DFS

Data Flow Systems

NETWORK INTERFACE & DISTRIBUTION MODULES

INSTALLATION AND OPERATION MANUAL

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NOTICE

Data Flow Systems, Inc. assumes no responsibility for any errors that may appear in this document, nor does it make any commitment to update the information contained herein. However, questions regarding the information contained in this document are welcomed.

Data Flow Systems also reserves the right to make changes to the specifications of the Network Interface Module, Fiber Interface Module, Network Fiber Module, and Network Switch Module and to the information contained in this document at any time without notice.

Purpose of this Manual

This manual is a reference guide for the network interface and distribution module product line: Fiber Interface Module (FIM), Network Interface Module (NIM), Network Fiber Module (NFM), and Network Switch Module (NSM). It describes procedures for installing, wiring, testing, and troubleshooting the four network modules.

This manual contains:

- Instructions for wiring and addressing the network interface and distribution modules
- Configuration option descriptions and setup instructions
- Information on how to test and troubleshoot the network interface and distribution modules
- Technical data and specifications

See the *HT3 User Guide* for detailed instructions on how to configure, monitor, and control your telemetry system.

Document Conventions

The following conventions are used throughout this manual:

- Bulleted lists provide information, not procedural steps.
- Numbered lists provide sequential steps or hierarchal information.
- *Italic* type is used for emphasis.

Abbreviations Used in this Manual

CIM – Computer Interface Module
CTU – Central Terminal Unit
FIM – Fiber Interface Module
HSS – Hyper SCADA Server
HSM – Hyper Server Module
MBP – Modular Backplane
NFM – Network Fiber Module
NIM – Network Interface Module
NSM – Network Switch Module
PSM – Power Supply Module
RIM – Radio Interface Module
RTU – Remote Terminal Unit

Notes

DFS' network modules are designed as generic, network-interface and -distribution platforms for use with TAC II telemetry systems. Network modules are typically used in conjunction with a Hyper SCADA Server (HSS)-based TAC II SCADA system.

Four types of network modules are available, all of which are based on the same printed-circuit board. The network module type is determined by the auxiliary components that are mounted on the board – CPU, media converter, and network.

Network modules can be classified as either network interface modules or network distribution modules.

- Network interface modules (Network Interface Module and Fiber Interface Module) feature a DOS-based network CPU and provide a function called "serial tunneling." Serial tunneling is a process that converts serial data into network data for transmission over an Ethernet network. A network interface module, such as the FIM, can also replace a Radio Interface Module (RIM) in an RTU to provide Ethernet-based communication with the central site (Hyper SCADA Server). The Fiber Interface Module's Ethernet media converter protects the unit from transient voltage damage.

- Network distribution modules (Network Switch Module and Network Fiber Module) do not have processing capabilities (they do not come with the DOS-based network CPU). They are used strictly as a point of network distribution, or as a media converter (CAT5 to fiber optic) to protect network devices, such as the Hyper SCADA Server, from transient voltage damage.

The network modules provide the means for rapid data retrieval by enabling the telemetry system's Remote Terminal Units (RTUs) to communicate over a network. In addition to an increased communication speed, the network modules' higher sample rate also produces more *accurate, near-real-time* data retrieval.

A card retainer interlock is included on all of the network modules. The interlock is a magnetic power up switch that prevents the network module (and all other modules powered by it) from being removed while powered up and drawing current. This interlock is only used if the network module is installed in the RIM slot of an RTU or CTU. If the network module is in an I/O module slot, the bypass is made by placing a jumper across pins 3 and 5.

Figure 1-1, below, is an example of a system using a Hyper SCADA Server (HSS) and several network RTUs.
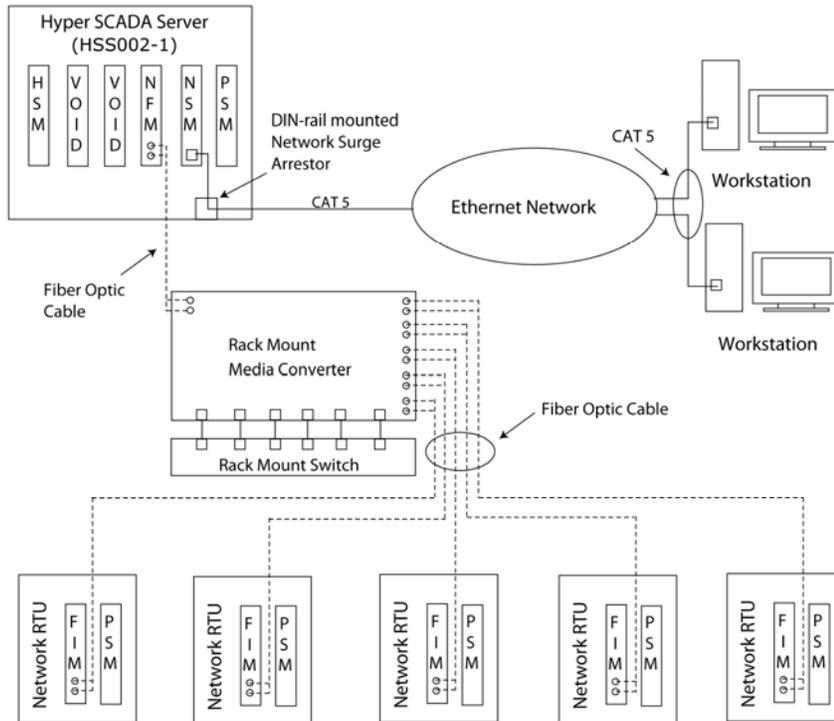
Figure 1-1, "Example of a Network RTU System"

Network Interface Module

The Network Interface Module (NIM) is a DOS-based module designed as a generic, network-interface platform for use with TAC II telemetry systems. The NIM functions as an interface between a 10base-T Ethernet network and up to fifteen function modules of any combination. By communicating via a network instead of through traditional radios, the NIM is able to pass data quickly and reliably. DFS' HT3 server can complete a system-polling loop in less than 5 seconds while communicating – simultaneously – with up to 100 NIM-based RTUs. The NIM plugs into the Radio Interface Module (RIM) slot of a Remote Terminal Unit (RTU) and provides the normal RIM functions of power supply, monitor, and control. The NIM can also be used with a RIM, a Computer Interface Module (CIM), or other NIMs. The NIM is capable of using serial tunneling – a process by which serial communications over a network is achieved – to communicate with RS232 devices, including Modbus devices.

Features of the NIM

- DOS-based network CPU
- 250 addresses per communications link
- Uses standard TCP/IP for communication
- May be polled by multiple HT3 servers

- System polling time of 2-5 seconds
- Plug-and-play network configuration
- Serial tunneling to RS-232 devices
- LEDs on power, transmit data, network link, CPU failure, and test
- Two (2) configurable RS-232 ports
- RS-232 Service Port for system debugging
- Test mode switch for system debugging
- Battery back up during power failure
- Flash memory for field upgrades
- Program updates available from HT3 server
- No on-board adjustments, switches or straps (self configuring)
- Card retainer interlock that is bypassable and shareable

Typical Application for the NIM

Serial Tunneling Device – The NIM uses serial tunneling, a process by which serial communications over a network is achieved, to communicate with RS-232 devices, including Modbus devices.

Fiber Interface Module

The FIM is a network-interface platform for use with TAC II telemetry systems. It functions as an interface between a 10 or 10/100 Base T Ethernet network and up to fifteen (15) function modules of any combination. The FIM's Ethernet media converter, which protects the unit from transient voltage damage, is available in 10 Mbps and 10/100 Mbps speeds and can be ordered with support for either multi-mode or single mode fiber.

Features of the FIM

- DOS-based network CPU
- 10 Mbps or 10/100 Mbps Ethernet media converter
- 250 addresses per communications link
- Uses standard TCP/IP protocol for communication
- May be polled by multiple HT3 servers
- System polling rate of 2-5 seconds
- Plug-and-play network configuration
- Serial tunneling to RS-232 devices
- 2 configurable RS-232 communication ports
- RS-232 service port and test mode switch for system debugging
- Battery back up during power failure
- Flash memory for field upgrades
- Program updates available from HT3 server

- LEDs for power, receive data, transmit data, network link, network traffic, COMM2, microprocessor fault, and test mode
- No on-board adjustments, switches, or straps (self-configuring)
- Card retainer interlock that is bypassable and shareable

Typical Applications for the FIM

Serial Tunneling Device in CTU: When used in a CTU, the FIM uses "serial tunneling" to convert the RIM's serial TTL (radio) data into network data for transmission over fiber optic cable to the Hyper SCADA Server.

Network Communication in RTU: When used in a 200 Series RTU, the FIM replaces the RIM; communications with the central site is accomplished via Ethernet. The FIM will interface with up to 15 I/O modules of any combination.

Available FIM Models

The FIM is available in four models:

- **FIM001-10**: 10 Mbps; multi-mode fiber applications up to 2 km
- **FIM001-10/100**: 10/100 Mbps; multi-mode fiber applications up to 2 km
- **FIM001-SM**: 10 Mbps; single-mode fiber applications from 2-15 km
- **FIM001-SM-10/100**: 10/100 Mbps; single-mode fiber applications from 2 15 km

Network Fiber Module

The Network Fiber Module (NFM) is designed as a generic, network media converter for use with TAC II telemetry systems. The NFM interfaces between the Hyper Server Module (HSM) - a component of the Hyper Server Unit (HSU) - and one of the following two components: the client network or the telemetry network (RTUs or CTU). Each HSU features at least two NFMs. The NFM's main function is to provide the HSU's components with protection from transient voltage damage. The NFM can be ordered to interface with either a 10 Mbps or 100 Mbps network. Additionally, the Ethernet and Fast Ethernet converters can each be ordered to support either multi-mode or single mode fiber applications.

Features of the NFM

- 10Mbps or 100Mbps Ethernet Media Converter
- LEDs on power, transmit data, network link, CPU failure, and test
- Monitors RTU power and DC bias
- Battery back up during power failure
- No on-board adjustments, switches or straps (self configuring)
- Card retainer interlock that is bypassable and shareable

Typical Application for the NFM

Hyper SCADA Server (HSS) Media Converter: Plugs in module slot and provides transient voltage protection to the HSS's Hyper Server Module (HSM). One NFM interfaces between the HSM and the client network. A second NFM interfaces between the HSM and the telemetry system (RTUs or CTU).

Available NFM Models

- **NFM001**: 10 Mbps; multi-mode fiber applications up to 2 km
- **NFM001-F**: 10/100 Mbps; multi-mode fiber applications up to 2 km
- **NFM001-SM**: 10 Mbps; single-mode fiber applications from 2-15 km
- **FIM001-FSM**: 10/100 Mbps; single-mode fiber applications from 2-15 km

Network Switch Module

The Network Switch Module (NSM) is designed as a generic 5-port network switch for use with TAC II telemetry systems. The NSM features a 5-port 10/100 Fast Ethernet UTP switch that can be used to connect the telemetry network and the client network in an in-plant monitor and control configuration.

