MultiSensor Interface

USER'S GUIDE

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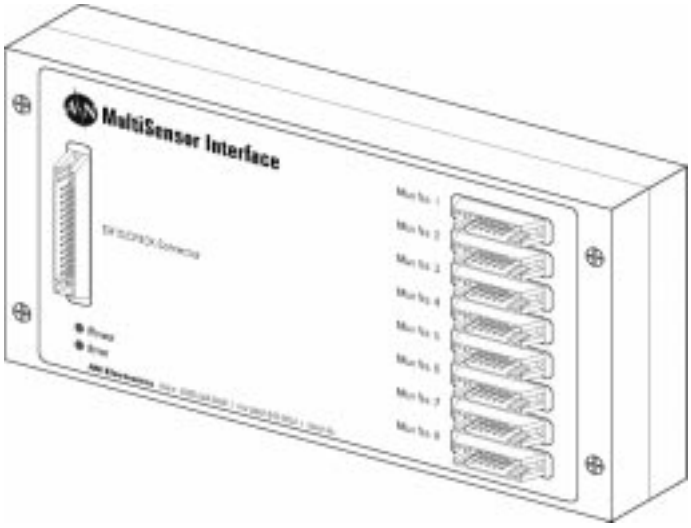
1.1 Overview

The MultiSensor Interface makes it possible to connect different types of sensors with varying inputs and outputs to instrument switching units (multiplexers) controlled by the CR10 or CR10X Controller. The multiplexers expand the number of instruments that can be read by the Controller in increments of 16, 32 or 48 channels, depending on the make and model. The MultiSensor Interface is typically connected to 16 channel, 4-wire switching multiplexers manufactured by Canary Systems, Campbell Scientific and Geokon.

In addition it provides other capabilities such as expansion of the control ports to control up to 8 multiplexers (typically the maximum is 7 multiplexers with no ports remaining) while leaving 1 of the control ports free to be used for power control or alarm devices. It also includes charging circuitry for maintaining the charge on an attached lead-acid type battery and status LED's for visual indication of power, charging and interface status. The LED's can be turned off where power drain must be kept as low as possible.

A micro-controller from MicroChip Devices communicates with the CR10/CR10X via its control ports and controls the power and sensor lead switching.



The MultiSensor Interface

The connection to the CR10 or CR10X Controller is made via a 26-pin connector while each multiplexer has its own 10-pin connector. The battery and charger connections are made via a 3-position screw terminal block located directly below the datalogger connector.

1.2 Specifications

General
Micro-controller: PIC16C65
Operating Speed: 4 Mhz
Quiescent Current (LED's disabled): 0.5 mA
Quiescent Current (LED's enabled): 8 mA
Operating Current (minimum): 15 mA
Operating Current (typical): 50 mA
Operating Current (maximum): 200 mA
Operating Temperature: -30 to +65°C

Power Supplies
±2.5V @ 20mA (direct from CR10 panel)
±2.5V @ 100mA
±5V @ 100mA
±10V @ 100mA
±12V @ 125 mA

Signal Conditioning & Input Ranges
125 ohm termination resistor
5K ohm termination resistor
Quarter bridge terminations
Half bridge terminations
±2.5 µV single-ended/differential
±7.5 µV single-ended/differential
±25 mV single-ended/differential
±250 mV single-ended/differential
±2500 mV single-ended/differential
±5000 mV single-ended/differential
±10000 mV single-ended
Remote Sense up to ±10VDC
Current Sense up to 100mA
For complete measurement specifications see the CR10/CR10X specifications.

Charging
Setpoint: 13.8VDC
Maximum Current: 1Amp
AC Adaptor: 110-230VAC Input, 18VDC@1.65A output

Expansion
1 Control Port unused on CR10/CR10X Wiring Panel
Controls up to (8) 16/32/48 channel multiplexers

This section explains how to connect the datalogger, multiplexers and power to your MultiSensor Interface and how to get up and running using the Interface with the MultiLogger software.

2.1 Datalogger Connection

The CR10 or CR10X datalogger connects to the MultiSensor Interface via a 26-pin connector and ribbon cable assembly. This assembly is available from Canary Systems. The connections are listed in the table below.

Pin	Color	Connection	Description
1	**Brown**	**AVW1/4 C+**	Coil + connection to the vibrating wire interface.
2	**Red**	**AVW1/4 C-**	Coil – connection to the vibrating wire interface.
3	**Orange**	**AVW1/4 Vx**	Power connection to the vibrating wire interface.
4	**Yellow**	**AVW1/4 G**	Ground connection to the vibrating wire interface.
5	**Green**	**AVW1/4 EX**	Excitation connection to the vibrating wire interface.
6	**Blue**	**AVW1/4 AG**	Analog ground connection to the vibrating wire interface.
7	**Purple**	**CR10WP C7**	Control port to enable the MultiSensor Interface.
8	**Grey**	**AVW1/4 F**	Frequency output from the vibrating wire interface.
9	**White**	**CR10WP C5**	Control port to reset/select the MultiSensor type.
10	**Black**	**CR10WP C6**	Control port to switch multiplexer channels.
11	**Brown**	**CR10WP C3**	Control port for sending BCD data C.
12	**Red**	**CR10WP C4**	Control port for sending BCD data D.
13	**Orange**	**CR10WP C1**	Control port for sending BCD data A.
14	**Yellow**	**CR10WP C2**	Control port for sending BCD data B.
15	**Green**	**CR10WP G**	Ground connection.
16	**Blue**	**CR10WP G**	Ground connection.
17	**Purple**	**CR10WP 12V**	Power connection for CR10/CR10X.
18	**Grey**	**CR10WP 12V**	Power connection for CR10/CR10X.
19	**White**	**CR10WP AG**	Analog ground connection for signal reference.
20	**Black**	**CR10WP E1**	Excitation output of CR10/CR10X.
21	**Brown**	**CR10WP 3H**	Differential input channel for measuring excitation current.
22	**Red**	**CR10WP 3L**	Differential input channel for measuring excitation current.
23	**Orange**	**CR10WP 2H**	Input channel #3.
24	**Yellow**	**CR10WP 2L**	Input channel #4.
25	**Green**	**CR10WP 1H**	Input channel #1.
26	**Blue**	**CR10WP 1L**	Input channel #2.

