LINEAR ACOUSTIC

Model LA-5180

MetaMAX Series Audio Metadata Frame Synchronizer and Generator

Operation Manual

L I N E A R   A C O U S T I C

Model LA-5180

AC-3 Frame Synchronizer and Rate Shaper

Operation Manual

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Chapter 1: Introduction

The Linear Acoustic LA-5180 Audio Metadata Frame Synchronizer and Generator is an integral part of any facility relying on the successful creation and continuity of metadata for proper audio transmission. The flexible unit accepts professional audio metadata (also known as Dolby or Dolby E metadata) via a standard RS-485 serial input, or as delivered inside the VANC space of an HD-SDI stream. The LA-5180 then corrects or replaces bad or missing metadata packets. Stable metadata is then output via RS-485 and also selectably back into the VANC space of the applied HD-SDI signal. The LA-5180 can also be used as a stand-alone audio metadata generator, with eight presets available to store all required parameters for both the professional metadata (also known as Dolby E metadata) and the consumer metadata (also known as the AC-3 metadata).

Optionally, the LA-5180 can be provided with Audio Metadata Analysis System (AMAS) to give users in-depth metadata error reporting. Individual metadata parameters are displayed two programs at a time, with all programs being monitored in the background. Error rules and parameter ranges and interactions are user-configurable. Summary red light/green light on-screen indications are provided by a Windows(R) compatible application connected via TCP/IP to the LA-5180. A rear-panel GP Output can be commanded to indicate the presence of warnings or errors.

The Linear Acoustic LA-5180 has the following features:

• Frame synchronization and/or generation of audio metadata: output errors are prevented by repeating or replacing any bad frames or unit can be used as a stand alone generator

• Metadata input via HD-SDI or RS-485, output via RS-485 and/or HD-SDI

• Metadata 'silent frame' mode replaces errored or missing metadata frames with known good internally stored versions

• GPI and front panel control of unit operation

• Fast 'manual revert' mode quickly replaces incoming metadata on command

• Dual, redundant power supplies and hard-bypass for mission critical applications

• Optional AMAS metadata analysis system

1.1   Principles of Operation

Figure 1-1 shows the internal audio path of the LA-5180.

It should be noted that this diagram is a general representation of signal flow. Please consult the appropriate section of this manual for specific functionality.
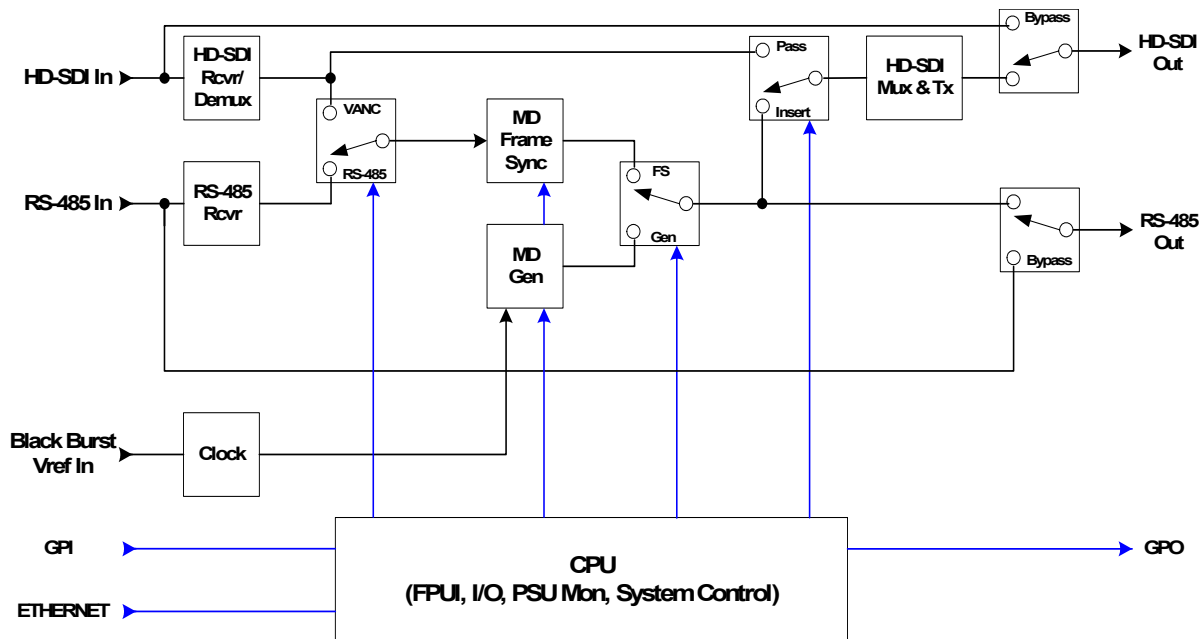
Figure 1-1 LA-5180 Metadata Frame Synchronizer and Generator Simplified Block Diagram

1.2   Location of LA-5180

The Linear Acoustic LA-5180 Metadata Frame Synchronizer and Generator can be located anywhere. Typical locations include audio mixing facilities or rooms, remote outside broadcast (OB) trucks, transmission facilities, playout facilities, satellite facilities, etc... In many cases, it may be located near AC-3 encoders such as a Dolby DP-569. Anywhere that an error-free metadata signal is required is an ideal location for an LA-5180. As it will likely be in a transmission environment, dual redundant power supplies and hard relay bypass are provided for trouble free operation.

1.3   Future Updates

Software updates may become available in the future to add additional features and performance. Updates will utilize the Ethernet port to accomplish the installation of upgraded software, and a loader application will be provided for this purpose.

1.4   Warranty and Feedback

Please take a moment to fill out the warranty card included with the unit and drop it in the mail. This will enable us to contact you if there are any software or documentation issues. Also, we are very interested in your feedback. This unit was designed based on feedback gathered directly from broadcast engineers and it will evolve further thanks to ongoing suggestions and comments from users such as you. We look forward to hearing from you!

Chapter 2: Connections

This chapter covers all required connections for the LA-5180.

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:

- Two power cords (style to match shipping location)

- Small bag with replacement fuses, a DB-9 Male connector and shielded plastic backshell, and a handy permanent marker.

- For AMAS option: DB9-M "Y" cable and AMAS software installation CD-ROM

- This manual

- 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   Installation

Linear Acoustic LA-5180 installation requires:

- One standard rack space units with ADEQUATE VENTILATION (the unit uses convection cooling via vents on the left and right sides of the unit);

- An analog black-burst video reference signal;

- A metadata source: RS-485 serial or from the VANC space of HD-SDI

- standard 75-Ohm BNC cables for signal connections;

WARNING: Reference analog Black Burst MUST be applied at all times for proper metadata timing.

2.3   Rear Panel

The rear panel of the Linear Acoustic LA-5180 contains all signal and power I/O.

WARNING: *Replace fuses only with the same type and rating*

2.3.1   Connection Ports

All of the LA-5180's connections are on the rear panel and are described in detail below. See Chapter 6: Specifications for specific pinouts.
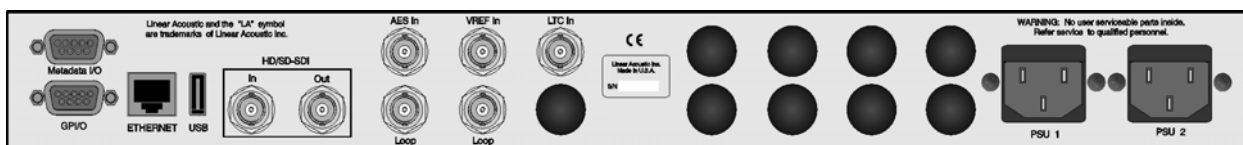
Figure 2-1 Rear Panel

- **Metadata:** This port is for input and output of RS-485 metadata. Note that it is normally configured as a tributary or output device. Thus it will connect pin-for-pin to any metadata receiving device (Linear Acoustic AEROMAX 5.1, Dolby DP-571, DP-569, etc...).

- **GPI/O:** This is the GPI/O connection for parallel control of the unit. There are four General Purpose (GP) Inputs and four GP Outputs whose function, polarity, and type (i.e. held or momentary) are adjustable via the front panel user interface.

- **ETHERNET**: 10 BASE-T connection for software updates and future control and monitoring applications.

- **USB:** Future Use.

- **HD-SDI In/Out:** Input of HD-SDI signal for extraction of metadata from vertical ancillary (VANC) space; Output signal is either a re-clocked duplicate of the input signal or the VANC data can be replaced with frame synchronized or locally generated metadata.

- **VREF In:** Apply either NTSC or PAL analog black burst reference signal.

WARNING: *Reference analog Black Burst MUST be applied at all times for proper operation*

- **LTC Input:** Used for generating timestamps in AMAS system logs.

- **AES In/Out:** Apply Dolby E signal for measurement of Dolby E guard band with respect to the vertical interval of the applied video reference signal.

NOTE: Front panel LEDs indicate input signal condition: Off=No Signal present or required, Red=Signal required but not present, Green=OK.

2.4   Quick Setup Notes

The LA-5180 requires only minimal setup to be up and running.

- Apply power to BOTH IEC AC power inlet modules.

- Note that once booted (~ 30 seconds), the front panel will display "No Reference" if no connections have been made to the rear panel.

- Connect plant analog black burst reference to the Vref input and terminate the loop-through if not used.

- Verify that the front panel indicator shows a Green LED for Internal Metadata or External Metadata.

- Frame synchronized or locally generated metadata will be present on the RS-485 output and re-inserted into the HD-SDI input signal if selected (FUTURE).

- See Chapter 5 for information concerning AMAS setup and use.

Chapter 3: Applications

The LA-5180 is intended to be used in an emission (transmission) environment, or installed in a production or master control area. This chapter shows several applications of the system as it is intended to be used. Of course other applications are possible:

• Metadata processor accepting an HD-SDI signal with metadata, extracting, processing, then outputting this metadata over serial RS-485 connector.