Features of the NSM

- 5-port 10/100 Fast Ethernet UTP switch
- LEDs on power, transmit data, network link, CPU failure, and test
- Monitors RTU power and DC bias
- Battery back up during power failure
- No on-board adjustments, switches or straps (self configuring)
- Card retainer interlock that is bypassable and shareable

Typical Application for the NSM

HSS (Hyper SCADA Server) Network Connectivity: The Network Switch Module can be inserted in one of the HSS' module slots to provide a connection from the Hyper Server Module (HSM) to the client network and the telemetry system's RTUs and/or CTU.

Temporary Network Connection: The NSM can also be placed in an RTU to provide a temporary network connection, for example, when programming a PLC.

Notes

Safety Precautions

Review the following statements before installing, servicing, or replacing any of the network interface or network distribution modules.

General Precautions

Carefully read the installation and wiring instructions before connecting the network interface or network distribution module to its power source.

Only trained and qualified personnel should install, service, or replace this equipment.

Do not work on the network interface or network distribution module, or connect or disconnect cables, during periods of lightning activity.

To prevent overheating the network interface and network distribution modules, do not operate them in an area that exceeds the maximum recommended ambient temperature of 70°C (150°F).

Ensure that the unit is connected to earth ground during normal use.

Working with the Network Modules

Before working with any of the network interface and network distribution modules, take note of these safety guidelines:

- Before removing a network module, ensure that all power sources coming into the enclosure are turned off. Even if the circuit breakers for the enclosure and the PSM have been turned off, dangerous voltages may still be present in the enclosure.
- Ensure that any fiber-optic cables connected to the network module will not become entangled in or caught on anything in the surrounding area.
- Put on an electrostatic discharge wrist strap that is attached to ground before touching anything inside the enclosure.
- When disconnecting a cable, pull on its connector or on its strain-relief loop, not on the cable itself. Some cables have a connector with locking tabs; when disconnecting this type of cable, press in on the locking tabs before disconnecting the cable. When pulling connectors apart, keep them evenly aligned to avoid bending any connector pins. Also, before connecting a cable, make sure both connectors are correctly oriented and aligned.
- Handle components and boards with care. Don't touch the components or contacts on a board. Hold a board by its edges or by its metal mounting bracket.
- Extra care must be taken when handling the network modules. Rough handling can damage the modules. Place them on a clean and grounded surface after removal. When installing modules, use gentle pressure to slide them in the module slots. Insert them slowly; never use force.
- Do not spill food or liquids on the network modules. If the network module gets wet, see "Appendix D: Support, Service, and Warranty Information," p. 47.

Protecting Against Electrostatic Discharge

Static electricity can harm the network modules' delicate components. To prevent static damage, put on an electrostatic discharge wrist strap before touching any of the network modules' electronic components.

In addition to the preceding precautions, the following steps can also be taken to prevent damage from electrostatic discharge (ESD):

- When unpacking a static-sensitive component from its shipping carton, do not remove the component's antistatic packing material until you are ready to install it. Be sure to put on an electrostatic discharge wrist strap before unwrapping the antistatic packaging.
- When transporting a sensitive component, first place it in an antistatic container or packaging.
- Handle all sensitive components in a static-safe area. Place the equipment on a grounded surface. If possible, use antistatic floor pads and workbench pads.

Note: Contact DFS if electrostatic discharge packaging is needed for return shipments. See Return Authorization (RA) Procedure, p. 47 for more information on returning equipment.

Installing the Network Modules

When using any of the network interface or network distribution modules, observe the following safety guidelines:

- To help prevent electric shock, wire the network modules and peripheral power cables into properly grounded power sources.
- To help protect the network modules from sudden, transient increases and decreases in electrical power, use a surge suppressor, line conditioner, or uninterruptible power supply (UPS).
- Be sure nothing rests on the network modules' cables and that the cables are not located where they can be stepped on or tripped over.

Receipt of Equipment

When equipment is received, examine the outside of the carton for any damage incurred during shipment. Remove the packing list and the equipment from the shipping carton. Carefully inspect the equipment for damage. Resolve any damage with the local carrier. Report damages to Data Flow Systems' RA Department' RA Department (321-259-5009 or rma@dataflowsys.com). Include the serial number of the unit and the extent of damage in your report.

All of the network modules use the same printed-circuit board ("skeleton" board) for their base. The difference lies in the components mounted on each (CPU, media converter, network switch). These mounted components determine how the module is to be used in the field.

We have included information on four possible applications, but you aren't limited to those described here. The versatility of these devices allows them to be used in any number of networked telemetry situations.

Most likely applications for the network modules are in-plant, close proximity operations where the RTU is close to either a computer or a network connection.

In order to use any of the network modules, the telemetry system must be running HyperTAC II 1.1.0 or later. This version of the software includes the NIM driver.

Network RTU (Replace RIM in Standard RTU Application)

Overview

In this configuration, data is passed between a local area (client) network or a master workstation, and a system of Network (FIM-based) Remote Terminal Units (RTUs). Each RTU contains a Fiber Interface Module (FIM) that is responsible for communications between the Hyper SCADA Server (HSS) and the station's function modules.

The Fiber Interface Module (FIM) is installed in the Radio Interface Module (RIM) slot of the RTU. No connector changes are necessary; the FIM and the RIM are keyed the same. The RTU *must* have an address between 1 (one) and 250. If the RTU is being converted from a RIM-based to a FIM-based unit, and it is currently addressed between 255 and 512, the RTU *must* be readdressed. Instructions for addressing the FIM are provided in the "Installation and Configuration Procedure," which begins on page 13 and also in "Appendix C: Addressing Modules."

Communication between the HSS and the RTU's function modules takes place over a network via a NIM driver; the Network RTUs and the HSS *must* be on the same local area network.

The FIM supports both 9600 and 1200 bps modules. To obtain the most efficient polling rate, we recommend that 9600-baud modules be used.

Reduced Polling Time

Polling time is greatly reduced when a network interface module replaces a RIM in an in-plant RTU that was using a "rubber duck" antenna. The polling rate of any external (out-of-plant) RTUs is also improved, because the amount of information being processed via radio has been reduced.

Similar I/O

The I/O of the RIM and the network interface modules nearly identical. The network interface modules have additional termination points to enable RS-232 communications.

Serial Tunneling

The DOS-based network CPU on FIMs provides network communication logic that allows each module to communicate over a network as if it were a radio. This function - referred to as serial tunneling - allows the FIM to communicate with RS-232 devices, including Modbus devices.

Two serial ports are provided for tunneling.

COM1

The first serial port (COM1) serves two functions:

- When the FIM is used as a stand-alone tunnel device, COM1 provides five-wire RS-232 serial communications, including RTS and CTS to support connections to equipment (such as radios and modems) that require hardware handshaking.
- When the FIM is used in conjunction with DFS RTU equipment, COM1 uses the communications buss of the module backplane to enable the transfer of data between the network and the radio.

COM2

The second serial port (COM2) is used only as a stand-alone serial tunnel; there is no buss communication. COM2 also includes RTS and CTS to support connections to equipment (such as radios and modems) that require hardware handshaking.

Program Updates

The DOS-based program on the FIM can be remotely updated through a driver-initiated download.

The module's on-board processor is in-socket programmable. The processor controls the power going to the CPU and any network hardware (for example, converters or switches) mounted on the module.

Automatic IP Addressing

FIMs obtain the first three octets of their IP address from the NIM driver and the last octet from their station address strap.

When the FIM boots up, it receives a broadcast from the NIM driver that includes the subnet portion of the IP address. The FIM reads its subnet and mates it with the station address to form a complete IP address.

IMPORTANT: The FIM cannot be addressed greater than 250. If the RIM that is being replaced is currently addressed greater than 250, you must readdress it at 250 or less. Instructions for addressing the FIM are provided in the "Installation and Configuration Procedure," which begins on page 13 and also in "Appendix C: Addressing Modules."

Plug-and-Play Network and Radio Communication

The plug-and-play functionality of the FIM allows RTUs to operate in a dual mode. If the network goes down, the RTU's FIM can be removed and replaced with a RIM. This allows the telemetry system to continue functioning via a radio link until the network problem is resolved.

This dual plug-and-play mode is possible because the network interface modules and the RIM use the same station address strap; the same "radio" address. It is important to note that a network interface module *cannot* be addressed at greater than 250. To have a true "plug and play" configuration, the FIM and the RIM must *both* be addressed between 1 and 250.

This configuration requires that two drivers be installed and configured – one for the FIM and one for the RIM. (**Note:** The driver for the module that is not actively being used appears as OFFLINE.) In addition, the RTU would have an antenna system connected on strictly a "stand-by" basis.

Power Monitoring Functions

- Monitors RTU Power and DC Bias from the Power Supply Module (PSM).
- Powers the buss through the startup plate (magnetic switch on front plate).
- Powers down the PSM for battery test.
- Powers network hardware (one-port media converter or four-port switch).
- Cycles power to network hardware and the CPU if communications stop for more than two minutes. This is done continuously until communications resume.

Test Mode

When a network interface module (FIM or NIM) is placed in test mode, its service port shows traffic to function modules. This information can be viewed using WinRTU Test's Inject or Antenna forms. WinRTU Test's Module, Module Config, and ROM Patch forms can be used to communicate with function modules.

To place a network interface module in test mode:

1. Power down the RTU by disconnecting the battery and then powering down the PSM.
2. On the network interface module, press and hold the test button while powering up the PSM. Press and hold the test button until the network interface module's transmit and receive LEDs start flashing and its Test LED comes on.
3. When the Test LED comes on and remains constant, the module is in test mode.

To exit test mode, power down the network interface module and then power up without pressing the test button.

Installation and Configuration Procedure

Network Considerations

Both network interface modules (FIM and NIM) have an RJ-45 jack and are designed to communicate over a 10base-T Ethernet network. The media converter on the FIM can be upgraded to a 10/100Mbps model for faster networks.

When installing a network interface module in an RTU, it is highly recommended that fiber optic cable be used to isolate the RTU from the rest of the network. The Fiber Interface Module (FIM) was designed for this purpose. The FIM is essentially a Network Interface Module (NIM) with an attached media converter that converts the twisted pair copper to fiber.

IMPORTANT: When dealing with a large number of networked RTU's, it isn't financially practical to try to bring *all* networking into the Hyper SCADA Server (HSS). For this reason, a centralized location is needed to convert the fiber back to copper and to connect the RTU(s) to the HSS. It is recommended that the fiber from all the RTUs be run to a common location (for example, a server or telephone room) where a large media converter has been installed. This larger unit, which typically mounts into a network hardware "rack," would have a single power supply and eight to 12 fiber-to-CAT5 converters. This central location would also require a larger switch to accommodate each converted fiber and must provide access to the HSS and the local area network. A UPS must be used to provide battery back up for all this network hardware.

