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**OPTICAL**

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**SYSTEMS**

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**DESIGN**

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**OPERATOR MANUAL**

**OSD8320 SERIES**

**DIGITAL COMPOSITE & SDI VIDEO,  
AUDIO AND DATA**

**FIBER OPTIC TRANSMISSION SYSTEM**



# OPTICAL SYSTEMS DESIGN

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## 1 TECHNICAL SUMMARY

### 1.1 BRIEF DESCRIPTION

#### 1.1.1 OVERVIEW

The OSD8320 series is a high-quality fiber optic digital video, audio, data and contact closure modem pair utilising both composite and HD/SDI video. The system consists of the OSD8320T and the OSD8320R which are designed to be used as a pair. They provide one-way fiber optic transmission of PAL, NTSC or SECAM video, one-way fiber optic transmission of a 3G serial digital video (SDI), two full-duplex data channels (TTL, RS232, RS485 or RS422, 31kHz Manchester or Bi-phase), two full-duplex audio channels and one duplex relay contact closure channel. The OSD8320 system can be used with any standard singlemode optical fiber for transmission and reception.

The OSD8320T accepts one analog composite video input signal, two digital data input signals, two audio channels and one contact relay signal on one fiber. The composite video signal is converted to digital with 9 or 10-bit resolution so as to preserve the quality of the input signals. The resulting digital signal is multiplexed and transmitted as a digital bit-stream through the fiber. The OSD8320T also includes an optical receiver section that decodes the digital signal transmitted by the OSD8320R to provide data, audio and contact relay signals. The OSD8320T also accepts one 3G HD/SDI video input signal (transmitted on a separate, dedicated fiber) where the serial digital video signal is equalized and reclocked to the SMPTE standards. The OSD8320T has an automatic equaliser for standard high quality coaxial cable such as Belden 1694A cable. This allows flexibility for permanent and temporary installations when the SDI source is some distance away from the unit. The user can disable the equaliser with a DIP switch mounted on the front panel.

The OSD8320R incorporates two high performance optical receivers for incoming composite video, data, audio and contact relay signals and the SDI signal. It also incorporates a transmitter that outputs a digital optical signal consisting of two data channels, two audio channels and one contact relay channel. The unit provides constant video output level that is independent of link loss and is adjustment free over all link lengths. The OSD8320R also has the extremely useful feature of having a basic built-in optical power meter for the HD/SDI video signal allowing the user to quickly identify any problem with the optical link.

Both the OSD8320T and OSD8320R have a built-in user bypassable automatic reclocker. The units will lock at 270Mbps, 1.485Gbps and 2.97Gbps. The user can disable the reclocker with a dip switch mounted on the front panel.

The OSD8320T and OSD8320R are available as a module and require an external power source.

# OPTICAL SYSTEMS DESIGN

## 1.1.2 APPLICATIONS

- ▲ Broadcast networks using a mix of analog and HD/SDI cameras for their outside broadcast systems: the same fiber link equipment can be used for everything, thus reducing overall inventory and costs
- ▲ Broadcast television systems

▲ Extremely high quality video conferencing.

## 1.1.3 FEATURES AND BENEFITS

- ▲ One way optic transmission of PAL, NTSC or SECAM video AND 3G HD/SDI signal with full duplex transmission of:

  - two duplex analog audio channels
  - two duplex data channels
  - one duplex contact closure channel

▲ Studio quality 10 bit video and 24 bit audio

▲ Remote control of Pan, Tilt and Zoom for video surveillance or broadcast rigs
- ▲ 3G HD/SDI available with built in user bypassable automatic reclocking at 270Mbps, 1.485Gbps and 2.97Gbps. When reclocking is bypassed the system operates from 19.4Mbps to 2.97Gbps

▲ 3G HD/SDI compatible with SMPTE 310M, 292M, 297M, 372M and 424M

▲ Automatic equalization of up to 350m @ 270Mbps and 70m @ 2.97Gbps of Belden 1694A cable

▲ Composite video inputs have 3dB overload capability

## 1.2 TYPICAL CONFIGURATION

Figure 1 below indicates the typical set-up for an OSD8320 system.

