



BM-AV2-SL

A/V monitor/alarm system



User's Guide

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Introduction

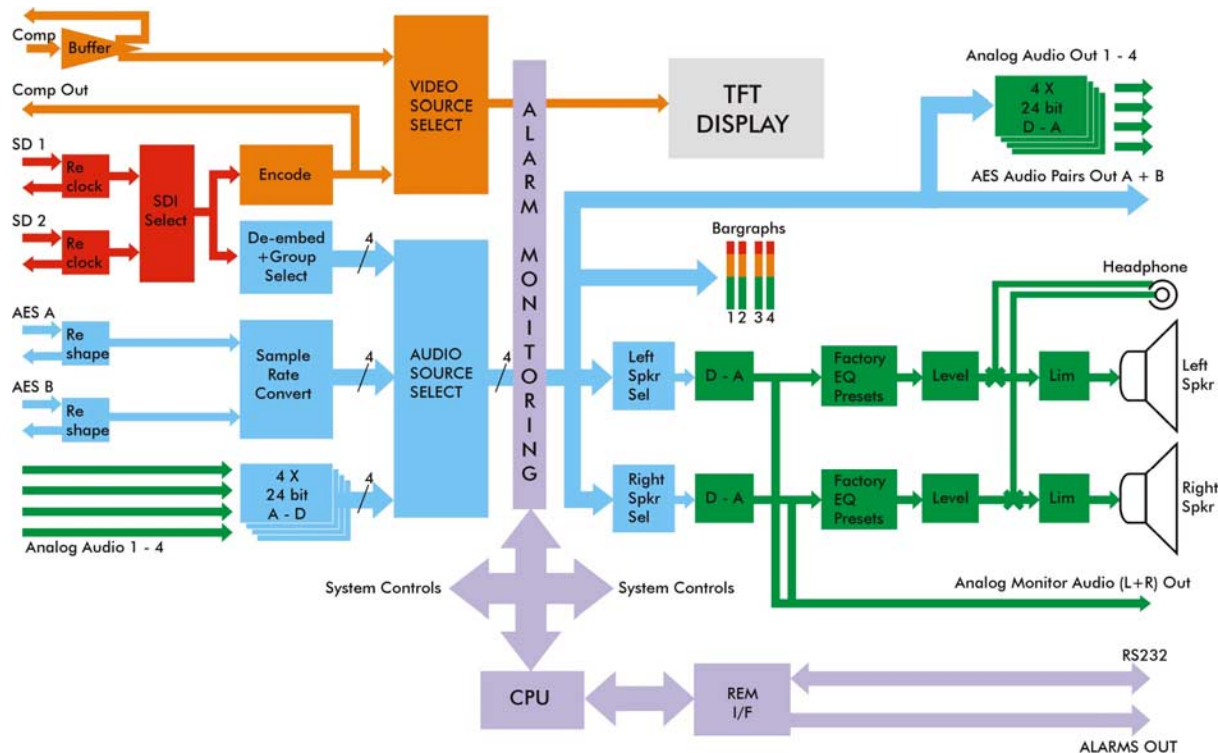
The BM-AV2-SL is a professional audio and video monitor/ alarm system housed in a 2U rack.

The unit features two speakers, a high quality four inch TFT video display, and re-shaped analog video and AES outputs. Audio input signals can be in the form of analog, AES (SPDIF) and SDI embedded data. The BM-AV2-SL accepts audio inputs in groups of 4 channels from the selected source and can direct any two from these to the speakers. Analog and AES outputs from the selected audio are also available at the rear connectors. Video input signals can be selected from a pair of SDI inputs or an analog composite input.

Alarms can be set to monitor audio-over-level, audio-loss, anti-phase and video loss.

Main features

- 2 x SDI and 1 x composite video inputs with four inch TFT color video display
- Auto PAL/NTSC detection
- SDI embedded (groups 1 – 4), 2 x AES and 2 x analog audio input pairs
- Option for balanced XLR or unbalanced BNC digital audio I/O
- High-quality, high SPL audio reproduction with soft limiting
- 4 x tri-color bargraphs with six standard scales and ballistics, adjustable color transition points and peak-hold facility
- Alarms for video/audio/AES loss, over-level and anti-phase
- AES output of selected audio input
- Line level analog audio output of sources directed to loudspeakers
- Audio follow video facility
- Selected SDI source converted to analog composite video for convenient monitoring
- Headphone connector with speaker mute
- Individually user-calibrated audio level inputs/outputs and metering
- Active re-clocked SDI outputs and re-shaped analog video and AES outputs
- Windows GUI and separate RS232 protocol for remote control of all alarm functions and audio/video switching
- TTL port for alarms reset and remote alarms indication



The BEL Digital BM-AV2-SL

All audio inputs are converted to 24 bit digital form and AES inputs are re-sampled using sample rate converters where necessary at an internally generated 48kHz. If embedded audio from a serial digital video input is selected, the sampling clock recovered from this is used instead.

The audio source switch selects which audio source is available to the speaker selectors, the bargraphs and the AES and analog audio out connectors.

The left and right speaker switches select which of the currently selected four audio channels is available at the speakers after three stages of analog processing.

The selected audio is first passed through factory preset equalization filters. Then electronic level control is then applied with the balance and volume knobs providing control voltages. Finally a soft limiter is used to protect the speakers. The headphone output is taken before the limiters and mutes the speakers when used. Alarm tone is added just before the speaker output.

A soft mute is applied to the audio when any select switches are used to reduce glitches.

Note: The alarm tone level control is mounted inside the unit and is not available from the front control panel.

Operation

The front panel user interface consists of 6 rotary controls, an alarms switch, a TFT display and four bargraphs. In addition there are four video controls for the display, a headphone output, two LEDs for sustained anti-phase, and six status LEDs.



The BM-AV2-SL front control panel

Selecting sources

The audio source switch selects which group of audio sources is available to the speaker selectors, the bargraphs and the AES and analog audio out connectors. The possible choices are analog, AES A + B, embedded groups 1 to 4 from either SD1 or SD2 or Audio Follow Video (AFV). The video source switch determines which SD input audio is de-embedded from.

The AFV position establishes the follow mode, where the audio is automatically selected depending on the position of the video source switch. For example, composite video selection will cause analog audio to be selected, SD1 will allow group 1 of the SD1 serial digital input to be monitored and SD2 will monitor group 1 from the SD2 serial digital video input.

The REM or remote position of the video source switch forces BM-AV2-SL to be controlled from the serial port. Any serial commands will then take precedence over the front control panel.

