CHAPTER

# 5

# SERIES C IOTA PINOUTS


- Analog Input IOTA Models CC-TAIX01, CC-TAIX11
- Analog Input non-HART/HARTIOTA Models Cx-TAIX51, Cx-TAIX61
- Non-HART Analog Input IOTA (Models CC-TAIN01, CC-TAIN11)
- Differential Analog input IOTA (Models CC-TAID01 and CC-TAID11)
- Analog Output IOTA Models CC-TAOX01, CC-TAOX11, CC-TAON01 and CC-TAON11
- Analog Output HART IOTA Models Cx-TAOX51, Cx-TAOX61
- Low Level Analog Input Mux (LLMUX) IOTA Models CC-TAIM01
- Digital Input High Voltage IOTA Models CC-TDI110, CC-TDI120, CC-TDI220, CC-TDI230
- Digital Input High Voltage PROX IOTA Model Cx-TDI151
- Digital Input 24V IOTA Models CC-TDIL01, CC-TDIL11
- Digital Input 24V IOTA Models Cx - TDIL51, Cx - TDIL61
- Digital Output 24V IOTA Models CC-TDOB01, CC-TDOB11
- Digital Output 24V IOTA Models Cx-TDOD51, Cx-TDOD61
- Digital Output Relay Module IOTA Models CC-TDOR01, CC-TDOR11
- Digital Output Relay Extender board Models CC-SDOR01
- Speed Protection Module IOTA Model CC-TSP411
- Servo Valve Positioner Module IOTA Models CC-TSV211
- Universal Input/Output IOTA Models CC-TUIO01 and CC-TUIO11
- Universal Input/Output Phase 2 IOTA Models CC-TUIO31 and CC-TUIO41
- Low Level Analog Input (LLAI) Module IOTA model CC-TAIL51
- Pulse Input Module IOTA Model CC-TPIX11
- Upgrading Firmware in Series C I/O components


## 5.1 Analog Input IOTA Models CC-TAIX01, CC-TAIX11

The Series C Analog Input IOTA board is represented by the following information and graphic.

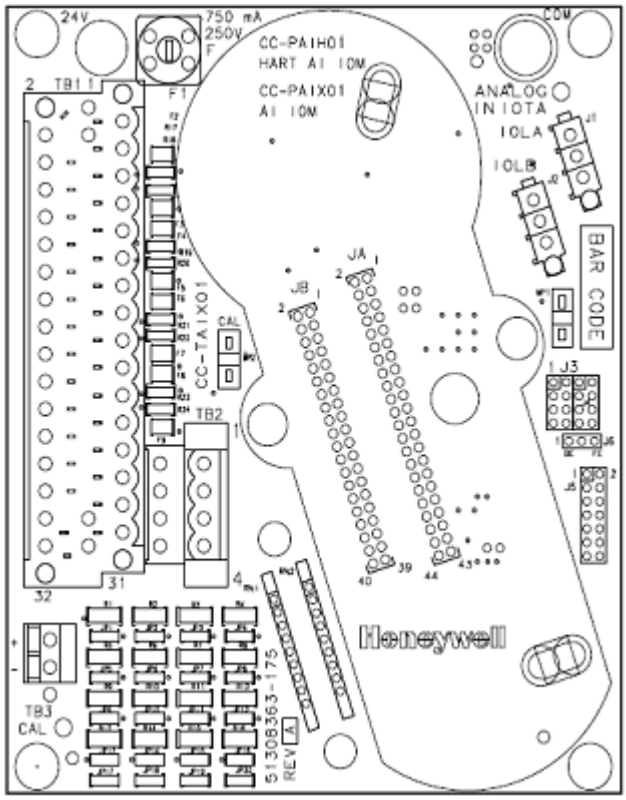
To access the parts information for the:

- module
- IOTA
- terminal plug-in assembly, and
- fuses

associated with this board and module, refer to Analog Input in the Recommended Spare Parts section.

Series C Analog Input 6 inch, non-redundant IOTA is displayed.

