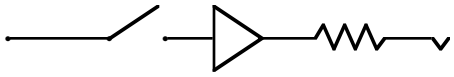
CUSTOM AUDIO ELECTRONICS INC.



4x4
AUDIO CONTROLLER

OPERATING GUIDE

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Designed and developed by Bob Bradshaw, well known for his world class Guitar Switching Systems. The 4x4 is the first in a series of high-quality audio switching modules for Custom Audio Electronics that can be used whenever ultra low noise, sonically transparent signal routing is required. Consisting of four discrete audio loops and four relay contact closures, the 4x4 is activated by MIDI controller data and may be configured for a wide variety of uses.

Features:

- Sonically transparent, passive audio switching elements.
- Ultra low noise, wide bandwidth and dynamic range.
- Silent, click-free switching...even in high gain applications.
- Separate in, out, send and return jacks for each of the four audio loops.
- Different audio switching elements can be installed for critical applications (consult factory).
- Super low noise buffer circuit for high to low impedance matching (bypassable).
- Four relay contact closures (C1-C4) for devices utilizing switch to ground functions.
- Stereo jacks for C1-C4 allow normally open or normally closed relay operation.
- MIDI controlled - simple to operate. Can be activated by a wide variety of MIDI controllers including the CAE RS-10 and RS-10 MKII.
- Powered by a 9 volt AC or DC remote power supply for lowest noise.
- Front panel LED display indicates status of each loop and control function.

Uses/Benefits:

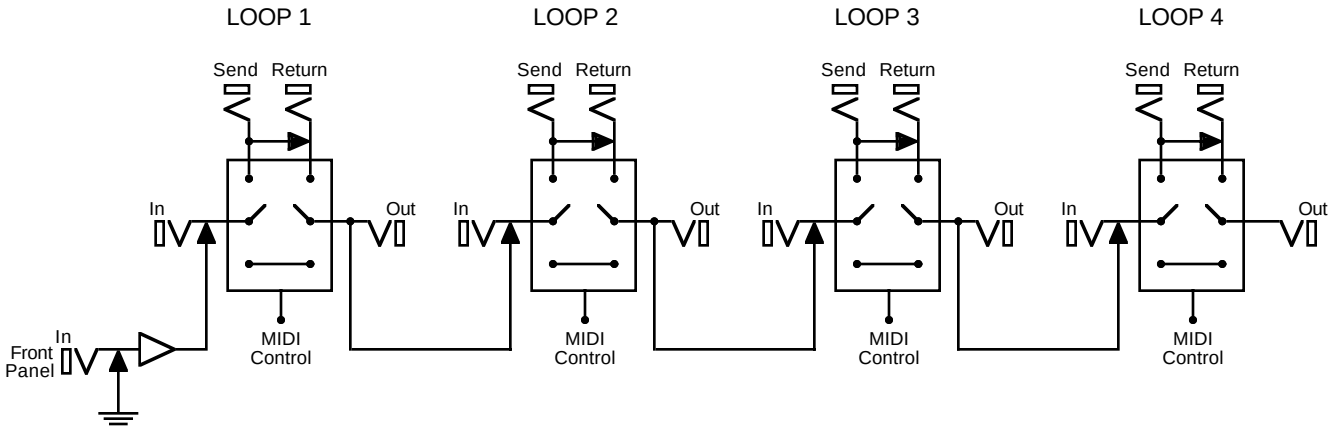
- Loops 1 through 4 can be used at instrument level before amps for switching pedal effects, or at line level for high quality signal processing between preamps and power amps.
- Transparent; when used in line between instruments and amps, the 4x4 loops cause no audible signal degradation or added noise.
- Loops can be configured as in-line bypass, audio muting and A/B select circuits with silent switching.
- Relay control C1-C4 functions are completely isolated, preventing ground loops and can be used to channel switch amps or wherever a latching footswitch function is used.
- High quality, low noise buffer circuit prevents unnecessary loading of high impedance instruments, thus allowing multiple amp combinations and long series chains of effects with unsurpassed clarity. Buffer can be bypassed for a completely passive switching system or factory adjusted for optimum use.
- Modular. More than one 4x4 may be used in a system with individual access to each loop or control function via MIDI controller data. Systems using more than one 4x4 can expand as your needs grow.
- Can be used to expand and improve performance of existing systems such as the Rocktron/Bradshaw RSB18R (consult factory for details).