Note: If an SD video source is selected using the video source switch, that input will provide de-embedded audio. If the video source switch is in the composite position (or REM with no active remote video selection) and an SD audio source is selected, then audio groups 1 to 4 are taken from SD1.

Using alarms

BM-AV2-SL can provide warnings of several input signal conditions:

Signal condition	Notes	Alarm indication
Invalid video input	There is a delay of 300 milliseconds before generating an invalid video alarm to allow for input switching.	Audio tone All top red bargraph segments flash red TTL/serial alarm
Audio loss	The currently selected four audio channels are monitored for persistent under-level. An alarm is generated when an input is < -30dB (-50dB for AES meter) for more than 15 seconds.	Audio tone Bottom bargraph segment flashes amber TTL/serial alarm
Audio-over-level	The currently selected four audio channels are monitored for transient over-level. An alarm is generated immediately when the first red segment of the relevant bargraph is illuminated.	Audio tone Bottom bargraph segment flashes red TTL/serial alarm
Audio anti-phase	Audio pairs 1&2 and pairs 3&4 are monitored for sustained anti-phase.	Audio tone Appropriate phase LED illuminates TTL/serial alarm

Button functions

Note: The over-level alarm threshold can be adjusted by moving the red bar transition point. To prevent the anti-phase detector from generating intermittent alarms, only persistent anti-phase conditions are used to raise an external alarm or generate an audio tone. An alarm is generated when an anti-phase condition exists for more than 10 seconds.

Alarm arming

The alarms available using the front panel toggle switch are audio loss, audio over-level and video-loss. No alarms are generated unless alarm functions have been 'armed'.

The front panel alarm toggle switch has four functions:

1. Upper position held – ALARM RESET - any armed input alarms are cleared
2. Upper position momentary – resets bargraph peak-level indicators
3. Middle position – OFF/MUTE - the internal audible alarm is muted
4. Lower position – SET - alarm functions are selectively armed

The switch must be held in the upper ALARM RESET position for more than 3 seconds for a reset to occur.

In the lower SET position the inputs currently active are automatically detected and the appropriate alarms are selectively enabled. The unit is then set to monitor only the active inputs. The SET function can be disabled using a serial command.

If alarms are present, moving the toggle switch to the center position will stop the audible alarm, but retain the visual alarm indications and TTL/serial alarm outputs. The switch must be held in the ALARM RESET position for more than 3 seconds for all alarms to be cleared.

The center position is the recommended position when alarm indication is not required.

Note: Restoring input signals to normal condition does not clear alarms.

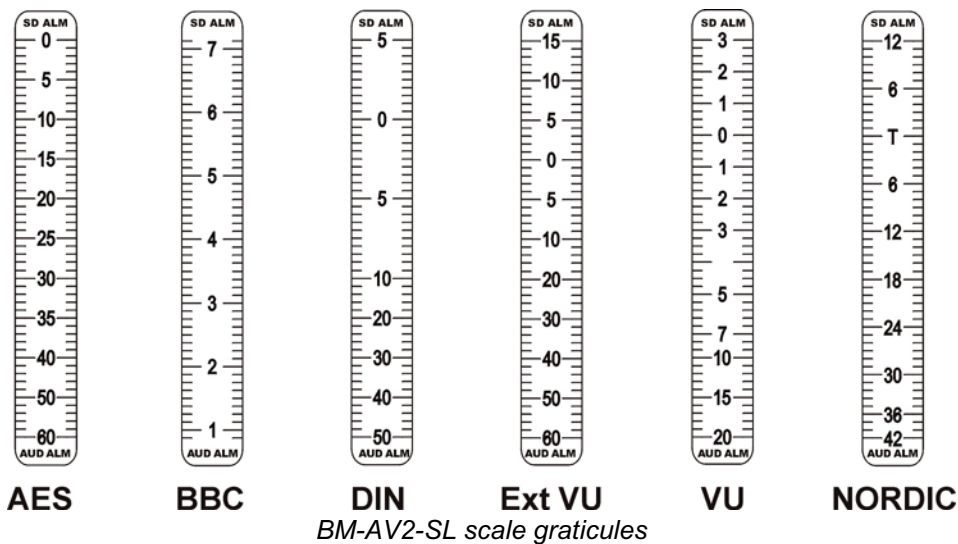
Bargraph scales

The following bargraph ballistics may be selected using internal switches.

Scale type	Range	Attack	Fallback
AES/EBU:	60dB (0 to -60dB)	1ms	1.5Sec per 20dB decay
DIN PPM:	55dB (+5 to -50dB)	10mSec	1.5Sec per 20dB decay
VU:	23dB (+3 to -20dB)	300mSec	300mSec
BBC PPM:	+12 to -12dB - mark 7 to 1	10mSec	2.85Sec - mark 7 to 1
VU EXT:	80dB (+20 to -60dB)	300mSec	300mSec
NORDIC:	54dB (+12 to -42dB)	5mSec	1.7Sec per 20dB decay

BM-AV2-SL scale ballistics

Stick-on scale graticules, which may be applied to the space between the front-panel bargraphs, are supplied with the machine.



Note: Bargraph color transition points and peak hold decay may also be adjusted internally.

Refer to the Configuration chapter for switch settings and graticule fitting instructions.

Installation

The BM-AV2-SL 2U frame may be installed in 19 inch bays with 300mm depth including typical cable and connector depth. Ventilation is by natural convection and there are vents at each side and on the top and bottom covers of the unit.

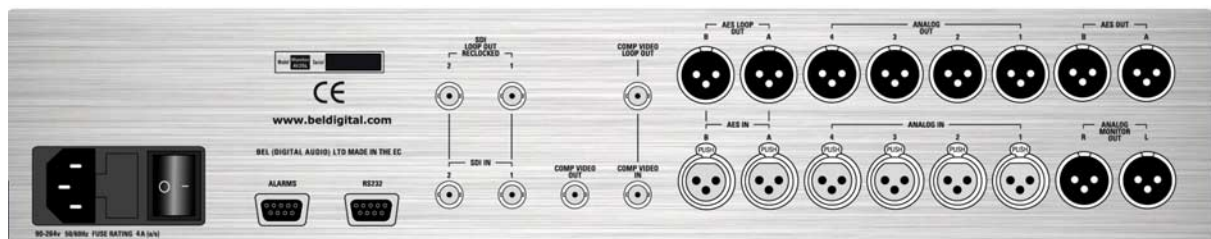
Frames may be installed into bays, providing airflow through these vents is not impeded.



