-METASYS®

Network Port

* Indicates those sections where changes have occurred since the last printing.

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Introduction

Description

Network Port is a bidirectional interface device that can act as a slave, peer, or master to allow communication between the Metasys® Building Automation System (BAS) and another control system or device. Through Network Port, the Metasys system monitors and commands Metasys data together with field gear and data resident on another system such as an Allen-Bradley PLC® on the Allen-Bradley Ethernet. Likewise, the Network Port allows the control system or device to monitor and command the Metasys BAS.

Network Port as Slave

The Network Port emulates PLC-3 or PLC-5 Programmable Logic Controller commands, allowing systems that can communicate with PLC-3/5s to communicate with the Metasys Network through the Network Port.

When the PLC is the master, it initiates all communication with the Network Port slave. The master PLC monitors and controls data objects in the Network Port, but the Network Port does not directly monitor and control field gear resident on the master PLC.

The primary advantages of using the Network Port in this method are “single-seat” user interface and a re-use of a prior investment in a control system computer.

Network Port as Peer

As a peer, Network Port functions like other peer devices in a communication network.

Network Port as Master

Network Port enhanced features communicate with the PLC slaves, and read data from and write data to a Data Highway Plus (DH+) node to monitor and control points. Bidirectional communication is possible since every node on the DH+ network has equal access to become the master.

Key Terms

ABDH Protocol The Allen-Bradley Data Highway (ABDH) Protocol procedure for transmitting and receiving data across the Allen-Bradley Data Highway. Also, the Network Port type for the port connecting to another control system or device.

AD Analog Data object, one of the point object types that can be defined for the Network Port. ADs are not directly associated with physical sensing hardware. Instead, they treat an analog value obtained as the result of a control process, operator entry, or associated parameter (attribute) from another object just like a hardware input. At the Network Port, AD objects are used to map data to and from an integrated system.

BD Binary Data object, one of the point object types that can be defined for the Network Port. BDs are not directly associated with physical sensing hardware. Instead, they a treat a binary (also known as Boolean) value obtained as the result of a control process, operator entry, or associated parameter (attribute) of another object just like a hardware input. At the Network Port, BD objects are used to map data to and from an integrated system.

Client A master or host that can read and write data via a server to another system or device. An example of a client application is Excel using Dynamic Data Exchange (DDE) servers to collect spreadsheet values.

DDL Dynamic Data Language, a software language for defining the NCM as a Network Port.

DF1 An Allen-Bradley protocol developed to communicate with a 1770-KF2, a data highway to serial communication adapter.

DH+ Data Highway Plus (DH+). A high-speed, token-passing network. Also, a set of PLC commands such as Read and Write messages.

GPL Graphic Programming Language, a graphics oriented software language used for creating software objects and programming control strategies. GPL can be used for defining the NCM as a Network Port.

Integrated System A system connected to the Network Port, communicating via the Allen-Bradley DF1 protocol. This system functions as a master, a slave, or both in a peer-to-peer configuration.

LAN	Local Area Network, a typical network configuration for an integrated system.
Master	The current host that reads data from, and writes data to, other DH+ nodes to monitor and control points. Every node on a DH+ network has equal access to become the master, allowing peer-to-peer communication.
Metasys Network Integrator	The Metasys Network Integrator is a Personal Computer (PC), similar to an Operator Workstation, on which third-party integration packages run. See *Metasys Network Integrator Technical Bulletin (LIT-6295100)* for details.
MSD	Multistate Data object, one of the point object types that can be defined for the Network Port. MSD objects can only be defined when the Network Port is acting as a master. At the Network Port, MSD objects are used to map data from an integrated system.
NCM	Network Control Module, the main processing module in the Network Control Unit (NCU).
NCU	Network Control Unit, a standalone panel used to control a building's mechanical equipment.
Network Port NCM	An NCM configured, through NCSETUP, as a Network Port.
Network Port Public Database	A collection of data consisting of cached data for every Binary Data (BD) and Analog Data (AD) object in the Network Port, referenced by a master.
Network Port Remote Database	A collection of data consisting of every AD, BD, and MSD object in the Network Port that references data in a DH+ slave node.
OWS	Operator Workstation, the operator interface for Metasys BAS and the primary operator interface connected to an integrated system.
Protocol	A set of rules or procedures to follow when transmitting or receiving data across a network. Protocols define timing, sequence, and error-checking systems.
Server	Software supporting a specific protocol, which collects data from a slave system for use by client software, such as Excel.

Hardware

The Network Port uses the same hardware as the NCM, but functionally, it acts as a "bridge" between the Metasys Network and another control system or device.

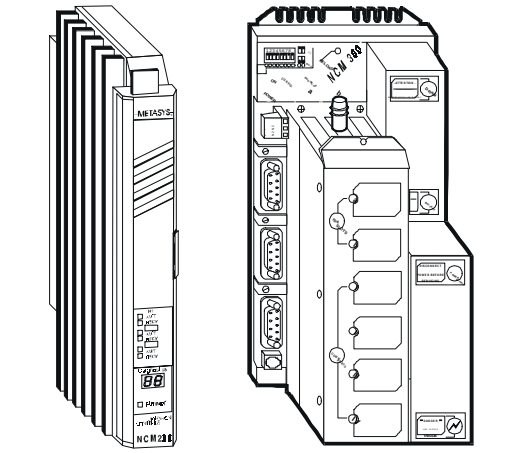


Figure 1: Network Port (NCM200 or NCM300 Chassis)

System Requirements

The Network Port has the following hardware and software requirements:

- Metasys Person-Machine Interface (PMI) Release 9.00 or greater
- Metasys Network Port (NCM)
- the proper software definition of the Network Port as a "Network Port NCM" in the Metasys Network
- the proper DDL or GPL, or online definition of the Network Port's remote and/or public database

If the facility's system communicates with third-party suppliers other than Allen-Bradley, see the *Metasys Network Integrator Technical Bulletin (LIT-6295100).* This requires a computer running industrial master software that can communicate with an Allen-Bradley PLC-3 or PLC-5. (PLC-3 messages use logical binary addressing mode. PLC-5 messages can use binary or ASCII addressing.)

Communication Between Systems

Communication occurs between the RS-232 port on the Network Port and the RS-232 port on the control system Personal Computer (PC) or controller. The Network Port communication settings are as follows:

- 8 data bits
- no parity bit
- 1 stop bit
- 9600 or 19.2k baud
- BCC error checking
- no embedded responses
- full duplex

We recommend a master system response time out of at least 2 seconds. Increase the time out to 10 seconds when there are multiple hosts or when a single host can have multiple outstanding requests.

For example, consider a network of PLCs connected to a PC on the Allen-Bradley DH+ network. Connect an Allen-Bradley Data Highway to Serial Communications adapter, such as the 1770-KF2, between the Network Port and the DH+ network. This allows the Network Port to communicate along the DH+ network at 9600 baud (the Allen-Bradley 1770-KF2 Data Highway to Serial Communications adapter communicates at 9600 baud only). The Network Port, in turn, communicates with the Metasys Network over the N1 LAN as an N1 node.

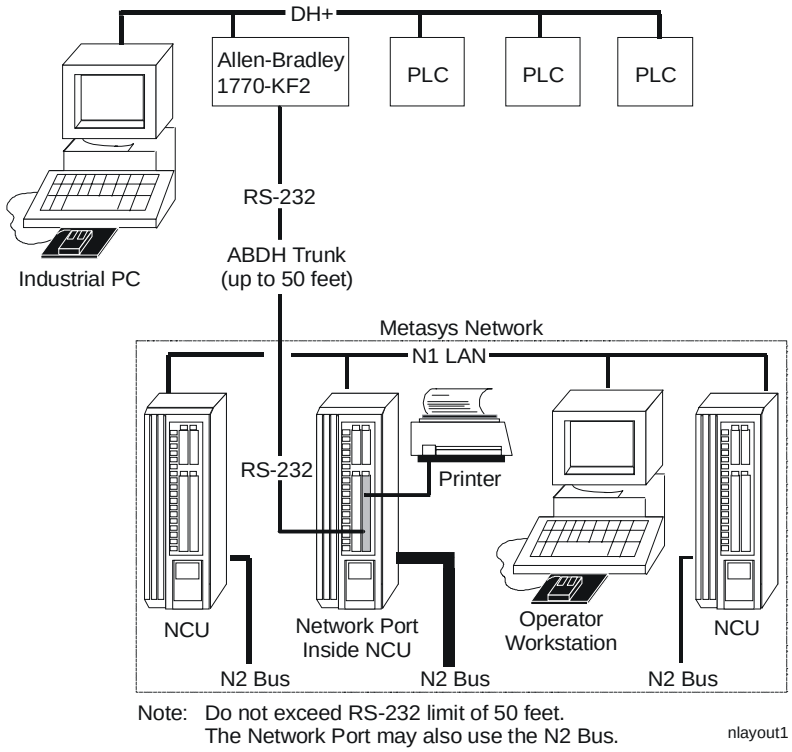


Figure 2: Network with Direct RS-232 Connection to a PC

The Network Port is connected to a PC or device directly through the RS-232 connection on the ABDH trunk. The distance between the Network Port and the control system PC or device must not exceed 50 feet.

Engineering

Theory of Operation

The Network Port is a microprocessor-based intelligent node in the Metasys Network. It is similar to the standard Network Control Module (NCM) in many ways. For example, the Network Port and the NCM both contain a global and local database. The Network Port also communicates on the N1 LAN with other NCMs and Operator Workstations. The Network Port can also communicate over the N2 Bus. The primary distinguishing characteristic of the Network Port is its function.

The Network Port emulates the functions of an Allen-Bradley 1770-KF2 interface module and PLC (Figure 3). This allows a control system or device, communicating through DF1 protocol, to monitor and control the Network Port. The Network Port also monitors and controls other systems and devices.

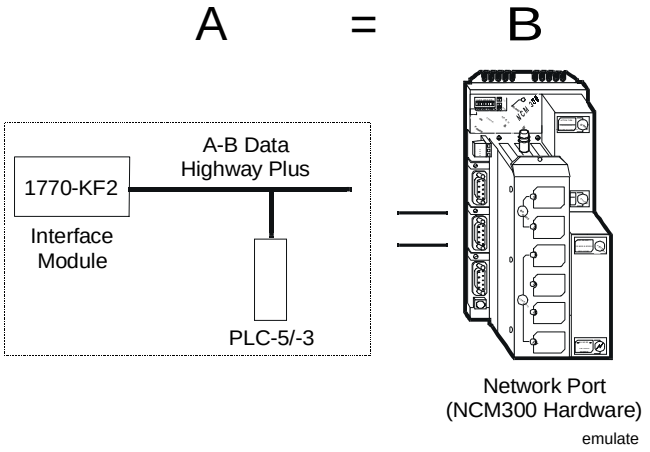


Figure 3: Network Port Emulation with Allen-Bradley PLCs

Object Mapping

The Network Port, as both a slave and a master, uses ABDH element numbers to define pseudo objects. When Network Port is a slave, each AD and BD object is associated to a host-monitored system or object attribute. When Network Port is a master, the element number defined as the AD, BD, and MSD object name references the ABDH element data at the slave.

For more details on defining objects, refer to *Network Port as a Slave* and *Network Port as a Master* in this technical bulletin.

The other Metasys Network objects also can be defined on the Network Port (e.g., ACM, AI, BO, MSD, etc.). Any object that can be defined on the NCM also can be defined on the Network Port.

Note: Because AD and BD object names identify not only objects mapped to a master, but also objects which obtain their value from a slave, standard Metasys objects cannot be defined using:

- alphanumeric object names from 0 to 3999
- associated object system names beginning with PLC3_ or PLC5_

Network Port supports functions and objects required to support the standard N2 devices. The N2 Bus functionality is the same as the standard NCM N2 Bus support.

Note: The Network Port NCM does **not** support the NCM diagnostic mapping explained in the *Analog Data (AD) Technical Bulletin (LIT-636078).*

Since Port 2 is defined as the master-device interface port, N2 devices can be connected only to Port 1 (N2 Bus). The Network Port can be configured to map Metasys objects from itself or from other NCMs to the master system.

Report Routing

Reports can be routed to and from another control system or device.

Table 1: Supported DH+ Messages used to Route Reports

DH+ Message	File Number and Type	Initiated By	Result
Word-Range Read	10 (ASCII)	Another Control System or Device	The oldest cached Metasys report text is converted to a DH+ ASCII file.
Word-Range Write	10 (ASCII)	Another Control System or Device	The Network Port NCM receives an unsolicited ASCII data file converted to a Metasys report.

For details on report routing when the Network Port is operating as a slave, refer to the *Network Port as a Slave* section in this technical bulletin.

For details on report routing when the Network Port is master, refer to the *Network Port as a Master* section in this technical bulletin.

Error Handling

The master outputs an error message when a command is issued to an undefined or offline object. Refer to the *Troubleshooting Procedures* section for details.

Uploading

Upload after defining a new object for the Network Port. Perform the upload at the Operator Workstation to copy the operational Network Port database to the archive Network Port database. This procedure maintains a current archive database at the Operator Workstation. Always keep the archive and operational databases synchronized.

Password Access

On the Metasys Network side, the Password feature in the Operator Workstation (OWS) or Network Terminal (NT) controls Network Port operator access. Adding, modifying, or deleting AD and BD objects at the Network Port requires password clearance.

If a PC is used on the other control system, the password security system of that PC defines operator access to the Network Port. That control system's password, not a Metasys password, is required for access to the Network Port.

For password information, refer to the *Password Technical Bulletin (LIT-636111)* in the *Metasys Network Technical Manual (FAN 636).*

Point History

When the Network Port functions as a slave, Point History reporting uses the same techniques as the standard NCM.

When the Network Port functions as a master, BD and Multistate Data (MSD) objects operate differently. When the BD and MSD objects map to data from an integrated system, the system issues history reports when the object value or status is updated, not when a command is issued.

System Restrictions

The Network Port has the following restrictions:

- Its software runs in an NCM200 or NCM300/350. Network Port cannot run software in a standard NCM101.
- It requires 4 megabytes (MBs) of memory to run an NCM 300 with Release 9.00 or later.
- It cannot communicate over the L2 or S2 Bus. Network Port communicates over the N1 LAN and ABDH trunk, and optionally over the N2 Bus.
- It supports those functions that are related to the mapping of data objects to the other control system or device, such as commanding an object or obtaining a value. Network Port cannot send summaries to another control system or device.
- It supports Metasys object definitions up to the limits of the available memory. However, due to existing NCM database structure limitations, do not define more than 4000 objects.
- The Delay All Alarms field and the Adjust Disable field are set to No internally for all BD, AD, and MSD objects defined at the Network Port.

Restrictions as a Slave

The following restrictions apply only for Network Port as a slave:

- If the Network Port loses communications with a PLC while sending ASCII data, the data is not resent when communications are restored.
- The Network Port can support at most the definition of 800 analog and 3200 binary data objects that can be referenced by a master system. Larger point counts can be handled with multiple Network Port devices. In other words, the Network Port addresses up to 4000 slave objects. The actual object count is less than 4000, depending on the dynamics of the interface and other applications running in the Network Port. To reference object values, object names must be numeric and within the ranges specified in the *Defining Objects* and *Network Port as a Slave* sections of this technical bulletin. Numerically named objects outside this range cannot be read or written to by a remote system and are supported by the Network Port NCM as standard objects.
- All commands from the control system or device are converted to manual commands in the Network Port for transmission on the Metasys system. The Network Port sends Binary Output (BO) commands at Priority 8. All other commands are sent Priority 3.
- Do not use numeric names for objects that are not intended to be accessed by the remote system. The Network Port reserves 0-3999 object names as objects that reside in its public database.
- Since MSD objects cannot be used to map Metasys data to a master control system or device, integer object attributes cannot be monitored or controlled by a master system.
- The use of block write commands is supported. However, the use of block write commands to control Metasys objects is not recommended and could adversely affect system performance.