NOTE: If excitation current measurement is NOT required then short wires #21 (Brown) and #22 (Red) together and remove from the CR10WP 3H and 3L terminals to optimize accuracy of the excitation output.

2.2 Multiplexer Connection

There are 8 10-pin connectors located on the MultiSensor Interface for connecting up to 8 16/32/48 channel multiplexers such as the Canary Systems MiniMux or MultiMux. The connection is also compatible with multiplexers manufactured by Campbell Scientific and Geokon.

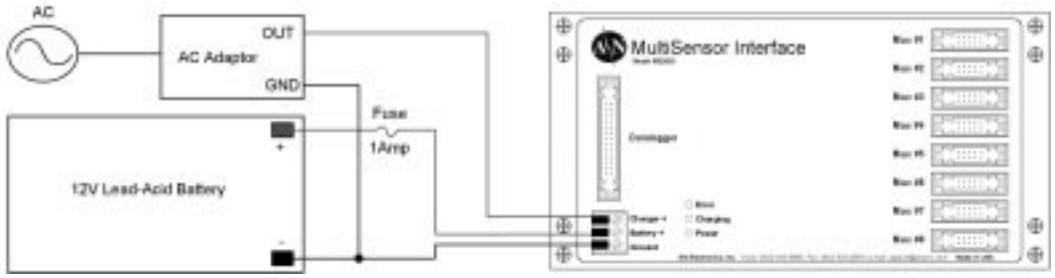
A 10-pin connector and ribbon cable assembly is available from Canary Systems for those making their own connections to multiplexers. The connector pinout is below.

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**	**AG**	Instrument cable shield drain wire connection.
6	**Blue**	**+12V**	Multiplexer power.
7	**Purple**	**GND**	Multiplexer ground.
8	**Grey**	**ENABLE**	Enable the multiplexer.
9	**White**	**CLOCK**	Increment the multiplexer channel.
10	**Black**	**SHIELD**	Multiplexer cable shield drain wire connection.

2.3 Battery and Charger Connection

The screw terminal block located below the datalogger connector is for connecting the battery and AC adaptor for charging the battery.

A typical power supply arrangement is depicted below.



The case of the MultiSensor Interface is connected to **Ground** so when attaching the battery you should remove the fuse to prevent accidental short circuiting. Alternately attach the **Battery+** connection first, then the **Ground** connection.

After attaching the battery and installing an appropriate fuse the **Power** LED should light. If the LED does not light check the following;

1. Is the battery properly charged?
2. Is the fuse blown?
3. Is the **Power** LED shut off to conserve power? (see section 2.4)

After attaching the AC adaptor and connecting it to AC the **Charger** LED should light. If the LED does not light check the following;

1. Is the AC power switched on?
2. Is the AC adaptor functioning?
3. Is the **Charger** LED shut off to conserve power? (see section 2.4)

2.4 Reducing Quiescent Current Drain

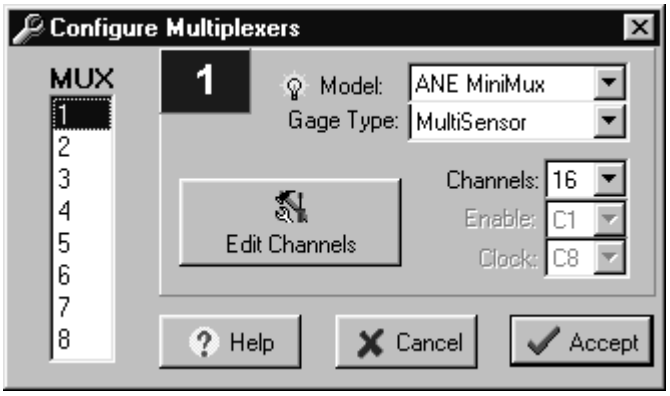
There is a two position DIP switch located on the component side of the MultiSensor Interface circuit board for disabling the **Power** and **Charger** LED's. The **Power** LED should be disabled when the data acquisition system will operate solely on battery power for periods greater than 1 week. The **Charger** LED should be disabled when a solar panel is used to charge the battery.

The DIP switch is located on the component side of the MultiSensor circuit board (depicted at right). To access the DIP switch remove the 4 screws located in the outer corners of the top of the Interface. The top will lift off with the circuit board attached to the underside. Note the DIP switch in the lower right corner to the left of the battery and charger terminal block.

The default is both switches down on in the ON position. To turn off each LED slide the respective switch up.

2.5 MultiLogger Software Configuration

To configure multiplexer channels for the MultiSensor Interface select your multiplexer **Model** on the **Configure | Multiplexers** form. Then select **MultiSensor** as the **Gage Type**. Select the channel switching, either **16 Channel** (typical) or **32 Channel**. The **Enable** and **Clock** port settings are not used when the **MultiSensor** is selected as the Gage Type so they will be disabled.

