Figures

Tables

REVISION HISTORY

REVISION	DESCRIPTION	DATE
1.0	Preliminary Version	Jun 00
1.1	First Release	Jul 00
1.2	Added De-embedding delay specification	Jul 00
1.3	Support serial data output at 14400 baud	Aug 00
1.4	Support serial output with regenerated parity matched to the upstream input Support serial output with regenerated SMPTE 207M BREAK character	Mar 01
1.4.1	Fixed Typographical errors	Oct 01
1.4.2	Corrected location of J17 in Figure 5 and section 6.3	Jul 03
1.4.3	Minor corrections to features and Table 3	Oct 03

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1. OVERVIEW

The 7721DD SDI data deembedder extracts data that has been embedded into a 270 Mb/s SDI video signal by the 7721DE data embedder and outputs it as an RS 232/422 data stream and GPO contact closures. The data packets are first deembedded from the SDI video then deformatted from AES audio packets into the original data stream. A data error detection and correction scheme is also applied to maintain data integrity. At the embedded packet layer, data packets resemble and have the same group DIDs as embedded audio packets.

Features:

- Automatic detection of 525 and 625 line SDI video input
- Automatic activation of internal 525 or 625 line black video generation at the loss of video input
- Deembedding mechanism based on SMPTE 272M-A
- Share the same group DIDs as for embedded audio, selectable from group 1 to 4
- Channel selection for extracting packetized data from one of four channels within a data group
- Deformats AES audio (sub-frame mode) to generic data content according to SMPTE 337M
- Supports data error detection and correction, or minimum delay mode without correction
- One RS232/422 serial output with automatic baud rate at 9600, 14,400, 19,200, 38,400 or 57,600
- Support serial output with regenerated parity matched to the upstream input
- Support serial output with regenerated BREAK character according to SMPTE 207M
- Six TTL level GPO signals activate when corresponding GPI inputs on 7721DE are activated.
- Clean or pass-through packets after de-embedding
- Removes packets with "Marked packets for deletion" and "Data end marker packet"
- EDH generation on video output
- Card edge LEDs indicate video signal and data presence, cable equalization and module fault.

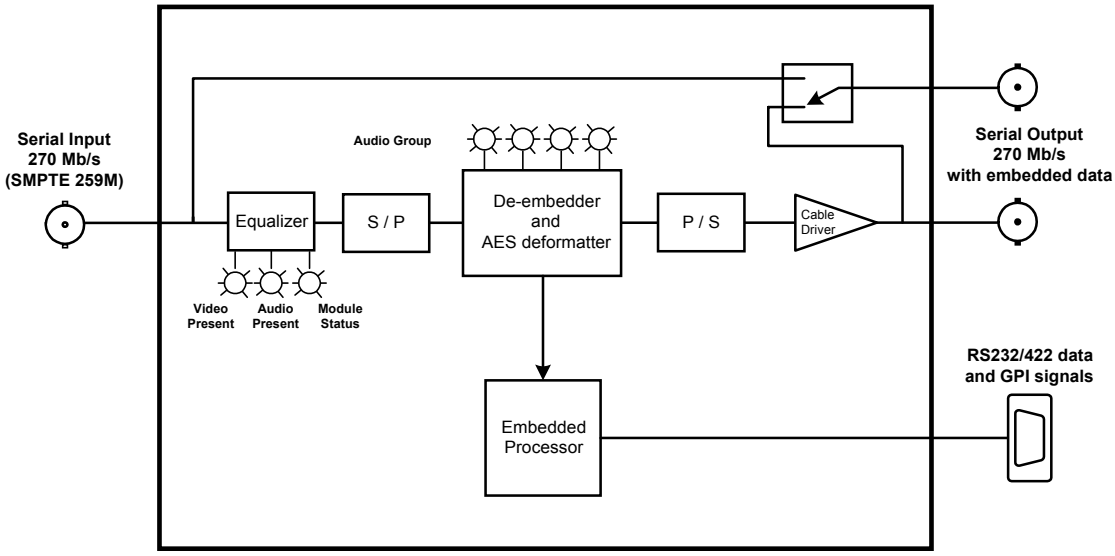

Figure 1: 7721DD Block Diagram

2. INSTALLATION

The 7721DD modules each come with a companion rear plate that has 3 BNCs and a high-density female DB 15 connector. For information on mounting the rear plate and inserting the module into the frame see section 3 of the 7700FR chapter.

