

Installation and Operation Manual



SS 16.16 ***Sixteen Input, Sixteen Output Stereo Audio Routing Switcher***

Firmware Version 1.1 or greater

Manual Revised 03/25/08

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INTRODUCTION

Thank you for your purchase of a Broadcast Tools® SS 16.16 Sixteen Input, Sixteen Output Stereo Audio Routing Switcher (referred to as the SS 16.16 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 16.16.

SAFETY INFORMATION

Only qualified personnel should install Broadcast Tools® products. Incorrect or inappropriate use and/or installation could result in a hazardous condition.

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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CAUTION!

Broadcast Tools® Products, as with any electronic device, can fail without warning. Do not use this product in applications where a life threatening condition could result due to failure.



NOTE:

This manual should be read thoroughly before installation and operation.

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DESCRIPTION

The Broadcast Tools® SS 16.16 provides audio routing of 16 stereo inputs to 16 stereo outputs. This type of switching allows any one stereo input to be assigned to any or all stereo outputs. The SS 16.16 may be controlled via front panel encoder controls and/or multi-drop RS-232 serial port. A 40 x 4 LCD back lit display provides for input descriptions and macro setup. A 16 x 16 GPIO port is provided when used with automation systems. FREE MS Windows “NetSwitch/II remote control software is available for download. Two versions are provided, serial/USB and Ethernet. Installation is simplified with removable screw terminals (Euro).

PRODUCT FEATURES

- Stereo routing of any one input to any or all outputs.
- Headphone amplifier with front panel 1/4” jack and level control.
- Front panel monitor speaker with mute switch and level control.
- 40 x 4 LED back lit LCD display with user programmable nine character input descriptions.
- Internal audio activity/silence sensor monitors output channel sixteen. A front panel “ACT” indicator and rear panel open collector are provided. Trigger set at -30dbu.
- Two front panel encoder controls are provided. One each for input / output channel selection.
- Power-up selection of channel configuration, mute or last source selected.
- Sixteen user configured macros.
- Most configuration options may be set via the easy access rear panel dip-switches.
- 16 input GPI port (PIP) with LED indicator.
- 16 open collector channel status outputs or programmable via burst commands.
- Multi-turn input level controls and single turn output level controls.
- Electronically balanced stereo inputs and outputs.
- Multi-drop RS-232 serial port with data activity LED.
- Multiple unit inputs may be cascaded to expand outputs.
- Depluggable screw (EURO) terminals for ALL connections.
- Logic functions via microprocessor with non-volatile memory.
- External tri-voltage universal switching power supply.
- 2-RU chassis.

PRODUCT DESCRIPTION

Front Panel:

The SS 16.16 is a 2 - RU device (19" w x 3.50" h x 10" d). The front panel supports two encoder controls, five function switches, 5 LED indicators, 1/4" headphone jack, monitor speaker, mute switch and level control.

Rear Panel:

Installation is simplified with pluggable screw terminal connectors. The SS 16.16 may be pre-wired and installed in minutes. The multi-drop RS-232 modular connector is provided for serial operation. The 5-pin "DIN" power connector is provided along with a universal switching tri-voltage power supply. Two power LED's indicate +/-15 & 5 Vdc power supply operation.

Switches:

Five pushbutton switches (The "PGM" switch is hidden) that may be used to mute or take selected audio configurations. Sixteen macros may also be programmed and selected.

LED Indicators:

The SS 16.16's 5 front panel LED indicators provide operational display of the following information:

- PGM LED, illuminates when the unit is in (menu) program mode.
- Power and serial data activity. This LED flashes when serial data is active.
- Macro indicator will light when in macro record or recall mode.
- "PIP" Parallel Input Port LED will flash indicating any change with the 16 input "Pulse Stretcher" GPI ports.
- One audio activity LED. Monitors output channel sixteen and lights when levels are above -30dbu.

