AVENTICS™

G3 Series
EtherCAT™
Technical Manual

EtherCAT®

EMERSON

Conditions for use of this product

(1) Aventics G3 Manifold ("the PRODUCT") shall be used in conditions;
i) Where any problem, fault or failure occurring in the PRODUCT, if any, shall not lead to any major or serious accident.

ii) Where the backup and fail-safe function are systematically or automatically provided outside of the PRODUCT for the case of any problem, fault or failure occurring in the PRODUCT.

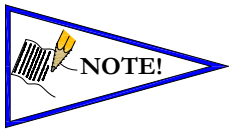
(2) The PRODUCT has been designed and manufactured for the purpose of being used in general industries.

ASCO L.P. shall have no responsibility or liability including but not limited to any and all responsibility or liability based on contract, warranty, tort, product liability for any injury or death to persons, loss or damage to property caused by the product that are operated or used in application not intended or excluded by instructions, precautions or warnings contained in Aventics Technical, User, Instruction, Safety manuals or bulletins.

Safety precautions

Before using this product, please read this manual and the relevant manuals carefully and pay attention to safety and product application. The following symbols are used in the manual to identify important safety, installation and application information.

Caution symbol indicates a possible hazard which may cause injury or equipment damage.



Note symbol indicates important information regarding equipment installation and setup

Electrical installation and operational guidelines

- To be connected to Class 2 power source only
- All Aventics communication nodes should be grounded during the installation process. These grounding guidelines can be found in National Electrical code IEC 60204-1 or EN 60204-1.
- All Aventics G3 Electronics Products to be installed or wired in accordance with Aventics's published instructions and applicable electrical codes.
- MULTIPLE CLASS 2 POWER SOURCES: When interconnects, class 2 sources shall be Listed and rated suitable for parallel interconnection
- Sources shall be Listed and rated suitable for parallel interconnection
- CLASS 2 WIRING: All field wiring shall be suitable for Class 1, Electric Light and Power, or Class 2, 3 wirings are routed separately and secured to maintain separation between 1) Class 2 wiring and all other class wiring, and 2) Limited energy circuit conductors from unlimited energy circuit conductors
- Class 2 Device Wiring Only – Do Not Reclassify and Install as Class 1, 3 or Power and Lighting Wiring
- When using molded connector power cables, Do Not rely on wire colors for Pin-Out. Always use pin number references.
- Wire connections shall be rated suitable for the wire size (lead and building wiring) employed
- MULTIPLE CLASS 2 POWER SOURCES: When interconnects, class 2 sources shall be Listed and rated suitable for parallel interconnection
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Table of Contents

1. About EtherCAT

EtherCAT™ is a registered trademark and patented technology, licensed by Beckhoff Automation (GmbH, Germany).

1.1 Overview

EtherCAT™ is an Ethernet-based networking solution for automation but has added benefits/features toward manufacturing applications.

The EtherCAT™ Technology Group or ETG develops and promotes EtherCAT™ technology.

G3 EtherCAT™ uses industrial M12 IP67-rated connectors. The protocol transfers data at a fixed speed of 100 Mbps. The maximum network cabling distance is limited to 100m segments at 20° C.

More information about EtherCAT™ can be obtained at the web site http://www.EtherCAT.org.

1.2 G3 EtherCAT™ Features

Features	*Description*
Spec. Supported	Designed by the EtherCAT™ Technology Group (ETG)
Bus Topology	Star, Tree, Ring or Daisy Chain
Baud Rates Supported	100 Mbps
CE	CE Compliant
Duplicate Address Detection	If a duplicate address is detected on power up, duplicates will not progress to run mode
Address Setting	Web Page Configuration, Graphical Display
Conformance Tested	ETG proof of conformity

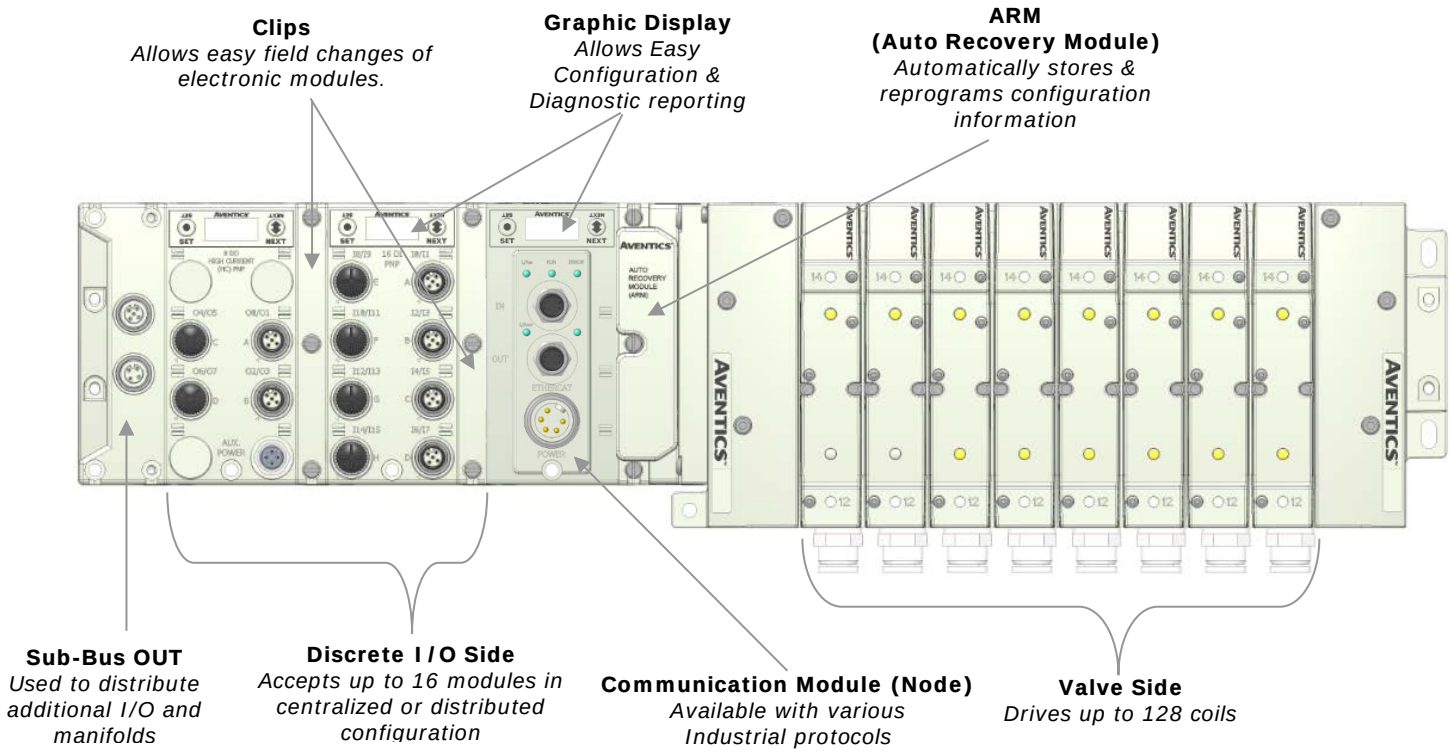
2. G3 Introduction

The G3 Series is an electronic product platform that features an integrated graphic display for simple commissioning and displaying of diagnostic information. In addition it has an innovative distribution capability which allows the same I/O components that make up a centralized manifold configuration to be used as the distribution components as well, decreasing the need for duplicate components on centralized and distributed applications. The G3 platform interfaces to a variety of valve series and fieldbus interface protocols and is capable of addressing a total of 1200 I/O points (150 bytes). With proper assembly and termination the G3 modules will have an IP65 rating.

The manifold can be viewed as having two sections to it, the *Valve Side* and the *Discrete I/O Side*. The *Valve Side* supports a maximum of 128 solenoid coils and the *Discrete I/O Side* supports a maximum of 16 modules capable of addressing up to 1200 outputs, 1200 inputs or various combinations.

Various discrete modules with integrated graphic display are available. They include digital I/O, analog I/O, and specialty modules which cover various application needs. Pin-outs for all connectors are labeled on the side of the respective modules and are also detailed in the module section of this document.

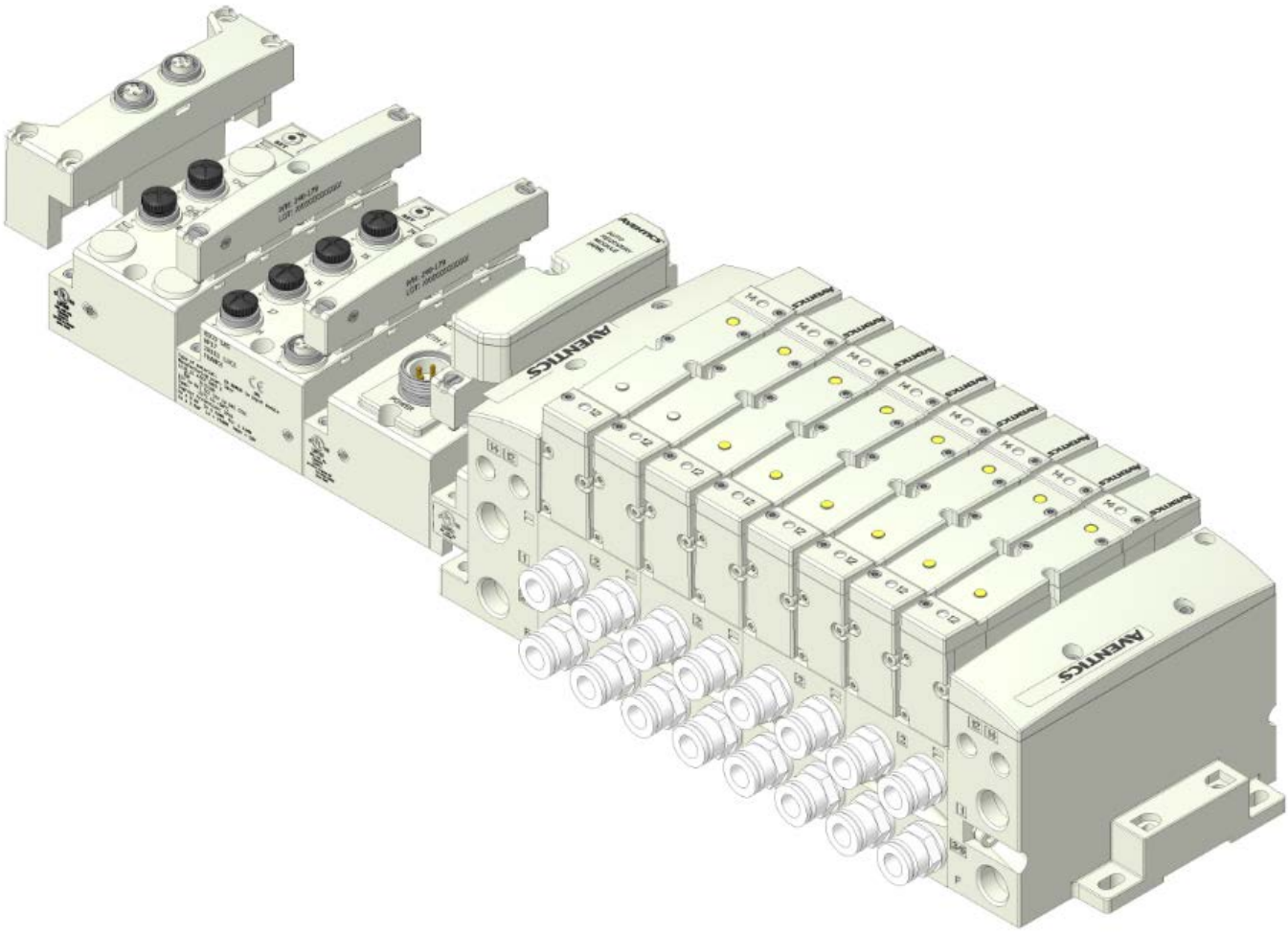
This manual details specific information for configuring and commissioning the Aventics G3 Series product line. For more information relating to pneumatic valves and valve manifold assemblies, please refer to the Aventics website at www.asco.com.



2.1 G3 Electronics Modularity

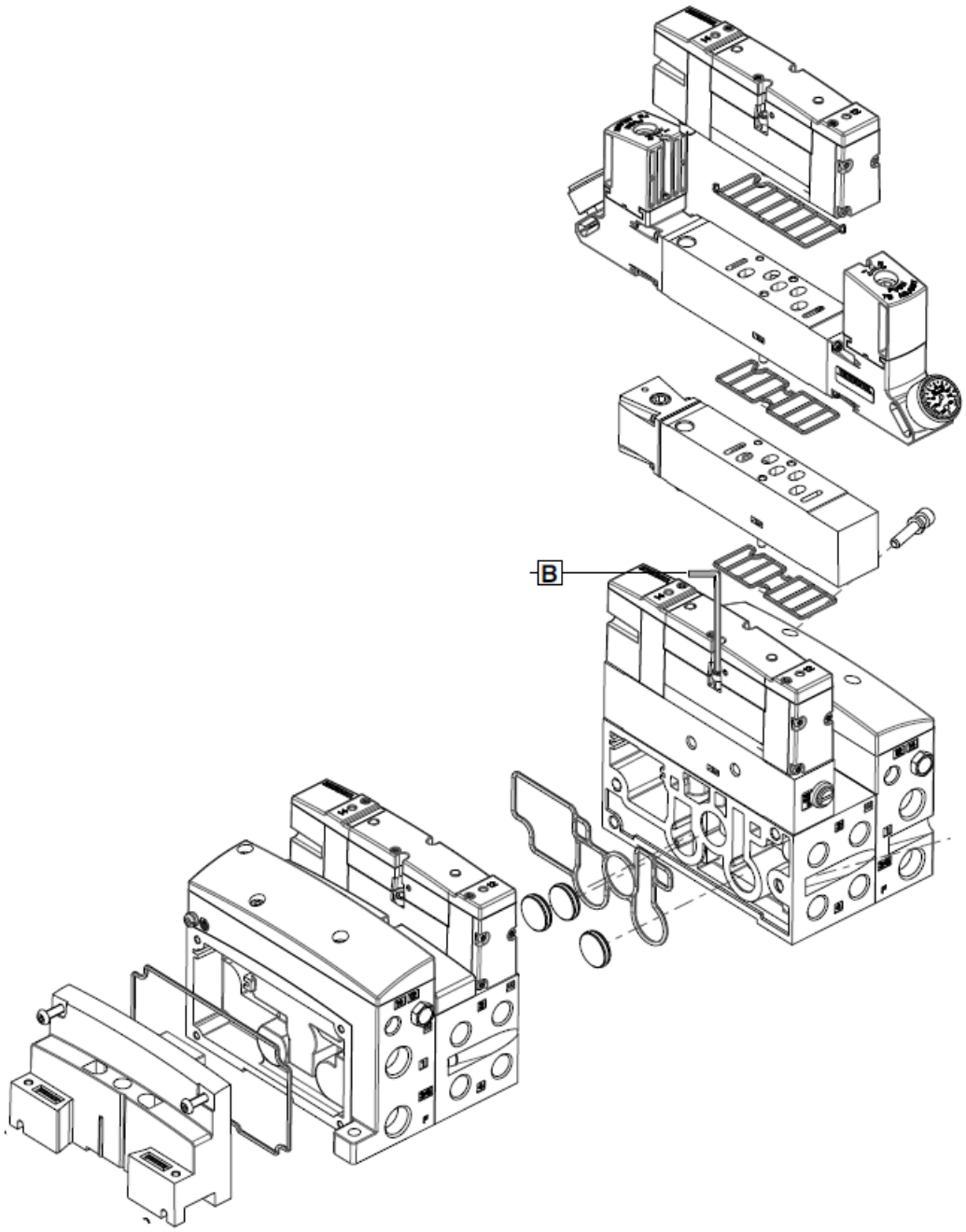
Discrete I/O

The G3 Series product line is a completely modular and scalable system. As shown below, all of the G3 electronic modules plug together, via mechanical clips, allowing for easy assembly and field changes.



2.2 500 Series Pneumatic Valve Manifold

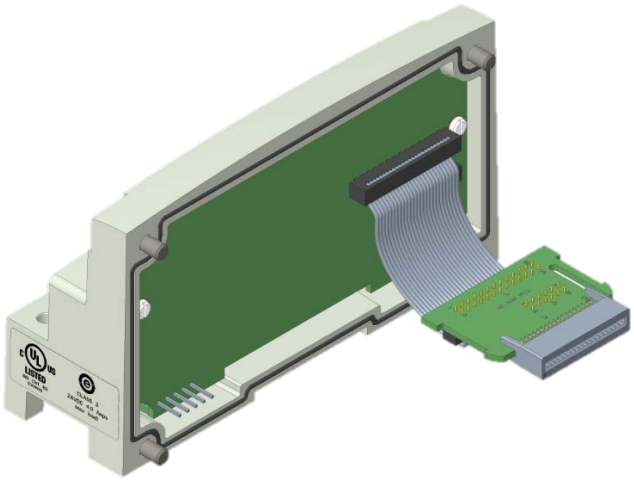
The pneumatic valve manifold with internal circuit board technology is also modular. The valve solenoid coil connections are automatically made using Z-Board™ technology (plug together PC boards), which allow internal connection from solenoid coils to output drivers without the use of wires). This allows easy assembly and field changes.

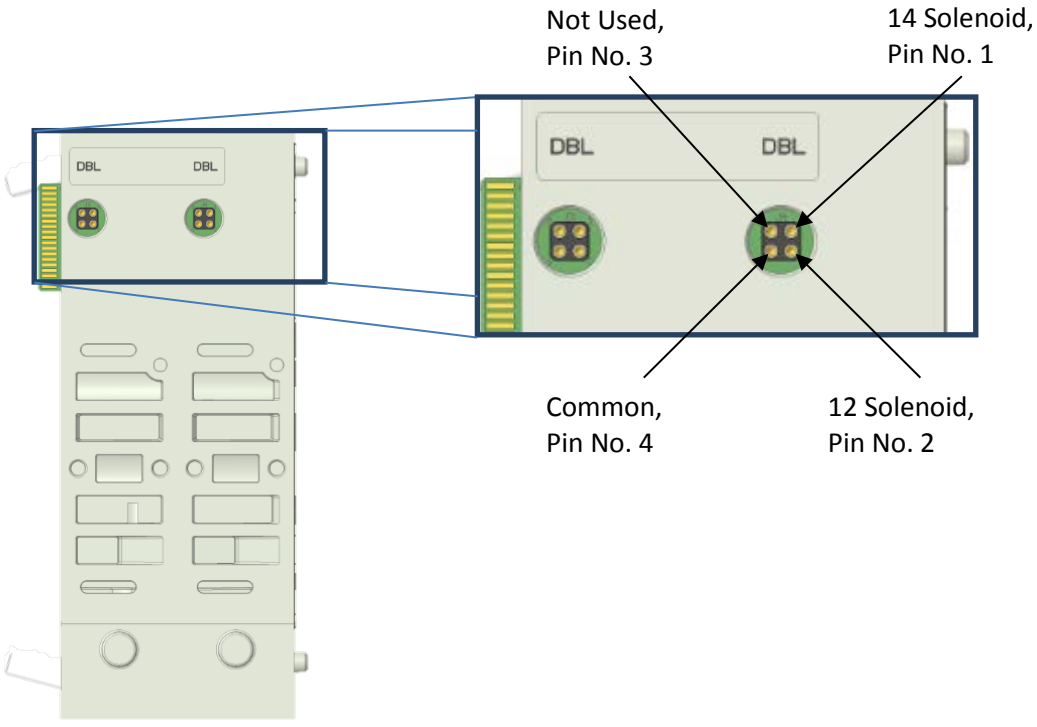


2.3 500 Series Manifold Stations

Solenoid Coil Connections using Z-Board™ Technology for 50X valve series

Z-Board™ plug together technology connects all valve solenoids to the valve coil output driver board, located in the valve adapter. There is a maximum of 32 coil outputs available on the complete manifold assemblies. The 32 available outputs are accessed on the 501 series valves utilizing 4 station manifolds and on the 502 and 503 series utilizing 2 station manifolds.



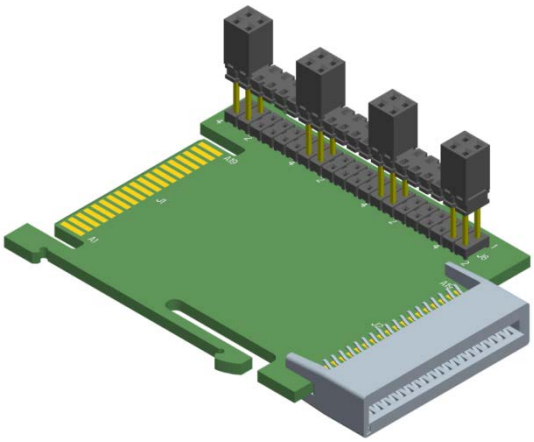


NOTE! A single solenoid valve's coil is always on the "14" end.

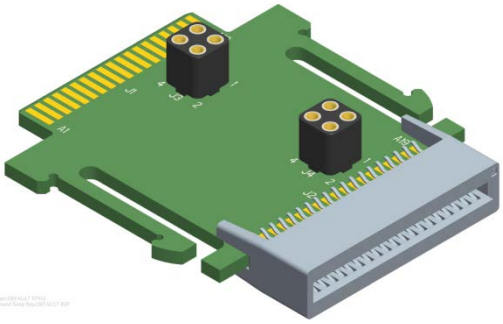
2.4 500 Series Z-Board™ Connectors

The 501, 502 and 503 valve series utilize 2 different Z-Board™ designs to achieve the single and double solenoid output functions. This yields the possible 32 single, 16 double, or various combinations of valve coil output capabilities.

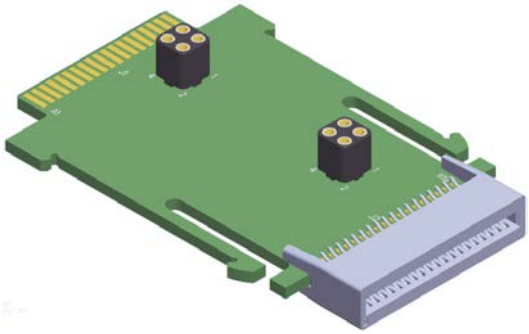
501 Series



502 Series

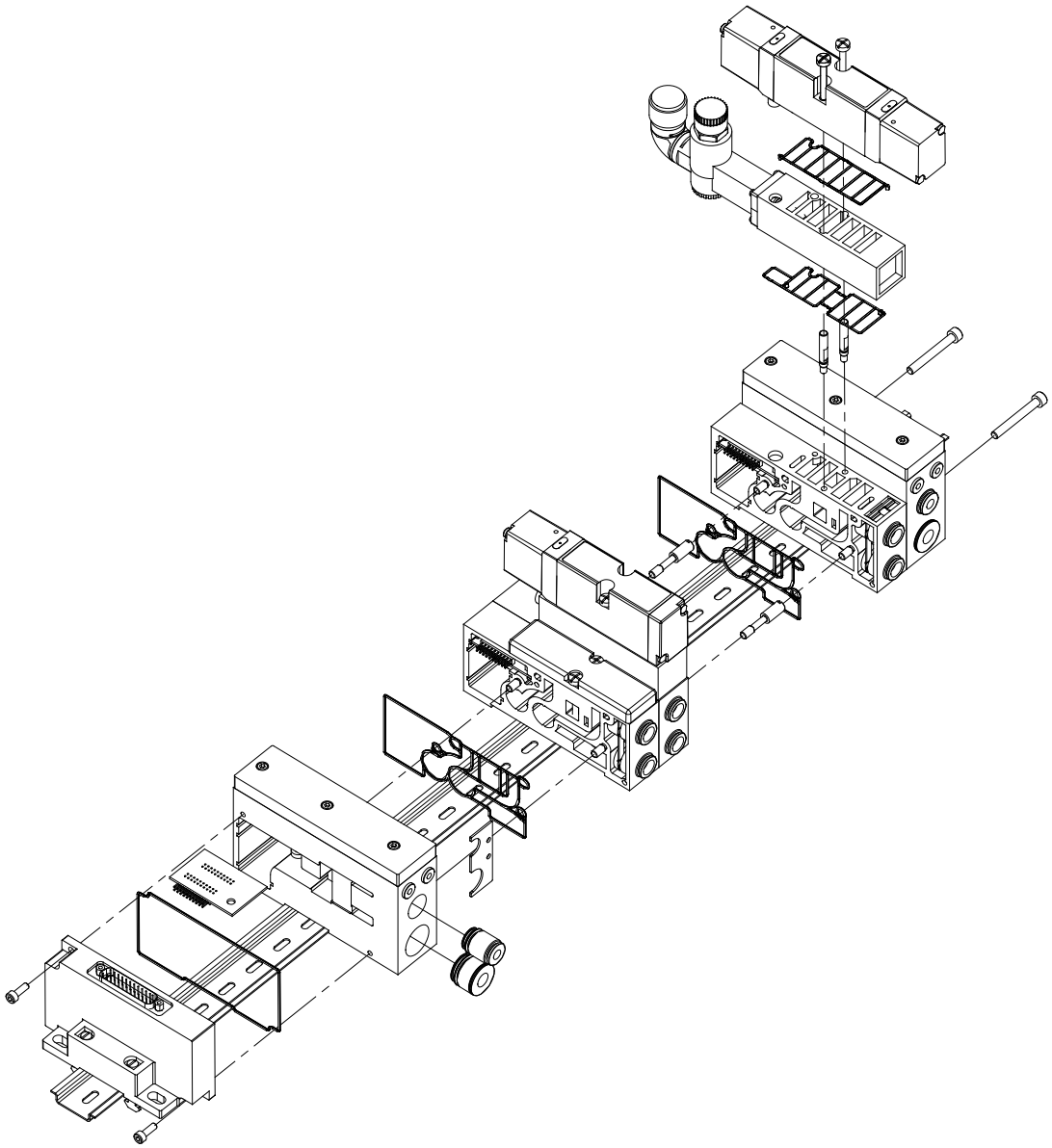


503 Series



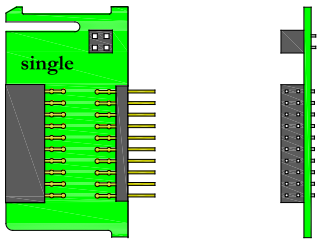
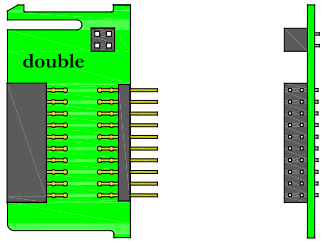
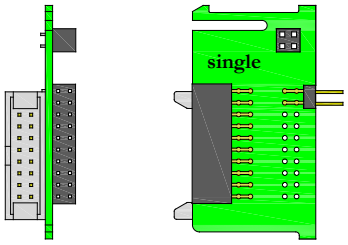
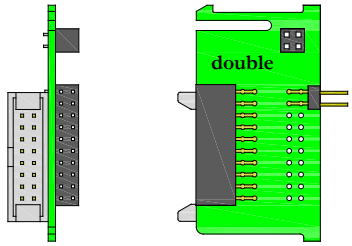
2.5 2000 Series Pneumatic Valve Manifold

The pneumatic valve manifold with internal circuit board technology is also modular. The valve solenoid coil connections are automatically made using Z-Board™ technology (plug together PC boards), which allow internal connection from solenoid coils to output drivers without the use of wires). This allows easy assembly and field changes.



2.6 2000 Series Z-Board™ Connectors

The 2005/2012/2035 valve series utilize 2 different Z-Board™ designs to achieve the single and double solenoid output functions. This yields the possible 32 single, 16 double, or various combinations of valve coil output capabilities.

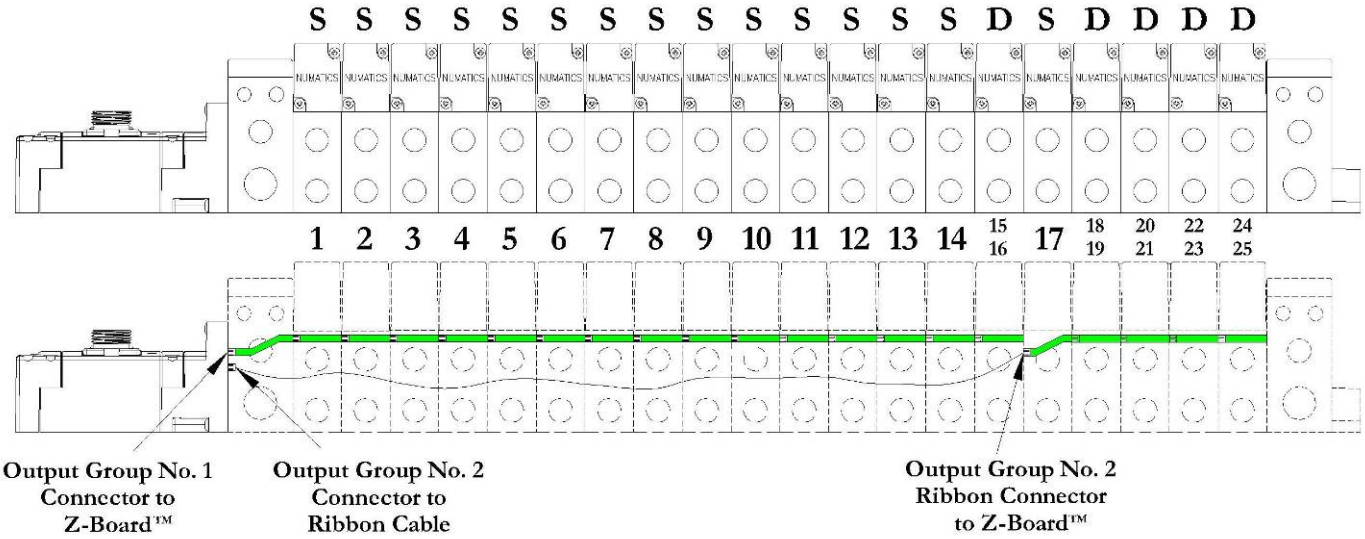
Single Z-Board™	Double Z-Board™
	
Ribbon Connection Single Z-Board™	**Ribbon Connection Double Z-Board™**
	

The 17th solenoid (output group No. 2's first bit) must be accessed via either the valve side Sub-D output module or a ribbon connector type Z-board.

2.7 2000 Series Z-Board™ and Ribbon Cable Example

If fourteen (14) single solenoid and one (1) double solenoid valves are connected directly to the communication node via their Z-Boards™, and one (1) single solenoid and four (4) double solenoid valves are connected to the communication node via the ribbon cable, the following would be the valve side bit map:

S = Single Solenoid with Single Z-Board™
D = Double Solenoid With Double Z-Board ™

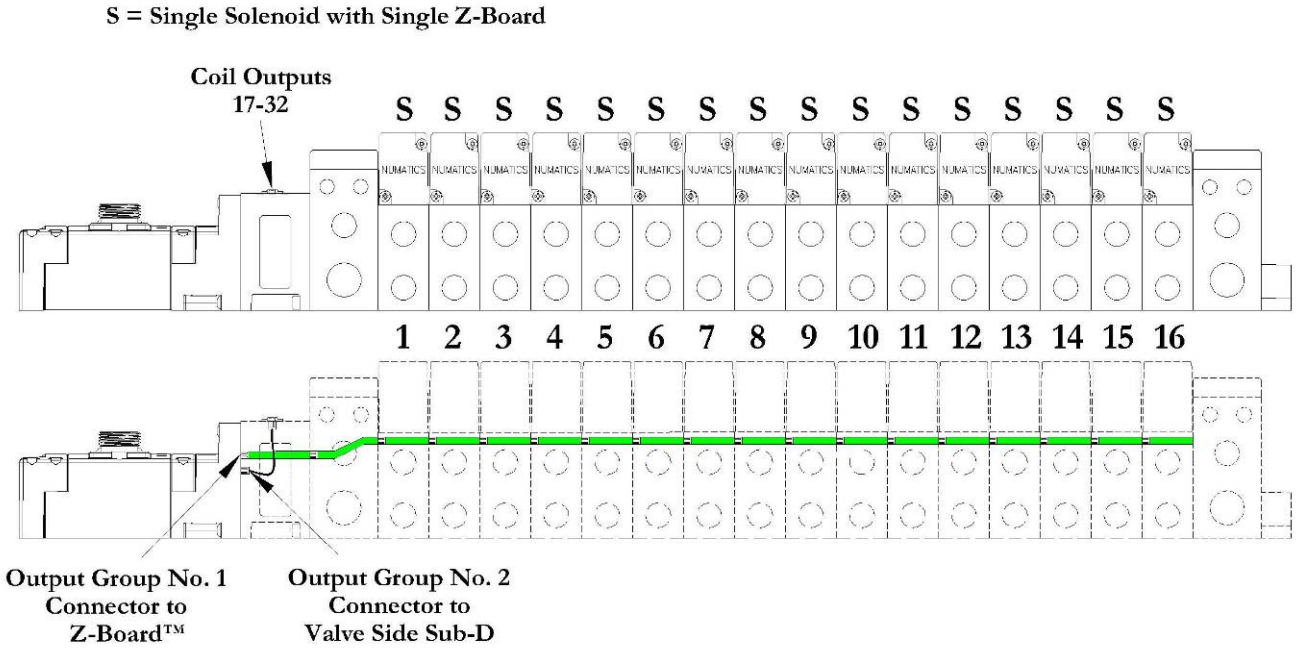


Output Word	0								1							
Output Byte	0								1							
Output Bit No.	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
Solenoid Coil Output No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Output Word	1															
Output Byte	2								3							
Output Bit No.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Solenoid Coil Output No.	17	18	19	20	21	22	23	24	25	n/a						

2.8 2000 Series Z-Board™ with Valve Side Sub-D Example

If sixteen (16) single solenoid valves are connected directly to the communication node via Z-Boards™ and a valve side Sub-D connector is connected to the communication node via the output Group No. 2 connector then the following would be the valve side bit map:

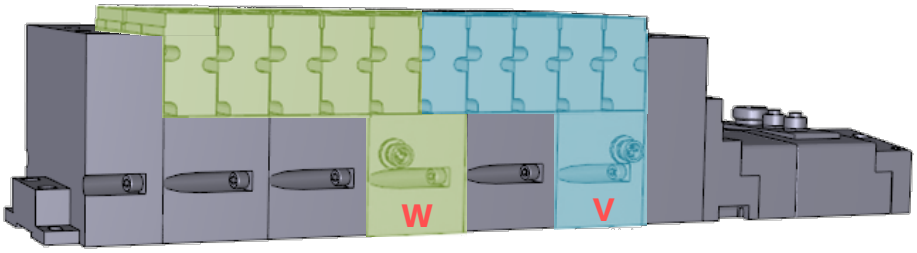


Output Word	0																1													
Output Byte	0								1								2								3							
Output Bit No.	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Solenoid Coil Output No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32

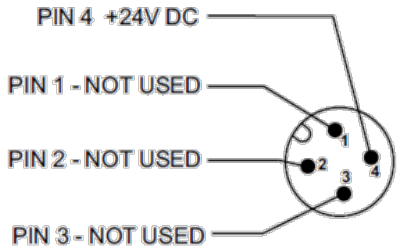
3. Zoned Power

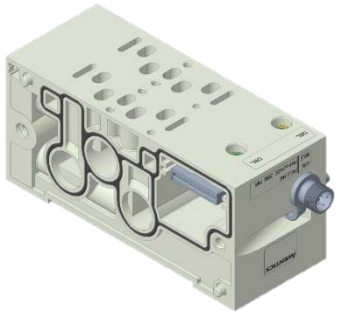
3.1 503 Series Zoned Power application

The Zoned Power Manifold blocks can be incorporated into a 503 manifold assembly to isolate Power to a number of valve stations, independent from the main power of the manifold. This is achieved by the integral 4 Pin M12 connector along with the modified manifold board. The total number of Zoned Power Manifold blocks is determined by the maximum solenoid outputs as defined by the type of interface (e.g. G3 Electronics, Terminal Strip, D-Sub). For user flexibility, the Zoned Power Manifold blocks are available in both "proprietary" and "ISO" versions and can be ordered with the M12 connector starting at the first or second station.

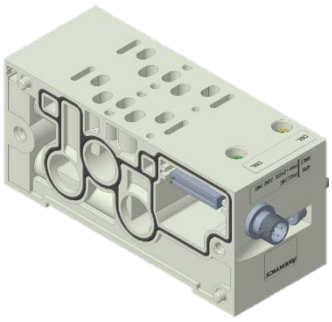


W & V Connector Pin Out





V Wiring Option



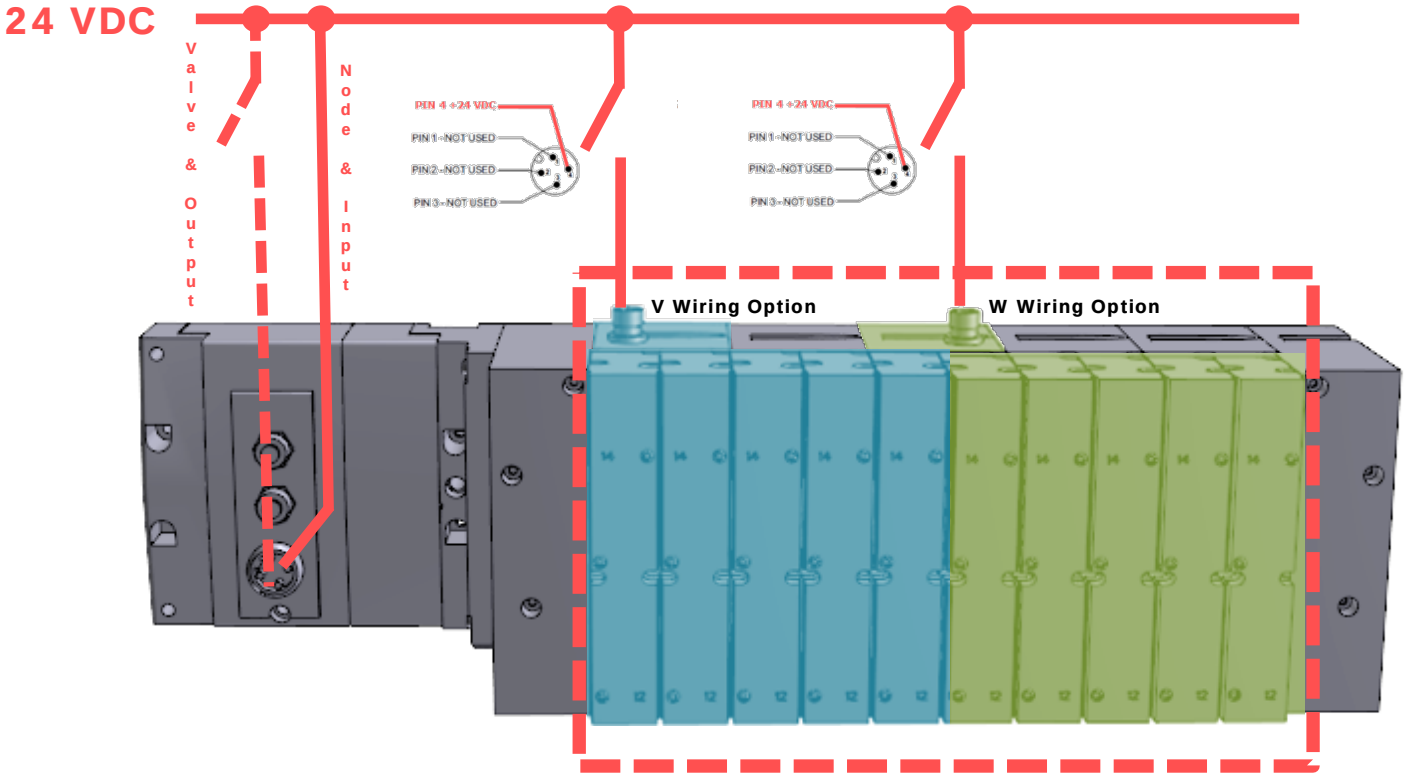
W Wiring Option

Technical Data

Electrical Data:	
Voltage:	24 VDC (0 VDC must be common with main power)
Connection:	4 Pin M12 Single Key Male
Environmental:	IP65 (with proper connection)

3.2 503 Series Zoned Power example

In the example shown below there are two Zoned Power Manifold blocks used. One is a "W" wiring option and the other is a "V" wiring option. The first (5) stations of the manifold assembly get their power from the M12 4 Pin connector at station one. The next (5) stations get their power from the M12 4 Pin connector at station six. Each of these "Zones" can be individually switched of if the machine or process requires. This example is considered a manifold with (2) Power Zones. The Main Power (7/8" MINI) cannot be considered or used as a Power Zone; Switched Power (Solenoid/Output Power) **MUST** be present for control to the solenoids.



The 0 VDC reference for the +24 VDC applied to Pin 4 of the M12 connector MUST be the same as the one used on G3/580/Terminal Strip/25 or 37 Pin Sub-D/19 or 26 Pin Round Connector. If multiple 24 VDC power supplies are used the 0 VDC references of each supply MUST be common.

4. Communication Module

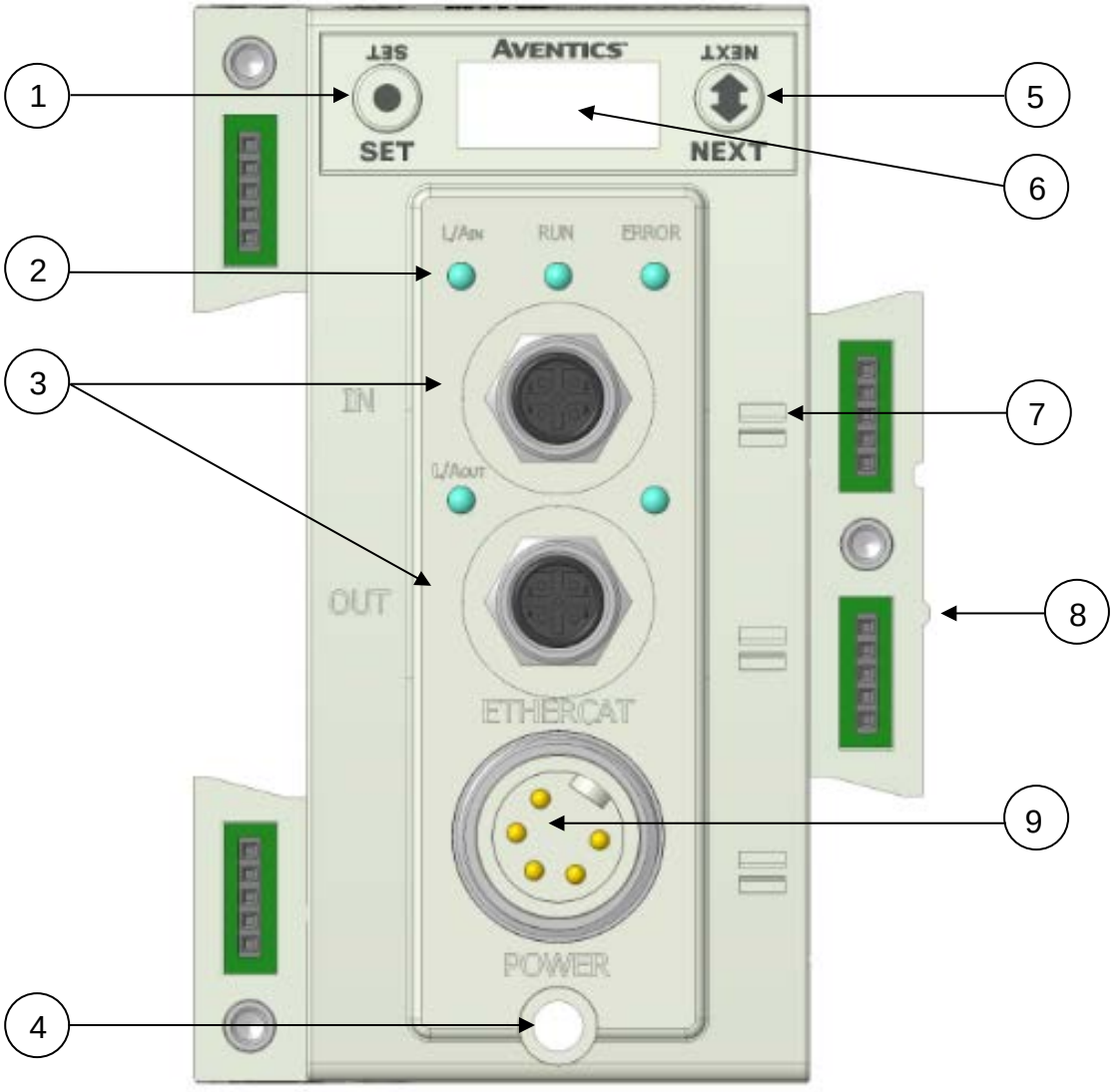
4.1 EtherCAT™ Communication Module (Node)

This module is the communication interface to the manifold. It contains communication electronics and internal short circuit protection for power. It can be configured via software and via the graphic display.

Communication Module Kit Part Number	
EtherCAT™ Communication module	240-310

4.2 Communication Module Description

Detail No.	Description
1	“Set” Button – used to navigate through user menus and to set parameters
2	Status LEDs
3	4 Pin M12 D-Coded Female Communication Connectors
4	Mounting Hole
5	“Next” Button – used to navigate through user menus and to set parameters
6	Graphic Display – used to display parameter information
7	Slot for text ID tags
8	Keying for preventing I/O module insertion
9	5 Pin MINI Male Power Connector



4.3 Connector Pin-Outs

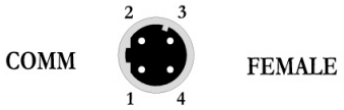
Industry standard connectors are used for communication and auxiliary power.
The communication connectors are a D-coded keyway 4 pin female M12 connector.
The Power connector is a single keyway 5 pin male 7/8" MINI connector.

Communication Connector Pin-Out

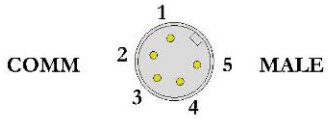
Pin No.	*Function*	*Description*
1	TD+	Positive Transmit Line
2	RD+	Positive Receive Line
3	TD-	Negative Transmit Line
4	RD-	Negative Receive Line

Power Connector Pin-Out

Pin No.	*Function*	*Description*
1	0 VDC Common (Valves and Outputs)	0 VDC Voltage used to power outputs (valve coils and discrete outputs) SW
2	0 VDC Common (Node and Inputs)	0 VDC Voltage used to power discrete inputs and node electronics UNSW
3	Earth Ground	Protective Earth
4	+24 VDC (Node and Inputs)	Voltage used to power discrete inputs and node electronics UNSW
5	+24 VDC (Valves and Outputs)	Voltage used to power outputs (valve coils and discrete outputs) SW



PIN 1= TX +
PIN 2= RX +
PIN 3= TX -
PIN 4= RX -



PIN 1= 0 VDC VALVES & OUT (SW)
PIN 2= 0 VDC NODE & IN (UNSW)
PIN 3= EARTH GROUND
PIN 4= +24 VDC NODE & IN (UNSW)
PIN 5= +24 VDC VALVES & OUT (SW)

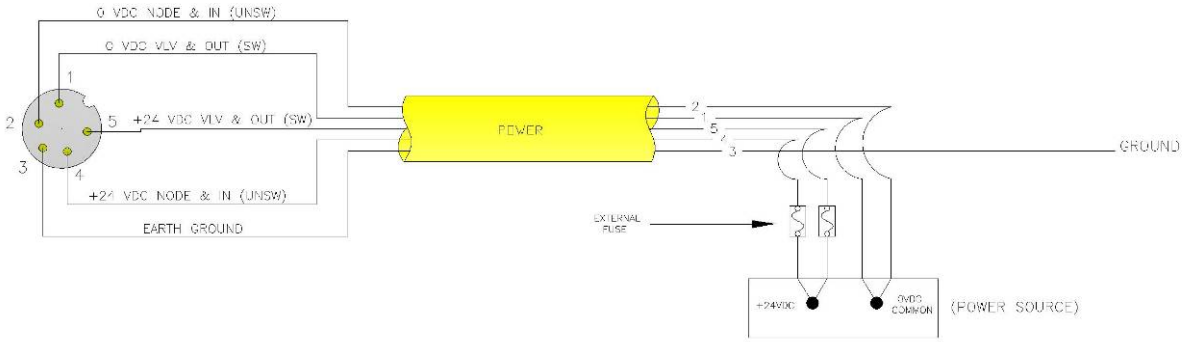
CAUTION

- *Power common (0 VDC) pins 1 and 2 are isolated from each other to allow separate (isolated) power supply connection if required. However, they can be tied together if a single common, non-isolated, application is preferred.*
- *The combined draw of the +24VDC Valves and Outputs and +24VDC Node and Inputs pins cannot exceed 8 Amps, at any given moment in time.*
- *The Node and Inputs pin supplies power to the node electronics. This pin must be powered at all times for communication node to be functional.*

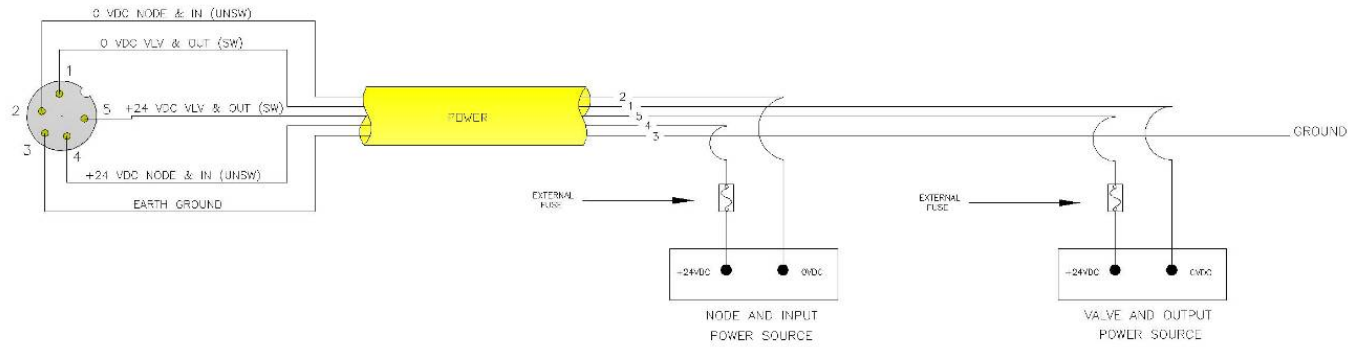
4.4 Electrical Connections

Power Connector Wiring Diagram

Power Supply Example (Non-isolated commons)



Power Supply Example (Isolated commons)



CAUTION

- *Please see page 4-26 for external fuse sizing guide.*
- *When using molded connector power cables, <u>Do Not</u> rely on wire colors for Pin-Out. <u>Always use pin number references.</u>*
- *Power common (0 VDC) pins 3 and 4 are isolated from each other to allow separate (isolated) power supply connection if required. However, they can be tied together if a single common, non-isolated, application is preferred.*

(Continued Below)

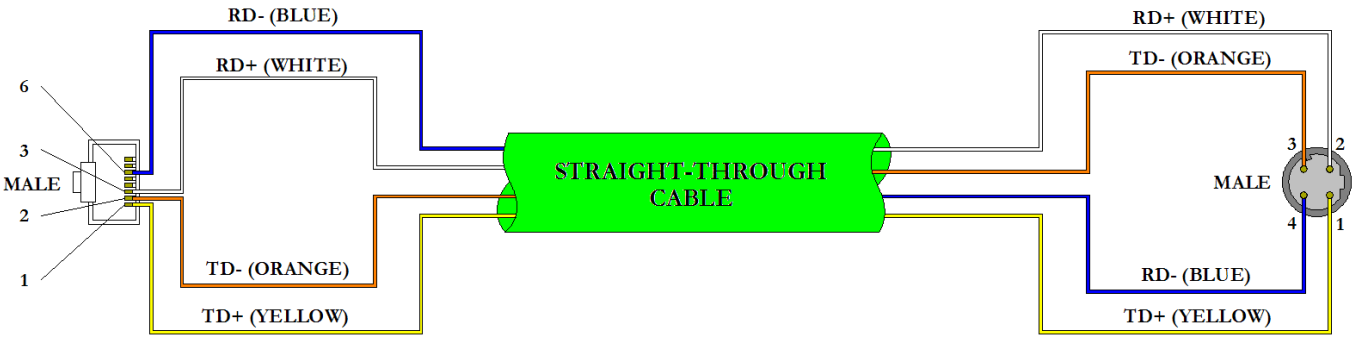
CAUTION

- *The combined draw of the +24VDC Valves and Outputs and +24VDC Node and Inputs pins cannot exceed 8 Amps, at any given moment in time.*
- *The Node and Inputs pin supplies power to the node electronics. This pin must be powered at all times for communication node to be functional.*
- *Class 2 Device Wiring Only – Do Not Reclassify and Install as Class 1, 3 or Power and Lighting Wiring*
- *Wire connections shall be rated suitable for the wire size (lead and building wiring) employed*
- *Up to a maximum 16 I/O modules (units) can be connected to 1 Communication Module not including any Sub-Bus and Miscellaneous modules, or equivalent*
- *CLASS 2 WIRING: All field wiring shall be suitable for Class 1, Electric Light and Power, or Class 2, 3 wirings are routed separately and secured to maintain separation between 1) Class 2 wiring and all other class wiring, and 2) Limited energy circuit conductors from unlimited energy circuit conductors*
- *MULTIPLE CLASS 2 POWER SOURCES: When interconnects, class 2 sources shall be Listed and rated suitable for parallel interconnection*
- *Sources shall be Listed and rated suitable for parallel interconnection*

4.5 Ethernet Straight-Through Cabling Diagrams

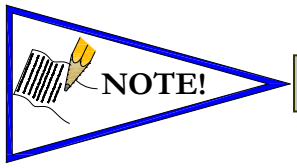
Straight-Through Ethernet cable is used when connecting an Ethernet node to any component (router, switch, hub, computer, etc.). Here are some basic wiring examples of Straight-Through cabling.

