

# System HD Single Channel Multi-Rate Optical Transmitter Operation Manual

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## Introduction to this Operation Manual

This manual covers the operation and use of the modules described below.

**WARNING...**

THE FRONT PANEL OF THE UNIT MUST NOT BE OPENED BY THE OPERATOR. ACCESS IS ONLY PERMITTED TO FULLY QUALIFIED INSTALLATION ENGINEERS.

System HD Modules must only be installed and/or replaced by qualified service personnel, with reference to the System HD Installation guide. Refer all installation and servicing to qualified personnel only.

All laser transmitters used in this product are Class 1 in accordance with EN60825-1 as well as 21CFR 1040.10 and 1040.11

**Class 1  
Laser Product**

- 1. Laser light can be damaging to the eyes. Optical fibres and Uniteres should be handled with great care.**
- 2. System HD Modules which incorporate Fibre Optic elements, are designed for use with Class 1 laser systems only. Ensure that all inputs do NOT exceed Class 1 as doing so will impair the safety of the system and may result in damage to the equipment.**
- 3. Active fibres should not be handled unless their source can be positively identified as not exceeding Class 1 limits.**

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## Important Notice

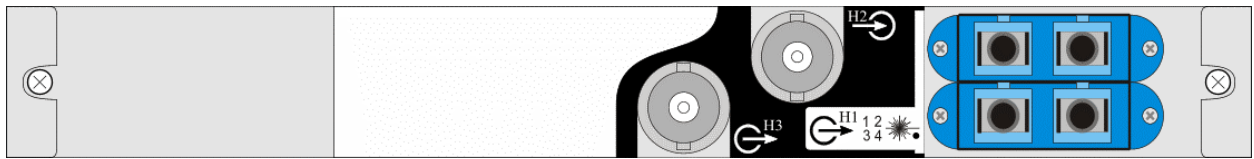
No responsibility is taken by the manufacturer or supplier for any non-compliance to EMC standards due to incorrect installation.

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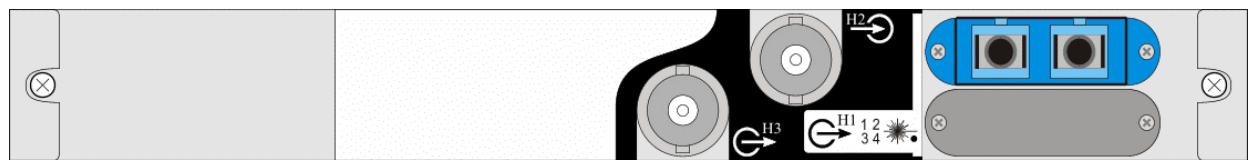
## Scope of this Operation Manual

This is the operation manual for the System HD Fibre Optic Transmitter module. It covers the modules ordered under the following codes :

- SHDFTM1-0T5** – Standard Single Input Transmitter with 4 optical outputs
- SHDFTM1-0T3** – Standard Single Input Transmitter with 2 optical outputs
- SHDFTM1-0T1** – Standard Single Input Transmitter with 1 optical output



SHDFTM1-0T5 : 4-Output Transmitter, Rear Panel View



SHDFTM1-0T3 and SHDFTM1-0T1 : 2-Output and 1-Output Transmitter, Rear Panel View

## Module Description

The Single Channel Optical Transmitter receives a single electrical serial digital (HD-SDI/SD-SDI) bitstream and provides up to four identical optical HD-SDI/SD-SDI outputs.

The electrical serial digital is via a 75Ω BNC connector on the backpanel of the interface board. The optical outputs are via the SMPTE292M recommended SC/PC singlemode fibre optic connector. The SC/PC connector is robust and easy to use, a simple snap-fit enables a reliable connection to be made in a matter of seconds.

The SDI input signal is fed from the interface board to the main board. It is then equalised and re-clocked before being used to drive a singlemode laser transmitter which converts the electrical signal into the optical domain. Connected to the single output of the laser transmitter is a passive optical splitting device providing up to four identical optical outputs. (Note: In Async mode the signal is only amplified.)

The optical power available from each of these outputs is sufficient to transmit an SDI signal over distances greater than 20km. An active loophrough of the electrical SDI bitstream is available from a BNC connector for monitoring purposes.

Higher power laser options are available providing higher splitter ratios and/or transmission distances (>20km) along with two wavelength options.

