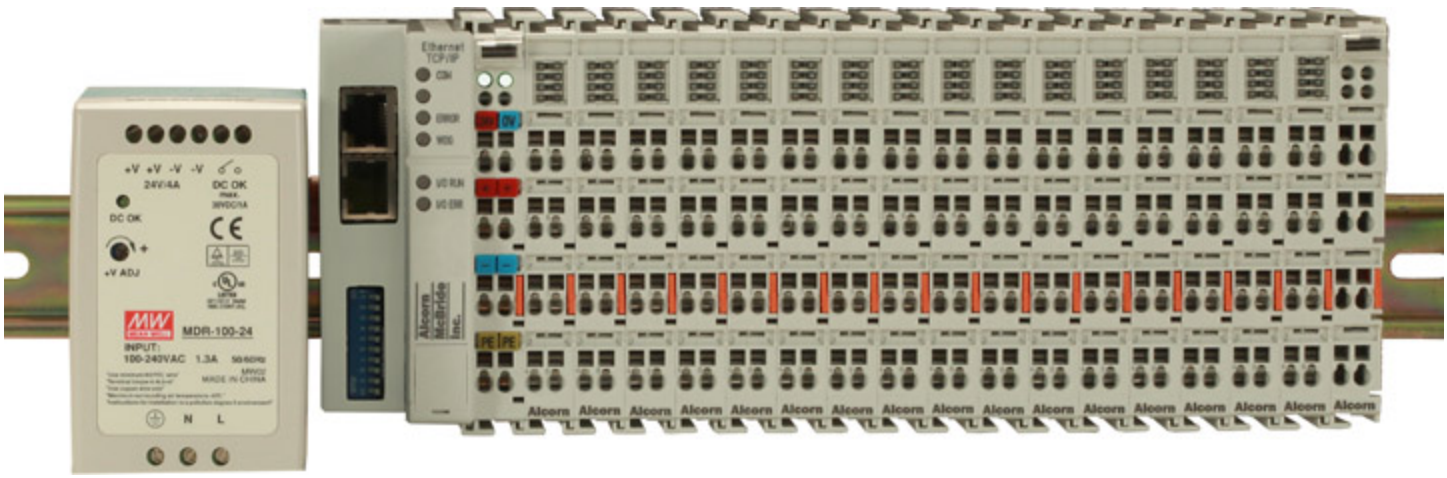
AMI/O

Distributed I/O Solution
User Guide



Alcorn McBride Inc.

AMI/O

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User Guide

8/3/2012

Preface

Every effort has been made to assure the accuracy of the information contained in this manual. If you find an error or typo, please bring it to our attention so that we can correct it for others. You may even get a coffee mug for your trouble. Alcorn McBride welcomes comments and suggestions on the content and layout of its documentation.
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Alcorn McBride Inc.
3300 S. Hiawassee, Suite 105
Orlando, Florida 32835
(407) 296-5800
Fax: (407) 296-5801
Internet: http://www.alcorn.com
E-mail: support@alcorn.com

Table of Contents

AMI/O at a Glance

About this Guide

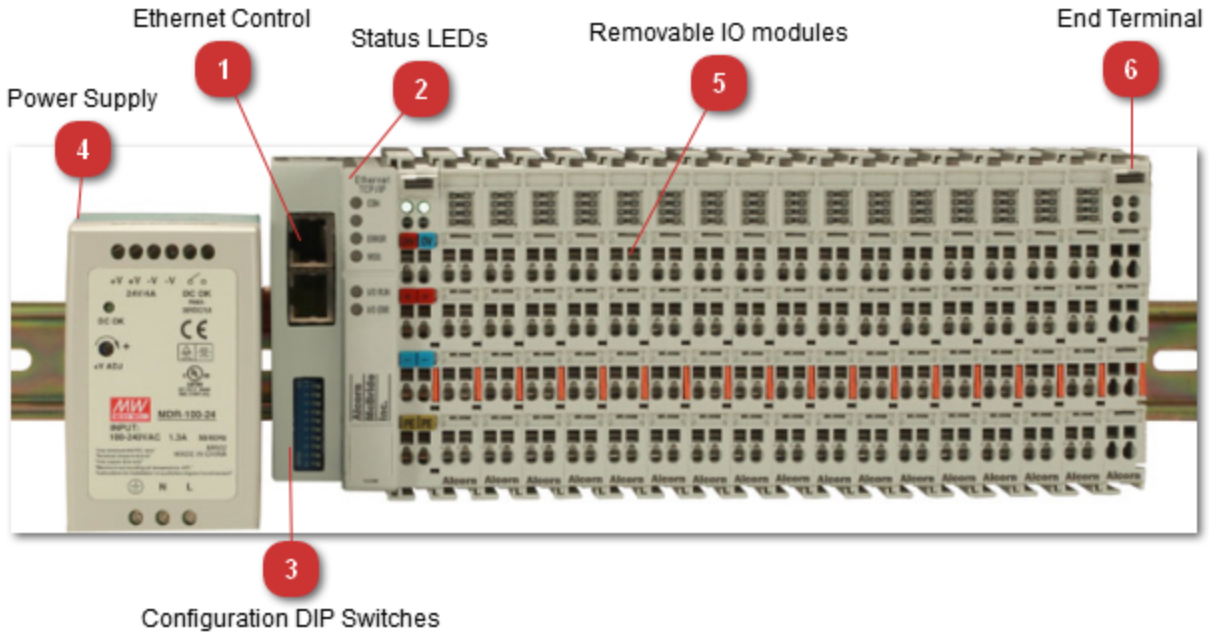
This guide describes the features of the AMI/O and how to configure its settings

Features

- Flexible configurations
- Ethernet TCP/IP
- Up to 64 I/O
- DIN-rail mountable
- Sleek form factor
- Easy to wire

AMI/O Overview

The LightCue standard is a distributed I/O solution. Primarily to be used with our VPro series Show Controllers.



1 Ethernet Control

RJ45 Ethernet ports 10/100T. Both Ethernet ports operate as 2-channel switches. The I/O stations can be configured with a line topology, instead of the star topology.

2 Status LEDs

Control	
COM	On/Flashing: Data received over TCP/IP. This is usually solid or blinking rapidly when connected to V4Pro/V16Pro show controller.
	blank LED not used
ERROR	Flashes slowly if DHCP or BootP is active but has not yet received an IP address The LED flashes rapidly (5 times, only when switching on); the Bus Coupler is addressed with ARP.
WDG	On - Watchdog error or Watchdog is set Off - no current TCP/IP communication or no error
I/O Run	Diagnostic LED for error.
I/O Error	Goes off after power up. If I/O ERR LED blinks, an error in the area of the terminals is indicated. Check power to input contacts. See "Connecting the Power Module" on page 7 Error could also indicate a device on the same network with the same IP Address.

On the upper right hand side of the network module are two more green LEDs that indicate the supply voltage. The left hand LED indicates the presence of the 24 V supply. The right hand LED indicates the presence of the supply to the power contacts.

3 Configuration DIP Switches


DIP Switches are used primarily to configure IP Address settings.

