

# WireBridge I/O

## **User Manual**

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## Overview

WireBridge I/O is a hardware and software solution that allows additional I/O functionality to be easily integrated into the robot. The provided URCap installation node allows live monitoring and control of the additional I/O, while the program node steps, make it easy to control the I/O within a program's execution.

The ethernet link between WireBridge and the robot allows remote monitoring and control applications.

## Installation

### Installation Steps Overview

- 1) Install provided URCap
- 2) Set robot IP address to be in the same subnet as default WireBridge IP
- 3) Connect Ethernet cable between robot and WireBridge
- 4) Install optional C-Series modules
- 5) Plugin WireBridge power supply
- 6) Navigate to WireBridge I/O installation tab and press "Scan"

The connected I/O modules will be displayed as shown in Figure 4.

### URCap Installation

After inserting the provided WireTank usbstick into the teach pendants USB port, the URCap installation can be done by pressing the "Hamburger" menu at the top right of the Polyscope software. Figure 1 below shows the URCap installation screen. Click the "+" button and navigate to the URCap file, WireBridgeIO-2.0.urcap, on the USB stick. A Polyscope restart is required for the URCap installation to complete.

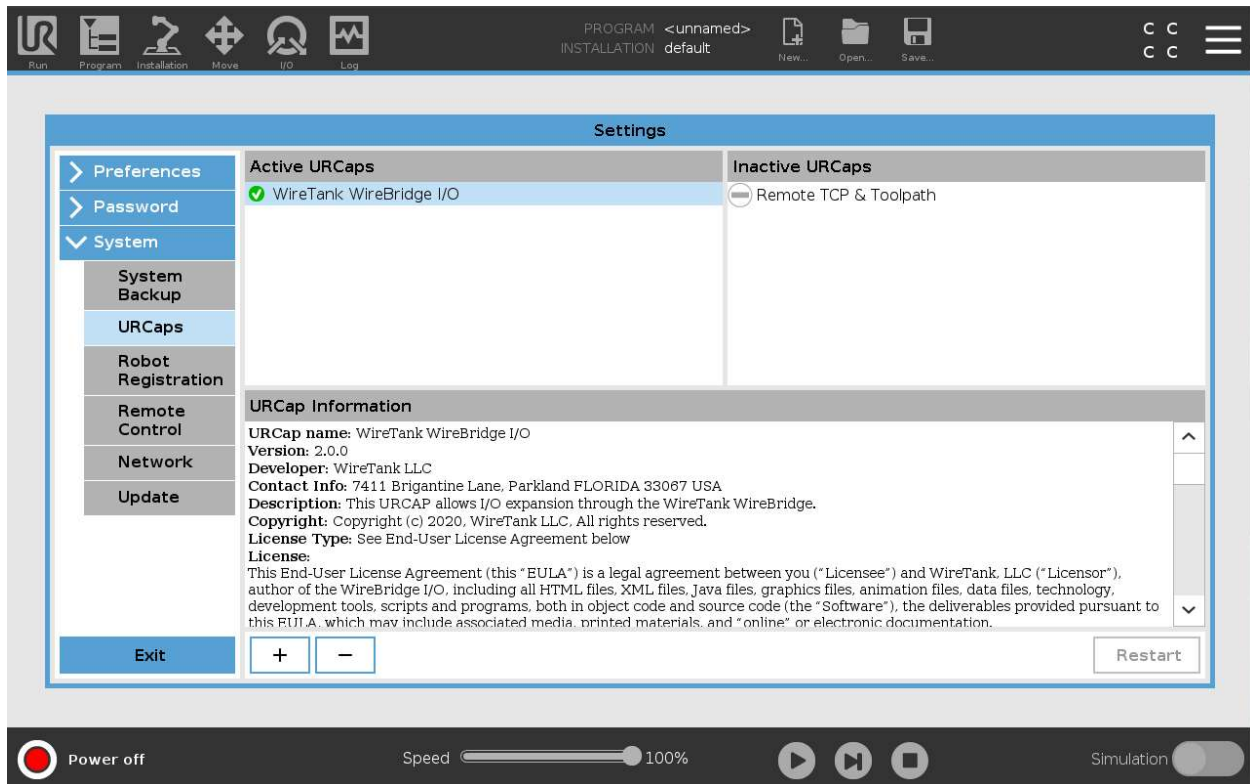


Figure 1 – URCAP Installation

## Network Setup

WireBridge ships with a static default IP address of 10.0.1.1. In order for the robot to be able to communicate with WireBridge, the robot network settings need to be configured to have a static IP address in the same subnet as shown in Figure 2.

