OPTICAL
SYSTEMS
DESIGN

OPERATOR MANUAL

OSD860 SERIES

DIGITAL 2/4/8 CHANNEL VIDEO/AUDIO/DATA/IP

FIBER OPTIC MULTIPLEXER

1 TECHNICAL SUMMARY

1.1 PRODUCT DESCRIPTION

The OSD860 series is a high-quality digital video, data, audio and IP optical fiber transmission system. The system consists of an OSD860 transmitter and OSD860 receiver which are designed to be used as a pair. The OSD860 standard product provides forward transmission of two, four or eight channels of PAL, NTSC or SECAM video and one way transmission of four data channels. The OSD860 can also be configured with the following options;

- Full duplex data operation.
- Transmission of four audio and/or four additional high speed data channels.
- Reverse path transmission configured to provide any combination of four audio channels and/or four data channels.
- Alternatively, the system may transmit eight audio only or eight data only signals either one way or full duplex.
- 10/100 Base-T Ethernet connections via an RJ45 connector.

The basic OSD860 transmitter has up to eight analogue composite video inputs which are converted to a digital signal with 9-bit resolution. The four digital data inputs can be RS232 on two channels, TTL or RS422 on the other two channels, with RS485 available on one channel, and operate from DC to 150kbps. Another added option allows a further 4 or 8 high speed data channels operating up to 400kbps. User adjustable turnaround times are provided for the RS485 on the optional data channels and a fixed 100us turnaround time for the standard channel.

The OSD860 transmitter can be optionally supplied with up to eight analogue audio channels where the audio signals are converted using 24-bit resolution. The audio channels can be balanced or unbalanced at 775mV nominal level and operate over a 15kHz bandwidth.

10/100 Base-T Ethernet connection is also a fitted option.

The resulting digital signals are multiplexed and transmitted as a digital bit-stream through the fiber as a laser light source operating at 1310nm or at 1550nm including the eighteen CWDM wavelengths between 1270 and 1610nm. Various transmitter power levels and receiver sensitivities are available providing cost effective operation over up to 120km. Two fibers are normally employed, one for each direction of transmission. Single fiber full duplex operation is possible by employing wavelength division multiplexing (WDM).

The OSD860 transmitter also includes an optical receiver section that decodes the digital signal transmitted by the OSD860 receiver, to provide data, optional audio and Ethernet output signals.

The OSD860 receiver incorporates a high performance optical receiver for the incoming digital bit-stream. The received digital signal is then decoded into video, data and audio signals, which are available at the unit's outputs. The OSD860 receiver also includes a transmitter that outputs a digital optical signal consisting of the return path channels for audio and/or data and IP. The unit provides constant analogue composite video output level which is independent of link loss, and the audio and data sections of the OSD860 receiver are also adjustment free over all link lengths.

The OSD860 is available in three physical configurations: 10T card, stand-alone modem case and 2RU rack mounting chassis. The 2RU version allows two OSD860 units effectively doubling the video, audio and data available in a single unit. The card versions are designed to fit the 3RU-high 19" OSD370 or OSD350 chassis allowing multiple OSD card products to be conveniently powered from and located in the one chassis. The module versions are intended for isolated use and require an external power source of +10 to +18V_{DC}. The 2RU rack mounting chassis is a fully independent mains or -48V powered unit.

1.1.1 APPLICATIONS

- σ CCTV networks
- σ Video conferencing
- σ Transportation networks
- σ Industrial monitoring systems
- σ Distance learning

1.1.2 FEATURES AND BENEFITS

- ▲ Uncompressed 9 bit video, 24 bit audio encoding, giving professional quality transmission.
- ▲ Fiber optic transmission of four or eight video signals on one fiber with four RS232 and RS422 data signals (two of each) which may be one way with the video or, optionally, full duplex.
- ▲ Optional transmission of four audio and/or four additional high speed data channels which may be one way or full duplex. Alternatively, the user may transmit eight audio or eight extra data signals, again either one way or full duplex.
- ▲ Range of up to 120km is possible with optional 1550nm operation.
- ▲ Optional 10/100 Base-T Ethernet bridging through the link.
- ▲ Optional duplex operation over one fiber.
- ▲ Operates over singlemode or multimode fiber.
- ▲ Video bandwidth of 6MHz, SNR >63dB
- ▲ Audio bandwidth of 15kHz, SNR >100dB
- ▲ Video inputs have 3dB overload capability.

1.2 TYPICAL CONFIGURATION

Figure 1 below shows a typical set-up for an OSD860 pair.

