MAC VALVES, INC.

DOCUMENT NUMBER

TITLE: Control Manual for MAC PowerLink MI/O-67 Manifold

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Control Manual
For
MAC Valves PowerLink
MI/O-67 Serial Manifold

10/25/2018

1. System Overview

PowerLink is an open protocol, which is the B & R Automation version of the EtherNet family of control protocols. It is supported by the EtherNet PowerLink Standards Group (EPSG).

The protocol itself consists of one or more master devices (managing nodes) and multiple slave devices (controlled nodes). Because it is an open network, the system will consist of products from a wide variety of vendors. It is important to note that even though PowerLink is an Ethernet family member, it is different than the commonly known Ethernet. One of the important differences is that even though IP Addresses are used for the devices, the communications between the managing node and controlled node is accomplished by way of node numbers. For PowerLink V2, the numbers range from 1-239 for the controlled nodes. The managing node has node number 240. For about that later.

The master (a PC or PLC with its network scanner) and slave devices are connected via a standard D-coded M12 connector on a PowerLink cable. The valve and electronics 24VDC will have to be supplied to the MI/O-67 manifold via an additional cable.

A. MAC Valves MI/O-67 Serial Manifold

The MAC MI/O-67 Serial Manifold is a slave device or controlled node within the PowerLink network. Thus, it will respond to all of the outputs and send back inputs in accordance with the memory addresses attached to the MI/O-67. These will be defined later.

Each manifold occupies a single node number on the network. The output portion consumes 210 bytes and the input portion produces 210 bytes. The system is highly configurable and can have a large variety of Digital Input/Output, Analog Input/Output (voltage or current), and Power Plus modules. It all starts with the Communications Module and a valve stack.

A typical valve manifold is shown in **Figure 1**. Note the functional module shown is for reference only. More about these modules later in this document.

The main communications module is call the Comms Module. Its functions is to provide front-end interfacing to the PowerLink line, operate 32 valve drivers for the stack valves, route power for the stack valves and electronics, and control the CAN bus backplane which interfaces the functional modules.

The functional modules are Analog Modules (voltage and current), Digital I/O Module, and a Power Plus Module. These will be discussed later in this document.

The stack will come fully assembled. However, if a need arises to add or subtract modules, turn off all power and air prior to changing the module configuration. Damage to the modules could result if the power is not off during the changing process.

The valve stack can operate up to 32 solenoids in any combination of double and single solenoid valves. It is set up for 24VDC valves.

Figure 1 Typical Valve Stack

Figure 2 PowerLink Comms Module


PWR COMM STAT
MODEL
MIO67A-PN-EC-01
PORT 1
PORT 2
STS
LA
LA
ERR
POWER

B. XDD File

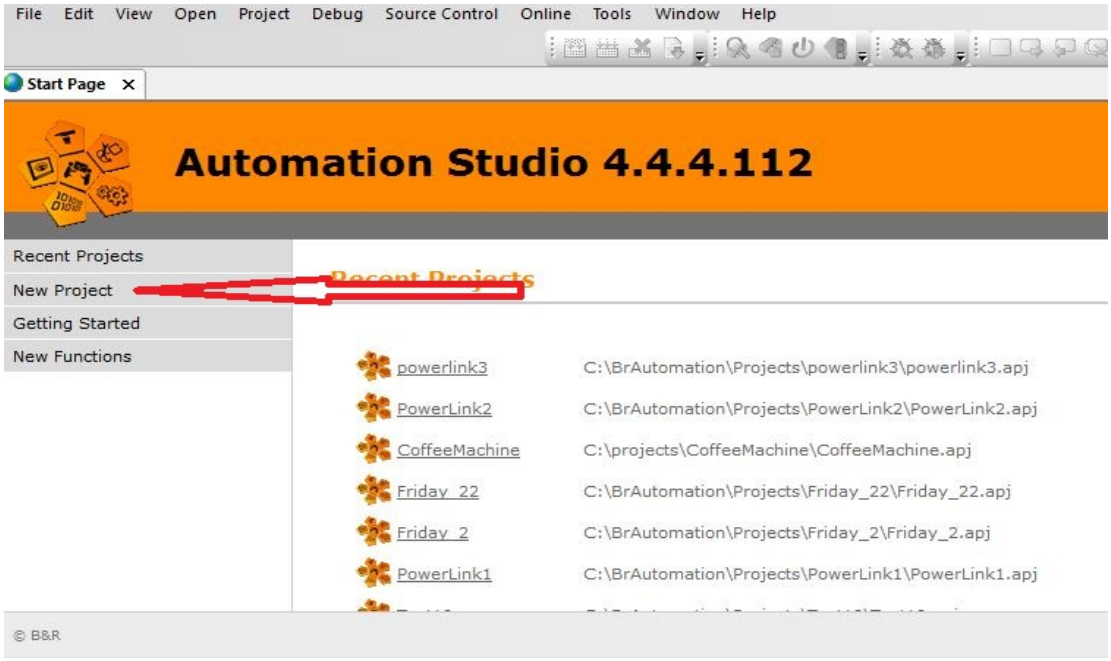
The basic start up properties are enabled in a XDD (General Station Description) supplied by MAC. It must be loaded into the master controller prior to continuing. Consult the controller manual for directions to that end. However, here are the basics using a B & R Automation X20CP1382 controller with Automation Studio Version 4.4 software for an example.

First, load the file "00000451_MIO67.xdd" into the computer that has the software for the controller. It is important to use the latest XDD file. If there is a mismatch, the controller will not connect correctly.

This process is assuming this is a new project. If the MI/O-67 is being added to an existing project than that project is opened. However the loading of the xdd file will be the same.

Next, start up inside the PLC software, select "New Project"" located along the left side of the screen as shown in **Figure 3.**

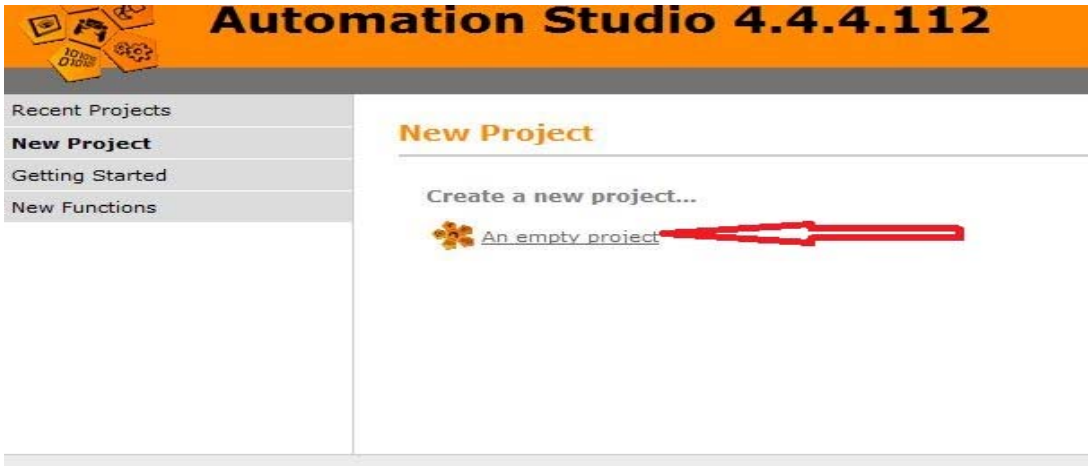
Figure 3 New Project, Getting Started



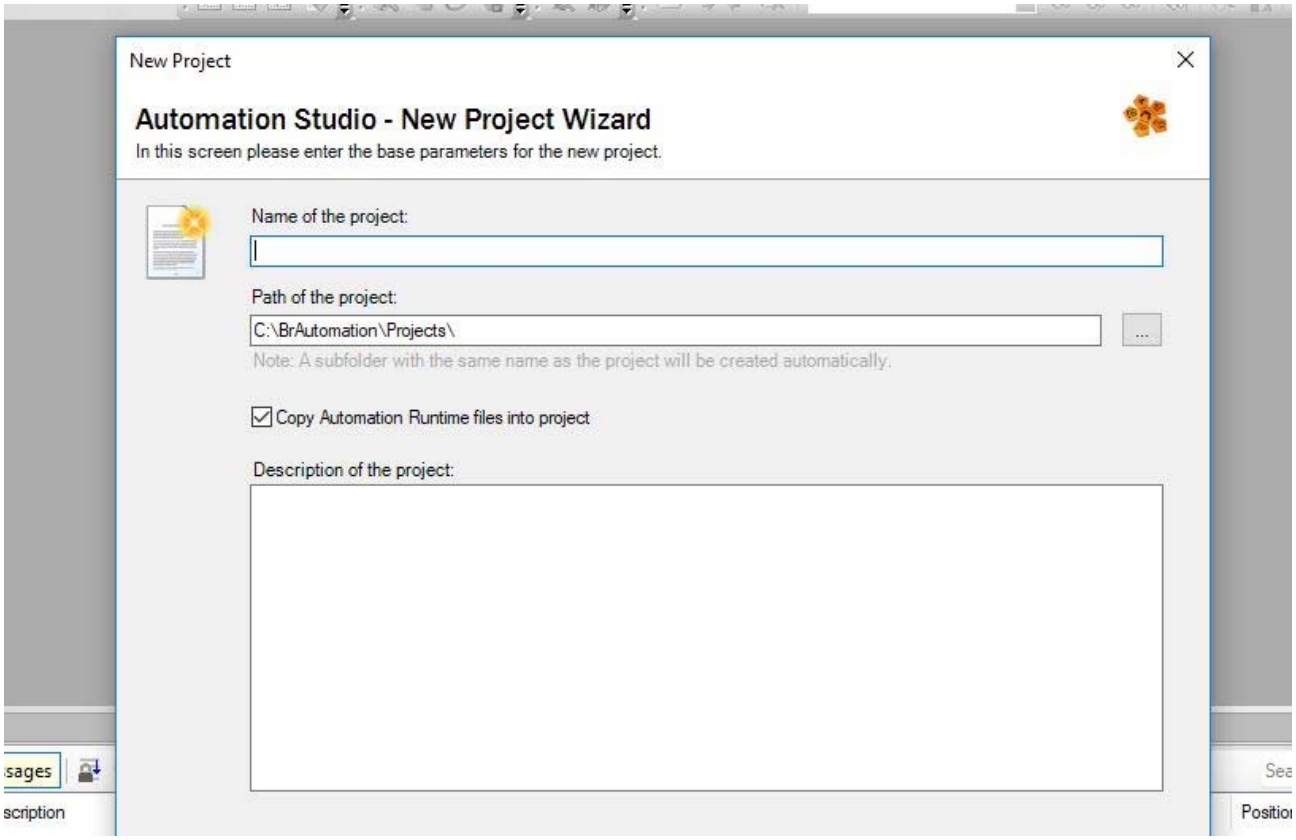
A new screen will appear asking whether this is an empty project. If this is new select this option. If this an existing project, then that will be loaded into the PLC when the file is selected on

the previous screen.

Figure 4 Starting With New, Empty Project



Type in a name and select a path for the new project.

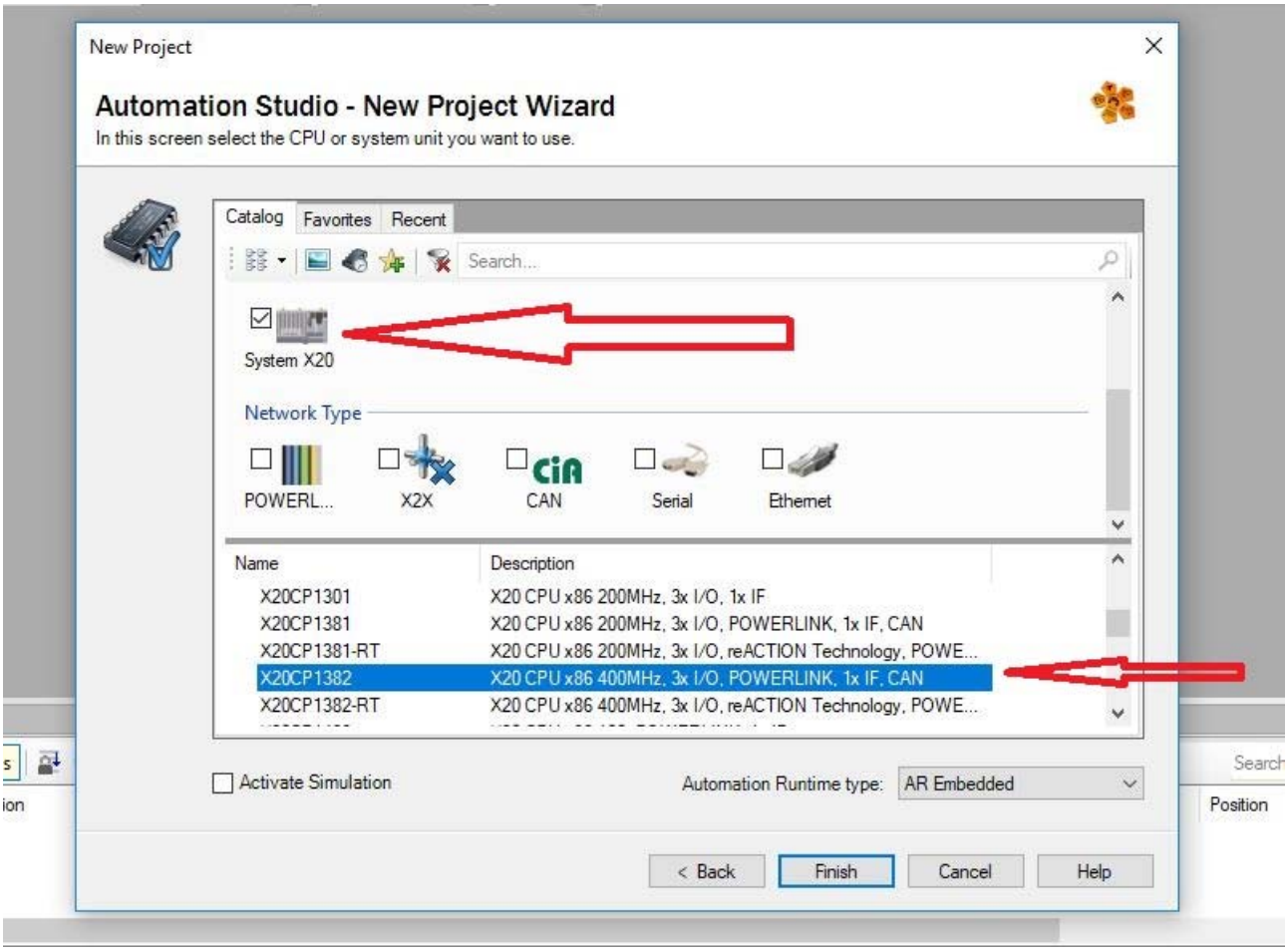


The software will next ask you whether you want the network to find the PLC or load the

parameters in manually. For our example, these will be loaded in manually.

