

User's Guide

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Python Plus

Multichannel Fiber Optic SDI and IP Transport System with CWDM

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toc

Table of Contents

1 About Python Plus.....	5
About the Python Plus System	6
Fiber Cable Overview	7
Unpacking the Python Plus	8
Product Returns	8
Safety and Fiber Optic Systems	9
Optical Fiber Safety	9
FCC Part A Manual Notice.....	9
2 Hardware and Block Diagrams	11
Available Models	12
Block Diagrams.....	13
PY3-FRAME + PY3-TX-G/PY3-RX and W4-TX-ST	13
3 Python Plus Components	15
Python Plus configuration	16
Python Plus front panel.....	17
Power and display panel.....	17
Python Plus front panel cards	18
PY3-RX card	18
PY3-TX card	19
Python Plus rear panel plates	20
Python Plus Units with CWDM and Fiber Capability (Dual Input/Output)	22
Python Plus Rear panel operation	24
Area A - Rear Panel Power Connectors	24
Redundant Power Supply Usage	25
Area B – ST Fiber Connectors	25
Power Connector Wiring.....	25
Fiber ADAP Power Supplies.....	26
4 Python Plus Operation	27
Fiber Optical Channel Monitoring	28
Using the Python Plus Optical Measurement Display.....	29
Python Plus Optical Measurement Display	29
Condition 1: No Optical Link	30
Condition 2 – Optical Link good but no SDI data present.....	30
Condition 3 - Active usable optical link with SDI Data	30
System Firmware Display	31
Technical Information Display	31

Best Practices	32
Troubleshooting	32
5 Understanding Python Plus Model Numbers	33
Part number ordering options	34
Frame	34
Coaxial Cards	34
Fiber Cards	34
Rear Options.....	34
Blank Plates.....	34
6 Specifications	35

1

About Python Plus

This chapter provides an overview of the Python Plus and includes the safety and warranty information about it.

<i>About the Python Plus System</i>	6
<i>Safety and Fiber Optic Systems</i>	9

About the Python Plus System

The Python Plus transmitter multiplexes a number of HD/SDI signals into a fiber optic transport stream. The number of signals can be 4, 8, 12, or 16 – always in multiples of four. Similarly, the Python Plus receiver de-multiplexes a corresponding number of fiber optic signals into HD/SDI.

The method of fiber optic signal transmission can use one-for-one pass through conversion of each HD/SDI signal or CWDM (course wavelength division multiplexing) for up to 16 HD/SDI signals combined into a signal fiber optic cable.

In addition to Python Plus transmitter and receiver models, Transceivers are also available which allow various combinations of transmit and receive in the same unit. Please see [Available Models](#) on page 12 for the model list.

Python Plus units accept electrical digital signals (via BNC), ranging from 19.4 Mbps up to 12 Gbps-uncompressed HD/SDI.

Along with LEDs to indicate the presence of an HD/SDI signal at each BNC input and output, the Python Plus features an integrated optical power meter for monitoring the received power for each optical HD/SDI signal. Fiber optical power is measured only at the receiver end of the signal path.

Figure 1-1 is a conceptual overview of an example Python Plus signal path.

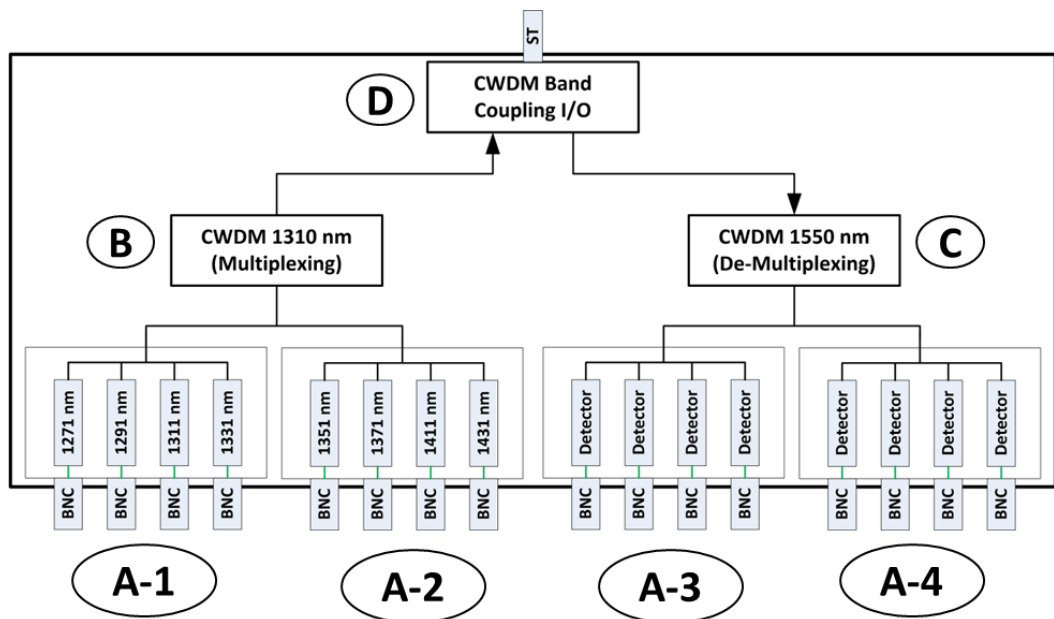


Fig. 1-1: Python Plus Conceptual Overview

The Python Plus also features dual 12-18 VDC power inputs for electrical redundancy. Up to 3 Gb/s (SDI) or 10 Gb/s (IP) is supported on each optical channel.

The Python Plus handles a wide range of digital video rates. Supported formats include:

- 12 Gb/s HD/SDI: SMPTE 2081
- 6 Gb/s HD/SDI: SMPTE 2082
- 3 Gb/s HD/SDI: SMPTE 424M

- 1.5 Gb/s HD/SDI: SMPTE 292M
- 143 Mb/s: SMPTE 259M
- 270 Mb/s DVB/ASI (re-clocked)
- 19.4 Mb/s ATSC: SMPTE 310M
- Non-standard digital signals to 3 Gb/s

The unit is interoperable with industry standard optical HD/SDI signals to/from other equipment, such as Rattler™, Diamondback™, SHED™, HDX™, and Viper™ series frames and modules, as well as other manufacturers' routers, DAs, etc.