RJ45 to M12 D Coded Cable



M12 D Coded to M12 D Coded Cable

Description			Color		Pin Number	
EtherCAT™	Ethernet		Star Quad	2-Pair	RJ45	M12
TD+	TX+	Transmit Data +	YELLOW	WHITE / ORANGE	1	1
TD-	TX-	Transmit Data -	ORANGE	ORANGE	2	3
RD+	RX+	Receive Data +	WHITE	WHITE / GREEN	3	2
RD-	RX-	Receive Data -	BLUE	GREEN	6	4

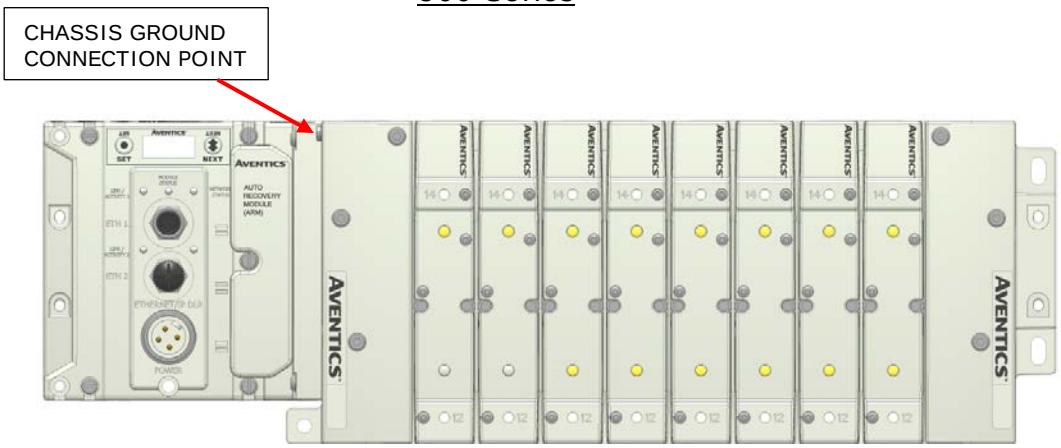


- *RJ45 shown as T-568B standard.*

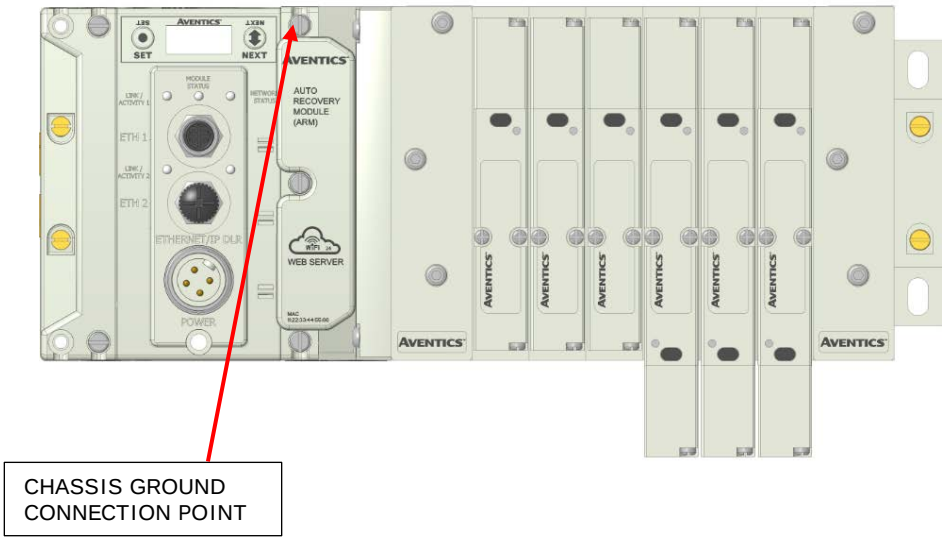
4.6 Ground Wiring

All Aventics Inc. communication nodes should be grounded during the installation process. These grounding guidelines can be found in National Electrical code IEC 60204-1 or EN 60204-1.

500 Series



2000 Series



CAUTION

- Proper grounding will prevent many intermittent problems with network communication.
- When grounding to a machine frame, please ensure that the machine frame itself is already properly grounded.
- Better grounding can be achieved when larger diameter (lower gauge) wire is used.

4.7 Power Consumption

Power Connection

Pin No.	*Function*	*Description*
1	0 VDC Common (Valves and Outputs)	0 VDC Voltage used to power outputs (valve coils and discrete outputs) SW
2	0 VDC Common (Node and Inputs)	0 VDC Voltage used to power discrete inputs and node electronics UNSW
3	Earth Ground	Protective Earth
4	+24 VDC (Node and Inputs)	Voltage used to power discrete inputs and node electronics UNSW
5	+24 VDC (Valves and Outputs)	Voltage used to power outputs (valve coils and discrete outputs) SW

Power Rating

- For maximum supply current capability please refer to page 8-63.
- Loads should not draw more than 0.5 Amps of current from any one individual discrete output point (Contact factory for higher current capability requirements).

Component	Voltage	Tolerance	+24VDC (Valves and Outputs) Pins 1 and 4		+24VDC (Node and Inputs) Pins 2 and 3	
			Current	Power	Current	Power
Solenoid Valve Coil 501 (Each)	24 VDC	+10%/-15%	0.03 A	0.80 W	0 A	0 W
Solenoid Valve Coil 502 (Each)	24 VDC	+10%/-15%	0.05 A	1.30 W	0 A	0 W
Solenoid Valve Coil 503 (Each)	24 VDC	+10%/-15%	0.07 A	1.70 W	0 A	0 W
Solenoid Valve Coil 2002 (Each)	24 VDC	+10%/-15%	0.02 A	0.48 W	0 A	0 W
Solenoid Valve Coil 2005 (Each)	24 VDC	+10%/-15%	0.06 A	1.44 W	0 A	0 W
Solenoid Valve Coil 2012 (Each)	24 VDC	+10%/-15%	0.11 A	2.64 W	0 A	0 W
Solenoid Valve Coil 2035 (Each)	24 VDC	+10%/-15%	0.11 A	2.64 W	0 A	0 W
Solenoid Valve Coil ISO 5599/2- SPA	24 VDC	+10%/-15%	0.17 A	4.08 W	0 A	0 W
Valve Adapter (Driver) 2000 series	24 VDC	+/- 10%	0.03A	0.72 W	0.02 A	0.48 W
Valve Adapter (Driver) 500 series	24 VDC	+/- 10%	0.03A	0.72 W	0.02 A	0.48 W
501 Series 32+ valve driver board	24 VDC	+/- 10%	0.03A	0.72 W	0.05 A	1.20 W
502 Series 32+ valve driver board	24 VDC	+/- 10%	0.03A	0.72 W	0.05 A	1.20 W
503 Series 32+ valve driver board	24 VDC	+/- 10%	0.03A	0.72 W	0.05 A	1.20 W
Digital Module (M12 style)	24 VDC	+/- 10%	0.04 A	0.96 W	0.05 A*	1.20 W*
Digital Module (M8 Style)	24 VDC	+/- 10%	0 A	0W	0.19A	4.56 W
Analog Module	24 VDC	+/- 10%	0.01 A	0.24 W	0.08 A*	1.92 W*
Sub-Bus Hub	24 VDC	+/- 10%	0 A	0 W	0.06 A	1.44 W*
RTD Module	24 VDC	+/- 10%	0.01 A	0.24 W	0.06 A	1.44 W*
Communication Module (Node)	24 VDC	+/- 10%	0.04 A	0.9 W	0.10 A*	2.50 W*
Sub-Bus Valve Module	24 VDC	+/- 10%	0.01 A	0.24 W	0.03 A*	0.72 W*
580 Sub-Bus Valve Module	24 VDC	+/- 10%	.034 A	0.8 W	0.04 A*	0.9 W*
Auto Recovery Module (ARM)	24 VDC	+/- 10%	0 A	0 W	0.03 A	0.72 W
ARM-Clip Module	24 VDC	+/- 10%	0 A	0 W	0.03 A	0.72 W

* Current depends on graphic display brightness setting. Max. value shown with high brightness. Values decrease by approx. 5% for Medium and 11% for Low brightness settings.

- Total power consumption for each Discrete I/O point is dependent on the specific current draw of input sensor

4.8 Recommended External Fuses

External fuses should be chosen based upon the physical manifold configuration. Please refer to the table below for the fuse sizing chart.

External Fuse Sizing Chart

Power Consumption - Power Connector Pin for Valves and Outputs		
Description		*Current*
Number of Solenoid Valve Coils Energized Simultaneously		
___ X 0.167 A (ISO - SPA Series)	=	_____Amps
___ X 0.105 A (2012 and 2035 Series)	=	_____Amps
___ X 0.056 A (2005 Series)	=	_____Amps
___ X 0.021 A (2002 Series)	=	_____Amps
		+
Total load current drawn by simultaneously energized Discrete Outputs	=	_____Amps
		+
Number of I/O modules installed ___ X 0.023 A	=	_____Amps
		+
Valve Adapters (219-828) installed ___ X 0.134 A	=	_____Amps
		+
Communication Node Power Consumption	=	.006 Amps
		+
Total:		_____Amps
Surge Compensation:	X	1.25
Suggested External +24 VDC (Valves and Outputs) Fuse Value:		_____Amps

Power Consumption – Power Connector Pin for Node and Inputs		
Description		*Current*
Communication Node Power Consumption	=	.091 Amps
		+
Total load current drawn by Sensor Devices from Discrete Inputs source	=	_____Amps
		+
Number of I/O modules installed ___ X 0.075 A	=	_____Amps
		+
Total:		_____Amps
Surge Compensation:	X	1.25
Suggested External Pin +24 VDC (Node and Inputs) Fuse Value:		_____Amps

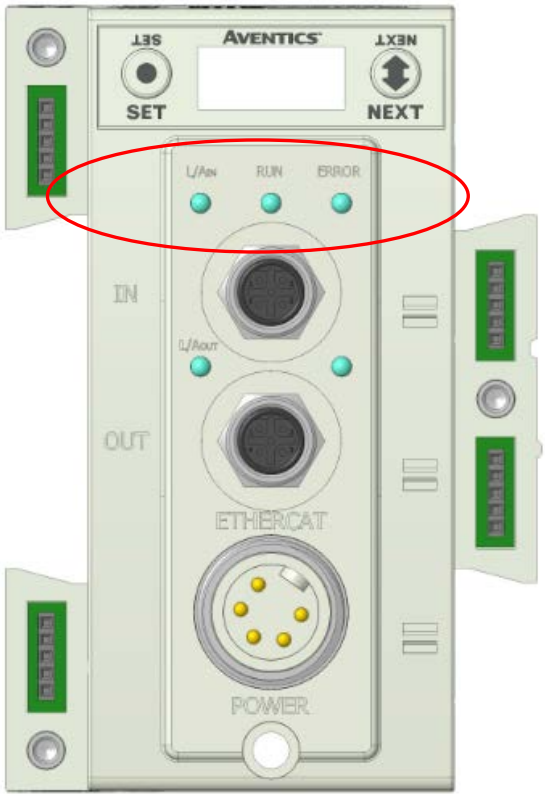
*Factory Default Settings

- The Node and Inputs Aux Power pins supply power to the node electronics. These pins must be powered at all times for communication node and Inputs to be functional.
- The internal electronic fuses exist to protect against damage due to catastrophic failure of internal components. External fuses are always recommended for protection against power supply failure and over-current conditions.

4.9 Diagnostics

Communication Module LED Functions

Upon power up, the LEDs indicate the status of the unit. There are three LEDs on the G3 EtherCAT™ node. These LEDs are described below.



LED Name	*Color*	*Status*	*Description*
RUN	Green	OFF	No Function
		ON	No Function
ERROR	Off	OFF	No Error
	ON	FLASH	EtherCAT™ communication with application controller was lost
L/Ain	Green	OFF	No EtherCAT™ connection is detected
		ON	EtherCAT™ connection established to the application controller
		FLASHING	The LED flashes each time a packet is received or transmitted.
L/Aout	Green	OFF	No EtherCAT™ connection is detected
		ON	EtherCAT™ connection established to downstream node
		FLASHING	The LED flashes each time a packet is received or transmitted.

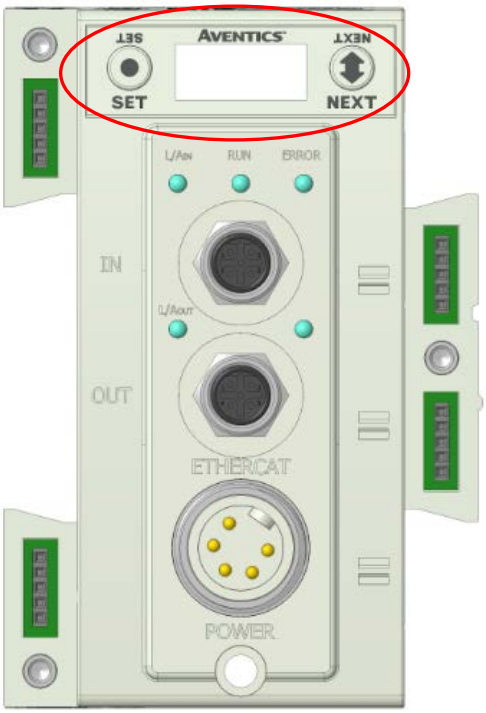
4.10 Output Short Circuit Protection

Status Bit Action during Fault Condition

Output Type	*Output State*	*Fault Condition*	*Status Bit*
Valve Solenoid Coil Driver	ON	No Fault	0
		Fault - Short Circuit, Over Temp/Over Current	1
	OFF	No Fault	0
		Fault - Open Load	1
Discrete Outputs	ON	No Fault	0
		Fault - Short Circuit, Over Temp/Over Current	1

5. G3 Graphic Display

The G3 Communication and I/O modules have an integrated graphic display that may be used to configure the parameters of the modules as well as showing diagnostic information.



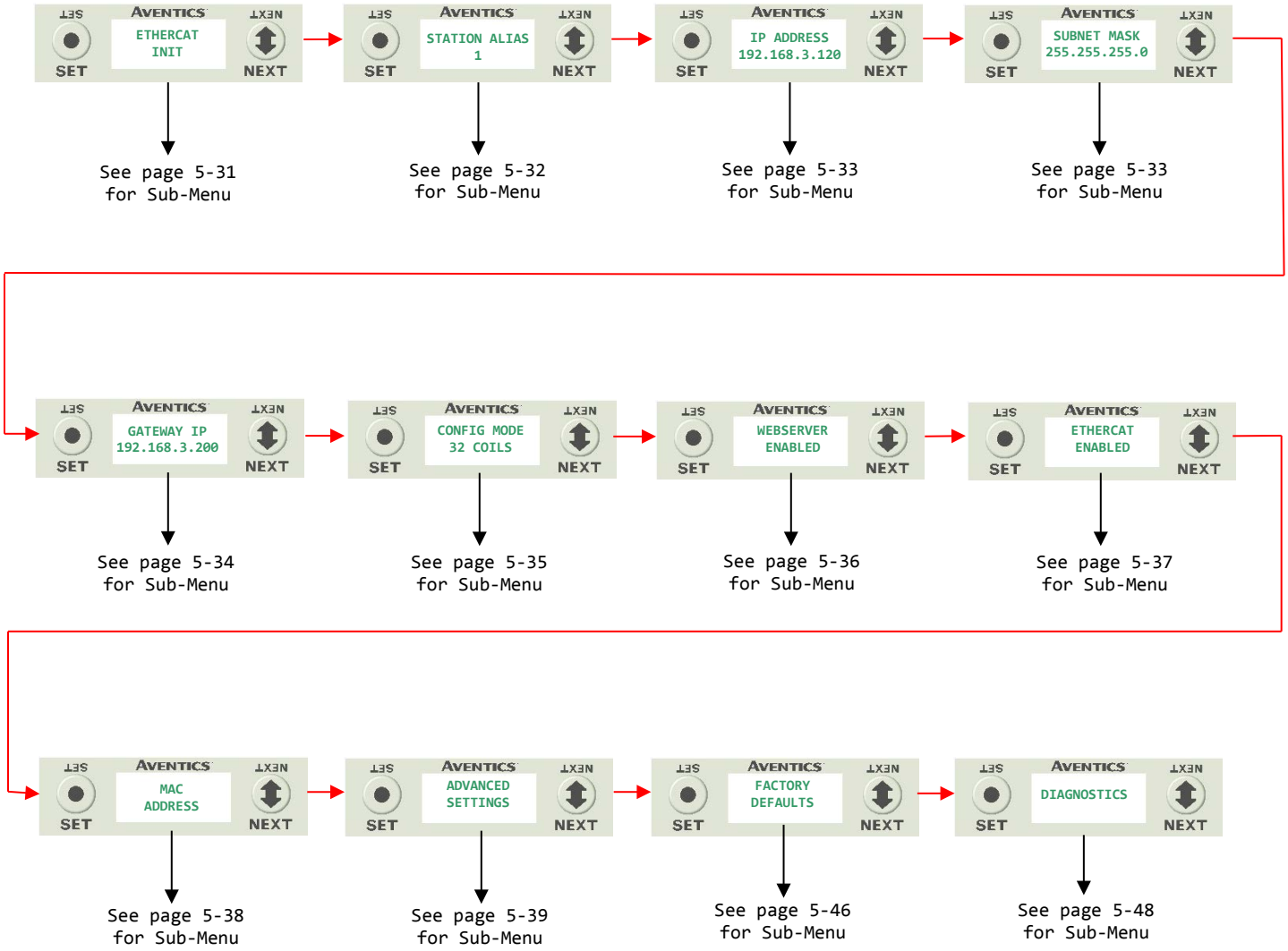
The following graphic displays represent the main menu selections of the G3 communication module (node). Use the NEXT button to scroll through the Main menu headings shown below. At this level pressing the SET button allows access the Sub-Menus. Please see the appropriate pages referenced below for further details and descriptions of the Sub-Menus.

NOTE: When a network I/O connection is established manual changes to node parameters are not allowed!

5.1 Main Menu Structure

Use the NEXT button to scroll through the Main menu headings shown below. At this level pressing the SET button allows access the Sub-Menus. Please see the appropriate pages referenced below for further details and descriptions of the Sub-Menus. Note that many of these settings can also be adjusted via software with GSD file parameters.

NOTE: When a network I/O connection is established manual changes to node parameters are not allowed!



NOTE!

- When a network I/O connection is established manual changes to node parameters are not allowed!

5.2 EtherCAT™ Operating States (Default Display)

The default display identifies one of four possible operating states of the EtherCAT™ node. The node state display cannot be modified through the G3 menus.

1. Initialization- After power on the module is ready for communication with the EtherCAT™ master.

2. Pre-Operational- Module parameters are loaded, Communication established process I/O is not executed.

3. Safe Operational- Input data is processed once synchronization is established with the EtherCAT™ master. Disconnecting communication with an operational node will cause the node to change to SAFE-OP.

4. Operational- Normal operating mode, the G3 node is synchronized with the EtherCAT™ master and processing I/O data.

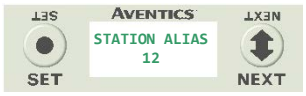
5. EtherCAT™ TCP Only- EtherCAT™ communication disabled by menu configuration Only TCP communication possible.

5.3 Station Alias Sub-Menu

Steps to Set Station Alias

1. Press the **SET** button to enter the “Station Alias” sub-menu.

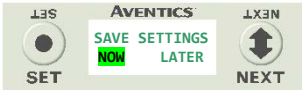
2. Press the **NEXT** button to scroll through the choices for the tens digit of the node address.
   Press the **SET** button to select the tens digit and move into the ones digit selection.



3. Press the **NEXT** button to scroll through the choices for the ones digit of the node address.
   Press the **SET** button to select the ones digit.

4. Press the **NEXT** button to select **Y**es or **N**o to accept the address shown on the display,
   a. Selecting **N**o will bring you back to the main Address menu.
   b. Selecting **Y**es will take you to the following SAVE SETTINGS menu.

   Press the **SET** button to confirm your choice.



5. Press the **NEXT** button to select either NOW or LATER.
   a. Selecting NOW will cause the node to reset and apply the new setting.
   b. Selecting LATER will cause the new Address to be saved in temporary memory and allow you to make additional parameter changes before the node is reset. However, you must ACCEPT the saved changes before your next power cycle otherwise they will be lost.

   Press the **SET** button to confirm your choice.

- *Only addresses 1- 192 are valid.*
- *Address 0 is not valid.*

5.4 IP Address

IP Address

1. The IP address can only be modified from the module display with EtherCat™ disabled (TCP IP only).

- *Factory default address is 192.168.003.120*

5.5 Subnet Mask

Subnet Mask

1. The Subnet Mask can only be modified from the module display with EtherCat™ disabled (TCP IP only).

- *The ETHERCAT™ Factory default Subnet Mask is 255.255.255.0.*

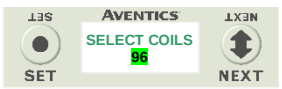
5.6 Gateway IP

Gateway IP Address

1. The Gateway IP can only be modified from the module display with EtherCat™ disabled (TCP IP only).

- *Factory default gateway IP is 0.0.0.0*

5.7 Config Mode



Steps to Set Coil Configuration

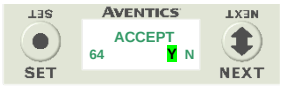
1. Press the **SET** button to enter the CONFIG MODE sub-menu.

2. Press the **SET** button and the **NEXT** button to change the number of coils.
   a. 64 - allows the node to recognize one additional valve driver.
   b. 96 - allows the node to recognize two additional valve drivers
   c. 128 - allows the node to recognize three additional valve drivers
   d. RETURN – Takes you back to the main menu

   Press the **SET** button to confirm your choice.

3. Press the **NEXT** button to select **Y**es or **N**o to accept the setting
   a. Selecting **N**o will bring you back to the main CONFIG MODE menu.
   b. Selecting **Y**es will take you to the following SAVE SETTINGS menu.

   Press the **SET** button to confirm your choice



Saved Setting Steps

4. Press the **NEXT** button to select either NOW or LATER.
   a. Selecting NOW will cause the node to reset and apply the new setting.
   b. Selecting LATER will cause the setting to be saved in temporary memory to allow you to make additional parameter changes before the node is reset. However, you must ACCEPT the saved changes before your next power cycle otherwise they will be lost.

   Press the **SET** button to confirm your choice.

5.8 Web-Server

This will allow the enabling/disabling of the G3 Web Server.

Web-Server Steps

1. Press the **SET** button to enter the Web-Server sub-menu.

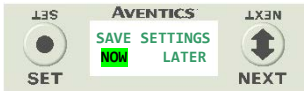
2. Press the **NEXT** button to scroll through the choices to enable or disable the feature.
   a. ENABLED (Factory Default)
   b. DISABLED
   c. RETURN (this will return you to the main menu)

   Press the **SET** button to confirm your choice.

3. Press the **NEXT** button to select **Y**es or **N**o to accept the selection.
   a. Selecting **N**o will bring you back to the main menu.
   b. Selecting **Y**es will take you to the following apply changes menu.

   Press the **SET** button to confirm your choice.

Apply Changes Steps



4. Press the **NEXT** button to select either NOW or LATER.
   a. Selecting NOW will cause the node to reset and apply the new setting.
   b. Selecting LATER will cause the new setting to be saved in memory, you must accept the saved changes before your next power cycle otherwise they will be lost.

   Press the **SET** button to confirm your choice.

- Factory default setting for WEB-SERVER is enabled.

5.9 EtherCAT™ communication

This will disable EtherCAT™ communication to connect to the G3 webserver.

EtherCAT™ Steps

1. Press the **SET** button to enter the EtherCAT™ communication sub-menu.

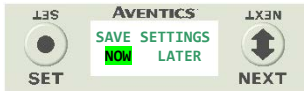
2. Press the **NEXT** button to scroll through the choices to enable or disable the feature.
   d. ENABLED (Factory Default)
   e. DISABLED
   f. RETURN (this will return you to the main menu)

   Press the **SET** button to confirm your choice.

3. Press the **NEXT** button to select **Y**es or **N**o to accept the selection.
   c. Selecting **N**o will bring you back to the main menu.
   d. Selecting **Y**es will take you to the following apply changes menu.

   Press the **SET** button to confirm your choice.

Apply Changes Steps



4. Press the **NEXT** button to select either NOW or LATER.
   c. Selecting NOW will cause the node to reset and apply the new setting.
   d. Selecting LATER will cause the new setting to be saved in memory, you must accept the saved changes before your next power cycle otherwise they will be lost.

   Press the **SET** button to confirm your choice.

CAUTION

- *Disabling EtherCAT™ stops all communication with the EtherCAT™ master!*

5.10 MAC Address

MAC (Machine Access Control) Address

1. The MAC Address is a fixed unique value that cannot be edited.

The actual MAC ADDR has an extra leading zero. The actual number in the example shown is 00-15-24-00-06-69

- *The MAC ADDR cannot be modified*
- *Please note that the leading 0 in this number has been left off*

5.11 Advanced Settings - I/O Diag. Menu

This will allow the enabling / disabling of the IO Status bits. The IO status bits include valve coil, discrete output, input short circuit and alarm status bits. The default condition is enabled.

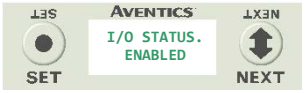
I/O Status Steps

1. Press the **SET** button to enter the ADVANCED SETTINGS sub-menu.

2. Press the **SET** button to enter the ADVANCED MENU / SET STATUS.

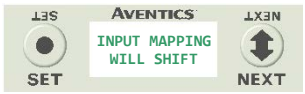
3. Press the **SET** button to enter the SET STATUS / I-O STATUS.

4. The current state of the parameter is shown.



5. Press the **SET** button to change this parameter
   Use the **NEXT** button to scroll through the choices to enable/disable the Diagnostic status for I/O.
   a. ENABLED (Factory Default)
   b. DISABLED
   c. RETURN (this will return you to the SET STATUS menu)

   Press the **SET** button to confirm your choice.

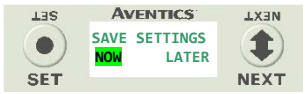


6. Press **NEXT** to confirm the warning message.

7. Press the **NEXT** button to select **Y**es or **N**o to accept the selection
   a. Selecting **N**o will bring you back to the main SET STATUS menu.
   b. Selecting **Y**es will take you to the following saved settings menu.

   Press the **SET** button to confirm your choice.

Save Settings Steps

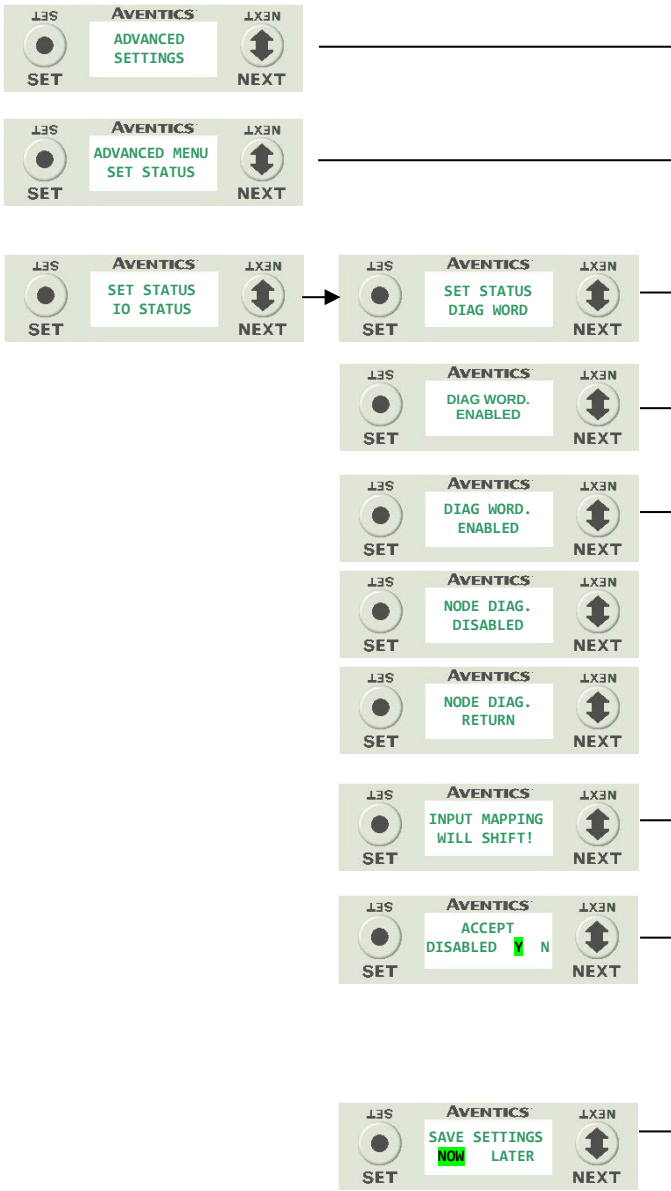


8. Press the **NEXT** button to select either NOW or LATER.
   a. Selecting NOW will cause the node to reset and apply the new setting.
   b. Selecting LATER will cause the new I/O STATUS selection to be saved in memory, you must Accept the saved changes before your next power cycle otherwise they will be lost.

   Press the **SET** button to confirm your choice.

5.12 Advanced Settings - Diagnostic Word

This will allow the enabling / disabling of the Diagnostic Word Status bits. The Diagnostic word data includes power status and sub-bus related status bits. Detailed information regarding these bits can be found on page 15-178. The Diagnostic Word comes enabled from the factory.



Diag. Word Status Settings

1. Press the **SET** button to enter the ADVANCED SETTINGS menu.
2. Press the **SET** button to enter the ADVANCED MENU /SET STATUS.
3. Press the **NEXT** button to scroll to the SET STATUS / DIAG WORD menu.
   Press the **SET** button to enter the SET STATUS / DIAG WORD menu.
4. The current state of the parameter is shown.
5. Press the **SET** button to change this parameter
   Use the **NEXT** button to scroll through the choices to enable/disable the Diagnostic Word status for.
   a. ENABLED (Factory Default)
   b. DISABLED
   c. RETURN (this will return you to the SET STATUS menu)

   Press the **SET** button to confirm your choice.
6. Press **NEXT** to confirm the warning message.
7. Press the **NEXT** button to select **Y**es or **N**o to accept the selection
   a. Selecting **N**o will bring you back to the main SET STATUS menu.
   b. Selecting **Y**es will take you to the following saved settings menu.

   Press the **SET** button to confirm your choice.

Save Settings Steps

8. Press the **NEXT** button to select either NOW or LATER.
   a. Selecting NOW will cause the node to reset and apply the new setting.
   b. Selecting LATER will cause the new NODE DIAG selection to be saved in memory, you must Accept the saved changes before your next power cycle otherwise they will be lost.

   Press the **SET** button to confirm your choice.

5.13 Advanced Settings – Comm. Fault

This will allow the enabling / disabling of the Fault Action parameter. The Fault Action parameter determines the behavior of the outputs during a communication fault.

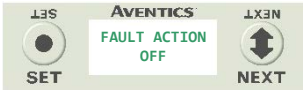
1. Press the **SET** button to enter the ADVANCED SETTINGS menu.

2. Press the **NEXT** button to scroll to the ADVANCED MENU / SET FAULT IDLE.

3. Press the **SET** button to enter the ADVANCED MENU / SET FAULT IDLE.

4. Press the **SET** button to enter the SET FAULT IDLE / FAULT ACTION menu.

5. The current state of the parameter is shown

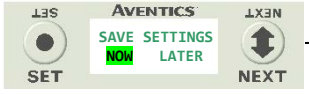


6. Press the **SET** button to change this parameter
   Press the **NEXT** button to scroll the choices for the desired output action during a fault state.
   a. OFF (Factory Default)
   b. HOLD LAST STATE
   c. RETURN (this will return you to the SET FAULT/IDLE menu)

   Press the **SET** button to confirm your choice.

7. Press the **NEXT** button to select **Y**es or **N**o to accept the selection
   Press the **SET** button to confirm your choice
   a. Selecting **N**o will bring you back to the main SET FAULT/IDLE menu.
   b. Selecting **Y**es will take you to the following saved settings menu.

   Save Settings Steps



8. Press the **NEXT** button to select either NOW or LATER.
   Press the **SET** button to confirm your choice.
   a. Selecting NOW will cause the node to reset and apply the new setting
   b. Selecting LATER will cause the new FAULT ACTION selection to be saved in memory, you must Accept the saved changes before your next power cycle

- Factory Default is ALL OFF, See page 5-46 for more details.

5.14 Advanced Settings – Brightness

Brightness Settings

1. Press the **SET** button to enter the ADVANCED SETTINGS menu.

2. Press the **NEXT** button to scroll to the CONFIG MENU / SET BRIGHTNESS.
   Press the **SET** button to enter the CONFIG MENU / SET BRIGHTNESS.

3. The current state of the parameter is shown

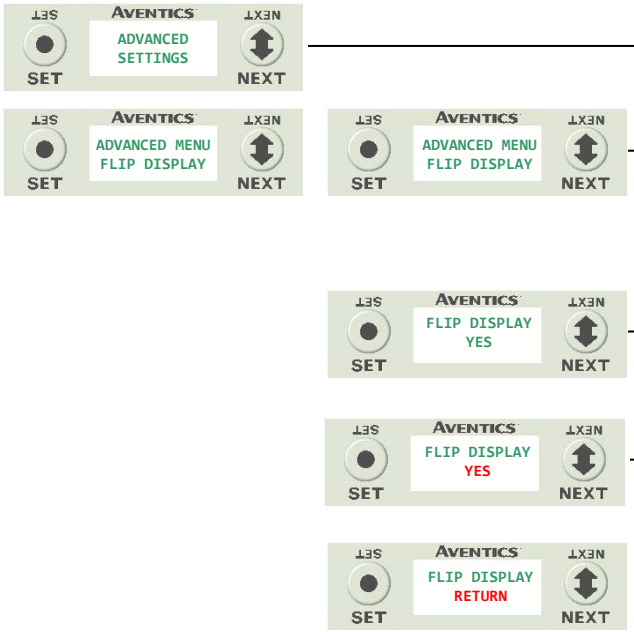
4. Press the **SET** button to change this parameter
   Press the **NEXT** button to scroll the choices for the desired brightness of the graphic display for all modules on the G3 system.

   a. LOW
   b. MEDIUM
   c. HIGH (Factory Default)

   Press the **SET** button to confirm your choice. The changes will take effect immediately.

5.15 Advanced Settings – Flip Display

Flip Display Settings



1. Press the **SET** button to enter the ADVANCED SETTINGS menu.
2. Press the **NEXT** button to scroll to the CONFIG MENU / FLIP DISPLAY.

   Press the **SET** button to enter the CONFIG MENU / FLIP DISPLAY.
3. The current state of the parameter is shown
4. Press the **NEXT** button to change this parameter

   a. YES
   b. RETURN

   Press the **SET** button to confirm your choice.

- This a global setting that affects all modules
- Each module, however, has its own setting if different settings are required.

5.16 Advanced Settings – Parameters Lock

PARAMETER Steps

1. Press the **SET** button to enter the Parameters sub-menu.

2. Press the **NEXT** button to scroll through the choices to enable or disable the feature.
   g. UNLOCKED (Factory Default)
   h. LOCKED
   i. RETURN (this will return you to the main menu)

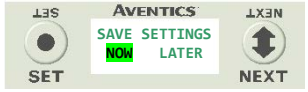
   Press the **SET** button to confirm your choice.

   By choosing LOCKED, all settable parameters will be read only via the graphic display. UNLOCKED, the factory default, will allow all parameters to be settable through the graphic display.
   Please note that all parameters are read only, regardless of this setting, when an IO connection between the communication module and the controller (PLC) is present

3. Press the **NEXT** button to select **Y**es or **N**o to accept the selection.
   e. Selecting **N**o will bring you back to the main menu.
   f. Selecting **Y**es will take you to the following apply changes menu.

   Press the **SET** button to confirm your choice.

Apply Changes Steps



4. Press the **NEXT** button to select either NOW or LATER.
   e. Selecting NOW will cause the node to reset and apply the new setting.
   f. Selecting LATER will cause the new setting to be saved in memory, you must accept the saved changes before your next power cycle otherwise they will be lost.

   Press the **SET** button to confirm your choice.

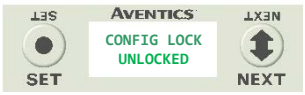
5.17 Advanced Settings – Configuration Lock

Configuration Lock Settings

1. Press the **SET** button to enter the ADVANCED SETTINGS menu.

2. Press the **NEXT** button to scroll to the CONFIG MENU / CONFIG. LOCK.

   Press the **SET** button to enter the CONFIG MENU / CONFIG. LOCK.



3. The current state of the parameter is shown

4. Press the **SET** button to change this parameter

5. Press the **NEXT** button to scroll through the choices to enable or disable the feature.
   a. UNLOCKED (Factory Default)
   b. LOCKED
   c. RETURN (this will return you to the main menu)

   Press the **SET** button to confirm your choice.

6. Press the **NEXT** button to select Yes or No to accept the selection.
   a. Selecting No will bring you back to the main menu.
   b. Selecting Yes will take you to the following apply changes menu.

   Press the **SET** button to confirm your choice.

Apply Changes Steps

7. Press the **NEXT** button to select either NOW or LATER.
   a. Selecting NOW will cause the node to reset and apply the new setting.
   b. Selecting LATER will cause the new setting to be saved in memory, you must accept the saved changes before your next power cycle otherwise they will be lost.

   Press the **SET** button to confirm your choice.

Note:
By choosing LOCKED, the manifold configurations will be stored in memory and the PHYSICAL manifold configuration cannot be changed. UNLOCKED, the manifold configurations can be changed without errors.

5.18 Factory Defaults

Factory Default Settings

1. Press the **SET** button to enter the FACTORY DEFAULTS sub-menu.

2. Press the **SET** button to change this parameter

3. Press the **NEXT** button to select **Y**es or **N**o.
   a. Selecting **N**o will bring you back to the main FACTORY DEFAULTS menu.
   b. Selecting **Y**es will cause the node to reset and return all parameters to the factory default conditions.
   c. Selecting RETURN will bring you back to the main FACTORY DEFAULS menu

   Press the **SET** button to confirm your choice.

FACTORY DEFAULT SETTINGS	
Description	*Default*
IP Address	193.168.3.120
Subnet Mask	255.255.255.0
Gateway IP	0.0.0.0
I/O Status	Enabled
Diag. Word	Enabled
Fault Action	Off
Brightness	Medium
Parameters	Unlocked
I/O configuration	Unlocked

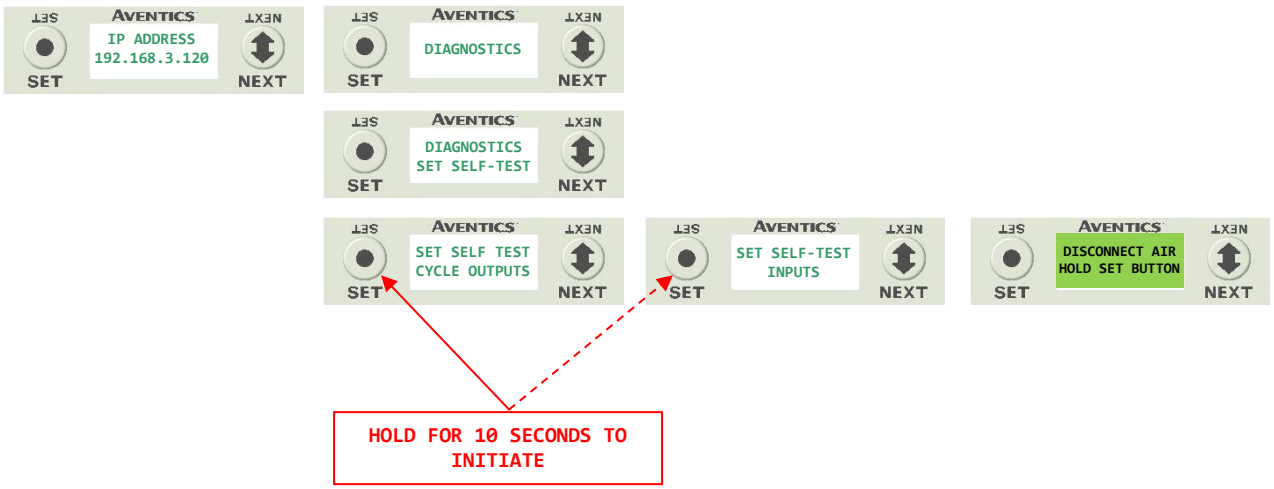
5.19 Diagnostics - Self Test Mode

An internal diagnostic tool can be enabled on the communication module (node) using the graphic display. This tool allows the user to confirm that all of the inputs and outputs on the manifold and any of the distributed modules are fully functional without needing a network connection or controller. There are two test modes that the user can choose. The “CYCLE OUTPUTS” test mode tests all the outputs by sequentially turning them ON and OFF for approximately .5 seconds. The “INPUTS” test mode tests the inputs by causing all of the outputs to toggle between even and odd values when any input is made. The Self Test mode on the communication module (node) is a global setting and will test all devices connected on the main manifold as well as any distributed modules and/or manifolds.

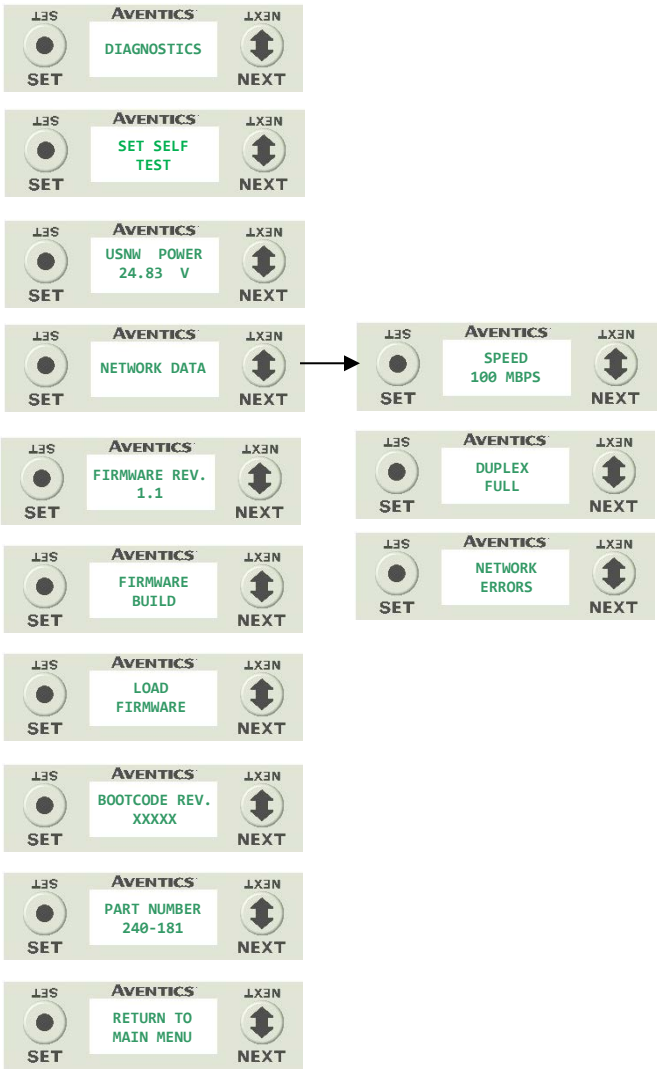
Similar “local” self tests are available on all output modules types. This “local” self-test function allows any output module to be tested without affecting any other output module.
NOTE: The number of Valve outputs that are tested are affected by the I/O size settings.

To use the Self Test Mode, the user must first set some initial conditions. Follow these steps to initiate the self-test mode.

1) Disconnect Air and Communication from the manifold!
2) Select the desired test mode using the graphic display. (See example below)
3) Starting at the Home Screen, navigate the menus by selecting the NEXT button until the DIAGNOSTICS menu is shown.
4) Select the SET button to access the DIAGNOSTICS menu and then again to access the SELF-TEST menu
5) Push NEXT to navigate to the desired test mode: CYCLE OUTPUTS or INPUTS
6) Push SET to select the desired test mode.
7) A message will appear: DISCONNECT AIR HOLD SET BUTTON
8) Hold the SET button down for approximately 10 seconds to enable the test. The Display will flash the above message while the button is pushed.
9) When the display stops flashing, the self-test mode will run and the Module Status LED will flash Red/Green while the display shows SELF TEST RUNNING.
10) The global self-test mode can only be disabled by disconnecting the power to the manifold.



5.20 Diagnostics



1. All diagnostic information is read only
2. Press the SET button to enter DIAGNOSTICS sub-menu.
3. Press the NEXT button to scroll through the main diagnostic menu choices.
   a. SET SELF TEST
      i. - Please see following page for description
   b. USNW POWER
      i. - Displays voltage level of unswitched power (Node & Inputs)
   c. NETWORK DATA
      i. - Displays the network diagnostics
   d. FIRMWARE REVISION
      i. - For service personnel
   e. FIRMWARE BUILD
      i. - For service personnel
   f. LOAD FIRMWARE
      i. - For service personnel
   g. BOOTCODE REVISION
      i. - For service personnel
   h. BOOTCODE BUILD
      i. - For service personnel
   i. PART NUMBER
      i. - Displays replacement part number of module
   j. RETURN TO MAIN MENU

- The UNSW POWER screen indicates the voltage level present on the UNSW (Node & Input) power pins (Pin No. 2 and 3) of the main power connector.

5.21 Network and Sub-Network Error Codes

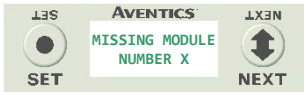
Error Code	Error	Error Description	Module No.
Main Network			
1		Output power not present on communication module	Comm.
2		Node / Input power is below 19VDC	Comm.
4		Error associated with a sub-bus module (see sub-bus error)	Comm.
8		short circuit detected on the sub-bus	Comm.
Sub Network			
22	1	Module did not respond	1
23	1	Module did not respond	2
24	1	Module did not respond	3
25	1	Module did not respond	4
26	1	Module did not respond	5
27	1	Module did not respond	6
28	1	Module did not respond	7
29	1	Module did not respond	8
2A	1	Module did not respond	9
2B	1	Module did not respond	10
2C	1	Module did not respond	11
2D	1	Module did not respond	12
2E	1	Module did not respond	13
2F	1	Module did not respond	14
30	1	Module did not respond	15
31	1	Module did not respond	16
42	2	Switched power is missing	1
43	2	Switched power is missing	2
44	2	Switched power is missing	3
45	2	Switched power is missing	4
46	2	Switched power is missing	5
47	2	Switched power is missing	6
48	2	Switched power is missing	7
49	2	Switched power is missing	8
4A	2	Switched power is missing	9
4B	2	Switched power is missing	10
4C	2	Switched power is missing	11
4D	2	Switched power is missing	12
4E	2	Switched power is missing	13
4F	2	Switched power is missing	14
50	2	Switched power is missing	15
51	2	Switched power is missing	16
62	3	Combination of errors 1 and 2	1
63	3	Combination of errors 1 and 2	2
64	3	Combination of errors 1 and 2	3
65	3	Combination of errors 1 and 2	4
66	3	Combination of errors 1 and 2	5
67	3	Combination of errors 1 and 2	6
68	3	Combination of errors 1 and 2	7
69	3	Combination of errors 1 and 2	8
6A	3	Combination of errors 1 and 2	9
6B	3	Combination of errors 1 and 2	10
6C	3	Combination of errors 1 and 2	11
6D	3	Combination of errors 1 and 2	12
6E	3	Combination of errors 1 and 2	13
6F	3	Combination of errors 1 and 2	14
70	3	Combination of errors 1 and 2	15
71	3	Combination of errors 1 and 2	16

5.22 Error Messages

The following are automatic error messages that are displayed when specific faults occur during operation:

Displayed when a short circuit condition is detected on the Sub-Bus power lines

Displayed when a short circuit condition is detected on a valve coil

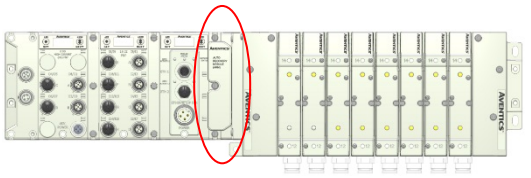


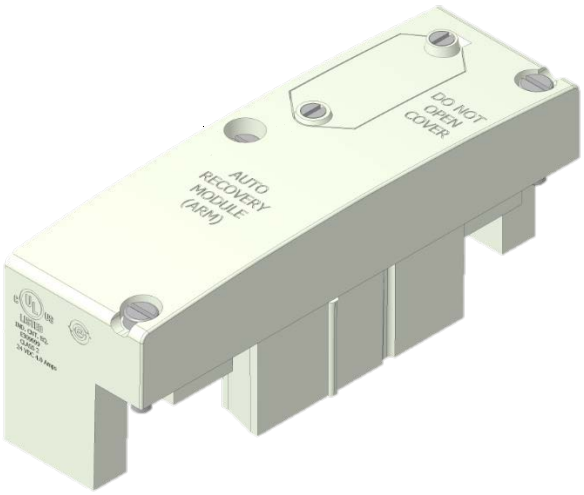
Displayed when a Sub-Bus module that had been previously installed becomes absent from the configuration

Displayed when +24 VDC on Pin No. 1 and No. 4 (Valves and Outputs) is not present or below 22 VDC

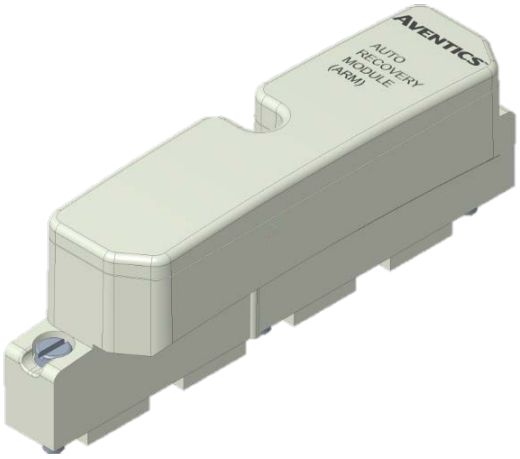
Displayed when +24 VDC on Pin No. 2 and No. 3 (Node and Inputs) is below 19 VDC

6. ARM – Auto Recovery Module (Optional)





ARM Module (Legacy)

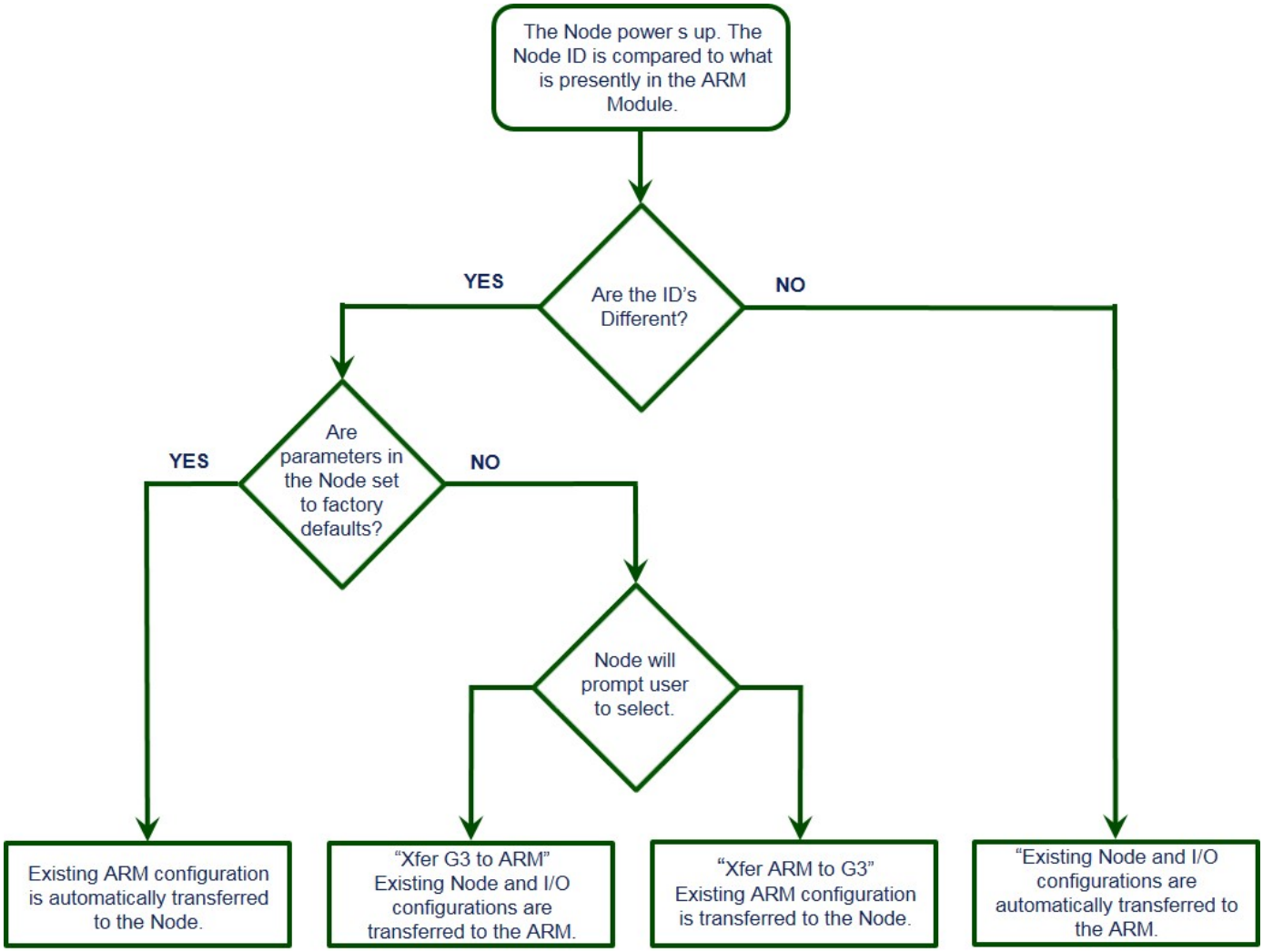


ARM-Clip Module

The Auto Recovery Module (ARM) is an optional memory module that is installed between the node and the valve adapter module and is used to preserve the manifold system parameters even during catastrophic failure. During the power-up process it reads the configuration of the manifold, including any user settable parameters of I/O modules, and stores the information in its non-volatile memory. Once the information is stored, it automatically disconnects itself from the power circuits while still mechanically attached to the manifold.

