



IOPoint-EVB
IOPoint-PL Module Evaluation Board

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OVERVIEW

The IOPoint-EVB Evaluation Board provides a platform for evaluating the performance of the IOPoint-PL module and for prototyping your application.

IOPoint-EVB devices are available with the following I/O options:

- Bare-bones model ready for your I/O circuitry with prototyping area and I/O pin connections
- Two channel 12-bit analog to digital converter inputs
- Pulse metering input
- 4-20ma current output
- RS232 Serial Console

This document provides instructions for assembling your IOPoint-EVB and IOPoint-PL modules. Schematics and descriptions for the I/O options are provided to assist you in developing your application.

INSTALLATION

Assembling the IOPoint-PL and IOPoint-EVB

You will need the following items for this step. These items are provided when you purchase the IOPoint-EVB and IOPoint-PL module:

Item	Quantity	Included With
IOPoint-PL Module	1	IOPoint-PL
IOPoint-EVB with optional 2 channel A/D, Meter Input, 4-20ma output, RS232 TXD/RXD	1	IOPoint-EVB
½ inch standoffs, 6-32	3	IOPoint-EVB
¼ inch screws, 6-32	6	IOPoint-EVB
Tamura 425A12400P DC Power Supply for LonWorks Accessories	1	IOPoint-EVB

NOTE: Make certain you are properly grounded to protect the IOPoint-PL and IOPoint-EVB from ESD while handling.

Here are the steps for installing the IOPoint-PL module into the IOPoint-EVB:

- 1) Remove the IOPoint-EVB from the protective ESD bag
- 2) Open the bag containing the standoffs and screws
- 3) Locate the 3 mounting holes for the IOPoint-PL module (the 3 mounting holes line up with the IOPoint-PL module)
- 4) For each mounting hole, insert a screw from the bottom of the IOPoint-EVB and attach a standoff to the top side.
- 5) Remove the IOPoint-PL from the protective ESD bag
- 6) Line up the pins of connectors P2 and P1 and push the IOPoint-PL module down until it is seated into connectors P2 and P1 and is sitting on top of the ½ inch standoffs
- 7) Use the 3 remaining 6-32 screws to secure the IOPoint-PL module to the ½ inch standoffs
- 8) Plug the Tamura supply into the DC power connector, P101.
- 9) Plug the Tamura supply into the power socket

At this point, the PWR LED should illuminate and the SVC (Service) LED should blink once and then it will indicate the IOPoint-PL status. The SVC LED indicates the status of the IOPoint-PL module as follows:

LED on solid – IOPoint-PL is applicationless and ready to be loaded

LED blinking on/off – IOPoint-PL has an application loaded, but is unconfigured

LED Blinks once then remains Off – IOPoint-PL has an application loaded, configured and

running

IOPoint-PL modules are typically shipped in the applicationless state. If you requested a pre-loaded application, the IOPoint-PL module will come in the state you request, either unconfigured or configured.

Downloading an Application

Downloading an application may be accomplished using any of the following tools:

- LonMaker for Windows with power line network interface
- NodeUtil (available on Echelon's website) with power line network interface
- NodeLoad (available on Echelon's website) with power line network interface
- Bibaja's USB12-01 USB power line network interface and TCL application

Some Ready-Made applications for the IOPoint-PL module and IOPoint-EVB are available on Bibaja's website at www.bibaja.com.

Downloading Using LonMaker

Downloading using LonMaker requires the following two files:

- <application>.xif - Interface file
- <application>.apb - Binary application image

Following the LonMaker instructions for commissioning the device and downloading the application.

LonMaker may complain if the device is applicationless. If it does, then download NodeLoad from Echelon's website and use to load the initial application.

Downloading Using NodeUtil

Downloading using NodeUtil may be simpler than using LonMaker, but will be slower than using NodeLoad. To download using NodeUtil, you will need a power line network interface that supports OpenLDV such as the PL-SLTA, i.Lon10, or i.Lon100 interfaces available from Echelon.

Follow these steps to download an application:

- 1 – Launch NodeUtil
- 2 – Press the service button on the IOPoint
- 3 – Type “G” for Go to node and select the IOPoint from the list
- 4 – Type “Y” for Download NXE.
- 5 – When prompted for the filename, type the name of the application image file ending in “.nxe”

NodeUtil will leave the device in the unconfigured state. You must configure the device with a valid network address and change the state to configured to make the device run the loaded application.

