Mini I/O Expansion Board Hardware Guide

Getting Started

About This Manual

CNC is a unique application involving hardware and software. We recommend that you read all of these instructions before using the product.

> **Since automated machining is potentially dangerous, please take the time to completely read through this manual and the software User's Guide to understand the operation of the electronics, software and machine before cutting a part.**

Turning Off the Controller

> **Always turn off the CNC Controller when it is not in use.**

Safety and Usage Guidelines

When running an automated machine tool, safety is of the utmost importance. For proper and safe use of the CNC program and your CNC machine, the following safety guidelines must be followed:

1. Never let the machine tool run unattended.
2. Require any person in the same room as a running machine tool to wear safety goggles and to stay a safe distance from the machine.
3. Allow only trained operators to run the machine tool. Any operator must have:
   ▪ Knowledge of machine tool operation.
   ▪ Knowledge of personal computer operation.
   ▪ Knowledge of Microsoft Windows.
   ▪ Good common sense.
4. Place safety guards around the machine to prevent injury from flying objects. It is highly recommended that you build a safety shield around the entire tool envelope.
5. Never place any part of your body within the tool envelope while the machine is online, since unexpected machine movement can occur at any time.
6. Always keep the tool envelope tidy and free of any loose objects.
7. Be on alert for computer crashes at all times.

WPI, Inc. is not responsible for the safe installation and use of this product. You and only you are responsible for the safety of yourself and others during the operation of your CNC machine tool. We supply this product but have no control over how it is installed or used. Always be careful!

WPI, Inc. or its affiliates are not responsible for damage to any equipment or workpiece resulting from use of this product.

If you do not understand and agree with all of the above safety guidelines, do not use this product.

Expansion Board Applications

Spindle Speed Feedback

The board can be used for spindle encoder input 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 us for support using encoders under 100 CPR)

PWM Output

The board can also provide 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.

Specifications:

- 0-100% Duty Cycle
- 1Hz-1MHz
- Based on two 16-bit counters, one each for high and low pulse
- 2MHz clock source

Analog I/O

Analog Input

The board supports analog input from 0-10VDC with a resolution is 10 bits (1024 levels). It is typically used for reading power or temperature levels of a device in real time.

Analog Output

This expansion board can also deliver a 12-bit analog output signal. This circuit is able to deliver 0 – 10V DC divided over 4,096 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.

Relays

The board also contains two dry contact relays that are typically used for turning on and off a device or changing direction of a spindle. Each relay is rated for up to 0.5A of current and up to 30V. They are controlled internally using Outputs 1 and 2 for each respective relay.

