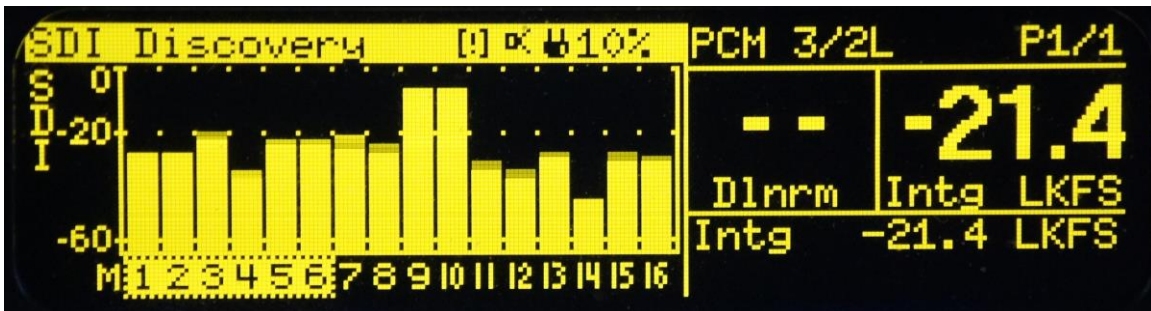


Figure 14 - SDI Discovery Mode

In the case of a MADI input, there are four separate discovery windows. The MT2000 divides a 64-channel MADI stream into four 16-channel groups. A separate discovery mode window exists for each of the four MADI groups.

Note!

These menu windows are only available when the input source is set to SDI or MADI input.

4.3.3. Quick Navigation in the 16-channel discovery mode

When in a 16-ch discovery mode window, the first two channels of that stream (or MADI group) are selected by default to be measured and monitored. Rotating the encoder to the right will scroll between channel pairs, and when the end is reached, it will change modes to allow 5.1-channel PCM groups to be monitored and measured. This mode selection will continuously wrap around for quick and easy access to combinations of stereo and multichannel signals

It is possible to monitor the left or right channel in a stereo pair by double-clicking the encoder to change to the volume control window, and pressing the encoder to the left to solo the left channel of the pair, or pressing the encoder to the right to solo the right channel of the pair.

When encountering a Dolby coded audio stream, that stereo pair will need to be selected (pressing the encoder to the right to “take” the choice) in order to decode the Dolby signal.

To change the input pairs for the SDI or MADI preset while in 16-ch discovery mode, simply press the encoder to the right (“enter”) two times.

Chapter 5: Preset Menu

5.1. Presets

The Presets Menu is where user presets can be recalled, modified, stored, named, and copied. Within the Presets menu, there are menu options for:

- Preset (16 possible locations)
- Preset Parameters
- Preset Name
- Copy Preset

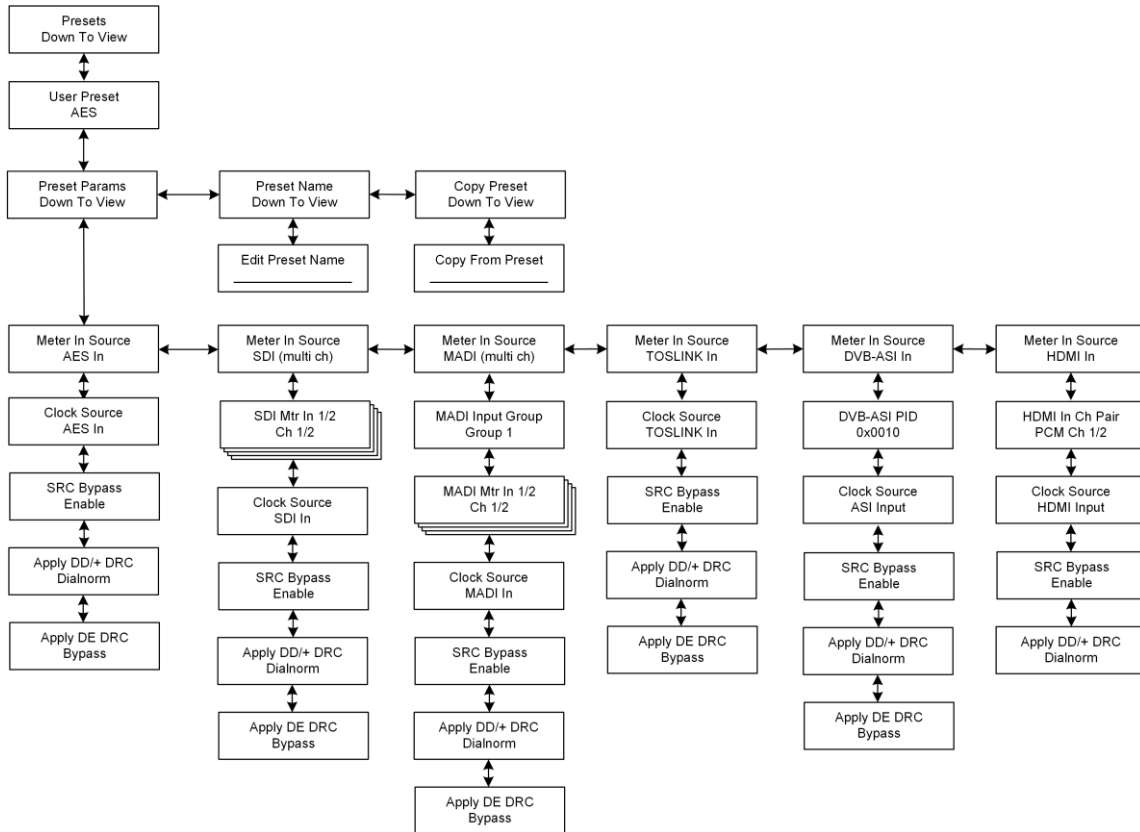


Figure 15 - Preset Menu

5.1.1. Presets

The MT2000 is capable of storing up to 16 user defined and adjustable presets. The unit ships from the factory with several presets pre-loaded into the unit, which include:

- AES Input
- SDI Input
- MADI Input (Group 1)
- HDMI Input (PCM, Channels 1/2)
- TOSLINK input
- SDI Input 2
- Internal Reference clock

Plus an additional 9 empty preset locations

The factory presets loaded into the unit may be overwritten.

The available parameters which are stored within a preset are tailored for the input source, and include:

- Meter Input Source
- Meter In 1/2 Source *
- Meter In 3/4 Source *
- Meter In 5/6 Source *
- Meter In 7/8 Source *
- Clock Source
- SRC Bypass
- Apply DD/DD+ DRC and dialnorm
- Apply Dolby E dialnorm **

* only available with multichannel capable input sources (SDI, MADI, HDMI).

** not available in consumer format inputs (HDMI and TOSLINK)

5.1.1.1. Meter Input Source

This selects the input source used to monitor and measure the loudness of. The available options are:

- AES In *
- TOSLINK In
- HDMI In
- MADI (multichannel)
- SDI (multichannel)
- DVB ASI

* indicates the default value

5.1.1.2. HDMI Input Channel Pair

When the HDMI option is enabled, this menu allows the selection of the channel pair from the HDMI connection to be monitored. The options are:

- PCM Ch 1/2 *
- PCM Ch 3/4
- PCM Ch 5/6
- PCM Ch 7/8
- SPDIF Ch 1/2
- SPDIF Ch 3/4
- SPDIF Ch 5/6
- SPDIF Ch 7/8

* indicates the default value

Note!

This parameter is only available when the HDMI input is selected.

5.1.1.3. MADI Input Group

The MT2000 divides up a MADI stream into groups of 16 channels. This menu selects the MADI Group to have a pair selected from for monitoring and measuring. The options are:

- Group 1 *
- Group 2
- Group 3
- Group 4

* indicates the default value

Note!

This parameter is only available when the MADI input is selected.

MADI streams are input and output via the AES connections.

5.1.1.4. MADI Mtr In 1/2 – 7/8

These parameters allow the selection of up to 8-channels of MADI audio, in pairs, to be monitored and measured. The options are:

- Ch 1/2 *
- Ch 11/12

- Ch 3/4
- Ch 5/6
- Ch 7/8
- Ch 9/10
- Ch 13/14
- Ch 15/16
- Mute

* the default value from inputs 1-8 matches the channels 1-8 of the input MADi stream

Note!

These parameters are only available when the MADi input is selected.

5.1.1.5. SDI Mtr In 1/2 – 7/8

These parameters allow the selection of up to 8-channels of audio, in pairs, from an SDI stream to be monitored and measured. The options are:

- Ch 1/2 *
- Ch 3/4
- Ch 5/6
- Ch 7/8
- Ch 9/10
- Ch 11/12
- Ch 13/14
- Ch 15/16
- Mute

* the default value from inputs 1-8 matches the channels 1-8 of the input SDI stream

Note!