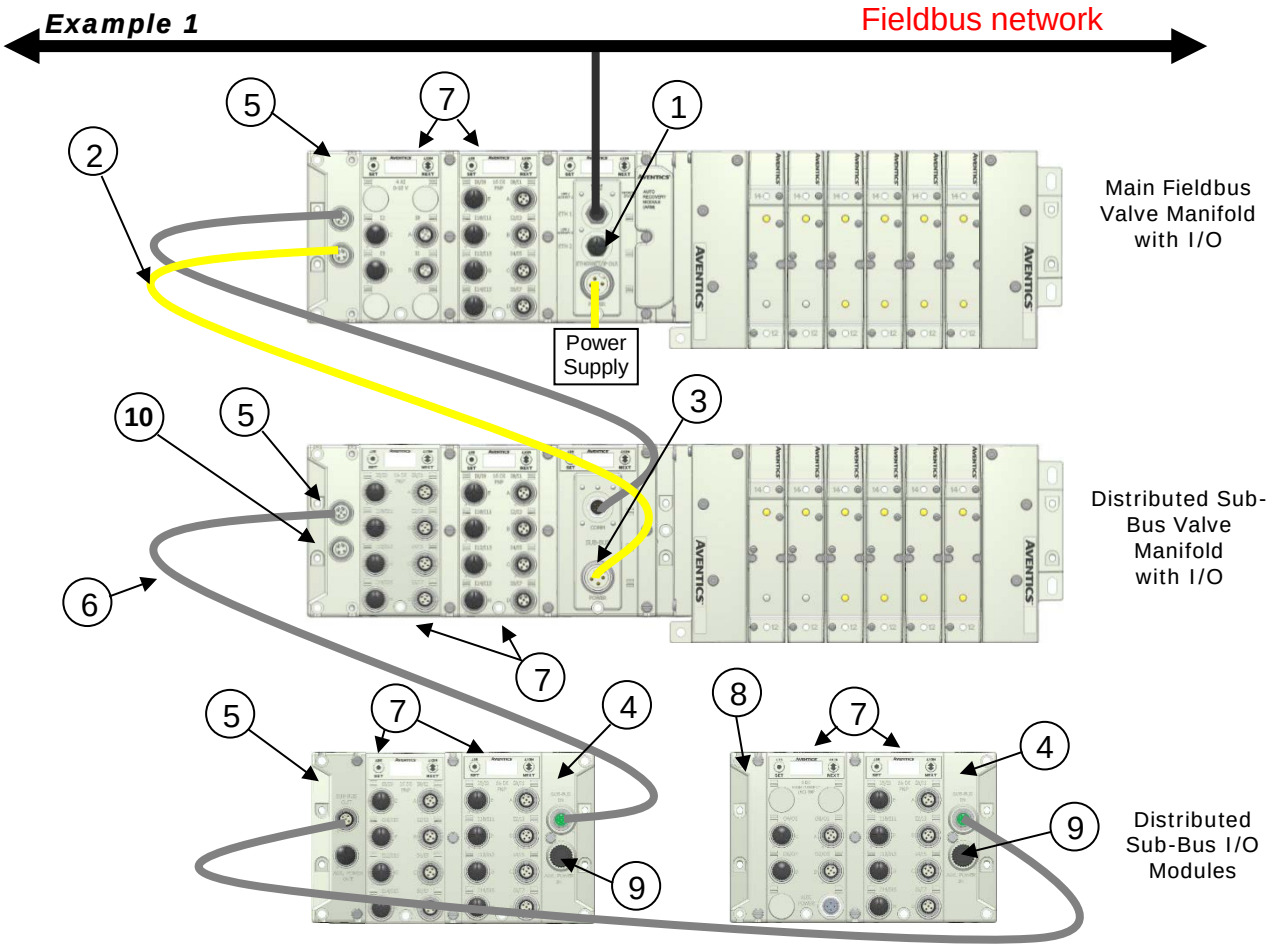
Description	*Replacement Part Number*
ARM Module (Legacy)	240-182
ARM-Clip Module	240-383

6.1 ARM process flowchart



7. Distribution

Distribution of I/O capability can be easily achieved with the G3 platform by means of Sub-Bus modules. I/O modules, valve manifolds and/or a combination of both can be simply separated from the main manifold and distributed via a sub-bus communication cable. The G3 platform uses the same I/O modules on the main manifold as on the distribution chain. The main communication module can control up to 16 I/O modules either on the main manifold or as part of the sub-bus connections. To utilize the sub-bus distribution capabilities the Sub-Bus OUT module must be located on the end of the main communication manifold and a Terminator Module must be located at the last sub-bus component.



Detail No.	Description
1	Main Communication Module (Node)
2	Sub-Bus Power Cable (Can be connected to separate power supply for isolated power control)
3	Distributed Sub-Bus Valve Module
4	Sub-Bus IN module
5	Sub-Bus OUT module
6	Sub-Bus Communication Cable
7	I/O Modules
8	Terminator Module (Used to terminate sub-bus)
9	Aux. Power IN (Used to augment Input power and/or supply power to Output modules)
10	Aux. Power OUT (Can be used to supply power to distributed modules)

7.1 Sub-Bus Distribution Modules

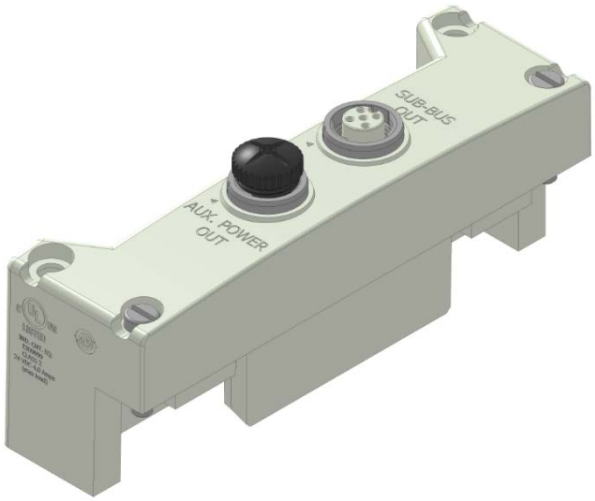
SUB-BUS OUT Module

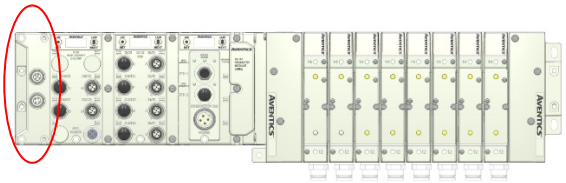
1. Used only when distributing the Sub-Bus to another assembly is required.

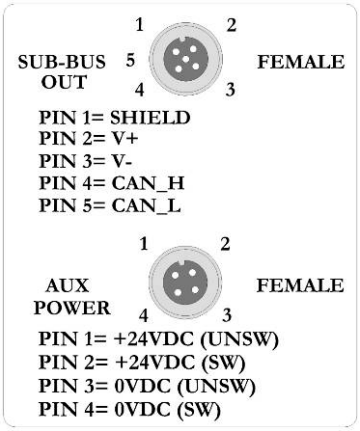
2. SUB-BUS OUT - 5 pin M12 female communication connector.
   - Used to distribute the Sub-Bus to the next Sub-Bus assembly.
   - Carries 24 VDC power for electronics of the next module.

3. AUX. POWER OUT - 4 pin M12 female aux. power connector.
   - Optional connection.
   - Used as a convenience way to distribute the power connection to the next Sub-Bus assembly.

Description	*Replacement Part Number*
Sub-Bus OUT Module with Din Rail Mounting	240-244
Sub-Bus OUT module without Din Rail Mounting	240-183







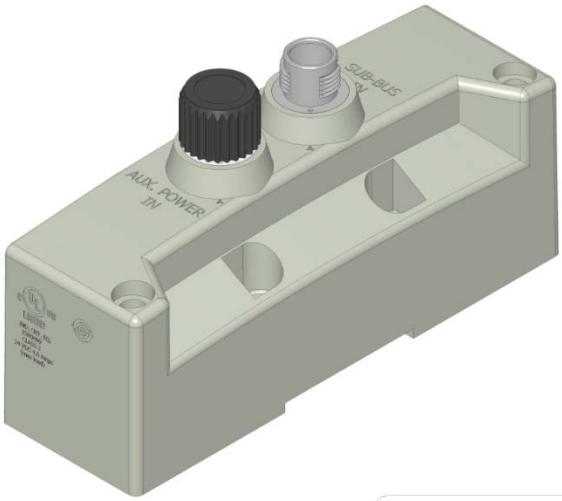
SUB-BUS IN Modules

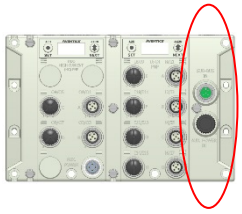
- Used to distribute I/O assemblies that do not have valves
  - Must be installed to the right of the I/O modules.

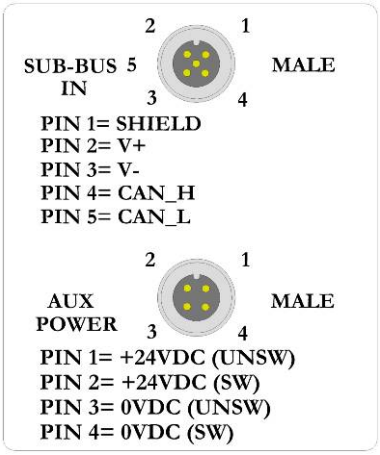
4. SUB-BUS IN - 5 pin M12 male communication connector.
   - Must be connected to the Sub-Bus Out connector of the previous assembly
   - Carries 24 VDC power for electronics of module

5. AUX. POWER IN - 4 pin M12 male connector.
   - Aux power is required for Output modules. This connection also allows Output power to be interrupted to all Output modules connected to this module.
   - Aux. Power is optional for Inputs. Power from the SUN-BUS IN connection is used to power sensors but can be augmented, if necessary, by adding additional power to this connector.

Description	*Part Number*
Sub-Bus IN module with Din Rail Mounting	240-246
Sub-Bus IN module without Din Rail Mounting	240-185



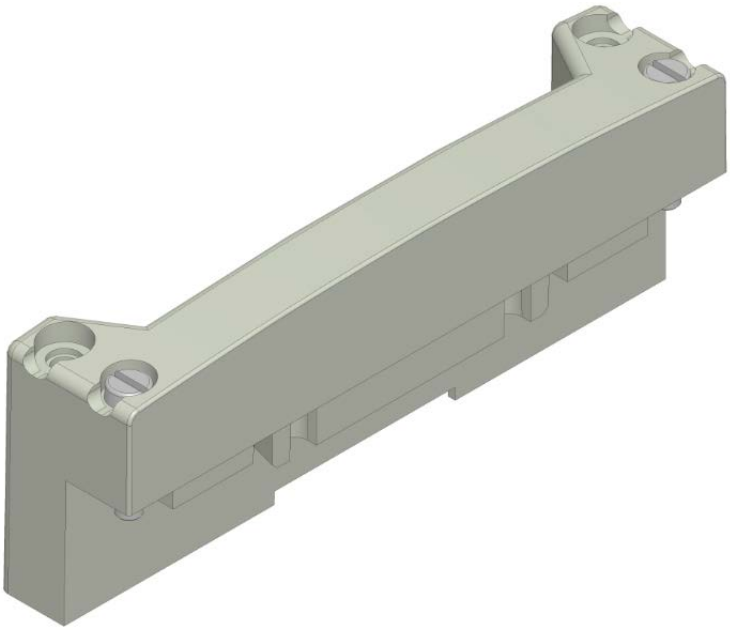




Terminator Module

6. Used to terminate SUB-BUS connections.
   - Must be installed on the left side of the last Sub-Bus module.

Description	*Part Number*
Terminator Module with Din Rail Mounting	240-245
Terminator Module without Din Rail Mounting	240-184



- *The terminator module is required to be installed in the G3 system for proper operation*

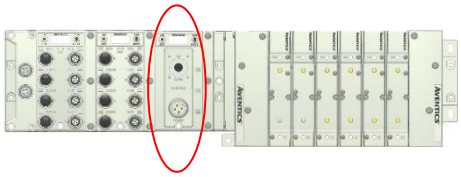
G3 Sub-Bus Valve Module

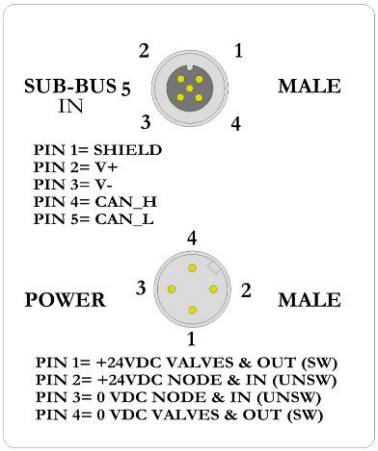
7. COMM - 5 pin M12 male Sub-Bus input communication connector.
   - Must be connected to the SUB-BUS OUT connector of the previous assembly
   - Carries 24 VDC power for electronics of module

8. POWER - 4 pin MINI male power connector.
   - Power is required for Outputs

9. Used to distribute Valves on the Sub-Bus.
   - Can accepts discrete I/O module to allow a Sub-Bus Valve manifold with I/O

Description	*Part Number*
Sub-Bus Valve Module	240-241





- *There is a 0.8 VDC drop in power across this module, consider this when distributing Aux. power.*

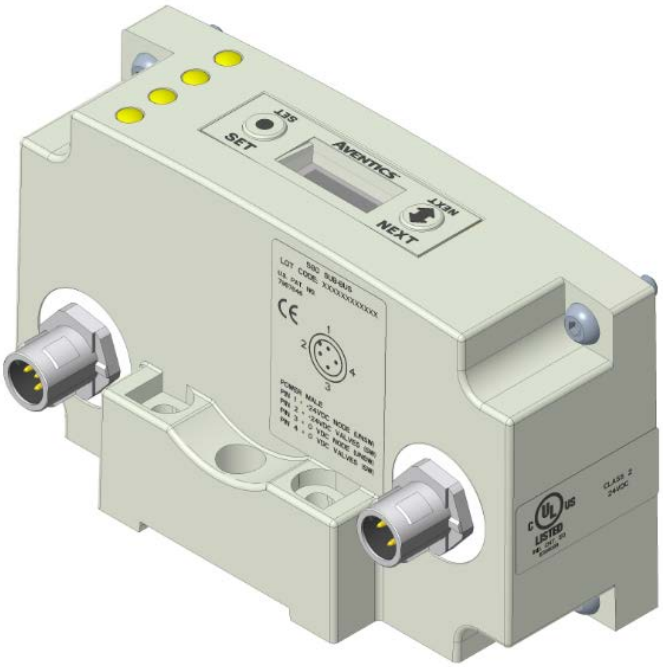
7.2 580 Series Sub-Bus Valve Module

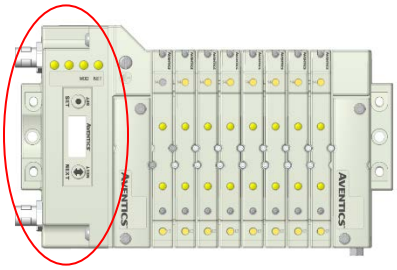
10. COMM - 5 pin M12 male Sub-Bus communication connector.
    - Must be connected to the SUB-BUS OUT connector of the previous assembly
    - Carries 24 VDC power for electronics of module

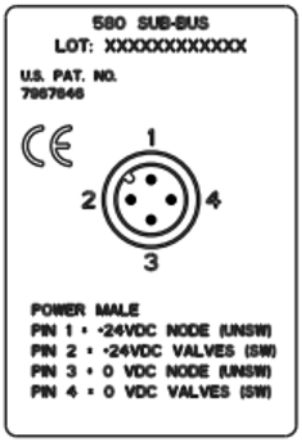
11. POWER - 4 pin M12 male power connector.
    - Power is required for Outputs

12. Used to distribute Valves on the Sub-Bus.
    - Does not allow connection to G3 I/O modules.

Description	Part Number
Sub-Bus Valve Module without I/O	P580AEDS4010A00







7.3 Sub-Bus Hub Module

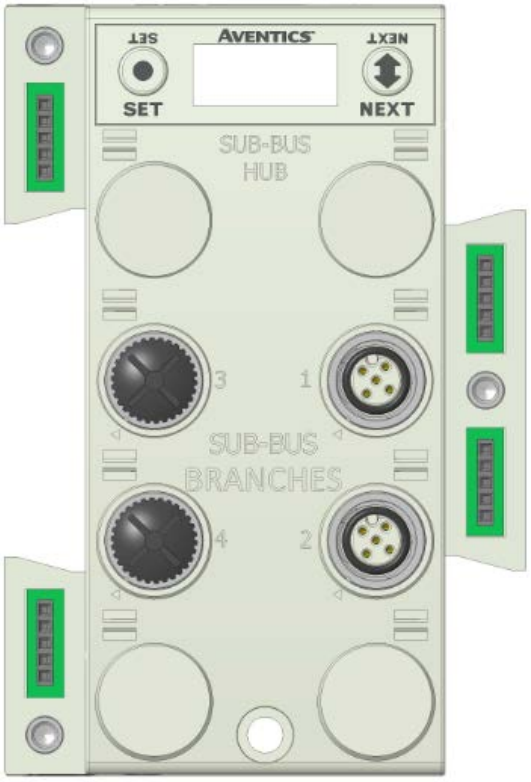
The G3 HUB module allows for branch distribution from the I/O side of the G3 System and can be integrated into the existing G3 Series Sub-Bus configuration. Auto Addressing allows for trouble free set up and configuration. Input, Output, as well as Valve manifolds can be attached to the available four Branches on a HUB module. Each G3 System can support up to two HUB modules, allowing for maximum flexibility. The HUB module is transparent to the I/O side of the G3 and does not reserve one of the potential sixteen positions.

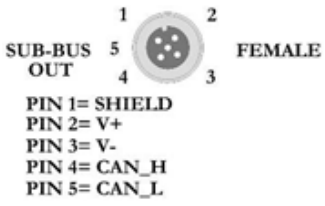
13. Used when distributing the Sub-Bus to another assembly.

14. SUB-BUS OUT - 5 pin M12 female communication connector.
    - Used to distribute the Sub-Bus to the next Sub-Bus assembly.
    - Carries 24 VDC power (up to 3A) for electronics of the next module.

15. Cannot connect a Hub to a branch of another Hub
16. Each branch of the Hub can accommodate a sub-bus cable length of 30 meters.

Description	*Part Number*
Sub-Bus Hub Module	240-326





7.4 Sub-Bus Cables

M12 STRAIGHT 5 PIN MALE TO FEMALE SUB-BUS CABLE - SHIELDED

TA0501MGDTC0571P – 1 Meter
TA0505MGDTC0571P – 5 Meter
TA0510MGDTC0571P – 10 Meter

M12 STRAIGHT 5 PIN FEMALE FIELD WIREABLE CONNECTOR, SPRING CAGE

TC05F2000000071V – PG9

M12 STRAIGHT 5 PIN MALE FIELD WIREABLE CONNECTOR, SPRING CAGE

TA05F2000000071V – PG9

M12 90° 5 PIN FEMALE FIELD WIREABLE CONNECTOR, SPRING CAGE

TD05F2000000071V – PG9

M12 90° 5 PIN MALE FIELD WIREABLE CONNECTOR, SPRING CAGE

TB05F2000000071V – PG9

BULK SUB-BUS CABLE	*NOTE
000550MGD0005000 – 50 Meter Length	
0005A0MGD0005000 – 100 Meter Length	

* Note:
Length of field wired cables should not exceed the maximum length of 30 meters for total sub-bus communications link. See appropriate technical manual for sub-bus length requirements. The cable assemblies and Bulk cable are the only approved cables for the G3 Sub-Bus link. See technical document TDG3SBWD1-0EN for proper installation and wiring of field wireable connectors.

Technical Data

TECHNICAL DATA	CABLE	CONNECTORS	BULK CABLE
Molded Body / Insert	TPU	Zinc - Nickel Plated	N/A
Coupling Nut	Zinc - Nickel Plated	Brass - Nickel Plated	N/A
Cable Jacket Material	PUR	N/A	Gray RAL 7001
Cable O.D.	6.70 mm	N/A	6.70 mm
Voltage Rating (Nominal)	60 Volts	60 Volts	60 Volts
Current Rating	4.0 Amps	4.0 Amps	4.0 Amps
Degree of Protection	IP65 (mated)	IP65 (mated)	IP65 (terminated)
Operating Temperature	-40° C - 80° C	-40° C - 80° C	-20° C - 75° C
Conductor Gauge	24 AWG Signal 22 AWG Power	26-20 AWG	24 AWG Signal 22 AWG Power
Bend Radius	67 mm	N/A	67 mm
No. of Bending Cycles	5 Million	N/A	5 Million

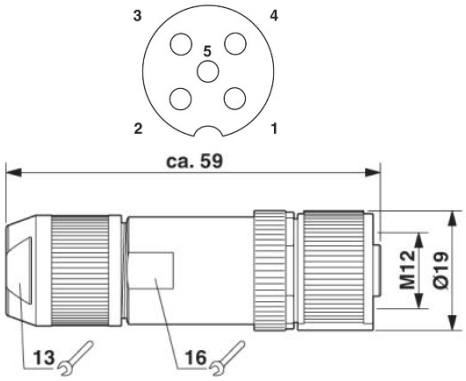
7.5 G3 Sub-Bus Field Wiring Directions

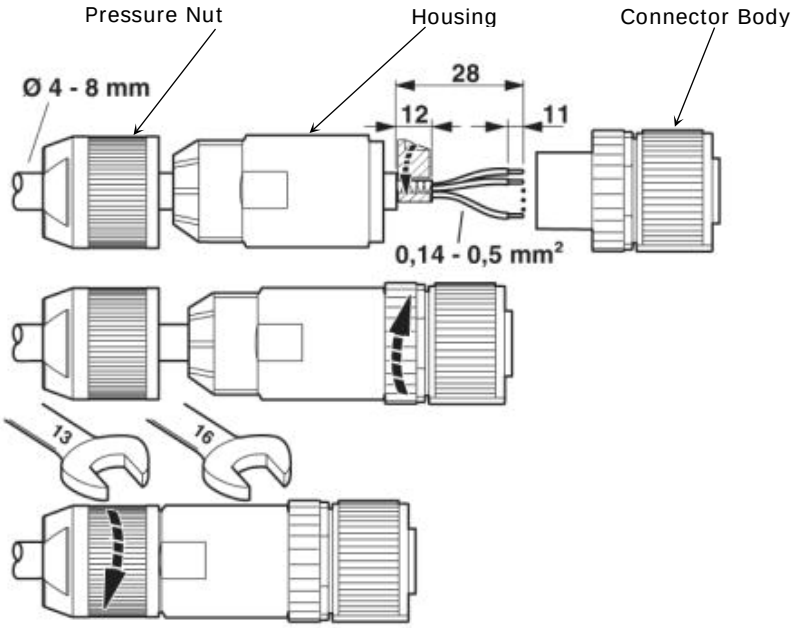
The purpose of this document is to instruct the end user of the proper wiring techniques required to make a G3 Sub-Bus cable from the available bulk cable and field wireable ends. The effectiveness of the resultant assembly remains on the end user and may have bearing on the proper functionality of the G3 Sub-Bus operation; please follow the manufacturer's Cable Assembly Procedure properly.

Cable Assembly Procedure

Step No.1	Cut cable to desired length.
Step No.2	Run cable through Pressure Nut and Housing.
Step No.3	Strip cable jacket back 28mm (1.10") for straight connectors and 35mm (1.38") for 90° connectors.
Step No.4	Remove shielding from end of wires back approximately 16mm (.630").
Step No.5	Apply shielding foil provided, around the shortened end of the shielding.
Step No.6	Strip individual conductors back approximately 11mm (.433").
Step No.7	Push stranded wires into appropriate colored terminal.
Step No.8	Attach the connector body onto the housing and tighten.
Step No.9	Attach the pressure nut on the back side and tighten
Step No.10	Confirm Continuity between all pins.

1 = Shield Wire (must be connected)
2 = Red
3 = Black
4 = White
5 = Blue



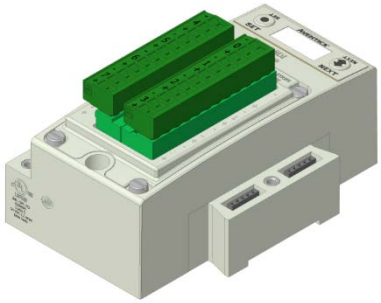


8. Digital I/O Module

8.1 Digital I/O Module Usage

The maximum number of modules that can be used on the Discrete I/O side of the manifold is 16. These modules can be centralized on the main fieldbus manifold, distributed or a combination of both. Modules can be connected in any combination of inputs, outputs and specialty up to the physical limitation of 16 modules.

Input Module Types



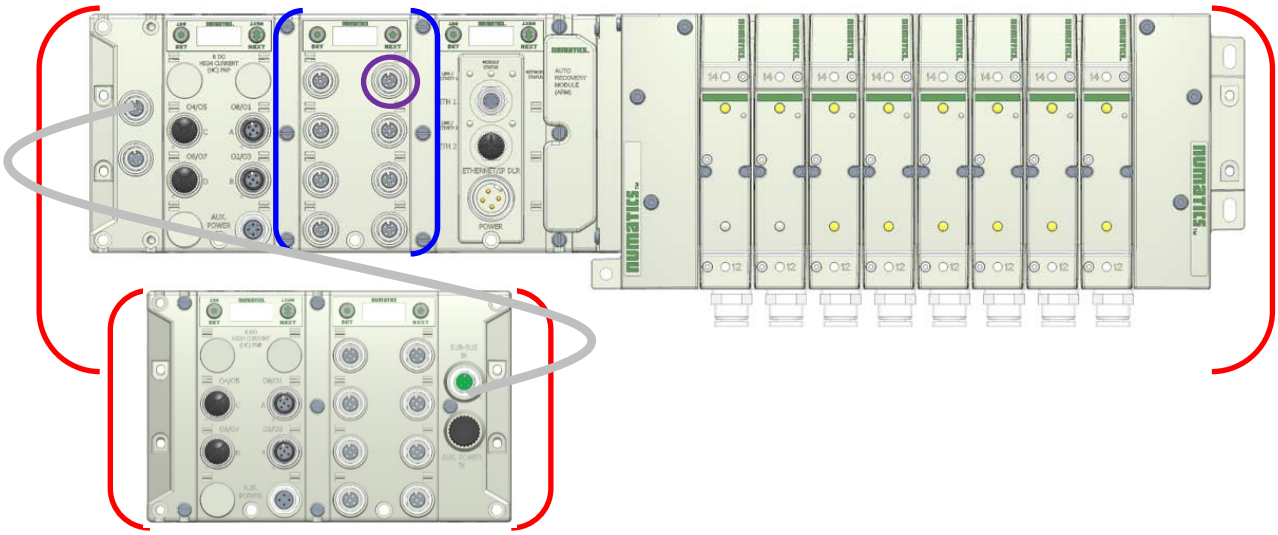
Output Module Types

Input/Output Module Types

Valve Side Output Module Types

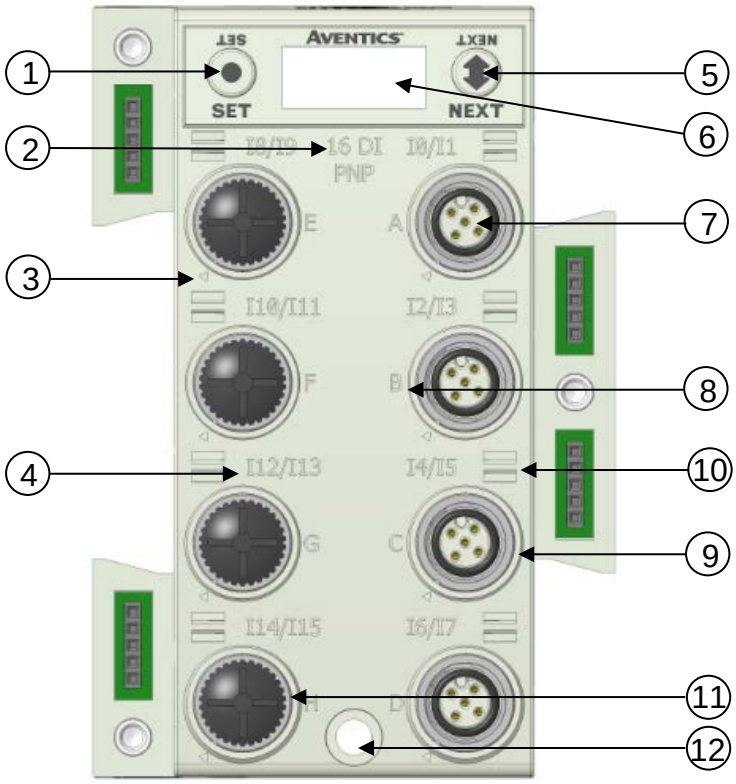
8.2 I/O Module Technical Data

Module No.	Description	Connector Type	Current Limitation for Module	Current Limitation for connector	Current Limitation for manifold assy.
240-203	16 PNP Inputs	Terminal Strip	1.2A	.30A for each +24VDC terminal	4A for +24 Valves and Outputs 4A for +24 Node and Inputs
240-204	16 NPN Inputs				
240-379	8 PNP Inputs	M8		.15A (Pin 1 to Pin 3)	
240-205	16 PNP Inputs	M12			
240-206	8 PNP Inputs				
240-207	16 PNP Outputs			.50A (Pin 3 to Pin 2/4)	
240-208	8 PNP Outputs				
240-209	16 NPN Inputs			.15A (Pin 1 to Pin 3)	
240-210	8 NPN Inputs				
240-211	8 PNP Input and 8 PNP Outputs			.50A / output connector (Pin 3 to Pin 2/4) .15A / input connector (Pin 1 to Pin 3)	
240-212 240-213 240-214 240-215	Analog IO modules			.15A (Pin 1 to Pin 3)	
240-300	8 High Current Outputs		8A (From Aux. Power Conn.)	2.0A / output connector (1.0A Pin 3 to Pin 2) (1.0A Pin 3 to Pin 4)	N/A
240-307	2 Analog Inputs and 2 High Current Analog Voltage Outputs		4A (From Aux. Power Conn.)	2.0A (Pin 3 to Pin 4)	N/A
240-311	RTD		1.2A	N/A	4A for +24 Valves and Outputs 4A for +24 Node and Inputs
240-316	8 PNP Inputs	Terminal Strip		.30A for each +24VDC terminal	
240-323	16 PNP Inputs			.30A for each +24VDC terminal	
240-330	16 PNP Outputs			.50A / output connector	
240-363	4 Analog Inputs and 4 High Current Analog Outputs	M12	8A (From Aux. Power Conn.)	2.0A (Pin 1 to Pin 3)	N/A



8.3 I/O Module Descriptions and Menus

Detail No.	Description
1	“Set” Button – used to navigate through user menus and set parameters
2	Module Function (I/O Type)
3	Alignment arrow for SPEEDCON connector
4	Bit Designation for I/O
5	“Next” Button – used to navigate through user menus and set parameters
6	Graphic Display
7	5 Pin M12 female I/O connector
8	Connector designation
9	Metal threads for SPEEDCON connector
10	Slot for text ID tags
11	Dust Cover
12	Mounting hole



NOTE!

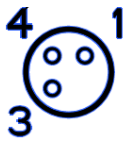
- *All dust covers must be tightened to a torque of 4-6 in. lbs. to maintain the IP65 integrity.*

8.4 Digital Input Modules

One Digital Input per Connector – M8 Female Modules

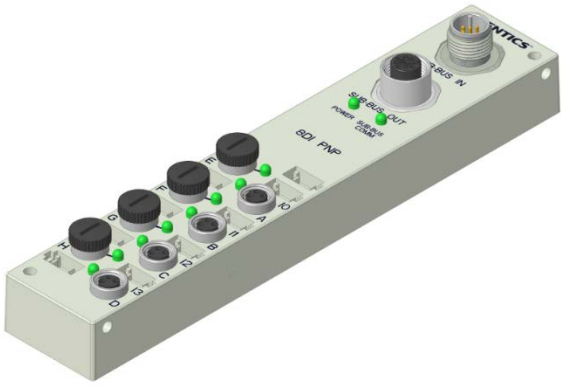
Module Part No.	*I/O Type*	*Short Circuit Protection*	*Short Circuit Protection Status Bits*	*Input Points*
240-379	PNP (Sourcing)	YES – Visual	YES – Optional	8

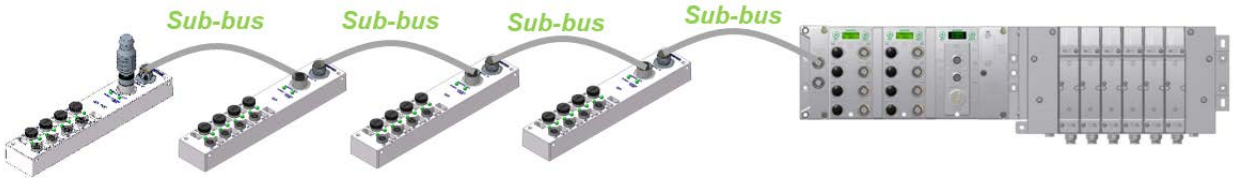
Input Mapping								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X (Required)	Input 7	Input 6	Input 5	Input 4	Input 3	Input 2	Input 1	Input 0
Diagnostics								
X (Selectable)	Conn. H SCP Status	Conn. G SCP Status	Conn. F SCP Status	Conn. E SCP Status	Conn. D SCP Status	Conn. C SCP Status	Conn. B SCP Status	Conn. A SCP Status



FEMALE

PIN 1= +24VDC (UNSW)
PIN 3= 0VDC (UNSW)
PIN 4= INPUT



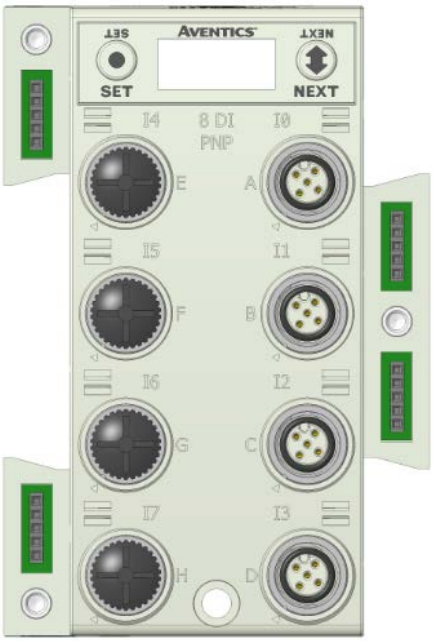


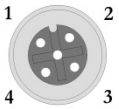
An external terminating resistor, p/n: TA05TR000000000, is required when the 240-379 is the last I/O module on the sub-bus.

One Digital Input per Connector – M12 Female Modules

Module Part No.	*I/O Type*	*Short Circuit Protection*	*Short Circuit Protection Status Bits*	*Input Points*
240-210	NPN (Sinking)	YES	YES	8
240-206	PNP (Sourcing)			

Input Mapping								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X	Input 7	Input 6	Input 5	Input 4	Input 3	Input 2	Input 1	Input 0
Diagnostic Telegram								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X (Selectable)	Conn. H SCP Status	Conn. G SCP Status	Conn. F SCP Status	Conn. E SCP Status	Conn. D SCP Status	Conn. C SCP Status	Conn. B SCP Status	Conn. A SCP Status





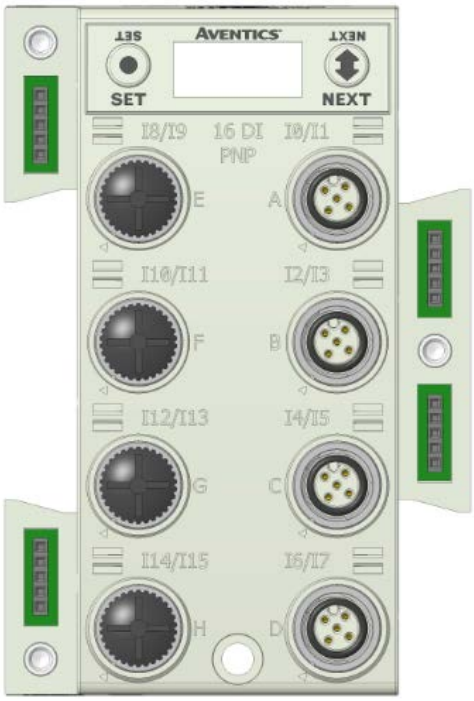
FEMALE

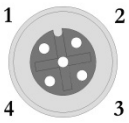
PIN 1= +24VDC (UNSW)
PIN 2= NOT USED
PIN 3= 0VDC (UNSW)
PIN 4= INPUT 1

Two Digital Inputs per Connector – M12 Female Modules

Module Part No.	*I/O Type*	*Short Circuit Protection*	*Short Circuit Protection Status Bits*	*Input Points*
240-209	NPN (Sinking)	YES	YES	16
240-205	PNP (Sourcing)			

Input Mapping								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X	Input 7	Input 6	Input 5	Input 4	Input 3	Input 2	Input 1	Input 0
X+1	Input 15	Input 14	Input 13	Input 12	Input 11	Input 10	Input 9	Input 8
Diagnostic Telegram								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X (Selectable)	Conn. H SCP Status	Conn. G SCP Status	Conn. F SCP Status	Conn. E SCP Status	Conn. D SCP Status	Conn. C SCP Status	Conn. B SCP Status	Conn. A SCP Status





FEMALE

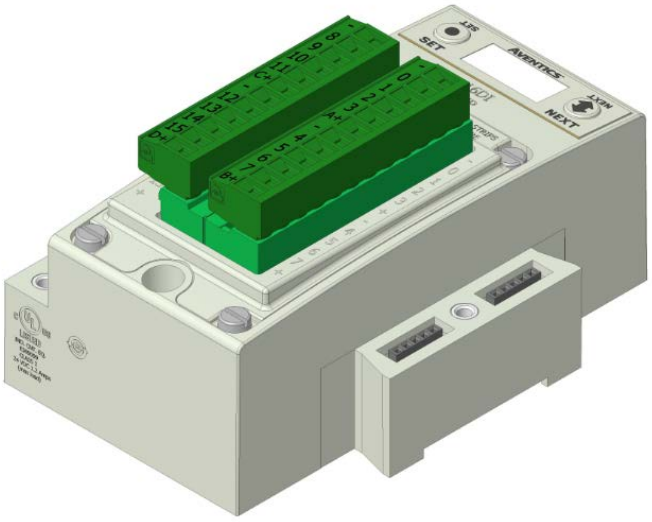
PIN 1= +24VDC (UNSW)
PIN 2= INPUT 2
PIN 3= 0VDC (UNSW)
PIN 4= INPUT 1

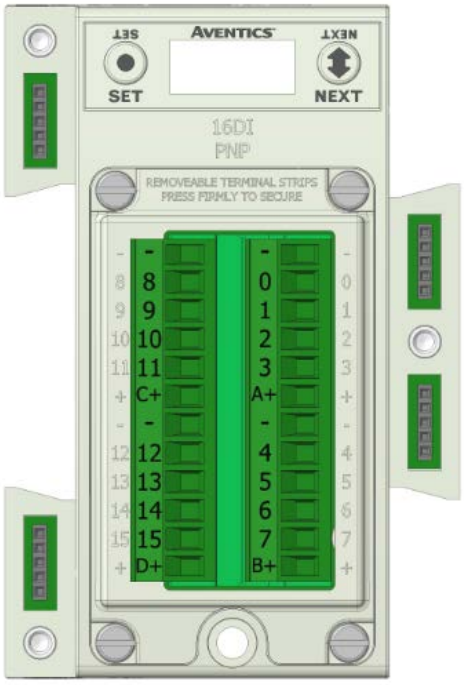
Sixteen Digital Inputs – Terminal Strip Modules

Specifications
- Wire Range: 12 to 24 AWG
- Strip Length: 7mm
- Tightening Torque: 0.5 Nm

Module Part No.	*I/O Type*	*Short Circuit Protection*	*Short Circuit Protection Status Bits*	*Input Points*
240-203	PNP (Sourcing)	YES	YES	16
240-204	NPN (Sinking)			

Input Mapping								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X	Input 7	Input 6	Input 5	Input 4	Input 3	Input 2	Input 1	Input 0
X+1	Input 15	Input 14	Input 13	Input 12	Input 11	Input 10	Input 9	Input 8
Diagnostic Telegram								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X (Selectable)	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	D+ SCP Status	C+ SCP Status	B+ SCP Status	A+ SCP Status





Intrinsically safe [Ex ia] NAMUR Compatible Input Module

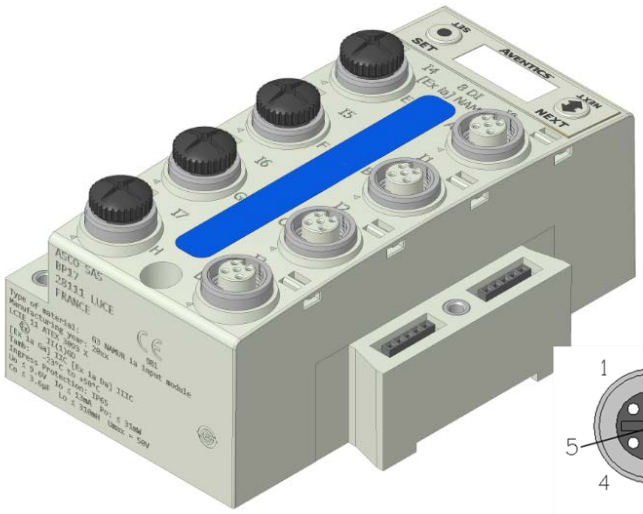
One Digital Input per Connector – M12 Female

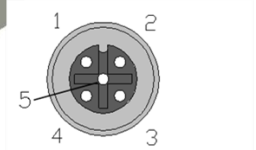
Input module is for use with NAMUR certified intrinsically safe (IS) sensors. The module can be placed in any G3 I/O position available but must be used in conjunction with appropriate clips with partition plates (see picture on page 8-71). This module is for use with (IS) sensors (certified to EN 60947-5-6) where the sensor is placed within the hazardous area, (e.g. ATEX 0-20, 1-21, and 2-22). This [Ex ia] module is part of the G3 electronics platform, which is designed to reside outside of the hazardous environment or in Zone 2-22, inside of a cabinet with appropriate ingress protection. The partition plate clips, used between standard G3 modules and [Ex ia] modules, are required to maintain ATEX approval. The 8.2 V sensor supply for each input connector is short circuit protected.

Part Numbers and Mapping

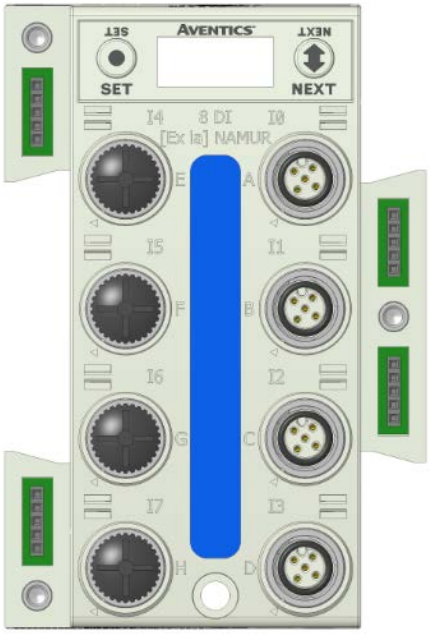
Module Part No.	*I/O Type*	*Short Circuit /Open Circuit Protection*	*Short Circuit /Open Circuit Present Status Bits*	*Input Points*
240-320	NAMUR	YES - Visual	YES - Optional	8

Input Mapping								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X (Required)	Input 7	Input 6	Input 5	Input 4	Input 3	Input 2	Input 1	Input 0
X	Conn. H SC Status	Conn. G SC Status	Conn. F SC Status	Conn. E SC Status	Conn. D SC Status	Conn. C SC Status	Conn. B SC Status	Conn. A SC Status
X + 1	Conn. H Open Status	Conn. G Open Status	Conn. F Open Status	Conn. E Open Status	Conn. D Open Status	Conn. C Open Status	Conn. B Open Status	Conn. A Open Status





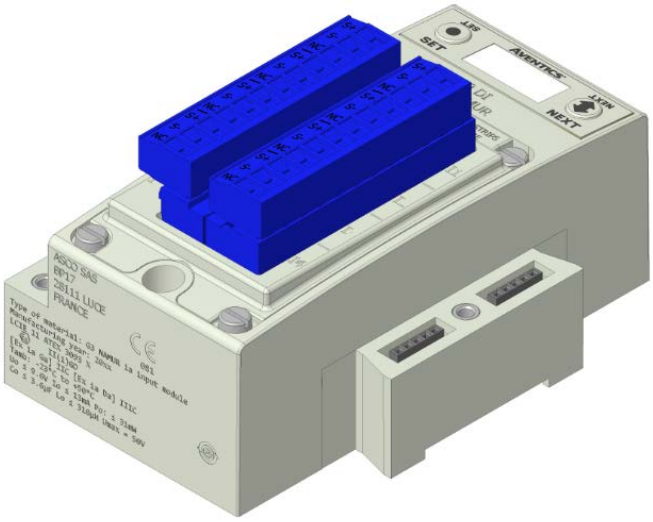
FEMALE
PIN 1 = SENSOR +
PIN 2 = SENSOR –
PIN 3 = Not Connected
PIN 4 = Not Connected
PIN 5 = Not Connected

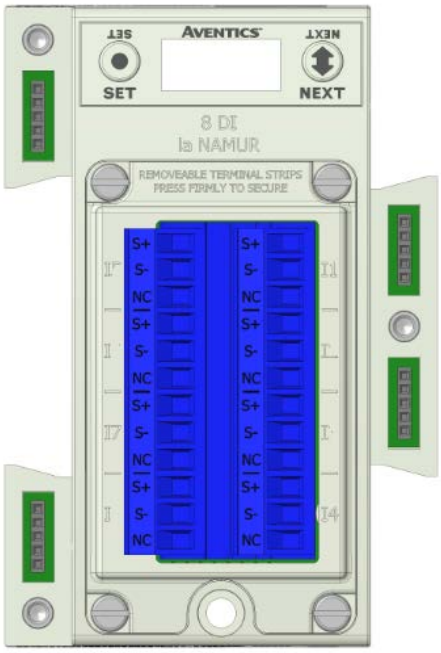


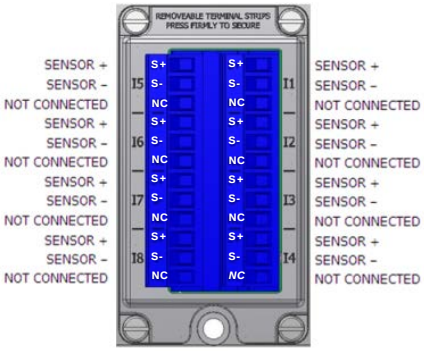
Intrinsically safe [Ex ia] NAMUR Compatible Input terminal strip module

Module Part No.	*I/O Type*	*Short Circuit /Open Circuit Protection*	*Short Circuit /Open Circuit Present Status Bits*	*Input Points*
240-322	NAMUR	YES - Visual	YES - Optional	8

Input Mapping								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X (Required)	Input 7	Input 6	Input 5	Input 4	Input 3	Input 2	Input 1	Input 0
X	Conn. H SC Status	Conn. G SC Status	Conn. F SC Status	Conn. E SC Status	Conn. D SC Status	Conn. C SC Status	Conn. B SC Status	Conn. A SC Status
X + 1	Conn. H Open Status	Conn. G Open Status	Conn. F Open Status	Conn. E Open Status	Conn. D Open Status	Conn. C Open Status	Conn. B Open Status	Conn. A Open Status

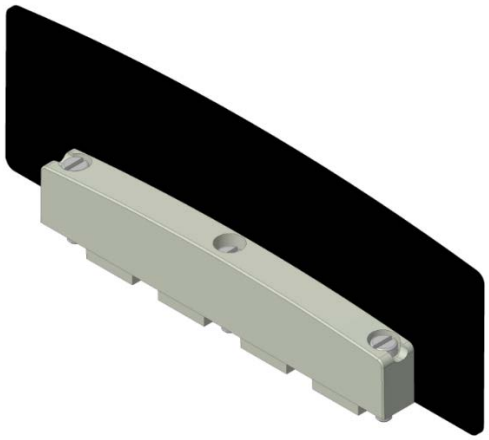




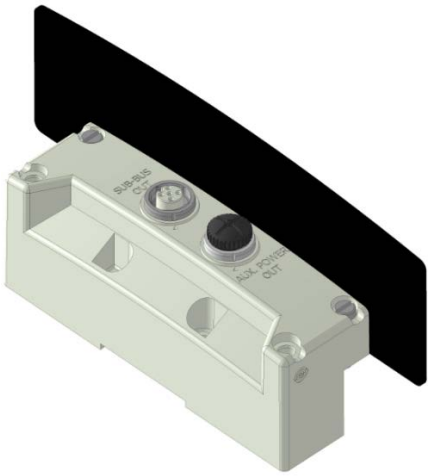


Intrinsically safe [Ex ia] Support Modules

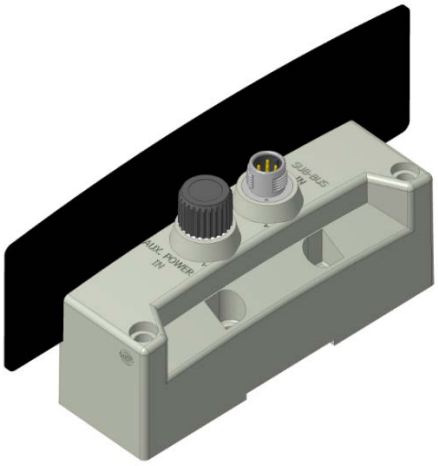
Mechanical isolation between standard and [Ex ia] modules is mandatory to fulfill ATEX certification. Clips with Partition Plates are available to achieve the required isolation.



G3 [Ex ia] Clip 240-317



G3 [Ex ia] Sub-Bus Out 240-318



G3 [Ex ia] Sub-Bus In 240-319

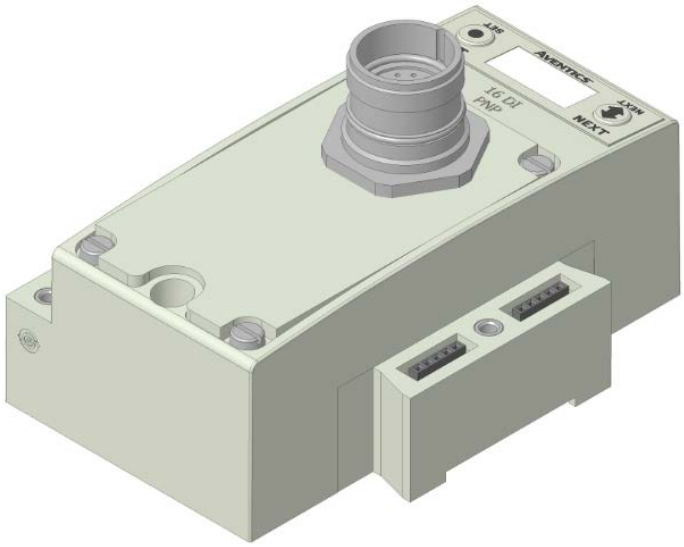
19 Pin M23 Input Module

The 19 Pin M23 Input module is for use with any Input block available from Phoenix Contact, Turck, Brad Harrison, etc. It can also be used with a single ended 19 Pin Cable.

Part Numbers and Mapping

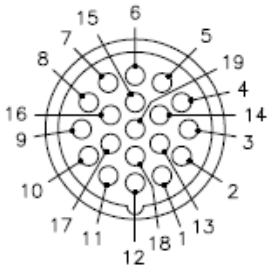
Module Part No.	*I/O Type*	*Short Circuit /Open Circuit Protection*	*Short Circuit /Open Circuit Present Status Bits*	*Input Points*
240-323	Digital	YES - Visual	YES - Optional	16

Input Mapping								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X (Required)	Input 7	Input 6	Input 5	Input 4	Input 3	Input 2	Input 1	Input 0
X	Input 15	Input 14	Input 13	Input 12	Input 11	Input 10	Input 9	Input 8
X + 1	Short Circuit	Short Circuit	Short Circuit	Short Circuit	Short Circuit	Short Circuit	Short Circuit	Short Circuit



Pin Out Information

Pin 1 = Input 14
Pin 2 = Input 10
Pin 3 = Input6
Pin 4 = Input 3
Pin 5 = Input 2
Pin 6 = 0 VDC
Pin 7 = Input 1
Pin 8 = Input 5
Pin 9 = Input 9 VDC
Pin 10 = Input 13
Pin 11 = Input 12
Pin 12 = P.E.
Pin 13 = Input 11
Pin 14 = Input 7
Pin 15 = Input 0
Pin 16 = Input 4
Pin 17 = Input 8
Pin 18 = Input 15
Pin 19 = + 24

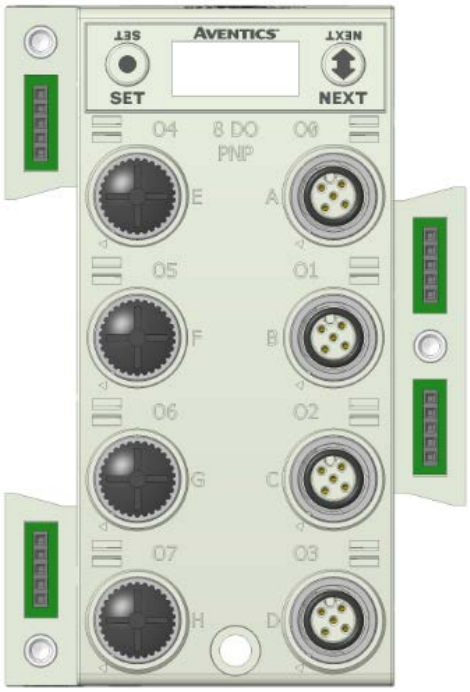


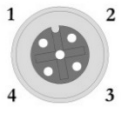
8.5 Digital Output Modules

One Digital Output per Connector - M12 Female Modules

Module Part No.	*I/O Type*	*Short Circuit Protection*	*Short Circuit Protection Status Bits*	*Output Points*
240-208	PNP (Sourcing)	YES	YES	8

Output Mapping								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X	Output 7	Output 6	Output 5	Output 4	Output 3	Output 2	Output 1	Output 0
Diagnostic Telegram								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X (Selectable)	Output 7 Status	Output 6 Status	Output 5 Status	Output 4 Status	Output 3 Status	Output 2 Status	Output 1 Status	Output 0 Status





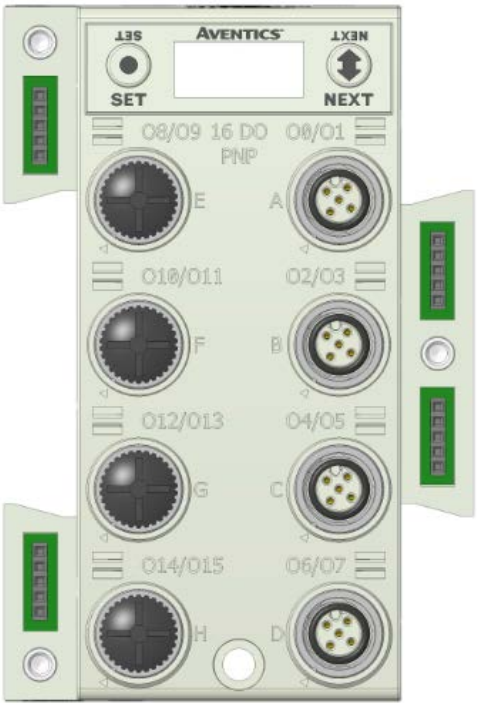
FEMALE

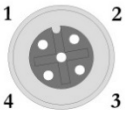
PIN 1= +24VDC (SW)
PIN 2= NOT USED
PIN 3= 0VDC (SW)
PIN 4= OUTPUT 1

Two Digital Outputs per Connector - M12 Female Modules

Module Part No.	*I/O Type*	*Short Circuit Protection*	*Short Circuit Protection Status Bits*	*Output Points*
240-207	PNP (Sourcing)	YES	YES	16

Output Mapping								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X	Output 7	Output 6	Output 5	Output 4	Output 3	Output 2	Output 1	Output 0
X+1	Output 15	Output 14	Output 13	Output 12	Output 11	Output 10	Output 9	Output 8
Diagnostic Telegram								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X (Selectable)	Output 7 Status	Output 6 Status	Output 5 Status	Output 4 Status	Output 3 Status	Output 2 Status	Output 1 Status	Output 0 Status
X+1 (Selectable)	Output 15 Status	Output 14 Status	Output 13 Status	Output 12 Status	Output 11 Satus	Output 10 Status	Output 9 Status	Output 8 Status





FEMALE

PIN 1= +24VDC (SW)
PIN 2= OUTPUT 2
PIN 3= 0VDC (SW)
PIN 4= OUTPUT 1

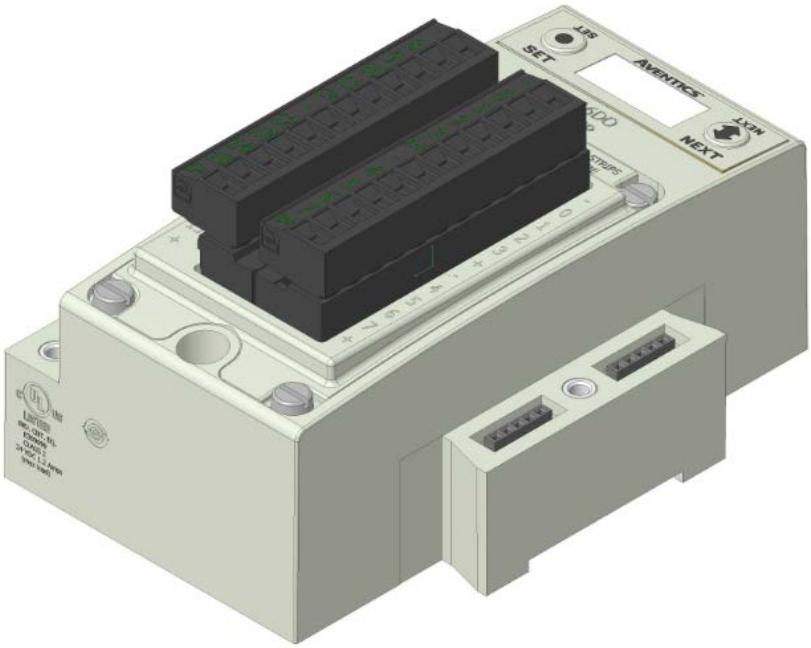
Sixteen Digital Outputs – Terminal Strip Modules

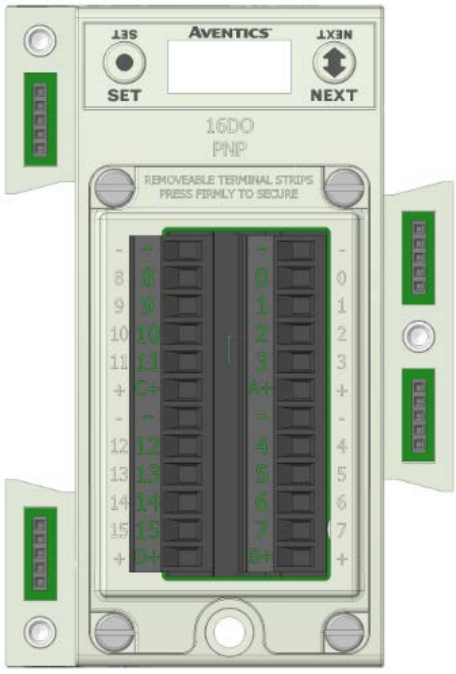
Specifications

- Wire Range: 12 to 24 AWG
- Strip Length: 7mm
- Tightening Torque: 0.5 Nm

Module Part No.	*I/O Type*	*Short Circuit Protection*	*Short Circuit Protection Status Bits*	*Output Points*
240-330	PNP (Sourcing)	YES	YES	16

Output Mapping								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X	Output 7	Output 6	Output 5	Output 4	Output 3	Output 2	Output 1	Output 0
X+1	Output 15	Output 14	Output 13	Output 12	Output 11	Output 10	Output 9	Output 8
Diagnostic Telegram								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X (Selectable)	Output 7 Status	Output 6 Status	Output 5 Status	Output 4 Status	Output 3 Status	Output 2 Status	Output 1 Status	Output 0 Status
X (Selectable)	Output 15 Status	Output 14 Status	Output 13 Status	Output 12 Status	Output 11 Status	Output 10 Status	Output 9 Status	Output 8 Status



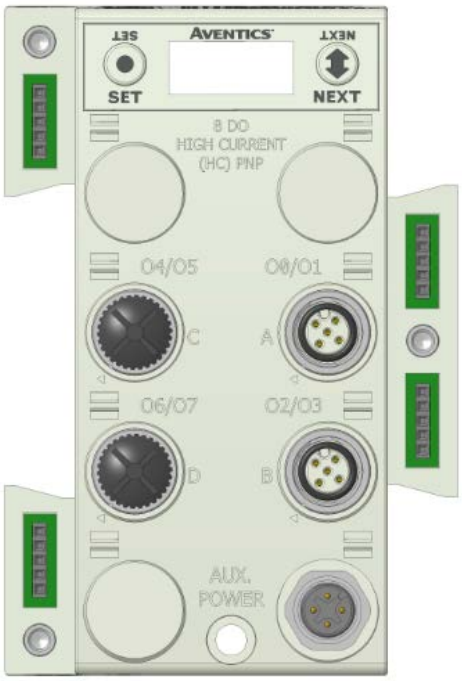


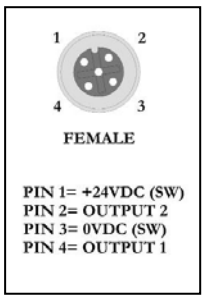
Two Digital High Current Outputs per Connector - M12 Female Modules

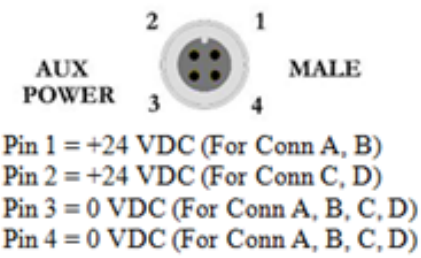
The high current output module is to be used with output devices requiring between 0.5 and 1.0 Amps. Each connector incorporates two outputs that are capable of sourcing 1.0 Amp per output.

