

numatics®

G3 Series CANopen™ Technical Manual



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About CANopen

Overview

CANopen is an open protocol based on the CAN (Controller Area Network) protocol. It was designed for motion orientated machine control but has migrated to various industrial applications. CAN in Automation (CIA) is the international users' and manufacturers' organization that develops and supports CAN-based protocols.

Numatics G3 nodes for CANopen have an integrated graphic display and are capable of addressing a combination of 32 bytes of inputs and 32 bytes of outputs.

More information about CANopen and CIA can be found at: www.can-cia.org

G3 CANopen Features

<i>Features</i>	<i>Description</i>
CANopen Spec. Supported	Designed to CANopen specification 301 V4.0.2
Bus Topology	Straight with restricted drops; trunkline-dropline configuration
Baud Rates Supported	125 Kbps, 250 Kbps and 500 Kbps and 1Mbps
Duplicate address detection	If duplicate address detected on power up, duplicates will not progress to run mode
Error Correction	Yes, if error detected, sender is requested to repeat the message
Address Setting	Via graphic display
PDO's supported	4
SDO's supported	Yes
Termination Resistor (external)	A 121 ohms, 1%, 1/4 Watt resistor is required at each end of the trunk line

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

Cable Lengths

<i>Baud Rate</i>	<i>Maximum Bus Length</i>	<i>Maximum Drop Length</i>	<i>Cumulative Drop Length</i>
125 Kbps	500 m (1640 ft)	22 m (72 ft)	110 m (360 ft)
250 Kbps	250 m (820 ft)	11 m (36 ft)	55 m (180 ft)
500 Kbps	100 m (328 ft)	5.5 m (18 ft)	27.5 m (90 ft)
1 Mbps	25 m (82 ft)	1.5 m (5 ft)	7.5 m (24 ft)

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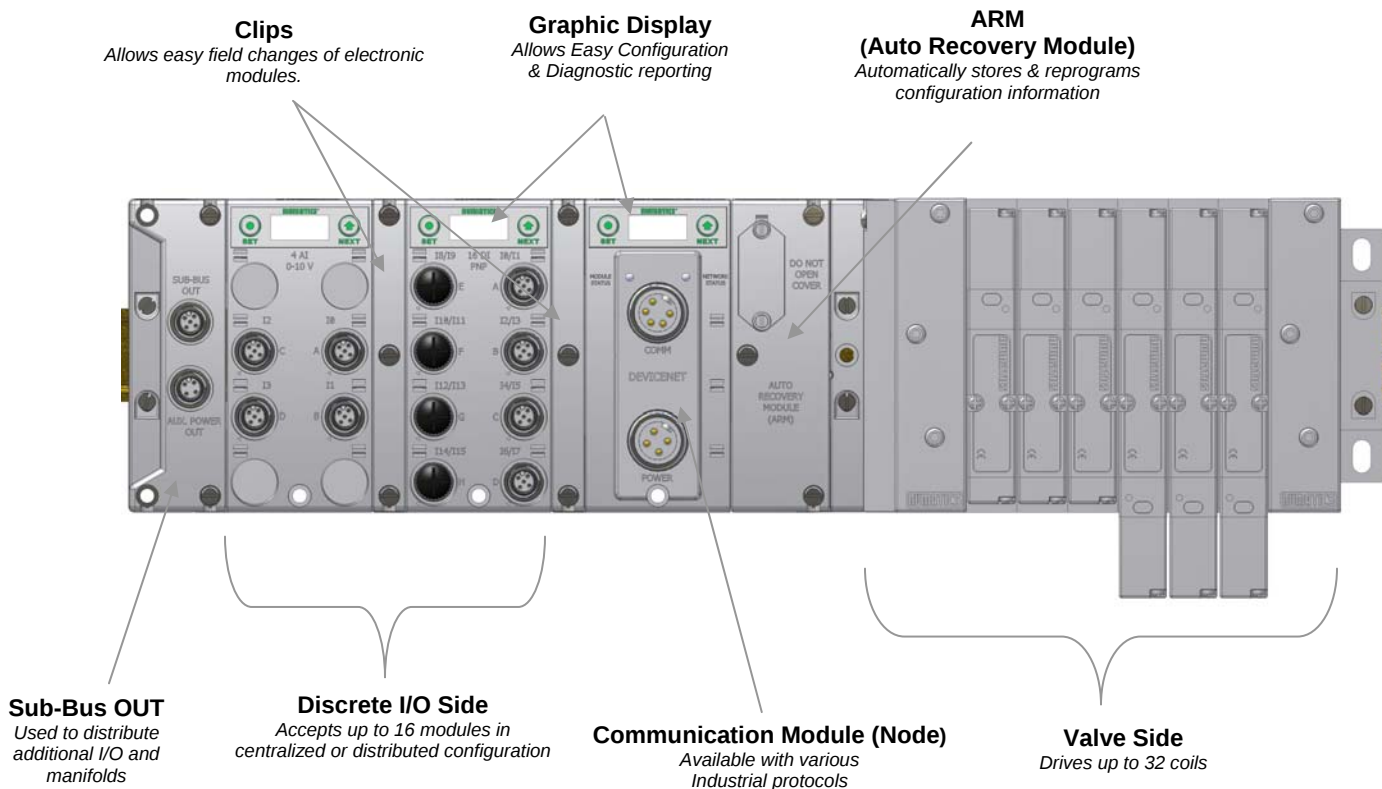
G3 Introduction

The G3 Series is an electronic 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) (CANopen is limited to 32 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 (current physical I/O combinations allows 1200 I / 544 O) (CANopen is limited to 32 bytes).

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.

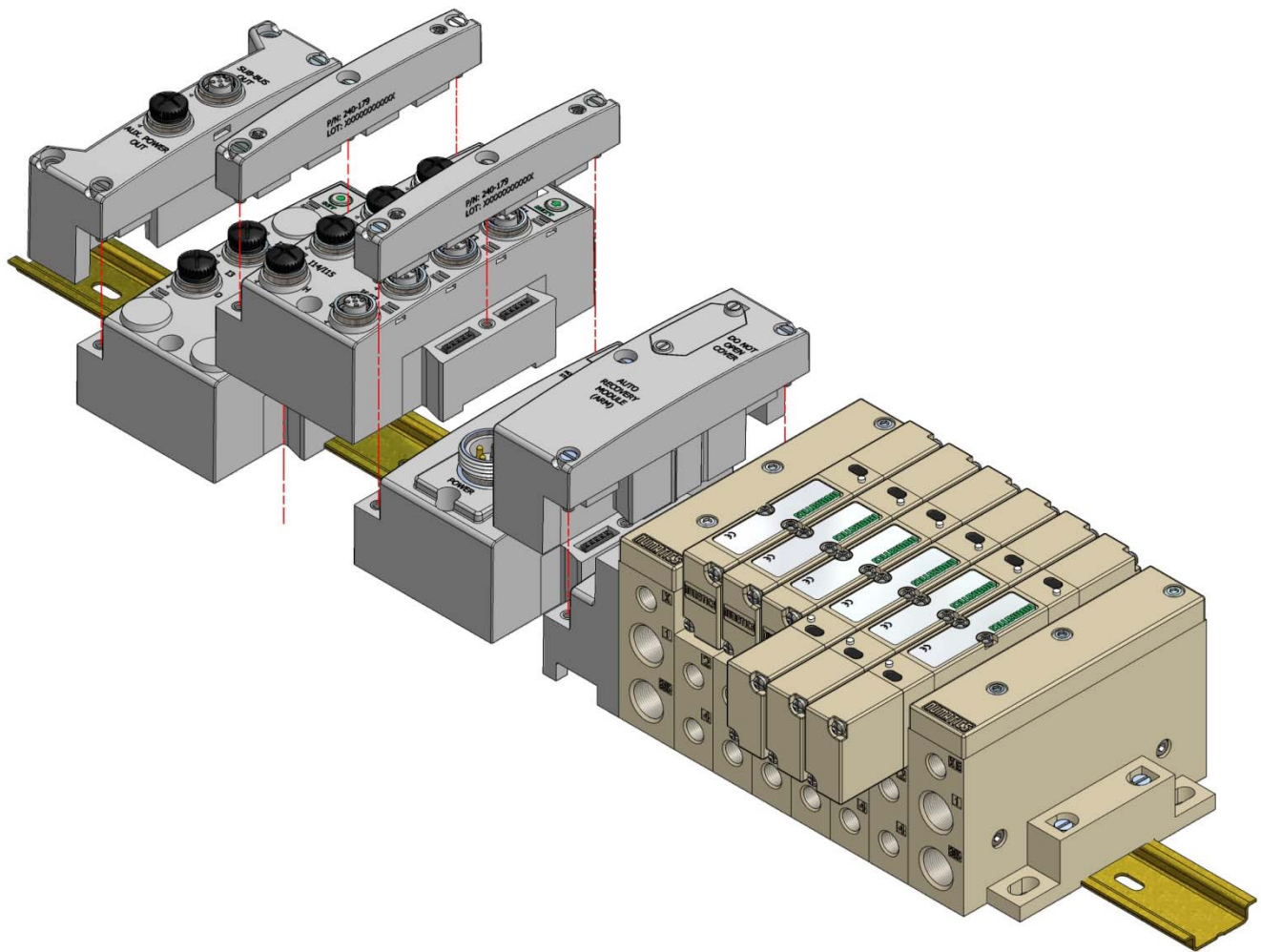


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G3 Electronics Modularity

Discrete I/O

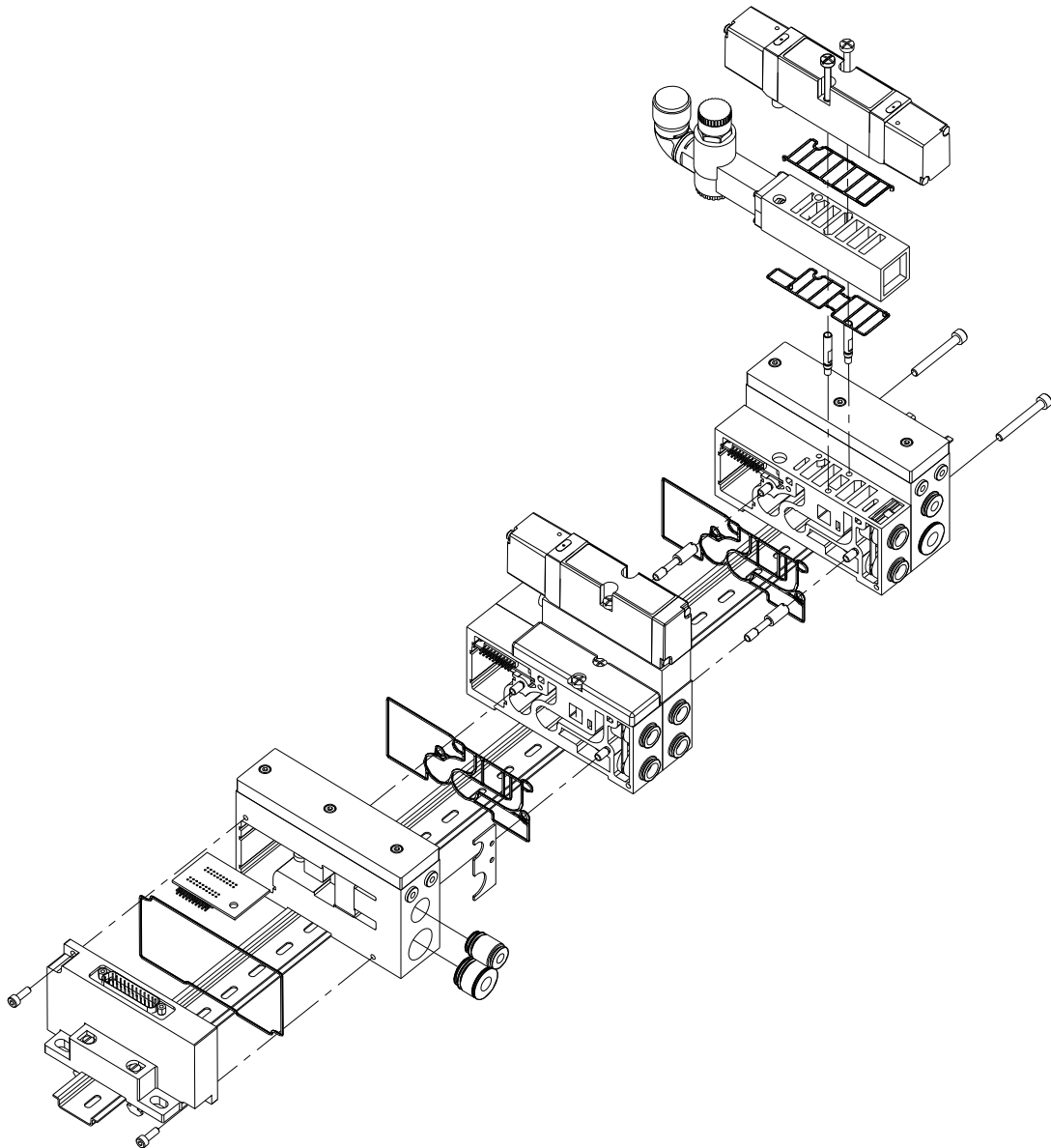
The G3 Series product line is a completely modular and scalable system. As shown below, all of the G3 electronic modules plug together, via mechanical clips, allowing for easy assembly and field changes.



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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.

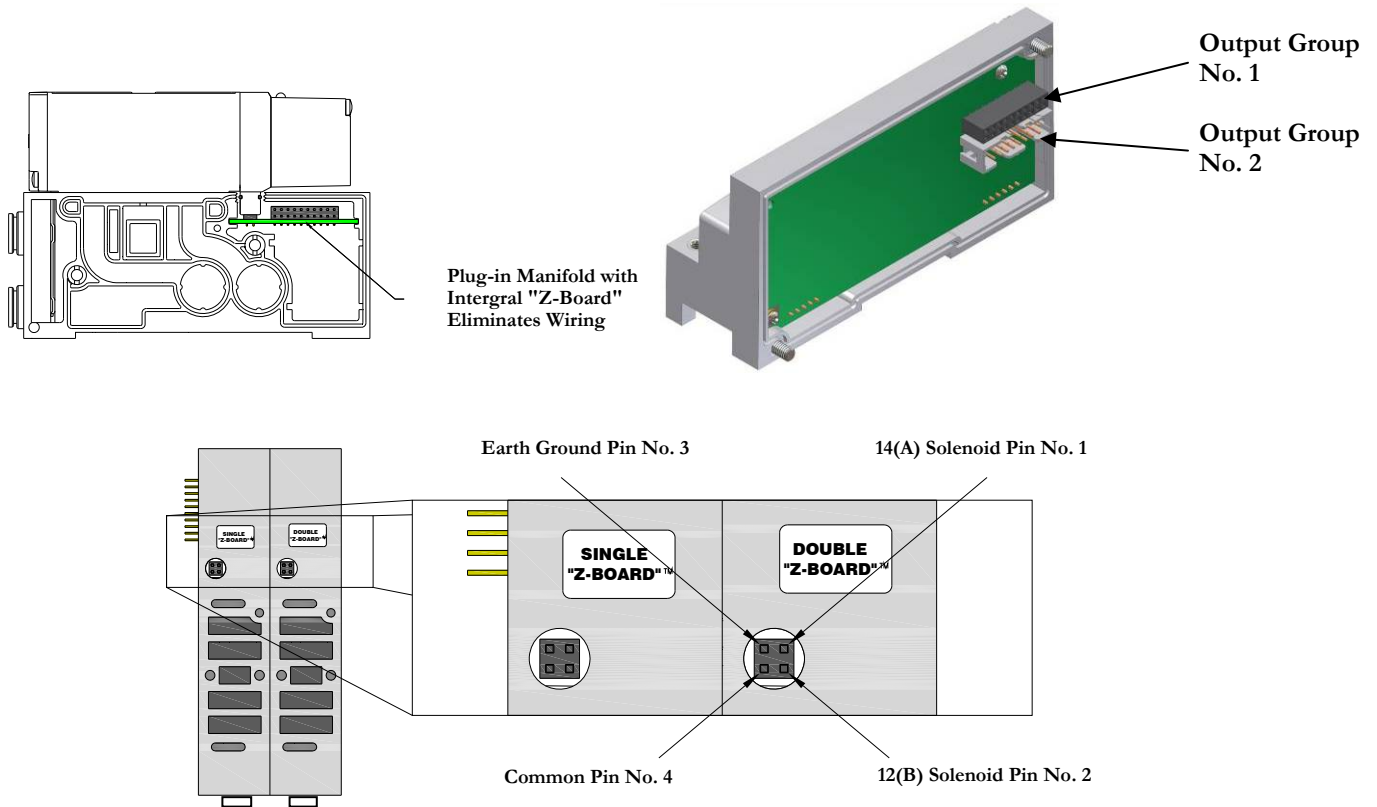


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Manifold Connectors

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.**

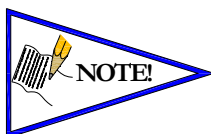
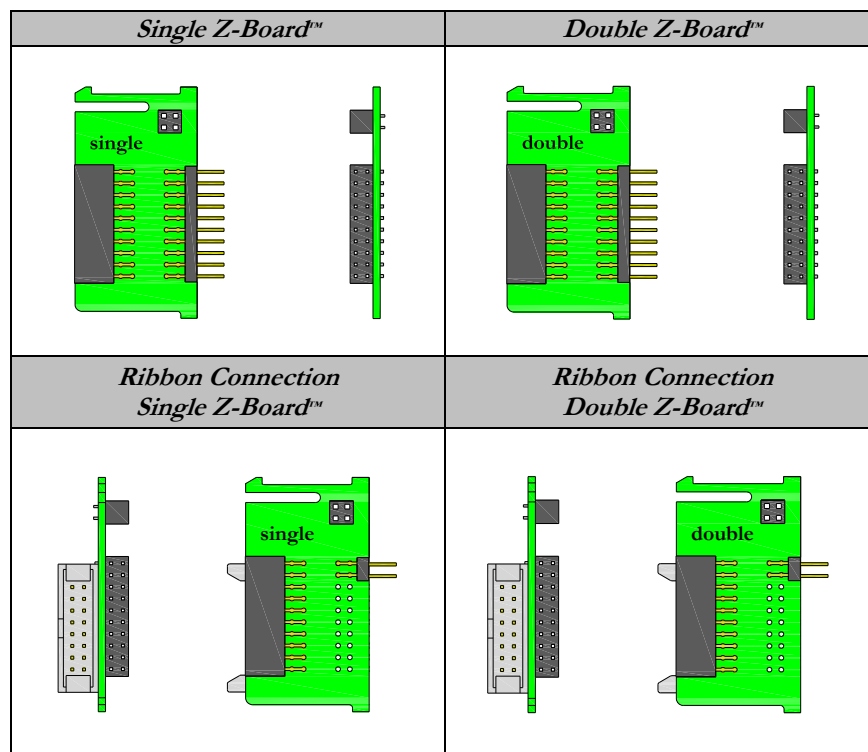


A single solenoid valve's coil is always on the "14" end.

