
IOX32 Assembly Instructions

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Introduction

This document describes the functional blocks of the IOX32 expander and how to assemble it.

Revision History

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1. IOX32 SYSTEM OVERVIEW

The Input/Output Expander 32 (IOX32) 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 two selectable board addresses, which is set by onboard jumpers. A maximum of four IOX32 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.

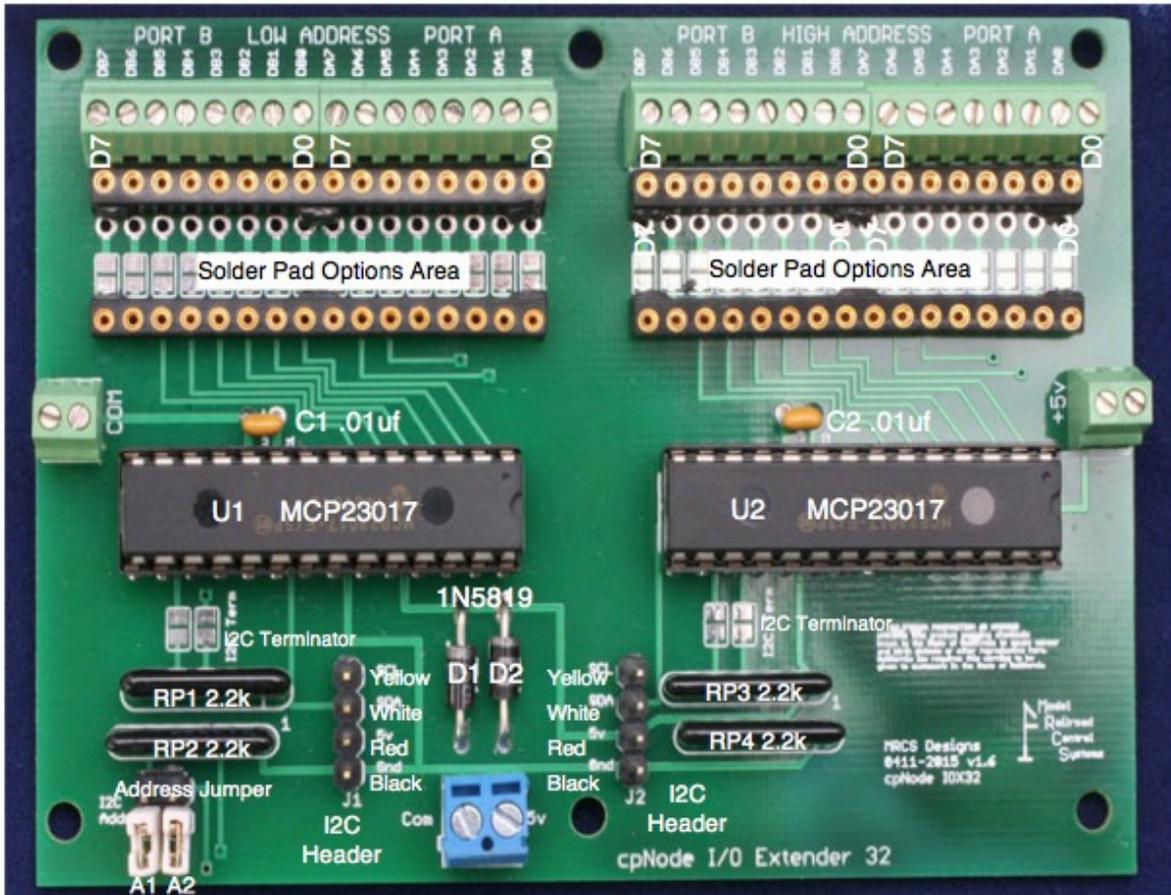


Figure 1 IOX32 Component Locations

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 IOX32 has 32 data ports, grouped as two board addresses each with 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.

IOX32 board addresses must start at an even address boundary. Setting the board address to the even address, sets the adjacent section to the higher odd address.

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

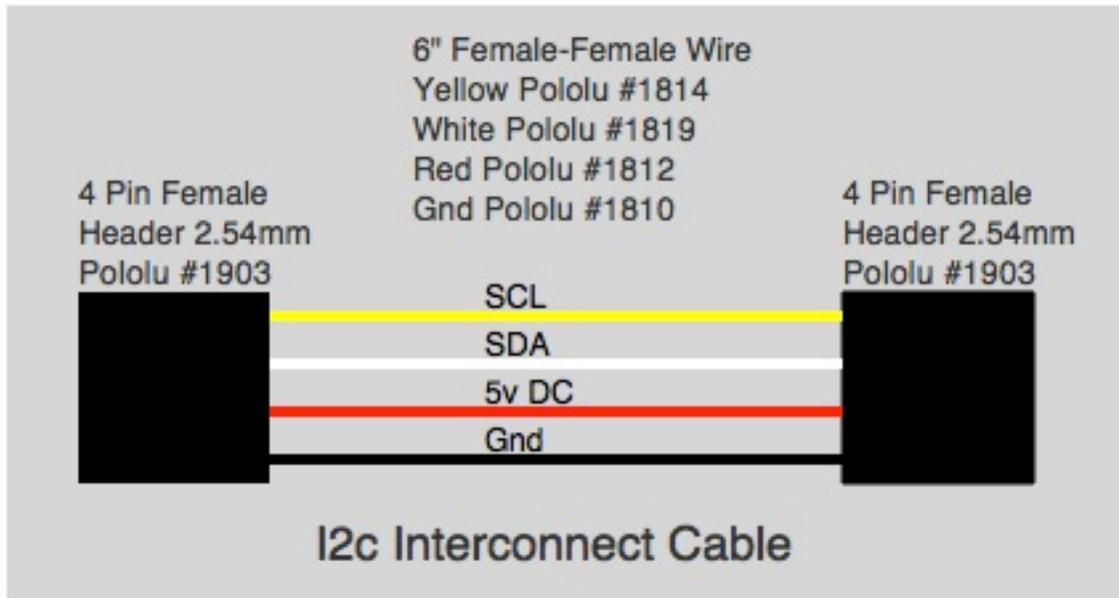


Figure 2 I2C Interconnect Cable

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 IOX32 PCB v2.0	PCB1	1	MRCs	IOX32
MCP23017	U1,U2	2	Digikey	MCP23017-E/SP-ND
Resistor Pack 2.2K 6 Pin	RP1	2	Digikey	4606X-1-222LF-ND
Capacitor .01uF 50v	C1,C2	2	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,IO3,IO4	0	Jameco	160882
Male pin Hdr 2x2 2.54 mm	A1,A2	1	Jameco	160882
DIP Socket 28 pin	MCP23017	2	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,IO3,IO4	4	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	0	Jameco	112432
4 wire I2C cable 6"	I2C Cable	1	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 sockets for U1, U2. 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 resistor pack RP3 (2.2k)

[] Install resistor pack RP4 (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 capacitors C1,C2 (.01uF)

Install the board address selector header pins, labeled 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 pin 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.