MCN RYB-8 Relay Board
with Power and Termination Options

Hardware Manual

S2-60657-115

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1. RYB-8 Relay Board

1.1 Introduction

The MCN-RYB-8 board is a relay board accessory to the MCN Monitoring and Control Network product family.

The MCN-RYB-8 board has the following features:
- (8) DPDT Relays (Configured to switch circuit pairs).
- Hi-reliability long-life sealed relays.
- Relays rated for low-level (dry circuit) audio switching, up to 2A.
- Selectable 600 Ohm terminations for the Normally Open, Normally Closed, or Common circuits (may be de-selected).
- LEDs to indicate which relays are active.
- Control Connector (relay coil inputs) which is pin-compatible with the MCN IOB modules.
- 25-pair telco connectors used for control inputs and relay outputs.
- Jumpers to control adjacent relays.
- Jumpers for Sub-Category strapping for MCNRCD variable status text messages.
- Optional EIA 19" rack-mount panel available for mounting (4) MCN-RYB-8 boards.

Part Number	Description
S3-60644	Basic board with no jumpers installed
S2-60694	Board with standard jumpers installed
	E1-E8: B1 installed (I/O Line 1 controls relays)
	B4 installed (Spare sub-category jumper, parked)
	E9-E16: (2) jumpers installed in park position
	(600 Ohm Termination de-selected)
S2-60508	Board with A/C jumpers installed
S2-60509	Board with B jumpers installed
S2-60510	Board with C/C jumpers installed
S2-60794	Board with A/B jumpers installed
S2-60645	Cable Assy, IOB/CIB/IIB to RYB-8, 50 Conductor, 1' Length

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Note: The MCN RYB-8 Relay board is pin-compatible with the IOB module and is fully supported for operation with it. Although it is also pin- compatible with the CIB Comparator Interface Module (in Spectra-TAC mode only), it is not supported for use with CIB modules. References are made within this document to the CIB Comparator Interface Module only for completeness, especially with the MCNRCD PC Software.

1.1.1 Related Documents

1. MCN IOB Input/Output Control Module
   Part Number S2-60630
2. MCN System Manual
   Part Number S2-60425
3. MCN Remote Comparator Display (MCNRCD) Manual
   Part Number S2-60428

1.2 Circuit Description

The MCN-RYB-8 board has 8 identical circuits. The following will describe the first such circuit.

Relay K1 has the following I/O bits associated with it:

J2 Pin	Relay	I/O Bit	Relay Board Function	CIB Module Signal	IOB Mode 1 Signal
21	1	1	Input/Output	VOTE 1	Input/Output 1
22	1	2	Output	RECEIVE 1	input 1
20	1	3	Input/Output	DISABLE 1	Input/Output 9
23	1	4	Output	FAIL 1	input 9

I/O bits 1 or 3 can be used as inputs to drive the coil of the relay (see Figure 1).

1.2.1 Relay Control Inputs E1-E8 "B" Side

Each relay has its own jumper block (E1-E8) to select the input that will drive the relay coil. Each relay can be controlled from either I/O bit 1 or 3 associated with it, depending upon the position of the B1 or B3 jumper in jumper blocks E1-E8. The following table shows the jumper configuration for relay K1:

J2 Pin	I/O Bit	Jumper
21	1	E1-B1 In (Default)
20	3	E1-B3 In

Only one jumper (E1-B1 or E1-B3) should be installed at a time.
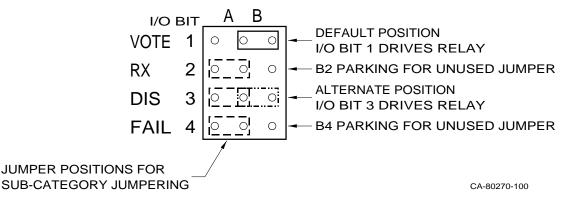

Figure 1. Input Jumpering E1-E8

Positions B2 and B4 can be used to "park" unused jumpers.

