BROADCAST tools® INC

Installation and Operation Manual

SRC-16
Serial Remote Control

Software Version 1.02 or above

Manual Update: 07/31/07

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INTRODUCTION

Thank you for your purchase of a Broadcast Tools® SRC-16, Serial Remote Control (referred to as the SRC-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® SRC-16.

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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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Designed, Assembled and Supported in WA State, USA

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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.
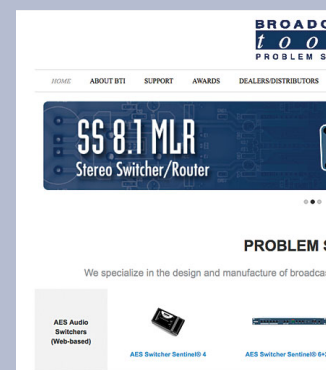
NOTE:

This manual should be read thoroughly before installation and operation.

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Product Description

The Broadcast Tools® SRC-16 is a computer interface to the real world. Connected through an RS-232 or RS-422/485 serial port the SRC-16 can notify your PC software program that any of 16 optically isolated inputs have been opened or closed and allows your software to control any of the 16 SPDT, 1-amp relays. Communication with the SRC-16 can be accomplished via short "burst" type ASCII or binary commands from your PC (computer mode). Also, two units can be operated in a standalone mode (master/slave mode) to form a "Relay extension cord," with sixteen channels of control in each direction. The unit can communicate using RS-232, RS-422 or RS-485 at data rates up to 38400. The SRC-16 may be expanded to 64 inputs x 64 outputs from a single serial port. Optional external Ethernet and USB capabilities may be added.

The SRC-16 is supplied with LED indicators to display input and relay status. Three front panel LED's display power, serial transmit and receive data. Plug-in euroblock screw terminals are provided for ease of wire installation/removal.

Inspection

Please examine your SRC-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 should contain the SRC-16, this manual and/or CD,

one foot RED straight-through CAT 5 (daisy-chain) cable, 7-foot DB-9 straight-through serial

cable and the 9 vac @ 1 amp wall transformer.

Front Panel Description

The front panel is equipped with sixteen red LED's for each relay and sixteen green LED's for each input. Three front panel LED's display power, serial transmit and receive data and comm. error.

Installation Guidelines

Each optically isolated input may be configured for wet or dry operation. Factory default = DRY
Each relay may be configured for normally open or closed contacts. Factory default = N.O.

It is recommended that all cables connected to the SRC-16 should 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 transformer. The purchase of an inexpensive uninterruptible power supply (UPS) will provide back up in case of power outages.

Connect the supplied 9vac power supply to the rear panel power connector. The default baud rate setting is 9600, 8, N, 1. The baud rate can be set to 2400, 4800, 9600 or 38400 baud. This can be done using either the ASCII or binary command formats listed below. Inputs can be simple contact closures or completely optically isolated with your external trigger sourcing current to the opto-isolators. See appendix for details on jumper settings to configure the inputs. The RS-232 serial connection is made to the male DB-9 connector. **JP17,18,19,20 are used to reverse the RS-232 transmit and receive pins on the DB-9. Factory setting is the "NN" position (Pin 5 = Ground, Pin 2 = Transmit and pin 3 = Receive).** The RS422/485 operation is via the removable screw terminals on the rear of the unit.

Dip Switch configuration:
DIP 1,2
The board address (ID) is set using switch numbers 1and 2 in normal hex format:
12

00	=	0 (master) Set the SRC-16 connected to the PC to ID 00.
01	=	1
10	=	2
11	=	3

DIP 3,4 = Set baud rate
34

00	=	9600 (default)
01	=	2400
10	=	4800
11	=	38400

Baud rate will be set by the DIPswitch on power up or reset. It can also be changed using the serial port commands at other times, but if the SRC-16 is reset, baud rate will be set according to the DIP settings. Custom baud rates may be ordered as an option.

CAUTION!

Installation of the SRC-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" terminals. The station ground should be connected to the chassis ground screw viewed from the rear. For lightning protection devices, check out www.polyphaser.com and www.itwlinx.com.

