

Telecast Fiber Solutions

Python 3G User Guide

M4040-9900-102

24 July 2014



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Warranty information is available in the Support section of the Grass Valley Web site (www.miranda.com).

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1

About Python 3G

This chapter provides an overview of the Python 3G and includes the safety and warranty information about it.

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About the Python 3G System

The Python 3G 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 3G 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 3G 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 8 for the model list.

Python 3G units accept electrical digital signals (via BNC), ranging from 19.4 Mbps up to 3Gbps-uncompressed HD/SDI.

Along with LEDs to indicate the presence of an HD/SDI signal at each BNC input and output, the Python 3G 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 3G signal path.

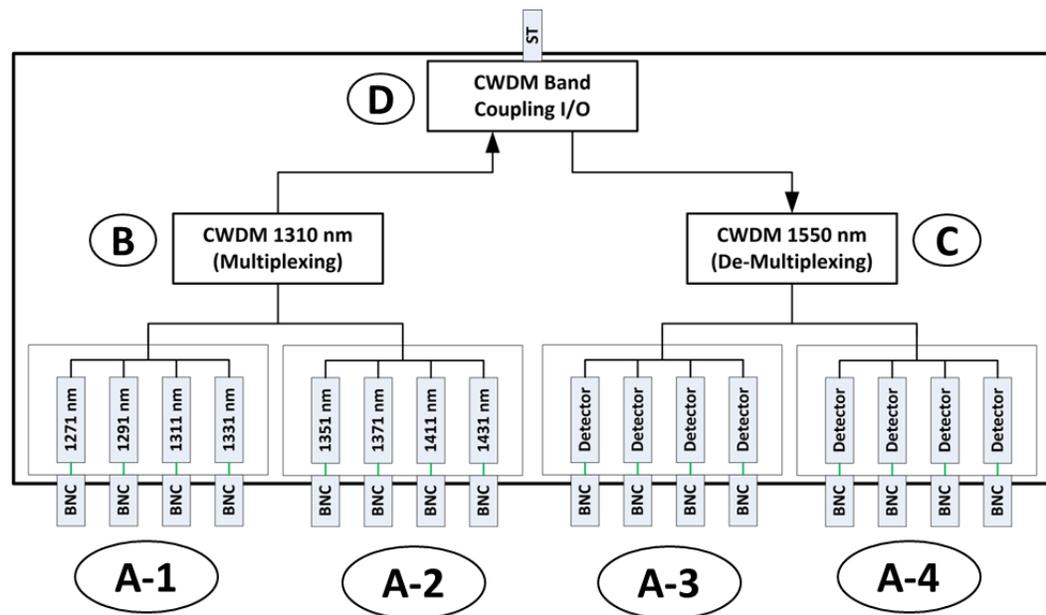


Fig. 1-1: Python 3G Conceptual Overview

The Python 3G also features dual 12-18 VDC power inputs for electrical redundancy. Up to 3Gbps is supported on each optical channel.

The Python 3G handles a wide range of digital video rates. Supported formats include:

- 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 3G 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 3G Model Numbers](#) on page 43 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 3G System. The Python 3G 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.

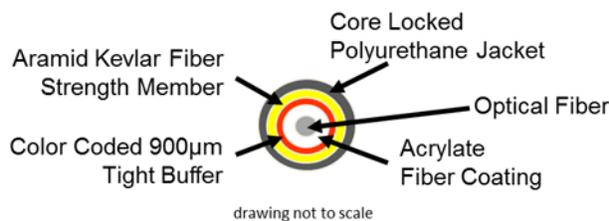


Fig. 1-2: Single Mode Fiber Optic Cable Cross-Section (Illustrative Only)

Unpacking the Python 3G

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 Fiber Solutions (see [Product Returns](#) on page 4).

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

Product Returns

In the unlikely event of damage to your Python 3G 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 49).

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 3G 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 3G. 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 49).

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 3G and lists the block diagrams of these models.

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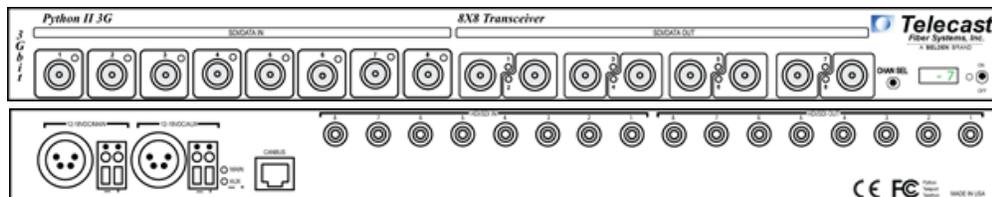
Available Models

The Python 3G is available in a variety of standard models. The following list covers the models available at the time of publication. Please see [Understanding Python 3G Model Numbers](#) on page 43 for an explanation of how to understand Python 3G Model Numbers.

The Python 3G may contain as many as 16 HD/SDI BNC Connectors on the front panel and as many as 16 ST Fiber Optic cable connectors on the rear panel. Illustrations of a few of the 29 standard models available at time of publication are included in this table.

Part Number	Type	HD/SDI Transmit	HD/SDI Receive	CWDM Equipped	Number of Fibers
PY3-R000-ST4	Receiver	X	4	No	4
PY3-RR00-ST8	Receiver	X	8	No	8
PY3-RRR0-W83W43	Receiver	X	12	Yes	2
PY3-RRRR-ST16	Receiver	X	16	No	16
PY3-RRRR-W16	Receiver	X	16	Yes	1
PY3-RRRR-X16	Receiver	X	16	Yes	2
PY3-A000-ST4	Transmitter	4	X	No	4
PY3-AA00-ST8	Transmitter	8	X	No	8
PY3-GHJ0-W83W43	Transmitter	12	X	Yes	1
PY3-AAAA-ST16	Transmitter	16	X	No	16
PY3-GHJK-W16	Transmitter	16	X	Yes	1
PY3-GHJK-D16	Transmitter	16	X	Yes	2

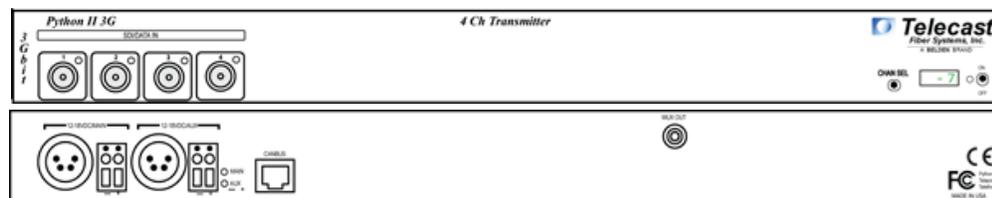
Part Number	Type	HD/SDI Transmit	HD/SDI Receive	CWDM Equipped	Number of Fibers
PY3-GHJR-W16	Transceiver	12	4	Yes	1
PY3-GHGR-W8W8	Transceiver	12	4	Yes	2
PY3-AAR0-ST12	Transceiver	8	4	No	12
PY3-AARR-ST16	Transceiver	8	8	No	16



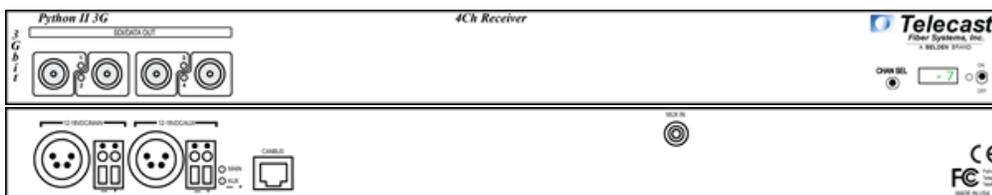
PY3-AR00-ST8	Transceiver	4	4	No	8
PY3-HRRR-W8W8	Transceiver	4	12	Yes	2
PY3-GHRR-W8W8	Transceiver	8	8	Yes	2
PY3-A0RR-ST12	Transceiver	4	8	No	12
PY3-KRRR-W16	Transceiver	4	12	Yes	1
PY3-GR00-W8	Transceiver	4	4	Yes	1
PY3-HR00-W8	Transceiver	4	4	Yes	1

The following Python 3G Models are Operated as a Matched Pair

PY3-G000-W41	Transmitter	4	X	Yes	1
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PY3-R000-W41	Receiver	X	4	Yes	1
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PY3-GH00-W8	Transmitter	8	X	Yes	1
PY3-RR00-W8	Receiver	X	8	Yes	1
PY3-GHRR-W16	Transceiver	8	8	Yes	1

Part Number	Type	HD/SDI Transmit	HD/SDI Receive	CWDM Equipped	Number of Fibers
PY3-JKRR-W16	Transceiver	8	8	Yes	1

