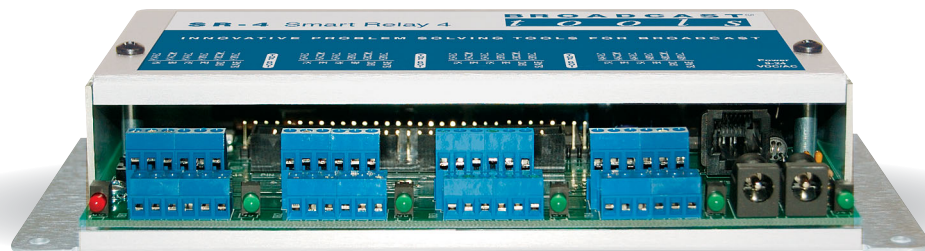# BROADCAST tools ®
INC

Installation and Operation Manual

SR-4
Smart Relay 4

Firmware Version 1.01 or above (PCB Rev A & B)

Manual Update: 09/12/11

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INTRODUCTION

Thank you for your purchase of a Broadcast Tools® Smart Relay 4, (referred to as the SR-4 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® Smart Relay 4.

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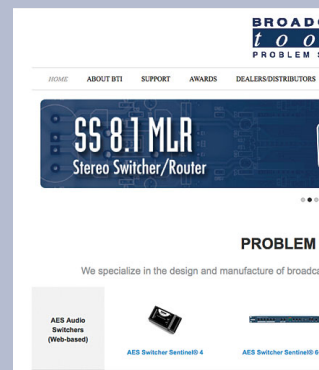
NOTE:

This manual should be read thoroughly before installation and operation.

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Product Description

The SR–4 provides four independent interfaces equipped with two optically isolated wet or dry inputs and a 2PDT relay. Additional features include; Independent user programmable logic and pulse stretching (delays) from 50ms to 99 hours, 59 minutes, 59.99 seconds. The SR-4 is supplied in a single small profile aluminum chassis. Mounting options range from surface mounting, DIN rail, two units mounted on the RM-3, 1-RU rack shelf or up to twelve units on the RA-12, 3-RU rack panel.
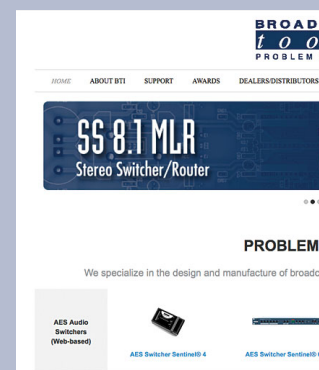
Features:

• All I/O connections via screw terminals or the RJ-21X, punch block cable option.
• Each 2PDT relay section can be configured with two independent 5 to 28 vdc optically isolated wet or (5-volt) dry inputs.
• LED indicators are provided for each relay, power and programming.
• Fifteen logic functions include, sustained, toggle, set-reset (flip-flop), dual alternate action or failing/rising edge, along with additional Boolean logic functions.
• The independent pulse stretcher or time delays may be user programmed from 50ms to 99 hours, 59 minutes, 59.99 seconds.
• Independent four position dipswitches are provided for all logic function configurations.
• Non-dedicated PC (w/HyperTerminal) is used for independent timing configurations.
• Dual power jacks allows for the daisy chaining of units from one wall supply.

Applications:

• Convert differing logic levels to 2PDT contact closures
• Time delay relays
• Pulse stretcher
• Sustained contact to pulse converters
• Rising and/or falling edge pulse converters
• Latching (flip-flop) relays
• Toggle action relays
• Dual alternate action relays
• Additional Boolean logic functions include; XOR, AND, NAND, OR, NOR.

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FEATURES & APPS

Installation

Please examine your Smart Relay 4 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 should contain the Smart Relay 4, 9vac, 1 amp wall power transformer, daisy-chain cable and this manual.

Timing Programming:
Windows HyperTerminal setup.

! NOTE:
The following instructions are for use with Windows 95/98/ME/NT/2000/XT HyperTerminal.

