

RS485 HVAC Communications Options Module

M/N RECOMM-H485

FRN 2.xxx

Modbus RTU

Metasys N2

Siemens Technologies P1 FLN

Instruction Manual VT-1001-3



The information in this manual is subject to change without notice.

Throughout this manual, the following notes are used to alert you to safety considerations:



ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.

Important: Identifies information that is critical for successful application and understanding of the product.



ATTENTION: The drive may contain high voltages that can cause injury or death. Remove all power from the drive, and then verify power has been removed before installing or removing an RS485 HVAC Communications Options module. Failure to observe these precautions could result in severe bodily injury or loss of life.

ATTENTION: Only qualified electrical personnel familiar with drive and power products and the associated machinery should plan or implement the installation, start up, configuration, and subsequent maintenance of the product using an RS485 HVAC Communications Options module. Read and understand this manual in its entirety before proceeding. Failure to observe these precautions could result in bodily injury and/or damage to equipment.

ATTENTION: DPI host products must not be directly connected together via RECBL-xxx cables. Unpredictable behavior due to timing and other internal procedures can result if two or more devices are connected in this manner. Failure to observe this precaution could result in bodily injury and/or damage to equipment.

ATTENTION: When a system is configured for the first time, there may be unintended or incorrect machine motion. Disconnect the motor from the machine or process during initial system testing. Failure to observe this precaution could result in bodily injury and/or damage to equipment.

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Windows, Windows NT, and Microsoft are trademarks of Microsoft Corporation.

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Summary of Changes

The information below summarizes the changes made to this manual since its last release (January 2003):

Description of Changes
Added network protocol/VTAC 9 drive compatibility chart.
Reversed "TxRxD" polarity at Terminals A and B in Figure 3.3 table, and corrected recommended Belden cable from "3105A" to "3106A."
Added "Setting Stop Bits (Modbus RTU only)" section.
Added "Direct Access" method to read/write drive parameter values at start of "Using Modbus Configurable Objects to Access Parameters" section.
Added "Using Broadcast Messages" section.
Changed name of Parameter 09 from "Net Stop Bits" to "Stop Bits Act."
Added Parameter 30 - [Stop Bits Cfg] and Parameter 31 - [RTU Ref. Adjust].

v2.xxx firmware adds the following features to Modbus RTU:

- Direct parameter access (Direct Access Method, [page 5-8](#))
- Broadcast messaging support (Using Broadcast Messages, [page 5-11](#))
- Stop bits can now be independently adjusted (Parameter 30, [page B-9](#))

No changes were made to the N2 or P1 FLN features.

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Introduction

This manual provides information about the RS485 HVAC Communications Options module (RECOMM-H485) and using it with DPI™ AC drives, such as VTAC 9™ drives. It is intended for qualified electrical personnel familiar with installing, programming, and maintaining AC drives and networks.

The module is mounted in the drive and receives its required power from the drive. It can be used with other products that implement DPI, which is a peripheral communication interface. Refer to the documentation for your product for specific information about how it works with this module.

1.1 Module Features

The RS485 HVAC Communications Options module features the following:

- Three network protocols that are selected using a switch on the module:
 - Modbus™ RTU
 - Metasys™ N2
 - Siemens Building Technologies P1 FLN™
- Switches that enable you to set a node address before applying power to the drive. Alternatively, you can use a parameter to configure the node address.
- Status indicators that report the status of the drive communications, module, and network. They are visible both when the cover is opened and when it is closed.
- I/O, including Logic Command/Reference and up to four pairs of Datalinks that may be configured for your application using a parameter.
- User-defined fault actions that determine how the module and drive respond to communication disruptions on the network.
- Read/write access to parameters. You can configure and monitor parameter values over the network.

1.2 Related Documentation

Refer to the following related publications as necessary for more information. All of the publications are available from <http://www.theautomationbookstore.com> or <http://www.vtacdrives.com>.

- VT-1000 VTAC 9 AC Drive User Manual
- D2-3488 VS Utilities™ Getting Results Manual
Online help installed with the software

1.3 Getting Assistance from Rockwell Automation

If you have any questions or problems with the products described in this instruction manual, contact your local Rockwell Automation authorized HVAC representative.

For technical assistance, call 1-800-726-8112. Before calling, please review the troubleshooting section of this manual and check the VTAC drives website for additional information. When you call this number, you will be asked for the drive model number and this instruction manual number.

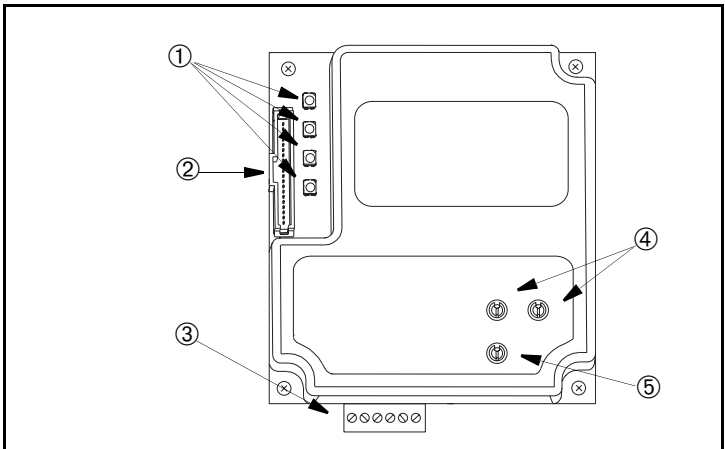
CHAPTER 2

Getting Started

This chapter provides:

- A description of the RS485 HVAC Communications Options module's components
- A list of parts shipped with the module
- A list of user-supplied parts required for installing the module
- An installation checklist

2.1 Module Components



①	Status Indicators	Four LEDs indicate the status of the connected drive, module, and network. Refer to Chapter 9, Troubleshooting .
②	DPI Connector	A 20-pin, single-row shrouded male header. An Internal Interface cable connects to this connector and one on the drive. See Table 2.A .
③	Terminal Block	A 6-screw terminal block connects the module to the network.
④	Node Address Switches	Two switches set the node address.
⑤	Network Selector Switch	One switch selects the network protocol.

Figure 2.1 – Components of the RS485 HVAC Options Module

2.2 Required Equipment

[Table 2.A](#) lists the equipment shipped with the RS485 HVAC Communications Options module. When you unpack the module, verify that the package includes all of these items.

Table 2.A – Equipment Shipped with the RS485 HVAC Module

Item Description
RS485 HVAC Communications Options module
2.54 cm (1 in) and 15.24 cm (6 in) Internal Interface cables (Only one cable is needed to connect the module to the drive)
Grounding wrist strap
RS485 HVAC Communications Options Module User Manual (VT-1001)

[Table 2.B](#) lists user-supplied equipment also required to install and configure the module.

Table 2.B – Required User-Supplied Equipment

Item Description
Small flathead screwdriver
Network-specific cable to connect the module to the network. See the network-specific documentation for cable recommendations and requirements.
Configuration tool, such as: <ul style="list-style-type: none">• LCD OIM• VS Utilities• Network-specific configuration software

2.3 Installation Checklist

This section is designed to help experienced users start using the RS485 HVAC Communications Options module. If you are unsure how to complete a step, refer to the referenced chapter.

	Step	Action	Refer to
<input type="checkbox"/>	1	Review the safety precautions for the module.	Throughout this manual
<input type="checkbox"/>	2	Verify that the drive is properly installed.	VTAC 9 AC Drive User Manual
<input type="checkbox"/>	3	Commission the module. Select the network protocol using the Network Selector switch on the module. Set a unique node address using the Node Address switches on the module, or configure the node address later using a parameter in the module.	Chapter 3 , Installing the Module
<input type="checkbox"/>	4	Install the module. Verify that the drive and the network are not powered. Then, connect the module to the network and the module to the drive. Use the captive screws to secure and ground the module to the drive.	Chapter 3 , Installing the Module
<input type="checkbox"/>	5	Apply power to the module. Verify that the module and network are installed correctly and then apply power to them. The module receives power from the drive. The topmost status indicator should be solid green. Refer to Chapter 9 for a description of the other LEDs.	Chapter 3 , Installing the Module
<input type="checkbox"/>	6	Configure the module for your application. Set the parameters for the following features as required by your application: <ul style="list-style-type: none">• Node address, data rate, and parity.• I/O configuration.• Fault actions.	Chapter 4 , Configuring the Module
<input type="checkbox"/>	7	Set up the master device to communicate with the module. Use a network tool to configure the master device on the network.	Instruction manual for your network tool.

Installing the Module

Chapter 3 provides instructions for installing the RS485 HVAC Communications Options module in a VTAC 9 drive.

3.1 Preparing for an Installation

Before installing the module, verify that you have all required equipment. Refer to [Chapter 2](#), Getting Started.

3.2 Commissioning the Module

To commission the module, you must set a unique node address and select a network protocol.

Important: New settings are recognized only when power is applied to the module. If you change a switch setting, cycle power to activate the changes.



ATTENTION: The module contains ESD- (Electrostatic Discharge) sensitive parts that can be damaged if you do not follow ESD control procedures. Static control precautions are required when handling the module. Failure to observe these precautions could result in damage to equipment.

Step 1. Set the Node Address switches as shown in [Figure 3.1](#).

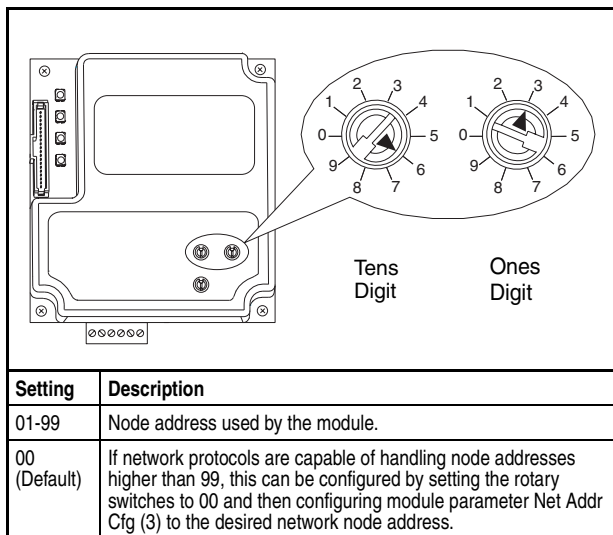


Figure 3.1 – Setting the Node Address

Step 2. Set the Network Selector switch as shown in [Figure 3.2](#).

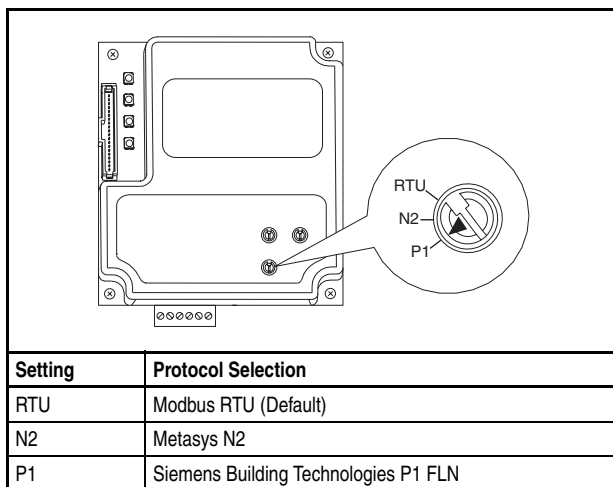


Figure 3.2 – Setting the Network Type

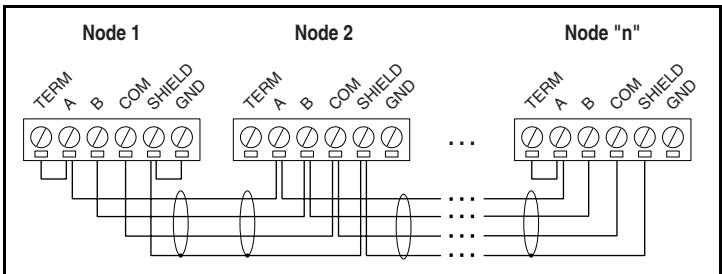
The switch settings can be verified using an OIM, and viewing Diagnostic Device item numbers 40-42 (see [page 9-6](#)).

3.3 Connecting the Module to the Network



ATTENTION: The drive may contain high voltages that can cause injury or death. Remove all power from the drive, and then verify power has been removed before installing or removing a module. Failure to observe these precautions could result in severe bodily injury or loss of life.

- Step 1. Remove power from the network and drive.
- Step 2. Use static control precautions.
- Step 3. Remove the drive cover.
- Step 4. Connect an RS485 cable to the network, and route it through the bottom of the drive.
- Step 5. Connect a six-pin linear plug to the RS485 cable. See [Figure 3.3](#) for the terminal definitions.



Terminal	Signal	Function
TERM	Termination ¹	Signal RC termination
A	Signal A	TxRxD-
B	Signal B	TxRxD+
COM	Common	Signal Common
SHIELD	Shield	Shield RC Termination
GND	Ground ²	Shield GND termination

Figure 3.3 – Typical Network Connections

- ¹ Jumper terminals TERM and A on the modules at end of the RS485 network. This enables a built-in RC termination network on the module.
- ² The shield must be grounded at a single point on the network (jumper terminals SHIELD and GND).

A 3-wire network using Belden 3106A cable or equivalent is recommended for Modbus RTU applications and shown in [Figure 3.3](#) above. A 2-wire network using Belden 3105A cable or equivalent (COM terminal is not connected) can also be used for most applications. However, a 3-wire network is more robust in noisy environments.

For Metasys N2 or Siemens P1 FLN applications, refer to published guidelines from Johnson Controls or Siemens Building Technologies respectively.

3.4 Connecting the Module to the Drive

- Step 1. Remove power from the drive and network.
- Step 2. Use static control precautions.
- Step 3. Remove the drive cover.
- Step 4. Connect the Internal Interface cable to the DPI port on the drive and then to the DPI connector on the module. See [Figure 3.4](#).
- Step 5. For 1-20 HP @ 460 V and 1-10 HP @208 V VTAC 9 drives: Fold the Internal Interface cable behind the module and mount the module on the drive using the four captive screws to secure and ground it to the drive. See [Figure 3.5](#).

For 25-150 HP VTAC 9 drives: Mount the module in the drive using the four captive screws to secure and ground it to the drive.

Important: All screws must be tightened because the module is grounded through a screw. The recommended tightening torque is 0.9 N-m (8 in.-lb.).

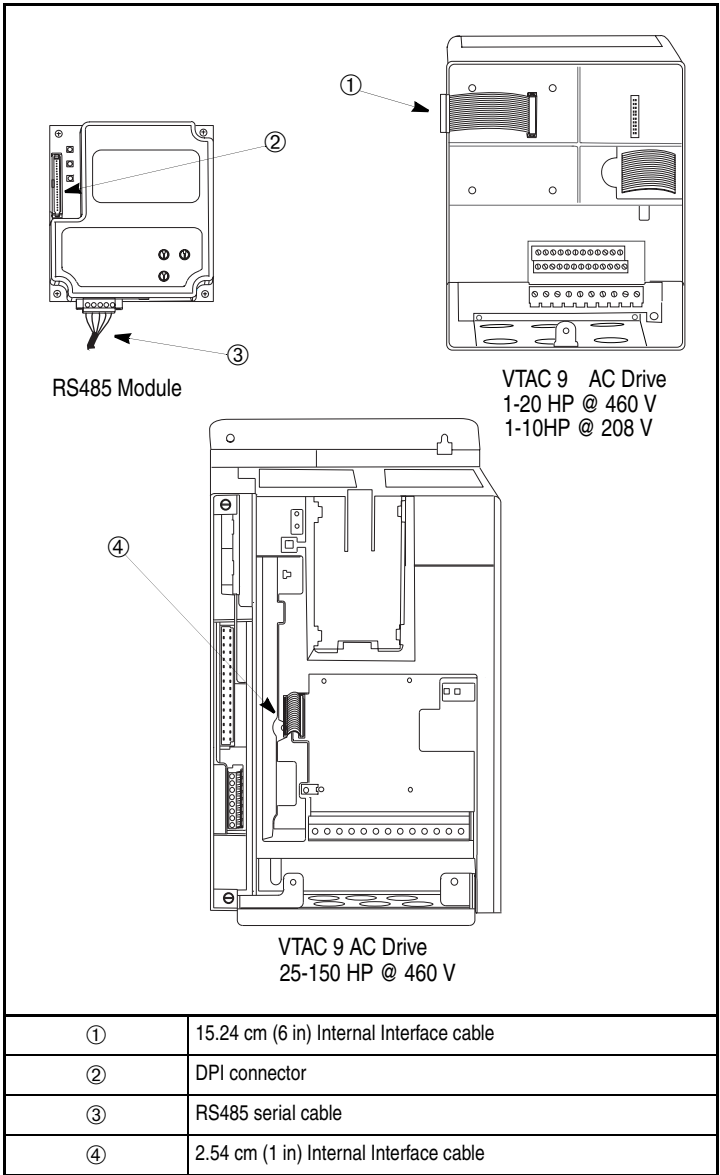


Figure 3.4 – DPI Ports and Internal Interface Cables

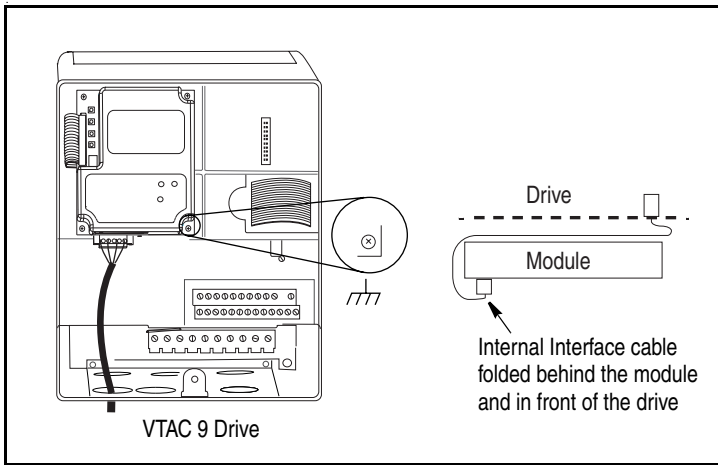


Figure 3.5 – Mounting and Grounding the Module

3.5 Applying Power



ATTENTION: Unpredictable operation may occur if you fail to verify that parameter settings and switch settings are compatible with your application. Verify that settings are compatible with your application before applying power to the drive. Failure to observe these precautions could result in severe bodily injury or loss of life.