Table. 2-1: Python 3G Available Models

Block Diagrams

PY3-AA00-ST4

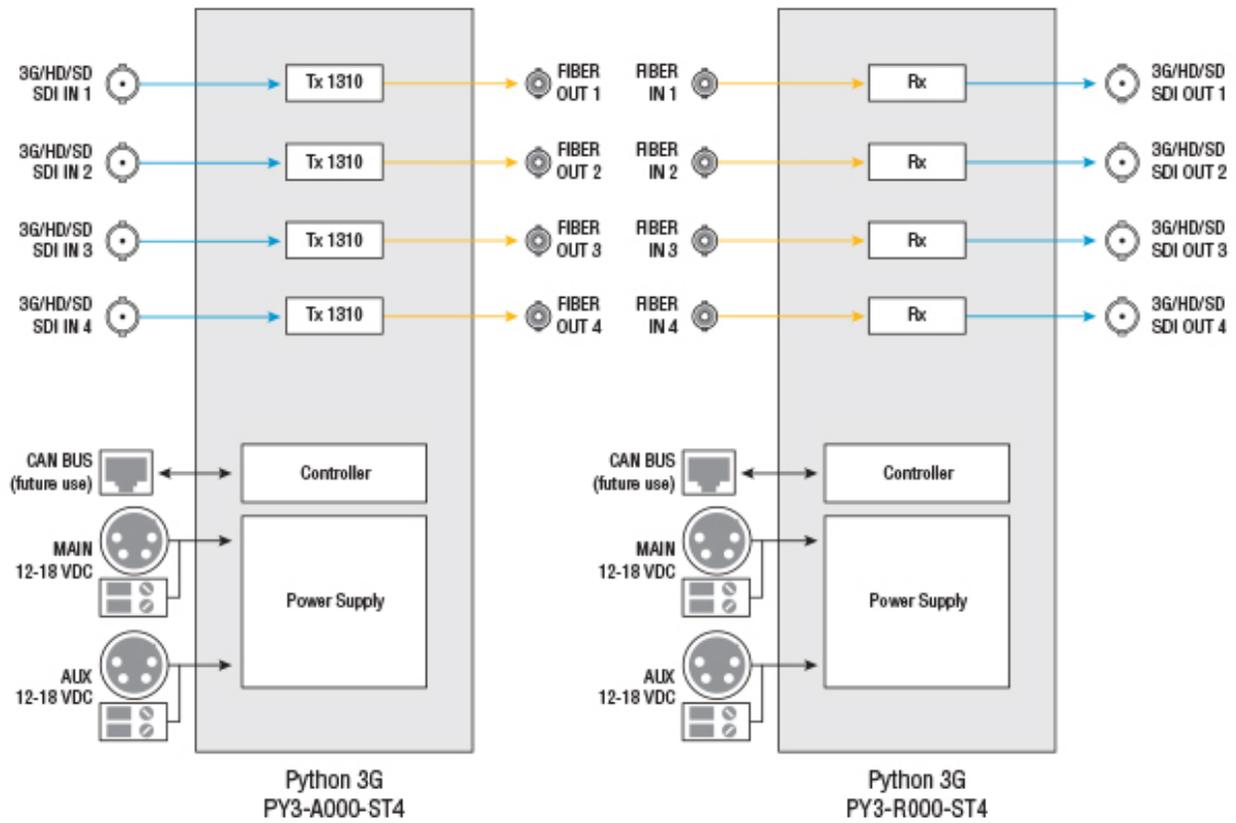


Fig. 2-2: 4 Channels Python 3G on 4 Fibers Block Diagram

PY3-AA00-ST8 / PY3-RR00-ST8

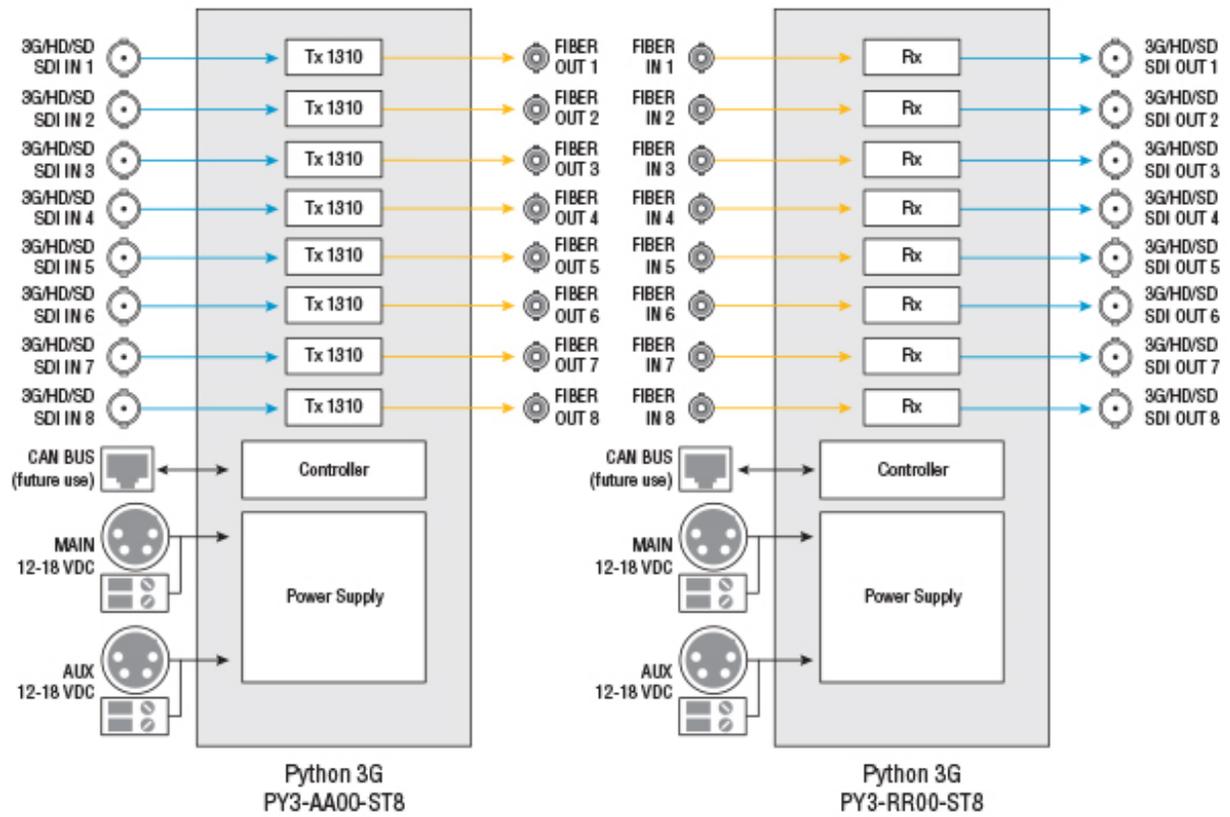


Fig. 2-3: 8 Channels Python 3G on 8 Fibers Block Diagram

PY3-AR00-ST8

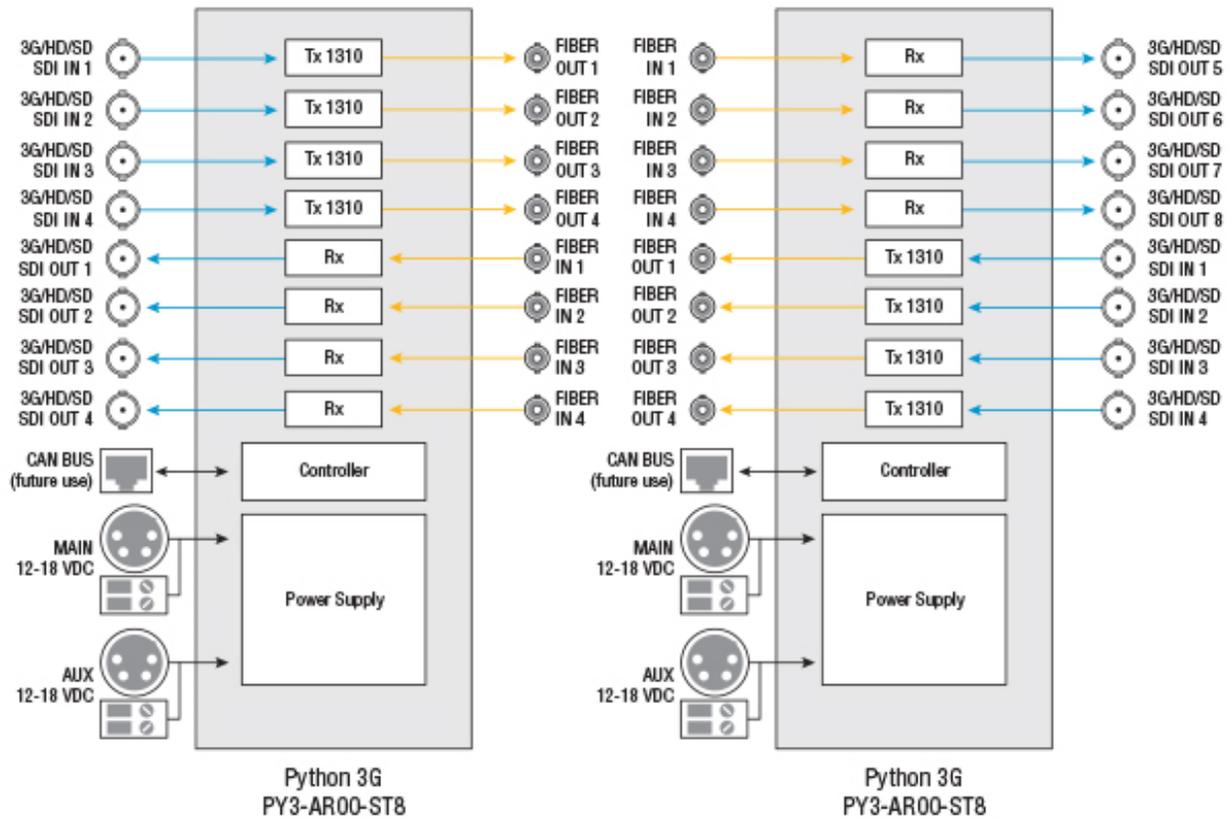


Fig. 2-4: 4x4 Channels Python 3G on 8 Fibers Block Diagram

