MiniMux
Multiplexer

USER'S GUIDE

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1.1 Overview

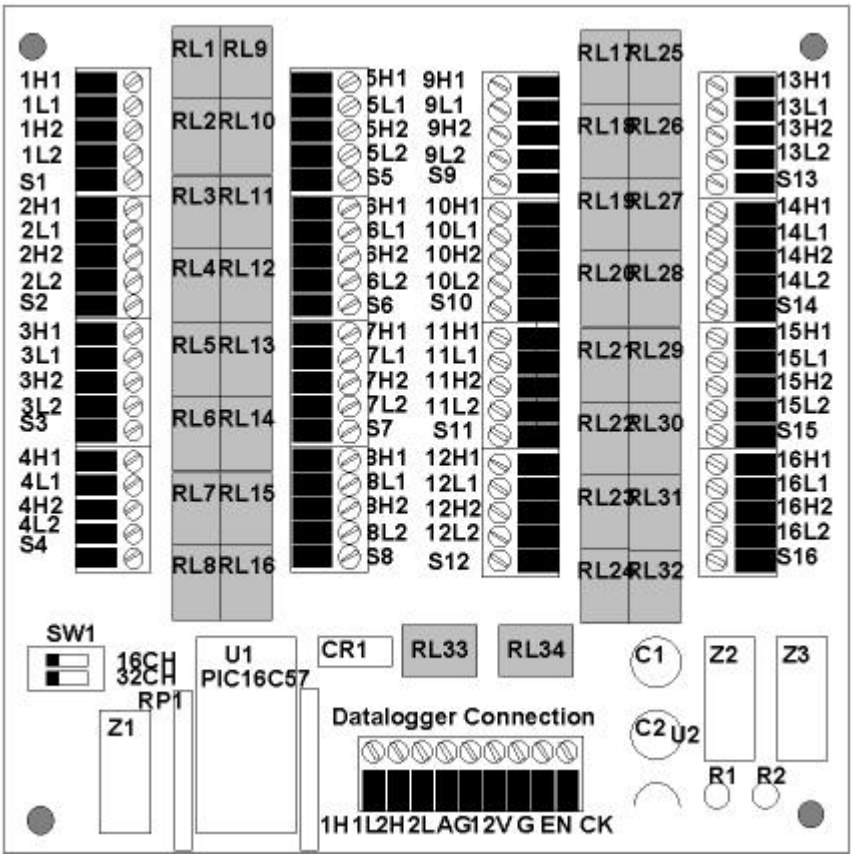
The MiniMux expands the number of instruments that may be read by the CR10 or CR10X in increments of 16 or 32, depending on the switch setting of the mux and the type of sensor being read. The MiniMux may be purchased installed in a NEMA 4 fiberglass/polyester enclosure or as a board assembly for users supplying their own packaging.

The complete list of features and ordering options is detailed on the MiniMux Ordering Guide available from our web site or by contacting Canary Systems directly.

The MiniMux utilizes advanced high-reliability components such as terminal blocks from Phoenix Contact (http://www.phoenixcontact.com), relays from Aromat corporation (http://www.aromat.com) and a microcontroller from Microchip Devices (http://www.microchip.com) to help insure years of reliable and trouble-free operation. The use of low contact resistance relays means almost universal instrument support, a high degree of lightning protection and virtually infinite channel isolation. The board assembly is protected against corrosion and inoperation by a heavy coat (~5 mil) of high quality acrylic resin conformal coating.

Warranty is applicable for 2 years from date of shipment. Warranty does not cover failure by misuse or by nature including lightning, flood, or other catastrophe. Should you encounter problems with your MiniMux see the troubleshooting flowchart in section 3.

A top view and description of the MiniMux terminal board is shown below.