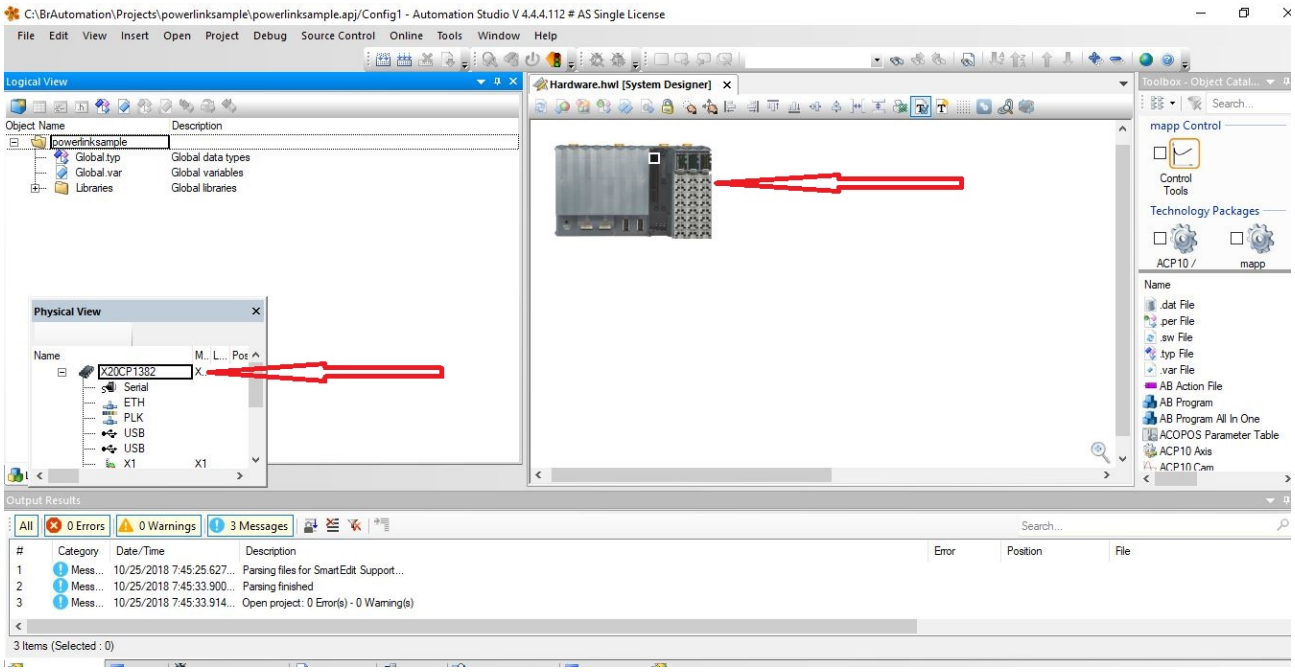
In our case, we are using a X20CP1382 controller. We select that from the list on the right as shown below.

Figure 5 Loading PLC into Software



The new network will appear in the Hardware view in the software and look similar to **Figure 6** below

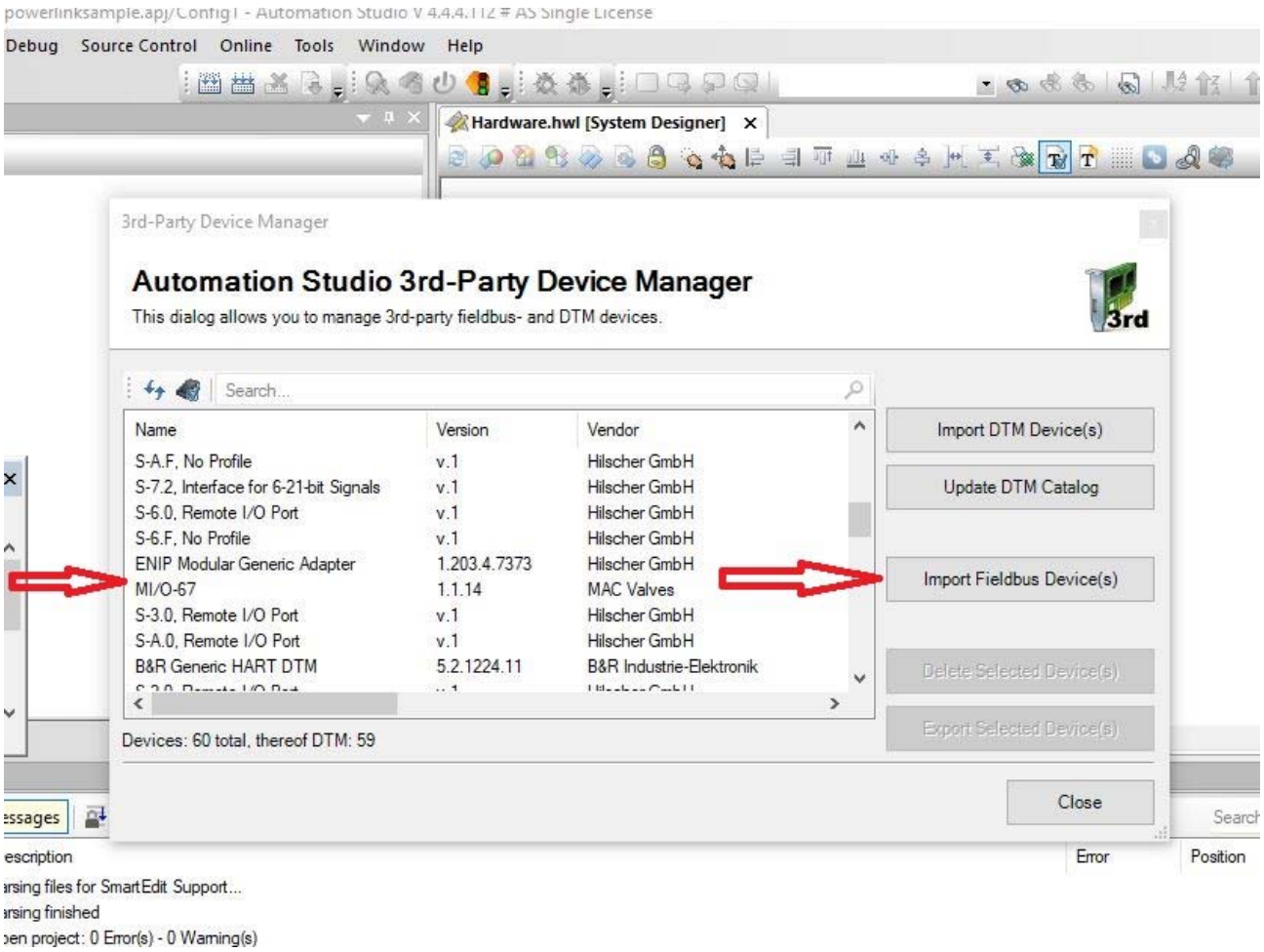
Figure 6 Hardware View



The next step is to load the XDD file for the MI/O-67 if it has not been already done. To do this, on the top menu in Figure 6, select "Tools". A submenu will pull down. Select "Manage 3rd Party Devices" from that menu.

A new screen will appear. Select "Import Fieldbus Device(s)" and pull in the MI/O-67 XDD file. It will appear on the screen to the left once the upload is completed as shown in **Figure 7**.

Figure 7 Uploading MI/O-67 XDD File



C. Network Creation

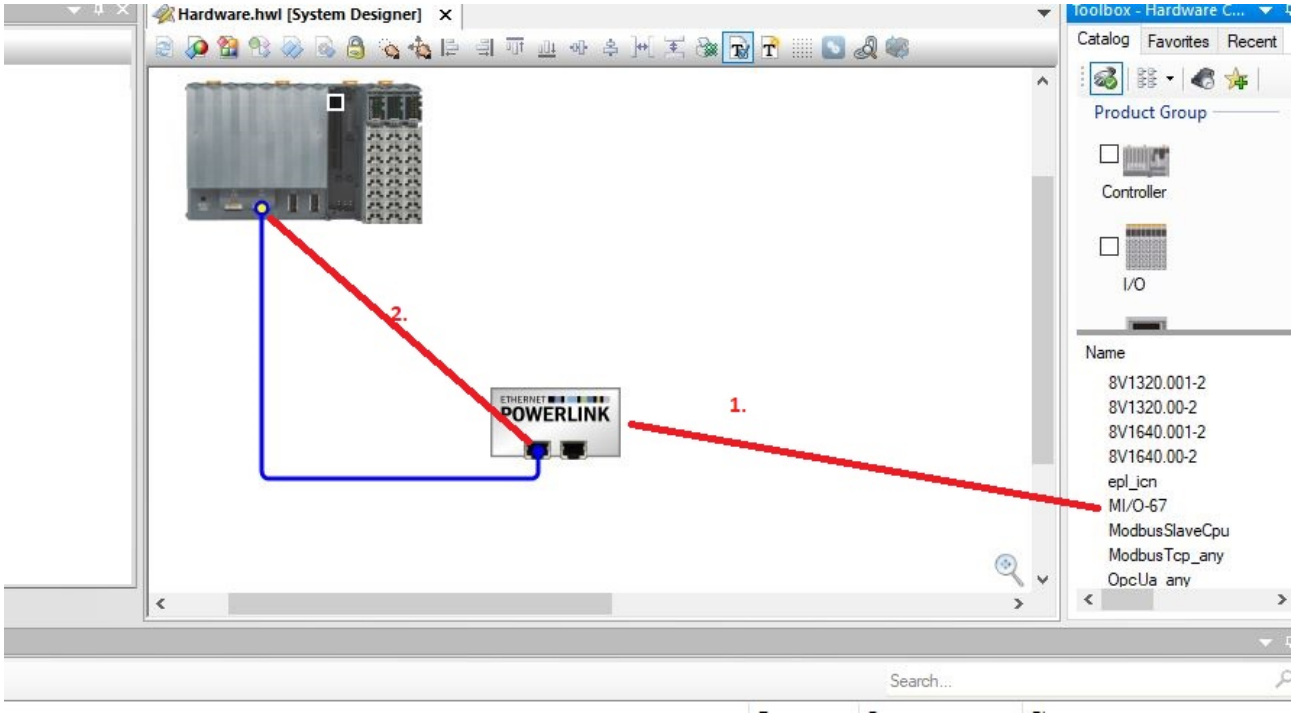
Once the XDD file is loaded into the controller, it will become part of the catalog and thus can be used to create a node on the network.

From the Hardware View, find the MI/O-67 in the catalog on the right. Select it and drag it into the Hardware View. It is now a new node.

Next, select the controller port for PowerLink. In our case, it is IF3. Drag the new network line between the controller and the MI/O-67 icon and attach it to the port as shown in **Figure 8.**

Repeat this process as needed for each new MI/O-67. Refer to PowerLink's network topology requirements for proper setup.

Figure 8 Adding MI/O-67 to Network



Next, select the EtherNet port on the controller. In our case and in Figure 8, it is the left port and is IF2. Right click it and select "Configuration".

A new menu will appear. In our network, we will use IP Address 192.168.1.1 for the controller and 192.168.1.75 for the PC where the software is. These must be on the same subnet mask. This is shown in **Figure 9**. **Figure 10** is the bottom half of this menu for reference.