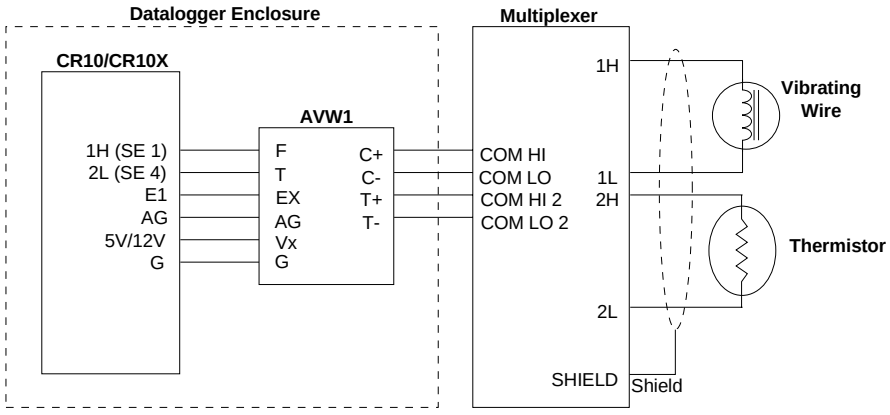


When configuring the multiplexer channels select the **Gage Type**, **Make** and **Model** for each channel. The generic gage types and wiring diagrams are described in section 3.

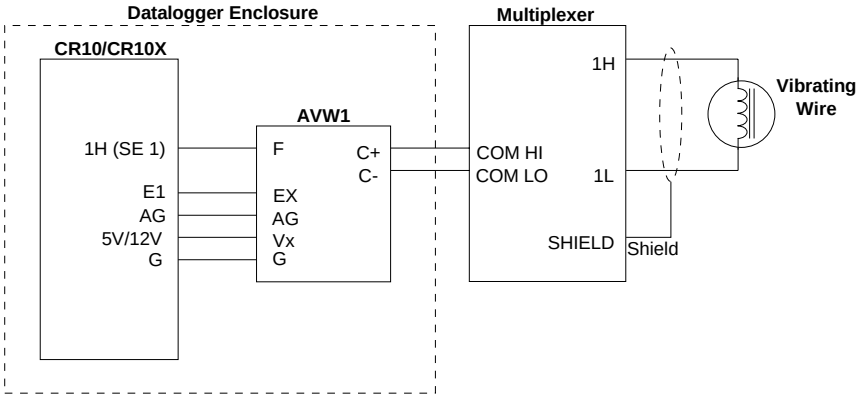
3.1 Vibrating Wire

Type	Make	Model	Instruction File	Description	Output Units
Vibrating Wire	Generic	Low Freq-12V	Vw-low.ins	Frequency range 400-1000Hz. 12V Excitation.	Digits ($freq^2 \times 10^{-3}$)
		Low Freq-5V	Vw-low.ins	Frequency range 400-1000Hz. 5V Excitation.	Digits ($freq^2 \times 10^{-3}$)
		Middle Freq-12V	Vw-middle.ins	Frequency range 1000-2800Hz. 12V Excitation.	Digits ($freq^2 \times 10^{-3}$)
		Middle Freq-5V	Vw-middle.ins	Frequency range 1000-2800Hz. 5V Excitation.	Digits ($freq^2 \times 10^{-3}$)
		High Freq-12V	Vw-high.ins	Frequency range 2000-3500Hz. 12V Excitation.	Digits ($freq^2 \times 10^{-3}$)
		High Freq-5V	Vw-high.ins	Frequency range 2000-3500Hz. 5V Excitation.	Digits ($freq^2 \times 10^{-3}$)
	Geokon	4000	4000.ins	Strain gage, 12V excitation.	Digits
		4100	4100.ins	Strain gage, 12V excitation.	Digits
		4200	4200.ins	Strain gage, 12V excitation.	Digits
		4400	4400.ins	Displacement, 5V excitation.	Digits
		4500	4500.ins	Piezometer, 5V excitation.	Digits
		4580	4580.ins	Piezometer, 5V excitation.	Digits
		4700	4700.ins	Temperature, 5V excitation.	Digits
		4800	4800.ins	Pressure Cell, 5V excitation.	Digits
		4900	4900.ins	Load Cell, 5V excitation	Digits

3.1.1 16 Channel



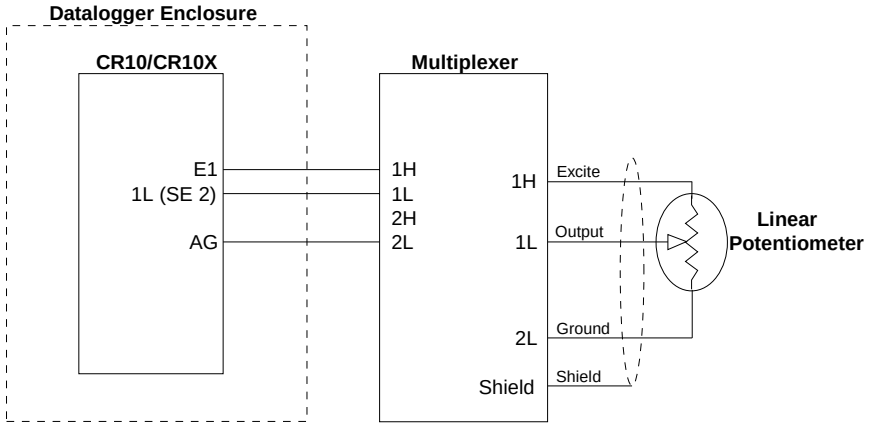
3.1.2 32 Channel



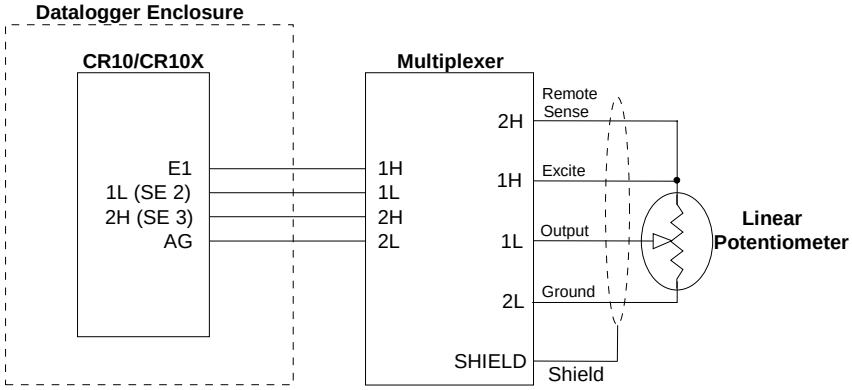
3.2 Linear Potentiometer

Type	Make	Model	Instruction File	Description	Output Units
Linear Pot	Generic	OutputV	Linpot.ins	Apply 2.5V excitation to pot and read output. Can be used in 32 Channel mode by connecting Ground lead of linear pot to SHIELD.	Volts (0-2.5V)
		RSOutputV	Linpotrs.ins	Apply 2.5V excitation to pot and read output. Read remote sense lead and correct output for Vout/2.5 factor.	Volts (0-2.5V)