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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.

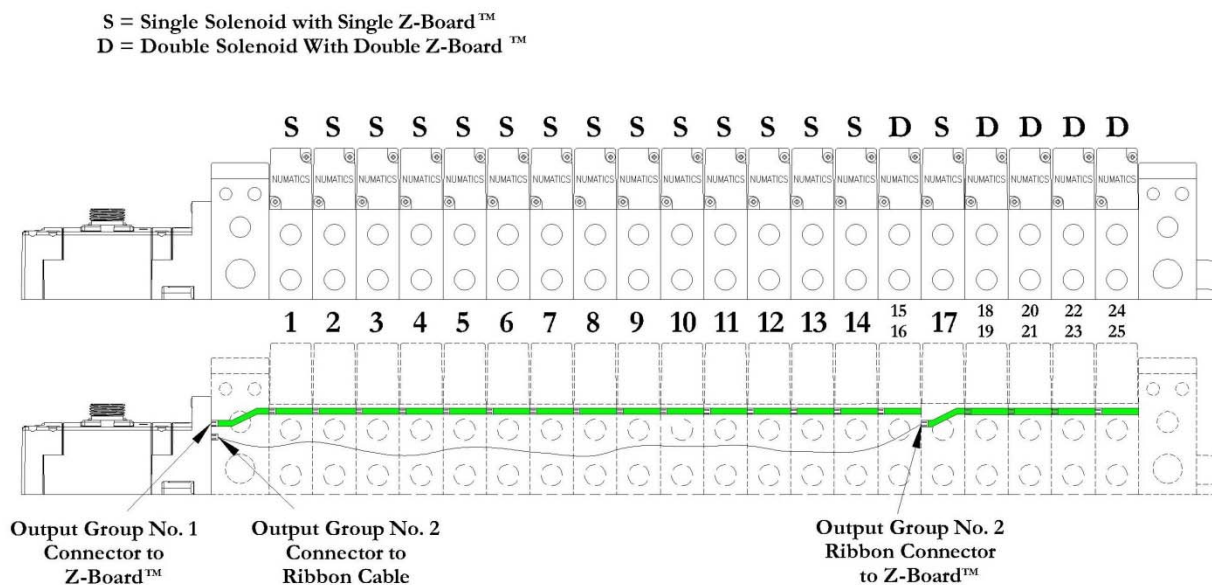


The 17th solenoid (output group No. 2's first bit) must be accessed via either the valve side Sub-D output module or a ribbon connector type Z-board.

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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:



Output Group No.	1															2																	
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	n/a							



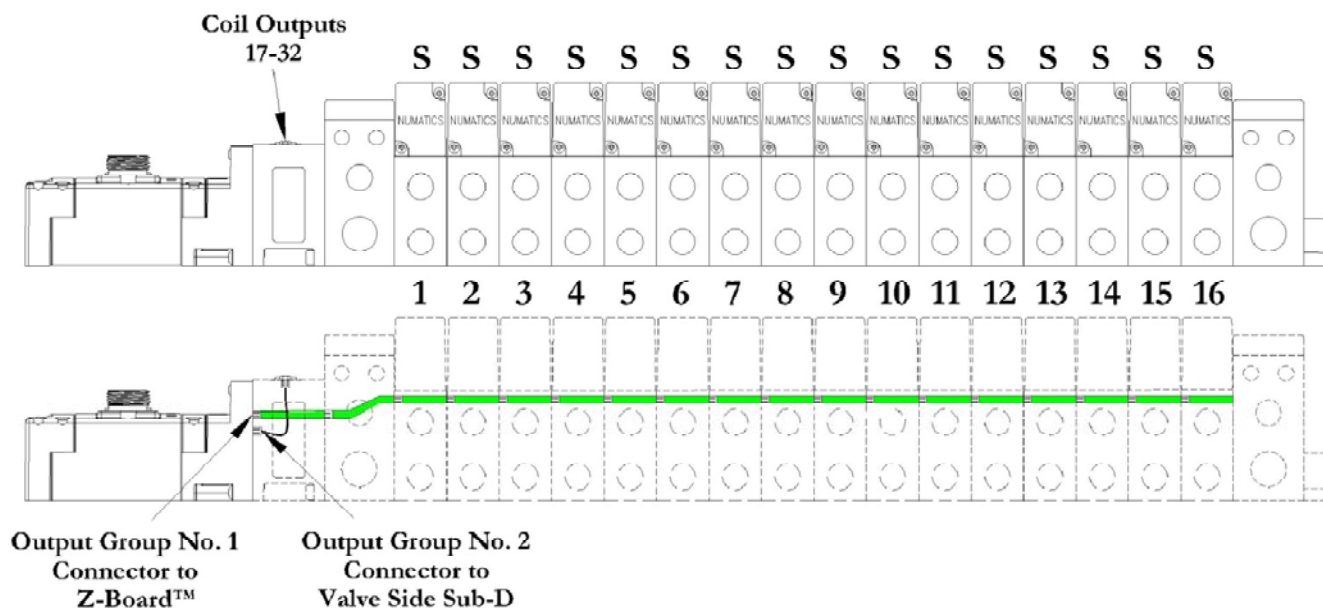
In the above example, Output Bits No. 25 thru No. 31 are allocated but not used. Allocation may be changed by configuration changes in the communication module (node). Refer to page 24 in this manual.

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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 Group No.	1																2															
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

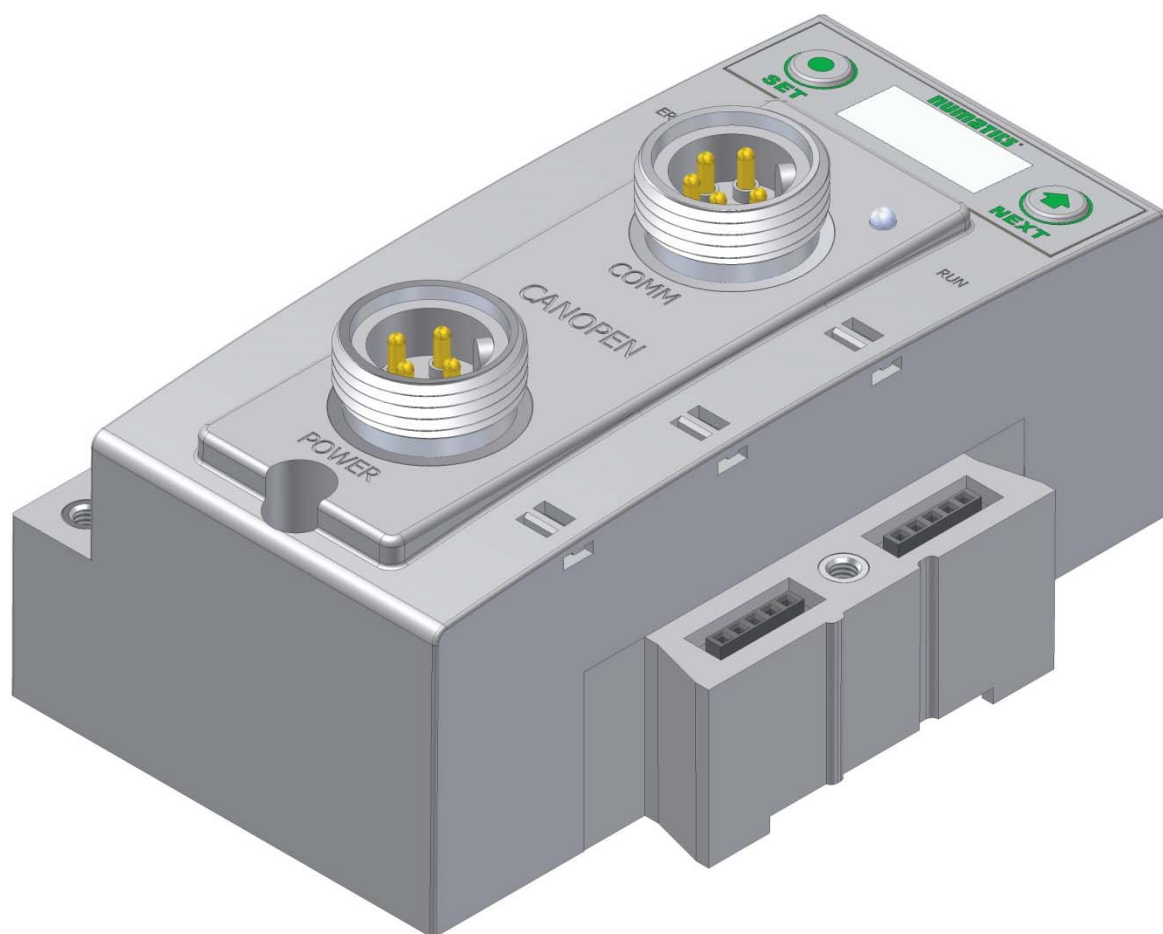
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Communication Module (Node)

CANopen 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 or via the graphic display .

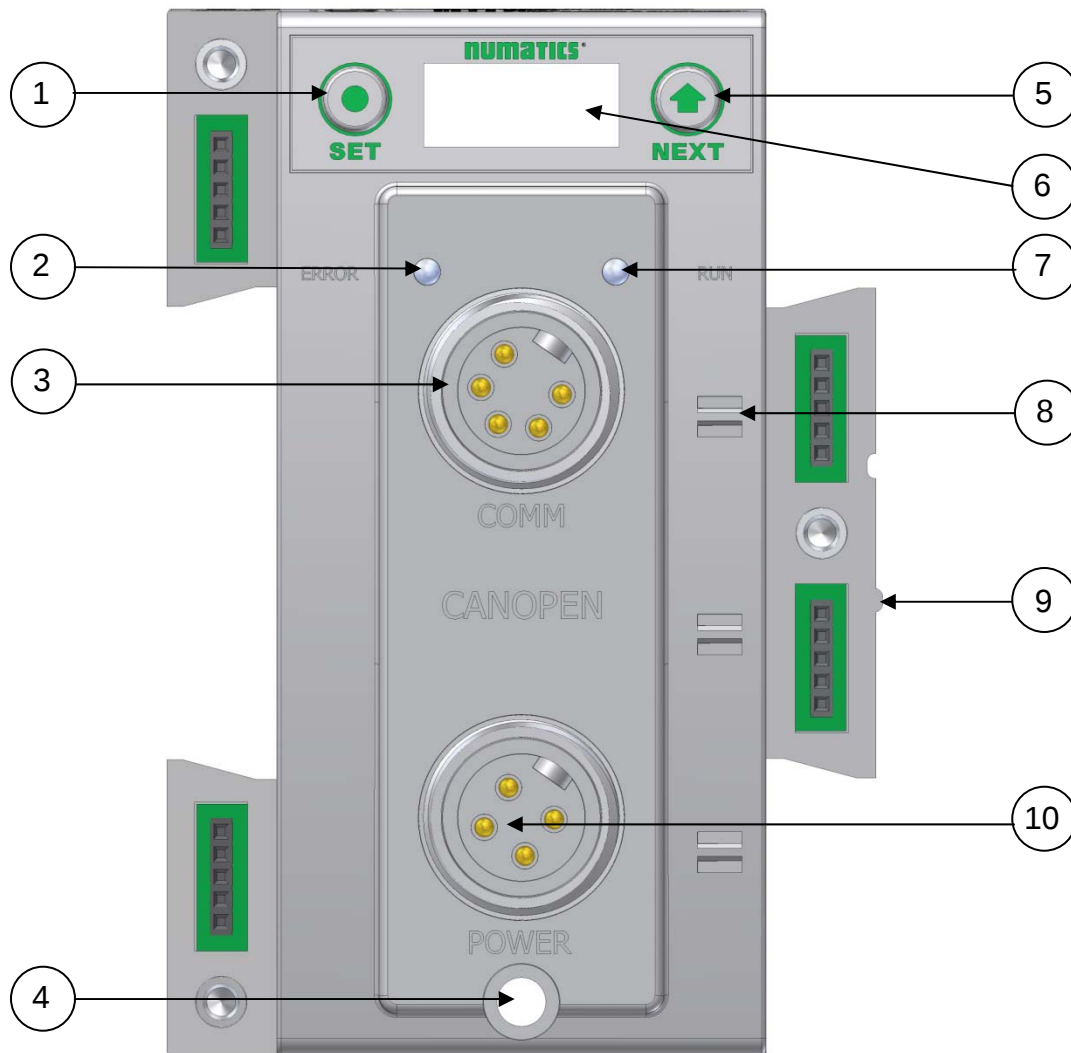
Communication Module	Part Number
CANopen Communication module	240-291



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Communication Module Description

Detail No.	Description
1	“Set” Button – used to navigate through user menus and to set parameters
2	Error LED
3	5 Pin MINI Male Communication Connector
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	Run LED
8	Slot for text ID tags
9	Keying for preventing I/O module insertion
10	4 Pin MINI Male Power Connector



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Connector Pin-Outs

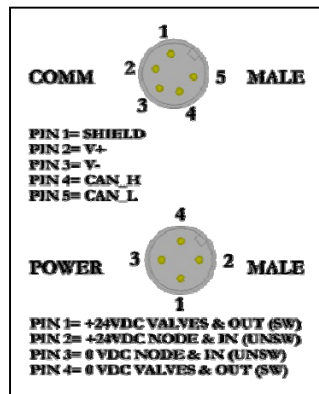
Industry standard 7/8" MINI connectors are used for communication and power.
The CANopen communication connector is a single keyway 5 pin male connector.
The Power connector is a single keyway 4 pin male connector.

CANopen Communication Connector Pin-Out

Pin No.	Function	Description
1	Shield	Cable shield
2	V+	Bus Power 11-25VDC
3	V-	Bus Power Common (0 VDC)
4	CAN_H	Controller Area Network High Communication Line
5	CAN_L	Controller Area Network Low Communication Line

Power Connector with CENELEC Style Pin-Out

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



- 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.
- 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.

