# *Python 3G*™

## *Multichannel SDI/HD-SDI Video Transport System*

### Instruction Manual

Python 3G Transceiver, front and rear views

**Software version Number:**

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## Laser Safety

**WARNING!** Class 1 laser. Do not look into a fiber port or connector.

## Laser Radiation

This TX unit contains CDRH Class 1 laser devices. Always avoid looking directly at, or staring into, the laser light located on an optical connector or on the end of a fiber.

Infrared radiation is produced at the fiber connection port on the rear of the TX unit and at the end of any un-terminated optical fibers that are attached to this port. Avoid any direct exposure to the light that comes from these sources.

Do not power up the unit when no fiber is attached to the fiber port.

There are no user adjustments inside the Python 3G. Do not attempt any type of service to this instrument other than any as instructed this manual. Refer all servicing to Telecast Fiber Systems, Inc.

## FCC Part A Manual Notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency (RF) energy and, if not installed and used in accordance with this instruction manual, may cause harmful interference to radio communications.

## Introduction

The Telecast Python 3G™ components can be transmitters, receivers or transceivers. SDI/HD-SDI signal counts can be eight or sixteen channels (or 8x 8) and fiber counts can vary dependent upon the use of integrated CWDMs. Other cross-compatible devices include the Telecast Rattler™, Viper II 5292 & 6292, Viper II 5259, Viper II 5270 and Viper I 292 and 259.

Python 3G supports a wide range of SDI Video formats including:
- 19.4 Mbps ATSC
- 143 Mbps NTSC Composite
- 177 Mbps PAL Composite
- 270 Mbps Serial Component
- DVB-ASI
- 360 Mbps Serial Component and Compressed HDTV
- 540 Mbps Proprietary
- 1.5 Gbps Uncompressed HDTV
- 3 Gbps Uncompressed HDTV

all with no pathological data errors.

In addition, the Python 3G supports the 75 Mb/sec and 125 Mb/sec digital outputs of our Adder II line of audio multiplexers.

Coax is equalized on both the inputs and outputs at 1.5 Gbps and the outputted data stream is not re-clocked.

Python 3G's are housed in a standard 19-inch electronics rack and are 1 RU high.

This manual covers the following part numbers:

| Standard Type | | CWDM Type | |
|---|---|---|---|
| P3-TX8-SL-ST | 8 TX / 8 Fibers | P3-TX8-13CW-ST | 8 TX / 1 Fiber |
| P3-RX8-L-ST | 8 RX / 8 Fibers | P3-RX8-13CW-ST | 8 RX / 1 Fiber |
| P3-TX16-SL-ST | 16 TX / 16 Fibers | P3-TX16-13CW-ST | 16 TX / 2 Fibers |
| P3-RX16-L-ST | 16 RX /16 Fibers | P3-RX16-13CW-ST | 16 RX / 2 Fibers |
| P3-TR-8X8-SL-ST | 8 each / 16 Fibers | P3-TR-8X8-SL-ST | 8 each / 2 Fibers |
| | | P3-16TX-35CW-ST | 16 TX  / 1 Fiber |
| | | P3-16RX-35CW-ST | 16 RX / 1 Fiber |

*Table 1: Python 3G Varieties*

## Setup

The Python 3G system consists of:
- One Python 3G TX Transmitter
- One Python 3G RX Receiver

or

- Two Python 3G 8x8 Transceivers
- External power supplies (AC/DC adapters)
- Rack mount adapter kits (ears)

After unpacking, inspect the units for mechanical damage, and all electrical connectors for bent or damaged pins and latches. Report any damage to the carrier and to Telecast Fiber Systems, Inc.

Leave the protective caps on the optical connectors until it is time to attach the fiber to the units. Replace the caps whenever the fiber is disconnected.

### Rack Mounting

Units feature integrated rack ears that are a part of the frame.

Place each unit in its intended location before attaching any cables or fibers to prevent accidental damage to the cables or their connectors.

### Line Power

Any power supply used with the Python 3G must provide a minimum of 1.5 amps, continuous, at 12 to 24 VDC. Two 4-pin DC power inputs are provided for redundancy.

