

OS4016\_U-V20.DOC  
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 Issue 2.0

**PRODUCT – OS4016**  
  
**16 Channel E1 Fibre Optic MUX.**  
  
**USER MANUAL**  
  
**VERSION 1.1**  
  
**31 May 2004**

<b>Product: OS4016</b>		<b>Model:</b>	
<b>Serial Number:</b>		<b>JOB No :</b>	
<b>TEST</b>	<b>CRITERIA</b>	<b>RESULT</b>	
Power Supply	+10.5V, -10.5V		
Free Running Rate	34,368MHz ±50ppm (±1700Hz)		
PLL Voltage	Vdc @ 34,368MHz Locked		
Jitter Acceptance @ E1 Rate	5UI @ 100Hz All 16 Channels		
Frequency Tolerance @ E1 Rate	2.048MHz ±50ppm All 16 Channels		
LED Indications & Alarms	Functional All 16 Channels		
B.E.R. Test < 1 x 10E-9	No errors in 8 mins (per E1 channel)		
Optic TX Level	- dBm		
Optic RX Level	- dBm		
Power Budget	dB		
LLOOP & RLOOP	Functional		

**Date:** ..... **Tested By:** .....

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# 1 PRODUCT DESCRIPTION

## 1.1 General

The OS4016 is a 16 Channel E1 fibre optic multiplexer / de-multiplexer.

The high speed multiplexing format conforms to the ITU multiplexing format.

The unit is housed in a 3U high, 19” rack-mount enclosure.

## 1.2 Basic System Description

The unit is of modular design, and can be configured with different Optic and Power Supply modules. The six different components :

1. Rack – 3U high 19”Rack Mechanics and Backplane.
2. PSU – Power Supply Module.
3. 4xE1 MUX – 4 Channel E1 to E2 Multiplexing Card.
4. HSMUX – 4 Channel E2 to E3 Multiplexing Card.
5. OPTIC – High Speed Data Encoder / Decoder & Optic Transceiver Card.
6. MANAGEMENT – Optional System Management Card.

The four 4 Channel Line Cards are fully interchangeable, and can be replaced separately - providing ease of maintenance.

Each one of the four E1 Line Cards multiplexes four E1 data channels into an E2 data stream. The four E2 data streams from the four line cards are then multiplexed together into an E3 high-speed data stream. Finally, the E3 data stream is CMI encoded, and then transmitted onto the fibre. The fibre receive path performs the exact opposite function – decoding & demultiplexing the high-speed optic data back into the 16 separate E1 data channels.

The equipment meets or exceeds the industry specifications, including ITU G703. The unit conforms to both (ITU) G.742 and G.751 multiplexing format defined by the ITU. (Formerly known as CCITT)

### Features

- Crystal-less Jitter Attenuation.
- 75Ω and 120Ω I/O (selectable)
- High Transmit and Receive return loss.
- Simple Network Management available.

## 2 Functional Description.

### 2.1 Rack – 3U 19”Rack and Backplane

All the modules of the system are designed to fit into a 3U high 19” Rack.

The modules slide into the rack and plug into a Backplane.

The Backplane interconnects all the modules, and houses the E1- 75Ω and 120Ω I/O connectors.

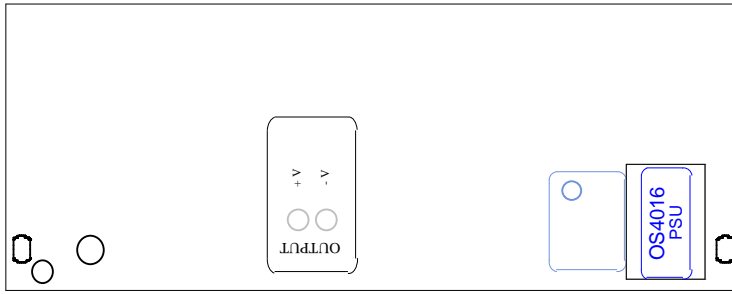
These impedance for the different connectors are configurable by link selection.

