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INC

PROBLEM SOLVED

Installation and Operation Manual

SS 4.1 MLR/RJ
RJ45 Audio Switcher/Router with Mechanical Latching Relays

Manual update: 6/8/2020
If you need a firmware upgrade, contact Broadcast Tools®

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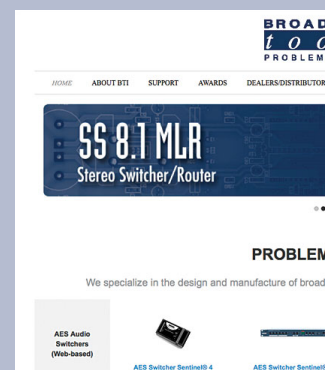
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e-mail: support@broadcasttools.com   voice: 360.854.9559   fax: 866.783.1742

INTRODUCTION

Thank you for your purchase of a Broadcast Tools® SS 4.1 MLR/RJ transparent four input, one output switcher/router (referred to as the SS 4.1 MLR/RJ 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® SS 4.1 MLR/RJ.

SAFETY INFORMATION

Only qualified technical personnel should install the SS 4.1 MLR/RJ. 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 SS 4.1 MLR/RJ 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 SS 4.1 MLR/RJ. 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:

Broadcast Tools, Inc.
131 State Street
Sedro-Woolley, WA 98284-1503 USA
Voice: 360.854.9559
Fax: 866.783.1742

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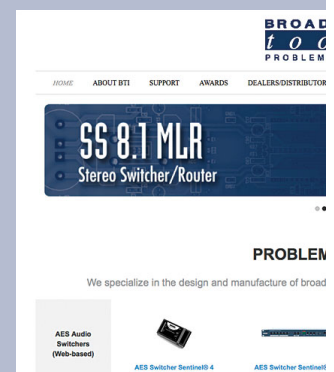
NOTE:

This manual should be read thoroughly before installation and operation.

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Product Overview

The SS 4.1 MLR/RJ is a transparent four input, one output RJ45 audio switcher/router with mechanical latching relays. The SS 4.1 MLR/RJ is perfect for all types of passive signal switching via front panel switches, contact closures and/or serial RS-232. The switching is accomplished with mechanical latching gold contact relays, which means that the unit can route a signal in either direction and it 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. The SS 4.1 MLR/RJ can be controlled and monitored locally and/or with simple contact closures to ground, as well with multi-drop RS-232 serial commands.

Features/Benefits

- Front panel input channel selection push buttons with active channel LED indicators.
- Front panel "Mute" switch, with LED indicator, to turn off all audio to the output.
- Front panel "Enable" switch, with LED indicator, can be configured to provide a safety lock to the front panel selection push buttons.
- Audio/signal switching via mechanical latching sealed relays utilizing 2-form-C bifurcated - crossbar silver alloy with gold overlay contacts.
- Four shielded RJ45 audio input jacks and one shielded RJ45 audio output jack.
- Removable euro-block screw terminal connectors are used for remote control connections. Necessary mating plugs are supplied.
- Internal silence sensor with front panel LED indicator, SPST silence sensor alarm relay, and adjustable alarm delay and restore duration.
- Eight input GPI port (PIP or Remote Control) with LED indicator.
- Remote control via contact closures, 5-volt TTL/CMOS logic levels and/or the multi-drop RS-232 serial port.
- Four open collector outputs for remote channel status.
- Power-up selection of inputs to outputs, mute or last source selected.
- If power is lost, the last selected channel is passed to the output.
- Fully RFI proofed.
- Surge protected internal power supply, universal switching power supply with domestic connector supplied. International power supply optional.
- Up to three units may be mounted on the optional RA-1 rack shelf. Desktop and wall mounting is also possible.

Applications

Automation source switching with eight PIP/trigger inputs; Studio selection and routing; Audio processing selection; Exciter input selection; Remote broadcast input selection; STL source selection; Multiple station program on-hold and/or PA switching; EAS audio switching; ISDN or Phone hybrid feed selection; IFB selection; Satellite audio channel switching and console monitor input and output selection.

