

VGA 4x1 Switcher

500160 [110V], 500161 [220-240V]



Installation Guide

P/N: 94-000649-A SE-000649-A

MuxLab

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1. Overview

1.1. Description

The VGA 4x1 Switcher allows the user to select any one of up to four (4) VGA (RGBHV) sources for one (1) display via Cat 5e/6 cables for more cost-efficient cabling. The Switcher works in conjunction with the following MuxLab products:

500140: Active VGA Balun II Kit (Tx & Rx)

500141: Active VGA Balun II, Tx, no PSU

500142: Active VGA Balun II, Rx, no PSU

500144: Power Supply for 500141 and 500142

500150/500151: VGA 1x4 Distribution Hub

At least one (1) Kit is required to support one (1) source. The Kit includes one (1) Transmitter and one (1) Receiver. Up to three (3) additional Transmitters may be added to support up to three (3) additional sources. The 500144 may be needed for each the 500141 and the 500142 for extended distance.

1.2. Features

- Plug-and-Play: DDC1/DDC2 compliant
- Remote power pass-through
- Automatic port selection
- Manual port selection via infrared remote control, pushbutton, USB and RS232
- Up to 600 ft (183 m) via Cat 5e/6 @ 1920 x 1440
- Up to 600 ft (183 m) via Cat 5e/6 @ 1080p
- Cascadable up to four (4) levels
- Modular RJ45 on input and output
- Ground loop isolation on every port
- Works with Active VGA Balun II products (500140, 500141, 500142, 500144) and VGA 1x4 Distribution Hub (500150, 500151)
- Supports VGA and RGB/YPbPr

2. Technical Specifications

Environment	VGA, VESA VP&D 1.0, VIP ver 2.0 and DDC1		
Devices	PCs, laptops, CRT monitors, LCD monitors, plasma screens, DLP projectors.		
Transmission	Transparent to the user		
Bandwidth	Up to 280 MHz (1920 x 1440 resolution), 1080p		
Impedance: Video	Coax: 75 ohms UTP: 100 ohms		
Connectors	VGA Input (Cat 5e/6): Four (4) RJ45 shielded VGA Output (Cat 5e/6): One (1) RJ45 shielded USB and RS232 connectors for switcher control		
DDC Control	Transmits DDC control signals on pins 4&5 for plug-and-play operation		
Remote Power	Transmits remote DC power on pins 4&5		
Max Distance:	Tx Balun to Switcher: 150 ft (46 m)		
Remote Power	Switcher to Rx Balun: 150 ft (46 m)		
Max Distance:	640 x 480 (VGA):	1,000 ft (305 m)	1366 x 768 (WXGA): 850 ft (260 m)
VGA Source to Display	800 x 600 (SVGA):	1,000 ft (305 m)	1680 x 1050 (WSXGA): 850 ft (260 m)
<i>Switcher may be placed anywhere in between</i>	1024 x 768 (XGA):	1,000 ft (305 m)	1600 x 1200 (UXGA): 800 ft (245 m)
	1280 x 1024 (SXGA):	850 ft (260 m)	1920 x 1200 (WUXGA): 600 ft (180 m)
RJ45 Pin Configuration Reverse Polarity Sensitive <i>Use EIA/TIA 568A or 568B straight-through wiring</i>	<div> <div>Red..... Pin 7 (R) Pin 8 (T)</div> <div>Green..... Pin 3 (R) Pin 6 (T)</div> <div>Blue..... Pin 1 (R) Pin 2 (T)</div> <div>DDC/Remote Power..... Pin 4 (R) Pin 5 (T)</div> </div> <div> </div>		
Gain Adjustment	Gain compensation rotary switch and a potentiometer for equalization		
Software	Includes USB flash drive containing port control software		
LED Indicators	Auto: One (1) amber LED Power: One (1) green LED Link: Four (4) amber LEDs Select: Four (4) green LEDs		
Cable	Cat 5e/6 unshielded twisted pair (or better)		
Ground Loop Isolation	Ground loop isolation on every port. -2VDC to +3VDC between PC and display ground		
Power Supply	110-240V/12VDC/3.35A. Detachable AC power cords included 12VDC power jacks		
Temperature	Operating: 0°C to 40°C Storage: -10°C to 70°C Humidity: Up to 95% non-condensing		
Enclosure	Black. ABS fire retardant plastic		
Dimensions	6.00" x 4.25" x 1.50" (15.3 cm x 10.8 cm x 3.8 cm)		
Weight	2.4 lbs (1.1 kg)		
Regulatory	FCC Class A, CE, RoHS		
Warranty	Two (2) years		
Order Information	500160: VGA 4x1 Switcher, 110V 500161: VGA 4x1 Switcher, 220-240V		

