Fire Alarm System Limitations

While a fire alarm system may lower insurance rates, it is not a substitute for fire insurance!

An automatic fire alarm system—typically made up of smoke detectors, heat detectors, manual pull stations, audible warning devices, and a fire alarm control panel with remote notification capability—can provide early warning of a developing fire. Such a system, however, does not assure protection against property damage or loss of life resulting from a fire.

The Manufacturer recommends that smoke and/or heat detectors be located throughout a protected premise following the recommendations of the current edition of the National Fire Protection Association Standard 72 (NFPA 72), manufacturer's recommendations, State and local codes, and the recommendations contained in the Guide for Proper Use of System Smoke Detectors, which is made available at no charge to all installing dealers. These documents can be found at http://www.systemsensor.com/html/applicat.html.

A study by the Federal Emergency Management Agency (an agency of the United States government) indicated that smoke detectors may not go off in as many as 35% of all fires. While fire alarm systems are designed to provide early warning against fire, they do not guarantee warning or protection against fire. A fire alarm system may not provide timely or adequate warning, or simply may not function, for a variety of reasons:

Smoke detectors may not sense fire where smoke cannot reach the detectors such as in chimneys, in or behind walls, on roofs, or on the other side of closed doors. Smoke detectors also may not sense a fire on another level or floor of a building. A second-floor detector, for example, may not sense a first-floor or basement fire.

Particles of combustion or “smoke” from a developing fire may not reach the sensing chambers of smoke detectors because:

- Barriers such as closed or partially closed doors, walls, or chimneys may inhibit particle or smoke flow.
- Smoke particles may become “cold,” stratify, and not reach the ceiling or upper walls where detectors are located.
- Smoke particles may be blown away from detectors by air outlets.
- Smoke particles may be drawn into air returns before reaching the detector.

The amount of “smoke” present may be insufficient to alarm smoke detectors. Smoke detectors are designed to alarm at various levels of smoke density. If such density levels are not created by a developing fire at the location of detectors, the detectors will not go into alarm.

Smoke detectors, even when working properly, have sensing limitations. Detectors that have photo-electronic sensing chambers tend to detect smoldering fires better than flaming fires, which have little visible smoke. Detectors that have ionizing-type sensing chambers tend to detect fast-flaming fires better than smoldering fires. Because fires develop in different ways and are often unpredictable in their growth, neither type of detector is necessarily best and a given type of detector may not provide adequate warning of a fire.

Smoke detectors cannot be expected to provide adequate warning of fires caused by arson, children playing with matches (especially in bedrooms), smoking in bed, and violent explosions (caused by escaping gas, improper storage of flammable materials, etc.).

Heat detectors do not sense particles of combustion and alarm only when heat on their sensors increases at a predetermined rate or reaches a predetermined level. Rate-of-rise heat detectors may be subject to reduced sensitivity over time. For this reason, the rate-of-rise feature of each detector should be tested at least once per year by a qualified fire protection specialist. Heat detectors are designed to protect property, not life.

IMPORTANT! Smoke detectors must be installed in the same room as the control panel and in rooms used by the system for the connection of alarm transmission wiring, communications, signaling, and/or power. If detectors are not so located, a developing fire may damage the alarm system, crippling its ability to report a fire.

Audible warning devices such as bells may not alert people if these devices are located on the other side of closed or partly open doors or are located on another floor of a building. Any warning device may fail to alert people with a disability or those who have recently consumed drugs, alcohol or medication. Please note that:

- Strobes can, under certain circumstances, cause seizures in people with conditions such as epilepsy.
- Studies have shown that certain people, even when they hear a fire alarm signal, do not respond or comprehend the meaning of the signal. It is the property owner's responsibility to conduct fire drills and other training exercises to make people aware of fire alarm signals and instruct them on the proper reaction to alarm signals.
- In rare instances, the sounding of a warning device can cause temporary or permanent hearing loss.

A fire alarm system will not operate without any electrical power. If AC power fails, the system will operate from standby batteries only for a specified time and only if the batteries have been properly maintained and replaced regularly.

Equipment used in the system may not be technically compatible with the control panel. It is essential to use only equipment listed for service with your control panel.

Telephone lines needed to transmit alarm signals from a premise to a central monitoring station may be out of service or temporarily disabled. For added protection against telephone line failure, backup radio transmission systems are recommended.

The most common cause of fire alarm malfunction is inadequate maintenance. To keep the entire fire alarm system in excellent working order, ongoing maintenance is required per the manufacturer's recommendations, and UL and NFPA standards. At a minimum, the requirements of NFPA 72 shall be followed. Environments with large amounts of dust, dirt or high air velocity require more frequent maintenance. A maintenance agreement should be arranged through the local manufacturer's representative. Maintenance should be scheduled monthly or as required by National and/or local fire codes and should be performed by authorized professional fire alarm installers.
Installation Precautions

Adherence to the following will aid in problem-free installation with long-term reliability:

**WARNING -** Several different sources of power can be connected to the fire alarm control panel. Disconnect all sources of power before servicing. The control unit and associated equipment may be damaged by removing and/or inserting cards, modules, or interconnecting cables while the unit is energized. Do not attempt to install, service, or operate this unit until this manual is read and understood.

**CAUTION - System Reacceptance Test after Software Changes.** To ensure proper system operation, this product must be tested in accordance with NFPA 72 after any programming operation or change in site-specific software. Reacceptance testing is required after any change, addition or deletion of system components, or after any modification, repair or adjustment to system hardware or wiring.

All components, circuits, system operations, or software functions known to be affected by a change must be 100% tested. In addition, to ensure that other operations are not inadvertently affected, at least 10% of initiating devices that are not directly affected by the change, up to a maximum of 50 devices, must also be tested and proper system operation verified.

**This system** meets NFPA requirements for operation at 0°C to 49°C (32°F to 120°F) and at a relative humidity 93% ± 2% RH (non-condensing) at 32°C ± 2°C (90°F ± 3°F). However, the useful life of the system’s standby batteries and the electronic components may be adversely affected by extreme temperature ranges and humidity. Therefore, it is recommended that this system and all peripherals be installed in an environment with a nominal room temperature of 15-27°C (60-80°F).

Verify that wire sizes are adequate for all initiating and indicating device loops. Most devices cannot tolerate more than a 10% I.R. drop from the specified device voltage.

Like all solid state electronic devices this system may operate erratically or can be damaged when subjected to lightning-induced transients. Although no system is completely immune from lightning transients and interferences, proper grounding will reduce susceptibility. Overhead or outside aerial wiring is not recommended, due to an increased susceptibility to nearby lightning strikes. Consult with the Technical Services if any problems are anticipated or encountered.

**Disconnect AC power and batteries** prior to removing or inserting circuit boards. Failure to do so can damage circuits.

Remove all electronic assemblies prior to any drilling, filing, reaming, or punching of the enclosure. When possible, make all cable entries from the sides or rear. Before making modifications, verify that they will not interfere with battery, transformer, and printed circuit board location.

Do not tighten screw terminals more than 9 in-lbs. Over-tightening may damage threads, resulting in reduced terminal contact pressure and difficulty with screw terminal removal.

**Though designed to last many years,** system components can fail at any time. This system contains static-sensitive components. Always ground yourself with a proper wrist strap before handling any circuits so that static charges are removed from the body. Use static-suppressive packaging to protect electronic assemblies removed from the unit.

Follow the instructions in the installation, operating, and programming manuals. These instructions must be followed to avoid damage to the control panel and associated equipment. FACP operation and reliability depend upon proper installation by authorized personnel.

---

**FCC Warning**

**WARNING:** This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for Class A computing devices pursuant to Subpart B of Part 15 of FCC Rules, which is designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user will be required to correct the interference at his own expense.

**Canadian Requirements:** This digital apparatus does not exceed the Class A limits for radiation noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications. This Class A digital apparatus complies with Canadian ICES-003.

Le présent appareil numérique n’émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Reglement sur le brouillage radioelectrique edicté par le ministere des Communications du Canada. Cet appareil numerique de la classe A est conforme a la norme NMB-003 du Canada.

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• Manual page number
• Your comment

Send email messages to:

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Please note this email address is for documentation feedback only. If you have any technical issues, please contact Technical Services.
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Section 1 Modbus Gateway Features

1.1 Product Description

The Modbus Gateway provides a communication link between networks that use the Modbus/TCP communication protocol and Fire Alarm Control Panels (FACPs) resident on an NFN network. The NFN network communicates with the Modbus Gateway through an HS-NCM-W/SF/MF or NCM-W/F network control module that is on that NFN network. The Modbus communication protocol is consistent with Modbus Application Protocol Specification V1.1b.

The Modbus Gateway Configuration Tool, a programming utility included with the Modbus Gateway assembly, is used to configure the Modbus Gateway. The Modbus Gateway is designed to need very little configuration. In most applications you will only need to enter the TCP/IP settings for your network and the nodes you would like to monitor. The gateway will automatically map all the configured points and supply you with a user friendly comma separated value report that defines the mapping. Refer to Section 3, “Modbus Gateway Configuration”, on page 33.

1.1.1 Modbus Gateway Features

The Modbus Gateway has the ability to:

- Monitor four compatible NFN or HS-NFN nodes not including the Modbus Gateway node itself.
- Provide data such as event type, active/inactive, enabled/disabled, acknowledged/unacknowledged, device type, analog value (4–20ma modules only), and system troubles.
- Support reads of up to 100 registers at a time. Analog values can be read 10 registers at a time.
- Receive configuration data from the Modbus Gateway Configuration Tool.
- Log diagnostic information.
- Send standard Modbus Exception Responses.
- Reduce configuration time by self configuring all nodes and points.
- Support standard Command Functions (See Section 4.2.1, “Modbus Commands” on page 43).

NOTE: This manual is written with the understanding that its user is trained in Modbus operations and services. The information provided here is solely for the configuration of the Modbus Gateway to communicate event information to an existing Modbus network.

1.1.2 Modbus Masters

Modbus Masters Compatibility

- The Modbus Gateway was designed to be compatible with standard Modbus/TCP masters.
- Support one-byte Unit IDs.
- Have configurable polling times.
- Support Modbus Exception responses including 0x0A and 0x0B.
- The Modbus Gateway supports one Modbus Master.
1.2 System Architecture

1.2.1 IP Requirements

An Internet or Intranet IP network connection is required to configure the Modbus Gateway, and to connect it with Modbus clients. The Internet or Intranet IP network connection must meet the following requirements.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet Network Configuration</td>
<td>Private or Business LAN</td>
</tr>
<tr>
<td>TCP/IP Requirements</td>
<td>Static IP address required</td>
</tr>
<tr>
<td>Peer-to-Peer/Domain Support</td>
<td>Peer-to-Peer</td>
</tr>
<tr>
<td>Ethernet Connection</td>
<td>Standard 100Base-T Connection</td>
</tr>
<tr>
<td>Bandwidth Requirements</td>
<td>Based on client polling rates</td>
</tr>
<tr>
<td>Firewall Configurations/Required Port(s)</td>
<td>502</td>
</tr>
<tr>
<td>DNS Support</td>
<td>No</td>
</tr>
</tbody>
</table>

1.2.2 Bandwidth Calculation

Use this information to calculate the network bandwidth your Modbus Gateway usage will require, and how it will impact your network.