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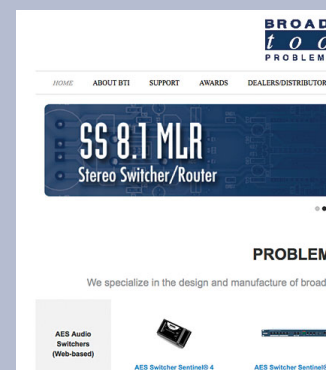
Inspection

Please examine your SS 4.1 MLR/RJ 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 SS 4.1 MLR/RJ, a modular cable with 9-pin "S9" female D-sub adapter, and a 7.5 to 12 VDC wall transformer. Manuals may be downloaded from our web site.

Installation
Surge Protection

The SS 4.1 MLR/RJ 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 SS 4.1 MLR/RJ 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 SS 4.1 MLR/RJ to a UPS system. A UPS helps minimize the risk to the SS 4.1 MLR/RJ and provides power during a power outage. **NOTE: If power is lost, the last selected channel is passed to the output.**

Installation/Operation
Input, Mute and Enable push buttons

Each of the four audio inputs and mute can be selected via its front panel push button labelled "1", "2", "3", "4", and "Mute" respectively. Each input push button has an associated LED indicator which will illuminate when the channel is selected. When an input channel is selected, the previous channel is deselected (interlock). The "Enable" (safety) push button can be enabled to 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, see page 9 for more information.

LED indicators

- "PWR" LED: Illuminates when power is applied and blinks when serial data is active.
- "PIP" LED: Flashes to indicate PIP/trigger activity.
- "SS": Silence Sensor indicator LED, lit when silence is detected (if enabled.)
- "Enable" LED: Illuminates when the front panel enable push button option is enabled.
- Channel ("1-4") and "Mute" LEDs: illuminate when the channel on or Mute is selected.

Power

Connect the 2.1mm barrel type center positive power connector into the unit and the 7.5 to 12 VDC 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.

Chassis Ground screw (CHS GND): The #6-32 sized chassis ground screw should be tied to the station (house) or system ground.
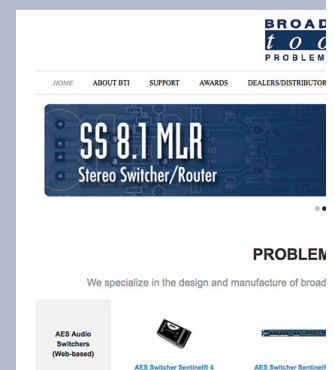
I/O Connections

The rear panel contains all the input, output, and remote control connectors. The multi-drop serial port is equipped with a modular RJ-11 jack and an "S9" modular to DB9 adapter/cable.

RJ45 Audio Inputs and Output

Input 1 RJ45	Input 3 RJ45	
Input 2 RJ45	Input 4 RJ45	Output RJ45

Input sources that are NOT selected are terminated with a 10K ohm resistor. If you do not require this load applied to the deselected sources, they may be removed from each channel. Each channel has a pair of resistors: channel 1 L & R = R30 & R31, channel 2 L & R = R32 & R33, channel 3 L & R, R34 & R35 and channel 4 L & R = R36 & R37.

If you are using the SS 4.1 MLR/RJ applications other than switching analog audio, the output Silence Sensor and ACT audio detection circuit should be disabled. To disable, remove the 1K ohm resistor network RP2 from its socket.

RJ45 Audio Cables

Please use shielded twisted pair Cat5e or Cat6 cables and connectors (STP) with the input and output RJ45 audio jacks.

RJ45 Audio Cat5 Pinout:

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
DC GND	Blue/White	4
n/c	White/Brown	7
n/c	Brown/White	8
Sig. Shield	Shield	Connector Shield
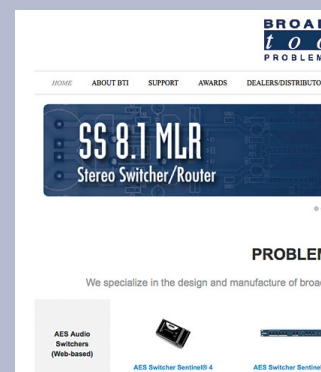
PIP Trigger/Remote Control Inputs

The SS 4.1 MLR/RJ interfaces to external equipment through removable euro-block screw terminals. The terminals accommodate wire sizes from 16 - 28 AWG solid or stranded wire. Before installing a wire, remove the euro-block screw terminal plug and turn each capture screw fully counterclockwise. Strip each conductor to a length of 0.25" and insert the conductor fully into the terminal. Turn the capture screw fully clockwise to secure the conductor.

