CII: Current Input, Isolated

Technical

Safety

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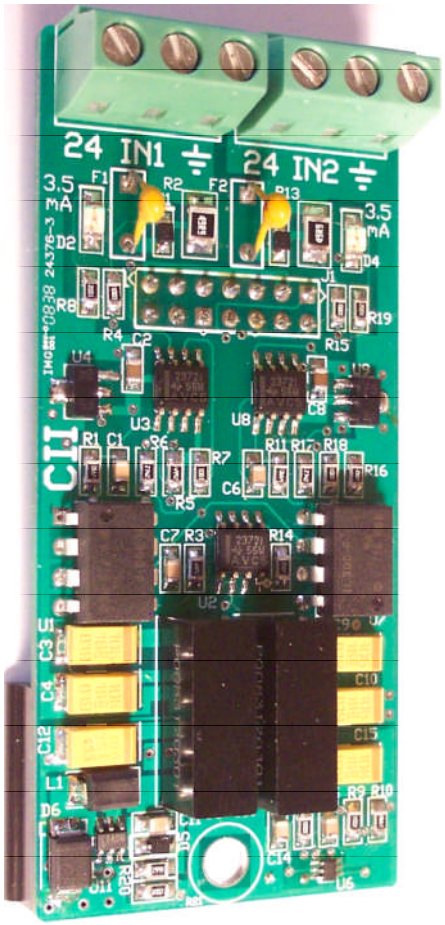
Safety
Electrical
30 VDC maximum on field wiring terminals.
24 VDC maximum on internal card surfaces.
Thermal
Driver card surfaces may exceed 70C, 160F
When installed in high ambient temperature
Controllers with both loops powered by the
Card and @ 20mA.

CII Driver Card



WARNINGS
Do not install more than one CII card in an Aegis Controller if powering sensors.

Do not install more than two CII cards in a MultiFlex series Controller if powering sensors.

Do not install CII cards in MultiFlex M10 series controllers Sensor Slots EF & IJ.T
These slots have clearance problems with the CCI heatsink.

Do not install CII cards in MultiFlex M5 series controllers Sensor Slot G.
This slot has a clearance problem with the CCI heatsink & only measures one current loop.

NOTE:
Using the CII card does not require controller firmware upgrade.

1. Application

Most 4-20mA current measurements can use the non-isolated **CI** (Current Input) driver card. The **CI** card connects the current loop '-' or loop return to electrical ground.

Use the **CII** when you need to DC isolate the 4-20mA current loop and the current loop power supply from the controller and electrical ground.
Wiring, connection detail for each of the three typical applications is depicted in Section 2.3.

Applications	Detail
Loop powered oxidant sensors	Prominent's loop powered oxidant sensors require both a 24VDC supply and DC isolation form electrical ground. The **CII** card can power and measure two of these loop powered sensors.
Splitting or sharing a 4-20mA current loop	It's common that you wish to use the value represented by an existing 4-20mA loop for chemical feed control. If the current loop is already in use by another monitoring or measuring device, you'll need to split the current loop to share it. The **CII** card allows you to split up to two current loops without causing a ground loop (grounding the loop in more than one location) which fails the loop for both users. Typical shared loops are make-up rate and steam demand, both of which are typically also used by the site's distributed control system (DCS).
Isolating powered 4-20mA current loops.	This is the least common applcation since most sensors and measuring equipment DC isolate the current loop output used to represent the measured parameter. In these applications, the current loop is powered by the sensor or measuring equipment and DC isolated at the Aquatrac controller input by the **CII** card.

