PowerCommand®

Network Installation and Operation Manual

FT−10

English
Original Instructions 5-2017 0900−0529 (Issue 3)

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Safety Precautions

The PowerCommand Network can be used to remotely operate power transfer equipment (e.g., transfer switches, paralleling systems) and start and stop generator sets. All of the safety precautions for that equipment must be observed. Refer to the Operator's Manual for the equipment that is being monitored and controlled by the network for important safety precautions.

The following symbols, found throughout this manual, alert you to potentially dangerous conditions to the operator, service personnel, or the equipment.

⚠ DANGER ***This symbol warns of immediate hazards which will result in severe personal injury or death.***

⚠WARNING ***This symbol refers to a hazard or unsafe practice which can result in severe personal injury or death.***

⚠ CAUTION ***This symbol refers to a hazard or unsafe practice which can result in personal injury or product or property damage.***

MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Keep your hands, clothing, and jewelry away from moving parts.
- Before starting work on the generator set, disconnect battery charger from its AC source, then disconnect starting batteries, negative (-) cable first. This will prevent accidental starting.
- Make sure that fasteners on the generator set are secure. Tighten supports and clamps, keep guards in position over fans, drive belts, etc.
- Do not wear loose clothing or jewelry in the vicinity of moving parts, or while working on electrical equipment. Loose clothing and jewelry can become caught in moving parts. Jewelry can short out electrical contacts and cause shock or burning.
- If adjustment must be made while the unit is running, use extreme caution around hot manifolds, moving parts, etc.

ELECTRICAL SHOCK CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Remove electric power before removing protective shields or touching electrical equipment. Use rubber insulative mats placed on dry wood platforms over floors that are metal or concrete when around electrical equipment. Do not wear damp clothing (particularly wet shoes) or allow skin surface to be damp when handling electrical equipment.
- Use extreme caution when working on electrical components. High voltages can cause injury or death. DO NOT tamper with interlocks.
- Follow all applicable state and local electrical codes. Have all electrical installations performed by a qualified licensed electrician. Tag and lock open switches to avoid accidental closure.
- Jewelry is a good conductor of electricity and should be removed before working on electrical equipment.

MEDIUM VOLTAGE GENERATOR SETS

(601V to 15kV)

- Medium voltage acts differently than low voltage. Special equipment and training is required to work on or around medium voltage equipment. Operation and maintenance must be done only by persons trained and qualified to work on such devices. Improper use or procedures will result in severe personal injury or death.
- Do not work on energized equipment. Unauthorized personnel must not be permitted near energized equipment. Due to the nature of medium voltage electrical equipment, induced voltage can remain even after the equipment is disconnected from the power source. Plan the time for maintenance with authorized personnel so that the equipment can be de-energized and safely grounded.

TRANSFER SWITCHES

- AC and DC voltages in the transfer switch components present serious shock hazards that can result in severe personal injury or death. Read and follow these instructions.
- Keep the transfer switch cabinet closed and locked. Make sure only authorized personnel have cabinet and operational keys.
- Due to the serious shock hazard from medium voltages within the cabinet, all service and adjustments to the transfer switch must be performed only by an electrician or authorized service representative.
- If the cabinet must be opened for any reason:
  1. Move the operation selector switch on the generator set to Stop.
  2. Disconnect battery charger from its AC source. Disconnect the starting batteries of the generator set. (Remove the negative [–] lead first to prevent arcing from igniting explosive battery gas.)
  3. Remove AC power to the automatic transfer switch. If the instructions require otherwise, use extreme caution due to the danger of shock hazard.

GENERAL SAFETY PRECAUTIONS

- The PowerCommand Network allows remote operation of equipment. PowerCommand Software for Windows can remotely start and stop a genset or exercise a transfer switch. Network modules can independently control other network modules and operate other electrical devices such as fans or pumps etc. Make certain that all appropriate personnel are notified before remotely operating equipment and make them aware of any equipment that can be energized automatically.
- Do not work on this equipment when mentally or physically fatigued, or after consuming any alcohol or drug that makes the operation of equipment unsafe.
- Use only the latest physical and logical connection diagrams for installing and maintaining the PowerCommand Network. If changes are made to the physical or logical network connections, make sure the site connection diagrams are updated. Create a new CSV file if the number or type of modules changes or if the bindings change.

1. Introduction

ABOUT THIS MANUAL

This manual covers the PowerCommand® FT-10 Network installation, setup, and service information. The PowerCommand FT-10 Network is an Echelon® LONWORKS® based local operating control network. This manual is intended for use by trained network installers and operators.

Sections 1 and 2 provide an overview of this manual, the expected technical background of the installer/operator, the required hardware and software tools, installation guidelines, and some basic network concepts.

Section 3 describes creating a self-installed network using auto-binding of devices. It includes guidelines for a self-installed network. If these guidelines cannot be met, the network must be installed using LonMaker™ software.

Section 4 describes the *logical* installation and connection of the various modules on the network using LonMaker software. This section also describes network testing and service procedures using LonMaker.

Much of the material in Section 4 is derived from the Echelon *LonMaker Installation Tool Users Guide.* The Echelon manual is included with the LonMaker software, and should be considered a reference companion to this manual.

Section 5 describes using Plug-Ins with LonMaker software to configure devices. This program is used to complete the network installation by performing several functions including setting network settings for each device.

Section 6 describes using InPower™ to configure devices. This program is used to complete the network installation by performing several functions including setting device network settings.

Section 7 describes monitoring network devices using PowerCommand for Windows® II (PCW II) software.

Sections 8 thru **20** describe individual modules, routers, the SLTA-10 Gateway, the ModLon Gateway, and the Junction Box/Terminator on the PowerCommand Network and provide procedures for locating, mounting, and wiring these devices (*physical* installation). As new devices are made available, they will be added to this manual.

A glossary of network terms, troubleshooting information, and installation aids (application notes, wiring diagrams, bindings, and network variables), are included in the Appendices at the back of this manual.

Use normal and necessary safety precautions before starting any service procedures. Identify all hazards by referring to the Safety Precautions section and observing all warnings and cautions within the manual. When troubleshooting, remember that the PowerCommand Network, generator set, transfer switch, and utility power source are all interdependent.

Keep this manual where it will be readily available to the network installer and operator.

WARNING

THE GENSET, TRANSFER SWITCH, AND OTHER EQUIPMENT ASSOCIATED WITH THE POWERCOMMAND NETWORK WILL NOT FUNCTION PROPERLY, OR WILL NOT BE SUBJECT TO PROPER MONITORING AND SERVICE, UNLESS THE INSTRUCTIONS IN THIS MANUAL ARE FOLLOWED IN DETAIL. IMPROPER FUNCTIONING CAN RESULT IN SEVERE PERSONAL INJURY, DEATH, AND/OR EQUIPMENT DAMAGE. SERVICE PERSONNEL MUST HAVE THE REQUIRED INSTALLATION TOOLS AND BE TRAINED AND EXPERIENCED TO PERFORM NETWORK INSTALLATIONS, INCLUDING USE OF INSTALLATION SOFTWARE, AND BE ABLE TO PERFORM ELECTRICAL AND MECHANICAL SERVICE. READ THIS ENTIRE MANUAL BEFORE STARTING.

REQUIRED BACKGROUND

To use this manual, you need:

- Experience and familiarity with generator set installation and service.
- A basic understanding of control networks.
- Experience and familiarity with personal computers and using a mouse.
- Experience and familiarity with DOS, and Windows-type graphical user interfaces.
- Experience and familiarity with the organization of disk drives, directories, subdirectories, files, and path names.

REQUIRED INSTALLATION TOOLS

In additional to conventional tools and all system components and cabling, you need the following tools and manuals to install a PowerCommand Network:

- PowerCommand Network Support CD (part number 326–5706) – includes the following:
  - Cummins Inc. Device Stencil
  - Resource Files
  - .XIF Files
  - .NXE Files
  - Plug-Ins
- Echelon LonMaker for Windows, version 3.1 software
- InPower, version 3.0
- PC with Pentium II 350 or better
- VGA monitor (color or gray scale) and video card
- Windows 2000 or Windows NT 4.0 with Service Pack 3
- 64 MB of conventional RAM
- 225 MB of available hard disk storage
- CD ROM drive
- Serial port, Network Gateway, cable, and driver software *or* PCC-10 network interface card, cables, connectors, PCMCIA-II Slot, and driver software
- Microsoft-compatible mouse and mouse driver software
- The *LonMaker Installation Tool Users Guide (provided with LonMaker)*

To test the PowerCommand Network before leaving the site, the following tools will be needed:

- A Network Gateway Module *or* a PCC-10 card, cables, and PCMCIA-II Slot
- InPower version 3.0
- LonMaker for Windows, version 3.1

New and Old Versions of LonMaker

IMPORTANT! Installing LonMaker 3.1 for Windows on the same computer as LonMaker 2.02 for DOS can cause software problems.

- If enough space is available on the hard drive, PartitionMagic® can be used to separate the two versions of software.
- If not enough space is available on the hard drive, install LonMaker for Windows and its operating software companions on a separate hard drive.

HOW TO OBTAIN SERVICE

When the equipment requires service, contact the nearest dealer or distributor. Factory-trained Parts and Service representatives are ready to handle all your service needs.

To contact your local Cummins Inc. distributor in the United States or Canada, call 1-800-CUMMINS™ (1–800–286–6467).

If you are unable to contact a distributor using the automated service, consult the Yellow Pages. Typically, our distributors are listed under:

Generators-Electric,
Engines-Gasoline or Engines-Diesel, or
Recreational Vehicles-Equipment,
Parts and Service.

For outside North America, call Cummins Inc., 1-763-574-5000, 7:30 AM to 4:00 PM, Central Standard Time, Monday through Friday. Or, send a fax to Cummins Inc. using fax number 1-763-528-7229.

WARNING

INCORRECT SERVICE OR PARTS REPLACEMENT CAN RESULT IN SEVERE PERSONAL INJURY, DEATH, AND/OR EQUIPMENT DAMAGE. SERVICE PERSONNEL MUST BE TRAINED AND EXPERIENCED TO PERFORM ELECTRICAL AND/OR MECHANICAL SERVICE ON HIGH VOLTAGE EQUIPMENT.

SYSTEM OVERVIEW

Figure 1-1 shows a block diagram using some of the network modules described in this manual. The network and network modules are covered in detail in the following sections.

The **PowerCommand Control** (PCC) communicates through the Genset Communications Module with other modules, such as a Digital I/O Module, or Network Communications Module.

The **Genset Communications Module** (GCM) is mounted in the PCC 3100 and is required for connecting the PCC to the network.

The **Genset LonWorks Card** (GLC) is mounted in the PCC 3200 and is required for connecting the PCC to the network.

The **Genset Network Communications Module** (NCM) is mounted in the PCC 2100 and is required for connecting the PCC to the network.

The **ATS Network Communications Module** (NCM) is mounted in the PowerCommand automatic transfer switch (OTPC, BTPC, OHPC, or CHPC) and is required for connecting the transfer switch to the network.

The **Digital I/O Module** (DIM) provides a group of relay contact outputs and discrete inputs for interfacing the PowerCommand system to alarm or status outputs and to equipment that does not have compatible communications capability.

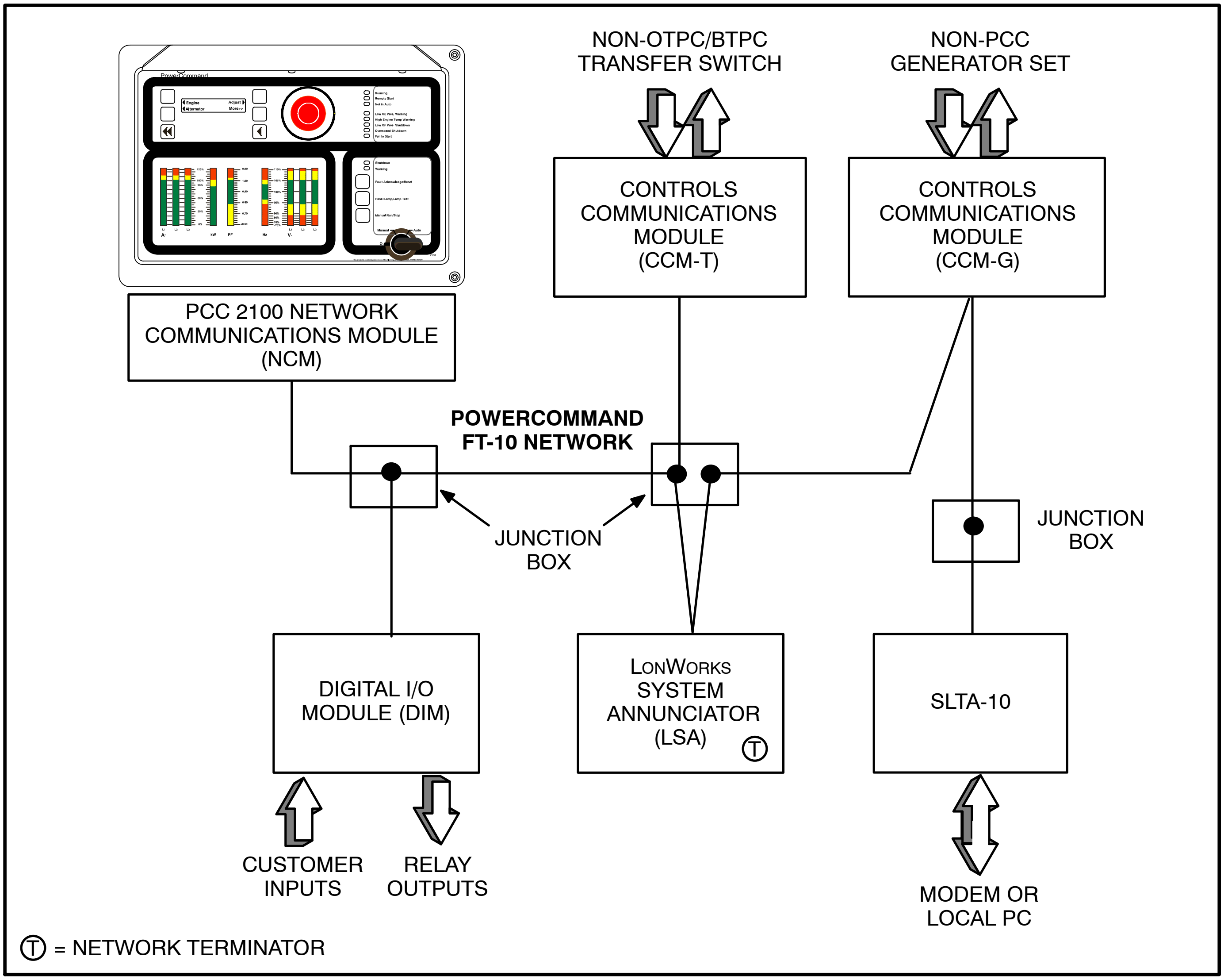

FIGURE 1-1. BLOCK DIAGRAM OF NETWORK MODULES

The LONWORKS® **System Annunciator** (LSA) allows remote annunciation via the PowerCommand Network of a genset or transfer switch etc. The annunciator shows an operator what is happening in the network.

The **SLTA-10 Gateway** provides a network interface to a PC or modem.

The **Junction Box/Terminator** provides connection points for network power and data wires.

The **Controls Communications Module** (CCM) allows interfacing the network to a non–PCC generator set (CCM-G) or transfer switch (CCM-T).

The PowerCommand LONWORKS **Network Router** connects two communications channels (for example, FT-10 to FT-10) and routes messages between them (see Figure 1-2).

The PowerCommand **Etherlon Router** connects one FT-10 Network LonWorks channel to one Ethernet channel (see Figure 1-3).

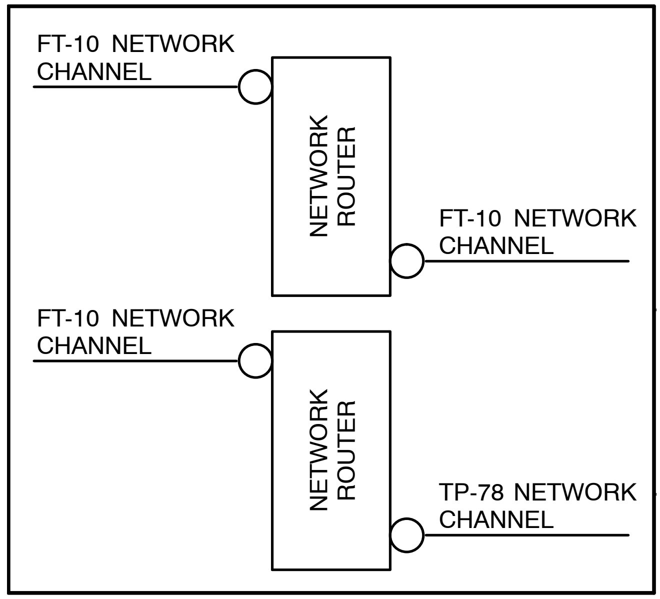

FIGURE 1-2. NETWORK ROUTERS

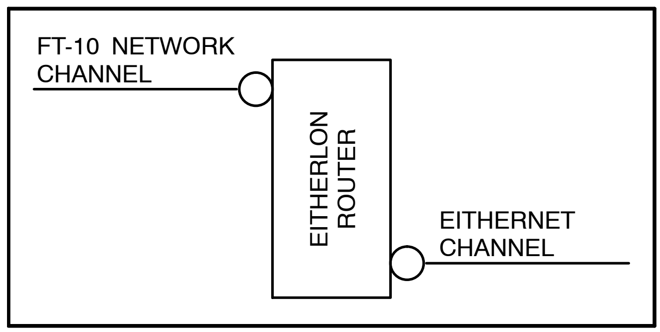

FIGURE 1-3. ETHERLON ROUTER

2. Network Hardware and Wiring

OVERVIEW

This section describes the free topology (FT) network communications protocol and the individual modules used in the PowerCommand® FT-10 network. This section also describes network media, network power supply, and physical connection requirements. For a definition of the terms used in a PowerCommand network, refer to the Glossary in Appendix A.

NETWORK CONFIGURATION

The PowerCommand network uses a free topology (Figure 2-1). The network is made up of individual devices that are connected by stranded twisted-pair communications cable for the transmission of network data. Network power is transmitted over wires in the DC conduit.

The devices used in this network include a free topology transceiver (FTT-10). FTT-10 devices are transformer isolated, have a 78 kbps bit rate, and are polarity insensitive. External power must be provided for FTT-10 devices (LSA, DIM, CCM-T, CCM-G, GLC, NCM, and GCM).

A router can be configured as a repeater to extend a segment into a channel. Repeaters transmit every network variable signal they receive, no matter where it originates.

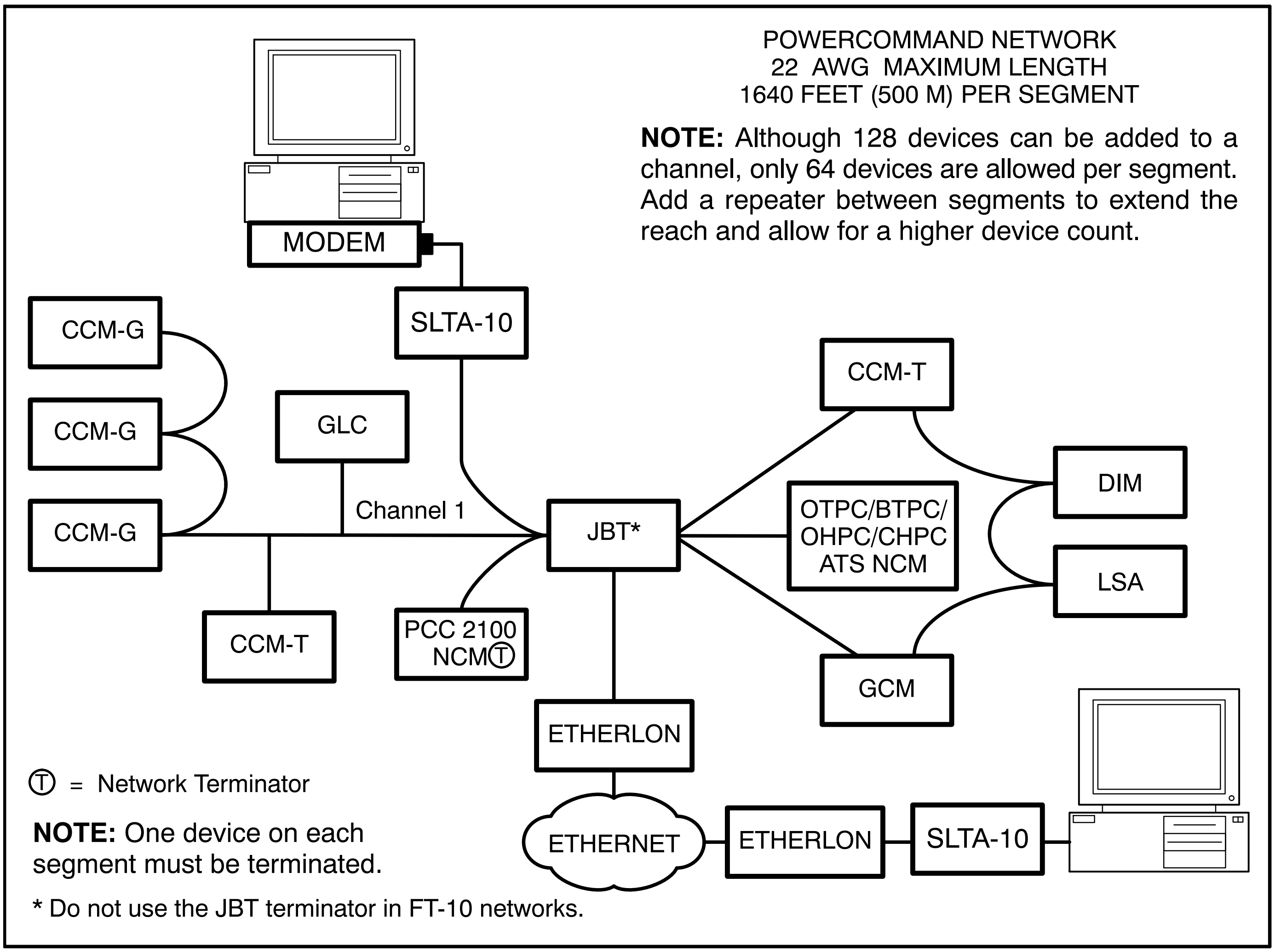

FIGURE 2-1. FREE TOPOLOGY NETWORK EXAMPLE

PowerCommand is a registered trademark of Cummins Inc.
Echelon, LonWorks, and Neuron are registered trademarks of Echelon Corporation.

A free topology architecture allows for wiring the control devices without topology restrictions. It supports the use of star, loop, and/or bus wiring. Some of the advantages of free topology include:

- It allows for a method of wiring that best suits the installation, thus reducing the need for advanced planning. It also allows for last minute changes.
- Rewiring of existing installations is usually not required.
- The network can be expanded by tapping into the existing wiring where it is most convenient to do so.

Figure 2-2 shows a typical network with several modules. Refer to Figure E-1 in Appendix D for a more detailed network example.

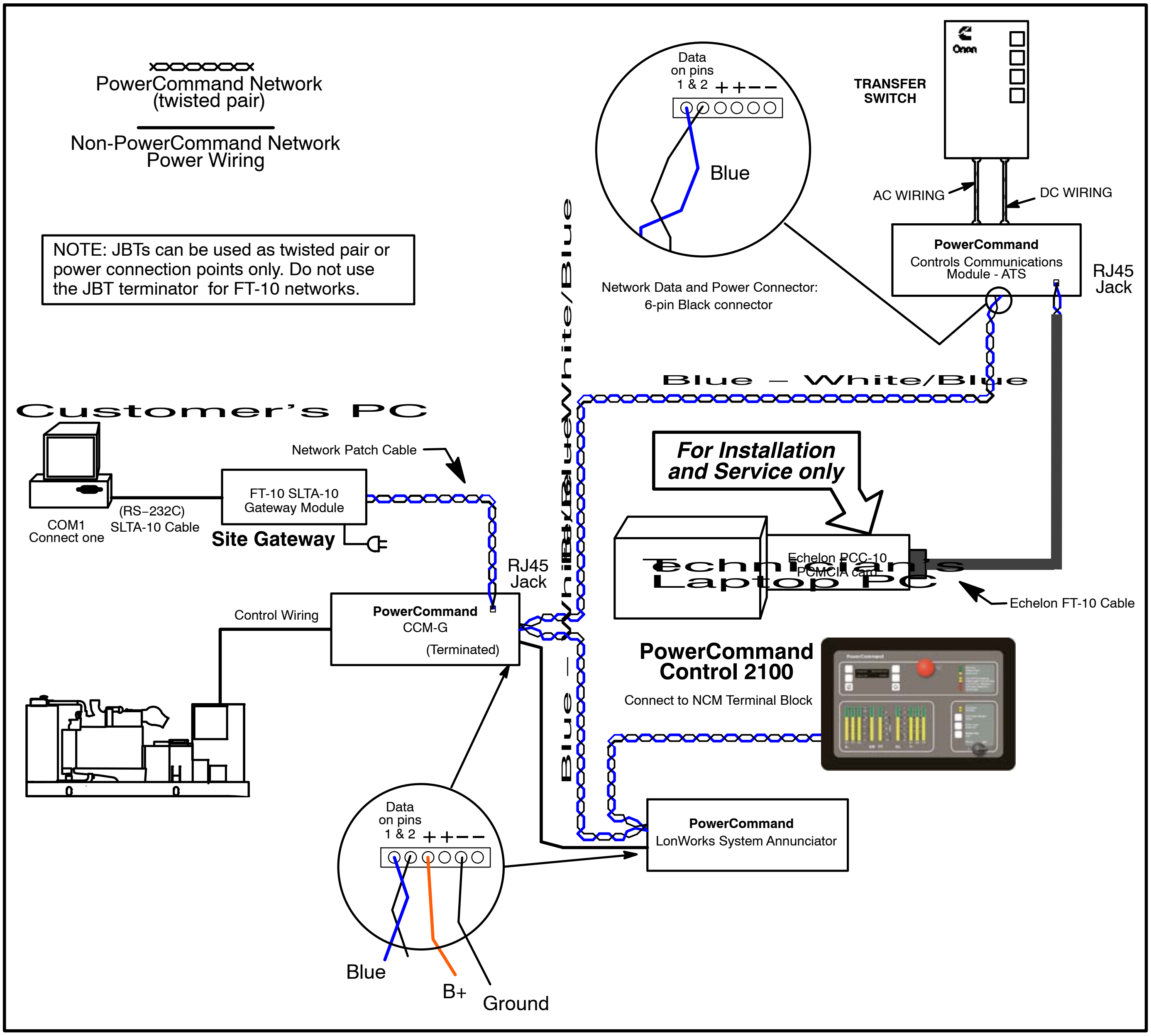

FIGURE 2-2. TYPICAL NETWORK CONFIGURATION

SYSTEM DESCRIPTION

The PowerCommand Network is a distributed control network. Echelon® LonWorks® technology provides the communications protocol via Echelon's Neuron® Chip and firmware. The network consists of nodes (for example: PCCs with Genset Communications Modules, Digital I/O Modules, Controls Communication Modules, and Network Gateway Modules) wired together on a common network data bus.

The control of the system does not reside in a central device, but rather is distributed at the system component level. That is, each node has its own intelligence—intelligence needed at that location to perform functions for that particular component.

The nodes communicate control and monitoring information to one another over the network data bus.

The nodes, their connections to one another, and the modules/devices they control/monitor collectively form the distributed control system. A distributed control system is a more robust control scheme than a conventional central control system. Single points of failure in the distributed control system do not necessarily render the whole system inoperative.

Communications Protocol

A distributed control network operates on a peer-to-peer communication protocol, whereby any device on the communication channel can communicate with any other device at any time.

Messages can be prioritized so that critical control messages have first access to the network. Reliability of transmission is provided through use of acknowledged or repeated message service levels. Accuracy of the message is checked by cyclical redundancy checking.

The application is defined by naming the network variable inputs and outputs for each device.

Nodes that do not have a local source of uninterrupted power are supplied by the network power lines. These power lines must be in the DC power conduit.

Neuron Chip

Each node contains a Neuron Chip. The primary function of the Neuron Chip is to serve as a communications link between the system component located at that node and other system components on the network. The Neuron Chip also provides the node with some local processing power to read switch positions, drive outputs, read analog data, etc. The Neuron Chip communicates by directly transmitting and receiving through a transformer-coupled transceiver.

POWERCOMMAND CONTROLS

The PowerCommand Controls (PCCs) are a family of microprocessor-based controls for Cummins Inc. generator sets. They provide fuel control and engine speed governing, main alternator voltage output regulation, and complete generator set control and monitoring.

The operating software provides control of the generator set and its performance characteristics, and displays operating information on a digital and analog display panel.

The PCC communicates through the Genset Communications Module or Network Communications Module with other modules, such as a LonWorks System Annunciator or Network Gateway Module.

Variations of the PowerCommand Controls are covered in your generator set Installation, Operator's, and Service manuals.

SYSTEM MODULES

Genset Communications Module (GCM)

The Genset Communications Module (GCM) is mounted inside the PCC 3100, and is required for connection of the PCC 3100 to the network.

The GCM provides an interface for data between the PCC 3100 and other modules on the network. It communicates with the PCC 3100 base board through the PCC's serial port to determine the operating state of the control. For example, the GCM monitors PCC 3100 data such as voltage, current, engine speed, and oil temp; and then stores it for the network.

The GCM also provides some direct local control and monitoring of the PCC 3100. Outputs from the GCM allow it to "wake up" the PCC 3100 when needed, or to cause an emergency shutdown on command. It monitors Not-In-Auto mode and battery voltage (when the PCC is asleep).

The GCM is installed piggyback on the analog board within the PCC 3100. A description of the GCM for PCC 3100 controls is covered in *Section 7*.

Genset LonWorks Card (GLC)

The Genset LONWORKS Card (GLC) is mounted inside the PCC 3200, and is required for connection of the PCC 3200 to the network.

The GLC provides an interface for data between the PCC 3200 and other modules on the network. It communicates with the PCC 3200 base board to determine the operating state of the control. For example, the GLC monitors PCC data such as voltage, current, engine speed, and oil temp; and then stores it for the network.

The GLC is installed in slot 4 in the control box card cage assembly. A description of the GLC for PCC 3200 controls is covered in *Section 9*.

Genset Network Communications Module (NCM) – PCC 2100 Control

The Genset Network Communications Module (NCM) is mounted inside the PCC 2100, and is required for connection of the PCC to the network.

The NCM provides an interface for data between the PowerCommand 2100 Control and other modules on the network. It communicates with the PCC base board through the PCC's serial port to determine the operating state of the control. For example, the NCM monitors PCC data such as voltage, current, engine speed, and oil temp; and then stores it for the network.

The NCM is installed piggyback on the base circuit board within the PCC 2100. A description of the NCM for PCC 2100 controls is covered in *Section 10*.

Network Communications Module (NCM) – PowerCommand ATS

The PowerCommand ATS Network Communications Module (NCM) is mounted inside the OTPC/BTPC/OHPC/CHPC ATS, and is required for connection of the ATS to the network.

The NCM provides an interface for data from the transfer switch to other modules on the network. It communicates with the digital board providing complete monitoring and control of the transfer switch.

The NCM is installed piggyback on the digital module within the ATS. A description of the NCM for PowerCommand Automatic Transfer Switches is covered in *Section 11*.

Digital I/O Module (DIM)

The base and expansion DIMs provide a group of relay contact outputs and discrete inputs for interfacing the PowerCommand System to status outputs and to equipment that does not have compatible communications capability.

Each module (base and expansion) provide eight 0.5A, 250VAC/30VDC Form-C dry contact relay outputs, which are driven by data from the network. The contacts are connected to pluggable terminal blocks for field wiring. Each relay can be programmed to operate from any SNVT switch variable on the network. Each module also includes four digital inputs to couple user inputs to the network for use elsewhere in control or monitoring.

Description and installation of the Digital I/O Module is covered in *Section 12*.

SLTA-10 Gateway

The PowerCommand LONWORKS SLTA-10 Gateway provides a network interface to a PC either directly or through a modem. It translates network protocol into a protocol that can be understood by a PC.

The SLTA-10 Gateway connects to network data wire through a 2-position connector. The SLTA-10 Gateway receives its power from AC wall power, and should be backed up by a standby uninterruptable power supply (UPS).

The SLTA-10 Gateway allows software running on a PC to access, and control all modules on a network. The PowerCommand Software uses this module to access the network.

A description of the SLTA-10 Gateway is covered in *Section 13*.

Junction Box/Terminator

A Junction Box/Terminator (JBT) provides connection points for network power and data wire. Junction Boxes may be used throughout a network for connecting in Pass Thru, Local Loop and Stub configurations. Stub connections are used in a multidrop bus topology. The JBT is a potted assembly.

A junction box provides two 6-position pluggable connector for data and power, two RJ45 jacks for 24AWG stub connections, a switch to connect the data lines to a terminator circuit*, and a switch to select either a Pass Thru or a Local Loop connection between the data lines on the two connectors.

*** The terminator circuit must only be used in a TP-78 network.**

Description of the JBT is covered in *Section 14*.

LONWORKS System Annunciator (LSA)

The LONWORKS® System Annunciator (LSA) is connected to the network by stranded twisted pair communication wire.

The LSA has 20 LEDs to annunciate alarms. This module has its own Operator's Manual (900-0293).

The LSA is covered in *Section 15* of this manual.

Controls Communications Module for Generator Set and Transfer Switch Monitoring

The Controls Communications Module (CCM) allows interfacing the network to conventional non-PCC generator sets, transfer switches, system or breakers.

These modules monitor discrete inputs, AC and DC analog inputs, and communicate data to the PowerCommand Network.

The CCM has 16 channels of analog input and 32 digital inputs.

The module also includes eight Form-C output relays to provide control of the monitored equipment from the network. For example, these outputs can be used to initiate a test within a transfer switch, or to remotely start a generator set.

A description of the CCM for genset applications is covered in *Section 16*, and a description of transfer switch applications is covered in *Section 17*.

Network Router

The Network Router (RTR) connects two communications channels by passing messages between the two channels. The PowerCommand Network Router is configured to connect two stranded twisted pair/transformer isolated 78kb (FT-10) channels.

The Router can be used within a PowerCommand Network to extend the physical length of the network beyond 1640 feet (500 m) and/or increase the maximum number of nodes to more than 64 nodes. Refer to the *Section 18* for application information on the Network Router.

Etherlon Router

The PowerCommand Etherlon Router(s) connects one FT-10 Network LONWORKS® channel to an Ethernet channel.

One Etherlon Router must be used to go from an FT-10 network to an Ethernet channel and another must be used to go from the Ethernet channel back to the FT-10 network.

Refer to the *Section 19* for application information on the Etherlon Router.

ModLon II Gateway

The Modlon II Gateway will be obsoleted in October 2016 and replaced with the PowerCommand Lon Gateway (A054V134). The PowerCommand Lon Gateway is currently available for purchase and will supersede any orders for the Modlon II Gateway after it has been obsoleted. Software and LonMaker stencils for the PowerCommand Lon Gateway are available on InCal for download.

The ModLon II Gateway provides a direct Echelon LonWorks network interface to any device that can communicate ModBus RTU or ModBus ASCII. This module translates LonWorks network protocol into ModLon ASCII or RTU.

A description of the ModLon II Gateway is included in *Section 20*.

DATA TRANSMISSION MEDIA

The modules communicate at 78 kbps over a communications channel of 22 AWG UL Level IV (or EIA Category 5) stranded twisted pair communications wire. The network data signal is coupled to the stranded twisted pair wire by transformer-coupled transceivers in each node. Nodes are isolated by transformer from the data lines, which makes the data wiring polarity insensitive. A high degree of noise immunity is achieved with this medium.

Wiring and connection of data transmission media is covered in the individual module sections.

NETWORK TOPOLOGY

There are two types of wiring topologies:

- Free Topology (Preferred – see Table 2-1)
  - Maximum Length Per Segment = 500 meters (1640 feet)
  - Maximum Number of Segments Per Channel = 2
  - Maximum Number of Devices per Segment = 64
  - Termination – One termination is required on an FT-10 network segment. Proper termination of the network is important for reliable communications. All PGA nodes have the terminator circuit built in except the Gateway and Routers. Termination is activated by a slide switch. Network terminator 300–5669 can also be used.
- Multidrop Bus (Daisy Chain)
  - Maximum Length = 2700 meters (8858 feet)
  - Maximum Number of Devices = 44
  - Termination – Two multidrop bus terminators (not the terminators on the devices) are required, one at each end of the network (Onan P/N 300–5729).

TABLE 2-1. NETWORK DATA SPECIFICATION

Data Communications Type:	Transformer coupled, Differential Manchester encoding
Media:	Stranded twisted pair communications wire
Bit Rate:	78k bits/sec
Wiring Topology:	Free Topology
Polarity:	Polarity insensitive
Max Segment Length:	1640 feet (500 meters)
Termination:	One terminator required (recommended that the terminator be located near the center of the segment)
Minimum Wire Type Required:	Segment – Unshielded 22 AWG UL Level IV or EIA Cat. 5 Stranded Twisted Pair Communication Wire
Maximum Length of Exposed Untwisted Wire at a Connector:	1/2 Inch (13 mm)
Maximum Number of Nodes:	128 per channel, 64 per segment
Maximum no. of channels:	20
Wire Color Codes:	Blue and White/Blue – primary wire pair for data Orange and White/Orange – secondary wire pair for Local Loops with 2 pair cable
Connector:	PGA nodes – 6 position pluggable black screw terminal block PGA Junction Box/Terminator – pluggable screw terminal blocks and RJ45s NGM node — 2-position connector (orange screw terminal block)

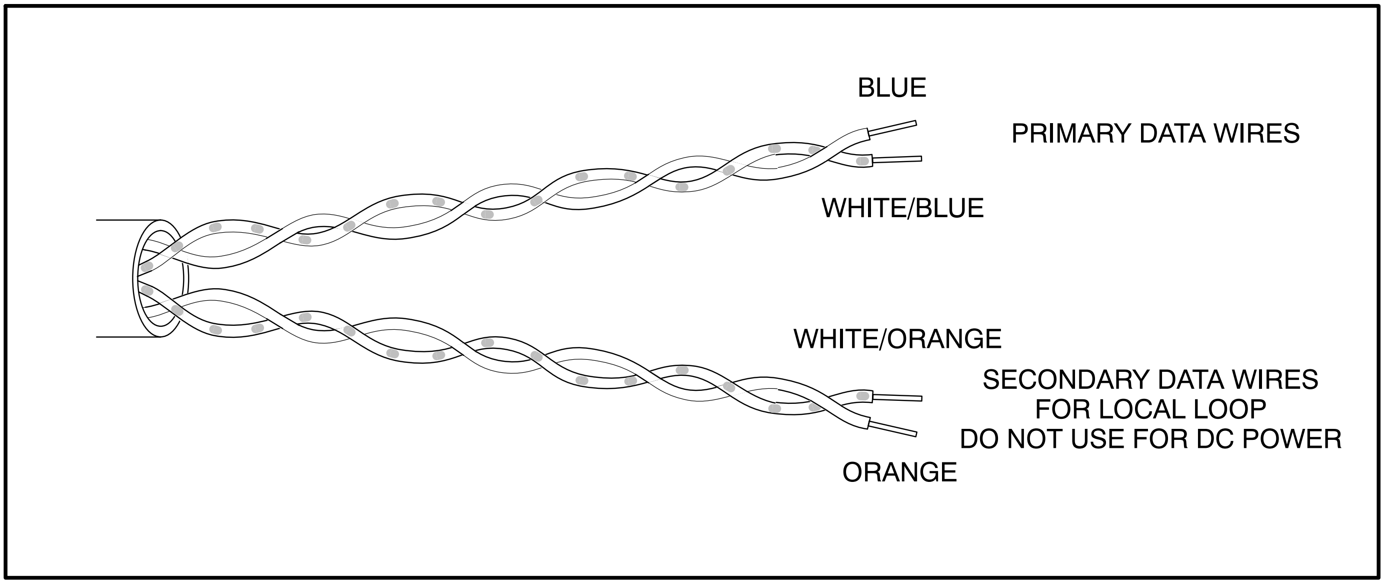

FIGURE 2-3. TWO STRANDED TWISTED PAIR COMMUNICATIONS WIRE

CONNECTORS AND WIRE COLOR CODES

The CCM-G, CCM-T, LSA, GLC, and the base DIM have a black, 6-position pluggable screw terminal block for connection to network data and network power (see Figure 2-4). These devices also have one RJ45 connector (see Figure 2-5).

The Junction Box/Terminator module has two 6-position pluggable terminal blocks (see Figure 2-4), as well as two RJ45 connectors.

The OTPC/BTPC/OHPC/CHPC ATS NCM uses a network harness to connect from the module's 2-position connector (see Figure 2-6) to two positions on the DIN rail customer connection terminals. This device also has an RJ45 connector.

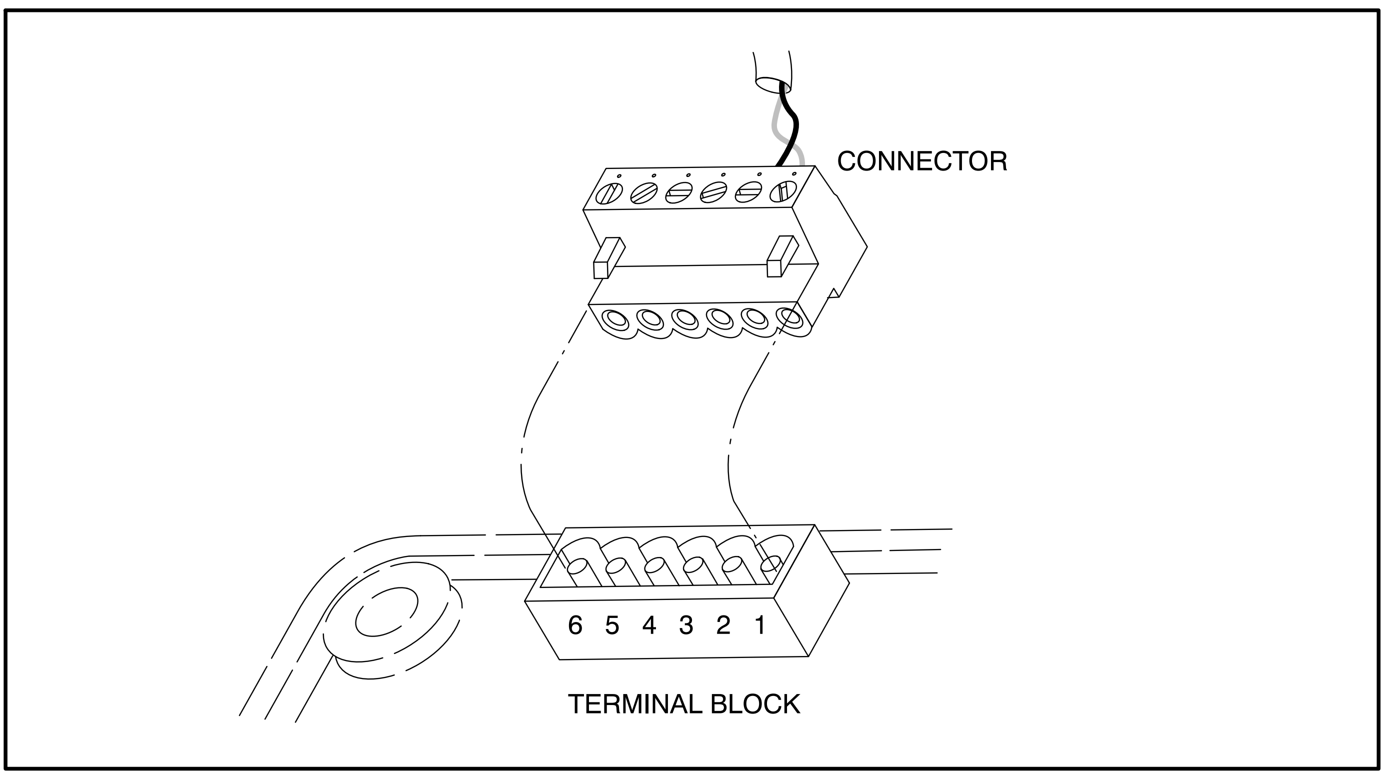

FIGURE 2-4. 6-POSITION PLUGGABLE CONNECTOR

The PCC 2100 Genset NCM uses a network harness to connect from the module's 2-position connector (see Figure 2-7) to another network device. This device also has an RJ45 connector.

The SLTA-10 Gateway has a 2-position connector (see Figure 2-8) for network data connections and network termination.

Connector positions and wire color codes are listed in Tables 2-2 and 2-3.

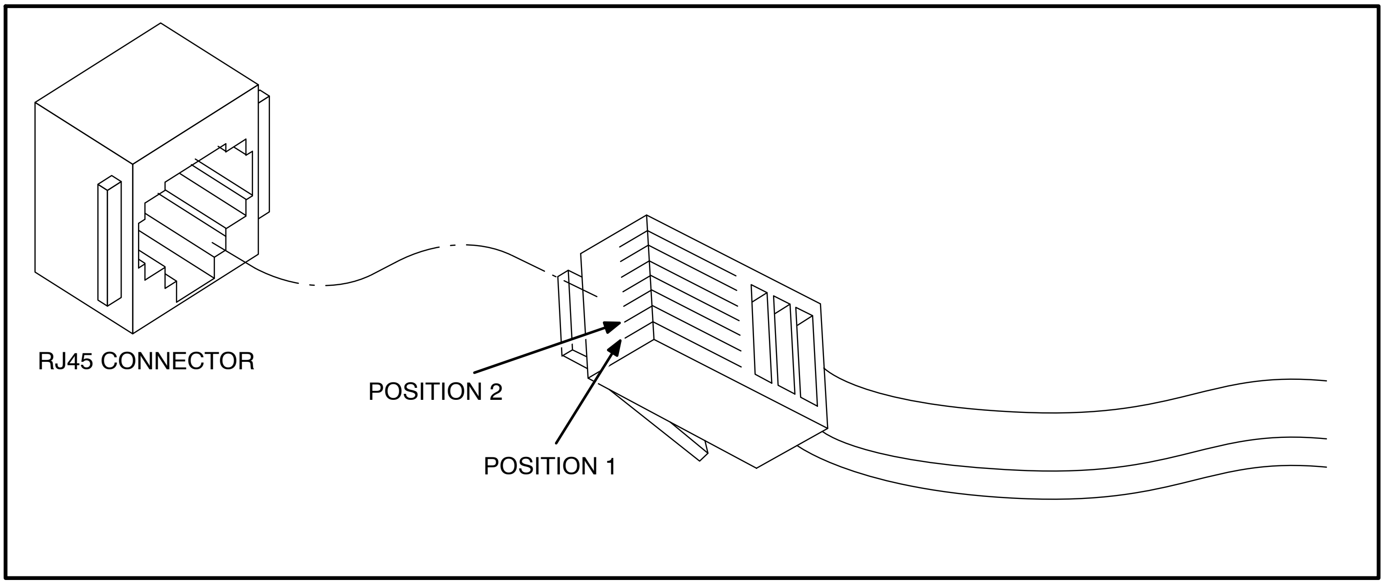

FIGURE 2-5. RJ45 CONNECTOR

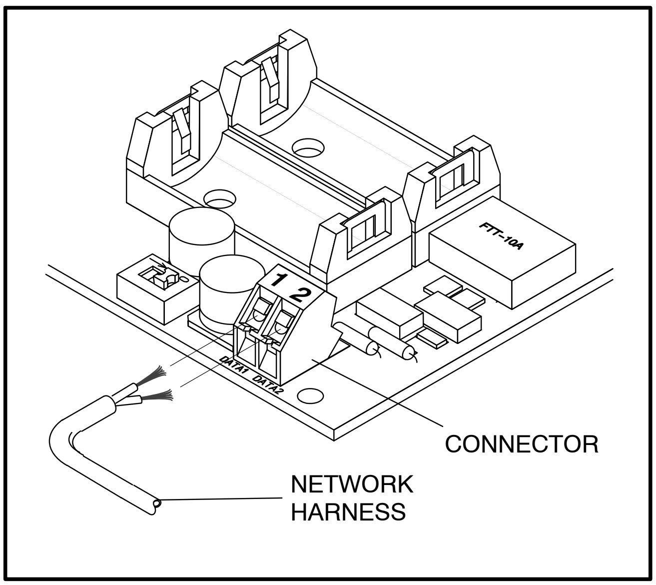

FIGURE 2-6. OTPC/BTPC/OHPC/CHPC ATS NCM TWO-POSITION CONNECTOR (OLD PRODUCTION)

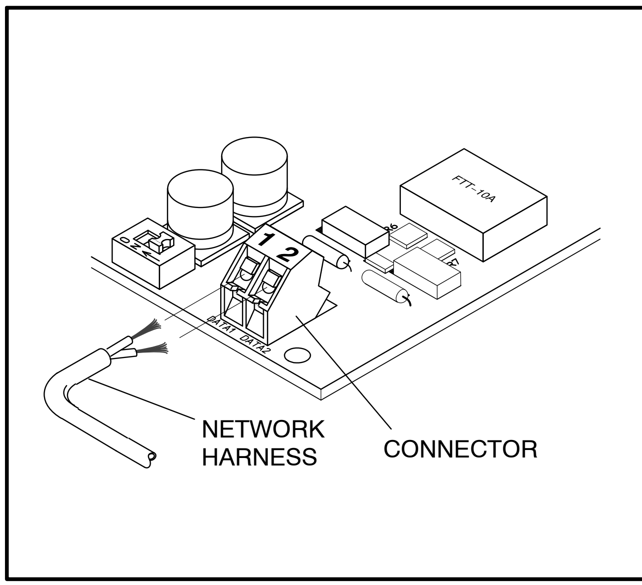

FIGURE 2-7. PCC 2100 AND OTPC/BTPC/OHPC/CHPC (NEW PRODUCTION) GENSET NCM TWO-POSITION CONNECTOR

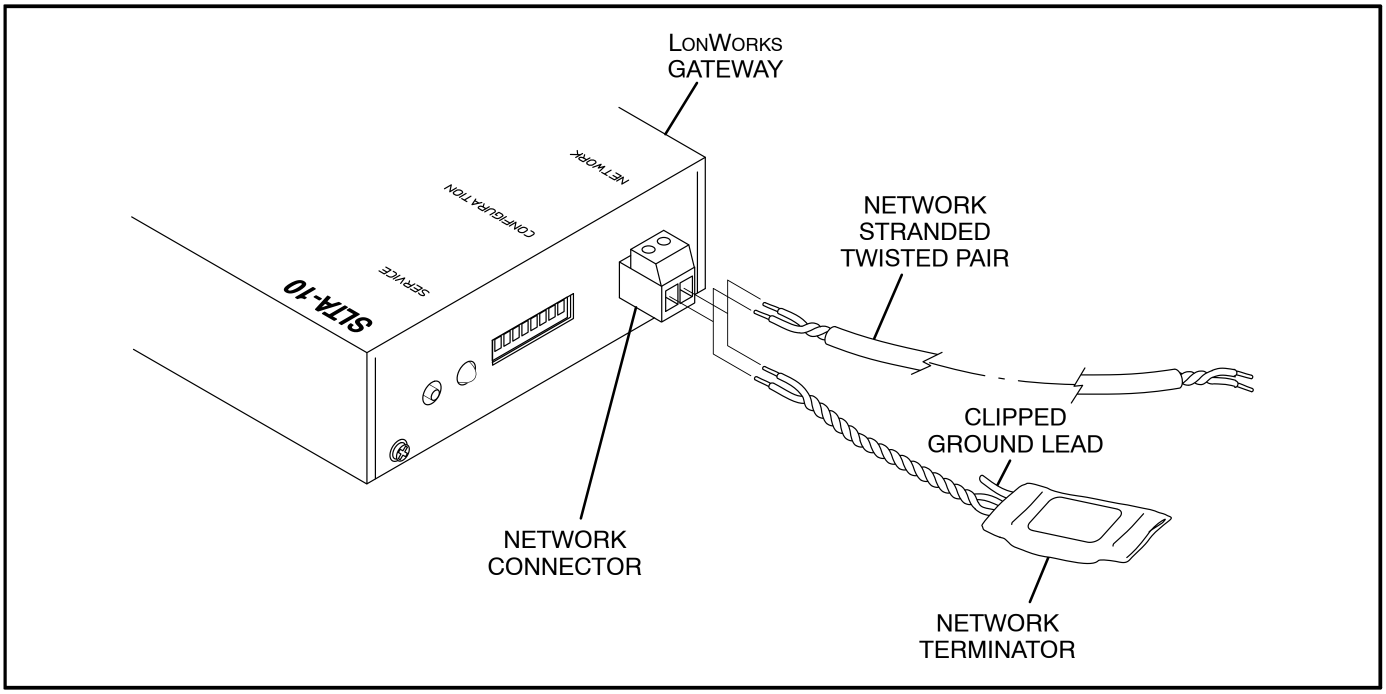

FIGURE 2-8. NETWORK CONNECTION

TABLE 2-2. 6-POSITION PLUGGABLE TERMINAL BLOCK

Position	Signal	Wire Color Code	Comments
1	Net Data1	white/blue	if 2pr cable – white/orange for Local Loop
2	Net Data2	blue	if 2pr cable – orange for Local Loop
3	Net Power+		
4	Net Power+		
5	Net Power–		
6	Net Power–		

TABLE 2-3. RJ45 CONNECTOR

Position	Signal	Wire Color Code	Comments
1	Net Data1	white/blue	24AWG only
2	Net Data2	blue	24AWG only
3	not used		
4	not used		
5	not used		
6	not used		
7	not used		
8	not used		

Note: Position numbering goes from left to right when looking into the jack with the pins at the top and the latching notch at the bottom.

WIRING GUIDELINES

Communication over stranded unshielded twisted pair (UTP) could be distorted by external sources of electromagnetic interference (EMI), especially if the conductors are physically degraded in any way. To avoid or minimize this interference, observe the following guidelines.*

⚠ CAUTION ***Electromagnetic interference (EMI) can cause communication signal distortion, which can cause network failure and unintended equipment operation. Read and follow these wiring guidelines.***

Observe all local wiring codes. Refer to the NEC (NFPA70) section on *Wiring Methods and Materials* for general wiring methods and procedures.

Routing: Whenever possible, cabling should be installed over corridor areas or along lines that are parallel to the contours of buildings. All deviations from straight runs should be made at right angles. Keep wire away from sharp, abrasive, and hot surfaces.

Separation from sources of EMI: All cabling should be installed in such a way as to comply with the minimum separations from AC power sources, as listed in Table 2-4.

In general, communications wiring should not be located in spaces that are shared with electrical panels, transformers, or other high voltage equipment.

Tension: All cabling should be free from tension at both ends, as well as over the length of each run.

Stranded Twisted pairs: All terminations should be made in such a way as to **minimize the extent to which each stranded twisted pair is unraveled at the point of its physical termination**. Allow no more than 0.5 inch (13 mm) of exposed untwisted pairs.

UTP cable bends: UTP cable bends, or radii, should be no less than eight times the cable diameter.

Harsh, hazardous, or corrosive environments: Communications wiring should not be installed where vapors, fumes, corrosives, dusts, or other industrial byproducts are present without taking appropriate precautions to protect the cables. Installers and cabling manufacturers of the materials involved must be consulted in all such cases.

Grounding and bonding: Although the use of UTP does not involve the use of shielded cables in horizontal station runs, the use of shielding in high-pair-count UTP riser cables as well as cables of all types used in outdoor conditions is not uncommon. In some cases, qualified installers or manufacturers will make related recommendations in the interest of human safety or mechanical protection of installed cables (e.g., shielding against rodents).

When shielded cables are used, all applicable regulations for grounding and bonding as defined by local building codes for electrical materials must be strictly adhered to.

TABLE 2-4. MINIMUM SEPARATION DISTANCES OF UTP FROM SOURCES OF EMI

Condition	<2 kVA	2–5 kVA	>5 kVA
Unshielded power lines or electrical equipment in proximity to open or nonmetal pathways	5 in. (127 mm)	12 in. (305 mm)	24 in. (610 mm)
Unshielded power lines or electrical equipment in proximity to a grounded metal pathway	2.5 in. (64 mm)	6 in. (152 mm)	12 in. (305 mm)
Power lines enclosed in a grounded metal conduit (or equivalent shielding) in proximity to a grounded metal pathway		3 in. (76 mm)	6 in. (152 mm)

*These guidelines are derived from “The Do’s and Don’ts of UTP Cabling,” by Mark W. McElroy, in EC&M, June 1994.

NETWORK POWER

This section describes the methods of supplying power (referred to as network power) to those network modules that require an external power source. Observe all local wiring codes and regulations when designing and installing network power wiring.

The modules that require DC network power are:

- Base Digital I/O Module (DIM)
- LonWorks System Annunciator (LSA)
- Controls Communications Module – Genset Applications (CCM-G)
- Controls Communications Module – Automatic Transfer Switch Applications (CCM-T)
- OTPC/BTPC/OHPC/CHPC ATS Network Communications Module (NCM)

The base DIM, LSA, and CCM-G modules can be powered by a 24V genset battery. The 24V genset battery can supply one or more of these modules within specific distance limitations.

The genset batteries cannot deliver network power over a long distance due to the voltage drop during cranking. The genset batteries require a battery charger that can supply the network load and maintain the batteries. Refer to the genset manual to determine B+ and GND connection points.

The CCM-G module can also be powered by a 12V genset battery power supply. The distance is very limited and no other types of modules can be powered off the same network power circuit. Refer to Table 2-6 for distance and wire gauge requirements. (When powering CCM modules only from a 24V genset battery, refer to Table 2-7.)

The CCM-T network power will be supplied by a 12 VDC battery that is included along with a battery charger in the CCM-T kit.

A 12V genset battery will not provide an adequate power supply for DIMs and LSAs. In cases where the genset is powered by a 12V battery, a separate power supply must be used.

Locate the CCM as close to the device being monitored as possible. Do not mount the CCM on a genset or vibration damage can result.

If current transformers will be monitored, the distance limitations between the current transformers and the CCM will generally be more restrictive than the network power distance limitations. Refer to the appropriate CCM section for current transformer distance charts.

The OTPC/BTPC/OHPC/CHPC ATS NCM is powered by two 2V Lithium batteries.

SELECTING NETWORK POWER CONFIGURATION AND WIRE SIZE

This section describes the procedures for selecting the copper wire gauge needed to supply network power. The wire gauge selected will be a function of the type and number of modules used, the type of power supply selected, and the distance between the power source and the farthest module in the power supply circuit. Do not use stranded twisted pair data wire for DC power.

Use this procedure for developing network power circuits for DIM, LSA, and CCM-G modules only. (CCM-T modules are not included because they are equipped with their own power supply.)

Refer to Figure 2-9 for illustrations of typical circuit configurations and notes.

1. Determine the number and type of load modules (DIM, LSA, and CCM-G modules).
2. Calculate the Total Load Factor by adding up the individual load factors for each DIM, LSA, and CCM-G in each circuit.

   Each CCM-G has a load factor of: 2.40
   Each DIM has a load factor of: 0.10
   Each LSA has a load factor of: 0.10
3. Determine the distance between the power source and the farthest load device (DIM, LSA or CCM-G module) in the circuit.
4. Look up the required minimum copper wire gauge. Refer to Table 2-5 for 24V genset battery power supply.

Example:

Application: The network plans call for one CCM-G at 40 feet (12 m), one DIM at 50 feet (15.2 m) and one LSA at 300 feet (91.4 m). The farthest module from the network power source is the LSA. The top drawing in Figure 2-9 shows each of these modules being supplied in one circuit.

Calculation: The total load factor =
(1 X 2.40) + (1 X 0.10) + (1 X 0.10) = **2.60**

Wire Size Required: Look up the total load factor (2.60) in the first column of Table 2-5. Then look across the table to find a distance equal to or greater than the distance to the farthest load device (300 feet). Table 2-5 indicates that the maximum distance obtainable is only 274 feet, this power supply is not adequate to supply all of these modules in one circuit.

The circuit can be redesigned so the CCM-G module is supplied by a second circuit off the same source (center diagram in Figure 2-9). Be careful not to exceed the current rating of the circuit. (The load factor equals the maximum current draw.)

–OR–

The circuit can be supplied by more than one genset power supply if available (bottom diagram in Figure 2-9). Do not connect separate network power sources in parallel or damage to the batteries will result from overcharging.

Using either of the redesigned circuits, recalculate the wire gauge based on steps 1 thru 4. The CCM-G with a load factor of 2.40 can be supplied using 18 gauge wire. The DIM and LSA with a total load factor of 0.20 can be supplied using 18 gauge wire.

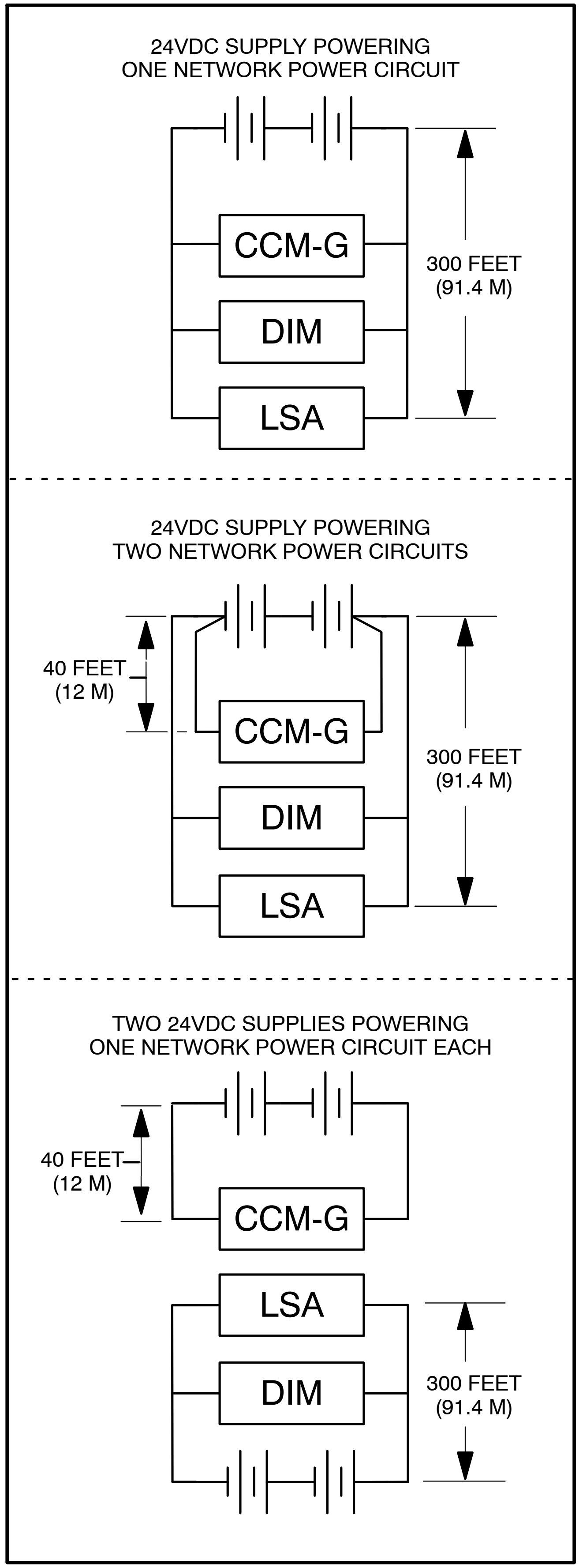

FIGURE 2-9. NETWORK POWER DIAGRAMS

TABLE 2-5. 24V GENSET BATTERY POWER SUPPLY

WIRE AWG	18 ($0.50\ mm^2$)		16 ($0.50\ mm^2$)		14 ($0.75\ mm^2$)		12 ($1.25\ mm^2$)	
TOTAL LOAD FACTOR	MAXIMUM DISTANCE BETWEEN THE NETWORK POWER SOURCE AND THE FARTHEST LOAD DEVICE IN FEET OR METERS							
	FEET	METERS	FEET	METERS	FEET	METERS	FEET	METERS
0.10	1887	575.1	2995	912.9	4754	1449.1	7547	2300.3
0.20	943	287.5	1498	456.4	2377	724.6	3774	1150.2
0.30	629	191.7	998	304.3	1585	483.0	2516	766.8
0.40	472	143.8	749	228.2	1189	362.3	1887	575.1
0.50	377	115.0	599	182.6	951	289.8	1509	460.1
0.75	252	76.7	399	121.7	634	193.2	1006	306.7
1.00	189	57.5	300	91.3	475	144.9	755	230.0
1.25	151	46.0	240	73.0	380	115.9	604	184.0
1.50	126	38.3	200	60.9	317	96.6	503	153.4
1.75	108	32.9	171	52.2	272	82.8	431	131.4
2.00	94	28.8	150	45.6	238	72.5	377	115.0
2.25	84	25.6	133	40.6	211	64.4	335	102.2
2.50	75	23.0	120	36.5	190	58.0	302	92.0
2.75	69	20.9	109	33.2	173	52.7	274	83.6
3.00	63	19.2	100	30.4	158	48.3	252	76.7
3.25	58	17.7	92	28.1	146	44.6	232	70.8
3.50	54	16.4	86	26.1	136	41.4	216	65.7
3.75	50	15.3	80	24.3	127	38.6	201	61.3
4.00	47	14.4	75	22.8	119	36.2	189	57.5
4.25	44	13.5	70	21.5	112	34.1	178	54.1
4.50	42	12.8	67	20.3	106	32.2	168	51.1
4.75	40	12.1	63	19.2	100	30.5	159	48.4
5.00	38	11.5	60	18.3	95	29.0	151	46.0
5.25	36	11.0	57	17.4	91	27.6	144	43.8
5.50	34	10.5	54	16.6	86	26.3	137	41.8
5.75	33	10.0	52	15.9	83	25.2	131	40.0
6.00	31	9.6	50	15.2	79	24.2	126	38.3
6.25	30	9.2	48	14.6	76	23.2	121	36.8
6.50	29	8.8	46	14.0	73	22.3	116	35.4
6.75	28	8.5	44	13.5	70	21.5	112	34.1
7.00	27	8.2	43	13.0	68	20.7	108	32.9
7.25	26	7.9	41	12.6	66	20.0	104	31.7
7.50	25	7.7	40	12.2	63	19.3	101	30.7

TABLE 2-5. 24V GENSET BATTERY POWER SUPPLY (Continued)

WIRE AWG	18 (0.50 mm^2)		16 (0.50 mm^2)		14 (0.75 mm^2)		12 (1.25 mm^2)	
TOTAL LOAD FACTOR	MAXIMUM DISTANCE BETWEEN THE NETWORK POWER SOURCE AND THE FARTHEST LOAD DEVICE IN FEET OR METERS							
	FEET	METERS	FEET	METERS	FEET	METERS	FEET	METERS
7.75	24	7.4	39	11.8	61	18.7	97	29.7
8.00	24	7.2	37	11.4	59	18.1	94	28.8
8.25	23	7.0	36	11.1	58	17.6	91	27.9
8.50	22	6.8	35	10.7	56	17.0	89	27.1
8.75	22	6.6	34	10.4	54	16.6	86	26.3
9.00	21	6.4	33	10.1	53	16.1	84	25.6
9.25	20	6.2	32	9.9	51	15.7	82	24.9
9.50	20	6.1	32	9.6	50	15.3	79	24.2
9.75	19	5.9	31	9.4	49	14.9	77	23.6
10.00	19	5.8	30	9.1	48	14.5	75	23.0
11.00	17	5.2	27	8.3	43	13.2	69	20.9
12.00	16	4.8	25	7.6	40	12.1	63	19.2
13.00	15	4.4	23	7.0	37	11.1	58	17.7
14.00	13	4.1	21	6.5	34	10.4	54	16.4
15.00	13	3.8	20	6.1	32	9.7	50	15.3
16.00	12	3.6	19	5.7	30	9.1	47	14.4
17.00	11	3.4	18	5.4	28	8.5	44	13.5
18.00	10	3.2	17	5.1	26	8.1	42	12.8
19.00	10	3.0	16	4.8	25	7.6	40	12.1
20.00	9	2.9	15	4.6	24	7.2	38	11.5

NOTES

1. **This table is for copper wire at 50°C (122°F). Derate the distances by 0.4% per °C over 50°C**
2. **Minimum wire gauge for NEC compliance is AWG 14**
3. **Network power wiring must be run in a conduit separate from the utility/genset power cables**
4. **Wire sizes given in mm^2 are for the nearest standard metric wire size.**
5. **DIMs and LSAs have a minimum operation voltage of 8 VDC. This Table is for use with DIMs, LSAs or DIMs LSAs and CCMs in combination. For network power supplies with CCMs, only refer to Tables 2-6 and 2-7.**

TABLE 2-6. 12V GENSET BATTERY POWER SUPPLY FOR CCMs ONLY

WIRE AWG4	18 (0.50 mm^2)		16 (0.50 mm^2)		14 (0.75 mm^2)		12 (1.25 mm^2)	
TOTAL LOAD FACTOR	MAXIMUM DISTANCE BETWEEN THE NETWORK POWER SOURCE AND THE FARTHEST LOAD DEVICE IN FEET OR METERS							
	FEET	METERS	FEET	METERS	FEET	METERS	FEET	METERS
2.40	26	7.9	42	12.8	66	20.1	105	32.0
4.80	13	3.9	21	6.4	33	10.0	52	15.8
7.20	9	2.7	14	4.2	22	6.7	35	10.6
9.60	7	2.1	10	3.0	17	5.1	26	7.9
12.00	5	1.5	8	2.4	13	3.9	21	6.4
14.40	4	1.2	7	2.1	11	3.3	17	5.1
16.80	4	1.2	6	1.8	9	2.7	15	4.5
19.20	3	.9	5	1.5	8	2.4	13	3.9
21.60	3	.9	5	1.5	7	2.1	12	3.6
24.00	3	.9	4	1.2	7	2.1	10	3.0
26.40	2	.6	4	1.2	6	1.8	10	3.0

NOTES

1. **This table is for copper wire at 50°C (122°F). Derate the distances by 0.4% per °C over 50°C.**
2. **Minimum wire gauge for NEC compliance is AWG 14.**
3. **Network power wiring must be run in a conduit separate from the utility/genset power cables.**
4. **Wire sizes given in mm^2 are for the nearest standard metric wire size.**
5. **CCMs each have a load factor of 2.40. CCMs have minimum operation voltage of 5 VDC (range 5–36 VDC).**

TABLE 2-7. 24V GENSET BATTERY POWER SUPPLY FOR CCMs ONLY

WIRE AWG	18 (0.50 mm^2)		16 (0.50 mm^2)		14 (0.75 mm^2)		12 (1.25 mm^2)	
TOTAL LOAD FACTOR	MAXIMUM DISTANCE BETWEEN THE NETWORK POWER SOURCE AND THE FARTHEST LOAD DEVICE IN FEET OR METERS							
	FEET	METERS	FEET	METERS	FEET	METERS	FEET	METERS
2.40	183	55.7	291	88.6	462	140.8	734	223.7
4.80	92	28.0	146	44.5	231	70.4	367	111.8
7.20	61	18.5	97	29.5	154	46.9	245	74.6
9.60	46	14.0	73	22.2	116	35.3	183	55.7
12.00	37	11.2	58	17.6	92	28.0	147	44.8
14.40	31	9.4	49	14.9	77	23.4	122	37.1
16.80	26	7.9	42	12.8	66	20.1	105	32.0
19.20	23	7.0	36	10.9	58	17.8	92	28.0
21.60	20	6.0	32	9.7	51	15.5	82	24.9
24.00	18	5.4	29	8.8	46	14.0	73	22.2
26.40	17	5.1	26	7.6	42	12.8	67	20.4
28.80	15	4.5	24	7.3	39	11.8	61	18.5
31.20	14	4.2	22	6.7	36	10.9	56	17.0
33.60	13	3.9	21	6.4	33	10.0	52	15.8
36.00	12	3.6	19	5.7	31	9.4	49	14.9
38.40	11	3.3	18	5.4	29	8.8	46	14.0
40.80	11	3.3	17	5.1	27	8.2	43	13.1
43.20	10	3.0	16	4.8	26	7.9	41	12.5
45.60	10	3.0	15	4.5	24	7.3	39	11.8
48.00	9	2.7	15	4.5	23	7.0	37	11.2

NOTES

1. **This table is for copper wire at 50°C (122°F). Derate the distances by 0.4% per °C over 50°C.**
2. **Minimum wire gauge for NEC compliance is AWG 14.**
3. **Network power wiring must be run in a conduit separate from the utility/genset power cables.**
4. **Wire sizes given in mm^2 are for the nearest standard metric wire size.**
5. **CCMs each have a load factor of 2.40. CCMs have minimum operation voltage of 5 VDC (range 5–36 VDC).**

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3. Self-Installation

ABOUT THIS SECTION

This sections describes self-installation (autobinding) of network devices.

Network communication takes the form of passing network variables from one device to another. The process of assigning connections—linking an output variable of one device to an input variable of another device—is called “binding.”