Downloading Using NodeLoad

Downloading using NodeLoad, a utility provided by Echelon, is much simpler than trying to use LonMaker and it won't use any credits. NodeLoad also doesn't care about the state of the device. NodeLoad tries to download the application as quickly as possible using large messages.

To download using NodeLoad, you need to know the name of your network interface, the application filename, and the options for NodeLoad.

The following example tells NodeLoad to use interface LON1, wait for a service button push, and download an application from the file named "application.nei":

```
nodeload -DLON1 -W30 -Lapplication.nei
```

When the download is complete, NodeLoad will leave the IOPoint-PL in the state specified in the file "application.nei".

Another useful option in NodeLoad is to download to an unconfigured or applicationless device. If you know you have only one unconfigured or application device on your network, you can safely use this option to find the device and download an application. This saves you from having to run find the device and press the service pin:

```
nodeload -DLON1 -Q -Lapplication.nei
```

The -Q option tells NodeLoad to use Query-ID messages to find unconfigured or applicationless devices. Once a device is found, NodeLoad will download the "application.nei" file to the device.

When NodeLoad has completed downloading the application image, it will return the Neuron ID of the device and will tell you if the download succeeded.

Downloading using Bibaja's USB12-01

Bibaja's USB12-01 and TCL/TK IOPoint Toolkit is still under development. When released, it will allow you to download applications, probe network variables, and configure a small network of IOPoint devices.

Feel free to contact us for more information about this product and to offer any suggestions/requests for features in advance. (info@bibaja.com)

IOPoint-EVB HARDWARE

This section gives an overview of the hardware features of the IOPoint-EVB. See Appendix A for the IOPoint-EVB schematic.

Proto Area and I/O Connections

Proto area and holes for connecting to the IOPoint-PL I/O pins are provided.

NOTE: The I/O pin connections are wired directly to the PL3120-E4T10 microcontroller on the IOPoint-PL module. You are responsible for taking proper precautions to protect these I/O pins from ESD and other transients that could damage the PL3120-E4T10 microcontroller.

Power and ground are provided in the proto area for convenience. The maximum combined current consumption from the 5V and VA supplies should not exceed 150ma. The remaining 250ma of the total 400ma from the Tamura is reserved for the worst case transmit current.

The following table gives a brief description of the I/O and power connections available in the proto area:

Name	Description
VA	Unregulated analog voltage supply, from 10 to 16 volts
5V	Regulated 5V supply, from 4.75 to 5.25 volts
RST	Active low reset. Goes low (0V) when the reset button is pushed or when the IOPoint-PL module drives reset low. This pin is open collector and may be used to reset external logic or to reset the IOPoint-PL module. DO NOT DRIVE THIS SIGNAL HIGH. Driving this signal high may cause improper code execution and corruption of memory in the IOPoint-PL module.
IO0-IO11	General purpose digital I/O pins.
GND	Ground connection for application circuits

Two Channel 12-Bit A/D Converter Inputs

Two 3.5mm stereo phone jacks serve as the inputs to the on board A/D converter. The A/D converter used is a Microchip MCP3204 with a 2.5V reference voltage input. Specification for the MCP3204 are available on Microchip's website.

The pin assignments for the 3.5mm stereo phone jack plug are:



Pin	Connection
TIP	2.5V reference voltage
RING	A/D Input Signal
SLEEVE	Ground

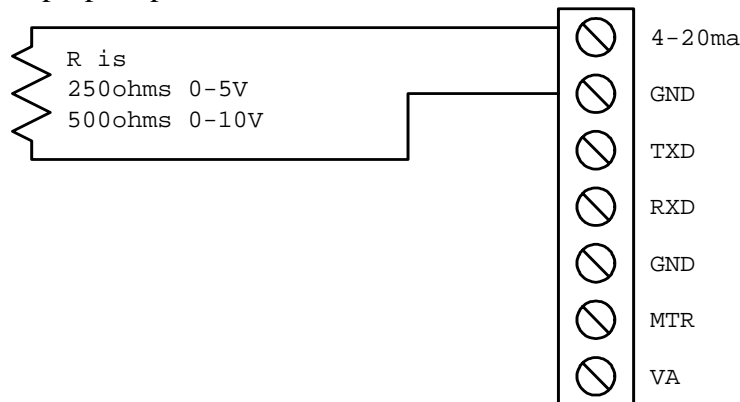
P201, next to the TX LED, is the input for A/D converter channel 1. P202 is the input for A/D converter channel 2 adjacent to the 2.54mm screw terminal block.