Figure 9 IF2 IP Address, Subnet Mask

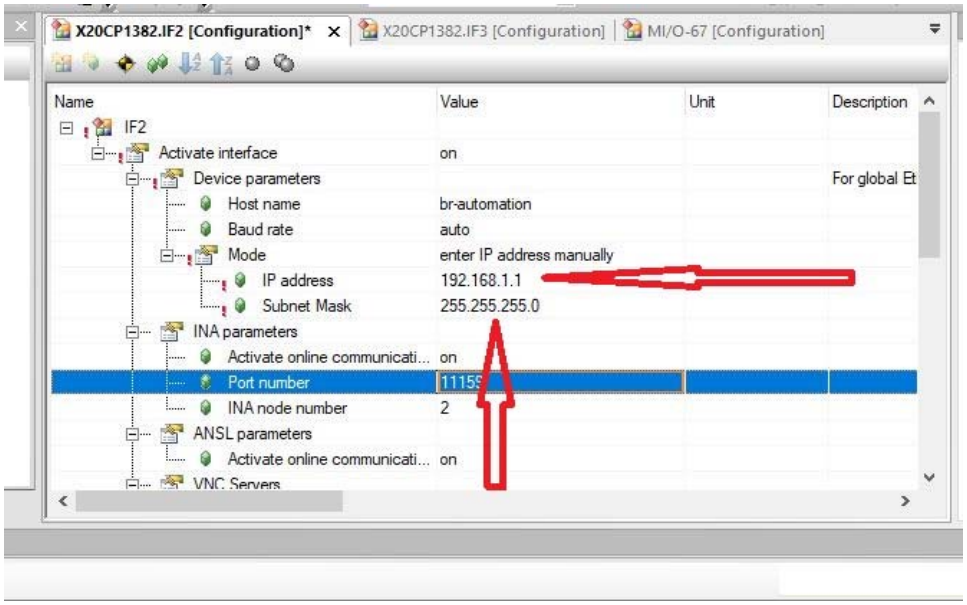
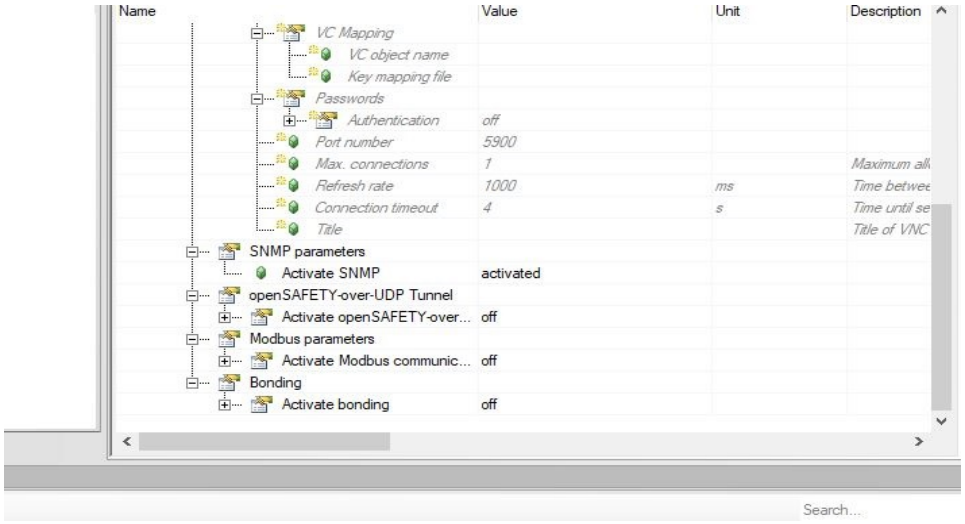


Figure 10 IF2 Configuration, Bottom Half

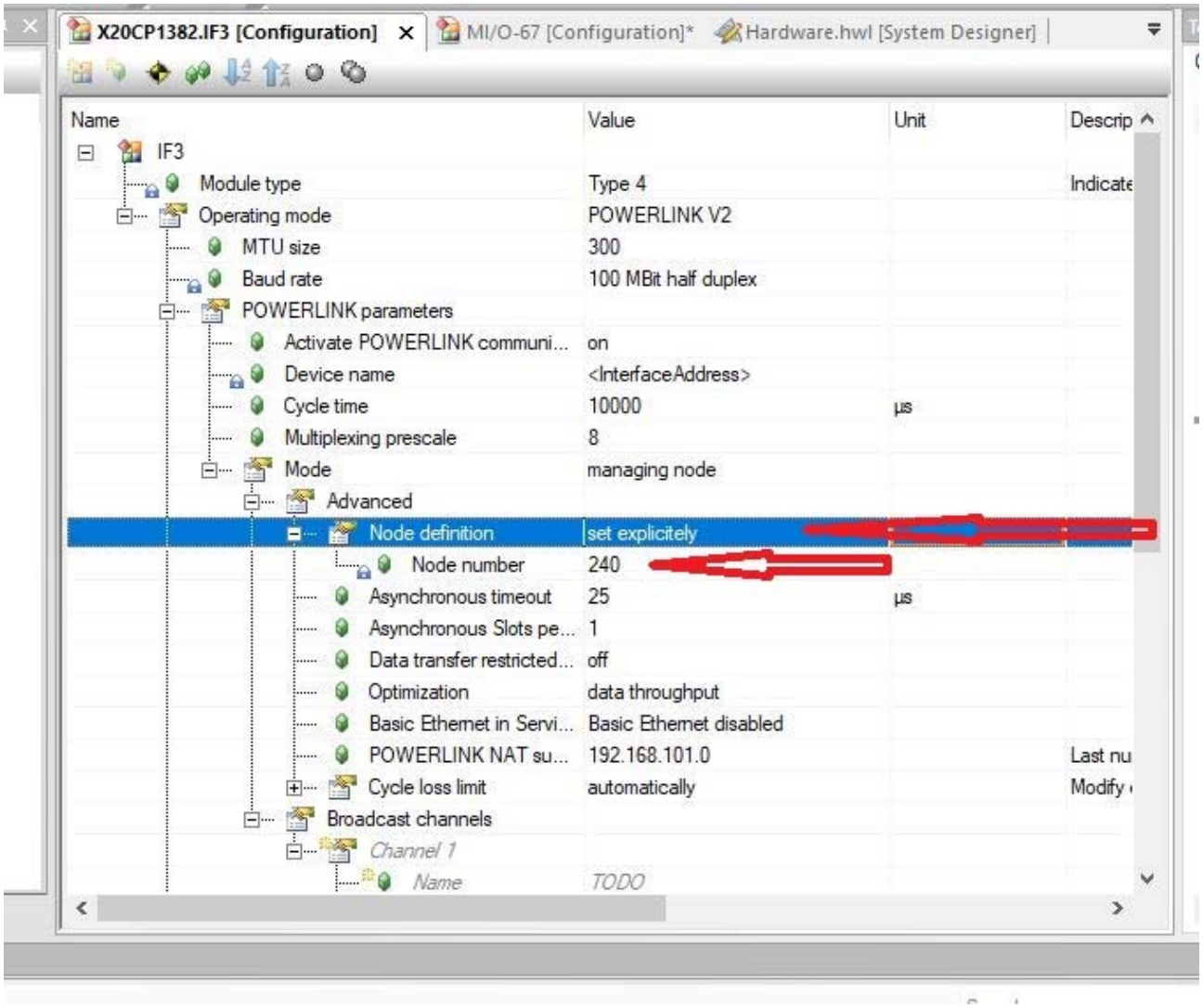


The PowerLink system is controlled by node numbers as opposed to IP Addresses. It that end,

the managing node (the master) has it's number explicitly side to 240 (0xf0). To that end, the MI/O-67 in the example, since it is the first one and by default set to station 1, becomes node number 1.

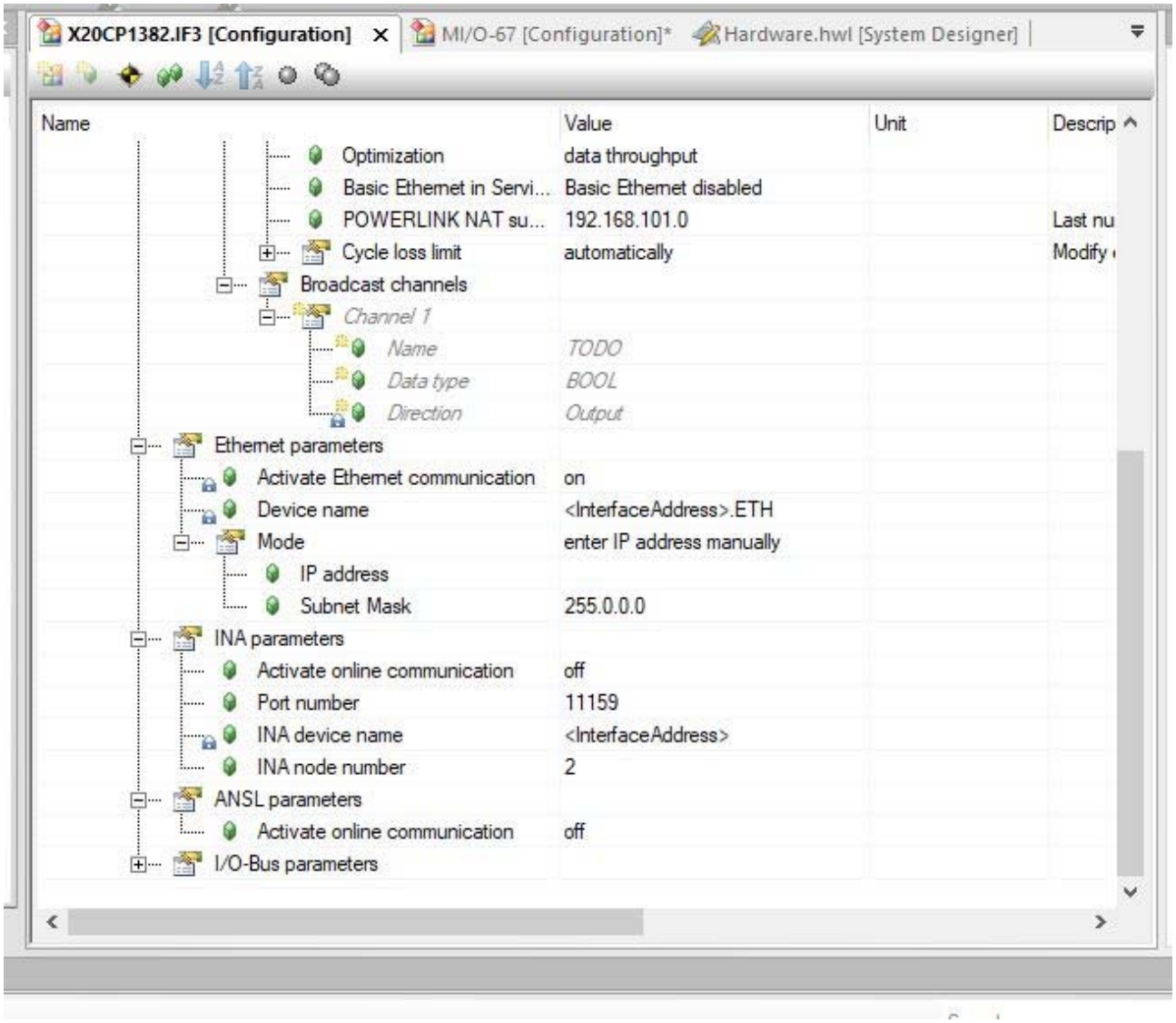
The controlled node has to be told which master to connect to. This is done by right clicking the IF3 port and setting it to "Set Explicitely" and node number "240" as shown below.

Figure 11 MI/O-67 PowerLink Node Number



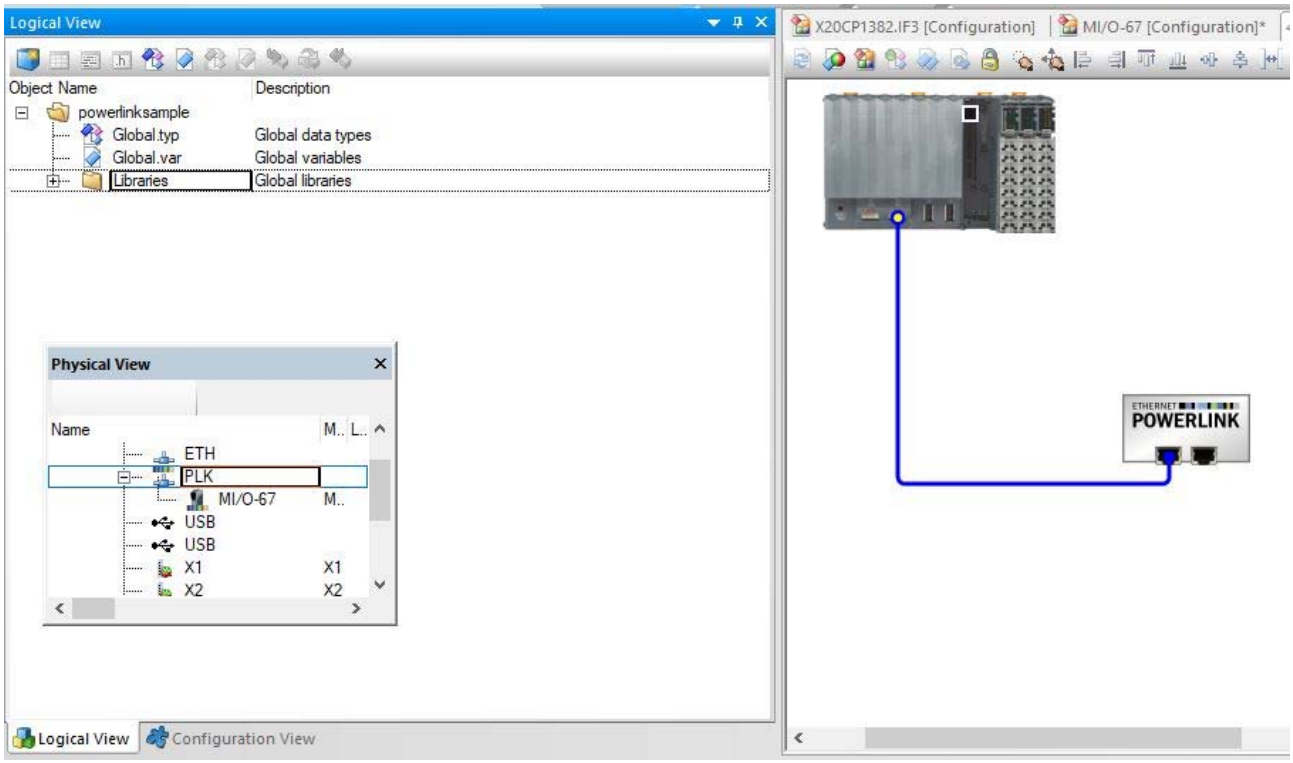
The Figure 12 shows the lower half of the screen above.

Figure 12 IF3 Configuration, Lower Half



Below in Figure 13, the completed network and Physical View are shown.

