
IOX16 Assembly Instructions

Revision v2.0 02/01/2016

Introduction

This document describes the functional blocks of the IOX16 expander and how to assemble it.

Revision History

| | | |
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1. IOX16 SYSTEM OVERVIEW

The Input/Output Expander 16 (IOX16) provides additional data ports that can be added to the cpNode using I/O extender cards attached through the i2C serial bus. Pin headers provide pass-through connections for the i2C signals, board to board. Each extender card has a selectable board address, which is set by onboard jumpers. A maximum of 8 extender boards can be added to a single node. All components are through-hole technology for ease of assembly and repair.

Pads for I/O connections are standardized on .100" centers. This provides a wider range of interconnect options and components. The I/O connection design is followed throughout the boards created in the cpNode system. Port connection schemes include screw terminal blocks, header pin connectors (male and female), soldered right angle headers, and direct soldered wires.

The solder pad option area has one configurable area for each I/O port. The option area consists of through-hole resistor pads and a solder jumper. The option area is not connected by default. To connect an I/O pin from the MPC23017 to a connection pad, either a solder jumper or resistor (normally used for LED current limiting) must be present. Wires can be inserted into the resistor pads if soldering the jumper pad is not desired.

Power and ground for the i2C chip are supplied by through interconnect cable as part of the i2C signal bus. The edge pads have power and ground signals, which can be picked up for, use, and off-board. A separate 5v supply can be connected through onboard pads to provide additional voltage drive for external devices. This separate power bus is Schottky diode protected to protect against cross coupling with the i2C power.