NOTE:

Refer to the appendix for input and relay configuration. All connections are denoted on the rear panel metal chassis.

INSTALLATION

DIP 5 = (ON) Hex mode – When on, hex "Burst" mode is selected. Refer to the protocol below for hex commands. (OFF) is ASCII mode. Refer to the ASCII protocol below for ASCII commands.

DIP 6 = (ON) Pair mode, inputs from one SRC-16 will map directly to outputs of another SRC-16 when connected together via RS-232 or RS422. (OFF) normal operation via RS-232/422. DIP 5 must also be on as pair mode only works in hex mode.

DIP 7 – (ON) will cause inputs to generate *uiix(cr/lf). Where * is the start character, u is Unit ID 0-3, ii=Input number 01-16, x = ON/OFF state, 1= ON, 0 = OFF.

DIP 8 – (ON) AT1616 Mode. When set, the SRC-16 emulates an AT1616. In this mode, a response string is retuned each time an input changes state or relays are set. The string consists of a dash (-) followed by 8 bytes. The first 4 bytes are ASCII hex representations of the 16 outputs with the first two bytes being the lower outputs 8,7,6,5 followed by 4,3,2,1 then the next two bytes representing the upper outputs 16,15,14,13, and 12,11,10,9. If outputs 1, 8, 15 & 10 were ON, these 4 bytes would appear as 8142.

The last four bytes represent the 16 inputs in ASCII hex format with four bytes: 16,15,14,13 12,11,10,9 8,7,6,5 4,3,2,1. If inputs 1,4,7,8,9,10,14,16 are all ON then these four bytes would appear as: A3C9. In the above example, the complete string would be -8142A3C9

To set relays ON, send a capital "P" followed by two ASCII hex bytes representing the bits for the lower 8 relays and a capital "Q" followed by two ASCII hex bytes representing the state of the upper 8 relays. For example, to turn ON relays 2,7,8 and 13, send PC2 and Q10. A dash (-) can be placed before the "P" and "Q" if needed in existing software applications.

The "K" Command is used to pulse relays. The protocol is Krtt where r=relay number represented as ASCII hex 0-F, and tt is an ASCII hex value from 01-FE representing values from .01- 2.56 seconds. A tt value of 00 will turn OFF the selected relay while FF will latch it ON.

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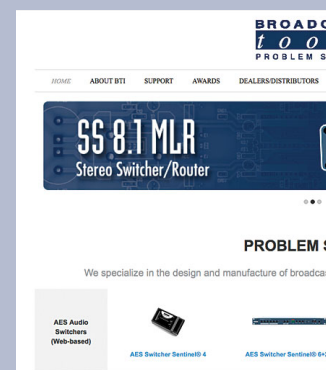
INSTALLATION

Pair Mode

The SRC-16 can be used to transmit the outputs from one unit to another over a serial connection. The logical sense of the inputs is inverted when written to the outputs of its corresponding unit. Normally inputs are high and when closed, go to logic 0 when in pair mode. When logic 0 is received, it will write logic 1 to the output. This allows the relay outputs 01-16 to come on if its corresponding input is closed. Multiple units can also be set up to communicate with the same number of units on the other end of a data link. All units must have DIPswitches 5 and 6 turned ON, and the unit addresses must have a corresponding unit on the other end of the link set to the same address. For example, if you have two units on each side set to address 0 and 2, then the two units on the other side of the data link must also be set to 0 and 2. All units will automatically transmit the states of their inputs on power up, every ten seconds and when any input changes state. If a unit does not receive an update from its corresponding paired unit for a period of about 20 seconds, it will begin flashing the red RX LED one second on, one second off. When communication is restored, the LED will cease to flash.

NOTE: To daisy-chain multiple SRC-16's, only use the supplied one foot RED straight-through CAT 5 (daisy-chain) cable to connect multiple SRC-16's together.

Pair mode can also be used to broadcast input closures from one unit to many using a shared data link. The inputs on the transmit SRC-16 will appear on all of the receive units as long as their address codes match. If only one unit is used at each site, it must be set to an address of zero. The red RX LED will blink on the transmit side to indicate it is not getting return data from the remote units. However, the data being broadcast will still cause the remote relays to follow their corresponding inputs on the broadcasting unit.

