Creating a 4-20 Ma Current Loop on the ACT-1B and ACT-3

Think of the IO port as a variable resistor that regulates the current to 4-20 ma in the loop. All the other devices in the loop are represented as a resistor equal to the input resistance of all the devices combined. This maximum allowable value for this resistance depends on the power supply used.

$R_{max} = (V_{supply} - 4)/ 0.02$

Conversely the formula can be expressed in the following manner if you know the loop resistance and you need to calculate the Supply voltage required.

$V_{supply} = (R_{max} \times 0.02) + 4$ V_{supply} should not exceed 40V.

Where
R_{max} is the maximum total loop resistance (except for the ACT)
V_{supply} is the Voltage for the power supply.
0.02 is the maximum current in the loop which is always 20mA..
4 is the minimum voltage across the ACT where it can properly regulate the current.

So for a

Supply	Max Loop Resistance
15V	550 ohms
20V	800 ohms
24V	1000 ohms
30V	1300 ohms
40V	1800 ohms

The ACT-3 always needs an external 20 to 30 Volt Power Supply capable of 30 mA for the loop. The COM pin of the IO port is isolated from the other common pins. This means the ACT-3 can be placed anywhere in the loop.

The ACT-1B has an internal power supply for IO option. The voltage source is 15 V at the +VA and OUT terminals. The voltage source will determine the maximum resistance of the load. The COM pin of the IO port is NOT isolated. If you use an external Power Supply, the common of the Power Supply MUST be connected to the COM pin of the ACT-1B 's IO port as shown in the manual. The load resistor in the diagram represents the other devices in the loop.

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