'*' indicates default in the table below

SW1-SW8	Used to determine if IP adress is saved on reboot (when using Win-ScriptLive or BootP IP set method). ON (1)* - IP Address is saved after next cold start. OFF(0) - IP Address is not saved after next cold start. To erase saved IP address (and set again using WinScriptLive) flip these to "OFF", reboot, and then flip back to "ON" (if IP Address save is desired).
SW9	ON (1)* - IP Address is configured using BootP server (WinScriptLive) OFF (0) - IP Address is configured using DHCP server
SW10	ON (1) - IP Address is configured using DHCP server OFF (0) - IP Address is configured using BootP (WinScriptLive)

4 Power Supply

Included with AMI/O configuration solutions is a power supply. Power module is a 96W (24V/4A) supply. This should be connected to the network coupler. (See "Connecting the Power Module" on page 7)

5 **Removable IO modules**


Input and Output modules have 4 LEDs (top 2 and bottom 2) to indicate status. Details on connections: See "Getting Started" on page 5

6 **End Terminal**


End terminal is required for proper operation. Additional IO modules can be inserted before end terminal. Release end terminal by pulling on orange tab.

Getting Started

This section will teach you how to begin using your AMI/O and configure your IP address. More detailed information is contained in the rest of this manual.

Connecting IO Modules

The AMI/O individual modules can be removed by pulling on the orange tabs on the side of each module.

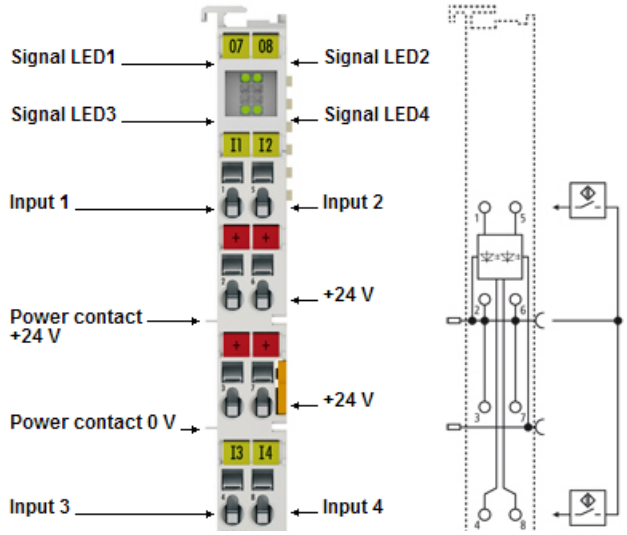
Input and output modules can be arranged in any order. The couplers recognize the terminals to which they are connected, and perform the assignment of the inputs and outputs automatically.

A maximum of input or output 512 modules may be connected to a single coupler. When using Win-ScriptLive, a maximum of 255 modules may be used (total of 1020 IO points).

Connecting Inputs

Each single module contains 4 inputs. The module labeled as 1404 on the bottom.The top and bottom 4 LEDs indicate the status of the 4 inputs. The digital input terminals acquire the binary 24 V control signals and retransmit their status to the network module. Four +24 V connection points are provided.

Power contacts +24 V and Power contact 0V run along the side of the left module (not visible when connected to other modules)

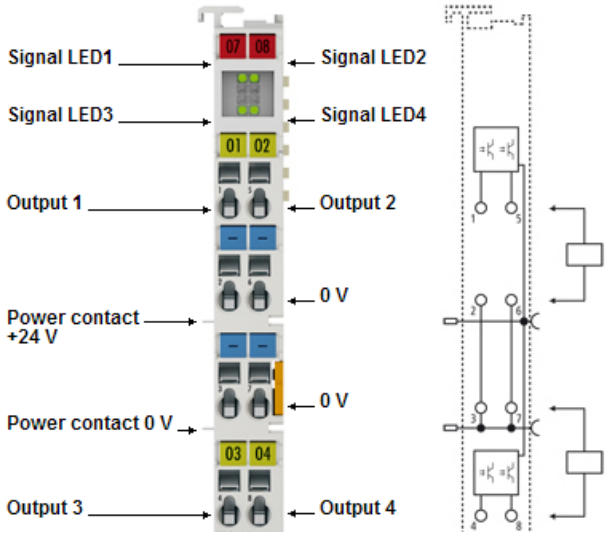


Additional Specifications are provided in the "Inputs Specifications" section of this manual. See "Specifications" on page 28.

Connecting Outputs

Each single module contains 4 outputs. The module is labeled 2404 on bottom. The top and bottom 4 LEDs indicate the status of the 4 outputs. The 4-channel terminals enable the direct connection of four 2-wire sensors. Four ground connection points are provided in the middle of the model.

Power contacts +24 V and Power contact 0V run along the side of the left module (not visible when connected to other modules)



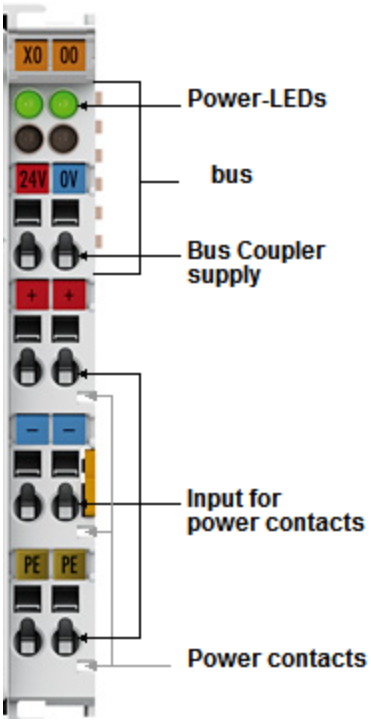
Additional specifications can be found in the "Output Specifications" section of this manual. See "Specifications" on page 28.

Connecting the Power Module

Connect 24V from the power to the Bus Coupler supply. You will also need to connect power to the input for power contacts.

The power contacts run along side of the module and are not visible when the input and output modules are added.

LEDs that indicate the supply voltage. The left hand LED indicates the presence of the 24 V supply. The right hand LED indicates the presence of the supply to the power contacts.



Controlling with WinScriptLive

WinScriptLive is a program used to configure V4Pro and V16Pro devices.

WinScriptLive has direct access to the IO available on V4Pro and V16Pro show controllers. AMI/O can be used within WinScriptLive in the same way.

To quickly connect AMI/O to a show controller without changing IP addresses, connect to "Port B" of the show controller (usually IP address 192.168.0.253). Then, add the AMI/O to the "devices" screen in WinScriptLive using IP address 192.168.0.254.

See "AMI/O with WinScriptLive" on page 12 for more details.

Setting IP address

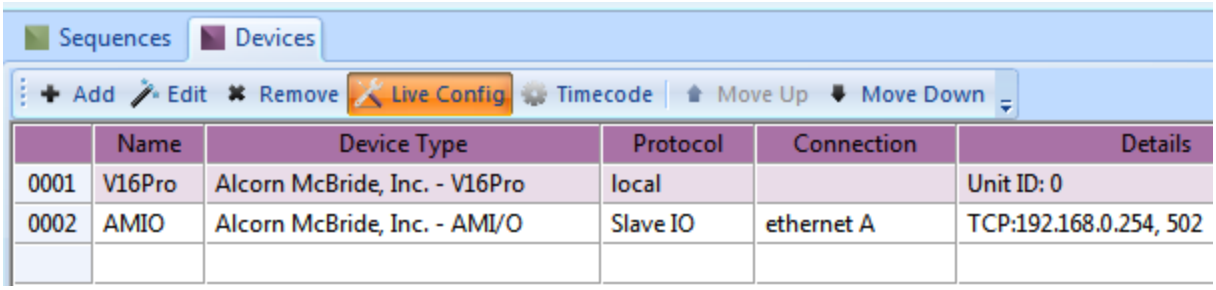
Configuring the IP address can be done via WinScriptLive (easiest method for use with our Show Controllers), using a DHCP server, or using an "arp" command.