Restrictions as a Master

The following restrictions apply only for Network Port as a master:

- There is no enforced limit to the number of Metasys objects that can reference data from another control system or device. However, only the first 1000 elements of each DH+ file can be referenced.
- When the Network Port is used as a master, its node address must not conflict with the addresses on the DH+ bus. The Network Port's node address is used as the source address in the DFI message.
- Values for elements of integer files as referenced by another control system device will only be signed integer values.

Installation Procedures

Hardware Installation

Network Port installation is the same as NCM installation. For NCM200 hardware, refer to the *Network Control Module 200 Series Technical Bulletin (LIT-636025).* For NCM300/350 hardware, refer to the *Network Control Module 300 Series Technical Bulletin (LIT-6360251).* Both documents are in the *Metasys Network Technical Manual (FAN 636).*

Cable Guidelines, NCM200 Chassis

Use the following cables for a Network Port in an NCM200.

Right-Angle Cable

The NCM200 uses a special right-angle connector with a narrow profile shell (NU-CBL101-0) allowing its door to close with the cable connected. The cable shown in Figure 5 requires this connector. Connect the pigtailed wires of these cables into a separately ordered hood, male (MHK101) or female (FHK101), according to the device pinout requirements.

Figure 4: NU-CBL101-0 Pinouts (NCM200 Chassis)

Control System Cabling

The facility's control system or device connects to the RS-232 submodule port on the Network Port. This requires an RS-232 cable (Figure 5).

Note: Do not connect the control system PC or device to the RS-232 serial port on the Network Port. The Network Port is unable to communicate with the Control System PC.

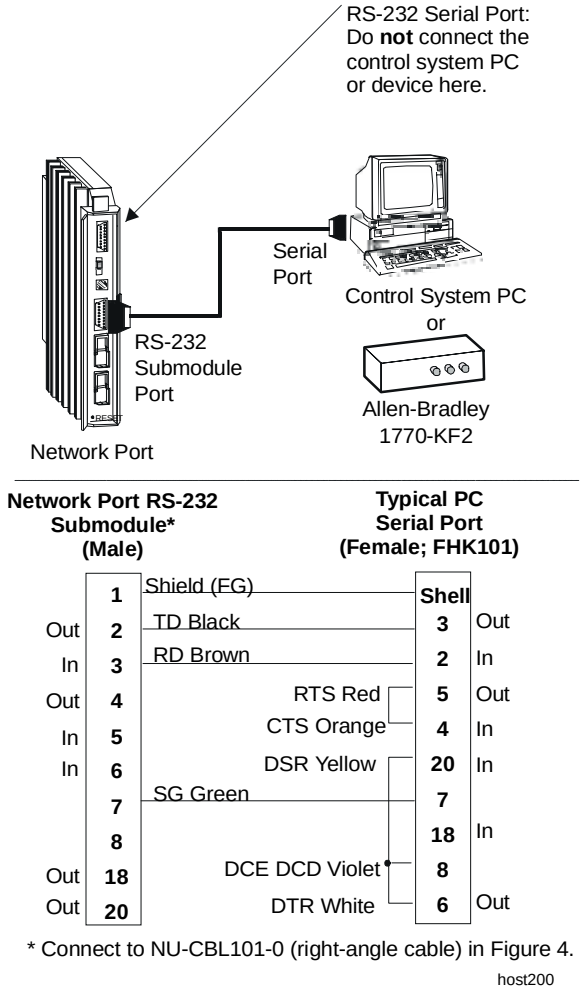


Figure 5: Control System PC Connection to Network Port RS-232 Submodule Port (NCM200 Chassis)

Cable Guidelines, NCM300/350 Chassis

Use the following cables for a Network Port with the NCM300/350 chassis.

Control System Cabling

The control system PC or device connects to Port 2 (first RS-232 port) on the Network Port via an RS-232 cable (Figure 6).

Note: Do not connect the control system PC or device to the Network Port RS-232 serial port, Ports 3 or 4. The Network Port will be unable to communicate with the Control System PC.

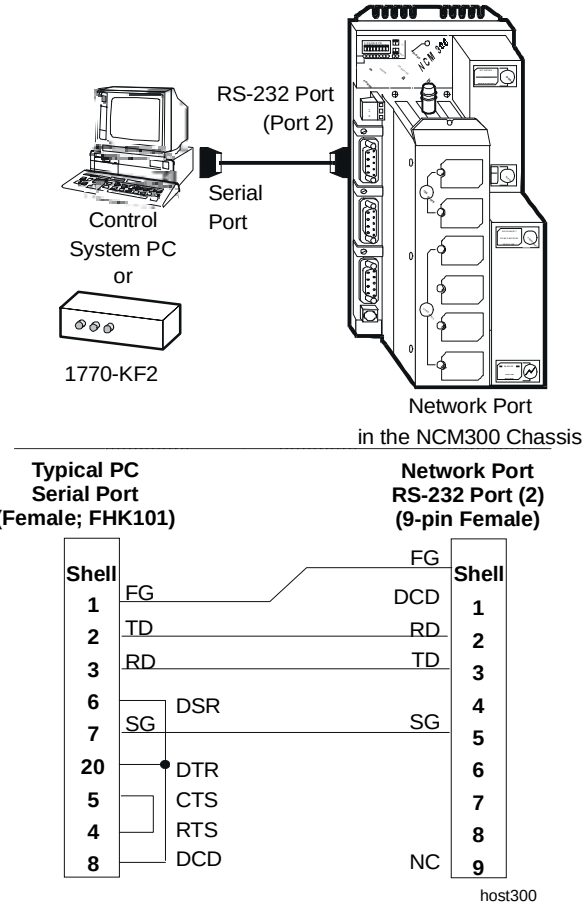


Figure 6: Control System PC Connection to Network Port RS-232 Port (NCM300/350 Chassis)

Commissioning Procedures

Introduction

Network Port commissioning is similar to that of an NCM. Configuring the NCM as a Network Port NC in NCSETUP makes the NCM a Network Port NCM.

Refer to *NCSETUP for Windows Technical Bulletin (LIT-6360251d)* in the *Metasys Network Technical Manual (FAN 636).*

For additional commissioning information, refer to the *Metasys Network Technical Manual (FAN 636), Control Modules*. For NCM200 hardware, refer to the *Network Control Module 200 Series Technical Bulletin (LIT-636025).* For NCM300/350 hardware, refer to the *Network Control Module 300 Series Technical Bulletin (LIT-6360251).*

Software Setup

Network Port software setup requires:

- defining the Network Port as a hardware device in the Metasys system
- defining the ADs, BDs, MSDs, and other objects
- uploading the changes to the archive database

Defining NCM in the Metasys System

To define the NCM in the Metasys system:

- use NCSETUP for Windows to define the NCM as a Network Port
- clear the `Reboot on Download Error` parameter
- define, save, and upload the NCM database at the Operator Workstation
- reset the Reboot on Download Error parameter

Configure the Network Port

Configure the Network Port with a laptop PC and the NCSETUP for Windows program. Starting the NCSETUP program displays the NCM Address Entry window. To configure:

1. Start NCSETUP for Windows.
2. Select the Network Port address from the View Other Addresses field in the NCM Address Entry window.
3. Select OK.
4. Select **Command** | NOVRAM... from the NCSETUP Main Menu.
5. Select Network Port from the Code Download Type field in the NOVRAM View and Modify window.
6. Complete the Archive Device Address section.

7. Set the node in the NCM Address field to a unique DH+ network address.

Note: The Network Port uses this Node ID as the source mode address when it sends read and write requests.

8. Select OK.

Define Devices with DDL

To define the Network Port and local devices with DDL, edit and compile the global file before creating and compiling the NC file.

Edit the Global File

To edit the global file:

1. Open the global file in a text editor.
2. Define the Network Port. For example, the port type to specify is ABDH for Allen-Bradley Data Highway.

   Example:

   ```
   NC "NC-1","NC-1 Network Port",0,0,1,1," ","ABDH",,,9600
   ```

3. Define any of the following, connected to the RS-232 serial port, as a printer:

   - local printer
   - PC (laptop or workstation)

   Example:

   ```
   PTR "LPTR3","Aux Printer",0,0,NCDIRECT,"NC-1",3
   ```

4. Save the file using a .DDL extension.
5. Close the file.
6. Compile the global file.

Create the NC Source File

To create and compile the NC source file:

1. Create an NC source file in a text editor to define the Network Port.

   Example:

   ```
   @NC "BLD-1","NC-1"
   ```

2. Save the file using a .DDL extension.
3. Exit the text editor.
4. Compile the NC file.

Define Network Port with the OWS

To define the Network Port with the Operator Workstation (OWS):

1. Follow standard procedures for defining, saving, and uploading a new NCM. Refer to the *Network Control Module 200 Series Technical Bulletin (LIT-636025)* or the *Network Control Module 300 Series Technical Bulletin (LIT-6360251)* in the *Metasys Network Technical Manual (FAN 636).*
2. If this Network Port is:
   - not used for objects on the N2 Bus, leave the Port 1 Type field blank
   - used for objects on the N2, enter N2 in the Port 1 Type field
3. Enter the control system network name in the Port 2 Type field. For example, enter ABDH for Allen-Bradley Data Highway.

To use the OWS to define local devices for the Network Port, follow procedures for defining NCM devices. Always upload the changes to the Network Port archive database.

Define a Printer

To send Metasys reports to the other control system or device, define a Network Port printer with an NC direct connection at Port 0, using DDL or OWS PMI.

Refer to the *Defining a Device* in the *Advanced User's Guide* section of the *Operator Workstation User's Manual (FAN 634).*

Defining Objects

Overview

The Network Port supports functions related to communicating to and from an integrated system using data objects. You can define these objects on the Metasys Network either offline with DDL/GPL or online with the Operator Workstation. The standard method of defining objects applies.

The following two sections, *Network Port as a Slave* and *Network Port as a Master*, describe general DDL, GPL, and Operator Workstation object-defining methods. For more details, refer to the respective programmer or user manuals. Refer to the *Appendix* section in this document for a DDL source file example.

Only ADs and BDs can be used to map Metasys object attributes from Network Port to an integrated system. AD, BD, and MSD objects can be defined for Network Port as a master. All AD, BD, and MSD objects defined to map data to and from an integrated system must have numeric names.

In most cases, the only objects you need to define at the Network Port are those you wish to use to map data to and from an integrated system. However, if the Network Port has extra room in its database, consider defining N2 devices and the required objects to support them.

Note: The Network Port NCM does **not** support the NCM diagnostic mapping explained in the *Analog Data (AD) Technical Bulletin (LIT-636078).*

Network Port as a Slave

Introduction

This section explains how to map Metasys AD and BD object attributes to a master system with Network Port functioning as a slave. Many devices and systems communicate with the Network Port. This section uses a generic master/slave relationship to explain how to map objects.

AD and BD Object Overview

Analog Data (AD) and Binary Data (BD) objects must be defined at the Network Port to allow a master device to monitor and control the Metasys Network. The Network Port relies on the associated input parameters of the two data objects, available on their definition screens, to link them with Metasys objects.

Associated input parameters linking data objects to Analog Output Setpoint (AOS) and Binary Output (BO) objects allows the system to perform many BAS tasks, such as starting and stopping fans, opening and closing dampers, and adjusting setpoints.

Data object associated input is located elsewhere on the N1 LAN, and provides the actual Metasys Network monitoring and command capabilities. Entering a command from the master to its data object controls each object. Any Metasys object can be configured for access.

The DF1 protocol uses station addresses to identify devices on the ABDH network. The first message sent to the Network Port sets the address assigned to the Network Port as a slave. The Network Port reads the destination address from the first message it receives from a master system. It then saves this address and uses the address as its own. After the Network Port accepts an address, it only responds to messages sent to that address.

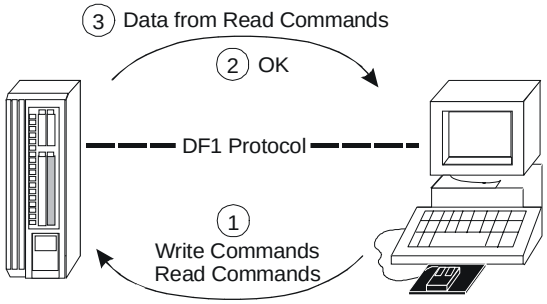
The Network Port maps Allen-Bradley register addresses into Metasys data objects. Through associated inputs, the data objects map to hardware objects. Refer to the *Mapping Objects* section for details.

Master System Interaction

Figure 7 shows the interactions between, and functions of, the slave Network Port and the master system. The master sends a command to a Metasys object through the Network Port①. The command is redirected to that object's associated object. The Network Port builds the appropriate messages and sends a manual command to the associated object. The Network Port then sends this command to the appropriate NCM. Network Port also returns an OK to the master② to acknowledge a sent command.

Another function of the Network Port returns the value of an attribute the master requests③. The master PC operator interface displays the value.

Note: Refer to the master system PC manufacturer literature for details on how to issue commands at the master.



Network Port (Inside NCU)

- Defined as NC on the Metasys Network.
- Contains the same global database as all other nodes on the network.
- Contains operational and archive databases containing ADs and BDs, some mapped to the host.
- Contains code to communicate over the Allen-Bradley DF1 protocol.

Master Control System PC

- Uses standard PLC-3/5 addressing to monitor and command Metasys objects.
- Operates as if monitoring and commanding a PLC-3/5 when it is actually doing so for the Metasys Network.

interact

Figure 7: Network Port to Master System Interaction

Network Port communicates over the N1 LAN and N2 Bus, but not over the L2 or S2 Bus. Network Port converts the commands from the master into Metasys commands. Refer to *Commands from the Master System* in this technical bulletin.

AD and BD Scanning

Network Port scans the associated input assigned to an AD object to detect the change in the object value. Four Network Port tasks run in parallel to scan the associated inputs. Each task is responsible for scanning all the NCM associated inputs containing the associated input object. AD points may be scanned once every 10 seconds or longer, depending on how many AD points are defined on the Network Port.

The method the Network Port uses to detect BD object changes in status depends on whether the associated input attribute is triggerable. If the attribute is triggerable, the NCM notifies Network Port that the attribute changed. If the attribute is not triggerable, the Network Port detects the change-of-state while it scans all defined BD objects once every 30 seconds. This scanning procedure is identical to that of the standard NCM.

Defining Objects

To map Metasys objects to PLC points, the system names for AD and BD objects can be alphanumeric, but the object names must be numeric and cannot be duplicated in the NCM's database.

AD object names must be in the range of 0 to 799, and BD object names must be in the range of 800 to 3999. Refer to Table 2.

Table 2: Choices for Mapped System\Object Names

Names	AD Objects	BD Objects
System	Alphanumeric	Alphanumeric
Object	0-799	800-3999

Additional objects may be defined to support any defined N2 devices. Standard rules apply to the object names, except that they must **not** be numeric. Numeric object names are reserved for objects that are mapped from the Network Port to the master system.

Defining with DDL

AD Objects

To define AD objects for Network Port as a slave:

1. Open the NC file.
2. Define each AD object. Example:

```
AD "NETPORT1","25","PLC MAP TO OUTDOOR AIR"
ASSOCINP "AI","POINTS","ODATMP","VALUE"
```

3. Save and close the file.
4. Compile the NC file.
5. Define the object in the appropriate PLC database.

BD Objects

To define BD objects for Network Port as a slave:

1. Open the NC file.
2. Define each BD object. Example:

```
BD "NETPORT1","821","RETURN FAN STATUS"
ASSOCINP "BI","BUILDB","RFANST","VALUE"
UNITS "OFF","ON"
```

3. Save and close the file.
4. Compile the NC file.
5. Define the object in the appropriate PLC database.

Defining with GPL

AD Objects

To define AD objects for Network Port as a slave:

1. Define an associated input for each AD object.
2. Define an alphanumeric system name for each AD object in the control strategy.
3. Define a numeric object name in the range of 0 to 799.
4. Save the file.
5. Check and translate the file.
6. Define the object in the appropriate PLC database.

