6G-SDI EXTENDER OVER FIBER

500732
500732-SM10
500732-SM40
500732-SM80

Installation & Operation Manual

Table of Contents

1.
Overview

1.1.   Description

The 6G-SDI Extender is a unique new solution from MuxLab for extending SDI based cameras* or other SDI sources* up to 4K @ 30Hz resolution with the added benefit of extending the High Resolution signal up to 985ft (300m) via OM3 multimode fiber (model 500732), up to 1300ft (400m) via OM4 multimode fiber (model 500732), up to 33,000ft (10km) via singlemode fiber (model 500732-SM10), up to 132,000ft (40km) via singlemode fiber (model 500732-SM40), and up to 264,000ft (80km) via singlemode fiber (model 500732-SM80).

The input source for the 6G-SDI Extender over FIBER is either HD-SDI using four coax cables, 3G-SDI using two coax cables, or 6G-SDI using a single coax cable.
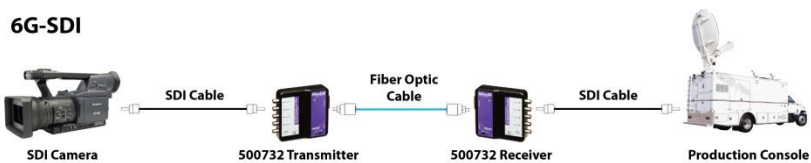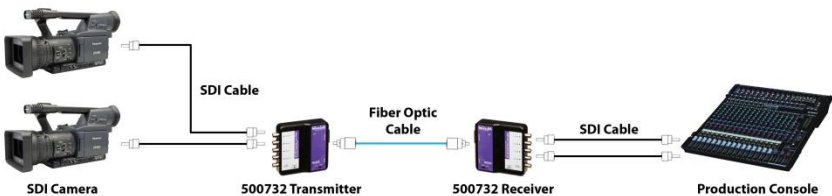
HD-SDI
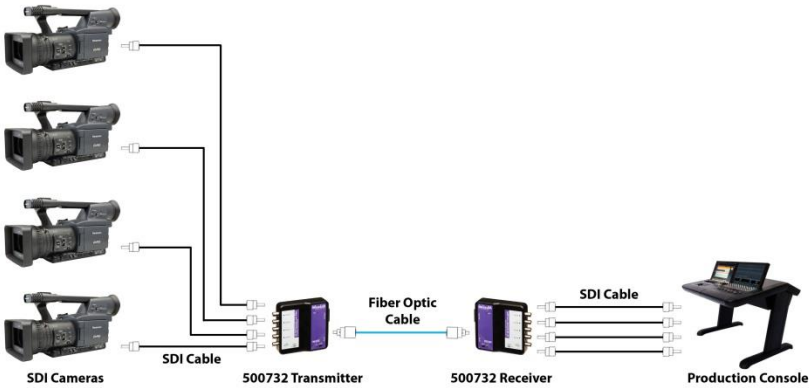
Figure 1 System Connectivity Overview

Typical Applications:

- Video (cinema) production
- Studio broadcasting production
- Studio to Studio
- Mobile video (broadcasting vehicle)
- News coverage and live events
- Post production

1.2. Features

- Up to 1300ft (400m) via multimode OM4 fiber and up to 264,000ft (80km) via singlemode fiber.

- HD-SDI using single, two or four coax cables, 3G-SDI using single or two coax cables, 6G-SDI using a single coax cable, with HDMI 3D support.

- Maximum resolution supported: 4096x2160 @ 24/25Hz, 3840x2160 @ 30Hz

- Supported SMPTE Standards:
  SMPTE-292M, SMPTE-296M, SMPTE-372M,
  SMPTE-424M, SMPTE-425M

- Supports all 6G channel configurations (1/2/4).

- Automatic SDI Link recognition and configuration.

- USB interface for field upgradable firmware and diagnostics.

- Standard 10G SFP+ module.

- Multiple ¼"-20 threads for Camera mounting or equipment attachment.