Controls:

Audio Inputs: Each of the 16 stereo inputs are balanced bridging (20K Ω) at a nominal line level of +4dBu. Multi-turn level controls are provided for each stereo channel. Odd numbered input level controls are left of the designated connector, while even numbered controls are right of the connector. The double-decker input connectors are configured with the odd numbered inputs on the bottom and the even numbered inputs on the top. If required, 600 Ω terminating resistors may be added to the connector.

Audio Outputs: The SS 16.16 provides sixteen balanced stereo outputs. Nominal line level at 100 ohms is set for +4dbm. Sixteen left and right output level controls are inside the unit and are labeled "OUT#LT or OUT#RT". Controls are single turn and provide approximately 2db of trim. The double-decker output connectors are configured with the odd numbered outputs on the bottom connectors, while the even numbered outputs are on top. If required, 600 Ω terminating resistors may be added to the connector.

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DESCRIPTION

“ACT” Audio Activity Sensor:

The SS 16.16 contains one audio activity sensor, which may be used as a silence sensor. The sensor monitors output channel sixteen. The factory default has a fixed signal threshold of -30dbu. Upon silence detection, the “ACT” indicator is extinguished for the duration of silence and the rear panel open collector switches to ground. When audio returns, the front panel “ACT” LED will illuminate and the open collector will go into a high impedance state.

PIP Input:

The Parallel Input Port (GPI) with the Programmable Pulse Stretcher provides 16 pulse-stretched parallel 5-volt TTL/CMOS compatible inputs. The inputs are pulled high to 5 volts through a 20K Ω resistor and are activated by pulling the input to ground. Inputs supply status to any serial polling device (**when the unit ID is set to 0, no polling of inputs is required**). For all PIP inputs, a pulse of 50ms or greater is required to go true. The pulse stretch width may be varied between 50ms and 2.55 seconds. This allows the polling computer more time to detect an input change.

Open Collector Outputs:

The SS 16.16 provides sixteen open collector status outputs. The status outputs may be configured to operate in one of three modes:

1. The status output follows the associated channel.
2. The status outputs a one-second pulse when the associated channel is selected.
3. Software burst mode control

Serial Communication:

The SS 16.16’s serial communication may be configured for multi-drop RS-232, allowing up to 8 - SS 16.16’s on the same computer’s serial port. Burst mode allows a computer or ASCII terminal to control and interrogate the unit. This section defines all burst mode commands. Each burst mode command starts with an asterisk (“*”). Next is a single decimal digit that corresponds to the unit (ID) address 0-7. Following that are one or more ASCII characters specifying the command. No carriage-return or line-feed is required to terminate the command except for those few commands of variable length, if the maximum length is not sent. If acknowledgements are enabled, successful commands are responded to with “RRR” while errors get an “EEE” response. The syntax of each command is given in the installation section of this manual.

User Programming:

The SS 16.16 programming is stored in non-volatile memory. Configurations are set with selection dipswitches and computer commands.

OPERATION GUIDELINES

Front Panel Indicators

Front Panel LED's	Number Of LED's	Activation Event/Mode	Activation Behavior
Pwr/Ser	1 Green	Valid Power or serial data activity	On with power or flashing with serial data activity
"PGM"	1 Red	Menu mode	On if in program or menu mode
Macro	1 Green	Macro selection	On if active
"PIP" Active	1 Yellow	Any valid "PIP" input	Blinking if active
"ACT"	1 Yellow	Audio Activity for OP 16	On if active audio
"PGM" and "MACRO"	Red/Green		Alternately flashing when the front panel is locked

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Front Panel Controls:

Controls:	Function:
Input Encoder	By turning this control, each input description is displayed on the LCD at the desired output channel.
Output Encoder	By turning this knob, the cursor will move through the output channels.
Take Switch	Stores your selection
Mute Switch	Mutes the selected output
Macro	Either selects a macro or allows the programming of a macro
Hidden "PGM" Note: This switch (hole) is between the Macro switch and PGM LED	Special programming functions
Monitor/Headphone control	Used to adjust the level of the headphones and/or monitor speaker
Speaker switch	Turns the monitor speaker on/off

Selecting an Input/Output channel:

1. Turn the "Output Select" encoder knob until the flashing asterisk is at the desired output channel.
2. Turn the "Input Select" encoder knob until the desired input channel is displayed.
3. When ready to select, press the "TAKE" button.
4. The display will stop flashing, indicating the selection has been made.