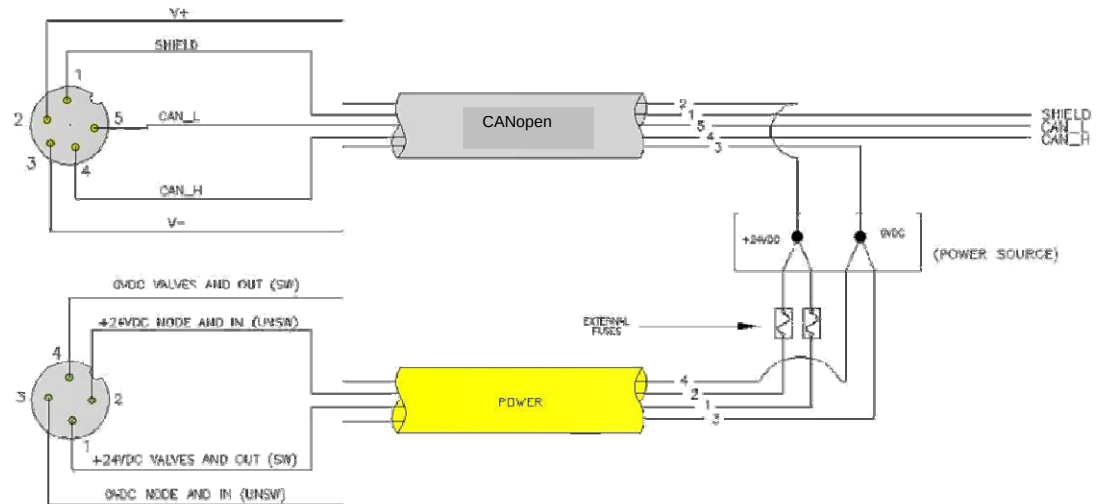
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Electrical Connections

Standard Power Connector Wiring Diagram Examples

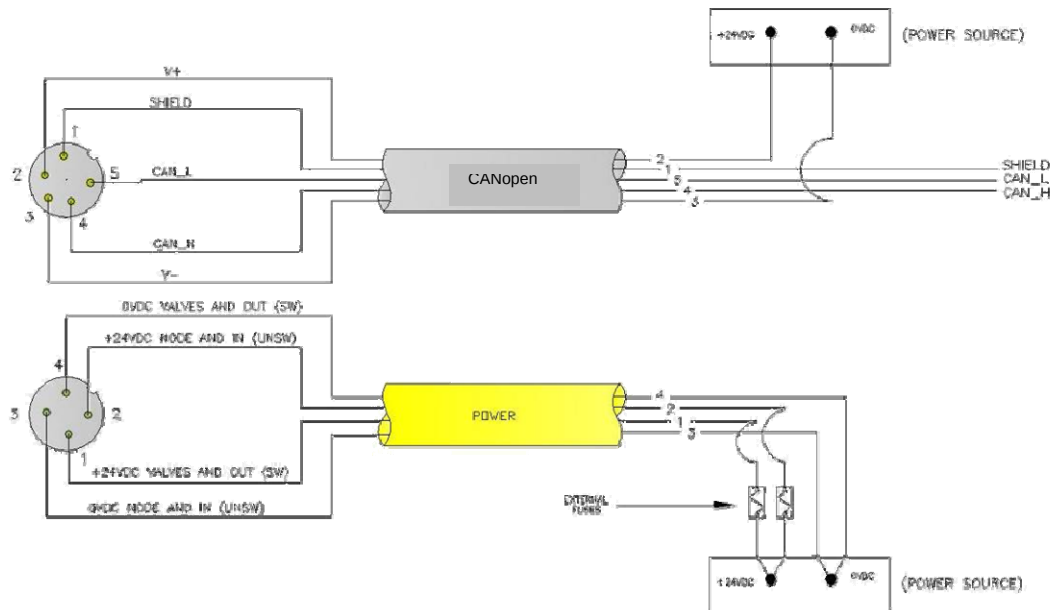
Single Power Supply Example (Non-isolated commons)

Male connector view



Separate Power Supply Example (Non-isolated commons)

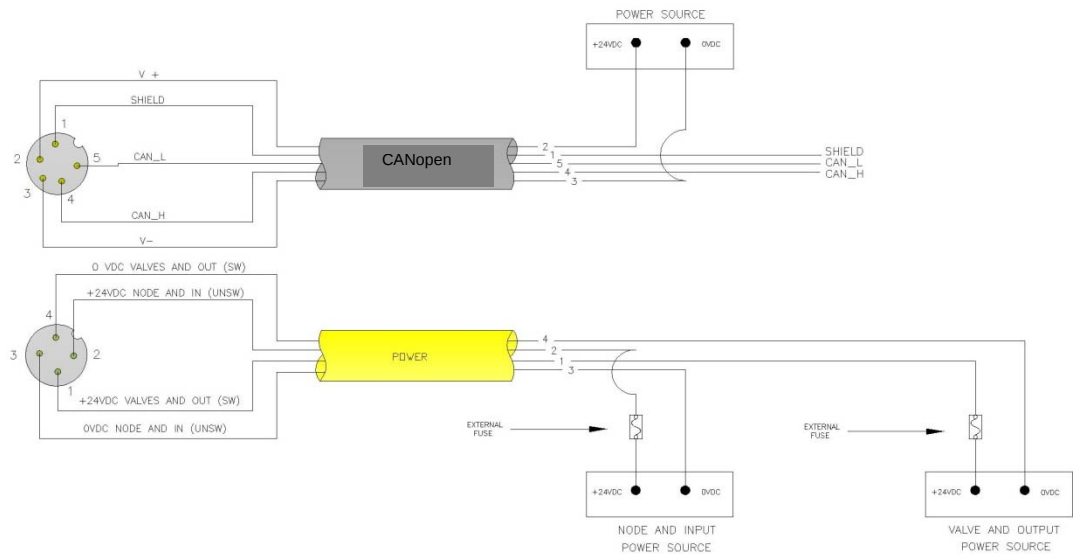
Male connector view



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Separate Power Supply Example (Isolated commons)

Male connector view



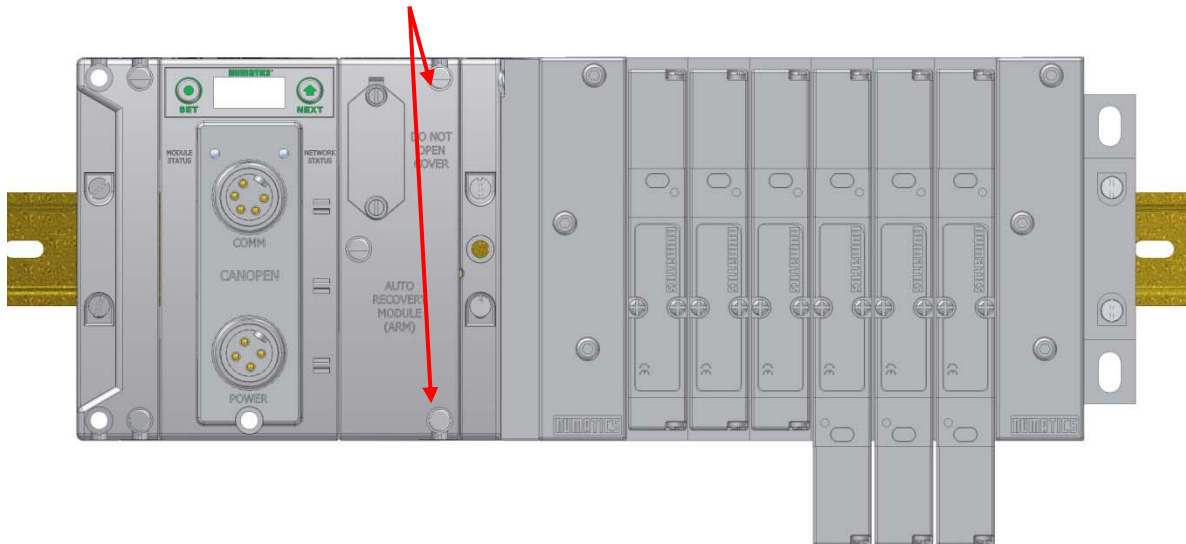
- Please see page 18 for external fuse sizing guide.
- When using molded connector power cables, Do Not rely on wire colors for Pin-Out. Always use pin number references.

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Ground Wiring

All Numatics 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.

CHASSIS GROUND (FE) CONNECTION POINTS



- *Proper grounding will alleviate and 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.*

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Power Consumption

Power Connection

<i>CENELEC Pin No.</i>	<i>Function</i>	<i>Description</i>
1	+24 VDC (Valves and Outputs)	Voltage used to power outputs (valve coils and discrete outputs) SW
2	+24 VDC (Node and Inputs)	Voltage used to power discrete inputs and node electronics UNSW
3	0 VDC Common (Node and Inputs)	0 VDC (-V) Voltage used to power discrete inputs and node electronics UNSW
4	0 VDC Common (Valves and Outputs)	0 VDC (-V) 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).

<i>Component</i>	<i>Voltage</i>	<i>Tolerance</i>	<i>+24VDC (Valves and Outputs) Pins 1 & 4</i>		<i>+24VDC (Node and Inputs) Pins 2 & 3</i>	
			<i>Current</i>	<i>Power</i>	<i>Current</i>	<i>Power</i>
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%	.068 A	1.63 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 Module (V & C)	24 VDC	+/- 10%	.020 A	0.288 W	.070 A*	1.85 W*
Communication Module (Node) CANopen Network Current =	24 VDC	+/- 10%	.006 A	0.144 W	.070 A*	1.7 W*
Sub-Bus Valve Module	24 VDC	+/- 10%	0 A	0 W	.032 A*	0.77 W*
Auto Recovery Module (ARM)	24 VDC	+/- 10%	0 A	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.*

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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

<i>Power Consumption - Power Connector Pin for Valves and Outputs</i>			
<u>Description</u>			<u>Current</u>
Number of Solenoid Valve Coils Energized Simultaneously			
___ X 0.167 A (ISO 5599-2 SPA Series)	=	_____	Amps
___ X 0.105 A (2012, 2035 and ISO 15407-2 26mm Series)	=	_____	Amps
___ X 0.056 A (2005 and ISO 15407-2 18mm 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 0.008 A	=	_____	Amps
		+	
Valve Adapter	=	.068	Amps
		+	
Communication Node Power Consumption	=	.008	Amps
		+	
Total:		_____	Amps
Surge Compensation:	X	1.25	
Suggested External +24 VDC (Valves and Outputs) Fuse Value:		_____	Amps
<i>Power Consumption - Power Connector Pin for Node and Inputs</i>			
<u>Description</u>			<u>Current</u>
Communication Node Power Consumption	=	.068	Amps
		+	
Total load current drawn by Sensor Devices from Discrete Inputs source	=	_____	Amps
		+	
Number of I/O modules installed ___ X 0.076 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...

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Diagnostics

Communication Module LED Functions

Upon power up, the RUN and ERROR LEDs indicate the state of the unit. There are two LEDs on the G3 CANopen node. The LEDs functions are described in the table below.



LED Name	Color	Status		Description
RUN	Green	OFF		Device is not currently powered.
		SINGLE FLASH		Stopped – The device is in a STOPPED state
		BLINKING		Pre-Operational – The device is in a Pre-Operational state
		ON		Operational – The device is in the operational state
ERROR	Red	OFF		No Error - The device is in working condition
		SINGLE FLASH		Warning Limit Reached – At least one of the error counters of the CAN controllers has reached or exceeded the warning level (too many error frames)
		DOUBLE FLASH		Error Control Event – A guard event (NMT- Slave or NMT-master) or a heartbeat event (Heartbeat consumer) has occurred
		TRIPLE FLASH		Sync Error – The sync message has not been received within the configured communication cycle period time out (see Object Dictionary Entry 0x1006)
		ON		Bus off – The CAN controller is bus off
	Green	Red	FLASHING	Module is in self-test mode.

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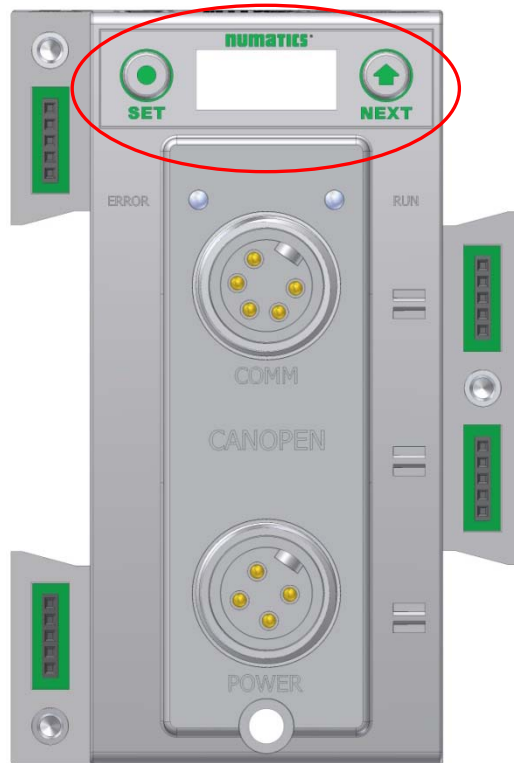
Output / Short Circuit Protection Diagnostic Status Bits

Diagnostic Status Bit Action during Fault Condition

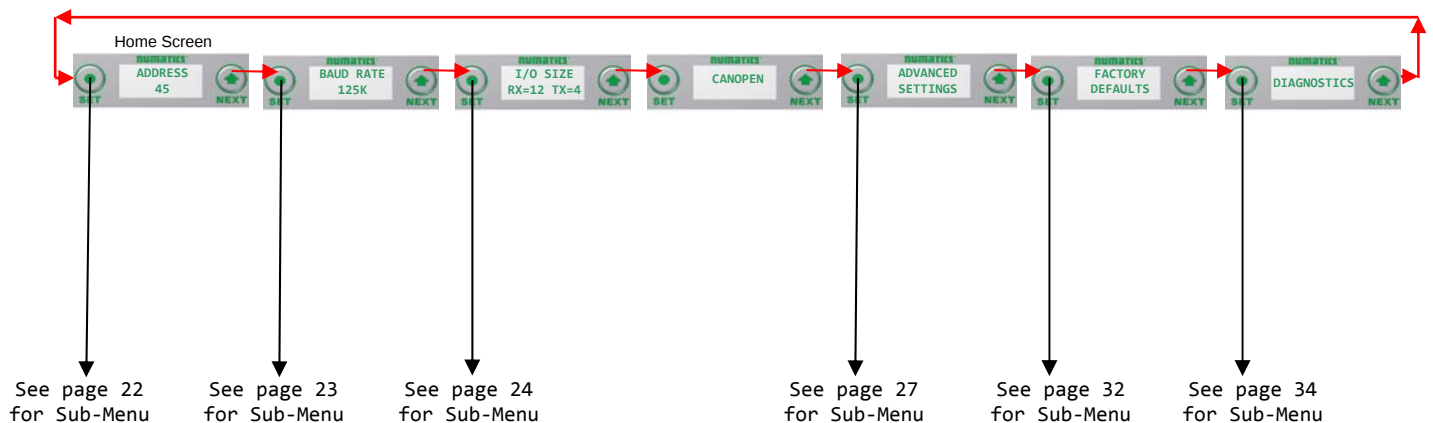
<i>Output Type</i>	<i>Output State</i>	<i>Fault Condition</i>	<i>Status Bit</i>
Valve Solenoid Coil Driver	ON	No Fault	0
		Fault - Short Circuit, Over Temp/Over Current	1
Valve Solenoid Coil Driver	OFF	No Fault	0
		Fault - Open Load	1
Discrete Outputs	ON	No Fault	0
		Fault - Short Circuit, Over Temp/Over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

G3 Node 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 CANopen 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 to 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 EDS file parameters. **NOTE: WHEN A NETWORK I/O CONNECTION IS ESTABLISHED MANUAL CHANGES TO NODE PARAMETERS ARE NOT ALLOWED!**



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Network Address Sub-Menu

Steps to Set Address



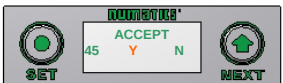
1. Press the SET button to enter the ADDRESS sub-menu.



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

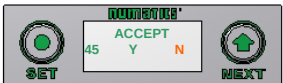


3. Press the NEXT button to scroll through the choices for the ones digit of the node address.
Press the SET button to select the ones digit.



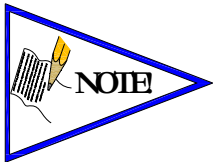
4. Press the NEXT button to select Yes or No to accept the address shown on the display,
 - a. Selecting No will bring you back to the main Address menu.
 - b. Selecting Yes will take you to the following SAVE SETTINGS menu.

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 0- 127 are valid.
- Address 0 is typically reserved for the master (i.e. PLC, IPC, etc...)
- Address 127 is the Factory Default node address.
- Setting the address through software is not supported.

numatics G3 Series CANopen Technical Manual

Baud Rate Sub-Menu

Steps to Set Baud Rate

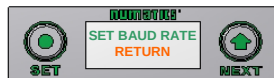
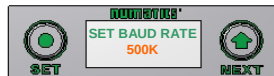


1. Press the SET button to enter the BAUD RATE sub-menu.



2. Press the NEXT button to scroll through the choices for the baud rate of the node:
 - a. 125K (Factory Default)
 - b. 250K
 - c. 500K
 - d. 1M
 - e. RETURN (this will return you to the top of BAUD RATE menu)

Press the SET button to confirm your choice.



3. Press the NEXT button to select Yes or No to accept the baud rate shown on the display..
 - a. Selecting No will bring you back to the main Baud Rate menu.
 - b. Selecting Yes 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 new Baud Rate 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.

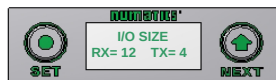


- *Node must be set to the same baud rate as the network master (i.e. PLC scanner, controller's communication module, etc...)*

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I/O Size - Coils Sub-Menu

I/O Size Steps



1. Press the SET button to enter the I/O SIZE sub-menu.



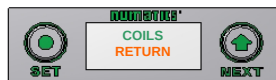
2. Press the SET button to enter the I/O ALLOC COILS menu.



3. Press the NEXT button to scroll through the choices for the number of allocated valve coils:

- a. 0 COILS
- b. 8 COILS
- c. 16 COILS
- d. 24 COILS
- e. 32 COILS (Factory Default)
- f. RETURN (this will return you to the I/O ALLOC menu)

Press the SET button to confirm your choice.



4. Press the NEXT button to select Yes or No to accept the number of allocated coils shown.
 - a. Selecting No will bring you back to the main I/O ALLOC menu.
 - b. Selecting Yes will take you to the following saved settings menu.
- Press the SET button to confirm your choice.



Save Setting Steps

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 Coil Allocation 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.

