OPTICAL
SYSTEMS
DESIGN

OPERATOR MANUAL

OSD820 SERIES

DIGITAL VIDEO, AUDIO AND DATA

FIBER OPTIC TRANSMISSION SYSTEM

OPTICAL SYSTEMS DESIGN

INDEX 1

OSD820 OPERATOR MANUAL

1 TECHNICAL SUMMARY

1.1 BRIEF DESCRIPTION

1.1.1 OVERVIEW

The OSD820T modem consists of an optical transmitter section which transmits a video signal plus data and audio signals in digital format as well as an optical receiver section for similar data and audio signals transmitted to the camera for control and communication purposes. The OSD820T receiver provides adjustment free operation over the full optical range of the unit.

The OSD820R incorporates a high performance optical digital receiver for incoming video + audio + data signals and a transmitter which outputs a digital optical signal consisting of two audio signals and four data channels. It is designed to be used with the OSD820T. The OSD820R receiver provides a constant video output level, which is independent of link loss. The audio/data section of the OSD820R is also adjustment free over all link lengths. Audio and data signal interface levels and impedances are the same as those of the OSD820T.

1.1.2 APPLICATIONS

▲ High quality CCTV networks requiring full duplex data and/or audio transmission between cameras and either control centre

▲ Extremely high quality video conferencing

▲ Broadcast television systems

▲ Transportation communication systems

1.1.3 FEATURES AND BENEFITS

▲ One way optic transmission of PAL, NTSC or SECAM video plus full duplex transmission of
• One audio channel
• Three data channels
• One relay contact channel

▲ Studio quality 10 bit video and 24 bit audio

▲ Video bandwidth of 10MHz

▲ Remote control of Pan, Tilt and Zoom for video surveillance

▲ Transmission of alarm and control signals from the camera site

▲ Operating range of at least 3km on multimode fiber, depending on optical devices

▲ Video inputs have 3dB overload capability and can be equalised for up to 300m of coaxial cable

1.2 TYPICAL CONFIGURATION

FIGURE 1 below indicates a typical set-up for an OSD820T and OSD820R.

OSD820T   **OSD820R**

Optical Fiber Link

VIDEO INPUT → OSD820T

DATA CH1-CH3

Twin Fiber version

AUDIO CH

RELAY CH

WDM version ONLY

POWER SUPPLY

VIDEO OUTPUT

DATA CH1-CH3

AUDIO CH

RELAY CH

POWER SUPPLY
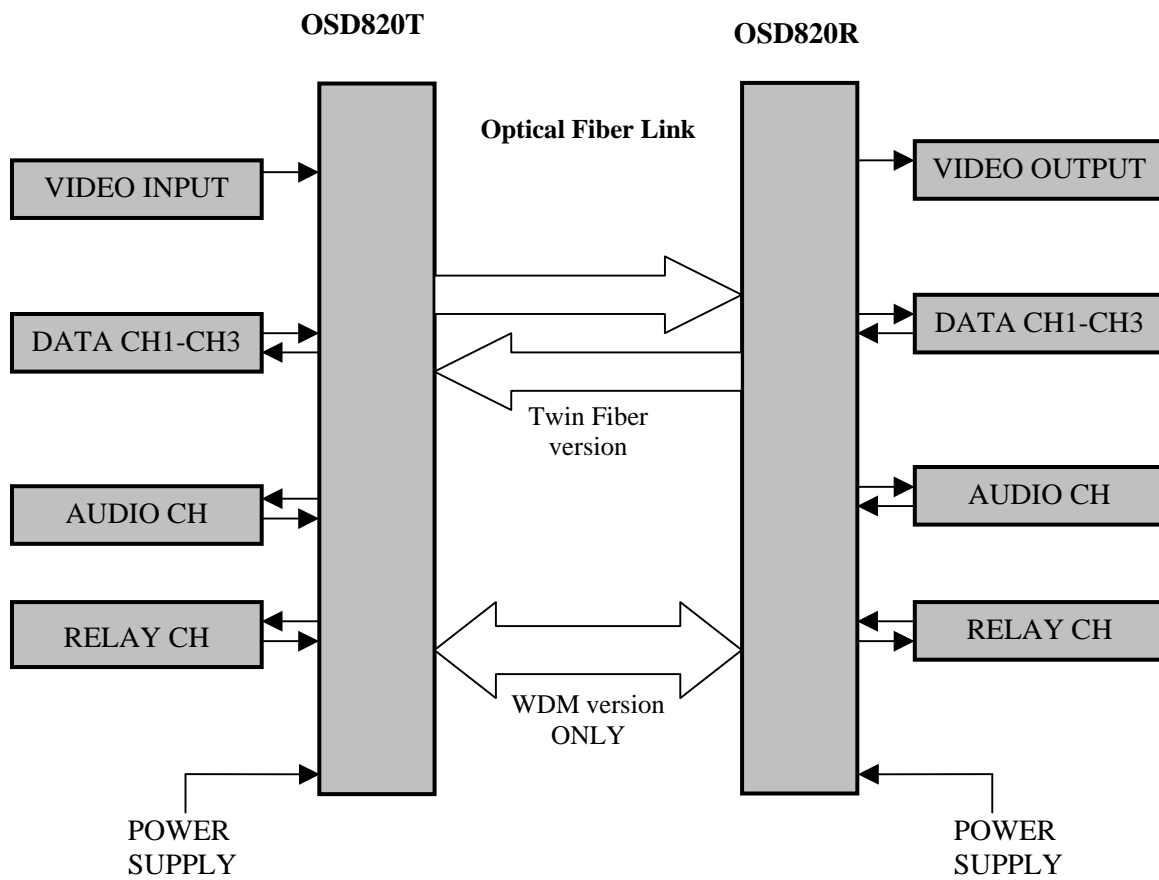
FIGURE 1: TYPICAL CONFIGURATION

