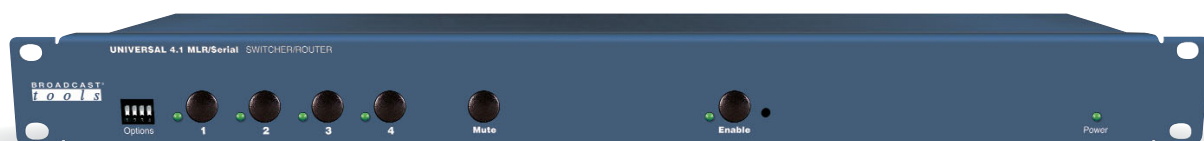# BROADCAST® tools INC

PROBLEM SOLVED

Installation and Operation Manual

Universal 4.1 MLR/Serial
Switcher/Router with Mechanical Latching Relays

NOTE: We recommend the use of Chrome, Firefox or Safari as your browser.

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INTRODUCTION

Thank you for your purchase of a BROADCAST TOOLS® UNIVERSAL 4.1 MLR/SERIAL transparent four inputs, single output switcher/router (referred to as the UNIVERSAL 4.1 MLR/SERIAL throughout this manual). We're confident that this product will give you many years of dependable service. This manual is intended to give you all the information needed to install and operate the BROADCAST TOOLS® UNIVERSAL 4.1 MLR/SERIAL.

SAFETY INFORMATION

Only qualified technical personnel should install the UNIVERSAL 4.1 MLR/SERIAL. Any attempt to install this device by a person who is not technically qualified could result in a hazardous condition to the installer or other personnel or damage to the UNIVERSAL 4.1 MLR/SERIAL or other equipment. Please ensure that proper safety precautions have been taken before installing this device. If you are unfamiliar with this type of equipment, please contact a properly qualified engineer to handle the installation and setup of the UNIVERSAL 4.1 MLR/SERIAL. Broadcast Tools, Inc., is unable to support NON-Broadcast Tools software, hardware or NON-Broadcast Tools computer/hardware/software problems. If you experience these problems, please research your hardware/software instruction manuals or contact the manufacturers technical support department.

WHO TO CONTACT FOR HELP

If you have any questions regarding your product or you need assistance, please contact your distributor from whom you purchased this equipment. If you would like more information about BROADCAST TOOLS® products, you may reach us at:

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THANK YOU FOR CHOOSING
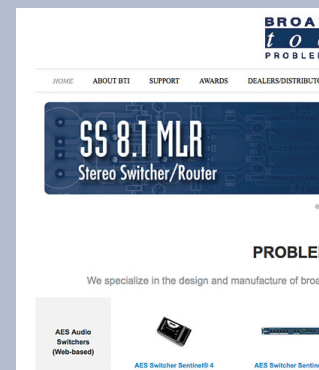***BROADCAST TOOLS® BRAND PRODUCTS!***

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Designed, Assembled and Supported in WA State, USA

INTRODUCTION

Product Overview

The Universal 4.1 MLR/Serial is a transparent four input, one output switcher/router with mechanical latching relays designed to pass AES/EBU digital audio or stereo analog audio signals. The Universal 4.1 MLR/Serial is perfect for all types of passive signal switching via front panel button, USB/RS-232 serial, and contact closures/logic remote control. The inputs and output feature stereo XLR and StudioHub+ compatible RJ45's connectors. Switching is accomplished via mechanical latching gold contact relays, which means that the unit can route a signal in either direction and will keep routing signal even after losing power. Due to the passive nature of the switching, any input level and impedance can be used. Inputs may be balanced or unbalanced, while output levels, impedance, distortion, noise and balancing will match that of the selected input.

