Telecast Fiber Solutions

Telethon 3G User Guide

M4041-9900-102

24 July 2014

grass valley
A BELDEN BRAND

Copyright & Trademark Notice

Belden, Belden Sending All The Right Signals, and the Belden logo are trademarks or registered trademarks of Belden Inc. or its affiliated companies in the United States and other jurisdictions. Grass Valley, Telethon 3G are trademarks or registered trademarks of Grass Valley. Belden Inc., Grass Valley, and other parties may also have trademark rights in other terms used herein.

Terms and Conditions

Please read the following terms and conditions carefully. By using Telethon 3G documentation, you agree to the following terms and conditions.

Grass Valley, a Belden Brand ("Grass Valley") hereby grants permission and license to owners of Telethon 3G to use their product manuals for their own internal business use. Manuals for Grass Valley products may not be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, for any purpose unless specifically authorized in writing by Grass Valley.

A Grass Valley manual may have been revised to reflect changes made to the product during its manufacturing life. Thus, different versions of a manual may exist for any given product. Care should be taken to ensure that one obtains the proper manual version for a specific product serial number.

Information in this document is subject to change without notice and does not represent a commitment on the part of Grass Valley.

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

Title	Telethon 3G User Guide
Part Number	M4041-9900-102
Revision	24 July 2014

toc

Table of Contents

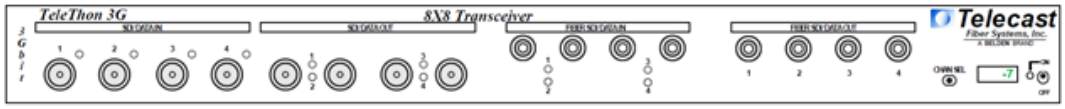
1 About Telethon 3G

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

About the Telethon 3G System

The Telethon 3G 8x8 Transceiver is a single optical and electrical multiplexer that combines up to eight HD/SDI signals and eight optical signals on a pair of Single-Mode Fiber Optic Cables at distances up to 30km. The system is bidirectional capable of sending and receiving four HD/SDI signals and four optical signals.

This Telethon 3G is delivered in a single standard model – the Model TN3-GRNP-W8W8 with 4 x 4 HD + 4 x 4 optical over two fibers.



Front Panel

Rear Panel

Fig. 1-1: Telethon 3G Front and Rear Panels

A pair of Telethon 3G units (one at each end of the two Fiber Optic cables) accepts electrical digital signals (via BNC), ranging from 19.4 Mbps up to 3Gbps uncompressed HD/SDI and optical signals of up to 3Gbps each, and multiplexes them for transmission in both directions. The CWDM (coarse wavelength division multiplexing) capability of the Telethon 3G system increases the capacity of fiber optic cables and in the case of the Telethon 3G reduces 16 channels down to two fiber optic cables.

Along with LEDs to indicate the presence of an HD/SDI signal at each BNC input and output, the Telethon 3G features an integrated optical power meter for monitoring the received power for each optical HD/SDI signal.

The Telethon 3G also features dual 12-18 VDC power inputs for electrical redundancy.

Each optical channel can support up to 3Gbps. The transceiver 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.

This examplein Figure 1-2 is just one of many possible uses for the Telethon 3G. It features a remote location (perhaps an auditorium venue) where a series of devices are combined together on a single Telethon 3G unit and transmitted to a Telethon 3G unit at a central

production facility. In turn, monitoring and intercom signals are returned from the central production facility to the venue.