You can start HyperTerminal by clicking Start, pointing to Programs, pointing to Accessories, pointing to Communications, clicking HyperTerminal, and then double-clicking on the icon labeled Hypertrm or Hypertrm.exe. Follow the steps below:

1. A new window will open labeled "CONNECTION DESCRIPTION".
2. In this window, type a name that describes the connection (We suggest SR-4), click the appropriate icon, if desired and click OK.
3. A new window will open labeled "CONNECT TO".
4. At the "CONNECT TO" screen, move your cursor to the "CONNECT USING" box.
5. Press the down arrow on the right of the box to select the available com port "Direct to com x"), where "x", (usually a number from 1 through 4) is an operating com port.
6. Then click the OK button.
7. The PORT SETTING window will appear.
8. At the PORT SETTING window, Change the baud rate to 9600.
9. Change flow control to NONE.
10. Then click OK button.

You will have a new window labeled with the Connection Description you typed in earlier (in our example, SR-4).

11. At this window, click in the word CALL at the upper center portion of the menu bar and click on the word "DISCONNECT".
12. Click on the word FILE at the upper left portion of the menu bar and click on Properties.
13. Click the Settings tab, then click on EMULATION and change to ANSI,
14. Click on the ASCII setup tab, then click the box "echo typed characters locally".

15. Click the OK button.
16. Click on FILE, click Save.
17. Click on CALL, click Call.
18. HyperTerminal is now ready. Check the bottom right side of screen for a running timer.
19. Remove the SR-4 cover and attach the free end of the supplied modular cord to the RJ11 behind the power jacks.
20. Take the other end of the modular cable that has the modular to DB-9 female adapter attached and plug that in to your PC's com port.
21. Push the PGM button and the timer menu will be displayed:

Timing Programming:

TIMER MENU, HOURS: MINUTES: SECONDS.00

CH1: 00:00:00.05
CH2: 00:00:00.05
CH3: 00:00:00.05
CH4: 00:00:00.05

TO CHANGE, SELECT 1,2,3,4:

Each of the four channels can be programmed with a timer value of 0 to 99 hours, 59 minutes, 59.99 seconds. Make a selection of 1,2,3 or 4 to set the timer value for that particular section. Press the ESC key or push the PGM button to exit. Reinstall the cover.

! NOTE: To program default timer values, hold down the RESET button and the PGM button. Release the reset button first. The PGM LED will come on for 2 seconds to show that the default values were programmed. Default timing value is 50ms for each section.

! NOTE: If the reset switch isn't installed, remove power; hold down the PGM switch while powering up the SR-4, then release the PGM switch.

INSTALLATION

Logic Programming:
! NOTE: Each section can be independently programmed. Sections may be combined to form custom logic/timing functions.

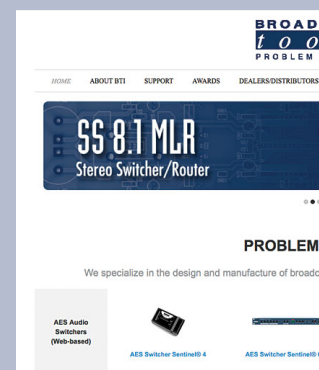To program the logic functions for each section, follow the step below:
1. Remove power.
2. Remove the cover.
3. Determine which section you need to program:
4. SW 3 = K1, SW4 = K2, SW5 = K3, SW6 = K4.
5. Select the desired mode and set the dipswitches accordingly.
6. When finished, reinstall the cover and repower the SR-4.

DIP Switch Mode Settings – Dipswitches 1 through 4 are weighted 8421 (standard binary format). Example: Dipswitch 1 has a weight of 8, while Dipswitch 4 has a weight of 1.