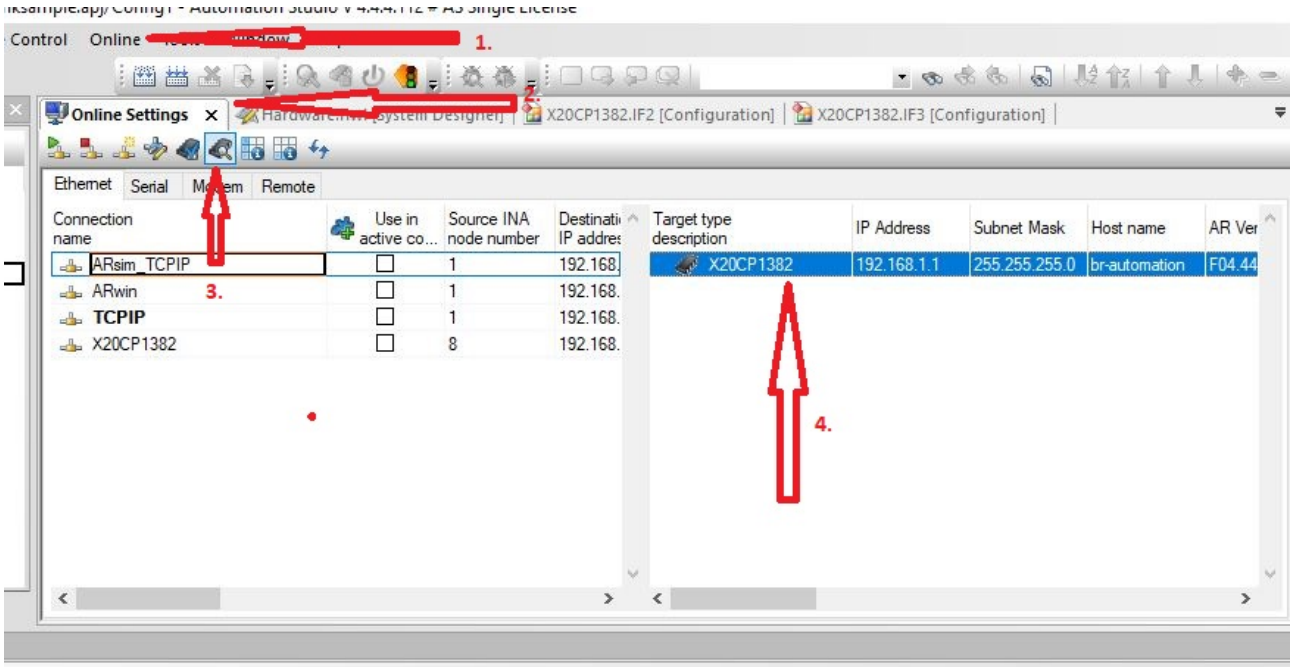
Figure 13 Completed Network



The next step is to connect the PC to the managing node and transfer the configuration to it.

To do this, on the top menu, select “Online”. Next, select “Settings”. A menu will appear that looks like **Figure 14**.

Figure 14 Connecting to PLC

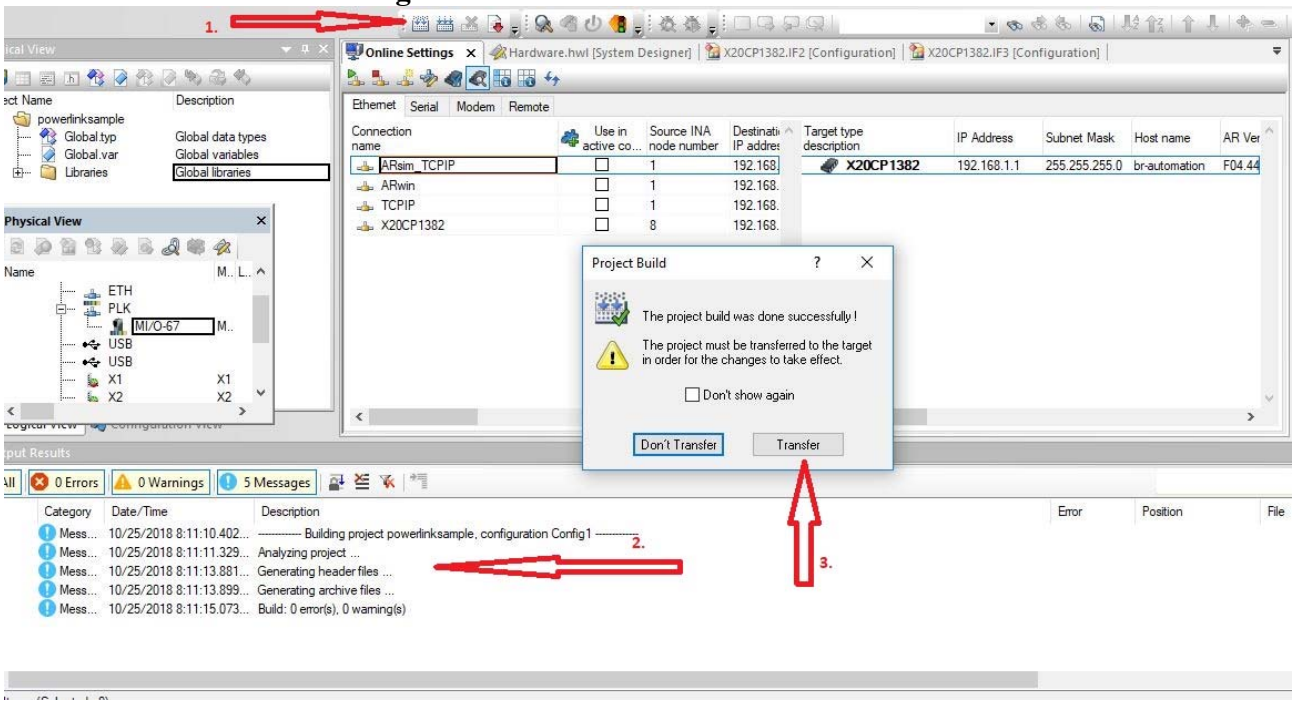


Select the icon as shown in (3) above. The controller will appear a short time later after the search (4). Select that, and it the green arrow connect icon under Online Settings.

Next, select the “Build” icon (1) **in Figure 15**. A series of step will appear on the screen on the bottom (2). After that is completed successfully, a Project Build menu will appear. Select

"Transfer" (3) from this.

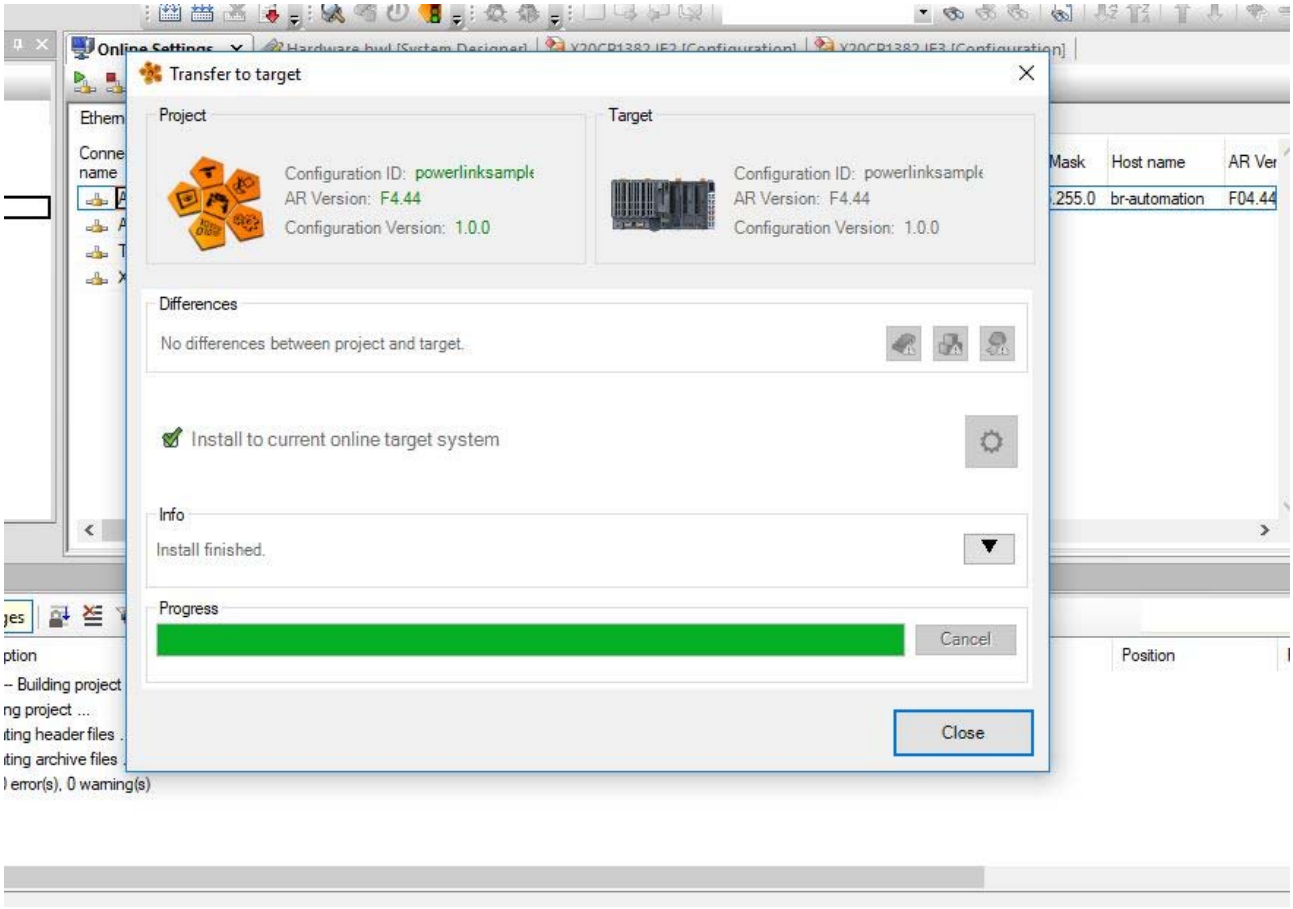
Figure 15 Transfer Process



The next thing that happens is the configuration is written to the controller, the controller is rebooted automatically, and goes into run mode (after asking if it is OK).

Figure 16 shows the transfer process screen.

Figure 16 Transfer Activation



During the transfer process, the PLC will be rebooted. The “E”, “R”., “RF”, “SE”, “ET”, and “PL” leds will flash during this process. This is normal.

When the managing node is online, then the “R” and “SE” leds will be solid green. The “ET” led (EtherNet) will blink green with activity along with the “PL” led (PowerLink). This is also normal.

See Figure 17 for the led description for a X20CP1382 module.

Figure 17 X20CP1382 Leds

Figure	LED	Color	Status	Description
	E	Red	On	SERVICE or BOOT operating mode
			Blinking	The "E" LED blinks red and the "RF" LED blinks yellow when there is a license violation.
			Double flash	Firmware update [1)]
	R	Green	On	Application running
			Blinking	Boot mode system start: CPU initializing the application, all bus systems and I/O modules [1)]
		Red	On	During reset
	RF	Yellow	On	SERVICE or BOOT operating mode
			Blinking	The "RF" LED blinks yellow and the "E" LED blinks red when there is a license violation.
	SE	Green/Red		Status/Error LED. The statuses of this LED are described in section "S/E" LED.
	ET	Green	On	A link to the Ethernet remote station has been established.
			Blinking	A link to the Ethernet remote station has been established. The LED blinks when Ethernet activity is taking place on the bus.
	PL	Green	On	A link to the POWERLINK peer station has been established.
			Blinking	A link to the POWERLINK peer station has been established. The LED blinks when Ethernet activity is taking place on the bus.
	A1 - A2	Green	Off	Open circuit or disconnected sensor
			Blinking	Input signal overflow or underflow
			On	Analog/digital converter running, value OK
	1 - 4	Green		Input state of the corresponding digital input
	C	Yellow	On	CPU transmitting or receiving data via the CAN bus interface
	S	Yellow	On	CPU transmitting or receiving data via the RS232 interface
	T	Yellow	On	The terminating resistor integrated in the CPU is switched on.
	DC	Yellow	On	CPU power supply OK

2. System Structure

A. Applicable MAC Valves Series for the MI/O-67

Following are the valves, which can be used with the MI/O-67 Valve Manifold:

92 Series
42 Series 46 Series

For other valve types, please consult the factory

The maximum wattage per channel is 12.0W, which corresponds to 500mA at 24VDC. The Comms Module uses 400mA from the valve current so the maximum total load is 7.6A. Please refer to the individual valve series and power calculator for further explanation of maximum wattage and current limits.

An example of a valve stack is shown in **Figure 1**. The stack consists of one Analog Module and one Comms Module, and 4 double solenoid valves for reference.

3. Power Wiring and Connectors

A. Connectors - Power

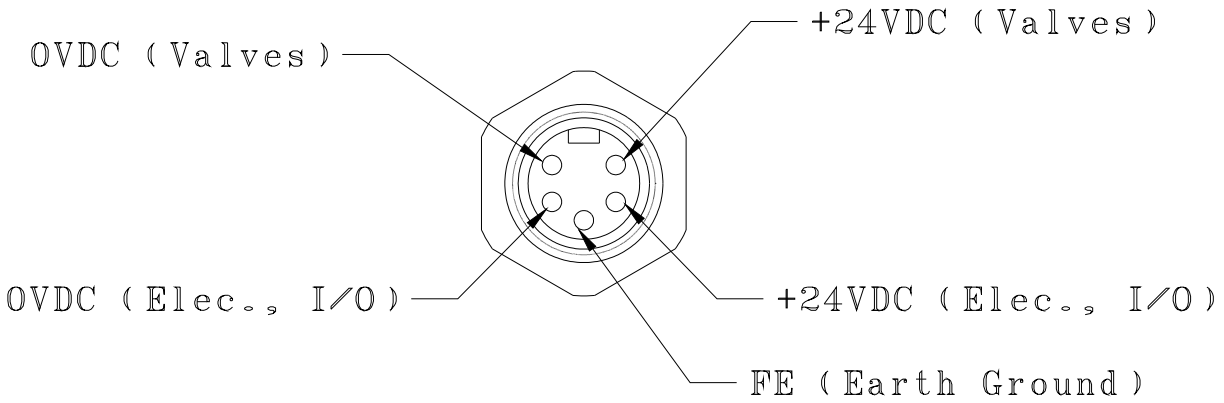
The power connector located on the top of the MI/O-67 is shown in **Figure 1 and Figure 2**. The power assignment of each pin is illustrated in **Figure 18**.

If it is desired to add or subtract modules from the stack, it is very important to remove all the power prior to connecting or discounting the modules. Failure to do this could result in module damage.

The power connector has two separate power channels on it. The first is the +24VDC required for the valves. The largest current a single valve can consume is 500mA. However since there can be up to 32 valves, each valve is limited to 225mA if all the channels are needed at the same time (8A total – 0.4A Comms Module Consumption = 7.6A….7.6A/32 Valve Channels = 0.238A/Channel….rounding down to 5.4W @24VDC =0.225A). Also, it is possible to run the electronics independent of the valves. If it is desirable to keep the electronics "awake," while the valve power is off, then two separate power supplies will be necessary. By disconnecting the valve power supply and keeping the electronics supply active, the node will stay online but the valves will not operate. Please note that it is also important to make a connection to the Earth.

