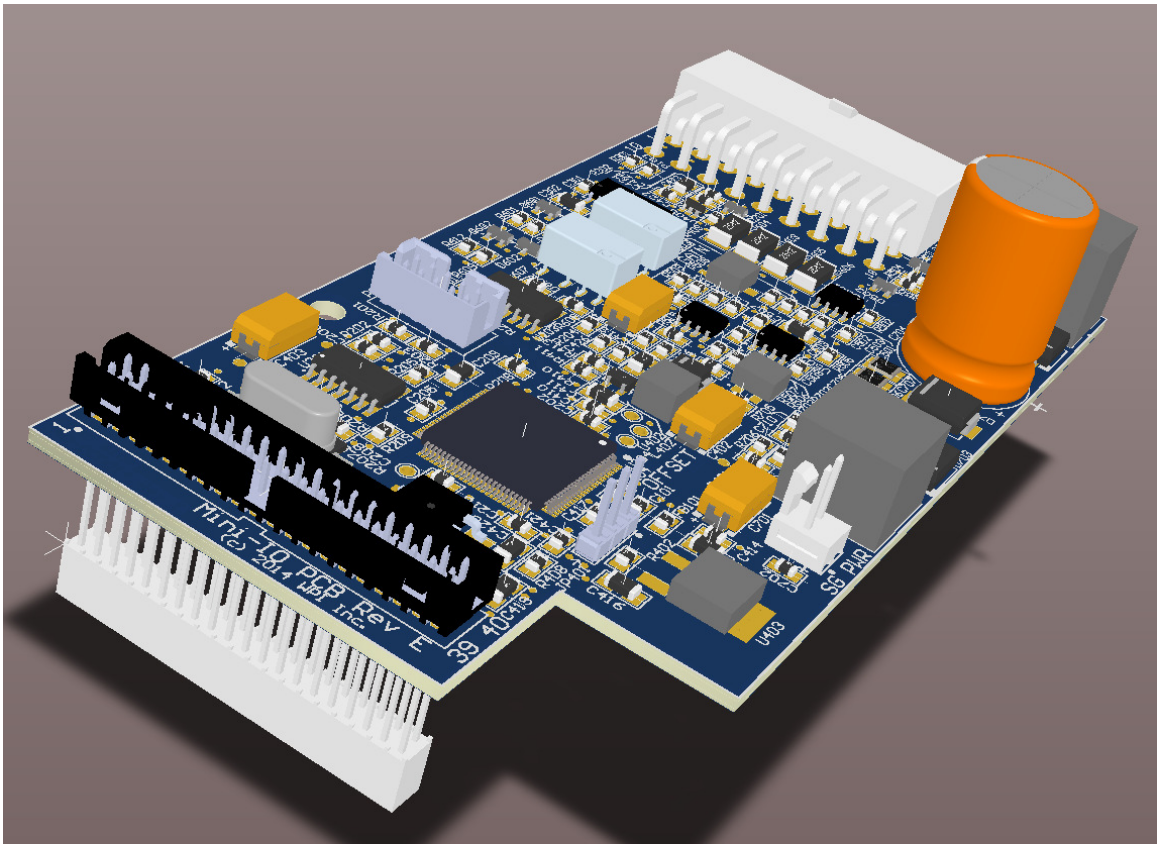
FLASHCUT CNC

CONTROL MADE SIMPLE ®

Mini I/O Expansion Board Manual



444 Lake Cook Road, Suite 22
Deerfield, IL 60015
Phone (847) 940-9305 ♦ Fax (847) 940-9315
www.flashcutcnc.com

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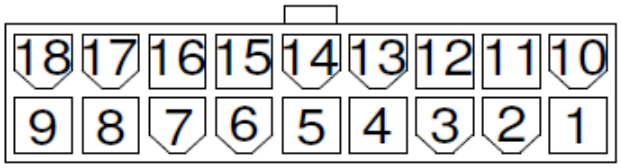
Table of Contents

1. I/O Connector Pinout

Molex Pin #	Function
1	CH A-
2	CH B-
3	INDEX-
4	GROUND
5	GROUND
6	RELAY 1-
7	RELAY 2-
8	GROUND
9	GROUND
10	CH A+
11	CH B+
12	INDEX+
13	+5V OUTPUT
14	PWM OUTPUT
15	RELAY 1+
16	RELAY 2+
17	ANALOG OUTPUT
18	ANALOG INPUT