If a static IP address is not possible because the robot is part of a DHCP network, please follow the steps outlined in the “Advanced Network Configuration” section below.

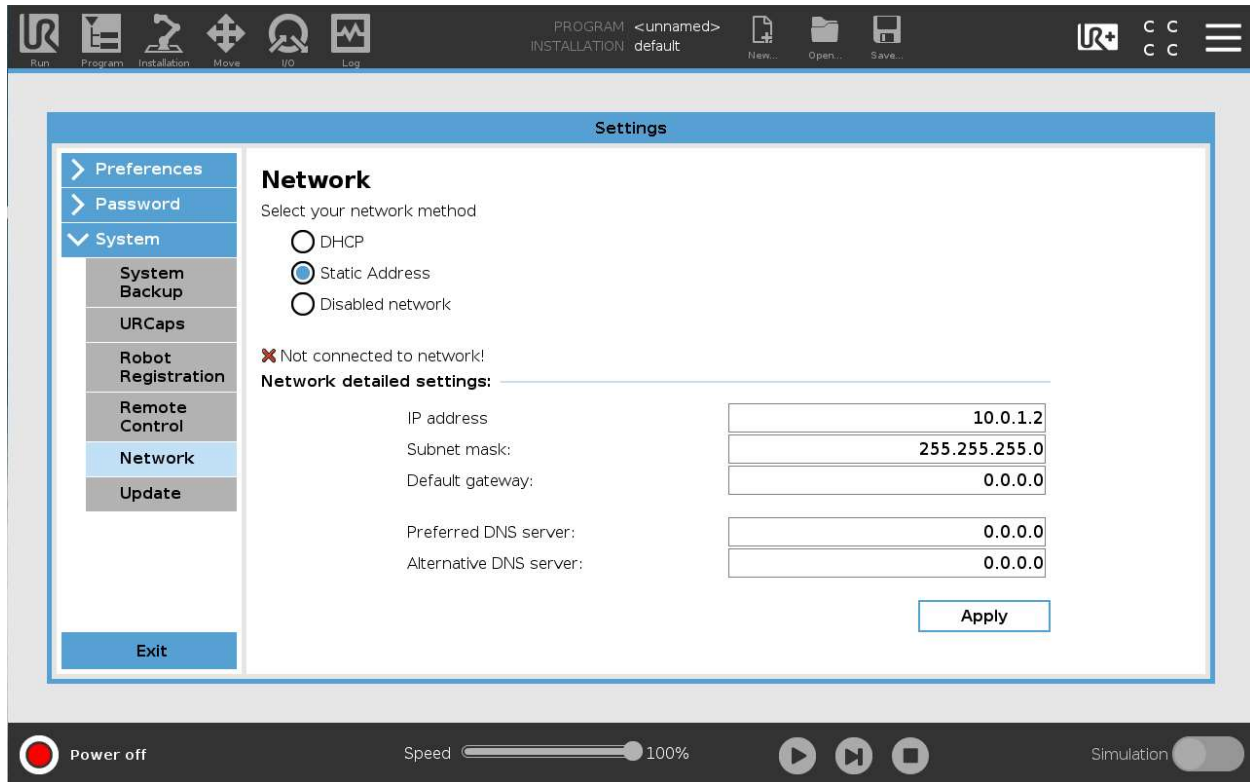


Figure 2 – Network Setup

## Cable connections

Power to the WireBridge is provided via the “Screw-In” power connector as shown in Figure 3a. The connector is keyed so there is no danger in placing it incorrectly but please be careful to align the key.

The ethernet port is shown in Figure 3b and can be connected directly to the robot’s ethernet port as the WireBridge supports “auto-crossover”.

If a router with DHCP is needed, please follow the instructions in the “Advanced Network Configuration” section.

The serial port of the WireBridge can be accessed by purchasing an additional URCap called WireBridge Serial. This URCap allows full control of the serial port both for sending and receiving commands.



Figure 3 – WireBridge Chassis

## Electrical Power Requirements

Voltage Input Range	9 VDC to 30 VDC
Maximum Power Input, with all slots populated	18 W

## Ethernet Specifications

Network Interface	10Base-T, 100Base-T, 1000Base-T Ethernet
Communication Rates	10 Mbps, 100 Mbps, 1000 Mbps auto-negotiated, half/full-duplex
Maximum cabling distance	100 m/segment

## Operation

Interacting with WireBridge I/O from within Polyscope is extremely simple. After installing the provided URCap, an installation node and two program nodes will be available within the URCap sections, respectively.