3. **Installation Procedure**

3.1. Parts List

The VGA 4x1 Switcher (500160, 500161) comes with the following parts:

- Base Unit
- One (1) External Power Supply
- One (1) AC Power Cord (North American or Continental Europe)
- One (1) Infrared Remote Control
- One (1) Battery for Infrared Remote Control
- One (1) USB Type A-Type B Cable
- One (1) USB flash drive with Port Control Software
- Installation Guide

Please verify that all pieces are present before proceeding.

VGA, RS232 and Cat 5e/6 cables are not included. The driver setup installation file (SC-000020) and the MuxLab Control Center software (SC-000015) are located on the USB flash drive and can also be downloaded at <http://www.muxlab.com>.

3.2. Product Overview

The external connections and diagnostic indicators of the VGA 4x1 Switcher are detailed in the following diagrams. Please familiarize yourself with them before installing the components.

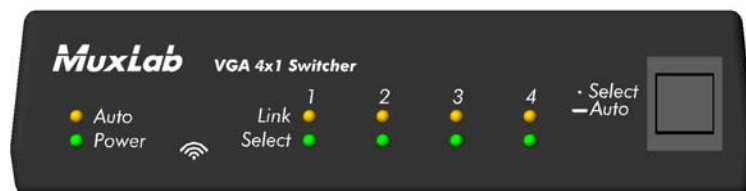


Figure 1: Front End Panel

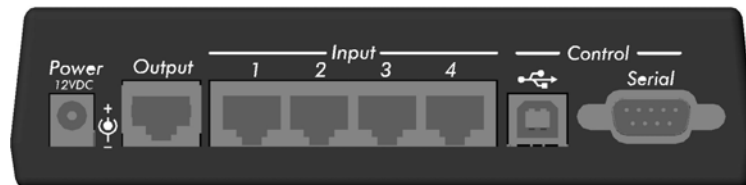


Figure 2: Rear End Panel

3.3. Pre-Installation Checklist

The VGA 4x1 Switcher works in conjunction with the Active VGA Balun II Kit (500140), the Active VGA Balun II Transmitter (500141), the Active VGA Balun II Receiver (500142), and Balun Power Supply (500144).

1. Verify that you have all the components necessary to install the complete system and determine the final location for each piece of equipment.
2. One (1) Kit (500140) is needed to support the first source. Each Kit includes one (1) Transmitter (500141), one (1) Receiver (500142), and two (2) Power Supplies (500144).
3. One (1) additional Transmitter (500141) is required for each additional source.
4. Consult the Technical Specifications to determine whether the Switcher and Active VGA Balun II components are within MuxLab distance limitations for Remote Power. If so, only the Switcher needs to be powered.
5. If extended distance is required beyond the limits of Remote Power, verify that each Active VGA Balun II component is powered by its own power supply. Additional 12VDC/0.5A Balun Power Supplies (500144) may be ordered from your MuxLab distributor.