Module Part No.	*I/O Type*	*Short Circuit Protection*	*Short Circuit Protection Status Bits*	*Output Points*
240-300	PNP (Sourcing)	YES	YES	8

Output Mapping								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X	Output 7	Output 6	Output 5	Output 4	Output 3	Output 2	Output 1	Output 0
Diagnostic Telegram								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X (Selectable)	Output 7 Status	Output 6 Status	Output 5 Status	Output 4 Status	Output 3 Status	Output 2 Status	Output 1 Status	Output 0 Status





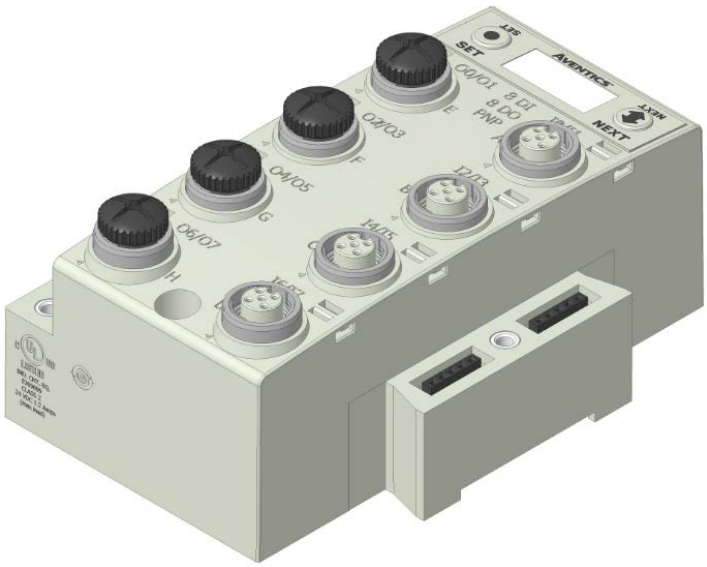


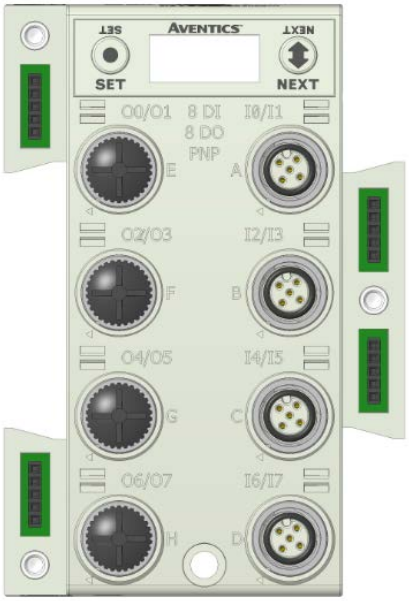
8.6 Digital Input/Output Modules

Two Digital I/O per Connector – M12 Female Modules

Module Part No.	*I/O Type*	*Short Circuit Protection*	*Short Circuit Protection Status Bits*	*Output Points*	*Input Points*
240-211	PNP (Sourcing)	YES	YES	8	8

Output Mapping								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X	Output 7	Output 6	Output 5	Output 4	Output 3	Output 2	Output 1	Output 0
Input Mapping								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X	Input 7	Input 6	Input 5	Input 4	Input 3	Input 2	Input 1	Input 0
Diagnostic Telegram								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X (Selectable)	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Conn. D SCP Status	Conn. C SCP Status	Conn. B SCP Status	Conn. A SCP Status
X+1 (Selectable)	Output 7 Status	Output 6 Status	Output 5 Status	Output 4 Status	Output 3 Status	Output 2 Status	Output 1 Status	Output 0 Status





FEMALE

CONNECTORS E, F, G, & H	CONNECTORS A, B, C, & D
PIN 1= +24VDC (SW)	PIN 1= +24VDC (UNSW)
PIN 2= OUTPUT 2	PIN 2= INPUT 2
PIN 3= 0VDC (SW)	PIN 3= 0VDC (UNSW)
PIN 4= OUTPUT 1	PIN 4= INPUT 1

9. Valve Interface Modules

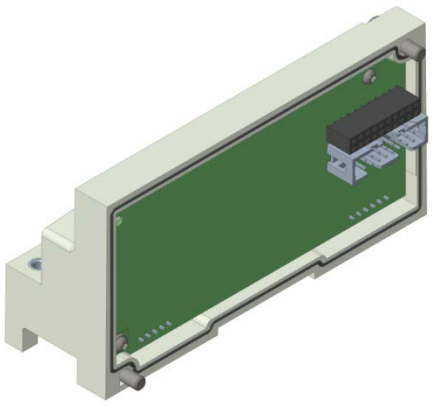
9.1 2000 Series & 500 Series Valve Driver

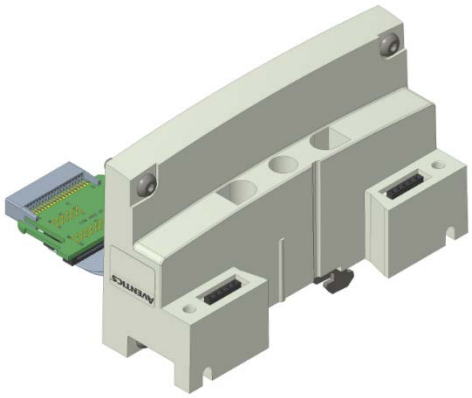
Output Data Mapping

Interface to control valves from a G3 communication module.

Module Part No.	*I/O Type*	*Short Circuit Protection*	*Short Circuit Protection Status Bits*	*Output Points*
219-828	NPN (Sinking) 2000 Series	YES – Visual	YES (32) – Optional	32
P599AE42518801	NPN (Sinking) 500 Series	YES – Visual	YES (128) – Optional	128

Output Mapping								
BYTE	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
X (Required)	Valve Coil No. 7	Valve Coil No. 6	Valve Coil No. 5	Valve Coil No. 4	Valve Coil No. 3	Valve Coil No. 2	Valve Coil No. 1	Valve Coil No. 0
X+1 (Selectable)	Valve Coil No. 15	Valve Coil No. 14	Valve Coil No. 13	Valve Coil No. 12	Valve Coil No. 11	Valve Coil No. 10	Valve Coil No. 9	Valve Coil No. 8
X+2 (Selectable)	Valve Coil No. 23	Valve Coil No. 22	Valve Coil No. 21	Valve Coil No. 20	Valve Coil No. 19	Valve Coil No. 18	Valve Coil No. 17	Valve Coil No. 16
X+3 (Selectable)	Valve Coil No. 31	Valve Coil No. 30	Valve Coil No. 29	Valve Coil No. 28	Valve Coil No. 27	Valve Coil No. 26	Valve Coil No. 25	Valve Coil No. 24
32 additional coils available per each additional 32+ manifold driver board								
X+4 (Selectable)	Valve Coil No. 39	Valve Coil No. 38	Valve Coil No. 37	Valve Coil No. 36	Valve Coil No. 35	Valve Coil No. 34	Valve Coil No. 33	Valve Coil No. 32
X+5 (Selectable)	Valve Coil No. 47	Valve Coil No. 46	Valve Coil No. 45	Valve Coil No. 44	Valve Coil No. 43	Valve Coil No. 42	Valve Coil No. 41	Valve Coil No. 40
X+6 (Selectable)	Valve Coil No. 55	Valve Coil No. 54	Valve Coil No. 53	Valve Coil No. 52	Valve Coil No. 51	Valve Coil No. 50	Valve Coil No. 49	Valve Coil No. 48
X+7 (Selectable)	Valve Coil No. 63	Valve Coil No. 62	Valve Coil No. 61	Valve Coil No. 60	Valve Coil No. 59	Valve Coil No. 58	Valve Coil No. 57	Valve Coil No. 56
32 additional coils available per each additional 32+ manifold driver board								
X+15 (Selectable)	Valve Coil No. 127	Valve Coil No. 126	Valve Coil No. 125	Valve Coil No. 124	Valve Coil No. 123	Valve Coil No. 122	Valve Coil No. 121	Valve Coil No. 120





Diagnostic Data Mapping

Module Part No.	*I/O Type*	*Short Circuit Protection*	*Short Circuit Protection Status Bits*	*Output Points*
219-828	NPN (Sinking) 2000 Series	YES – Visual	YES (32) – Optional	32
P599AE42518801	NPN (Sinking) 500 Series	YES – Visual	YES (128) – Optional	128

BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X (Selectable)	Coil 7 Status	Coil 6 Status	Coil 5 Status	Coil 4 Status	Coil 3 Status	Coil 2 Status	Coil 1 Status	Coil 0 Status
X+1	Coil 15 Status	Coil 14 Status	Coil 13 Status	Coil 12 Status	Coil 11 Status	Coil 10 Status	Coil 9 Status	Coil 8 Status
X+2	Coil 23 Status	Coil 22 Status	Coil 21 Status	Coil 20 Status	Coil 19 Status	Coil 18 Status	Coil 17 Status	Coil 16 Status
X+3	Coil 31 Status	Coil 30 Status	Coil 29 Status	Coil 28 Status	Coil 27 Status	Coil 26 Status	Coil 25 Status	Coil 24 Status
32 additional coil status bits per each additional 32+ manifold driver board								
X+4	Coil 39 Status	Coil 38 Status	Coil 37 Status	Coil 36 Status	Coil 35 Status	Coil 34 Status	Coil 33 Status	Coil 32 Status
X+5	Coil 47 Status	Coil 46 Status	Coil 45 Status	Coil 44 Status	Coil 43 Status	Coil 42 Status	Coil 41 Status	Coil 40 Status
X+6	Coil 55 Status	Coil 54 Status	Coil 53 Status	Coil 52 Status	Coil 51 Status	Coil 50 Status	Coil 49 Status	Coil 48 Status
X+7	Coil 63 Status	Coil 62 Status	Coil 61 Status	Coil 60 Status	Coil 59 Status	Coil 58 Status	Coil 57 Status	Coil 56 Status
128 coil status bits possible								
X+15	Coil 127 Status	Coil 126 Status	Coil 125 Status	Coil 124 Status	Coil 123 Status	Coil 122 Status	Coil 121 Status	Coil 120 Status

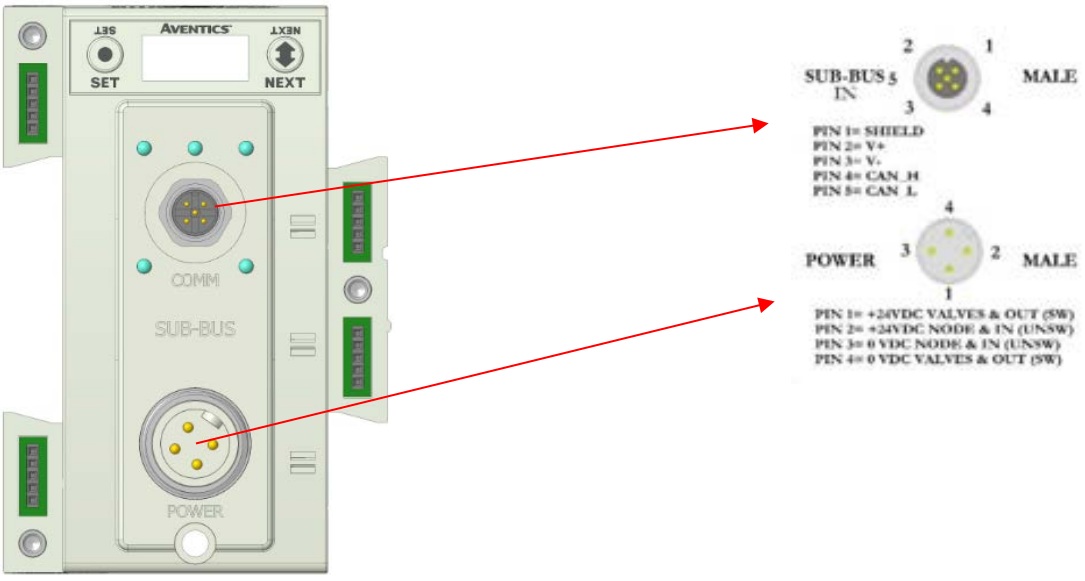
9.2 Sub-bus Valve Module

Output Data Mapping

Used to control a distributed valve manifold through the Sub-Bus.

Module Part No.	*I/O Type*	*Short Circuit Protection*	*Status Bit Data*	*Output Points*
240-241	NPN (Sinking)	YES – Visual	YES (128) – Optional	128

Output Mapping								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X (Required)	Valve Coil No. 7	Valve Coil No. 6	Valve Coil No. 5	Valve Coil No. 4	Valve Coil No. 3	Valve Coil No. 2	Valve Coil No. 1	Valve Coil No. 0
X+1 (Selectable)	Valve Coil No. 15	Valve Coil No. 14	Valve Coil No. 13	Valve Coil No. 12	Valve Coil No. 11	Valve Coil No. 10	Valve Coil No. 9	Valve Coil No. 8
X+2 (Selectable)	Valve Coil No. 23	Valve Coil No. 22	Valve Coil No. 21	Valve Coil No. 20	Valve Coil No. 19	Valve Coil No. 18	Valve Coil No. 17	Valve Coil No. 16
X+3 (Selectable)	Valve Coil No. 31	Valve Coil No. 30	Valve Coil No. 29	Valve Coil No. 28	Valve Coil No. 27	Valve Coil No. 26	Valve Coil No. 25	Valve Coil No. 24
32 additional coils available per each additional 32+ manifold driver board								
X+4 (Selectable)	Valve Coil No. 39	Valve Coil No. 38	Valve Coil No. 37	Valve Coil No. 36	Valve Coil No. 35	Valve Coil No. 34	Valve Coil No. 33	Valve Coil No. 32
X+5 (Selectable)	Valve Coil No. 47	Valve Coil No. 46	Valve Coil No. 45	Valve Coil No. 44	Valve Coil No. 43	Valve Coil No. 42	Valve Coil No. 41	Valve Coil No. 40
X+6 (Selectable)	Valve Coil No. 55	Valve Coil No. 54	Valve Coil No. 53	Valve Coil No. 52	Valve Coil No. 51	Valve Coil No. 50	Valve Coil No. 49	Valve Coil No. 48
X+7 (Selectable)	Valve Coil No. 63	Valve Coil No. 62	Valve Coil No. 61	Valve Coil No. 60	Valve Coil No. 59	Valve Coil No. 58	Valve Coil No. 57	Valve Coil No. 56
128 coils total possible								
X+15 (Selectable)	Valve Coil No. 127	Valve Coil No. 126	Valve Coil No. 125	Valve Coil No. 124	Valve Coil No. 123	Valve Coil No. 122	Valve Coil No. 121	Valve Coil No. 120



Diagnostic Data Mapping

Module Part No.	*I/O Type*	*Short Circuit Protection*	*Status Bit Data*	*Output Points*
240-241	NPN (Sinking)	YES – Visual	YES (128) – Optional	128

Diagnostics								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X (Selectable)	Coil 7 Status	Coil 6 Status	Coil 5 Status	Coil 4 Status	Coil 3 Status	Coil 2 Status	Coil 1 Status	Coil 0 Status
X+1	Coil 15 Status	Coil 14 Status	Coil 13 Status	Coil 12 Status	Coil 11 Status	Coil 10 Status	Coil 9 Status	Coil 8 Status
X+2	Coil 23 Status	Coil 22 Status	Coil 21 Status	Coil 20 Status	Coil 19 Status	Coil 18 Status	Coil 17 Status	Coil 16 Status
X+3	Coil 31 Status	Coil 30 Status	Coil 29 Status	Coil 28 Status	Coil 27 Status	Coil 26 Status	Coil 25 Status	Coil 24 Status
32 additional coil status bits per each additional 32+ manifold driver board								
X+4	Coil 39 Status	Coil 38 Status	Coil 37 Status	Coil 36 Status	Coil 35 Status	Coil 34 Status	Coil 33 Status	Coil 32 Status
X+5	Coil 47 Status	Coil 46 Status	Coil 45 Status	Coil 44 Status	Coil 43 Status	Coil 42 Status	Coil 41 Status	Coil 40 Status
X+6	Coil 55 Status	Coil 54 Status	Coil 53 Status	Coil 52 Status	Coil 51 Status	Coil 50 Status	Coil 49 Status	Coil 48 Status
X+7	Coil 63 Status	Coil 62 Status	Coil 61 Status	Coil 60 Status	Coil 59 Status	Coil 58 Status	Coil 57 Status	Coil 56 Status
128 coil status bits possible								
X+15	Coil 127 Status	Coil 126 Status	Coil 125 Status	Coil 124 Status	Coil 123 Status	Coil 122 Status	Coil 121 Status	Coil 120 Status

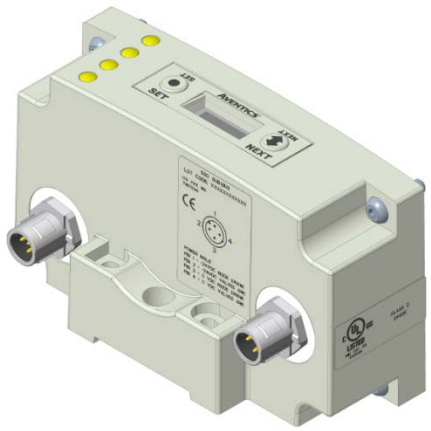
9.3 Sub-bus Valve Module without Distribution

Used to control a distributed valve manifold through the Sub-Bus.

Module Part No.	*I/O Type*	*Short Circuit Protection*	*Status Bit Data*	*Output Points*
P580AEDS4010A00	NPN (Sinking)	YES – Visual	YES (128) – Optional	128

Output Mapping

BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X (Required)	Valve Coil No. 7	Valve Coil No. 6	Valve Coil No. 5	Valve Coil No. 4	Valve Coil No. 3	Valve Coil No. 2	Valve Coil No. 1	Valve Coil No. 0
X+1 (Selectable)	Valve Coil No. 15	Valve Coil No. 14	Valve Coil No. 13	Valve Coil No. 12	Valve Coil No. 11	Valve Coil No. 10	Valve Coil No. 9	Valve Coil No. 8
X+2 (Selectable)	Valve Coil No. 23	Valve Coil No. 22	Valve Coil No. 21	Valve Coil No. 20	Valve Coil No. 19	Valve Coil No. 18	Valve Coil No. 17	Valve Coil No. 16
X+3 (Selectable)	Valve Coil No. 31	Valve Coil No. 30	Valve Coil No. 29	Valve Coil No. 28	Valve Coil No. 27	Valve Coil No. 26	Valve Coil No. 25	Valve Coil No. 24
32 additional coils available per each additional 32+ manifold driver board								
X+4 (Selectable)	Valve Coil No. 39	Valve Coil No. 38	Valve Coil No. 37	Valve Coil No. 36	Valve Coil No. 35	Valve Coil No. 34	Valve Coil No. 33	Valve Coil No. 32
X+5 (Selectable)	Valve Coil No. 47	Valve Coil No. 46	Valve Coil No. 45	Valve Coil No. 44	Valve Coil No. 43	Valve Coil No. 42	Valve Coil No. 41	Valve Coil No. 40
X+6 (Selectable)	Valve Coil No. 55	Valve Coil No. 54	Valve Coil No. 53	Valve Coil No. 52	Valve Coil No. 51	Valve Coil No. 50	Valve Coil No. 49	Valve Coil No. 48
X+7 (Selectable)	Valve Coil No. 63	Valve Coil No. 62	Valve Coil No. 61	Valve Coil No. 60	Valve Coil No. 59	Valve Coil No. 58	Valve Coil No. 57	Valve Coil No. 56
128 coils total possible								
X+15 (Selectable)	Valve Coil No. 127	Valve Coil No. 126	Valve Coil No. 125	Valve Coil No. 124	Valve Coil No. 123	Valve Coil No. 122	Valve Coil No. 121	Valve Coil No. 120



Used to control a distributed valve manifold through the Sub-Bus.

Module Part No.	*I/O Type*	*Short Circuit Protection*	*Status Bit Data*	*Output Points*
P580AEDS4010A00	NPN (Sinking)	YES – Visual	YES (128) – Optional	128

Diagnostics								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X (Selectable)	Coil 7 Status	Coil 6 Status	Coil 5 Status	Coil 4 Status	Coil 3 Status	Coil 2 Status	Coil 1 Status	Coil 0 Status
X+1	Coil 15 Status	Coil 14 Status	Coil 13 Status	Coil 12 Status	Coil 11 Status	Coil 10 Status	Coil 9 Status	Coil 8 Status
X+2	Coil 23 Status	Coil 22 Status	Coil 21 Status	Coil 20 Status	Coil 19 Status	Coil 18 Status	Coil 17 Status	Coil 16 Status
X+3	Coil 31 Status	Coil 30 Status	Coil 29 Status	Coil 28 Status	Coil 27 Status	Coil 26 Status	Coil 25 Status	Coil 24 Status
32 additional coil status bits per each additional 32+ manifold driver board								
X+4	Coil 39 Status	Coil 38 Status	Coil 37 Status	Coil 36 Status	Coil 35 Status	Coil 34 Status	Coil 33 Status	Coil 32 Status
X+5	Coil 47 Status	Coil 46 Status	Coil 45 Status	Coil 44 Status	Coil 43 Status	Coil 42 Status	Coil 41 Status	Coil 40 Status
X+6	Coil 55 Status	Coil 54 Status	Coil 53 Status	Coil 52 Status	Coil 51 Status	Coil 50 Status	Coil 49 Status	Coil 48 Status
X+7	Coil 63 Status	Coil 62 Status	Coil 61 Status	Coil 60 Status	Coil 59 Status	Coil 58 Status	Coil 57 Status	Coil 56 Status
128 coil status bits possible								
X+14	Coil 127 Status	Coil 126 Status	Coil 125 Status	Coil 124 Status	Coil 123 Status	Coil 122 Status	Coil 121 Status	Coil 120 Status

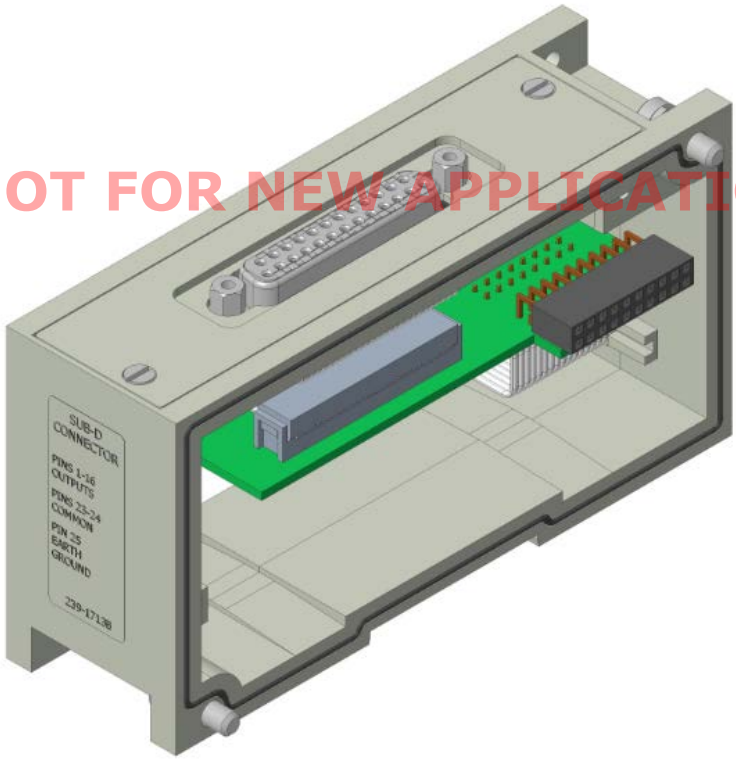
9.4 Valve Side Output Module

The valve side output module is used to distribute available valve side output points (i.e. when valves are located away from the rest of the electronics). These modules go to the right of the G3 valve adapter. The 16 bit output module utilizes the last 16 output bits on the valve side of the manifold (bits 16-31).

This module is not available with the 501, 502 or 503 series valves.

Sixteen Outputs per Connector - Sub-D 25 Pin Female Module

Module Part No.	*I/O Type*	*Short Circuit Protection*	*Internal Status Bits*	*Output Points*	*Module Size*
239-1713	NPN (Sinking)	Yes	16 – Optional	16	Narrow



9.5 500 Series Extended Coil Capability

The Extended Coil manifolds must be connected to a G3 Electronics Node to operate. Not all G3 supported protocols will support the Extended Coil Manifolds. Below is a list of the hardware and minimum firmware levels that support the Extended Coil Manifolds.

Extended Solenoid Coil Capability requirements:		
Module	**Part Number**	**Firmware**
Communication Module	240-310	Rev 1.01 Build 42509
Valve Driver Module	P599AE508827001	Rev 4.019

Module firmware revision levels can be confirmed in the integrated graphic display and the built-in web browser. See pg. 5-48 for more information.

9.6 Extended Coil Configuration

The Extended Coil Manifold can be configured to control 3 additional extended coil valve driver assemblies; unless already configured from the factory. Modify the configuration with either the graphic display interface as shown on page 5-34 or using the integrated web server configuration page shown on page 9-85.

Valve Series	Number of Extended Coil Valve Drivers	Total number of coils	**Configuration Selection**	Allocated number of I/O Bytes designated for valves
501	0	3-32	**32 coils**	4
	1	33-64	**64 coils**	8
	2	65-96	**96 coils**	12
	3	97-128	**128 coils**	16
502/503	0	1-32	**32 coils**	4
	1	33-48	**64 coils**	8
	2	49-64	**64 coils**	8
	3	65-80	**96 coils**	12

The following example of the G3 diagnostic webpage "Node Configuration" identifies the details of a manifold configured for 64 possible coils.

Number of Maximum Coils should only be adjusted if 1 or more additional extended coil valve driver(s) has been physically added.

Node Configuration (Green selections denote Factory Default settings)	
Station Alias:	3
Web Server:	Enabled
Max Coils on Manifold (32 = Standard):	32
Safety Zones (Only configurable when Max Coils = 32):	None
COMM Fault / Idle Mode:	Turn OFF All Outputs
Diagnostic Word:	Mapped
I/O (Diagnostics) Status:	Mapped
Node Configuration Parameters:	Unlocked
I/O Configuration:	Unlocked
Display Orientation (Global):	Normal
Display Brightness (Global):	Medium

Update Configuration

The following is an example of the G3 diagnostic webpage "Diagnostics" which identifies the details of the valve driver's control of 64 possible coils

Module	Part No.	Description	Details	Activity
Node	240-310	EtherCAT Communications Module	☐ Show Details	✓
Valve Driver	P599AE42518800x	50X Series Valve Driver Output Module	☑ Show Details	✓

Export Config and Log | Close all Details | Close all Details

Firmware Revision:	4.19							
☑ Show Valve Coils 0-31: Check/Uncheck box to force/un-force valve coil	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐
	8 ☐	9 ☐	10 ☐	11 ☐	12 ☐	13 ☐	14 ☐	15 ☐
	16 ☐	17 ☐	18 ☐	19 ☐	20 ☐	21 ☐	22 ☐	23 ☐
	24 ☐	25 ☐	26 ☐	27 ☐	28 ☐	29 ☐	30 ☐	31 ☐
Valve Status: ● = Shorted Coil ● = Open Coil ✕ = No Coil Detected	0 ✕	1 ✕	2 ✕	3 ✕	4 ✕	5 ✕	6 ✕	7 ✕
	8 ✕	9 ✕	10 ✕	11 ✕	12 ✕	13 ✕	14 ✕	15 ✕
	16 ✕	17 ✕	18 ✕	19 ✕	20 ✕	21 ✕	22 ✕	23 ✕
	24 ✕	25 ✕	26 ✕	27 ✕	28 ✕	29 ✕	30 ✕	31 ✕
☑ Show Valve Coils 32-47: Check/Uncheck box to force/un-force valve coil	32 ☐	33 ☐	34 ☐	35 ☐	36 ☐	37 ☐	38 ☐	39 ☐
	40 ☐	41 ☐	42 ☐	43 ☐	44 ☐	45 ☐	46 ☐	47 ☐
Valve Status: ● = Shorted Coil ● = Open Coil ✕ = No Coil Detected	32	33	34	35	36	37	38	39
	40	41	42	43	44	45	46	47
☐ Show I/O Mappings and Sizes								

☐ Show Error/Event Log

9.7 Extended Coil Valve Driver Mapping

IO Mapping for each additional 501 series 32 coil valve driver added to the manifold assembly

Input Mapping								
BYTE	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
X	Coil 7 Status	Coil 6 Status	Coil 5 Status	Coil 4 Status	Coil 3 Status	Coil 2 Status	Coil 1 Status	Coil 0 Status
X+1	Coil 15 Status	Coil 14 Status	Coil 13 Status	Coil 12 Status	Coil 11 Status	Coil 10 Status	Coil 9 Status	Coil 8 Status
X+2	Coil 23 Status	Coil 22 Status	Coil 21 Status	Coil 20 Status	Coil 19 Status	Coil 18 Status	Coil 17 Status	Coil 16 Status
X+3	Coil 31 Status	Coil 30 Status	Coil 29 Status	Coil 28 Status	Coil 27 Status	Coil 26 Status	Coil 25 Status	Coil 24 Status

Output Mapping								
BYTE	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
X	Valve Coil No. 7	Valve Coil No. 6	Valve Coil No. 5	Valve Coil No. 4	Valve Coil No. 3	Valve Coil No. 2	Valve Coil No. 1	Valve Coil No. 0
X+1	Valve Coil No. 15	Valve Coil No. 14	Valve Coil No. 13	Valve Coil No. 12	Valve Coil No. 11	Valve Coil No. 10	Valve Coil No. 9	Valve Coil No. 8
X+2	Valve Coil No. 23	Valve Coil No. 22	Valve Coil No. 21	Valve Coil No. 20	Valve Coil No. 19	Valve Coil No. 18	Valve Coil No. 17	Valve Coil No. 16
X+3	Valve Coil No. 31	Valve Coil No. 30	Valve Coil No. 29	Valve Coil No. 28	Valve Coil No. 27	Valve Coil No. 26	Valve Coil No. 25	Valve Coil No. 24

IO Mapping for each additional 502/503 series 16 coil valve driver added to the manifold assembly

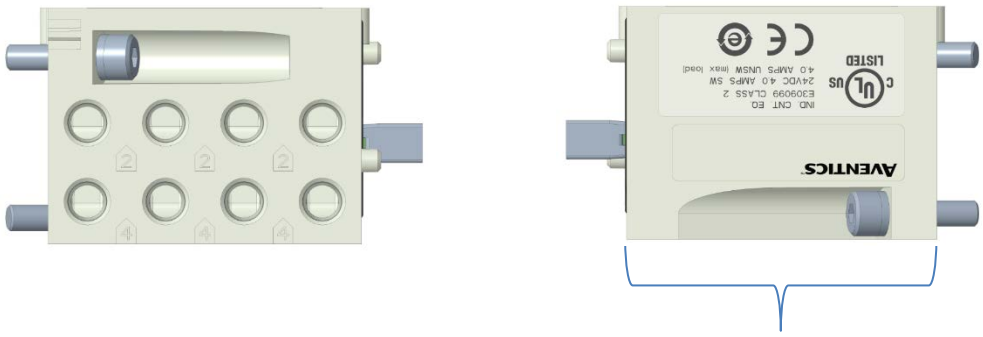
Input Mapping								
BYTE	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
X	Coil 7 Status	Coil 6 Status	Coil 5 Status	Coil 4 Status	Coil 3 Status	Coil 2 Status	Coil 1 Status	Coil 0 Status
X+1	Coil 15 Status	Coil 14 Status	Coil 13 Status	Coil 12 Status	Coil 11 Status	Coil 10 Status	Coil 9 Status	Coil 8 Status

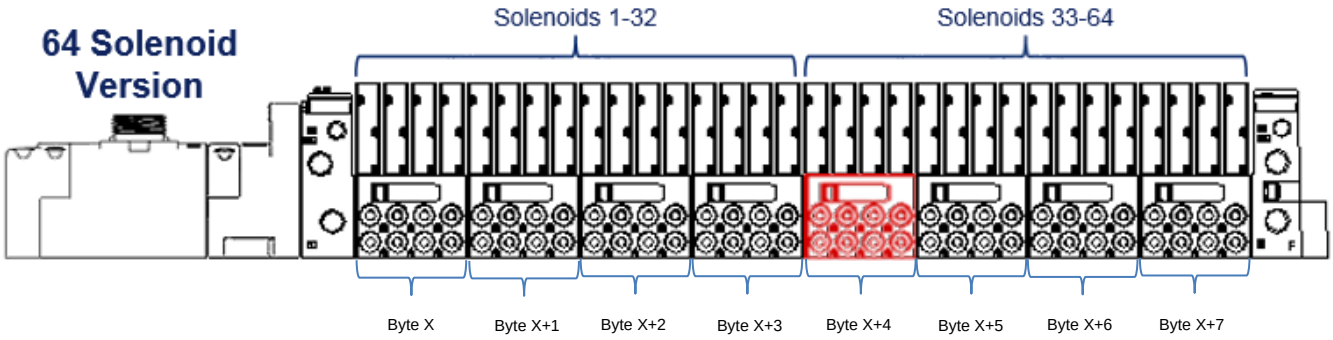
Output Mapping								
BYTE	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
X	Valve Coil No. 7	Valve Coil No. 6	Valve Coil No. 5	Valve Coil No. 4	Valve Coil No. 3	Valve Coil No. 2	Valve Coil No. 1	Valve Coil No. 0
X+1	Valve Coil No. 15	Valve Coil No. 14	Valve Coil No. 13	Valve Coil No. 12	Valve Coil No. 11	Valve Coil No. 10	Valve Coil No. 9	Valve Coil No. 8

9.8 501 Series, up to 64 solenoid coils

501 series, 4 station manifold block with an integrated 32 coil valve driver

- To be used with 501 series valves on valve manifold assemblies with 33-64 coils.
- Only to be used on assemblies where additional power, supply and/or exhaust capacity is not required

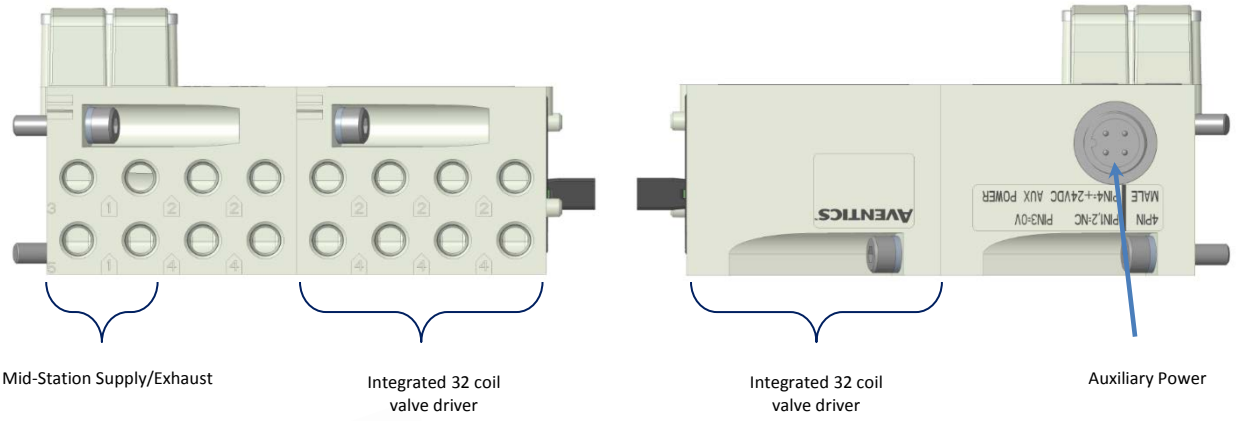


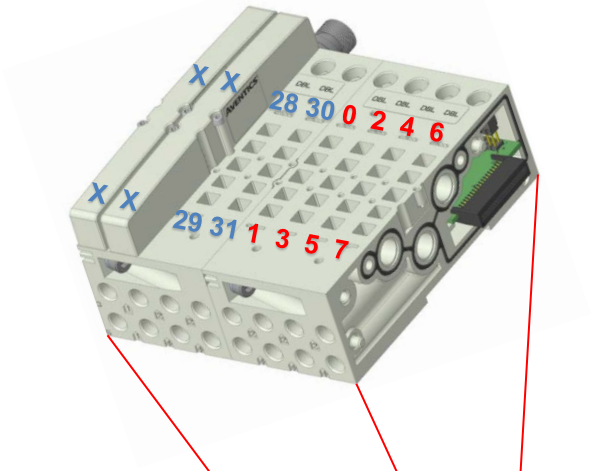


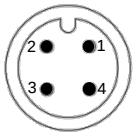
9.9 501 Series, up to 128 solenoid coils

501 series, 8 station manifold with integrated 32 coil valve driver, auxiliary power connector and mid-station supply and exhaust ports

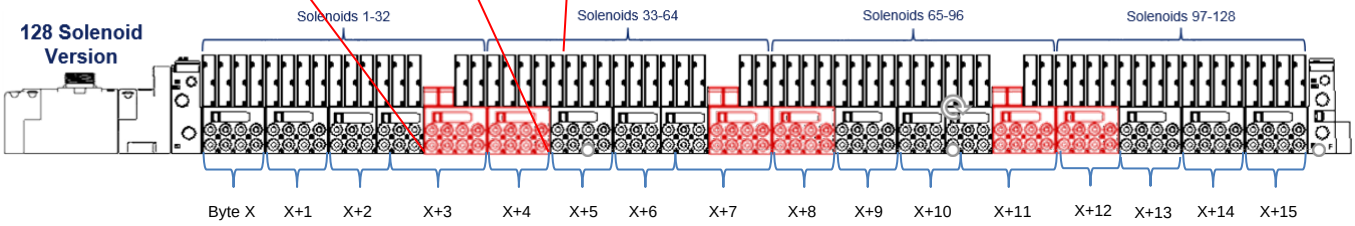
- To be used with 501 series valves on valve manifold assemblies with 33-128 coils.
- Up to 3 of these valve drivers can be used on each assembly
- Required to use on manifold assemblies larger than 64 coils, this manifold block has a M12 power connector to supplement the main power connection on the G3 node and two additional port 1 supply and port 3/5 exhaust ports.
- Aux power is required to be connected to the aux power connector provided on the extended coil valve driver.







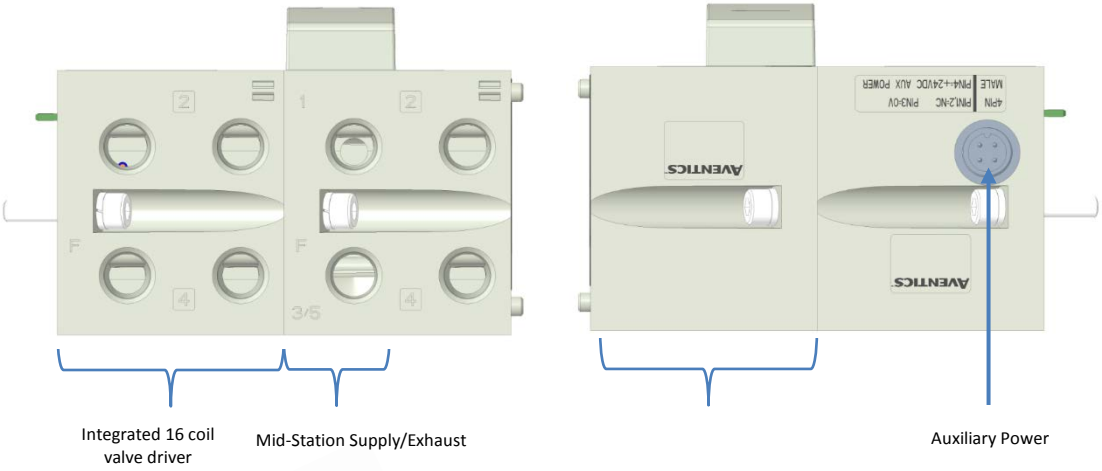
Pin #1 = No Connection
Pin #2 = No Connection
Pin #3 = 0 VDC
Pin #4 = +24 VDC

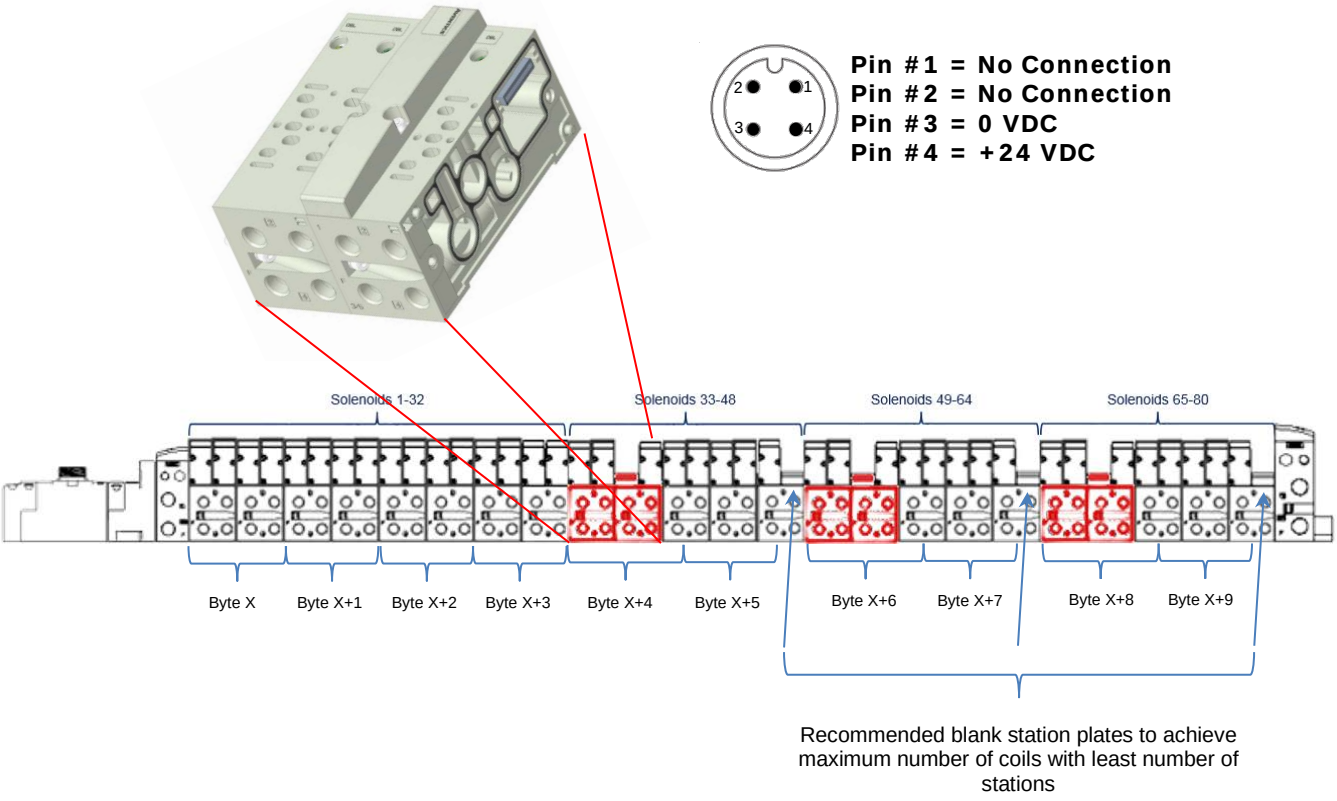


9.10 502 and 503 Series, up to 80 solenoid coils

502 and 503 series, 4 station manifold with integrated 16 coil valve driver, power connector and mid-station supply and exhaust ports

- To be used with 502 and 503 series valves on valve manifold assemblies with 33-80 coils.
- Up to 3 of these valve drivers can be used on each assembly
- Required to use on manifold assemblies larger than 32 coils, this manifold block has a M12 power connector and two additional port 1 supply and port 3/5 exhaust ports.
- Aux power is required and will provide power to the 16 coils available via the extended coil valve driver.





10. Analog I/O Modules

10.1 Analog I/O Module Rules

The analog I/O modules follow the same rules as the digital I/O modules. The maximum total number of modules on the Sub-Bus is 16. The analog boards allow the user to control devices using an analog signal. The analog modules also allow the user to relay analog information from input devices. These modules are available in two analog signal types: 0-10 V and 4-20 mA. These two signal types are offered in two different I/O configurations: 2 analog input channels/ 2 analog outputs channels and 4 analog input channels.