If you are not using one of our show controllers, the "Arp" method is usually the preferred method.

The default IP address is 192.168.0.254.

IP Address Configuration via WinScriptLive

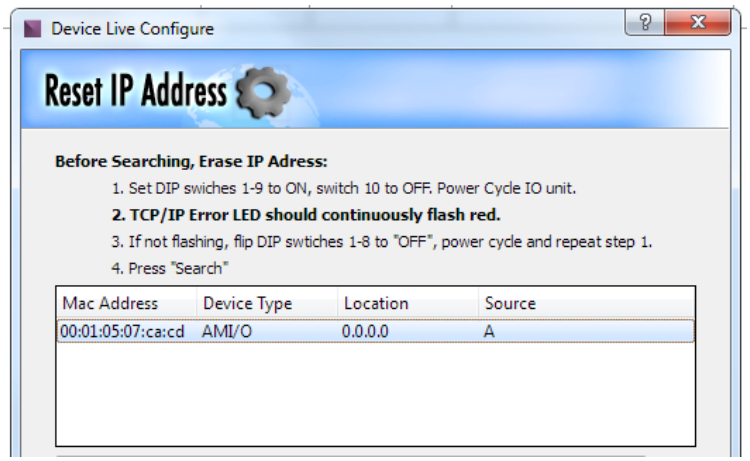
Address configuration can be done via the "devices" Window in WinScriptLive. After adding an AMI/O device, select "Live Configure".



	Name	Device Type	Protocol	Connection	Details
0001	V16Pro	Alcorn McBride, Inc. - V16Pro	local		Unit ID: 0
0002	AMIO	Alcorn McBride, Inc. - AMI/O	Slave IO	ethernet A	TCP:192.168.0.254, 502

Alternatively, click "Find Device" while in the "Add Device" wizard.

The wizard will appear to help find the AMI/O or set the IP address on the AMI/O.



Follow the on-screen instructions. For more details on the WinScriptLive configuration dialogs, See "AMI/O with WinScriptLive" on page 12.

IP Address Configuration via ARP

An easy method of modifying the IP address is to set the address using the DOS window. It is, however, only possible to alter addresses within the same network class. The new IP address that has been set remains stored even after the Bus Coupler has been switched off.

The default IP address for the AMI/O is in the 192.168.0.254, so make sure your PC is on the same network as the AMI/O before attempting the procedure/example below.

You must know the IP address of the AMI/O before using this method.

Note: This requires administrative privilages on Windows 7.

Procedure:

- Set DIP switches 9 and 10 to OFF. DIP switches 1-8 then no longer have any address function.
- Open a command line on your PC.
- Enter the command "ping <OLD IP address>" to create an entry in the ARP table.
- Read the table with the command "ARP -a".
- Enter "ARP -d <OLD IP address>" to remove the Bus Coupler from the table.
- Use "ARP -s <NEW IP address> <MAC-ID>" to make an entry manually.
- With "ping -l 123 <NEW IP address>" the new IP address becomes valid.
- A short flash from the ERROR LED at the moment of switching on indicates that the Bus Coupler is being addressed by ARP, and that DIP switches 1-8 give no indication of the address that is set.

Note: When the IP address is changed, all the dynamic ARP entries should be cleared. To change the IP address it is one ping with the length of 123 bytes is permitted for reconfiguration of the IP address (<ping -l "IP address>) necessary.

Example:
C:>ping 192.168.0.254
C:>arp -a
192.168.0.254 00-01-05-00-11-22
C:>arp -d 192.168.0.254
C:>arp -s 192.168.44.44 00-01-05-00-11-22
C:>ping -l 123 192.168.44.44

IP Address Configuration via DHCP Server

- To set the address by means of a DHCP server, set DIP switch 9 to OFF (0) and DIP switch 10 to ON (1).
- In this state, the DHCP service is switched on, and the Bus Coupler is assigned an IP address by the DHCP server.
- For this purpose the DHCP server must know the Bus Coupler's MAC-ID and should assign the same IP-Address to this MAC-ID at every startup!
- The TCP/IP Error LED flashes while the address is being allocated.

AMI/O with WinScriptLive

Integration

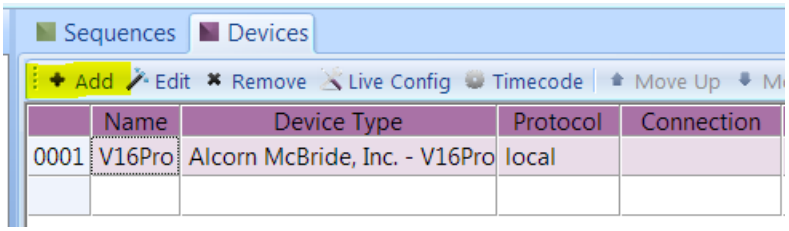
The AMIO can be added like any other remote device to WinScriptLive. Once added, IO appears that can be used just like local show controller IO in a WinScriptLive script. Complete instruction on WinScriptLive is beyond the scope of this document and can be found in the "V16Pro/V4Pro" user's guide.

Setup

After creating a new WinScriptLive script, add the AMI/O device by going to the "Devices" resource screen.

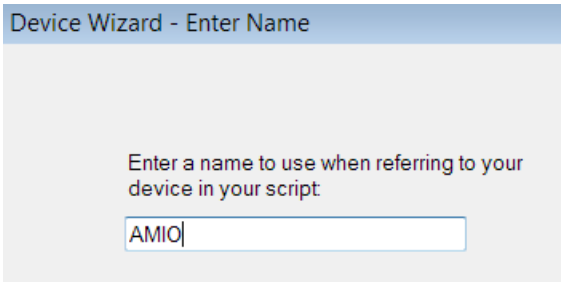
Add AMI/O Device

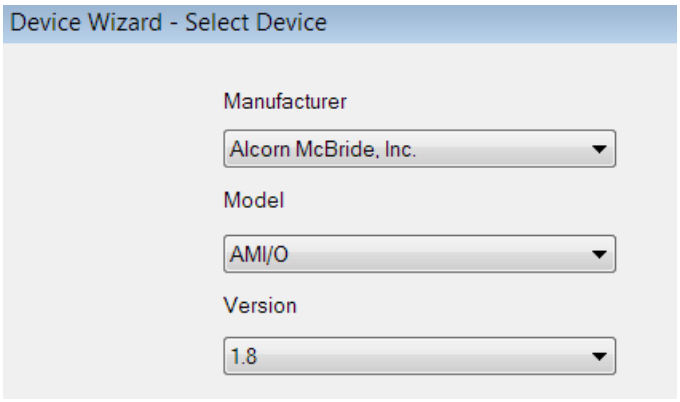
Click on the "Add" button to add a new AMI/O device. (shown below)



Type any name you'd like in the "enter name" field. Later, this name will be the prefix for addressing the individual IO points. For example, naming the device "AMIO" will result in inputs called "AMIO.input1" and "AMIO.input2" being created.

