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REVISION HISTORY

REVISION	DESCRIPTION	DATE
1.0	Original Version	June 99
1.1	Figure 3 updated to show correct location of jumpers and switches 7710MD-S added	Aug 99
1.2	Added section on adjusting the EQ threshold, Changed description of LOCAL FAULT and EQ LEDs	Oct 99
1.3	Features current for Firmware version 2.0 Support for Colour Space Conversion, Support for 1080i/50 and 1080p/24sF video formats, and auto standard detection Support for 7710MD-HSN	Mar 00
1.4	Added/changed sections documenting the sF option which is only available at order time and is required for 1080p/24sF support. Support for 1080p/24sF to PAL conversion.	May 00
1.5	Added specification for delay through the downconverter	Dec 00
1.5.1	Updated specifications	Feb 01
1.6	Features current for Firmware version 3.0 Support for 480P video format, auto video standard always enabled NTSC setup pedestal control, DIP switch functions redefined	Jan 02
1.7	Features current for Firmware version 4.0.1 DIP switch 6 now controls output format for all input video standards 720P now supports center crop	Nov 02
1.8	Modified format	Apr 09

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1. OVERVIEW

The 7710MD series Monitoring Down Converter provides an inexpensive method of confidence monitoring of your 1.5 Gb/s HDTV signals on standard definition monitors. The 7710MD is ideal to use with your existing standard resolution monitors whether they have analog or component serial digital inputs. The 7710MD accepts 1080i, 720p, and 480p (SMPTE 292M) video formats. (See Table 3-1 for a complete list of the video formats supported.)

When the 7710MD is fitted at the factory with the sF option, it will also accept 1080p/24 segmented frame inputs. In this mode, the 7710MD downconverts the 1080p/24sf input video to 525i/60 with a 3:2 pulldown or 625i/50 with a 24:25 pulldown. The 7710MD inserts extra fields to create the 3:2 or 24:25 pulldown of the picture content with a random pulldown cadence on the downconverted output.

The 7710MD is available in 5 different versions to meet a variety of applications. (See specifications for complete information)

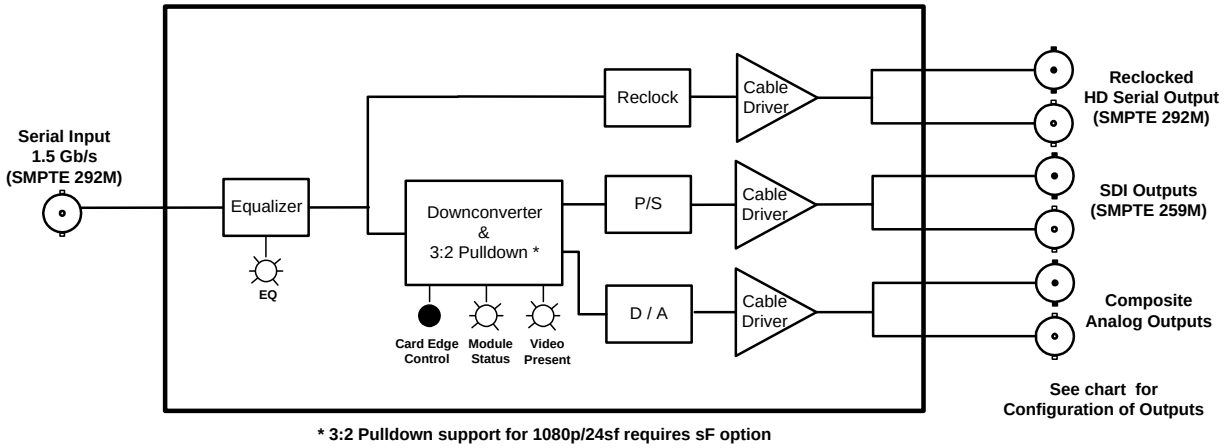

Figure 1-1: 7710MD Block Diagram

Model	HD 1.5 Gb/s Reclocked Outputs	Down Converted Outputs	
		Component SDI	Composite Analog
7710MD-HS	2	2	---
7710MD-HN	2	---	2
7710MD-HSN	4	2	2
7710MD-SN	---	2	2
7710MD-S	---	4	---

Table 1-1: Outputs for Various Product Models

The 7710MD has colour space conversion from ITU rec. 709 to ITU rec. 601, has selectable NTSC pedestal, and will provide various down converted formats such as letterbox, side crop and more.