3.2.2 16 Channel



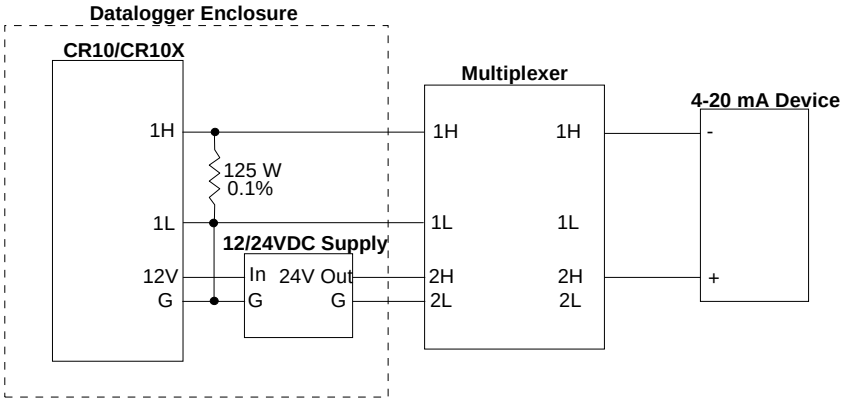
3.2.1 16 Channel – Remote Sense



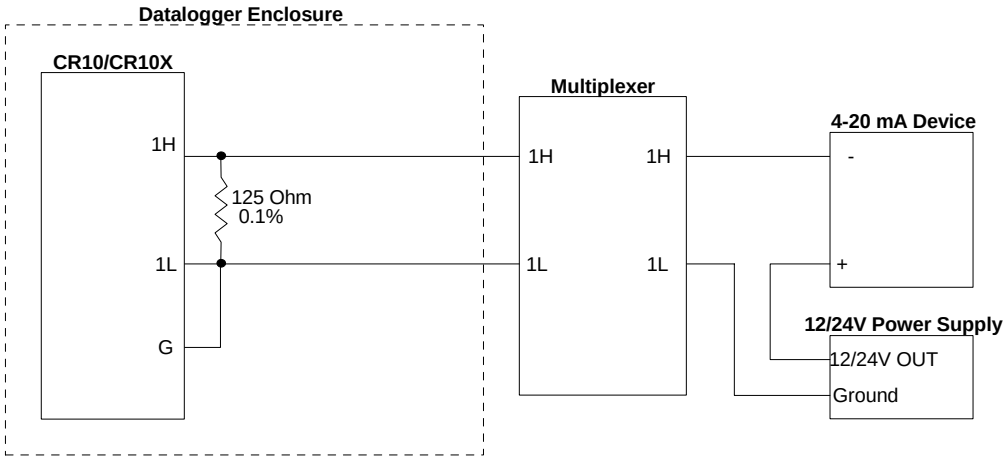
3.3 4-20 mA Devices

Type	Make	Model	Instruction File	Description	Output Units
4-20mA	Generic	4-20mA	4-20ma.ins	External power supply. **32-channel mode only.**	Current (4-20mA)
		4-20mA LoopPwr	4-20ma.ins	Supplies +24V, default power on delay of 0.25 seconds. **16-Channel mode only.**	Current (4-20mA)
		12V_4-20mA	12V_4-20ma.ins	Supplies +12V, default power on delay of 10 seconds. **16-Channel mode only.**	Current (4-20mA)
		24V_4-20mA	24V_4-20ma.ins	Supplies +24V, default power on delay of 0.25 seconds. **16-Channel mode only.**	Current (4-20mA)

3.3.1 16 Channel



3.3.2 32 Channel (External Power Supply Required)



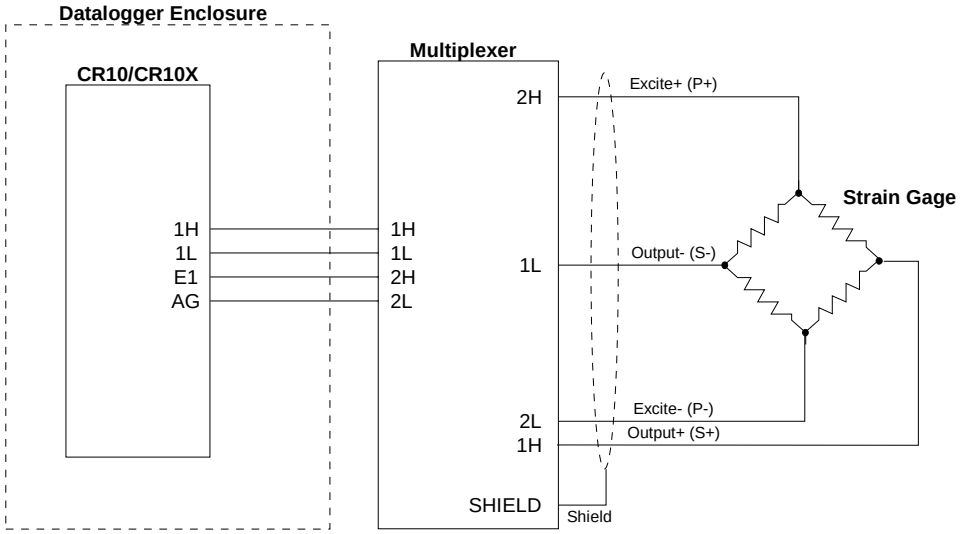
Note: The MultiSensor codes were updated beginning in MultiLogger v2.2.0 Use MLSetup to examine the multilogger.ini setup file (or use a text editor) to verify/update these settings:

```
MultiSensor Code #5=15,0,0,0,0,0
MultiSensor Code #6=15,0,10,0,0,0
MultiSensor Code #26=15,0,6,0,0,0
MultiSensor Code #42=15,0,26,0,0,0
```