Four I/O - 12mm Female Modules

Specifications

- Input Resolution: 16 bit (65,536 Counts),
- Output Resolution: 16 bit (65,536 Counts)
- Settling Time: 3 ms Max
- Absolute Precision: ≤ 1.0% of Signal
- Voltage Input Impedance: 0-10VDC – 40K Ohms
- Current Input Impedance: 250 Ohms
- Input Cutoff Frequency: 100 Hz

Module Part No.	*Signal Type*	*Input Points*	*Output Points*	*Short Circuit Protection*
240-212	0 - 10V	4	0	Yes
240-213	0 - 10V	2	2	
240-214	4 - 20mA	4	0	
240-215	4 - 20mA	2	2	
240-307	0 – 10V	2	2	
240-363	4 - 20mA	4	4	

FEMALE

PIN 1= +24VDC (UNSW)
PIN 2= NOT USED
PIN 3= 0VDC (UNSW)
PIN 4= INPUT 1

One Analog Input per Connector – M12 Female Modules

Module Part No.	*Signal Type*	*Short Circuit Protection*	*Short Circuit Protection Status Bits*	*Input Points*
240-212	0-10 VDC	YES – Visual	YES (4) – Selectable	4
240-214	4-20 mA			

Input Mapping								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X (Required)	Input No. 1	Input No. 1	Input No. 1	Input No. 1	Input No. 1	Input No. 1	Input No. 1	Input No. 1 (LSB)
X+1 (Required)	Input No. 1 (MSB)	Input No. 1	Input No. 1	Input No. 1	Input No. 1	Input No. 1	Input No. 1	Input No. 1
X+2 (Required)	Input No. 2	Input No. 2	Input No. 2	Input No. 2	Input No. 2	Input No. 2	Input No. 2	Input No. 2 (LSB)
X+3 (Required)	Input No. 2 (MSB)	Input No. 2	Input No. 2	Input No. 2	Input No. 2	Input No. 2	Input No. 2	Input No. 2
X+4 (Required)	Input No. 3	Input No. 3	Input No. 3	Input No. 3	Input No. 3	Input No. 3	Input No. 3	Input No. 3 (LSB)
X+5 (Required)	Input No. 3 (MSB)	Input No. 3	Input No. 3	Input No. 3	Input No. 3	Input No. 3	Input No. 3	Input No. 3
X+6 (Required)	Input No. 4	Input No. 4	Input No. 4	Input No. 4	Input No. 4	Input No. 4	Input No. 4	Input No. 4 (LSB)
X+7 (Required)	Input No. 4 (MSB)	Input No. 4	Input No. 4	Input No. 4	Input No. 4	Input No. 4	Input No. 4	Input No. 4
Diagnostics								
X	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Power Status for Conn. D	Power Status for Conn. C	Power Status for Conn. B	Power Status for Conn. A
X+1	High Alarm for Conn. D	Low Alarm for Conn. D	High Alarm for Conn. C	Low Alarm for Conn. C	High Alarm for Conn. B	Low Alarm for Conn. B	High Alarm for Conn. A	Low Alarm for Conn. A

FEMALE

PIN 1= +24VDC (UNSW)
PIN 2= NOT USED
PIN 3= 0VDC (UNSW)
PIN 4= INPUT 1

One Analog I/O per Connector – M12 Female Modules

Module Part No.	*Signal Type*	*Short Circuit Protection*	*Short Circuit Protection Status Bits*	*Output Points*	*Input Points*
240-213	0-10 VDC	YES	YES	2	2
240-215	4-20 mA				

Output Mapping								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X	Output No. 1	Output No. 1	Output No. 1	Output No. 1	Output No. 1	Output No. 1	Output No. 1	Output No. 1 (LSB)
X+1	Output No. 1 (MSB)	Output No. 1	Output No. 1	Output No. 1	Output No. 1	Output No. 1	Output No. 1	Output No. 1
X+2	Output No. 2	Output No. 2	Output No. 2	Output No. 2	Output No. 2	Output No. 2	Output No. 2	Output No. 2 (LSB)
X+3	Output No. 2 (MSB)	Output No. 2	Output No. 2	Output No. 2	Output No. 2	Output No. 2	Output No. 2	Output No. 2
Input Mapping								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X	Input No. 1	Input No. 1	Input No. 1	Input No. 1	Input No. 1	Input No. 1	Input No. 1	Input No. 1 (LSB)
X+1	Input No. 1 (MSB)	Input No. 1	Input No. 1	Input No. 1	Input No. 1	Input No. 1	Input No. 1	Input No. 1
X+2	Input No. 2	Input No. 2	Input No. 2	Input No. 2	Input No. 2	Input No. 2	Input No. 2	Input No. 2 (LSB)
X+3	Input No. 2 (MSB)	Input No. 2	Input No. 2	Input No. 2	Input No. 2	Input No. 2	Input No. 2	Input No. 2
Diagnostic Telegram								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X (Selectable)	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	SCP Status for Conn. D	SCP Status for Conn. C	SCP Status for Conn. B	SCP Status for Conn. A
X+1 (Selectable)	High Alarm for Conn. D	Low Alarm for Conn. D	High Alarm for Conn. C	Low Alarm for Conn. C	High Alarm for Conn. B	Low Alarm for Conn. B	High Alarm for Conn. A	Low Alarm for Conn. A

FEMALE

CONNECTORS C & D	CONNECTORS A & B
PIN 1= +24VDC (UNSW)	PIN 1= +24VDC (UNSW)
PIN 2= OUTPUT	PIN 2= NOT USED
PIN 3= 0VDC (UNSW)	PIN 3= 0VDC (UNSW)
PIN 4= INPUT	PIN 4= INPUT

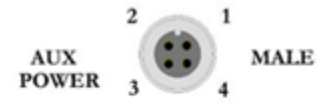
One High Current Analog I/O per Connector – M12 Female Modules

Module Part No.	*Signal Type*	*Short Circuit Protection*	*Short Circuit Protection Status Bits*	*Output Points*	*Input Points*
240-307	0-10 VDC	YES	YES	2	2

Output Mapping								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X	Output No. 1	Output No. 1	Output No. 1	Output No. 1	Output No. 1	Output No. 1	Output No. 1	Output No. 1 (LSB)
X+1	Output No. 1 (MSB)	Output No. 1	Output No. 1	Output No. 1	Output No. 1	Output No. 1	Output No. 1	Output No. 1
X+2	Output No. 2	Output No. 2	Output No. 2	Output No. 2	Output No. 2	Output No. 2	Output No. 2	Output No. 2 (LSB)
X+3	Output No. 2 (MSB)	Output No. 2	Output No. 2	Output No. 2	Output No. 2	Output No. 2	Output No. 2	Output No. 2
Input Mapping								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X	Input No. 1	Input No. 1	Input No. 1	Input No. 1	Input No. 1	Input No. 1	Input No. 1	Input No. 1 (LSB)
X+1	Input No. 1 (MSB)	Input No. 1	Input No. 1	Input No. 1	Input No. 1	Input No. 1	Input No. 1	Input No. 1
X+2	Input No. 2	Input No. 2	Input No. 2	Input No. 2	Input No. 2	Input No. 2	Input No. 2	Input No. 2 (LSB)
X+3	Input No. 2 (MSB)	Input No. 2	Input No. 2	Input No. 2	Input No. 2	Input No. 2	Input No. 2	Input No. 2
Diagnostic Telegram								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X (Selectable)	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Power / Short Status for Conn. D	Power / Short Status for Conn. C	Allocated and Reserved	Allocated and Reserved
X+1 (Selectable)	High Alarm for Conn. D	Low Alarm for Conn. D	High Alarm for Conn. C	Low Alarm for Conn. C	High Alarm for Conn. B	Low Alarm for Conn. B	High Alarm for Conn. A	Low Alarm for Conn. A

Connector A,B
Pin 1 = +10 VDC
Pin 2 = Not Used
Pin 3 = 0 VDC
Pin 4 = Input
Pin 5 = Not Used

Connector C,D
Pin 1 = +24 VDC
Pin 2 = Output
Pin 3 = 0 VDC
Pin 4 = Input
Pin 5 = Not Used



Pin 1 = +24 VDC (For Conn A, B)
Pin 2 = +24 VDC (For Conn C, D)
Pin 3 = 0 VDC (For Conn A, B, C, D)
Pin 4 = 0 VDC (For Conn A, B, C, D)

One Analog Input + One Analog Output per Connector – M12 Female Modules

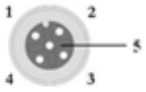
Module Part No.	*Signal Type*	*Short Circuit Protection*	*Short Circuit / Power Present Status Bits*	*Input Channels*	*Output Channels*
240-363	4-20 mA	YES	YES (4) – Selectable	4	4

Output Mapping								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X (Required)	Output No. 1	Output No. 1	Output No. 1	Output No. 1	Output No. 1	Output No. 1	Output No. 1	Output No. 1 (LSB)
X + 1 (Required)	Output No. 1 (MSB)	Output No. 1	Output No. 1	Output No. 1	Output No. 1	Output No. 1	Output No. 1	Output No. 1
X + 2 (Required)	Output No. 2	Output No. 2	Output No. 2	Output No. 2	Output No. 2	Output No 2	Output No. 2	Output No. 2 (LSB)
X + 3 (Required)	Output No. 2 (MSB)	Output No. 2	Output No. 2	Output No. 2	Output No. 2	Output No. 2	Output No. 2	Output No. 2
X + 4 (Required)	Output No. 3	Output No. 3	Output No. 3	Output No. 3	Output No. 3	Output No. 3	Output No. 3	Output No. 3 (LSB)
X + 5 (Required)	Output No. 3 (MSB)	Output No. 3	Output No. 3	Output No. 3	Output No. 3	Output No. 3	Output No. 3	Output No. 3
X + 6 (Required)	Output No. 4	Output 4	Output No. 4	Output No. 4	Output No. 4	Output No. 4	Output No. 4	Output No. 4 (LSB)
X + 7 (Required)	Output No. 4 (MSB)	Output 4	Output No. 4	Output No. 4	Output No. 4	Output No. 4	Output No. 4	Output No. 4
Input Mapping								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X (Required)	Input No. 1	Input No. 1	Input No. 1	Input No. 1	Input No. 1	Input No. 1	Input No. 1	Input No. 1 (LSB)
X + 1 (Required)	Input No. 1 (MSB)	Input No. 1	Input No. 1	Input No. 1	Input No. 1	Input No. 1	Input No. 1	Input No. 1
X + 2 (Required)	Input No. 2	Input No. 2	Input No. 2	Input No. 2	Input No. 2	Input No. 2	Input No. 2	Input No. 2 (LSB)
X + 3 (Required)	Input No. 2 (MSB)	Input No. 2	Input No. 2	Input No. 2	Input No. 2	Input No. 2	Input No. 2	Input No. 2
X + 4 (Required)	Input No. 3	Input No. 3	Input No. 3	Input No. 1	Input No. 1	Input No. 1	Input No. 1	Input No. 1 (LSB)
X + 5 (Required)	Input No. 3 (MSB)	Input No. 3	Input No. 3	Input No. 1	Input No. 1	Input No. 1	Input No. 1	Input No. 1
X + 6 (Required)	Input No. 4	Input No. 4	Input No. 4	Input No. 2	Input No. 2	Input No. 2	Input No. 2	Input No. 2 (LSB)
X + 7 (Required)	Input No. 4 (MSB)	Input No. 4	Input No. 4	Input No. 2	Input No. 2	Input No. 2	Input No. 2	Input No. 2

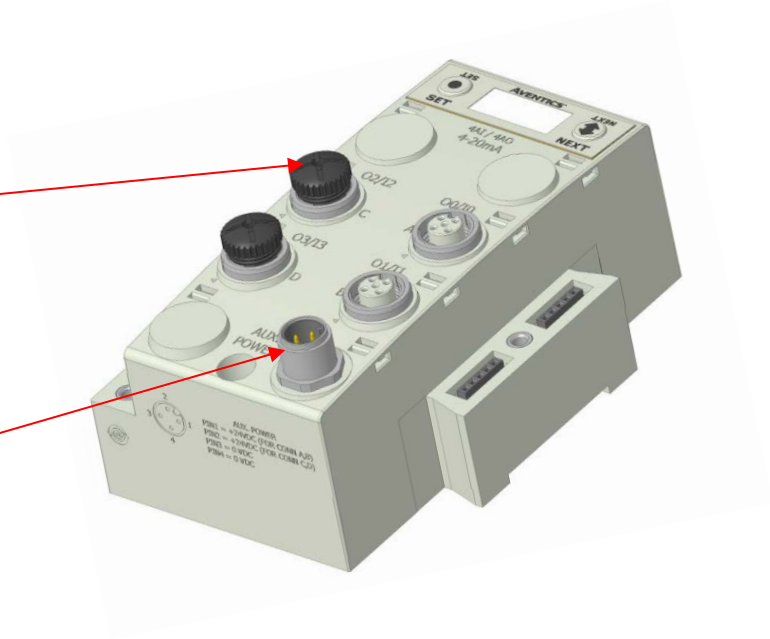
One 4-20ma Analog Input + One 4-20 Analog Output per Connector – M12 Female Modules

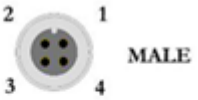
Module Part No.	*Signal Type*	*Short Circuit Protection*	*Short Circuit / Power Present Status Bits*	*Input Channels*	*Output Channels*
240-363	4-20 mA	YES	YES (4) – Selectable	4	4

Diagnostic Mapping								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X (Selectable)	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Power/ Short Status for Conn. D	Power/ Short Status for Conn. C	Power/ Short Status for Conn. B	Power/ Short Status for Conn. A
X + 1 (Selectable)	High Alarm for Conn. D Input	Low Alarm for Conn. D Input	High Alarm for Conn. C Input	Low Alarm for Conn. C Input	High Alarm for Conn. B Input	Low Alarm for Conn. B Input	High Alarm for Conn. A Input	Low Alarm for Conn. A Input
X + 2 (Selectable)	High Alarm for Conn. D Output	Low Alarm for Conn. D Output	High Alarm for Conn. C Output	Low Alarm for Conn. C Output	High Alarm for Conn. B Output	Low Alarm for Conn. B Output	High Alarm for Conn. A Output	Low Alarm for Conn. A Output



Pin 1 = +24VDC
Pin 2 = Output
Pin 3 = 0 VDC
Pin 4 = Input
Pin 5 = Not Used





Pin 1 = +24 VDC (For Conn A, B)
Pin 2 = +24 VDC (For Conn C, D)
Pin 3 = 0 VDC (For Conn A, B, C, D)
Pin 4 = 0 VDC (For Conn A, B, C, D)

Internal or Aux. Power Select (240-363 Only)

Analog devices connected to the 240-363 can be powered from the Aux. Power supply port (Internal Power Disabled) or from the module backplane (Internal Power Enabled). This is selected through the “Internal Power Menu” as shown. Channels A/B and C/D are controlled independently.

Internal Power Settings

1. Press the **SET** button to enter the INTERNAL POWER menu

2. CHANNEL A & B DISABLE

3. Press the **NEXT** button to scroll through the choices to enable or disable the feature.
   a. ENABLED (Factory Default)
   b. DISABLED
   c. RETURN (this will return you to the main menu)

Press the **SET** button to confirm your choice

4. CHANNEL C & D DISABLE

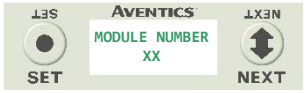
5. Press the **NEXT** button to scroll through the choices to enable or disable the feature.
   a. ENABLED (Factory Default)
   b. DISABLED
   c. RETURN (this will return you to the main menu)

Press the **SET** button to confirm your choice

Power Source	Current Limitation for Module	Current Limitation for connector
Aux Power	8A (From Aux. Power Conn.)	2.0A / output connector (2.0A Pin 1 to Pin 3)
Internal Power	1.2A (from Backplane)	.15A (Pin 1 to Pin 3)

10.2 Analog Graphic Display

The G3 Analog I/O modules have an integrated graphic display that may be used to configure the parameters of the modules as well as show diagnostic information. Please see the following pages for detailed information regarding these displays.

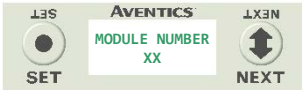


Analog Module / I/O Mapping

Displays the starting Input and Output byte address for the module

Analog Module / Module Number

Displays the module number; identifying its position in the G3 I/O system.



Analog Module / Alarm Settings

Allows the setting of low and high alarms for analog inputs and outputs

Alarm Settings Steps

1. Press the **SET** button to enter the Alarm Settings sub-menu.
2. Press the **SET** button to Disable all alarms (default setting)
   *Note- Setting the Minimum value for Low alarm and the Maximum value for High alarm (for a channel) disables the alarm for that channel.
3. Press the **NEXT** button to scroll to the appropriate analog channel.
4. Press the SET button to set the LO alarm setting
   a. Push the **SET** button to access the menu and enter the alarm value
5. Press the **NEXT** button to set the HI alarm setting.
   a. Push the **SET** button to access the menu and enter the alarm value
   b. Accept the changes by selecting **Y** and pushing **SET**
6. Press the **SET** button while in the RETURN screen to return to the main menu

Analog Module / Description

Displays the quantity and type of I/O on the module
Ex. 2 analog Inputs and 2 analog outputs

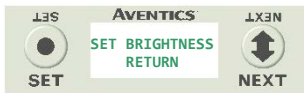
Analog Module / Part number

Displays the replacement part number of the module

Analog Module / Firmware

Displays the firmware revision level for the module

Analog Module / Brightness



Brightness Settings

1. Press the **SET** button to enter the SET BRIGHTNESS menu.

2. Press the **NEXT** button to scroll the choices for the desired brightness of the LCD display for the analog module.

    a. LOW
    b. MEDIUM (Factory Default)
    c. HIGH
    d. RETURN (this will return you to the main menu)

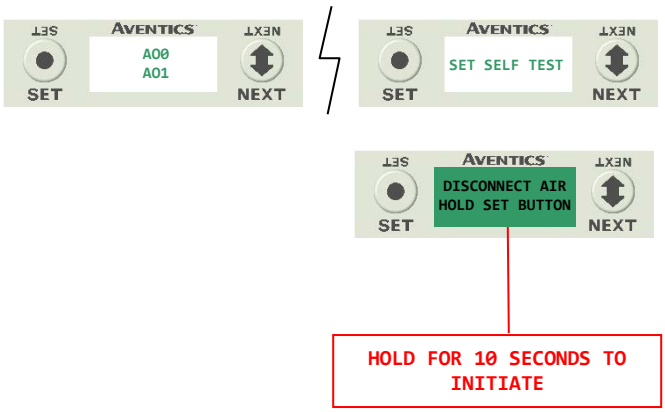
    Press the **SET** button to confirm your choice. The changes will take effect immediately.

10.3 Analog Module / Self Test Mode

Self test mode is an internal diagnostic tool that can be enabled on the analog module using the graphic display. This tool allows the user to confirm that all of the outputs on the module are fully functional without needing a network connection or controller. The test will cycle the analog outputs. Starting with Output 0 it will increment the analog signal at 10% intervals; once it has reached 100% it will test the next available output. The self-test will continue to run until it is turned off by pressing the SET button.

To use the Self Test Mode, the user must first set some initial conditions. Follow these steps to initiate the self-test mode.

1) Disconnect Air and Communication from the manifold!
2) Starting at the Home Screen, navigate the menus by selecting the NEXT button until the SELF-TEST menu is shown.
3) Select the SET button to access the SELF-TEST menu
4) A message will appear: DISCONNECT AIR HOLD SET BUTTON
5) Hold the SET button down for approximately 10 seconds to enable the test. The Display will flash the above message while the button is pushed.
6) When the display stops flashing, the self-test mode will be running
7) Push or hold the NEXT button to cycle through the outputs. Holding the NEXT button will allow the analog outputs to cycle through the 10% intervals automatically. Pushing the NEXT button will allow the outputs to manually step through each 10% interval.
8) Releasing the NEXT button will keep the output in its current state.
9) The self-test mode can only be disabled by pushing the SET button



10.4 Analog Module / Factory Defaults

Factory Default Settings

1. Press the **SET** button to enter the FACTORY DEFAULTS sub-menu.

2. Press the **NEXT** button to select **Y**es or **N**o.
   a. Selecting **N**o will bring you back to the main FACTORY DEFAULTS menu.
   b. Selecting **Y**es will cause the module to reset and return all parameters to the factory default conditions.

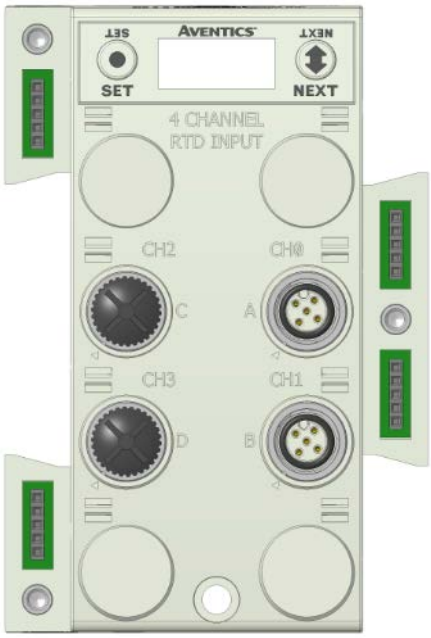
   Press the **SET** button to confirm your choice.

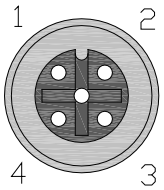
FACTORY DEFAULT SETTINGS	
Description	*Default*
Low Alarm Values	0 V / 4 mA
High Alarm Values	10 V / 20 mA
Brightness	Medium

11. Specialty Modules

11.1 RTD Module

The G3 RTD Temperature module is used with Resistive Temperature Detectors (RTDs) and can support up to 4 RTD devices simultaneously. This module supports various RTD types including: Pt100, Pt200, Pt500, Pt1000, Ni100 and Ni1000. Standard M12 single key connector types are used; each connector/port supports one RTD device, but four different device types can be used simultaneously. User configuration of parameters include: RTD type, temperature scale (Celsius or Fahrenheit), Hi/Low temperature alarms, and filter times, and can be selected individually for each connector port using the integrated display. The G3 RTD module can be incorporated into any G3 electronic system regardless of the protocol or I/O module position.

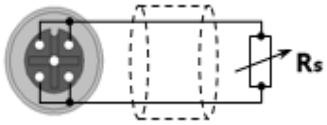




FEMALE
PIN 1 = Sensor Current Source (I+)
PIN 2 = Sense Voltage (VIN+)
PIN 3 = Sensor Current Source (I-)
PIN 4 = Sense Voltage (VIN-)
PIN 5 = Not Used

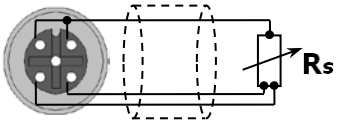
Sensor Wiring Diagrams

2 Wire Sensor Type
2 Wire Cable (Fig 1)



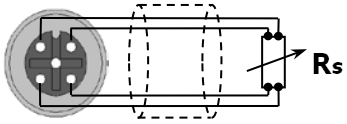
2 Wire
Sensor Type
Low Accuracy

3 Wire Sensor Type
3 Wire Cable (Fig 2)

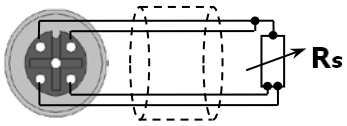


3 Wire
Sensor Type
Medium Accuracy

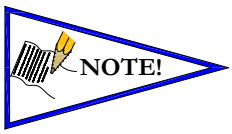
4 Wire Sensor Type
4 Wire Cable (Fig 4)



4 Wire
Sensor Type
High Accuracy



3 Wire Sensor Type
4 Wire Cable (Fig 3)



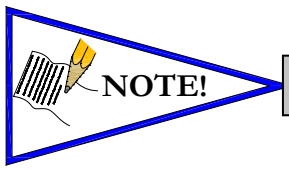
- For maximum accuracy on a 3 wire sensor type make identified jumper connections at the sensor end (see Figure 3). Cable resistance, resulting from cable length, affects measuring error; therefore use cables that are as short as possible.

Electrical Data	
Voltage	24 VDC Module Supply (Via G3 System Aux. Power Connection)
Input Type	RTD (Resistive Temperature Detector), 4 per Module
Supported Sensor Types	Pt100, Pt200, Pt500, Pt1000, Ni100, Ni1000
Supported Temperature Coefficients	.00385; .00392; ….Ω/Ω/°C
Resolution	15 bits, plus sign.
Data Format	Signed Integer; Two's complement.
Calibration	Factory Calibrated. Field Calibration w/ high tolerance (± 0.005%) 100 ohm and 350 ohm resistor.
Input Update (filter) Rate	Adjustable (5-20mS), factory default: 5mS
Accuracy	0.1% of full scale @ 25° C
Mechanical Data	
I/O Connector	M12 4 Pin Female (Accepts 5 Pin)
Mass	247g / 8.7 oz
Operating Data	
Temperature Range	-10º to 115º F (-23º to 46º C)
Humidity	95% relative humidity: non-condensing
Ingress Protection	IP65 (with appropriate assembly and terminations)

Part Numbers and Mapping

Module Part No.	*I/O Type*	*Alarms*	*Diagnostics*	*Input Points*
240-311	RTD	Hi/Low Temp for each Channel	Open/Short, Out of Range	4

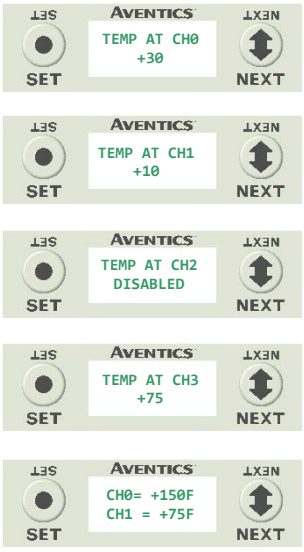
Input Mapping								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X	RTD Channel 0	RTD Channel 0	RTD Channel 0	RTD Channel 0	RTD Channel 0	RTD Channel 0	RTD Channel 0	RTD Channel 0
X + 1	Sign Bit Channel 0	RTD Channel 0	RTD Channel 0	RTD Channel 0	RTD Channel 0	RTD Channel 0	RTD Channel 0	RTD Channel 0
X + 2	RTD Channel 1	RTD Channel 1	RTD Channel 1	RTD Channel 1	RTD Channel 1	RTD Channel 1	RTD Channel 1	RTD Channel 1
X + 3	Sign Bit Channel 1	RTD Channel 1	RTD Channel 1	RTD Channel 1	RTD Channel 1	RTD Channel 1	RTD Channel 1	RTD Channel 1
X + 4	RTD Channel 2	RTD Channel 2	RTD Channel 2	RTD Channel 2	RTD Channel 2	RTD Channel 2	RTD Channel 2	RTD Channel 2
X + 5	Sign Bit Channel 2	RTD Channel 2	RTD Channel 2	RTD Channel 2	RTD Channel 2	RTD Channel 2	RTD Channel 2	RTD Channel 2
X + 6	RTD Channel 3	RTD Channel 3	RTD Channel 3	RTD Channel 3	RTD Channel 3	RTD Channel 3	RTD Channel 3	RTD Channel 3
X + 7	Sign Bit Channel 3	RTD Channel 3	RTD Channel 3	RTD Channel 3	RTD Channel 3	RTD Channel 3	RTD Channel 3	RTD Channel 3
Diagnostic Telegram								
X + 8	Channel 3 Out of Range	Channel 2 Out of Range	Channel 1 Out of Range	Channel 0 Out of Range	Channel 3 Open/ Short	Channel 2 Open/ Short	Channel 1 Open/ Short	Channel 0 Open/ Short
X + 9	Channel 3 High Alarm	Channel 3 Low Alarm	Channel 2 High Alarm	Channel 2 Low Alarm	Channel 1 High Alarm	Channel 1 Low Alarm	Channel 0 High Alarm	Channel 0 Low Alarm



Data is represented by Two's Complement, in tenths of a degree.

RTD Module Graphic display

RTD Module / Temperature Monitoring



1) Press the **NEXT** button to scroll through the Temperature Monitoring display options.

   Pressing the **SET** button while in one of the Temperature Monitoring displays, will return the display back to the home screen.

   If “DISABLED” is the temperature identified at any channel, advance the display to Sensor Type Select, to choose a sensor/Enable the channel, or press the “SET” button to jump directly to the selection display.

   Unused channels should be left “DISABLED”.

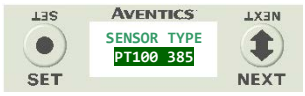
RTD Module / Sensor Type Select (Channel Enable)
Allows the sensor type for each channel to be selected, and, enable the channel selected

A) Press the **SET** button to enter the Sensor Type Select sub menu.

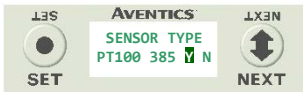
B) Press the **NEXT** button to scroll through the channels.

C) Press the **SET** button to select the desired channel. If "DISABLED" is the first selection, the channel is not enabled. Select a sensor type to enable the channel.

D) Press the **NEXT** button to scroll through the available sensor types.



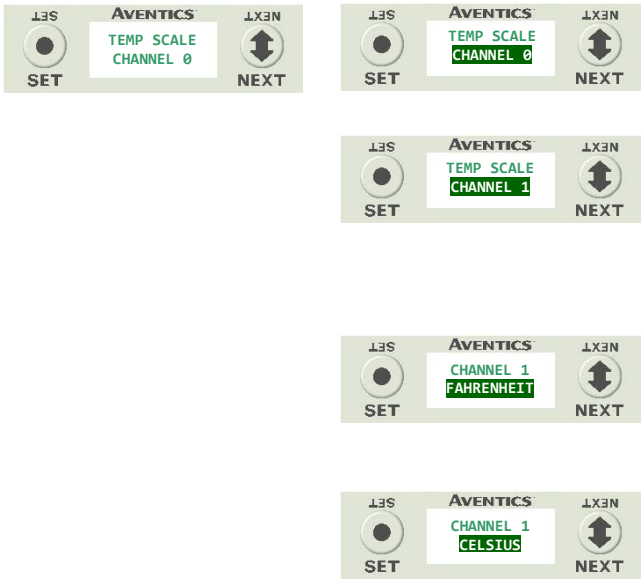
E) Press the **SET** button to select the desired sensor type.



F) Press the **SET** button to load the selected sensor type.

RTD Module / Temperature Scale

Allows the temperature scale for each channel to be set to Celsius or Fahrenheit.



A) Press the SET button to enter the Temp Scale sub menu.

B) Press the NEXT button to scroll through the channels.

C) Press the SET button to choose the desired channel.

D) Press the NEXT button to choose the desired scale.

E) Press the SET button to load the selection.

RTD Module / Alarm Settings

Allows the Low and High alarms of each RTD Input channel to be set. This parameter generates a visual and logical (bit) when set value is achieved.

A) Press the **SET** button to enter the Alarm Settings sub-menu.

B) Press the **NEXT** button to scroll through the RTD Input channels.

C) Press the **SET** button to enter the alarm setting for the selected Input channel.

D) Press the **NEXT** button to select the Lo or High setting for the selected channel.

E) Press the **SET** button to select the change process for the chosen alarm. The first digit/sign will be highlighted.

F) Press the **NEXT** button to choose the value, or the **SET** button to select and move to the next digit.

G) Press the **NEXT** button to choose "**Y**" or "**N**" Select. Then press the **SET** Button to Accept.

- When alarm values are set to maximum/minimum values, the alarm function is disabled.
- Factory default settings for all alarms are disabled.

RTD Module / Advanced Setting
Allows the Update Filters for each channel to be set.

A) Press the **SET** button to enter the Advance Settings sub-menu.

B) Press the **NEXT** button to choose the option; Update Filters or Calibrate RTD.

Update Filters

C) Press the **SET** button to choose the Update Filter setting.

D) Press the **NEXT** button to scroll through the filter times.

E) Press the **SET** button to select the desired Update Filter time.

RTD Module / I/O Mapping Input Byte

RTD Module / Module Number (Position)

RTD Module / Module Description

RTD Module / Part Number

RTD Module / Firmware Revision

RTD Module / Set Display Brightness

Allows the Brightness of the display to be changed

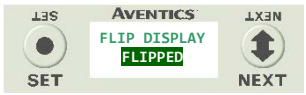
A) press the **SET** button to enter the Set Brightness sub menu.

B) Press the **NEXT** button to scroll through the brightness options

C) Press the **SET** button to load the selection.

RTD Module / Flip Display

Allows the Display to be flipped 180 degrees.



A) press the **SET** button to enter the Flip Display sub menu.

B) Press the **NEXT** button to choose the orientation.

C) Press the **SET** button to load the selection.

RTD Module / Factory Defaults
Set all parameter settings to default values.

A) Press the **SET** button to enter the Factory Defaults sub menu.

B) Presss the **NEXT** button to choose **Y**es or **N**o.

C) Press the **SET** button to confirm.

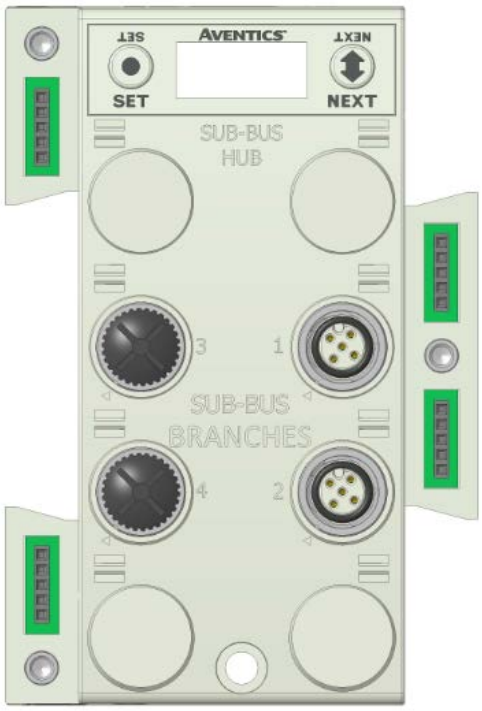
D) Press the **SET** button again.

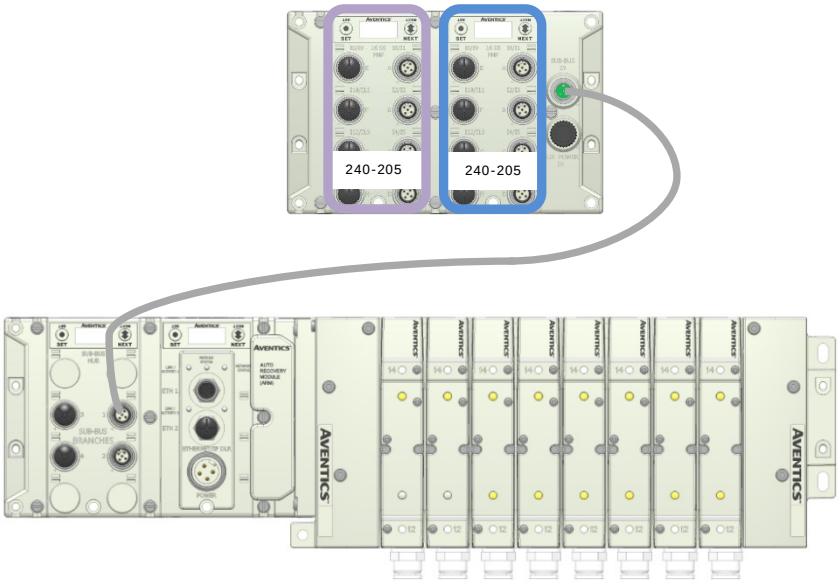
Factory Default Settings	
Alarm – High & Low	Disabled (Set to Min/Max for each chosen sensor)
Input Update Filter	5 mS
Sensor Type	Pt 100 385
Temp Scale	Celsius
Display Brightness	Medium
Flip Display	Normal

11.2 Sub-Bus Hub Module

The G3 HUB module allows for branch distribution from the I/O side of the G3 System and can be integrated into the existing G3 Series Sub-Bus configuration. Auto Addressing allows for trouble free set up and configuration. Input, Output, as well as Valve manifolds can be attached to the available four Branches on a HUB module. Each G3 System can support up to two HUB modules, allowing for maximum flexibility. The HUB module is transparent to the I/O side of the G3 and does not reserve one of the potential sixteen positions.

Module Part No.	*Module Type*	*Diagnostics*	*Input Size / Output Size*	*Branches*
240-326	HUB	Sub-Bus Short Circuit	0 / 0 – See Note	4





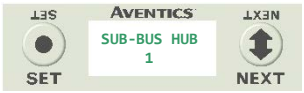
NOTE!

The Sub-bus hub module does not produce mapped diagnostics. The data table in this example represents what is physically attached to the HUB module. This will change as modules are added or removed.

Example I/O Mapping of Attached Modules								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X (Required)	Input 7	Input 6	Input 5	Input 4	Input 3	Input 2	Input 1	Input 0
X + 1 (Required)	Input 15	Input 14	Input 13	Input 12	Input 11	Input 10	Input 9	Input 8
X + 2 (Selectable)	Conn. H SCP Status	Conn. G SCP Status	Conn. F SCP Status	Conn. E SCP Status	Conn. D SCP Status	Conn. C SCP Status	Conn. B SCP Status	Conn. A SCP Status
X + 3 (Required)	Input 7	Input 6	Input 5	Input 4	Input 3	Input 2	Input 1	Input 0
X + 4 (Required)	Input 15	Input 14	Input 13	Input 12	Input 11	Input 10	Input 9	Input 8
X + 5 (Selectable)	Conn. H SCP Status	Conn. G SCP Status	Conn. F SCP Status	Conn. E SCP Status	Conn. D SCP Status	Conn. C SCP Status	Conn. B SCP Status	Conn. A SCP Status

Where X = starting byte

Hub Module / Identification



1) Identifies HUB module in G3 System.

Hub Module / Description

2) Identifies Module type.

Hub Module / Advanced Settings

3) Allows the user to set/configure module parameters.

Press the **SET** button to advance to the first parameter/setting.

Brightness

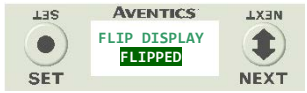
A) Press the **SET** button to enter the Set Brightness sub-menu and highlight the selection.

B) Press the **NEXT** button to select the desired Brightness selection, (Low, Medium, High).

C) Press the **SET** button to slect the desired Brightness level.

Screen Jumps to Next Parameter/Selection

Flip Display



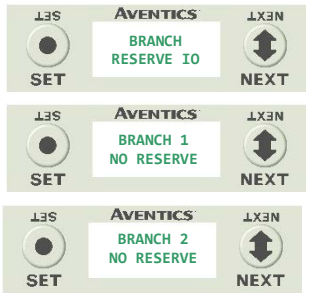
A) Press the **SET** button to enter the Flip Display sub-menu and highlight the selection.

B) Press the **NEXT** button to select the desired Flip Display selection, (Normal, Flipped).

C) Press the **SET** button to select the desired display orientation.

D) Press **NEXT** to advance to the next parameter selection (Branch Reserve)

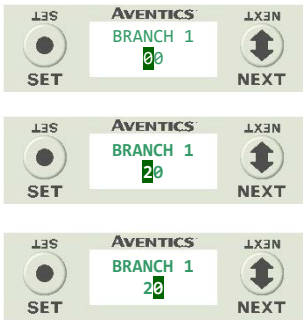
Branch Reserve I/O



A) Press the **SET** button to enter the Branch Reserve IO sub-menu.

B) Press the **NEXT** button to select the desired Branch to reserve I/O bytes.

I/O data bytes can be reserved on each branch for future expansion within the G3 system. Space is reserved in Byte levels, and populates Input, Output, and Status depending on the protocol and configuration chosen. A maximum of 64 bytes per channel can be reserved.



C) Press the **SET** button to enter the chosen Branch/Byte Selection screen.

D) Press the **NEXT** button to select the desired Tens value of reserved bytes.

E) Press the **SET** button to set the desired Tens value.

F) The screen will advance to the Ones selection

G) Press the **NEXT** button to select the desired Ones value for reserved bytes.

H) Press the **SET** button to set the desired Ones value.

Once the desired byte size is chosen for the selected branch, the screen will jump to the next branch. The same process is performed for the remaining branches, if desired. Press the **NEXT** button to skip over branches that do not require reserving I/O.

Factory Defaults

4) Allows all parameter settings to be set back to default values.

A) Press the SET button to enter the Factory Defaults sub menu.

B) Press the NEXT button to choose Yes or No.

C) Press the SET button to confirm.

D) Press the SET button again.

Factory Default Settings	
Brightness	Medium
Flip Display	Normal
Reserve I/O	No Reserve (all Branches)

Diagnostics

5) Allows the user to refernce Part No., Firmware Rev., and Branch Connections.

Part Number

Firmware Rev.

Branch Connections

A) Press the **NEXT** button to enter the Diagnostics sub-menu.

The Part Number screen is displayed (reference only).

B) Press the **NEXT** button to advance to the Firmware revision screen (reference only).

C) Press the **NEXT** button to advance to the Branch Connections screen.

D) Press the **SET** button to enter the Branch Connections sub-menu.

E) Press the **NEXT** button to advance through the Branches.

Each Branch screen indicates identifys the module numbers that are currently connected to that Branch.

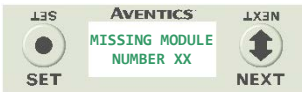
HELP

6) Directs the user to the Aventics website.

A) Press the **SET** button for website address.

Error/Event Messages

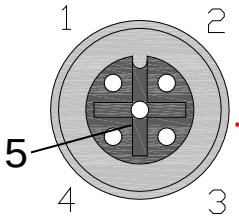
The following are error messages that are displayed when specific faults/events occur during operation:



Displayed when a Sub-Bus module that had been previously installed becomes absent from the configuration

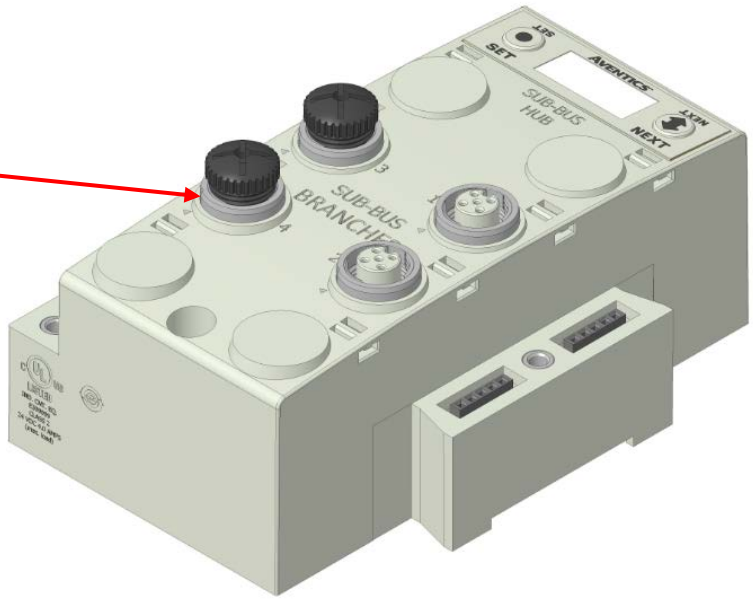
Displayed when a Sub-Bus power short circuit condition is detected

Connector Pin Out



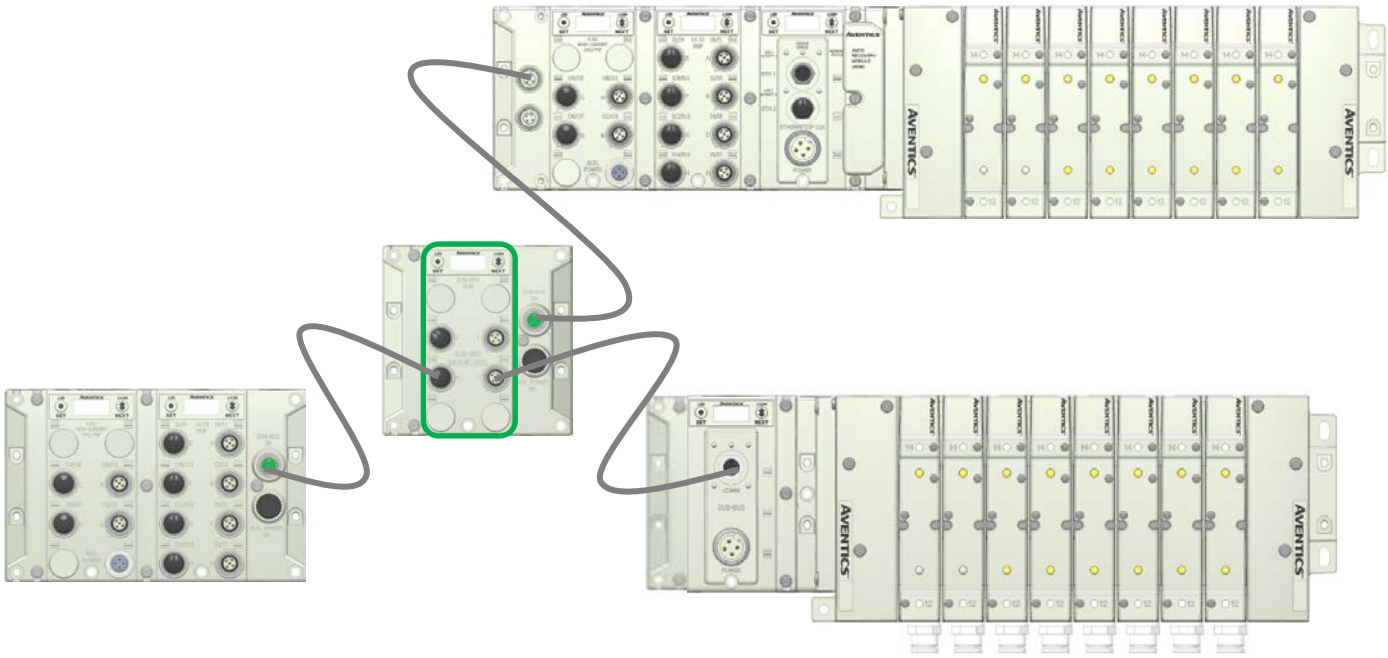
FEMALE

PIN 1 = Shield
PIN 2 = V+
PIN 3 = V-
PIN 4 = CAN_H
PIN 5 = CAN_L



- *Length of molded or field wired Sub-Bus Branch cables should not exceed the maximum length of 30 meters per Sub-Bus Branch communication link.*
- *The molded cable assemblies and bulk cable are the only approved cables for the G3 Sub-Bus and Branch Link. Please refer to the G3 Electronics catalog, for Sub-Bus cable and connectors options. See Technical Document TDG3SBWD1-0EN for proper installation and wiring of field wire-able connectors.*

HUB Integration - Example



Module	Part No.	Description	Details	Activity
Node	240-325	EtherNet/IP DLR/QC Communications Module	Show Details	✓
ARM	240-182	Auto Recovery Module	Show Details	✓
No. 1	240-205	16 Inputs PNP Digital M12 x 8	Show Details	✓
Hub 1	240-326	Sub-Bus Hub Module	Show Details	✓

	Firmware Revision	2.070			
		Branch 1	Branch 2	Branch 3	Branch 4
	I/O Reserved (bytes)	-	-	-	-
	Unused Reserved Input (bytes)	-	-	-	-
	Unused Reserved Diagnostic (Status) Inputs (bytes)	-	-	-	-
	Unused Reserved Output (bytes)	-	-	-	-
	Module No's. on branch	-	2, 3, 4	-	5, 6

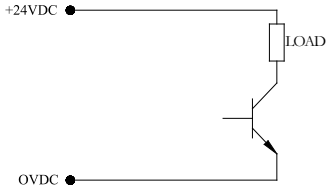
→ Branch 2, Mod. No. 2	240-241	Sub-Bus Valve Driver	Show Details	✓
→ Branch 2, Mod. No. 3	240-205	16 Inputs PNP Digital M12 x 8	Show Details	✓
→ Branch 2, Mod. No. 4	240-205	16 Inputs PNP Digital M12 x 8	Show Details	✓
→ Branch 4, Mod. No. 5	240-205	16 Inputs PNP Digital M12 x 8	Show Details	✓
→ Branch 4, Mod. No. 6	240-205	16 Inputs PNP Digital M12 x 8	Show Details	✓
			Show Error/Event Log	

12. I/O Module(s) Wiring Diagrams

12.1 12.1 NPN/PNP Definitions

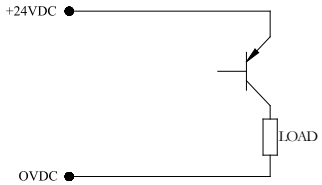
NPN Descriptions

- Sinking
- Switching Negative
- Positive Common

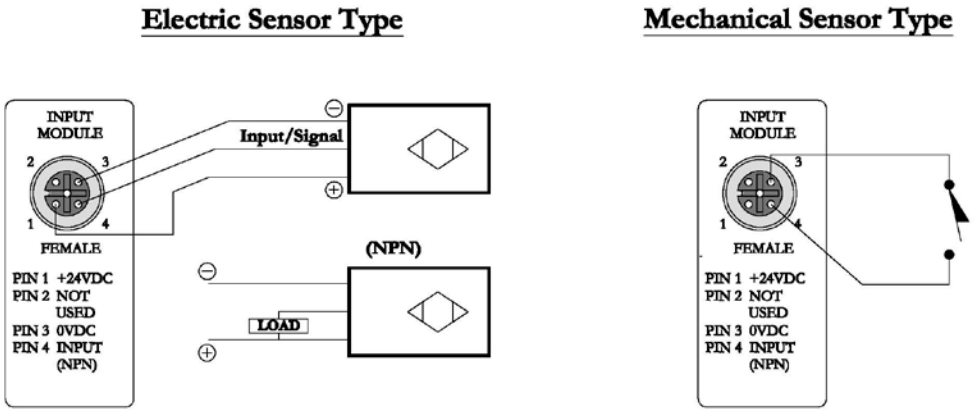


PNP Descriptions

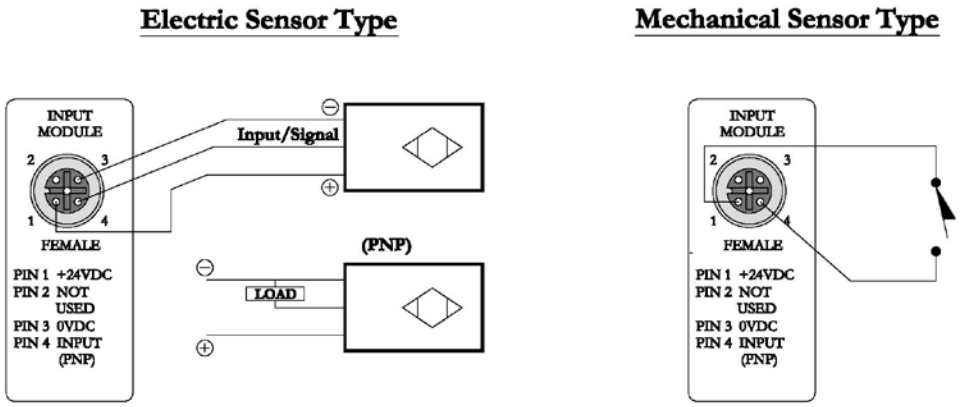
- Sourcing
- Switching Positive
- Negative Common



NPN (Sinking) Input Connection

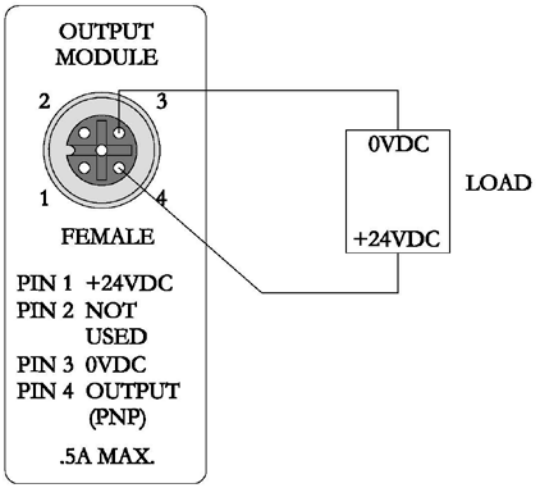


PNP (Sourcing) Input Connection



I/O Module(s) Wiring Diagrams Continued

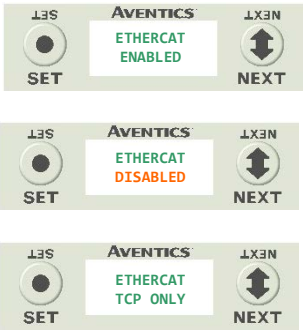
PNP (Sourcing) Output Connection



13. G3 EtherCAT™ Web Server

13.1 Connecting to a G3 Series EtherCAT™ node

Note: To access the G3 Node's diagnostic Web Page the G3 EtherCAT™ node must be set to EtherCAT™ disabled (TCP ONLY mode).



EtherCAT™ Steps

1. Press the **SET** button to enter the Web-Server sub-menu.
2. Press the **NEXT** button to scroll through the choices to enable or disable the feature.
   d. ENABLED (Factory Default)
   e. DISABLED
   f. RETURN (this will return you to the main menu)

   Press the **SET** button to confirm your choice.

The status screen changes to;
ETHERCAT™
TCP ONLY

CAUTION

- *Disabling EtherCAT™ stops all communication with the EtherCAT™ master!*

13.2 Connecting to a G3 Series EtherCAT™ Node (Windows 7)

This section will discuss how to connect a computer to a G3 Series EtherCAT™ node. There are multiple ways to complete this task, so only two will be discussed.

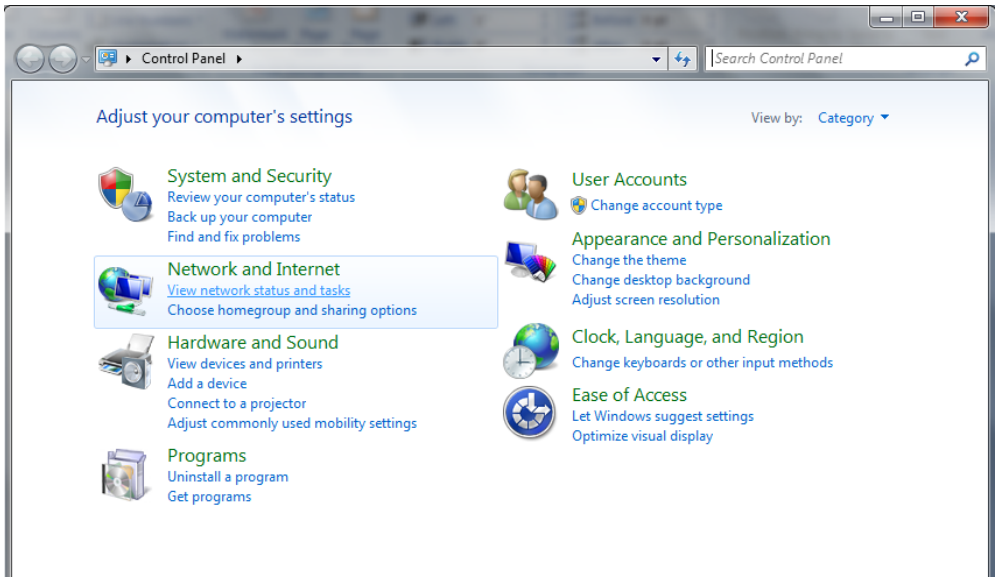
1. Connect a 24VDC power supply to the valve manifold. The connector pin-out can be found on the side of the EtherCAT™ node or on page 4-20 of this document. (Note: 24VDC only needs to be applied to the "+24VDC (NODE & INPUTS)" pin to power the node.)

2. Connect an Ethernet cable directly from the manifold to the computer -OR- Connect an Ethernet cable from the manifold to a router, hub, or switch. Connect a second Ethernet cable from the computer to the router, hub, or switch. (Network lights should appear on the router, hub, or switch if the correct cables are used).

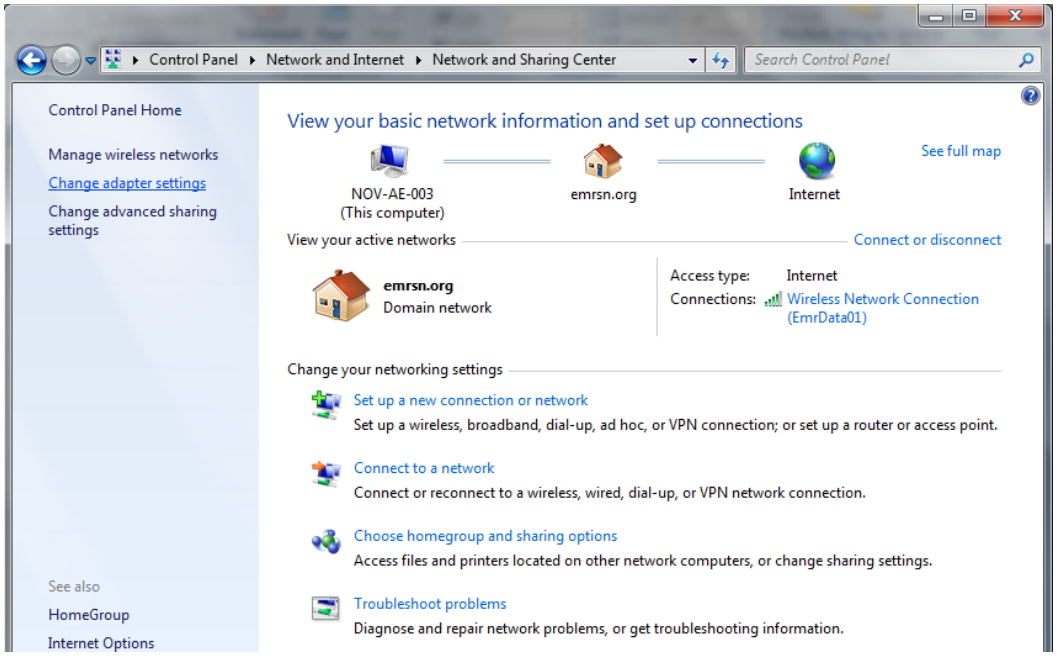
3. Turn on the computer. Also, make sure the manifold and the router, hub or switch has power.

4. To communicate with an EtherCAT™ manifold the IP address of your computer must be known. To start this process, left click on the "Start" button.

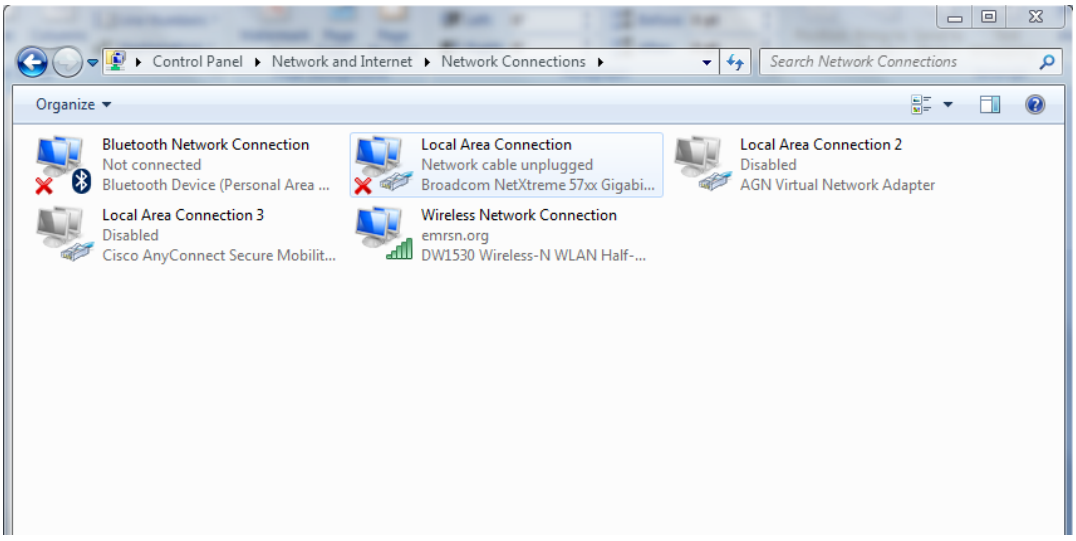
5. Left click on control panel, then left click view network status and tasks



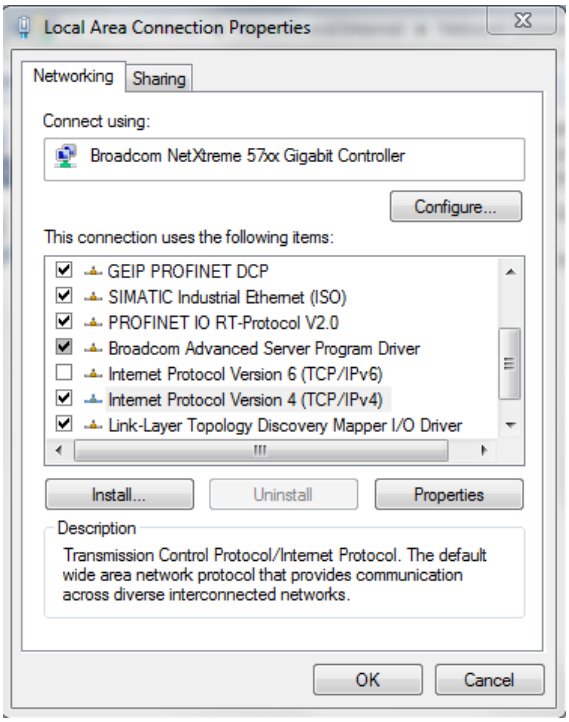
6. The “Network and Sharing Center” window will open. Double click on “Change adapter settings”.