1.3   PRODUCTS AND OPTIONS

There are various options available for the OSD820 as identified in Table 1 below:

TABLE 1: PRODUCTS AND OPTIONS

ITEM	DESCRIPTION
OSD820AT	VIDEO TRANSMITTER WITH 1 DUPLEX AUDIO, 3 DUPLEX DATA CHANNELS AND RELAY CHANNEL
OSD820AR	VIDEO REVCEIVER WITH 1 DUPLEX AUDIO, 3 DUPLEX DATA CHANNELS AND RELAY CHANNEL
OSD820BT	VIDEO TRANSMITTER WITH AUDIO AND DATA TO CAMERA
OSD820BR	VIDEO RECEIVER WITH AUDIO AND DATA TO CAMERA
ITEM	DESCRIPTION
OPTION C	MODULE VERSION
OPTION L	1300nm SINGLEMODE OPTION FOR THE ABOVE
OPTION LDN	1300nm AND 1550nm LASER (where "N" indicates Laser type)
OPTION W	SINGLE FIBER OPERATION

1.4   TECHNICAL SPECIFICATIONS

TABLE 2: TECHNICAL SPECIFICATIONS

SPECIFICATION	PERFORMANCE
Video Input/Output Impedance	75Ω composite
Video Input/Output Levels	1.0 Vpp nominal
Video Connectors	BNC
Video Bandwidth	5Hz to 10MHz (±1dB)
Signal to Noise Ratio (Weighted)	> 67dB at all receive levels over the unit's full dynamic range
Linearity	<0.5% Differential Phase (DP), <0.5° Differential Gain (DG)
Audio Input/Output Impedance	>10kΩ/200Ω Balanced/Unbalanced
Audio Bandwidth	10Hz – 22kHz ± 1dB
Audio Input & Output Level	0dBu (0.775V_{rms}) nominal, balanced or unbalanced
Audio Headroom	20dB balanced, 15dB unbalanced
Audio Signal to Noise Ratio	>100dB (weighted at max level)
Audio Distortion	< 0.02% Total Harmonic Distortion (THD)
Data Interface	TTL, RS232, RS422 and RS485 31kHz Manchester or Biphase possible in either direction
Data Rates	DC to >400kbps on 2 data channels DC to >100bps on relay channel
Data Bit Error Rate	< $1x10^{-9}$
Audio and Data Connectors	26 Pin female high density D connector
Transmitter Wavelength	850nm (1310nm for OSD820TL or OSD820RL options)
OSD820T Transmitter Coupled Power	>-15 to –5dBm into multimode fiber >-15 to –3dBm into singlemode fiber (OSD820TL version only)
OSD820R Transmitter Coupled Power	>-20 to –14dBm into multimode fiber >-20 to –10dBm into singlemode fiber (OSD820RL version only)
OSD820R Receiver Sensitivity	<-29dBm
OSD820R Receiver Saturation	>-3dBm
OSD820T Receiver Sensitivity	<-37dBm
OSD820T Receiver Saturation	>-10dBm
Link Distances	>2km multimode for standard 850nm OSD820 link (fiber bandwidth limited) >3km multimode for optional 1310nm OSD820L link (fiber bandwidth limited) >30km singlemode for optional 1310nm OSD820L link (fiber loss limited)
Optical Connectors	ST standard, others optional
Dimensions (mm)	104W x 144D x 25H module 25W x 208D x 100H card
Weight	400g (module), 200g (card)
Power Requirements	10V to 24V_{DC} @ 5VA
Operating Temperature	-20 to +75°C
Relative Humidity	0 to 95% non-condensing
Chassis Current Consumption (CCC)	0.40Amp

