



## C1z0 Controller & Driver

### User's Guide



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## Warnings & Notices

**WARNING:**

Installation and operation of electric and high pressure systems (fluids and compressed gas) involves risk including property damage and personal injury or death.

Installers and users should be properly trained or certified and take safety precautions. This product may cause death, personal injury, or property damage if improperly used or installed.

The information in this document and other information from Enfield Technologies and its authorized representatives are intended for use by persons having technical expertise in selecting and using these products. Product owners ("you") should analyze all technical and safety requirements of your specific application, including the consequences of any possible failure, before selecting a product. This product may not be suitable for all applications, such as those acting upon people. Suitability is solely your responsibility. Because the requirements for each application may vary considerably, you are solely responsible for conducting any testing or analysis that may be required to determine the suitability of the product for your application, and to ensure that all performance, safety and warning requirements for your application are met.

**Caution:**

While the product is low voltage, it contains open-frame electronic components and care should be taken to prevent unintentional contact with the product to avoid damage to person or property.

The C1z0 is an electro-static sensitive device. Use appropriate electro-static discharge (ESD) procedures during handling and installation.

**Notice:**

Use and purchase of this product is subject to Enfield Technologies' Terms and Conditions of Sale and Use. Improper installation or use voids warranty. Consult factory regarding special applications. Specifications are subject to change. Reasonable efforts have been made to provide useful and correct information in this document, but this document may contain errors and omissions, and it is subject to change.

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## Quick Start Procedure

1. Configure Jumpers
  - a. Configure the left side of Jumpers 2 and 3 to select a command input of 0...10Vdc or 4...20mA
  - b. Configure the right side of Jumpers 2 and 3 to select a command input of 0...10Vdc or 4...20mA
  - c. Configure Jumper 1 to select the area ratio for the cylinder
2. Wire Feedback
  - a. For 4...20mA signals: 4mA should correspond to the minimum feedback value and 20mA should correspond to the maximum feedback value. Also, for 4...20mA signals, low side should connect to ground.
  - b. For 0...10V signals: 0V should correspond to the minimum feedback value and 10V should correspond to the maximum feedback value
3. Wire Command
4. Wire Power
5. Connect Pneumatic Lines
  - a. Connect valve as shown in "system setup"
  - b. Inlet air should be dry (-40F dew point) non-lubricated air, non-flammable & non-corrosive dry gases (0.3 micron fine grade coalescing filter with 5 micron pre-filter) at 0-150psig.
6. Tune System
  - a. Restore potentiometers to factory default settings
  - b. Tune System
7. Troubleshooting
  - a. See "Troubleshooting"
  - b. Contact Enfield Technologies for additional help

**Factory Default Setting**

**Potentiometer**

RP1 – Proportional Gain
RP2 – Derivative Gain
RP3 – Force Damping
RP4 – Offset

**Factory Default Condition**

Fully Counter Clockwise
Fully Counter Clockwise
Fully Counter Clockwise
Centered

**Setting**

Proportional gain is zero
Derivative gain is zero
Force damping gain is zero
Offset is zero

**Jumper**

J1 – Area Ratio
J2 (left side) - Command
J3 (left side) - Command
J2 (right side) - Feedback
J3 (right side) - Feedback

