Honeywell

Experion Series C I/O
Specifications and Technical Data

Revision 0.4
February 7, 2006

Product Introduction Summary

Overview

This document provides **preliminary** information to configure the Experion ® Series C I/O and the C300 Controller, released with Experion R300. This document should not be used after October 30, 2005. This document will be replaced by the final Series C C300 and Series C I/O specifications documents.

Scope

The following Series C I/O items are included in this document.

- Digital Input 24 VDC
- Digital Input 110 VAC
- Digital Input 220 VAC
- Digital Output (24 VDC bussed)
- Digital Output Relay
- High Level Analog Input with HART
- Analog Output with HART
- Low Level Multiplexer – RTD & TC

Not included in this document are other items included in the Series C infrastructure:

- C300 Controller
- Control Firewall (8 port + 1 uplink)
- Series C Power System
- Infrastructure to support a cabinet level deliverable (mechanical and electrical details)
- Approval support for all modules equivalent to the current PMIO product line.
- FIM4 module (4 H1 Links per Module)

Definitions

Input Output Termination Assembly (IOTA): This part has both the IOM and the connections for wiring, FTE, IOLINK (as appropriate for the IOM) so it replaces the FTA in most cases.

Input Output Module (IOM): The actual module that has the appropriate circuitry and plugs into the IOTA.

IOTA Carrier: The assembly that allows mounting of the IOTA.

IOTA Support: Supports mounting the carrier to the cabinet.

Features

All Series C components feature an innovative design that supports enhanced heat management. This unique look provides a significant reduction in overall size for the equivalent function.

The unique features of Series C I/O include:

- New modules “tilted” for better heat distribution.
- I/O Module and field terminations are combined in the same area. The I/O Module is plugged into the IOTA to eliminate the need for a separate chassis to hold the electronics assemblies
- Two level “detachable” terminals for landing the field wiring in the enclosure, providing easier plant installation and maintenance.
- Field power is supplied through the IOTA, with no need for extra power supplies and the associated craft wired marshalling.
- Redundancy is accomplished directly on the IOTA without any external cabling or redundancy control devices, by simply adding a second IOM to an IOTA. The C300 redundancy is accomplished with a cable physically connecting two C300 Controllers in a redundant configuration.

The Series C innovative styling is one of their unique features. This styling includes features to facilitate the effective use of control hardware in a systems environment. These features include:

- Vertical mounting of components to facilitate effective wiring. Vertical mounting allows for more effective wiring since most field wiring applications require entry from the top or bottom of the systems cabinet.
- Information "circle" allows for a quick visual queue to draw the Maintenance Technician's eye to important status information.
- "Tilted" design allows for effective heat management within the cabinet enclosure. Since Series C allows for a significant increase in cabinet density, an effective heat management system is critical for high systems availability.

Series C IOTAs combine several functions into a single piece of equipment.

- Single and redundant configurations
- On-board termination of process signals
- On-board signal conditioning
- On-board connection to appropriate networks (FTE, I/O LINK)
- Field power distribution without external marshalling
- IOM plugs into the IOTA and receives power from the IOTA
- The IOTA receives its power from a 24 VDC bus that is part of the IOTA carrier – the IOTA is simply screwed into the bussed power.

I/O Module Functions

- **High Level Analog Input /HART Input Module** (16pt) – The High Level Analog Input Module supports both high level analog and HART inputs. Analog inputs are typically 4-20madc for both traditional and HART devices. HART data can be used for status and configuration. HART data, such as the secondary and tertiary variables, can also be used as process control variables.
- **Analog Output/HART Output Module** (16pt) – The Analog Output Module supports both standard 4-20ma outputs and HART transmitter outputs.
- **Digital Input 24 VDC** (32pt) – Digital input sensing for 24V signals
- **Digital Input High Voltage** (32pt) – Digital input sensing for 110 VAC, 220 VAC, 125VDC.
- **Digital Output 24 VDC** (32 pt) – Current sourcing digital outputs. Outputs are electronically short-circuit protected.
- **Relay Digital Output** (32 pt) – Digital output with NO or NC dry contacts. Can be used for low power or high power applications.
- **Temperature Multiplexer** (64pt). – Provides thermocouple (TC) and resistance temperature device (RTD) inputs. The Multiplexer support up to four, field proven PMIO FTAs.