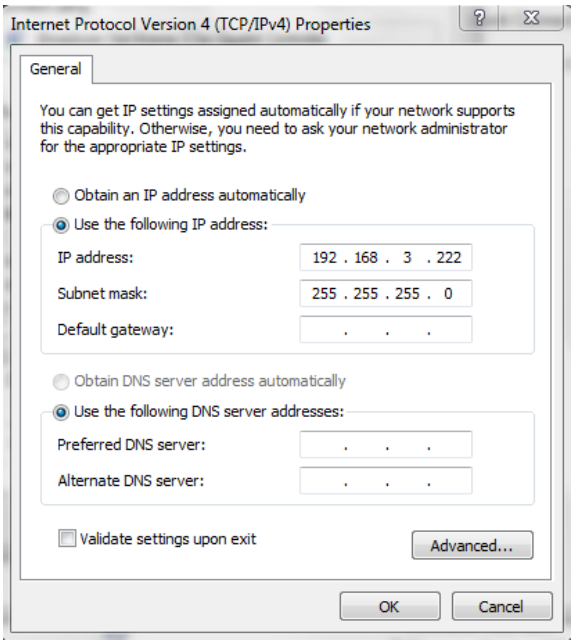
7. The “Network Connections” window opens. Double click the “Local Area Connection Icon”



8. Click on “Internet Protocol Version 4 (TCP/IPv4)” the properties window will open



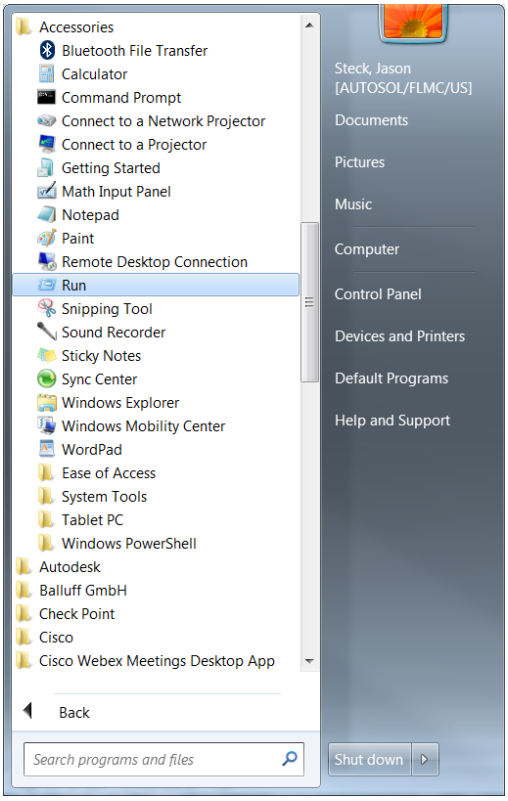
9. Choose the option marked “Use the following IP address” and type in an IP address that has the same first three octets as the address as you the manifold you are connected with. For the last octet you may choose any number from 0-255, just make sure that it is not the same number as the IP address that the manifold will have. Make sure your subnet mask is set to “255.255.255.0” (this value can be changed, but this value will be used for demonstration purposes).



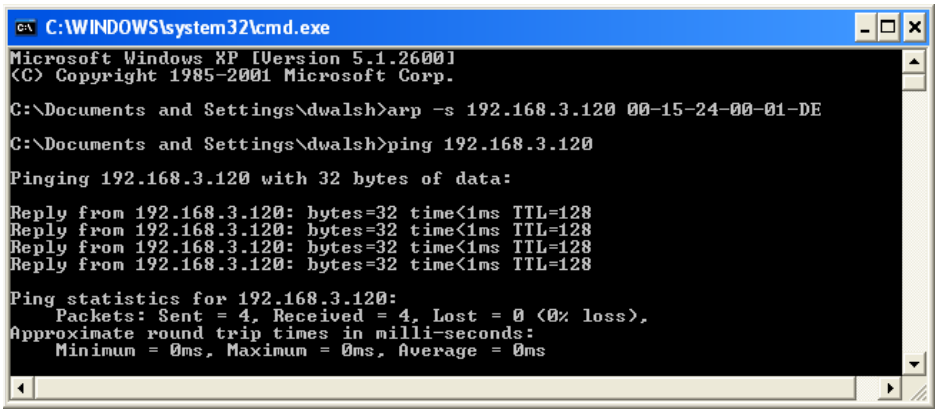
10. Left click “OK” in the “Internet Protocol (TCP/IP) Properties” and “Local Area Connection” windows for the changes to take effect on the computer. Close out of any open windows.

Once the IP address for the computer is known, you can set the IP address of the Aventics manifold using one of the methods described on page 5-33.

11. Click on “Start” then select “All Programs ->Accessories ->Run”



12. Type, “Ping, and then the IP address of the manifold, you can view the address on the graphical display. For example, if the IP address is 192.168.3.120, “ping 192.168.3.120” would be typed. You will get a message stating, “Reply from 192.168.3.120: bytes=32 time<1ms TTL=128”, if the manifold responds.



13. Open a web browser on the computer and type the IP address of the manifold.
    Ex. http://192.168.3.120. The Aventics G3 webpage should load after several seconds.

13.3 Connecting to a G3 Series EtherCAT™ Node (Windows 10)

This section will discuss how to connect a computer to a G3 Series EtherNet/IP™ node. There are multiple ways to complete this task, so only two will be discussed. All computer commands are shown in Windows 10.

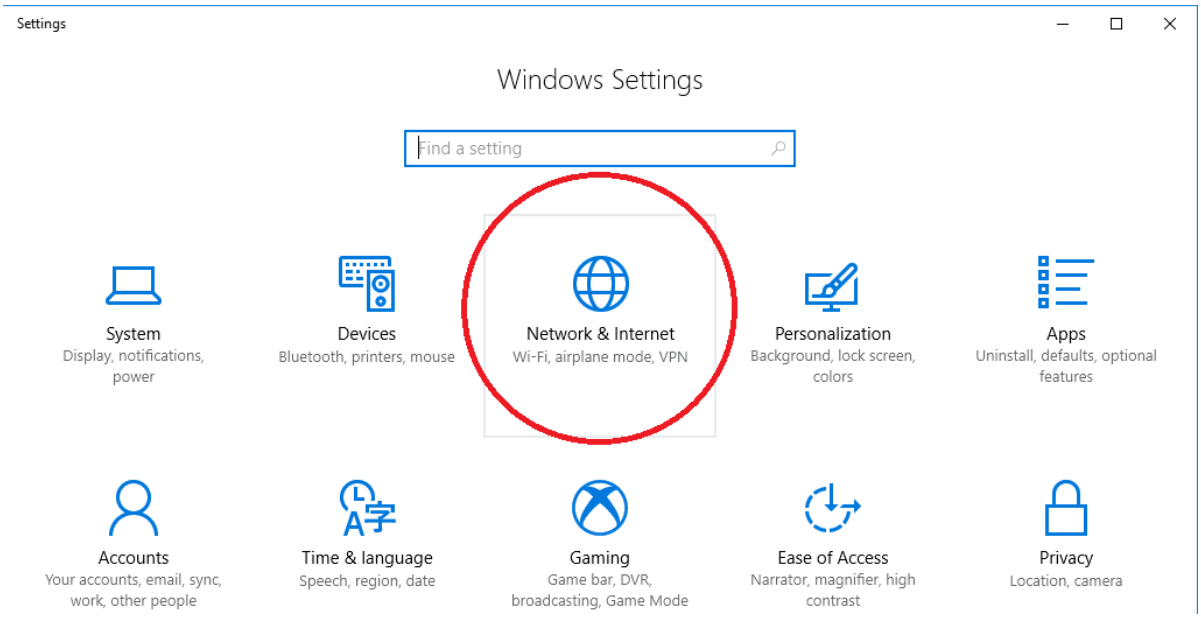
1. Connect a 24VDC power supply to the valve manifold. The connector pin-out can be found on the side of the EtherNet/IP™ node or on page 4-20 of this document. (Note: 24VDC only needs to be applied to the "+24VDC (NODE & INPUTS)" pin to power the node.)

2. Connect an Ethernet cable directly from the manifold to the computer -OR- Connect an Ethernet cable from the manifold to a router, hub, or switch. Connect a second Ethernet cable from the computer to the router, hub, or switch. (Network lights should appear on the router, hub, or switch if the correct cables are used).

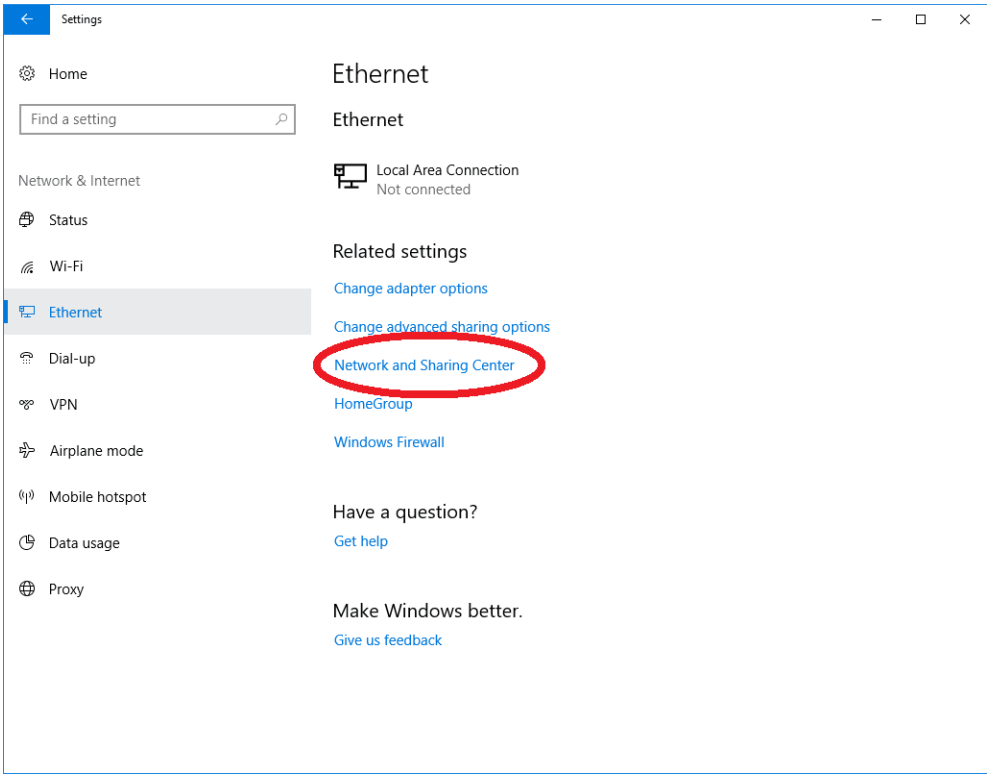
3. Turn on the computer. Also, make sure the manifold and the router, hub, or switch has power.

4. To communicate with an EtherNet/IP™ manifold the IP address of your computer must be known. To start this process, left click on the "Windows" (Start) button.

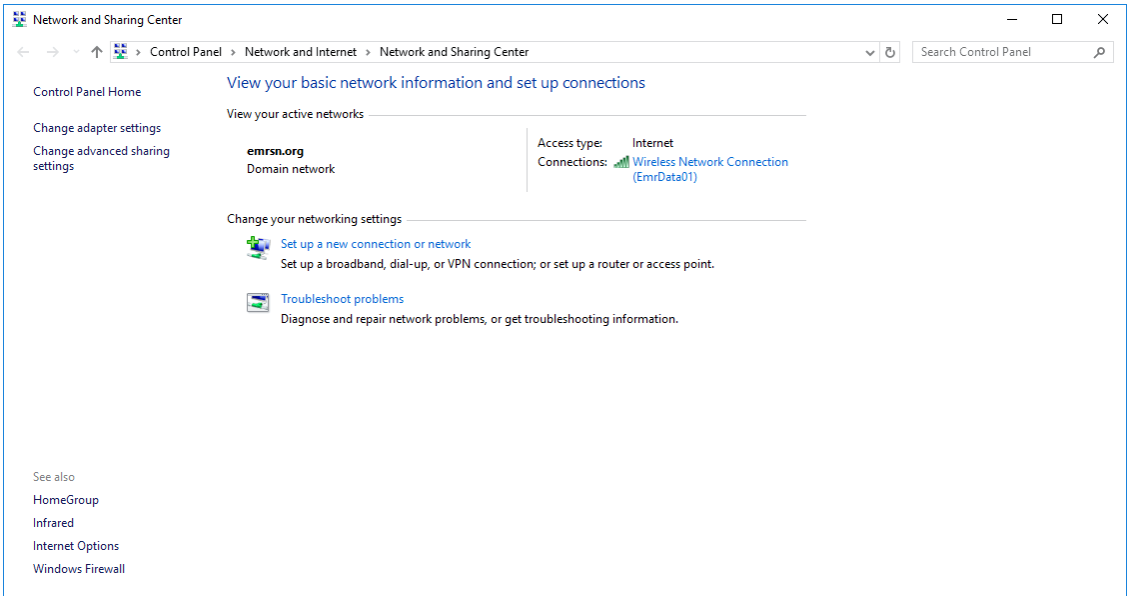
5. Left click on Settings (gear icon), then on Network & Internet.



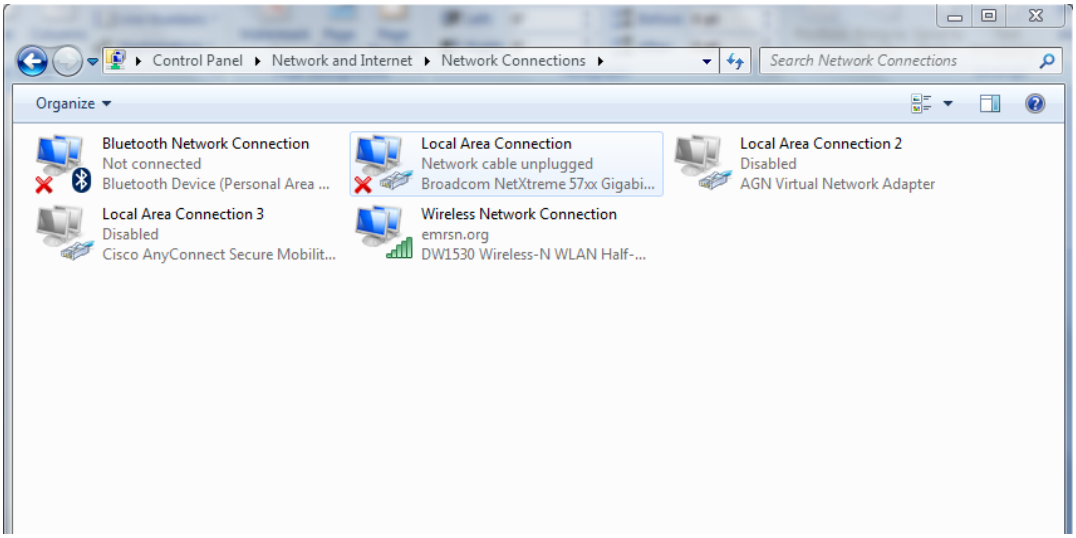
6. Next, left click on “Ethernet” on the left-hand side of the window, and then “Network and Sharing Center”.



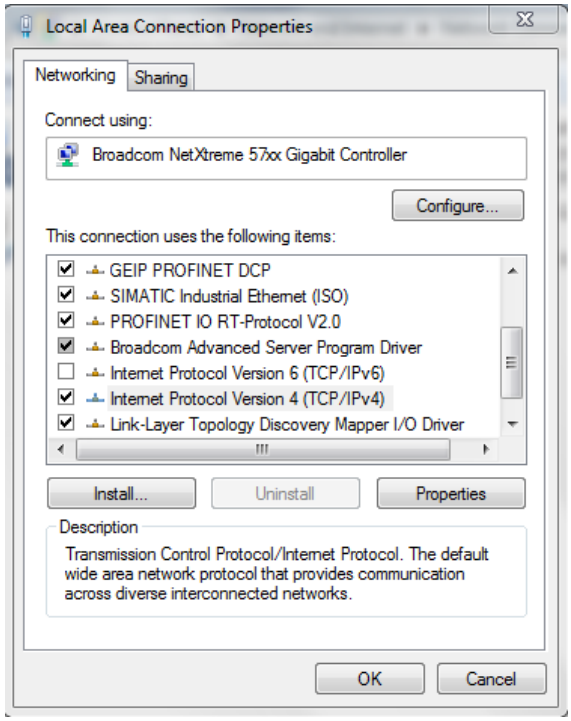
7. The “Network and Sharing Center” window will open. Double click on “Change adapter settings”.



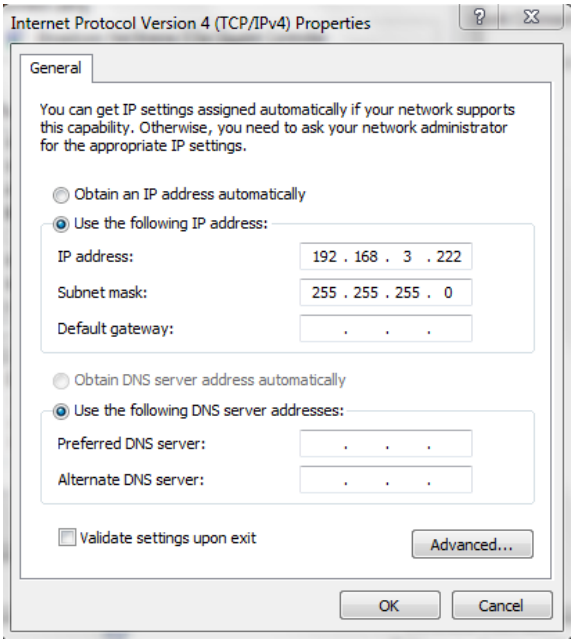
8. The “Network Connections” window opens. Double click the “Local Area Connection Icon”



9. Click on “Internet Protocol Version 4 (TCP/IPv4)” the properties window will open



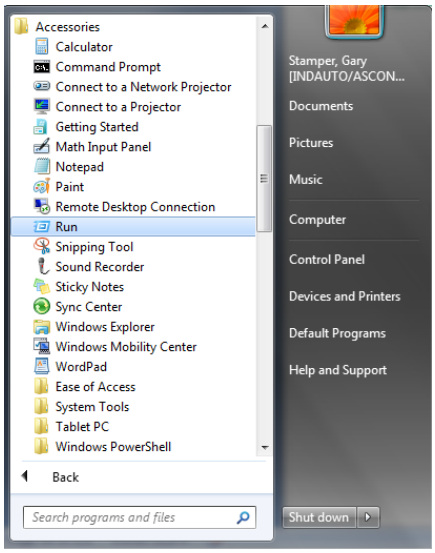
10. Choose the option marked “Use the following IP address” and type in an IP address that has the same first three octets as the address that you will set the manifold to. For the last octet you may choose any number from 0-255, just make sure that it is not the same number as the IP address that the manifold will have. Make sure your subnet mask is set to “255.255.255.0” (this value can be changed, but this value will be used for demonstration purposes).



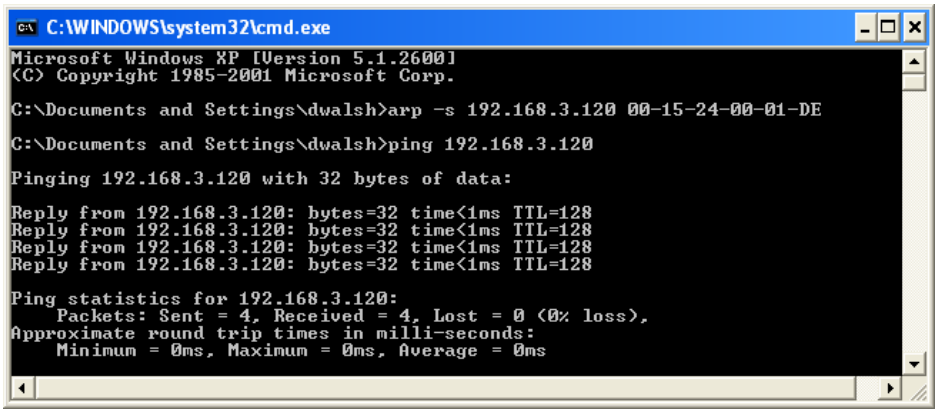
11. Left click “OK” in the “Internet Protocol (TCP/IP) Properties” and “Local Area Connection” windows for the changes to take effect on the computer. Close out of any open windows.

Once the IP address for the computer is known, you can set the IP address of the Aventics manifold using one of the methods described on page 5-33 .

12. Click on “start” then select “All Programs->Accessories->Run”.



13. Type, “Ping, and then the IP address of the manifold, you can view the address on the graphical display. For example, if the IP address is 192.168.3.120, “ping 192.168.3.120” would be typed. You will get a message stating, “Reply from 192.168.3.120: bytes=32 time<1ms TTL=128”, if the manifold responds.



14. Open a web browser on the computer and type the IP address of the manifold.
Ex. http://192.168.3.120. The Aventics G3 webpage should load after several seconds.

13.4 Using the Functionality of the G3 Series EtherCAT™ Web Server

This section will discuss the functionality of the built in Ethernet server. Every Aventics EtherCAT™ node has this feature. Through this server you can configure the node, force I/O, check diagnostics, etc. Each Aventics' web page will be explained.

Home

To get to the Aventics "Home" page, open a web browser. In the URL line, type in the IP address of the manifold and press "Enter". The Aventics "Home" page will appear. This page shows a picture of the Aventics EtherCAT™ manifold. From this page, the user can navigate the entire built-in web server.

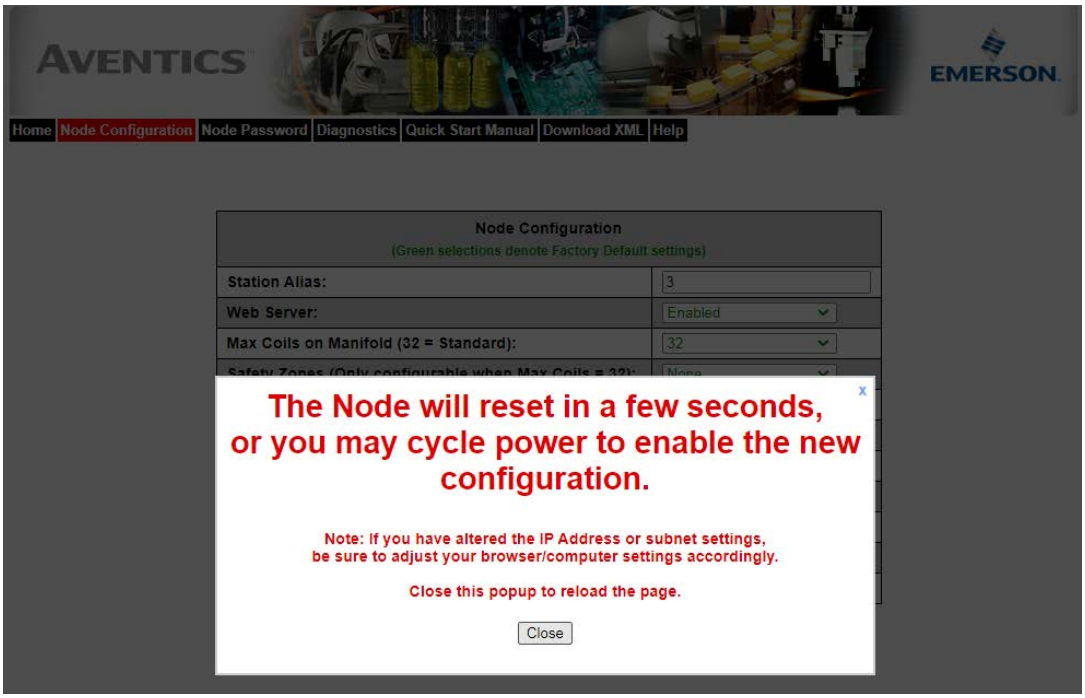
Node Configuration

The “Node Configuration” window can be used to control different parameters within the manifold. These parameters include, “Station Alias”, “Max Coils”, “Node Configuration Parameters (lock)” and “I/O Configuration (lock)”.

Node Configuration (Green selections denote Factory Default settings)	
Station Alias:	3
Web Server:	Enabled
Max Coils on Manifold (32 = Standard):	32
Safety Zones (Only configurable when Max Coils = 32):	None
COMM Fault / Idle Mode:	Turn OFF All Outputs
Diagnostic Word:	Mapped
I/O (Diagnostics) Status:	Mapped
Node Configuration Parameters:	Unlocked
I/O Configuration:	Unlocked
Display Orientation (Global):	Normal
Display Brightness (Global):	Medium

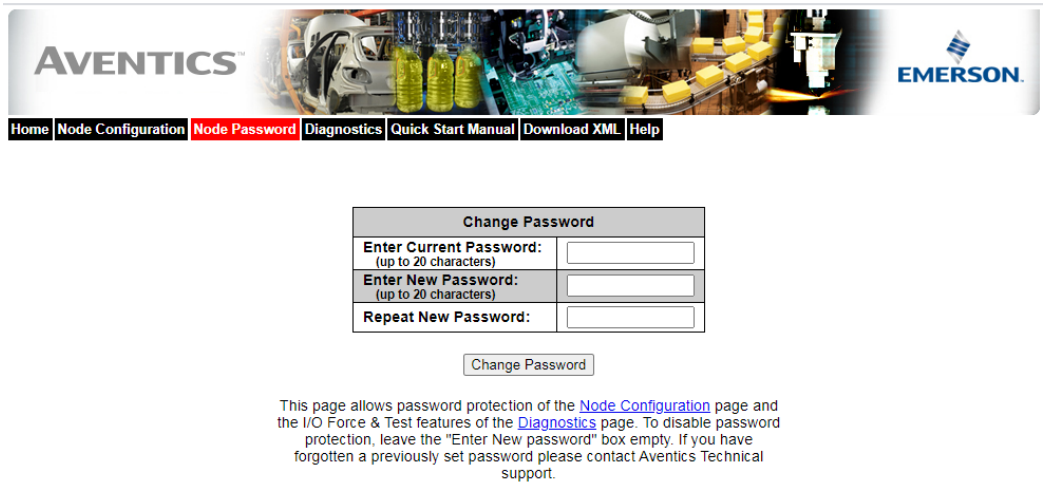
Update Configuration

Once the changes have been made, left click on the “Update Configuration” button. The “Configuration Successfully Updated” window will appear. The EtherCAT™ node will reset in a few seconds, or the user may cycle power to enable the new configuration.

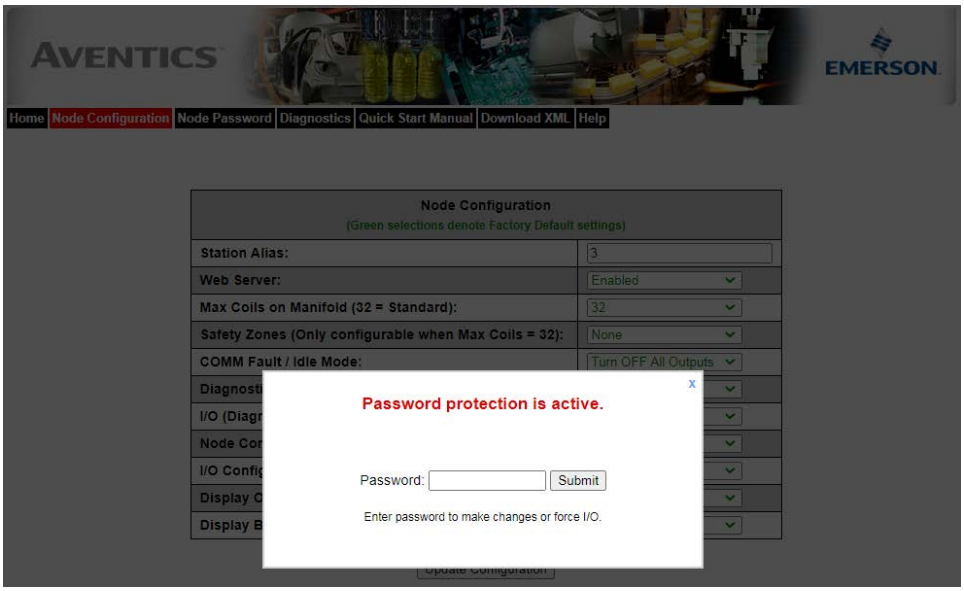


Password

The “Password” window allows the user to set a password that will prevent unwanted access to the I/O Force and Test functionality. The password comes disabled from the factory. To set the initial password, leave the “Enter Current Password” field blank and type in the new password in the “Enter New Password” field.



Once a Password has been set, the security check screen will appear when accessing Diagnostic or Node Configuration parameters.



- If the password has been lost or forgotten, go through the process of changing the password. Enter the last 6 digits of the MAC Address in the current password field and then enter the desired password in the new password field.

Diagnostics

The “Diagnostics” window allows the user to monitor different values. These values include, “MAC Address”, “Serial Number”, “Firmware Revision”, and “Valve Diagnostic Table”. The “Valve Diagnostic Table” enables the user to check the status of the valve side outputs.

Actual Configuration of modules with part numbers and descriptions including distributed modules

Module	Part No.	Description	Details	Export Config and Log	Activity
Node	240-310	EtherCAT Communications Module	☐ Show Details		✓
Valve Driver	P599AE42518800x	50X Series Valve Driver Output Module	☐ Show Details		✓
ARM	240-383	Auto Recovery Module	☐ Show Details		✓
No. 1	240-214	4 Inputs 4-20mA Analog M12 x 4	☐ Show Details		✓
No. 2	240-211	8 Inputs / 8 Outputs PNP Digital M12 x 8	☐ Show Details		✓
No. 3	240-207	16 Outputs PNP Digital M12 x 8	☐ Show Details		✓
			☐ Show Error/Event Log		

Reports module status:

✓ = OK
! = Attention
X = Lost comm.

Selects which module details will be shown, more than 1 can be selected simultaneously.

Module	Part No.	Description	Details	Activity
Node	240-310	EtherCAT Communications Module	Show Details	

Firmware Revision:	1.1 Build 44022
IP Address:	192.168.1.120
Subnet Mask:	255.255.255.0
Gateway IP Address:	0.0.0.0
MAC Address:	00-15-24-00-fa-af
Active EtherCAT Connections:	0
Node / Input Power:	24.2 VDC
Diagnostic Word Status:	OK
Diagnostic Word Byte 0:	0 1 2 3 4 5 6 7
	Bit 0: Switched Power Status Bit 1: Unswitched Power Low (Below 19 VDC) Bit 2: Sub-Bus Module Error Bit 3: Sub-Bus Short Circuit Bits 4-7: Not Used
Diagnostic Word Byte 1:	0 1 2 3 4 5 6 7
	Bits 0-4: Module Number Bits 5-7 Error Code 0: No error 1: Lost communications between I/O module and communications module 2: Valve / Output power is missing 3-7: Not defined / Reserved
Show I/O Mappings and Sizes	

Relevant node information including firmware revision

Graphic of module

"Diagnostic word" data

Valve Driver	P599AE42518800x	50X Series Valve Driver Output Module	Show Details

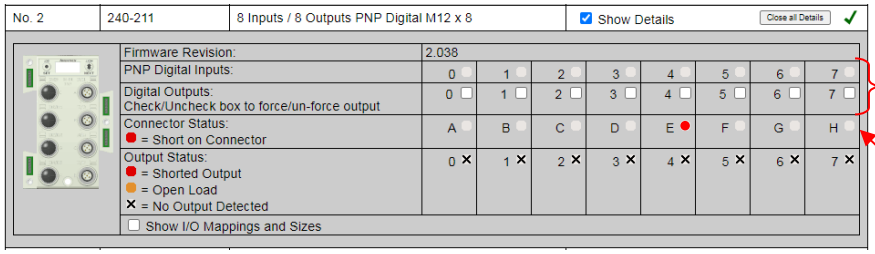
Firmware Revision:	4.19								
Valve Coils 0-31: Check/Uncheck box to force/un-force valve coil	0	1	2	3	4	5	6	7
	8	9	10	11	12	13	14	15
	16	17	18	19	20	21	22	23
	24	25	26	27	28	29	30	31
Valve Status: ● = Shorted Coil ● = Open Coil ✕ = No Coil Detected	0	1	2	3	4	5	6	7
	8	9	10	11	12	13	14	15
	16	17	18	19	20	21	22	23
	24	25	26 ✕	27	28	29	30	31
Show I/O Mappings and Sizes								

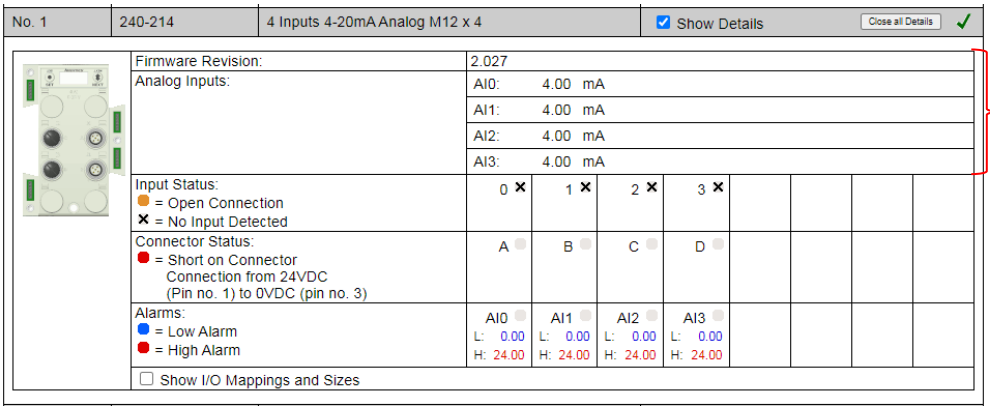
Valve coil forcing capability. Can be disabled with password

Shows diagnostic status of whether coils are shorted or open.

*Note
The G3 node must be switched to Pre-Operational mode via the Twincat system manager software to allow forcing output states from the G3 webpage. See next page

Show Details:





Error / Event Log:

Keeps a running count of 50 events.
First in First out (FIFO)

Allow user to clear log

Allows user to add comments

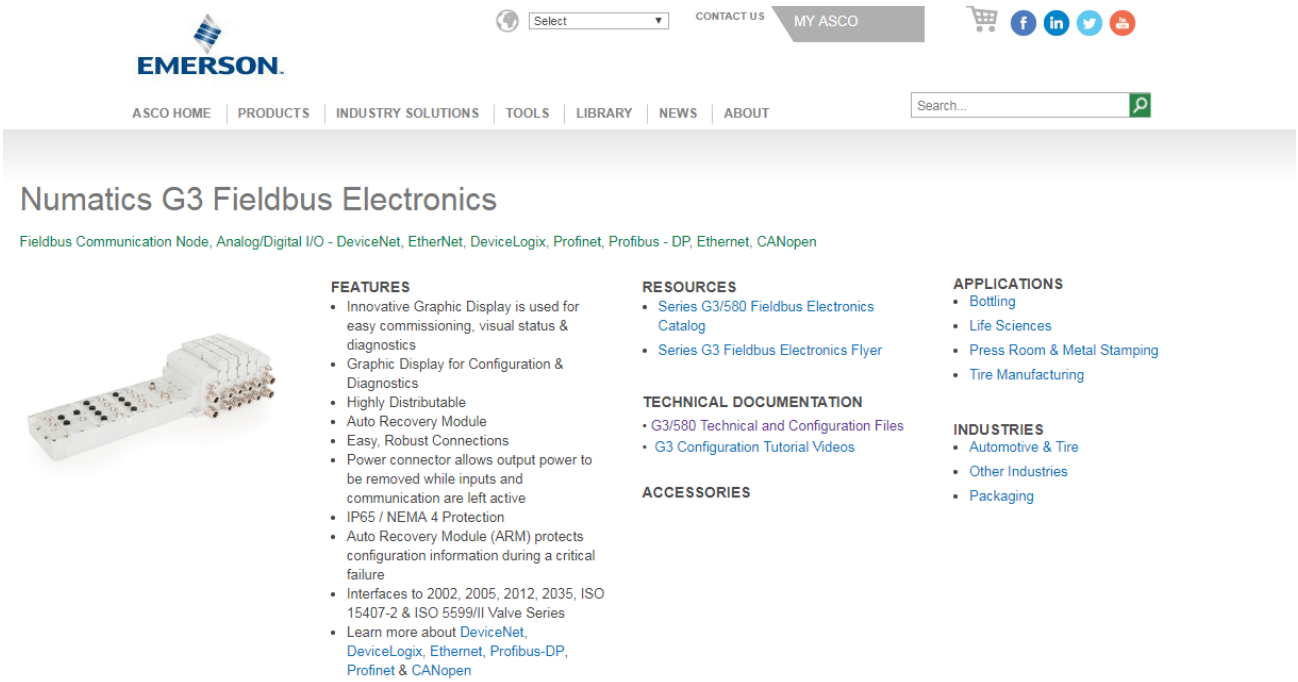
Reboot events are shown in red

Show Error/Event Log

Event Number	Boot Count	Relative Time (HH:MM:SS.SS)	Description	User Comment	Clear Log
1	1	00:00:00.49	Reboot - build 43227		Add Comment
2	2	00:00:00.85	Reboot - build 43227		Add Comment
3	2	00:00:01.78	I/O Configuration Changed		Add Comment
4	3	00:00:00.49	Reboot - build 43227		Add Comment
5	4	00:00:00.49	Reboot - build 43227		Add Comment
6	5	00:00:00.07	Reboot - build 43227		Add Comment
7	6	00:00:00.07	Firmware reload initiated		Add Comment
8	7	00:00:00.07	Reboot - build 43476		Add Comment
9	7	00:00:00.98	I/O Configuration Changed		Add Comment
10	7	00:01:10.10	Ethernet link lost (Port 0)		Add Comment

Help:

The “Help” tab is a quick link to Aventics’ website. The computer must have internet access for this tab to be functional.



13.5 IP Address Configuration

EtherCAT™ fieldbus devices do not communicate using a standard IP address. The Aventics G3 node's IP address is only used to access the nodes integrated web server for configuration and diagnostic information via a personal computer's web browser.
The IP address of the Aventics G3 EtherCAT™ node may only be set once EtherCAT communication is disabled (See page 5-36).

Integrated Web Page Configuration

The Aventics EtherCAT™ node has an integrated web server. This server can be accessed via any standard web browser program through a properly configured EtherCAT™ master device. With the IP Address, the "Node Configuration" page for the node can be accessed and the configuration parameters changed. Please note that the PC, where the web browser is installed, must be correctly configured for operation with the appropriate network IP ranges and subnet settings that match the EtherCAT™ master device configuration.

- *Consult appropriate personnel before changing your computer's network settings and always record previous settings for later reversal before attempting changes.*

Below is a representation of the "Node Configuration" page which is stored in the EtherCAT™ node.
The IP address and Subnet Mask selections cannot be modified from this page. These parameters will be programmed in the node's non-volatile FLASH memory once "Update Configuration" is clicked, and power to the node is cycled.

Node Configuration (Green selections denote Factory Default settings)	
Station Alias:	3
Web Server:	Enabled
Max Coils on Manifold (32 = Standard):	32
Safety Zones (Only configurable when Max Coils = 32):	None
COMM Fault / Idle Mode:	Turn OFF All Outputs
Diagnostic Word:	Mapped
I/O (Diagnostics) Status:	Mapped
Node Configuration Parameters:	Unlocked
I/O Configuration:	Unlocked
Display Orientation (Global):	Normal
Display Brightness (Global):	Medium

Update Configuration

13.6 User Configurable Device Parameters

The Aventics' G3 EtherCAT™ node allows the user to set many user options which define how the manifold behaves in certain instances. The following is a description of these device parameters.

		Settable Via	
Name	*Description*	*Display*	*Web Server*
IP Address	Sets the IP address to access the node web page	X	X
Gateway IP	Set the Gateway IP address	X	X
Params Lock	Selects Parameters Locked/Unlocked	√	√
Config Lock	Selects I/O Configuration Locked/Unlocked	√	√
Diagnostic Word	Enables / Disables the diagnostic word	√	X
I/O Diagnostic Status	Allocates I/O diagnostic status bits	√	X
Output Fault Action	Determines whether to use idle value attribute or hold last state	√	X

13.7 Parameters Lock

This parameter lock is used to lock out changes to all node configuration parameters (except parameter lock). Once the manifold is commissioned the Parameters lock should be set to "LOCKED" to ensure that parameters are not unintentionally modified.

13.8 I/O Configuration Lock

This I/O configuration lock parameter is used to lock the I/O configuration of the manifold. The manifold's I/O configuration map is determined on power-up of the node. Once the manifold is commissioned the I/O configuration lock should be set to "LOCKED" to ensure the I/O will not re-map in the event of an I/O module failure. If an I/O module fails with configuration locked the node will report an I/O module missing at the location of the failed module.

13.9 Communication Fault Mode Parameter

This parameter is used to describe characteristics or behaviors of output points (bits). The parameter shown below is used to determine what state the outputs will have, during a "Fault" event. The Communication Fault Mode parameter will allow control of all output points on the manifold.

The user, through PLC configuration settings, can determine how the outputs behave when a communication fault action occurs. These settings are non-volatile and thus will not change upon loss of power.

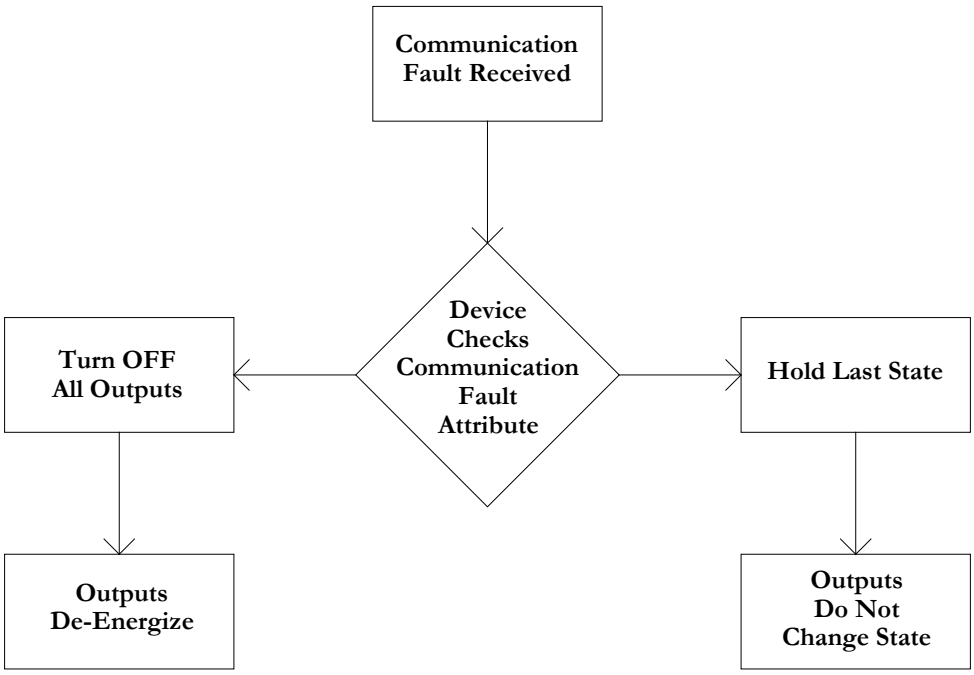
The two behavior options are:

1. Turn Off All Outputs
2. Maintain Last Output State

Communication Fault Sequence

The Communication Fault parameter determines the output state if the device encounters a communication fault. A Communication Fault is defined as an inability for the master node to communicate with a slave node on a network. The process for determining the output state during a Communication Fault/Idle Mode is as follows:

1. The device receives a Communication Fault event.
2. The device determines what action to take based on the Communication Fault attribute setting configured in the G3 EtherCAT™ node advanced parameters.
3. If the attribute is set to turn off all outputs, all of the outputs will turn off (Factory Default Setting).
4. If the attribute is set to hold last state, all of the outputs will hold their last state.

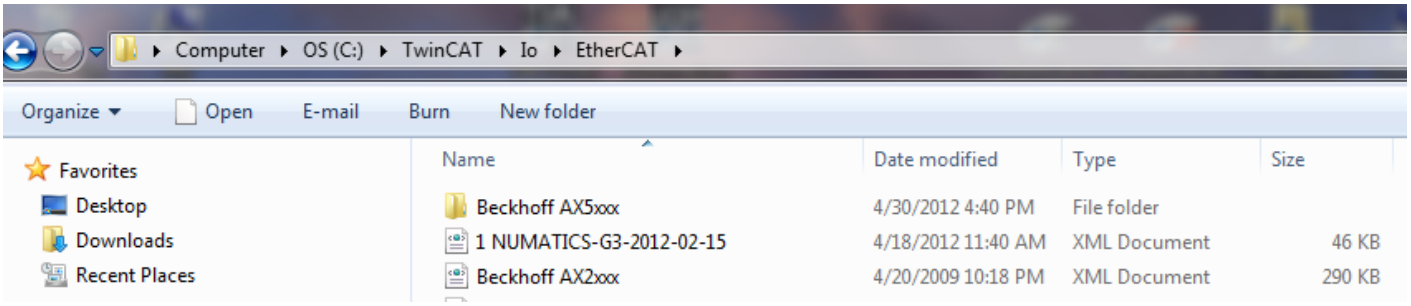


14. G3 EtherCAT™ PLC Configuration

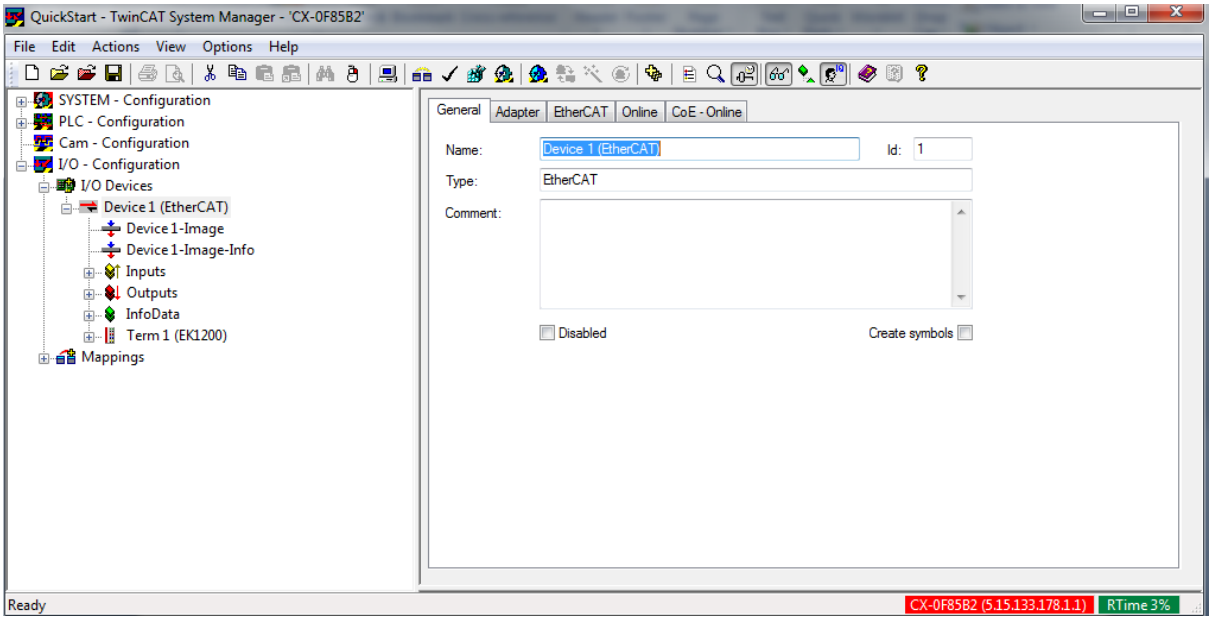
14.1 Create Aventics G3 EtherCAT™ configuration (Beckhoff PLC)

The following example illustrates the necessary steps to add a Aventics G3 EtherCAT™ Manifold to an existing Beckhoff PLC configuration. This includes how to install the Aventics EtherCAT™ XML file and how to select the various software components to configure a G3 Manifold (GSD and XML files are available at www.asco/g3.com). The following examples assume an existing configuration based on Beckhoff TwinCAT System Manager Ver. 2.11 programming software.