The installation node can be used for live monitoring and control of the WireBridge I/O in nearly the same way as the I/O tab that is used to control the native I/O.

## Slots

The WireBridge I/O has four slots that can be loaded with C-Series I/O modules sold online by National Instruments or provided at cost by WireTank at the time of purchase. The modules in each slot are recognized at power up by the WireBridge chassis and are therefore field loadable by the user.

Slots that are not populated will show as empty. The slots are numbered from Slot 1 to Slot 4, also showing the model number. WireBridge will scan the slots at power-up, so the modules should be installed BEFORE applying power to the WireBridge chassis. Swapping modules while the power is on, is also not supported.

## Lines

Lines are the individual signals of each slot. Line numbering starts at 0. Analog out lines will show as sliders, analog input lines will show as progress bars and digital lines will show as checkboxes. Each module in a slot will recognize the amount of lines available and populate the user interface accordingly.

## Line Naming

In order to simplify programming, lines can be named, similarly to the functionality of native I/O for the robot. The names will travel with the slot, using the serial number as the key, so moving slots around will not erase line naming. This is done from the WireBridge I/O installation node shown in Figure 4.

Line names are assigned using the “LINE NAME” text field, once the appropriate slot and line have been selected. The default names can be reassigned by pressing “Clear” for that particular slot and line combination.

These line names will not show up in the read and write program nodes, since the user may want to write the program while not connected to the WireBridge.

Installation and program variables can be used for this case, they can be created and assigned to a particular slot and line index and then recalled in the read and write nodes.

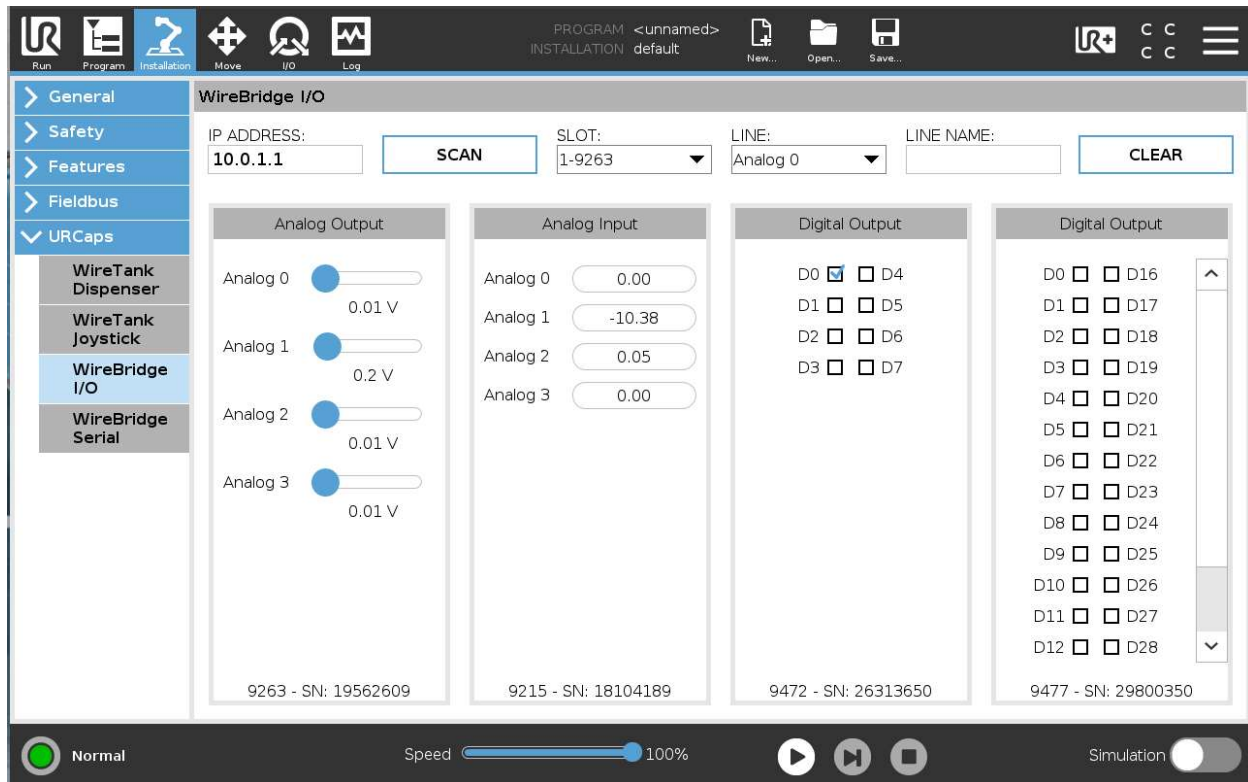


Figure 4 – Installation Node

## Read Program Node

The WireBridge I/O Read program node can be used to read the state of any slot/line combination into a program or installation variable as a number as shown in Figure 5.