The Python Plus has four Input/Output card positions that can either convert incoming SDI/Data BNC signals into Fiber Optic signals or can detect received Fiber Optic signals and convert them to SDI/Data. Each position handles four channels

In the above example the two card positions A-1 and A-2 are transmitter cards. Slot A-1 handles 1310 nm low range signals and slot A-2 handles 1310 nm high range signals. Please see [Understanding Python Plus Model Numbers](#) on page 33 for a list of all of the available I/O cards.

Positions A-3 and A-4 each have a four channel detector card that converts the incoming de-multiplexed fiber optic feed into individual SDI/Data signals.

The eight input signals are multiplexed (B) and sent to the CWDM Band Coupling I/O card (D). This I/O card manages on a single ST Fiber Connector the eight outgoing and eight incoming Fiber Optic signals. 16 signals are coupled on to a single Fiber I/O. The band coupler combines 1310 nm and 1550 nm ranges into a single Fiber Optic signal.

The incoming eight Fiber signals are decoupled, de-multiplexed (C) and sent to the Detector cards for conversion to SDI/Data.

Fiber Cable Overview

Fiber Optics and Fiber Optic Cable are the core technologies at the heart of the Python Plus System. The Python Plus features the ability to multiplex and de-multiplex a variety of video, audio, and data signals so that they can be carried over a thin strand of Fiber Optic cable for long distances. The specific theory and operation of Fiber Optics is beyond the scope of this document.

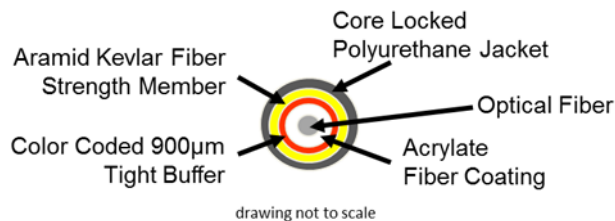


Fig. 1-2: Single Mode Fiber Optic Cable Cross-Section (Illustrative Only)

Unpacking the Python Plus

Please consult your packing slip and purchase order to ensure that you have received all of the expected components.

Inspect all components for scratches and other mechanical damage, and inspect the electrical connectors for bent or damaged pins and latches. Report any missing or damaged components to Grass Valley (see [Product Returns](#) on page 8).

Leave the protective caps on the optical connectors whenever the fiber is disconnected.

Product Returns

In the unlikely event of damage to your Python Plus during shipping or delivery, take note of any damage with the delivery or shipping service. If any component does not work correctly out of the box, please contact Grass Valley Fiber Solutions service ([Contact Us](#) on page 37).

If the problem cannot be remedied through a service telephone call, you will receive an RMA number (Return of Merchandise Authorization). Please note this RMA number inside and outside of all shipping boxes and on all documentation provided with the items to be returned.

Safety and Fiber Optic Systems

Optical Fiber Safety

Never look directly into the end of the optic fiber while either end of the system is operating.

This Python Plus contains CDRH Class 1 laser devices. To prevent damaging your eyes, 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 units 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 if there are no fiber cables connected to the fiber port.

There are no manual adjustments to make inside the Python Plus. Do not attempt any type of service on this instrument, other than any procedures as instructed in this Guide. Refer all servicing to the Fiber Solutions division of Grass Valley (see [Contact Us](#) on page 37).

Always use cable connector caps when the cables are not connected. This protects the connector from damage and the unlikely event of exposure to an operating optical link. Keeping the caps in place when the connectors are not in use will prevent dirt and dust from entering the connector and degrading the performance of the optical link.

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. If not installed and used in accordance with this User Guide, this equipment may cause harmful interference to radio communications.

Hardware and Block Diagrams



This chapter lists the models available with the Python Plus and lists the block diagrams of these models.

<i>Available Models</i>	12
<i>Block Diagrams</i>	13

Available Models

The Python Plus is available in a variety of standard models. The following list covers the models available at the time of publication. Please see [Understanding Python Plus Model Numbers](#) on page 33 for an explanation of how to understand Python Plus Model Numbers.