The SS 4.1 MLR/RJ has eight status inputs that may be configured for PIP ("triggers") or remote control operation and accept momentary contact closures (or sustained, if break before make); open collector or TTL/CMOS input logic levels.

(Top row, TB3)
See Below

							GND
PIP1	PIP2	PIP3	PIP4	PIP5	PIP6	PIP7	PIP8
(IN-1)	(IN-2)	(IN-3)	(IN-4)	(Mute)	(Step)		(EAS)

PIP/Remote Control Inputs
(Bottom Row, TB3)

The PIP/remote control operation mode is set by the SW9-7 DIP-switch, when SW9-7 is OFF the unit is in remote control mode and when SW9-7 in ON the unit is in PIP mode. The PIP/remote control connections to the switcher are found on the bottom row of the connector TB3. Each channel may be selected by a momentary contact to ground. Each channel is pulled high (5-volts) through a 22K resistor.

In remote control mode the inputs are triggered by momentary closure to (pulse) to ground (low.) For example, pulsing the "MUTE" input to ground would turn off the output of the SS 4.1 MLR/RJ until a front panel source switch is pressed, a different remote control input is activated, the unit is powered up and/or a serial command is received from a PC or other serial device.

Pulsing the "STEP" input to ground will step the unit one source for each low to high transition on this input. Automatic timed sequencing may be accomplished by holding the step input low. The unit will now step to each source at a user programmable rate from 1 to 99 seconds (10 seconds by default). The last step channel is user programmable and is set to 4 by default. This feature may be used to sequence through multiple station air monitor signals for a program on-hold feed.

The SS 4.1 MLR/RJ is also capable of being used for EAS audio insertion via contact closure. This feature is enabled by setting the EAS controlled input channel via RS232 to the desired audio input channel (see the Serial Operation section of this manual for more information.) Once an input channel has been designated the SS 4.1 MLR/RJ will automatically switch to that input for the duration of a sustained closure to ground on the "PIP8/EAS" remote control input. When an EAS controlled input channel is configured PIP8 is not used for PIP triggers.
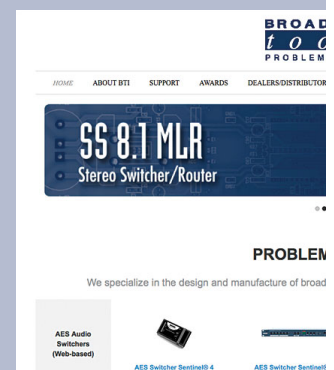
Open Collector and Silence Sense Relay Outputs

The SS 4.1 MLR/RJ has four open collector outputs that are used to indicate channel selection status. OC1 indicates for Input 1, OC2 indicates for Input 2, etc. The status open collector (OCx) output for the selected channel will go low to ground (GND) providing a return for an LED indicator, TTL/CMOS logic or relay. External pull-up resistors may be required in some installations. In addition to the open collector outputs located on TB3, the SPDT silence sense alarm relay contacts are also present, labeled SS-NC (normally closed), SS-NO (normally open) and SS-CM (common.)

(Top row, TB3)
Open Collector/Silence Sense Relay Outputs

OC1	OC2	OC3	OC4	SSNC	SSNO	SSCM	GND

See Above
(Bottom Row, TB3)

RS-232 Serial Port (RJ-11 Jack):

This RJ-11 jack is used to connect the SS 4.1 MLR/RJ 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 your PC does not have a built-in RS-232 serial port but does have USB, then a USB-to-serial adapter cable is a good way to add serial capability. We recommend USB-to-serial adapter cables that use the FTDI chipset and have had good results with the model "SBT-FTDI" from Sabrent.

CAUTION!

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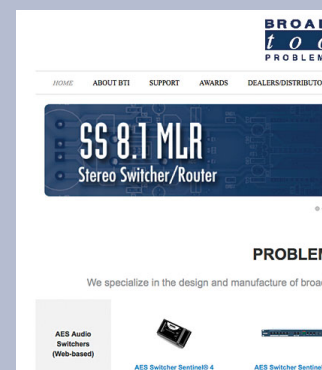
NOTE:

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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Configuration Jumpers

JP4:   Disabled = Front panel enable switch defeated. (Factory default)

Enabled = Front panel ENABLE push button active and the enable LED is illuminated.