These two ports interface directly to Decagon's ECH₂O Soil Moisture and Temperature probes (www.ech2o.com).

4-20ma Current Output

The first screw terminal adjacent to phone jack P202 is the 4-20ma current output. This output produces current from 0.1ma to 20.0ma in steps of 0.1ma. 0.0ma is not possible due to the circuit implemented for the EVB.

The current loop should be connected between the 4-20ma screw terminal and the ground screw terminal for proper operation as follows:



The 4-20ma output may be used to produce a control voltage at the far end of a loop as shown above. To produce a 0 to 5 volt control, place a 250 ohm resistor just in front of the device at the far end of the loop. This will give a control range of 0.025 to 5 volts using a current of 0.1ma to 20.0ma.

Using a 500 ohm resistor, you may produce a 0.05 to 10 volt control voltage. You must make certain that the VA supply remains at or above 12 volts to insure adequate headroom for proper loop operation.

The pulsewidth output using the integrated counter in the IOPoint-PL is used to create a voltage reference used by the voltage to current converter circuit on the IOPoint-EVB. IO0 is configured to output a 19.53kHz pulsewidth modulated output in Neuron C as follows:

```
IO_0 output pulsewidth clock(0) ioPWM0;
```

Three resistors on the IOPoint-EVB set the output current based on the voltage produced by an RC attached to the IO0 output. Assuming the supply voltage is 5 volts, the RC circuit will produce a voltage according to the following equation:

$$V_{RC} = (\text{pulsewidth setting } 0\text{-}255) / 256 * 5 \text{ volts}$$

The values of the three resistors are:

$$R207 = 2.05\text{Kohms}$$

$$R206 = 1.05\text{Kohms}$$

$$R208 = 100 \text{ ohms}$$

The output current is determined by a function of these 3 resistor values and V_{RC} as follows:

$$I_{out} = (V_{RC} / R207) * R206 / R208$$

$$I_{out} = ((5 * \text{pulsewidth} / 256) / 2050) * 1050 / 100$$

$$I_{out} = \text{pulsewidth} / 9996.19$$

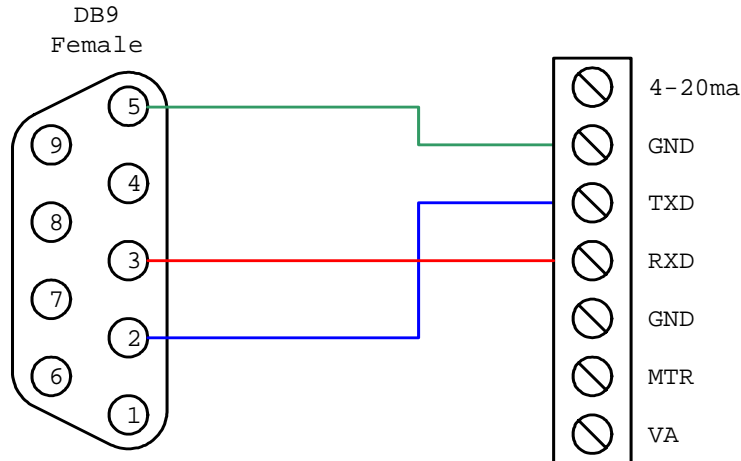
The pulsewidth setting for 4ma is 40, and the pulsewidth setting for 20ma is 200. This is controlled from Neuron C by issuing the following commands:

```
io_out(ioPWM0, 40); // Set current to about 4ma  
io_out(ioPWM0, 200); // Set current to about 20ma
```

RS232 TXD/RXD

Screw terminals are provided for RS232 level transmit data (TXD) and receive data (RXD) signals. A MAX232 RS232 level translator converts the digital levels of IO8 and IO10 (RX and TX) to RS232 line levels.