There is no internal backup battery of any sort in the Python 3G.

Power input is through a 4-pin XLR connector located on the left side of the rear panel; see Table 2 for pin-out and Figure 2 for location. Be sure that AC outlets are within reach of their 6-foot power cords.

| PIN | SIGNAL |
|-----|--------|
| 1 | Ground |
| 2 | No Connection |
| 3 | No Connection |
| 4 | +12 to +24 VDC |

*Table 2: Power XLR Pin-out*
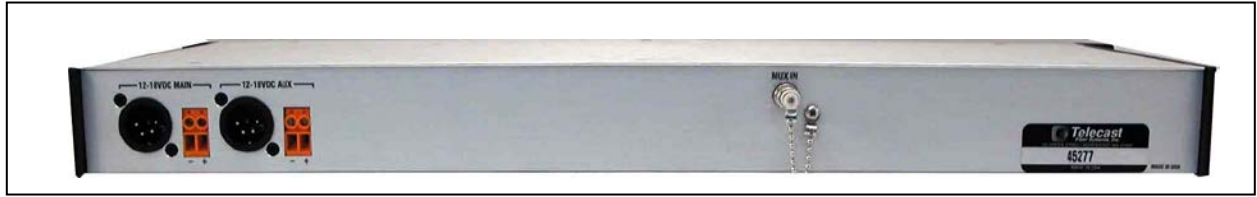
Figure 1: Rear Panel Connections for non-CWDM and CWDM Versions

**Optical Connectors**

All optical connectors are on the rear panel, which is nearly identical for the TX, TR and RX units; see Figure 2.

The rear panel has 1, 2, 8, or 16 ST type connectors, dependent upon version.

## Front Panel Connections/Indicators

The front panels of the RX and TX are shown in Figures 2 and 3. The front panel will have 8 or 16 BNC connectors.



*Figure 2: Front Panel, 8 Channel CWDM Transmitter*



*Figure 3: Front Panel, 8 Channel bidirectional CWDM Transceiver*

## TX Front Panel Indicators

**Power**     The POWER LED illuminates RED when 12-18 VDC mains power
is applied at either of the rear 4-pin inputs. The LED changes to
GREEN when the unit is turned on.

Each BNC input has a single LED that indicates the following:

**Signal**     RED                     No Data present
GREEN                 SDI Data present


## RX Front Panel Indicators

**Power**     The POWER LED illuminates RED when 12-18 VDC mains power
is applied at either of the rear 4-pin inputs. The LED changes to
GREEN when the unit is turned on.

Each BNC output has a single LED that indicates the following:

**Signal**     RED                     No Optical link
RED/GREEN             Flashing indicates good optical link
GREEN                 SDI Data present


In addition, the RX features a 4-segment LED display and a toggle switch that
allows you to see the software revision number on the unit, the received optical
power of EACH input and the internal ambient temperature of the frame.

By moving the toggle switch to the right, you may select any received channel.
By then moving it back to the left you will get a description of that channel.



Figure 4: using the toggle to change channels to be monitored

As you scroll through the channels, you will see one of four conditions:

1. If there is no fiber link for a given channel, n/A will be displayed



Figure 5 : n/a indicates no optical link

2. If there is an optical link but no SDI data present, the optical power reading will flash between a high and low value, such as -7 and -30. This is because, when there is no data present at the TX, the laser turns on and off ("blinks") until SDI is present. This is also why the individual RX channel LED blinks RED/GREEN.



Figure 6 : Variable optical power levels = NO SDI present

3. When the optical link is good AND a valid SDI data stream is present, an optical power level will be indicated. Depending on the loss in the fiber run, this number could range from approximately -5 to -22.



Figure 7: A steady numerical value IS the received optical power for that channel.

4. After the last channel is displayed, the ambient temperature inside the frame will be indicated in degrees Celsius.

## Fiber Optic Cable Runs

The optical output from each TX is generated by an infrared laser diode that is coupled to the fiber. User connections are made at the bulkhead ST type connectors on the rear panel; refer to Figure 2 on page 7. Operation is intended for use on single mode fiber, however, transport over limited distances is possible on multimode fiber. Since higher bit rates result in shorter link capabilities, HD transport on multimode will be severely limited and is not recommended.

