G3 Series
PROFIBUS-DP
Technical Manual

TDG3PTTM1-2EN 02/09
Subject to change without notice

www.numatics.com/g3

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About PROFIBUS-DP

Overview

PROFIBUS-DP is a communication protocol used to network industrial devices to eliminate labor intensive and expensive point to point wiring schemes. Siemens originally developed PROFIBUS DP, but it is now supported by a multitude of manufacturers and the protocol standard governed by the PROFIBUS Trade Organization (PTO).

The G3 Series PROFIBUS-DP product is designed to conform to the PROFIBUS standard EN50170, and is certified by PROFIBUS Interface Center (PIC) according to the guidelines determined by the PROFIBUS Trade Organization (PTO). The certification process ensures interoperability for all PROFIBUS-DP devices.

PROFIBUS-DP uses a 2-wire (plus shield) network and can have up to 126 nodes. The protocol can transfer a maximum of 244 bytes of data per node cycle with nine selectable communication (baud) rates of 9.6 Kbps, 19.2 Kbps, 45.45 Kbps, 93.75 Kbps, 187.5 Kbps, 500 Kbps, 1.5 Mbps, 3 Mbps, 6 Mbps and 12 Mbps. Maximum distance is depended upon baud rate and cable media type. Refer to the section below for details.

More information about PROFIBUS can be obtained from the PROFIBUS web site www.PROFIBUS.com

G3 PROFIBUS-DP Features

Features	*Description*
Bus Topology	Linear bus, active bus termination on both ends. Stub lines permitted only for <= 1.5Mbit/sec baud rates.
Baud Rates Supported	9.6 Kbps, 19.2 Kbps, 45.45 Kbps, 93.75 Kbps, 187.5 Kbps, 500 Kbps, 1.5Mbps, 3 Mbps, 6 Mbps and 12 Mbps
Duplicate address detection	Node address must match address in Master configuration software, before node will enter the data exchange mode
Error Correction	If error detected, sender is requested to repeat the message
Address Setting options	Via Software (with Profibus-DP Class 2 Master) ,with standard Manual Configuration Module (MCM), or graphic display

Cabling and Drop Line Lengths (as defined by PROFIBUS specification)

Maximum Cable Length

Baud Rate	9.6Kbps	19.2Kbps	93.75Kbps	187.5Kbps	500Kbps	1.5Mbps	12Mbps
Range/ Segment	1200M	1200M	1200M	1000M	400M	200M	100M

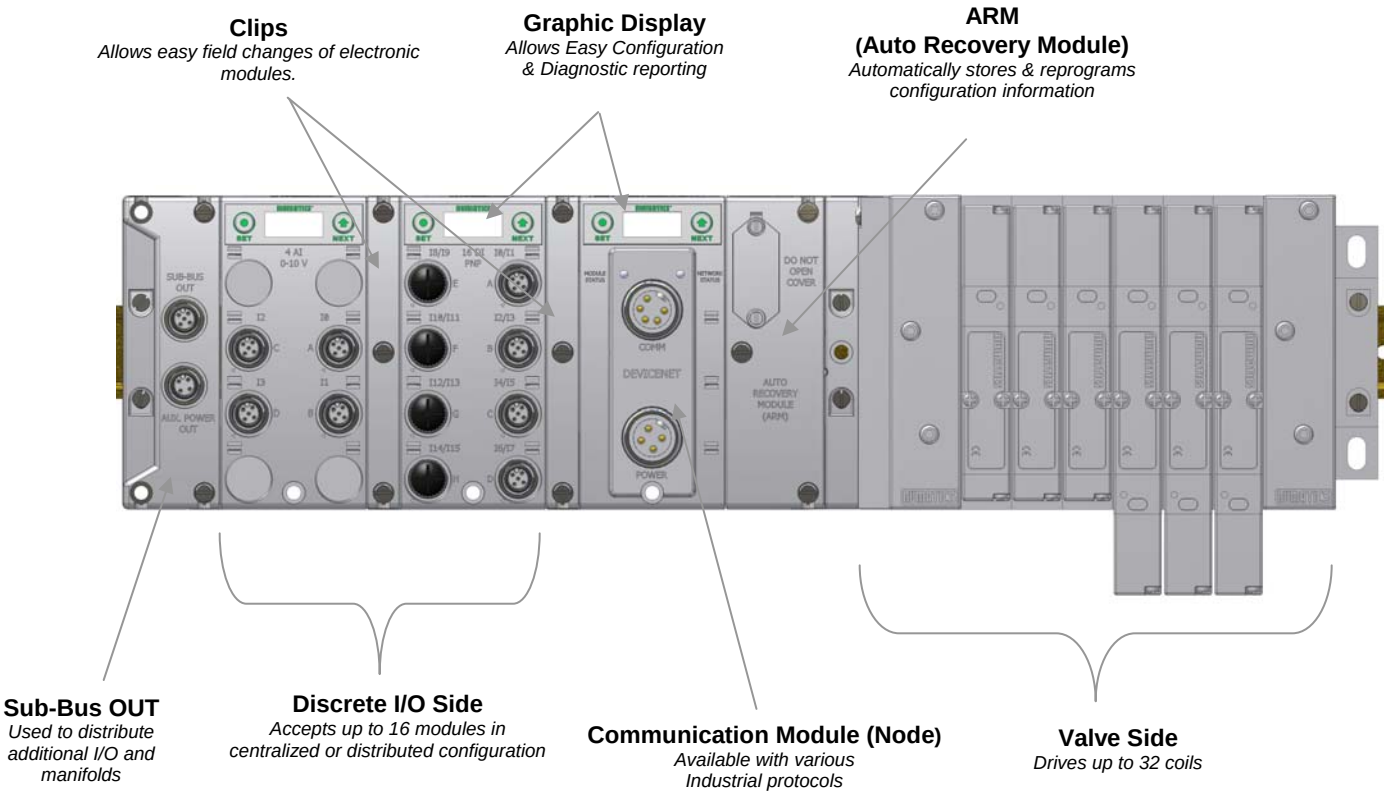
G3 Introduction

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 / IP67 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 32 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.

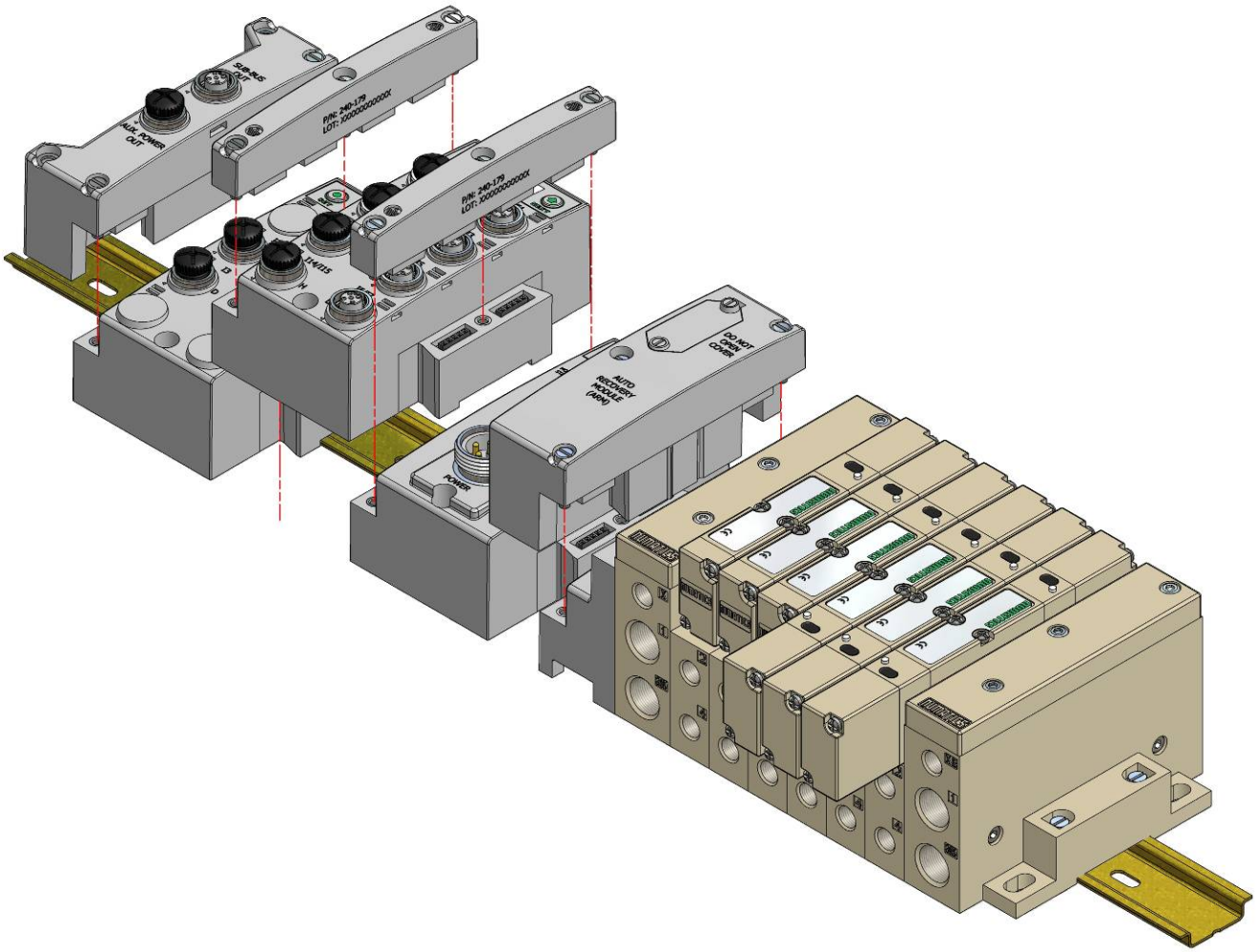
This manual details specific information for configuring and commissioning the Numatics G3 Series product line. For more information relating to pneumatic valving and valve manifold assemblies, please refer to the Numatics *In Control* Catalog at www.numatics.com.



G3 Electronics Modularity

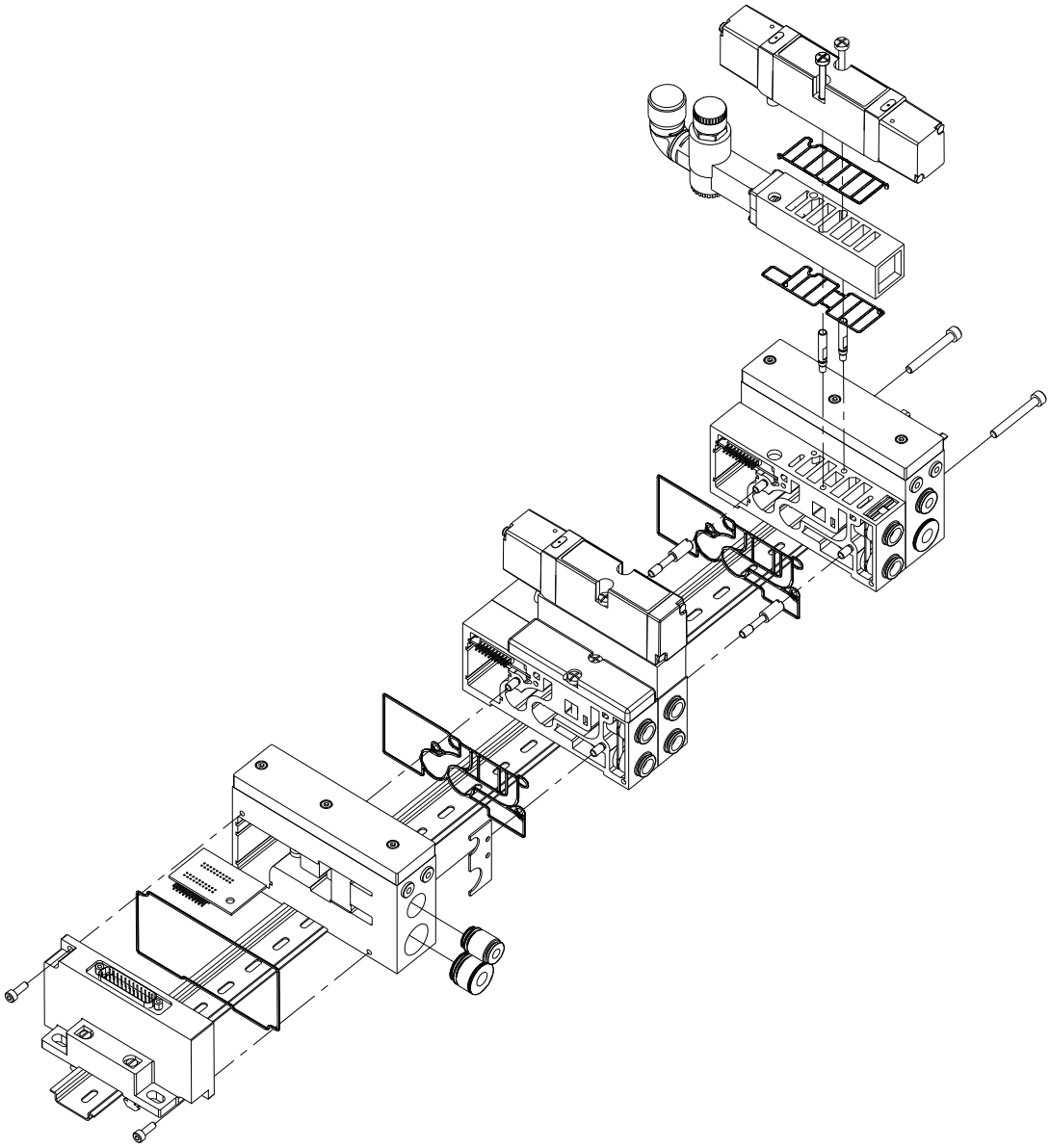
Discrete I/O

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 easy assembly and field changes.