PY3-AAR0-ST12 / PY3-RRA0-ST12

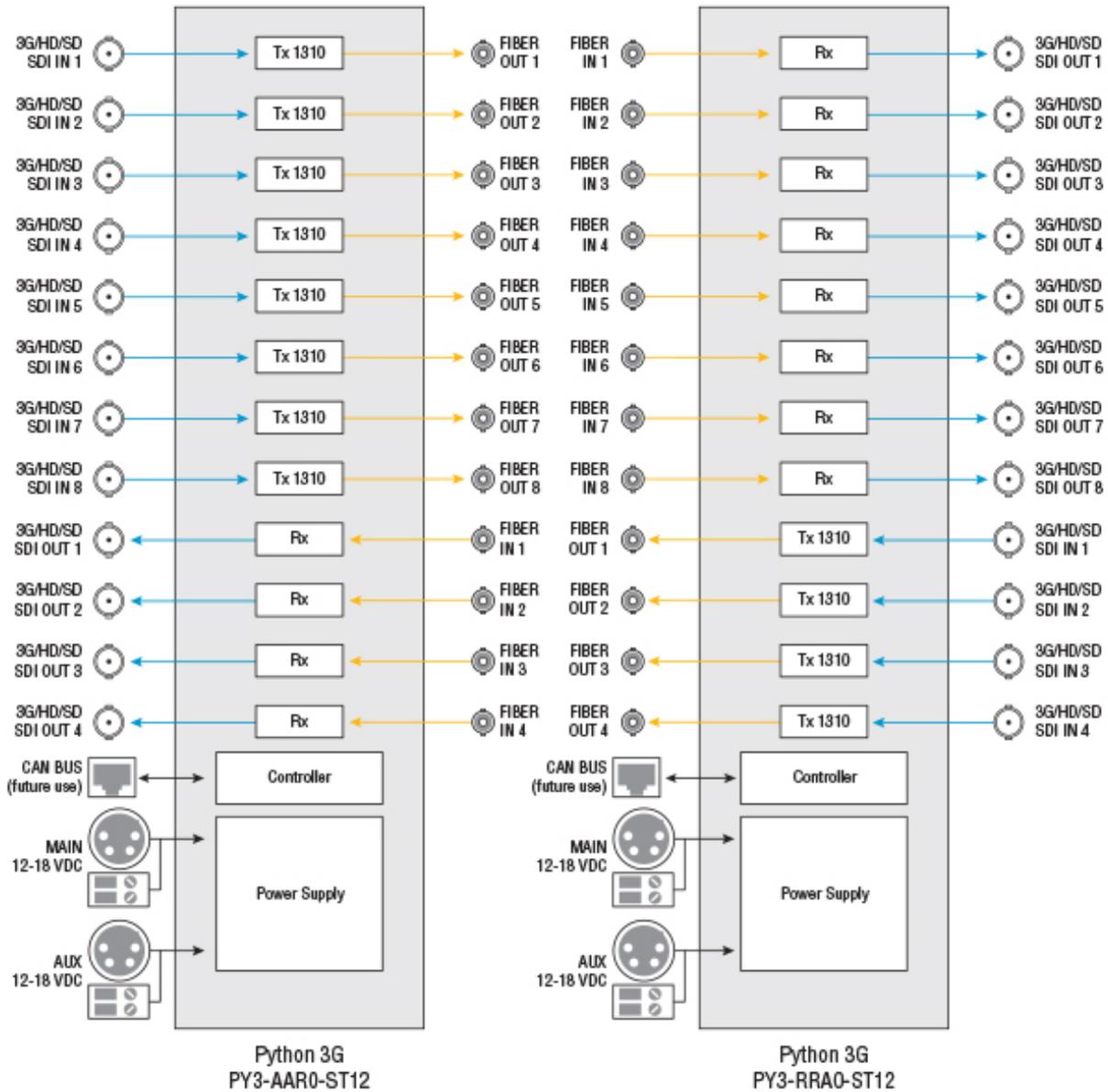


Fig. 2-5: 8x4 Channels Python 3G on 12 Fibers Block Diagram

PY3-AAAA-ST16 / PY3-RRRR-ST16

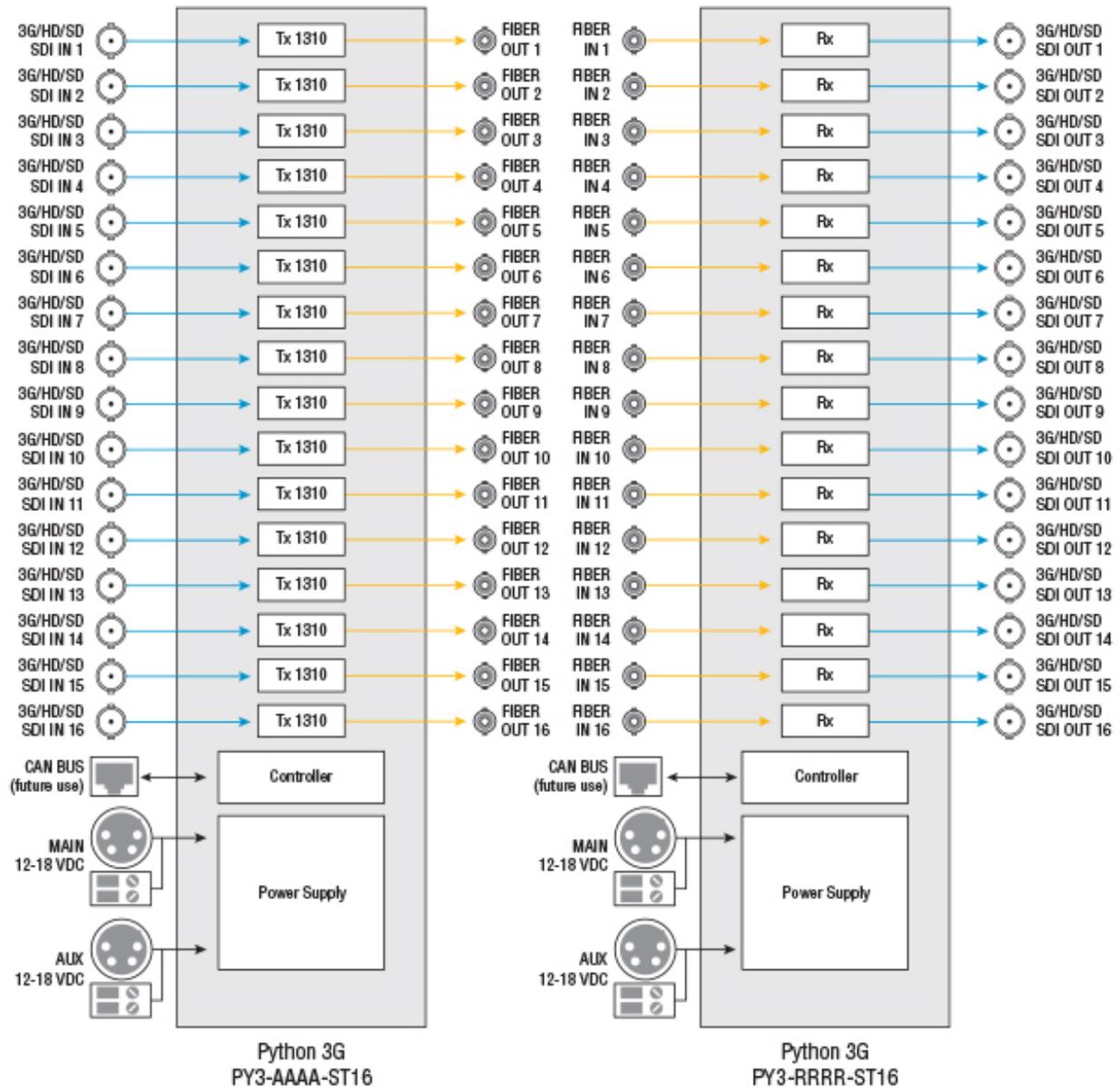


Fig. 2-6: 16 Channels Python 3G on 16 Fibers Block Diagram

PY3-AARR-ST16

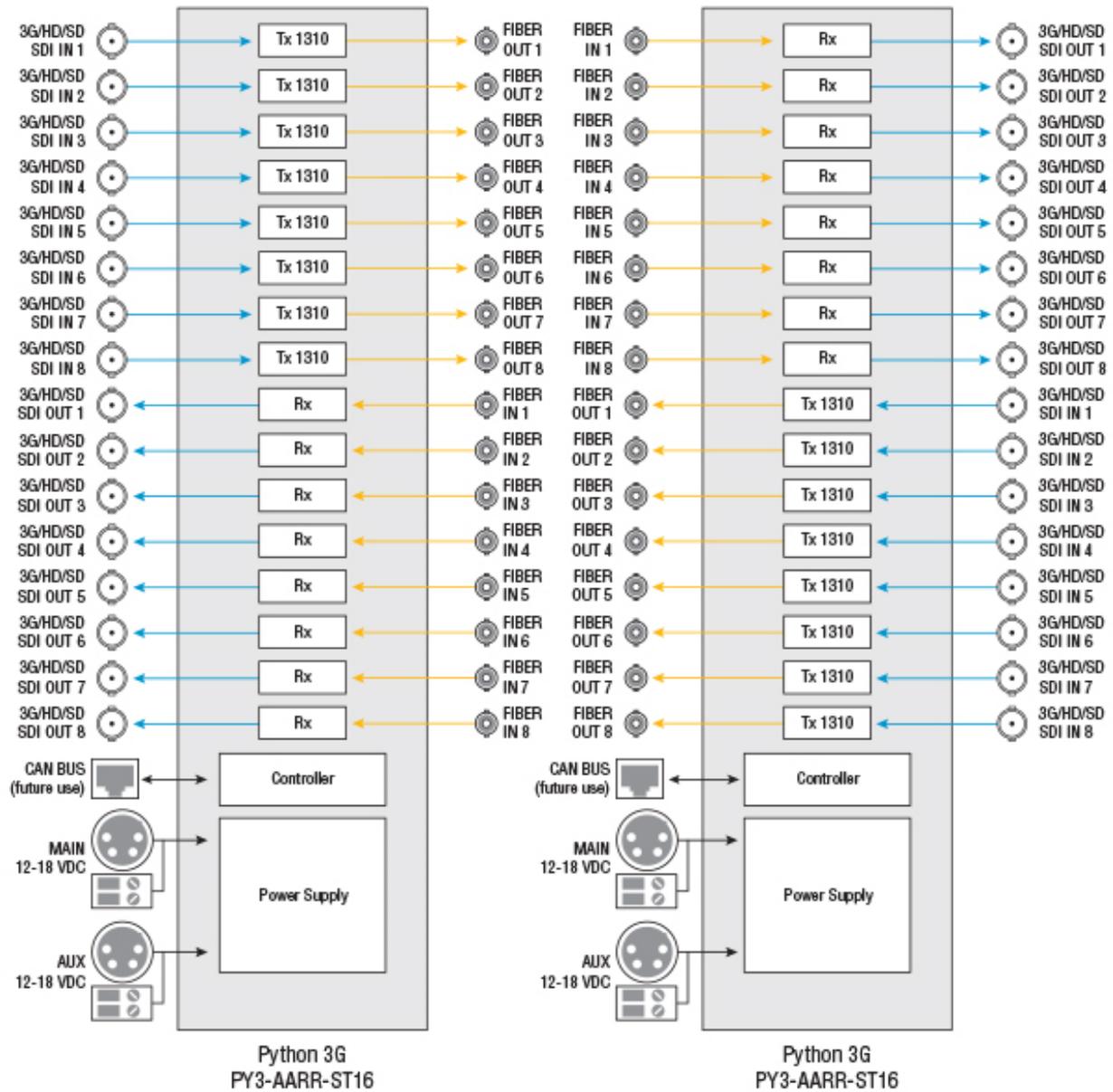


Fig. 2-7: 8x8 Channels Python 3G on 16 Fibers Block Diagram

PY3-G000-W41/PY3-R000-W41