6. Verify that the screen resolution and cable lengths are within MuxLab specifications (see Technical Specifications).

3.4. Installation Procedure

In order to install the VGA 4x1 Switcher, please follow the steps below:

1. Install the VGA 4x1 Switcher in its final location.
2. Connect an Active VGA Balun II Transmitter to each VGA source. If there are any local monitors, connect them to the Local Monitor Output of the associated Active VGA Balun II Transmitter via a VGA cable (not included).
3. If the distance exceeds the MuxLab specification for remote power, connect a Power Supply (500144) to the Active VGA Balun II Transmitter. The green power LED should be ON.
4. Connect a length of Cat 5e/6 (or better) UTP cable between the each Active VGA Balun II Transmitter and the VGA 4x1 Switcher.
5. Connect an Active VGA Balun II Receiver to the display.
6. If the distance exceeds the MuxLab specification for remote power, connect a Power Supply (included with the Active VGA Balun II Kit) to the Active VGA Balun II Receiver. The green power LED should be ON.

7. Connect a Cat 5e/6 (or better) UTP cable between the VGA 4x1 Switcher and the Active VGA Balun II Receiver.
8. The Active VGA Balun II features a gain compensation rotary switch and a potentiometer for equalization. For more information, please refer to the Active VGA Balun II Installation Guide.
9. The factory default setting of the switcher upon power-up is automatic port selection mode. To select a port manually, press the push button until the **Select** LED of the desired port is illuminated. To switch back to automatic mode, hold the pushbutton down for 3 seconds. The amber **Auto** LED will again be ON.
10. Assemble the infrared remote control as shown in Figure 3. To manually select the desired port with the infrared remote control, press the numbered buttons. To switch back to automatic mode, press the **Auto Mode** button.

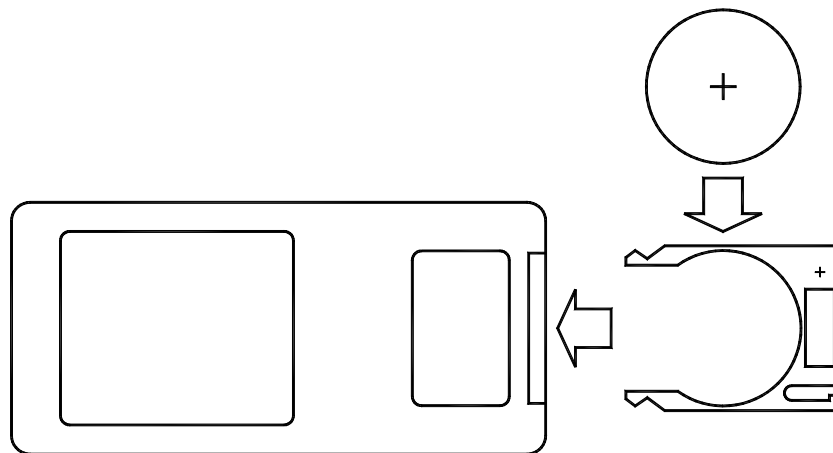


Figure 3: Infrared Remote Control Assembly

11. In order to control the Switcher via USB, connect the USB cable between the Switcher and the PC. Similarly, to control the Switcher via RS232, connect an RS232 cable (not included) between the Switcher and the PC. Refer to Section 3.6 for the RS232 cable configuration. Note: Connect only a USB cable *or* an RS232 cable (not both) between the Switcher and the PC.
12. Figure 4 shows a typical configuration.