Figure 3-6 illustrates a self-installed network fully utilizing auto-bind capability. Figure 3-7 illustrates annunciator autobinding and Figure 3-8 shows Digital I/O Module (DIM) autobinding. With a self-installed network,

- Bindings are preset
- Configurations cannot be changed
- PowerCommand® for Windows® II (PCW II) and InPower™ cannot be used over the network (InPower can be directly connected).

Self-Installation Guidelines

The following guidelines apply when installing a self-installed network:

- Self-installation is limited to one PowerCommand Genset or CCM-G, one PowerCommand Automatic Transfer Switch (ATS) or CCM-T, and no more than four annunciators or five DIMs.
- The **CCM-G** can be autobound by an ATS and up to two annunciators and two DIMs, but by no more than a total of three annunciators and DIMs.
- The **CCM-T** can autobind to a genset and be autobound by up to two annunciators and two DIMs, but by no more than a total of three annunciators and DIMs.
- The **PCC 3100 GCM** can be autobound by an ATS and up to three annunciators and three DIMs, but by no more than a total of four annunciators and DIMs.
- The **PCC 3200 GLC** can be autobound by an ATS and three annunciators and three DIMs, but by no more than a total of four annunciators and DIMs.
- The **PCC 2100 NCM** can be autobound by an ATS and up to three annunciators and four DIMs, but by no more than a total of five annunciators and DIMs.
- The OTPC/BTPC **PowerCommand ATS NCM** can autobind to a genset and can be autobound by up to two annunciators and two DIMs, but by no more than a total of three annunciators and DIMs.
- With annunciators and DIMs, there can only be one NFPA-110 version of each, one Extended version of each, and only one Custom version of either (set with InPower).

If these requirements cannot be met, the network must be installed using LonMaker™ (see *Section 4*).

NOTE: For all network devices listed above, nciNetConfig must be set to LOCAL by pressing and holding the Service pin of each device for two seconds. Devices should be shipped from the factory with the proper setting. If using a device from another network, be sure to press and hold the Service pin for two seconds to allow it to self-install.

NOTE: For firmware with the following title AnnA03, CCMTA04, CCMGA05, DimA02, PCAtsA05, 2100A05, 3100A04, 3200A04 or newer, self-installation is executed by holding the Service button for two seconds. If the firmware is an older version, then the variable nciNetConfig must be set to “local” through LonMaker Browser for self-installation.

Custom Annunciation and Custom Relay Events – PowerCommand Controls

Custom annunciation allows you to select up to 16 different fault code messages to be sent to the annunciator when the fault becomes active.

Before self-installing a PCC 2100 NCM, InPower can be used to configure custom annunciation and custom relay events for a PCC 2100. For more information, see pages 6-8 and 6-9.

The Custom Relay Events feature (PCC 2100 only) allows you to enter up to 16 fault codes that will actuate a corresponding relay on a DIM.

Before self-installing a PCC 3100 GCM, a Plug-In can be used to configure custom annunciation. For more information, see page 5-6.

PowerCommand is a registered trademark of Cummins Inc.
LonMaker is a trademark of Echelon Corporation.
InPower is a trademark of Onan Corporation.
Windows is a registered trademark of Microsoft Corporation.

Before self-installing a PCC 3200 GLC, InPower can be used to configure custom annunciation. For more information, see page 6-2.

Self-Installation

To self-install a network:

1. Select the devices needed for the network. You must have either a genset or automatic transfer switch (ATS) and a LonWorks System Annunciator (LSA) or Digital I/O Module (DIM).

2. Set the network address switches. Make sure each device in the network has a unique network address. The following network addresses are set at the factory:

   – Genset and CCM-G 1
   – ATS and CCM-T 2
   – LSA 4
   – DIM 8

   Network address switches are shown in Figures 3-1, 3-2, and 3-3. Switch position 4 is the least significant digit. Therefore, the switch address is read from right to left in binary (see examples in Figure 3-4). Once the address is set, the “Status” (GCM, GLC, DIM, CCM-G, and CCM-T) or “OK” (LSA, PCC 2100 NCM, and PowerCommand ATS NCM) LED flashes the address number.

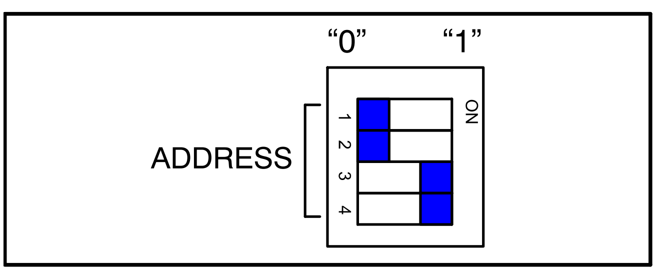


FIGURE 3-1. GENSET AND ATS ADDRESS SWITCH SETTINGS

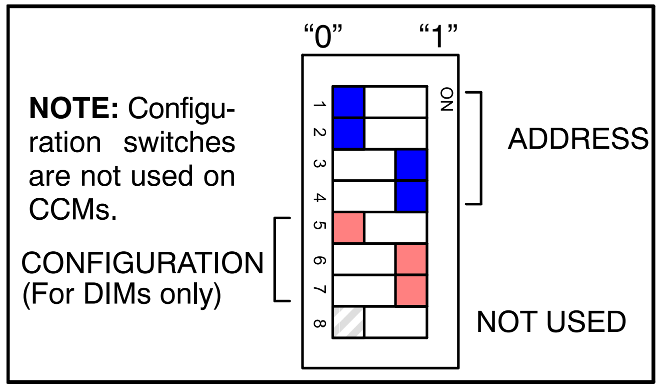


FIGURE 3-2. DIM AND CCM ADDRESS SWITCH SETTINGS

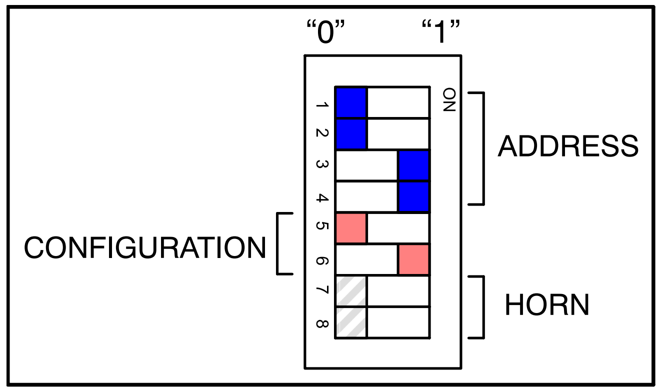


FIGURE 3-3. ANNUNCIATOR ADDRESS SWITCH SETTINGS

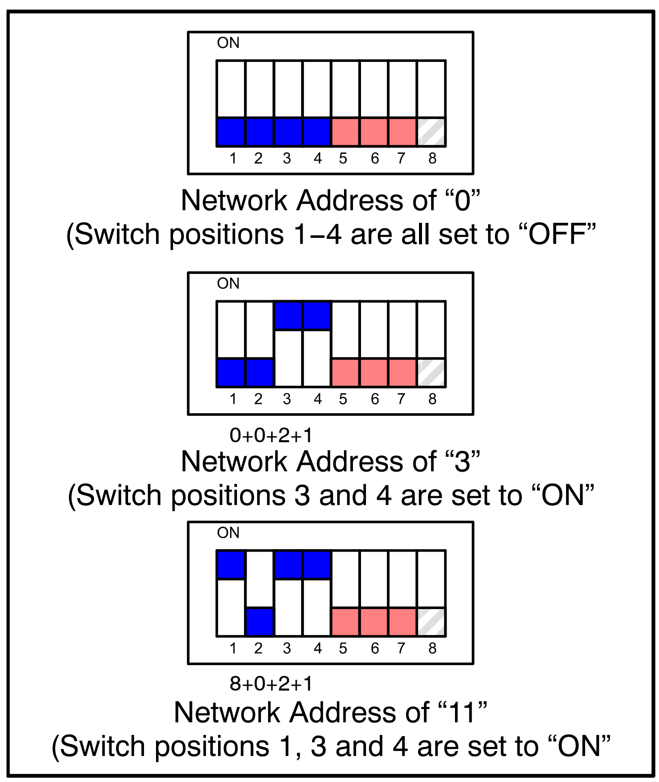


FIGURE 3-4. ADDRESS EXAMPLES

3. Set the function configuration switches on the DIM(s) and LSA(s).

   DIMs:

   – NFPA-110 0
   – Genset Extended 1
   – Custom 2
   – ATS Extended 3
   – Relay Custom 4

   LONWORKS System Annunciators:

   – NFPA-110 0
   – Genset Extended 1
   – Genset Custom 2
   – ATS Extended 3

   Positions 5, 6 and 7 make up the configuration portion of the network address switch on DIMs. Only positions 5 and 6 make up the configuration portion of the network address switch on an annunciator. The switch position on the right is the least significant digit and the switch address is read from right to left in binary (see examples in Figure 3-5).

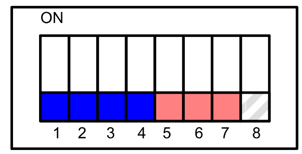
4. Install the network.

   – Gensets must be installed to the network **first**. They set up the binding table in their memory with room for the rest of the devices.
   – Transfer switches must be installed **second**. They set up a binding table in their memory with room for the rest of the devices and bind themselves to the genset.
   – Annunciators and DIMs bind to genset and transfer switches and can be installed in any order. They set a binding table in their memory with room for the rest of the devices and bind themselves to all other devices in the network.

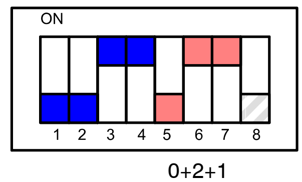
   NOTE: If a device fails, start the self-installation over, starting with the genset.

5. Power-up the devices and press the Service button in the order listed in step 4.

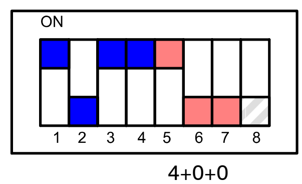
6. Test the network.



Configuration of “0”
(Switch positions 5−7 are all set to “OFF”



Network Address of “3”
(Switch positions 6 and 7 are set to “ON”



Network Address of “4”
(Switch position 5 is set to “ON”

FIGURE 3-5. CONFIGURATION EXAMPLES

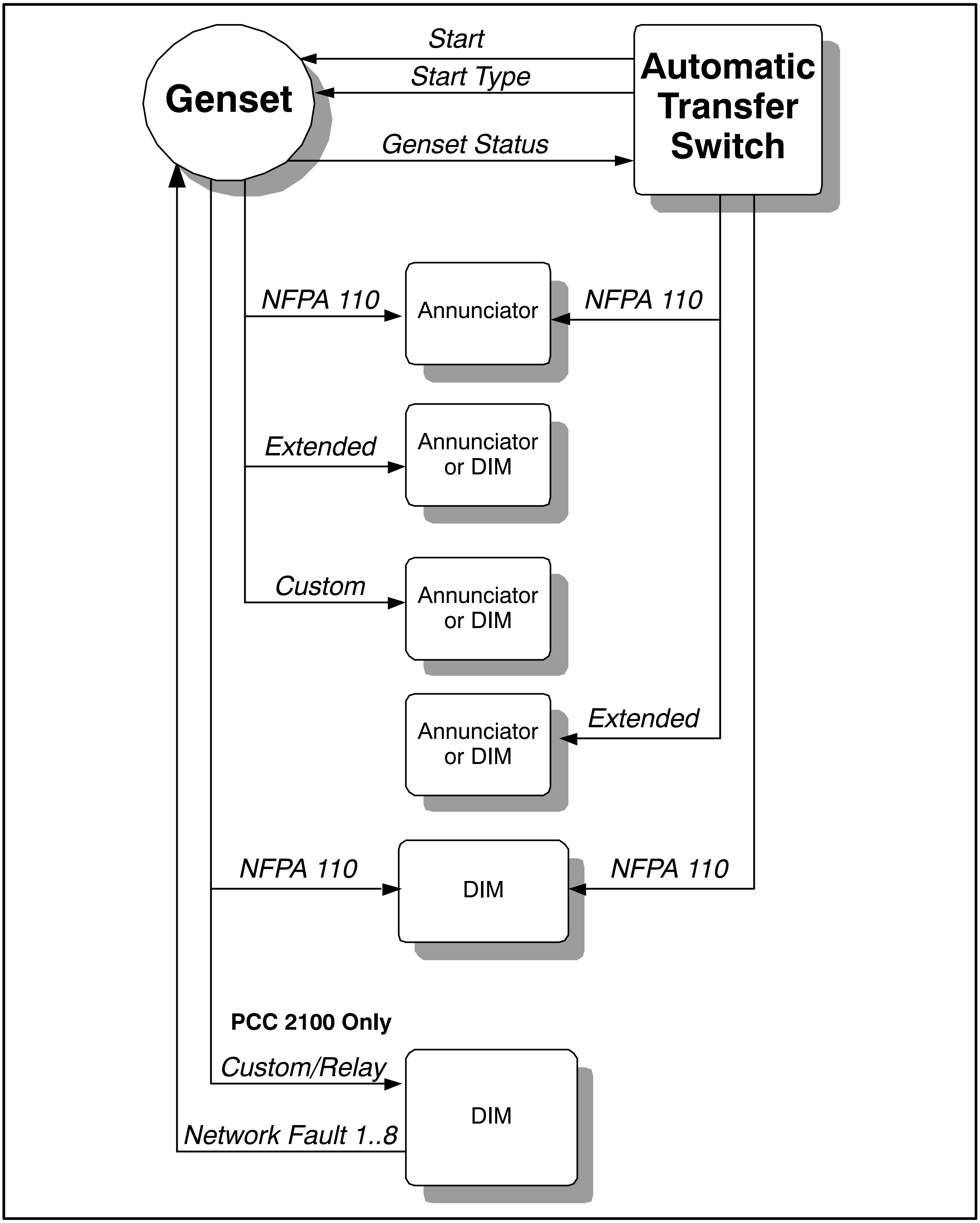
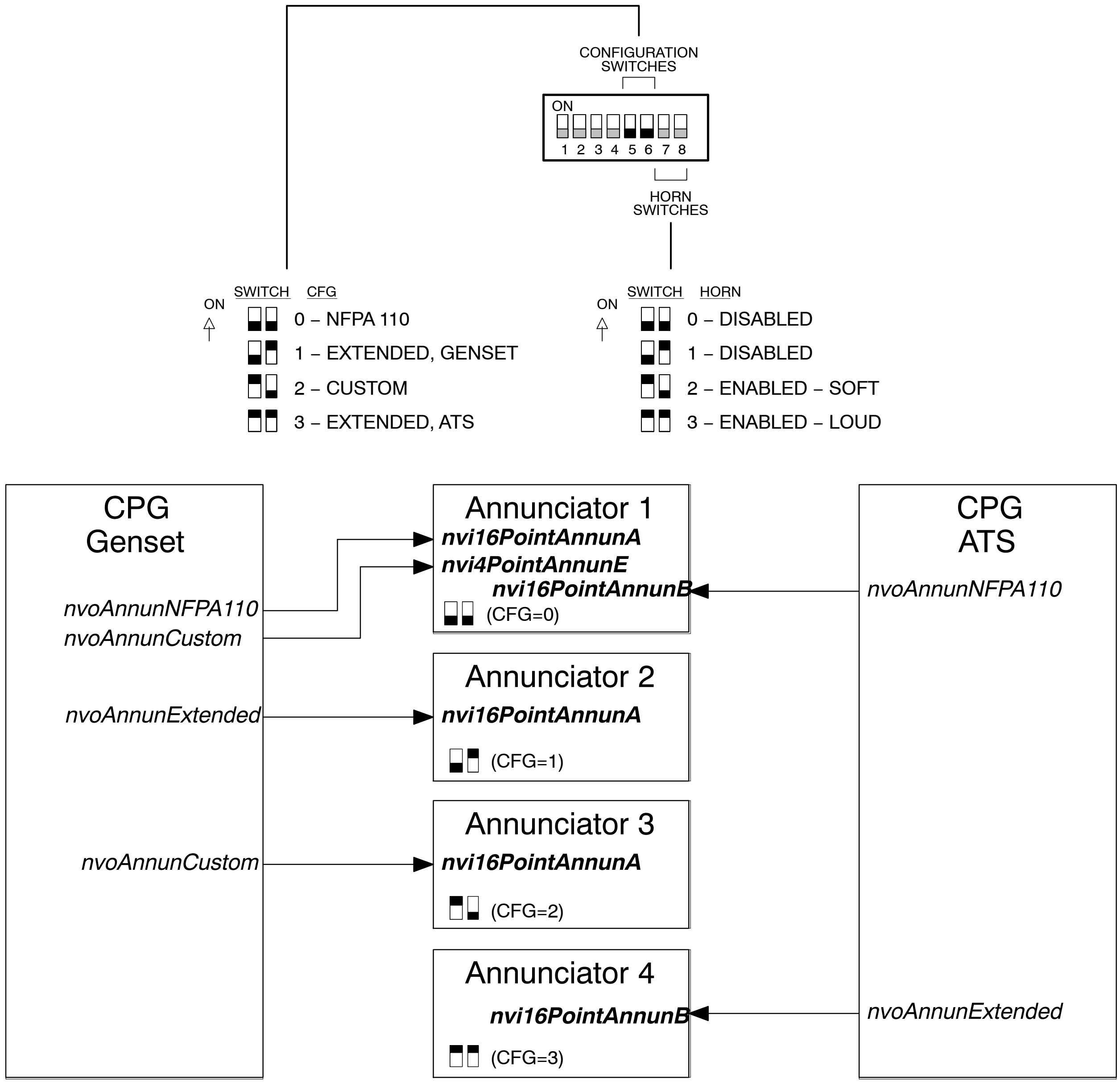


FIGURE 3-6. THE SELF-INSTALLED NETWORK



NOTE: nvoAnnunCustom – nvi4PointAnnunE binding in NFPA110 configurations is only valid for autobinding gensets with a PCC2100 or PCC3200 control.

FIGURE 3-7. ANNUNCIATOR AUTOBINDING

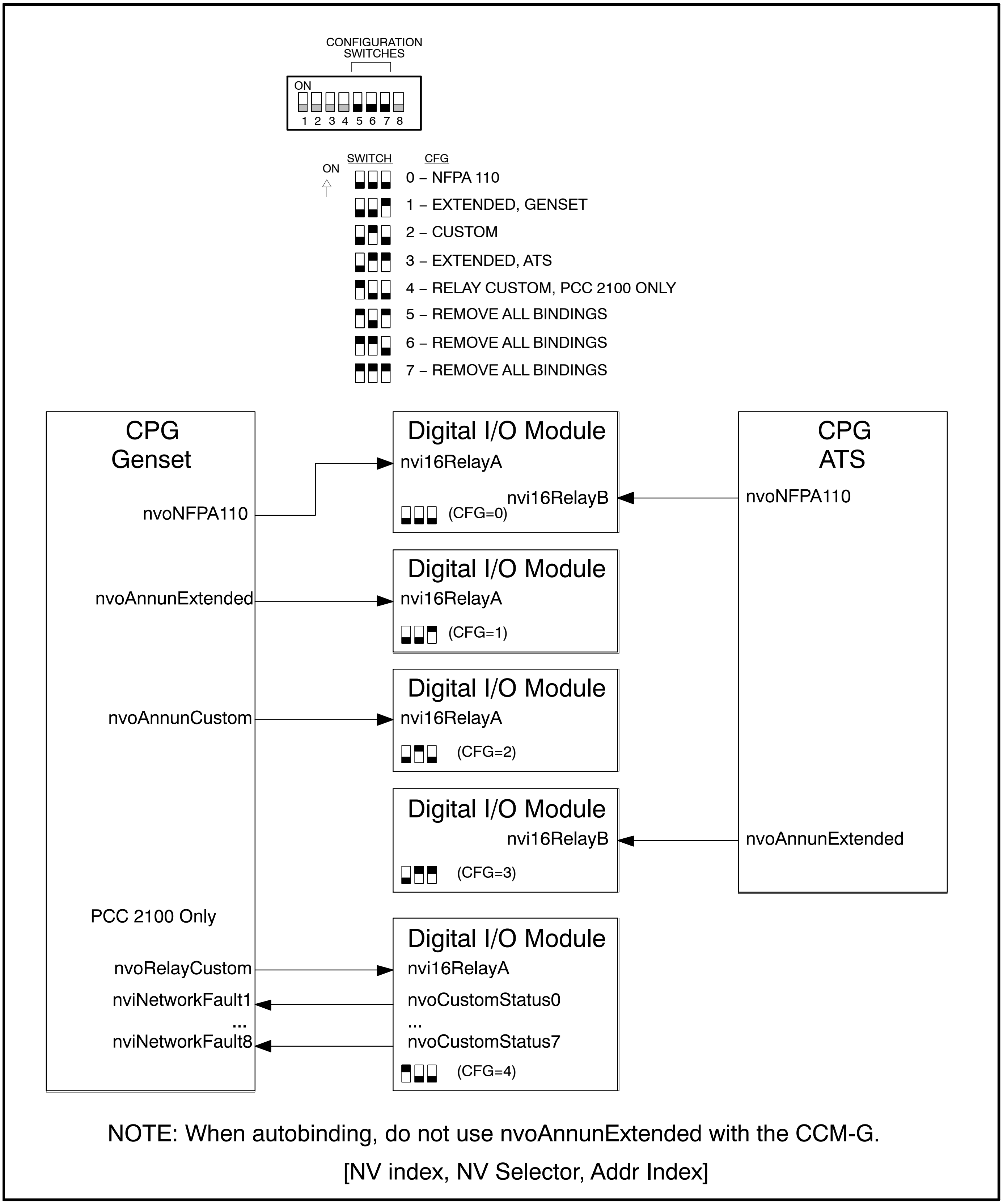


FIGURE 3-8. DIM AUTOBINDING

4. Using LonMaker for Windows

ABOUT THIS SECTION

This section describes procedures for the *logical* installation and connection of the various modules on the network using LonMaker™ for Windows®. Refer to the Glossary section for definitions of network terms.

LonMaker for Windows allows you to easily use different media with routers to create a network that operates as a single network instead of pieces that must be monitored separately. With LonMaker for Windows, you can easily install and remove network modules, test connections and network modules, and replace any failed network modules.

Detailed information on using LonMaker to design, create, install, and maintain networks is included in the Echelon® *LonMaker User's Guide.* It also includes detailed information on using Plug-Ins, monitoring and controlling devices, and using LonMaker shapes and stencils. The Echelon manual is included with the LonMaker software, and should be considered a reference companion to this manual.

Detailed information on using Visio® to create an FT-10 network drawing is included in the *User's Guide for Microsoft® Visio 2000*.

Stencils for Cummins Inc. devices have already been created and are available on the InCal CD or the CPGA intranet site.

The following is a brief overview of the steps required for installing a network using LonMaker for Windows.

1. Install LonMaker for Windows and Visio – Takes about ten minutes (download to the C drive).
2. Download/install the network support files from the PowerCommand Network Support CD (part number 326–5706).
3. Launch LonMaker for Windows.
4. Select a new site.
5. Answer the pop-up questions.
6. Open the CPG Devices stencil and create a site using the stencil templates and bindings.
7. Commission the network, register the Plug-Ins, and test the network. Once commissioned, the device is charged against your device credit account.

CPG NETWORK SUPPORT FILES

The network support CD includes support files for all CPG devices.

The following types of files are included on the FT-10 network support CD:

- Network Support Files.zip – .zip (WinZip® is needed to open them) files containing supporting files for CPG PowerCommand® FT-10 network.
- Network Support Files.exe – Self-extracting executable version of Network Support Files.zip.
  - External Interface Files (.) – Files that tell the eight CPG devices and four versions of the ModLon Gateway how to communicate.
  - Neuron Executable (.nxe) Files – Files that tell the eight CPG devices and four versions of the ModLon Gateway how to operate.
  - Resource files – Used by third party software to interpret UNVTs for the Etherlon router and the ModLon Gateway.
  - CPG Device Stencil – Contains templates for CPG devices and their variables.
  - Etherlon Support Files
- Plug-In Files – There are eight CPG PowerCommand devices that each have an individual Plug-In configuration file that must be registered for use of the devices in LonMaker for Windows. The Plug-Ins are located in a .zip file (CumminsPlugins.zip) and WinZip is needed to extract them. For additional information on Plug-Ins, refer to *Section 5*.

PowerCommand is a registered trademark of Cummins Inc.
Echelon and LonWorks are registered trademarks of Echelon Corporation.
LonMaker and LonPoint are trademarks of Echelon Corporation.
Visio is a registered trademark of Visio Corporation.

Windows is a registered trademark of Microsoft Corporation.
Microsoft is a registered trademark of Microsoft Corporation
WinZip is a registered trademark of WinZip Computing, Inc.

The following CPG PowerCommand FT-10 network devices are supported by these files:

- LonWorks®System Annunciator (LSA)
- Control Communications Module – ATS version (CCM-T)
- Control Communications Module – Genset version (CCM-G)
- Digital I/O Module (DIM)
- PowerCommand Transfer Switch (PC ATS – OTPC/BTPC)
- PowerCommand 2100 Control (PCC 2100)
- PowerCommand 3100 Control (PCC 3100)
- PowerCommand 3200 Control (PCC 3200)

Support Files Installation Instructions

Support files can be installed in two ways. Running the self-extracting executable will install all of the files to your PC. The program will prompt you for a root directory (with **C:**\ as the default selection), and then will install the files into that root directory with a pre-defined sub-directory structure. If your PC has WinZip you can view this structure by double-clicking the Network Support Files.zip icon and reading the ”Path” column.

If your PC has WinZip you may select individual files to install to your PC. Double-click the Network Support Files.Zip icon. Select the files that you want to install, then click on **Extract**. Check the “Use folder names” box on the WinZip Extract dialog box to place the file in the path shown (see Figure 4-1). Uncheck that box to specify your own path on your PC where you want the files when prompted to do so.

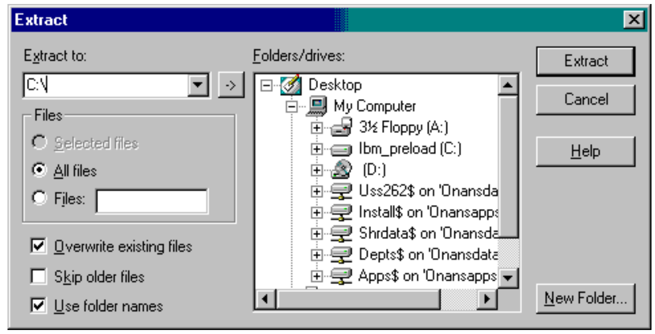


FIGURE 4-1. WINZIP EXTRACT DIALOG BOX

Configuration Plug-In Installation Instructions

LonMaker for Window must be installed before the configuration Plug-Ins can be installed and registered. The eight configuration Plug-Ins are installed by extracting each of them from their .zip file using WinZip. After they are installed, each Plug-In must be registered by running its application program. This must be done once for each Plug-In.

WinZip software is required to install the Plug-Ins. Start by double clicking on the CumminsPlugins.zip file and then use the Extract tool in the WinZip window. The default extraction location will be the C: drive. After extracting to this default location, the eight Plug-In files are put in the C:\Program Files\Cummins folder. Using Windows Explorer, the files will appear as shown in Figure 4-2.

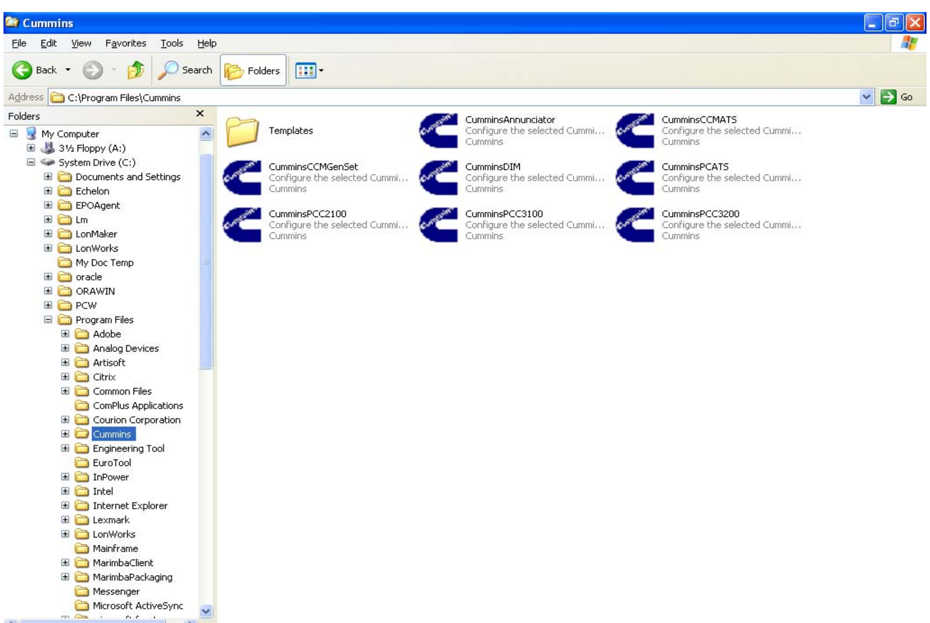


FIGURE 4-2. PLUG-IN FILES AND LOCATION

To register the Plug-Ins, navigate to the location of the extracted files (C:\Program Files\Cummins). When you run the application, the dialog box shown in Figure 4-3 is displayed. Click on Register Plug-In and than Exit to register the Plug-In. This application must be run for each device that will be used.

If you upgrade to a new version of software, click on Deregister Plug-In, install the new Plug-In, and then register it.

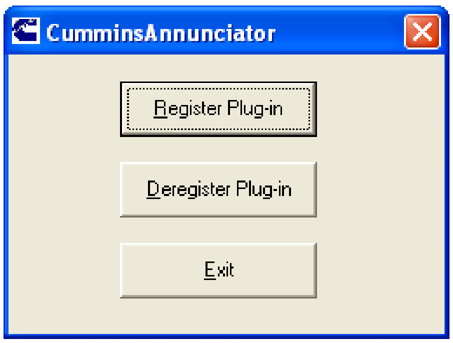


FIGURE 4-3. REGISTRATION OF THE DEVICE PLUG-IN

USING LONMAKER

Starting LonMaker

To start LonMaker:

1. Select Start → Programs → Echelon LonMaker for Windows. The LonMaker Start-Up Menu is displayed (see Figure 4-4).

2. To start a new network, select “New Network.” Enter a name for the network.

   NOTE: To monitor the site with PowerCommand Software for Windows II (PCW II), the network name (site ID) must consist of no more than seven characters. The characters can only be upper case letters, numbers, and underscores. The name must start with an upper case letter. The use of lower case letters, special characters, and spaces will prevent PCW II from recognizing dial-in alarms from the site.

3. Enter information on the kind of network interface, whether or not the interface is attached to the network, drawing write access permissions, and registration of un-registered Plug-Ins.

LonMaker starts the LNS Server to operate the database. It also launches Visio which is used to create or modify an existing drawing of the network.

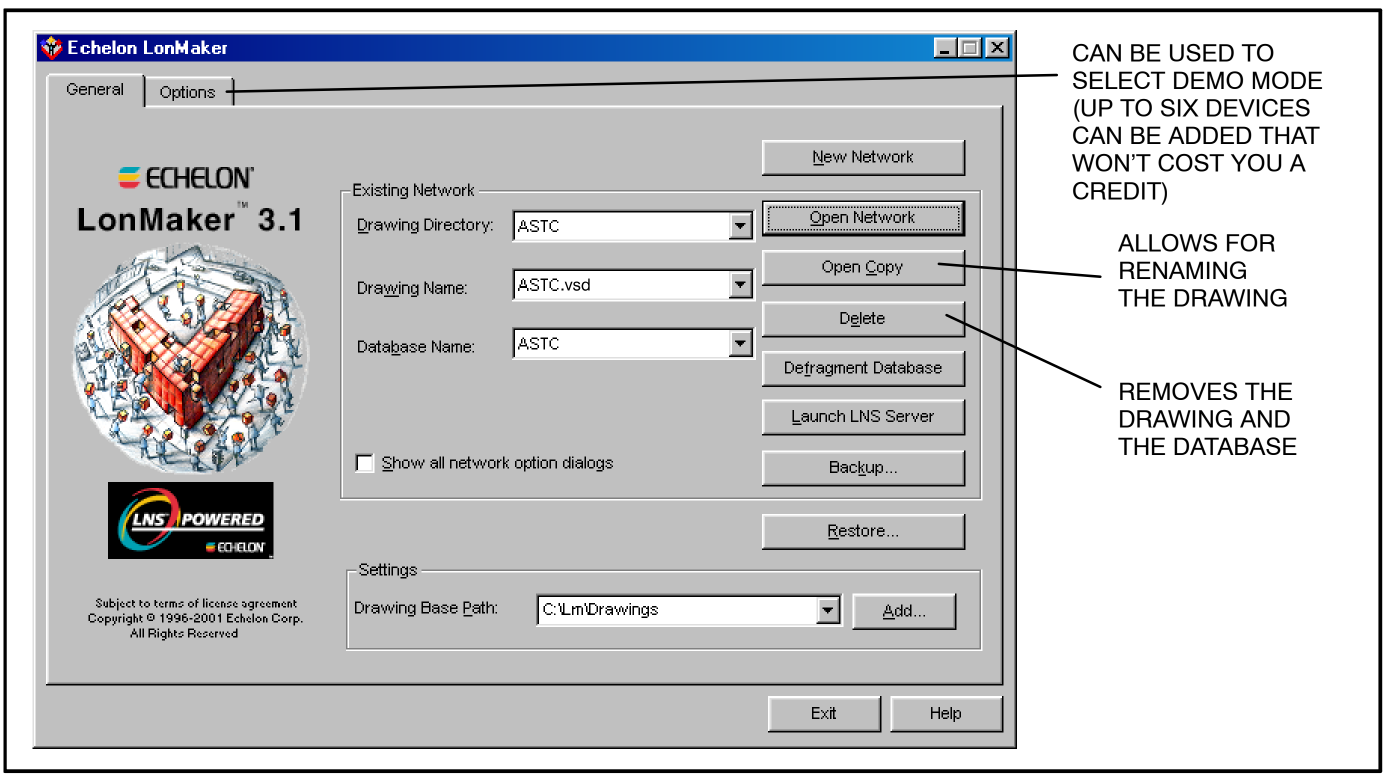


FIGURE 4-4. LONMAKER START-UP MENU

For new networks, a basic Visio drawing is displayed (see Figure 4-5) with the following two stencils shown on the left.

- LonPoint™ Shapes 3.0 – Includes master shapes for Echelon LonPoint devices
- LonMaker Basic Shapes – Includes basic LonMaker for Windows shapes.

To open an existing network drawing (see Figure 4-6):

1. Select Start → Programs → Echelon LonMaker for Windows. The LonMaker Start-Up Menu is displayed (see Figure 4-4).
2. In the “Existing Network” field, select a Drawing Directory, Drawing Name, and Database Name.
3. Select “Open Network.”

If an existing network is opened, the Visio drawing opens with the network drawing displayed.

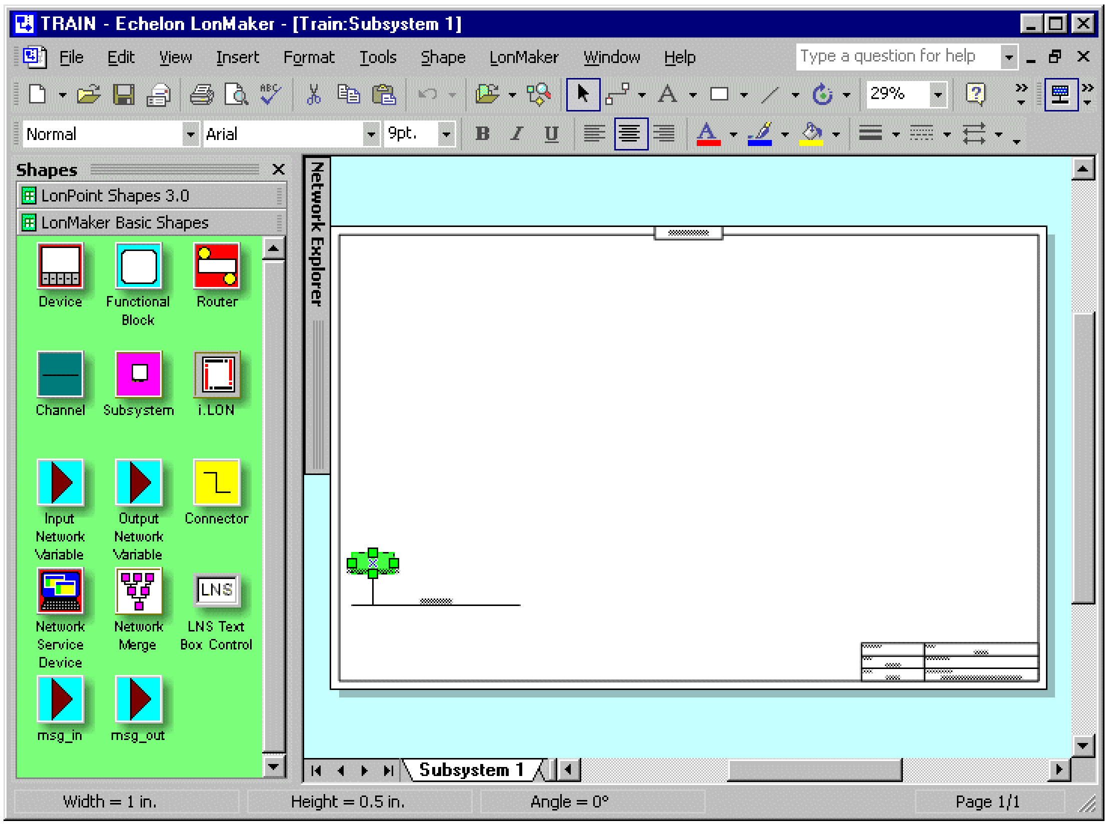


FIGURE 4-5. BASIC VISIO DRAWING

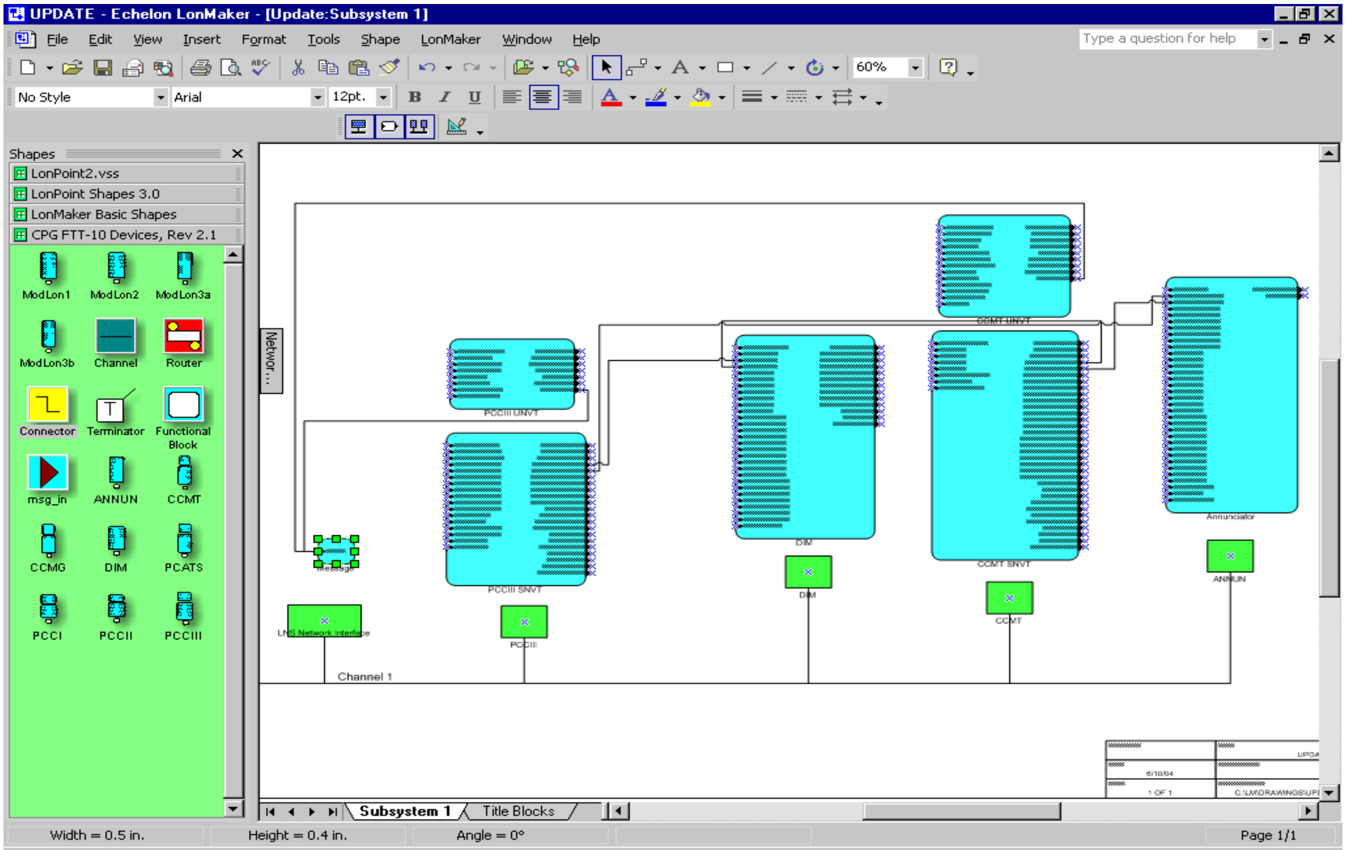


FIGURE 4-6. COMPLETED NETWORK DRAWING

Adding the CPG Device Stencil

To add the CPG device stencil (downloaded from the network support CD or the CPG intranet site) to create an FT-10 network drawing,

1. Select File → Stencils → CPG FTT-10 Devices, ModLon or ModLonII.

   NOTE: Stencils are installed in C:\LonWorks\LonMaker\Visio\ directory by default. If they are installed in another directory, use the browse feature to locate them.

2. Open the stencil (see Figures 4-7, 4-8, or 4-9).

TABLE 4-1. TEMPLATE MASTER SHAPES

Master Shape	Function
Channel	LonWorks communication media
Router	A connection between channels or segments
Connector	Used to add bindings of network variables
Terminator	Serves as a reminder on the network drawing of a device you selected to be terminated
LNS Network Interface	SLTA-10 functional block

The CPG Device stencil includes master shapes (see Table 4-1) and device templates (see Table 4-2).

TABLE 4-2. FT-10 DEVICE TEMPLATES

Template Name	Device
ANNUN	LonWorks System Annunciator (LSA)
CCMG	Controls Communications Module for Gensets (CCM-G)
CCMT	Controls Communications Module for Transfer Switches (CCM-T)
DIM	Digital I/O Module (DIM)
PCATS	Power Command ATS Network Communications Module (NCM)
PCCI	PCC 3100 Genset Communications Module (GCM)
PCCII	PCC 3200 Genset LonWorks Communications Module (GLC)
PCCIII	PCC 2100 Genset Networks Communications Module (NCM)

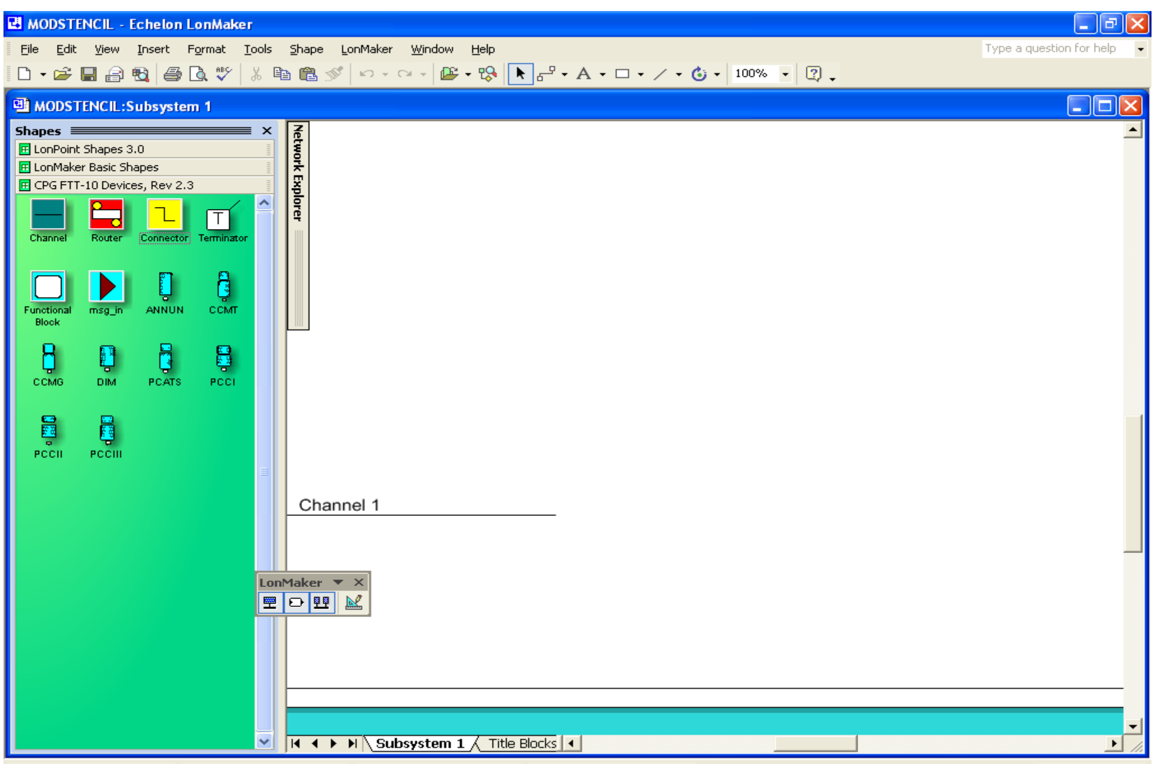


FIGURE 4-7. CPG DEVICES STENCIL, REV 2.3

The ModLon stencil (see Figure 4-8) contains the device templates listed in Table 4-3.

TABLE 4-3. MODLON DEVICE TEMPLATES

Template Name	Device
ModLon1	ModLon Option 1 – Used with a maximum of 5 non-paralleling gensets, 5 PowerCommand ATSs, and 2 DIMs
ModLon2	ModLon Option 2 – Used with a maximum of 5 paralleling gensets, 5 CCM transfer switches, and 2 DIMs
ModLon3	ModLon Option 3 – Used with a maximum of 10 paralleling gensets
ModLon4	ModLon Option 4 – Used with a maximum of 10 PowerCommand ATSs

The ModLon II stencil (see Figure 4-9) contains the device templates listed in Table 4-4.

TABLE 4-4. MODLON II DEVICE TEMPLATES

Template Name	Configuration (Selected through Dipswitches)
ModLon II Template 1	Five genset controls (any type or combination), Five transfer switches (any type or combination), and two DIM modules.
ModLon II Template 2	Five genset controls (any type or combination) including paralleling data, five transfer switches (any type or combination), and two DIM modules.
ModLon II Template 3	Ten genset controls (any type or combination), including paralleling data.
ModLon II Template 4	Ten transfer switch controls (any type or combination).
ModLon II Template 5	Five genset controls (any type or combination), five transfer switches (any type or combination), and two DIM modules. The Register Map is identical to the ModLon Map for TP-78 Power Command Network Devices.

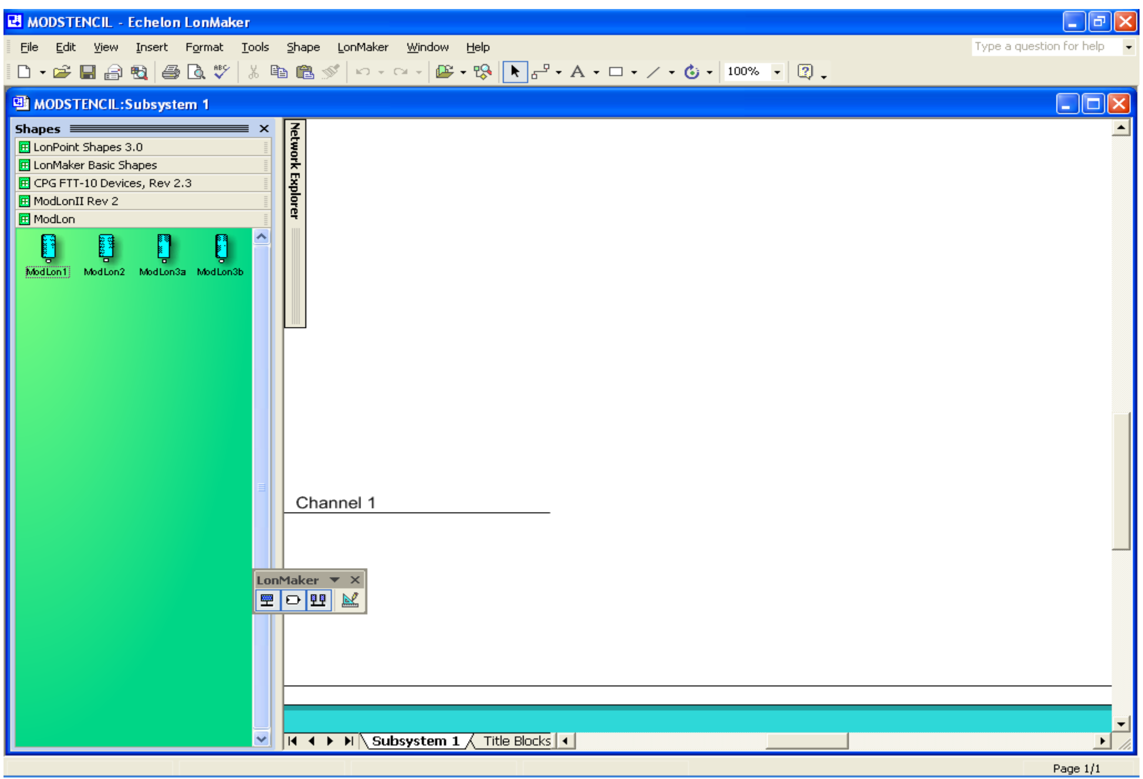


FIGURE 4-8. MODLON STENCIL

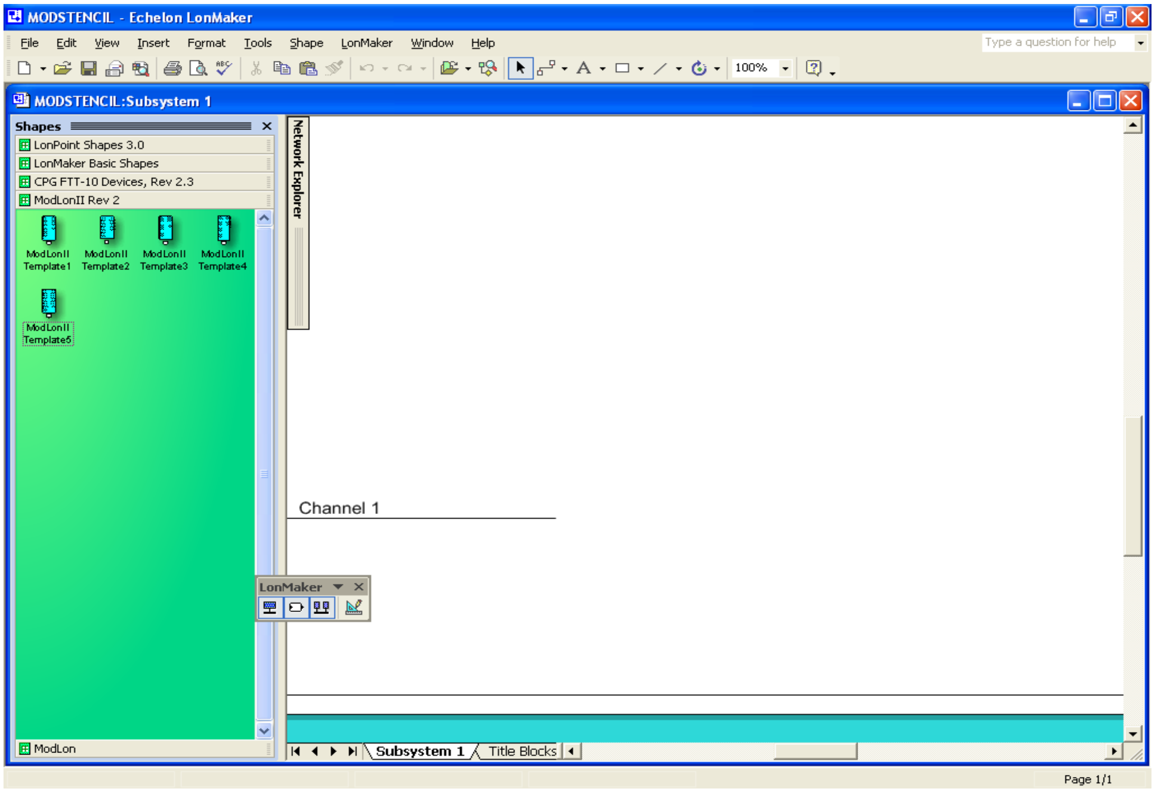


FIGURE 4-9. MODLON II STENCIL, REV 2

Adding a Device to the Network

To add a device to the drawing frame:

1. Click on a master shape/device template and drag it into the drawing (see Figure 4-11). Device templates include the device icon and functional block(s). A complete list of the master shapes and device templates is shown in Tables 4-1 and 4-2.

2. Enter a device name in the New Device Wizard dialog (see Figure 4-10).

   NOTE: Device names must consist of no more than eight characters and must be typed in all upper case letters. No special characters, numbers, or spaces are allowed.

3. Click on **Next** and continue to use the New Device Wizard dialog to select channel type and device properties.

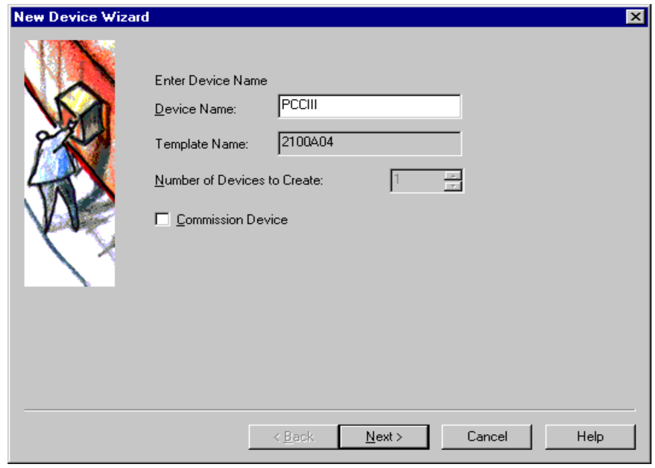


FIGURE 4-10. NEW DEVICE WIZARD DIALOG

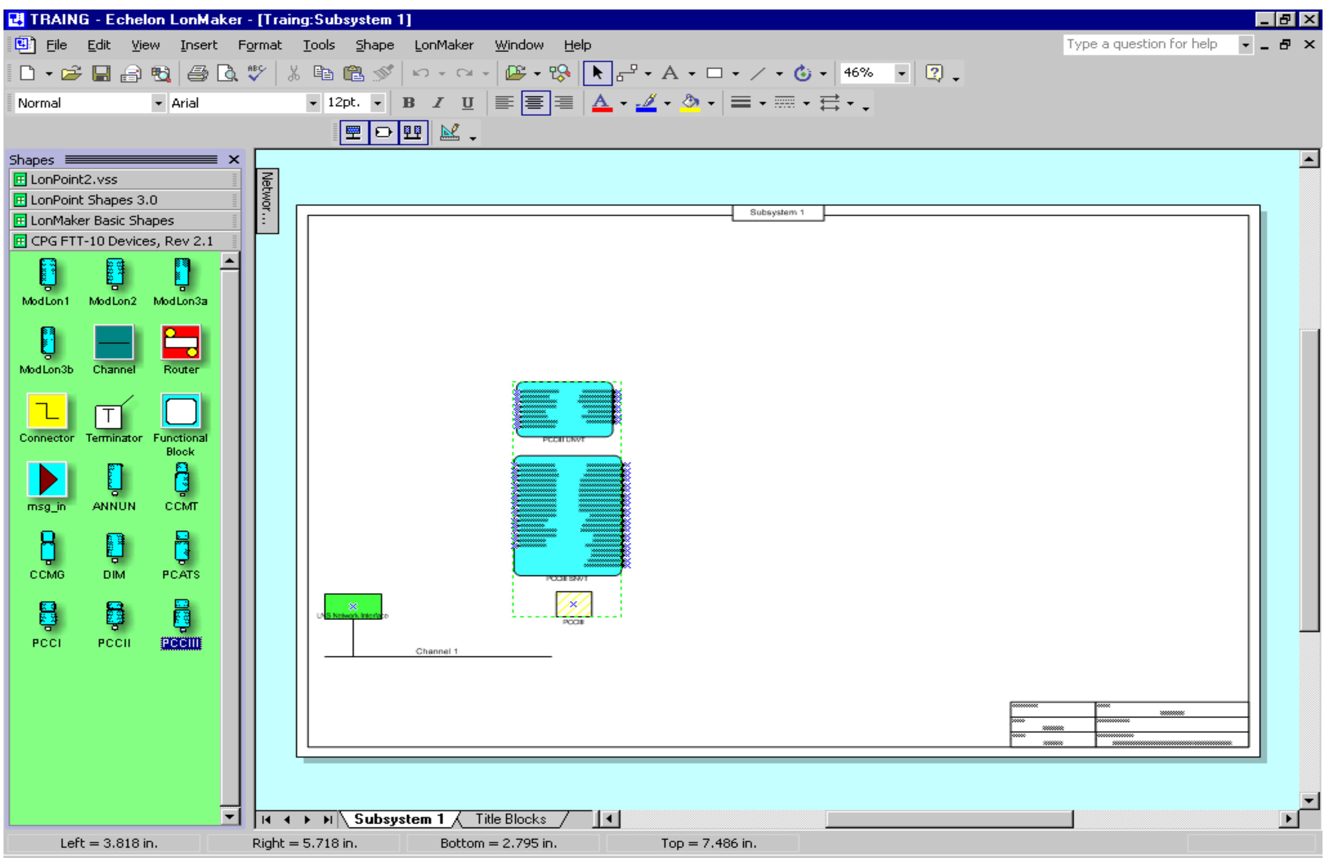


FIGURE 4-11. ADDING A DEVICE TEMPLATE

Adding Bindings

Factory-authorized bindings for each of the network devices are listed in Appendix E. A detailed description of all network variables is included in Appendix F.

To add bindings to the network drawing (see Figure 4-12),

1. Click on a Connector shape either in the CPG FTT-10 Devices stencil or the LonMaker Basic Shapes stencil.
2. Drag the connector into the drawing.
3. Click on one end of the connector and drag it to the appropriate variable. Connect the "x" end of the connector to an output variable and the "+" end of the connector to an input variable.

   NOTE: You can make one-to-one, one-to-many, many-to-one, or many-to-many bindings.

The input value is displayed by double-clicking on a binding. Double-click on the binding again to see the output value.

Saving the Drawing and Commissioning Devices

Once all devices and bindings are added to the network (see Figure 4-13), save the drawing and commission the devices. First the network interface must be attached and the network placed On Net. To commission a device:

1. Select the device.
2. Right-click and select Commission from the pop-up menu (see Figure 4-13).

When you commission a device, it is charged against your device credit account. A LonMaker Credits Info menu is displayed showing the available credits (see Figure 4-14).

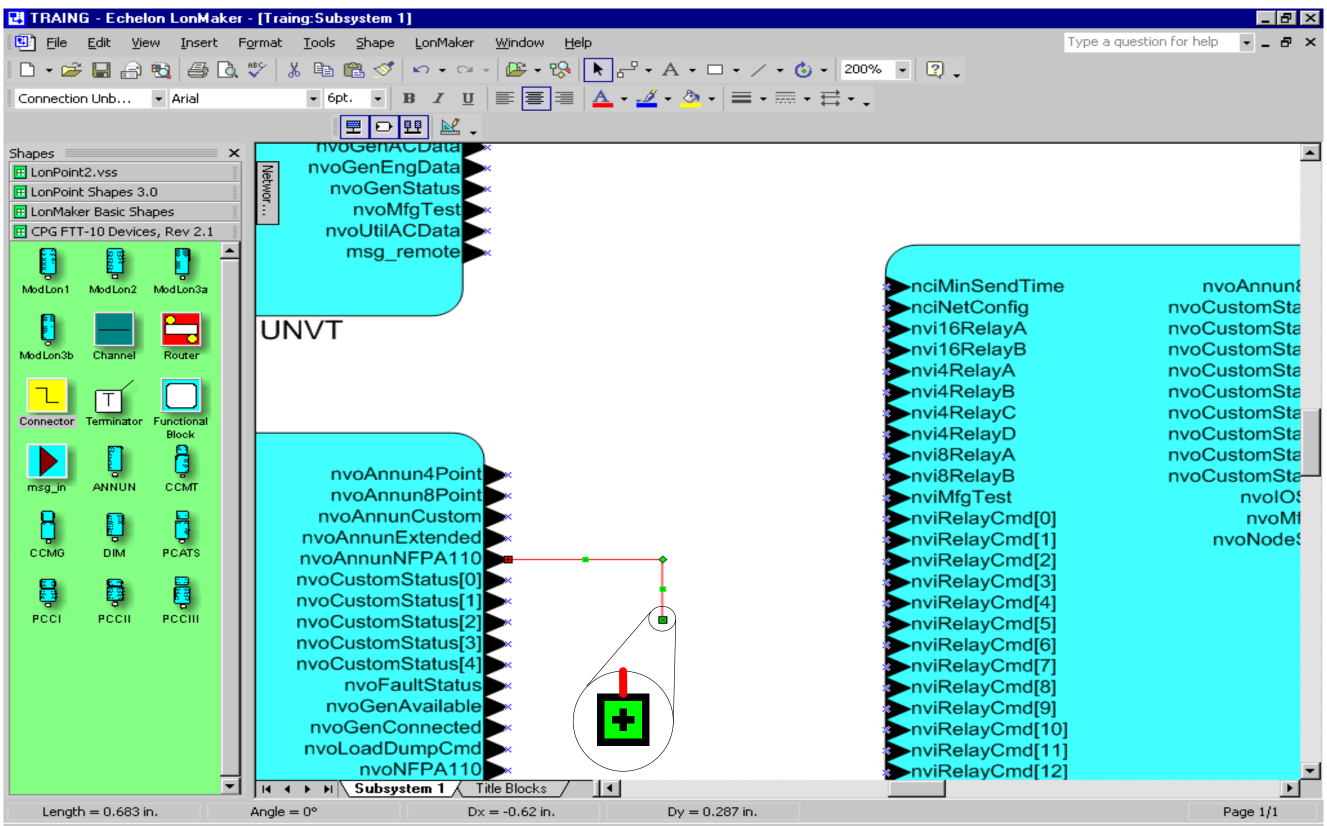


FIGURE 4-12. ADDING BINDINGS

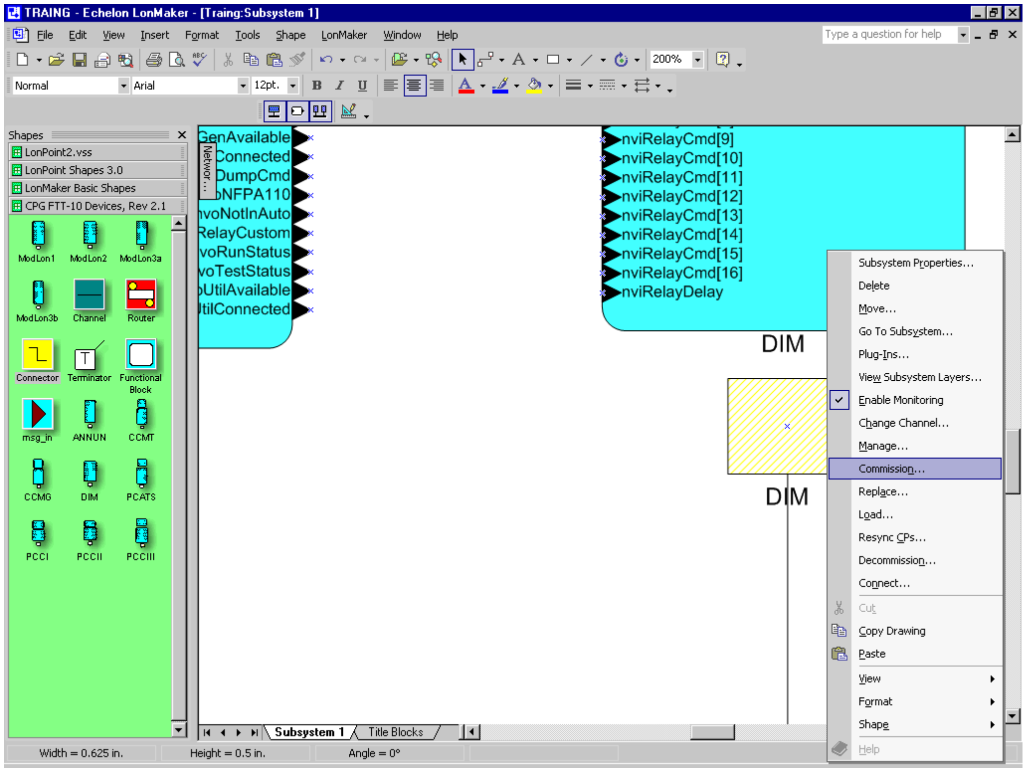


FIGURE 4-13. COMMISSIONING A DEVICE

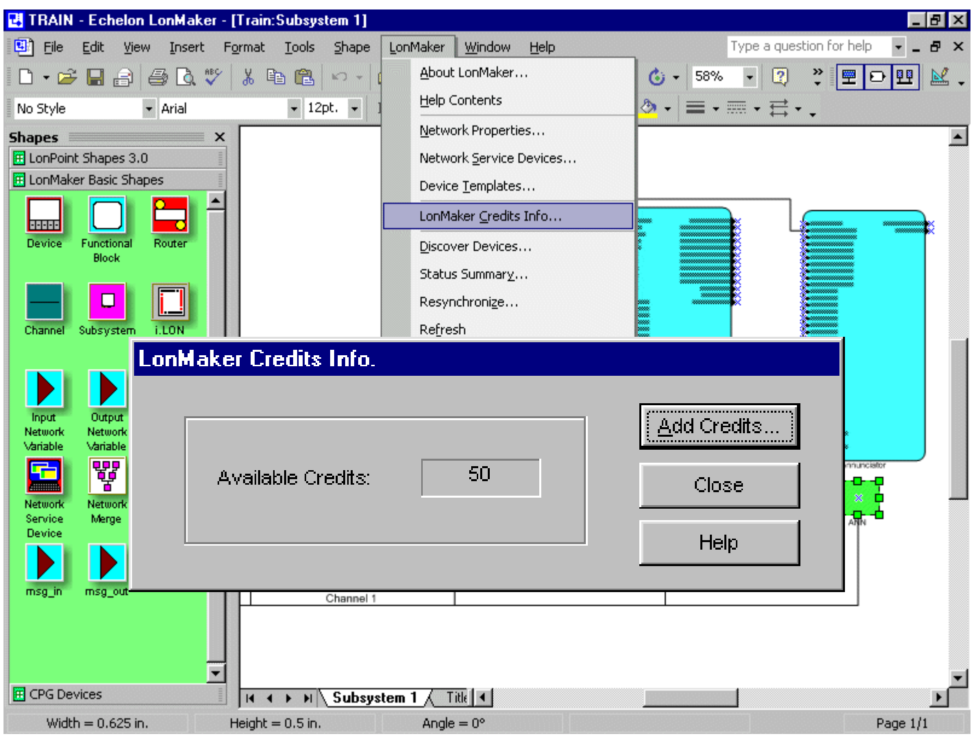


FIGURE 4-14. LONMAKER CREDITS INFO MENU

Registering Plug-Ins

Before you can use Plug-Ins, including genset Plug-Ins, they must be registered. To register the Plug-Ins:

1. Go to LonMaker → Network Properties. Click on the Plug-In Registration tab.

   NOTE: The Plug-In Registration dialog box is also displayed when opening the network drawing. It is preferable to register the Plug-Ins at this time, before placing the devices on the network.

2. Select the desired Plug-Ins in the Not Registered list and click on the Add button. The Plug-Ins are now displayed in the To Be Registered list.
3. Click on the Finish button.
4. Click on the OK button to close the Plug-In Registration dialog box.
5. Select a device, right click, and select Plug-Ins. The Plug-In for the device should be listed. Select it and click on the OK button. This writes the site name and device name to the device.

   If the Plug-In does not appear in the list, save the network, close it, and reopen it.

   If the problem persists, delete the device from the drawing, remove the device template (select LonMaker → Device Templates, select the template, and remove it), and re-register the Plug-In.
6. Select a device, right click, and select Browse. Additional information on using the Browser follows.
7. Click on nviNodeLocation. Information on this variable is displayed in the edit box (See Figure 4-15). The first seven numbers (hex character codes) represent the site name. If any of the numbers are “32” (hex character for a space), change them to “0.”
8. Click on nviNodeInfo. Information on this variable is displayed in the edit box. Skip the first eight numbers. The second set of eight numbers (hex character codes) represents the device name. If any of the numbers are “32” (hex character for a space), change them to “0.”
9. Close the Browser and save the network.

Using the LonMaker Browser

You can view and modify a device’s network variables and configuration properties with the LonMaker browser.

In some cases, you can use the LonMaker browser to enter values outside of the range allowed by the Plug-In for that device. The device being browsed and the network interface have to be connected in order to monitor and change values. Additional information on Plug-Ins is included in *Section 5*.

To view the LonMaker browser (see Figure 4-15) and change values, select the device, right click, and select “Browse.” For more information on the LonMaker browser, see the LonMaker User’s Guide.

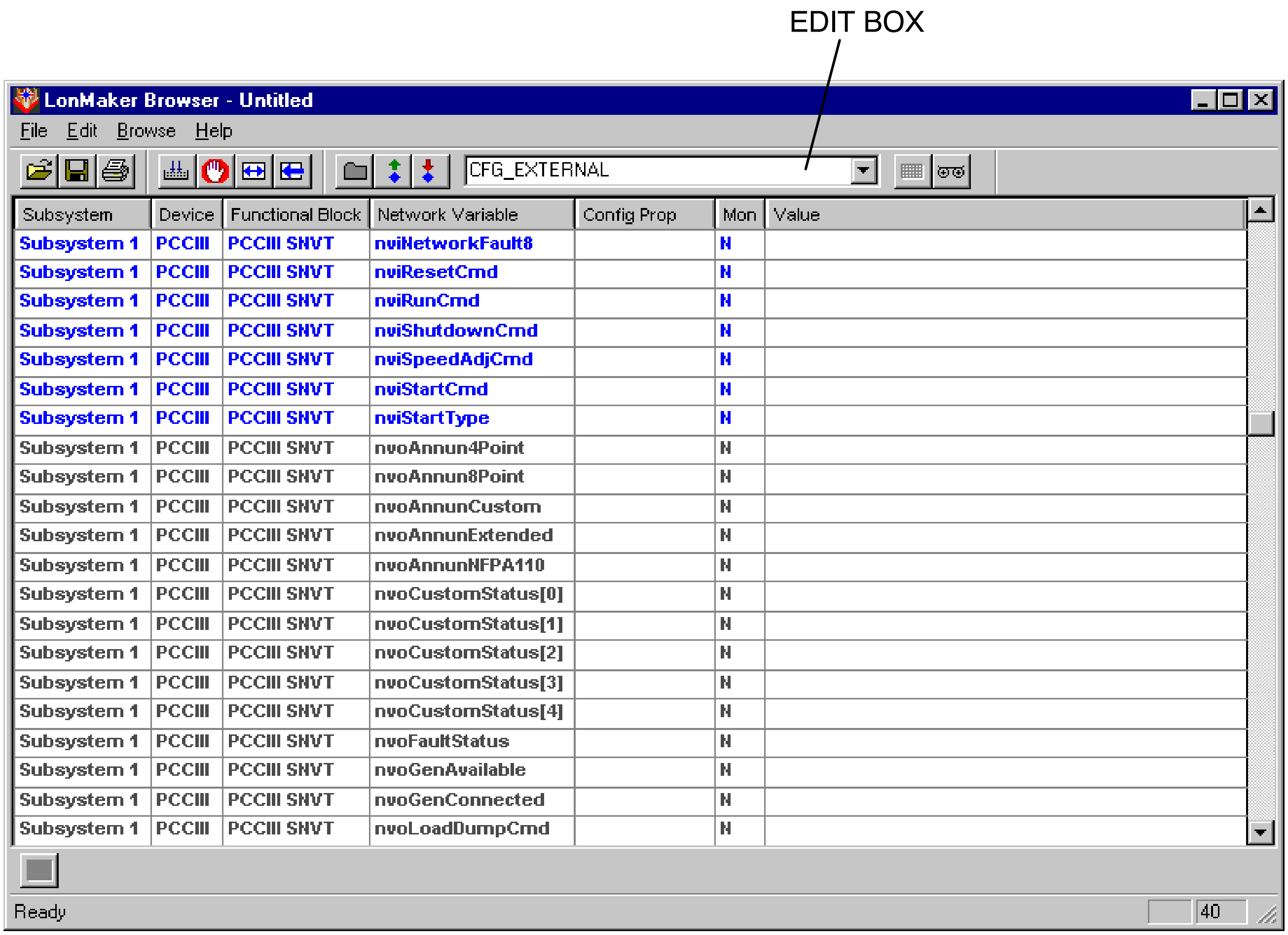


FIGURE 4-15. LONMAKER BROWSER

INSTALLING SOFTWARE UPGRADES TO AN EXISTING NETWORK

The current software is compatible with previously released FT-10 software. Networks can include devices loaded with new and old software. File names have been changed to make it clear which version of software is loaded on each device.