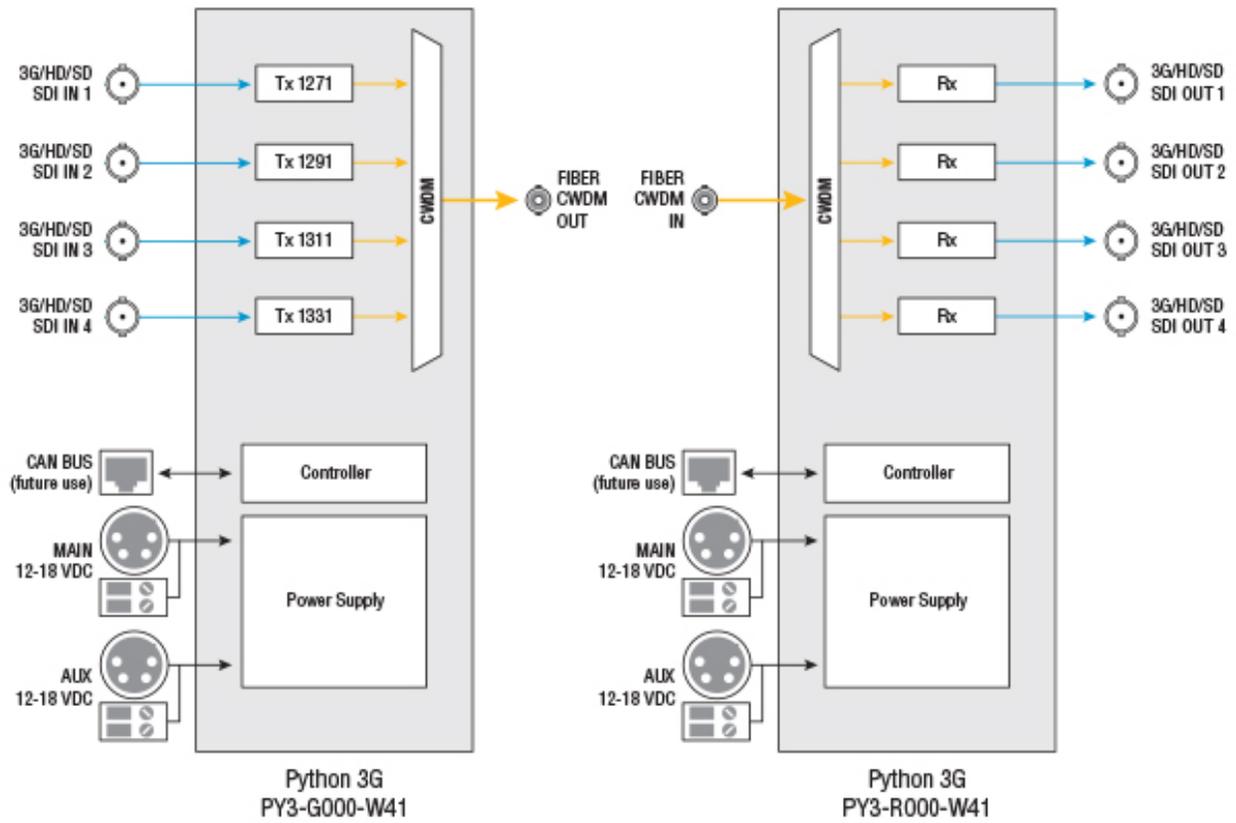


Fig. 2-8: 4 Channels Python 3G on 1 Fiber Block Diagram

PY3-GH00-W8/PY3-RR00-W8

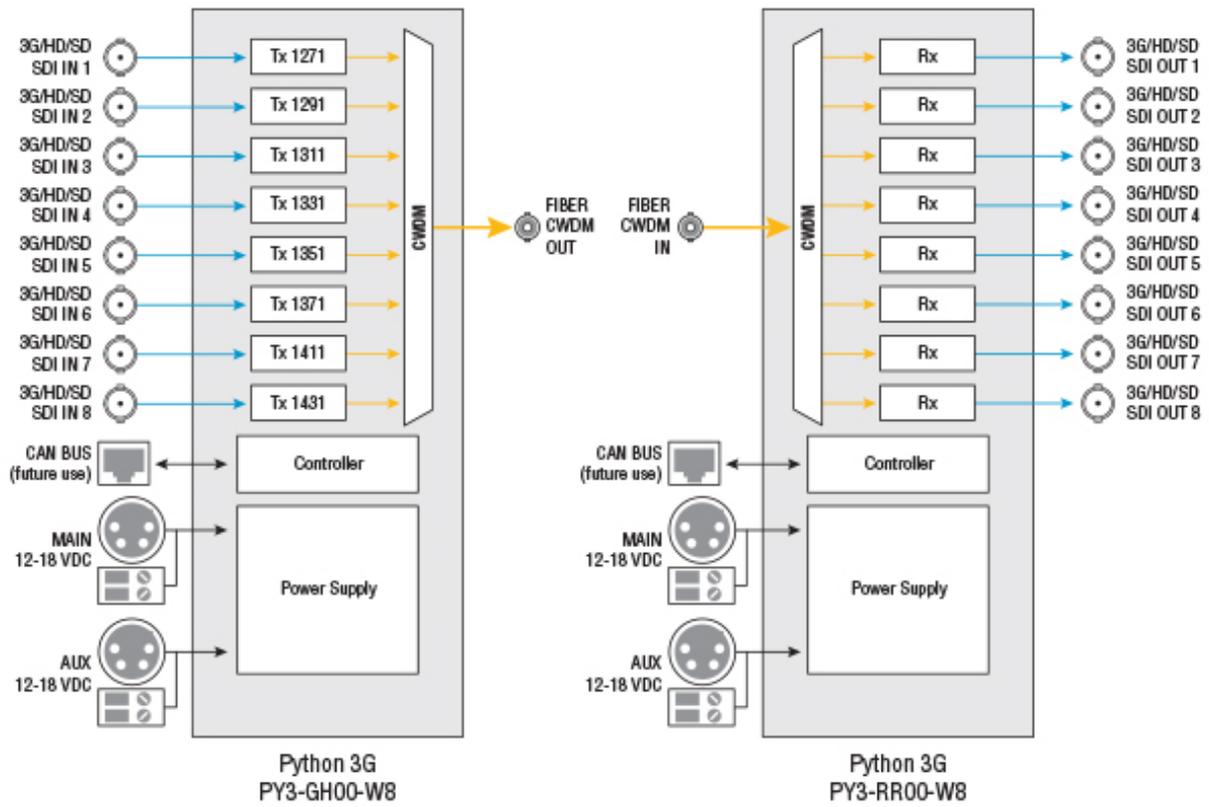


Fig. 2-9: Eight Channels Python 3G on 1 Fiber Block Diagram

PY3-GR00-W8/PY3-HR00-W8

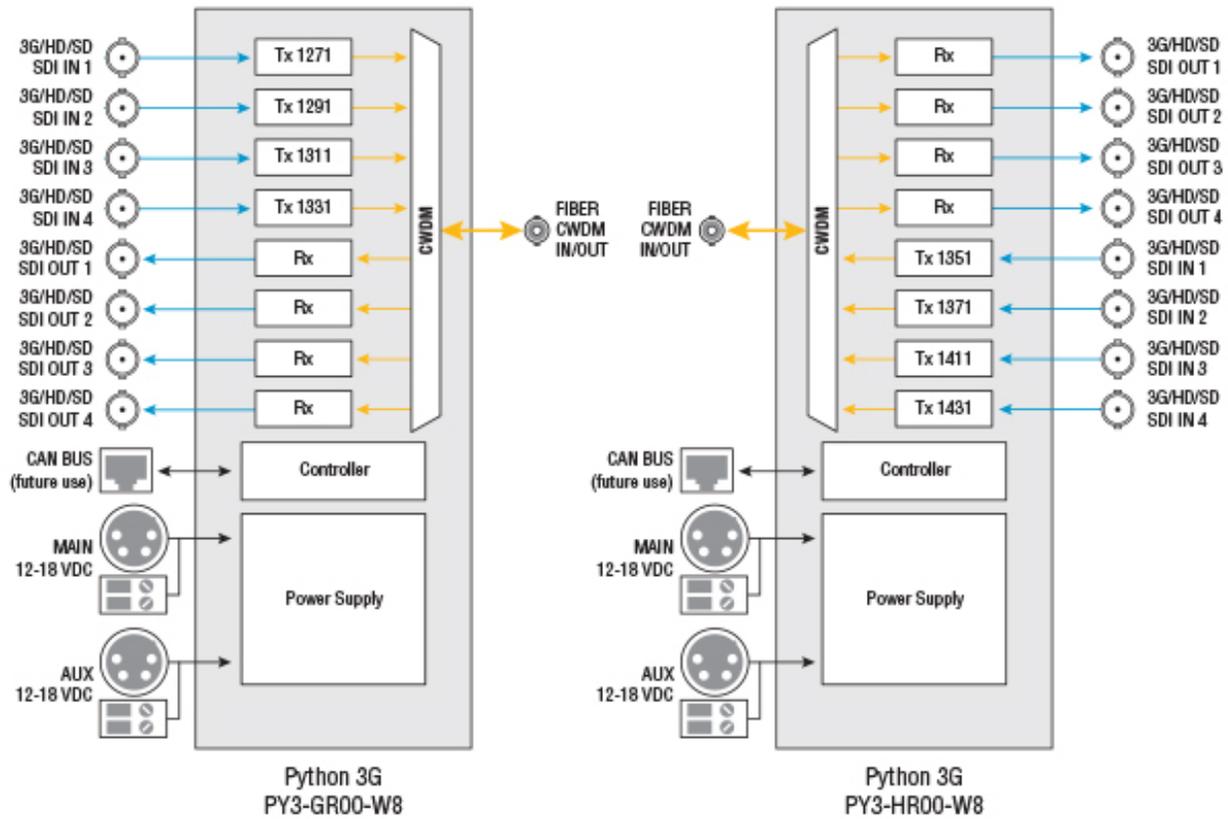


Fig. 2-10: 4x4 Channels Python 3G on 1 Fiber Block Diagram

PY3-GHJK-W16/PY3-RRRR-W8

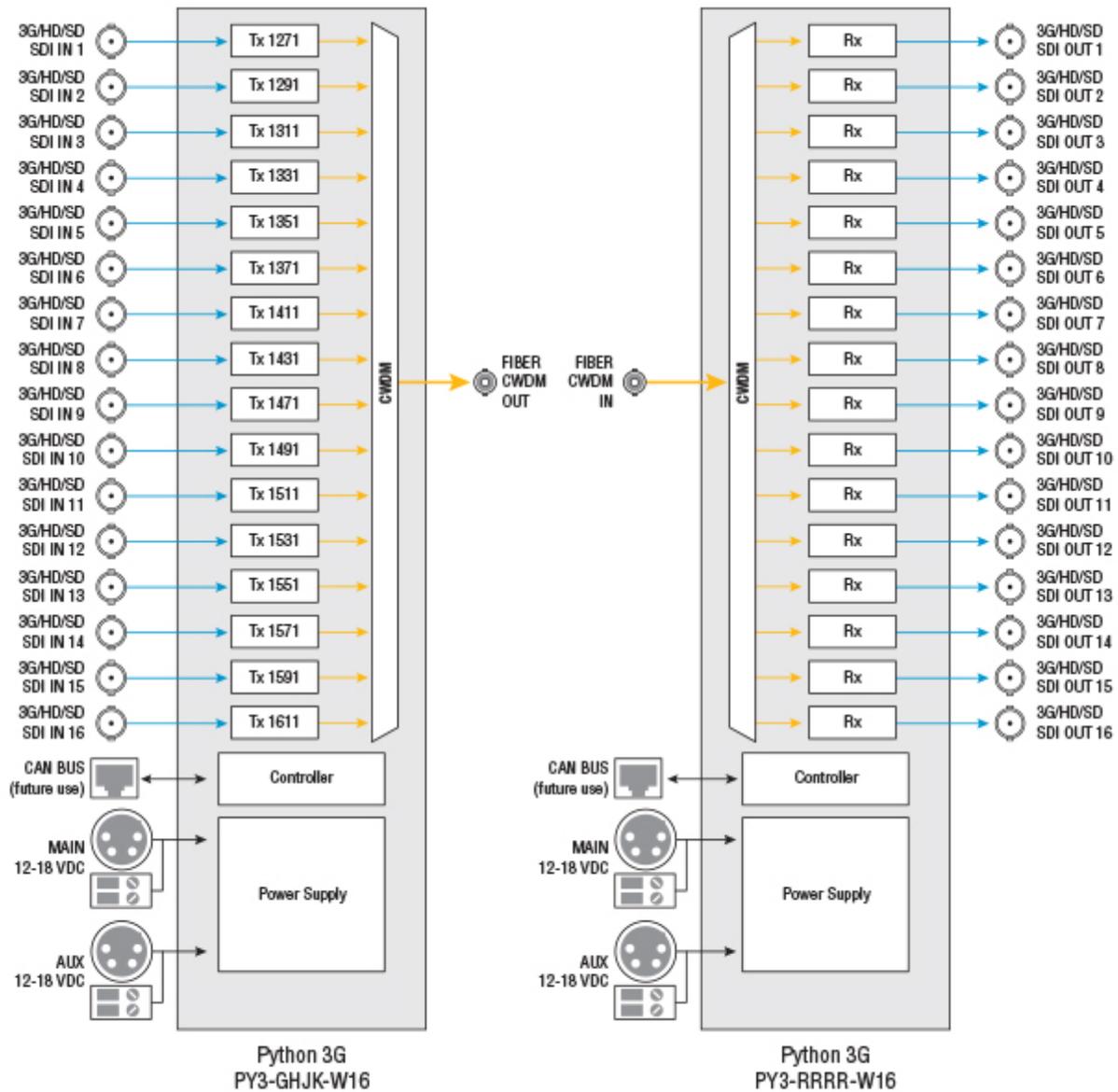