- Step 1. Close the door or reinstall the cover on the drive. The status indicators can be viewed on the front of the drive after power has been applied.
- Step 2. Apply power to the drive. The module receives its power from the connected drive. When you apply power to the product and network for the first time, the topmost status indicator should be solid green. Refer to [Chapter 9](#), Troubleshooting the Module and Network, for more information.

CHAPTER 4

Configuring the Module

Chapter 4 provides instructions and information for setting the parameters in the module.

For a list of parameters, refer to [Appendix B](#), Module Parameters. For definitions of terms used in this chapter, refer to the Glossary.

4.1 Configuration Tools

The module stores parameters and other information in its own non-volatile memory. Therefore, you must access the module to view and edit its parameters. [Table 4.A](#) lists the tools that can be used to access the module parameters.

Table 4.A – Configuration Tools

Tool	Refer To:
VS Utilities Software	VS Utilities online help
LCD OIM	Section 4.2

4.2 Using the LCD OIM

Use the procedure in [Figure 4.1](#) to access the parameters on the module using the LCD OIM.

If you are unfamiliar with the operation of the LCD OIM, refer to VTAC 9 AC Drive User Manual (VT-1000) for more information.

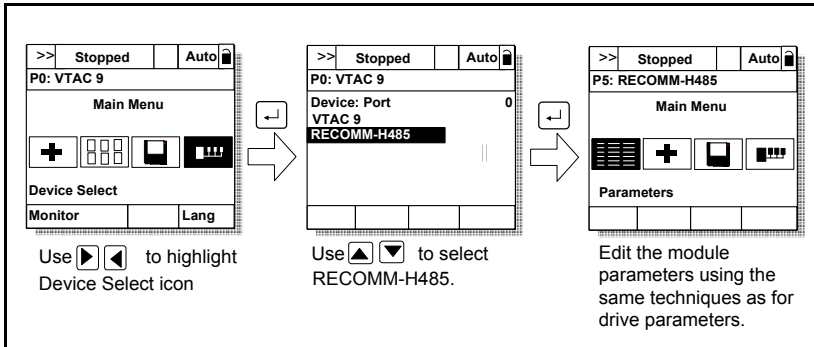


Figure 4.1 – Accessing the Module Parameters Using the LCD OIM

4.3 Setting the Node Address

If the node address rotary switches are set to 00, then the value in module Parameter 3 (Net Addr Cfg) is used to configure the node address.

- Step 1. Set the value of Parameter 3 (Net Addr Cfg) to a unique node address. See [Figure 4.2](#).

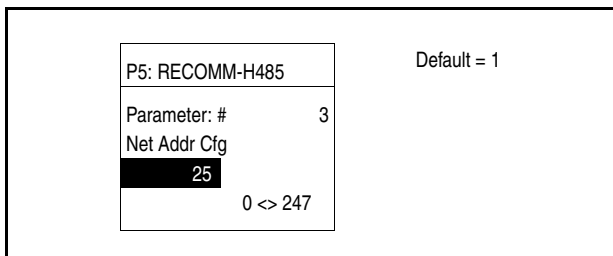


Figure 4.2 – Module Node Address Screen on an LCD OIM

- Step 2. Reset the module. Refer to [Section 4.10](#) for this procedure.

The actual node address is displayed in Parameter 4 (Net Addr Act).

4.4 Setting the Network Data Rate

- Step 1. Set the value of Parameter 5 (Net Rate Cfg) to the data rate at which your network is operating. See [Table 4.B](#) for the baud rate selections for each network type. See [Figure 4.3](#) for the module data rate screen on the LCD OIM.

Table 4.B – Data Rate Selections

Network	Baud
Siemens Building Technologies P1 FLN	4800, 9600
Metasys N2	9600
Modbus RTU	4800, 9600, 19200, 38400

P5: RECOMM-H485	
Parameter: #	5
Net Rate Cfg	1
9600 Baud	

Value	Baud
0	4800
1	9600 (Default)
2	19200
3	38400

Figure 4.3 – Module Data Rate Screen on an LCD OIM

- Step 2. Reset the module. Refer to [Section 4.10](#) for this procedure.

The actual network data rate is displayed in Parameter 6 (Net Rate Act).

4.5 Setting the Network Parity

- Step 1. Set the value of Parameter 7 (Net Parity Cfg) to the parity at which the network is operating. See [Table 4.C](#) for the parity selections for each network type. See [Figure 4.4](#) for the network parity data screen on the LCD OIM.

Table 4.C – Parity Selections

Network	Parity
Siemens Building Technologies P1 FLN	None
Metasys N2	None
Modbus RTU	None, even/odd

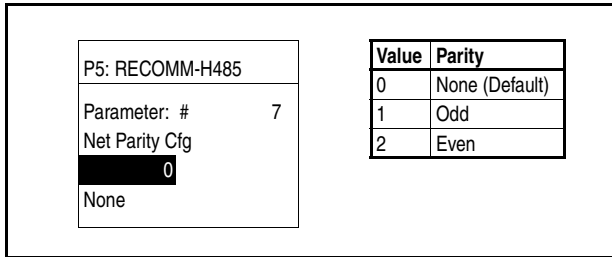


Figure 4.4 – Network Parity Data Screen on an LCD OIM

- Step 2. Reset the module. Refer to [Section 4.10](#) for this procedure.

The actual network parity is displayed in Parameter 8 (Net Parity Act).

4.6 Setting Stop Bits (Modbus RTU only)

Parameter 30 (Stop Bits Cfg) enables you to set 1 or 2 stop bits for the Modbus RTU network protocol. When the module rotary switch is set to "N2" or "P1," the Stop Bits Cfg value is ignored and does not transfer to read-only Parameter 9 (Stop Bits Act) on power-up or reset (N2 and P1 are fixed at 1 stop bit).

Step 1. Set the value of Parameter 30 (Stop Bits Cfg).

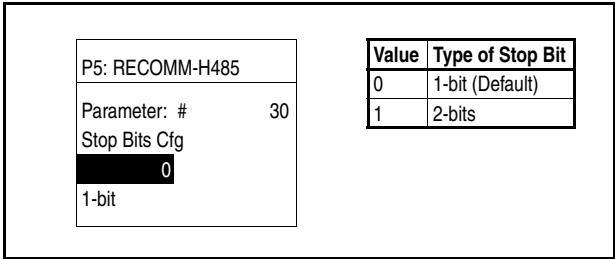


Figure 4.5 – Stop Bits Screen on an LCD OIM

Step 2. Reset the module. Refer to [Section 4.10](#) for this procedure.

The actual stop bits is displayed in Parameter 9 (Stop Bits Act).

4.7 Setting the I/O Configuration

The I/O configuration determines the type of data sent to the drive. Logic Command/Status and Datalinks may be enabled or disabled.

- Step 1. Set the bits in Parameter 16 (DPI I/O Config). A “1” enables the I/O. A “0” disables it. Bit 0 is the right-most bit. In [Figure 4.6](#), it is highlighted and equals “1.”

P5: RECOMM-H485		Bit		Description	
Parameter: #	16	0		Logic Command/Reference (Default)	
DPI I/O Config		1		Datalink A	
x x x x x x x x x x 0 0 0 1		2		Datalink B	
Cmd/Ref	b00	3		Datalink C (not used with Metasys N2)	
		4		Datalink D (not used with Metasys N2)	
		5-15		Not Used	

Figure 4.6 – I/O Configuration Screen on an LCD OIM

- Step 2. If you enabled Logic Command/Reference, configure the parameters in the drive to accept the Logic Command from the module. For example, set VTAC 9 drive Parameter 90 (Speed Ref A Sel) to “Network” so that the drive uses the reference from the module.
- Step 3. If you enabled one or more Datalinks, configure parameters in the drive to determine the source and destination of data in the Datalink(s). Also, ensure that the RS485 HVAC Options module is the only module using the enabled Datalink(s).
- Step 4. Reset the module. Refer to the [Section 4.10](#) for this procedure.

The module is ready to send and receive I/O. The following chapters contain information on basic data transfers specific to each protocol type:

- Modbus RTU, see [Chapter 5](#).
- Metasys N2, see [Chapter 6](#).
- Siemens Building Technologies P1 FLN, see [Chapter 7](#).

For information on using advanced data transfers (Datalinks) for all protocols, refer to [Chapter 8](#).

4.8 Setting a Network Timeout

The network timeout sets an interval within which the module must communicate with its master. If this time is exceeded, the module determines a loss of network communications has occurred and responds with the action specified in Parameter 15 (Comm Fit Action).

By default, the timeout is set to ten (10) seconds. You can increase or decrease this value. Alternatively, you can set the value to zero (0) so that the module does not detect communication losses.



ATTENTION: Network Timeout (Parameter 11) lets you determine how long it will take your module to detect network communication losses. By default, this parameter sets the timeout to ten (10) seconds. You can set it so that the duration is shorter, longer, or disabled. Take precautions to ensure that the setting does not create a risk of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected cable). Failure to observe this precaution could result in bodily injury or damage to equipment.

Set the network timeout in Parameter 11 (Network Timeout) as shown in [Figure 4.7](#).

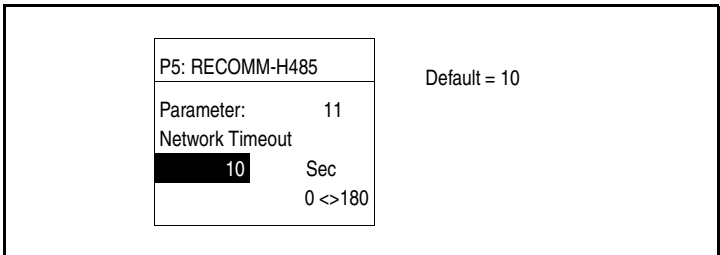


Figure 4.7 – Network Timeout Screen on an LCD OIM

Changes to this parameter take effect immediately. A reset is not required.

4.9 Setting a Fault Action



ATTENTION: Comm Flt Action (Parameter 15) lets you determine the action of the module and connected drive if communications are disrupted. By default, this parameter faults the drive. You can set this parameter so that the drive continues to run. Precautions should be taken to ensure that the setting of this parameter does not create a hazard of injury or equipment damage. Failure to observe these precautions could result in bodily injury or damage to, or destruction of, equipment.

By default, when communications are disrupted (for example, a cable is disconnected), the drive responds by faulting if it is using I/O from the network. You can configure a different response to communication disruptions using Parameter 15 (Comm Flt Action).

4.9.1 To Change the Fault Action

Set the value of Parameter 15 (Comm Flt Action) to the desired response as shown in [Table 4.D](#). See [Figure 4.8](#) for a sample LCD OIM Fault Action Screen.

Table 4.D – Selections for Drive Response to Communication Fault

Value	Action	Description
0	Fault	The drive is faulted and stopped. (Default)
1	Stop	The drive is stopped, but not faulted.
2	Zero Data	The drive is sent 0 for output data. This does not command a stop.
3	Hold Last	The drive continues in its present state disruption.
4	Send Flt Cfg	The drive is sent the data that you set in the fault configuration parameters Flt Cfg Logic (18) through Flt Cfg D2 (27).

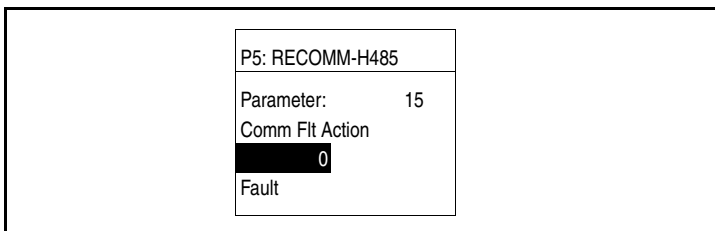


Figure 4.8 – Fault Action Screen on an LCD OIM

Changes to these parameters take effect immediately. A reset is not required.

4.9.2 To Set the Fault Configuration Parameters

If you set Parameter 15 (Comm Flt Action) to “Send Flt Cfg,” the values in parameters shown in [Table 4.E](#) are sent to the drive after a communications fault occurs. You must set these parameters to the values required by your application.


Table 4.E – Fault Configuration Parameters

Module Parameter	Name	Description
18	Flt Cfg Logic	A 16-bit value sent to the drive for Logic Command (drive Parameter 89).
19	Flt Cfg Ref	A 32-bit value (0 – 4294967295) sent to the drive as a Reference (drive Parameter 90) or Datalink.
20 – 27	Flt Cfg x1 In or Flt Cfg x2 In	Important: If the drive uses a 16-bit Reference or 16-bit Datalinks, the most significant word of the value must be set to zero (0) or a fault will occur.

Changes to these parameters take effect immediately. A reset is not required.

4.10 Resetting the Module

Changes to switch settings or some module parameters require that you reset the module before the new settings take effect. You can reset the module by cycling power to the drive or by using Parameter 14 (Reset Module).



ATTENTION: If the module is transmitting control I/O to the drive, the drive may fault when you reset the module. Determine how your drive will respond before resetting a connected module. Failure to observe these precautions could result in bodily injury or damage to equipment.

Set Parameter 14 (Reset Module) to 1 “Reset Module”. See [Figure 4.9](#).

P5: RECOMM-H485	
Parameter:	14
Reset Module	
1	
Reset Module	

Value	Description
0	Ready (Default)
1	Reset Module
2	Set Defaults

Figure 4.9 – Reset Screen on an LCD OIM

When you enter **1** (“**Reset Module**”), the module will be immediately reset. When you enter **2** (“**Set Defaults**”), the module will set all module parameters to their factory-default settings. After performing a Set Defaults, enter **1** (“**Reset Module**”) so that the new values take effect. The value of this parameter will be restored to **0** (“**Ready**”) after the module is reset.

4.11 Viewing the Module Configuration

The read-only parameters in [Table 4.F](#) provide information about how the module is configured. You can view these parameters at any time.

Table 4.F – Module Configuration Status Parameters

Number	Name	Description
1	DPI Port	Displays the port on the drive to which the module is connected. Usually, it is port 5.
2	DPI Data Rate	Displays the data rate used by the drive. It will be either 125 kbps or 500 kbps. It is set in the drive, and the module detects it.
4	Net Addr Act	Displays the node address used by the module.
6	Net Rate Act	Displays the data rate used by the module. Note that only valid values for the specified network are displayed. 0 = 4800 2 = 19200 1 = 9600 3 = 38400
8	Net Parity Act	Displays the actual network parity used by the module. Note that only valid values for the specified network are displayed. 0 = None 1 = Odd 2 = Even
9	Stop Bits Act	Displays the number of stop bits used by the selected protocol. 0 = 1 bit 1 = 2 bits This value is network-dependent: <ul style="list-style-type: none"> • Modbus RTU Protocol – The number of stop bits used depends on the value set by Parameter 30 (Stop Bits Cfg). If the value is "0," the module uses 1 stop bit; otherwise, it uses 2 stop bits. • Metasys N2 Protocol – Uses only 1 bit, so the module shows only this value. • Siemens Building Technologies P1 FLN Protocol – Uses only 1 bit, so the module shows only this value.
10	Net Chksum Type	Displays the type of checksum used by the selected protocol. 0 = CRC16 (0) 1 = RLC 2 = CRC16 (-1) This value is network dependent: <ul style="list-style-type: none"> • CRC16 (0) is Cyclic Redundancy Check with 0 as a seed value. The Siemens Building Technologies P1 FLN protocol uses this checksum. • RLC is Run Length Checksum. The Metasys N2 protocol uses this checksum. • CRC16 (-1) is Cyclic Redundancy Check with -1 as a seed value. The Modbus RTU protocol uses this checksum.

Table 4.F – Module Configuration Status Parameters (Continued)

Number	Name	Description
12	Ref/Fdbk Size	Displays the size of the Reference/Feedback. It is set in the drive and the module automatically uses the correct size. 0 = 16 bits 1 = 32 bits
13	Datalink Size	Displays the size of the Datalinks. It is set in the drive and the module automatically uses the correct size. 0 = 16 bits 1 = 32 bits
17	DPI I/O Active	Displays I/O the module is configured to transmit. The value of this parameter will usually be equal to the value of Parameter 16 (DPI I/O Config). Bit Definitions 0 = Cmd/Ref 1 = Datalink A 2 = Datalink B 3 = Datalink C 4 = Datalink D

Using Basic Data Transfers: Modbus RTU

Data transfers are used to transfer the data that controls the drive and sets its Reference. I/O can also be used to transfer data to and from Datalinks in VTAC 9 drives.

This chapter provides information about using basic data transfers to control a VTAC 9 drive when the Modbus RTU network protocol is selected. For information about using advanced data transfers, see [Chapter 8](#).

5.1 Overview of DPI/Modbus RTU Functionality

Modbus RTU protocol is a messaging structure used to establish master-slave communication between intelligent devices. The protocol defines the format of the messages.

Messages from a master to a slave contain the address of the slave, a function code defining the requested action, any data to be sent, and an error-checking field.

A slave's response message contains fields confirming the action taken, any data to be returned, and an error-checking field. If an error occurred in the receipt of the message, or if the slave is unable to perform the requested action, the slave will construct an error message and send it as its response.

Modbus RTU can access single addresses or multiple address simultaneously; either reading or writing single-bit values or 16-bit values.

Important: The RS485 HVAC Options module must be actively communicating with the master and it must be selected as the drive control source for any inputs to be transferred from the module to the drive regulator. (See Logic Source Select, Parameter 89, and Speed Ref A Sel, Parameter 90, in the drive instruction manual for more information.)

Important: Any parameter changes made via the LCD OIM during this time will be overwritten when the next network update occurs.

5.1.1 Modbus RTU Data Formats

Modbus data types are 1-bit and 16-bit values as shown in [Table 5.A](#).

Table 5.A – Modbus RTU Data Formats

Modbus Type	Description	Reference
Coil Status	Discrete Output	0x
Input Status	Discrete Input	1x
Holding Register	16-bit Output Register	4x
Input Register	16-bit Input Register	3x

5.1.2 Supported Modbus RTU Commands

The RS485 HVAC Options module supports the Modbus RTU commands listed in [Table 5.B](#).

Table 5.B – Modbus RTU Commands Supported by RS485 Module

Function Code	Description
01	Read Coil Status
02	Read Input Status
03	Read Holding Registers
04	Read Input Registers
05	Force Single Coil
06	Preset Single Register
08	Diagnostics <ul style="list-style-type: none">• Subfunction 00 Only - Return Query Data (loop back)
16	Write Multiple Registers
23	Read/Write 4x Registers

5.2 Modbus RTU Point Map for I/O

The following sections provide a description of the Modbus RTU I/O image. Note that **Output I/O** is data that is output from the master and consumed by the module. **Input I/O** is status data that is produced by the module and consumed as input by the master.