2.
Technical Specifications

Specifications	
Environment	6G-SDI Digital Signal Transmission
Enclosures Measurements	Tx: 110mm (4.3") x 110mm (4.3") x 32mm (1.25") Rx: 110mm (4.3") x 110mm (4.3") x 32mm (1.25")
Color	Black Electrophoresis (Tx Unit)
Control	Serial Console Emulation with USB Interface
Distance	• **Model 500732**: Up to 985ft (300m) via OM3 multimode fiber and 1300ft (400m) via OM4 multimode fiber. • **Model 500732-SM10**: Up to 33,000ft (10km) via singlemode fiber. • **Model 500732-SM40**: Up to 132,000ft (40km) via singlemode fiber. Requires a 5dB attenuator for distances less than 33,000ft (10km). • **Model 500732-SM80**: Up to 264,000ft (80km) via singlemode fiber. Requires a 10dB attenuator for distances less than 115,500ft (35km).
Compliance	FCC, CE, RoHS
Power	12VDC, 1.25Amp External Power Supply with US, UK & Euro blades
Temperature	Operating: 0° to 40°C Storage: -20° to 85°C Humidity: Up to 95% non-condensing

Table 1 Specifications

Transmitter Connectivity	
Front Side	4x BNC SDI Input Connectors (0.8V pp, 75Ohms) 1x BNC Sync Output Connector
Rear Side	1x SFP+ module Connector 1x terminal block for RS232 interface
Top Side	Mini USB for firmware updates (plus control & status)

Table 2 Transmitter Connectivity

Receiver Connectivity	
Front Side	4x BNC SDI Output Connectors (0.8V pp, 75Ohms) 1x BNC Sync Input Connector
Rear Side	1x SFP+ module Connector 1x terminal block for RS232 interface
Top Side	Mini USB for firmware updates (plus control & status)

Table 3 Receiver Connectivity

3.
Installation Procedure

3.1.   Parts List

The 6G-SDI Extender over FIBER Kit (500732, 500732-SM10, 500732-SM40 & 500732-SM80) come with the following parts:

- 1x Transmitter Unit (Tx)

- 1x Receiver Unit (Rx)

- 2x 12VDC Wall-mount Power Supply

- US, UK & Euro Blades for the Wall-mount Power Supply

- 10G SFP+ modules with LC connectors

3.2. Product Overview

3.2.1.Transmitter

The external connections and light indicators of the transmitter unit are detailed in Figure 2. Please familiarize yourself with them before installing the unit.
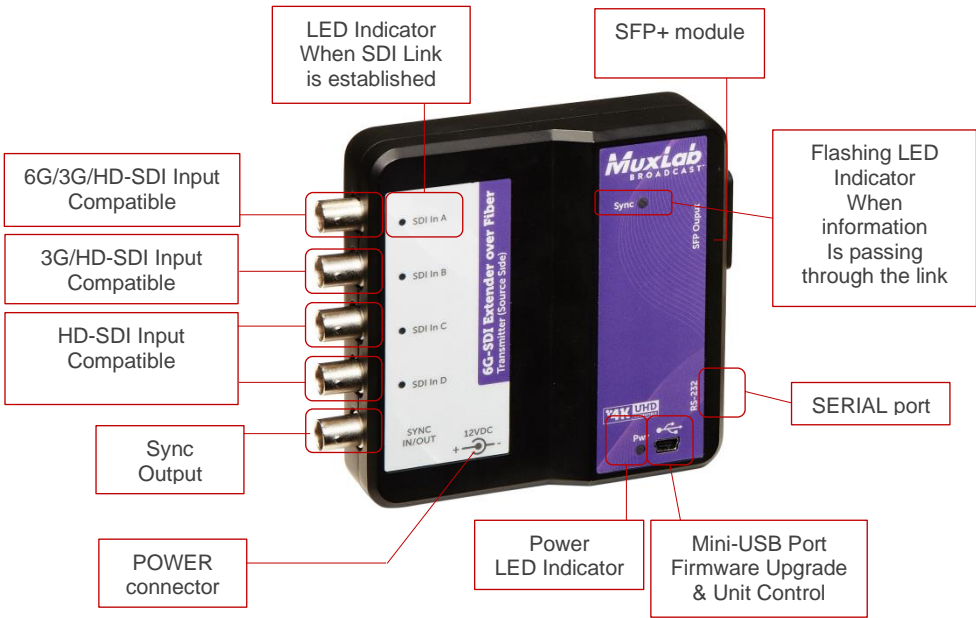
Figure 2 Front View of Transmitter