BD Objects

To define BD objects for Network Port as a slave:

1. Define an associated input for each BD object.
2. Define an alphanumeric system name for each BD object in the control strategy.
3. Define a numeric object name in the range of 800 to 3999.
4. Save the file.
5. Check and translate the file.
6. Define the object in the appropriate PLC database.

Defining with OWS

AD Objects

Use the same procedure as above. Specify a numeric name for the object in the range of 0 to 799. Then add the analog object to the appropriate PLC database.

BD Objects

Use the same procedure as above. Specify a numeric name for the object in the range of 800 to 3999. Then add the analog object to the appropriate PLC database.

Mapping Objects

The Network Port maps ADs with object names from 0 to 799 and BDs with object names from 800 to 3999 to the master device. These object-naming limitations automatically map the named objects.

To map the AD and BD objects to the master PC or device, follow the PLC addressing scheme. An addressing Element Number maps to a Metasys object as follows:

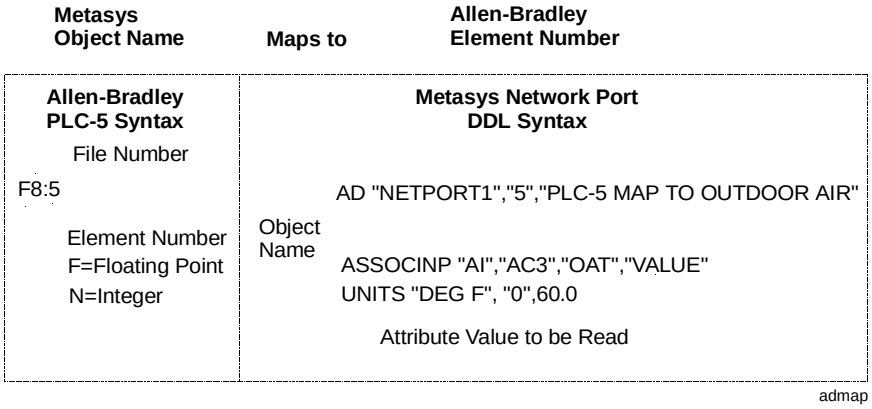


Figure 8: Metasys DDL to PLC-5 AD Object Mapping

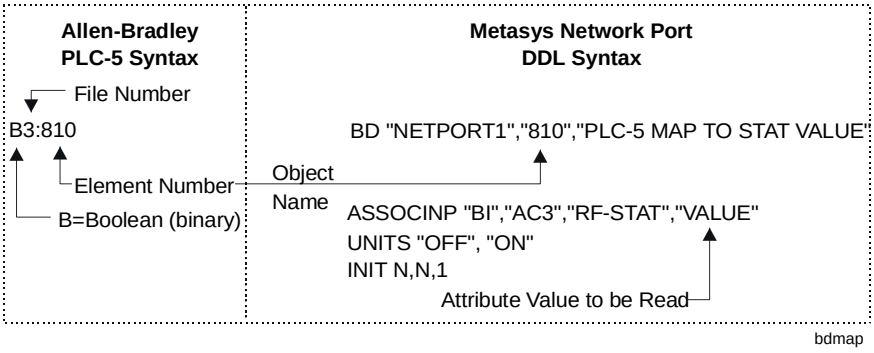


Figure 9: Metasys DDL to PLC-5 BD Object Mapping

To map Metasys objects to the master system, define them first on the Metasys Network, then on the master system. When mapping Metasys objects to PLC points on the master, print the DDL or GPL source file or the Operator Workstation Focus windows for reference. The numeric object names defined on the Metasys Network must exactly match the element numbers defined at the master.

Mapping Object Status

In addition to the value of an AD or BD object, the Network Port also maps certain status of the object to the master system. The offline status is set to 1 (true) when the associated object does not exist or the NCM with the associated object is offline. The object defined status is set to 1 when the AD object is defined. The reliability status is set to 0 (false) when the associated object is unreliable for any reason (e.g., offline).

Analog Data Object

For an AD object, Network Port maps the Offline, Object Defined, and Reliability statuses to the master. Refer to Table 3. The method of mapping used adds an offset of 4000 to the AD object name. For example, to obtain the status of an AD object called “12,” enter “4012” at the master system.

Table 3: Statuses, Values, and Bit Assignments for AD Objects

Status	Values	Bit Assignment
Not Applicable	Unused	0
Offline	1 = Offline 0 = Online	1
Object Defined	1 = Defined 0 = Undefined	2
Reliability	1 = Reliable 0 = Unreliable	3

Example: Mapping to obtain the analog statuses of an object named “8.”

DDL Definition:

```
AD "NETPORT1","8","AHU1/RET_TEMP"
ASSOCINP "AI","AHU1","RET_TEMP","VALUE"
GRAPHICS 0,0
UNITS "OFF","ON"
```

PLC-3s and PLC-5s use different encoding schemes for floating point values. PLC-3s should read/write F6:XXX. PLC-5s should read/write F8:XXX.

Master System Mapping for PLC-5:

- F8:8 Maps to Value for F8:8 in PLC-5 float format.
- N7:8 Maps to Value for N7:8 in integer format.
- B3:4008:1 Maps to Offline status for F8:8.
- B3:4008:2 Maps to Object Defined status for F8:8.
- B3:4008:3 Maps to Reliability status for F8:8.

  Note: F6:8 Maps to Value for F8:8 in PLC-3 float format.

The Network Port uses one database to store analog values that are readable from a host system. This means that the Network Port returns the same value for any of the following addresses: F8:00, F6:00, N7:00, or N5:00. The format of the returned value is different for each address, as shown in Table 4.

Table 4: Format of Returned Values for Analog Data

Type	PLC-3	PLC-5
Floating Point	F6:XX	F8:XX
Integer	N5:XX	N7:XX

Binary Data Object

For a BD object, map the status of Value, Offline, Object Defined, and Reliability. Refer to Table 5. The mapping method adds a bit assignment to the BD object name. For example, to get the Offline status of an BD object called “808,” enter “808:1” at the master system.

Table 5: Statuses, Values, and Bit Assignments for Binary Objects

Status	Values	Bit Assignment
Value	1 = Close 0 = Open	0
Offline	1 = Offline 0 = Online	1
Object Defined	1 = Defined 0 = Undefined	2
Reliability	1 = Reliable 0 = Unreliable	3

Example: Mapping to obtain the binary statuses of an object named “808.”

DDL Definition:

```
BD "NETPORT1","808","AHU1/SUPPLYFAN"
ASSOCINP "BI","AHU1","SUPPLYFAN","VALUE"
GRAPHICS 0,0
UNITS "OFF","ON"
```

Master System Mapping:

- B3:808:0 Maps to Value status for B3:808.
- B3:808:1 Maps to Offline status for B3:808.
- B3:808:2 Maps to Object Defined status for B3:808.
- B3:808:3 Maps to Reliability status for B3:808.

Commands from the Master System

As a slave to a master system, the Network Port supports four basic PLC commands. The type of PLC determines which commands to use.

Table 6: Metasys Slave Commands

Command Type	PLC-3	PLC-5
Word-Range Write	✓	✓
Word-Range Read	✓	✓
Read-Modify Write		✓
Bit Write	✓	

PLC-3 formatted commands must use logical binary addressing. PLC-5 formatted commands may use binary or ASCII addressing.

In general, program PLC-5s to read values from and write values to a Network Port using PLC-5 messages. However, if the programming language does not allow defining a PLC-5 Word-Range Read or Word-Range Write, you can use the PLC-3 Word-Range Read and Word-Range Write commands.

Note: If the host device is a PLC-5, read and write floating point values using file F8. If the host is a PLC-3, read and write floating point values using file F6. Reads using file F6 return PLC-3 formatted floating point values. Reads using file F8 return PLC-5 formatted floating point values.

All commands to the Network Port are issued from the master PC through the master system's operator interface. The Metasys Operator Workstation cannot send commands to the Network Port.

Word-Range Write

The Word-Range Write command describes several Metasys commands that change the value of an object attribute. The attribute affected is the one specified for the associated input of the Metasys AD or BD object, such as AOS Value.

Refer to Table 24 located in the *Appendix* of this document, for a complete list of attributes per object.

The master system sends a Word-Range Write command to the Network Port. The Network Port converts this command to an equivalent Metasys command.

The Network Port sends BO commands at Priority 8. All other commands are sent at Priority 3.

Although Network Port supports writing up to 238 bytes of data, restrict each write command to command only one object. Do not write to more objects than you want to command. The use of block write commands to control Metasys objects is not recommended and could adversely affect system performance.

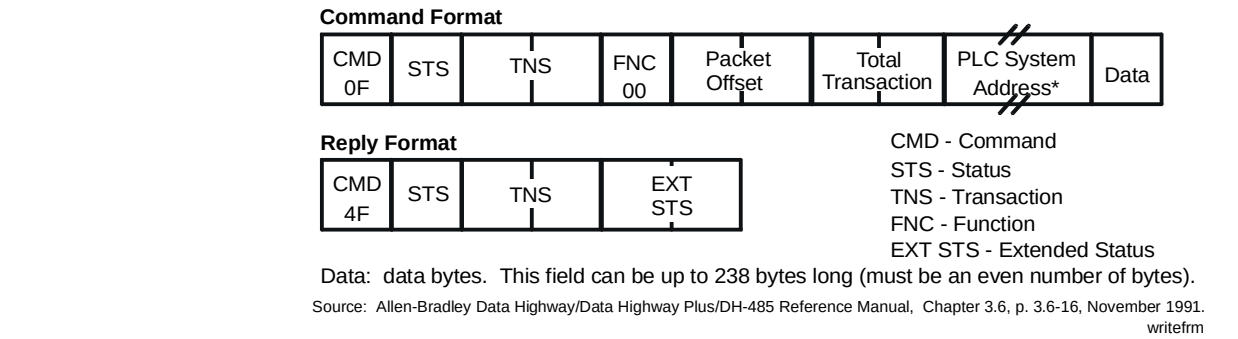


Figure 10: Packet Format for Word-Range Write

Figure 11 shows an example of an actual Word-Range Write command in the message packet format. The system\object name is NETPORT1\810 and the attribute commanded is Value.

Notes: Only the value bit (see Table 5) is set to command the object to a closed state.

For example, given the value read for system\object Netport\810 is **000C**, indicating that it is open, online, defined, and reliable, write the value **000**1 to command the object to a closed value.

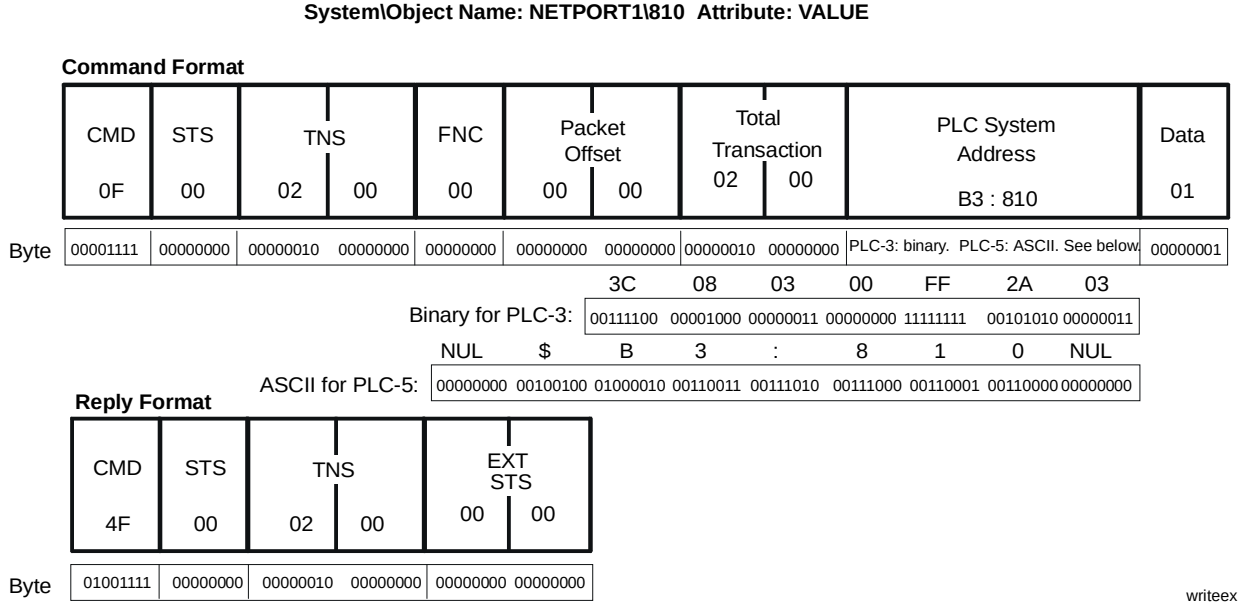


Figure 11: Word-Range Write Example

Word-Range Read

The Word-Range Read command is a read-attribute command, which obtains the readable floating point or binary-attribute value of any Metasys object.

The master system sends the Word-Range Read command to the Network Port. The Network Port retrieves the value of the attribute from its database manager, which keeps the values of all floating point and binary readable attributes of all defined objects current. In this way, the database manager ensures that the Network Port does not wait for a value to be returned over the N1 LAN when the master system requests the value. The value is transmitted to the master for display.

Refer to Table 24 located in the *Appendix* of this document.

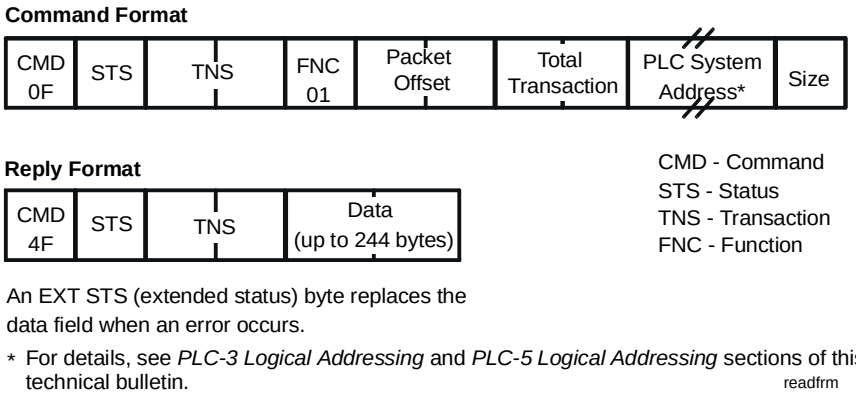


Figure 12: Packet Format for Word-Range-Read

Figure 13 shows an example of a Word-Range Read command in the message packet format. The system\object name is NETPORT1\810 and the attribute read is the attribute mapped into the BD object.