3.4 Resistance Strain Gage

Type	Make	Model	Instruction File	Description	Output Units
ResistanceSG	Generic	Bridge2.5mV	Bridge2.5mv.ins	Read full-bridge Wheatstone. Maximum output of 2.5mV.	Digits (mv/V × 4000)
		Bridge7.5mV	Bridge2.5mv.ins	Read full-bridge Wheatstone. Maximum output of 7.5mV.	Digits (mv/V × 4000)
		Bridge25mV	Bridge2.5mv.ins	Read full-bridge Wheatstone. Maximum output of 25mV.	Digits (mv/V × 4000)
		Bridge250mV	Bridge2.5mv.ins	Read full-bridge Wheatstone. Maximum output of 250mV.	Digits (mv/V × 4000)
	Geokon	3000	3000.ins	Geokon Model 3000 Load Cell. Maximum output of 7.5mV.	Digits (mv/V × 4000)

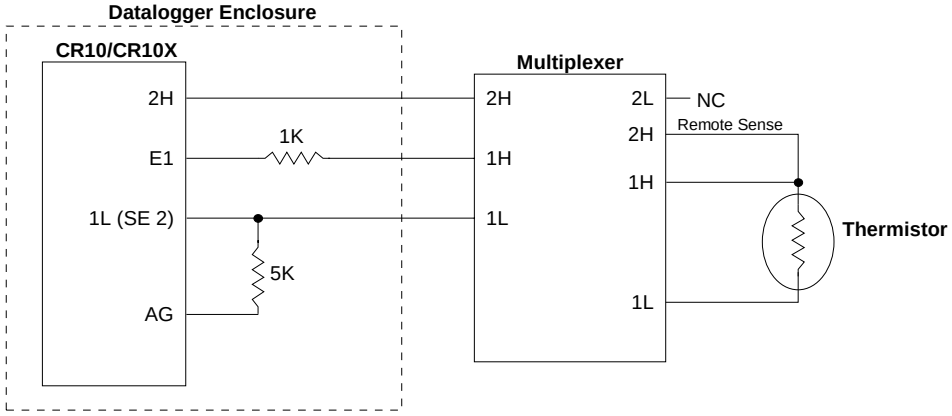
3.4.1 16 Channel



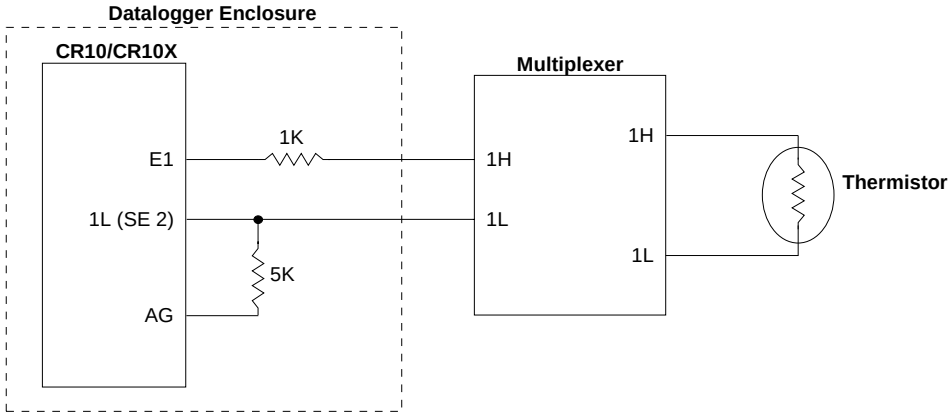
3.5 Thermistor

Type	Make	Model	Instruction File	Description	Output Units
Thermistor	Generic	YSI44005-°C	Ysi44005c.ins	YSI type 44005 thermistor.	°C
		YSI44005-°F	Ysi44005c.ins	YSI type 44005 thermistor.	°F
		YSI44005-°CRS	Ysi44005crs.ins	YSI type 44005 thermistor. Correct output with remote sense.	°C
		YSI44005-°FRS	Ysi44005frs.ins	YSI type 44005 thermistor. Correct output with remote sense.	°F