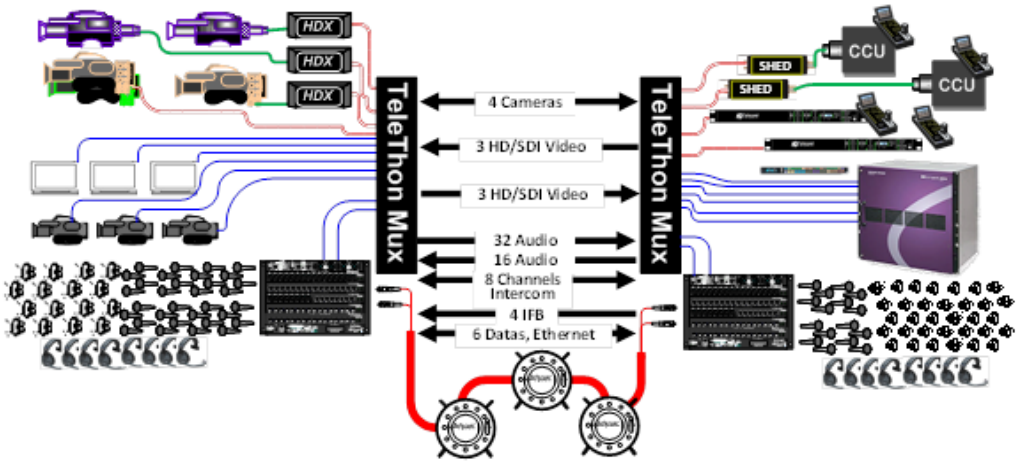


Fig. 1-2: Possible uses for the Telethon 3G

Fiber Cable Overview

Fiber Optics and Fiber Optic Cable are the core technologies at the heart of the Telethon 3G System. 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 enables the Telethon 3G. The specific theory and operation of Fiber Optics is beyond the scope of this document.

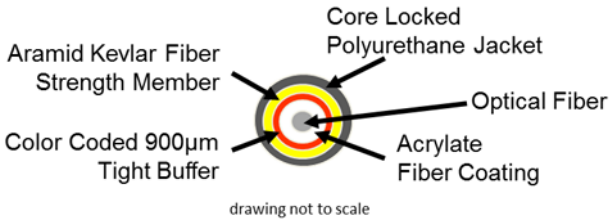


Fig. 1-3: Single Mode Fiber Optic Cable Cross-Section

Unpacking the Telethon 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 Grass Valley (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 Telethon 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, contact Grass Valley Support (see Contact Us on page 25).

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 Telethon 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 when no fiber is attached to the fiber port.

There are no user adjustments inside the Telethon 3G. Do not attempt any type of service to this instrument other than any as instructed this manual. Refer all servicing to the Grass Valley (see Contact Us on page 25).

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 radiates radio frequency (RF) energy and, if not installed and used in accordance with this User Guide, may cause harmful interference to radio communications.

2 Block Diagrams

This chapter lists the block diagrams of the Telethon 3G models.