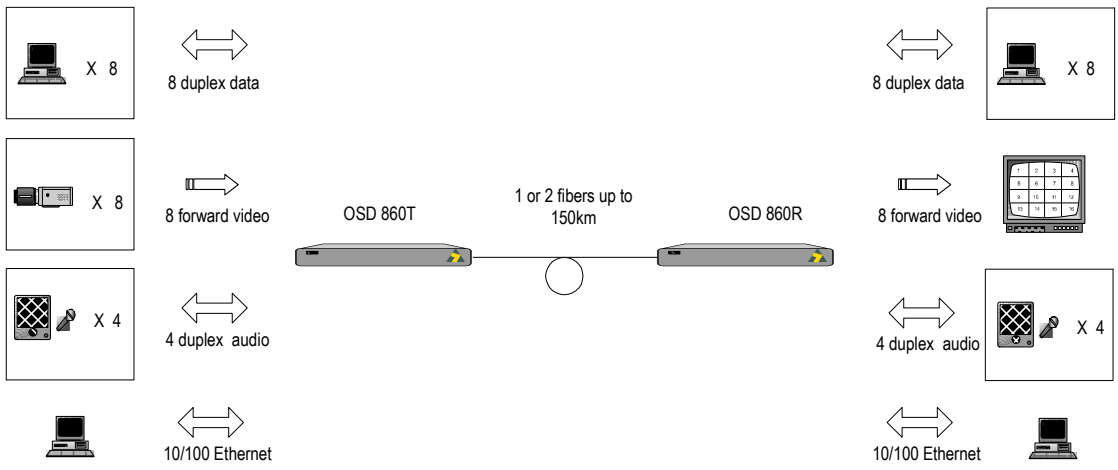

FIGURE 1: TYPICAL CONFIGURATION

1.1 PRODUCTS AND OPTIONS

There are various options available for the OSD860 as identified in Table 1 below:

TABLE 1: PRODUCTS AND OPTIONS

ITEM	DESCRIPTION
NV	N video channels (where N = 4, or 8)
A	Forward path audio
a	Reverse path audio
D	Forward path data
d	Reverse path data
W	Single fiber operation (WDM)
E	10/100BaseT Ethernet Interface
NMS	Network Management System

TABLE 2: OSD860 POSSIBLE CONFIGURATIONS

	OPTION	OSD860T			OSD860R		
		VIDEO	DATA	AUDIO	VIDEO	DATA	AUDIO
F	Basic	4V/8V	4D	-	4V/8V	4D	-
	B+Audio & Data	4V/8V	8D	4A	4V/8V	8D	4A
	B+Audio	4V/8V	4D	4A or 8A	4V/8V	4D	4A or 8A
	B+Data	4V/8V	8D or 12D	-	4V/8V	8D or 12D	-
F + R	Basic	4V/8V	4Dd	-	4V/8V	4Dd	-
	B+Audio & Data	4V/8V	8Dd	4Aa	4V/8V	8Dd	4Aa
	B+Audio	4V/8V	4Dd	4Aa or 8Aa	4V/8V	4Dd	4Aa or 8Aa
	B+Data	4V/8V	12Dd	-	4V/8V	12Dd	-
	Ethernet	Can be added to all options in F + R			Can be added to all options in F + R		

*F- Forward path
*F+R - Forward + Reverse path
*B- Basic option
*A- Forward Audio
*D- Forward Data
*a- Reverse audio
*d- Reverse data

1.2 TECHNICAL SPECIFICATIONS

TABLE 3: TECHNICAL SPECIFICATIONS

SPECIFICATION	PERFORMANCE	
	VIDEO	**AUDIO**
Input/Output Impedance	75Ω	10kΩ/200Ω Balanced/Unbalanced
Input/Output Levels	1.0 Vpp nominal	0dBu nominal, 15dBu maximum
Bandwidth (±0.5dB)	10Hz to 6MHz	10Hz - 15kHz
Signal to Noise Ratio	> 63dB (weighted)	>100dB (A weighted at max level)
Linearity	<0.7% Differential Phase (DP) <0.7° Differential Gain (DG)	< 0.05% Total Harmonic Distortion (THD)
Standard Data Interface	2 x RS232 and 2 x RS422	
Standard Data Rates	DC to 150kbps	
Optional Data Interface	RS232 or RS422 with RS485 also available on Channel 1	
Optional Data Rate	DC to 400kbps	
Optional Ethernet Interface	10/100BaseT via RJ45 connector with system rate of 3.5Mbps	
Data Bit Error Rate	$< 1x10^{-9}$	
Connectors	BNC	
Standard Data Connectors	Female 15 pin D connector	
Optional Audio/Data Connector	Female 44 pin high density D connector	
Transmitter Wavelength	1310nm or 1550nm (including CWDM devices from 1470 to 1610nm)	
Transmitter Coupled Power	Several options are available from –7dBm to +4dBm	
Receiver Sensitivity	<-22dBm (PIN) <-29dBm (APD)	
Reverse Path Sensitivity	<-38dBm	
Link Budget	From 15dB to 33dB at 1310nm or 1550nm	
Optical Connectors	ST standard, FC and SC are optional	
Dimensions (mm)	100W x 208D x 50H card, powered from OSD370/350 chassis 105W x 210D x 55H module 483W x 210D x 88H 2RU case	
Weight	0.2kg (card), 1.0kg (module), 3.1kg (2RU case)	
Power Requirements (version dependable)	90 to 265 V_{AC} @ 20VA (2RU), 10 to 18V_{DC} @ 12VA (module), -48V_{DC} power is optional is 2RU version only	
Operating Temperature	-20 to +75°C	
Relative Humidity	0 to 95% non-condensing	
Chassis Current Consumption (CCC)	0.50 Amp for 4-channel video version 0.70 Amp for 8-channel video version Add 0.30 Amp for additional audio, data and/or Ethernet channels	