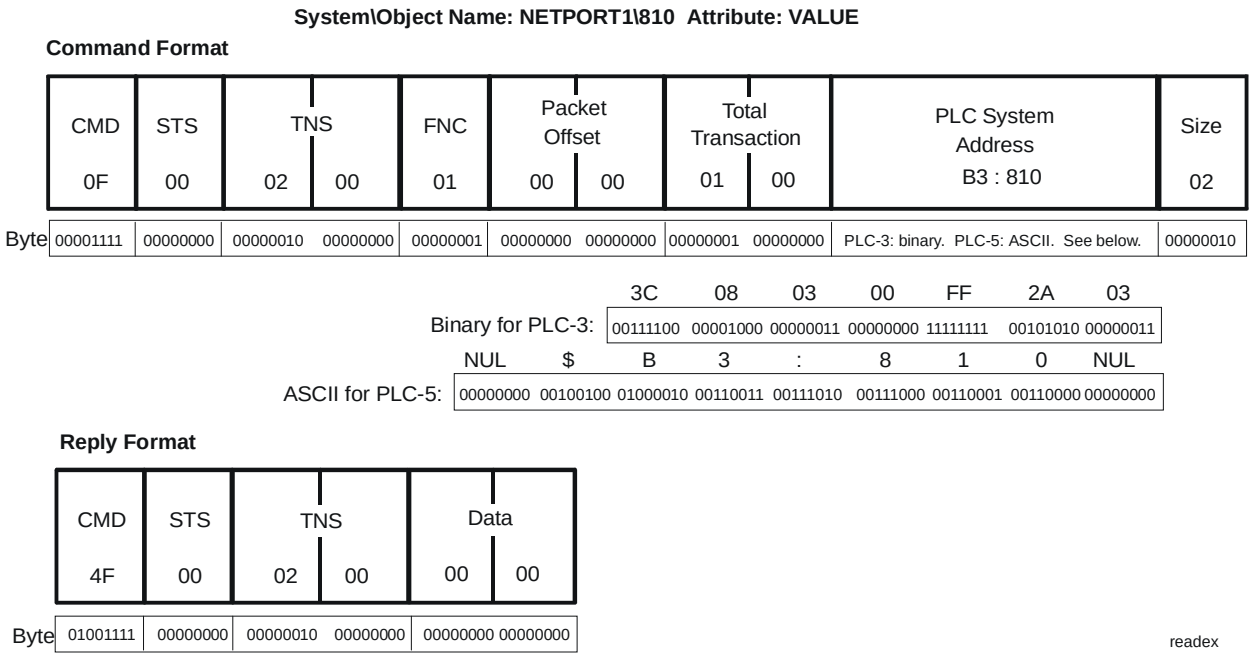


Figure 13: Word-Range Read Example

Read-Modify Write

The Read-Modify Write command is for binary data objects only. This command describes any one of several commands, which the Network Port converts to an equivalent Metasys system command. The Read-Modify Write command applies an AND mask, then an OR mask, to the current value prior to the write.

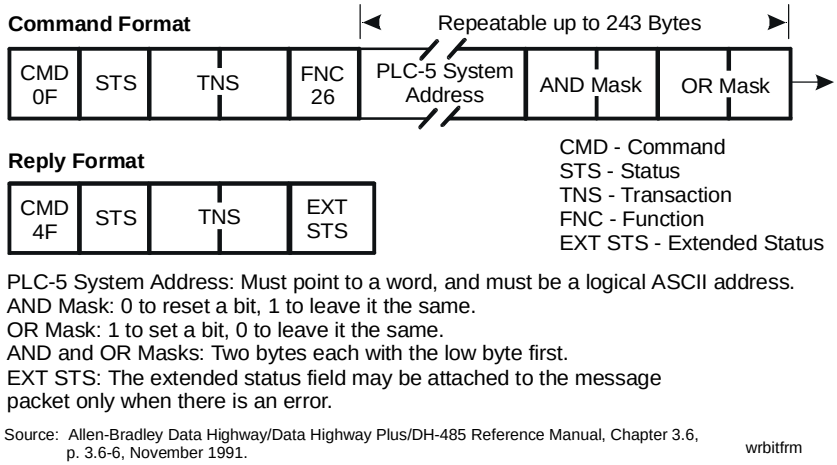


Figure 14: Packet Format for Read-Modify Write

Figure 15 shows an example of a Read-Modify Write command in the message packet format. The system\object name is NETPORT1\925 and the attribute commanded is the attribute mapped into the BD object.

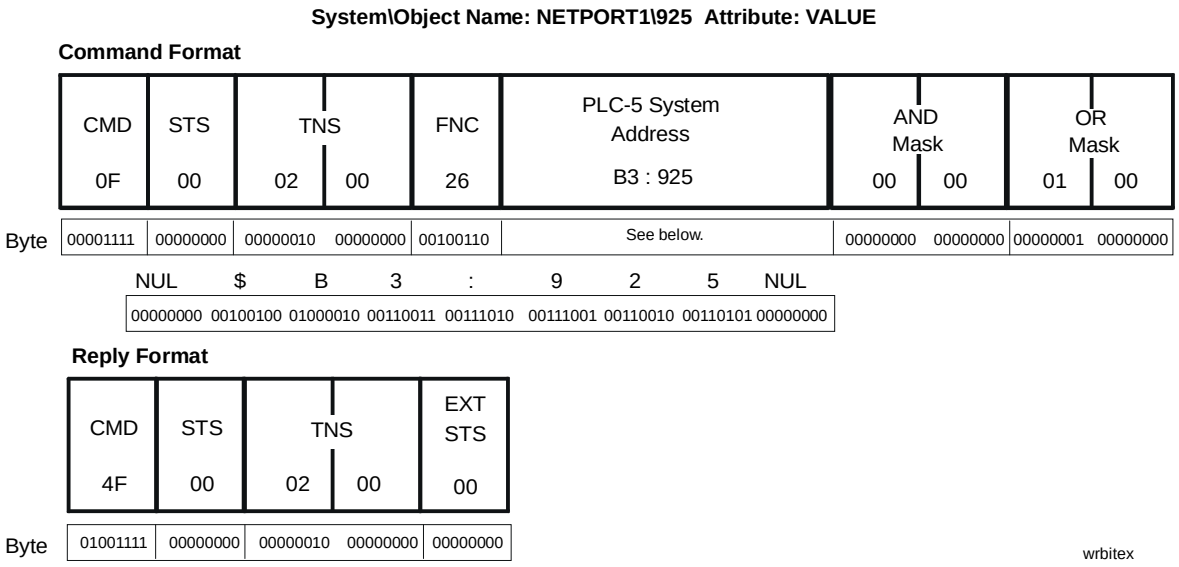


Figure 15: Read-Modify Write Example

Bit Write

The Bit Write command is for binary data objects only. This command describes any one of several commands that the Network Port converts to an equivalent Metasys system command. The Bit Write command applies a Set mask, then a Reset mask, to the current value prior to the write.

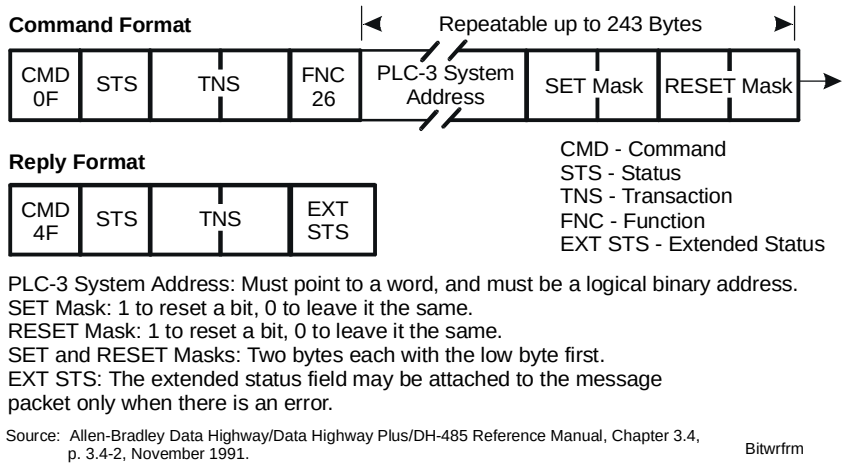


Figure 16: Packet Format for Bit Write

Figure 17 shows an example of a Bit Write command in the message packet format. The system\object name is NETPORT1\925 and the attribute commanded is Value.

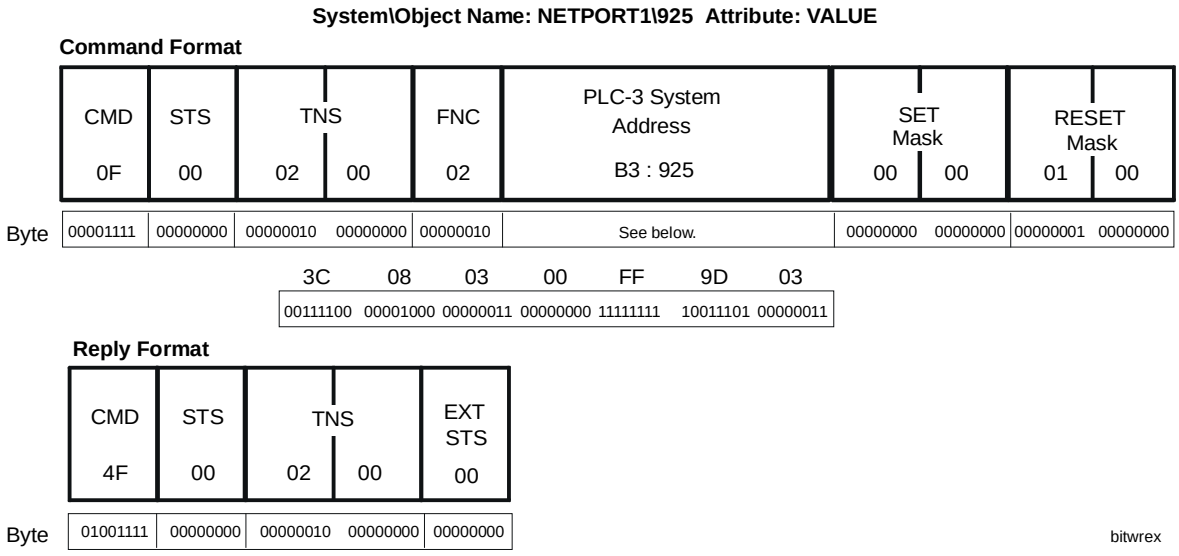


Figure 17: Bit Write Example

PLC-3 Logical Addressing

The Network Port only supports PLC-3 logical binary addressing schemes. Figure 18 is an example of the addressing scheme structure. Logical binary addressing represents the file number and element number with binary values. See Table 7 for the reserved file numbers. Within the Network Port, four levels of binary addressing are supported.

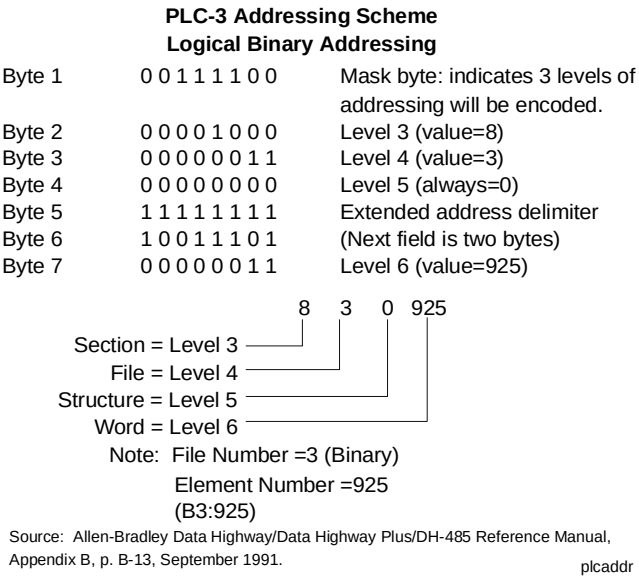


Figure 18: Example of Logical Binary Addressing

Table 7: Reserved PLC-3 File Numbers

Network Port Reserved File Numbers	PLC-3 File Type	Element Numbers
5	Integer	0-799
6	Float	0-799
8	Binary	800-4799
10	Reserved by Johnson Controls for ASCII read and write messages	0-200
13	Status, e.g., date and time	0-23

PLC-5 Logical Addressing

The Network Port supports PLC-5 logical binary and logical ASCII addressing schemes. Figure 19 is an example of logical ASCII addressing. Logical ASCII addressing represents the file number and element number with ASCII characters. See Table 8 for reserved file numbers. Within the Network Port, two levels of ASCII addressing are supported.

Note: Figure 18 and Figure 19 are expansions of the PLC System Address field mentioned in Figure 11 through Figure 17. The address for Figure 11 and Figure 13 is B3:810. The address for Figure 15 and Figure 17 is B3:925.

PLC-5 Addressing Scheme
Logical ASCII Addressing

		ASCII	Hex
	Byte 1	Nul	00
	Byte 2	$	24
File Number	Byte 3	F	46
File Number	Byte 4	8	38
	Byte 5	:	3A
	Byte 6	8	38
Element Number	Byte 7	1	31
Element Number	Byte 8	0	30
	Byte 9	Nul	00

Source: Allen-Bradley Data Highway/Data Highway Plus/DH-485 Reference Manual, Appendix B, p. B-13, September 1991.

asciiadr

Figure 19: Example of PLC-5 Logical ASCII Addressing

Table 8: Reserved PLC-5 File Numbers

Reserved File Numbers*	PLC-5 File Type	Element Numbers
2	Status, e.g., date and time	0-23
3	Binary	800-4799
7	Integer	0-799
8	Float	0-799
10	Reserved by Johnson Controls for ASCII read and write messages	0-200

* Assume these file types unless ASCII addressing specifies the file type. In this case, the character S specifies status, B specifies binary, N specifies integer, F specifies floating point, and A specifies ASCII.

Command Conventions

The field size parameter in PLC point command conventions can command multiple objects through a single command. For example, the command parameters for B3:810:5 mean:

B3 = Binary, default file 3

810 = Element Number = Metasys Object Name

5 = Number of consecutively addressed objects to command

The last parameter in B3:810:5 commands five points: B3:810, B3:811, B3:812, B3:813, and B3:814. Use this feature to monitor large blocks of data within the Metasys Network.

The convention for the PLC-3 Bit Write command only allows writing to one word at a time. With a PLC-3 Bit Write command, each Metasys object commanded requires a separate command from the master control system or device.

COS Reporting

The printer or PC connected to the Network Port RS-232 serial port receives Change-of-State (COS) reports and summaries in the same manner as a printer or PC connected to the NCM. This output, which defines the device as an output destination, can originate from the Network Port, an NCM, or a PC on the network. The master PC or device cannot send COS reports to the Metasys Network.

Exception-based reporting such as COS does not occur between the Metasys Network and the ABDH+ network. For example, if a mapped object goes into Alarm, the Network Port does not notify the master PC. Similarly, the master PC does not notify the Network Port of changes-of-state on the data highway. The master control system scans the objects in the Network Port's database and performs all necessary alarm processing. Refer to the master system literature for details.

Routing Metasys Reports to a Master System

Reports can be routed to a master control system, when a printer is defined, using Port 0. The First-In First-Out (FIFO) queue at the Network Port saves up to 100 report files, and is sent to this pseudo printer. The master control system sends the Word-Range Read message to request each report. Specify a file size within 201 characters. The Network Port responds with the oldest Metasys report.

When the report response message is sent, the message is removed from the queue. If more elements are requested than are in the report, the remaining elements are initialized to spaces.

The oldest queued message is discarded if a new Metasys report message is received while the queue is full.

Metasys reports sent to a master are formatted in the same way the report is output to a printer. Each report includes the Metasys time stamp and each can use up to 201 characters or 101 elements. If fewer elements are requested than are included in the report, the report is truncated.

If not truncated, reports are terminated with a null, and the value of the element following the last valid report character is a zero. The values of all remaining requested characters are spaces.

When the queue has no reports, the first element is a null.

Mapping Current Date and Time

Through Network Port, the host computer can use the Metasys system date and time. This data is read-only; the host cannot update the date and time with a Word-Range Write command.

Table 9: Mapping to Current Date and Time

File: Element	Description	Range
$S2:18	Year	Offset by 1900
$S2:19	Month	1-12
$S2:20	Day	1-31
$S2:21	Hour	0-23
$S2:22	Minute	0-59
$S2:23	Seconds	0-59

Network Port Operation

Network Port functions depend on the master control system PC or device. Master system functions:

- display the value of any defined Metasys object that is mapped to the master system
- command objects
- start and stop equipment manually
- set an analog or binary data value
- set a PID Loop value
- set Control System (CS) object attribute values

Instructions

To perform any Network Port task:

1. Log on at the master PC.

   Note: Follow the standard log on procedure. The password at the master does not have to match a Metasys password.

