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E MON-1/M

8-Channel Dolby Digital Audio Monitor

User Guide

Part Number 821607, Revision F

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Last Update

July 06, 2010

E MON-1/M User Guide

Introduction

Overview

The 2RU, E MON-1/M is a powered eight-channel digital audio monitor designed for decoding, processing, and monitoring Dolby E, Dolby Digital, and linear PCM (AES/EBU) audio signals. The E MON-1/M decodes either standard SDI or high-definition HD-SDI audio signals in addition to the other digital audio formats.

Topics

Safety Instructions

1. Read, keep, and follow all of these instructions; heed all warnings.
2. Do not use this equipment near water.
3. Use only a dry cloth to clean the equipment.
4. Do not block any ventilation openings. Install only in accordance with the instructions in the section entitled, "Installation Recommendations" on page 3.
5. Do not install near any heat source such as a radiator, heat register, amplifier, or stove.
6. Do not expose the equipment to rain or moisture.
7. Do not attempt to plug the unit into a two-blade outlet (with only two prongs of equal width).

IMPORTANT: By design, these monitors will only plug into a three-prong outlet for your safety. If the plug does not fit into your outlet, contact an electrician to replace the obsolete outlet.

8. Protect the power cord from being walked on or pinched, particularly at plug's source on the equipment and at the socket.
9. Use only the attachments/accessories specified by the manufacturer.
10. Unplug the equipment during lightning storms or when unused for long periods of time.
11. Refer all servicing to qualified service personnel. Servicing will be required under all of the following conditions:
    - The equipment has been damaged in any way, such as when the power-supply cord or plug is damaged.
    - Liquid had been spilled or objects have fallen onto the equipment.
    - The equipment has been exposed to rain or moisture.
    - The equipment does not operate normally.
    - The equipment has been dropped.

Installation Recommendations

Mounting

The unit is designed to install into a standard 19" rack mounted at eye level for best visual observation of the monitor screens.

Heat Dissipation

The ambient temperature inside the mounting enclosure should not exceed 40° Celsius (104° Fahrenheit). Adjacent devices can be rack mounted (or stacked) in proximity to the unit if the above temperature is not exceeded. Allow a 1RU (1.75”/44.45mm) space above and below the unit for air circulation.

Important: To reduce noise, the monitor have any fans. As a result, the heat generated by the class D power amplifiers, power supplies, and other components is vented by slots in the side of the unit. Therefore, as a safety precaution, we advise you to be sure to allow proper ventilation on both sides of the unit.

Power

The unit comes with a standard 24VDC/3.0A internal power supply and connects an A/C mains power source (65W, 100 to 240 VAC, 50/60Hz) to the IEC connector provided on the rear panel of the unit.

Sympathetic Vibration

Sympathetic vibration from other equipment (cables, etc.), in the rack may be serious enough to interfere with the unit’s sound quality out in the listening area. The use of thin card stock and/or felt or foam weather-stripping type materials between adjacent vibrating surfaces, or tying up loose cables, etc., may be required to stop vibrations external to the unit.

Elimination of cabinet and component sympathetic vibrations (resonances) requires considerable attention to mechanical details. Because of this, and the physical constraints of the speaker’s acoustic enclosures, even minor changes to any of the mechanical details of the

unit can seriously impair its acoustic performance. This especially applies to the speaker baffles. If mechanical work on the unit is necessary, be sure to make adequate notes to permit accurate reassembly.

Unfortunately, the unusual and wholly proprietary method of magnetic shielding is usually degraded slightly by any disassembly of the unit, except removal of the rear panel. Almost any maintenance or repair will require removal of the cover. If an immediately adjacent video monitor shows magnetic interference after reassembly of the unit, it must be returned to the factory to restore the shielding completely.

Mechanical Bracing

Even though the unit is fairly heavy, the chassis is securely attached to the front panel at eight points along its surface, not just at the four corners of the chassis ears. This feature will reduce or eliminate rear bracing requirements in many mobile/portable applications. The weight of internal components is distributed fairly evenly around the unit.

Audio Connections

Connection of the audio feeds is straightforward. Set the DIP switches for Source 1 and Source 2 input connector termination (rear panel) according the the input signal chaining configuration you will use.

Electrical Interference

As with any audio equipment, maximum immunity from electrical interference requires the use of shielded cable. The internal circuitry common is connected to the chassis.

