

MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

Reference package for procurement and maintenance review

INVENSYS TRICONEX

3706A

NON-ISOLATED THERMOCOUPLE INPUT MODULE

Used with the applicable Tricon v9-v10 system configuration.

REFERENCE PACKAGE

OFFICIAL DOCUMENT

Selected official pages follow this cover with source pagination retained.

Invensys 9700077-012, February 2009

Thermocouple Input Modules

This section describes the Thermocouple Input Modules available for use with Tricon v9-v10 systems. For important operational restrictions, see [Thermocouple Input Installation and Operation](#) on page 194.

Table 51 Thermocouple Input Modules

Model	Module Description	Type
3706A	Non-Isolated Thermocouple Input	TMR
3708E	Isolated Thermocouple Input	TMR

A thermocouple input module has three independent input channels. Each input channel receives variable voltage signals from each point, performs thermocouple linearization and cold-junction compensation, and converts the result to degrees Celsius or Fahrenheit. Each channel then transmits 16-bit signed integers representing 0.125 degrees per count to the three Main Processors on demand. To ensure correct data for every scan, a value is selected using a mid-value selection algorithm.

Each module is configured by TriStation for the thermocouple type and engineering units you select. Each module can support one of a variety of thermocouple types, as indicated in the specifications. Engineering units are in Celsius or Fahrenheit.

TriStation programs the Isolated Thermocouple Module for upscale or downscale burnout detection depending on the hardware specification in the TriStation control program. The Non-Isolated Thermocouple Module provides upscale or downscale burnout detection depending on the field termination selected. If a thermocouple burnout occurs, or if the thermocouple input voltage is out of range, the Main Processors receive the integer value +32,767 for upscale burnout detection or -32,767 for downscale.

Triuplicated temperature transducers residing on the field termination module support cold-junction compensation. Each channel of a thermocouple module performs auto-calibration and reference-junction compensation every five seconds using internal-precision voltage references. On the Isolated Thermocouple Module, a cold-junction indicator announces the failure of a cold-junction transducer. On the Non-Isolated Thermocouple Module, a Fault indicator announces a transducer fault.

Sensing of each thermocouple input is performed in a manner which prevents a single failure on one channel from affecting another channel. Each module performs complete ongoing diagnostics on each channel.

Thermocouple Modules include the hot-spare feature which allows online replacement of a faulty module. Like all I/O modules, Thermocouple Modules require a cable interface to a remotely located external termination panel. Each module is mechanically keyed to prevent improper installation in a configured chassis.

32-Point Thermocouple Modules

This figure is a simplified schematic for model 3706A, which is a non-isolated Thermocouple Input Module.

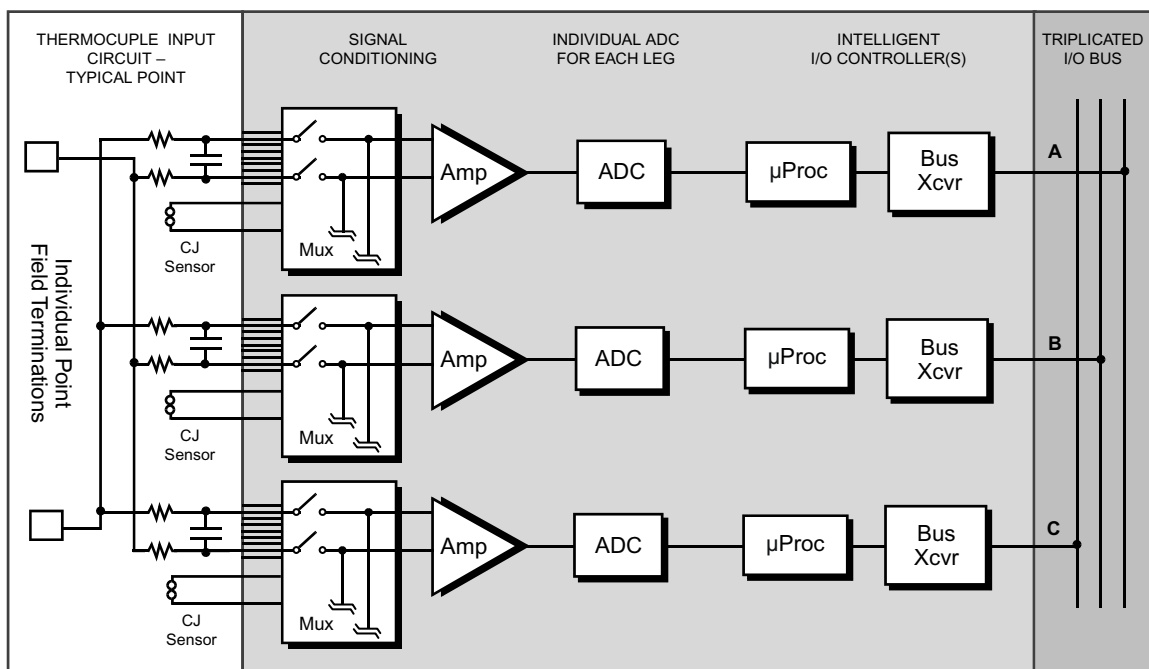


Figure 56 3706A Simplified Schematic

This figure shows the front panel of model 3706A.

