Discrete Input Signal Conditioning Card

User Manual

CQ9501-DI-16

Concurrent Real-Time 800 Northwest 33rd Street Pompano Beach, FL 33064	Document Number	0810002
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Revision History

Revision	Date	Author	Changes
A	01/27/2025	Jim Millener	UM Initial Release

TABLE OF CONTENTS

1. Introduction

This document describes the design and operational aspects of the Concurrent Real-Time CQ9515-DI-16 Configurable Discrete Input Signal Conditioning Board.

2. Product Description

2.1 Overview

The Discrete Input Signal Conditioner is a board with 16 digital circuits that are designed to be a front end to Concurrent Real-Time digital input device, such as a WC-CP-FIO Programmable FPGA Card, or other discrete digital input interfaces. There are two variants of the card, The standard version is designed to be installed into a CCRT Signal Workbench General Purpose Signal Conditioning (GPSD) chassis HS000-SIGWB-8 The DIN variant is designed to be mounted on a DIN rail. The board requires a power supply of +15VDC, or a user supply of up to +28VDC. The output is open drain pulled up to the +15VDC supply or +5VDC supplied separately. The input supports 4 voltage ranges, 5VDC, 12VDC, 28VDC, and 60VDC. The DIN Mount variant of the card requires an external power supply, such as the CCRT CX-NPSC-PWR1.

2.2 Block Diagram

Figure 1

shows a block diagram of the board identifying the I/O connectors. Figure 2 is a block diagram of the board showing the locations of the individual channel circuits.

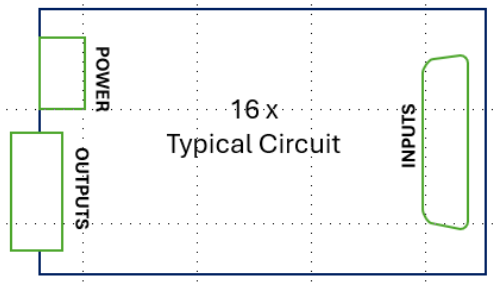


Figure 1

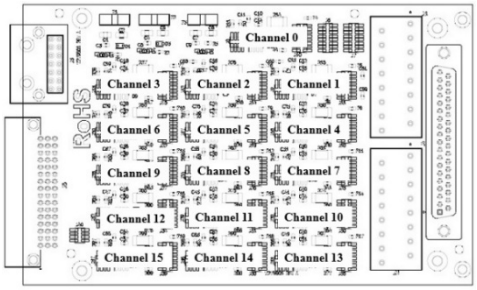
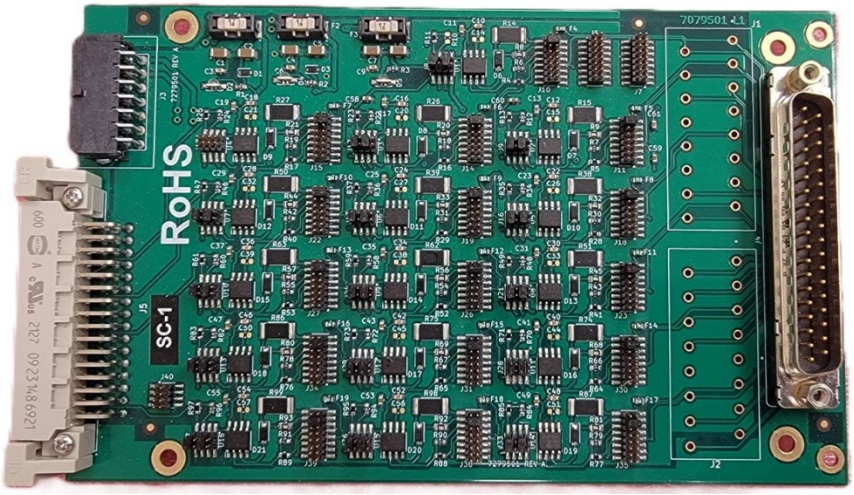


