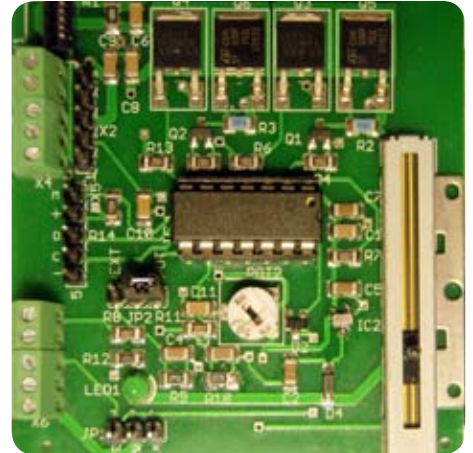


CIB Controller • Evaluation Board for Firgelli Linear Actuators

The CIB is a stand-alone closed-loop controller board for Firgelli actuators. Supported input signals include 4–20mA, 0–5V, RC/Hobby Servo Compatible, and 1kHz PWM. Each CIB will control one actuator using a software-based algorithm running on a PIC 16F688 micro controller. The micro controller is socketed and also in-circuit user-programmable.¹

The CIB is initially configured as an “evaluation board” that includes a battery holder (3 AAA cells not included) and a hand-operated linear slider (labeled P1 on reverse) that can be used to control the actuator for demonstration purposes. By changing an on-board jumper J1, and replacing the battery power supply with an external 5–12 volt source, the CIB can then be used to control a variety of actuators using any of the supported control modes. The minimum step size allowed in the control software can be adjusted for each type of actuator or application. This is done on the board using a small trim pot P2.



¹ Programming tools and methods are neither provided nor supported by Firgelli Technologies.

Specifications

Control input modes	0–5 V, 4–20 mA, RC Servo PWM, 1 kHz PWM
Controller	Microchip® PIC 16F688
Compatible Actuators	PQ12 Actuators with position feedback L12–P Actuators with position feedback, 6 or 12 volts FA Series Actuators with position feedback, 12 volts
Dimensions	64 mm x 60 mm (excluding battery holder)
Power	5–12 Vdc, 4 Amps peak current at 10% duty cycle
Operating environment	–10 to +70°C at 10–80% relative humidity

Operation

When the CIB is powered up, it will repeatedly scan pins 2, 3, 4 on the control interface connector X6 (see reverse for External Connections Detail illustration) for an input signal that is valid under any of the four supported interface modes. When a valid signal is first detected, the actuator will self-configure to the corresponding interface mode, and all other interface modes and input leads are disabled until the actuator is next powered on. Jumper J1 must be set for external control before using external inputs to the control interface. If J1 is set to POT, then the slider P1 can be used to control the actuator.

The sensitivity or accuracy of the actuator control algorithm can be set by adjusting the trim potentiometer P2. Turning P2 clockwise will allow the actuator to move in smaller increments and be more accurate. However due to the differences in actuator types this may cause jittery or unstable behaviour. If this occurs P2 should be turned counter-clockwise to decrease the sensitivity. Each time P2 is adjusted, the power to the CIB must reset before the new setting will take effect.



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External Connections Detail

X1 PQ12 actuator connector

5 pin, 1 mm Pitch FPC connector

X2 L12-P actuator connector

Pin Function

- 1 **Potentiometer Reference** (yellow)
- 2 **Motor Terminal** (black)
- 3 **Motor Terminal** (red)
- 4 **Potentiometer Feedback (wiper)** (purple)
- 5 **Potentiometer Reference** (orange)

X3 Radio control receiver connector

Pin Function

- 1 **Control** (white)
- 2 **Power** (red)
- 3 **Ground** (black)

X4 FA series actuator connector

Pin Function

- 1 **Potentiometer Reference** (blue)
- 2 **Motor Terminal** (black)
- 3 **Motor Terminal** (red)
- 4 **Potentiometer Feedback (wiper)** (yellow)
- 5 **Potentiometer Reference** (white)

NOTE: If the actuator moves to one end then stops, swap pins 2 and 3 to change the motor direction.