Mating Connector Info		Molex P/N
Housing	18 pin Molex-Waldom Mini Fit Jr. Series	P/N# 39-01-2180
Female Pins	AWG 18-24	P/N# 39-00-0039
Female Pins	AWG 22-28	P/N# 39-00-0047

1.1 Spindle Speed Feedback

Pins 1-4 and 10-13, see above table for specific pin functions, are used for spindle encoder input, most commonly as spindle speed feedback to read the spindle speed in real time and to control threading operations on CNC lathes. The spindle encoder inputs A, B and INDEX may be single-ended or differential and they may be connected to single channel or quadrature encoders. Using these inputs to index the start of a threading operation allows the operator to re-start a specific thread or turn multiple threads on the same work piece.

The encoder signal requirements are as follows:

1. RS-422 inputs (A, B, index), single ended (A) or differential signals (A+ and A-).
2. +5V output supply (+5V ±5%, 100ma)
3. Single channel (A) or 2 channel (A+B) used for spindle direction.
4. Indexing optional
5. 16 to 2048 CPR (contact FlashCut for support using encoders under 100 CPR)

1.2 PWM output

Pins 14(PWM) and 5(Ground) are for a PWM output. It is a 5V TTL level signal that can vary by frequency or pulse width depending on how it is configured in the software. The signal can source or sink up to 20mA. It is typically used for controlling a PWM controlled power level of a device such as a spindle or a laser.

Specifications:

- 0-100% Duty Cycle
- 1Hz-1MHz
- Based on two 16-but counters
    - One for high pulse
    - One for low pulse
- 2MHz clock source

1.3 Analog Output

Pins 17(Analog Out) and 8(Ground) are for a 12-bit analog output channel. This circuit is able to deliver 0 – 10V DC divided over 4,096 (2^{12}) levels approximately 2.5mV apart. It is able to drive up to a 10 kΩ load. It is typically used to control spindle speed or other devices that require a variable voltage input.

1.4 Analog Input

Pins 18(Analog In) and 9(Ground) are for an analog input. The input must be 0-10VDC and the resolution is 10 bits (1024 levels). It is typically used for reading power or temperature levels of a device in real time.

1.5 Relays

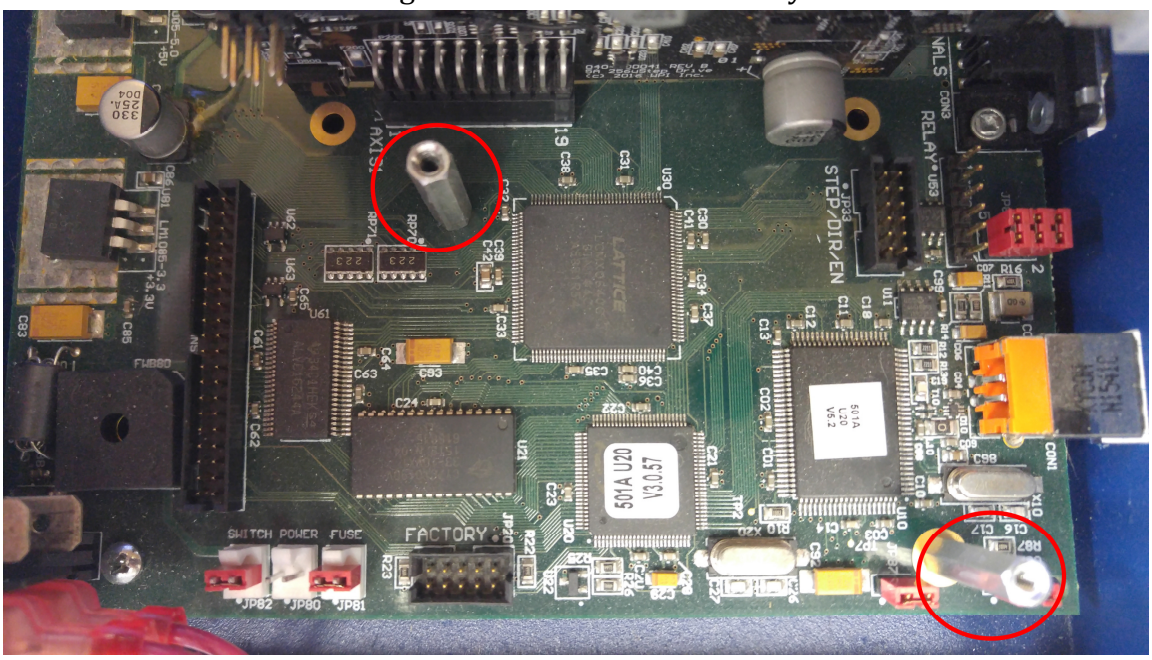
Pins 6 (Relay 1-), 7 (Relay 2-), 15 (Relay 1+) and 16 (Relay 2+) connect to two dry contact relays that are typically used for turning on and off a device or changing direction of a spindle. Each relay can handle up to 0.5A of current and up to 30V.

