

# Analog Input Options for Syringe Pumps

## Installation and Operation Instructions

### Overview

Teledyne Isco offers several options for external analog control. Voltage and current inputs control functions of run/stop, flow setpoint, and pressure setpoint.

The D-Series pump controller underwent design updates in November 2011, and the HL-Series pump controller underwent the same in October 2013. Some features and options are only compatible with either the legacy controller or the current controller. If you are unsure which version you have, refer to Technical Bulletin [TB28 D-Series Syringe Pump Controller Versions](#) before selecting options for, servicing, or operating the controller.

**Table 1: Inputs for Voltage & Current**

Controller Version	Voltage: 0-10V	Current: 4-20mA
Legacy	Standard feature Internal circuit board Up to 3 pumps	Optional External converter box Up to 3 pumps
Current/Future	Standard feature Internal circuit board Up to 4 pumps	Optional (release date: 12/13) 4-20-Integrated controller (not converted) Up to 4 pumps

### Preparation for External Analog Control

Before programming the controller to accept the analog signal, you must know the value of the maximum flow rate (constant flow) or the maximum pressure (constant pressure).

**Note**

The high and low limits you enter cannot exceed the pump specifications:  
4-20mA maximum input = 8V;  
Normal input = 10V.

To determine the analog voltage range, use the formula explained below:

$$FS \times \left(\frac{V}{U}\right) = V_{max}$$

where:

FS = Maximum flow rate or Maximum pressure (Full Scale): This is the same value entered when setting LIMITS, as described in Section 3 of your user manual, for MAX PRESS or MAX FLOW.

- V = Volts per unit of flow or pressure
- U = Incremental unit of flow or pressure
- V<sub>max</sub> = Maximum input voltage

### Calculation Examples

**Flow Rate** – If MAX FLOW is set at 25 ml/min in the LIMITS menu and the desired scale factor is 5.0 volts per 20 ml/min, do the following to determine the analog voltage range:

$$25 \times \left(\frac{5}{20}\right) = 6.25$$

In this example, the analog voltage range would be 0.0–6.25 volts.

**Pressure** – If MAX PRESS is set at 510.2 ATM in the LIMITS menu and the desired scale factor is 2.0 volts per 100 ATM, do the following to determine the analog voltage range:

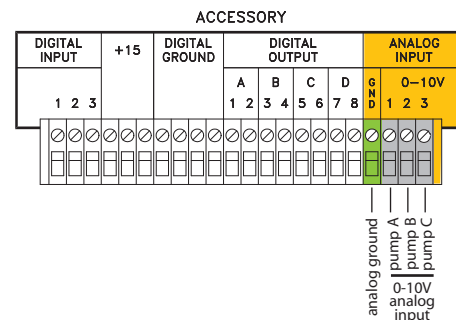
$$510.2 \times \left(\frac{2}{100}\right) = 10.204$$

In this example, the analog voltage range would be 0.0–10.204 volts.

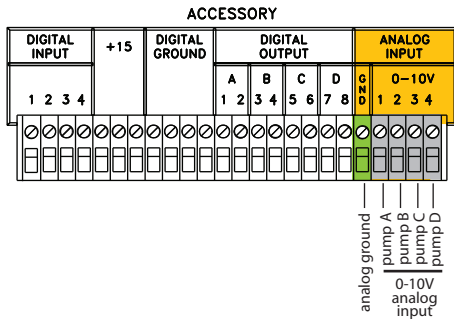
### Voltage Input Wiring Connections

Connect the analog ground wire to the GND terminal under ANALOG INPUT on the ACCESSORIES terminal block on the rear panel of the controller (Figure 1). Connect the input wire to terminal 1. To control a second, third, and fourth pump, connect input wires to terminals 2, 3, and 4, respectively.

A multi-pump system running in continuous flow mode only requires connection to terminal 1.



**Figure 1: Analog voltage input terminals**  
For legacy controller



**Figure 2: Analog voltage input terminals**  
For current controller

0 Volts = Stop

Vmax = Max flow in constant flow mode; max pressure in constant pressure mode

**Legacy Controller: 4-20mA Input Wiring Connections**

For legacy controllers, the 4-20 mA input option requires an external converter box connected to the rear panel of the controller. The box has two external cables, labeled Cable A for control of pump A and Cable B for control of pump B. Connect the signal source to the 25-pin D connector on the side of the converter box.