Block Diagrams

PY3-FRAME + PY3-TX-G/PY3-RX and W4-TX-ST

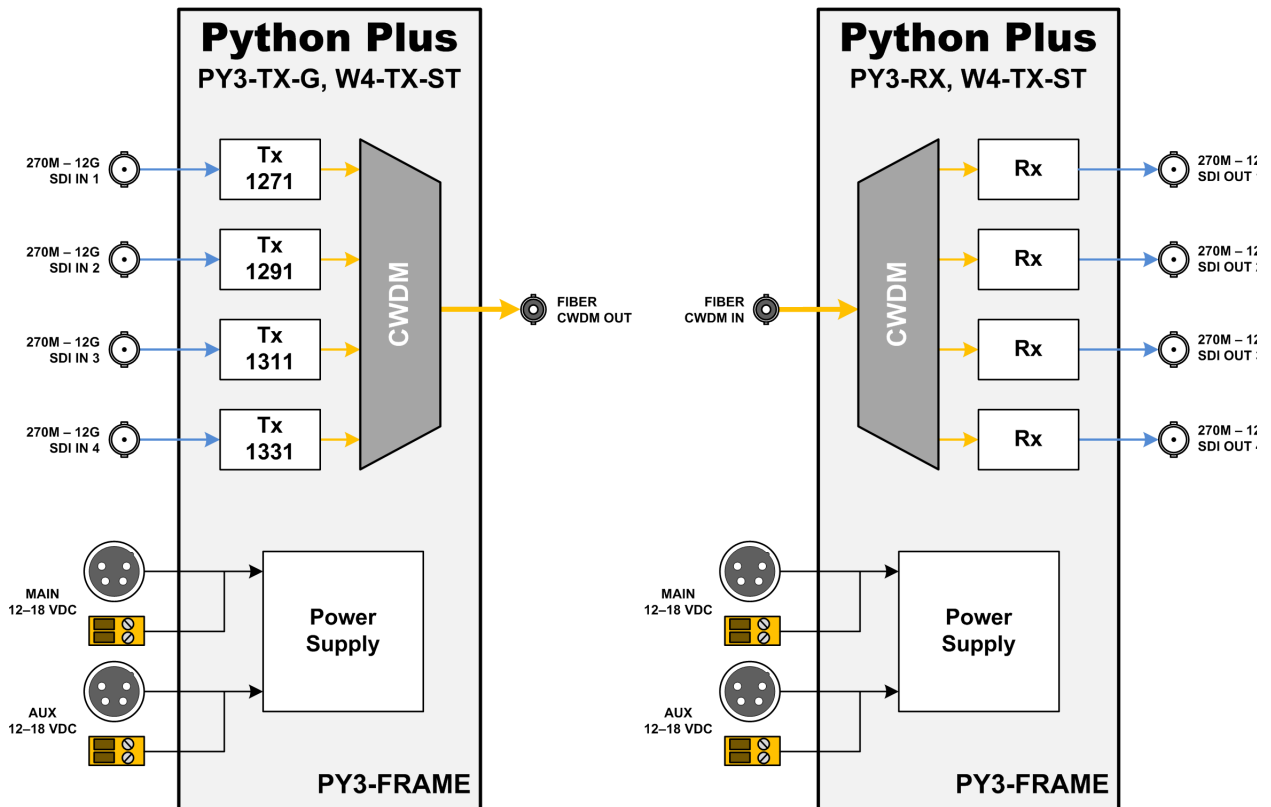


Fig. 2-1: 4 Channels Python Plus.

3 Python Plus Components

This chapter describes the main components of the Python Plus.

<i>Python Plus configuration</i>	16
<i>Python Plus front panel</i>	17
<i>Python Plus rear panel plates</i>	20

Python Plus configuration

Designed as a modular product, Python Plus supports a wide variety of signals, with each port providing multirate capability. Each unit can transport a mix of digital and IP cameras or virtually any digital video transceiver through fiber or copper cables. One unit can support up to eight of any type of cameras, 2,048 AES channels or any mix of these signals desired, all in a compact 1 RU frame. All of these signals can be converted individually to fiber, or muxed to transport them over a single or pair of fibers.

A typical Python Plus unit consists of a Python Plus frame that can be equipped with up to 4 Fiber/Coaxial Cards and Rear panel options.

The Python Plus has two main interface/interconnection panels:

- The Front panel
- The Rear panel

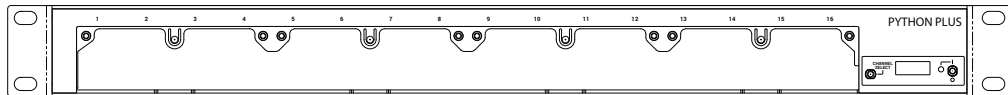


Fig. 3-1: Python Plus Frame front panel.

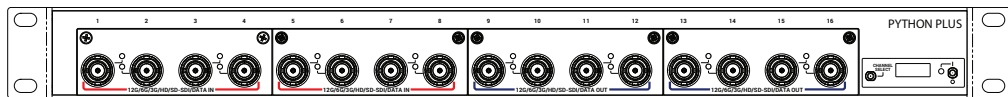


Fig. 3-2: Example of a Python Plus front panel with four mounted modules.

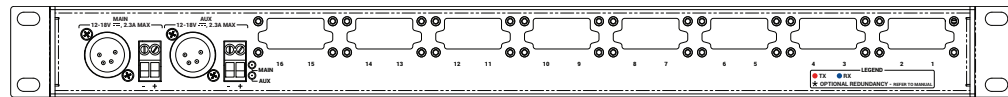


Fig. 3-3: Empty Python Plus Frame back panel.

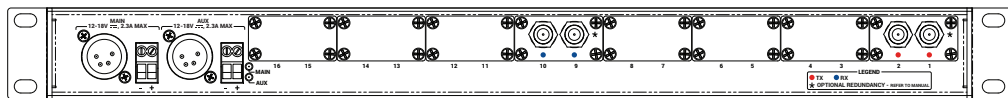


Fig. 3-4: Example of a Python Plus back panel with fiber plates installed.

Python Plus front panel

The composition of the Python Plus front panel varies depending on the configuration of the frame: transmitters or/and receiver cards can be installed, both coaxial and fiber options are possible. Identify the particular Python Plus module of interest and then go to the page indicated.

Power and display panel

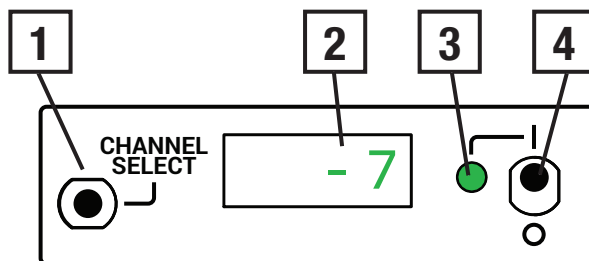


Fig. 3-5: Power and display area

The Power and Display Area has four features.

- **1: CHANNEL SELECT** – scrolls the LED display through each of the Fiber Channels
- **2: Digital Display** – display optical power levels, firmware version and operating temperature
- **3: Power Monitor LED** – indicates the current Power status
- **4: ON/OFF Switch** – controls power to the Python Plus unit

For information on how to use the CHANNEL SELECTION switch and the digital display see [Using the Python Plus Optical Measurement Display](#) on page 29.

Python Plus front panel cards

PY3-RX card

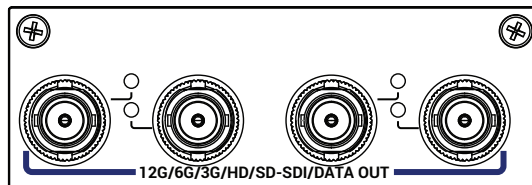


Fig. 3-6: Coaxial 12G/6G/3G/HD/SD-SDI/Data OUT card.