2. Installation

2.1 Services

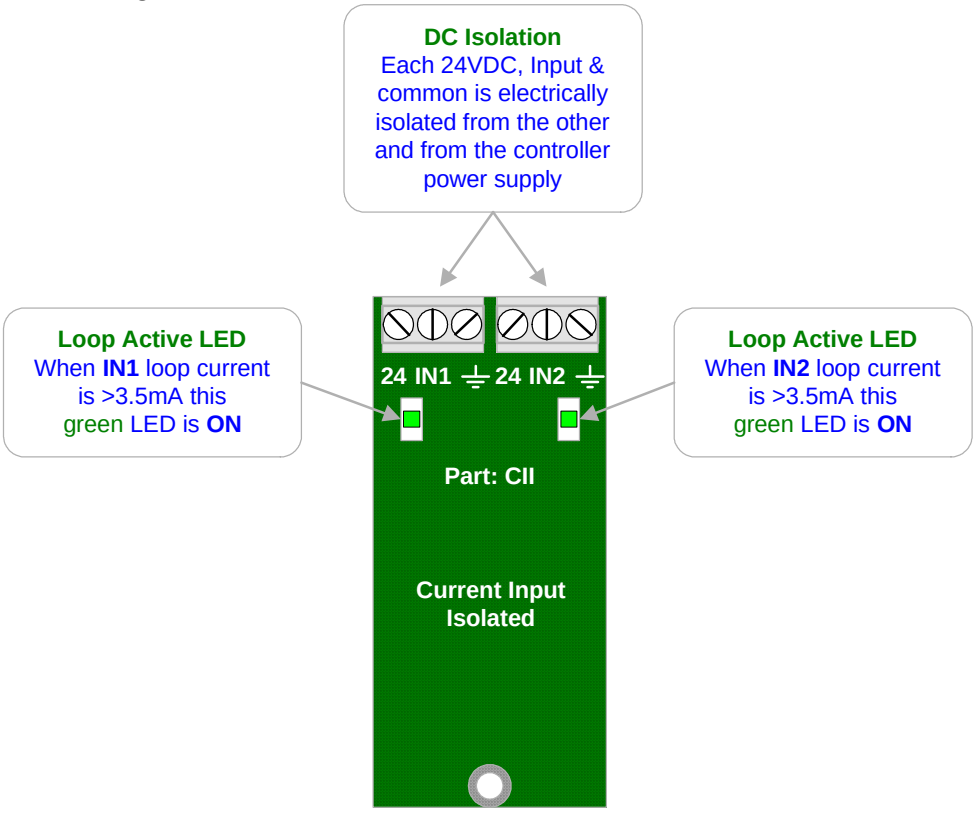
The **CII** driver DC isolates and measures two 4-20mA current loops.
Each current loop may be powered by a DC isolated 24VDC supply included on the **CII** card.
The **CII** driver terminates each current loop with 50 ohms.
Each 4-20mA input is polarity and thermally protected.

2.2 Driver Card Installation

1. Enable both of the analog inputs at the driver socket location.
2. Turn OFF the controller AC power
3. **MultiFlex**: **CII** drivers may be installed in 5 of the 7 M10 series controller slots and 3 of the 4 of the M5 series controller slots. Do not install the **CII** card in M10 slots EF & IJ. Do not install the **CII** card in M5 slot G.
4. **Aegis:** A **CII** driver may be installed in either of the controller's card slots.
5. ON the controller after installing the **CII** Driver and the controller will auto-configure, displaying both inputs as millivolt levels, 200mV=4mA to 1000mV=20mA.

2.3 Driver Card Wiring

AWG22 / 0.25 mm^2, current loop cabling may be extended several hundred feet or meters without causing measurement errors.
The maximum cable length is determined by the open loop voltage and the cable gauge.
Do not install current loop cabling in the same conduit as AC power cabling.
Current loop cabling may share a common conduit with other sensors, water meter and contact set cabling.



Controller Powered 4-20mA Current Loops

Loop Powered Sensor 1
Controller 24VDC powers sensor.

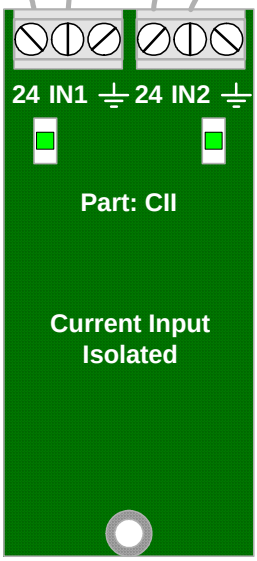
Return '-' Output

24VDC '+' Input

Loop Powered Sensor 2
Controller 24VDC powers sensor.

24VDC '+' Input

Return '-' Output



IN1
If the **CCI** card is installed in the **CD** controller slot, the **IN1** shows up as Sensor **C.**

IN2
If the **CCI** card is installed in the **CD** controller slot, the **IN2** shows up as Sensor **D.**

Warning
Multflex controllers are limited to 2 **CII** & Aegis controllers are limted to 1 **CII** used in Controller Powered sensor mode. There is no limit on **CII** used in sensor powered mode.

Mix Sensor & Controller Powered 4-20mA
Controller powered and sensor powered current loops may be connected to the same **CII** card, one loop to each input