**Factory Default Condition**

Configuration #2
Jumper Off
Jumper Off
Jumper Off
Jumper Off

**Setting**

0.905
0...10V Command
0...10V Command
0...10V Feedback
0...10V Feedback

**LED**

Power
Offset

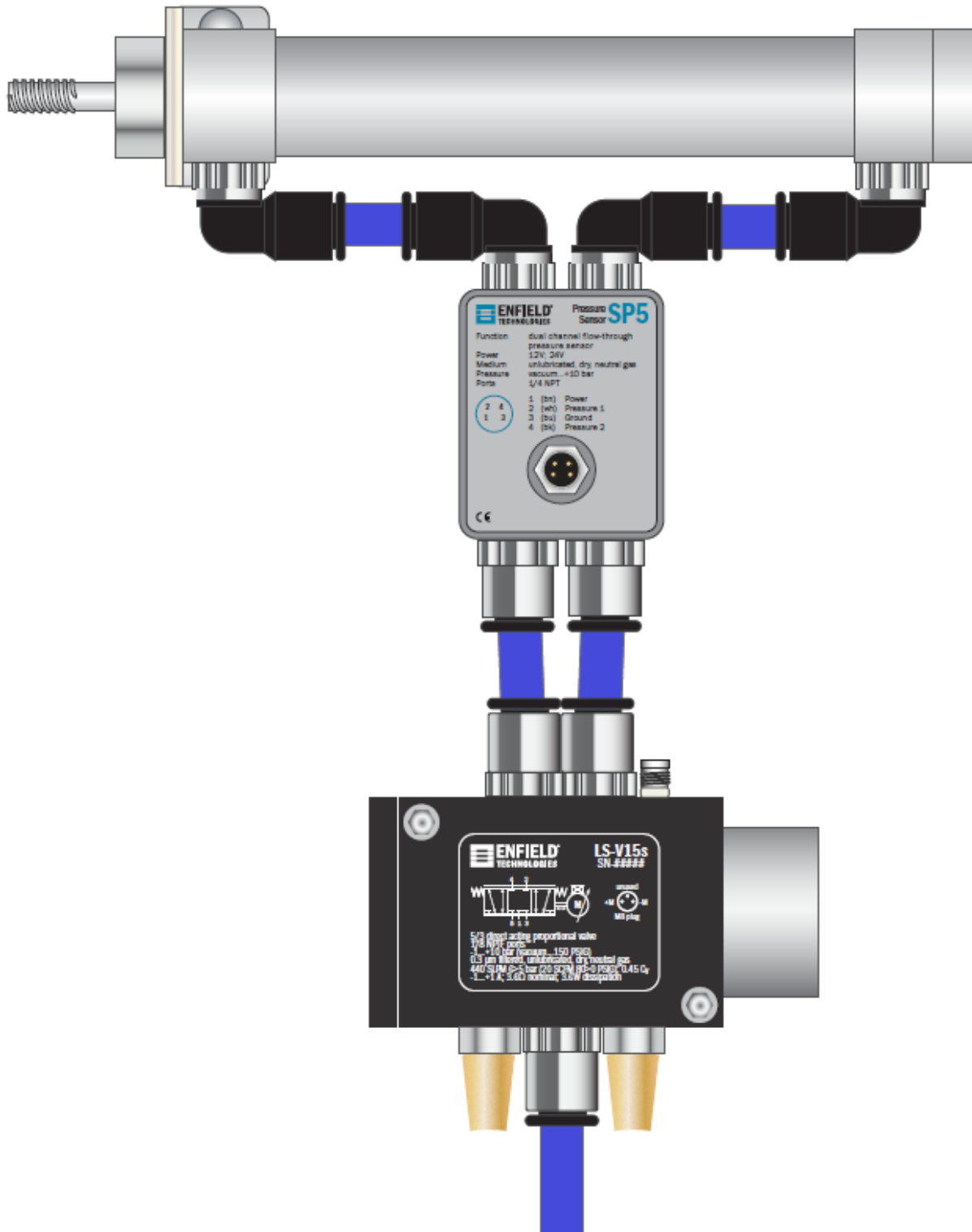
**Factory Default Condition**

On
On

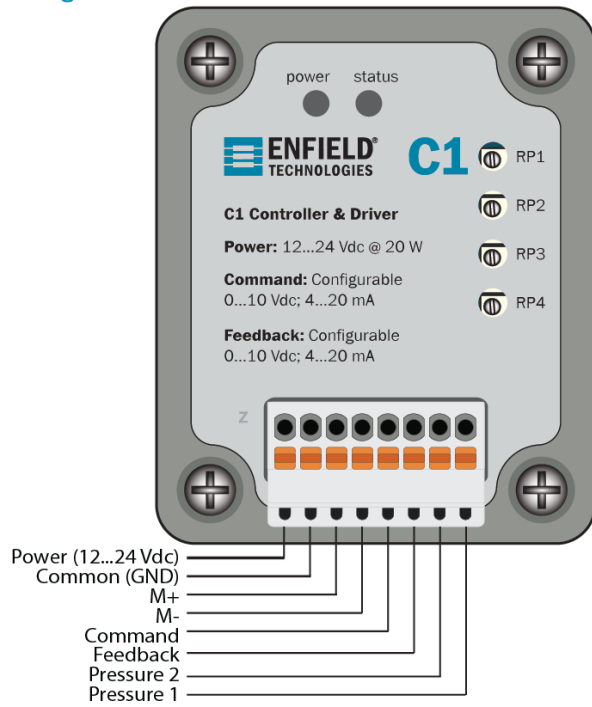
**Setting**

Power is On
Offset is centered

System Setup

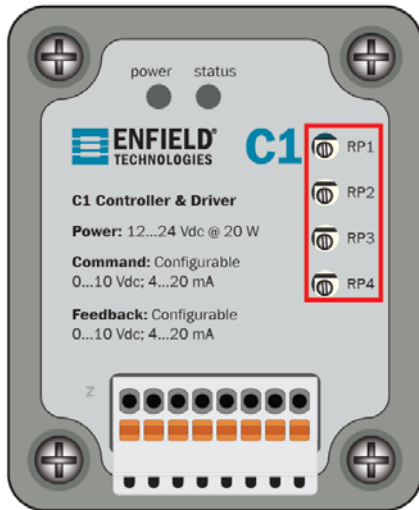


Wiring



Pin	Label	Function
1	+Pwr	+12...24VDC, power supply connection
2	Gnd	common (dc ground), connect to power supply common
3	M+	Valve+ (brown wire from valve)
4	M-	Valve- (blue wire from valve)
5	Cmd	Command Input
6	Fbk	Feedback Input
7	P2	Pressure 2 (black wire from SP5)
8	P1	Pressure 1 (white wire from SP5)

## Potentiometers/Tuning



The C1z0 has 4 potentiometers (Responsiveness, Speed Damping, Force Damping, and Offset) which allow for maximum flexibility. A polymer non-conductive screwdriver is the preferred method for adjusting the potentiometers. Care should be taken not to allow metal screwdrivers to touch other components on the board.

- 1) **Responsiveness (RP1)** –By adjusting RP1, the user can adjust the responsiveness of the pneumatic cylinder to changes in command or feedback. The responsiveness of the cylinder can be increased or decreased by turning RP1 clockwise or counterclockwise, respectively. A gain that is too low can result in an unresponsive system while a gain that is too high can cause the system to become unstable.
- 2) **Speed Damping (RP2)** – By adjusting RP2, the user can set the speed damping applied to the system. This damping can be increased or decreased by turning RP2 clockwise or counterclockwise, respectively. Speed damping helps reduce overshoot and smoothes out system performance. However, too much speed damping can cause the system to undershoot and “creep” into the target position or become unstable.
- 3) **Force Damping (RP3)** – By adjusting RP3, the user can set force damping applied to the system. Damping can be increased or decreased by turning RP3 clockwise or counterclockwise, respectively.