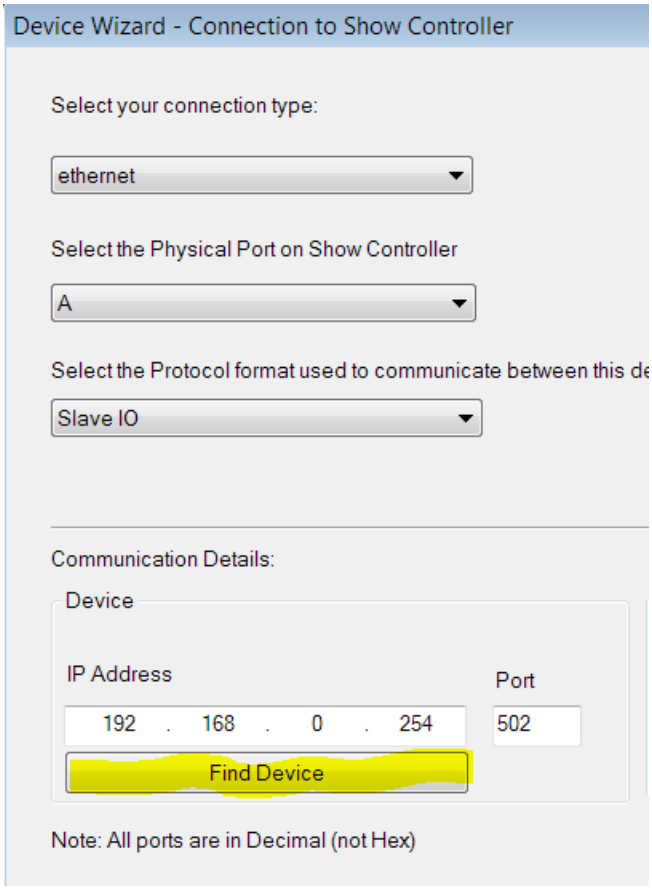
These names will also appear as drop down selection options on the "Inputs" and "Outputs" WinScriptLive resources windows.





Select the "Make", "Model" and "Version" for the AMI/O as shown above. The version number may increment as slight changes are released.

Specify Communication



On the next communications dialog, specify the IP address location of the AMI/O. By default, this address is 192.168.0.254.

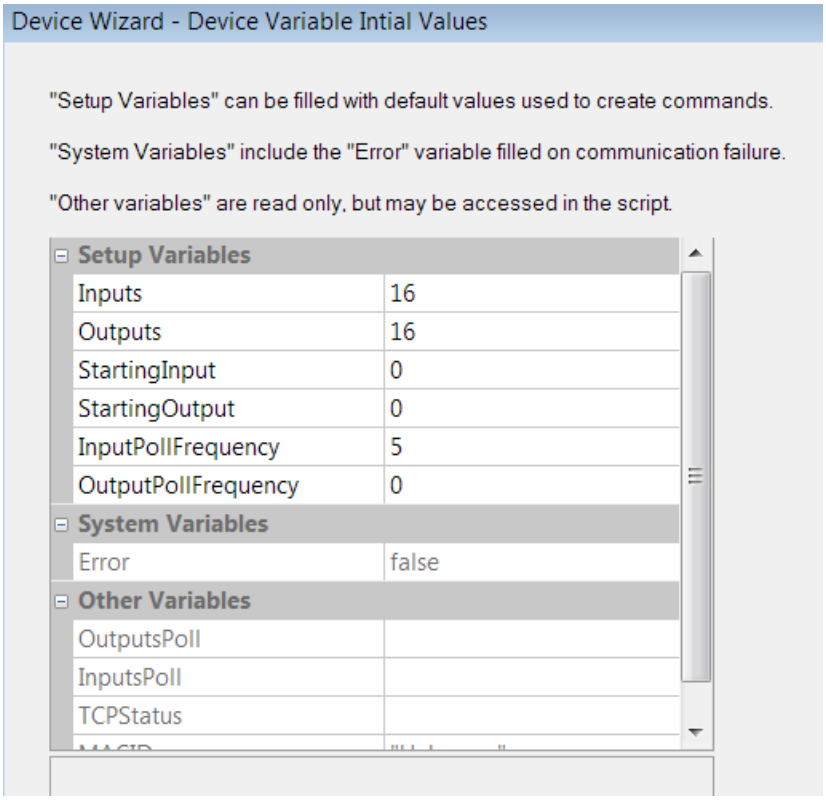
If you do not know the IP address, click the "Find Device" button. "Find Device" is only allowed if a V16Pro/V4Pro show controller is also online and can be connected in live mode.

Note: The "Find Device" feature can be accessed at any time by clicking on the "Live Config" tool button on the toolbar in the main devices view.

It is not necessary to find the device while adding the AMI/O to the script. This is done only for ease of use. Even if a valid IP address is not known, the necessary Inputs and Outputs resources will be added to the script. The device can be configured at a later time before testing begins.

For more details on the "Find Device" dialogs and their functions, See "AMI/O with WinScriptLive" on page 12

Number of Inputs and Outputs



Enter the desired number of inputs and outputs for the show controller to control using the "**Inputs**" and "**Outputs**" fields.

The "**Starting Input**" and "**Starting Output**" fields specify the input/output to start controlling. This is typically left at zero, but can be useful if multiple show controllers are controlling the same AMI/O unit.

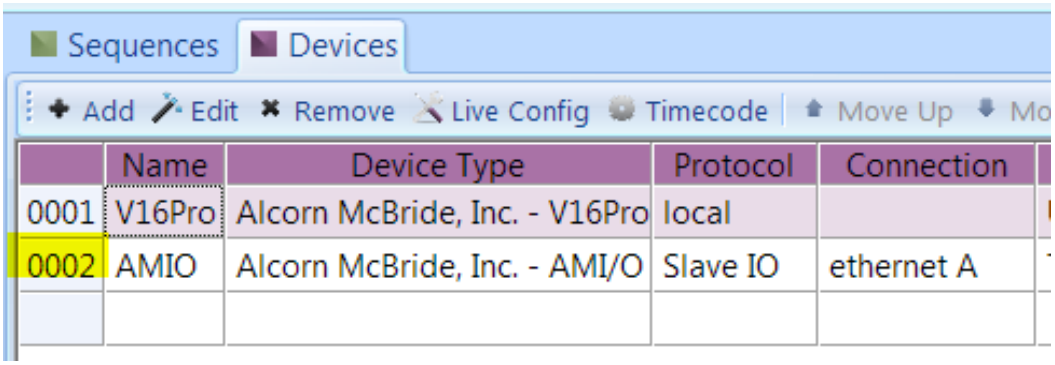
Note: The position of the output modules relative to the input modules has no effect on the Starting Input or Starting Output fields. Input and output modules can be arranged in any order. The Couplers recognize the terminals to which they are connected, and perform the assignment of the inputs and outputs automatically.

The "**InputPollFrequency**" is the frequency (in frames) that the show controller will send a request for the value of the AMI/O inputs. If zero, the inputs will not be polled. Leave at zero if you have a AMI/O that only includes outputs.

