

## Connector Interface Modules TECHNICAL INFORMATION



### Summary:

CIM1 – This model comes standard with the Black Lab System. It has 6 Analog Channels, 4 digital, Temperature Reference, +5V digital excitation

CIM2 – This version offers the advantage of providing plug-in connectors with strain relief. It also has the advantage of a cable length of up to 50 ft. Four analog and three digital inputs in rugged enclosure. Temperature reference, excitation of +5 and +12 volts

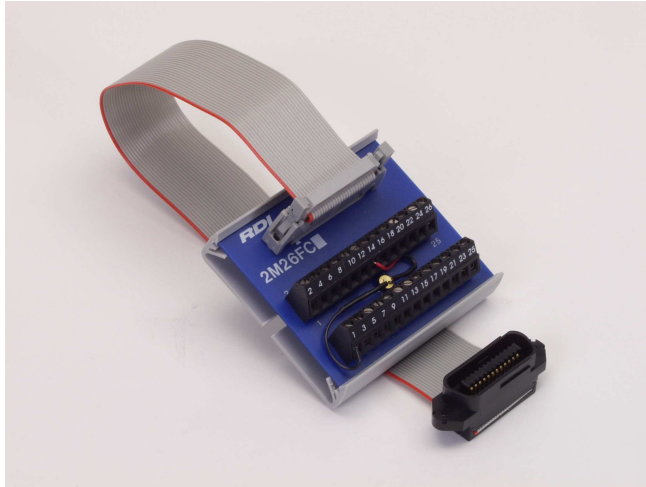
CIM3 – For when you need a lot of sensor excitation options - +5, +12, 1.2 to 10 V selectable, 24V. Six analog and 4 digital channels in a rugged enclosure. Plug input connections with strain relief.

CIM3X – offers same features as CIM3 but without 1.2 to 10V selectable and 24V power supplies.

CIM4 – (Not shown above – see picture below) CIM4 is the simplest option for connecting to an analog sensor. It consists of a cable with a connector on the end for plugging into the Black Lab. It provides six channels of analog input. The cable terminates in bare wire. Its advantages are:

Simple, cheap hookup when additional features aren't needed.  
Length of cable can be ordered as 10, 20, 30, 40 or 50 feet.

## Type 1 Connector Interface Module



### FEATURES:

- Low cost, open construction
- 6 Analog channels, 4 digital channels
- Temperature Reference for TC inputs
- +5 V Digital Excitation

### DESCRIPTION:

This Connector Interface Module provides the user with a 26-position terminal strip connection for each of the analog and digital inputs. It is connected to the Black Lab with a 1-foot long ribbon cable. Included on the terminal strip connector is a temperature reference (to accommodate thermocouple inputs), 6 analog input channels, 4 digital input channels, and +5V excitation for use with the digital inputs. The following chart shows the terminal numbers and their associated function.

Term.		Term.
1	+V TC REFERENCE	Return 2
3	Analog Gnd	Analog Gnd 4
5	Chan 1 HI	Chan 1 LO 6
7	Chan 2 HI	Chan 2 LO 8
9	Chan 3 HI	Chan 3 LO 10
11	Chan 4 HI	Chan 4 LO 12
13	Chan 5 HI	Chan 5 LO 14
15	Chan 6 HI	Chan 6 LO 16
17	DIG2 HI	DIG2 LO 18
19	DIG3 HI	DIG3 LO 20
21	DIG4 HI	DIG4 LO 22
23	DIG5 HI	DIG5 LO 24
25	+5V Excitation	Digital Gnd 26

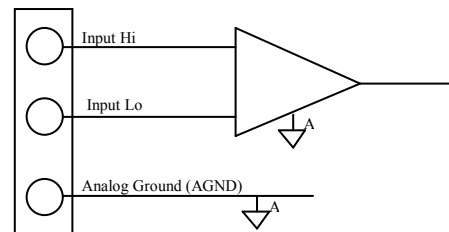
## **TEMPERATURE REFERENCE**

A temperature sensor is mounted on the terminal strip assembly and is used to measure the ambient temperature for reference junction compensation when making thermocouple measurements. Terminals 1 and 2 are used exclusively for this purpose and no other connections should be made to these terminals.