1.2 Specifications

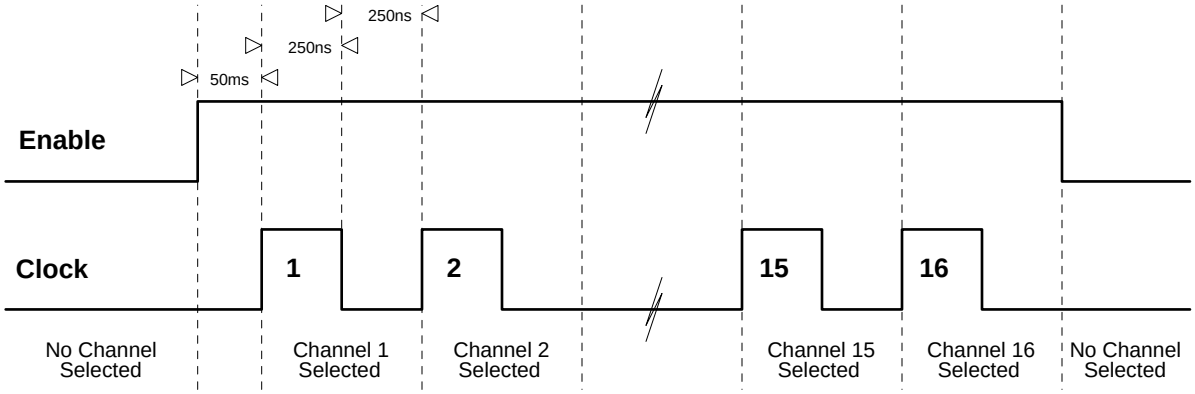
General
Power requirements: 11-16 VDC (unregulated), nominal 12 VDC
Quiescent current: 500 µA
Channel activated current (2 or 4-wire): ~40 mA
Channel activated current (6-wire): ~50 mA
Control line input impedance: 100 kilohms
Control line input levels: TTL or CMOS (5V logic)
Power input transient protection: 17.1 VDC, 1500W Transzorbs
Control signal input transient protection: 5.8 VDC, 1500W Transzorbs
Operating temperature: -40 to +70° C (-40 to +160° F)

Relays
Power: 11 mA @ 12VDC (140 mW)
Contact type: Gold-clad silver alloy
Electrostatic capacitance: 3 picofarads
On resistance: 50 milliohms
Coil resistance: 1,028 ohms
Maximum switching voltage: 125 VAC, 110 VDC
Maximum switching power: 30 W (resistive load)
Maximum switching current: 1 A
Operate time: ~2 milliseconds
Release time: ~1 milliseconds
Initial contact bounce: ~1 millisecond
Surge withstand (between open contacts): 1,500 V
Switching life (mechanical): 100,000,000 operations

2.1 Operation Details

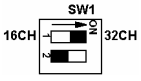
The MiniMux is controlled by the CR10 or CR10X Controller using 2 digital control signals. The operation of the MiniMux is simple enough so that virtually any device capable of controlling 2 digital TTL/CMOS type signals can be used to control the multiplexer. Generally speaking the timing diagram depicted below describes how the 2 digital signals are used to control the MiniMux.

Note: Timing values shown are minimum values.



In the case of the 32 channel mode the maximum number of pulses to advance through all the channels would be 32.

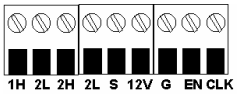
The channel switching mode is selected by configuring the DIP switch mounted on the MiniMux relay board. The table shown below describes the 4 possible configurations.

DIP Settings	Mode	Description
	***16 Channel***	***Standard mode for switching 4 or 6-wire instruments (default).***
	32 Channel	Switching 32 2-wire instruments.
	DaisyMux	Mode where control signals are common to more than 1 multiplexer. Switch **16CH** or **32CH** determines number of channels.

The factory default setting is 16 Channel mode (unless specified otherwise).

2.2 Datalogger Connection

The MiniMux is connected to the CR10/CR10X Controller using the screw terminals on the terminal board.



The screw terminal block connections:

The table below lists the connections for the screw terminal block.

Color	Screw Terminals	CR10 Connection	Description
Brown	**1H**	**1H**	Low side of input channel 1.
Red	**1L**	**1L**	High side of input channel 1.
Orange	**2H**	**2H**	Low side of input channel 2.
Yellow	**2L**	**2L**	High side of input channel 2.
Green	**S**	**Analog Ground (AG)**	Instrument shield connection.
Blue	**12V**	**+12V**	MiniMux power.
Purple	**G**	**Ground (G)**	MiniMux ground.
White	**EN**	**Control Port (C1-C8)**	MiniMux enable.
Black	**CLK**	**Control Port (C1-C8)**	MiniMux clock.

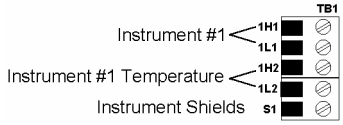
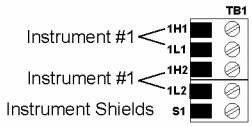
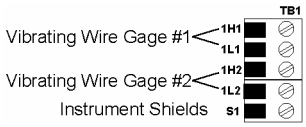
If using the MultiSensor Interface with your CR10 or CR10X then connect from the 10-pin connector (using the supplied cable) on the Interface to the screw terminals of the MultiMux in the following order:

Pin	Color	Connection	Description
1	**Brown**	**1H**	High side of multiplexer channel 1.
2	**Red**	**1L**	Low side of multiplexer channel 1.
3	**Orange**	**2H**	High side of multiplexer channel 2.
4	**Yellow**	**2L**	Low side of multiplexer channel 2.
5	**Green**	**S**	Instrument cable shield drain wire connection.
6	**Blue**	**12V**	MiniMux power.
7	**Purple**	**G**	MiniMux ground.
8	**Grey**	**EN**	MiniMux enable.
9	**White**	**CLK**	MiniMux clock.
10	**Black**	**Cable Shields**	Multiplexer cable shield drain wire connection.