NOTE: The enable push button must be held in/closed to operate any of the other front panel push buttons and isn't associated with any of the remote control functions.

Configuration DIP-switch Setup

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

Unit ID	SW9-1	SW9-2	SW9-3
ID 0 *	OFF	OFF	OFF
ID 1	ON	OFF	OFF
ID 2	OFF	ON	OFF
ID 3	ON	ON	OFF
ID 4	OFF	OFF	ON
ID 5	ON	OFF	ON
ID 6	OFF	ON	ON
ID 7	ON	ON	ON

Baud Rate	SW9-4	SW9-5
2400	ON	OFF
9600 *	OFF	OFF
19200	OFF	ON
38400	ON	ON

Power Up	SW9-6
User selected	ON
Last source selected *	OFF

Note: To select an input at power-up with SW9-6 ON, hold down the push-button for the desired input channel or mute until the front panel LEDs flash.

| Operation Mode	SW9-7
Remote Control *	OFF
PIP/Triggers	ON

• Remote control operation mode: Pulse 1-IN 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 "M-IN" (mute) pin to turn off all channels.

• PIP/Trigger 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 default setting.**
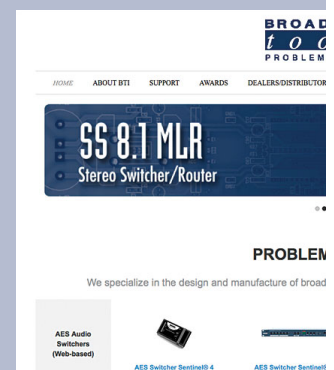
SERIAL OPERATION

RS-232 Serial Control
Connect one end of the modular cable to the RJ11 jack on the rear panel of the product and the other end to the RJ11 to the jack on the "S9" 9-pin female D-sub adapter. Connect the 9-pin female D-sub "S9" adapter to the COM port of the controlling PC. The default protocol is as follows: 9600, N, 8, 1 (other baud rates are user selectable). Select the desired unit ID address for each unit using the configuration DIP-switches, zero is the factory default setting. Never duplicate addresses.

Note: If your PC does not have a built-in RS-232 serial port but does have USB, then a USB-to-serial adapter cable is a good way to add serial capability. We recommend USB-to-serial adapter cables that use the FTDI chipset and have had good results with the model "SBT-FTDI" from Sabrent.

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

1 2 3 4
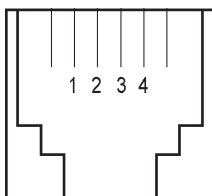
Modular Jack
Pin Numbers

CAUTION!

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NOTE:
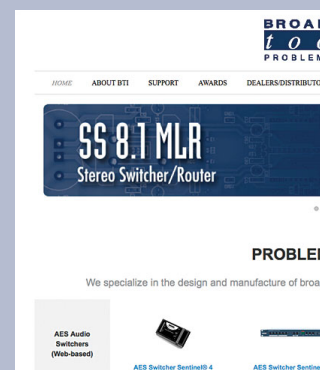
For safety, **DO NOT** *connect ...*

! TIP

Helpful tips area.

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Serial Commands

The switcher may be controlled and monitored by burst serial strings or by the embedded menu.

Where the   < * > Denotes start of string character
              < u > Unit ID (address, 0 through 7)
              < ii > Input channel (01, 02, 03, or 04).
              < o > Output channel (1)

|		
*uii -	Switch to input ii	
*uMA -	Mute output	
*0MM -	Go to setup menu, see menu operation section of the manual for more information. Unit ID 0 only.	

(NOTE: The setup menu times out after 60 seconds of keyboard inactivity).

Examples: *004   This string would turn on channel 4 for a switcher set to unit ID 0.
*0MM   Accesses the setup menu.