Description

Figure 1–1 E MON-1/M (Oblique View)

Bright, wide-range, high-resolution LED bar graph level meters are provided for all eight channels for superior visability and accuracy of audio level monitoring. Fifty three tri-color segments simultaneously display signal levels according to PPM and VU standards. A high-contast LCD display on the front panel provides Mode and Audio Select information at a glance.

This unit contains three audiophile-quality drivers and three power amplifiers; two amplifiers (and two speakers) that reproduce midrange and high frequency information in stereo, and a third amp/driver combination (and speaker) that handles summed Low Frequency (LF) information below the 500 Hz crossover point. This unique audio design provides optimally focused sound in an ultra near field (1 to 3 feet) environment and allows higher SPL for the operator while reducing overall ambient sound and adjacent bay crosstalk.

Features

- Decodes Dolby E, Dolby Digital, PCM (AES/EBU), HD/SD-SDI
- Balanced analog output of selected channels (downmix) on XLR connectors
- Data port for downloading of software upgrades
- Eight 53-segment, high-resolution, tri-color, LED, bar graph level meters show simultaneous VU and PPM
- Channel acitivity and status LED for each of eight channels

- LCD displays system status, mode and audio selection, and Dolby E and Dolby Digital metadata information
- Headphone output, power indication LED, volume/balance, and bar graph level meter brightness controls
- Full certification from Dolby

Applications

The E MON-1/M is intended primarily for use in machine rooms and edit bays where on-the-spot, high-fidelity confidence monitoring of up to eight channels of digital audio signals is required. Thorough magnetic shielding (less than 1 Gauss at any surface) allows installation of the unit immediately adjacent to video monitors. Designed for optimum reproduction in relatively close-up use, this unit has more than enough acoustic output, even for noisy transmitter sites (104 dB SPL at two feet), and a surprisingly broad and smooth useable frequency response of 40 Hz to 18 kHz.

Specifications

Table 1–1 E MON-1/M Specifications

Specification	Value/Domain
Input Connector Impedance	XLR: 110 Ω, balanced BNC: 75 Ω, unbalanced
Peak Acoustic Output at 2 Feet	104 dB SPL
Power Output RMS Each Side (4Ω) RMS Bass (4Ω)	 20 W transient/11 W continuous 36 W transient/20 W continuous
Frequence Response, Sixth Octave	80 Hz to 16 kHz ± 5 dB (-10 dB at 40 H, 20 kHz)

Table 1–1 E MON-1/M Specifications (Continued)

Specification	Value/Domain
Input Level for Maximum Output (Volume Full On)	0 dBv balanced/-10 dB unbalanced
Hum and Noise (analog)	Better than -68 dB below full output
Distortion, Electrical	<0.1 at any level below input threshold
Distortion, Acoustic	Typically < 1.5%, 6% or less at worst case frequencies above 120 Hz, including cabinet resonance
Converted Analog Output S/N	>90 dB
Converted Analog Output	THD: <0.008%
Magnetic Shielding	<0.8 Gauss any adjacent surface
Power Consumption (Average Maximum)	60 W
AC Mains Power Input	100 to 250 V AC, 50 to 60 Hz Universal
Weight	18 lbs. (8.2 kg)
Dimensions	3.5″ h x 19″ w x 12″ d (89 mm x 483 mm x 305 mm)
Level Meter Type	56-segment LED bar graph
Meter Dynamics	VU (bar) and PPM (dot)
Dynamic Range	65 dB
Midscale Resolution	1 dB
Segment Colors	Tricolor (Green, Red, and Amber)
Segment Size	0.158″ x 0.04″ (4.0132 mm x 1.016 mm)

Digital Audio Formats

The following sections describe the digital audio formats that are monitored by the E MON-1/M.

Dolby E

This is one of the non-linearly coded audio formats supported. An AES3 bitstream (a.k.a. IEC 61937) may carry such coded audio data instead of standard PCM audio data. The monitor automatically detects and decodes any Dolby E bitstream.

A single AES channel of Dolby E type is capable of carrying between one and eight programs. A program is a collection of associated channels of audio (except mono, which has a single channel per program). Since the maximum number of discrete audio channels a Dolby E stream can carry is eight, no more than two programs may be carried in a Dolby E stream if each program has four channels. Another possible arrangement is four programs having only two channels each.