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1.5   PRODUCT DESCRIPTION

The OSD820 series is a high-quality fiber optic digital video, audio and data transmission system. The system consists of the OSD820T and the OSD820R, which are designed to be used as a pair, and provide one-way transmission of PAL, NTSC or SECAM video, plus full-duplex transmission of one audio, one relay and three data channels.

The OSD820T accepts one analog composite video input signal and one analog audio input signal along with three digital data input signals and one relay contact signal. The video signal is converted to digital with 10-bit resolution, while the audio signal is converted using 24-bit resolution so as to preserve the quality of the input signals. The resulting digital signals are multiplexed and transmitted as a digital bitstream through the fiber. The OSD820T also includes an optical receiver section that decodes the digital signal transmitted by the OSD820R, to provide audio, data and relay output signals. The audio channel can be balanced or unbalanced at 775mV nominal level and operates over a 22kHz bandwidth. First data channel can be configured as RS232, TTL, RS422 or RS485, second channel as R422 or RS232 and third is RS232 only. Data channels may operate from DC to 400kbps. The fourth channel is a full duplex contact input/relay output channel for control/alarm purposes. User adjustable turnaround times are provided for RS485. The OSD820T receiver provides adjustment free operation over the full optical range of the unit.

The OSD820R incorporates a high performance optical digital receiver for incoming video, audio and data signals, and a transmitter that outputs a digital optical signal consisting of one audio signal, three data and one relay channels. The unit provides a constant video output level which is independent of link loss, and the audio and data section of the OSD820R is also adjustment free over all link lengths. Audio and data signal interface levels and impedances are the same as those of the OSD820T.

The OSD820T and OSD820R are available in two physical configurations: card or stand-alone case. The card versions are designed to fit the 3RU-high 19" OSD370 chassis, which allows multiple OSD card products to be conveniently powered from and located in the one chassis. The standalone case version is intended for isolated use and require an external power source.

The OSD820 system can be used with any standard multi-mode optical fiber, and is available optionally for single-mode fiber use. A Wavelength Division Multiplexing version is also available to allow the use of a single fiber for transmission and reception.

1.6   PIN ASSIGNMENTS

Pin assignments for the "Audio/Data Input/Output" DB26 high density connector (Figure 2) is shown in Table 3 below.

TABLE 3: PIN ASSIGNMENT

FUNCTION	PIN	FUNCTION	PIN
Data ground	1,6	Relay input	22
Audio ground	15,18	Relay output n.o.	5
Data1 input +	10	Relay output n.c.	14
Data1 input -	19	Relay output common	23
Data1 output +	2	Audio1 input +	24
Data1 output -	11	Audio1 input -	7
Data2 input +	20	Audio1 output +	16
Data2 input -	3	Audio1 output -	25
Data2 output +	12		
Data2 output -	21		
RS232 input channel 3	4		
RS232 output channel 3	13		

NOTES:

2-wire RS485 is available on pins 2 and 11
Data channel 1 RS232 output is available on pin 2 when link LK6 has pins 1 and 2 connected
Data channel 2 RS232 output is available on pin 12 when link LK4 has pins 1 and 2 connected
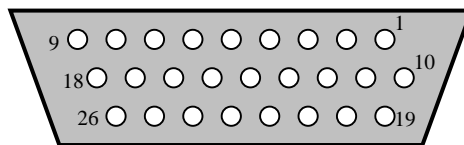