Fig. 2-11: 16 Channels Python 3G on 1 Fiber Block Diagram

PY3-GHRR-W8W8

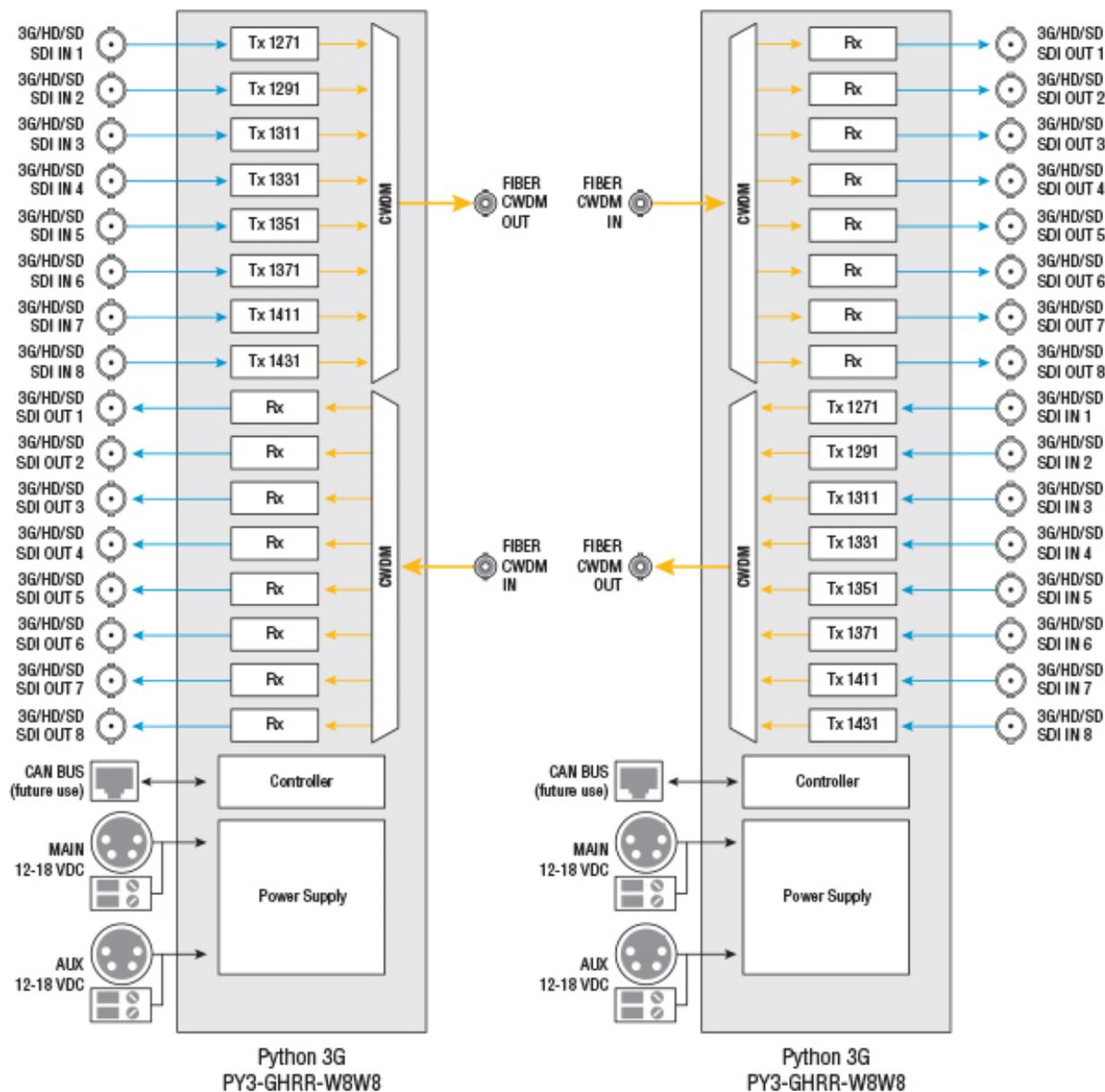


Fig. 2-12: 8x8 Channels Python 3G on 2 Fibers Block Diagram

PY3-GHRR-W16/PY3-JKRR-W16

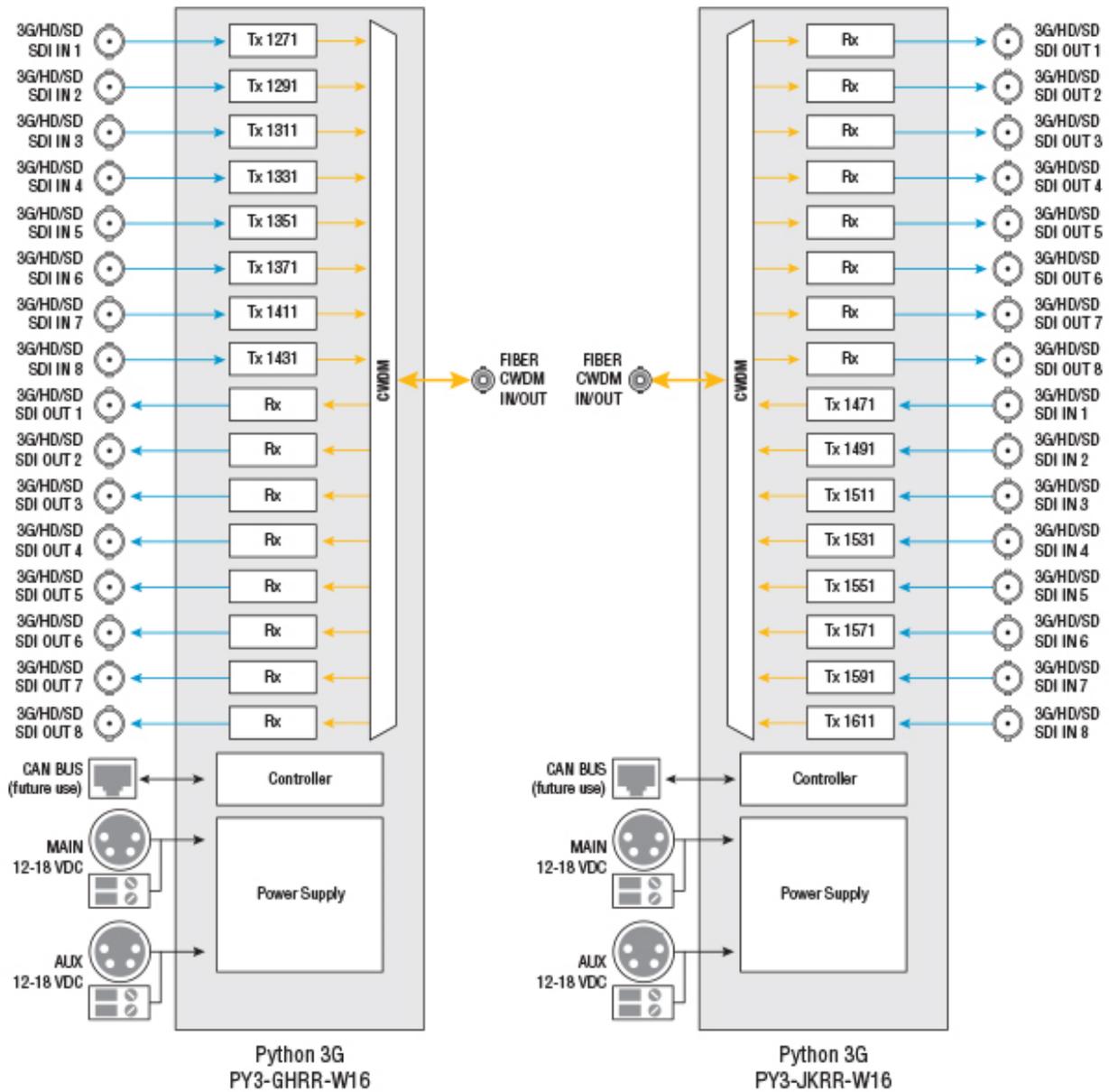


Fig. 2-13: 8x8 Channels Python 3G on 1 Fiber Block Diagram

Python 3G Components

This chapter describes the main components of the Python 3G.