Mode	DIPswitch	Description
0	0000	Relay closes when the odd input is active and opens when the odd input is inactive.
1	0001	Relay toggles on leading edge of the odd input.
2	0010	The relay closes on the leading edge of the odd input. Relay remains closed until the leading edge of the even input is active.
3	0011	The relay closes after the odd input has been active for the programmed time period. It opens after the even input is closed for the time period.
4	0100	The relay closed on the leading edge of the odd input. The relay opens after the trailing edge is closed for the time period.
5	0101	Relay closes on leading edge of the odd input for time period.
6	0110	Relay closes for the time period on the trailing edge of the odd input.
7	0111	Relay closes for the time period on the leading or trailing edge of the odd input.
8	1000	Relay closes on leading edge of the odd input and remains closed for at least the time period. If the odd input stays active for longer than the time period, the relay will open on the trailing edge of the odd input.
9	1001	Relay closes on the leading edge of the odd input for no longer than the time period. If a trailing edge is encountered before the time has expired, the relay will open with the edge. Otherwise, the relay opens when the time period expires.

INSTALLATION

Mode	DIPswitch	Description
10	1010	Two input NOR (0 = input inactive, 1 = active)
		00 1
		01 0
		10 0
		11 0
11	1011	Two input OR
		00 0
		01 1
		10 1
		11 1
12	1100	Two input XOR
		00 0
		01 1
		10 1
		11 0
13	1101	Two input AND
		00 0
		01 0
		10 0
		11 1
14	1110	Two input NAND
		00 1
		01 1
		10 1
		11 0
15	1111	Reserved (feature creep).

Installation of the Smart Relay 4 in high RF environments should be performed with care. Shielded cable is suggested for all connections. All shields should be tied to the EGND terminals. The station ground should be connected to the chassis ground screw located on the far right side of the SR-4 as viewed from the rear. It is recommended that all cables connected to the SR-4 be looped through ferrite cores to suppress RF. Surge protection with RF filtering is also suggested for the wall transformer. The purchase of an inexpensive UPS will provide back up in case of power outages.

Connections are via screw terminals and/or the RJ-21X option. Remove about 1/8" of insulation from each wire. Insert the wire into the desired terminal and tighten the screw. Be sure no bare wires are exposed.

! NOTE: Refer to page 11 of this manual when using the RJ-21X option.

INSTALLATION

Inputs and Relay:
Each section has two independent inputs and one 2PDT relay. Each optically isolated input can be configured for either wet or dry operation. The factory configuration is supplied as dry. Follow the top cover label information or the text below for the desired connection and jumper settings:

The K1 section is accessed on TB1. Follow the list below for connection information. The JP(#) number in parentheses is the opto-isolator configuration header:

1 - Input 1A (JP1)
2 - Input 1B (JP1)

3 - Input 2A (JP2)
4 - Input 2B (JP2)

5 - Ground
6 - Slave K1 relay input (pull to ground to activate K1)

7 - K1A Normally Closed
8 - K1A Common (wiper)
9 - K1A Normally Open
10 - K1B Normally Closed
11 - K1B Common (wiper)
12 - K1B Normally Open

The K2 section is accessed on TB2. Follow the list below for connection information. The JP(#) number in parentheses is the opto-isolator configuration header:
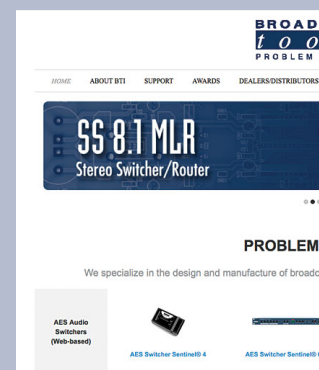
1 - Input 3A (JP3)
2 - Input 3B (JP3)

3 - Input 4A (JP4)
4 - Input 4B (JP4)

5 - Ground
6 - Slave K2 relay input (pull to ground to activate K2)

7 - K2A Normally Closed
8 - K2A Common (wiper)
9 - K2A Normally Open
10 - K2B Normally Closed
11 - K2B Common (wiper)
12 - K2B Normally Open

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The K3 section is accessed on TB3. Follow the list below for connection information. The JP(#) number in parentheses is the opto-isolator configuration header:

      1 - Input 5A (JP5)
      2 - Input 5B (JP5)

      3 - Input 6A (JP6)
      4 - Input 6B (JP6)

      5 - Ground
      6 - Slave K3 relay input (pull to ground to activate K3)