These parameters are only available when the SDI input is selected.

5.1.1.6. Clock Source

The control allows selection of the reference clock source used by the MT2000. The available options are:

- AES Input
- HDMI
- SDI
- Internal 48KHz
- TOSLINK
- MADI
- VRef

The default value of the clock reference is the input source that is selected.

The one exception to the default clock setting is when SDI embedding is enabled, the clock reference will be forced to the SDI input or internal video generator reference if no SDI input signal is available.

Note!

Proper clocking referencing is very important and is the cause of many audio problems. Input Sample Rate Converters (SRC) are included in the MT2000 in case the handling of audio from multiple clock bases is required. PCM audio is the only type of audio which can be passed through SRCs without harm. Coded audio such as Dolby E, etc. will be destroyed by passing it through a SRC.

5.1.1.7. DVB-ASI PID

This control allows selection of the audio PID in the DVB-ASI stream to monitor

- 0x0010

Note!

This parameter is only available when the DVB-ASI input is selected.

5.1.1.8. SRC Bypass

The MT2000 includes sample rate converters (SRC) on the AES and TOSLINK inputs. These SRCs accommodate input audio if it is at a different sample rate (44.1 kHz) or more typically if it is using a different clock reference than the output audio. The outputs of the SRCs go to the main output, the SDI embedder, and the MADI inserter. This control allows the asynchronous sample rate converters used on the input to the MT2000 to be bypassed. The options are:

- Enable (SRCs bypassed)
- Disable * (SRCs in circuit)

* indicates the default value

Unless the input and output audio are known to synchronous, or Dolby coded audio is not being decoded correctly (sounds like teeth chattering), SRC Bypass should be set to "OFF"

5.1.1.9. Apply DD/+ DRC

This control allows for the selection of dynamic range compression during the Dolby Digital or Dolby Digital Plus decode. The available options for this are:

- dialnorm * Dialnorm only
- Line Mode + Dn Dialnorm with Line Mode Compression
- RF Mode + Dn Dialnorm with RF Mode Compression

* indicates the default value

5.1.1.10. Apply DE DRC

This control allows for the selection of dynamic range compression during the Dolby Digital or Dolby Digital Plus decode. The available options for this are:

- Bypass * No Dynamic Range Compression or dialnorm applied
- dialnorm Dialnorm only
- Line Mode + Dn Dialnorm with Line Mode Compression
- RF Mode + Dn Dialnorm with RF Mode Compression

* indicates the default value

Note!

Dolby E is not a valid audio format for HDMI connections, and therefore this parameter will not be available with HDMI inputs.

5.1.1.11. Preset Name

Each Preset includes a 15-character preset name. Presets are able to be named or renamed to something meaningful and intuitive.

To name a preset:

Press the encoder to the left or to the right to select the space to update. Rotate the encoder left or right to select the desired character. Once the preset name has been changed to the desired name, keep pressing the encoder to the right through all the spaces to accept the change in the name.

5.1.1.12. Copy Preset

The MT2000 allows users to copy preset information from another preset into the current working preset.

To copy a preset:

Enter the “Copy Preset” menu and press the joystick / encoder down. The display will show “Copy From Preset” and the current preset name. Rotate the joystick/encoder until the desired preset to be copied is found, then press the joystick to the right to accept it.

Chapter 6: Output and Loudness Measurement Menus

6.1. Output/Loudness Measurement Menu

The Output and Loudness Measurement menu is where all adjustments for the output configuration, signal generation, and loudness measurement are configured. The menu tree for this section is shown below:

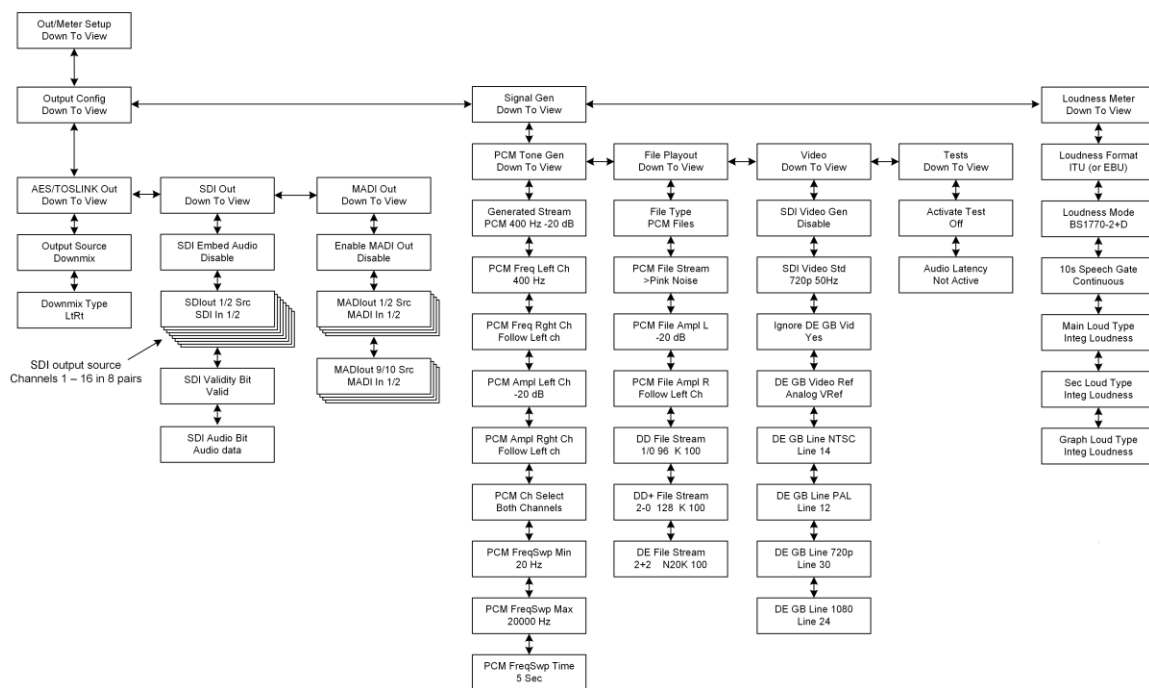


Figure 16 - Output / Loudness Menus

The Output / Loudness menu is divided up into 3 submenus. There are submenus for:

- Output Configuration
- Signal Generation
- Loudness Measurement

These submenus are described in the following sections.

6.2. Output Configuration Submenu

The Output Configuration Submenu includes control over

- AES/TOSLINK Output
- SDI Output
- MADI Output

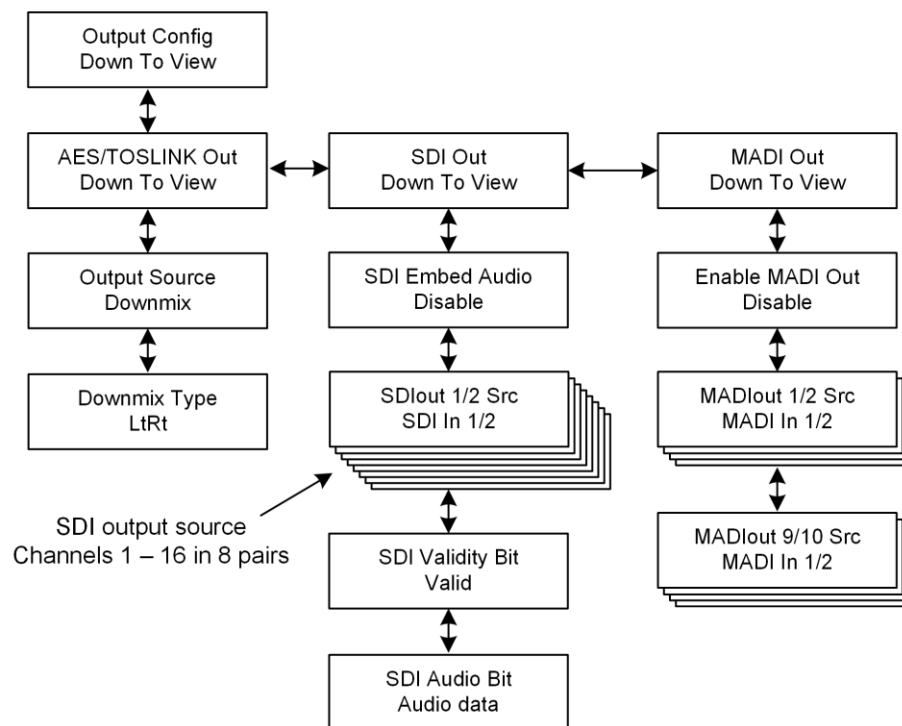


Figure 17 - Output Configuration Submenu

6.2.1. AES/TOSLINK Output submenu

6.2.1.1. Output Source

The Output Source parameter determines the audio source to be output at the AES and TOSLINK outputs. This signal may also be embedded into the SDI and MADI outputs. The choices for the main output source are:

- Downmix *
- Signal Generator
- File Playback
- MADI Input
- SDI Input 1/2
- SDI Input 3/4
- SDI Input 7/8
- SDI Input 9/10
- SDI Input 11/12
- SDI Input 13/14
- SDI Input 15/16
- AES In

- SDI Input 5/6

- TOSLINK In

* indicates the default value

The downmix option is a downmix of the main program being decoded and monitored. If the audio program contains more than 2-channels, it will be downmixed to stereo for your listening pleasure.