• Stand-Alone Audio Metadata Generator accepts analog black burst video reference signal and outputs locally adjustable metadata.

• AMAS Metadata Analysis accepts analog black burst reference, LTC timecode, metadata (serial or VANC), and Dolby E AES signal (for guard band timing info) and communicates with AMAS application via an ETHERNET connection.

3.1   VANC Metadata Application
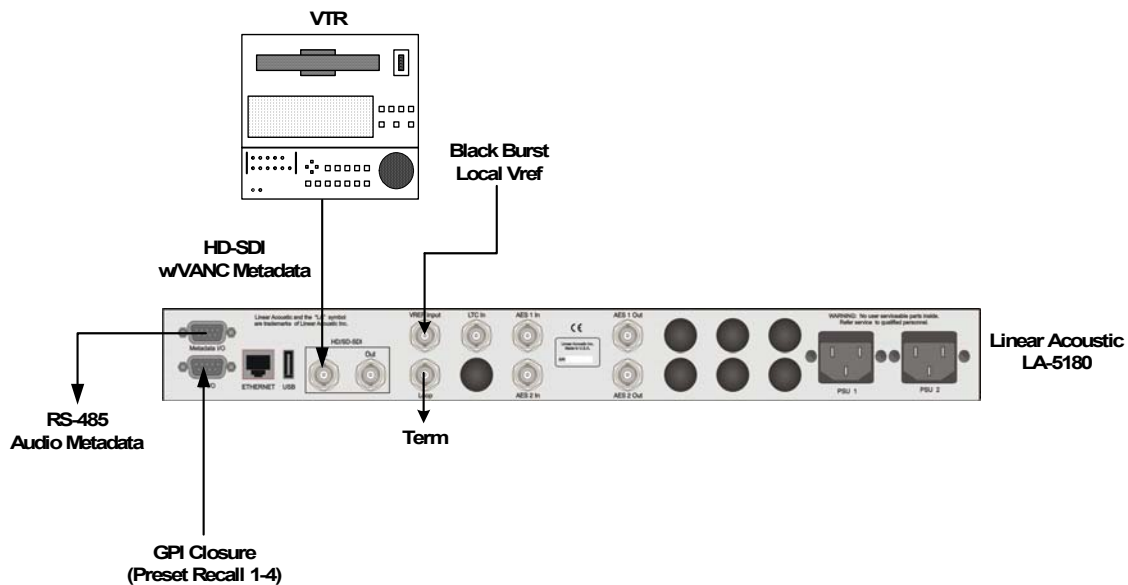
Figure 3-1 LA-5180 processing VANC metadata

Figure 3-1 above shows the LA-5180 processing metadata supplied via the VANC space of an HD-SDI signal. The unit will extract the metadata, frame synchronize it back to plant reference, and allow editing or replacement of one or all parameters. It can be switched seamlessly from external to internal generation manually or automatically.

3.2   Stand-alone Metadata Generator Application
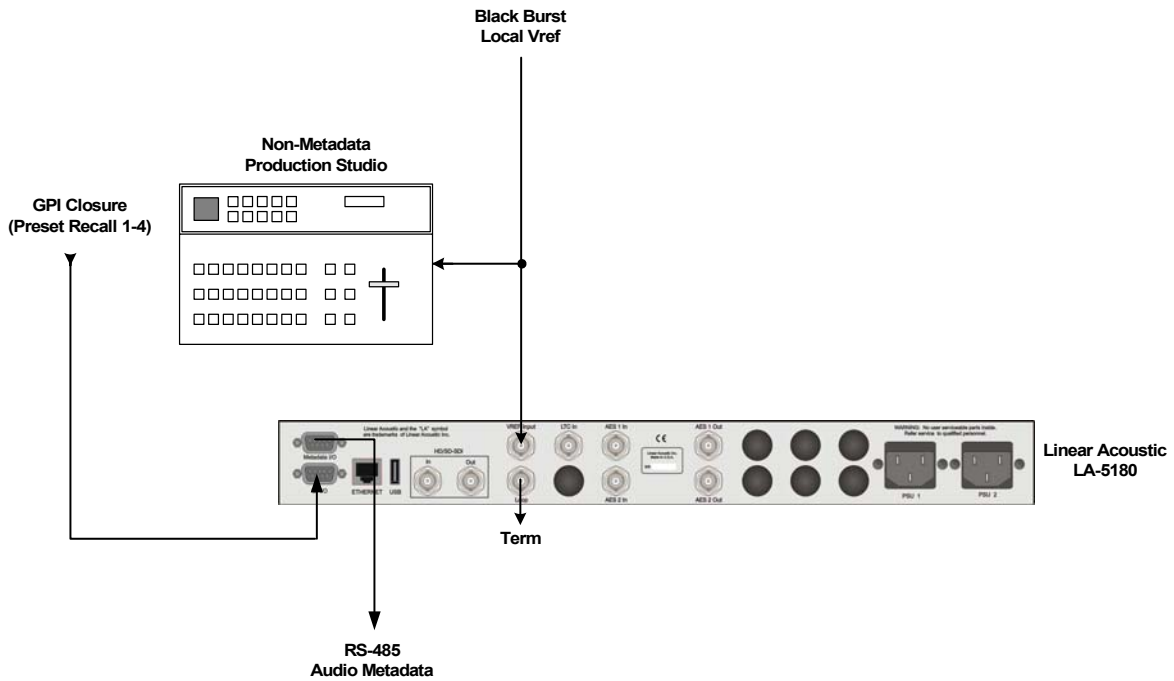
Figure 3-2 LA-5180 Used as a stand-alone metadata generator

Figure 3-1 above shows the LA-5180 used as a stand-alone metadata generator. The only required input is Video Reference (analog black burst), and optionally a contact closure to change presets. Note that video reference is required to produce proper metadata timing.

3.3   AMAS Metadata Analysis Application
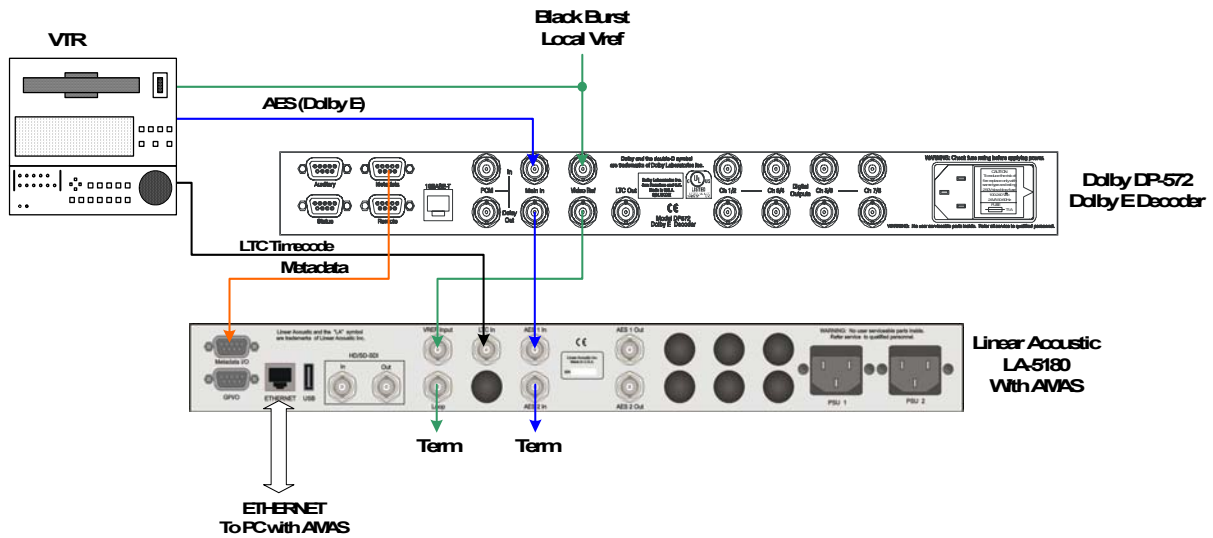
Figure 3-3 Audio Metadata Analysis System (AMAS) typical setup

AMAS can be used to analyze live or pre-recorded content to verify that proper metadata has been included with a given program. The LA-5180 metadata output can also be connected to downstream equipment to allow for real-time correction of metadata issues. This can be done on a parameter-by-parameter basis or automatically by simply overwriting all incoming parameters with preset values.

Chapter 4: Menus

This chapter discusses how to use the front panel LED interface to access the menus. Most of it is rather obvious, and a bit of experimentation will quickly make you comfortable navigating through the submenus. The menus and submenus are structured to access more complex functionality as you go deeper into the hierarchy.

The following two pages show the menu structure for the LA5180. All up/down access is by the up/down front panel buttons, all left/right access is by the left/right (Prev/Next) front panel buttons, and parameter changes (where applicable) are by the use of the rotary encoder knob. When a parameter is changed, an asterisk (*) will be displayed next to the parameter denoting that it has changed and that in order for this change to be stored, the right (Next) front panel button must be pressed. To continue without storing the change, press the left (Prev) front panel button.