      7 - K3A Normally Closed
      8 - K3A Common (wiper)
      9 - K3A Normally Open
      10 - K3B Normally Closed
      11 - K3B Common (wiper)
      12 - K3B Normally Open

The K4 section is accessed on TB4. Follow the list below for connection information. The JP(#) number in parentheses is the opto-isolator configuration header:

      1 - Input 7A (JP7)
      2 - Input 7B (JP7)

      3 - Input 8A (JP8)
      4 - Input 8B (JP8)

      5 - Ground
      6 - Slave K4 relay input (pull to ground to activate K4)

      7 - K4A Normally Closed
      8 - K4A Common (wiper)
      9 - K4A Normally Open
      10 - K4B Normally Closed
      11 - K4B Common (wiper)
      12 - K4B Normally Open

Input jumper set-up:
Each input is equipped with a four-position header. The header is labeled JPx and is numbered 1 through 8. The factory default is for a DRY input (switch, contact, open collector) with a jumper between 1 & 2 and another jumper over 3 & 4. To change the input to WET (user supplied voltage between 5 and 24vdc), remove both jumpers and place ONE jumper over pins 2 & 3.
! NOTE: Refer to the schematic diagram for the proper polarity when attaching equipment to the inputs.

Slave Relay Connection:

The slave output can be used to drive one or all of the other sections and/or additional   SR-4's. Connect a jumper wire between each of the "SL" terminals.

Mounting:

Mount up to two units on the RM-3 or up to twelve on the RA-12.

! NOTE: Special brackets are required for DIN rail mounting. Please contact the factory for information and pricing.

Power:

The supplied 9vac wall transformer may be used to power the SR-4. Up to three additional SR-4's may be powered from the same wall transformer by unitizing the supplied daisy chain cable. The user may also power the SR-4 from the punch block if this option is employed.
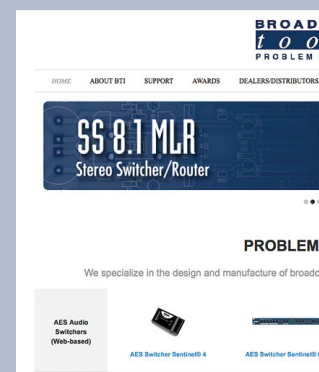
RJ-21X option:

To install this option, follow the steps below:

1. Remove power from the SR-4.
2. Remove the cover.
3. Locate J4, the 50-pin shrouded keyed header.
4. Insert the 50-pin IDC KEYED connector into J4 (it only inserts one way).
5. Lay the ribbon cable over terminals TB2 and TB3.
6. Carefully install the cover, while tucking the ribbon cable under the cover lip.
7. Install the AMP champ 50-pin connector in to the user supplied RJ-21X punch block connector.
8. Follow the spreadsheet on the next page for wiring information.
9. Reapply power to the SR-4 when the installation is complete.

INSTALLATION

Specifications

Logic: Flash uProcessor with non-volatile memory

Inputs: Optically isolated (5 to 24vdc) wet or dry.
                              Default = Dry (5 volt internally sourced)

Relays: 2PDT, 1 amp @ 30Vdc. Sealed relays utilizing

                              2 - form – C, Bifurcated-Crossbar silver alloy
                              with gold overlay contacts. Equipped with LED
                              indicators.

                              ! NOTE: For safety, never connect 120 Vac cir-
                              cuits to these relays!

Connectors: Screw terminals, 2.1mm power jacks and/or the
                              RJ-21X punch block option.

Power Requirements: 9 to 24 volts AC/DC, 200 ma. 9 Vac @ 1 amp
                              wall transformer supplied. Equipped with LED
                              power indicator.

Physical Dimensions: 7.75" x 4" x 1.25" (WDH)

Weight: 2.0 lb.

Shipping Weight: 3.0 lb.

Options: RM-3 Rack shelf. 1- RU.

                              RA-12 Rack panel. 3-RU.

                              RJ-21X punch block cable option (18" ribbon
                              cable with mating connectors).
                              NOTE: The Siemon S66M1-50R is NOT supplied
                              but recommended.