6.2.1.2. Downmix Type

The downmix type being performed by the MT2000 for the Main Output is selectable and is stored as part of a preset. The available choices are:

- LtRt * Left Total / Right Total. A Dolby Surround encoded format
- LoRo Left Only / Right Only. No phase shift information in the surround channels. Recommended for headphone monitoring and mono downmixes
- Auto Based upon preferred downmix metadata values contained in a Dolby bitstream

* indicates the default value

6.2.2. SDI Output submenu

This submenu allows construction of the SDI output, including whether embedding or re-embedding is enabled and which source is routed to each audio pair contained in the output SDI stream.

The submenu is shown below:

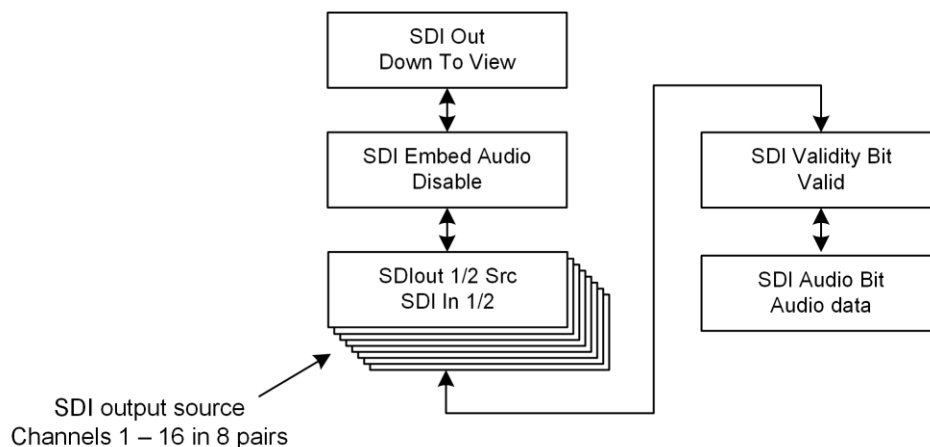


Figure 18 - SDI Output Submenu

The individual parameters included in the SDI Output menu are listed below:

6.2.2.1. SDI Embed Audio

This control determines whether audio is being embedded into the SDI output or simply passed through from the SDI input. The choices are:

- Enable
- Disable *

* indicates the default value

6.2.2.2. SDI Output 1/2 Source – SDI Output 15/16 Source

The following 8 parameter settings select the audio source to be embedded into the various audio pairs in an HD/SD-SDI stream. The default value is that the same input pair is matched to the same output pair. Example: SDI 1/2 input is routed to SDI 1/2 output. The available output source options are:

- SDI Input 1/2
- SDI Input 3/4
- SDI Input 5/6
- SDI Input 7/8
- SDI Input 9/10
- SDI Input 11/12
- SDI Input 13/14
- SDI Input 15/16
- Muted
- AES/TOS Out
- AES Input
- TOSLINK Input
- Signal Generator
- File Payout

6.2.2.3. SDI Embed Audio

Reserved for future use

6.2.2.4. SDI Audio Bit

Reserved for future use.

6.2.3. MADI Output submenu

This submenu determines the behavior of the MADI output. The routing assigned to MADI output channels 1-16 are duplicated for MADI output channels 17-32, 33-48, and 49-64. The MADI Output Configuration menu tree is shown below:

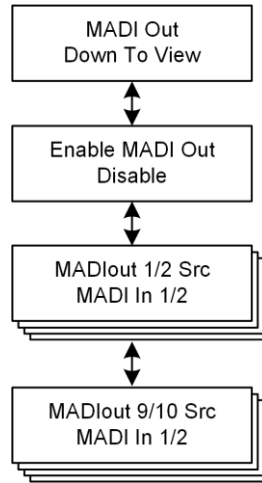


Figure 19 - MADI Output Submenu

The parameters contained in the MADI Output are listed below:

6.2.3.1. Enable MADI Output

The following 8 parameter settings select the audio source to be embedded into the various audio pairs in an HD/SD-SDI stream. The default value is the same input pair matched to the output pair. The available output source options are:

- Enable
- Disable *

* indicates the default value

6.2.3.2. MADI Output 1/2 Source – MADI Output 15/16 Source

The following parameter settings select the audio source to be embedded into the first 8 audio pairs (16-channels) in a MADI stream. The default value is the same input pair (1-4) matched to the output pair (1-4 and 5-8). The available output source options are:

- MADI Input 1/2
- MADI Input 3/4
- MADI Input 5/6
- MADI Input 7/8
- Muted

- AES/TOS Out
- AES Input
- TOSLINK Input
- Signal Generator
- File Playback

* indicates the default value

6.3. Signal Generation Menu

The Signal Generator Menu includes submenus for:

- PCM Tone Generator
- File Playback
- Video Generator
- Tests

The Signal Generator Menu is shown below:



Figure 20 - Signal Generation Mmenu

The submenus and parameters included in the Signal Generator menu are listed below:

6.3.1. Signal Generator Submenu

The MT2000 includes a 2-channel PCM signal generator to aid in troubleshooting and calibrating systems. The two channels are capable of being operated and configured individually for both frequency and amplitude, or linked together.

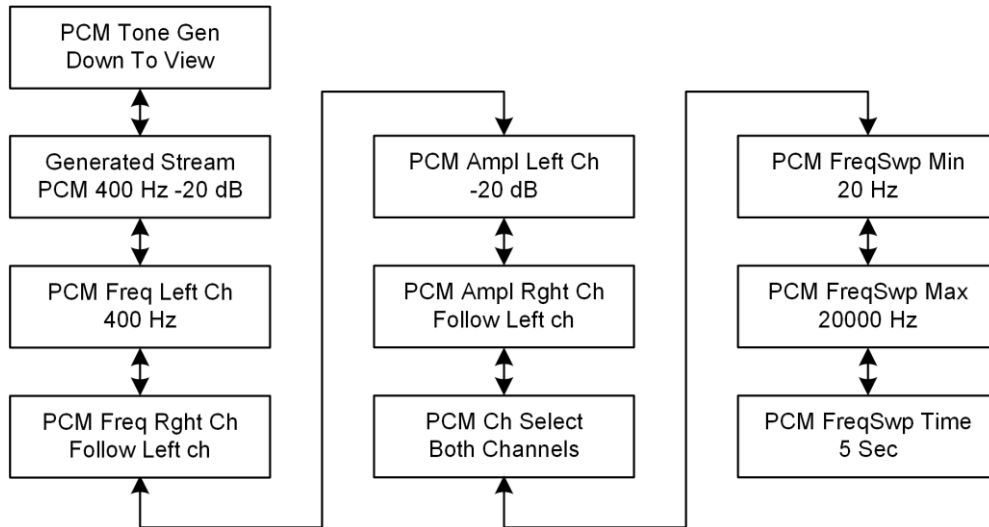


Figure 21 - PCM Tone Generator Submenu

The parameters and controls in the Signal Generator submenu are:

6.3.1.1. PCM Tone Gen

This parameter controls the function of the PCM test tones generator. It allows for presets to be selected or for custom settings controlled by the user. The available settings are:

- PCM 400Hz -20 dBFS * Preset 400 Hz tone at -20 dBFS in both Left and Right channels
- PCM 1KHz -20 dBFS Preset 1 KHz tone at -20 dBFS in both Left and Right channels
- PCM 5KHz -20 dBFS Preset 5 KHz tone at -20 dBFS in both Left and Right channels
- PCM Silence Preset Silence in both Left and Right channels
- PCM Custom Allows for user adjustable frequency and amplitude in both the Left and Right channels
- PCM FSwp 20-12K Preset frequency sweep at -20 dBFS in both Left and Right channels
- PCM FSwp Custom Allows for user adjustable frequency sweep

* indicates the default value

Note!

For any of the following parameters in the Signal Generator submenu to be active, the Generated Stream parameter must be set to *PCM Custom* or *PCM FSwp Custom*.

6.3.1.2. PCM Generator Frequency – Left channel

This parameter controls the frequency being generated for the Left channel of the Test Tone output pair.