LEDs mounted at the front of the main board allow monitoring of the transmitter performance. More detailed performance information can be obtained via the RollCall interface.

### WARNING...

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### Quick guide to order codes:

Laser options      Interface options  
 SHD FTM1-  T

Laser device option code	Laser properties	
	Wavelength $\lambda$ ( $\mu\text{m}$ )	Laser output power before split $P_o$ (dBm)
0	1.3	-2
1	1.3	0
6	1.5	0

Interface card option code	Interface card supplied with main transmitter board
5	1x4 splitter
3	1x2 splitter
1	patchcord (no split)

Codes other than those listed refer to custom laser options.

## Features

- SMPTE 292M 1.485Gbit/s HD-SDI data rate supported
- SMPTE 259M 270Mbit/s SD-SDI data rate supported
- Async mode of operation. For use with D2, DVB-ASI, MPEG streams, AES-EBU, etc.
- SMPTE 292M recommended SC/PC singlemode user interface connector
- Four optical outputs from a single coaxial input
- Transmission distances up to 20km
- Two optical output wavelengths (1310/1550nm) available
- Bit error rate (BER) <10<sup>-12</sup>
- Optical data transport offering:
  - Large signal bandwidth EMI immunity
  - No earth loops
  - Small, lightweight, flexible cabling
  - Easy to locate and repair cable breaks
- Alarm functions for poor quality input signals and device malfunction
- Stand-alone or RollCall™ operation
- Incoming signal analysis available as an option, it includes:
  - CRC status
  - Line standard
  - Field rate
  - Error rate

### Note:

RollCall™ enabled for remote system control & monitoring.

In Async mode some SDI outputs may not be compatible with certain equipment due to the use of complimentary outputs. e.g. Some ASI streams aren't inversion compatible.  
monitoring.

## Technical Profile

### INPUT

Electrical	1.485Gbit/s HD-SDI 270Mbit/s SD-SDI
Connector Format	BNC 75ohm panel jack
Input Cable Length	Up to 100m
Peak-to-peak signal amplitude	800mV $\pm$ 10%
D.C. offset	0V $\pm$ 0.5V
Rise time (20-80%)	< 270ps
Fall time (20-80%)	< 270ps
Difference	$\leq$ 100ps
Return loss	>15dB

### Active Loop-through

Electrical	1.485Gbit/s HD-SDI 270Mbit/s SD-SDI
Connector Format	BNC 75ohm panel jack
Peak-to-peak signal amplitude	800mV $\pm$ 10%
D.C. offset	0V $\pm$ 0.5V
Rise time (20-80%)	< 270ps
Fall time (20-80%)	< 270ps
Difference	$\leq$ 100ps
Return loss	>15dB

### OUTPUT

Optical	1.485Gbit/s HD-SDI 270Mbit/s SD-SDI
Connector Format	SC/PC singlemode panel uniter
Outputs	4 as standard
Wavelength	1300nm $\pm$ 30nm (1550nm optional)
Spectral width (FWHM)	<1nm
Output power (after 4 way split)	Low power 1.3 $\mu$ m ~ -10dBm High power 1.3 $\mu$ m ~ -8dBm High power 1.5 $\mu$ m ~ -8dBm
Extinction ratio	>5:1

### SWITCHES, Board Edge

*Not accessible to the Operator*

Tx disable	Disables the laser
HD/SD	Selects mode

### INDICATOR LEDS

*Not accessible to the Operator*

Power	Power supplies valid
Fault	Board fault
CPU	Valid CPU activity
SD	Rate mode
P <sub>in</sub>	Input of sufficient power
Present	
PLL Lock	Output locked to input standard
CRC Error	Data error
Line and frame rate	Indicates line and frame rate
Prog/Int	Indicates progressive or interlaced frames

### RollCall™

RollCall monitoring options:	General alarm Supply voltage levels Board temperature CRC status Line standard Field frequency Error rate Rate Selection – HD / SD / Async
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### POWER CODE

1

### WEIGHT

<820gm (Main Board plus Interface Board)

### OPTIONS

See page 5



### Notes

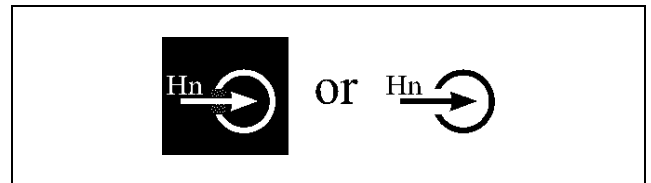
- Each transmitter board has a laser device. Refer to the laser device option code on page 5 to identify what laser is fitted.
- Each interface card for a transmitter board will contain a splitter (or a patchcord when no splitter is fitted). Refer to the interface card option code on page 5 to identify what interface card has been supplied with the main transmitter board.
- Codes in the ORDER NUMBER other than those listed on page 5 will refer to custom laser/interface card options. Additional information should have been delivered with the cards. If further information is required please contact the factory.