                              USB-RS-232 smart adapter cable.

                              DIN rail brackets are special order only.
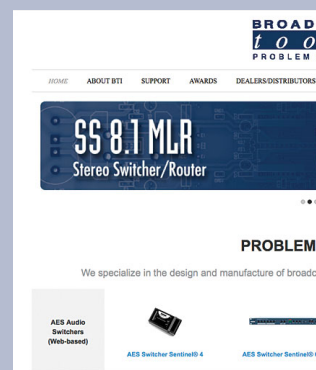
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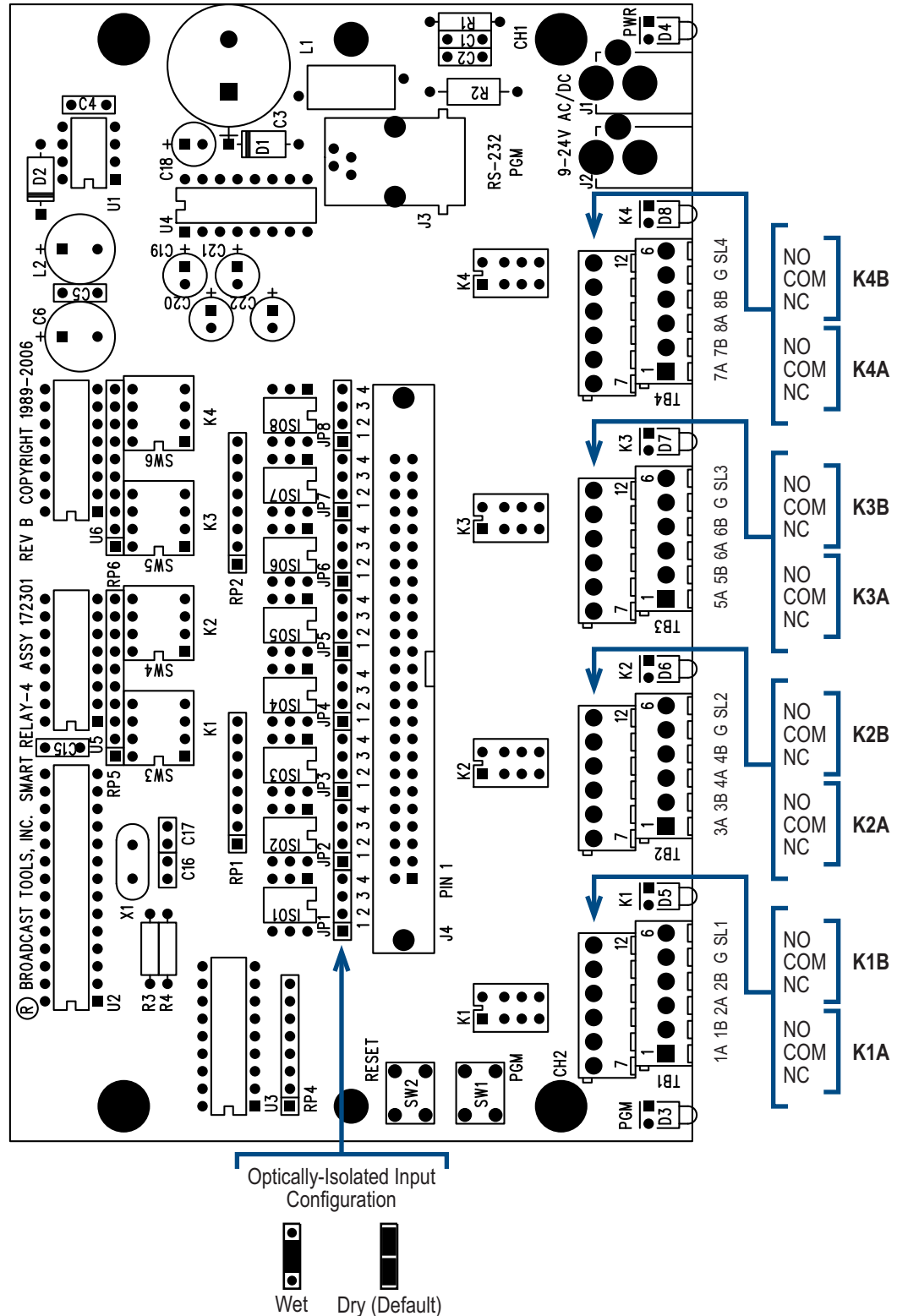131 State Street
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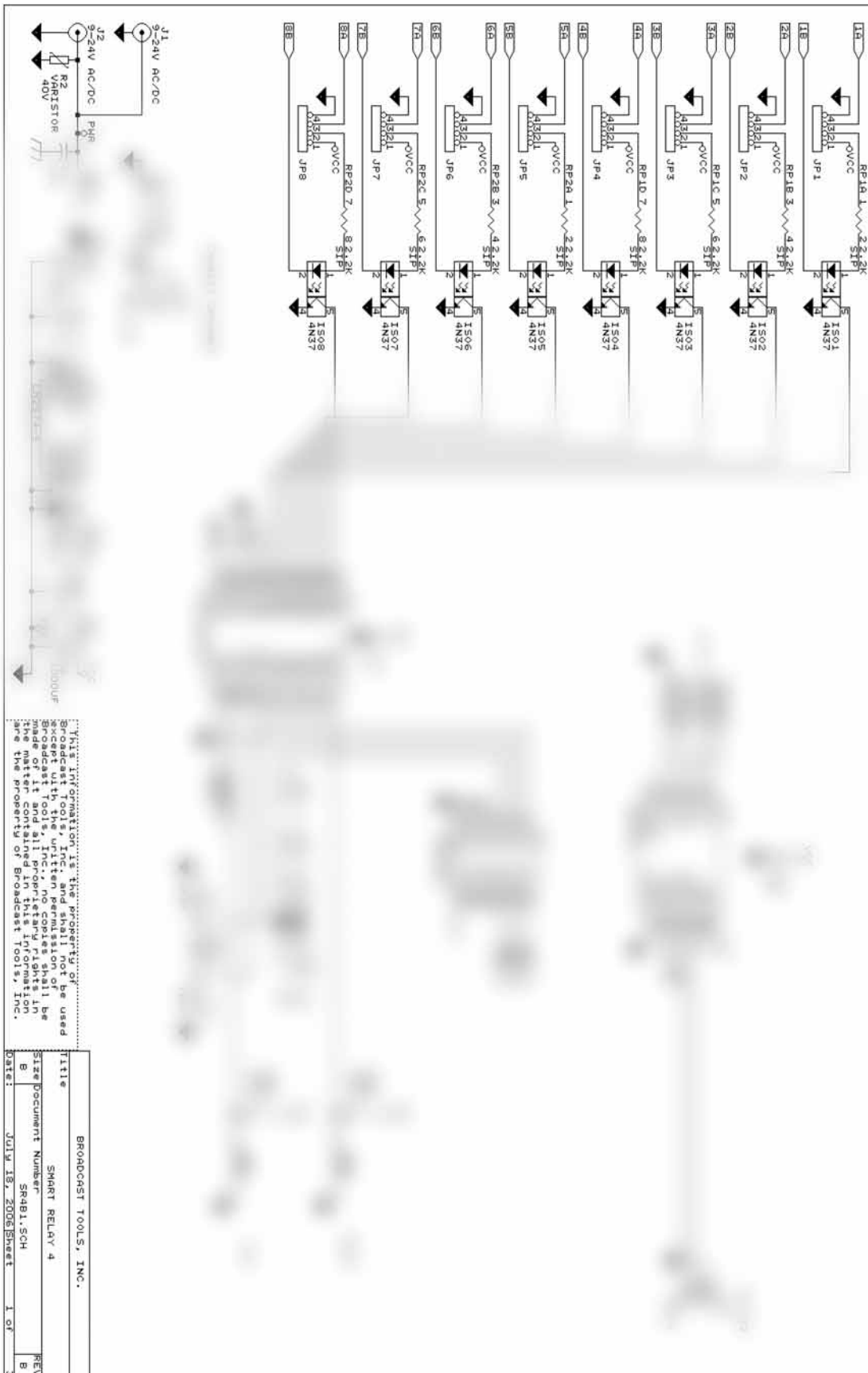
PUNCH BLOCK & SCREW TERMINAL DOCUMENTATION