The available frequency range is:

- 20 Hz – 1 KHz in 10 Hz increments
- 1 KHz – 20 KHz in 100 Hz increments

The default frequency setting is 400 Hz.

6.3.1.3. PCM Generator Frequency – Right channel

This parameter controls the frequency being generated for the Right channel of the Test Tone output pair.

The available frequency range is:

- Follow Left Channel
- 20 Hz – 1 KHz in 10 Hz increments
- 1 KHz – 20 KHz in 100 Hz increments

The default frequency setting is to Follow Left Channel setting.

6.3.1.4. PCM Generator Amplitude – Left channel

This parameter controls the amplitude of the signal generator for the Left channel of the Test Tone output. This control affects both the steady test tone and the frequency sweep.

The available amplitude control range is:

- 0 dBFS to -60 dBFS in 1 dB increments

- Silence

The default setting is -20 dBFS.

6.3.1.5. PCM Generator Amplitude – Right channel

This parameter controls the amplitude of the signal generator for the Right channel of the Test Tone output. This control affects both the steady test tone and the frequency sweep.

The available amplitude control range is:

- Follow Left channel
- 0 dBFS to -60 dBFS in 1 dB increments
- Silence

The default setting is to Follow Left Channel setting.

6.3.1.6. PCM Channel Select

This control allows the selection of which channel to populate with audio when using the signal generator. The choices are:

- Left Channel
- Right Channel
- Both Channels *

* indicates the default value

6.3.1.7. PCM Frequency Sweep – Minimum Frequency

This parameter controls the minimum frequency generated for the Frequency Sweep signal.

The available frequency range is:

- 20 Hz – 1 KHz in 10 Hz increments
- 1 KHz – 19.9 KHz in 100 Hz increments

The default frequency setting is 20 Hz.

6.3.1.8. PCM Frequency Sweep – Maximum Frequency

This parameter controls the maximum frequency generated for the Frequency Sweep signal.

The available frequency range is:

- 30 Hz – 1 KHz in 10 Hz increments
- 1 KHz – 20 KHz in 100 Hz increments

The default frequency setting is 20 KHz.

6.3.1.9. PCM Frequency Sweep Time

This parameter controls the length of time the frequency sweep signal takes to sweep from the minimum frequency to the maximum frequency.

The control range is:

- 1 second through 10 seconds in 1 second increments

The default frequency setting is 5 seconds.

6.3.2. File Playout Submenu

The MT2000 also includes the ability to play back audio test files. Most of these files are Dolby coded audio (Dolby E, Dolby Digital, Dolby Digital Plus), but a few PCM signals such as Pink Noise and White Noise are also available.

One unique feature is that the MT2000 is capable of playing a test file simultaneously while generating PCM test tones.

Note!

In the File Playout submenu, the “>” symbol is displayed to the left of the name of the file being played, regardless if it is PCM, Dolby Digital, Dolby E, or Dolby Digital Plus

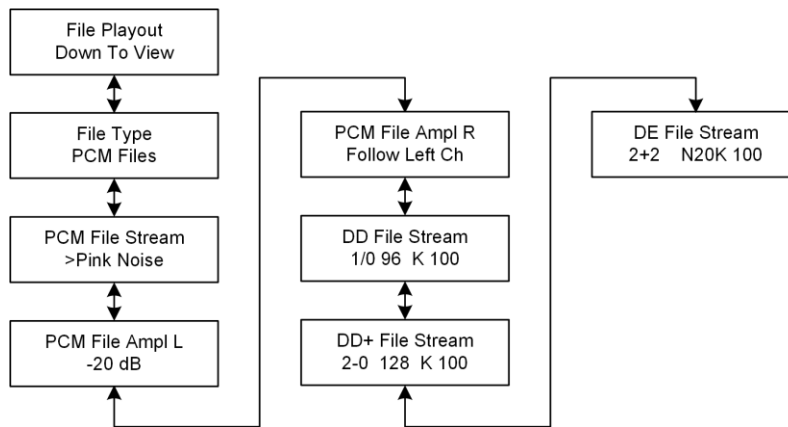


Figure 22 - File Playback Submenu

6.3.2.1. File Type

This parameter selects the type of file/stream to be played back. Each file type has a submenu for selection of the preferred stream in each format. The available loudness mode options are:

- PCM File
- DD Files (Dolby Digital)
- DE Files (Dolby E)
- DD+ Files (Dolby Digital Plus)

6.3.2.2. PCM File Stream

This submenu allows the selection of the PCM files to be played back. The available options are:

- Pink Noise
- White Noise

6.3.2.3. File Playback Amplitude – Left channel

This parameter controls the amplitude of the signal generator for the Left channel of the File Playback signal, when playing back one of the PCM files.

The available amplitude control range is:

- 0 dBFS to -60 dBFS in 1 dB increments
- Silence

The default setting is -20 dBFS.

Note!

This parameter is only available when a PCM file is being played back. It does not affect the level of any Dolby encoded test streams, and will not be accessible when a Dolby encoded file is selected for playback.

6.3.2.4. File Playback Amplitude – Right channel

This parameter controls the amplitude of the signal generator for the Right channel of the File Playback signal, when playing back one of the PCM files.

The available amplitude control range is:

- Follow Left channel
- 0 dBFS to -60 dBFS in 1 dB increments
- Silence

The default setting is to Follow Left Channel setting.

Note!

This parameter is only available when a PCM file is being played back. It does not affect the level of any Dolby encoded test streams, and will not be accessible when a Dolby encoded file is selected for playback.

6.3.2.5. DD File Stream

This submenu allows the selection of the Dolby Digital (AC-3) bitstream to be played. There are many bitstreams to choose from, varying in channel configuration (acmod), test tone frequency, test tone amplitude, and data rates

The file name for each test signal describes the signal itself. The guide to interpreting the contents of the file based on the name is as follows:

Filename: 2/0 256 K 400

2/0 Audio coding mode (acmod or channel configuration)
 256 Data rate (kilobits per second or kbps)
 K Amplitude
 1k Test tone frequency (MT = multi-tone)

The Dolby Digital files for playback include:

1-channel streams		
• 1/0 96 K 100	• 1/0 96 K 1k	• 1/0 96 K 5k
• 1/0 96 K 12k	• 1/0 96 K 400	

2-channel streams		
• 2/0 192 K 100	• 2/0 192 K 1k	• 2/0 192 K 5k
• 2/0 192 K 12k	• 2/0 192 K 400	
• 2/0 256 K 100	• 2/0 256 K 1k	• 2/0 256 K 5k
• 2/0 256 K 12k	• 2/0 256 K 400	

5.1 and 5.0 channel streams		
• 3/2L 384 K 100	• 3/2L 448 K 100	• 3/2 384 K 100
• 3/2L 384 K 12k	• 3/2L 448 K 12k	• 3/2 384 K 12k
• 3/2L 384 K 1k	• 3/2L 448 K 1k	• 3/2 384 K 1k
• 3/2L 384 K 400	• 3/2L 448 K 400	• 3/2 384 K 400
• 3/2L 384 K 5k	• 3/2L 448 K 5k	• 3/2 384 K 5k
• 3/2L 384 K MT	• 3/2L 448 K MT	
• 3/2 448 K 100	• 3/2 448 K 1k	• 3/2 448 K 5k
• 3/2 448 K 12k	• 3/2 448 K 400	

6.3.2.6. Dolby E File Stream

This submenu allows the selection of the Dolby E bitstream to be played. There are many bitstreams to choose from, varying in program configuration, video frame rate, test tone frequency, and test tone amplitude

The file name for each test signal describes the signal itself. The guide to interpreting the contents of the file based on the name is as follows:

Filename: 2+2 N20K 1k

2+2 Dolby E program configuration
 N NTSC frame rate (29.97 Hz), or "P" for PAL frame rate (25 Hz)

20 Bit depth of Dolby E frame (16- or 20-bit)
 K Amplitude
 1k Test tone frequency (MT = multi-tone)

The Dolby E files for playback include:

NTSC Streams	PAL Streams
• 2+2 N20K 100	• 2+2 P20K 100
• 2+2 N20K 12k	• 2+2 P20K 12k
• 2+2 N20K 1k	• 2+2 P20K 1k
• 2+2 N20K 400	• 2+2 P20K 400
• 2+2 N20K 5k	• 2+2 P20K 5k
3X2 N16K 100	3X2 P16K 100
3X2 N16K 12k	3X2 P16K 12k
3X2 N16K 1k	3X2 P16K 1k
3X2 N16K 400	3X2 P16K 400
3X2 N16K 5k	3X2 P16K 5k
• 5.1+2 N20K 100	• 5.1+2 P20K 100
• 5.1+2 N20K 12k	• 5.1+2 P20K 12k
• 5.1+2 N20K 1k	• 5.1+2 P20K 1k
• 5.1+2 N20K 400	• 5.1+2 P20K 400
• 5.1+2 N20K 5k	• 5.1+2 P20K 5k
5.1 N16J MT	5.1 P16J MT
5.1 N16K 100	5.1 P16K 100
5.1 N16K 12k	5.1 P16K 12k
5.1 N16K 1k	5.1 P16K 1k
5.1 N16K 400	5.1 P16K 400
5.1 N16K 5k	5.1 P16K 5k
5.1 N16K MT	5.1 P16K MT
5.1 N20J MT	5.1 P20J MT
5.1 N20K MT	5.1 P20K MT
• 8x1 N20K 100	• 8x1 P20K 100
• 8x1 N20K 12k	• 8x1 P20K 12k
• 8x1 N20K 1k	• 8x1 P20K 1k
• 8x1 N20K 400	• 8x1 P20K 400
• 8x1 N20K 5k	• 8x1 P20K 5k

6.3.2.7. Dolby Digital Plus File Stream

This submenu allows the selection of the Dolby Digital Plus (E-AC-3) bitstream to be played. There are many bitstreams to choose from, varying in channel configuration (acmod), test tone frequency, test tone amplitude, and data rates

The file name for each test signal describes the signal itself. The guide to interpreting the contents of the file based on the name is as follows:

Filename: 2/0 256 K 400

2/0 Audio coding mode (acmod or channel configuration)
 256 Data rate (kilobits per second or kbps)
 K Amplitude (K = -20 dBFS)
 1k Test tone frequency (MT = multi-tone)

The Dolby Digital Plus files for playback include:

2-channel streams		
• 2/0 96 K 100	• 2/0 128 K 100	• 2/0 256 K 1k L
• 2/0 96 K 10k	• 2/0 128 K 10k	• 2/0 256 K 1k R
• 2/0 96 K 1k	• 2/0 128 K 12k	
• 2/0 96 K 400	• 2/0 128 K 1k	
• 2/0 96 K 5k	• 2/0 128 K 400	
• 2/0 96 K MT	• 2/0 128 K 5k	
	• 2/0 128 K MT	

5.1 and 5.0 channel streams		
• 3-2L K 1k L	• 3-2L K 1k C	• 3-2L K 1k Ls
• 3-2L K 1k R	• 3-2L K 63 LFE	• 3-2L K 1k Rs
• 3/2L 192 K 100	• 3/2 192 K 100	• 3/2L 384 K 100
• 3/2L 192 K 10k	• 3/2 192 K 10k	• 3/2L 384 K 10k
• 3/2L 192 K 1k	• 3/2 192 K 1k	• 3/2L 384 K 12k
• 3/2L 192 K 400	• 3/2 192 K 400	• 3/2L 384 K 1k
• 3/2L 192 K 5k	• 3/2 192 K 5k	• 3/2L 384 K 400
• 3/2L 192 K MT	• 3/2 192 K MT	• 3/2L 384 K 5k
		• 3/2L 384 K MT
• 3/2L 256 K 100	• 3/2 256 K 100	
• 3/2L 256 K 10k	• 3/2 256 K 10k	• 3/2 384 K 100
• 3/2L 256 K 1k	• 3/2 256 K 1k	• 3/2 384 K 10k
• 3/2L 256 K 400	• 3/2 256 K 400	• 3/2 384 K 12k
• 3/2L 256 K 5k	• 3/2 256 K 5k	• 3/2 384 K 1k
• 3/2L 256 K MT	• 3/2 256 K MT	• 3/2 384 K 400
		• 3/2 384 K 5k

		• 3/2 384 K MT
--	--	----------------

7.1-channel streams		
• 3-4L K 1k L	• 3-4L K 1k Ls	• 3-4L K 1k Lb
• 3-4L K 1k R	• 3-4L K 1k Rs	• 3-4L K 1k Rb
• 3-4L K 1k C	• 3-4L K 63 LFE	
• 3-4L 384 K 100	• 3/4L 384 K 100	• 3-4L 576 K 10k
• 3-4L 384 K 10k	• 3-4L 384 K 10k	
• 3-4L 384 K 1k	• 3-4L 384 K 1k	• 3-4L 640 K 10k
• 3-4L 384 K 400	• 3-4L 384 K 400	• 3-4L 640 K 12k
• 3-4L 384 K 5k	• 3-4L 384 K 5k	
• 3-4L 384 K MT	• 3-4L 384 K MT	

6.3.3. Video Generator Submenu

The MT2000 is capable of generating video signals for the SDI output. The video format is selectable, along with the guard band timing when outputting Dolby E.

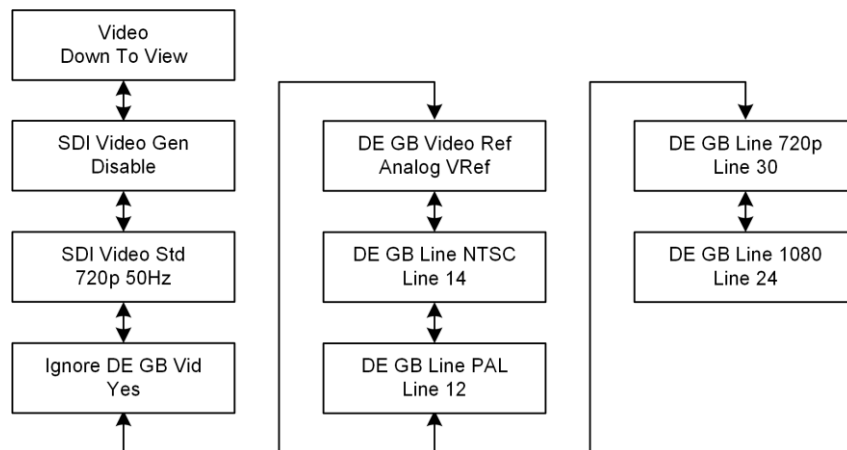


Figure 23 - Video Generator Submenu

6.3.3.1. SDI Video Generator Enable

This control enables the video generator. The available loudness mode options are:

- Enable
- Disable *

* indicates the default value

6.3.3.2. SDI Video Standard

This parameter allows the selection of the video format generated and used for the SDI output. The supported video standards are:

- | | |
|--------------------|------------------|
| • 720p 50 Hz * | • 1080p 23.98 Hz |
| • 720p 59.94 Hz | • 1080p 24 Hz |
| • 720p 60 Hz | • 1080p 25 Hz |
| • 1080 sf 23.98 Hz | • 1080p 29.97 Hz |
| • 1080 sf 24 Hz | • 1080p 30 Hz |
| • 1080i 25 Hz | • SD NTSC |
| • 1080i 29.97 Hz | • SD PAL |
| • 1080i 30 Hz | |

* indicates the default value

6.3.3.3. Ignore Dolby E Guard band Video (Ignore DE GB Vid)

This control allows for Dolby E test signals to be properly aligned with video reference or purposefully misaligned. The available options are:

- Yes *
- No

* indicates the default value

6.3.3.4. Dolby E Guard Band Video Reference (DE GB Video Ref)

This parameter selects the video reference source to align the Dolby E frames to when playing back Dolby E test files. The available reference options are:

- Analog VRef *
- SDI

* indicates the default value

6.3.3.5. Dolby E Line Position – NTSC (DE GB Line NTSC)

This parameter selects the line position / guard band timing for Dolby E test files referenced to the analog VRef signal. It is possible to adjust the timing of the Dolby E frame to any line (Line 1 through Line 524) in the NTSC frame.

The default value is Line 14, which is the ideal line position for Dolby E with this frame rate and reference.

The available settings are:

- Line 1 through Line 524
- Line 14 *

* indicates the default value

6.3.3.6. Dolby E Line Position – PAL (DE GB Line PAL)

This parameter selects the line position / guard band timing for Dolby E test files referenced to the analog VRef signal. It is possible to adjust the timing of the Dolby E frame to any line (Line 1 through Line 624) in the PAL frame.

The default value is Line 12, which is the ideal line position for Dolby E with this frame rate and reference.

The available settings are:

- Line 1 through Line 624
- Line 12 *

* indicates the default value

6.3.3.7. Dolby E Line Position – 720p (DE GB Line 720p)

This parameter selects the line position / guard band timing for Dolby E test files referenced to the SDI signal. It is possible to adjust the timing of the Dolby E frame to any line (Line 1 through Line 750) in the video frame.

The default value is Line 30, which is the ideal line position for Dolby E with this frame rate and reference.

The available settings are:

- Line 1 through Line 750
- Line 30 *

* indicates the default value

6.3.3.8. Dolby E Line Position – 1080 (DE GB Line 1080)

This parameter selects the line position / guard band timing for Dolby E test files referenced to the SDI signal. It is possible to adjust the timing of the Dolby E frame to any line (Line 1 through Line 1125) in the video frame.