Table 2 describes the function of each terminal on the block, and also the converter box wiring

(Figure 3. Table 3 describes the pin functions for the 25-pin D input connector on the converter box.

**Table 2: Controller Terminal Connections for 4-20mA Input**

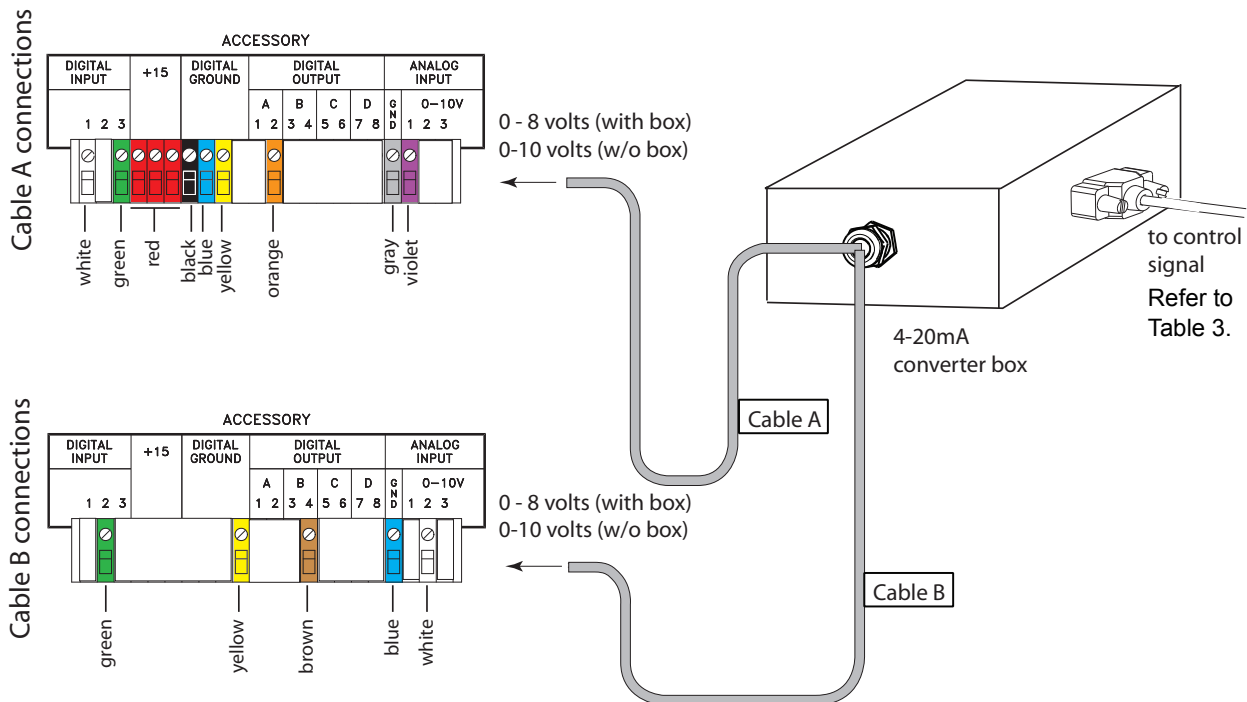
Terminal Name	Function	4-20mA Wiring
Digital Input 1	Run/Stop, Pump A	Cable A: White
Digital Input 2	Run/Stop, Pump B	Cable B: Green
Digital Input 3	Direction, Pump A	Cable A: Green
+15 Volt	15VDC to converter box	Cable A: Red
Digital Ground	15V Rtn	Cable A: Black
Digital Ground	Run/Stop Rtn, Pump A	Cable A: Blue
Digital Ground	Direction Rtn, Pump A	Cable A: Yellow
Digital Ground	Run/Stop Rtn, Pump B	Cable B: Yellow
Digital Output A2	Run/Stop Status, Pump A	Cable A: Orange
Digital Output B4	Run/Stop Status, Pump B	Cable B: Brown
Analog Ground	Flow/Pressure Rtn, Pump A	Cable A: Gray
Analog Ground	Flow/Pressure Rtn, Pump B	Cable B: Blue
Analog Input 1	Flow/Pressure Ctrl, Pump A	Cable A: Purple
Analog Input 2	Flow/Pressure Ctrl, Pump B	Cable B: White

4 mA = Stop

20 mA = Max flow in constant flow mode; max pressure in constant pressure mode

**Note**

When using the 4-20 mA converter box, if a third pump is added, another cable will be installed and labeled Cable C.