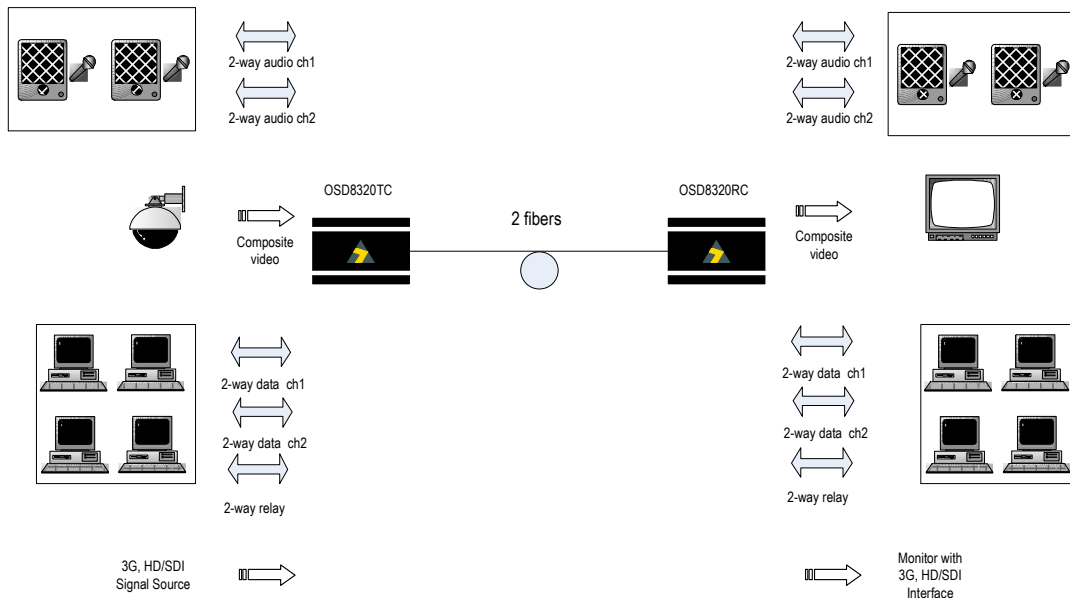


FIGURE 1: OSD8320 TYPICAL CONFIGURATION

# OPTICAL SYSTEMS DESIGN

## 1.3 TECHNICAL SPECIFICATIONS

TABLE 1: TECHNICAL SPECIFICATIONS

SPECIFICATION	PERFORMANCE
Video Input/Output Impedance	75Ω composite
Video Input/Output Levels	1Vpp nominal
Video Connectors	BNC
Video Bandwidth	5Hz to 10MHz (±1dB)
Video Distortion	<0.7% Differential Phase (DP) <0.7° Differential Gain (DG)
Signal to Noise Ratio (Weighted)	> 63dB at all receive levels over the unit's full dynamic range
Coax Equalization (SDI)	350m @ 270Mbps 140m @ 1.485Gbps 70m @ 2.97Gbps
Audio Input Impedance	>10KΩ or 600Ω, user selectable
Audio Output Impedance	<200Ω
Audio Bandwidth	5Hz – 21kHz ± 1dB
Audio Input & Output Level	0dBu (0.775Vrms) nominal, balanced or unbalanced
Audio Headroom	19dB balanced, 13dB unbalanced
Audio Signal to Noise Ratio	>96dB at maximum level
Audio Distortion	<0.05%
Audio Connectors	3-pin Mini-XLR for audio
Data Interface	TTL, RS232, RS422 and RS485. 31kHz Manchester or Biphasic in either direction
Data Rate	DC to > 400kbps on two data channels DC to > 100bps on relay channel
Data Connectors	15 pin female subminiature D connector
Transmitter Wavelength	1310nm (AVD Tx and SDI)/1550nm (AVD Rx)
OSD8320T AVD Transmitter Coupled Power	-13 to -8dBm @ 1310nm into singlemode fiber
OSD8320T AVD Receiver Sensitivity	<-36dBm
OSD8320T AVD Receiver Saturation	>-10dBm
OSD8320R AVD Transmitter Coupled Power	-15 to -9dBm @ 1550nm into singlemode fiber
OSD8320R AVD Receiver Sensitivity	<-27dBm
OSD8320R AVD Receiver Saturation	>-3dBm
OSD8320T SDI Transmitter Coupled Power	-5 to 0dBm @ 1310nm into singlemode fiber
OSD8320R SDI Receiver Sensitivity	-18dBm
OSD8320R SDI Receiver Saturation	+2dBm
Link Distances	>30km on singlemode fiber @ 1310nm (fiber loss limited)
Optical Connectors	FC standard, others optional
Dimensions (mm)	104W x 107D x 56H (module)
Weight	0.4kg (module)
Power Requirements	+10V to +24Vdc @ 8VA
Operating Temperature	-20°C to +75°C
Relative Humidity	0 to 95% non-condensing

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### 1.4 OSD8320 DRAWING AND DIMENSIONS

The OSD8320TC and OSD8320RC are designed to be mounted on a flat even surface. Dimensions are shown in millimeters (mm).

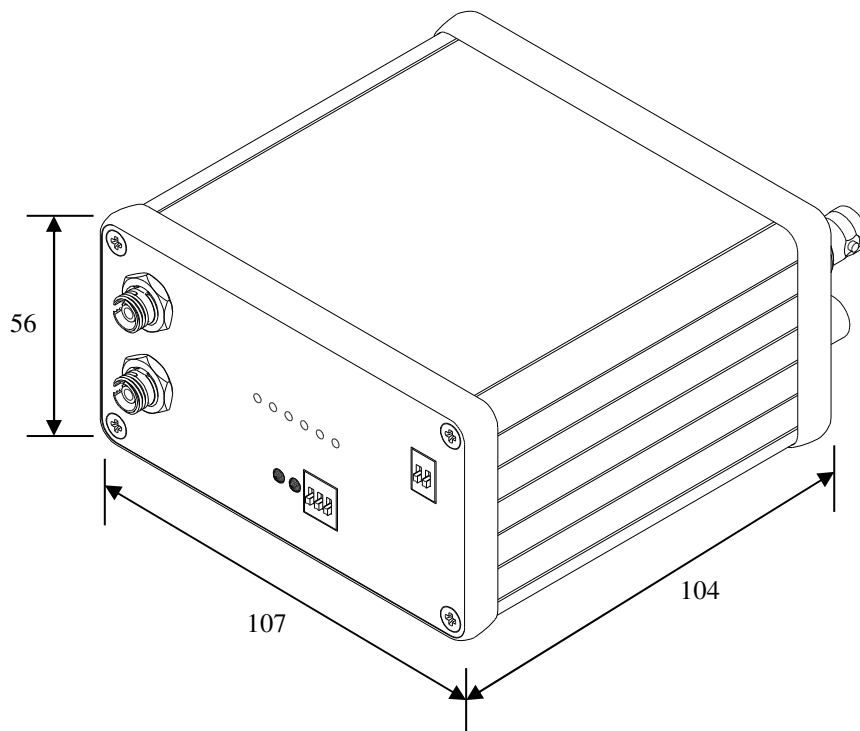


FIGURE 2: OSD8320 DIMENSIONS



## 2 INSTALLATION AND OPERATION

### 2.1 INTRODUCTION

This section outlines the methods required to install and operate the OSD8320T and OSD8320R successfully. It should be studied carefully if damage to the equipment or poor results are to be avoided.

