

# 6G-SDI EXTENDER OVER UTP

## 500730



## Installation Guide



P/N: 94-000764-A

SE-000764-A

**MuxLab**  
BROADCAST™

**Copyright Notice:**

Copyright © 2014 MuxLab Inc. All rights reserved.

Printed in Canada. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise without prior written permission of the author.

**Trademarks:**

MuxLab Broadcast is a registered trademark of MuxLab Inc.

## Table of Contents

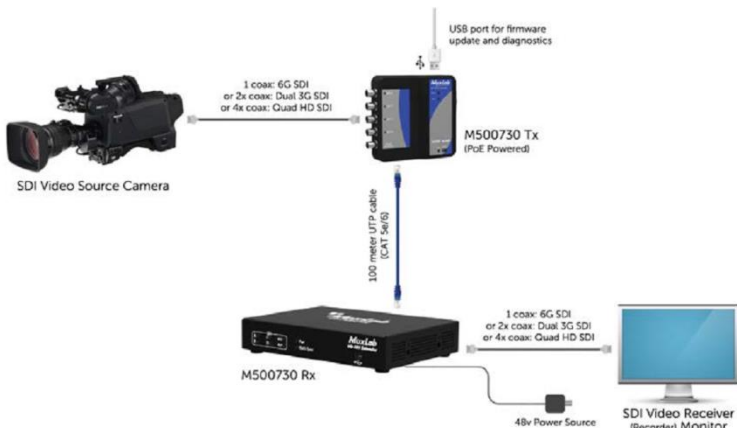
<b>1. Overview .....</b>	<b>4</b>
1.1. Description .....	4
1.2. Features .....	6
<b>2. Technical Specifications.....</b>	<b>7</b>
<b>3. Installation Procedure .....</b>	<b>9</b>
3.1. Parts List.....	9
3.2. Product Overview .....	10
3.3. Physical Installation .....	12
3.4. Installation & Power-up Procedure.....	13
3.5. Supported SDI Modes .....	14
3.6. Supported Video Modes.....	15
3.7. SDI Input Connection .....	16
3.8. SDI Output Connection .....	16
<b>4. Firmware Upgrade Procedure .....</b>	<b>17</b>
4.1. Firmware Upgrade Procedure.....	17
4.2. USB Driver Setup .....	20
<b>5. Unit Control and Status.....</b>	<b>23</b>
<b>6. Troubleshooting .....</b>	<b>24</b>
<b>7. Appendix .....</b>	<b>26</b>
A. ASCII Command Set .....	26
<b>8. Product Warranty Policy.....</b>	<b>29</b>

# 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 resolution with the added benefit of extending the Hi Resolution signal up to 330 feet (100M).

Standard Cat5e/6 UTP cable is used for the extension. The pair (Transmitter, Receiver) uses PoE for power and only requires the Receiver (Rx) side to be powered. The input source for the 6G-SDI Extender over UTP is either HD-SDI using four coax cables, 3G-SDI using two coax cables, and 6G-SDI using a single coax cable.



**Figure 1: System Overview**

Applications:

- Cinema recording
- Movie making
- Studio production
- News coverage / live reporting

## 1.2. Features

- Up to 330 feet (100m).
- HD-SDI using single, two or four coax cables, 3G-SDI using single or two coax cables, 6G-SDI using a single coax cable HDMI 3D support.
- Maximum resolution supported:  
4096x2160@24/25Fps, 3840x2160@30Fps
- 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  
Firmware is field upgradable.
- Automatic turn on of the long reach mode  
(150meters) when HD signal is detected.
- USB interface for field upgradable firmware and  
diagnostics.
- PoE to power the Transmitter .
- Ethercon connectivity and solid Aluminum  
enclosure for ruggedized use.
- Multiple 1/4"-20 threads for Camera mounting or  
equipment attachment.

2.