The 2U BM-AV2-SL frame showing ventilation slots

Connector I/O

All connections, with the exception of the headphone socket, are provided on the rear panel of the frame. Video inputs and outputs use BNC connectors and all data connectors use 9 way 'D' type connectors.



The BM-AV2-SL balanced audio version rear view

Digital audio I/O may be supported with either XLR connectors for balanced audio or BNCs for unbalanced audio, depending on the BM-AV2-SL version.

Alarms connector pinout

Connector type: 9 way sub-D female

Pin	Description
1	Audio alarm out (TTL compatible active high)
2	Video alarm out (TTL compatible active high)
3	Reset in (TTL compatible active low)
4	GND
5	Not connected
6	Not connected
7	Not connected
8	Not connected
9	Not connected

Note: TTL outputs can supply up to 10mA.

RS232 Host interface connector pinout

Connector type: 9 way D female

Speed: 9600 bps

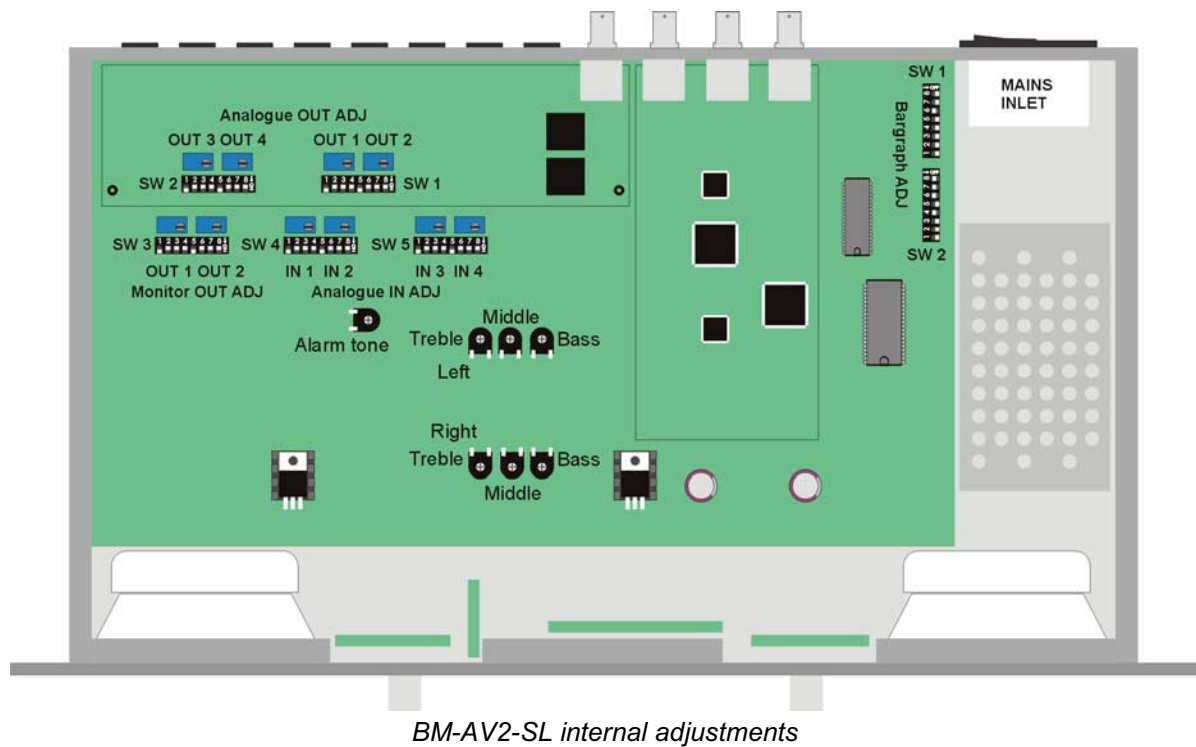
Format: 8 bit, no parity, 2 stop bits

Pin	Description
1	Not connected
2	Rx (from host)
3	Tx (to host)
4	Not connected
5	GND
6	Not connected
7	Not connected
8	Not connected
9	Not connected

Note: A null-modem lead will be required to interface to a PC. See the MonitorMx software chapter for more details.

Configuration

Access to BM-AV2-SL internal adjustments is obtained with the top removed.



The following adjustments may be made:

- Monitor output level – SW3/potentiometers main board
- Analog output level – SW1 and SW2/potentiometers output sub-board
- Analog input level – SW4 and SW5/potentiometers main board
- Bargraph settings – SW1 and SW2 main board, near power supply
- Alarm tone – RV7 main board

Warning: Configuration instructions are for trained personnel. To avoid dangerous electric shock, do not remove any covers or carry out adjustments unless qualified to do so.

Adjusting analog input level

In the following tables, ON is obtained with a switch lever in the DOWN position. The adjustments are located on the main board under the output sub-board.



Analog input adjustments – 0dB setting shown

SW4	Anlg Input	Setting when ON
1	1	0 dB (0dBu in = 0 on analog scale)
2	1	4 dB (+4dBu in = 0 on analog scale)
3	1	8 dB (+8dBu in = 0 on analog scale)
4	1	Variable – adjacent pot* –10 to +12 dB
5	2	0 dB (0dBu in = 0 on analog scale)
6	2	4 dB (+4dBu in = 0 on analog scale)
7	2	8 dB (+8dBu in = 0 on analog scale)
8	2	Variable – adjacent pot* –10 to +12 dB

SW5	Anlg Input	Setting when ON
1	3	0 dB (0dBu in = 0 on analog scale)
2	3	4 dB (+4dBu in = 0 on analog scale)
3	3	8 dB (+8dBu in = 0 on analog scale)
4	3	Variable – adjacent pot* –10 to +12 dB
5	4	0 dB (0dBu in = 0 on analog scale)
6	4	4 dB (+4dBu in = 0 on analog scale)
7	4	8 dB (+8dBu in = 0 on analog scale)
8	4	Variable – adjacent pot* -10 to +12 dB

Note: It is intended that only one switch lever is set ON for each analog input.

The ON position is obtained with a switch lever in the direction of the arrow (downward in the above drawing).

*Clockwise rotation increases gain.

Adjusting analog output level

In the following tables, ON is obtained with a switch lever in the DOWN position. The adjustments are located on the output sub-board at the rear of the unit.