FIGURE 2: DB26 FEMALE HIGH DENSITY CONNECTOR

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   INSTALLATION AND OPERATION

2.1   INTRODUCTION

This section outlines the methods required to install and operate the OSD820T and OSD820R 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.
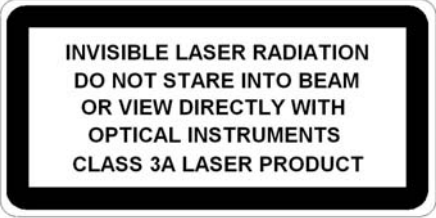
2.2   INSTALLATION

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

| Class 1	Class 3A
The multimode version of the OSD820 is a **Class 1 LED product**. Wavelength of 850nm and <-8dBm power output.	The singlemode and WDM versions of the OSD820 are **Class 3A laser products.** Wavelength of 1310nm and <+5dBm power output or wavelength of 1550nm and <+7dBm power output.
	INVISIBLE LASER RADIATION DO NOT STARE INTO BEAM OR VIEW DIRECTLY WITH OPTICAL INSTRUMENTS CLASS 3A LASER PRODUCT

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.

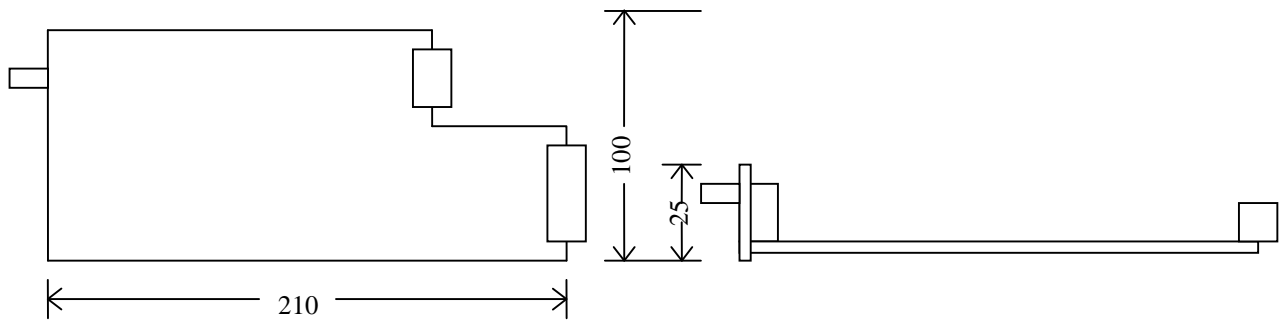▲   Protective eyewear should be worn in the vicinity of laser equipment.

2.2.2   PACKAGING

The OSD820TC and OSD820RC are designed to be mounted on an even surface and to be secured by means of M4 or smaller screws.

The OSD820T and OSD820R card versions are designed to be inserted into a chassis and secured by means of captivated screws.
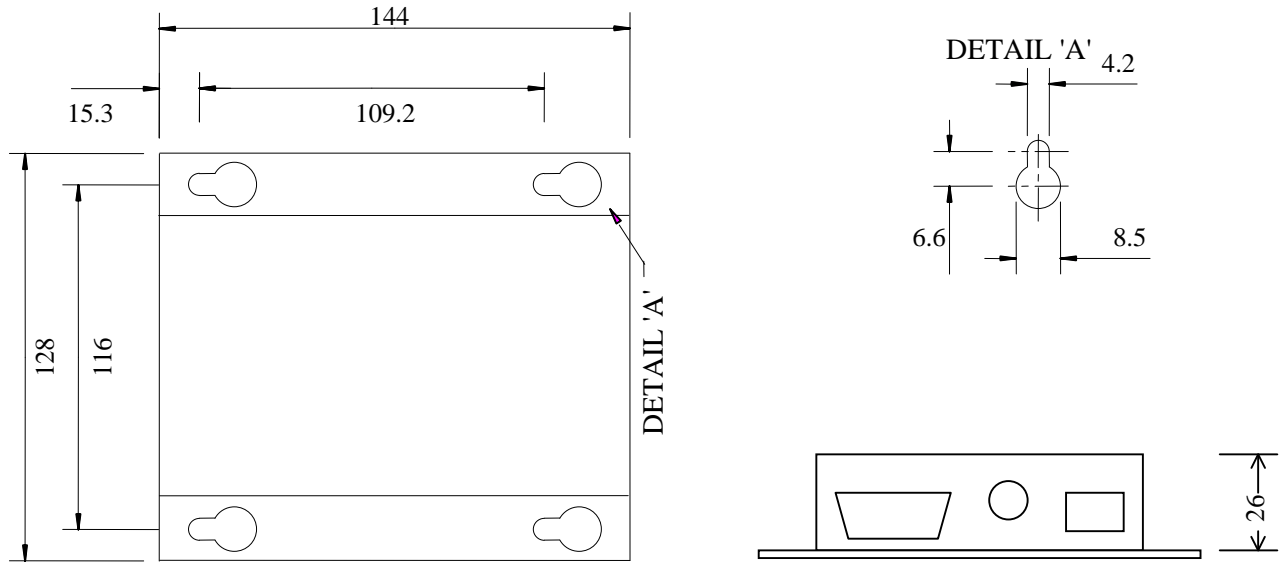
(a) OSD820 case version