Like all Linear Acoustic products, when in doubt you can simply use the Left Arrow (Prev) to back out towards the Main menu level.
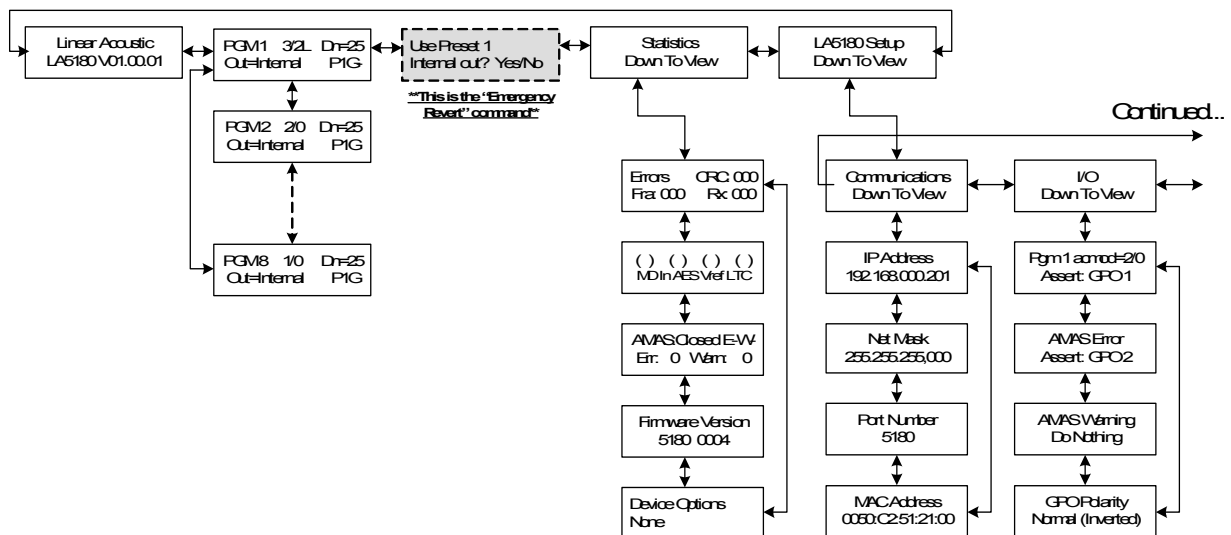
Figure 4-1 LA-5180 Menu Tree (first half)

Continued...

Program 1 – X
(X determined by pgm config)

Presets
Down To View

System
Down To View

1G1   Dialnorm
-25

1GX   Dialnorm
-25

Active Preset
Preset 1 (base)

Set To Defaults
Set: GPIs

GPI Sets Preset
Disable

Set Bypass Mode
Set: Bypass off

View/Edit Preset
Preset 1 (base)

1G1 Acmod+LFE On
3/2L

1G1   Copyright Bt
Yes

1   Metadata From
RS-485

1G1   Bsmod
CM

1G1   Orig Btstrm
Yes

1   Metadata To
RS-485

1G1   Line Mode
Film Std

1G1   Aud Prod Inf
No

1   Preset Type
Generate

1G1   RF Mode
Film Std

1G1   Mixing Level
80 dB

1G   Pgm Config
5.1 + 2

1G1   RF OV Prot
Disable

1G1   Room Type
Not Indicated

1G   Frame Rate
NTSC

1G1   DC Filter
Enable

1G1   Pref Dwnmx
LtRt Downmix

1G   Use XBSI
Enable

1G1   Lowpass Fillt
Enable

1G1   LtRt C Dwnmx
-3.0 dB

1G Select Program
Program (1-2): 1

1G1   LFE LP Filt
Enable

1G1   LtRt S Dwnmx
-3.0 dB

Key:

= AC-3 Metadata

= Dolby E Metadata

1G1 = Preset 1, Generate, Program 1

1G1   Srnd Ph Shft
Enable

1G1 LoRo C Dwnmx
-3.0 dB

1G1   Srnd 3dB Attn
Disable

1G1 LoRo S Dwnmx
-3.0 dB

1G1   Cntr Dwnmx
-3.0 dB

1G1   Surround EX
Not Surr EX

1G1   Srnd Dwnmx
-3.0 dB

1G1 Headphone Mod
Not Indicated

1G1   Dolby Srnd
Not Indicated

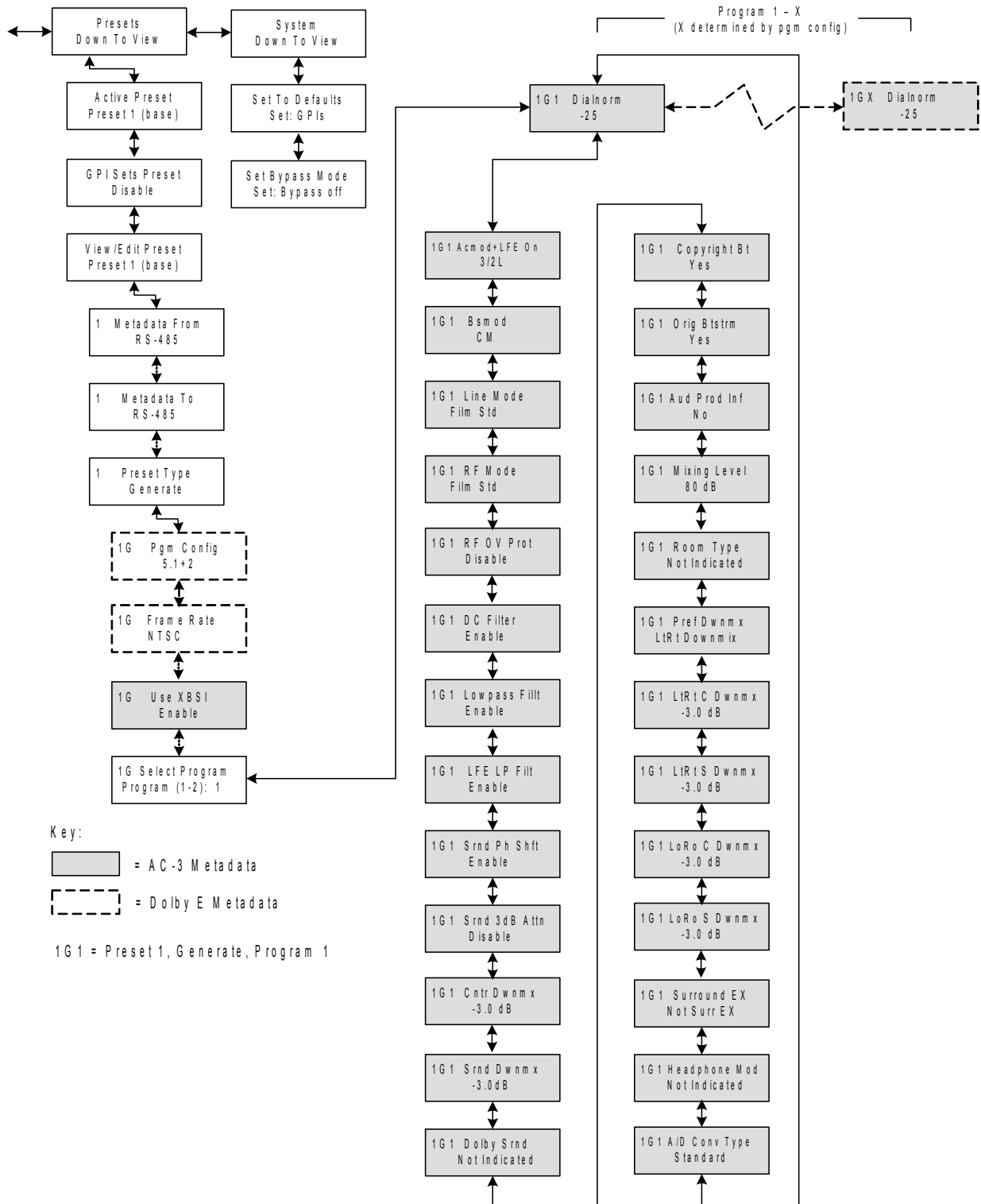1G1 A/D Conv Type
Standard

Figure 4-2 LA-5180 Menu Tree (second half)

4.1   Main Menu Level

Referring to the menu tree on the preceding page, it can be seen that the Main Menu level can be scrolled through using either the left or right arrows. The choices are: Version, Status, Statistics, and Setup, each of which have sub menus (except the version screen). The submenus can be accessed by pressing the down arrow. Note that both the Status and Statistics screens are informational and have no adjustments.

4.1.1   Status Menu

Upon booting, the Version screen in briefly displayed then switched to the Status Menu. The Status Menu shows the current status of each of the eight possible metadata programs. Note that if the Vref signal is not present, no metadata values will be displayed.

Pressing the Down arrow will step through each of the eight possible metadata programs. Active programs are determined by the Program Config setting, and any program that is not currently being used will have dashes (----) in place of metadata values.

NOTE: Pressing the Right (Next) key while in any of the eight metadata status menus will immediately allow access to recalling Preset 1. This is useful for fast reversion of the unit to a known good set of metadata parameters.

4.1.2   Statistics Menu

The **Statistics** menu provides details about the signals applied to the unit:

•   Errors: Count of metadata framing, CRC, and Receive errors. While the LA-5180 will correct these errors prior to outputting a metadata stream, it is useful to know the condition of the applied signals to aid in troubleshooting.

•   Input Signal Presence indicated by an asterisk (*): MD In V(VANC) or R(RS-485); AES; Vrf (video reference); and LTC (timecode)

•   [AMAS Status (Closed/Open) E- W-] - Indicates if AMAS application is connected to LA-5180 and if (and on the second line, how many) errors or warnings have been recorded. These counters can be reset by simply pressing the Next (Right arrow) key.

•   Firmware Version: Shows current version

•   Device options: Indicates any factory installed options (none for LA-5180)

4.1.3   Setup Menu

The Setup Menu is the main menu from which adjustments to the unit will be made. It contains the I/O, System, and Preset Menus. To adjust a particular parameter, simply rotate the rotary encoder knob until the desired value is displayed. An asterisk (*) is also displayed noting that the change will be made and stored to memory when the Right (Next) front panel button is pressed.

4.1.4   I/O Menu

This menu contains settings for the IP address, Net Mask, Port, and MAC address (set at the factory).