Power-Up Feature, user programmable:

1. Verify that dipswitch SW1-7 is OFF.
2. Select the desired input/output channel configuration.
3. Press the hidden "PGM" button with a non-metallic object. Macro number will be displayed in the output-1 slot on the LCD.
4. Rotate the "INPUT SELECT" encoder knob until macro number 0 displayed.
5. Press the "TAKE" button to save.
6. Your power up configuration is saved.

Power-Up Feature, last source selected:

1. Verify that dipswitch SW1-7 is ON.
2. The SS 16.16 will power up with whatever channel configuration was present at power off.

Macro “RECORD” Feature:

1. Select the desired input/output configuration.
2. Press the hidden “PGM” button with a non-metallic object. Macro number will be displayed in the output-1 slot on the LCD.
3. Rotate the “INPUT SELECT” encoder knob until the desired macro number is displayed.
4. Press the “TAKE” button to save.

Macro “RECALL” Feature:

1. Press the macro button: Macro number will be displayed in the output-1 slot on the LCD.
2. Rotate the “INPUT SELECT” encoder knob until the desired macro number is displayed.
3. Press the “TAKE” button.

To monitor audio with the headphone or Monitor amplifier

1. Select output 16 and the desired input.
2. Press the SPKR switch in the turn on the monitor speaker.
3. Adjust level with the Hdph/Spkr control.

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INSTALLATION GUIDELINES

Inspection:

Please examine your SS 16.16 carefully for any damage that may have been sustained during shipping. If any is noted, please notify the shipper immediately and retain the packaging for inspection by the shipper. The package contains the SS 16.16, Installation manual, reversed modular serial cable, 9-pin D-Sub (S 9) adapter and IPS model HUP45-32 universal switching tri-voltage power supply.

Setting Operation “DIP” Switches:

The SS 16.16 is equipped with an 8-position “PGM” DIP Switch. The DIP Switch specifies 3-bit unit ID, baud rate, power-up modes, remote control and other features listed below. The dipswitch (SW1) is located on the rear panel.

DIP (SW1) Switch Functions

SW1, Switch Number	Default Setting	Function
1	OFF	Add 1 to Address (base address is 0)
2	OFF	Add 2 to Address (base address is 0)
3	OFF	Add 4 to Address (base address is 0)
4	OFF	Baud Rate: 0 - 9600, 1 - 38400
5	OFF	OPEN
6	OFF	Open collector follow latch mode = OFF Open collector follow Pulse mode = ON NOTE: Refer to SW1-8
7	OFF	<u>Power-up Channel configuration</u> Channel selection user programmable = OFF Last source(s) selected = ON
8	OFF	Enables SW1-6 = OFF Software controlled = ON

Address (ID) DIP Switches

SW1 – 1	SW1 – 2	SW1-3	ID
OFF	OFF	OFF	ID = 0
ON	OFF	OFF	ID = 1
OFF	ON	OFF	ID = 2
ON	ON	OFF	ID = 3
OFF	OFF	ON	ID = 4
ON	OFF	ON	ID = 5
OFF	ON	ON	ID = 6
ON	ON	ON	ID = 7

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Baud Rate DIP Switches

SW1 – 4	Baud Rate
OFF	9600
ON	38400

Open Collector Follow Mode DIP Switches

SW1 – 6	Mode
OFF	OC Follow
ON	OC Pulse

Power up/Last source DIP Switch

SW1 – 7	Function
OFF	User Programmable
ON	Last Source(s) selected

Open Collector control DIP Switch

SW1 – 8	Function
OFF	Enable SW1-6
ON	Software control of Open Collectors

Mounting:

The SS 16.16 is designed to be rack mounted in a standard 19” rack, (2 – RU). It should be mounted in an area that is accessible from the rear and preferably away from sources of heat. We recommend before permanently installing the SS 16.16, you bench test and become familiar with the operation of the unit.

