



BM-A2-E16SHD

16 Channel Digital Audio Monitor



User's Guide

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Main features

- Eight pairs of unbalanced (BNC) digital audio (AES) inputs.
- Two auto-sensing SD/HD/3G inputs with loop-through.
- Loudness measurement to ITU-R BS.1770-2 / EBU R128
- Dolby® Digital or Dolby® E decoder.
- Dolby mix-down program select switch.
- Custom channel mix-downs for de-embedded audio channels and Dolby independent mode.
- Two groups of eight tri-colour bargraphs with selectable meter types/ballistics, colour transition points.
- Analogue line output and 8 analogue audio outputs, eight pairs of AES outputs.
- Status display.
- Headphone connector with speaker mute.

Front panel controls



Volume

The volume of the speaker and headphone output can be adjusted using this control. It can also be set to adjust analogue and line output level from the menu. Pressing the end of the control will mute the speaker audio. This can also mute the line and analogue outputs as selected in the menu.

Balance

This control will differentially adjust the level of the speaker and headphone output. Pressing the end of this control will centre the audio output.

Dolby pair select

This control will select which pair of audio inputs is applied to the Dolby decoder.

Mode select

This control will set the way in which the monitor will treat the incoming audio. The **PCM** position will treat the current audio input as straight PCM encoding and reproduce it unprocessed on the 16 available channels.

The **IND** position will decode Dolby encoded information from the selected Dolby pair and produce 8 audio outputs. These can then be mixed as required.

The positions **1** to **8** will provide a stereo mixdown of the program's encoded in the Dolby input.

Menu

Pressing the end of this control will enter the menu mode described in the *Menu* section.

Input select

Rotating this control will select one of the four audio input sources; Analogue, AES, SDI1 or SDI2.

Status display



The Status display will show general status information related to the currently selected input such as the source selected and video standard where applicable. If a Dolby input is selected and the Dolby decoder is enabled, further Dolby information will be shown as illustrated below.



Operation

Selecting sources

The input source select switch determines which source (Analogue, AES, SDI 1 or SDI 2) is available to the Dolby decoder, speaker selectors and bargraphs. AES inputs can be at 44.1 kHz or 48 kHz sampling rate.

SDI input mode

The unit automatically detects SD, HD or 3G video and provides the video mode on the Status display. The four SDI groups will be demuxed to give 16 audio signals

Dolby mode

To enable the Dolby decoder, select the '*Independent*' or '*Program*' position using the front panel switch. The unit will decode Dolby Digital and Dolby E from the AES inputs or embedded audio carried in an SDI signal.

Dolby E encoding allows several separate 'programs' or groups of audio to be carried in the same data stream. The program switch is provided to allow the individual programs to be selected and their channels directed to bargraphs.

See the section entitled, *Using the program switch* for more information about the Dolby E monitoring features available.

Decoding AES inputs

Rotate the **CHANNEL PAIR** switch to select the input carrying the Dolby encoded audio. The unit will automatically detect and decode the Dolby signals and display up to 8 audio signals on the bargraphs. The type of Dolby encoding will be shown on the display.

Decoding SDI inputs

Dolby E or Dolby Digital bit-streams embedded in a pair of audio signals in an SDI stream can be decoded with up to eight audio signals being shown on the bargraphs. The type of Dolby encoding used will be shown on the display.

Selecting the channel pair carrying the Dolby encoded signal is achieved using the **CHANNEL PAIR** rotary switch. For example, if the Dolby signal was encoded in the second pair of audio signals in SDI Group 1 this corresponds to channels 3/4 and is selected by rotating the **CHANNEL PAIR** select switch to position 3/4.

Using the PROGRAM switch

Dolby E encoding allows several separate 'programs' or groups of audio to be carried in the same data stream. The **PROGRAM** switch allows individual mix-downs and channels within a Dolby E program to be monitored. Available mix-downs are selected with the **PROGRAM** switch. The selected signal is sent to the left and right speakers and the first two bargraphs (left most looking at the front of the unit).

The following example may help to explain the facilities provided. Consider the situation where a studio wants to convey a surround sound music signal together with two technical commentaries for transmitter operators. For the surround sound component, a 5.1 configuration might be ideal since it has 5 audio channels and one LF effects channel as shown in Appendix A. However, the two independent engineering feeds (two different languages and not for transmission) can be encoded into two unused channels to give a configuration of 5.1+1+1.