Connector Diagram

The receptacle that plugs into this connector is a Mini-Fit Jr. Series 18 pin receptacle (Molex part number 39-01-2180), with female pins (Molex part number 39-00-0039 or 39-00-0047 for 22 gauge or thinner wires). The Molex 63819-0901 crimp tool is recommended for installing the pins. Kits containing connectors and pins are available through us or at an electronics distributor.
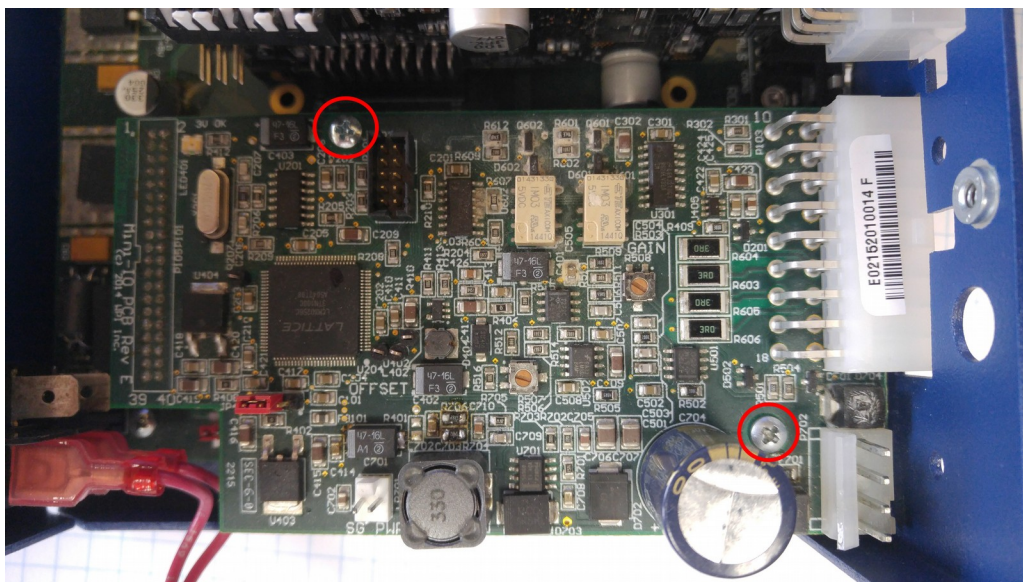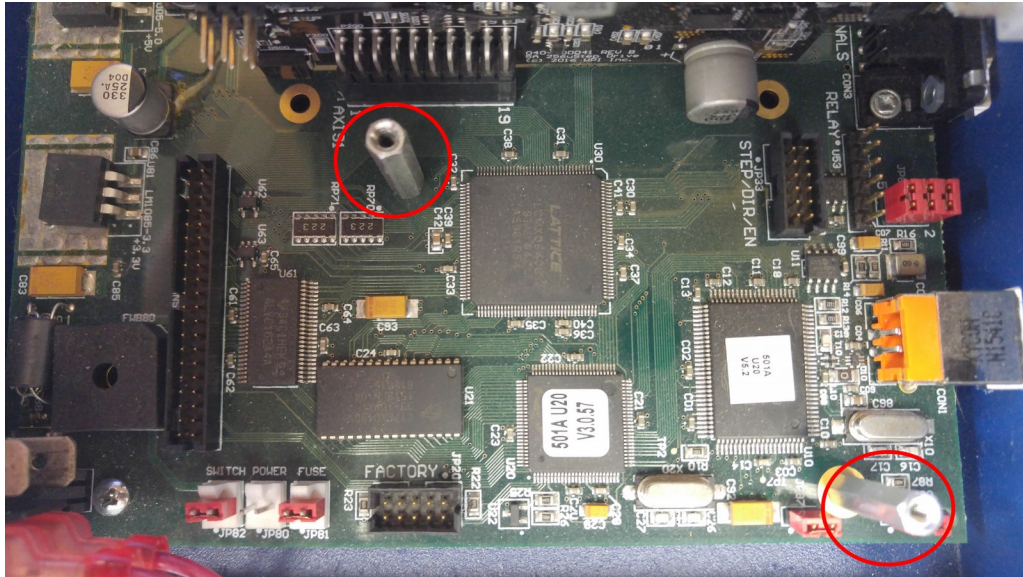
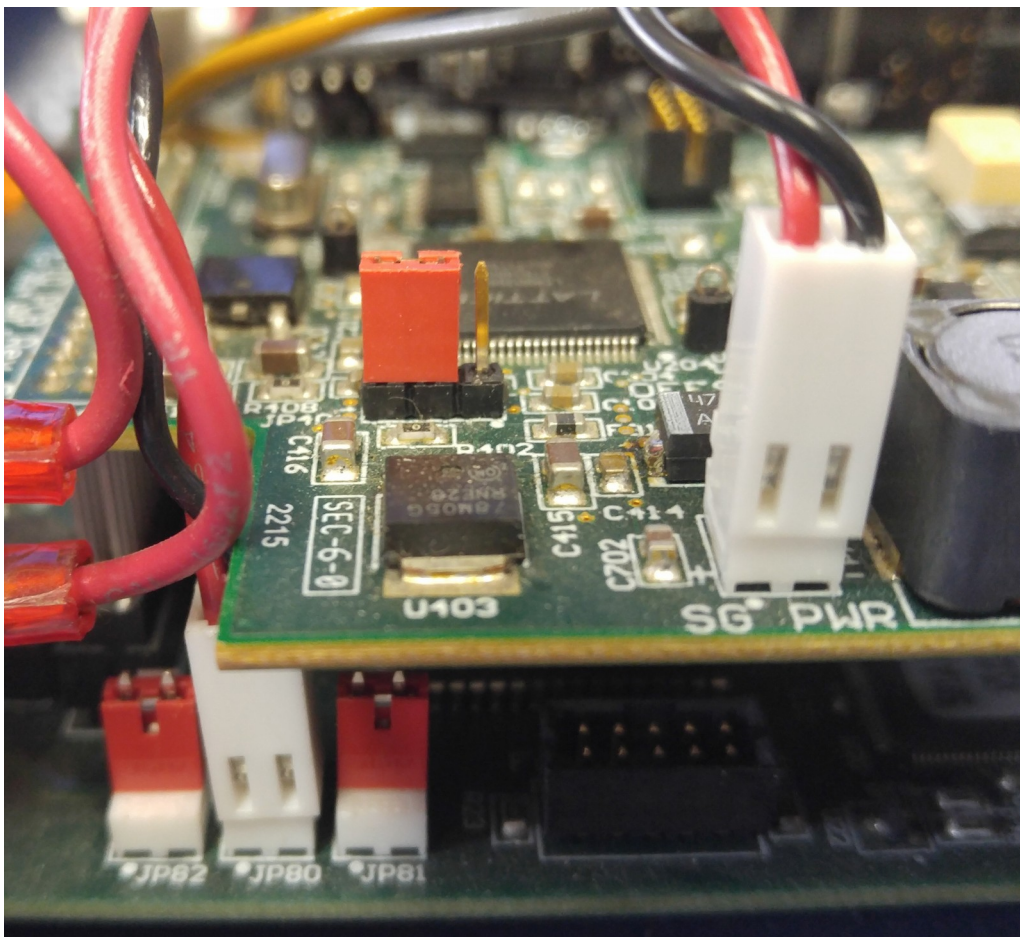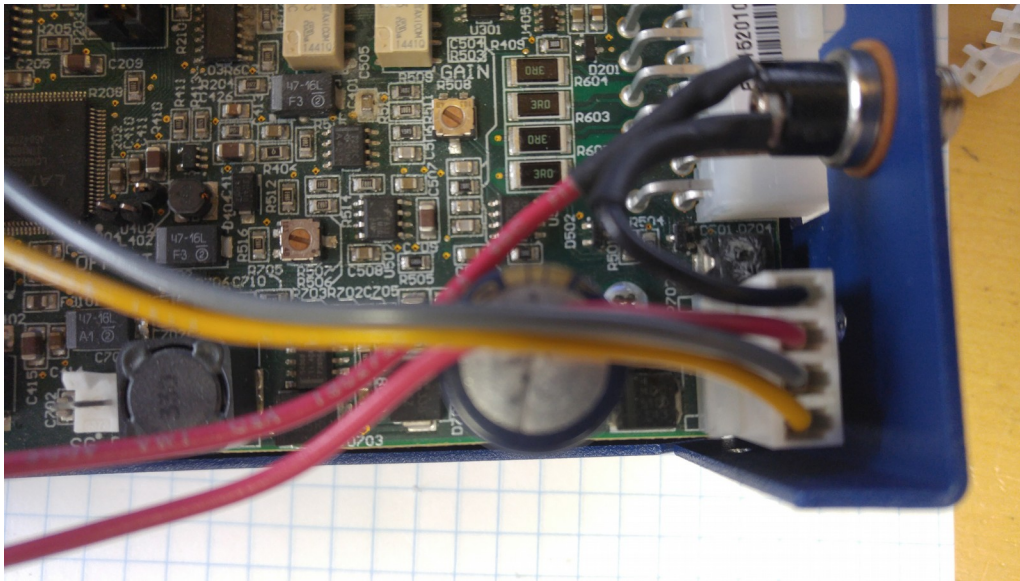| Mini I/O Expansion Board			
Pin #	*Signal*	*Pin #*	*Signal*
1	CH A-	10	CH A+
2	CH B-	11	CH B+
3	INDEX-	12	INDEX+
4	GND	13	+5 VDC