3.2.2.Receiver

The external connections and light indicators of the receiver unit are detailed in Figure 3 & Figure 4. Please familiarize yourself with them before installing the unit.
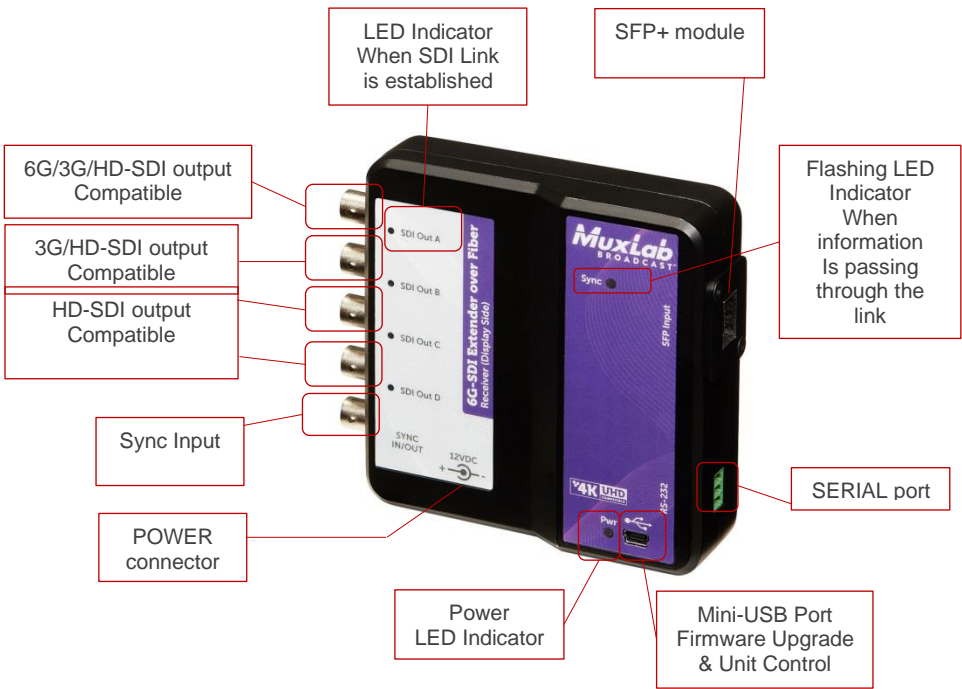
Figure 3 Front View of Receiver

3.3.   **Physical Installation**

Duplex Connection:

SOURCE INPUT (Camera, Etc)
Must use 6G/3G/HD 75Ω graded coax cable
In accordance with the SDI Throughput needed.

Connection to FIBER
(Duplex Connection)

1 Channel
6G/3G/HD-SDI

2 Channels 3G-SDI

4 Channels HD-SDI

Optional Sync Out

Important: Always Use SDI A, then B, etc… as first connections for any SDI transmission speed.

DESTINATION OUTPUT (Recorder, Monitor, Ect.)
Must use 6G/3G/HD 75Ω graded coax cable
In accordance with the SDI Throughput needed.

Connection to FIBER
(Duplex Connection)

A

B

C

D

Optional
Sync In

12VDC
Power Input

Important: The Receiver outputs the signals in the same order and speed as the Transmitter.