Pneumatic Valve Manifold

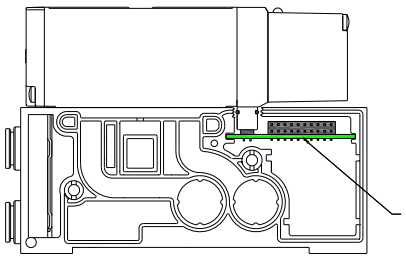
The pneumatic valve manifold with internal circuit board technology is also modular. The valve solenoid coil connections are automatically made using Z-Board™ technology (plug together PC boards), which allow internal connection from solenoid coils to output drivers without the use of wires). This allows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



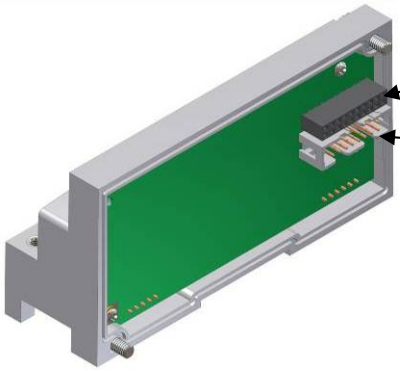
Manifold Connectors

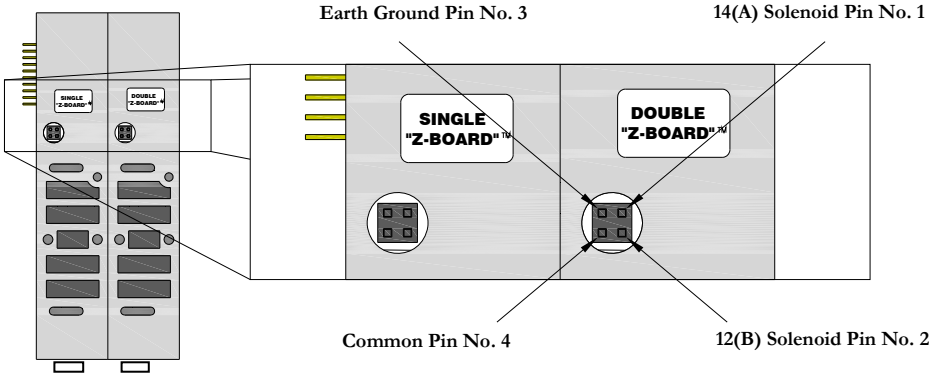
Solenoid Coil Connections using Z-Board™ Technology for 2005/2012/2035 valve series

Z-Board™ plug together technology connects all valve solenoids to the valve coil output driver board, located in the valve adapter. The 32 available coil outputs are divided into 2 separate connector groups. Output group No. 1 is comprised of the first output word, bits 0-15, and output group No. 2 is comprised of the second output word, bits 16-31. Output group No. 1 connects directly to the Z-Boards™. Output group No. 2 is connected to the Z-Boards™ via an internal ribbon cable or valve side Sub-D module. The first output (bit 0) connects to the "14" (A) solenoid on the valve closest to the communication node. The 17th – 32nd solenoids interconnect via the Z-Boards™ to output group No. 2. For the maximum capability of 32 solenoids on the same manifold, the 16th and 17th solenoid coils must NOT be on the same sub-base.



Plug-in Manifold with Intergral "Z-Board" Eliminates Wiring



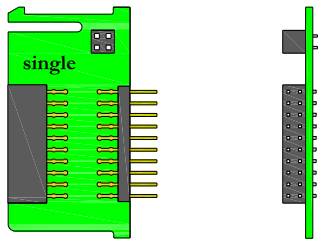
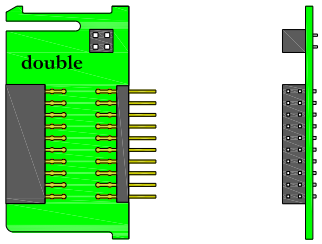
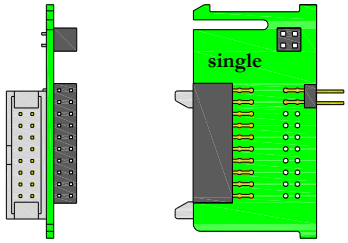
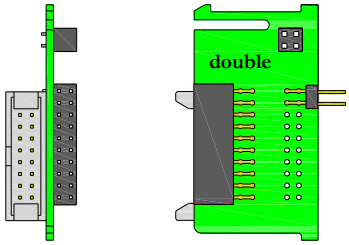


NOTE!

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

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.

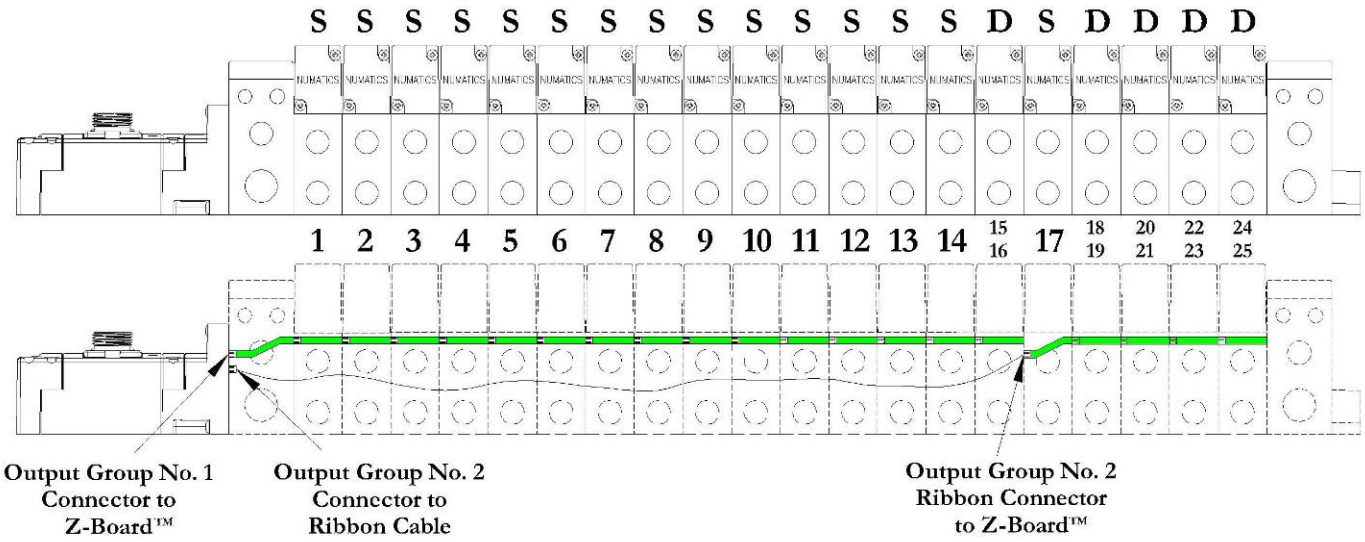
Single Z-Board™	*Double Z-Board™*
	
Ribbon Connection Single Z-Board™	***Ribbon Connection Double Z-Board™***
	

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.

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

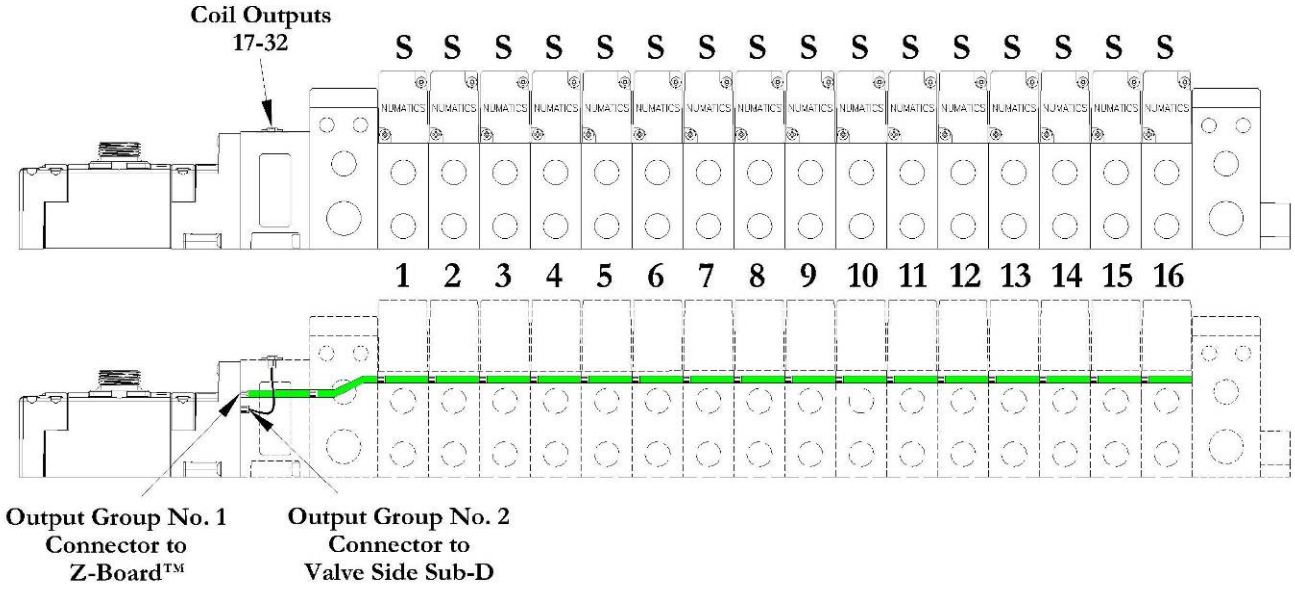
Output Word	1															
Output Byte	2								3							
Output Bit No.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Solenoid Coil Output No.	17	18	19	20	21	22	23	24	25	n/a						

In the above example, Output Bits No. 25 thru No. 31 are allocated but not used. Allocation may be changed by configuration changes in the communication module (node). Refer to page 23 in this manual.

Z-Board™ with Valve Side Sub-D Example

If sixteen (16) single solenoid valves are connected directly to the communication node via their 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:

S = Single Solenoid with Single Z-Board



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

Communication Module (Node)

PROFIBUS-DP Communication Module

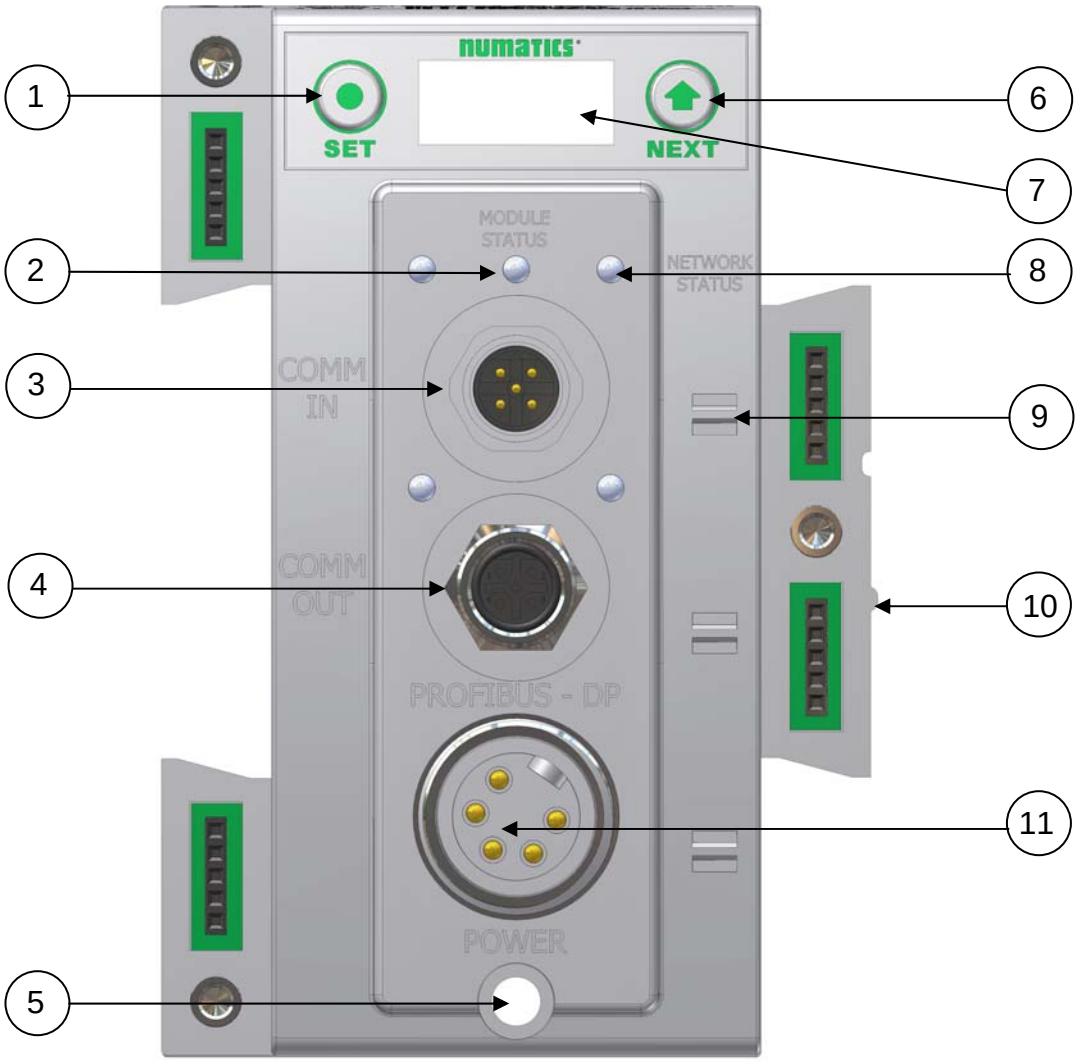
This module is the communication interface to the manifold. It contains communication electronics and internal short circuit protection for power. It can be configured via software, via the graphic display, or manually via DIP switches through the optional Manual Configuration Module (MCM).