4.1.5   System Menu

This menu contains the ability to reset all of the LA-5180 parameters to factory defaults. The user will be prompted to assure that this is the desired action as all settings will be affected and this could interrupt the metadata output.

The **System Menu** also contains the Bypass setting which will de-energize both the RS-485 metadata bypass relay as well as the HD-SDI bypass relay, thereby bypassing all processing functions.

4.1.6   Presets Menu

The LA-5180 can store eight presets containing professional metadata and up to eight consumer metadata programs in each. The current active preset can be manually chosen or selected via GPI control. For a detailed description of metadata functionality and parameter descriptions, please see Chapter 7: Metadata.

Below is a description of the top-level parameters within this menu, stopping just before the individual metadata parameter settings begin (please see the menu tree in figures 4-1 and 4-2 above).

- **Active Preset -** Selects the currently active preset. Preset 1 (base) is the default and is the fall-back preset when GPI control is enabled but not active.

- **GPI Sets Preset (Enable/Disable) -** Maps control of preset selection from GPI 1-4 directly to Presets 1-4. Enabling this menu allows preset 4 to be recalled by activating GPI 4, etc...

- **View/Edit Preset (Preset 1-Preset 8) -** Select which preset the following settings will apply to. Note that the "x" before each of the settings indicates which preset is currently being adjusted.

- **x Metadata From (RS-485/VANC) -** Selects the source of metadata input to the LA-

5180. RS-485 is the 9-pin serial metadata input, and VANC is the metadata extracted from an applied HD-SDI signal.

- **x Metadata To (RS-485, VANC, RS-485 & VANC) -** Selects how metadata is output from the LA-5180 (serial, VANC, or both).

- **x Preset Type (Generate/Modify) -** In generate mode, all output metadata is internally generated. In Modify mode, all metadata parameters are set to "Pass" through externally applied values (unless the external metadata fails, then internal metadata generation takes over). In Modify mode, each externally applied metadata value can be over-written as needed. NOTE: Depending on the mode selected, either a "G" or an "M" is appended after the "x" from above. For example, if editing Preset 1 and Generate mode is chose, "1G" will appear in front of the following values:

- **PGM Config (5.1, 5.1+2, 4x2, etc...) -** Sets the "Dolby E" program configuration to any desired value. Note that this setting affects the number of programs that will be created within a given metadata stream. For example, 5.1+2 is two programs, so there will be two dialnorm values to adjust, two Line Mode settings to adjust, etc...

- **Use XBSI (Enable/Disable) -** Determines whether optional extended bitstream values are included in the metadata stream. These values include settings such as A/D Converter Type and Preferred Downmix modes. Note that many but not all consumer decoders respond to these values.

- **Select Program (1-y) -** To adjust the metadata of the programs determined by the PGM Config setting, select it using this menu. "y" determines which program is being adjusted and is appended to the preset/generate tag. For example, if Preset 1 is in Generate mode and Program 2 is being adjusted, the prefix on the display will show: 1G2.

From here, each individual metadata parameter can be adjusted.

Chapter 5: AMAS Software

The Audio Metadata Analysis System (AMAS) option for the LA-5180 provides a comprehensive tool for monitoring, analyzing, and logging audio metadata signals. Further, critical information about the status and position of Dolby E encoded audio is provided to aid in diagnosing issues related to incorrectly encoded or recorded bitstreams.

The AMAS system requires a Windows (2000 or XP)-compatible application be installed on one or more machines connected to the LA-5180 unit via Ethernet. Installation, configuration, and operation of AMAS is described below.

5.1 Installation

Requirements:

- A PC or Apple Macbook with Parallels (or Linux with Wine) running Windows 2000 or XP with the latest service packs installed (SP2 minimum)

- An ETHERNET connection on the same LAN as the LA-5180 hardware

Software Installation:

Insert the CD-ROM included in the packing kit into the CD_ROM drive of the target computer. The installation application should automatically launch and walk the user through the installation procedure. If it does not automatically start, browse to the CD and double-click Setup.exe.

5.2 Starting AMAS

Once installed, the AMAS software will be located in the list of installed programs. To begin a session, simply click the Windows Start button. Select "All Programs" then "Linear Acoustic" then "AMAS Metadata Analysis System." A job file will be created where all AMAS messages will be stored during the current AMAS session. The directory where this text file is stored is user-selectable or it can simply be left at the default.

5.3 Connecting to LA-5180 Hardware

Ensure that AES, black burst video reference, LTC timecode and Metadata signals are connected to the LA-5180 hardware. Front panel LEDs will indicate the presence of these signals when illuminated green.

At the top left of the AMAS window, verify and adjust the IP Addr field and Port fields to match the equivalent fields on the hardware (IP Address and Port Number). Once done,

click the "Connect" button. The Hardware Communication Status should change to "Connected" and the "Recs:" field count should now start incrementing.

To change these fields on the hardware see the unit's user manual. NOTE: the LA5170's default Port Number is 5170, and the LA5180's is 5180. Currently, the AMAS software has a default Port of 5180.

To change these fields in the AMAS software, on the menu, select Settings, then Data Parameters. Change the Remote IP Address and Remote Port if needed to match the hardware values.

5.4   General Application Layout

There are many square status indicators in the various windows. These are colored to visually show the status of fields. Red = Error, Yellow = Warning or Caution, Green = OK, Light Gray = Ignored. When an error or warning is detected, the relevant status indicator will change color. It will STAY SET - even if the field changes back to an "OK" value - until the "Reset Statistics" button is clicked.

Similarly, field verbiage values may include an "(!)" = Error or "(?)" = Warning or Caution. These values show the current status for the field.

5.4.1   Main AMAS Window (Figure 5-1):

This window shows the overall high-level status of all of the input signals. It is divided into several sections:

- **Hardware Communication** - shows and controls the overall communication with the hardware.

- **Summary** - Shows an overall picture of the system status. The 4 Signals indicators show the status of the equivalent 4 inputs on the hardware. The Programs indicators show the overall metadata status for each of the 8 Dolby Digital programs.

- **Statistics** - Shows when the first and last error occurred (since last reset). Shows what edit rules are being used to determine metadata errors. The "Reset Statistics" button can be clicked to reset the statistics as well as all status indicators. The larger indicator to the right of this button shows the overall metadata status.

- **Dolby E** - Shows the status of Dolby E field metadata values.

- **General** - Shows non-metadata statuses. There is also a "MD Src" selector in this section. This is a drop-down box that allows you to select which metadata source to use. NOTE: this is currently functional only on the LA5180 unit.
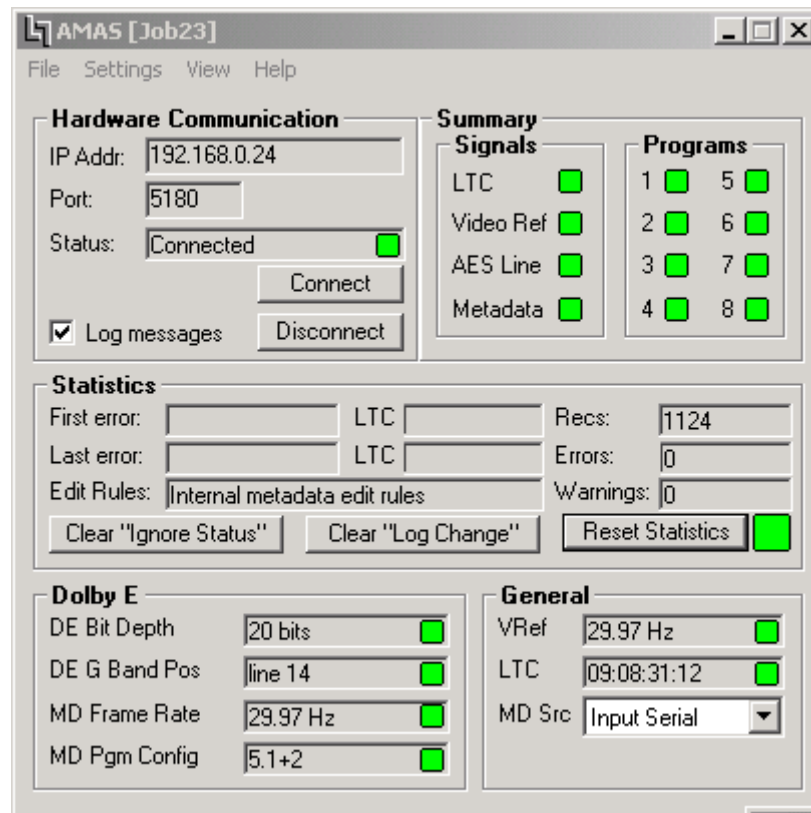
Figure 5-1 Main AMAS window.

5.4.2   Program Status Window (Figure 5-2):

This shows the Dolby Digital metadata fields detail for two programs. You can select which 2 programs to display from the Program Fields drop-down selectors at the top of the window. If any of the normally green indicators from the Summary Programs window are red, the values can be investigated further in this section. In most all cases however, only two programs worth of metadata are present in a given metadata stream.

Figure 5-2 Program Status window showing primary metadata programs.