## Rear Interface Connections

### Rear Interface Notation Guide

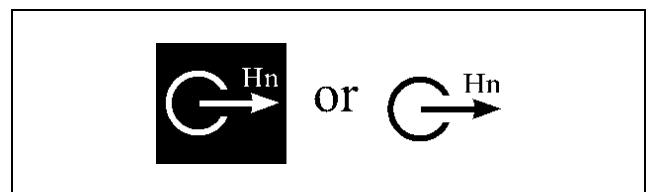
#### Electrical SDI Input

A Serial Digital electrical input through a 75Ω BNC connector is denoted in the way shown opposite. The “H” denotes the High Definition capable element and the “n” is the connection number for that particular rear interface.



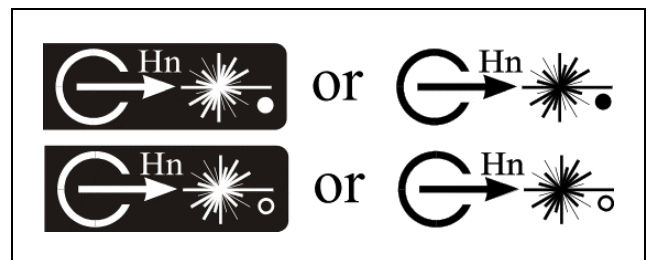
#### Electrical SDI Output

A Serial Digital electrical output through a 75Ω BNC connector is denoted in the way shown opposite. The “H” denotes the High Definition capable element and the “n” is the connection number for that particular rear interface.



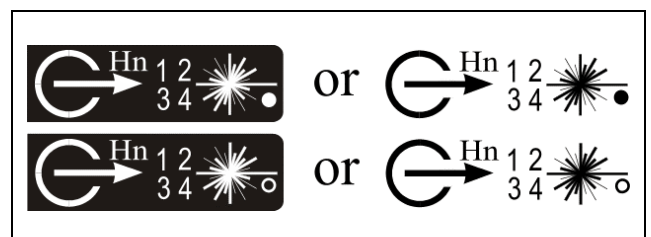
#### Single Optical SDI Output

A single Serial Digital optical output through one SC/PC single mode panel unit is denoted in the way shown opposite. The “H” denotes the High Definition capable element and the “n” is the connection number for that particular rear interface. The solid “dot” indicates that only a single wavelength can be presented through the connector. A hollow circle indicates multiple wavelengths are permissible.



#### Multiple Optical SDI Outputs

Multiple Serial Digital optical outputs through two or four SC/PC single mode panel units are denoted in the way shown opposite. The numbers 1 to 4 are arranged to indicate the individual element within the multiple output connector. The “H” denotes the High Definition capable element and the “n” is the overall connection number for that particular rear interface. The solid “dot” indicates that only a single wavelength will be output through the connectors. A hollow circle indicates multiple wavelengths are present.



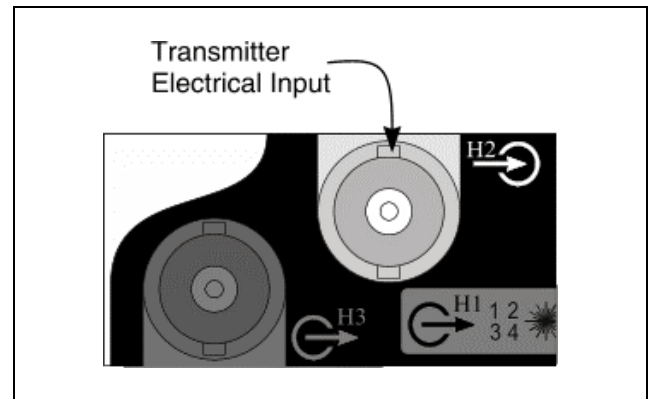


## Standard Transmitter Input

### Electrical SDI

Used On : SHDFTM1\_0T5  
SHDFTM1\_0T3  
SHDFTM1\_0T1

The serial digital electrical input for the laser transmitter is connected to a 75Ω BNC connector. The connector is shown opposite and is labelled **H2** on the rear panel.