This equipment has been fully tested prior to dispatch and is ready for immediate operation. However it is advisable to check for external transportation damage before operation. If damage is evident, return the unit with the packaging to your supplier immediately.

### 2.2 INSTALLATION

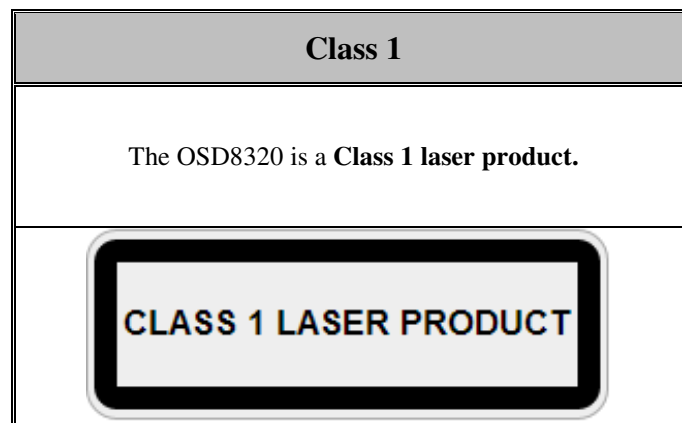
#### 2.2.1 WARNING AND PRECAUTIONS

##### ▲ ELECTROMAGNETIC COMPATIBILITY

**WARNING:** This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

##### ▲ OPTICAL OUTPUT OPERATION

**WARNING: Laser Safety:** Class 1 Laser Product per IEC/EN 60825-1:20011 standard.



#### PRECAUTIONS

- ▲ All service personnel should be provided training as to the hazards of direct viewing of laser radiation and of the precautionary measures during servicing of equipment
- ▲ Areas where laser products are installed should be restricted in access to trained service personnel only and appropriate warning signs posted in the work area.
- ▲ All laser apertures should be covered by protective covers when not connected to optical fibers. Never leave outputs uncovered.
- ▲ Laser equipment should be positioned above or below eye level where possible. Apertures should be positioned away from personnel.
- ▲ Protective eyewear should be worn in the vicinity of laser equipment.

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## 2.3 POWER SUPPLY CONNECTIONS

The OSD8320 requires external DC power. The voltage range of the OSD8320 is +10V<sub>DC</sub> to +24V<sub>DC</sub> @ 8VA. Power should be connected to the power socket located at the back of the case as indicated in Table 2.

TABLE 2: POWER CONNECTION

External Power Pin	Specification
Pin 1	+10V <sub>DC</sub> to +24V <sub>DC</sub>
Pin 2	Ground – 0V

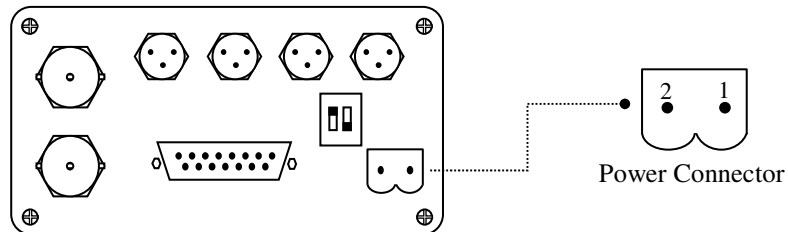


FIGURE 3: OSD8320 POWER SUPPLY CONNECTIONS

# OPTICAL SYSTEMS DESIGN

## 2.4 DATA CONNECTIONS

The OSD8320 pair provides two full-duplex data channels capable of accepting TTL, RS232, RS485 or RS422, 31kHz Manchester or Bi-phase connections to/from the modem pair. Data is connected to the OSD8320 via the DB15 female connector located on the rear panel.

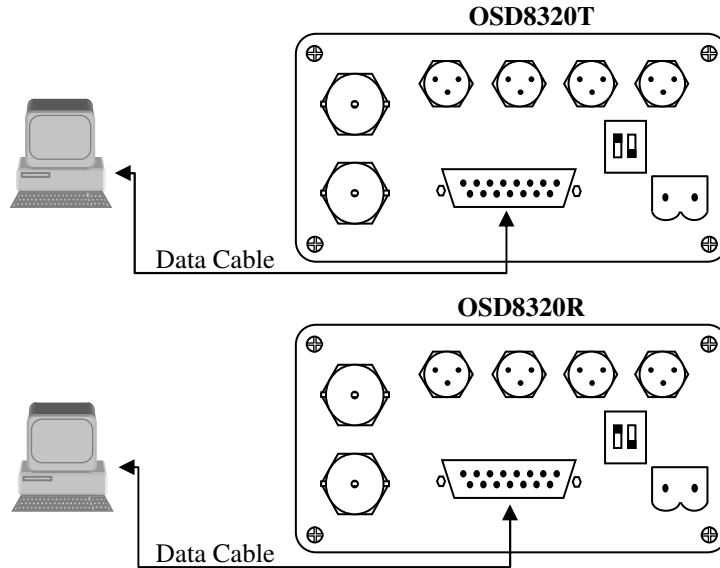


FIGURE 4: DATA CONNECTIONS

### 2.4.1 DATA PIN ASSIGNMENTS

TABLE 3: DB15F PIN ASSIGNMENT

Pin	Function	Pin	Function
1	RS422/RS485 Input +	9	RS422/RS485 Input -
2	Relay Input	10	Ground
3	Ground	11	RS422/RS485 Output -
4	RS422/RS485 Output +	12	Relay Output (Common)
5	Relay Output (Normally Open)	13	Ground
6	Not Connected	14	RS232 Output
7	Ground	15	Not Connected
8	RS232 Input	-	-