5.4.3   Activity Log Window

This shows the same data as that sent to the Job File. An "**" at the beginning of a line indicates a warning or error has been detected.
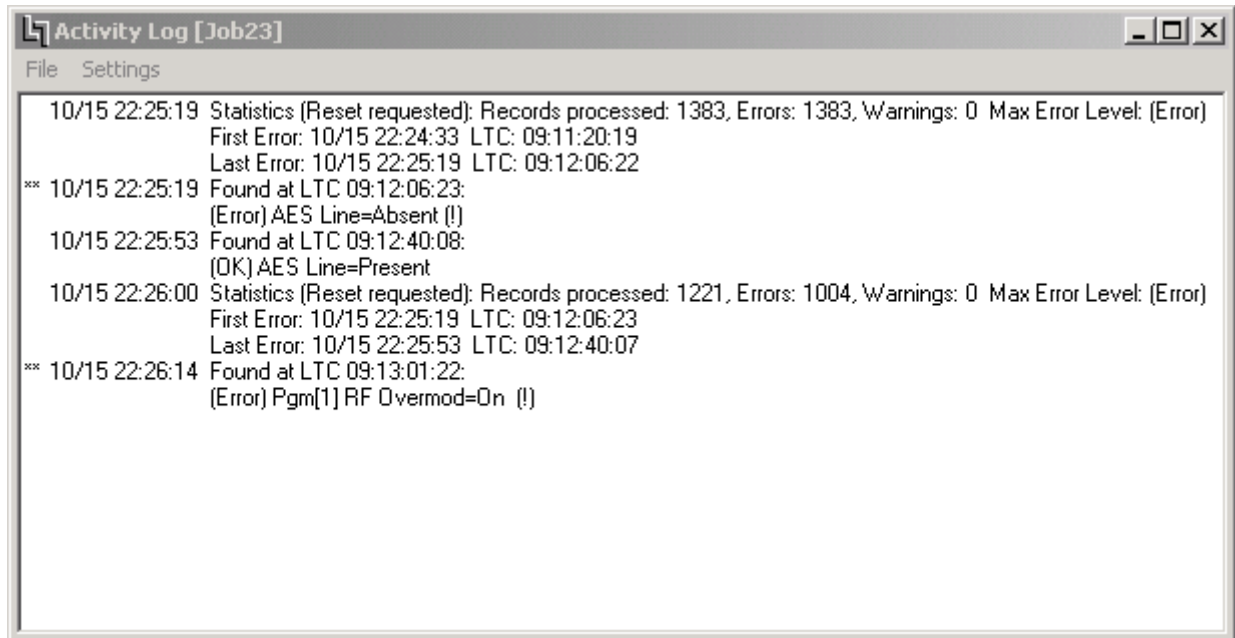
Figure 5-3 Activity Log window showing details also written to log file

5.5   Metadata Edit Rules

Edit rules are used to determine when metadata fields should be flagged as invalid. There is a stock set of rules embedded in the AMAS program. You can also create and use your own custom sets of rules.

To create your own rules, right-click on a field value. In the pop-up window, select the field's "Edit Rules..." menu item. You will see the Edit Rules window for that field.
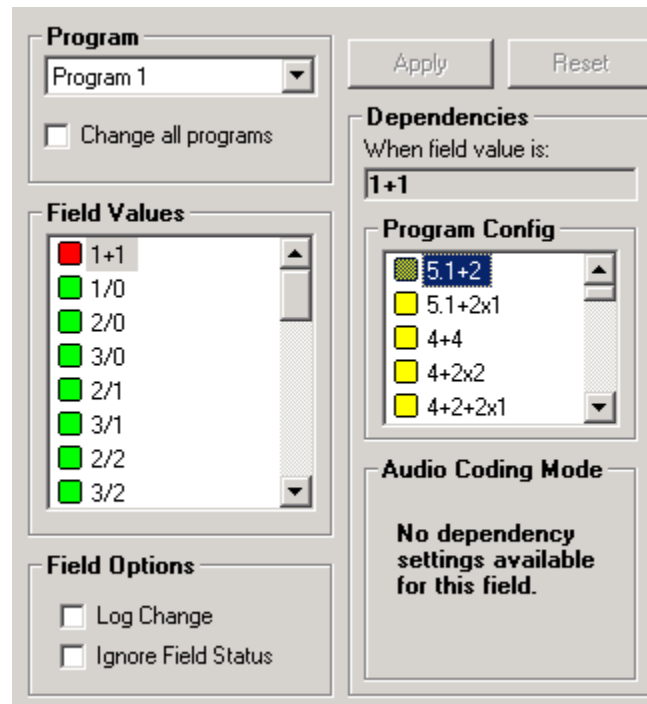
Figure 5-4 Edit rules window

In the Field Values box, all the possible values are displayed, with a status square next to each value. For "simple" edit rules the color of the square indicates how to treat the field when it has that value. To set a "simple" edit rule, double-click on the value to change the square color to Red, Yellow, or Green as you wish. Any of the values that are labeled "Rsvd ()" can be ignored, since they should never occur in a metadata stream (and are by default set to Red = error). After making a change, click "Apply" to save it to the current Edit Rules.

Some fields need more complex editing; a field may be in error when it has a certain value depending on the value that another field has. These dependencies can happen in relation to Program Config (for all fields) and Audio Coding Mode (for Dolby Digital fields only). To set a "dependent" edit rule, select the desired field value by single-clicking it in the Field Values box. That value will now appear under Dependencies "When field value is:". Next double-click the value for the dependent field (in the Program Config box), changing the square color to Red, Yellow, or Green. After a change is made, click "Apply" to save it to the current Edit Rules.

A "dependent" rule states that "when the field value is X and the Program Config value is Y, flag the metadata as Z", where X is the field value in the "When field value is:" box, Y is the value double-clicked in the Program Config Box, and Z is the color action (Red, Yellow, Green). When a "dependent" rule triggers a warning or error, the verbiage "pcf" (Program Config dependency) or "acm" (Audio Coding Mode dependency) will be appended

to the field's value verbiage. This alerts the operator that the field is in error because of a dependency edit rule.

Note that "simple" edit rules and "dependent" edit rules can both be applicable at the same time. When this happens, the more severe edit rule will take effect - for example an error takes precedence over a warning.

Users can click the "Reset" button while editing a field to reset all edit rules for that field to the values it had before opening the Edit Rules window.

When editing a Dolby Digital field (i.e. a field found in the Program Status Window), edit rules can be set for just one program or for all programs by selecting from the Program box in the Edit Rules window. As noted earlier, Dolby Digital fields can have dependencies for either Program Config or Audio Coding Mode.

After changing the edit rules, the new rules will be active until exiting AMAS or loading an Edit Rules file (found in the AMAS File menu). Users can save the currently active edit rules to a file for later recall - accessed via the AMAS File menu. To switch between an Edit Rules file and the internal default edit rules, check or uncheck "Use Edit Rules From File" in the AMAS File menu.

5.6   Other Features

Users can select to log changes detected in a field by right-clicking on the field in the AMAS Window or Program Status Window and selecting "Log xxxxx Change" where xxxxx is the field name. When selected, an asterisk will appear to the right of the field's square status indicator. Every time the field value changes a message will be logged indicating the old and new value. Clear an individual Log Change setting by following the procedure again, or clear all Log Change settings by clicking the "Clear Log Change" button in the Statistics area of the AMAS Window.

Users can select to ignore editing for a field by right-clicking on the field in the AMAS Window or Program Status Window and selecting "Ignore xxxxx Status" where xxxxx is the field name. When selected, the field's square status indicator will turn light gray. This overrides any edit rules in effect for that field - if errors or warnings occur they will not be logged and the field's status indicator will not change color. Clear an individual Ignore Status setting by following the procedure again, or clear all Ignore Status settings by clicking the "Clear Ignore Status" button in the Statistics area of the AMAS Window.

To minimize the display space used by AMAS, you can close all windows except the main AMAS window, relying on the Summary indicators and Statistics to report problems.

5.7   Diagnostics

In the Settings Menu, there is a "Show Diagnostic Options" menu item. When clicked, several diagnostic options are available. These options are not generally helpful for AMAS metadata monitoring. They can produce massive amounts of data logging activity, so it is best to leave these options turned off.

Chapter 6: Specifications

Table 6-1 Electrical Specifications

Sampling Rate	48 kHz (±0.1%)
Output Delay	1 video frame: NTSC = 33 msec, PAL = 40 msec
Programs	Up to eight AC-3 metadata programs
HD-SDI I/O	75-Ohm BNC female connectors, per SMPTE 292M, compatible with 1080i and 720p formats
Vref Input	Analog black burst, NTSC or PAL, passive loop through
LTC Input	Future Use
AES I/O	Future Use
Processing	Metadata frame synchronization, selectable silent frame insertion upon input error or loss
Metadata I/O	9-pin female D-connector
GPIO Port	TTL level, 9-pin female D-connector
Ethernet Port	RJ-45 female jack connector, 10 BASE-T
Boot Time	Less than 30 seconds

Table 6-2

Table 6-3 Mechanical Specifications

Dimensions	1.75 × 19 × 24 in (4.45 × 48.3 × 61 cm)
Net Weight	6 lb (2.72 kg) approx.
Shipping Weight	8 lb (3.62 kg) approx.
Power Requirements	95-240 VAC, auto ranging, 50–60 Hz, 2 supplies for redundancy
Power Consumption	20 W total maximum

Table 6-4 Environmental Specifications

Operating Temperature	0°C to 50°C, convection cooled
Non Operating Temperature (Storage)	-20°C to $+70^{o}$C
Humidity	Up to 98% relative humidity, non-condensing
EMC Radiation Limits	FCC Part 15 Class A, ICES-003

RS485/422/232 Port

9-pin female D-connector with full-duplex RS-485 protocol running up to 115 kbps. Pinout is compatible with SMPTE 207M. Input is relay bypassed to Output on system failure, power off, or via front user control.

Table 6-5 RS-485 Metadata I/O Port Pinout

Pin	Connection
1	Shield
2	Metadata IN– (Rx-)
3	Metadata OUT + (Tx +)
4	Ground
5	NC
6	Ground
7	Metadata IN + (Rx +)
8	Metadata OUT – (Tx-)
9	Shield

Status (GPI/O) Port

9-pin female D-connector, TTL compatible levels.