If the link is present, the channel is configured for 75Ω unbalanced, and if the link is out the channel is configured for 120Ω balanced.

### 2.2 PSU – Power Supply.

The Power Supply for the system slides into the rack and connect on a 20pin edge connector on the Backplane.

This power supply delivers power to all the modules in the system.

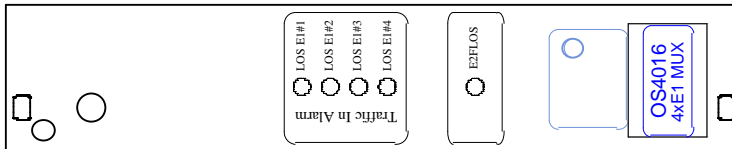


### 2.2.1 Indications

- +V Indicates that the Positive Output of the power supply is present.
- V Indicates that the Negative Output of the power supply is present.

### 2.3 4xE1 MUX – 4 Channel E1 to E2 Multiplexer

These cards house the four E1 Line Interface circuits, and an E1 to E2 Multiplexer circuit. The E2 signals propagate to and from the HSMUX via the Backplane.

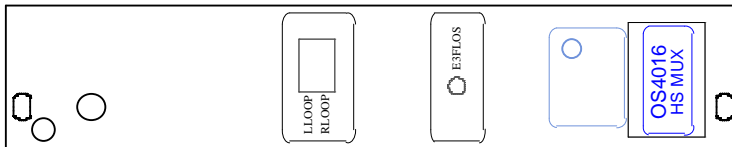


### 2.3.1 Indications

- LOSS E1 #x – Indicates that the corresponding incoming E1 signal (#x) is not present.
- E2FLOS – Indicates that there is a frame loss on the incoming E2 signal.

### 2.4 HSMUX – 4 Channel E2 to E3 Multiplexer

This card combines the four E2 signals into a single high speed E3 signal. The E3 signal propagates to and from the OPTIC card via the backplane.



### 2.4.1 Dip Switch

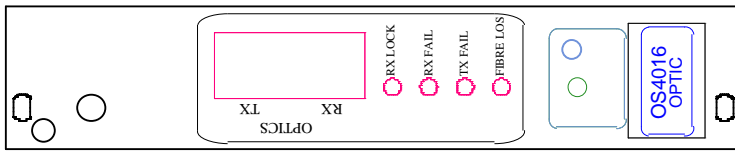
1. L Loop will loop the 16 E1 tributaries back to the source.
2. R Loop will loop the 16 remote E1 tributaries back to their respective inputs – allowing a loop on the remote unit without having to be there to enable it with copper loops. This function is only functional if a signal is present at the remote tributary input. If no signal is present, the remote unit will send AIS.

### 2.4.2 Indications

- E3FLOS – Indicates that there is a frame loss on the incoming E3 signal.

### 2.5 OPTIC – Optic Interface.

This module takes the E3 signal from the backplane, encodes it to CMI, and sends it to the remote system on fibre. The remote system in turn sends a signal on fibre back to the local unit. That received signal is now decoded to an E3 signal and then fed back onto the backplane.

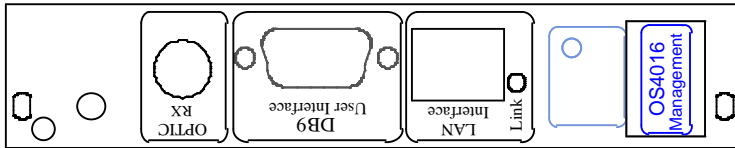


**2.5.1 Indications**

- RX LOCK – Receiver is locked onto the incoming optic signal.
- RX FAIL – No or bad optic data is decoded from the optic data stream.
- TX FAIL – No E3 transmit data (brightly lit). (Remains dimly lit under some normal conditions).
- FIBRE LOS – Incoming Fibre Signal is lost.

**2.6 MANAGEMENT – System Management.**

The management unit receives all the error messages from the various modules. These messages are then processed and sent out on a management interface which is comprised of a normal DB9 RS232 Interface and an Ethernet LAN module. The system can be configured by using the DB9 connector, or the LAN interface.