The Numatics G3 PROFIBUS-DP node is tested by the PIC to ensure compatibility and interoperability.

Communication Module	*Part Number*
PROFIBUS-DP Communication module	**240-239**

Communication Module Description

Detail No.	Description
1	"Set" Button – used to navigate through user menus and to set parameters
2	Module Status LED
3	5 Pin M12 Reverse Key Male Communication Connector
4	5 Pin M12 Reverse Key Female Communication Connector
5	Mounting Hole
6	"Next" Button – used to navigate through user menus and to set parameters
7	Graphic Display – used to display parameter information
8	Network Status LED
9	Slot for text ID tags
10	Keying for preventing I/O module insertion
11	5 Pin MINI Male Power Connector



Connector Pin-Outs

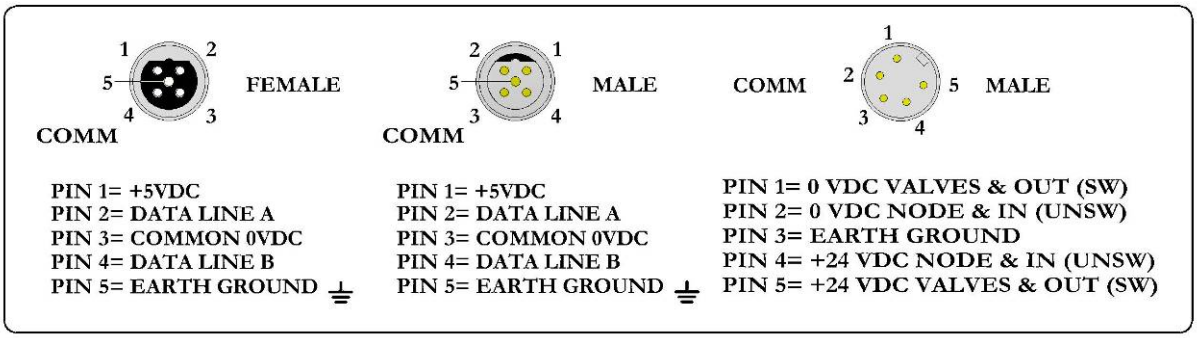
Industry standard connectors are used for communication and power. The PROFIBUS-DP communication connectors are a M12 reverse key 5 pin male connector and a M12 reverse key 5 pin female connector. The Power connector is a 7/8" MINI 5 pin male connector.

PROFIBUS Communication Connector Pin-Out

Pin No.	*Function*	*Description*
1	+5 VDC	+5 volt output from node, used for termination of network or auxiliary devices.
2	Data Line A	Profibus-DP Communication Line A (Green)
3	0VDC Common	Common for +5V output and Data Lines A & B
4	Data Line B	Profibus-DP Communication Line B (Red)
5	Earth Ground	Internally connected to earth ground (case). Connect to shield of Profibus-DP cable.

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 (-V) 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	0 VDC Common (Valves and Outputs)	0 VDC Voltage used to power outputs (valve coils and discrete outputs) SW



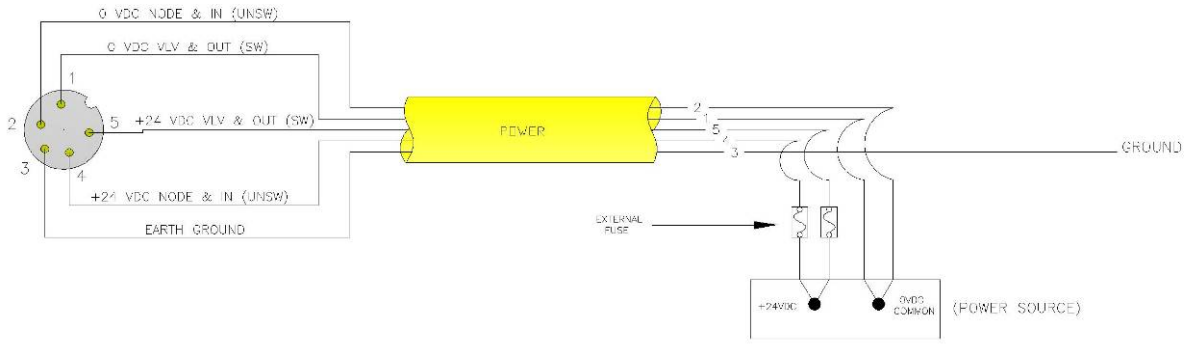
ATTENTION

- *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 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 pins supplies power to the node electronics. These pins must be powered at all times for communication node to be functional.*

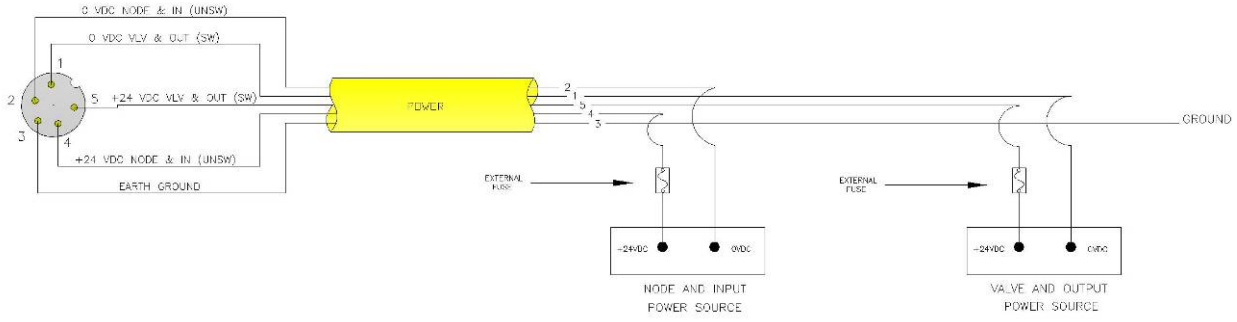
Electrical Connections

Standard Power Connector Wiring Diagram Examples

Single Power Supply Example (Non-isolated commons)



Separate Power Supply Example (Isolated commons)



ATTENTION

- *Please see page 18 for external fuse sizing guide.*
- *When using molded connector power cables, Do Not rely on wire colors for Pin-Out. Always use pin number references.*

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 (-V) 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	0 VDC Common (Valves and Outputs)	0 VDC Voltage used to power outputs (valve coils and discrete outputs) SW

Power Rating

- The maximum system current capability is 8 Amps. Care should be taken not to exceed 8 Amp draw through the Aux. power connector pins.
- Discrete I/O current draw is dependent on the device(s) connected. It is critical to know what these values are in order to remain safely within the 8 Amp limitations (4 Amps if using distribution).
- 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 5*		*+24VDC (Node and Inputs) Pins 2 and 4*	
			Current	*Power*	*Current*	*Power*
Solenoid Valve Coil 2002 (Each)	24 VDC	+10%/-15%	0.021 A	0.5 W	0 A	0 W
Solenoid Valve Coil 2005 (Each)	24 VDC	+10%/-15%	0.056 A	1.35 W	0 A	0 W
Solenoid Valve Coil 2012 (Each)	24 VDC	+10%/-15%	0.105 A	2.5 W	0 A	0 W
Solenoid Valve Coil 2035 (Each)	24 VDC	+10%/-15%	0.105 A	2.5 W	0 A	0 W
Solenoid Valve Coil ISO - SPA	24 VDC	+10%/-15%	0.167 A	4.0 W	0 A	0 W
Valve Adapter (Driver)	24 VDC	+/- 10%	.134 A	3.22 W	0 A	0 W
Discrete Digital Input Module	24 VDC	+/- 10%	.012 A	.29 W	.085 A*	2.04 W*
Discrete Digital Output Module	24 VDC	+/- 10%	.051 A	1.2 W	.060 A*	1.44 W*
Discrete Digital I/O Module	24 VDC	+/- 10%	.035 A	0.84 W	.076 A*	1.82 W*
Discrete Analog Input Module (V & C)	24 VDC	+/- 10%	.012 A	0.288 W	.077 A*	1.85 W*
Discrete Analog I/O Module (V & C)	24 VDC	+/- 10%	.018 A	0.432 W	.087 A*	2.08 W*
Communication Module (Node)	24 VDC	+/- 10%	.006 A	0.144 W	.094 A*	2.26 W*
Sub-Bus Valve Module	24 VDC	+/- 10%	.012 A	0.288 W	.066 A*	1.58 W*
Auto Recovery Module (ARM)	24 VDC	+/- 10%	0A	0 W	.022 A	.53 W
Manual Configuration Module (MCM)	24 VDC	+/- 10%	0 A	0 W	.022 A	.53 W

* Current depends on graphic display brightness setting. Max. value shown with high brightness. Values decrease by approx. 12% for Medium and 25% for Low brightness settings.

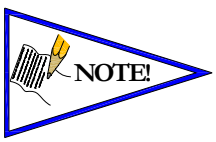
- *Total power consumption for each Discrete I/O point is dependent on the specific current draw of input sensor devices and output loads.*

Recommended External Fuses

External fuses should be chosen based upon the physical manifold configuration. Please refer to 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 0.87* A	=	_____Amps
		+
Valve Adapter	=	.134 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	=	.094 Amps
		+
Total load current drawn by Sensor Devices from Discrete Inputs source	=	_____Amps
		+
Number of I/O modules installed ___ X 0.080 A	=	_____Amps
		+
Total:		_____Amps
Surge Compensation:	X	1.25
Suggested External Pin +24 VDC (Node and Inputs) Fuse Value:		_____Amps



- *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, over-current conditions, etc…*

Diagnostics

Communication Module LED Functions

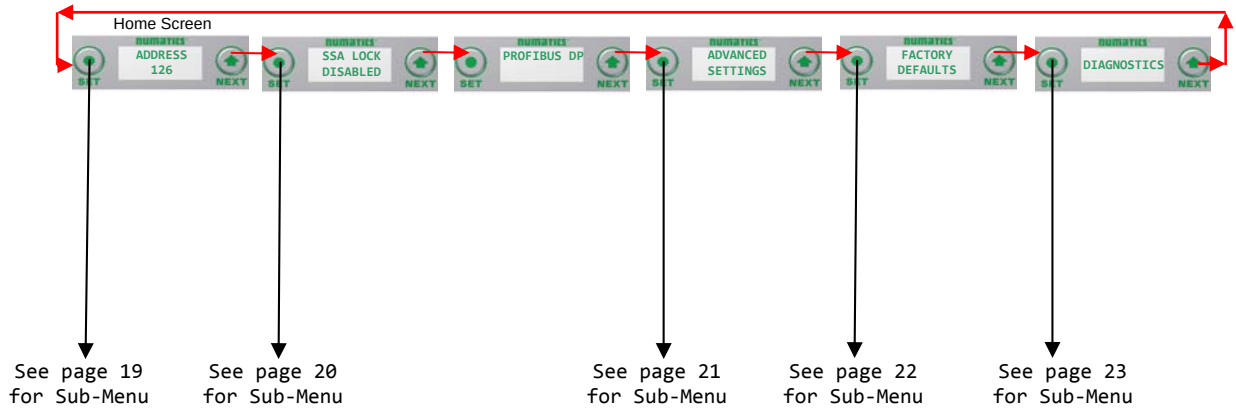
Upon power up, the Module and Network Status LEDs indicate the state of the unit. There are two LEDs on the G3 PROFIBUS-DP node. The LEDs functions are described in the table below.

LED Name	*Color*	*Status*	*Description*
NETWORK STATUS	Red	ON	Bus Error. Bus connection failed or off-line; Invalid parameterization, configuration, or bus address."
	Green	ON	Normal operation. The bus link is OK. Baud rate, detected parameterization and configuration OK. Unit is in data exchange mode.
	Green / Red	FLASHING	The module configuration (I/O and valves) in the user application is different than the physical configuration of the manifold.
MODULE STATUS	Red	ON	Critical hardware fault. The microprocessor is not running.
	Green	ON	Normal operation. Node hardware is OK.
	Green / Red	FLASHING	Module is in self-test mode. Cycle power to end self-test mode.

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.

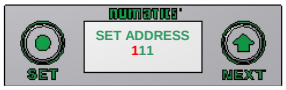
The following graphic displays represent the main menu selections of the DeviceNet communication module (node). Use the NEXT button to scroll through the Main menu headings shown below. At this level pressing the SET button allows access the Sub-Menus. Please see the appropriate pages referenced below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



Network Address Sub-Menu

Steps to Set Address

1. Press the SET button to enter the ADDRESS sub-menu.



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

3. 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.
   Change the ones digit using the same procedure.

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 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.

- ***Only addresses 0- 126 are valid.***
- ***Address 126 is the Factory Default node address.***

SSA LOCK Sub-Menu

Steps to Set SSA (Set Slave Address) LOCK

1. Press the SET button to enter the SSA Lock sub-menu.

2. Press the NEXT button to enable / disable the SSA Lock
   a. ENABLE
      - **allows the address to be set only through the G3 graphic display**
   b. DISABLE
      - **allows the address to be set through either the G3 graphic display or software**
   c. RETURN (this will return you to the top of SSA LOCK 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 SSA LOCK 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.