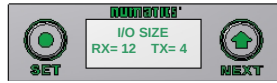


- Choose the appropriate number of valve coils to optimize the number of I/O bytes allocated for the manifold.
- Optimizing number of coils may cause extra coil output not to be allocated for future expansion. Thus, adding valves in the future would require this parameter to be adjusted.

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I/O Size - Allocation Menu

I/O Allocation Steps



1. Press the SET button to enter the I/O SIZE sub-menu.



2. Press the NEXT button to scroll to the I/O ALLOC TOTAL OUT menu.
3. Press the SET button to enter the I/O ALLOC TOTAL OUT menu.



4. Press the NEXT button to scroll through the choices for the tens digit of the total output size.
Press the SET button to confirm the tens digit and move into the ones digit selection.



5. Press the NEXT button to scroll through the choices for the ones digit of the total output size.
Press the SET button to confirm the ones digit.



6. Press the NEXT button to select Yes or No to accept the number of outputs shown.
 - a. Selecting No will bring you back to the main I/O ALLOC menu.
 - b. Selecting Yes will take you to the following saved settings menu.

Press the SET button to confirm your choice.



Save Setting 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 Total Output size to be saved in memory, you must Accept the saved changes before your next power cycle otherwise they will be lost.

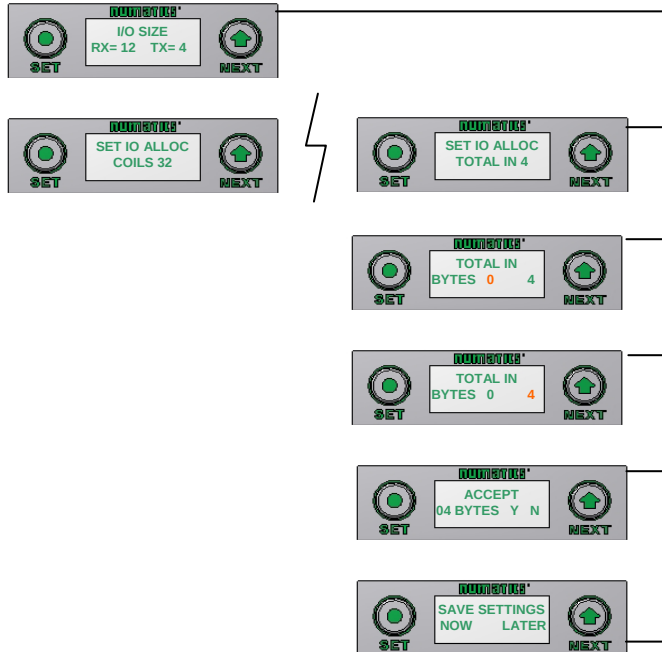
Press the SET button to confirm your choice



- *Setting this value will turn off the default condition in the manifold of Auto Configuring its total I/O size based on installed modules.*
- *This value will allow you to set a preset I/O size for the manifold configuration regardless of modules installed as long the value is greater than the actual physical configuration.*

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I/O Size - Allocation Sub-Menu Cont.



I/O Allocation Steps

1. Press the SET button to enter the I/O SIZE sub-menu.
2. Press the NEXT button to scroll to the I/O ALLOC TOTAL IN menu.
3. Press the SET button to enter the I/O ALLOC TOTAL IN menu.
4. Press the NEXT button to scroll through the choices for the tens digit of the total input size.
Press the SET button to confirm the tens digit and move into the ones digit selection.
5. Press the NEXT button to scroll through the choices for the ones digit of the total input size.
Press the SET button to confirm the ones digit.
6. Press the NEXT button to select Yes or No to accept the number of input bytes shown.
 - a. Selecting No will bring you back to the main I/O ALLOC menu.
 - b. Selecting Yes will take you to the following saved settings menu.

Press the SET button to confirm your choice.

Save Setting 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 Total Input size to be saved in memory, you must accept the saved changes before your next power cycle otherwise they will be lost.

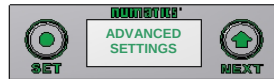
Press the SET button to confirm your choice.

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Advanced Settings - I/O Diag. Menu

This menu allows the enabling / disabling of all the I/O status bits. The I/O status bits include valve coil, discrete outputs, 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 CONFIG MENU / DIAG. STATUS.



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

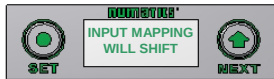


4. Press the NEXT button to scroll through the choices to enable/disable the Diagnostic status for I/O.
 - a. ENABLED (Factory Default)
 - b. DISABLED
 - c. RETURN (this will return you to the DIAG. STATUS menu)

Press the SET button to confirm your choice.



5. Press NEXT to confirm the warning message.



6. Press the NEXT button to select Yes or No to accept the selection
 - a. Selecting No will bring you back to the main SET STATUS menu.
 - b. Selecting Yes will take you to the following saved settings menu.

Press the SET button to confirm your choice.



Save Settings 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 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.



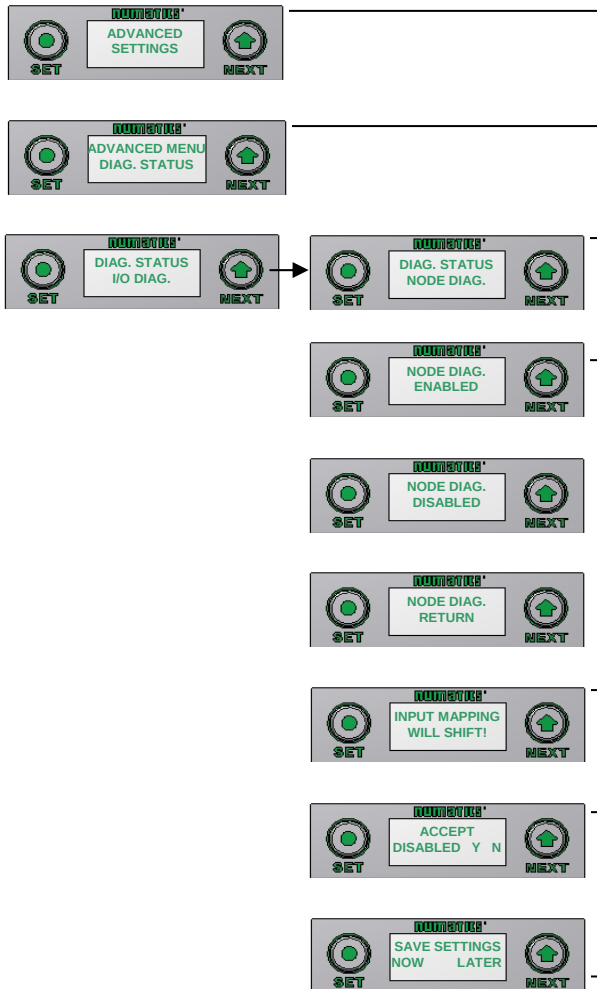
I/O Status Bits are diagnostic bits. They include the valve coil status bits, AUX Power status bits, and Short Circuit & Alarm status bits of various I/O modules.

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Advanced Settings – Node Diagnostics (Diagnostic Word)

This menu allows the enabling / disabling of the diagnostic word status bits. The Diagnostic word bits include power status and sub-bus related status bits. Detail information regarding these bits can found on page 81 . 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 / DIAG. STATUS.
3. Press the NEXT button to scroll to the DIAG. STATUS / NODE DIAG. menu.
Press the SET button to enter the DIAG. STATUS / NODE DIAG. menu.
4. Press the NEXT button to scroll the choices to enable/disable the I/O status.
 - a. ENABLED (Factory Default)
 - b. DISABLED
 - c. RETURN (this will return you to the DIAG. STATUS menu)
 Press the SET button to confirm your choice.
5. Press Next to confirm the warning message.
6. Press the NEXT button to select Yes or No to accept the selection
 - a. Selecting No will bring you back to the main SET STATUS menu.
 - b. Selecting Yes will take you to the following saved settings menu.
 Press the SET button to confirm your choice.

Save Settings 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 NODE DIAG selection to be saved in memory, you must Accept the saved changes before your next power cycle otherwise they will be lost.

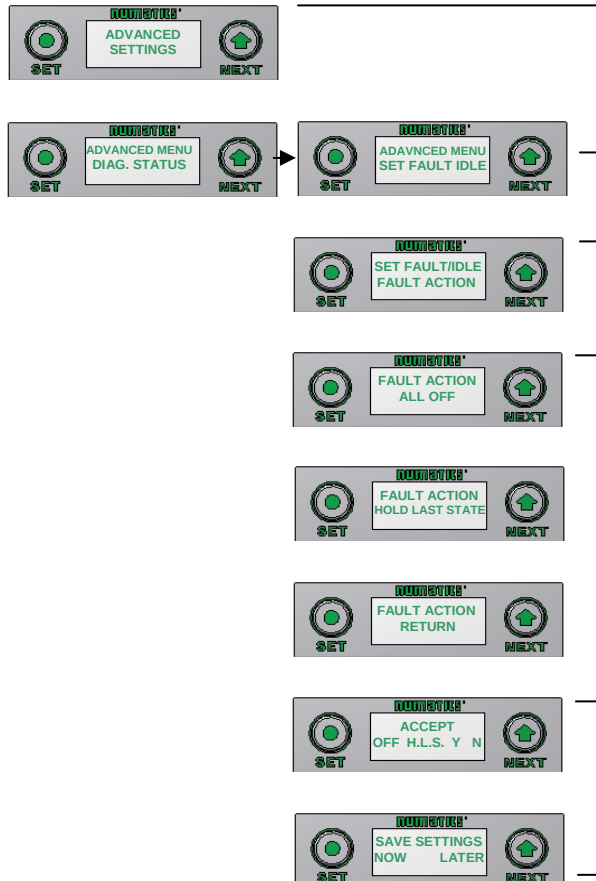
Press the SET button to confirm your choice.

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Advanced Settings - Fault Action

This menu allows the enabling / disabling of the fault action parameter. The fault action parameter determines the behavior of the outputs during a communication fault. Please see page 67 for more details.

Fault Action Settings



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. Press the NEXT button to scroll the choices for the desired output action during a fault state.
 - a. ALL 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.
6. Press the NEXT button to select **Yes** or **No** to accept the selection
Press the SET button to confirm your choice
 - a. Selecting **No** will bring you back to the main SET FAULT/IDLE menu.
 - b. Selecting **Yes** will take you to the following saved settings menu.

Save Settings Steps

7. 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 otherwise they will be lost.
- Press the SET button to confirm your choice.



- See page 63 for more details.
- Factory Default is "ALL OFF"

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Advanced Settings - Idle Action

This menu allows the enabling / disabling of the fault action parameter. The fault action parameter determines the behavior of the outputs during a communication fault. Please see page 67 for more details.

Idle Action Settings



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



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



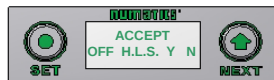
3. Press the NEXT button to scroll to the SET FAULT IDLE / IDLE ACTION. Press the SET button to enter the SET FAULT IDLE / IDLE ACTION menu.



4. Press the NEXT button to scroll the choices for the desired output action during an idle state.

- ALL OFF (Factory Default)
- HOLD LAST STATE
- RETURN (this will return you to the SET FAULT/IDLE menu)

Press the SET button to confirm your choice.



5. Press the NEXT button to select Yes or No to accept the selection.
 a. Selecting No will bring you back to the main SET FAULT/IDLE menu.
 b. Selecting Yes will take you to the following saved settings menu.

Press the SET button to confirm your choice.

Save Settings Steps



6. 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 IDLE ACTION 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.

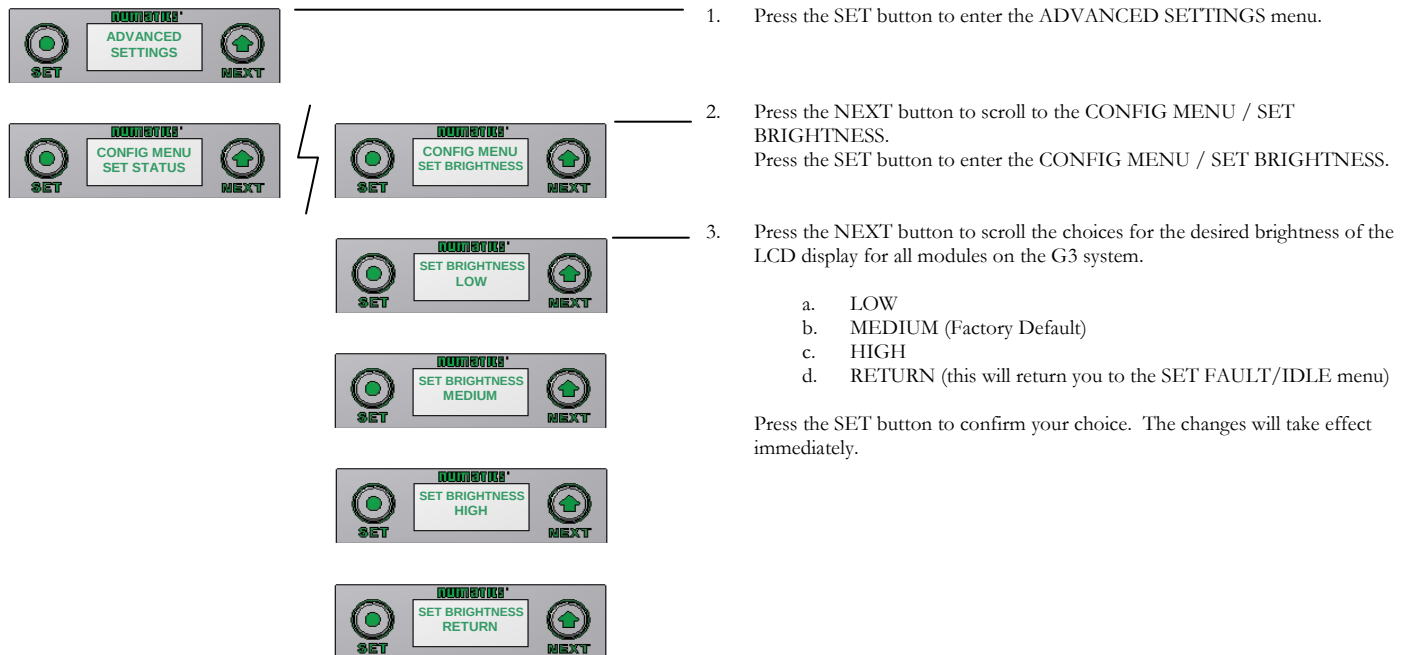


- *Factory Default is ALL OFF*

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Advanced Settings - Brightness

Brightness Settings



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

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Advanced Settings – Parameters

This menu allows the enabling / disabling of the Parameters setting. By setting the PARAMETERS LOCKED function all user settable parameters on the node will be locked out via the graphic display.

Parameters Settings



4. Press the SET button to enter the ADVANCED SETTINGS menu.



5. Press the NEXT button to scroll to the ADVANCED MENU / PARAMETERS.
Press the SET button to enter the PARAMETERS menu.

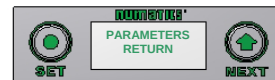


6. Press the NEXT button to scroll the choices for the desired choice.

- e. UNLOCKED (Factory Default)
- f. LOCKED
- g. RETURN (this will return you to the ADVANCED SETTINGS menu)



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



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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.

<i>FACTORY DEFAULT SETTINGS</i>	
<i>Description</i>	<i>Default</i>
Node Address	127
Baud Rate	125K
Valve Side Output Bytes	4 Bytes (32 Allocated Valve Coil Outputs)
Input / Output Values	Self-Configuring
Diagnostic Word	Enabled
I/O Diagnostic Status	Enabled
Fault Action	Reset to All Off
Idle Action	Reset to All Off
Brightness	Medium
Parameters Lock Status	Unlocked

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Diagnostics - Self Test Mode

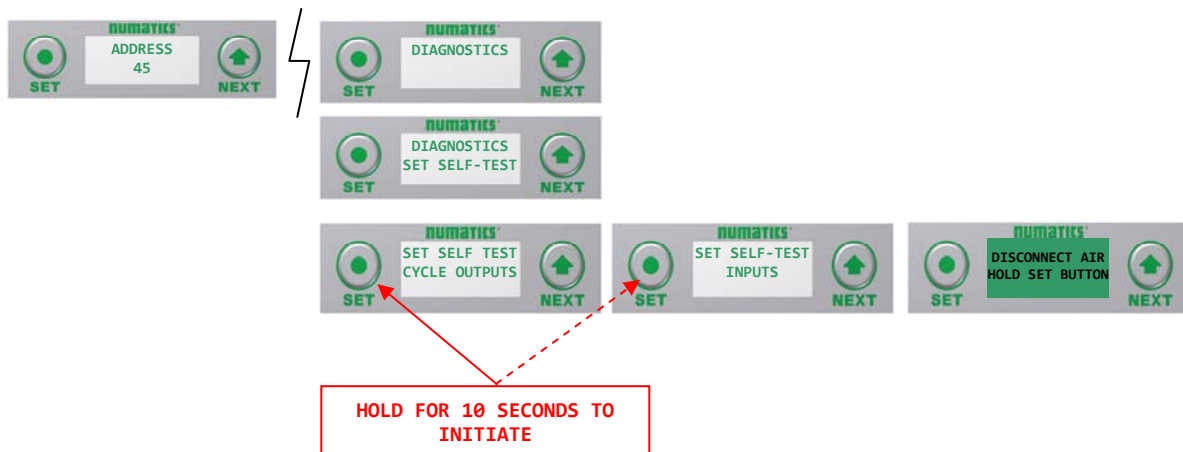
An internal diagnostic tool can be enabled on the communication module (node) using the graphic display. This tool allows the user to confirm that all of the inputs and outputs on the manifold and any of the distributed modules are fully functional without needing a network connection or controller. 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.