Figure 2

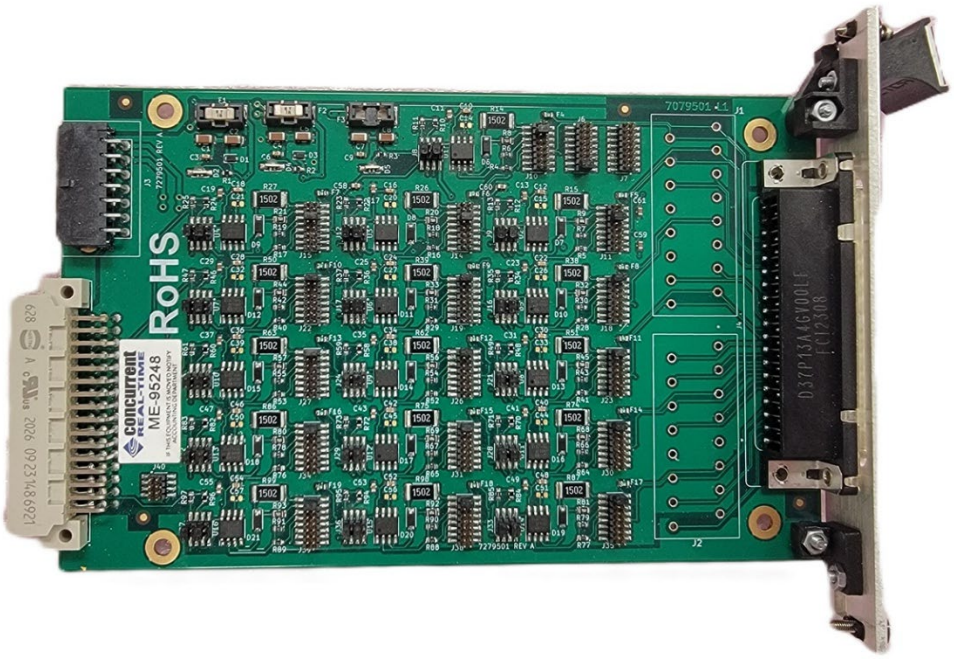
3. Picture

Picture 1 is a picture of the DIN mount board assembly.



Picture 1

Picture 2 is a picture of the Workbench mount board assembly.



Picture 2

4. General Operation

The following sections show the general steps required for operation.

4.1 Initial Configuration Setup

1) Before powering on a system with this board in it, configure the jumpers as described in this document to make sure that the I/O is configured as necessary.
2) Connect cables from the I/O interface to the system.
3) After power is applied to the system, if the LEDs are visible, confirm that the +15V indicator LED and the +5V indicator LED are ON. If any system I/Os are being supplied by an external voltage of up to 30V, make sure that the Vdd LED is showing active power as well.

4.2 Typical circuit schematic.

The typical input circuit is shown in Figure 3. There is a jumper on each circuit to connect multiple circuits to a common ground. The common ground is not required. It is possible for each input to be isolated from all the other inputs. There are 4 selections of current limiting for each input. Only one jumper should be placed on a pin pair from pin numbers 9 through 16. Jumper pins 9 and 10 for nominal 5V input. Jumper pins 11 and 12 for nominal 12V input. Jumper pins 13 and 14 for nominal 24V input. Jumper pins 15 and 16 for nominal 48V input.

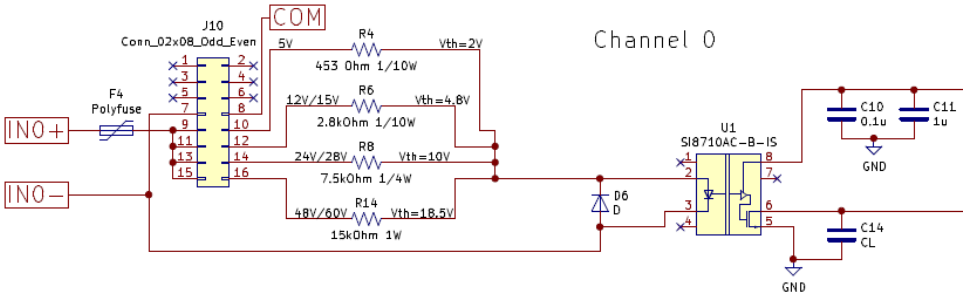


Figure 3

The power for all of the output circuits is common. The output circuit is shown in Figure 4. Power for the opto coupler output can be supplied by the external VBATT power by placing a jumper across pins 1and 2 of the jumper block, or by the onboard +15V by placing a jumper across pins 3 and 4 of the jumper block. The selection of one of these is required. The output side of the circuit is an open drain FET. A pullup to +15V can be selected by placing a jumper on the output jumper block pins 5 and 6. A pullup to +5V can be selected by placing a jumper on the output jumper block pins 7 and 8. If no pullup is selected, the user must supply a pullup of their choice, not to exceed 30V.