Analog out adjustments – 0dB setting shown

SW2	Anlg Output	Setting when ON
1	1	0 dB (0 on analog scale = 0dBu on output)
2	1	4 dB (0 on analog scale = +4dBu on output)
3	1	8 dB(0 on analog scale = +8dBu on output)
4	1	Variable – adjacent pot* 0 to +12 dB
5	2	0 dB (0 on analog scale = 0dBu on output)
6	2	4 dB (0 on analog scale = +4dBu on output)
7	2	8 dB(0 on analog scale = +8dBu on output)
8	2	Variable – adjacent pot* 0 to +12 dB

SW1	Anlg Output	Setting when ON
1	3	0 dB (0 on analog scale = 0dBu on output)
2	3	4 dB (0 on analog scale = +4dBu on output)
3	3	8 dB(0 on analog scale = +8dBu on output)
4	3	Variable – adjacent pot* 0 to +12 dB
5	4	0 dB (0 on analog scale = 0dBu on output)
6	4	4 dB (0 on analog scale = +4dBu on output)
7	4	8 dB(0 on analog scale = +8dBu on output)
8	4	Variable – adjacent pot* 0 to +12 dB

Note: It is intended that only one switch lever is set ON for each analog output.

The ON position is obtained with a switch lever in the direction of the arrow (downward in the above drawing).

*Clockwise rotation increases gain.

Adjusting audio monitor output level

In the following tables, ON is obtained with a switch lever in the DOWN position. The adjustments are located on the main board under the output sub-board.



Analog monitor output adjustments – 0dB setting shown

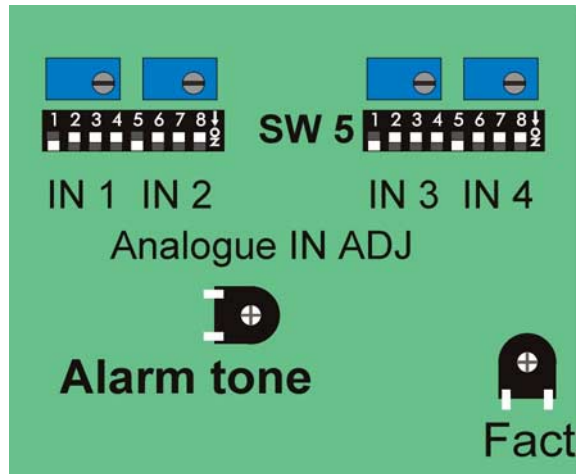
SW3	Monitor Output	Setting when ON
1	Left	0 dB (0 on analog scale = 0dBu on output)
2	Left	4 dB (0 on analog scale = +4dBu on output)
3	Left	8 dB (0 on analog scale = +8dBu on output)
4	Left	Variable – adjacent pot* 0 to +12 dB
5	Right	0 dB (0 on analog scale = 0dBu on output)
6	Right	4 dB (0 on analog scale = +4dBu on output)
7	Right	8 dB (0 on analog scale = +8dBu on output)
8	Right	Variable – adjacent pot* 0 to +12 dB

Note: It is intended that only one switch lever is set to ON for each monitor output. The ON position is obtained with a switch lever in the direction of the arrow (downward in the above drawing).

*Clockwise rotation increases gain.

Adjusting alarm tone

The alarm tone adjustment is located near the analogue input controls.

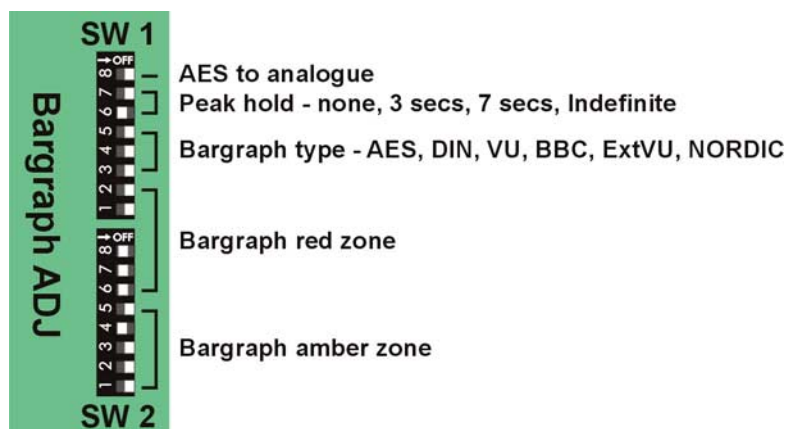


Alarm tone adjustment

Control	Effect of clockwise rotation
Alarm tone	Decrease alarm level

Adjusting bargraph break-points and ballistics

The adjustments, SW1 and SW2 are located near the power supply.



BM-AV2-SL bargraph adjustments

SW1-8	AES to analog adjust
OFF	-18dBFS = 0 on analog scale
ON	-20dBFS = 0 on analog scale

The -18dB and -20dB settings define the correspondence between AES input level and the 0 mark on an analog scale. This allows analog scales to be used with digital signals.

Note: When digital inputs are used with an analogue scale the analogue outputs will be less than that indicated on the meters since the digital to analogue converters clip at +15 dB. The effective loss is -3dB when the 18 dB position is selected and -5dB when the 20 dB position is selected.

SW1-7	SW1-6	Peak hold decay
OFF	OFF	None (Off)
OFF	ON	3 seconds
ON	OFF	7 seconds
ON	ON	Indefinite

SW1-5	SW1-4	SW1-3	Scale type
OFF	OFF	OFF	AES
OFF	OFF	ON	DIN
OFF	ON	OFF	VU
OFF	ON	ON	BBC
ON	OFF	OFF	Extended VU
ON	OFF	ON	NORDIC
ON	ON	OFF	No scale
ON	ON	ON	No scale

Note: The OFF position is obtained with a switch lever in the direction of the arrow, (to the right in the above drawing).

Each bargraph has 53 tri-color segments. The top and bottom segments are reserved as alarm indicators leaving 51. Up to 31 of the remaining top most segments may be colored red. Up to 31 of segments from the end of the red zone downward may be colored amber. The remaining segments (if any) are always green.

