Thermocouple Module

June 2000 GFK-1864

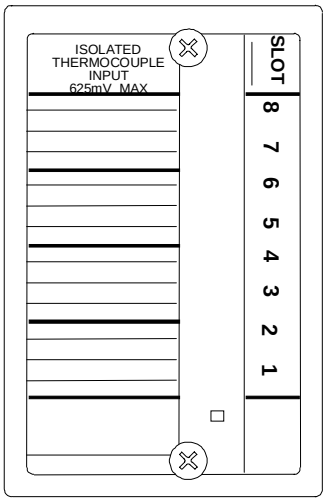
Product Information

Revision:	ALG631-AA
Firmware:	Version 1.10
Compatibility:	ALG631-AA requires a Bus Interface Unit release 2.0 or later.
Upgrade kit:	Thermocouple modules ALG630 can be upgraded using kit 44A749490-G01. Optional.

New Features

Module ALG631 is a new Thermocouple module version. It is derived from Thermocouple module ALG630. The hardware of these two modules is identical. The difference between these modules is how they react when an open circuit condition is detected. The ALG630 module defaults the affected %AI reference to zero and sets the open circuit diagnostic bit when an open circuit fault is detected. New module ALG631 defaults to the maximum negative temperature value for the configured Thermocouple type when configured for temperature, and to the minimum millivolts for the configured Thermocouple type when configured for millivolts. It also sets the open circuit diagnostic bit.

For both module types, the application program should continue to monitor the %I diagnostic bits to detect the presence of specific error conditions, as explained on another page.



Power Sources

This module does not require a separate power supply to operate.

LED

A single indicator shows module status:

ON:	normal operation
	Intermittent flashing: module fault
OFF:	loss of backplane power

Module Operation

The Thermocouple Input Module accepts eight inputs from thermocouples and converts the input level of each to a digital value. The module supports a variety of Thermocouple types, as listed in the Module Specifications table.

Module Specifications

Number of Channels	Eight. Each channel individually configurable.
Scan time	60 Hz: approximately 60 milliseconds per point 50 Hz: approximately 70 milliseconds per point
Fault detection	Open thermocouple, underrange, overrange, and high/low alarm.
Normal mode rejection	60dB, at 50/60 Hz, 100% span
Common mode rejection	120 dB at 50/60Hz, 100 ohm imbalance
Common mode voltage	250 Vrms (350 VDC or peak AC)
Maximum voltage between channels	250VAC
Normal mode voltage	100% overrange DC or peak AC operational 28 VDC or peak AC maximum
Isolation: User input to logic, user input to frame ground. Channel to Channel	 1500 VAC for 1 minute, 250 VAC continuous. 250 VAC continuous.
Current drawn from BIU power supply	195 mA maximum
Digital Resolution	15 bits plus sign
Operating temperature range	0 to 55 Degrees C ambient
Thermocouple types	J, K, T, E, S, R, B, N, G, C, D, Platinel II
Spans (+/-)	19.5mV, 39mV, 78.125mV, 156.25mV, 312.5mV, 625mV
Accuracy, at 25deg. C on voltage measurement	+/-0.1% of reading, +/- 0.05% of span for J, K, T, and E thermocouple types
Temperature sensitivity (0deg. to 60deg. C)	+/-0.004% of reading, +/-1.5µV per deg. C referred to input
Cold junction compensation	If used, reference junction temperature either measured at thermocouple termination using a precision thermistor, or supplied by system, or by fixed compensation value.
Cold junction temperature error	+/-0.25 degree C (local measurement). To reduce temperature transients, thermocouple terminations should not be installed in the same cabinet as high heat-dissipation assemblies.
Conformity error	+/-0.3 degree C, +/-0.5 degree F.

Keying Locations

Optional keying locations for the Thermocouple Module are:

Keying Locations									
A	B	C	D	E	F	G	H	J	K
x			x				x	x	

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Installation Instructions

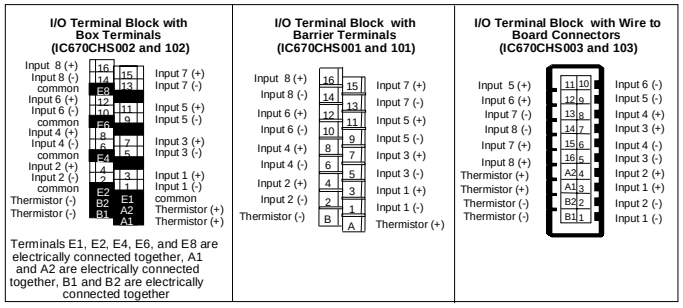
Thermocouples can be wired directly to the I/O Terminal Block on which the Thermocouple module is installed, or wired to an optional Thermocouple Terminal Block (IC670CHS004).

