Honeywell CC-PUIO31 51454220-176

Series C Universal I/O Module-2

Honeywell CC-PUIO31 51454220-176 is the Series C Universal I/O Module-2 for mixed process signals in an Experion PKS control system. Its 32 channels can serve analog transmitters, analog output loops, switch contacts and digital loads. This is the UIO-2 model, so match the installed module, IOTA and configured functions when selecting a replacement.



Technical Specifications

Product Identity	
Manufacturer	Honeywell
Model	CC-PUIO31 51454220-176
Product type	Series C Universal I/O Module-2 (UIO-2)
Functional Configuration	
Channel capacity	32 configurable I/O channels; AI, AO, DI or DO
Analog input	0–20 mA or 4–20 mA; 2-, 3- or 4-wire current devices
Analog output	4–20 mA; 12-bit resolution
HART	HART 7 on analog I/O; HART modem per channel
Digital input SOE	1 ms resolution; 20 ms PV scan
Pulse input	Any four channels; 0–15 kHz; minimum pulse width 25 µs
Digital output	Solid-state sourcing; 0.5 A maximum per channel; 9 A maximum per module, subject to configuration and ambient temperature
Non-redundant IOTA	CC-TUIO31, nominal 9 in
Redundant IOTA	CC-TUIO41, nominal 12 in
Configuration environment	Experion Control Builder, Series C I/O library (UIO-2); introduced with R432
Performance & Power	
Analog input conversion / scan	16 bit; 10 ms input scan
Power arrangement	Module power and field connections via the matching IOTA; Series C IOTA power supplied from a 24 VDC carrier bus
Environment	
Module ambient temperature	–40 to +70 °C; apply the UIO-2 high-temperature-limit calculation

Selected original manufacturer pages follow on pages 3–12.

Compatibility & Selection Guide

System compatibility. Honeywell introduced CC-PUIO31 with Experion R432. Configure the UIO-2 module and its AI, AO, DI or DO channel blocks in the Series C I/O library of Experion Control Builder. The specified IOTAs are CC-TUIO31 for non-redundant use and CC-TUIO41 for redundant use. Confirm the installed Experion release, redundancy arrangement, channel settings and temperature-alarm calculation before selecting CC-PUIO31 51454220-176.

Wiring & Installation Reference

Field connections

Analog input. Use the documented 2-, 3- or 4-wire current-transmitter arrangement; check the transmitter power reference and allowable field-loop resistance.

Digital input. Fit the specified field resistor arrangement near the switch when open-wire detection is enabled.

Digital output. Check per-channel current, module total and thermal limits. Do not apply the module's maximum current rating to every channel simultaneously.

Mounting and configuration

Confirm the assembly. Identify CC-PUIO31 and the installed CC-TUIO31 or CC-TUIO41 IOTA. Confirm redundancy and the saved channel configuration.

Prepare the installation. Turn off all power at the installation location before the installation procedure. Mount and ground the correct IOTA/carrier assembly as described in the user guide.

Fit the module. Mate the module correctly with the IOTA connector and secure the specified screws. Use a #2 Phillips screwdriver for the long gray plastic screw; do not use a battery-powered screwdriver.

Check loading and temperature. Mount the module upright for natural-convection cooling and complete the applicable UIO thermal calculation before putting configured channels into service.

Installation precautions. UIO analog inputs measure current; do not connect a voltage, thermocouple, RTD or NAMUR signal directly as though it were a supported current loop. Channel settings, open-wire monitoring components and actual load must match. Follow all power-isolation, grounding and installation requirements in the manufacturer's complete guide. The published –40 to +70 °C module ambient range does not permit unrestricted output loading. Apply the current configuration and inlet-air temperature to the manufacturer's thermal calculation.

View terminal assignments (PDF) · PDF page 12 | View mounting and safety reference (PDF) · PDF page 8

Manufacturer sources: Experion Series-C I/O Specification / Experion Series-C I/O Specification - Series C platform and module/IOTA selection / Experion PKS Series C I/O User's Guide.

5.20. Universal Input Output – CC-PUIO31

Function

The Universal Input Output module interfaces with analog input, analog output, digital input, and digital output field devices.