Simplex Connection:

If transmission is only required in one direction, this device can be connected with a single fiber in a simplex arrangement as indicated in the following steps below.

1. While looking at the unit from the top, connect the single fiber cable to the Transmitter right most LC connector as shown below.

2. While looking at the unit from the top, connect the opposite end of the fiber cable to the Receiver left most LC connector as shown below.

3. The unused LC connector on both the Transmitter and Receiver must be protected from dust. This can easily be accomplished by cutting the protective rubber plug in half and inserting the plug into the unused LC connectors.

Important note: The serial port is not available when only using a single fiber cable in a simplex arrangement.

3.4.   Installation & Power-up Procedure

In order to install the product, please follow the steps below:

1. First, install the Transmitter near the SDI signal source. Attach the unit via the mounting holes or by other appropriate means.

2. Connect the necessary number of SDI Compatible 75Ω Coax cables in order to carry the video/audio signal. Always start by connecting the first cable to the BNC A, then B and so on.

3. Once the Transmitter is installed and connected with the SDI coax cables, then connect and run the fiber optic cable from the Transmitter to the Receiver unit, using either multimode or singlemode fiber depending on the 6G-SDI Extender model being installed. Respect the distance specification listed on Table 1.

4. After hooking up the fiber optic cable to the SFP+ port on the Receiver, proceed to connect the SDI coax cables from the Receiver to the destination device (e.g.: Recorder, Monitor, Capture card, etc.).

5. Once all the cabling is installed, next plug the 12VDC wall-mount power supplies to both the Transmitter and Receiver.

6. Each unit will power up and auto-initialize.

7. Next the fiber link will sync, and the link indicator on each unit will blink after the negotiation process has successfully completed.

8. If the source is generating a video signal at the Transmitter end, then the Receiver will output the

same signal which can be terminated on a mixer, display monitor, video recorder, etc.

3.5.   Supported SDI Modes

	OUTPUT MODES					
INPUT MODES	**Single 6G-SDI**	**Single 3G-SDI**	**Dual 3G-SDI**	**Single HD-SDI**	**Dual HD-SDI**	**Quad HD-SDI**
Single 6G-SDI	YES	---	---	---	---	---
Single 3G-SDI	---	YES	---	---	---	---
Dual 3G-SDI	---	---	YES	---	---	---
Single HD-SDI	---	---	---	YES	---	---
Dual HD-SDI	---	---	---	---	YES	---
Quad HD-SDI	---	---	---	---	---	YES

Table 4 Supported SDI Mode Matrix

3.6.   Supported Video Modes

Resolution	10Bit 4:2:0 10Bit 4:2:2	12Bit 4:2:0 12Bit 4:2:2 12Bit 4:4:4 10Bit 4:4:4:4
2160p @ 30/29.97Hz 2160p @ 25Hz 2160p @ 24/23.98Hz	6Gbit/s Single Link 6G Dual Link 3G	
1080p @ 60/59.94Hz 1080p @ 50Hz	3Gbit/s Single Link 3G Dual link 1.5G (HD)	6Gbits/s Single Link 6G Dual Link 3G
1080i @ 60/59.94Hz 1080i @ 50Hz 1080p @ 30/29.97Hz 1080p @ 25Hz 1080p @ 24/23.98Hz	1.5Gbit/s Single Link 1.5G (HD)	3Gbit/s Single Link 3G Dual Link 1.5G (HD)
720p @ 60/59.94Hz 720p @ 50Hz 720p @ 30/29.97Hz 720p @ 25Hz 720p @ 24/23.98Hz	1.5Gbit/s Single Link 1.5G (HD)	3Gbit/s Single Link 3G
3D: 1080p @ 60/59.94Hz 3D: 1080p @ 50Hz	6Gbit/s Single Link 6G Dual Link 3G	
3D: 1080i @ 60/59.94Hz 3D: 1080i @ 50Hz 3D: 1080p @ 30/29.97Hz 3D: 1080p @ 25Hz 3D: 1080p @ 24/23.98Hz	3Gbit/s Single Link 3G Dual Link 1.5G (HD)	6Gbit/s Single Link 6G Dual Link 3G
3D: 720p @ 60/59.94Hz 3D: 720p @ 50Hz 3D: 720p @ 30/29.97Hz 3D: 720p @ 25Hz 3D: 720p @ 24/23.98Hz	3Gbit/s Single Link 3G Dual Link 1.5G (HD)	6Gbit/s Single Link 6G Dual Link 3G

