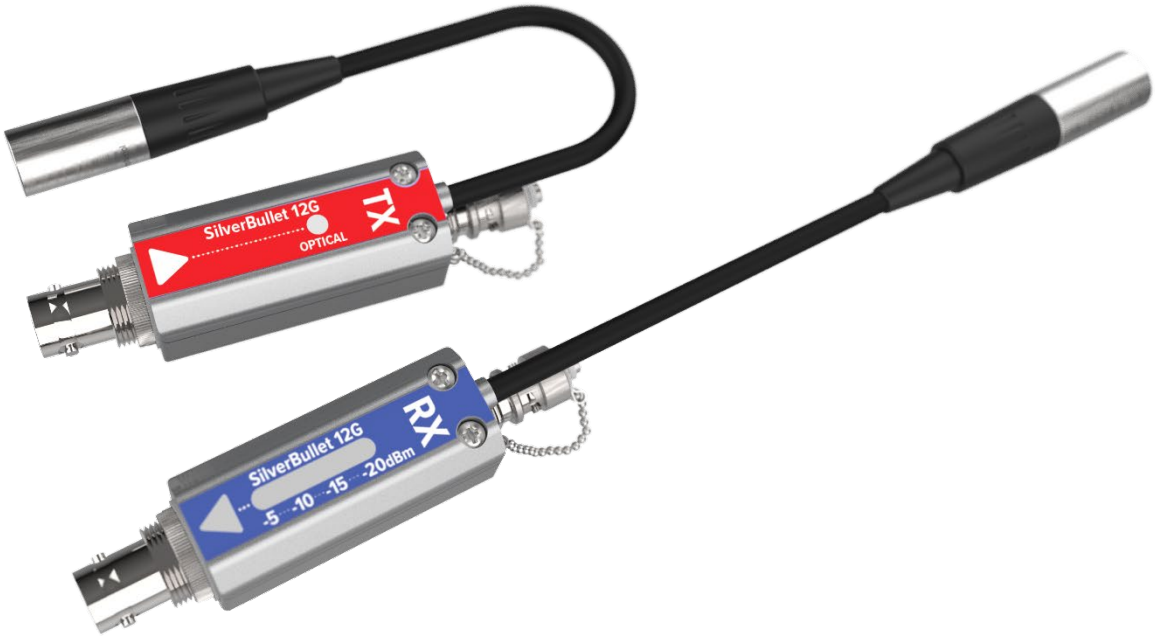
MultiDyne®
Video & Fiber Optic Systems

SilverBullet 12G
SDI Fiber Transport

USER MANUAL



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Document Revisions

Revision	Description	Date	Author
A	Initial	3/18/2024	SDP

Safety Info

- Do not use this apparatus near water.
- Clean only with lint free dry cloth.
- Do not block any ventilation openings.
- Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
- Do not defeat the safety purposes of the grounding- type plug. A ground type plug has two blades and a third grounding prong. The third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
- Install in accordance with the MultiDyne® installation instructions.
- Install all peripheral equipment (cameras, routers, etc.) in accordance with the manufacturer's instructions and safety requirements.
- Protect the power cord from being walked on or pinching particularly at plugs, convenience receptacles, and point where they exit from the apparatus.
- Only use attachments/accessories specified by MultiDyne®.
- Use only with the cart, rack, stand, tripod, bracket, or table specified by MultiDyne®, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.

	**Warning** –indicate danger that requires proper procedures or practices to prevent injury or death to personnel.
	**Cautions** indicate proper procedures or practices to prevent damage to equipment or property.
	**Warning** –The safe operation of this product requires that a protective earth connection be provided. A grounding conductor in the equipment's mains supply cord provides this protective earth. To reduce the risk of electrical shock to the operator and service personnel, this ground conductor must be connected to an earthed ground. The mains plug shall remain readily operable.
	**Warning** –The apparatus shall not be exposed to dripping or splashing and that no objects filled with liquids, such as vases, shall be placed on the apparatus.
	**Warning** - This symbol on the equipment indicates for use at altitudes not exceeding 2000 m.
	**Warning** - Contact your local authority for further details on the correct disposal of this waste, in accordance with your national legislation.