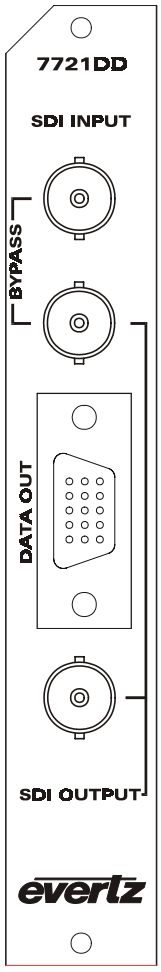

Figure 2: 7721DD Rear Panel

2.1. VIDEO INPUTS AND OUTPUTS

SDI INPUT Input BNC connector for 10-bit serial digital video signals compatible with the SMPTE 259M standard.

SDI OUTPUT There are two BNC connectors with reclocked serial component video outputs, compatible with the SMPTE 259M standard. These outputs contain a reclocked copy of the input video. The top output is protected by a bypass relay, which will activate in the event of power loss to the module. The remaining output is not bypass protected.

2.2. GENERAL PURPOSE INPUTS AND OUTPUTS

The following is the pinout of the female HD DB-15 connector labeled **Data Out**

DB-15	Name	Description
1	GPO 6	GP Output
2	Tx-/Tx	RS 422 Tx - / RS-232 TxD output
3	GPO 5	GP Output
4	GPO 3	GP Output
5	GND	Gnd
6	Rx-/Rx	RS 422 Rx- / RS-232 RxD input
7	Tx+/CTS	RS 422 Tx+ / RS-232 CTS output
8	GPO 4	GP Output
9	GND	GND
10	GP +5	General Purpose +5Volts Supply output
11	Rx+/RTS	RS 422 Rx+ / RS-232 RTS input
12	GND	Gnd
13	GPO 7	GP Output
14	GPO 8	GP Output
15	Vext	Ext. Voltage Input to GPIO Circuitry (input)

Table 1: Data Out DB 15 Connector Pinout

The GPOs are activated when the corresponding GPI inputs on the 7721DE Data Embedder are avtivated. They can be used to pass simple contact closure information along with the video signal. The GPOs are active low with an internal pull up (10k Ohm) resistor to the Vext pin. When active, the output will go low and is able to sink up to 10mA. When inactive, the signal will go high (to the voltage applied to the Vext pin). Do not attempt to source more than 100μA from the output.