Block Diagrams

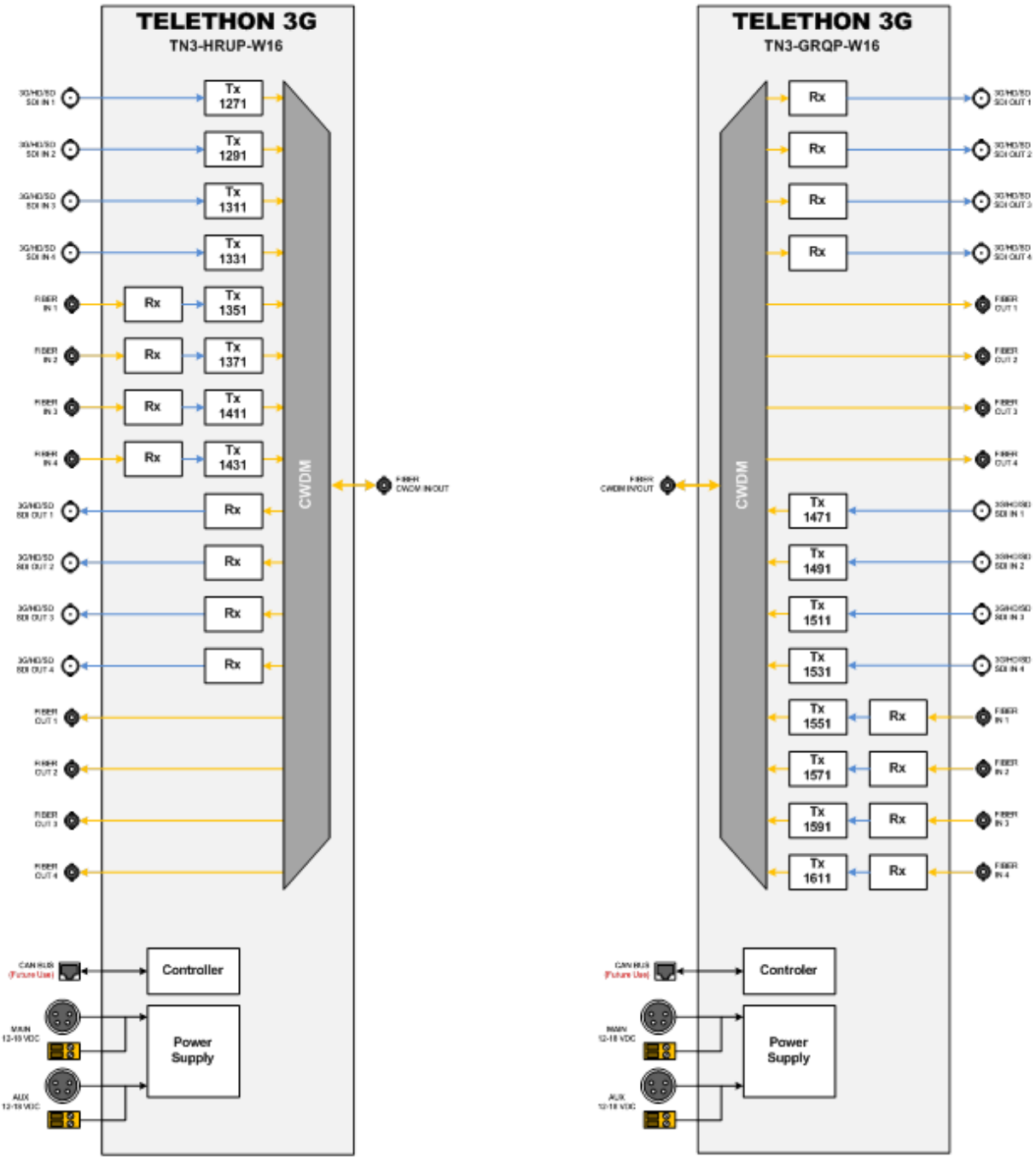


Fig. 2-1: Telethon 3G on 1 Fiber Block Diagram

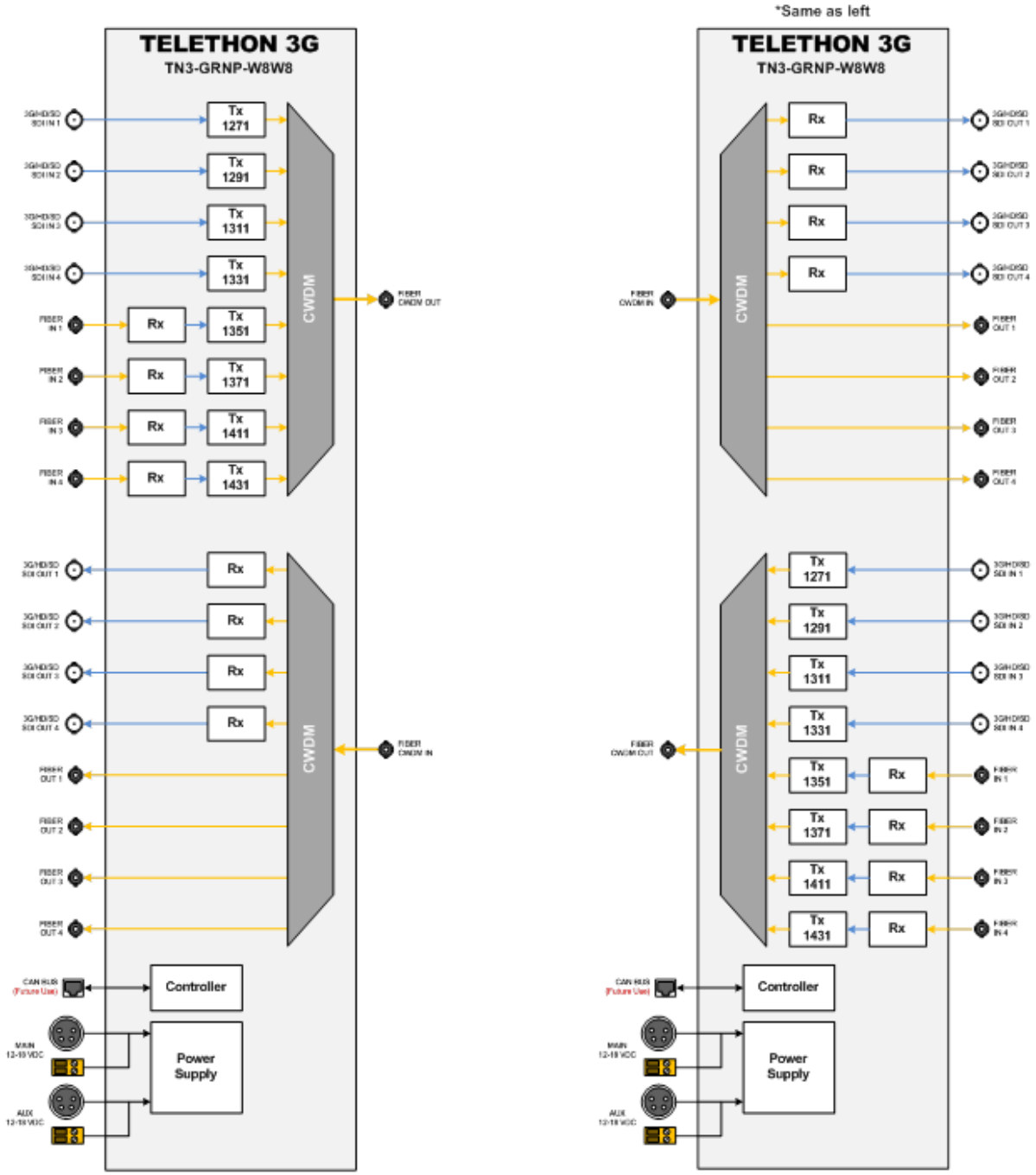


Fig. 2-2: Telethon 3G on 2 Fibers Block Diagram

3 Telethon 3G Components

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

Telethon 3G Front Panel Features

The Telethon 3G is used as a set of two units. The inputs to one unit of the pair are received by the second unit and appear as the corresponding outputs. Unit one SDI/DATA Inputs 1-4 are reflected on Unit Two as SDI/DATA Outputs 1-4. Similarly the fours fiber inputs on Unit One are reflected as the four fiber outputs on Unit Two. Inputs to Unit Two are therefore reflected in the same way on Unit One.

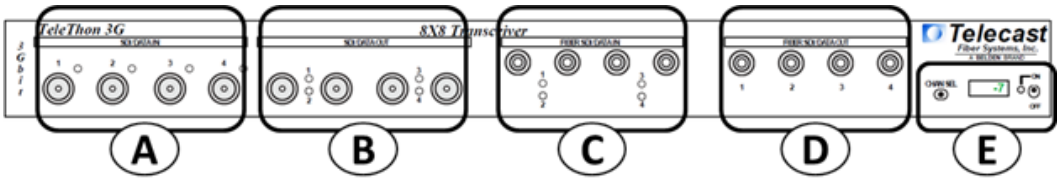


Fig. 3-1: Telethon 3G Front Panel

There is no requirement that all connectors be active. For example, if you are using BNC Inputs 1 and 3,but you are skipping Input 2, the output on the opposite unit will be on Output 1 and Output 3.

The Telethon 3G provides no user-accessible adjustments: the unit is a pass-through device with selectable monitoring capability.