Features/Benefits

• Front panel channel selection push buttons with active channel LED indicators.
• The "MUTE" function with LED indicator allows the user to turn off all audio to the output.
• Front panel Enable switch with enabled LED indicator can be configured to provide a safety lock to the front panel selection push buttons.
• Signal switching via mechanical latching sealed relays utilizing 2-form-C bifurcated – crossbar silver alloy with gold overlay contacts.
• USB and RS-232 serial interfaces for connection to control PC.
• Five input GPI port (PIP triggers or remote control)
• Four normally open relay contact closure outputs for remote channel status.
• Stereo XLR and StudioHub+ RJ45's connectors. The RJ45's conforms to the StudioHub+ wiring standard and passes "DC-LINK" power.
• Removable euro-block screw terminal connectors are used for remote control connections. Necessary mating plugs are supplied.
• If power is lost, the last selected channel is passed to the output.
• Fully RFI proofed.
• Surge protected internal power supply, 9 VDC universal switching power supply with domestic connector supplied. International connectors optional.
• Small 1-RU rack chassis.

Applications

Source switching; Studio selection and routing; Audio processing selection; Exciter input selection; Remote broadcast input selection; STL source selection; PA switching; IFB selection; Satellite audio channel switching and console monitor input and output selection.

Inspection

Please examine your UNIVERSAL 4.1 MLR/SERIAL carefully for any damage that may have been sustained during shipping. If any damage is present, please notify the shipper immediately and retain the packaging for inspection by the shipper. The package should contain the UNIVERSAL 4.1 MLR/SERIAL, a USB type A/B cable, a modular cable with 9-pin "S9" female D-sub adapter, and a 9 VDC wall transformer. Manuals may be downloaded from our web site.

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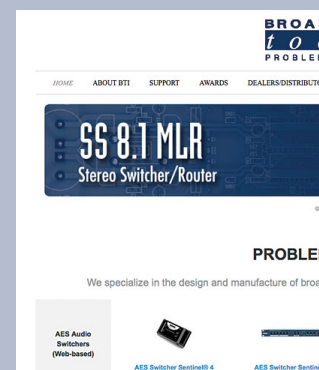
Installation

Surge Protection
The UNIVERSAL 4.1 MLR/SERIAL has built-in resistance to voltage changes; we recommend that you use a power surge protector or line conditioner on the incoming AC line. Lightning strikes and/or other high voltage surges may damage your UNIVERSAL 4.1 MLR/SERIAL and connected equipment if it is not properly protected. For lightning protection devices, check out www.polyphaser.com and www.itwlinx.com.

UPS Standby Power System
We recommend that you connect your UNIVERSAL 4.1 MLR/SERIAL to a UPS system. A UPS helps minimize the risk to the UNIVERSAL 4.1 MLR/SERIAL and provides power during a power outage.
NOTE: If power is lost, the last selected channel is passed to the output.

Installation/Operation

Front Panel Controls
The first four front panel push buttons represent the four inputs (1-4) that can be routed to the switcher's output, additionally there are mute and enable push buttons. Each push button has an associated LED indicator. When an input channel is selected its LED will light and the previously selected channel will turn off (interlock). Only one input can be routed to the output at a time. When the Mute button is pressed the switcher will deselect all inputs and stop routing audio, the Mute LED will light to indicate this state. The enable (safety) function can be turned on, which will require the user to hold down the Enable push button while selecting any of the other front panel push buttons, the enable LED is illuminated when this function is enabled.

SW7 Enable Configuration Switch:
IN = Front panel enable switch defeated.
OUT = Front panel ENABLE push button active and the Enable LED is illuminated.
NOTE: The enable push button must be held in to operate any of the other front panel push buttons and isn't associated with any of the remote-control functions.

LED indicators
  • "Power" LED: Illuminates when power is applied.
  • "Enable" LED: Illuminates when the front panel enable push button option is enabled.
  • Channel LEDs illuminate when the input channel is selected, the Mute LED is lit when the output is muted.