5.2.1 Data Addresses in Modbus Messages

All data addresses in Modbus messages are referenced to zero; that is, the first occurrence of a data item is addressed as item number zero. Therefore, when you create a message, you must address it to one less than the Modbus address in the manual. For example:

- Logic Command (Holding Register address 4x0001) is addressed as register “0000” in the data address field of the message.
- Feedback (Input Register address 3x0003) is addressed as register “0002” in the data address field of the message.
- Start (Coil address 0x0002) is addressed as coil “0001” in the data address field of the message.
- At Speed (Input address 0x0009) is addressed as input “0008” in the data address field of the message.

Note that this applies to all of the Modbus addresses listed in the tables in [Section 5.2](#).

5.2.2 Product Logic Status: Discrete Inputs to Host Controller (Output from Drive)

The Product Logic Status discrete input points are derived from the 16-bit Product Logic Status word (see [Table 5.D](#), Modbus address 3x0001). Therefore, there are 16 discrete points to represent the whole status word bit by bit. These must be used for single-bit status only. Multi-bit field status must be accessed through the Product Status word to maintain data integrity.

Table 5.C – Modbus Product Logic Status: Discrete Inputs

Modbus Address	Logic Status Bit	VTAC 9 Example	
		Description	Values
1x0001	0	Ready	0 = Not Ready 1 = Ready
1x0002	1	Active	0 = Not Running 1 = Running
1x0003	2	Command Direction	0 = Reverse 1 = Forward

Table 5.C – Modbus Product Logic Status: Discrete Inputs (Continued)

Modbus Address	Logic Status Bit	VTAC 9 Example	
		Description	Values
1x0004	3	Actual Direction	0 = Reverse 1 = Forward
1x0005	4	Accel	0 = Not Accelerating 1 = Accelerating
1x0006	5	Decel	0 = Not Decelerating 1 = Decelerating
1x0007	6	Alarm	0 = No Alarm 1 = Alarm
1x0008	7	Fault	0 = No Fault 1 = Fault
1x0009	8	At Speed	0 = Not at Reference 1 = At Reference
1x0010	9	Local Control	Address <u>12 11 10</u> 0 0 0 = Port 0 (TB) 0 0 1 = Port 1 0 1 0 = Port 2 0 1 1 = Port 3 1 0 0 = Port 4 1 0 1 = Port 5 1 1 0 = Port 6 1 1 1 = No Local
1x0011	10		
1x0012	11		
1x0013	12	Reference	Address <u>16 15 14 13</u> 0 0 0 0 = Ref A Auto 0 0 0 1 = Reserved 0 0 1 0 = Preset 2 Auto 0 0 1 1 = Preset 3 Auto 0 1 0 0 = Preset 4 Auto 0 1 0 1 = Preset 5 Auto 0 1 1 0 = Preset 6 Auto 0 1 1 1 = Purge Speed 1 0 0 0 = Term Blk Manual 1 0 0 1 = DPI 1 Manual 1 0 1 0 = DPI 2 Manual 1 0 1 1 = DPI 3 Manual 1 1 0 0 = DPI 4 Manual 1 1 0 1 = DPI 5 Manual 1 1 1 0 = DPI 6 manual 1 1 1 1 = Jog Ref
1x0014	13		
1x0015	14		
1x0016	15		

5.2.3 Product Logic Status and Feedback

Table 5.D – Modbus Product Logic Status and Feedback

Modbus Address	Input Description	Values
3x0001	Product Status Word	16-bit, bit-oriented word.
3x0002	Feedback Lo	Bit 0-15 of 32-bit feedback
3x0003 ¹	Feedback Hi	Bit 16-31 of 32-bit feedback or the whole 16-bit feedback.

¹ The Feedback value is refreshed from the DPI I/O image only when accessing address 3x0003. This is to maintain data integrity.

5.2.4 Product Logic Command: Discrete Outputs from Host Controller (Inputs to Drive)



ATTENTION: Select and use **either** the Product Logic Command Discrete Outputs (0x000x) or the Product Logic Command Word (4X0001), but **not both**. Conflicts resulting from using both can cause dangerous operation. Failure to observe this precaution could result in severe bodily injury or loss of life.

The Product Logic Command output points represent the bits of the 16-bit Product Logic Command word (see [Table 5.E](#), Modbus address 4x0001). A 16-bit Product Logic word is buffered in the module, holding the last logic command sent to the drive regardless of whether it was sent through these discrete outputs or through the Product Logic Command points. When a bit is updated through these discrete outputs, a new logic command is generated and sent to the drive.

Table 5.E – Modbus Product Logic Command: Discrete Outputs

Modbus Address	Logic Command Bit	VTAC 9 Example	
		Description	Values
0x0001	0	Stop	0 = Not Stop 1 = Stop
0x0002	1	Start ^{1, 2}	0 = Not Start 1 = Start
0x0003	2	Jog	0 = Not Jog 1 = Jog
0x0004	3	Clear Faults ²	0 = Not Clear Faults 1 = Clear Faults
0x0005	4	Direction	Address 06 05 0 0 = No Command 0 1 = Forward Command 1 0 = Reverse Command 1 1 = Hold Direction Control
0x0006	5		

Table 5.E – Modbus Product Logic Command: Discrete Outputs (Continued)

Modbus Address	Logic Command Bit	VTAC 9 Example	
		Description	Values
0x0007	6	Local Control	0 = No Local Control 1 = Local Control
0x0008	7	MOP Increment	0 = Not Increment 1 = Increment
0x0009	8	Accel Rate	Address 10 09 0 0 = No Command 0 1 = Accel Rate 1 Command 1 0 = Accel Rate 2 Command 1 1 = Hold Accel Rate
0x0010	9		
0x0011	10	Decel Rate	Address 12 11 0 0 = No Command 0 1 = Decel Rate 1 Command 1 0 = Decel Rate 2 Command 1 1 = Hold Decel Rate
0x0012	11		
0x0013	12	Reference Select	Address 15 14 13 0 0 0 = No Command 0 0 1 = Ref 1 (Ref A Select) 0 1 0 = Reserved 0 1 1 = Ref 3 (Preset 3) 1 0 0 = Ref 4 (Preset 4) 1 0 1 = Ref 5 (Preset 5) 1 1 0 = Ref 6 (Preset 6) 1 1 1 = Ref 7 (Purge Speed)
0x0014	13		
0x0015	14		
0x0016	15	MOP Decrement	0 = Not Decrement 1 = Decrement

¹ For the Product Logic Command Bit 0, the 0 = Not Stop condition must first be present before a Product Logic Command Bit 1, 1 = Start condition will start the drive.

² To perform this command, the value must change from “0” to “1.”

5.2.5 Product Logic Command and Reference

Table 5.F – Modbus Product Logic Command and Reference

Modbus Address	Output Description	Values
4x0001	Product Logic Command	16-bit, bit-oriented word.
4x0002	Reference Lo	Bit 0-15 of 32-bit reference.
4x0003 ¹	Reference Hi	Bit 16-31 of 32-bit reference or the whole 16-bit reference.

¹ The reference value is sent only when accessing address 4x0003. If a 32-bit reference is used, the 32-bit value will be merged together by register 4x0002 and 4x0003 when accessing address 4x0003.

Important: Since the Product Logic words are defined bit fields, you must use these discrete points only for single-bit handling. Multi-bit fields must be accessed through the Product Logic words (addresses 3x0001 and 4x0001) to maintain data integrity.

A 16-bit product logic word is buffered in the module, holding the last logic command sent to the drive regardless of whether it was sent through the discrete outputs or through the product logic command register output. When a bit is updated through the discrete outputs or the register output, a new logic command is generated and sent to the drive.

To set the Reference, you must use a register output (Modbus Address 4x0002 and/or 4x0003 in [Table 5.F](#)). Remember that the Reference value is a scaled value; it is not an engineering value. For example, in VTAC 9 drives, the reference is scaled based on the value of Parameter 55 (Maximum Freq), but the commanded maximum speed can never exceed the value of Parameter 82 (Maximum Speed). [Table 5.G](#) shows example References and their results on a VTAC 9 drive that has its Parameter 55 (Maximum Freq) set to 130 Hz and Parameter 82 (Maximum Speed) set to 60 Hz.

Table 5.G – Example Speed Reference and Feedback for a VTAC 9 Drive

Reference Value	Scale		Output Speed	Feedback Value
	Percent	Value		
32767 ¹	100%	130 Hz	60 Hz ²	15123 ³
16384	50%	65 Hz	60 Hz ²	15123 ³
8192	25%	32.5 Hz	32.5 Hz	8192
0	0%	0 Hz	0 Hz	0

¹ A value of 32767 is equivalent to 100%. The effects of values greater than 32767 depend on whether the DPI product uses a bipolar or unipolar direction mode. Refer to the documentation for your DPI product.

² The drive runs at 60 Hz instead of 130 Hz or 65 Hz because Parameter 82 (Maximum Speed) sets 60 Hz as the maximum speed.

³ The Feedback value is also scaled based on the value of Parameter 55 (Maximum Freq). For example, $60/130 = 0.46$ so $32767 \times 0.46 = 15123$.

5.3 Accessing Drive Parameters

There are two methods for accessing drive parameters: the direct access method and the pointer method.

5.3.1 Direct Access Method

You can use Function Code 03 to read and Function Codes 06 (single) and 16 (multiple) to write, to directly access the drive parameters (see [Table 5.B](#)). This allows direct access of parameters in a single read or write as opposed to first having to write the “Param# for INx” or “Param# for OUTx” using the Pointer Access Method.

When a 41000 or higher Modbus address is used, the module assumes the controller is accessing the drive’s parameters directly. The address is determined by:

$$\text{Modbus Address} = 41000 + (\text{Drive Parameter \#} - 1)$$

For example, Parameter 1 is accessed by Modbus Address 41000. Any attempts to access a parameter number that does not exist will return an error.

5.3.2 Pointer Access Method

5.3.2.1 Reading Parameter Values

With a configurable input point, you can read any 16-bit parameter in the drive. The sequence for reading parameter values is:

- Step 1. Set one or more Param# for INx points in the controller to the parameter number(s) that you want to read. You can set up to eight Param# for INx points. Refer to [Table 5.H](#).
- Step 2. Send a message with a Write Single Register (code 06) or Write Multiple Register (code 16) function. You need to send the Param# for INx point(s) to the module only one time per power cycle because, when the module receives the Param# for INx point(s), it stores them in its RAM. The module then continuously reads the values for the drive parameters specified in the Param# for INx points.
- Step 3. Send a message with a Read Input Register (code 04) function. The module reads the drive parameter(s) that have been configured in the Param# for IN point(s) and returns their values in the User INx point(s). It can return up to eight User INx points. Refer to [Table 5.H](#). You can perform Read Input Registers continuously, if desired.

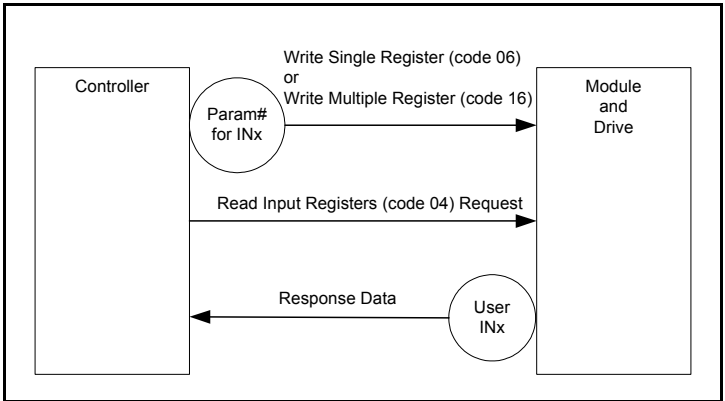



Figure 5.1 – Configurable Input Point Operations

Table 5.H – Modbus Configurable Objects: Inputs

Modbus Address	Data Direction	Description	Values	User Default
3x0004	Register Input	User IN1	depends on parameter selected	0
3x0005	Register Input	User IN2	depends on parameter selected	0
3x0006	Register Input	User IN3	depends on parameter selected	0
3x0007	Register Input	User IN4	depends on parameter selected	0
3x0008	Register Input	User IN5	depends on parameter selected	0
3x0009	Register Input	User IN6	depends on parameter selected	0
3x0010	Register Input	User IN7	depends on parameter selected	0
3x0011	Register Input	User IN8	depends on parameter selected	0
4x0004	Register Output	Param# for IN1	0 = Not in use, 1 to max. parameter #	0
4x0005	Register Output	Param# for IN2	0 = Not in use, 1 to max. parameter #	0
4x0006	Register Output	Param# for IN3	0 = Not in use, 1 to max. parameter #	0
4x0007	Register Output	Param# for IN4	0 = Not in use, 1 to max. parameter #	0
4x0008	Register Output	Param# for IN5	0 = Not in use, 1 to max. parameter #	0
4x0009	Register Output	Param# for IN6	0 = Not in use, 1 to max. parameter #	0
4x0010	Register Output	Param# for IN7	0 = Not in use, 1 to max. parameter #	0
4x0011	Register Output	Param# for IN8	0 = Not in use, 1 to max. parameter #	0

5.3.2.2 Writing Parameter Values



ATTENTION: Risk of equipment damage exists. If configurable output points are programmed to write parameter data to Non-Volatile Storage (NVS) frequently, the NVS will quickly exceed its life cycle and cause the drive to malfunction. Do not create a program that frequently uses configurable outputs to write parameter data to NVS. Datalinks do not write to NVS and should be used for frequently changed parameters.

With a configurable output point, you can write a new value for any 16-bit parameter in the drive. The sequence for writing parameter values is:

- Step 1. Set one or more Param# for OUTx points in the controller to the parameter number(s) to which you want to write. A value of zero in the Param# field disables the writing of data for that specific point. Refer to the VTAC 9 drive user manual for the desired parameter number(s). You can set up to three Param# for OUTx points at a time. Refer to [Table 5.I](#).
- Step 2. Send a message with a Write Single Register (code 06) or Write Multiple Register (code 16) function. You need to send the Param# for OUTx point(s) to the module only one time per power cycle because, when the module receives the Para# for OUTx point(s), it stores them in its RAM.
- Step 3. Set the values that you want to write to the parameters in the User OUTx points. You can set up to three User OUTx points at a time. Refer to [Table 5.I](#).
- Step 4. Send a message with a Write Single Register (code 06) or Write Multiple Register (code 16) function. Each time that the module receives the values in the User OUTx points, it writes them to the drive parameters.

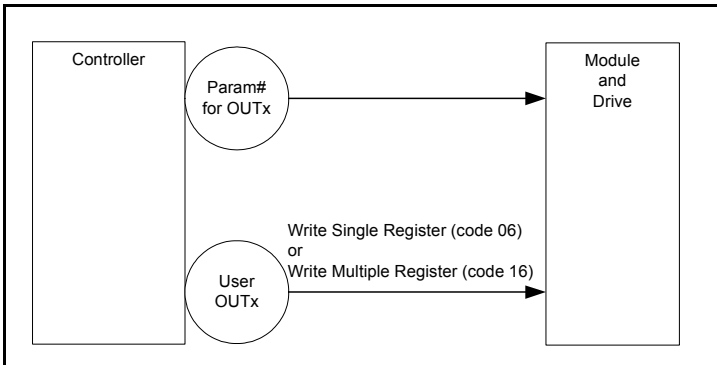


Figure 5.2 – Configurable Output Point Operations

Table 5.1 – Modbus Configurable Objects: Outputs

Modbus Address	Data Direction	Description	Values	User Default
4x0012	Register Output	User OUT1	depends on parameter selected	0
4x0013	Register Output	User OUT2	depends on parameter selected	0
4x0014	Register Output	User OUT3	depends on parameter selected	0
4x0015	Register Output	Param# for OUT1	0 = Not in use, 1 to max. parameter #	0
4x0016	Register Output	Param# for OUT2	0 = Not in use, 1 to max. parameter #	0
4x0017	Register Output	Param# for OUT3	0 = Not in use, 1 to max. parameter #	0

5.4 Using Broadcast Messages

A Modbus RTU global broadcast feature enables you to send a command (start, stop, etc.) to all drives on the network at the same time. by using Modbus Address “0.” This feature can also be used to write the same message to each network drive via a single message, for example setting Accel Time to 5 seconds in every drive.

Important: Every node capable of receiving a broadcast message will act upon the message, so it is required that broadcast messages are used only on networks of similar devices. For example, VTAC 9 drives use the same Logic Command structure, Reference format and the same Modbus addressing, so these could be controlled together using a broadcast message. Always check the Modbus addressing, Logic Command structure, Reference format, etc. for every node device type before designing a system with broadcast messages.

The module also enables you to independently scale the broadcast message Reference of its connected drive by using Parameter 31 (RTU Ref. Adjust). The scaling factor can be set from 0-200.0%. This lets the drive’s Reference either match the broadcast message Reference (= 100%), scale below the broadcast message Reference (<100%), or scale above the broadcast message Reference (>100%).

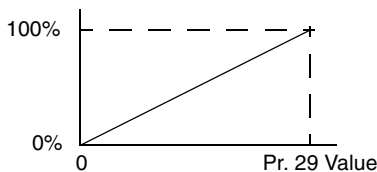
Using Basic Data Transfers: Metasys N2

Data transfers are used to transfer the data that controls the drive and sets its Reference. I/O can also be used to transfer data to and from Datalinks in VTAC 9 drives.

This chapter provides information about using basic data transfers to control a VTAC 9 drive when the Metasys N2 network protocol is selected. For information about using advanced data transfers, see [Chapter 8](#).

6.1 Additional Configuration Specific for Metasys N2

The reference (AO#2) for Metasys N2 is set as a percentage from -100% to +100%. However, the actual value transmitted over the N2 network is in an engineering unit that equals the entered percentage. Parameter 29 (N2 Ref Scale) determines the engineering unit value sent when AO#2 is set to 100%. The relationship is linear, where:



By default, Parameter 29 (N2 Ref Scale) equals 32,767, which is the maximum Reference value for VTAC 9 drives. Note that additional scaling is performed in the VTAC 9 drive, where 32,767 equals the frequency selected in drive Parameter 55 (Maximum Freq). For other DPI Hosts, refer to the documentation of the specific DPI Host product.

6.2 Overview of DPI/Metasys N2 Functionality

Metasys nodes are built up by the use of several virtual objects. The Metasys N2 master performs read and write commands to these virtual objects, and the module transfers/translates the data between these virtual objects and the drive.