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1.3 OSD860 DRAWINGS AND DIMENSIONS

The OSD860 are designed to be mounted on an even surface and to be secured by means of M4 or smaller screws. The card versions are designed to be inserted into a chassis and secured by means of captivated screws.

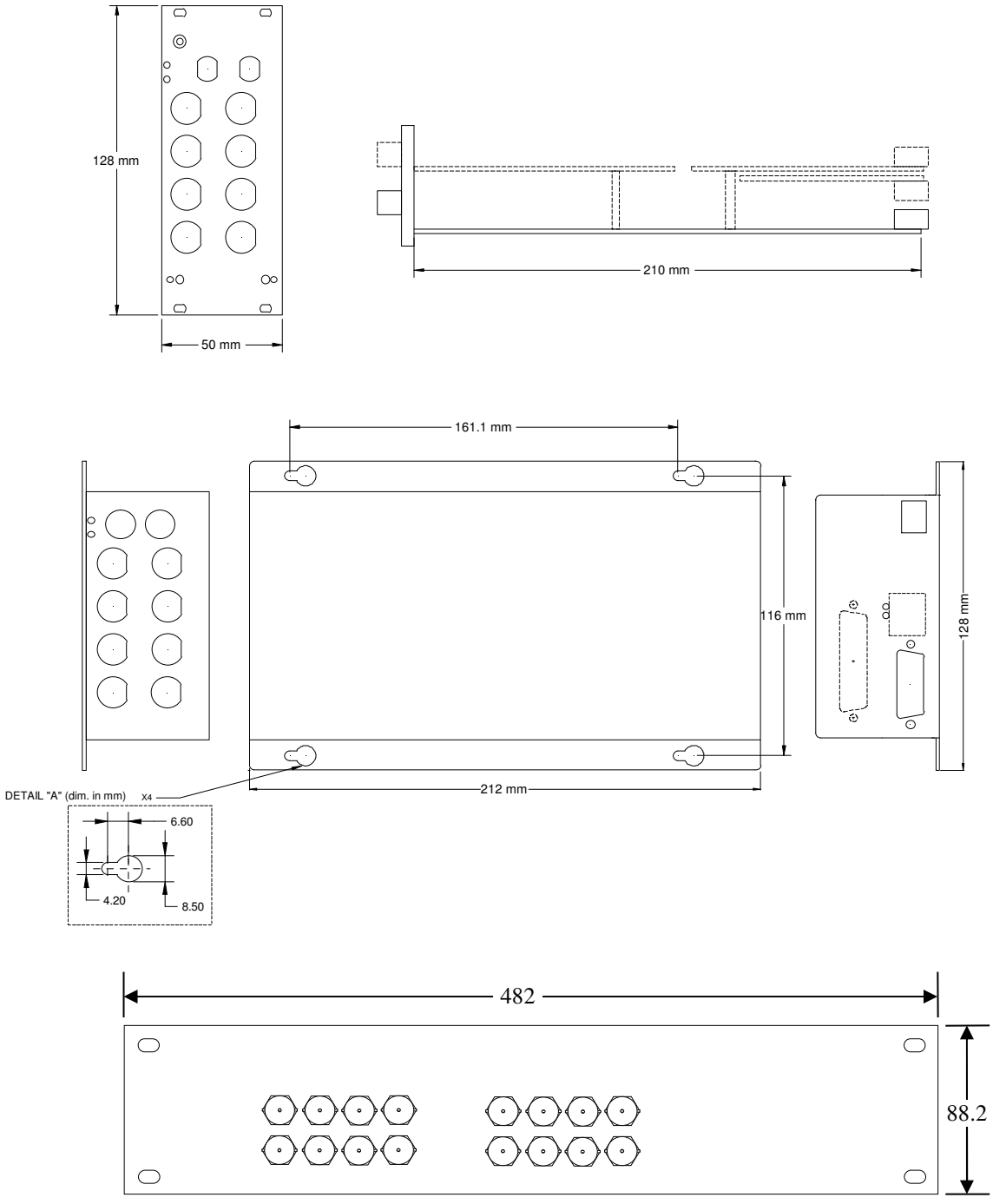

FIGURE 2: OSD860 DIMENSIONS

2 INSTALLATION AND OPERATION

2.1 INTRODUCTION

This section outlines the methods required to install and operate the OSD860 system 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.