TP3-RX card

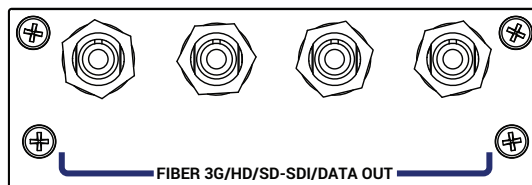


Fig. 3-7: Fiber 3G/HD/SD-SDI/Data OUT (passive) card.

TP3-ARX card

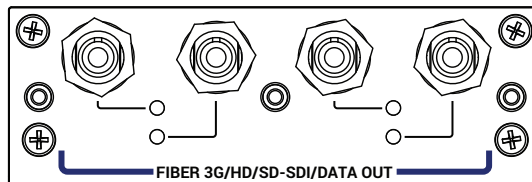


Fig. 3-8: Fiber 3G/HD/SD-SDI/Data Out (active) card.

The Fiber 3G/HD/SD-SDI/Data out (active) card has 4 3G/HD/SD-SDI/Data output BNC connectors. All four outputs operate identically.

- On units without CWDM, the four outputs correspond to the four Fiber Optic inputs on the back panel.
- For CWDM units, the four outputs are de-multiplexed from a single Fiber Optic input.

Each output has an LED indicator that indicates the following status:

- **Green:** the Python Plus is receiving a signal for the indicated channel over the Multiplexed Fiber Optic Cable and SDI signal is present
- **Alternating between Red and Green:** a Fiber Optic connection is detected for the indicated channel but no SDI is present.
- **Red:** no optical connection is detected or the active optical signal has fallen below -22 dBm

TP3-RX10 card

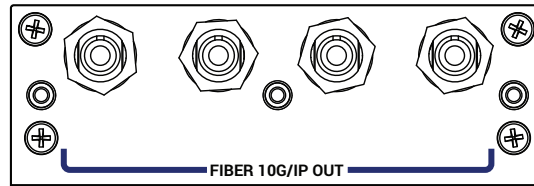


Fig. 3-9: Fiber 10G/IP out card.

PY3-TX card

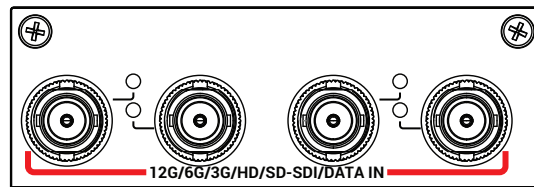


Fig. 3-10: Coaxial 12G/6G/3G/HD/SD-SDI/Data IN card.

The coaxial 12G/6G/3G/HD/SD-SDI/Data IN card has four SDI/DATA In BNC Connectors. All four inputs operate identically, but CWDM models are multiplexed for transmission on the fiber output of the unit for demultiplexing to the four SDI outputs on the receiving unit. On pass-through models, conversion to fiber optical signal occurs individually and four Fiber Optic outputs are available on the rear panel.

The SDI/DATA connections can carry a variety of Baseband and Data type signals (see [Specifications](#) on page 35 for a list).

Each input has a LED indicator that indicates the following:

- **Green:** SDI signal present
- **Unlit :** Nothing connected

TP3-TX card

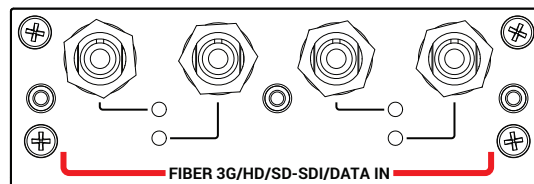


Fig. 3-11: Fiber 3G/HD/SD-SDI/Data IN card.

TP3-TX-BK card

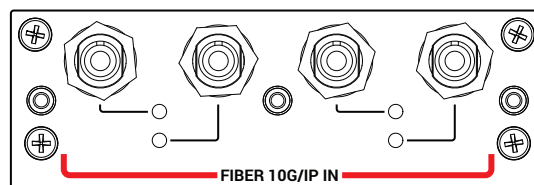
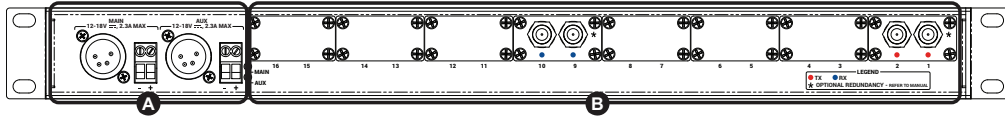


Fig. 3-12: Fiber 10G/IP In card.

Python Plus rear panel plates

The configuration of the Python Plus rear panel varies depending on whether the unit is a receiver, transmitter or transceiver. It also varies depending on whether the unit is a CWDM unit or an SDI to Fiber conversion unit.



The following sections describe the different types of Rear Panel options that are available, but the caption letters in each figure refers to the following sections:

- **A - Power Connector Area** - see [Area A - Rear Panel Power Connectors](#) on page 24
- **B - Rear panel options Area** - see below:

TR-LC plate

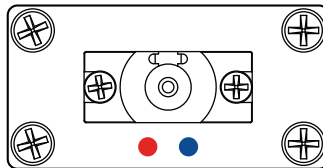


Fig. 3-13: Rear panel option 1.

S2-TX-LC plate

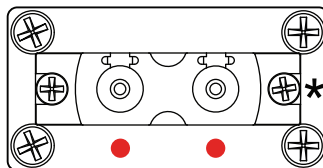


Fig. 3-14: Rear panel option 2.

S2-RX-LC plate

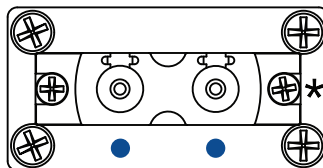


Fig. 3-15: Rear panel option 3.

TR-ST plate

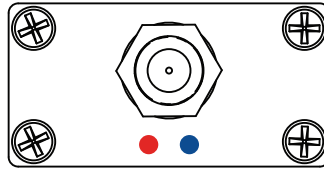


Fig. 3-16: Rear panel option 4.

TX-ST plate

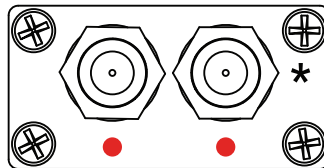


Fig. 3-17: Rear panel option 5.