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INSTALLATION

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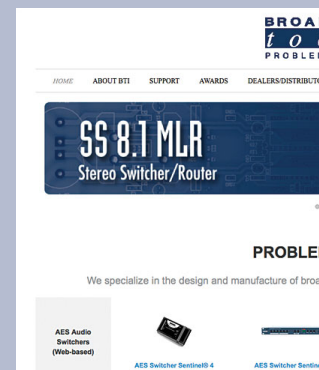
Power
Connect the 2.1mm coaxial barrel type power connector into the unit and the 9 to 12 VDC universal switching power supply with domestic connector into a 120 Vac 50-60 Hz power source. Never use any type of power supply other than the specified/supplied power supply.

USB Port
This type B USB port is used to connect the Universal 4.1 MLR/Serial to a computer's USB port using the supplied USB A/B cable. When you first plug the Universal 4.1 MLR/Serial into your PC, it should automatically install the correct FTDI USB Serial "Virtual COM port" driver which will allow you to access the Universal 4.1 MLR/Serial on a COM port. If the switcher is being used for RS-232 serial operation the USB connection should remain disconnected and driver installation is not necessary.

NOTE: If the Universal 4.1 MLR/Serial's FTDI USB Serial "Virtual COM port" drivers do not automatically install they may be downloaded by clicking on the "setup executable" link found here: http://www.ftdichip.com/Drivers/VCP.htm

RJ11 Serial Port:
This RJ-11 jack is used to connect the Universal 4.1 MLR/Serial to a computer's COM port for RS-232 serial operation using the included reverse modular cable with 9-pin "S9" female D-sub adapter. If the switcher is being used for USB operation this will remain disconnected.

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INSTALLATION

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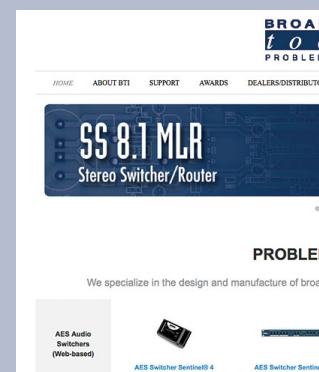
Audio Inputs and Outputs

Each of the Universal 4.1 MLR/Serials inputs and output have StudioHub+ compatible RJ45 jacks, and balanced stereo XLR jacks wired in parallel. This means that any input connector can route to any output connector, providing an easy way to interface between devices with different connectors without the need for custom cables.

Switching is accomplished via mechanical latching gold contact relays, which means that the unit can route a signal in either direction and will keep routing that signal even after losing power. Due to the passive nature of the switching, any input level and impedance can be used. Inputs may be balanced or unbalanced, while output levels, impedance, distortion, noise and balancing will match that of the selected input.

XLR Connector Pinout

The input and output XLR connector pinouts conform to 3-pin XLR wiring standards: Pin 1 = Ground. Pin 2 = Positive. Pin 3 = Negative.

RJ45 Pinout

The input and output RJ45 jacks conform to StudioHub+ wiring standards. Please use shielded twisted pair Cat5e or Cat6 cables and connectors (STP).

| Function:	Wire Pair:	RJ45 Pins:
Left+/AES+	White/Orange	1
Left-/AES-	Orange/White	2
Right+	White/Green	3
Right -	Green/White	6
n/c	White/Blue	5
GND*	Blue/White	4
15V-*	White/Brown	7
15V+*	Brown/White	8
GND	Shield	Shield

StudioHub+ Pinout:

* StudioHub+ "DC-LINK" allows +/-15 VDC and Ground to pass on pin 8, 7, and 4 (respectively) of the RJ45. These pins are connected in parallel across all RJ45s on the Universal 4.1 MLR/Serial.

For AES/EBU signals please use AES/EBU digital audio qualified cable.