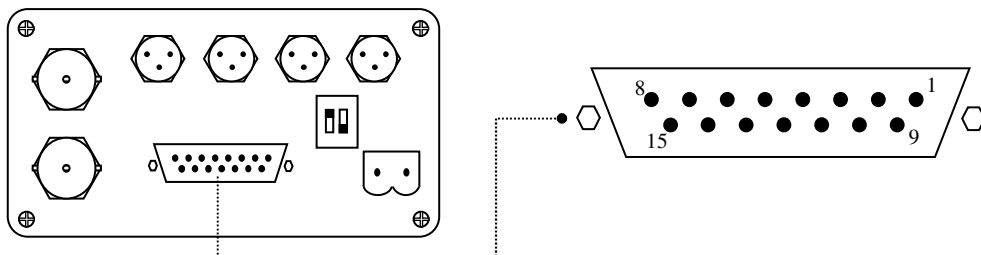


FIGURE 5: DB15F CONNECTOR

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**RS485 2-Wire** half duplex is used to connect several devices to the same bus when only one unit transmits data at a time. All units are normally in high impedance receive mode waiting for data. When transmission of data is requested, the device waits for a protocol specific turn-around time delay before transmitting after which it returns to receive mode.

**RS485 4-Wire** full duplex is used for master/slave arrangement. Devices are polled and respond faster with no turn-around time delay required between request/response. The receiver is always enabled allowing the devices to receive data even while responding to a request.

**Note:** If a link doesn't seem to be working correctly, try swapping the polarity of the data lines on both ends. Some devices are marked opposite the RS485 standard.

## 2.4.2 DATA MODE SWITCH SETTINGS

The 4-way data control switch is located at the front of OSD8320 modem. Switches SW1, SW2 and SW3 are used for setting the Data Mode Options (NOTE: SW4 is **not used** and has no function).

**Note:** For correct operation, ensure that both OSD8320T and OSD8320R have the switch settings in the same modes.

TABLE 4: DATA MODE SWITCH SETTINGS

SWITCH	STATE	POSITION	FUNCTION
SW1	OFF	DOWN	RS422
	ON	UP	RS485
SW2	OFF	DOWN	4-Wire Operation
	ON	UP	2-Wire Operation
SW3*1	OFF	DOWN	10-Bit Video Mode
	ON	UP	9-Bit Video + Data Mode
SW4	OFF	DOWN	NOT USED
	ON	UP	

\*1 Note: In 10-bit video mode only reverse data is enabled. Forward audio, data and relay is disabled.

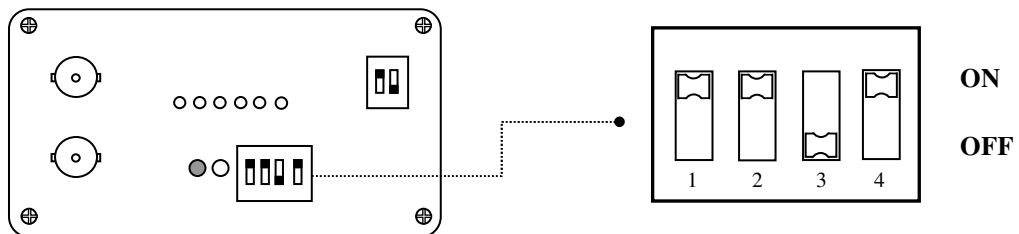


FIGURE 6: DATA SWITCH DIAGRAM

# OPTICAL SYSTEMS DESIGN

## 2.5 AUDIO CONNECTIONS

The OSD8320 pair provides two full-duplex audio channels. Audio is connected to the OSD8320 via the mini XLR male connectors located on the rear panel.