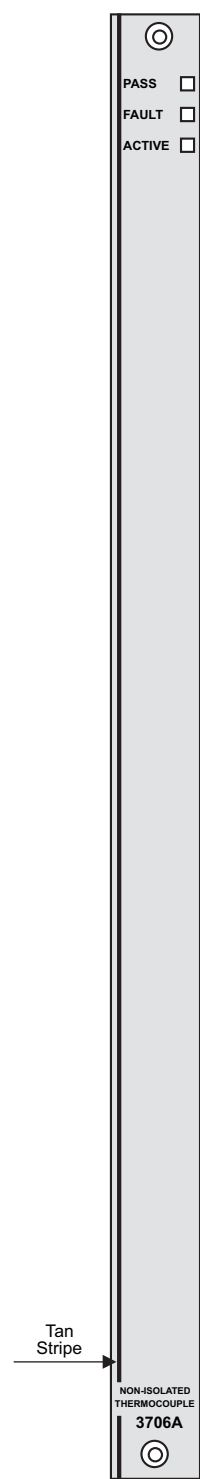


Figure 57 3706A Front Panel

3706A Specifications

This table lists the specifications for model 3706A, which is a Thermocouple Input Module.



If the common mode voltage range of a channel is exceeded, Triconex does not guarantee proper operation of the module and accuracy of other channels.



Rapidly or continuously changing inputs may cause mis-compare readings because the measured values of the three channels may be different by more than 0.5 percent of full scale, which may cause a fault to be declared in error.

Table 52 3706A Thermocouple Input Specifications

Feature	Specification
Color code	Tan
Thermocouple types supported	J, K, T
Open detect	Upscale/downscale selected on termination module
Number of input signals	32 differential, DC-coupled
Input update rate ¹	50 ms maximum
Accuracy of thermocouple types and temperature ranges supported	See table, 3706A Accuracy on page 137 .
Input resistance (load)	22 M Ω (DC), typical
Input point protection	110 VAC continuous without damage
Noise rejection: Common mode	-85 dB @ 0 – 60 Hz minimum -95 dB @ 60 Hz typical
Noise rejection: Normal mode	-17 dB @ 60 Hz
Common mode range (See Warning)	± 10 VDC maximum (channel-to-channel or channel-to-ground)
Channel-to-channel isolation	200 k Ω , typical
Reference-junction compensation range	32° to 140° F (0° to 60° C)
Module status indicators	Pass, Fault, Active
Input diagnostic fault coverage ²	
Minimum input change	0.5% of full scale
Input change sample period	50 milliseconds
Minimum period of mis-compares	256 samples
Logic power	< 10 watts

1. Later versions of NITC firmware (Meta 4873 or greater) freeze inputs for 1 second upon detection of hot-spare insertion.
2. If the input readings differ by a minimum of 0.5 percent of full scale and continue for a minimum period of 256 input samples, the probability of a fault increases.

3706A Accuracy

Accuracy specifications account for errors related to reference-junction compensation but do not account for errors caused by temperature gradients between the temperature transducers and thermocouple terminations. Customers are responsible for maintaining a uniform temperature across the Thermocouple Field Termination Module.

Table 53 Accuracy of Model 3706A Thermocouple Types

TC Type	Temperature Range	Accuracy @ 32° to 140° F (0° to 60° C)	
		Ta=77° F (25° C)	Ta=32° to 140° F (0° to 60° C)
		Typical	Maximum
J	-250° to 32° F (-157° to 0° C)	± 5.0° F (2.8° C)	± 7.0° F (3.9° C)
	>32° to 2000° F (0° to 1093° C)	± 4.0° F (2.3° C)	± 5.0° F (2.8° C)
K	-250° to 32° F (-157° to 0° C)	± 6.0° F (3.4° C)	± 9.0° F (5.0° C)
	>32° to 2500° F (0° to 1371° C)	± 4.0° F (2.3° C)	± 6.0° F (3.4° C)
T	-250° to 32° F (-157° to 0° C)	± 5.0° F (2.8° C)	± 9.0° F (5.0° C)
	>32° to 752° F (0° to 400° C)	± 3.0° F (1.7° C)	± 5.0° F (2.8° C)

Proof Testing for Counter Overflow

When a counter overflows, its value becomes negative. You can test this condition quickly by installing the PTI module in a Tricon controller chassis without a hot-spare module and not allowing the control program to reset the counter values to zero. After the PTI module powers up and passes its self-test, it initializes its counters to 2147479552 – only 4096 counts away from overflow.

Thermocouple Input Installation and Operation

Thermocouple Modules include these requirements for proper operation.



- Proper operation of a Thermocouple Input Module requires that you install and connect its field termination panel. Otherwise, fault conditions occur. Unused thermocouple inputs should be shorted.
- On the Non-Isolated Thermocouple Module, a Fault condition may be caused by a faulty cold-junction transducer. If the fault is not fixed by replacing the module, then replace the field termination module.

For fault indicators, see [CJ \(Cold Junction\) Indicator](#) on page 238.

Installing Model 3807 BiPolar Analog Output Modules

The 3807 BiPolar Analog Output Module includes this requirement for proper operation.



If the I/O cable (the cable that connects the termination panel to the Tricon backplane) is routed outside the cabinet that houses the Tricon chassis, the I/O cable should be routed in a metal conduit.