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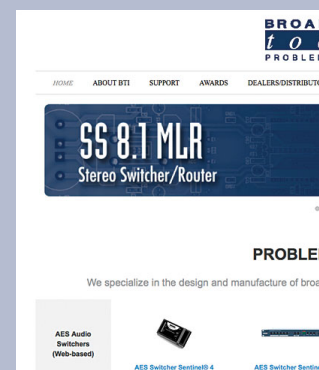
PIP (GPI)/Remote Control Inputs

The Universal 4.1 MLR/Serial has five remote control inputs that may be configured for PIP ("triggers") for use with automation systems or remote-control operation. The inputs accept momentary contact closures, or sustained if break before make; open collector or TTL/CMOS input logic levels.

The operation mode is set by the SW9-4 Dip-switch, when SW9-4 is OFF the unit is in remote control mode and when SW9-4 in ON the unit is in PIP mode.
For example, in Remote Control mode, pulsing the "I2" input to ground would switch Input 2 to the output of the Universal 4.1 MLR/Serial and remain switched that way until a front panel source switch is pressed, a different remote-control input is activated.

		Relay Outputs (Top row, TB1)			
I1 (Input 1)	I2 (Input 2)	I3 (Input 3)	I4 (Input 4)	Mute	Gnd (Ground)
		See Below (Bottom Row, TB1)			

Relay Outputs

The Universal 4.1 MLR/Serial has four normally open relay contact outputs that are used to indicate switch position. O1 indicates for Input 1, O2 indicates for Input 2, etc. The relay output for the selected channel will connect to the "Com" (common) terminal providing a return for an LED indicator, TTL/CMOS logic or relay.

		See Above (Top row, TB3)			
O1	O2	O3	O4	Com	Gnd
		Relay Outputs (Bottom Row, TB3)			

CAUTION!

Installation of the UNIVERSAL 4.1 MLR in high RF environments should be performed with care. The station ground should be connected to the chassis using a 20 to 24-gauge wire.
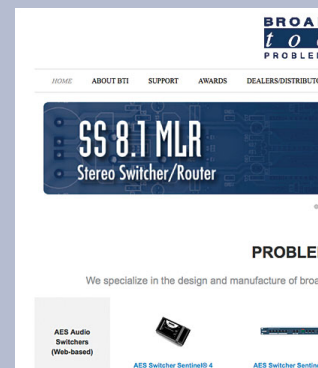
NOTE:

For wiring information, refer to the grids in this section of the manual, the silk-screen text on the rear panel of the product or the fractional schematic in the appendix.

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INSTALLATION

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Configuration Dip-switch Setup

Follow the tables below for SW9 dip-switch configuration options.

Unit ID	SW9-1	SW9-2
ID 0*	OFF	OFF
ID 1	ON	OFF
ID 2	OFF	ON
ID 3	ON	ON

Baud Rate	SW9-3
9600*	OFF
38400	ON

| Operation Mode	SW9-4
Remote Control *	OFF
PIP	ON

- Remote control operation mode: Pulse 1-IN to ground to select channel 1, pulse IN-2 to select channel 2, pulse IN-3 to select channel 3, pulse IN-4 to select input 4, pulse the "Mute" pin to turn off all channels.

- PIP mode: Activity on any of the PIP inputs will generate a serial status string in the PIP format. For use with automation software.

Note: **After changing any dip-switch, please repower the unit.**
Note: ***Denotes factory setting.**

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INSTALLATION
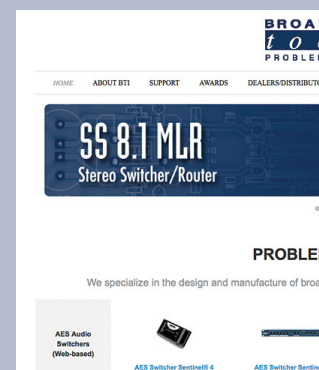
USB/RS-232 SERIAL SETUP
The Universal 4.1 MLR/Serial can be connected to your computer for control by one of two interfaces; USB or RS-232 serial. USB and serial cables are supplied with the unit.