1.2.2 Sub-Category Jumpers E1-E8 "A" Side

When you use the MCN Relay Board with an MCN IOB module and the MCNRCD PC Software, you can use the "A" side of jumper blocks E1 through E8 to provide static sub-category status text selections. This will allow you to specify different status text messages (On/Off, Up/Down, Main/Standby, etc. as defined in the MCNRCD.CFG file) for different relays on the MCN-RYB-8 board.

For relay K1, the jumpering is shown in Table 1:

J2 Pin	Relay	I/O Bit	Jumper	CIB Signal	IOB Mode 1 Signal	MCNRCD Bit Weight
21	1	1	E1-A1 In	VOTE 1	Input/Output 1	1
22	1	2	E1-A2 In	RECEIVE 1	input 1	04
20	1	3	E1-A3 In	DISABLE 1	Input/Output 9	10
23	1	4	E1-A4 In	FAIL 1	input 9	40

Table 1 - Sub-Category Jumpers

Since I/O bit 1 is normally used to control the relay, I/O bits 2-4 are available for sub-category selection. Up to (8) sub-categories can be configured with these 3 bits. When a jumper is inserted, the bit is active. See the MCNRCD Software Manual and IOB hardware manual for more details on sub-categories.

1.2.3 Adjacent Relay Drive Jumpers E17-E23

In some applications you may need to drive two relays from the same input signal. You can use jumpers E17-E23 to connect a relay's coil to an adjacent relay's coil.

E17 jumpers the coils for relays 1 & 2 together. E18 jumpers relays 2 & 3, and so on.

Caution

When you insert the Adjacent Relay Drive jumpers (E17-E23), be sure that you have only one input active (E1-E8 "B" side) for each set of relays that are connected together.

These jumpers are normally not installed from the factory, unless a custom configuration is ordered.

1.2.4 600 Ohm Termination Jumpers E9-E16

A selectable 600 Ohm termination is available for each relay. The termination is used in some telephone line applications when you need to terminate an unused phone line. Jumper blocks E9 to E16 control the terminations. You can terminate the Normally Open, Normally Closed, or Common pair as shown in Table 2 and Figure 2

600 Ohm Termination	E9-E16 Jumpers Installed
None	None (or insert in "Park" positions)
Common Pair	A1 & B1
Normally Open Pair	A2 & B2
Normally Closed Pair	A4 & B4

Table 2 - 600 Ohm Termination Jumpering

CA-80272-100

Figure 2. 600 Ohm Termination Jumpering E9-E16

1.2.5 Jumper List

Jumper	Controls Relay	Description
E1	1	Input Select (B1 & B3) and Sub-Category Jumpering (A1-A4)
E2	2	Input Select (B1 & B3) and Sub-Category Jumpering (A1-A4)
E3	3	Input Select (B1 & B3) and Sub-Category Jumpering (A1-A4)
E4	4	Input Select (B1 & B3) and Sub-Category Jumpering (A1-A4)
E5	5	Input Select (B1 & B3) and Sub-Category Jumpering (A1-A4)
E6	6	Input Select (B1 & B3) and Sub-Category Jumpering (A1-A4)
E7	7	Input Select (B1 & B3) and Sub-Category Jumpering (A1-A4)
E8	8	Input Select (B1 & B3) and Sub-Category Jumpering (A1-A4)
E9	1	600 Ohm Termination Selection
E10	2	600 Ohm Termination Selection
E11	3	600 Ohm Termination Selection
E12	4	600 Ohm Termination Selection
E13	5	600 Ohm Termination Selection
E14	6	600 Ohm Termination Selection
E15	7	600 Ohm Termination Selection
E16	8	600 Ohm Termination Selection
E17	1 & 2	Adjacent relay coil selection--Connects relay coils 1 & 2
E18	2 & 3	Adjacent relay coil selection--Connects relay coils 2 & 3
E19	3 & 4	Adjacent relay coil selection--Connects relay coils 3 & 4
E20	4 & 5	Adjacent relay coil selection--Connects relay coils 4 & 5
E21	5 & 6	Adjacent relay coil selection--Connects relay coils 5 & 6
E22	6 & 7	Adjacent relay coil selection--Connects relay coils 6 & 7
E23	7 & 8	Adjacent relay coil selection--Connects relay coils 7 & 8

Table 3 - Jumper Block List

1.2.6 Power Input - TB1

The board requires 12V external power at 704 mA. Power is applied through screw terminal block TB1 as shown in Table 4.