Figure 5.1 Series C Analog Input 6 inch, non-redundant IOTA




**NOTE**

All I/O field terminations accept up to 14 gauge stranded wire.

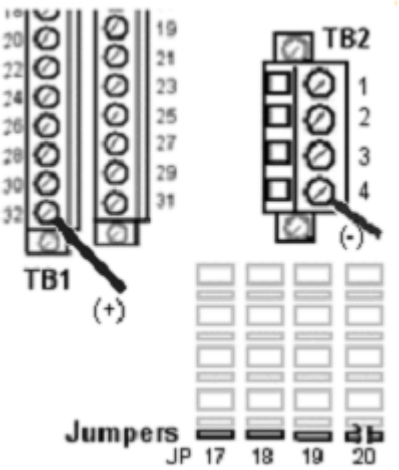
To properly wire, your module to the Series C Analog Input IOTA board with terminal block 1 (TB1) and terminal block 2 (TB2), use the following tables.

Table 5.1 AI 6 inch, non-redundant - terminal block 1

| Terminal block 1<br>Channel | Return screw | Power screw |
|---|---|---|
| Channel 1 | 2 | 1 |
| Channel 2 | 4 | 3 |
| Channel 3 | 6 | 5 |
| Channel 4 | 8 | 7 |
| Channel 5 | 10 | 9 |
| Channel 6 | 12 | 11 |
| Channel 7 | 14 | 13 |
| Channel 8 | 16 | 15 |
| Channel 9 | 18 | 17 |
| Channel 10 | 20 | 19 |
| Channel 11 | 22 | 21 |

| Terminal block 1 | | |
|---|---|---|
| Channel | Return screw | Power screw |
| Channel 12 | 24 | 23 |
| Channel 13 | 26 | 25 |
| Channel 14 | 28 | 27 |
| Channel 15 | 30 | 29 |
| Channel 16 | 32 | 31 |

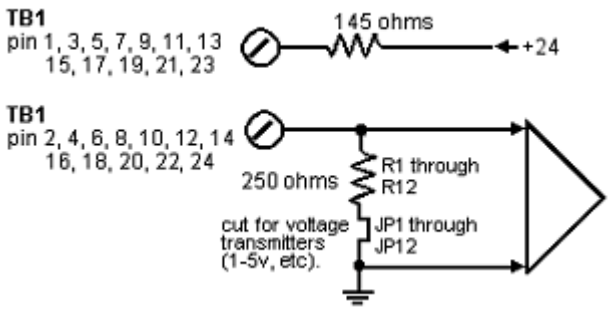
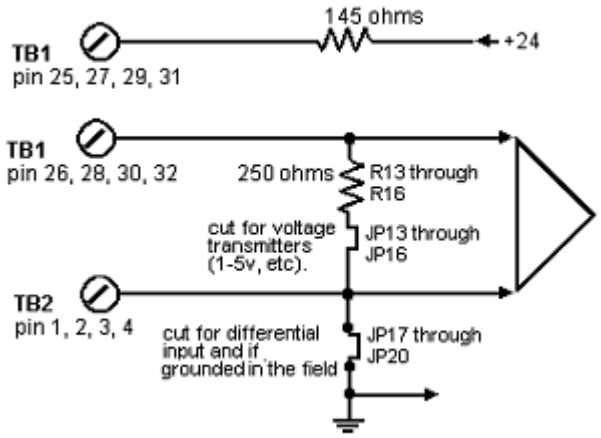
Table 5.2 AI 6 inch, non-redundant - terminal block 2

| Terminal block 2 - Low side of the differential inputs | | | |
|---|---|---|---|
| If this TB2 screw is used | Then this channel is used | And this jumper is clipped | |
| 1 | 13 | JP17 | In the example below, cutting J20 would configure channel 16 for differential operation and pin 4 would be the low side (-) of the input signal.   Refer to Custom wiring - Analog Input module for additional power connection possibilities. |
| 2 | 14 | JP18 | |
| 3 | 15 | JP19 | |
| 4 | 16 | JP20 | |

Jumpers are utilized to support the following conditions:

Table 5.3 Jumpers to support Analog Input connections

| Channels | Signal screw |
|---|---|
| For channels 1 through 12 | Each channel (1 through 12):<br>• has a corresponding jumper. Therefore, channel 1's jumper would be JP1, and so forth.<br>• the jumper must be cut if connected to voltage transmitters (1-5v. etc.) |

| Channels | Signal screw |
|---|---|
| | **Channels 1 through 12**<br><br> |
| For channels<br><br>13 through 16 | Each channel 13 through 16:<br>• has a corresponding jumper. Therefore, channel 13's jumper would be JP13, and so forth.<br>• the jumper must be cut if connected to voltage transmitters (1-5v. etc.)<br><br>Jumpers J17 through J20 are used with Terminal Block 2 (TB2) and are used if the device is grounded in the field.<br><br>**Channels 13 through 16**<br><br> |

- Field wiring and module protection - Analog Input module
- Two-wire transmitter wiring - Analog Input module
- Non two-wire transmitter wiring - Analog Input module
- Custom wiring - Analog Input module
- Analog Input wiring reference table
- Allowable field wiring resistance - Analog Input module
- IOTA board and connections - Analog Input module

## 5.1.1 Field wiring and module protection - Analog Input module

Individual field wiring is protected by an internal protection circuit permitting:

- Short circuit protection of input for field short circuits. Protection suitable for Division 2 non-incendive / Zone 2 non-arcing.
- Each signal can be shorted in the field with no damage to module or board. Other channels on the same IOM will not be affected

## 5.1.2 Two-wire transmitter wiring - Analog Input module

The AI IOM/IOTA is optimized for use with classic two-wire transmitters. All 16 channels can accept inputs from two-wire transmitters without any special wiring or jumper options.

The standard usage is to:

- reserve the first 12 channels of the AI IOM/IOTA for classic two-wire transmitters, and
- use the last 4 channels of the IOM/IOTA to interface any of the supported input styles (including two-wire transmitters).

Depending on the input style applied to channels 13 through 16, you may need to cut jumpers on the IOTA and apply wiring to the TB2 terminal block on the IOTA. This is discussed in detail in the following sections.

## 5.1.3 Non two-wire transmitter wiring - Analog Input module

The IOTA is pre-engineered (without custom wiring) to accept sources that are not two-wire transmitters, but you must use channels 13 through 16.

When sources other than two-wire transmitters are to be interfaced and you have more than 4 per IOTAs, then:

- the first four must be interfaced to channels 13 through 16, and
- the remainder may be able to interface to channels 1 through 12 (depending on input style) but you must perform some degree of custom wiring.

**NOTE**

There are some input styles that simply cannot be applied to channels 1 through 12 - if that applies to you then you will likely need to purchase an additional IOM/IOTA.

**CAUTION**

The jumpers on the IOTA are non-repairable; once cut, they stay cut. Careful planning is a must.

## 5.1.4 Custom wiring - Analog Input module

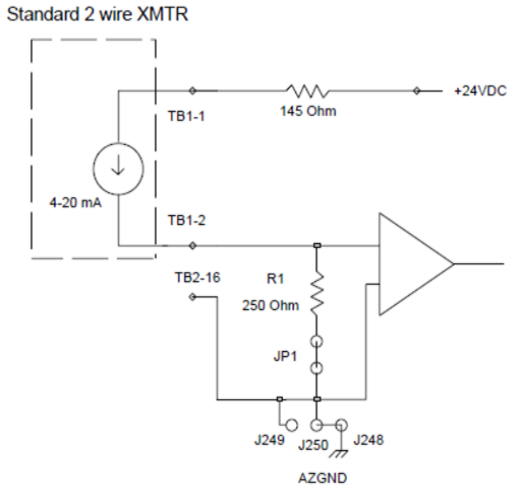
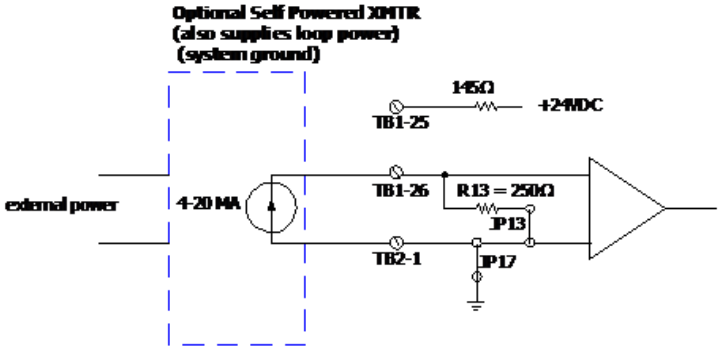
Custom wiring means:

- using additional wires to TB2 (beyond their intended purpose for channels 13 through 16)
- and/or using wires to another termination area in the cabinet engineered on a project-basis.

Some of the styles (other than two-wire transmitter):

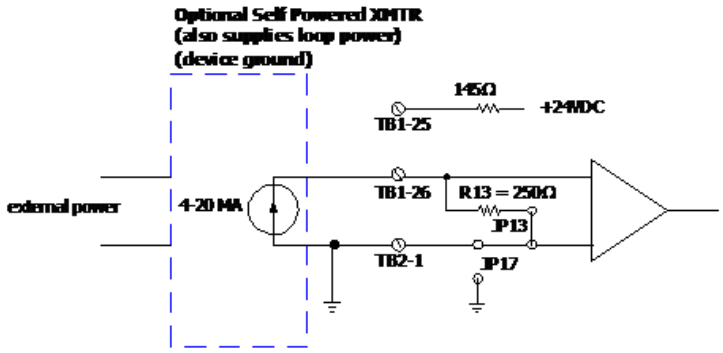
- can be applied to channels 1 through 12 with the use of custom wiring.
- Other cannot be applied to channels 1 through 12 at all.

Table 5.4 Custom wiring to support Analog Input

| Custom wiring scenarios |
| --- |
| *Standard and self-powered two-wire transmitter wiring*<br><br>It is recommended to use channels 13 through 16, since these channels have a dedicated Series C ground screw (although it is possible to use channels 1 through 12).<br><br>Following figure illustrates an example jumper configuration for channel 1 of non-redundant 6 inch IOTA.<br><br><br> |
| *Self-powered transmitter with Experion PKS system ground*<br><br>It is recommended to use channels 13 through 16, since these channels have a dedicated Series C ground screw (although it is possible to use channels 1 through 12).<br><br>For the following example:<br><br>• Channel 13 is used<br>• No jumpers need to be cut.<br>• The wire-pair is terminated to TB1-26 and TB2-1<br>• TB1-25 is not used.<br><br><br> |
| *Self-powered transmitter with device grounded*<br><br>This case can only be applied to channels 13 through 16 and the corresponding jumper must be cut.<br><br>For the following example: |

## Custom wiring scenarios

- Cutting jumper JP-17 permits the transmitter's ground to be utilized
    - Series C ground is then not used. Device ground must remain within the specified common-mode limits of the AI IOM.
    - JP17 through JP20 are for channels 13 through 16, respectively.
- The wire-pair is terminated to TB1-26 and TB2-1.
- TB1-25 is not used.

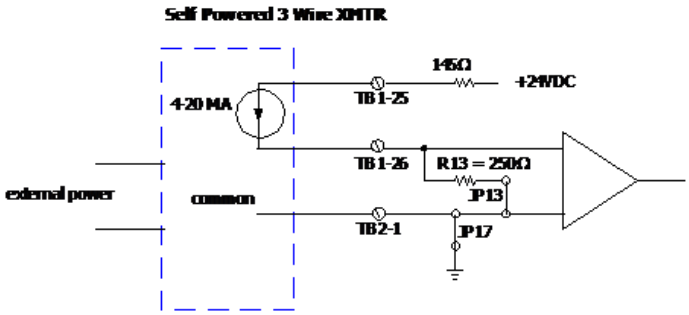



*Self-powered 3-wire transmitter (system ground)*

It is recommended to use channels 13 through 16, since these channels have 3 screws per channel (although it is possible to use channels 1 through 12).