Note: If jumpers JP23 and 24 are on, and the SRC-16 is in pair mode, it will control its own relays, essentially being a pair with itself. This is an easy way to test the inputs and outputs of a single unit. Normally JP23 and 24 should not be on, or you may have unintended consequences of a unit's relays responding to input closures generated from the same board.

Serial Burst Mode Commands

The 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 03. Following are one or more ASCII characters specifying the command. A carriagereturn is required to terminate each command. 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 acknowledgments 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	03
ii	Input Number	0116
oo	Relay Number	0116

Setup Commands

*uCCx   Set Serial Speed. x = 0: 2400 1: 9600 2: 4800 3: 38400

*uCEx   Enable Error and Good Responses   Where x = Y to enable and N = disable. In this mode, when a command is sent, the unit will reply (possibly before receiving the entire command) with "EEE." If the command is sent correctly, the unit will reply with "RRR."

Relay Control Commands

*uORrrL Latch Relay rr, relay number
*uORrrF Unlatch Relay rr, relay number
*uORrrPtt Pulse Relay rr, relay number 01à16.
Pulse Length tt: 0099 corresponds to 00 9.9 Seconds.

Information Retrieval Commands

*POLL Respond with unit (ID) address in appropriate time slot. If there are multiple units on the line, each will respond with a different delay after receipt of this command.

*uSPii Send status of input ii. Response is SuP,ii,x where x is 1 if the corresponding input is high, 0 otherwise.

*uSPA Send status of all inputs. Response is SuP,A,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x <CR><LF > where input 1 is first and input 16 is last. x is 1 if the corresponding input is high, 0 otherwise.

*uSR   Send   status   of   all   OUTPUTS.   Response   is: SuA,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x,x <CR><LF>

*uU – Send Unit Information :<name(SRC-16)><version n.nn><cr><lf>

INSTALLATION

Binary Commands

All commands start with a 2Ah (ASCII *)

The first byte contains the board ID and the byte count iiibbbbb

The byte count is the number of bytes after the byte containing the byte count including checksum. The second byte contains an 8 bit command. Some commands are followed by data bytes.

Checksum is the LSByte of the sum of all bytes preceding checksum including start. Binary commands must be received as a packet. If 50 ms or more passes after a character is received, with no new character following, the SRC-16 will begin looking for a new string if no valid data packet has been received.

SRC-16 Commands

Command	Additional Data Bytes	Function
		Test Strings
42h		2A 02 42 6E	Set serial speed to 2400
43h		2A 02 43 6F	Set serial speed to 9600
44h		2A 02 44 70	Set serial speed to 19200
45h		2A 02 45 71	Set serial speed to 38400
46h		2A 02 46 72	Enable error & good responses
47h		2A 02 47 73	Disable error & good responses
48h	n	2A 03 48 01 76	Latch output n (00 – 0F)
49h	n	2A 03 49 01 77	Unlatch output n (00 – 0F)
4Ah	n t	2A 04 41 01 0A 83	Pulse output n (00 – 0F), t= time (1-63h =.1-9.9sec)
4Bh	n	2A 03 4B 01 79	Poll output n (00 – 0F) (see 55h)
4Ch	n	2A 03 4C 01 7A	Poll input n (00 – 0F) (see 55h)
4Dh		2A 02 4D 79	All Output status request (see 52h)
4Eh		2A 02 4E 7A	All Input status request (see 53h)
4Fh		2A 02 4F 7B	Unit version request (see 54h)

Response from SRC-16		Function
50h		Error response if enabled by 46h
51h		Good response if enabled by 46h
52h	n byte	Response of 4Dh, outputs are sent as 1 byte
53h	n byte	Response of 4Eh, inputs are sent as 1 byte
		Also sent when any input changes state
54h	nn 01h, 03h =	Response to 4Fh outputs version, (ie ver 1.02)
55h	n	Response to 4Bh or 4Ch for polled output or input where the

three highest bits of n are used to identify if an input/output is low/high and the lowest 4 bits identify the input or output. n = 00h – 0Fh if input n is low, n = 20h – 2Fh if input n is high, n = 40h – 4Fh if output n is low and n = 60 – 6F if output n is high. n=cccxnnnn where ccc = 000 = input low, 001 = input hi, 010 = output lo, 011 = output hi. nnnnn lowest 5 bits used to identify the input or output