Series C I/O Sizing

In virtually all configurations, the Series C controller and I/O provides process useful, maintainable process equipment connections in a smaller footprint than existing competitors and Honeywell equivalent products. Series C is a major contributor to overall savings in a project's total installed cost.

IOTA sizes vary based on the application. Some generalities can be made, however. In general, an analog module has 16 points and resides on a 6 inch (152mm) IOTA for non-redundant applications and a 12 inch (304mm) IOTA for redundant applications. A discrete module has 32 points and resides on a 9-inch (228mm) IOTA for non-redundant applications and a 12 inch IOTA for redundant applications. Specific information on the size of a particular module can be found in the Model Number Table.

Approval Bodies

Factory Mutual

Division 2 Approvals

All models to be Approved as nonincendive for use in Class I, Division 2, Group A, B, C, D hazardous (classified) locations.
Selected low voltage AO, AI and DI models will also have additional approval as having non-incendive field wiring for connection to Class I, Division, 2, Group A, B, C and D hazardous (classified) locations.

Zone 2 Approvals

All models to be Approved as normally non-sparking apparatus for use in Class I, Zone 2, AEx nA IIC hazardous (classified) locations.
Selected low voltage AO, AI and DI models will also have additional approval as having non-incendive field wiring connections to Class I, Zone 2, Group IIC hazardous (classified) locations.

Temperature rating of all individual models as well cabinet configurations is not to exceed T4

Canadian Standards Association

Division 2 Certifications

All models to be Certified as suitable for use in Class I, Division 2, Group A, B, C, D hazardous locations.

Zone 2 Certifications

All models to be Certified as normally non-sparking apparatus, Ex nA IIC, for use in Zone 2 hazardous locations
Selected low voltage AO, AI and DI models will also have additional Certification as having energy limited circuits, Ex nA [L] IIC, for field wiring connections within Class I, Zone 2, Group IIC hazardous (classified) locations.

Temperature rating of all individual models as well cabinet configurations is not to exceed T4

ATEX Certification

Zone 2 Certifications

All models to be Certified as normally nonsparking apparatus, II 3 G EEx nA IIC, for use in Zone 2 hazardous locations

Selected low voltage AO, AI and DI models will also have additional Certification as having energy limited circuits, II 3 G EEx nA [L] IIC, for field wiring connections within Zone 2, Group IIC hazardous locations.

Temperature rating of all individual models as well cabinet configurations is not to exceed T4

CE

EN 61326 -1998 Electrical equipment for measurement, control and laboratory use -EMC requirements.

EN 50082-2-1995 Electromagnetic Compatibility -Generic Immunity Standard, Part 2: Industrial Environment.

EN 55011-1991 Limits and Methods of Measurement of Radio Disturbance Characteristics of Industrial, Scientific and
Medical (ISM) Radio-Frequency Equipment

EN 6101 0-1-1993 Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use.
Part 1: General Requirements

C-Tick

Australian Radio communications Act of 1997, Section 182

Model Numbers

The table below illustrates the various I/O modules and their associated IOTAs.

Size column – The size table entry denotes the relative (not exact) size of the IOTA in inches. No size is shown for the IOMs since they reside on the IOTA.

“RED.” column – Denotes if the IOM can be made redundant.

Model Prefix column – The “CC” designation represents the corrosion protected model. When applicable, only the corrosion protected device is offered. This provides a more robust function which allows for enhanced piece of mind. Corrosion protected devices support the ANSI/ISA-S71.04-1985 corrosion standard at the harsh environment or G3 level.