The inputs at the RX uses an InGaAs pin diode and amplifier to convert the optical signal back into an electrical signal.

## Making the Fiber Connections

Inspect the fiber ends and clean them with with Kim-Wipes that have been wet with pure isopropyl alcohol. Fingerprints or other dirt on the optical connector end surfaces will reduce the received optical signal level.

Connect the fibers to their matching ports on both the TX and RX units.

## Optical Transmitter Losses

The maximum fiber distance is defined by the optical loss margin. The RX signal must be - 22 dBm or better (@ HD rates). Losses on single mode fiber are approximately 0.5 dB/km or less. Refer to Table 3 for the expected TX output requirement and the consequent RX input power.

|  | @270Mbps | @1.5 Gbps |
|---|---|---|
| TX Optical Output    (std.) | - 6   dBm | - 6   dBm |
| RX Optical Input | - 30 dBm | -22 dBm |
| Optical Loss Margin | 24  dBm | 18 dBm |

*Table 3: Optical Power and Link Margins.*

Note that 0 dBm output lasers are available for increased optical margins.

Use an optical power meter for testing the optical power and its transmission over the fiber. Instructions for this test are supplied with the meter.

## Powering Up

Power is applied to the units via the front panel on/off switch. The POWER LED illuminates RED when 12-18VDC is present at either of the rear 4-pin power inputs. This LED turns GREEN when the switch is moved to the ON position.


## Standard Model Operation

For the standard (non-CWDM) Python 3G's, each SDI channel BNC on the front panel corresponds with an ST on the back panel. No electrical or optical multiplexing is taking place and patching the fiber is simply a matter of matching the fiber output on the transmitter to the proper fiber input on the receiver.


## CWDM Model Operation

In CWDM equipped Python 3G's, an internal course wavelength division multiplexer combines multiple SDI channels optically onto a single fiber.

For example, in a P3-8TX-13CW-ST, 8 channels are optically muxed to a single ST connector.  All 8 signals are then sent to the receiver over one fiber where they are de-muxed and presented on the front panel BNCs. On a 16-channel unit, two ST connectors would be present on the rear panel.

There are no adjustments or patches for the user. All of the optical muxing is accomplished inside the frame.

In the 16-channel unit with the band-coupler option, all 16 signals are carried on one fiber. The first 8 channels are in the 1300nm optical window and the second 8 channels are in the 1550nm optical window. The band coupler combines the aggregate output of each CWDM and couples that onto a single fiber. See Figure 8 on page 12.
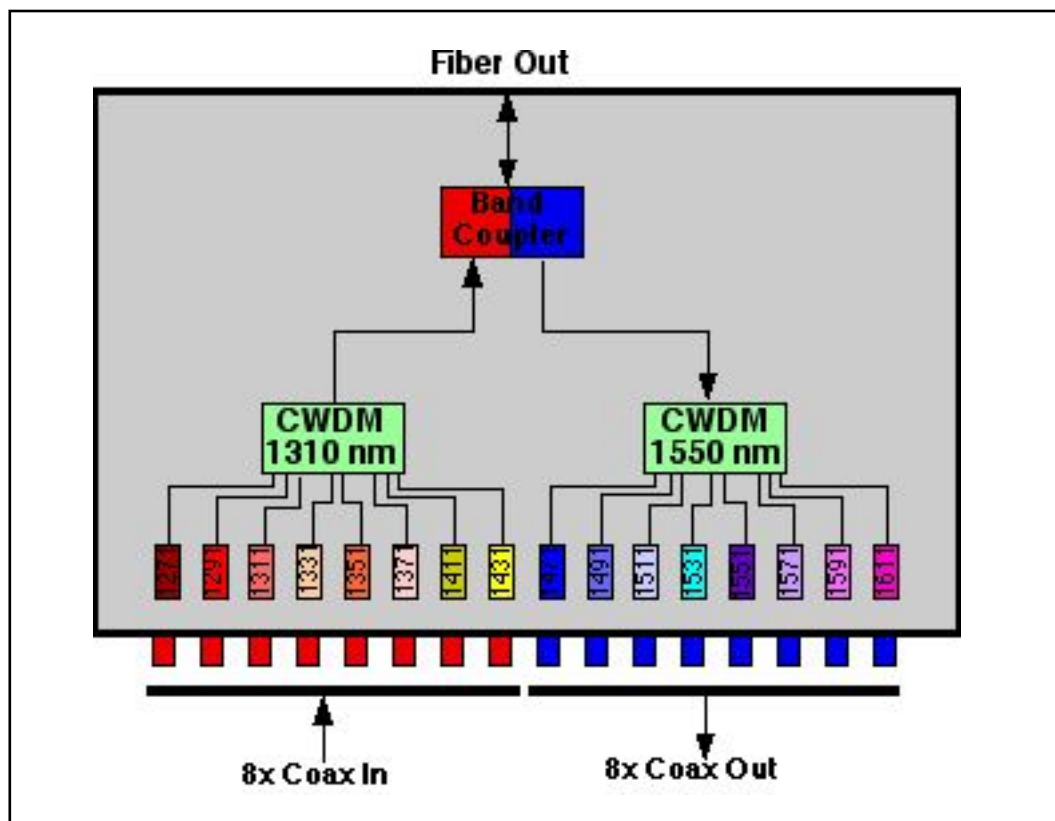
*Figure 8: Python 3G with Band-Coupler Option for 16 Signals on a Single Fiber*