Cable and Converter Selection

When planning an installation, consider the following when selecting the type of fiber-optic cable (multi-mode or single-mode) and the type of media converters:

- Speed of the local area network
- Distance between the HSS and rack-mount media converter to which the system's Network RTUs are connected

Cable Selection

- Multi-mode fiber-optic cable covers distances up to 2 km (~ 1.2 miles).
- Single-mode fiber-optic cable covers distances up to 15 km (~ 9.3 miles).

Converter Selection

The standard converter used on the Fiber Interface Module (FIM) is a 10Mbps Ethernet Media Converter that accepts multi-mode fiber. The converter on the FIM can be upgraded to a 100Mbps converter for systems running a faster network. The FIM can also be ordered with a converter that accepts single-mode fiber.

Baud Rate Considerations

To have the FIM communicate at its fastest speed, all of the station's I/O modules must be able to communicate at 9600 baud. I/O modules that meet this requirement are the AMM002, ACM002, DMM002, and all versions of the DCM003.

If any *one* module at the station communicates at 1200 baud, the entire station will communicate at that speed. The exception to this is when the station contains a PLC that is being used for local logical control at the RTU (PLCs communicate at 9600). In this situation, the communication speed of the I/O modules that are downstream from the PLC is irrelevant.

What you will need:

- One (1) Fiber Interface Module (FIM)
- One (1) CAT 5 patch cable terminated with RJ-45 connectors
- Fiber-optic cable of sufficient length to cover the distance from the RTU to the connection to the local area (client) network

- Electrostatic discharge wrist strap (this must be worn while working inside the RTU)

Note: These instructions provide details on converting an existing radio-based RTU to a network-based RTU. If you are creating an original network-based RTU, disregard references to removing the RIM and readdressing the station.

1. Remove power from the RTU.
2. Remove the RIM. Note that the RTU's module address blocks do not require any changes.
3. Install a FIM in the RTU's RIM slot. The FIM does not require a configuration jumper.
4. Address the FIM. The FIM must be addressed less than 250 (1-250). The station must be readdressed if it originally contained a RIM that was addressed between 255 and 512. Figure 3-1, "FIM Addressed at 208" (below) is an example of how to set the station address for a network RTU. See "Appendix C: Addressing Modules" for more information.
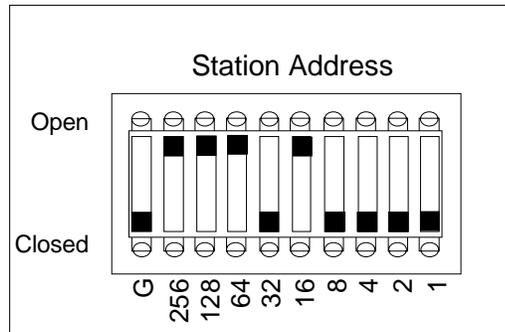
Figure 3-1, "FIM Addressed at 208"

5. Connect the FIM's media converter to its DOS-based network CPU using a CAT 5 patch cable terminated with RJ-45 connectors.
6. Connect the RTU to the local area (client) network. Connection to the network is through a fiber-optic cable that is attached to the FIM's media converter (TX and RX connectors). In most circumstances, multi-mode cable can be used. If the distance to be covered is greater than 2 km, use single-mode cable and appropriate converters.

7. Restore power to the RTU.
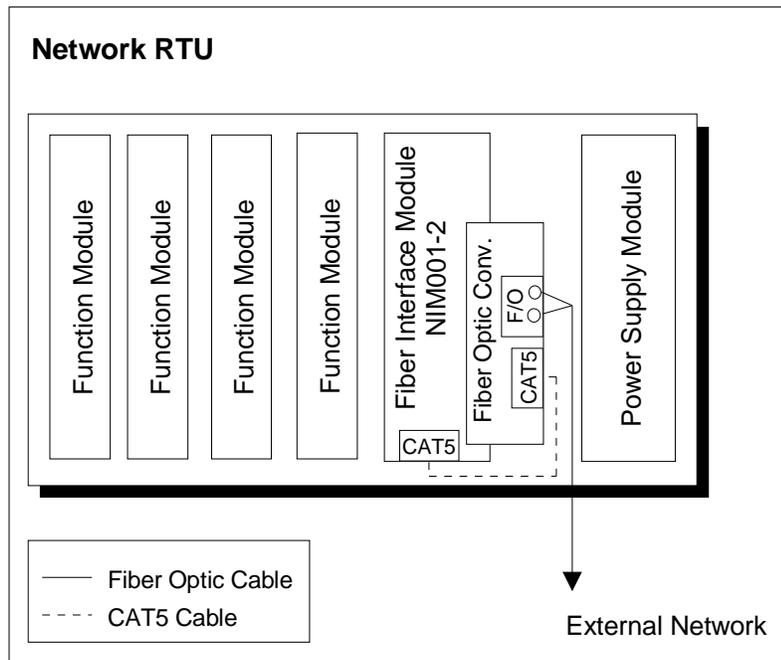
Figure 3-2, "Block Diagram of Network RTU"

8. Add and configure a NIM driver in HT3. For instructions on adding a NIM driver, see the *HT3 User Guide*.
9. Configure this station in HT3. (**Note:** If this is an RTU that is being converted from radio to network communications, you can copy the existing station – and its related module and point configurations – from the DFS driver to the newly created NIM driver. You can then delete the station from the DFS driver.) For instructions on configuring stations, see the *HT3 User Guide*.

Figure 3-3, "Network RTU Address Settings"

Tunnel CTU (Replace CIM in Standard CTU Application)

Overview

In this configuration (Hyper SCADA Server - Tunnel CTU), data is passed between a local area (client) network and a Tunnel CTU. A Tunnel CTU is radio-based CTU that uses a Fiber Interface Module to send serial (radio) data through a network using a process called serial tunneling.
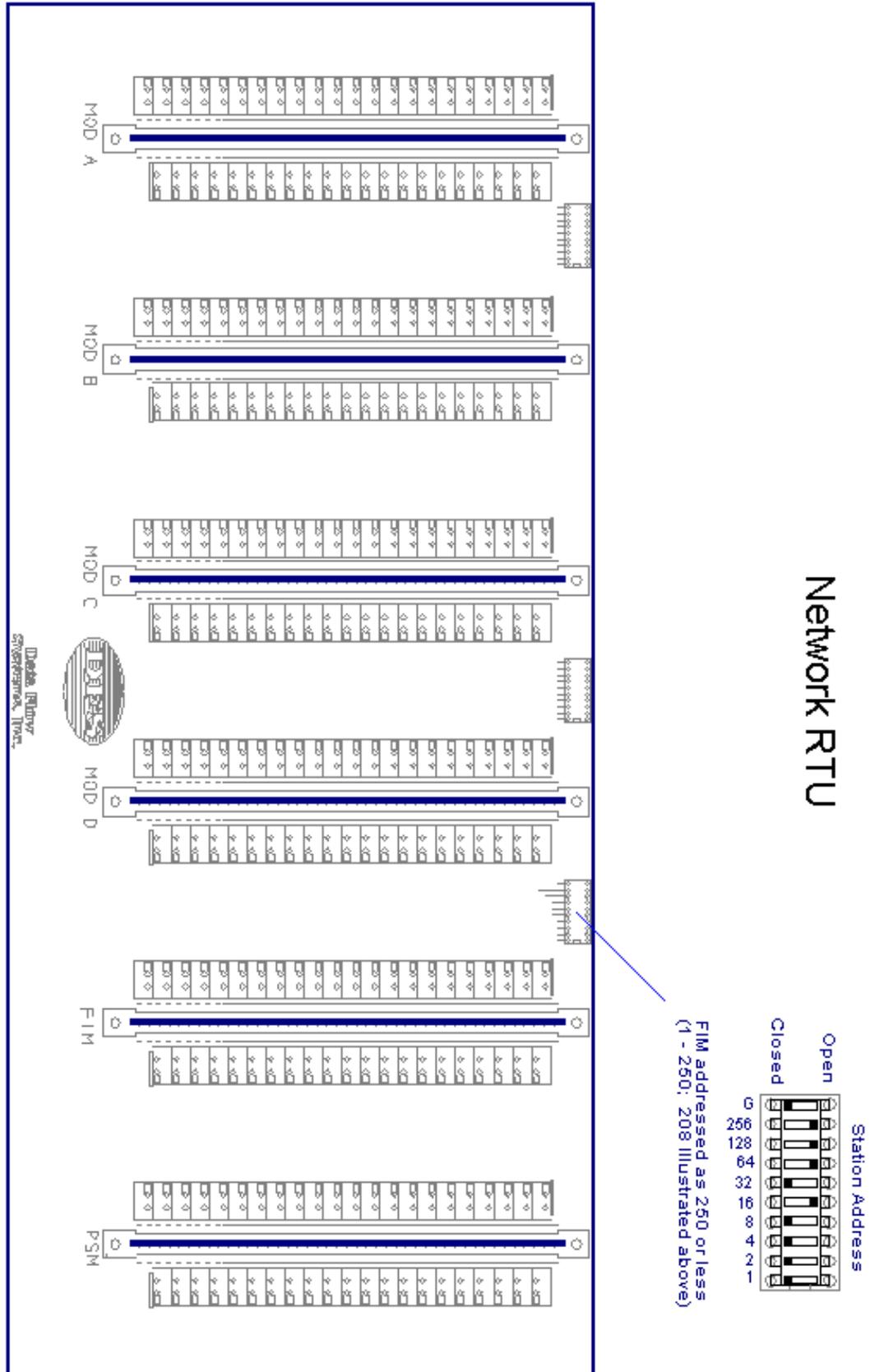
A Hyper SCADA Server (HSS) - Tunnel CTU system utilizes a CTU that includes both a FIM and a RIM. Messages from the HSS are sent through the network to the CTU's FIM. The FIM translates the network data into serial (radio) data and passes this information out its COM1 port to the CTU's RIM, which then sends it out to radio-based RTUs. In HT3, a DFS or Modbus radio-type driver is configured for the Tunnel CTU; a Tunnel CTU does not require a NIM driver.

Tunnel CTU

An optional second tunnel on the FIM (COM2) enables the FIM to poll a second serial device (such as a Modbus device). For this application, a second driver (i.e., Modbus ASCII or Modbus RTU) would be configured. The IP address for the driver would have a fifth octet of 2 (e.g., 192.168.10.185.2) to indicate it is communicating through the FIM's COM2 port. See "Two Serial Tunnels" on page 17 for more information on this feature.

(**IMPORTANT:** There is no test mode function when the FIM's COM2 port is used as a serial tunnel.)

Functions and Features

Installs in CIM Slot

If the existing CTU contains a Computer Interface Module (CIM), the CIM must be replaced with a FIM. The illustration below shows the placement of the FIM in a CTU.