USB Control
Connect the supplied USB A/B cable from the "USB" jack on the Universal 4.1 MLR/Serial to a USB port on your PC. When you first plug the unit into your PC, it should automatically install the correct FTDI USB Serial "Virtual COM port" driver which will allow you to access the unit on a COM port. Once you've installed the driver, the Universal 4.1 MLR/Serial will be listed as "USB Serial Port" in device manager.

Start a serial terminal application like Tera Term, PuTTY or HyperTerminal configured for the USB COM port the Universal 4.1 MLR/Serial is assigned to at 9600 baud ,8, N, 1, flow control to NONE, Emulation set to ANSI, and local character echo enabled.

NOTE: If the Universal 4.1 MLR/Serial's FTDI USB Serial "Virtual COM port" drivers do not automatically install they may be downloaded by clicking on the "setup executable" link found here: http://www.ftdichip.com/Drivers/VCP.htm

RS-232 Serial Control
Connect the supplied reverse modular cable with 9-pin "S9" female D-sub adapter from the "RS-232" jack on the switcher to a RS-232 serial COM port on your PC.

Start a serial terminal application like Tera Term, PuTTY, or HyperTerminal configured for the COM port the Universal 4.1 MLR/Serial is connected to at 9600 baud ,8, N,1 flow control to NONE, Emulation set to ANSI, and local character echo enabled.

RJ-11 Adapter Pin	DB-9 Female Pin #	Product's point of view Function Name.
4	3	RS-232 Receive
3	2	RS-232 Transmit
2	5	Ground
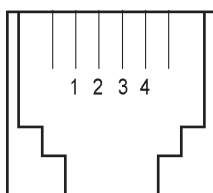
Modular Jack
Pin Numbers

Modular connector's point
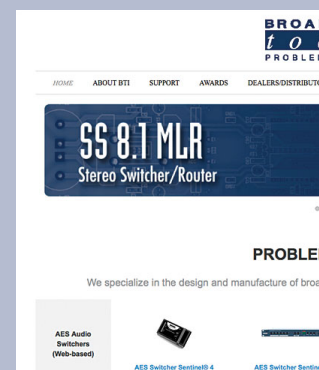
INSTALLATION

USB/Serial Control

The switcher may be controlled and monitored by the burst serial string commands listed below or by the embedded setup menu.

Command Key

Where: < * > Denotes start of string character
                < u > Unit ID (address, 0 through 3)
                < ii > Input channel (01, 02, 03, 04 or M (MUTE)).

Commands

*uii   Switch to input ii, 01-04.
                Command example: *004
                Response Example: S0A,0,0,0,1<cr><lf>

*uMA   Mute output.
                Command example: Mute output: *0MA
                Response Example: S0A,0,0,0,0<cr><lf>

*0MM   Go to setup menu. Only available for unit ID 0. See Menu
                Operation section of the manual for more information.
*POLL   Returns unit ID address in appropriate time slot.
*uSL   Seaudio status for all inputs: SuLo,x,x,x,x<CR><LF>
*uSPii   Sends PIP status for input ii: SuP,ii,x
*uSPA   Sends PIP status for all inputs: SuP,A,x,x,x,x<CR><LF>

*uU   Send firmware version.Response format:
                <product_name>_ver_<n.nn><cr><lf>
                Command example: *0U
                Response Example: U 4.1 MLR V:1.0<cr><lf>

*uY   Display configuration.
*uZx   Echo character x to serial control port - for debugging command
                strings
*uCEx   Enable error and good responses if x = Y (default N)
*uCDEF   Reset to factory defaults.
*uCLx   Lock front panel: x = L (Lock) x = U (Unlock)
*uCIIttt   Sets PIP minimum pulse length ttt: 000 - 255 => off to 2.55 seconds.
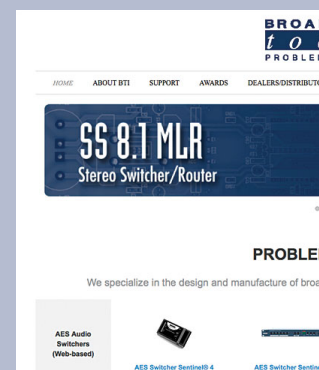*uCPS   Power up audio state: save power up state now
*uDxx   Delay xx seconds before processing next command.
 *uDLxxx   Delay xxx seconds before processing next command.