TB1 Pin	Function
1	+12V
2	+12V (can be used to daisy-chain power)
3	Ground
4	Ground (can be used to daisy-chain power)

Table 4 - Power Connections TB1

1.2.7 Relay Output Connections - J1

The relay output connections appear on a 50-pin female micro-ribbon telco-style connector, J1. The pinouts are as follows:

J1 Pin	Function
26	K1 Tip Common
1	K1 Ring Common
27	K1 Tip Normally Open (N.O.)
2	K1 Ring Normally Open (N.O.)
28	K1 Tip Normally Closed (N.C.)
3	K1 Ring Normally Closed (N.C.)
29	K2 Tip Common
4	K2 Ring Common
30	K2 Tip Normally Open (N.O.)
5	K2 Ring Normally Open (N.O.)
31	K2 Tip Normally Closed (N.C.)
6	K2 Ring Normally Closed (N.C.)
32	K3 Tip Common
7	K3 Ring Common
33	K3 Tip Normally Open (N.O.)
8	K3 Ring Normally Open (N.O.)
34	K3 Tip Normally Closed (N.C.)
9	K3 Ring Normally Closed (N.C.)
35	K4 Tip Common
10	K4 Ring Common
36	K4 Tip Normally Open (N.O.)
11	K4 Ring Normally Open (N.O.)
37	K4 Tip Normally Closed (N.C.)
12	K4 Ring Normally Closed (N.C.)
38	K5 Tip Common
13	K5 Ring Common
39	K5 Tip Normally Open (N.O.)
14	K5 Ring Normally Open (N.O.)
40	K5 Tip Normally Closed (N.C.)
15	K5 Ring Normally Closed (N.C.)
41	K6 Tip Common
16	K6 Ring Common
42	K6 Tip Normally Open (N.O.)
17	K6 Ring Normally Open (N.O.)
43	K6 Tip Normally Closed (N.C.)
18	K6 Ring Normally Closed (N.C.)
44	K7 Tip Common
19	K7 Ring Common
45	K7 Tip Normally Open (N.O.)
20	K7 Ring Normally Open (N.O.)
46	K7 Tip Normally Closed (N.C.)
21	K7 Ring Normally Closed (N.C.)
47	K8 Tip Common
22	K8 Ring Common
48	K8 Tip Normally Open (N.O.)
23	K8 Ring Normally Open (N.O.)
49	K8 Tip Normally Closed (N.C.)
24	K8 Ring Normally Closed (N.C.)
50	No Connection
25	No Connection

Table 5 - J1 Relay Contact Pinout

1.2.8 Relay Input Connections - J2

The relay input connections appear on a 50-pin female micro-ribbon telco-style connector, J2. The relay input connector is laid out to match the MCN IOB module pin-for-pin. J2 can be connected to the IOB module directly through a 25-pair straight-through male to male cable.

Since the MCN CIB module was originally set up to match the Digitac P805 pinout, the signals are a bit scrambled. For convenience, the pinouts are as shown in two tables, the first sorted by relay and function, and the second sorted by pin number. The corresponding signal names for the CIB and IOB modules are also shown.