As far as the Electronics and I/O power is concerned; it depends on the number of modules and the load on each module. For starters, each module except the Comms Module will draw about 100mA without a load (sensor, analog load, etc.). The Comms Module (electronics side) draws 150mA. The maximum capacity for this line is also 8.0A. Refer to the Power Handling Section (10) for the load calculations.

Figure 18 Power Connector Pin-Out

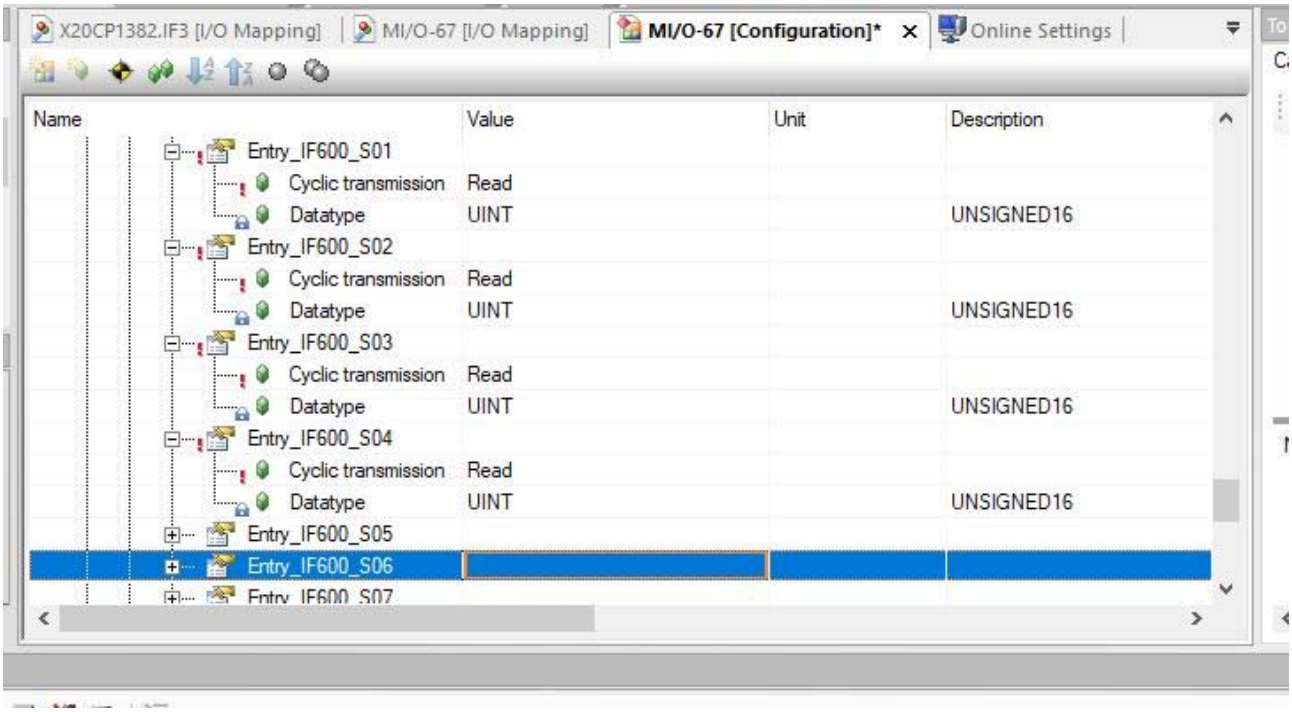


4. Stack Valve Operation

To operate the valves on the stack, the mapping to the device must be set to “write” in Module Output

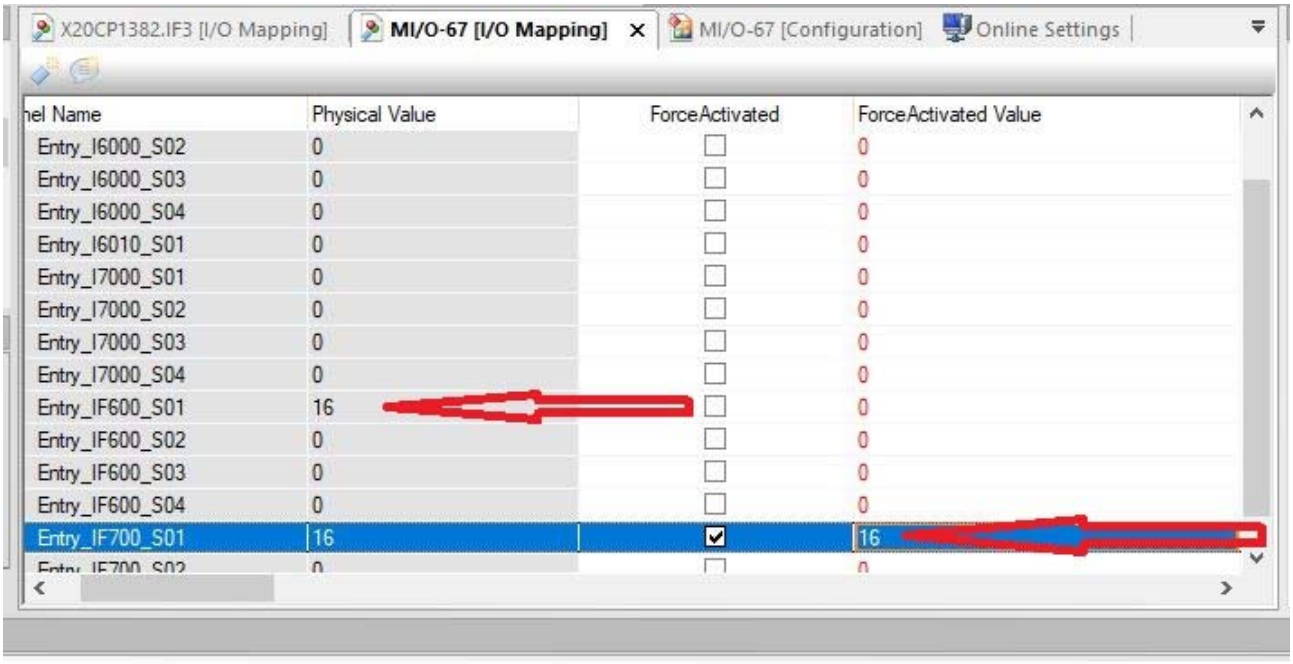
IF700_SO1 and Module Output_IF700_S02. Also, there is a command echo back located in Module Input IF600_S01 and S02 which must be set to “read”. These are set in the module configuration. The input configuration example is shown in **Figure 18**.

Figure 18 MI/O-67 Input Configuration



Shown in Figure 19, the fifth solenoid is operated on the valve stack. This is controlled from Module Output_IF700_S01. The read back is seen in Module Input_IF600_S01.

Figure 19 Operating Stack Valves



5. Analog Module Wiring and Connectors

A. Connectors

The four connectors for these modules on the top of the MI/O-67 are shown in **Figure 19**. The pin outs can be found in **Figure 20**.

Each module has four channels on four different connectors. The modules themselves are either 0-10V I/O or 4-20mA I/O.

Figure 19 Analog I/O Module

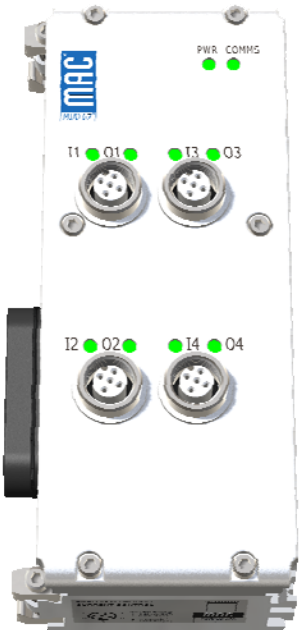
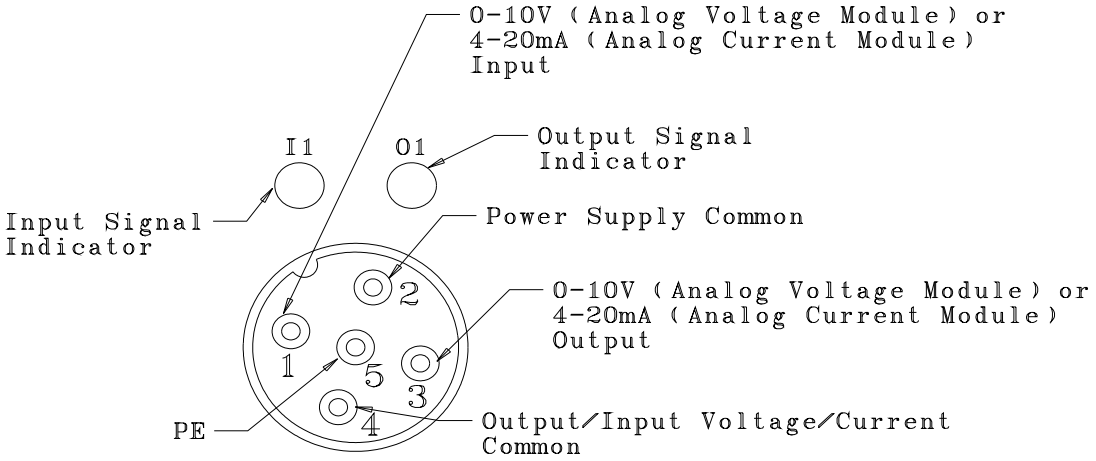


Figure 20 Analog I/O Pin-Out



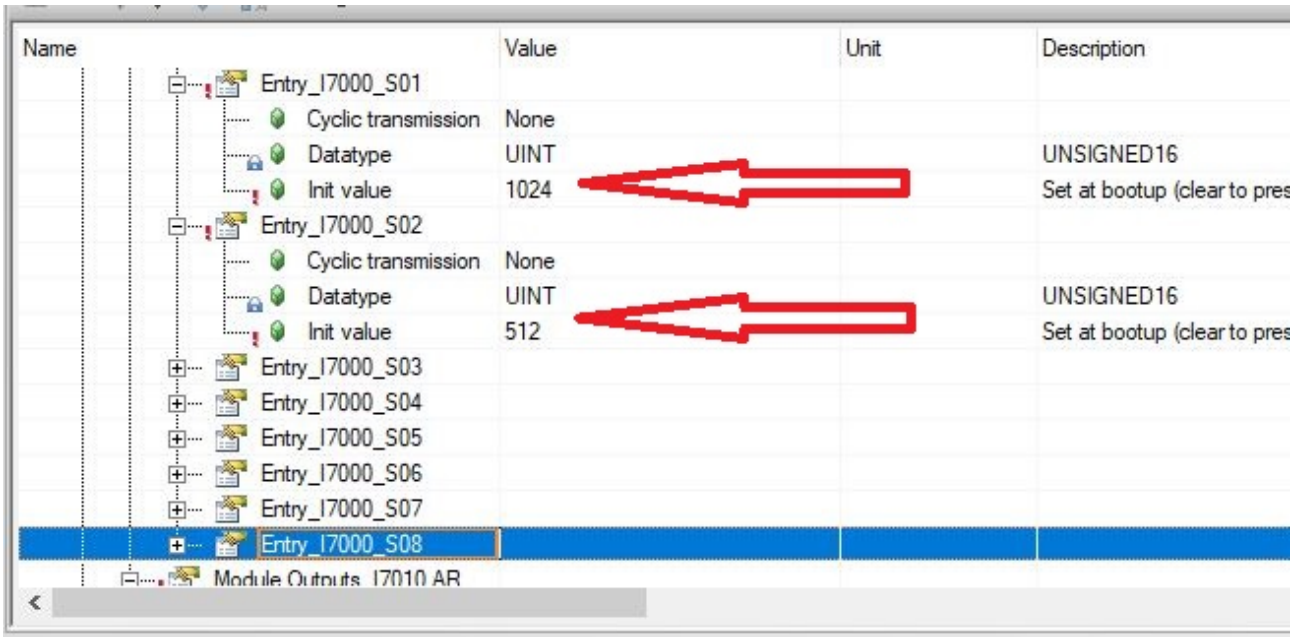
B. Memory Mapping

Below are the memory locations for the module. In our example in **Figure 19**, the module is the first from the Comms Module. These are for example only. The module has 12 bit resolution.

Our example in **Figure 19** we are operating an Analog Module (Voltage) output of 2.50V on connector 1 and 1.25V on connector 2.

In the table below the "nn" is the module location in the stack. The first module connected directly to the Comms Module is nn = 00, the second is nn = 01 (example above), etc.

Figure 21 Analog Module Outputs



Connector	Input	Output
1		
	Input 1	Module Input_I6nn0_S01
	Output 1	Module Output_I7nn0_S01
2		
	Input 2	Module Input_I6nn0_S02
	Output 2	Module Output_I7nn0_S02
3		
	Input 3	Module Input_I6nn0_S03
	Output 3	Module Output_I7nn0_S03
4		
	Input 4	Module Input_I6nn0_S04
	Output 4	Module Output_I7nn0_S04

C. Scaling

The table below gives approximate values for the given signals for either the 0-10V or 0-20mA inputs or outputs. These will vary slightly in the lower bits from module to module.

Analog Value	Digital Equiv. (UNSIGNED16)
0V	0
1.25V	512
2.5V	1024
5.0V	2048
7.5V	3072
10.0V	4096
0mA	0
4mA	819
8mA	1638
12mA	2458
16mA	3277
20mA	4096

6. Digital I/O Module Connectors and Configuration

A. Connectors

The eight connectors for these modules on the top of the MI/O-67 are shown in **Figure 21**. The pin outs can be found in **Figure 22**.

Each module has sixteen channels on the eight different connectors. The module can be configured for sixteen inputs, sixteen outputs, or eight inputs and eight outputs.

Also shown in **Figure 21** is the window for access to the mode selector dipswitches. More about that later.