Table 5 Supported Video Mode Matrix

3.7.   SDI Input Connections

SDI, Input BNC Connector (Transmitter)

Input Modes	SDI A	SDI B	SDI C	SDI D
Single 6G-SDI	Link A	---	---	---
Single 3G-SDI	Link A	---	---	---
Dual 3G-SDI	Link A	Link B	---	---
Single HD-SDI	Link A	---	---	---
Dual HD-SDI	Link A	Link B	---	---
Quad HD-SDI	Link A	Link B	Link C	Link D

Table 6 SDI Input Connections Matrix

3.8.   SDI Output Connections

SDI, Input BNC Connector (Receiver)

Input Modes	SDI A	SDI B	SDI C	SDI D
Single 6G-SDI	Link A	---	Link A'	---
Single 3G-SDI	Link A	---	Link A'	---
Dual 3G-SDI	Link A	Link B	Link A'	Link B'
Single HD-SDI	Link A	---	Link A'	---
Dual HD-SDI	Link A	Link B	Link A'	Link B'
Quad HD-SDI	Link A	Link B	Link C	Link D

Table 7 SDI Output Connection Matrix

Notes: Link A' and Link B' are redundant outputs of Link A & B.

4.
Firmware Upgrade
Procedure

4.1.   Firmware Upgrade Procedure

1. Make sure the PC USB device driver has been installed (see section 4.2 for more details)

2. Download the latest version of the appropriate firmware upgrade from the MuxLab website.

3. Unzip the firmware upgrade executable in a directory of your choice.

4. Connect the mini-USB cable to the unit and to the PC.

5. When the device driver has recognized your device to be upgraded you can double click on the upgrade application to execute it.

6. The output should look like below:

```
You are about to upload the firmware version x.x.x

Detecting COM port and Baud Rate..................OK
COM PORT Number : 3
Baud rate       : 115200

Checking product .......... RX OK
Muxlab 6G SDI EXT 500732 RX/TX
>>
Preparing to Upload Programmable Logic ............ OK
Sending Programmable Logic data ................... 100% OK
Preparing to Upload Firmware ...................... OK
Sending data ...................................... 100% OK

Please wait while the unit is rebooting ........... 100%
Press any key to exit
```

7. The behavior of the Transmitter and Receiver unit should be as outlined below during upgrade. The device uses the SDI LEDs to indicate the actual status.

    • SDI A/B/C/D Blinking: Download phase. Clear memory space and write new image.

    • SDI A Blinking: Erasing previous programmable logic memory

    • SDI B Blinking: Copying programmable logic from secondary memory to primary memory.

    • SDI C Blinking: Copying firmware from secondary memory to primary memory.

8. Once the process is completed, the upgraded firmware will automatically start and the SDI A/B/C/D LEDs will cycle.

4.2.   USB Driver Setup

When interfacing a MuxLab device with the USB port on Windows XP, Windows 7, Windows 8 or Windows 10 operating systems, a driver setup file will be required. For Linux and Mac OS X operating systems, no driver is necessary.

To install the USB serial driver, download the SC-000032-A USB to serial driver file from the MuxLab website and save it to the local hard drive. NOTE: If the downloaded file is compressed, it will need to be uncompressed before it may be utilized.

Plug the USB cable between the MuxLab device and the PC, and power up the device. The **Found New Hardware** wizard will open (see Figure 4). Select **L**ocate and install driver software (**recommended**).