Analog lines will have the read analog value while digital lines will have a value of 0 when false and a value of 1 when true.

The slot and line selections can either be statically selected or can be defined using variables. The ability to use variables can be very convenient when looping through lines to look for a particular value or if slots and lines are defined via installation values so that they can be easily changed from one place rather than having to change every program node that uses that slot or line.

There is also a convenience text field that can be used to create variables directly within the program node. This variable, once created, is automatically assigned as the output variable.



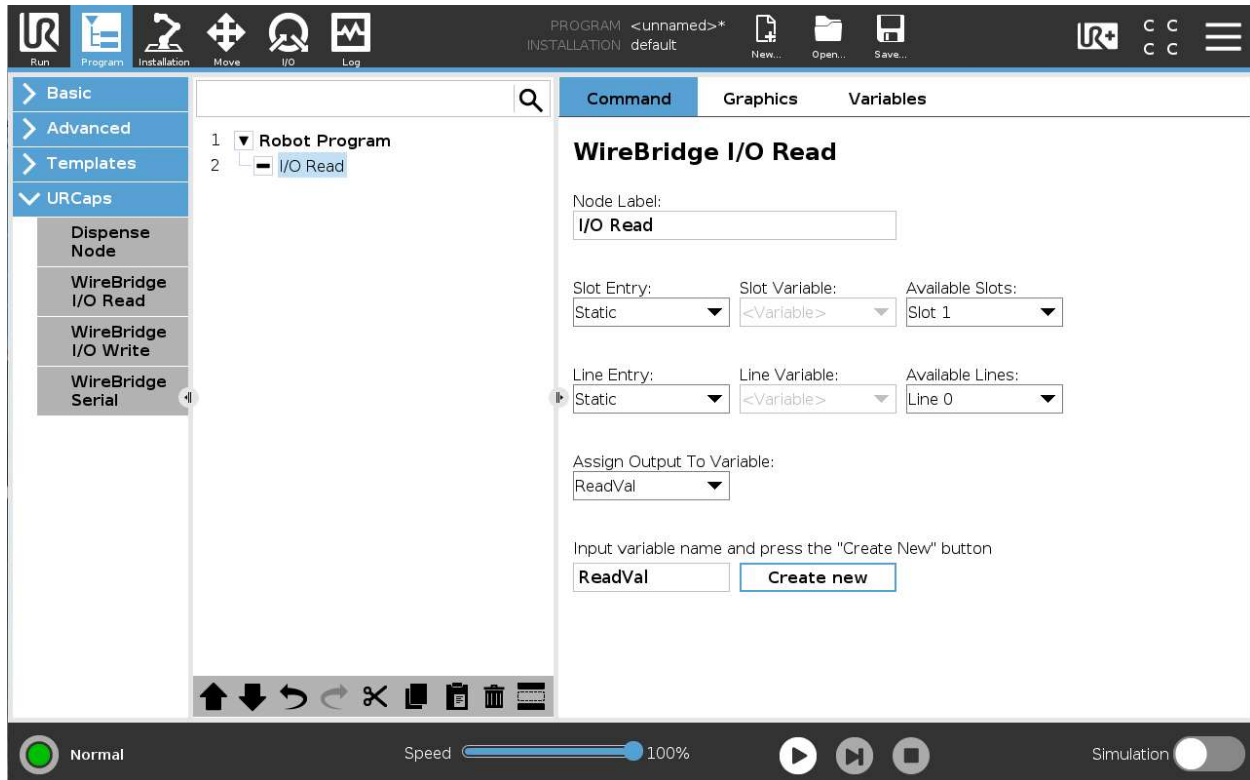


Figure 5 – IO Read Program Node

## Write Program Node

The WireBridge I/O Write program node is like the read node except that it is used to write the values of a line. As with the read node, slots and line selections can either be static or variable. The output value to write can also be a static value or a variable.