J2 Pin	Relay	I/O Bit	Relay Board Function	CIB Module Signal	IOB Mode 1 Signal
21	1	1	Input/Output	VOTE 1	Input/Output 1
22	1	2	Output	RECEIVE 1	Input 1
20	1	3	Input/Output	DISABLE 1	Input/Output 9
23	1	4	Output	FAIL 1	Input 9
46	2	1	Input/Output	VOTE 2	Input/Output 2
47	2	2	Output	RECEIVE 2	Input 2
45	2	3	Input/Output	DISABLE 2	Input/Output 10
48	2	4	Output	FAIL 2	Input 10
15	3	1	Input/Output	VOTE 3	Input/Output 3
16	3	2	Output	RECEIVE 3	Input 3
14	3	3	Input/Output	DISABLE 3	Input/Output 11
17	3	4	Output	FAIL 3	Input 11
40	4	1	Input/Output	VOTE 4	Input/Output 4
41	4	2	Output	RECEIVE 4	Input 4
39	4	3	Input/Output	DISABLE 4	Input/Output 12
42	4	4	Output	FAIL 4	Input 12
9	5	1	Input/Output	VOTE 5	Input/Output 5
10	5	2	Output	RECEIVE 5	Input 5
8	5	3	Input/Output	DISABLE 5	Input/Output 13
11	5	4	Output	FAIL 5	Input 13
34	6	1	Input/Output	VOTE 6	Input/Output 6
35	6	2	Output	RECEIVE 6	Input 6
33	6	3	Input/Output	DISABLE 6	Input/Output 14
36	6	4	Output	FAIL 6	Input 14
3	7	1	Input/Output	VOTE 7	Input/Output 7
4	7	2	Output	RECEIVE 7	Input 7
2	7	3	Input/Output	DISABLE 7	Input/Output 15
5	7	4	Output	FAIL 7	Input 15
28	8	1	Input/Output	VOTE 8	Input/Output 8
29	8	2	Output	RECEIVE 8	Input 8
27	8	3	Input/Output	DISABLE 8	Input/Output 16
30	8	4	Output	FAIL 8	Input 16
1	Common		Ground	Ground	Ground

Table 6 - Relay Inputs Connector J2 Pinout - Sorted by Relay & Function

J2 Pin	Relay	I/O Bit	Relay Board Function	CIB Module Signal	IOB Mode 1 Signal
26					
1	Common		Ground	Ground	Ground
27	8	3	Input/Output	DISABLE 8	Input/Output 16
2	7	3	Input/Output	DISABLE 7	Input/Output 15
28	8	1	Input/Output	VOTE 8	Input/Output 8
3	7	1	Input/Output	VOTE 7	Input/Output 7
29	8	2	Output	RECEIVE 8	Input 8
4	7	2	Output	RECEIVE 7	Input 7
30	8	4	Output	FAIL 8	Input 16
5	7	4	Output	FAIL 7	Input 15
31					
6					
32					
7					
33	6	3	Input/Output	DISABLE 6	Input/Output 14
8	5	3	Input/Output	DISABLE 5	Input/Output 13
34	6	1	Input/Output	VOTE 6	Input/Output 6
9	5	1	Input/Output	VOTE 5	Input/Output 5
35	6	2	Output	RECEIVE 6	Input 6
10	5	2	Output	RECEIVE 5	Input 5
36	6	4	Output	FAIL 6	Input 14
11	5	4	Output	FAIL 5	Input 13
37					
12					
38					
13					
39	4	3	Input/Output	DISABLE 4	Input/Output 12
14	3	3	Input/Output	DISABLE 3	Input/Output 11
40	4	1	Input/Output	VOTE 4	Input/Output 4
15	3	1	Input/Output	VOTE 3	Input/Output 3
41	4	2	Output	RECEIVE 4	Input 4
16	3	2	Output	RECEIVE 3	Input 3
42	4	4	Output	FAIL 4	Input 12
17	3	4	Output	FAIL 3	Input 11
43					
18					
44					
19					
45	2	3	Input/Output	DISABLE 2	Input/Output 10
20	1	3	Input/Output	DISABLE 1	Input/Output 9
46	2	1	Input/Output	VOTE 2	Input/Output 2
21	1	1	Input/Output	VOTE 1	Input/Output 1
47	2	2	Output	RECEIVE 2	Input 2
22	1	2	Output	RECEIVE 1	Input 1
48	2	4	Output	FAIL 2	Input 10
23	1	4	Output	FAIL 1	Input 9
49					
24					
50					
25					

Table 7 - Relay Inputs Connector J2 Pinout - Sorted by Pin Number

1.3 Mounting and Cabling

The following options are available for the MCN-RYB-8 Relay Board:
        S2-60646   Relay Board quad rack-mounting panel
        S2-60645   Ribbon Cable assembly for CIB or IOB to Relay Board
                               (25-pair)

The Mounting Panel mounts in an EIA 19" rack. It can hold 4 MCN RYB-8 boards. It has snap-in standoffs for board mounting and includes tie-points for use with cable ties. It is 10.5" high (6 Rack Units).