Class 1
The OSD860 is a **Class 1 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.

2.3 POWER SUPPLY CONNECTIONS

The OSD860 card version requires DC power which is connected via a DB9 connector and supplied by the OSD370 or OSD350 chassis. The card should be fixed into the chassis using the captivated screws. The cards can be plugged in or out of the chassis with power on or off.

The OSD860 module version requires external DC power and is connected to the power socket located at the back of the case. Power should be connected as indicated in Table 4.

The 2RU rack version requires AC mains power supplied by standard IEC mains plug of $90V_{AC}$ to $265V_{AC}$ @ 20VA. Fuse: 1A Antisurge.

.

TABLE 4: POWER CONNECTION

OSD860 Version	Specification	Power	Connection
Card	$12V_{DC}$	Supplied by OSD370 or OSD350 chassis	DB9
Module	10 to $18V_{DC}$	Power Pack 15VA	2 way terminal connector
2RU	90 V_{AC} to 265 V_{AC} @ 20VA	Mains Power	IEC mains plug

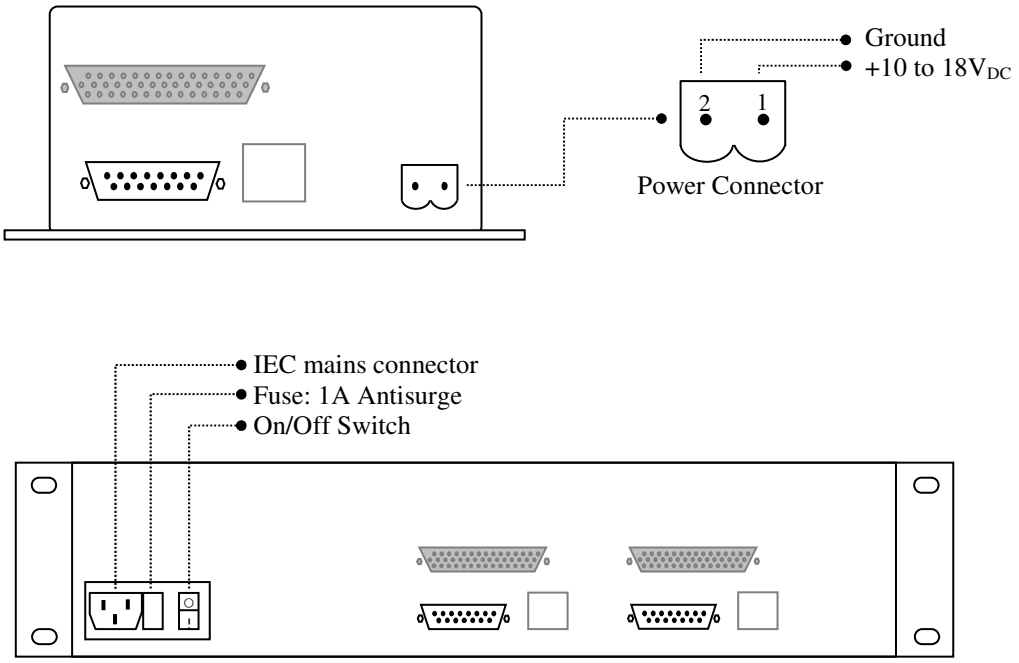

FIGURE 3: OSD860 POWER SUPPLY CONNECTIONS

2.4 DATA CONNECTIONS

The OSD860 basic option provides four full duplex data channels capable of accepting RS232 on two channels, TTL or RS422 on the other two channels, with RS485 available on one channel with a fixed 100us turnaround time. Data is connected to the OSD860 via the DB15 female connector located on the rear panel.

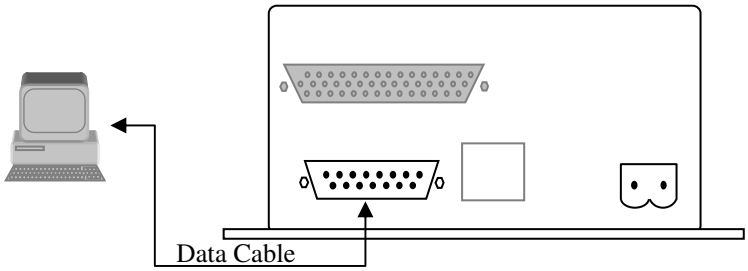

FIGURE 4: BASIC DATA CONNECTIONS

2.4.1 BASIC OPTION CONNECTOR

TABLE 5: BASIC OPTION DB15 FEMALE CONNECTOR AND PIN ASSIGNMENTS

PIN	DATA CONNECTION	PIN	DATA CONNECTION
1	RS422 INPUT 1 + / RS485 INPUT + (4W)	15	RS232 INPUT 1
9	RS422 INPUT 1 - / RS485 INPUT - (4W)	8	RS232 INPUT 2
2	RS422 INPUT 2 +	6	RS232 OUTPUT 1
10	RS422 INPUT 2 -	14	RS232 OUTPUT 2
11	RS422 OUTPUT 1- /RS485 OUTPUT -(4W)/ RS485 IN/OUT - (2W)	3	NC
4	RS422 OUTPUT 1+ /RS485 OUTPUT +(4W)/RS485 IN/OUT +(2W)	13	GROUND
12	RS422 OUTPUT 2 +	7	GROUND
5	RS422 OUTPUT 2 -	-	-

RS485 is available on one channel only.