Force Damping helps increase the stability of the system. Too little force damping can result in an oscillatory system while too much damping can result in an unresponsive system, resulting in steady state error.

- 4) **Offset** By adjusting RP4, the user can set the offset of the system. Offset is used when the cylinder is mounted vertically to create symmetrical motion. If the cylinder is facing rod up the offset should be increased. When a cylinder is facing down the offset should be decreased to create symmetrical motion. The offset can be increased or decreased by turning RP4 clockwise or counterclockwise, respectively.

## Recommended Tuning Method

### Return C1z0 to Factory Defaults

- 1) Turn off air and power to the system.
- 2) Turn RP1, RP2 and RP3 fully counterclockwise. Make sure to go at least 11 full turns. (FYI these pots do not have “bottoming out” indication)
- 3) Provide power to the controller.
- 4) Adjust RP4 until green LED is on. (center position)

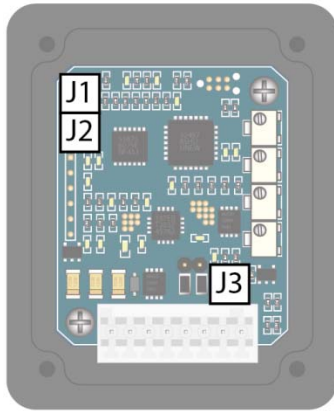
### Tune System

- 5) Turn on air to the C1z0.
- 6) Provide a continuously varying command signal to the C1z0. A 0.1Hz square wave would be ideal.
- 7) Turn RP1 (responsiveness) clockwise slowly. The system should begin to move. If the system does not move or “rails” consult system setup diagram.
- 8) Once the system begins to follow the command signal, continue increasing RP1 until some overshoot or oscillation is obtained, or desired speed is reached.
- 9) Adjust RP3 (force damping) clockwise until the overshoot is dampened.
- 10) Repeat steps 8 and 9 as necessary, until the system exhibits the desired dynamics.
- 11) To optimize system performance, slowly decrease RP3 (force damping) and increase RP2 (speed damping) until optimum system performance is reached.
- 12) If the motion is asymmetrical, RP4 (offset) can be adjusted to compensate. Also insure that proper cylinder size has been selected on Jumper 1.