Figure 3 shows a view of the Mounting Panel from the front side of the equipment rack. Since the Relay Boards are mounted to the opposite side, they are shown as if the panel and boards were transparent. This figure also shows the ribbon cable used to connect the relay boards with an IOB or CIB module.
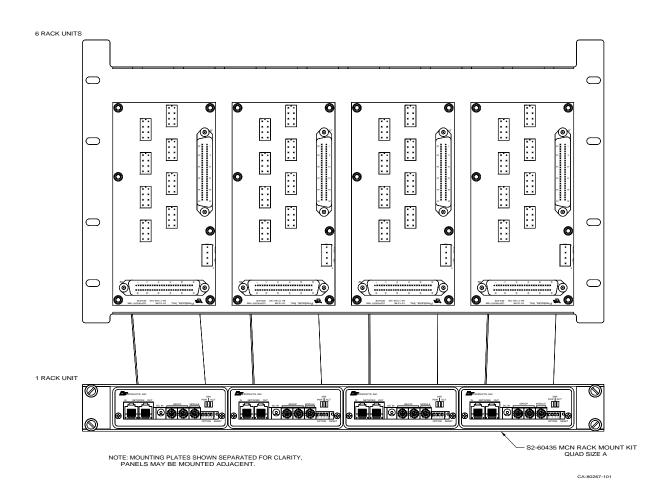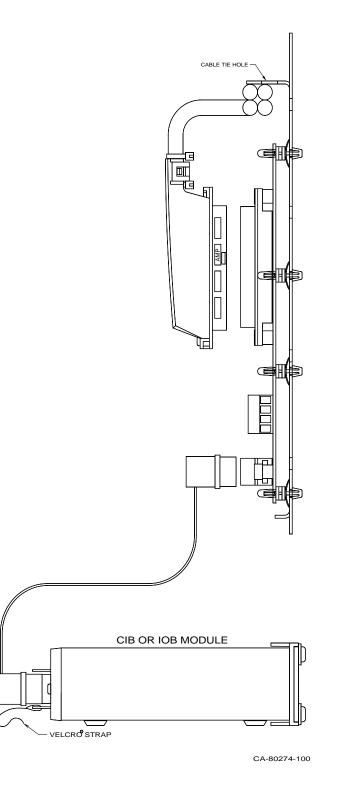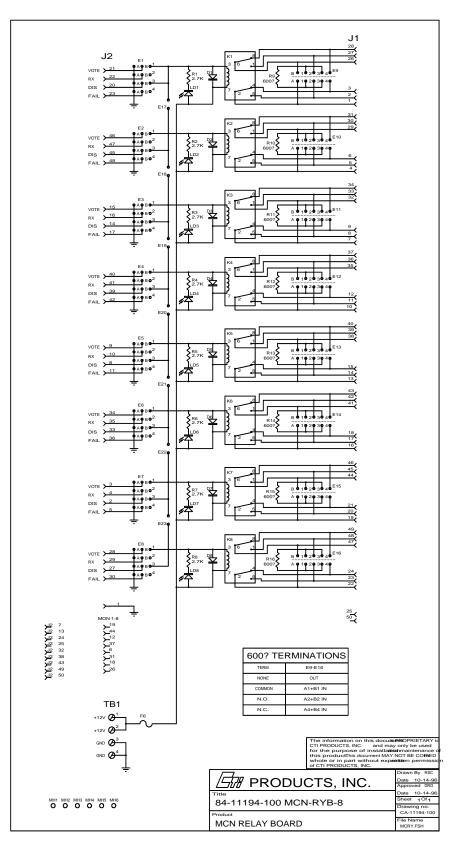