Power and Display Panel

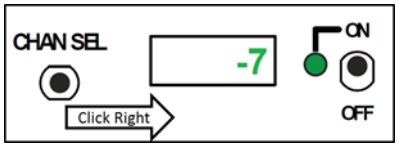


Fig. 3-2: Power and Display features

The Power and Display Area has four features:

- **CHAN SEL** – scrolls the LED display through each of the Fiber Channels
- **Digital Display** – display optical power levels, unit firmware and operating temperature
- **Power Monitor** LED – indicates Power Status
  - **Red**: Standby (power applied to rear connectors but unit not switched on)
  - **Green**: Unit switched on
- **ON/OFF Switch** – controls power to the Telethon 3G unit

Area A – SDI/DATA IN

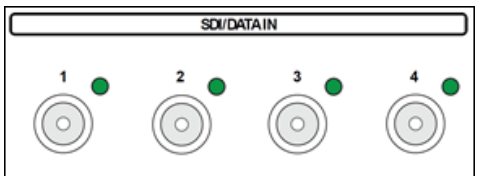


Fig. 3-3: Four SDI/DATA In BNC Connectors

The Telethon 3G has four SDI/DATA In BNC Connectors. All four inputs operate identically and are multiplexed for transmission on the fiber output of the unit for demultiplexing to the four SDI outputs on the receiving unit.

The SDI/DATA connections can carry a variety of Baseband and Data type signals (see Fiber Cable Overview on page 3).

Each input has an LED monitor that indicates the following:

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

Area B – SDI/DATA OUT

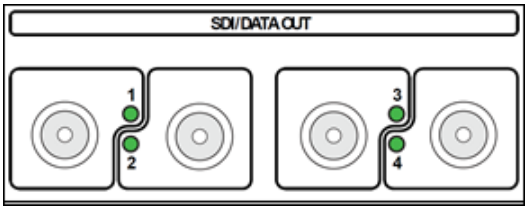


Fig. 3-4: Four Fiber SDI/DATA Output BNCConnectors

The Telethon 3G has four SDI/DATA Output BNC Connectors. All four Outputs operate identically and are multiplexed for transmission on the fiber output of the unit.

Each output has an LED monitor that indicates the following:

- **Green**: the Telethon 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

See Area C– Fiber SDI/Data In on page 12 for more information on understanding dBm measurements.

Area C– Fiber SDI/Data In

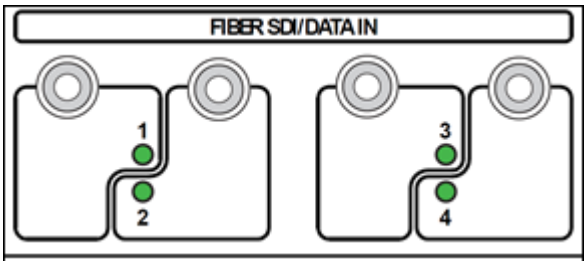


Fig. 3-5: Fiber SDI/DATA Input ST Connectors

The Telethon 3G has four Fiber Channel SDI/DATA Input ST Connectors. All four inputs operate identically and are multiplexed for transmission on the fiber output of the unit. The four Fiber signals are demultiplexed in the receiving unit and appear on the four ST outputs.

The Fiber connections can carry a digital optical signal of not more than 3Gb/s.

Each input has an LED monitor that indicates the following:

- **Green**: fiber optic connection is present with active SDI signal
- **Red**: no optical connection is detected or the active optical signal has fallen below -22 dBm
- **Alternating between Red and Green**: a fiber optic connection is detected for the indicated channel, but no SDI is present.

Area D– Fiber SDI/Data Out

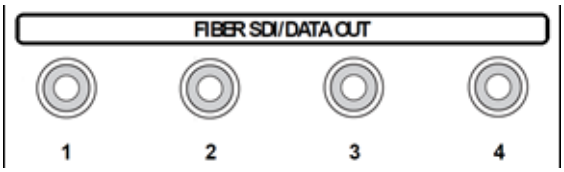


Fig. 3-6: 4 SDI/DATA Output STConnectors

The Telethon 3G has four Fiber Channel SDI/DATA Output ST Connectors. All four Outputs operate identically and are demultiplexed from the signals received from the sending unit.

The Fiber connections can carry a digital optical signal of not more than 3Gb/s.

The Fiber outputs do not have associated LED indicators.

Telethon 3G Rear Panel Features

The Telethon 3G illustration is repeated for ease of use of this guide. All Telethon 3G units operate the same: the only difference is in whether the Fiber Optic ST connectors are Inputs or Outputs.

Fig. 3-7: Telethon 3G Rear Panel

Area F- Rear Panel Power Connectors

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

Power can be supplied to the unit by either a four-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.