When a read or write command occurs to a certain dedicated virtual object, data in the virtual objects is refreshed from or transferred to the drive.

The Metasys N2 master performs read and write commands to the virtual objects one at a time. The data types that are used in the virtual objects are binary input, binary output, and internal integer (ADI), which is a 16-bit data value.

The Metasys master also performs a cyclic polling of all the virtual objects.

Important: The RS485 HVAC Options module must be actively communicating with the master and it must be selected as the drive control source in order for any output to be transferred from the module to the drive regulator. (See Logic Source Select, parameter 89, and Speed Ref A Sel, parameter 90, in the drive instruction manual for more information.)

Important: Parameter changes made via the LCD OIM during this time will be overwritten when the next network update occurs.

6.2.1 Metasys N2 Virtual Objects

A Metasys N2 node may contain up to 256 virtual objects in each of its seven different data types, called regions. The regions are defined in [Table 6.A](#).

Table 6.A – Description of the Regions of a Virtual Object

Region	Type	Short	Description
Region 1	Analog Input	AI	32-bit, IEEE-standard floats
Region 2	Binary Input	BI	1-bit
Region 3	Analog Output	AO	32-bit, IEEE-standard floats
Region 4	Binary Output	BO	1-bit
Region 5	Internal Float	ADF	32-bit, IEEE-standard floats (Analog Data Float)
Region 6	Internal Integer	ADI	16-bit (Analog Data Integer)
Region 7	Internal Byte	DB	8-bit (Analog Data Byte)

6.2.2 Metasys N2 Data Types

Table 6.B – Internal Structure of Metasys N2 Analog Input (AI)

Attribute	Type	Description
1	Byte	Object Configuration
2	Byte	Object Status
3	Float	Analog Input Value
8	Float	Low Alarm Limit
9	Float	Low Warning Limit
10	Float	High Warning Limit
11	Float	High Alarm Limit
12	Float	Differential

Table 6.C – Internal Structure of Metasys N2 Binary Input (BI)

Attribute	Type	Description
1	Byte	Object Configuration
2	Byte	Object Status

Table 6.D – Internal Structure of Metasys N2 Analog Output (AO)

Attribute	Type	Description
1	Byte	Object Configuration
2	Byte	Object Status
3	Float	Current Value

Table 6.E – Internal Structure of Metasys N2 Binary Output (BO)

Attribute	Type	Description
1	Byte	Object Configuration
2	Byte	Object Status
3	Integer	Minimum On-Time
4	Integer	Minimum Off-Time
5	Integer	Maximum Cycle/Hour

Table 6.F – Internal Structure of Metasys N2 Internal Integer (ADI)

Attribute	Type	Description
1	Byte	Object Status
2	Integer	Current Value. Signed 16-bit.

6.3 Metasys N2 Point Map for I/O

The following sections provide a description of the Metasys N2 I/O image. Note that **Output I/O** is data that is output from the master and consumed by the module. **Input I/O** is status data that is produced by the module and consumed as input by the master.

6.3.1 Product Logic Status: Binary Inputs

The Product Logic status binary input points are derived from the 16-bit Product Logic Status word (see network point address 1 in [Table 6.H](#)). Therefore, there are 16 binary points to represent the whole status word bit by bit.

Table 6.G – Metasys Product Logic Status: Binary Inputs
(Outputs from Drive to Metasys Module)

Network Point Type (NPT)	Network Point Address (NPA)	Logic Status Bit	VTAC 9 Example		
			Description	Values	Typical Status
Bl	1	0	Ready	0 = Not Ready 1 = Ready	1 = Ready
Bl	2	1	Run	0 = Not Active 1 = Active (Run)	1 = Active (Run)
Bl	3	2	Command Direction	0 = Reverse 1 = Forward	1 = Forward
Bl	4	3	Actual Direction	0 = Reverse 1 = Forward	1 = Forward
Bl	5	4	Accel	0 = Not Accelerating 1 = Accelerating	0 = Not Accelerating
Bl	6	5	Decel	0 = Not Decelerating 1 = Decelerating	0 = Not Decelerating
Bl	7	6	Alarm	0 = No Alarm 1 = Alarm	0 = No Alarm
Bl	8	7	Fault	0 = No Fault 1 = Fault	0 = No Fault
Bl	9	8	At Speed	0 = Not at Reference 1 = At Reference	1 = At Reference
Bl	10	9	Logic Source Sel (parameter 89)	Network Point Addresses <u>12 11 10</u> 0 0 0 = Port 0 (TB) 0 0 1 = Port 1 (local) 0 1 0 = Port 2 0 1 1 = Port 3 1 0 0 = Port 4 1 0 1 = Port 5 (Metasys Comm bd) 1 1 0 = Port 6 1 1 1 = No Local	101 = Port 5 (Metasys Comm Board)
Bl	11	10			
Bl	12	11			

Table 6.G – Metasys Product Logic Status: Binary Inputs
(Outputs from Drive to Metasys Module) (Continued)

Network Point Type (NPT)	Network Point Address (NPA)	Logic Status Bit	VTAC 9 Example		
			Description	Values	Typical Status
BI	13	12	Speed A Sel Source (parameter 94) (Typically used when commanding drive speed from source other than Metasys)	Network Point Addresses 16 15 14 13	0111 = Hardwired Purge Input Closed
BI	14	13		0 0 0 0 = Ref A Auto	
BI	15	14		0 0 0 1 = Reserved	
BI	16	15		0 0 1 0 = Preset 2 Auto	
				0 0 1 1 = Preset 3 Auto	
				0 1 0 0 = Preset 4 Auto	
				0 1 0 1 = Preset 5 Auto	
				0 1 1 0 = Preset 6 Auto	
				0 1 1 1 = Hardwired purge input clsd	
				1 0 0 0 = Term Blk Manual	
				1 0 0 1 = DPI 1 Manual	
				1 0 1 0 = DPI 2 Manual	
				1 0 1 1 = DPI 3 Manual	
				1 1 0 0 = DPI 4 Manual	
				1 1 0 1 = DPI 5 Manual	
				1 1 1 0 = DPI 6 Manual	
				1 1 1 1 = Jog Ref	

6.3.2 Product Logic Status and Feedback

Table 6.H – Product Logic Status and Feedback (Analog Inputs)

Network Point Type (NPT)	Network Point Address (NPA)	Parameter Description	Range
AI	1	Product Status Word	16-bit-oriented word (see Table 6.I)
AI	2	Feedback	-100.0% to +100.0%

Table 6.I – Product Logic Status Word Read as AI

AI#1 Bit Address	Parameter Description	Values	Typical Status
1	Ready	0 = Not Ready 1 = Ready	1 = Ready
2	Run	0 = Not Active 1 = Active (Run)	1 = Active (Run)
3	Command Direction	0 = Reverse 1 = Forward	1 = Forward
4	Actual Direction	0 = Reverse 1 = Forward	1 = Forward
5	Accel	0 = Not Accelerating 1 = Accelerating	0 = Not Accelerating

Table 6.1 – Product Logic Status Word Read as AI (Continued)

AI#1 Bit Address	Parameter Description	Values	Typical Status
6	Decel	0 = Not Decelerating 1 = Decelerating	0 = Not Decelerating
7	Alarm	0 = No Alarm 1 = Alarm	0 = No Alarm
8	Fault	0 = No Fault 1 = Fault	0 = No Fault
9	At Speed	0 = Not at Reference 1 = At Reference	1 = At Reference
10	Logic Source Select (parameter 89)	Network Point Addresses <u>12 11 10</u> 0 0 0 = Port 0 (terminal board) 0 0 1 = Port 1 (local) 0 1 0 = Port 2 0 1 1 = Port 3 1 0 0 = Port 4 1 0 1 = Port 5 (Metasys Comm board) 1 1 0 = Port 6 1 1 1 = No Local	101 = Port 5 (Metasys Comm Board)
11			
12			
13	Speed A Sel Source (parameter 94) (Typically used when commanding drive speed from source other than Metasys)	Network Point Addresses <u>16 15 14 13</u> 0 0 0 0 = Ref A Auto 0 0 0 1 = Reserved 0 0 1 0 = Preset 2 Auto 0 0 1 1 = Preset 3 Auto 0 1 0 0 = Preset 4 Auto 0 1 0 1 = Preset 5 Auto 0 1 1 0 = Preset 6 Auto 0 1 1 1 = Hardwired purge input clsd 1 0 0 0 = Term Blk Manual 1 0 0 1 = DPI 1 Manual 1 0 1 0 = DPI 2 Manual 1 0 1 1 = DPI 3 Manual 1 1 0 0 = DPI 4 Manual 1 1 0 1 = DPI 5 Manual 1 1 1 0 = DPI 6 Manual 1 1 1 1 = Jog Ref	0111 = Hardwired Purge Input Closed
14			
15			
16			

6.3.3 Product Logic Command: Binary Outputs (Inputs to Drive)



ATTENTION: Select and use **either** Binary Outputs (BO) or the word type Analog Output (AO#1) as a control method, but **not both**. Conflicts caused from using both methods can result in dangerous operation. Failure to observe this precaution could cause severe bodily injury or loss of life.

The Product Logic Command output points represent the bits of the 16-bit Product Logic Command word (see network point address 0 in [Table 6.K](#)). A 16-bit Product Logic word will be buffered in the module, holding the last logic command sent to the drive regardless of whether it was sent through these binary outputs or through the Product Logic command points. When a bit is updated through these binary outputs, a new logic command will be generated and sent to the drive.

Table 6.J – Product Logic Command: Binary Outputs (to Drive)

Network Point Type (NPT)	Network Point Address (NPA)	Description	Values	Typical Setting
BO	1	Stop	0 = Not Stop 1 = Stop	0 = Not Stop (must be present first)
BO	2	Start ^{1, 2}	0 = Not Start 1 = Start	1 = Start
BO	3	Jog	0 = Not Jog 1 = Jog	0 = Not Jog
BO	4	Clear Faults ²	0 = Not Clear Faults 1 = Clear Faults	0 = Not Clear Faults
BO	5	Direction	Network Point Addresses <u>06 05</u> 0 0 = No Command 0 1 = Forward 1 0 = Reverse 1 1 = Hold Direction Control	01 = Forward Command
BO	6			
BO	7	Local Control	0 = No Local Control 1 = Local Control	0 = No Local Control (Control from network)
BO	8	MOP Increment	0 = Not Increment 1 = Increment	0 = Not Increment (MOP off)
BO	9	Accel Rate	Network Point Addresses <u>10 09</u> 0 0 = No Command 0 1 = Accel Rate 1 1 0 = Accel Rate 2 1 1 = Hold Accel Rate	01 = Accel Rate 1 Command
BO	10			

Table 6.J – Product Logic Command: Binary Outputs (to Drive) (Continued)

Network Point Type (NPT)	Network Point Address (NPA)	Description	Values	Typical Setting
BO	11	Decel Rate	Network Point Addresses <u>12 11</u> 0 0 = No Command 0 1 = Decel Rate 1 1 0 = Decel Rate 2 1 1 = Hold Decel Rate	01 = Decel Rate 1 Command
BO	12			
BO	13	Reference Select	Network Point Addresses <u>15 14 13</u> 0 0 0 = No Command 0 0 1 = Ref 1 (Ref A Select) 0 1 0 = Reserved 0 1 1 = Ref 3 (Preset 3) 1 0 0 = Ref 4 (Preset 4) 1 0 1 = Ref 5 (Preset 5) 1 1 0 = Ref 6 (Preset 6) 1 1 1 = Ref 7 (Purge Speed/Preset 7)	001 = Ref 1 (Ref A Select)
BO	14			
BO	15			
BO	16	MOP Decrement	0 = No Decrement 1 = Decrement	0 = No Decrement (MOP off)

- 1 For the Product Logic Command Bit 0, the 0 = Not Stop condition must first be present before a Product Logic Command Bit 1, 1 = Start condition will start the drive.
- 2 To perform this command, the value must change from “0” to “1.”

6.3.4 Product Logic Command and Reference

Table 6.K – Product Logic Command and Reference: Analog Outputs

Network Point Type (NPT)	Network Point Address (NPA)	Parameter Description	Range
AO	1	Product Logic Command	16-bit oriented word (see Table 6.L)
AO	2	Reference	-100.0% to +100.0%

Table 6.L – Product Logic Command and Reference Word Write as AO

AO#1 Bit Address	Parameter Description	Range	Typical Setting
1	Stop	0 = Not Stop 1 = Stop	0 = Not Stop (must be present first)
2	Start ^{1, 2}	0 = Not Start 1 = Start	1 = Start
3	Jog	0 = Not Jog 1 = Jog	0 = Not Jog

Table 6.L – Product Logic Command and Reference Word Write as AO (Continued)

AO#1 Bit Address	Parameter Description	Range	Typical Setting
4	Clear Faults ²	0 = Not Clear Faults 1 = Clear Faults	0 = Not Clear Faults
5	Direction	Network Point Addresses <u>06 05</u> 0 0 = No Command 0 1 = Forward 1 0 = Reverse 1 1 = Hold Direction Control	01 = Forward Command
6			
7	Local Control	0 = No Local Control 1 = Local Control	0 = No Local Control (Control from network)
8	MOP Increment	0 = Not Increment 1 = Increment	0 = Not Increment (MOP off)
9	Accel Rate	Network Point Addresses <u>10 09</u> 0 0 = No Command 0 1 = Accel Rate 1 1 0 = Accel Rate 2 1 1 = Hold Accel Rate	01 = Accel Rate 1 Command
10			
11	Decel Rate	Network Point Addresses <u>12 11</u> 0 0 = No Command 0 1 = Decel Rate 1 1 0 = Decel Rate 2 1 1 = Hold Decel Rate	01 = Decel Rate 1 Command
12			
13	Reference Select	Network Point Addresses <u>15 14 13</u> 0 0 0 = No Command 0 0 1 = Ref 1 (Ref A Select) 0 1 0 = Reserved 0 1 1 = Ref 3 (Preset 3) 1 0 0 = Ref 4 (Preset 4) 1 0 1 = Ref 5 (Preset 5) 1 1 0 = Ref 6 (Preset 6) 1 1 1 = Ref 7 (Purge Speed/Preset 7)	001 = Ref 1 (Ref A Select)
14			
15			
16	MOP Decrement	0 = No Decrement 1 = Decrement	0 = No Decrement (MOP off)

¹ For the Product Logic Command Bit 0, the 0 = Not Stop condition must first be present before a Product Logic Command Bit 1, 1 = Start condition will start the drive.

² To perform this command, the value must change from “0” to “1.”

Important: Since the Product Logic words are defined bit fields, you must use these binary points only for single-bit handling. Multi-bit fields must be accessed through the Product Logic words (addresses AI#1 and AO#1) to maintain data integrity. However, these bits are still accessible.

A 16-bit product logic word is buffered in the module, holding the last logic command sent to the drive regardless of whether it was sent through the binary outputs or through the product logic command outputs (AO#1). When a bit is updated through either of these outputs, a new Logic Command will be generated and sent to the drive.

To set the Reference, you must use an analog output (AO#2). [Table 6.M](#) shows example References and their results on a VTAC 9 drive that has its Parameters 55 (Maximum Freq) set to 70 Hz and 82 (Maximum Speed) set to 60 Hz, and module Parameter 29 (N2 Ref Scale) is set to 32,767.

Table 6.M – Example Speed Reference and Feedback for a VTAC 9 Drive

Reference ¹		Feedback ²	
Percent	Speed	Speed	Percent
100%	70 Hz	60 Hz ³	85.7%
50%	35 Hz	35 Hz	50%
25%	17.5 Hz	17.5 Hz	25%
0%	0 Hz	0 Hz	0%

¹ The actual value transmitted over the network is an engineering unit where 100% equals sending the value in module Parameter 29 (N2 Ref Scale), and 0% equals sending a zero.

² The Feedback percent value is also scaled based on the value of the module Parameter 29 (N2 Ref Scale).

³ The drive runs at 60 Hz instead of 70 Hz because Parameter 82 (Maximum Speed) sets 60 Hz as the maximum speed.

6.3.5 Metasys Configurable Objects

Configurable objects are inputs and outputs that let you read and write parameter values. These objects handle only 16-bit parameter values.

6.3.5.1 Reading Parameter Values

The configurable points may show any 16-bit parameter in the drive by configuring the Param# point. The Param# for INx points are stored in RAM in the module and need to be written to only one time per power cycle.

The module reads the value of the drive parameter configured in the Param# point and shows the result in the User INx point. The module reads the parameter values from the drive continuously one at a time when Param# is set to a non-zero value. See [Figure 6.1](#) and [Table 6.N](#).

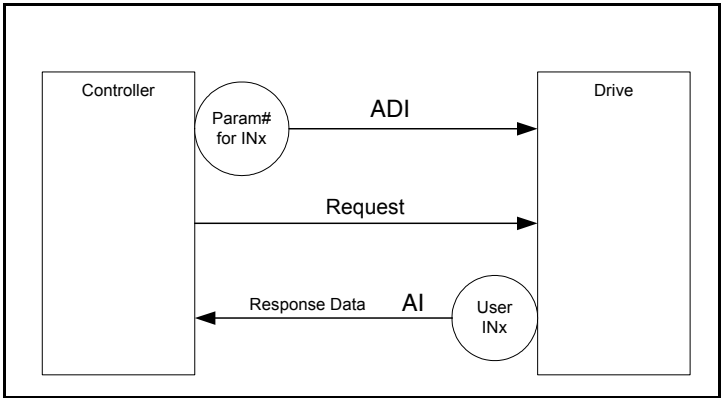


Figure 6.1 – Configurable Input Point Operation: Reading Drive Parameters


Table 6.N – Configurable Objects: Inputs

Network Point Type (NPT)	Network Point Address (NPA)	Name	Description	Default
AI	3	User IN1	User-defined Input 1	0
AI	4	User IN2	User-defined Input 2	0
AI	5	User IN3	User-defined Input 3	0
AI	6	User IN4	User-defined Input 4	0
ADI	1	Param# for IN1	0 = Not in use, 1 to maximum # of drive parameters	0
ADI	2	Param# for IN2	0 = Not in use, 1 to maximum # of drive parameters	0
ADI	3	Param# for IN3	0 = Not in use, 1 to maximum # of drive parameters	0
ADI	4	Param# for IN4	0 = Not in use, 1 to maximum # of drive parameters	0

Table 6.O – Example of Configurable Objects: Inputs

Network Point Type (NPT)	Network Point Address (NPA)	Name	Description	Sample Setting
AI	3	Output Frequency	+/-400 Hz [0.1 Hz]	60.0
AI	4	Output Current	0.0 to Drive Rated Amps [0.1 A]	14.0
AI	5	Output Voltage	0.0 to Drive Rated Volts [0.1 VAC]	460.0
AI	6	Output Power	0.0 to Drive Rated kW [0.1 kW]	7.5
ADI	1	Param# for IN1	Integer# of drive parameter	1
ADI	2	Param# for IN2	Integer# of drive parameter	3
ADI	3	Param# for IN3	Integer# of drive parameter	6
ADI	4	Param# for IN4	Integer# of drive parameter	7

6.3.5.2 Writing Parameter Values



ATTENTION: Risk of equipment damage exists. If configurable outputs are programmed to write parameter data to Non-Volatile Storage (NVS) frequently, the NVS will quickly exceed its life cycle and cause the drive to malfunction. Do not create a program that frequently uses configurable outputs to write parameter data to NVS. Datalinks do not write to NVS and should be used for frequently changed parameters.