For example, in Figure 6, the write node has been configured to use an installation variable called “i\_Digital\_Mod” for the slot, and the program variable “Loop\_1” for the line. In the program, the loop is configured to run 8 times, which will therefore set all digital lines for the module as high.

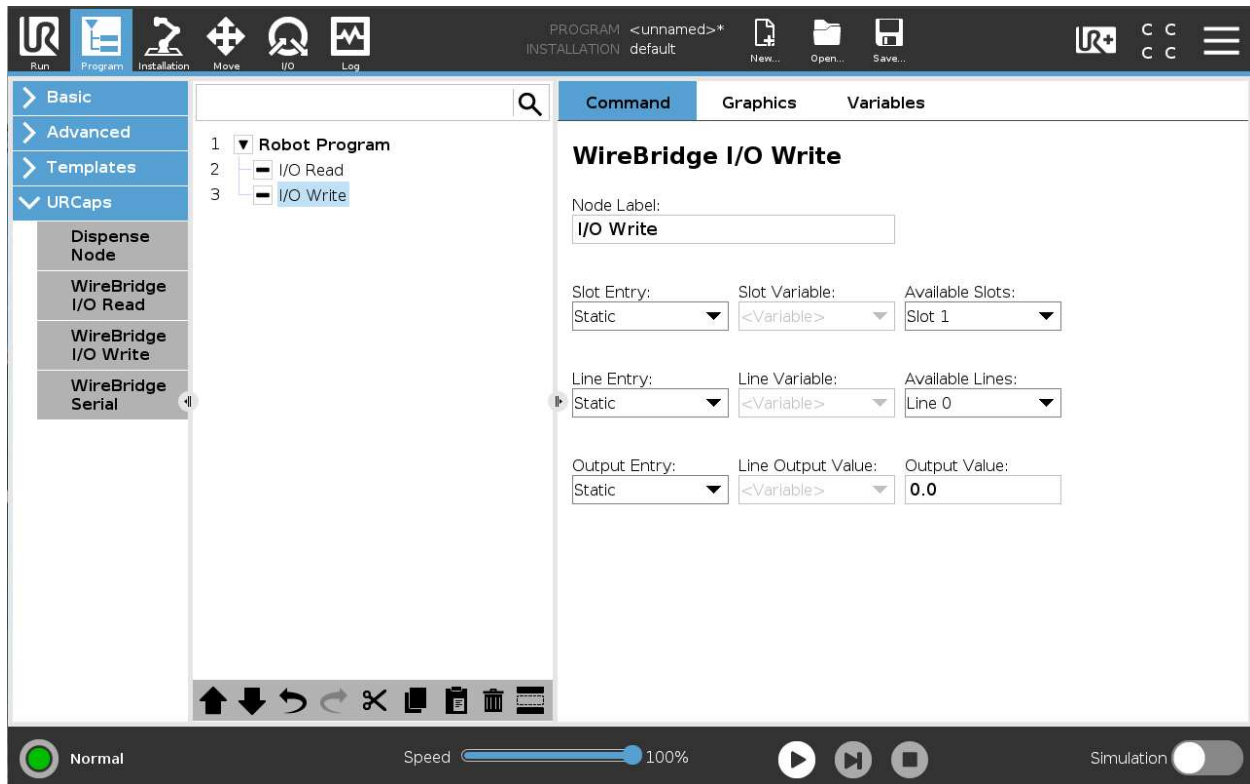
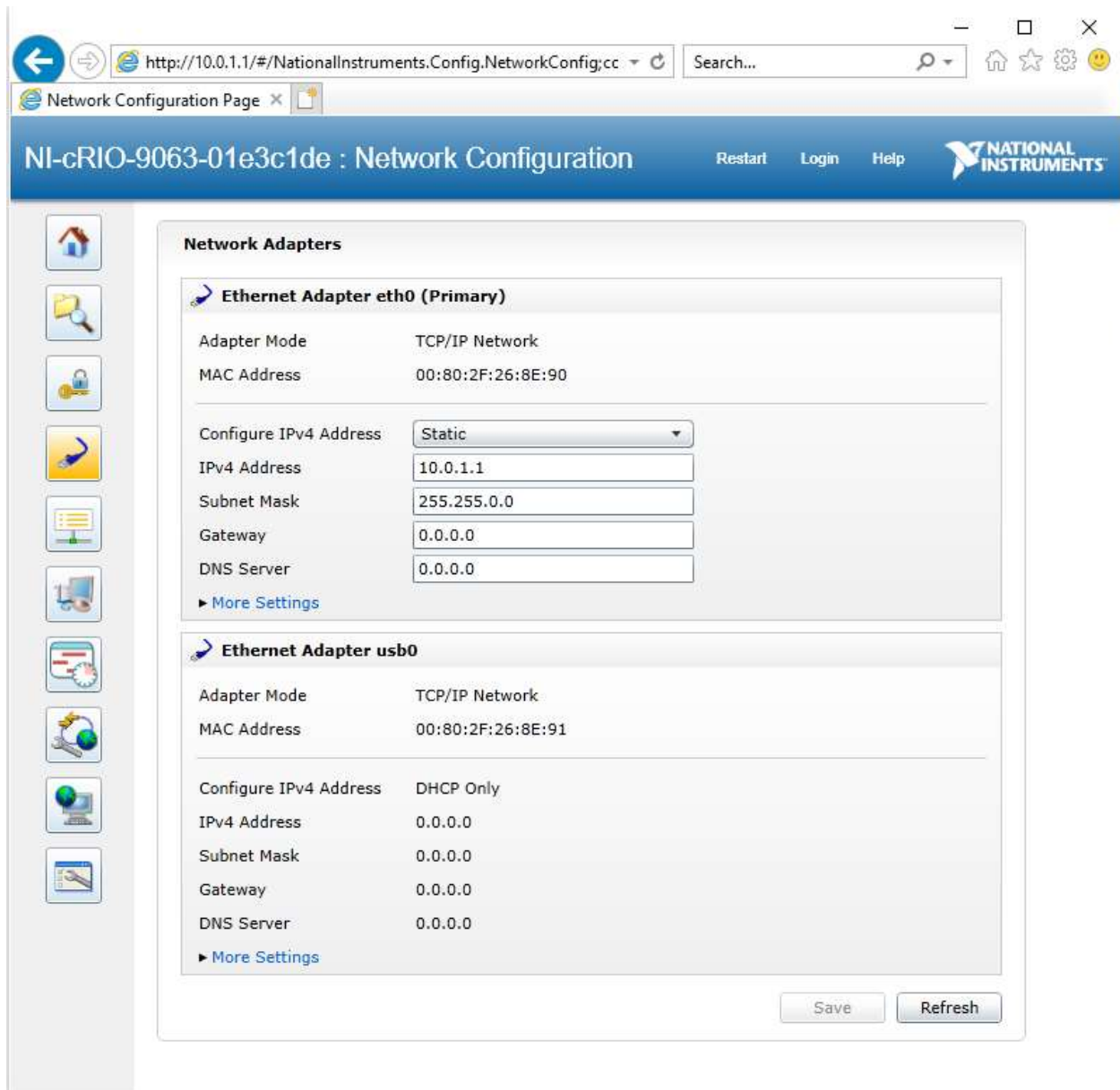