## System Examples

The Python 3G platform can be used for point-to-point links or for multi-point distribution. With Optical splitting (optional), a single TX unit can send to multiple RX units.

When combined with other Telecast modules like the Rattler, Viper II 5292, 5259 and 5270, and Viper I 292 and 259 many different signal topologies are possible.
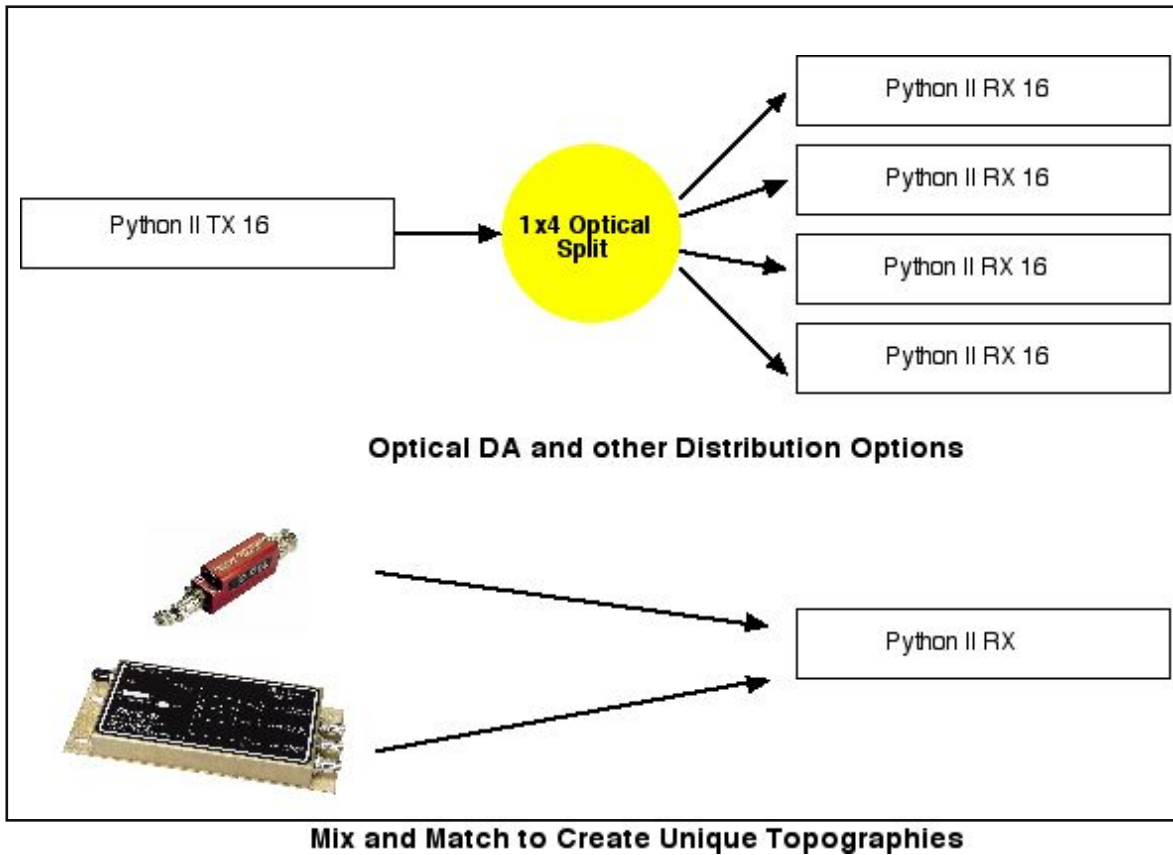