Front panel LEDs indicate signal presence as well as equalization warning and/or signal loss warning for broadcast applications.

Features:

- Letterbox, side crop and anamorphic squeeze down conversion formats
- 1080i/60, 1080i/50, 480p/60, or 720p/60 input formats
- 1080p/24sF support for with sF option (must be specified at order time)
- Auto video standard detection
- 8 position DIP switch selects NTSC Pedestal, Input Format and Down-converted format
- ITU rec. 709 to ITU rec. 601 colour space conversion
- Tally output upon loss of input signal

2. INSTALLATION

All the 7710MD series modules, except the 7710MD-HSN, come with a companion rear plate that has 5 BNC connectors and occupy one slot in the frame. The 7710MD-HSN comes with a companion rear plate that has 9 BNC connectors and occupies two slots in the frame. For information on mounting the rear plate and inserting the module into the frame see section 3 of the 7700FR chapter.

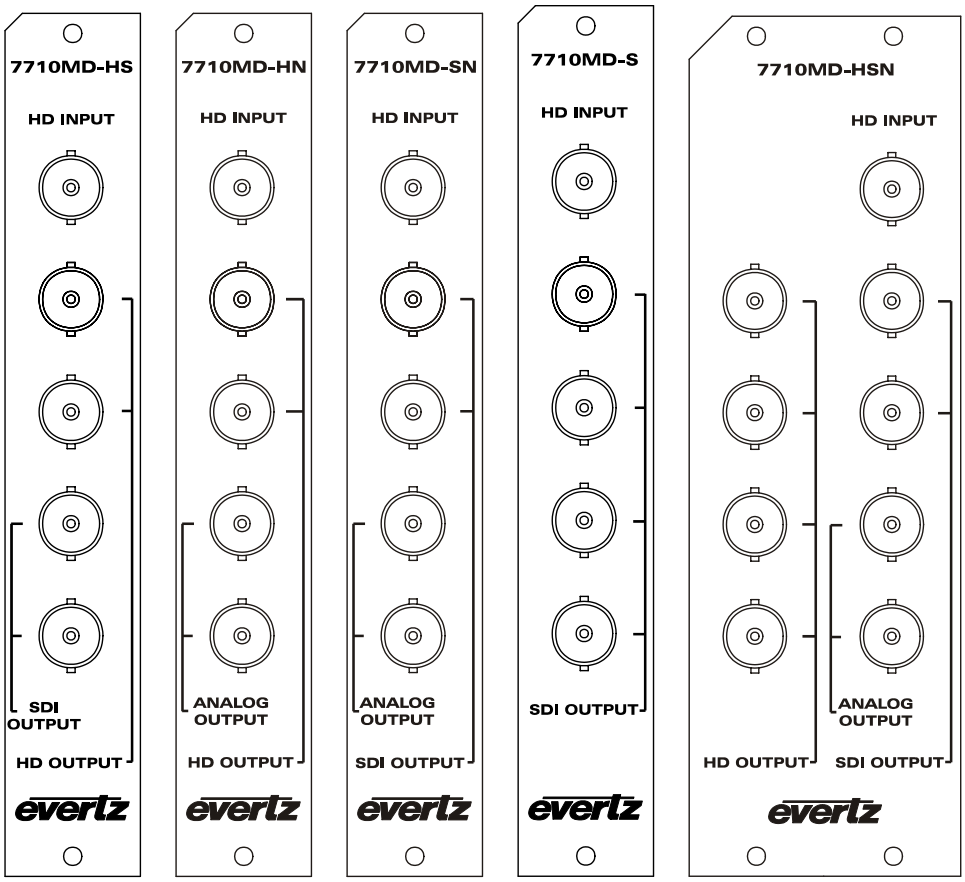

Figure 2-1: 7710MD Rear Panels

HD INPUT: Input BNC connector for 10-bit serial digital video signals with embedded audio, compatible with the SMPTE 292M standard. The 7710MD automatically selects the video standard. See Table 3-1 for a list of the video standards supported.

HD OUTPUT: (7710MD-HS, 7710MD-HSN and 7710MD-HN) These BNC connectors are used to output a reclocked copy of the input video, compatible with the SMPTE 292M standard.