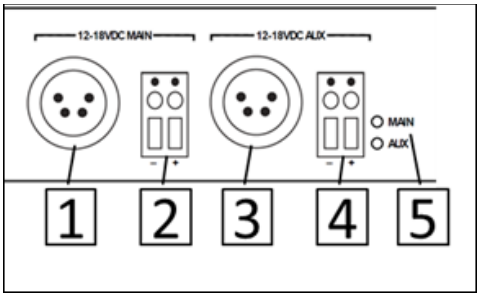


Fig. 3-8: Rear Panel Power Connectors

- **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 Telethon 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: it only indicates that the power source is good.

Redundant Power Supply Usage

The Telethon 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, then the Telethon 3G uses power from both.

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	
	1	Minus Voltage Terminal
	2	Plus Voltage Terminal

Area G – CAN BUS Connector

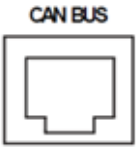


Fig. 3-9: CAN BUS connector

CAN (Communication Area Network) is a protocol designed to support the monitoring of microcontrollers.

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

Area H – The ST Fiber Connectors

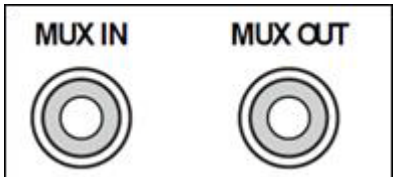


Fig. 3-10: MUX IN and OUT connectors

The MUX IN connector receives up to eight or 16 channels, depending on whether the unit is a Tranceiver or Receiver.

Conversely the Transceiver or Transmitter MUX OUT connector sends the up to eight or 16 channels to the opposite TelePort 3G.

Fiber ADAP Power Supplies

The Telethon 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: specific geography required). You can use any power supply meeting the required specification and providing power through an XLR-4 Female connector. Contact Grass Valley, a Belden Brand (see Contact Us on page 25) or your Grass Valley Solutions dealer for more information.

You can use direct wire power connections from a customer provided power source with the Terminal Block power connections on the back panel.

Fig. 3-11: Power Supply

Supplied with 4PIN XLR/A4F connector for the power plug on the Telethon 3G unit (Fiber Part Number ADAP-AC-04)

4 Telethon 3G Operation

This chapter describes the operation of the Telethon 3G. Please keep in mind that once the system is properly set up and configured, there is very little to do during normal operation.

Fiber Optical Channel Monitoring

The Telethon 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 1/10th 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 Telethon 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 Telethon 3G units. Any use of repeaters of 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 Telethon 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 eight 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 5 dBm 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.

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 25).

Using the Telethon 3G Optical Measurement Display

Telethon 3G Optical Measurement Display

The Telethon 3G optical signal strength display has characteristics for the Telethon 3G Transmitter, Receiver, and Transceiver.

The Channel Select switch is a dual function switch:

- Flicking to the right allows scrolling through the individual channels to provide basic status on the signal.
- Flicking 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 eight SDI channels and the four fiber channels being received at the unit. The signal strength of the four fiber channels received is measured. The four fiber channel signals being sent from the unit are not displayed.

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

After each flick, the display will indicate the monitored channel (such Tx01 or Rx01). Once the four fiber channel signals are received at the unit, the display will shift to one of the conditions described below.

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

- No fiber link for a channel (see Condition 1: No Optical Link on page 19)
- Existing optical link but with no active SDI Data (see Condition 2 - Optical Link good but no SDI data present. on page 20)
- Active usable optical link with SDI Data (see Condition 3 - Active usable optical link with SDI Data on page 20)

Condition 1: No Optical Link

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

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**.

This fluctuation between high and low occurs because the laser for that chanel 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**.

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

System Firmware Display

The Telethon 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.

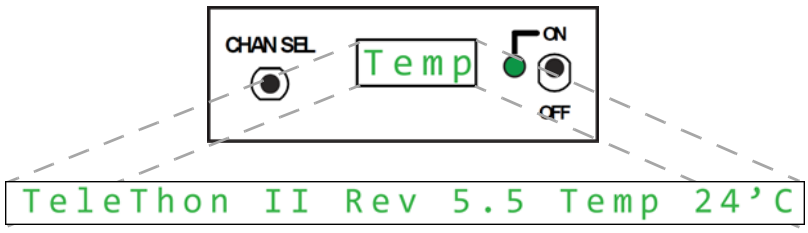


Fig. 4-2: Firmware display

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.