These outputs are written from the module each time the User OUT point is written from the network.

A value of zero in the Param# field disables the writing of data for that specific point. Refer to the drive user manual for the desired parameter number.

The configurable points may show any 16-bit parameter within the drive by configuring the Param# point. The Param# for INx points are stored in the module's RAM and only need to be written to one time per power cycle.

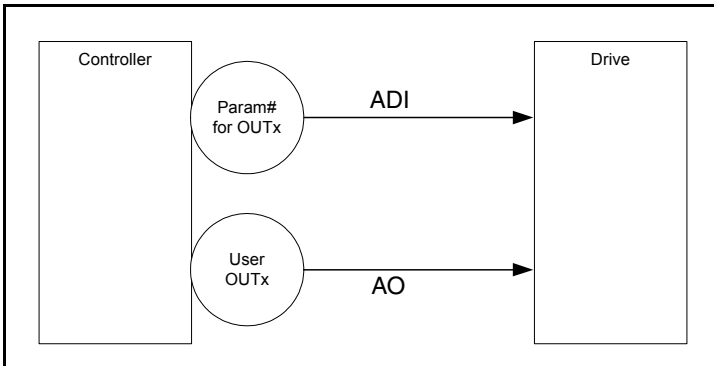


Figure 6.2 – Configurable Objects: Outputs

Table 6.P – Configurable Objects: Outputs

Network Point Type (NPT)	Network Point Address (NPA)	Name	Description	Default
AO	3	User OUT1	User-defined Output 1	0
AO	4	User OUT2	User-defined Output 2	0
ADI	5	Param# for OUT1	0 = Not in use, 1 to maximum # of drive parameters	0
ADI	6	Param# for OUT2	0 = Not in use, 1 to maximum # of drive parameters	0

Using Basic Data Transfers: Siemens Building Technologies P1 FLN Protocol

This chapter provides information about using basic data transfers to control a VTAC 9 drive when the Siemens Building Technologies P1 FLN network protocol is selected. For information about using advanced data transfers (Datalinks), refer to [Chapter 8](#).

7.1 Overview of the DPI/Siemens Building Technologies P1 FLN Functionality



ATTENTION: Risk of injury or equipment damage exists. On P1 FLN networks, 16-bit values are truncated to 15-bit values. Dangerous operation may result from using **non-15-bit** drive parameters with the configurable points. Recognize the data range limitation of P1 FLN and understand the data value ranges of each parameter to be accessed over the network. Refer to the drive user manual for information about drive parameter sizes.

P1 FLN nodes are built by the use of several points. The P1 FLN master controller performs read and write commands to these points, and the module transfers/translates the data between these points and the drive.

All values (byte-sized, Boolean, and true integers) are represented in a 16-bit word over the network, where the sign bit is always positive. The actual range allowed by P1 FLN, however, is always 15 bits: 0-32767 for integers, 0-255 for bytes, and 0-1 for Booleans. The limit of 15 bits prevents the use of the module's P1 FLN mode with 32-bit DPI hosts, where either Reference/Feedback or Datalink values are represented in 32-bit format. 16-bit real values will be truncated to show only 15-bit values.

Important: The RS485 HVAC Options module must be actively communicating with the master and it must be selected as the drive control source for any inputs to be transferred from the module to the drive regulator. (See Logic Source Select, Parameter 89, and Speed Ref A Sel, Parameter 90, in the drive instruction manual for more information.) Parameter changes made via the LCD OIM during this time will be overwritten when the next network update occurs.

7.2 Siemens Building Technologies P1 FLN Point Map for I/O

The following sections provide a description of the Siemens Building Technologies P1 I/O image. Note that **Output I/O** is data that is output from the master and consumed by the module. **Input I/O** is status data that is produced by the module and consumed as input by the master.

7.2.1 P1 FLN Point Types

Logic analog and digital I/O points are used to control the drive, monitor status, and read/write to parameters. [Table 7.A](#) describes the four point types.

Table 7.A – Point Types

Abbreviation	Name	Used for:
LDI	Logical Digital Inputs	Reading bit-level points (0 or 1), such as drive status. For example, FWD.REV MON (point 21) provides the status of the rotation direction of the drive.
LDO	Logical Digital Outputs	Writing bit-level points (0 or 1) such as drive commands. For example, CMD RUN.STOP (point 24) commands the drive to run.
LAI	Logical Analog Inputs	Reading word-level points such as FREQ OUTPUT (point 03) and CURRENT (point 06).
LAO	Logical Analog Outputs	Writing word-level points such as REFERENCE (point 92) and ACCELERATION (point 31).

Some points can be unbundled. Unbundle means that you can characterize the subpoint so that three additional items can be enabled for that specific subpoint:

- The subpoint can be monitored for COV (Change of Value). All unbundled points are reported for any change of value when a “Scan for COV” command is issued. (Analog points may have COV limits defined to reduce network traffic).
- The subpoint can be overridden by the operator.

- Unbundling a point allows the operator to set up a virtual point in the controller's database, which when commanded, can also affect the subpoints in the device.

7.2.2 Point Map

[Table 7.B](#) lists the P1 FLN point list point by point.

Table 7.B – Siemens Building Technologies P1 Point List

Point Number ¹	Point Type ²	Descriptor	Factory Default	Description
01	LAO	CTRL ADDRESS	99	Node address of this device.
02	LAO	APPLICATION	2718	Firmware application number.
{03}	LAI	FREQ OUTPUT	0	Drive speed in frequency (Hertz).
{04}	LAI	PCT OUTPUT	0	Drive speed in percentage of max.
{05}	LAI	SPEED	0	Drive speed in RPM.
{06}	LAI	CURRENT	0	Drive current consumption in amps.
{07}	LAI	TORQUE	0	Drive torque in percentage of max.
{08}	LAI	POWER	0	Drive power in kW.
{09}	LAI	DRIVE TEMP	0	Drive temperature in degree C.
{11}	LAI	DRIVE MWH	0	Drive total power consumption in MWH.
{12}	LAI	RUN TIME	0	Drive total run time in hours.
{13}	LAI	DC BUS VOLT	0	Drive DC bus voltage.
{20}	LAO	OVRD TIME	0	Not used by this application.
{21}	LDI	FWD.REV MON	0 (FWD)	Monitor the rotation direction of the drive.
{22}	LDO	CMD FWD.REV	0 (FWD)	Command the rotation direction of the drive.
{23}	LDI	RUN.STOP MON	0 (STOP)	Monitor the Run/Stop status of the drive.
{24}	LDO	CMD RUN.STOP	0 (NO)	Command RUN (1) to the drive. A STOP (0) issues a momentary Stop command to the drive.
{25}	LDI	READY	0 (NOTRDY)	Monitor the Ready status of the drive.
{26}	LDO	RUN ENABLE	0 (NO)	Must be set to ENABLE (1) to allow controlling the drive. A STOP (0) prohibits drive operation.
{29}	LDO	DAY.NIGHT	DAY	Not used by this application.
{30}	LAO	CURRNT LIMIT	Drive-dependent	Current limit of the drive. Min value 0.9; max value 6.0
{31}	LAO	ACCEL TIME	Drive-dependent	Acceleration time of the drive. Min value 0.1; max value 3276.7
{32}	LAO	DECEL TIME	Drive-dependent	Deceleration time of the drive. Min value 0.1; max value 3276.7
36	LAO	PARAM IN	0	Parameter number to User In point.
{37}	LAI	USER IN	0	User-defined input.

Table 7.B – Siemens Building Technologies P1 Point List (Continued)

Point Number ¹	Point Type ²	Descriptor	Factory Default	Description
38	LAO	PARAM OUT	0	Parameter number to User Out point.
39	LAO	USER OUT	0	User-defined output.
{44}	LAI	DLINK A1 OUT	0	Bits 0-14 of Datalink Out A1.
{46}	LAI	DLINK A2 OUT	0	Bits 0-14 of Datalink Out A2.
{48}	LAI	DLINK B1 OUT	0	Bits 0-14 of Datalink Out B1.
{50}	LAI	DLNK B2 OUT	0	Bits 0-14 of Datalink Out B2.
{52}	LAI	DLNK C1 OUT	0	Bits 0-14 of Datalink Out C1.
{54}	LAI	DLNK C2 OUT	0	Bits 0-14 of Datalink Out C2.
{56}	LAI	DLNK D1 OUT	0	Bits 0-14 of Datalink Out D1.
{58}	LAI	DLNK D2 OUT	0	Bits 0-14 of Datalink Out D2.
{60}	LAI	INPUT REF 1	0	Shows the Input Reference 1 parameter.
{61}	LAI	INPUT REF 2	0	Shows the Input Reference 2 parameter.
{62}	LAO	DLNK A1 IN	0	Bits 0-14 of Datalink In A1.
{64}	LAO	DLNK A2 IN	0	Bits 0-14 of Datalink In A2.
{66}	LAO	DLNK B1 IN	0	Bits 0-14 of Datalink In B1.
{68}	LAO	DLNK B2 IN	0	Bits 0-14 of Datalink In B2.
{70}	LAO	DLNK C1 IN	0	Bits 0-14 of Datalink In C1.
{72}	LAO	DLNK C2 IN	0	Bits 0-14 of Datalink In C2.
{74}	LAO	DLNK D1 IN	0	Bits 0-14 of Datalink In D1.
{76}	LAO	DLNK D2 IN	0	Bits 0-14 of Datalink In D2.
{89}	LAO	LOGIC CMD LO	0	Lower 8 bits of Product Logic Command Word.
{90}	LAO	LOGIC CMD HI	0	Higher 8 bits of Product Logic Command Word.
{91}	LAI	FEEDBACK	0	Feedback value bits 0-14 (absolute value).
{92}	LAO	REFERENCE	0	Reference value bits 0-14.
{93}	LDI	OK.FAULT	0 (OK)	Shows if the drive is faulted or not.
{94}	LDO	RESET FAULT	0(NORMAL)	Resets the fault condition in the drive. Special point. Will return to NORMAL (0) automatically.
{95}	LAI	LOGIC STS LO	0	Lower 8 bits of Product Logic Status Word.
{96}	LAI	LOGIC STS HI	0	Higher 8 bits of Product Logic Status Word.
{99}	LAO	ERROR STATUS	0	Not used by this application.

¹ Points not listed are not used in this application. Point numbers that appear in braces { } may be unbundled.

² For a description of point types, refer to [Table 7.A](#). Note that the outputs and inputs are from the network perspective, not the drive perspective. For example, an LAO is an output from the controller on the network, but it is an input to the drive.

7.3 Controlling the Drive Using Points (LDO)



ATTENTION: Select and use **either** the point type Digital (LDI/LDO) or the word type Analog (LAI/LAO) as a control method, but **not both**. Conflicts caused from using both methods can result in dangerous operation. Failure to observe this precaution could cause severe bodily injury or loss of life.

You can control the drive using points such as CMD RUN.STOP (point 24) and RUN ENABLE (point 26). (Refer to [Table 7.C.](#))

For example, to start a VTAC 9 drive, you set RUN ENABLE (point 26) to “ENABLE” (1). You can then set CMD RUN.STOP (point 24) to “RUN” (1). To stop the drive, you can set either point 26 or point 24 back to “STOP” (0).



ATTENTION: If the drive is running from the network, LevelSense Start (Parameter 168) is enabled, and a fault occurs, the drive coasts to rest and generates a fault. In this case, resetting and clearing the fault immediately restarts the drive without any change to the start or stop input bit states.

The user must ensure that automatic start up of the driven equipment will not cause injury to operating personnel or damage to the driven equipment. In addition, the user is responsible for providing suitable audible or visual alarms or other devices to indicate that this function is enabled and the drive may start at any moment. Failure to observe this precaution could result in severe bodily injury or loss of life.

ATTENTION: Disabling LevelSense Enable will alter the operation of the drive or, for drives with the bypass option, inhibit the drive from starting. Do not disable LevelSense Enable. Failure to observe this precaution could result in severe bodily injury or loss of life.

Table 7.C – VTAC 9 Control Commands (Points)

Point#	Descriptor	Point Type	Command Values
26	RUN ENABLE	LDO	0 = Stop 1 = Enable
24	CMD RUN.STOP	LDO	0 = Stop 1 = Run
94	RESET FAULTS	LDO	0 = Normal 1 = Reset faults
22	CMD FWD.REV	LDO	0 = Forward 1 = Reverse

7.4 Controlling the Drive Using the Logic Command Word (LAI)



ATTENTION: Select and use either the point type Digital (LDI/LDO) or the word type Analog (LAI/LAO) as a control method, but not both. Conflicts caused from using both methods can result in dangerous operation. Failure to observe this precaution could cause severe bodily injury or loss of life.

ATTENTION: LOGIC CMD LO (89) must be written prior to LOGIC CMD HI (90) to maintain data integrity of the command word. Failure to observe this precaution could result in bodily injury and/or damage to equipment.

You can control the drive using points such as LOGIC CMD HI (point 90) and LOGIC CMD LO (point 89). The LOGIC CMD LO and LOGIC CMD HI points are both 8-bit points. The module joins these two words together to make a 16-bit command word.

When using the LOGIC CMD LO and LOGIC CMD HI points, the entire buffered command word is updated and transferred to the drive with the content of LOGIC CMD LO and LOGIC CMD HI points when LOGIC CMD HI is written. To maintain data integrity of the command word, LOGIC CMD LO (point 89) must be written prior writing to LOGIC CMD HI (point 90).

For example, for VTAC 9 drives, the Logic Command stop bit is bit 0 and the start bit is bit 1. You can start the drive by setting a value of '2' to LOGIC CMD LO and the value of '0' to LOGIC CMD HI. You can then stop the drive by writing the value of '1' to LOGIC CMD LO and the value of '0' to LOGIC CMD HI.

Stop commands take precedence over run commands. Once a stop command is issued and released, the run command must be toggled before it is accepted.

[Table 7.D](#) shows the commands you can execute on VTAC 9 drives and the point(s) that you use to execute them.

Table 7.D – Logic VTAC 9 Control Commands (Command Word)

Point #	Point Name	Logic Command Bit	Description	Command Values
24	CMD RUN.STOP	0	Stop ¹	0 = Not Stop 1 = Stop ³
26	RUN ENAVBLE			
89	LOGIC CMD LO bit 0			
24	CMD RUN.STOP	1	Start ^{1, 2}	0 = Not Start 1 = Start
89	LOGIC CMD LO bit 0			

Table 7.D – Logic VTAC 9 Control Commands (Command Word)

Point #	Point Name	Logic Command Bit	Description	Command Values
89	LOGIC CMD LO bit 2	2	Jog	0 = Not Jog 1 = Jog
94	RESET FAULTS	3	Clear Faults ²	0 = Not Clear Faults 1 = Clear Faults
89	LOGIC CMD LO bit 3			
22	CMD FWD.REV	4 and 5	Direction	Bits <u>5 4</u> 0 0 = No Command 0 1 = Forward Command 1 0 = Reverse Command 1 1 = Hold Direction Control
89	LOGIC CMD LO bits 4, 5			
89	LOGIC CMD LO bit 6	6	Local Control	0 = No Local Control 1 = Local Lockout
89	LOGIC CMD LO bit 7	7	MOP Increment	0 = Not Increment 1 = Increment
90	LOGIC CMD HI bits 0, 1	8 and 9	Accel Rate	LOGIC CMD HI Bits <u>01 00</u> 0 0 = No Command 0 1 = Accel Rate 1 Command 1 0 = Accel Rate 2 Command 1 1 = Hold Accel Rate Command
90	LOGIC CMD HI bits 3, 2	10 and 11	Decel Rate	LOGIC CMD HI Bits <u>03 02</u> 0 0 = No Command 0 1 = Decel Rate 1 Command 1 0 = Decel Rate 2 Command 1 1 = Hold Accel Rate Command
90	LOGIC CMD HI bits 6, 5, 4	12, 13, and 14	Reference Select	LOGIC CMD HI Bits <u>06 05 04</u> 0 0 0 = No Command 0 0 1 = Ref. 1 (Ref A Select) 0 1 0 = Ref. 2 (Ref B Select) 0 1 1 = Ref. 3 (Preset 3) 1 0 0 = Ref. 4 (Preset 4) 1 0 1 = Ref. 5 (Preset 5) 1 1 0 = Ref. 6 (Preset 6) 1 1 1 = Ref. 7 (Preset 7)
90	LOGIC CMD HI bit 7	15	MOP Decrement	0 = Not Decrement 1 = Decrement

¹ For the Product Logic Command Bit 0, the 0 = Not Stop condition must first be present before a Product Logic Command Bit 1, 1 = Start condition will start the drive.

² To perform this command, the value must change from “0” to “1.”

³ Setting CMD RUN.STOP to STOP issues a momentary Stop command to the drive. Logic Command Bit 0 is momentarily set to 1 (STOP) to initiate a Stop and then set to 0 (Not Stop).

7.5 Determining Drive Status Using the Logic Status Word

There are two ways to determine drive status. The more common way uses points such as FWD.REV MON (point 21) and RUN.STOP MON (point 23), which represent individual bits in the Logic Status word. For example, to view if a VTAC 9 drive is running, you can read RUN.STOP MON (point 23) to see if it is “RUN” or “STOP” To view its direction, you can read FWD.REV MON (point 21) to see if it is “FWD” or “REV.”

The second way uses LOGIC STS LO (point 95) and LOGIC STS HI (point 96).The LOGIC STS LO and LOGIC STS HI are both 8-bit points that the module can use to report its 16-bit status word.