Connection to the screw terminals for the RS232 serial port may be made as follows:

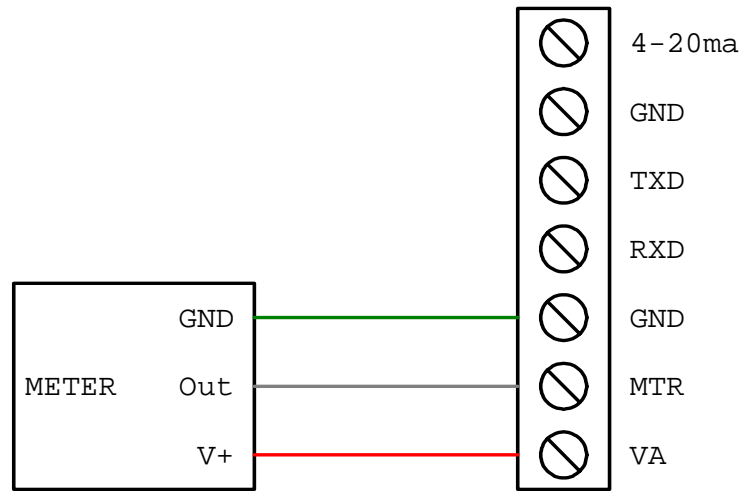


For customers developing their own application using the IOPoint-EVB, two spare RS232 level translators are available (see back of IOPoint-EVB). These spare translators may be used to implement flow control or a bit-banged serial port using the IOPoint-PL or other future IOPoint modules.

Pulse Meter Input

The pulse meter input is designed to support open collector and contact closure type pulse meters. An internal pull-up keeps the meter input at 5V until a contact closes or an open collector transistor pulls the meter input low. An RC filter on the input reduces susceptibility to noise and limits the maximum frequency of operation to 125 pulses per second.

The following diagram shows how a meter requiring a supply voltage might be connected:



Meters usually accept a broad supply voltage range. Confirm that your meter will accept a supply voltage in the range of 10-16 volts if you use the unregulated VA supply output. Remember also that the sum of the current drawn from the VA and 5V supplies must not exceed 150ma.

Reset Button

A reset button is provided to reset the device in case something goes awry with application execution. The reset button is labeled RST in the silkscreen just behind the button. The reset button is located next to the VA screw terminal.

Service Button and LED

The service button triggers the IOPoint-PL to send its unique 6-byte address on the network when pressed. This is used during installation so the installer knows the unique address of the device. The adjacent service LED indicates when the button has been pushed, and the LED also indicates the state of the device. The behavior of this LED means the following things:

Blinks after reset then turns on solid -
IOPoint-PL is operating, but no application is loaded

Blinks after reset, then blinks on and off constantly –
IOPoint-PL has an application loaded, but it is unconfigured

Blinks once after reset, then stays off –
IOPoint-PL has an application loaded and is configured and running

If the Service LED comes on when the device is powered on, but does not blink once, then it could indicate your IOPoint-PL module has malfunctioned. Check to be certain the module is seated properly in the socket and has the correct supply voltages.

When the service button is pressed, the service LED will blink and the TX LED will blink indicating the unique ID has been transmitted on the power line network.

TX, RX, and BIU Network Activity Status Indicators

The three LEDs TX, RX, and BIU indicate the network activity and status.

TX blinks when the IOPoint-PL transmits a packet on the network

RX blinks when the IOPoint-PL has detected a packet on the network.