SDI OUTPUT: (7710MD-HSN, 7710MD-HS, 7710MD-S and 7710MD-SN) These BNC connectors are used to output the downconverted input video as serial component video, compatible with the SMPTE 259M standard.

ANALOG OUTPUT: (7710MD-HSN, 7710MD-HN and 7710MD-SN) These BNC connectors are used to output the downconverted input video as analog composite video.

3. SPECIFICATIONS

3.1. HD SERIAL VIDEO INPUT

Standard: 1.485 Gb/sec SMPTE 292M – standards supported are shown in Table 3-1
Connector: 1 BNC per IEC 169-8
Equalization: Automatic to 150m @ 1.5Gb/s with Belden 1694 or equivalent cable

Common Name	Pixels / Active Lines	Frame Rate	Progressive /Interlace	SMPTE Standard
1080i/60	1920 x 1080	30	I	274M
1080i/59.94	1920 x 1080	29.97 (30/1.001)	I	274M
1080i/50	1920 x 1080	25	I	274M
1080p/24sF[1]	1920 x 1080	24	P (sF)	274M
1080p/23.98sF[1]	1920 x 1080	23.98 (24/1.001)	P (sF)	274M
720p/60	1280 x 720	60	P	296M
720p/59.94	1280 x 720	59.94 (60/1.001)	P	296M
480p/59.94[2]	720 x 483	59.94 (60/1.001)	P	293M, 349M

Table 3-1: Video Input Formats

[1]1080p/24sF, 1080p/23.98sF input formats are only available with sF option installed.
[2]480p/59.94 input formats switch selectable, others are autodetect – see section 5.4.

3.2. RE-CLOCKED HD SERIAL VIDEO OUTPUTS
(**7710MD-HSN, 7710MD-HS AND 7710MD-HN ONLY**)

Standard: Same as input - reclocked
Connectors: 2 BNC per IEC 169-8 (4 on 7710MD-HSN)
Signal Level: 800mV nominal
DC Offset: 0V ±0.5V
Rise and Fall Time: 200ps nominal
Overshoot: <10% of amplitude
Wide Band Jitter: < 0.2 UI

3.3. SDI SERIAL VIDEO OUTPUTS
(**7710MD-HSN, 7710MD-HS, 7710MD-S AND 7710MD-SN ONLY**)

Number of Outputs: 2 per card (4 on 7710MD-S).
Standards: Serial component 270 Mb/s (SMPTE 259M)
Connectors: 2 BNC per IEC 169-8 (4 on 7710MD-S)
Signal Level: 800mV nominal
DC Offset: 0V ±0.5V
Rise and Fall Time: 200ps nominal
Overshoot: <10% of amplitude
Return Loss: > 15 dB
Wide Band Jitter: < 0.2 UI

3.4. ANALOG VIDEO OUTPUTS

(**7710MD-HSN, 7710MD-HN AND 7710MD-SN ONLY**)

Number of Outputs: 2 Per Card
Standards: NTSC if input is 1080i/59.94, 1080p/23.98sF[1], 480p/59.94 or 720p/59.94
Monochrome 525 if input is 1080i/60, 1080p/24sF[1] or 720p/60
PAL if input is 1080i/50, or 1080p/24sF[1]
Connectors: 2 BNC per IEC 169-8
Signal Level: 1 V p-p nominal
DC Offset: 0V ±0.1V
Return Loss: > 45 dB up to 6 MHz

[1]1080p/24sF, 1080p/23.98sF support only available with sF option installed. See section 5.3 to select between 625/PAL or 525/NTSC outputs for segmented frame inputs.

3.5. INPUT TO OUTPUT VIDEO PROCESSING DELAY

The delay between the input HD video's line 1 and the downconverted output video's line 1 is 50 lines of the SD video when the incoming and outgoing frame rate is the same. When the incoming frame rate is 24 (23.98) there is an additional frame of delay.

Input Video	Output Video	Delay (lines)	Delay (ms)
1080i/59.94	525i/59.94	50	3.17
1080i/50	625i/50	50	3.2
1080p/23.98	525i/59.94	706	44.87
1080p/24	625i/50	701	44.86
720p/59.94	525i/59.94	50	3.17
480p/59.94	525i/59.94	50	3.17

Table 3-2: Input to Output Processing Delay

3.6. ELECTRICAL

Voltage: + 12VDC
Power: 12 watts,10 watts (7710MD-S), 14 watts (7710MD-HSN)
EMI/RFI: Complies with FCC regulations for class A devices.
Complies with EU EMC directive.