Table 6-6 GPI/O Port Pinout

Pin	Connection
1	GP Input 1
2	GP Input 2
3	GP Input 3
4	GP Input 4
5	Ground
6	GP Output 1
7	GP Output 2
8	GP Output 3
9	GP Output 4

Ethernet Port

The Ethernet port is a standard RJ-45 female connector that supports 10BASE-T. This connector is currently reserved for software updates but will support monitoring and control functions in a future software version.

Chapter 7: Metadata

7.1   Metadata Structural Overview

Audio Metadata, or data about the audio data, comes in two varieties: Consumer and Professional. Consumer Metadata (sometimes called Dolby Digital Metadata) describes a single audio program that can be from one to 5.1 channels of audio, carries setup information for the emission encoder (Dolby Digital (AC-3), aacPlus or other), and helps consumer decoders optimize their reproduction of multichannel audio. Professional Metadata (sometimes called Dolby E Metadata) carries up to eight consumer metadata programs along with setup information for mezzanine coders such as the Dolby E and Linear Acoustic e-squared systems (if they are used). In essence, Consumer Metadata is a subset of Professional Metadata.

It is very important to note that Consumer Metadata is found only inside an emission bitstream. The metadata connectors found broadcast equipment produce and accept only Professional Metadata.   The products then extract the Consumer Metadata for only the program whose audio they are processing. Here is an example:

A program is being created and it contains 5.1 channels of main audio plus mono SAP and a mono Visual Descriptive versions. The Professional Metadata is set for a 5.1 + 1 + 1 Program Configuration (5.1 plus two mono, or three programs in total). When this metadata stream is eventually connected to three emission encoders, each one is set to "look" at a different program. The first encoder would extract and use the Consumer Metadata for Program 1 (which tells is to configure itself for a 5.1 channel main program), the second encoder simultaneously extracts and uses the Consumer Metadata for Program 2 (which tells it to configure itself for a mono SAP program), and the third encoder extracts and uses the Consumer Metadata for Program 3 (a mono Visual Descriptive program).

Ideally, metadata is first inserted during program creation or mastering (although it can be added or modified later during distribution), and is carried through transmission. Consumer decoders process the decoded audio according to metadata parameters set by the program creator. Metadata can provide content producers with unprecedented control over how original program material is reproduced in the home. A prime example of this is the separation of loudness and dynamic range, allowing both to be controlled independently *as long as the metadata is set properly.*

7.2   Informational and Control Metadata

In the simplest terms, there are two functional classifications of metadata parameters within a consumer metadata stream:

Informational: These parameters convey information but do not affect either the encoded bitstream or the decoding process. For example, the Bitstream Mode parameter describes the audio service provided in the bitstream. This information may be used by certain components in the audio system.

Control: These parameters direct how the decoder, encoder, or both process the audio when certain modes are applied to the encoder or decoder. For example, the LFE Lowpass Filter parameter determines whether a lowpass filter is applied to the LFE input of a Dolby Digital encoder.

Table 7-1 below lists all of the consumer metadata parameters and indicates whether the parameter is for informational purposes or control purposes.

Table 7-1 Metadata Parameters

Metadata Parameter	Info	Ctrl
Dialogue Level (dialnorm)		X
Channel Mode (acmod)		X
LFE Channel (lfeon)		X
Bitstream Mode	X	
Line Mode (dynrng)		X
RF Mode (compr)		X
Center Downmix Level (cmixlev)		X
Surround Downmix Level (smixlev)		X
Surround Mode (dsurmod)		X
Audio Production Info	X	
Mix Level	X	
Room Type	X	
Copyright	X	
Original Bitstream	X	
Encoder Control Metadata:		
RF Overmodulation Protect		X
DC Filter		X
Low Pass Filter		X
LFE Lowpass Filter		X
Surround 3dB Attenuation		X
Surround Phase Shift		X
Extended BSI (optional):		
Preferred Stereo Downmix		X
LtRt cmixlev		X
LtRt smixlev		X
LoRo cmixlev		X
LoRo smixlev		X
Surround EX mode		X
A/D COnverter Type	X	

7.3   The Three D's

The three most critical types of metadata parameters, Dialog Level, Dynamic Range Control, and Downmixing, are discussed in detail below. Channel Mode, which determines how many audio channels will be Dolby Digital encoded, is equally important, with the remaining parameters falling in behind.

7.3.1   Dialogue Level

Dialogue level (also known as dialogue normalization or dialnorm) is perhaps the single most important metadata parameter. The dialogue level setting represents the average loudness of dialogue in a presentation.

When received at the consumer's decoder, this parameter setting determines the level shift in the decoder that sets, or normalizes, the average audio output of the decoder to a preset level. This aids in matching audio volume between program sources.

The proper setting of the dialogue level parameter enables the Dynamic Range Control profiles chosen by the content producer to work as intended in less-than-optimal listening environments, and is essential in any content production, whether it is for transmission in a broadcast stream or for direct distribution to consumers, as in DVDs.

In broadcast transmission, standard setting of dialogue level ensures that the consumer can switch channels or watch a television program without having to adjust the volume control during commercial breaks. Using that standard for all content, whether conveyed by broadcast television, DVD, or other media, enables the consumer to switch between sources and programs while maintaining a comfortable listening level.

Note:Programs without dialogue, such as an all-music program, still require a careful setting of the dialogue level parameter. When setting the parameter for such content, it is useful to compare the program to the level of other programs. The goal is to allow the consumer to switch to your program without having to adjust the volume control.

The Scale

The scale used in the dialogue level setting is from -1 to -31 dB in 1 dB steps. Contrary to initial logic, a setting of -31 represents no level shift in the consumer's decoder, and -1 represents the maximum level shift. Here's why: consumer decoders standardize the average loudness (averaged over time by the formula LeqA) to -31 dBFS (31 dB below 0 dB full-scale digital output) by applying a shift in level based on the dialogue level parameter setting. When a decoder receives an input signal with a dialogue level setting of -31, it applies no level shift to the signal because this indicates to the decoder that the signal already matches the target level and therefore requires no shift. In contrast, a louder program requires a shift to match the -31 dB standard. When the dialogue level parameter setting is -21, the decoder applies a 10 dB level shift to the signal. When the setting is -11, it applies a 20 dB level shift, and so on.

A Simple Rule:

31 + (dialogue level value) = Shift applied

Example:

31 + (-21) = 10 dB

The most important point to remember is that in setting the dialogue level parameter, you are providing your listener with an essential service. For your listeners, setting this level properly means:

- The volume level is consistent with other programs.

- The DRC profiles you make available to them work as you intend.

Note that when calibrating a system, if the dialogue level parameter is set to anything other than -31, the system is not unity gain. For proper alignment, remember to set the dialogue level parameter to -31 (no attenuation decoder) during calibration. In modern digital systems where levels are usually unity, this will not be much of an issue but when adjusting analog to digital converters it could cause quite a bit of confusion.

7.3.2   Dynamic Range Control (DRC)

Different home listening environments present a wide range of requirements regarding dynamic range. Rather than simply compressing the audio program to work well in the poorest listening environments, Dolby Digital encoders can calculate Dynamic Range Control (DRC) information and send it via the Line Mode and RF Mode metadata parameters to the consumer decoder. This metadata can then be applied to the audio signal by the decoder to reduce its dynamic range.

Through the proper setting of DRC profiles during content creation, the producer can provide the best possible presentation of program content in virtually any listening environment, regardless of the quality of the equipment, number of channels, or ambient noise level in the consumer's home.

Many decoders offer the consumer the option of defeating the Dynamic Range Control metadata, but some do not. Decoders with six discrete channel outputs (full 5.1-channel capability) typically offer this option. Decoders with stereo, mono, or RF-remodulated outputs, such as those found on DVD players and set-top boxes, often do not. In these cases the decoder automatically applies the DRC metadata associated with the decoder's selected operating mode.

There is separate DRC metadata for the two possible operating modes of the decoder. The

operating modes are known as Line Mode and RF Mode due to the type of output they are typically associated with. Line Mode is typically used on decoders with six- or two-channel line-level outputs and RF Mode is used on decoders that have an RF-remodulated output. Full-featured decoders allow the consumer to select whether to use DRC and if so, which operating mode to use. The consumer sees options such as Off, Light Compression, and Heavy Compression instead of None, Line Mode, and RF Mode. Advanced decoders may also allow custom scaling of the DRC metadata.

All that needs to be done during encoding is selection of the dynamic range control profiles for Line Mode and RF Mode. The profiles are described in the following sections.

Note:While the use of DRC modes during decoding is a consumer-selectable feature, the dialogue level parameter setting is not. Therefore, the proper setting of the dialogue level parameter is essential before selecting a DRC profile.

Line Mode (dynrg)

Line Mode offers these features:

- Low-level boost compression scaling is allowed.

- High-level cut compression scaling is allowed when not downmixing.

- Dialogue, as set by the dialogue level parameter, is reproduced at a constant level of -31 dBFS LAeq.

All line-level or power-amplified outputs from two-channel set-top decoders, stereo digital televisions, 5.1-channel digital televisions, and A/V surround receivers use Line mode.

Consumer control of the dynamic range is limited when downmixing. Products with stereo or mono outputs do not usually allow consumer scaling of Line Mode. This is because these devices are usually downmixing, (for example, when receiving a 5.1-channel signal.) However, in these products the consumer may have a choice between Line Mode and RF Mode.

RF Mode (compr)

RF Mode offers these features:

- High- and low-level compression scaling is not allowed (when active, fully applied).

- +11 dB gain shift raises overall program level.

- Dialogue, as set by the dialogue level parameter and combined with the +11 dB gain shift, is reproduced at a constant level of -20 dBFS LAeq.

RF Mode is designed for products (such as set-top boxes) that generate a downmixed signal for connection to the RF/Antenna input of a television set; however, it is also useful in situations where heavy DRC is required-for example, when small PC speakers are used for DVD playback. In RF Mode, the overall program level is raised 11 dB, while the peaks are limited to prevent signal overload in the D/A converter. By limiting headroom, severe overmodulation of television receivers is prevented. The 11 dB gain provides an RF modulation level that compares well with analog television broadcasts and premium movie channels.