If a Thermocouple Terminal Block is used, installing the Thermocouple Module itself on an I/O Terminal Block with Wire to Board Connectors provides the simplest connection between terminal blocks. However, the module can be installed on any Field Control I/O Terminal Block. Terminal assignments for each type of Field Control I/O Terminal Block are shown below. Note that if a thermistor is connected locally to the I/O Terminal Block on which the module is installed, to achieve "local" cold junction compensation, the thermistor must be electronically identical to the thermistor in the Thermocouple Terminal Block.

The Terminal Block with box terminals has 25 terminals for each module. Each terminal accommodates one AWG #14 (avg 2.1mm^2 cross section) to AWG #22 (avg 0.36mm^2 cross section) wire, or two wires up to AWG #18 (avg. 0.86mm^2 cross section). When an external jumper is used, wire capacity is reduced from AWG #14 (2.10mm^2) to AWG #16 (1.32mm^2).

The I/O Terminal Block with barrier terminals has 18 terminals per module. Each terminal can accommodate one or two wires up to AWG #14 (avg 2.1mm^2 cross section).

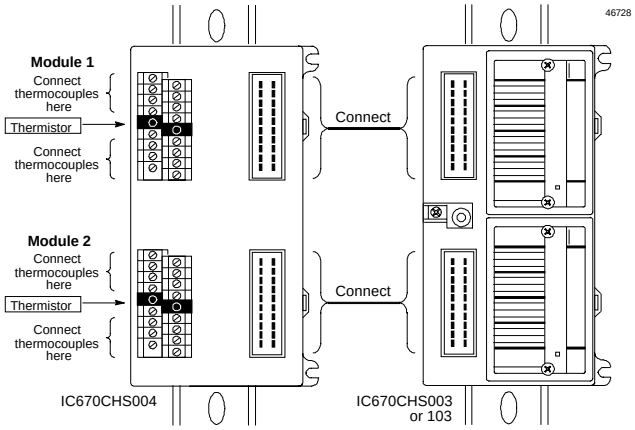
The I/O Terminal Block with Connectors has one 20-pin male connector per module.



Note: When connecting a thermistor to an I/O terminal block, it is important to be sure that no other connection is made to the thermistor terminals.

Using an Optional Thermocouple Terminal Block

The Thermocouple Terminal Block (IC670CHS004), which has two built-in thermistors, can be used to provide local reference junction compensation. The Thermocouple Terminal Block is installed in the same manner as other Field Control I/O Terminal Blocks.

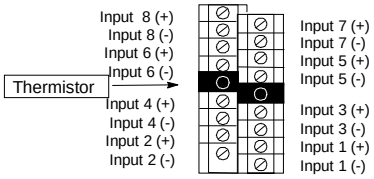


Caution

The Thermocouple Terminal Block must be used with a grounded conductive DIN rail to assure that the assembly screws in the terminal block base cover are connected to chassis ground.

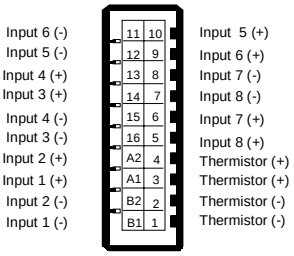
Connecting Thermocouples to a Thermocouple Terminal Block

For each module, the connector pin assignments on terminal block IC670CHS004 with the base mounted in the position shown are:



Connecting a Thermocouple Terminal Block to the I/O Terminal Block

Connect a Thermocouple Terminal Block (IC670CHS004) to the I/O Terminal block (IC670CHS003) using an appropriate cable. The diagram below shows the pin assignments for each Wire to Board connector on the Thermocouple Terminal Block (IC670CHS004).

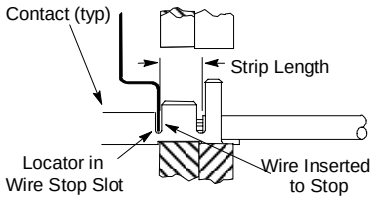


Using a Crimping Tool

Pins (catalog number IC670ACC003) must be installed on individual wires using a crimping tool. The AMP™ Pro-Crimper™ II, Hand Tool Assembly 90546-1 is recommended. The tool must be properly adjusted, as detailed in the instructions that come with the tool.