Grounding the CAE 4x4 Audio Controller

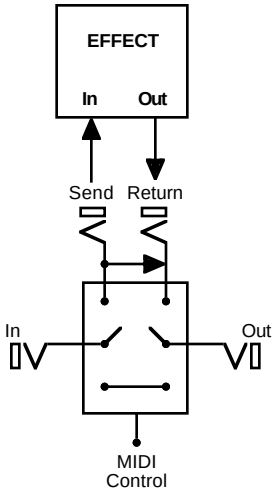
This CAE 4x4 Audio Controller is equipped with an internal ground lift switch. This switch removes audio common from chassis to eliminate ground loops. It comes from the factory in the grounded position. If you have trouble with ground loops (with the 4x4 bolted to a rack along with other equipment), follow this procedure:

1. Remove the 10 screws from the top cover.
2. Locate the ground lift switch at the lower left of the main circuit board with the unit facing you.
3. Set the switch to the right to lift ground.
4. Reinstall the top cover.

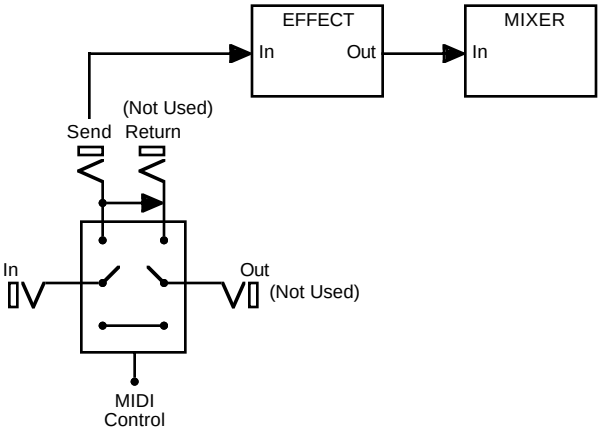
Block Diagram 4x4 Loops



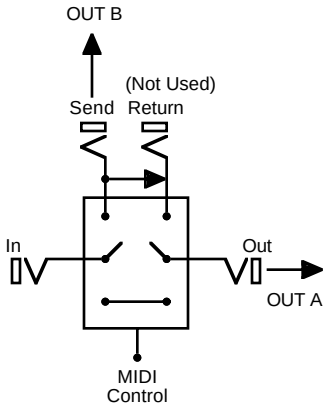
4 Ways To Use 4x4 Loops



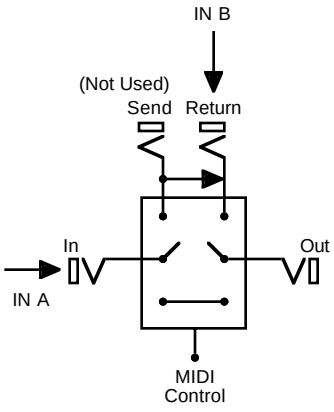
Typical Loop In Effect Bypass Configuration (Shown effect "In")



Loop Used As Input Mute For Use With Mixers, Etc. (Shown Effect "Out")