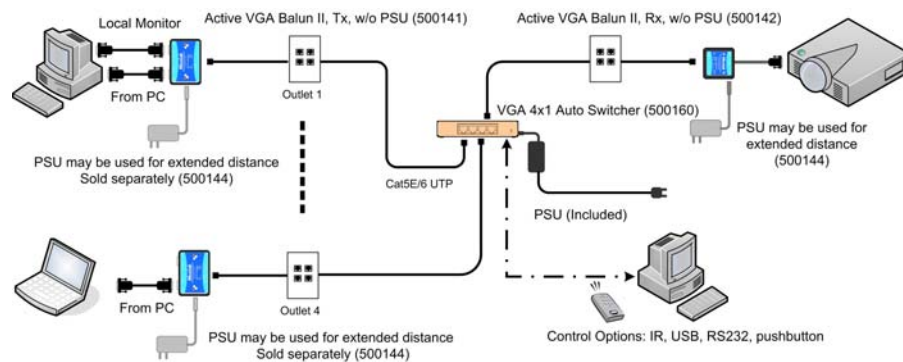


Figure 4: Typical Configuration

3.5. Cascadability

In order to distribute from one (1) of up to four (4) VGA sources to more than one (1) display, the VGA 4x1 Switcher may be cascaded with up to three (3) levels of the VGA 1x4 Distribution Hub. In other words, any one of up to four (4) VGA sources may be selected to feed up to sixty-four (64) displays. For illustration purposes, Figure 5 shows one (1) level of cascading for up to four (4) displays.

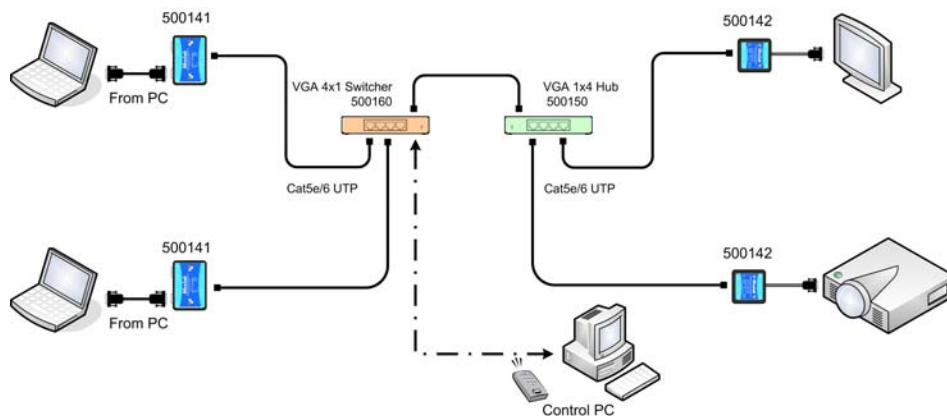


Figure 5: Cascading Illustration

3.6. Port Control Operation

The VGA 4x1 Switcher features built-in firmware that allows commands from an ASCII terminal to be sent directly to the device via either a USB or RS232 connection (not both simultaneously). If connecting with an RS232 cable, ensure that the cable has the straight-through configuration shown in Figure 6.

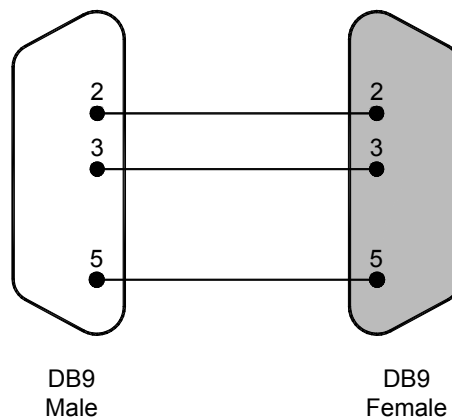


Figure 6: RS232 Cable Configuration

Port Control is performed with either the MuxLab Control Center software, described in Section 3.7, or with a terminal emulator such as the one available under Windows with the ASCII Command Set described in Appendix A. Please note that USB to RS232 converter cables are not supported.

3.7. Driver Setup

When interfacing a MuxLab device with Windows 2000 (or more recent) operating system, a driver setup file will be required.

To install the MuxLab Control Center software, insert the USB flash drive into the PC. Plug the USB cable between the device and the PC, and power up the device. The **Found New Hardware** wizard will open (Figure 7). Select **Locate and install driver software**.



Figure 7: Found New Hardware Wizard

A new dialog box will open (Figure 8). Select **Browse my computer for driver software**.