Menu Operation

```
Broadcast Tools(R) U 4.1 MLR, v1.0 - Setup Menu

1 - Set PIP Minimum Hold Time (0 - 2.55 sec) - Now:0.05
2 - Lock/Unlock Front Panel          - Now: UNLOCKED

S - Turn ON audio input
M - Turn OFF audio

V - Save Audio State for Power Up
C - Show Configuration and Status
F - Set Factory Defaults

Audio Status: Channel 1

Enter Selection, or Q to quit:
```
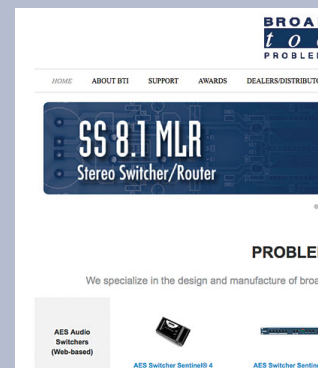
Type *0mm to access the setup menu. To select a menu function, simply enter the letter on the left side of the menu and wait for the prompt. Example: Type the letter "S" Response: Enter Input Channel: Entering a 1 would select channel 1.

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SPECIFICATIONS

Inputs/Outputs:	Any input level and impedance can be used. Inputs may be balanced or unbalanced. Output levels, impedance, distortion, noise and balancing will match that of the selected input.
Switching Method:	Passive. Mechanical latching sealed relays utilizing 2-form-C bifurcated-crossbar silver alloy with gold overlay contacts.
Operation Control:	Front Panel - Momentary switches. Remote - Momentary or sustained, compatible with 5 volts CMOS/TTL logic, open collector or contact closures to ground.
Status:	Front Panel - LED Indicators. Remote – Four channel relay status output contacts. 30 VDC @ 1 amp maximum.

CAUTION! For safety, never connect 120 Vac circuits to the relays!

Interfacing:	Audio I/O- balanced stereo XLR, balanced stereo ¼" TRS and StudioHub+ RJ45 connectors. Remote control - Rear panel pluggable screw terminals. Mating connectors supplied.
Power Requirements:	7.5 to 12 VDC @ >500 ma. Center positive. Universal switching power supply with domestic connector supplied. International connectors optional.
Physical Dimensions:	19.00" x 4.00" x 1.75" (WDH), 1-RU rack mount painted aluminum chassis.
Weight:	2.0 lb.
Shipping Weight:	3.0 lb.