2. Enter a command to perform a Metasys function, such as obtaining an object value or starting a fan.

Three PLC-3 commands are:

- Word-Range Write (various Metasys commands)
- Word-Range Read (Metasys Read Attribute command)
- Bit Write (various Metasys Binary commands)

Three PLC-5 commands are:

- Word-Range Write (various Metasys commands)
- Word-Range Read (Metasys Read Attribute command)
- Read-Modify Write (various Metasys commands)

Apply a Word-Range Write, Read-Modify Write, or Bit Write command only to certain attributes of an object. The *Appendix* lists the attributes that can be commanded in this way.

The Word-Range Read command can obtain the value of any readable attribute that is a floating point or binary type.

Input errors result in error-message output. For a list of error messages, refer to Table 19 and Table 20, located in the *Troubleshooting Procedures* section of this document.

Display or print COS reports and summaries from the local device (PC or printer) connected to the RS-232 serial port of the Network Port.

Note: The Metasys Network recognizes the master PC as a gateway interface. When the master PC issues a command to a Metasys AD or BD object, the History Data window for the associated input of the object indicates Gateway as the feature ID. Similarly, in the focus window for the object, the Commanded Feature indicates Gateway.

Network Port as Master

Data Objects

When the Network Port acts as a master, Metasys objects reference data from a slave system through AD, BD, and MSD objects resident in the Network Port. Associated inputs must be defined for each object referencing data from a slave system. The associated object name provides the routing information. The data objects within the Network Port are given object names consistent with DH+ file type, file number, and element number naming conventions.

Through the use of Metasys data objects, the Network Port polls the server system for data values. The Network Port also routes string data as Metasys reports.

Metasys objects referencing data from a slave system must be defined at the Network Port NCM using the existing DDL, online, and GPL techniques for Network Port's database generation. Objects have no special system naming requirements.

Network Port Interaction with Slave System

Figure 20 defines the interactions and functions of the Network Port as master and the other control system or device as the slave. The Network Port can send a command to the slave system①. The slave system returns a value②. The value is displayed though the Operator Workstation③. See Table 10 for the communication parameters used by the Network Port.

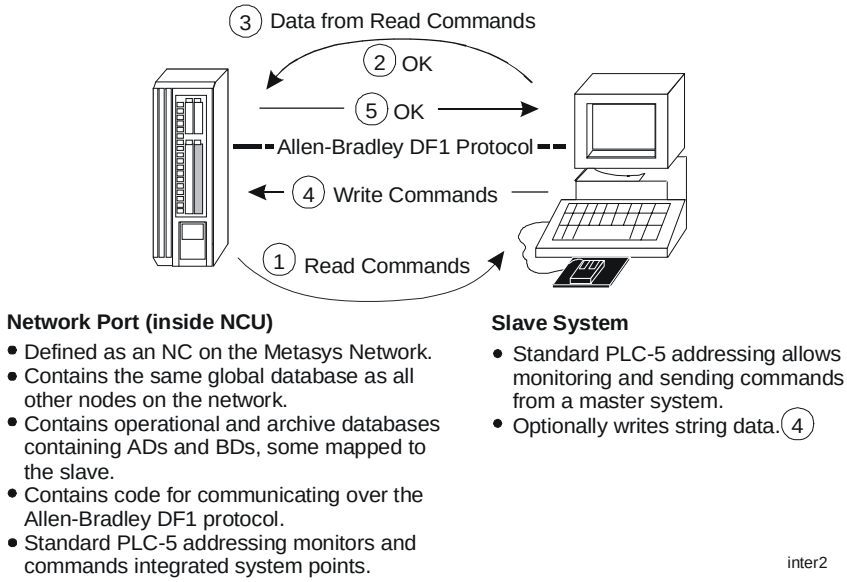


Figure 20: Network Port to Slave System Interaction

Table 10: Network Port Client DF1 Communication Parameters

DF1 Communication Parameter	Setting
Poll delay	0 ms
Time-out to receive acknowledgment message	3 seconds
Maximum retries for no responses	3
Maximum inquiries	3
Link layer checksum	BCC
Duplicate messages	Ignore

Mapping to a Slave System

To reference data from an Allen-Bradley slave, the following information is required:

- PLC type
- destination address
- file number and type
- element number for value and status

A pseudo object must define all routing information for each. Each object referencing an element must include an associated input defining the file-routing information. Many objects can reference the same associated input.

Associated System Naming

Associated system name input must be formatted `PLCi_ddd`.

Table 11: Associated System Name Definition

Field	Required Field	Description	Format	Range
PLCi	Yes	PLC type	PLC-5	N/A
_	Yes	Delimiter	Any character, underscore recommended	N/A
ddd	Yes	Destination Address	Three digit octal number with leading zeros	000-377

Associated Object Naming

Object names have two sets of file types and file numbers, formatted `tnnntnnn`. Refer to Table 12.

The first file type is the value elements location. The second file type is the status elements location.

Note: Do not define a file number more than once using different file types to access data from the same PLC device.

Table 12: Associated Object Definition for Objects

Field	Required Field	Description	Format	Range
t	Yes	File Type, Includes Value Element Location	B=Binary N=Integer F=Floating Point	N/A
nnn	Yes	File Number, Includes Value Element Location	3-character integer with leading zeros	000-999
t	No	File Type, Includes Status Element Location	B=Binary N=Integer	N/A
nnn	No (Required if any objects include status element.)	File Number, Includes Status Element Location	3-character integer with leading zeros	000-999

Table 13: Recommended Object Attributes

File Type	Object Type	Associated Input Type	Attribute
F (Float)	AD	AD	Value
N (Integer)	AD	AD	Value
	BD	AD	History
	MSD	AD	Status
B (Boolean)	BD	BD	Value

Defining Objects

This section explains how to define AD, BD, and MSD objects, with Network Port as a master using DDL, GPL, or the Operator Workstation. Define a status element for every object that can report trouble. Also, if connecting to slave devices via an interface, define a status for every object to allow monitoring offline and reliability. See Table 14.

Table 14: Metasys Bit Requirements for Status Elements

Bit	Status Indicator	Units	Object Types
0	Unused	N/A	N/A
1	Offline	1= Offline 0= Online	AD, BD, MSD
2	Object Defined	1= Not Defined 0= Defined	AD, BD, MSD
3	Reliability	1= Unreliable 0= Reliable	AD, BD, MSD
4	Trouble Status	1= Trouble 0= Not Trouble	BD, MSD
5 to 15	Reserved for future use for BDs, ADs, and MSDs.	N/A	N/A

Data Point Details

BD Points

Binary Data point object names must be formatted `xeeebsss`. Refer to Table 15. Each element referenced by a BD object for status must use bits as described in Table 15.

Table 15: BD Object Name Requirements for Data-Element Referencing

Field	Required Field	Description	Format	Range
x	Yes	Defines read/write point	R for read only W for read and write*	N/A
eee	Yes	DH+ element number of the point's value	Three digit integer	000-999
b	Yes	Value's bit number	Hexadecimal	0-F
sss	Optional	DH+ element number of the point's status	Three digit integer	000-999

* It is recommended that a normal state and warning delay be defined for all write points. If defined, the current command value updates the normal state. The Delay All Alarms field will internally be set to No, independent of the definition.

AD and MSD Points

AD and MSD point object names must be formatted `xeee_sss`. Refer to Table 16. Each element an AD object references for status must use the bits described in Table 16.

Note: If a status element (sss) is not defined, the object defaults to defined, online, reliable, and not in trouble.

Table 16: AD and MSD Object Name Requirements for Objects Referencing Data from a Slave System or Device

Field	Required Field	Description	Format	Range
x	Yes	Defines whether this is a writeable point	R for read only W for Read and Write*	N/A
eee	Yes	Element number of the point's value	Three character integer	000-999
_	Required if next field is specified	Delimiter	Any character, underscore recommended	N/A
sss	Optional	Element number of the point's status	Three character integer	000-999
* It is recommended that a setpoint is defined along with a warning delay for each writeable point. Once defined, the command value will update the setpoint. The Delay All Alarms field will internally be set to No, independent of the definition.				

Defining with DDL

BD Objects

To define BD objects with DDL:

1. Open the NC file and define each BD object. Example:

```
BD "TankFm01","W0100"," "T301 Normal PL"
ASSOCINP "AD","PLC5_001","B003","HISTORY"
```

2. Save the file and exit.
3. Compile the NC file.
4. Define the object in the appropriate PLC database.

AD Objects

To define AD objects with DDL:

1. Open the NC file and define each AD object. Example:

```
AD "OFFICE1","R010_005","COMPRESSOR LOAD AMPS"
ASSOCINP "AD","PLC5_005","N077B003","VALUE"
```

2. Save the file and exit.
3. Compile the NC file.
4. Define the object in the appropriate PLC database.

MSD Objects

To define MSD objects with DDL:

1. Open the NC file and define each MSD object. Example:

```
MSD "VSDPump1","R011_006","Run State"
ASSOCINP "MSD","PLC5_005","N077B003","VALUE"
```

2. Save the file and exit.
3. Compile the NC file.
4. Define the object in the appropriate PLC database.

Defining with GPL

BD Objects

To define BD objects with GPL:

1. Define an associated input for each BD object.
2. Define an alphanumeric system name for each BD object in the control strategy.
3. Define an object name. Refer to Table 15 for object-name format.
4. Save the file.
5. Check and translate the file.
6. Define the object in the appropriate PLC database.

AD Objects

To define AD objects with GPL:

1. If not already defined, define an associated input for each AD object.
2. For each AD object block pasted down in your control strategy, define an alphanumeric system name.
3. Define an object name. Refer to Table 16 for object name format.
4. Save the file.
5. Check and translate the file.
6. Define the object in the appropriate PLC database.

MSD Objects

To define MSD objects with GPL:

1. Define an associated input for each MSD object.
2. Define an alphanumeric system name for each MSD object in the control strategy.
3. Define an object name. Refer to Table 16 for object name format.
4. Save the file.
5. Check and translate the file.
6. Define the object in the appropriate PLC database.

Defining with OWS

Online errors appear while objects are defined on the OWS. In DDL or GPL, errors do not appear until Network Port is downloaded.

AD Objects

Use the standard procedure, but specify an alphanumeric name for the object. Refer to Table 16. Add the analog object to the appropriate PLC database as needed.

BD Objects

Use the standard procedure, but specify an alphanumeric name for the object. Refer to Table 15. Add the binary object to the appropriate PLC database as needed.

MSD Objects

Use the standard procedure, but specify an alphanumeric name for the object. Refer to Table 16. Add the multistate object to the appropriate PLC database as needed.

Mapping Examples

Table 17: Object Definition Example, Network Port as Master

DH+ Elements			Metasys Object		
Value	**Status**	**Description**	**Type**	**Name**	**Associated Object Name**
N50:001	N/A	Meter1 Online	BD	Meter1/R001	PLC5_001/N050
F8:0001	N50:0001	KW	AD	Meter1/R001_001	PLC5_001/F008N050
F8:0002	N50:0001	Power Factor	AD	Meter1/R002_001	PLC5_001/F008N050
F8:0003	N50:0001	kW Hours	AD	Meter1/R003_001	PLC5_001/F008N050
F8:0004	N50:0001	Peak Demand	AD	Meter1/R004_001	PLC5_001/F008N050
B3:0001	N50:0001	Relay 1 Status	BD	Meter1/R0010001	PLC5_001/B003N050
B3:0001	N50:0001	Relay 2 Status	BD	Meter1/R0011001	PLC5_001/B003N050
B3:0001	N50:0001	Relay 3 Status	BD	Meter1/R0012001	PLC5_001/B003N050
B3:0001	N50:0001	Relay 4 Status	BD	Meter1/R0013001	PLC5_001/B003N050
B3:0005	N/A	Reset kW Hours	BD	Meter1/W0050	PLC5_001/B003N050
B3:0005	N/A	Reset Peak Demand	BD	Meter1/W0051	PLC5_001/B003N050
N4:0000	N50:0001	Setpoint Alarm 0=Normal 1=Current Unbalance 1=Voltage Unbalance 2=Over Voltage	MSD	Meter1/R000_001	PLC5_001/N004N050
N50:002	N/A	Meter2 Online*	BD	Meter2/R001	PLC5_001/N050
F8:0101	N50:0002	kW	AD	Meter2/R101_002	PLC5_001/F008N050
F8:0102	N50:0002	Power Factor	AD	Meter2/R102_002	PLC5_001/F008N050
F8:0103	N50:0002	kW Hours	AD	Meter2/R103_002	PLC5_001/F008N050
F8:0104	N50:0002	Peak Demand	AD	Meter2/R104_002	PLC5_001/F008N050
B3:0101	N50:0002	Relay 1 Status	BD	Meter2/R1010002	PLC5_001/B003N050
B3:0101	N50:0002	Relay 2 Status	BD	Meter2/R1011002	PLC5_001/B003N050
B3:0101	N50:0002	Relay 3 Status	BD	Meter2/R1012002	PLC5_001/B003N050
B3:0101	N50:0002	Relay 4 Status	BD	Meter2/R1013002	PLC5_001/B003N050
B3:0105	N/A	Reset kW Hours	BD	Meter2/W1050	PLC5_001/B003N050
B3:0105	N/A	Reset Peak Demand	BD	Meter2/W1051	PLC5_001/B003N050
N4:0100	N50:0002	Setpoint Alarm 0=Normal 1=Current Unbalance 1=Voltage Unbalance 2=Over Voltage	MSD	Meter2/R100_002	PLC5_001/N004N050