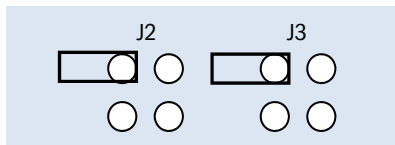


### Jumper Configurations

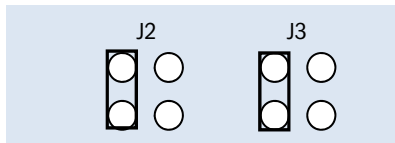
To configure jumpers remove lid for access



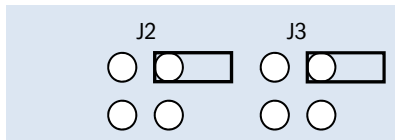
Configure Command for 0...10Vdc



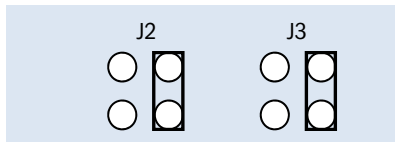
Configure Command for 4...20mA



Configure Feedback for 0...10Vdc

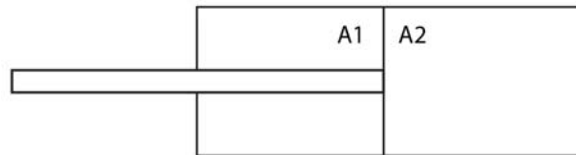


Configure Feedback for 4...20mA



### Configure Area Ratio

Configuration of J1	A1/A2 Ratio
Config #1 	0.88
Config #2 	0.905 (default)
Config #3 	0.9375
Config #4 	1 (Rodless Cylinders)



A1 = Surface Area on Rod Side of Cylinder  
 A2 = Surface Area on Piston Side of Cylinder

## Troubleshooting

Symptom	Probable Causes	Corrective Action
System Totally Unresponsive	Power Not Applied	Apply power, check all power wiring
	Air Off	Turn air on
	Proportional Gain too Low	Turn Proportional Gain Clockwise
	Inverted Polarity	Verify signal wiring for command and feedback; also verify mechanical system polarity
System Mildly Responsive or Sluggish	Signal Wiring	Verify all Wiring
	Proportional Gain too Low	Turn Proportional Gain Clockwise
	Power Supply Voltage not Stable	Check power wiring; change power supply
System 'Pegs' or 'Rails'	No Feedback Signal	Connect Feedback Signal
	Feedback Connected Improperly	Verify all wiring is as shown in application examples and as described in the "System Setup" section of this document
System Fails to Converge or is Inaccurate	Incorrect Wiring	Verify all wiring is as shown in application examples and as described in the "Installation" section of this document
	Mechanical System	Consult Factory for Suggestions
	Proportional Gain too Low	Turn Proportional Gain Clockwise
	Air Leaks	Insure there are no air leaks in the system
	Valve Sticking	Insure that inlet air meets valve specifications.
System Oscillates	Proportional Gain too High	Turn Proportional Gain Counter Clockwise
	Valve Oversized for System	Consult Factory
System 'Buzzes'	Input Signal Noise (possibly 60Hz)	Verify that large or high power machinery is not operating nearby. Also, verify input signal integrity by examining the signal with an oscilloscope.
	Input Signals not connected	Verify all wiring as shown in the "System Setup" section of this document
	DC Common not connected	Verify all DC common connections
High Pitched Tone or Whine from Valve	Dither	This is an artifact of the built-in dither and is intended to keep the electro-mechanical device in constant motion.

Warranty: This product is covered by a 1 year Enfield Technologies limited warranty. Contact Enfield Technologies or visit website for more details.

Notice: Use and purchase of this product is subject to Enfield Technologies' Terms and Conditions of Sale and Use. Improper installation or use voids warranty. This product may not be suitable for all applications, such as those acting upon people, and suitability is solely the buyer's responsibility. Consult factory regarding special applications.