- Follow all local Electrical Codes for Grounding, Lightning Arrestment and Surge Protection. Unplug this apparatus during lightning storms or when unused for extended periods of time.
- All Electrical Work to the facility must be performed by a qualified Licensed Electrician. All local Electrical Codes must be followed and, if necessary, must be inspected by a Local or State Inspector.
- All servicing of MultiDyne equipment must be performed at the factory by a MultiDyne trained service technician or engineer.
- Throughout this manual, several Warnings and Cautions and Notes may be presented to alert the user to important safety or operating information.
- Always adhere to local building, safety and fire prevention codes during the installation and operation of this product.
- Use only power cords that were shipped with specified for this product and certified for the country of use.

SAFETY INFO

- Connect the unit only to a power source with the specified voltage rating.
- Unless otherwise stated in the Installation Instructions, and in adherence to local Electrical Codes. MultiDyne® Equipment should only be plugged into a standard 15-amp dedicated circuit.

Laser Safety Information

This unit is classified as a CLASS 1 LASER PRO15-ampccording to EN60825-1 (EU) and FDA 21CFR 1040.10 (USA). Class 1 laser products are considered safe and do not result in biological hazard if used according to these instructions.

	Warning – Use of controls, adjustments, or performance of procedures other than those specified herein may result in hazardous radiation exposure.
	Warning – Never look directly into the end of the optical fiber while either end of the system is operating.
	Warning – Never clean an optical fiber connector on equipment or cable that is carrying light.
	Warning – Always use dust caps on fiber optic connectors when cables are not connected. This will protect the connector from damage and accidental exposure of a human eye to an operating laser.

1. Overview

The SilverBullet 12G is a device designed to extend the reach of SDI (Serial Digital Interface) signals over long distances using single-mode fiber optic cables. At 11.88 Gbps, coax-only devices are typically limited to 50m runs, compared to the 10km distance fiber transmission is capable of. It provides a reliable and efficient solution for transmitting SDI signals while minimizing signal degradation and maintaining high-quality video transmission.

The extender consists of two main components: a transmitter and a receiver. The transmitter unit takes a digital signal on coax and converts it into an optical signal compatible with single-mode fiber. The optical signal is then transmitted over the fiber optic cable to the receiver unit located at the remote end.

On the receiving end, the receiver unit takes the optical signal from the fiber optic cable and converts it back into a coaxial signal, allowing easy integration with standard SDI devices such as monitors, recorders, or switchers.

The SilverBullet 12G offers several advantages over traditional copper-based transmission methods. Fiber optic cables have a significantly higher bandwidth capacity, enabling the transport of uncompressed SDI signals over long distances without signal degradation. They are also immune to electromagnetic interference, ensuring a stable and reliable transmission.

The SilverBullet 12G provides a robust and efficient solution for extending SDI signals over long distances while maintaining signal integrity and compatibility with standard coaxial SDI equipment. It is a valuable tool for various applications such as broadcasting, video production, and surveillance systems.

Transmitters can be ordered with standard 1310 or 1550 nm wavelengths, or 16 of the common CWDM wavelengths from 1271 to 1571 nm.

Key Features

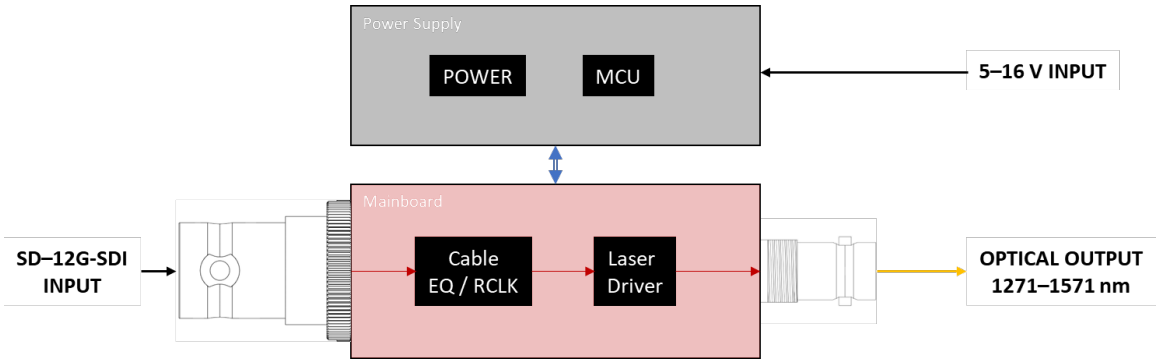
- -3 dBm laser output power, 10km operational distance
- Re-clocks & Transmits SMTPE signals from 270 Mbps to 11.88 Gbps and other digital signals (AES, MADI, DVB-ASI), up to 2.5V
- Built-in optical power meter (RX) for easy system setup and status monitoring
- Low power consumption compatible with 5 to 16V DC input
- Automatic cable equalization of coax (1694A, 4794R) up to 60m for 12G and 200m for 3G
- ST/UPC fiber connections