<table>
<thead>
<tr>
<th>Description</th>
<th>Bytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet header</td>
<td>14</td>
</tr>
<tr>
<td>IP Header</td>
<td>20</td>
</tr>
<tr>
<td>TCP Header</td>
<td>20</td>
</tr>
<tr>
<td>MBAP Header</td>
<td>7</td>
</tr>
<tr>
<td>Message—5 bytes Function code (1) + Start Address (2) + Quantity of Registers (2)</td>
<td>5</td>
</tr>
<tr>
<td>Total Bytes</td>
<td>66</td>
</tr>
</tbody>
</table>
Calculating Bandwidth Requirement

- One request and response pair requires 329 Bytes (66 + 263).
- If a client is polling at one second intervals, then request and response are both possible in one second.
- A request and response pair creates network traffic of 329 Bytes per second (329 x 1).
- In other words, a request and response pair creates network traffic of 2632 bits per second (329 x 8).
- Therefore, the network must be able to accommodate at least 0.0027 Mbps data flow.
- Once every five seconds, an analog request adds a small amount of network traffic.
- Formula for Modbus Gateway network bandwidth requirement based on polling rate:

\[
\text{Bandwidth requirement} = \frac{(329 \times (1000/\text{polling rate in milliseconds}) \times 8)}{(10^6)} \text{ Mbps}
\]
1.2.3 Modbus Gateway Architecture

These illustrations show possible configurations for Modbus Gateway architecture.

Figure 1.1 Example System: Modbus Gateway on NFN Network
Figure 1.2 Example System: Modbus Gateway Direct to Fire Alarm Control Panel
1.2.4 Redundancy

The Modbus Gateway supports redundancy. To implement a redundant gateway, simply set up another Modbus Gateway to monitor the same nodes as the first. The second gateway will need to have a separate and unique IP address from the first gateway. The Modbus client can get the same information from either gateway.

Figure 1.3 Redundant Modbus Gateways
1.3 Related Documentation

Below is a list of documentation that relates to the use of the Modbus Gateway.

Table 1.4 Related Documentation

<table>
<thead>
<tr>
<th>For information on</th>
<th>Refer to</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cabinets &amp; Chassis</td>
<td>CAB-3/CAB-4 Series Installation Document</td>
<td>15330</td>
</tr>
<tr>
<td>Panels and Annunciators</td>
<td>NFS-320 Installation/Operation/Programming Manual</td>
<td>52745/52746/52747</td>
</tr>
<tr>
<td></td>
<td>NFS-640 Installation/Operation/Programming Manual</td>
<td>52544/52545/52546</td>
</tr>
<tr>
<td></td>
<td>NFS2-640 Installation/Operation/Programming Manual</td>
<td>52741/52742/52743</td>
</tr>
<tr>
<td></td>
<td>NFS-3030 Installation/Operation/Programming Manual</td>
<td>51330/51344/51345</td>
</tr>
<tr>
<td></td>
<td>NFS2-3030 Installation/Operation/Programming Manual</td>
<td>52544/52546/52545</td>
</tr>
</tbody>
</table>

1.4 Agency Listings

NOTE: The Modbus Gateway is recognized by UL as an ancillary reporting device.

NOTE: UL 864, 9th Edition—This system works with products that have been UL 864, 9th Edition listed as well as products that have not received UL 864, 9th Edition certification. Operation of systems that are comprised of equipment that is UL 864, 9th Edition listed together with products that are not UL 864, 9th Edition listed requires the approval of the local Authority Having Jurisdiction (AHJ).

CAN/ULC-S559-04, 1st Edition—This system works with products that have been CAN/ULC-S559-04, 1st Edition listed as well as products that have not received CAN/ULC-S559-04, 1st Edition certification. Operation of systems that are comprised of equipment that is CAN/ULC-S559-04, 1st Edition listed together with products that are not CAN/ULC-S559-04, 1st Edition listed requires the approval of the local Authority Having Jurisdiction (AHJ).

1.4.1 Compliance

This product has been investigated to, and found to be in compliance with the following standards.

National Fire Protection Association
• NFPA 72—National Fire Alarm Code

Underwriters Laboratories
• UL-864—Control Units for Fire Alarm Systems, Ninth Edition
• UL-2017—General-Purpose Signaling Devices and Systems, First Edition

Underwriters Laboratories Canada
• CAN/ULC-S559-04—Equipment for Fire Signal Receiving Centres and Systems, First Edition

1.4.2 Installation

This product is intended to be installed in accordance with the following regulatory agencies.
Local

- AHJ—Authority Having Jurisdiction

National Fire Protection Association

- NFPA 70—National Electrical Code
- NFPA 72—National Fire Alarm Code

Underwriters Laboratories

- UL-1076—In certified applications, the unit shall be installed in accordance with Proprietary Burglar Alarm Units and Systems, Fifth Edition

Underwriters Laboratories Canada

- CAN/ULC-S561-03—Installation and Services for Fire Signal Receiving Centres and Systems, First Edition

Canada

- CSA C22.1—Canadian Electrical Code, Part I, Safety Standard for Electrical Installations

WARNING: Installation

Improper installation, maintenance, and lack of routine testing could result in system malfunction.

1.5 Environmental Requirements

This product must be installed in the following environmental conditions:

- Temperature range of 0°C to 49°C (32°F - 120°F).
- 93% humidity non-condensing at 30°C (86°F).

The contents of this manual are important and must be kept in close proximity of the hardware. If building ownership is changed, this manual and all other testing and maintenance information must also be passed to the current owner of the facility. A copy of this manual was shipped with the equipment and is also available from the manufacturer.

1.6 Compatibility

1.6.1 Compatible Panels

<table>
<thead>
<tr>
<th>NFN Node Type</th>
<th>High Speed Network Boards Supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFS-320</td>
<td>HS-NCM-W/SF/MF</td>
</tr>
<tr>
<td>NFS-640</td>
<td>HS-NCM-W/SF/MF</td>
</tr>
<tr>
<td>NFS2-640</td>
<td>HS-NCM-W/SF/MF</td>
</tr>
<tr>
<td>NFS-3030</td>
<td>HS-NCM-W/SF/MF</td>
</tr>
<tr>
<td>NFS2-3030</td>
<td>HS-NCM-W/SF/MF</td>
</tr>
<tr>
<td>AFP-2800*</td>
<td>HS-NCM-W/SF/MF</td>
</tr>
</tbody>
</table>

*When interfacing with AFP-2800 FACPs, Modbus Gateway only supports objects that are in line with Notifier USA panels, such as loop devices and zones. Rings and virtual points are not supported. For more information, please contact technical support.

Note: The NFS(2)-3030 can not be in receive mode.
1.6.2 Compatible NFN Node Types

The panels listed below cannot be monitored by a Modbus Gateway, however they may reside on the same NFN network as a Modbus Gateway without causing any interference.

- DVC
- NCA
- NCA-2
- NWS
- BACnet Gateway
- NFN Gateway
- ONYXWorks
- FirstVision
- Classic panels (AM-2020, AFP-1010, AFP-200, AFP-300/400)
Section 2 Modbus Gateway Embedded Installation

2.1 Required Equipment

The Modbus Gateway requires the following:

Modbus Gateway Assembly
The following are shipped with the Modbus Gateway:

- Modbus Gateway printed circuit board
- PNET-1 surge suppressor (P/N PNET-1)
- RJ45 to RJ45 standard Ethernet network cable (P/N 75585)—used to connect the Modbus Gateway to PNET-1 surge suppressor
- NUP to NUP Cable (P/N 75556)—used to connect the Modbus Gateway to an NCM-W/F or HS-NCM-W/SF/MF and supported panel
- Wire leads to NUP Network Communications Module power cable (P/N 75583)
- Modbus Configuration Tool

Network Components
- RJ45 to RJ45 standard Ethernet network cable—customer’s internet or intranet connection to Modbus Gateway
- NFN network—version 5.0 or above (sold separately)
- High Speed Network Communication Module: HS-NCM-W/SF/MF board—used to facilitate network communication between the Modbus Gateway and a High Speed NFN network. OR
- Network Communication Module: NCM-W/F board—used to facilitate network communication between the Modbus Gateway and an NFN network.

Cabinet and Hardware (sold separately)
- CAB-3/CAB-4 series cabinet
- CHS-4L chassis

Customer Supplied Equipment
- Windows XP based computer to run the Modbus Configuration Tool
2.2 Modbus Gateway Installation Overview

CAUTION: Multiple Modbus Gateway Installations
Modbus Gateways must be installed and configured one at a time because all Modbus Gateways use the same predefined IP address and node number.

2.2.1 Gateway Installation Process Overview Flow Diagram

Start

"Installing a CAB3/CAB4 Cabinet" on page 22

"Installing the Modbus Gateway Printed Circuit Board" on page 24

"Installing the Network Communication Module" on page 28

"Connect the Modbus Gateway to the PNET-1 Surge Suppressor" on page 32

To Section 3.1, "Modbus Gateway Configuration", on page 33

Figure 2.1 Gateway Installation Process Flow Diagram
2.2.2 Modbus Gateway Printed Circuit Board Layout

![Diagram of Modbus Gateway Printed Circuit Board]

Figure 2.2 Modbus Gateway Printed Circuit Board
2.3 Installing a CAB3/CAB4 Cabinet

Install a new CAB-3/CAB-4 series cabinet according to the requirements of the local authority having jurisdiction or prepare an existing CAB-3/CAB-4 series cabinet that houses a supported NOTIFIER® panel or annunciator. Refer to Section 1.6, “Compatibility” on page 16 for list of compatible panels and annunciators.

**NOTE:** The CAB3/CAB4 cabinet is ordered separately. For installation details, refer to the CAB-3/CAB-4 Series Installation Document, 15330 and or the panel’s or annunciator’s documentation.

**NOTE:** Knockouts are provided on the unit so that the field wiring may be run in conduit if required by the local authority having jurisdiction. All field wiring connections are intended to be made at the installation wiring terminals provided as part of the unit.

![ CAB-3/CAB-4 Series Installation Document, 15330 ](image)

Figure 2.3 CAB-3/CAB-4 Series Installation Document, 15330
2.4 Installing a CHS-4L Chassis

A chassis holds the gateway within a CAB-3/CAB-4 series cabinet. A CHS-4L chassis fits into any CAB-3/CAB-4 series cabinet row except for the bottom row, which provides battery housing and does not have PEM studs for mounting. Follow these instructions to install a CHS-4L chassis in a CAB-3/CAB-4 series cabinet.

Step 1. Position the chassis so the PEM cabinet studs are aligned with the chassis mounting holes, and mount the chassis onto the cabinet.

Step 2. Secure the chassis to the PEM studs with the two hex nuts (PN 36047) provided with the chassis.

Figure 2.4 Installing a CHS-4L Chassis
2.5 Installing the Modbus Gateway Printed Circuit Board

Install the Modbus Gateway printed circuit board onto the mounting studs on the CHS-4L chassis, making sure to use only the mounting holes bordered by grounding area.

![Grounding area](image)

**Figure 2.5 Install Modbus Gateway Printed Circuit Board onto Chassis**

**NOTE:** There must be enough clearance on the right side of the printed circuit board to allow an Ethernet cable to be connected to the Ethernet port.