The default value is Line 24, which is the ideal line position for Dolby E with this frame rate and reference.

The available settings are:

- Line 1 through Line 1125
- Line 24 *

* indicates the default value

6.3.4. Tests Submenu

The MT2000 is capable of generating an Audio / Video synchronization test signal (Flash Beep) and performing an audio latency test. The tests submenu is where these tests are enabled and selected.

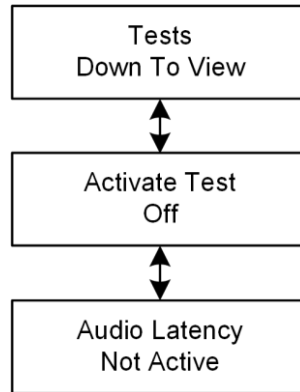


Figure 24 - Tests Submenu

6.3.4.1. Activate Test

This control allows for the desired test to be selected or disabled. The test options are:

- Off *
- Beep Flash Test
- Audio Latency Test

* indicates the default value

6.3.4.2. Beep Flash Test

This test generates a white image that is 1-frame in length, once every 5 seconds. A short burst of PCM audio is output synchronous with the start of the white video frame. The format of the video being generated is adjusted via the controls in the Video submenu (section 6.3.3 below)

6.3.4.3. Audio Latency Test

The MT2000 supports measuring the latency of devices and audio signal paths. It generates a PCM signal burst once every 5 seconds, and measures the amount of time it takes to be returned to the MT2000. This is a closed loop test where the MT2000 is both the test source and the test end point

6.3.4.4. Audio Latency Status

This screen displays the measurement status of the audio latency test. The measured value can be displayed in either audio samples or in time.

To change the display units between samples and time, press the joystick encoder to the right.

The available Audio Latency test displays are:

- | | |
|-----------------------|---|
| • Latency measurement | displayed in number of audio samples |
| • Latency measurement | Displayed in time |
| • No Input | No input audio is detected |
| • No Burst In | Input audio is detected, though the test signal burst is not yet recognized |

Note!

Because the audio test signal is output once every 5 seconds, it can take several seconds for the returned test signal to be recognized and the measurement calculated.

6.4. Loudness Meter Menu

This submenu allows the configuration of the loudness meters used in the MT2000. It includes control over:

- Loudness Measurement Format
- Loudness Measurement Mode
- Integration Times

The menu tree is shown below:

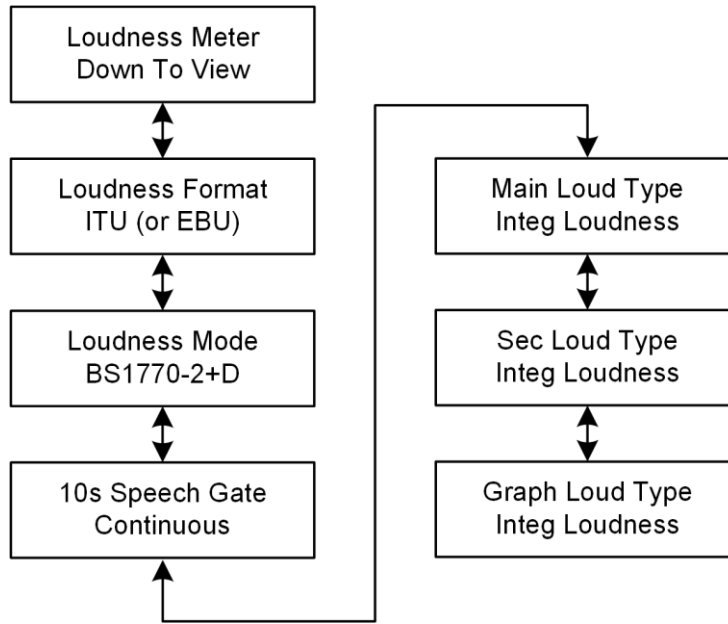


Figure 25 - Loudness Meter Submenu

The parameters included in the Loudness Meter menu tree are listed below:

6.4.1. Loudness Format

This menu allows the selection of whether the loudness measurement values are displayed in ITU mode (for ATSC A/85 and other similar measurements) or formatted for EBU R128 based measurements. Loudness estimation is performed based on the ITU BS.1770 standard regardless of which setting is used. The available loudness mode options are:

- ITU
- EBU *

* indicates the default value

6.4.2. Metering Type

This menu allows the loudness measurement mode to be selected. Loudness estimation is performed based on the ITU BS.1770 standard. The available loudness mode options are:

- BS1770-1 ITU BS.1770-1

- BS1770-1+D ITU BS.1770-1 + Dolby Dialog Intelligence
- Leq(A) Leq A scale
- Leq(A) + D Leq A scale + Dolby Dialog Intelligence
- BS1770-2 ITU BS.1770-2
- BS1770-2+D * ITU BS.1770-2 + Dolby Dialog Intelligence *

* indicates the default value

6.4.3. 10 seconds Speech Gate

This menu allows the speech gating for the 10 second loudness measurement window to either run continuously or to stop and hold when speech is not detected. The available loudness mode options are:

- Continuous *
- Hold Non-Speech

* indicates the default value

6.4.4. Main Loudness Meter Integration (Main Loud Type)

This menu allows the loudness measurement mode for the main loudness meter to be selected. Different integration times and True-Peak measurement are selectable. The available loudness mode options are:

- Integrated Loudness measurement *
- 10 Second Loudness measurement
- 3 Second Loudness measurement
- Momentary Loudness measurement
- Maximum True-Peak
- Range (LRA)

* indicates the default value

6.4.5. Secondary Loudness Meter Integration (Sec Loud Type)

This menu allows the loudness measurement mode for the secondary loudness meter to be selected. Different integration times and True-Peak measurement are selectable. The available loudness mode options are:

- Integrated Loudness measurement *
- 10 Second Loudness measurement
- 3 Second Loudness measurement
- Momentary Loudness measurement
- Maximum True-Peak
- Range (LRA)

* indicates the default value

6.4.6. Floating Bar Graphical Loudness Meter (Graph Loud Type)

This menu allows the loudness measurement mode for the floating bar loudness meter, shown on the audio meter display, to be selected. Different integration times and True-Peak measurement are selectable. The available loudness mode options are:

- Integrated Loudness measurement *
- 10 Second Loudness measurement
- 3 Second Loudness measurement
- Momentary Loudness measurement
- Maximum True-Peak
- Range (LRA)

* indicates the default value

Chapter 7: System Menu

7.1. System Menu Overview

The System Menu is where the unit statistics are displayed, Alerts are configured and monitored, IP communications are configured, and where system maintenance such as software updates are performed.