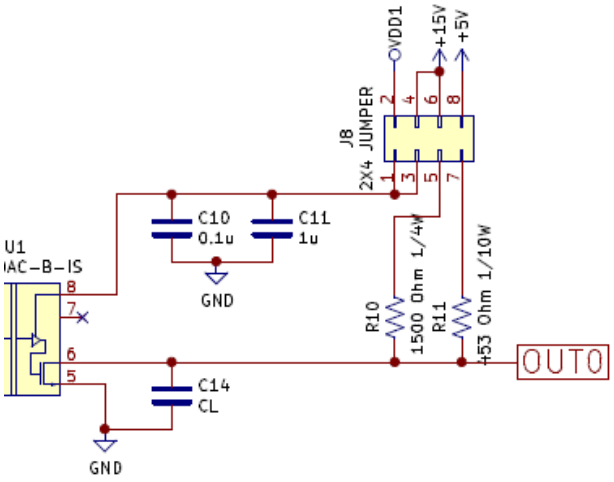


Figure 4

5. Circuit assembly

Figure 5 shows the layout of a single typical circuit.

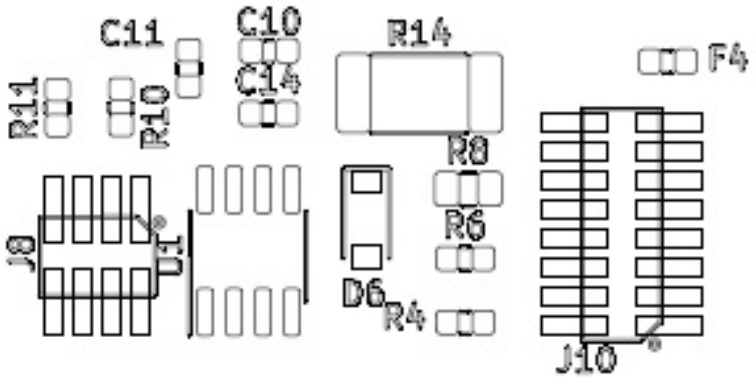


Figure 5

6. Timing

The propagation delay through the opto coupler is less than 50nS. Delays on the output circuit would be mainly due to the off-board impedance. Capacitor CL is not normally inserted.

7. Physical Characteristics

The Discrete Input Signal Conditioner Board is a 100mm X 160mm card that can be mounted on a DIN rail or in a 3U chassis. Power consumption depends on load but the maximum total power consumption is roughly 1 watt for the combined +15V and +5V supplies with all channels being used.

8. External Connectors

8.1 Analog Input Connector

Inputs are connected to connector J4, 37 Pin D-Sub connector. Outputs use a standard 3-row DIN style connector J5 which can be connected to a backplane or cable depSub-Dending on system requirements. The following are the connector as viewed when looking at the board:

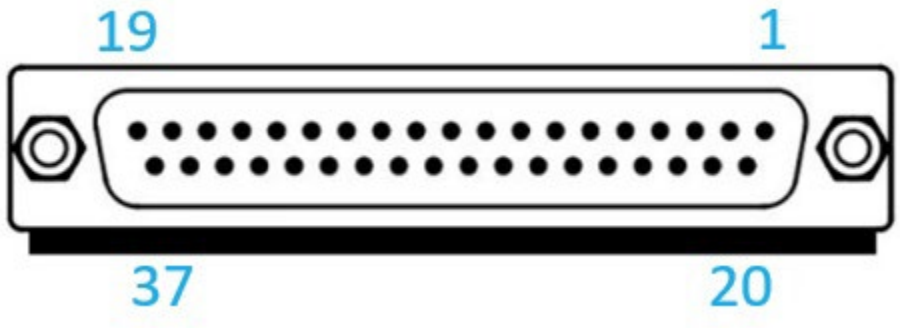
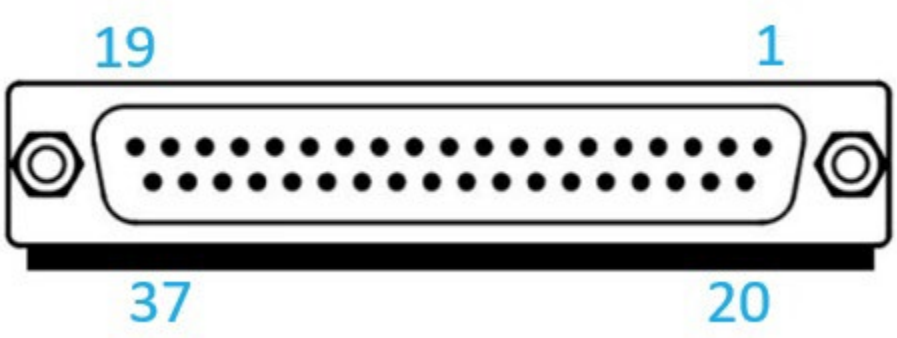