WX-YZZZNM	Series C Model Numbering Key

W = Series C Product Line - C
X = U = Standard Assembly (G1) - C = Corrosion Protected Assembly (G3), x = Either
Y - P= IOProcessor, T=Termination Assembly,
G=GI/IS Termination Assembly, H=Hazardous Interface, S=Custom Interface,
PW=Power, K=Cabling, E=Enclosure, M=Mechanical
ZZZ - Particular function or model
N = Series of Model - Also can be used as additional model information
- +1 = Redundant complement to an IOTA
M = Series or Release number of Model - Also can be used as additional model information

IOTA Sizing is nominal (6in = 152mm, 9in =228mm, 12in =304mm)

I/O modules are associated with their respective IOTAs in the table below. The I/O Module spans one or more IOTAs.

I/O Module	IOTA	Description	Circuits	Size	RED.
CC-PAIH01		Hi-level AI HART	16		√
	CC-TAIX01	AI IOTA		6	
	CC-TAIX11	AI IOTA Red		12	√
CC-PAOH01		AO 16pt HART	16		√
	CC-TAOX01	AO IOTA		6	
	CC-TAOX11	AO IOTA Red.		12	√
CC-PDIL01		DI 24V	32		√
	CC-TDIL01	DI 24V IOTA		9	
	CC-TDIL11	DI 24V IOTA Red.		12	√
CC-PDIH01		Digital Input High Voltage	32		√
	CC-TDI110	DI 110V IOTA		9	
	CC-TDI120	DI 110V IOTA Red.		12	√
	CC-TDI220	DI 220VAC IOTA		9	√
	CC-TDI230	DI 220VAC IOTA Red.		12	√
CC-PDOB01		DO - 24V Bussed Out	32		√
	CC-TDOB01	DO 24V Buss IOTA		9	
	CC-TDOB11	DO 24V Buss IOTA Red.		12	√
	CC-TDOR01	DO Relay IOTA		12	
	CC-TDOR11	DO Relay IOTA Red.		12	√
	CC-SDOR01	DO Relay Extension Board		12	
CC-PFB401		Fieldbus - 4 Nets	4		√
	CC-TFB401	Fieldbus IOTA - 4 Nets		6	
	CC-TFB411	Fieldbus IOTA Red. - 4 Nets		12	√
CC-PAIM01		PMIO LL Mux	64		
	CC-TAIM01	PMIO LL Mux IOTA		6	
	CC-TAIM01	PMIO LL Mux IOTA w/ PA			
	Mx-TAMT04	LL Mux TC FTA	16	12	
	Mx-TAMR04	LL Mux RTD FTA	16	12	

Specifications

The following specifications are ***PRELIMINARY*** specifications for the Series C I/O.

Analog Input w/ HART

The overall nature of the Analog Input Module is to accept high level current or voltage inputs from transmitters and sensing devices.

Notable Features

- Extensive self diagnostics
- Optional redundancy
- Supplies non-incendive field power
- HART-capable, multivariable instruments
- Fast (50ms) loop scan
- PV protection through a broken wire detection diagnostic

Non-Incendive Power

Non-incendive power is provided with no external marshalling to support the 4-20ma loop and still provide for channel power protection. This protection supports the Non-incendive power rating.

Broken-wire Bad PV Detection

Each channel is able to detect and annunciate a broken field wire. In addition, a seemingly-valid PV from a channel diagnosed as having a broken-wire will be marked as invalid thus preventing incorrect control action. A soft failure is generated to alert the maintenance staff for corrective action. This function is channel configurable.