- For a CTU in a 202 box, the FIM must be placed in the far left module slot (opposite end from the PSM).
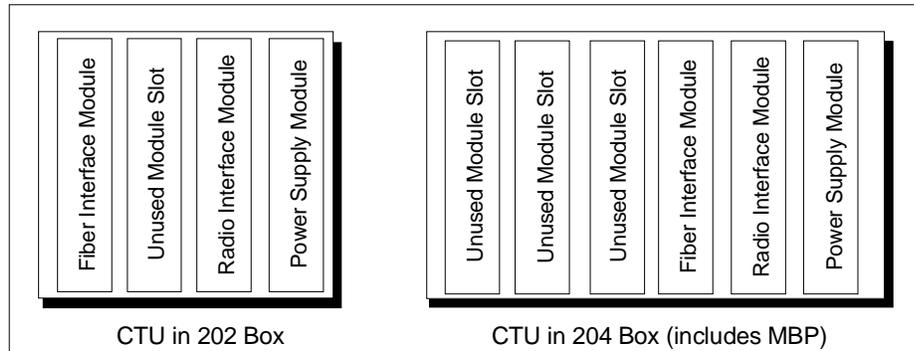- For a CTU in a 204 box, place the FIM directly beside the RIM.

CTU in 202 Box   CTU in 204 Box (includes MBP)

Figure 3-4, "CTU in 202 or 204 Box"

Drivers

The operation of this setup is identical to a radio system, and supports both DFS and Modbus radio drivers. A NIM driver is *not* applicable when a FIM is being used as a tunneling device.

For both DFS and Modbus serial (ASCII or RTU), the driver is configured with a five octet IP address (subnet + station address + COM port number).

Two Serial Tunnels

When the network interface module is used in conjunction with DFS RTU equipment, the COM1 serial tunnel uses the communications buss of the module backplane to communicate with the Radio Interface Module (RIM). This tunnel enables the transfer of data between the network and the radio. The Tunnel IP Address for the driver would be xxx.xxx.xxx.AAA.1, where xxx.xxx.xxx represents the subnet portion of the network interface module's IP address, AAA represents the station address, and 1 represents the COM port number the RIM is connected to.

If the network interface module is used strictly as a tunneling device (for example, to provide a communication port to Modbus equipment), COM1 provides five-wire RS-232 serial communications, including RTS and CTS, to support connections to equipment (such as radios and modems) that require hardware handshaking.

The network interface modules provide an optional second serial tunnel (COM2). This second tunnel enables one network interface module to poll two different types of devices (for example, a DFS RIM and a Modbus ASCII or RTU device). The COM2 port does not provide buss communication; it only provides a second serial tunnel. COM2 includes RTS and CTS to support connections to equipment that require hardware handshaking.

Service Port and Test Mode

There is no test mode function with a network interface module that is being used for tunneling.

The network interface module's service port can be used to view COM1's traffic. To view traffic, connect a laptop to the network interface module's service port and use WinRTU Test's Inject or Antenna form. If the COM2 port (optional second tunnel) is being used for tunneling, the service port function is disabled.

Installation and Configuration Procedure

Network Considerations

Both network interface modules (FIM and NIM) have an RJ-45 jack and are designed to communicate over a 10base-T Ethernet network. The media converter on the FIM can be upgraded to a 10/100Mbps model for faster networks.

When installing a network interface module in a CTU, it is highly recommended that fiber optic cable be used to isolate the CTU from the rest of the network. The Fiber Interface Module (FIM) was designed for this purpose. The FIM is essentially a Network Interface Module (NIM) with an attached media converter that converts the twisted pair copper to fiber.

When planning an installation, consider the following when selecting the type of fiber-optic cable (multi-mode or single-mode) and the type of media converters:

- Speed of the local area network
- Distance between the HSS and rack-mount media converter to which the system's Network RTUs are connected

Cable Selection

- Multi-mode fiber-optic cable covers distances up to 2 km (~ 1.2 miles).
- Single-mode fiber-optic cable covers distances up to 15 km (~ 9.3 miles).

Converter Selection

The standard converter used on the Fiber Interface Module (FIM) is a 10Mbps Ethernet Media Converter that accepts multi-mode fiber. The FIM's converter can be upgraded to a 100Mbps converter for systems running a faster network. The FIM can also be ordered with a converter that accepts single-mode fiber.

What you'll need:

- One (1) Fiber Interface Module (FIM)
- One (1) CAT 5 patch cable terminated with RJ-45 connectors
- Fiber-optic cable of sufficient length to cover the distance from the CTU to the Hyper SCADA Server
- Configuration jumpers (black #16 stranded wire can be used for making jumpers)
- Electrostatic discharge wrist strap (this must be worn while working inside the CTU)

These instructions provide details on converting an existing CIM-based CTU. If you are creating an original FIM-based CTU, disregard references to removing the CIM. See Figure 3-7, "Tunnel CTU Jumper and Address Settings" on page 23 to view a diagram of jumper and address settings for the Tunnel CTU.

1. Power down the unit. Ensure that any other power sources coming into the enclosure are turned off. Even if the circuit breakers for the enclosure and the PSM have been turned off, dangerous voltages may still be present in the enclosure.
2. Remove the CIM and all CIM jumpers.
3. Insert the FIM in the vacated CIM slot. See Figure 3-4, "CTU in 202 or 204 Box" on page 19.
4. Swap the buss to the RIM by placing a jumper across pins 15 and 21 of the FIM.
5. Bypass the startup plate by placing a jumper across pins 3 and 5 on both the FIM and the RIM.
6. Give the FIM a valid station address (1-250) by placing a jumper across the appropriate terminals. See "Appendix C: Addressing Modules" for more information.
    [**IMPORTANT:** The given address cannot already be in use by any other network device, including other network RTUs or CTUs.)
7. The RIM maintains a CTU address (0 or 251-254). See Figure 3-5, "RIM Addressed at 254". "Appendix C: Addressing Modules" provides details on addressing modules.
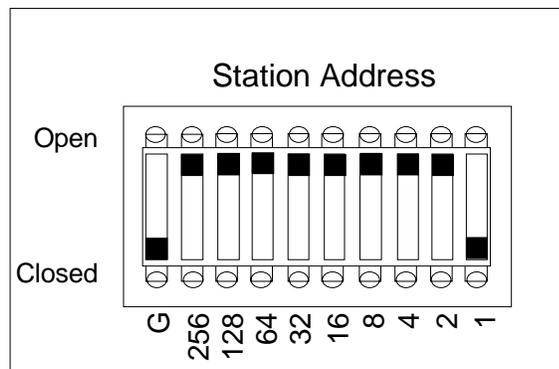
Figure 3-5, "RIM Addressed at 254"

8. Remove the module address block between the FIM and the last unused module slot. (In a 204 box, the module address block between the first and second unused slots may be removed or left in place.)
9. Connect the FIM's media converter to its DOS-based network CPU using a CAT 5 patch cable terminated with RJ-45 connectors.
10. Connect the RTU to the network. Connection to the network is through a fiber-optic cable attached to the FIM's media converter (TX and RX connectors). In most circumstances, multi-mode cable can be used. If the distance to be covered is greater than 2 km, use single-mode cable and appropriate converters.

11. Restore power to the CTU.

Tunnel CTU

Hyper Server Unit

Fiber Interface Module (NIM001-2)

Fiber Optic Conv.

F/O

CAT5

CAT5

Unused Module Slot

Radio Interface Mod.

Power Supply Module
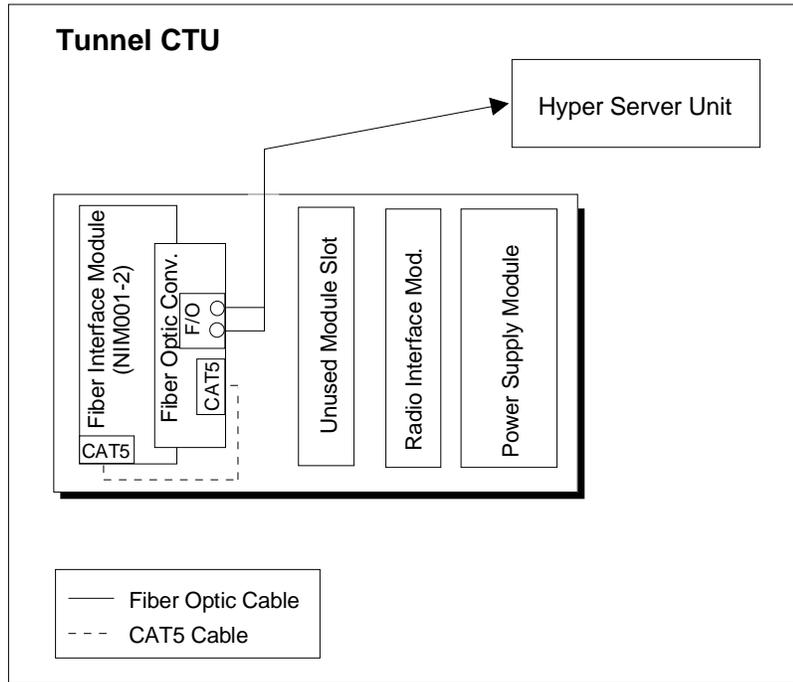
—— Fiber Optic Cable
- - - CAT5 Cable

Figure 3-6, "Block Diagram of Tunnel CTU"