For the following example:

- Channel 13 is used
- No jumpers need to be cut
- The three wires are terminated to TB1-25, TB1-26 and TB2-1




*Voltage input (system ground)*

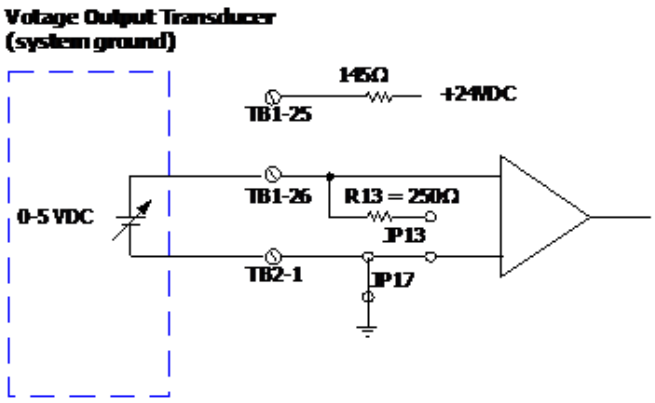
It is recommended to use channels 13 through 16, since these channels have a dedicated Series C ground screw (although it is possible to use channels 1 through 12).

For the following example:

- Channel 13 is used.
- Jumper JP13 (for the 250 ohm spool) needs to be cut.
- The wire-pair is terminated to TB1-26 and TB2-1.

**Custom wiring scenarios**

- TB1-25 is not used.




*Slidewire*

- Series C does not support Slidewire.

*Range spool damage and wire shorting*

Jumpers JP1 through JP16 are also used to overcome a damaged range spool (250 ohm dropping resistor).

A range spool can be damaged by being directly connected across a 24V for an extended period, such as, taking an even numbered terminal from TB1 to 24V. It can be removed from the circuit by clipping the corresponding jumper. You can continue to use the channel by providing a discrete (axial lead) 250 ohm resistor.

Example: using channel 5 and overcoming a damaged spool

1. One lead of the resistor connects to the even numbered screw on TB1 associated with that channel.

   (i.e. screw N = 2 times channel M, so screw 10 is for channel 5).

2. The other lead of the resistor connects to Series C ground, which can probably be found on any of the TB2 screw positions (assuming the corresponding jumper JP17-20 is still installed).

   If TB2 is already filled with wiring, 'doubling up' is permitted as long as the total wire dimension is less than the 14 AWG equivalent dimension.

3. Transmitter power is supplied in a non-incendive fashion through the odd-numbered terminals on TB1. This is done through a 145 ohm resistor inline with a Positive Temperature Coefficient (PTC) device that acts like a fuse (but never needs replacement).

   Thus, these field terminals can be permanently shorted to ground without damage. This is an improvement over Process Manager due to the inclusion of the PTC device.

## 5.1.5 Analog Input wiring reference table

The following table summarizes the possible Analog Input wiring connections.

Table 5.5 Summary - Analog Input wiring connections

| *Input style* | *Connection characteristics* |
|---|---|
| Standard 2-wire transmitter | • Can use any of the 16 channels.<br>• No custom wiring required.<br>• No jumper cuts required. |
| Standard self-powered transmitter | • Can use any of the 16 channels.<br>• No custom wiring required.<br>• No jumper cuts required. |
| Self-powered transmitter with loop power (system ground) | • Can use any of the 16 channels.<br>• Custom wiring is required for channels 1-12: you must find a screw terminal at Series C ground for one leg of the transmitter.<br>• No jumper cuts required |
| Self-powered transmitter with loop power (device ground) | • Cannot use channels 1-12.<br>• Only use channels 13-16. |
| Self-powered 3-wire transmitter<br>(system ground) | • Can use any of the 16 channels.<br>• Custom wiring is required for channels 1-12: you must find a screw terminal at Series C ground for one leg of the transmitter.<br>• No jumper cuts required |
| Voltage Input (system ground) | • Can use any of the 16 channels.<br>• Custom wiring is required for channels 1-12: you must find a screw terminal at Series C ground for one leg of the transducer.<br>• You must cut the jumper associated with the range spool. |
| Voltage Input (device ground) | • Cannot use channels 1-12.<br>• Only use channels 13-16. |

**NOTE**

If multiple instruments need a ground reference the four positions of TB2 can serve as those ground points (assuming the JP17-JP20) jumpers are intact. If more than four grounding screws are needed then a custom wire from TB2 to a separate terminal block can allow for more grounding screw positions.