(b) OSD820 card version

FIGURE 3: OSD820 MOUNTING DIMENSIONS

2.2.3   POWER SUPPLY CONNECTIONS

The OSD820 card version is powered from the OSD370 chassis.

The OSD820 module requires external DC power. The voltage range of the OSD820 is +10 to +24V_{DC} @ 5VA. Power should be connected to the power socket located at the back of the case. DC power should be connected as indicated in Table 4.

DC power in the OSD820 card version is connected via a DB9 connector. Power is supplied by the chassis.

TABLE 4: POWER CONNECTION

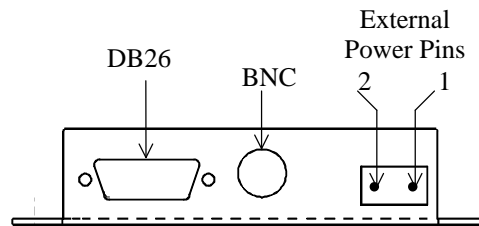| External Power Pin	Specification
Pin 1	+10 to +24V_{DC}
Pin 2	Ground

FIGURE 4: OSD820TC AND OSD820RC POWER SUPPLY CONNECTIONS

NOTES:
   1. The card version of the OSD820T and OSD820R should be fixed into the OSD370 chassis using the captivated screws

   2. Either card can be plugged in or out of the OSD370 chassis with power on or off.

2.2.4   OTHER CONNECTIONS

The video-input signal (eg. from camera) is connected to the video input BNC connector on the OSD820T. The video output signal (eg. to monitor) is connected from the video output BNC connector on the OSD820R.

All Data, Audio and Relay signals are connected to the DB26 connector as set out in Table 3.

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.

2.2.5   LINK SETTINGS

Link settings are shown in Table 5, and can be configured to suit user requirements. To gain access to the Jumper Links in the Case Version, the case must be opened using the following method. *Note: Observe ESD precautions when removing the case.* Disconnect power connection. Remove BNC connector nut and washer, D-Type connector female screw locks and Base Plate countersink screws. Remove the base plate then slide the board out of the cover.

Extra care must be taken not to damage internal fiber pigtail with WDM Units and Fiber pigtail devices. The board must be removed gently to gain access to internal WDM connector. Unscrew or unplug this connection, then remove board. Set the Jumper Links to the appropriate links as set out in Table 5.

To re-assemble, reverse the above process, taking care not to damage internal optical fibers.

Both the OSD820T and the OSD820R have 6 user configurable links labeled as LK1, LK3-LK7 on the PCB. Table 5 below lists the links and settings. Links labeled LK8-LK12 are factory set. Do not touch. Permanent damage may occur and/or void warranty.

TABLE 5: OSD820T AND OSD820R LINKS CONFIGURATION

LK	No. of Pins	FUNCTION	SETTING
1	2	600R termination audio channel 1	ON/OFF
2	2	Not Used	Not Used
3	3	Sets RS232 at output1 to normal phasing	1,2
3	3	Sets RS232 at output1 to reversed phasing	2,3
4	3	Sets RS232 at output2 to normal phasing	1,2
4	3	Sets RS232 at output2 to reversed phasing	2,3
5	3	Sets RS232 at RS232 O/P to normal phasing	1,2
5	3	Sets RS232 at RS232 O/P to reversed phasing	2,3
6	3	Links RS232 channel 1 to output 1+	1,2
6	3	Links RS422 channel 1 to output 1+	2,3
7	3	Links RS232 channel 2 to output 2+	1,2
7	3	Links RS422 channel 2 to output 2+	2,3
8	3		**"For Factory Use Only - Do not Touch"**
9	3		
10	2		
11	2		

NOTES:

"Normal phasing" refers to RS232 signal being passed through the link with the same phase at the output as at the input.