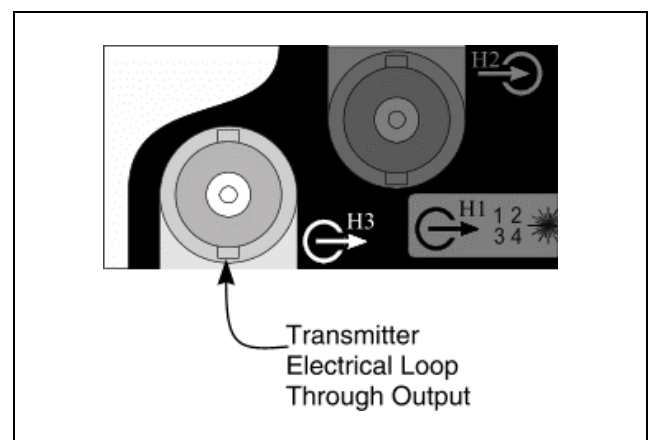


## Standard Transmitter Electrical Loop-Through

### Electrical SDI

Used On : SHDFTM1\_0T5  
SHDFTM1\_0T3  
SHDFTM1\_0T1

An equalised and reclocked version of the serial digital electrical input for the transmitter is available as an active loop-through from a 75Ω BNC connector. The connector is shown opposite and is labelled **H3** on the rear panel. (Note: In Async mode the bitstream is not reclocked.)



## Standard Transmitter Outputs

1. **Laser light can be damaging to the eyes. Optical fibres and Uniter's should be handled with great care.**
2. **System HD Modules which incorporate Fibre Optic elements, are designed for use with Class 1 laser systems only. Ensure that all inputs do NOT exceed Class 1 as doing so will impair the safety of the system and may result in damage to the equipment.**
3. **Active fibres should not be handled unless their source can be positively identified as not exceeding Class 1 limits.**

### ! Notes...

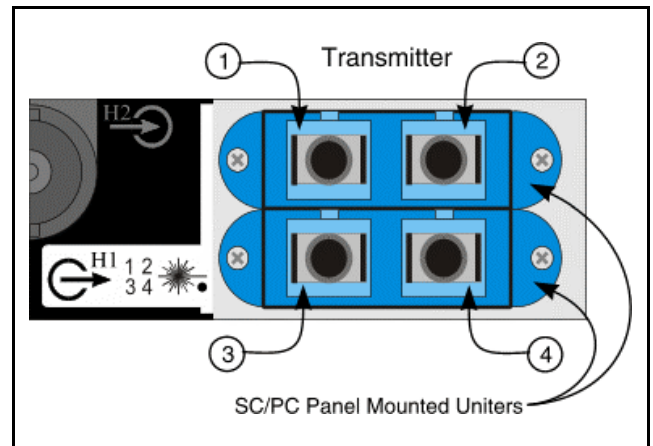
1. Optical uniter's have plastic covers to prevent the ingress of dust. These covers should only be removed when connecting optical fibres. A uniter should never be left open without a cover or a fibre connector
2. The ends of optical fibres should be cleaned with a liquid fibre cleaner, using a cotton bud, to ensure that there is no dust present, before they are plugged in (the uniter is polarised).
3. Observe the warning about not viewing live optical sources.

### Optical SDI Output – Quad Output Option

Used On : **SHDFTM1-0T5**

The serial digital optical outputs are provided via a pair of dual SC/PC single mode panel mounted uniters. The overall connection is labelled as **H1** on the rear panel as shown opposite. The four optical outputs are denoted as 1, 2, 3, and 4 and arranged as shown in the diagram. All four outputs produce almost identical levels of optical power and identical digital bitstreams. These are single optical wavelength outputs.

Do not remove the covers from the uniters until a fibre connection is ready to be inserted.