Power Supply Connection:

Install the 5-pin “DIN” connector into the DIN receptacle on the SS 16.16. Mount the power supply in a convenient location. When ready, plug the cord into the appropriate AC receptacle.

NOTE: Only use IPS model HUP45-32

Connecting The Audio Inputs, Outputs, PIP, remote control inputs and OC/Relays:

The SS 16.16 interfaces to your audio equipment through depluggable rear panel screw terminals. Remove each screw terminal, strip each conductor, insert the conductor into the terminal and screw down the capture screw. The terminals accommodate wire sizes from 16 - 28 AWG solid or stranded wire. Connections may be made to the + and - inputs for balanced operation, or to the + input and grounding the - side for unbalanced input operation. Connections can be made to the + and - outputs for balanced operation, or to the + output and ground for unbalanced output operation.

The input impedance is high, 600Ω terminations may be installed on the connector.

It is recommended that all cables connected to the SS 16.16 be looped through ferrite cores to suppress RF. Surge protection with RF filtering such as the Tripp Lite "ISOBAR 4" is also suggested for the power supply. The purchase of an inexpensive uninterruptible power supply (UPS) will provide back up in case of power outages. Check out our web site for lightning protection links.

Adjusting Input and Output Levels:

Once the input and output connections have been made, the input levels can be set. The switcher is factory set for unity. Maximum input levels should be limited to + 27dbu. Should input levels need to be changed, they are accessible from the rear panel. Each input trimmer has one adjustment per channel. Output adjustments must be made internally on the main circuit board. The trimmers are labeled.

Remote Control:

The PIP inputs and open collector outputs may be connected via the rear panel removable screw terminals. The SS 16.16 accepts momentary contact closures, open collector or 5-volt TTL/CMOS logic levels. Open collector control is also provided. Please refer to the appendix for the connector layout.

CAUTION!

Never connect either the + or - outputs to ground.

CAUTION!

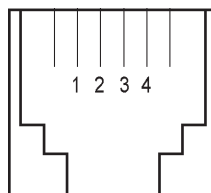
Installation of the SS 16.16 in high RF environments should be performed with care. Shielded cable is suggested for all control, audio inputs and outputs. All shields should be tied to the "CHASSIS GROUND" terminal. The station ground should be connected to the chassis ground screw (CH1) located behind J1 as viewed from the rear. For lightning protection devices, check out www.polyphaser.com and www.itwlinx.com.

Connecting the RS-232 Serial Port:

Use the provided modular 9-pin D-sub connector adapter (S9) and reversed modular cord to connect the SS 16.16's serial connector to your serial port.

The pin out of the adapter is shown below.

RJ-11 Adapter Pin	DB-9 D-Sub	SS 8.2 (Point of view)
4	3	RS-232 Receive
3	2	RS-232 Transmit
2	5	Ground

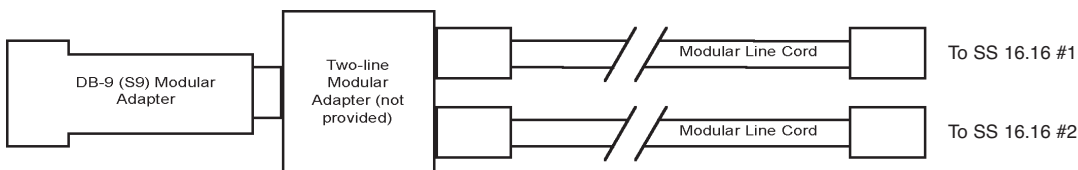


Modular Jack Pin Numbers

The SS 16.16 is supplied with a reversed modular cable and a 9-pin D-connector modular adapter (S9) for serial control. Only use the reversed modular cord that is supplied with the SS 16.16 or a replacement that reverses, such as Radio Shack Cat No. 279-347. Connect the cable between the SS 16.16 and your computer. The SS 16.16 may operate at baud rates 9600 or 38400 baud. The unit is shipped set for 9600 baud, with 8 data bits, no parity and one stop bit. Load your favorite communication software package (Windows 95/98/ME/NT/2000/XP HyperTerminal, etc.) using the protocol of 9600-N-8-1. Set the mode to: DIRECT, Flow Control to: NONE and emulation to: ANSI.