In some situations it may be necessary to further constrain signal peaks above the average dialogue level so that there is less than 20 dB of headroom. The selection of a suitable RF Mode profile achieves this.

Dynamic Range Control Profiles

Six preset DRC profiles are available to content producers: Film Light, Film Standard, Music Light, Music Standard, Speech, and None. Each is generated based on the transform function shown below. As DRC is a wide-band gain control, all DRC profiles are generated using a modified B-weighted curve to prevent intermodulation.
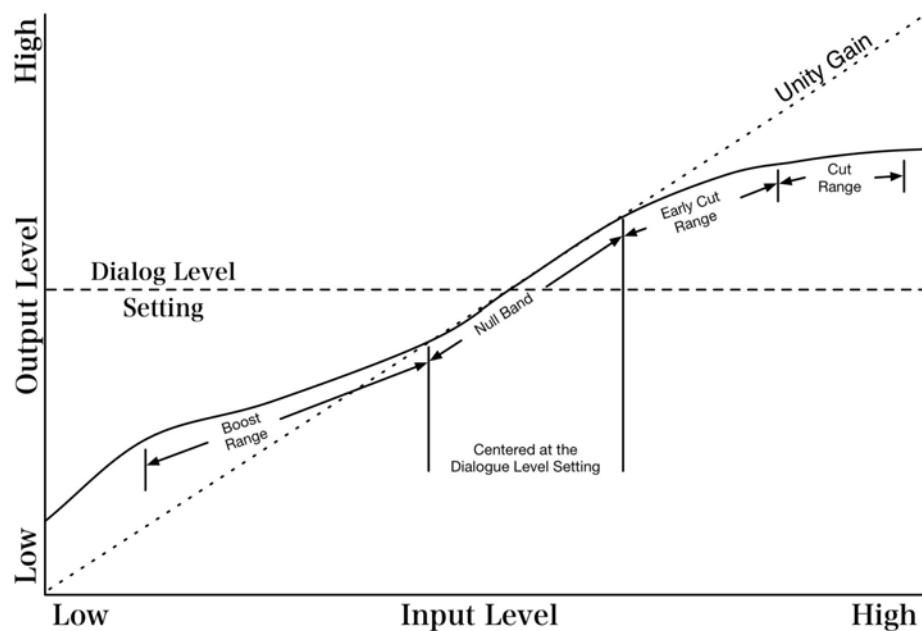
Figure 7-1 Transform function of DRC system in AC-3, aacPlus, and others.

In each case the center of the null band is assigned to the dialogue level parameter setting, and the DRC profile is applied in relation to that level.

- **Film Light**

  Max Boost: 6 dB (below -53 dB)

  Boost Range: -53 dB to -41 dB (2:1 ratio)

  Null Band Width: 20 dB (-41 dB to -21 dB)

  Early Cut Range: -26 dB to -11 dB (2:1 ratio)

  Cut Range: -11 dB to +4 dB (20:1 ratio)

- **Film Standard**

  Max Boost: 6 dB (below -43 dB)

  Boost Range: -43 dB to -31 dB (2:1 ratio)

  Null Band Width: 5 dB (-31 dB to -26 dB)

  Early Cut Range: -26 dB to -16 dB (2:1 ratio)

  Cut Range: -16 dB to +4 dB (20:1 ratio)

- **Music Light (No early cut range)**

  Max Boost: 12 dB (below -65 dB)

  Boost Range: -65 dB to -41 dB (2:1 ratio)

  Null Band Width: 20 dB (-41 dB to -21 dB)

  Cut Range: -21 dB to +9 dB (2:1 ratio)

- Music Standard

  Max Boost: 12 dB (below -55 dB)

  Boost Range: -55 dB to -31 dB (2:1 ratio)

  Null Band Width: 5 dB (-31 dB to -26 dB)

  Early Cut Range: -26 dB to -16 dB (2:1 ratio)

  Cut Range: -16 dB to +4 dB (20:1 ratio)

- **Speech**

  Max Boost: 15 dB (below -50 dB)

  Boost Range: -50 dB to -31 dB (5:1 ratio)

  Null Band Width: 5 dB (-31 dB to -26 dB)

  Early Cut Range: -26 dB to -16 dB (2:1 ratio)

  Cut Range: -16 dB to +4 dB (20:1 ratio)

- **None**

  No DRC profile selected. The dialogue level parameter (dialnorm) is still applied

---

NOTE: *Protection DRC is still active in "None" mode*

These choices are available to the content producer for both Line Mode and RF Mode. The content producer chooses which of these profiles to assign to each mode; when the consumer or decoder selects a DRC mode (i.e. apply DRC fully, not at all, or anywhere in-between), the profile chosen by the producer is applied.

Note that the DRC profile is a choice available only when setting up metadata, and is used by the emission encoder to guide its generation of the actual Line Mode and RF Mode gain control values (dynrng and compr, respectively). Once the profile is set and is used by the encoder, the only information available in the metadata stream are these gain control values. Importantly, these gain control values can be extracted and displayed in the form of a gain reduction/expansion meter a very useful tool available in the Linear Acoustic LAMB-DA and Dolby DM100, DP564, and LM100 products.

In addition to the DRC profile, metadata can limit signal peaks to prevent clipping during downmixing. This metadata, known as overload protection, is inserted by the encoder only if necessary. For example, consider a 5.1-channel program with signals at digital full scale on all channels being played through a stereo, downmixed line-level output. Without some form of attenuation or limiting the output signal would obviously clip. Correct setting of the dialogue level and DRC profiles normally prevents clipping and unnecessary application of overload protection.

7.3.3   Downmixing

Downmixing allows a multichannel program to be reproduced over fewer speaker channels than for which the program is optimally intended. Downmixing allows consumers to enjoy a multichannel program without requiring a full-blown home theater setup.

As with stereo mixing where the mix is monitored in mono on occasion to maintain compatibility, multichannel audio mixing requires the engineer to reference the mix to fewer speaker channels to ensure compatibility in downmixing situations. In this way, metadata allows every consumer who receives the program and proper metadata to enjoy the best audio reproduction possible, regardless of the playback system.

For a set-top box or DVD player, the analog stereo output is a downmixed version of the audio data stream. In these devices, the analog stereo output is one of two different stereo downmixes. One type is a stereo-compatible Matrix Surround downmix (left-total/right-total, or Lt/Rt) of the multichannel source program that is suitable for Pro Logic, PL II, dts neo:6, or other matrix decoding.

The other type is a simple stereo representation (called a left-only/right-only, or Lo/Ro) suitable for playback on a stereo hi-fi or on headphones, and from which a mono signal is derived for use on an RF/Antenna output. The difference between the downmixes is how the surround channels are handled. The Lt/Rt downmix sums the surround channels and adds them, out-of-phase to the left channel and in-phase to the right channel. This allows a consumer matrix decoder to reconstruct the L/C/R/S channels for a Pro Logic home theater. The Lo/Ro downmix adds the right and left surround channels discretely to the left and right speaker channels. This preserves the stereo separation for stereo-only monitoring and produces a mono-compatible signal.

NOTE: *Note:The LFE channel is not included in any downmix- it is ignored.*

On most home equipment, the consumer can use the product's user interface to choose the appropriate stereo output for their playback system. There are separate metadata parameters for the adjustment of the Lo/Ro and Lt/Rt downmix conditions. Certain metadata parameters allow the engineer to select how the stereo downmix is constructed and which stereo analog signal is preferred, but Lt/Rt is the default selection in all consumer decoders. During downmixing the adjustment of dynamic range control parameters is limited. Broadly speaking, the stereo outputs use the Line Mode compression profile and the mono signal uses RF Mode compression. As with dynamic range control, downmixing is ultimately dependent upon each consumer's unique listening environment.

While the engineer must optimize the multichannel mix for reproduction in an ideal listening environment, it is also important to preview the mix in downmixing conditions to ensure compatibility with different playback systems when selecting the downmixing metadata parameters. These previews can be achieved in real time using the Dolby DP570 Multichannel Audio Tool, the Linear Acoustic LAMBDA, and other products.

7.4   Typical Program Scenarios

The following section will describe a number of different program types and the process used to successfully produce and deliver those programs to a network with proper audio and metadata. Although actual programs and network requirements will vary, these basic scenarios can be used to design an approach that fits any application.

One fundamental aspect of each of the following examples is that the audio monitoring system must be accurately calibrated and have the ability to monitor the audio with metadata applied to it. If these requirements are met, the audio quality heard at the point of production will make it all the way to the consumer.

It is very important to note that in every situation described, the metadata is modified to match standard mixing practices, not the other way around. Metadata can be thought of as a descriptive shell around the program, or like an accurate label on the tape box that is automatically read and applied.

7.4.1   Live Sporting Event

In a broadcast truck parked outside a stadium, the program mixer listens to the audio in a calibrated environment and chooses the appropriate metadata for the audio programs being created. The appropriate dialnorm value depends on things such as the operating level of the truck and where the audio mixer sets announcer levels. Using a loudness meter such as a Dolby LM100, the dialnorm value can be measured and inserted using the LA-5180. Once set, it is not necessary to change this value for the duration of the program as dialnorm is now calibrated to the meters on the console. If an announcer were to suddenly reduce in level, the mixer would use a fader to correct the level- not dialnorm. Suggested values for the remaining metadata parameters are shown in the table at the end of this document.