Autobinding capabilities of the PCC 3200, the PCC 2100, and the annunciator have been upgraded with the current software. More details on these upgrades are included later in this manual.

If Both the .nxe and .xif Files Have Changed:

A change of the letter of a device file (for example, CCMGA03 to CCMGB03) represents a change of both the .xif and the .nxe files. This will result in the deletion of the old files and replacing them with the new files. The letter change also means that there is a change in the device stencil and that it also needs to be updated.

Note that the original versions of .xif files under this naming convention (those with .xif version “A”) are equivalent to the latest .xif files in PowerCommand FT-10 Network Support Files v1.4. Lonmaker recognizes them as being equivalent. For example, changing from the latest version of CCM0206 to CCMGA03 does not change the .xif file.

1. Remove all of the bindings from the device and delete it from the LonMaker drawing.
2. Remove the device template from the drawing (Click on LonMaker → Device Templates → select the template and remove it).
3. Using Windows Explorer, delete (or copy to another directory) any binary files (.xfb, .xfo, .apb files) associated with the device. These files should be in the same directory as the .nxe and .xif file. The default directory specified is C:\LonWorks\Import\Cummins\. (The .apb file will only be present if you have previously downloaded the application image to the device with LonMaker with this PC.)
4. Copy the new .nxe and .xif files into the same directory where the old files were.
5. Copy the new device stencil over the old device stencil. The default directory for the stencils is C:\LonWorks\LonMaker\Visio\.
6. Drag the new device from the stencil onto the drawing and re-create the bindings. If the new stencil is not available, drag the device and functional block shapes onto the drawing from the Basic Shapes stencil and browse to find the .nxe and .xif file when LonMaker prompts you to do so.

If Only the .nxe File Has Changed:

A change of the number of a device file (for example, CCMGA03 to CCMGA04) represents a change in the .nxe file. This will result in the .apb and .nxe files being replaced with the new files. The .xif files remain unchanged, along with the device’s stencil.

1. Using Windows Explorer, delete (or copy to another directory) the .apb file associated with the device. These files should be in the same directory as the .nxe and .xif file. The default network support files directory is C:\LonWorks \Import\Cummins\. (The .apb file is only present if you have previously downloaded the application image to the device with LonMaker with this PC.)
2. Copy the new .nxe file into the same directory where the old file was.
3. In LonMaker, right click on the device and select replace. Select “download application image” when prompted to do so and make sure that the path and filename are the correct ones for the new .nxe file.

INSTALLING FT-10 NETWORKS FOR BOTH LOCAL AND REMOTE MONITORING

FT-10 networks can be set up to deliver alarms remotely while maintaining a persistent local connection. This type of installation includes creating one network database for the local PC (using the local SLTA on Channel 1, unbound – see Figure 4-16) and a different network database for the remote PC (using the remote SLTA on Channel 2, bound – see Figure 4-23). The “remote” network must always be commissioned last for these bindings to be active.

1. Create the following two directories on the technician’s laptop:

   c:\lm\backup\local\
   c:\lm\backup\remote\

2. Using the technician’s laptop, connect to the network with the local SLTA and install and bind all devices with LonMaker as you would for any other network using a single SLTA, except for the remote message tags. Drag the functional block for the LNS Network Interface onto the drawing but do not bind it. As an alternative, the installation and bindings could be done in engineering mode off site (see Figure 4-16).

3. Add a second channel (Channel 2) and a router to the drawing.

4. Backup the network (drawing and database) to c:\lm\backup\local\.

5. On the customer’s PC, set up the SLTA for local monitoring using Link Manager.

   a. Launch the SLTA Link Manager from the Start menu (or the taskbar icon).

   b. Click on the Link menu and select **New**. The Link Description dialog box is displayed (see Figure 4-17).

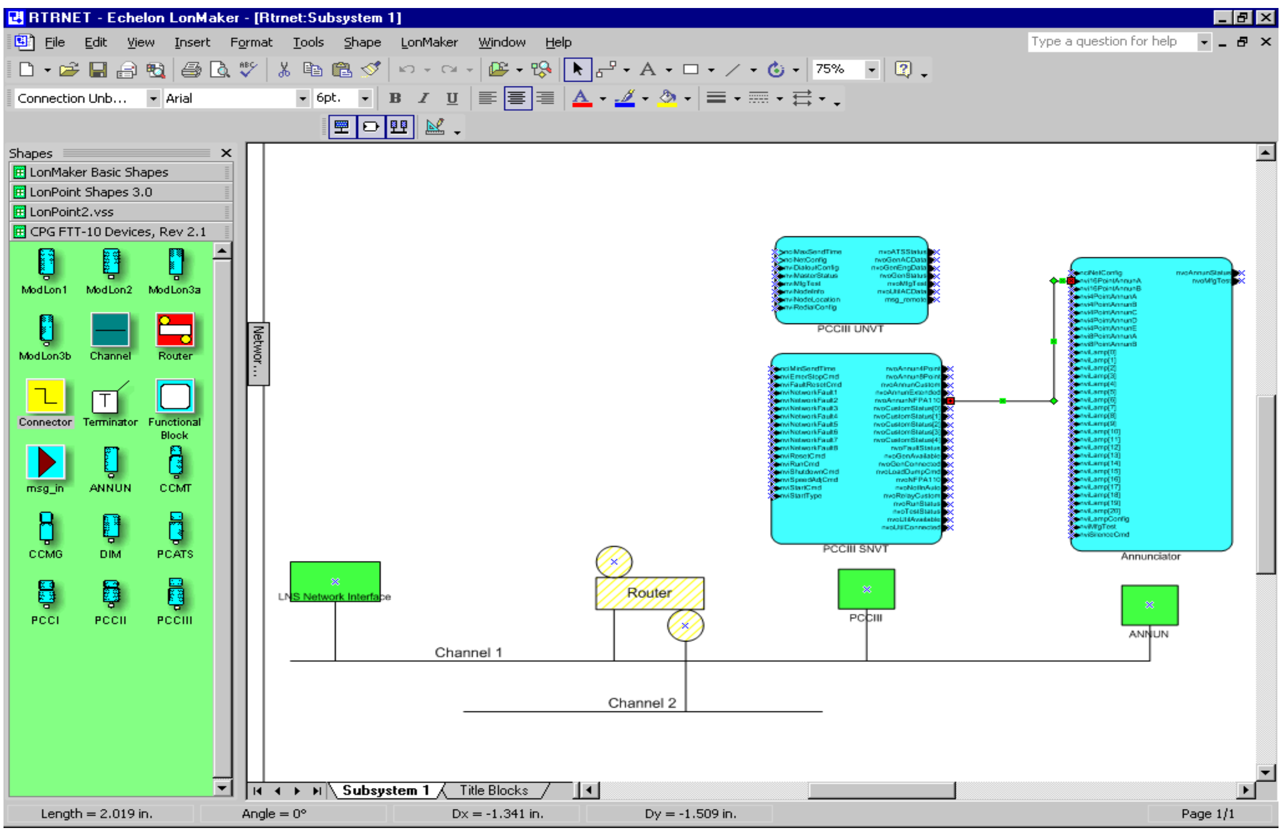


FIGURE 4-16. FT-10 NETWORK DRAWING – LOCAL MONITORING

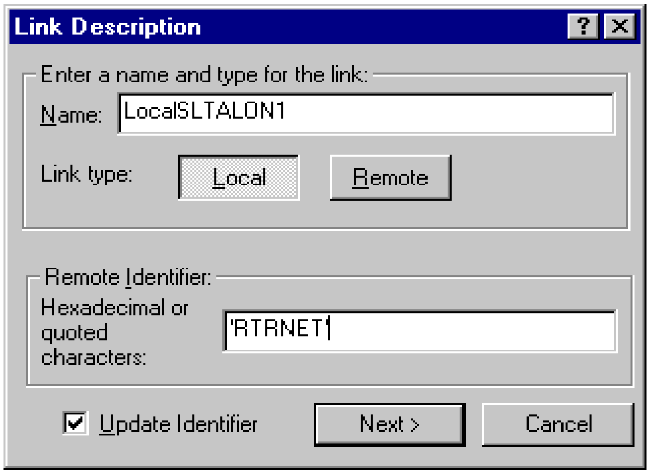


FIGURE 4-17. SLTA LOCAL SETUP

c. Enter the name (**LocalSLTALON1**) and click on the **Local** Link type button.

NOTE: To operate correctly, the name must be entered exactly as shown.

d. Click on the **Update Identifier** box to select it; then click on **Next**. The Comm Port dialog box is displayed (see Figure 4-18).

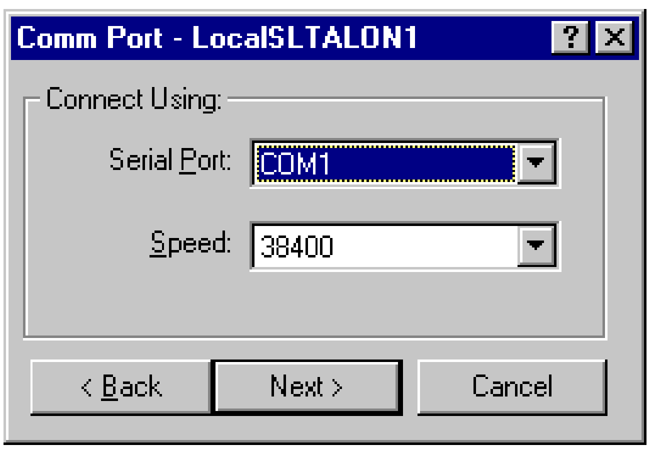


FIGURE 4-18. SLTA LOCAL SETUP SPEED

e. Use the **Serial Port** drop-down arrow to select the serial port that the SLTA is attached to on the monitoring PC.

f. Use the Speed drop-down arrow to select **38400** as the communication speed, click on **Next** to continue. The Link Properties dialog box is displayed (see Figure 4-19).

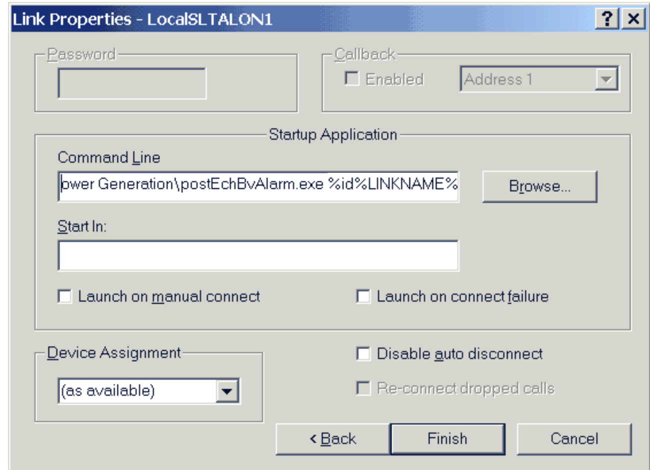


FIGURE 4-19. SLTA LOCAL LINK PROPERTIES

g. Setup the Command Line by clicking on the **Browse** button.

h. Navigate to and select the file named **PostEchBvAlarm.exe**. This file is located in the following directory:

C:\Program files\common files\cummins shared\power generation

(For example: Double click on each folder, beginning with the Program Files folder, until you reach the **PostEchBvAlarm.exe** file. Double click on (or open) this file, the directory path and file will be added to the Command Line.)

i. The Command Line needs to be appended with additional instructions. Refer to Figure 4-19. Click inside the Command Line and use the right arrow key, to reach the end of the Command Line (or use the **End** key). Enter the following text, including spaces, enter a space before the first percent symbol:

%**id**% %**LINKNAME**%

j. Click on **Finish**, to complete the Link Properties settings for the local PC. Click on **OK**, to close the SLTA Link Manager editing window. Select Link → Hide Link Manager to minimize the program.

6. On the customer's PC, import the local network, register the network database, and set up the site.

   a. Locate the site backup file (***sitename*.zip**) using Windows Explorer. Double click on the file to launch the **WinZip** utility (see Figure 4-20).

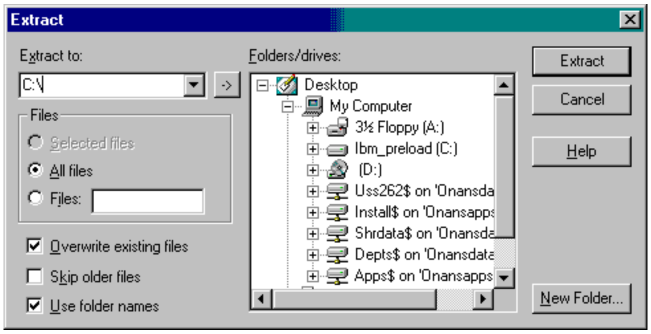


FIGURE 4-20. WINZIP EXTRACT DIALOG BOX

   b. Use WinZip to extract the database .zip file and save the network site database to the C: drive on the host computer. A network folder is created in the C:\Lm\Db directory.

   c. Select **Start** → **Programs** → **PowerGeneration** → **PCW** → **RegEchDB**. The dialog box shown in Figure 4-21 is displayed.

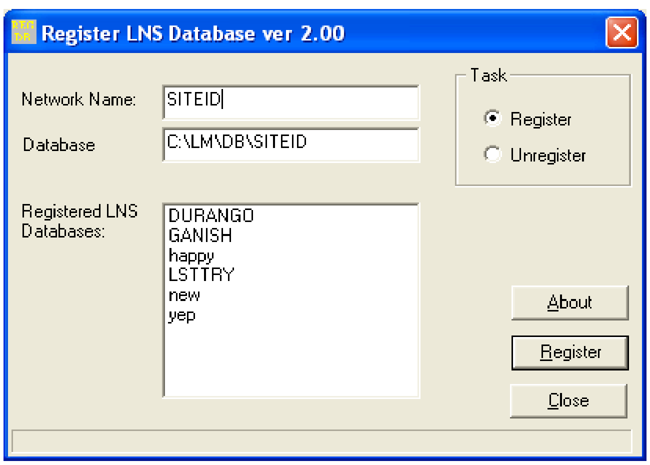


FIGURE 4-21. NETWORK DATABASE REGISTRATION WINDOW REGECHDB

   d. Type in the name of the Network. It must be the same as the network folder created in step 2. Now click on **Register**. The message shown in Figure 4-22 is displayed. Click on **OK**.

FIGURE 4-22. SITE DATABASE INSTALLED

7. Using the technician's laptop, connect to the network through the remote SLTA.

8. Using LonMaker, right click on the SLTA (LNS Network Interface) icon on the drawing and select "Change Channel." The drawing should now show the SLTA connected to Channel 2 (see Figure 4-23).

9. Bind device message tags to the message tag on the SLTA functional block.

10. Backup the network (drawing and database) to C:\lm\backup\remote\.

11. On the remote PC, set up the SLTA for remote monitoring using LinkManager. Note that the SLTA must be set to monitor for incoming calls.

   a. Launch the SLTA Link Manager from the Start menu (or the taskbar icon).

   b. Click on the Link menu and select **New**. The Link Description dialog box is displayed (see Figure 4-24).

   c. Enter the name (**RemoteSLTALON1**) and click on the **Remote** Link type button.

      NOTE: To operate correctly, the name must be entered exactly as shown.

   d. Click on the **Update Identifier** box to select it; then click on Next. The Dialing Address dialog box is displayed (see Figure 4-25).

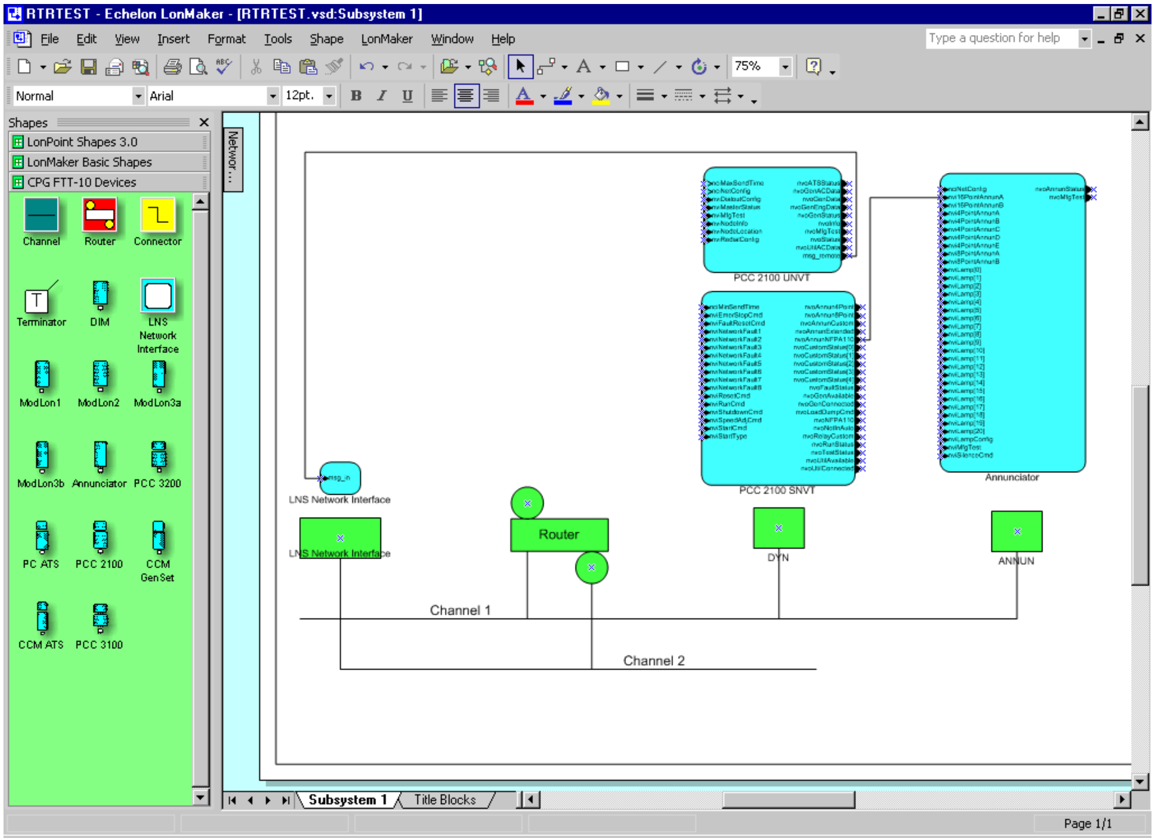


FIGURE 4-23. FT-10 NETWORK DRAWING – REMOTE MONITORING

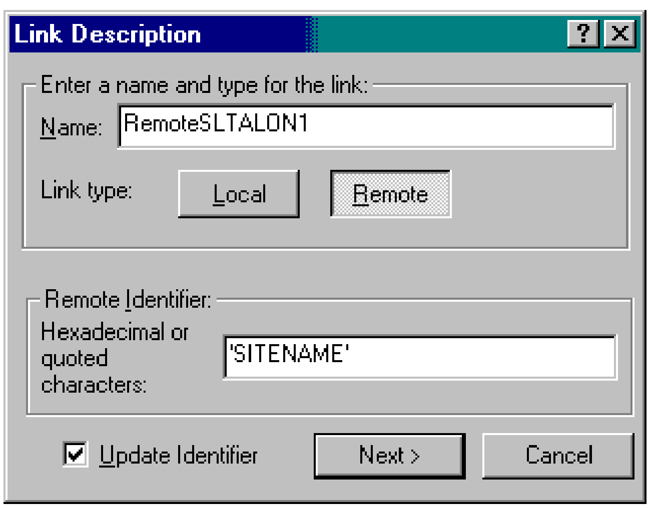


FIGURE 4-24. SLTA REMOTE SETUP

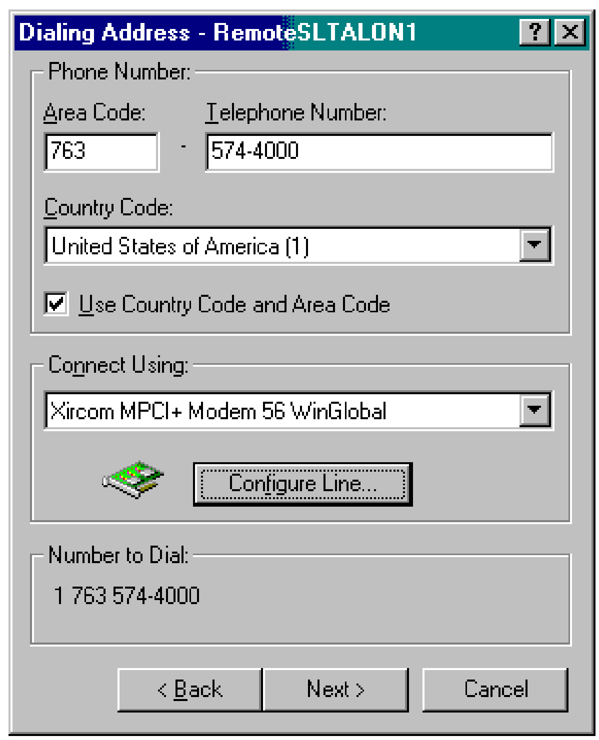


FIGURE 4-25. SLTA REMOTE DIALING ADDRESS

e. Use the Dialing Address dialog to enter the area code (if applicable) and phone number of the phone line that is connected to the modem at the remote site. Skip the Configure Line setting, connection speed will be set automatically.

f. Click on the **Next** button. The Link Properties dialog box is displayed (see Figure 4-26).

g. Setup the Command Line by clicking on the **Browse** button.

h. Navigate to and select the a file named **PostEchBvAlarm.exe**. This file is located in the following directory:

C:\Program files\common files\cummins shared\power generation

(For example: Double click on each folder, beginning with the Program Files folder, until you reach the **PostEchBvAlarm.exe** file. Double click on (or open) this file, the directory path and file will be added to the Command Line.)

i. The Command Line needs to be appended with additional instructions. Refer to Figure 4-26. Click inside the Command Line and use the right arrow key, to reach the end of the Command Line (or use the **End** key). Enter the following text, including spaces, enter a space before the first percent symbol:

%**id**% %**LINKNAME**%

j. Click on **Finish**, to complete the Link Properties settings for the remote PC. The SLTA Link Manager is displayed (see Figure 4-27)

k. Click on the **Bell** shaped toolbar icon. The Monitor Line for Dial-In dialog box is displayed.

l. Click on the **Monitor** button to enable the monitoring PC to receive remote alarms. Then click **OK**. The Bell icon will be highlighted and the SLTA Link Manager status line will display the message Monitoring Line. Click on **OK** to close the SLTA Link Manager.

12. **On the remote PC, import the remote network, register the network database, and set up the site following the procedures defined in step 6.**

NOTE: If any changes are made to the network, both the local and remote databases will need to be updated and the remote database must be updated last for the binding to the remote SLTA to take effect. It is recommended that the network be deleted from the technician's laptop, using the LonMaker Delete button. Restore the backed up copies created in steps 4 and 13 to do any maintenance.

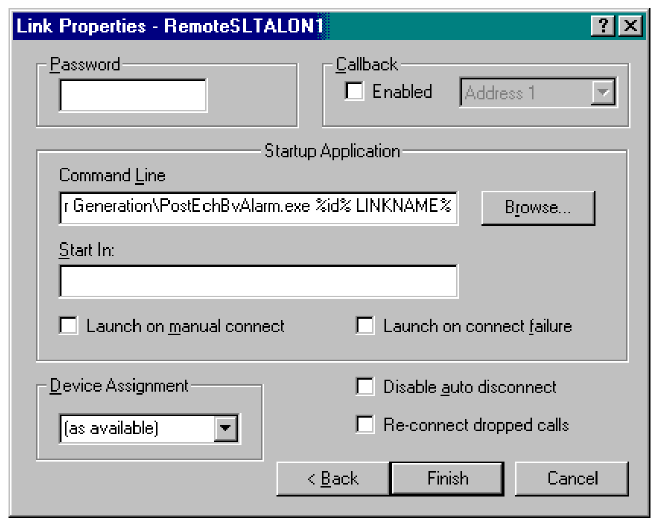


FIGURE 4-26. SLTA REMOTE LINK PROPERTIES

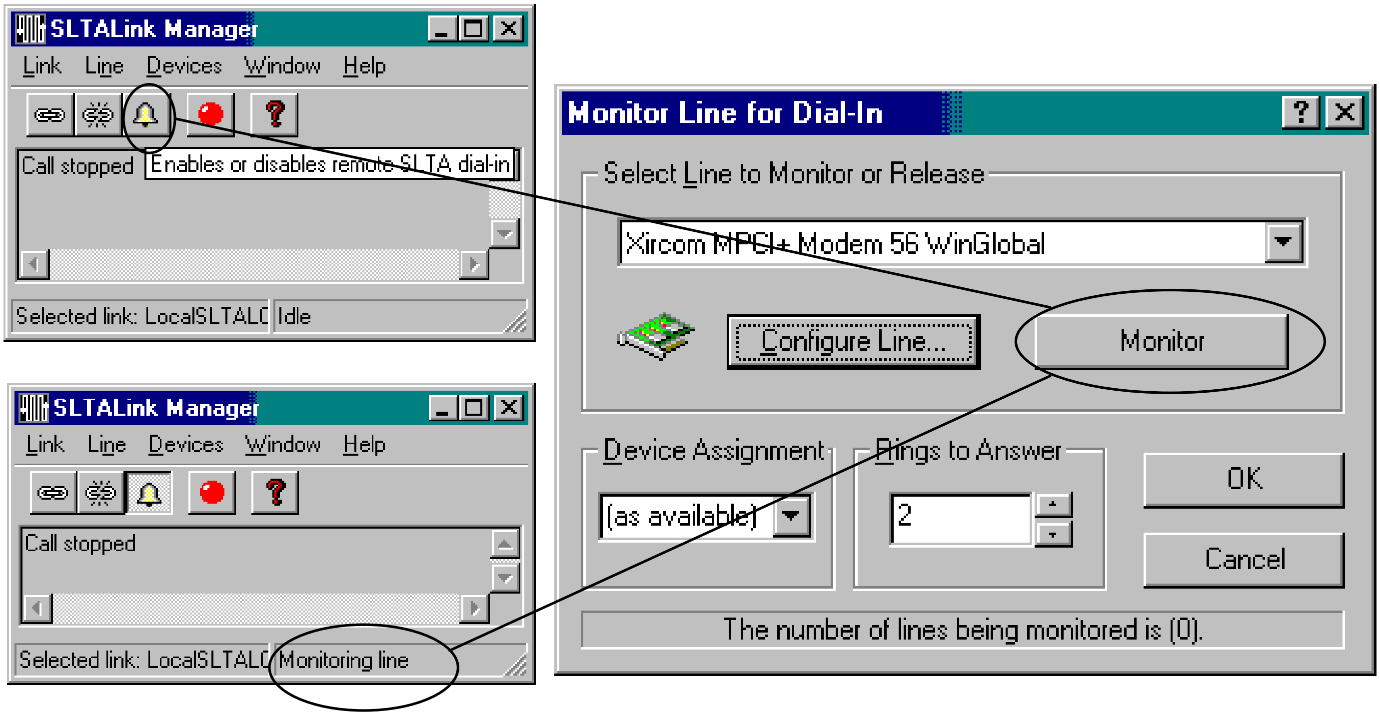


FIGURE 4-27. SLTA DIALING CONFIGURATION

5. Device Configuration Using LonMaker Plug-Ins

ABOUT THIS SECTION

This section describes how to configure network devices using LonMaker™ Plug-Ins. Plug-Ins are available for each of the devices and can be used to change some of their configuration parameters.

Using the Plug-Ins for CCMs, GCMs, and annunciators is recommended. InPower™ can be used to configure all devices except GCMs and has limitations when configuring CCMs (see *Section 6*). InPower can be used to configure an annunciator but the process is simplified with a Plug-In.

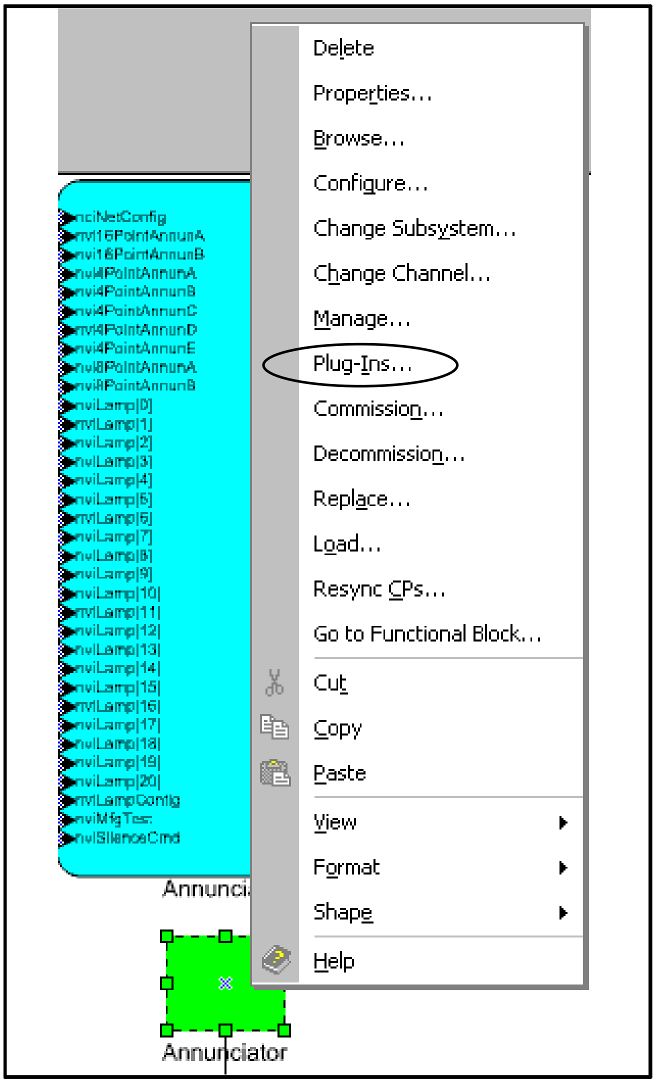


FIGURE 5-1. ACCESSING THE PLUG-IN MENU

USING PLUG-INS

NOTE: All genset controls must be commissioned before using Plug-Ins.

Plug-Ins must be installed on the Service PC in order to use them in LonMaker for Windows. Refer to Section 4 for instructions on installing CPG Plug-Ins.

Open the network site, select a device, right-click to view the menu options, and select "Plug-Ins" (see Figure 5-1).

Select the Cummins or CPG Plug-In and click "OK" to launch the Plug-In (see Figure 5-2).

Make sure each of the modules has been **reset** after using Plug-Ins to configure the network **or** make changes.

After all appropriate settings have been made to a CCM or annunciator Plug-In, it can be saved as a template (File → Save As) and applied to other devices of the same type.

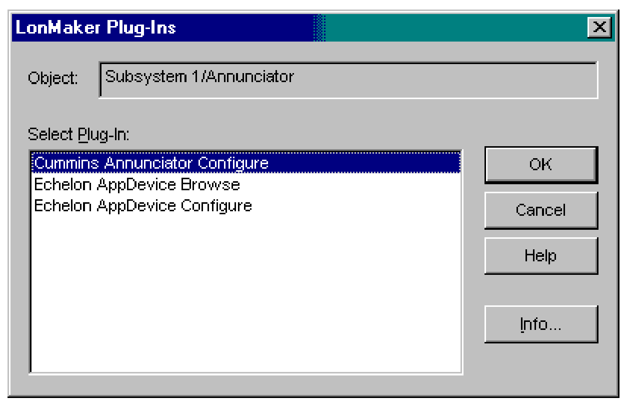


FIGURE 5-2. SELECTING A PLUG-IN

LONWORKS SYSTEM ANNUNCIATOR (LSA)

The **Info** tab describes the device that the Plug-In is being used on. Click on the **Annunciator** tab and select the lamp color and annunciation (horn and flash) for each lamp. Click on the **Apply** button to write the settings to the device (see Figure 5-3).

PowerCommand is a registered trademark of Cummins Inc.
LonMaker is a trademark of Echelon Corporation.
Detector and InPower are trademarks of Onan Corporation.
Windows is a registered trademark of Microsoft Corporation.

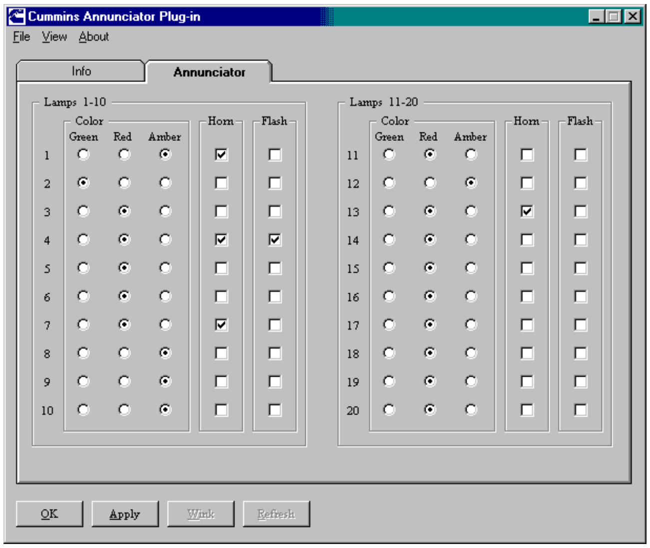


FIGURE 5-3. ANNUNCIATOR MENU

GENERATOR SET CONTROL COMMUNICATIONS MODULE (CCM-G)

To confirm a CCM-G or CCM-T, select the device and right-click to view the menu options and select "Plug-Ins."

The **Info** tab describes the device that the Plug-In is being used on. Click on the **Volts**/**Amps** tab (see Figure 5-4) and enter volt and amp information as described below. Also select Single or Three phase.

CCM – Volts

This parameter contains information on external Potential Transformers (PTs) which may be used to step down the line voltages. Secondary refers to the voltage applied to the CCM. For each phase, enter the nominal *Primary* and *Secondary* voltages and units (volts LN or volts LL) of the PTs. If the CCM is directly monitoring the line voltage (external PTs are not used), enter the nominal line voltage in the *Primary* and *Secondary* fields.

Valid PT voltages (*Primary*) are 0 to 13,800.
Valid values for *Secondary* are 1 to 425 Volts LN (736 Volts LL).

> ***Example 1:*** The CCM is monitoring the load-side of a Transfer Switch (3-phase, 13,800 volts LL). External PTs are used to step-down the line voltage from 13,800 Volts LL to 120 Volts LN.
>
> ***General:*** Select Three.
> ***Volts:*** *For each phase:* Enter 13800 for *Primary* and select LL. Enter 120 for *Secondary* and select LN.

When viewing the module in PCW II, if the displayed voltages are higher (on average) than the measured line voltages, decrease the *Primary* value(s). Likewise, if the displayed voltages are lower (on average) than the measured voltages, increase the *Primary* value(s).

CCM – Amps

This parameter contains information on external Current Transformers (CTs) which must be used to step-down the line currents. *Secondary* refers to the current winding connected to the CCM. For each phase, enter the nominal *Primary:Secondary* CT ratio.

Valid CT current (*Primary*) are 0 to 10,720.
Valid values for *Secondary* are 1 to 5 (Amps).

> ***Example:*** The CCM is monitoring the load-side of a Transfer Switch (3-phase). External CTs are used to step-down the line currents. The CT ratio is 10,000:5.
>
> ***Amps:*** *For each phase:* Enter 10000 for *Primary* and 5 for *Secondary*.

When viewing the module in PCW II, if the displayed currents are higher (on average) than the measured line currents, decrease the Primary value(s). Likewise, if the displayed currents are lower (on average) than the measured currents, increase the Primary value(s).

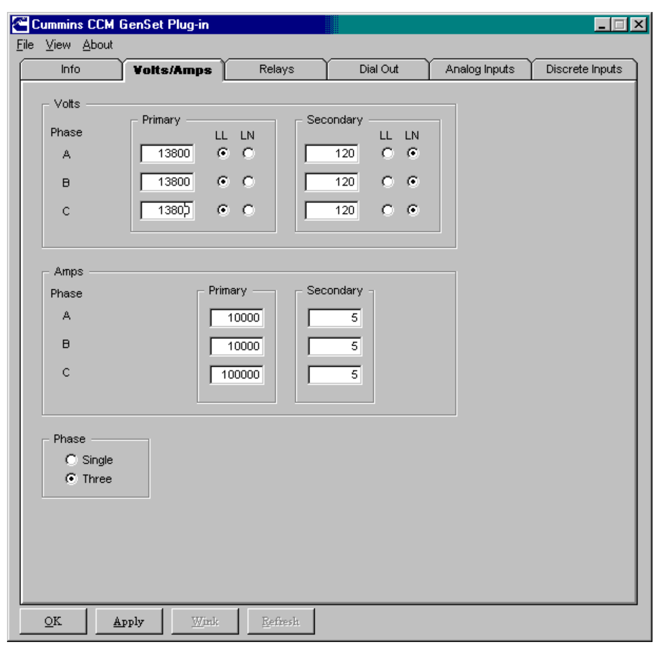


FIGURE 5-4. CCM-G VOLTS/AMPS MENU

CCM – Relays

Click on the **Relays** tab (see Figure 5-5) and enter a relay activation delay time for as many relays as needed.

To activate or change a delay for relays 4 though 8, double click on the edit box for the desired relay, the current value will be highlighted. Enter the desired delay time in seconds.

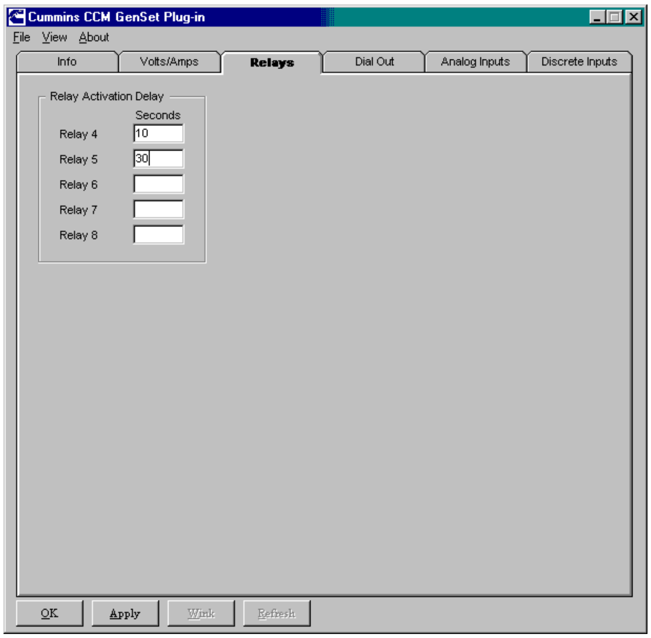


FIGURE 5-5. CCM-G RELAYS MENU

Dial Out

Click on the **Dial Out** tab (see Figure 5-6) and enter dial out information as described below.

Dialout Attempts: Used to set the number of dial-out retries, if the first alarm dialout fails while attempting to deliver a dial out message. The default setting 10, is the recommended setting. A setting of zero, is equal to one attempt.

Redial Delay: Enter the time delay between dialout attempts. The recommended setting is 60 seconds.

Timeout Delay: After a dialout command has been sent to the modem, this feature specifies how long to wait for the site to connect to the remote monitoring location. The default setting is 120 seconds.

Host 1 thru 5 Enable: Up to five remote monitoring sites (hosts) can be enabled to receive alarm messages. Select the hosts you want to enable.

NOTE: These host numbers must match the Dial Directory numbers assigned to the phone numbers entered with SLTA Link Manager (see page 7-5).

Hang Up and Dial Out: When enabled, this feature breaks a current connection after two minutes in order to complete a dialout.

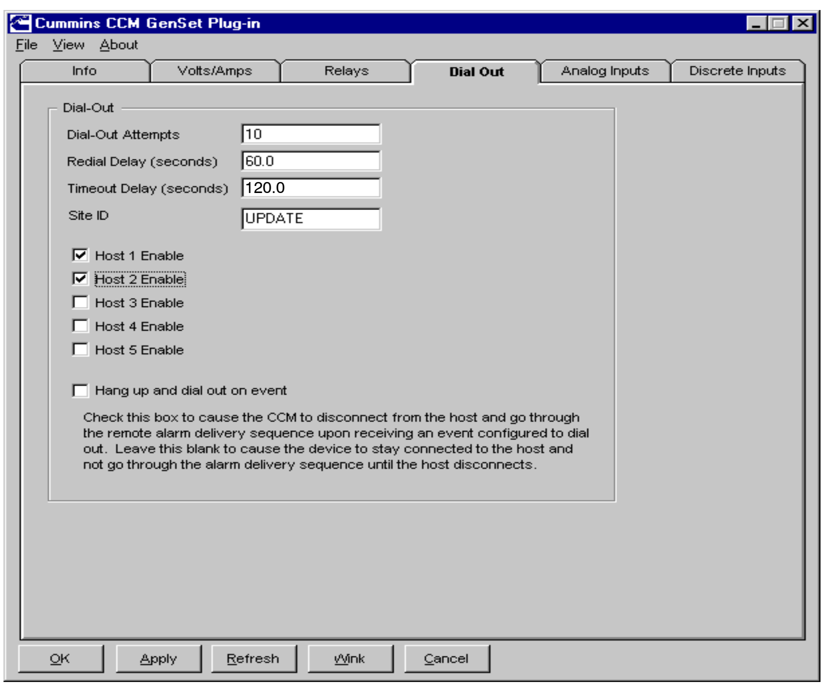


FIGURE 5-6. CCM-G DIAL OUT MENU

CCM – Analog Inputs

Click on the **Analog Inputs** tab (see Figure 5-7) and enter analog input information as described below.

These parameters configure the I/O characteristic of analog inputs. These inputs can be used to monitor various senders. Select the desired input to configure and edit the *Sender Voltage*, *Meter Reading* and *Sender Gain* fields to yield meaningful values.

Sender Voltage is the DC voltage of the sender at a known operating point.

Meter Reading is the gauge value of the sender at the same known operating point. Valid values vary with *Sender Gain* (Units may vary).

Sender Gain is the relational slope of Meter Reading to Sender Voltage.

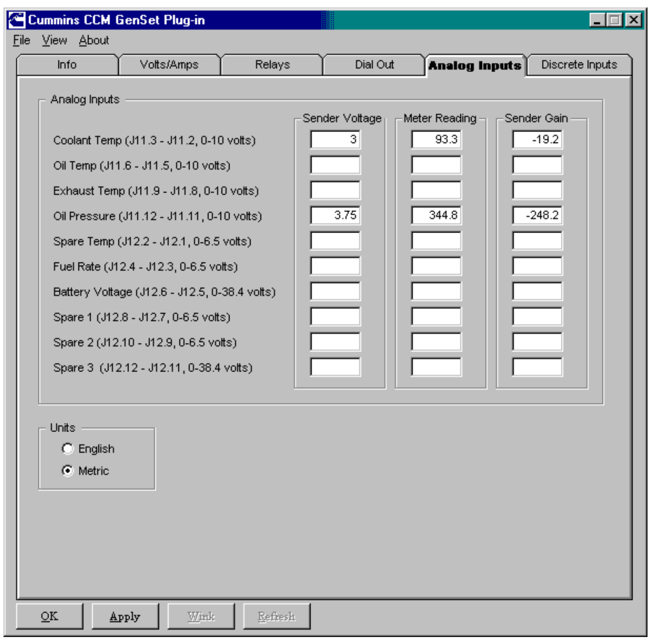


FIGURE 5-7. CCM-G ANALOG INPUTS MENU

CCM – Temperature

This parameter configures the I/O characteristic of analog input *Coolant Temperature*. This input can be used to monitor the coolant temperature sender. Select *Coolant Temperature* and edit the *Sender Voltage*, *Meter Reading* and *Sender Gain* fields to configure the input to yield meaningful temperature values.

Sender Voltage is the DC voltage of the sender at a known operating point. Valid values are 0 to +9 (VDC).

Meter Reading is the gauge value of the sender at the same known operating point. Valid values vary with *Sender Gain* (Units may vary).

Sender Gain is the relational slope of Meter Reading to Sender Voltage. Valid values are −3273 to +3273 (Temperature value/VDC = Gain). If working with an unknown sensor, it is necessary to map several temperature points to determine the slope characteristics of the sensor. Many sensors are not linear and they may contribute to inaccurate readings at some temperatures. Two measurement points are necessary and should be taken within the expected temperature range you expect to monitor. Measure the voltage and the corresponding temperature at several temperature points; then calculate the Gain.

$$\frac{T_1 - T_2}{V_1 - V_2} = \text{Gain}$$

(T_1 is the first temperature measurement and V_1 is the voltage)

An increase of voltage with a decrease of temperature provides a negative gain value while a decrease of voltage with a decrease of temperature provides a positive gain value.

Refer to Table 5-1 for sample temperature sender settings. Refer to Appendix B for more information on calculating temperature sender gain.

TABLE 5-1. TEMPERATURE SENDER GAIN SETTINGS

	SENDER	SENDER VOLTAGE	METER READING	SENDER GAIN
TEMP (OIL/COOL)	Detector/DK (Imperial) Detector/DK (Metric)	3 (VDC) 3 (VDC)	200 (°F) 93.3 (°C)	−34.5 (°F/VDC) −19.2 (°C/VDC)
	500−2200 Ω RTD (Imperial) 500−2200 Ω RTD (Metric)	3 (VDC) 3 (VDC)	176 (°F) 80 (°C)	97.1 (°F/VDC) 53.9 (°C/VDC)
TEMP (EXHAUST)	80−390 Ω RTD (Imperial) 80−390 Ω RTD (Metric)	2 (VDC) 2 (VDC)	752 (°F) 400 (°C)	700 (°F/VDC) 388.8 (°C/VDC)

These values are only nominal. Verify these values yield acceptable readings. If not, refer to Appendix C for determining the specific sender characteristics.

Example 1: The CCM is monitoring a Detector™ /DK Genset with Temperature 1 monitoring the coolant temperature. The customer would like to view all data in metric units.

Temperature 1: Enter 3.00 for *Sender Voltage*, 93.3 for *Meter Reading* and −19.20 for *Sender Gain*.

CCM – Oil Pressure

This parameter configures the I/O characteristic of analog input *Oil Pressure*. This input can be used to monitor various oil pressure senders. Select *Oil Pressure* and edit the *Sender Voltage*, *Meter Reading* and *Sender Gain* fields to configure the input to yield meaningful pressure values.

Sender Voltage is the DC voltage of the sender at a known operating point. Valid values are 0 to +9 (VDC).

Meter Reading is the gauge value of the sender at the same known operating point. Valid values vary with Sender Gain (Units may vary).

Sender Gain is the relational slope of Meter Reading to Sender Voltage. Valid values are −475 to +475 (Pressure value/VDC = Gain). If working with an unknown sensor, it is necessary to map several pressure points to determine the slope characteristics of the sensor. Many sensors are not linear and they may contribute to inaccurate readings at some pressures. Two measurement points are necessary and should be taken within the expected pressure range you expect to monitor. Measure the voltage and the corresponding pressure at several pressure points; then calculate the Gain.

$$\frac{P_1 - P_2}{V_1 - V_2} = \text{Gain}$$

(P_1 is the first pressure measurement and V_1 is the voltage)

An increase of voltage with a decrease of pressure provides a negative gain value while a decrease of voltage with a decrease of pressure provides a positive gain value.

Refer to Table 5-2 for sample oil pressure sender settings. Refer to Appendix B for more information on calculating oil pressure sender gain.

These values are only nominal. Verify these values yield acceptable readings. If not, refer to Appendix B for determining the specific sender characteristics.

Example 1: The CCM is monitoring a Detector/DK Genset. The customer would like to view all data in English (Imperial) units.

Oil Pressure: Enter 3.75 for *Sender Voltage*, 50 for *Meter Reading* and −36 for *Sender Gain.*

These values are only nominal. Verify these values yield acceptable readings. If not, refer to Appendix C for determining the specific sender characteristics.

Example 1: The CCM is monitoring a Detector/DK Genset. The customer would like to view all data in metric units.

Oil Pressure: Enter 3.75 for *Sender Voltage*, 344.8 for *Meter Reading* and −248.2 for *Sender Gain.*

Example 2: The CCM is monitoring a non-Onan Genset with a Kavlico oil pressure sender. The customer would like to view all data in Metric units.

Oil Pressure: Enter 2.50 for *Sender Voltage*, 344.8 for *Meter Reading* and 172.4 for *Sender Gain*.

TABLE 5-2. OIL PRESSURE SENDER GAIN SETTINGS

	SENDER	SENDER VOLTAGE	METER READING	SENDER GAIN
PRESSURE	Variable Resistor			
	Detector/DK (Imperial)	3.75 (VDC)	50 (PSI)	−36 (PSI/VDC)
	Detector/DK (Metric)	3.75 (VDC)	344.8 (kPa)	−248.2 (kPa/VDC)
	Transducer			
	Kavlico (Imperial)	2.5 (VDC)	50 (PSI)	25 (PSI/VDC)
	Kavlico (Metric)	2.5 (VDC)	344.8 (kPa)	172.4 (kPa/VDC)

CCM – Spare 1, Spare 2, Spare 3

These parameters configure the I/O characteristic of analog inputs Spare 1, Spare 2, and Spare 3. Spare 1 and Spare 2 can be used to monitor customer-defined 0−5 VDC analog voltages. The voltage battery for Spare 3 is the same as Spare 1 and Spare 2 but the valid sender voltages and sender gains are different. Select the desired input to be configured and edit the *Sender Voltage*, *Meter Reading* and *Sender Gain* fields to yield meaningful values.

Sender Voltage is the DC voltage of the sender at a known operating point. Valid Spare 1 and Spare 2 values are 0 to +5 (VDC). Valid Spare 3 values are 0 to +34 (VDC).

Meter Reading is the gauge value of the sender at the same known operating point. Valid values vary with Sender Gain (Units may vary).

Sender Gain is the relational slope of *Meter Reading* to *Sender Voltage*. Valid Spare 1 and Spare 2 values are −503 to +503 (Units/VDC). Valid Spare 3 values are −85 to +85 (Units/VDC).

Click on the **Apply** button to write the settings to the device.

CCM – Discrete Inputs

Click on the **Discrete Inputs** tab (see Figure 5-8) and enter discrete input information as described below. All 32 discrete input configurations are in two groups. Use the buttons on the lower right corner of the window to access each group. To edit the label for each input, click on the edit box.

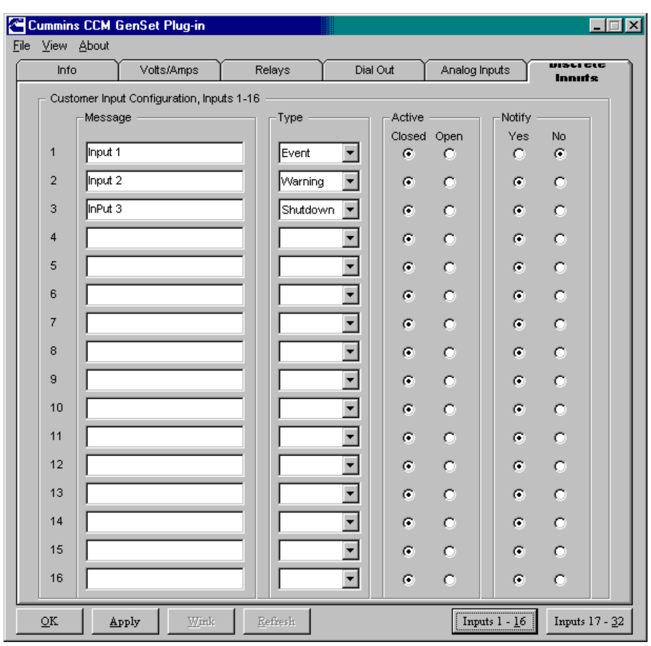


FIGURE 5-8. CCM-G DISCRETE INPUTS MENU

Event Message: This field configures the text message. The message may be 16 alpha-numeric characters including spaces. Enter a meaningful message describing the state of the input. This message is for reference purposes only and is not sent when an event occurs.

(Event) Type: This field configures the level of an alarm/event. *Event Type* only applies when *Notify* is "Yes."

Event: This will force the event message to be immediately logged at the host. This is useful for logging system events that do not require acknowledgment by a user. An Event will not send a popup alarm.

Warning: This may force a pop-up message at the remote PC (if remote PC is configured as such). The alarm requires acknowledgment by a user before it is logged.

Shutdown: This may force a pop-up message at the remote PC (if remote PC is configured as such). The alarm requires acknowledgment by a user before it is logged.

Active (State): This field configures the state of the input which is considered "active". Some input signals are active when they go to ground while others are active when they go to B+. The Active State field allows the user to configure the input for either scenario. The *Active State* of each input must be configured.

Closed: The input is activated when the input is shorted to ground.

Open: The input is activated when the input is removed from ground.

Notify: This field configures the module to send an alarm when the input is activated or not to. If a user would like notification of this input becoming active, select "Yes." If this input does not require notification when activated, then select "No."

Click on the **Apply** button to write the settings to the device.

PCC 3100 GENSET COMMUNICATIONS MODULE (GCM)

The GCM menus are used to configure dial out settings.

The **Info** tab (see Figure 5-9) describes the device that the Plug-In is being used on.

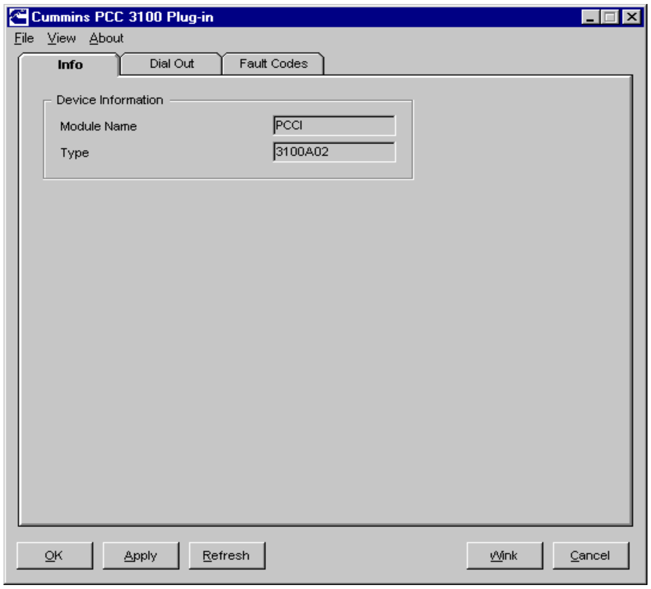


FIGURE 5-9. GCM INFO MENU

Using the Plug-In on a Self-Installed GCM

The following steps are required before self-installing a GCM.

1. Use LonMaker to create a dummy network with a GCM.
2. Connect to the GCM with LonMaker.
3. Use the GCM Plug-In to perform Dial Out and Fault Code adjustments.
4. Save the network.
5. Press the Service pin for two seconds to set the GCM to LOCAL.
6. Close the network and delete it.

Dial Out

Click on the **Dial Out** tab (Figure 5-10) and enter dial out information as described below.

Dial-Out Attempts: Used to set the number of dial-out retries, if the first alarm dialout fails while attempting to deliver a dial out message. The default setting (10) is the recommended setting. A setting of 0 is equal to one attempt.

Redial Delay (seconds): Enter the time delay between dialout attempts. The recommended setting is 60 seconds.

Timeout Delay (seconds): After a dialout command has been sent to the modem, this feature specifies how long to wait for the site to connect to the remote monitoring location. The default setting is 60 seconds.

Host 1 thru 5 Enable: Up to five remote monitoring sites (hosts) can be enabled to receive alarm messages. Select the hosts you want to enable.

NOTE: These host numbers must match the Dial Directory numbers assigned to the phone numbers entered with SLTA Link Manager (see page 7-5).

Hang up and Dial Out on Event: When enabled, this feature breaks a current connection after two minutes in order to complete a dialout.

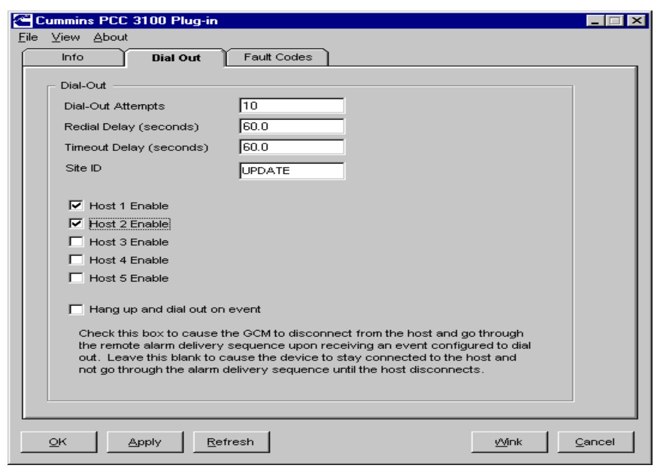


FIGURE 5-10. GCM DIAL OUT MENU

Fault Codes

The Fault Codes tab (Figure 5-11) allows the user to enter fault codes to activate annunciator lamps 2–16. Use InPower to view a list of PCC 3100 fault codes and fault descriptions.

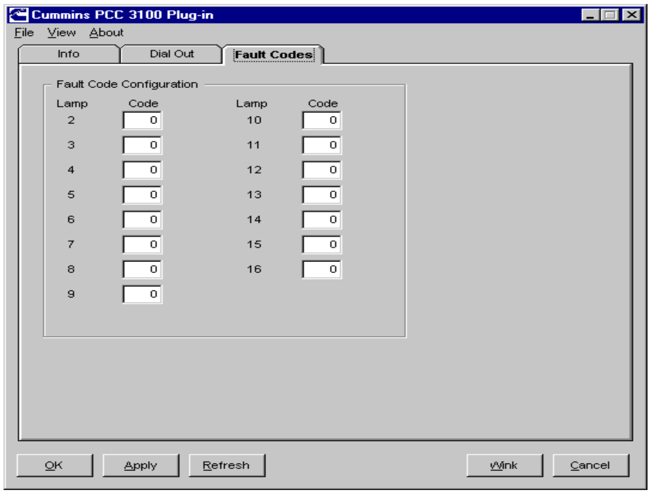


FIGURE 5-11. GCM FAULT CODES MENU

PCC 3200 GENSET LONWORKS CARD (GLC), PCC 2100 NETWORK COMMUNICATIONS MODULE (NCM), AND POWERCOMMAND ATS NCM

The GLC/NCM menus are used to configure dial out settings.

The **Info** tab describes the device that the Plug-In is being used on.

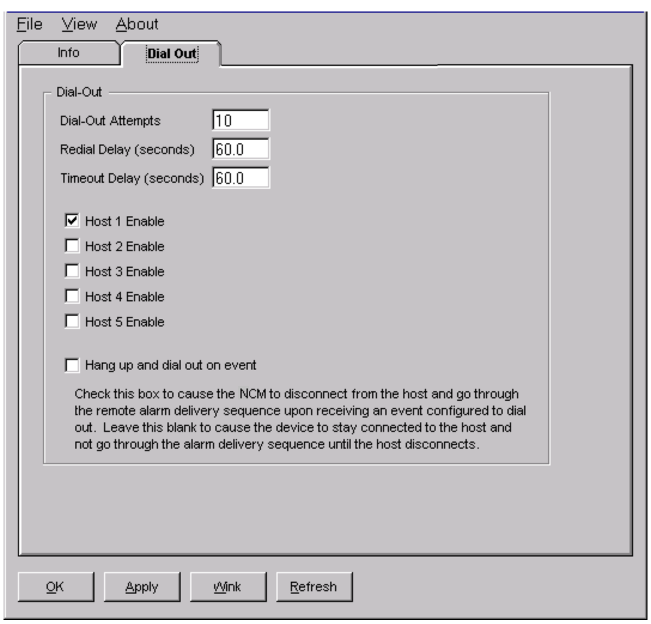


FIGURE 5-12. GLC AND NCM DIAL OUT MENU

Dial Out

Click on the **Dial Out** tab (Figure 5-12) and enter dial out information as described below.

Dial-Out Attempts: Used to set the number of dial-out retries, if the first alarm dialout fails while attempting to deliver a dial out message. The default setting 10, is the recommended setting. A setting of 0 is equal to one attempt.

Redial Delay (seconds): Enter the time delay between dialout attempts. The recommended setting is 60 seconds.

Timeout Delay (seconds): After a dialout command has been sent to the modem, this feature specifies how long to wait for the site to connect to the remote monitoring location. The default setting is 60 seconds.

Host 1 thru 5 Enable: Up to five remote monitoring sites (hosts) can be enabled to receive alarm messages. Select the hosts you want to enable.

NOTE: These host numbers must match the Dial Directory numbers assigned to the phone numbers entered with SLTA Link Manager (see page 7-5).

Hang up and Dial Out on Event: When enabled, this feature breaks a current connection after two minutes in order to complete a dialout.

6. Device Configuration Using InPower

ABOUT THIS SECTION

This section describes how to configure network devices using InPower™ software. InPower can be used to configure all devices but has limitations when configuring CCMs and GCMs. Using Plug-Ins to configure CCMs and GCMs is recommended (see *Section 5*).

This section describes how to use InPower to configure network settings and how to configure devices over a commissioned network.

NETWORK CONFIGURATION

A **LonWorks**® folder has been added in the **Adjustments** directory for PCC 3200, PCC 2100 and PowerCommand® transfer switch controls. This group of parameters is used to configure network settings. Each device type has a unique group of settings.

PCC 3100 controls use a GCM for network applications. Configuration of network settings for this device are available through a Plug-In, used with LonMaker™ .

The service PC, with InPower version 3.0 or later, must be connected to the genset or ATS, in order to configure the network settings.

Refer to the *InPower User's Guide*, Sections 4 and 5, for information on connecting InPower to a genset and a transfer switch. Refer to Network Connection Setup, later in this section, for information on configuring a device over a commissioned network.

PCC 3200

Start InPower and connect to the port (COM1, COM2, etc.) that matches the COM port on the service PC, that is being used for the PCC 3200 genset connection.

Open the **Adjustments** folder, and then the **LonWorks** folder (Figure 6-1). The following parameter groups are available for network configuration:

- Custom Annunciation
- Customer Outputs
- Device
- Dialout
- Fault Settings

This section describes how to use each of the parameter groups, in the PCC 3200 LonWorks directory. Press the **Reset** button on the Genset LonWorks Card (GLC), after saving changes to the PCC 3200, to write the changes from the base board to the GLC.

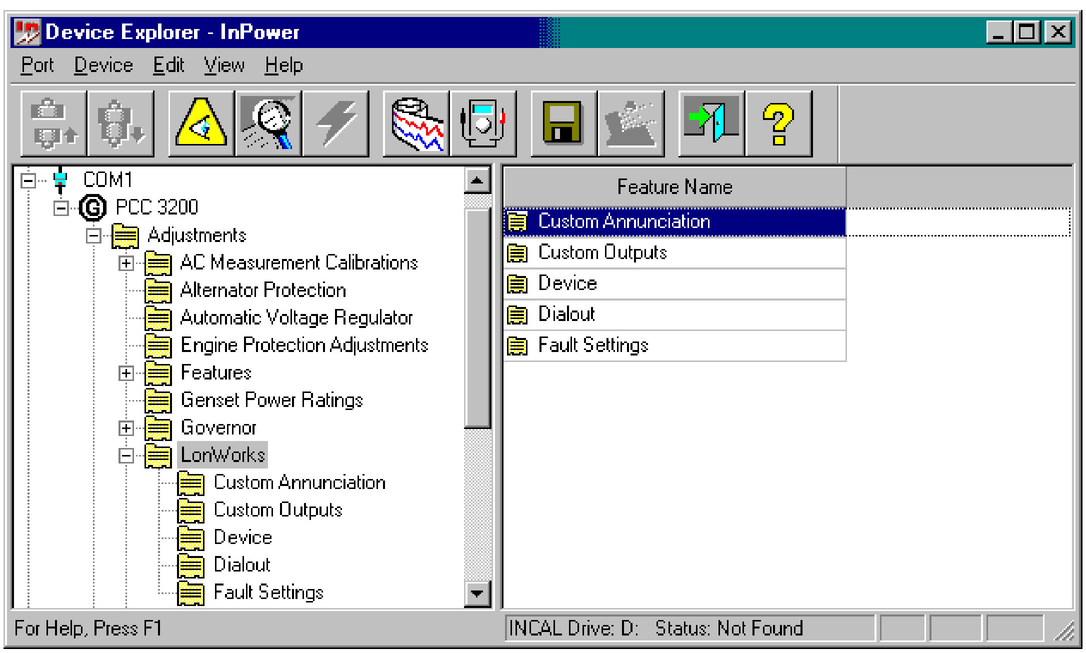


FIGURE 6-1. LONWORKS – PCC 3200

PowerCommand is a registered trademark of Cummins Inc.
LonWorks is a registered trademark of Echelon Corporation.
LonMaker is a trademark of Echelon Corporation.

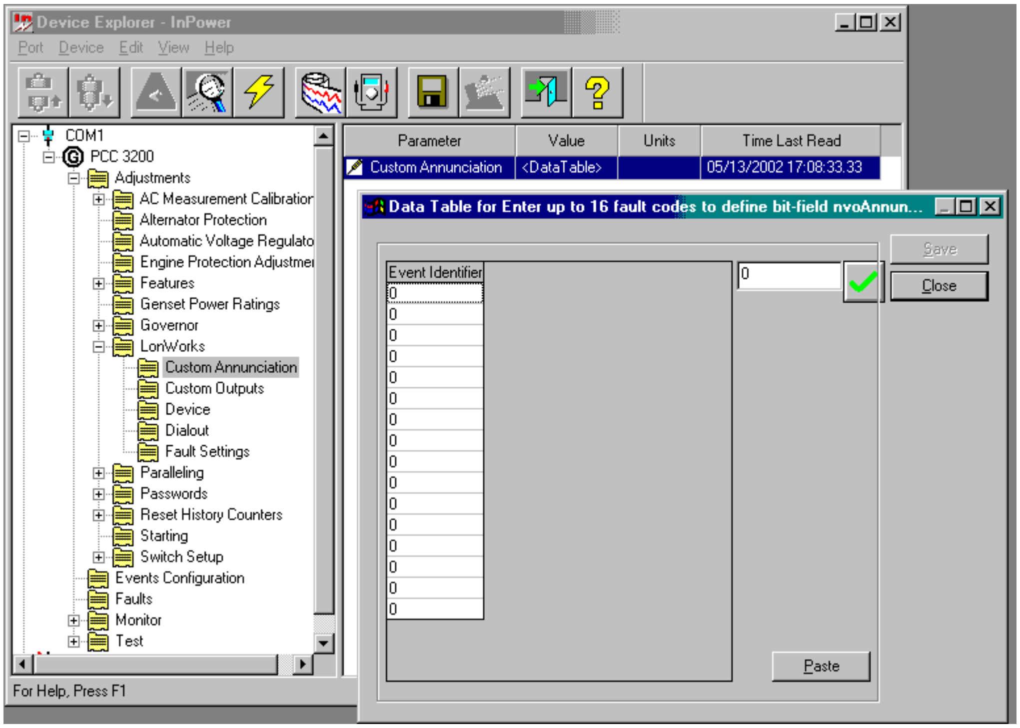


FIGURE 6-2. LONWORKS – PCC 3200 CUSTOM ANNUNCIATION

Custom Annunciation

The Custom Annunciation feature allows the customer to select up to 16 different fault codes to be displayed by an annunciator, when the fault becomes active. A listing of fault codes can be viewed with InPower, by opening the **Events Configuration** folder (Figure 6-7).

The desired fault codes are entered directly into a Data Table (Figure 6-2). Select the **Custom Annunciation** feature and double click on the **Data Table** Value cell. The Data Table will open in a new window.

To enter or edit data in the table, click on the first **Event Identifier** field, then enter the desired fault code number into the edit box, next to the check mark. Click on the check mark to enter the fault code number into the **Event Identifier** table. Repeat this process until all of the desired fault codes have been entered.

Click on the **Save** button, to update the **Data Table** changes. Click on **Close**, when you are finished adding fault codes or making changes.

Click on the **Save Trims** button, on the toolbar, to write the Custom Annunciation Data Table settings to the device. Press the **Reset** button, on the GLC, to download the new data table setting from the base board to the GLC.

The **Paste** button is used to import spreadsheet data from an Excel spreadsheet. This feature is useful for configuring multiple devices with the same event fault codes.

InPower is a trademark of Onan Corporation.
Windows is a registered trademark of Microsoft Corporation.
WinZip is a registered trademark of WinZip Computing, Inc.

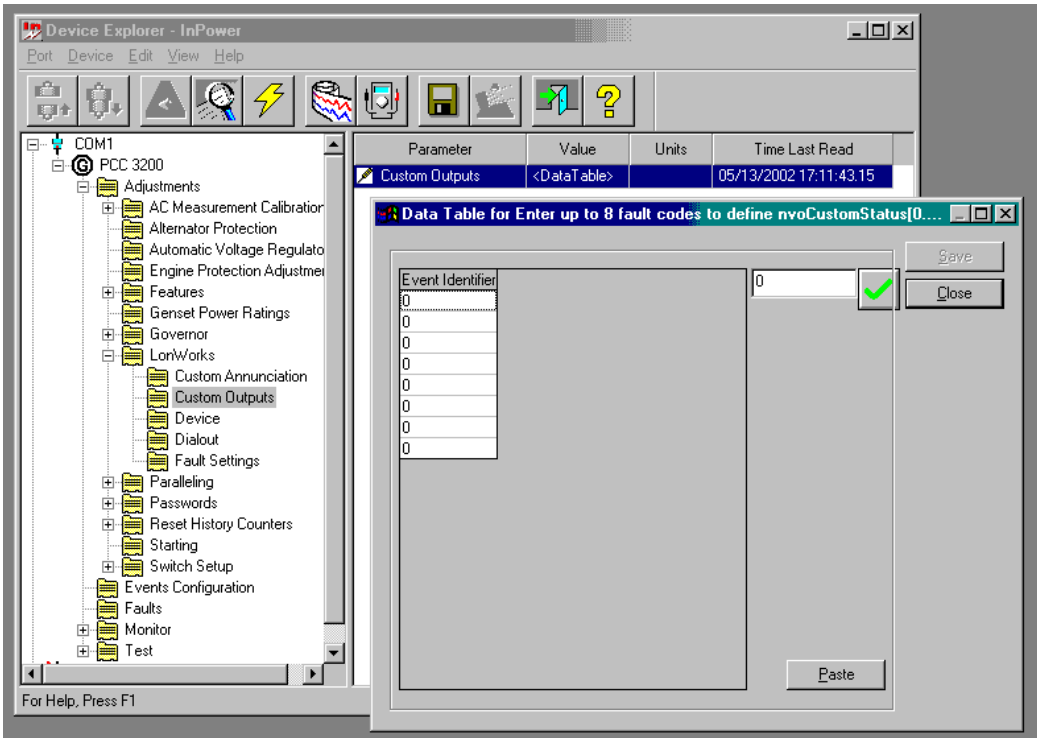


FIGURE 6-3. LONWORKS – PCC 3200 CUSTOM OUTPUTS

Custom Outputs

The Custom Outputs feature allows the customer to send the status of eight events to a Digital Master Control (DMC) or other third party monitoring device when the fault becomes active. (Custom Outputs are not read by PowerCommand for Windows® monitoring software.) A listing of fault codes can be viewed with InPower, by opening the **Events Configuration** folder.

The desired fault codes are entered directly into a Data Table (Figure 6-3). Select the **Custom Outputs** feature and double click on the **Data Table** Value cell. The Data Table will open in a new window.

To enter or edit data in the table, click on the first **Event Identifier** field, then enter the desired fault code number into the edit box, next to the check mark. Click on the check mark to enter the fault code number into the **Event Identifier** table. Repeat this process until all of the desired fault codes have been entered.

Click on the **Save** button, to update the Data Table changes. Click on **Close**, when you are finished adding fault codes or making changes.

Click on the **Save Trims** button, on the toolbar, to write the Custom Output Data Table settings to the device. Press the **Reset** button, on the GLC, to download the new data table settings from the base board to the GLC.

The **Paste** button is used to import spreadsheet value data from an Excel spreadsheet. This feature is useful for configuring multiple devices with the same event fault codes.