Optional RJ-21X Punch Block Pin Number	Telco Block Pair Number	25-Pair Cable Telco Color Code	Function Description	Screw Terminal Number:	User Notes
26	1	White/Blue	Input 1B	**TB1-2(B)**	_____
1		Blue/White	Input 1A	1(B)	_____
27	2	White/Orange	Input 2B	4(B)	_____
2		Orange/White	Input 2A	3(B)	_____
28	3	White/Green	K1A Common	8(T)	_____
3		Green/White	K1A N.O.	9(T)	_____
29	4	White/Brown	K1 Coil (Slave Input)	6(B)	_____
4		Brown/White	K1A N.C.	7(T)	_____
30	5	White/Slate	K1B Common	11(T)	_____
5		Slate/White	K1B N.O.	12(T)	_____
31	6	Red/Blue	Ground	5(B)	_____
6		Blue/Red	K1B N.C.	10(T)	_____
32	7	Red/Orange	Input 3B	**TB2-2(B)**	_____
7		Orange/Red	Input 3A	**1(B)**	_____
33	8	Red/Green	Input 4B	**4(B)**	_____
8		Green/Red	Input 4A	**3(B)**	_____
34	9	Red/Brown	K2A Common	**8(T)**	_____
9		Brown/Red	K2A N.O.	**9(T)**	_____
35	10	Red/Slate	K2 Coil (Slave Input)	**6(B)**	_____
10		Slate/Red	K2A N.C.	**7(T)**	_____
36	11	Black/Blue	K2B Common	**11(T)**	_____
11		Blue/Black	K2B N.O.	**12(T)**	_____
37	12	Black/Orange	Ground	**5(B)**	_____
12		Orange/Black	K2B N.C.	**10(T)**	_____
38	13	Black/Green	Input 5B	TB3-2(B)	_____
13		Green/Black	Input 5A	1(B)	_____
39	14	Black/Brown	Input 6B	4(B)	_____
14		Brown/Black	Input 6A	3(B)	_____
40	15	Black/Slate	K3A Common	8(T)	_____
15		Slate/Black	K3A N.O.	9(T)	_____
41	16	Yellow/Blue	K3 Coil (Slave Input)	6(B)	_____
16		Blue/Yellow	K3A N.C.	7(T)	_____
42	17	Yellow/Orange	K3B Common	11(T)	_____
17		Orange/Yellow	K3B N.O.	12(T)	_____
43	18	Yellow/Green	Ground	5(B)	_____
18		Green/Yellow	K3B N.C.	10(T)	_____
44	19	Yellow/Brown	Input 7B	TB4-2(B)	_____
19		Brown/Yellow	Input 7A	**1(B)**	_____
45	20	Yellow/Slate	Input 8B	**4(B)**	_____
20		Slate/Yellow	Input 8A	**3(B)**	_____
46	21	Violet/Blue	K4A Common	**8(T)**	_____
21		Blue/Violet	K4A N.O.	**9(T)**	_____
47	22	Violet/Orange	K4 Coil (Slave Input)	**6(B)**	_____
22		Orange/Violet	K4A N.C.	**7(T)**	_____
48	23	Violet/Green	K4B Common	**11(T)**	_____
23		Green/Violet	K4B N.O.	**12(T)**	_____
49	24	Violet/Brown	Ground	**5(B)**	_____
24		Brown/Violet	K4B N.C.	**10(T)**	_____
50	25	Violet/Slate	SR-4 Power Supply Positive	J1/J2	_____
25		Slate/Violet	SR-4 Power Supply Ground	J1/J2	_____

APPENDIX

Smart Relay 4
Input, Relay and Jumper Layout

Optically-Isolated Input
Configuration

Wet   Dry (Default)

Fractional Schematic