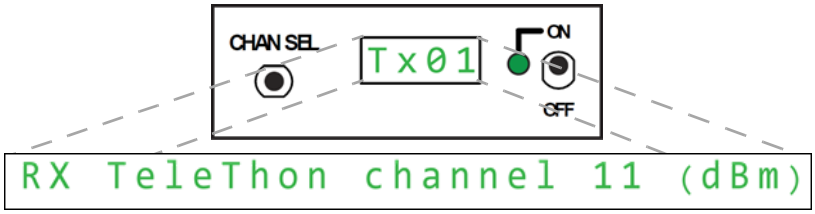


Fig. 4-3: Technical Information display

Standard Operation

This section is devoted to a number of “Best Practices” for use of the Telethon 3G System. Specific information on how to operate the system has been presented in the sections above.

- Take the possibility of Laser Eye damage seriously.
- Protect the Fiber Optic Cable and the Fiber Optic Connectors. **Always** keep these capped unless there are being connected.
- Make sure that the Telethon 3G unit is secure and cannot be inadvertently moved or kicked about. 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 panes cannot be damaged by being inadvertently struck or pulled.
- Secure the power supplies and power connectionsto ensure that power is continuous.
- Once the system is set up and running, carefullymonitor the system display on the Telethon 3G.
- The system is digital, so the Signal Strength should meet or exceed requirements. When it is no longer strong enough, the signal stops.
- Be as careful during System tear down andSystem setup.
- 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 25).

Troubleshooting

Troubleshooting any technical issues with the Telethon 3G System is similar to any piece of television production gear with the obvious exception of the core Fiber Optic technology. Here is a list of things to look out for and check – some of them obvious but sometimes forgotten.

- Check all your cables for any broken connections or bad connectors.
- Ensure that the Power Supply is working. If there is a power problem, check the power supplies.
-
- If you cannot resolve the problem in the field, contact Support (see Contact Us on page 25).

5 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 ..... -0 dBm
- Receiver Sensitivity ..... -22 dBm/ -20 At 3 Gb/S
- Optical Source ..... Laser Diode
- Optical Detector ..... PIN
- Fiber Type ..... Single Mode

Mechanical/Environmental

- Dimensions (LxWxH) ..... 7.5"x17.5"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
- EMI/RFI ..... Complies with IEC/EN 60825-1
- Certifications ..... RoHS

Contact Us

Grass Valley Technical Support

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

Americas

Office hours: 9:00 a.m. – 9:00 p.m. (EST)
Telephone: 1-800-224-7882
Fax: +1 514 335 1614
E-mail: support@miranda.com

Asia

Office hours: 9:00 a.m. – 6:00 p.m. (GMT+8)
Telephone: +852 2539 6987
Fax: +852 2539 0804
E-mail: asiatech@miranda.com

Europe, Middle East, Africa, UK

Office hours: 9:00 a.m. – 6:00 p.m. (GMT)
Telephone: +44 118 952 3444
Fax: +44 118 952 3401
E-mail: eurotech@miranda.com

China

Office hours: 9:00 a.m. – 6:00 p.m. (GMT+8)
Telephone: +86 10 5873 1814
E-mail: asiatech@miranda.com

France

Office hours: 9:00 a.m. – 5:00 p.m. (GMT+1)
Telephone: +33 1 55 86 87 88
Fax: +33 1 55 86 00 29
E-mail: eurotech@miranda.com

Malaysia

Telephone: +60 3 2247 1808

EMERGENCY After Hours (Global)

Toll Free: 1-800-224-7882 (US and Canada)
Telephone: +1 514 333 1772

Corporate Head Office

Grass Valley
3499 Douglas-B.-Floreani
St-Laurent, Quebec H4S 2C6
Canada
Telephone: +1 514 333 1772
Fax: +1 514 333 9828
Web: www.miranda.com