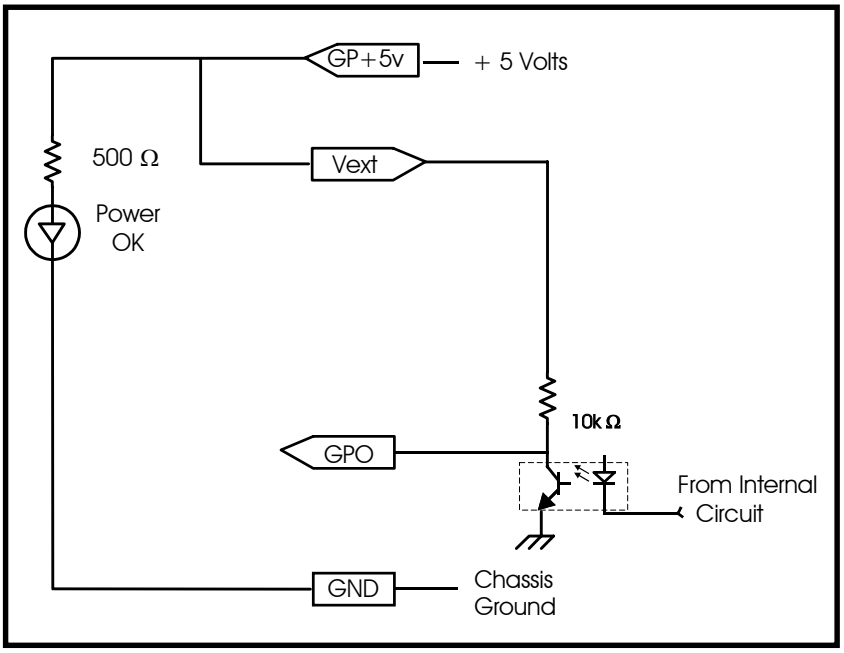

Figure 3: Powering the General Purpose Output Opto Isolators from the Module

The user can connect GP+5V supplied from the frame into the Vext pin to provide power to the GPO opto-isolator circuitry. In this configuration the GPOs will be internally pulled up to 5 volts. (See Figure 3) Five volts is available to the user to be used for driving external circuitry. Care must be taken to limit the load to 0.5W so there is no affect on the power supply source on the module.

Alternately, the user can connect an external power source for the opto-isolator circuitry. The Vext voltage must be greater than the voltage required by the GPO by at least 5v. Figure 4 shows how to wire the GPOs from an external power supply.

Warning: Do not connect GP+5V from one module to another module's GP+5V.

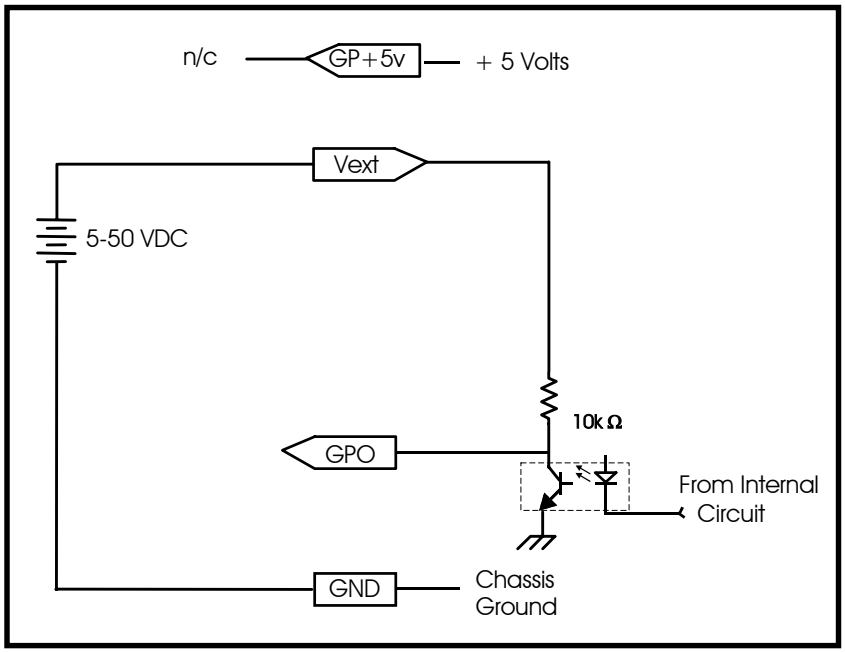

Figure 4: Powering the General Purpose Output Opto Isolators from an External Power Supply

3. SPECIFICATIONS

3.1. SERIAL VIDEO INPUT

Standard: SMPTE 259M C – 525 or 625 line component.
Connector: 1 BNC per IEC 169-8
Equalization: Automatic 300m @ 270 Mb/s with Belden 8281 or equivalent cable
Return Loss: > 15 dB up to 270 Mb/s

3.2. SERIAL VIDEO OUTPUTS WITH EMBEDDED DATA

Number of Outputs: 2 (1 output bypass relay protected)
Standard: same as input
Connectors: BNC per IEC 169-8
Signal Level: 800mV nominal
DC Offset: 0V ±0.5V
Rise and Fall Time: 470ps nominal
Overshoot: <10% of amplitude
Return Loss: > 15 dB up to 270 Mb/s
Wide Band Jitter: < 0.2 UI

3.3. DATA OUTPUT

Standard: RS-232 or RS-422 – Jumper Selectable
Connector: Female High Density DB-15
Baud Rate: 9600, 14400, 19200, 38400 or 57600 automatically set from embedded data
Format: 8 bits, parity (none, even or odd), 1 stop bit

3.4. GENERAL PURPOSE OUTPUTS

Number of Outputs: 6
Type: Opto-isolated, active low with internal pull-ups to user supplied voltage. (provides +5V which may be used for this purpose)
Connector: Female High Density DB-15
Signal Level: +5V nominal