1.6 ATHC Operation

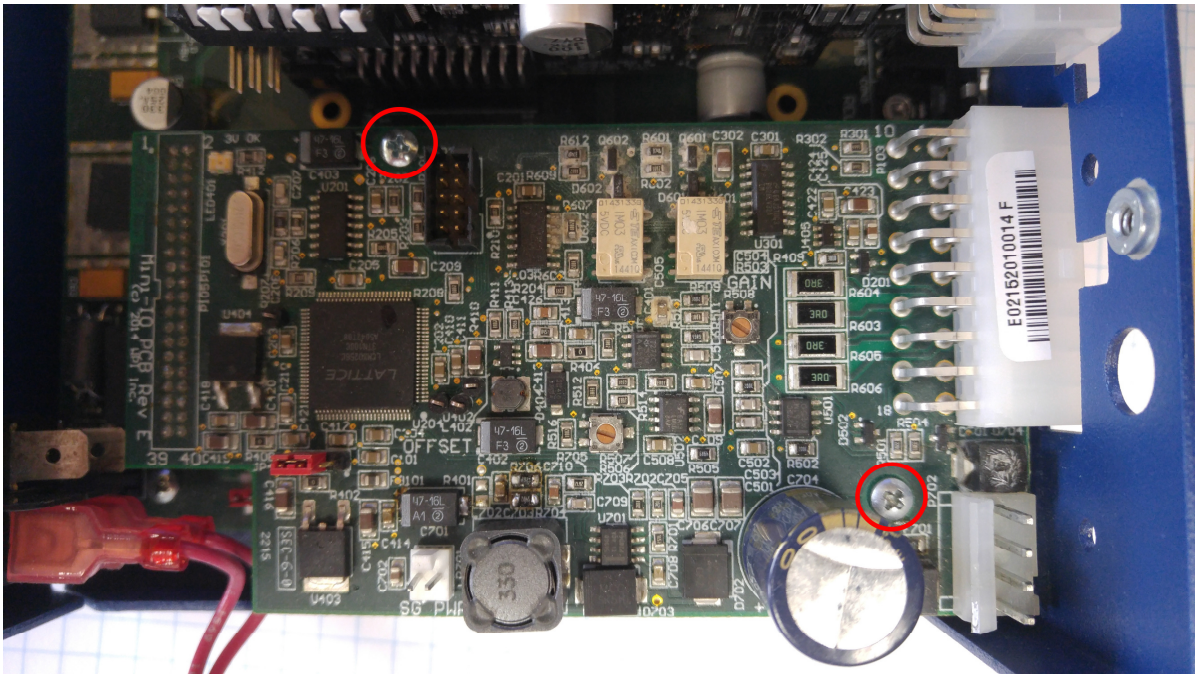
When used to interface to an ATHC Isolation Box, the A+, I+, +5VDC, Relay 1 contacts, Analog Input, and GND signals are used.