12. Add and configure a DFS RTU driver in HT3. The **CTU Tunnel IP Address** field must show the IP address of the FIM. For instructions on configuring drivers, see the *HT3 User Guide*.
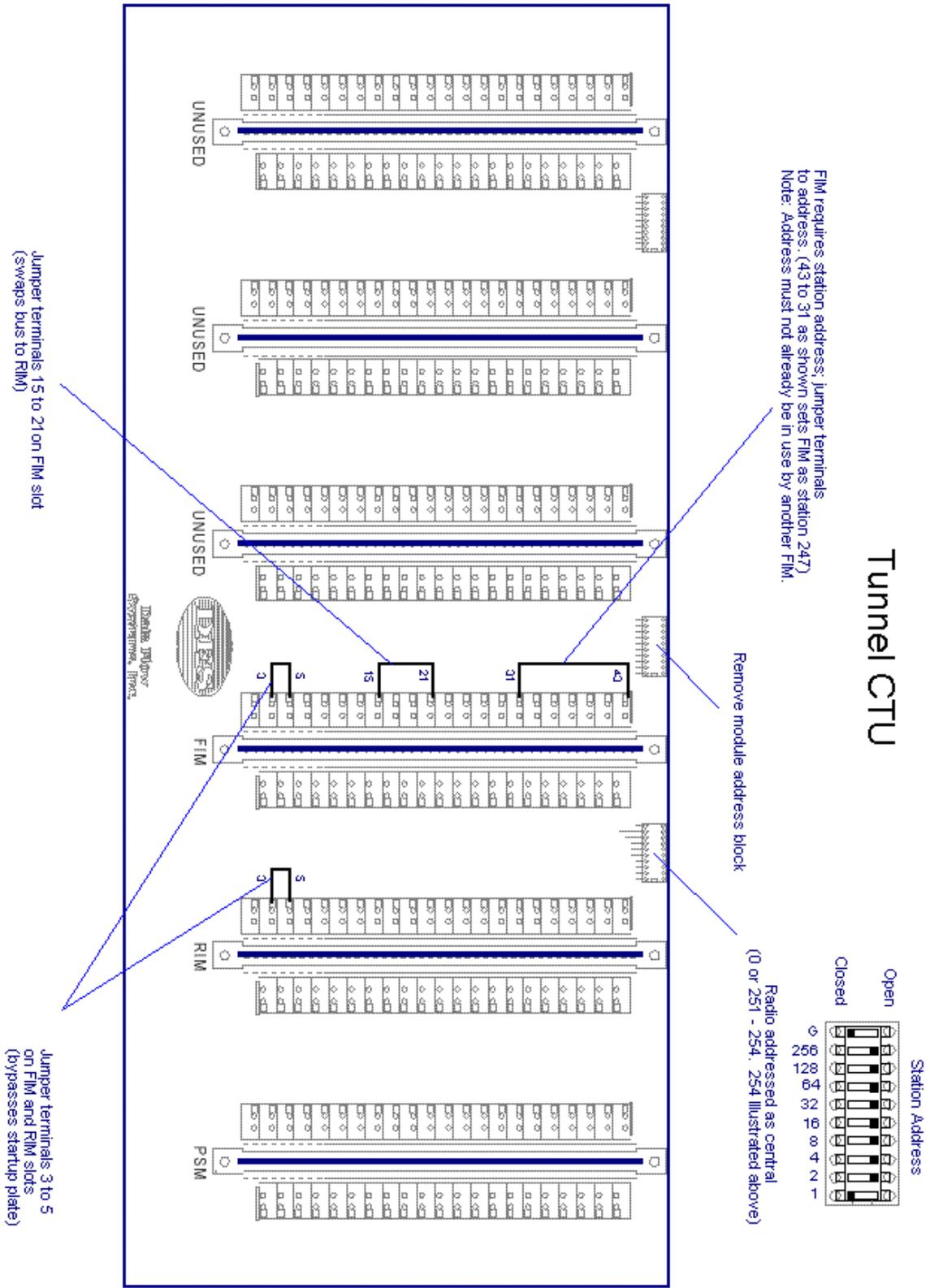
Figure 3-7, "Tunnel CTU Jumper and Address Settings"

Provide Network Hardware in RTU

Overview

A Network Switch Module (NSM) or Network Fiber Module (NFM) can be installed in any unwired module slot of a network-based Remote Terminal Unit (RTU) to provide additional network switch ports or media conversion. An example of this application is to use a NSM to provide a network connection for a laptop computer that is being used to program a PLC.

Installs in Module Slot

In this application, the NSM or NFM is *not* installed in the RTU's RIM slot. It is inserted in any other unused module slot, and it must be addressed as 256. To address the module as 256, place a jumper across pins 43 and 25 on the NSM or NFM. The NSM or NFM *must* be addressed as 256 to identify it as a network distribution module (network module without a DOS-based network CPU).

Power Distribution

The "skeleton board," which is used as the base of all network modules (NIM, FIM, NSM, and NFM), is used to provide power to the attached network hardware (switch or media converter). The NSM or NFM, because it is wired to the RTU's backplane, obtains power from the RTU and benefits from the RTU's battery backup function.

Reset Remotely

The microprocessors on both network distribution modules are programmed to monitor the TX data line of the RTU bus. If communication problems are experienced, the modules can be remotely reset via software on the HSM. It is possible to "toggle" the TX data line to either reset the network hardware on the network distribution modules, or shut down the power supply in order to perform a battery test. HT3's Server Control Center provides the ability to perform these functions from any configured Windows workstation. See the "Using System Troubleshooting and Maintenance Tools" in the *HT3 User Guide* for more information.

Service Port

The service port on network distribution modules provides no function.

Installation and Configuration Procedure

What you'll need:

- Network Switch Module (NSM) or Network Fiber Module (NFM)
- Configuration jumpers (black #16 stranded wire can be used for making jumpers)
- CAT 5 patch cable terminated with RJ-45 connectors and/or fiber-optic cable (depending on the application)
- Electrostatic discharge wrist strap (this must be worn while working inside the unit)

Refer to Figure 3-8, "Network Hardware in RTU – Jumper and Address Settings" for a wiring and configuration diagram. (**Note:** This configuration requires no changes to HT3.)

1. Power down the unit. Ensure that any other power sources coming into the enclosure are turned off. Even if the circuit breakers for the enclosure and the PSM have been turned off, dangerous voltages may still be present in the enclosure.
2. Insert a NSM or NFM in any unused module slot in the network-based RTU.
3. The NSM or NFM *must* be addressed as 256 to identify it as a network distribution module (network module without a DOS-based network CPU). Place a jumper across pins 43 and 25 of the NSM or NFM.
4. Bypass the startup plate by placing a jumper across pins 3 and 5 on the NSM or NFM.
5. Use the patch cable and/or fiber-optic cable to make network connection.
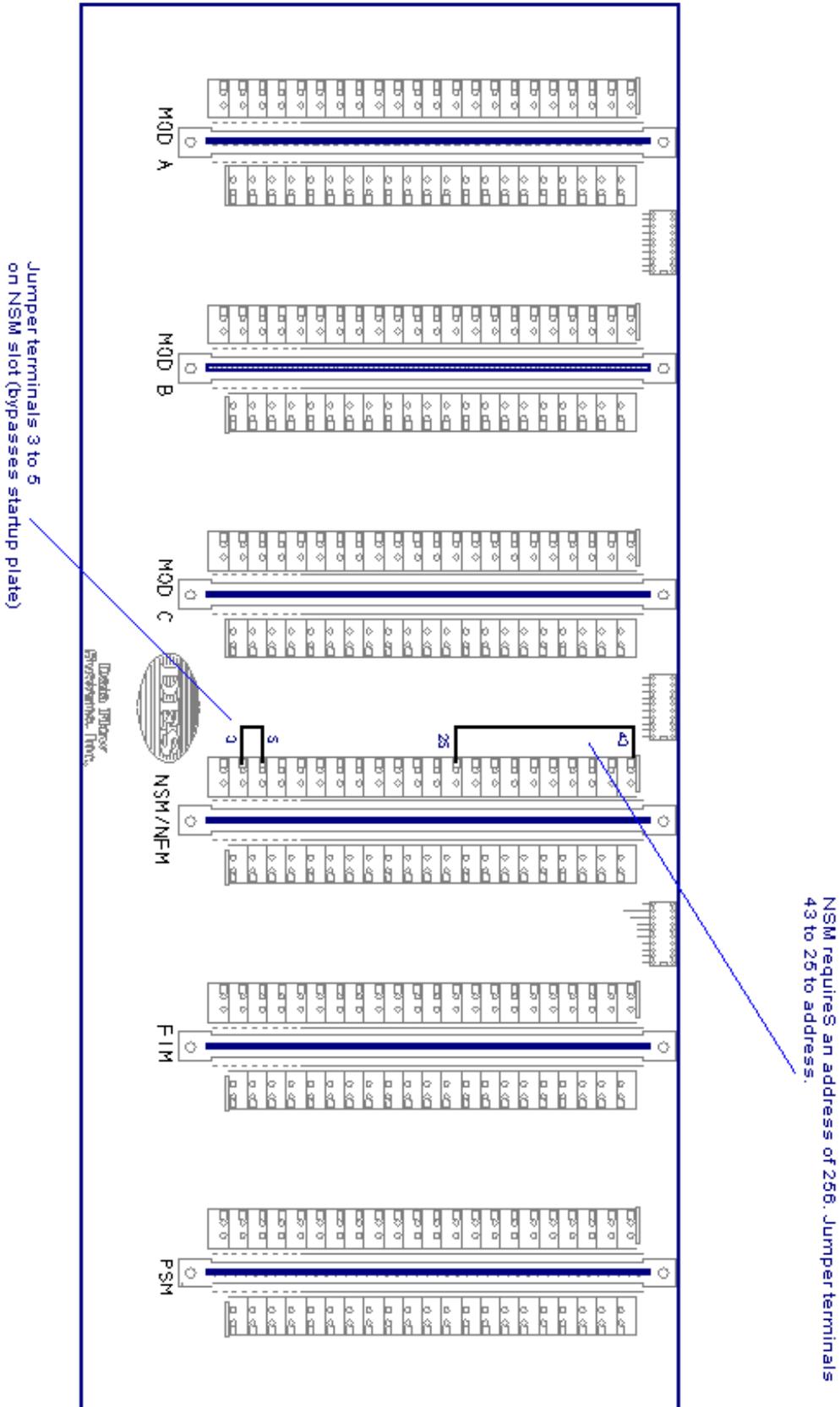6. Restore power to the unit.

Figure 3-8, "Network Hardware in RTU – Jumper and Address Settings"

Provide Network Hardware in HSS

Overview

In this application, the Network Switch Module (NSM) or Network Fiber Module (NFM) is providing a point of distribution for networking inside the Hyper SCADA Server (HSS). The network distribution module (NSM or NFM) is used to provide the Hyper Server Module (HSM) with additional network switch ports or media converters.

Redundant-Capable HSS

Functions of Network Modules in the HSS

Network Distribution and Isolation

A Network Switch Module (NSM) is installed in the RIM slot of the HSS's backplane. In a redundant unit, two NSMs are installed: one in each backplane. The NSMs provide a central network distribution point for each Hyper Server Module within the HSS.

The HSS also features two NFMs that fiber-optically isolate the HSM(s) from the "outside world."

- One NFM isolates the Hyper Server Module(s) from the client, or local area, network.
- The second NFM isolates the HSM(s) from the telemetry system's CTU or network-based RTUs.

All of the network distribution modules communicate over the buss to the Hyper Server Module.

Power Distribution

The "skeleton board," which is used as the base of all network modules (NIM, FIM, NSM, and NFM), provides power to the attached network hardware (switches or converters). The network distribution modules, because they are wired to the HSS's backplane, obtain power from the HSS and benefit from the HSS's battery backup function.

Controlled by HSM

The network distribution module monitors the HSM's Power Supply Module (PSM) and reports status to the HSM. It also initiates a PSM shutdown when requested by the HSM. The HSM instructs the network distribution module to cycle power to its network hardware if communication problems are detected.

Reset Remotely

The microprocessors on both types of network distribution modules are programmed to monitor the TX data line of the HSS bus. If communication problems are detected, the modules can be remotely reset via software on the HSM. It is possible to "toggle" the TX data line to either reset the network hardware on the network distribution modules, or shut down the power supply in order to perform a battery test. These functions can be performed from any HT3 workstation through the System Control Center. See "Using System Troubleshooting and Maintenance Tools" in the *HT3 User Guide*.