3.5. DE-EMBEDDING DELAY

3.5.1. Video I/O Delay

The video I/O delay is approximately 12μs

3.5.2. Delay For Data De-Embedding - Serial Output

Baud rate	Average latency (μs) +/- 20%	
	Minimum Delay Mode	Error Detection / Correction Mode
9600	1600	1900
14400	1300	1600
19200	1100	1400
38400	800	1100
57600	700	1000

3.5.3. Delay For Data De-Embedding - GPO signals

GPO Outputs	Average latency (μs) +/- 10%	
	Minimum Delay Mode	Error Detection / Correction Mode
All	800	800

3.6. ELECTRICAL

Voltage: + 12VDC
Power: 6 Watts.
EMI/RFI: Complies with FCC Part 15, class A and EU EMC directive.

3.7. PHYSICAL

7700 or 7701 frame mounting:
Number of slots: 1

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

The location of the status LEDs is shown in Figure 5.

4.1. MODULE 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 input video is missing, or audio is missing from both AES inputs 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 250 meters of Belden 8281 or equivalent cable). See section 6.4 for information on adjusting the cable equalizer warning threshold.

DATA PRESENT This Green LED will be On solid when there is a valid data packet in the audio group selected for de-embedding. This indicator is only valid when input video is present.

4.2. AUDIO/DATA GROUP STATUS LEDS

Four LEDs located on the lower end of the module (opposite the DIP switch) indicate the status of the audio/data groups. Group LED 1 is located closest to the center of the module.

Group LED	Color	Group Status
1	Off	There is no group 1 audio/data on the video input.
	On	Group 1 audio/data is present on the video input.
	Flashing	Group 1 audio/data on the video input is being de-embedded.
2	Off	There is no group 2 audio/data on the video input.
	On	Group 2 audio/data is present on the video input.
	Flashing	Group 2 audio/data on the video input is being de-embedded.
3	Off	There is no group 3 audio/data on the video input.
	On	Group 3 audio/data is present on the video input.
	Flashing	Group 3 audio/data on the video input is being de-embedded.
4	Off	There is no group 4 audio/data on the video input.
	On	Group 4 audio/data is present on the video input.
	Flashing	Group 4 audio/data on the video input is being de-embedded.

Table 2: Group Status LEDs

5. CARD EDGE CONTROLS

The 7721DD is equipped with an 8 position DIP switch to allow the user to select various functions. All positions are assigned sequentially such that the first position is located at the top of the DIP switch (farthest from to the card ejector). Sections 5.1 to 5.2 show the assigned DIP switch functions. The On position is down, or closest to the printed circuit board. Table 3 gives an overview of the DIP switch functions.

DIP Switch	Function
1	Audio Group Selection for Data De-embedding
2	
3	Primary Audio Channel Selection within the selected group for Data De-embedding
4	
5	Select internal 525 and 625 line black video generation
6	Select minimum delay or error detection and correction processing
7	Reserved for future use (default off)
8	Select clean all or pass-through de-embedding

Table 3: DIP Switch Functions

5.1. SELECTING THE AUDIO GROUP AND CHANNEL WHERE THE DATA WILL BE DE-EMBEDDED

The SMPTE 272M standard permits up to 4 groups of 4 audio/data channels to be embedded into the 270 Mb/s video bitstream.

The model 7721DD de-embeds one group of audio packets containing data (selected by switches 1 and 2) onto the Data output port. Switches 3 and 4 select the channel within the group where data will be extracted from.

DIP 1	DIP 2	Audio Group ID
Off	Off	1 (default)
On	Off	2
Off	On	3
On	On	4

Table 4: Audio Group Assignment for Data Extraction Switch Settings

DIP switches 3 and 4 are used to select which channel within the selected group will be the primary channel where data is extracted from.

DIP 3	DIP 4	Audio Channel
Off	Off	1 (default)
On	Off	2
Off	On	3
On	On	4

Table 5: Audio Channel Assignment for Data Extraction Switch Settings

5.2. SELECTING LINE STANDARD OF THE INTERNAL BLACK VIDEO SOURCE

DIP switch 5 is used to select the default line standard of the internal black video source at the loss of video input.