Figure 22 Digital I/O Module

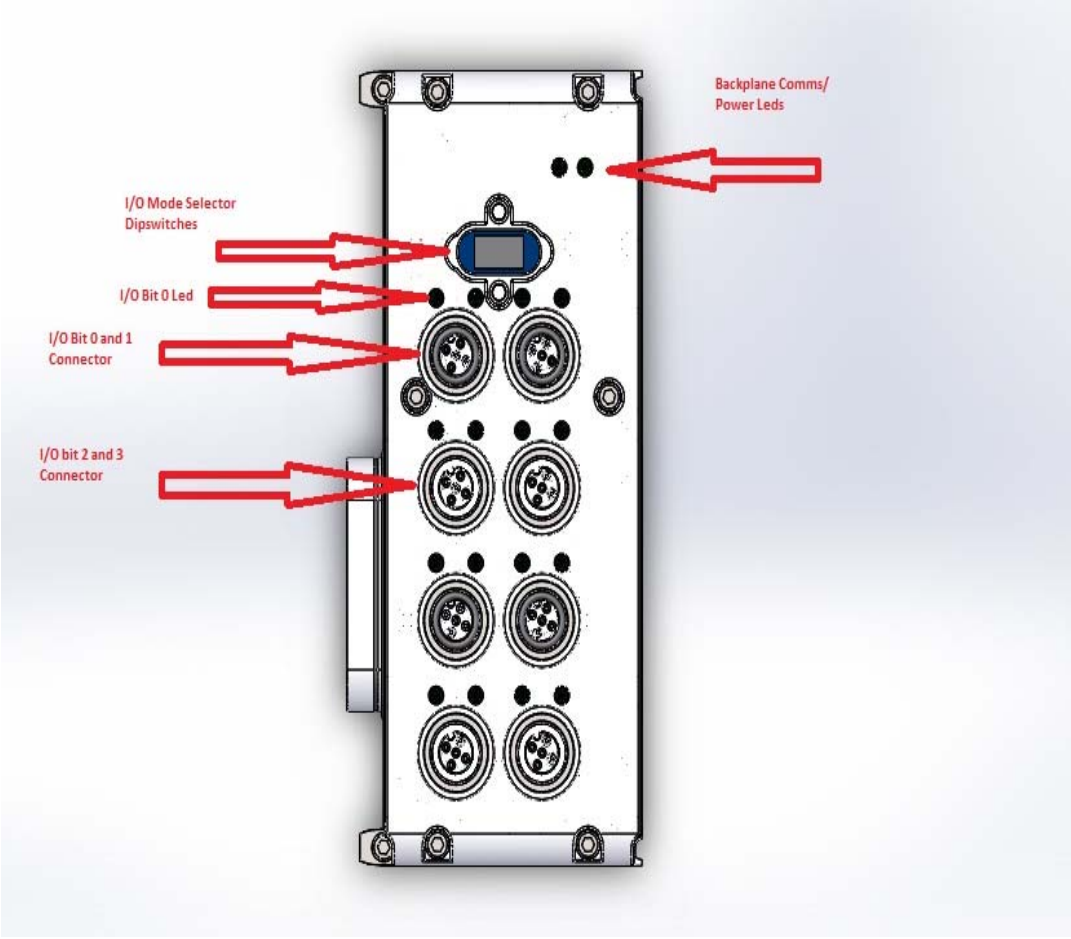


Figure 22 I/O Connectors Pin-Out

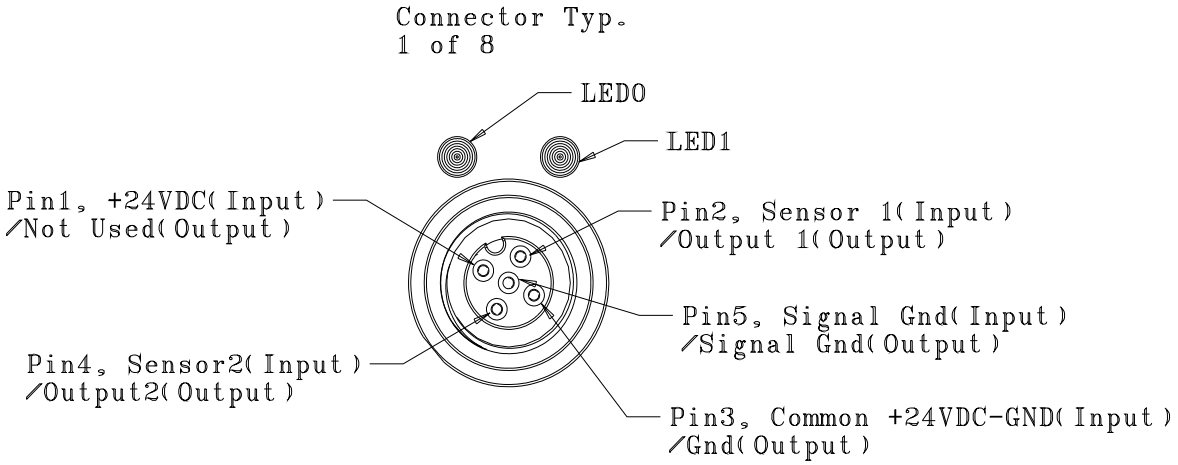
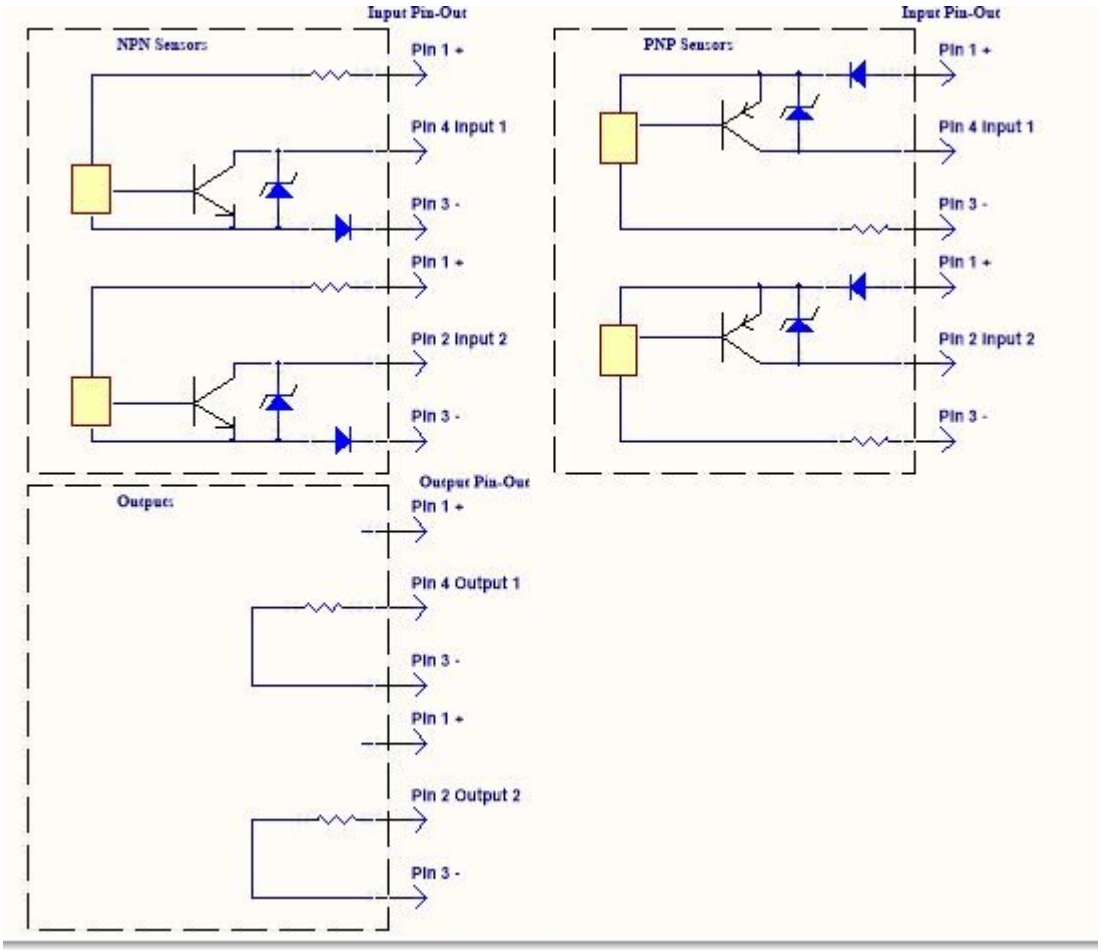


Figure 23 Sensor/Load Wiring



B. Dipswitch Configuration

The module is broken down into two banks of 8 points. The left 4 connectors are considered Bank A and the right 4 connectors are considered Bank B. The dipswitches shown in **Figure 21** will set the bank function of being either input or output connectors for these modules. The pin outs can be found in **Figure 22**. The wiring for each is shown in **Figure 23**.

As stated above, each module has sixteen channels on the eight different connectors. The module can be configured for sixteen inputs, sixteen outputs, or eight inputs and eight outputs. For the inputs, along with setting the banks, you can also set whether they are for npn or pnp sensors. The table below shows the dipswitch settings.

Left to Right as shown in **Figure 21**, where 0 = off position (dipswitch position away from top edge of board) and 1 = on position (dipswitch position is closer to top edge of board) for the switches:

Dipswitch			**Bank A**	**Bank B**
A	**B**	**C**		
0	0	0	Input/NPN	Input/NPN

0	0	1	Input/NPN	Output
0	1	0	Input/PNP	Input/PNP
0	1	1	Input/PNP	Output
1	0	0	Output	Input/NPN
1	0	1	Output	Output
1	1	0	Output	Input/PNP
1	1	1	Output	Output

C. Indicator LEDs

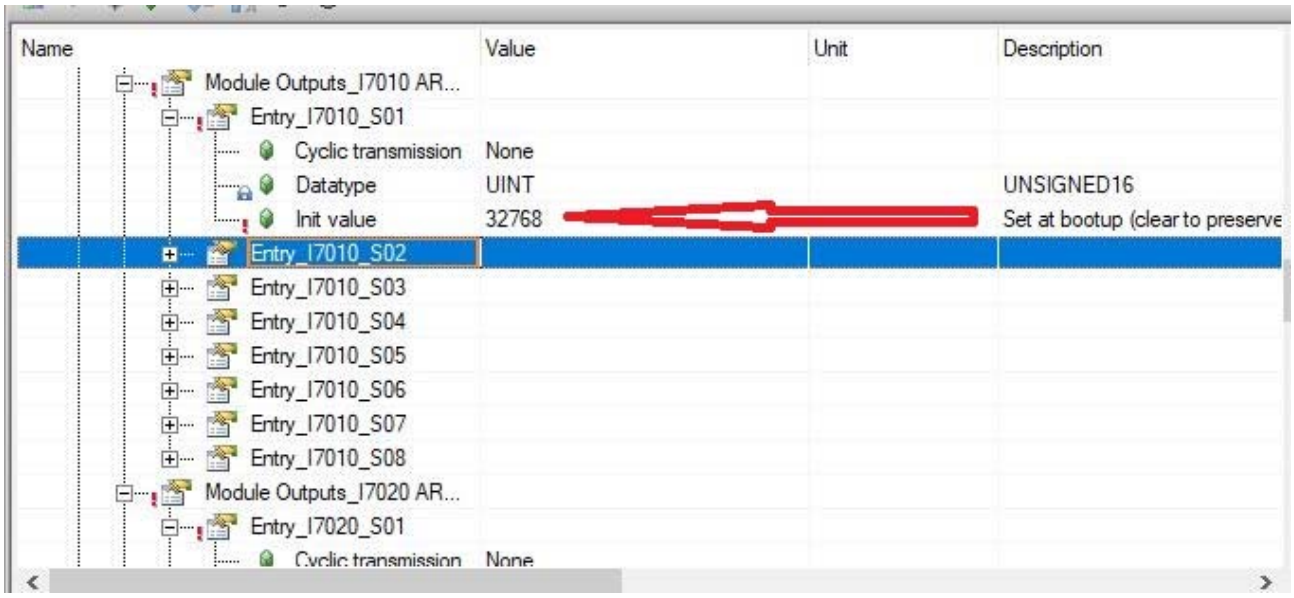
Each connector has two leds near them. The leds are solid green when the change is active (driving an output load or sensing an input).

D. Memory Mapping

Below are the memory locations for the module. In our example in **Figure 20**, the module is the second from the Comms Module. The addresses can be set to other locations. These are for example only. The toggles associated with either the inputs or outputs are UNSIGNED16.

Our example in Figure 20 is operating Output 16. It is the second module on the stack after the Comms Module.

Figure 23 Digital I/O (Output) Example



In the table below the “nn” is the module location in the stack. The first module connected directly

to the Comms Module is nn = 00, the second is nn = 01 (example above), etc. The number in the () is the decimal which corresponds to the input/output channel

Connector	Input Location	Output Location
1		
	Input 1	Module Inputs_I6nn0_S01 (1)
	Input 2	Module Inputs_I6nn0_S01 (2)
	Output 1	Module Outputs_I7nn0_S01 (1)
	Output 2	Module Outputs_I7nn0_S01 (2)
2		
	Input 3	Module Inputs_I6nn0_S01 (4)
	Input 4	Module Inputs_I6nn0_S01 (8)
	Output 3	Module Outputs_I7nn0_S01 (4)
	Output 4	Module Outputs_I7nn0_S01 (8)
3		
	Input 5	Module Inputs_I6nn0_S01 (16)
	Input 6	Module Inputs_I6nn0_S01 (32)
	Output 5	Module Outputs_I7nn0_S01 (16)
	Output 6	Module Outputs_I7nn0_S01 (32)
4		
	Input 7	Module Inputs_I6nn0_S01 (64)
	Input 8	Module Inputs_I6nn0_S01 (128)
	Output 7	Module Outputs_I7nn0_S01 (64)
	Output 8	Module Outputs_I7nn0_S01 (128)
5		
	Input 9	Module Inputs_I6nn0_S01 (256)
	Input 10	Module Inputs_I6nn0_S01 (512)
	Output 9	Module Outputs_I7nn0_S01 (256)
	Output 10	Module Outputs_I7nn0_S01 (512)
6		
	Input 11	Module Inputs_I6nn0_S01 (1024)
	Input 12	Module Inputs_I6nn0_S01 (2048)
	Output 11	Module Outputs_I7nn0_S01 (1024)
	Output 12	Module Outputs_I7nn0_S01 (2048)
7		
	Input 13	Module Inputs_I6nn0_S01 (4096)
	Input 14	Module Inputs_I6nn0_S01 (8192)
	Output 13	Module Outputs_I7nn0_S01 (4096)
	Output 14	Module Outputs_I7nn0_S01 (8192)
8		
	Input 15	Module Inputs_I6nn0_S01 (16384)
	Input 16	Module Inputs_I6nn0_S01 (32768)
	Output 15	Module Outputs_I7nn0_S01 (16384)
	Output 16	Module Outputs_I7nn0_S01 (32768)

7. Power Plus Module

A. Connectors

This module will have six connectors (twelve outputs total, two outputs per connectors) for external valve operation plus an external power connection.