**3 PREPARATION FOR USE**

**3.1 Unpacking**

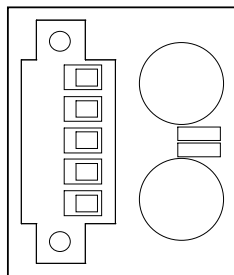
Each OS4016 is shipped factory tested, and packed in a protective packaging. Inspect the packaging for any visual damage.

The manufacturer is not liable for damage during shipment.

**3.2 Configuration of the Links**

The links are provided to configure the unit for the type of connector the user requires. The default factory setting is 120 Ohm balanced. To configure a specific connector for 75 Ohm unbalanced, the corresponding termination on the 4xE1 Mux card must be inserted, and the ground link on the backplane inserted as well.

**3.3 Connecting to Copper Cables**

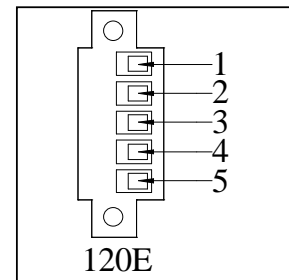


The **75Ω BNC** and the **120Ω Screw Terminal** connections are located on the backplane of the unit, in a configuration as shown on the left, for each channel.

To connect the **BNC connector** the links located between the connectors must be inserted. Connect the Traffic In to the top BNC connector, and the Traffic Out to the bottom.

If a **120Ω Screw connection** is required, the links must be removed and the connections done as indicated on the right-hand drawing and connected as described below:

- Input** - Connect the positive wire to no.1 of the connector, and the negative to no.2 of the same connector.
- Screen** - Connect the screen wire to no.3 of the 120E connector.
- Output** - Connect the positive wire to no.4 of the connector and the negative wire to no.5 of the same connector.

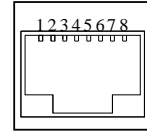
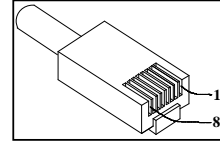


J45 NT Cable Configuration	
1	TX Tip (Data Out)
2	TX Ring (Data Out)
3	TX Shield
4	RX Tip (Data In)
5	RX Ring (Data In)
6	RX Shield
7,8	Not Used

The Connectors for **120Ω RJ45 connection** are located on the front panel if requested.

The connection configuration for the RJ45 connector is described in Cable configuration table and drawings.

Make sure that the links on the BNC connectors on the back are removed for the configuration of the 120Ω connections.



### 3.4 Fibre Connection

Carefully remove the optic connector covers and connect the fibre cables to the “TX” and “RX” connections as illustrated on the unit. Be careful not to bend the fibre in a small radius, or to contaminate it with your fingers.

### 3.5 Installation

Ensure that the link loss over the fibre cable is within the power budget of the equipment. Confirm budget with test certificate on the front page of the manual. Allow at least 2dB safe margin in power budget calculation.

## 4 OPERATOR’S INSTRUCTION

The unit needs no operator intervention to function.

If a fault arises, it is necessary to observe the alarm indications and to perform such procedures as first line maintenance as described in the following chapter.

## 5 MAINTENANCE INSTRUCTIONS

No routine maintenance is required on this equipment.

### 5.1 First Line Maintenance

#### 5.1.1 Instrument and tools required

Optic power meter  
Multi-meter.

#### 5.1.2 Maintenance Procedure

When arriving at a suspect unit, it is always necessary to ensure that the unit has been correctly coupled to the power, I/O signals, and optical fibres. The alarm conditions of the equipment should be observed. If any power indicators are OFF, check the supply voltages, and the supply fuses on the power supply card. Then check the mains fuse at the back of the unit underneath the mains plug. **For safety reasons, replace a faulty fuse only with one of the same value and rating.**

Check the channel card alarm indicators.

If one or more of the LOSS E1 indicators are lit, that corresponding E1 input channel on the 4xE1 MUX is not connected, or the data is not present.