Detail Specifications – Analog Input with HART

Parameter	Specification
Input / Output Model	**CC-PAIH01 -** Hi-Level AI with HART
IOTA Models	**Cx-TAIX01** **Non Redundant** **6”** **Cx-TAIX11** **Redundant** **12”**
Input Type	Voltage, current (2-wire or self-powered transmitters)
Input Channels	16 differential input channels
Common Mode Rejection Ratio, dc to 60 Hz (500 Ω source imbalance)	70 dB
Common Mode Voltage, dc to 60 Hz (1)	-6 to +5 V peak
A/D Converter Resolution	16 bits (14 bits used)
Input Range	0 to 5 V, 1 to 5 V, 0.4 to 2 V, 4-20 mA (through 250 Ω)
Normal Mode Rejection Ratio, at 60 Hz	26 dB
Normal Mode Filter Response	Single-pole RC, -3 dB @ 1 Hz
Maximum Normal Mode Input (differential inputs, no damage)	± 30 Volts
Crosstalk, dc to 60 Hz (channel-to-channel)	-60 dB
Input Impedance (Voltage Inputs)	> 10 MΩ powered
Maximum Input Voltage (any input referenced to common, no damage)	± 30 Volts
Input Scan Rate	**50** ms
Hardware Accuracy (@ CMV = 0 V)	± 0.075% full-scale (23.5°± 2°C) **(4)** ± 0.15% full-scale (0 to 50°C) **(4)**
Transmitter Field Power Conditioning	Individually Protected Current Limiting Circuits for Class 1, Div 2 interfacing Maximum current: 30 mA Minimum voltage 23V
Surge withstand capability (Common mode)	ANSI/IEEE C37.90.1-1989
(1) The low-side input connection is normally connected to system common by a wire jumper on the IOTA. This jumper can be removed by the user subject to operating within the CMV specification.	

Analog Output w/ HART

Function

The overall nature of the Analog Output (AO) Module is to deliver high-level constant-current to actuators and recording/indicating devices. The function of the AO is closely modeled after the PAOY22 and HART AO IOP.

Notable Features

- Extensive self diagnostics
- Optional redundancy
- HART-capable, multivariable instruments
- Safe-state (FAILOPT) behaviors
- Output readback checking (on actual current delivered to the field)
- Non-incendive output

Harmonized with HART IOP

The intent is that Series C HART be harmonized with the implementation of HART in PM IOP format. See Document "PlantScape Redundant PMIO HART Integration Product Abstract Part 2 version 0.04 April 5 2002" and successor documents.

Standby Manual *(future product function)*

The Series C I/O AO function will provide a way of holding outputs while servicing the module ("standby manual").

FAILOPT

Series C AO module supports the FAILOPT parameter on a per channel basis. The user can configure each channel to either HOLD LAST VALUE, or SHED to a SAFE VALUE. The Output will always go to zero, the safe state, if the IOM device electronics fails

Broken-wire Detection

This Series C IO function will be able to detect and annunciate broken field wire.

Detail Specifications – Analog Output with HART

Parameter	Specification
Input / Output Model	**CC-PAOH01 -** Hi-Level AO with HART
IOTA Models	**Cx-TAOX01** **Non-Redundant** **6”** **Cx-TAOX11** **Redundant** **12”**
Output Type	4-20 mA
Output Channels	16
Output Ripple	100 mV peak-to-peak at power line frequency, across 250 Ω load
Output Temperature Stability	±0.02% Full Scale/°C
Output Readback Accuracy	±4% Full Scale
Output Current Linearity	± 0.05% Full Scale nominal
Resolution	± 0.05% Full Scale
Calibrated Accuracy	± 0.35% Full Scale (25°C) including linearity
Directly Settable Output Current Range	0 mA, 2.9 mA to 21.1 mA
Absolute Max Current Output for AO Value Digital Input Code	24 mA
Maximum Resistive Load (24 V supply = 20 V)	750 Ω @ 20 mA
Maximum Output Compliant Voltage (24 V supply = 20 V)	15 V
Output Settling Time (digital input code to 98% of final output value)	4 ms
Surge Withstand Capability	ANSI/IEEE C37.90.1-1989
Gap (0 mA) of Output to Field on Switchover	20 ms maximum (applies to Redundancy only)
Switching Hardware Diagnostic Frequency	Once per minute (applies to Redundancy only)

Digital Input 24VDC

Function

The Digital Input 24VDC accepts 24VDC signals as discrete inputs.