The Dolby mix-down

The operator at the transmitter might want to listen to the music but not necessarily in full surround sound. Fortunately, the Dolby decoder has an internal buss, which carries a mix-down. This is a stereo signal that contains a mixture of, in this case, all 6 music signals with any phasing or special effect applied. The Dolby decoder 'knows' that the audio is encoded as 5.1+1+1. In order to listen to the engineering feeds it must be possible to direct the decoder to select the 5.1, +1 or other +1 signals and output the appropriate mix-down to the buss. The three separately encoded audio 'programs' can be selected using the PROGRAM switch. Clearly the mix-down of the +1 signals will be a simple mono signal.

When the BM-A2-E16SHD is in any of the P1 to P8 Program select modes (or Dolby Down-Mix modes), the stereo audio available on the internal buss is sent to the left and right speakers and to bargraphs 1&2.

Independent mode

All of the Dolby E audio signals can be decoded and made available on their own (i.e., not mixed) by setting the **PROGRAM** switch to the independent position (**IND**).

In the 5.1 +1 +1 example, music might be presented on bargraphs 1 to 6 and the two engineering feeds on bars 7 and 8. It is then easy to select which of these to listen to by pressing the button under the appropriate bargraph. A mix down of some or all of the channels can be obtained by selecting several audio signals to be sent to each speaker.

Note: Independent mix-down does not apply all of the phasing effects of the Dolby mix down modes.

Directing sources to speakers

Where more than two audio signals are present (i.e., Dolby E independent mode or de-embedded mode), it may be useful to direct and combine sources to selected speakers. The left speaker is indicated by a red LED and the right by a green LED on the top of the bargraphs.

To direct a particular source to the left or right speakers proceed as follows:

Repeatedly press the button under the bargraph corresponding to the input audio signal required until the top LEDs of the bargraph shows red for the left speaker, green for the right or both to direct the audio to both speakers. Each speaker can receive a mix of audio from inputs 1 to 16.

Note that the mix button assignments are retained over power-down.

Rear panel inputs

The BM-A2-E16SHD accepts SDI video, AES and analogue audio inputs. Eight differential analogue inputs are provided on a 25 way 'D' type connector. Inputs 1 and 2 are duplicated on XLR connectors and sum with the corresponding inputs from the 'D' type connector. Eight pairs of AES unbalanced inputs are available on BNC connectors. Two SD, HD, 3G auto select SDI inputs are provided.

Rear panel outputs

The BM-A2-E16SHD provides both digital and analogue audio outputs on the rear panel. Eight differential analogue outputs on a 25 way 'D' type connector and eight pairs of AES3 on BNC connectors are available. The audio carried on the AES outputs are derived from the currently selected input source (analogue, AES or SDI). In effect, these audio outputs are a copy of the signals shown on the unit's bargraphs. The analogue outputs are derived from the lower 8 inputs. They can thus be a copy of the AES inputs, two of the currently demuxed SDI groups or the eight decoded Dolby signals. Two line outputs are provided which carry the same audio as the speakers. The levels of the analogue and line outputs are adjustable in the menu. It is possible to mute the output from the unit's speakers by pressing the end of the **VOLUME** control. It is also possible to independently mute the analogue outputs and the line outputs using the volume control.

An SDI loop through is available which carries a reconstituted SDI signal from the currently selected SDI input.



Menu

Many of the characteristics of the BM-A2-E16SHD can be adjusted in the menu. When the menu is activated, by pressing the **NAV** rotary encoder, the top level of the menu will appear. The items in this level can be selected by rotating the encoder and then pressing it for approximately 0.5 seconds. The second level will then appear and the required item selected by rotating the encoder and then pressing it. At this point in the menu the value of the current parameter can be adjusted. To go back one step in the menu press and hold the encoder for longer than 1 second.