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. Press the NEXT button to scroll the choices for the desired brightness of the LCD display for all modules on the G3 system.

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

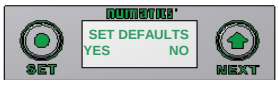
   Press the SET button to confirm your choice.
   The changes will take effect immediately.

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

Factory Defaults

Factory Default Settings

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



2. Press the NEXT button to select Yes or No.
   a. Selecting No will bring you back to the main FACTORY DEFAULTS menu.
   b. Selecting Yes will cause the node to reset and return all parameters to the factory default conditions.

   Press the SET button to confirm your choice.

FACTORY DEFAULT SETTINGS	
Description	***Default***
Node Address	**126**
SSA Lock	**Disabled**
Brightness	**High**

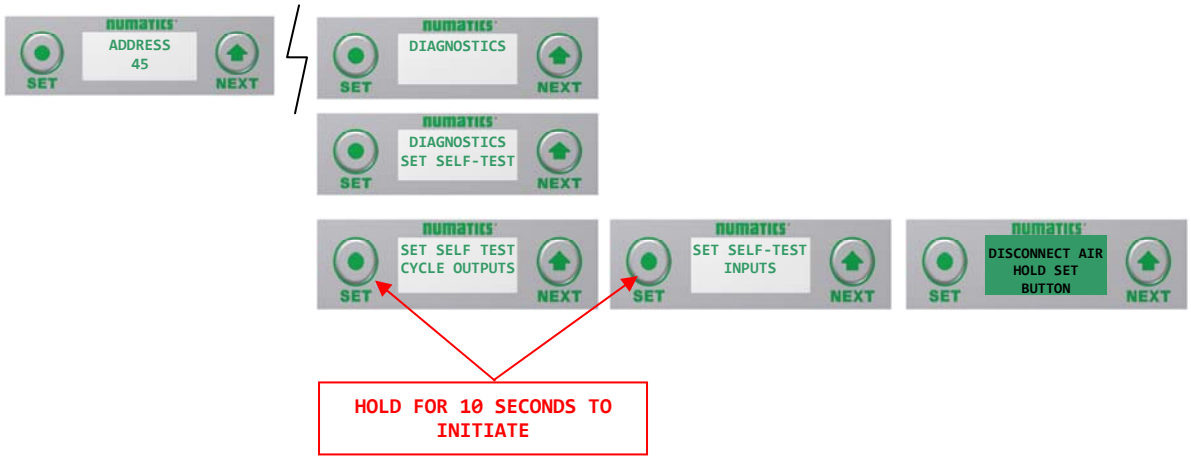
Diagnostics - Self Test Mode

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.

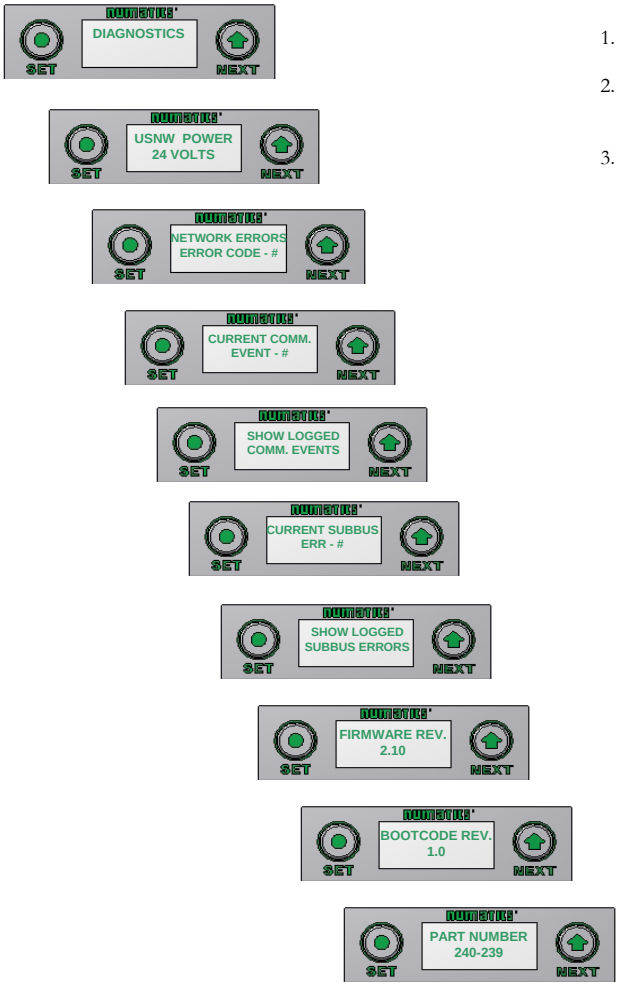
Similar "local" self tests are available on all output modules types. This "local" self test function allows any output module to be tested without affecting any other output module.
NOTE: The number of Valve outputs that are tested are affected by the I/O size settings.

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

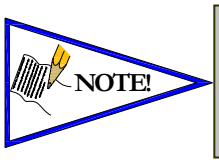
1) **Disconnect Air and Communication from the manifold!**
2) Select the desired test mode using the graphic display. (See example below)
3) Starting at the Home Screen, navigate the menus by selecting the NEXT button until the **DIAGNOSTICS** menu is shown.
4) Select the SET button to access the **DIAGNOSTICS** 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.



Diagnostics Continued



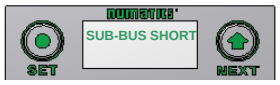
1. All diagnostic information is read only
2. Press the SET button to enter DIAGNOSTICS sub-menu.
3. Press the NEXT button to scroll through the main diagnostic menu choices.
   a. UNSW POWER
      . - Displays voltage level of unswitched power (Node & Inputs)
   b. NETWORK ERRORS - ERROR CODE
      . - Displays fieldbus network errors
   c. CURRENT COMM. EVENT NUMBER
      . - Displays
   d. SHOW LOGGED COMM. EVENTS
      . - Displays log of network errors
   e. CURRENT SUBBUS ERROR
      . - Displays sub bus errors
   f. SHOW LOGGED SUBBUS ERRORS
      . - Displays log of sub bus errors
   g. FIRMWARE REV.
      . - For service personnel
   h. BOOTCODE REV.
      . -For service personnel
   i. PART NUMBER
      . - Displays replacement part number of module



- **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.**
- **A voltage level less than 19 volts will generate an error screen and an associated diagnostic bit (see 'Diagnostic' section for more details).**

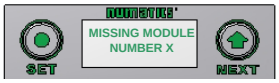
Error Messages

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

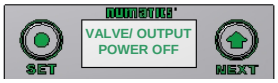


Displayed when a short circuit condition is detected on the Sub-Bus power lines.

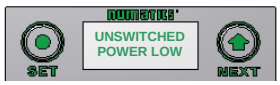
Displayed when a short circuit condition is detected on a valve coil



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

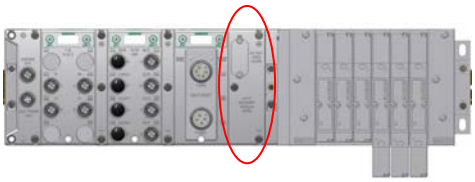


Displayed when +24 VDC on Pin No. 1 and 5 (Valves and Outputs) is not present or below 22 VDC



Displayed when +24 VDC on Pin No. 2 and 4 (Node and Inputs) is below 19 VDC

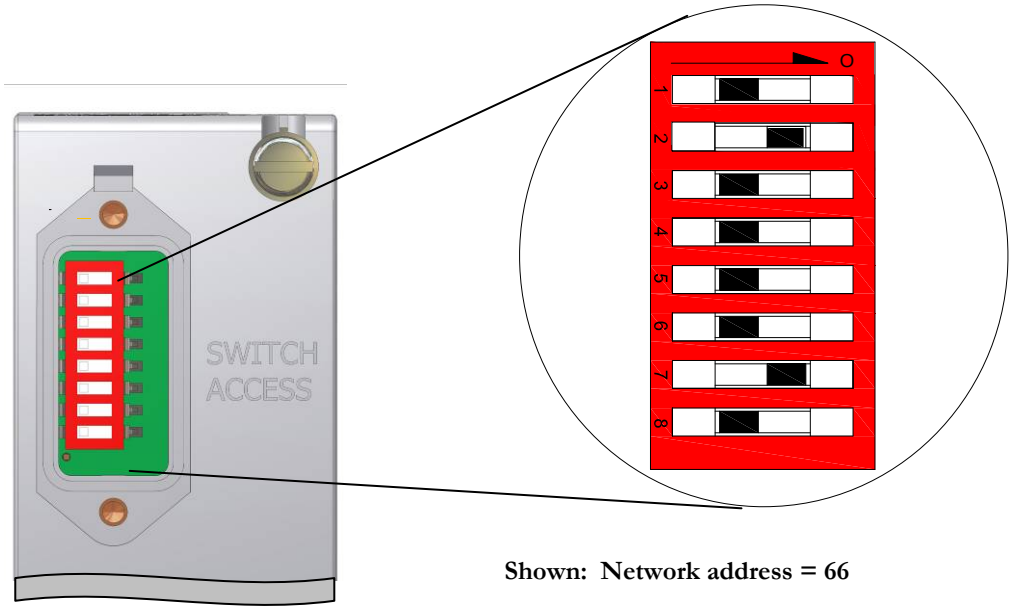
MCM – Manual Configuration Module (Optional)



The MCM is an optional module that is installed between the node and the valve adapter module and allows the user to manually set, via DIP switches, the node address without the need for software configuration or the use of the integrated graphic display in the node. If software configuration or configuration via the integrated graphic display in the node is preferred, this module is not necessary.

Description	*Replacement Part Number*
Complete Module	240-186

DIP Switch Settings

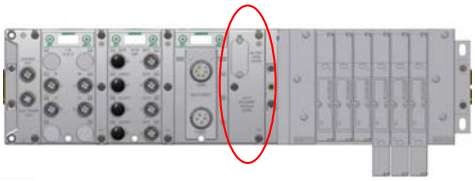


Shown: Network address = 66

Network Address:

2^6=64 *SW-7*	2^5=32 *SW-6*	2^4=16 *SW-5*	2^3=8 *SW-4*	2^2=4 *SW-3*	2^1=2 *SW-2*	2^0=1 *SW-1*	*Address Value (Decimal)*
OFF	OFF	OFF	OFF	OFF	OFF	OFF	0
OFF	OFF	OFF	OFF	OFF	OFF	ON	1
OFF	OFF	OFF	OFF	OFF	ON	OFF	2
OFF	OFF	OFF	OFF	OFF	ON	ON	3
OFF	OFF	OFF	OFF	ON	OFF	OFF	4
OFF	ON	ON	ON	OFF	OFF	OFF	56
ON	OFF	ON	OFF	ON	OFF	ON	85
ON	ON	OFF	OFF	ON	OFF	OFF	100
ON	ON	ON	ON	ON	ON	OFF	126

ARM – Auto Recovery Module (Optional)



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 configuration settings 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. Upon power-up it reconnects itself and compares the stored configuration settings to the actual manifold configuration. If these settings are different it gives the user the option of:

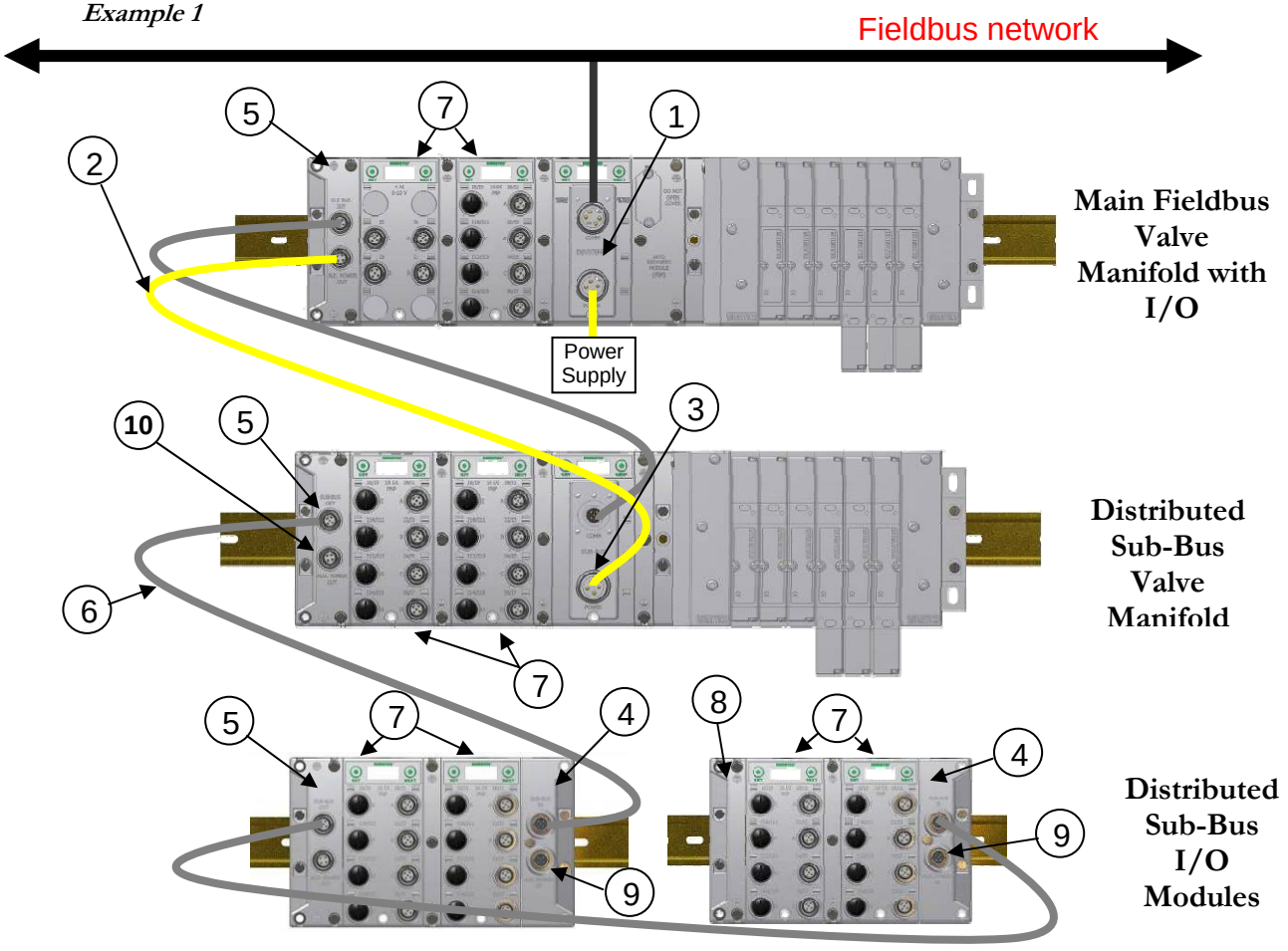
1. **Updating the manifold setting with the stored values**
2. **Updating the ARM module with the current settings**
3. **Continue operation with present configuration without updating ARM**

Description	*Replacement Part Number*
Complete ARM Module	240-182

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.