Figure 3-9, "Typical HSS Configuration with Redundancy" illustrates network interface and distribution modules used in an HSS002-X (redundant HSS).
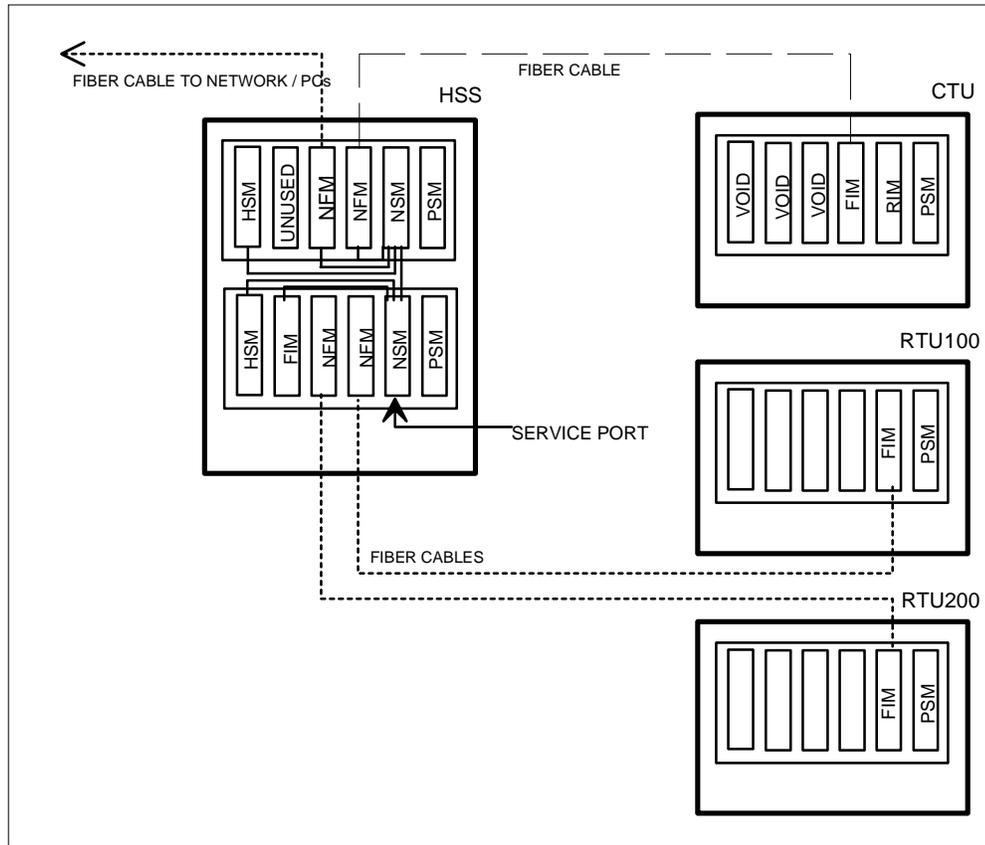
Figure 3-9, "Typical HSS Configuration with Redundancy"

Installation and Configuration Procedure

Network Considerations

When planning an installation, consider the following when selecting the type of fiber-optic cable (multi-mode or single-mode) and the type of media converters:

- Will the HSS be connected to an existing local area network (via a fiber optic media converter) or directly to a master workstation (via a fiber optic media converter)?
- If the HSS is to be connected to an existing local area network, what is the speed of the network?
- If the HSS is to be connected to a master workstation, what is the speed of the media converters used in the HSS?
- What is the distance between the HSS and the telemetry system connection point (the CTU or the media converter to which the system's Network RTUs are connected)?
- What is the distance between the HSS and the entry point to the local area network?

Cable Selection

- Multi-mode fiber-optic cable covers distances up to 2 km (~1.2 miles).
- Single-mode fiber-optic cable covers distances up to 15 km (~9.3 miles).

Converter Selection

The converter used on the Fiber Interface Module (FIM) and the Network Fiber Module (NFM) is a 10Mbps Ethernet Media Converter. This converter can be upgraded to a 100Mbps converter for systems running a faster network. The type of media converter used is solely based on application.

For example, FIMs installed in RTUs will always require a 10Mbps media converter, but the length of the fiber cable (distance between the RTU and the HSS) will dictate which model 10Mbps media converter is needed.

Because most of today's Ethernet networks and workstations are capable of 100Mbps, the most common media converter used to connect the HSS to an existing network or to the "Master" workstation will be 100Mbps. The distance between the HSS and the network or Master workstation will determine which model must be used. It is common to have different model media converters in the HSS.

What you'll need:

*   HSS with Hyper Server Module (HSM) and Power Supply Module (PSM)
*   One Network Switch Module (NSM)
*   Two Network Fiber Modules (NFM)
*   Tunnel CTU or Network RTUs (Network RTUs require a desktop-style or rack-mount fiber-optic media converter between them and the HSS).
*   Local area network or master workstation. Each requires installation of an appropriate fiber-optic media converter between it and the HSS.
*   Configuration jumpers (black #16 stranded wire can be used for making jumpers).
*   3 (three) or 4 (four) CAT 5 patch cables terminated with RJ-45 connectors. Four cables are needed if the HSS is being connected to a master workstation.
*   2 (two) fiber-optic cables. One should be of sufficient length to cover the distance between the HSS and the telemetry system connection point (the Tunnel CTU or the media converter to which the system's Network RTUs are connected). The second cable must cover the distance between the HSS and the media converter to which the local area (client) network or master workstation is connected. In most circumstances, multi-mode cable can be used. If the distance to be covered is greater than 2 km, it will be necessary to use single-mode cable and appropriate converters.
*   Keyboard and monitor. This will be connected to the HSM after all components are installed in the HSS and will be used to configure the HSM's IP address.
*   Electrostatic discharge wrist strap (this must be worn while working inside the unit).

Note: When configuring an HSS002-X (redundant capable HSS), the HSM is placed in the Module A slot; the second slot (Module B slot) is unused.

See Figure 3-11, "HSS Jumper and Address Settings" to view a diagram of the HSS's address and jumper settings. (**Note:** Figure 3-11 shows a non-redundant HSS001.)

1. Power down the unit. Ensure that any power sources coming into the enclosure are turned off. Even if the circuit breakers for the enclosure and the PSM have been turned off, dangerous voltages may still be present in the enclosure.
2. Remove all module address blocks.
3. Insert a NSM in the RIM slot.

4. Insert a NFM in the Module C slot. This NFM (hereafter referred to as NFM1) will be connected to the external network or to a stand-alone client.
5. Insert a second NFM in the Module D slot. This NFM (hereafter referred to as NFM2) will be connected to the telemetry system's CTU.
6. Place a jumper across pins 3 and 5 on each NSM and NFM. This allows them to bypass the startup plate.
7. Address each network distribution module (NSM, NFM1, and NFM2) at 256. These modules must be addressed as 256 to identify them as network distribution modules (network modules that do *not* contain a DOS-based network CPU). Address modules at 256 by placing a jumper across pins 43 and 25.
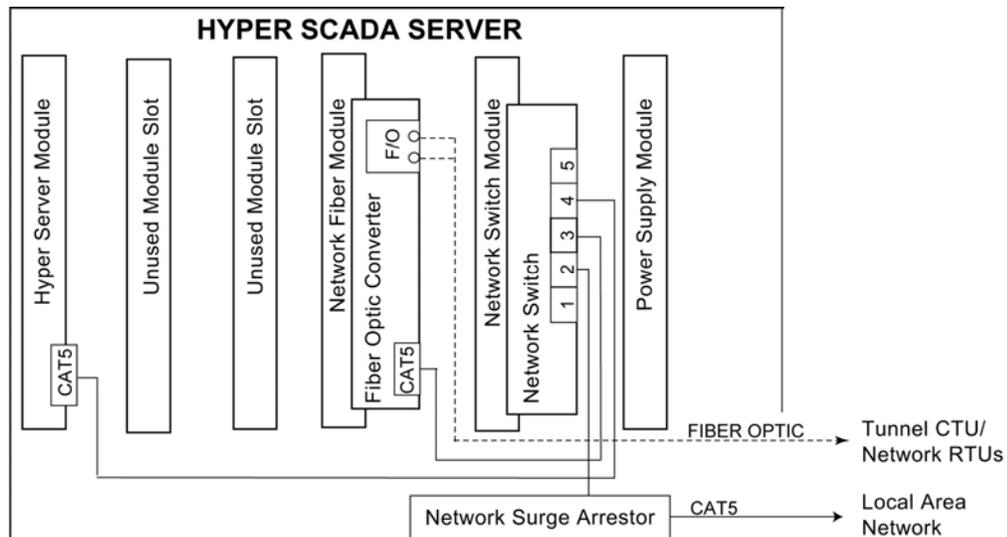

Figure 3-10, "Block Diagram of Network Hardware in HSS"

8. Connect the Hyper Server Module, NFM1, and NFM2 to one of the NSM's open switch ports using CAT 5 patch cables that have been terminated with RJ-45 connectors.
9. Connect NFM1 to the external, local area network (client network) or to the master workstation via the appropriate media converter. Connection to a local area network or a master workstation* is through a fiber-optic cable that is attached to NFM1's media converter (TX and RX connectors). Use multi-mode cable for distances less than 2km; use single mode for distances greater than 2km.

   (* If the HSS is being connected to a master workstation, the link speed of the workstation's Ethernet adapter (network card) must be configured. See "Workstation Configuration: Connecting over a Network" in the Hyper SCADA Server Installation and Operation Manual for more information.)

10. Connect NFM2 to the telemetry system connection point (Tunnel CTU or hub of network RTUs). Connection is through a fiber-optic cable attached to NFM2's media converter (TX and RX connectors). Use multi-mode cable for distances less than 2km; use single mode for distances greater than 2km.
11. Connect the keyboard and monitor to the HSM.

12. Restore power to the unit.
    A. Turn on the PSM.
    B. Connect the battery. The HSS is now activated.
13. It is not necessary to power up the HSM; it will automatically power up when it senses power has been applied. LED sequence during power up is as follows:
    C. The ACT LED is constant. The SDN LED blinks slowly and then more quickly. +CPU and +5V LEDS are constant and remain constant during and after power up.
    D. The SDN LED goes off and the ACT LED is constant.
    E. The ACT LED begins to blink indicating that the HSM is fully powered up.
14. When the HSM is fully powered and booted up, a login prompt appears on the monitor. Enter *mgr* for the login and *htiimgr* for the password.
15. At the command prompt, type *change_ip xxx.xxx.xxx.xxx* (where xxx.xxx.xxx.xxx represents the IP address of the HSM).
16. Reboot the HSM.
    A. Press the power down button on the HSM and watch the HSM's LEDs. When the +CPU LED goes off, the HSM is fully powered down. After the HSM has been powered down, it cannot be restarted for 10 seconds. All inputs are ignored until 10 seconds have passed.
    B. After 10 seconds have passed, press the power up button on the HSM and watch the HSM's LEDs. When the ACT LED begins to blink, the HSM is fully powered up.