3.5.1 16 Channel with Remote Sense



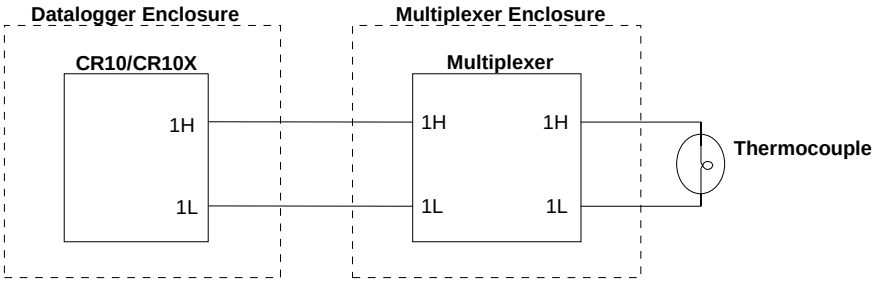
3.5.2 32 Channel



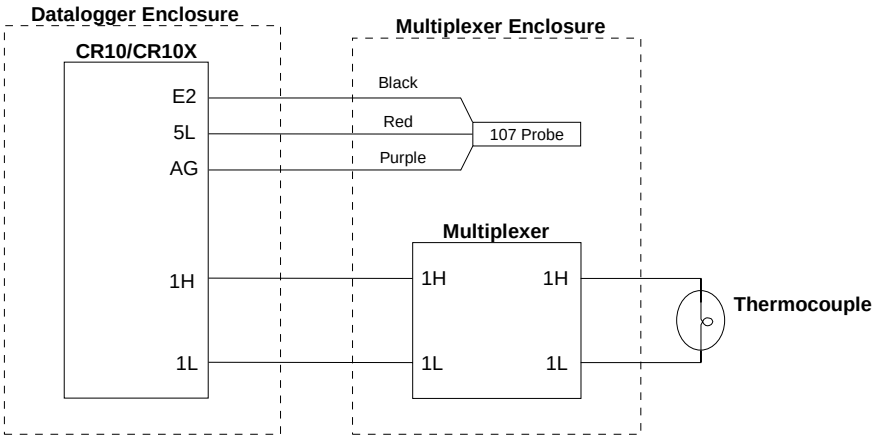
3.6 Thermocouple

Type	Make	Model	Instruction File	Description	Output Units
Thermocouple	Generic	TypeT-°C	Typetc.ins	Type T thermocouple (copper-constantan) using 107 probe for junction temperature reference.	°C
		TypeT-°C_panel	Typetcpanel.ins	Type T thermocouple (copper-constantan) using panel temperature for junction temperature reference.	°C
		TypeT-°F	Typetf.ins	Type T thermocouple (copper-constantan) using 107 probe for junction temperature reference.	°F
		TypeT-°F_panel	Typetfpanel.ins	Type T thermocouple (copper-constantan) using panel temperature for junction temperature reference.	°F

3.6.1 32 Channel – Panel Temperature for Junction Temperature



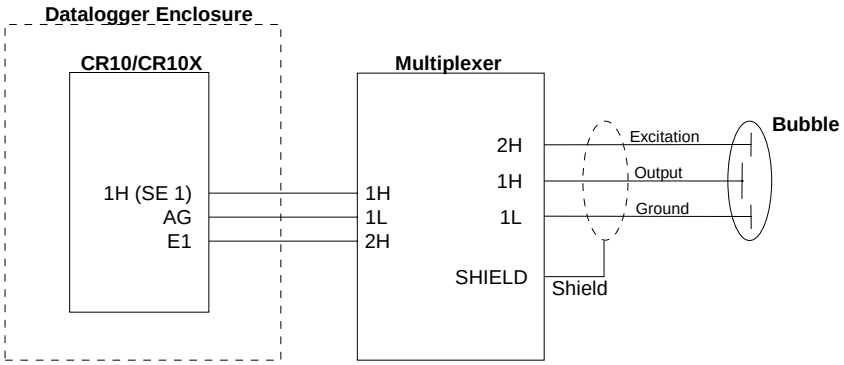
3.6.2 32 Channel – 107 Probe for Junction Temperature



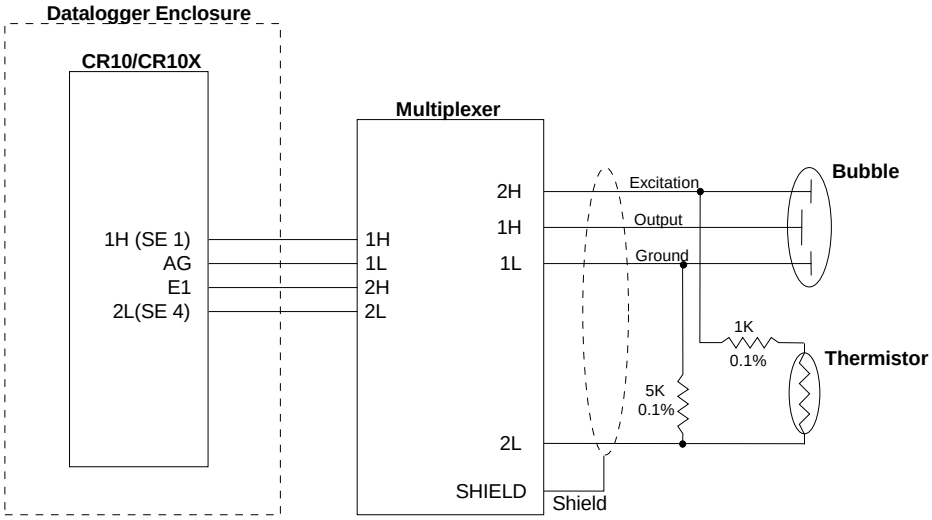
3.7 Electrolytic Bubble

Type	Make	Model	Instruction File	Description	Output Units
Electrolytic	Generic	Generic	Bubble.ins	Standard electrolytic bubble measurement.	Millivolts (0-2500)
		6700	6700.ins	Geokon model 6700 electrolytic bubble sensor with thermistor for temperature measurement.	Millivolts (0-2500)