Since this is an open terminal assembly, the reference temperature accuracy is poorer than with the Type 2 or Type 3 Connector Interface Module and is specified as  $\pm 4$  °C. Thermocouples are connected to the analog input terminals as described in the following section for analog inputs.

## **ANALOG INPUT STRUCTURE**

The general input structure of an analog input when using a Type 1 Connector Interface Module is shown in the figure below. Each of the HI and LO input lines goes to an input of a differential input, high impedance, programmable gain, instrumentation amplifier. In order to get accurate and reliable measurements, the input signals must be referenced to the circuit's analog common. The following sections show how to connect various types of sensors to achieve the best results. This Connector Interface Module does not provide for any excitation of analog sensors.

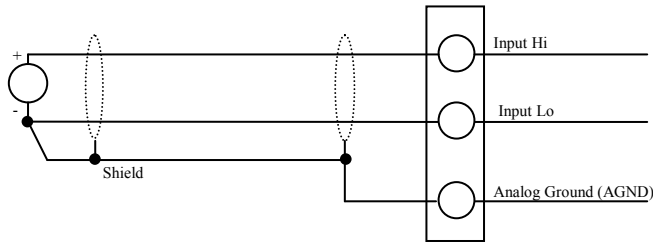


Typical Black Lab Analog Input Circuit  
Using the Type 1 Input Connector

## **CONNECTING ANALOG INPUTS**

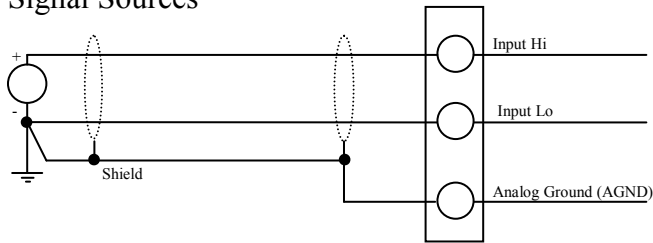
Refer to Technical Note #101 for a more detailed discussion of analog input connections.

## CONNECTION TECHNIQUES: Ungrounded (floating) Signal Sources



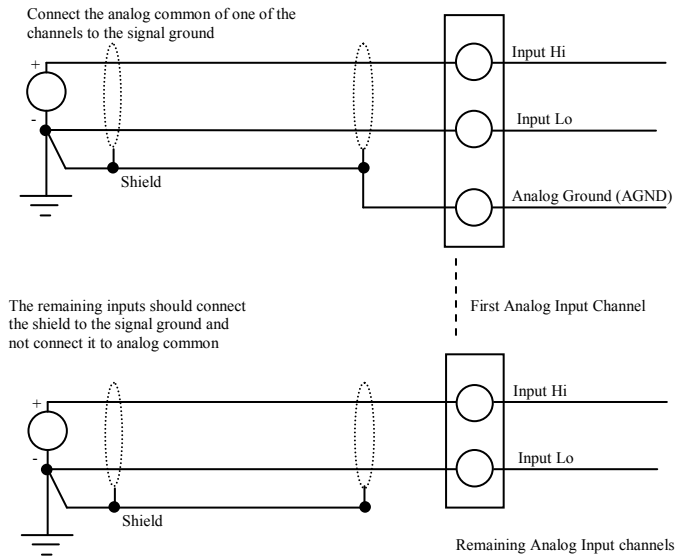
Typical Black Lab Analog Input Connection  
For an Ungrounded Signal Source Using  
A Type 1 Connector Interface Module

## Grounded Signal Sources

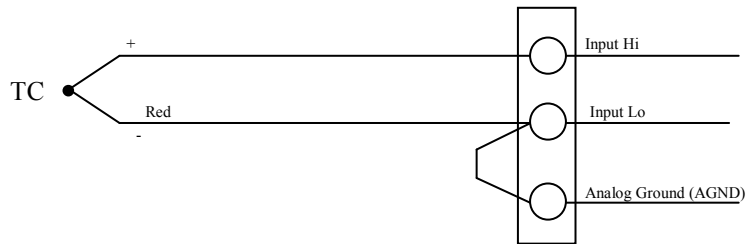


Typical Black Lab Analog Input Connection  
For an Ungrounded Signal Source Using  
A Type 1 Connector Interface Module

## Multiple Grounded Sensors



## Ungrounded Thermocouples



Typical Black Lab Analog Input Connection  
For an Ungrounded Thermocouple Using  
A Type 1 Connector Interface Module

## Grounded Thermocouples

Grounded thermocouples should be connected in the same manner as shown for other grounded sensors above. Only 1 connection should be made from analog common to earth ground. It is best to avoid using grounded thermocouple if at all possible.