*Figure 9: Example of Python 3G flexibility*

## System Maintenance

### Repair

For assistance with your Python 3G system, contact Telecast Fiber Systems, Inc. at 508-754-4858. To return a unit for repair, you must obtain a return material authorization (RMA) number from Telecast service.

### Accessory List

The following accessories are available from Telecast:
- Optical power meter kit with wavelength filter
- Cable repair kit
- Loop-back cable to localize signals during installation test
- Prefabricated cables built to custom lengths
- Optical Splitters

## Troubleshooting

| Symptoms | Possible Cause | Corrective Action |
|---|---|---|
| No operation, all indicators are off. | Check DC power inputs | Verify that the external power supply is delivering12-24 VDC. |
| TX LED RED | Bad SDI signal | Confirm presence of SDI signal at the end of the coax or reduce coax cable length at input |
| TX LED GREEN RX LED RED | Bad fiber link or fiber mis-patched | Reconfirm fiber link and ensure that fibers are patched properly on multi fiber units |
| TX LED GREEN RX LED flashing RED/GREEN | Fiber link is good | RX unit malfunction. Contact Telecast For RMA number. |
| LEDs correct Bad video | Too much fiber loss Optical Link is marginal | • Clean connectors<br>• Minimize connection points<br>• Search for tight bends in fiber run |
| | | |
| | | |

*Table 4: Troubleshooting guide*

# Appendix

## Python/TelePort/TeleThon Display Characteristics



**Basic Display Functionality**

**Power up** — Model and software revision of unit scrolls across display.

**Channel select** — Left Right

**Channel Description** — Brief description of channel currently being monitored scrolls across display.

**Monitoring Menu** — Cycles through all channels and monitoring option available for unit.

**Telethon 00 display functionality**

**XX°C** — meter displays internal temperature of unit & activates fan if temperature reaches 50°C

**Channel Description** — Local temperature ( Deg c ) scrolls across display.

**Channel select** — Left Right

**Prim** — TOGGLES BETWEEN CHANNEL & OPTICAL METER. Meter displays N/A when no optical power is present and approximate muxed optical power from -30 to 10 dbm

**Channel Description** — Optical power primary (dbm) scrolls across display.

**Channel select** — Left Right

**Power up** — Telethon 00 rev. 0 scrolls across display.

**Tx01**

**Channel Description** — Tx Python scrolls across display.

**Channel select** — Left Right

**Tx02**

**Channel Description** — Tx Python scrolls across display.

**Channel select** — Left Right

**Tx03**

**Channel Description** — Tx Python scrolls across display.

**Channel select** — Left Right

**Tx01**

**Channel Description** — Tx Python scrolls across display.

**Channel select** — Left Right

**Rx01** — TOGGLES BETWEEN CHANNEL & OPTICAL METER. Meter displays N/A when no optical power is present and approximate optical power from -30 to >0 dbm