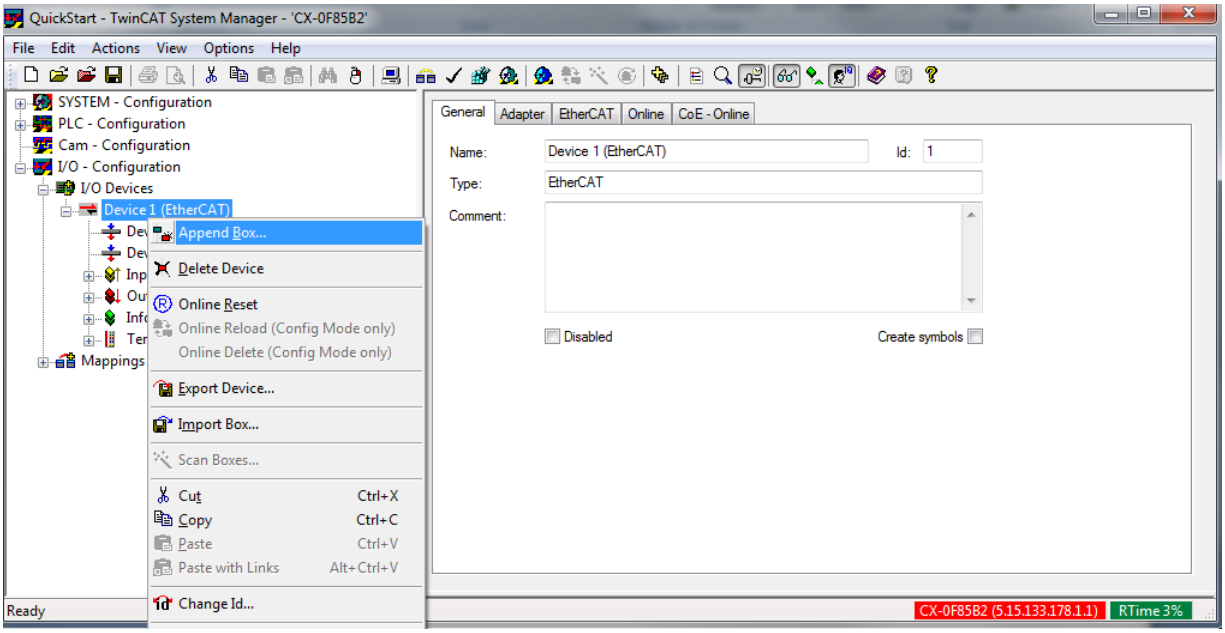
Copy the current “Aventics-G3.XML” file to the following directory; C:\TwinCAT\IO\EtherCAT



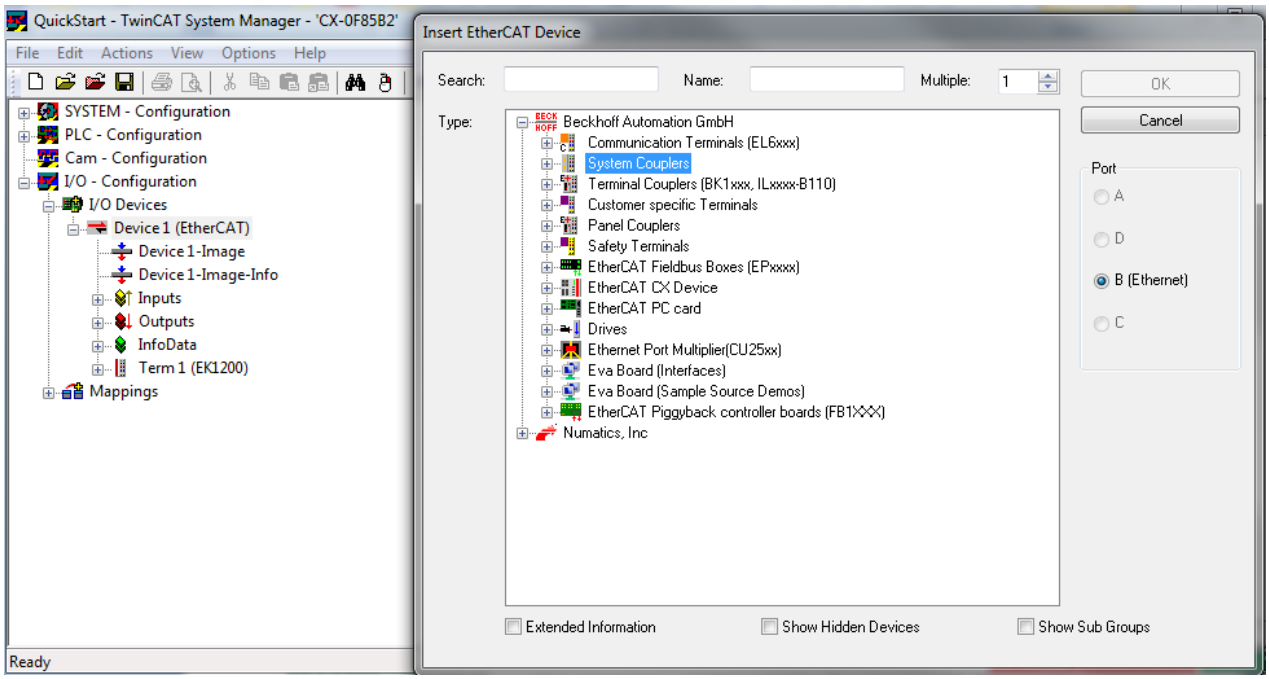
Add the G3 EtherCAT™ node
Launch TwinCAT “System Manager”
Select I/O Configuration
Expand I/O Devices



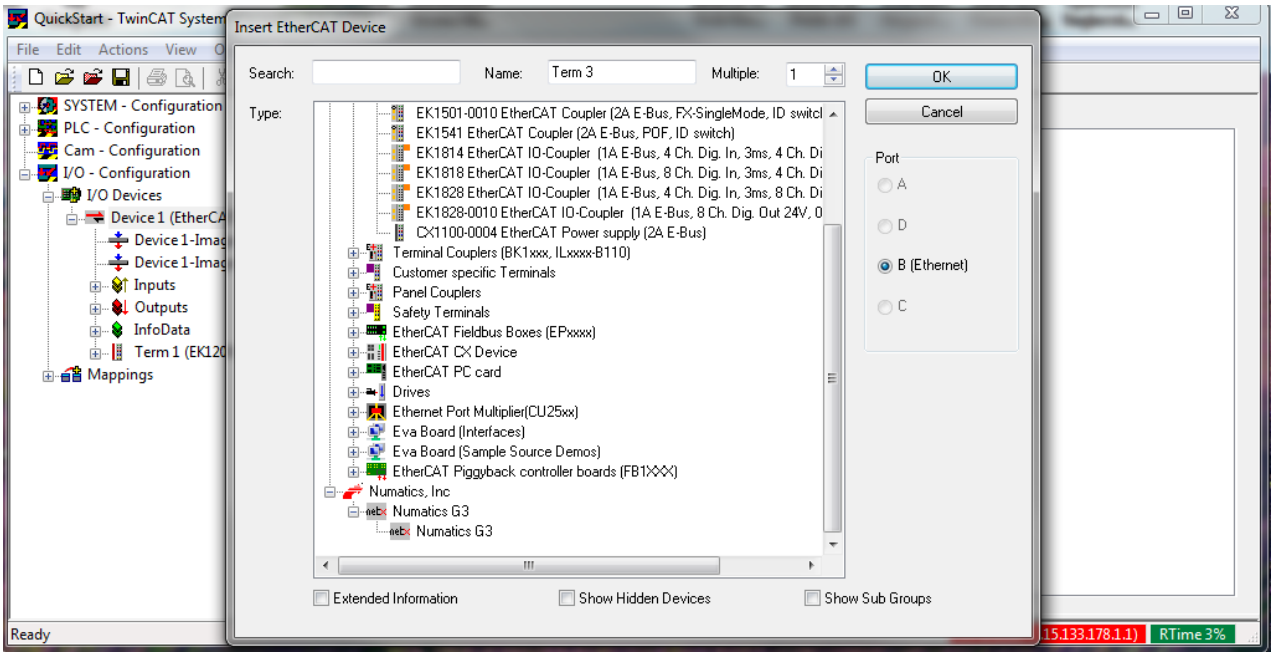
Right Click I/O Devices
Select Append Box



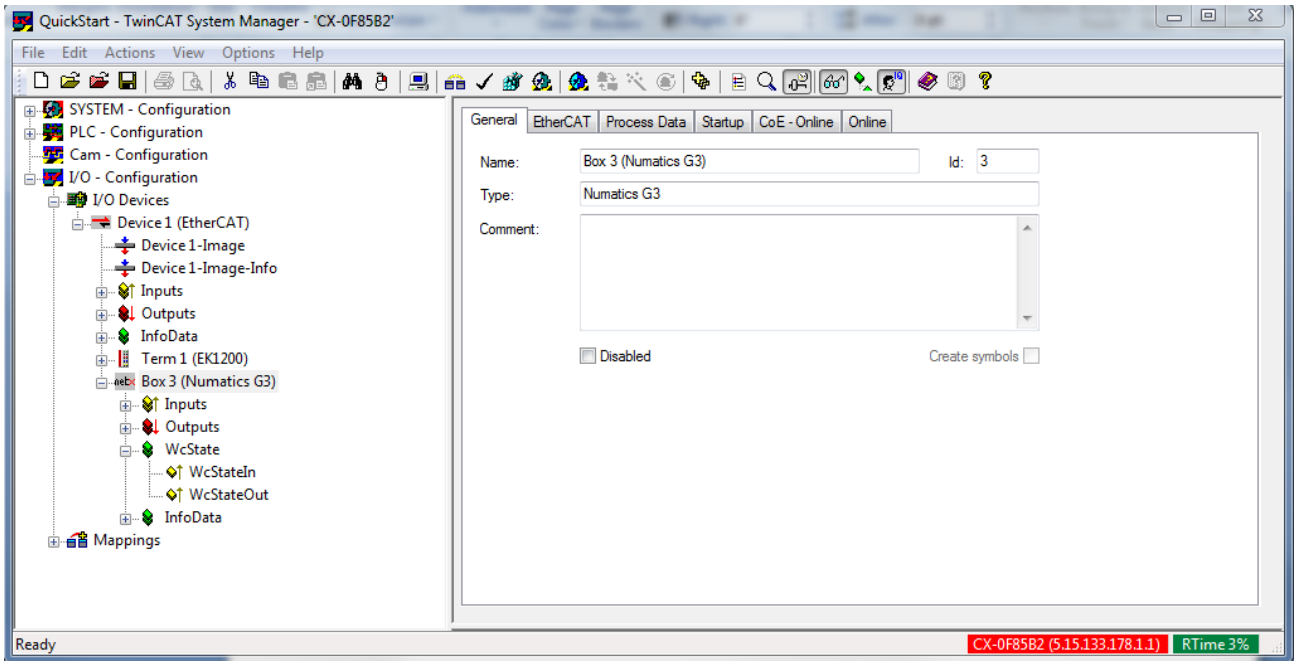
The “Insert EtherCAT™ Device” Dialogue Box Appears
Select the “Numatics Inc.” Device Folder



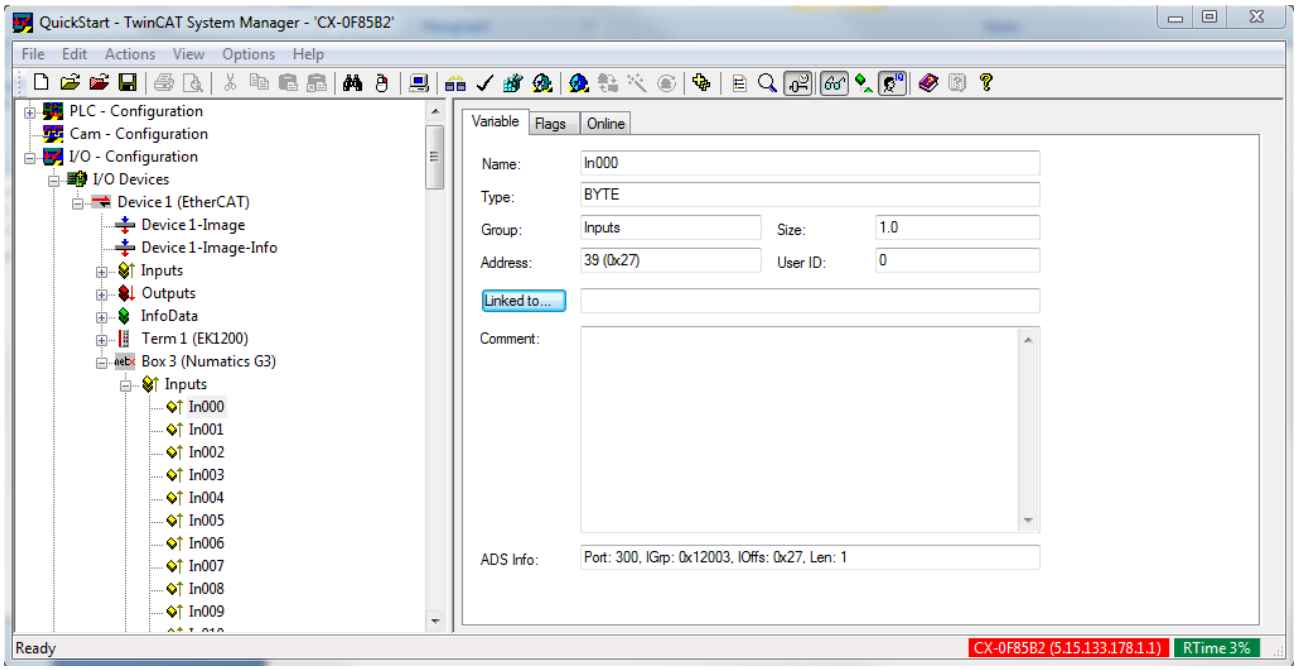
Double Click Numatics G3



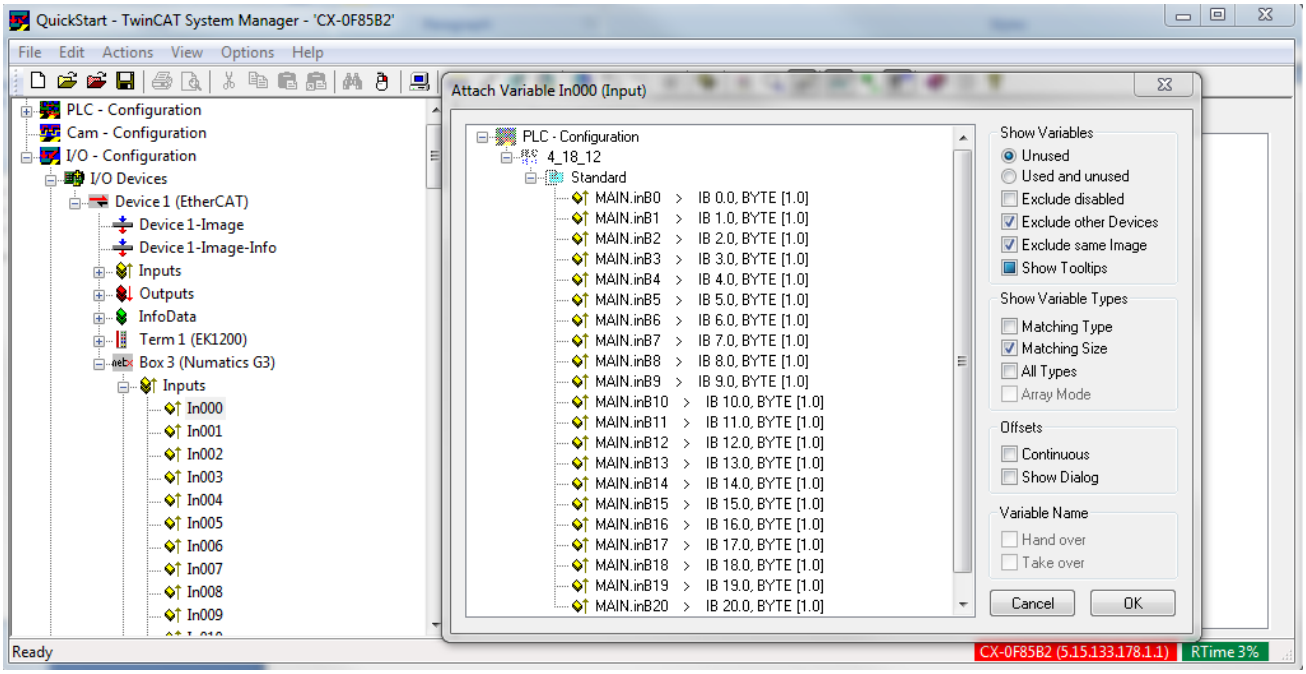
Create the G3 I/O mapping
Expand the “Numatics G3” Box (device)



Press the “Linked to” button to select an input variable (byte) to map to the G3 manifold
*Note- the I/O variables must already exist within the associated PLC Control Project



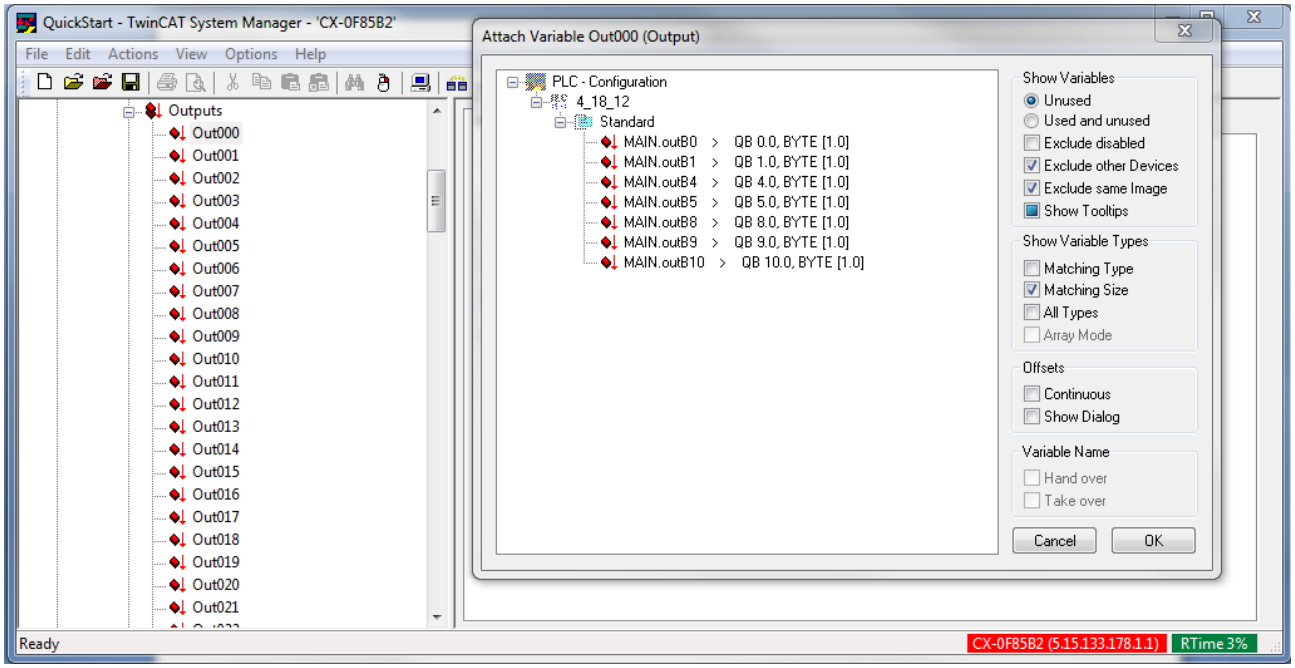
Select the Variable tag(s) from the PLC program to associate with the G3 Input Byte(s)



Expand the Numatics G3 Outputs list

Press the “Linked to” button to select an output variable (byte) to map to the G3 manifold

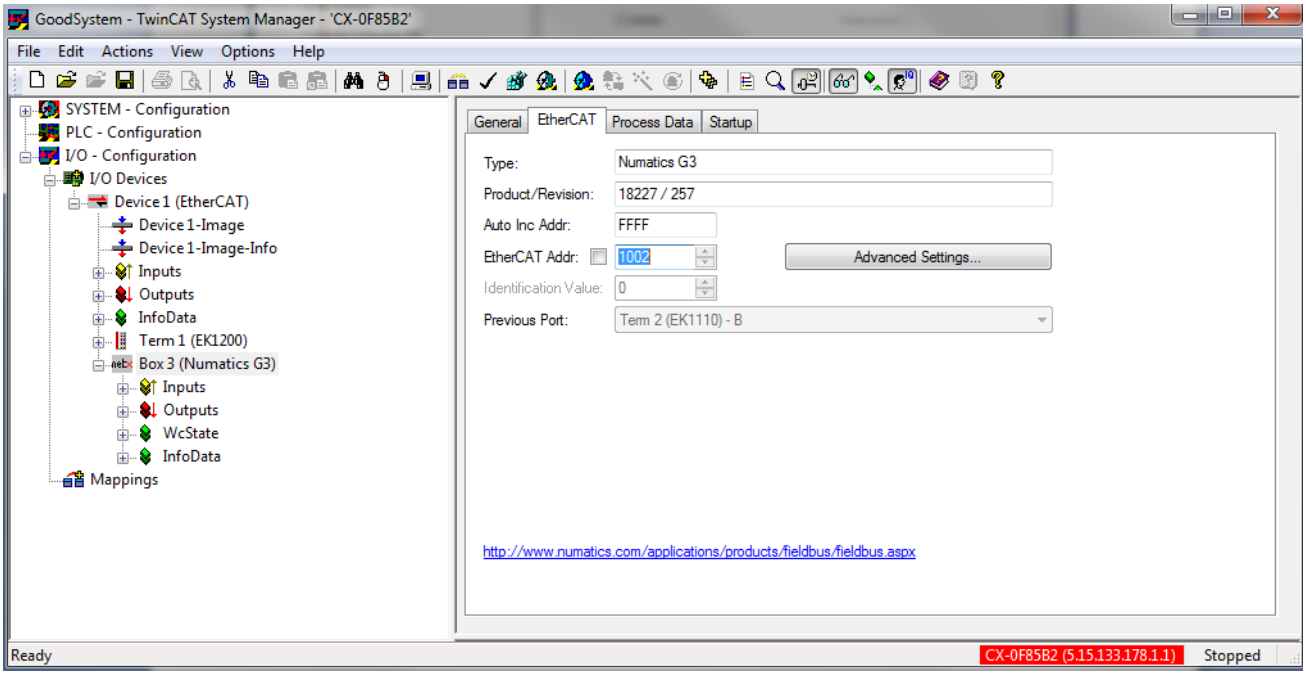
Select the Variable tag(s) from the PLC program to associate with the G3 Output Byte(s)



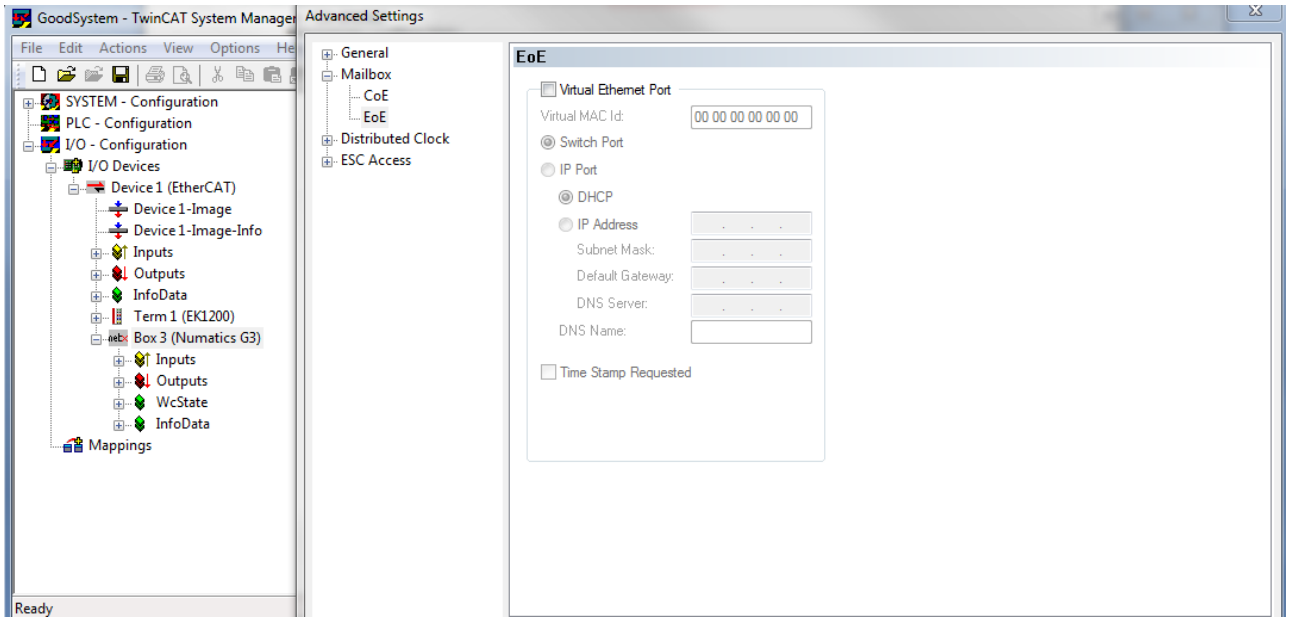
14.3 Twincat configuration for IP communication over EtherCAT™ (Beckhoff PLC)

This configuration is required for a PC to communicate with the G3 node web page through the EtherCAT™ master device.

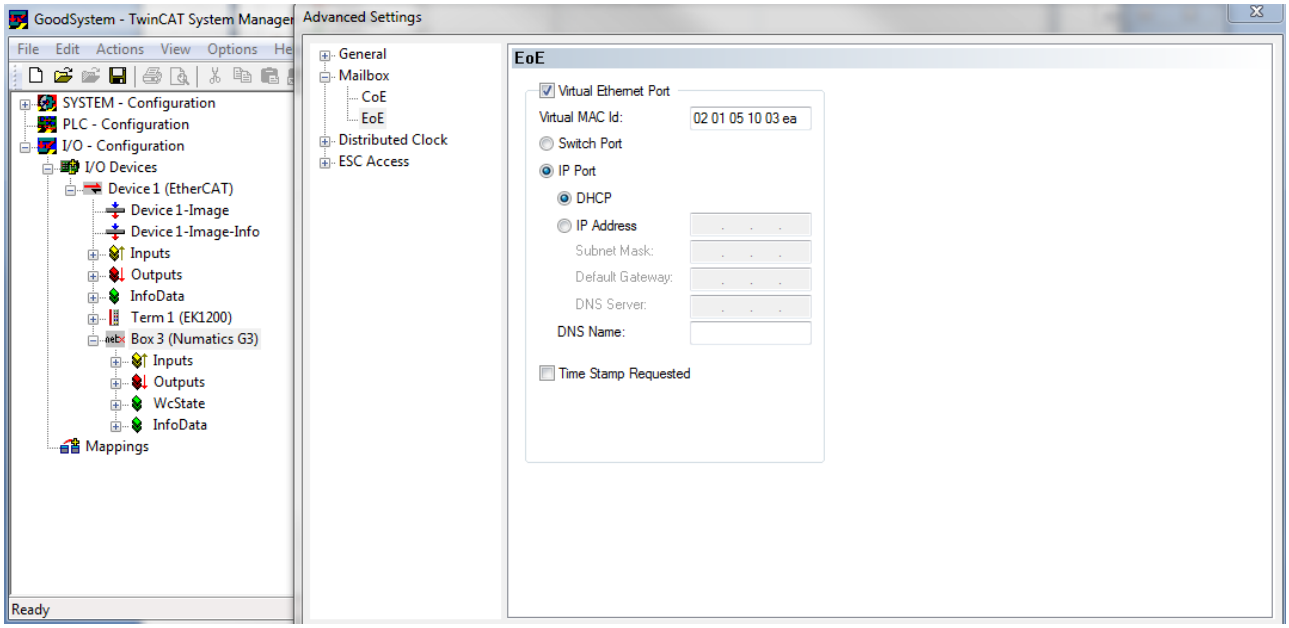
Expand the “Numatics G3” Box (device)
Select the EtherCAT™ tab
Click advanced settings



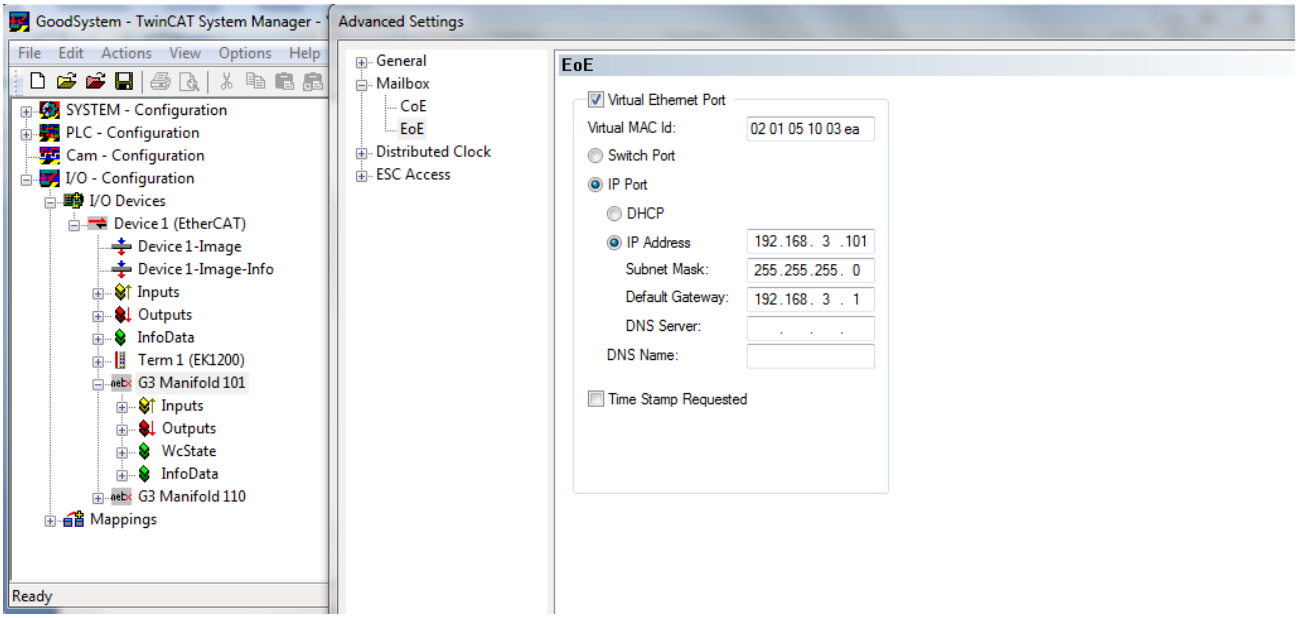
Expand the mailbox item
Select EOE (Ethernet over EtherCAT™)



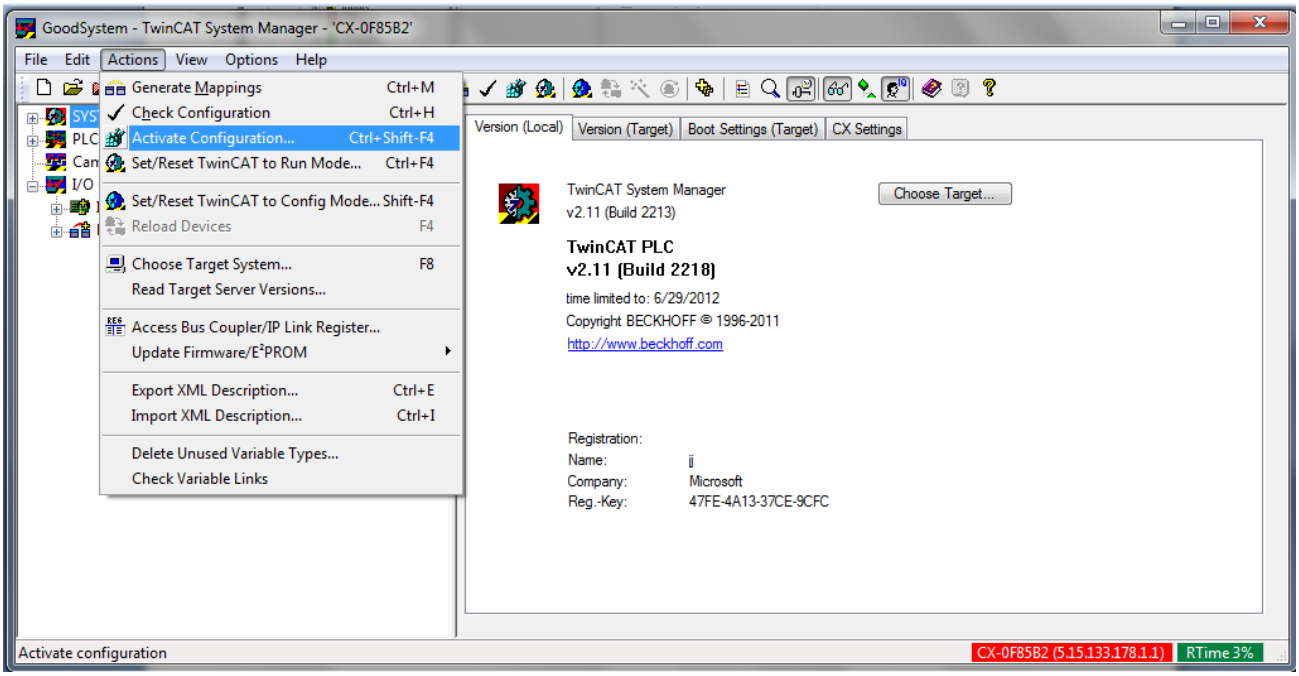
Check “Virtual Ethernet Port”
Select “IP Port”



Select the box for IP Address
Enter an IP address of the G3 EtherCAT™ node
Enter the Subnet mask
Enter the default Gateway (The gateway must be the same as the Beckhoff controller's virtual port address)
Enter the DNS name "netx"



"Activate" the configuration



14.4 Configure IP communication with G3 over EtherCAT™ (Beckhoff PLC)

The Beckhoff PLC must be specifically configured to allow ethernet communications with the G3 node to access the G3 web page. This is accomplished by connecting a PC to the EtherCAT™ master device's ethernet port and connecting to the G3 node via ethernet over Ethercat™ (EoE) using the PLC's virtual Ethernet port. The Beckhoff virtual Ethernet port address is configured within the Beckhoff PC/PLC configuration (refer to your specific Beckhoff PLC's documentation for more information).

To access the G3 web page over EtherCAT™ the following settings must be configured on the Beckhoff PLC (master device) and the PC.

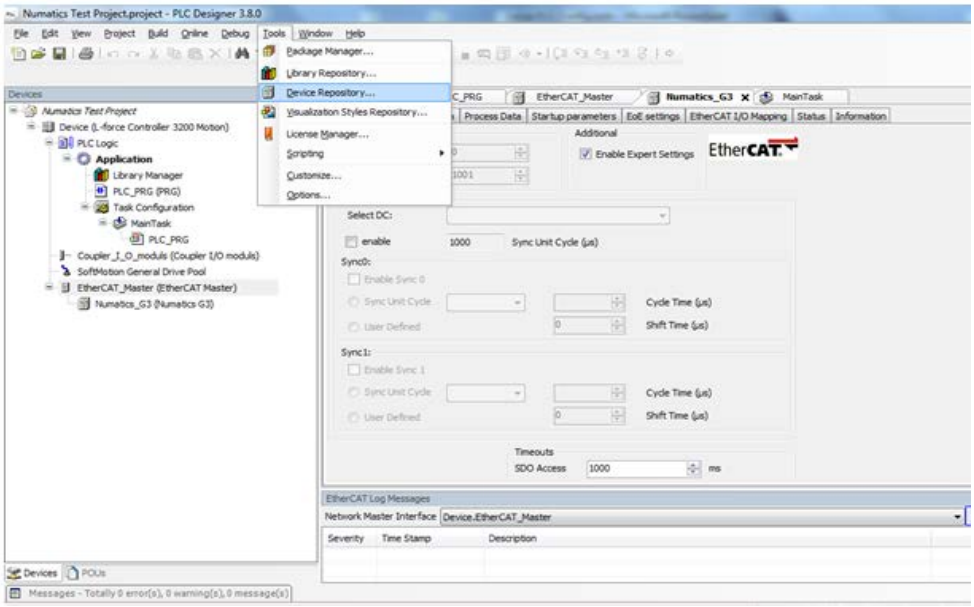
Set the PLC Ethernet communication port and the PC used to access the web page to the same subnet.
Set the Beckhoff PLC's virtual Ethernet port address setting to a different subnet.
Open the Beckhoff PLC's configuration "TCIP settings" select "IP Routing".

- Your PC:
  - IP Address: 192.168.1.10
  - Subnet Mask: 255.255.255.0
- X2 Interface on PLC (as identified by Beckhoff)
  - IP Address: 192.168.1.20 (same subnet as PC)
  - Subnet Mask: 255.255.255.0
- MP1 Interface on PLC (Virtual Ethernet port to access the EtherCAT™ network):
  - IP Address: 192.168.3.20 (different subnet than PC)
  - Subnet Mask: 255.255.255.0
- Numatics "Box" configuration in TwinCAT
  - IP Address: 192.168.3.120 (same subnet as X1/MP1 interface)
  - Subnet Mask: 255.255.255.0
  - Gateway IP: 192.168.3.1 (same address as virtual Ethernet port)
- From a DOS/CMD prompt (run as administrator on Win7) enter the following command:
  - route add 192.168.3.0 mask 255.255.255.0 192.168.1.20 metric 1
    - The first address is the subnet address of the "MP1" and the Numatics "Box".
    - The second address is the IP Address of the "X2" interface.
    - This tells the PC: any packets bound for 192.168.3.XXX should be sent to 192.168.1.20, i.e. to the PLC. The PLC then routes them to the other interface (due to checking of the "IP Routing" check box in the CX Configuration).
    - The command should respond with "Ok"

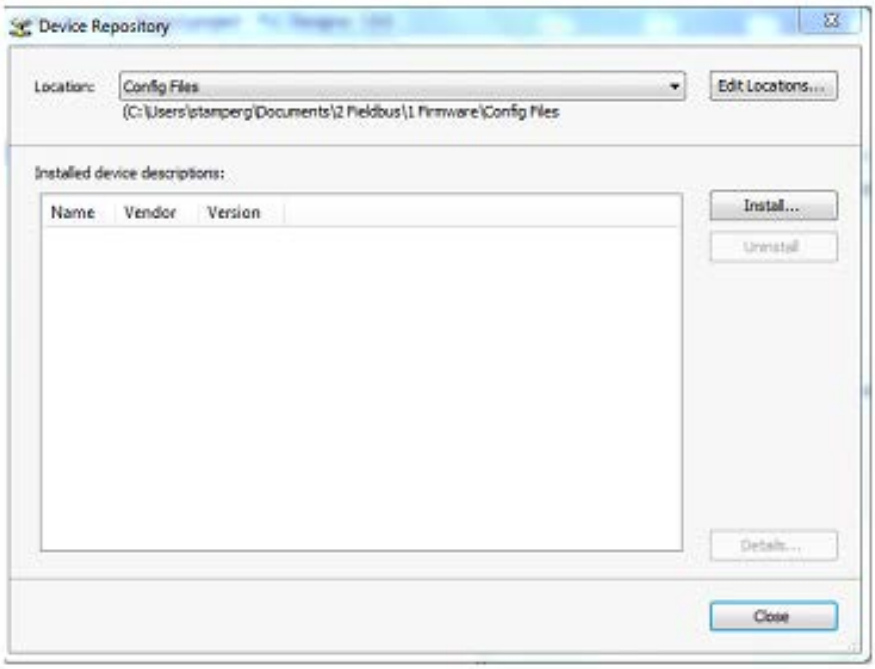
14.5 Create Aventics G3 EtherCAT™ configuration (Lenze PLC)

The following example illustrates the necessary steps to add a Aventics G3 EtherCAT™ Manifold to an existing Lenze PLC configuration. This includes how to install the Aventics EtherCAT™ XML file and how to select the various software components to configure a G3 Manifold (GSD and XML files are available at www.asco.com/g3). The following examples assume an existing configuration based on Lenze PLC Designer V3.8 programming software.

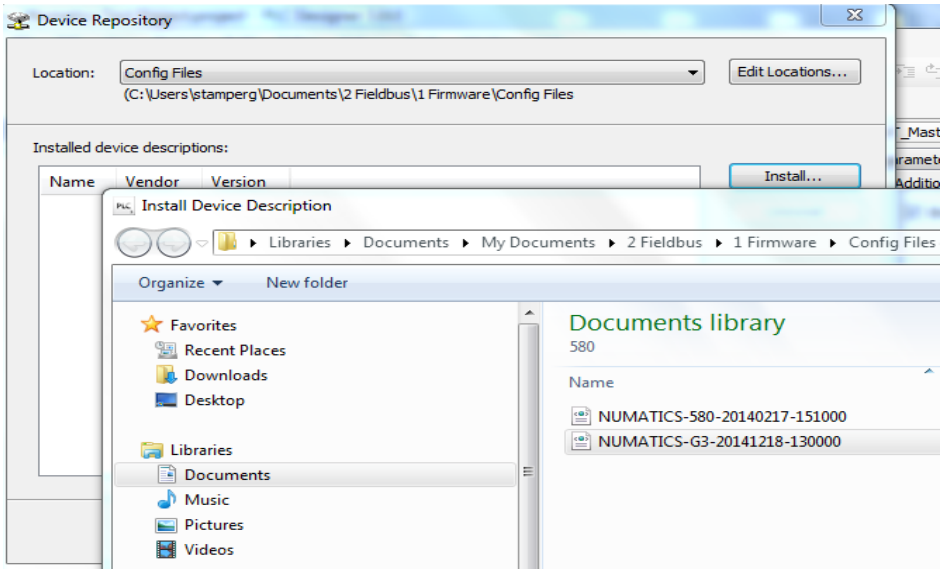
Install the Aventics G3 XML file
Launch PLC Designer V3.8 and
Select Tools from the main menu
Select Device Repository



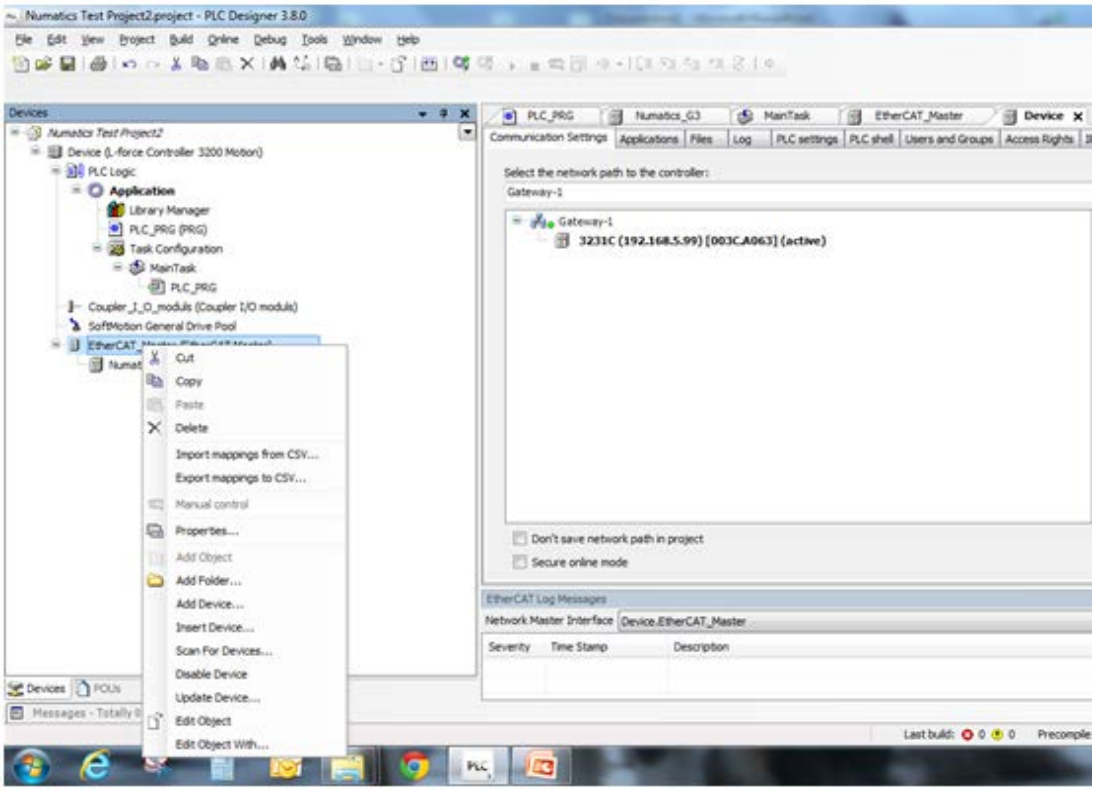
Configure the location of the Aventics G3 XML file
Select Install



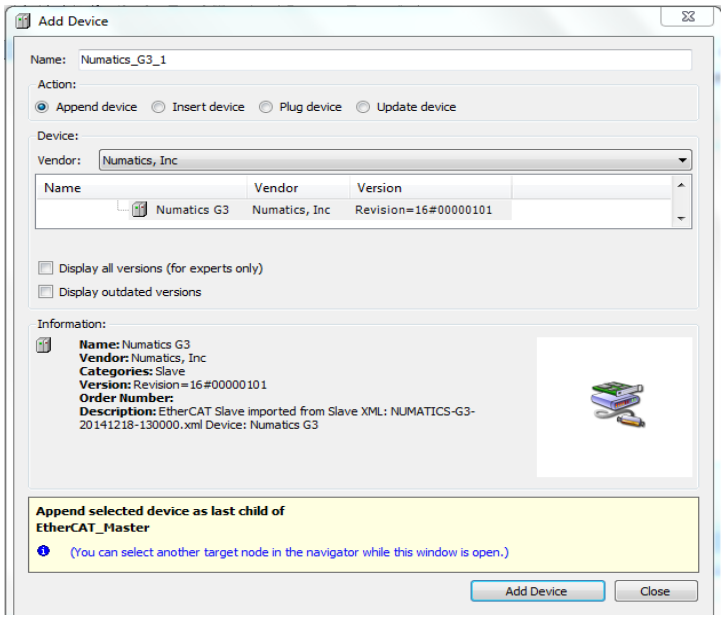
Select the XML file



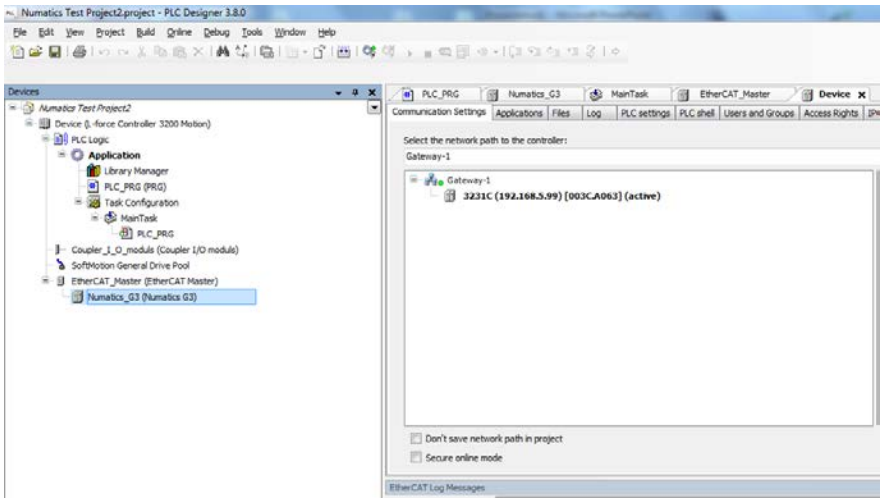
Add the G3 EtherCAT™ node
PLC Designer V3.8
Select the EtherCAT™ Master from the Project Tree
Right Click and Select Add Device



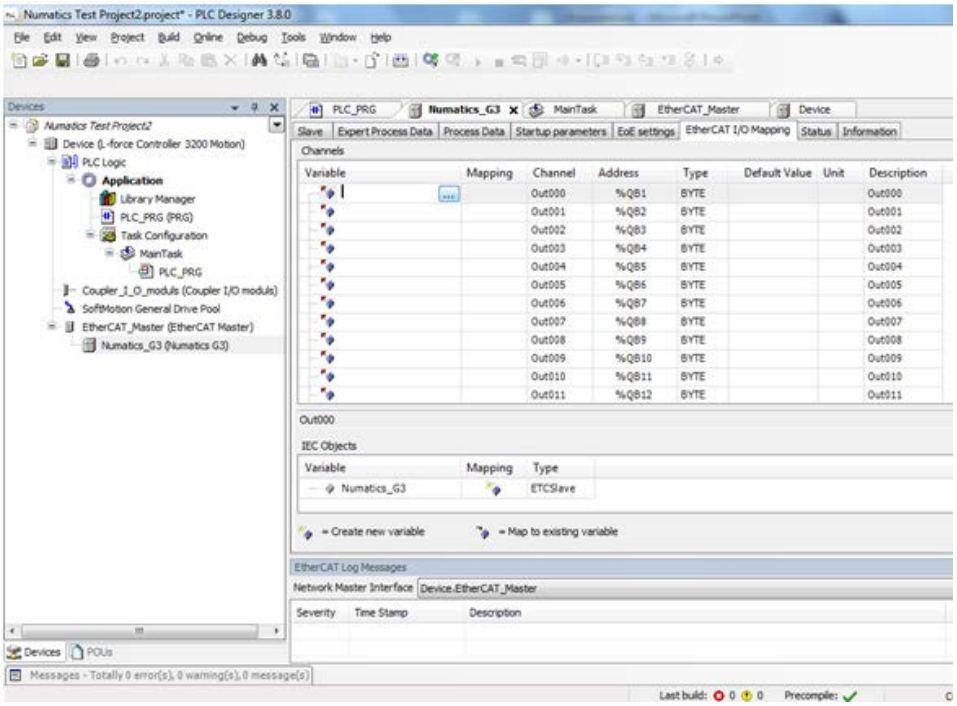
Select the Numatics G3
Select Add Device



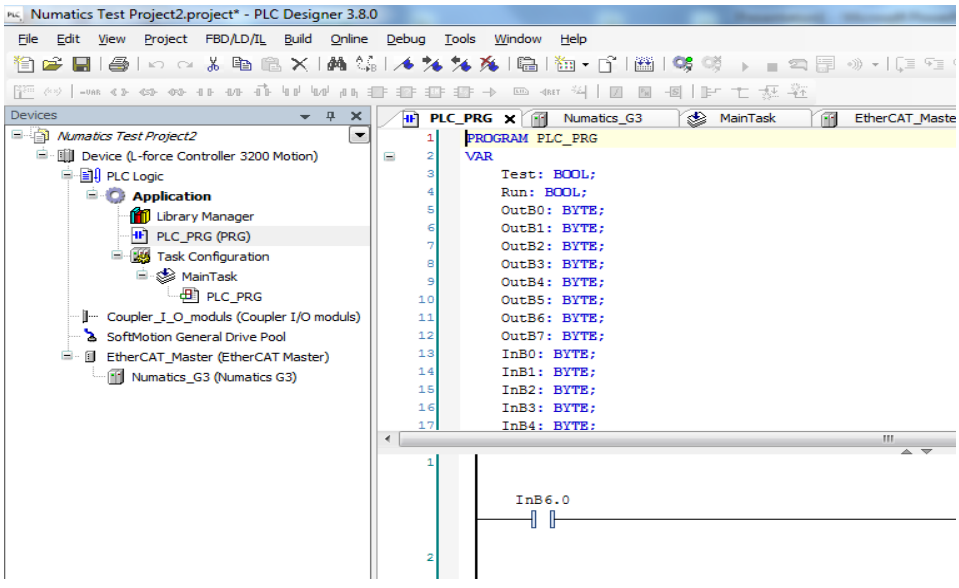
Double Click Numatics G3



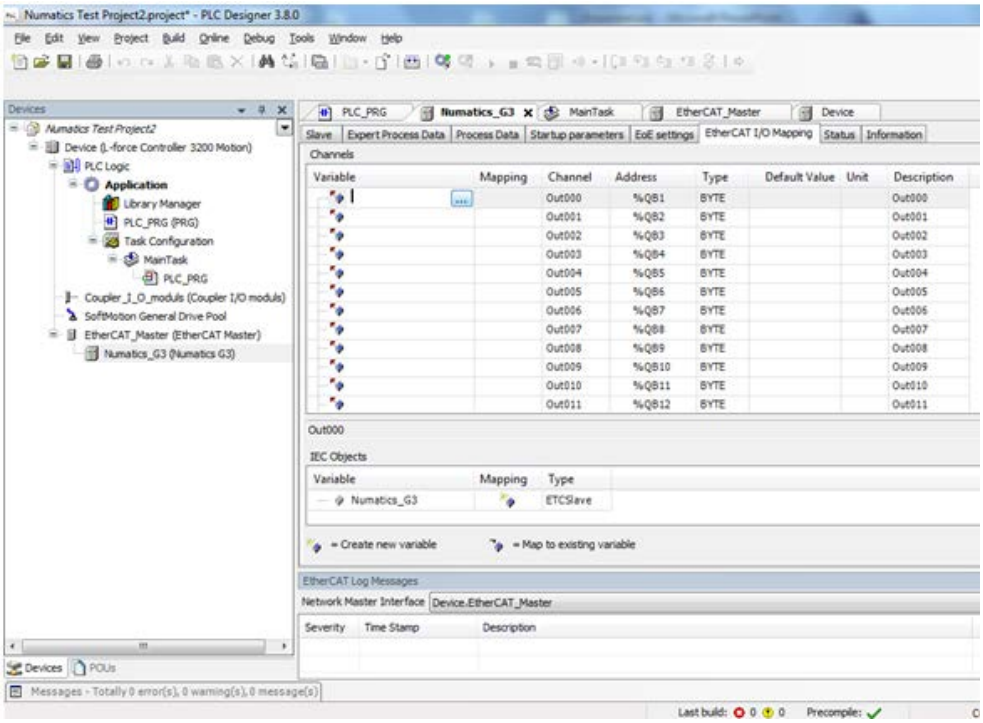
Select the PLC Program Tab



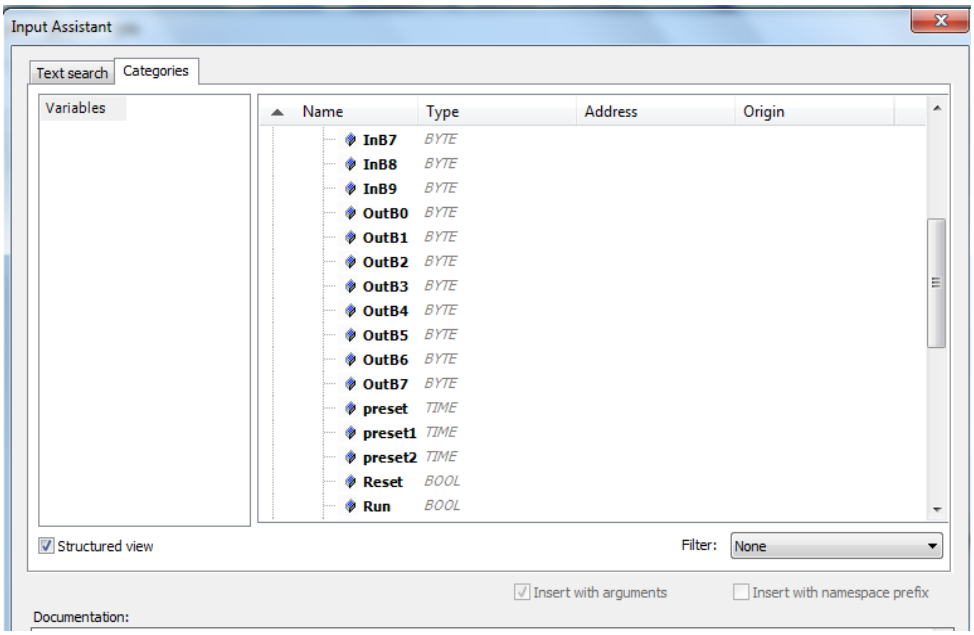
Create the G3 I/O Program (Byte) Variables that will connect to the G3 I/O map
Example Outputs – OutB0, OutB1, OutB2 etc.
Example Inputs – InB0, InB1, InB2 etc.



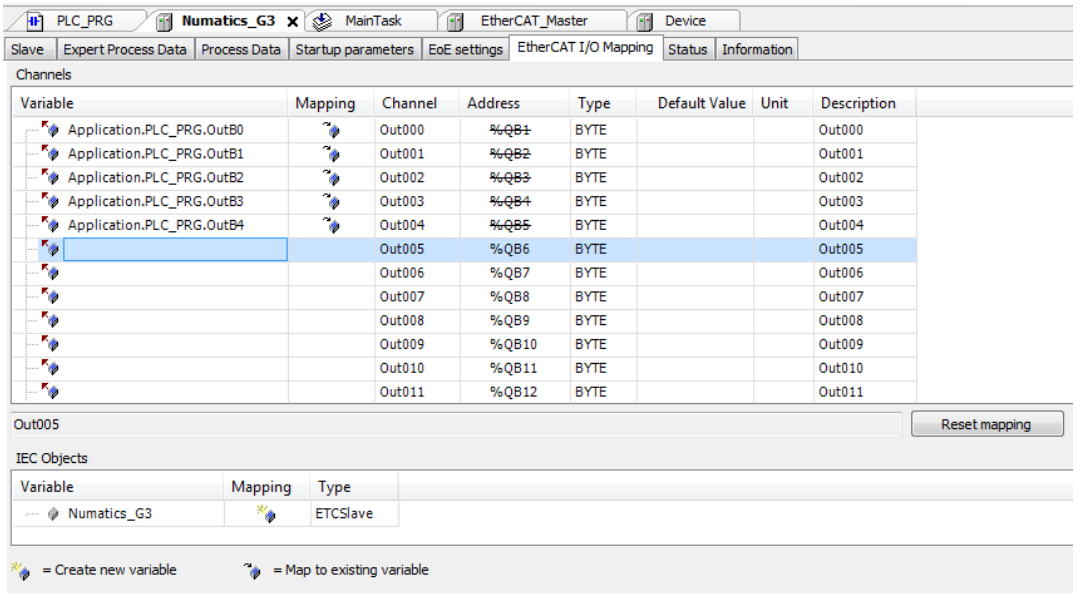
Map the G3 I/O data to program variables
Select the Mapping reference for %QB0 (byte 0 Output data)
Press the Radio button to launch the Input Assistant (PLC variables table)



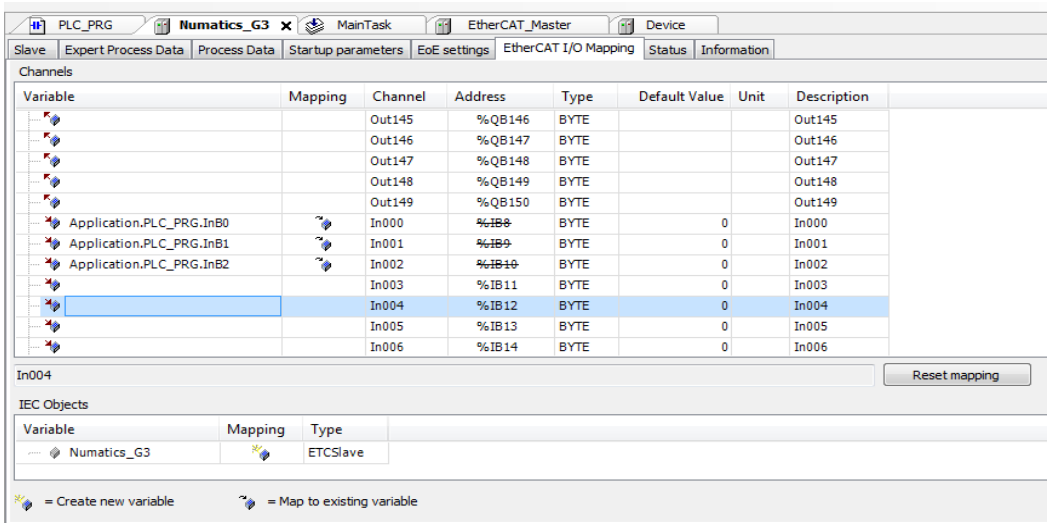
Select the Variable that will reference Byte 0 of G3 Outputs



Complete Mapping all necessary G3 Output Data to PLC variables



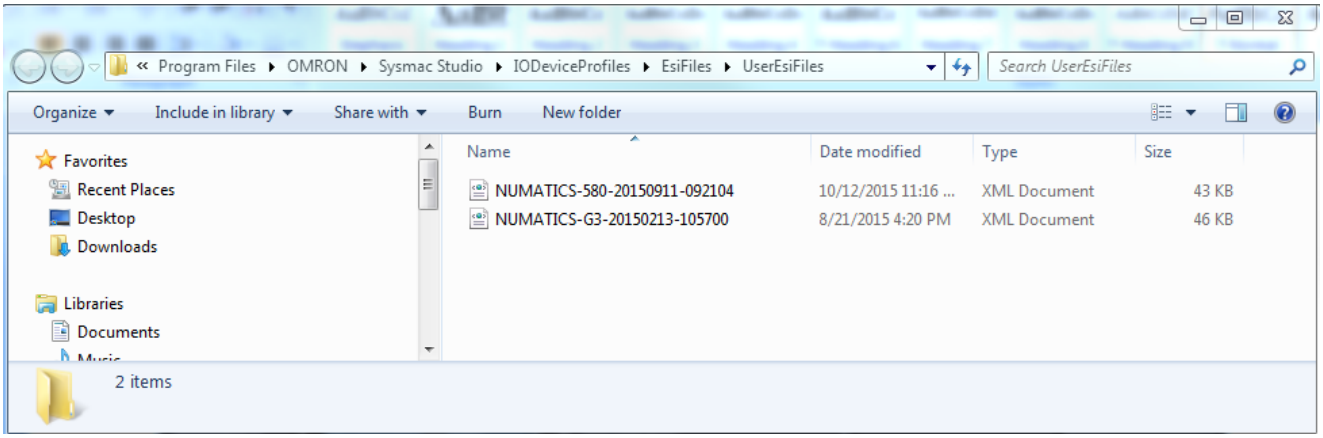
Complete Mapping all necessary G3 Input Data to PLC variables



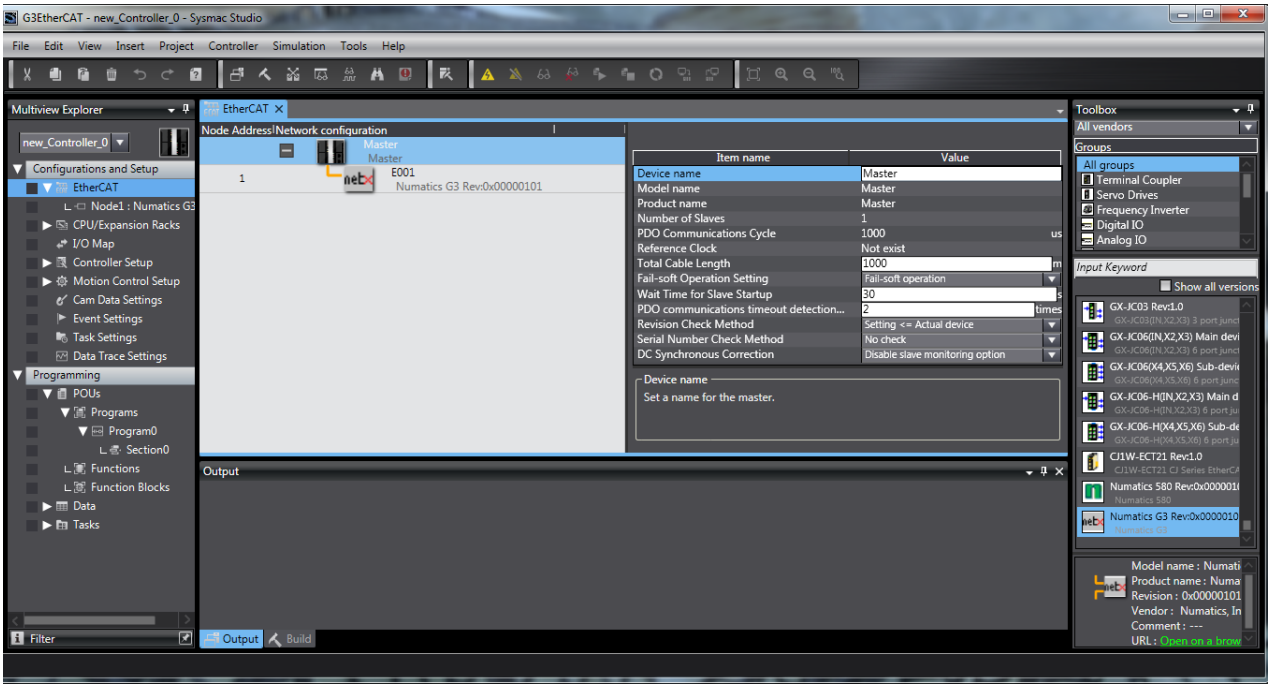
14.7 Create Aventics G3 EtherCAT™ configuration (Omron PLC)

The following example illustrates the necessary steps to add an Aventics G3 EtherCAT™ Manifold to an existing Omron PLC configuration. This includes how to install the Aventics EtherCAT™ XML file and how to select the various software components to configure a G3 Manifold (XML files are available at www.asco.com/g3). The following examples assume an existing configuration based on Omron Sysmac Studio (V 1.13).