Notable Features

- Extensive internal diagnostics for data integrity
- Broken wire detection
- IOM redundancy
- Internal or external field power selection
- Supplies Non-incendive field power
- Input direct/reverse
- Galvanic isolation

Broken-wire Bad PV Detection

This Series C IO function will be able to detect and annunciate broken field wire. In addition, a seemingly-valid PV from a channel diagnosed as having a broken-wire will not be made available (thus preventing incorrect control action).

Detail Specifications – DI 24VDC

Parameter	Specification
Input / Output Model	**CC-PDIL01 –** Digital Input 24V
IOTA Models	**Cx-TDIL01** **Non Redundant** **9”** **Cx-TDIL11** **Redundant** **6”**
No. Points per IOP/FTA	32
Galvanic Isolation (any input terminal voltage referenced to common)	30 VAC, ±42.4 VDC (max)
Isolation Technique	Optical (in IOP)
DI Power Voltage Range	15 to 30 VDC
Input Signal Direction	Source
ON Sense Voltage/Current OFF Sense Voltage/Current	13 VDC (min) or 3 mA (min) 5 VDC (max) or 1.2 mA (max)
Input Impedance	4.2 KΩ
Absolute Delay Across Input Filter and Isolation	5 ms ± 20%
Field Resistance for Guaranteed ON Condition	300 Ω max @ 15 VDC
Field Resistance for Guaranteed OFF Condition	30 KΩ min @ 30 VDC
Surge Withstand Capability	ANSI/IEEE C37.90.1-1989

Digital Input High Voltage

Function

The Digital Input High Voltage accepts 120VAC or 250VAC / 125VDC signals as discrete inputs. The same IOM but different IOTA is used for both the 120VAC and 250VAC / 125VDC models. This reduces the number of spares required to support Series C system maintenance.

Notable Features

- Extensive internal diagnostics to ensure data integrity
- Functional redundancy
- Input direct/reverse
- Galvanic isolation

High Voltage

Require high voltage inputs 90–264 VAC and 125 VDC. Inputs can travel over 500ft without triggering a false positive.

Detail Specifications – Digital Input High Voltage

Parameter	**Specification**		
Input / Output Model	**CC-PDIH01** – Digital Input High Voltage		
	120 VAC IOTA	240 VAC IOTA	
IOTA Models	**Cx-TDI110 Non Redundant 9** **Cx-TDI120 Redundant 12**	**Cx-TDI210 Non Redundant 9** **Cx-TDI220 Redundant 12**	
Input Channels	32	32	
Galvanic Isolation (field to logic common)	1500 VAC RMS or ±1500 VDC	1500 VAC RMS or ±1500 VDC	
Isolation Technique	Optical	Optical	
		240VAC	**125VDC**
Digital Input Pwr. Range	90-132 VAC RMS	180-264 VAC RMS	TBD
Sense Current (ON condition)	3.5 mA minimum	2.2 mA minimum	TBD
Sense Current (OFF condition)	1.5 mA maximum	1.0 mA maximum	TBD
Pick Up Voltage (ON condition)	90 VAC RMS minimum (3)	180 VAC RMS minimum (3)	TBD
Drop Out Voltage (OFF condition)	25 VAC RMS maximum (3)	50 VAC RMS maximum (3)	TBD
Absolute Delay Across Input Filter and Isolation (Bounceless Input to logic level change)	25 ms maximum	25 ms maximum	TBD
Frequency Range	47-63 Hz	47-63 Hz	
Surge withstand capability	ANSI/IEEE C37.90.1-1989	ANSI/IEEE C37.90.1-1989	

Digital Output - Bussed 24VDC

Function

The Digital Output bussed 24VDC (DO24V) module provides reliable 24V digital output signals to control other process equipment as well as solenoid valves and interposing relays. The DO24V can support high energy outputs to reduce the number of external components in the output loop.