2.3 Instrument Connection

The way instruments are connected to the MiniMux will vary slightly depending on the Mode selection (section 2.1).

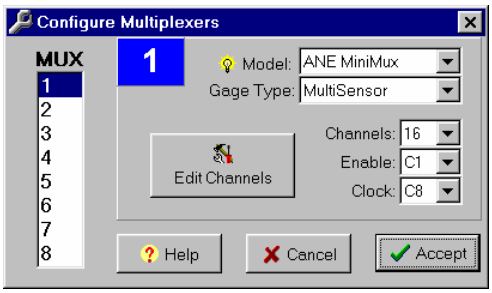
The following table illustrates typical connection techniques for each of the operating modes.

Mode	Description	Example
16 Channel (4-wire)		
32 Channel		

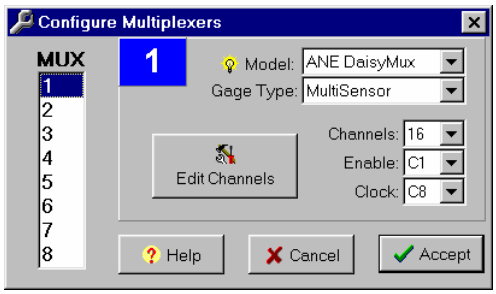
If the CR10 or CR10X is not equipped with the MultiSensor Interface see Appendix D of the **MultiLogger Software User's Guide** for sensor wiring diagrams. If the CR10 or CR10X is equipped with the MultiSensor Interface then see the **MultiSensor Interface User's Guide** for additional sensor wiring diagrams.

2.4 MultiLogger Software Configuration

To configure MultiLogger to use the MiniMux select **ANE MiniMux** as your multiplexer **Model** on the **Configure | Multiplexers** form. Before the individual channels may be edited you must select a Gage Type, if the MultiSensor Interface is being used then select MultiSensor, as shown in the illustration at right, otherwise the type of gage connected. Select either **16 Channel** (default) or **32 Channel** to match the DIP switch settings of the MiniMux. The **Enable** and **Clock** port settings are ignored when **MultiSensor** is selected as the Gage Type.



If the MiniMux is being used in a daisy chain fashion (a single cable running to all the multiplexers) then select **ANE DaisyMux** as illustrated at right. When using the DaisyMux configuration select **16 Channel** as the channel setting. Also, be sure to match the Multiplexer # with the DaisyMux sequence (each multiplexer in a DaisyMux system will be labeled #1, #2, #3, etc.).



2.6 CR10/CR10X Program Example

The following example illustrates how to write custom programs for the CR10/CR10X to read instruments connected to the MiniMux. The example assumes a 16 Channel Mode MiniMux reading 16 vibrating wire gages and their respective thermistors.