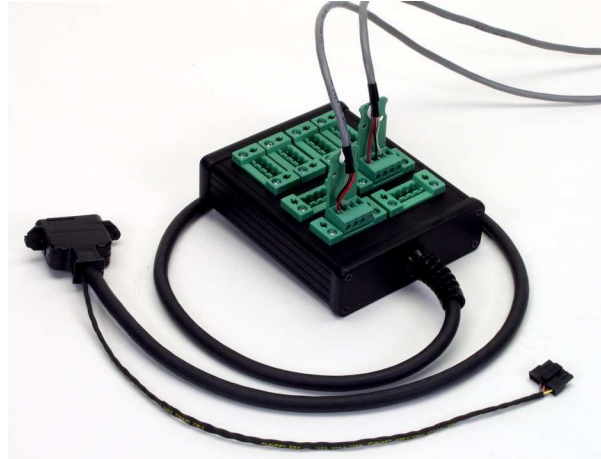
## **CONNECTING DIGITAL INPUTS**

Refer to Technical Note #102 for a more detailed discussion of digital input connections.

**DO NOT CONNECT THE DIGITAL GROUND TO AN EXTERNAL EARTH**

-----

## Type 2 Connector Interface Module

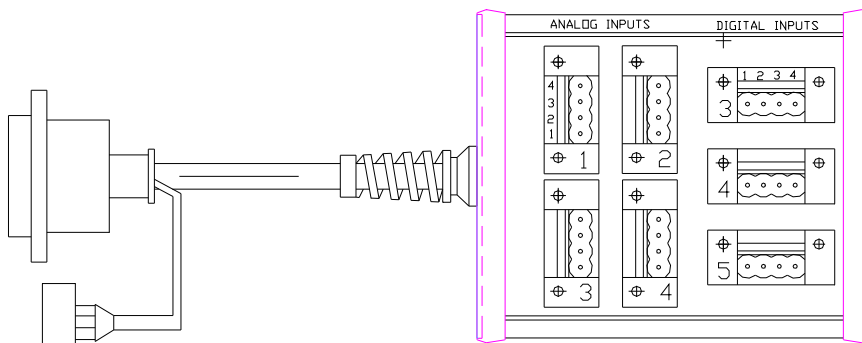


### FEATURES:

- Plug Connector with integral cable strain relief
- Long Cable Length
- 4 Analog channels, 3 digital channels
- Temperature Reference for TC inputs
- +12 V Sensor Excitation @100mA
- +5 V Digital Excitation @ 100mA
- Rugged Extruded Aluminum Enclosure

### DESCRIPTION:

The unique feature of this Connector Interface Module is that it connects to the Black Lab with a multi-conductor cable. Within this cable, each of the analog signals is carried on separate 2-conductor shielded inner cables. Because the analog signals are carried on shielded cables, long cable lengths can be provided. 12 V excitation is available on each analog input connector for analog sensor excitation. +5 volts is also made available on each of the digital input connector to use for powering opto-isolators for each of the digital signals.



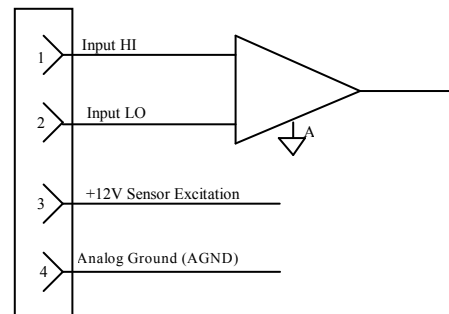
## **TEMPERATURE REFERENCE**

A temperature sensor is mounted inside the terminal assembly and is used to measure the ambient temperature for reference junction compensation when making thermocouple measurements. The reference temperature accuracy is specified as  $\pm 1$  °C.

Thermocouples are connected to the analog input terminals as described in the following section for analog inputs.

## **ANALOG INPUT STRUCTURE**

The general input structure of an analog input is shown in the figure below. Each of the HI and LO input lines goes to an input of a multiplexer and then to a differential input, high impedance, programmable gain, instrumentation amplifier. In order to get accurate and reliable measurements, the input signals must be referenced to the circuit's analog common.