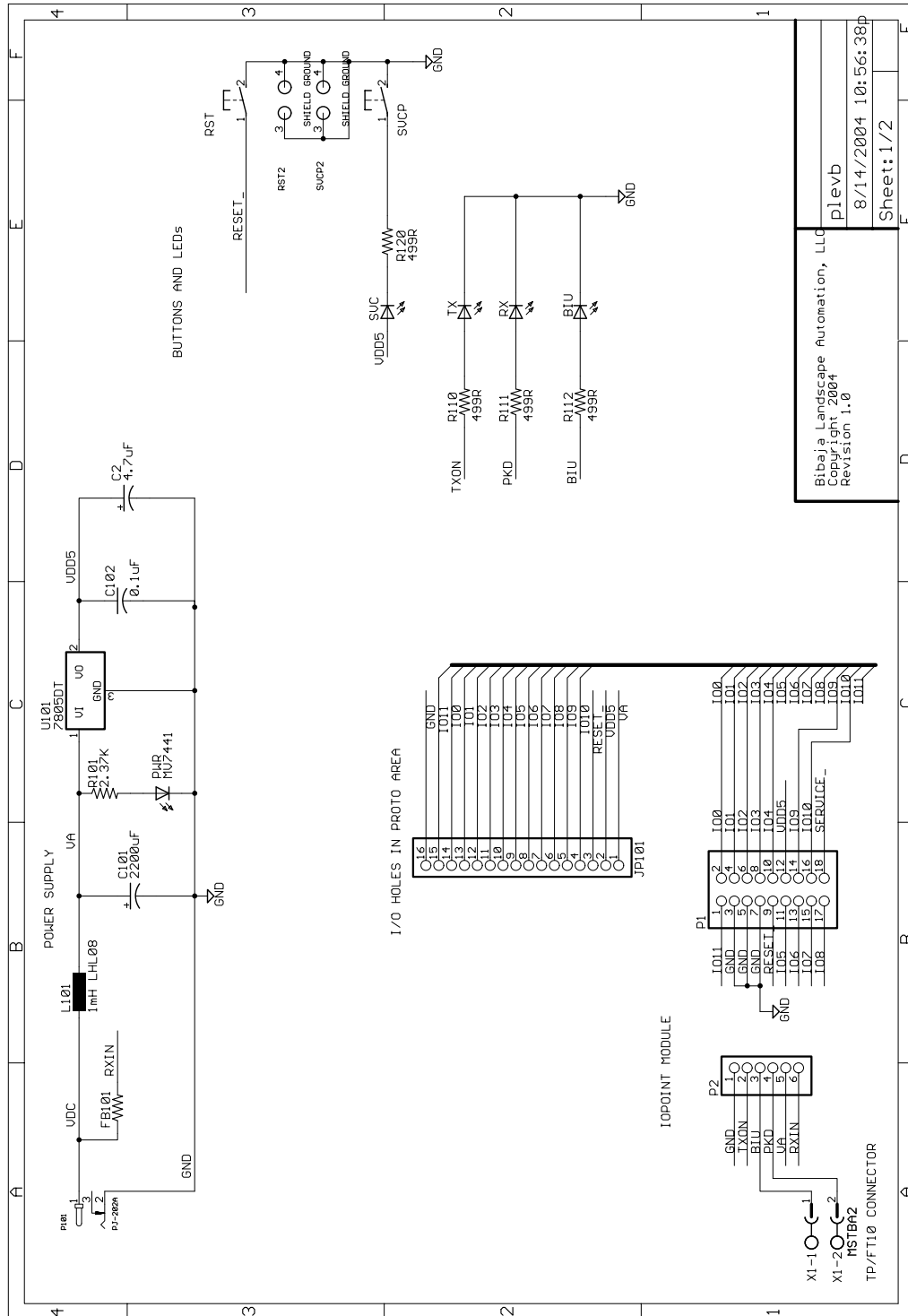
BIU, short for band in use, detects that a signal or noise of some kind is present in the 132kHz region. Both BIU and RX will blink if another IOPoint-PL is located nearby on the power line network. Only RX will blink if the other IOPoint-PL is remote on the network. This is because the BIU LED will only blink if the signal on the network is above a certain threshold

Tamura Power Supply with Integrated Coupling Circuit

The Tamura power supply provided with your IOPoint-EVB includes an integrated coupling circuit. Without this circuit, the power line communications would be blocked by the step-down transformer inside the wall plug supply. If this supply should fail for some reason, you will either need to purchase another one from Bibaja or directly from Tamura corporation. Regular wall plug supplies will not work with the IOPoint-PL device.

NOTE: Reversing the supply voltage on P101 will damage the IOPoint-EVB and the installed IOPoint-PL module. Use only the Tamura supply provided with your IOPoint-EVB. You may contact Bibaja for a replacement supply.

APPENDIX A – IOPOINT-EVB SCHEMATIC



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Revision 1.0
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Sheet: 1/2