## 5.1.6 Allowable field wiring resistance - Analog Input module

The maximum allowable field wiring resistance between the transmitter and the IOTA connection terminal is dependent upon the voltage requirement of the transmitter. The formula for calculating the max wiring resistance for the Series C Analog Input is given by the following equation.

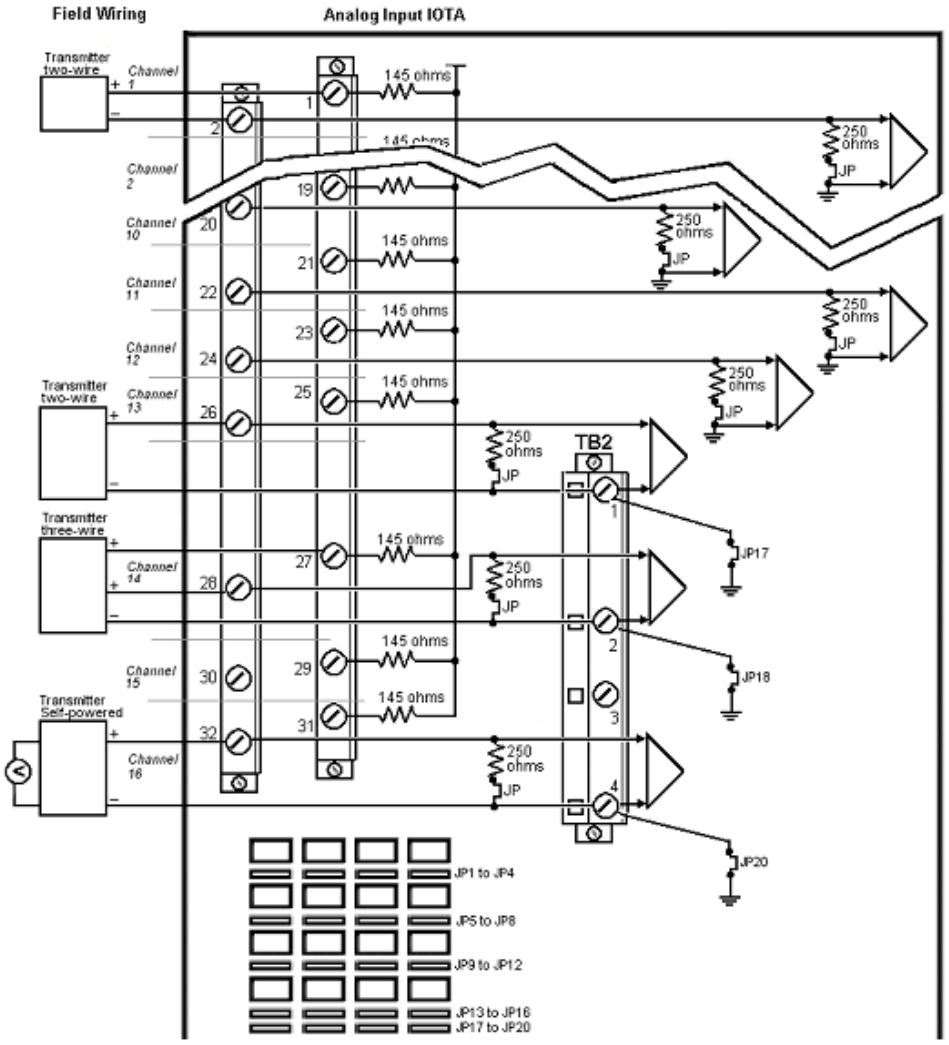
Rmax = [(13.0 - Vtx) / (0.022)]