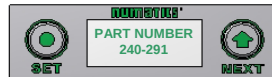
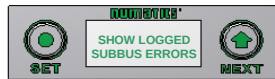
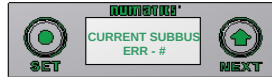
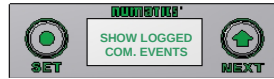
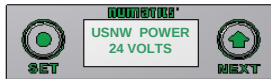
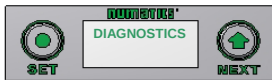
- 1) **Disconnect Air and Communication from the manifold!**
- 2) Select the desired test mode using the graphic display. (See example below)
- 3) Starting at the Home Screen, navigate the menus by selecting the NEXT button until the **DIAGNOSTICS** menu is shown.
- 4) Select the SET button to access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



- Please be aware of the original position of detented valves so that they can be returned to the correct position after the self-test is disabled.

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Diagnostics Cont.



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

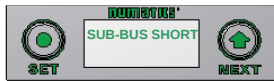


- The UNSW POWER screen indicates the voltage level present on the UNSW (Node & Input) power pins (Pin No. 2 and 3) of the main power connector.
- A voltage level less than 19 volts will generate an error screen and an associated diagnostic bit (see 'Diagnostic' section for more details).

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Error Messages

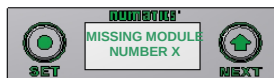
The following are automatic error messages that are displayed when specific faults occur during operation:



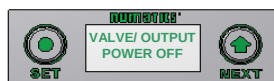
Displayed when a short circuit condition is detected on the Sub-Bus power lines.



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 & 4 (Valves and Outputs) is not present or below 22 VDC



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

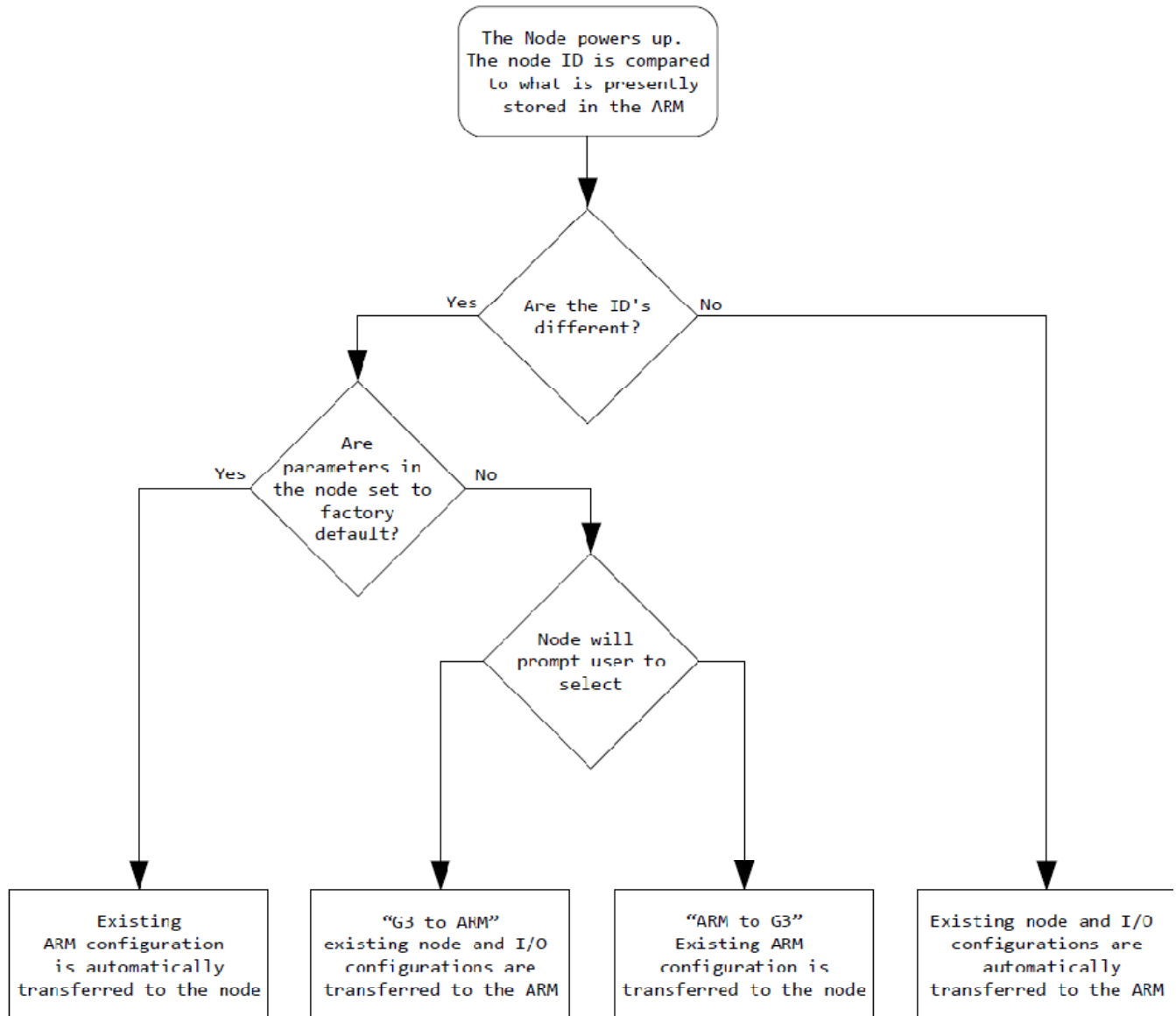
ARM – Auto Recovery Module (Optional)



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 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.

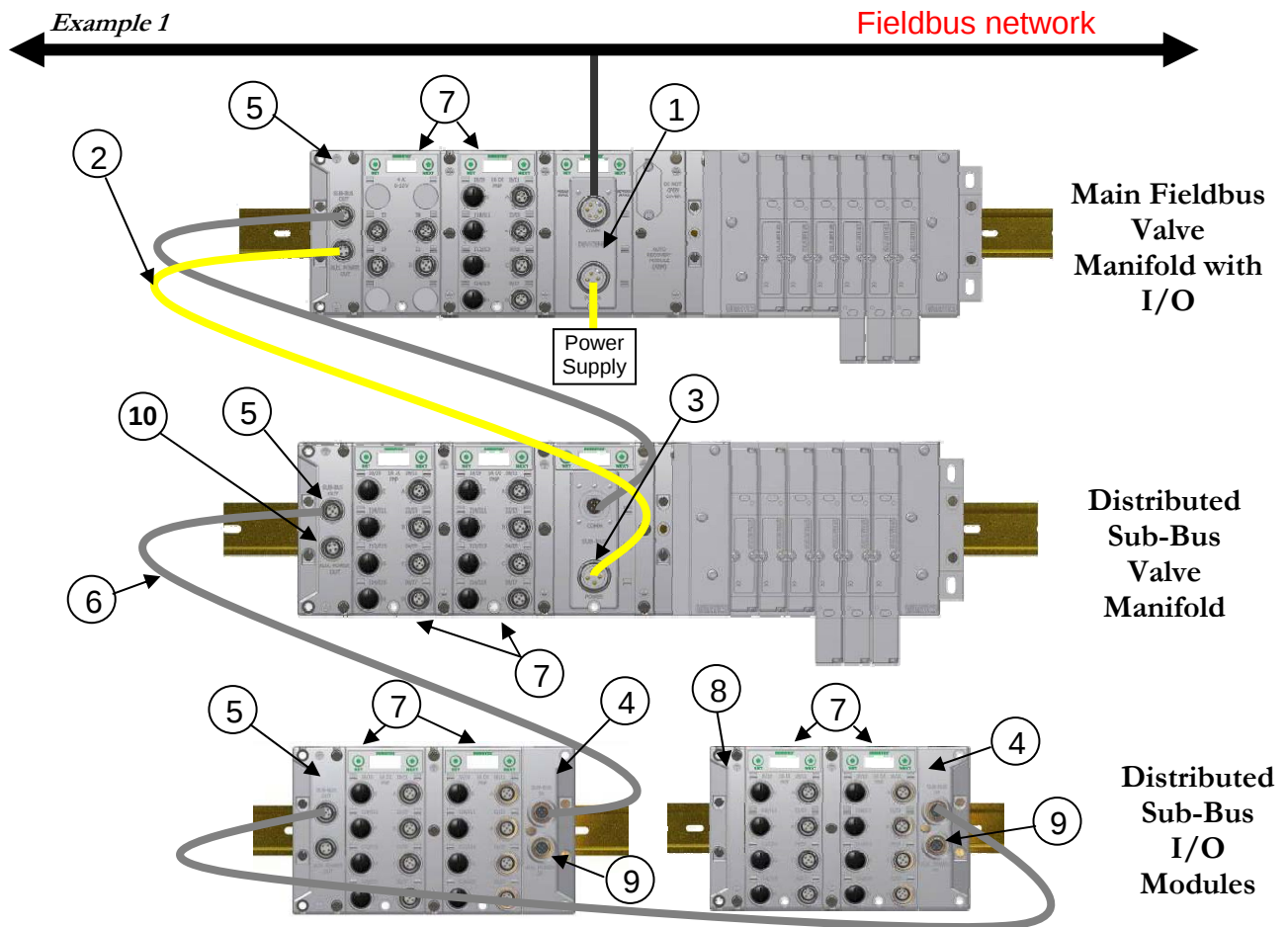
<i>Description</i>	<i>Replacement Part Number</i>
Complete ARM Module	240-182

ARM process flowchart



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)

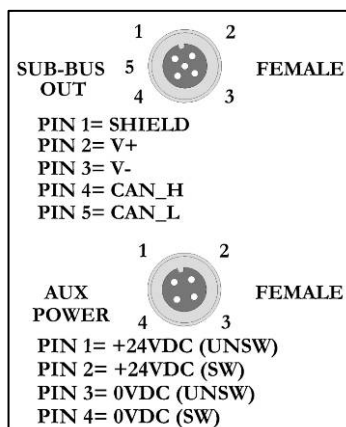
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Sub-Bus Distribution Modules

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 convenient way to distribute the power connection to the next Sub-Bus assembly.

<i>Description</i>	<i>Replacement Part Number</i>
Sub-Bus OUT Module with Din Rail Mounting	240-244
Sub-Bus OUT module without Din Rail Mounting	240-183

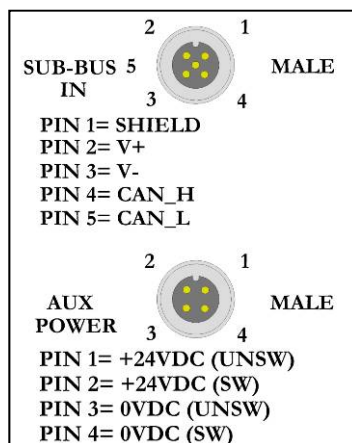


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Sub-Bus IN Modules

- 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 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

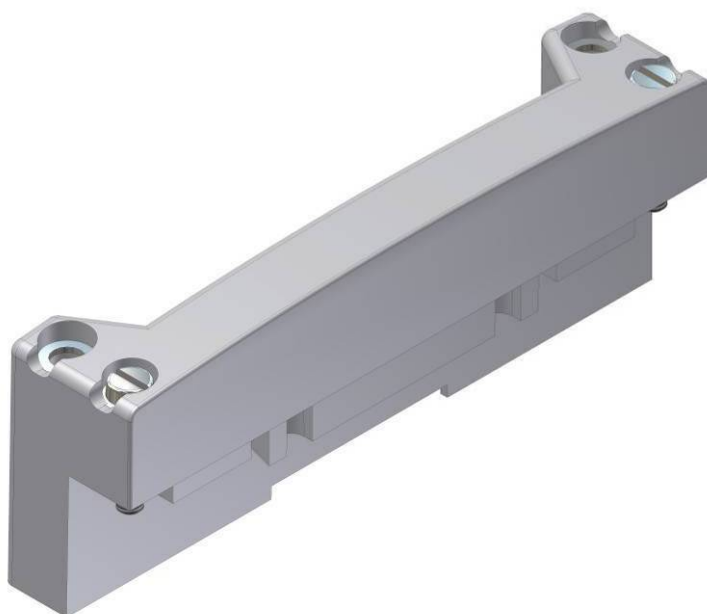


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Terminator Module

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

<i>Description</i>	<i>Part Number</i>
Terminator Module with Din Rail Mounting	240-245
Terminator Module without Din Rail Mounting	240-184



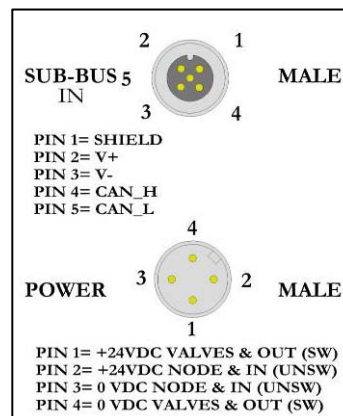
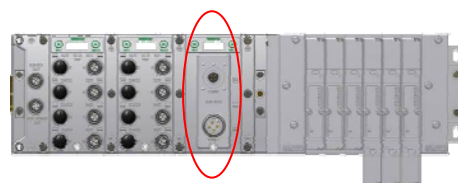
The terminator module is required to be installed in the G3 system for proper operation

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Sub-Bus Valve Module

- **COMM** - 5 pin M12 male Sub-Bus input communication connector.
 - 0 Must be connected to the SUB-BUS OUT connector of the previous assembly
 - 0 Carries 24 VDC power for electronics of module
- **POWER** - 4 pin MINI male power connector.
 - 0 Power is required for Outputs
- Used to distribute Valves on the Sub-Bus.
 - 0 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



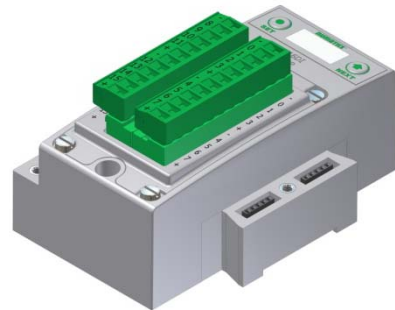
There is a 0.8 VDC drop in power across this module.
 Please consider this when distributing the Aux. Power after this module.