Figure 4 Found New Hardware Wizard

A new dialog box will open (see Figure 5). Select **Browse my computer for driver software (advanced)**.

Figure 5 Found New Hardware Dialog Box

Another dialog box will open (see Figure 6). Click **Browse** and locate the SC-000032-A USB to serial driver file downloaded earlier. Once found, click **Next**.
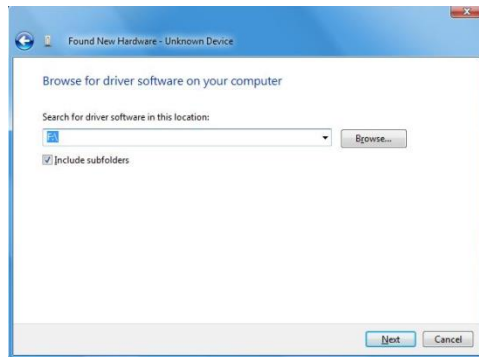

Figure 6 Browsing for Unknown Device

A security window will now appear, indicating that the driver software is unsigned (see Figure 7). Select **<u>I</u>nstall this driver software anyway**.

Figure 7 Windows Security

A window will appear instructing that the software for the driver has been successfully installed (Figure 8). Click **Close**.
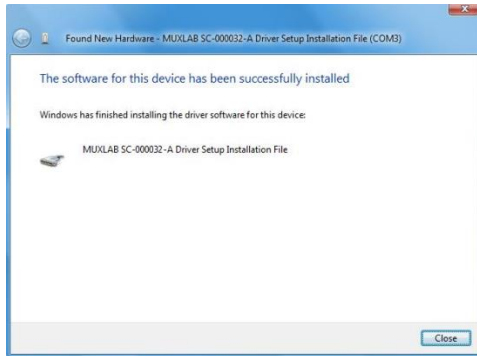

Figure 8 Successful Installation Dialog Box

5.
Unit Control and Status

USB Control & Status

Commands from an ASCII terminal (e.g. PUTTY) may be sent directly to the device via a USB connection (serial connection emulation). Maintenance can be performed with a terminal emulator, such as the one available under windows with the ASCII Command set described in the Appendix of this manual.

Troubleshooting

The following table describes some of the problem symptoms, the probable causes and possible solutions. If the information below does not solve the problem, the technical support contact information can be found at the end of this section.

PROBLEM	POSSIBLE SOLUTIONS
No Power @ Transmitter or Receiver	Verify the power adapter and connectors
4K Misaligned Quadrant	Wrong order in the SDI Links either at the receiver or transmitter. Check for cable inversion. (reboot the system when ordered properly)
No Link	Check the fiber for damage, check if the fiber connectors are clean Verify that you have not exceeded the maximum length.

If the above Troubleshooting does not resolve the problem, contact your nearest MuxLab dealer or MuxLab Technical Support at 877-689-5228 (toll free in North America) or (+1) 514-905-0588 (International), please have the following information ready:

- Unit model number.

- Cabling layout. Please include the model of SDI source and receiver, cable length and type (e.g.: Fiber and Coax at both ends).

- Description of problem.

- List of tests performed.

Appendix

A. ASCII Command Set

Ensure that the terminal emulation program parameters are set to the following:

BAUD Rate:	115200
Data bits:	8
Stop bits:	1
Parity:	None
Flow control:	None

It should be noted that commands are case sensitive and arguments must be separated by a single space. Commands must be entered as outlined here-in and end with a carriage return:

Serial/USB Port Commands

1. HELP Command

help

Description: Display all the command list definition available

Response: List all available commands

help –c <command>

Description: Help for a specific command

Response: List the specifics of the demanded command

2. RESET Command

reset –f

Description: Reset the unit and restore the default factory settings

Response: "ok"

3. STATUS Command

status

Description: Report current operation condition

Response:

```
"Master firmware version: x.x.x
User variable Version : 2
FPGA Version : RX 1.000 4
Status
 SDI MODE  :  3G SDI on 1 channel
 SDI ratio : 0
 SDI ref.  : 148.5  MHz
 SDI freq. : 148.505 MHz
 HDMI freq.: 148.504 MHz
```