"Reverse phasing" refers to the output phase being opposite to that of the input. This is useful in converting from RS422 at the input of the link to RS232 at the output.

2.3   OPERATION

2.3.1   OSD820T OPERATION

When using the OSD820T for the first time, check that the unit is in good condition with no visible damage.

If a card version is used, insert it in an appropriate slot on the OSD chassis and check that the indicators illuminate accordingly on power up. If a module version (OSD820C) is used, connect the unit to an appropriate power source and check that the indicators illuminate accordingly on power up.

In either case take special note of the "Laser OK" indicator, it should be green. If it is red there may be a problem with the laser. Disconnect power and have the Laser checked as soon as possible.

If RS485 data is required set the RS422/485 Mode switch to the "On" position, ie down (which is the 1st switch of the 4way DIPswitch. It is located on the Front Panel of Card Version and on the front of the box in Case Version). Then switch 2, 3 and 4 to set the RS485 Turnaround Delay to the value appropriate to your system. If you are not sure of the correct value, leave all Turnaround Delay switches "Off", ie up. Refer to Table 6 for delay selection. As described in Table 3, RS485 is available on Pins 2 (RS485+) and 11 (RS485-). If RS485 is not required, keep all four switches in the "Off" position, ie up (see Figure 5).

All 'two wire' RS485 devices are by default in receive mode, and only change to transmit mode for data transmission. All RS485 protocols use a transmit delay to ensure successful transmissions to the ends of the network. The delay is data rate and protocol dependent.

To connect a video signal, connect a BNC terminated coaxial cable from the camera to the unit. If the camera is operational, the "Video Present" indicator should change from Red to Green.

Finally, plug in the optical connectors of the optical cable. If the remote OSD820R is connected, the "Data Link" LED will change from Red to Green.

Plug the digital signal source and/or audio signal into the 26-pin D connector (DB26) on the rear of the module.

Ensure that the correct signals are connected to the correct pins of Audio/Data Input/Output connector as specified in Table 3.

TABLE 6: OSD820T/R RS-485 TIMING DELAYS

SWITCH COMBINATIONS				FUNCTION	DELAY
1	2	3	4		(± 1%)
0	0	0	0	RS-422	N/A
1	1	1	1	RS-485	30us
1	0	1	1	RS-485	100us
1	1	0	1	RS-485	300us
1	0	0	1	RS-485	1ms
1	1	1	0	RS-485	3ms
1	0	1	0	RS-485	10ms
1	1	0	0	RS-485	30ms
1	0	0	0	RS-485	100ms

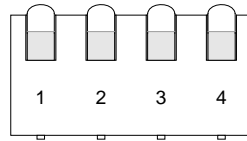NOTE: Data Control Switch Settings for RS485 (0 = off, 1 = on)
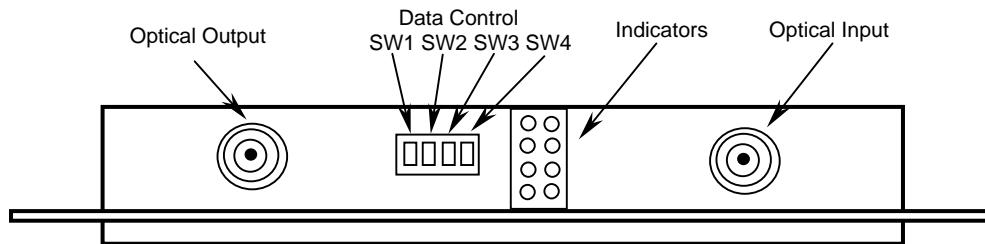
FIGURE 5 DATA CONTROL SWITCH

FIGURE 6: OSD820TC AND OSD820RC SIDE VIEW

2.3.2   OSD820R OPERATION

When using an OSD820R for the first time check that the unit is in good condition with no visible damage.