Technical Specifications

Specifications	
Environment	6G-SDI Digital Signal Transmission
Enclosures	Tx: 110mm (4.3”) x 110mm (4.3”) x 32mm (1.250”)
Measurements	Rx: 146mm (5.75”) x 105mm (4.13”) x 26mm (1.02”)
Color	Black Enamel (Rx Unit)
	Black Electrophoresis (Tx Unit)
Control	Serial Console Emulation with USB Interface
Compliance	FCC, CE, RoHS
Power	48VDC, 0.7Amp
	External Power Supply with US, UK and Euro blades

Table 1 - Specifications

Connectivity - Transmitter	
Front Side	4x BNC SDI Input Connectors (0.8V pp, 75Ohms) 1x BNC Sync Output Connector
Rear Side	1x RJ-45 Ethercon Connector (Compatible with NE8MC System)
Top Side	Mini USB for firmware updates (and control & status)

Table 2 – Connectivity Transmitter

Connectivity - Receiver	
Front Side	Mini USB for firmware updates (and control & status)
Rear Side	1x RJ-45/UTP Connector 4x BNC SDI Output Connectors (0.8V pp, 75Ohms) 1x BNC Sync Input Connector 1x Power Connector (5.5mm x 2.1mm)

Table 3 – Connectivity Receiver



## **3.** **Installation Procedure**

### **3.1. Parts List**

The 6G-SDI Extender over UTP Kit (500730) comes with the following parts:

- 1x Transmitter Unit (Tx)
- 1x Receiver Unit (Rx)
- 1x 48VDC Wall-mount Power Supply
- Blades for the Wall-mount Power Supply

## 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.

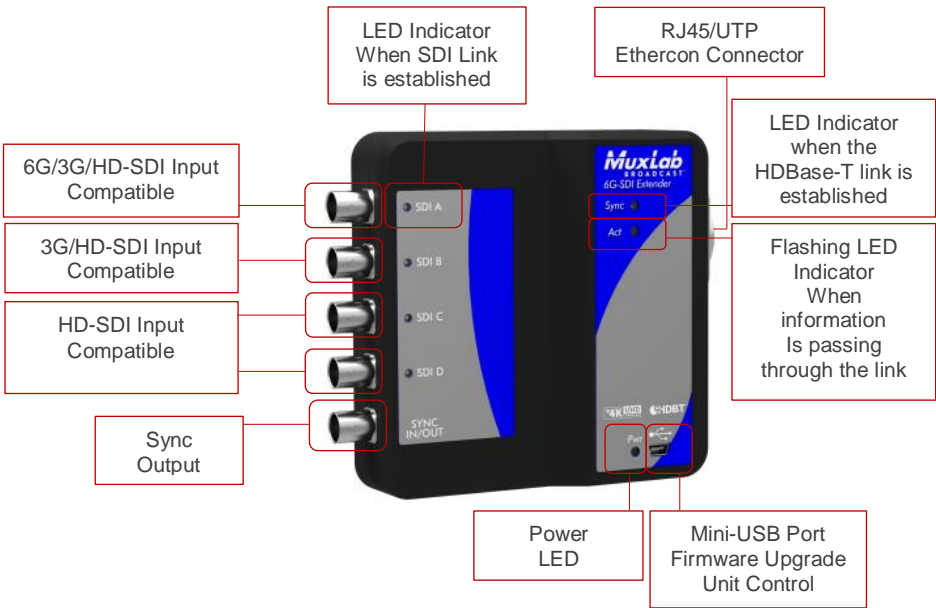


Figure 2: Front Transmitter Unit

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.