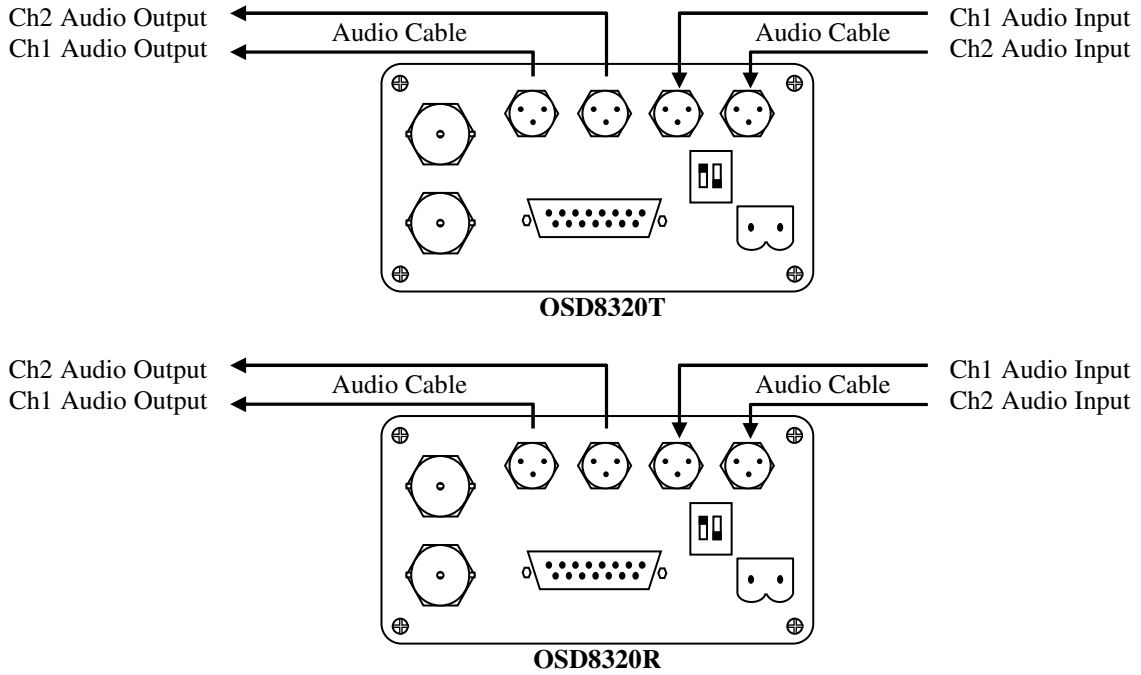


FIGURE 7: AUDIO CONNECTIONS

### 2.5.1 AUDIO PIN ASSIGNMENTS

TABLE 5: MINI XLR PIN ASSIGNMENT

Pin Number	Function
1	Negative
2	Positive
3	Shield

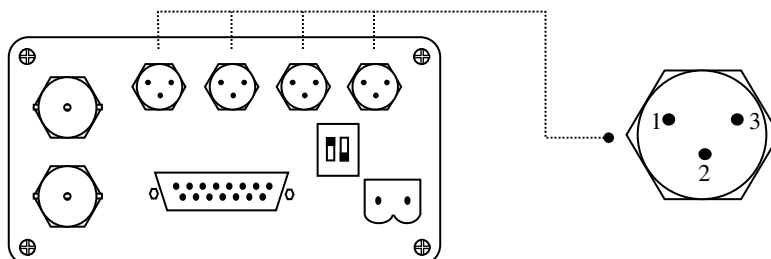


FIGURE 8: MINI XLR CONNECTOR

# OPTICAL SYSTEMS DESIGN

## 2.5.2 AUDIO MODE SWITCH SETTINGS

The 2-way audio mode switch is located at the rear panel of OSD8320 modem. Switches SW1 and SW2 are used for setting the Audio input termination for each of the two channels.

TABLE 6: AUDIO MODE SWITCH SETTINGS

SWITCH	AUDIO CHANNEL	STATE	POSITION	INPUT TERMINATION
1	CH2	OFF	UP	>10KΩ*
		ON	DOWN	600R ON
2	CH1	OFF	UP	>10KΩ*
		ON	DOWN	600R ON

\* - Denotes default setting

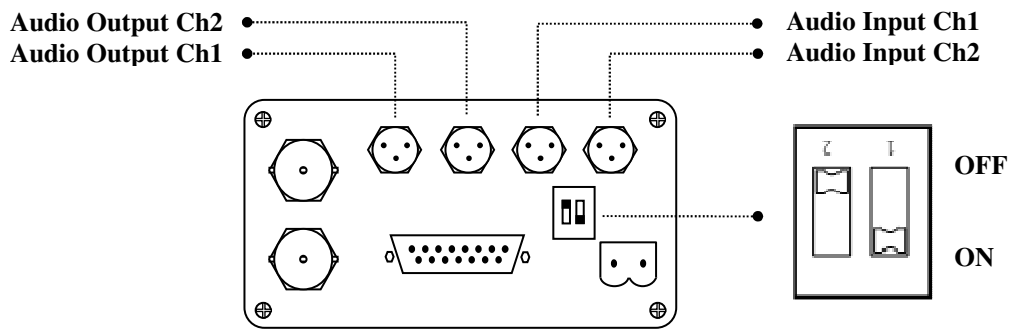


FIGURE 9: AUDIO SWITCH DIAGRAM

## 2.6 COMPOSITE VIDEO CONNECTIONS

The composite video-input signal (eg. from camera) is connected to the video input BNC connector on the OSD8320T. The composite video output signal (eg. to monitor) is connected from the video output BNC connector on the OSD8320R. Select the switch settings as per Figure 6 and Table 4 for 9-bit or 10-bit operation. Ensure that both OSD8320T and OSD8320R have same mode settings.

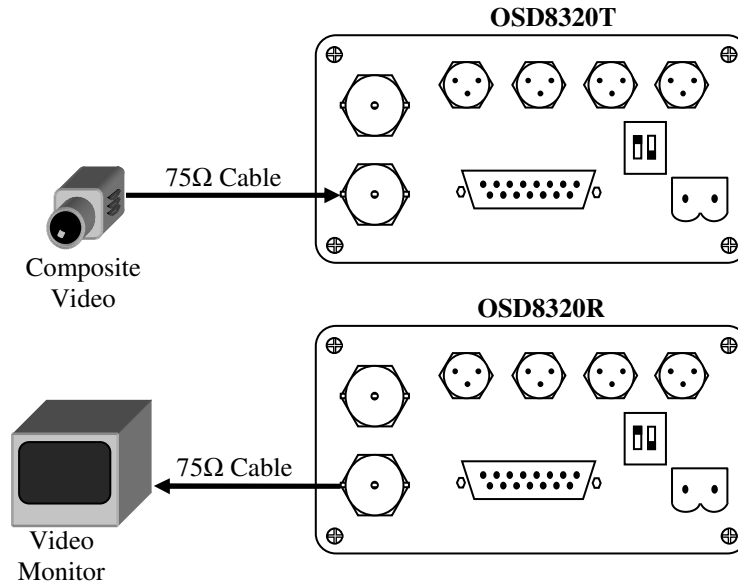


FIGURE 10: COMPOSITE VIDEO CONNECTIONS

# OPTICAL SYSTEMS DESIGN

## 2.7 HD/SDI VIDEO CONNECTIONS

The HD/SDI video-input signal is connected to the HD/SDI video input BNC connector on the OSD8320T. The HD/SDI video output signal (eg. to HD monitor) is connected from the HD/SDI video output BNC connector on the OSD8320R.