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



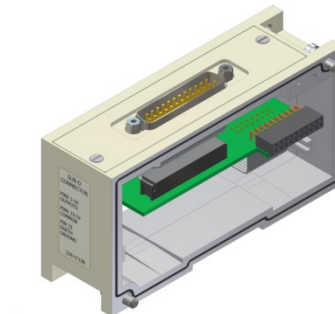
Output Module Types



Input/Output Module Types



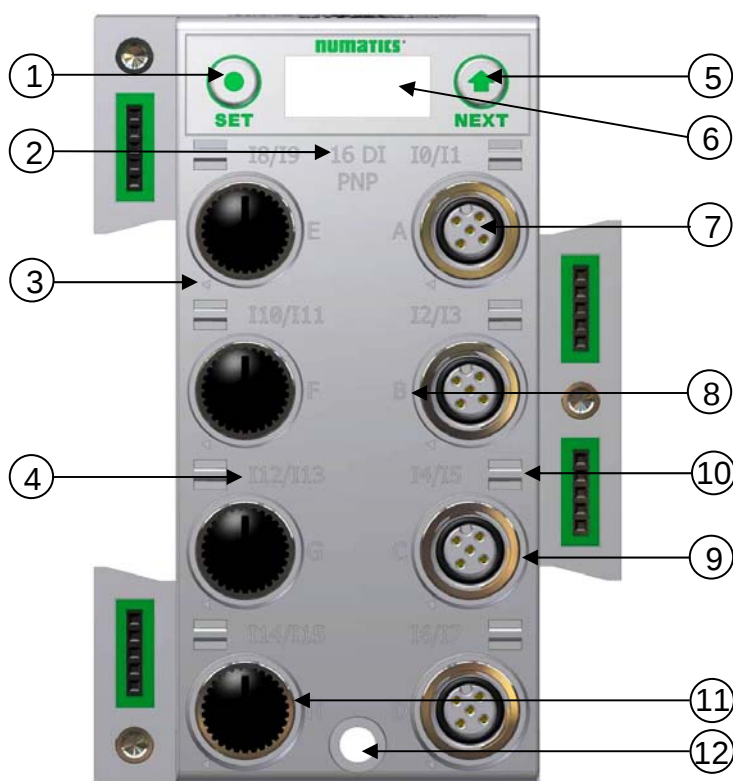
Valve Side Output Module Types



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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



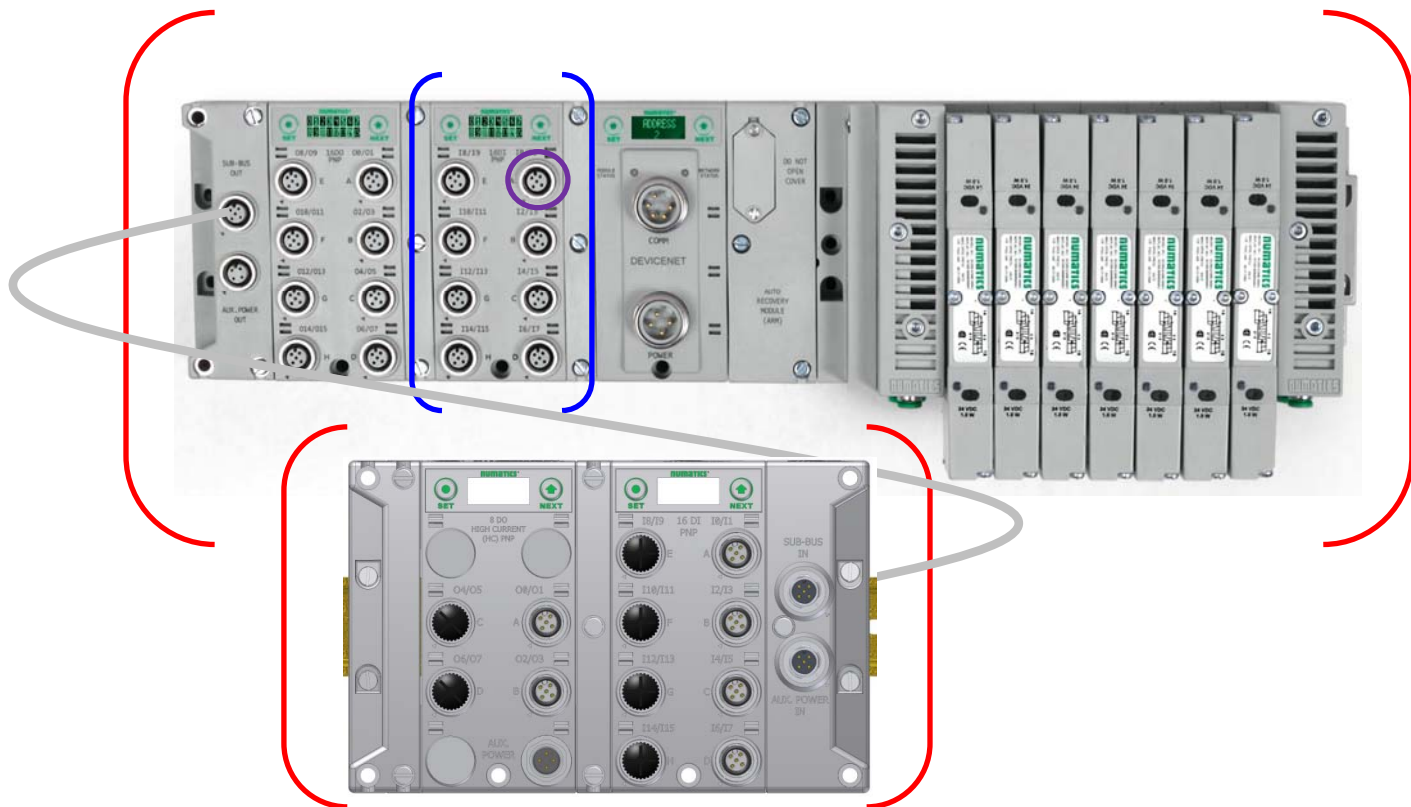
Menu



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I/O Module Technical Data

Module No.	Description	Connector Type	Current Limitation for Module	Current Limitation for connector	Current Limitation for physical manifold assembly
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	Terminal Strip	1.2A	.30A for each +24VDC terminal	
240-205	16 PNP Inputs	M12	1.2A	.15A (Pin 1 to Pin 3)	
240-206	8 PNP Inputs	M12	1.2A	.15A (Pin 1 to Pin 3)	
240-207	16 PNP Outputs	M12	1.2A	.50A (Pin 3 to Pin 2/4)	
240-208	8 PNP Outputs	M12	1.2A	.50A (Pin 3 to Pin 2/4)	
240-209	16 NPN Inputs	M12	1.2A	.15A (Pin 1 to Pin 3)	
240-210	8 NPN Inputs	M12	1.2A	.15A (Pin 1 to Pin 3)	
240-211	8 PNP Input and 8 PNP Outputs	M12	1.2A	.50A / output connector (Pin 3 to Pin 2/4) .15A / input connector (Pin 1 to Pin 3)	
240-300	8 High Current Outputs	M12	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



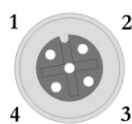
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Digital Input Modules

One Digital Input per Connector - M12 Female Modules

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

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+1 (Default is Enabled)	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

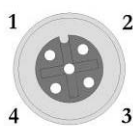
PIN 1= +24VDC (UNSW)
PIN 2= NOT USED
PIN 3= 0VDC (UNSW)
PIN 4= INPUT 1

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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 – Visual	YES – Optional	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 (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 (Default is Enabled)	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

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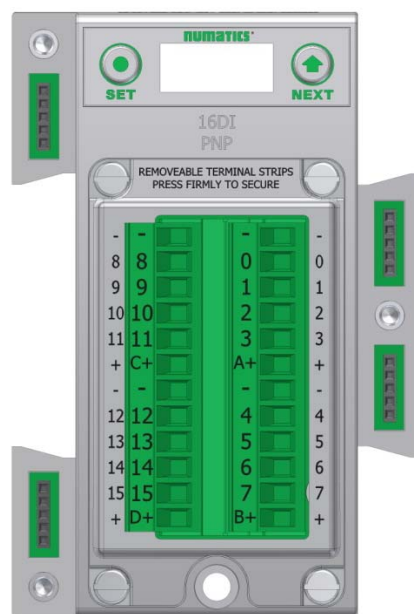
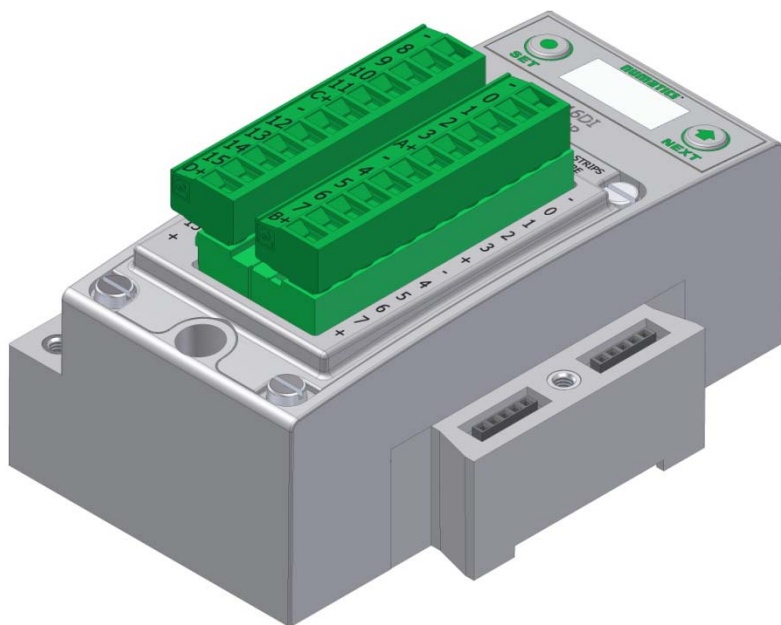
Sixteen Digital Inputs – Terminal Strip Modules

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)	Short Circuit Protection Status Bits	Input Points
240-203	PNP (Sourcing)	YES Visual and Logical Status Bits	4 user enabled bits monitor Short Circuits on the four different + voltage connections of terminal strip	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 (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 (Default is Enabled)	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	SCP Status 1 = Fault “D+”	SCP Status 1 = Fault “C+”	SCP Status 1 = Fault “B+”	SCP Status 1 = Fault “A+”



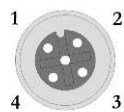
numatics G3 Series CANopen Technical Manual

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 – Visual	YES (8) – Optional	8

Output Mapping								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X (Required)	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 (Default is Enabled)	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

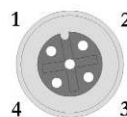
PIN 1= +24VDC (SW)
PIN 2= NOT USED
PIN 3= 0VDC (SW)
PIN 4= OUTPUT 1

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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 – Visual	YES (8) – Optional	16

Output Mapping								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X (Required)	Output 7	Output 6	Output 5	Output 4	Output 3	Output 2	Output 1	Output 0
X+1 (Required)	Output 15	Output 14	Output 13	Output 12	Output 11	Output 10	Output 9	Output 8
Input Mapping								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X (Default is Enabled)	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 (Default is Enabled)	Output 15 Status	Output 14 Status	Output 13 Status	Output 12 Status	Output 11 Status	Output 10 Status	Output 9 Status	Output 8 Status



FEMALE

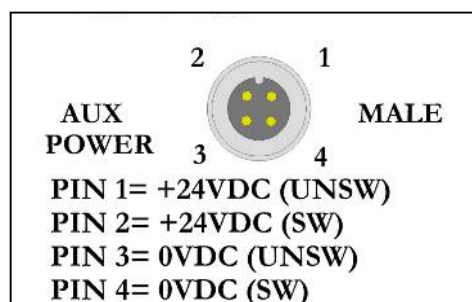
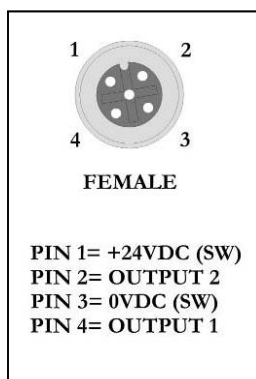
PIN 1= +24VDC (SW)
PIN 2= OUTPUT 2
PIN 3= 0VDC (SW)
PIN 4= OUTPUT 1

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Two Digital High Current Outputs per Connector - M12 Female Modules

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

Output Mapping								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X (Required)	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 (Default is Enabled)	Output 7 Status	Output 6 Status	Output 5 Status	Output 4 Status	Output 3 Status	Output 2 Status	Output 1 Status	Output 0 Status



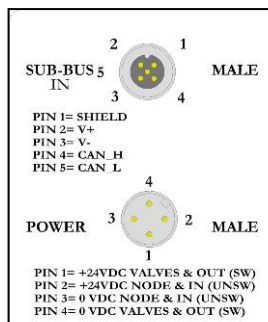
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Sub-Bus Valve Module

Used to control a distributed valve manifold through the Sub-Bus. See page 43 for more information.

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

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 (Required)	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 (Required)	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 (Required)	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
Input Mapping								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X (Default is Enabled)	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 (Default is Enabled)	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 (Default is Enabled)	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 (Default is Enabled)	Coil 31 Status	Coil 30 Status	Coil 29 Status	Coil 28 Status	Coil 27 Status	Coil 26 Status	Coil 25 Status	Coil 24 Status



Subject to change without notice

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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 – Visual	YES (8) – Optional	8	8

Output Mapping								
BYTE	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
X (Required)	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 (Required)	Input 7	Input 6	Input 5	Input 4	Input 3	Input 2	Input 1	Input 0
X+1 (Default is Enabled)	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+2 (Default is Enabled)	Output 7 Status	Output 6 Status	Output 5 Status	Output 4 Status	Output 3 Status	Output 2 Status	Output 1 Status	Output 0 Status



CONNECTORS E, F, G, & H

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

CONNECTORS A, B, C, & D

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

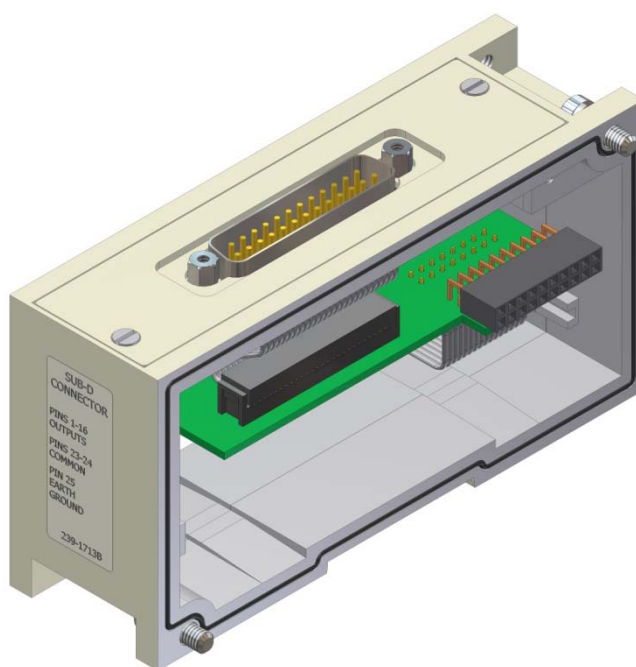
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Valve Side Digital Output Modules

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). Refer to page 10 for more information.

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

<i>Module Part No.</i>	<i>I/O Type</i>	<i>Short Circuit Protection</i>	<i>Internal Status Bits</i>	<i>Output Points</i>	<i>Module Size</i>
239-1713	NPN (Sinking)	Yes	16 – Optional	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: $\leq 1.0\%$ of Signal
- Voltage Input Impedance: 0-10VDC – 40K Ohms
- Current Input Impedance: 250 Ohms
- Input Cutoff Frequency: 100 Hz

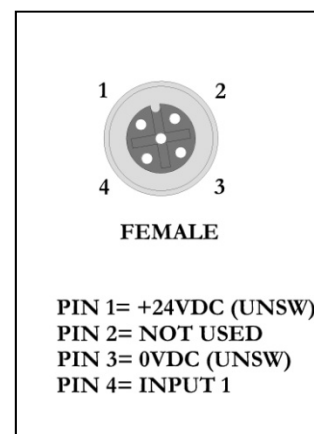
<i>Module Part No.</i>	<i>Signal Type</i>	<i>Input Points</i>	<i>Output Points</i>	<i>Short Circuit Protection</i>
240-212	0 - 10V	4	0	Yes
240-213	0 - 10V	2	2	
240-214	4 - 20mA	4	0	
240-215	4 - 20mA	2	2	

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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) – Optional	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
X+8 (Default is Enabled)	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+9 (Default is Enabled)	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

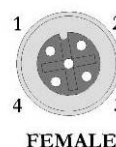


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One Analog I/O per Connector - M12 Female Modules

Module Part No.	Signal Type	Short Circuit Protection	Short Circuit Protection Status Bits	Output Points	Input Points
240-213	0-10 VDC	YES – Visual	YES (4) – Optional	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 (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
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 (Default is Enabled)	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+5 (Default is Enabled)	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



CONNECTORS C & D

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

CONNECTORS A & B

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

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G3 Analog Graphic Display

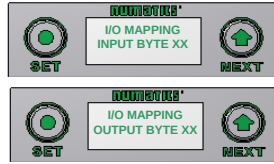
The G3 Analog I/O modules have an integrated graphic display that may be used to configure the parameters of the modules as well as show diagnostic information. Please see the following pages for detailed information regarding these displays.



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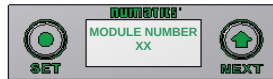
Analog Module / I/O Mapping

Displays the starting Input and Output byte address for the module



Analog Module / Module Number

Displays the assigned module number for the analog unit identifying its position in the G3 system.



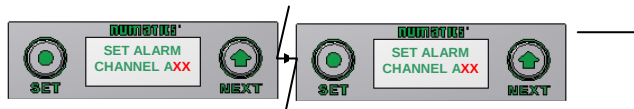
Analog Module / Alarm Settings

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.



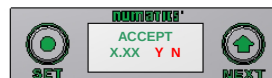
2. Press the NEXT button to scroll to the appropriate analog channel.



3. Press the SET button to set the LO 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



4. 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



5. Press the SET button while in the RETURN screen will return you to the main menu

numatics G3 Series CANopen Technical Manual

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.



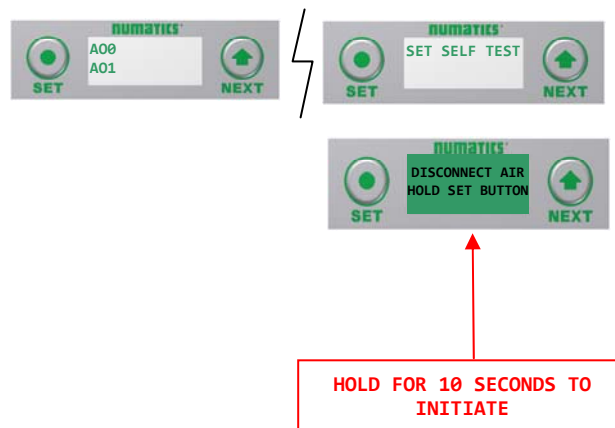
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Analog Module / Self Test Mode

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



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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 Yes or No.
 - a. Selecting No will bring you back to the main FACTORY DEFAULTS menu.
 - b. Selecting Yes 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

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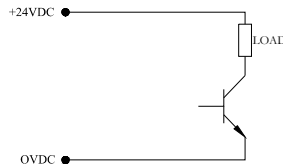
I/O Module(s) Wiring Diagrams

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.