B. Wiring

Shown below in **Figure 24** are the load connections to drive a valve or other 12W or less loads on the Power Plus Module. Note; each connector has two outputs. The wiring for these connectors is show in **Figure 23**.

The power to operate the electronics of the module comes from the Comms Module Electronics power. The load power comes from the mini connector on the module and is wired according to **Figure 25**. The outputs cannot be operated without power from the mini connector. If this power is absent, the channel leds will be solid red and an error message will be sent to the PLC.

Figure 23 Pin-Outs, Power Plus Module

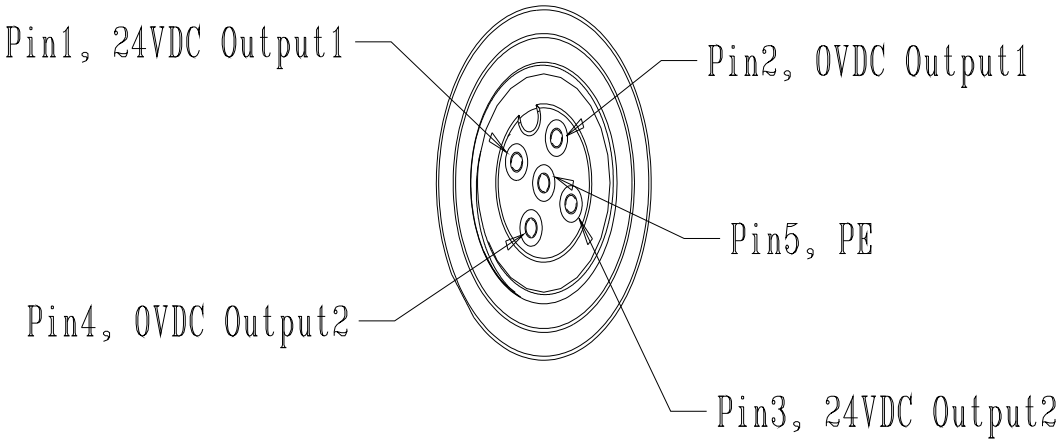


Figure 24 M12 Load Connections

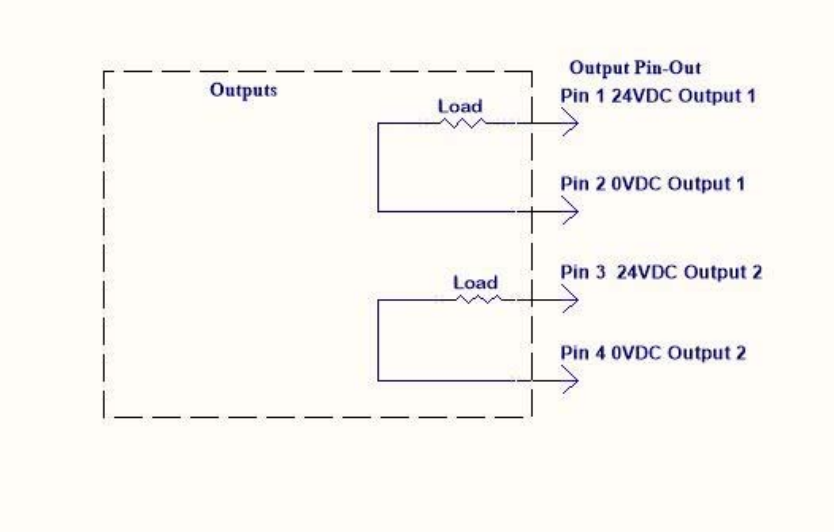
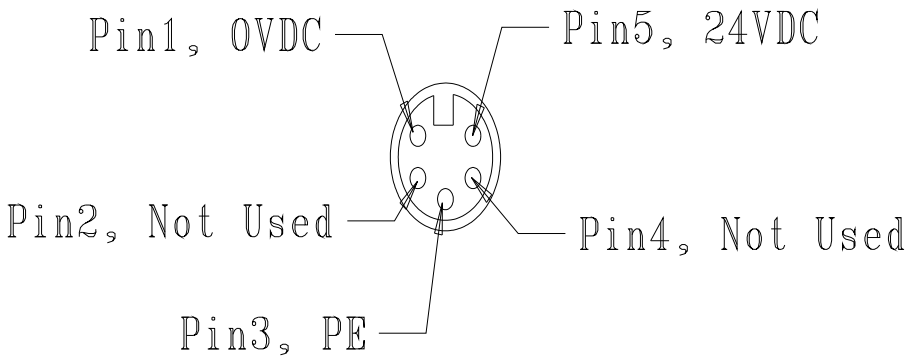


Figure 25 Mini Power Connector



C. Indicator LEDs

Each connector has two leds near them. The leds are solid green when the change is active (driving an output load). If there is no output power to the module, the leds will be solid red.

D. Memory Mapping

The memory mapping for the module is given in the table below. It uses address %QW308 for our example. The signals themselves are BOOL.

Connector 1	Output
Output 1	308.0

	Output 2	308.1
2		
	Output 3	308.2
	Output 4	308.3
3		
	Output 5	308.4
	Output 6	308.5
4		
	Output 7	308.6
	Output 8	308.7
5		
	Output 9	308.8
	Output 10	308.9
6		
	Output 11	308.10
	Output 12	308.11

8. Network Connection

A. Connectors – PowerLink

There are two PowerLink connectors shown in **Figure 1 and Figure 2**. The one on the left is Port 1; the one on the right is Port 2. If you are connecting this in a standard "drop" type configuration where one port is used, either Port 1 or Port 2 can be connected without any other configuration. The software for the controller will have to be set for which port is connected to the MIO but either can be used.

9. Power Plus Module

A. Connectors

This module will have six connectors (twelve outputs total, two outputs per connectors) for external valve operation plus an external power connection.

B. Wiring

Shown below in **Figure 27** are the load connections to drive a valve or other 12W or fewer loads on the Power Plus Module. Note; each connector has two outputs.

The power to operate the electronics of the module comes from the Comms Module Electronics power. The load power comes from the mini connector on the module and is wired according to **Figure 28**. The outputs cannot be operated without power from the mini connector. If this power is absent, the channel leds will be solid red and an error message will be sent to the PLC.

Figure 24 M12 Load Connections

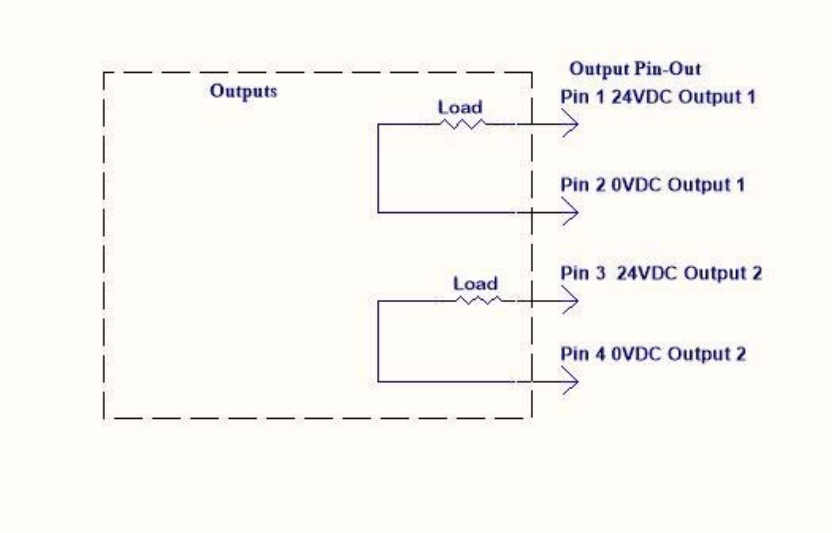
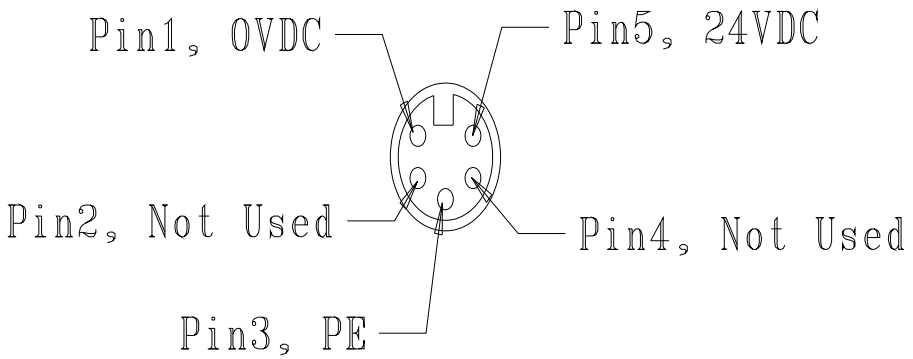


Figure 25 Mini Power Connector



C. Indicator LEDs

Each connector has two leds near them. The leds are solid green when the change is active (driving an output load). If there is no output power to the module, the leds will be solid red.

10. Network Connection

A. Connectors – PowerLink

There are two PowerLink connectors shown in **Figure 1 and Figure 2**. The one on the left is Port 1; the one on the right is Port 2. If you are connecting this in a standard "drop" type configuration where one port is used, either Port 1 or Port 2 can be connected without any other configuration. The software for the controller will have to be set for which port is connected to the MIO but either can be used.

11. Comms Module Diagnostics

The Comms Module has system diagnostics which can be read from the PLC.

A. Back Plane Status Word

Bit	Description
0-7	Heartbeat Values 0x00 = Bootup Message 0x04 = Stopped 0x05 = Operational 0x7f = Pre-operational
8	Heartbeat Producer Timeout 1 = Slave – Master Timeout 0 = No error
9	Heartbeat Consumer Timeout 1 = Master – Slave Timeout 0 = No error
10	Non-Volatile CRC Error 1 = Non-Volatile Memory Corruption

0 = No error

11 CAN Error Passive
1 = CAN controller is in 'Error Passive' state. The module is not permitted to add errors to the CAN warning registers. Thus, the backplane is offline.
0 = No error

12 CAN Receive Overrun Error
1 = Data was lost
0 = No error

13 CAN Transmit Overrun Error
1 = Data was lost
0 = No error

14 CAN Bus-Off Error
1 = Device will auto-recover from this failure once the failure condition has been removed.
0 = No error

15 External I/O Error
1 = Module Fault
Power Plus Module short or over temperature
Power Plus Module open-load detection
Power Plus Module driver chip fault
Analog Module, Voltage output shorted
Analog Module, Voltage output over-temperature
Analog Module, Voltage input over-voltage
Analog Module, Current input under-current
Analog Module, Current input over-current
Analog Module, Current output open-load
0 = No error

12. Power Handling

The MI/O-67 system has two power paths for the valves and the modules as shown in **Figure 1** in Section 3.1. In addition to that, the Power Plus Module uses an external power connector to operate the valves connected to that module.

A. Valve Power

The first power system is for the valves on the stack. It is isolated from the electronics power and thus can be separately disconnected of desired. It can pass up to 8A at 24VDC maximum. To calculate the total power for the valve line, use the following formula:

Total Current (Amps) = Number of Valves x (Valve Wattage/24) +0.4A $\leq$ 8 Amps.

If there are valves of different wattages on the stack then each group of wattages must be

added up separately. Thus:

Total Current (Amps) = [Number of Valves (Wattage1) x (Valve Wattage1/24)] + [Number of Valves (Wattage2) x (Valve Wattage2/24] + [Number of Valves (Wattage3) x (Valve Wattage3/24] + [Number of Valves (Wattage4) x (Valve Wattage4/24)] …..etc.

Note: Valve wattage must be $\leq$ 12 watts per channel at 24VDC.

B. Electronics Power

There is an isolated power line which also can handle up to 8 Amps at 24VDC. This line is used for the PowerLink electronics, module electronics, and the electronics (but not the outputs) of the Power Plus Module.
In general, the power consumed by the modules by themselves (excluding the Comms Module) will be 100mA per module. This number does not include the loads on the module from sensors, analog outputs, and outputs from the Digital I/O Module.

1. Comms Module

The Comms Module will consume 150mA from the 8A total. Thus, for additional modules, and assuming there is 8A available at the connector, the first module will have 7.85A maximum to work with.

2. Analog Module, Current

The Analog Module can operate 4 channels of 4-20mA outputs at the same time. If all the channels are running at maximum output the module will consume 180mA from the electronics power allotment per module.

3. Analog Module, Voltage

Like the Analog Current Module above, the Analog Voltage Module has four channels which can output 10V at a maximum of 16mA per channel. This module will consume, at maximum output, 180mA per module from the electronics power allotment.

4. Digital I/O Module

The modes of the Digital I/O Module must be considered when calculating the module's current draw.

If the module is run completely as an output unit, then the total current draw will be 100mA (for the module) + (number of channels used up to 16 x current load of the outputs). For example, if there are 16 250mA loads on the device, then the current draw will be 100mA + (16 x 250mA) = 4.1A. Care must be taken with this module because the individual channel maximum outputs are 0.5A and

if the unit is loaded down to the maximum (16 x 0.5A) it is possible to completely load the entire stack and take the PowerLink off line.