Example 1



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)

Sub-Bus Distribution Modules

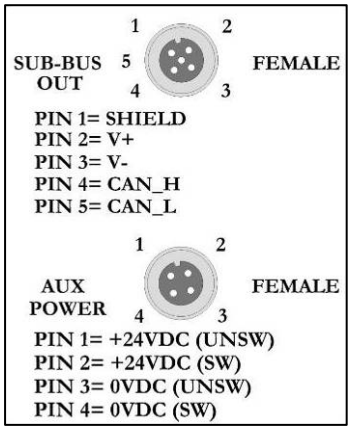
Sub-Bus Out Module

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

- **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.**

- **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



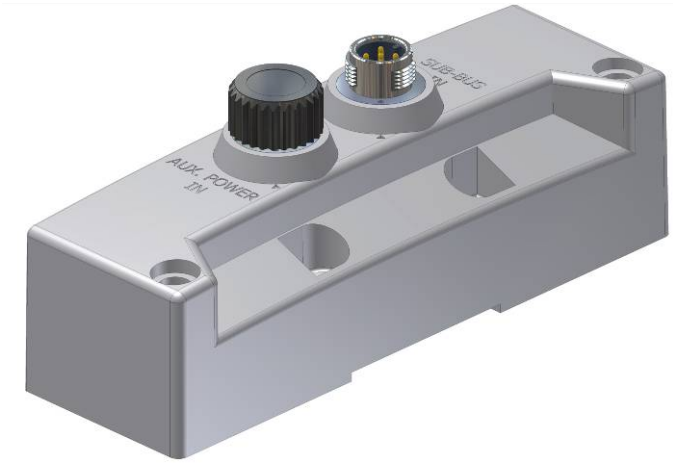
Sub-Bus In Modules

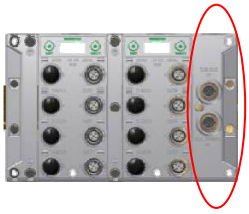
- Used to distribute I/O assemblies that do not have valves
  - Must be installed to the right of the I/O modules.

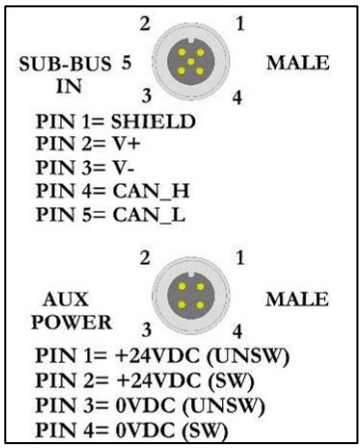
- Sub-Bus In - 5 pin M12 male communication connector.
  - Must be connected to the Sub-Bus Out connector of the previous assembly
  - Carries 24 VDC power for electronics of module

- 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 Sub-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



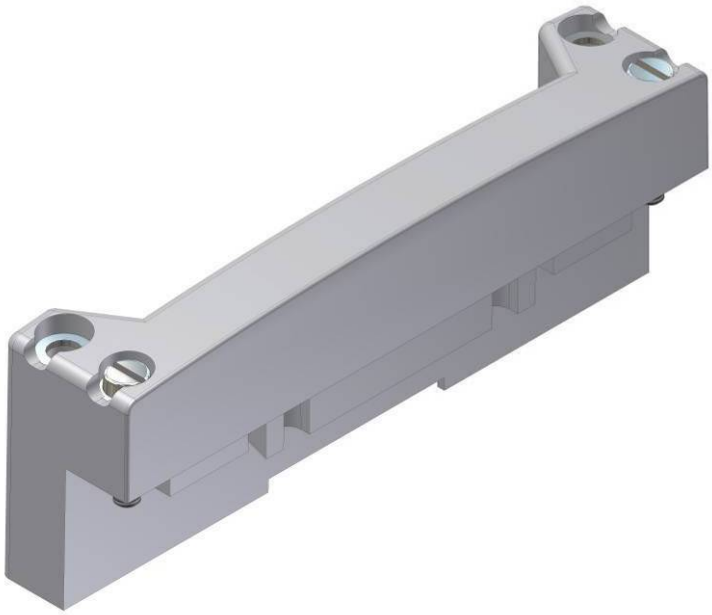


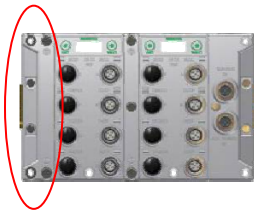


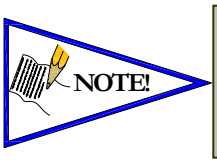
Terminator Module

- 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





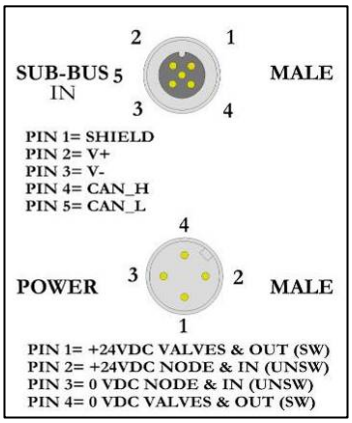


The terminator module is required to be installed in the G3 system for proper operation

Sub-Bus Valve Module

- 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
- POWER - 4 pin MINI male power connector.
  - Power is required for Outputs
- Used to distribute Valves on the Sub-Bus.
  - Can accept discrete I/O module to allow a Sub-Bus Valve manifold with I/O

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

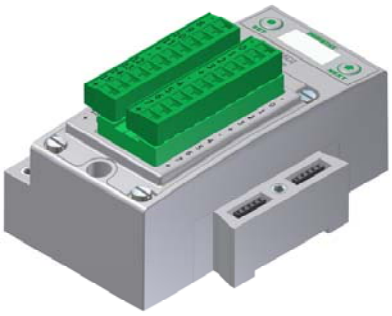


Digital I/O Modules

Digital I/O Module Rules

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



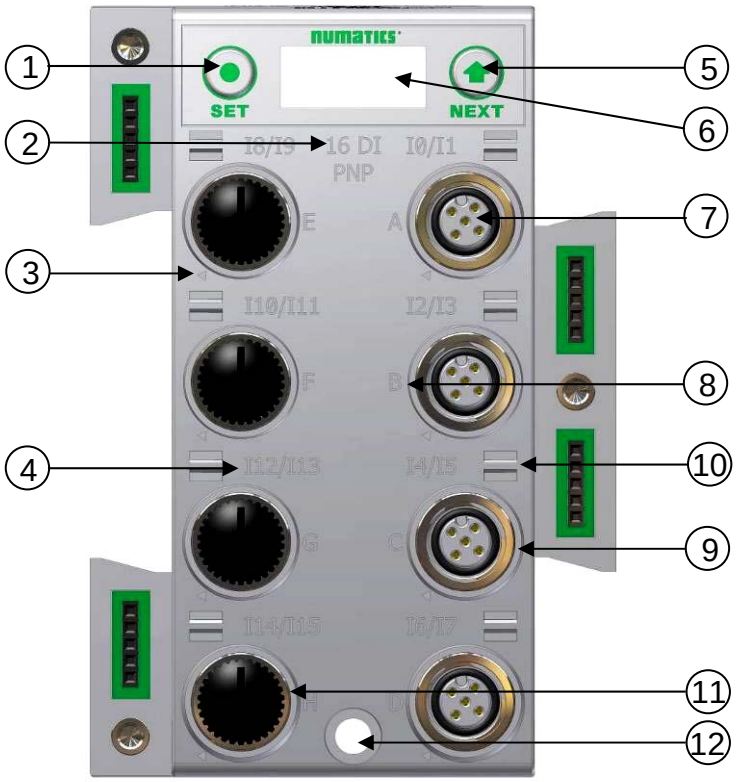
Output Module Types

Input/Output Module Types

Valve Side Output Module Types

I/O Module Descriptions & 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



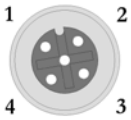
Menu

Digital Input Modules

One Digital Input per Connector - M12 Female Modules

Module Part No.	*I/O Type*	*Short Circuit Protection (SCP)*		*Input Points*
240-210	NPN (Sinking)	YES – Visual		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	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



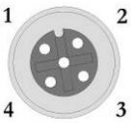
FEMALE

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 (SCP)*		*Input Points*
240-209	NPN (Sinking)	YES – Visual		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	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

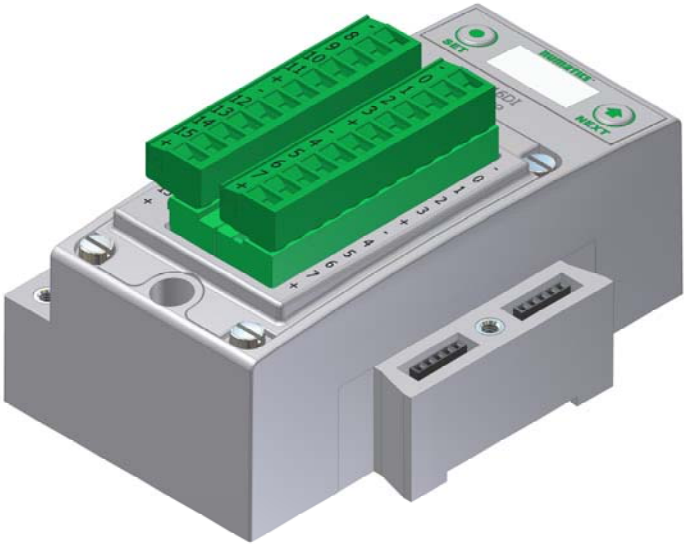
PIN 1= +24VDC (UNSW)
PIN 2= INPUT 2
PIN 3= 0VDC (UNSW)
PIN 4= INPUT 1

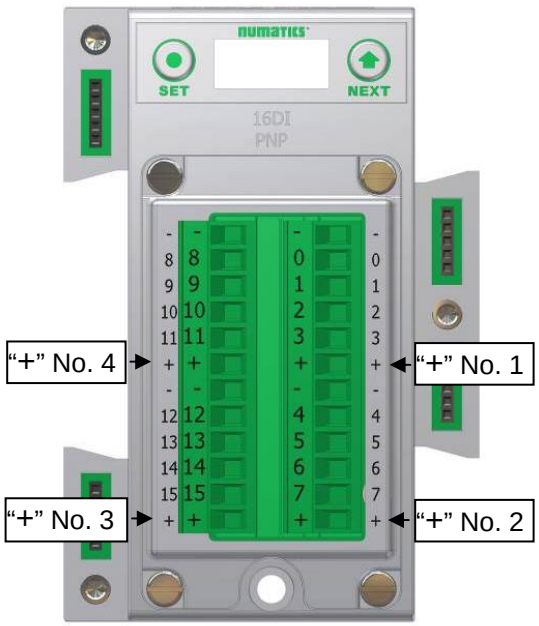
Sixteen Digital Inputs – Terminal Strip Modules

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

Module Part No.	*I/O Type*	*Short Circuit Protection (SCP)*		*Input Points*
240-203	PNP (Sourcing)	YES -Visual		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	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	SCP Status "+" No. 4	SCP Status "+" No. 3	SCP Status "+" No. 2	SCP Status "+" No. 1



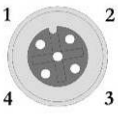


Digital Output Modules

One Digital Output per Connector - M12 Female Modules

Module Part No.	*I/O Type*	*Short Circuit Protection (SCP)*		*Output Points*
240-208	PNP (Sourcing)	YES – Visual		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	Output 7 Status	Output 6 Status	Output 5 Status	Output 4 Status	Output 3 Status	Output 2 Status	Output 1 Status	Output 0 Status



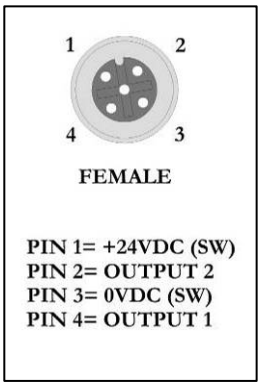
FEMALE

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 (SCP)*		*Output Points*
240-207	PNP (Sourcing)	YES – Visual		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	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	Output 15 Status	Output 14 Status	Output 13 Status	Output 12 Status	Output 11 Status	Output 10 Status	Output 9 Status	Output 8 Status

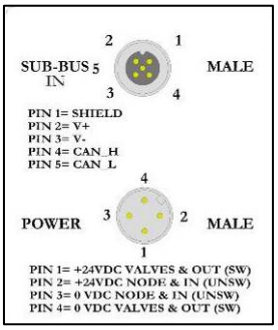


Sub-Bus Valve Module

Used to control a distributed valve manifold through the Sub-Bus. See page 33 for more information.