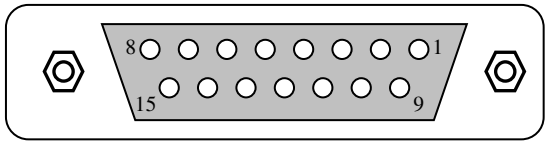

FIGURE 5: DB15F DATA CONNECTOR

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.

2.4.1.1 RS485 OPERATION

The standard OSD860 is configured for RS422 operation. Typically, the unit will be set to RS485 2-Wire or 4-Wire at time of ordering as the access to the jumper settings is limited (particularly the module version). If however there is a requirement for changing to RS485 2-Wire or 4-Wire, modifications should be carried out by OSD or an authorised OSD distributor by setting the jumper links as follows;

Note: There are two versions of switch/link jumper settings on the OSD860 current revisions;

1. 6-pin single in line (SIP) on the OSD860T
2. 8-pin dual in line (DIP) on the OSD860R

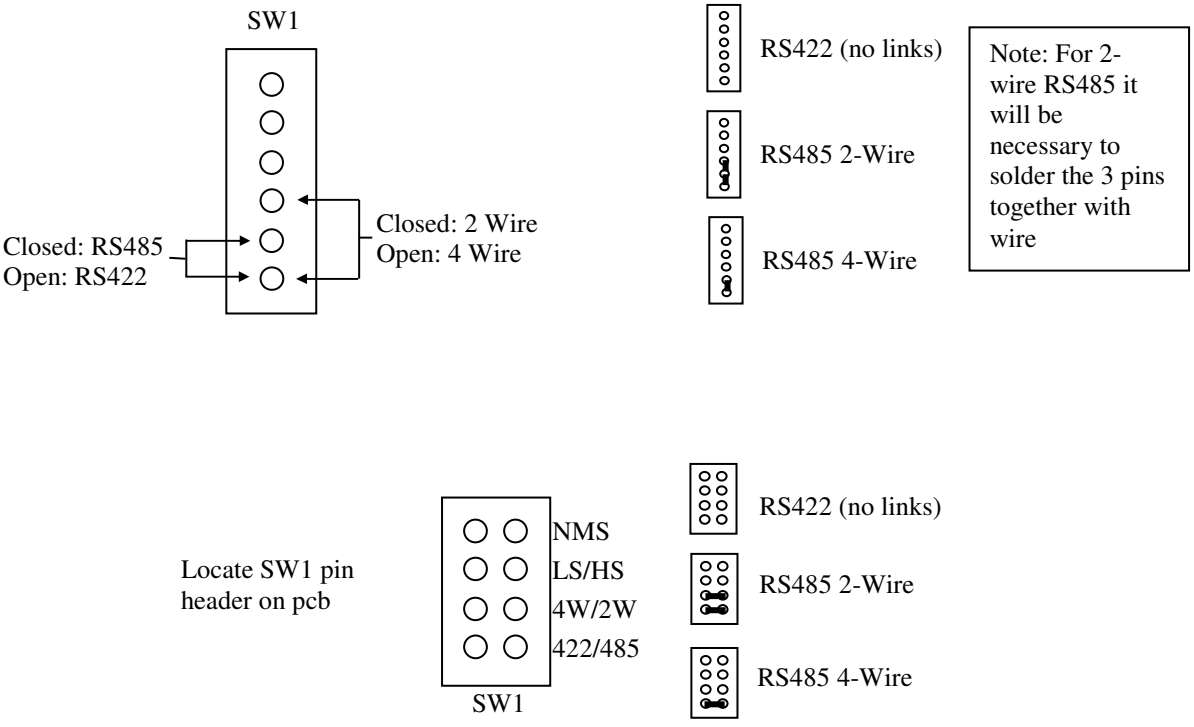

FIGURE 6: STANDARD CHANNEL 1 CONFIGURATION

2.4.2 OPTIONAL DATA/AUDIO CONNECTOR

The OSD860 provides an option for adding the following combinations;

- 4 or 8 data channels
- 4 or 8 audio channels
- 4 data and 4 audio channels

The data channels are capable of accepting RS232, TTL or RS422 and RS485. Data is connected to the OSD860 via the DB44 female connector located on the rear panel. Table 6 outlines the pin connections for the available configurations.