We recommend that you keep the keyboard and monitor attached to the HSM until you verify that you can communicate with the HSM from a Windows workstation.
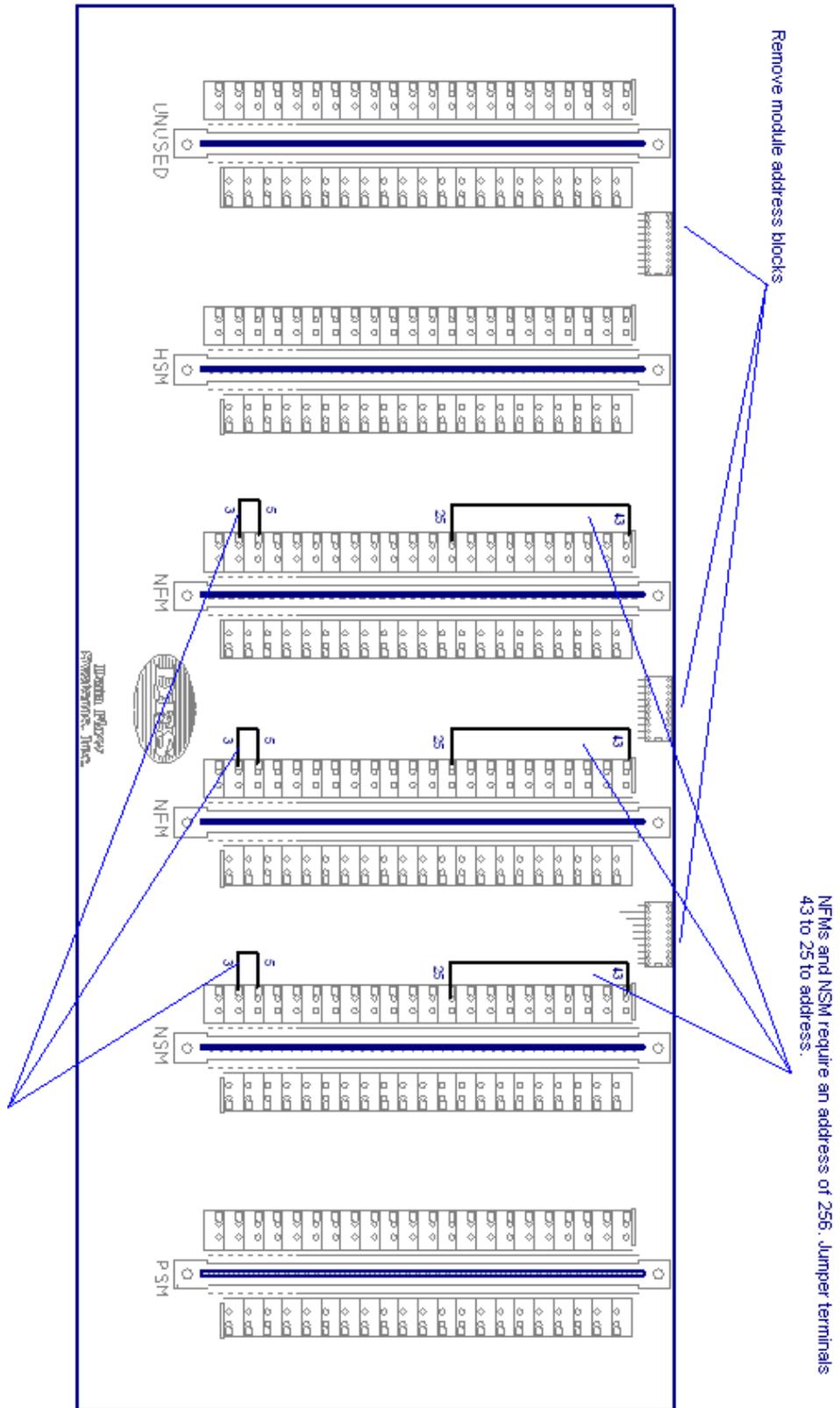
Figure 3-11, "HSS Jumper and Address Settings"

Notes

Troubleshooting Toolbox

The following items are necessary for troubleshooting a network interface module (NIM or FIM):

- Laptop computer with serial port and Ethernet adapter
- RIM/NIM communication cable
- HyperTerminal or similar terminal program

A Network Switch Module (NSM) is optional, but is useful for obtaining a connection to the network. Becoming a client on the network enables you to perform such tasks as:

- Pinging the server
- Accessing HT3 from a remote location

A NSM can be installed in any unused module slot of an RTU. For more information on this, see "Provide Network Hardware in RTU" on page 24.

Note: The following paragraphs refer only to the Fiber Interface Module (FIM), but the information also applies to the Network Interface Module (NIM).

Potential Problems and Suggested Troubleshooting Steps:

My Network RTU is offline!

If you find that your network RTU is offline, verify the following:

Physically check

- Is the FIM powered?
- Is the FIM's media converter powered?
- Is the media converter fiber linked?

Verify by obtaining a console to the FIM (see procedure on page 36)

- Is the FIM addressed < 250?
- Is the FIM's DOS-based CPU booting?
- Is the FIM seeing its station address?
- Is the FIM getting a network address from HT3

Verify through HT3

- Has a NIM driver been configured and is it polling?
- Has the station been configured under the NIM driver and is it being polled?

My Tunnel CTU is not Polling!

If you find that your tunnel CTU is not polling, verify the following:

Physically check

- Is the FIM powered?
- Is the FIM's media converter powered?
- Is the media converter fiber linked?
- Is there a jumper placed across pins 15 and 23 on the FIM?
- Is the RIM addressed as a CTU (0 or 251 - 254)?

Verify by obtaining a console to the FIM (see procedure below)

- Is the FIM addressed < 250?
- Is the FIM's DOS-based CPU booting?
- Is the FIM seeing its station address?
- Is the FIM getting a network address from HT3?

Verify through HT3

- Has a NIM driver been configured to poll the correct NIM address?

Obtaining a Console to a FIM

Connecting a laptop computer to a FIM enables you to:

- Verify that the FIM's CPU is functional
- Determine the version of DOS code that the FIM is running
- Determine the version of firmware running on the FIM's 8051 processor
- Determine the station address to which the FIM is set
- Determine the network address, or subnet, that is being broadcast by HT3
- Determine the settings (baud rate, data bits, parity, stop bits) of the NIM driver under which the FIM has been configured

Notes:

A console cannot be accessed if both serial ports on the FIM are being used for tunneling.

This is *not* the FIM's **test mode operation**, which is used to monitor buss communication. Test mode does *not* require setting the console to noquiet; test mode is designed to function with WinRTU Test at the following settings: 9600 baud, 7 data bits, Odd parity, and 2 stop bits.

To obtain a console:

1. Connect the laptop's serial port to the FIM's service port using the RIM/NIM cable.
2. Configure HyperTerminal to connect directly to the FIM's serial port at 9600 8 N 1 (9600 baud, 8 data bits, No parity, 1 stop bit).
3. Press Ctrl + C while powering up the FIM.
4. Type noquiet
5. Type boot

The following information is provided (see screenshot below):

- The initial boot screen verifies that the FIM's CPU is functional
- Version of DOS code running on the FIM's CPU
- Version of firmware running on the FIM's 8051 processor
- Station address at which the FIM is set
- Network address (subnet) that is being broadcast by HT3
- Baud rate, data bits, parity setting, and stop bits (in that order) to which the FIM's driver has been configured.

When troubleshooting via the console is complete, the FIM must be returned to quiet mode in order for the COM2 serial port to be available for serial tunneling.

1. Type the word *quiet*.
2. Type the word *boot* OR cycle power to the FIM.
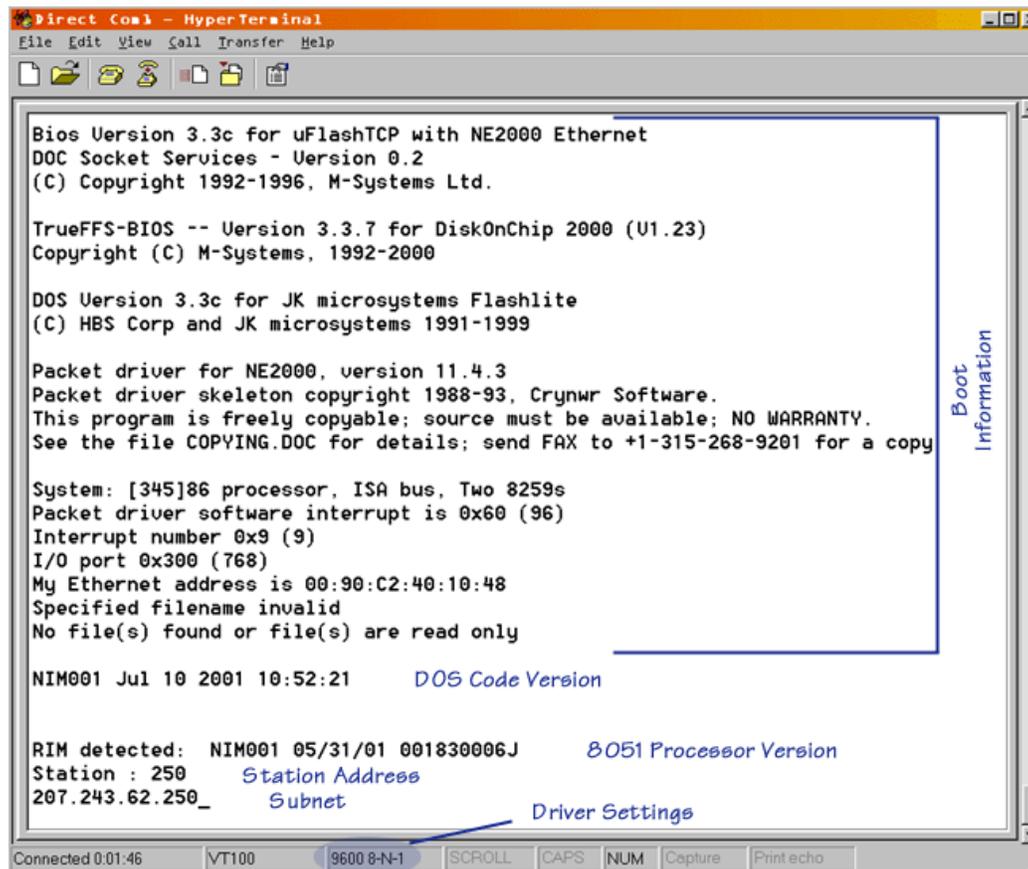
Notes

Fiber Interface Module

Model Number – FIM001

Part Number – DFS-00375-008-02

Board Size – 5.25" X 6.88"

Service Port – RS-232 (ASCII)

Circuit Protection – Transorb

Power Requirements – 12 to 14 VDC; 653 mA

Network Interface – 10base-T or 10/100base T (determined by model selected)

Network Protocol – TCP/IP (UDP Datagram)

Serial Interfaces – Two (2) external serial interfaces with four (4) modes of operation. Interfaces are configurable at the connector.