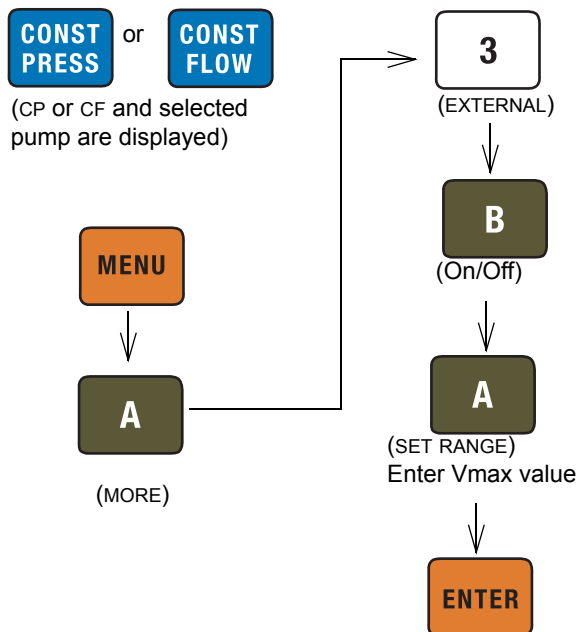


**Figure 3: Analog control wiring connections** (Legacy controller only, Converter Box Part #68-1247-119))

**Table 3: 4-20mA Input Pin Functions for Operator Interface**

Pin	Functions	Value	Pin	Functions	Value
1	Chassis		14	Flow Pump A Rtn	
2	Flow In, Pump A	4mA = 0 ml/min 20mA = max flow, depending on pump	15	Flow In, Pump B	4mA = 0 ml/min 20mA = max flow, depending on pump
3	Rtn Flow, Pump B		16	Flow In, Pump C	4mA = 0 ml/min 20mA = max flow, depending on pump
4	Rtn Flow, Pump C		17	R/S status, Pump C	Contact Closure
5	R/S status, Pump C	Common	18	R/S status, Pump B	Contact Closure
6	R/S status, Pump B	Common	19	R/S status, Pump A	Contact Closure
7	R/S status, Pump A	Contact Closure	20	Direction, Pump C	Logic High = Up Logic Low = Down
8	Run/Stop, Pump C	Logic High = On Logic Low = Off	21	Direction Rtn, Pump C	
9	Run/Stop Rtn, Pump C		22	Direction, Pump B	Logic High = Up Logic Low = Down
10	Run/Stop, Pump B	Logic High = On Logic Low = Off	23	Direction Rtn, Pump B	
11	Run/Stop Rtn, Pump B		24	Direction, Pump A	Logic High = Up Logic Low = Down
12	Run/Stop, Pump A	Logic High = On Logic Low = Off	25	Run/Stop Rtn, Pump A	
13	Direction Rtn, Pump A	NOTE: Pump C references are not normally enabled. If Pump C is enabled, another cable will be added to the converter box and labeled Cable C. Also note that the Direction control for Pump A (pins 24 & 13) will provide direction control for both pumps in dual pump mode.			

**Setting Up External Control**



**Figure 4: Button sequence for external analog control setup**

**4-20 mA Input Integrated Controller**

The integrated controller will process actual current signals instead of using a conversion. This bulletin will be updated with information about the integrated controller upon its release, scheduled for December 2013.

*Last modified August 19, 2013*

**Teledyne Isco**

P.O. Box 82531, Lincoln, Nebraska, 68501 USA  
 Toll-free: (800) 775-2965 • Phone: (402) 464-0231 • Fax: (402) 465-3001  
 E-mail: IscoService@teledyne.com



Teledyne Isco is continually improving its products and reserves the right to change product specifications, replacement parts, schematics, and instructions without notice.