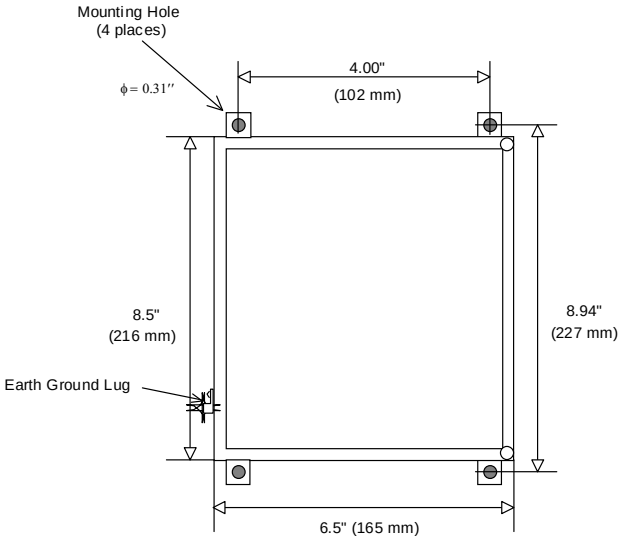
The program example illustrates how measurements of instruments connected to the MiniMux are read, it does not include instructions that would store the measurements for later retrieval. Consult the CR10 Operators Manual for more information on storing measurements.

```
1:  Set Port(s) (P20) ;Configure the control ports of the CR10/CR10X, C1=Enable, C8=Clock
 1: 7999     C8..C5 = output/nc/nc/nc
 2: 9994     C4..C1 = nc/nc/nc/10ms

2:  Do (P86) ;Enable the MiniMux
 1: 41       Set Port 1 High

3:  Excitation with Delay (P22) ;50ms delay after enabling the MultiMux
 1: 1        Ex Channel
 2: 0        Delay W/Ex (units = 0.01 sec)
 3: 5        Delay After Ex (units = 0.01 sec)
 4: 0        mV Excitation

4:  Beginning of Loop (P87)
 1: 0        Delay
 2: 16       Loop Count ;Total number of instruments

5:  Do (P86) ;Advance the channel
 1: 78       Pulse Port 8

6:  Vibrating Wire (SE) (P28) ;Read the Vibrating Wire Gage
 1: 1        Reps
 2: 1        SE Channel
 3: 1        Excite all reps w/Exchan 1
 4: 20       Starting Freq. (units = 100 Hz)
 5: 35       End Freq. (units = 100 Hz)
 6: 250      No. of Cycles
 7: 0        Rep Delay (units = 0.01 sec)
 8: 1     -- Loc [ VWGage_1  ]
 9: 1000     Mult
10: 0        Offset

7:  Excite-Delay (SE) (P4) ;Read the Thermistor
 1: 1        Reps
 2: 5        2500 mV Slow Range
 3: 2        SE Channel
 4: 1        Excite all reps w/Exchan 1
 5: 5        Delay (units 0.01 sec)
 6: 2500     mV Excitation
 7: 17    -- Loc [ VWTemp_1  ]
 8: .001     Mult
 9: 0        Offset

8:  Polynomial (P55) ;Convert thermistor voltage to °C
 1: 1        Reps
 2: 17    -- X Loc [ VWTemp_1  ]
 3: 17    -- F(X) Loc [ VWTemp_1  ]
 4: -104.78  C0
 5: 378.11   C1
 6: -611.59  C2
 7: 544.27   C3
 8: -240.91  C4
 9: 43.089   C5

9:  End (P95) ;End of measurement loop

10:  Do (P86) ;Disable the MiniMux
 1: 51       Set Port 1 Low
```

2.5 Enclosure Installation

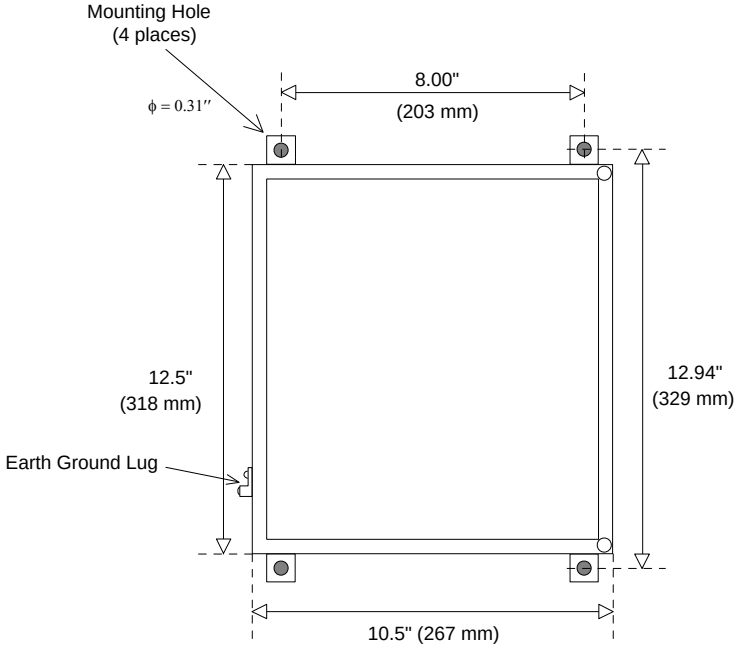
The standard enclosure for the MiniMux is a Hoffman 8Lx6Wx4”H, 203x152x102 mm, fiberglass/polyester NEMA 4 type. The enclosure can be mounted to a wall or other surface by attaching the 4 supplied mounting tabs to the bottom of the enclosure using the supplied screws.

The placement of the mounting holes is depicted in the illustration below.



The MiniMux is available installed in a Hoffman 12Lx10Wx6”H, 305x254x152 mm, fiberglass/polyester NEMA 4 enclosure. The enclosure can be mounted to a wall or other surface by attaching the 4 supplied mounting tabs to the bottom of the enclosure using the supplied screws.

The placement of the mounting holes is depicted in the illustration below.



3.1 Troubleshooting Flowchart

If you cannot obtain readings using the MiniMux or the readings are unstable then see the troubleshooting flowchart below for help in determining the nature of the problem. If all fails contact Canary Systems by phone, fax or e-mail for further assistance.