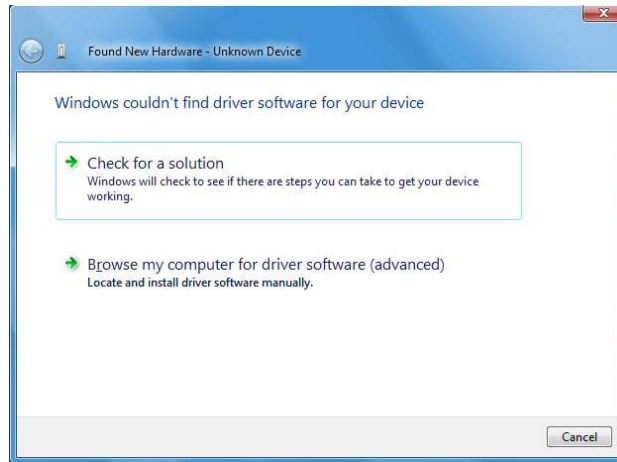


Figure 8: Found New Hardware Dialog Box

Another dialog box will open (Figure 9). Click **Browse** and locate the USB flash drive. Once found, click **Next**.

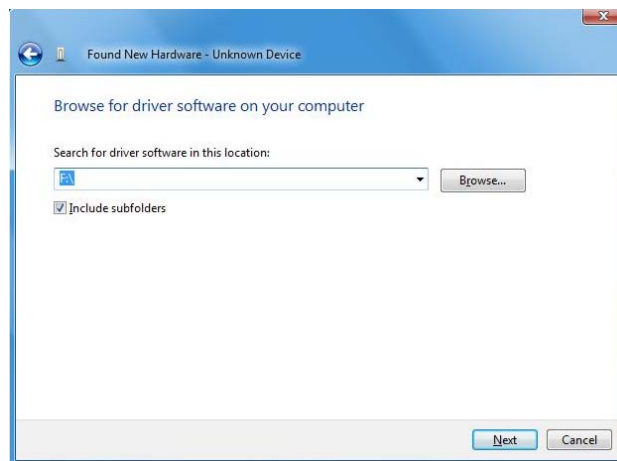


Figure 9: Browsing for Unknown Device

A security window will now appear, indicating that the driver software is unsigned (Figure 10). Select **Install this driver software anyway**.



Figure 10: Windows Security

A final window will appear indicating that the software for the driver has been successfully installed (Figure 11). Click **Close**. You are now ready to launch the MuxLab Control Center software.

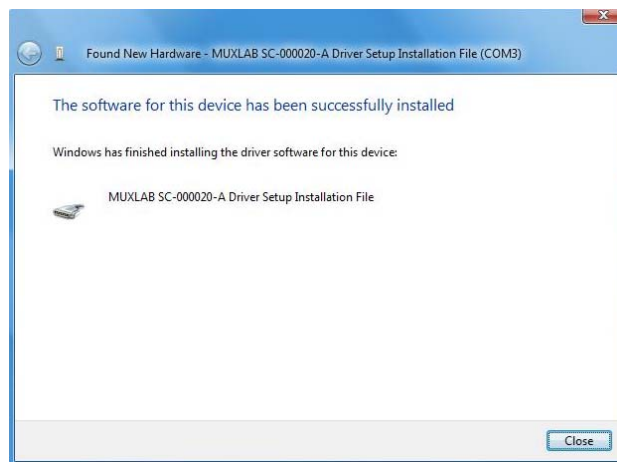


Figure 11: Successful Installation Dialog Box

3.8. MuxLab Control Center Software

MuxLab provides the user with software for operating the VGA 4x1 Switcher via a PC. Each Switcher has 4 input ports and 1 output port, and the MuxLab Control Center software enables the user to select which input port to feed to the output port.

To install the MuxLab Control Center software, insert the USB flash drive into the PC, open the folder, and double click the SC-000015 file.

When running the MuxLab Control Center software for the first time, the main window will appear (Figure 12).