If the Optic RX Fail indicator is lit, the high-speed optic fibre receiver is not receiving optic data. Disconnect the fibre from the optic receiver connector and connect it to the optic power meter. If the input level is below the level specified on the test sheet, then the transmitter on the other side might be faulty, or the optical fibre has been damaged.

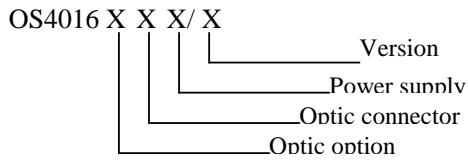
If the “Frame Loss” indicator is lit, the demultiplexer is not detecting a frame word from the data coming from the high-speed fibre optic receiver. This might be because of no, or bad, signal reception from the receive fibre. The same should be observed at the other OS4016 unit. If all these tests have been done, and the unit is still not

operational, then the supplier must be notified. The unit is not field-serviceable, and must be returned to the supplier for repair, except for swapping of line cards, or other modules.

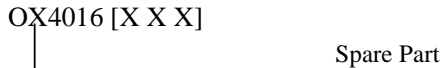
**Modules should NEVER be swapped while the unit has power.** Modules should also be carefully handled, and proper precautions for static-sensitive equipment should be observed.

## 6 SYSTEM CONFIGURATION

### 6.1 Product Stock Code



### Spare Parts



Spare Part	Description
A	Power Supply
B	4 Channel Line Card
C	Hi Speed Multiplex Card
D	Optic Interface
E	Management Interface

### 6.2 Available Options

Optic Option / Connector	Wavelength / Fibre Mode	Range	Budget distance	Connector
AB	850nm Multimode	Short	3km	ST
BB	1300nm Multimode	Medium	10km	ST
CD	1300nm Singlemode	Long	20km	SC

## 7 SPECIFICATIONS

### 7.1 Electrical Characteristics

#### Power Supply

Power Connector -	3 Pin Mains Plug (AC); 2 Pin Screw Terminal (DC)
Supply Voltage -	220Vac; 110Vac; 48Vdc
Supply Current -	100mA max @ 220Vac; 200mA max @ 110Vac; 510mA max @ 48Vdc
Power Dissipation -	22Watt max (AC); 24.5Watt max (DC)

### 7.2 Hi Speed Data Specifications

E2 Frame Format -	ITU G742 multiplexing format
E3 Frame Format -	ITU G751 multiplexing format
E3 Encoding Format -	CMI Encoded

**7.3 Optical Characteristics**

Connector -	ST or SC
Transmission	
Wavelength -	850nm, or 1300nm
Reception Wavelength -	850nm, or 1300nm
Responsivity -	7 mV/μW Typical or 13mV/μW
Fibre Compatibility -	Multimode: 50/125 μm diameter Singlemode: 9/125 μm diameter
Minimum Receive Level -	-30dBm
Transmission Level-	850nm multimode Short range-19dB 1300nm multimode Med Range -21dB 1300nm singlemode Long Range -14dB

**7.4 Channel Line Characteristics**

HDB3 Input/Output-Impedance -	Complies with CCITT ITU G703 standards. 75Ω Nominal Unbalanced 120Ω Nominal balanced
HDB3 Data Speed -	2048Kbits/Sec
Frequency Variation -	>100 ppm.
Jitter Tolerance -	>ITU recommendation G823 table 2/G823. >1.5 Unit Intervals for freq. 20 to 2400 Hz. >0.2 Unit Intervals for freq. 18kHz to 500kHz.
Jitter Transfer -	>ITU recommendation G742. >+0.5 dB for frequencies below 40Hz. >-20dB for frequencies above 400Hz.
Number of Channel -	16 in both directions.
Channel Frequency - Separation	Each Channel will sync to it's own receive frequency within the limit of 50ppm.

**7.2 Physical Characteristics**

Overall Unit Dimensions -	Depth - 280 mm Width - 480 mm Height - 133 mm
Weight -	5 kg (max)

**8 NOTES**

Other Optic Options for single mode fibre available on request.

## 9 Contact Details

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