When accepting a Dolby E type stream, the front panel LCD Display indicates the data width of the stream being fed in (16, 20, or 24 bit). This data width does not have any bearing on the resolution of the audio being reproduced, it does however, constrain the number of channels that can be carried by that stream. Sixteen-bit data, for example, is limited to six channels, while both 20- and 24-bit data may carry eight channels of audio.

When a multi-program Dolby E stream is sent to the unit, the user may select between each program by pushing the **Program Select** button. As the available programs are cycled through, various channel LEDs above the bar graphs will light up to show those channels which are active and being monitored (green), and also those channels which are active (present) in the selected program, but not being monitored at the moment (amber). A typical Dolby E type stream might contain one program of six channels (a multi-channel program) and a two channel program (a stereo program).

Once the program of interest has been selected, it is possible to indicate some of the metadata associated with that program by pressing the **MData** button. The initial parameter shown will be dialogue normalization level. The various parameters may be stepped through by pressing the **Up** or **Down** buttons. Pressing the **Esc** button exits the metadata menu and returns the user to the main menu.

Where the selected program is multi-channel, the user may cycle through channel pairs to monitor by pressing the **Audio Select** button. The channel LEDs above the channel being monitored will indicate green if the corresponding channel is in the audio mix, amber if the channel in the corresponding program is not in the audio mix, and off if the channel is not in the selected program.

The monitor has a time out feature; if the user has not changed the audio monitor select for four minutes, the unit reverts back to normal operation and indicates the main menu.

Dolby Digital (AC-3)

This is also a non-linear audio format, which the E MON-1/M is also capable of automatically detecting and decoding. When a Dolby Digital stream is fed into the monitor, the LCD indicates the coding format and the data rate for that stream. It is possible to indicate some metadata elements associated with that program by pressing the **MData** button. The initial parameter shown will be dialogue normalization level. The various parameters may be stepped through by pressing the **Up** or **Down** buttons. Pressing the **Esc** button exits the metadata menu and returns the user to the main menu.

Where the program is multi-channel, the user may select channel pairs to monitor using the **Audio Select** button. The channel LEDs above the channel being monitored will indicate green if the corresponding channel is being monitored and amber if the channel is not being monitored.

The monitor has a time out feature; if the user has not changed the audio monitor select for two minutes, the unit reverts back to normal operation and indicates the main menu.

PCM (AES/EBU)

The E MON-1/M accepts linear PCM (AES/EBU) signals. Note that regardless of whether such signals are input directly or via an embedded HD/SD-SDI connection, PCM audio always appears only on Channels 1 and 2.