RX-ST plate

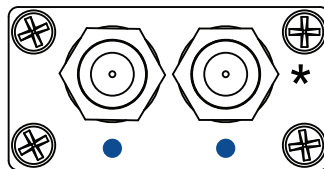


Fig. 3-18: Rear panel option 6.

Python Plus Units with CWDM and Fiber Capability (Dual Input/Output)

Two available models provide internal primary and backup for sixteen channels.

- The transmitter provides duplicate output of up to 16 SDI/Data signals.
- The receiver provides internal failover capability between the duplicate sets of 16 signals.

The following diagrams illustrate how the primary and backup signals work within the Python Plus.

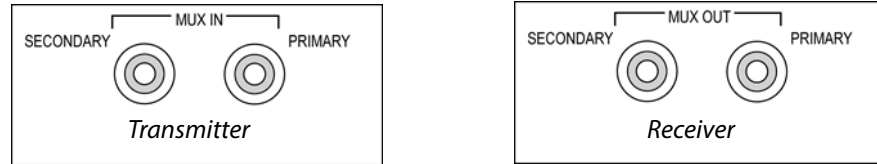


Fig. 3-19: The Input and Output ports

- The transmitter has two outputs each carrying eight signals. Both outputs are active all the time.
- The receiver has two inputs each carrying eight signals.

The Python Plus unit has an internal splitter which receives fiber optic signals from each input. If a good optic signal is detected on the primary side of the splitter, that set of eight is used. If for any reason the optic signal is poor or missing, the system will automatically switch to the secondary side of the splitter.

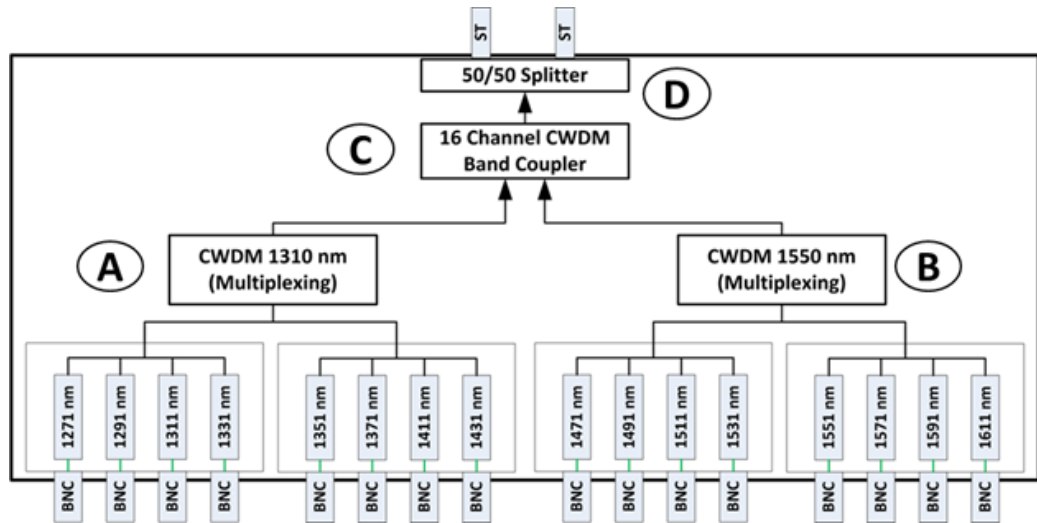


Fig. 3-20: Python Plus Transmitter with Primary and Backup Outputs

The Python Plus Transmitter equipped with primary and secondary Fiber Optic outputs utilizes an Optical Splitter (D) to take the 16 Channel CWDM signal and split the signal into two equal 16 channel outputs.

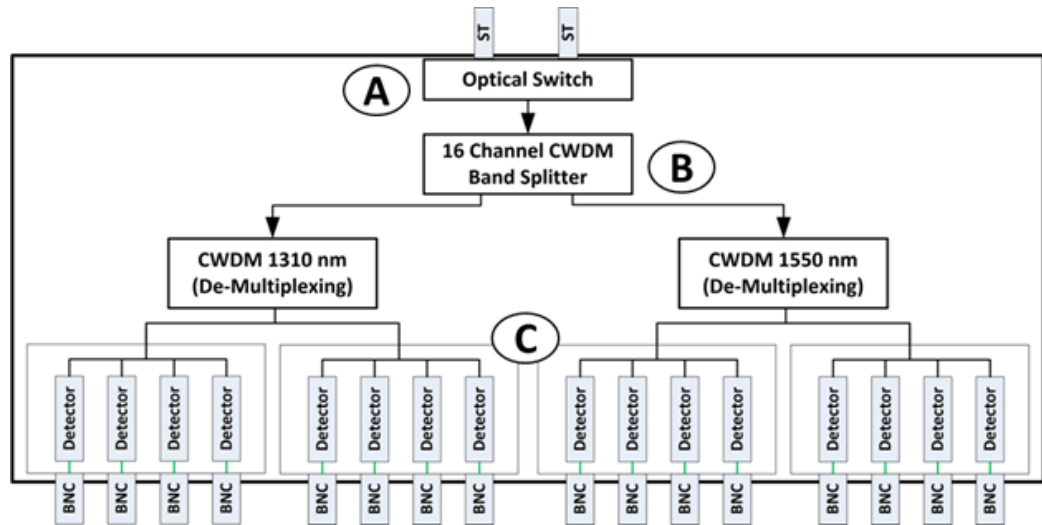


Fig. 3-21: Python Plus Receiver with Primary and Backup Inputs

The Python Plus Receiver equipped with primary and secondary Fiber Optic inputs utilizes an Optical Switch to detect which of the incoming Fiber Optic signals is best.

Python Plus Rear panel operation

The Python Plus illustration is repeated for ease of use of this guide. Note that all Python Plus units operate in the same manner: the only difference is in whether the Fiber Optic ST connectors are inputs or outputs.