Figure 6 – IO Write Program Node

## Advanced Network Configuration

For more advanced network setups, the network settings of the WireBridge can be modified as needed. In order to change network settings, the following steps must be followed:

- 1) Set your computer's network card settings to be on the same subnet as the default settings of the WireBridge
  - a. IP: 10.0.1.100
  - b. Subnet: 255.255.255.0
- 2) Using Internet Explorer, navigate to <http://10.0.1.1>
  - a. Note, other browsers will not be compatible with this step as the SilverLight plugin is used.
- 3) Click on the network icon, as shown in Figure 7, and set the network settings according to your IT department's suggestion.
- 4) Click "Save" and power cycle the WireBridge for the network settings to take effect.



http://10.0.1.1/#/NationalInstruments.Config.NetworkConfig:cc

Network Configuration Page

NI-cRIO-9063-01e3c1de : Network Configuration

Restart Login Help

**Network Adapters**

**Ethernet Adapter eth0 (Primary)**

Adapter Mode	TCP/IP Network
MAC Address	00:80:2F:26:8E:90
Configure IPv4 Address	Static
IPv4 Address	10.0.1.1
Subnet Mask	255.255.0.0
Gateway	0.0.0.0
DNS Server	0.0.0.0

[More Settings](#)

**Ethernet Adapter usb0**

Adapter Mode	TCP/IP Network
MAC Address	00:80:2F:26:8E:91
Configure IPv4 Address	DHCP Only
IPv4 Address	0.0.0.0
Subnet Mask	0.0.0.0
Gateway	0.0.0.0
DNS Server	0.0.0.0

[More Settings](#)

Save Refresh

Figure 7 – WireBridge Advanced Network Configuration