The "**OutputPollFrequency**" is the frequency (in frames) that the show controller will send a request for the value of the AMI/O outputs. If zero, the outputs will automatically be polled for verification after every "set" of an output.

User Comments

Enter any comments for the AMI/O device. These will appear in the "devices" grid.

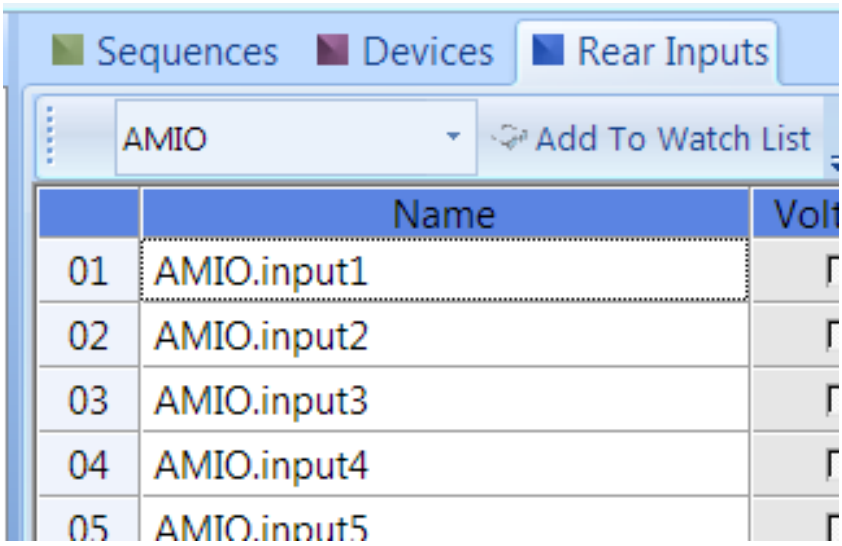


The AMI/O device is now added to the list of WinScriptLive devices.

Accessing Inputs and Outputs

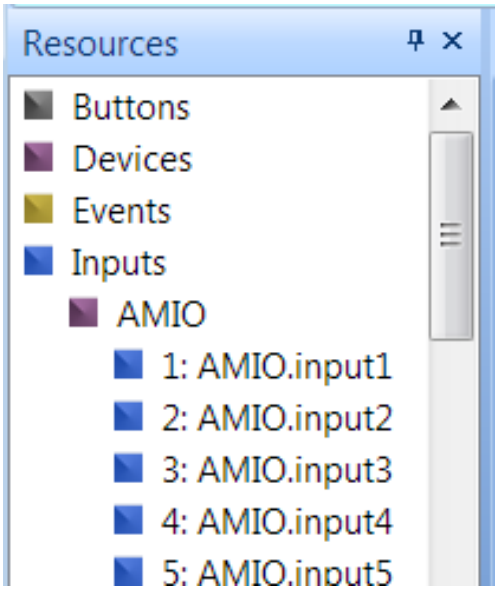
Automatically, input and output resources are created based on the number of inputs and outputs specified in the wizard.

These resources can be viewed and renamed by going to the "Inputs" or "Outputs" screen (under the "Resources" menu).

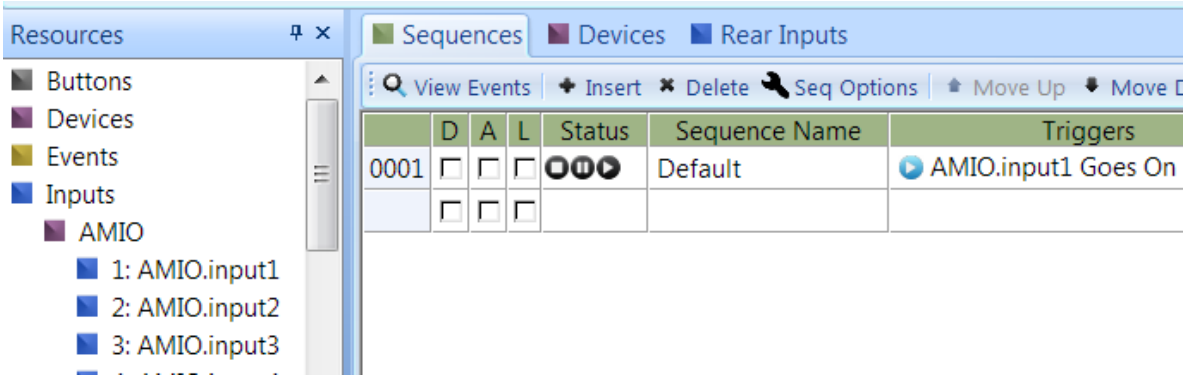


Once on the "Rear Inputs" screen (above), click the drop down menu on the toolbar to select "AMIO" or whatever name you've specified for your IO in the devices wizard.

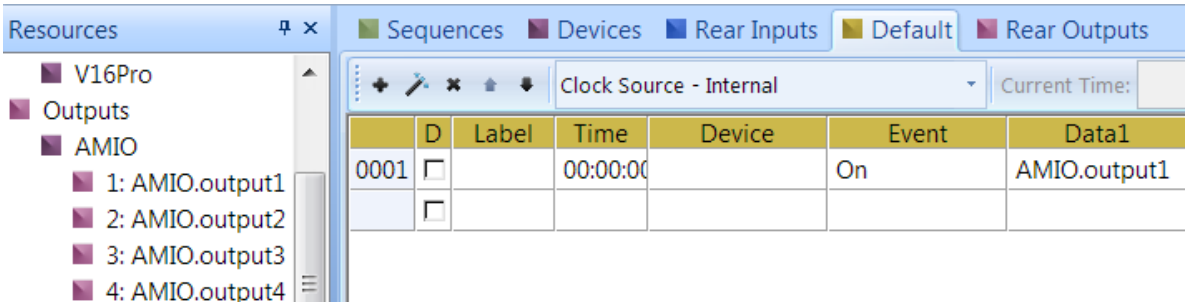
Type in the "Name" column to rename your inputs (if desired).



The list of your inputs also appears in the "Resources" tree on the left side of the screen.



Drag the inputs into the "Sequences" view to easily create triggers. (Shown above)



Similarly, outputs can be dragged into the "Events" view to turn on and off an output.

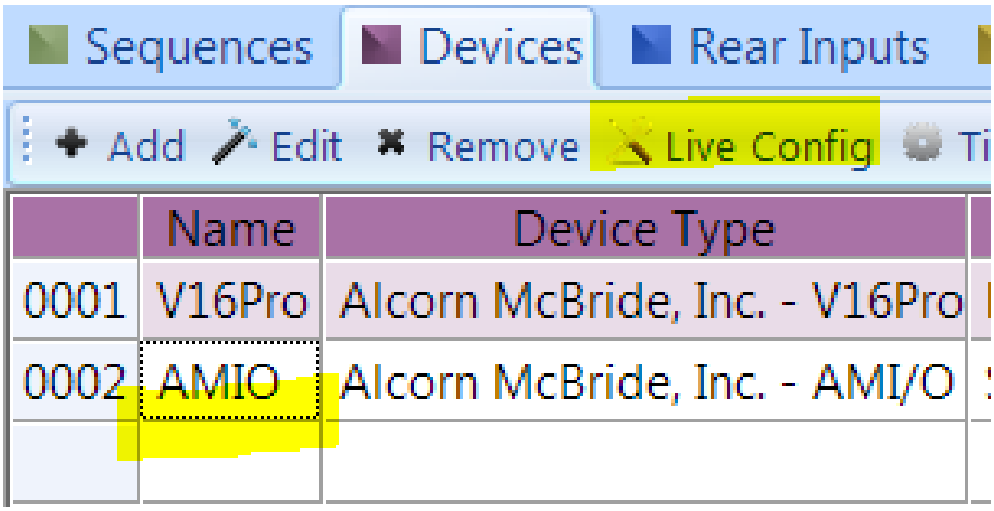
Setting IP Address with WinScriptLive

This section describes setting using the BootP configuration and using the WinScriptLive wizard. For other methods of setting the IP address, See "Getting Started" on page 5.