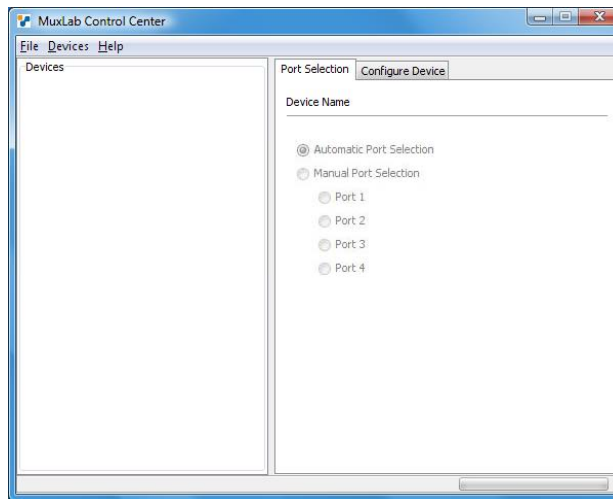


Figure 12: MuxLab Control Center Main Window

On the left is the **Devices** tree, and on the right are the **Port Selection** and **Configure Device** tabs. A device may be a Switcher (as in this case), or any other software-controllable MuxLab product. Depending on the type of device selected, the tabs on the right will change. For a Switcher, the **Port Selection** tab deals with the Switcher's input ports, and the way in which

they are selected to be fed to the output port. The **Configure Device** tab deals with naming a Switcher, along with each of its input ports, as well as the COM port on the PC to which the Switcher is connected.

Once all hardware has been connected, the user must perform the following three steps:

1. Load a device
2. Configure a device
3. Choose a port selection method for a device

1. Loading a Device

Loading a device consists of detecting a Switcher (or other software-controllable MuxLab product) connected to the PC. Loading can be done either automatically or manually. Once a device has been successfully loaded, it will be displayed in the **Devices** tree.

To load devices automatically, select **Devices>Load All Connected Devices...** (Figure 13).

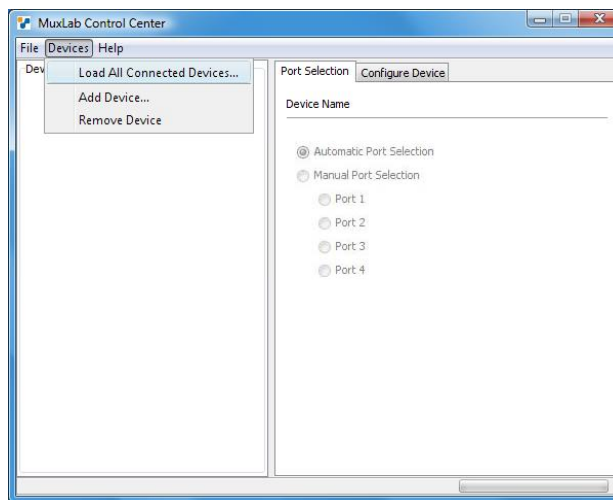


Figure 13: Loading All Connected Devices

Automatically loading a device detects the Switcher connected to a PC, as well as the COM port on the PC to which it is connected.

To load devices manually, select **Devices>Add Device...** This loads devices one at a time, and does not automatically detect the COM port on the PC to which the device is connected. This COM port assignment must be completed in the **Configure Device** tab. Until this assignment is completed by the user, the loaded device will appear in brackets as “offline” in the **Devices** tree.

2. Configuring a Device

Configuring a device consists of three operations:

- (i) Assigning a PC COM port to the device
- (ii) Naming the device
- (iii) Naming the four input ports on the device

To configure a device, select the device in the Devices tree and click the **Configure Device** tab (Figure 14).

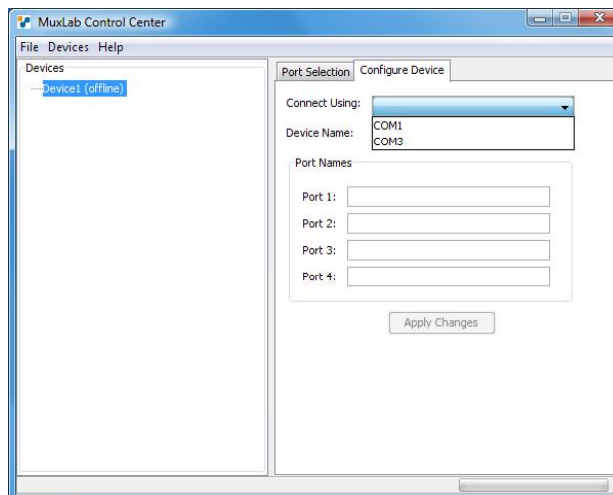


Figure 14: The Configure Device Tab

If a device has been loaded manually, a COM port on the PC must first be selected by clicking the down arrow next to **Connect Using**. The user can then select a COM port and finalize this choice by clicking on the **Apply Changes** button. Once this is done, other fields will no longer be grayed out, and the user can proceed to name (or rename) a device and its four input ports.