Figure 3. Relay Mounting Panel

CABLE TIE HOLE

AMP

CIB OR IOB MODULE

VELCRO STRAP

CA-80274-100

Figure 4. Relay Mounting Panel – Side View

1.4 Specifications – RYB-8 Relay Board

Relay Circuits	8, DPDT (Dual Form C), Sealed
Relay Type	MIL-R-39016/6
Contact Type	Gold Plated over Hardened Silver; Stationary contacts are bifurcated
Contact rating and life expectancy	0.5 A @ 28VDC Resistive 500,000 Operations 1.0 A @ 28VDC Resistive 250,000 Operations 2.0 A @ 28VDC Resistive 100,000 Operations 3.0 A @ 28VDC Resistive 50,000 Operations 0.16 A @ 28VDC Lamp 10,000 Operations 30 uA @ 50 mVDC Low Level 1,000,000 Operations Relays which are used for intermediate and high-level (above .5A and/or 28 volts), inductive, or lamp service will not be suitable for low-level operation.
Relay Coil Load	Active low 88 mA max. @12VDC 110 mA max. @15VDC
Operate & Release Time	4.0 ms max. with 12 VDC supply and contact load of 10 mA @ 6VDC
Supply Voltage	12 VDC Nominal (10-15 VDC)
Supply Current (all 8 relays activated)	704 mA max. @12VDC 880 mA max. @15VDC
Relay Control (Input) Connector	50-pin Female Micro-ribbon AMP connector (TELCO 25-pair style)
Relay Output (Contact) Connector)	50-pin Female Micro-ribbon AMP connector (TELCO 25-pair style) with Velcro cable clamp
Optional telephone line terminations:	620 Ohm 1/4 W 5%
Power Connector:	4-pin screw terminal strip, accepts #24 to #14 AWG wire.
Fuse	AGC 1A
PCB Flammability Rating:	94V-0
Temperature Rating	-25 to +65 Degrees C
Size	7.5"H x 3.75"W x 2.5"D (mounted, with connectors seated)

1.5 Schematic – RYB-8 Relay Board

1.6 Board Layout – RYB-8 Relay Board

2. Hot-Standby Power Supply Option

2.1 Introduction

The Hot-Standby Power Supply Option is a redundant 12Vdc supply to power the relay coils of the RYB-8 Relay Boards. This option consists of dual 100/240Vac to 12Vdc Power Supplies (81-11665), a Relay Power Distribution Board (S3-61193), and mounting hardware. A single (non-redundant) Power Supply is also available. For this option, the information in Section 5.1 should be ignored.

Part Number	Description
S2-61084	Hot-Standby Power Supply Option
S2-61390	Hot-Standby Power Supply Option with Rack Panel
S2-61240	Single Power Supply Option
S2-61117	Single Power Supply Option with Rack Panel

2.1.1 Power Distribution

The outputs from the redundant power supplies are independently connected to inputs on the Relay Power Distribution Board. Each supply input on this board is separately fused with an automotive style fuse, and has an "OK" and "FAIL" LED indicator. When the input supply is present (and the input fuse is intact), the corresponding green "OK" LED is lit. If either input supply is not present, or the fuse is blown, the green "OK" LED for that input is turned off, and the red "FAIL" LED is lit. In addition, an on-board buzzer sounds when either supply input is not present, or if any of the input (F5, F6) or output (F1 – F4) fuses are blown. The buzzer may be disabled by moving Jumper E4 to the "OFF" position.

The Relay Power Distribution Board passes the supply current from the input supplies to four outputs (one for each relay board on the mounting panel). Each supply output is separately fused, and has an "OK" and "FAIL" LED indicator. When the output supply is present (and the output fuse is intact), the corresponding green "OK" LED is lit. If an output supply is not present, or the fuse is blown, the green "OK" LED for that output is turned off, and the red "FAIL" LED is lit.