**Channel Description** — Rx Python Channel 5 (dbm) scrolls across display.

**Channel select** — Left Right

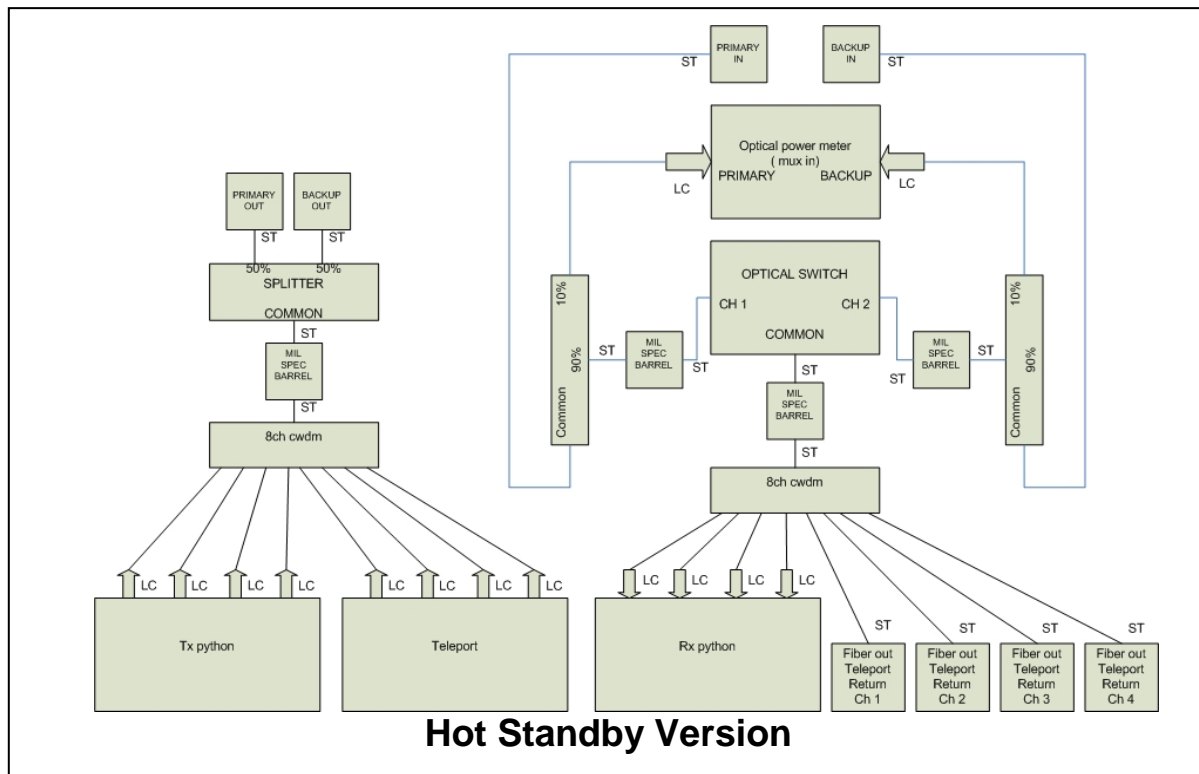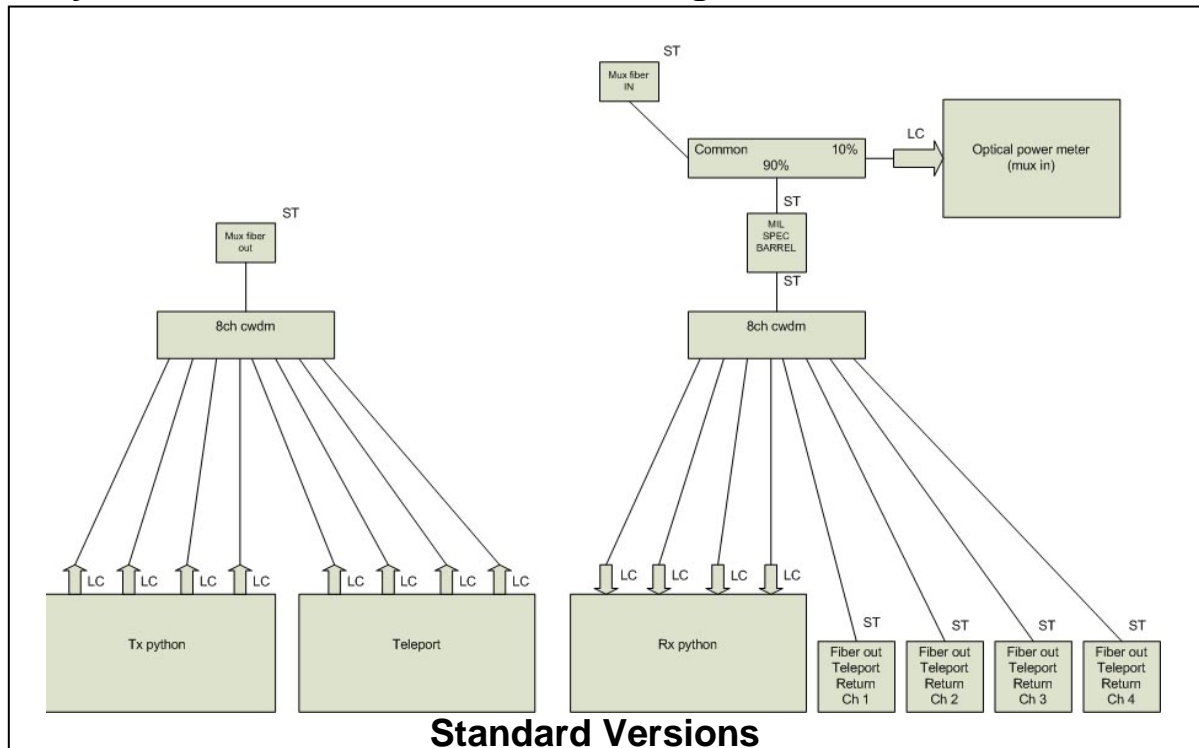**Rx02** — TOGGLES BETWEEN CHANNEL & OPTICAL METER. Meter displays N/A when no optical power is present and approximate optical power from -30 to >0 dbm