### 2.5.1 Modbus Gateway Power Supply Connection

The Modbus Gateway requires +24VDC @450mA nominal and supervised battery backup in accordance with local code requirements. Outside Canada, the Modbus Gateway can be powered by any regulated, UL 1481 listed, power limited, battery backed, +24VDC power supply. For Canadian installation, The Modbus Gateway must be powered by a ULC listed Fire Alarm Control Unit or a ULC listed power supply for fire application. Conform to UL or ULC standards as applicable in your area.

<table>
<thead>
<tr>
<th>Table 2.1 Power Supply Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NOMINAL</strong></td>
</tr>
<tr>
<td>Input Voltage</td>
</tr>
<tr>
<td>Input Current @ +24VDC</td>
</tr>
</tbody>
</table>
NOTE: All wiring from the power supply is power limited, and a separation of at least ¼” (6.35 mm) must be maintained between power limited and non-power limited wiring.

CAUTION: Power Sources
Different sources of power are used in conjunction with the Modbus Gateway product. Disconnect all sources of power before servicing. This device and associated equipment may be damaged by removing and/or inserting cards, modules or interconnecting cables while this unit is powered. This damage may adversely affect the operation of this unit, but its effect may not be readily apparent.

Power Connection Options for NCM and HS-NCM

NOTE: For information about which type of NCM to use and how to make an NFN network connection to an NCM, refer to Section 2.5.3, “Installing the Network Communication Module”, on page 28, and the sections following it through the end of this chapter.
**Routing Power to a Standard NCM**

To route power from a Modbus Gateway to a Network Communication Module (NCM), follow these steps:

1. Connect the black (negative) wire end of the NCM power cable (P/N 75583) to the -24V Out port on the Modbus Gateway power connector.
2. Connect the red (positive) wire end of the NCM power cable (P/N 75583) to the +24V Out port on the Modbus Gateway power connector.
3. Connect the NUP end of the NCM power cable (P/N 75583) to either NUP connector on the NCM.

![Figure 2.7  Powering a Standard NCM from a Modbus Gateway](image-url)
Routing Power to an HS-NCM with NUP Data Connection

To route power from a Modbus Gateway to a High Speed NCM (HS-NCM) with a NUP data connection, follow these steps:

Step 1. Use a properly insulated wire to connect the -24V Out port on the Modbus Gateway power connector to the -24V In port on the HS-NCM power connector.

Step 2. Use a properly insulated wire to connect the +24V Out port on the Modbus Gateway power connector to the +24V In port on the HS-NCM power connector.

Figure 2.8  Powering an HS-NCM from a Modbus Gateway with NUP Data Connection

2.5.2 Wiring Restrictions

NOTE: All wiring connections are supervised and power limited.

NOTE: USB and NUP wiring connections must be located within 20 feet and encased in conduit within the same room, or the connection must be within a common enclosure.

NOTE: In Canada, if the gateway is installed in a separate cabinet, the cabinet must be connected to the Fire Alarm Control Panel (FACP) with a close nipple fitting.

RS232 (NUP)

• Line Impedance 5k ohm
• Max Distance 50 feet

Ethernet

• Line Impedance 100 ohm
• Max Distance 100 meters

USB

• Line Impedance 90 ohm ±15%
• Max Distance 40 meters
2.5.3 Installing the Network Communication Module

Install the type of network communication module you will use (whether high speed or not, wire or fibre) onto the chassis in the new CAB3/CAB4 cabinet or an existing panel’s or annunciator’s cabinet.

Table 2.2 Network Communication Module Details

<table>
<thead>
<tr>
<th>HIGH SPEED NFN NETWORKS—USE HS-NCM ONLY</th>
<th>NFN NETWORKS—USE NCM ONLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use the High Speed Network Control Module configuration that fits your installation needs.</td>
<td></td>
</tr>
<tr>
<td>• HS-NCM-W with twisted pair wire</td>
<td></td>
</tr>
<tr>
<td>• HS-NCM-SF with single mode fiber-optic cable</td>
<td></td>
</tr>
<tr>
<td>• HS-NCM-MF with multimode fiber-optic cable</td>
<td></td>
</tr>
<tr>
<td>Use the Network Control Module configuration that fits your installation needs.</td>
<td></td>
</tr>
<tr>
<td>• NCM-W with twisted pair wire</td>
<td></td>
</tr>
<tr>
<td>• NCM-F with fiber-optic cable</td>
<td></td>
</tr>
</tbody>
</table>

Figure 2.9 HS-NCM Installation Document PN 54014

Figure 2.10 NCM Installation Document PN 51533

BE SURE TO INSTALL THE CORRECT SPEED NETWORK CONTROL MODULE, BASED ON WHETHER YOU HAVE A HIGH SPEED NFN NETWORK.

Find Your Fire System Connection Option

Connect Modbus Gateway to either a fire alarm control panel or an appropriate network control module. Refer to Table 2.3, "Modbus Gateway to Fire System Connection Options" for details.

Table 2.3 Modbus Gateway to Fire System Connection Options

<table>
<thead>
<tr>
<th>When Connecting...</th>
<th>Refer to</th>
</tr>
</thead>
<tbody>
<tr>
<td>...to a high speed NFN network consisting exclusively of High Speed compatible panels</td>
<td></td>
</tr>
<tr>
<td>Section 2.6, “Connecting a Modbus Gateway to a High Speed NCM” on page 28</td>
<td></td>
</tr>
<tr>
<td>...to an NFN network</td>
<td></td>
</tr>
<tr>
<td>Section 2.7, “Connecting a Modbus Gateway to an NCM” on page 30</td>
<td></td>
</tr>
<tr>
<td>...to an FACP</td>
<td></td>
</tr>
<tr>
<td>Section 2.8, “Connecting a Modbus Gateway to a Fire Alarm Control Panel (FACP)”, on page 31</td>
<td></td>
</tr>
</tbody>
</table>

2.6 Connecting a Modbus Gateway to a High Speed NCM

- Use an HS-NCM-W for a twisted pair wire connection.
- Use an HS-NCM-SF for a single mode fiber-optic cable connection.
- Use an HS-NCM-MF for a multimode fiber-optic cable connection.
Connecting the Modbus Gateway to an HS-NCM-W/SF/MF allows the gateway to communicate with devices on a high speed NFN network. Refer to Section 1.6.1, “Compatible Panels” on page 16 and Section 1.6.2, “Compatible NFN Node Types” on page 17 for information about compatible devices. Connect an Modbus Gateway to a High Speed Network Control Module using either of these methods:

**NUP to NUP Cable Connection**

A NUP to NUP cable is used to connect between the gateway and the NFN network. Connect the cable between to the Modbus Gateway circuit board NUP “A” connector and an HS-NCM-W/SF/MF board NUP “A” connector.

![Figure 2.11 NUP to NUP Connection—HS-NCM](image-url)
2.7 Connecting a Modbus Gateway to an NCM

- Use an NCM-W for a twisted pair wire connection.
- Use an NCM-F for a fiber-optic cable connection.

**NUP to NUP Cable Connection**

Connecting the Modbus Gateway to an NCM-W/F allows the gateway to communicate with devices on an NFN network. Refer to Section 1.6.1, “Compatible Panels” on page 16 and Section 1.6.2, “Compatible NFN Node Types” on page 17 for information about compatible devices. A NUP to NUP cable is used to connect between the gateway and the NFN network. Connect the cable between the Modbus Gateway board NUP “A” connector and either NUP connector on an NCM W/F board.

![Diagram of NUP to NUP Connection—NCM](image-url)

*Figure 2.12 NUP to NUP Connection—NCM*
2.8 Connecting a Modbus Gateway to a Fire Alarm Control Panel (FACP)

■ NUP to NUP Cable Connection

The Modbus Gateway can connect to and communicate directly with an FACP. Refer to Section 1.6.1, “Compatible Panels” on page 16 for information about compatible FACPs. A NUP to NUP cable is used to connect between the gateway and the FACP. Connect the cable between the Modbus Gateway board NUP “A“ connector and any available NUP connector on an FACP.

Figure 2.13 NUP to NUP Connection—FACP
2.9 Connect the Modbus Gateway to the PNET-1 Surge Suppressor

This ensures the Modbus Gateway is properly protected from power surges before it is connected to a configuration computer, and later to your IP network.

Step 1. Plug the PNET-1 surge suppressor into the Modbus Gateway board.
Step 2. Plug the RJ45 cable into the PNET-1.
Step 3. Plug the RJ45 cable into your IP network.

Figure 2.14 PNET-1 Connection
Section 3 Modbus Gateway Configuration

3.1 Modbus Gateway Configuration

3.1.1 Modbus Gateway Configuration Overview

Perform the gateway configuration in this order:

- “Modbus Configuration Tool Installation” on page 33
- “Connect the Configuration Computer to the Modbus Gateway” on page 33
- “Configure the Modbus Gateway IP Settings” on page 35
- “Configure Gateway Mapping and Options” on page 36

3.1.2 Modbus Configuration Tool Installation

The Modbus Configuration Tool CD-ROM is provided when the gateway is ordered. Use these steps as guideline to install the application onto a computer that has Windows XP installed.

Step 1. Insert the CD-ROM into the CD-ROM drive on the computer.

Step 2. From Windows Explorer or the Run command, select and start the setup.exe file that is located in the CD-ROM’s root directory. The installation program starts.

Step 3. Follow the displayed instructions to install the Modbus Configuration Tool.

3.1.3 Connect the Configuration Computer to the Modbus Gateway

This procedure assumes that you are connecting to the gateway in one of the following ways:

- Directly from the configuration computer to the gateway with a crossover cable (Some computers have auto sensing Ethernet ports and do not require a crossover cable). For more information about how to connect a configuration computer to the gateway with a crossover cable, refer to Appendix E, “Modbus Gateway Local Configuration”, on page 115.
- From a configuration computer to a gateway through a switch/hub
It is not recommended that you attach the Modbus Gateway to an existing Ethernet network until you configure the IP settings in the gateway to match that network. Please also note that you can only initially configure one gateway at a time on an Ethernet network because the factory default IP addresses on the gateways are the same and will conflict.

Configure your configuration computer to communicate with the default Modbus Gateway IP address of 192.168.1.2:

Step 1. From the Windows taskbar, click **Start ➔ Connect To ➔ Show All Connections**.
Step 2. Right-click your LAN connection, and then click **Properties** in the menu that appears.

Step 3. Select **Internet Protocol (TCP/IP)**, and then click **Properties**.

Step 4. Record your current Internet Protocol (TCP/IP) property settings so you can restore them later.
Step 5. Click **Use the following IP address**, and then type $192.168.1.X$ into the **IP address** field.

![Image of IP address configuration]

**NOTE:** $X$ can be any number between 0 and 255 except for 2 (since the Modbus Gateway default IP address is $192.168.1.2$).

Step 6. Click **OK**, and then close all remaining open windows.

Step 7. Ping the gateway from the configuration computer to confirm that you have IP communication.

### 3.1.4 Configure the Modbus Gateway IP Settings

**Log in to the Gateway**

Step 1. Launch the Modbus Configuration Tool by clicking **Start ➔ All Programs ➔ Modbus Gateway Config Tool** from the Windows taskbar.