2. Feature Descriptions

2.1 Transmitter

1. BNC Connector
2. ST/UPC Connector
3. Status LEDs
4. Mini-XLR Locking Power Connector

2.1.1 TX Block Diagram



2.1.2 Wavelengths

A 2-digit code on the bottom label indicates the laser wavelength.

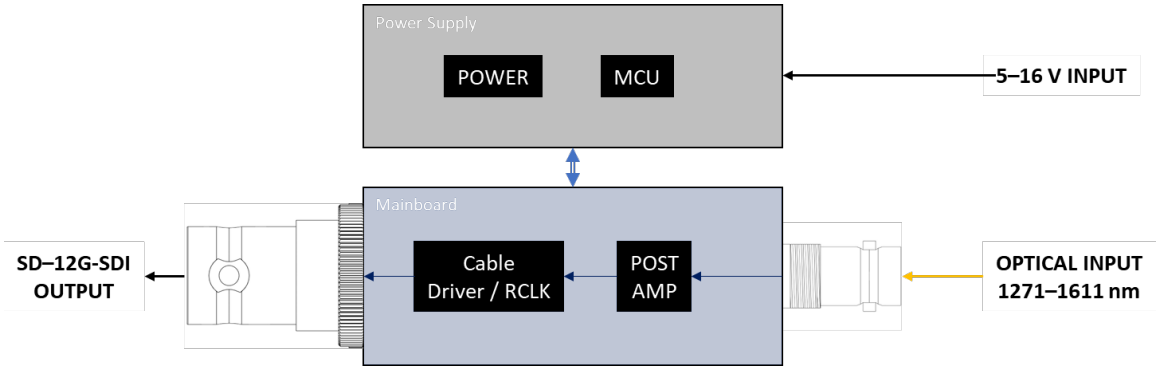
Example: "13" for 1310nm

WDM		CWDM							
Code	Wave	Code	Wave	Code	Wave	Code	Wave	Code	Wave
13	1310	*27*	1271	*35*	1351	*43*	1431	*51*	1511
15	1550	*29*	1291	*37*	1371	*45*	1451	*53*	1531
		31	1311	*39*	1391	*47*	1471	*55*	1551
		33	1331	*41*	1411	*49*	1491	*57*	1571

2.2 Receiver

1. BNC Connector
2. ST/UPC Connector
3. Status LEDs
4. mini-XLR Locking Power Connector

2.2.1 RX Block Diagram



3. Operation

3.1 Transmitter

Connect coax and fiber to unit before powering up. When a valid signal is present and the unit is powered up, the LEDs will function as shown:

“Status” Arrow

Green	Red	Yellow	Off
BNC SMPTE Signal Present	High temp	BNC Signal Present (non-SMPTE Rate), no CDR	No Power
“Breathe” for power but no signal			

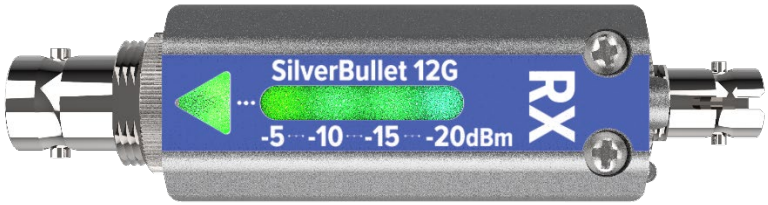
“OPTICAL” LED

Green – Laser enabled, signal transmitting.

Red – Laser Fault. If overheated, let the unit cool and cycle the power. If it remains red service will be required.