Important: Since LOGIC STS LO gets updated only when LOGIC STS HI is read, you must read LOGIC STS HI prior to reading LOGIC STS LO to maintain data integrity of the status word. For example, to view if a VTAC 9 drive is running, you can read LOGIC STS HI and LOGIC STS LO and determine if bit 1 is “0” (Not Running) or “1” (Running). To view its direction, you can read LOGIC STS LO and LOGIC STS HI and determine if bit 3 is “0” (Reverse) or “1” (Forward).

[Table 7.D](#) shows the status you can view on VTAC 9 drives and the points that you can use to view them.

Table 7.E – Logic Status (Read Only)

Point #	Point Name	Logic Status Bit	Description	Value
25	READY	0	Ready	0 = Not Ready 1 = Ready
95	LOGIC STS LO bit 0			
23	RUN.STOP MON	1	Running	0 = Not Running 1 = Running
95	LOGIC STS LO bit 1			
95	LOGIC STS LO bit 2	2	Command Direction	0 = Reverse 1 = Forward
21	FWD.REV MON	3	Rotating Direction	0 = Reverse 1 = Forward
95	LOGIC STS LO bit 3			
95	LOGIC STS LO bit 4	4	Accel	0 = Not Accelerating 1 = Accelerating
95	LOGIC STS LO bit 5	5	Decel	0 = Not Decelerating 1 = Decelerating

Table 7.E – Logic Status (Read Only) (Continued)

Point #	Point Name	Logic Status Bit	Description	Value
95	LOGIC STS LO bit 6	6	Alarm	0 = No Alarm 1 = Alarm
93	OK.FAULT	7	Fault	0 = No Fault 1 = Fault
95	LOGIC STS LO bit 7			
96	LOGIC STS HI bit 0	8	At Reference	0 = Not At Reference 1 = At Reference
96	LOGIC STS HI bits 3, 2, 1	9, 10, and 11	Local Control	LOGIC STS HI Bits <u>03 02 01</u> 0 0 0 = Port Local (motor product control I/O) 0 0 1 = Port 1 Local 0 1 0 = Port 2 Local 0 1 1 = Port 3 Local 1 0 0 = Port 4 Local 1 0 1 = Port 5 Local 1 1 0 = Port 6 Local 1 1 1 = No Local
96	LOGIC STS HI bits 7, 6, 5, 4	12, 13, 14, and 15	Reference	LOGIC STS HI Bits <u>07 06 05 04</u> 0 0 0 0 = Product Ext. Reference 1 0 0 0 1 = Int. Ref. 1 (Preset 1) 0 0 1 0 = Int. Ref. 2 (Preset 2) 0 0 1 1 = Int. Ref. 3 (Preset 3) 0 1 0 0 = Int. Ref. 4 (Preset 4) 0 1 0 1 = Int. Ref. 5 (Preset 5) 0 1 1 0 = Int. Ref. 6 (Preset 6) 0 1 1 1 = Int. Ref. 7 (Preset 7) 1 0 0 0 = Product Ext. Reference 2 1 0 0 1 = Port 1 Ext. Reference 1 0 1 0 = Port 2 Ext. Reference 1 0 1 1 = Port 3 Ext. Reference 1 1 0 0 = Port 4 Ext. Reference 1 1 0 1 = Port 5 Ext. Reference 1 1 1 0 = Port 6 Ext. Reference 1 1 1 1 = Int. Jog Reference

7.5.1 Reference and Feedback

The Reference value (point 92) and the Feedback value (point 91) are both 16-bit values in the drive but will only use 15 bits due to the P1 FLN protocol limitation. Remember that the Reference value is a scaled engineering value. For example, in VTAC 9 drives, the Reference is scaled based on the value of Parameter 55 (Maximum Freq), but the commanded maximum speed can never exceed the value of Parameter 82 (Maximum Speed). [Table 7.F](#) shows example References and their results on a VTAC 9 drive that has its

Parameters 55 (Maximum Freq) set to 130 Hz and 82 (Maximum Speed) set to 60 Hz.

Table 7.F – Example Speed Reference and Feedback for a VTAC 9 Drive

Reference Value	Scale		Output Speed	Feedback Value
	Percent	Value		
32767	100%	130 Hz	60 Hz ¹	15123 ²
16384	50%	65 Hz	60 Hz ¹	15123
8192	25%	32.5 Hz	32.5 Hz	8192
0	0%	0 Hz	0 Hz	0

¹ The drive runs at 60 Hz instead of 130 Hz because Parameter 82 (Maximum Speed) sets 60 Hz as the maximum speed.


² The Feedback value is also scaled based on the value of Parameter 55 (Maximum Freq). For example, $60/130 = 0.46$ so $32767 \times 0.46 = 15123$.

FREQ OUTPUT (point 03), PCT OUTPUT (point 04), and SPEED (point 05) can be used to report the Feedback in values such as Hz, percent of maximum speed, and RPM, respectively.

7.6 Other Functions

The functions described in the following sections must be enabled during start up of the VTAC 9 drive.

7.6.1 Parameter Access



ATTENTION: Dangerous operation may be a result of using **non-15-bit** drive parameters with the configurable points. Refer to the drive user manual for information about drive parameter sizes. Failure to observe this precaution could result in severe bodily injury or loss of life.

Configurable points USER IN (point 37) and PARAM IN (point 36) are points that enable any parameter in the drive to be monitored. The USER IN shows only 15-bit values; therefore, only 16-bit drive parameters can be used (however, only values between 0 - 32767 would be used).

The PARAM IN is used to configure which parameter is to be monitored, and the value ends up in the USER IN. For example, for a VTAC 9 drive, writing the value of '1' into PARAM IN point (reading drive Parameter 1) would provide the Output Frequency in USER IN point.



ATTENTION: Risk of equipment damage exists. If configurable output points are programmed to write parameter data to Non-Volatile Storage (NVS) frequently, the NVS will quickly exceed its life cycle and cause the drive to malfunction. Do not create a program that frequently uses configurable outputs to write parameter data to NVS. Datalinks do not write to NVS and should be used for frequently changed parameters.

Configurable Points USER OUT (point 39) and PARAM OUT (point 38) are points that enable write access to any parameter in the drive. However, due to the 15-bit limitation, only 16-bit drive parameters should be accessed.

For example, for a VTAC 9 drive, writing the value of '140' in PARAM OUT (writing drive Parameter 140) and the value of '200' in USER OUT would set drive parameter Accel Time 1 (140) to 20.0 seconds.

7.6.2 Changing Drive Direction

Drive direction can be changed using the two methods described in [Section 7.3](#). The easiest way is to use the CMD FWD.REV (point 22) sub point. LOGIC CMD LO (point 89) and LOGIC CMD HI (point 90) points can also be used for changing the direction of the drive.



ATTENTION: Changing drive direction while the controlled equipment is moving may damage HVAC equipment. Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should start and adjust it. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

7.6.3 Reading and Resetting Faults

The points OK.FAULT (point 93) and RESET FAULT (point 94) are used for monitoring fault conditions and to clear them. LOGIC CMD LO / LOGIC CMD HI and LOGIC STS LO / LOGIC STS HI can also be used.

7.6.4 Setting the Module's Control Address

CTLR ADDRESS (point 1) holds the control address of the module. The default value for this point is 99. The rotary switches on the module configure what control address is used by the module.

When the rotary switches are set to '00,' the module obtains the control address from the network module Parameter 3 (Net Addr Cfg). The current control address is shown in module Parameter 4 (Net Addr Act). These module parameters can be accessed via the LCD OIM on the drive or by using VS Utilities.

Advanced Data Transfers: All Protocols

This chapter provides information and examples showing how to use Datalinks.

8.1 Using Datalinks

A Datalink is a mechanism used by VTAC 9 drives to transfer data to and from the network. They allow parameter values to be changed without using an Explicit Message.

Applications using PI FLN loops in the drive or over the network require the use of Datalinks. Most other applications do not require this function.

When enabled, each Datalink occupies two 16- or 32-bit words in both the input and output image. The size of Datalinks (16-bit words or 32-bit words) is determined by the drive and displayed in module Parameter 13 (Datalink Size).

Datalinks are set in VTAC 9 drive parameters 300 - 317.

8.1.1 Rules for Using Datalinks

Note the following regarding the use of Datalinks:

- Each set of Datalink parameters in a VTAC 9 drive can be used by only one module. If more than one module is connected to a single drive, multiple modules must not try to use the same Datalink.
- Parameter settings in the drive determine the data passed through the Datalink mechanism. Refer to the documentation for your drive.
- When you use a Datalink to change a value, the value is not written to the Non-Volatile Storage (NVS). The value is stored in volatile memory and lost when the drive loses power. Use Datalinks when you need to change the value of a parameter frequently.

8.1.2 32-Bit Parameters Using 16-Bit Datalinks

To read (and/or write) a 32-bit parameter using 16-bit Datalinks, typically both Datalinks of a pair are set to the same 32-bit parameter.

For example, to read Elapsed MWH (VTAC 9 drive parameter 9), both Datalink A1 and A2 are set to "9." Datalink A1 will contain the least significant word (LSW) and Datalink A2 the most significant word (MSW). In this example, the parameter 9 value of 5.8 MWH is read as a "58" in Datalink A1.

Datalink	Most/Least Significant Word	Drive Parameter	Data (decimal)
A1	LSW	9	58
A2	MSW	9	0

Regardless of the Datalink combination, x1 will always contain the LSW and x2 will always contain the MSW. In the following examples, Power Up Marker (VTAC 9 drive parameter 242) contains a value of 88.4541 hours.

Datalink	Most/Least Significant Word	Drive Parameter	Data (decimal)
A1	LSW	242	32573
A2	- Not Used -	0	0

Datalink	Most/Least Significant Word	Drive Parameter	Data (decimal)
A1	- Not Used -	0	0
A2	MSW	242	13

Datalink	Most/Least Significant Word	Drive Parameter	Data (decimal)
A2	MSW	242	13
B1	LSW	242	32573

32-bit data is stored in binary as follows:

MSW	2^{31} through 2^{16}
LSW	2^{15} through 2^0

Example:

Power Up Marker (drive parameter 242) = 88.4541 hours

$$\text{MSW} = 13_{\text{decimal}} = 1101_{\text{binary}} = 2^{16} + 2^{18} + 2^{19} = 851968$$

$$\text{LSW} = 32573$$

$$851968 + 32573 = 884541$$

8.1.3 Configuring Datalinks

Configuring Datalinks from the drive side is a two-step process:

- Step 1. Program drive parameters 300 (Data In A1) to 317 (Data Out D2) to “point” to the parameters to be accessed. For example, to read drive parameter 1 (Output Freq), set parameter 310 (Data Out A1) to “1.”
- Step 2. Enable the desired Datalinks in module Parameter 16 (DPI I/O Config). This tells the module to transfer Datalink data to and from the drive. For example, to enable Datalink A1, set bit 1 to “1.” Note that a module reset is required for this change to take effect – use module Parameter 14 (Reset Module) or cycle power.

8.2 Modbus DPI Datalinks

This section presents information about using Datalinks with Modbus networks. See [Section 8.3](#) for information on using Datalinks for Metasys networks or [Section 8.4](#) for Siemens P1 FLN networks.

8.2.1 Modbus DPI Datalinks Out: A-D

Table 8.A – Modbus DPI Datalinks Out - A1, A2

Modbus Address	Data Direction	Parameter Description	16-Bit Datalink	32-Bit Datalink
3x0012	Register Input	Datalink A1 Out	Not used	LSW of 32-bit
3x0013 ¹	Register Input	Datalink A1 Out	16-bit value	MSW of 32-bit
3x0014	Register Input	Datalink A2 Out	Not used	LSW of 32-bit
3x0015 ²	Register Input	Datalink A2 Out	16-bit value	MSW of 32-bit

¹ A read access to address 3x0013 initiates a refresh of Datalink A1 value before reading.

² A read access to address 3x0015 initiates a refresh of Datalink A2 value before reading.

Table 8.B – Modbus DPI Datalinks Out - B1, B2

Modbus Address	Data Direction	Parameter Description	16-Bit Datalink	32-Bit Datalink
3x0016	Register Input	Datalink B1 Out	Not used	LSW of 32-bit
3x0017 ¹	Register Input	Datalink B1 Out	16-bit value	MSW of 32-bit
3x0018	Register Input	Datalink B2 Out	Not used	LSW of 32-bit
3x0019 ²	Register Input	Datalink B2 Out	16-bit value	MSW of 32-bit

¹ A read access to address 3x0017 initiates a refresh of Datalink B1 value before reading.

² A read access to address 3x0019 initiates a refresh of Datalink B2 value before reading.

Table 8.C – Modbus DPI Datalinks Out - C1, C2

Modbus Address	Data Direction	Parameter Description	16-Bit Datalink	32-Bit Datalink
3x0020	Register Input	Datalink C1 Out	Not used	LSW of 32-bit
3x0021 ¹	Register Input	Datalink C1 Out	16-bit value	MSW of 32-bit
3x0022	Register Input	Datalink C2 Out	Not used	LSW of 32-bit
3x0023 ²	Register Input	Datalink C2 Out	16-bit value	MSW of 32-bit

¹ A read access to address 3x0021 initiates a refresh of Datalink C1 value before reading.

² A read access to address 3x0023 initiates a refresh of Datalink C2 value before reading.

Table 8.D – Modbus DPI Datalinks Out - D1, D2

Modbus Address	Data Direction	Parameter Description	16-Bit Datalink	32-Bit Datalink
3x0024	Register Input	Datalink D1 Out	Not used	LSW of 32-bit
3x0025 ¹	Register Input	Datalink D1 Out	16-bit value	MSW of 32-bit
3x0026	Register Input	Datalink D2 Out	Not used	LSW of 32-bit
3x0027 ²	Register Input	Datalink D2 Out	16-bit value	MSW of 32-bit

¹ A read access to address 3x0025 initiates a refresh of Datalink D1 value before reading.

² A read access to address 3x0027 initiates a refresh of Datalink D2 value before reading.

8.2.2 Modbus DPI Datalinks In: A-D

Table 8.E – Modbus DPI Datalinks In - A1, A2

Modbus Address	Data Direction	Parameter Description	16-Bit Datalink	32-Bit Datalink
4x0018	Register Output	Datalink A1 In	Not used	LSW of 32-bit
4x0019 ¹	Register Output	Datalink A1 In	16-bit value	MSW of 32-bit
4x0020	Register Output	Datalink A2 In	Not used	LSW of 32-bit
4x0021 ²	Register Output	Datalink A2 In	16-bit value	MSW of 32-bit

¹ A write access to address 4x0019 initiates an update of the Datalink A1 field in the DPI I/O image.

² A write access to address 4x0021 initiates an update of the Datalink A2 field in the DPI I/O image.

Table 8.F – Modbus DPI Datalinks In - A1, A2

Modbus Address	Data Direction	Parameter Description	16-Bit Datalink	32-Bit Datalink
4x0022	Register Output	Datalink B1 In	Not used	LSW of 32-bit
4x0023 ¹	Register Output	Datalink B1 In	16-bit value	MSW of 32-bit
4x0024	Register Output	Datalink B2 In	Not used	LSW of 32-bit
4x0025 ²	Register Output	Datalink B2 In	16-bit value	MSW of 32-bit

¹ A write access to address 4x0023 initiates an update of the Datalink B1 field in the DPI I/O image.

² A write access to address 4x0025 initiates an update of the Datalink B2 field in the DPI I/O image.

Table 8.G – Modbus DPI Datalinks In - C1, C2

Modbus Address	Data Direction	Parameter Description	16-Bit Datalink	32-Bit Datalink
4x0026	Register Output	Datalink C1 In	Not used	LSW of 32-bit
4x0027 ¹	Register Output	Datalink C1 In	16-bit value	MSW of 32-bit
4x0028	Register Output	Datalink C2 In	Not used	LSW of 32-bit
4x0029 ²	Register Output	Datalink C2 In	16-bit value	MSW of 32-bit

¹ A write access to address 4x0027 initiates an update of the Datalink C1 field in the DPI I/O image.

² A write access to address 4x0029 initiates an update of the Datalink C2 field in the DPI I/O image.

Table 8.H – Modbus DPI Datalinks In - D1, D2

Modbus Address	Data Direction	Parameter Description	16-Bit Datalink	32-Bit Datalink
4x0030	Register Output	Datalink D1 In	Not used	LSW of 32-bit
4x0031 ¹	Register Output	Datalink D1 In	16-bit value	MSW of 32-bit
4x0032	Register Output	Datalink D2 In	Not used	LSW of 32-bit
4x0033 ²	Register Output	Datalink D2 In	16-bit value	MSW of 32-bit

¹ A write access to address 4x0031 initiates an update of the Datalink D1 field in the DPI I/O image.

² A write access to address 4x0033 initiates an update of the Datalink D2 field in the DPI I/O image.

8.3 Metasys DPI Datalinks

This section presents information about using Datalinks with Metasys networks. See [Section 8.2](#) for information on using Datalinks for Modbus networks or [Section 8.4](#) for Siemens P1 FLN networks.

8.3.1 Metasys DPI Datalinks Out: A & B (No Datalinks C & D)

Table 8.I – Metasys DPI Datalinks Out - A1, A2

Point Type	Object #	Direction	Parameter Description	16-Bit Datalink	32-Bit Datalink
AI	7	Input	Datalink A1 Out	16-bit value	Limited to -16,777,215 to +16,777,215
AI	8	Input	Datalink A2 Out	16-bit value	Limited to -16,777,215 to +16,777,215

Table 8.J – Metasys DPI Datalinks Out - B1, B2

Point Type	Object #	Direction	Parameter Description	16-Bit Datalink	32-Bit Datalink
AI	9	Input	Datalink B1 Out	16-bit value	Limited to -16,777,215 to +16,777,215
AI	10	Input	Datalink B2 Out	16-bit value	Limited to -16,777,215 to +16,777,215

8.3.2 Metasys DPI Datalinks In: A & B (No Datalinks C & D)

Table 8.K – Metasys DPI Datalinks In - A1, A2

Point Type	Object #	Direction	Parameter Description	16-Bit Datalink	32-Bit Datalink
AO	5	Output	Datalink A1 In	16-bit value	Limited to -16,777,215 to +16,777,215
AO	6	Output	Datalink A2 In	16-bit value	Limited to -16,777,215 to +16,777,215

Table 8.L – Metasys DPI Datalinks In - B1, B2

Point Type	Object #	Direction	Parameter Description	16-Bit Datalink	32-Bit Datalink
AO	7	Output	Datalink B1 In	16-bit value	Limited to -16,777,215 to +16,777,215
AO	8	Output	Datalink B2 In	16-bit value	Limited to -16,777,215 to +16,777,215

8.4 Siemens DPI Datalinks

This section presents information about using Datalinks with Siemens P1 FLN networks. See [Section 8.2](#) for information on using Datalinks for Modbus networks or [Section 8.3](#) for information on using Datalinks for Metasys networks.