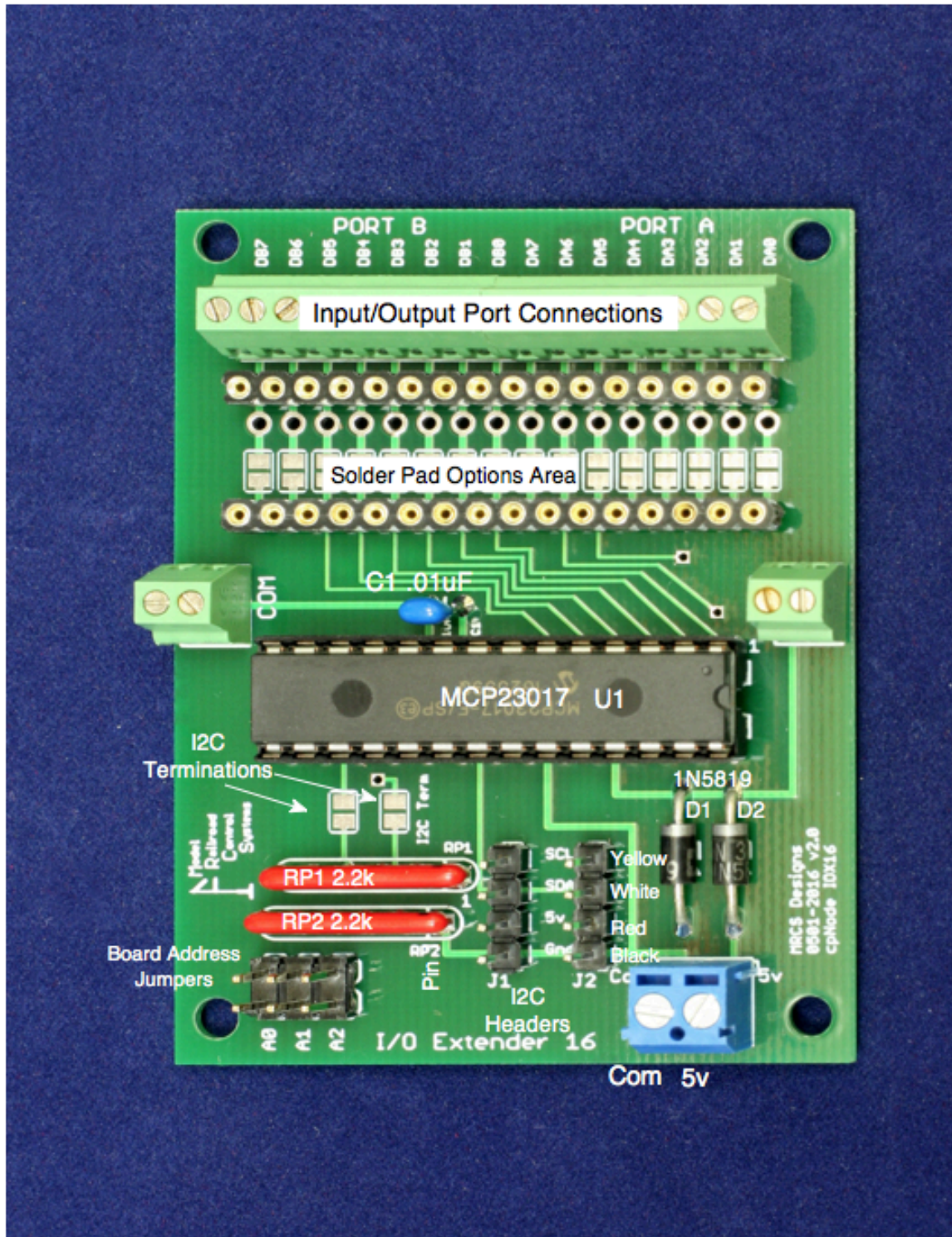


Figure 1 IOX16 Component Location

2. I2C INTERFACE

To provide additional input and output ports to a cpNode, I/O extender boards (IOX) connect to the I2C serial bus. This serial bus is tailored to driving low-level devices like LED's and contact sensors. The bus is present in some automobiles and is the interface for many dashboard and interior control functions. The cpNode connects to the input/output extender boards with four-wire cable through the I2C connector (I2CHEADER)

A MPC23017 chip provides the i2C interface. The IOX16 has 16 data ports, grouped as two bytes, which can be configured as either Input or Output. Mixing of data bit direction within a single byte is not supported. Ports configured as Input, have built-in weak pull up resistors enabled within the controller chip.

IOX boards are interconnected in daisy chain fashion using four wire .100 header cables.

An established color code for I2C wires is:

| | | |
|-------|-----|--------|
| Pin 1 | SCL | Yellow |
| Pin 2 | SDA | White |
| Pin 3 | +5v | Red |
| Pin 4 | Gnd | Black |

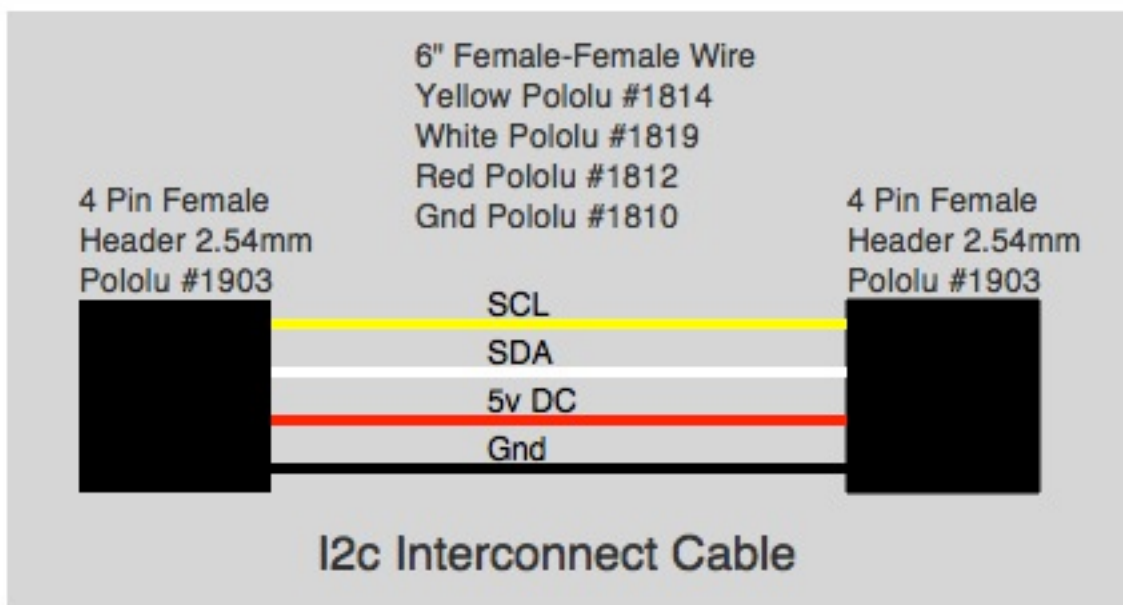


Figure 2 I2C Interconnect Cable

3. BILL OF MATERIALS

A quantity of zero may denote an alternate component or a component that may be used in a particular configuration. The LED limiting resistors are one example.