Sensor powered 4-20mA Current Loops

Powered Sensor 1
Sensor powered by its power supply

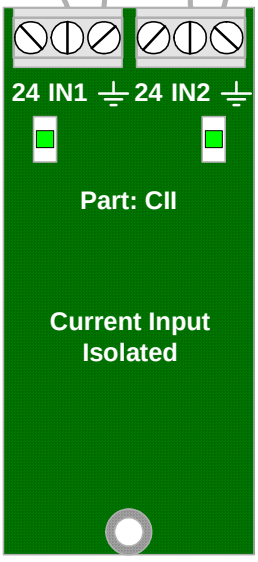
4-20mA '-' Return

4-20mA '+' Output

Powered Sensor 2
Sensor powered by its power supply

4-20mA '+' Output

4-20mA '-' Return



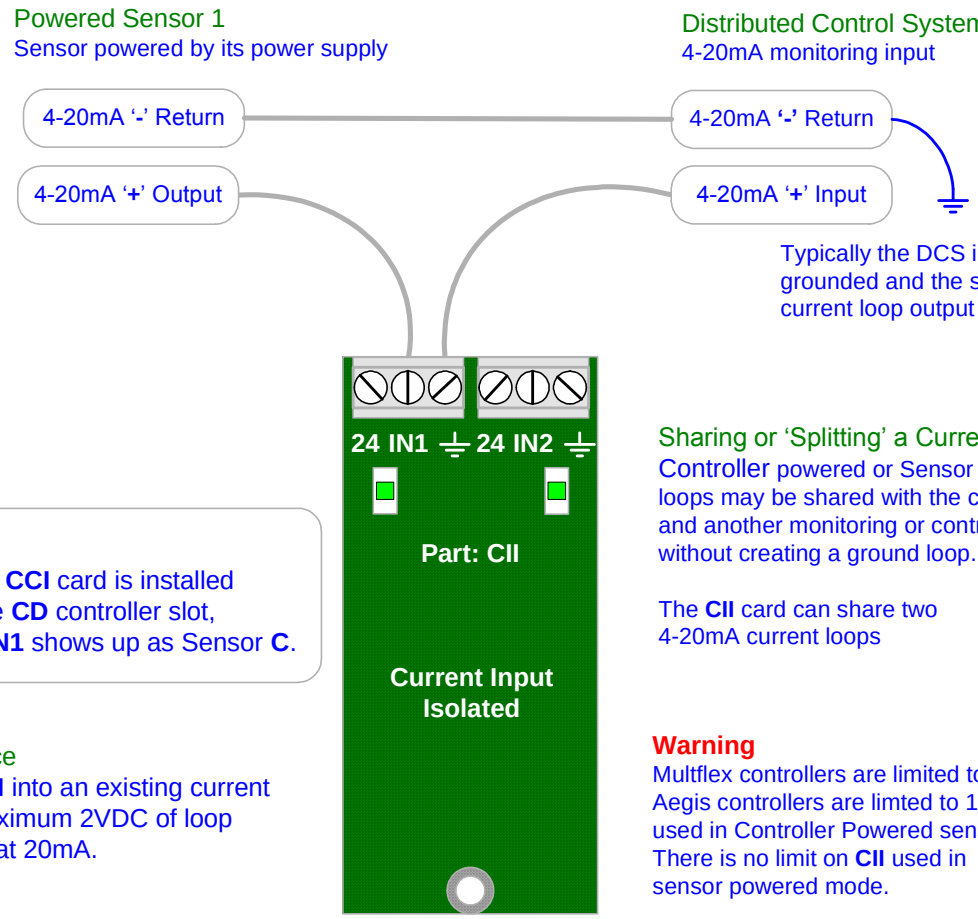
IN1
If the **CCI** card is installed in the **CD** controller slot, the **IN1** shows up as Sensor **C**.

IN2
If the **CCI** card is installed in the **CD** controller slot, the **IN2** shows up as Sensor **D**.

Mix Sensor & Controller Powered 4-20mA
Controller powered and Sensor powered current loops may be connected to the same **CII** card, one loop to each input

2.3 Driver Card Wiring cont.

Sharing a 4-20mA Current Loop



3. Configuration - Operation

3.1 MultiFlex Diagnostics

Parameter	LCD Display	Browser	Value : Use
Sensor Location		OK	**C:** Installation slot. LCD displays slot letter on screen.
Input Card Type	OK	OK	**4-20mA Input:** verifies driver card type
Current State	OK	OK	**Operational / Alarmed**:
Displayed Value	OK	OK	1836 gpm: Current measured value, with user set units, '**---**' default. Displayed with user set resolution
Period Maximum		OK	1920 gpm: Data from current log interval. Used to assess controls.
Period Minimum		OK	1110 gpm:
Period Average		OK	1412 gpm:
Sample Size		OK	1110: Samples in Period Max. Min. & Average
Current Period		OK	46 minutes: Elapsed time in current log period
Log Period		OK	60 minutes: User set log period 5 to 1440 minutes
Compensation	OK	OK	**None / Rate-to-Volume**:
Measured Level	OK	OK	787.5 mV: Raw sensor level in mV, before Gain & Offset after ID Level correction.
Gain Multiplier	OK	OK	3.1250: Calibration adjusts Gain. Displayed Value = Measured Level x Gain Multiplier + Offset Adjust Both single and two point calibrations recalculate Gain.
Default Gain	OK	OK	**1.0000:** Factory default Gain. Gain selected by Input Card ID
Offset Adjust	OK	OK	-625: Offset. May be user adjusted. Both single and two point calibrations recalculate Offset.
Default Offset	OK	OK	**0.0000:** Factory default Offset. Offset selected by Input Card ID
Input Card ID	OK	OK	2209 mV: Design level = 2216mV.