Connecting Two SS 16.16's to a Single Computer's Serial Port:

Multiple SS 16.16's may be cascaded serially to operate from the same serial port. The first step is to assign unit ID's to each SS 16.16. One suggestion is to assign 1 to the first SS 16.16 and 2 to the second switcher. The second step is to parallel the serial ports of the SS 16.16's. Plug the male end of the duplex modular adapter into the supplied female (S9) DB-9 to RJ-11 adapter, then attach the supplied reversed modular line cords into each of the duplex modular adapter receptacles (Radio Shack Cat No. 279-0357) and the other ends into each SS 16.16 modular receptacles. See the diagram below.



NOTE:

Three or more SS 16.16's may be daisy chained by using the above description and a Radio Shack Cat No. 279-0410, 5-jack modular adapter.

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INSTALLATION

Serial Control:

The unit is controlled in either Menu or Burst mode. It can run at the following data rates: 9600 (default) and 38,400. Serial communications is multi-drop RS-232. Commands may be entered either via a menu (menu mode) or a short form code (burst mode). All commands and responses use normal ASCII characters, facilitating scripting. A burst mode command starts with an asterisk (“*”) followed by the device (ID) address as a single decimal digit. A burst mode command must be entered within 5 seconds or it will time out. The command to enter menu mode starts with an asterisk (“*”) followed by the device (ID) address as a single decimal digit and then MM. The menu mode displays certain parameters, and allows the setting of these parameters. In both cases, device (ID) address (0-7) is specified with the on-board dipswitches.

Menu Mode:

*Type *0MM, follow the prompts on the pop-up menu.*

The command to enter menu mode starts with an asterisk (“*”) followed by the device (ID) address as a single decimal digit, then the MM command.

NOTE: Commands you type will NOT be seen, unless you turn “Echo On” in HyperTerminal.

The menu mode displays advanced configuration parameters. Unit ID, Baud rate and other configurations are set via the rear panel dipswitches (SW1).

```
Broadcast Tools® SS 16.16, v1.X - Setup Menu
1 - Set PIP Minimum (0 - 2.55 sec)           - Now: .05
A - Save Current Audio State for Power Up
C - Show Current Configuration
N - Set name for Input
F - Set Factory Defaults
Enter Selection, or Q to quit:
```

Serial Burst Mode Commands:

Burst mode allows a computer or ASCII terminal to control and interrogate the unit. This section defines all burst mode commands. Each burst mode command starts with an asterisk (“*”). Next is a single decimal digit that corresponds to the unit (ID) address 0-7. Following that are one or more ASCII characters specifying the command. No carriage-return or line-feed is required to terminate the command except for those few commands of variable length, if the maximum length is not sent. If the command requested a response, the response will consist of an upper case “S”, followed by the unit address, and then the specific response. If acknowledgements are enabled, successful commands are responded to with “RRR” while errors get an “EEE” response. The syntax of each command is given below. The syntax shows the command exactly as it should be sent, except that lower case characters represent values that should be substituted:

Glossary Of Command Notation:

Character String	Meaning	Allowable Values
u	Unit ID	0-7
ii	Input Number	01-16
oo	Output Number	01-16
rr	Open Collectors	01-16

Set-up Commands:

- *uCE_x - Enable Error and Good Responses - Where x = Y to enable and N = disable. In this mode, when a command is sent that is in error, the unit will reply (possibly before receiving the entire command) with “EEE.” If the command is sent correctly, the unit will reply with “RRR.”
- *CDEF - Reset to factory defaults
- *uCIIttt - Set “PIP” Programmable Pulse Stretcher Input Duration = ttt: 000 – 254
Off to 2.54 Seconds.
- *uCL_x - Lock Front Panel if x is “L”. Unlock Front Panel if x is “U”
- *uCNiiaaaaaaaaa - Set name of input (up to 9 characters)
- *uMM - Enter menu mode, ONLY if unit ID = 0
- *uMS_{xx} - Save current I/O configuration as Macro # xx (01 - 16).
- *uMR_{xx} - Retrieve (invoke) macro # xx (01 - 16).