3.7.1 16 Channel - Generic



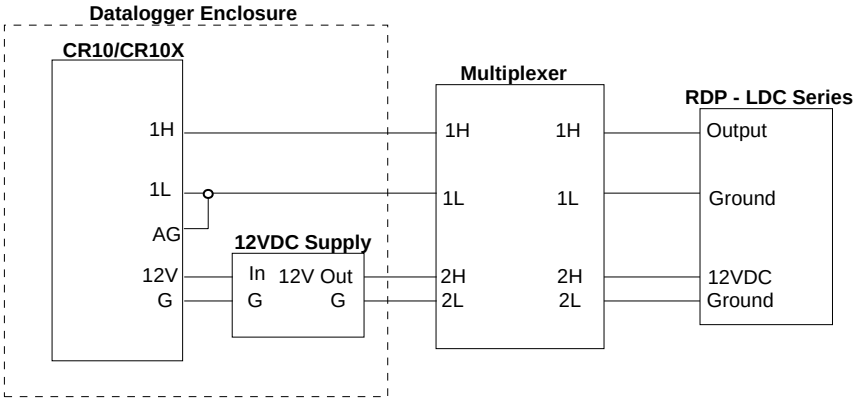
3.7.2 16 Channel – Model 6700



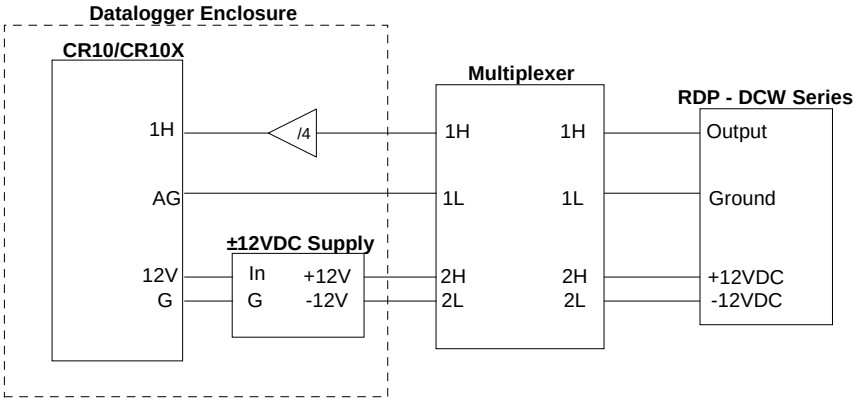
3.8 LVDT

Type	Make	Model	Instruction File	Description	Output Units
LVDT	RDP	LDC Series	Rdpldc.ins	RDP LDC Series LVDT's.	Volts (0-2.5V)
		DCW Series	Rdpdcw.ins	RDP DCW Series LVDT's.	Volts (0-10V)
		DCT Series	Rdpdct.ins	RDP DCT Series LVDT's.	Volts (0-5V)
	Transtek	Series 240	Series240.ins	Transtek Series 240 LVDT's.	Volts/Volt
		Series 241	Series241.ins	Transtek Series 241 LVDT's.	Volts/Volt
		Series 242	Series242.ins	Transtek Series 242 LVDT's.	Volts/Volt
		Series 243	Series243.ins	Transtek Series 243 LVDT's.	Volts/Volt
		Series 244	Series244.ins	Transtek Series 244 LVDT's.	Volts/Volt
		Series 245	Series245.ins	Transtek Series 245 LVDT's.	Volts/Volt
		Series 246	Series246.ins	Transtek Series 246 LVDT's.	Volts/Volt