2.1.2 Status Indication

Three status signals are available to inform monitoring equipment if the redundant power supplies are functioning or if any fuses are blown. The three status signals are driven from solid state relays, with an output rating of 60V, and protected with 0.5A fuses. (These fuses are non-field replaceable, since they are soldered.) These signals can either be referenced to the GND signal by installing the appropriate jumper, or isolated by removing the jumper. Table 11 lists the terminal connections for these signals and jumpers for referencing to GND.

2.1.3 Fuses

Table 8 lists field replaceable fuses for the Relay Power Distribution Board.

Fuse Designation	CTI Part Number	Description
F1, F2, F3, F4	65-11820	Fuse 1A 60V Fast Blow GMT Indicating
F5, F6	65-11851	Fuse 4A 32V Fast Blow Auto Mini

Table 8 – Fuses for Relay Power Distribution Board

2.1.4 Terminal Blocks

2.1.4.1 TB1 – TB4: Supply Outputs

Signal	TB1 – TB4 Terminal	Description
+12Vdc	1	Fused Supply Output Voltage
GND	2	Ground Reference

Table 9 – TB1 – TB4 Terminal Blocks

2.1.4.2 TB5 – TB6: Supply Inputs

Signal	TB5 – TB6 Terminal	Description
+12Vdc	1	Supply Input Voltage
GND	2	Ground Reference

Table 10 – TB5 – TB6 Terminal Blocks

2.1.4.3 TB7 - Status Output Signals

Signal	TB7 Terminal	GND Ref Jumper	Description
GND	1		Ground Reference
ALRM_FUSE-	2	E3	Relay contact closes if either input supply is
ALRM_FUSE+	3		not present, or if any fuse (F1 – F6) is blown.
PWRB_OK-	4	E2	Relay contact closes if the input supply is
PWRB_OK+	5		present and Fuse F6 is OK.
PWRA_OK-	6	E1	Relay contact closes if the input supply is
PWRA_OK+	7		present and Fuse F5 is OK.

Table 11 – TB7 Terminal Block

2.2 Mounting

The Power Supply Options are normally mounted to the panel on the side opposite to where the relay boards are mounted as indicated in Figure 5. This figure shows the Hot-Standby Power Supply Option. For the Single Power Supply Option, only the supply on the right-hand side is used. (The Relay Power Distribution Board is not used for the Single Power Supply Option.)
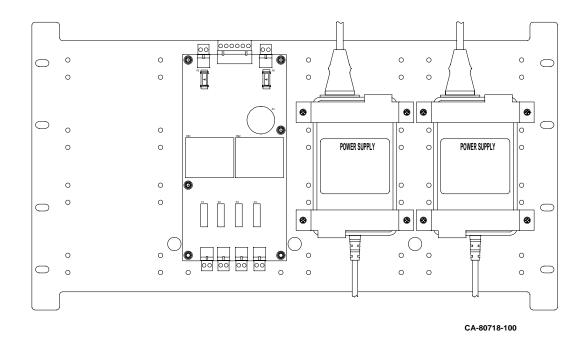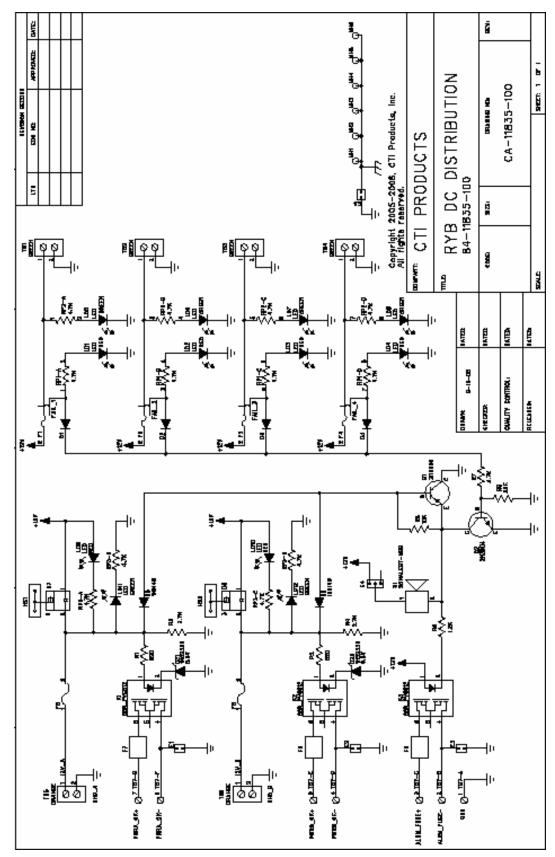