where: Vtx = Voltage required at the transmitter terminal

## 5.1.7 IOTA board and connections - Analog Input module

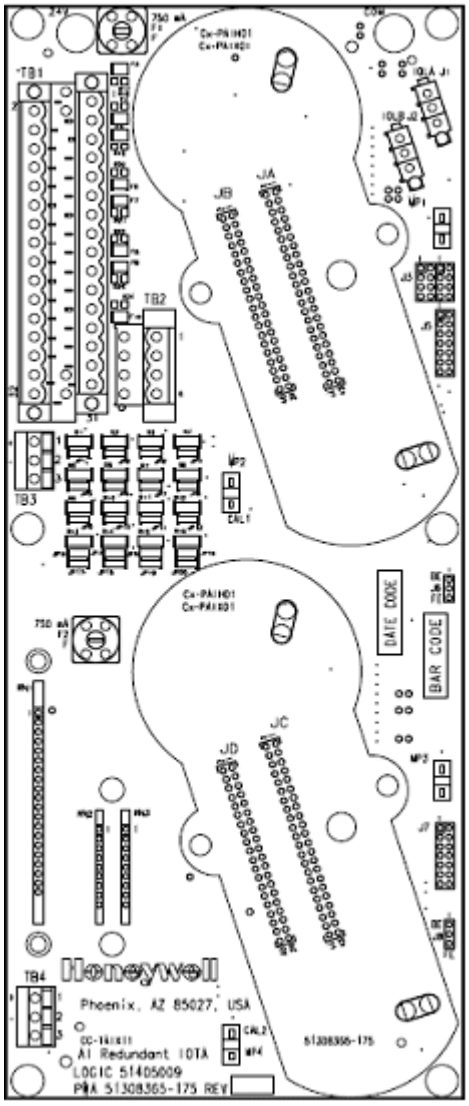
Series C Analog Input 6 inch, non-redundant IOTA and field wiring connection is displayed below:

Figure 5.2 Series C Analog Input 6 inch, non-redundant IOTA and field wiring connections




Series C Analog Input 12 inch, redundant IOTA is displayed:

Figure 5.3 Series C Analog Input 12 inch, redundant IOTA




## 5.2 Analog Input non-HART/HARTIOTA Models Cx-TAIX51, Cx-TAIX61

This series C Analog Input IOTA board is represented by the following information and graphic.

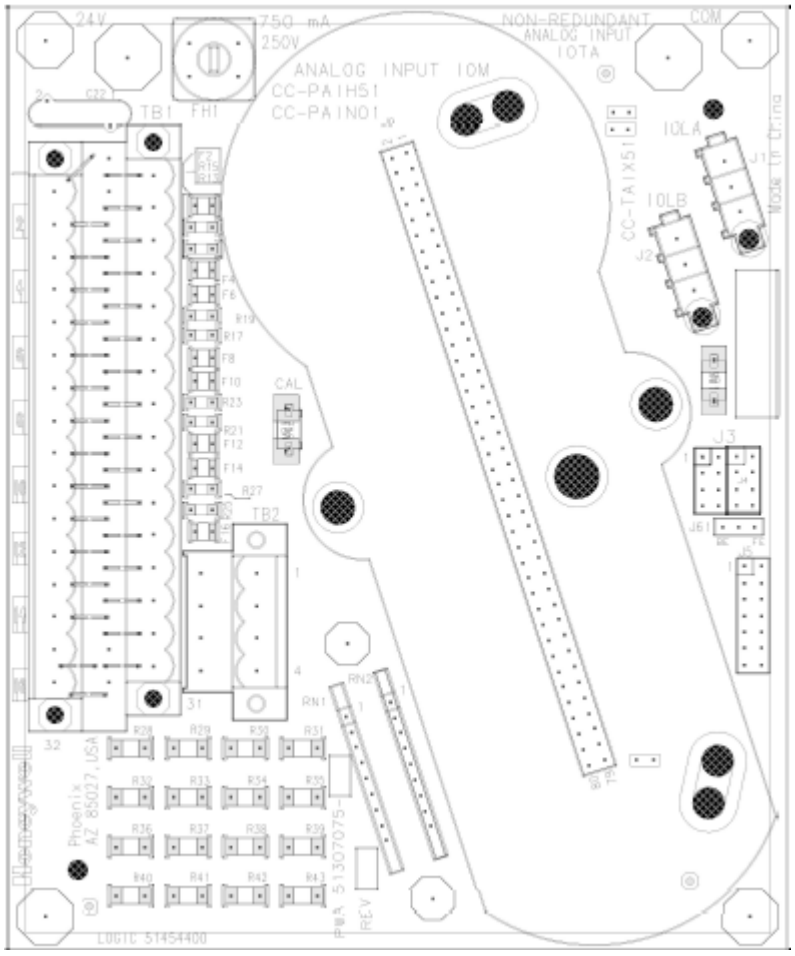
To access the parts information for the:

- module
- IOTA
- terminal plug-in assembly, and
- fuses

associated with this board and module, refer to Analog Input in the Recommended Spare Parts section.

Series C HART/non-HART Analog Input 6 inch, non-redundant IOTA is displayed in the following figure.

Figure 5.4 Series C HART/non-HART Analog Input 6 inch, non-redundant IOTA




**NOTE**

All I/O field terminations accept up to 14 gauge stranded wire.

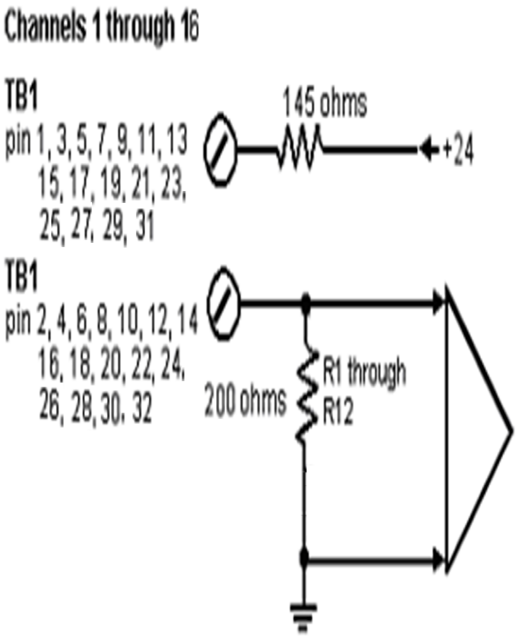
To properly wire your module to the HART/non-HART Analog Input IOTA with terminal block 1 (TB1) and terminal block 2 (TB2), use the following table.

Table 5.6 AI 6 inch HART AI, non-redundant - terminal block 1

| Terminal Block 1 (TB1) | | |
|---|---|---|
| Channel | Return Screw | Power Screw(24V) |
| Channel 1 | 2 | 1 |
| Channel 2 | 4 | 3 |
| Channel 3 | 6 | 5 |
| Channel 4 | 8 | 7 |
| Channel 5 | 10 | 9 |
| Channel 6 | 12 | 11 |

| Terminal Block 1 (TB1) | | |
|---|---|---|
| Channel | Return Screw | Power Screw(24V) |
| Channel 7 | 14 | 13 |
| Channel 8 | 16 | 15 |
| Channel 9 | 18 | 17 |
| Channel 10 | 20 | 19 |
| Channel 11 | 22 | 21 |
| Channel 12 | 24 | 23 |
| Channel 13 | 26 | 25 |
| Channel 14 | 28 | 27 |
| Channel 15 | 30 | 29 |
| Channel 16 | 32 | 31 |

Table 5.7 AI 6 inch, HART/non-HART AI, non-redundant terminal block 2

| Channels | Signal screw |
|---|---|
| For channels<br>1 through 16 | Channels 1 through 16<br> |

- Field wiring and module protection - Analog Input HART module
- Two-wire transmitter wiring - Analog Input HART module
- Standard and self-powered two-wire transmitter wiring - Analog Input HART module
- Self-powered 3-wire transmitter (system ground) - Analog Input HART module
- Analog Input HART module wiring reference table
- Allowable field wiring resistance - Analog Input HART module
- IOTA board and connections - Analog Input HART module