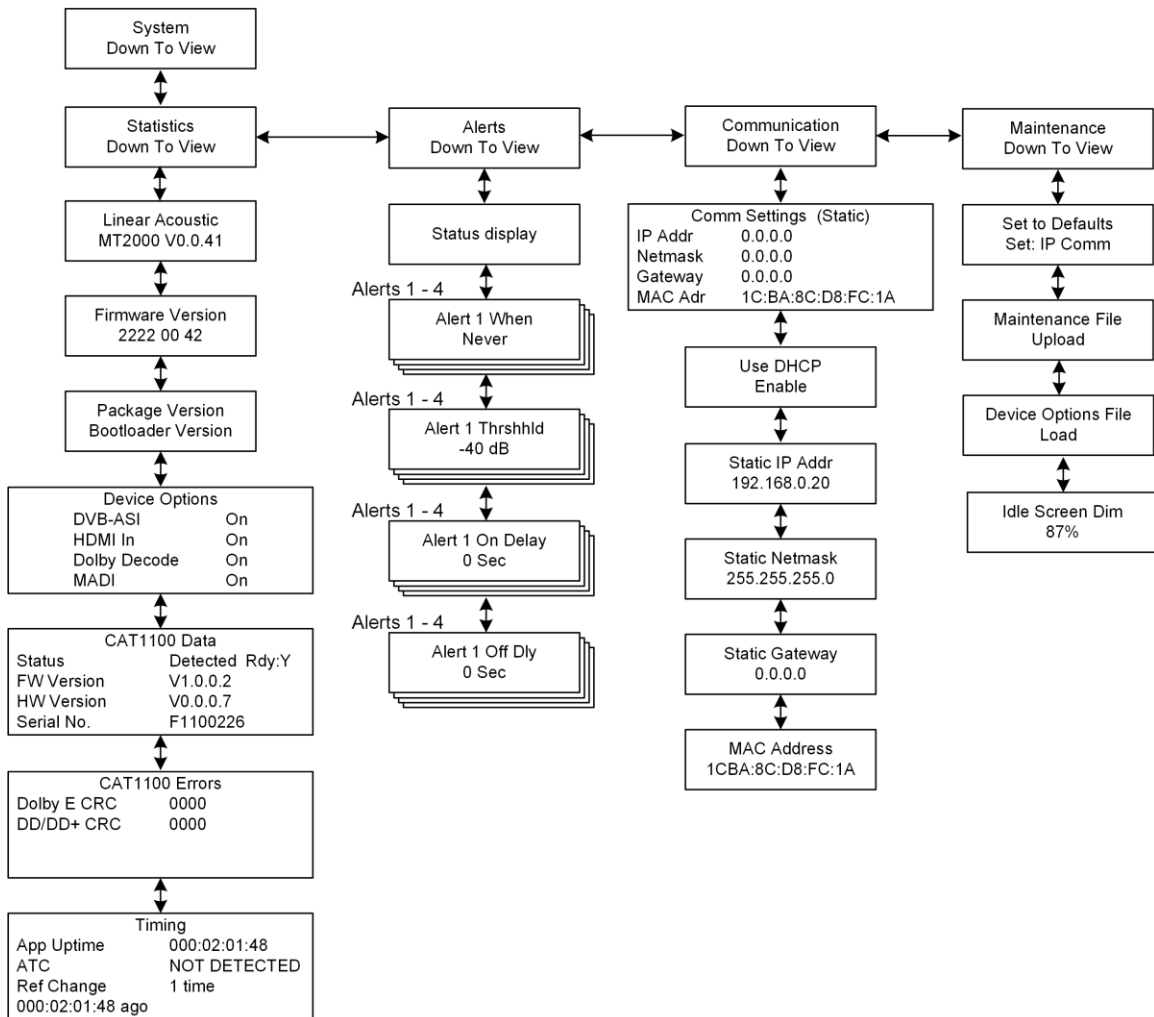


Figure 26 - System Menu

The system menu contains several submenus for Statistics, Alerts, Communications, and Maintenance. The submenus and their parameters are described below:

7.2. Statistics submenu

This submenu displays statistics and information about the MT2000. Information regarding:

- Product Options
- Alert settings and values
- Dolby CAT1100 card
- How long the MT2000 has been running, and the time of the last reference change

are all available in this submenu

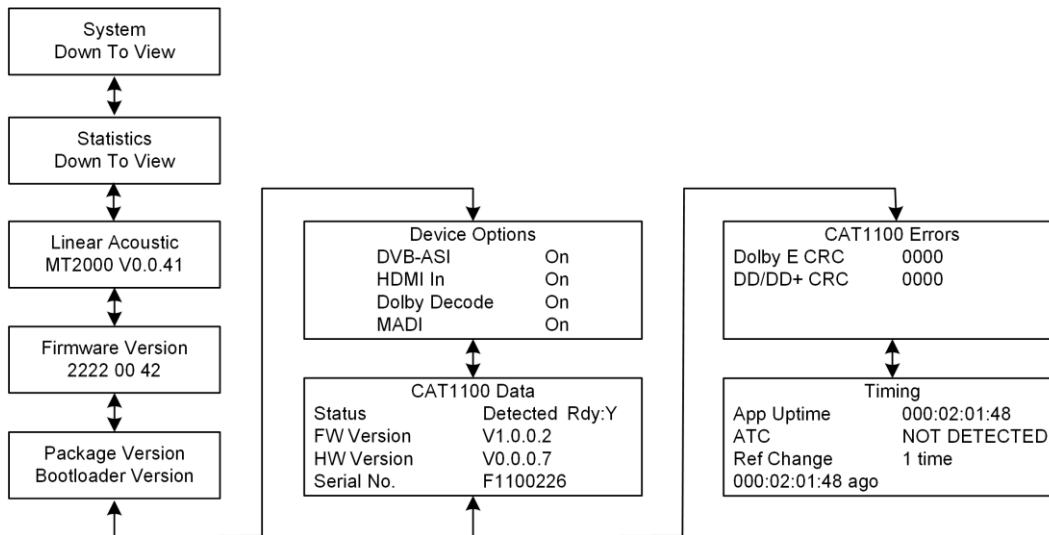


Figure 27 - Statistics Submenu

To navigate through the various display windows, press the joystick encoder up or down. Pressing the joystick encoder to the left acts as an escape key and jumps the display back to the main Statistics Menu option at the top menu level.

7.2.1. Version Number

The MT2000 software version number is displayed at this window.

7.2.2. Firmware Version

The MT2000 firmware version is displayed at this window.

7.2.3. Package Version

The MT2000 upgrade package version, which includes software and firmware files, is displayed at this window, along with the bootloader version and date.

7.2.4. Device Options

The options enabled in the MT2000 are displayed at this window.

7.2.5. CAT1100 Data

Information regarding the Dolby CAT1100 module contained within the MT2000 is displayed at this window.

7.2.6. CAT1100 Errors

CRC errors for the Dolby CAT1100 module are displayed at this window.

7.2.7. Timing

Information regarding uptime of the unit, reference changes and ATC time code from an SDI input are displayed at this window.

7.3. Alerts submenu

The MT2000 is able to monitor for certain conditions and alert the user if these conditions are true. Up to 4 simultaneous Alerts are supported.

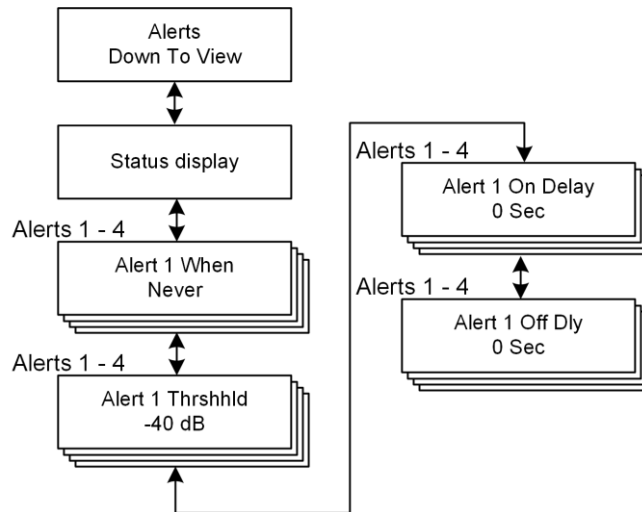


Figure 28 - Alerts Menu

7.3.1. Alerts Status Display

This display shows the status of the 4 possible Alerts supported by the MT2000. For each Alert, there is a display for the number of occurrences of the trigger, the Alert type, Alert Threshold, and current value of the Alert.

7.3.2. Alert When

This control allows the function for triggering an alert to be selected for the 4 Alerts supported in the MT2000. The available Alert triggers are:

- Never *
- LKFS Over Threshold
- LKFS Under Threshold
- Center Channel Threshold
- Silence Detect
- Auto Channel Under
- Any Channel Over Threshold
- Reference Loss
- Bitstream Error

* indicates the default value

7.3.3. Alert Threshold (1-4)

This control adjusts the threshold for audio level alerts. The control range is:

- 0 to -70 dBFS in 1 dB increments, -75 dB, -80 dB, -85 dB, Muted

- -40 dBFS *

* indicates the default value

7.3.4. Alert On Delay (1-4)

This control sets a delay on triggering the Alert. The Alert condition must be active for the amount of time the delay control is set to before the Alert is triggered.

Using this control allows the Alert condition to momentarily occur without triggering the Alert. An example of this is allowing the loudness measurement to momentarily cross the threshold.

The control range for this parameter is:

- 0 – 20 seconds in 1 sec increments
- 0 seconds *

* indicates the default value

7.3.5. Alert Off Delay (1-4)

This control sets a delay on releasing the Alert once the condition has ceased. This control and the Alert On Delay control allow hysteresis to be added to the Alert function in order to prevent many annoying false triggers

The control range for this parameter is:

- 0 – 10 seconds in 1 sec increments
- 0 seconds *

* indicates the default value

7.4. Communication submenu – RESERVED FOR FUTURE USE

The communication submenu is where the IP communication settings are managed. IP control and communications are currently not enabled. This section is reserved for future use.