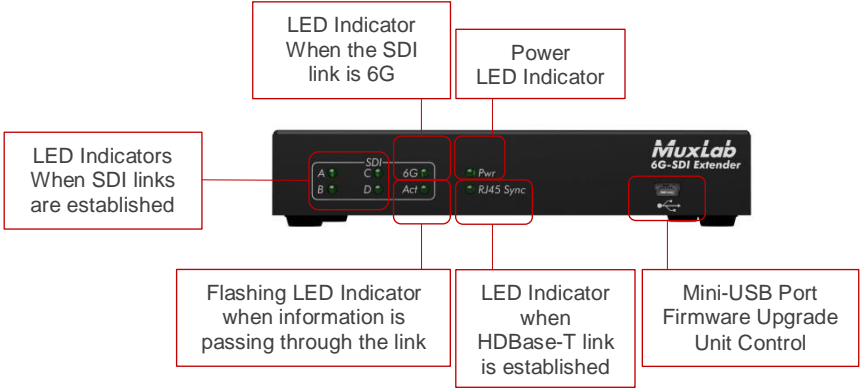


Figure 3: Front Receiver Unit

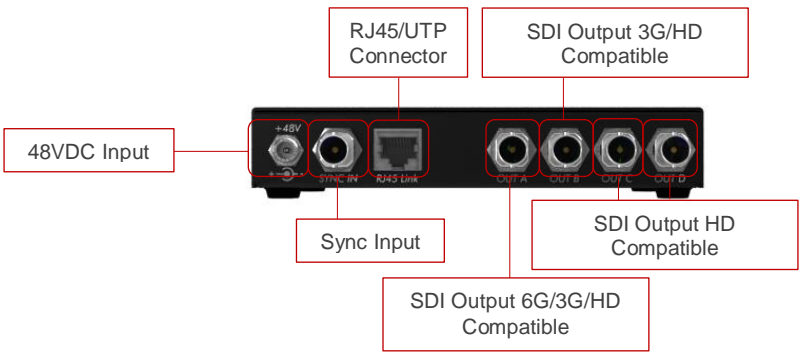


Figure 4: Rear Receiver Unit

### 3.3. Physical Installation

SOURCE INPUT (Camera, Etc)

Must use 6G/3G/HD 75Ω graded coax cable  
In accordance with the SDI Throughput needed.

1 Channel  
6G/3G/HD-SDI

2 Channels 3G-SDI

4 Channels HD-SDI

Optional Sync Out



Connection to UTP  
Cable Cat5E/Cat6  
In order to maintain  
the specifications

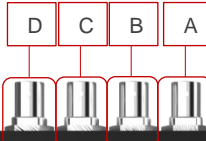


Important: Always Use SDI A, then B, etc... as first connection  
for any SDI transmission speed.

DESTINATION OUTPUT (Recorder, Monitor, Ect.)

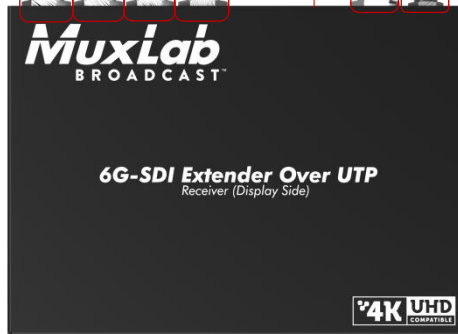
Must use 6G/3G/HD 75Ω graded coax cable  
In accordance with the SDI Throughput needed.

Connection to UTP  
Cable Cat5E/Cat6  
In order to maintain  
the specifications



Optional Sync In

48VDC Power Input



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

Recommended Coaxial Cable:  
RG-59 (HD-SDI) Belden 1505A  
RG-6 (3G/6G-SDI) Belden 1694A

### 3.4. Installation & Power-up Procedure

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

1. First, install the Transmitter unit by attaching it by its mounting holes or by other means close to the SDI generating source.
2. Then, connect the necessary number of SDI Compatible 75Ω Coax cable 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. When the Transmitter is installed and connected with the SDI coax cables then connect and run the UTP Cat5E or Cat6 to the receiver unit. (100m max for 6G/3G Signal and 150m max for HD Signal).
4. After hooking up the UTP cable to the RJ-45 port on the receiver unit. Connect the SDI coax cables from the unit to the destination device (e.g.: Recorder, Monitor, Capture card, Etc...)
5. Now that all the cabling is installed, the only thing left to do is to plug the 48VDC wall-mount power supply.
6. Each unit will power up then initialize itself. The receiver unit is supplying the transmitter through the UTP cable.
7. The next step is for the UTP link to connect, the link indicator on each unit will blink when the negotiation process will be over.
8. If the source is generating a video signal at the transmitter unit, then the receiver will output the same signal.

### 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	---	YES <sup>(1)</sup>	---	---	---
Single 3G-SDI	---	YES	---	---	YES <sup>(1)</sup>	---
Dual 3G-SDI	YES <sup>(1)</sup>	---	YES	---	---	---
Single HD-SDI	---	---	---	YES	---	---
Dual HD-SDI	---	YES <sup>(1)</sup>	---	---	YES	---
Quad HD-SDI	---	---	---	---	---	YES

**Table 4 – Supported SDI Modes Matrix**

Notes: <sup>(1)</sup> A terminal command needs to be performed in order to execute the ratio change (1:2 or 2:1) see Appendix for more information.