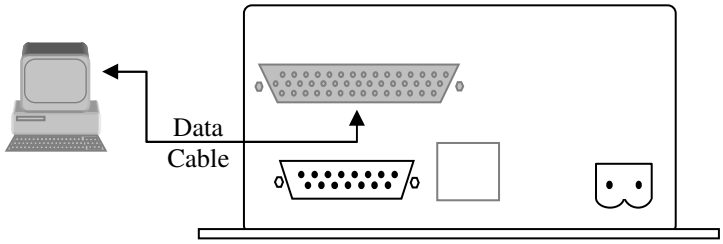

FIGURE 7: OPTIONAL DATA/AUDIO CONNECTOR

TABLE 6: OPTIONAL 44 PIN FEMALE CONNECTOR PIN ASSIGNMENT

DB44 HD PIN-OUT	FUNCTION 4Aa4Dd	FUNCTION 8Aa	FUNCTION 8Dd
1, 8, 15, 16, 30, 38, 41	Ground	Ground	Ground
31	Not Connected	Not Connected	Not Connected
19	CH1 Data Input +	CH5 Audio Input +	CH1 Data Input +
20	CH1 Data Input -	CH5 Audio Input -	CH1 Data Input -
32	CH2 Data Input +	CH6 Audio Input +	CH2 Data Input +
33	CH2 Data Input -	CH6 Audio Input -	CH2 Data Input -
2	CH3 Data Input +	CH7 Audio Input +	CH3 Data Input +
3	CH3 Data Input -	CH7 Audio Input -	CH3 Data Input -
17	CH4 Data Input +	CH8 Audio Input +	CH4 Data Input +
18	CH4 Data Input -	CH8 Audio Input -	CH4 Data Input -
5	CH1 RS232 Output		CH1 RS232 Output
35	CH2 RS232 Output		CH2 RS232 Output
4	CH3 RS232 Output		CH3 RS232 Output
34	CH4 RS232 Output		CH4 RS232 Output
23	CH1 RS422 Output +	CH5 Audio Output +	CH1 RS422 Output +
24	CH1 RS422 Output -	CH5 Audio Output -	CH1 RS422 Output -
36	CH2 RS422 Output +	CH6 Audio Output +	CH2 RS422 Output +
37	CH2 RS422 Output -	CH6 Audio Output -	CH2 RS422 Output -
6	CH3 RS422 Output +	CH7 Audio Output +	CH3 RS422 Output +
7	CH3 RS422 Output -	CH7 Audio Output -	CH3 RS422 Output -
21	CH4 RS422 Output +	CH8 Audio Output +	CH4 RS422 Output +
22	CH4 RS422 Output -	CH8 Audio Output -	CH4 RS422 Output -
27	CH1 Audio Input +	CH1 Audio Input +	CH5 Data Input +
28	CH1 Audio Input -	CH1 Audio Input -	CH5 Data Input -
42	CH2 Audio Input +	CH2 Audio Input +	CH6 Data Input +
43	CH2 Audio Input -	CH2 Audio Input -	CH6 Data Input -
13	CH3 Audio Input +	CH3 Audio Input +	CH7 Data Input +
14	CH3 Audio Input -	CH3 Audio Input -	CH7 Data Input -
29	CH4 Audio Input +	CH4 Audio Input +	CH8 Data Input +
44	CH4 Audio Input -	CH4 Audio Input -	CH8 Data Input -
9	CH1 Audio Output +	CH1 Audio Output +	CH5 RS422 Output +
10	CH1 Audio Output -	CH1 Audio Output -	CH5 RS422 Output -
39	CH2 Audio Output +	CH2 Audio Output +	CH6 RS422 Output +
40	CH2 Audio Output -	CH2 Audio Output -	CH6 RS422 Output -
25	CH3 Audio Output +	CH3 Audio Output +	CH7 RS422 Output +
26	CH3 Audio Output -	CH3 Audio Output -	CH7 RS422 Output -
11	CH4 Audio Output +	CH4 Audio Output +	CH8 RS422 Output +
12	CH4 Audio Output -	CH4 Audio Output -	CH8 RS422 Output -

Notes:

- RS232 operation; pins 20, 33, 3, 18 (channels 1-4) as data inputs when data option fitted
- Single channel RS485 is available on pin 23 (+) and pin 24 (-) when data option fitted
- Use column Function 4Aa4Dd for 4-Audio and 4-Data channel option
- Use column Function 8Aa for 8-Audio channel option
- Use column Function 8Dd for 8-Data channel option
-

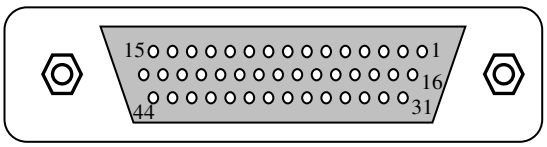

FIGURE 8: OPTIONAL DB44 - FEMALE CONNECTOR PIN OUT

The optionally fitted data provides a number of control settings. These are pre-set at time of ordering as the access to the switch mode settings are limited (particularly the module version). If however there is a requirement for changing settings, the data control switch is located on the OSD8914 Data Interface Daughter board inside the unit. Generally, settings should be carried out by OSD or an authorised OSD distributor by setting the switch positions as indicated on Table 7 and Figure 9.