Module Part No.	*I/O Type*	*Short Circuit Protection*		*Output Points*
240-241	NPN (Sinking)	YES – Visual		32

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



Digital Input/Output Modules

Two Digital I/O per Connector - M12 Female Modules

Module Part No.	*I/O Type*	*Short Circuit Protection*		*Output Points*	*Input Points*
240-211	PNP (Sourcing)	YES – Visual		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 (Optional)	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 (Optional)	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

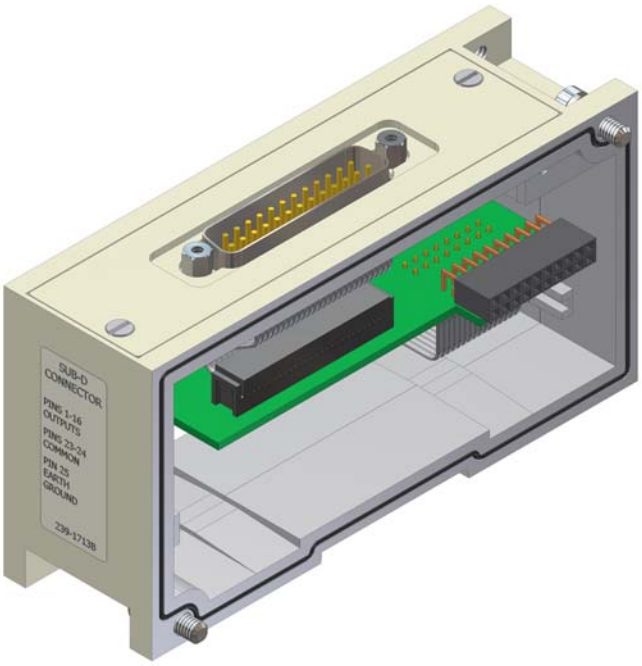
CONNECTORS E, F, G, & H	CONNECTORS A, B, C, & D
PIN 1= +24VDC (SW)	PIN 1= +24VDC (UNSW)
PIN 2= OUTPUT 2	PIN 2= INPUT 2
PIN 3= 0VDC (SW)	PIN 3= 0VDC (UNSW)
PIN 4= OUTPUT 1	PIN 4= INPUT 1

Valve Side Digital Output Modules

The valve side output module is used to distribute available valve side output points via a Sub-D connector (i.e. when a Sub-D valve manifold is located away from the rest of the electronics). This module goes 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)

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

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



Analog I/O Modules

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 modules allow the user to control and/or read analog devices using an analog signal. These modules are available in two analog signal types: 0-10 V and 4-20 mA, and are available in two different I/O configurations: 2 analog input channels/ 2 analog outputs channels (2AI/2AO) or 4 analog input channels (4AI).

4 Channel I/O - M12 Female Modules

Specifications

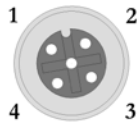
- Input Resolution: 16 bit (65,536 Counts)
- Output Resolution: 16 bit (65,536 Counts)
- Settling Time: 3 ms Max
- Absolute Precision: ≤ 1.0% of Signal
- Voltage Input Impedance: 0-10VDC – 40K Ohms
- Current Input Impedance: 250 Ohms
- Input Cutoff Frequency: 100 Hz

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	

One Analog Input per Connector - M12 Female Modules

Module Part No.	*Signal Type*	*Short Circuit Protection*		*Input Points*
240-212	0-10 VDC	YES – Visual		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	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
X+4	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	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	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	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
Diagnostic Telegram								
BYTE	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
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



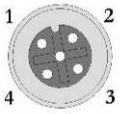
FEMALE

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*		*Output Points*	*Input Points*
240-213	0-10 VDC	YES – Visual		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	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

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

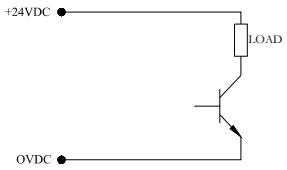
I/O Module(s) Wiring Diagrams

NPN/PNP Definitions

There is confusion between NPN, PNP, Sinking and Sourcing terminologies. Basically, if one is using sensors that provide a 24 VDC signal to the input module then a PNP input module type will be required. If one is using a sensor that supplies a 0 VDC signal to the input module then an NPN input module type will be required.

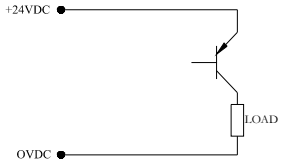
NPN Descriptions

- Sinking
- Switching Negative
- Positive Common



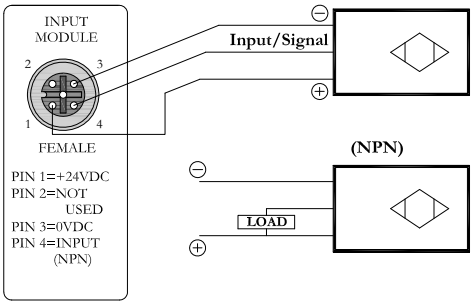
PNP Descriptions

- Sourcing
- Switching Positive
- Negative Common

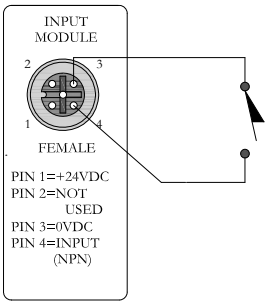


NPN (Sinking) Input Connection

Electronic Sensor Type

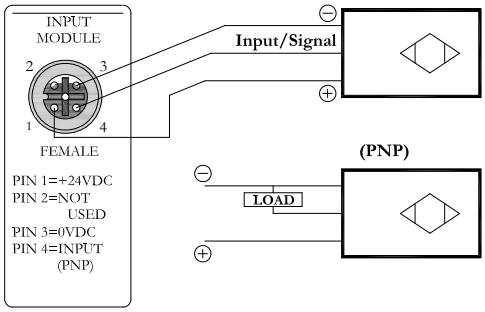


Mechanical Sensor Type

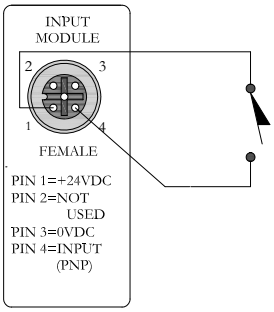


PNP (Sourcing) Input Connection

Electronic Sensor Type

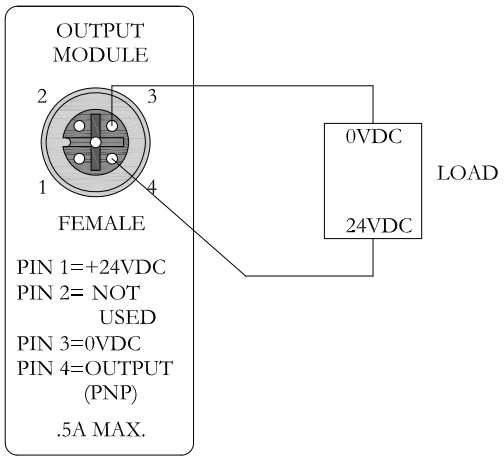


Mechanical Sensor Type



I/O Module(s) Wiring Diagrams Continued

PNP (Sourcing) Output Connection



PROFIBUS-DP Configuration and Mapping

GSD File

The GSD file contains configuration information required to establish communication to a node on a PROFIBUS-DP network. The GSD file is available on the Numatics, Inc., website at www.numatics.com/fieldbus.

User Configurable Device Parameters

The Numatics' G3 PROFIBUS-DP node allows the user to set many user options which define how the manifold behaves in certain instances. The following are descriptions of these device parameters.

		Settable Via		
Parameter Name	*Description*	*Display*	*Software*	*MCM*
Address	Node address	√	√	√
Brightness	Adjust brightness of graphic display	√	X	X
I/O Allocation Coils	Allocates how many valve output points are mapped (8, 16, 24, 32)	X	√	X
Output Idle Action	Determines whether to use idle value attribute or hold last state	X	√	X
Output Fault Action	Determines whether to use idle value attribute or hold last state	X	√	X
SSA Lock	Determines how the network address may be set	√	X	X

Communication Fault/Idle Mode Parameter

This parameter is used to set the behaviors of output points (bits) during a communication fault or an "idle" event (when a PLC is "Idle mode" not in RUN mode). The parameter shown below is used to determine what state the outputs will have during an "Idle" event and a "Fault" event. It will allow control of all output points, valves and discrete I/O, on the manifold.

The user, through the graphic display or software, can determine how the outputs behave when a communication fault or idle actions occurs. These settings are non-volatile and thus will not change upon loss of power.

The two behavior options are:

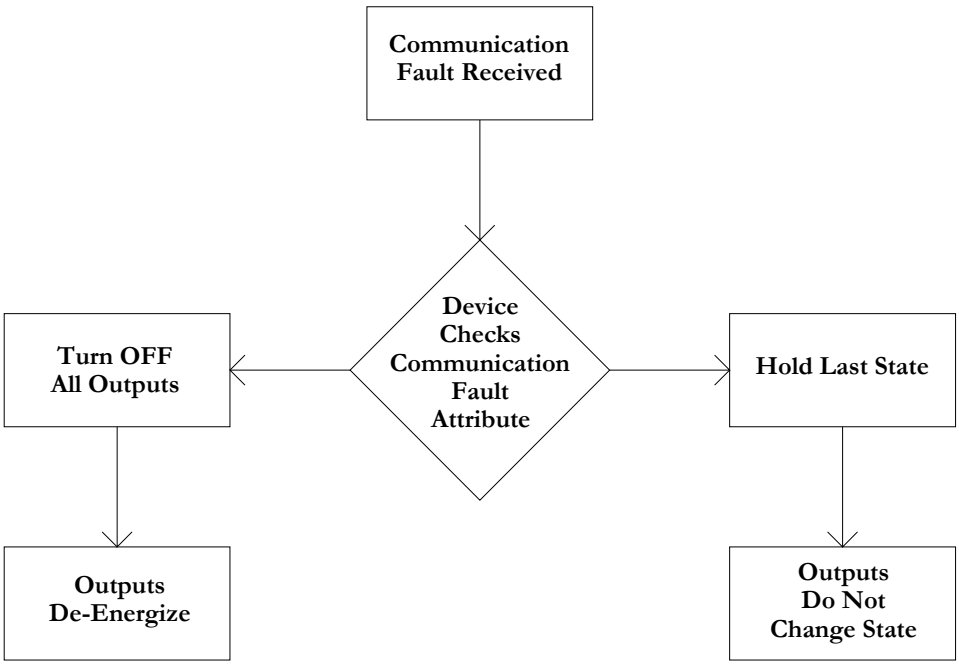
1. Hold Last State of Outputs
2. Turn Off All Outputs

Communication Fault/Idle Mode Sequence

The Communication Fault/Idle Mode parameter determines the output state if the device encounters a communication fault and/or idle action. A Communication Fault is defined as an inability for the master node to communicate with a slave node on a network. Idle Mode is a condition when the processor is in program mode.

The process for determining the output state during a Communication Fault/Idle Mode is as follows:

1. The device receives a Communication Fault/Idle Mode event.
2. The device determines what action to take based on the Communication Fault/Idle Mode attribute setting.
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.



PROFIBUS-DP Mapping

I/O Sizes

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. 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. This value for the valve side size is configurable via GSD file. See the following table:

Selection	Outputs Bytes	Inputs Bytes
8 Solenoid Coils	1	0
16 Solenoid Coils	2	0
24 Solenoid Coils	3	0
32 Solenoid Coils	4	0

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. an input bit for each input point).

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. The I/O size can vary greatly, due to the many physical configurations. The worksheet on page 53 will allow accurate sizing of the I/O data.

Manifold and I/O Data Sizing Worksheet

Step	
1	: Choose corresponding *Input* and Output values based on the chosen *"Valve Side Output Options"* and place the values in the boxes labeled, "Valve Side 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 (including distributed modules) and place sum of the corresponding input bytes and output bytes in the boxes labeled, "Discrete Side Byte Requirements" at the bottom of the page.
3	: Add the input bytes and output bytes values from the boxes labeled "Discrete Side Byte Requirements" and "Valve Side Byte Requirements" and place total in the boxes labeled "Total I/O Bytes for Manifold. This is the total input and output byte count values required for the configured manifold.