Choosing how many segments are colored red from the top of the bargraph sets the 'red zone'. Select from none to 31 using SW1-2, SW1-1, SW2-8, SW2-7 and SW2-6 as follows:

SW1-2	SW1-1	SW2-8	SW2-7	SW2-6	Segment from bargraph top
OFF	OFF	OFF	OFF	OFF	None
OFF	OFF	OFF	OFF	ON	1
OFF	OFF	OFF	ON	OFF	2
OFF	OFF	OFF	ON	ON	3
OFF	OFF	ON	OFF	OFF	4
OFF	OFF	ON	OFF	ON	5
OFF	OFF	ON	ON	OFF	6
OFF	OFF	ON	ON	ON	7
OFF	ON	OFF	OFF	OFF	8
OFF	ON	OFF	OFF	ON	9
OFF	ON	OFF	ON	OFF	10
OFF	ON	OFF	ON	ON	11
OFF	ON	ON	OFF	OFF	12
OFF	ON	ON	OFF	ON	13
OFF	ON	ON	ON	OFF	14
OFF	ON	ON	ON	ON	15
ON	OFF	OFF	OFF	OFF	16
ON	OFF	OFF	OFF	ON	17
ON	OFF	OFF	ON	OFF	18
ON	OFF	OFF	ON	ON	19
ON	OFF	ON	OFF	OFF	20
ON	OFF	ON	OFF	ON	21
ON	OFF	ON	ON	OFF	22
ON	OFF	ON	ON	ON	23
ON	ON	OFF	OFF	OFF	24
ON	ON	OFF	OFF	ON	25
ON	ON	OFF	ON	OFF	26
ON	ON	OFF	ON	ON	27
ON	ON	ON	OFF	OFF	28
ON	ON	ON	OFF	ON	29
ON	ON	ON	ON	OFF	30
ON	ON	ON	ON	ON	31

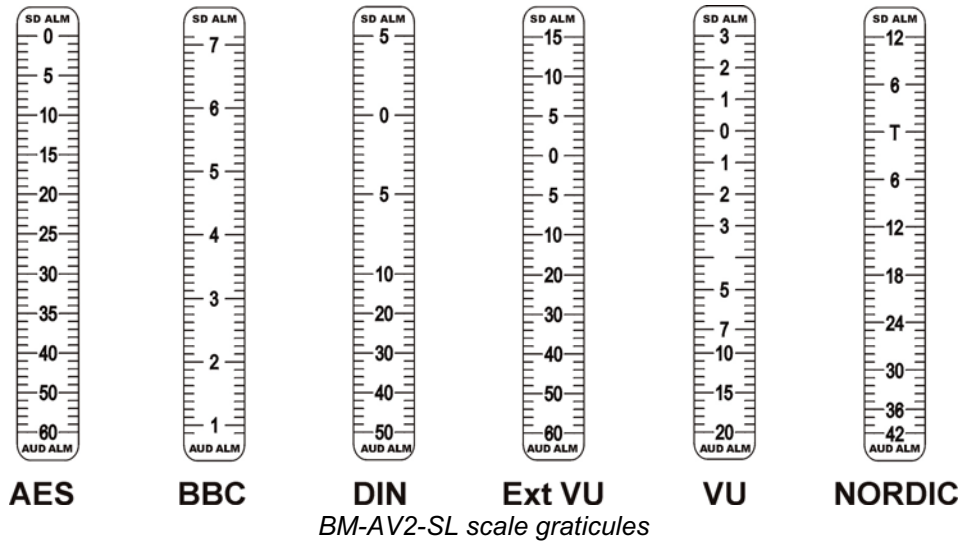
Note: It is not possible to set 31 red *and* 31 amber segments, since there are only 51 segments for level display purposes.

Choosing how many segments are colored amber from the end of 'red zone' sets the 'amber zone'. Select from none to 31 using SW2-5, SW2-4, SW2-3, SW2-2 and SW2-1 as follows:

SW2-5	SW2-4	SW2-3	SW2-2	SW2-1	Segment from last RED ZONE
OFF	OFF	OFF	OFF	OFF	None
OFF	OFF	OFF	OFF	ON	1
OFF	OFF	OFF	ON	OFF	2
OFF	OFF	OFF	ON	ON	3
OFF	OFF	ON	OFF	OFF	4
OFF	OFF	ON	OFF	ON	5
OFF	OFF	ON	ON	OFF	6
OFF	OFF	ON	ON	ON	7
OFF	ON	OFF	OFF	OFF	8
OFF	ON	OFF	OFF	ON	9
OFF	ON	OFF	ON	OFF	10
OFF	ON	OFF	ON	ON	11
OFF	ON	ON	OFF	OFF	12
OFF	ON	ON	OFF	ON	13
OFF	ON	ON	ON	OFF	14
OFF	ON	ON	ON	ON	15
ON	OFF	OFF	OFF	OFF	16
ON	OFF	OFF	OFF	ON	17
ON	OFF	OFF	ON	OFF	18
ON	OFF	OFF	ON	ON	19
ON	OFF	ON	OFF	OFF	20
ON	OFF	ON	OFF	ON	21
ON	OFF	ON	ON	OFF	22
ON	OFF	ON	ON	ON	23
ON	ON	OFF	OFF	OFF	24
ON	ON	OFF	OFF	ON	25
ON	ON	OFF	ON	OFF	26
ON	ON	OFF	ON	ON	27
ON	ON	ON	OFF	OFF	28
ON	ON	ON	OFF	ON	29
ON	ON	ON	ON	OFF	30
ON	ON	ON	ON	ON	31

Inserting bargraph graticules

The following bargraph scale graticules are supplied with each BM-AV2-SL:



To apply a graticule proceed as follows:

- peel back the protective backing from the chosen graticule
- apply the graticule to the space between a pair of bargraphs
- repeat the process for the other bargraph graticule position
- ensure that the bargraph setting matches the graticule
- adjust the color transitions and peak hold decay as desired

Using MonitorMx software

The MonitorMx remote control and status software has been provided to ease the task of operating and monitoring one or more BM-AV2 units from remote locations.