**Channel Description** — Rx Python Channel 6 (dbm) scrolls across display.

**Channel select** — Left Right

**Rx03** — TOGGLES BETWEEN CHANNEL & OPTICAL METER. Meter displays N/A when no optical power is present and approximate optical power from -30 to >0 dbm

**Channel Description** — Rx Python Channel 7 (dbm) scrolls across display.

**Channel select** — Left Right

**Rx04** — TOGGLES BETWEEN CHANNEL & OPTICAL METER. Meter displays N/A when no optical power is present and approximate optical power from -30 to >0 dbm

**Channel Description** — Rx Python Channel 8 (dbm) scrolls across display.

**Channel select** — Left Right

**Tp01** — TOGGLES BETWEEN CHANNEL & OPTICAL METER. Meter displays N/A when no optical power is present and approximate optical power from -30 to >0 dbm

**Channel Description** — teleport Channel 9 (dbm) scrolls across display.

**Channel select** — Left Right

**Tp02** — TOGGLES BETWEEN CHANNEL & OPTICAL METER. Meter displays N/A when no optical power is present and approximate optical power from -30 to >0 dbm

**Channel Description** — Teleport Channel 10 (dbm) scrolls across display.

**Channel select** — Left Right

**Tp03** — TOGGLES BETWEEN CHANNEL & OPTICAL METER. Meter displays N/A when no optical power is present and approximate optical power from -30 to >0 dbm

**Channel Description** — Teleport Channel 11 (dbm) scrolls across display.

**Channel select** — Left Right

**Tp04** — TOGGLES BETWEEN CHANNEL & OPTICAL METER. Meter displays N/A when no optical power is present and approximate optical power from -30 to >0 dbm