Valve Side				
Step	*Valve Side Output Options (selected via GSD file)*		*Input Bytes*	*Output Bytes*
1	Up to 8 Solenoid Coils		0	1
	Up to 16 Solenoid Coils		0	2
	Up to 24 Solenoid Coils		0	3
	Up to 32 Solenoid Coils		0	4

Digital Modules				
Step	*Module Part Number*	*Description*	*Input Bytes*	*Output Bytes*
2	240-203/204	16 Inputs - Terminal Strip	2	0
	240-205/209	16 Inputs - 8 x M12	2	0
	240-206/210	8 Inputs - 8 x M12	1	0
	240-207	16 Outputs - 8 x M12	0	2
	240-208	8 Outputs - 8 x M12	0	1
	240-211	8 Inputs / 8 Outputs - 8 x M12	1	1
	240-241	Distributed Sub-Bus Valve Module	0	1, 2, 3 or 4

Analog Modules				
Step	*Module Part Number*	*Description*	*Input Bytes*	*Output Bytes*
2	240-212/214	4 Inputs – 4 x M12	8	0
	240-213/215	2 Inputs/ 2 Outputs – 4 x M12	4	4

Total Input/Output Size Calculation				
Step	*Module Position (includes distributed modules)*	*Module Part Number*	*Input Bytes*	*Output Bytes*
2	1st			
	2nd			
	3rd			
	4th			
	5th			
	6th			
	7th			
	8th			
	9th			
	10th			
	11th			
	12th			
	13th			
	14th			
	15th			
	16th			
		Discrete Side Byte Requirements:		
1		Valve Side Byte Requirements:		
3		**Total I/O Bytes for Manifold**		

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 Numatics 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 adjustable from 0 to 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 at byte 0. The input bits from the second module will be mapped directly after the input bits from the 1st module and so on.

I/O Mapping Examples

Example No. 1

Assumed Settings

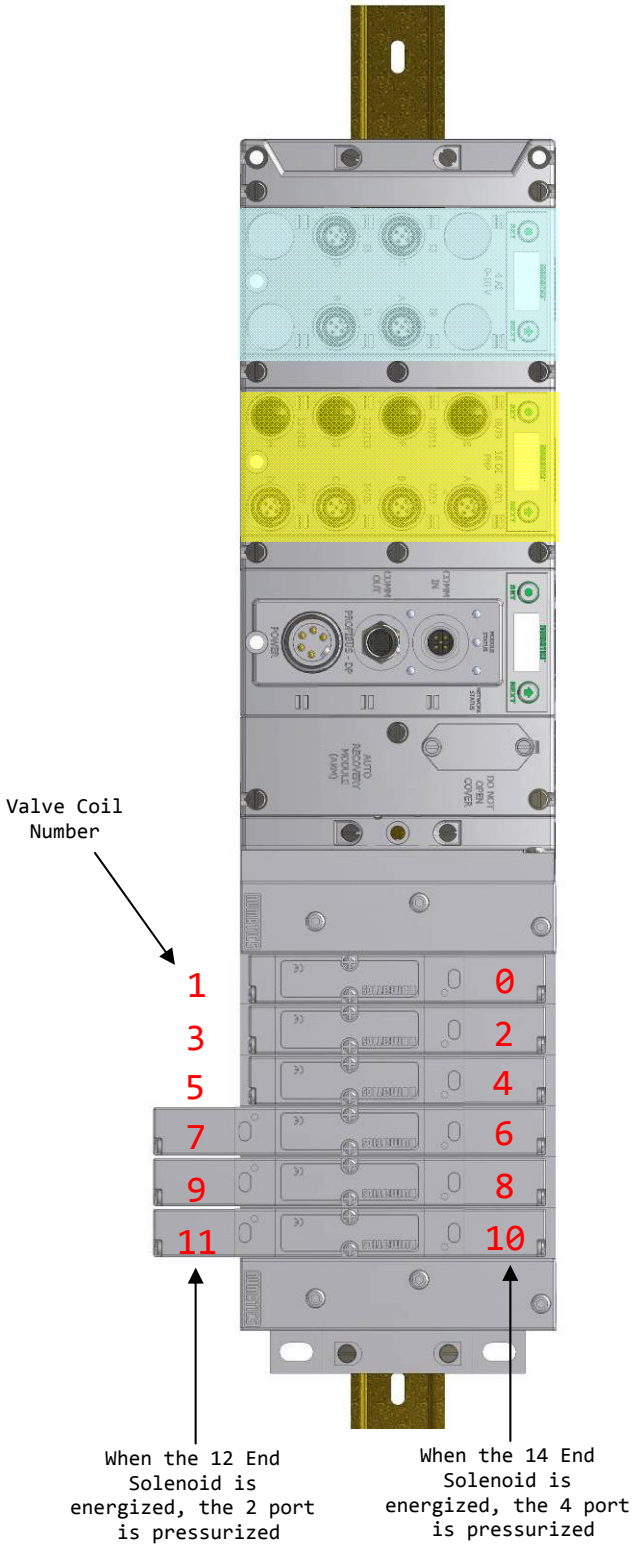
- Double Z-Boards™ used with all valves
- I/O Modules and mapping schemes are identified by their corresponding color.
- 32 coils are allocated

Manifold I/O Configuration

Pos No.	*Module Type*	*Part No.*	*In*	*Out*
			Bytes	
1	16I PNP	240-205	2	0
2	4AI Analog	240-212	8	0
	Local Valve Size		0	4
		Total:	10	4

How to Order

Qty	*Part Number*
1	AK3EF00003NDRM
3	051BA4Z2MN00061
3	051BB4Z2MN00061
1	G3PT102R0G32
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 (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
3 (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

Input Table								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	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
1	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
2	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)
3	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
4	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)
5	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
6	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)
7	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
8	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)
9	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

- ***The number of Outputs Bytes Allocated for valve coils may be optimized and set to 8, 16, 24 or 32 coils.***

Example No. 2

Assumed Settings

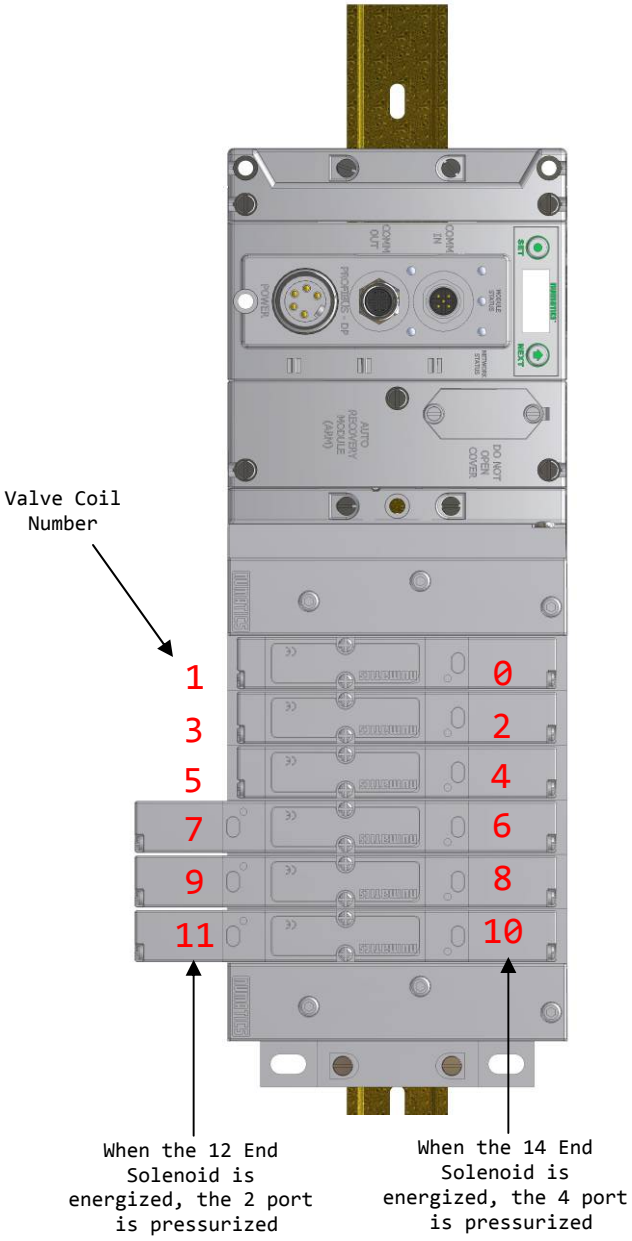
- Double Z-Boards™ used with all valves
- I/O Modules and mapping schemes are identified by their corresponding color.
- 32 coils are allocated.

Manifold I/O Configuration

Pos. No.	*Module Type*	*Part No.*	*In*	*Out*
			Bytes	
		Local Valve Size:	0	4
		Total:	0	4

How to Order

Qty	*Part Number*
1	AK3EF00003NDRM
3	051BA4Z2MN00061
3	051BB4Z2MN00061
1	G3PT100R0G32
	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 (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
3 (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

Input Table								
BYTE	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**

Example No. 3

Assumed Settings

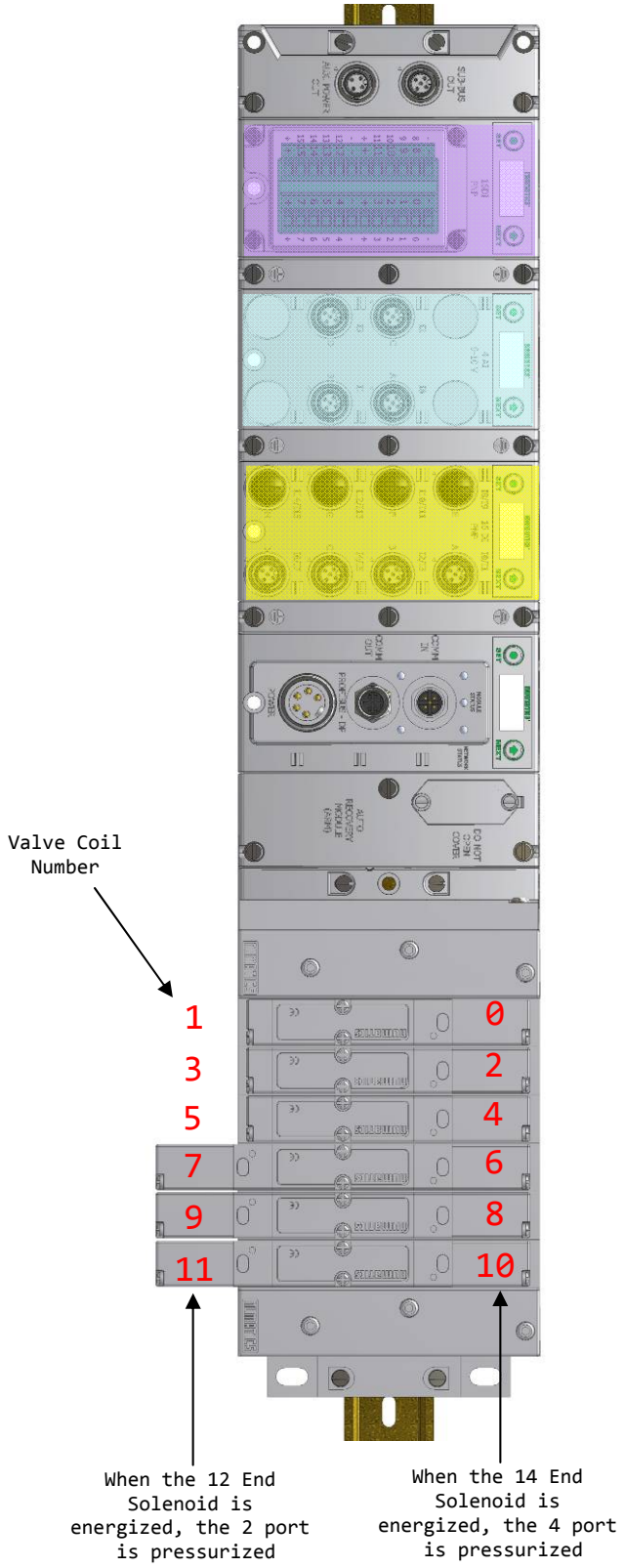
- Double Z-Boards™ used with all valves
- I/O Modules and mapping schemes are identified by their corresponding color.
- 32 coils are allocated

Manifold I/O Configuration

Pos No.	*Module Type*	*Part No.*	*In*	*Out*
			Bytes	
1	16I PNP	240-205	2	0
2	4AI Analog	240-212	8	0
3	16I PNP	240-203	2	0
		Local Valves:	0	4
		Total:	12	4

How to Order

Qty	*Part Number*
1	AK3EF00003NDRM
3	051BA4Z2MN00061
3	051BB4Z2MN00061
1	G3PT103D0G32
1	240-205
1	240-212
1	240-203
	ASSEMBLED