Notable Features

- Extensive internal diagnostics to ensure data integrity
- Functional redundancy
- Direct/Reverse output support
- Safe-state (FAILOPT) behaviors
- "Fuse-less" short circuit protection
- Latched, pulsed* or pulse-width* modulated output (per channel)
- Galvanic isolation
- Output readback checking to screw terminal

Bussed 24VDC DO

The Digital Output Bussed 24VDC has provisions for both internal and external field power excitation. As a bussed output device, all of the outputs share a common return (ground).

All output circuits, can be isolated from the Series C power system. An optional wiring option on the IOTA can support discrete outputs referenced to either Series C system power or an external field power source.

Fuse-less Short Circuit Protection

This unique feature allows a short circuit to exist without blowing any fuses. When a particular channel is shorted, internal circuits detect this and remove power to the field connection. The channel remains de-energized until the short circuit is repaired. Additional "back-up" removable fuses are provided on the IOTA as a secondary means of protection. These fuses would not need replacement under normal circumstances including multiple short circuit outputs.

FAILOPT

Series C DO module will support FAILOPT parameter on a per channel basis. The output can be directed by configuration to either HOLD THE LAST VALUE, or SHED to a SAFE VALUE. The safe value can be configured by the user. The output will always go to zero, regardless of Failopt state upon a failure of the IOM in a non-redundant condition.

Detail Specifications - Bussed 24VDC DO

Parameter	Specification
Input / Output Model	**CC-PDOB01** - 24Volt Field Isolated, Bussed output
IOTA Model Numbers	**Cx-TDOB01** **Non Redundant** **9** **Cx-TDOB11** **Redundant** **12**
Output Channels	32
Output Type	Source
Load Voltage Range	15-30 VDC
Load Current	0.5 A (max) per point 1.0 A (max) per 2 points 5 A (max) per 32 points
Isolation	Galvanic Isolation (photo coupler) 120 VAC, ±42.4 VDC max. (see trace tag below) (Any output voltage referenced to common)
On-State Voltage	24 V (max), load current @ 0.5A
Off-State Voltage	30 VDC (max)
Off-State Leak Current	0.5 μA (max)
Turn-On/Turn-Off Time	200 mS (max)
Surge withstand capability	ANSI/IEEE C37.90.1-1989

Digital Output – Relay IOTA

Function

Support a dry contact for isolated low voltage / low current or high voltage / high current discrete output applications. Each relay supports a Form-A or Form-B output based on jumper configuration.

The Relay IOTA uses the Digital Output 24V (DO24V) IOM with a special IOTA to support the Relay IOTA. All characteristics of the DO24V are incorporated here.

Notable Features

- Galvanic isolation
- Output readback checking (on system side of driver)
- Isolated Dry Contact (Form A or B)
- Counter EMF Snubbing Circuit