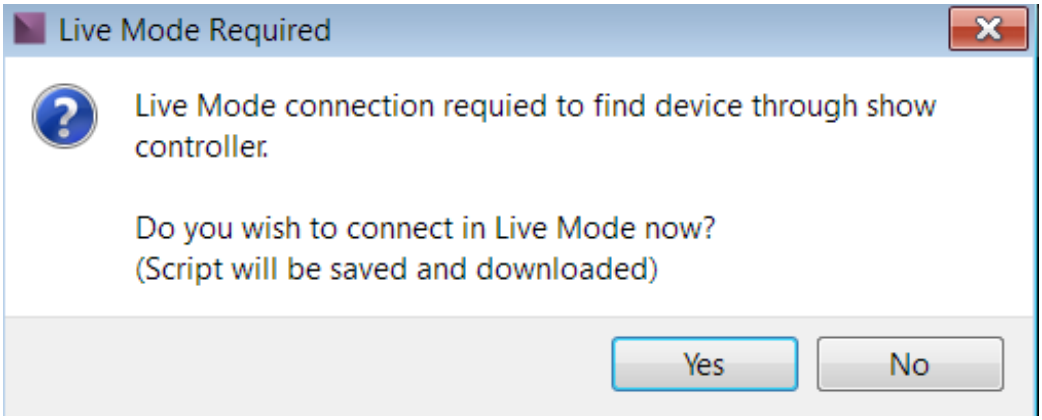
If the device is already added, proceed with following instructions. Otherwise, follow the instructions for adding a device (See "Add AMI/O Device" on page 12).

Start "Live Config"

From the "Devices" screen, click on the "Live Config" toolbar button with the AMI/O device's row selected in the grid.



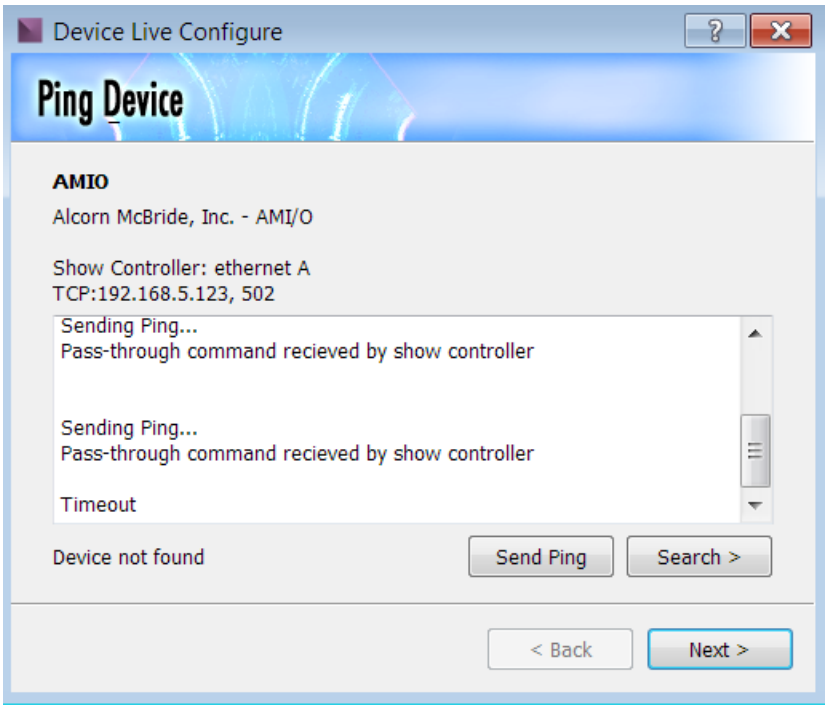
If you are already in Live Mode, the "ping" dialog appears. Otherwise, you will be prompted to go into Live Mode now. This will save your script and download it to the show controller.



Click "Yes" to continue to live and device live configure dialogs. Once in live mode, the "ping" dialog will appear.

Ping Dialog

This ping is actually sending the ping through the show controller and NOT your computer. Therefore, it is not required for your computer to be on the same network as the the device you are trying to ping. Conversly, the V16Pro or V4Pro must be on the same network as the device you are trying to ping, regardless of your PC's IP Address.

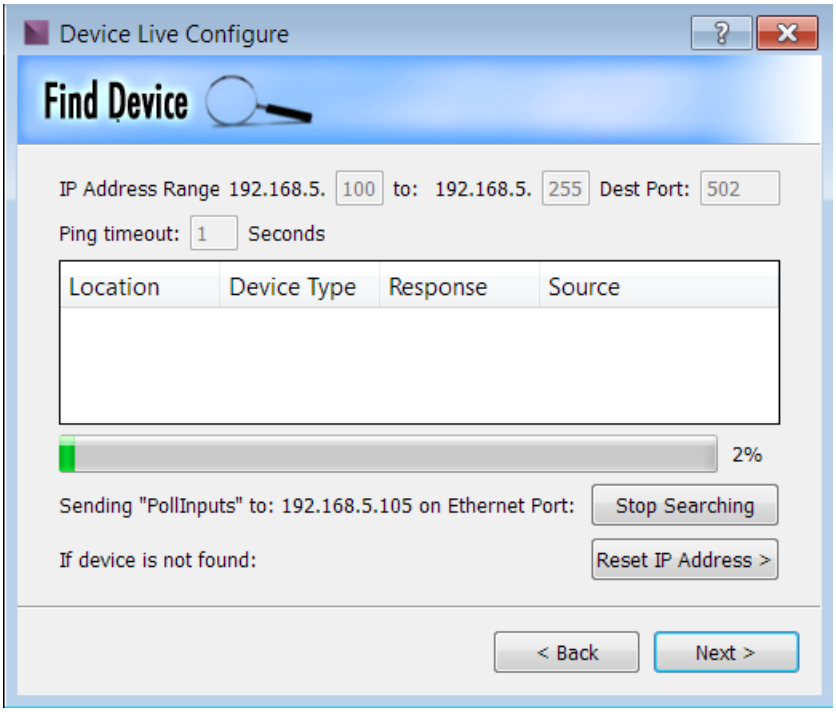


If the "ping" log window shows "reply received", no further configuration is nessessary. Your AMI/O is ready to use with the show controller.

If the device is not found, proceed to the "Find Device" by clicking "Search >" or "Next".