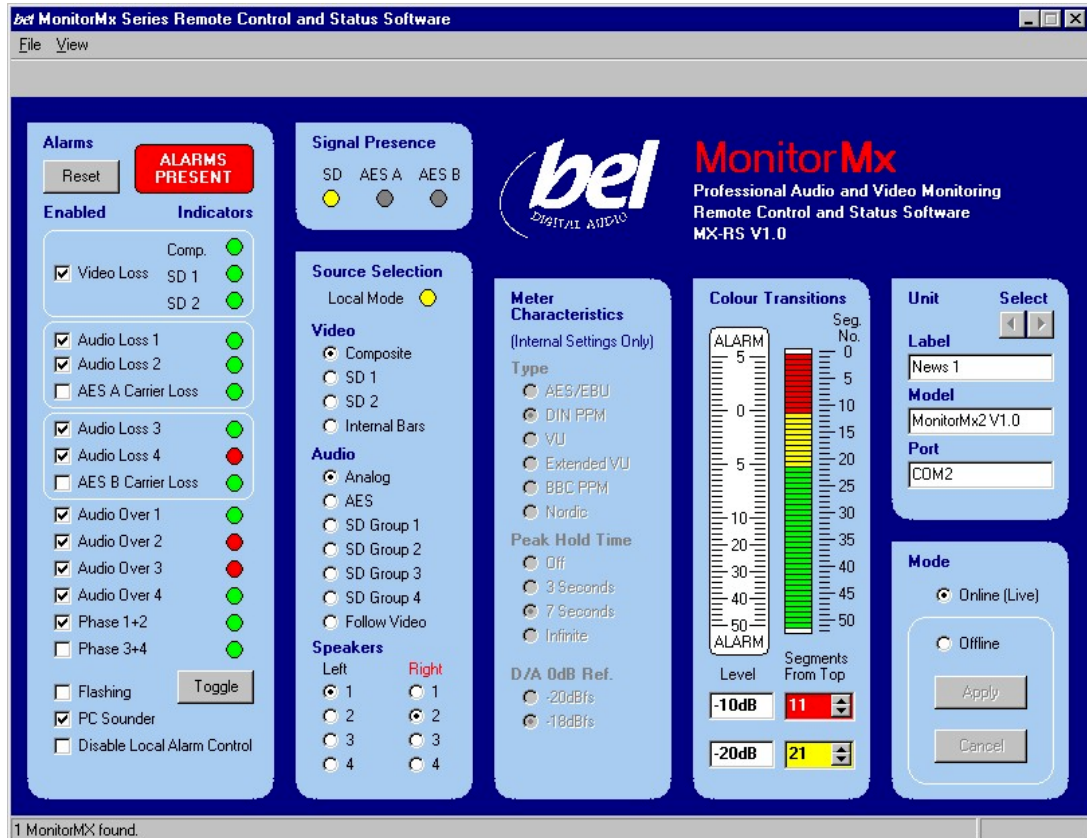
Main Features

- Fifteen alarm categories
- Signal presence
- Support for multiple BM-AV2 units
- Automatic model detection and custom unit names
- Reads selected meter ballistics
- Full editing of scale transition points and peak hold characteristics
- Visual and aural alarms
- Individual and system alarm reset
- Disable option for local controls

The MonitorMx software will run on Windows 98 Second Edition, Windows NT4 and Windows 2000. It will not run on Windows 95 or Windows 98 First Edition.

MonitorMx software operation

The MonitorMx application provides monitoring of video and audio alarm status for any local BM-AV2 frame or multiple-frame system.



MonitorMX main screen

Running MonitorMx software for the first time

The MonitorMx software will search automatically for BM-AV2 frames connected to the serial ports of the PC the software is running on when the application loads. The Alarms Present indicator will illuminate red if any of the connected frames are generating alarms. Individual alarms and alarm configuration will only be shown for selected frames.

MonitorMx will not interrogate or connect to frames on a network.

Viewing connected frames

To view connected frames use the unit select box or select List Devices under the view menu.

Configuring alarms

To enable alarms on a selected BM-AV2 frame, check the alarm categories at the left of the main screen. Toggle inverts the selection. If an alarm is generated the associated virtual LED will change from green to red and will flash if the Flashing box has been checked. If PC Sounder has been checked an audio alert will also be sent to a sound card and any connected speakers if fitted.

System alarms

The Systems Alarms command under the View menu will bring up the systems alarms window.



The MonitorMX system alarms

System alarms are alarms generated by any connected frame. Controls are provided to reset alarms from all frames and to enable visual alarm flashing and audible alerts for alarms generated from any connected frames.

Resetting alarms

Alarms are not automatically cancelled when a monitored signal is restored to normal. To cancel alarms click on a Reset button for an individual frame or for all frames using the Reset button in the Systems Alarms window.

Muting alarms

An audio alert in the form of a **.wav** file can be sent to any sound card and connected speakers. Mute the alarm by un-checking the PC Sounder box for an individual frame or for all frames using the Systems Alarms window.

Notes: Un-checking the PC Sounder box does not affect audible alarms on any BM-AV2 frame(s).

The selective SET function of the front control panel is not required, since any alarm may be selected individually.

Source selection

The source selection check boxes will only function if the Video Source switch on the selected unit's front panel is in the REM (remote) position. The source selection is the same as that obtained at the front control panel with the addition of a color bar test signal. Selecting color bars does not affect the current audio source selection.

Meter characteristics

The meter type, peak hold time and the digital to analog reference setting are read when the software loads and can only be changed from the internal switches in the BM-AV2 frame.

Color transitions

Each bargraph has 53 tri-color segments. The top and bottom segments are reserved as alarm indicators leaving 51. Up to 31 of the remaining top most segments may be colored red. Up to 31 of segments from the end of the red zone downward may be colored amber. The remaining segments (if any) are always green.

The red and amber sections of the selected bargraph scale may be adjusted by changing the values in the spin boxes provided. Be careful not to erase red zone segments with the amber control.

Tip: Use the Off-line mode to make configuration changes. Click apply or go online when ready.

Disabling local control

The local controls of a selected frame may be disabled by checking the 'Disable Local Control' check box.

MonitorMx software installation

The MonitorMx Remote Control and Status software is designed for the Bel Series of professional audio and video monitor units.

The MonitorMx software **MUST** run on the same PC that the BM-AV2 unit(s) are physically connected to.

Minimum pre-requisites:

- A PC with Windows 98 Second Edition, NT4 with SP 5 or higher or Windows 2000
- An RS232 serial connection from the PC to at least one BM-AV2 frame
- A sound card and connected speakers to hear the audio alert siren .wav file

Notes: Additional serial ports (up to four in total) may be required on the host PC for additional frames.

Serial cable

Null-Modem cable from BM-AV2 RS232 port to PC RS232 port

BM-AV2 RS232 9 pin female 'D' connector	RS232 PC port 9 pin female 'D' connector	RS232 PC port 25 pin female 'D' connector
2 (Rx)	3	2
3 (Tx)	2	3
5	5	7

Note: A standard screened null-modem cable should be adequate however pin numbers not shown, do not need to be wired. The screen is normally wired to ground via the 'D' connector metalwork.