Detail Specifications - Relay DO IOTA

Parameter	Specification
Input / Output Model	**CC-PDOB01** - 24Volt Field Isolated, Bussed output
IOTA Model Numbers	**Cx-TDOR01** **Non Redundant** **6** **Cx-TDOR11** **Redundant** **12** **Cx-TDORE1** **Relay Extension** **12**
Output Channels	32 isolated Form A (SPST/NO) or Form B (SPST/NC) contacts (jumper selectable per output)
Contact Type	Gold-clad silver nickel
Maximum Load Voltage	250 VAC (RMS)/125 VDC
Maximum Steady State Load Current per Output	Current Voltage 3 A 250 VAC (resistive) 3 A 125 VAC (resistive) 3 A 30 VDC (resistive) 1 A 48 VDC (resistive) 0.4 A 125 VDC (resistive) 2 A 250 VAC (inductive = 0.4 power factor) 2 A 125 VAC (inductive = 0.4 power factor) 1 A 30 VAC (inductive L/R = 100 ms) 0.3 A 48 VAC (inductive L/R = 100 ms) 0.1 A 125 VAC (inductive L/R = 100 ms)
Minimum Load Voltage	5 VDC (4)
Minimum Load Current	10 mA (4)
Isolation	1500 VAC RMS or ±1500 VDC Channel-to-channel, and channel-to-logic common
Turn-On Time	10 ms maximum
Turn-Off Time	10 ms maximum
Contact Life	Operations % of Max Load 10,000,000 0 (Mechanical Life) 200,000 @ 3 A (100%)
Surge Absorber for Coil	120Ω + 0.03 μF for each channel
Surge withstand capability	ANSI/IEEE C37.90.1-1989
(4) The minimum 10 mA load current and 5 VDC load voltage specified are only valid if the gold is not burned off the gold-plated silver-nickel contact by a "high-voltage" or "high-current" load. Otherwise, the minimum load current is 100 mA and the minimum load voltage is 24 VDC.	

Low Level Analog (Temperature) Input - LLMUX

Function

This module supports up to 64 channels of temperature inputs. Low level inputs use the Honeywell PMIO LLMUX FTA. Each FTA supports 16 channels. An FTA can provide either TC or RTD inputs.

Notable Features

- TC and RTD operation
- Remote cold junction capability
- 1 Second PV scanning with OTD protection
- Configurable OTD protection (See below)
- Temperature points can be added in 16 point increments

Temperature Support

The Temperature Input device supports the existing solid state and relay PMIO LLMUX FTA. The LLMUX FTA supports RTD and Thermocouple (TC) inputs. , Support 1 sec scanning, High density I/O (like today's 32 channel), CJT compensation, types equivalent to LLMUX today, Medium cost. The remoting feature of today's LLMUX is not considered a requirement.

Sampling and Open Sensor Detect

The Temperature multiplexer supports RTD and Thermocouples with Open Sensor Detect before PV delivered if so configured. With the OTD configuration active, the PV is sampled and held while an OTD cycle is performed. If the OTD is negative, the PV is propagated up through the system. If the OTD is positive, the PV is set to NAN and the input channel soft failure is set. In this way, no inappropriate control action occurs for PV values that are invalid due to an open thermocouple.

Detailed Specs – Low Level Input Multiplexor

Parameter	Specification
Input / Output Model	**CC-PAIM01**
PMIO FTA Models (1)	**MU-TAMR04, TAMT04, TAMT14**
Input Type	Thermocouple and / or RTD
Input Channels	64 galvanically isolated in 16t point increments
A/D Converter Resolution	14 bits TC types J, K, E, T, B, S, R, RP: 10 µV per bit 100 Ω and 120 Ω RTDs: 64 mΩ per bit 10 Ω RTD: 8 mΩ per bit Linear mV sensors: 20 µV per bit
CMV, dc to 60 Hz	250 VAC Peak or ±250 VDC
Dielectric Strength	250 VAC channel to channel (operating) TBD field-to-system common (not operating)
Crosstalk, dc to 60 Hz	120 dB
Input Impedance	2 MΩ min. @ 100 mV
Maximum Normal Mode Continuous Input (No damage)	-1 V to 10 V
Input Scan Rate	Each FTA samples all inputs with OTD in one Second
Line Frequency Synchronization	Configurable to 50 or 60 Hz
Hardware (only) Accuracy	±40 µV, or ± 160 mΩ 23.5° ±2°C
Software (only) Accuracy(2)	±0.1°C typical, ±0.5°C maximum at 23.5° ±2°C
Surge withstand capability (common mode)	ANSI/IEEE C37.90.1-1989

(1) Note : FTAs are PMIO FTAs. These must be installed in FTA channels. These are similar to but not identical to Series C channels. The TPC will support this configuration.