2. Installing the Mini I/O Expansion Board

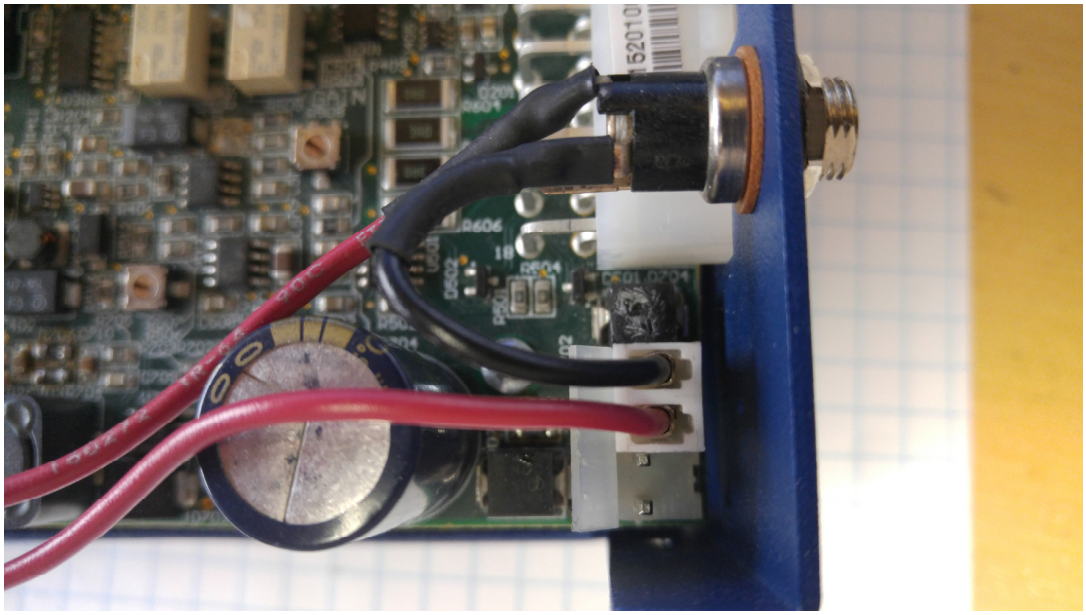
1. Install two standoffs in the Signal Generator PCB Assembly as shown.



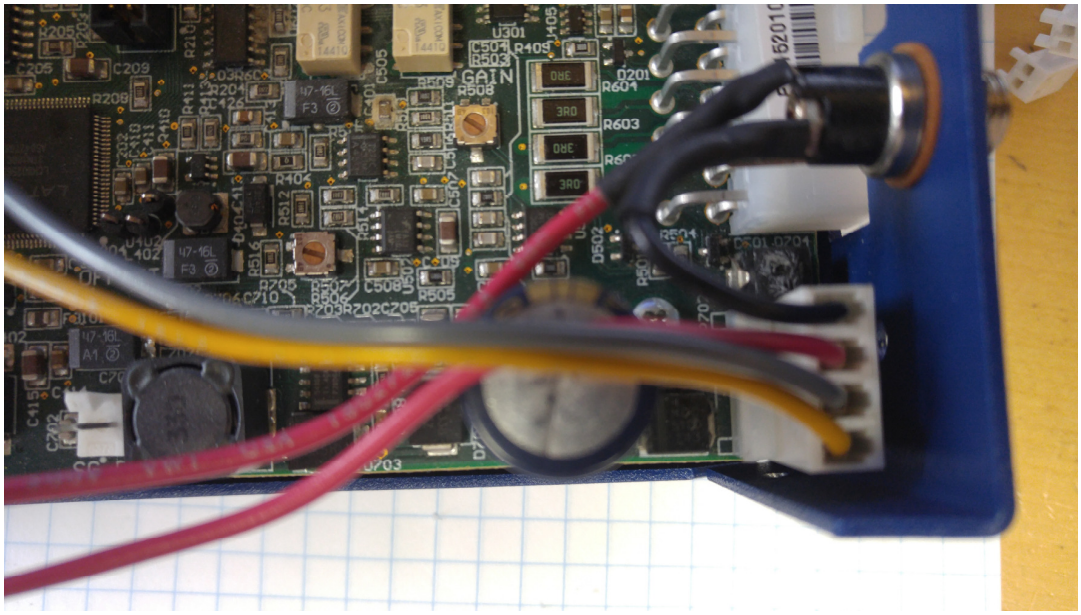
2. Install the Mini I/O Expansion Board as shown, securing it with two screws as shown.