To install the MonitorMx software proceed as follows:

- To view all of the application window, set graphics resolution to at least 800 x 600
- Remove any previous version of the software using the Add/Remove Programs application in the Windows Control Panel
- Insert the supplied CD and the installation should start immediately – if it does not, run the **setup.exe** file on the CD
- Obey any installation program prompts and restart the PC if prompted

If successful, the installation program will install a BEL Digital program group. Run the program from the program group using Start>Programs>BEL Digital>MonitorMx. Please see the Operation chapter for an explanation of program features.

BM-AV2 serial protocol

Overview

Commands to be communicated to the remote unit (BM-AV2) are arranged in frames. These frames will then be sent to the remote unit, which will always reply with either ACK for acceptance or NAK for rejection. Any requested reply then follows in the same frame format.

Frame format

The frame starts with a start character 0xAA (alternating ones and zeros). This is followed by the destination address, the source address, the command code, the data count, the data, a checksum and an end flag 0xFE.

- Start Flag 0xAA
- Destination Address
- Source Address
- Command
- Data Count
- Data
- Checksum
- End Flag 0xFE

Start Flag:

The start flag 0xAA may be sent at any time. If sent during a frame this will cause the frame to effectively restart.

Destination Address:

This should be set to 1.

Source Address:

This should be set to 1.

Command:

This character is the command for the remote unit and must fall in the range 0X80 to 0XEF. More details of the relevant codes are shown below.

Data count:

This is the total number of data bytes following, up to a maximum of 127.

Data:

The data required for the command is carried here. Each character can have a value of 0X00 to 0X7F i.e. 7 bits.

Checksum:

This is the modulo sum of the characters in the frame between the destination address and the last data character inclusively. It is calculated thus:

```
DO
{
checksum = (character+checksum) AND 0x7F
}
FOR ALL CHARACTERS IN FRAME.
```

End Flag:

A character 0XFE ends the frame.

Commands

Commands from the remote controller to the BM-AV2-SL.

Code(Hex)	Function	Reply
80	General prompt for a reply	C0 - ACK (OK) C1 - NAK (send again)
81	Use first data char as a second command	ACK
82	Request unit identifier	C2.
83	Set up switches Data count =5 See below for format	ACK
84	Set up alarm functions Data count=2 See below for format	ACK
85	Request Detail	C5
86	Request Switches	C6

Replies

Replies, when requested (e.g. 82), will consist of frames that contain the original command value plus 0X40. So a request for an ident, 0x82, will elicit a reply of a frame containing 0xC2 and the ident string. (BM-AV2-SL Vn.n)

Data formats

General Prompt (0x80)

This command will cause the BM-AV2 to respond with an ACK or NACK reply. It can be used to poll the BM-AV2 for alarms.

Set up switches (0x83)

This command will operate only when the video select switch on the unit front panel is in the remote position. It does, however, set up the BM-AV2 internal remote commands even when the unit is not in remote mode. Selecting the remote setting on the video select switch will activate these commands.

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0				Ms bit of Video select	Video select	Ms bit of Audio select	Audio select	Audio select
Byte 1				Color bar enable	Ms bit of Right speaker select	Right speaker select	Ms bit of Left speaker select	Left speaker select
Byte 2				Ms Red zone	Red zone	Red zone	Red zone	Red zone
Byte 3				Ms amber zone	Amber zone	Amber zone	Amber zone	Amber zone
Byte 4			AES offset	Ms Peak type	Peak type	Ms bar type	Bar type	Bar type

Audio select codes

Code	Function
000	Analog audio input selected
001	AES audio input selected
010	SDI audio group 1 selected
011	SDI audio group 2 selected
100	SDI audio group 3 selected
101	SDI audio group 4 selected
111	Audio follows video selection

Video select codes

Code	Function
00	Composite video input selected
01	SDI 1 input video selected
10	SDI 2 input video selected
11	Remote position of switch

Left and right speaker select codes

Code	Function
00	Select audio input 1
01	Select audio input 2
10	Select audio input 3
11	Select audio input 4

Color bar generator

Setting this bit will replace the current SDI image with color bars.

Red zone data

The numerical value of the five bits of the red zone data corresponds to the length of the red zone. The origin of the red zone is the top of the bar graph.

Amber zone data

The numerical value of the five bits of the red zone data corresponds to the length of the amber zone. This zone is 'attached' to the bottom of the red zone.

Bar type

These 3 bits select the bar ballistics and type.

Code	Bar type
000	AES
001	DIN
010	VU
011	BBC
100	Extended VU
101	Nordic

Bar peak indicator

These two bits select the peak indicator timing.

Code	Time
00	No peak indicator
01	3 Second hold time
10	7 Second hold time
11	Indefinite hold time

AES offset

This bit selects the bar graph offset when AES is input to an analog bar graph.

Code	Function
0	-18dB
1	-20dB

Set up alarms (0x84)

Bit 6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	
Byte 0	Reset	Auto	Video	Audio Channel 4	Audio Channel 3	Audio Channel 2	Audio Channel 1
Byte 1	Toggle Disable	Anti-Phase 3/4	Anti-Phase 1/2	Over-level 4	Over-level 3	Over-level 2	Over-level 1

The Auto bit will cause the BM-AV2 to generate spontaneous ACK signals every second while an alarm is active. The toggle disable bit will inhibit the set-up function of the front panel toggle switch.

Request Detail (0x85)

This command will cause the BM-AV2 to respond with a frame containing the command 0XC5 and data describing the state of the unit and any alarms.

	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0			Ms bit of Video select	Video select	Ms bit of Audio select	Audio select	Audio select
Byte 1 Alarms			Video	Audio loss 4	Audio loss 3	Audio loss 2	Audio loss 1
Byte 2 Alarms		Anti-phase 3/4	Anti-phase 1/2	Audio over-level 1	Audio over-level 1	Audio over-level 1	Audio over-level 1
Byte 3	Ms bit of Video Standard code	Video Standard code	Video Standard code	Video Standard code	AES 2 lock	AES 1 lock	SDI lock
Byte 4				Embedded 4	Embedded 3	Embedded 2	Embedded 1
Byte 5			Armed Video	Armed Audio loss 4	Armed Audio loss 3	Armed Audio loss 2	Armed Audio loss 1
Byte 6		Armed Anti-phase 3/4	Armed Anti-phase 1/2	Armed Audio over-level 4	Armed Audio over-level 3	Armed Audio over-level 2	Armed Audio over-level 1

Request Current switch settings (0X86)

This command will cause the BM-AV2 to respond with a frame containing the command 0XC6, data describing the settings of the front panel and internal switches.

The data will be returned in the same format as the set up switch command. (0X85) The remote state is indicated by the value 3 for the video switch.