12mA Driver Verification Test:
12mA is 50% of a 4-20mA loop 16mA span.
Connect a 2K ohm (Optionally use 2 x 1K, 5%, 1/4W) resistor between **CII** card **+24** VDC terminal & adjacent **IN1** or **IN2** terminal.
OR:
Connect the output of a 4-20mA output **IO** card into the **CII** card using the **CII** card 24V supply to power the **IO** card loop and set the 4-20mA output to 50%.

Diagnostic 'Displayed Value' will be nominally 570mV at Factory Default GAIN = 1 & OFFSET = 0.0.
The actual test current in mA is the DC voltage across the test resistor divided by 2000.
The measured voltage is 50 ohm x the DC voltage in mV.

3.2 Calibration

Current loops require two point calibration to convert the measured current into end user units.
If 4mA represents zero sensor value, single point calibration may be used.

The current loop may be calibrated using either the Keypad or the Browser.
It's also possible to calculate the input OFFSET & GAIN to convert a 4-20mA signal to its equivalent sensor value.

Single Point Calibration:

Many current loops use 4mA to represent 0uS, 0C, 0ppm, 0GPM…
These loops can use single point calibration.

The controller assumes that the 4mA level is set correctly measures 200.0mV (4mA x 50 ohms)
and calculates and OFFSET and GAIN to convert the user calibration input to a disaplyed value:

WARNING: Requires a current loop level greater than 4mA; preferably in the 8mA to 20mA range.
This method fails at 4mA since there is not sufficient measured level to set the GAIN & OFFSET correctly.

Two Point Calibration:

1. Configure the device or sensor controlling the current loop to operate at 4mA.
2. Select Sensors / Calibrate and @ 'Enter first value' key the 4mA level in site units. For example if your current loop was spanned 0-2500GPM = 4-20mA, you would key 0 & Enter
3. Configure the device or sensor controlling the current loop to operate at 20mA.
4. Key the 20mA level @ the 'Enter second Value' prompt. In our example you would key 2500 & Enter
5. The controller will then calculate the Offset & Gain required to convert the measured current to user units. In our 0-2500GPM example Gain = 3.125 & Offset = 625.

Any two loop currents may be used to calibrate. The previous 4mA & 20mA example is the optimum.
Accuracy improves as the difference between the two calibration currents increase.

Calculating Offset & Gain

1. The input Offset Adjust and Gain Multiplier may be manually set using Sensors / Configuration.
2. This method to convert a measured current to a user value may be used if it's not easy to drive the current loop between 4 & 20 mA.

At 4mA the 50ohm loop terminating resistor measures 200mV (50 x 0.004).
At 20mA the 50ohm loop terminating resistor measures 1000mV (50 x 0.020).
As the current loop varies from 4-20mA, the controller measures a mV change from 200 to 1000; an 800mV change.

If the site 4mA_Level & 20mA_Level are known.
Gain Multiplier = (20mA_Level – 4mA_Level) / 800
Offset Adjust = -200 x Gain Multiplier

Example: 4mA_Level = 0 GPM & 20mA_Level = 2500 GPM
Gain Multiplier = 2500 /800 = 3.125
Offset Adjust = -200 x 3.125 = 625

Check: At 4mA we'll measure 200mV and display 200 x 3.125 – 625 = 0 GPM
At 20mA we'll measure 1000mV and display 1000 x 3.125 – 625 = 2500 GPM

4.0 Specifications

Function		Notes
Resolution	0.0125% of span, 2uA	Most current loop sources are 10 bit , resolution; typically 0.1% of span. In this case, the source of the current loop or loop powered sensor constrains overall accuracy and resolution.
Accuracy	+/- .05% of span	Accuracy stated after calibration correct for GAIN error through the DC isolator
Max Input Voltage	24VDC	Input is polarity protected to 50VDC and thermally fused at 50mA. 0 mA if loop polarity incorrect.
Terminated Loop Indicator	Green LED ON at loop currents greater than 3.5mA	Visual indication of correct loop wiring polarity and active loop power.
Dual Isolated 24VDC Supplies	21mA @ 24VDC +/-4% 75mV P-P noise 85C Max.	Dual 24VDC supply powered by controller unregulated supply.
DC Isolation	50VDC maximum	DC supplies rated 1000VDC, 60 Sec. PCB sets isolation voltage limit

Notes:

1. Resolution Example: If 4-20mA represents 0-2500GPM and the current transmitter has 10 bit resolution, then flow rate would change in increments of 2.5 GPM.