The resulting audio program, together with metadata, can be encoded and sent back to the network via fiber, microwave, or other transmission link. At the receiving end of this transmission, the stream is decoded back to baseband audio and metadata. The audio program is monitored and the metadata is altered or re-created as other elements of the program are added in preparation for broadcast. This new audio program/metadata pair can then be kept as baseband with metadata being inserted into the VANC space. The audio then leaves the postproduction studio in either baseband or compressed form and is passed through the plant to Master Control. The audio program that is selected by master control plus its associated SAP or Visual Descriptive audio (if present) can then be distributed to affiliates using Linear Acoustic e-squared, Dolby E, or some other method.

At the local station, the stream is decoded back to baseband audio and metadata. The audio program is monitored and the metadata is altered or re-created as other elements of the program are added in preparation for broadcast. This new audio program/metadata pair

can then be kept as baseband with metadata being inserted into the VANC space. The audio then leaves the postproduction studio in either baseband or compressed form and is passed through the plant to Master Control. The audio program that is selected by master control plus its associated SAP or Visual Descriptive audio (if present) is sent to the transmission audio processor (such as the Linear Acoustic AEROMAX 5.1) which accept baseband audio and the Professional Metadata stream and encode the audio program according to its associated metadata.

Finally, the signal is decoded in the consumer's home, with metadata providing the information for that decoding process. Through the use of metadata, the mixer in the truck has been able to control the home decoder for the sporting event, while news breaks, commercials, station IDs, and the like are similarly appropriately decoded due to their pre-existing metadata.

7.4.2   Theatrical Movies for Broadcast

This situation is probably the most straightforward, as multichannel audio and metadata have been part of film transfers since the first laser disc was released with a Dolby Digital (AC-3) soundtrack in the early 1990's. Film mix stages went through a transformation in the mid 1970's when Dolby Stereo was introduced. A large and ongoing effort was begun in order to standardize the film mixing process and mixing levels so that the soundtrack would play back consistently from one facility to another and from the final mix stage to the theatre. Dialog loudness was chosen as the anchor or reference for the soundtrack, and speaker positions and calibration levels were carefully chosen. Today it is possible to start a project at one facility, finish it at another, and release a film with confidence that it will play properly in theatres. This consistency has greatly simplified the task of transferring film to video, especially films with multichannel audio. Picking the correct metadata values is very straightforward, and it is likely that a preset group of values like the ones shown in the table at the end of this document will work in virtually every situation. However, there are a few things that should be kept in mind:

- If the film is simply being edited for television and there is no re-mixing, the dialnorm value will most likely fall in the -27 to -31 range. If the soundtrack is re-mixed to a different reference level, the dialnorm value will be different and should be re-measured. Currently, the simplest way to do this is with a Dolby LM100 or a DP570.

- Film mix stages are aligned to 85 dB Sound Pressure Level (SPL) and generally use large horn-loaded theatre speakers. This translates well to theatres, but not so well to home environments. It is strongly recommended that for television transfers that smaller speakers with dome-type HF drivers be used and that the room be calibrated to around 79 dB SPL; 78-80 dB SPL is typical. Smaller speakers and lower levels has revealed some very interesting mistakes on film soundtracks that have been corrected prior to the DVD release.

- Unlike consumer systems where all main speakers are calibrated for equal SPL, film soundtracks are mixed in environments where the SPL of the surround speakers is 3dB

lower than the other main channels. This causes the film mixers to record the surrounds louder (it sounds quieter, so they turn up the level to compensate), and a film soundtrack played directly into a consumer system will have surrounds 3 dB too loud. Not that many consumers will complain, but it is technically not correct and should be compensated for. Compensation can be done during the television transfer (lower the surround tracks by 3 dB), but there is also a metadata parameter that can be flagged and it will be taken care of automatically by the Dolby Digital encoder.

• The Dolby Digital (AC-3) system is capable of passing audio from 20 Hz to 20 KHz from all main channels, but it is unlikely that many consumers have speakers that can reproduce this range. Therefore, home theatre systems can send the low frequency information from the main channels, which cannot reproduce them, to the subwoofer, which can. This is called Bass Management and television transfers should be checked for compatibility.

7.4.3   Sitcom

Many sitcom's have been mixed in surround for over a decade. It is common practice, and the transition to 5.1 channel surround for these facilities should be relatively straightforward. The only new additions are the storage of 5.1 channels (remember that surround mixes are stored as 2-channel LtRt), and creation and storage of metadata. Experience has shown that the creation of metadata has not hampered or greatly complicated standard mixing practices.

As with other genres, the key parameter to be adjusted during sitcom mixing is dialog level. Testing of unprocessed material (no compression or limiting) from a few of the major networks has shown that a typical sitcom dialnorm value is in the range of -24 to -27, but of course this needs to be checked on a program-by-program basis.

7.4.4   News

Because of its day-to-day consistency, the news broadcast is probably the simplest case of all. Metadata can literally be set once to match the mixing practices of that show, and likely not ever change. The values shown in the table at the end of this section can be plugged in, dialnorm can be checked, and the program can continue to be mixed exactly the way it is today. Again, the only issue is making sure that the metadata travels in sync with the audio data whether it is in a compressed or baseband environment.

7.4.5   SAP

The Secondary Audio Program usually carries an alternate language version of the main program. In NTSC, the SAP is transmitted as a mono subcarrier with severe performance limitations. The ATSC system provides the capability for sending a separate program that in theory could be up to 5.1 channels of audio with full frequency response and dynamic range. Typically, however, the program will be stereo or mono but will still have full frequency response and dynamic range- a definite advantage over previous systems.

The SAP program audio can be treated like a standard mono or stereo program with the table at the end of this section being used as the basis for metadata settings. Note that just like the main audio program, the bitstream mode metadata parameter is set to Complete Main as the SAP program contains all of the elements necessary for a complete alternate language program.

In the U.S., the ATSC system provides two ways to accommodate the Secondary Audio Program. It can either be sent as a separate audio service, or as a separate virtual channel.

7.4.6   Visual Descriptive

A Visual Descriptive soundtrack is comprised of the main audio program mixed with a narration track that describes the on-screen action. Although it is possible to create a 5.1 channel Visual Descriptive program, there are usually not enough distribution audio channels nor emission data rate to handle more than a mono or stereo program. In many ways, a Visual Descriptive program is similar to an SAP program and can be treated as such. The primary difference is that the bitstream mode metadata parameter should be set to Assc. Visual Imp. (Associated Visual Impaired program).

7.5   Summary

All of the flexibility and control afforded by audio systems that utilize metadata absolutely requires the producer to correctly set the parameters because they affect important aspects of the audio-and can seriously compromise the final product if set improperly. Although most metadata parameters are transparent to consumers, certain parameters affect the output of a home decoder, for example when downmixing for a specific speaker configuration, or when the consumer chooses Dynamic Range Control to avoid disturbing family and neighbors. Monitoring in a calibrated environment with the proper metadata tools and an understanding of the basic functionality of the system is essential and will go a long way towards making a successful production.

7.6   Typical Metadata Settings

The table on the next page shows typical settings for several types of audio content. Note that the dialogue level (dialnorm) setting is not indicated as the true value of this parameter must be measured using a loudness meter such as the Dolby LM100. Other settings are generally valid for any program of the type indicated at the head of the column, but note that it is critical to monitor the effects of these settings.

NOTE: *The following table is a guide only; the effects of these settings may or may not be appropriate for a given program. Monitor carefully to verify.*

Parameter	Live Sports Event (5.0)	Action Film (5.1)	Drama (Lt/Rt)	News (Stereo)	SAP or Visual Descriptive
Dialogue Level	Measured (see text)	Measured (see text)	Measured (see text)	Measured (see text)	Measured (see text)
Channel Mode	3/2	3/2L	2/0	2/0	1/0 or 2/0
LFE Channel	Disable	Enable	N/A	N/A	N/A
Bitstream Mode	Main Complete	Main Complete	Main Complete	Main Complete	Main Complete or Assc. Visual Imp.
Line Mode Pro	Film Standard	Film Standard	Film Light	Speech	Film Standard
RF Mode Pro	Film Standard	Film Standard	Film Light	Speech	Film Standard
RF Ovrmd Protect	Disable	Disable	Disable	Disable	Disable
Center Dwnmix Lev	0.707 dB (–3 dB)	0.707 dB (–3 dB)	N/A	N/A	N/A
Srnd Dwnmix Lev	0.707 dB (–3 dB)	0.707 dB (–3 dB)	N/A	N/A	N/A
Dolby Srnd Mode	N/A	N/A	Dolby Surround	Dolby Surround	N/A or Dolby Surround
Audio Prod Info	No	Yes	Yes	No	Yes
Mix Level	N/A	101 dB	90 dB	N/A	90 dB
Room type	N/A	Large	Small	N/A	Small
Copyright	Yes	Yes	Yes	Yes	Yes
Original Bitstream	Yes	Yes	Yes	Yes	Yes
Pref. Stereo Downmix	Lt/Rt	Lt/Rt	N/A	N/A	N/A
Lt/Rt C Dwnmx lvl	0.707 (–3 dB)	0.707 (–3 dB)	N/A	N/A	N/A
Lt/Rt S Dwnmx lvl	0.707 (–3 dB)	0.707 (–3 dB)	N/A	N/A	N/A
Lo/Ro C Dwnmx lvl	N/A	N/A	N/A	N/A	N/A
Lo/Ro S Dwnmx lvl	N/A	N/A	N/A	N/A	N/A
Surround EX	N/A	Surround EX	N/A	N/A	N/A
A/D Converter Type	Standard	Standard	Standard	Standard	Standard
DC Filter *	Enable	Enable	Enable	Enable	Enable
Lowpass Filter *	Enable	Enable	Enable	Enable	Enable
LFE Lowpass Filter *	N/A	Enable	N/A	N/A	N/A
Srnd 3 dB Atten *	Disable	Enable	N/A	N/A	N/A
Srnd Phase Shift *	Enable	Enable	N/A	N/A	N/A