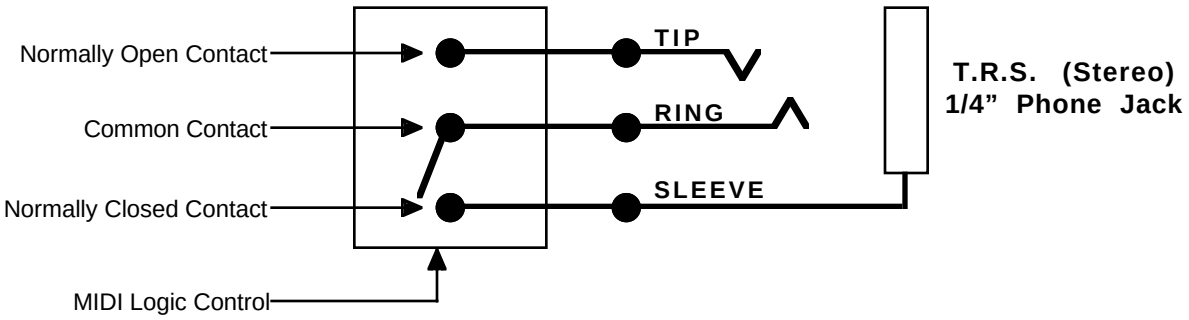


Loop As A/B Output Select (Shown output "A" on)



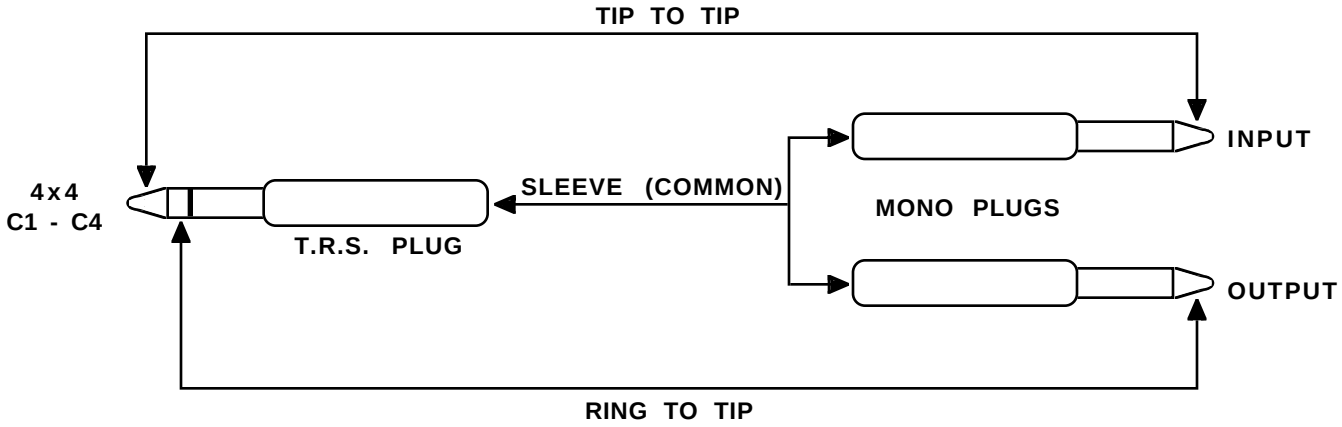
Loop As A/B Source Select (Shown "In B" Active)