3. Choosing a Port Selection Method

Once a device has been loaded and configured, it can be controlled by the user via the **Port Selection** tab. This consists of selecting which of a device's four input ports, each assigned a unique number from 1 to 4, will be fed to the device's output port. Port selection can be done either automatically or manually:

Automatic Port Selection chooses the lowest numbered *connected* input port on a device to feed to its output port. For example, if all 4 input ports on a device are connected to sources, Automatic Port Selection will feed input port 1 on the device to its output. If input port 1 were then to be disconnected from its source, Automatic Port Selection would feed input port 2 on the device to its output. If only input ports 3 and 4 are connected to sources, Automatic Port Selection would feed input port 3 on the device to its output.

Manual Port Selection leaves the choice of which input port on a device to feed to its output entirely up to the user. In fact the user can choose to feed an input port *with no signal* to the output port of a device. Please note that when no signal is detected at an input port, the expression **(No Signal Detected)** will be appended to that port's name (Figure 15).

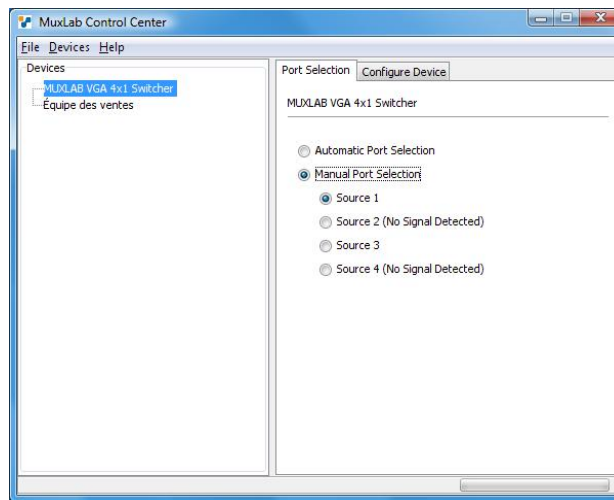


Figure 15: The Port Selection Tab

4. 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	LEDs	Probable Cause	Possible Solution
No Image	Power: OFF	No power	<ul style="list-style-type: none"> • Check power connections
No Image	Power: ON Auto: ON/OFF Associated Sync: OFF Associated Select: OFF	Wiring	<ul style="list-style-type: none"> • Check continuity • Check correct wiring • Check cabling
No Image	Power: ON Auto: OFF Associated Sync: ON Associated Select: OFF	Wrong port selected	<ul style="list-style-type: none"> • Select port manually
No Image	Power: ON Auto: OFF Associated Sync: ON Associated Select: OFF	Wiring	<ul style="list-style-type: none"> • Check continuity • Check correct wiring • Check cabling
No Image	Power: ON Auto: OFF Associated Sync: ON Associated Select: OFF	Wrong port selected	<ul style="list-style-type: none"> • Select port manually • Unplug and replug all lower numbered ports
No Image	Power: ON Auto: ON Associated Sync: ON Associated Select: ON	Wiring	<ul style="list-style-type: none"> • Check continuity • Check correct wiring • Check cabling
Smearing	Power: ON	Cable length exceeded	<ul style="list-style-type: none"> • Reduce cable length • Adjust contrast and brightness
Ghosting	Power: ON	Impedance mismatch	<ul style="list-style-type: none"> • Check cabling • Try different VGA card or display
Wrong colors	Power: ON	Swapped pairs	<ul style="list-style-type: none"> • Check wiring
Loss of detail	Power: ON	Cable length exceeded	<ul style="list-style-type: none"> • Reduce cable length • Adjust contrast and brightness
Image shakes	Power: ON	Too much gain	<ul style="list-style-type: none"> • Adjust gain and equalization on Active VGA Balun II Receiver
Unable to open COM port	Power: OFF	No power	<ul style="list-style-type: none"> • Check power connections
Unable to open COM port	Power: ON	Wiring	<ul style="list-style-type: none"> • Check continuity • Check correct wiring • Check cabling
When typing ASCII commands, nothing appears	Power: ON	Wrong COM port setting Local echo is off	<ul style="list-style-type: none"> • Check that the terminal emulation program parameters match those listed in section 3.6 of this document • Enable local echo in terminal emulation software
When typing ASCII commands, weird characters appear	Power: ON	Wrong COM port setting	<ul style="list-style-type: none"> • Check that the terminal emulation program parameters match those listed in section 3.6 of this document