3.7. PHYSICAL

7700 or 7701 frame mounting:
Number of slots: 1 (all versions except 7710MD-HSN)
2 (7710MD-HSN)

Stand Alone Enclosure:
Dimensions: 14 " L x 4.5 " W x 1.9 " H
(355 mm L x 114 mm W x 48 mm H)
Weight: approx. 1.5 lbs. (0.7 Kg)

4. STATUS LEDS

MODULE OK: This Green LED will be On when the module is operating properly

LOCAL FAULT: This Red LED makes it easy to identify one module in a frame that is missing an essential input or has another fault.

The LED will blink on and off if the microprocessor is not running.

The LED will be on solid when the cable length warning is active, when input video is lost or there is a fault in the module power supply.

VIDEO PRESENT: This Green LED will be On when there is a valid video signal present at the module input.

EQ: This Yellow LED will be On when the cable equalizer detects that the cable length is greater than a preset threshold. (Factory set for 125 meters of Belden 1694 or equivalent cable). See section 6.3 for information on adjusting the cable equalizer warning threshold.

5. CARD EDGE CONTROLS

The 7710MD is equipped with an 8 position DIP switch to allow the user to select various functions. All positions are assigned sequentially such that the DIP switch 1 is located at the top of the DIP switch (farthest from the card ejector). Table 5-1 gives an overview of the DIP switch functions. Sections 5.1 to 5.4 show the assigned DIP switch functions. The On position is down, or closest to the printed circuit board.

DIP Switch	Function
1	Down Converter Aspect Ratio Control
2	
3	Not used
4	Not used
5	NTSC Setup Pedestal Control
6	Output Video Format
7	Not used
8	1080i/480p Input Format Selection

Table 5-1: DIP Switch Functions

5.1. SELECTING THE DOWN CONVERTED ASPECT RATIO FORMAT

DIP switches 1 and 2 are used to select one of four down conversion formats.

DIP 1	DIP 2	Down converted Format
Off	Off	Letter Box
On	Off	Side Cut
Off	On	4x3 Squeeze
On	On	Future use (defaults to Letter box)

Table 5-2: Down Converter Aspect Ratio Format Switch Settings

5.2. SELECTING WHETHER THE NTSC SETUP PEDESTAL IS ON

DIP switch 5 is used to select whether the 7710MD will add a 7.5 IRE Setup pedestal to the NTSC outputs. The setup pedestal should not be present when operating in Japan.

DIP 5	FUNCTION	DESCRIPTION
Off	Setup Enabled (default)	NTSC setup pedestal is enabled.
On	Setup Disabled	NTSC setup pedestal is disabled.

Table 5-3: NTSC Setup Switch Settings

5.3. SELECTING THE OUTPUT VIDEO STANDARD

DIP switch 6 is used to set the downconverted output video standard. Refer to the following table to set the output format. The 7710MD will insert extra fields of some frames to create a 3:2 or 24:25 pulldown on the output video when 23.98 sF or 24 sF video is input. The relationship of the pulldown sequence to the input video will be random. For other input formats, the 7710MD will insert or remove fields of some frames to create the correct number of output frames.

Input	DIP 6 OFF	DIP 6 ON
1080i/60	525i/60	625i/50 (PAL)
1080i/59.94	525i/59.94 (NTSC)	INVALID OUTPUT
1080i/50	525i/60	625i/50 (PAL)
1080p/25sF	525i/60	625i/50 (PAL)
1080p/24sF	525i/60	625i/50 (PAL)
1080p/23.98sF	525i/59.94 (NTSC)	INVALID OUTPUT
720p/60	525i/60	625i/50 (PAL)
720p/59.94	525i/59.94 (NTSC)	INVALID OUTPUT

Table 5-4: Output Video Standard Switch Settings

5.4. SELECTING THE INPUT VIDEO FORMAT

The 7710MD will auto detect the input video standard for 1080I, 1080p and 720p formats and whether the input video frame rate is an integer or an integer/1.001. When 480P video formats are carried on a SMPTE 292M interface they use the same raster structure as the 1080I formats, making it impossible to auto detect the 480P video. The 7710MD uses DIP switch 8 to determine whether the input should be interpreted as 1080I or 480P.