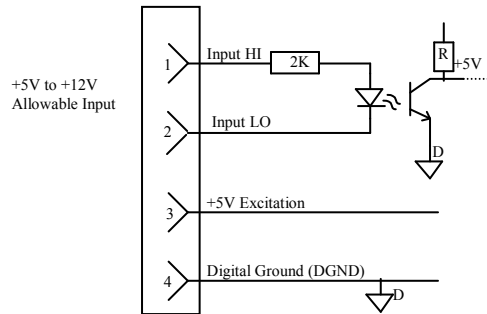
Typical Type 2 CIM Analog Input Circuit

Refer to Technical Note #101 for examples of how to connect different analog sensors to the Connector Interface Module. However, since installations vary from place to place, these may not cover all possible situations. Call us if you need help with sensor connections that are not shown here.

## **DIGITAL INPUT STRUCTURE**

The general input structure of a digital input is shown in the figure below. Each of the HI and LO input lines is connected to the input of an optical isolator designed to accept inputs ranging from 5 volts to 12 volts. The input current for each line is about 2 milliamps at 5 volts. +5 V excitation is provided with the Type 2 Connector Interface Module to provide power for the opto-isolator inputs when used with external relay contacts and open collector inputs.

**DO NOT CONNECT THE DIGITAL GROUND TO AN EXTERNAL EARTH GROUND OR TO EXTERNAL EQUIPMENT GROUNDS!** Potential damage to the Black Lab could occur.

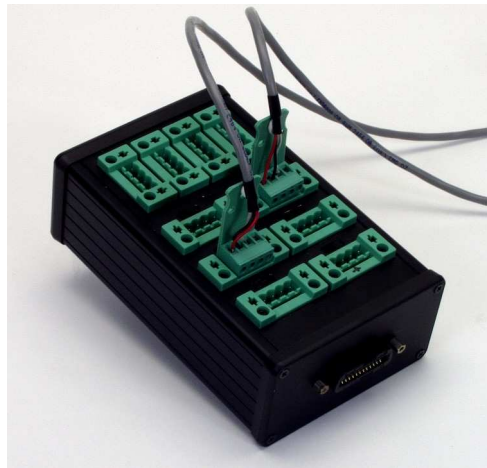


Typical Type 2 CIM Digital Input Circuit

Refer to Technical Note #102 for examples of how to connect different digital or contact sensors to a digital input. However, since installations vary from place to place, these may not cover all possible situations. Call us if you need help with sensor connections that are not shown here.

---

## Type 3 Connector Interface Module



### FEATURES:

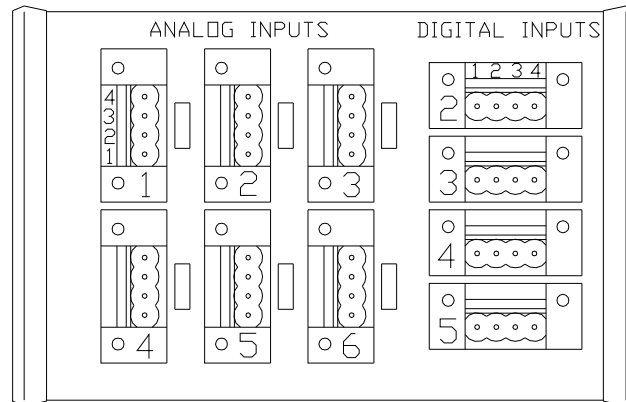
- Plug Connector with integral cable strain relief
- 6 Analog channels, 4 digital channels
- Temperature Reference for TC inputs
- +12 V Sensor Excitation @ 100mA
- Optional +24 V and dual 1.2 to 10 V Sensor Excitation
- +5 V Digital Excitation @ 100mA
- Rugged Extruded Aluminum Enclosure

## **DESCRIPTION:**

This Connector Interface Module provides the user with a durable plug connection for each of the 6 analog inputs and 4 digital inputs. It is connected to the Black Lab with two cables, a 1 foot, 26 conductor ribbon cable that carries the analog and digital signals back to the Black Lab, and a 1 foot, 6 conductor power cable.