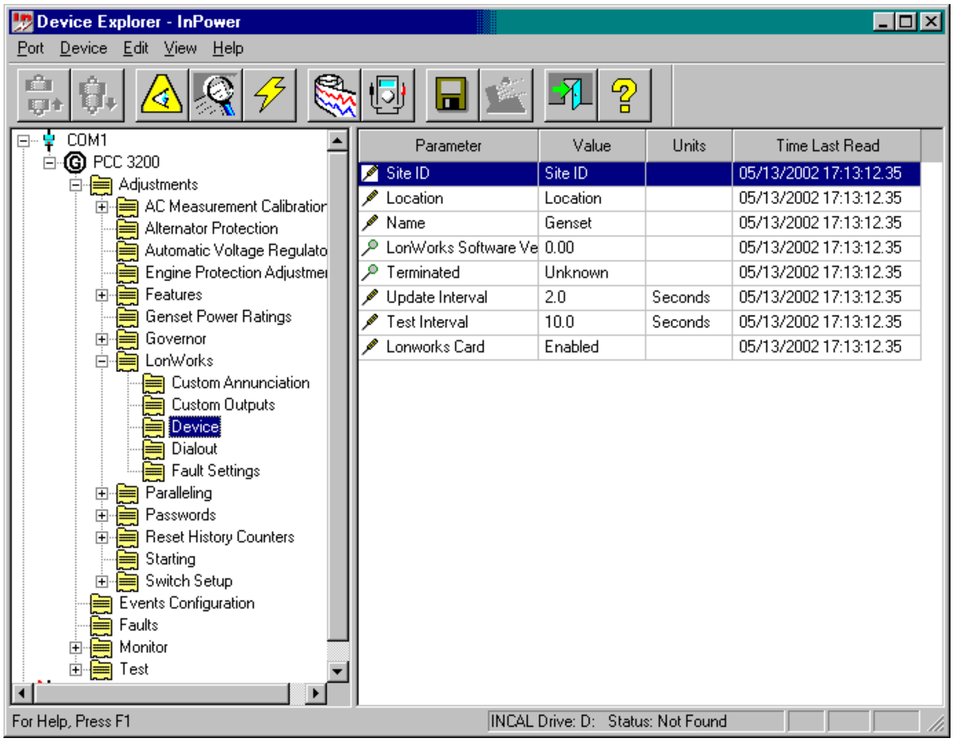


FIGURE 6-4. LONWORKS – PCC 3200 DEVICE

Device

The Device group of parameters (Figure 6-4) allows the user to view and edit several parameters related to the network site, the device and network performance. Use these settings as follows:

Site ID: The **site ID** must consist of no more than seven characters. The characters can only be a combination of upper case letters, numbers and underscores. Use of lower case letters, special characters or spaces will prevent PCW II from recognizing dialed-in alarms. Do not use spaces, special characters or lower case letters in the Site ID.

NOTE: The Site ID name must match the name used in the LonMaker database.

Location: Enter a description for the location of the unit (up to 16 characters).

Name: The device **Name** (tag) is used when sending system data. Provide a different name for each device on the network (up to 8 characters).

NOTE: The device name must match the name used in the LonMaker database.

LonWorks Software Version: Displays the current LonWorks network software version.

Terminated: Displays the network termination switch setting on the network module (the network module must be installed and enabled to be read).

Update Interval: Use to set the send time for analog network variables and the network status check. The default 2 second interval is recommended.

Test Interval: Use to set the send time for the network test interval. The default 10 second interval is recommended.

LonWorks Card: Use to enable the network module. (The network module must be physically installed before the feature can be enabled.)

After making any necessary adjustments, click on the **Save Trims** button, on the toolbar, to write the settings to the device. Press the **Reset** button, on the GLC, to download the new settings from the base board to the GLC.

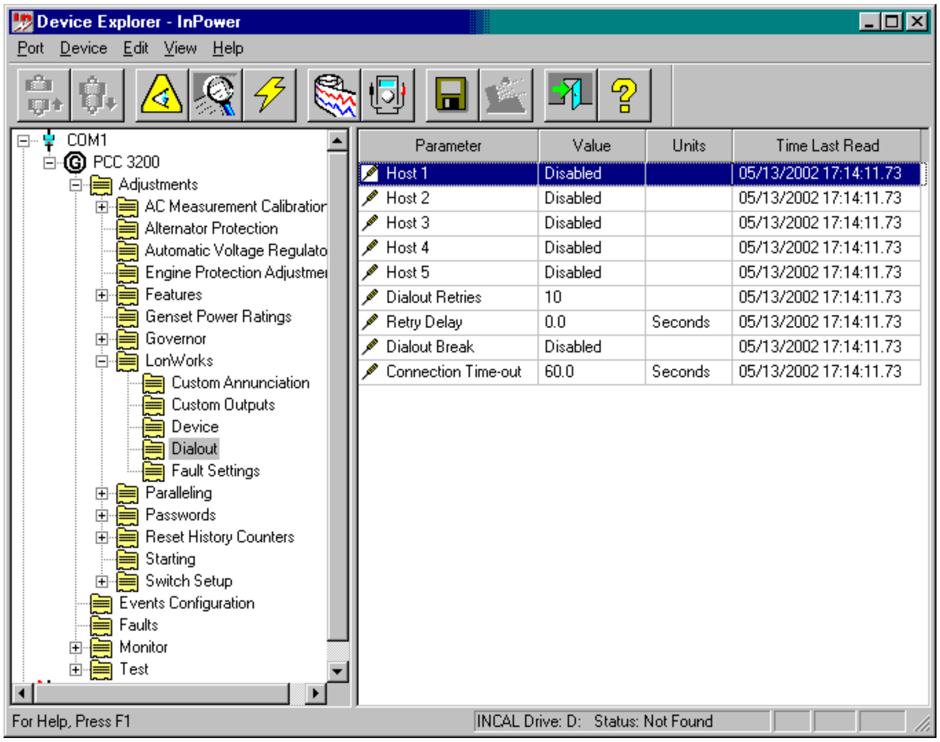


FIGURE 6-5. LONWORKS – PCC 3200 DIALOUT

Dialout

The Dialout group of parameters (Figure 6-5) allows the customer to configure the dialout settings for remote monitoring of devices on the network. Use these settings as follows:

Host 1 thru 5: Enable the number of remote monitoring sites (hosts) that you want to send alarm messages to. Click on the value cell and select **Enabled** from the drop-down list.

NOTE: These host numbers must match the Dial Directory numbers assigned to the phone numbers entered with SLTA Link Manager (see page 7-5).

Dialout Retries: Used to set the number of dialout retries, if the first alarm dialout fails while attempting to deliver a dial out message. The default setting 10, is the recommended setting. A setting of zero, is equal to one attempt.

(Dialout) Retry Delay: Enter the time delay between dialout attempts. The recommended setting is 60 seconds.

Dialout Break: When enabled, this feature breaks a current connection after two minutes in order to complete a dialout.

Connection Timeout: After a dialout command has been sent to the modem, this feature specifies how long to wait for the site to connect to the remote monitoring location. The default setting is 60 seconds.

If the site does not connect with the remote monitoring location, it will dialout to Host 2, Host 3 etc. (if additional hosts are enabled) until it connects. If it still does not connect, it will repeat the process, beginning with Host 1, based on the number of retries that have been set.

After making any necessary adjustments, click on the **Save Trims** button, on the toolbar, to write the settings to the device. Press the **Reset** button, on the GLC, to download the new data from the base board to the GLC.

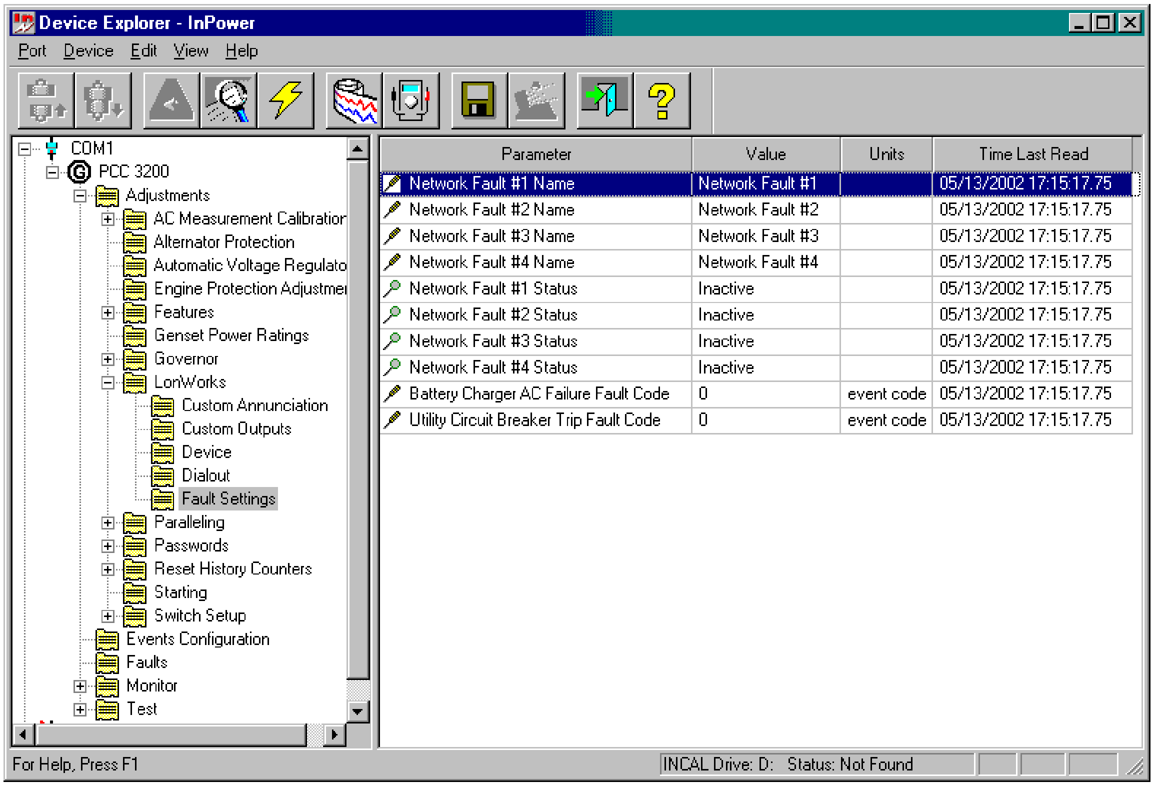


FIGURE 6-6. LONWORKS – PCC 3200 FAULT SETTINGS

Fault Settings

The Fault Settings group (Figure 6-6) allows you to name the network message for Network Faults 1 through 4, and view their status. This feature also allows you to assign a fault code to the Battery Charger AC Failure and S1 Circuit Breaker Trip.

Use these settings as follows:

Network Fault Name 1 thru 4: Allows the user to enter a description for network input faults 1 through 4. Double click the value cell and enter the new description. The new name should define the customer network input such as *Louvers Open* or *Remote Cooling Fan On*. This fault name will be displayed when the network input becomes active.

Network Fault Status 1 thru 4: Displays the current status of the network input fault (Active or Inactive) for each of the four network faults. Use the Refresh button, on the toolbar, to update the value fields.

Battery Charger AC Failure Fault Code: Enter a fault code number for an event related to this fault. As an example, use fault code 1311 or 1312.

Refer to the Event Configuration folder for fault code descriptions.

Utility Circuit Breaker Trip Fault Code: Enter a fault code number for an event related to this fault. As an example, for paralleling applications, use fault code 1317 or 1318.

After making any necessary adjustments, click on the **Save Trims** button, on the toolbar, to write the settings to the device. Press the **Reset** button, on the GLC, to download the new data from the base board to the GLC.

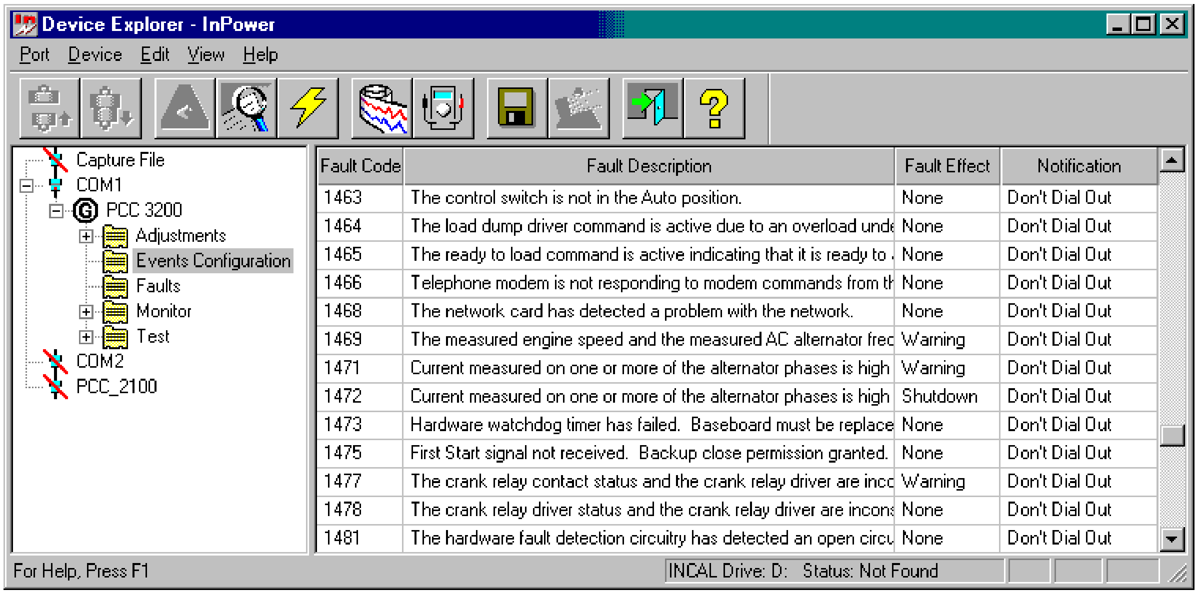


FIGURE 6-7. LONWORKS – PCC 3200 EVENT CONFIGURATION

PCC 3200 Events Configuration

When setting up the network settings for a PCC 3200 control, refer to the **Events Configuration** folder (Figure 6-7).

Review the settings in this parameter group to make sure the desired setting are configured.

To configure a fault to dial out for remote monitoring, go to the **Notification** value field for the fault and double click on the **Notification** value cell, select **Dial Out** from the drop-down list. If a fault code is not set to dial out, it will not show up in remote monitoring software or in PCW II connected locally.

After making any necessary adjustments, click on the **Save Trims** button, on the toolbar, to write the settings to the device. Press the **Reset** button, on the GLC, to download the new data from the base board to the GLC.

PCC 2100

Start InPower and connect to the port (COM1, COM2, etc.) that matches the COM port on the service PC, that is being used for the PCC 2100 genset connection.

Open the **Adjustments** folder, and then the **LonWorks** folder (Figure 6-8). The following group of parameters are available for network configuration:

- Custom Annunciation
- Customer Outputs
- Device
- Dialout
- Fault Settings

This section describes how to use each of the parameter groups, in the PCC 2100 LonWorks directory. Press the **Reset** button on the NCM, after saving changes to the PCC 2100, to write the changes from the base board to the NCM.

Custom Annunciation

The Custom Annunciation feature allows the customer to select up to 16 different fault codes to be displayed by an annunciator when the fault becomes active. A listing of fault codes can be viewed with InPower, in the **Fault Settings** folder (Figure 6-12).

The desired fault codes are entered directly into a Data Table (Figure 6-8). Select the **Custom Annunciation** feature and double click on the **Data Table** Value cell. The Data Table will open in a new window.

To enter or edit data in the table, click on the first **Event Identifier** field, then enter the desired fault code number into the edit box, next to the check mark. Click on the check mark to enter the fault code number into the **Event Identifier** table. Repeat this process until all of the desired fault codes have been entered.

Click on the **Save** button, to update the **Data Table** changes. Click on **Close**, when you are finished adding fault codes or making changes.

Click on the **Save Trims** button, on the toolbar, to write the Custom Annunciation Data Table settings to the device. Press the **Reset** button, on the NCM, to download the new data table settings from the base board to the NCM.

The **Paste** button is used to import spreadsheet value data from an Excel spreadsheet. This feature is useful for configuring multiple devices with the same event fault codes.

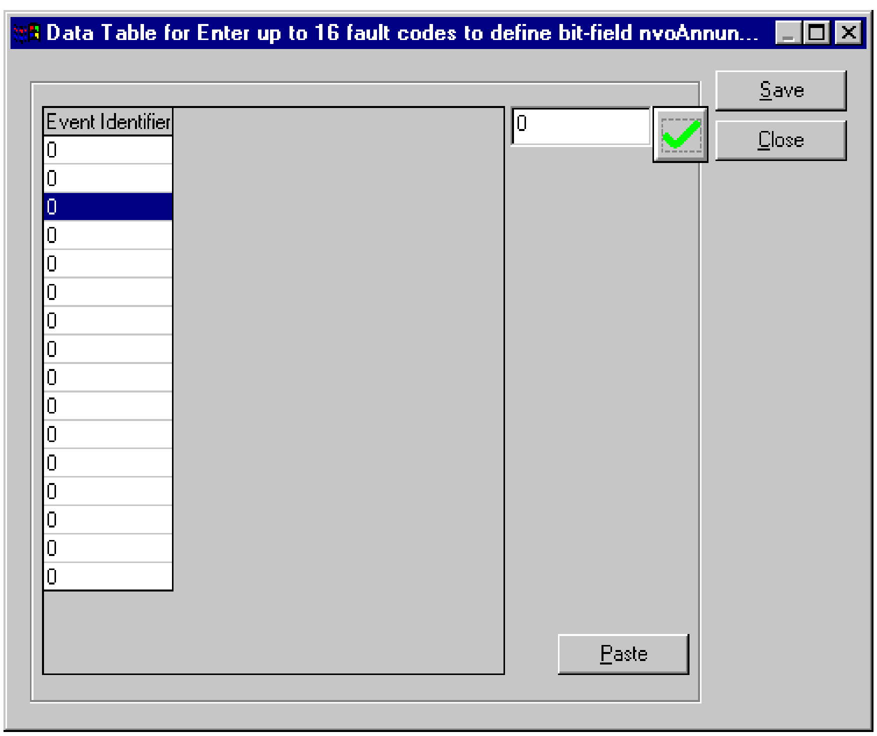


FIGURE 6-8. LONWORKS – PCC 2100 CUSTOM ANNUNCIATION

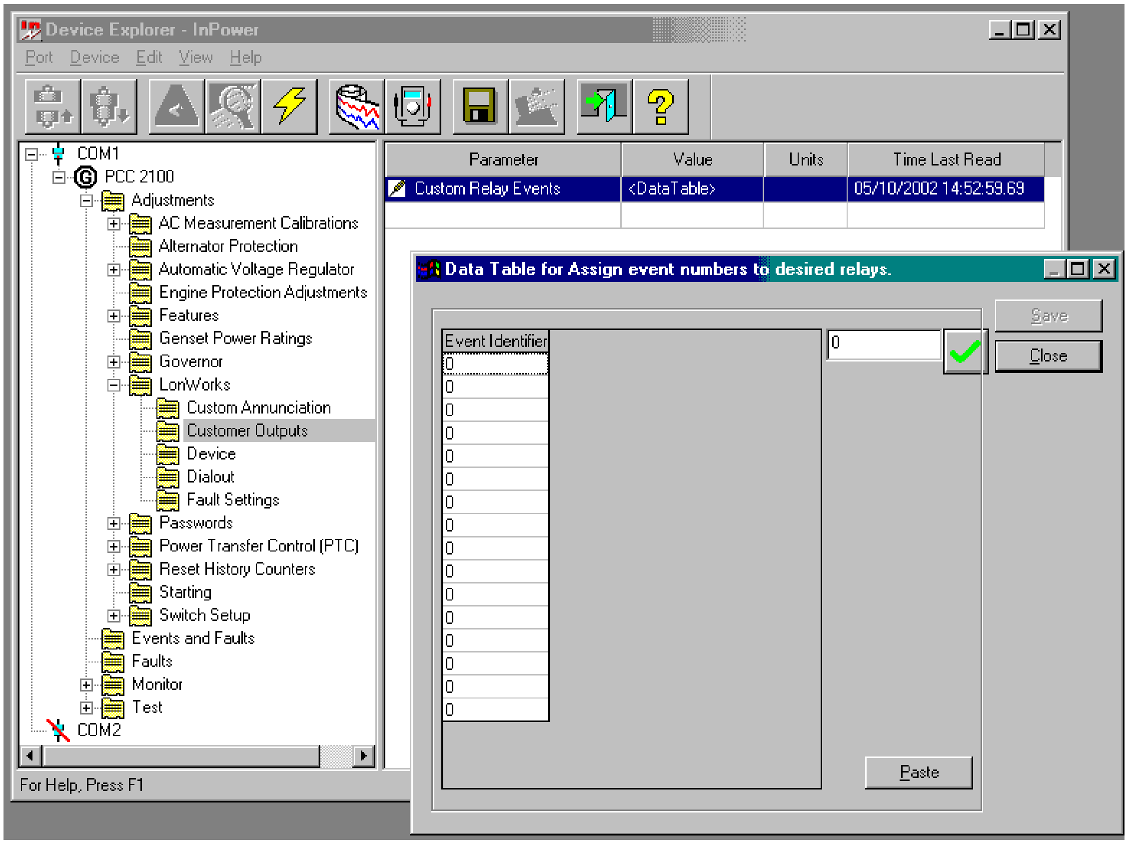


FIGURE 6-9. LONWORKS – PCC 2100 CUSTOM RELAY EVENTS

Custom Relay Events

The Custom Relay Events feature allows the customer to enter up to 16 fault codes that will actuate a corresponding relay on the optional Digital I/O Module. When the selected fault becomes active, the corresponding relay will energize, and remain energized until the fault becomes inactive.

A listing of fault codes can be viewed with InPower, in the **Fault Settings** folder.

The fault codes are entered directly into a Data Table (Figure 6-9). Select the **Custom Relay Events** feature and double click on the **Data Table** Value cell. The Data Table will open in a new window.

To enter or edit data in the table, click on the first **Event Identifier** field, then enter the desired fault code number into the edit box, next to the check mark. Click on the check mark to enter the fault code number into the **Event Identifier** table. Repeat this process until all of the desired fault codes have been entered.

Click on the **Save** button, to update the Data Table changes. Click on **Close**, when you are finished adding fault codes or making changes.

Click on the **Save Trims** button, on the toolbar, to write the Custom Annunciation Data Table settings to the device. Press the **Reset** button, on the NCM, to download the new data table settings from the base board to the NCM.

The **Paste** button is used to import spreadsheet value data from an Excel spreadsheet. This feature is useful for configuring multiple devices with the same event fault codes.

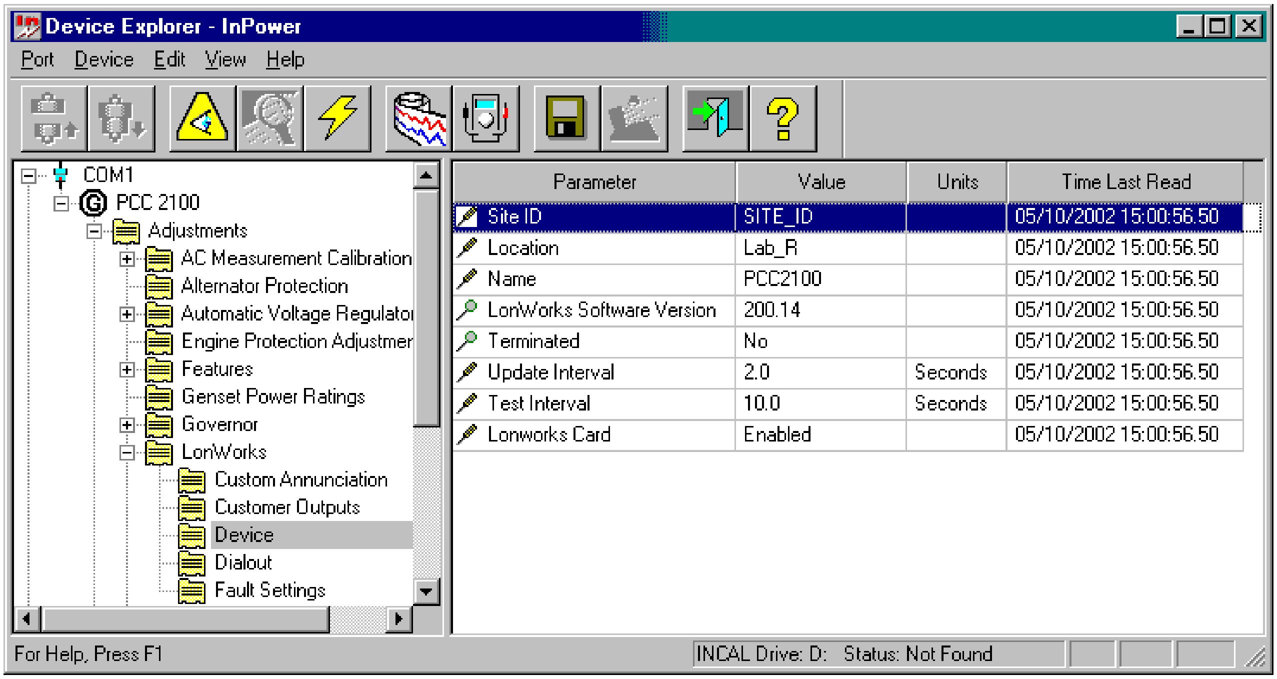


FIGURE 6-10. LONWORKS – PCC 2100 DEVICE

Device

The Device group of parameters allows the user view and edit several parameters related to the network site, the device and network performance. Use these settings as follows:

Site ID: The **site ID** must consist of no more than seven characters. The characters can only be a combination of upper case letters, numbers and underscores. Use of lower case letters, special characters, or spaces will prevent PCW II from recognizing dialed-in alarms. Do not use spaces, special characters, or lower case letters in the Site ID.

NOTE: The Site ID name must match the name used in the LonMaker database.

Location: Enter a description for the location of the unit (up to 16 characters).

Name: The device **Name** (tag) is used when sending system data. Provide a different name for each device on the network (up to 8 characters).

NOTE: The device name must match the name used in the LonMaker database.

Terminated: Displays the network termination switch setting on the network module (the network module must be installed and enabled to be read).

Update Interval: Use to set the send time for analog network variables and the network status check. The default 2 second interval is recommended.

Test Interval: Use to set the send time for the network test interval. The default 10 second interval is recommended.

LonWorks Card: Use to disable the network feature after the network module has been removed.

After making any necessary adjustments, click on the **Save Trims** button, on the toolbar, to write the settings to the device. Press the **Reset** button, on the NCM, to download the new data from the base board to the NCM.

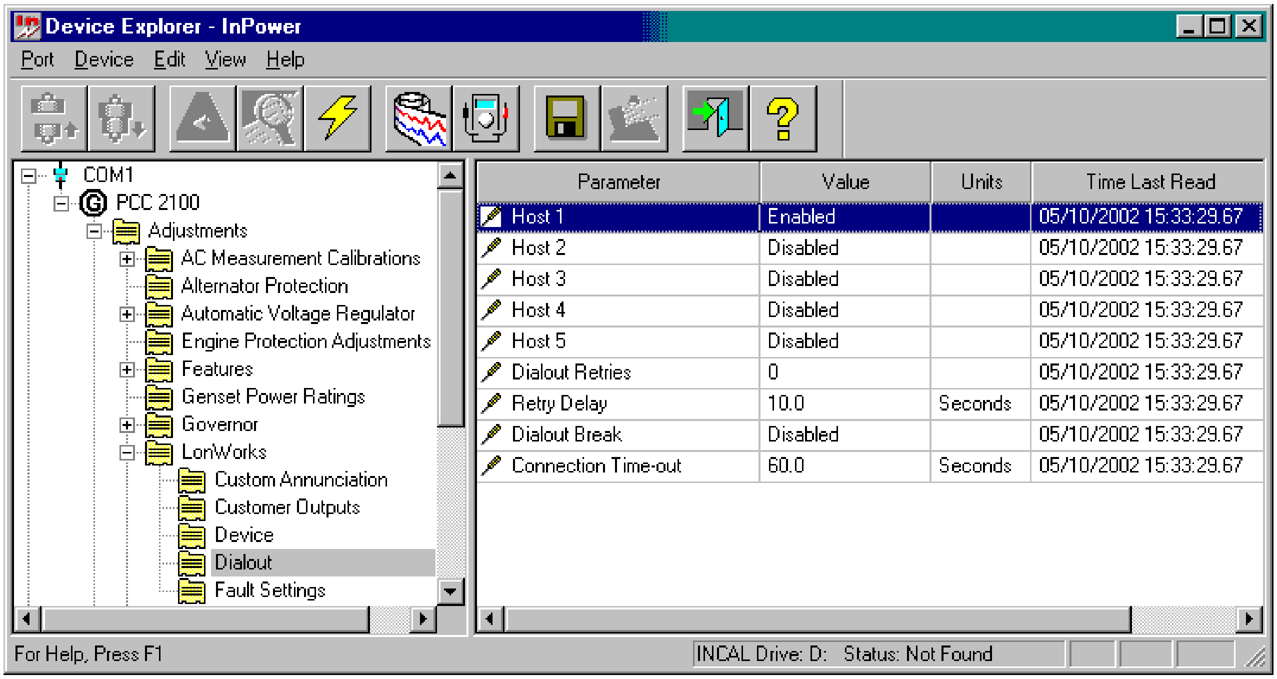


FIGURE 6-11. LONWORKS – PCC 2100 DIALOUT

Dialout

The Dialout group of parameters (Figure 6-11) allows the customer to configure the dialout settings for remote monitoring of devices on the network. Use these settings as follows:

Host 1 thru 5: Enable the number of remote monitoring sites (hosts) that you want to send alarm messages to. Click on the value cell and select **Enabled** from the drop-down list.

NOTE: These host numbers must match the Dial Directory numbers assigned to the phone numbers entered with SLTA Link Manager (see page 7-5).

Dialout Retries: Used to set the number of dialout retries, if the first alarm dialout fails while attempting to deliver a dial out message. The default setting 10, is the recommended setting. A setting of zero, is equal to one attempt.

Retry Delay: Enter the time delay between dialout attempts. The the recommended setting is 60 seconds.

Dialout Break: When enabled, this feature breaks a current connection after two minutes in order to complete a dialout.

Connection Timeout: After a dialout command has been sent to the modem, this feature specifies how long to wait for the site to connect to the remote monitoring location. The default setting is 60 seconds.

If the site does not connect with the remote monitoring location, it will dialout to Host 2, Host 3 etc. (if additional hosts are enabled) until it connects. If it still does not connect, it will repeat the process, beginning with Host 1, based on the number of retries that have been set.

After making any necessary adjustments, click on the **Save Trims** button, on the toolbar, to write the settings to the device. Press the **Reset** button, on the NCM, to download the new data from the base board to the NCM.

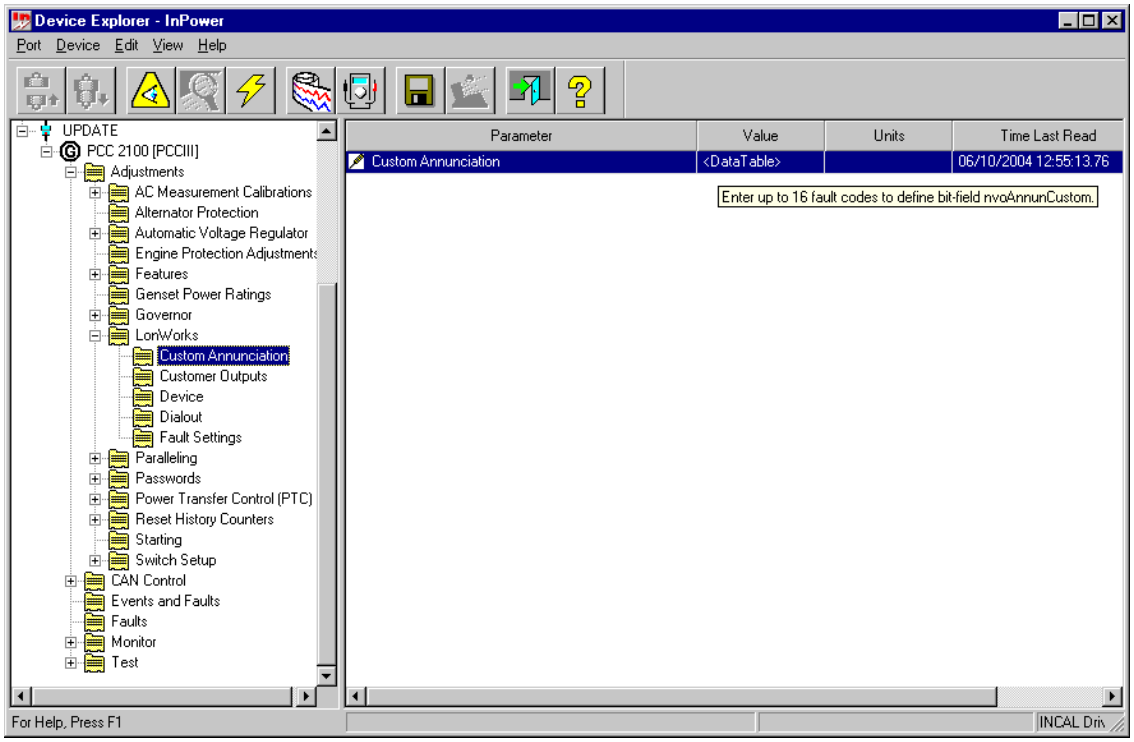


FIGURE 6-12. LONWORKS – PCC 2100 FAULT SETTINGS

Fault Settings

The Fault Settings group (Figure 6-12) allows you to name the network input message (event name) for Network Inputs 1 through 8, and view their status. This feature also allows you to assign a fault code to the Battery Charger AC Failure and S1 Circuit Breaker Trip.

Use these settings as follows:

Network Input Status (1–8): Displays the current status of the fault (Active or Inactive) in the Value field for each of the eight network inputs. Use the **Refresh** button, on the toolbar, to update the value fields.

Network Input Event Name (1–8): Allows the user to enter a description for network input 1 through 8. Double click the value cell and enter the new description. The new name should define the customer network input such as *Louvers Open* or *Remote Cooling Fan On*. This event name will be displayed when the network input becomes active.

Battery Charger AC Failure Fault Code: Enter a fault code number for an event related to this fault. As an example for genset use fault code 1311 or 1312.

Refer to the Events and Faults folder for fault code descriptions.

Utility Circuit Breaker Trip Fault Code: Enter a fault code number for an event related to this fault. As an example for paralleling use fault code 1317 or 1318.

After making any necessary adjustments, click on the **Save Trims** button, on the toolbar, to write the settings to the device. Press the **Reset** button, on the NCM, to download the new data from the base board to the NCM.

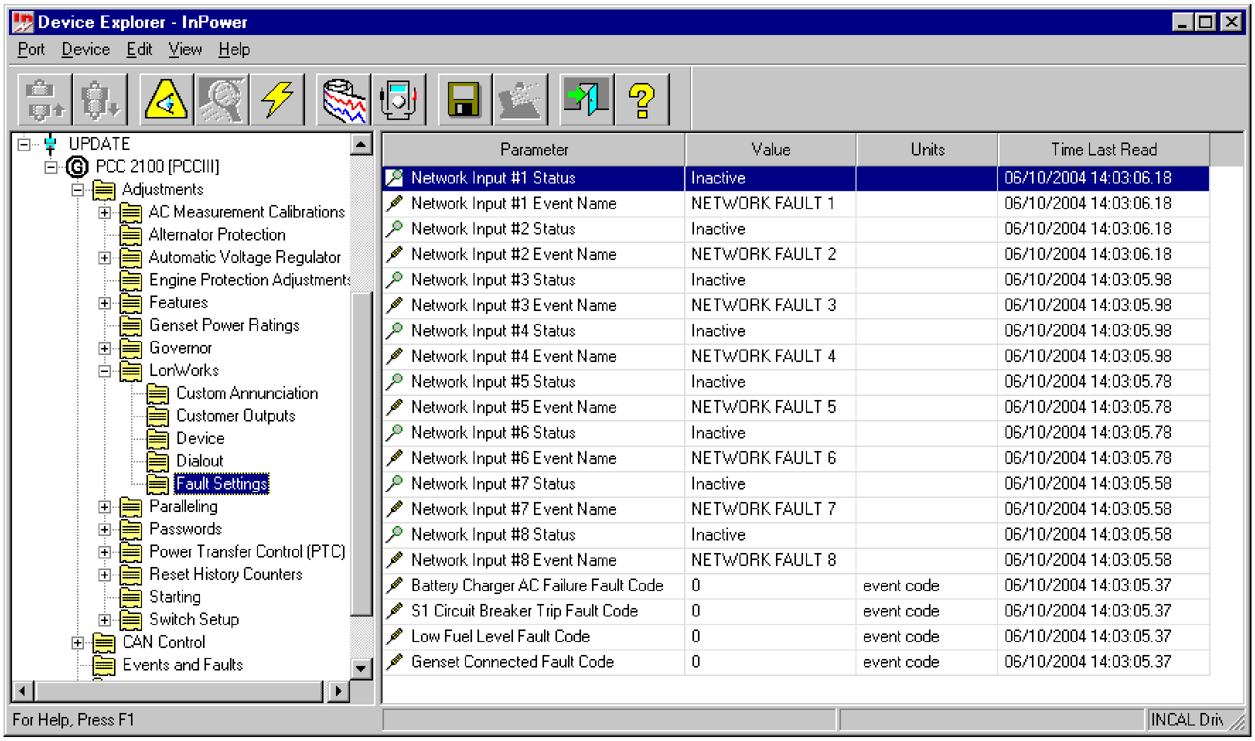


FIGURE 6-13. PCC 2100 EVENTS AND FAULTS

PCC 2100 Events and Faults Configuration

When setting up the network settings for a PCC 2100 control, refer to the **Events and Faults** folder (Figure 6-13).

The last columns allows the user to Bypass (disable) the notification (Dial Out). This feature allows the user to eliminate nuisance event messages by setting the Bypass value to **Enabled**. Some events may not be bypassed, like Overspeed and Speed Governor Signal.

Review the settings in this parameter group to make sure the desired setting are configured.

To configure a fault to dial out for remote monitoring, go to the **Notification** value field for the fault and double click on the **Notification** value cell, select **Dial Out** from the drop-down list.

After making any necessary adjustments, click on the **Save Trims** button, on the toolbar, to write the settings to the device. Press the **Reset** button, on the NCM, to download the new data from the base board to the NCM.

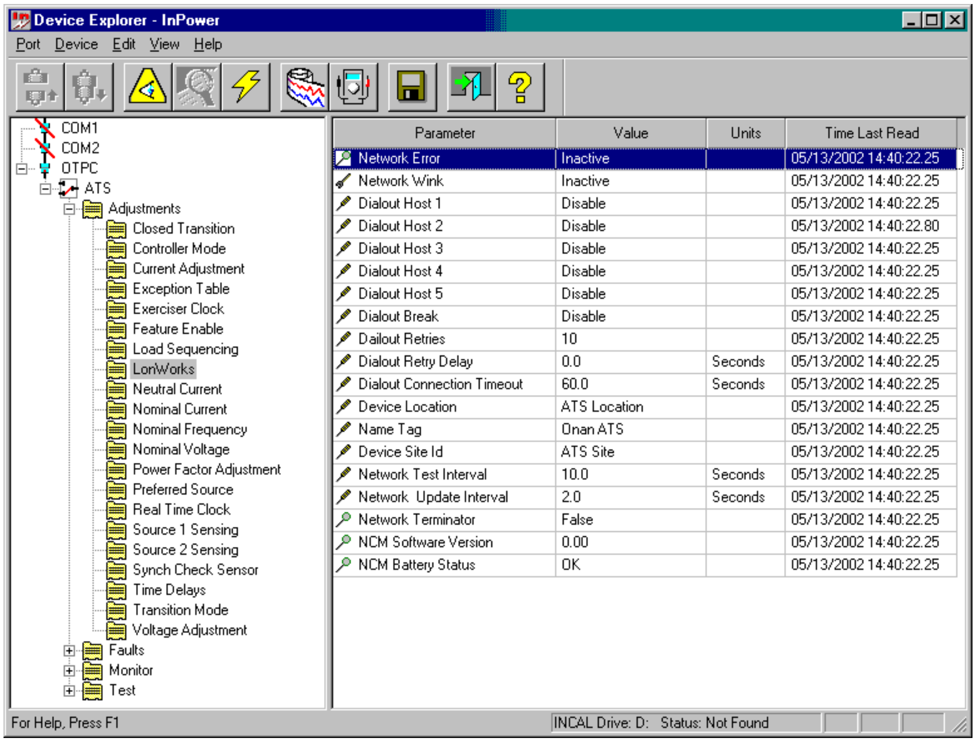


FIGURE 6-14. LONWORKS – PC ATS

PC ATS

The **LonWorks** directory for a typical PowerCommand transfer switch (PC ATS) contains all of the network settings within one folder. (To enable the network feature, use the **Feature Enable** folder, in the Adjustments directory.)

Press the **Reset** button on the NCM, after saving changes to the PC ATS NCM, to write the changes from the base board to the NCM.

Start InPower and connect to the port (COM1, COM2, etc.) that matches the COM port on the service PC, that is being used for the PC ATS connection.

Open the **Adjustments** folder, and then the **LonWorks** folder (Figure 6-14). This section describes how to use each of the parameter groups, in the LonWorks directory.

Network Error: Displays the current status of the Network Error fault (Active or Inactive) in the Value field. The Network Error fault signifies that the network is not working when the fault is active. Use the **Refresh** button, on the toolbar, to update the value fields.

Network Wink: Use this feature to test a network module. Click on the Value cell and select **Active** to send a test signal to the device. The service led will wink when the message is received, indicating that the network connection and the network module are working.

Host 1 thru 5: Enable the number of remote monitoring sites (hosts) that you want to send alarm messages to. Click on the value cell and select **Enable** from the drop-down list.

NOTE: These host numbers must match the Dial Directory numbers assigned to the phone numbers entered with SLTA Link Manager (see page 7-5).

Dialout Break: When enabled, this feature breaks the connection after two minutes in order to complete a dial out.

Dialout Retries: Used to set the number of dialout retries, if the first alarm dialout fails while attempting to deliver a dial out message. The default setting 10, is the recommended setting. A setting of zero, is equal to one attempt.

Dialout Retry Delay: Enter the time delay between dialout attempts. The recommended setting is 60 seconds.

Connection Timeout: After a dialout command has been sent to the modem, this feature specifies how long to wait for the site to connect to the remote monitoring location. The default setting is 60 seconds.

If the site does not connect with the remote monitoring location, it will dialout to Host 2, Host 3 etc. (if additional hosts are enabled) until it connects. If it still does not connect, it will repeat the process, beginning with Host 1, based on the number of retries that have been set.

Device Location: Enter a description for the location of the unit (up to 16 characters).

NameTag: The device **Name Tag** is used when sending system data. Provide a different name for each device on the network (up to 8 characters).

NOTE: The device name must match the name used in the LonMaker database.

Device Site ID: The **site ID** must consist of no more than seven characters. The characters can only be a combination of upper case letters, numbers and underscores. Use of lower case letters, special characters, or spaces will prevent PCW II from recognizing dialed-in alarms. Do not use spaces, special characters, or lower case letters for the Device Site ID.

NOTE: The Site ID name must match the name used in the LonMaker database.

Network Test Interval: Use to set the send time for the network test interval. The default 10 second interval is recommended.

Network Update Interval: Use to set the send time for the network message updates. The default 2 second interval is recommended.

Network Terminator: Displays the network termination switch setting on the network module (the network module must be connected and enabled to be read).

NCM Software Version: Displays the current network software version installed in the network module (NCM).

NCM Battery Status: Displays the status (condition) of the batteries suppling voltage to the network module (NCM).

NOTE: These batteries are no longer included on current production ATS NCMs.

After making any necessary adjustments, click on the **Save Trims** button, on the toolbar, to write the settings to the device. Press the **Reset** button, on the NCM, to download the new data from the base board to the NCM.

PCC ATS Event Configuration

When setting up the network settings for a transfer switch, refer to the **Event Configuration** folder, in the **Faults** directory (Figure 6-15).

Review the last three columns of value settings. Dailout Active needs to be set to **True**, before an event will dial out when it goes active. The Dailout Inactive must be set to **True**, to dial out when the event goes Inactive.

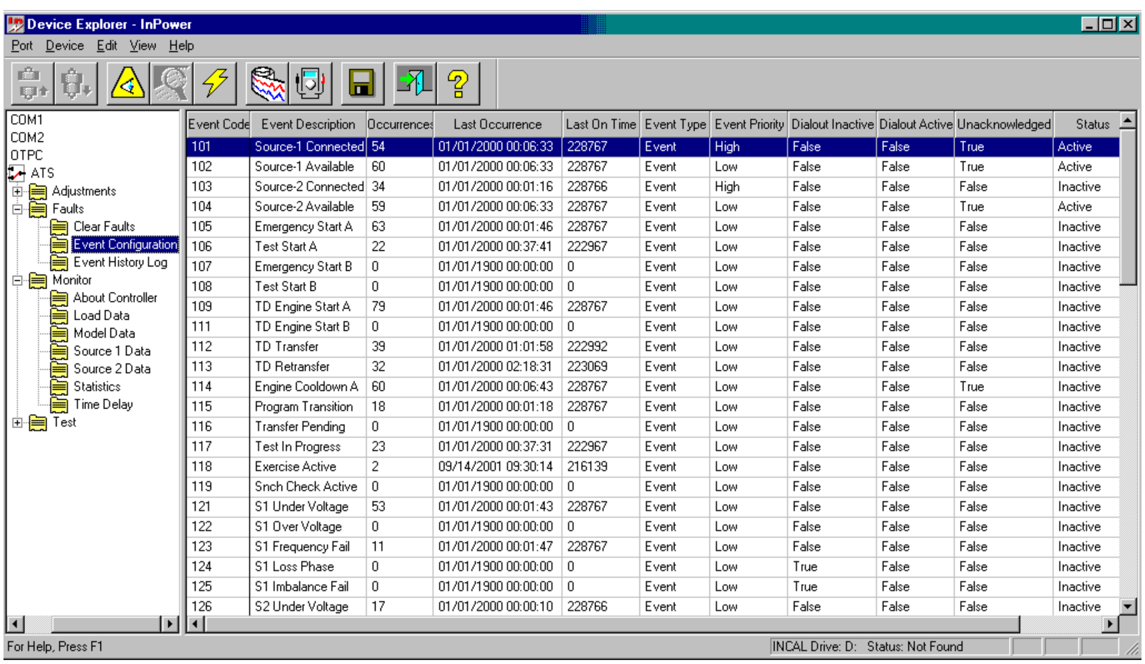


FIGURE 6-15. FAULTS – EVENT CONFIGURATION – PCC ATS

NETWORK CONNECTION SETUP

InPower, beginning with version 3.0, can configure devices over an FT-10 network. The service PC must be setup for connecting to a network and the network must be commissioned and operating.

The service PC must have LonMaker for Windows version 3.1 installed. This program is available from Echelon. The service PC will need a gateway driver (either PCC-10 or SLTA-10, depending on the device being used). Also, a copy of the network site database must be obtained from the network, and installed on the service PC.

This section covers the required service PC setup steps for local and remote network connections.

Familiarity with LonMaker for Windows and the SLTA Link Manager program would be helpful for creating a backup of the network site database and for troubleshooting connection problems. This experience can be gained thorough LonMaker for Windows training and from PGA FT-10 Networks training.

Install LonMaker for Windows software on the service PC following the instructions provided by Echelon.

Gateway Driver Installation and Setup

If the network gateway driver, has not already been installed, follow these instructions:

A copy of the SLTA-10 gateway driver is included on the LonMaker for Windows CD. Gateway drivers are also available from the Echelon web site at (www.echelon.com). Install the driver that matches the gateway device type that will be used to connect to the network.

Most applications will use either an SLTA-10 external gateway, or a PCC-10 gateway card, in the service PC.

In this example the SLTA-10 installation and setup will be described.

1. Locate the SLTA-10 gateway driver on the CD, double click on the **slta10....exe** file to begin the driver installation.
2. From the Setup window, select **Next** to view the license agreement.
3. Review the license agreement and select **Yes,** to accept the terms of the agreement.
4. In the Choose Destination Location window, select **Next**, to use the default destination (recommended).
5. In the Select Program Folder window, select **Next** to create the program folder.
6. Select **No** to the option of accessing the file from DOS.
7. Click on the **Finish** button to complete the installation setup.

Gateway Settings

Launch the SLTALink Manager from the **Start** menu (or the taskbar icon). Click on the **Link** menu and select **New**.

Local Setup: For a local network application, enter a name and type for the link, Name: **LocalSLTALON1**. **To operate correctly, the name must be entered exactly as shown.** Click on the **Local** button, click on the Update Identifier box to select it, then click on **Next** (Figure 6-16).

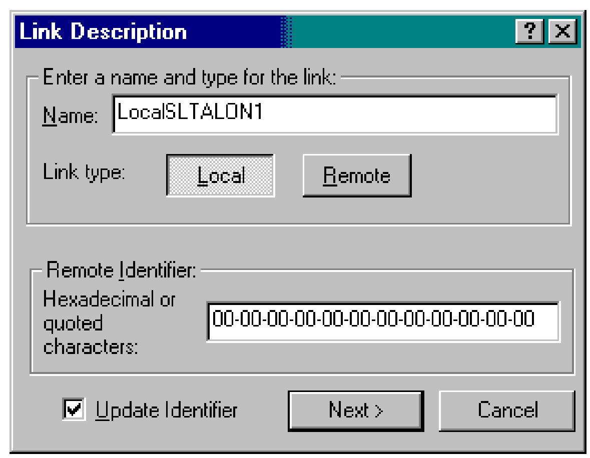


FIGURE 6-16. SLTA LOCAL SETUP

Use the **Serial Port** drop-down arrow to select the serial port that the SLTA is attached to on the monitoring PC. Use the **Speed** drop-down arrow to select **38400** as the communication speed, click on **Next** to continue (Figure 6-17).

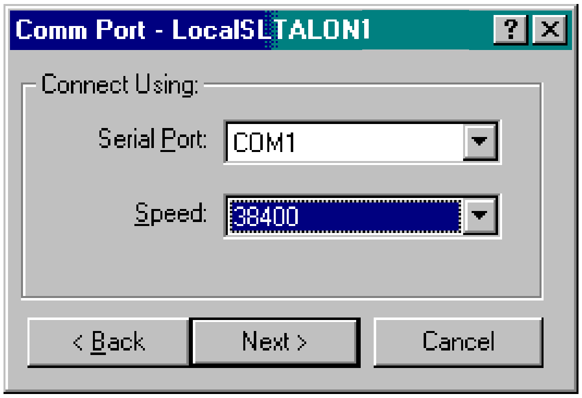


FIGURE 6-17. SLTA SETUP SPEED

Remote Setup: For a remote network application, enter a name and type for the link, **Name: RemoteSLTALON1** and click on the **Remote** button. **To operate correctly, the name must be entered exactly as shown.** Enter the network site name in single quotes. Click on the **Update Identifier** box to select it, then click on **Next** (Figure 6-18).

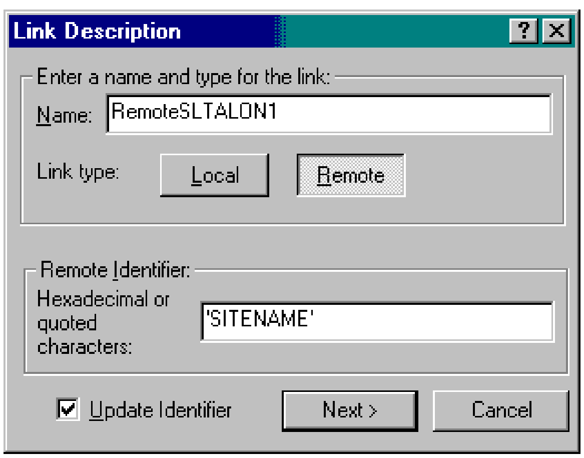


FIGURE 6-18. SLTA REMOTE SETUP

Use the Dialing Address dialog to enter the area code (if applicable) and phone number of the phone line that is connected to the modem at the remote site (Figure 6-19). Skip the Configure Line setting, connection speed will be set automatically. Click on the **Next** button and then the **Finish** button to complete the setup.

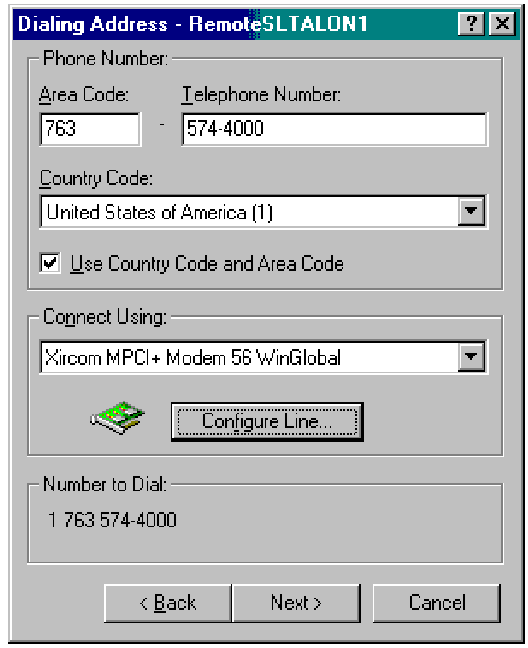


FIGURE 6-19. SLTA REMOTE DIALING ADDRESS

Alarm Settings

After making the initial local or remote gateway settings, a Link Properties dialog box is displayed. This feature is used to setup the gateway for delivering alarms.

Setup the Command Line by clicking on the **Browse** button. Navigate to and select the a file named **PostEchBvAlarm.exe**. This file is located in the following directory:

C:\Program files\common files\cummins shared\power generation

Double click on each folder, beginning with the Program Files folder, until you reach the **PostEchBvAlarm.exe** file. Double click on this file, and the directory path and file will be added to the **Command Line**.

The **Command Line** needs to be appended with additional instructions. Refer to Figure 6-20. Click inside the **Command Line** and use the right arrow key, to reach the end of the Command Line. Enter the following text, including spaces, enter a space before the first percent symbol:

%id% %LINKNAME%

Click on **Finish**, to complete the Link Properties settings.

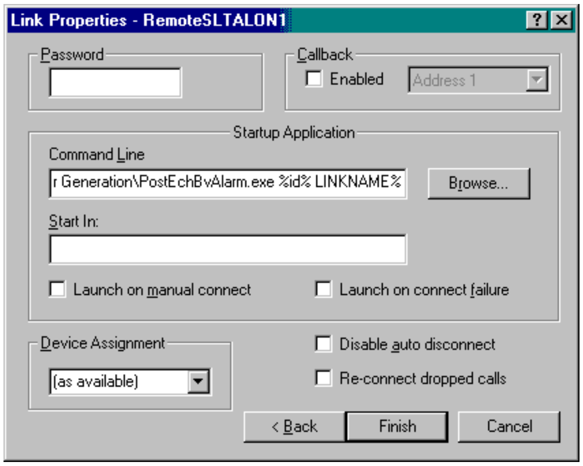


FIGURE 6-20. SLTA LINK PROPERTIES

Importing the Network Site Database

The network site database is created by the network installer. A backup copy of the database can be created from the PC used to install the network. Use the LonMaker for Windows **Backup** feature, with the **Backup Database** selection. LonMaker for Windows creates the backup copy of the network site, as a compressed (ZIP) file.

NOTE: To monitor the site with PowerCommand Software for Windows II (PCW II), the network name (site ID) must consist of no more than seven characters. The characters can only be upper case letters, numbers, and underscores. The name must start with an upper case letter. The use of lower case letters, special characters, and spaces will prevent PCW II from recognizing dial-in alarms from the site.

NOTE: Device names in network applications must consist of no more than eight characters. The characters can only be upper case letters. Use of lower case letters, special characters, numbers, and spaces will prevent PCW II from recognizing the device name in an alarm message.

NOTE: If the customer's PC does not have WinZip, create a self-extracting executable file from the site backup file using a PC that does have WinZip. The executable file can then be run on the customer's PC to import the database.

Obtain the network site database from the network installer. If the site database is not available, and you are able to connect to the network site with Lonmaker for Windows, use the **Recover Database from Network** selection, displayed after selecting **New Network**.

The site backup database file is usually small enough to be transferred to a floppy disk. Locate the site backup file (***sitename*.zip**) using Windows Explorer. Double click on the file to launch the **WinZip** utility.

Extract the file to the root directory where LonMaker for Windows is installed (typically C:\). Click on the User Folder Names check box in the Extract dialog (see Figure 6-21) to maintain the correct directory structure. When finished extracting the file, close the WinZip® program and close Windows Explorer.

NOTE: In applications where the site will be monitored by both a local PC and a remote PC, two unique copies of the network site database is required. The network site database file names will be the same, but one file should be identified for use on the local PC and the other files should be identified for use on the remote PC.

Import the network site database file that matches the InPower application.

When finished extracting the file, close the WinZip program and close Windows Explorer.

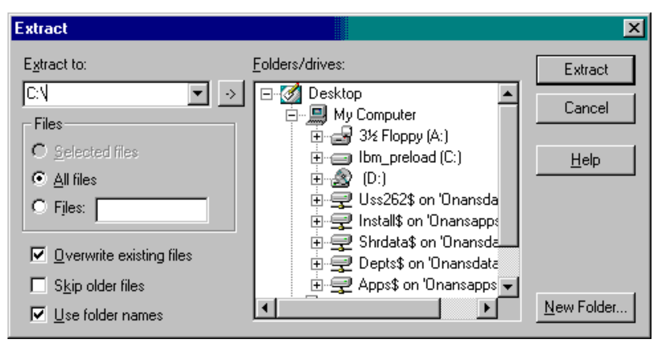


FIGURE 6-21. WINZIP EXTRACT DIALOG BOX

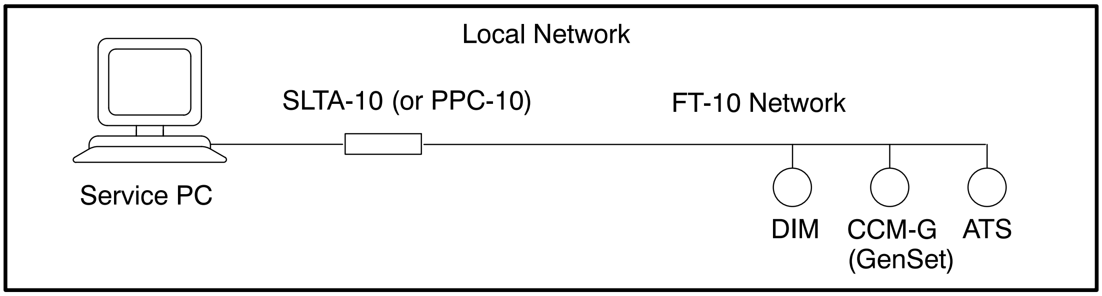


FIGURE 6-22. TYPICAL LOCAL NETWORK CONNECTION SETUP

Local Network Site Setup

The following procedures describe how to setup InPower for local communication.

The **Setup** feature is accessed from the **Start** menu by clicking on the **Power Generation – InPower** program group. Click on **Setup**, to launch the Setup dialog.

In this example the user will define a new site for a local network application.

Site Setup

Click on the **Site Setup** tab to access the **Site Setup** dialog. Click on the **Add** button, to display the **Create Site** dialog (Figure 6-23).

Create Site

Enter the following information in the dialog to create a new local site:

Site Type – Select **Network** from the drop down list.

Network – Use the drop-down list and select the name for the network you want to connect to. (If the network name is not present in the drop-down list, cancel the setup and return to the section on Importing the Network Site Database, in this section.)

Site Name – Enter the name as it appears in the preceding **Network** name.

Location – Enter **Local,** from the drop-down list.

SLTA Password: This feature is typically not used. If the SLTA has a password, enter it here.

Click on the **OK** button to save the new site. This establishes the site, in network applications it is not necessary to create devices for the site because the devices that are at the site are imported from the network database.

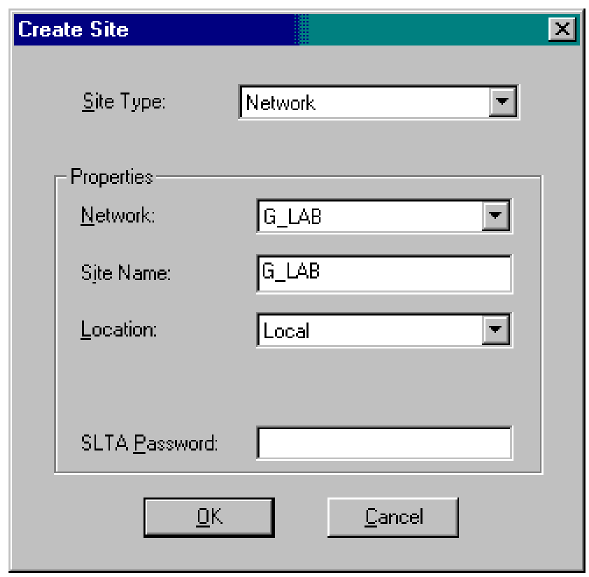


FIGURE 6-23. CREATE SITE DIALOG

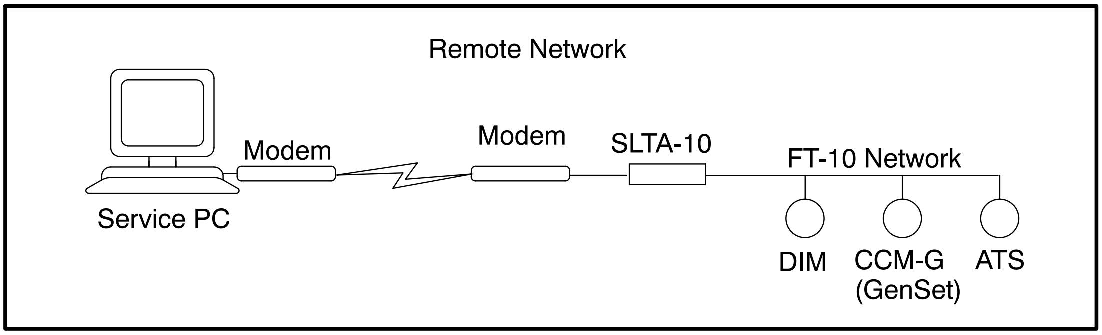


FIGURE 6-24. TYPICAL REMOTE NETWORK CONNECTION SETUP

Remote Network Site Setup

The following procedures describe how to setup In-Power for remote communication.

The **Setup** feature is accessed from the **Start** menu by clicking on the **Power Generation – InPower** program group. Click on **Setup**, to launch the Setup dialog.

In this example the user will define a new site for a remote network application.

NOTE: If the device times out when delivering an alarm via a remote network, use LonMaker to open the device's Plug-In and increase the time delay (see *Section 5*).

Site Setup

Click on the **Site Setup** tab to access the **Site Setup** dialog. Click on the **Add** button, to display the **Create Site** dialog (Figure 6-25).

Create Site

Enter the following information in the dialog to create a new remote site:

Site Type – Select **Network** from the drop down list.

Network – Use the drop-down list and select the name for the network you want to connect to. (IF the network name is not present in the drop-down list, cancel the setup and return to the section on Importing the Network Site Database, in this section.)

Site Name – Enter the name as it appears in the preceding **Network** name.

Location – Enter **Remote,** from the drop-down list.

Telephone Number: Enter the telephone number of the phone line connected to the modem at the site location.

SLTA Password: This feature is typically not used. If the SLTA has a password, enter it here.

Click on the **OK** button to save the new site. This establishes the site, in network applications it is not necessary to create devices for the site because the devices that are at the site are imported from the network database.

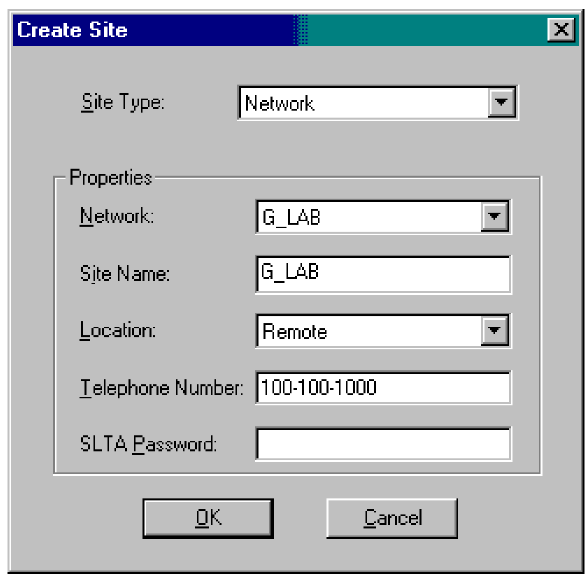


FIGURE 6-25. CREATE SITE DIALOG

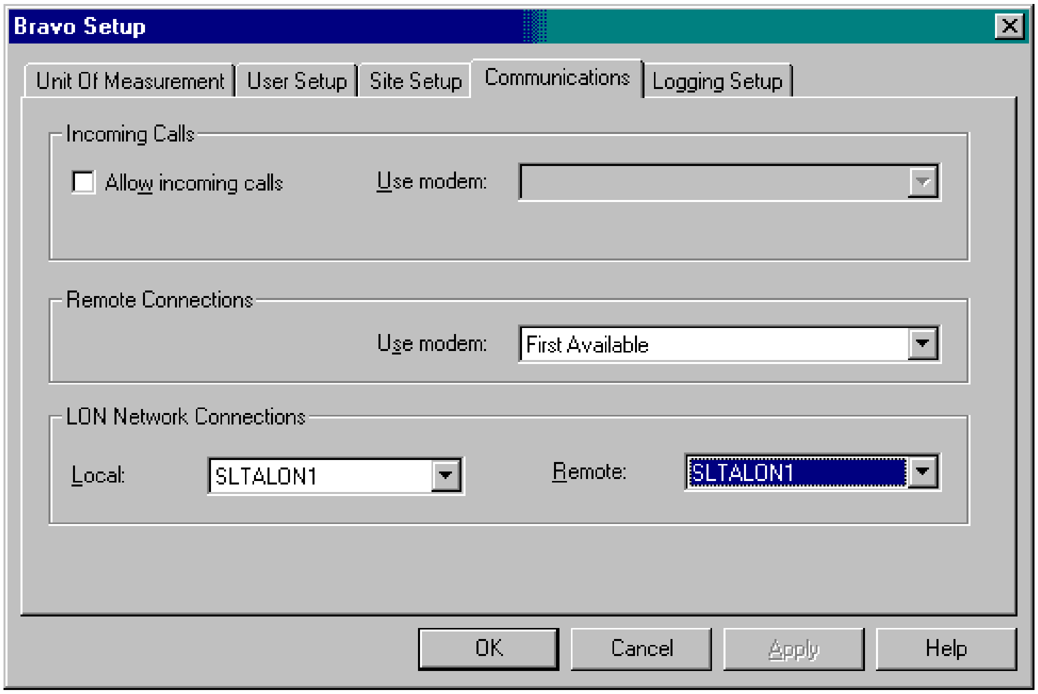


FIGURE 6-26. NETWORK COMMUNICATION SETUP

InPower Communications Setup

After setting up InPower for either a local or remote network site, the Communications setup needs to be completed.

Click on the **Communications** setup tab, then establish a Lon Network Connection for Local or Remote, or both if you plan to make local and remote network connections.

Local: Click on the drop-down arrow and select **SLTALON1** from the list (or use **PCCLON1** if using PCC-10 card). Click on the **Apply** button (Figure 6-26).

Remote: Click on the drop-down arrow and select **SLTALON1** from the list (or use **PCCLON1** if using PCC-10 card). Click on the **Apply** button.

Click on the **OK** button when finished.

The next section describes connecting to a network and gives examples of configuring devices over the network.

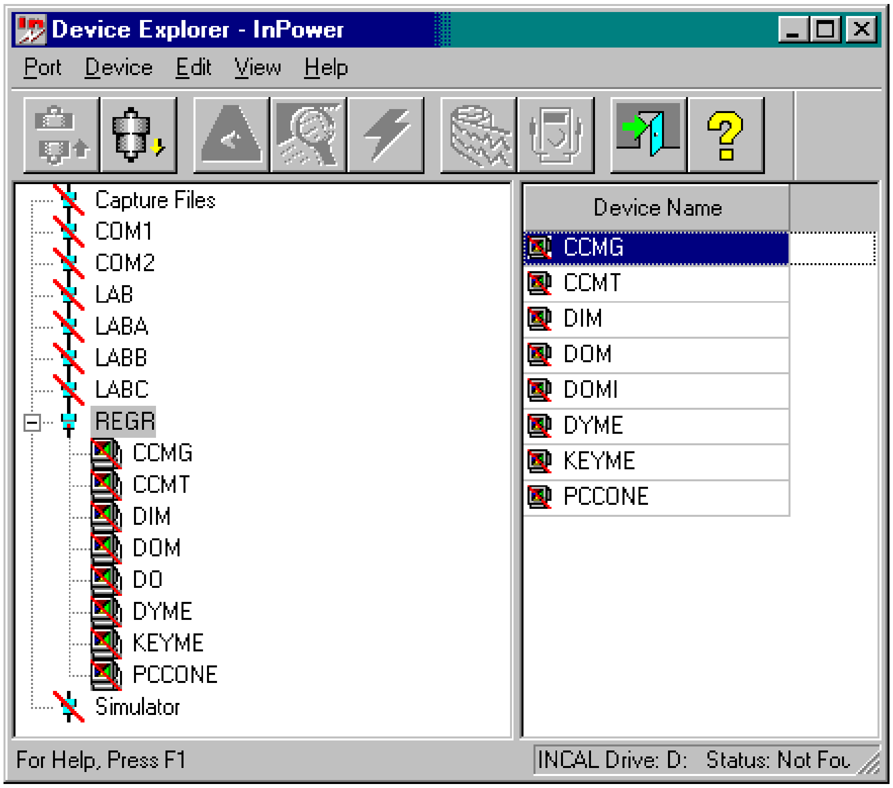


FIGURE 6-27. NETWORK CONNECTION

NETWORK CONNECTION EXAMPLE

Start InPower and connect to the port (typically the site name created in Site Setup). All of the devices on the network will be displayed in the Device Explorer directory (Figure 6-27).

If the connection is not made, check the SLTALink Manager, to view the status of the connection of the service PC to the gateway. Launch the **SLTALink Manager** from the **Echelon** folder in the **Start – Programs** menu, or from the Taskbar.

If the service PC is not connected to the gateway, select the gateway device from the **Select/Action** menu pick, in the **Link** menu, and click on the **Connect Now** button.

If the gateway is connected, and the network site still does not open, make sure the network is operating. It may be necessary to resynchronize the network using LonMaker for Windows.

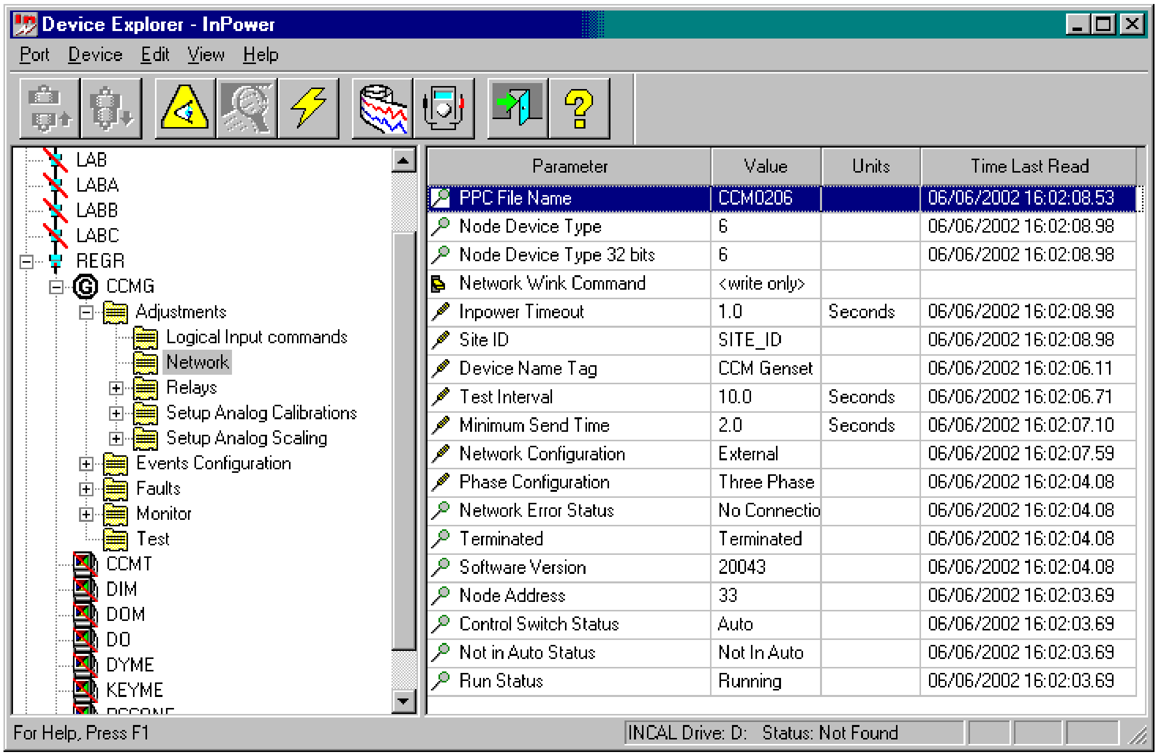


FIGURE 6-28. CCM-G – NETWORK FOLDER

In this example, the network settings for the Controls Communication Module – Genset (CCM-G) are accessed over the network. Open the **Adjustments** folder, and then open the **Network** folder (Figure 6-28).