3.2 Receiver

Connect coax and fiber to unit before powering up. When a valid signal is present and the unit is powered up, the LEDs will function as shown:



“Status” Arrow

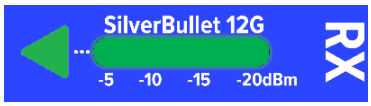
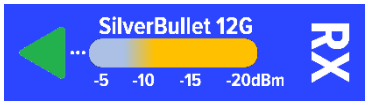
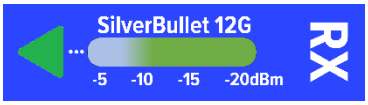
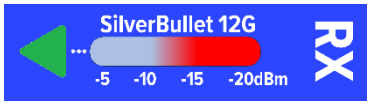
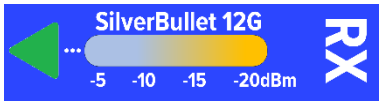
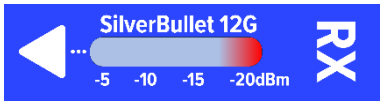
Green	Red	Yellow	Off
Fiber SMPTE Signal Present	High temp	Fiber Signal Present (non-SMPTE Rate), no CDR	No Power
“Breathe” for power but no signal			

3.2.1 Optical Power Meter

The smart optical power meter gives information based on the measured light levels according to the data rate, i.e., the LED color ranges are data-dependent. “Green” is good, “yellow” is near failure, and “red” is out of range.

The operational range for 12G-SDI is narrower than it is, for example, 3G-SDI. Therefore, when passing 12G data errors will start to occur when received light levels are lower than -14 dBm, whereas 3G-SDI will operate down to -18 dBm. The meter indicates this performance difference by showing yellow at ≈ -14 dBm for 12G, and yellow for slower data rates at ≈ -18 dBm.

Examples:

Optical Power (dBm)	12G/6G Reading	≤ 3G Reading
≥ -5		
-12		
-15		
-20		
≤-25	Photodiode squelch level No signal/optical level meter	

3.3 Maintaining Clean Fiber

Cleaning an ST/UPC fiber connector properly is crucial to maintain optimal performance and prevent signal loss. Cleaning is recommended if the optical level is low. Here's a step-by-step procedure to clean an ST/UPC fiber connector:

1. Gather the necessary tools and materials:
    - Lint-free wipes, cleaning cassette, or fiber optic cleaning pen
    - Fiber optic cleaning solution or isopropyl alcohol (99% purity)
    - Compressed air or a blower bulb

2. Prepare a clean and controlled environment:
    - Work in a clean and well-lit area to avoid contamination.
    - Ensure there is no dust or debris around the work area.

3. Blow away loose debris:
    - Use compressed air or a blower bulb to blow away any loose dust or debris from the connector end face.
    - Ensure the airflow is gentle and directed away from yourself and any nearby sensitive equipment.

4. Apply cleaning solution:
    - Apply a small amount of fiber optic cleaning solution or isopropyl alcohol (99% purity) to a lint-free wipe.
    - Be cautious not to touch the wipe or the connector end face with your fingers.

5. Clean the connector end face:
    - Gently wipe the connector end face using the wipe with cleaning solution.
    - Use a circular motion while applying slight pressure to remove any contaminants.
    - Avoid excessive pressure or aggressive scrubbing to prevent damage.

7. Dry the connector:
    - If you used a cleaning solution, allow the connector to air dry for a few seconds.
    - Alternatively, use a dry section of the lint-free wipe to gently dry the connector end face.

8. Reassemble and protect the connector:
    - Once the connector end face is clean, reassemble it into the ST coupler and install protective dust cap.
    - Avoid touching the end face or exposing it to any potential contaminants.

By following these steps, you can effectively clean an ST/UPC fiber connector and ensure optimal performance and reliability. Remember to always handle fiber connectors with care and maintain a clean environment throughout the cleaning process.

4. Accessories & Replacement Parts

4.1 Carrying Case

Part Number	Description
###	Ruggedized, weather-proof carrying case, 2 SilverBullet with Power Supply Tray