Example No. 3 Table

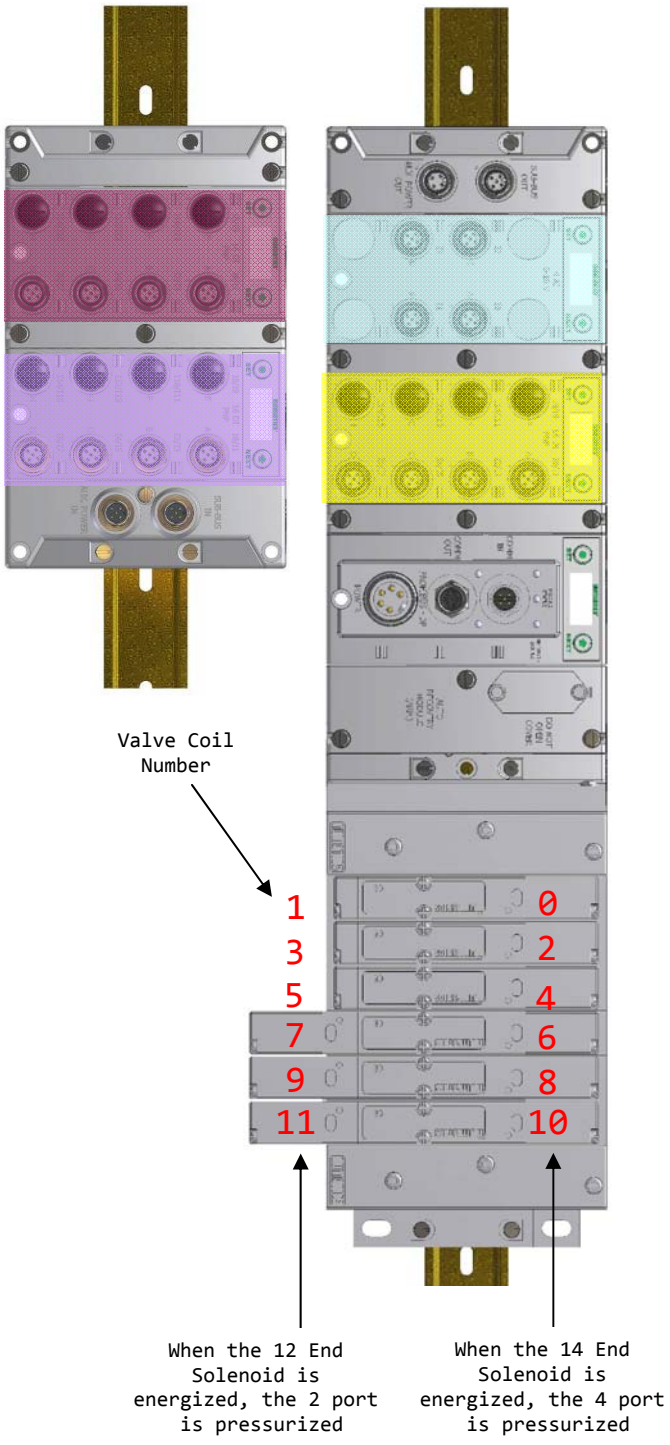
Output Table								
BYTE	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Valve Coil No. 7	Valve Coil No. 6	Valve Coil No. 5	Valve Coil No. 4	Valve Coil No. 3	Valve Coil No. 2	Valve Coil No. 1	Valve Coil No. 0
1	Allocated and Reserved	Allocated and Reserved	Allocated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

Input Table								
BYTE	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	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
1	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
2	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)
3	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
4	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)
5	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
6	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)
7	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
8	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)
9	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
10	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
11	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

Example No. 4

Assumed Settings

- Double Z-Boards™ used with all valves
- I/O Modules and mapping schemes are identified by their corresponding color.
- 32 coils are allocated



Manifold I/O Configuration

Pos No.	Module Type	Part No.	In	Out
			Bytes	
1	16I PNP	240-205	2	0
2	4I Analog	240-212	8	0
3	16I PNP	240-205	2	0
4	16I PNP	240-205	2	0
	Local Valves:		0	4
	Total:		14	4

How to Order

Qty	Part Number
1	AK3EF00003NDRM
3	051BA4Z2MN00061
3	051BB4Z2MN00061
1	G3DN102R0G32
1	240-205
1	240-212
	ASSEMBLED

1	G3DS302R0DRM
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 (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
3 (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

Input Table								
BYTE	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	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
1	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
2	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)
3	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
4	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)
5	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
6	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)
7	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
8	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)
9	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
10	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
11	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
12	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
13	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

Example No. 5

Assumed Settings

- Double Z-Boards™ used with all valves
- I/O Modules and mapping schemes are identified by their corresponding color.
- 32 coils are allocated

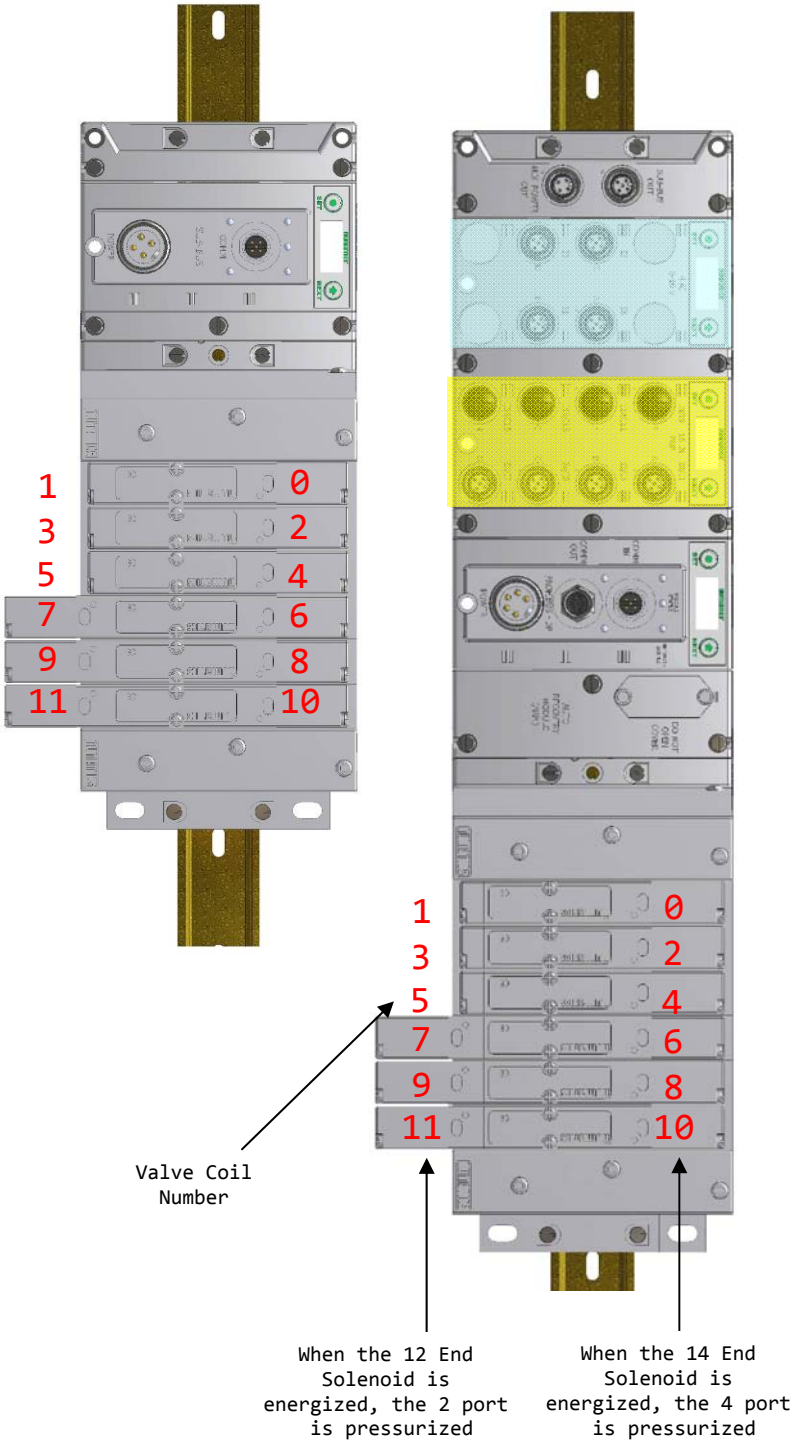
Manifold I/O Configuration

Pos No.	*Module Type*	*Part No.*	*In*	*Out*
			Bytes	
1	16I PNP	240-205	2	0
2	4I Analog	240-212	8	0
Local Valves (DeviceNet)			0	4
Local Valves (Sub-Bus)			0	4
		Total:	10	8

How to Order

Qty	*Part Number*
1	AK3EF00003NDRM
3	051BA4Z2MN00061
3	051BB4Z2MN00061
1	G3DN102D0G32
1	240-205
1	240-212
	ASSEMBLED

1	AK3EF00003NDRM
3	051BA4Z2MN00061
3	051BB4Z2MN00061
1	G3DS202R0DRM
	ASSEMBLED



Example No. 5 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 (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
3 (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
4	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
5	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
6 (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
7 (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

Input Table								
BYTE	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	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
1	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
2	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)
3	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
4	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)
5	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
6	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)
7	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
8	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)
9	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

Extended Diagnostics

Data Diagnostic Telegram

Example data structure (Hexadecimal):

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9
07	00	00	07	00	FF	FF	XX	XX	XX

Byte 0	07	Total number of bytes in telegram determined by physical configuration
Byte 1	00	Diagnostic Word, byte 0 (see below)
Byte 2	00	Diagnostic Word, byte 1 (see below)
Byte 3	07	1st diagnostic byte of valve driver module. Diagnostic for Output byte 0 (00000111) Diagnostic bit high for coils 0, 1, 2
Byte 4	00	2nd diagnostic byte of valve driver module. Diagnostics for output byte 1
Byte 5	FF	3rd diagnostic byte of valve driver module. Diagnostics for output byte 2
Byte 6	FF	4th diagnostic byte of valve driver module. Diagnostics for output byte 3
Byte 7…	XX	Diagnostics for next I/O module in system if applicable

Diagnostic bits for outputs are as follows:

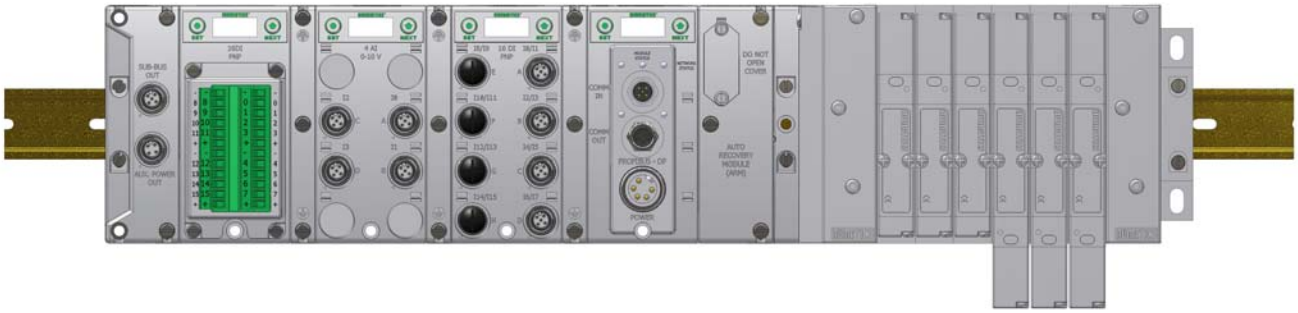
Output Type	*Output State*	*Fault Condition*	*Status Bit*
Valve Solenoid Coil Driver	ON	No Fault	0
		Fault - Short Circuit, Over Temp/Over Current	1
	OFF	No Fault	0
		Fault - Open Load	1
Discrete Outputs	ON	No Fault	0
		Fault - Short Circuit, Over Temp/Over Current	1

Diagnostic bits for inputs are as follows:

Input Type	*Input State*	*Fault Condition*	*Status Bit*
Input	N/A	No Fault	0
		Fault - Short Circuit on connector	1

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

Diagnostic Telegram Example



Diagnostic Telegram Data for above manifold (Hexadecimal)

0C	00	00	2A	F0	F F	F F	00	00	00	00

0C	Total number of bytes in telegram
00	Diagnostic Word, byte 0 (00000000)
00	Diagnostic Word, byte 1 (00000000)
2A	First diagnostic byte of valve driver module. (01010100)
F0	Second diagnostic byte of valve driver module. (11110000)
F F	Third diagnostic byte of valve driver module. (11111111)
F F	Fourth diagnostic byte of valve driver module. (11111111)
00	Diagnostic byte for 16 pt Input module (M12) (00000000)
F0	1st diagnostic byte of 4 pt Analog Input module (11110000)
00	2nd diagnostic byte of 4 pt Analog Input module (00000000)
F0	Diagnostic byte for 16 pt Input module (terminal strip) (11110000)

Appendix

System Specifications

Electrical	
Supply Voltage	Valves (2005, 2012, 2035): 24 VDC + 10%, -15% 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 Power Connector pins are each internally fused with an electronically resettable fuse. These fuses are set to the maximum current allowable through the G3electronics.
Recommended External Fuse	External fuses should be chosen depending upon manifold configuration. Please refer to power consumption chart on page 16 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 46°C)

Factory Default Settings

FACTORY DEFAULT SETTINGS	
Description	*Default*
Node Address	126
SSA Lock	Disabled
Brightness	High

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 52 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.

I/O Modules

Symptom	*Possible Cause*	*Solution*
Outputs remain on when communication is lost and/or PLC is in "Program" mode.	Communication Fault parameters are set incorrectly. See pages 51.	Check the communication fault/idle mode parameter setting to ensure that it is not set to "Hold Last Output State".

Glossary of Terms

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

Term	Description
Auto-Baud	A technology that enables the communication node to automatically set its own baud rate to match the DeviceNet scanners' baud rate.
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.
Byte	8 bits (1/2 word).
Discrete I / O	The Inputs / Outputs that are available via the "Discrete I/O" side of manifold.
Ground	This term is used to indicate an earth ground.
Group 2	DeviceNet message group applicable to Numatics' Serial/Bus products.
MCM	Manual Configuration Module. A module that allows MAC ID to be set manually via DIP switches. Not required if software configuration is used.
NEMA	National Electrical Manufacturers Association.
Sinking (NPN)	Method of connecting electrical circuits in which the zero (0) volt DC side is switched and the common is positive
SCP	Short Circuit Protection
Sourcing (PNP)	Method of connecting electrical circuits in which the positive side is switched and the common is zero (0) volts DC.
Word	2 Bytes (16 bits)
Z-Board™	Circuit board installed in the valve sub-base which electrically connects the valve solenoid to the electrical /electronics interface. Available in single or double solenoid versions.

Technical Support

For technical support, contact your local Numatics distributor. If further information is required, please call Numatics Inc. Technical Support Department at (248) 596-3333.

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 Numatics, Inc. products and support issues can be found on the Numatics, Inc's. WEB site at www.numatics.com