SCHEMATIC DIAGRAM OF EACH 4X4 AUDIO/CONTROL FUNCTION

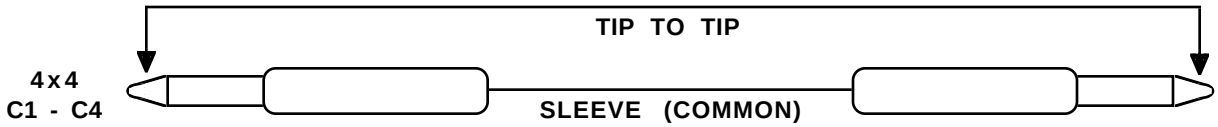


1 of 4 Circuits

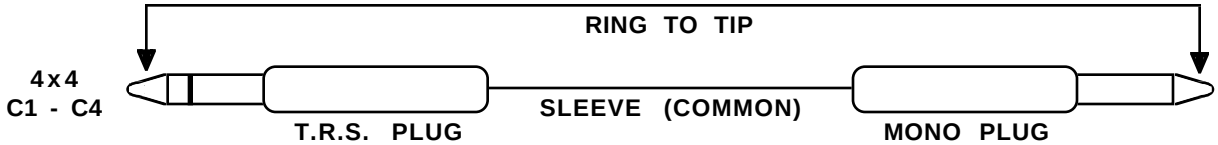
USE THIS TYPE OF CABLE TO USE THE 4X4 FUNCTIONS AS AUDIO MUTES



USE A STANDARD MONO CABLE FOR NORMALLY OPEN CONTROL FUNCTIONS



USE THIS TYPE OF CABLE FOR NORMALLY CLOSED CONTROL FUNCTIONS



Description of CAE 4x4 & RS-10 MIDI Control Assignments

The CAE 4x4 Audio Controller's loops and control functions respond to MIDI control change commands in omni mode. These numbers are fixed at the factory and cannot be changed except by software revision. Currently there are several different configurations available (see chart). In a system consisting of several 4x4's, care must be taken so that loops and/or control functions do not share the same MIDI control number, unless multiple loops and/or control functions need to be activated at the same time (by one MIDI control number). For example: a 4x4 stereo loop consists of 2 mono loops assigned, via software, the same MIDI control number. The CAE RS-10 MIDI Foot Controller has the ability to assign any MIDI control number (0-127) to each of its 10 direct access controller switches (SW0-SW9), as well as its continuous control ports (P1 and P2). This way you can arrange and group your system controls according to their functions. For example, preamp or amp select switches can be arranged in a row or group with other effects or functions in other rows or groups. Please consult the RS-10 operating manual on how to program (assign) MIDI controller numbers to the 10 direct access controller switches (as well as continuous control ports P1 and P2). The following is a chart showing 4x4 loop/control functions, software revision, RS-10 MIDI control number assignments as well as each loop/control function's role in your specific system. Please retain for future reference.

Note: 4x4's receive control commands in omni mode.

4x4 ________		MIDI Control #	Specific Function in System
Software Revision: ________	W1 ☐ ON ☐ OFF	L1 ______	______
		L2 ______	______
		L3 ______	______
		L4 ______	______
		C1 ______	______
		C2 ______	______
		C3 ______	______
		C4 ______	______

4x4 ________		MIDI Control #	Specific Function in System
Software Revision: ________	W1 ☐ ON ☐ OFF	L1 ______	______
		L2 ______	______
		L3 ______	______
		L4 ______	______
		C1 ______	______
		C2 ______	______
		C3 ______	______
		C4 ______	______

4x4 ________		MIDI Control #	Specific Function in System
Software Revision: ________	W1 ☐ ON ☐ OFF	L1 ______	______
		L2 ______	______
		L3 ______	______
		L4 ______	______
		C1 ______	______
		C2 ______	______
		C3 ______	______
		C4 ______	______

RS-10		MIDI Channel	MIDI Control #	4x4 Loop/Control Function	Specific Function in System
Software Revision: ________	SW0	______	______	______	______
	SW1	______	______	______	______
	SW2	______	______	______	______
	SW3	______	______	______	______
	SW4	______	______	______	______
	SW5	______	______	______	______
	SW6	______	______	______	______
	SW7	______	______	______	______
	SW8	______	______		
	SW9	______	______		
	P1	______	______		
	P2	______	______		

Important: The above MIDI control numbers assigned to the 10 direct access controller switches may be different that the RS-10's factory default settings. If the RS-10's memory has been cleared or reset, the above MIDI control numbers must be reassigned for each switch so that proper communication between RS-10 and 4x4's will occur.

Other Available 4x4 Software Versions

4x4 #1

W1 OFF	W2 ON
4x4 L1 = MIDI Control #13	4x4 L1 = MIDI Control #17
4x4 L2 = MIDI Control #14	4x4 L2 = MIDI Control #17
4x4 L3 = MIDI Control #15	4x4 L3 = MIDI Control #18
4x4 L4 = MIDI Control #16	4x4 L4 = MIDI Control #18
4x4 C1 = MIDI Control #9	4x4 C1 = MIDI Control #9
4x4 C2 = MIDI Control #10	4x4 C2 = MIDI Control #10
4x4 C3 = MIDI Control #11	4x4 C3 = MIDI Control #11
4x4 C4 = MIDI Control #12	4x4 C4 = MIDI Control #12