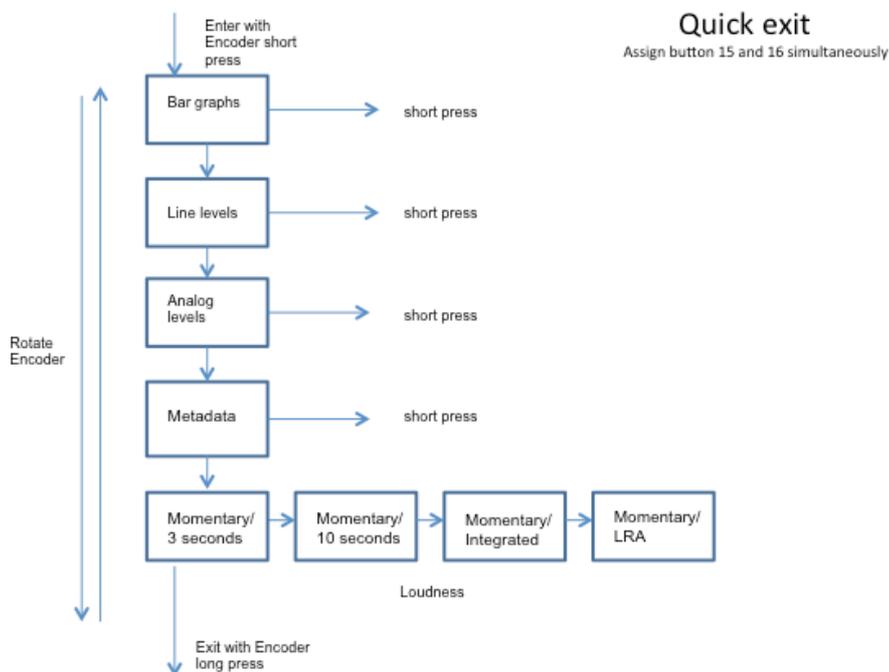
Tip: Simultaneously pressing the buttons under the bargraphs 15 and 16 will completely exit the menu.

The characteristics that can be adjusted in the menu are shown below.

Top level menu page

The top level of the menu carries the main areas of operation of the BM-A2-E16SHD that can be adjusted.

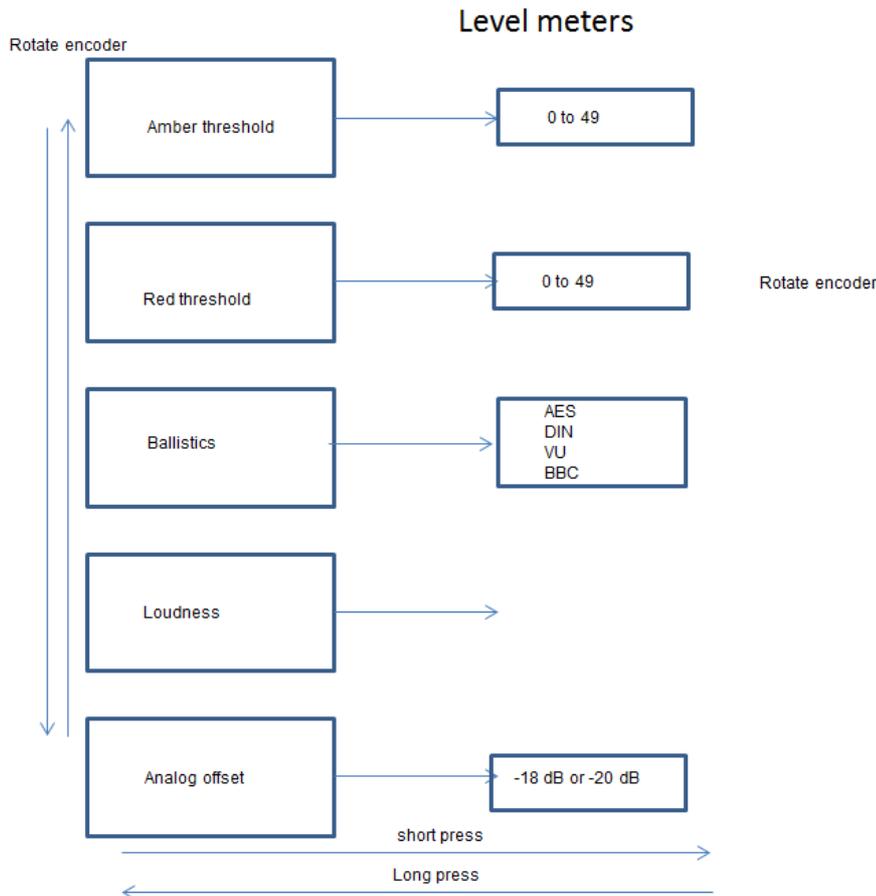
1. **Level meters** - This section allows access to the bargraph colour break points and ballistics.
2. **Line levels** - The line output level control can be selected here (either fixed level or controlled by the volume control). The line output can also be muted, or slaved to the main speaker mute control.
3. **Analogue levels** - The analogue output level control can be selected here (either fixed level or controlled by the volume control). The analogue output can also be muted, or slaved to the main speaker mute control.
4. **Dolby** - Various aspects of the Dolby operation can be accessed here.
5. **Loudness** – Rotate the encoder to display the four Loudness measurement screens.



Level Meter Adjustment

Various aspects of the audio level indication can be adjusted here.