X5 In-circuit programming header

Pin Function

- 1 **MCLR** (master clear) connects to PIC pin 4
- 2 **V+** connects to PIC pin 1
- 3 **ICSPDAT** connects to PIC pin 13
- 4 **ICSPCLK** connects to PIC pin 12
- 5 **GND** connects to PIC pin 14

X6 Control interface

Pin Function

- 1 **Voltage input signal** (0–5 V) or 1 kHz PWM
- 2 **Current input signal** (4–20 mA)
- 3 **RC / Hobby Servo input signal**
- 4 **Ground**
- 5 **5–12 Vdc power**

B1 Battery holder

3 × AAA batteries (can be replaced with external power source 5–12 Vdc)

J1 Internal/external control jumper

POT activates slider P1 to control actuator

EXT activates connector X6 to control actuator

P1 Slider control

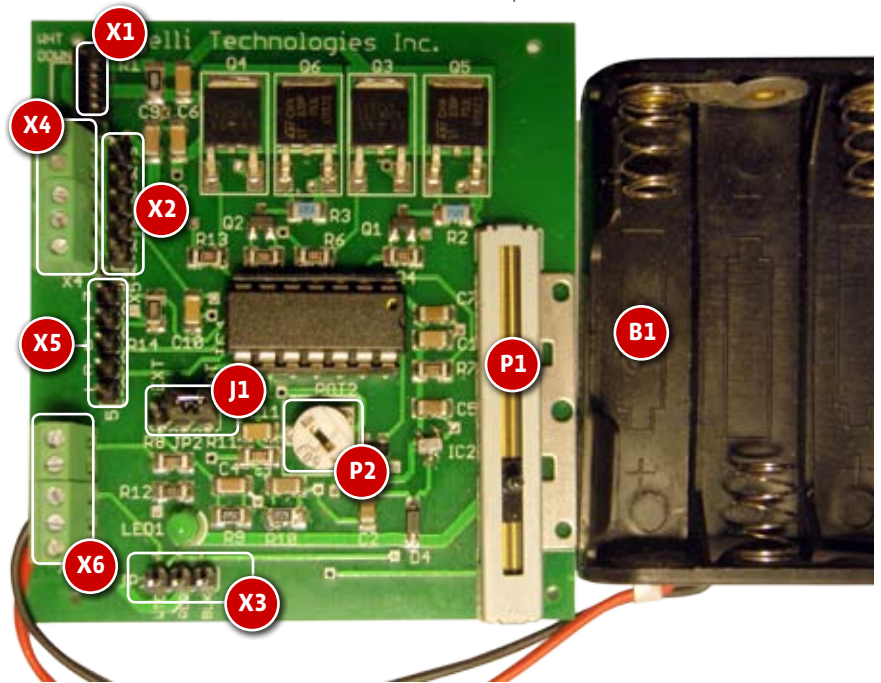
For control of actuators by hand

P2 Sensitivity adjustment

Clockwise: smaller step size increments

Counter-clockwise: larger step size increments

Connector Pins numbered from Top to Bottom



Control Modes

0–5V Interface Mode: This mode allows an actuator to be controlled with just a battery, and a potentiometer to signal the desired position to the actuator – a simple interface for prototypes or home automation projects. The desired actuator position (setpoint) is input to the CIB on connector X6 pin 1 as a voltage between ground and 5 V. The setpoint voltage must be held on pin 1 until the desired actuator stroke position is reached. Pin 1 is a high impedance input.

4–20 mA Interface Mode: This mode is compatible with PLC devices typically used in industrial control applications. The desired actuator position (setpoint) is input to the CIB on connector X6 pin 2 as a current between 4 mA and 20 mA. The setpoint current must be held on pin 2 until the desired actuator stroke position is reached.

RC Servo Interface Mode: This is a standard hobby-type remote-control digital servo interface, compatible with servos and receivers from manufacturers like Futaba™ and Hi-Tec™. The desired actuator position is input to the CIB on connector X6 pin 3 as a positive 5 Volt pulse-width signal. A 1 ms pulse commands the controller to fully retract the actuator, and a 2 ms pulse signals full extension. Connector X3 can also be used for the RC control signal, and uses the standard 3 pin 0.1" spacing typical on most hobby servo receivers.

PWM Mode: This mode allows control of the actuator using a single digital output pin from an external micro controller. The desired actuator position is encoded as the duty cycle of a 5 Volt 1 kHz square wave on CIB connector X6 pin 1, where the percent duty cycle sets the actuator position to the same percent of full stroke extension. 100% duty cycle represents full extension, and 0% duty cycle represents full retraction.