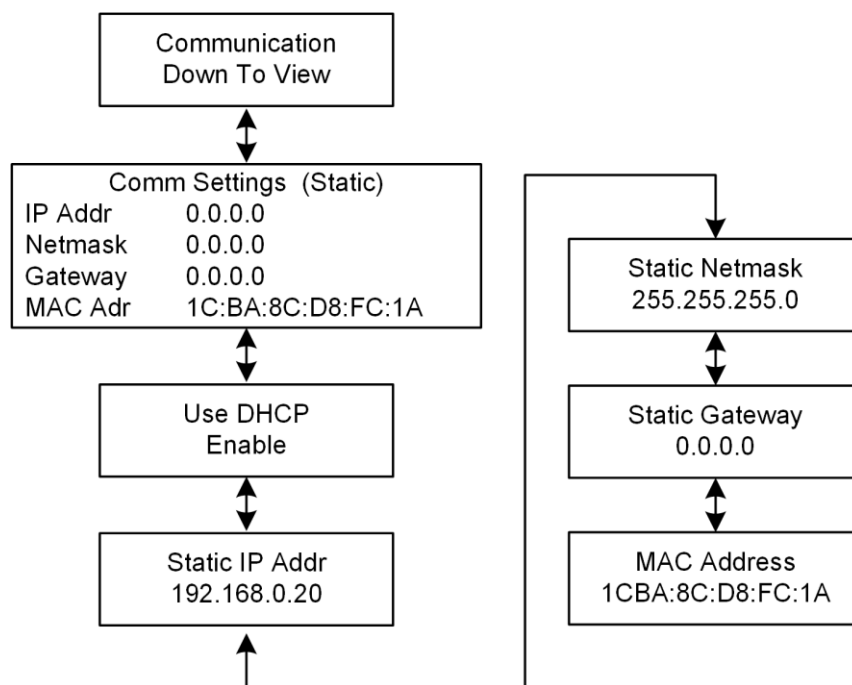


Figure 29 - Communications Menu

7.4.1. Communication Status Display

This display shows the status of the IP communication configuration. It displays the IP address, Netmask, Gateway, and MAC Address of the MT2000.

7.4.2. Use DHCP

This control determines whether the unit is configured to have its IP address automatically configured via Dynamic Host Configuration Protocol (DHCP) or if the IP configuration is static and set manually.

The available options are:

- Enable *
- Disable

* indicates the default value

7.4.3. Static IP Address

This parameter sets the IP address of the MT2000 when DHCP is not used.

The default Static IP Address is: 192.168.0.20

7.4.4. Static Netmask

This parameter sets the Netmask (Subnet mask) of the MT2000 when DHCP is not used.

The default Static Netmask is: 255.255.255.0

7.4.5. Static Gateway

This parameter sets the default Gateway of the MT2000 when DHCP is not used.

The default Static Gateway is: 0.0.0.0

7.4.6. MAC Address

This window displays the unique MAC Address of the MT2000.

7.5. Maintenance submenu

The Maintenance Submenu is where settings are restored to their factory conditions and the operating software / firmware is updated.

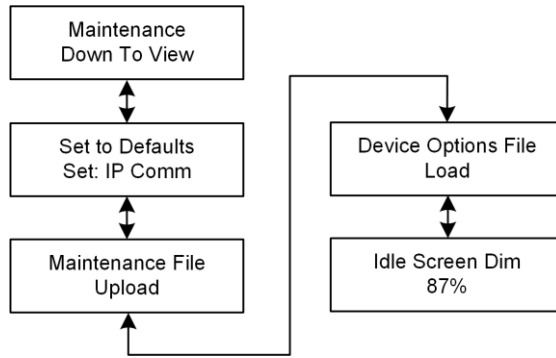


Figure 30 - Maintenance Submenu

7.5.1. Set to Defaults

This control allows a partial or complete factory reset. The available Return to Default options are:

- Set: IP Comm * Returns IP communication to factory default values
- Set: UserPreset Returns the 16 User Preset settings to factory default values
- Set: I/O Returns I/O settings to factory default values
- Set: All Returns IP communication, User Presets, and I/O settings to factory default values

* indicates the default value

7.5.2. Maintenance File Upload

Allows for software version and firmware updates to be performed to the MT2000. Updates are performed via the USB port and the update code must be loaded on a USB Thumb drive.

7.5.3. Device Options File Upload

Allows options to be enabled in the field. Updates are performed via the USB port and the update code must be loaded on a USB Thumb drive. Option files are referenced to the unit's MAC address and are non-transferable between units.

7.5.4. Idle Screen Dim

Allows control over the brightness of the OLED display when the unit is sitting idle. This will take effect a few minutes after the last adjustment made from the front panel.

100% is full brightness and 0% is off.

Chapter 8: Troubleshooting

The Linear Acoustic MT2000 is a very stable and reliable unit, and most problems can be traced back to mis-wiring causing incorrect signals to be applied to the unit, or more than likely mis-configuration. In an effort to speed troubleshooting, some common problems and solutions are described below.

8. Problems and Possible Causes

8.1 Unit won't power on

The internal battery may be fully discharged. Connect the power supply, plug it in to wall power and try again. If the unit still will not power up, check to make sure that the unit is connected to a live outlet (it happens...).

8.2 Volume Control does not work


Verify that the active window is the Loudness and Volume Control Window. The yellow bar at the top of the display should be on the right half of the display window. Press the encoder twice quickly (double-click) to change the active window.

8.3 Unit does not recognize the input signal

Ensure that the proper input source is selected. The MT2000 is capable of accepting inputs on any one of 4 input connectors.

The HDMI input, and certain signal types such as Dolby MADI and DVB-ASI transport streams, and the ability to decode Dolby E, Dolby Digital, and Dolby Digital Plus bitstreams are optionally supported. Verify that the proper options are installed in the MT2000.

8.4 Cannot change test generator or file playback settings.

The Audio Latency test may be enabled. If a padlock symbol  is displayed next to the test stream selection, these controls are locked out. Disable the test that is running.

8.5 SDI output stream does not contain signals generated by the MT2000

Verify that SDI Embedding is enabled, and that the desired signal source is routed to the SDI pair to be embedded.

Chapter 9: Specifications

9.1. Physical

Mechanical	
Dimensions	7.9"H x 4"W x 1.6"D (200 x 100 x 41 mm)
Weight	3 lbs (1.4 kg)
Environmental	
Operating	0 – 50 degrees C
Non-operating	-20 – 70 degrees C
User Interface	
Display	240 x 64 dot matrix, single color OLED display
Control	Single joystick/rotary encoder. Capable of being pressed up, down, left, right, in, and being rotated left and right.

9.2. Electrical

Power	
Battery	Internal NiMH rechargeable battery
External Power	12 VDC input
	Universal Power Supply included, IEC cord matches country of delivery
Cooling	Internal fan
Internal Speaker	
Frequency Response	200 Hz–10 kHz, ± 3 dB
Maximum Output Level	85 dB SPL minimum
Headphone Output	
Frequency Response	20 Hz–20 kHz, ± 1 dB
Level	+12 dBu maximum
Connector	1/8-in (3.5-mm) side panel jack
Digital I/O	
HD/SD-SDI Auto-Sensing I/O	Connections are unbalanced, 75- Ω , with internal termination via BNC-F connectors De-embed up to 16 audio channels from SDI, monitor/measure and re-embed up to 16 channels. Signal levels per SMPTE 292M /259M Supports up to 1080i/60/59.94/50 Hz
Digital Audio I/O	Connections are unbalanced, 75- Ω , with internal termination via BNC-F connectors

	Signal levels per SMPTE 276M/ AES-3ID-2001 Compatible with consumer S/PDIF connections.
Optical	Consumer IEC 60958 and 61937 formatted streams per Toshiba TOSLINK interface.
HDMI Input	HDMI 1.4 input. Multichannel baseband or encoded audio can be demultiplexed and analyzed from HDCP and non-HDCP signals.
Ethernet	100 BASE-T via RJ-45 connector
USB	USB Type A connection for system updates and option enabling.

9.3. Audio

Audio	
Format	PCM, Dolby coded audio as described below.
Sample Rate	48 KHz
Bit depth	Up through 24 bits
Dolby Decoding	
Formats	Dolby E, Dolby Digital, Dolby Digital Plus
Performed by	Internal Dolby CAT1100 module
Loudness Measurement	
Standard and Measurement Modes	BS.1770-1
	BS.1770-1 with Dolby Dialogue Intelligence
	BS.1770-1
	BS.1770-1 with Dolby Dialogue Intelligence
	Leq(A) Leq(A) with Dolby Dialogue Intelligence
Loudness Measurement Formats	ITU (for ATSC A/85, etc.)
	EBU R-128
Integration Times and Modes	Momentary, 3 sec, 10 sec, Integrated, Maximum True- Peak
Input / Output Formats	
HD-/SD-SDI	I/O
AES-3id	I/O
TOSLINK	I/O
MADI	I/O via AES connections
DVB-ASI *	I/O via SDI connections
HDMI *	Input only
*	Indicates optional formats

9.4. Other

Options	
	DVB-ASI I/O
	HDMI Input
Option Enabling	Via software key, can be enabled in the field.
Warranty	
	2-year warranty as previously described in the manual; 90 days for battery.
Regulatory	
North America	Designed to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC rules (CFR). Power supplies are UL tested and approved.
Europe	Designed to comply with the limits of harmonised Low Voltage Directive 2006/95/EC and EMC Directive 2004/108/EC as indicated by the affixed CE marking; RoHS and WEEE compliant.