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SPECIFICATIONS

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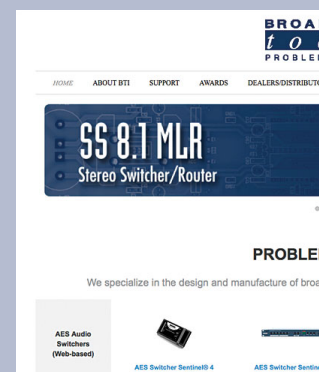
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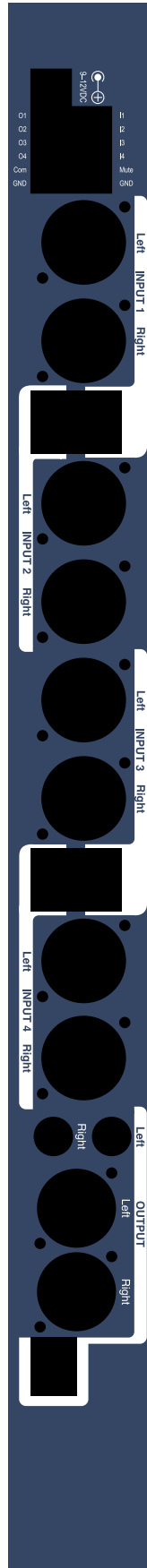
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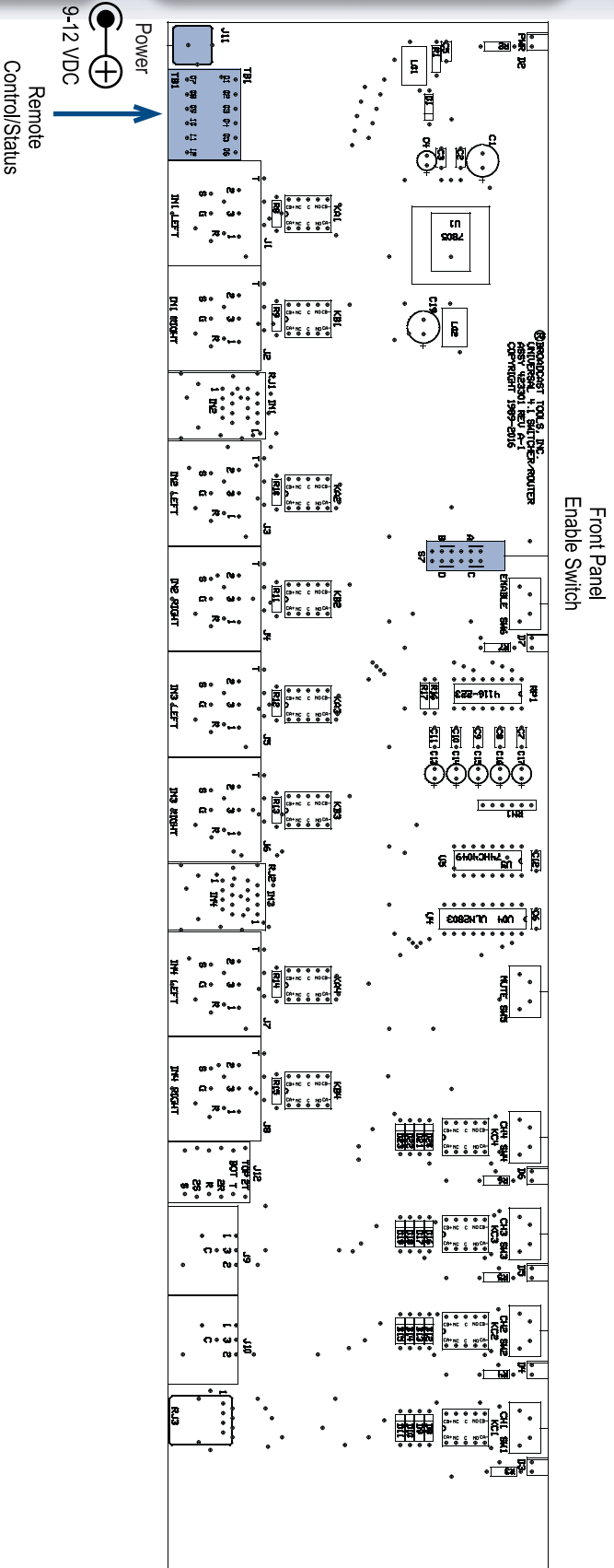
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www.broadcasttools.com **website**

BROADCAST tools

UNIVERSAL 4.1 MLR SWITCHER/ROUTER

1
2
3
4

Mute

Enable

Power

9-12VDC

O1
O2
O3
O4
Com
GND

I1
I2
I3
I4
Mute
GND

INPUT 1   Left   Right

INPUT 2   Left   Right

INPUT 3   Left   Right

INPUT 4   Left   Right

OUTPUT   Left   Right   Left   Right

Universal 4.1 MLR

Component Layout

Power

9-12 VDC

Remote
Control/Status

Front Panel
Enable Switch

Fractional Schematic