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<i>Python 3G Rear Panel</i>	30
<i>Python 3G Rear Panel</i>	30

Python 3G Models

For illustration purposes, the following models will be included:

Part Number	Type	HD/SDI Transmit	HD/SDI Receive	CWDM Equipped	Number of Fibers
PY3-R000-ST4	Receiver	X	4	No	4
PY3-A000-ST4	Transmitter	4	X	No	4
PY3-AR00-ST8	Transceiver	4	4	No	8
PY3-GR00-W8	Transceiver	4	4	Yes	1
Matched Pair					
PY3-R000-W41	Receiver	X	4	Yes	1
PY3-G000-W41	Transmitter	4	X	Yes	1

Each model is a four channel unit. Whether your unit is a four channel unit or some multiple up to 16 channels, the operation is identical.

The Python 3G has two main components:

- The Front panel
- The Rear panel

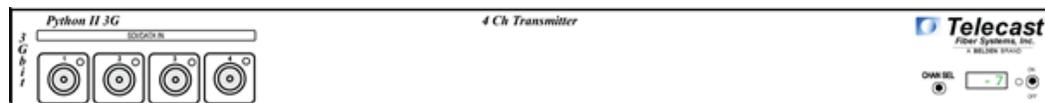


Fig. 3-1: Transmitter Front Panel



Fig. 3-2: Transmitter Rear Panel – Straight Through Conversion to Fiber Optical Signal



Fig. 3-3: Transmitter Rear Panel – CWDM Multiplexed Fiber Optical Signal

Python 3G Front Panel

The composition of the Python 3G front panel will vary depending on whether the unit is a receiver, transmitter or transceiver. Identify the particular Python 3G unit of interest and then go to the page indicated.

Power and Display Panel

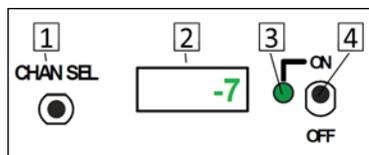


Fig. 3-4: Power and Display Area

The Power and Display Area has four features.

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

For information on how to use the CHAN SEL switch and the digital display, see [Using the Python 3G Optical Measurement Display](#) on page 39.

Python 3G Transmitter

The following model is the PY3-A000-ST4 which features four SDI/Data inputs converted to four fiber optic signals. The number of BNC connectors corresponds to the type model: 4, 8, 12, or 16 inputs.

The front panel is identical to the similar CWDM equipped model with a single fiber output.

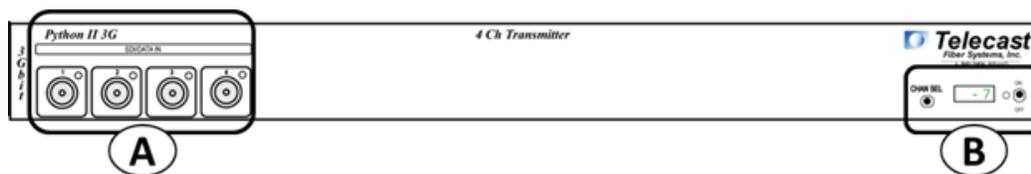


Fig. 3-5: Python 3G Transmitter Front Panel

The Python 3G Receiver Front Panel has two features:

- **A - SDI/Data In** - see [Area A – SDI/DATA IN](#) on page 26.
- **B - Power & Display Area** - see [Power and Display Panel](#) on page 25.

Area A – SDI/DATA IN

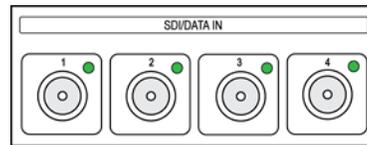


Fig. 3-6: SDI/DATA Input ports

The Python 3G Transmitter 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 47 for a list).

Each input has an LED monitor that indicates the following:

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

Python 3G Receiver

The following model is the PY3-R000-ST4 which features four ST fiber inputs converted to four SDI/Data BNC outputs. The number of BNC connectors corresponds to the type model: 4, 8, 12, or 16 outputs.

The front panel is identical to the similar CWDM equipped model with a single fiber input.

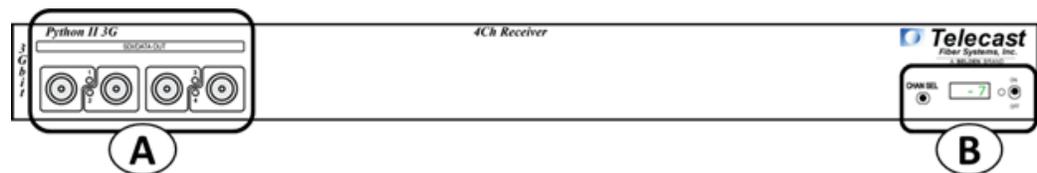


Fig. 3-7: Python 3G Front Panel

The Python 3G Receiver Front Panel has two features:

- **A - SDI/Data Out** - see [Area A – SDI/DATA OUT](#) on page 27.
- **B - Power & Display Area** - see [Power and Display Panel](#) on page 25.

Area A – SDI/DATA OUT

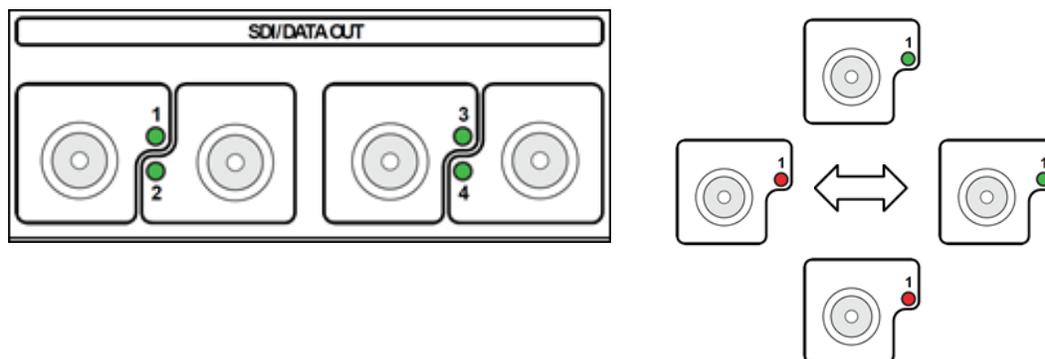


Fig. 3-8: 4 SDI/DATA Output BNC Connectors

The Python 3G Receiver has four 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 monitor that indicates the following:

- **Green:** the Python 3G is receiving a signal for the indicated channel over the 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

For more information on Fiber Optical measurement, see [Fiber Optical Channel Monitoring](#) on page 38.

Python 3G Transceiver

The following model is the PY3-AR00-ST8 with four SDI/Data inputs and four SDI/Data outputs. The inputs are converted to four fiber outputs and the outputs are converted from four fiber inputs. The number of BNC connectors corresponds to the type model:

- Four receive and four transmit
- Eight receive and eight transmit
- Four receive and eight transmit
- Eight receive and four transmit.

The front panel is identical to the similar CWDM equipped model with a single fiber input and a single fiber output.

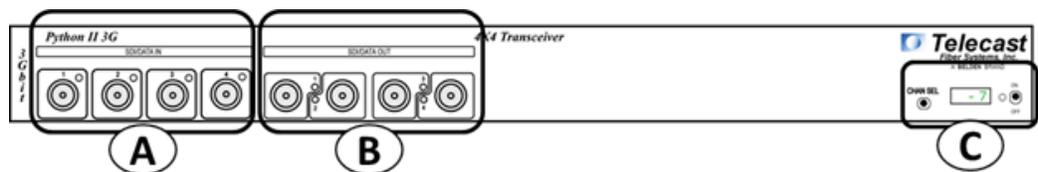


Fig. 3-9: Python 3G Transceiver Front Panel

The Python 3G Receiver Front Panel has three features:

- **A - SDI/Data In** - see [Area A – SDI/DATA IN](#) on page 28.
- **B - SDI/Data Out** - see [Area B – SDI/DATA OUT](#) on page 29.
- **C - Power & Display Area** - see [Power and Display Panel](#) on page 25.

Area A – SDI/DATA IN

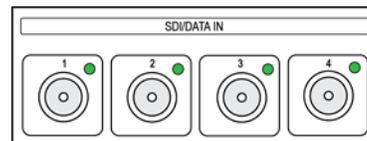


Fig. 3-10: 4 SDI/DATA In BNC Connectors

The Python 3G Transceiver has four SDI/DATA In BNC Connectors. All four inputs operate identically. For CWDM models, they 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 47 for a list).

Each input has an LED monitor that indicates the following:

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

Area B – SDI/DATA OUT

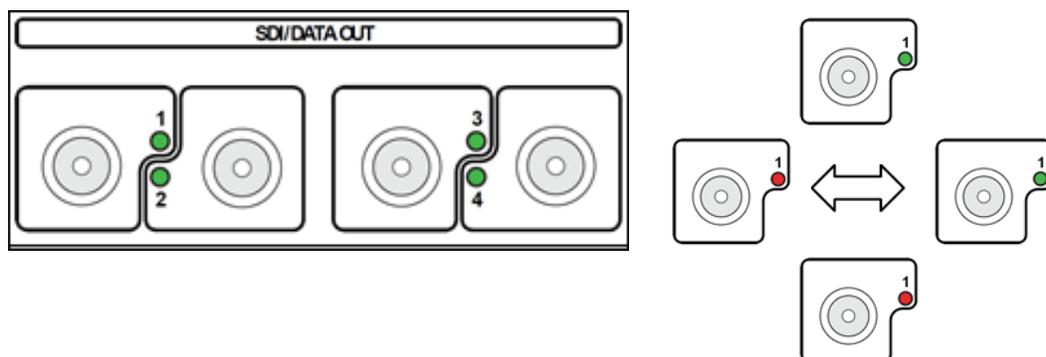


Fig. 3-11: 4 SDI/DATA Output BNC Connectors

The Python 3G Transceiver has four 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 monitor that indicates the following:

- **Green:** the Python 3G 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

Python 3G Rear Panel

The composition of the Python 3G front panel will vary depending on whether the unit is a receiver, transmitter or transceiver. It will also vary depending on whether the unit is a CWDM unit or a one for one SDI to Fiber conversion unit.

The following sections describe the different types of Rear Panels 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 34
- **B - CANBUS Connector** - see [Area B – CAN BUS Connector](#) on page 35
- **C - Fiber Connectors** - see [Area C – The ST Fiber Connectors](#) on page 35

Python 3G Transmitter Rear Panel without CWDM

The following model is the PY3-A000-ST4 with four pass-through outputs. The number of ST connectors corresponds to the type model: 4, 8, 12, or 16 inputs.