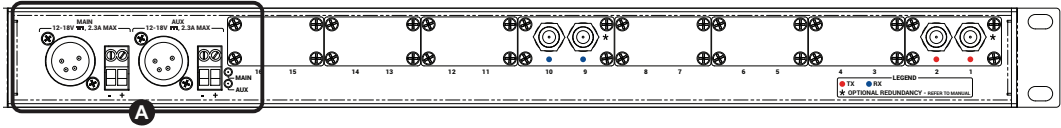


Fig. 3-22: Python Plus Rear Panel

Area A - Rear Panel Power Connectors

The Python Plus provides for the use of redundant 12-18 Volts DC power supplies. A battery backup option is not provided for the Python Plus unit.

Power can be supplied to the unit by either a 4-pin XLR connector from an external power supply (such as a ADAP-AC-04) or with direct wiring from a 12-18 Volt DC power supply connected to the provided terminal block.

The main power supply can be of one type (XLR or direct wire) while the Aux power supply is of the other type.

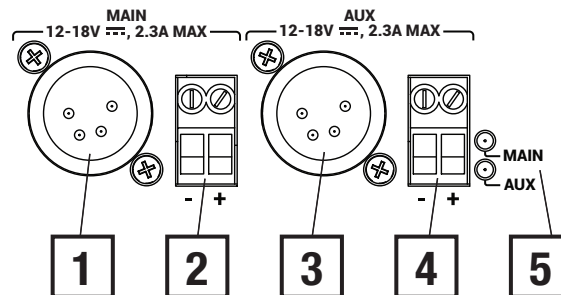


Fig. 3-23: Rear Panel Power Connectors

- **1 & 2 – Connectors for the Main 12-18 VDC power supply** (XLR and Direct wire terminal block)
- **3 & 4 – Connectors for the Main 12-18 VDC power supply** (XLR and Direct wire terminal block)
- **5 – MAIN/AUX Indicator LEDs:**
 - The LED for each power supply will be Green if power is being applied to the Python Plus.
 - If both Main and Aux are connected to a power source, both LEDs will be Green.
 - A lit LED is not an indication of which power source is being used at the time; only that the power source is good.

Redundant Power Supply Usage

The Python Plus power supply contains circuitry to detect which of the power sources (Main or Aux) is producing the highest voltage and then uses that source to power the unit. If the power sources are about the same, the Python Plus uses power from both.

Area B – ST Fiber Connectors

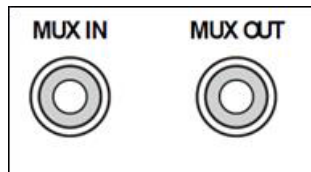


Fig. 3-24: MUX IN and OUT connectors

The MUX IN connector carries up to eight channels from the opposite Python Plus, while the MUX OUT connector carries the up to eight channels to the opposite Python Plus. These signals appear on the front panel as four SDI/DATA channels and four Fiber SDI/DATA channels.

Power Connector Wiring

Figure	Pin	Function
	1	Ground
	2	Unused
	3	Unused
	4	+ Power 12 VDC
This matching connector is from either an ADAP-AC 04 or a customer 12-18 VDC power supply		
	5	Minus Voltage Terminal
	6	Plus Voltage Terminal

Fiber ADAP Power Supplies

The Python Plus requires a power supply providing 12-18 volts at 1.5 Amps. Any power supply meeting the required specification and providing power through an XLR-4 Female connector can be used. Please contact Grass Valley ([Contact Us](#) on page 37) or your authorized dealer for more information.

Direct wire power connections from a customer provided power source can also be used with the Terminal Block power connections on the back panel.



Fig. 3-25: Power Supply

Supplied with 4PIN XLR/A4F connector for the power plug on the Python Plus unit.

4 Python Plus Operation

This chapter describes the operation of the Python Plus. Please keep in mind that once the system is properly set up and configured, there is very little to do during normal operation.

<i>Fiber Optical Channel Monitoring</i>	28
<i>Using the Python Plus Optical Measurement Display</i>	29
<i>Best Practices</i>	32
<i>Troubleshooting</i>	32

Fiber Optical Channel Monitoring

The Python Plus provides direct digital readout of the Fiber Optic Link signal strength for signals received at the unit. This readout is presented in units of dBm. It is useful to understand both the dB or decibel and the dBm or decibel referenced to one milliwatt.

The decibel (dB) is a logarithmic unit of measurement that expresses the magnitude of a physical quantity (usually power or intensity) relative to a specified or implied reference level. Since it expresses a ratio of two quantities with the same unit, it is a dimensionless, relative unit. A decibel is one tenth of a bel, a seldom-used unit. Typically dB has been employed in Audio Measurement and Fiber Optics among many uses.

Proper measurement of signal strength requires an absolute measurement and the dBm provides this measurement. Since it is referenced to the milliwatt, it is an absolute unit, used when measuring absolute power. By comparison, the decibel (dB) is used for quantifying the ratio between two values, such as signal-to-noise ratio

The Python Plus operates within a defined range of Fiber Optic Link signal strength. The minimum recommended signal strength is -20 dBm or better. Typically the system should operate at levels between -8 dBm and -20 dBm. The standard laser output strength is -6 dBm. Cable length affects signal strength as does the number of connections between the two Python Plus units. Any use of repeaters or cable bulkhead connector will produce a minimal signal loss through each connection.

The optical output from each transmitter is generated by an infrared laser diode that is coupled to a CWDM and onto the fiber. User connections on the Python Plus are made at the bulkhead ST type connectors on the front and rear panels. Operation is intended for use on single mode fiber. Since the CWDM output of the Python is the aggregate output of all 8 or 16 optical transmitters inside the frame, the total optical power output on a single fiber optic cable will be in the +4 to +8 dBm range. Standard practice of NEVER looking directly into a fiber should be followed at all times.

The maximum fiber distance is defined by the optical loss margin. The RX signal must be -20 dBm or better. Losses on single mode fiber are approximately 0.5 dB/km or less. CWDM's account for about 5dBm of loss per pair and must be considered when computing your link loss budget.

The integrated optical power meter will show the received optical power for each receiver but note that this figure is post CWDM.

