

# **Fibre Optic Line Driver Reference Manual**

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## STATUTORY NOTICES

### APPROVALS

The Approval Number is NS/3660/12/H/452538.

The G.703 Fibre Optic Line Driver module is approved for connection to G.703 2048kbit/s private circuits and G.703 2048kbit/s PABX ports subject to the following conditions:-

- 1) Interconnection directly or by way of other apparatus, of ports marked:-  
"WARNING. CONNECT ONLY APPARATUS COMPLYING WITH BS6301 TO THIS PORT".  
OR  
"WARNING. CONNECT ONLY APPARATUS COMPLYING WITH BS6301 TO THESE PORTS".  
with ports not so marked may produce hazardous conditions on the network. Advice should be obtained from a competent engineer before such a connection is made.
- 2) The PCM ports are labelled as shown in para 1 and, unless connected to a Public Telecommunications Network, may only have equipment complying with BS6301 connected to them.
- 3) Connection of power supply. This apparatus may only be used within a Case Technology 3200 or 3400 multiplexer chassis.

Other usage will invalidate any approval given to this apparatus if as a result it ceases to comply with BS6301:1982.

The safety status of the interface is SELV.

The Modules are a 'Class 1 Laser Product'



Case Technology Ltd declare that this product conforms with the protection requirements of Council Directive 89/336/EEC on the approximation of the laws of the member states relating to electromagnetic protection.

This equipment has been tested using shielded cables supplied by Case Technology Ltd. These cables, or equivalents, must be used to ensure compliance with this declaration.

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All PCB assemblies contain Electrostatic Sensitive Devices (ESDs) which may be permanently damaged if incorrectly handled. This equipment must be handled in accordance with BS5783 code of practice for the handling of electrostatic sensitive devices.

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The Fibre Optic Line Drivers provide a bi-directional interface between an electrical 2048kbit/s G.703 signal and an optical signal for transmission via an optical fibre cable.

The module fits into the rear of 3200 and 3400 Cray Communications multiplexers. Six versions are available:-

<b>Product Code</b>	<b>G.703 Interface</b>	<b>Optical Interface</b>	
DT504	75 ohms	850nm	Multimode
DT505	75 ohms	850nm	Singlemode
DT506	75 ohms	1300nm	Singlemode
DT507	120 ohms	850nm	Multimode
DT508	120 ohms	850nm	Singlemode
DT509	120 ohms	1300nm	Singlemode

The module has LED indicators to show loss of electrical and optical inputs.



The electrical 2048kbit/s G.703 line signal is received by the module, has clock and data extracted with jitter reduction, and then undergoes HDB3 decoding before being transmitted into the optical fibre. The timing source for the optical signal is derived from the electrical input.

When electrical line signal loss occurs, the module will 'free run' to within 50ppm of 2048kbit/s and transmit AIS (unframed) into the fibre.

Line code violations received by the electrical input may cause data errors, however the errored data will be transmitted at the remote electrical output with a correct HDB3 signal.

The electrical output timing is derived from the optical input. If optical signal loss occurs, timing will automatically be sourced from the electrical input signal. The electrical output signal will be unframed AIS in this condition.

Where equipment connected to the module is deriving its clock from the electrical output of the module, loss of the optical signal will cause the equipment's own timing to be looped back. Unless the equipment is programmed to recognise an AIS signal to be an invalid clock source, synchronisation problems can result.

Should both electrical and optical inputs fail, both outputs will use the same 'free run' clock to transmit AIS



### 3.1 Optical Ports

Wavelength	850nm	850nm	1300nm
Mode	Multi	Single	Single
Max. Launch Power	-17dBm	-24dBm	-15dBm
Min. Launch Power	-21dBm	-28dBm	-26dBm
RX Overload Level	-13dBm	-13dBm	-13dBm
Receiver Sensitivity for BER of $1 \times 10^{-6}$	<-43dBm	<-44dBm	<-45dBm
for BER of $1 \times 10^{-10}$	<-42dBm	<-43dBm	<-44dBm
Component ageing	<3dB	<3dB	<2dB
Minimum Optical Loss Budget at BER of $1 \times 10^{-10}$ (after ageing allowance)	18dB	12dB	16dB

**Note:** Launch power is the power transmitted into the fibre with the pseudo-random pattern  $2^{15}-1$ .

### 3.2 Electrical Ports

Compliant with CCITT Recommendations G.703, G.823.

Line Rate:	2048kbit/s $\pm$ 50ppm
Line Code:	HDB3
Transmit Signal Level:	$\pm$ 2.37V (75ohms) $\pm$ 3V (120ohms)
Receive Signal Level:	0 to >6db line loss

### 3.3 Delay

Overall delay (G.703 to G.703)

Typical:	16 $\mu$ s + fibre delay
Maximum:	24 $\mu$ s + fibre delay

### 3.4 Typical Power Requirements

3.5 Watts per module



The fibre optic modules mount in the rear of the 3200 and 3400 multiplexers. The location for each module is shown on the rear view drawing for each multiplexer in the relevant Reference Manual.

Remove the blanking panel for the required location and insert the module into the guide rails to align the connector on the backplane. Secure the module into the chassis using the captive screws fitted to the module. The DIN connector on the module provides power and alarm connections to the module.

**Note:** Care should be taken when inserting modules with power on. Ensure that the module is inserted vertically using the guide rails to locate the electrical interface between the PCB and multiplexer backplane.

#### 4.1 Links

One link is fitted to the module marked LK1, this should be fitted in position 1-2 for normal operation.

#### 4.2 PCM Connections

DT504, DT505, DT506 support 75ohms BNC unbalanced connectors, with the screen of the transmit (output) connector earthed by mechanically securing it at the body of the module. The screen of the receive connector is isolated from the body of the module with an insulating washer.

If it is required to earth the screen of the receive connector instead of the transmit, then it will be necessary to re-assemble the module with the insulating washer fitted to the transmit connector.

DT507, DT508, DT509 support 120 ohms PCM balanced connections via a 9 way 'D' type connector. The transmit (output) signal is present on pins 5 and 9 and the receive input signal on pins 1 and 6. The cable screen should be connected to the body of the connector.

### 4.3 Optical Connections

The connectors for single mode modules are of the FC/PC Type, and for multimode modules they are 9mm FSMA Type.

The dust caps should be kept on the optical connectors whenever the fibre cable connectors are not fitted to the module.

Protective covers should always be fitted to the fibre cable connectors when not in use. The fibre cable connectors may be cleaned if required by wiping with a lens grade tissue pre-moistened with isopropyl alcohol and then polished with a dry tissue.

### 4.4 Fault Reporting

The system control card can read the module status in order to log 'module status' fault conditions as follows:

Status 1 = Electrical line signal loss.

Status 2 = Optical line signal loss.

Two LED indicators on the module also indicate electrical and optical line signal input loss.

<b>Safety Warning:</b>
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Under no circumstances should the optical output port be viewed directly with the naked eye.
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