Notable Features

- Each channel user configurable as:
  - Analog Input
  - Analog Output
  - Digital Input
    - DISOE - Sequence of Events (1ms resolution SOE, 20ms PV scan)
  - Digital Output
  - Pulse Input (any four channels)
- Open Wire Detection
- Electronic short circuit protection[1]
- Fast Scan (Priority I/O Module Scan)
- Safe-state (FAILOPT) behaviors configurable on a per channel basis for Digital / Analog Output
- HART 7 support (Analog I/O)
- HART Modem per Channel for Fast Performance
- Extended Temperature Range -40 to +70°C module ambient

Model Specifications

Parameter	Specification		
Universal Process IO Module	**CC-PUIO31**		
IOTA Model Numbers	**CC-TUIO31**	Non Redundant	9”
	CC-TUIO41	Redundant	12”
Note 1: Each signal can be shorted in the field with no damage to the IOM or IOTA. Other channels on the same IOM will not be affected. AI, AO and DI channels are further protected and certified to support energy limited / nonincendive field wiring connections to Zone 2 / Division 2 hazardous locations.			

Detail Specifications – Analog Input

Parameter	Specification
Input type	Current (2, 3, or 4 wire devices)
Input Channels	32 Maximum per module (with or without open wire detect)
A/D Converter Resolution	16 bit
Input Range	0-20 mA or 4-20 mA
Normal Mode Rejection Ratio	18 dB at 50 Hz, 20 dB at 60 Hz
Input Filter Response	Single pole, -3dB @ 6 Hz
Crosstalk, dc to 60 Hz (channel-to-channel)	60 dB
Input Impedance	250 Ω
Input Voltage Range (any input referenced to common, no damage)	+33 VDC to -1 VDC (1)
Input Scan Rate	10 ms
Hardware accuracy	0.1% of full-scale (23.5 ± 2°C) 0.175% of full-scale (0 to +70°C) 0.25% of full-scale (-40 to +70°C)
Short Circuit Current Limit	25 mA
Note 1: Return terminal is connected directly to Common (Ground)	

Detail Specifications – Pulse Input

Parameter	Specification
Channels	Any 4 channels
Frequency	0-15 kHz
Minimum Pulse Width	25 µs
Duty Cycle	Any Duty Cycle that meets the Minimum Pulse Width specification

Detail Specifications – Analog Output with HART[1]

Parameter	Specification
Output Type	4-20 mA
Output Channels	32 Maximum per module [2]
Output Temperature Drift	0.007% of Full Scale/°C
Output Readback Diagnostic	± 4% of Full Scale
Output Current Linearity	± 0.05% of Full Scale (nominal)
Resolution	12 bit
Calibrated Accuracy	< 0.35% of Full Scale (25ºC) including linearity
Directly Settable Output Current Range	0 mA, 2.9 mA to 21.1 mA
Maximum Resistive Load (24 V supply)	825 ohms @ 20 mA
Maximum Output Compliant Voltage (24 V supply)	16.5 VDC @ 20 mA
Open Circuit Voltage	Supply Voltage (26 VDC maximum)
Response Time, DAC input code to output (within 3% of final value)	80 ms in HART mode 0.25 ms in non-HART mode
Gap (0 mA) of Output to Field on Switchover	0 ms (both partners continuously active)

Note 1: If an AO channel's configuration is changed from non-HART to HART, and the analog OP remains energized, there will be a disturbance of the output of no more than 65ms while the channel is reloaded. Changing an AO channel from HART to non-HART will not produce any OP disturbance.

Note 2: Please refer to the User's Guide for calculation method to determine channel usage versus operating temperature.

Detail Specifications – Digital Input with OWD[1]

Parameter	Specification
Open Circuit Voltage	Supply Voltage (26 VDC maximum)
Closed contact current	7 mA (maximum)
Closed contact detection	3.1 mA < I < 7 mA
Open contact detection	0.9 mA < I < 2.0 mA
Open wire detect	I < 0.9 mA
Digital Input Resolution for Sequence of Events (SOE)	1ms (any /all Channels)
Note 1 Please refer to the User's Guide for appropriate field resistor configuration for OWD function.	