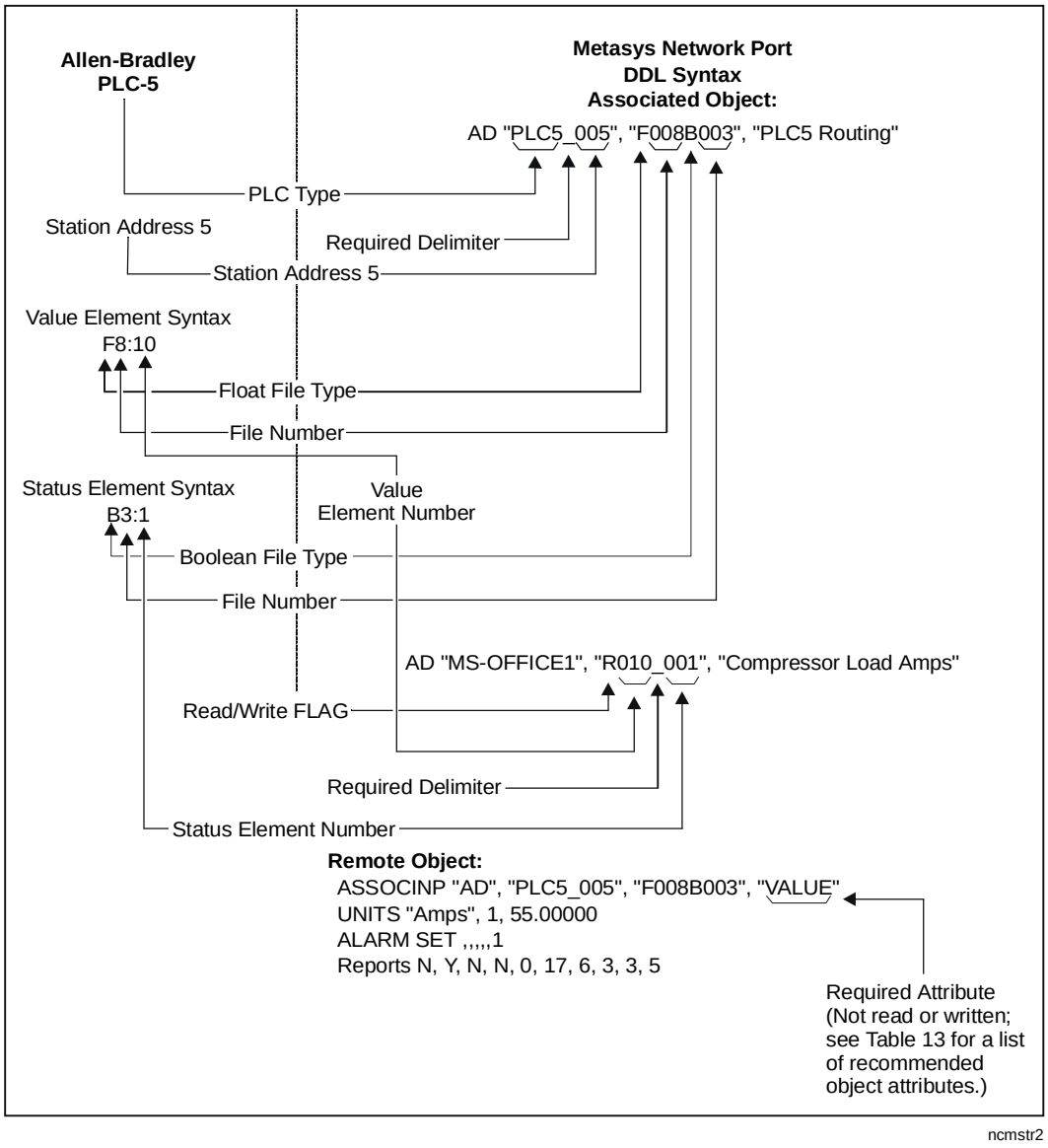


Figure 21: Metasys DDL to PLC-5 AD Object Mapping Example

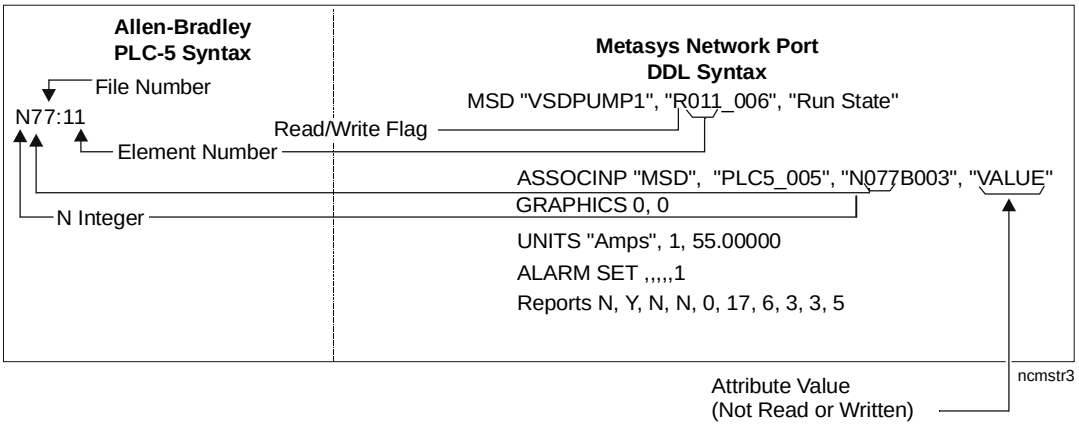


Figure 22: Metasys DDL to PLC-5 MSD Object-Mapping Example

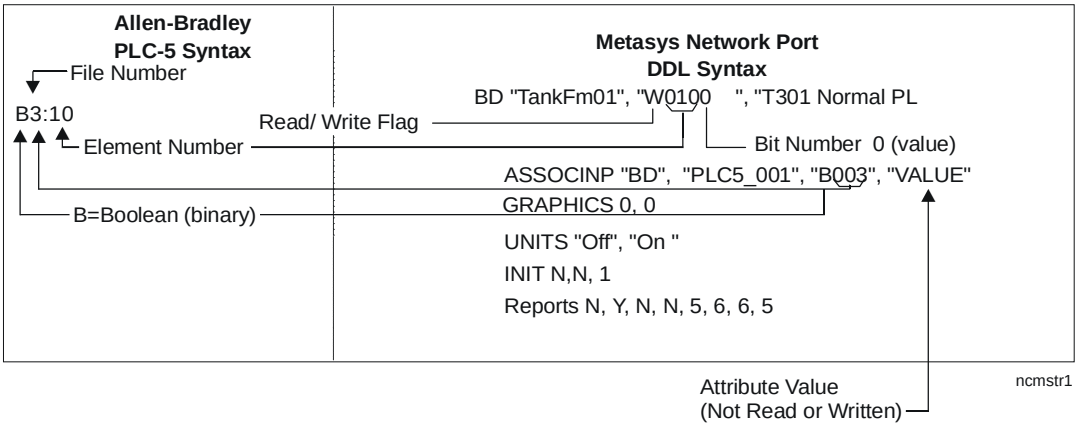


Figure 23: Metasys DDL to PLC-5 BD Object Mapping Example

Commands to a Slave System

All DH+ messages initiated by the Network Port use ASCII addressing. The Network Port requests data using the DH+ Word-Range Read messages. For each object, Network Port reads:

- an element that includes the value. The data from the value element updates the value of the BD, MSD, or AD object in the same way a value from an associated input updates the value of a BD or AD object.
- if defined, an element that includes the status of the element. If a status element is specified, the object's status may be updated to offline if the element is not defined or is offline. The value may be unreliable if the status element indicates that the value element's data is unreliable.

Element data is read in blocks using the maximum 60 sequential floating or integer point elements, and up to 960 Booleans per read (see Figure 12 for Word-Range Read message information).

All SET_BD, SET_MSD, SET_AD, and OVERRIDE commands are sent as the appropriate DH+ write command for objects flagged as writeable.

COS Reporting

COS reporting is supported for data elements from a slave system referenced by AD, BD, and MSD objects. The value from the slave system is the current value if no Override command is in effect. While overridden, the object's value is the overridden value. Otherwise, the value of the object is the value read from the slave system. For BD and MSD objects, the normal condition attribute is automatically updated to be the command value from the Metasys system. If the object's value does not update within the time-out to the commanded value, it reports an alarm state.

Additional information about COS reporting is:

- All COS processing is supported as defined for standard AD, BD, and MSD objects.
- Network Port BD and MSD objects support the trouble status. However, BD objects that latch alarms do not require an Unlatch command to clear a trouble status.
- All values reported for AD and MSD objects read from file type N are handled as signed integer values.
- For MSD objects, a value read from the slave system that is less than 0, updates the MSD value to 0. A value greater than, or equal to, the number of configured states updates the MSD value to the number of configured states -1. For example, if the number of configured states is 4 and a value of 4 is reported, the MSD displays a value of 3.
- Since the associated input is used only to store routing information, the associated inputs are not scanned.

ASCII Data Routed to the Metasys System

ASCII data from an integrated system can be routed as a Metasys generic report. The report text field accepts up to 60 ASCII data characters. Characters beyond the 60 limit are truncated. Every report is associated with the local Network Port NCM object name. Therefore, each report is routed as a CRIT2 report using hardware report defaults.

Note: For integrations using a Metasys Network Integrator, split messages as required.

Reports with the object name of the local Network Port NCM are not routed to the integrated system. This prevents reports generated from an integrated system from being routed back to it. See the *Routing Metasys Reports to a Master System* section in this technical bulletin for additional information.

Each report is time-stamped with the time it is received at the Network Port NCM. Reports are written to the Network Port using the Word-Range Write command (see Figure 10) and file number 10 (see Table 8).

Note: The Network Port has no actual ASCII file.

Commanding Objects

When the Network Port is the master, command the objects mapped to the slave system in the same manner as any other Metasys objects. Use any standard Metasys device, such as an Operator Workstation, Network Terminal, Operator Terminal, etc.

Table 18: Metasys Master Command Translation to System DH+ Write Messages

		Metasys Object	
Type	**Commands**	**File Types**	**PLC-5 Command**
AD	Set_AD and Override	Float or Integer	Word-Range Write (See Figure 10.)
BD	Set_BD and Override	Boolean or Integer	Read-Modify-Write (See Figure 14.)
MSD	Set_MSD and Override	Integer	Word-Range Write (See Figure 10.)

If defined, the normal state for BDs and MSDs is updated with the command value. Define an alarm delay to prevent the object from reporting an alarm status.

The setpoint for ADs is updated with the command value if warning limits are defined. Define a warning delay to prevent the object from reporting warning status.

History reports are not re-issued for commands to BD and MSD objects. Instead, the report is issued when the object changes state or status.

Note: Unlatch commands are not issued to the slave system.

Troubleshooting Procedures

Methods of troubleshooting the Network Port are the same as those for the NCM. For complete troubleshooting information, refer to the respective technical bulletins. For NCM200 hardware, refer to the *Network Control Module 200 Series Technical Bulletin (LIT-636025).* For NCM300/350 hardware, refer to the *Network Control Module 300 Series Technical Bulletin (LIT-6360251).* Both documents are found in the *Metasys Network Technical Manual (FAN 636).*

Additional Diagnostics

Metasys DDL does not verify Network Port specific errors. If a Network Port database download fails or a value does not update, a remote object may be incorrectly defined.

Value Not Updated

Find Duplicate Associated Object Attributes (objects named 800 to 3999 only)

If a BD object named 800 to 3999 has a reliable value but the value is not the current value of the associated object attribute, there may be more than one BD object referencing the attribute. Only the last one added is kept updated. To find it, search the Network Port DDL for the associated object attribute and delete all but the required reference. Determine if it is a diagnostic point.

Note: The Network Port NCM does **not** support the NCM diagnostic mapping explained in the *Analog Data (AD) Technical Bulletin (LIT-636078).*

Correcting Objects

Display Object Error Messages

To list the download error messages:

1. Open NCSETUP for Windows.
2. Select the Reboot on Download Error field from the NOVRAM View and Modify window.

Note: For more information, see the *NOVRAM View and Modify* section in the *NCSETUP for Windows Technical Bulletin (LIT-6360251d).*

3. Select NCM from the Metasys system map to display the NCM error log file.
4. Select Action/Diagnostics.

5. Select Task/Error from the Diagnostics window. The log lists three error messages for the last object downloaded:
   - Log error 555 includes the reference ID of the object that failed.
   - Log error 556 includes the error status number as listed in Table 19.
   - Log error 557 includes the Point Type (AD, BD, or MSD).
   - Log error 573 includes the object name of a duplicated slave object.

Find the Failed Object for Log Error 555

To find the failed object:

1. Run WDRI.EXE located in c:\fms\bin to start the Dump command.
2. Select [H] REF_SEG_TABLE from the main Dump window.
3. Find the Reference ID (RID) record for the object that failed to download.
4. Convert the RID to hexadecimal.
5. Select the segment that is equal to the high byte.
6. Convert the low byte to decimal. Continue to the next screen (low byte - 1) times. The failed object has references filled in for every field but the record number.

   For example, given an RID of 620, the hexadecimal value is 26C. Select Segment 2 and continue to the next screen 107 (6C - 1) times.

Table 19: Network Port Log Error Status Number Messages

Error Status Number	Error Message Text
5400	Invalid Object Name: First character is Read/Write Flag (R or W).
5401	Invalid Object Name: Element Number (2nd-4th character) Decimal range is 000-999.
5402	Invalid Object Name: Status Element (6th-8th character) Decimal range is 000-999.
5403	Invalid Object Name: Bit Number (5th character) Hexadecimal range is 0-F.
5404	Invalid Associated Input System Name: PLC Device Mismatch
5405	Invalid Associated Input System Name: PLC Address (6th-8th characters) Octal range is 000-376.
5406	Invalid Associated Input Object Name: First character is File Type (B, F, or N).
5407	Invalid Associated Input Object Name: Invalid File Number Decimal range is 000-999.
5408	Invalid Associated Input Object Name: Fifth character is Status File Type (B or N).
5409	Invalid Associated Input Object Name: Invalid Status File Number Decimal range is 000-999.
5410	Invalid Object Name: Missing Delimiter (_ or -) Between Elements
5411	Invalid Object Name: PLC File Element Already Defined
5412	Invalid Associated Object Name: File_Type_Mismatch
5413	Invalid Associated System Name: PLC octal address can’t be equal to NCM decimal address.

Resolving Error Messages

The master PC prompts an error message when an invalid command is entered (Table 20).

Table 20: Network Port Errors and Corrective Action

DF1 Error Number	Error Message	Cause	Solution
1	`A field has an illegal value`	A Word-Range Write or Read-Modify Write command is issued from the master to an undefined Metasys object.	Specify a defined object and try again. (This message is from an existing PLC-5 error code.)
6	`Address Contents Unusable`	A Word-Range Read is issued from the master to request data before the Network Port has initialized all object values.	Try again later.
16	`Scanner unable to communicate to 1771`	A Word-Range Write or Read-Modify Write command is issued from the master to an offline Metasys object. (This message is from an existing PLC-5 error code. The numbers “1771” refer to the Allen-Bradley I/O scanner module, catalog number 1771-ASC.)	Place the object online and try again.

Note: If you issue a Word-Range Read command from the master to an undefined Metasys analog object, the value returned is: `99999.9`.

Ordering Information

The Network Port may use either the NCM200, NCM300, or NCM350 hardware. The NCM350 has replaced the NCM200 and NCM300. Refer to the appropriate table below.

Table 21: Product Code Numbers for NCM200 Network Port

Description	Product Code Number
Network Port (repair)	NU-NCM201-701
Network Identity Module 206*	NU-NIM206-1
Power Supply Module	NU-PWR101-0
RS-232 Cable 35 ft (right-angle with narrow profile)	NU-CBL101-0
Male Hood Kit for NU-CBL101-0	MHK-101-0
Female Hood Kit for NU-CBL101-0	FHK-101-0
Battery Submodule	NU-BAT101-0
* The Network Identity Module is required only for the NU-NCM200-1 and NU-NCM200-701. It is included in the NU-NCM201-1 and NU-NCM201-701.	

Table 22: Product Code Numbers for NCM300 Network Port

Description	Product Code Number
Network Port (repair part for NCM300)	NU-NCM300-701
Replacement Battery Pack	NU-BAT300-1

Table 23: Product Code Numbers for NCM350 Network Port

Description	Product Code Number
Network Port (using NCM350-8)	NU-NCM350-8
Network Port (repair part for NU-NCM350-1)	NU-NCM350-701
Network Port (repair part for NU-NCM350-8)	NU-NCM350-708
Replacement Power Supply Module	NU-PWR350-8
Replacement Battery Pack	NU-BAT300-1

Note: When returning the Network Port for repair, include the battery submodule or pack (NU-BAT101-0 or NU-BAT300-0) with the return shipment.

Do not return any other submodules with a Network Port.