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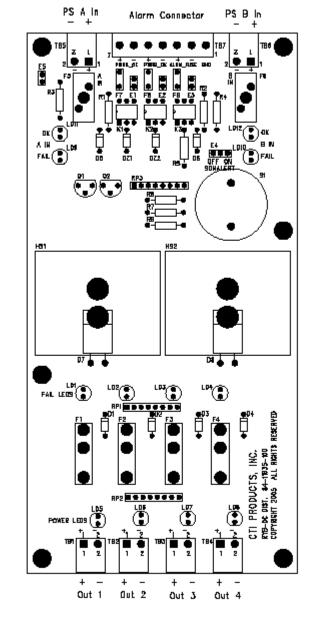**Figure 5. Mounting of Hot-Standby Power Supply Option**

2.3 Specifications – Hot-Standby Power Supply Option

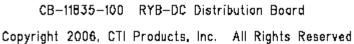|	
Redundant Input Supplies	2, 150-240Vac, IEC Connector, 4A max each, See Table 8
Output Supplies	4, 12Vdc, 1A max each, See Table 8
Status Signals	See Table 11
Indicators	Power OK & FAIL LEDs for each input & output supply
Audible Alert	Enabled with Jumper E4

2.4 Schematic - Power Distribution Board

2.5 Board Layout – Power Distribution Board

CB-11835-100   RYB-DC Distribution Board

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3. Passive Bridge Board

3.1 Introduction

The PBB-6x4 Passive Bridge Board provides six balanced, 600 ohm, 4-port passive audio bridge circuits on a single circuit board. It provides switchable terminations on all ports. Each of the six bridge circuits is independent from the other bridge circuits.

Part Number	Description
S1-61197	Cust PBB-6x4 Passive Bridge Board Unit
S2-61222	User Manual PBB-6x4

3.2 Mounting

Figure 6 shows the PBB-6x4 Passive Bridge Board mounted to the same side of the panel as the Relay Boards. Figure 7 shows the PBB-6x4 Passive Bridge Board mounted to the same side of the panel as the Power Supply.
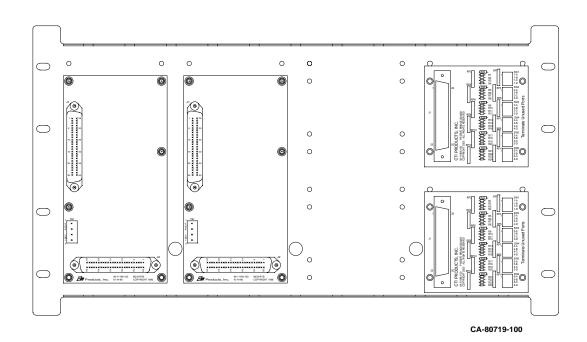
CA-80719-100
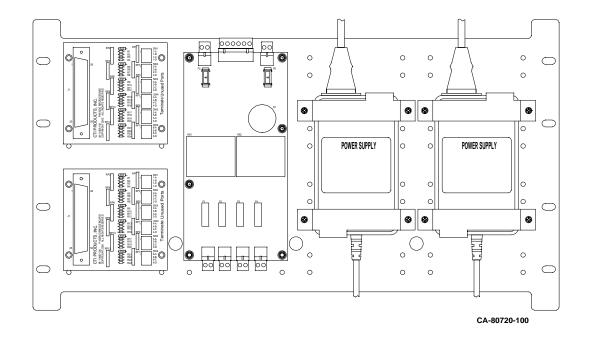
Figure 6. Mounting PBB-6x4 next to Relay Boards

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Figure 7. Mounting PBB-6x4 next to Power Supply