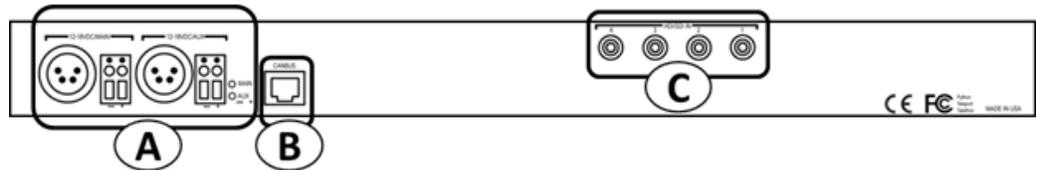


Fig. 3-12: Python 3G Transmitter Rear Panel without CWDM

Python 3G Transmitter Rear Panel with CWDM

The following model is the PY3-G000-W41 with a single ST input.



Fig. 3-13: Python 3G Transmitter Rear Panel with CWDM

Python 3G Receiver Rear Panel without CWDM

The following model is the PY3-R000-ST4 with four ST fiber inputs converted to four SDI/Data BNC outputs.

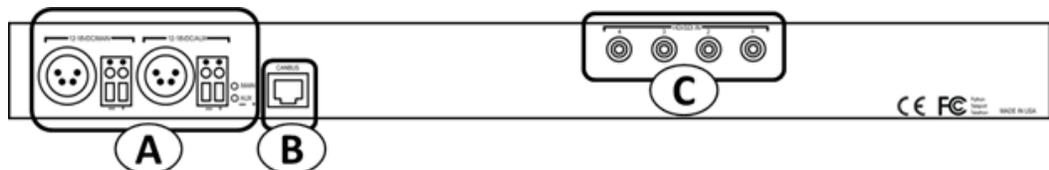


Fig. 3-14: Python 3G Receiver Rear Panel without CWDM

Python 3G Receiver Rear Panel with CWDM

The following model is the PY3-R000-W41 with a single ST input.



Fig. 3-15: Python 3G Receiver Rear Panel with CWDM

Python 3G Transceiver Rear Panel without CWDM

The following model is the PY3-AR00-ST8 with four ST outputs and four ST inputs.

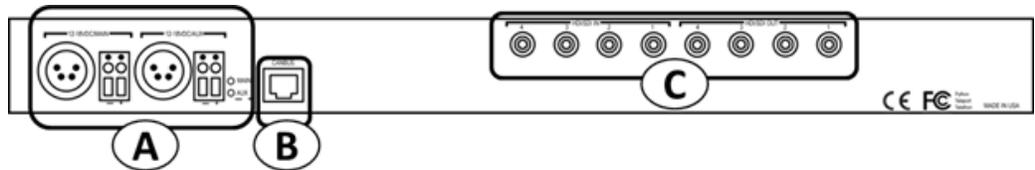


Fig. 3-16: Python 3G Transceiver Rear Panel without CWDM

Python 3G Transceiver Rear Panel with CWDM

The following model is the PY3-GR00-W8 with one ST input and one ST output.

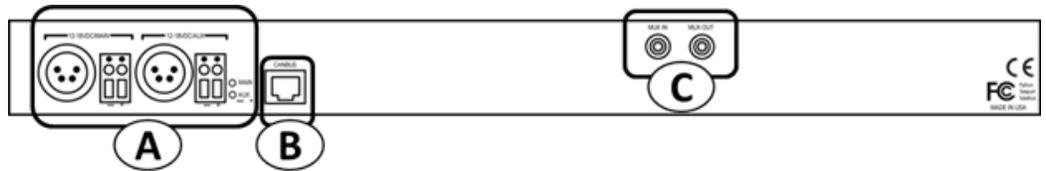


Fig. 3-17: Python 3G Transceiver Rear Panel with CWDM

Python 3G 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 models with this feature are listed in the following table. The Primary and Secondary outputs are identical.

Part Number	Type	HD/SDI Transmit	HD/SDI Receive	CWDM Equipped	Number of Fibers
PY3-GHJK-D16	Transmitter	16	X	Yes	2
PY3-RRRR-X16	Receiver	X	16	Yes	2

The following diagrams illustrate how the primary and backup signals work within the Python 3G.

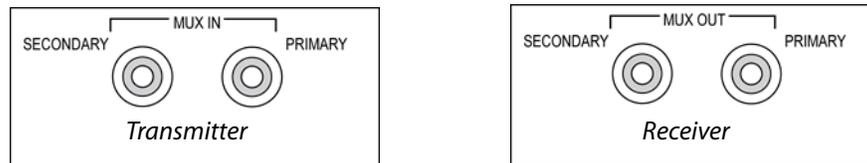


Fig. 3-18: The Input and Output ports

- 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 3G 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.

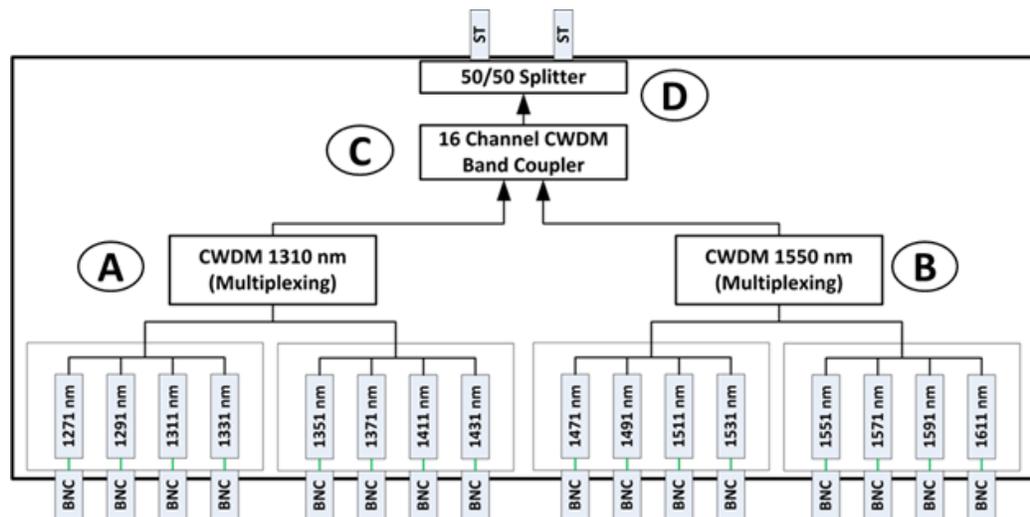


Fig. 3-19: Python 3G Transmitter with Primary and Backup Outputs

The Python 3G 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.

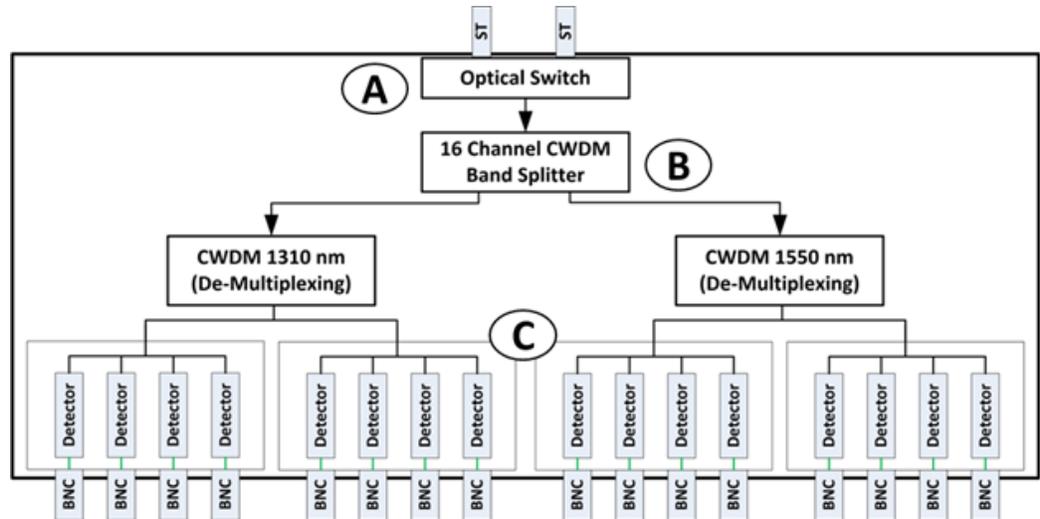


Fig. 3-20: Python 3G Receiver with Primary and Backup Inputs

The Python 3G 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 3G Rear Panel Operation

The Python 3G illustration is repeated for ease of use of this Guide. Note that all Python 3G units operate in the same manner: the only difference is in whether the Fiber Optic ST connectors are inputs or outputs.

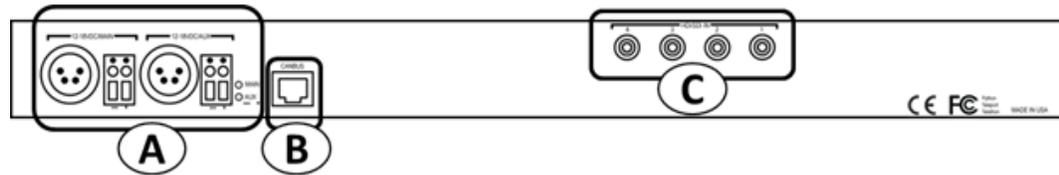


Fig. 3-21: Python 3G Rear Panel

Area A - Rear Panel Power Connectors

The Python 3G provides for the use of redundant 12-18 Volts DC power supplies. A battery backup option is not provided for the Python 3G 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.

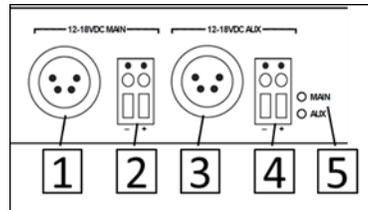


Fig. 3-22: Rear Panel Power Connectors

- **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 3G.
 - 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 3G 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 3G uses power from both.

Area B – CAN BUS Connector

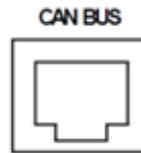


Fig. 3-23: CAN BUS connector

The CAN BUS connector is inactive in this version of the Python 3G. It may be used for system monitoring in the future.

CAN is an acronym for Communication Area Network and is a protocol designed to support the monitoring of microcontrollers.