4.   <u>VERSION</u> Command

version

Description: Report firmware version of the microcontroller

Response: "**Master firmware version: x.x.x"**

8.
Product Warranty Policy

Items Under Warranty - Company Policy

MuxLab guarantees its products to be free of defects in manufacturing and workmanship for the warranty period from the date of purchase. If this product fails to give satisfactory performance during this warranty period, MuxLab will either repair or replace this product at no additional charge, except as set forth below. Repair and replacement parts will be furnished on an exchange basis and will be either reconditioned or new. All replaced parts and products become the property of MuxLab. This limited warranty does not include repair services for damage to the product resulting from accident, disaster, misuse, abuse, or unauthorized modifications or normal decay of battery driven devices. Batteries, if included with the product, are not covered under this warranty.

Limited warranty service can be obtained by delivering the product during the warranty period to the authorized MuxLab dealer from whom you purchased the product, or by sending it to MuxLab. MuxLab will not accept any such product for repair without a Return Material Authorization number (RMA#) issued by its Customer Service Department and a proof of purchase date. If this product is delivered to MuxLab by mail, you agree to assume risk of loss or damage in transit, to prepay shipping charges to the warranty service location, and to use the original shipping container or equivalent.

THE ABOVE LIMITED WARRANTY IS THE ONLY WARRANTY COVERING YOUR MUXLAB PRODUCT. THERE ARE NO OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. SOME STATES DO NOT ALLOW LIMITATIONS ON IMPLIED WARRANTIES, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

IF THIS PRODUCT IS NOT IN GOOD WORKING ORDER, YOUR SOLE REMEDY SHALL BE REPAIR OR REPLACEMENT AS PROVIDED FOR ABOVE. IN NO EVENT SHALL MUXLAB BE LIABLE TO YOU FOR ANY DAMAGES, INCLUDING ANY LOSS OF PROFITS, LOST SAVINGS, OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OF OR INABILITY TO USE THIS PRODUCT, EVEN IF MUXLAB OR AN AUTHORIZED MUXLAB DEALER HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES; NOR WILL MUXLAB BE LIABLE FOR ANY CLAIM BY ANY OTHER PARTY. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR CONSUMER PRODUCTS, SO THE ABOVE LIMITATIONS OR EXCLUSIONS MAY NOT APPLY TO YOU. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS. YOU MAY ALSO HAVE OTHER RIGHTS WHICH MAY VARY FROM STATE TO STATE.

Warranty Periods

Any product found to be defective within three (3) months of invoice, including one (1) month shelf life, may be returned for replacement by a new unit or a satisfactory repair within one (1) month of receiving any returned product. The customer must provide MuxLab with the serial number and proof of purchase of the defective unit being returned. <u>All RMA's issued are subject to inspection by MuxLab,</u> and will be returned to customer if not properly packaged – units must be returned in original container or equivalent. MuxLab will not accept any such product for repair without an authorization from its Technical Support department and without an RMA# issued by MuxLab Customer Service department. For a credit & replace RMA, the customer will be liable to pay replacement invoice if defective products are not returned.

For Product more than six months old, including shelf life. The defective unit must be returned prepaid to MuxLab and then the unit will be repaired or if repair is not possible, replaced by an equivalent unit and returned to the customer within one (1) month of receiving any returned product. There is no charge for repair (parts and labor) during the full warranty period.

Items Defective and not under Warranty

For products which are no longer under warranty the policy is repair and return. An amount of 25% of the products published list price at the time of purchase will be charged. Customer must issue a purchase order to cover the cost of repair.

Each unit will be returned to the customer within one (1) month from receipt of the unit by MuxLab. The defective unit must be returned prepaid to MuxLab. The repaired unit will be returned to the customer FOB MuxLab. The repaired unit includes a 90 day warranty.

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