Step 2. Click the **Address** field, and then click the default gateway IP address $192.168.1.2$ in the menu that drops down. (You may have to type in the IP if it does not show up)

![Image of address field]

Step 3. Click **File ➔ Login...**

![Image of login page]

Step 4. Type the default password, **00000000**, and then click **OK**.

**NOTE:** **Off Line Mode**—Upon login, if the Modbus Configuration Tool does not detect any nodes on the NFN network, it switches to Off Line Mode. The Modbus Gateway can be fully configured in Off Line Mode. Off Line nodes are colored in red.
Configure IP Settings

Step 1. In the left pane of the Modbus Configuration Tool under the Gateway heading, click **IP Configuration**.

Step 2. Click the fields under the Value heading, and type the IP, Subnet Mask, and Gateway (router) addresses this Modbus Gateway will use on your network.

Step 3. Click **Tools ➔ Export Configuration to GW**. This downloads your IP settings to the gateway. The Modbus Gateway reboots automatically. The reboot may take several minutes.

Step 4. Follow the procedure above to restore your computer back to the IP settings that you recorded earlier.

**NOTE:** Make sure your computer's IP settings are compatible with the settings you assigned to the Modbus Gateway.

3.2 Connect Modbus Gateway to Your IP Network

This allows Modbus Gateway to communicate through your IP network (Internet or Intranet).

Step 1. Plug an RJ45 cable into the PNET-1.

Step 2. Plug the RJ45 cable into your IP network.

3.2.1 Configure Gateway Mapping and Options

**NOTE:** You must be logged in to the tool to make configuration changes.

Step 1. Select the gateway to configure.
The Address bar drop down lists all the gateways the tool detects on your network. If your gateway is not listed, then click View ➔ Refresh Gateway List and try again.

If the gateway is still not listed, it may be on a separate subnet. In that case, you can manually type in the IP address of the gateway on the address bar. If none of this works, try pinging the gateway from the Windows command line in order to confirm the gateway is communicating.

Step 2. Log in to the gateway (See “Log in to the Gateway” on page 35).

The Modbus Configuration Tool now displays the remaining configurable settings for the Modbus Gateway. Click the fields under the Value heading to enter appropriate values, following the guidelines below.

■ Gateway Properties

- **Gateway Version**
  This is the version of the Modbus Gateway (read only).

- **Port**
  This is the IP port on which the gateway communicates (read only).

- **Analog Value Polling Time Out**
  This is the minimum frequency at which the client should poll the same analog values. If the client polls for analog value slower than this rate, then the gateway ceases polling analog values and requires another initialization poll (for more information, refer to Section 4.4, “Analog Values and Trending”, on page 44). By default this is 20 seconds.

- **Authorized Modbus Client IP Address**
  This is an optional security feature. By default (that is, with an Authorized Modbus Client IP Address of 0.0.0.0) the gateway allows any client to request data. If you enter an IP address of anything other than 0.0.0.0 into the Authorized Modbus Client IP Address field, then the gateway only responds to requests from a single client at that IP—no other clients may communicate with the gateway.

- **IP Configuration**
  - **IP Address**—IP address of the Modbus Gateway
  - **Subnet Mask**—Subnet mask of the gateway
  - **IP Gateway**—IP address of an Ethernet router if used
MAC Address—MAC address of the gateway (read only).

Node Mapping

- In the Nodes pane, the Modbus Configuration Tool displays the nodes it detects on the NFN network. If a node does not show up, then there is potentially a problem with that node that needs to be investigated.
- Click the name of a network node to view information about that node.
- A box appears beside each node which is on the NFN network. To monitor a node, check the box next to the node.
- You can select up to 4 nodes.
- Nodes without selection boxes cannot be monitored by the gateway.

- Nodes that will be added to the NFN network in the future can be added to the configuration tool by right clicking anywhere in the nodes pane and selecting Add Node from the list of choices that appear. This node will be colored red and labeled "Misc-Not Defined". You can also add nodes by clicking Edit  Add Node from the Modbus Configuration Tool menu.
- Select off line nodes to monitor by checking the box under the Monitored column. If an off line node is selected but is not supported for monitoring (based on the node type reported by the network), then the checkmark is automatically removed from the box in the Monitored column when the node comes on line, and the node is not monitored.
- Off line nodes can be removed from the nodes pane by right clicking them and selecting Remove Node from the list of choices that appear. You can also remove nodes by clicking

---

**Edit** Remove Node from the Modbus Configuration Tool menu. Only off line nodes can be removed.

- If there are NFN Gateways on the NFN that you are monitoring with a Modbus Gateway, the NFN Gateways may show up in the left hand nodes pane and be labeled as Modbus Gateways.

#### Node Properties
- **Unit ID**—This is a configurable property of the nodes. By default the Modbus Unit ID for a monitored node is set to be the same as the NFN Node ID. If for any reason the Unit ID needs to be changed, click the value and type the new Unit ID number. Changing this is not recommended.
- **Node Number**—Network node number. The network node number cannot be changed by this tool. (read only)
- **Node Status**—Monitored or Not Monitored status is determined by the check box in the Nodes pane. (read only)
- **Register Type**—Drop down box to allow user to view different register types
- **Register Information**—Fixed mapping information of monitored nodes (read only)
- You may enter up to 4 nodes for FACPs to be monitored.

---

**NOTE:** Redundancy—it is possible for two Modbus Gateways to monitor the same nodes on an NFN network.

**Register Mapping**

**NOTE:** Default Register Mapping is only shown for "Monitored" Nodes. For more information, refer to "Node Mapping" on page 38.
3.2.2 Saving Configuration Data to the Gateway:

After entering configuration for a gateway, click **Tools ➜ Export Configuration to the GW.** This downloads the configuration data to the gateway and reboots the gateway. Once the gateway reboots, it is ready to monitor the selected nodes.

3.2.3 Importing Configuration Data from a Gateway:

If you want to save the configuration data of a particular Modbus Gateway, then first select the gateway IP from the drop down box and then click **Tools ➜ Import Configuration from GW.** This saves the gateway configuration information to a file called **RegisterMapping.XML** in the **Data** folder.
3.2.4 Setting New Gateway Password:

Set a new password for the gateway by clicking Tools → Set Gateway Password and entering the old and new passwords.

NOTE: If you forget your old password, please contact Tech support to reset the password.

3.2.5 Register Map Report

The Modbus Gateway Configuration Tool can be used to generate a register map report in standard Comma Separated Value (CSV) file format. This register map file serves as a reporting tool for Modbus Master configuration. A register map report contains the following information:

- **Gateway IP Address**—Gateways configured IP address
- **Gateway Node Number**—NFN node number of the Modbus Gateway
- **Gateway Version**—Modbus Gateway Firmware version
- **Gateway Unit ID**—Modbus Unit ID. It is recommended this be the same as the Gateway Node Number.
- **Gateway Node Type**—Modbus Gateway
- **Authorized Modbus Client IP Address**—This is a security feature. This the IP address of the client that is allowed to connect to the Modbus Gateway. If it is set to 0.0.0.0 then any client can connect.
- **Node Mapping for All Four Nodes**—Modbus mapping of NFN nodes

Two types of register map report can be created:

- **With Actual Points**—(Recommended) Shows a map of the points that are configured and mapped.
- **With All Points**—Shows a map of all possible points on all configured panels.
3.2.6 Print CSV Report File:

Clicking **Tools ➔ Print CSV Report** prints the most recently generated register map report from a printer you select.
Section 4 Modbus Gateway Operation

4.1 Time Synchronization Functionality

The Modbus Gateway itself is not a time master. It accepts time synchronization messages broadcast from the NFN network, but does not accept time synchronization messages broadcast from its clients.

4.1.1 Panel and Gateway Synchronization

When making programming changes to a panel, it is important that you verify that the Modbus Gateway has synchronized with these changes. This assures that you will not get unreliable data from the gateway. There are several ways in which a Modbus Gateway synchronizes with a panel:

• Every 24 hours the gateway will attempt to compare its database with the panel database. If there is a difference then the gateway will synchronize.
• If the gateway receives a message from the panel that it has been reprogrammed through a programming tool or from the front panel, then the gateway will attempt to resynchronize.
• If the gateway is reset, the power is cycled or the panel connectivity is lost and reapplied.

Resynchronization does several things. First, the gateway updates all of its device type registers to match the panels. Second, the gateway updates the device status registers to assure the gateway will provide accurate state data. If the panel and panel network are not completely stable while the gateway is resynchronizing, then the gateway aborts resynchronization.

4.2 Modbus Command Support

4.2.1 Modbus Commands

The Modbus Gateway supports the following Modbus commands:

• Read Input Registers (0x4)
• Read Holding Registers (0x3)
• Write Single register (0x6)
• Read Device Identification supported 43 / 14 (0x2B / 0x0E)

4.2.2 Exception Responses

Modbus Gateway sends exception responses to its Modbus clients as appropriate (e.g. Invalid Command, invalid data etc.). For more information, refer to Appendix A, “Exception Responses”, on page 59.

4.3 Modbus Addressing

The Modbus Gateway uses Modbus Addressing within the following guidelines:

• The Modbus Gateway operates similarly to a Modbus Bridge. Each Modbus Gateway can support up to four panels on an NFN network. Each fire panel being addressed by the Modbus master on the NFN network is identified by the Unit ID.
• The Unit ID used in the Modbus Gateway must be in the range 1 through 247. This is a Modbus range limitation. The Unit ID should match the node number of the NFN node you are addressing. For example, a unit ID of 127 addresses NFN node 127.
4.4 Analog Values and Trending

Trending of analog values is supported on all of the panels/networks 4–20ma modules. The only limitation is that the gateway will only actively read analog values for up to 10 analog modules at a time. You can read all the analog values on all the modules as long as you send a separate poll for these points in groups of up to 10 points at a time, following the rules outlined below. Please reference the use cases for clarity on this issue.

- Accept a poll for up to any 10 analog (4–20ma) points per gateway.
  - Requests for more points than this are rejected with an exception code.
  - If any of the points in the request are not 4–20 ma modules then the gateway rejects the request with an exception code.
- The first poll for analog values is an initialization poll. This initialization poll informs the gateway to start acquiring analog values for these points at 5 second intervals.
  - Points are only polled on the NFN if the 4–20ma module is in at least the first level of alarm status. If the point is normal then the gateway returns a value of zero.
- Upon receiving the initialization confirmation, the client can begin polling the analog points. The client should wait 5 seconds after the initialization request to insure that the Modbus Gateway has had enough time to get the analog values and load the registers. Thereafter the Modbus Gateway continues to poll the points. The analog value in the Modbus Gateway are updated no faster than once every 5 seconds.
  - Points are polled if the device is in at least the first level of alarm status. Zero is returned for devices not in alarm status.
  - When a point being polled enters normal status, polling for that point on the NFN is terminated and the analog value register for that point is filled with zeros.
- The Modbus Gateway ceases polling the analog points when:
  - The client does not make a request for these exact same points over a period defined in the Modbus Configuration Tool as "Analog Value Time Out". The default is 20 seconds.
  - The gateway makes a request for a point (or points) that is not exactly the same as the initial request. The Modbus Gateway first sends an initial confirmation for the new set of analog points, and then begins polling those points at 5 second intervals.

Analog Value Use Cases

Use Case 1: A client requests analog values from the points L1M1 through L1M10 every 10 seconds.