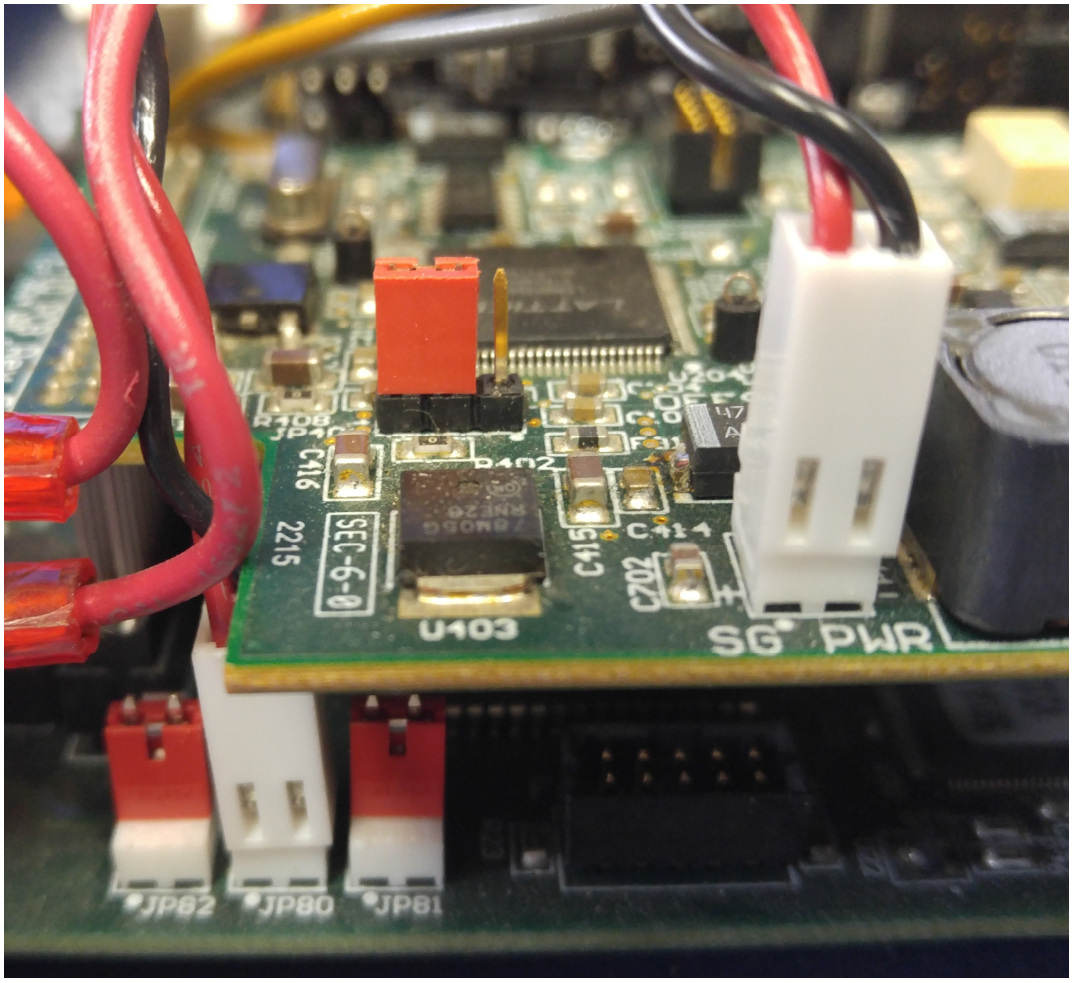
3. For Compact Chassis, connect the internal cables as shown. No internal cable connections are required for Pro Series or Titanium Series controllers.
    a. Power Input