*POLL	Returns unit ID address in appropriate time slot.
*uSL	Sends audio 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>

*uSS	Sends status of silence sensor: SuS,a<CR><LF>
	a = 1 = not silent, 0 is silent
*uU	Sends unit firmware version: <name><version><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

*uCSLx	Sets silence sensor detection threshold to Off, -20, -25, -30 dB (0,1,2,3)
*uCSAtttt	Sets silence sensor acquire delay to tttt seconds (0, 2-255)
*uCSBtttt	Sets silence sensor restore delay to tttt seconds (0, 2-255)

*uCSCtt	Sets step interval in seconds 1-99 seconds.
*uCSSt	Sets last step channel 1-4 (0 disables step feature.)
*uCSEi	Sets EAS controlled input channel (i) to 1-4 or 0 for off. This allows you to assign one input channel that will be switched to with sustained closure to ground on the PIP8/EAS remote control input from an EAS encoder for EAS audio insertion with the SS 4.1 MLR/RJ.
*uDxx	Delay xx seconds before processing next command.
*uDLxxx	Delay xxx seconds before processing next command.
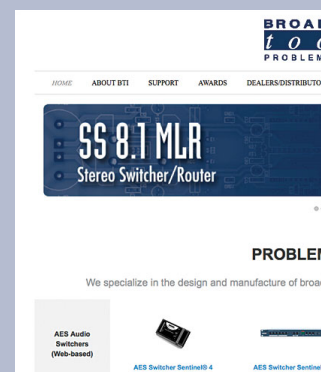
OPERATION

Menu Operation

```
Broadcast Tools(R) SS 4.1 MLR, v1.15 - Setup Menu

1 - Set PIP Minimum Hold Time(0 - 2.55 sec)     - Now:0.05
2 - Set Silence Sense Acquire Delay (sec)       - Now:  10
3 - Set Silence Sense Restore Delay (sec)       - Now:   2
4 - Set Silence Sense Threshold                 - Now:OFF
5 - Set Stepping Interval (sec 1-99)            - Now:  10
6 - Set Last Step Channel                       - Now:   4
7 - Lock/Unlock Front Panel                     - Now:UNLOCKED
8 - Set EAS Controlled Input                    - Now: Off


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:Present - Channel 1


Enter Selection, or Q to quit:
```
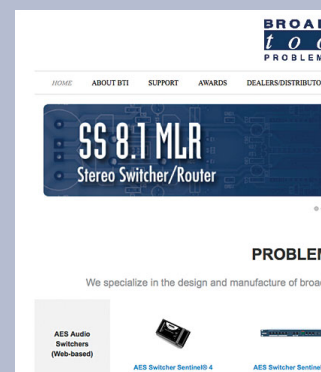
To enter menu mode send the command: *0MM

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 input channel one.

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.

Logic: Flash microprocessor with non-volatile memory.

Operation Control: Front Panel: Momentary switches.
Remote: Momentary or sustained, compatible with 5 volts CMOS/TTL logic, open collector or contact closures to ground.
Serial: Multi-drop RS-232, 2400, 9600, 19200, 38400 8,N,1.

Status: Front Panel: LED Indicators.
Remote: Four channel open collector status outputs. One SPST Silence Sense relay. 1-amp @ 30 VDC maximum. Refer to the fractional schematic and/or text on the rear panel for connection details.

Interfacing: Audio I/O: shielded RJ45 jacks.
Remote control: (2) 8-position pluggable screw terminal blocks, mating connectors supplied.
Serial: RJ-11 jack. Reversed RJ11 modular cable/female "S9" 9-pin D-Sub adapter supplied.

Power Requirements: 7.5 to 12 VDC @ >500 ma. Power supply with domestic connector supplied. International power supply optional.

Physical Dimensions: 5.66" x 7.125" x 1.58", aluminum extrusion chassis with (4) #6-32 screw thread mounting holes for optional RA-1 rack shelf.

Weight: 2.0 lb.

Shipping Weight: 3.0 lb.

Options: RA-1 rack shelf, holds three units (1-RU), filler panels supplied. International power supply.