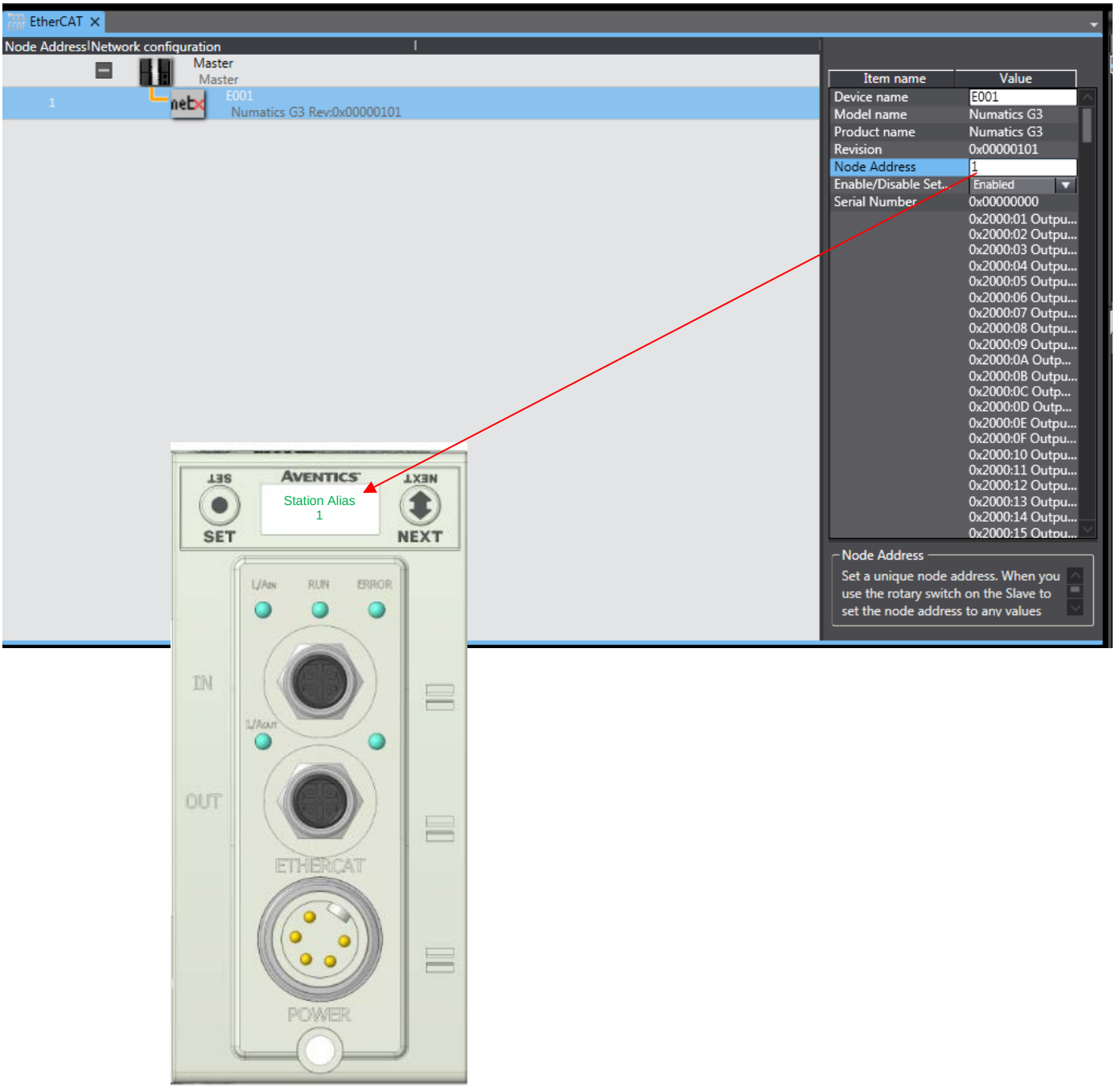
Install the Aventics G3 XML file
Copy the current Aventics XML file into the following Sysmac Studio directory.
Program Files\Omron\Sysmac Studio\IODeviceProfiles\EsiFiles\UserEsiFiles
Launch Sysmac Studio



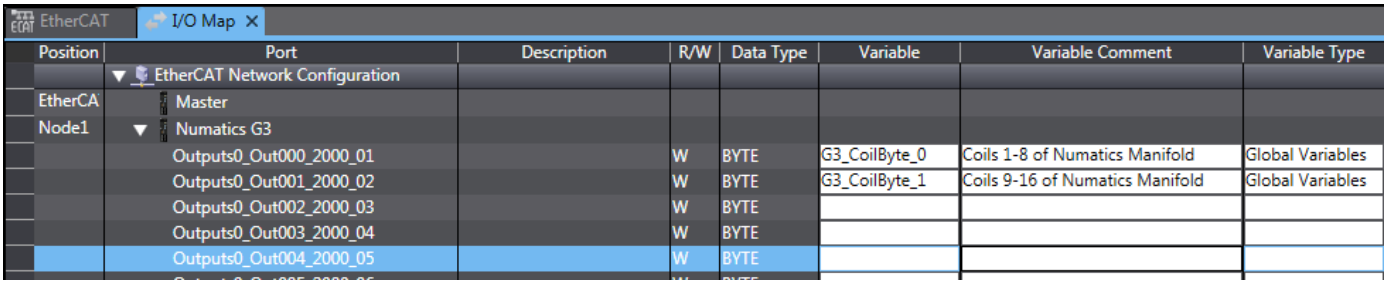
Add the G3 EtherCAT™ node
Open the Sysmac Studio project
Double click EtherCAT™
Scroll through the devices under the toolbox list at the right to find the Numatics G3
Drag the Numatics G3 to the EtherCat™ master



Configure the G3 EtherCat™ Node Address
Set the G3 Station Alias to match the Omron Node Address setting
For more information on setting Station Alias; see page 5-32



Assign Variables to the G3 I/O map data for the PLC program
Build the Controller project and Transfer to controller



15. EtherCAT™ Mapping

15.1 I/O Sizes

Manifold

Outputs

Outputs are defined as any valve solenoid coil and/or any discrete output point from any output module. The output size depends upon the physical configuration of the manifold (i.e. module type and how many are used). Please reference the following pages for a detailed explanation for calculating the output size.

Inputs

Inputs are defined as physical input bits from input modules and status bits (i.e. diagnostic word generated by the node, status input bits produced by output drivers and SCP status bits). Thus, the input size will include physical input points, as well as status input bits. Please reference the following pages for a detailed explanation for calculating the input size.

Valve Side

The size for the “valve side” of the manifold consists of an output bit for each valve solenoid coil driver and an input bit for the corresponding diagnostic status input bit. This value for the valve side size is 4 bytes of inputs and 4 bytes of outputs.

Discrete Side

The discrete side of the manifold is defined as all I/O modules connected to the left of the communication node. This includes physically attached modules as well as any distributed sub-bus modules. I/O sizes for the discrete side are automatically configured based on the I/O module type installed. However, the user can affect these sizes manually via settable parameters on the node. The output value consists of physical outputs (i.e. output bit for each output point). The input value consists of physical inputs (i.e. input bit for each input point) and user settable status input bits for corresponding physical outputs and SCP status bits.

Total I/O Size

The overall size of the I/O data for the manifold will consist of the valve size plus the discrete I/O size and all enabled Diagnostic bits. The I/O size can vary greatly, due to the many physical configuration and user settable parameters combinations. The following worksheet will allow accurate sizing of the I/O data.

15.3 Manifold and I/O Data Sizing Worksheet

1	**: Choose appropriate value and place the corresponding Input and Output values in the boxes labeled, "Valve Byte Requirements" at the bottom of the page**
2	**: Choose up to sixteen modules to be included on the discrete I/O side of the manifold and place sum of the corresponding input bytes and output bytes in the boxes labeled, "Sub-Bus Byte Requirements" at the bottom of the page.**
3	: Total the input bytes and output bytes values from the boxes labeled "Sub-Bus Byte Requirements" and "Valve Byte Requirements" in the boxes labeled "Total Input and Output Bytes for Manifold. This is the total input and output byte values required for the configured manifold.

Valve Side					
Step	*Valve Side*		*Input Bytes*		*Output Bytes*
			Status Enabled	*Status Disabled*	
1	Up to 32 Solenoid Coils		4	0	4

Digital Modules					
Step	*Module No.*	*Description*	*Input Bytes*		*Output Bytes*
			Status Enabled	*Status Disabled*	
2	240-203/204	16 Inputs	3	2	0
	240-205/209	16 Inputs	3	2	0
	240-206/210/379	8 Inputs	2	1	0
	240-207	16 Outputs	2	0	2
	240-208	8 Outputs	1	0	1
	240-211	8 Inputs / 8 Outputs	3	1	1
	240-241	Sub – Bus Valve Output	4	0	4
	240-300	High Current 8 Outputs	1	0	1

Analog Modules					
Step	*Module No.*	*Description*	*Input Bytes*		*Output Bytes*
			Status Enabled	*Status Disabled*	
2	240-212/214	4 Inputs	10	8	0
	240-213/215/307	2 Inputs/ 2 Outputs	6	4	4

Total Input/Output Size Calculation				
Step	*Module Position*	*Model Number*	*Input Bytes*	*Output Bytes*
2	1st			
	2nd			
	3rd			
	4th			
	5th			
	6th			
	7th			
	8th			
	9th			
	10th			
	11th			
	12th			
	13th			
	14th			
	15th			
	16th			
	Sub-Bus Byte Requirements:			
	Optional Diagnostic Word:		2	0
1	Valve Byte Requirements:			
3	Total Input and Output Bytes for Manifold			

15.4 Bit Mapping Rules

The bit mapping for a G3 manifold varies with the physical configuration of the manifold. The following is a breakdown of the bit mapping rules associated with the Aventics valve manifold.

Valve Side

1) Solenoid coil outputs are connected to the valve coils using the Z-Boards™.

2) The valve solenoid coil output portion of the total output size is fixed at 4 bytes.

3) Solenoid coil output addressing begins at the 1st manifold station nearest the node using "14" coil 1st and then, if applicable, the "12" coil, and continues in ascending order away from the communication node.

4) Each manifold station allocates 1 or 2 output bits. This is dependent on the Z-Board™ type installed. A single Z-Board™ allocates 1 output bit. A double Z-Board™ allocates 2 output bits.

5) Z-Boards™ can be used in any arrangement (all singles, all doubles, or any combination) as long as output group No.1 and output group No. 2 bits do not overlap (i.e. combinations of Z-Boards™ could exist where the physical configuration of the manifold could exceed the output capacity.

Single solenoid valves can be used with double Z-Boards™. However, one of the two available outputs will remain unused.

Discrete I/O Side

Outputs

1) The Sub-Bus output byte size portion is self-configuring in byte increments, after an output module is installed on the Sub-Bus and power is applied.

2) Outputs are mapped consecutively by module. The output bits from the 1st module will be mapped directly after the bits from the valve coils. The output bits from the second module will be mapped directly after the output bits from the 1st module and so on.

Inputs

1) The Sub-Bus input byte size portion is self-configuring in byte increments, after an input module is plugged into back plane and power is applied.

2) Inputs are mapped consecutively by module. The input bits from the 1st module will be mapped directly after the status bits from the valve side. The input bits from the second module will be mapped directly after the input bits from the 1st module and so on.

3) All of the modules have associated internal status bits, which will affect the total value of input bytes.

4) When a module has discrete and status inputs, the status bits are mapped after the discrete input bits.

I/O Mapping Examples

Assumed Settings

Example No. 1

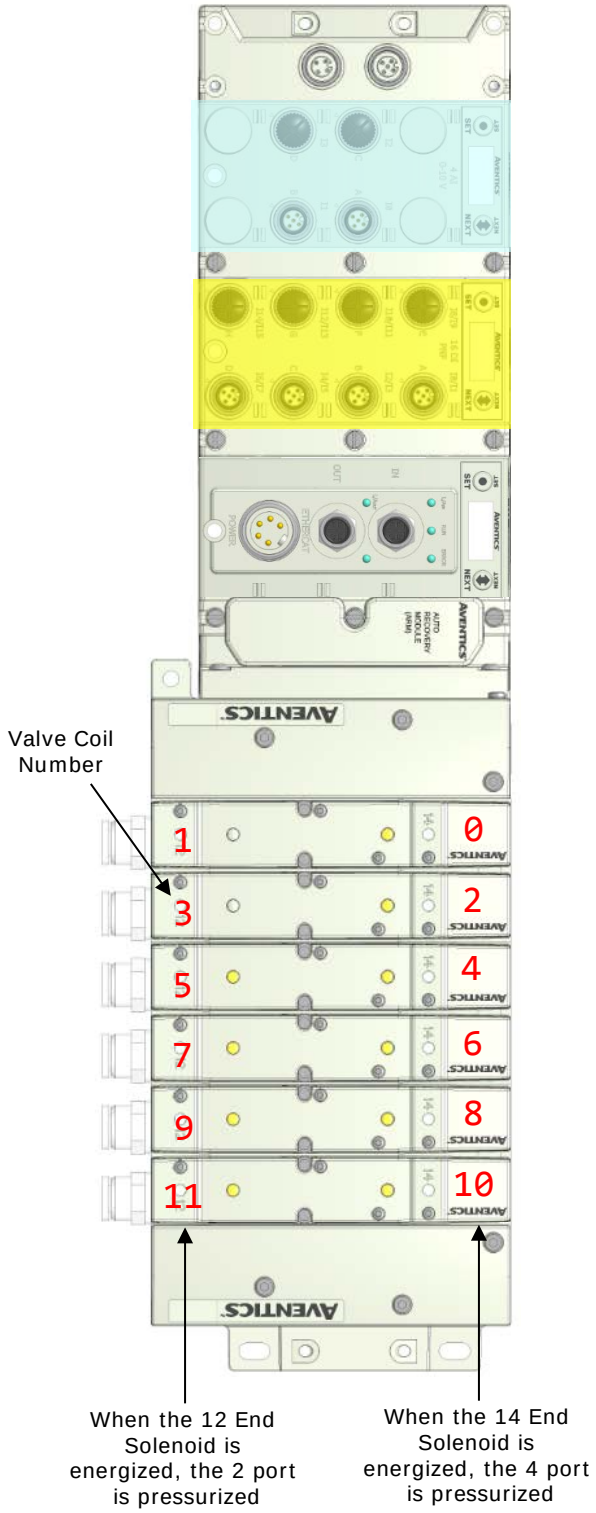
a. Double Z-Boards™ used with all valves
b. I/O Modules and mapping schemes are identified by their corresponding color.
c. I/O Status bits are enabled
d. Diagnostic Word is enabled

Manifold I/O Configuration

Pos No.	Module Type	Part No.	In Bytes	Out Bytes
1	16I PNP	240-205	3	0
2	4AI Analog	240-212	10	0
	Diagnostic Word		2	0
	Local Valve Size		4	4
		Total:	19	4

How to Order

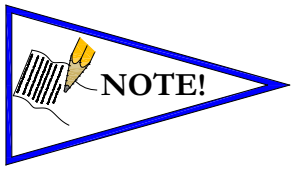
Qty	Part Number
1	8502AV3F300VA00
2	R502A1B10MA00F1
1	K502AMM22MA0010
1	R502A1B10MA00F1
1	R502A1B40MA00F1
1	K502AMM22MA0010
2	R502A1B40MA00F1
1	K502AMM22MA0010
1	G3EC102R0E44
1	240-205
1	240-212
	ASSEMBLED



Example No. 1 Table

Output Table								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Valve Coil No. 7	Valve Coil No. 6	Valve Coil No. 5	Valve Coil No. 4	Valve Coil No. 3	Valve Coil No. 2	Valve Coil No. 1	Valve Coil No. 0
1	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Valve Coil No. 11	Valve Coil No. 10	Valve Coil No. 9	Valve Coil No. 8
2	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved
3	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved

Input Table								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0 (Optional)	Comm. Module Diagnostic Bit	Comm. Module Diagnostic Bit	Comm. Module Diagnostic Bit	Comm. Module Diagnostic Bit	Comm. Module Diagnostic Bit	Comm. Module Diagnostic Bit	Comm. Module Diagnostic Bit	Comm. Module Diagnostic Bit
1 (Optional)	Sub-bus Diagnostic Bit	Sub-bus Diagnostic Bit	Sub-bus Diagnostic Bit	Sub-bus Diagnostic Bit	Sub-bus Diagnostic Bit	Sub-bus Diagnostic Bit	Sub-bus Diagnostic Bit	Sub-bus Diagnostic Bit
2 (Optional)	Coil No. 7 Status	Coil No. 6 Status	Coil No. 5 Status	Coil No. 4 Status	Coil No. 3 Status	Coil No. 2 Status	Coil No. 1 Status	Coil No. 0 Status
3 (Optional)	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Coil No. 11 Status	Coil No. 10 Status	Coil No. 9 Status	Coil No. 8 Status
4 (Optional)	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved
5 (Optional)	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved
6	Discrete Input No. 7	Discrete Input No. 6	Discrete Input No. 5	Discrete Input No. 4	Discrete Input No. 3	Discrete Input No. 2	Discrete Input No. 1	Discrete Input No. 0
7	Discrete Input No. 15	Discrete Input No. 14	Discrete Input No. 13	Discrete Input No. 12	Discrete Input No. 11	Discrete Input No. 10	Discrete Input No. 9	Discrete Input No. 8
8 (Optional)	Power Status for Conn. H	Power Status for Conn. G	Power Status for Conn. F	Power Status for Conn. E	Power Status for Conn. D	Power Status for Conn. C	Power Status for Conn. B	Power Status for Conn. A
9	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1 (LSB)
10	Analog Input No. 1 (MSB)	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1
11	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2 (LSB)
12	Analog Input No. 2 (MSB)	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2
13	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3 (LSB)
14	Analog Input No. 3 (MSB)	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3
15	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4 (LSB)
16	Analog Input No.4 (MSB)	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4
17 (Optional)	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Power Status for Conn. D	Power Status for Conn. C	Power Status for Conn. B	Power Status for Conn. A
18 (Optional)	High Alarm for Conn. D	Low Alarm for Conn. D	High Alarm for Conn. C	Low Alarm for Conn. C	High Alarm for Conn. B	Low Alarm for Conn. B	High Alarm for Conn. A	Low Alarm for Conn. A



- *The Comm. Module Diagnostic Bits, Sub-Bus Diagnostic Bits, Coil Status Bits and Power Status Bits are optional. The factory default condition is Diagnostic bits enabled. These bits may be disabled to optimize the logical size of the manifold.*

Assumed Settings

Example No. 2

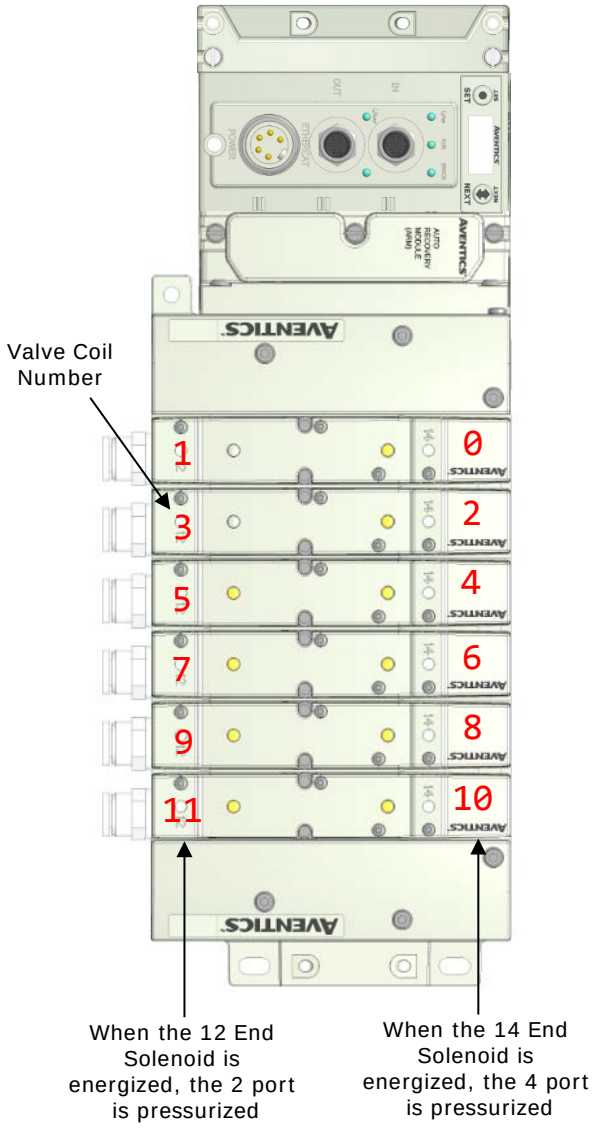
a. Double Z-Boards™ used with all valves
b. I/O Modules and mapping schemes are identified by their corresponding color.
c. I/O Status bits are enabled
d. Diagnostic Word is enabled

Manifold I/O Configuration

Pos. No.	Module Type	Part No.	In	Out
			Bytes	
		Diagnostic Word	2	0
		Local Valve Size:	4	4
		Total:	6	4

How to Order

Qty	Part Number
1	8502AV3F300VA00
2	R502A1B10MA00F1
1	K502AMM22MA0010
1	R502A1B10MA00F1
1	R502A1B40MA00F1
1	K502AMM22MA0010
2	R502A1B40MA00F1
1	K502AMM22MA0010
1	G3EC100R0E44
	ASSEMBLED



Example No. 2 Table

Output Table								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Valve Coil No. 7	Valve Coil No. 6	Valve Coil No. 5	Valve Coil No. 4	Valve Coil No. 3	Valve Coil No. 2	Valve Coil No. 1	Valve Coil No. 0
1	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Valve Coil No. 11	Valve Coil No. 10	Valve Coil No. 9	Valve Coil No. 8
2	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved
3	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved

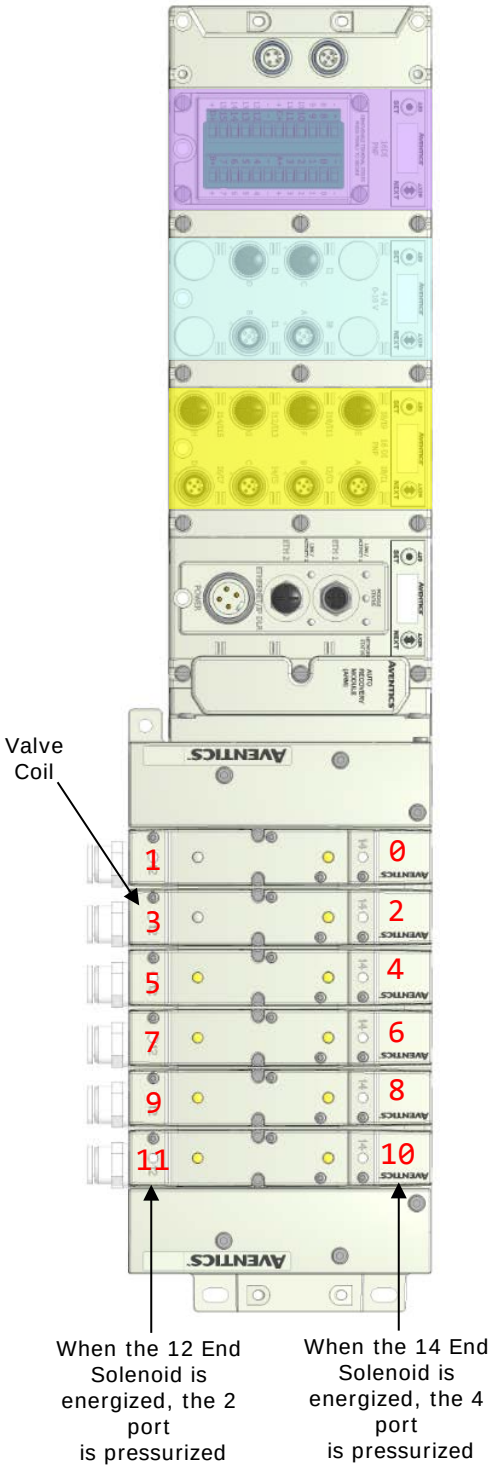
Input Table								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0 (Optional)	Comm. Module Diagnostic Bit	Comm. Module Diagnostic Bit	Comm. Module Diagnostic Bit	Comm. Module Diagnostic Bit	Comm. Module Diagnostic Bit	Comm. Module Diagnostic Bit	Comm. Module Diagnostic Bit	Comm. Module Diagnostic Bit
1 (Optional)	Sub-bus Diagnostic Bit	Sub-bus Diagnostic Bit	Sub-bus Diagnostic Bit	Sub-bus Diagnostic Bit	Sub-bus Diagnostic Bit	Sub-bus Diagnostic Bit	Sub-bus Diagnostic Bit	Sub-bus Diagnostic Bit
2 (Optional)	Coil No. 7 Status	Coil No. 6 Status	Coil No. 5 Status	Coil No. 4 Status	Coil No. 3 Status	Coil No. 2 Status	Coil No. 1 Status	Coil No. 0 Status
3 (Optional)	Coil No. 15 Status	Coil No. 14 Status	Coil No. 13 Status	Coil No. 12 Status	Coil No. 11 Status	Coil No. 10 Status	Coil No. 9 Status	Coil No. 8 Status
4 (Optional)	Coil No. 23 Status	Coil No. 22 Status	Coil No. 21 Status	Coil No. 20 Status	Coil No. 19 Status	Coil No. 18 Status	Coil No. 17 Status	Coil No. 16 Status
5 (Optional)	Coil No. 31 Status	Coil No. 30 Status	Coil No. 29 Status	Coil No. 28 Status	Coil No. 27 Status	Coil No. 26 Status	Coil No. 25 Status	Coil No. 24 Status

- *The Comm. Module Diagnostic Bits, Sub-Bus Diagnostic Bits, Coil Status Bits and Power Status Bits are optional. The factory default condition is Diagnostic bits are enabled. These bits may be disabled to optimize the logical size of the manifold*

Assumed Settings

Example No. 3

a. Double Z-Boards™ used with all valves
b. I/O Modules and mapping schemes are identified by their corresponding color.
c. I/O Status bits are enabled
d. Diagnostic Word is enabled



Manifold I/O Configuration

Pos No.	Module Type	Part No.	In	Out
			Bytes	
1	16I PNP	240-205	3	0
2	4AI Analog	240-212	10	0
3	16I PNP	240-203	3	0
		Diagnostic Word	2	0
		Local Valves:	4	4
		Total:	22	4

How to Order

Qty	Part Number
1	8503AV3F300VA00
2	R502A1B10MA00F1
1	K502AMM22MA0010
1	R502A1B10MA00F1
1	R502A1B40MA00F1
1	K502AMM22MA0010
2	R502A1B40MA00F1
1	K502AMM22MA0010
1	G3EC103D0E44
1	240-205
1	240-212
1	240-203
	ASSEMBLED

Example No. 3 Table

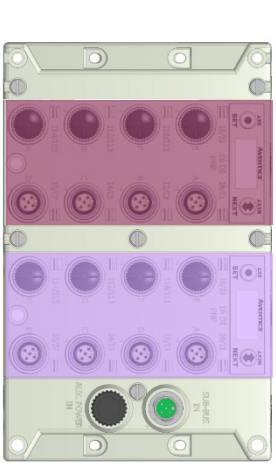
Output Table								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Valve Coil No. 7	Valve Coil No. 6	Valve Coil No. 5	Valve Coil No. 4	Valve Coil No. 3	Valve Coil No. 2	Valve Coil No. 1	Valve Coil No. 0
1	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Valve Coil No. 11	Valve Coil No. 10	Valve Coil No. 9	Valve Coil No. 8
2	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved
3	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved

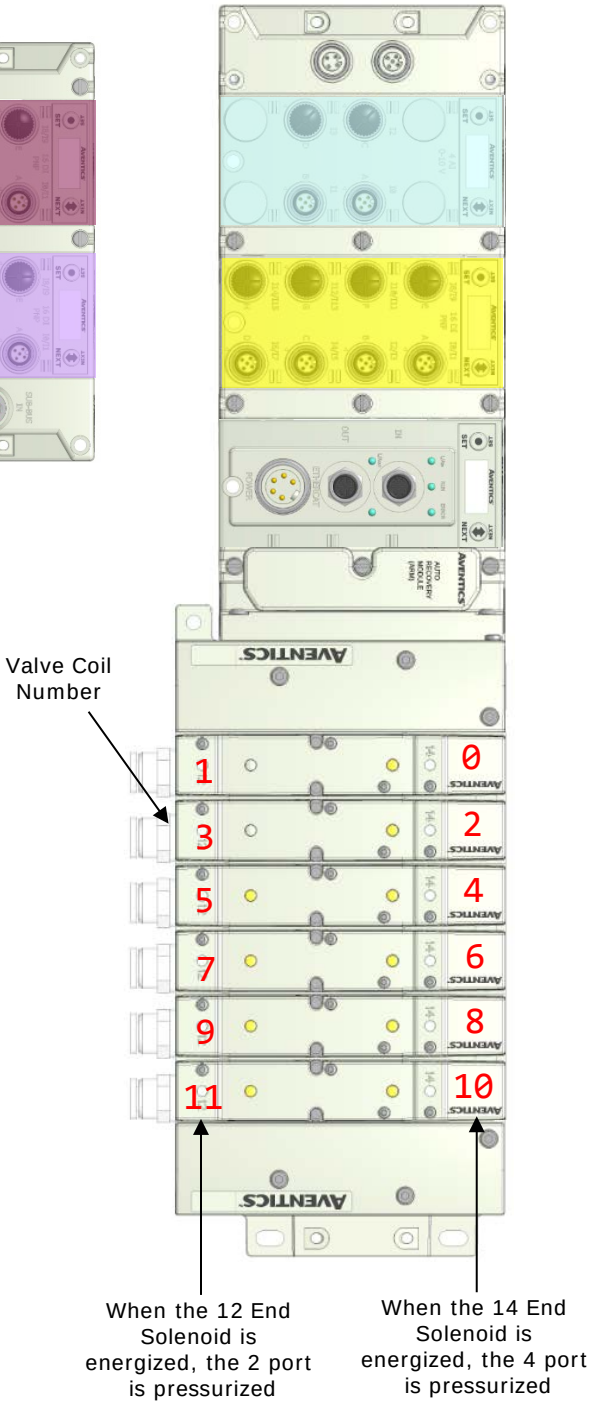
Input Table								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0 (Optional)	Comm. Module Diagnostic Bit	Comm. Module Diagnostic Bit	Comm. Module Diagnostic Bit	Comm. Module Diagnostic Bit	Comm. Module Diagnostic Bit	Comm. Module Diagnostic Bit	Comm. Module Diagnostic Bit	Comm. Module Diagnostic Bit
1 (Optional)	Sub-bus Diagnostic Bit	Sub-bus Diagnostic Bit	Sub-bus Diagnostic Bit	Sub-bus Diagnostic Bit	Sub-bus Diagnostic Bit	Sub-bus Diagnostic Bit	Sub-bus Diagnostic Bit	Sub-bus Diagnostic Bit
2 (Optional)	Coil No. 7 Status	Coil No. 6 Status	Coil No. 5 Status	Coil No. 4 Status	Coil No. 3 Status	Coil No. 2 Status	Coil No. 1 Status	Coil No. 0 Status
3 (Optional)	Coil No. 15 Status	Coil No. 14 Status	Coil No. 13 Status	Coil No. 12 Status	Coil No. 11 Status	Coil No. 10 Status	Coil No. 9 Status	Coil No. 8 Status
4 (Optional)	Coil No. 23 Status	Coil No. 22 Status	Coil No. 21 Status	Coil No. 20 Status	Coil No. 19 Status	Coil No. 18 Status	Coil No. 17 Status	Coil No. 16 Status
5 (Optional)	Coil No. 31 Status	Coil No. 30 Status	Coil No. 29 Status	Coil No. 28 Status	Coil No. 27 Status	Coil No. 26 Status	Coil No. 25 Status	Coil No. 24 Status
6	Discrete Input No. 7	Discrete Input No. 6	Discrete Input No. 5	Discrete Input No. 4	Discrete Input No. 3	Discrete Input No. 2	Discrete Input No. 1	Discrete Input No. 0
7	Discrete Input No. 15	Discrete Input No. 14	Discrete Input No. 13	Discrete Input No. 12	Discrete Input No. 11	Discrete Input No. 10	Discrete Input No. 9	Discrete Input No. 8
8 (Optional)	Power Status for Conn. H	Power Status for Conn. G	Power Status for Conn. F	Power Status for Conn. E	Power Status for Conn. D	Power Status for Conn. C	Power Status for Conn. B	Power Status for Conn. A
9	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1 (LSB)
10	Analog Input No. 1 (MSB)	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1
11	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2 (LSB)
12	Analog Input No. 2 (MSB)	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2
13	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3 (LSB)
14	Analog Input No. 3 (MSB)	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3
15	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4 (LSB)
16	Analog Input No.4 (MSB)	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4
17 (Optional)	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Power Status for Conn. D	Power Status for Conn. C	Power Status for Conn. B	Power Status for Conn. A
18 (Optional)	High Alarm for Conn. D	Low Alarm for Conn. D	High Alarm for Conn. C	Low Alarm for Conn. C	High Alarm for Conn. B	Low Alarm for Conn. B	High Alarm for Conn. A	Low Alarm for Conn. A
19	Discrete Input No. 7	Discrete Input No. 6	Discrete Input No. 5	Discrete Input No. 4	Discrete Input No. 3	Discrete Input No. 2	Discrete Input No. 1	Discrete Input No. 0
20	Discrete Input No. 15	Discrete Input No. 14	Discrete Input No. 13	Discrete Input No. 12	Discrete Input No. 11	Discrete Input No. 10	Discrete Input No. 9	Discrete Input No. 8
21 (Optional)	Power Status for Conn. H	Power Status for Conn. G	Power Status for Conn. F	Power Status for Conn. E	Power Status for Conn. D	Power Status for Conn. C	Power Status for Conn. B	Power Status for Conn. A

Assumed Settings

Example No. 4

a. Double Z-Boards™ used with all valves
b. I/O Modules and mapping schemes are identified by their corresponding color.
c. I/O Status bits are enabled
d. Diagnostic Word is enabled





Manifold I/O Configuration

Pos No.	Module Type	Part No.	In	Out
			Bytes	
1	16I PNP	240-205	3	0
2	4I Analog	240-212	10	0
3	16I PNP	240-205	3	0
4	16I PNP	240-205	3	0
	Diagnostic Word		2	0
	Local Valves:		4	4
	Total:		18	4

How to Order

Qty	Part Number
1	8503AV3F300VA00
2	R501A1B10MA00F1
1	K502AMM22MA0010
1	R501A1B10MA00F1
1	R501A1B40MA00F1
1	K502AMM22MA0010
2	R501A1B40MA00F1
1	K502AMM22MA0010
1	G3EP102D0E44
1	240-205
1	240-212
	ASSEMBLED

1	G3DS302R0STD
1	240-205
1	240-205
	ASSEMBLED

Example No. 4 Table

Output Table								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Valve Coil No. 7	Valve Coil No. 6	Valve Coil No. 5	Valve Coil No. 4	Valve Coil No. 3	Valve Coil No. 2	Valve Coil No. 1	Valve Coil No. 0
1	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Valve Coil No. 11	Valve Coil No. 10	Valve Coil No. 9	Valve Coil No. 8
2	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved
3	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved

Input Table								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0 (Optional)	Comm. Module Diagnostic Bit	Comm. Module Diagnostic Bit	Comm. Module Diagnostic Bit	Comm. Module Diagnostic Bit	Comm. Module Diagnostic Bit	Comm. Module Diagnostic Bit	Comm. Module Diagnostic Bit	Comm. Module Diagnostic Bit
1 (Optional)	Sub-bus Diagnostic Bit	Sub-bus Diagnostic Bit	Sub-bus Diagnostic Bit	Sub-bus Diagnostic Bit	Sub-bus Diagnostic Bit	Sub-bus Diagnostic Bit	Sub-bus Diagnostic Bit	Sub-bus Diagnostic Bit
2 (Optional)	Coil No. 7 Status	Coil No. 6 Status	Coil No. 5 Status	Coil No. 4 Status	Coil No. 3 Status	Coil No. 2 Status	Coil No. 1 Status	Coil No. 0 Status
3 (Optional)	Coil No. 15 Status	Coil No. 14 Status	Coil No. 13 Status	Coil No. 12 Status	Coil No. 11 Status	Coil No. 10 Status	Coil No. 9 Status	Coil No. 8 Status
4 (Optional)	Coil No. 23 Status	Coil No. 22 Status	Coil No. 21 Status	Coil No. 20 Status	Coil No. 19 Status	Coil No. 18 Status	Coil No. 17 Status	Coil No. 16 Status
5 (Optional)	Coil No. 31 Status	Coil No. 30 Status	Coil No. 29 Status	Coil No. 28 Status	Coil No. 27 Status	Coil No. 26 Status	Coil No. 25 Status	Coil No. 24 Status
6	Discrete Input No. 7	Discrete Input No. 6	Discrete Input No. 5	Discrete Input No. 4	Discrete Input No. 3	Discrete Input No. 2	Discrete Input No. 1	Discrete Input No. 0
7	Discrete Input No. 15	Discrete Input No. 14	Discrete Input No. 13	Discrete Input No. 12	Discrete Input No. 11	Discrete Input No. 10	Discrete Input No. 9	Discrete Input No. 8
8 (Optional)	Power Status for Conn. H	Power Status for Conn. G	Power Status for Conn. F	Power Status for Conn. E	Power Status for Conn. D	Power Status for Conn. C	Power Status for Conn. B	Power Status for Conn. A
9	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1 (LSB)
10	Analog Input No. 1 (MSB)	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1	Analog Input No. 1
11	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2 (LSB)
12	Analog Input No. 2 (MSB)	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2	Analog Input No. 2
13	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3 (LSB)
14	Analog Input No. 3 (MSB)	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3	Analog Input No. 3
15	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4 (LSB)
16	Analog Input No.4 (MSB)	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4	Analog Input No. 4
17 (Optional)	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Power Status for Conn. D	Power Status for Conn. C	Power Status for Conn. B	Power Status for Conn. A
18 (Optional)	High Alarm for Conn. D	Low Alarm for Conn. D	High Alarm for Conn. C	Low Alarm for Conn. C	High Alarm for Conn. B	Low Alarm for Conn. B	High Alarm for Conn. A	Low Alarm for Conn. A
19	Discrete Input No. 7	Discrete Input No. 6	Discrete Input No. 5	Discrete Input No. 4	Discrete Input No. 3	Discrete Input No. 2	Discrete Input No. 1	Discrete Input No. 0
20	Discrete Input No. 15	Discrete Input No. 14	Discrete Input No. 13	Discrete Input No. 12	Discrete Input No. 11	Discrete Input No. 10	Discrete Input No. 9	Discrete Input No. 8
21 (Optional)	Power Status for Conn. H	Power Status for Conn. G	Power Status for Conn. F	Power Status for Conn. E	Power Status for Conn. D	Power Status for Conn. C	Power Status for Conn. B	Power Status for Conn. A
22	Discrete Input No. 7	Discrete Input No. 6	Discrete Input No. 5	Discrete Input No. 4	Discrete Input No. 3	Discrete Input No. 2	Discrete Input No. 1	Discrete Input No. 0
23	Discrete Input No. 15	Discrete Input No. 14	Discrete Input No. 13	Discrete Input No. 12	Discrete Input No. 11	Discrete Input No. 10	Discrete Input No. 9	Discrete Input No. 8
24 (Optional)	Power Status for Conn. H	Power Status for Conn. G	Power Status for Conn. F	Power Status for Conn. E	Power Status for Conn. D	Power Status for Conn. C	Power Status for Conn. B	Power Status for Conn. A

15.5 I/O Mapped Diagnostic Word

Diagnostic Word Format								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0 (Comm. Status)	Reserved	Reserved	Reserved	Reserved	Sub-Bus Short Circuit (1 = Error)	Sub-Bus Error (1=Error)	Un-Switched Power Status (1=Error)	Switched Power Status (1=Error)
1 (Sub-Bus Status)	Error Code	Error Code	Error Code	Module Address	Module Address	Module Address	Module Address	Module Address

Byte 0 (Communication Status)

Byte 0, Bit 0 Switched Power Status = Bit is high when valve / output power is not present on the comm. module.

Byte 0, Bit 1 Un-switched Power Status = Bit is high when node / input power is below 19VDC

Byte 0, Bit 2 Sub-Bus Error = Bit is high when there is an error on the sub-bus; see “Byte 1” of the diagnostic word for description.

Byte 0, Bit 3 Sub-Bus Short Circuit = A short circuit has been detected across the Sub-Bus

I/O Mapped Diagnostic Word Continued

Byte 1 (Sub-Bus Status)

Module Address

Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Description
0	0	0	0	0	No error
0	0	0	0	1	Communication Module
0	0	0	1	0	I/O module No. 1
0	0	0	1	1	I/O module No. 2
0	0	1	0	0	I/O module No. 3
0	0	1	0	1	I/O module No. 4
0	0	1	1	0	I/O module No. 5
0	0	1	1	1	I/O module No. 6
0	1	0	0	0	I/O module No. 7
0	1	0	0	1	I/O module No. 8
0	1	0	1	0	I/O module No. 9
0	1	0	1	1	I/O module No. 10
0	1	1	0	0	I/O module No. 11
0	1	1	0	1	I/O module No. 12
0	1	1	1	0	I/O module No. 13
0	1	1	1	1	I/O module No. 14
1	0	0	0	0	I/O module No. 15
1	0	0	0	1	I/O module No. 16
1	0	0	1	1	Communication Valve driver
1	0	1	0	0	ARM
X	X	X	X	X	N/A

Sub-Bus Errors

Error Code	Bit 7	Bit 6	Bit 5
0	0	0	0
1	0	0	1
2	0	1	0
3	0	1	1
4	1	0	0
5	1	0	1
6	1	1	0
7	1	1	1

Error Code 0 = No Errors
Error Code 1 = Lost communications between I/O module and communications module
Error Code 2 = Valve / Output power is below 19VDC
Error Code 3...7 = not defined / reserved

16. Appendix

16.1 System Specifications

Electrical	
Supply Voltage	Valves (2005, 2012, 2035): 24 VDC + 10%, -15% Valves (501, 502, 503): 24 VDC +/- 10% Node and Discrete I/O: 24 VDC ± 10%
Current	Total current on the Auxiliary Power Connector (“Valves and Outputs” and “Node and Inputs” Pins) must not exceed 8 Amps.
Internal Electronic Resettable Fuses	The Auxiliary Power Connector pins are each internally fused with an electronically resettable fuse. These fuses are set to the maximum current allowable through the G3 electronics.
Recommended External Fuse	External fuses should be chosen depending upon manifold configuration. Please refer to power consumption chart on page 4-26 for additional fuse sizing information.
Spike Suppression	Output spike suppression is internally provided for both discrete and valve outputs.
Discrete Outputs	Maximum 0.5 Amps per output. All outputs are short circuit protected and have internal spike suppression. Contact factory for higher current requirements.
Valve Solenoid Coil Output Drivers	Maximum 0.5 Amps per output. All output points are short circuit protected and have internal spike suppression.
Operating Temperature for Electronic Components	23 to 114°F (-5 to 50°C)

16.2 Factory Default Settings

FACTORY DEFAULT SETTINGS	
Description	*Default*
IP Address	193.168.003.120
Subnet Mask	255.255.255.0
Gateway IP	0.0.0.0
I/O Status	Enabled
Diag. Word	Enabled
Fault Action	Off
Brightness	Medium
Parameters	Unlocked
I/O configuration	Unlocked

16.3 G3 EtherCAT™ Process Data Map

The following process data map is available from the G3 node over EtherCat™ communications to controllers capable of reading the manifold configuration and building an internal mapping and diagnostic table.

Object

Index:SubIndex	Description
0x4000:0	Number of detected modules
0x4000:1	Module #1 ID (See ID numbers below)
0x4000:2	Module #2 ID
...	
0x4000:31	Module #31 ID
0x4010:0	Detected I/O sizes (number of elements: 2)
0x4010:1	Detected Input size
0x4010:2	Detected Output size
0x4020:0	Current I/O sizes (number of elements: 2)
0x4020:1	Current Input size (writable, default 150)
0x4020:2	Current Output size (writable, default 150)

Module ID's	Description
0x1000: 219-828	Valve Driver Output Module
0x1020: 219-898	PWM Valve Driver Output Module
0x2000: 240-203	16DI PNP Terminal Strip
0x2010: 240-204	16DI NPN Terminal Strip
0x2020: 240-205	16DI PNP M12 x 8
0x2030: 240-206	8DI PNP M12 x 8
0x2040: 240-207	16DO PNP M12 x 8
0x2050: 240-208	8DO PNP M12 x 8
0x2060: 240-209	16DI NPN M12 x 8
0x2070: 240-210	8DI NPN M12 x 8
0x2080: 240-211	8DI/8DO PNP M12 x 8
0x3000: 240-212	4AI 0-10V M12 x 4
0x3010: 240-213	2AI/2AO 0-10V M12 x 4
0x3020: 240-214	4AI 4-20mA M12 x 4
0x3030: 240-215	2AI/2AO 4-20mA M12 x 4
0x2090: 240-294	16DI PNP M12 with PE
0x20a0: 240-295	8DI PNP M12 with PE
0x20b0: 240-300	8DO High Current PNP M12 x 4
0x3040: 240-307	2AI/2AO High Current 0-10V M12 x 4
0x3050: 240-311	4AI RTD M12 x 4
0x2100: 240-316	8DI PNP Terminal Strip
0x20c0: 240-320	8DI Intrinsically Safe M12 x 8
0x20d0: 240-322	8DI Intrinsically Safe Terminal Strip
0x20e0: 240-323	16DI PNP 19 Pin
0x20f0: 240-330	16DO PNP Terminal Strip
0x1030: 425186-001	Atlas Valve Driver Output Module
0x1013: 240-241	Sub-Bus Valve Driver

16.4 Troubleshooting

Communication Node

Symptom	*Possible Cause*	*Solution*
The wrong valve solenoid coils are being energized.	Z-Board™ type mismatch. Single Z-Board™ present where double Z-Board™ expected or vice versa.	Check that correct Z-Board™ types are installed. Check that ribbon cable (Output group No. 2) is connected to appropriate valve station. See page 15-169 for bit mapping rules
Valve outputs do not energize.	Output power not present or connected improperly on Auxiliary Power connector.	Check for 24VDC on the +24 VDC (Valves and Outputs) pin of the MINI Auxiliary Power connector of the Comm. module.
No Activity/Link LED	No network connection	Verify the type of cable (straight-thru or crossover) that is being used. Also, verify the wiring of the cable.

I/O Modules

Symptom	*Possible Cause*	*Solution*
Outputs remain on when communication is lost and/or PLC is in “Program” mode.	Communication Fault parameters in PLC configuration set incorrectly	Review G3 Slave Node Configuration Comm. Fault Parameter

16.5 Glossary of Terms

The following is a list and description of common terms and symbols used throughout this document:

Term	*Description*
Address Resolution Protocol (ARP)	A protocol used to set an IP address using a MAC Address hardware address. This can be done in the command prompt window.
Bit	Smallest unit of digital information either a “0” or “1”
Bit Mapping	Chart showing which bit is connected to which physical input or output point.
BOOTstrap Protocol (BOOTP)	A protocol used to set an IP Address, Subnet Mask, and Gateway using a server.
Broadcast	A transmission method that sends packets to multiple unspecified devices.
Byte	8 bits (1/2 word)
Comm. Fault	One or more of the I/O connections have timed out.
Discrete I / O	The inputs / outputs that are available via the “Discrete I/O” side of manifold.
Dynamic Host Configuration Protocol (DHCP)	A protocol used by a node to obtain an IP Address, Subnet Mask, and Gateway Address from a server.
XDD File	XDD files are GSD files written in XML format. They describe the features of the ETHERCAT™ device model.
Explicit Messaging	Messaging that sends data to perform request/response functions.
Ground	This term is used to indicate an earth or chassis ground.
I/O	Any combination of inputs and outputs
Idle	A zero (0) length poll message (i.e.: scanner in program mode)
IGMP Snooping	See Implicit Messaging
Implicit Messaging	A function that that can control I/O messaging to another I/O device.
Internet Group Management Protocol (IGMP)	A protocol used to keep local switches informed in a multicast group. Nodes that leave the group will no longer be sent packets of information from switches and routers.
Layer 2 (data link layer or level)	The data layer that physically refers to the frame format and addressing. A layer 2 address is an Ethernet address.
Layer 3 (network layer or level)	The data layer that refers to IP and the IP packet format. A layer 3 address is an IP address.
Link	A group of nodes with different MAC addresses. Segments connected by repeaters make a link. Links that are connected by routers make up a network.
MAC Address	Media Access Connection Address
Multicast	A transmission where a packet is sent to all possible nodes of a certain subset.

Glossary of Terms Continued

Term	*Description*
NEMA	National Electrical Manufacturers Association
Network	A group of nodes connected by a communication medium through repeaters, router, and gateways.
Node	A device on the network that contains a single MAC Address, which can communicate over a subnet.
Octet	8 bits of information. An IP address is made up of four octets.
Ping	A group of messages sent between a master and a slave that coordinates time.
Ping Request	A request to see if a device has received a message.
Ping Response	Response to a ping request.
Requested Packet Interval (RPI)	The frequency measure of the required transmission of data from the originating device to the target device.
Segment	Nodes connected to a continuous section of communication media.
Simple Network Management Protocol (SNMP)	A protocol used to monitor Ethernet devices, switches, routers, and networks connected by communication media.
Sinking (NPN)	Method of connecting electrical circuits in which the zero (0) volt DC side is switched and the common is positive
Sourcing (PNP)	Method of connecting electrical circuits in which the positive side is switched and the common is zero (0) volts DC.
Status Input bit	A bit in the input table that reports the health of a corresponding output. Indicates short circuit or open coil (load) diagnostics
Subnet	Nodes using the same protocol and shared media access arbitration.
System	Contains one or more domains.
Time to Live (TTL)	A method used in best-effort delivery systems to negate endlessly looping packets.
Unicast	A transmission where a packet is sent to a single node.
Word	2 Bytes (16 bits)
Z-Board™	Circuit board installed in the valve manifold which electrically connects the valve solenoid to the electrical /electronics interface. Available in single or double solenoid versions.

16.6 Technical Support

For technical support, contact your local Aventics distributor. If further information is required, please call the Technical Support Department at (248) 596-3337.

Issues relating to network setup, PLC programming, sequencing, software related functions, etc. should be handled with the appropriate product vendor.

Information on device files, technical manuals, local distributors, and other Aventics or Numatics products and support issues can be found on the Aventics web site at www.asco.com