Result: The Modbus Gateway sends back zeros in response to the first request for analog values from the points L1M1 through L1M10. The Modbus Gateway sends back actual values
Analog Values and Trending

Modbus Gateway Operation

Use Case 2: A client requests analog values from the points L1M1 through L1M10. After 10 minutes of polling on a 10 second interval the client stops requesting analog values for these points.

Result: The Modbus Gateway sends back zeros in response to the first request for analog values from the points L1M1 through L1M10. The Modbus Gateway sends back actual values on the second request from the client 10 seconds later. The Modbus Gateway continues to poll these devices as long as the client continues to send analog value requests for points L1M1 through L1M10. When the client stops polling at 10 minutes, the Modbus Gateway will stop polling the NFN after the Analog Value Time Out expires.

Use Case 3: A client requests analog values from the points L1M1 through L1M10. After 10 minutes of polling on a 10 second interval the client requests analog values from the points L1M20 to L1M22.

Result: The Modbus Gateway sends back zeros in response to the first request for analog values from the points L1M1 through L1M10. The Modbus Gateway sends back actual values on the second request from the client 10 seconds later. The Gateway continues to poll these devices as long as the client continues to send analog value requests for the points L1M1 through L1M10. When the client sends a request for analog values from the points L1M20 through L1M22, the Modbus Gateway immediately sends back zeros in response to the first analog value request from these points, and starts polling L1M20 through L1M22. The Modbus Gateway only polls the points specifically requested.

Use Case 4: A client requests analog values from the points L1M1 through L1M10. After 10 minutes of polling on a 10 second interval, the client requests analog values from the points L1M5 through L1M12.

Result: The Modbus Gateway sends back zeros in response to the first request for analog values from the points L1M1 through L1M10. The Modbus Gateway sends back actual values in response to the second request from the client 10 seconds later. The Modbus Gateway continues to poll these devices as long as the client continues to send analog value requests for the points L1M1 through L1M10. When the client sends a request for analog values from the points L1M5 through L1M12, the gateway immediately sends back zeros in response to the first analog value request from points L1M11 and L1M12 (since these are newly requested points) and it sends back actual values in response to the continuing analog value requests for points L1M5 through L1M10 (since it already has been polling these points). The gateway stops polling points L1M1 through L1M4 and starts polling points L1M5 through L1M12.

Use Case 5: A client requests analog values from the points L1M1 through L1M15.

Result: The Modbus Gateway sends back an exception response, because it can only process requests for up to 10 analog values at a time. The client should request and receive values for L1M1 through L1M10, and then send a request for L1M11 through L1M15. Note that the first request for analog values from a valid range of points is considered an initialization request, which returns zeros.
Section 5 Register Mapping

5.1 Register Mapping Overview

- Modbus Gateway uses 16-bit registers.
- One Modbus Input register and one Modbus Holding Register are allocated for each device address.
- These registers represent a contiguous address mapping of all devices and points.

5.2 Point Status Holding Registers

Each of the point status holding registers are divided up into two bytes as defined below:

- **Active Event Type**: This byte communicates the active event type as defined in Appendix B, “Active Event Types”, on page 61. An active state is defined in this gateway as any Fire, Security, Critical Process, Medical or Supervisor alarm state. This byte will be all 0's if the device is not in an active state (see Active bit description in the bulleted list below). Inactive states include any state not shown in Appendix B. These states include, normal, troubles, disables, prealarms, etc. This byte will be all 1's if the point is not present in the panel.
- **Ack Fire Alarm**: If this bit is set to 1 then the fire alarm on this point is acknowledged.
- **Disable**: If this bit is set to 1 then the point is disabled.
- **Enable**: If this bit is set to 1 then the point is enabled.
- **Active**: If this bit is set to 1 then the point is Active and there will be an active event type in the lower byte.
- **Inactive**: If this bit is set to 1 then the point is not active.
- **Trouble**: If this bit is set to 1 then the point is in a trouble state.
- **Prealarm**: If this bit is set to 1 then the point is in a prealarm state.
- **Ack Block**: If this bit is set to 1 then all events on this point, other than fire alarm, are acknowledged.

```
Upper Byte \n15 14 13 12 11 10 9 8 \n3 2 1 0

| Ack Block | Prealarm | Trouble | InActive | Active | Enable | Disable | Ack Fire Alarm | Active Event Type |
```

Table 5.1 Device/Module Holding Register Addresses

<table>
<thead>
<tr>
<th>Start Address</th>
<th>End Address</th>
<th>Device Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>40001</td>
<td>40200</td>
<td>L1D1–L1D159</td>
</tr>
<tr>
<td>40201</td>
<td>40400</td>
<td>L1M1–L1M159</td>
</tr>
<tr>
<td>40401</td>
<td>40600</td>
<td>L2D1–L2D159</td>
</tr>
<tr>
<td>40601</td>
<td>40800</td>
<td>L2M1–L2M159</td>
</tr>
<tr>
<td>40801</td>
<td>41000</td>
<td>L3D1–L3D159</td>
</tr>
<tr>
<td>41001</td>
<td>41200</td>
<td>L3M1–L3M159</td>
</tr>
</tbody>
</table>
5.3 Point Device Type Holding Registers

- Consists of 2000 holding registers.
- Each register represents the device or module type for two points as defined below.
- The upper byte has the even number points; the lower byte has the odd number points.
- See Appendix C, “Device Types”, on page 63 for device type definition.

### Table 5.1 Device/Module Holding Register Addresses

<table>
<thead>
<tr>
<th>Start Address</th>
<th>End Address</th>
<th>Device Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>41201</td>
<td>41400</td>
<td>L4D1–L4D159</td>
</tr>
<tr>
<td>41401</td>
<td>41600</td>
<td>L4M1–L4M159</td>
</tr>
<tr>
<td>41601</td>
<td>41800</td>
<td>L5D1–L5D159</td>
</tr>
<tr>
<td>41801</td>
<td>42000</td>
<td>L5M1–L5M159</td>
</tr>
<tr>
<td>42001</td>
<td>42200</td>
<td>L6D1–L6D159</td>
</tr>
<tr>
<td>42201</td>
<td>42400</td>
<td>L6M1–L6M159</td>
</tr>
<tr>
<td>42401</td>
<td>42600</td>
<td>L7D1–L7D159</td>
</tr>
<tr>
<td>42601</td>
<td>42800</td>
<td>L7M1–L7M159</td>
</tr>
<tr>
<td>42801</td>
<td>43000</td>
<td>L8D1–L8D159</td>
</tr>
<tr>
<td>43001</td>
<td>43200</td>
<td>L8M1–L8M159</td>
</tr>
<tr>
<td>43201</td>
<td>43400</td>
<td>L9D1–L9D159</td>
</tr>
<tr>
<td>43401</td>
<td>43600</td>
<td>L9M1–L9M159</td>
</tr>
<tr>
<td>43601</td>
<td>43800</td>
<td>L10D1–L10D159</td>
</tr>
<tr>
<td>43801</td>
<td>44000</td>
<td>L10M1–L10M159</td>
</tr>
</tbody>
</table>

NOTE: There are unused registers on every loop in order to make the register addresses easier to remember and allow for future expansion (e.g. registers 40159 through 40200 are not used).

NOTE: Note: On the AFP-2800, output point activation status is not reported to the Modbus Gateway and therefore the bits and event type will always indicate a non active state. AFP-2800 activations from the Modbus client is not supported.
5.4 Zones/Panel Circuits Status Holding Registers

Each of the zones/panel circuits holding registers are divided up into two bytes as defined below:

- **Active Event Type**: This byte communicates the active event type as defined in Appendix B, “Active Event Types”, on page 61. An active state is defined in this gateway as any Fire, Security, Critical Process, Medical or Supervisory alarm state. This byte will be all 0's if the zone/panel circuit is not in an active state (see Active bit description in the bulleted list below). Inactive states include any state not shown in Appendix B. These states include, normal, troubles, disables, prealarms, etc. This byte will be all 1's if the zone/panel circuit is not present in the panel.

- **Ack Fire Alarm**: If this bit is set to 1 then the fire alarm on the zone/panel circuit is acknowledged.

- **Disable**: If this bit is set to 1 then the zone/panel circuit is disabled.

### Table 5.2 Device And Module Addresses

<table>
<thead>
<tr>
<th>Start Address</th>
<th>End Address</th>
<th>Devices In Upper Byte</th>
<th>Devices In Lower Byte</th>
</tr>
</thead>
<tbody>
<tr>
<td>44001</td>
<td>44100</td>
<td>Loop 1 Detector 2,4,6,8,10...158</td>
<td>Loop 1 Detector 1,3,5,9,11...159</td>
</tr>
<tr>
<td>44101</td>
<td>44200</td>
<td>Loop 1 Module 2,4,6,8,10...158</td>
<td>Loop 1 Module 1,3,5,9,11...159</td>
</tr>
<tr>
<td>44201</td>
<td>44300</td>
<td>Loop 2 Detector 2,4,6,8,10...158</td>
<td>Loop 2 Detector 1,3,5,9,11...159</td>
</tr>
<tr>
<td>44301</td>
<td>44400</td>
<td>Loop 2 Module 2,4,6,8,10...158</td>
<td>Loop 2 Module 1,3,5,9,11...159</td>
</tr>
<tr>
<td>44401</td>
<td>44500</td>
<td>Loop 3 Detector 2,4,6,8,10...158</td>
<td>Loop 3 Detector 1,3,5,9,11...159</td>
</tr>
<tr>
<td>44501</td>
<td>44600</td>
<td>Loop 3 Module 2,4,6,8,10...158</td>
<td>Loop 3 Module 1,3,5,9,11...159</td>
</tr>
<tr>
<td>44601</td>
<td>44700</td>
<td>Loop 4 Detector 2,4,6,8,10...158</td>
<td>Loop 4 Detector 1,3,5,9,11...159</td>
</tr>
<tr>
<td>44701</td>
<td>44800</td>
<td>Loop 4 Module 2,4,6,8,10...158</td>
<td>Loop 4 Module 1,3,5,9,11...159</td>
</tr>
<tr>
<td>44801</td>
<td>44900</td>
<td>Loop 5 Detector 2,4,6,8,10...158</td>
<td>Loop 5 Detector 1,3,5,9,11...159</td>
</tr>
<tr>
<td>44901</td>
<td>45000</td>
<td>Loop 5 Module 2,4,6,8,10...158</td>
<td>Loop 5 Module 1,3,5,9,11...159</td>
</tr>
<tr>
<td>45001</td>
<td>45100</td>
<td>Loop 6 Detector 2,4,6,8,10...158</td>
<td>Loop 6 Detector 1,3,5,9,11...159</td>
</tr>
<tr>
<td>45101</td>
<td>45200</td>
<td>Loop 6 Module 2,4,6,8,10...158</td>
<td>Loop 6 Module 1,3,5,9,11...159</td>
</tr>
<tr>
<td>45201</td>
<td>45300</td>
<td>Loop 7 Detector 2,4,6,8,10...158</td>
<td>Loop 7 Detector 1,3,5,9,11...159</td>
</tr>
<tr>
<td>45301</td>
<td>45400</td>
<td>Loop 7 Module 2,4,6,8,10...158</td>
<td>Loop 7 Module 1,3,5,9,11...159</td>
</tr>
<tr>
<td>45401</td>
<td>45500</td>
<td>Loop 8 Detector 2,4,6,8,10...158</td>
<td>Loop 8 Detector 1,3,5,9,11...159</td>
</tr>
<tr>
<td>45501</td>
<td>45600</td>
<td>Loop 8 Module 2,4,6,8,10...158</td>
<td>Loop 8 Module 1,3,5,9,11...159</td>
</tr>
<tr>
<td>45601</td>
<td>45700</td>
<td>Loop 9 Detector 2,4,6,8,10...158</td>
<td>Loop 9 Detector 1,3,5,9,11...159</td>
</tr>
<tr>
<td>45701</td>
<td>45800</td>
<td>Loop 9 Module 2,4,6,8,10...158</td>
<td>Loop 9 Module 1,3,5,9,11...159</td>
</tr>
<tr>
<td>45801</td>
<td>45900</td>
<td>Loop 10 Detector 2,4,6,8,10...158</td>
<td>Loop 10 Detector 1,3,5,9,11...159</td>
</tr>
<tr>
<td>45901</td>
<td>46000</td>
<td>Loop 10 Module 2,4,6,8,10...158</td>
<td>Loop 10 Module 1,3,5,9,11...159</td>
</tr>
</tbody>
</table>
Register Mapping