This section describes how to use each of the adjustable parameters, in the CCM-G Network directory.

Network Wink: Use this feature to test a network module. Click on the **Value** cell and select **Active** to send a test signal to the device. The service led will wink when the message is received, indicating that the network connection and the network module are working.

InPower Timeout: If displayed, do not adjust, this parameter will be removed.

Site ID: The **site ID** must consist of no more than seven characters. The characters can only be a combination of upper case letters, numbers and underscores. Use of lower case letters, special characters, or spaces will prevent PCW II from recognizing dialed-in alarms. Do not use spaces, special characters, or lower case letters for the Device Site ID.

NOTE: The Site ID name must match the name used in the LonMaker database.

Device Name Tag: The **Device Name Tag** is used when sending system data. Provide a different name for each device on the network (up to 8 characters).

NOTE: The device name must match the name used in the LonMaker database.

(Network) Test Interval: Use to set the send time for the network test interval. The default 10 second interval is recommended.

Minimum Send Time: Use to set the send time for the analog data network variables. The default 2 second interval is recommended.

Network Configuration: Displays the device network application. Self installed devices read **Local** (factory default) and are not available to InPower or PCW II for adjustment or monitoring. Devices that are self installed are configured using the dip switches on the device.

When the self-installed feature is not used, the configuration is **External** and the device is available to InPower and PCW II.

Phase Configuration: Displays single or three phase connection for use in PCW II.

After making any necessary adjustments, click on the **Save Trims** button, on the toolbar, to write the settings to the device.

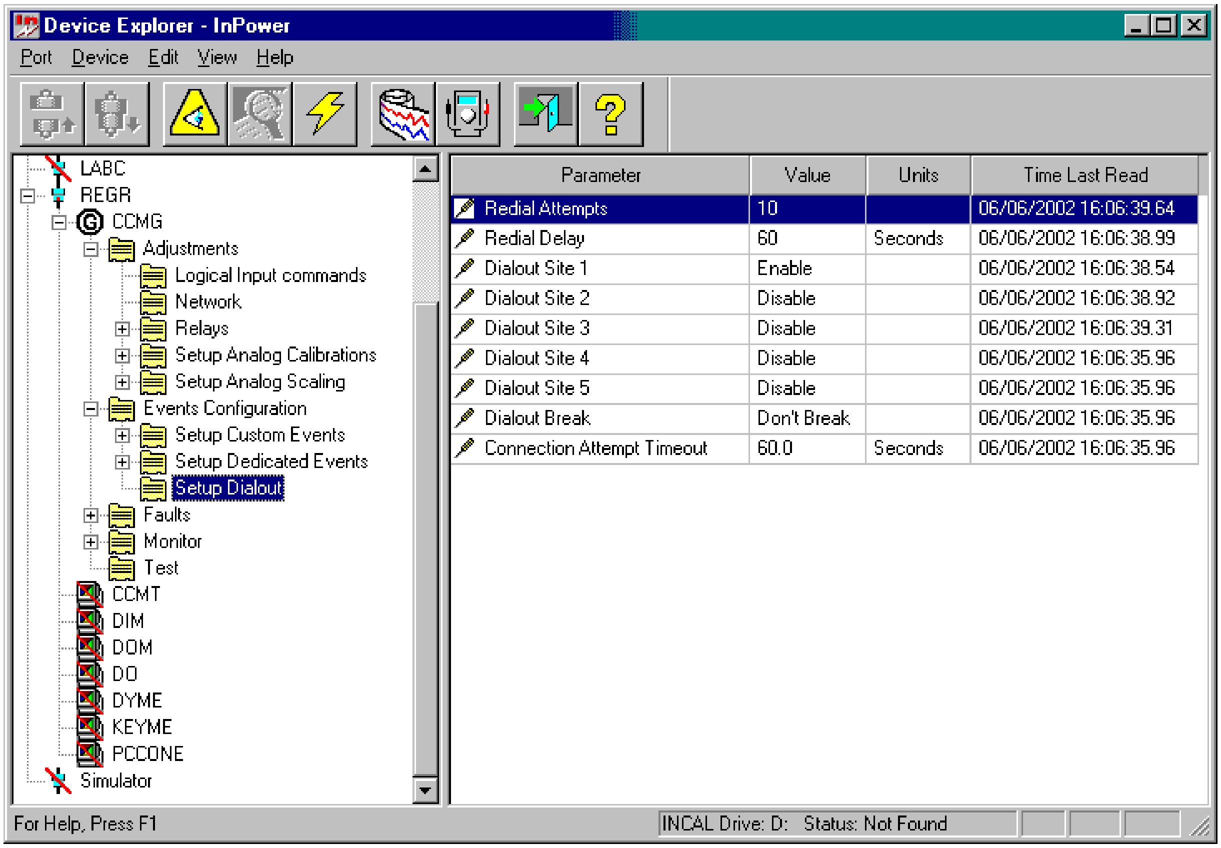


FIGURE 6-29. CCM-G – SETUP DIALOUT

Setup Dialout

The Dialout group of parameters allows the customer to configure the dialout settings for remote monitoring of devices on the network. Use these settings as follows:

Redial Attempts: Used to set the number of dialout retries, if the first alarm dialout fails while attempting to deliver a dial out message. The default setting 10, is the recommended setting. A setting of zero, is equal to one attempt.

Redial Delay: Enter the time delay between dialout attempts. The default, 60 seconds, is the recommended setting.

Dialout Site 1 thru 5: Enable the number of remote monitoring sites (hosts) that you want to send alarm messages to. Click on the value cell and select **Enabled** from the drop-down list.

NOTE: These Dialout Site numbers must match the Dial Directory numbers assigned to the phone numbers entered with SLTA Link Manager (see page 7-5).

Dialout Break: When enabled, this feature breaks a current connection after two minutes in order to complete a dialout.

Connection Timeout: After a dialout command has been sent to the modem, this feature specifies how long to wait for the site to connect to the remote monitoring location. The default setting is 60 seconds.

If the site does not connect with the remote monitoring location, it will dialout to Host 2, Host 3 etc. (if additional hosts are enabled) until it connects. If it still does not connect, it will repeat the process, beginning with Host 1, based on the number of retries that have been set.

After making any necessary adjustments, click on the **Save Trims** button, on the toolbar, to write the settings to the device.

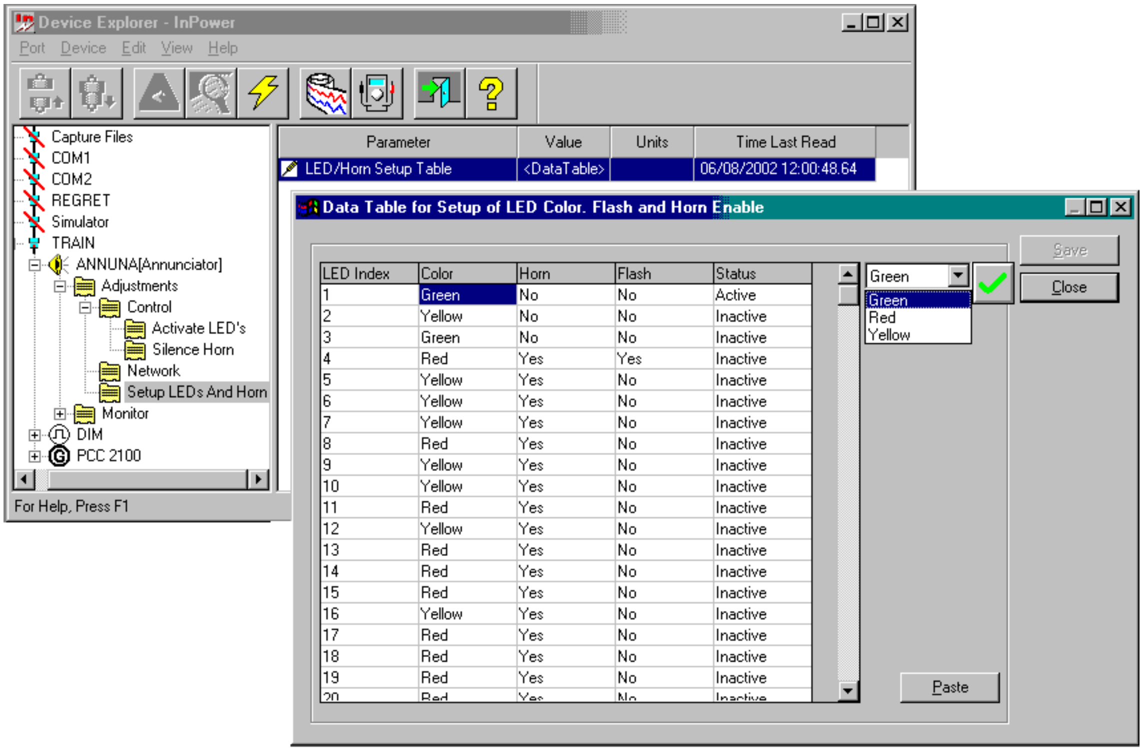


FIGURE 6-30. ANNUNCIATOR – SETUP LEDS AND HORN

In this example, InPower is connected to an Annunciator over the network. Open the **Adjustments** folder, and then open the **Setup LEDs and Horn** folder (Figure 6-30).

The **LED Index** (number) for each LED is listed in the first column. The **Color**, **Horn** and **Flash** columns are all adjustable to the desired type of annunciation. The Status column indicates if the input is active.

To change the setting for the color, the horn or to enable the LED flash setting, Click on the value cell for the desired item. The item selected will be displayed in the edit box, in the upper right of the dialog. Click on the drop-down arrow and a list of the choices will be displayed. Click on the desired option. Click on the check mark to enter the selection in the Data Table. Repeat this process until all of the desired settings have been chosen.

Click on the **Save** button, to update the Data Table changes. Click on **Close**, when you are finished adding fault codes or making changes.

After making any necessary adjustments, click on the **Save Trims** button, on the toolbar, to write the settings to the device.

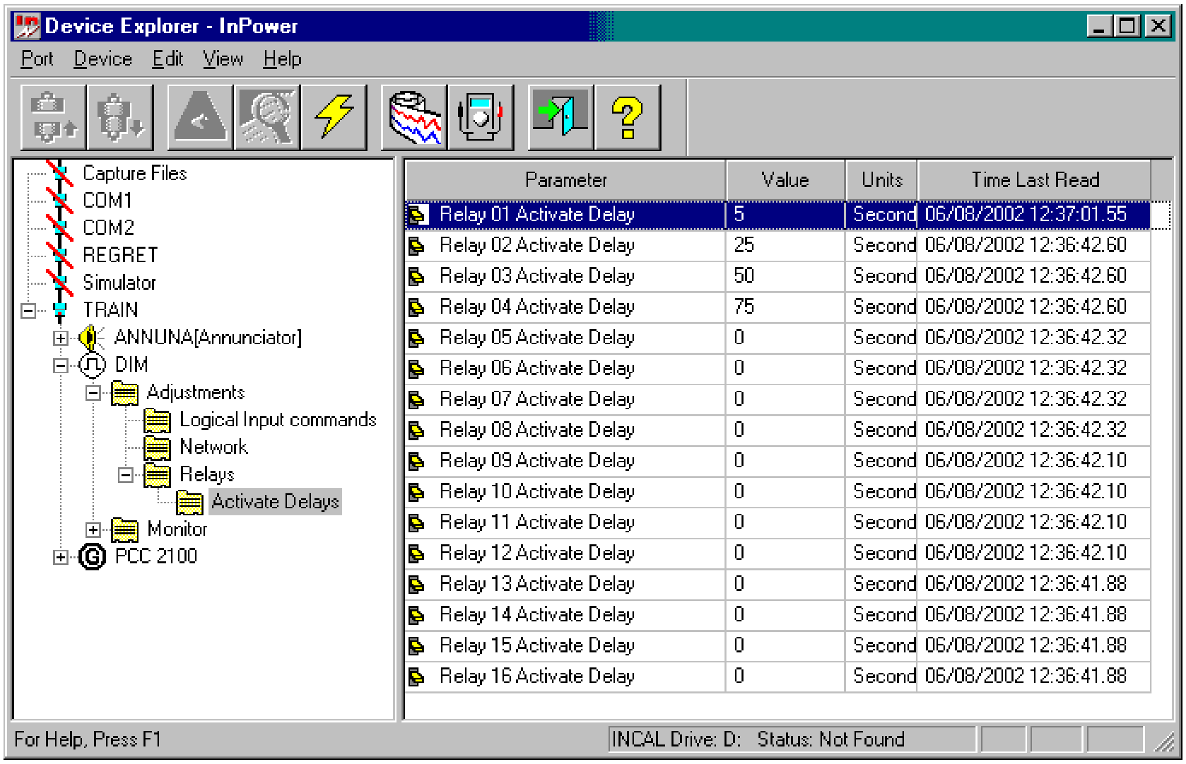


FIGURE 6-31. DIM – ACTIVATE DELAYS

In this example, InPower is connected to a DIM module, with an expansion board, over the network. Open the **Adjustments** folder, and then open the **Activate Delays** folder (Figure 6-31).

The first column displays the first eight relays from the DIM and the second eight relays (9 through 16) on the expansion board. This feature adds a delay between the time the input becomes active and when the relay is energized. Entering a delay time (in seconds) into the value cell for the relay, and saving the change, activates the delay.

To activate or change a delay, double click on the **Value** cell for the desired relay, the current value will be highlighted. Enter the desired delay time in seconds.

Click on the **Save Trims** button, on the toolbar, to write the new value to the device.

7. Device Monitoring Using PowerCommand for Windows II

ABOUT THIS SECTION

This section describes how to monitor network devices using PowerCommand® for Windows® II (PCW II) software.

To monitor devices over an FT-10 network, additional installation steps are required. Network applications require the Echelon® LNS server to be installed on the monitoring PC.

For monitoring a local network, the PC requires a network interface (gateway) driver installation and setup.

In all network applications the network site database must be imported for use with PCW II. Each of these procedures are described in this section.

Review the typical network installation drawings shown in Figure 7-1. If the application does not call for monitoring devices on a network, do not perform the procedures in this section.

A backup copy of the network site database is required to complete the PCW II setup. Contact the network installer to obtain a backup copy of the site database. This file is required to enable PCW II to create a Site for the network.

NOTE: To monitor a PCC 2100 controlled genset, a PCATS, or any device other than a PCC 3100 or PCC 3200, an FT-10 network will be required.

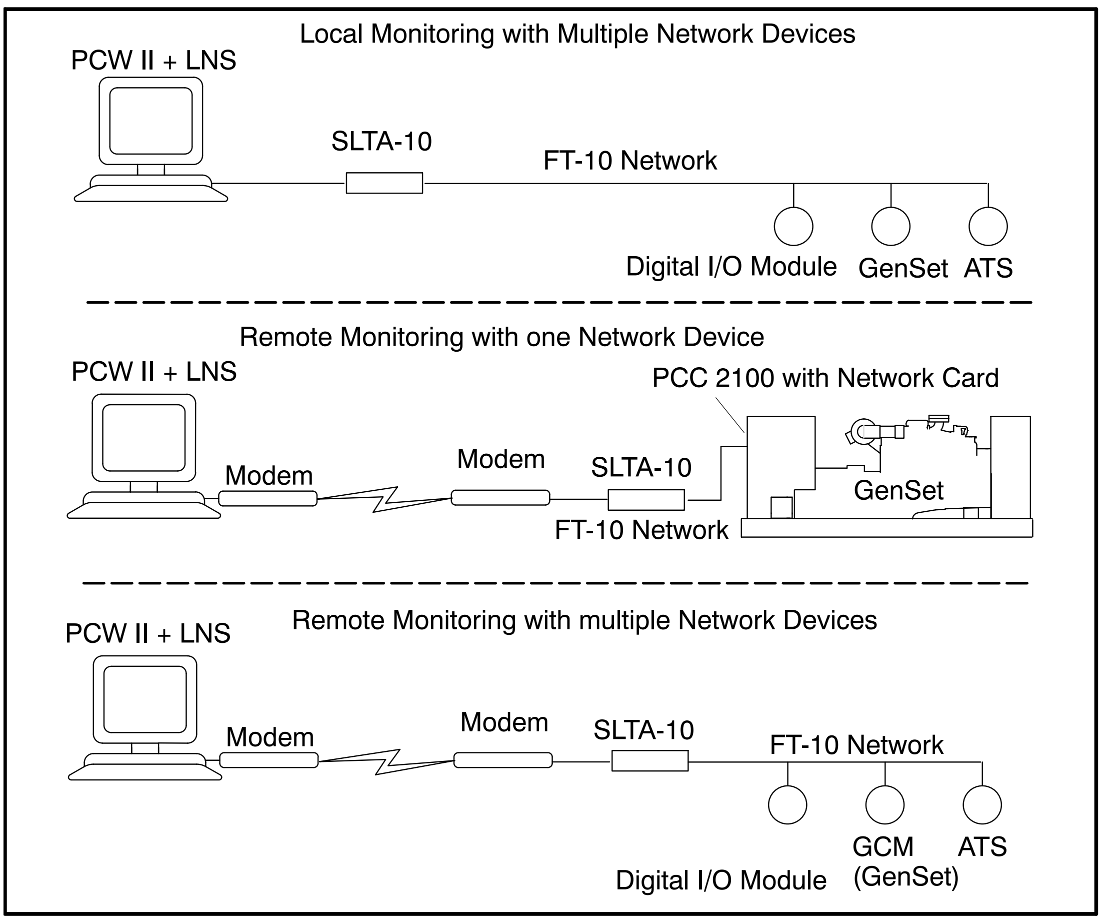


FIGURE 7-1. TYPICAL LOCAL AND REMOTE MONITORING SETUPS THAT REQUIRE NETWORK INSTALLATIONS

PowerCommand is a registered trademark of Cummins Inc.
Echelon is a registered trademark of Echelon Corporation.
Windows is a registered trademark of Microsoft Corporation.

The following setup steps must be completed to setup the monitoring PC for use over an FT−10 network after installing PCW II software.

- LNS Server Installation
- LNS Server Service Pack Installation
- Gateway Driver Installation and Setup
- Dialing Configuration for Alarms
- Import the Network Site Database
- Preparing the Site Database File for PCW II
- Import the Network Site Database
- Local or Remote Site Setup
- Communications Setup

LNS SERVER INSTALLATION

The PCW II package for network applications includes a separate support CD for the LNS server and network gateway drivers.

This installation includes installing a service pack (SP7) update to the LNS server. Close all other programs, including the Microsoft® Office shortcut bar. Close any programs that have been docked to the taskbar.

To install LNS software:

1. Insert the LNS CD into the CD drive.
2. Select **Run** from the taskbar **Start** menu.
3. At the prompt, type:
   D:\LNS Server\Setup.exe
   (or use the drive letter of the CD drive) and then select **OK,** or use the **ENTER** key.
   (If the setup program does not start, use the Run dialog Browse button to locate the LNS Server setup.exe file. Double click on the file to start the install.)
4. Follow the on-screen prompts, if prompted to remove any disks before rebooting, remove any disks ***except*** the installation CD.
5. The program will begin the setup and display a status bar showing the progress as the LNS server files are copied to the PC.

When the installation is completed, leave the LNS CD in the CD drive and proceed to the SP7 service pack installation.

To install the SP7 Service Pack:

1. Select **Run** from the the **Start** menu again, to begin the service pack installation.
2. At the prompt, type:
   D:\LNS3SP7.exe
   (or use the drive letter of the CD drive) and then select **OK,** or use the **ENTER** key.
   (If the setup program does not start, use the Run dialog Browse button to locate the service pack .exe file. Double click on the file to start the install.)
3. The install program will extract the service pack files and begin the installation. At the Welcome dialog, select **Next**, to install the files.
4. At the LNS Version ... Detected dialog, select **Yes**, to proceed with the installation.
5. Review the license agreement and select **Yes,** to accept the terms of the agreement.
6. Fill in the Name and Company information and select **Next**, to proceed.
7. Accept the default destination folder by selecting **Next**.
8. At the Setup Complete dialog, select **Finish** to restart the computer and complete the installation.

When the service pack installation is finished, close the Echelon LNS Utilities (if displayed) close it and proceed to the gateway driver installation instructions.

GATEWAY DRIVER INSTALLATION AND SETUP

The LNS CD contains drivers for FT-10 network gateway devices. Install the driver that matches the gateway device type used with the monitoring PC. Most applications will use either an SLTA-10 external gateway, or a PCLTA-20 gateway.

In this example the SLTA-10 installation and setup will be described.

1. Use Windows explorer to locate the gateway driver folder for the gateway device type used with the monitoring PC (in this case SLTA-10). Double click on the **slta10....exe** file to begin the driver installation.
2. From the WinZip Extractor window, select **Next** to begin the setup.
3. From the Setup window, select **Next** to view the license agreement.
4. Review the license agreement and select **Yes,** to accept the terms of the agreement.

5. In the Choose Destination Location window, select **Next**, to use the default destination (recommended).
6. In the Select Program Folder window, select **Next**, to create the program folder.
7. Select **No** to the option of accessing the file from DOS.
8. Click on the **Finish** button to complete the installation setup.

Gateway Module Settings

Launch the SLTA Link Manager from the Start menu (or the taskbar icon). Click on the Link menu and select **New**. Follow the instructions to setup the gateway for either local or remote applications.

Local Setup: For a local network applicaton, enter the name and type for the link. **To operate correctly, the name must be entered exactly as shown.**

Name: LocalSLTALON1 and click on the **Local** button, click on the **Update Identifier** box to select it, then click on Next (Figure 7-2).

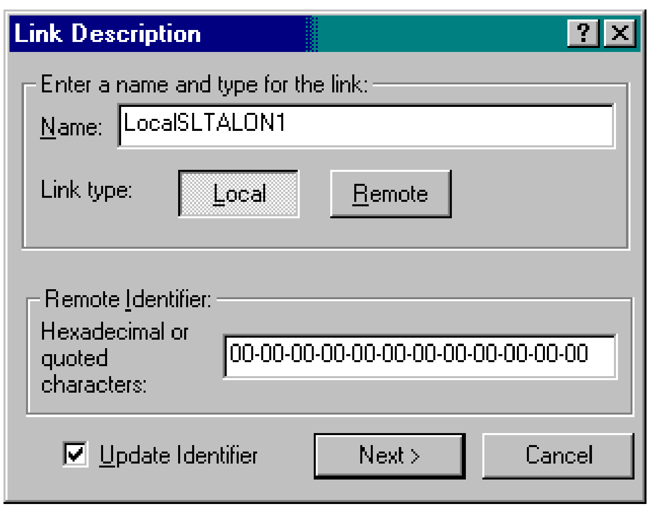


FIGURE 7-2. SLTA LOCAL SETUP

Use the **Serial Port** drop-down arrow to select the serial port that the SLTA is attached to on the monitoring PC. Use the Speed drop-down arrow to select **38400** as the communication speed, click on **Next** to continue.

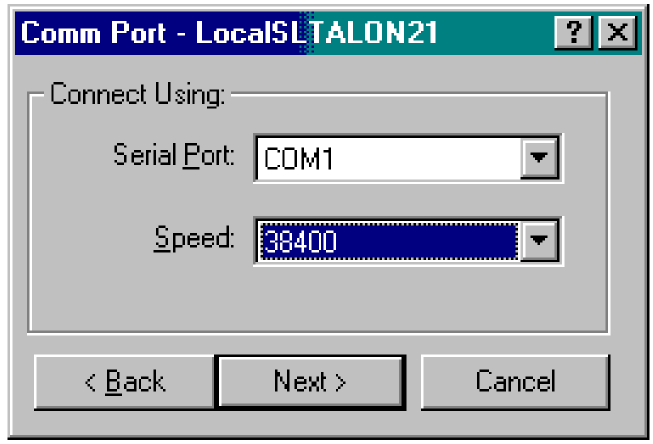


FIGURE 7-3. SLTA SETUP SPEED

Remote Setup: For a remote network application, enter the name and type for the link, use the following name. **To operate correctly, the name must be entered exactly as shown.**

Name: **RemoteSLTALON1** and click on the **Remote** button. Enter the network name in single quotes. Click on the Update Identifier box to select it, then click on **Next** (Figure 7-4).

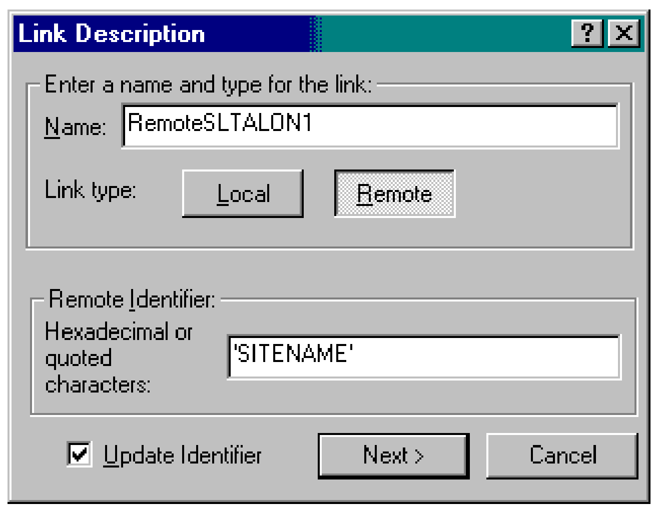


FIGURE 7-4. SLTA REMOTE SETUP

Use the Dialing Address dialog to enter the area code (if applicable) and phone number of the phone line that is connected to the modem at the remote site. Skip the Configure Line setting, connection speed will be set automatically. Click on the **Next** button and then the **Finish** button to complete the setup.

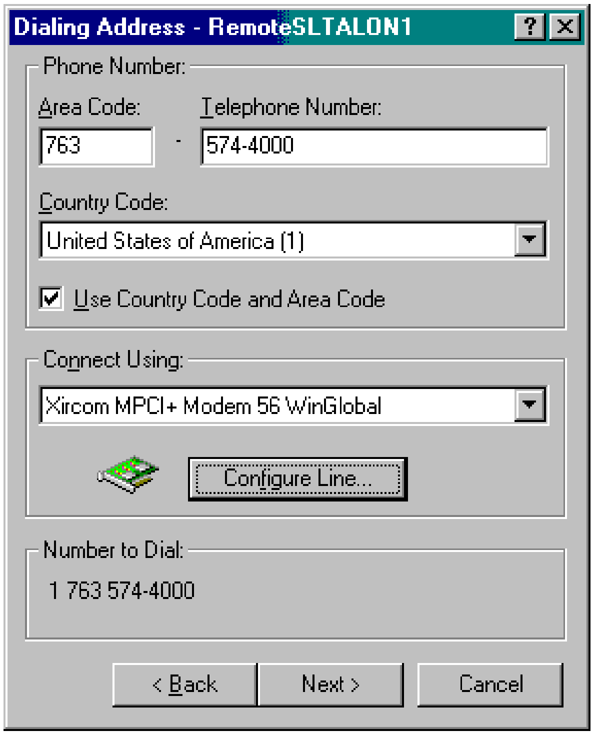


FIGURE 7-5. SLTA REMOTE DIALING ADDRESS

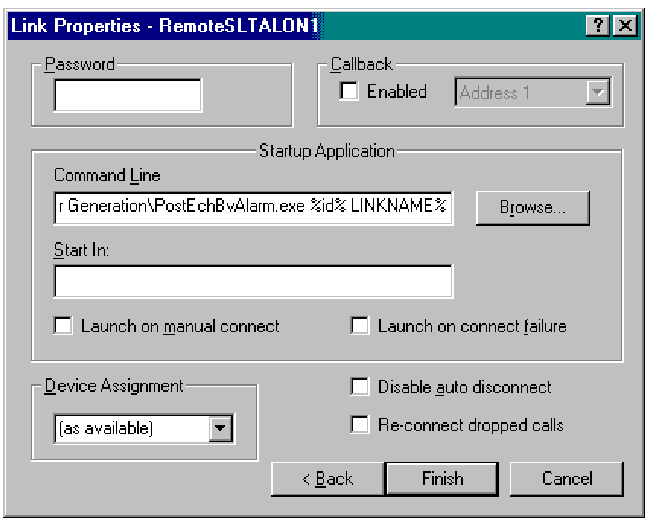


FIGURE 7-6. SLTA LINK PROPERTIES

Alarm Settings

After making the initial local or remote gateway settings, a Link Properties dialog box is displayed. This feature is used to setup the gateway for delivering alarms.

Setup the Command Line by clicking on the **Browse** button. Navigate to and select the a file named **PostEchBvAlarm.exe**. This file is located in the following directory:

C:\Program files\common files\cummins shared\power generation

Double click on each folder, beginning with the Program Files folder, until you reach the **PostEchBvAlarm.exe** file. Double click on (or open) this file, the directory path and file will be added to the Command Line.

The Command Line needs to be appended with additional instructions. Refer to Figure 3-5. Click inside the Command Line and use the right arrow key, to reach the end of the Command Line (or use the **End** key). Enter the following text, including spaces, enter a space before the first percent symbol:

%id% %LINKNAME%

Click on **Finish**, to complete the Link Properties settings. Click on **OK**, to close the SLTA Link Manager.

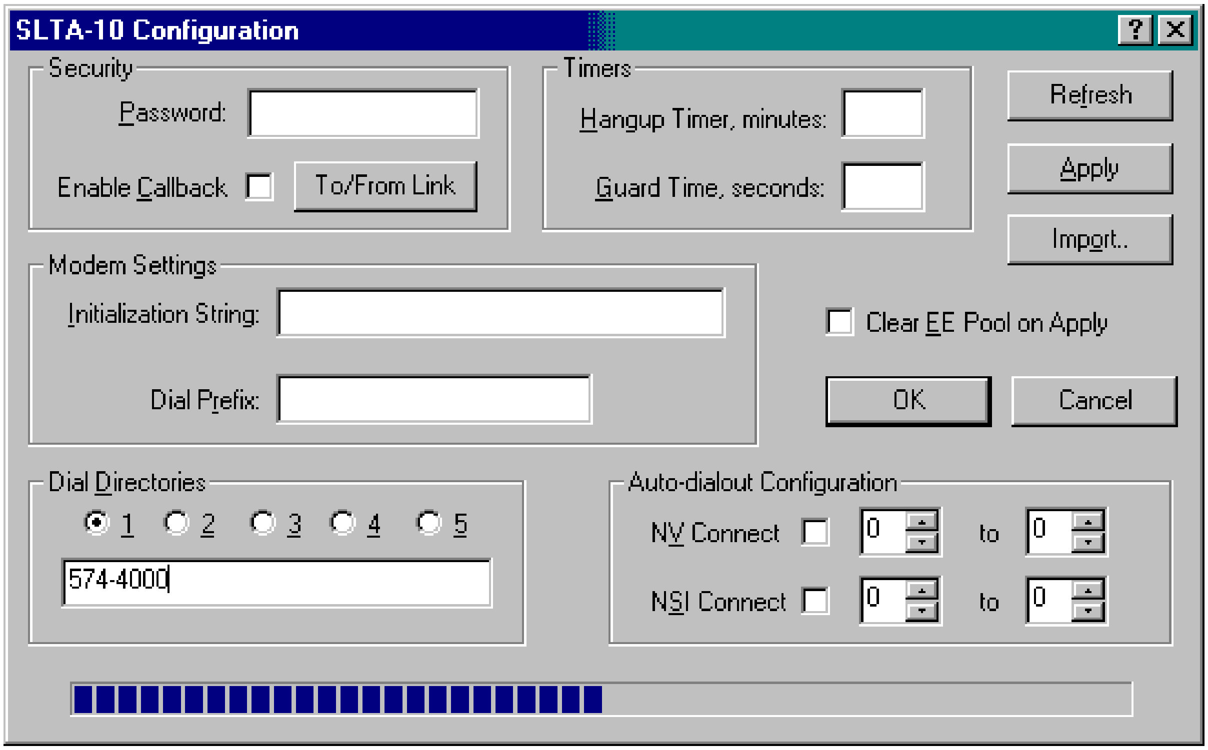


FIGURE 7-7. SLTA DIALING CONFIGURATION

Dialing Configuration for Alarms

In this step, the PC must be connected to the SLTA-10 network interface (gateway).

This feature is used to configure the gateway module with the phone number of the monitoring host(s). Start the SLTA Link Manager from the **Start** menu (or the taskbar icon). Click on the **Link** menu and click on **Select**/**Action**, then select the gateway from the Link Name list to be setup for dialing out to the monitoring PC. Click on the gateway, and click **OK**.

Click on the Devices menu, select **Configure SLTA....** When the Configuration dialog is displayed (Figure 7-7), click on the **Dial Directories** number **1** button. Enter the phone number of the modem at the primary monitoring host. Click on the **Apply** button to save the change.

Repeat the Dial Directories settings to configure up to four more monitoring hosts. When an alarm is sent to the first host but it is not received, the alarm will go to the second host, and continue down the list of hosts until the message is received. The alarm is sent to all hosts that are enabled and have a phone number entered.

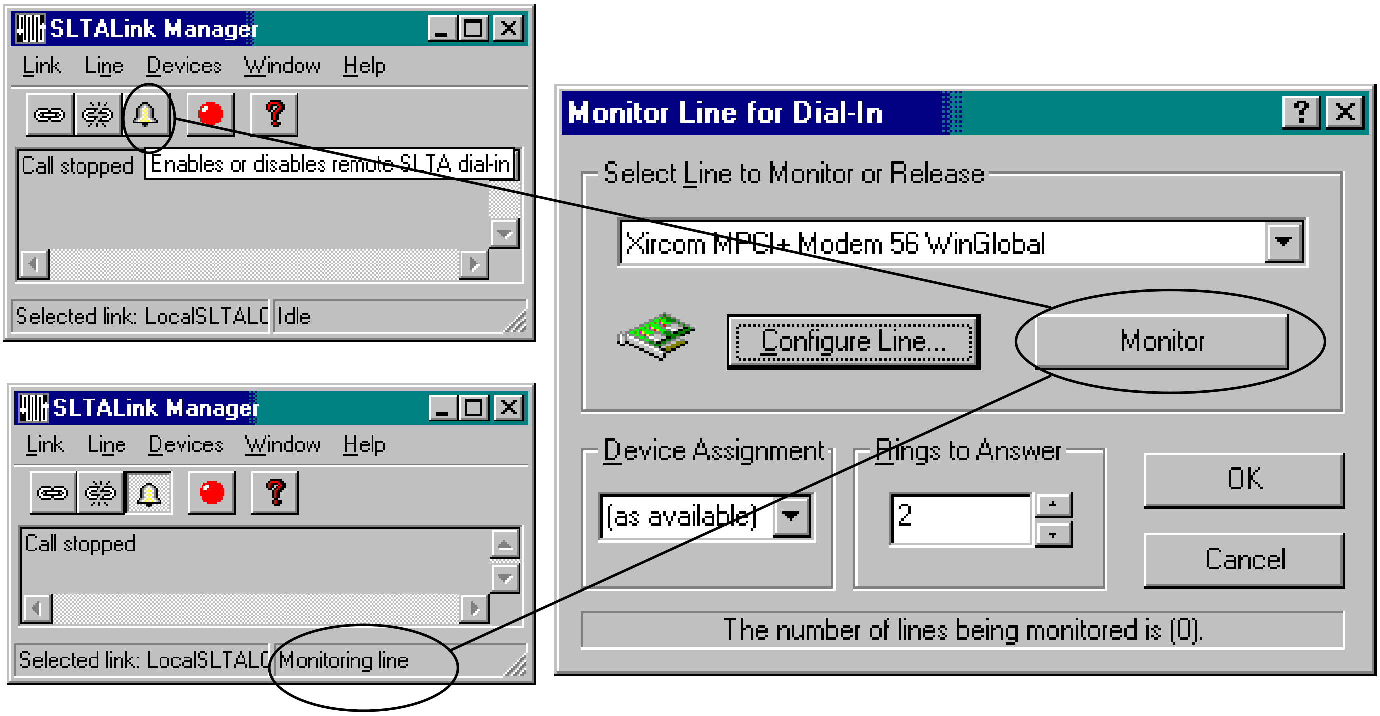


FIGURE 7-8. SLTA DIALING CONFIGURATION

Enabling the Monitoring PC to Receive Remote Alarms

In this step, the SLTA Link Manager is configured to enable the monitoring PC to receive remote alarm messages. **This is required for monitoring remote sites when PCW II is operating, but the monitoring PC is not connected to the site.**

Start the SLTA Link Manager from the Start menu (or the taskbar icon). Click on the **Bell** shaped toolbar icon.

The **Monitor Line for Dial-In** dialog will be displayed. Click on the **Monitor** button (Figure 3-7) to enable the monitoring PC to receive remote alarms. Then click **OK**. The Bell icon will be highlighted and the SLTA Link Manager status line will display the message Monitoring Line.

To disable this feature, click on the **Bell** icon again and click on the **Release** button.

IMPORTING THE NETWORK SITE DATABASE

The network site backup database is created by the network installer. The network installer uses the LonMaker for Windows **Backup** feature, and the **Backup Database** selection. LonMaker for Windows creates the backup copy of the network site, as a compressed (ZIP) file.

NOTE: To monitor the site with PowerCommand Software for Windows II (PCW II), the network name (site ID) must consist of no more than seven characters. The characters can only be upper case letters, numbers, and underscores. The name must start with an upper case letter. The use of lower case letters, special characters, and spaces will prevent PCW II from recognizing dial-in alarms from the site.

NOTE: Device names in network applications must consist of no more than eight characters. The characters can only be upper case letters. Use of lower case letters, special characters, numbers, and spaces will prevent PCW II from recognizing the device name in an alarm message. The device name must match the name used in the LonMaker database.

The site backup database file is usually small enough to be transferred to a floppy disk. Locate the site backup file (***sitename*.zip**) using Windows Explorer. Double click on the file to launch the **WinZip** utility.

Extract the file to the root drive on the monitoring PC (typically the C:\ drive). Click on the User Folder Names check box in the Extract dialog (see Figure 7-9) to maintain the correct directory structure. When finished extracting the file, close the WinZip® program and close Windows Explorer.

Import the network site database file that matches the InPower application.

NOTE: In applications where the site will be monitored by both a local PC and a remote PC, two unique copies of the network site database is required. The network site database file names will be the same, but one file should be identified for use on the local PC and the other files should be identified for use on the remote PC.

When finished extracting the file, close the WinZip program and close Windows Explorer.

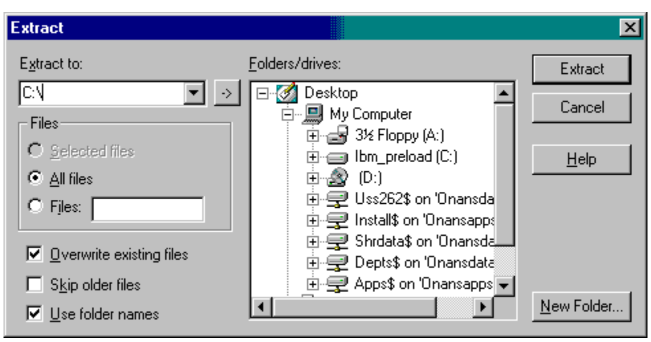


FIGURE 7-9. WINZIP EXTRACT DIALOG BOX

Prepare the Network Site Database File for PCW II

To use a network site database in PCW II, it must first be registered. This database can only be registered if PCW II software has been installed. The registration process involves using the RegEchDb function in PCW II. Follow the steps below:

1. Use WinZip to extract the database .zip file and save the network site database to the C: drive on the host computer. A network folder is created in the C:\Lm\Db directory.
2. Select **Start** → **Programs** → **PowerGeneration** → **PCW** → **RegEchDB**. The dialog box shown in Figure 7-10 is displayed.

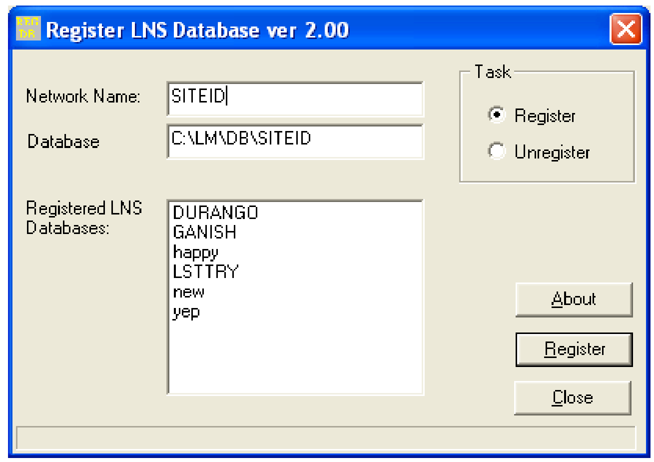


FIGURE 7-10. NETWORK DATABASE REGISTRATION WINDOW REGECHDB

3. Type in the name of the Network. It must be the same as the network folder created in step 2. Now click on **Register**. The message shown in Figure 7-11 is displayed. Click on **OK**.

FIGURE 7-11. SITE DATABASE INSTALLED

To Unregister a network database,

1. Highlight the name of the Network and click on **Unregister**. This will delete the database folder created in C:\Lm\Db.
2. When finished, close the window and follow steps for Setup in PCW.

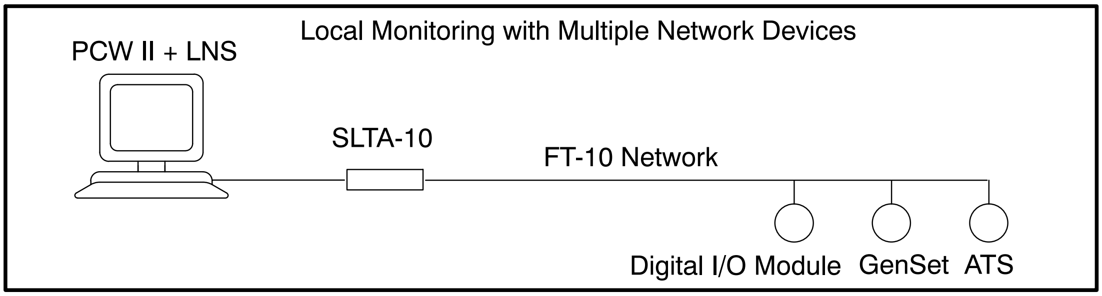


FIGURE 7-12. TYPICAL LOCAL NETWORK MONITORING SETUP

LOCAL NETWORK SITE SETUP EXAMPLE

The following procedures describe how to setup PCW II for remote communication.

The **Setup** feature is accessed from the **Start** menu by clicking on the **Power Generation – PCW** program group. Click on **Setup**, to launch the Setup dialog.

In this example the user will define a new site for a local network application.

Site Setup

Click on the **Site Setup** tab to access the **Site Setup** dialog (Figure 2-3). Click on the **Add** button, to display the **Create Site** dialog.

Create Site

Enter the following information in the dialog to create a new remote site:

Site Type – Select **Network** from the drop down list.

Network – Use the drop–down list and select the name for the network to be monitored. (IF the network name is not present in the drop-down list, cancel the setup and return to the section on importing the network database in this section.)

Site Name – Enter the name as it appears in the preceding Network name.

Location – Enter **Local,** from the drop down list.

SLTA Password: This feature is typically not used. If the SLTA has a password, enter it here and write the password down for future use.

Click on the **OK** button to save the new site. This establishes the site, in network applications it is not necessary to create devices for the site because the devices that are at the site are imported from the network database.

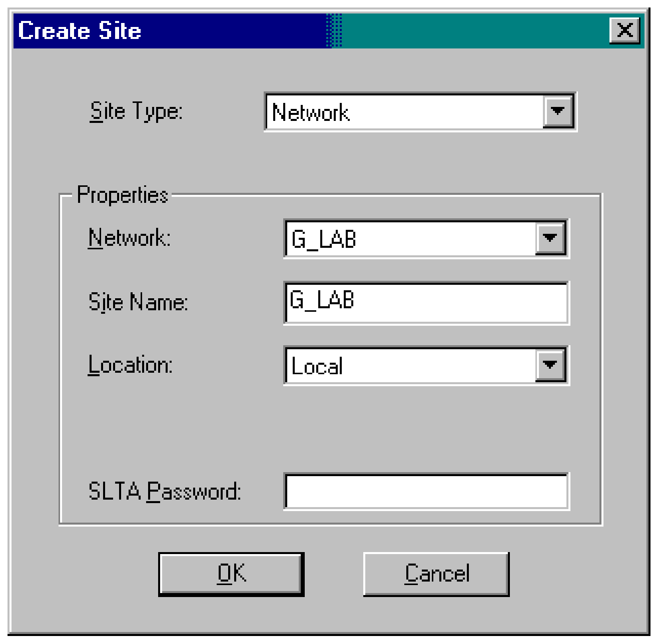


FIGURE 7-13. CREATE SITE DIALOG

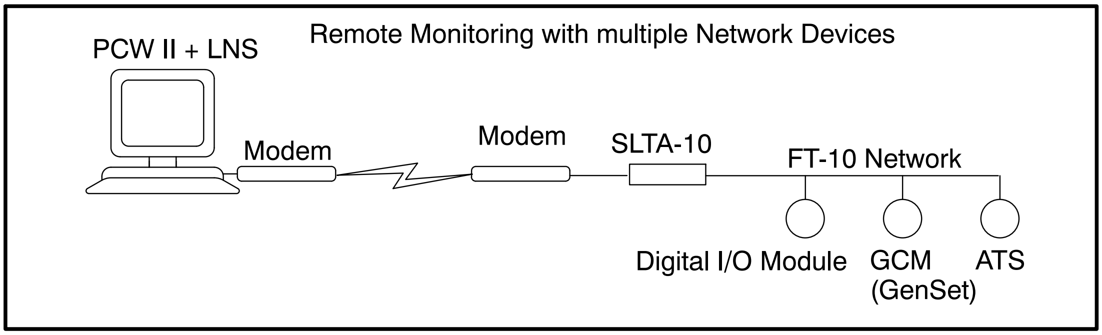


FIGURE 7-14. TYPICAL REMOTE NETWORK MONITORING SETUP

REMOTE NETWORK SITE SETUP EXAMPLE

The following procedures describe how to setup PCW II for remote communication.

The **Setup** feature is accessed from the **Start** menu by clicking on the **Power Generation – PCW** program group. Click on **Setup**, to launch the Setup dialog.

In this example the user will define a new remote network site.

NOTE: If the device times out when delivering an alarm via a remote network, use LonMaker to open the device's Plug-In and increase the time delay (see *Section 5*).

Site Setup

Click on the **Site Setup** tab to access the **Site Setup** dialog (Figure 2-3). Click on the **Add** button, to display the **Create Site** dialog.

Create Site

Enter the following information in the dialog to create a new remote site:

Site Type – Select **Network** from the drop down list.

Network – Use the drop–down list and select the name for the network to be monitored. (IF the network name is not present in the drop-down list, cancel the setup and return to the section on importing the network database in this section.)

Site Name – Enter the name as it appears in the preceding Network name.

Location – Enter **Remote,** from the drop-down list.

Telephone Number: Enter the telephone number of the phone line connected to the modem at the site location.

SLTA Password: This feature is typically not used. If the SLTA has a password, enter it here.

Click on the **OK** button to save the new site. This establishes the site, in network applications it is not necessary to create devices for the site because the devices that are at the site are imported from the network database.

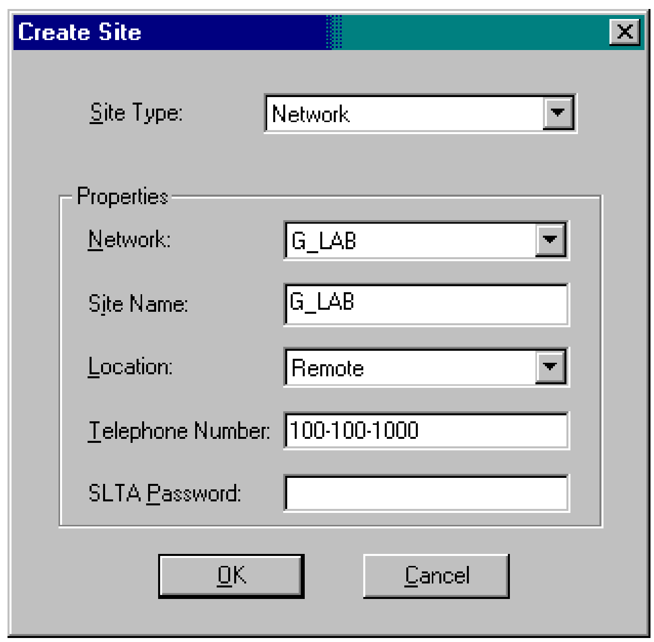


FIGURE 7-15. CREATE SITE DIALOG

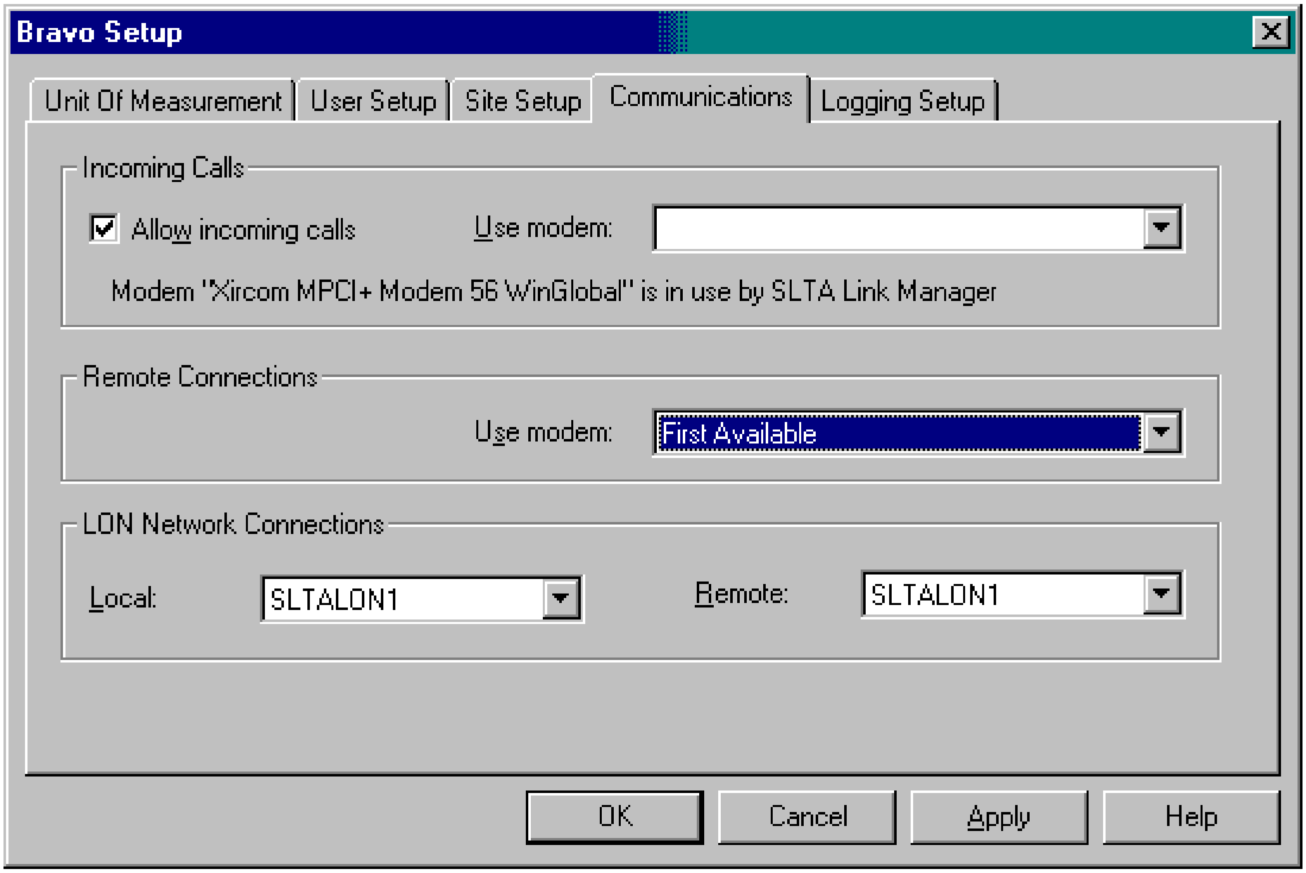


FIGURE 7-16. NETWORK COMMUNICATION SETUP

COMMUNICATIONS SETUP NETWORK SITE EXAMPLE

After setting up PCW II for either a local or remote network site, the Communications setup needs to be completed.

The Communications setup feature is used to enable incoming calls for remote applications and setup remote and network connections.

Click on the **Communications** setup tab. Enable the **Allow incoming calls** check box, to allow incoming calls (alarms). (Check mark appears in check box when the feature is enabled.)

Next, establish a Lon Network Connection for Local or Remote, or both if you plan to make local and remote network connections.

Local: Click on the drop-down arrow and select **SLTALON1** from the list (or use **PCCLON1** if using PCC-10 card). Click on the **Apply** button (Figure 13-14).

Remote: Click on the drop-down arrow and select **SLTALON1** from the list (or use **PCCLON1** if using PCC-10 card). Click on the **Apply** button.

Click on the **OK** button when finished.

8. Genset Communications Module used with PCC 3100 Controls

ABOUT THIS SECTION

This section describes the Genset Communications Module (GCM) and its functional role in the PowerCommand® FT-10 Network. This section also describes the physical mounting and wiring of this module, and provides information for the *logical* installation and *connection* of the GCM on the network.

In network terms, "logical installation and connection" refers to programming the various devices (or nodes) on the network so that they can communicate with one another. This communication takes the form of passing network variables from one device to another. The process of assigning connections—linking an output variable of one device to an an input variable of another device—is called "binding."

This section describes mounting the GCM inside the control box and connecting the J6 and J7 connectors to the engine interface board.

The GCM must be used with PowerCommand® operating software version 1.06 or newer for all models except DFHA, DFHB, DFHC and DFHD (these models have unique operating software and are GCM compatible with version 2.0 or newer). Before installing a GCM, check the version on the display menu. Access the version by pressing the menu buttons displayed in Figure 8-1. If the version is earlier than the version listed above, obtain and install an EPROM upgrade kit from your distributor before installing a CGM.

When installation is complete, the genset is ready for connection to an FT-10 network. Refer to *Section 2* for instructions on network wiring and *Section 4* for network software installation.

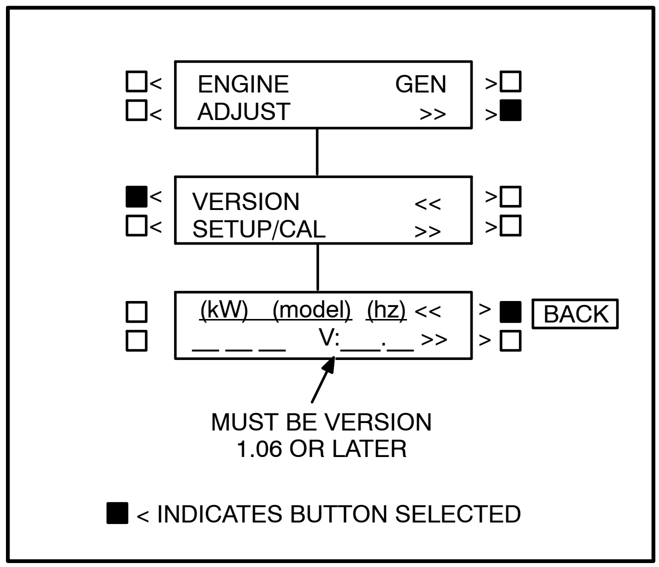


FIGURE 8-1. EPROM VERSION CHECK

PowerCommand is a registered trademark of Cummins Inc.
InPower is a trademark of Onan Corporation.
LONWORKS IS a registered trademark of Echelon Corp.
LonMaker is a trademark of Echelon Corporation.

DESCRIPTION

A Genset Communication Module (GCM) is required for connection of a PowerCommand® 3100 Genset to an FT-10 network. The GCM provides an interface for data from the PowerCommand 3100 Genset to other modules on the network. It communicates with the genset via the engine interface board, and it monitors various circuits to determine the operating state of the control. For example, the GCM stores PCC data such as volts, current, engine speed, and oil temp; and then sends it out on the network when another network node requests the data.

Outputs from the GCM allow remote start of the PCC when needed, or to cause an emergency shutdown on command. The GCM also provides some direct local control and monitoring of the PCC. It monitors for Not-In-Auto mode and High and Low battery voltage.

The GCM is mounted inside the PCC housing. The GCM is powered from the genset battery. It remains powered even when the PCC is "asleep," but it is recommended that the PCC "S5" switch (see Figure 8-2) is set to "AWAKE" at all times when a GCM is used.

SAFETY PRECAUTIONS

Read these instructions completely and become familiar with safety warnings, cautions, and procedures before starting the installation.

CAUTION ***Electrostatic discharge will damage circuit boards. Do not remove the circuit board from the antistatic shipping bag until you are grounded to the PCC with a wrist strap.***

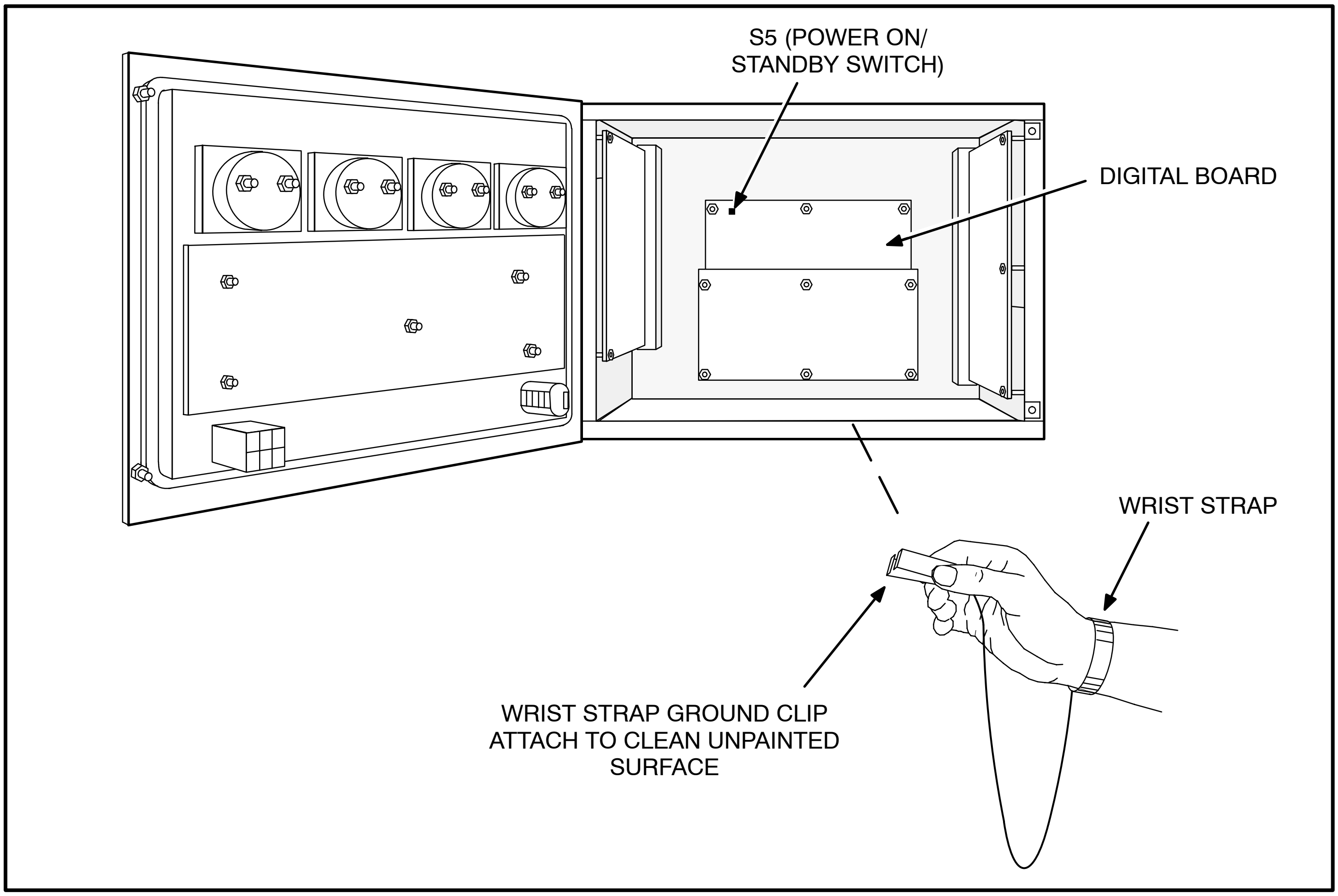


FIGURE 8-2. WRIST STRAP CONNECTION

Special Tools Required

- Grounding wrist strap with grounding clip

Circuit Board Handling Precautions

To help prevent circuit board damage due to electrostatic discharge (ESD), a grounding wrist strap must be worn when handling the circuit board. (The wrist strap **does not** provide a direct short to ground, it is typically rated at approximately 1 megohm to ground.)

Attach the clip to a clean unpainted surface of the control box (see Figure 8-2) and place the strap around your wrist before handling a circuit board.

PHYSICAL INSTALLATION

1. On the front control panel, place the genset Run/Off/Auto switch in the Off position.
2. Disconnect the battery charger (if applicable). Remove all electrical supply sources.

   CAUTION ***Always disconnect a battery charger from its AC source before disconnecting the battery cables. Otherwise, disconnecting the cables can result in voltage spikes high enough to damage the DC control circuits of the set.***

3. Disconnect the generator set starting battery cable(s). Disconnect the negative (–) cable(s) first to reduce the risk of arcing.

   WARNING ***Accidental starting of the genset while working on it can cause severe personal injury or death. Prevent accidental starting by disconnecting the starting battery cables. To reduce the risk of arcing, disconnect the negative (–) cable first. When reconnecting, connect the negative (–) cable last.***

   Make certain the battery area has been well-ventilated before servicing the battery. Arcing can ignite explosive hydrogen gas given off by batteries, causing severe personal injury. Make certain hydrogen gas, engine fuel, and other explosive fumes are fully dissipated. This is especially important if battery has been connected to a battery charger.

4. Open the control box door. Connect the wrist strap ground clip as shown in Figure 8-2.
5. Use a Phillips screwdriver to remove the four analog board mounting screws shown in Figure 8-3.
6. Install four new standoffs in place of the analog board mounting screws removed in step 5 (Figure 8-4). Tighten the standoffs securely.

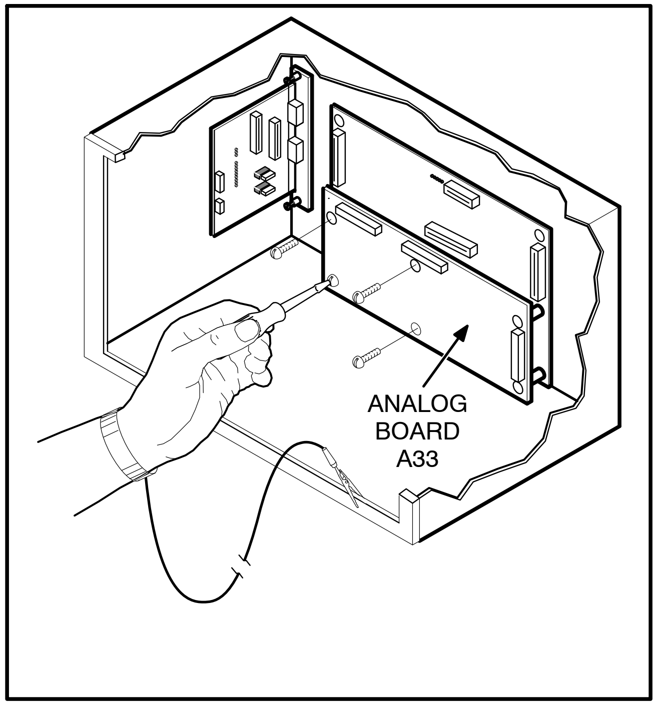


FIGURE 8-3. PREPARING TO MOUNT GCM

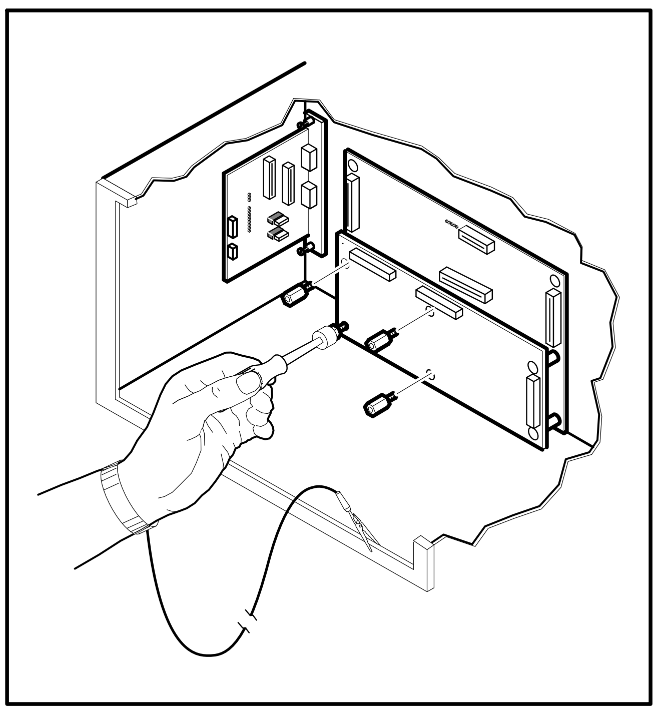


FIGURE 8-4. INSTALLING STANDOFFS

7. Mount the GCM as shown in Figure 8-5, use the screws removed from the analog board. Tighten the mounting screws securely.
8. Orient the J6 harness connector as shown in Figure 7. Push the J6 plug securely into the connector on the engine interface board.
9. Spread locking tabs apart on the J7 connector. Fold the ribbon cable, as shown in Figure 8-6, align key on plug with socket cutout. Insert the J7 harness plug into the J7 connector on the engine interface board. Press in the harness connector, at the location indicated by the arrow, until the locking tabs lock into place.
10. Set the S4 switch on the GCM to **24V** for a 24V battery system or **12V** for a 12V battery system (Figure 8-6).
11. If the GCM is to be terminated, the termination switch S3 must be set. This is accomplished by moving it to the ON or TERM position.

    NOTE: For free topology, only one device on each segment must be terminated. The device terminator switch can be used for this type of termination. Multidrop bus topology requires termination at each end of the bus using multidrop bus terminators (Onan P/N 300−5729).

Refer to *Section 2* for instructions on network wiring and *Section 4* for network software installation.

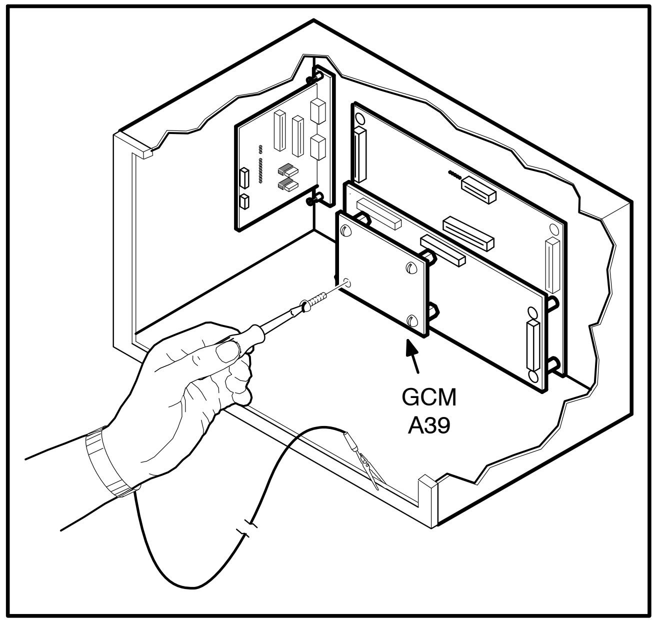


FIGURE 8-5. GCM MOUNTING

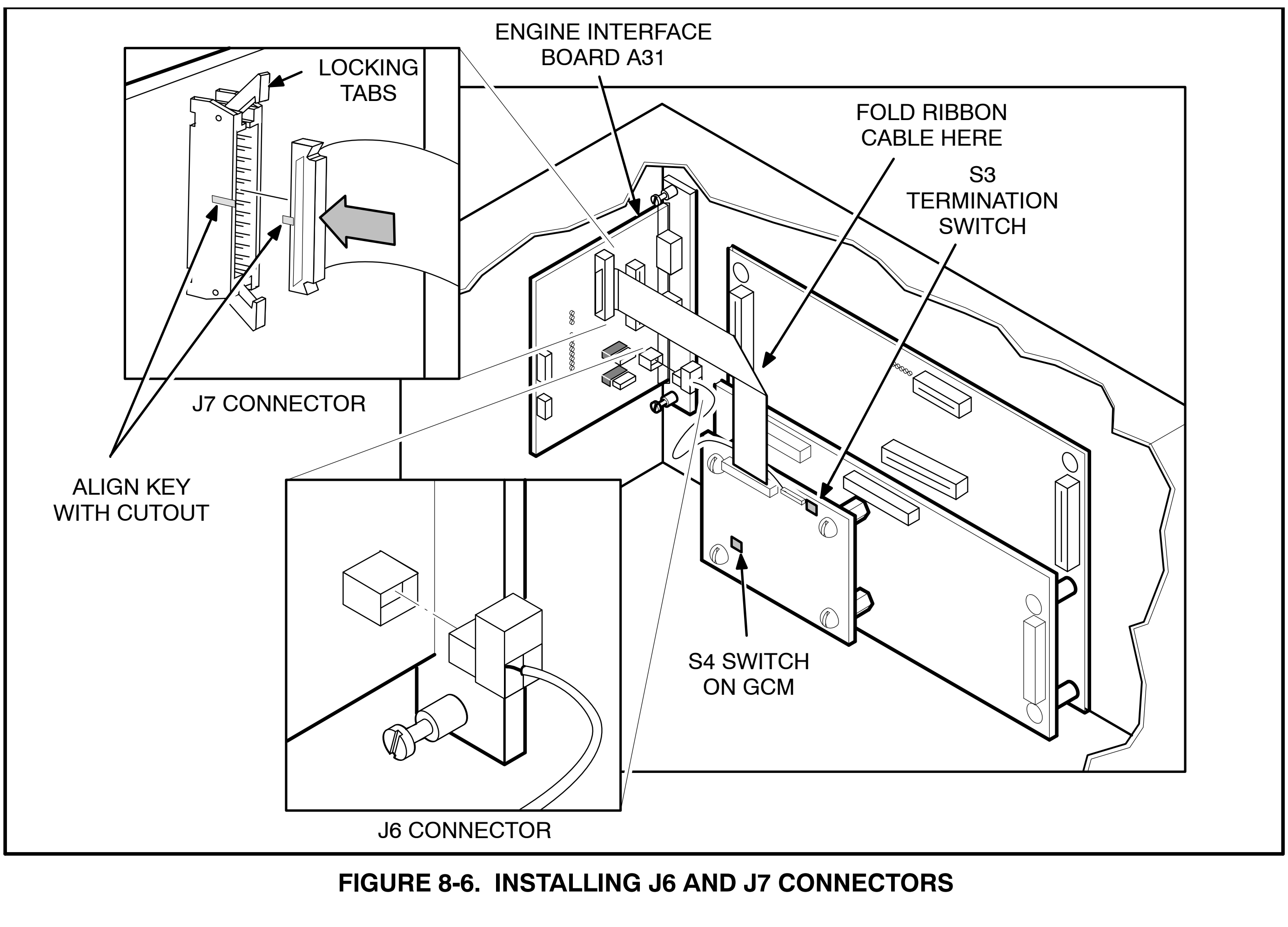


FIGURE 8-6. INSTALLING J6 AND J7 CONNECTORS

SELF-INSTALLATION

Self-installation guidelines, information on PCC custom annunciation and relay events, and information on how to self-install a network is included in *Section 3*.

Requirements

This procedure can be used to logically install the GCM when the following requirements are met.

Self-installation is limited to one PowerCommand Genset or CCM-G, one PowerCommand Automatic Transfer Switch (ATS) or CCM-T, and no more than four annunciators or five DIMs. The GCM can be autobound by an ATS and up to three annunciators and three DIMs, but by no more than a total of four annunciators and DIMs.

A transfer switch (OTPC or BTPC) must be v1.2.138, or later, to support the Genset Communication Module software. A CCM-T with an FTT-10 transceiver will also work.

The genset GCM must be logically installed before the transfer switch is logically installed and before the annunciators, DIMs, and other network accessories are logically installed.

If these requirements cannot be met, the system must be installed with LonMaker™. Refer to LonMaker Installation on page 8-6.

Node Address

Each node on a self-installed network must have a unique address. Switches 1 through 4 of switch S5 are used to set the *Node Address* (see Figure 8-7). The default node address is 0001, which is a "STATUS" LED pulse rate of 1.

The switches are oriented so that switch S5-1 is the most significant bit (MSB) of the *Node Address.* Thus, S5-1 has a value of "8" when it is ON. S5-2 has a value of 4, S5-3 has a value of 2, and S5-4 has a value of 1. For example, to set the *Node Address* to 9, set switch S5 to 1001 (8+0+0+1=9). See Table 8-1.