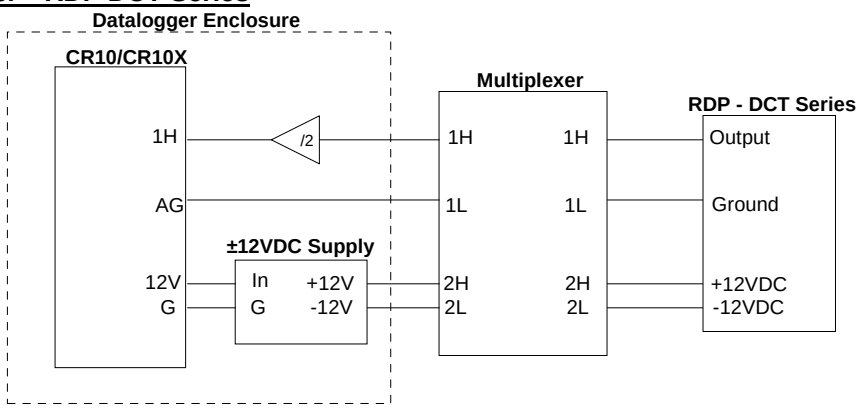
3.8.1 16 Channel – RDP LDC Series



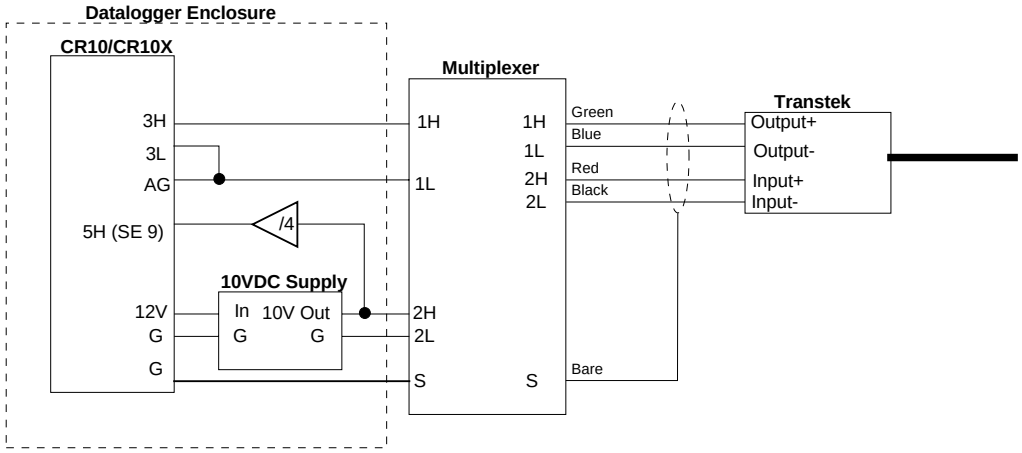
3.8.2 16 Channel – RDP DCW Series



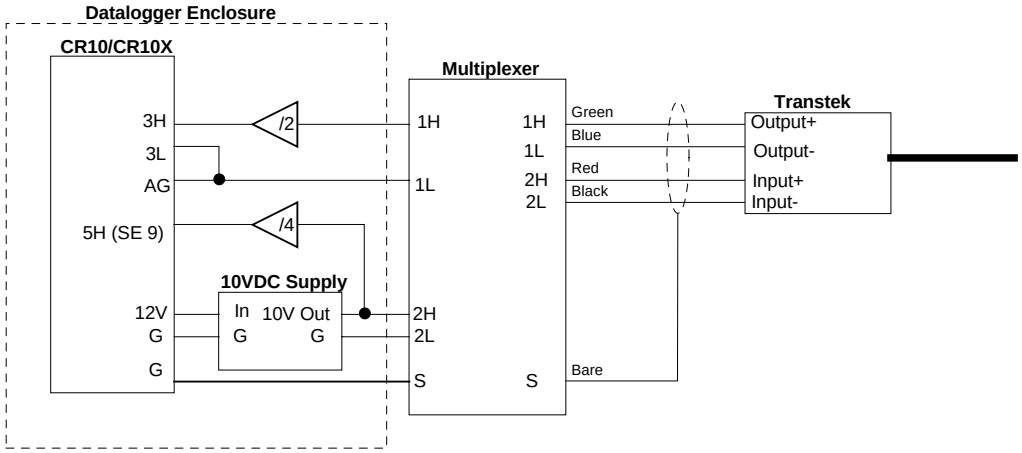
3.8.3 16 Channel – RDP DCT Series



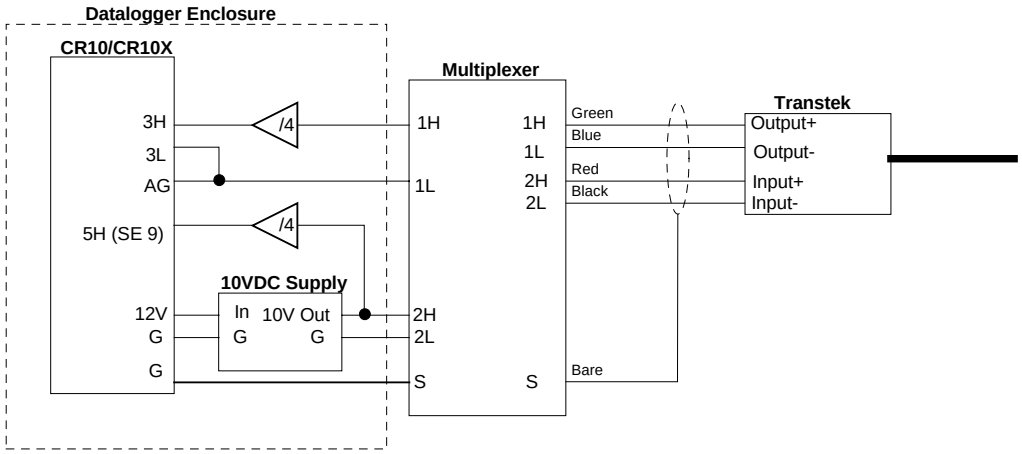
3.8.4 16 Channel – Transtek Series 240, 242



3.8.5 16 Channel – Transtek Series 241, 243, 246



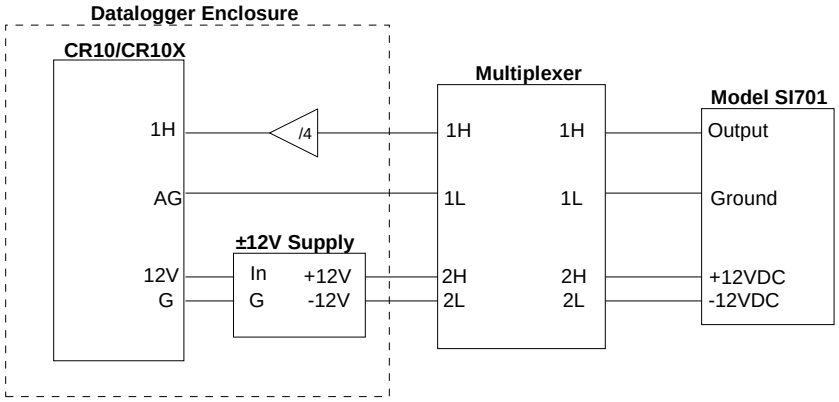
3.8.6 16 Channel – Transtek Series 244, 245



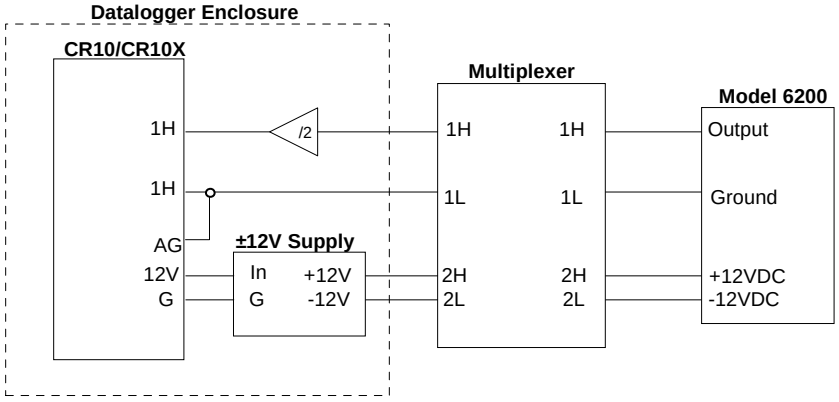
3.9 Tiltmeter

Type	Make	Model	Instruction File	Description	Output Units
Tiltmeter	Columbia	SI701	Si701.ins	Model SI701 Tiltmeter.	Volts (±7V)
	Geokon	6200	6200.ins	Model 6200 Tiltmeter.	Volts (±5V)

3.9.1 16 Channel - Columbia



3.9.2 16 Channel – Geokon 6200



Note: The MultiSensor codes were updated beginning in MultiLogger v2.2.0 Use MLSetup to examine the multilogger.ini setup file (or use a text editor) to verify/update these settings:

```
MultiSensor Code #16=10,0,22,0,1,2
MultiSensor Code #17=10,0,22,0,1,1
```

Also, the P2 multiplier in the 6200.ins instruction file may need to be updated, it was changed to 0.002 Use MLEditor to view/update the multiplier in the 6200.ins instruction file.