Figure 6

DB37 Pin Assignment for CQ9501-DI-16		
Pin Number	Name	Description
1	IN15-	Negative side of input 15.
20	IN15+	Positive side input 15.
2	IN14-	Negative side of input 14.
21	IN14+	Positive side input 14.
3	IN13-	Negative side of input 13.
22	IN13+	Positive side input 13.
4	IN12-	Negative side of input 12.
23	IN12+	Positive side input 12.
5	IN11-	Negative side of input 11.
24	IN11+	Positive side input 11.
6	IN10-	Negative side of input 10.
25	IN10+	Positive side input 10.
7	IN9-	Negative side of input 9.
26	IN9+	Positive side input 9.
8	IN8-	Negative side of input 8.
27	IN8+	Positive side input 8.

Table 1



DB37 Pin Assignment for CQ9515-DI-16		
Pin Number	Name	Description
9	IN7-	Negative side of input 7.
28	IN7+	Positive side input 7.
10	IN6-	Negative side of input 6.
29	IN6+	Positive side input 6.
11	IN5-	Negative side of input 5.
30	IN5+	Positive side input 5.
12	IN4-	Negative side of input 4.
31	IN4+	Positive side input 4.
13	IN3-	Negative side of input 3.
32	IN3+	Positive side input 3.
14	IN2-	Negative side of input 2.
33	IN2+	Positive side input 2.
15	IN1-	Negative side of input 1.
34	IN1+	Positive side input 1.
16	IN0-	Negative side of input 0.
35	IN0+	Positive side input 0.
17	N/C	No Connect
36	GND	Circuit GND
18	+5V	+5V Supply
37	+15V	+15V Supply
19	VBATT+	+VBATT < 30VDC

8.2 Discrete Output Connector

Figure 7 shows the discrete output connector and Table 2 shows the pin assignment, looking into the connector with the PCB below the connector body.

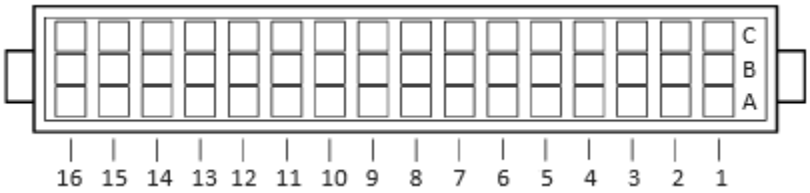


Figure 7

DIN48 Pin Assignment for CQ9515-AI-16							
Pin Num	**Name**	**Pin Num**	**Name**	**Description**	**Pin Num**	**Name**	**Description**
A1	OUT15	B1	GND	Discrete output 0	C1	N/C	No connect
A2	OUT14	B2	GND	Discrete output 1	C2	N/C	No connect
A3	OUT13	B3	GND	Discrete output 2	C3	GND	System ground
A4	OUT12	B4	GND	Discrete output 3	C4	GND	System ground
A5	OUT11	B5	GND	Discrete output 4	C5	GND	System ground
A6	OUT10	B6	GND	Discrete output 5	C6	+5V	+5V Supply
A7	OUT9	B7	GND	Discrete output 6	C7	+15V	+15V Supply
A8	OUT8	B8	GND	Discrete output 7	C8	N/C	No connect
A9	OUT7	B9	GND	Discrete output 8	C9	+BATT	+Alt supply
A10	OUT6	B10	GND	Discrete output 9	C10	+BATT	+Alt supply
A11	OUT5	B11	GND	Discrete output 10	C11	-BATT	-Alt supply
A12	OUT4	B12	GND	Discrete output 11	C12	-BATT	-Alt supply
A13	OUT3	B13	GND	Discrete output 12	C13	N/C	No connect
A14	OUT2	B14	GND	Discrete output 13	C14	N/C	No connect
A15	OUT1	B15	GND	Discrete output 14	C15	N/C	No connect
A16	OUT0	B16	GND	Discrete output 15	C16	N/C	No connect

Table 2

8.3 Power Connector

Power connector pin assignment. Figure 8 is a view of the power connector looking into the pins on the PCB with the key on the top.

Figure 8

Table 3 shows the pin names and descriptions of the signals in the power connector.

Pin	Signal Name	Description	Pin	Signal Name	Description
1	No Connect		8	No Connect	
2	No Connect		9	No Connect	
3	NBATT	Negative external Vin	10	PBATT	Positive external Vin
4	NBATT	Negative external Vin	11	PBATT	Positive external Vin
5	GND	Board Ground	12	N15V	Negative 15V
6	GND	Board Ground	13	P15V	Positive 15V
7	GND	Board Ground	14	No Connect	

Table 3