DLNK A1 OUT to DLNK D2 OUT contain the Datalink Out A1 to D2 parameters **from** the drive. DLNK A1 IN to DLNK D2 IN contain the Datalink In A1 to D2 parameter values **to** the drive.

For example, a VTAC 9 drive enabling Datalink A for the module and configuring drive parameter 310 (Data Out A1) to 1 will provide drive parameter 1 (Output Frequency) at the DLNK A1 OUT point. Configuring parameter 300 (Data In A1) to 140 in the drive will transfer the value of the DLNK A1 IN point value to drive parameter 140 (Accel Time 1) when accessed.

Note that certain drives may use 32-bit Datalinks. In this case, Datalinks are not supported by the module. The module will only support 15-bit Datalink values.



ATTENTION: Risk of injury or equipment damage exists. On P1 FLN networks, 16-bit values are truncated to 15-bit values. Dangerous operation may result from using **non-15-bit** drive parameters with the configurable points. Recognize the data range limitation of P1 FLN and understand the data value ranges of each parameter to be accessed over the network. Refer to the drive user manual for information about drive parameter sizes.

8.4.1 Siemens DPI Datalinks Out: A-D

P1 FLN devices work only with 15-bit integer values; therefore, these points only show 15-bit values. If the module is connected to a host using 32-bit Datalinks, the module will be prevented from using Datalinks. The DPI host determines if 16- or 32-bit Datalink values are used. See [Table 8.M](#).

Table 8.M – Siemens P1 FLN DPI Datalinks Out: A-D

Point Number ¹	Point Type	Descriptor	Factory Default	Description
{44}	LAI	DLINK A1 OUT	0	Bit 0-14 of Datalink Out A1.
{46}	LAI	DLINK A2 OUT	0	Bit 0-14 of Datalink Out A2.
{48}	LAI	DLINK B1 OUT	0	Bit 0-14 of Datalink Out B1.
{50}	LAI	DLNK B2 OUT	0	Bit 0-14 of Datalink Out B2.
{52}	LAI	DLNK C1 OUT	0	Bit 0-14 of Datalink Out C1.
{54}	LAI	DLNK C2 OUT	0	Bit 0-14 of Datalink Out C2.
{56}	LAI	DLNK D1 OUT	0	Bit 0-14 of Datalink Out D1.
{58}	LAI	DLNK D2 OUT	0	Bit 0-14 of Datalink Out D2.

¹ Point numbers in braces { } may be unbundled at the field panel.

8.4.2 Siemens DPI Datalinks In: A-D

P1 FLN devices work only with 15-bit integer values; therefore, these points only show 15-bit values. If the module is connected to a host using 32-bit Datalinks, the module will be prevented from using Datalinks. The DPI host determines if 16- or 32-bit Datalink values are used. See [Table 8.N](#).

Table 8.N – Siemens P1 FLN DPI Datalinks In: A-D

Point Number ¹	Point Type	Description	Factory Default	Description
{62}	LAO	DLNK A1 IN	0	Bits 0-14 of Datalink In A1.
{64}	LAO	DLNK A2 IN	0	Bits 0-14 of Datalink In A2.
{66}	LAO	DLNK B1 IN	0	Bits 0-14 of Datalink In B1.
{68}	LAO	DLNK B2 IN	0	Bits 0-14 of Datalink In B2.
{70}	LAO	DLNK C1 IN	0	Bits 0-14 of Datalink In C1.
{72}	LAO	DLNK C2 IN	0	Bits 0-14 of Datalink In C2.
{74}	LAO	DLNK D1 IN	0	Bits 0-14 of Datalink In D1.
{76}	LAO	DLNK D2 IN	0	Bits 0-14 of Datalink In D2.

¹ Point numbers in braces { } may be unbundled at the field panel.

Troubleshooting the Module and Network

Chapter 9 contains information for troubleshooting the module and network.

9.1 Understanding the Status Indicators

The module has four bi-colored status indicators on the left side of the module. They can be viewed on the module or through the drive cover. See [Figure 9.1](#).

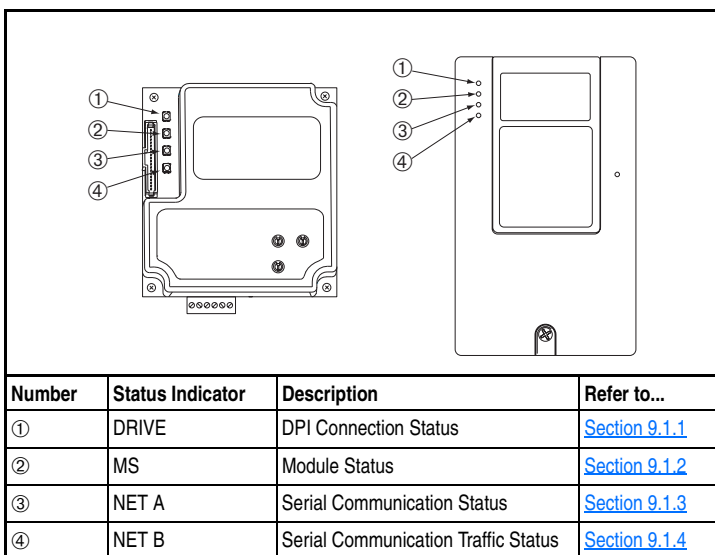


Figure 9.1 – Status Indicators (location on drive may vary)

Sections [Section 9.1.1](#) through [Section 9.1.4](#) describe what the state of each status indicator means. Note that if all status indicators are off, the module is not receiving power. Refer to [Chapter 3](#), [Installing the Module](#), for installation instructions.

9.1.1 DRIVE Status Indicator

The DRIVE status indicator is the top LED on the drive. Refer to [Figure 9.1](#).

Table 9.A – DRIVE Status Indicator: State Definitions

State	Cause	Corrective Action
Off	The module is not powered or is not connected properly to the drive.	<ul style="list-style-type: none"> Securely connect the module to the drive using the ribbon cable. Apply power to the drive.
Flashing Red	The module is not receiving a ping message from the drive.	<ul style="list-style-type: none"> Verify that cables are securely connected. Cycle power to the drive.
Solid Red	<p>The drive has refused an I/O connection from the module.</p> <p>Another DPI peripheral is using the same DPI port as the module.</p>	<p>Important: Cycle power to the product after making any of the following corrections:</p> <ul style="list-style-type: none"> Verify that all DPI cables on the drive are securely connected and not damaged. Replace cables if necessary. Verify that the drive supports Datalinks. Configure the module and drive to use a Datalink that is not already being used by another peripheral.
Orange	<p>The module is connected to a product that does not support Rockwell Automation DPI communications.</p> <p>A connection to a host with a 32-bit reference or 32-bit Datalinks is detected when the peripheral has been configured to use the P1 FLN protocol. The peripheral doesn't support 32-bit devices when using the P1 FLN network protocol.</p>	<ul style="list-style-type: none"> Connect the module to a product that supports Rockwell Automation DPI communications (for example, VTAC 9 drives). Connect the module to a product that uses a 16-bit reference and 16-bit Datalinks.
Flashing Green	The module is establishing an I/O connection to the drive or the I/O has been disabled.	<ul style="list-style-type: none"> Verify the settings of Parameter 16 (DPI I/O Cfg). Normal behavior if all I/O is disabled in Parameter 16 (DPI I/O Cfg).
Solid Green	The module is properly connected and is communicating with the drive.	No action required.

9.1.2 MS Status Indicator

The MS status indicator is the second LED from the top on the drive. Refer to [Figure 9.1](#).

Table 9.B – MS Status Indicator: State Definitions

State	Cause	Corrective Action
Off	The module is not powered.	<ul style="list-style-type: none">Securely connect the module to the drive using the ribbon cable.Apply power to the drive.
Flashing Red	Bad CRC of module parameters or Flash program; other recoverable fault condition.	<ul style="list-style-type: none">Clear any faults in the module.Cycle power to the drive.If cycling power does not correct the problem, the parameter settings may have been corrupted. Reset faults and reconfigure the module.If resetting defaults does not correct the problem, flash the module with the latest firmware release.
Solid Red	The module has failed the hardware test.	<ul style="list-style-type: none">Cycle power to the drive.Replace the module.
Flashing Green	The module is operational, but is not transferring I/O data.	<ul style="list-style-type: none">Place the scanner in RUN mode.Program the controller to recognize and transmit I/O to the module.Configure the module for the program in the controller.Normal behavior if all I/O has been disabled in Parameter 16 (DPI I/O Cfg).
Solid Green	The module is operational and transferring I/O data.	No action required.

9.1.3 NET A Status Indicator

The NET A status indicator is the third LED from the top on the drive. Refer to [Figure 9.1](#).

Table 9.C – NET A Status Indicator: State Definitions

State	Cause	Corrective Actions
Off	<p>The module is not powered or is not properly connected to the network.</p> <p>The first incoming network command not yet recognized.</p>	<ul style="list-style-type: none"> Securely connect the module to the drive using the ribbon cable. Correctly connect the RS485 cable to the connector. Apply power to the drive. Set the baud rate and/or parity to match the controller. Set the correct network protocol.
Flashing Red	A network connection has timed out.	<ul style="list-style-type: none"> Set the timeout in Parameter 11 (Network Timeout). Place the scanner in RUN mode. Verify that there is not too much traffic on the network.
Solid Red	The device has detected an error that has made it incapable of communication on the network.	<ul style="list-style-type: none"> Select the correct network protocol. Select correct data rate. Verify node address is correct. Cycle power to apply changes.
Flashing Green	<p>Online to network, but not producing or consuming I/O information.</p> <p>If Parameter 11 (Network Timeout) has not been set to zero (0), this indicates that the module has not received any messages for an interval, but it has not yet timed out. The LED will turn solid green when communication resumes.</p>	<ul style="list-style-type: none"> Place the scanner in RUN mode. Program the scanner to send messages to this specific module within the specified timeout. Configure the module for the program in the controller or the I/O from the peer device.
Solid Green	The module is properly connected and communicating on the network.	No action required.

9.1.4 NET B Status Indicator

The NET B status indicator is the bottom LED on the drive. Refer to [Figure 9.1](#).

Table 9.D – NET B Status Indicator: State Definitions

State	Cause	Corrective Actions
Off	Module is not receiving data over the network.	<ul style="list-style-type: none"> Program a controller to recognize and transmit I/O to the module. Place the controller in RUN mode or apply power. Configure the module for the program in the controller.
Solid Green	Module is transmitting data.	No action required.

9.2 Module Diagnostic Items

The following diagnostic items can be accessed using VS Utilities or the LCD OIM.

Table 9.E – Diagnostic Items Accessed Using VS Utilities

No.	Name	Description
1	Common Logic Cmd	The current value of the common Logic Command being transmitted to the drive by this module.
2	Prod Logic Cmd	The current value of the product-specific Logic Command being transmitted to the drive by this module.
3	Reference	The current value of the product-specific Reference being transmitted to the drive by this module. Note that a 16-bit value will be sent as the MSW of the 32-bit field.
4	Common Logic Sts	The current value of the common Logic Status being received from the drive by this module.
5	Prod Logic Sts	The current value of the product-specific Logic Status being received from the drive by this module.
6	Feedback	The current value of the product-specific Feedback being received from the drive by this module. Note that a 16-bit value will be sent as the MSW of the 32-bit field.
7 8 9 10 11 12 13 14	Datalink A1 In Datalink A2 In Datalink B1 In Datalink B2 In Datalink C1 In Datalink C2 In Datalink D1 In Datalink D2 In	The current value of respective Datalink In being transmitted to the drive by this module. (If the module has not enabled the Datalink, this parameter should have a value of zero. See Chapter 8 , Advanced Data Transfers, for more information about Datalinks.)

Table 9.E – Diagnostic Items Accessed Using VS Utilities (Continued)

No.	Name	Description
15	Datalink A1 Out	The current value of the respective Datalink Out being received from the drive by this module. (See Chapter 8 , Advanced Data Transfers, for more information about Datalinks.)
16	Datalink A2 Out	
17	Datalink B1 Out	
18	Datalink B2 Out	
19	Datalink C1 Out	
20	Datalink C2 Out	
21	Datalink D1 Out	
22	Datalink D2 Out	
23	Field Flash Cntr	The number of times this device has been flash updated.
24	DPI Rx Errors	The current value of the DPI CAN Receive error counter register.
25	DPI Tx Errors	The maximum value of the DPI CAN Transmit error counter register.
26	Net Packet Sent	The number of packets sent by the module.
27	Net Packet Rcvd	The number of OK packets received by the module.
28	Net Bad Packet	The number of BAD packets received by the module.
29	User IN 1	The current value of configurable point User IN 1 (RTU / N2 / P1 FLN).
30	User IN 2	The current value of configurable point User IN 2 (RTU / N2).
31	User IN 3	The current value of configurable point User IN 3 (RTU / N2).
32	User IN 4	The current value of configurable point User IN 4 (RTU / N2).
33	User IN 5	The current value of configurable point User IN 5 (RTU).
34	User IN 6	The current value of configurable point User IN 6 (RTU).
35	User IN 7	The current value of configurable point User IN 7 (RTU).
36	User IN 8	The current value of configurable point User IN 8 (RTU).
37	User OUT 1	The current value of configurable point User OUT 1 (RTU / N2 / P1 FLN).
38	User OUT 2	The current value of configurable point User OUT 2 (RTU / N2).
39	User OUT 3	The current value of configurable point User OUT 3 (RTU).
40	Switch 1	The current value of Rotary Switch 1 (Protocol Select) which can be "1" = RTU, "0" = N2, or "9" = P1.
41	Switch 2	The current value of Rotary Switch 2 (Node Address ones digit).
42	Switch 3	The current value of Rotary Switch 3 (Node Address tens digit).

9.3 Viewing and Clearing Events

The module maintains an event queue that reports the history of its actions. You can view the event queue using an LCD OIM or VS Utilities software.

To View and Clear Events Using an LCD OIM

Use the procedure shown in [Figure 9.2](#) to access the event queue using the LCD OIM. Note that you must have the RECOMM-H485 module as the selected device to access the event queue.

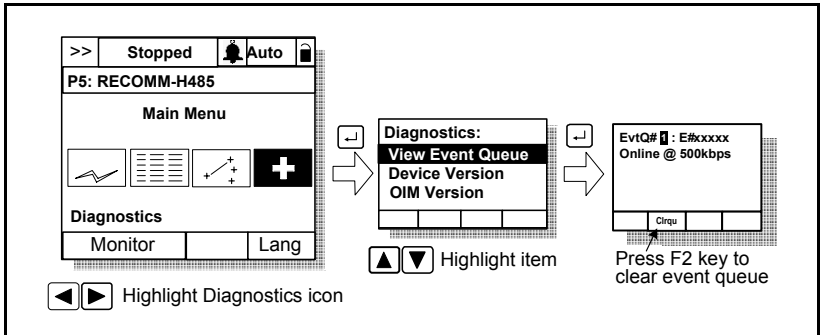


Figure 9.2 – Viewing and Clearing Events Using an LCD OIM

Events

Many events in the event queue occur under normal operation. If you encounter unexpected communications problems, the events may help you or Rockwell Automation personnel troubleshoot the problem. [Table 9.F](#) lists events that may appear in the event queue.

Table 9.F – Event Codes and Descriptions

Code	Event	Description
1	No Event	Empty event queue entry.
2	DPI Bus Off Flt	A bus off condition was detected on DPI. This event may be caused by loose or broken cables or by noise.
3	Ping Time Flt	A ping message was not received on DPI within the specified time.
4	Port ID Flt	The module is not connected to a correct port on a DPI product.
5	Port Change Flt	The DPI port changed after start up.
6	Host Sent Reset	The drive send a reset event message.
7	EEPROM Sum Flt	The EEPROM in the module is corrupt.
8	Online @ 125 kbps	The module detected the drive communicating at 125 kbps.
9	Online @ 500 kbps	The module detected the drive communicating at 500 kbps.
10	Bad Host Flt	The module was connected to an incompatible product.

Table 9.F – Event Codes and Descriptions (Continued)

Code	Event	Description
11	Dup. Port Flt	Another peripheral with the same port number is already in use.
12	Type 0 Login	The module has logged in for Type 0 control.
13	Type 0 Time Flt	The module has not received a Type 0 status message within the specified time.
14	DL Login	The module has logged into a Datalink.
15	DL Reject Flt	The drive rejected an attempt to log in to a Datalink because the Datalink is not supported or is used by another peripheral.
16	DL Time Flt	The module has not received a Datalink message within the specified time.
17	Control Disabled	The module has sent a "Soft Control Disable" command to the drive.
18	Control Enabled	The module has sent a "Soft Control Enable" command to the drive.
19	Message Timeout	A client-server message sent by the module was not completed within one second.
20	DPI Fault Msg	The drive has faulted.
21	DPI Fault Clear	The drive issued this because a fault was cleared.
22	Normal Startup	The module successfully started up.
23	Fault Cfg Error	The module detected a 32-bit fault configuration Reference when the drive supports only a 16-bit Reference, or detected a 32-bit fault configuration Datalink value when the drive supports only 16-bit Datalinks.
24	Net Comm Flt	The module detected a communications fault on the network.
25	Net Detected	The module has detected network communication.
26	Net Timeout Flt	The module has detected a network timeout. The timeout period is configured in Parameter 11 (Network Timeout).
27	Lang CRC Bad	The CRC of the language text file is incorrect.

APPENDIX A

Technical Specifications

Communications

Network Protocols	Rotary switch-selectable: Modbus RTU Metasys N2 Siemens Building Technologies P1 FLN
Data Rates	Modbus: 4800, 9600, 19200, or 38400 baud Metasys: 9600 baud Siemens Building Technologies: 4800 or 9600 baud
Drive Protocol	DPI
Drive Data Rates	125 kbps or 500 kbps

Electrical

Consumption	150 mA at 5 VDC
Drive Network	None

Mechanical

Dimensions	
Height	19 mm (0.75 in)
Length	86 mm (3.33 in)
Width	78.5 mm (3.09 in)
Weight	85g (3 oz.)

Environmental

Temperature	
Operating	-10 to +50° C (14 to 149° F)
Storage	-40 to +85° C (-40 to 185° F)
Relative Humidity	5 to 95% non-condensing
Atmosphere	Important: The module must not be installed in an area where the ambient atmosphere contains volatile or corrosive gas, vapors or dust. If the module is not going to be installed for a period of time, it must be stored in an area where it will not be exposed to a corrosive atmosphere.