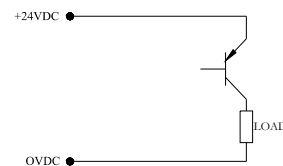
NPN Descriptions

- Sinking
- Switching Negative
- Positive Common



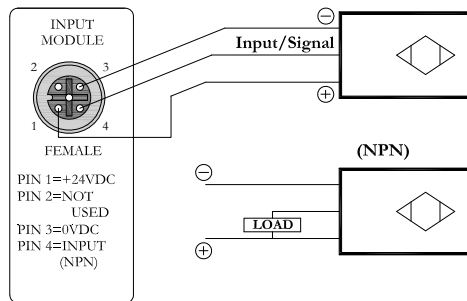
PNP Descriptions

- Sourcing
- Switching Positive
- Negative Common

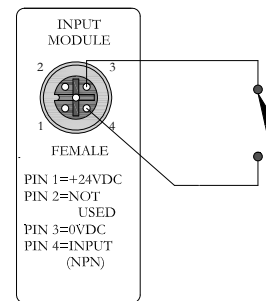


NPN (Sinking) Input Connection

Electronic Sensor Type

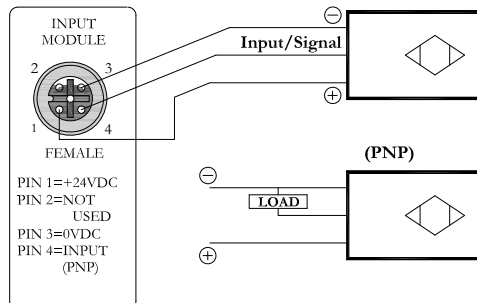


Mechanical Sensor Type

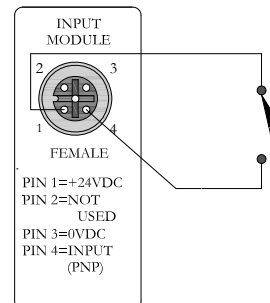


PNP (Sourcing) Input Connection

Electronic Sensor Type



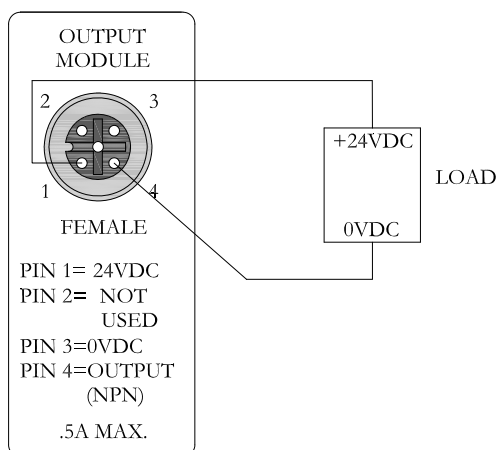
Mechanical Sensor Type



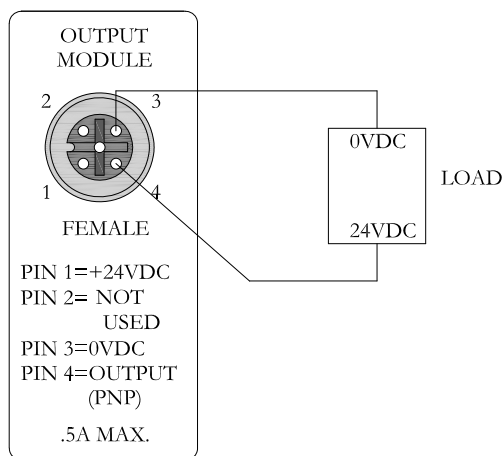
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I/O Module(s) Wiring Diagrams Continued

NPN (Sinking) Output Connection



PNP (Sourcing) Output Connection



CANopen Configuration and Mapping

EDS File

The EDS file contains configuration information required to establish communication to a node on a CANopen network. EDS files are available on the Numatics, Inc., website at www.numatics.com/fieldbus.

User Configurable Device Parameters

The Numatics' G3 CANopen 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. All of these configurable parameters can be adjusted using appropriate configuration software or by selecting the appropriate parameters in the node's graphic display screen.

		Settable Via
<i>Parameter Name</i>	<i>Description</i>	<i>Display</i>
MAC ID	Node address	✓
Baud Rate	Network speed	✓
Autobaud	Enables/Disables Autobaud setting	✓
Diagnostic Word	Enables/Disables the diagnostic Input word	✓
I/O Allocation Coils	Allocates how many valve output points are mapped (0, 8, 16, 24, 32)	✓
I/O Allocation Inputs	Allows a fixed value to be set for the number of Input Bytes allocated for the assembly	✓
I/O Allocation Output	Allows a fixed value to be set for the number of Output Bytes allocated for the assembly	✓
I/O Diagnostic Status	Allocates I/O diagnostic status bits	✓
Output Idle Action	Determines whether to use idle value attribute or hold last state	✓
Output Fault Action	Determines whether to use idle value attribute or hold last state	✓

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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:

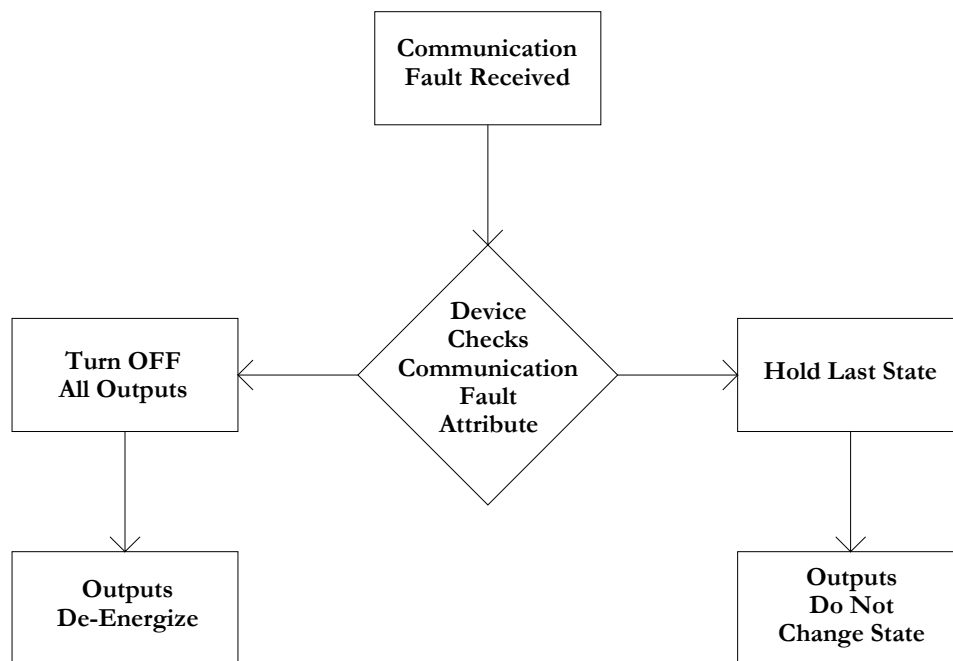
1. Hold Last State of Outputs
2. Turn Off All Outputs

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.



CANopen Mapping

I/O Sizes - Rx/Tx

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 configurable. See the following table:

Selection	Outputs Bytes	Inputs Bytes
0 Coils	0	0
8 Solenoid Coils	1	1
16 Solenoid Coils	2	2
24 Solenoid Coils	3	3
32 Solenoid Coils (factory default)	4	4

Please refer to page 24 for further details.

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.

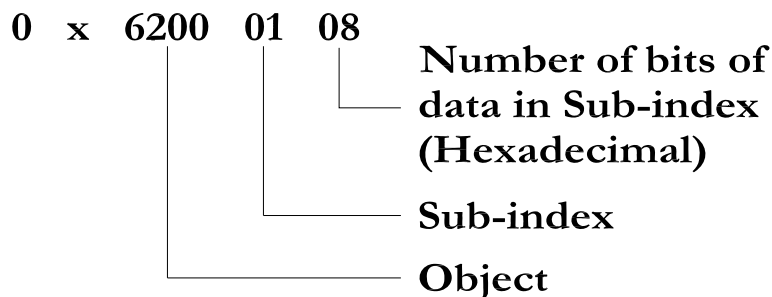
Total I/O Size

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 worksheet on page 69 will allow accurate sizing of the I/O data.

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PDOs

PDOs or Process Data Objects are used to transfer the real time data (I/O) with no protocol overhead. The G3 series supports four transmit and four receive PDOs defined in the Pre-Defined Connection Set. Each PDO can transfer up to eight bytes of data. Therefore, the logical maximum I/O size is 32 bytes of input and 32 bytes of output. The transmit PDOs have input objects mapped to them. The receive PDOs have output objects mapped to them.



Object:

Object		Sub-index (Hexadecimal)	Bit Value (Hexadecimal)
Value	Description		
6000	Digital Inputs	01-20	08
6200	Digital Outputs	01-20	08
6400	Analog Inputs	01-0C	10
6401	Analog Outputs	01-0C	10
3000	System Diagnostics	01-02	08

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Manifold and I/O Data Sizing Worksheet

Step	
1	: Choose corresponding <i>Rx</i> and <i>Tx</i> values based a chosen “ <i>Valve Side Output Options</i> ” 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 (<i>Rx/Tx</i>) Bytes for Manifold. This is the total input and output byte count values required for the configured manifold (total <i>Rx/Tx</i> values).

Valve Side					
Step	Valve Side Output Options (selected on node)		Input Bytes (<i>Rx</i>)		Output Bytes (<i>Tx</i>)
			Status Enabled	Status Disabled	
1	0 Coils		0	0	0
	Up to 8 Solenoid Coils		1	0	1
	Up to 16 Solenoid Coils		2	0	2
	Up to 24 Solenoid Coils		3	0	3
	Up to 32 Solenoid Coils (factory default)		4	0	4

Digital Modules					
Step	Module Part Number	Description	Input Bytes (<i>Rx</i>)		Output Bytes (<i>Tx</i>)
			Status Enabled	Status Disabled	
2	240-203/204	16 Inputs - Terminal Strip	3	2	0
	240-205/209	16 Inputs - 8 x M12	3	2	0
	240-206/210	8 Inputs - 8 x M12	2	1	0
	240-207	16 Outputs - 8 x M12	2	0	2
	240-208	8 Outputs - 8 x M12	1	0	1
	240-211	8 Inputs / 8 Outputs - 8 x M12	3	1	1
	240-241	Distributed Sub-Bus Valve & I/O Module	4	0	4
	240-300	8 Outputs - 8 x M12	1	0	1

Analog Modules					
Step	Module Part Number	Description	Input Bytes (<i>Rx</i>)		Output Bytes (<i>Tx</i>)
			Status Enabled	Status Disabled	
2	240-212/214	4 Inputs - 4 x M12	10	8	0
	240-213/215	2 Inputs/ 2 Outputs - 4 x M12	6	4	4

Total Input/Output Size Calculation				
Step	Module Position (includes distributed modules)	Module Part Number	Input Bytes (<i>Rx</i>)	Output Bytes (<i>Tx</i>)
2	1 st			
	2 nd			
	3 rd			
	4 th			
	5 th			
	6 th			
	7 th			
	8 th			
	9 th			
	10 th			
	11 th			
	12 th			
	13 th			
	14 th			
	15 th			
	16 th			
	Discrete Side Byte Requirements:			
	Optional Diagnostic Word:		2	0
1	Valve Side Byte Requirements:			
3	Total I/O (<i>Rx/Tx</i>) Bytes for Manifold			

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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, with 4 bytes (32 bits) as the factory default.
- 3) Each solenoid coil output has an associated status input bit (refer to the section labeled, “Output Short Circuit Protection”, on page 20 for functional details). The solenoid coil status input size can be adjusted from 0 to 4 bytes, with 4 input bytes (32 bits) as the factory default.
- 4) 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.
- 5) 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.
- 6) 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.

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I/O Mapping Examples

Example No. 1

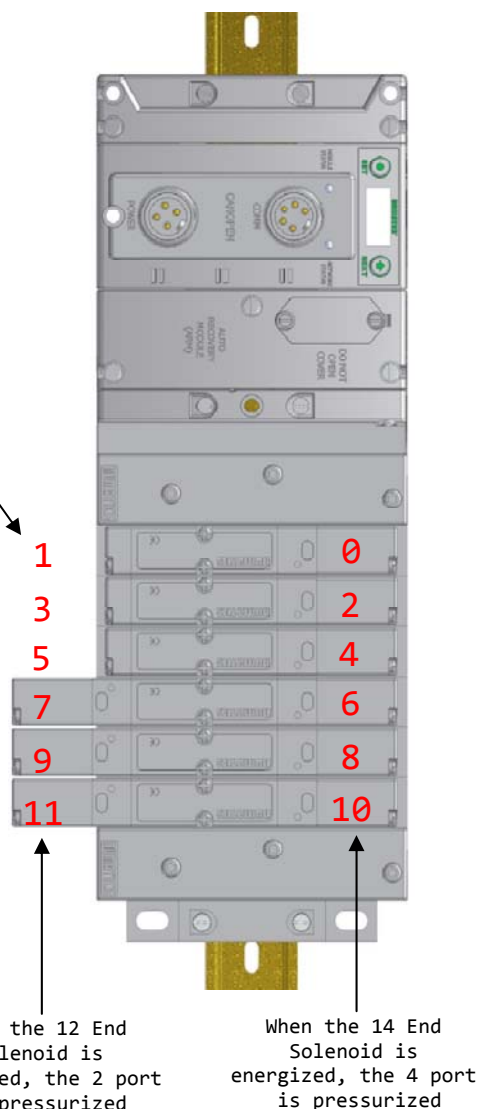
Assumed Settings

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

How to Order

Qty	Part Number
1	AK3EF00003NDRM
3	051BA4Z2MN00061
3	051BB4Z2MN00061
1	G3C0100R0G32
	ASSEMBLED

Valve Coil
Number



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Example No. 1 Table

<i>Output Table</i>								
SUB-INDEX	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
6200 01 08	Valve Coil No. 8	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
6200 02 08	Allocated & Reserved	Allocated & Reserved	Allocated & Reserved	Allocated & Reserved	Valve Coil No. 12	Valve Coil No. 11	Valve Coil No. 10	Valve Coil No. 9
6200 03 08	Allocated & Reserved	Allocated & Reserved	Allocated & Reserved	Allocated & Reserved	Allocated & Reserved	Allocated & Reserved	Allocated & Reserved	Allocated & Reserved
6200 04 08	Allocated & Reserved	Allocated & Reserved	Allocated & Reserved	Allocated & Reserved	Allocated & Reserved	Allocated & Reserved	Allocated & Reserved	Allocated & Reserved

<i>Received PDO Mappings</i>									
OBJECT	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	
1 st Received PDO Object 1600	62000108	62000208	62000308	62000408					

<i>Input Table</i>								
SUB-INDEX	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
3000 01 08	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
3000 02 08	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
6000 01 08	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
6000 02 08	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
6000 03 08	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved
6000 04 08	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved

<i>Transmitted PDO Mappings</i>									
OBJECT	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	
1 st Transmitted PDO Object 1A00	60000108	60000208	60000308	60000408	30000108	30000208			



- *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*
- *The number of Outputs Bytes Allocated for valve coils may be optimized and set to 0, 8, 16, 24 or 32 coils. (32 coils is the factory default setting.)*

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Example No. 2

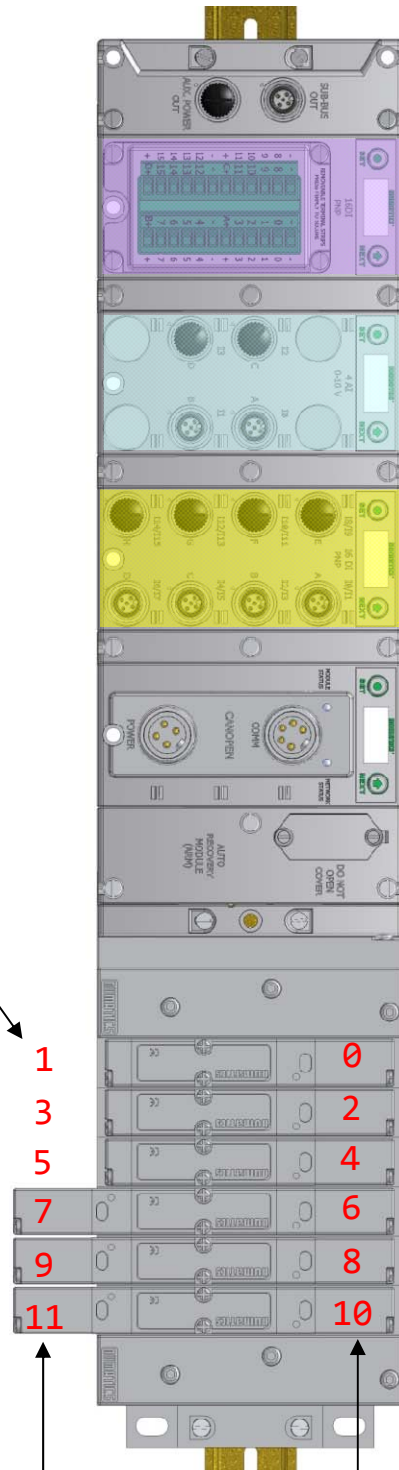
Assumed Settings

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

How to Order

Qty	Part Number
1	AK3EF00003NDRM
3	051BA4Z2MN00061
3	051BB4Z2MN00061
1	G3C0103D0G32
1	240-205
1	240-212
1	240-203
	ASSEMBLED