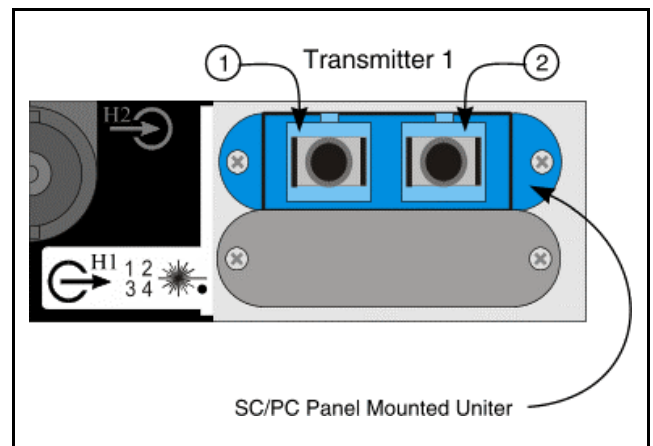


### Optical SDI Output – Dual Output Option

Used On : **SHDFTM1-0T3**

The serial digital optical outputs are provided via a dual PC/SC single mode panel mounted uniter set. The overall connection is labelled as **H1** on the rear panel as shown opposite. The two optical outputs are denoted as 1, and 2. The rear label mentions connections 3, and 4 as well, but these are not present in this case. The connectors are arranged as shown in the diagram. Both outputs produce almost identical levels of optical power and identical digital bitstreams. These are single optical wavelength outputs.

Do not remove the covers from the uniters until a fibre connection is ready to be inserted.

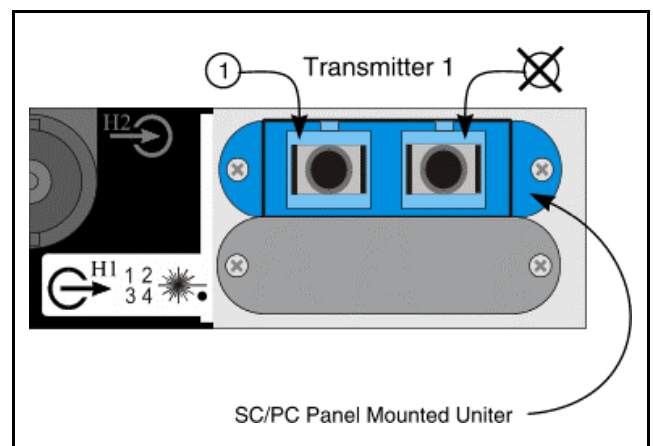


### Optical SDI Output – Single Output Option

Used On : **SHDFTM1\_0T1**

The serial digital optical output is provided from one side of a dual SC/PC single mode panel mounted uniter. The overall connection is labelled as **H1** on the rear panel as shown opposite. The optical output is denoted as connection 1. The rear label mentions 2, 3, and 4 as well but these are not present in this case. The connector is arranged as shown in the diagram. This is a single optical wavelength output.

Do not remove the cover from the uniter until a fibre connection is ready to be inserted.



## RollCall Menu System

When a System HD Control and Monitor board is fitted in the enclosure a range of monitoring information is available to RollCall™

External Monitoring	Description
General alarm	Input power fault or overcurrent trip or system failure
Supply voltage levels	Actual voltage levels
Board temperature	Actual board temperature
Bit error rate	Error rate over defined time period

## Rollcall Monitoring Features

- Module Infrastructure:
  - General Alarm
  - Supply Voltage Levels
  - Board Temperature
  
- Incoming Signal analysis:
  - Input Status
  - Line standard
  - Frame Type
  - Frame Rate
  
- CRC Error analysis:
  - CRC Error Count
  - CRC Error Total
  - CRC Reset
  
- Rate Sel:
  - HD – HD-SDI Reclocking mode.
  - SD – SD-SDI Reclocking mode.
  - Async – Asynchronous mode.
  
- Bias/EQ – The value in this field is a guide to the strength of equalisation that is being applied to the input signal for longer cable runs. The lower the value, the less equalisation is being employed. It is intended as a guide for troubleshooting the system. It should be noted that when an equalisation of 100% is shown, it doesn't necessarily mean that the maximum input cable length has been reached. As soon as CRC errors are being reported then the input cable length should be decreased until an error free signal can be received.
  
- Laser Case Temperature / Bias (Degrees °C) – The case temperature is an indication of how much Laser Drive Strength is being applied i.e. Laser Bias current. As the laser becomes older, the drive strength will be increased which will therefore cause its case temperature to rise.

