**The de facto Industry Standard** using "Negative true" Logic   *Digital I/O Interfacing*

Industry Standard I/O is configured using individual "negative-true" I/O signal control lines for each I/O position. Standard I/O Modules are designed for "open-collector" sinking logic[2]. (See Figure 1). Standard I/O Mounting racks employ a pull-up resistor on each I/O signal line (usually in the range of 3.3k to 4.7k). In the inactive or "off" state, the control signal line is pulled high to the +Logic Power. Likewise, in the active or "on" state, the I/O signal line is asserted to Logic 0 (low) to logic common.

Figure 1

What controls the I/O signal line?

Standard **Input** modules <u>assert the signal line</u> (module pin 4)[1] low when an input is present. Where Standard **Output** modules are used, the module will turn "on" when (module pin 4) is <u>asserted low by the controller</u>.
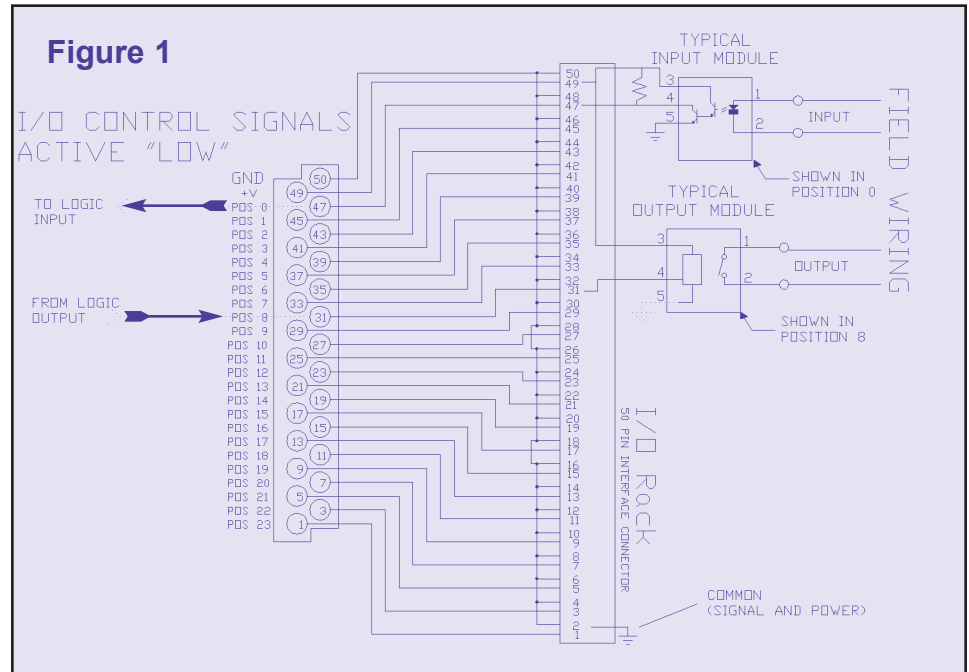
Design Notes:

#1 *INTERFACING TO I/O LOGIC SIGNALS* - The circuitry (or system) which interfaces to the I/O must be capable of the same logic levels of the I/O Modules (e.g. - 5V Modules--5V logic, 24V Modules-- 24V logic). Standard Output Modules may be driven by open-collector, or compatible logic circuitry.

#2 *AVOIDING INADVERTENT OUTPUTS TURNED-ON* - When controlling Output Modules, considerations should be taken for "power-up" and any possibility that the controller could lose power or stop functioning while I/O logic power is present. (e.g. - if the controller outputs are initialized to "logic low", the output modules will be "ON". This may also occur if the controller were to lose power and the outputs fail to a "logic low" state.) A few considerations may be to include an interlock circuit, an external interlock timer or a Watchdog Timer, depending on the application.

Reading Digital *Inputs*

Standard Input modules employ an open-collector output (module pin 4) to assert the corresponding I/O position's control signal line to logic low (module pin 5) with an when an active input is present (on module pins 1 & 2). The input circuit of the controller must be logic level compatible and able to withstand the "logic-high" voltage. Logic common must be connected between the I/O mounting Rack and the controller (module pin 5) and a +Logic supply voltage must be provided (module pin 3).

Controlling Digital *Outputs*

Standard Output modules are controlled by asserting the individual I/O position's control signal line (module pin 4) to logic low to activate the output (module pins 1 & 2). +Logic voltage is required on I/O mounting rack (module pin 3). For 5-pin output modules, logic ground is also required to be connected to the I/O mounting rack (module pin 5).

Notes: 1. The module pin nos. shown refer to individual module pin nos.
        2. Open-collector logic is typical. However, some other types of logic are compatible with Standard I/O.