Example of binary exchange

To poll the status of outputs of unit 2 when outputs (0-7) 0, 6 are high, all else low:

Command string to SRC-16:

00101010b	2Ah	Start byte
01000010b	42h	Board ID 2 (010b), Byte count 2 (00010b)
01001101b	4Dh	All Output Status Request
10111001b	B9h	Check sum (2Ah+42h+4Dh=B9h)

Response string from SRC-16

00101010b	2Ah	Start byte
01000100b	44h	Board ID 2 (010b), Byte count 4 (00100b)
01010010b	52h	Response code for an All Output Status Request
00000000b	00h	Outputs 7-F are all low
01000001b	41h	Outputs 6 and 0 are high
00000001b	01h	Check sum (2Ah+44h+52h+00h+41h=01h)

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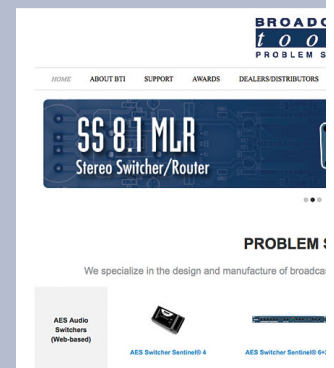
Broadcast Tools® SRC-16 Specifications

Digital Inputs:	16 - Selectable 5 to 24 vdc optically Isolated inputs (Jumper selectable. Factory default = Dry). 50 ms minimum duration.
Relay Outputs:	16 - SPDT, 1 amp/30 vdc relays. Jumper selectable either N.O or N.C. Factory default = N.O.
RS-232 Serial Port:	2400, 4800, 9600 or 38400 baud, 8 data bits, no parity, 1 stop bit. Custom baud rates may be requested
RS-422 Serial Port:	2400, 4800, 9600 or 38400 baud, 8 data bits, no parity, 1 stop bit. Custom baud rates may be requested.
Display:	LED's for inputs, relays, Tx & Rx serial data and power.
Interfacing:	Inputs – Plug-in euroblock screw terminals. Relays - Plug-in euroblock screw terminals. RS-232 Serial Port - Female DB-9. Data flow programmable. RS-422 Serial port - Plug-in euroblock screw terminals. Expansion port - Two, RJ45 connectors.
Logic:	Flash microprocessor / Non-volatile memory.
Power:	9 Vac @1 amp or 500 ma / 120 Vac 50-60 Hz, "Wall Wart" Supplied. (CE, 240 Vac 50-60 Hz optional)
Mechanical:	8.50" x 1.55" x 6.00" (WHD)
Weight:	3.0 lbs.
Mounting Option:	RA-1 rack shelf for mounting up to two units in 1-RU. Filler panels included
Ethernet Option:	Optional external Ethernet Device Server. Broadcast Tools® ESS-1.
USB Option:	Optional external Smart USB to Serial adapter. Broadcast Tools® Smart USB to RS232 cable.