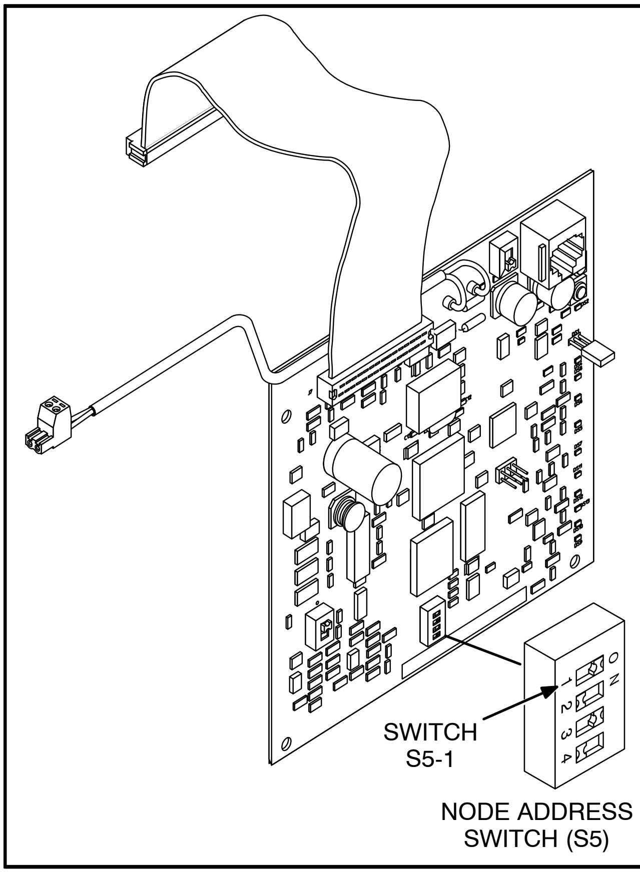


FIGURE 8-7. NODE ADDRESS SWITCH

TABLE 8-1. SETTING THE NODE ADDRESS (S5)

S5-1 (8)	S5-2 (4)	S5-3 (2)	S5-4 (1)	Address (binary)	Address (decimal)
OFF	OFF	OFF	OFF	0000	0[1]
OFF	OFF	OFF	ON	0001	1
OFF	OFF	ON	OFF	0010	2
				↓	↓
ON	ON	ON	ON	1111	15

NOTE 1. "0" (zero) is not a valid *Node Address*.

Be sure to assign each node in the network a unique address.

After the device has been installed, the *Node Address* can be verified by counting the number of pulses of the "STATUS" LED (DS6) (see Figure 8-8). Make sure each device has a unique node address.

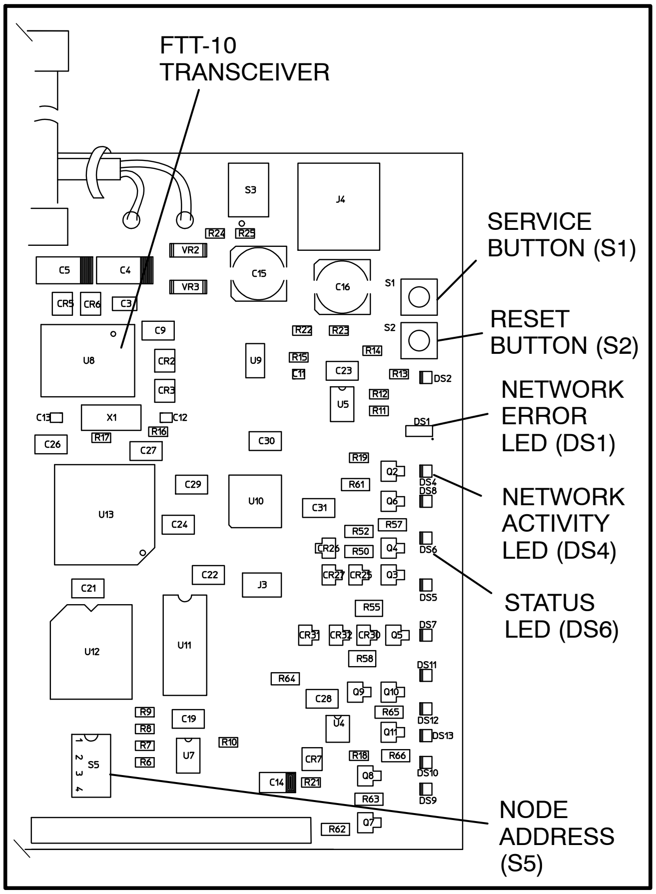


FIGURE 8-8. BUTTON AND LED LOCATIONS

Logical Installation

After the GCM is *physically* connected to the network, it is ready to be *logically* installed.

1. Make sure the GCM node and other network devices are powered and connected to the twisted-pair data bus.
2. Make sure S5-1, S5-2, S5-3, and S5-4 on the GCM are configured for the desired node address. Each device on the network must have a unique address.
3. Make sure the network is terminated.
4. Press and hold the *Service* button (S1) (see Figure 8-8) for approximately two seconds until the *Network Status* LED (DS6) begins flashing.
5. Release the *Service* button.

Binding Sequence

Logically connecting to another device is referred to as *binding*. *Binding* may be done when all the nodes are installed, connected, and powered.

Binding the node must occur in the proper sequence. Logically install the genset first, followed by the transfer switch, and then the annunciator(s) and other network accessories.

NOTE: The genset (GCM) and ATS module must be Cummins Inc. devices which are able to self-install in the network. Each device on the network must have a unique address.

After the genset is *physically* installed, a DIM, annunciator, or ATS may bind to the genset. Because the genset does not execute the binding function, the genset must be installed first.

Verify Binding

To verify the genset has installed itself properly and is bound to the ATS, disconnect the J6 data cable from the engine interface board. The "Network Error" LED (DS1) (see Figure 8-8) should turn on (red) within 10 seconds. This indicates communications have failed and that the device was properly bound.

Reconnect the twisted pair cable and confirm that DS1 turns off within 10 seconds.

Remove Bindings

If unresolved system errors occur, the bindings can be removed and then re-installed to reset the system. The bindings can also be removed if the network is being changed or the device is being moved to another network.

To remove all bindings from the device, change the *Node Address* (S5) to 0 (zero) and logically re-install the device.

The node will remove all bindings at this time, including the genset and annunciator bindings. The "STATUS" LED will not flash when the *Node Address* is 0, nor will it attempt to bind to a genset.

Re-Binding

Re-Binding the node must occur in the proper sequence. Logically install the genset first, followed by the transfer switch, and then the annunciator(s), DIMs, and other network accessories.

To re-bind an annunciator, DIM, or ATS to the genset node, press and hold the Service pin for 2 seconds.

LONMAKER INSTALLATION

The PowerCommand 3100 Genset GCM can be manually installed with LonMaker. The Device Stencil is required.

LonMaker installation is required to use PowerCommand Software (PCW II). Self-installation does not require LonMaker.

To install using LonMaker:

1. Run LonMaker. Refer to *Section 4* for site and device name conventions.
2. Open the Device Stencil.
3. Create a new site (or update an existing site).
4. Define, install, and bind devices.
5. Verify system operation.

The PowerCommand 3100 Genset is defined and installed like any other device in LonMaker.

Configuring the GCM

The device Plug-In in LonMaker for Windows must be used to configure the GCM (see *Section 5*).

GCM CONNECTIONS

GCM connections are made at connectors J4, J6, and J7.

Refer to Table 8-2 and Figures 8-6 and 8-9.

NETWORK TOPOLOGY, DATA MEDIA, AND NETWORK POWER

Refer to *Section 2* for information on the network topology and data transmission media. Also refer to *Section 2* for network power supply wiring calculation procedures.

NETWORK DATA MEDIA AND POWER WIRING

⚠WARNING ***AC voltages and currents present an electrical shock hazard that can cause severe personal injury or death. Only trained, experienced personnel are to perform the following procedures.***

TB1 Connections

Network data and power wiring connections are made at terminal block TB1 in the generator set accessory box, which is located on the back of the control housing (Figures 8-10 and 8-11).

Conduit

When installing conduit, observe the following precautions:

1. Before beginning conduit installation, cover the components in the accessory box to prevent accidental entry of metal chips.
2. If using rigid conduit, install at least 2 feet (610 mm) of flexible conduit between the rigid conduit and generator set to absorb vibration.
3. Always run DC circuit wiring in a separate metal conduit from AC power cables to avoid inducing currents that could cause problems within the control.
4. Data wire can be run without conduit if it is adequately protected. Do not run data wire in conduit with network power wiring.

   ⚠CAUTION ***Installation debris can cause equipment failure and damage. Use extreme care to keep drill chips and filings out of the accessory box when mounting or connecting conduit. Screwdrivers should be used carefully to prevent damage to components.***

SWITCHES AND LEDS

The Service switch is used during installation (when prompted by the LonMaker program). The Terminator switch must be set to the appropriate position at installation. Switches are described in Table 8-3. LEDs are described in Table 8-4.

NETWORK INSTALLATION

Sections 4 and *5* provide a detailed description of the network installation process. Read *Sections 1* and *2* before constructing the network. *Sections 4* and 5 provide the following step-by-step installation procedures:

1. Setting up Network Installation Tools
2. Starting LonMaker Software
3. Using LonMaker Software
4. LonMaker Network Setup
5. Connecting Devices with LonMaker
6. Installing Devices with LonMaker
7. Testing Devices and Verifying Installation

NETWORK VARIABLES

Figure 8-12 illustrates the GCM functional block and shows the network variables associated with this device. For more information on these variables, see Appendix F.

TABLE 8-2. GCM CONNECTIONS

Connector	Description
J7	Ribbon cable harness from GCM to A31 engine interface board. Plugs into outermost connector on engine interface board. Cannot physically mate with any of the other connectors. This cable carries all GCM/PCC interface signals except network data.
J6	Twisted pair cable harness from the GCM to the engine interface board. This cable carries network data to the engine interface board where it then goes out through the lower waterproof connector on its way to the customer connection terminal strip.
J4	RJ45 connector for network data – service and Installation use only.
TB1−14	Accessory Box –– Network Data 1 signal from GCM
TB1−15	Accessory Box –– Network Data 2 signal from GCM

TABLE 8-3. GCM SWITCHES

Ref	Name	Type	Description
S1	SERVICE	momentary push	Used at time of logical installation to identify device to the installation software. Pressing S2 will light the DS2 LED.
S2	RESET	momentary push	Resets the Neuron Chip processor. Must be pushed after Install action.
S3	TERMINATOR	slide	Switch is set to position opposite of text “TERM” from factory. One device in an FT-10 network must be terminated.
S4	12/24V SENSING	slide	Selects whether high/low battery sensing is for a 24VDC or 12VDC system. It is set to 24V position from the factory.
S5	NODE ADDRESS	slide	Switches 1 through 4 are used to set a unique address for the node. The default node address is 0001.

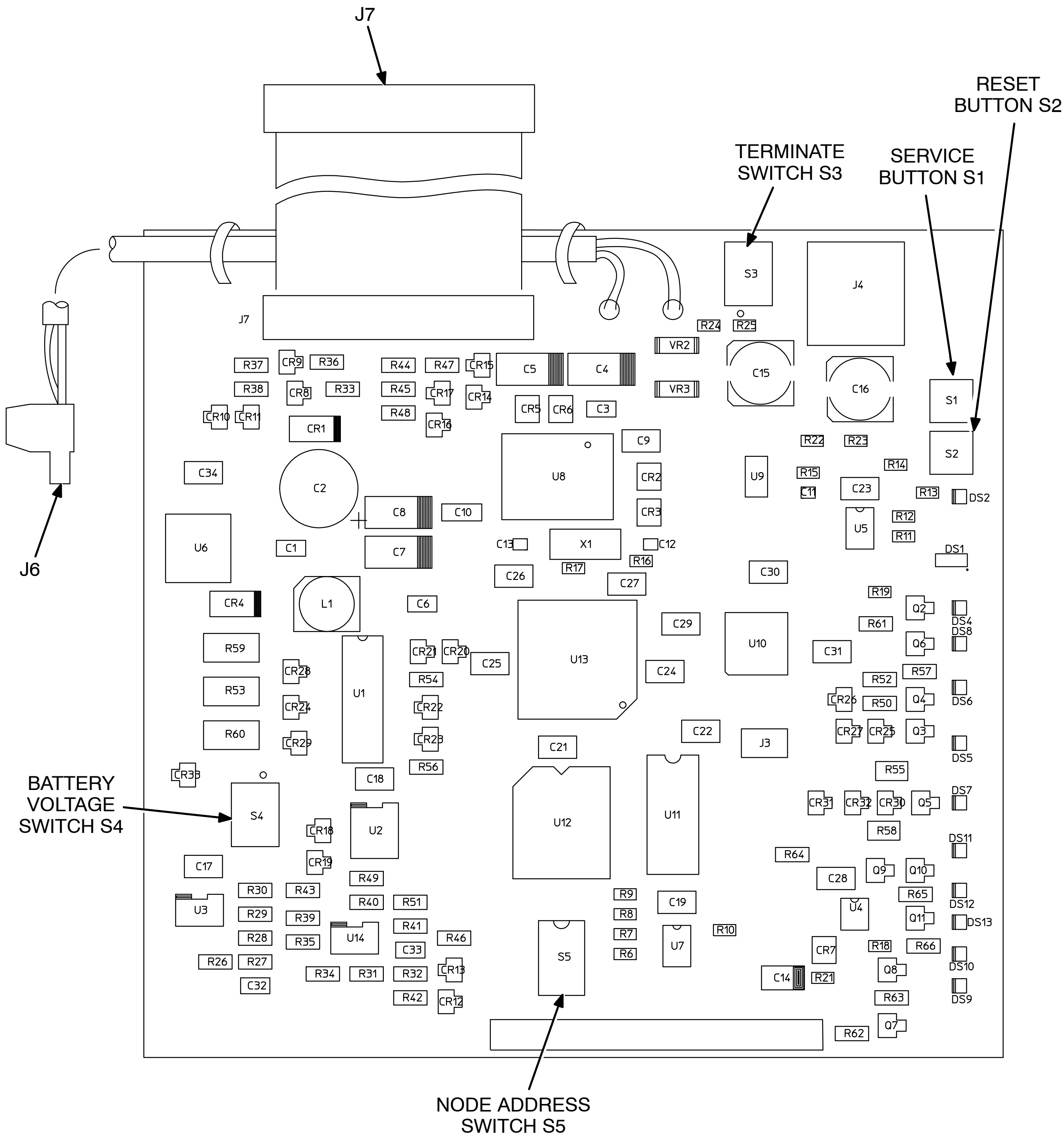


FIGURE 8-9. GENSET COMMUNICATIONS MODULE

TABLE 8-4. GCM LED INDICATORS

Ref	Color	Name	Description
DS1	Red/ Orange/ Green	NETWORK ERROR	Red indicates a network error (failed network integrity test) Green indicates the network is operating normally (passed network integrity test) Orange indicates the device is not bound.
DS2	Amber	SERVICE	Indicates various states of the GCM node. It will be ON if S2 is pressed and held. States without S2 pressed: **OFF** = All OK. GCM has application image and is installed in a network. **ON** = GCM is applicationless or has experienced a error that prevents Neuron Chip from executing application code. **1/2 Hz BLINKING (1 second on / 1 second off)** = GCM has an application, but has not been logically installed in a network. **FLASHING (momentarily)** once every 2–3 seconds = GCM is experiencing an error condition, causing a watchdog timeout reset.
DS4	Green	NETWORK ACTIVITY	Flashes momentarily when a device communicates over the network.
DS5	Red	E–STOP	ON when a network emergency stop is active.
DS6	Green	STATUS	**Approximately 1/2 Hz Blinking (1 second on / 1 second off)** indicates that the GCM's processor is executing the application code.
DS7	Green	WAKE UP	ON when the GCM has turned on the PCC.
DS8	Red	HIGH B+	ON for a high battery condition sensed by GCM.
DS9	Green	RXD	Indicates Serial Data output from the GCM to the PCC. If the PCC is awake and no service tool is connected, this LED should be flickering regularly. RXD may be steady ON if the PCC is not awake.
DS10	Green	TXD	Indicates Serial Data input to the GCM from the PCC. Should be flickering regularly if the PCC is awake. If the service tool is connected, flickering will indicate responses from the PCC to the service tool. TXD may be steady ON if the PCC is not awake.
DS11	Red	LOW B+	ON for a low battery condition sensed by GCM.
DS12	Green	DTR	ON indicates that the PCC is capable of communicating with the GCM (i.e. PCC is awake and no service tool is connected).
DS13	Green	RTS	ON indicates that the PCC has new information for the GCM to retrieve. (May not be used.)

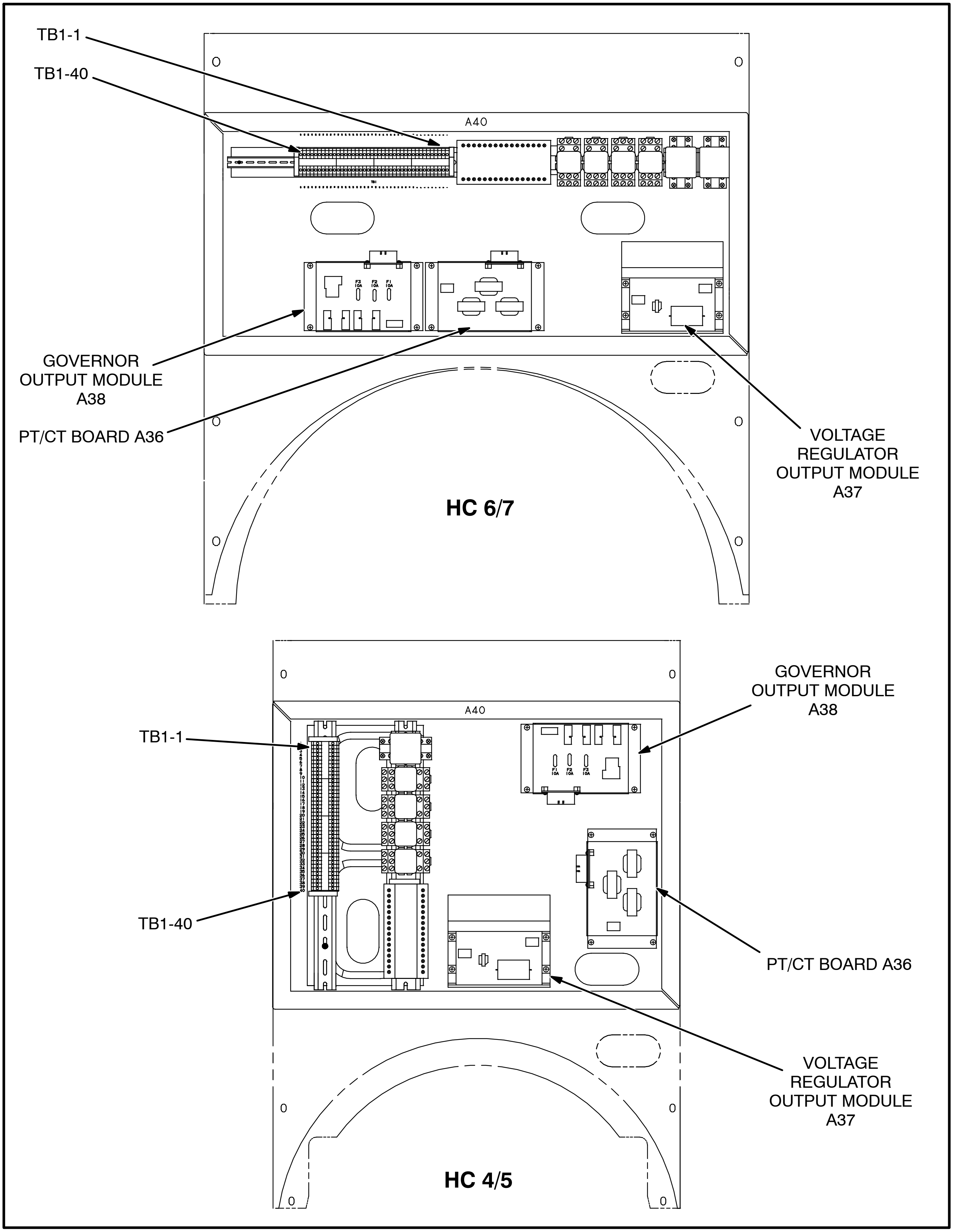


FIGURE 8-10. ACCESSORY BOX

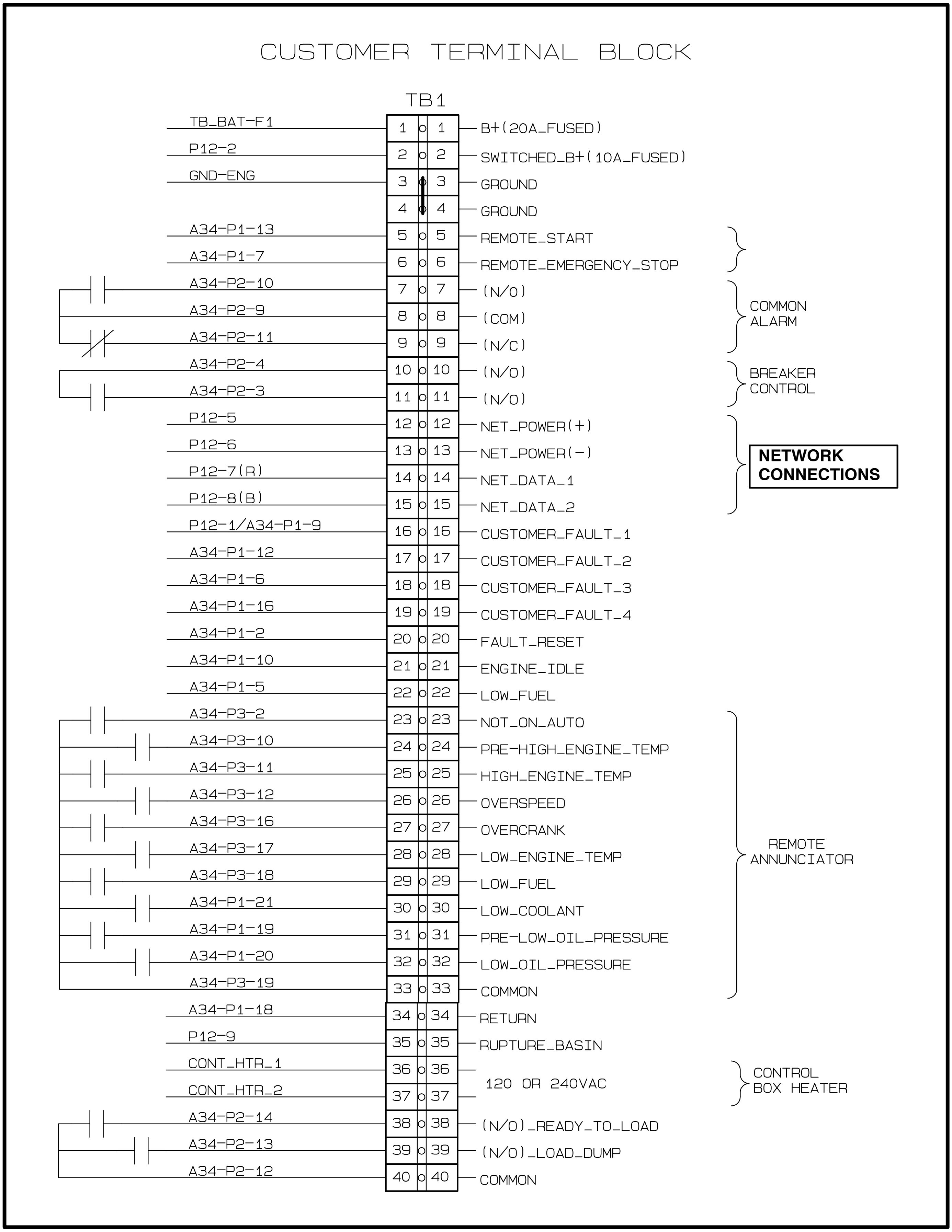


FIGURE 8-11. WIRING THE PCC/GCM

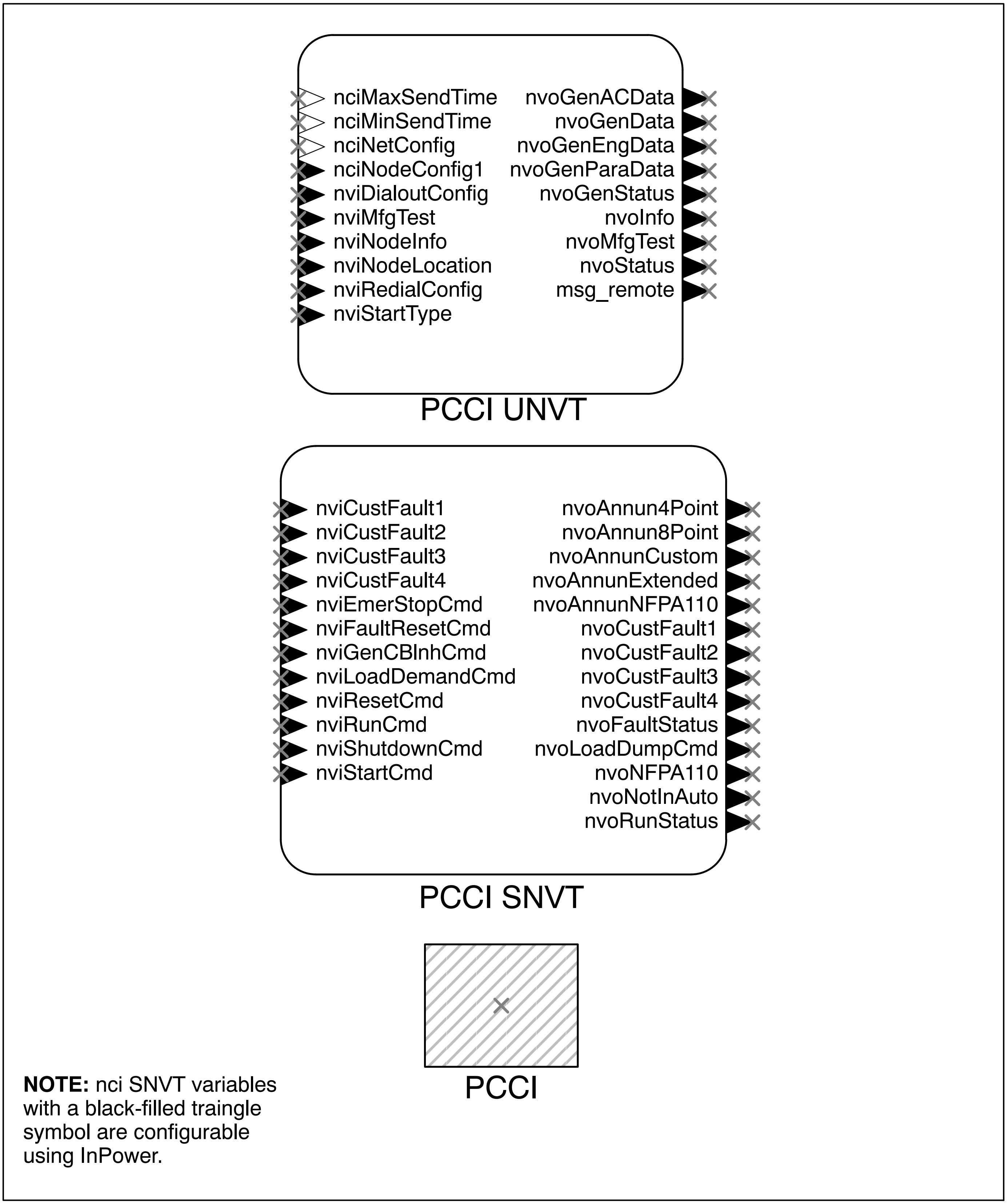


FIGURE 8-12. GENSET COMMUNICATIONS MODULE FUNCTIONAL BLOCK

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9. Genset LONWORKS Card used with PCC 3200 Controls

ABOUT THIS SECTION

The Genset LONWORKS® Card (GLC) is required for connection of a PowerCommand® (PCC 3200) Genset to a LONWORKS® FT-10 network. The GLC (Figure 9-1) provides an interface for data from the PCC 3200 control to other modules within the network. It communicates with the PCC 3200 control via the backplane of the card cage assembly.

GENERAL INFORMATION

There are two versions of the PCC 3200 control (Type I and Type II). Each version (see Figure 9-3) has a unique power harness.

NOTE: In addition to the Type II control shown in Figure 9-2, which includes the operator panel assembly installed in the door, some Type II controls include operator panel piece parts installed in the door.

When this installation is complete, the genset is ready for connection to a network. Refer to *Section 2* for instructions on network wiring and *Section 4* for network software installation.

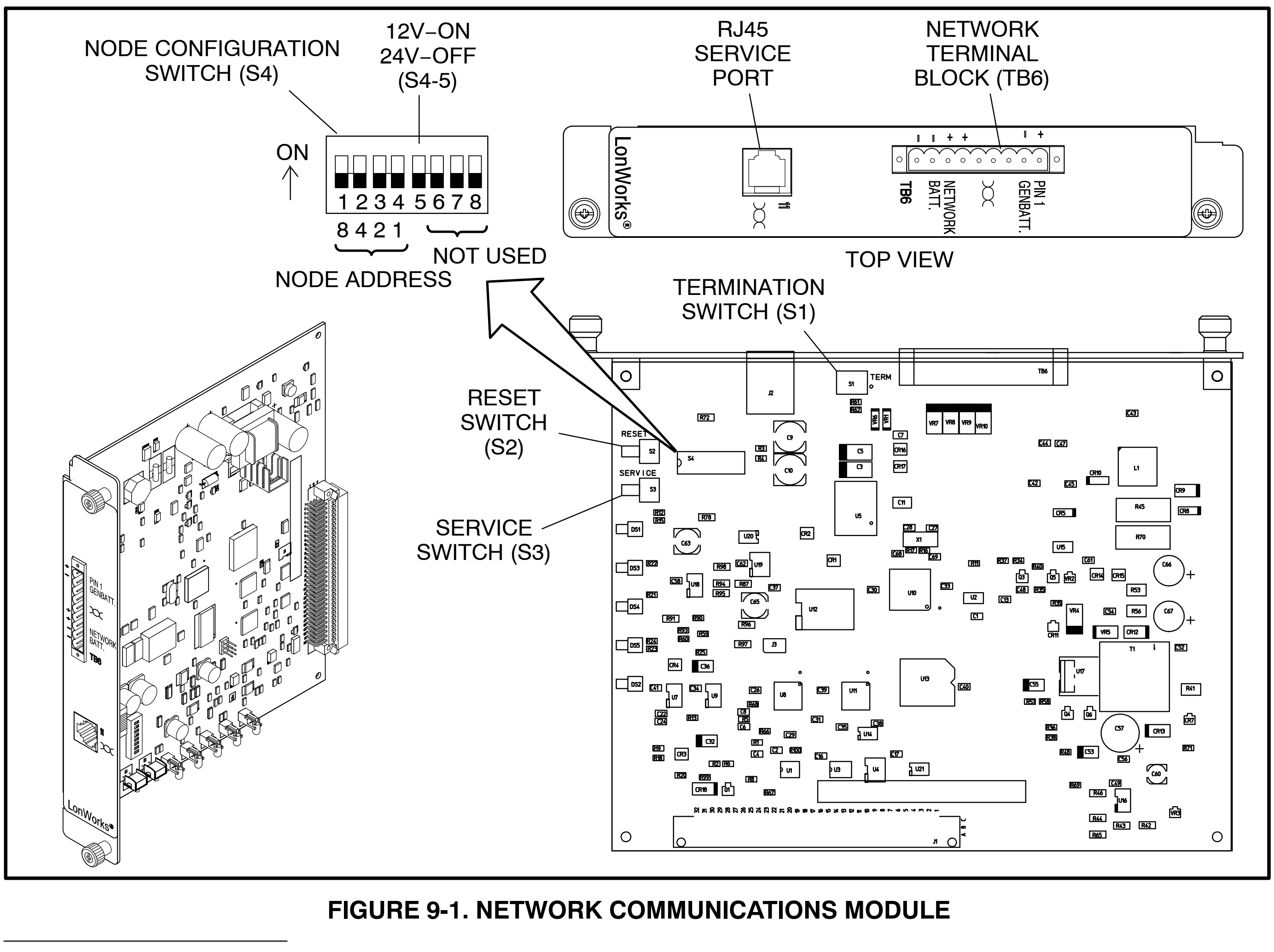


FIGURE 9-1. NETWORK COMMUNICATIONS MODULE

SAFETY PRECAUTIONS

Read these instructions completely and become familiar with safety warnings, cautions, and procedures before starting to install a GLC.

Circuit Board Handling Precautions

CAUTION ***Electrostatic discharge will damage circuit boards. Do not remove the circuit board from the antistatic shipping bag until you are grounded to the control box assembly with a wrist strap.***

To help prevent circuit board damage due to electrostatic discharge (ESD), a grounding wrist strap must be worn when handling the circuit board. (The wrist strap does not provide a direct short to ground, it is typically rated at approximately 1 megohm to ground.)

Attach the clip to a clean unpainted surface of the control box (see Figure 9-2) and place the strap around your wrist before handling a circuit board.

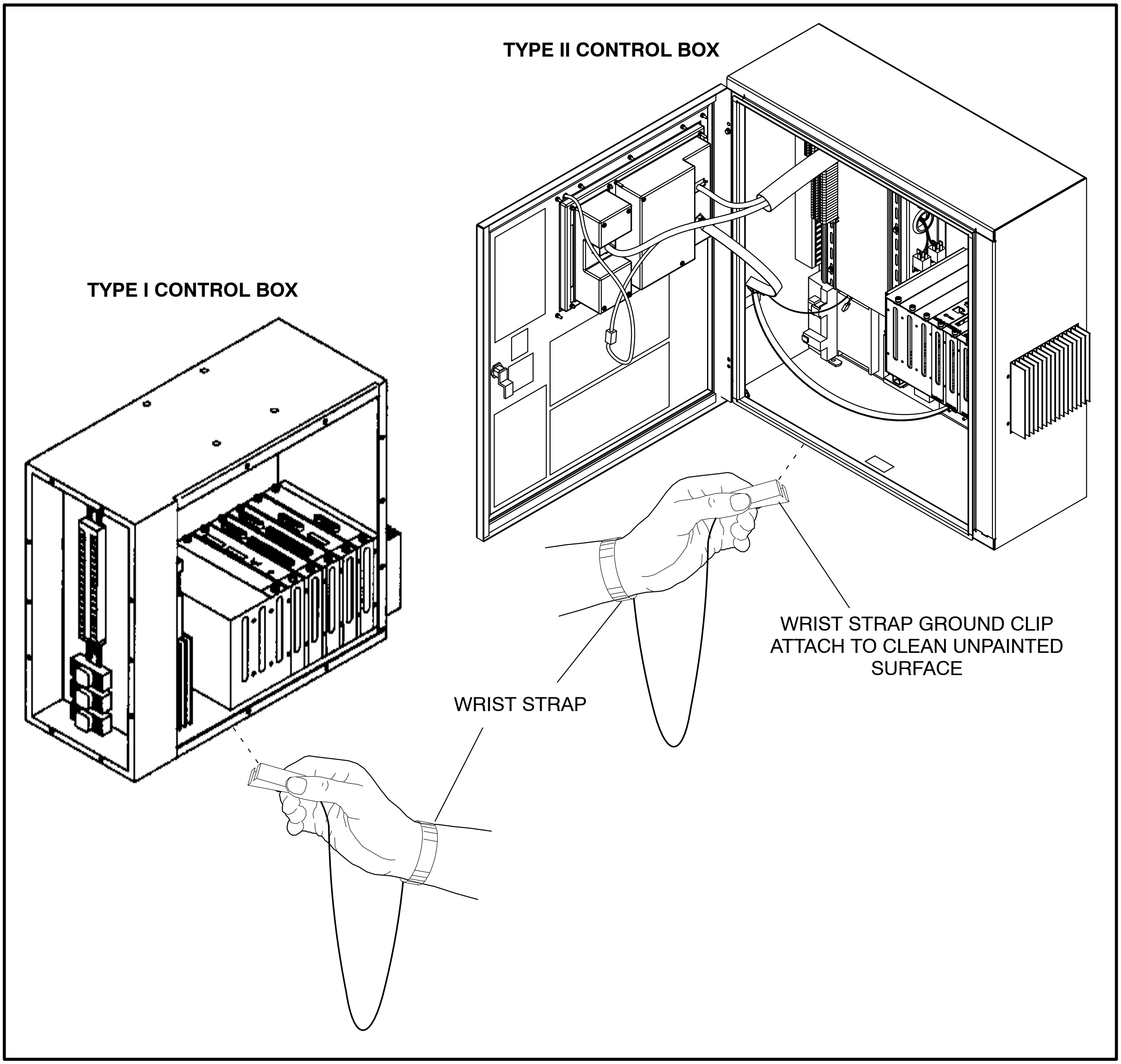


FIGURE 9-2. WRIST STRAP CONNECTION

PHYSICAL INSTALLATION

Make sure the *Node Address* and battery voltage selections are made before proceeding with the physical installation (see *CONFIGURATION* on page 9-6).

1. Place the genset O/Manual/Auto switch in the O (Off) position.

   WARNING ***Arcing at battery terminals, light switch or other equipment, flame, pilot lights and sparks can ignite battery gas causing severe personal injury.***

   Ventilate battery area before working on or near battery—Wear safety glasses—Do not smoke—Switch trouble light ON or OFF away from battery—Stop genset and disconnect charger before disconnecting battery cables—Disconnect negative (–) cable first and reconnect last.

   CAUTION ***Disconnect battery charger from AC source before disconnecting battery cables. Otherwise, disconnecting cables can result in voltage spikes damaging to DC control circuits of the set.***

   WARNING ***Accidental starting of the generator set can cause severe personal injury or death. Prevent accidental starting by disconnecting the negative (–) cable from the battery terminal.***

2. Disconnect the battery charger (if applicable). Remove all electrical supply sources.
3. Disconnect the negative (**–**) cable from the battery to prevent accidental starting.

For Type I PCC 3200 control, perform steps 4 through 12.

4. Locate the electronics box assembly (Figure 9-3). For a set-mounted control, it is attached to the drive end of the generator control housing. For a free-standing control, it is located inside the free-standing enclosure.
5. On the free-standing control, remove the 10 fasteners holding the lower front cover using a 13mm nut driver and remove cover. Loosen the two remaining fasteners in the slots and remove the cover.
6. Remove the 10 fasteners holding the front cover of the electronics box assembly using a 10mm nut driver and remove cover. Loosen the two remaining fasteners in the slots and remove the cover.
7. Connect the wrist strap ground clip as shown in Figure 9-2.
8. Locate slot 4 on the card cage assembly (Figure 9-3). Loosen the two fasteners holding the blank plate and remove plate.

   NOTE: Not all installations include slots that are marked. Slot 4 can be located by counting from the Fuel Card which is installed in slot 0.
9. Insert the GLC into slot 4. Tighten the two fasteners about one-half turn.
10. Install the DC power harness between **TB6** of the GLC and **Inline K**, as shown in Figure 9-3 and Figure 9-5.
11. Install all panels that were removed during this procedure.
12. Reconnect the negative (**–**) cable to the battery. Also, reconnect battery charger (if used).

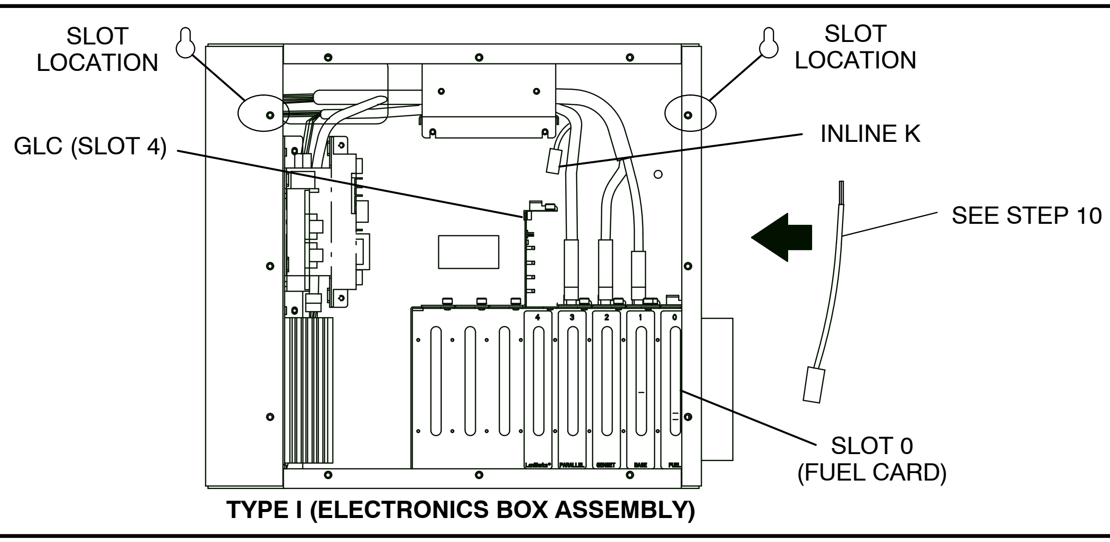


FIGURE 9-3. GLC INSTALLATION – TYPE I CONTROL

For Type II PCC 3200 control, perform steps 13 through 20.

13. Locate the control box assembly. For a set mounted control, it is mounted on the non-drive end of the generator control housing. For the free-standing control, it is located at the top half of the control.

14. Open the control box door by turning the latch 1/4 turn using an 8mm hex wrench.

15. Connect the wrist strap ground clip as shown in Figure 9-2.

16. Locate slot 4 on the card cage assembly (Figure 9-4). Loosen the two fasteners holding the blank plate and remove plate.

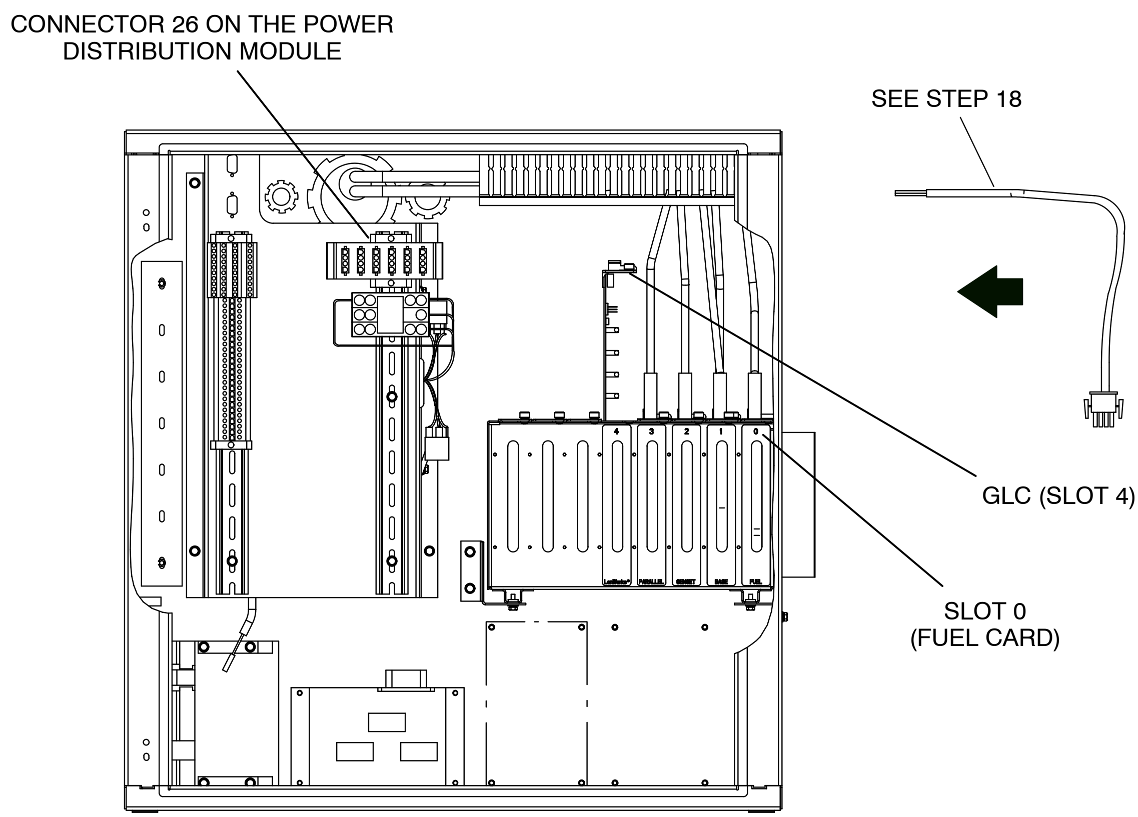
NOTE: Not all installations include slots that are marked. Slot 4 can be located by counting from the Fuel Card which is installed in slot 0.

17. Insert the GLC into slot 4. Tighten the two fasteners about one-half turn.

18. Route the DC power harness through the overhead cable tray. Connect the DC power harness between **TB6** of the GLC and **Connector 26** of the power distribution module, as shown in Figure 9-4 and Figure 9-5.

19. Install all panels that were removed during this procedure.

20. Reconnect the negative (–) cable to the battery. Also, reconnect battery charger (if used).



TYPE II (PCC CONTROL BOX ASSEMBLY)

FIGURE 9-4. GLC INSTALLATION – TYPE II CONTROL

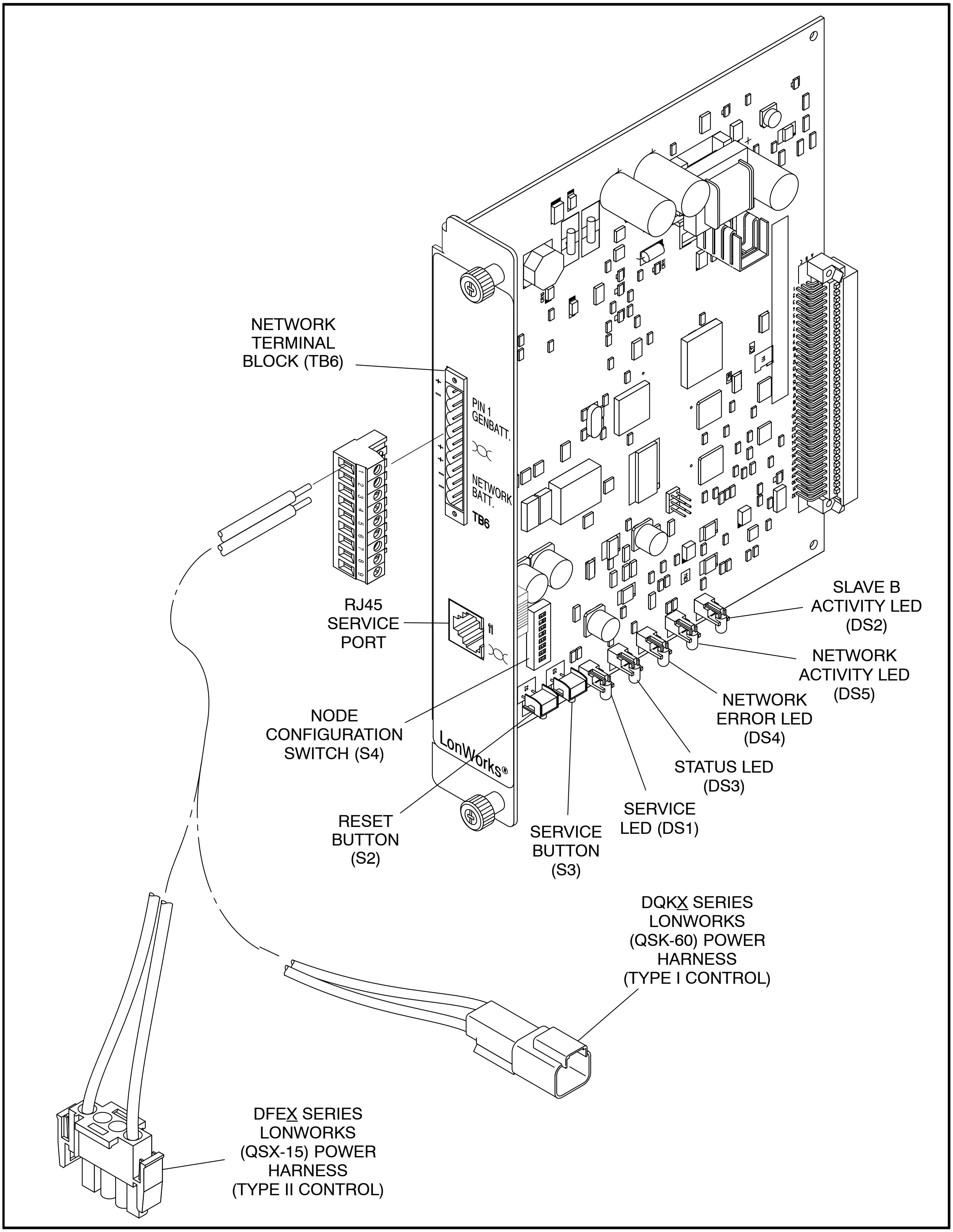


FIGURE 9-5. LED LOCATIONS

CONFIGURATION

Termination

1. If the device is terminated, the termination switch (S1) must be set to the **ON** position. See Figure 9-1 for the location of the Termination switch.

   NOTE: For free topology, only one device on each segment must be terminated. The device terminator switch can be used for this type of termination. Multidrop bus topology requires termination at each end of the bus using multi-drop bus terminators (Onan P/N 300–5729).

Battery Voltage Setting

2. Set **S4-5** to the **ON** position for a 12V-battery system or to **OFF** for a 24V-battery system (Figure 9-1). (The GLC will automatically wake the genset controller if the battery is below the respective threshold.)

Node Address (Self-Installation Only)

3. Each node on a self-installed network must have a unique address. Switches 1 through 4 of the Node Configuration Switch (S4) are used to set the *Node Address*. See Figure 9-1 for the location of the Node Configuration switch.

   The switches are oriented so that switch S4-1 is the most significant bit (MSB) of the *Node Address*. Thus, S4-1 has a value of "8" when it is ON; S4-2 value of 4, S4-3 value of 2, and S4-4 value of 1. For example, to set the *Node Address* to 9, set switch S4 to 1001 (8+0+0+1=9). See Table 9-1.

4. **Be sure to assign each node in the network a unique address**. The *Node Address* can be verified by counting the number of pulses of the "STATUS" LED (see Figure 9-5). The default node address is 0001, which is a "STATUS" pulse rate of 1.

TABLE 9-1. SETTING THE NODE ADDRESS (S4)

S4-1 (8)	S4-2 (4)	S4-3 (2)	S4-4 (1)	ADDR (BIN)	ADDR (DEC)
OFF	OFF	OFF	OFF	0000	0*
OFF	OFF	OFF	ON	0001	1
OFF	OFF	ON	OFF	0010	2
				⇓	⇓
ON	ON	ON	ON	1111	15

SELF-INSTALLATION

Self-installation guidelines, information on PCC custom annunciation and relay events, and information on how to self-install a network is included in *Section 3*.

Requirements

This procedure can be used to logically install the GLC when the following requirements are met.

Self-installation is limited to one PowerCommand ATS or CCM-T, one PowerCommand Genset or CCM-G, and no more than four annunciators or five DIMs. The GLC can be autobound by an ATS and three annunciators and three DIMs, but by no more than a total of four annunciators and DIMs.

If these requirements cannot be met, the system must be installed with LonMaker™ . Refer to LonMaker Installation, following this section.

Node Address

Each node on a self-installed network must have a unique address. Refer to *CONFIGURATION*.

After the device has been logically installed, the *Node Address* can be verified by counting the number of pulses of the "STATUS" LED. See Figure 9-5.

Logical Installation

After the GLC is *physically* connected to the network, it is ready to be *logically* installed.

1. Make sure the GLC node and other network devices are powered and connected to the twisted-pair data bus.
2. Make sure S4-1, S4-2, S4-3, and S4-4 on the GLC are configured for the desired node ad-

dress. Each device on the network must have a unique address.

3. Make sure the network is terminated.
4. Press and hold the *Service* button (S3) (see Figure 9-5) for approximately two seconds until the *Network Status* LED (DS3) begins flashing.
5. Release the *Service* button.

Binding Sequence

Logically connecting to another device is referred to as *binding*. *Binding* may be done when all the nodes are installed, connected, and powered.

Binding the node must occur in the proper sequence. Logically install the genset first, followed by the transfer switch, and then the annunciator(s) and other network accessories.

NOTE: The genset (GLC) and ATS (NCM) must be Cummins Inc. devices which are able to self-install in the network. Each device on the network must have a unique address.

Verify Binding

To verify the genset has installed itself properly and is bound to the ATS, disconnect the data cable at J14. The “NETWORK ERROR” LED (DS4) (see Figure 9-5) should turn on (red) within 10 seconds. This indicates communications have failed and that the device was properly bound.

Reconnect the twisted pair cable and confirm that DS4 turns off within 10 seconds.

If no error is produced, use InPower to verify the *Test Interval* (located in the LonWorks device folder from the Adjustments directory) is set for 10.0 seconds. Also check the wiring and Address of each node. Repeat the Self-Installation steps to re-initiate *binding*.

Remove Bindings

If unresolved system errors occur, the bindings can be removed and then re-installed to reset the system. The bindings can also be removed if the network is being changed or the device is being moved to another network.

To remove all bindings from the device, change the *Node Address* (S4) to 0 (zero) and logically re-install the device.

The node will remove all bindings at this time, including the genset and annunciator bindings. The “STATUS” LED will not flash when the *Node Address* is 0, nor will it attempt to bind to a genset.

Re-Binding

Re-Binding the node must occur in the proper sequence. Logically install the genset first, followed by the transfer switch; and then the annunciator(s), DIM(s), and other network accessories.

To re-bind an annunciator, DIM, or ATS to the genset node, press and hold the Service pin for two seconds.

LONMAKER INSTALLATION

The GLC can be installed with LonMaker. The Device Stencil is required. To install using LonMaker:

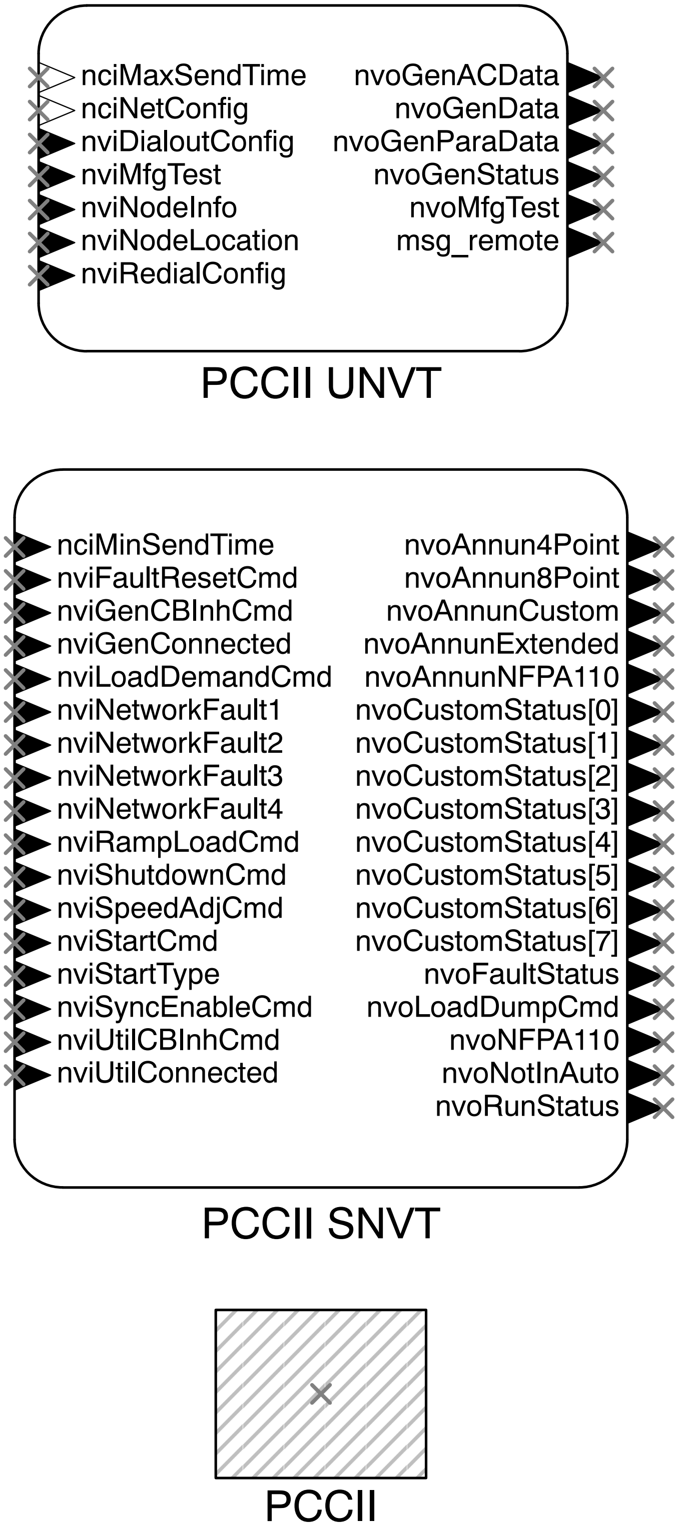
1. Run LonMaker. See *Section 4*.
2. Open the Device Stencil.
3. Create a new site (or update an existing site).
4. Define, install and bind devices.
5. Verify system operation.

The GLC is defined and installed like any other device in LonMaker.

NETWORK VARIABLES

Figure 9-6 illustrates the GLC functional block and shows the network variable inputs and outputs. For more information on these variables, see Appendix F.

NOTE: nci network variables with a black connector are configurable in InPower.



NOTE: nci SNVT variables with a black-filled traingle symbol are configurable using InPower.

FIGURE 9-6. GENSET LONWORKS CARD FUNCTIONAL BLOCK

NETWORK INSTALLATION

Sections 4 and *5* provide a detailed description of the network installation process. Read *Sections 1* and *2* before constructing the network. *Sections 4* and 5 provide the following step-by-step installation procedures:

1. Setting up Network Installation Tools
2. Starting LonMaker Software
3. Using LonMaker Software
4. LonMaker Network Setup
5. Connecting Devices with LonMaker
6. Installing Devices with LonMaker
7. Testing Devices and Verifying Installation

SWITCHES AND LEDS

The Service switch is used during installation (when prompted by the LonMaker program). The Terminator switch must be set to the appropriate position at installation. Switches are described in Table 9-2. LED indicators are described in Table 9-3.

TABLE 9-2. GLC SWITCHES

Ref	Name	Type	Description
S1	TERMINATOR	Slide	Switch is set to position opposite of text “ON” from factory. One device in an FT-10 network must be terminated.
S2	RESET	Toggle	Resets the Neuron Chip processor. Must be set to “ON” after Install action.
S3	SERVICE	Toggle	Used at time of logical installation to identify device to the installation software. Setting the switch to “ON” will light the DS1 LED.
S4	NODE CONFIGURATION	Slide	Switches 1 through 4 are used to set a unique address for the node. The default node address is 0001. Switches 5 through 8 are not used and should be set to the “OFF” position.

TABLE 9-3. GLC LED INDICATORS

Ref	Color	Name	Description
DS1	Amber	SERVICE	Indicates various states of the GLC node. It will be ON if S3 is pressed and held. States without S3 pressed: **OFF** = All OK. GLC has application image and is installed in a network. **ON** = GLC is application-less or has experienced a error that prevents Neuron Chip from executing application code. **1/2 Hz BLINKING (1 second on/1 second off)** = GLC has an application, but has not been logically installed in a network. **FLASHING** once every 2–3 seconds = GLC is experiencing an error condition causing a watchdog timeout reset (fatal error).
DS2	Green	SLAVE B ACTIVITY	Flashes momentarily when the GLC communicates with the base board.
DS3	Green	STATUS	**1 Hz BLINKING (1/2 second on/1/2 second off)** indicates that the GLC’s processor is executing the application code. When self-installed, the STATUS LED pauses after blinking the number of times that match the node address (for example, if the node address is 2, the LED blinks twice, stays off for 1 second, and then repeats).
DS4	Red	NETWORK ERROR	Indicates a network error (failed network integrity test).
DS5	Green	NETWORK ACTIVITY	Flashes momentarily when a device communicates over the network.

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10. Network Communications Module used with PCC 2100 Controls

ABOUT THIS SECTION

This section describes the Network Communications Module (NCM). An NCM is required for connection of a PowerCommand® Control 2100 (PCC) to an FT-10 LONWORKS® network. The NCM provides an interface for data from the genset to other modules on the network. It communicates with the PCC 2100 baseboard, providing complete monitoring and control of the genset.

GENERAL PRECAUTIONS

Read these installation instructions completely and become familiar with safety warnings, cautions, and the installation procedure before starting.

Before servicing the PCC, it is recommended that all settings be recorded by making a capture file. This will make sure of correct and complete readjustment of the PCC in the event that all previous entries are lost during servicing.

WARNING ***Incorrect service or replacement of parts can result in severe personal injury or death, and/or equipment damage. Service personnel must be trained and experienced to perform electrical and mechanical service.***

WARNING ***The PCC 2100 control cabinet must be opened only by technically qualified personnel. Voltages of up to 600 VAC are present in the PCC cabinet. These voltages can cause electrical shock, resulting in personal injury or death.***

Even with power removed, improper handling of components can cause electrostatic discharge and damage to circuit components.

Requirements

- NEMA Level IV, 22 AWG Stranded Twisted-Pair Cable
- Cummins Inc. Device Stencil (LonMaker installed only)
- LonMaker™ Software (Manual Installation)
- Self-installation with an ATS requires an FT-10 OTPC NCM or a CCM-T

Network installation must be performed by trained network personnel. When installation is complete, the genset is ready for connection to a network. Refer to *Section 2* and *Section 4* for instructions on network wiring and network software installation.

Circuit Board Removal Safety Precautions

To prevent circuit board damage due to electrostatic discharge (ESD), a grounding wrist strap must be worn when handling circuit boards or socket-mounted ICs. (The wrist strap **does not** provide a direct short to ground, but is typically rated at approximately 1 megohm to ground.)

Network installation must be performed by trained network personnel. When installation is complete, the genset is ready for connection to a network. Refer to *Section 2* for instructions on network wiring and network software installation.

Turn off or remove AC power from the battery charger and then remove the negative (–) battery cable from the set starting battery. This is to make sure the set will not start while working on it and to avoid circuit board damage, caused by voltage spikes when removing and replacing circuit board connectors.

CAUTION ***Always disconnect a battery charger from its AC source before disconnecting the battery cables. Otherwise, disconnecting the cables can result in voltage spikes high enough to damage the DC control circuits of the generator set.***

PowerCommand is a registered trademark of Cummins Inc.
InPower is a trademark of Onan Corporation.
LONWORKS is a registered trademark of Echelon Corp.
LonMaker is a trademark of Echelon Corporation.

WARNING ***Accidental starting of the generator set while working on it can cause severe personal injury or death. Prevent accidental starting by disconnecting the starting battery cables (negative [–] first).***

Make certain the battery area has been well-ventilated before servicing the battery. Arcing can ignite explosive hydrogen gas given off by batteries, causing severe personal injury. Arcing can occur when a cable is removed or re-attached, or when the negative (–) battery cable is connected and a tool used to connect or disconnect the positive (+) battery cable touches the frame or other grounded metal part of the generator set. Always remove the negative (–) cable first, and reconnect it last. Make certain hydrogen from the battery, engine fuel, and other explosive fumes are fully dissipated. This is especially important if the battery has been connected to a battery charger.

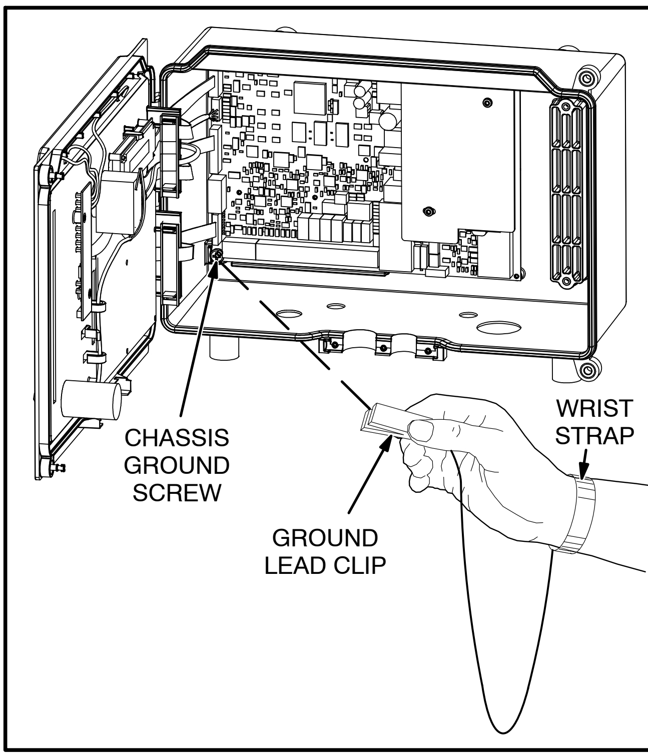


FIGURE 10-1. WRIST STRAP

Attach the clip to the chassis ground connection in the lower left-hand corner of the control box and place the strap around your wrist before handling a circuit board (see Figure 10-1).

CAUTION ***Electrostatic discharge will damage circuit boards. Always wear a grounding wrist strap when handling circuit boards or socket-mounted ICs.***

PHYSICAL INSTALLATION

Network Module Installation

1. Turn the PCC selector switch to the “O” (Off) position.
2. Disconnect the battery charger (if applicable). Remove all electrical supply sources.
3. If there is an external battery charger, disconnect it from its AC power source. Then disconnect the set starting battery (negative [–] lead first).

   WARNING ***Ignition of explosive battery gases can cause severe personal injury. Do not smoke or cause any spark, arc, or flame while servicing batteries.***

4. Disconnect the generator set starting battery cable(s). Disconnect the negative (–) cable(s) first to reduce the risk of arcing.
5. Open the control door.
6. Use a wrist strap, or touch a grounded surface to discharge any static charge before handling circuit boards (see Figure 10-1).
7. Attach the four standoffs to the base circuit board (see Figure 10-2).
8. Mount the network module to the four standoffs using four M3 x 8mm pan head screws.

   CAUTION ***Ribbon cables are fragile. Do not fold or bend sharply or pull on the end connectors. Cable damage can degrade signal performance.***

9. Attach the network module ribbon cable to connector J6, on the base circuit board (A1).
10. Attach one end of the network harness to the Data 1 and Data 2 terminals of the two-position terminal block (J30), (polarity insensitive, see Figure 10-3).
11. Attach the other end of the network harness to another network device.

Termination

12. If the device is to be terminated, set the S1 termination switch to the ON position.

    NOTE: For free topology, only one device on each segment must be terminated. The device terminator switch can be used for this type of termination. Multidrop bus topology requires termination at each end of the bus using multidrop bus terminators (Onan P/N 300–5729).

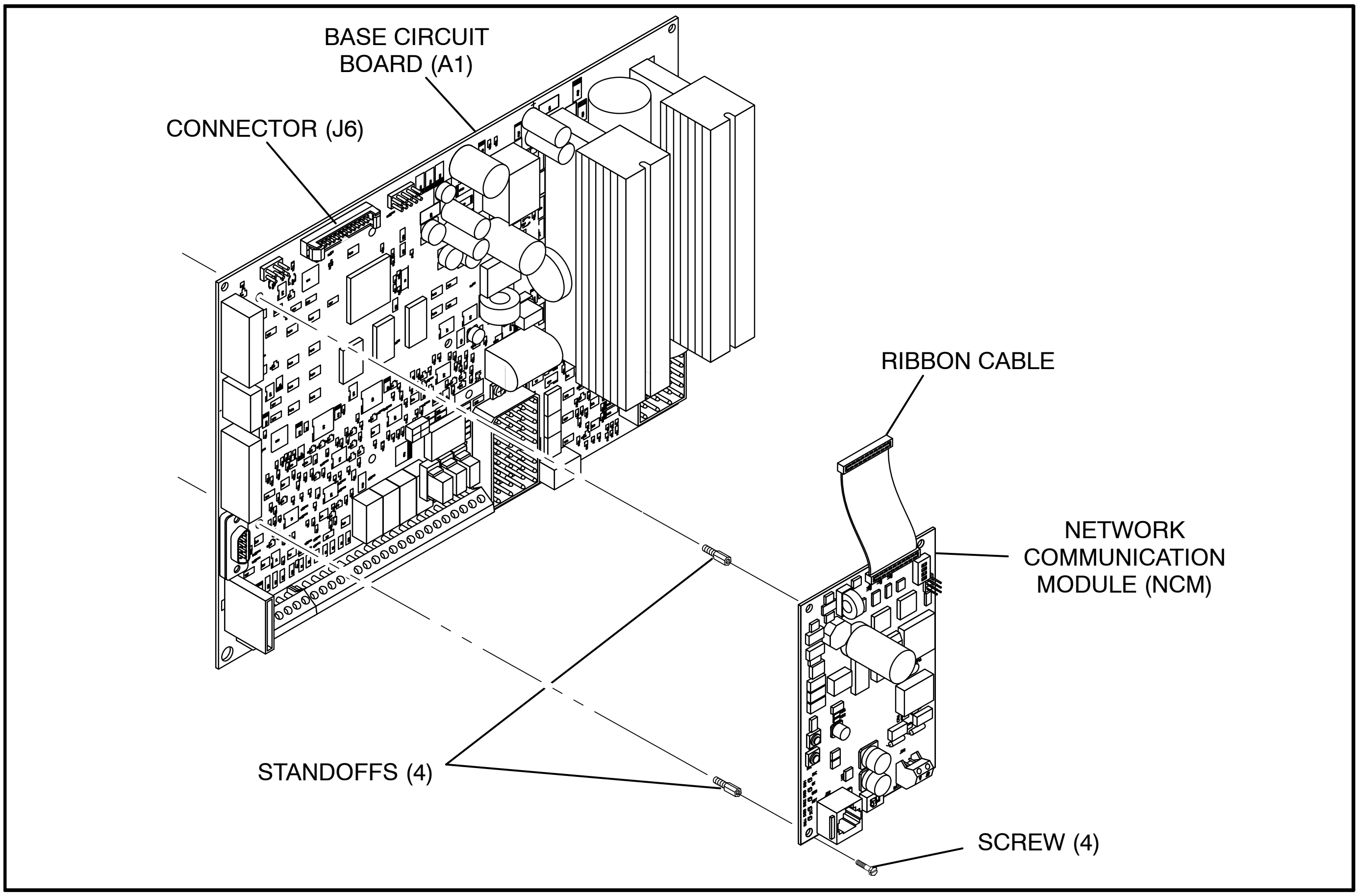


FIGURE 10-2. NETWORK COMMUNICATION MODULE INSTALLATION

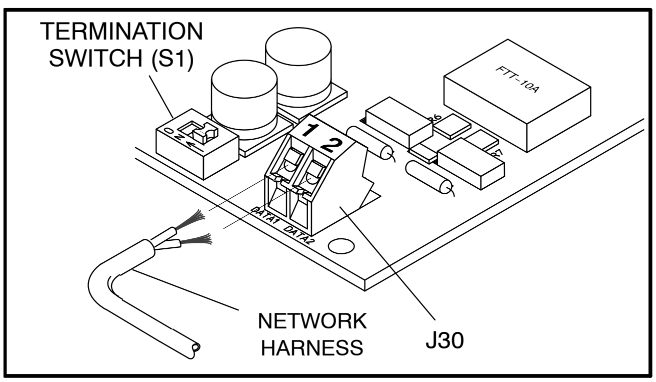


FIGURE 10-3. NETWORK HARNESS CONNECTION

13. Reconnect the generator starting battery cable(s). Verify that the "SVC" indicator blinks on the NCM (see Figure 10-4).
14. If there is an external battery charger, reconnect it to its AC power source. Then reconnect the set starting battery (negative [–] lead last).
15. Turn the PCC selector switch to the "Manual" position to "wake up" the PCC 2100. Verify that the "OK" indicator blinks on the NCM (see Figure 10-4).

Refer to *Section 2* for instructions on network wiring and network software installation.

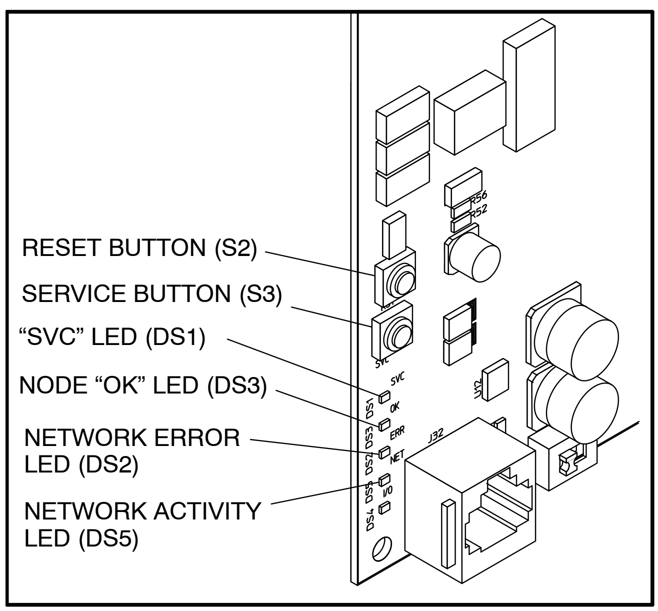


FIGURE 10-4. BUTTON AND LED LOCATIONS

SELF-INSTALLATION

Self-installation guidelines, information on PCC custom annunciation and relay events, and information on how to self-install a network is included in *Section 3*.