For more information on returning a defective Network Port, refer to the *Material Return and Allowance Program* documented in the *Materials Management Manual (FAN 627.5).*

Appendix

This section contains Network Port reference information, including the following:

- sample DDL file
- error message handling
- list of writeable attributes
- list of readable attributes

Sample DDL Files

Network Port as a Slave

The following is a sample DDL source file for the Network Port as a slave. This DDL file serves as the database for the Network Port. For details on creating and compiling DDL source files, refer to the *DDL Programmer's Manual (FAN 630).*

```
@NC "NTT1","NETWORK_PORT"
*============================================================
* EXAMPLE DATABASE DEFINITION FILE FOR NETWORK PORT.
* THIS FILE SERVES AS THE SOURCE FOR THE DOWNLOAD TO THE
* NETWORK PORT FOR ITS DATABASE. THE NETWORK PORT THEN
* SERVES AS DATA SERVER BY PERIODICALLY SCANNING THE
* OBJECTS (ASSOCINP) DEFINED WITHIN THE GIVEN DATA POINT
* (AD or BD).
*
*
* FILENAME: NETPORT.DDL
*
*------------------------------------------------------------
* DDL DATABASE DEFINITION RULES FOR NETWORK PORT DATABASE:
* (1) ANY TYPE OF OBJECT CAN BE DEFINED, BUT ONLY ANALOG
DATA
*  AND BINARY DATA OBJECTS CAN BE MAPPED TO THE HOST
* (2) AD OBJECT NAMES MUST BE NUMERIC ONLY FROM 0 TO 799.
* (3) BD OBJECT NAMES MUST BE NUMERIC ONLY FROM 800 TO 3999.
* (4) SYSTEM NAME CAN BE ANY ALPHANUMERIC VALUE.
*
*------------------------------------------------------------
*PLC5 value element at F8:0 or N7:0, status element at
*F8:4000 or N7:4000
AD "NETPORT1","0","OUTDOOR AIR TEMP"
 ASSOCINP "AI","BUILDA","AIRTEMP","VALUE"
 UNITS "Deg F",1
*
```

```
*PLC5 value element at F8:1 or N7:1, status element at
*F8:4001 or N7:4001
AD "NETPORT1","1","DISCHARGE AIR TEMP"
 ASSOCINP "AI","BUILDA","DIS_TMP","VALUE"
 UNITS "Deg F",1
*
*PLC5 value element at F8:2 or N7:2, status element at
*F8:4002 or N7:4002
AD "NETPORT1","2","DISCHARGE AIR HUMIDITY"
 ASSOCINP "AI","BUILDA","DIS_HUM","VALUE"
 UNITS "% RH",1
*
*PLC5 value element at F8:3 or N7:3, status element at
*F8:4003 or N7:4003
AD "NETPORT1","3","DISCH SETPOINT HI LIMIT"
 ASSOCINP "AI","BUILDA","DIS_HLIM","VALUE"
 UNITS "Deg F",1
*
*PLC5 value element at F8:4 or N7:4, status element at
*F8:4004 or N7:4004
AD "NETPORT1","4","DISCH SETPOINT LO LIMIT"
 ASSOCINP "AI","BUILDA","DIS_HLIM","VALUE"
 UNITS "Deg F",1
*
*PLC5 value element at F8:5 or N7:5, status element at
*F8:4005 or N7:4005
AD "NETPORT1","5","VALVE HI FOR DEHUMID"
 ASSOCINP "AI","BUILDA","CLG_HIGH","VALUE"
 UNITS "% Open",1
*
*PLC5 value element at F8:6 or N7:6, status element at
*F8:4006 or N7:4006
AD "NETPORT1","6","VALVE LO FOR DEHUMID"
 ASSOCINP "AI","AHU-2A","CLG_LOW","VALUE"
 UNITS "% Open",1
*
*PLC5 value and status element at B3:800
BD "NETPORT1","800","RETURN FAN1 STATUS"
 ASSOCINP "BI","BUILDB","RF1_STAT","VALUE"
 UNITS "OFF","ON"
*
*PLC5 value and status element at B3:801
BD "NETPORT1","801","SUPPLY FAN1 STATUS"
 ASSOCINP "BI","BUILDB","SF1_STAT","VALUE"
 UNITS "OFF","ON"
*
*PLC5 value and status element at B3:802
BD "NETPORT1","802","RETURN FAN2 STATUS"
 ASSOCINP "BI","BUILDB","RF2_STAT","VALUE"
 UNITS "OFF","ON"
*
*PLC5 value and status element at B3:803
BD "NETPORT1","803","RETURN FAN3 STATUS"
 ASSOCINP "BI","BUILDB","RF3_STAT","VALUE"
 UNITS "OFF","ON"
*
*PLC5 value and status element at B3:804
BD "NETPORT1","804","SUPPLY FAN2 STATUS"
 ASSOCINP "BI","BUILDB","SF2_STAT","VALUE"
 UNITS "OFF","ON"
*
*PLC5 value and status element at B3:805
BD "NETPORT1","805","FREEZE INDICATION"
 ASSOCINP "BI","BUILDB","LOW_LIMT","VALUE"
 UNITS "NORMAL","ALARM"
```

```
*
*PLC5 value and status element at B3:806
BD "NETPORT1","806","PRIMARY CHLR PUMP STATUS"
 ASSOCINP "BI","BUILDB","CHR_STAT","VALUE"
 UNITS "OFF","ON"
*
*PLC5 value and status element at B3:811
BD "NETPORT1","811","OA ECONOMIZER"
 ASSOCINP "BI","BUILDB","ODA_ECON","VALUE"
 UNITS "OFF","ON"
*
*PLC5 value and status element at B3:812
BD "NETPORT1","812","SUPPLY FAN3 STATUS"
 ASSOCINP "DCM","NC1_HW","DCM_1","OFFLINE"
 UNITS "OFFLINE","ONLINE"
*
* STANDARD METASYS OBJECTS DEFINED ON NETWORK PORT
*
DCM "AHU-1", "CONTROL", "DCM 1 IN 2-SLOT"
 ADDRESS 1, 1, 3
 GRAPHICS 0, 0
 REPORT N, N
*
BO "AHU-1", "SF-CTRL", "Supply Fan Start/Stop"
 HARDWARE "AHU-1", "CONTROL"
 GRAPHICS 0, 1
 DCMHW 1, 3, 200, Y
 UNITS "OFF", "ON", N, Y, N
 RESET Y
 TIMER 5, 1, 0, 255
 FEEDBACK "AHU-1", "SF-STAT", Y
 REPORT N, Y, N, N, , 6, 0, 4
*
BO "AHU-1", "RF-CTRL", "Return Fan Start/Stop"
 HARDWARE "AHU-1", "CONTROL"
 GRAPHICS 0, 2
 DCMHW 1, 4, 200, Y
 UNITS "OFF", "ON", N, Y, N
 RESET Y
 TIMER 5, 1, 0, 255
 FEEDBACK "AHU-1", "RF-STAT", Y
 REPORT N, Y, N, N, , 6, 0, 5
*
```

```
BI "AHU-1", "SF1_STAT", "Supply Fan Status"
 HARDWARE "AHU-1", "CONTROL"
 GRAPHICS 0, 0
 DCMHW 3, 1, 1, 2,
 INIT N, 2, 10
 UNITS "OFF", "ON"
 REPORT N, Y, Y, N, 0, 6, 2, 5
*
AI "AHU-1", "OAT", "Outside Air Temperature"
 HARDWARE "AHU-1", "CONTROL"
 GRAPHICS 0, 0
 DCMHW 2, 1
 RANGE 1
 UNITS "DEG F", 1
 SPANS 25.10000, 115.0000, -20.00000, 120.0000
 ALARMSET , , , , , 1
 REPORT N, Y, N, N, 0, 0, 6, 3, 2, 5
*
AI "AHU-1", "RETURN", "Return Air Temperature"
 HARDWARE "AHU-1", "CONTROL"
 GRAPHICS 0, 5
 DCMHW 1, 1
 RANGE 1
 UNITS "DEG F", 1
 SPANS 25.00000, 115.0000, 50.00000, 100.0000
 ALARMSET 3.000000, 75.00000, 30.00000, 45.00000, 95.00000, 1
```

Network Port as a Master

The following is a sample DDL source file for the Network Port as a master. This DDL file serves as the database for the Network Port. For details on creating and compiling DDL source files, refer to the *DDL Programmer's Manual (FAN 630).*

```
@NC "JCHDQTRS", "NC-142"

These are Network Port Associated Points
AD "PLC5_005", "N007B003", "Chiller Points"
AD "PLC5_005", "F008B003", "Chiller Points"

* PLC5 station 5, value element @ N7:5 bit 7, status element at
*B3:5
BD "M-OFFICE", "R0057005", "Chiller On"
 ASSOCINP "AD", "PLC5_005", "N007B003", "HISTORY"
 UNITS "OFF", "ON"
 INIT N, N, 0, 30
 REPORT N, Y, N, N, 5, 6, 3, 5

* PLC5 station 5, value element @ N7:5 bit 15, status element at
*B3:5
BD "M-OFFICE", "R005F005", "Chiller Motor On"
 ASSOCINP "AD", "PLC5_005", "N007B003", "HISTORY"
 GRAPHICS 0, 0
 UNITS "OFF", "ON"
 REPORT N, Y, N, N, 5, 6, 3, 5

* PLC5 station 5, value element at F8:9, status element at B3:5
AD "M-OFFICE", "R009_005", "Compressor Load Percent"
 ASSOCINP "AD", "PLC5_005", "F008B003", "VALUE"
 GRAPHICS 0, 0
 UNITS "%", 1, 55.00000
 ALARMSET , , , , , 1
 REPORT N, Y, N, N, 0, 17, 6, 3, 3, 5

* PLC5 station 5, value element at F8:10, status element at B3:5
AD "M-OFFICE", "R010_005", "Compressor Load Amps"
 ASSOCINP "AD", "PLC5_005", "F008B003", "VALUE"
 GRAPHICS 0, 0
 UNITS "AMPS", 1, 55.00000
 ALARMSET , , , , , 1
 REPORT N, Y, N, N, 0, 17, 6, 3, 3, 5
```

Attributes

Writeable

Command the following Metasys writeable attributes from the master PC. Attributes are listed by object type. Specifying an attribute other than a listed attribute outputs an error message. The Network Port sends BO commands at Priority 8. All other commands are sent at Priority 3.

Table 24: Writeable Attributes

Object Type	Attribute Name	Attribute Type	Metasys Commands
AD	VALUE	REAL	SET_AD
AOS	VALUE	REAL	SET_AOS
BD	VALUE	BINARY	SET_BD
BO	VALUE	BINARY	MAN_START or MAN_STOP
CS	AO_1 to AO_16	REAL	STCSAN_CMD
	BO_1 to BO_16	BINARY	STCSBN_CMD
	SP_1 to SP_32	REAL	STCSAN_CMD
LCG	VALUE	BINARY	LC_TIMED_OVERRIDE
PIDL	SETPOINT	REAL	SET_PIDL_CMD

Readable

Read the following Metasys attributes from the master PC. Only floating point and binary types are listed because Network Port does not map other types to the master PC. Attributes are listed by object type in alphabetical order. Specifying an attribute other than a listed attribute outputs an error message. For attribute details, refer to the Metasys object documents in the *Metasys Network Technical Manual (FAN 636).*

ACM Object

Attribute	Type	Attribute	Type
COS_DEL	Binary	**LO_WARN**	Binary
DEADBAND	Floating Point	**LO_WARNL**	Floating Point
DIAL_UP	Binary	**LOC_CNTL**	Binary
DIFF	Floating Point	**NORMAL**	Binary
DISCONCT	Binary	**NORMBAND**	Floating Point
FBK_PROB	Binary	**OFFLINE**	Binary
FILTER	Floating Point	**OVERRIDE**	Binary
HI_ALARM	Binary	**PPM**	Floating Point
HI_LIMIT	Floating Point	**PREFIX**	Binary
HI_WARN	Binary	**REPORT**	Binary
HI_WARNL	Floating Point	**SAVE_HIS**	Binary
HISTORY	Binary	**SCAN**	Binary
LED_STAT	Binary	**SETPOINT**	Floating Point
LO_ALARM	Binary	**TRIGGER**	Binary
LO_LIMIT	Floating Point	**VALUE**	Floating Point

AD Object

Attribute	Type	Attribute	Type
COS_DEL	Binary	**LO_WARN**	Binary
DIAL_UP	Binary	**LO_WARNL**	Floating Point
DIFF	Floating Point	**NORMAL**	Binary
DISCONCT	Binary	**NORMBAND**	Floating Point
FILTER	Floating Point	**OFFLINE**	Binary
HI_ALARM	Binary	**OVERRIDE**	Binary
HI_LIMIT	Floating Point	**PREFIX**	Binary
HI_WARN	Binary	**REPORT**	Binary
HI_WARNL	Floating Point	**SAVE_HIS**	Binary
HISTORY	Binary	**SCAN**	Binary
INITIAL	Floating Point	**SETPOINT**	Floating Point
LO_ALARM	Binary	**TRIGGER**	Binary
LO_LIMIT	Floating Point	**VALUE**	Floating Point

AHU, UNT, VAV, MIG, PHX, VND Hardware Objects

Attribute	Type	Attribute	Type
DIAL_UP	Binary	**PREFIX**	Binary
DISCONCT	Binary	**SCAN**	Binary
OFFLINE	Binary	**TRIGGER**	Binary

AI Object

Attribute	Type	Attribute	Type
COS_DEL	Binary	**OFFLINE**	Binary
DIAL_UP	Binary	**OVERRIDE**	Binary
DIFF	Floating Point	**PRE_VAL**	Floating Point
DISCONCT	Binary	**PREFIX**	Binary
FILTER	Floating Point	**RANGE_1**	Floating Point
FLOW_K	Floating Point	**RANGE_2**	Floating Point
FLTR_VAL	Floating Point	**RANGE_3**	Floating Point
HI_ALARM	Binary	**RANGE_4**	Floating Point
HI_LIMIT	Floating Point	**REPORT**	Binary
HI_WARN	Binary	**SAVE_HIS**	Binary
HI_WARNL	Floating Point	**SCAN**	Binary
HISTORY	Binary	**SETPOINT**	Floating Point
LO_ALARM	Binary	**SPAN_IN1**	Floating Point
LO_LIMIT	Floating Point	**SPAN_IN2**	Floating Point
LO_WARN	Binary	**SPAN_OT1**	Floating Point
LO_WARNL	Floating Point	**SPAN_OT2**	Floating Point
NORMAL	Binary	**TRIGGER**	Binary
NORMBAND	Floating Point	**VALUE**	Floating Point

AOD Object

Attribute	Type	Attribute	Type
DIAL_UP	Binary	**SAVE_HIS**	Binary
DISCONCT	Binary	**SCAN**	Binary
HISTORY	Binary	**SPAN_IN1**	Floating Point
HOA	Binary	**SPAN_IN2**	Floating Point
OFFLINE	Binary	**SPAN_OT1**	Floating Point
OVERRIDE	Binary	**SPAN_OT2**	Floating Point
PREFIX	Binary	**STEP**	Floating Point
REPORT	Binary	**TRIGGER**	Binary
RESTORE	Binary		

AOS Object

Attribute	Type	Attribute	Type
DIAL_UP	Binary	**REPORT**	Binary
DISCONCT	Binary	**RESTORE**	Binary
FB_SET	Binary	**SAVE_HIS**	Binary
HISTORY	Binary	**SCAN**	Binary
HOA	Binary	**SPAN_IN1**	Floating Point
INITIAL	Floating Point	**SPAN_IN2**	Floating Point
LOC_CNTL	Binary	**SPAN_OT1**	Floating Point
LOC_ELIG	Binary	**SPAN_OT2**	Floating Point
OFFLINE	Binary	**STEP**	Floating Point
OVERRIDE	Binary	**TRIGGER**	Binary
PREFIX	Binary	**VALUE**	Floating Point

BD Object

Attribute	Type	Attribute	Type
COS_DEL	Binary	**OFFLINE**	Binary
DIAL_UP	Binary	**OVERRIDE**	Binary
DISCONCT	Binary	**PREFIX**	Binary
HISTORY	Binary	**REPORT**	Binary
INITIAL	Binary	**SAVE_HIS**	Binary
LATCH	Binary	**SCAN**	Binary
LATCHING	Binary	**TRIGGER**	Binary
NORMAL	Binary	**VALUE**	Binary

BI Object

Attribute	Type	Attribute	Type
COS_DEL	Binary	**PREFIX**	Binary
DIAL_UP	Binary	**PT_ENA**	Binary
DISCONCT	Binary	**REPORT**	Binary
HISTORY	Binary	**RLAY_RST**	Binary
LATCH	Binary	**RLAY_SET**	Binary
LATCHING	Binary	**SAVE_HIS**	Binary
LED_STAT	Binary	**SCAN**	Binary
NORMAL	Binary	**TRIGGER**	Binary
OFFLINE	Binary	**TROUBLE**	Binary
OVERRIDE	Binary	**VALUE**	Binary