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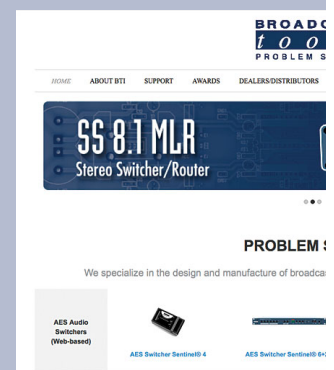
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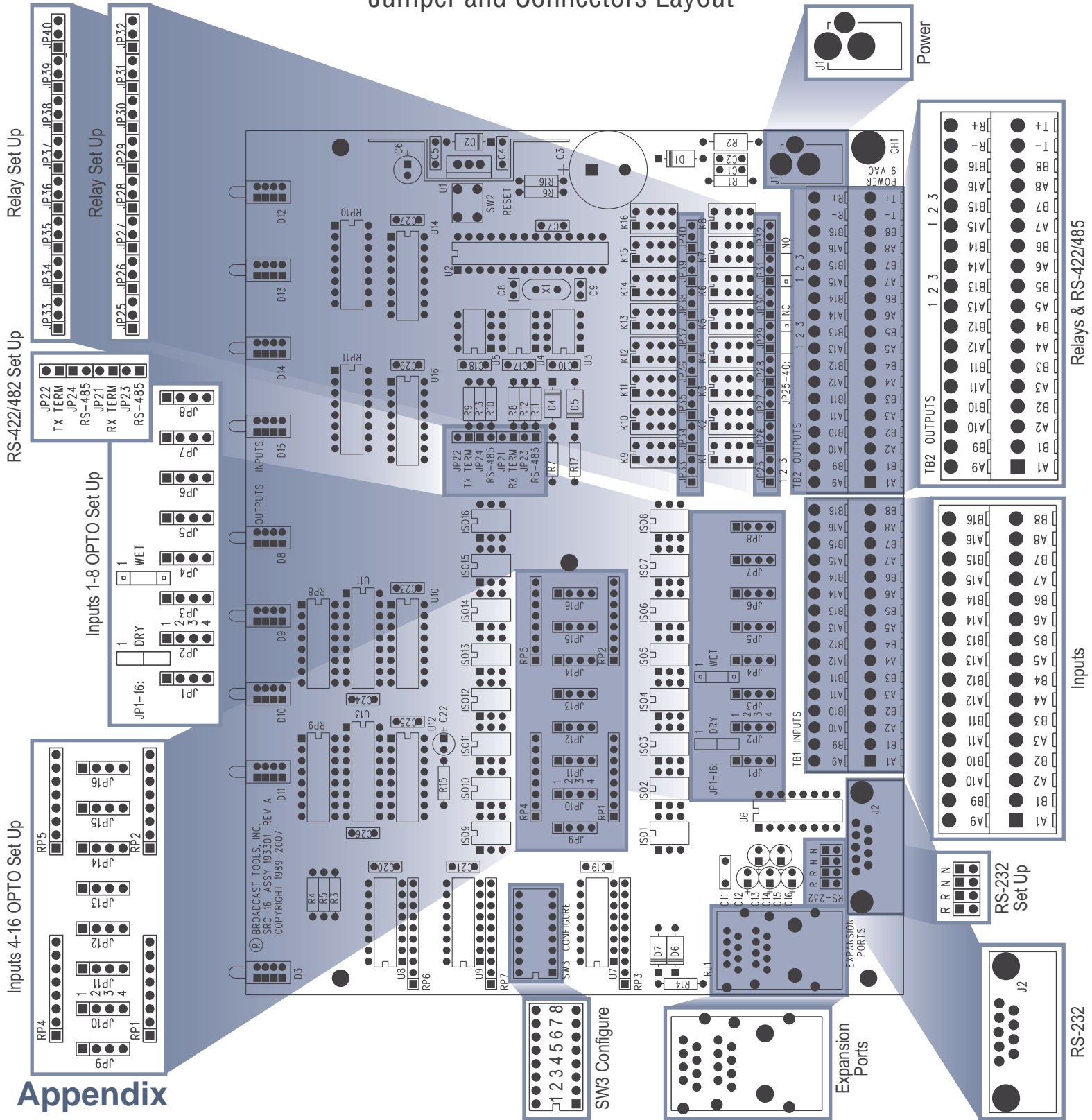
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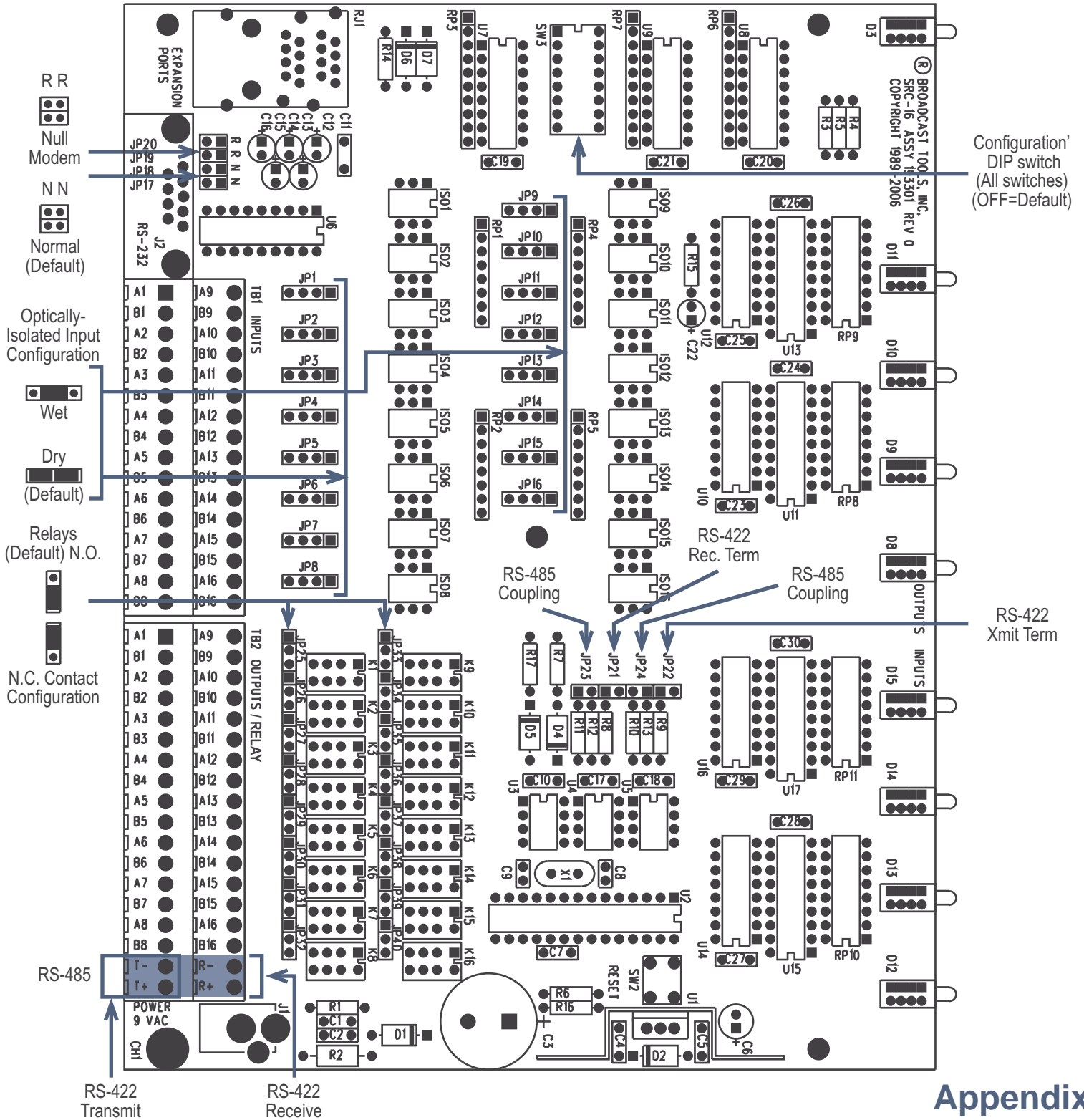www.broadcasttools.com **website**

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Broadcast Tools® SRC-16 Serial Remote Control
Jumper and Connectors Layout

Appendix

Broadcast Tools® SRC-16 Serial Remote Control
Jumper Layout

Null Modem

Normal (Default)

Optically-Isolated Input Configuration

Wet

Dry (Default)

Relays (Default) N.O.

N.C. Contact Configuration

RS-485

RS-422 Transmit

RS-422 Receive

Configuration' DIP switch (All switches) (OFF=Default)

RS-422 Rec. Term

RS-485 Coupling

RS-485 Coupling

RS-422 Xmit Term

RS-485 Coupling

Appendix

Modification Date: 10/24/06