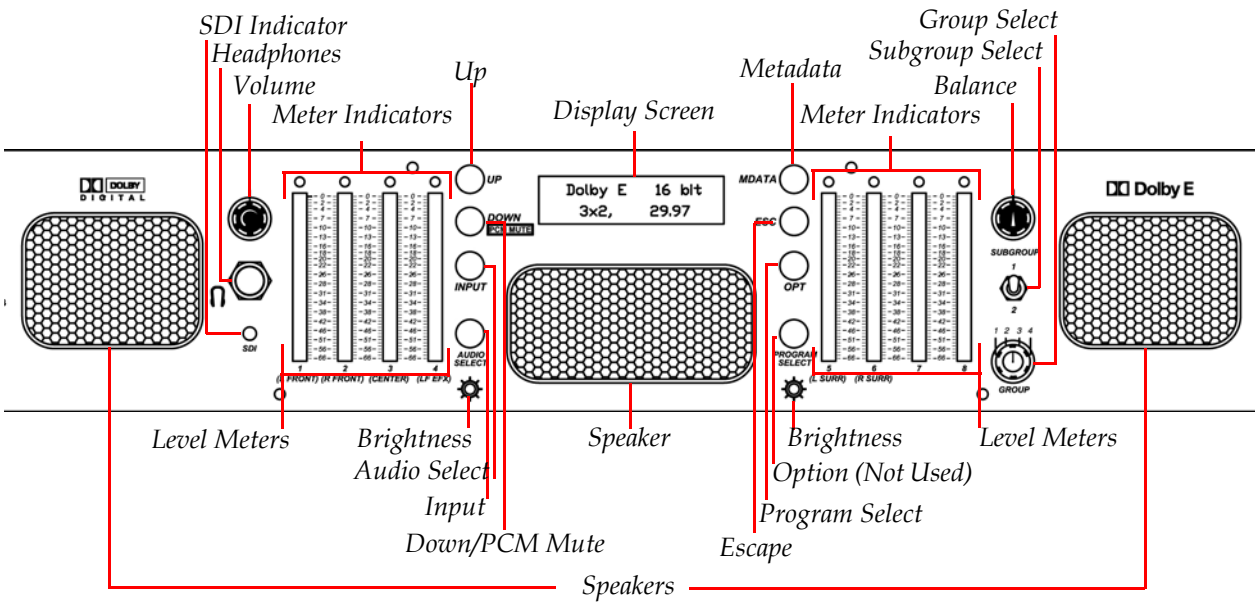
HD-SDI and SD-SDI

The E MON-1/M accepts either standard, or high-definition HD/SD-SDI source signals and any embedded channel pair (audio subgroup) can be de-embedded and decoded as for these formats.

Front Panel Controls

Please refer to Figure 1–2 on the following page to familiarize yourself with the front panel features of the E MON-1/M.

Figure 1–2 E MON-1/M Front Panel



- **Speakers**: The E MON-1/M internal speaker system is comprised of two mid-range speakers (left and right) and one woofer speaker (middle). The two side channel speakers reproduce, in stereo, only the mid and high frequencies. The middle woofer speaker reproduces the low frequencies summed from the left and right channels. Please note that the woofer speaker (middle) is not a dedicated center nor LFE speaker.

- **Headphone Jack** (1/4" Phone Jack): When you plug in headphones, the internal speakers will mute. This jack accepts the standard 1/4" phone type stereo plug.

- **Audio Level Meters** (1 through 8): Audio levels for source channels 1 through 8 are displayed via eight high-resolution 53-segment LED bar graph meters (four on the left side of the front panel; four on the right side). Dynamic range for these meters is 66 dB and they simultaneously display signal levels using both PPM and VU standards. The first six meters are labeled according to the standard surround sound nomenclature (left front, right front, center, low frequency effects, left surround, and right surround).

- **Volume Control**: This controls the loudness of the audio reproduced by the internal speakers or connected headphone.

- **Balance Control**: This pans the volume balance between the left and right speakers.

- **Level Meter Bar Graph Brightness Adjust** (Left and Right): The brightness of the bargraph meters are adjustable via these two recessed controls. The left control adjusts the brightness of the left four LED bargraphs and the right control adjusts the brightness of the right four LED bargraphs. Use a small flat blade screwdriver or similar tool to adjust these controls. Clockwise rotation increases the bargraph brightness.

- **Channel Activity/Status Indicators**: The LEDs above each bargraph meter indicate that the meter is being monitored as well as the type of signal activity for that meter; green if the corresponding channel is in the audio mix, amber if the channel is not in the audio mix, and off if the channel is not in the selected program. See the section "*User Interface Control and Display Features*" on page 10 for more information about these indicator LEDs.

- **User Interface and Display Programming Buttons**: See the section "*User Interface Control and Display Features*" on page 10 for a description of the function and use of these buttons and the LCD display.

- **SDI Group Select Switch** (1, 2, 3, or 4): This 4-position rotary switch allows the operator to choose SDI Group 1, 2, 3, or 4 for monitoring. The subgroup (1 or 2) of each SDI Group is selected using the **SDI Subgroup Select** switch. Note that the **Input** button must be used to select the Source 1 inputs for the connected HD/SD-SDI signals to be actively monitored.

- **SDI Subgroup Select Switch** (1 or 2): This two-position toggle switch allows the operator to choose whether the unit will monitor Subgroup 1 or Subgroup 2 of the chosen SDI Group (1, 2, 3, or 4) as selected by the **SDI Subgroup Select** switch. Subgroup selection chooses the channels to be monitored from the selected SDI Group:

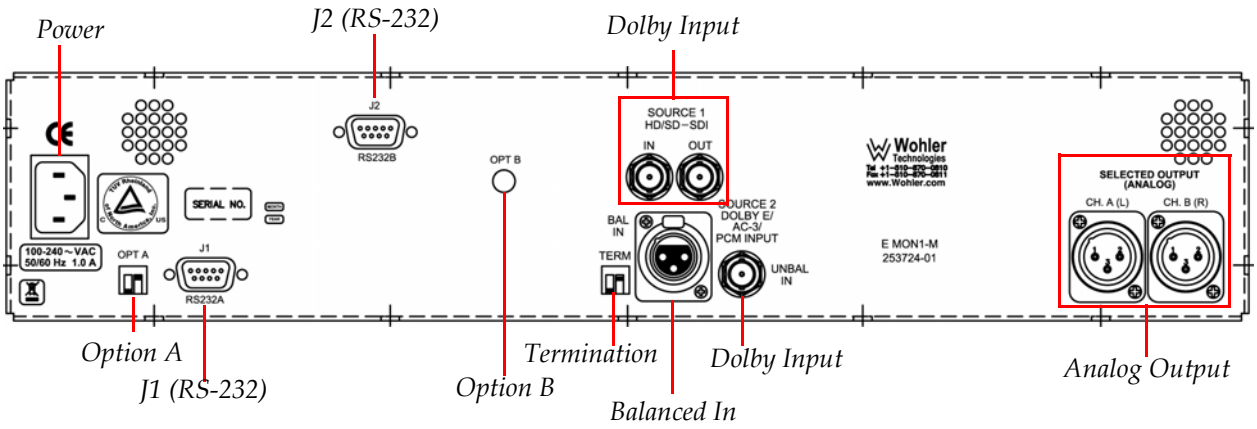
  - Subgroup 1 = Channels 1 and 2
  - Subgroup 2 = Channels 3 and 4

  Note that the **Input** button must be used to select the Source 1 inputs for the connected HD/SD-SDI signals to be actively monitored.

- **SDI (HD-SDI) Signal Status Indication**: This LED indicates the status of an HD/SD-SDI signal entering the unit regardless of any monitor selection settings. This LED is off when no valid SDI signal is present and is green when a valid SDI signal is present.

Rear Panel Connectors

Figure 1–3 E MON-1/M Rear Panel



- **Power** (IEC-320 Connector): Attach a standard IEC-320 power cord between this connector and mains power (100 to 240VAC nominal, 50/60 Hz).

- **Option A** (Two-Position DIP Switch): Both sections on this DIP switch are set in the up position for normal operation. Both sections should be set in the down position when downloading software via the J1 Data Port.

- **Option B** (10-Position Rotary Switch): Reserved for future use.

- **J1** (RS-232 on DB-9): This connector is used for downloading software upgrades.

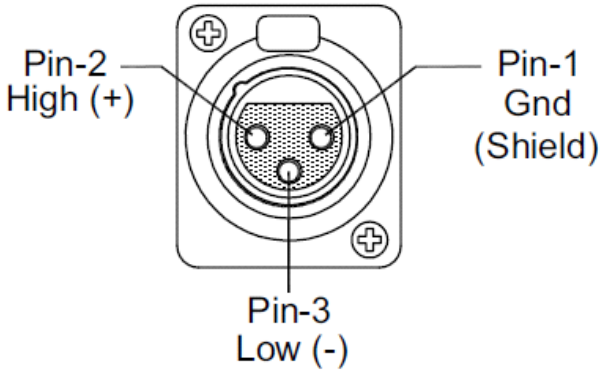
- **J2** (RS-232 on DB-9): This connector is used for downloading software upgrades.

- **Termination** (Two-Position DIP Switch): The left-side section (S1) of this DIP switch selects for Source 1 termination and the right-side section (S2) selects for Source 2. If signals entering the unit are output to downstream equipment, then the respective DIP section should be set to **Up** (unterminated). If there is no connection to downstream equipment, the respective DIP section should be set to **Down** (terminated).

- **Source 2 Digital** (In): The XLR input connector is meant to receive Dolby E, Dolby Digital, or standard linear PCM (AES) signals and is

configured for a balanced connection (110 Ω impedance). See Figure 1–4 below for XLR pinout information.