DIP 8	FUNCTION	DESCRIPTION
Off	1080 (default)	Input video formats supported are 1080I, 1080p/sf and 720P.
On	480P	Input video formats supported are 480P and 720P.

Table 5-5: Input Video Switch Settings

6. JUMPERS AND USER CONTROLS

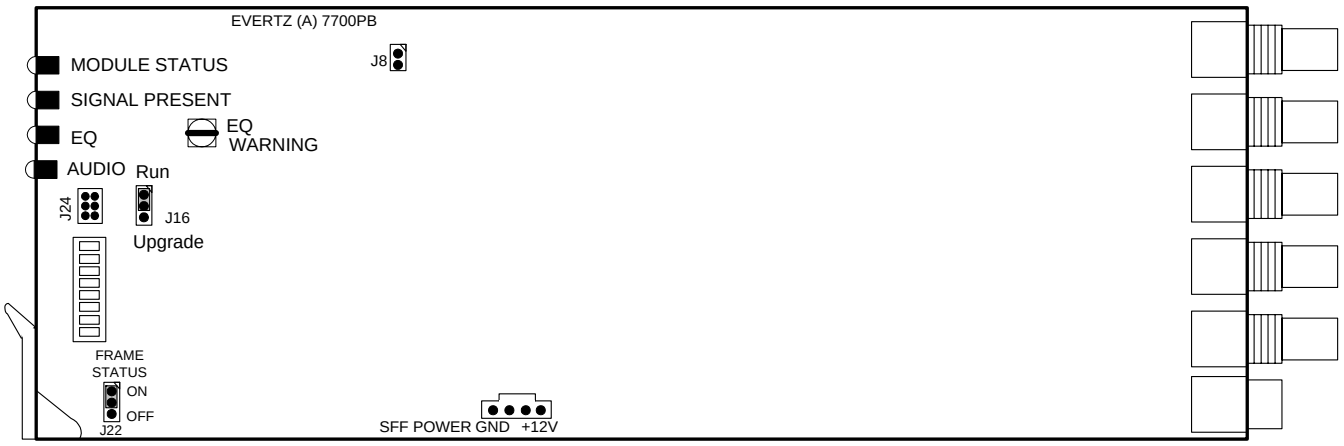

Figure 6-1 : Location of Jumpers on Rev A 7700PB Boards

6.1. SELECTING WHETHER LOCAL FAULTS WILL BE MONITORED BY THE GLOBAL FRAME STATUS

FRAME STATUS: The FRAME STATUS jumper located at the front of the module determines whether local faults (as shown by the Local Fault indicator) will be connected to the 7700FR frame's global status bus. (This feature is not available on Rev 1 versions of the board)

To monitor faults on this module with the frame status indicators (on the PS FRAME STATUS LED's and on the Frame's Fault Tally output) install this jumper in the On position. (Default)

When this jumper is installed in the Off position, local faults on this module will not be monitored.

6.2. CONFIGURING THE MODULE FOR FIRMWARE UPGRADES

UPGRADE: The UPGRADE jumper J16 located at the front of the module is used when firmware upgrades are being done to the module. For normal operation it should be installed in the *RUN* position. On Rev 1 versions of this board the upgrade jumper is located in another location. See the *Upgrading Firmware* section of this manual for more information.

To upgrade the firmware in the module unit pull it out of the frame. Move Jumper J16 into the *UPGRADE* position. Install the Upgrade cable provided (located in the vinyl pouch in the front of this manual) onto header J24 at the card edge. Re-install the module into the frame. Run the upgrade as described in the *Upgrading Firmware* section of this manual. Once the upgrade is completed, remove the module from the frame, move J16 into the *RUN* position, remove the upgrade cable and re-install the module. The module is now ready for normal operation.

6.3. SETTING THE EQUALIZER WARNING THRESHOLD

The EQ trimpot located near jumper J16 is used to set the threshold of the cable equalizer warning. The equalizer warning is factory set to 125 meters of Belden 1684 cable, but may be adjusted for other cable types or cable lengths. To adjust the cable equalizer warning threshold, connect a signal to the input of the 7710MD using the required length of cable. Adjust the trimpot slowly until the Equalizer warning LED comes on. You can verify that the equalizer warning is operating correctly by removing a few meters of cable from the input. The LED should go off.