Regulatory Compliance

UL	UL508C
cUL	CAN / CSA C22.2 No. 14-M91
CE	EN50178 and EN61800-3

NOTE: This is a product of category C2 according to IEC 61800-3. In a domestic environment this product may cause radio interference in which case supplementary mitigation measures may be required.

APPENDIX B

Module Parameters

The following information is provided for each module parameter along with its description:

Parameter Number:	Unique number assigned to each parameter.
Parameter Name:	Unique name assigned to each parameter.
Range:	Predefined parameter limits or selections.
Default:	Factory default setting.
Type:	Read Only or Read/Write
Reset Required:	Module must be reset before parameter value is recognized.

The parameters in the module are numbered sequentially. However, depending on the configuration tool used, they may have different numbers.

1 DPI Port

Range: 0 to 7
Default: 5
Type: Read Only
Reset Required: N/A

Displays the port to which the module is connected. This will usually be port 5.

2 DPI Data Rate

Range: 0 = 125 kbps
1 = 500 kbps
Default: 0 = 125 kbps
Type: Read Only
Reset Required: N/A

Displays the data rate used by the drive. This data rate is set in the drive and the module detects it.

3 Net Addr Cfg

Range: 0 to 247
Default: 1
Type: Read/Write
Reset Required: Yes

Configures the network node address if the rotary switches on the module are set to "00."

4 Net Addr Act

Range: 0 to 247
Default: 1
Type: Read Only
Reset Required: N/A

Displays the network node address actually used by the module.

5 Net Rate Cfg

Range: 0 = 4800
1 = 9600
2 = 19200
3 = 38400

Default: 1 = 9600

Type: Read/Write

Reset Required: Yes

Configures the network data rate at which the module communicates.

The available range for this parameter depends on the network protocol selected. Only valid entries for the specific network are displayed.

6 Net Rate Act

Range: 0 = 4800
1 = 9600
2 = 19200
3 = 38400

Default: 1 = 9600

Type: Read Only

Reset Required: N/A

Displays the network data rate actually used by the module.

7 Net Parity Cfg

Range: 0 = None
1 = Odd
2 = Even

Default: 0 = None

Type: Read/Write

Reset Required: Yes

Configures the network parity.

The available range for this parameter depends on the network protocol selected. Only valid entries for the specific network are displayed.

8 Net Parity Act

Range: 0 = None
1 = Odd
2 = Even
Default: 0 = None
Type: Read Only
Reset Required: N/A

Displays the actual network parity used by the module.

9 Stop Bits Act

Range: 0 = 1 bit
1 = 2 bits
Default: 0 = 1 bit
Type: Read Only
Reset Required: N/A

Displays the actual number of stop bits used by the selected protocol.

This value is network-dependent. Metasys N2 and Siemens Building Technologies P1 FLN protocols use only 1 bit, and the module will show only this value. For the Modbus RTU protocol, the number of stop bits used is dependent on the value set by Parameter 30 (Stop Bits Cfg).

10 Net Chksum Type

Range: 0 = CRC16 (0)
1 = RLC
2 = CRC16 (-1)
Default: 0 = CRC16 (0)
Type: Read Only
Reset Required: N/A

Displays the actual type of checksum used by the selected protocol.

CRC16 (0) is Cyclic Redundancy Check with 0 as a seed value. The Siemens Building Technologies P1 FLN protocol uses this checksum.

RLC is Run Length Checksum. This is used by the Metasys N2 protocol.

CRC16 (-1) is Cyclic Redundancy Check with -1 as a seed value. The Modbus RTU protocol uses this checksum.

11 Network Timeout

Range: 0 (no detection) to 180 seconds
Default: 10 seconds
Type: Read/Write
Reset Required: No

Configures the time in seconds to be used to detect network communication loss.



ATTENTION: Risk of injury or equipment damage exists. Parameter 11 (Network Timeout) lets you determine how long it will take your module to detect network communication losses. By default, this parameter sets the timeout to 10 seconds. You can set it so that the duration is shorter, longer, or disabled. Take precautions to ensure that the setting does not create a risk of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected cable).

12 Ref/Fdbk Size

Range: 0 = 16-bit
1 = 32-bit
Default: 0 = 16-bit
Type: Read Only
Reset Required: N/A

Displays the size of the Reference/Feedback. The drive determines the size of the Reference/Feedback.

13 Datalink Size

Range: 0 = 16-bit
1 = 32-bit
Default: 0 = 16-bit
Type: Read Only
Reset Required: N/A

Displays the size of each Datalink word. The drive determines the size of Datalinks.

14 Reset Module

Range: 0 = Ready (No action)
1 = Reset Module
2 = Set Defaults (Restores module to factory-default settings)

Default: 0 = Ready

Type: Read/Write

Reset Required: No

Resets the module if set to “Reset Module.” Restores the module to its factory default settings if set to “Set Defaults.” This parameter is a command. It will be reset to “0 = Ready” after the command has been performed.



ATTENTION: Risk of injury or equipment damage exists. If the module is transmitting I/O that controls the drive, the drive may fault when you reset the module. Determine how your drive will respond before resetting a connected module.

15 Comm Flt Action

Range: 0 = Fault
1 = Stop
2 = Zero Data
3 = Hold Last
4 = Send Flt Cfg

Default: 0 = Fault

Type: Read/Write

Reset Required: No

Sets the action that the module will take if it detects a network failure because it has not communicated with its master within the interval specified in Parameter 11 (Network Timeout). This action takes effect only if I/O that controls the drive is transmitted through the module.



ATTENTION: Risk of injury or equipment damage exists. Parameter 15 (Comm Flt Action15) lets you determine the action of the module and connected drive if communications are disrupted. By default, this parameter faults the drive. You can set this parameter so that the drive continues to run. Take precautions to ensure that the setting of this parameter does not create a risk of injury or equipment damage. When commissioning the drive, verify that your system responds correctly to various situations (for example, a disconnected cable).

16 DPI I/O Cfg

Range: See Figure B.1.

Default: xxx0 0001

Type: Read/Write

Reset Required: Yes

Configures the I/O that is transferred through the module.

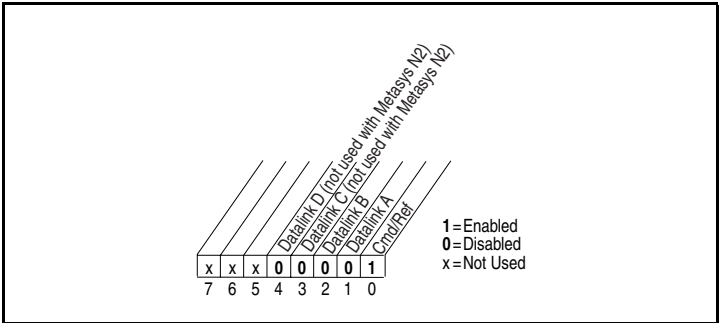


Figure B.1 – DPI I/O Config (16)

17 DPI I/O Active

Range: See Figure B.2.

Default: xxx0 0001

Type: Read Only

Reset Required: N/A

Displays the I/O that the module is actively transmitting. The value of this parameter will usually be equal to the value of DPI I/O Config (16).

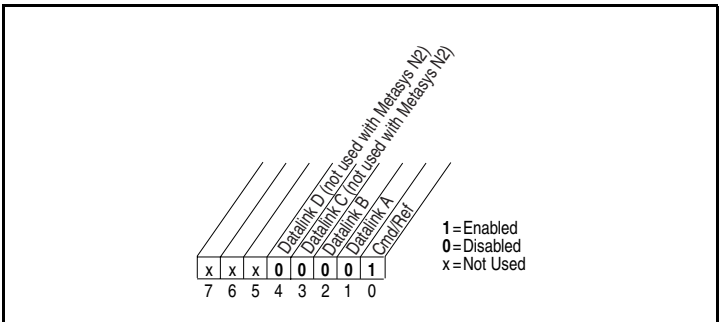


Figure B.2 – DPI I/O Active (17)

18 Flt Cfg Logic

Range: 0000 0000 0000 0000 to 1111 1111 1111 1111
Default: 0000 0000 0000 0000
Type: Read/Write
Reset Required: No

Sets the Logic Command data that is sent to the drive (writes to drive parameter P89) if module Parameter 15 (Comm Flt Action) is set to “Send Flt Cfg” and the module times out.

The bit definitions depend on the product to which the module is connected.

19 Flt Cfg Ref

Range: 0 to 4294967295
Default: 0
Type: Read/Write
Reset Required: No

Sets the Reference data that is sent to the drive (writes to drive parameter P90) if module Parameter 15 (Comm Flt Action) is set to “Send Flt Cfg” and the module times out.

Important: If the drive uses a 16-bit Reference, the most significant word of this value must be set to zero (0) or a fault will occur.

-
- 20 Flt Cfg A1 In
 - 21 Flt Cfg A2 In
 - 22 Flt Cfg B1 In
 - 23 Flt Cfg B2 In
 - 24 Flt Cfg C1 In
 - 25 Flt Cfg C2 In
 - 26 Flt Cfg D1 In
 - 27 Flt Cfg D2 In

Range: 0 to 4294967295
Default: 0
Type: Read/Write
Reset Required: No

Sets the data that is sent to the Datalink in the drive when module Parameter 15 (Comm Flt Action) is set to “Send Flt Cfg” and the module times out.

Important: If the drive uses 16-bit Datalinks, the most significant word of this value must be set to zero (0) or a fault will occur.

28 Clear Counters

Range: 0 = Ready
1 = Clear
Default: 0 = Ready
Type: Read/Write
Reset Required: No

Clears the network diagnostic counters.

29 N2 Ref Scale

Range: 0 to 4294967295
Default: 32767
Type: Read/Write
Reset Required: No

Only used if Metasys N2 protocol is selected. Determines the engineering unit sent over the network for the Reference when 100% is set for AO#2.

30 Stop Bits Cfg

Range: 0 = 1 bit
1 = 2 bits
Default: 0 = 1 bit
Type: Read/Write
Reset Required: Yes

Sets the number of stop bits used by the module when the module's network protocol switch is set to "Modbus RTU." When any other protocol is selected, this parameter setting has no effect.

31 RTU Ref Adjust

Range: 0.0 to 200.0%

Default: 100.0%

Type: Read/Write

Reset Required: No

Sets the percent scale factor for the Reference from the network when the module's network protocol switch is set to "Modbus RTU," and broadcast messages (Modbus address "0") are sent. This lets the drive's Reference either match the broadcast message Reference (=100%), scale below it (<100%), or scale above it (>100%). When any other protocol is selected, this parameter setting has no effect.



ATTENTION: To guard against equipment damage and/or personal injury, note that changes to Parameter 31 (RTU Ref Adjust) take effect immediately. A drive receiving a broadcast message Reference from the module will receive the newly scaled Reference, resulting in a change of speed.

APPENDIX C

Logic Command/ Status Words

Appendix C provides the definitions of the Logic Command/Logic Status words that are used for the VTAC 9 AC Drive that can be connected to the RS485 HVAC Communications module.

Logic Command Word

Logic Bits																Command	Description
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0		
															x	Stop	0 = Not Stop 1 = Stop
															x	Start ^{1, 2}	0 = Not Start 1 = Start
															x	Jog	0 = Not Jog 1 = Jog
													x			Clear Faults ²	0 = Not Clear Faults 1 = Clear Faults
										x	x					Direction	00 = No Command 01 = Forward Command 10 = Reverse Command 11 = Hold Direction Control
										x						Local Control	0 = No Local Control 1 = Local Control
																MOP Increment	0 = Not Increment 1 = Increment
							x	x								Accel Rate	00 = No Command 01 = Accel Rate 1 Command 10 = Accel Rate 2 Command 11 = Hold Accel Rate
					x	x										Decel Rate	00 = No Command 01 = Decel Rate 1 Command 10 = Decel Rate 2 Command 11 = Hold Decel Rate
	x	x	x													Reference Select	000 = No Command 001 = Ref. 1 (Ref A Select) 010 = Reserved 011 = Ref. 3 (Preset 3) 100 = Ref. 4 (Preset 4) 101 = Ref. 5 (Preset 5) 110 = Ref. 6 (Preset 6) 111 = Ref. 7 (Preset 7)
x																MOP Decrement	0 = Not Decrement 1 = Decrement

¹ A 0 = Not Stop condition (logic 0) must first be present before a 1 = Start condition will start the drive.

² To perform this command, the value must change from "0" to "1."

Logic Status Word

Logic Bits																Status	Description
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0		
															x	Ready	0 = Not Ready 1 = Ready
															x	Active	0 = Not Active 1 = Active
													x			Command Direction	0 = Reverse 1 = Forward
											x					Actual Direction	0 = Reverse 1 = Forward
											x					Accel	0 = Not Accelerating 1 = Accelerating
										x						Decel	0 = Not Decelerating 1 = Decelerating
									x							Alarm	0 = No Alarm 1 = Alarm
								x								Fault	0 = No Fault 1 = Fault
						x										At Speed	0 = Not At Reference 1 = At Reference
			x	x	x											Local Control	000 = Port 0 (TB) 001 = Port 1 010 = Port 2 011 = Port 3 100 = Port 4 101 = Port 5 110 = Port 6 111 = No Local
x	x	x	x													Reference	0000 = Ref A Auto 0001 = Reserved 0010 = Preset 2 Auto 0011 = Preset 3 Auto 0100 = Preset 4 Auto 0101 = Preset 5 Auto 0110 = Preset 6 Auto 0111 = Preset 7 Auto 1000 = Term Blk Manual 1001 = DPI 1 Manual 1010 = DPI 2 Manual 1011 = DPI 3 Manual 1100 = DPI 4 Manual 1101 = DPI 5 Manual 1110 = DPI 6 Manual 1111 = Jog Ref

GLOSSARY

bus off - A condition that occurs when an abnormal rate of errors is detected in a device. The bus off device cannot receive or transmit messages on the network. This condition is often caused by corruption of the network data signals due to noise or data rate mismatch.

controller - A solid-state control system that has a user-programmable memory for storage of instructions to implement specific functions such as I/O control, logic, timing, counting, report generation, communication, arithmetic, and data file manipulation. A controller consists of a central processor, input/output interface, and memory. Also called programmable logic controller (PLC). *See also* scanner.

data rate - The speed at which data is transferred on the network. Each device on a network must be set for the same data rate.

Datalink - A type of pointer used by some drives to transfer data to and from the controller. Datalinks allow specified parameter value(s) to be accessed or changed without using Explicit Messages. When enabled, each Datalink consumes either four bytes or eight bytes in both the input and output image table of the controller. The drive determines the size of Datalinks.

DPI - A peripheral communication interface used by various Rockwell Automation drives and power products.

DPI peripheral - A device that provides an interface between DPI and a network or user. Peripheral devices are also referred to as "modules" and "adapters." The VTAC 9 OIM is an example of a DPI peripheral.

DPI product - A device that uses the DPI communications interface to communicate with one or more peripheral devices. For example, a motor drive such as a VTAC 9 drive is a DPI product. In this manual, a DPI product is also referred to as "product" or "host."

Explicit Messaging - Explicit Messages are used to configure, monitor, and diagnose devices over the network.

fault action - Determines how the module and connected product act when a communications fault occurs (for example, a cable is disconnected).

fault configuration - When communications are disrupted (for example, a cable is disconnected), the module and drive can respond with a user-defined fault configuration. The user sets the data that is sent to the drive in the fault configuration parameters 18 (Flt Cfg Logic) through 27 (Flt Cfg D2). When a fault action parameter is set to use the fault configuration and a fault occurs, the data from these parameters is sent as the Command Logic, Reference, and/or Datalink(s).

flash update - The process of updating firmware in the module. The module can be flash updated using the X-Modem protocol and a RECOMM-232 serial converter.

hold last - When communications are disrupted (for example, a cable is disconnected), the module and drive can respond by holding last. Hold last results in the drive receiving the last data received via the network connection before the disruption. If the drive was running and using the Reference from the module, it will continue to run at the same Reference.

I/O data - I/O data, sometimes called “implicit messages” or “input/output,” transmit time-critical data such as a Logic Command and Reference. The terms “input” and “output” are defined from the scanner’s point of view. Output is transmitted by the scanner and consumed by the module. Input is transmitted by the module and consumed by the scanner.

Logic Command/Logic Status - The Logic Command is used to control the drive (e.g., start, stop, direction). It consists of one 16-bit word of input to the module from the network. The definitions of the bits in this word depend on the drive.

The Logic Status is used to monitor the drive (for example, operating state, motor direction). It consists of one 16-bit word of output from the module to the network. The definitions of the bits in this word depend on the drive.

node address - A unique address used to identify a device on a network. On Modbus, RTU, Metasys N2, and Siemens Building Technologies PI FLN networks, devices can have node addresses between 1 and 255 if the network is set up to accommodate that number of devices.

non-volatile storage (NVS) - The permanent memory of a device. Devices such as the module and drive store parameters and other information in NVS so that they are not lost when the device loses power. NVS is sometimes called “EEPROM.”

operator interface module (OIM) - A device that can be used to configure and control a drive.

parity check - When the module uses a parity check, a non-data bit is added to each binary word that it sends and receives. Devices on the network verify the data integrity of the transmitted data by checking that the sum of the number of ones in a word is always even or odd.

ping - A message that is sent by a DPI product to its peripheral devices. They use the ping to gather data about the product, including whether it can receive messages and whether they can log in for control.

Reference/Feedback - The Reference is used to send a reference (for example, speed, frequency, torque) to the product. It consists of one word of input to the module from the network. The size of the word (either a 16-bit word or 32-bit word) is determined by the drive.

Feedback is used to monitor the speed of a product. It consists of one word of output from the module to the network. The size of the word (either a 16-bit word or 32-bit word) is determined by the drive.

scanner - A separate module (of a multi-module controller) or a built-in component (of a single-module controller) that provides communication with modules connected to a network. *See also* controller.

status indicators - LEDs that are used to report the status of the module, network, and drive. They are on the module and can be viewed on the front cover of the drive when the drive is powered.

Type 0/Type 1/Type 2 control - When transmitting I/O, the module can use different types of messages for control. The Type 0, Type 1, and Type 2 events help Rockwell Automation personnel identify the type of messages that a module is using.

VS Utilities software - A Windows-based software tool for monitoring and configuring VTAC 9 products and modules.

zero data - When communications are disrupted (for example, a cable is disconnected), the module and drive can respond with zero data. Zero data results in the drive receiving zero as values for command data. If the drive was running and using the reference from the module, it will stay running but at zero reference.

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