Zones/Panel Circuits Status Holding Registers

- **Enable**: If this bit is set to 1 then the zone/panel circuit is enabled.
- **Active**: If this bit is set to 1 then the zone/panel circuit is Active and there will be an active event type in the lower byte.
- **InActive**: If this bit is set to 1 then the zone/panel circuit is not active.
- **Trouble**: If this bit is set to 1 then the zone/panel circuit is in a trouble state.
- **Preamalarm**: If this bit is set to 1 then the zone/panel circuit is in a prealarm state.
- **Ack Block**: If this bit is set to 1 then all events on the zone/panel circuit, other than fire alarm, are acknowledged.

<table>
<thead>
<tr>
<th>Upper Byte</th>
<th>Lower Byte</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Ack Block</td>
<td>Preamalarm</td>
</tr>
<tr>
<td>Trouble</td>
<td>InActive</td>
</tr>
<tr>
<td>Active</td>
<td>Enable</td>
</tr>
<tr>
<td>Disable</td>
<td>Ack Fire Alarm</td>
</tr>
<tr>
<td>Active Event Type</td>
<td></td>
</tr>
</tbody>
</table>

- **General Zones**

<table>
<thead>
<tr>
<th>Register Address</th>
<th>Zone Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>46101–47100</td>
<td>Z 1,2,3,4,5,6,7,8,...1000</td>
</tr>
</tbody>
</table>

- **Logic Zones**

<table>
<thead>
<tr>
<th>Register Address</th>
<th>Zone Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>47101–49100</td>
<td>Z 1,2,3,4,5,6,7,8,...2000</td>
</tr>
</tbody>
</table>

- **Trouble Zones**

<table>
<thead>
<tr>
<th>Register Address</th>
<th>Zone Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>49101–49200</td>
<td>Z 1,2,3,4,5,6,7,8,...100</td>
</tr>
</tbody>
</table>

- **Releasing Zones**

<table>
<thead>
<tr>
<th>Register Address</th>
<th>Zone Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>49201–49210</td>
<td>Z 1,2,3,4,5,6,7,8,9,10</td>
</tr>
</tbody>
</table>

- **Panel Circuits**

<table>
<thead>
<tr>
<th>Register Address</th>
<th>Panel Circuits</th>
</tr>
</thead>
<tbody>
<tr>
<td>49211–49218</td>
<td>P1.1–P1.8</td>
</tr>
<tr>
<td>49219–49226</td>
<td>P2.1–P2.8</td>
</tr>
<tr>
<td>49227–49234</td>
<td>P3.1–P3.8</td>
</tr>
<tr>
<td>49235–49242</td>
<td>P4.1–P4.8</td>
</tr>
<tr>
<td>49233–49250</td>
<td>P5.1–P5.8</td>
</tr>
<tr>
<td>49251–49258</td>
<td>P6.1–P6.8</td>
</tr>
<tr>
<td>49259–49266</td>
<td>P7.1–P7.8</td>
</tr>
<tr>
<td>49267–49274</td>
<td>P8.1–P8.8</td>
</tr>
<tr>
<td>49275–49282</td>
<td>P9.1–P9.8</td>
</tr>
<tr>
<td>49283–49290</td>
<td>P10.1–P10.8</td>
</tr>
<tr>
<td>49291–49298</td>
<td>P11.1–P11.8</td>
</tr>
<tr>
<td>49198–49205</td>
<td>P12.1–P12.8</td>
</tr>
</tbody>
</table>
5.5 Bell Circuits Status Holding Registers

**NFS2-640 and NFS-320 Only**

Each of the bell circuits status holding registers are divided up into two bytes as defined below:

- **Active Event Type**: This byte communicates the active event type as defined in Appendix B, “Active Event Types”, on page 61. An active state is defined in this gateway as any Fire, Security, Critical Process, Medical or Supervisory alarm state. This byte will be all 0’s if the bell circuit is not in an active state (see Active bit description in the bulleted list below). Inactive states include any state not shown in Appendix B. These states include, normal, troubles, disables, prealarms, etc. This byte will be all 1’s if the bell circuit is not present in the panel.

- **Ack Fire Alarm**: If this bit is set to 1 then the fire alarm on the bell circuit is acknowledged.

- **Disable**: If this bit is set to 1 then the bell circuit is disabled.

- **Enable**: If this bit is set to 1 then the bell circuit is enabled.

- **Active**: If this bit is set to 1 then the bell circuit is Active and there will be an active event type in the lower byte.

- **Inactive**: If this bit is set to 1 then the bell circuit is not active.

- **Trouble**: If this bit is set to 1 then the bell circuit is in a trouble state.

- **Prealarm**: If this bit is set to 1 then the bell circuit is in a prealarm state.

- **Ack Block**: If this bit is set to 1 then all events on the bell circuit, other than fire alarm, are acknowledged.

<table>
<thead>
<tr>
<th>Panel</th>
<th>Max Panel Circuits Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFS-640</td>
<td>8</td>
</tr>
<tr>
<td>NFS2-320</td>
<td>Not Supported</td>
</tr>
<tr>
<td>NFS2-640</td>
<td>Not Supported</td>
</tr>
<tr>
<td>NFS-3030</td>
<td>12</td>
</tr>
<tr>
<td>NFS2-3030</td>
<td>Not Supported</td>
</tr>
</tbody>
</table>

Table 5.3  Supported Circuits by Panel

<table>
<thead>
<tr>
<th>Panel</th>
<th>Supported Circuits by Panel</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFS-640</td>
<td>8</td>
</tr>
<tr>
<td>NFS2-320</td>
<td>Not Supported</td>
</tr>
<tr>
<td>NFS2-640</td>
<td>Not Supported</td>
</tr>
<tr>
<td>NFS-3030</td>
<td>12</td>
</tr>
<tr>
<td>NFS2-3030</td>
<td>Not Supported</td>
</tr>
</tbody>
</table>

Table 5.4  Bell Circuit Holding Register Addresses

<table>
<thead>
<tr>
<th>Start Address</th>
<th>End Address</th>
<th>Device Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>49400</td>
<td>49400</td>
<td>Bell Circuit 1</td>
</tr>
<tr>
<td>49401</td>
<td>49401</td>
<td>Bell Circuit 2</td>
</tr>
<tr>
<td>49402</td>
<td>49402</td>
<td>Bell Circuit 3</td>
</tr>
</tbody>
</table>
### 5.6 Bell Circuits Device Type Holding Registers

Each register represents the device type for two points as defined below.
- Each register represents two bell circuits as defined below.
- See Appendix C, “Device Types”, on page 63 for device type definition.

<table>
<thead>
<tr>
<th>Upper Byte</th>
<th>Lower Byte</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 14 13 12 11 10 9 8</td>
<td>7 6 5 4 3 2 1 0</td>
</tr>
<tr>
<td>Device Type</td>
<td>Device Type</td>
</tr>
</tbody>
</table>

### 5.7 Panel Status Holding Register

The holding register is divided up into bit fields as defined below:
- **Reset**: Not used.
- **Silence**: The fire alarm control panel is silenced when this bit is set to 1.

<table>
<thead>
<tr>
<th>Start Address</th>
<th>End Address</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>49500</td>
<td>49500</td>
<td>Panel Status Holding Register</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Upper Byte</th>
<th>Lower Byte</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 14 13 12 11 10 9 8</td>
<td>7 6 5 4 3 2 1 0</td>
</tr>
<tr>
<td>Not used</td>
<td>Silence Reset</td>
</tr>
</tbody>
</table>

### 5.8 Analog Values Input Registers

**Analog Values**

Analog Values are only available for 4–20ma modules.

**NOTE**: For all modules that are not 4–20ma, the Analog Value field is filled with zeros.
### Table 5.6 Input Register Analog Values

<table>
<thead>
<tr>
<th>Start Address</th>
<th>End Address</th>
<th>Analog Value (16 bits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30001</td>
<td>30200</td>
<td>L1M1–L1M159</td>
</tr>
<tr>
<td>30201</td>
<td>30400</td>
<td>L2M1–L2M159</td>
</tr>
<tr>
<td>30401</td>
<td>30600</td>
<td>L3M1–L3M159</td>
</tr>
<tr>
<td>30601</td>
<td>30800</td>
<td>L4M1–L4M159</td>
</tr>
<tr>
<td>30801</td>
<td>31000</td>
<td>L5M1–L5M159</td>
</tr>
<tr>
<td>31001</td>
<td>31200</td>
<td>L6M1–L6M159</td>
</tr>
<tr>
<td>31201</td>
<td>31400</td>
<td>L7M1–L7M159</td>
</tr>
<tr>
<td>31401</td>
<td>31600</td>
<td>L8M1–L8M159</td>
</tr>
<tr>
<td>31601</td>
<td>31800</td>
<td>L9M1–L9M159</td>
</tr>
<tr>
<td>31801</td>
<td>32000</td>
<td>L10M1–L10M159</td>
</tr>
</tbody>
</table>

### 5.9 Panel & System Troubles Input Registers

Sixty-Four 16 bit registers are reserved for panel troubles. One register is assigned as an overall panel trouble indicator.

<table>
<thead>
<tr>
<th>Start Address</th>
<th>End Address</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>35000</td>
<td>35000</td>
<td>Panel Trouble Summary (Total number of Trouble bits set for the node)</td>
</tr>
<tr>
<td>35001</td>
<td>35064</td>
<td>Panel Troubles</td>
</tr>
</tbody>
</table>

A single bit is reserved for each trouble in the system. The assignment of bits to trouble codes are shown in Appendix D, “System Troubles”, on page 67.

### 5.10 Gateway Information Input Registers

**NOTE:** Information/debug values are used by the Modbus Gateway Unit ID only. All other nodes reject reads in this address range.

The Modbus Gateway records some status and configuration information for debugging and technical support purposes. This information is stored in some reserved gateway registers as outlined below.

- Gateway Modbus address
- Gateway IP address
- Gateway Version Number
- Gateway status
Node Status Details

Each node's status is represented by a bit in a register. If the bit is set then the node is on line. Below is an example of how this is represented in a register.