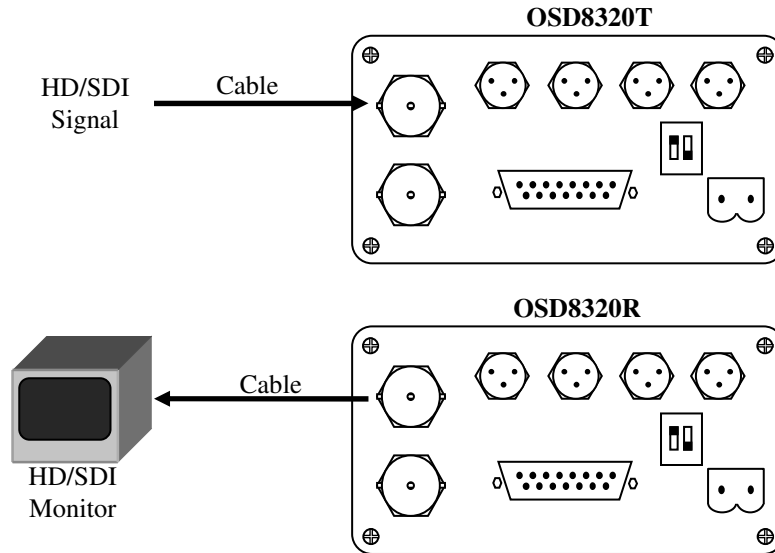


FIGURE 11: HD/SDI VIDEO CONNECTIONS

### 2.7.1 SDI MODE SWITCH SETTINGS

The 2-way SDI mode switch is located at the front of OSD8320 modem. Switches SW1 and SW2 are used on the OSD8320T while the OSD8320R uses only SW1 (NOTE: SW2 on the OSD8320R is **not used** and has no function).

TABLE 7: SDI MODE SWITCH SETTINGS

#### OSD8320T

SWITCH	STATE	POSITION	FUNCTION
1	OFF	DOWN	Reclocker OFF
	ON	UP	Reclocker ON
2	OFF	DOWN	Equaliser OFF
	ON	UP	Equaliser ON

#### OSD8320R

SWITCH	STATE	POSITION	FUNCTION
1	OFF	DOWN	Reclocker OFF
	ON	UP	Reclocker ON
2	OFF	DOWN	NOT USED
	ON	UP	



# OPTICAL SYSTEMS DESIGN

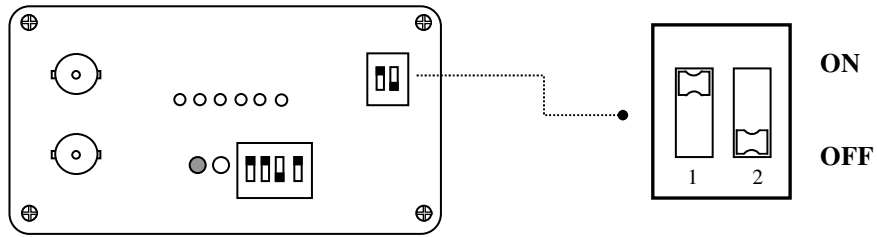


FIGURE 12: HD/SDI SWITCH DIAGRAM

## 2.8 CONTACT CLOSURE CONNECTIONS

The OSD8320T and OSD8320R have one contact closure channel. The contact closure input (Pin 2 on the DB15F connector) is driven high. To operate the contact closure, the input should be switched to ground (see Figure 13).

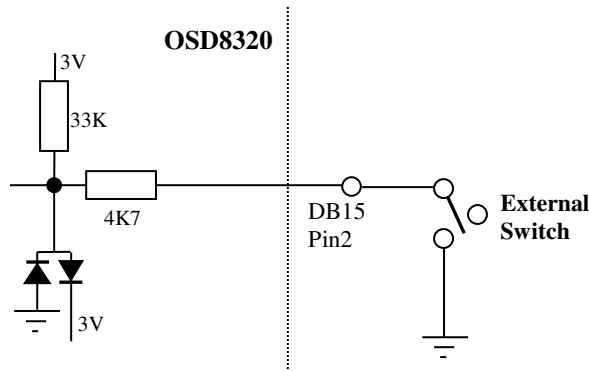


FIGURE 13: CONTACT CLOSURE INPUT

The contact closure common output is on pin12 while the normally open contact is connected to pin5 of the DB15F connector. Maximum ratings the OSD8320 relay can drive is 120mA @ 350V<sub>(max)</sub>. Isolation Voltage: 2000V<sub>RMS</sub>

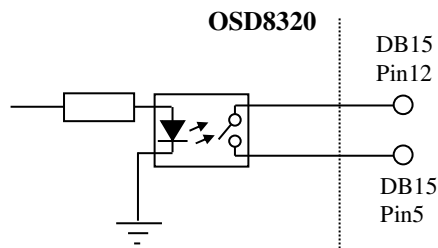


FIGURE 14: CONTACT CLOSURE OUTPUT

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## 2.9 FIBER CONNECTIONS

The OSD8320T and OSD8320R provide two optical fiber connections;

- **The AV & Data Optical I/O fiber connection;** providing one-way fiber optic transmission of PAL, NTSC or SECAM video, two full-duplex data, two full-duplex audio channels and one duplex relay contact closure channel.
- **The HD/SDI Optical Input (OSD8320T) and Optical Output (OSD8320R);** providing one-way fiber optic transmission of a 3G serial digital video (SDI).

The OSD8320 system can be used with any standard singlemode optical fiber for transmission and reception. The optical fiber cable must be terminated with the appropriate optical connector. Before connection, inspect the ends of the connectors to ensure that no dust or dirt is present as it could contaminate the modem connector and result in poor performance.