Real Time Control Commands:

- *uD_{xx} - Delay xx seconds before processing next command.
- *uZ_x - Echo character “x” to serial control port. This is useful in debugging command strings.

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“Open Collector” Status Outputs, 16 Port Output Control

The SS 16.16 provides 16 open collector status outputs. The status outputs may be configured to operate in one of three modes:

1. The status output follows the associated channel. SW1-6 OFF.
2. The status outputs a one-second pulse when the associated channel is selected. SW1-6 ON.
3. SW1-8 OFF enables SW1-6. SW1-8 ON disables SW1-6 and allows software control.

“PIP” with Programmable Pulse Stretcher:

PIP is always active. Minimum input pulse width must be 50ms. The Programmable Pulse Stretcher (PIP) provides 16 “PIP” (GPI) inputs. The Programmable Pulse Stretcher Duration may be globally set from none to 2.55 seconds.

NOTE: When the unit ID is set to 0, no polling of the “PIP” (GPI) inputs is required.

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SPECIFICATIONS

Input Levels:	Max + 27 dBu, balanced, bridging. > 20k Ω .
Output Levels:	Stereo balanced outputs +24 dBm. @ 600 Ω . / +27dbu @ 10K Ω
Gain:	3dB
Frequency Response:	* 20 to 20 kHz; +/- .025dB
Signal/Noise Ratio:	* >90 dB nominal, weighted 20 to 22Khz, @ +24 dBm.
Distortion: *	Less than 0.005% THD @ +24 dBu.
IMD (250/7kHz): *	Less than 0.017% IMD @ +24 dBu.
Crosstalk: *	>-80 dB @ 1khz / -55 dB @ 10 kHz from adjacent channel.
Switching Method:	Digitally controlled CMOS professional level analog switch arrays.
Logic:	Microprocessor with non-volatile memory.
Operation Control:	Front Panel - Momentary switches and rotary encoders PIP -16 - Momentary closures to ground. >50ms. (5 volt though 20 k pull-up) RS-232 - Multi-drop Serial 9600 or 38.400 K baud, 8N1.
Status/Control:	Front Panel -40 x 4 LED back lit LCD display and LED indicators. Remote - 16 - Open collector outputs. (5 volt @ 100ma per output) RS-232 - Multi-drop Serial 9600 or 38.400 baud, 8N1.
Interfacing:	Audio & Remote Control - Rear panel depluggable screw terminals. Accommodates 16 - 28 AWG wire. Mating connectors supplied. RS-232 Serial - RJ-11/6P4C Modular, Adapter & cable supplied.
Power:	Output: + 15 Vdc @ 2 amps / - 15 Vdc @ 800 ma /+ 5 Vdc @ 5 amp, Input: Universal 100 – 240 Vac 47 - 63 Hz, 1.2 amps. Switching power supply. Supplied. Note: Only use IPS model HUP45-32
Mechanical:	19" x 3.5" x 10.0" (WHD) / Weight: 8.0 lbs.

LIMITED WARRANTY

The term "Buyer" as used in this document refers to and includes both (but only) (a) any person or entity who acquires such an item for the purpose of resale to others (i.e., a dealer or distributor of an item), and (b) the first person or entity who acquires such an item for such person's or entity's own use.

Broadcast Tools warrants to each Buyer of any item manufactured by Broadcast Tools that the item will be free from defects in materials and workmanship at the time it is shipped by Broadcast Tools if the item is properly installed, used and maintained.