    b. Motor Power

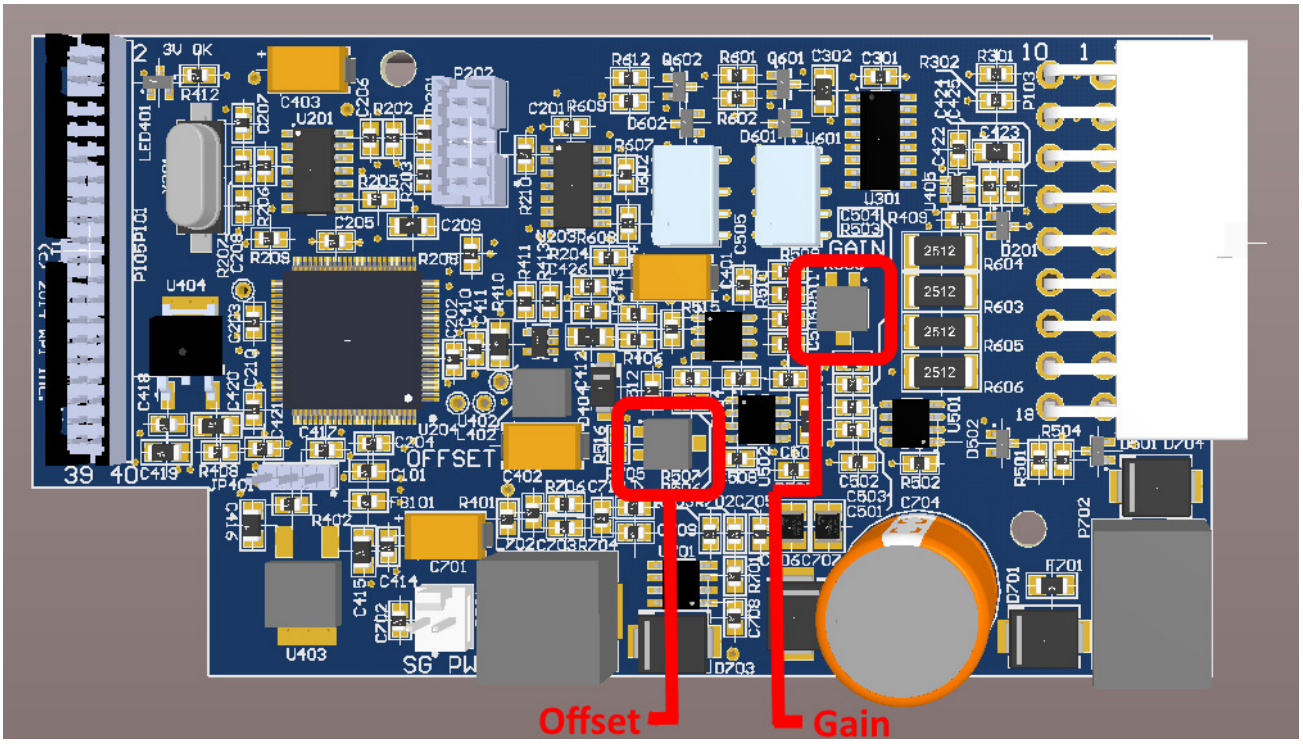


c. Signal Generator Power.
Connect the SG PWR header of the Mini IO to JP80 of the signal generator.



3. Calibrating the Mini I/O Board

The locations of the GAIN and OFFSET potentiometers are shown below. The adjustment procedure is described below.



Each Mini I/O Board that is purchased at the same time as a Flashcut Signal generator will come pre-calibrated. If the Mini I/O Board is purchased as an add-on to an existing system it is possible to calibrate the board using the following directions (you will need a multi-meter or a way to read DC voltage).

1. Begin by removing the lid of the chassis exposing the signal generator and Mini I/O board.
2. In the FlashCut software, select Configuration>>I/O>>Analog Output. Set the Output Voltage Range to have a minimum of 0V and maximum of 10V; set the Spindle Speed Range to have a minimum of 0 RPM and a maximum of 4095 RPM.
3. Use a multi-meter to find the DC voltage across the pins 8 & 17 of the 18 pin Molex connector (where 8 is the ground and 17 is analog out).
4. In the AUX panel of the FlashCut software, set the analog spindle RPM to 0.
5. Using a small flathead screwdriver, carefully turn the “OFFSET” screw (pictured above) so the voltage between pins 8 and 17 is at its most minimal point. This minimum voltage will generally be around 20 mV.

6. Now, set the analog spindle RPM to the max value, 4095.
7. Turn the “GAIN” screw so that the voltage is stable at 10 volts.
8. You have now calibrated the Mini I/O Expansion board for use with analog spindle control.

Revision History

Revision	Date	Description of Revision
--	03-07-2012	Draft
A	01-15-2013	Added Tuning procedure, Flashcut graphics, Installation instructions
B	02-04-2013	Added tables, reformatted sections
C	03/29/2018	Revised for latest revision of PCB