LEDs – Power, receive data, transmit data, network link, network traffic, COMM2, microprocessor fault, test mode

Models

- **FIM001-10**: 10 Mbps; multi-mode fiber applications up to 2 km
- **FIM001-10/100**: 10/100 Mbps; multi-mode fiber applications up to 2 km
- **FIM001-SM**: 10 Mbps; single-mode fiber applications from 2-15 km
- **FIM001-SM-10/100**: 10/100 Mbps; single-mode fiber applications from 2-15 km

Typical Applications

- **Serial Tunneling Device in CTU**: When used in a CTU, the FIM uses "serial tunneling" to convert the RIM's serial TTL (radio) data into network data for transmission over fiber optic cable to the Hyper SCADA Server.

- **Network Communication in RTU**: When used in a 200 Series RTU, the FIM replaces the RIM; communications with the central site is accomplished via Ethernet. The FIM will interface with up to 15 I/O modules of any combination.

Network Interface Module

Model Number – NIM001

Part Number – DFS-00375-008-01

Board Size – 5.25" X 6.88"

Service Port – RS-232 (ASCII)

Circuit Protection – Transorb

Power Requirements – 12 to 14 VDC; 579 mA

Network Interface – 10base-T

Network Protocol – TCP/IP (UDP Datagram)

Serial Interfaces – Two (2) external serial interfaces with four (4) modes of operation. Interfaces are configurable at the connector.

Typical Application
Serial Tunneling Device: Enables serial communications from RS-232 devices (including Modbus devices) to be sent over a network.

Network Fiber Module

Model Number – NFM001

Part Number – DFS-00375-008-03

Board Size – 5.25" X 6.88"

Circuit Protection – Transorb

Power Requirements – 12 to 14 VDC; 280 mA

Network Interface – 10base-T or 10/100base T (determined by model selected)

Network Protocol – TCP/IP (UDP Datagram)

Models

- **NFM001**: 10 Mbps; multi-mode fiber applications up to 2 km

- **NFM001-F**: 10/100 Mbps; multi-mode fiber applications up to 2 km

- **NFM001-SM**: 10 Mbps; single-mode fiber applications from 2-15 km

- **FIM001-FSM**: 10/100 Mbps; single-mode fiber applications from 2-15 km

Typical Application

Hyper SCADA Server (HSS) Media Converter: Plugs in module slot and provides transient voltage protection to the HSS's Hyper Server Module (HSM). One NFM interfaces between the HSM and the client network. A second NFM interfaces between the HSM and the telemetry system (RTUs or CTU).

Network Switch Module

Model Number – NSM001

Part Number – DFS-00375-008-04

Board Size – 5.25" X 6.88"

Circuit Protection – Transorb

Power Requirements – 12 to 14 VDC; 790 mA

Network Interface – 10base-T

Network Protocol – TCP/IP (UDP Datagram)

Typical Application

HSS (Hyper SCADA Server) Network Connectivity: The Network Switch Module can be inserted in one of the HSS' module slots to provide a connection from the Hyper Server Module (HSM) to the client network and the telemetry system's RTUs and/or CTU.

| Name	Pin		Name
STATION ADDRESS GROUND	43		
		42	SYSTEM V+
	=key=		
STATON ADDRESS BIT 7	41		
		40	SYSTEM GROUND
STATION ADDRESS BIT 6	39		
		38	POWER DOWN
STATION ADDRESS BIT 5	37		
		36	REQUEST TO SEND
STATION ADDRESS BIT 4	35		
		34	CLEAR TO SEND
STATION ADDRESS BIT 3	33		
		32	RECEIVE DATA
STATION ADDRESS BIT 2	31		
		30	TRANSMIT DATA
STATION ADDRESS BIT 1	29		
		28	(PSM) POWER SUPPLY V+
STATION ADDRESS BIT 0	27		
		26	(PSM) POWER SUPPLY GROUND
STATION ADDRESS BIT 8	25		
		24	(PSM) POWER SUPPLY CONTROL
PROGRAM STRAP 3	23		
		22	
PROGRAM STRAP 2	21		
		20	(PSM) / RTU POWER OK
PROGRAM STRAP 1	19		
		18	(PSM) / BIAS OK
PROGRAM STRAP 0	17		
		16	232 CTS 2
PROGRAM STRAP GROUND	15		
		14	232 RTS 2
232 CTS 1	13		
		12	232 GND 2
	=key=		
232 RTS 1	11		
		10	232 TXD 2
BATTERY GROUND	9		
		8	232 RXD 2
BATTERY V+	7		
		6	232 GND 1
/ POWER UP	5		
		4	232 TXD 1
REDUNDANT POWER SUPPLY GROUND	3		
		2	232 RXD 1
	=key=		
REDUNDANT POWER SUPPLY V+	1		

Notes

With regards to addressing, modules are one of two types: those addressed by placing a jumper across two pins or those addressed by moving DIP switches.

Each pin or DIP switch has an assigned bit value. The station address is derived by totaling the values of the bits that are not grounded.

- A pin is grounded if a jumper has been placed across it and pin 43 (ground).

- A DIP switch is grounded if it is in the CLOSED, or ON, position.

DIP Switches

In the DIP switch example below, we arrive at the station address by totaling the bit values of the switches that are OFF, or OPEN.
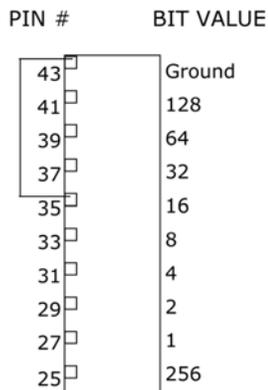
BIT VALUE

G
256
128
64
32
16
8
4
2
1

O N   O F F
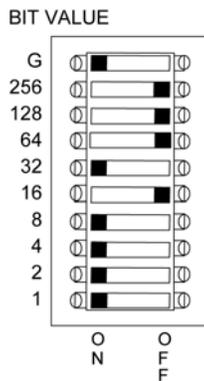
This DIP switch example shows a station address of 208:

$128 + 64 + 16 = 208$

Pins/Jumper

In the pins/jumper example below, we arrive at the station address by totaling the bit values of the pins that are not jumpered to Ground.

PIN #   BIT VALUE

43   Ground
41   128
39   64
37   32
35   16
33   8
31   4
29   2
27   1
25   256

This pins/jumper example shows a station address of 239:

$128 + 64 + 32 + 8 + 4 + 2 + 1 = 239$

Note: The NSMs and NFMs in the HSS must be addressed at 256 to identify them as network distribution modules. To address the module at 256, place a jumper across pins 43 and 25.

Notes:

Support and Service

Data Flow Systems, Inc. offers support services nationwide from its home office and through authorized Value Added Resellers (VARs) and System Integrators.

Contact your local Data Flow Systems, Inc. representative for:

- sales and order support
- product technical training
- warranty support
- support service agreements

If you are unsure of whom to contact, call DFS' Melbourne headquarters at 321-259-5009 and ask for the Sales Department. Alternatively, send email to sales@dataflowsys.com.

Technical Product Assistance

Please review the information in the *Troubleshooting* section before contacting Data Flow Systems, Inc. If you need further assistance, visit the DFS web site (www.dataflowsys.com) and click the "Help Desk" link or contact your local Data Flow Systems representative. If you are unsure of whom to contact, call DFS' Melbourne headquarters at 321-259-5009 and ask for the Sales Department. Alternatively, send email to sales@dataflowsys.com.

Return Authorization (RA) Procedure

Data Flow Systems' function modules are designed to be robust and highly reliable. We back this performance with a 3-year full warranty (see our warranty statement for details). In the event that a function module fails, during or after the warranty period, it may be returned to Data Flow Systems to be repaired or replaced.

All RA's will be subject to standard shipping and handling charges. Minimum handling charges will be assessed, in most cases, for work such as Radio Tuning, Backplanes, "No Problem Found," and other minor repairs. Handling charges will be waived on warranty equipment. Standard shipping and charges will be based on UPS ground. Please advise if other arrangements are needed (UPS Red, FedEx, Pickup, Freight…). Standard cost of repairs and shipping charges can be obtained by contacting our RA Department by phone or e-mail.

STEP 1: Replace the failed module with a spare module of the same type if one is available.

STEP 2: Contact Data Flow Systems Inc. in one of the following ways to receive a RA#.

E-mail – An RA# can be received by e-mailing DFS at rma@dataflowsys.com and must include the following information.

- Customer/Utility Name and Ship to Address

- Contact Name and Phone Number
- Products to be returned and Serial Numbers
- Detailed description of failure
- PO#

Phone – RA# will be issued over the phone by calling DFS at 321-259-5009 during normal operating hours. The following information will be needed.

- Customer/Utility Name and Ship to Address
- Contact Name and Phone Number
- Products to be returned and Serial Numbers
- Detailed description of failure
- PO#

Note   The lack of "Detailed description of failure" could result in the return of equipment due to the inability to properly determine the nature of the failure or testing resulting in "No Problem Found."

STEP 3: Place the function module(s) individually in an electrostatic discharge bag and then wrap with foam or bubble wrap. Pack the wrapped module(s) in a sturdy box filled with popcorn-type or bubble wrap packing material. Include a packing slip with the following information:

- Module(s) model, serial number, probable cause of failure, and the RA number
- Shipping address
- Shipping instructions (shipping costs greater than UPS ground are charged to the customer)

STEP 4: Address the box to:

> RA Department # {the RA number you received here}
> Data Flow Systems, Inc.
> 605 N. John Rodes Blvd.
> Melbourne, FL 32934-9105

STEP 5: Ship the box to DFS using any typical shipping carrier (for example, UPS, FedEx, etc.). If circumstances permit, have a DFS employee hand carry the package to the headquarters for you. NOTE: DFS employees are not permitted to hand carry unpacked modules.

Modules are typically repaired and shipped back to the customer within a 2-week period starting at the time the module reaches the RA Department. If additional information is required during the repair of the module(s), the DFS service department will contact you.

To get information on the progress of any of your equipment in for repair, contact the DFS - RA Department at rma@dataflowsys.com or 321-259-5009.

Replacement of equipment may be necessary in the event that the equipment and/or parts are unrepairable. Warranty equipment will be replaced with out prior notification as warranty replacement. The customer will be notified by phone if equipment not under warranty cannot be repaired with information of available options.

DFS reserve the right to return any material received without an RA# or not conforming to the requirements of this RA process.

Warranty

Data Flow Systems, Inc. (DFS) offers a one (1) year on-site warranty covering defects in materials and workmanship. All DFS "plug-in" function modules, Pump Control Units (PCU), and Back Pack Radios (BPR) carry an extended two (2) year return-to-factory warranty. This extended warranty does not cover misuse, vandalism, or Acts of God. However, these items are warranted against damage due to lightning for the entire three-year period.

Questions or Comments on This Manual

If you find a problem with any of the information in this manual or have suggestions on how it could be improved, please contact us at the address below:

Data Flow Systems, Inc.
Documentation Department
605 N. John Rodes Blvd.
Melbourne, FL 32934

Alternatively, e-mail us at:

documentation@dataflowsys.com

Notes

DFS

Data Flow Systems

Data Flow Systems, Inc.

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