Requirements

This procedure can be used to logically install the NCM when the following requirements are met.

Self-installation is limited to one PowerCommand Genset or CCM-G, one PowerCommand Automatic Transfer Switch (ATS) or CCM-T, and no more than four annunciators or five DIMs. The PCC 2100 can be autobound by an ATS and up to three annunciators and four DIMs, but by no more than a total of fie annunciators and DIMs.

If these requirements are not met, the system must be installed with LonMaker. Refer to "LonMaker Installation" on 10-5.

A transfer switch (OTPC or BTPC) must be v1.2.138, or later, to support the Network Communication Module software. A CCM-T with an FTT-10 transceiver will also work.

With networks containing a transfer switch, the genset NCM must be installed before the transfer switch, the annunciator, DIM, and other network devices are logically installed.

NOTE: The genset must be installed first.

Node Address

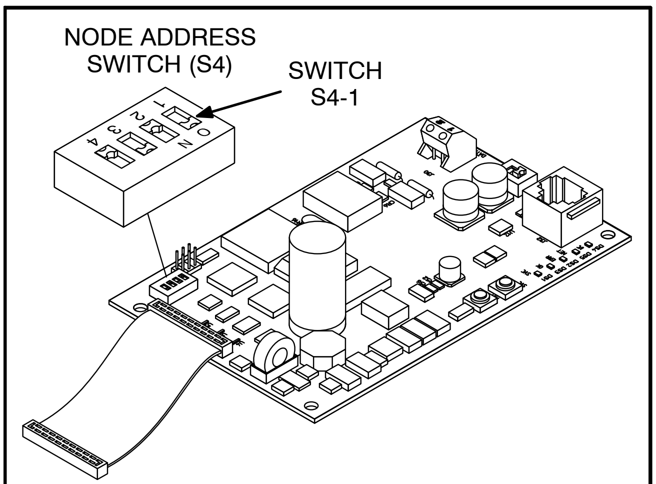


FIGURE 10-5. NODE ADDRESS SWITCH

Each node on a self-installed network must have a unique address. Switches 1 through 4 of switch S4 are used to set the *Node Address* (see Figure 10-5). The default node address is 0001, which is an "OK" LED pulse rate of 1.

The switches are oriented so that switch S4-1 is the most significant bit (MSB) of the *Node Address.* Thus, S4-1 has a value of "8" when it is ON. S4-2 has a value of 4, S4-3 has a value of 2, and S4-4 has a value of 1. For example, to set the *Node Address* to 9, set switch S4 to 1001 (8+0+0+1=9). See Table 10-1.

TABLE 10-1. SETTING THE NODE ADDRESS (S4)

S4-1 (8)	S4-2 (4)	S4-3 (2)	S4-4 (1)	Address (binary)	Address (decimal)
OFF	OFF	OFF	OFF	0000	0[1]
OFF	OFF	OFF	ON	0001	1
OFF	OFF	ON	OFF	0010	2
				↓	↓
ON	ON	ON	ON	1111	15

NOTE 1. "0" (zero) is not a valid *Node Address*.

Be sure to assign each node in the network a unique address.

After the device has been installed, the *Node Address* can be verified by counting the number of pulses of the "OK" LED (DS3) (see Figure 10-4). Make sure each device has a unique node address.

After the genset has been installed, a DIM, annunciator, or ATS may bind to the genset. Because the genset does not execute the binding function, the genset must be installed first.

Logical Installation

After the NCM is *physically* connected to the network, it is ready to be *logically* installed.

1. Make sure the NCM node and other network devices are powered and connected to the twisted-pair data bus.
2. Make sure S4-1, S4-2, S4-3, and S4-4 on the NCM are configured for the desired node address. Each device on the network must have a unique address.
3. Make sure the network is terminated.
4. Press and hold the *Service* button (S3) (see Figure 10-4) for approximately two seconds

until the *Node "OK"* LED (DS3) begins flashing.

5. Release the *Service* button.

Binding Sequence

Logically connecting to another device is referred to as *binding*. *Binding* may be done when all the nodes are installed, connected, and powered.

Binding the node must occur in the proper sequence. Logically install the genset first, followed by the transfer switch, and then the annunciator(s) and other network accessories.

NOTE: The genset (NCM) and ATS module must be Cummins Inc. devices which are able to self-install in the network. Each device on the network must have a unique address.

Verify Binding

To verify the genset has installed itself properly and is bound to the ATS, disconnect the twisted-pair data cable at J30. The "Network Error" LED (DS2) (see Figure 10-5) should turn on (red) within approximately 10 seconds. This indicates communications have failed and that the device was properly bound.

Reconnect the twisted pair cable and confirm that DS2 turns off within approximately 10 seconds.

If no error is produced, use InPower to verify the *Test Interval* (located in the LONWORKS device folder from the Adjustments directory) is set for 10.0 seconds. Also check the wiring and Address of each node. Repeat the Self-Installation steps to re-initiate *binding*.

Remove Bindings

If unresolved system errors occur, the bindings can be removed and then re-installed to reset the system. The bindings can also be removed if the network is being changed or the device is being moved to another network.

To remove all bindings from the device, change the *Node Address* (S4) to 0 (zero) and re-install the device.

The node will remove all bindings at this time, including the genset and annunciator bindings. The "OK" LED will not flash when the *Node Address* is 0, nor will it attempt to bind to a genset.

Re-Binding

Re-Binding the node must occur in the proper sequence. Logically install the genset first, followed by the transfer switch; and then the annunciator(s), DIM(s), and other network accessories.

To re-bind an annunciator, DIM, or ATS device to the genset, press and hold the Service pin for two seconds.

LONMAKER INSTALLATION

The PowerCommand 2100 Genset NCM can be manually installed with LonMaker. The Device Stencil is required.

LonMaker installation is required to use PowerCommand Software (PCW II). Self-installation does not require LonMaker.

To install using LonMaker:

1. Run LonMaker. See *Section 4*.
2. Open the Device Stencil.
3. Create a new site (or update an existing site).
4. Define, install, and bind devices.
5. Verify system operation.

The PowerCommand 2100 Genset is defined and installed like any other device in LonMaker.

NETWORK INSTALLATION

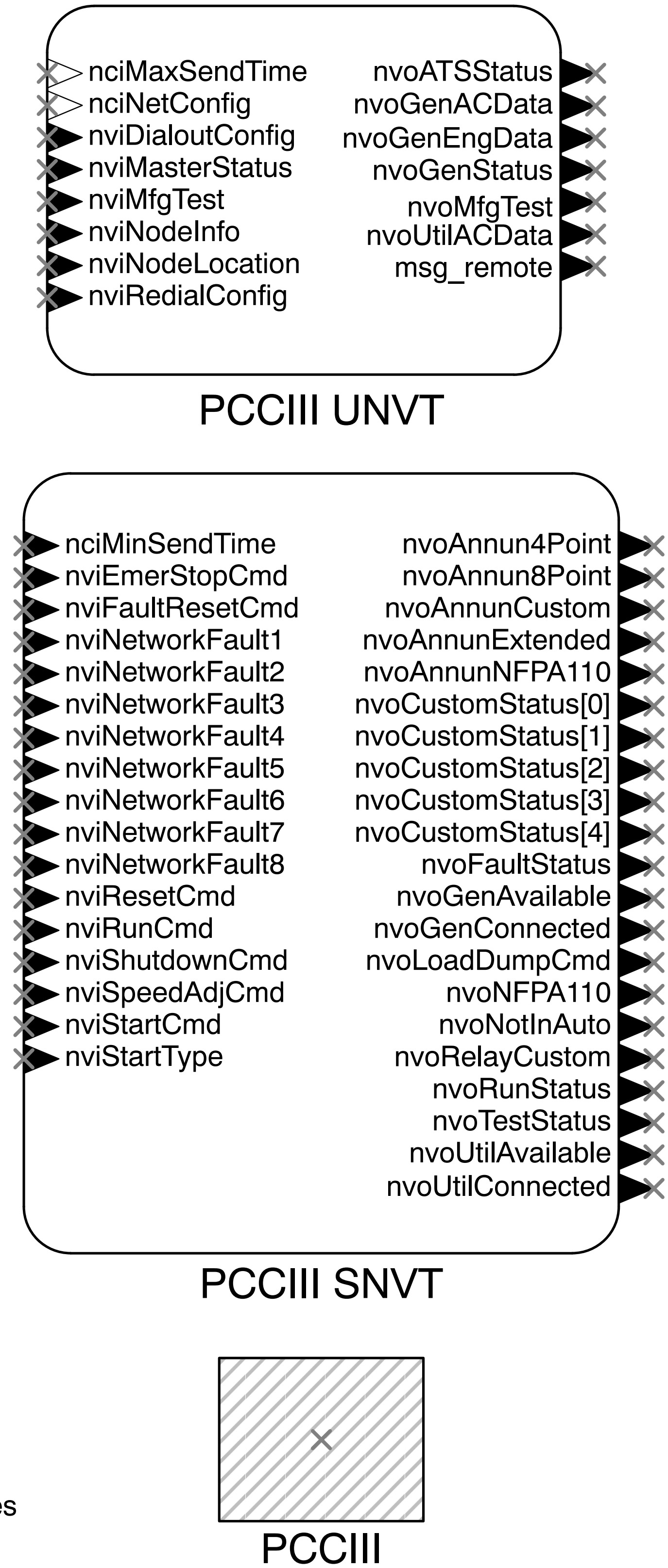
Sections 4 and *5* provide a detailed description of the network installation process. Read *Sections 1* and *2* before constructing the network. *Sections 4* and 5 provide the following step-by-step installation procedures:

1. Setting up Network Installation Tools
2. Starting LonMaker Software
3. Using LonMaker Software
4. LonMaker Network Setup
5. Connecting Devices with LonMaker
6. Installing Devices with LonMaker
7. Testing Devices and Verifying Installation

NETWORK VARIABLES

Figure 10-6 illustrates the PCC 2100 NCM functional block and shows the network variable inputs and outputs. For more information on these variables, see Appendix F.

NOTE: nci network variables with a black connector are configurable in InPower.



NOTE: nci SNVT variables with a black-filled traingle symbol are configurable using InPower.

FIGURE 10-6. PCC 2100 NETWORK COMMUNICATIONS MODULE FUNCTIONAL BLOCK

SWITCHES AND LEDS

The Service switch is used during installation (when prompted by the LonMaker program). The Terminator switch must be set to the appropriate position at installation. Switches are described in Table 10-2. LED indicators are described in Table 10-3.

TABLE 10-2. PCC 2100 NCM SWITCHES

Ref	Name	Type	Description
S1	TERMINATOR	Slide	Switch is set to position opposite of text “TERM” from factory. One device in an FT-10 network must be terminated.
S2	RESET	Momentary push	Resets the Neuron Chip processor. Must be pushed after Install action.
S3	SERVICE	Momentary push	Used at time of logical installation to identify device to the installation software. Pressing S3 will light DS1 LED.
S4	NODE ADDRESS	Slide	The switches are used to set a unique address for the node. The default node address is 0001.

TABLE 10-3. PCC 2100 NCM LED INDICATORS

Ref	Color	Name	Description
DS1	Amber	SERVICE	Indicates various states of the NCM node. It will be ON if S3 is pressed and held. States without S3 pressed: **OFF** = All OK. NCM has application image and is installed in a network. **ON** = NCM is application-less or has experienced a error that prevents Neuron Chip from executing application code. **1/2 Hz BLINKING (1 second on/1 second off)** = NCM has an application, but has not been logically installed in a network. **FLASHING** once every 2–3 seconds = NCM is experiencing an error condition causing a watchdog timeout reset (fatal error).
DS2	Red	NETWORK ERROR	Indicates a network error (failed network integrity test).
DS3	Green	OK (Status)	**1 Hz BLINKING (1/2 second on/1/2 second off)** indicates that the NCM’s processor is executing the application code. When self-installed, the OK LED pauses after blinking the number of times that match the node address (for example, if the node address is 2, the LED blinks twice, stays off for 1 second, and then repeats).
DS4	Green	I/O	Flashes momentarily when the NCM communicates with the base board.
DS5	Green	NETWORK ACTIVITY	Flashes momentarily when a device communicates over the network.

11. Network Communications Module used with PowerCommand Automatic Transfer Switches

ABOUT THIS SECTION

This section describes the Network Communications Module (NCM) required for connection of a PowerCommand® Automatic Transfer Switch (ATS) (OTPC / BTPC and OHPC / CHPC) to a LonWorks® FT-10 network. The NCM provides an interface for data from the transfer switch to other modules on the network. It communicates with the digital board providing complete monitoring and control of the transfer switch.

GENERAL INFORMATION

Requirements

- NEMA Level IV, 22 AWG Stranded Twisted-Pair Cable
- CPG Device Stencil (LonMaker installed only)
- LonMaker™ Software (Manual Installation)
- PowerCommand® Transfer Switch Software v1.08.204 or later
- Self-Installation with a genset requires a genset with an FT-10 network interface device.*

  ***NOTE:** PCC 3100 with GCM (327−1301), PCC 3200 with GLC (327−1299), PCC 2100 with NCM (327−1275), or CCM-G (327−1280).

- InPower® Service Software. (Use to enable the network feature. See the ATS Service Section in the *InPower User's Guide* 3397101)

Network installation must be performed by trained network personnel. When installation is complete, the transfer switch is ready for connection to a network. Refer to *Sections 2* and *4* for instructions on network wiring and network software installation.

PowerCommand is a registered trademark of Cummins Inc.
InPower is a trademarks of Onan Corporation.
LonWorks is a registered trademark of Echelon Corp.
LonMaker is a trademark of Echelon Corporation.

SAFETY PRECAUTIONS

Read these instructions completely and become familiar with safety warnings, cautions, and procedures before starting the installation.

WARNING ***AC power within the cabinet and the inside the cabinet door presents a shock hazard that can cause severe personal injury or death. Always wear eye protection and use extreme caution to avoid touching electrical contacts when the cabinet door is open. Remove power to the door by disconnecting connectors J1/P1 (OTPC, OHPC, CHPC) or J10/P10 (BTPC) located on the cabinet door or on the control plate near the motor disconnect switch. The following procedures are to be performed only by technically trained and experienced personnel.***

WARNING ***Accidental starting of the generator set while working on it can cause severe injury or death. Disconnect the battery cables to prevent accidental starting. Always disconnect the negative (−) cable first, and connect it last, to prevent arcing if a tool accidentally touches the frame or other grounded metal parts of the set while connecting or disconnecting the positive (+) cable. Arcing can ignite explosive hydrogen gas given off by the battery and cause severe injury. Ventilate the battery compartment before removing cables.***

PHYSICAL INSTALLATION

Network Module Installation

1. Turn the operation selector switch to Off/Stop. (The selector switch is located on the generator set control panel on two-wire start systems.)
2. If possible, remove all sources of AC power to the transfer switch.
3. If there is an external battery charger, disconnect it from its AC power source. Then disconnect the set starting battery (negative [−] lead first).

⚠WARNING ***Ignition of explosive battery gases can cause severe personal injury. Do not smoke or cause any spark, arc, or flame while servicing batteries.***

4. Open the transfer switch door and disconnect power to the door by disconnecting connector P1 on the OTPCs, OHPCs, and CHPCs or P10 on the BTPCs.

5. Use a wrist strap, or touch a grounded surface to discharge any static charge before handling circuit boards.

6. Locate the digital module on the cabinet door. Remove one of the batteries from the Digital Module. Remove the four mounting screws on the left side of the board.

7. Attach the four standoffs to the digital module (see Figure 11-1 or 11-2).

⚠CAUTION ***Ribbon cables are fragile. Do not fold or bend sharply or pull on the end connectors. Cable damage can degrade signal performance.***

8. Attach the ribbon cable to connector J20, on the digital module.

9. Use two M3 x 8 pan head screws to mount the network module on the top two standoffs.

10. Attach one end of the network harness to the Data 1 and Data 2 terminals of the two-position terminal block (J30), (polarity insensitive, see Figure 11-4 or 11-3).

11. Install the battery lead (see Figure 11-5):
    a. Remove the P27 connector from the J27 connector on the digital module.
    b. Insert the lead terminal into pin 21 of the P27 connector.
    c. Fasten the stripped end of the lead to terminal 3 (B+) of TB2 on the transfer switch.
    d. Reconnect the P27 connector on the digital module.
    e. Use cable ties to secure the lead to the ATS harness.

12. For early production units (see Figure 11-2),
    a. Install the two Lithium batteries.
    b. Use two M3 x 8 pan head screws to install the battery bracket and secure the network module on the lower two standoffs.

13. Reinstall the battery on the Digital Module.

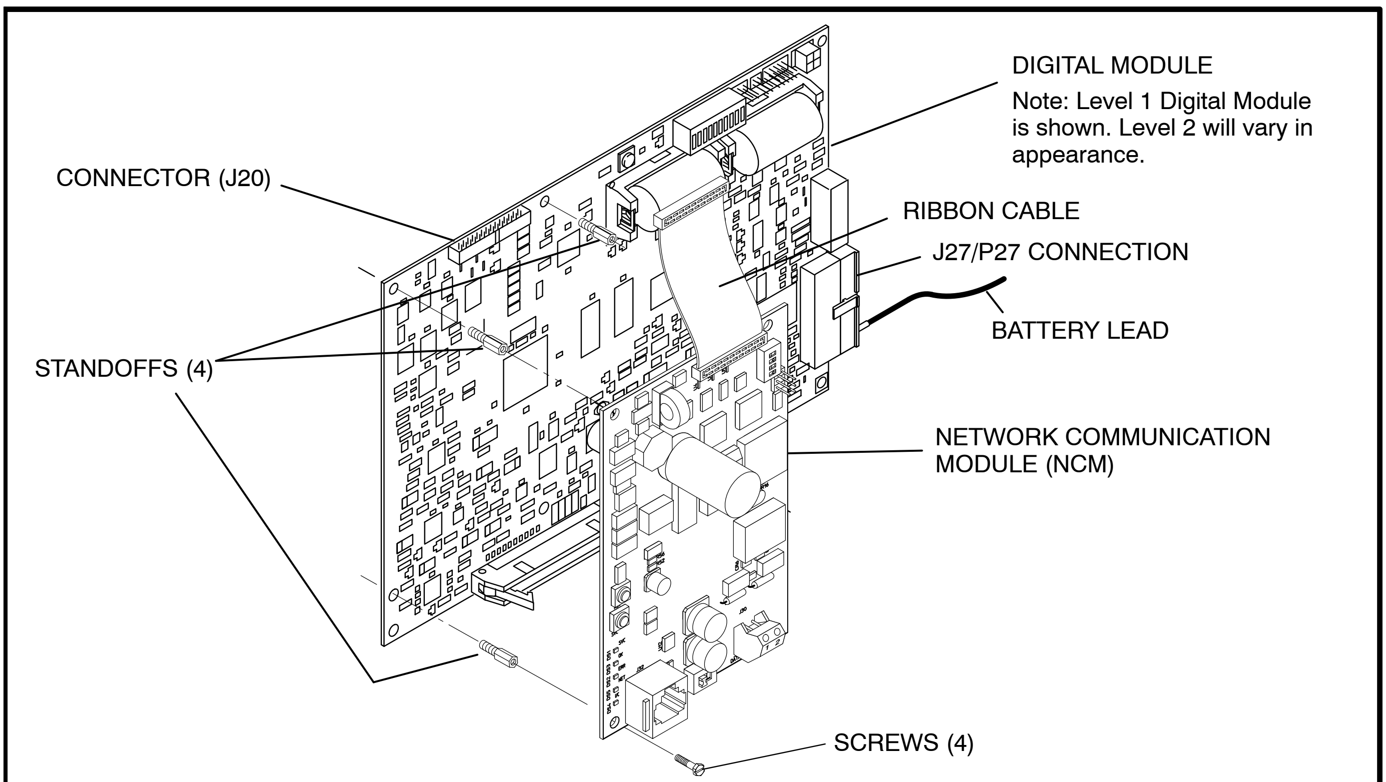


FIGURE 11-1. NETWORK COMMUNICATION MODULE INSTALLATION (CURRENT PRODUCTION)

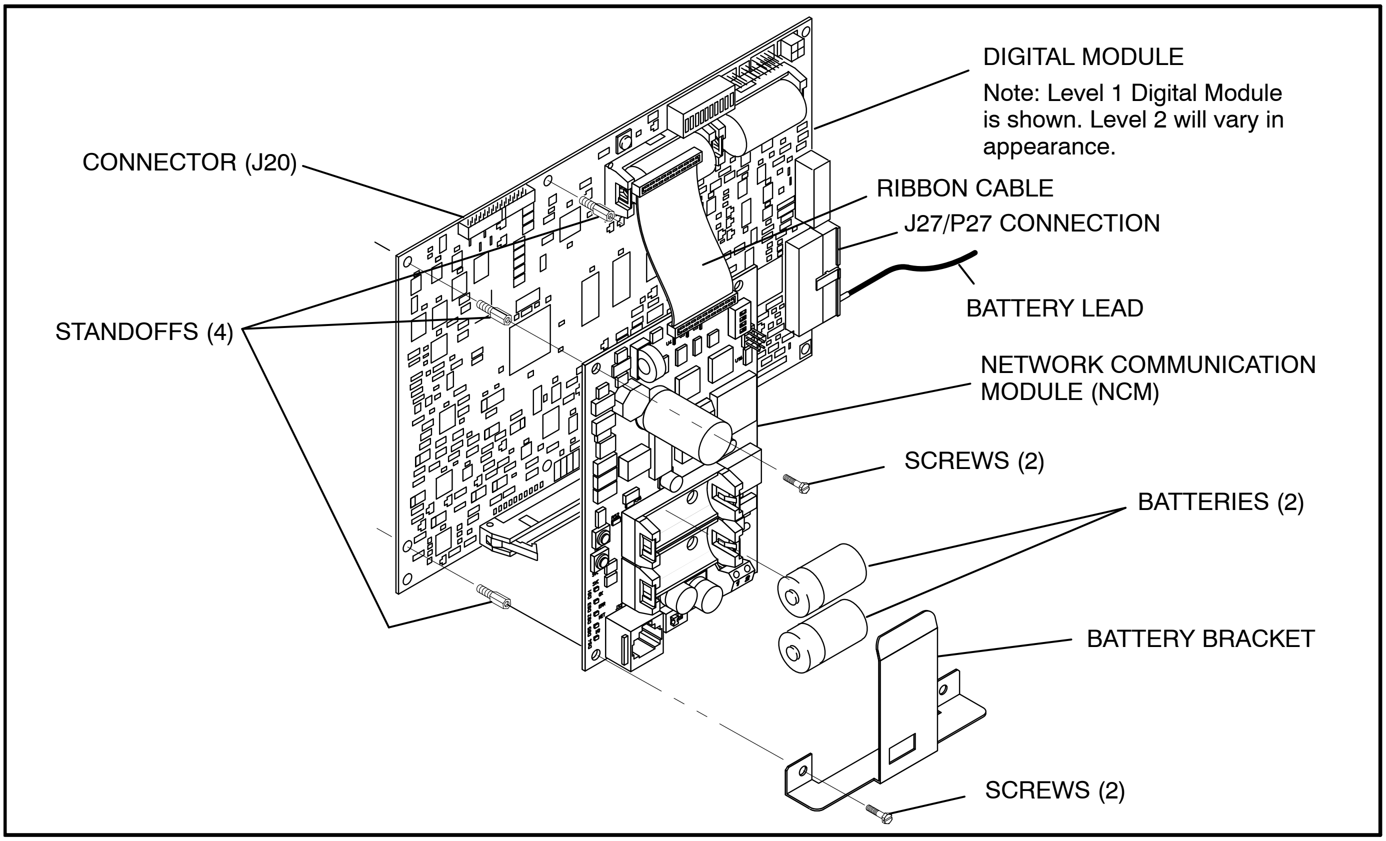


FIGURE 11-2. NETWORK COMMUNICATION MODULE INSTALLATION (EARLY PRODUCTION)

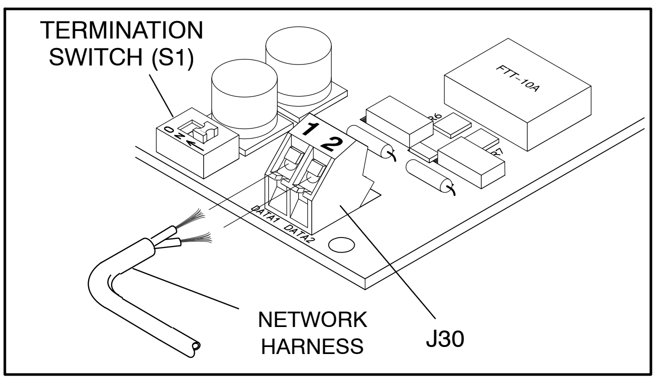


FIGURE 11-3. NETWORK HARNESS CONNECTION (CURRENT PRODUCTION)

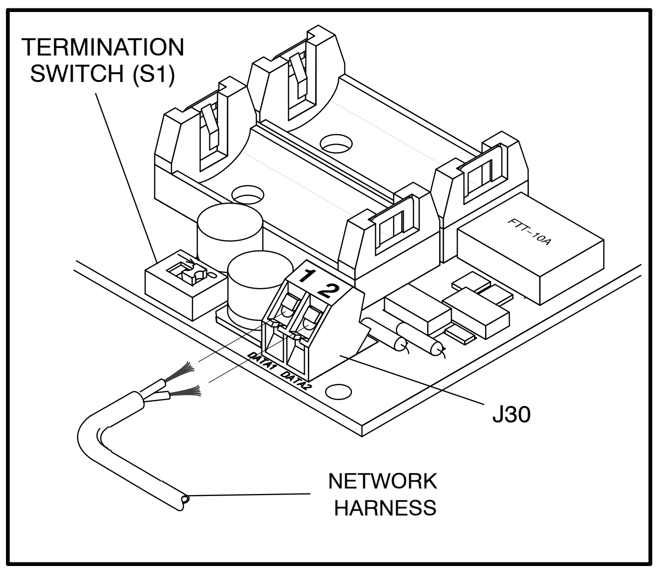


FIGURE 11-4. NETWORK HARNESS CONNECTION (EARLY PRODUCTION)

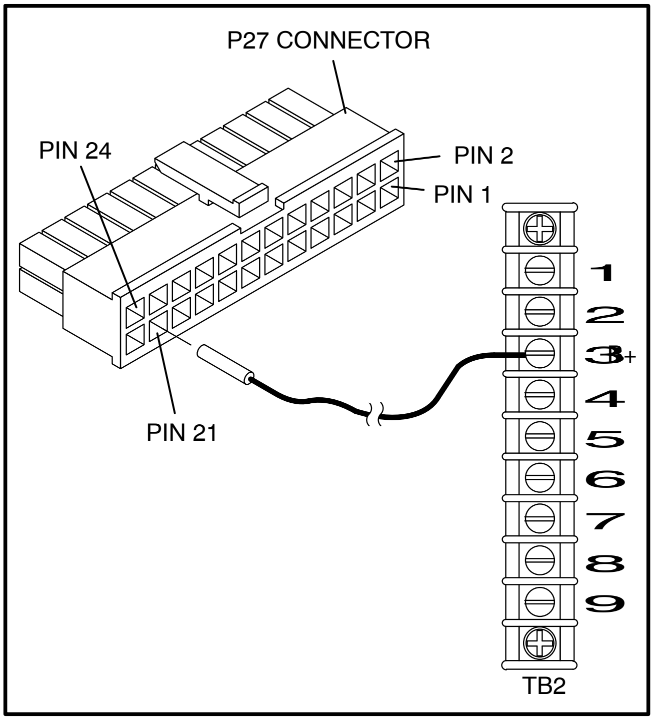


FIGURE 11-5. BATTERY LEAD INSTALLATION

Termination

14. If the device is to be terminated, set the S1 switch to the ON position.

    NOTE: For free topology, only one device on each segment must be terminated. The device terminator switch can be used for this type of termination. Multidrop bus topology requires termination at each end of the bus using multidrop bus terminators (Onan P/N 300−5729).

Refer to *Section 2* for instructions on network wiring and *Section 4* for network software installation.

DIN Rail Installation

Figure 11-6 shows the installation of the din rail for kit 40−1000 amp transfer switches. Figure 11-7 shows the installation for 1200−3000 amp transfer switches.

1. Assemble together the two-position terminal block, rail, end plate and end brackets for TB3.

   NOTE: If the transfer switch is already equipped with TB3, loosen the lower end bracket and slide it down the rail. Attach the two new terminals to the rail and slide the end bracket back up. Tighten against the two new terminal blocks. The end brackets, end plate, rail, and hardware are not required.

2. Apply the terminal tag labels (51 and 52) to the terminals.
3. For 1200−3000 amp transfer switches, use the two M4 hex nuts to secure the rail on the transfer switch cabinet according to the size and type of cabinet listed in Table 11-1. Go to step 6.
4. For 40−1000 amp transfer switches, install TB3 to the mounting plate using the two hex nuts and round head screws provided.
5. Secure the mounting plate to the cabinet according to the size and type of cabinet listed in Table 11-1.
6. Attach the free end of the network harness (from J30) to terminals 51 and 52.
7. Secure the network harness to the existing harness(es), using cable ties provided.
8. Reconnect power to the door by connecting plugs P1 on the OTPCs, OHPCs, and CHPCs, or P10 on the BTPCs.

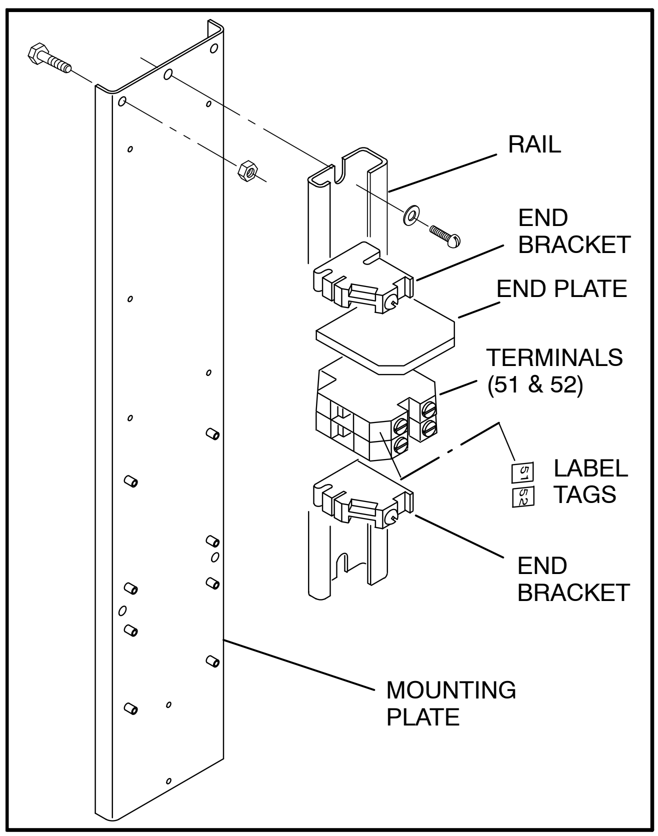


FIGURE 11-6. DIN RAIL ASSEMBLY (40−1000 AMP TRANSFER SWITCHES)

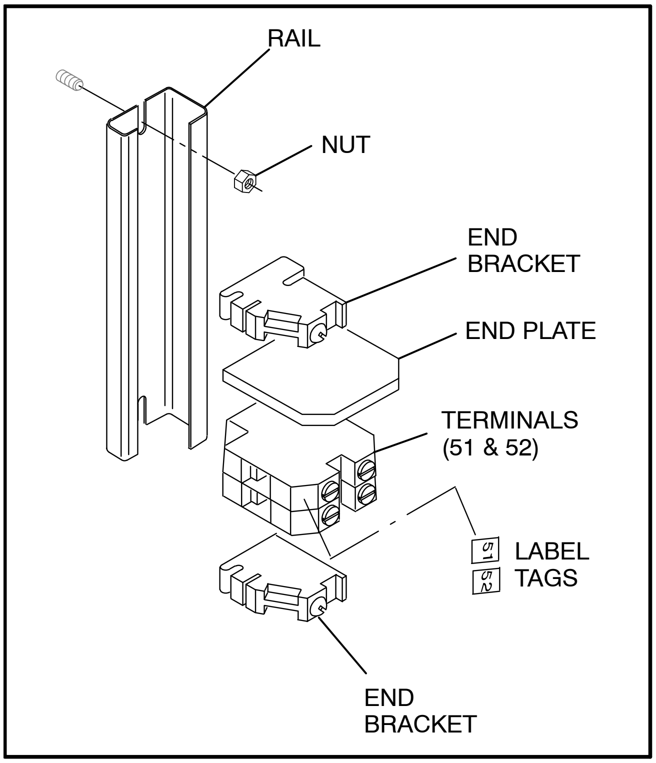


FIGURE 11-7. DIN RAIL ASSEMBLY (1200–3000 AMP TRANSFER SWITCHES)

TABLE 11-1. DIN RAIL LOCATIONS

Model (Amps)	Cabinet Type	Location
OTPC 40–1000 Amps	All Types	Inside, upper left wall
OTPC 1200 Amps	All Types	Inside, upper left wall
OTPC 1600–3000 Amps	Type 1	Left side of cabinet
OTPC 1600–3000 Amps	Type 3R, 4, 12	Right side of cabinet
BTPC 150–1000 Amps	All Types	Inside, upper left wall
BTPC 1200 Amps	Type 1	Inside cabinet, below TB2
BTPC 1200–3000 Amps	All Types	Right side of cabinet
OHPC and CHPC 125–800 Amps	All Types	Inside, upper left wall

9. Reconnect the set starting battery (negative [–] lead first). If there is an external battery charger, connect it to its AC power source.
10. Reconnect the transfer switch to the AC power source (if removed).
11. Return the operation selector switch on the genset to Auto/Remote position.

SELF-INSTALLATION

Self-installation guidelines and information on how to self-install a network is included in *Section 3*.

Requirements

This procedure can be used to logically install the NCM when the following requirements are met.

The transfer switch operating and software version must be v1.08.204, or later, to support the Network Communication Module software. The software version can be viewed using the digital display in the “About” menu (if equipped) or with InPower.

InPower™ software is required to download software to the PowerCommand ATS and to enable the LONWORKS feature.

Self-installation is limited to one PowerCommand ATS or CCM-T, one PowerCommand Genset or CCM-G and no more than four annunciators or five DIMs. The PowerCommand ATS can autobind to a genset and can be autobound by up to two annunciators and two DIMs but by no more than a total of three annunciators and DIMs.

With networks containing a genset, the transfer switch NCM must be logically installed after the genset is logically installed and before the annunciator(s) and DIM(s) are logically installed.

If these requirements cannot be met, the system must be installed with LonMaker. Refer to LonMaker Installation, following this section.

Node Address

Each node on a self-installed network must have a unique address. Switches 1 through 4 of switch S4 are used to set the *Node Address* (see Figure 11-8 or 11-9). The default node address is 0010, which is an "OK" LED pulse rate of 2.

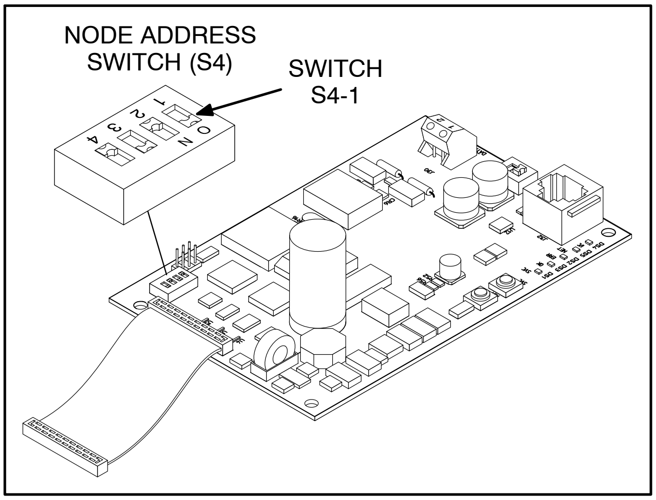


FIGURE 11-8. NODE ADDRESS SWITCH (CURRENT PRODUCTION)

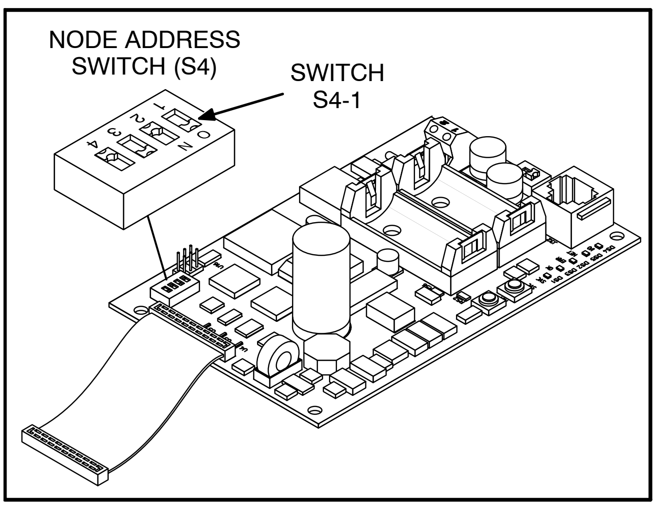


FIGURE 11-9. NODE ADDRESS SWITCH (EARLY PRODUCTION)

The switches are oriented so that switch S4-1 is the most significant bit (MSB) of the *Node Address.* Thus, S4-1 has a value of "8" when it is ON. S4-2 has a value of 4, S4-3 has a value of 2, and S4-4 has a value of 1. For example, to set the *Node Address* to 9, set switch S4 to 1001 (8+0+0+1=9). See Table 11-2.

TABLE 11-2. SETTING THE NODE ADDRESS (S4)

S4-1 (8)	S4-2 (4)	S4-3 (2)	S4-4 (1)	Address (binary)	Address (decimal)
OFF	OFF	OFF	OFF	0000	0[1]
OFF	OFF	OFF	ON	0001	1
OFF	OFF	ON	OFF	0010	2
				↓	↓
ON	ON	ON	ON	1111	15

NOTE1. "0" (zero) is not a valid *Node Address*.

Be sure to assign each node in the network a unique address.

After the device has been installed, the *Node Address* can be verified by counting the number of pulses of the "OK" LED (DS3). See Figure 11-10 or 11-11. Make sure each device has a unique node address.

Logical Installation

After the ATS is *physically* connected to the genset, the NCM is ready to be *logically* connected to the genset. Logically connecting to another device is referred to as *binding*. *Binding* may be done at any time once all nodes are installed, connected, and powered.

NOTE: The genset and ATS must be FT-10 devices which are able to self-install in the network. Each device on the network must have a unique address.

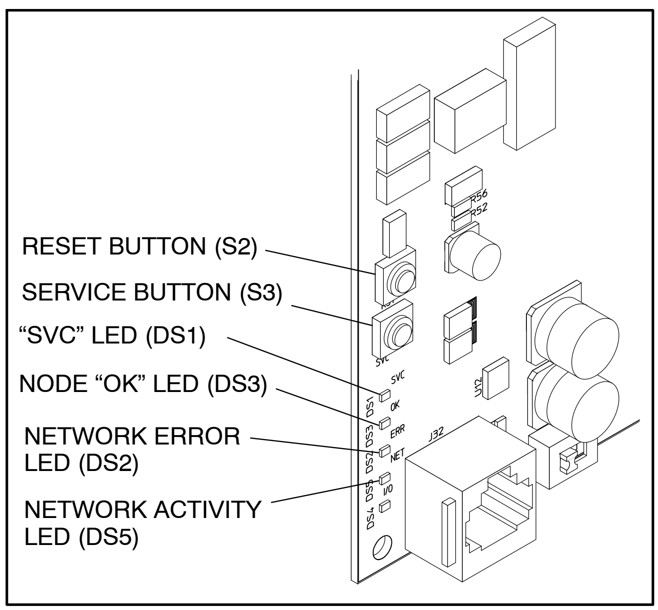


FIGURE 11-10. BUTTON AND LED LOCATIONS (CURRENT PRODUCTION)

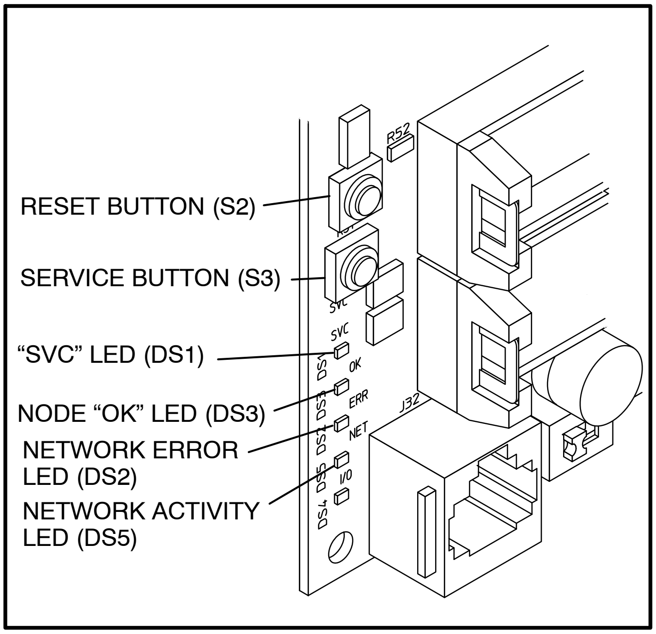


FIGURE 11-11. BUTTON AND LED LOCATIONS (EARLY PRODUCTION)

1. Make sure the genset node is powered, connected to the twisted-pair data bus, and that it has been logically installed **first**.
2. Make sure the PC ATS NCM node is powered and connected to the twisted-pair data bus.
3. Make sure S4-1, S4-2, S4-3, and S4-4 on the NCM are configured for the desired address. Each device on the network must have a unique address.
4. Make sure the network is terminated.
5. Press and hold the *Service* button (S3) (see Figure 11-11) for approximately two seconds until the *Node "OK"* lamp (DS3) begins flashing.
6. Release the *Service* button to bind to the genset.

The NCM will install itself and search for a CPG FT-10 genset device. If found, the NCM will update its node address and bind to the genset *Start Inputs* and *Status*. An FT-10 annunciator or DIM may now install itself and bind to the ATS.

Binding Sequence

Logically connecting to another device is referred to as *binding*. *Binding* may be done when all the nodes are installed, connected, and powered.

Binding the node must occur in the proper sequence. Logically install the genset first, followed by the transfer switch, and then the annunciator(s) and other network accessories.

NOTE: The genset module and ATS (NCM) must be Cummins Inc. devices which are able to self-install in the network. Each device on the network must have a unique address.

Verify Binding

To verify the ATS has installed itself properly and is bound to the genset, disconnect the twisted-pair data cable at J30. The "Network Error" LED (DS2) (Figure 11-11) should turn on (red) within 10 seconds. This indicates communications have failed and that the device was properly bound.

Reconnect the twisted pair cable and confirm that DS2 turns off within 10 seconds.

If no error is produced, use InPower to verify the *Test Interval* (located in the LonWorks folder from the Adjustments directory) is set for 10.0 seconds. Also check the wiring and Address of each node. Repeat the Self-Installation steps to re-initiate *binding*.

Remove Bindings

If unresolved system errors occur, the bindings can be removed and then re-installed to reset the system. The bindings can also be removed if the network is being changed or the device is being moved to another network.

To remove all bindings from the device, change the *Node Address* (S4) to 0 (zero) and logically re-install the device.

The node will remove all bindings at this time, including the genset and annunciator bindings. The "OK" LED will not flash when the *Node Address* is 0, nor will it attempt to bind to a genset.

Re-Binding

Re-Binding the node must occur in the proper sequence. Logically install the genset first, followed by the transfer switch, and then the annunciator(s) and DIMs.

To re-bind an annunciator or DIM to the transfer switch node, press and hold the Service pin for 2 seconds.

LONMAKER INSTALLATION

The PowerCommand Transfer Switch NCM can be installed with LonMaker. The Device Stencil is required. To install using LonMaker:

1. Run LonMaker. See *Section 4*.
2. Open the Device Stencil.
3. Create a new site (or update an existing site).
4. Define, install and bind devices.
5. Verify system operation.

The PowerCommand Transfer Switch is defined and installed like any other device in LonMaker.

NETWORK INSTALLATION

Sections 4 and *5* provide a detailed description of the network installation process. Read *Sections 1* and *2* before constructing the network. *Sections 4* and *5* provide the following step-by-step installation procedures:

1. Setting up Network Installation Tools
2. Starting LonMaker Software
3. Using LonMaker Software
4. LonMaker Network Setup
5. Connecting Devices with LonMaker
6. Installing Devices with LonMaker
7. Testing Devices and Verifying Installation

NETWORK VARIABLES

Figure 11-12 illustrates the NCM functional block and shows the network variable inputs and outputs. For more information on these variables, see Appendix F.

NOTE: nci network variables with a black connector are configurable in InPower.

SWITCHES AND LEDS

The Service switch is used during installation (when prompted by the LonMaker program). The Terminator switch must be set to the appropriate position at installation. Switches are described in Table 11-3. LED indicators are described in Table 11-4.

TABLE 11-3. POWERCOMMAND ATS NCM SWITCHES

Ref	Name	Type	Description
S1	TERMINATOR	Slide	Switch is set to position opposite of text “TERM” from factory. One device in an FT-10 network must be terminated.
S2	RESET	Momentary push	Resets the Neuron Chip processor. Must be pushed after Install action.
S3	SERVICE	Momentary push	Used at time of logical installation to identify device to the installation software. Pressing S3 will light DS1 LED.
S4	NODE ADDRESS	Slide	The switches 4 are used to set a unique address for the node. The default node address is 0010.

TABLE 11-4. POWERCOMMAND ATS NCM LED INDICATORS

Ref	Color	Name	Description
DS1	Amber	SERVICE	Indicates various states of the NCM node. It will be ON if S3 is pressed and held. States without S3 pressed: **OFF** = All OK. NCM has application image and is installed in a network. **ON** = NCM is application-less or has experienced a error that prevents Neuron Chip from executing application code. **1/2 Hz BLINKING (1 second on/1 second off)** = NCM has an application, but has not been logically installed in a network. **FLASHING** once every 2–3 seconds = NCM is experiencing an error condition causing a watchdog timeout reset (fatal error).
DS2	Red	NETWORK ERROR	Indicates a network error (failed network integrity test).
DS3	Green	OK (Status)	**1 Hz BLINKING (1/2 second on/1/2 second off)** indicates that the NCM's processor is executing the application code. When self-installed, the OK LED pauses after blinking the number of times that match the node address (for example, if the node address is 2, the LED blinks twice, stays off for 1 second, and then repeats).
DS4	Green	I/O	Flashes momentarily when the NCM communicates with the base board.
DS5	Green	NETWORK ACTIVITY	Flashes momentarily when a device communicates over the network.

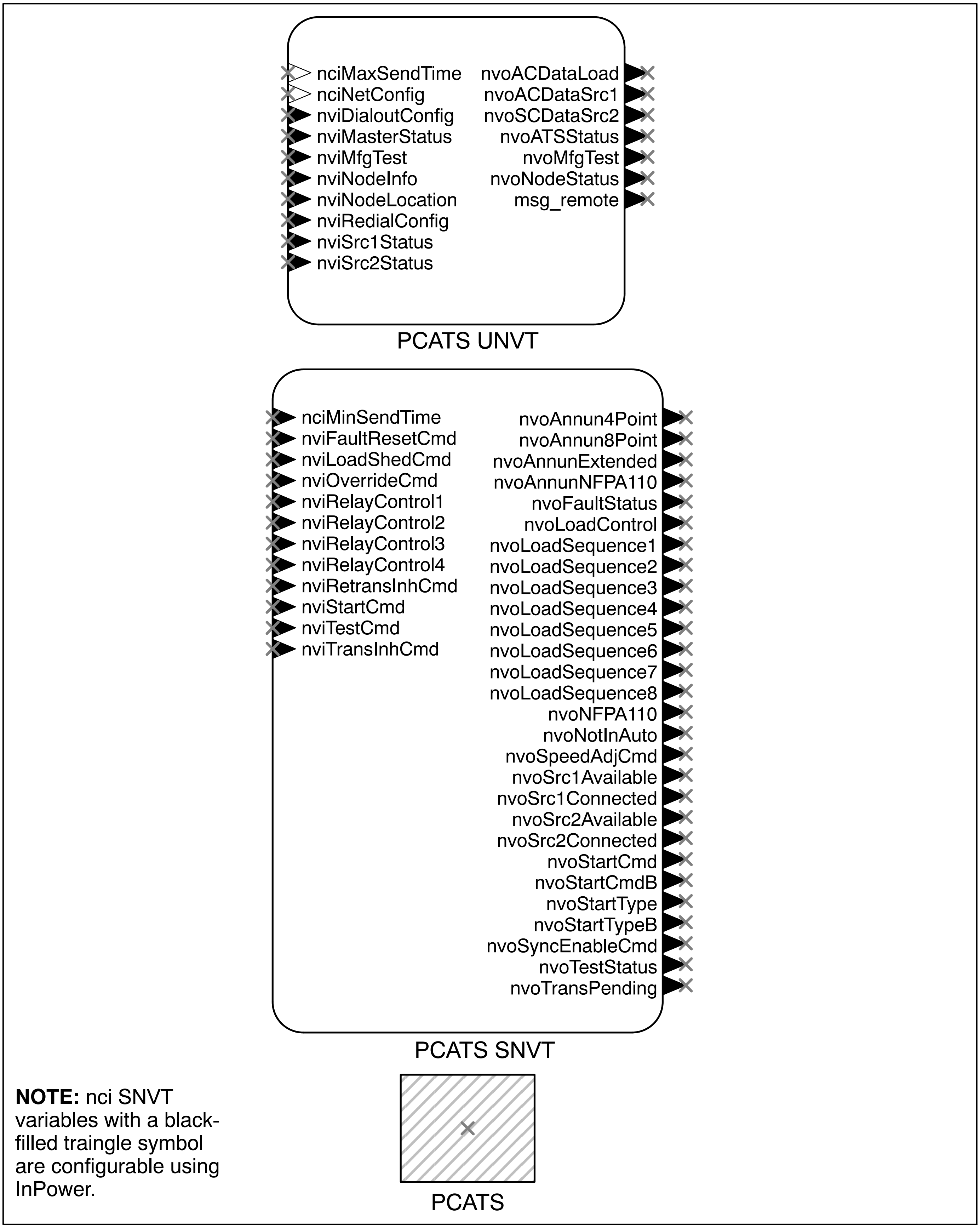


FIGURE 11-12. POWERCOMMAND ATS NETWORK COMMUNICATIONS MODULE FUNCTIONAL BLOCK

12. Digital I/O Module

ABOUT THIS SECTION

This section describes the Digital I/O Module (DIM) and its functional role in the PowerCommand FT-10 network.

The DIM makes provisions for a group of relay contact outputs and discrete inputs to interface with a PowerCommand® FT-10 network. The DIM enables alarms or status output signals to equipment that does not have compatible communications capability.

Base Digital I/O Module

The base Digital I/O Module is shown in Figure 12-1.

Digital I/O Expansion Module

The Digital I/O Expansion Module is shown in Figure 12-2. If an expansion module is used, it must be installed with a base DIM.

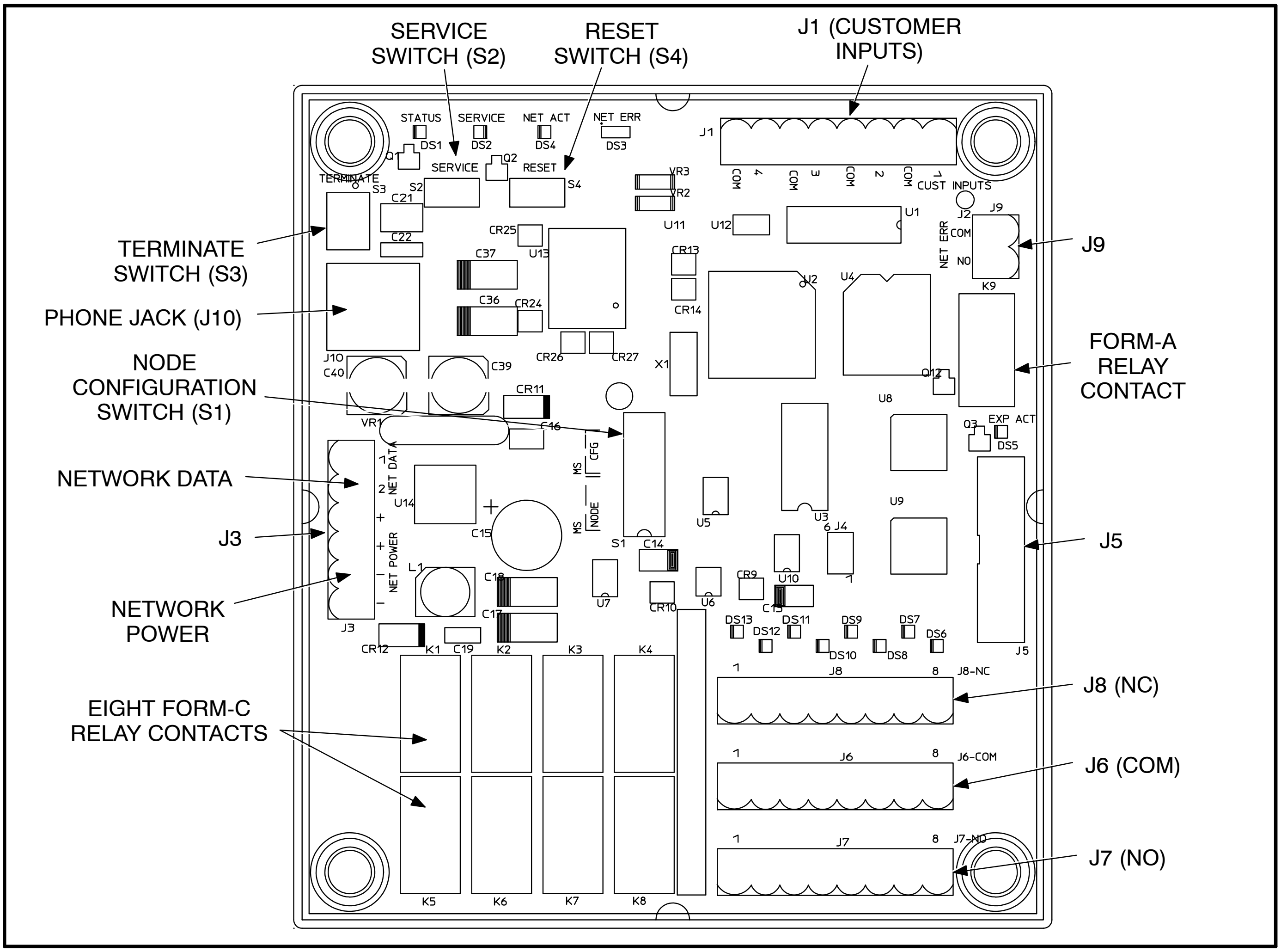


FIGURE 12-1. BASE DIGITAL I/O MODULE

PowerCommand is a registered trademark of Cummins Inc.
LONWORKS is a registered trademark of Echelon Corporation.
LonMaker is a trademark of Echelon Corporation.

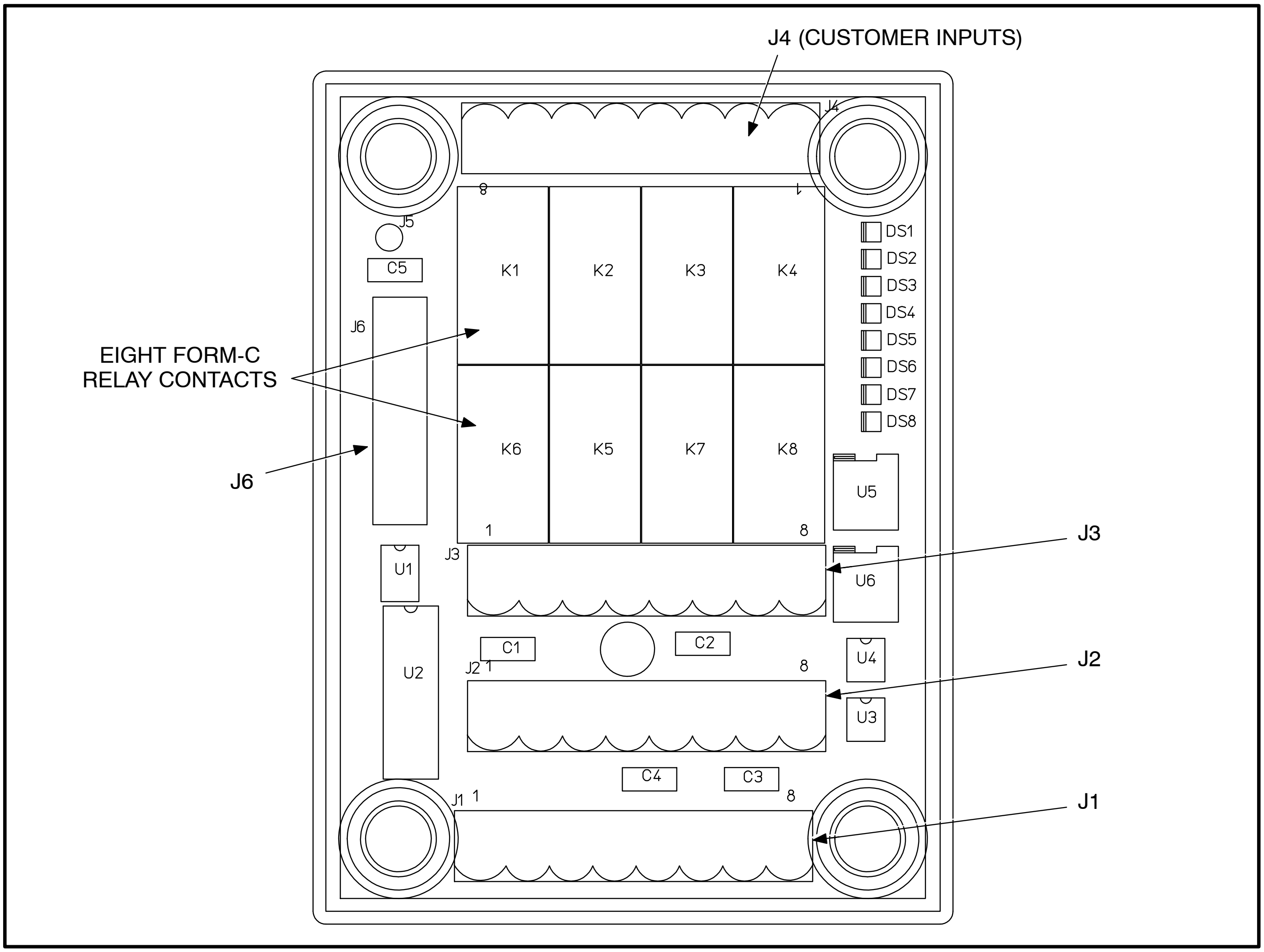


FIGURE 12-2. DIGITAL I/O EXPANSION MODULE

GENERAL INFORMATION

Each module provides eight Form-C relay contacts, which are driven by data from the network. The contacts are connected to terminal blocks for field wiring. Each relay can be programmed to operate from any variable on the network. Each module also includes four isolated discrete inputs to couple user inputs to the network for additional control and monitoring. If both kits are installed, there is a total of sixteen relays and eight user inputs.

All network data wiring must follow a specific network topology and must fall within distance limits. Network power wiring must be sized according to source voltage, distance and load.

Refer to *Section 2* for instructions on wiring, installing, and connecting this module to the network.

PHYSICAL INSTALLATION

Location

The modules are packaged for panel mounting within other equipment enclosures.

If there is a site network installation drawing, refer to it for the module location. If a site network installation drawing is not available, refer to *Section 2* for network topology, maximum network length and power supply requirements.

Choose a clean, vibration-free mounting surface. Avoid locations that are hot, damp, or dusty or that are close to EMI sources. The temperature range must not exceed −40°F (−40°C) to 85°F (29°C).

Mounting

Figure 12-3 shows the Digital I/O Module base and expansion outline dimensions. The outside dimensions do not include necessary clearance for wire connections.

If mounting the module to a wall, make sure that no wires, plumbing, gas or exhaust lines run behind the wall before drilling the mounting holes. Ground the J2 and J5 ring terminals to Earth ground (see Figure 12-4).

Termination

If the DIM is to be terminated, the termination switch S3 on the base module must be set (see Figure 12-1). This is accomplished by moving it to the ON position.

NOTE: For free topology, only one device on each segment must be terminated. The device terminator switch can be used for this type of termination. Multidrop bus topology requires termination at each end of the bus using multidrop bus terminators (Onan P/N 300−5729).

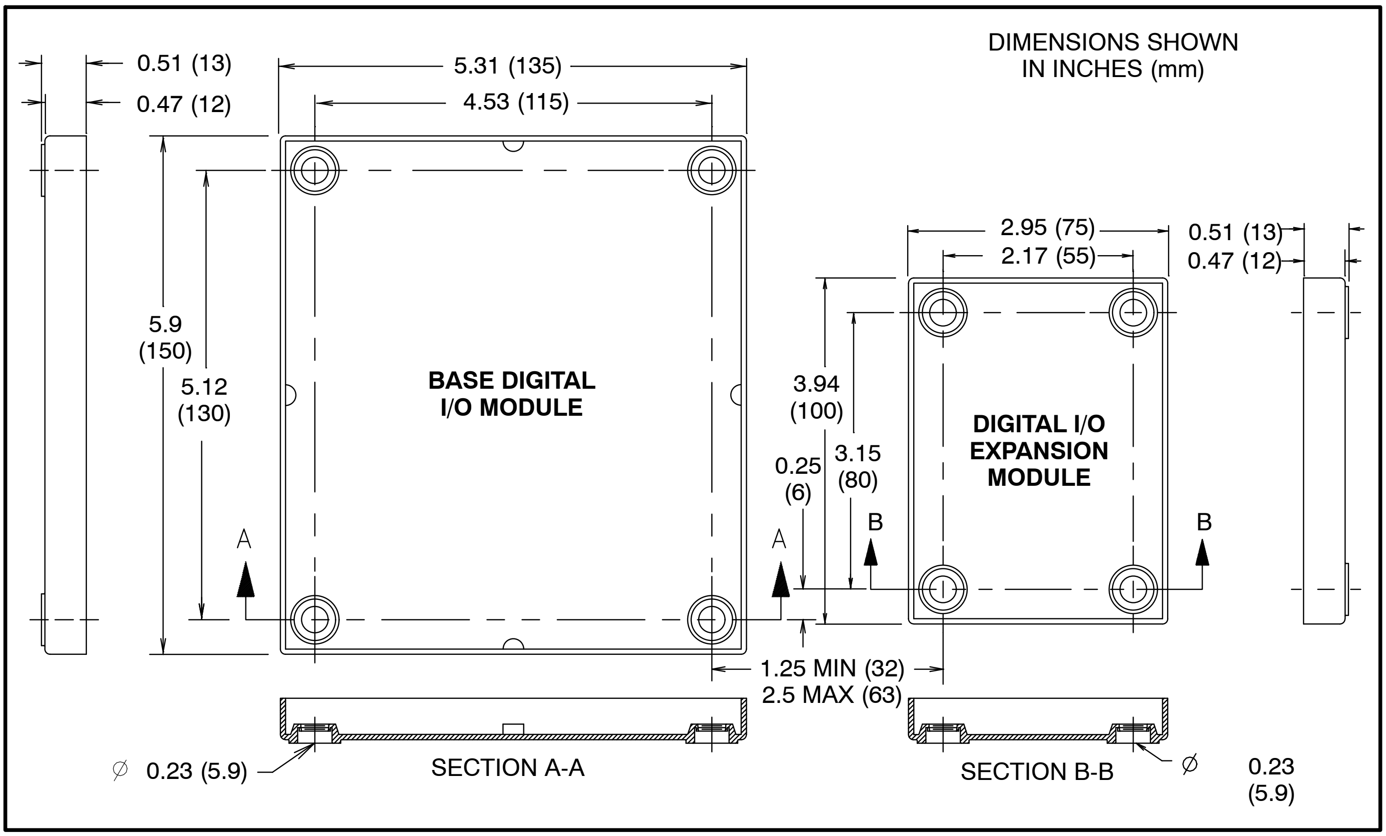


FIGURE 12-3. DIGITAL I/O MODULE FOOTPRINTS

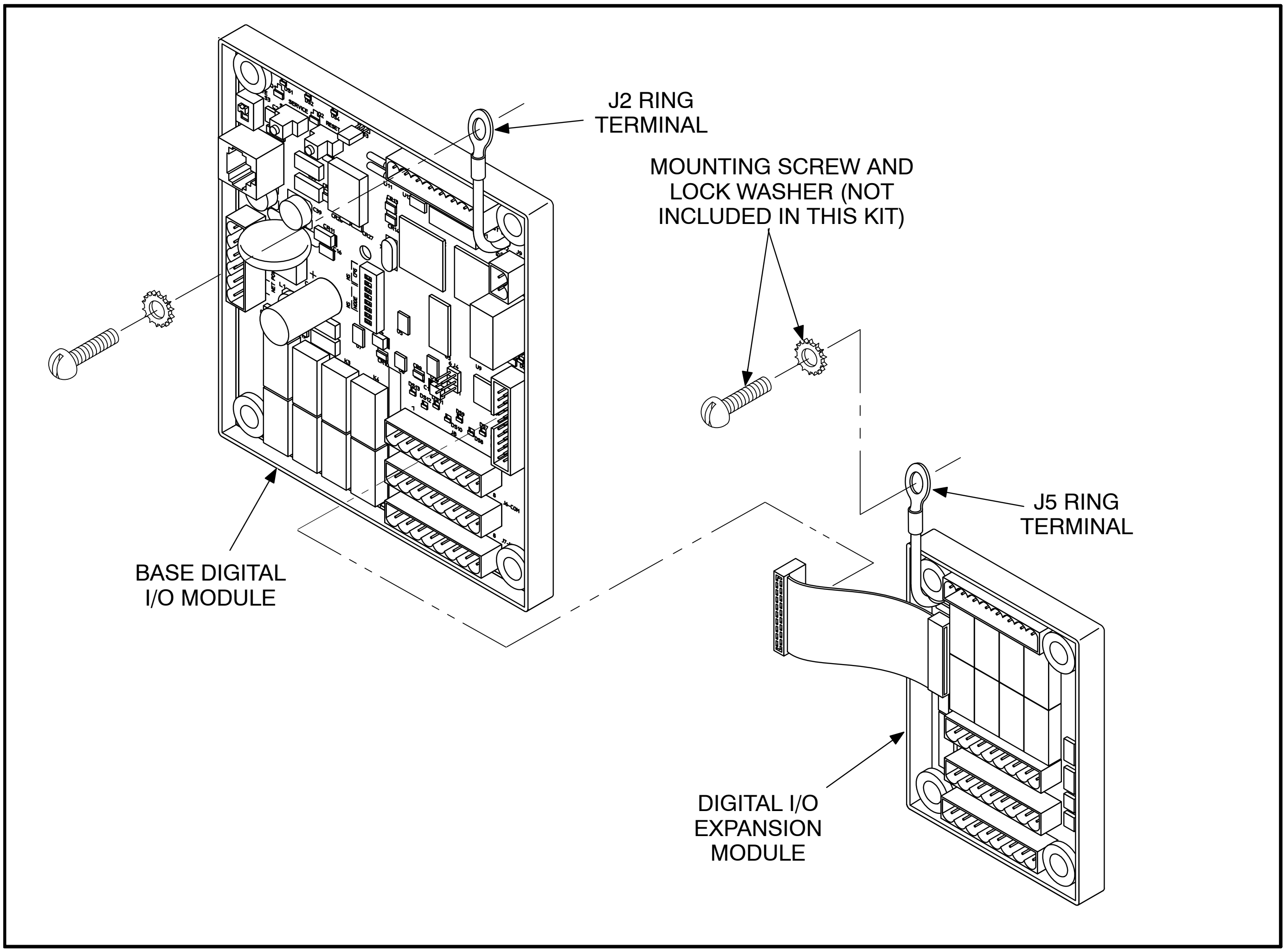


FIGURE 12-4. DIGITAL I/O MODULE INSTALLATION

WIRING DIAGRAM

Figure 12-5 shows the interconnect wiring diagram for the Digital I/O Modules. Refer to the specifications and notes for the drawing (see Figure 12-6).

Inputs

The base and expansion modules each have four discrete inputs which can be connected to external dry contacts. These inputs must be referenced back to their "input common" terminals (J1 on the base DIM and J4 on the DIM expansion module) through dry contacts (refer to note 6 on Figure 12-6).

Outputs

The Digital I/O base and expansion modules each provide eight 0.5A, 125VAC/30VDC Form-C dry contact latching relay outputs. Secure wires in the terminal block to 2 inch-lbs. (0.23 N•m).

Power Supply

The Digital I/O operates between 10–36 VDC. Refer to *Section 2* for power supply information.

NOTE: Refer to Figure 12-6 for Specifications and Notes.