ACK format

ACK is a standard frame with command 0xC0 and one data byte. This byte contains brief alarm and status information.

Byte 0	SDI lock	AES2 lock	AES1 lock	Remote mode	Auto	Video Alarm	Audio Alarm
--------	----------	-----------	-----------	-------------	------	-------------	-------------

NACK format

A reply indicating that an error occurred communicating with the MM2 it carries the command 0xC1. Brief error information is carried in two data bytes.

Byte 0	Error message value
Byte 1	Erroneous checksum character

Error message values

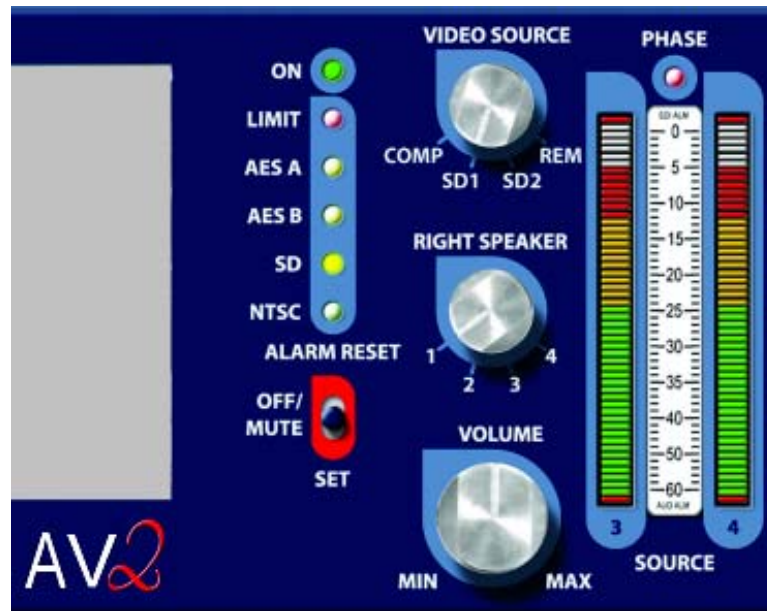
Value	Message
1	A time out occurred after receipt of a valid start character
2	A character was detected before receipt of a start character.
3	A checksum error occurred. The erroneous value is placed in Byte 1

RS232 format

8 data bits, no parity, 2 stop bits, 9600 Baud.

Problem solving

The front panel provides six status LEDs.



The BM-AV2-SL status LEDs

The status LEDs have the following functions:

- ON – lights green when the unit is powered and switched on
- LIMIT – lights yellow to indicate that the soft limiter is protecting the speakers
- AES A/B – lights yellow to indicate presence of the AES A and/or AES B inputs
- SD – lights yellow to indicate presence of selected SD input
- NTSC – lights red when composite or SD NTSC input detected

Sample problems and their solutions

There is no power to the unit

Check the power cabling and the integral fuse in the IEC mains socket at the rear of the frame.
Check that the power switch at the rear is in the on position.

The display is too bright or too dim

Adjust the TFT brightness and or contrast with a small screwdriver in the BRT (brightness) and PIC (contrast) controls adjacent to the display.

The display color saturation is incorrect

Adjust the TFT color with a small screwdriver in the COL (color) control adjacent to the display.

The display colors or hue are incorrect (NTSC only)

Adjust the display tint or hue with a small screwdriver in the TNT (tint) control adjacent to the display.

The bargraph display does not have the desired ballistics or color transition points

Check that the appropriate scale and color transition points have been selected with the internal DIL switches.

Check that the chosen ballistics setting and bargraph scale graticules match.

An alarm continues to sound even though normal signals have been restored

Mute the alarm with the ALARM MUTE switch or reset all alarms with the ALARM RESET switch by holding it upwards for more than 3 seconds.

An input signal has failed but no alarm was asserted

Alarms are only generated in respect of selected video or audio signals when the ALARM SET switch is down in the SET position.

Note: In the unlikely event that the unit 'locks up' switch the unit off at the rear for a few seconds and then restore power.

Specification

Audio inputs

Analog inputs impedance 25k Ω differential

Digital inputs impedance 110 Ω differential (XLR connector) or 75 Ω unbalanced (BNC connector)

Analog monitor outputs

Max output level +15dB
Noise +THD -95dB (Analog input)
-98dB (AES input)

Loop through outputs

Noise +THD -95dB (Analog input)
-105dB (AES input)

Frequency response

All analog outputs 20 Hz to 20kHz \pm 1dB

Main drive amp

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

Speaker driver units

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

Meters

Level meters 4 x hi-resolution tri-color bargraphs

(All audio measurements made using Audio Precision un-wtd 22Hz to 22kHz)

Video

Input	2 x SDI SMPTE 259M 1 x composite analog 1V p/p
Output	1 x composite video converted from selected SDI input on BNC connector
Screen	TFT, 4 inch diagonal, 480H x 234V resolution
Controls	Tint, color, brightness and picture (contrast)

Scales and Ballistics

NORDIC:	Overall dynamic range: 54dB (+12 to -42dB) Attack time: 5mSec Fallback: 1.7Sec per 20dB decay
DIN PPM:	Overall dynamic range: 55dB (+5 to -50dB) Attack time: 10mSec Fallback: 1.5Sec per 20dB decay
BBC PPM:	Overall dynamic range: (+12 to -12dB from mark 7 to mark 1) Attack time: 10mSec Fallback: 2.85Sec (from mark 7 to mark 1)
VU:	Overall dynamic range: 23dB (+3 to -20dB) Attack time: 300mSec Fallback: 300mSec
VU EXT:	Overall dynamic range: 80dB (+20 to -60dB) Attack time: 300mSec Fallback: 300mSec
AES/EBU:	Overall dynamic range: 60dB (0 to -60dB) Attack time: 10ms Fallback: 1.5Sec per 20dB decay

Alarms

Audio loss, audio-over-level, sustained audio anti-phase,
AES/EBU carrier loss, SDI loss, video sync loss

Housing	19" Rack Mount: 2U high. Outline Dimensions: 483mm(W) x 256mm(D) x 89mm(H) Outline Dimensions: 19inch(W) x 10inch(D) x 3.5inch(H)
Power	100W (max) 90-264 VAC 50-60Hz Autoselect, Fuse 4A HAC
Environmental	Temperature 0°C to 30°C Humidity 70% max (non-condensing)
Weight	14lbs (6kg)
Computer interface	9 pin RS-232 male PC-AT serial interface (null-modem)