Area C – The ST Fiber Connectors

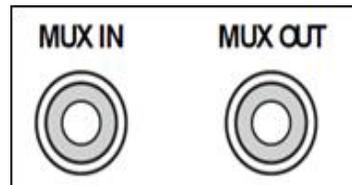


Fig. 3-24: MUX IN and OUT connectors

The MUX IN connector carries up to eight channels from the opposite Python 3G, while the MUX OUT connector carries the up to eight channels to the opposite Python 3G. These signals appear on the front panel as four SDI/DATA channels and four Fiber SID/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 3G requires a power supply providing 12-18 volts at 1.5 Amps. The power supply recommended for the unit is the ADAP-AC-04-X (X being the specific geography required). 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 49) 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 3G unit (Fiber Part Number ADAP-AC-04)

4 Python 3G Operation

This chapter describes the operation of the Python 3G. 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>	38
<i>Using the Python 3G Optical Measurement Display</i>	39
<i>Best Practices</i>	42
<i>Troubleshooting</i>	42

Fiber Optical Channel Monitoring

The Python 3G 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 3G 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 3G 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 3G 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 49).

Using the Python 3G Optical Measurement Display

The optical measurement functionality is similar across all three types of Python 3G. 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 3G Optical Measurement Display

The Python 3G optical signal strength display has characteristics for the Python 3G 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.

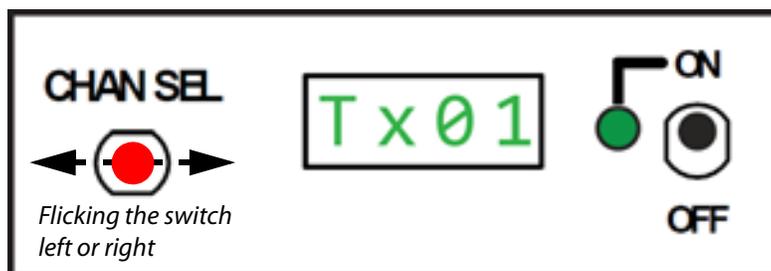


Fig. 4-1: Flicking the CHAN SEL switch

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.

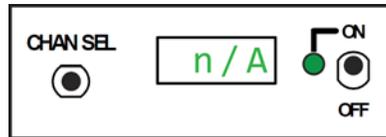


Fig. 4-2: No Optional Link Display

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.



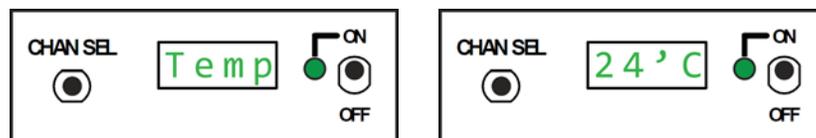
Fig. 4-3: No SDI Data Present Display

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 3G 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.

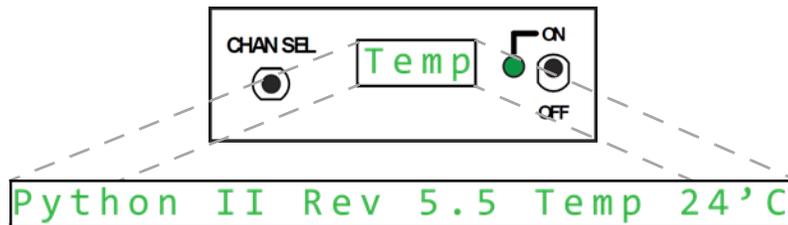


Fig. 4-4: Firmware display

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.

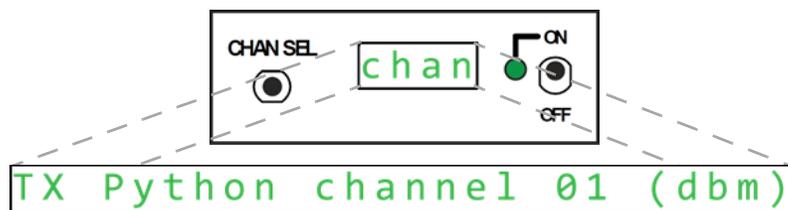


Fig. 4-5: Technical Information display

Best Practices

This section is devoted to a number of “Best Practices” for use of the Python 3G 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 49).

- Make sure that the Python 3G 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 3G.
- 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 3G 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 49).

5

Understanding Python 3G Model Numbers

This chapter explains how to decode the Python 3G Part Number. Sample part numbers are decoded at the end of this section.

<i>Part Numbers</i>	44
<i>Example Python 3G Models</i>	46

Part Numbers

The Python 3G part number consists of three sections as described below:

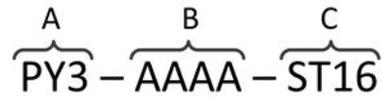


Fig. 5-1: Python 3G part number

- **A - The product designation** – in this case PY3 stands for Python 3G
- **B - Channel Card Options** – the four letters correspond to the four available slots. If a position has “0,” then the slot is empty. The available card options are listed below.
- **C - Fiber I/O Options** – typically varies between “ST” for ST connectors with straight-through conversion for SDI/Data to or from Fiber Optic signal. “W” for units with CWDM. The number indicates the number of fiber optic channels.

The I/O options are listed below.

Part Number Card Options

Code Letter	Usage	Type (All cards have 4 channels)	Wavelength
A	Transmit	Straight-through Convert	All 1310 nm
R	Receive	Straight-through Convert	Detector for any wavelength
G	Transmit	CWDM	1310 Low Range: 1271, 1291, 1311, 1331 nm
H	Transmit	CWDM	1310 High Range: 1351, 1371, 1411, 1431 nm
J	Transmit	CWDM	1550 Low Range: 1471, 1491, 1511, 1531 nm
K	Transmit	CWDM	1550 High Range: 1551, 1571, 1591, 1611 nm

Fiber I/O Cards

Desig.	Usage	Type	Wavelength
ST4	Receive or Transmit	4 – Fiber I/O	NA
ST8	Receive or Transmit	8 – Fiber I/O	NA
ST12	Receive or Transmit	12 – Fiber I/O	NA
ST16	Receive or Transmit	16 – Fiber I/O	NA
W16	Receive or Transmit	1 – Fiber I/O – 16 channels	CWDM
W41	Receive or Transmit	4 Channel 1310 Low Range	CWDM
W42	Receive or Transmit	4 Channel 1310 High Range	CWDM
W43	Receive or Transmit	4 Channel 1550 Low Range	CWDM
W44	Receive or Transmit	4 Channel 1550 High Range	CWDM
W83	Receive or Transmit	8 Channel 1310 Range	CWDM
W85	Receive or Transmit	8 Channel 1550 Range	CWDM
D16	Transmitter	16 Channel Dual Redundant Output	CWDM
D41	Transmitter	4 Channel 1310 Low Range Dual Redundant Output	CWDM
D42	Transmitter	4 Channel 1310 High Range Dual Redundant Output	CWDM
D43	Transmitter	4 Channel 1550 Low Range Dual Redundant Output	CWDM
D44	Transmitter	4 Channel 1550 High Range Dual Redundant Output	CWDM
D83	Transmitter	8 Channel 1310 Range Dual Redundant Output	CWDM
D85	Transmitter	8 Channel 1550 Range Dual Redundant Output	CWDM
X16	Receiver	16 Channel on Dual Switched Input	CWDM
X41	Receiver	4 Channel on Dual Switched Input 1310 Low Range	CWDM
X42	Receiver	4 Channel on Dual Switched Input 1310 High Range	CWDM
X43	Receiver	4 Channel on Dual Switched Input 1550 Low Range	CWDM
X44	Receiver	4 Channel on Dual Switched Input 1550 High Range	CWDM
X83	Receiver	8 Channel on Dual Switched Input 1310 Range	CWDM
X85	Receiver	8 Channel on Dual Switched Input 1550 Range	CWDM

Example Python 3G Models

Model PY3-RRR0-W83W43 – Receiver with 12 Channels equipped with CWDM and 2 Fibers I/O		
Position	Item	Description
Card Slot #1	R	4 straight-through conversion channels
Card Slot #2	R	4 straight-through conversion channels
Card Slot #3	R	4 straight-through conversion channels
Card Slot #4	0	No card installed
I/O #1	W83	8 Channel Demux card for 1310 nm wavelength on its own fiber
I/O #2	W43	4 Channel Demux card for 1310 nm wavelength on its own fiber

Model PY3- PY3-GHJK-D16 – Transmitter with 16 Channels equipped with CWDM and 2 Dual Fiber I/O		
Position	Item	Description
Card Slot #1	G	CWDM Multiplexer 1310 nm Low Range
Card Slot #2	H	CWDM Multiplexer 1310 nm High Range
Card Slot #3	J	CWDM Multiplexer 1550 nm Low Range
Card Slot #4	K	CWDM Multiplexer 1550 nm High Range
I/O #1	D16	Dual Output 16 channels on Dual Redundant Fiber Output
I/O #2		NA

Model PY3-AR00-ST8– Transceiver with 4 Transmit Channels and 4 Receive Channels with straight-through conversion to Fiber Optic signal equipped with 8 Fiber I/O		
Position	Item	Description
Card Slot #1	A	4 straight-through transmit conversion 1310 nm channels
Card Slot #2	R	4 straight-through receive conversion channels
Card Slot #3		No card installed
Card Slot #4		No card installed
I/O #1	ST8	8 ST Connectors Fiber I/O
I/O #2		NA

6 Specifications

Video

Transmission Method.....	Digital
Input Level.....	800 mV (Peak To Peak)
Input/Output Impedance.....	75 Ohms
Return Loss	>15 dB, 5 Mhz To 1.5 Ghz
.....	>10 dB, 1.5 Ghz To 3 Ghz
Coaxial Input Equalization	
Maximum Rate	3 Gb/S
Equalization At 3 Gb/S.....	300m Of Belden 1694A
Bit-Error Rate (@ -22 dBm Rx Optical Power)	10 ⁻¹²
Jitter (Using Pathological Data Pattern)	<0.2 UI

Transmission

Operating Wavelength	1310 nm Or 1550 nm Optical Window
Optional CWDM available	
Link Margin	Up To 22dB
Transmitter Output Power Options	-7 dBm
Receiver Sensitivity	-20 dBm
Optical Source	Laser Diode
Optical Detector.....	PIN
Fiber Type.....	Single Mode

Mechanical/Environmental

Dimensions (LxWxH)	10.5"x16.7"x1.75"
Weight, each end... ..	5 lbs
Connectors	
Electrical	BNC
Optical	ST
Input voltage.....	12-18 VDC
Power consumption	<15 W
Indicators.....	Power ON, SDI Data Presence, Optical Power
Temperature Range	-20° to 55 °C
Humidity Range	0 to 95 % non-condensing

Compliance

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



Grass Valley Technical Support

For technical assistance, please contact the Grass Valley Technical Support center nearest you:

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