<table>
<thead>
<tr>
<th>Bit#</th>
<th>15</th>
<th>14</th>
<th>13</th>
<th>12</th>
<th>11</th>
<th>10</th>
<th>9</th>
<th>8</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>35100</td>
<td>N16</td>
<td>N15</td>
<td>N14</td>
<td>N13</td>
<td>N12</td>
<td>N11</td>
<td>N10</td>
<td>N9</td>
<td>N8</td>
<td>N7</td>
<td>N6</td>
<td>N5</td>
<td>N4</td>
<td>N3</td>
<td>N2</td>
<td>N1</td>
</tr>
</tbody>
</table>

Table 5.8 Node Status Example

Read Device Identification (0x2B/0x0E)

This function code allows reading the identification and additional information.

<table>
<thead>
<tr>
<th>Object ID</th>
<th>Object Name / Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x00</td>
<td>VendorName</td>
<td>Notifier</td>
</tr>
<tr>
<td>0x01</td>
<td>ProductCode</td>
<td>1</td>
</tr>
<tr>
<td>0x02</td>
<td>MajorMinorRevision</td>
<td>V1.0</td>
</tr>
<tr>
<td>0x03</td>
<td>VendorUrl</td>
<td><a href="http://www.honeywelllifesafety.com">www.honeywelllifesafety.com</a></td>
</tr>
<tr>
<td>0x04</td>
<td>ProductName</td>
<td>Modbus Gateway</td>
</tr>
<tr>
<td>0x05</td>
<td>ModelName</td>
<td>Modbus Gateway</td>
</tr>
<tr>
<td>0x06</td>
<td>UserApplicationName</td>
<td>Modbus Gateway</td>
</tr>
</tbody>
</table>
Section 6 Troubleshooting

6.1 What are some basic guidelines I should use when installing a Modbus Gateway?

- Polling should be done slowly to start.
- Use Modscan® to debug the system rather than a more complicated client. Make sure you can see registers being updated as events happen on the NFN network/panel.
- Make sure you can ping the gateway from the same computer on which you are installing the client application.
- Check and double check your power supplies as well as all cabling.
- Make sure the client supports Unit IDs.
- Stop the client from sending a subsequent request until after it receives a response from the gateway.
- Make sure the client accepts all exception responses. Including 0xA and 0xB.
- Use Wireshark to debug IP traffic.
- Be sure only one client is polling the gateway.
- Check the Modbus Gateway configuration tool and be sure that the Authorized Client IP address is set to 0.0.0.0. If you are using the Authorized Client IP security feature then confirm that the address in the gateway matches the address in your Modbus client.

6.2 How fast can the Modbus client poll the gateway?

The polling rate is a function of several variables. Some issues that will determine the maximum poll rate are:

- The size of the NFN network that you are monitoring.
- The number of points on the panels.
- The event activity on the NFN network/panel (i.e. VeriFire downloads).
- Requests for analog values are much slower than other requests.
- If you see only a partial response form the gateway in your Modbus client then try increasing the “response time out” value in the client to a larger value. If you set it to 5 seconds or more then this should be adequate. The exact response time out will depend on your IP network delays and routing. On a small IP network the gateway responds to a read of 100 register in less than 1 second.

The gateway also has some processing overhead in order to do such things as maintain the registers.

6.3 How can I tell if the gateway is running?

- Ping the gateway from the computer on which you are running your Modbus client.
- Use Wireshark® to analyze the data on the IP network.
- Modscan was one tool that was used during development to test the gateway. It is designed primarily as a testing device for verification of correct protocol operation in new or existing systems.
6.4 How do I recover a lost password from the gateway?

If the password for the gateway is lost then you will not be able to make programming changes. Technical support can provide you with a procedure for resetting the password. This password reset will also reset the entire configuration back to factory default and thus require you to reconfigure the gateway. Go through this procedure only if it is absolutely necessary and you have documented all of the gateway settings that will need to be reprogrammed.

6.5 What is an “initialization read” for analog values?

This is the first read of up to 10 analog values from a 4–20ma module. This first read tells the gateway that it should begin a polling routine for the analog values in this request. The first response from the initialization will usually be all zeros. Subsequent responses will have the actual values.

6.6 How many analog values can I read at a time?

Ten analog values can be read at a time. Remember that you must do an initialization read.

6.7 Why do I get an exception code when trying to read an analog value?

There are several reasons you may receive an exception code when requesting an analog value.

• The point you are requesting an analog value from is not a 4–20ma Analog Input Module.
• At least one of the points in the group of points you are requesting an analog value from is not a 4–20ma Analog Input Module.
• You requested more than 10 analog values in a single request.

6.8 Why do I get all zeros when I read an analog value?

There are several reasons you will receive a zero reading from an FMM-4–20 Analog Input Module.

• The first read for an analog value from the gateway initializes the polling routine in the gateway to retrieve analog values from the NFN network. The first response will usually be all zeros. This is normal. The subsequent polls of an analog value for the same point or group of points will return actual values. As long as you continue to poll the same points at a rate faster than the Analog Poll Time Out then the gateway will continue to poll the same points.
• The gateway will not actually take an analog value reading unless the module has reached the first threshold and therefore it will return a zero reading.
• If the client polls the gateway too quickly after the initialization poll then the gateway may still return zeros.
• If the client polls the analog values slower than the Analog Poll Time Out, then the gateway may return all zeros.

6.9 What is the “Analog Value Polling Time Out”?

This is how long a gateway will continue to poll analog points after the last client read request of the points. As long as the client makes analog reads of the same points faster than the Analog Value Polling Time then the gateway will continue to poll these points. If the client polls slower than the Analog Value Polling Time then the gateway may return readings of zero because this will be considered an initialization read.
6.10 System Trouble

For information about system trouble information stored in holding registers, please refer to “Panel & System Troubles Input Registers” on page 53.
Appendix A: Exception Responses

If a Modbus master device sends an invalid command or attempts to read an invalid holding register, an exception response is generated. The exception response follows the standard packet format. The high order bit of the function code in an exception response is 1. The data field of an exception response contains the exception error code. The list below describes the exception codes supported and the possible causes.

<table>
<thead>
<tr>
<th>Exception Code</th>
<th>Conditions</th>
<th>Exception Name</th>
</tr>
</thead>
</table>
| 0x01           | • Protocol Identifier in Modbus packet does not match Modbus protocol. Protocol Identifier in Modbus should always be "0".  
• Function code sent by the client is not supported by the Modbus Gateway or the FACP.  
• A Control command was sent to the gateway. Please contact customer service. | Illegal function        |
| 0x02           | • Register address range specified by the client is not supported by the FACP.  
• Register address range requested is valid but the device (e.g. Detector, Module, Zone, etc.) is not present in the specified FACP.  
• Analog Value is requested from a register which is not associated with a 4–20 mA device. | Illegal data address    |
| 0x03           | • Number of registers requested exceeds the maximum allowed limit. The maximum number of registers that a client can read at one time is 100. The exception to this is for analog values where the maximum number of registers a client can read at one time is 10.  
• Invalid Data written to the register when sending commands. | Illegal data value      |
| 0x0A           | Unit ID specified in the request packet is not configured for monitoring.    | Gateway path failed     |
| 0x0B           | FACP is offline or there is a communication problem on your panel and/or NFN. | Gateway target failed   |
Appendix B: Active Event Types

Categories

All NFN events are mapped into Modbus event categories which are stored in the Modbus register. Events are mapped as shown in Table B.1, “Event Type Categories”.

Table B.1 Event Type Categories

<table>
<thead>
<tr>
<th>Event</th>
<th>Modbus Register Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Active Status (see note)</td>
<td>00H</td>
</tr>
<tr>
<td>Fire Alarm</td>
<td>10H</td>
</tr>
<tr>
<td>Security Alarm (Life)</td>
<td>11H</td>
</tr>
<tr>
<td>Critical Process Alarm (Life)</td>
<td>12H</td>
</tr>
<tr>
<td>Medical Emergency (Life)</td>
<td>13H</td>
</tr>
<tr>
<td>Security Alarm (Property)</td>
<td>20H</td>
</tr>
<tr>
<td>Critical Process (Property)</td>
<td>21H</td>
</tr>
<tr>
<td>Supervisory Signal (Guard’s Tour)</td>
<td>30H</td>
</tr>
<tr>
<td>Supervisory Signal (Equipment)</td>
<td>40H</td>
</tr>
<tr>
<td>Disabled Alarm</td>
<td>52H</td>
</tr>
<tr>
<td>Disabled Active</td>
<td>55H</td>
</tr>
<tr>
<td>Non-Fire Activation</td>
<td>71H</td>
</tr>
<tr>
<td>Non-Fire Activation (no acknowledgment required)</td>
<td>72H</td>
</tr>
<tr>
<td>Device Not Present</td>
<td>0xFF</td>
</tr>
</tbody>
</table>

**NOTE:** Multiple states are possible for a device. For example, a device connected to a Fire Alarm Control Panel may be both Active and Disabled. Also, a device may be in the Trouble and Fire Alarm states at one time.

**NOTE:** "No Active Status" does not indicate the point/device is in a normal state. The holding register for the point or device contains more detail. For more information, refer to Section 5, “Register Mapping”, on page 47.
Appendix C: Device Types

Table C.1, “Device Type Values” shows the values used for devices types. These values reflect the following device categories:

- Detectors (1–50)
- Monitor Modules (51–150)
- Control Module (151–250)