Figure 1–4 Female XLR Pin-Out

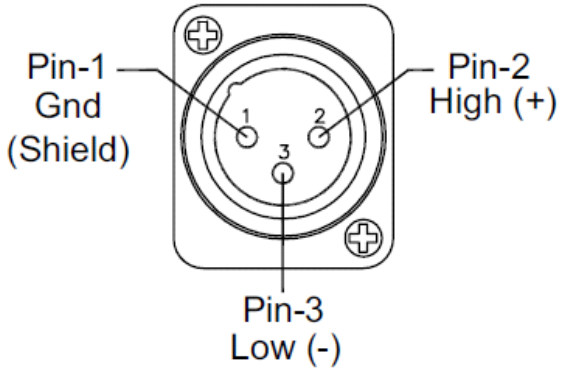


- **Source 1 HD/SD-SDI** (In and Out): The BNC In connector is meant to receive HD/SD-SDI signals and the BNC Out connector outputs a reclocked (regenerated) copy of the signal entering the In connector. Both connectors are configured for unbalanced connections (75 Ω impedance).

- **Source 2 AES** (In): This BNC input receives unbalanced AES signals.

- **Selected Analog Output Connectors** (Left and Right): These two three-pin male XLR connectors are analog outputs of the input signals as selected for monitoring through the left and right speakers (or headphones). The left Channel A (L) connector outputs the left speaker channel and the right Channel B (R) connector outputs the right speaker channel (Channel B). Both connectors are configured for low impedance connections and the output signals are not affected by the **Volume** and **Balance** controls or headphone mute feature. For XLR connector pinout information, see Figure 1–5 on page 14.

Figure 1–5 Male XLR Pin-Out



User Interface

Note: Throughout this manual, the term "multichannel" refers to an audio program consisting of more than two channels; it does not mean a simple two channel (stereo) program.

- **Audio Select Button**: When monitoring a multi-channel input source (such as Dolby Digital 3/2), it is possible to isolate and listen to channel pairs. Pressing this button sequencially cycles through the following monitoring types when the selected program is a multichannel type:
  - Lo/Ro = standard two channel down mix (see Stereo Down Mix below)
  - Lo/Ro+Lo/Ro = mono down mix compatibility
  - L/R = isolated Left and Right channels
  - C/C = isolated Center channel (to both speakers)
  - Ls/Rs = isolated Left Surround and Right Surround channels
  - LFE/LFE = isolated Low Frequency Effects channel (to both speakers)
  - Lt/Rt = surround down mix compatibility (see Stereo Down Mix below)
  - L+C/R+C = front channels downmix

- **Stereo Down Mix**: Two types of stereo down mix are available from the selections shown above: Lo/Ro and Lt/Rt.
  - **Lo/Ro**: This is the is the preferred down mix when multi-channel program is to be presented to the listener in stereo (such as the internal speakers or external headphones on the monitor. In this mode, the left output comprises a weighted mix of left front, left surround and center channels. The right output comprises a weighted mix of right front, right surround and center channels.

    Note: While cycling through audio selections, it is possible to revert immediately to default to Lo/Ro mode by pressing **Esc**.

  - **Lt/Rt**: This is the preferred down mix where the two analog outputs from the monitor are to be fed into an external professional surround decoder, amplifiers and external loudspeakers. Lo/Ro is recommended for normal monitoring while Lt/Rt mode can be used to check down mix compatibility when the user will have further surround decoding in the broadcast chain.

- **Input:** This buttons selects between the Source 1 and Source 2 inputs on the rear panel (page 8).

- **Up and Down** (with PCM Auto Mute): Parameters shown in the LCD Display may be cycled by pressing the UP and DOWN Buttons.

  The PCM Auto Mute feature is enabled by pressing the **Down** button while in normal monitor mode. If this feature is enabled, then the unit will not decode any PCM streams which may be applied to the unit in order to avoid possible transient noise bursts in the speakers when the input signal type changes between PCM and either of the encoded formats (Dolby E or Dolby Digital). This mute function enables the unit to provide more seamless switching between Dolby Audio formats.

  Pressing the **Up** button while in normal monitor mode displays the revision of the Cat558 module.

- **LCD Display**: The LCD Display indicates the particular coding format, the data width of the stream, some of the metadata, and other parameters associated with the signals being processed by the E MON-1/M.

- **MData**: When pressed, the MData button shows some of the metadata associated with the selected program.
- **Esc**: This button resets the display to show the main menu.
- **Opt**: Reserved for future use.
- **Program Select**: This button cycles through the available programs when the unit is receiving multi-program Dolby E signals. The channel LEDs above each bargraph pair light up to indicate the channels within the program being monitored.

Functional Technical Overview

The diagram in Figure 1–6 illustrates the functionality of the E MON-1/M.

Figure 1–6 E MON-1/M Block Diagram