BO Object

Attribute	Type	Attribute	Type
CMD_ACTN	Binary	**LSTATUS**	Binary
COS_DEL	Binary	**LOAD**	Binary
DIAL_UP	Binary	**NORMAL**	Binary
DISCONCT	Binary	**OFFLINE**	Binary
FB_ACTN	Binary	**OVERRIDE**	Binary
FB_SET	Binary	**PREFIX**	Binary
FBK_PROB	Binary	**RATE**	Floating Point
FEEDBACK	Binary	**REPORT**	Binary
HISTORY	Binary	**RESTORE**	Binary
HOA	Binary	**SAVE_HIS**	Binary
INITIAL	Binary	**SCAN**	Binary
LED_STAT	Binary	**STATE_0**	Binary
LOC_CNTL	Binary	**STATE_1**	Binary
LOC_ELIG	Binary	**TRIGGER**	Binary
LOCK	Binary	**VALUE**	Binary

C210A Object

Attribute	Type	Attribute	Type
ACTC	Floating Point	**OFRH**	Floating Point
AUXAAPP	Binary	**OVERRIDE**	Binary
AUXBAPP	Binary	**OVF_SETP**	Binary
AUXI	Floating Point	**PMAX**	Binary
AUXP	Floating Point	**PFOF**	Binary
AUXR	Floating Point	**PFSS**	Binary
AUXT	Floating Point	**PRCL**	Floating Point
AXBI	Binary	**PREFIX**	Binary
AXDP	Floating Point	**PRRH**	Floating Point
CNWU	Binary	**REHT**	Binary
DFPR	Floating Point	**REPORT**	Binary
DIAL_UP	Binary	**RZSP**	Floating Point
DMPR	Floating Point	**SARE**	Binary
DPSP	Floating Point	**SCAN**	Binary
HCPB	Floating Point	**SDBC**	Binary
HLTC	Binary	**SDBO**	Binary
HRTZ	Binary	**SETPOINT**	Floating Point
HTDB	Floating Point	**SFOF**	Binary
HWSD	Binary	**SFSU**	Binary
HWUO	Binary	**SUSB**	Floating Point
INTE	Floating Point	**TRIGGER**	Binary
INTG	Floating Point	**UNOC**	Binary
LTCH	Binary	**VALUE**	Floating Point
LV12	Binary	**WMUP**	Binary
MNDP	Floating Point	**WTMP**	Floating Point
MXDP	Floating Point	**ZNSP**	Floating Point
OFFLINE	Binary	**ZNT**	Floating Point

C260A Object

Attribute	Type	Attribute	Type
ATMP	Floating Point	**MNDP**	Floating Point
AURH	Floating Point	**MXDP**	Floating Point
AUXAAPP	Binary	**OFFLINE**	Binary
AUXI	Floating Point	**OVR_SETP**	Binary
AUXR	Floating Point	**OVERRIDE**	Binary
AUXT	Floating Point	**PE**	Floating Point
AXBI	Binary	**PFOF**	Binary
AXDP	Floating Point	**PFSS**	Binary
CLPB	Floating Point	**PRCL**	Floating Point
CNWU	Binary	**PREFIX**	Binary
CPCM	Floating Point	**PRRH**	Floating Point
DIAL_UP	Binary	**REHT**	Binary
FLOW	Binary	**REPORT**	Binary
FNON	Binary	**RVAL**	Binary
FOCO	Binary	**RZSP**	Floating Point
HCPB	Floating Point	**SCAN**	Binary
HLTC	Binary	**SDWN**	Binary
HRTZ	Binary	**SETPOINT**	Floating Point
HTCM	Floating Point	**SFOF**	Binary
HTDB	Floating Point	**SFSU**	Binary
HTPB	Floating Point	**STUP**	Floating Point
HWSD	Binary	**TRIGGER**	Binary
HWUO	Binary	**UNOC**	Binary
INTE	Floating Point	**VALUE**	Floating Point
INTG	Floating Point	**ZNSP**	Floating Point
LTCH	Binary	**ZNT**	Floating Point
LV12	Binary		

C260X Object

Attribute	Type	Attribute	Type
AI1OVR - AI6OVR	Binary	**OVERRIDE**	Binary
AI1VAL - AI6VAL	Floating Point	**OVR_SETP**	Binary
AO1OVR - AO2OVR	Binary	**PREFIX**	Binary
AO1VAL - AO2VAL	Floating Point	**REPORT**	Binary
BI1OVR - BI4OVR	Binary	**SCAN**	Binary
BI1VAL - BI4VAL	Binary	**SETPOINT**	Floating Point
BO1OVR - BO5OVR	Binary	**SP1OVR - SP13OVR**	Binary
BO1VAL - BO5VAL	Binary	**SP1VAL - SP13VAL**	Floating Point
DIAL_UP	Binary	**TRIGGER**	Binary
OFFLINE	Binary	**VALUE**	Floating Point

C500X Object

Attribute	Type	Attribute	Type
AI1OVR - AI6OVR	Binary	**OVERRIDE**	Binary
AI1VAL - AI6VAL	Floating Point	**OVR_SETP**	Binary
AO1OVR - AO6OVR	Binary	**PREFIX**	Binary
AO1VAL - AO6VAL	Floating Point	**REPORT**	Binary
BI1OVR - BI5OVR	Binary	**SCAN**	Binary
BI1VAL - BI5VAL	Binary	**SETPOINT**	Floating Point
BO1OVR - BO4OVR	Binary	**SP1OVR - SP16OVR**	Binary
BO1VAL - BO4VAL	Binary	**SP1VAL - SP16VAL**	Floating Point
DIAL_UP	Binary	**TRIGGER**	Binary
OFFLINE	Binary	**VALUE**	Floating Point

CS Object

Attribute	Type	Attribute	Type
ADADJEN	Binary	**BOADJS**	Binary
ADADJS	Binary	**BOOVREN**	Binary
ADOVREN	Binary	**BO_1 - BO_16**	Binary
AD_1 - AD_32	Floating Point	**DIAL_UP**	Binary
AIADJEN	Binary	**DISCONCT**	Binary
AIADJS	Binary	**MSADJEN**	Binary
AIOVREN	Binary	**MSADJS**	Binary
AD_1 - AI_16	Floating Point	**MSOVREN**	Binary
AOADJEN	Binary	**NTCMDADJ**	Binary
AOOVREN	Binary	**OFFLINE**	Binary
AO_1 - AO_16	Floating Point	**OVERRIDE**	Binary
BDADJEN	Binary	**PREFIX**	Binary
BDADJS	Binary	**REPORT**	Binary
BDOVREN	Binary	**SCAN**	Binary
BD_1 - BD_32	Binary	**SPADJEN**	Binary
BIADJEN	Binary	**SPADJS**	Binary
BIOVREN	Binary	**SPOVREN**	Binary
BI_1 - BI_16	Binary	**SP_1 - SP_32**	Floating Point
BOADJEN	Binary	**TRIGGER**	Binary

D600 Hardware Object

Attribute	Type	Attribute	Type
ACDWNEED	Binary	**OFFLINE**	Binary
AC_FAIL	Binary	**OP_CHNG**	Binary
AC_TAMP	Binary	**PIN_5**	Binary
BAT_LOW	Binary	**PREFIX**	Binary
DIAL_UP	Binary	**REP_ALM**	Binary
DL_IN_PR	Binary	**SCAN**	Binary
G01 through G64	Binary	**TRIGGER**	Binary
GLO_ACC	Binary	**TZ_CHEK**	Binary
INXIT	Binary	**VALUE**	Binary
NOREPVCD	Binary		

DCDR Hardware Object

Attribute	Type	Attribute	Type
DIAL_UP	Binary	**PREFIX**	Binary
DISCONCT	Binary	**SCAN**	Binary
OFFLINE	Binary	**TRIGGER**	Binary

DCM/DCM-140 Hardware Object

Attribute	Type	Attribute	Type
DIAL_UP	Binary	**PREFIX**	Binary
DISCONCT (DCM only)	Binary	**SCAN**	Binary
OFFLINE	Binary	**TRIGGER**	Binary

DSC-8500 Hardware Objects

Attribute	Type	Attribute	Type
DIAL_UP	Binary	**PREFIX**	Binary
DL_PROG	Binary	**SCAN**	Binary
OFFLINE	Binary	**TRIGGER**	Binary

DSC Hardware Object

Attribute	Type	Attribute	Type
DIAL_UP	Binary	**SCAN**	Binary
OFFLINE	Binary	**TRIGGER**	Binary
PREFIX	Binary		

DX9100 Hardware Object

Attribute	Type	Attribute	Type
DIAL_UP	Binary	**PREFIX**	Binary
DISCONCT	Binary	**SCAN**	Binary
OFFLINE	Binary	**TRIGGER**	Binary

Fire Controller Hardware Object

Attribute	Type	Attribute	Type
AC_FAIL	Binary	**OPER_ENB**	Binary
ALARM	Binary	**PREFIX**	Binary
BAT_LOW	Binary	**QY_IN_PR**	Binary
DB_MATCH	Binary	**REPORT**	Binary
DIAL_UP	Binary	**SCAN**	Binary
DL_IN_PR	Binary	**SGNL_SIL**	Binary
DL_REQR	Binary	**TRIGGER**	Binary
DNLD_ENB	Binary	**VALUE**	Binary
OFFLINE	Binary		

FPU Hardware Object

Attribute	Type	Attribute	Type
DIAL_UP	Binary	**SCAN**	Binary
OFFLINE	Binary	**TRIGGER**	Binary
PREFIX	Binary		

JCB Object

Attribute	Type
RELIABLE	Binary

LCD Hardware Object

Attribute	Type	Attribute	Type
ALM_STAT	Binary	**OUT_STAT**	Binary
DIAL_UP	Binary	**PREFIX**	Binary
IN_STAT	Binary	**SCAN**	Binary
OFFLINE	Binary	**TRIGGER**	Binary

LCG Object

Attribute	Type	Attribute	Type
BLNK_FLG	Binary	**REPORT**	Binary
DIAL_UP	Binary	**SAVE_HIS**	Binary
HISTORY	Binary	**SCAN**	Binary
OFFLINE	Binary	**TRIGGER**	Binary
OVERRIDE	Binary	**VALUE**	Binary
PREFIX	Binary		

LCP Hardware Object

Attribute	Type	Attribute	Type
DIAL_UP	Binary	**PREFIX**	Binary
DISCONCT	Binary	**SCAN**	Binary
OFFLINE	Binary	**TRIGGER**	Binary

MSD Object

Attribute	Type	Attribute	Type
ALARM	Binary	**OFFLINE**	Binary
COS_DEL	Binary	**OVERRIDE**	Binary
DIAL_UP	Binary	**PREFIX**	Binary
DISCONCT	Binary	**REPORT**	Binary
HISTORY	Binary	**SAVE_HIS**	Binary
LATCH	Binary	**SCAN**	Binary
LATCHING	Binary	**STATE_0**	Binary
		STATE_1	
		STATE_2	
		STATE_3	
NORMAL	Binary	**TRIGGER**	Binary

MSI Object

Attribute	Type	Attribute	Type
ALARM	Binary	**PREFIX**	Binary
COS_DEL	Binary	**REPORT**	Binary
DIAL_UP	Binary	**SAVE_HIS**	Binary
DISCONCT	Binary	**SCAN**	Binary
HISTORY	Binary	**STATE_0**	Binary
LATCH	Binary	**STATE_1**	Binary
LATCHING	Binary	**STATE_2**	Binary
LED_STAT	Binary	**STATE_3**	Binary
NORMAL	Binary	**TRIGGER**	Binary
OFFLINE	Binary	**WIRED_0**	Binary
OVERRIDE	Binary		

MSO Object

Attribute	Type	Attribute	Type
ALARM	Binary	**LOC_ELIG**	Binary
AUTO_MAN	Binary	**LOCK**	Binary
CMD_ACTN	Binary	**LSTATUS**	Binary
COS_DEL	Binary	**NORMAL**	Binary
DIAL_UP	Binary	**OFFLINE**	Binary
DISCONCT	Binary	**OVERRIDE**	Binary
FB_ACTN	Binary	**PREFIX**	Binary
FB_SET	Binary	**RATE_1**	Floating Point
FBK_PROB	Binary	**RATE_2**	Floating Point
HISTORY	Binary	**RATE_3**	Floating Point
HOA	Binary	**REPORT**	Binary
LC_HOA	Binary	**RESTORE**	Binary
LC_LED	Binary	**SAVE_HIS**	Binary
LC_PROB	Binary	**SCAN**	Binary
LC_SET	Binary	**STATE_0**	Binary
LC_WRD_0	Binary	**STATE_1**	Binary
LED_STAT	Binary	**STATE_2**	Binary
LOAD	Binary	**STATE_3**	Binary
LOC_CNTL	Binary	**TRIGGER**	Binary

N2OPEN Hardware Object

Attribute	Type	Attribute	Type
DIAL_UP	Binary	**PREFIX**	Binary
DISCONCT	Binary	**SCAN**	Binary
OFFLINE	Binary	**TRIGGER**	Binary

PIDL Object

Attribute	Type	Attribute	Type
AUX_ENA	Binary	**OVF_LSAT**	Binary
AUX_IN	Floating Point	**OVF_OFFS**	Binary
AUX_REF	Binary	**OVF_SEL**	Binary
DEADBAND	Floating Point	**OVF_SETP**	Binary
DEFAULT	Floating Point	**OVF_SWCH**	Binary
DIAL_UP	Binary	**PID_CALC**	Floating Point
DWEIGHT	Floating Point	**PIDA_REL**	Binary
FEEDBACK	Floating Point	**PREFIX**	Binary
FILTER	Floating Point	**PROPBAND**	Floating Point
FLTR_VAL	Floating Point	**RELIABLE**	Binary
HI_SAT_F	Binary	**REPORT**	Binary
HI_SAT_V	Floating Point	**SCALAR1 - SCALAR6**	Floating Point
HISAT_RF	Binary	**SCAN**	Binary
HYST_CMP	Floating Point	**SEL_FLAG**	Binary
INP1REF - INP6REF	Binary	**SEL_OUT**	Floating Point
INP1VAL - INP6VAL	Floating Point	**SEL_REF**	Binary
INT_TIME	Floating Point	**SELTYPE**	Binary
LO_SAT_F	Binary	**SETPOINT**	Floating Point
LO_SAT_V	Floating Point	**SWCH_OUT**	Floating Point
LSAT_RF	Binary	**STP_REF**	Binary
OFFLINE	Binary	**TRIGGER**	Binary
OFFSET	Floating Point	**TUNE_BND**	Floating Point
OFS_REF	Binary	**TUNE_WT**	Floating Point
OVERRIDE	Binary	**UNR_TYPE**	Binary
OVF_HSAT	Binary		
OVF_IN1 - OVF_IN6	Binary		

READER Object

Attribute	Type	Attribute	Type
ACC_SEC	Binary	**OVER_SCH**	Binary
ANTI_PAS	Binary	**PIN_BAK**	Binary
ANTI_TAI	Binary	**PREFIX**	Binary
AUX_ACC	Binary	**REPORT**	Binary
DIAL_UP	Binary	**SCAN**	Binary
FAC_BAK	Binary	**TRIGGER**	Binary
OFFLINE	Binary		

XM Hardware Objects (XBN, XRE, XRM, XRL)

Attribute	Type	Attribute	Type
DIAL_UP	Binary	**PREFIX**	Binary
DISCONCT	Binary	**SCAN**	Binary
OFFLINE	Binary	**TRIGGER**	Binary

XT9100/XTM Hardware Object

Attribute	Type	Attribute	Type
DIAL_UP	Binary	**PREFIX**	Binary
DISCONCT	Binary	**SCAN**	Binary
OFFLINE	Binary	**TRIGGER**	Binary

ZONE Object

Attribute	Type	Attribute	Type
ALARM	Binary	**REPORT**	Binary
DIAL_UP	Binary	**SCAN**	Binary
DISABLED	Binary	**TRIGGER**	Binary
DNLD_ENB	Binary	**TROUBLE**	Binary
OFFLINE	Binary	**VALUE**	Binary
PREFIX	Binary		

Notes

Notes

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