<table>
<thead>
<tr>
<th>DEVICE TYPE</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat Detector</td>
<td>1</td>
</tr>
<tr>
<td>Ion Detector</td>
<td>2</td>
</tr>
<tr>
<td>Photo Detector</td>
<td>3</td>
</tr>
<tr>
<td>Laser Detector</td>
<td>4</td>
</tr>
<tr>
<td>Omni Detector</td>
<td>5</td>
</tr>
<tr>
<td>Photo Detector</td>
<td>6</td>
</tr>
<tr>
<td>Monitor Module</td>
<td>51</td>
</tr>
<tr>
<td>HEAT DETECT</td>
<td>52</td>
</tr>
<tr>
<td>MONITOR</td>
<td>53</td>
</tr>
<tr>
<td>PULL STATION</td>
<td>54</td>
</tr>
<tr>
<td>RF MON MODUL</td>
<td>55</td>
</tr>
<tr>
<td>RF PULL STA</td>
<td>56</td>
</tr>
<tr>
<td>SMOKE CONVEN</td>
<td>57</td>
</tr>
<tr>
<td>SMOKE DETECT</td>
<td>58</td>
</tr>
<tr>
<td>WATERFLOW</td>
<td>59</td>
</tr>
<tr>
<td>WATERFLOW S</td>
<td>60</td>
</tr>
<tr>
<td>ACCESS MONTR</td>
<td>61</td>
</tr>
<tr>
<td>AREA MONITOR</td>
<td>62</td>
</tr>
<tr>
<td>AUDIO SYSTEM</td>
<td>63</td>
</tr>
<tr>
<td>EQUIP MONITR</td>
<td>64</td>
</tr>
<tr>
<td>HOLD UP</td>
<td>65</td>
</tr>
<tr>
<td>RF SUPERVSRY</td>
<td>66</td>
</tr>
<tr>
<td>SECURITY L</td>
<td>67</td>
</tr>
<tr>
<td>LATCH SUPERV</td>
<td>68</td>
</tr>
<tr>
<td>DEVICE TYPE</td>
<td>Value</td>
</tr>
<tr>
<td>------------------</td>
<td>-------</td>
</tr>
<tr>
<td>TRACK SUPERV</td>
<td>69</td>
</tr>
<tr>
<td>SPRINKLR SYS</td>
<td>70</td>
</tr>
<tr>
<td>SYS MONITOR</td>
<td>71</td>
</tr>
<tr>
<td>TAMPER</td>
<td>72</td>
</tr>
<tr>
<td>ACK SWITCH</td>
<td>73</td>
</tr>
<tr>
<td>ALLCALL PAGE</td>
<td>74</td>
</tr>
<tr>
<td>DRILL SWITCH</td>
<td>75</td>
</tr>
<tr>
<td>EVACUATE SW</td>
<td>76</td>
</tr>
<tr>
<td>FIRE CONTROL</td>
<td>77</td>
</tr>
<tr>
<td>HAZARD ALERT</td>
<td>78</td>
</tr>
<tr>
<td>MEDIC ALERT</td>
<td>79</td>
</tr>
<tr>
<td>NON FIRE</td>
<td>80</td>
</tr>
<tr>
<td>PAS INHIBIT</td>
<td>81</td>
</tr>
<tr>
<td>POWER MONITR</td>
<td>82</td>
</tr>
<tr>
<td>PROCESS MON</td>
<td>83</td>
</tr>
<tr>
<td>PROCESS AUTO</td>
<td>84</td>
</tr>
<tr>
<td>RESET SWITCH</td>
<td>85</td>
</tr>
<tr>
<td>SIL SWITCH</td>
<td>86</td>
</tr>
<tr>
<td>TELE PAGE</td>
<td>87</td>
</tr>
<tr>
<td>TORNADO ALRT</td>
<td>88</td>
</tr>
<tr>
<td>TROUBLE MON</td>
<td>89</td>
</tr>
<tr>
<td>ABORT SWITCH</td>
<td>90</td>
</tr>
<tr>
<td>MAN RELEASE</td>
<td>91</td>
</tr>
<tr>
<td>MANREL DELAY</td>
<td>92</td>
</tr>
<tr>
<td>SECOND SHOT</td>
<td>93</td>
</tr>
<tr>
<td>SECURITY T</td>
<td>94</td>
</tr>
<tr>
<td>NC MONITOR</td>
<td>95</td>
</tr>
<tr>
<td>NC SUP T</td>
<td>96</td>
</tr>
<tr>
<td>NC SUP L</td>
<td>97</td>
</tr>
</tbody>
</table>
### Table C.1 Device Type Values

<table>
<thead>
<tr>
<th>DEVICE TYPE</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>NC NON FIRE</td>
<td>98</td>
</tr>
<tr>
<td>SECURE/ACCESS</td>
<td>99</td>
</tr>
<tr>
<td>DISABLE MON</td>
<td>100</td>
</tr>
<tr>
<td>FMM 4-20</td>
<td>101</td>
</tr>
<tr>
<td>CONTROL</td>
<td>151</td>
</tr>
<tr>
<td>RELAY</td>
<td>152</td>
</tr>
<tr>
<td>BELL CIRCUIT</td>
<td>153</td>
</tr>
<tr>
<td>STROBE CKT</td>
<td>154</td>
</tr>
<tr>
<td>HORN CIRCUIT</td>
<td>155</td>
</tr>
<tr>
<td>AUDIBLE CKT</td>
<td>156</td>
</tr>
<tr>
<td>SPEAKER</td>
<td>157</td>
</tr>
<tr>
<td>REL END BELL</td>
<td>158</td>
</tr>
<tr>
<td>(blank)</td>
<td>159</td>
</tr>
<tr>
<td>RELEASE CKT</td>
<td>160</td>
</tr>
<tr>
<td>REL CKT ULC</td>
<td>161</td>
</tr>
<tr>
<td>RELEA.FORM C</td>
<td>162</td>
</tr>
<tr>
<td>REL AUDIBLE</td>
<td>163</td>
</tr>
<tr>
<td>NONRESET CTL</td>
<td>164</td>
</tr>
<tr>
<td>TELEPHONE</td>
<td>165</td>
</tr>
<tr>
<td>REL CODE BELL</td>
<td>166</td>
</tr>
<tr>
<td>INSTANT RELE</td>
<td>167</td>
</tr>
<tr>
<td>ALARMS PEND</td>
<td>168</td>
</tr>
<tr>
<td>CONTROL NAC</td>
<td>169</td>
</tr>
<tr>
<td>GEN ALARM</td>
<td>170</td>
</tr>
<tr>
<td>GEN SUPERVIS</td>
<td>171</td>
</tr>
<tr>
<td>GEN TROUBLE</td>
<td>172</td>
</tr>
<tr>
<td>GENERAL PEND</td>
<td>173</td>
</tr>
<tr>
<td>TROUBLE PEND</td>
<td>174</td>
</tr>
<tr>
<td>FORM C RESET</td>
<td>175</td>
</tr>
</tbody>
</table>
# Table C.1 Device Type Values

<table>
<thead>
<tr>
<th>DEVICE TYPE</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISOLATED SPK</td>
<td>176</td>
</tr>
<tr>
<td>ISOLATED NAC</td>
<td>177</td>
</tr>
<tr>
<td>RELAY FDBACK</td>
<td>178</td>
</tr>
<tr>
<td>REL FORM C FB</td>
<td>179</td>
</tr>
</tbody>
</table>
## Appendix D: System Troubles

### Table D.1 System Troubles Register Map

<table>
<thead>
<tr>
<th>Register</th>
<th>Bit Number</th>
<th>System Trouble Name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>GROUND FAULT</td>
</tr>
<tr>
<td>35001</td>
<td>1</td>
<td>AC FAIL</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>BATTERY</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>STYLE 6 POS. LOOP 1</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>STYLE 6 POS. LOOP 2</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>CORRUPT LOGIC EQUAT</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>LCD80 SUPERVISORY</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>EPROM ERROR</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>INTERNAL RAM ERROR</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>EXTERNAL RAM ERROR</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>PROGRAM CORRUPTED</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>NO DEV. INST ON L1</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>PANEL DOOR OPEN</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>AUXILIARY TROUBLE</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>TERM. SUPERVISORY</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>ANNUN. 1 TROUBLE</td>
</tr>
</tbody>
</table>
### Table D.1  System Troubles Register Map

<table>
<thead>
<tr>
<th>Register</th>
<th>Bit Number</th>
<th>System Trouble Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>35002</td>
<td>0</td>
<td>ANNUN. 1 NO ANSWER</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>ANNUN. 2 TROUBLE</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>ANNUN. 2 NO ANSWER</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>ANNUN. 3 TROUBLE</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>ANNUN. 3 NO ANSWER</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>ANNUN. 4 TROUBLE</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>ANNUN. 4 NO ANSWER</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>ANNUN. 5 TROUBLE</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>ANNUN. 5 NO ANSWER</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>ANNUN. 6 TROUBLE</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>ANNUN. 6 NO ANSWER</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>ANNUN. 7 TROUBLE</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>ANNUN. 7 NO ANSWER</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>ANNUN. 8 TROUBLE</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>ANNUN. 8 NO ANSWER</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>ANNUN. 9 TROUBLE</td>
</tr>
<tr>
<td>Register</td>
<td>Bit Number</td>
<td>System Trouble Name</td>
</tr>
<tr>
<td>----------</td>
<td>------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>ANNUN. 9 NO ANSWER</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>ANNUN.10 TROUBLE</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>ANNUN.10 NO ANSWER</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>ANNUN.11 TROUBLE</td>
</tr>
<tr>
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<td>4</td>
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</tr>
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</tr>
<tr>
<td>15</td>
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### Table D.1 System Troubles Register Map

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<tr>
<th>Register</th>
<th>Bit Number</th>
<th>System Trouble Name</th>
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</thead>
<tbody>
<tr>
<td>35048</td>
<td>0</td>
<td>Reserved</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Reserved</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Reserved</td>
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<td>3</td>
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</tr>
<tr>
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<td>15</td>
<td>Reserved</td>
</tr>
</tbody>
</table>
Appendix E: Modbus Gateway Local Configuration

NOTE: This procedure is only necessary if you are configuring an Modbus Gateway using a configuration computer that is not already on the same IP network as the Modbus Gateway. Refer to “Connect the Modbus Gateway to the PNET-1 Surge Suppressor” on page 32.

NOTE: A direct connection requires that a cross over Ethernet cable be made or purchased by the customer.

E.1 Direct Connection to the Gateway Printed Circuit Board

Step 1. Connect the cross over cable between the PNET-1 Ethernet connector and the configuration computer network card Ethernet connector (refer to "Cross Over Cable Specifications").

![Figure E.1 Configuration Computer Direct Connection](image)

Step 2. The configuration computer is connected. Complete the remaining procedures in Section 3.1.3, “Connect the Configuration Computer to the Modbus Gateway”, on page 33.

### Cross Over Cable Specifications

This cross over cable connects the configuration computer network card and the PNET-1 surge suppressor, which is itself connected to the Modbus Gateway board.

The cross over cable can be purchased or you can make one. Please use the following information for the correct pinout requirements for each end of the cable. EIA/TIA wire color-code standard 568B is applicable.

<table>
<thead>
<tr>
<th>RJ45 Pin # (END 1)</th>
<th>Wire Color</th>
<th>Diagram End #1</th>
<th>RJ45 Pin # (END 2)</th>
<th>Wire Color</th>
<th>Diagram End #2</th>
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<tbody>
<tr>
<td>1</td>
<td>White/Orange</td>
<td><img src="image" alt="Diagram" /></td>
<td>1</td>
<td>White/Green</td>
<td><img src="image" alt="Diagram" /></td>
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</table>
### Table E.1 Cross Over Cable (568B)

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<tr>
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<th>Color</th>
<th></th>
<th>Color</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Orange</td>
<td>2</td>
<td>Green</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>White/Green</td>
<td>3</td>
<td>White/Orange</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Blue</td>
<td>4</td>
<td>Blue</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>White/Blue</td>
<td>5</td>
<td>White/Blue</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Green</td>
<td>6</td>
<td>Orange</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>White/Brown</td>
<td>7</td>
<td>White/Brown</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Brown</td>
<td>8</td>
<td>Brown</td>
<td></td>
</tr>
</tbody>
</table>

![Diagram of Cross Over Cable](image)
Appendix F: Glossary

F

**FTP**  File Transfer Protocol, used to back up the Modbus Gateway database and download firmware for field upgrades.

H

**HS-NCM-W/F**  High Speed Network Control Module, a network interface enabling the Modbus Gateway to communicate with other NFN devices.

I

**IP Address**  Logical address designating a node on an IP network with the format NNN.NNN.NNN.NNN, where NNN groups can be between 0 and 255.

**Modbus Gateway**  A printed circuit board interface that allows the NFN network to communicate with a Modbus network.

**NFN**  The network of Fire Alarm Control Panels. Ethernet - Local area network protocol.

T

**Telnet**  An Internet protocol that allows you to communicate directly with another computer on the Internet by specifying the host name, port and terminal type.
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