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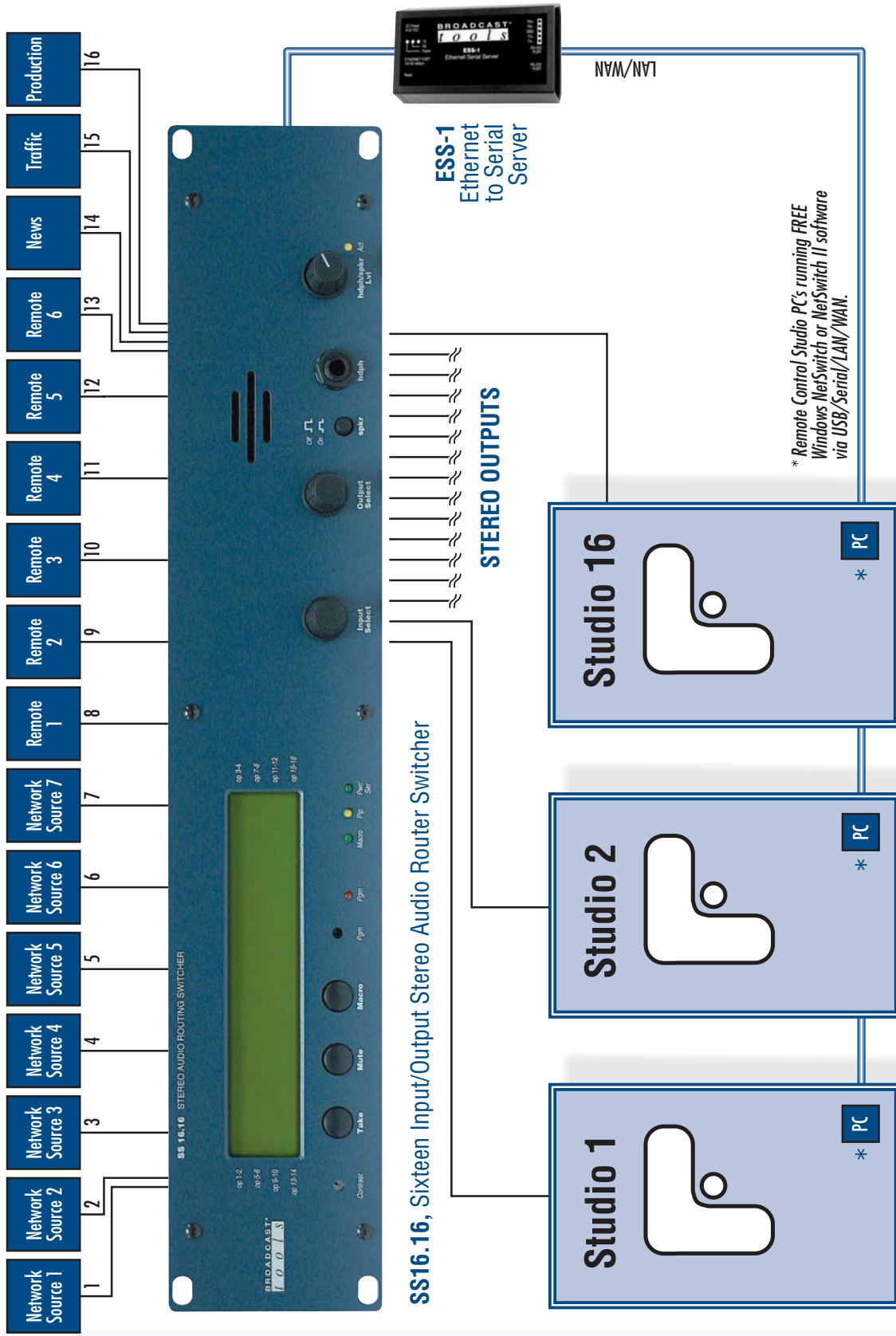
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SS16.16, Sixteen Input/Output Stereo Audio Router Switcher

* Remote Control Studio PC's running FREE Windows NetSwitch or NetSwitch II software via USB/Serial/LAN/WAN.

Broadcast Tools® Installation Using 16 External Stereo Audio Sources
 SS 16.16, Sixteen Input/Output Stereo Audio Router Switcher
 Broadcast Tools® ESS-1 Ethernet to Serial Server
 * FREE Windows "NetSwitch/NetSwitch II" Control Software