1. Strip the wire 3.96 to 4.75mm (0.156 to 0.187in), taking care not to nick or cut wire strands.
2. Hold the tool with the back (wire side) facing you. Squeeze tool handles together and allow them to open fully.
3. Holding the contact by the mating end, insert the contact-insulation barrel first-through the front of the tool into the appropriate crimp section. Position the contact with the mating end on the locator side of the tool, so that the open “U” of the wire and insulation barrels face the top of the tool. Place the contact up into the nest so that the movable locator drops into the slot in the contact. Butt the front end of the wire barrel against the movable locator.

   NOTE: Be sure both sides of the insulation barrel are started evenly into the crimping section. DO NOT attempt to crimp an improperly-positioned contact.
4. Hold the contact in position and squeeze the tool handles together until ratchet engages enough to hold the contact in position. DO NOT deform insulation barrel or wire barrel.
5. Insert stripped wire into contact until it is butted against wire stop as shown.
6. Holding wire in place, squeeze tool handles together until ratchet releases.
7. Check the contact's crimp height as described in the tool instruction sheet. Adjust the crimp height if necessary before continuing.



Diagnostics

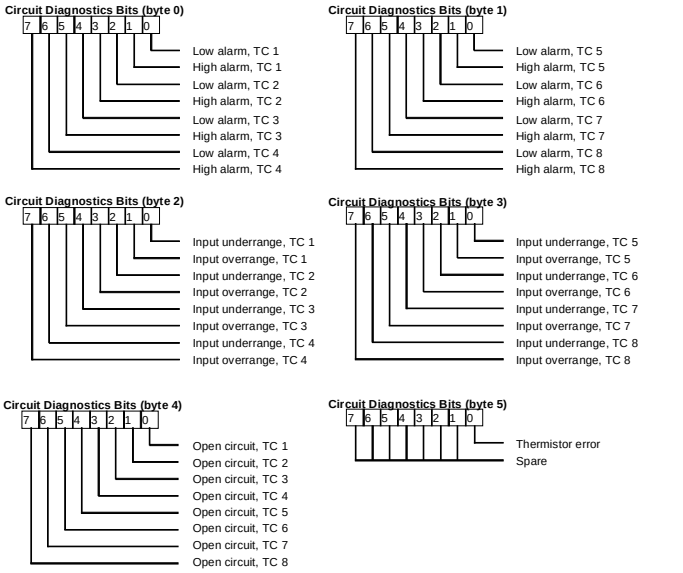
The Thermocouple module performs diagnostics and provides the diagnostic data to the Bus Interface Unit's discrete input (I) table.

The module sets the appropriate bit when a diagnostic condition is detected. The bit remains set until it is cleared.

Alarm bits are set if the processed value for a channel exceeds its configured alarm limit.

Overrange bits are set if the millivolt value for an input exceeds the limits of its span.

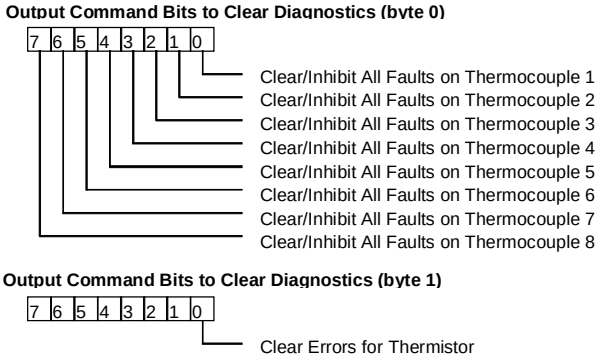
Open circuit is checked every time a thermocouple input is read (unless Open TC checking is disabled). If the circuit is open, the corresponding bit is set, and the input is not processed further.



Clearing Faults and Alarms

The host can use a set of 16 discrete output bits in the BIU's discrete output (Q) table to clear and inhibit faults and alarms for the Thermocouple Input module. Setting the appropriate bit from the host clears all diagnostic bits for that thermocouple that may be set.

The discrete input bits for a channel remain clear in the BIU as long as the corresponding discrete output bit is set.



A thermistor error occurs if the calculated temperature value from the thermistor is less than -10 degrees C or greater than +75 degrees C.