5	GND	14	PWM
6	RELAY 1-	15	RELAY 1+
7	RELAY 2-	16	RELAY 2+
8	GND	17	ANALOG OUT
9	GND	18	ANALOG IN
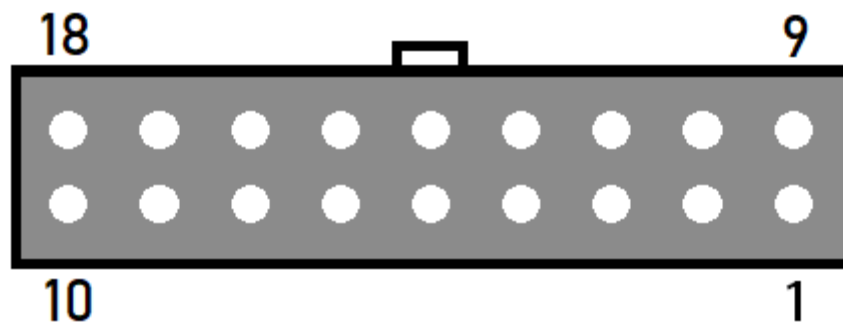
Expansion Board Installation

Mounting

First, install the two standoffs provided with the board. You will have to remove of the already-present screws. Then, seat the board in the JP32 Bus Expansion slot on the Signal Generator below. Secure the board to the standoffs using the provided screws.

Cabling (Compact Series Only)

Use the internal cabling from the previous Compact Power Board to interface the expansion board as shown in the pictures below.

Revision History

Revision A

Revision	Date	Comments
A	04/12/20	Extensive rewrite from original