Switch 4 sets the data mode: RS422/232 or RS485. Switches 2, 3 and 4 set the RS485 Turnaround Delay to the delay appropriate to your system (Table 7). If you are not sure of the correct delay value, leave all Turnaround Delay switches "Off", ie 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.

TABLE 7: OSD860 RS-485 TIMING DELAYS

SWITCH COMBINATIONS				**FUNCTION**	**DELAY (µs)**
1	**2**	**3**	**4**		**(± 3%)**
OFF	OFF	OFF	OFF	RS-422	N/A
OFF	OFF	OFF	ON	RS-485	100000
OFF	OFF	ON	ON	RS-485	30000
OFF	ON	OFF	ON	RS-485	10000
OFF	ON	ON	ON	RS-485	3000
ON	OFF	OFF	ON	RS-485	1000
ON	OFF	ON	ON	RS-485	300
ON	ON	OFF	ON	RS-485	100
ON	ON	ON	ON	RS-485	30

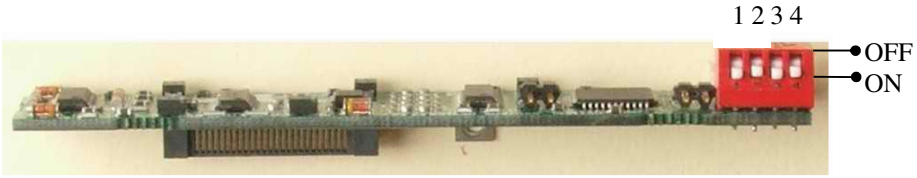

FIGURE 9: DIP SWITCH SETTING

2.5 OPTIONAL ETHERNET CONNECTOR (10/100 BASE-T ETHERNET)

The OSD860 can also provide 10/100 BASE-T Ethernet connection as an option. Standard CAT5e or higher Ethernet connections are required. RJ45 connector is located on the rear panel of the unit.

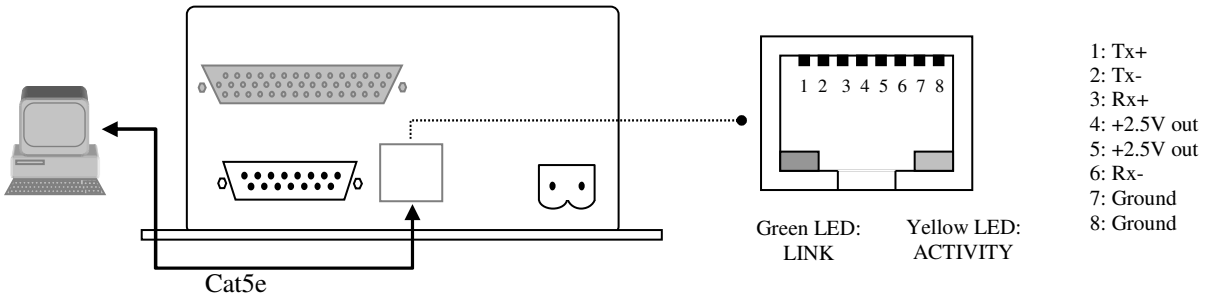

FIGURE 10: 10/100 BASE-T ETHERNET RJ45 CONNECTOR

2.6 VIDEO CONNECTIONS

The OSD860 provides transmission of up to 8 video channels (up to 16 on 2RU version). The video-input signal (eg. from camera) is connected to the video input BNC connectors on the OSD860 transmitter. The video output signal (eg. to monitor) is connected from the corresponding video channel output BNC connectors on the OSD860 receiver. Video channel allocation in shown on the product label.