DIP 5	Line Standard
Off	625 lines
On	525 lines

Table 6: Default Line Standard Selection Switch Settings

5.3. SELECTING MINIMUM DELAY OR ERROR DETECTION AND CORRECTION MODE

DIP switch 6 controls whether the data deembedder will perform error detection and correction as it de-embeds the data. Data verification causes a data error detection and correction scheme to be applied to the extracted data to maintain data integrity. When data verification is enabled, there is an additional delay before the extracted data can be sent to the data output serial port.

DIP 6	FUNCTION	DESCRIPTION
Off	Minimum Delay Mode	Extracted data is passed through to the data output port with minimum delay.
On	Data Verification Mode (default)	Data error detection and correction is performed before data is sent to the data output port. This mode requires additional delay before the data is available on the output port.

Table 6: Data Verification Mode Switch Settings

5.4. SELECTING WHETHER EXISTING AUDIO/DATA WILL BE REMOVED

DIP switch 8 controls whether existing audio/data packets will be passed or removed from the video stream.

DIP 8	FUNCTION	DESCRIPTION
Off	Clean	De-embed incoming audio/data packets with the group ID selected by DIP switches 1 & 2. Removes all audio/data packets. The H blanking period after EAV is filled with the default blanking value.
On	Pass (default)	De-embed and remove incoming audio/data packets with the group ID selected by DIP switches 1 & 2. Left justify remaining packets.

Table 7: Embedded Audio Cleaning Switch Settings

6. JUMPERS AND USER ADJUSTMENTS

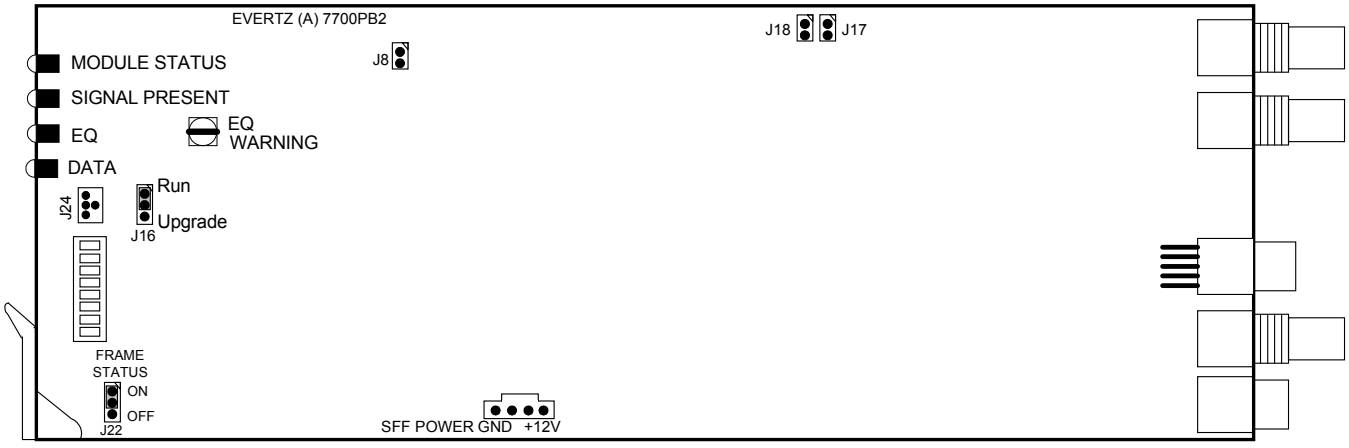

Figure 5: Location of Jumpers on 7700PB2 Boards

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.

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. 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. CONFIGURING THE SERIAL PORT FOR RS 232 OR RS 422 OPERATION

J17

Jumper J17 located at the side of the module is used to select whether the serial port receiver/driver hardware is configured for balanced RS422 or RS232 with flow control. For RS 422 operation install jumper J17. For RS 232 operation remove jumper J17. For convenience you may re-install the jumper so that only one side is connected.

6.4. SETTING THE EQUALIZER WARNING THRESHOLD

The *Cable Length Warning Adj* trimpot located near the *Signal Present* LED is used to set the threshold of the cable equalizer warning. The equalizer warning is factory set to 250 meters of Belden 8281 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 module 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.