You should read the Using Fiber Optics Guide for information on how to manage and deploy your fiber optics cabling, safety precautions, tips & tricks, and recommendations for creating complex fiber optic networks. You can find a copy of this document on the Support portal (see [Contact Us](#) on page 37).

Using the Python Plus Optical Measurement Display

The optical measurement functionality is similar across all three types of Python Plus. A transceiver, transmitter, and receiver work identically with one exception. The system reports fiber optical strength only for fiber optic signals received at a unit. Transmission strength is not measured.

Python Plus Optical Measurement Display

The Python Plus optical signal strength display has characteristics for the Python Plus Transmitter, Receiver, and Transceiver.

The Channel Select switch is a dual function switch and functions as follows:

- Flicking the switch to the right allows scrolling through the individual channels to provide basic status on the signal.
- Flicking the switch to the left provides additional information about the current channel.

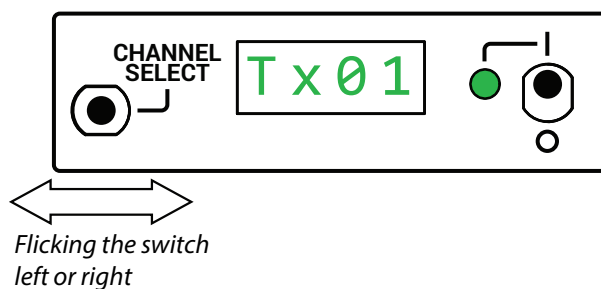


Fig. 4-1: Flicking the CHAN SEL switch

Scroll through the signal channels by flicking the switch to the right. The system reports on the installed SDI channels and the installed fiber channels being transmitted by the unit.

In a 4 x4 Transceiver, the CHAN SEL switch will display the four Transmit channels first followed by the four Receive Channels.

After the last channel, the display will show the current ambient temperature within the unit chassis in degrees Celsius.

After each flick, the display will indicate the monitored channel such as Tx01 or Tx02 (for the Transmitter and Transceiver) and Rx01 or Rx02 (for the Receiver). For each TX/RX channel, you can flick the switch to the left to display Technical Information about the channel.

As you scroll through the channels, one of three conditions will be displayed for the Received channels:

- No fiber link for a channel
- Existing optical link but with no active SDI Data
- Active usable optical link with SDI Data (Available only for Receive channels)

Condition 1: No Optical Link

If there is no optical link on a particular channel the display will show n/A for not available.

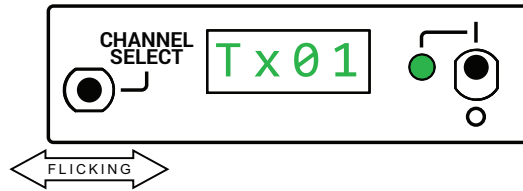


Fig. 4-2: No Optional Link Display

Condition 2 – Optical Link good but no SDI data present.

When an optical link is active, but no SDI data present, the optical power reading will change between a high and low value, such as -7 and -30.

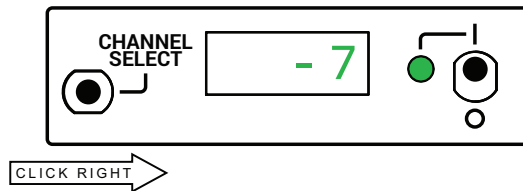


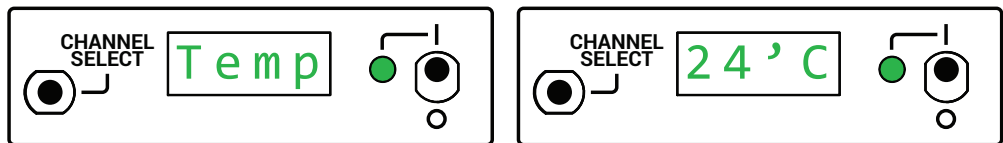
Fig. 4-3: No SDI Data Present Display

This fluctuation between High and Low occurs because the laser for that channel turns On and Off until SDI is present. This causes corresponding individual RX channel LED to blink Red/Green.

Condition 3 - Active usable optical link with SDI Data

When the optical link is good and a valid SDI data stream is present, the optical power level will be indicated.

Depending on the loss over the distance of the fiber cable run, this value could range from approximately -5 to -20.



Display scrolls to reveal temperature.

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

System Firmware Display

The Python Plus display will display the current firmware version when the unit is powered On. This appears in the display as a scrolling series of alphanumeric character four characters wide.

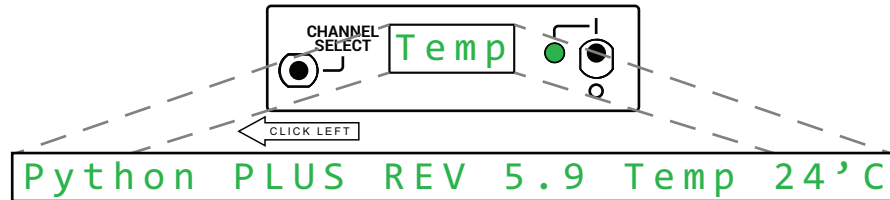


Fig. 4-4: Firmware display

Technical Information Display

Flicking the CHAN SEL switch to the left provides additional technical information that identifies the specific physical channel that is being measured. This information is presented in scrolling format four characters wide.

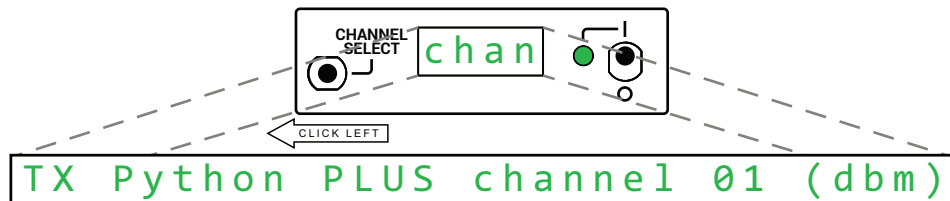


Fig. 4-5: Technical Information display

Best Practices

This section is devoted to a number of “Best Practices” for use of the Python Plus System.