4x4 #2

4x4 L1 = MIDI Control #9	4x4 L1 = MIDI Control #17
4x4 L2 = MIDI Control #10	4x4 L2 = MIDI Control #18
4x4 L3 = MIDI Control #11	4x4 L3 = MIDI Control #19
4x4 L4 = MIDI Control #12	4x4 L4 = MIDI Control #20
4x4 C1 = MIDI Control #9	4x4 C1 = MIDI Control #9
4x4 C2 = MIDI Control #10	4x4 C2 = MIDI Control #10
4x4 C3 = MIDI Control #11	4x4 C3 = MIDI Control #11
4x4 C4 = MIDI Control #12	4x4 C4 = MIDI Control #12

4x4 #3

4x4 L1 = MIDI Control #13	4x4 L1 = MIDI Control #17
4x4 L2 = MIDI Control #14	4x4 L2 = MIDI Control #17
4x4 L3 = MIDI Control #15	4x4 L3 = MIDI Control #18
4x4 L4 = MIDI Control #16	4x4 L4 = MIDI Control #18
4x4 C1 = MIDI Control #17	4x4 C1 = MIDI Control #13
4x4 C2 = MIDI Control #18	4x4 C2 = MIDI Control #14
4x4 C3 = MIDI Control #19	4x4 C3 = MIDI Control #15
4x4 C4 = MIDI Control #20	4x4 C4 = MIDI Control #16

4x4 #4

4x4 L1 = MIDI Control #19	4x4 L1 = MIDI Control #19
4x4 L2 = MIDI Control #20	4x4 L2 = MIDI Control #19
4x4 L3 = MIDI Control #21	4x4 L3 = MIDI Control #20
4x4 L4 = MIDI Control #21	4x4 L4 = MIDI Control #20
4x4 C1 = MIDI Control #22	4x4 C1 = MIDI Control #21
4x4 C2 = MIDI Control #23	4x4 C2 = MIDI Control #22
4x4 C3 = MIDI Control #24	4x4 C3 = MIDI Control #23
4x4 C4 = MIDI Control #25	4x4 C4 = MIDI Control #24

4x4 #5

4x4 L1 = MIDI Control #41	4x4 L1 = MIDI Control #51
4x4 L2 = MIDI Control #42	4x4 L2 = MIDI Control #52
4x4 L3 = MIDI Control #43	4x4 L3 = MIDI Control #53
4x4 L4 = MIDI Control #44	4x4 L4 = MIDI Control #54
4x4 C1 = MIDI Control #45	4x4 C1 = MIDI Control #55
4x4 C2 = MIDI Control #46	4x4 C2 = MIDI Control #56
4x4 C3 = MIDI Control #47	4x4 C3 = MIDI Control #57
4x4 C4 = MIDI Control #48	4x4 C4 = MIDI Control #58

NOTE: W1 is a port on the microprocessor circuit board that must be shorted (on) or left open (off), depending on which configuration is used for a given 4x4 software revision.

Controlling the CAE 4x4 Audio Controller with the CAE RS-10 MIDI Foot Controller

Connect the MIDI out of the RS-10 to the MIDI in of the 4x4 with a 7 pin DIN (MIDI) cable. You can connect other MIDI devices via the MIDI out/thru jack of the 4x4. Connect the 9VAC Power Supply to the 4x4 AC power jack. The 4x4 will supply power to the RS-10. There is no need for two power supplies when using a 4x4 with an RS-10.
The 4x4 Audio Controller responds to MIDI Controller data in Omni mode.
MIDI value 0 = Loop out/Control function relay unenergized/LED off
MIDI Value 127 = Loop in/Control function relay energized/LED on
The 4x4 Loops/Control functions and their respective MIDI Controller numbers are as follows:

W1 OFF	W1 ON
L1 = MIDI Control #11	L1 = MIDI Control #31
L2 = MIDI Control #12	L2 = MIDI Control #32
L3 = MIDI Control #13	L3 = MIDI Control #33
L4 = MIDI Control #14	L4 = MIDI Control #34
C1 = MIDI Control #15	C1 = MIDI Control #35
C1 = MIDI Control #16	C1 = MIDI Control #36
C1 = MIDI Control #17	C1 = MIDI Control #37
C1 = MIDI Control #18	C1 = MIDI Control #38
L1 + L2 = MIDI Control #19	L1 + L2 = MIDI Control #39
L3 = L4 = MIDI Control #20	L3 + L4 = MIDI Control #40
C1 Momentary (60ms.) = #21	C1 Momentary (60ms.) = #41
C2 Momentary (60ms.) = #22	C2 Momentary (60ms.) = #42
C3 Momentary (60ms.) = #23	C3 Momentary (60ms.) = #43
C4 Momentary (60ms.) = #24	C4 Momentary (60ms.) = #44

NOTE: W1 is a port on the micro controller circuit board that must be shorted (ON) or left open (OFF), depending which configuration is used.

These controller numbers are fixed and cannot be changed except by software revision. Consult the factory if you require different numbers.

When the RS-10 has its factory default settings, the direct access controller switches (SW0 - SW9) control the 4x4 loops/control functions as follows:

RS-10 SW0 = 4x4 Not Used
RS-10 SW1 = 4x4 Not Used
RS-10 SW2 = 4x4 L1
RS-10 SW3 = 4x4 L2
RS-10 SW4 = 4x4 L3
RS-10 SW5 = 4x4 L4
RS-10 SW6 = 4x4 C1
RS-10 SW7 = 4x4 C2
RS-10 SW8 = 4x4 C3
RS-10 SW9 = 4x4 C4

Controlling the CAE 4x4 Audio Controller with the Rocktron RSB 18

The 4x4 Audio Controller responds to MIDI controller data in Omni mode.

MIDI value 0 = Loop out/Control function relay unenergized
MIDI value 127 = Loop in/Control function relay energized

Connect MIDI out of the RSB 18R to the MIDI in of the CAE 4x4. Use the CAE 4x4 MIDI out/thru to connect MIDI to other devices in the chain.

The 4x4 Loops/Controls and their respective MIDI controller numbers are as follows:

4x4 Loop 1	MIDI controller #11	4x4 C1	MIDI controller #15
4x4 Loop 2	MIDI controller #12	4x4 C2	MIDI controller #16
4x4 Loop 3	MIDI controller #13	4x4 C3	MIDI controller #17
4x4 Loop 4	MIDI controller #14	4x4 C4	MIDI controller #18

To Program the RSB 18F to send controller numbers, follow this procedure:

In Bank/Preset mode:

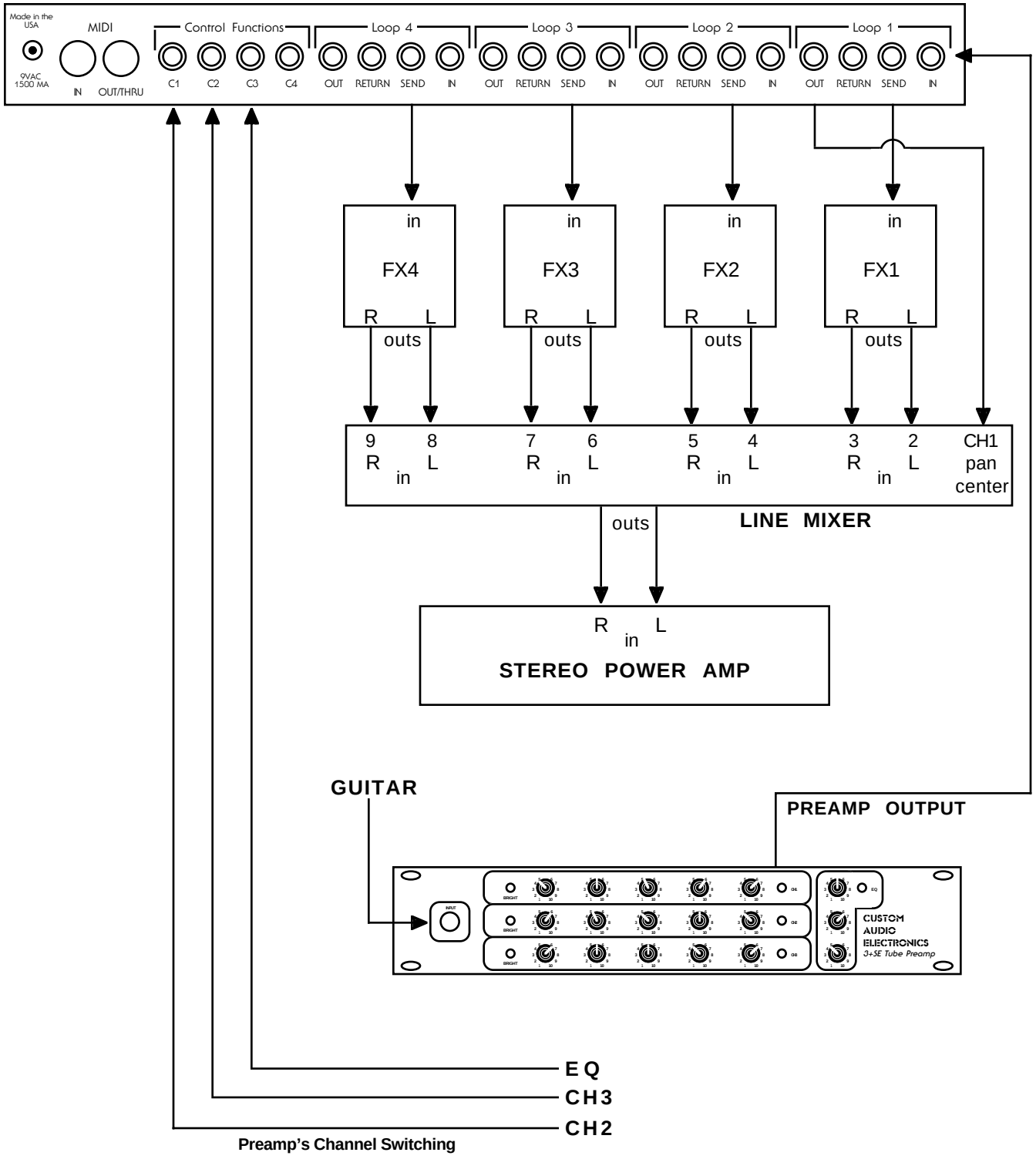
1. Press 2nd, then the MIDI switch five times.
2. Use the set/select switches (< >) to scroll through the loops and control functions.
3. Assign the loop the proper controller number using the bank up/down switches.