Find Device

The find device will ONLY find the AMI/O IF the IP address is on the same network as your show controller. For example, if your show controller has IP address 192.168.0.253 and your AMI/O is on the default IP address of 192.168.0.254.



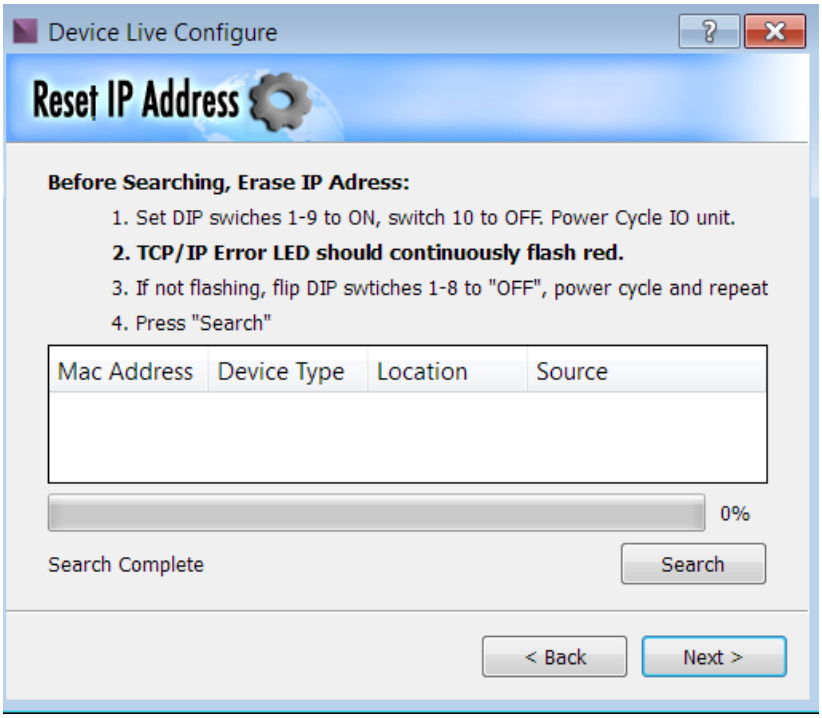
Each IP address in the range will be "pinged" by the show controller and will try to establish a response to the Modbus TCP command of "Poll Inputs".

If the device is found, select the device and click "Next". You will then be prompted to choose the IP address to set. See "IP Set " on page 23.

If the device is not found on the same network, it is recommended to erase the IP address (back to 0.0.0.0) and then apply a new address. Click next and follow the instructions specified in the following "Reset IP Address" section.

Reset IP Address

To change address back to 0.0.0.0, the DIP switches must be toggled and at least one cold boot must take place.



Before the AMI/O will appear, the IP address must be erased and the "ERROR" led on the front of the AMI/O must be blinking red.

To do this, follow the on screen instructions (printed here)
1. Set the DIP switches 1-8 to "ON" and power cycle
2. The "ERROR" led should continuouly flash red
3. If not flashing, flip DIP switches 1-8 to "OFF", power cycle and repeat step 1.
4. Click "Search"

Once the desired AMI/O device appears in the list, select it from the list and click "Next" to move to the "IP Set" screen.

Note: if the device does not appear, make sure you are connected on the same local network and that the "ERROR" led is blinking red.

IP Set

Select the desired option for setting the IP address in either WinScriptLive, on the AMI/O itself, or in both.

Option 1: Change "AMI/O" device to use WinScriptLive location
This option should be used if you want to change the AMI/O's IP address to match the address you have already specified in WinScriptLive

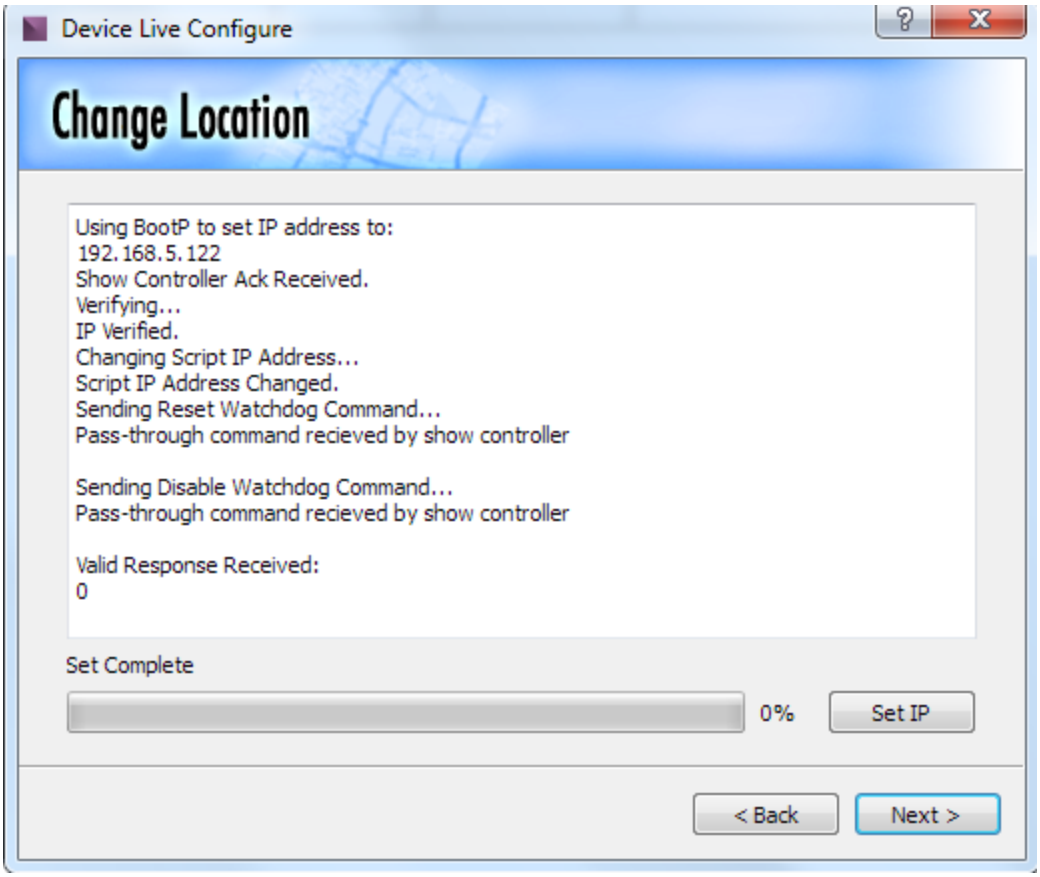
Option 2: Change Winscript to use found device "AMI/O" location
This option is only available if you have already set the IP address of the AMI/O, and have found the device on the same network as your show controller. This will only change the WinScriptLive script and not the AMI/O.

Option 3: Change WinScript and "AMI/O" device to be location
The WinScriptLive's script is changed to the specified IP address. The AMI/O device is also set to the IP address specified.

After clicking "next", a log will appear as the actions desired are preformed on the AMI/O and/or Script.

IP Set Log

Depending on the options selected in the previous "IP Set" screen, actions will be performed on your script and/or your AMI/O device. The watchdog will also be reset and disabled as part of this step.



Control Protocols

The control protocol used is a standard Modbus TCP protocol.

TCP port number
The TCP port number for ModbusTCP has been standardized to 502.