Valve Coil Number



When the 12 End Solenoid is energized, the 2 port is pressurized

When the 14 End Solenoid is energized, the 4 port is pressurized

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Example No. 2 Table

Output Table								
SUB-INDEX	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
6200 01 08	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
6200 02 08	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
6200 03 08	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved
6200 04 08	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved

Received PDO Mappings								
OBJECT	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
1 st Received PDO Object 1600	62000108	62000208	62000308	62000408				

Input Table								
SUB-INDEX	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
3000 01 08	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
3000 02 08	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
6000 01 08	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
6000 02 08	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
6000 03 08	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
6000 04 08	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
6000 05 08	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
6000 06 08	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
6000 07 08	Short Circuit Status for H	Short Circuit Status for G	Short Circuit Status for F	Short Circuit Status for E	Short Circuit Status for D	Short Circuit Status for C	Short Circuit Status for B	Short Circuit Status for A
6400 01 10	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)
	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
6400 02 10	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)
	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
6400 03 10	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)
	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
6400 04 10	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)
	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
6000 08 08	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Short Circuit Status for Conn. D	Short Circuit Status for Conn. C	Short Circuit Status for Conn. B	Short Circuit Status for Conn. A
6000 09 08	High Alarm for Conn. D	Lo Alarm for Conn. D	High Alarm for Conn. C	Lo Alarm for Conn. C	High Alarm for Conn. B	Lo Alarm for Conn. B	High Alarm for Conn. A	Lo Alarm for Conn. A
6000 0A 08	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
6000 0B 08	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
6000 0C 08	Short Circuit Status for H	Short Circuit Status for G	Short Circuit Status for F	Short Circuit Status for E	Short Circuit Status for D	Short Circuit Status for C	Short Circuit Status for B	Short Circuit Status for A

Transmitted PDO Mappings								
OBJECT	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
1 ST Transmitted PDO Object 1A00	60000108	60000208	60000308	60000408	60000508	60000608	60000708	60000808
2 ND Transmitted PDO Object 1A00	6400 01 10		6400 02 10		6400 03 10		6400 04 10	
3 RD Transmitted PDO Object 1A00	60000908	60000A08	60000B08	60000C08	30000108	30000208		

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Example No. 3

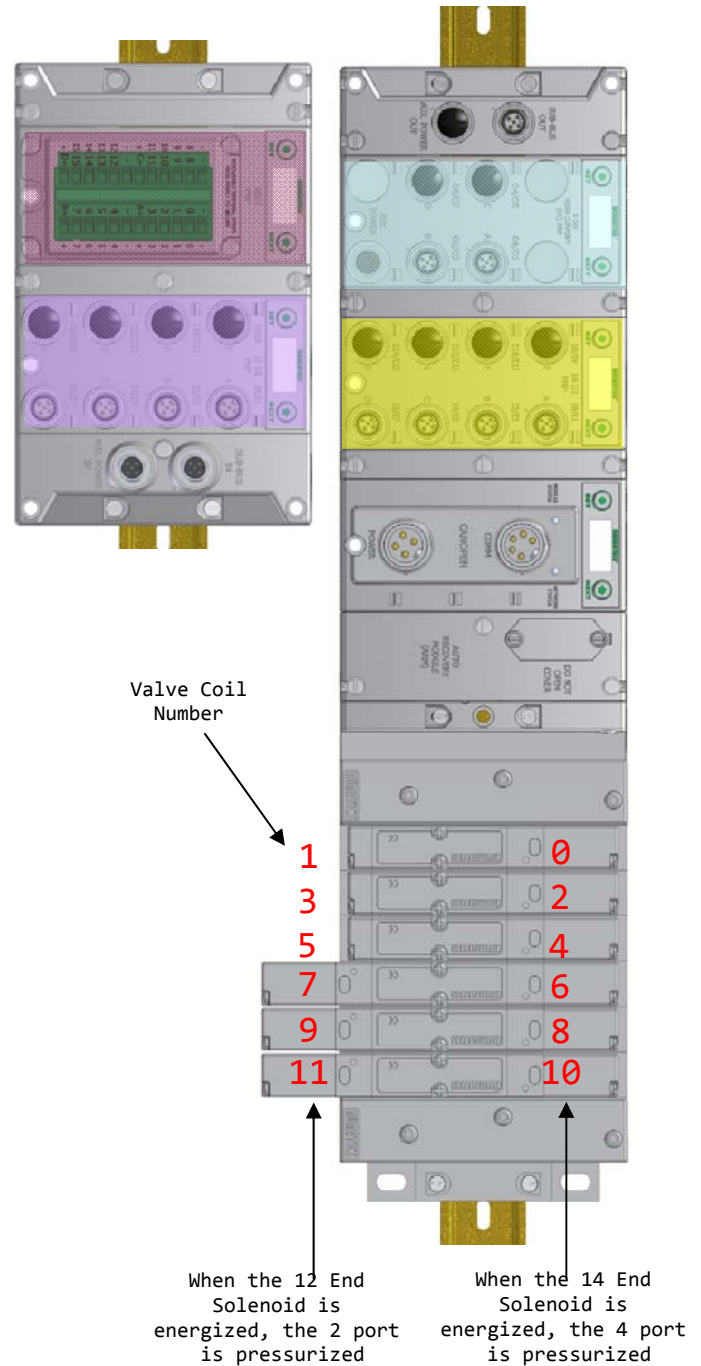
Assumed Settings

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

How to Order

Qty	Part Number
1	AK3EF00003NDRM
3	051BA4Z2MN00061
3	051BB4Z2MN00061
1	G3C0102R0G32
1	240-205
1	240-300
	ASSEMBLED

1	G3DS302R0DRM
1	240-205
1	240-203
	ASSEMBLED



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Example No. 3 Table

Output Table								
SUB-INDEX	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
6200 01 08	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
6200 02 08	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
6200 03 08	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved
6200 04 08	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved
6200 05 08	Discrete Output No. 7	Discrete Output No. 6	Discrete Output No. 5	Discrete Output No. 4	Discrete Output No. 3	Discrete Output No. 2	Discrete Output No. 1	Discrete Output No. 0

Received PDO Mappings								
OBJECT	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
1 st Received PDO Object 1600	62000108	62000208	62000308	62000408	62000508			

Input Table								
SUB-INDEX	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
3000 01 08	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
3000 02 08	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
6000 01 08	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
6000 02 08	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
6000 03 08	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
6000 04 08	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
6000 05 08	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
6000 06 08	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
6000 07 08	Short Circuit Status for H	Short Circuit Status for G	Short Circuit Status for F	Short Circuit Status for E	Short Circuit Status for D	Short Circuit Status for C	Short Circuit Status for B	Short Circuit Status for A
6000 08 08	Output No. 7 Status	Output No. 6 Status	Output No. 5 Status	Output No. 4 Status	Output No. 3 Status	Output No. 2 Status	Output No. 1 Status	Output No. 0 Status
6000 09 08	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
6000 0A 08	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
6000 0B 08	Short Circuit Status for H	Short Circuit Status for G	Short Circuit Status for F	Short Circuit Status for E	Short Circuit Status for D	Short Circuit Status for C	Short Circuit Status for B	Short Circuit Status for A
6000 0C 08	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
6000 0D 08	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
6000 0E 08	Short Circuit Status for H	Short Circuit Status for G	Short Circuit Status for F	Short Circuit Status for E	Short Circuit Status for D	Short Circuit Status for C	Short Circuit Status for B	Short Circuit Status for A

Transmitted PDO Mappings								
OBJECT	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
1 st Transmitted PDO Object 1A00	60000108	60000208	60000308	60000408	60000508	60000608	60000708	60000808
2 nd Transmitted PDO Object 1A00	60000908	62000A08	62000B08	62000C08	62000D08	62000E08	30000108	30000208

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Example No. 4

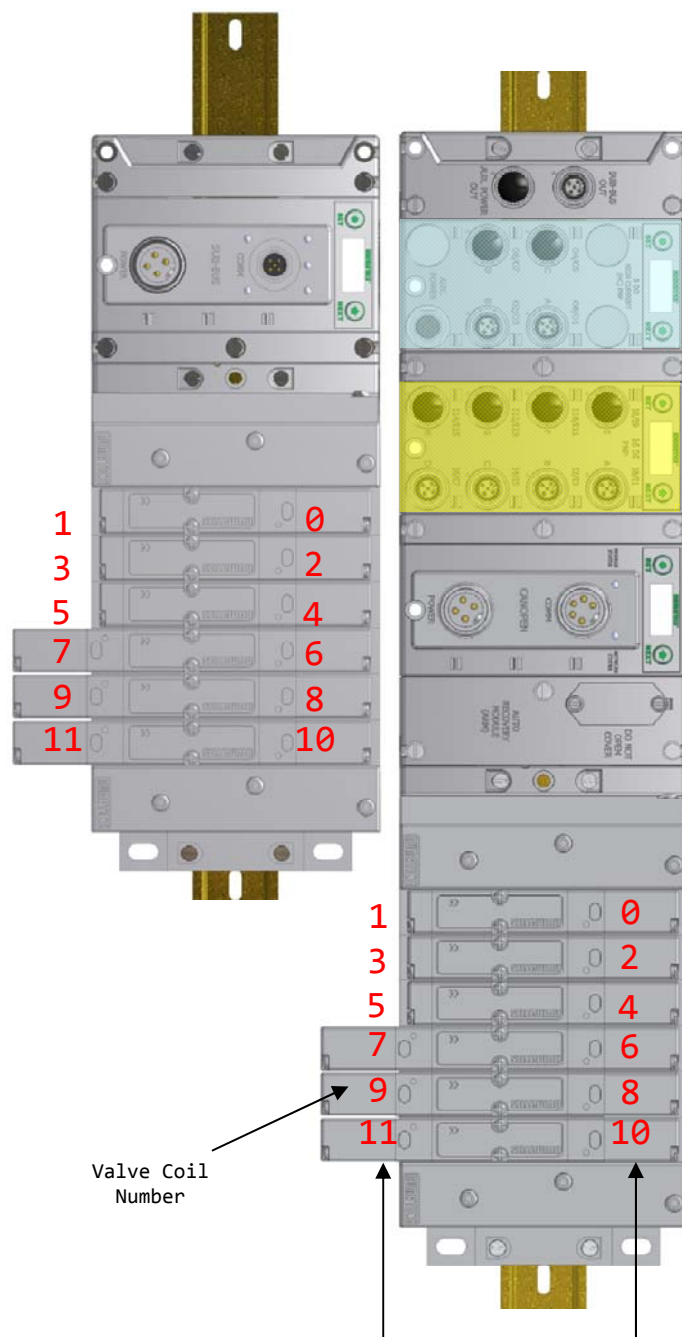
Assumed Settings

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

How to Order

Qty	Part Number
1	AK3EF00003NDRM
3	051BA4Z2MN00061
3	051BB4Z2MN00061
1	G3C0102D0G32
1	240-205
1	240-300
	ASSEMBLED

1	AK3EF00003NDRM
3	051BA4Z2MN00061
3	051BB4Z2MN00061
1	G3DS202R0DRM
	ASSEMBLED



Valve Coil
Number

When the 12 End
Solenoid is
energized, the 2 port
is pressurized

When the 14 End
Solenoid is
energized, the 4 port
is pressurized

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Example No. 4 Table

Output Table								
SUB-INDEX	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
6200 01 08	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
6200 02 08	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
6200 03 08	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved
6200 04 08	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved
6200 05 08	Discrete Output No. 7	Discrete Output No. 6	Discrete Output No. 5	Discrete Output No. 4	Discrete Output No. 3	Discrete Output No. 2	Discrete Output No. 1	Discrete Output No. 0
6200 06 08	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
6200 07 08	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
6200 08 08	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved
6200 09 08	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved	Allocated and Reserved

Received PDO Mappings								
OBJECT	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
1 st Received PDO Object 1800	62000108	62000208	62000308	62000408	62000508	62000608	62000708	62000808
2 nd Received PDO Object 1800	62000908							

Input Table								
SUB-INDEX	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
3000 01 08	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
3000 02 08	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
6000 01 08	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
6000 02 08	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
6000 03 08	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
6000 04 08	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
6000 05 08	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
6000 06 08	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
6000 07 08	Short Circuit Status for H	Short Circuit Status for G	Short Circuit Status for F	Short Circuit Status for E	Short Circuit Status for D	Short Circuit Status for C	Short Circuit Status for B	Short Circuit Status for A
6000 08 08	Output No. 7 Status	Output No. 6 Status	Output No. 5 Status	Output No. 4 Status	Output No. 3 Status	Output No. 2 Status	Output No. 1 Status	Output No. 0 Status
6000 09 08	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
6000 0A 08	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
6000 0B 08	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
6000 0C 08	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

Transmitted PDO Mappings								
OBJECT	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
1 st Transmitted PDO Object 1A00	62000108	62000208	62000308	62000408	62000508	62000608	62000708	62000808
2 nd Transmitted PDO Object 1A00	62000908	62000A08	62000B08	62000C08	30000108	30000208		

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Diagnostic Word

<i>Diagnostic Word Format</i>								
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 Module 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 Module Error = Bit is high when there is an error on the sub-bus; see “Byte 1” of diagnostic word for description.

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

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Diagnostic Word Cont.

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
1	0	1	0	1	MCM
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

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Appendix

System Specifications

<i>Electrical</i>	
Supply Voltage	Valves (2005, 2012, 2035): 24 VDC + 10%, -15% Node and Discrete I/O: 24 VDC $\pm$ 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 18 for additional fuse sizing information.
Spike Suppression	Output spike suppression is internally provided for both discrete and valve outputs.
Discrete Outputs (NPN (Sinking) or PNP (Sourcing))	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)

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Factory Default Settings

<i>FACTORY DEFAULT SETTINGS</i>	
<i>Description</i>	<i>Default</i>
Node Address	127
Baud Rate	125K
Valve Side Output Bytes	4 Bytes (32 Allocated Valve Coil Outputs)
Input / Output Values	Self-Configuring
Diagnostic Word	Enabled
I/O Diagnostic Status	Enabled
Fault Action	Reset to All Off
Idle Action	Reset to All Off
Brightness	Medium
Parameters Lock Status	Unlocked

Troubleshooting

Communication Node

<i>Symptom</i>	<i>Possible Cause</i>	<i>Solution</i>
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 68 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

<i>Symptom</i>	<i>Possible Cause</i>	<i>Solution</i>
Outputs remain on when communication is lost and/or PLC is in “Program” mode.	Communication Fault parameters are set incorrectly. See pages 67.	Check the communication fault/idle mode parameter setting to ensure that it is not set to “Hold Last Output State”.

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Glossary of Terms

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

Term	Description
ADR	Auto-Device Replacement is a feature (enabled by Allen Bradley scanners) that consists of Configuration Recovery and Auto-Address Recovery. Configuration Recovery (CF) refers to the scanner's ability to store a device's configuration. Auto-Address Recovery (AAR) refers to the ability of the scanner to change a device's node address from 63 to that desired by the scanner. Please refer to Allen Bradley's Release Notes No. 1747-5.8-RN1 for additional information.
Assembly parameter	A Numatics' term describing a user definable parameter that allows user to allocate the number of valve output drivers. A 0, 8, 16, 24, 32 option is available and is helpful if there are I/O memory constraints in the PLC.
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).
CAN_H	Controller Area Network – High; Communication Line.
CAN_L	Controller Area Network – Low; Communication Line.
CANBUS	Serial communication BUS network based on CAN protocol.
Change of State	I/O message type in which either the expiration of the transmission timer or a change in input state triggers data production.
Comm. Fault	One or more of the I/O connections have timed out.
Cyclic	I/O message type in which data production is triggered by the expiration of the transmission timer.
DeviceNet Manager	Allen-Bradley's DeviceNet configuration software.
Discrete I / O	The Inputs / Outputs that are available via the "Discrete I/O" side of manifold.
EDS file	<u>Electronic Data Sheet</u> . A text file, which contains specific product information, definitions of product capabilities and configurable parameters necessary for operation on a DeviceNet network.
EDS Stub file	An abridged version of the EDS file, which contains only the minimum information necessary to make the product functional on a DeviceNet network.
Ground	This term is used to indicate an earth ground.
Group 2	DeviceNet message group applicable to Numatics' Serial/Bus products.
I/O	Any combination of Inputs and Outputs.
Idle	A zero (0) length poll message (i.e.: scanner in program mode).
MAC ID	Media Access Connection Identification (00-63) – Node (network drop) address.
MCM	<u>Manual Configuration Module</u> . A module that allows MAC ID, baud rates and other configurable parameters to be set manually via DIP switches and rotary switches. Not required if software configuration is used.
NEMA	National Electrical Manufacturers Association.
ODVA	Open DeviceNet Vendor Association (www.odva.org)
Polled	I/O message type in which the device consumes I/O data from its master and produces I/O data when the master requests it.
RS NetWorx	Allen-Bradley's DeviceNet configuration software.

Glossary of Terms Continued

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Term	Description
Rx/Tx	Rx = Consumed byte size; analogous to Input byte size. Tx = Produced byte size; analogous to Output byte size.
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.
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
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.

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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