Example:		
	RSB L1 = C11	RSB C1 = C15
	RSB L2 = C12	RSB C2 = C16
	RSB L3 = C13	RSB C3 = C17
	RSB L4 = C14	RSB C4 = C18

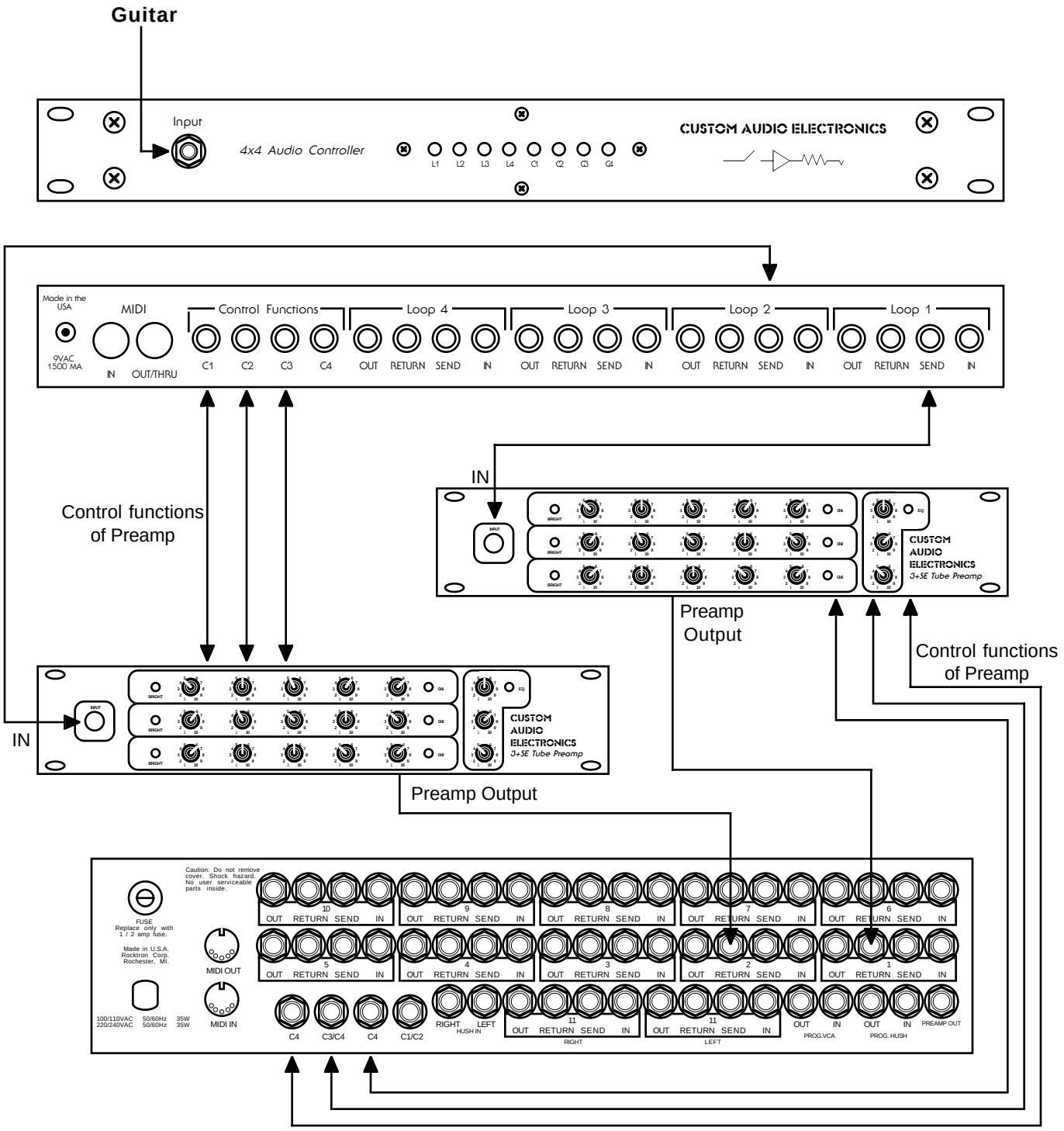
4. After assigning the Loops/Controls their MIDI controller numbers, press store.
5. Press 2nd switch to exit 2nd mode.

You have now assigned the RSB 18F to control the CAE 4x4. The RSB 18F Loop 1-4 switches control both the RSB 18R loops (1-4) and the 4x4 loop (1-4) at the same time. The same is true with the C1 - C4 control functions. The RSB 18F activates both C1 - C4 in the RSB 18R and the CAE 4x4. You can now plug your instrument into the 4x4's front panel input and send the signal via the 4x4's send jacks to four preamp inputs. Bring each preamp's output to the RSB 18R return jacks. This physically separates the preamp's inputs from their outputs (inputs connect from the 4x4, outputs to the RSBR) and allows high gain switching without oscillations, squealing, and unnecessary noise.

Use 4x4 with pedals before amplifier.
Use C1-C4 to channel switch amp if necessary.



4x4 with stereo line mixer and stereo effects



Interfacing to the Rocktron RSB Systems for using multiple preamps.