If a card version (OSD820R) is used, insert it in an appropriate slot on the OSD chassis and check that the indicators illuminate accordingly. If a module version (OSD820RC) is used, connect the unit to an appropriate power source and check that the indicators illuminate accordingly.

The "Laser OK" indicator LED should be green in both Card and Case Versions, if the LED is red there may be a problem with the laser. Disconnect power and have the Laser checked as soon as possible.

If RS485 data is required set the RS422/485 Mode switch to the "On" position, i.e. down (which is the 1st switch of the 4way DIP switch (see Figure 5). It is located on the Front Panel of Card Version and on the front of the box in the Case Version). Switches 2, 3 and 4 set the RS485 Turnaround Delay to the value appropriate to your system. If you are not sure of the correct value, leave all Turnaround Delay switches "Off", i.e. up. Refer to Table 6 for delay selection. As described in Table 4, RS485 is available on Pins 2 (RS485+) and 11 (RS485-). If RS485 is not required, keep all four switches in the "Off" position, i.e. up.

All 'two wire' RS485 devices are by default in receive mode, and only change to transmit mode for data transmission. All RS485 protocols use a transmit delay to ensure successful transmissions to the ends of the network. The delay is data rate and protocol dependent.

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

Connect the optical cable: if adequate optical power is received and signal is locked the "Data Link" indicator will change from 'red' to 'green'. If a video signal is being received the "Video Present" indicator should be 'green'; if no video signal is being received this indicator will be 'red'.

Plug the digital signal source and/or audio signal into the 26-pin D connector (DB26) on the rear of the module. Ensure that the correct signals are connected to the correct pins of Audio/Data Input/Output connector as specified in Table 3.

2.3.3   CONTROLS

The OSD820T and OSD820R each has a 4-way DIP switch (located at the front panel for Card Version and front of box for Case Version) which is used to select RS422 or RS485 mode, with different RS485 Turnaround Delay settings from 30uSec to 100mSec. See Table 6.

There are 6-User link settings available for setting up desired output configurations for AUDIO, RS232 & RS422 outputs. See Table 5.
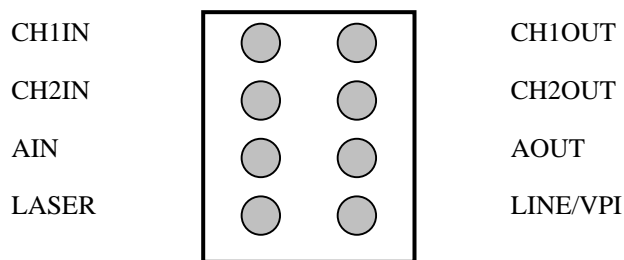

2.3.4   OSD820T AND OSD820R INDICATORS

CH1IN		CH1OUT
CH2IN		CH2OUT
AIN		AOUT
LASER		LINE/VPI

FIGURE 7: OSD820T AND OSD820R LED INDICATORS

TABLE 7: OSD820T AND OSD820R INDICATOR FUNCTION

INDICATOR	PARAMETER	COLOUR	FUNCTION
CH1IN	Data Input Ch 1	Green Red	Present Not Present
CH2IN	Data Input Ch 2	Green Red	Present Not Present
AIN	Audio Input Ch	Green Red	Present Not Present
LASER	Optical Output	Green Red	OK Fail
CH1OUT	Data Output Ch 1	Green Red	Present Not Present
CH2OUT	Data Output Ch 2	Green Red	Present Not Present
AOUT	Audio Output	Green Red	Present Not Present
LINE/VPI	Video Input/LINK	Green Red	OK Fail

NOTE: "Link" Indicator refers to the received data stream. It is 'green' after the optical link is established and the receiver is locked onto the incoming data stream and detected a low Bit Error Rate. It will indicate 'red' after the Bit Error Rate reaches an unacceptable level and before the number of bit errors has reduced to a low rate.

3 MAINTENANCE

3.1 INTRODUCTION

The following section outlines the fault-finding procedure for the OSD820T and OSD820R 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 sensitive (ES) 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 data signals are connected to the modem correctly and that the distant OSD820T or OSD820R 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 OSD820T and OSD820R.

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.

OPTICAL

SYSTEMS

DESIGN

PTY LTD   A.B.N. 83 003 020 504