### 3.6. Supported Video Modes

SUPPORTED VIDEO MODES (10Bits Color)			
<b>HD (1.5GBits)</b>	720P50	720P59.94	720P60
<b>[4:2:2]</b>	1080i50	1080i59.94	1080i60
	1080PsF23.98	1080PsF24	1080PsF25
	1080PsF29.97	1080PsF30	1080P23.98
	1080P24	1080P25	1080P29.97
	1080P30	---	---
<b>3G (3GBits)</b>	1080P50	1080P59.94	1080P60
<b>[4:2:2]</b>	2Kx1556	2Kx1556	2Kx1556
	PsF23.98	PsF24	PsF25
Support HD Modes in [4:4:4]	2Kx1556P23.98	2Kx1556P24	2Kx1556P25
Support 3D Modes			
<b>6G (6GBits)</b>	3840x2160	3840x2160	3840x2160
	P23.98	P24	P25
<b>[4:2:2]</b>	3840x2160	3840x2160	4096x2160
	P29.97	P30	P23.98
Support 3G Modes in [4:4:4]	4096x2160	4096x2160	---
	P24	P25	

Table 5 – Supported Video Modes

### 3.7. SDI Input Connection

<b>SDI, Input BNC Connector (Transmitter)</b>				
<b>Input Modes</b>	<b>SDI A</b>	<b>SDI B</b>	<b>SDI C</b>	<b>SDI D</b>
<b>Single 6G-SDI</b>	Link A	---	---	---
<b>Single 3G-SDI</b>	Link A	---	---	---
<b>Dual 3G-SDI</b>	Link A	Link B	---	---
<b>Single HD-SDI</b>	Link A	---	---	---
<b>Dual HD-SDI</b>	Link A	Link B	---	---
<b>Quad HD-SDI</b>	Link A	Link B	Link C	Link D

**Table 6 – SDI Input Connections Matrix**

### 3.8. SDI Output Connection

<b>SDI, Input BNC Connector (Receiver)</b>				
<b>Input Modes</b>	<b>SDI A</b>	<b>SDI B</b>	<b>SDI C</b>	<b>SDI D</b>
<b>Single 6G-SDI</b>	Link A	---	Link A'	---
<b>Single 3G-SDI</b>	Link A	---	Link A'	---
<b>Dual 3G-SDI</b>	Link A	Link B	Link A'	Link B'
<b>Single HD-SDI</b>	Link A	---	Link A'	---
<b>Dual HD-SDI</b>	Link A	Link B	Link A'	Link B'
<b>Quad HD-SDI</b>	Link A	Link B	Link C	Link D

**Table 7 – SDI Output Connections 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 USB device driver has been installed (see section 4.2 for more details)
2. Download the latest version of the firmware upgrade on 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 1.x.x

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

Checking product ..... RX OK
Muxlab 6G SDI EXT DRAKONDIA-B RX
>>
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 unit (Rx & Tx) should be as follow 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. After completion, firmware will 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, or Windows 8 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 have to be uncompressed before using it.

Plug the USB cable between the device and the PC, and power up the device. The **Found New Hardware** wizard will open (Figure 13). Select **Locate and install driver software (recommended)**.



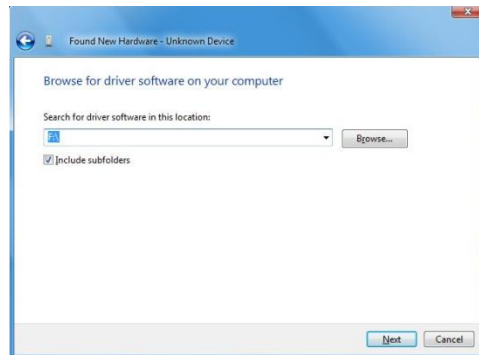
Figure 3: Found New Hardware Wizard

A new dialog box will open (Figure 14). Select **Browse my computer for driver software (advanced)**.



**Figure 4: Found New Hardware Dialog Box**

Another dialog box will open (Figure 15). Click **Browse** and locate the SC-000032-A USB to serial driver file downloaded earlier. Once found, click **Next**.