+12 V excitation @ 100mA is available on each connector for analog sensor excitation. When equipped with the optional sensor power supplies, +24V @ 100 mA or one of two variable power supplies (1.2V @ 100mA to 10V) can be made available on any analog input connector by means of a 4 position slide switch located next to the input connector.

+5 volts @ 100mA is also made available to use for powering opto-isolators for each of the digital signals.



## **TEMPERATURE REFERENCE**

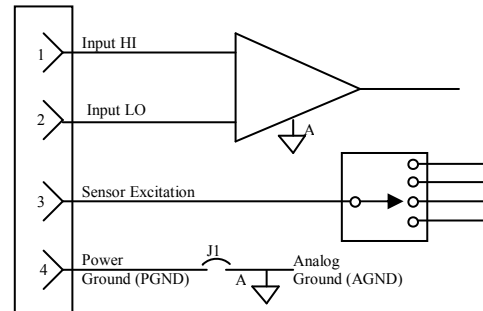
A temperature sensor is mounted inside the terminal assembly and is used to measure the ambient temperature for reference junction compensation when making thermocouple measurements. The reference temperature accuracy is specified as  $\pm 1$  °C.

Thermocouples are connected to the analog input terminals as described in the following section for analog inputs.

## ANALOG INPUT STRUCTURE

The general input structure of an analog input is shown in the figure below. Each of the HI and LO input lines goes to an input of a multiplexer and then to a differential input, high impedance, programmable gain, instrumentation amplifier.

In order to get accurate and reliable measurements, the input signals must be referenced to the circuit's analog common. A jumper, J1, in the Connector Interface Module connects the Analog Ground (AGND) to the Sensor Excitation Power Ground (PGND). For almost all situations, this jumper should remain in place.



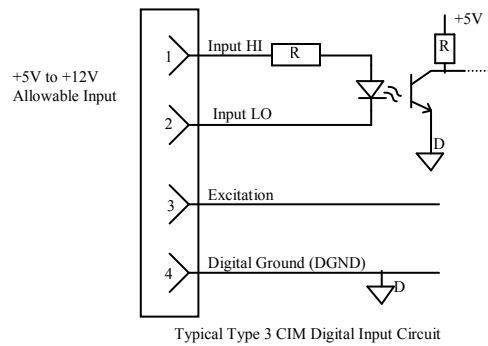
Typical Type 3 CIM Analog Input Circuit

Refer to Technical Note #101 for examples of how to connect different analog sensors to the Connector Interface Module. However, since installations vary from place to place, these may not cover all possible situations. Call us if you need help with sensor connections that are not shown here.

## **DIGITAL INPUT STRUCTURE**

The general input structure of a digital input is shown in the figure below. Each of the HI and LO input lines is connected to the input of an optical isolator designed to accept inputs ranging from 5 volts to 12 volts. The input current for each line is about 2 milliamps at 5 volts. +5 V excitation is provided with the Type 3 Connector Interface Module to provide power for the opto-isolator input when used with external relay contacts and open collector inputs.

**DO NOT CONNECT THE DIGITAL GROUND TO AN EXTERNAL EARTH GROUND OR TO EXTERNAL EQUIPMENT GROUNDS! Potential damage to the Black Lab could occur.**



Refer to Technical Note #102 for examples of how to connect different digital or contact sensors to a digital input. However, since installations vary from place to place, these may not cover all possible situations. Call us if you need help with sensor connections that are not shown here.

## Type 4 Connector Interface Module



### FEATURES:

- Lowest cost option
- 6 Analog channels

### DESCRIPTION:

This Connector Interface Module comes with a six pair cable with one end terminated with a Black Lab input connector and the other end with bare wires. It is available in standard lengths of 10, 20, 30, 40 or 50 feet. The following chart shows the cable colors for each channel. All shields are connected internally to analog ground.

CHANNEL 1	HI	RED
	LO	BLACK
	SH	SHIELD
CHANNEL 2	HI	WHITE
	LO	BLACK
	SH	SHIELD
CHANNEL 3	HI	GREEN
	LO	BLACK
	SH	SHIELD
CHANNEL 4	HI	BLUE
	LO	BLACK
	SH	SHIELD
CHANNEL 5	HI	YELLOW
	LO	BLACK
	SH	SHIELD
CHANNEL 6	HI	BROWN
	LO	BLACK
	SH	SHIELD