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SPECIFICATIONS
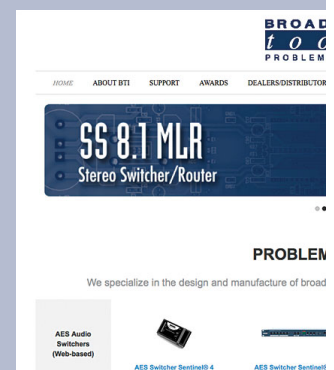
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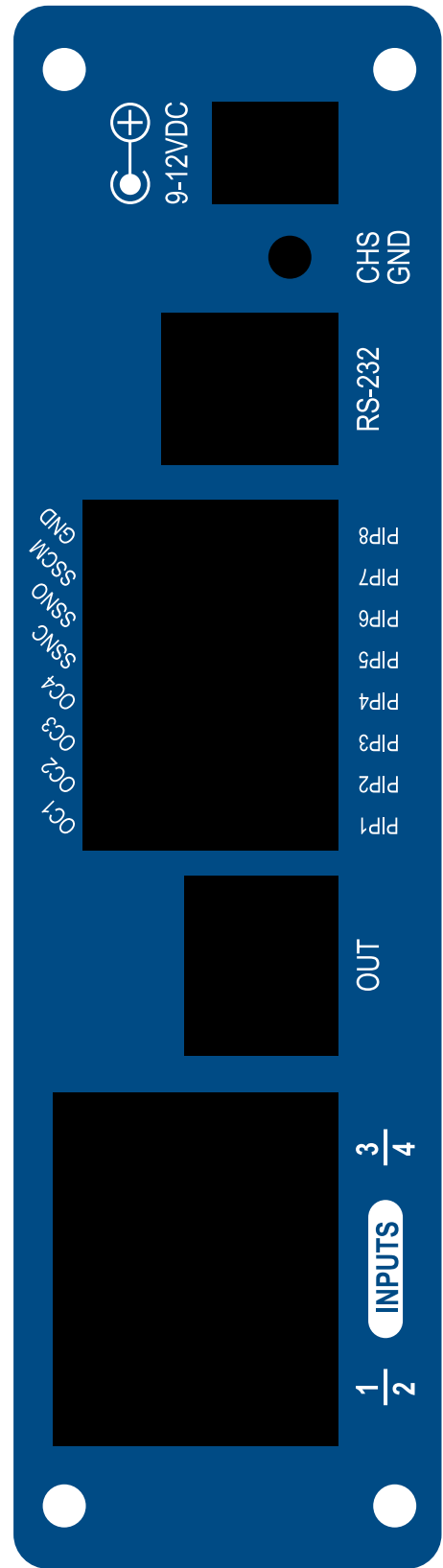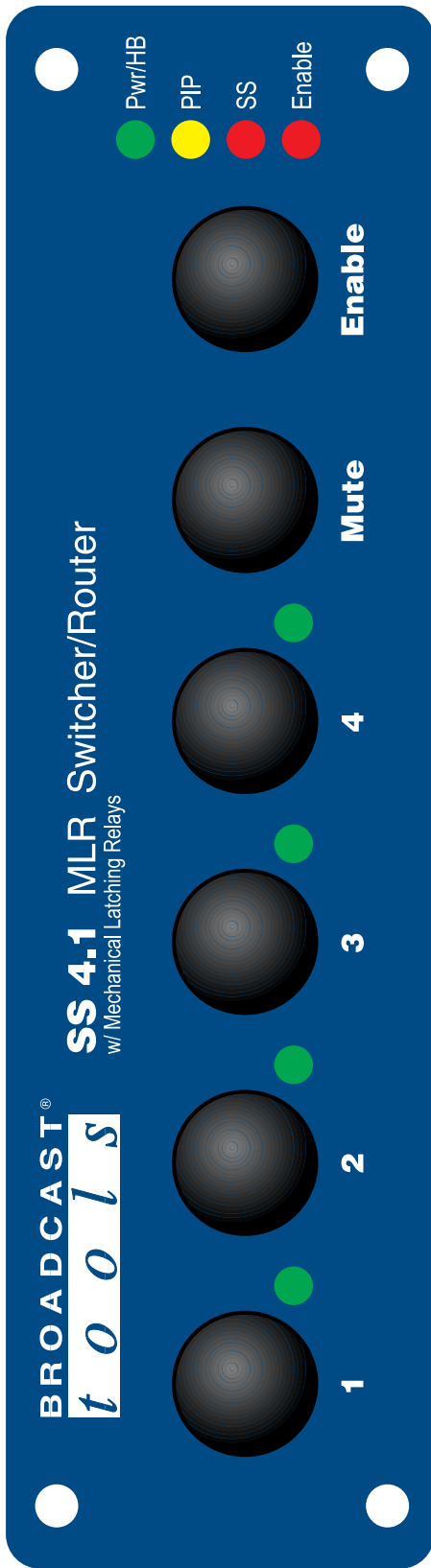
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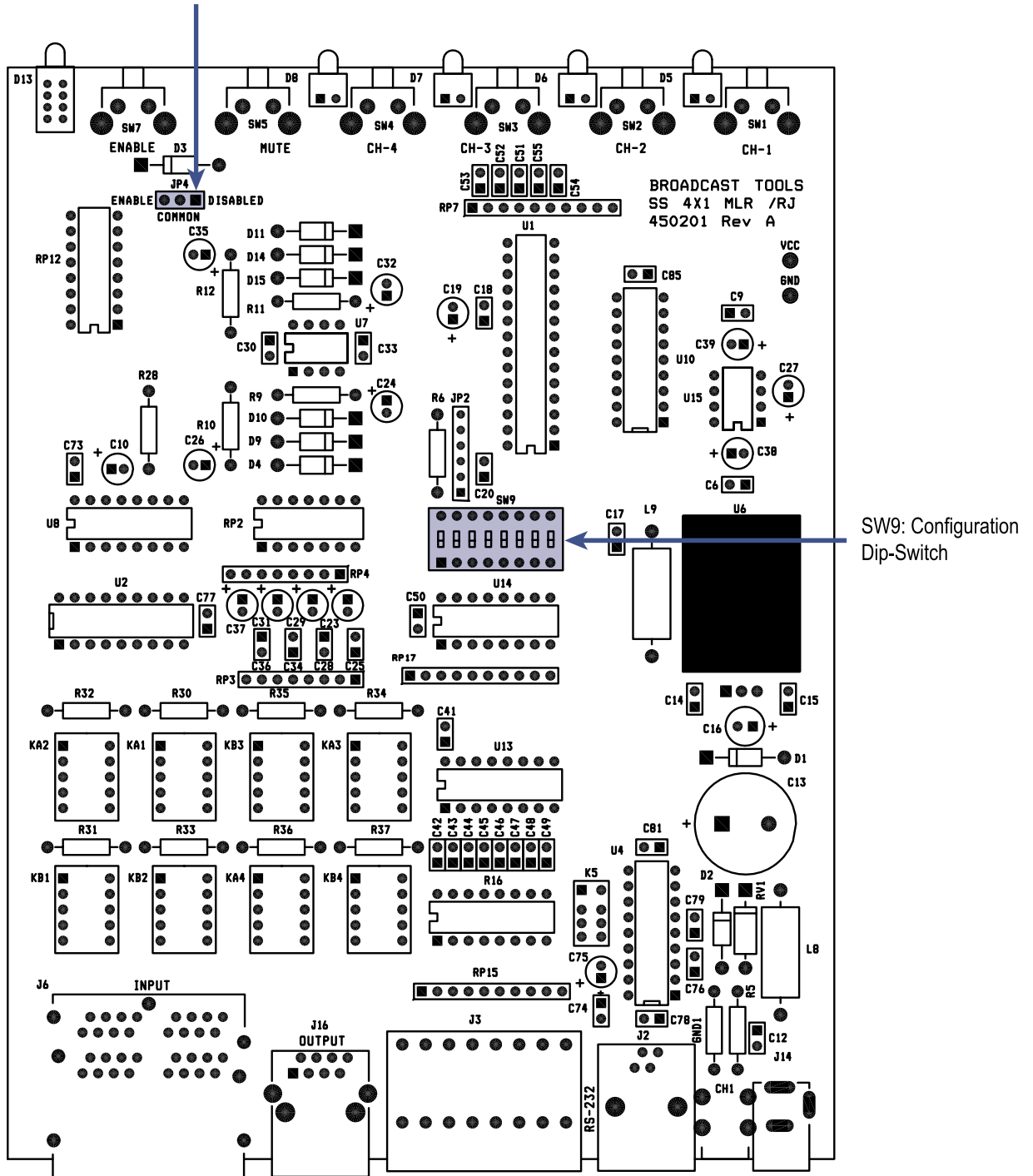
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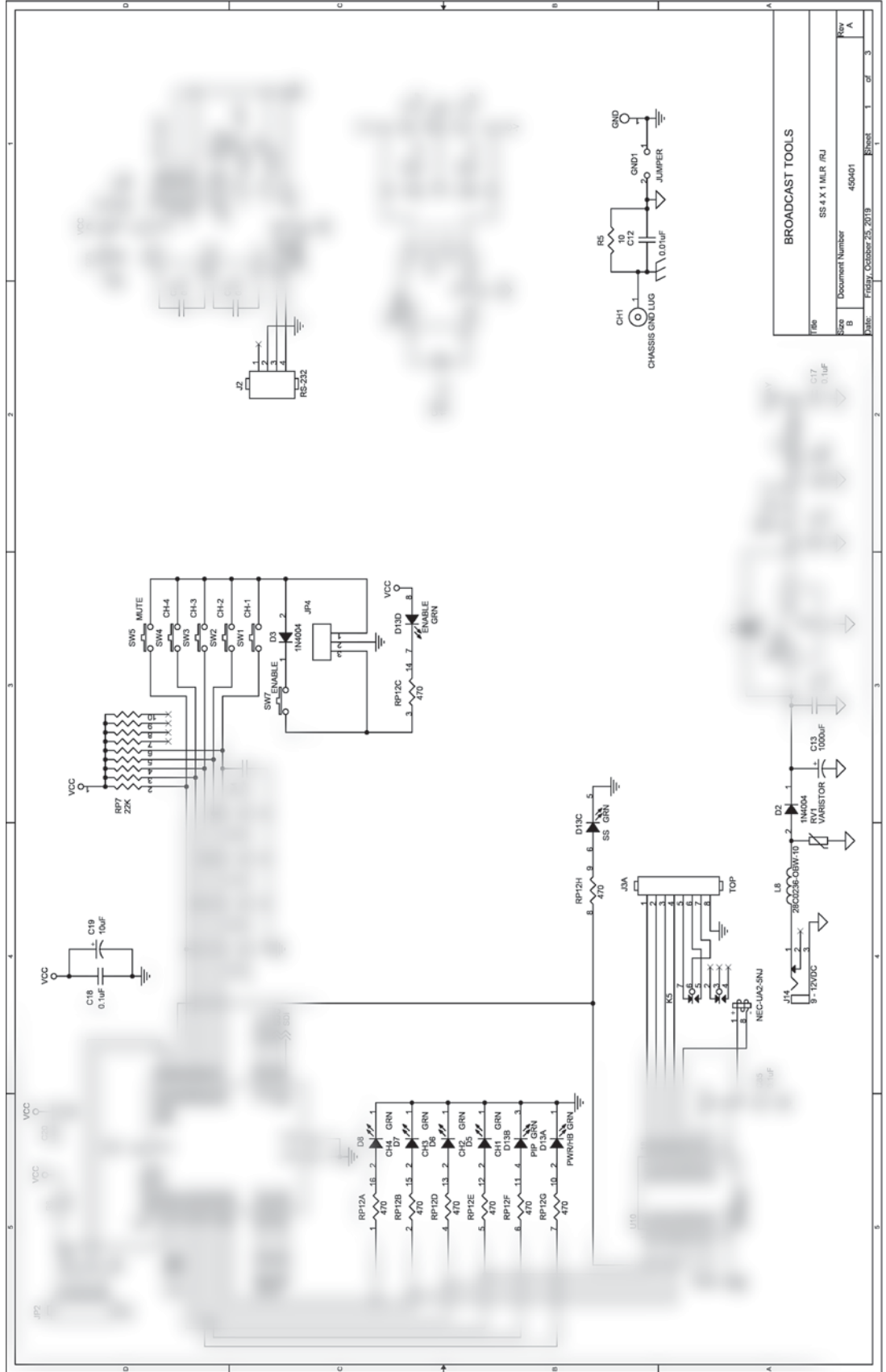www.broadcasttools.com **website**

BROADCAST *tools*®

SS 4.1 MLR Switcher/Router
w/ Mechanical Latching Relays

Pwr/HB
PIP
SS
Enable

Enable

Mute

4

3

2

1

9-12VDC

CHS
GND

RS-232

GND
SSCM
SSNO
SSNC
OC4
OC3
OC2
OC1

PIP8
PIP7
PIP6
PIP5
PIP4
PIP3
PIP2
PIP1

OUT

INPUTS

1
—
2

3
—
4

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Component Layout

JP4: Front Panel
Enable Switch Jumper.
Default=Disable

SW9: Configuration
Dip-Switch

BROADCAST TOOLS
SS 4X1 MLR /RJ
450201 Rev A

Fractional Schematic

Modified 03/06/20

SS 4.1 MLR/RJ
Switcher/Router w/ Mechanical Latching Relays

Fractional Schematic

Modified 03/06/20

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Fractional Schematic

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