| Description | Ref | Qty | Supplier | Part No. |
|----------------------------------|-------------|-----|-------------------|------------------|
| cpNode IOX16 PCB v2.0 | PCB1 | 1 | MRCS | IOX16 |
| MCP23017 | U1 | 1 | Digikey | MCP23017-E/SP-ND |
| Resistor Pack 2.2K 6 Pin | RP1 | 1 | Digikey | 4606X-1-222LF-ND |
| Capacitor .01uF 50v | C1 | 1 | Jameco | 25507 |
| Diode Shottky 1N5819 | D1,D2 | 2 | Jameco | 177965 |
| Male pin Hdr 1x2 2.54 mm | COM,5v | 0 | Jameco | 160882 |
| Male pin Hdr 1x4 2.54 mm | I2C Hdr | 2 | Jameco | 160882 |
| Male pin Hdr 1x16 2.54 mm | IO1,IO2 | 0 | Jameco | 160882 |
| Male pin Hdr 3x2 2.54 mm | A0,A1,A2 | 1 | Jameco | 160882 |
| DIP Socket 28 pin | MCP23017 | 1 | Jameco | 526248 |
| 2 pos Screw Terminal 2.54 mm | COM,5v | 2 | Electronics Salon | GS019-2.54 |
| 8 pos Screw Terminal 2.54 mm | IO1,IO2 | 2 | Electronics Salon | GS019-2.54 |
| 2 pos Screw Terminal 3.5 mm | J1 Ext 5v | 1 | Jameco | 2094506 |
| SIP 16 machine tool round socket | Option pads | 2 | HSC | In store |
| DIN RAIL 2.75" 2TK2-48 | Mounting | 0 | Digikey | A111893-ND |
| Shorting Plug 0.100" | A0,A1,A2 | 0 | Jameco | 112432 |
| 4 wire I2C cable 6" | I2C Cable | 0 | Pololu | |

4. ASSEMBLY

- [] All of the components are through-hole technology with wire leads. A useful tool is a lead bender for forming the leads at 90 degrees for easy insertion into the pad holes. Start with inserting the lower height components.
- [] Install the IC socket for U1. Orient the sockets with pin 1 shown on the silk screen.
- [] Pull up resistor packs. These components are in single inline package (SIP) format. Orient the white dot (pin 1) to pin one on the silkscreen.
 - [] Install resistor pack RP1 (2.2k)
 - [] Install resistor pack RP2 (2.2k)
- [] Install the Shottky protection diodes, D1 and D2.
 - If external 5v power is to be supplied to the 5v power bus, install the 3.5mm screw terminal block.

[] Install the bypass capacitor C1 .1uF

[] Install the board address selector header pins, labeled A0, A1, A2 on the silkscreen.

[] Install the two I2C bus, four pin headers, J1, J2.

[] Choose the type of connector for the external COM and 5v connections. Either screw terminal blocks or header pins are appropriate.

[] Input/Output Port Connections. Depending upon the connection scheme, .100" screw terminals, header pins, or other interconnect hardware can be inserted into the pad area.

[] Solder Pad Options. For each data port, there is a solder jumper pad and two through-hole component pads. They are intended to be used to configure the electrical path between the I/O pins on the I2C chip and the physical device connection.

The default circuit path is unconnected; one option must be chosen to complete the circuit. For a straight through connection, bridge the gap with a small amount of solder. Alternatively, a wire jumper can be connected using the through-hole pads.

Current limiting resistors for LEDs can be inserted into the through-hole pads. The solder pads will accommodate surface mount technology (SMT) resistors.

Single inline package (SIP) machine tool pins can be installed to provide flexible re-configuration scenarios.