Standard Modbus commands 1, 2, 5 and 15 are used.

IO	Offset	Modbus Function code
Inputs:	Offset 0 ... 4095	Reading: 2
Outputs:	Offset 0 ... 4095	Reading: 1 Writing: 5, 15

The header of the Modbus/TCP protocol is specified below:

Byte	Name	Description
0	Transaction identifier	Is returned by the slave
1	Transaction identifier	Is returned by the slave
2	Protocol identifier	Always 0
3	Protocol identifier	Always 0
4	Length field	0 (if the message is less than 256 bytes in length)
5	Length field	Number of following bytes
6	Unit identifier	Is returned by the slave
7	Modbus	The Modbus protocol with the function

Read Coil Status (Function 1)

The Read Coil Status function can be used to read the digital outputs that have been set. The first 10 digital outputs are read in this example. The start address is zero. An offset can be entered in the Start address field.

Query

Byte Name	Example
Function code	1
Start address high	0
Start address low	0
Count high	0
Count low	10

Response

The query was for 10 bits, and these are now distributed over 2 bytes. The third output is "on", so data bit 3 is set resulting in a value of "4".

Byte Name	Example
Function code	1
Byte Count	2
Data bits 0...7	4
Data bits 8...18	0

Read Input Status (Function 2)

The Read Input Status function can be used to read the digital input data. The first 10 digital inputs are read in this example. The start address is zero. An offset can be entered in the Start address field.

Query

Byte Name	Example
Function code	2
Start address high	0
Start address low	0
Count high	0
Count low	10

Response

Byte Name	Example
Function code	2
Byte Count	2
Data bits 0...7	1
Data bits 8...18	0

Specifications

Overview

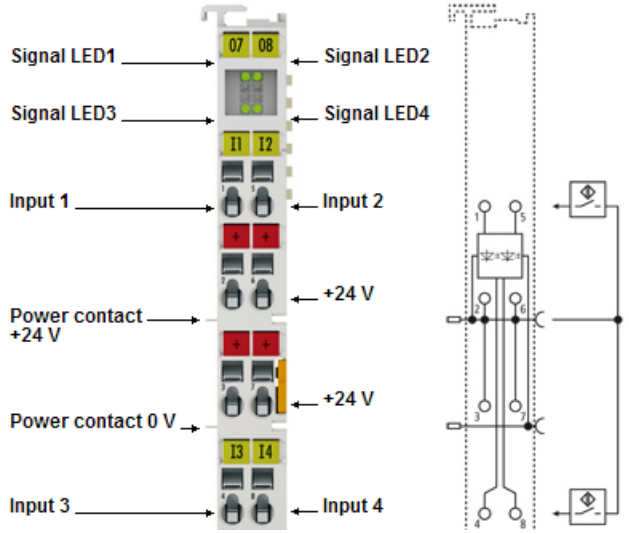
Control	
Ethernet	2 RJ45 ethernet ports, 100 Base-T, (TCP/IP Modbus control)
Digital Inputs	+24V (4 per module)
Digital Outputs:	24V load voltage-max, 2A load current

Physical	
Power	96W (24V/4A) Max Output, Input (100-240 VAC)
Size	Varies by configuration, DIN-rail not included

Input Specifications

Each single module contains 4 inputs. The module labeled as 1404 on the bottom.The top and bottom 4 LEDs indicate the status of the 4 inputs. The digital input terminals acquire the binary 24 V control signals and retransmit their status to the network module. Four +24 V connection points are provided.

Power contacts +24 V and Power contact 0V run along the side of the left module (not visible when connected to other modules)

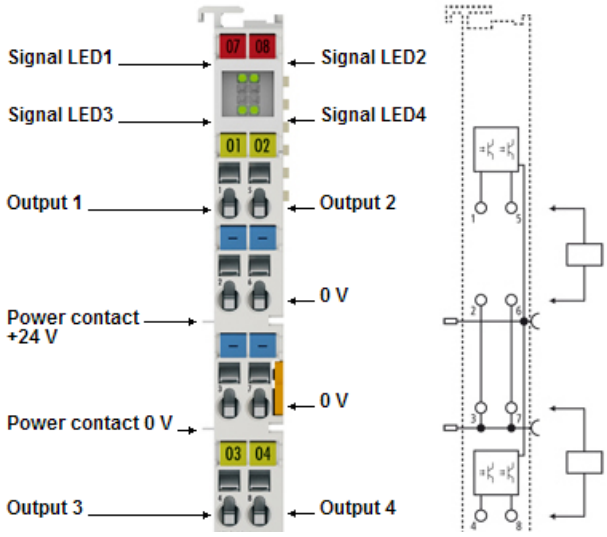


Input Details	
Nominal voltage	24 V DC (-15 %/+20 %)
“0“ signal voltage	-3…+5 V
“1“ signal voltage	11…30 V
“0“ signal current	0…1.5 mA
“1“ signal current	2.0…2.5 mA
Weight approx.	0.10 lbs
Operating temperature	0…+55 °C/-25…+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
	Approvals CE, UL, Ex, GL

Output Specifications

Each single module contains 4 outputs. The module is labeled 2404 on bottom. The top and bottom 4 LEDs indicate the status of the 4 outputs. The 4-channel terminals enable the direct connection of four 2-wire sensors. Four ground connection points are provided in the middle of the model.

Power contacts +24 V and Power contact 0V run along the side of the left module (not visible when connected to other modules)



Output Details	
Rated load voltage	24 V DC (-15 %/+20 %)
Load type	ohmic, inductive, lamp load
Max. output current	0.5 A (short-circuit-proof) per channel
Short circuit current	< 2 A
Breaking energy	< 150 mJ/channel
Weight	approx 0.15lbs
Reverse voltage protection	yes
Operating temperature	0…+55 °C/-25…+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27/29
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
	Approvals CE, UL, Ex, GL

Troubleshooting Tips

Symptom	Possible Cause	Possible Solution
No response to Modbus inputs/outputs poll. TCP/IP communication present.	Watchdog is turned on	Clear the Watchdog and disable the Watchdog using Modbus TCP or WinScrpiptLive. (see instructions below for TCP/IP removal)
Can not control AMI/O	IP Address is not set	Use IP switches to reset IP address and set using DHCP or WinScriptLive.
Can not ping AMI/O	IP Address is not on the same network	Change your PC or Show Controller's IP address to have the same first 3 octets as your AMI/O

Removing the Watchdog

Removing the Watchdog is recommended and can be done via WinScriptLive (if you're using our Show Controllers) or by sending an appropriate Modbus TCP command.

If you are using WinScriptLive, the watchdog is automatically removed when you set the IP address. See "AMI/O with WinScriptLive" on page 12

By default, the watchdog will turn on after one minute if inactivity. Standard Modbus TCP IO request/set communication will be unable to resume until the watchdog has been reset.

Reset the watchdog

Send the following hex characters over TCP on port 502: (do not send "h")

h00 h00 h00 h00 h00 h06 h01 h06 h11 h21 hBE hCF h00 h00 h00 h00 h00 h06 h01 h06 h11 h21 hAF hFE

Disable the watchdog

Send the following hex characters over TCP on port 502:

h00 h00 h00 h00 h00 h06 h01 h06 h11 h20 h00 h00