Detail Specifications – Digital Input without OWD

Parameter	Specification
Open Circuit Voltage	Supply Voltage (26 VDC maximum)
Closed contact current	7 mA (maximum)
Closed contact detection	I > 3.2 mA
Open contact detection	I < 2.0 mA
Digital Input Resolution for Sequence of Events (SOE)	1ms (any /all Channels)

Detail Specifications – Digital Output

Parameter	Specification
Output Channels	32 Maximum per module [2] (with or without open wire detect)
Output Type	Solid state source, short circuit protected [3]
Load Current Off Load Current On	< 0.1 mA 1 mA Minimum to 0.5 A Maximum per channel 9 A Maximum per module [1]
On-State Voltage	24 V (typ), load current @ 0.5 A
Off-State Leak Current	0 V
Off-State Leak Current	< 0.1 mA
Gap (0 current) of Output to Field on Switchover	0 ms

Note 1: Dependent on actual channel configuration for the module and the environment. Please refer to the User's Guide for calculation method.

Note 2: Please refer to the User's Guide for calculation method to determine channel usage versus operating temperature.

Note 3: Short circuit will be limited to less than 1.4 Amps within 2 microseconds, and to 750 mA within 10 microseconds. If the short period persists more than 10 mili seconds, the DO channel will be shutoff

4.3 Mounting the I/O module on the IOTA

4.3.1 Prerequisites

It is recommended to attach the IOTA board to the Backplane prior to mounting the module to the IOTA. Ensure the following:

- IOTA is mounted on the Backplane.
- Power supply is installed.
- Control firewall is installed.
- All wiring and pre-fabricated cables are available and labeled as applicable.
- All power is turned off at the installation location.
- You have the mounting hardware supplied with the components.

4.3.2 Mounting the module

1. Insert the module onto the IOTA board making sure that the circuit board mates properly with the IOTA board connector.
2. Secure the module to the:
   - IOTA board - with two screws located on each side of the plastic cover.
   - Backplane - with the long gray plastic screw located on the module's face.

> **CAUTION**
> Use only a #2 Phillips screw-driver to carefully loosen or tighten the long gray plastic screw. Do not use either a #1 Phillips screw-driver or a battery-powered screw-driver to remove or install the plastic screw as this can damage the screw head.

4.4 Grounding and power considerations - IOTA boards

4.4.1 Attaching the IOTA board

The Series C cabinet allows mounted carriers that support the attachment of the IOTA boards. By making these connections, power, and chassis, grounding is provided to the IOTA board.

- Testing for power

4.4.2 Testing for power

> **CAUTION**

Extreme care must be taken when testing for power at the Series C bus bars. Improper testing can result in an electrical short circuit, which will impact all modules attached to the channel carrier assembly.

Never use a test probe at an unattached IOTA's 24V screw hole. The probe can potentially touch the back channel assembly causing a short circuit.

The following locations are recommended for testing power:

Preferred location if IOTAs are attached

- Center of the screw that attaches the IOTA to the 24V bus bar.

Preferred location if IOTAs are NOT attached.

- Center of the screw of top connection terminal for power cable.

Testing for power at IOTA screw

1. Insert the test probe at the center of the screw that attaches the IOTA to the 24V power connection.
2. This concludes this procedure.

Testing for power at 24V bus bar top terminal

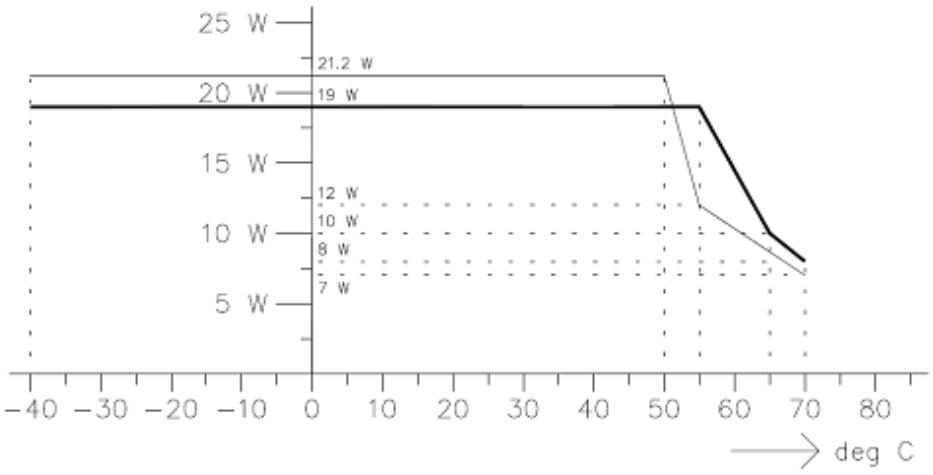
1. Carefully pull the red cap from the top of the terminal. It remains attached to the power cable.
   - Insert the test probe at the center of the screw to the 24V power terminal.
2. Carefully pull the black cap from the top of the terminal. It remains attached to the ground cable.