(2) Software EU conversion error including software reference junction compensation, at reference temperature. The temperature conversion by software meets or exceeds the accuracy tolerances for fifth order polynomials as specified in the National Institute of Standards and Technology (NIST) Monograph 125 (IPTS-68).

Data Conversion Performance --Thermocouple (TC) and Voltage Input		
Parameter	**Specification**	
Thermocouple Device Range	Normal Signal Range	Extended Signal Range
ANSI J ANSI K ANSI E ANSI T ANSI B ANSI S ANSI R JAPAN Type R	-100 to 750° C 0 to 1100° C -150 to 500° C -200 to 300° C +600 to 1650° C +550 to 1500° C +550 to 1500° C +550 to 1500° C	-200 to 1200° C -200 to 1370° C -200 to 1000° C -230 to 400° C +100 to 1820° C 0 to 1700° C 0 to 1700° C 0 to 1700° C
Voltage Input Signal Range	0 to 100 mV	
CMRR, dc to 60 Hz (0-100 mV)	120 dB min. with 500Ω lead imbalance	
NMRR, at line frequency (50 or 60 Hz)	60 dB min.	
NMRR, at other than line frequency (1-15 mV)	NMRR = $-20 \times \log_{10}\left(\frac{\sin(\pi^x f^x t)}{(\pi^x f^x t)}\right) - 20 \times \log_{10}\left(\frac{1}{K^x f}\right)$ Where: π= 3.14159 f= Noise Frequency t= Integration Time (20 ms @ 50 Hz, 16.66ms @ 60 Hz) K= 0.20878 (a constant)	
Normal Mode Filter Response (TC & mV)	-3 dB point: Typical 5.1 Hz; min. 4.3 Hz; max. 6.4 Hz	
Hardware Reference Junction Accuracy	±1.0°C maximum at 23.5° ±2°C (in cabinet)	
Temperature Stability Voltage Input, current input, thermocouple input (except reference junction)	 20 ppm/°C RSS 30 ppm/°C maximum	
TC Max Length, 250 V Peak/dc Common Mode 16 Gauge TC Wire 18 Gauge TC Wire 20 Gauge TC Wire	 3,500 ft. 2,250 ft. 1,250 ft.	
TC max loop resistance	1000 Ω total loop resistance	
Open thermocouple detect	<=1000 Ω is good, >1200 Ω is bad (NAN) performed every conversion (if configured)	

(Continued)

Data Conversion Performance--Resistive Temperature Device (RTD)	
Parameter	**Specification**
RTD (3 Wire) Input Signal Range Pt: 100 Ω DIN (4376) Pt: 100 Ω JIS (C-1604) Ni: 120 Ω Ed #7 Cu: 10 Ω	 -200 to 850°C -200 to 650°C -45 to 315°C -20 to 250°C
CMRR, dc to 60 Hz (0-100 mV)	10Ω RTD: 120 dB min. 100Ω RTD: 110 dB min.
NMRR, at line frequency (50 or 60 Hz)	10Ω RTD: 60 dB min. (for 50/60 Hz noise of 0-15 mV) 100Ω RTD: 60 dB min. (for 50/60 Hz noise of 0-75 mV)
NMRR, at other than line frequency 10Ω RTD: (0-15 mV) 100Ω RTD: (0-75 mV)	NMRR = $-20 \times \log_{10}\left(\frac{\sin(\pi^x f^x t)}{(\pi^x f^x t)}\right) -20 \times \log_{10}\left(\frac{1}{K^x f}\right)$ Where: π= 3.14159 f= Noise Frequency t= Integration Time (20 ms @ 50 Hz, 16.66ms @ 60 Hz)
Hardware Reference Junction Accuracy	±1.0°C maximum at 23.5° ±2°C (in cabinet)
Temperature Stability RTD Input	 30 ppm/°C RSS 40 ppm/°C maximum
RTD Max Lead Resistance	15 Ω
CMRR = Common Mode Rejection Ratio. NMRR = Normal Mode Rejection Ratio.	