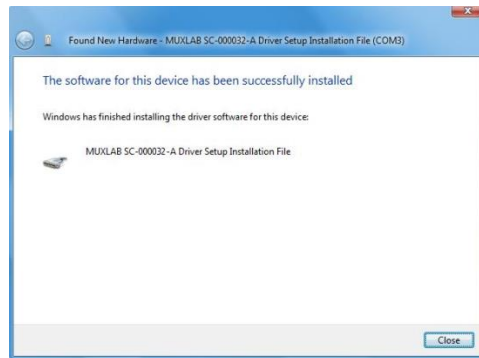
**Figure 5: Browsing for Unknown Device**

A security window will now appear, indicating that the driver software is unsigned (Figure 16). Select **Install this driver software anyway**.



**Figure 6: Windows Security**

A window will appear instructing that the software for the driver has been successfully installed (Figure 17). Click **Close**.



**Figure 7: 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.

## 6. 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
<i>No Power @ Transmitter</i>	<p>Verify the UTP Cable and connectors (The Tx unit is supplied through the UTP Cable)</p> <p>Make sure the Receiver unit is powered (The Tx unit is supplied through the UTP Cable by the receiver)</p>
<i>4K Misaligned Quadrant</i>	<p>Disorder in the SDI Links either at the receiver or transmitter. Check for inversion. (reboot the system when ordered properly)</p>
<i>No Link</i>	<p>Check the grade of the Cable (e.g.: Cat5e/6, Etc) the quality of the cable and connectors</p> <p>Verify that you have not exceeded the maximum length.</p>
<i>No SDI Link @ 3G/6G</i>	<p>Verify the quality of the cable and its connector used are the right grade to allow the transport of the bandwidth needed.</p> <p>Recommended Cable: RG-59 (HD-SDI) Belden 1505A – RG-6 (3G/6G-SDI) Belden 1694a</p>
<i>1x 6G-SDI to 2x 3G-SDI is not working</i>	<p>In order to transform 1x 6G link into 2x 3G link, or vice-versa, one of the unit needs to be programmed through the USB port. Only then, the 2:1 or 1:2 will work. (Refer to the appendix for more information). The default mode is 1:1.</p>



When contacting 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.: UTP and Coax at both end).
- Description of problem.
- List of tests performed.

# 7. 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 in the following way and ended 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. SDI Command

#### **sdi -r <1,2>**

*Description:* Set the ratio between the number of Input BNC versus the number of outputs BNC (see table 4 for details). This command is stored in NV memory and will remain valid after power cycle.

*Arguments:* <1,2> 1 = 1:1, 2 = 2:1 or 1:2

*Response:* “ok”

#### 4. STATUS Command

##### **status**

*Description:* Report current operation condition

*Response:*

```
"Master firmware version: x.x.x
User variable Version : 2
FPGA Version : RX 1.002 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

UTP version : 13090C10

UTP Bit Error Rate (10 exp -N) : (10=best, 0=worst )
Total : 10
Video : 0
Audio : 0
blank : 0
Ctrl  : 0

UTP lane Status ( lower number = better )
Lane [ 41 , 48 , 39 , 37 ]
Lane [ 34 , 39 , 31 , 29 ]
Lane [ 32 , 37 , 32 , 30 ]
Lane [ 35 , 42 , 31 , 30 ]

UTP operating mode : 6"
```

#### 5. VERSION 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. All R.M.A.'s issued are subject to inspection by MuxLab, and will be returned to customer if not properly package – units must be returned in original container or equivalent. MuxLab will not accept any such product for repair without an authorization for its Technical Support department and without a return authorization number issued by MuxLab Customer Service department. For credit & replace R.M.A., customer will be liable to pay replacement invoice if defective products are not returned.*

*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 has a 90 day warranty.*



MuxLab Inc.  
8495 Dalton Road  
Mount Royal, Quebec  
Canada H4T 1V5  
Tel.: +1 (514) 905-0588 Fax: +1 (514) 905-0589  
Toll Free (North America): 877 689-5228  
URL: [www.muxlab.com](http://www.muxlab.com)  
E-mail: [videoease@muxlab.com](mailto:videoease@muxlab.com)