**Channel Description** — Teleport Channel 12 (dbm) scrolls across display.

**Channel select** — Left Right

# Python/TelePort/TeleThon Block Diagrams



**Standard Versions**



**Hot Standby Version**

## Operating Characteristics

**Optical**

| | |
|---|---|
| Wavelength: | 1300 nm or 1550 nm Optical Window |
| | CWDM wavelengths (optional |
| Fiber: | Single mode or Multi mode |
| Optical Data Rate: | Up to 1.5 Gb/sec |
| Optical Source | Laser diode (-7 dBM) or DFB (0 dBm) CWDM |
| Optical Detector | PIN |
| Link margin: | 22 db for HD rates, 30 db for 270 rates |
| Distance | |
| @1310nm | 30 km max |
| @1550nm DFB | 40 km max |

**Video and Data**

Any Serial digital signal up to 1.5 Gb/sec at any of the up to 16 signal channels.

| | |
|---|---|
| Transmission Method | Digital |
| Input Level | 800 mV (peak to peak) |
| Interface | Up to SMPTE 292M |
| Input/Output Impedance | 75 Ohm |
| Return Loss | 15 db |
| Coaxial Input Equalization | |
| Max Rate | 1.5 Gbps |
| EQ @ 1.5 Gpbs | 300 meters of Belden 8281 |
| HD Bit Error Rate | |
| @ -22dBm RX optical power | $10^{-12}$ |
| Jitter (on path. error test) | < 0.2 UI |

Power Requirements

| | |
|---|---|
| Voltage: | 12 to 24 VDC |
| Current: | < 1.5 Amp |
| Power: | < 15 watts |

Mechanical/Environmental

| | |
|---|---|
| Dimensions (L x W x H) | 16.7" x 10.5" x 1.75" |
| Weight, each unit | 5 lbs |
| Connectors | |
| Electrical | BNC |
| Optical | ST |
| Indicators | Power On, SDI data present |
| Temperature Range | - 20C to + 55C case temperature |
| Humidity Range | 0 to 95%, non-condensing |

# WARRANTY

## LIMITED WARRANTY STATEMENT

**Telecast Fiber Systems, Inc. ("Telecast") expressly warrants to Buyer that the Products supplied shall be free from defects in materials and workmanship for a period of 12 months following the date the Products are delivered to Buyer (the "Warranty Period"). Telecast's liability under this limited warranty shall be limited, at its option, to providing refund of purchase price for Products, or replacing or repairing Products shown to be defective either in materials or workmanship. Buyer's sole and exclusive remedy for breach of warranty shall be such refund, replacement or repair.**
**A claim of defect in materials or workmanship in any Product shall be allowed only when it is submitted in writing to Telecast Fiber Systems, Inc. within seven days after discovery of the defect, and in any event within the Warranty Period. No claim shall be allowed in respect of any Product which has been altered, neglected, damaged or stored in any manner which adversely affects it. In order to obtain service under the terms of this warranty, Distributor's customer or Distributor must notify Telecast of the defect prior to the expiration of the applicable warranty period and obtain a Return Authorization Number from Telecast. In no event may products be returned to Telecast or to Distributor for warranty service without having obtained from Telecast a Return Authorization Number.**

**This limited warranty applies only to new and unused Products delivered to Buyers located within the United States of America, or to international Buyers if sold through an authorized Distributor organization, and shall not extend to any equipment not manufactured by Telecast Fiber Systems, Inc., even though such equipment may be sold or operated with the Products. In addition, this limited warranty shall be void and of no further force or effect whatsoever if the Product is repaired or modified by any person other than an authorized representative of Telecast Fiber Systems, Inc. without the consent of Telecast Fiber Systems, Inc. This warranty shall not apply to any defect, failure or damage caused by improper use or inadequate maintenance and care. Nor shall this warranty apply to any damage caused in whole or in part by attempts by personnel other than Telecast's personnel, as approved in advance in accordance with the foregoing provisions, to open, install, repair, or service the Product; nor to damage resulting from improper connection with incompatible equipment; nor to damage to a unit which has been modified by personnel other than Telecast personnel.**

**Products returned to Telecast for warranty service shall be shipped, freight prepaid to Telecast. Telecast will return the repaired product or ship a replacement, freight prepaid, to either Distributor or Distributor's customer, as requested by Distributor's customer, at a location within the United States or, at Telecast's option, to Distributor's location in the case of international sales.**
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