- Take every precaution to prevent damaging your eyes while using the equipment.
- Protect the Fiber Optic Cable and the Fiber Optic Connectors. **Always** keep these capped unless there are being connected.
- Read the section on planning the Fiber Run.

The Using Fiber Optics Guide explains how to manage and deploy your fiber optics cabling, safety precautions, tips & tricks, and recommendations for creating complex fiber optic networks. You can find a copy of this document on the Support portal (see [Contact Us](#) on page 37).

- Make sure that the Python Plus unit is secure and cannot be inadvertently moved. The units may usually be rack mounted and therefore safe and secure, but in instances where it must be used in “table top” operation, ensure that the connectors on both the front and rear panels cannot be damaged by being inadvertently struck or pulled.
- Secure the power supplies and power connections so that power is continuous.
- Once the system is set up and running, monitor the system display carefully on the Python Plus.
- Because the system is digital, the Signal Strength either meets or exceeds the system requirements. When the Signal Strength is no longer strong enough, the signal stops.
- Be as careful during System tear down as during System setup.

Troubleshooting

Troubleshooting any technical issues with the Python Plus System is similar to any piece of television production gear, with the exception of the core Fiber Optic technology.

Keep the following in mind:

- Check all your cables for any broken connections or bad connectors.
- Ensure that your Power Supply is working properly.

If you cannot resolve the problem in the field, contact Support ([Contact Us](#) on page 37).

5 Understanding Python Plus Model Numbers

This chapter explains how to decode the Python Plus Part Number. Sample part numbers are decoded at the end of this section.

Part number ordering options 34

Part number ordering options

Frame

- PY3-FRAME Python Plus frame

Coaxial Cards

- PY3-RX Quad fiber to SDI receiver
- PY3-TX-A Quad SDI to fiber transmitter 1310 all
- PY3-TX-X* Quad SDI to fiber transmitter CWDM

Fiber Cards

- TP3-RX Quad fiber to fiber receiver
- TP3-RX10 Quad 10G fiber to 10G fiber receiver
- TP3-ARX Quad fiber to fiber receiver ADP
- TP3-TX-A Quad fiber to fiber transmitter 1310 all
- TP3-TX-X* Quad 10G fiber to 10G fiber transmitter CWDM
- TP3-TX-X* Quad fiber to fiber transmitter CWDM

Rear Options

- S2-RX-XX* Rear panel receiver 2-ch (XX*/UPC)
- S2-TX-XX* Rear panel transmitter 2-CH (XX*/UPC)
- W4-XX-XX* Rear panel 4-ch RX or TX or TR CWDM demux to 1 (XX*/UPC)
- W8-XX-XX* Rear panel 8-ch RX or TX or TR CWDM demux to 1 (XX*/UPC)
- W16-XX-XX* Rear panel 16-ch RX or TX or TR CWDM demux to 1 (XX*/UPC)
- X8-RX-XX* Rear panel 8-ch receiver CWDM demux with redundancy to 2 (XX*/UPC)
- X16-RX-XX* Rear panel 16ch receiver CWDM demux w/ redundancy to 2 (XX*/UPC)
- D8-TX-XX* Rear panel 8ch transmitter CWDM mux w/redundancy to 2 (XX*/UPC)
- D16-TX-XX* Rear panel 16ch transmitter CWDM mux w/ redundancy to 2 (XX*/UPC)

Blank Plates

- PY3-BLANK Front blank panel
- SR-BLANK Rear blank panel

X* Different CWDM wavelength are available and depend on a configuration.

XX* Available as LC/UPC or ST/UPC.

6 Specifications

Video

Transmission Method.....	Digital
Input Level	800 mV (Peak To Peak)±10%
Input/Output Impedance.....	75 Ohms
Return Loss	>15 dB, 5 MHz to 1.5 GHz
.....	>10 dB, 1.5 GHz to 3 GHz
.....	>7 dB, 3 GHz to 6 GHz
.....	>4dB, 6 GHz to 12 GHz
Coaxial Input Equalization (with Belden 1694A cable):	
At 12 Gb/s.....	50 m
At 6 Gb/s	120 m
At 3 Gb/s	200 m (up from 120 m)
At 1.5 Gb/s.....	200 m
At 270 Mb/s	400 m
Bit-Error rate (at -21 dBm Rx Optical Power)	PRBS $2^{-23}-1$, 1×10^{-12}
Timing jitter (color bars).....	<2 UI, alignment jitter <0.2 UI

Optical

Operating wavelength	1310 nm with optional CWDM: 1271-1611 nm
Link Margin	up to 22dB
1310 nm transmitter output power.....	-7 dBm
CWDM transmitter output power	-5 to 1 dBm
Receiver Sensitivity:	
6 Gbs/ to 12 Gb/s.....	-11 dBm with color bars (per Optoway SFP specs)
270 Mb/s to 3 Gb/s.....	- 20 dBm pathological
Optical source	SFP or SFP+
Optical Launch	-5 to 1 dBm (also per Optoway)
Maximum data rate, per channel:.....	12 Gb/s or 10 Gb/s
Fiber Type	Single-mode

Mechanical/Environmental

Dimensions (WxHxD)	266.7 x 44.45 x 424.18 mm (10.5 x 1.75 x 16.7 in)
Weight, each end.	2.27 kg (5 lbs)
Electrical connectors	BNC
Optical connectors:	
Front.....	ST/UPC
Rear.....	ST/UPC and LC/UpC

Input voltage..... 11-18 VDC
Power consumption:
TX4.5 W per PCB
RX1.3 W per PCB
Total.....< 25 W
Temperature Range -20° to 45 °C (-4° to 113°F)
Humidity Range0 to 95 % non-condensing

Compliance

Laser Safety.....Class 1 Laser 21 CFR 1040.10
EMI/RFI.....Complies with IEC/EN 60825-1
CertificationsRoHS



Grass Valley Technical Support

For technical assistance, our international support center, at 1-800-547-8949 (US and Canada) or +1 530 478 4148.

To obtain a local phone number for the support center nearest you, please consult the Contact Us section of Grass Valley's website (www.grassvalley.com).

An online form for e-mail is also available on the website.

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