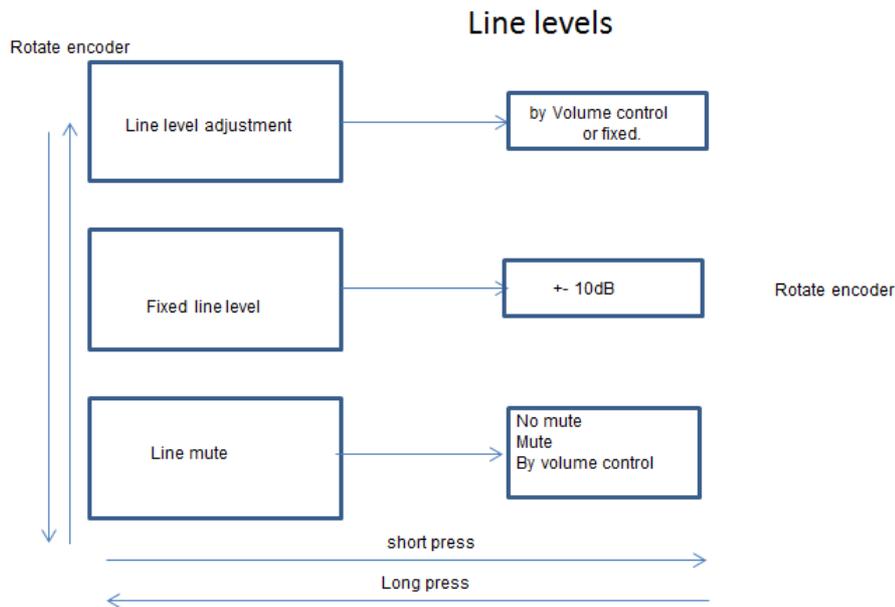
1. **Amber threshold** - The point at which the bargraph changes from green to amber can be adjusted here. Bargraph 16 is forced to full scale to allow easy control of the colour transitions.
2. **Red threshold** - The point at which the bargraph changes from amber to red can be adjusted here. Bargraph 16 is forced to full scale to allow easy control of the colour transitions.
3. **Ballistics** - The scales and dynamics of the bargraphs can be selected here. The options are AES, DIN, VU and BBC. The appropriate scales should be affixed to the front panel.
4. **Loudness** - Loudness metering will be activated here (in a subsequent revision of firmware).
5. **Analogue offset** - When an analogue input is selected and the bargraph ballistics are AES the way in which this is displayed is adjusted here. If 0 dB analogue is applied to the unit the bargraph can be configured to show either -18 dB or -20 dB.



Line level output adjustment

The audio currently selected for the two front panel speakers is also available on two XLR connectors on the rear panel. The level of these can be adjusted from this menu.

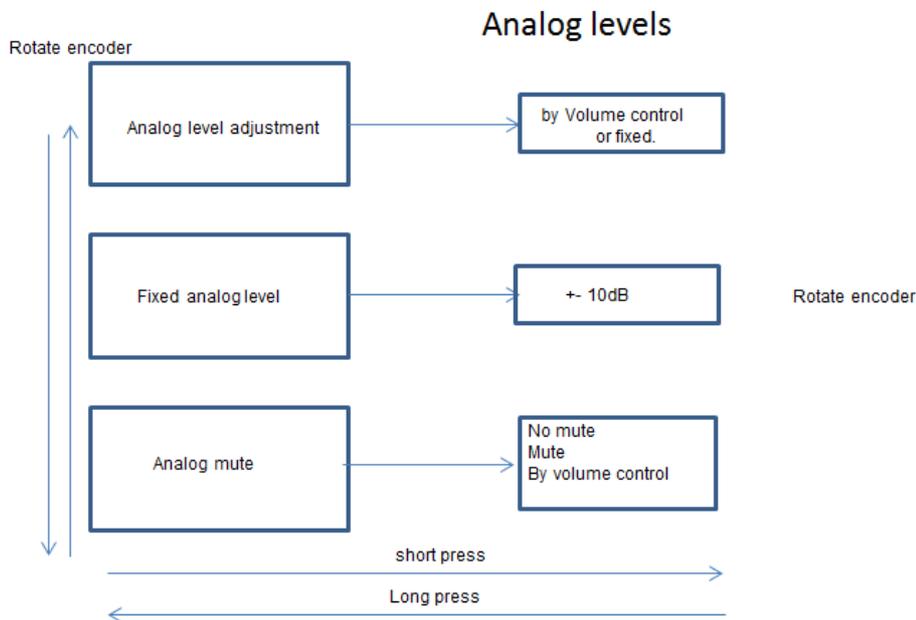
1. **Line level** - The line output level can be fixed or controlled by the front panel volume control and this can be selected here.
2. **Fixed line level** - When fixed output level is selected its level can be adjusted here.
3. **Line mute** - The line outputs can be muted here or the mute can be slaved to the front panel volume control.