4.2 Cables

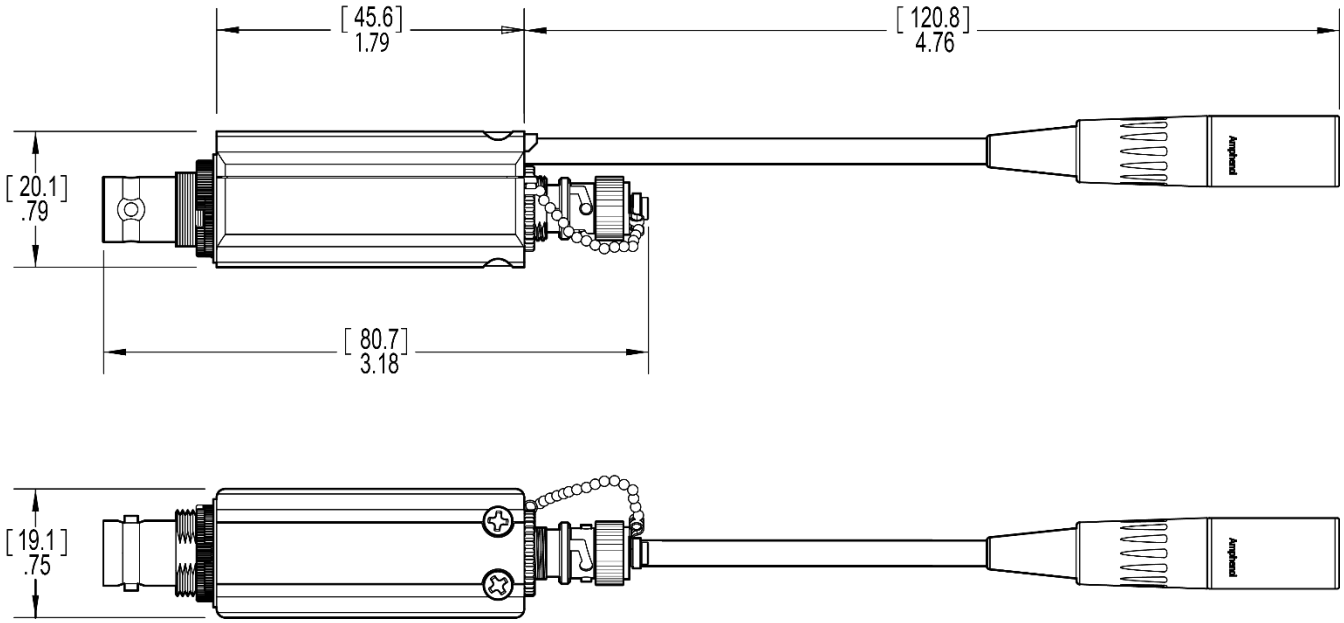
Part Number	Description
CA-BNCM-BNCM-6	BNC male to BNC male adapter cable, six inches
CA-BNCM-HDBNCM-6	BNC male to HDBNC male adapter cable, six inches
###	USB-C to 2.5mm power cable assembly
###	USB-A to 2.5mm power cable assembly

4.3 Power Supplies

Part Number	Description
SB2-PS-12V-INT	POWER SUPPLY, 12V, 1.5A, mXLRF, SILVERBULLET 2, I'NATIONAL MULTI-BLADE

5. Specifications

5.1. Unit Dimensions & Weight



SB2-12G-TX and RX	(WxHxD) 80.7mm x 19.1mm x 20.1mm (3.18 x 0.75 x 0.79 in.), 53 grams (0.11 lbs)

5.2. Video

Input/Output Impedance	75Ω
Amplitude	800mV$_{p-p}$ (SMPTE) 2500mV$_{p-p}$ Digital
Coax EQ:	3G: 200m 12G: 70m
Jitter (Color bars)	< 0.2UI
Rise/Fall Times (coax)	< 45ps
SMPTE Compliance Standards (SDI)	259M (SD) 292M (HD) 424M (3G) ST 2081-1 (6G) ST 2082-1 (12G)

5.3. Electro-Optical

TX Launch Power (Avg.)	-3 dBm (0.5mW)
RX Sensitivity (Avg.)	≤ 3G: -18 dBm 12G: -14 dBm
Optical Budget (typ.)	3G 15dB 12G 11dB
Fiber Type	Singlemode
Fiber Polish	Ultra-physical contact [UPC]
Fiber Connectors	ST
Optical Power Meter Accuracy	+/- 2dB
Operational Temperature	-20 – 55°C
WDM Wavelengths (± 10nm)	1310 1550
CWDM Wavelengths (± 3nm)	1271 1291 1311 1331 1351 1371 1391 1411 1431 1451 1471 1491 1511 1531 1551 1571
Coaxial Connector	75-ohm BNC
Input Voltage	5–16V DC

Power Connector	2.5mm Switchcraft 712ACF
SMPTE Compliance Standards (Optical)	S297

5.4 Power

SB2-12G-TX-xx-ST	1W
SB2-12G-RX-ST	1W

5.4.1 Power Connector Pinout

Contact Info

Contact support@multidyne.com