If it is necessary to clean the cable connectors, use isopropyl alcohol and lint free tissue to remove contamination.

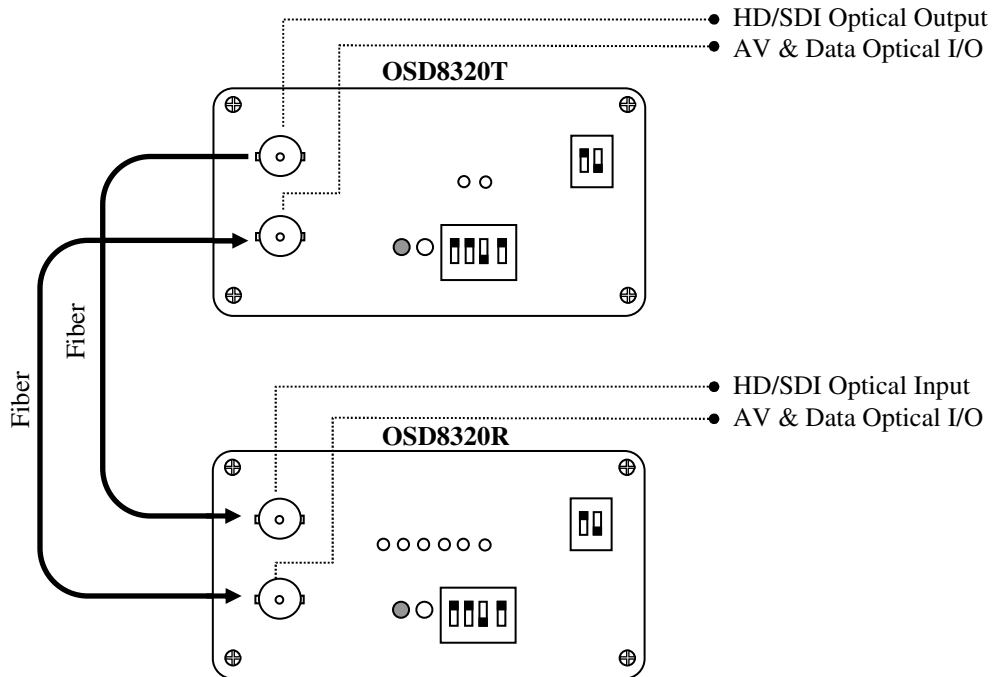


FIGURE 15: OPTICAL FIBER CONNECTIONS

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## 2.10 OSD8320 OPERATION

### 2.10.1 OSD8320T AND OSD8320R OPERATION

When using the OSD8320 for the first time, check that the unit is in good condition with no visible damage.

Connect the unit to an appropriate power source and check that the indicators illuminate accordingly on power up (see Table 8 and Table 9).

To connect a composite video signal, connect a BNC terminated coaxial cable from the camera to the OSD8320T Video Input. If the camera is operational, the "Video Present" indicator should illuminate 'Amber'.

Connect a BNC terminated coaxial cable between the BNC socket on the rear of the OSD8320R Video Output and the video monitor or switcher.

Plug in the optical fiber connectors of the optical cable to the AV & Data Optical I/O on both the OSD8320T and OSD8320R. If the set-up is connected correctly, the OSD8320R "Link OK" LED will change from 'Red' to 'Green'. If a video signal is being received the "Video Present" indicator on the OSD8320R should be 'Amber'; if no video signal is being received this indicator will not be illuminated.

Plug the digital signal source (data) into DB15F connector on the rear of the module. Ensure that the correct signals are connected to the correct pins of Data Input/Output connector as specified in Table 3. Check that both OSD8320T and OSD8320R switch settings are in the same modes (see Table 4).

Plug the audio signal source to the mini XLR inputs and the speaker to the mini XLR outputs. If required, set the audio terminations as specified in section 2.5.2

To connect the HD/SDI signal source, connect a BNC terminated Low Loss Serial Digital Coax Cable (such as BELDEN 1694A) to the HD/SDI Input on the OSD8320T. Similarly, connect the BNC terminated Low Loss Serial Digital Coax Cable (such as BELDEN 1694A) to the HD/SDI output from the OSD8320R to the HD/SDI monitor input.

Plug in the optical fiber connectors of the optical cable to the HD/SDI Optical Output on the OSD8320T and HD/SDI Optical Input on the OSD8320R.

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## 2.10.2 OSD8320T AND OSD8320R INDICATORS

### OSD8320T

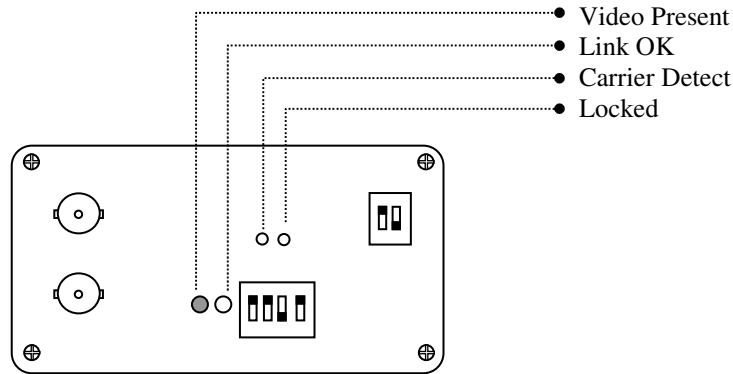


FIGURE 16: OSD8320T LED INDICATORS

TABLE 8: OSD8320T INDICATOR FUNCTION

INDICATOR	COLOUR	FUNCTION
VIDEO PRESENT	Off	No composite video signal present
	Amber	Video signal present
LINK OK	Red	Loss of reverse link
	Green	Reverse link OK
CARRIER DETECT	Red	No SDI carrier detected
	Off	SDI source is detected
LOCKED	Red	SDI Reclocker is locked
	Off	SDI Reclocker not locked or reclocker in bypass mode.