Analogue output level

The audio currently showing on the lower 8 bar graphs are directed to 8 analogue outputs on a 25-way 'D' connector on the rear panel. The level of these can be adjusted here.

1. **Analogue level control** - The analogue output level can be fixed or controlled by the front panel volume control from here.
2. **Fixed analogue output level** - When fixed analogue output level is selected, its level can be adjusted here.
3. **Analogue output mute** - The analogue outputs can be muted here or the mute can be slaved to the front panel volume control.

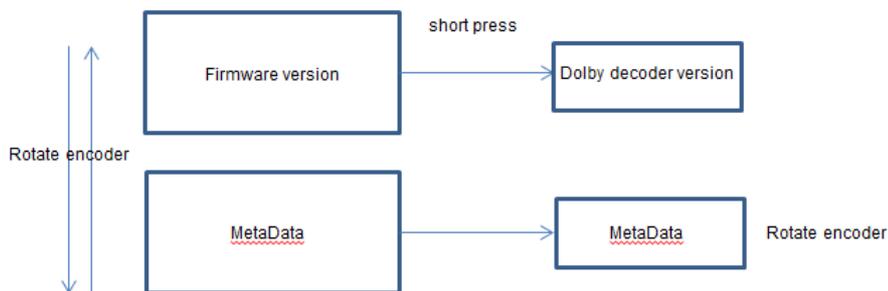


Dolby Information

The firmware version of the Dolby decoder card and MetaData information can be accessed from this menu.



Dolby information



Loudness Measurement Displays

Four displays are available to view Loudness information. Loudness measurement conforms to the ITU-R BS.1770-2 / EBU R128 standards. The upper line in all four displays represents the momentary value in LKFS/LUFS. The lower readout changes depending on the display selected. Rotating the encoder scrolls through the available measurements:

Display one: Momentary and 3 second averaging values.

Display two: Momentary and 10 second averaging values.

Display three: Momentary and Integrated values (this can be reset by moving the mode select switch between **PCM/IND** and back).

Display four: Momentary and Loudness Range (in dB)

Installation

The BM-A2-E16SHD is designed to be installed in 19 inch bays on an equipment tray. Ventilation is by natural convection.



Analogue audio inputs and outputs

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

Specifications

Audio inputs

Digital	AES3-id 8 x 75 ohm (BNC connector) Sample rate 44.1/48 kHz. Accepts SPDIF sources.
Analogue	8 differential (25-way 'D' connector). Clipping +15 dB

Audio outputs

Digital	AES3-id 8 x 75 ohm (BNC connector) sample rate 48 kHz.
Analogue	8 differential audio channels, level adjustable (25-way 'D' connector).
Line output	Copy of speaker outputs, level adjustable on 2 x XLR3M connectors.
Analogue noise	Noise+THD: -108 dB w.r.t clipping
Analogue frequency response:	20 Hz to 20 kHz \pm 1dB

Video inputs

Video format	SDI SD, HD or 3G
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Video output

1 SDI active loop-through (BNC connector).

Main drive amp

Noise +THD -80dB w.r.t. maximum output.

Speaker driver units

Peak acoustic level (@2ft)	100 dB SPL
Shielding	Magnetic

Meters

16 tri-colour LED bargraphs with adjustable colour break points and ballistics.

DIN PPM: Overall dynamic range: 55 dB (+5 to -50 dB)

Attack time: 10 mSec

Fallback: 1.5 Sec per 20 dB decay

BBC PPM: Overall dynamic range: (+12 to -12 dB from mark 7 to mark 1)

Attack time: 10 mSec

Fallback: 2.85 Sec (from mark 7 to mark 1)

VU: Overall dynamic range: 23 dB (+3 to -20 dB)

Attack time: 300 mSec

Fallback: 300 mSec

AES/EBU: Overall dynamic range: 60 dB (0 to -60 dB)

Attack time: 1 mSec

Fallback: 1.5 Sec per 20 dB decay

Dimensions

19" Rack Mount: 2U high.

Outline Dimensions: 483 mm(W) x 256 mm(D) x 89 mm(H)

Outline Dimensions: 19 inch(W) x 10 inch(D) x 3.5 inch(H)

Environmental

Temperature 0° C to 30° C Humidity 70% max (non-condensing)

Weight

6 kg (14lbs)