   Insert the test probe at the center of the screw to the COM ground terminal.
3. Replace the both caps.

* Analog input current above 24mA must be avoided. Field devices for the analog input must be configured to drive current below 24mA. For example, 3.5mA, for sensor fault conditions to minimize the UIO internal power dissipation. The thin-line derating curve needs to be taken when you are using current above 24mA.

3.4.7 Temperature Derating curves for UIO

The following graph displays the maximum outside module temperature versus the internal power dissipation.



Thick line: applicable for most applications having AO<=20mA and AI<=24mA

Thin line: applicable if one or more channels have AO>20mA or AI>24mA

3.4.8 Maximum Temperature Alarm for UIO-2

The alarm threshold safe operating temperature is determined based on the I/O channel configuration of the module and the anticipated module inlet air temperature.

ATTENTION

- Airflow through the module is assumed to be natural convection.
- Ensure that the UIO modules are installed in the correct position. A UIO module must be mounted in the upright position.

To determine the maximum acceptable outside module temperature for a typical configuration, perform the following steps:

1. Perform the **High Temperature Limit Calculation for UIO-2**.
   a. Determine and record the actual configuration data and the **Estimated Ambient** inlet air temperature.
   b. Calculate the totals per dissipation contributor. For each channel type, multiply the total number of configured channels by the corresponding **Maximum Temperature Rise per**

channel value.

c. Add the totals of the previous step to the **Estimated Ambient** temperature to determine the **High Temperature Limit Setting**. This limit value should not exceed 120 °C.

2. Enter the limit value into UIO-2 module configuration screen in Experion Control Builder.

3.4.9 High Temperature Limit Calculation for UIO-2

Table 3.6 Dissipation Calculation

Estimated Ambient [°C]		50		
Dissipation Contributor		Temperature Rise per channel [°C]	Number of channels (Total not to exceed 32)	Channel Contribution to Temperature Rise [°C]
DI	Closed contact	0.91	0	0.00
DO	<500 mA	1.06	0	0.00
AI	<20 mA	1.42	0	0.00
AO	<22 mA, 220 ohms	1.56	0	0.00
Total Number of Configured Channels			0	
High Temperature Limit Setting [°C]				50

3.5 I/O Link performance specifications

The concept of a Link Unit (LU) was introduced with PM I/O where a LU was defined as being roughly equivalent to one parameter read (or write) per second.

With the introduction of Series C I/O, the transmission rate of data on an IOLINK configured with Series C I/O is now double that of PM I/O.

> **ATTENTION**
>
> The Specification and Technical information is subject to change without notice and is superseded by information in applicable Experion product Specification and Technical data documents. Hence, for each Experion release, you are recommended to refer the applicable Specification and Technical data documents.

Table 3.7 Transmission rate of data on an I/O Link

I/O type	Link rate per second	Link Units per second
PM I/O	1 parameter read or write	1000
Series C I/O	1 parameter read or write	2000

Table 5.49 Terminal block 1

Terminal block 1		
Channel	Return screw	Power screw
Channel 1	-1	+1
Channel 2	-2	+2
Channel 3	-3	+3
Channel 4	-4	+4
Channel 5	-5	+5
Channel 6	-6	+6
Channel 7	-7	+7
Channel 8	-8	+8
Channel 9	-9	+9
Channel 10	-10	+10
Channel 11	-11	+11
Channel 12	-12	+12
Channel 13	-13	+13
Channel 14	-14	+14
Channel 15	-15	+15
Channel 16	-16	+16

Table 5.50 Redundant - Terminal Block 2

Terminal block 2		
Channel	Return screw	Power screw
Channel 17	-17	+17
Channel 18	-18	+18
Channel 19	-19	+19
Channel 20	-20	+20
Channel 21	-21	+21
Channel 22	-22	+22
Channel 23	-23	+23
Channel 24	-24	+24
Channel 25	-25	+25
Channel 26	-26	+26
Channel 27	-27	+27
Channel 28	-28	+28
Channel 29	-29	+29
Channel 30	-30	+30
Channel 31	-31	+31
Channel 32	-32	+32

Table 5.51 Redundant - Terminal Block 3

Signal	Screw Number
+24V	1
+24V	2
+24V	3
+24V	4