**NOTE:**

“Link OK ” Indicator refers to the received data stream. LED is ‘green’ after the optical link is established and the receiver is locked onto the incoming data stream and detects a low Bit Error Rate. LED will indicate ‘red’ after the Bit Error Rate reaches an unacceptable level or when there is no optical link established.

# OPTICAL SYSTEMS DESIGN

## OSD8320R

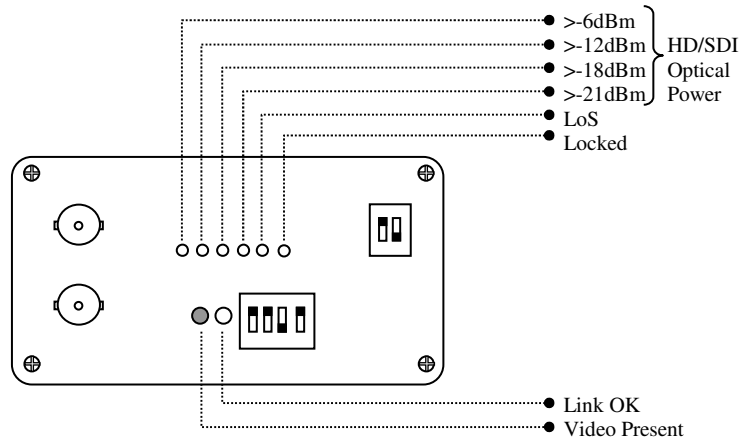


FIGURE 17: OSD8320R LED INDICATORS

TABLE 9: OSD8320R LED INDICATORS

INDICATOR	COLOUR	FUNCTION
<b>-6dBm</b>	Green	Optical Power above -6dBm
<b>-12dBm</b>	Green	Optical Power above -12dBm
<b>-18dBm</b>	Green	Optical Power above -18dBm
<b>-21dBm</b>	Green	Optical Power above -21dBm
<b>LoS</b>	Red	No or too low optical signal
	Off	Optical signal present
<b>Locked</b>	Off	Reclocker not locked or reclocker in bypass mode.
	Green	Reclocker is locked
<b>VIDEO PRESENT</b>	Off	No video signal present
	Amber	Video signal present
<b>LINK OK</b>	Red	Forward link loss
	Green	Forward signal OK

## 3 MAINTENANCE

### 3.1 INTRODUCTION

The following section outlines the fault-finding procedure for the OSD8320T and OSD8320R modems. Please take note of the following:

- ▲ Personnel without appropriate training should not attempt any maintenance except that outlined below.
- ▲ If further maintenance is attempted you are warned that every care should be taken to ensure that internal measurements made while the equipment is operational are taken carefully as some components within the unit are expensive and may be damaged by failure of any portion of their support circuitry.
- ▲ Some components within the unit are Electrostatic (ES) sensitive and Electrostatic Discharge (ESD) precautions should be taken when performing maintenance upon the unit.

### 3.2 EXTERNAL INSPECTION

Visually check for the following:

- ▲ Check that the correct power source is connected to the power socket.
- ▲ Check that the video, data and audio signals are connected to the modem correctly and that the distant OSD8320T or OSD8320R modem has been terminated correctly to any external equipment.
- ▲ Inspect the optical connectors for any contamination and clean using isopropyl alcohol and a lint free tissue if any contamination is detected.
- ▲ Check that any external termination resistors are connected if the system configuration requires them.

### 3.3 ROUTINE MAINTENANCE

- ▲ There is no routine maintenance required with the OSD8320T and OSD8320R.

## 4 WARRANTY

Thank you for purchasing equipment designed, manufactured and serviced by Optical Systems Design (OSD). OSD warrants that at the time of shipment, its products are free from defects in material and workmanship and conforms to specifications. Our Warranty conditions are outlined below:

### 4.1 WARRANTY PERIOD

For warranty period, please call your local OSD distributor.

### 4.2 REPAIRS

Optical Systems Design reserves the right to repair or replace faulty modules/units. Please obtain a "Return Material Authorisation" (RMA) form and number before returning goods.

Goods must be returned in adequate packing material to Optical Systems Design, Warriewood or its nominated authorised representative, for all repairs.

#### 4.2.1 WARRANTY REPAIRS

Return shipments to OSD shall be at customer's expense and freight back to the customer will be at OSD expense.

#### 4.2.2 OUT-OF-WARRANTY REPAIRS

OSD reserves the right to repair or replace any faulty goods. Freight costs and insurance for both journeys are met by the user. All equipment repaired by OSD will have a 3-Month Warranty from the date of dispatch.

#### 4.2.3 SITE REPAIRS

By agreement site repairs may be undertaken for which out of pocket, hotel and travel expenses will be charged.

#### 4.2.4 EXCLUSIONS

This warranty does not apply to defects caused by unauthorized modifications, misuse, abuse or transport damage to the equipment. All modifications to OSD's standard product will need written authorization and will be charged at normal repair rates. All modifications are to be carried out by OSD Technicians. Warranty is void if unauthorized removal and/or tampering with serial number and/or repair labels is evident.

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Optical Systems Design Pty. Ltd.

7/1 Vuko Pl. Warriewood 2102

P.O. Box 891 Mona Vale

N.S.W. Australia 2103

Telephone: +61 2 9913 8540

Facsimile: +61 2 9913 8735

Email: [sales@osd.com.au](mailto:sales@osd.com.au)

Web Site: [www.osd.com.au](http://www.osd.com.au)

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