When contacting your nearest MuxLab dealer or MuxLab Technical Support (+1 514-905-0588), please have the following information ready:

- Unit model number.
- Cabling layout. Include model of source equipment and display used, cable length and type.
- Description of problem.
- List of tests performed.

5. Appendix

A. ASCII Command Set

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

BAUD Rate:	9600
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. Characters that are not supported will be rejected by the response: **ILLEGAL CHARACTER**. Commands must be entered in the following way and ended with a carriage return:

version

Description: Returns firmware version

Example: version

Arguments: [none]

Response: **Version X.X.X**

Example: Version 1.0.0

get {port number}

Description: Returns the port or device name

Example: get 2

Arguments: **port number**
Number of port in context
(1, 2, 3, 4 or 0 for the device name)

Response: **PORTX: YY..Y** or **DEVICE: YY..Y**
X Port number (1, 2, 3, or 4)
YY..Y Name (up to 20 characters long)

Example: PORT2: Office1

get state

Description: Returns current state of device

Example: get state

Arguments: [none]

Response: **STATE X PORT Y LINKS Z,Z..Z**
X M for manual, A for automatic
Y Port currently selected (1, 2, 3, 4 or
0 when no port is selected)
Z,Z..Z Port(s) detecting a link (1, 2, 3, or 4)

Example: STATE M PORT 2 LINKS 1,4

get

Description: Returns complete device configuration

Example: get

Arguments: [none]

Response: **Version V.V.V**

DEVICE: WW..W

PORT1: WW..W

PORT2: WW..W

PORT3: WW..W

PORT4: WW..W

STATE X PORT Y LINKS Z,Z..Z

WW..W Name (up to 20 characters long)

X M for manual, A for automatic

Y Port currently selected (1, 2, 3, 4 or 0 when no port is selected)

Z,Z..Z Port(s) detecting a link (1, 2, 3, or 4)

Example: Version 1.0.0

DEVICE: R&D SWITCHER

PORT1: JOHN'S PC

PORT2: MARK'S PC

PORT3: LAB PC

PORT4: PORT4

STATE M PORT 2 LINKS 1,4

set {port number} {name}

Description: Provides a port or the device with a name

Example: set 2 Office1

Arguments: **port number**
Number of port in context
(1, 2, 3, 4 or 0 to name the device)

name
The name (up to 20 characters long)

Response: **PORTX: YY..Y** or **DEVICE: YY..Y**
X Port number (1, 2, 3, or 4)
YY..Y Name (up to 20 characters long)

Example: PORT2: Office1

select {port number}

Description: Selects the appropriate port

Example: select 1

Arguments: **port number**
The port number to be selected
(1, 2, 3, 4, or a for automatic port selection)

Response: **PORT X SELECTED** or
AUTOMATIC MODE SELECTED
X Port currently selected (1, 2, 3, or 4)

Example: PORT 1 SELECTED

B. Infrared Remote Control Codes

Code (hex)	Identification
00	Auto Mode
0D	1
12	2
15	3
10	4

6. 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

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