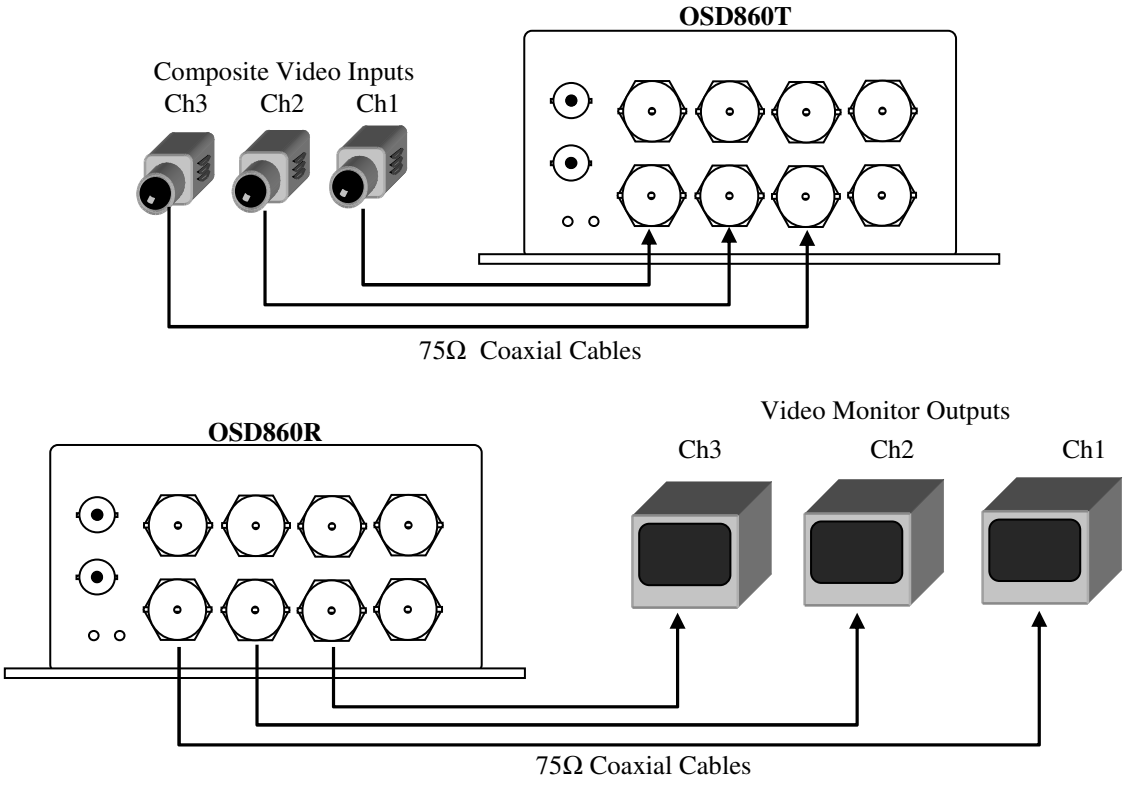

FIGURE 11: OSD860 VIDEO CONNECTIONS

2.7 OSD860 OPERATION

If a card version is used, insert it in an appropriate slot on the OSD chassis and check that the indicators illuminate correctly on power up. If a module version is used, connect the unit to an appropriate power source and check that the indicators illuminate correctly 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 device. Disconnect power and have the unit checked as soon as possible.

Connect the appropriately terminated fiber cable to the OSD860 receiver, checking that correct fiber is connected ie. from OSD860T transmitter to the OSD860R receiver (and vice versa). "ROS” (Received Optical Signal) LED will change from Red to Green.

To connect composite video signals, connect 75Ω BNC terminated coaxial cable from the camera to the OSD860T video inputs. Connect 75Ω BNC terminated coaxial cable from the OSD860R video outputs to the video monitor/switcher.

Plug the digital signal source (data) into the DB15 (or data/audio to the optional DB44) connector 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 5 or Table 6.

2.7.1 OSD860 INDICATORS

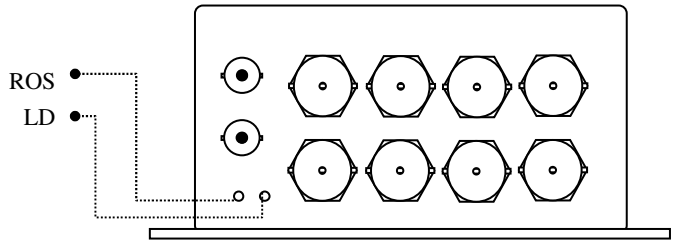

FIGURE 12: OSD860 INDICATORS

TABLE 8: OSD860 INDICATORS

INDICATOR	COLOUR	FUNCTION
ROS	Red	No or low signal detected
	Green	Received optical signal OK
LD	Red	Laser faulty
	Green	Laser OK

3 MAINTENANCE

3.1 INTRODUCTION

The following section outlines the faultfinding procedure for the OSD860 modems. Please take note of the following:

- σ Personnel without appropriate training should not attempt any maintenance except that outlined below.
- σ 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.
- σ Some components within the unit are electrostatic sensitive and ESD precautions should be taken when performing maintenance upon the unit.

3.2 EXTERNAL INSPECTION

Visually check for the following:

- σ Check that the correct power source is connected to the power socket.
- σ Check that the video, data and audio signals are connected to the modem correctly and that the distant OSD860 modem has been terminated correctly to any external equipment.
- σ Inspect the optical connectors for any contamination and clean using isopropyl alcohol and a lint free tissue if any contamination is detected.
- σ Check that any external termination resistors are connected if the system configuration requires them.

3.3 ROUTINE MAINTENANCE

- σ There is no routine maintenance required with the OSD860.

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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