If the module is used only as an input unit, then the draw of the sensors must be taken into account. This works out as 100mA for the module and then the current draw of each sensor x the number of sensors on the module. For example, if there are 16 Hall Effect proximity sensors on the module and each sensor draws 2mA, then the total current draw for the module will be 100mA + (16 x 2mA) = 132mA total.

Using the module as a combination input/output module will require using input and output current calculations plus the module current draw (100mA).

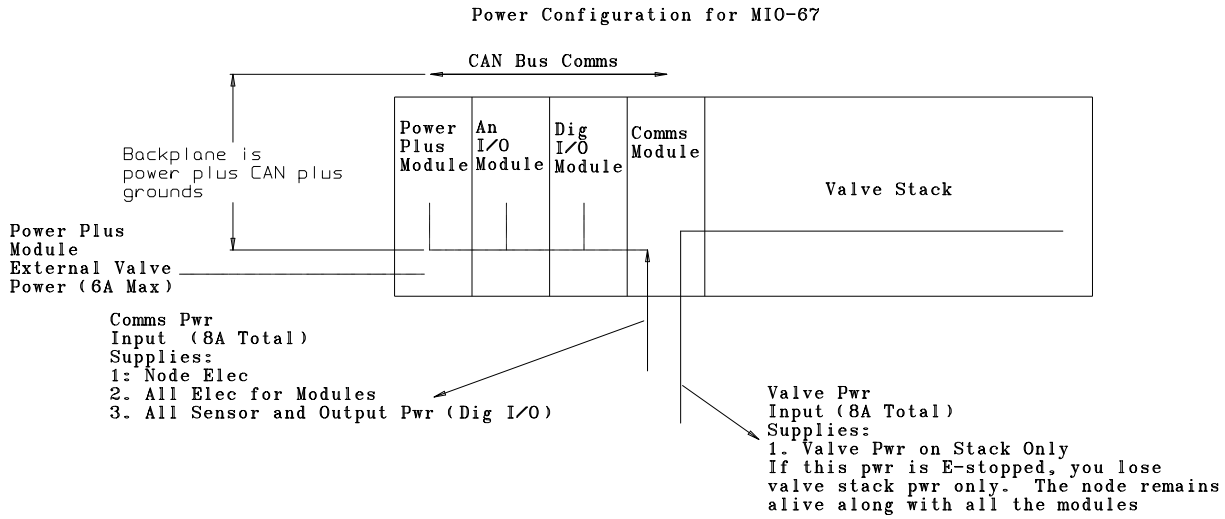
5. Power Plus Module

The Power Plus Module can operate up to 12 0.5A loads (valves, outputs, etc.). However, this power does not come from the electronics total. The module itself draws 100mA.

C. Power Distribution

The stack's power distribution is shown in **Figure 35**. Note, the Electronics power handles all the module electronics plus the I/O electronics for the Digital and Analog I/O Modules. This is routed through the backplane along with the CAN control signals. The stack valve power comes from the Comms Module power. The Power Plus Module has a separate source for its loads.

Figure 28 Stack Power Distributions

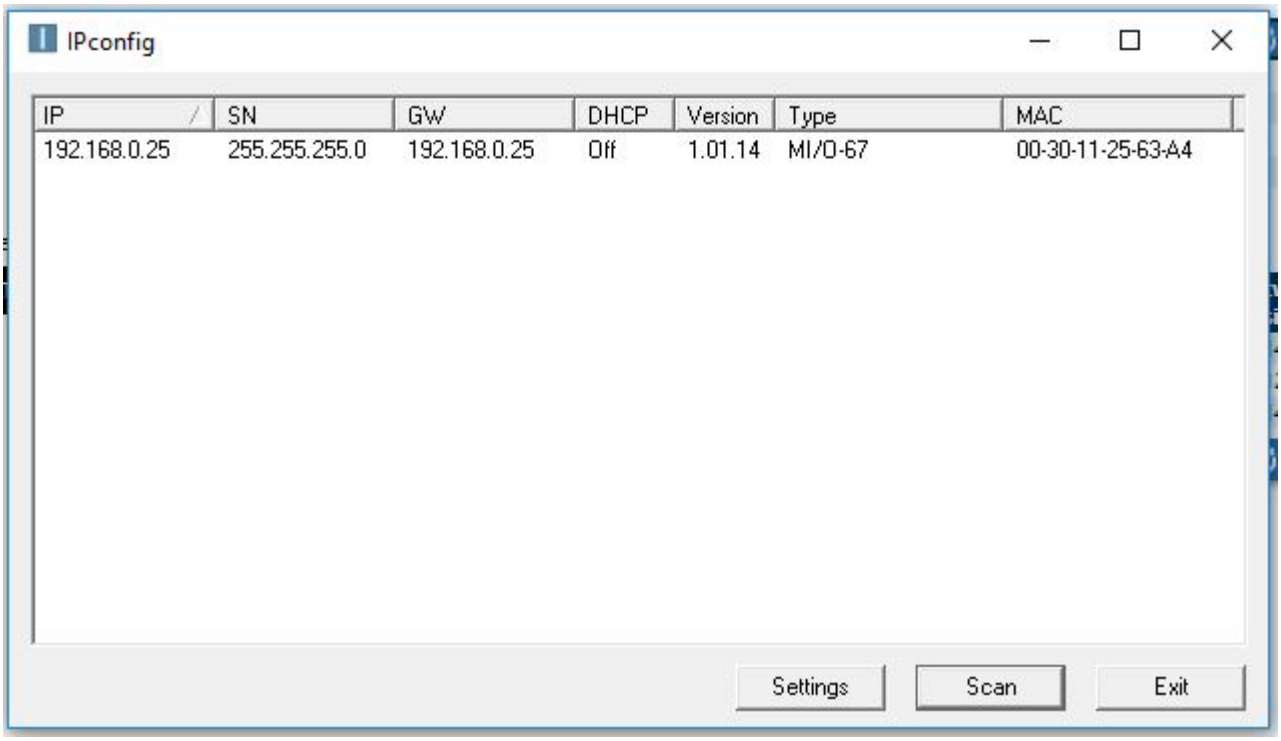


13. Configuration Using the IP Config and Web Config Tools (See UI-174 for more detailed instructions)

The IP Address comes as the factory default as 192-168.1.25. However, if the address is not known or needs to be verified, then the IP Config tool is the easiest way to accomplish this.

The steps are:

1. Connect the unit to a PowerLink line and host computer.
2. Connect power to the stack.
3. Start the IP Config Tool (must be preloaded onto the host computer).



4. A screen will appear showing the stack, IP Address, MAC ID, etc.
5. To re-set the IP Address, select the stack on the list (double click). A second menu will appear, load the desired IP Address, Subnet Mask…etc. Exit menu.
6. The first menu will appear. Scan the network and the new information regarding the stack will appear.

To use the Web Config Tool:

1. Connect the unit to a PowerLink line and host computer.
2. Connect power to the stack.
3. Launch the web browser (i.e. Google Chrome, Mozilla Firefox, etc.)
4. Browse to http://192.168.0.25 (or whatever the IP Address has been set into the Comms Module)
5. A screen will appear that looks like below.
6. On the left-hand menu bar, go to "1. Network".
7. Type in the desired IP Address in the space and hit "Save Settings".
8. Power cycle the Comms Module for the new address to take effect.
9. Also using this tool, you can see the complete device using the various menu items.


192.168.0.25
MAC VALVES
MI/O-67® WebConfig
DEVICE
Overview
Status
Control
Network
I/O Data
All Parameters
CONFIGURATION
1. Network
2. Topology
3. Device
Device Overview
Communications Module Details
Refresh
Device Name: MI/O-67®
Uptime: 0 days, 3h:20m:13s
Network CPU Load: 9%
Network Interface: PROFINET IRT (FW v1.39.2)
Additional Module Information
Module Number | Module Type | Module ID | Serial Number | Hardware Version | Software Version
0 | Communications | --- | 0xA0398CE4 | 1.3.0 | 1.1.14a
1 | Digital I/O | 0x70030191 | 0x0000000B | 1.3.1 | 1.1.12
2 | Valve Driver + PI | 0x84030191 | 0x00000009 | 1.2.1 | 1.1.14
Refresh

14. Specifications

General Specifications

Item	Specifications
Operating ambient temperature	0~+50°C (consult the factory for higher temperature operation)
Operating ambient humidity	10~90% RH (no condensation)
Vibrating resistance	5G (10~55 Hz, 0.5mm)
Impact resistance	10G
Dielectric strength	500VAC 60 Hz for 1 sec. (between external terminal and case)
Insulation resistance	10Mohm
Operating atmosphere	No corrosive gases

PowerLink Performance Specifications

Item	Specification
Transmission Speed	10Mbit/100Mbit
Transmission Distance	100m
Transmission Media	CAT-5 PowerLink cable
Protocols	PowerLink

15. Troubleshooting Guide

In the event of difficulties in either operation or installation of the MI/O-67, there are number of fault detection tools available. Along with the short/open detection mentioned above, each module has groups of LEDs which can help to get the manifold online in the event of problems.

A. Comms Module

Below the EtherNet Ports, there are four LEDs. Along the top of the Comms Module are three LEDs.

For NS (Network Status):

State	Description
Off	No Power/No IP Address
Green	Online, 1 or more connections established
Green Flashing	Online, no connection established
Red	Duplicated IP Address, Fatal Error
Red Flashing	Connection timed out

For MS (Module Status):

State	Description
Off	No power
Green	Controlled by a scanner in run mode
Green Flashing	Not configured or scanner in idle mode
Red	Fatal Error
Red Flashing	Recoverable fault. If operating in non-DLR mode, this while flash red as a connector time out.

For LS (Link/Activity)

State	Description
Off	No Link/No Activity
Green	Link established, 100mb
Green Flickering	Activity, 100mb
Yellow	Link established, 10mb
Yellow Flickering	Activity, 10mb

For Power:

State	Description
Off	No Power
Green	Power OK

For Comm (Backplane Communications):

State	Description
Off	No power
Green	OK
Green Flashing	Not configured or scanner in idle mode
Red	Fatal Error
Red Flashing	Recoverable fault

For Stat (Backplane Status)

State	Description
Off	No Link/No Activity
Green	Run Mode
Green Flashing	Standby Mode

B. Digital I/O Module

Leds on top right of module

Com Led-- Red: (CANopen Status, Error Led)

State	Description
Off	No error
Single Flash	Warning limit reached (error passive)
Flickering	LSS Config Mode
On	Bus Off/fatal error
Double Flash	Heartbeat timeout error

Com Led-- Green: (CANopen Status, Run Led)

State	Description
Single Flash	CANopen stopped state
Flickering	LSS Config Mode
On	CANopen operational state
Blinking	CANopen pre-operational state

PWR Led:

State	Description
Green	Power/Application loaded
Green w/Red Single Flash	IO Comm failure
Flickering between Green and Red	Dip switch state changed
Red	Fatal error in application

IO Led near each M12 connector, 2 ea.:

Input Mode

State	Description
Green	NPN-connection is sinking current, PNP-connection is sourcing current.
Red	Fault on channel
Off	Channel off

Output Mode

Green	Output on
Red	Fault on channel
Off	Channel off

During start up, PWR, IO, and Com Leds will be 0.25sec Green, 0.25sec Red.

C. Power Plus Module

Leds on top right of module

Com Led-- Red: (CANopen Status, Error Led)

State	Description
Off	No error
Single Flash	Warning limit reached (error passive)
Flickering	LSS Config Mode
On	Bus Off/fatal error
Double Flash	Heartbeat timeout error

Com Led-- Green: (CANopen Status, Run Led)

State	Description
Single Flash	CANopen stopped state
Flickering	LSS Config Mode
On	CANopen operational state
Blinking	CANopen pre-operational state

PWR Led:

State	Description
Green	Power/Application loaded
Green w/Red Single Flash	IO Comm failure
Flickering between Green and Red	Dip switch state changed
Red	Fatal error in application

Output Led near each M12 connector, 2 ea:

State	Description
Green	Output on
Red	Fault (output power not present)
Off	Output off

During start up, PWR, Output, and Com Leds will be 0.25sec Green, 0.25sec Red.

D. Analog I/O Module (Voltage and Current)

Leds on top right of module

Com Led-- Red: (CANopen Status, Error Led)

State	Description
Off	No error
Single Flash	Warning limit reached (error passive)
Flickering	LSS Config Mode
On	Bus Off/fatal error
Double Flash	Heartbeat timeout error

Com Led-- Green: (CANopen Status, Run Led)

State	Description
Single Flash	CANopen stopped state
Flickering	LSS Config Mode
On	CANopen operational state
Blinking	CANopen pre-operational state

PWR Led:

State	Description
Green	Power/Application loaded
Green w/Red Single Flash	IO Comm failure
Flickering between Green and Red	Dip switch state changed
Red	Fatal error in application

During start up, PWR, IO, and Com Leds will be 0.25sec Green, 0.25sec Red.

16. Troubleshooting Chart

Fault	**Description**
Do valves operate?	

No	Check power to Comms Module Check network wiring Check network indicator LEDs on Comms Module Check network IP Address and Configuration Check for correct Bytes to operate valves in PLC Output Table
Do modules operate?	
No	Check configuration in PLC If using a Digital I/O Module, check dipswitches on module If using a Power Plus Module, check external power Check all module for wiring (sensors, loads, etc)
Are you getting faults on Comms Module?	Check the Open Load Diagnostics in PLC and valve set up
Is unit coming online in the PLC network?	
No	Check the IP address and whether the EDS file is loaded

Warning:

Under no circumstances are MAC Valves to be used in any application or system where failure of the valves or related components to operate as intended could result in injury to the operator or any

other person.

- Do not operate outside of prescribed pressure or temperature ranges.
- Air supply must be clean. Contamination of valve can affect proper operation.
- Before attempting to perform any service on valve, consult catalog, P & O sheet, or factory for proper maintenance procedures. Never attempt service with air pressure to valve.
- If air line lubrication is used, consult catalog, P & O sheet, or factory for recommended lubricants.
- Before interfacing the product to any bus or serial system, consult the controller and bus manuals for proper usage.