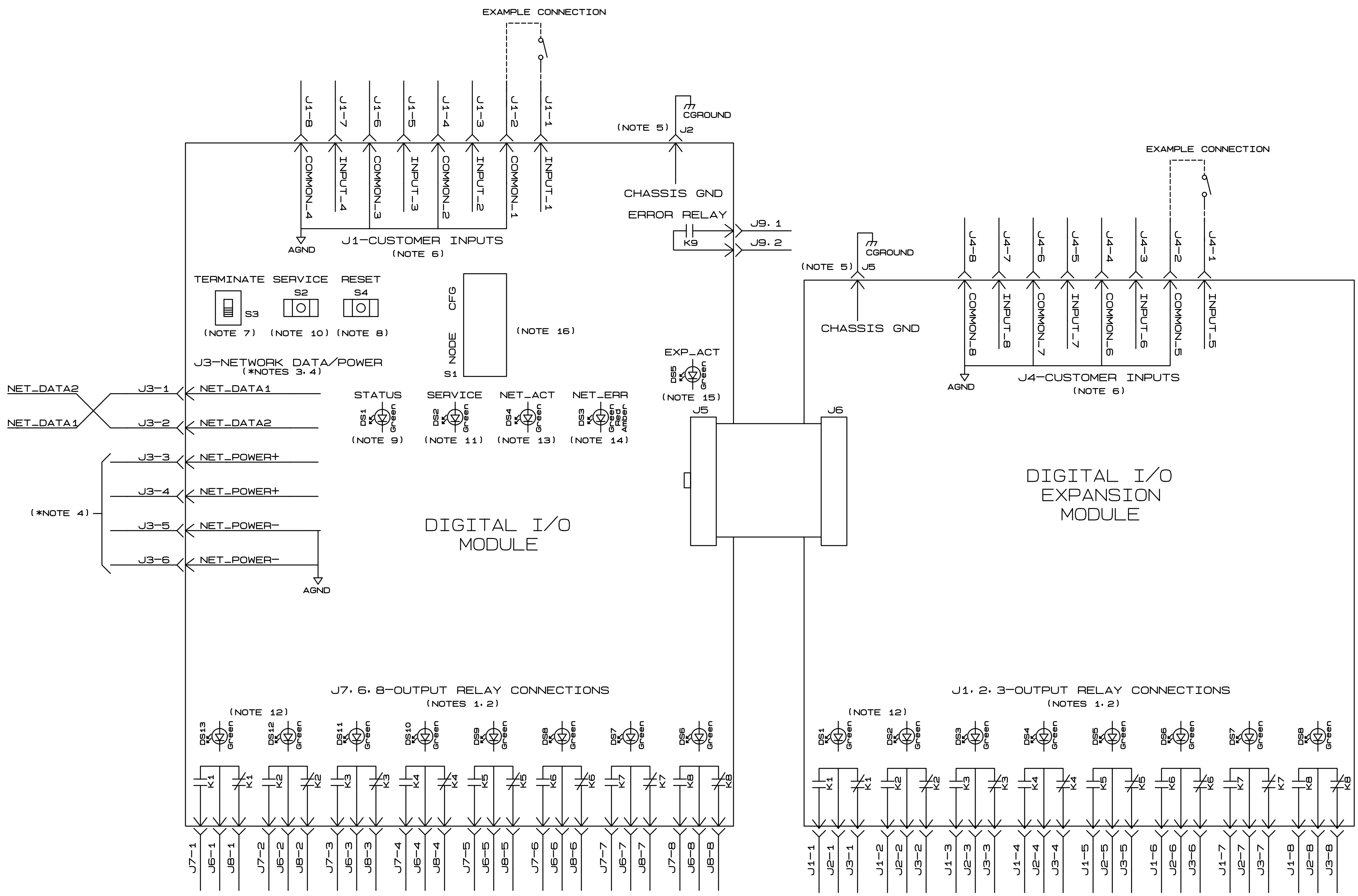


FIGURE 12-5. DIGITAL I/O MODULE INTERCONNECT WIRING DIAGRAM

SPECIFICATIONS

1. NET POWER
 1.1 INPUT VOLTAGE = 8-40VDC
   (OPERATING RANGE)
 1.2 INPUT CONNECTIONS = J3-3(NET POWER+)
   J3-5(NET POWER-)
 1.3 OUTPUT CONNECTIONS = J3-4(NET POWER+)
   J3-6(NET POWER-)

2. NET DATA
 2.1 TYPE ECHELON LONTALK™
   78Kb TWISTED PAIR
   TRANSFORMER COUPLED
 2.2 INPUT CONNECTIONS = J3-1(NET DATA1)
   J3-2(NET DATA2)

3. CUSTOMER INPUTS
 3.1 TYPE = DISCRETE
 3.2 NUMBER = 4 : 8 WITH EXPANSION BOARD
   CONNECT TO DRY CONTACTS ONLY
   RETURN TO COMMON OF SAME NUMBERED INPUT
 3.3 OUTPUT = 5VDC (OPEN)
   5mA SOURCE MAX (CLOSED)
 3.8 INPUT CONNECTIONS = J1-1(INPUT 1) 1262 board
   J1-2(COMMON 1) 1262 board
   J1-3(INPUT 2) 1262 board
   J1-4(COMMON 2) 1262 board
   J1-5(INPUT 3) 1262 board
   J1-6(COMMON 3) 1262 board
   J1-7(INPUT 4) 1262 board
   J1-8(COMMON 4) 1262 board
   J4-1-8 on 1265 board

4. OUTPUT RELAYS
 4.1 TYPE = NON-LATCHING
 4.2 NUMBER = 8 : 16 WITH EXPANSION BOARD
 4.3 CONTACTS = 1 FORM C
   .5A, 250VAC 1262 board
   1A, 125VAC 1265 board
   2A, 30VDC
   (RATINGS LIMITED BY UL TEST)
 4.4 OUTPUT CONNECTIONS = J8(N/C CONTACTS) 1262 board
   J6(COMMON) 1262 board
   J7(N/O CONTACTS) 1262 board
   J3(N/C CONTACTS) 1265 board
   J2(COMMON) 1265 board
   J1(N/O CONTACTS) 1265 board

5. ENVIRONMENTAL
 5.1 STORAGE TEMPERATURE = -40 TO 85°C
 5.2 OPERATING TEMPERATURE = -40 TO 85°C
 5.3 HUMIDITY = 45 TO 85% RH

6. NETWORK ERROR RELAY
 6.1 TYPE = NON-LATCHING
 6.2 NUMBER = 1
 6.3 CONTACTS = 1 FROM A (NORMALLY OPEN)
   1 AMP, 250V AC, 30V DC
 6.4 OUTPUT CONNECTIONS = J9 - 1 (NORMALLY OPEN)
   J9 - 2 (COMMON)

NOTES

1. ALL RELAYS SHOWN IN RESET OR DE-ENERGIZED POSITION. DO NOT MAINTAIN THE LAST STATE WHEN POWER IS LOST.
2. OUTPUT RELAYS ARE CONTROLLED VIA THE NETWORK.
3. REFER TO INTERCONNECTION PRINT (0630-2293).
4. REFER TO POWERCOMMAND NETWORK INSTALLATION AND OPERATION MANUAL(900-0529).
5. CONNECT J2 RING TERMINAL TO A GOOD EARTH GROUND. USE AN 'EXTERNAL TOOTH' LOCKWASHER BETWEEN RING AND GROUNDING SURFACE.
6. DO NOT APPLY VOLTAGE TO CUSTOMER INPUTS 1-8 (J1 AND J4)
7. S3, WHEN SET TO TERMINATE , WILL TERMINATE THE TWISTED PAIR BUS. DATA LINES MUST BE TERMINATED WHEN THE DIM IS PHYSICALLY LOCATED AT THE END OF THE NETWORK BUS.
8. S4, RESET PUSH-BUTTON SWITCH, WILL MANUALLY RESET THE DIM.
9. DS1, STATUS LED(GREEN), INDICATES DIM PROCESSOR IS RUNNING.
10. S2, SERVICE PUSH-BUTTON SWITCH, USED TO GENERATE NETWORK MANAGEMENT MESSAGE FOR NODE LOGICAL INSTALLATION.
11. DS2, SERVICE LED(AMBER), INDICATES THE INSTALLATION AND ERROR STATUS.
12. DS6-DS13(GREEN) ON THE DIM BOARD INDICATE WHICH RELAYS ARE ENERGIZED. DS1-DS8(GREEN) ON THE EXPANSION BOARD INDICATE WHICH RELAYS ARE ENERGIZED.
13. DS4, NET_ACT LED(GREEN), INDICATES NETWORK ACTIVITY.
14. DS3, NET_ERR LED(GREEN,RED,AMBER), INDICATES NETWORK CONNECTION. IF IT IS RED, THE DIM IS NOT CONNECTED TO THE NETWORK. IF IT IS AMBER, IT IS CONNECTED, BUT NOT BOUND. IF IT IS GREEN, THE DIM IS CONNECTED AND BOUND.
15. DS5, EXP_ACT LED(GREEN), INDICATES COMMUNICATION BETWEEN MAIN AND EXPANSION BOARD.
16. S1, CONFIGURATION SWITCH, USED TO CONFIGURE DEVICE FOR SELF-INSTALLATION. SEE SECTION 3.

REF. 630-2276C

FIGURE 12-6. DIGITAL I/O MODULE INTERCONNECT WIRING DIAGRAM

SELF-INSTALLATION

Self-installation guidelines and information on how to self-install a network is included in *Section 3*.

Configuration

When using the self-installation method, the DIM is configured with switch S1 only. Switch S1 sets the *Node Address* and *Autobinding* configuration.

Node Address

Each node on a self-installed network must have a unique address. Switches 1 through 4 of S1 are used to set the *Node Address* of the DIM. The default binary node address is 1000 (decimal address = 8), which is a “STATUS” LED pulse rate of 8.

The switches are oriented so that switch S1-1 is the most significant bit (MSB) of the *Node Address.* Thus, S1-1 has a value of “8” when it is ON. S1-2 has a value of 4, S1-3 has a value of 2, and S1-4 has a value of 1.

Example: To set up a *Node Address* of 3, set switch node configuration switch S1 as follows: S1-1 OFF, S1-2 OFF, S1-3 ON and S1-4 ON (binary setting 0011=0+0+2+1=3 decimal). See Table 12-1 and Figure 12-7.

TABLE 12-1. SETTING THE NODE ADDRESS (S1-1–4)

S1-1 (8)	S1-2 (4)	S1-3 (2)	S1-4 (1)	Address (binary)	Address (decimal)
OFF	OFF	OFF	OFF	0000	0[1]
OFF	OFF	OFF	ON	0001	1
OFF	OFF	ON	OFF	0010	2
OFF	OFF	ON	ON	0011	3
				↓	↓
ON	ON	ON	ON	1111	15

Note 1: “0” (zero) is not a valid Address.

Be sure to assign each node in the network a unique address. The *Node Address* can be verified by counting the number of pulses of the “STATUS” LED (DS1). See Figure 12-7.

NOTE: If the DIM is installed using LonMaker, switches S1-1 thru S1-4 have no bearing on the Node Address.

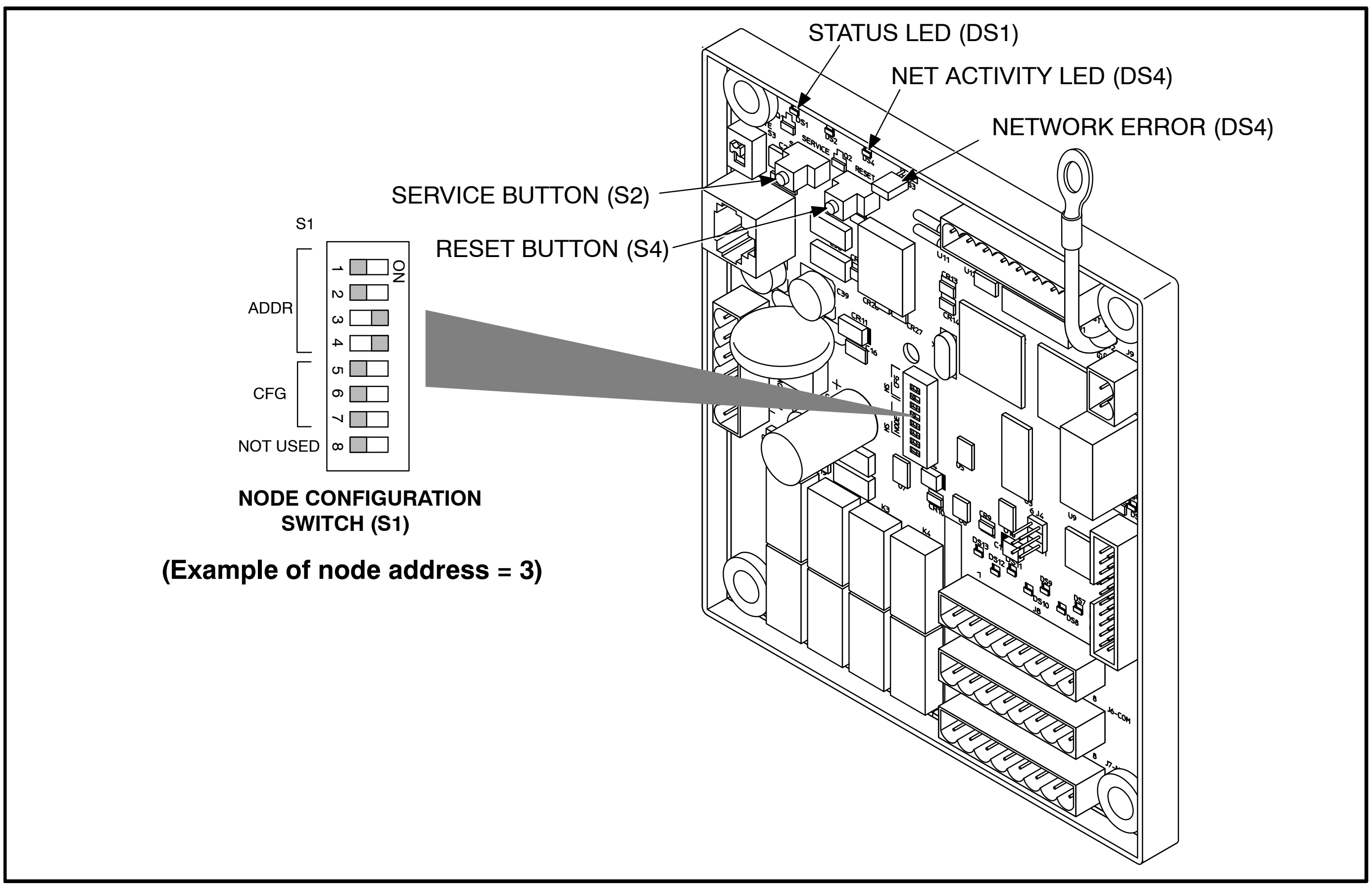


FIGURE 12-7. DIM SWITCHES

Autobinding Configurations

For self-installation, the DIM may be configured for 1 of 5 configurations: *NFPA 110, Genset Extended, Genset Custom, ATS Extended,* or *Relay Custom* (PCC 2100 only). Up to 5 DIMs may be self-installed without requiring LonMaker™ . However, each DIM must be configured for a different configuration (*NFPA 110, Genset Extended, Genset Custom, ATS Extended, or Relay Custom*). See Table 12-2 to configure switches S1-5, S1-6, and S1-7.

NOTE: Relays cannot be individually configured when self-installed.

TABLE 12-2. SWITCH CONFIGURATION SETTINGS

S1-5	S1-6	S1-7	CONFIGURATION	CONFIG. VALUE
OFF	OFF	OFF	NFPA 110	0
OFF	OFF	ON	Genset Extended	1
OFF	ON	OFF	Genset Custom	2
OFF	ON	ON	ATS Extended	3
ON	OFF	OFF	Relay Custom	4
ON	OFF	ON	N/A	5
ON	ON	OFF	N/A	6
ON	ON	ON	N/A	7

Table 12-3 shows the autobinding configurations for gensets and transfer switches. For installations that include a PCC 2100, additional autobinding configurations for gensets are available (see Table 12-4).

When changing the desired configuration, re-bind the Genset and/or ATS to the network. See *Binding*.

PCC 2100 Custom Relay Autobinding Configurations

In addition to the other four configurations, a DIM may autobind to a genset with a PCC 2100 control so that the status of the eight inputs are bound to the PCC 2100 network variables, while the 16 user-defined faults on the PCC 2100 are bound to the DIM relays. Refer to *Section 10*.

NOTE: This feature is available only when autobinding to a genset with a PCC 2100 control.

Logical Installation

After configuring S1 as desired and the DIM is *physically* connected to the Genset and/or ATS, the DIM is ready to be *logically* connected to a Genset and/or ATS. Logically connecting to another device is referred to as *binding*. Binding may be done at any time after all nodes are installed, connected, and powered.

1. Make sure the DIM, Genset and/or ATS LonWorks® modules are all powered and all are connected to the twisted-pair data bus.
2. Make sure S1-1, S1-2, S1-3, and S1-4 on the base DIM are configured for the desired address. Each device on the network must have a unique address.
3. Make sure S1-5, S1-6, and S1-7 on the base DIM are configured for the desired configuration.
4. Make sure the network is terminated.
5. Press and hold the *Service* button (S2) (see Figure 12-7) until the *Network Status* LED (DS1) begins flashing (amber).
6. Release the *Service* button.

At this time, the DIM will self-install and bind to the Genset and/or ATS. If it is able to bind to either a Genset or ATS, the *Network Status* lamp turns green. If no Genset or ATS devices are detected, the lamp remains amber. If lamp remains amber, verify data connections to Genset and/or ATS.

NOTE: The Genset and ATS must be CPG FT-10 devices that are able to self-install in the network. Each device on the network must have a unique address.

Binding Sequence

Logically connecting to another device is referred to as *binding*. *Binding* may be done when all the nodes are installed, connected, and powered.

Binding the node must occur in the proper sequence. Logically install the genset first, followed by the transfer switch, and then the annunciator(s) and other network accessories.

NOTE: The genset module and ATS module must be Cummins Inc. devices which are able to self-install in the network. Each device on the network must have a unique address.

Verify Binding

To verify the genset has installed itself properly and is bound to the ATS, disconnect the J3 data cable from the engine interface board. The “Network Error” LED (DS3) (see Figure 12-7) should turn on (red) within 10 seconds. This indicates communications have failed and that the device was properly bound.

Reconnect the twisted pair cable and confirm that DS3 turns off within ten seconds.

Remove Bindings

If unresolved system errors occur, the bindings can be removed and then re-installed to reset the system. The bindings can also be removed if the network is being changed or the device is being moved to another network.

To remove all bindings from the device, change the *Node Address* (S1) to 0 (zero) and logically re-install the device.

The node will remove all bindings at this time, including the genset and annunciator bindings. The “STATUS” LED will not flash when the *Node Address* is 0, nor will it attempt to bind to a genset.

Re-Binding

Re-Binding the node must occur in the proper sequence. Logically install the genset first, followed by the transfer switch, and then the annunciator(s), DIMs, and other network accessories.

To re-bind an annunciator, DIM, or ATS to the genset node, press and hold the Service pin for two seconds.

LONMAKER INSTALLATION

The DIM can be installed with LonMaker. The CPG Service Stencil is required. To install with LonMaker:

1. Run **LonMaker**. Refer to *Section 4*.
2. Open the Device Stencil.
3. Create a new site (or update an existing site).
4. Define, install, and bind devices.
5. Verify system operation.

The DIM is defined and installed like any other device in LonMaker.

TABLE 12-3. AUTOBINDING CONFIGURATIONS AVAILABLE FOR THE GENSET AND ATS

DIM RELAY	GENSET NFPA 110	GENSET EXTENDED	GENSET, ANNUNCIATOR, OR RELAY CUSTOM*	ATS NFPA 110	ATS EXTENDED
Relay 1	Common Alarm	Check Genset	User-defined Fault 1	Common Alarm	Source1 Available
Relay 2	Genset Supplying Load	Ground Fault	User-defined Fault 2	Genset Supplying Load	Source2 Available
Relay 3	Genset Running	High AC Voltage	User-defined Fault 3		Source1 Connected
Relay 4	Genset Not In Auto	Low AC Voltage	User-defined Fault 4	ATS Not In Auto	Source2 Connected
Relay 5	High Battery	Under Frequency	User-defined Fault 5		Check ATS
Relay 6	Low Battery	Overload	User-defined Fault 6		ATS Not in Auto
Relay 7	Charger AC Failure	Overcurrent	User-defined Fault 7	Charger AC Failure	Test/Exercise
Relay 8	Fail to Start	Short Circuit	User-defined Fault 8		Low ATS Battery
Relay 9	Low Engine Temp	Reverse kW	User-defined Fault 9		Load Shed
Relay 10	Pre-High Engine Temp	Reverse kVAR	User-defined Fault 10		Transfer Inhibit
Relay 11	High Engine Temp	Fail to Sync	User-defined Fault 11		Retransfer to Inhibit
Relay 12	Pre-Low Oil Pressure	Fail to Close	User-defined Fault 12		Fail to Close
Relay 13	Low Oil Pressure	Load Demand	User-defined Fault 13		Fail to Disconnect
Relay 14	Overspeed	Genset CB Tripped	User-defined Fault 14		Fail to Sync
Relay 15	Low Coolant Level	Utility CB Tripped	User-defined Fault 15		Bypass to Source1
Relay 16	Low Fuel Level	Emergency Stop	User-defined Fault 16		Bypass to Source2

* Relay Custom bindings are used by PCC 2100 only and must be set with InPower

TABLE 12-4. RELAY CUSTOM AUTOBINDING CONFIGURATIONS AVAILABLE FOR THE GENSET (PCC 2100 ONLY)

DIM INPUT	GENSET
Input 1	Network Fault 1
Input 2	Network Fault 2
Input 3	Network Fault 3
Input 4	Network Fault 4
Input 5	Network Fault 5
Input 6	Network Fault 6
Input 7	Network Fault 7
Input 8	Network Fault 8

NETWORK TOPOLOGY, DATA MEDIA, AND NETWORK POWER

Refer to *Section 2* for information on the network topology and data transmission media. Also refer to *Section 2* for network power supply wiring calculation procedures.

NETWORK DATA MEDIA AND POWER WIRING

WARNING ***AC voltages and currents present an electrical shock hazard that can cause severe personal injury or death. Only trained, experienced personnel are to perform the following procedures.***

Connections

Network data and power wiring connections are made at connector J2.

Refer to Figures 12-1, 12-2, and 12-5. Follow standard wiring practices. Properly secure wire terminals when needed. Secure wires in the terminal blocks to 2 in-lbs. (0.23 N•m).

Conduit

When installing conduit, observe the following precautions:

1. Before beginning conduit installation, cover all components to prevent accidental entry of metal chips.
2. If using rigid conduit, install at least 2 feet (610 mm) of flexible conduit between the rigid conduit and generator set to absorb vibration.
3. Always run DC circuit wiring in a separate metal conduit from AC power cables to avoid inducing currents that could cause problems within the control.
4. Data wire can be run without conduit if it is adequately protected. Do not run data wire in conduit with network power wiring.

CAUTION ***Installation debris can cause equipment failure and damage. Use extreme care to keep drill chips and filings out of the components when mounting or connecting conduit. Screwdrivers should be used carefully to prevent damage to components.***

CUSTOMER INPUT AND RELAY OUTPUT CONNECTIONS

Customer input and relay output connections are made at connectors J1, J6, J7, and J8.

Refer to Figures 12-1, 12-2 and 12-5.

SWITCHES AND LEDS

The Service switch is used during installation (when prompted by the LonMaker program). The Terminator switch must be set to the appropriate position at installation. Switches are described in Table 12-5. LED indicators are described in Table 12-6.

TABLE 12-5. DIM SWITCHES

Ref	Name	Type	Description
S1	NODE CONFIGURATION	Slide	Switches 1 through 4 are used to set a unique address for the node. The default node address is 1000. Switches 5 through 7 are used to set an autobinding configurations (see "Autobinding Configurations" on page 12-8). Switch 8 is not used and should be set to the "OFF" position.
S2	SERVICE	Momentary push	Used at time of logical installation to identify device to the installation software. Pressing S2 will light DS2 LED.
S4	RESET	Momentary push	Resets the Neuron Chip processor. Must be pushed after Install action.
S3	TERMINATOR	Slide	Switch is set to position opposite of text "TERM" from factory. One device in an FT-10 network must be terminated.

TABLE 12-6. DIM LED INDICATORS

Ref	Color	Name	Description
DS1	Green	STATUS	**1 Hz BLINKING (1/2 second on/1/2 second off)** indicates that the DIM's processor is executing the application code. When self-installed, the STATUS LED pauses after blinking the number of times that match the node address (for example, if the node address is 2, the LED blinks twice, stays off for 1 second, and then repeats).
DS2	Amber	SERVICE	Indicates various states of the DIM node. It will be ON if S2 is pressed and held. States without S2 pressed: **OFF** = All OK. DIM has application image and is installed in a network. **ON** = DIM is application-less or has experienced a error that prevents Neuron Chip from executing application code. **1/2 Hz BLINKING (1 second on/1 second off)** = DIM has an application, but has not been logically installed in a network. **FLASHING** once every 2–3 seconds = DIM is experiencing an error condition causing a watchdog timeout reset (fatal error).
DS3	Red/ Orange/ Green	NETWORK ERROR	Red indicates a network error (failed network integrity test) Green indicates the network is operating normally (passed network integrity test) Orange indicates the device is not bound.
DS4	Green	NETWORK ACTIVITY	Flashes momentarily when a device communicates over the network.
DS5	Green	EXP	Flashes momentarily when a device communicates with the expansion module.
DS6	Green	RELAY 8	Indicates the state of the relay coil.
DS7	Green	RELAY 7	Indicates the state of the relay coil.
DS8	Green	RELAY 6	Indicates the state of the relay coil.
DS9	Green	RELAY 5	Indicates the state of the relay coil.
DS10	Green	RELAY 4	Indicates the state of the relay coil.
DS11	Green	RELAY 3	Indicates the state of the relay coil.
DS12	Green	RELAY 2	Indicates the state of the relay coil.
DS13	Green	RELAY 1	Indicates the state of the relay coil.

NETWORK INSTALLATION

Section 3 provides a detailed description of the LonWorks network installation process. Read sections 1 and 2 before constructing the network. *Section 3* provides the following step-by-step installation procedures:

1. Setting up Network Installation Tools
2. Starting LonMaker Software
3. Using LonMaker Software
4. LonMaker Network Setup
5. Connecting Devices with LonMaker
6. Installing Devices with LonMaker
7. Testing Devices and Verifying Installation

NETWORK VARIABLES

The 16 relays can be individually linked to alarm or status outputs from any system device. Eight digital inputs are also provided for customer input to the network. Figure 12-8 illustrates the DIM functional block and shows the network variable inputs and outputs. For more information on these variables, see Appendix F.

NOTE: nci network variables with a black connector are configurable in InPower.

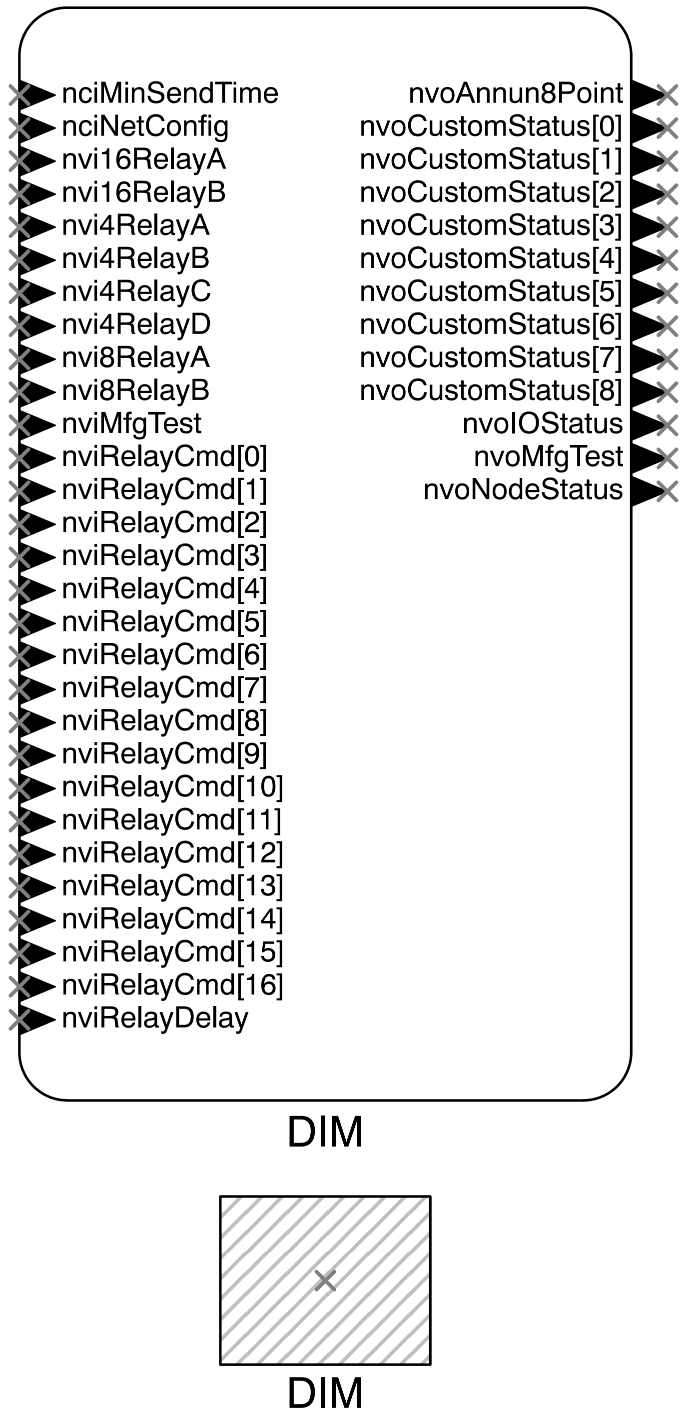
Network Variable Outputs

Network variables nvoCustStatus1 to nvoCustomStatus8 are for customer inputs to the Network (the inputs are located on the DIM). These variables are individually set by closing a corresponding external contact to short that input to the COM pin of the DIM.

Network Variable Inputs

When the DIM receives an update of any of the network variables within nviRelayCmd1 to 16, the DIM sets the appropriate relay to the desired state.

Refer to *Appendix B* for *Application Table Consumption* to review the number of connections that can be made.



NOTE: nci variables with a black-filled traingle symbol are configurable using InPower.

FIGURE 12-8. DIGITAL I/O MODULE FUNCTIONAL BLOCK

13. SLTA-10 Gateway

ABOUT THIS SECTION

This section describes the PowerCommand® LonWorks® SLTA-10 Gateway and its functional role in an FT-10 network. It also describes the physical mounting and wiring of the SLTA-10, and provides procedures for the *logical* installation and connection of the SLTA-10 on the network.

DESCRIPTION

The LonWorks® SLTA-10 Gateway is the hardware interface between a personal computer and a LonWorks FT-10 network, in this case a PowerCommand Network. The PC can access the network either locally through its EIA-232 port or remotely through modems and existing telephone lines.

The gateway translates LonWorks network protocol into a protocol that a PC can understand. The software can access, poll, and control all devices on a PowerCommand network.

Refer to *Section 2* for instructions on network topology, wiring, software installation, and connection of the Gateway to the network.

The following table lists the power supply needed for the SLTA-10 Gateway kits.

KIT	POWER SUPPLY
541–0866–01	None
541–0866–02	US 120V
541–0866–03	EUR 220V
541–0866–04	UK 220V
541–0866–05	JAPAN 100V

INSTALLATION

If there is a site network installation drawing, refer to it for the LonWorks Gateway location. If a site network installation drawing is not available, refer to *Section 2* for network topology and maximum network length. **All wiring must conform to the specific network topology, node and distance limits.**

Locate the LonWorks Gateway near an electrical outlet. If the LonWorks Gateway must remain powered during an electrical power failure, use an uninterruptible power supply (UPS). A UPS provides backup AC power for a minimum of 30 minutes. Use of a UPS allows the modules on the PowerCommand network to communicate a power failure to a remote location via the SLTA-10 and modem during a power failure. A multi-plug receptacle may be needed to connect more than one device to the UPS. Refer to Appendix A for more UPS information.

Choose a clean, vibration-free mounting surface. Avoid locations that are hot, damp or dusty. The temperature range must not exceed −40 to +185°F (−40 to 85°C).

CONFIGURATION

The Gateway has an 8-position DIP switch that configures the gateway. The eight switches are shown in Figure 13-1. Each switch must be set correctly for proper operation with PowerCommand software for Windows II. The default positions are set for 38,400 bps data transfer rate. The PC serial port must be set for the same data transfer rate. Switches 6, 7, and 8 set the transfer rate. Alternately, the Gateway can be set for “autobaud” in which case the Gateway will sync in at the data rate of the host PC. Configure the Gateway for autobaud by setting switch 5 in the up position.

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InPower is a trademarks of Onan Corporation.
LonWorks is a registered trademark of Echelon Corp.
LonMaker is a trademark of Echelon Corporation.
Windows is a registered trademark of Microsoft Corp.

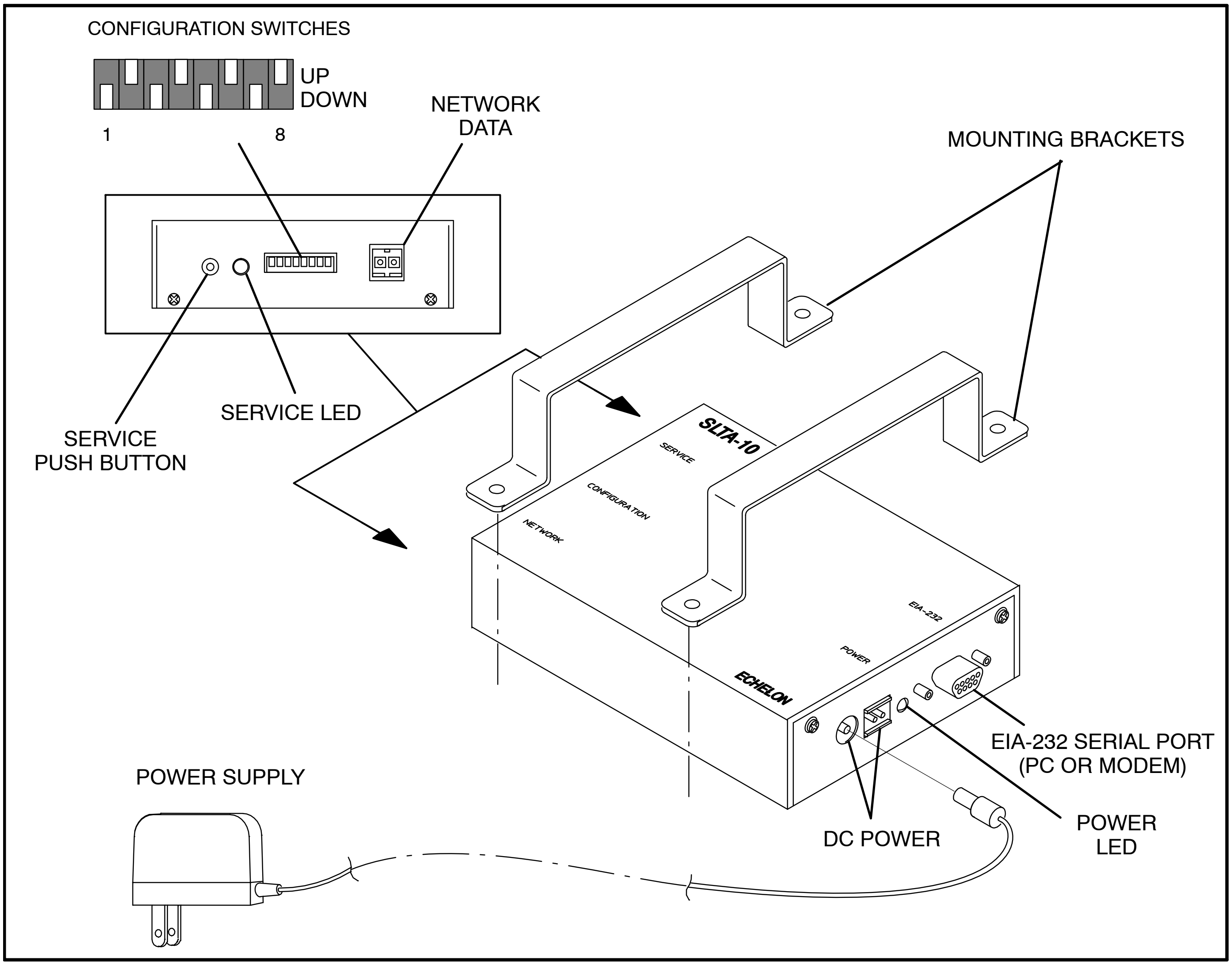


FIGURE 13-1. PowerCommand LonWorks GATEWAY

For a Remote Host, set Switch 2 in the up position (the PC is connected through a modem). For a Local Host, set Switch 2 in the down position (the PC is connected directly).

After changing the configuration switches, cycle power to the Gateway to activate the changes.

Data Transfer Rate Settings for Switches 6, 7, and 8

SWITCH	6	7	8
9,600 bps	Down	Up	Up
19,200 bps	Up	Down	Down
38,400 bps	Up	Down	Up

Default Configuration Switch Settings

SWITCH	POSITION
1	Down
2	Up
3	Down
4	Up
5	Down
6	Up
7	Down
8	Up

NETWORK CONNECTION

The channel may be terminated at the Gateway with a network terminator. One device on each network segment must be terminated.

To terminate a network segment, connect the network terminator and the network twisted-pair cable in the two-position network connector. The network terminator has three leads: two data and one ground. The ground lead (green/yellow) is not used and should be clipped.

Use NEMA Level IV (or greater) stranded twisted-pair cable to connect the router to the network bus. Each segment of the network must be terminated. If the router is to be the termination point for this segment, a terminator is provided (see Figure 13-2).

Network data lines and terminator leads are polarity insensitive. Connect one twisted-pair lead with one terminator lead and the other twisted-pair lead with the other terminator lead. Figure 13-2 shows the network terminator and twisted-pair cable connected to the Gateway.

PC CONNECTION

CAUTION ***Use only the custom made cables included in the kit. Cables from a computer supply store may look the same but may cause equipment damage or connection problems.***

For local direct connections to a PC, connect the EIA-232 port of the Gateway directly to the serial port of PC using the 9-pin to 9-pin serial cable (Onan P/N 338-3777).

For remote connections to a PC via a Hayes compatible modem, connect the EIA-232 port of the Gateway directly to the modem using the null modem (9-pin to 25-pin) cable (Onan P/N 338-3778). Connect the Line socket of the modem into a dedicated phone line.

The Gateway can be configured with SLTA Link Manager software, installed with LonMaker™ for Windows, InPower™, or PCW II. Refer to *Sections 4, 5,* or *6* for more information.

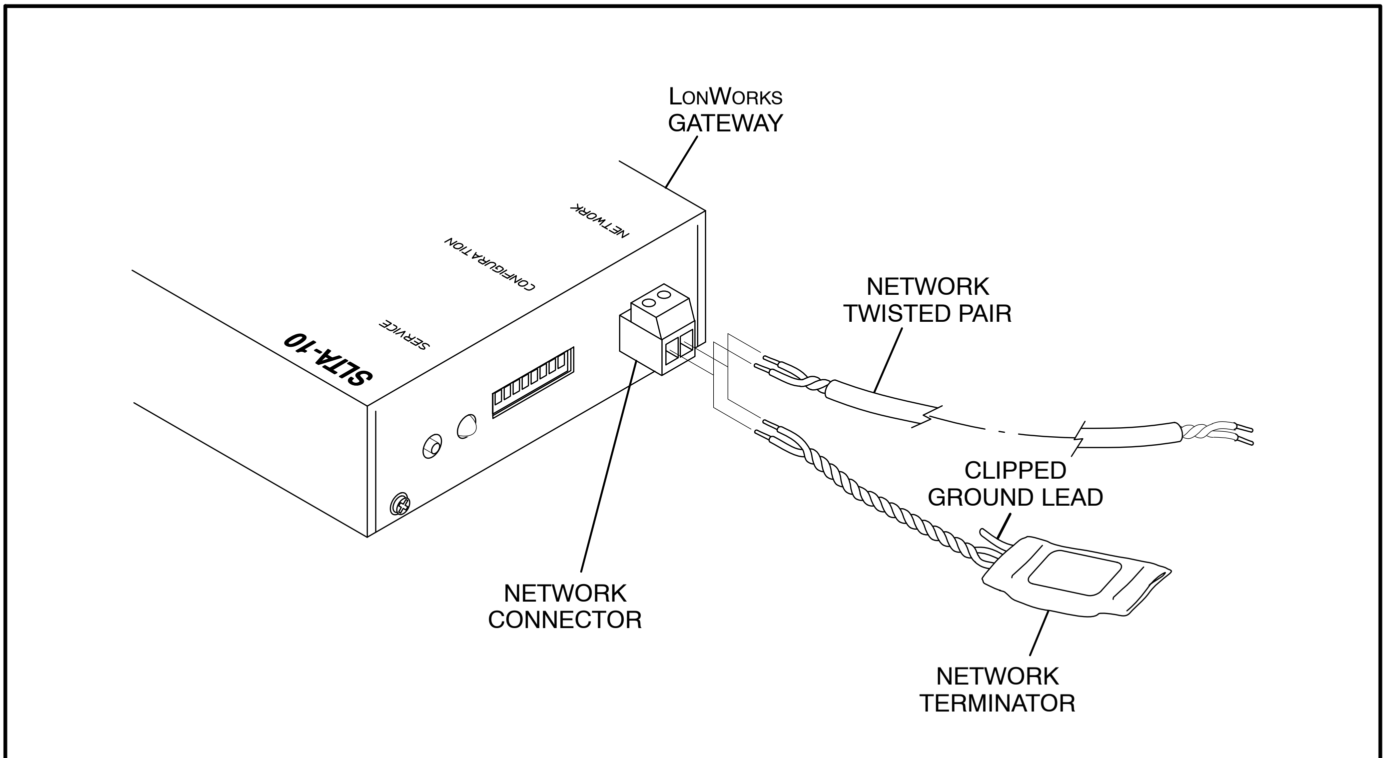


FIGURE 13-2. NETWORK CONNECTION

MOUNTING

Install the gateway on a clean flat surface, wall, or other flat surface with mounting brackets included in the kit. Figure 13-3 shows the mounting hole locations for the mounting brackets.

If it is mounted to a wall, make sure that no wires, plumbing, gas, or exhaust lines run behind the wall before drilling mounting holes.

SERIAL CABLES

These cables provide the following interconnects:

- LONWORKS Gateway Module to a Modem
- LONWORKS Gateway Module to a PC

Refer to the site network installation drawing, if available, or refer to *Section 2* for LONWORKS Gateway connection information.

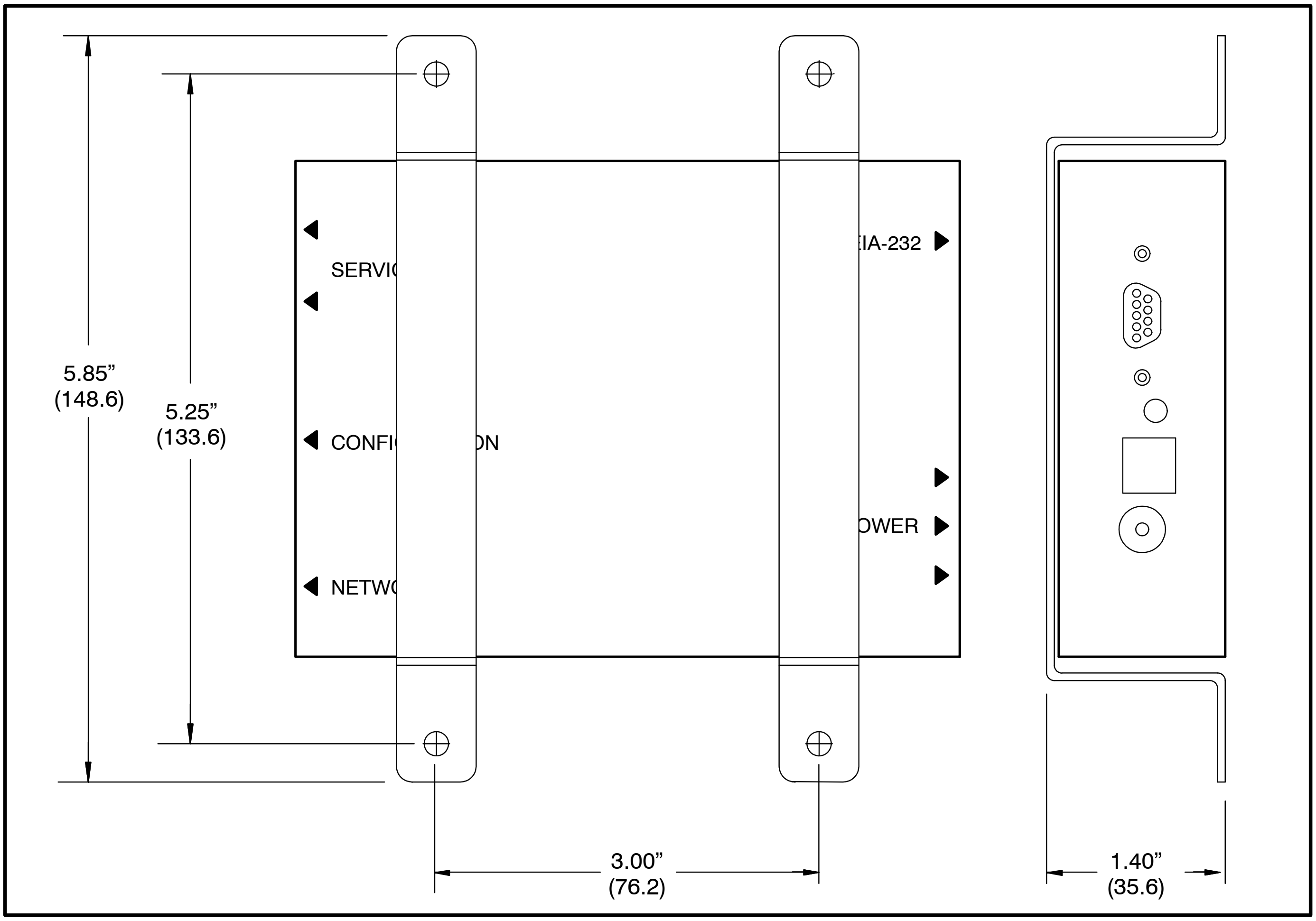


FIGURE 13-3. MOUNTING BRACKET HOLE LOCATIONS

14. Junction Box / Terminator

OVERVIEW

A Junction Box/Terminator (JBT) is a device that provides connection points for network power and data wires. **Although the JBT contains a terminate circuit, the terminator switch must not be used in an FT-10 network.** JBTs should be used throughout a network for connecting in Pass Thru configurations.

DESCRIPTION

The JBT provides two 6-position pluggable terminal blocks for data and power (J1 and J2), and two RJ45 jacks for 24AWG stub connections (J3 and J4). The JBT also has a switch (S1) to connect the data lines to a terminator circuit, and a switch (S2) to select either Pass Thru or Local Loop connection between the data lines on the two terminal blocks.

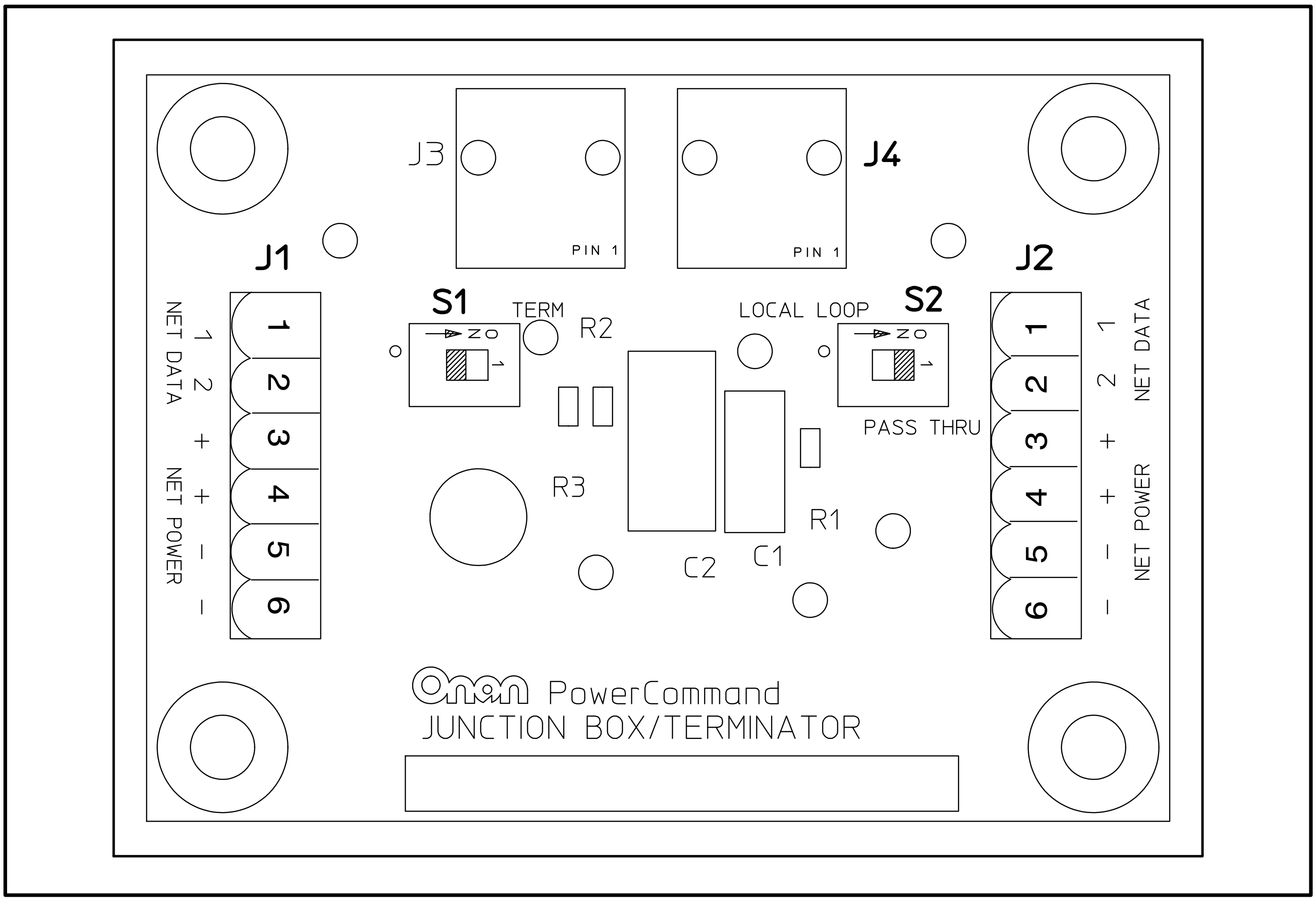


FIGURE 14-1. JUNCTION BOX / TERMINATOR MODULE

LOCATION

Refer to *Section 2* for network topology and maximum network length. **All wiring must follow a specific network topology and must fall within distance limits.**

The JBT is designed for panel mounting within other equipment enclosures. The module is potted with clear compound in a black molded shell.

Choose a clean, vibration-free mounting surface. Avoid locations that are hot, damp or dusty. The temperature range must not exceed −40°F (−40°C) to 158°F (70°C).

MOUNTING

Figure 14-2 shows the JBT outline dimensions. The outside dimensions do not include clearance for wire connections.

If mounting the module to a wall, make sure that no wires, plumbing, gas, or exhaust lines run behind the wall before drilling the mounting holes.

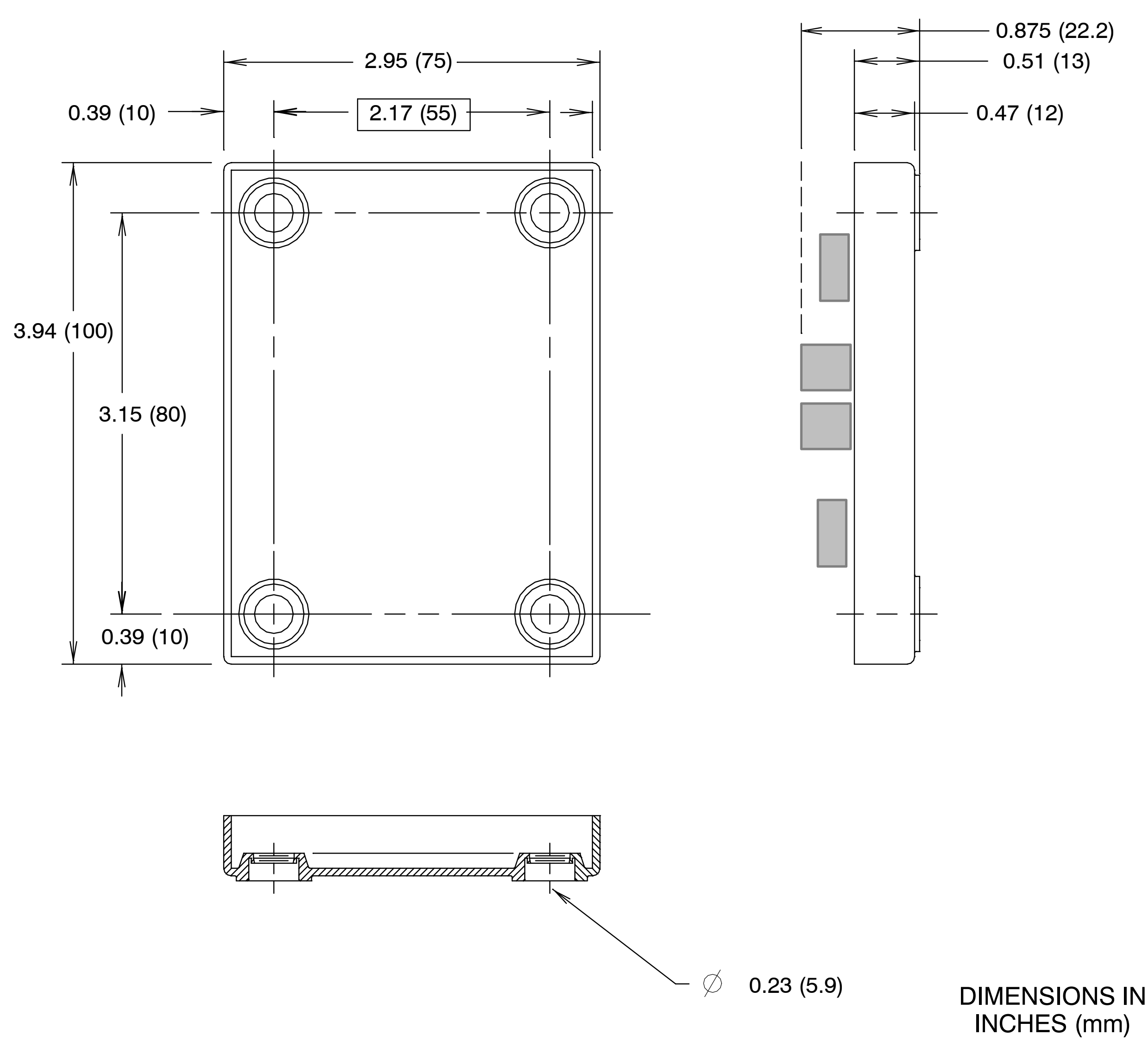


FIGURE 14-2. MOUNTING THE JUNCTION BOX / TERMINATOR MODULE OUTLINE DRAWING

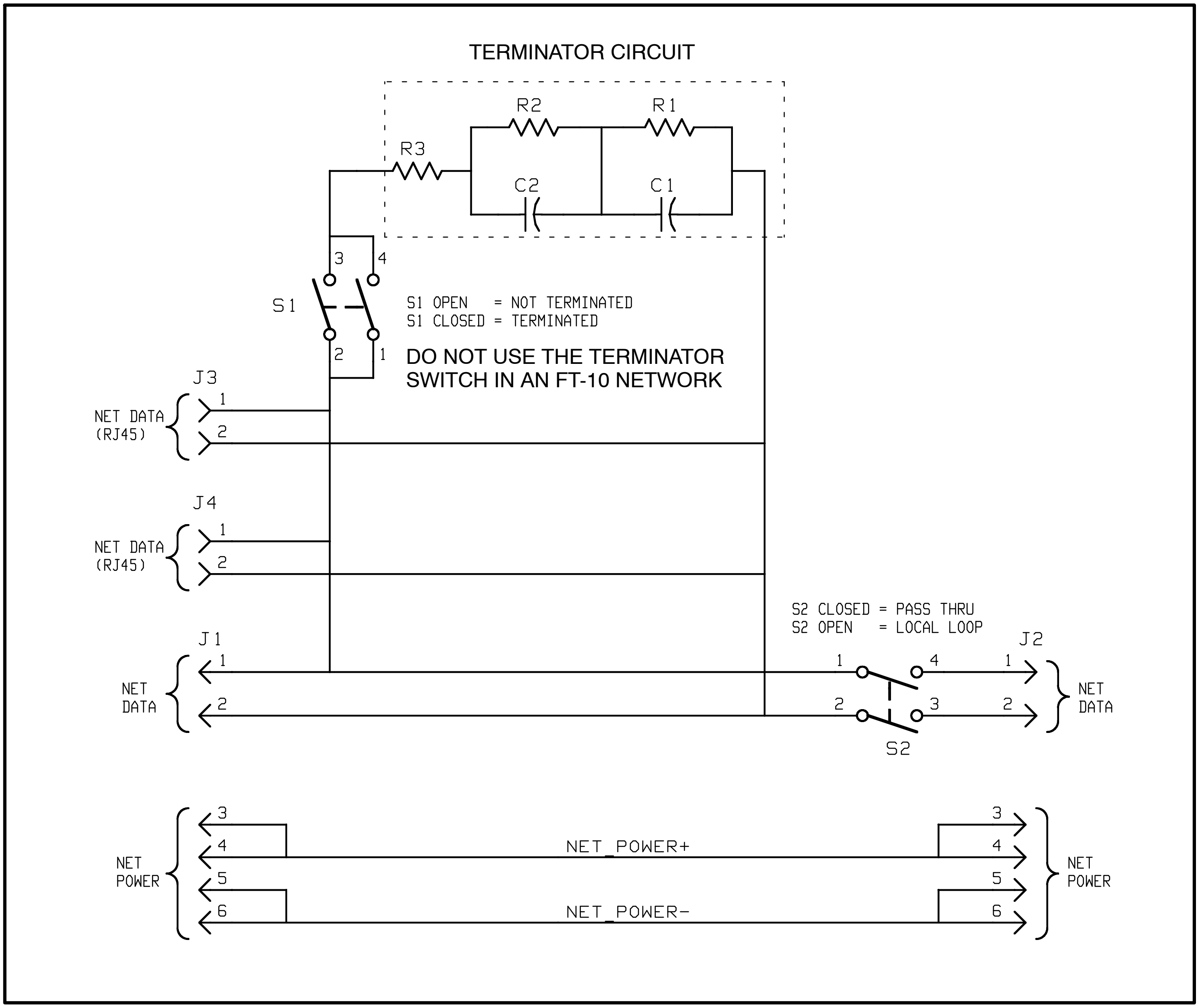


FIGURE 14-3. JUNCTION BOX/TERMINATOR MODULE SCHEMATIC

WIRING DIAGRAM

Figure 14-3 shows the wiring diagram for the JBT. The diagram shows the functions of the S1 and S2 switches on the module.

NETWORK TOPOLOGY, DATA MEDIA, AND NETWORK POWER

Refer to *Section 2* for information on the network topology and data transmission media. Also refer to *Section 2* for network power supply wiring calculation procedures.

NETWORK DATA MEDIA AND POWER WIRING

⚠WARNING ***AC voltages and currents present an electrical shock hazard that can cause severe personal injury or death. Only trained, experienced personnel are to perform the following procedures.***

Connections

Network data and power wiring connections are made at connectors J1, J2, J3, and J4. (Refer to Table 14-1 and Figure 14-1.)

Conduit

When installing conduit, observe the following precautions:

1. Before beginning conduit installation, cover all components to prevent accidental entry of metal chips.
2. If using rigid conduit, install at least 2 feet (610 mm) of flexible conduit between the rigid conduit and generator set to absorb vibration.
3. Always run DC circuit wiring in a separate metal conduit from AC power cables to avoid inducing currents that could cause problems within the control.
4. Data wire can be run without conduit if it is adequately protected. Do not run data wire in conduit with network power wiring.

⚠CAUTION ***Installation debris can cause equipment failure and damage. Use extreme care to keep drill chips and filings out of the components when mounting or connecting conduit. Screwdrivers should be used carefully to prevent damage to components.***

SWITCHES

Terminator and Local Loop / Pass Thru switches are described in Table 14-2.

TABLE 14-1. JBT CONNECTIONS

Connector	Description
J1−1	Network Data1 signal
J1−2	Network Data2 signal
J1−3,4	Network Power+
J1−5,6	Network Power−
J2−1	Network Data1 signal
J2−2	Network Data2 signal
J2−3,4	Network Power+
J2−5,6	Network Power−
J3	Network Data −− Use patch cable 0338−3240 to connect to NGM
J4	Network Data −− Use patch cable 0338−3240 to connect to NGM

TABLE 14-2. JBT SWITCHES

Ref	Name	Type	Description
S1	TERMINATOR	slide	This switch is not used in FT-10 networks.
S2	LOCAL LOOP/ PASS THRU SELECT	slide	Switch is set to position “PASS THRU” from factory. Switch should only be set to “LOCAL LOOP” for a local loop wiring arrangement. Setting switch to “LOCAL LOOP” breaks network data connection between J1 and J2. J3 and J4 are then connected as a stub from J1 only.

15. Network LonWorks System Annunciator

ABOUT THIS SECTION

This section covers the operation and installation of the LonWorks® FT-10 System Annunciator in a PowerCommand® FT-10 Network.

The LonWorks System Annunciator (LSA) monitors and reports operational status of a generator set and/or transfer switch connected to a network.

The following topics are covered in this section:

- Installation
  - Physical Installation
  - Self-Installation
- Operation
- Troubleshooting

Requirements

- PowerCommand FT-10 Genset, Transfer Switch, CCM-G, or CCM-T
- NEMA Level IV Stranded Twisted-Pair Cable
- 14–22 AWG copper stranded wire (depending on distance)
- LonMaker™ Software
- Cummins Inc. Device Stencil (LonMaker installed only)

Network installation must be performed by trained and experienced network personnel.

Refer to *Sections 2* and *4* for instructions on network wiring and LonMaker software.

All network data wiring must follow a specific network topology and must fall within distance limits. Network power wiring must be sized according to source voltage, distance and load.

Study this manual carefully and observe all warnings, cautions, and installation procedures.

WARNING ***Incorrect service or parts replacement can result in severe personal injury, death, and/or equipment damage. Service personnel must be trained and experienced to perform electrical and/or mechanical service on high voltage equipment.***

PowerCommand is a registered trademark of Cummins Inc.
LonWorks is a registered trademark of Echelon Corporation.
LonMaker is a trademark of Echelon Corporation.
InPower is a trademark of Onan Corporation.

DESCRIPTION

The LonWorks System Annunciator:

- Available with or without an enclosure
- Includes NFPA 110 English and Spanish language inserts with blank backs
- Self-Installs (4 nodes) or LonMaker programmed and Installed
- Verifies Network Communications
- Configurable Lamps (LonMaker programmed only)
- Configurable Horn
- Annunciates Multiple Devices Simultaneously (Genset, Automatic Transfer Switch [ATS], etc.)
- Customizable Lamp Nameplate Insert.

The LonWorks System Annunciator contains 20 programmable[1] lamps and a horn to annunciate the system status and fault conditions of the emergency power system (see Figure 15-1). The lamp colors can be configured as *green, red*, or *amber,* as well as *steady on* or *flashing*.

Each lamp may be configured to sound an audible horn. The horn can be configured for loud or soft operation, or disabled entirely.

The *Network Status* lamp indicates the state of the network in the event that communications to the emergency power system have failed.

The Annunciator can install itself into the network (self-installed) or may be programmed and installed using LonMaker. For simple limited installations, up to four Annunciators may be installed in the same network with a single Genset and ATS. However, more complicated network systems require LonMaker for installation.

1 Requires LonMaker installation method to customize the lamp operation.

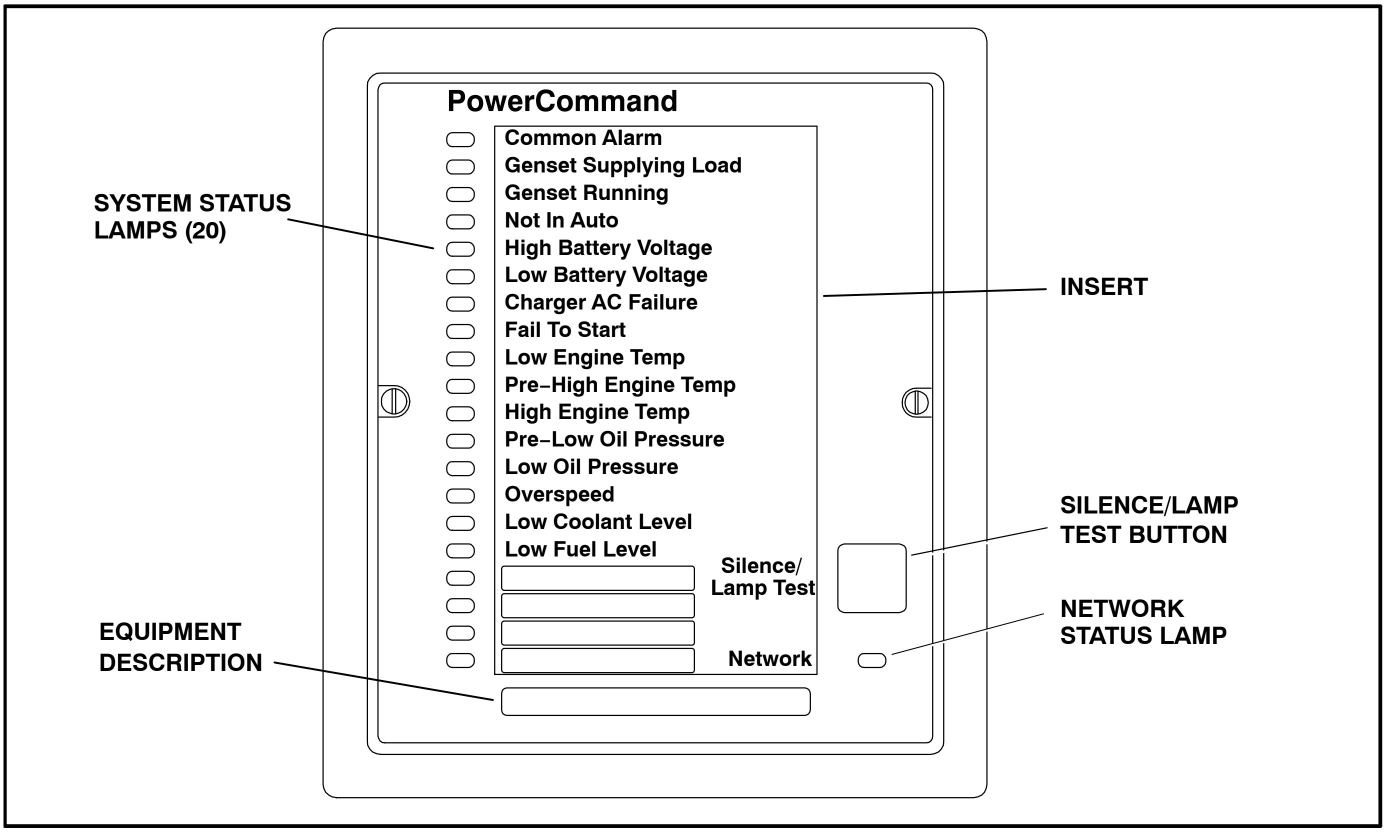


FIGURE 15-1. ANNUNCIATOR PANEL

NETWORK OVERVIEW

After mounting, the LonWorks System Annunciator is ready to install itself into a network. LonMaker is not required to install the device(s), if the following criteria are met.

- The system consists of a single genset and/ or a single ATS.
- All devices in the system have the ability to self-install to an FT-10 network (see Figure 15-2). The following genset and ATS devices have the ability to self-install:
  - PCC 3100 genset with an FT-10 GCM
  - PCC 3200 genset with an FT-10 GLC
  - PCC 2100 genset with an FT-10 NCM
  - Non-PCC genset with an FT-10 CCM-G
  - PowerCommand ATS with an FT-10 NCM
  - Non-PowerCommand ATS with an FT-10 CCM-T
- NFPA 110, Genset Extended*, Genset Custom, or ATS Extended *Annunciation Set* is selected.
- A maximum of 4 Annunciators are being installed. Each Annunciator must display a different *Annunciation Set*. (See page 15-7.)

If the above conditions are met, all devices in the system can be automatically installed (self-install) when powered up. After power up, proceed with *Self-Installation* on page 15-6.

If any of the above conditions are not satisfied, the entire system must be programmed and installed using LonMaker (Page 15-10).

* A CCM-G does not support a Genset Extended Annunciation set.

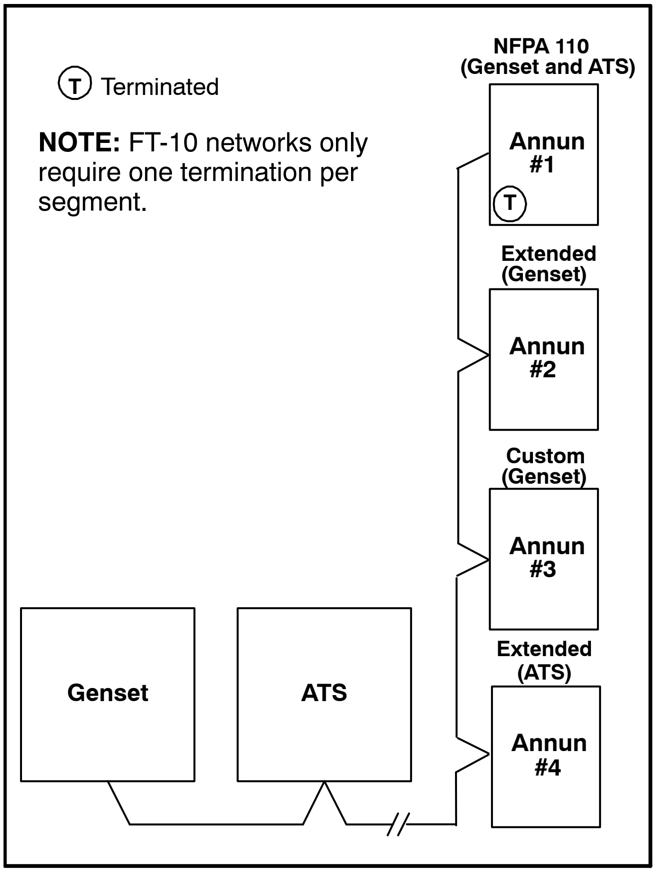


FIGURE 15-2. SELF-INSTALLED NETWORK REPRESENTATION

PHYSICAL INSTALLATION

DANGER ***High voltage is deadly. Installation and service of the network annunciator involves working with high voltage equipment. Installation and service must be performed by trained and experienced personnel working with such equipment. Disconnect the utility line from the transfer switch and disconnect power from the battery charger, day tank, and any other power equipment where connections are to be made.***

WARNING ***Accidental starting of the generator set while working on it can cause severe injury or death. Disconnect the battery cables to prevent accidental starting. Always disconnect the negative (–) cable first, and connect it last, to prevent arcing if a tool accidentally touches the frame or other grounded metal parts of the set while connecting or disconnecting the positive (+) cable. Arcing can ignite explosive hydrogen gas given off by the battery and cause severe injury. Ventilate the battery compartment before removing cables.***

Mounting

The Annunciator is available either with a panel or enclosure mounting.

Enclosure Mounting

1. Remove the front panel assembly from the enclosure.
2. Punch out necessary hole(s) in the enclosure for conduit or wires.

   WARNING ***Drilling into utility lines can cause severe personal injury or death. Make sure no wires, plumbing, or gas lines run behind the mounting area before drilling the mounting holes.***

3. Locate the desired location on wall. Using the enclosure as a template, mark the required holes (see Figure 15-3). Before cutting or drilling, make sure no wiring, plumbing, or gas lines run behind the wall. Attach mounting brackets to annunciator using the screws provided.

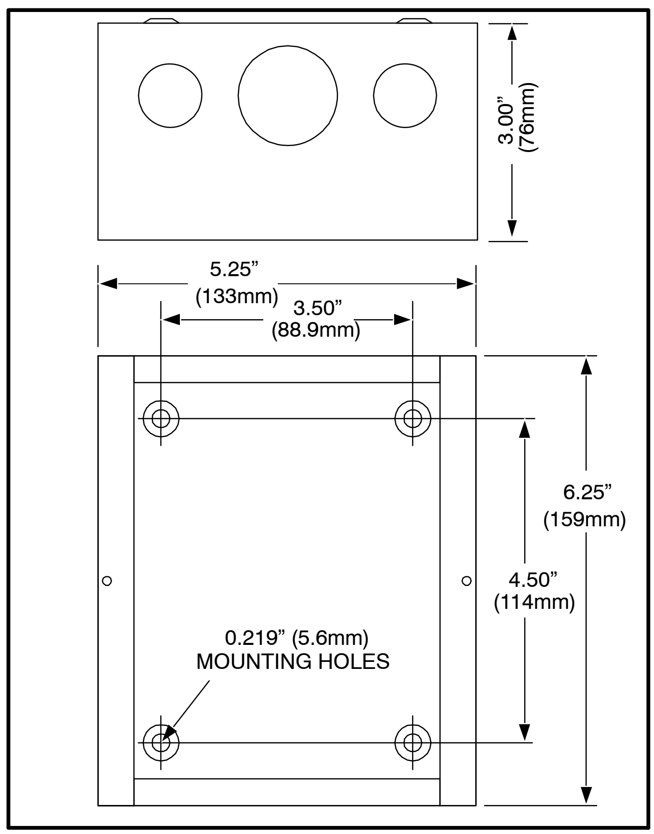


FIGURE 15-3. ENCLOSURE FOOTPRINT

4. Mount the enclosure securely to the wall at the desired location.
5. Install conduit and wiring as needed. See page 15-4.

Panel Mounting

1. Remove hex nuts from the front panel assembly.

2. Locate desired location on the modular panel and cutout rectangle and holes as shown in Figure 15-4.

3. Install conduit and wiring as needed. See page 15-4.

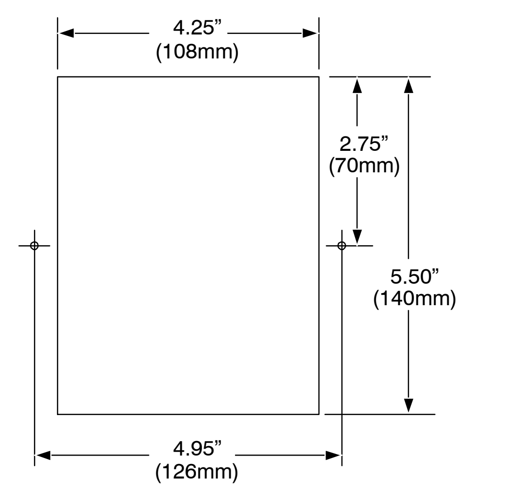


FIGURE 15-4. PANEL FOOTPRINT

WIRING

Termination

If the Annunciator is terminated, the termination switch S1 must be set (see Figure 15-5). This is accomplished by moving it to the ON or TERM position.

NOTE: For free topology, only one device on each segment must be terminated. The device terminator switch can be used for this type of termination. Multidrop bus topology requires termination at each end of the bus using multidrop bus terminators (Onan P/N 300−5729).

Power

Power Inputs:	J1-3 (+) and J1-5 (−)
Power Outputs:	J1-4 (+) and J1-6 (−)
Operating Voltage:	8.0 to 30.0 VDC
Power:	3.5 W max, 0.8 W typical
Input Current:	430 mA max, 80 mA typical
Distance:	See Table 15-1.

TABLE 15-1. DISTANCE vs WIRE SIZE

Copper Wire Size (AWG)	Maximum Distance in feet	
	12V	24V
22[1]	330 (100m)	1110 (338m)
20	520 (158m)	1760 (537m)
18	820 (250m)	2790 (852m)
16	1300 (398m)	4430 (1352m)
14	2070 (631m)	4600[2] (1400m)

1. Twisted-pair cable (use orange/orange-white).
2. Limited by maximum data bus length.

See *Section 2* for more information.

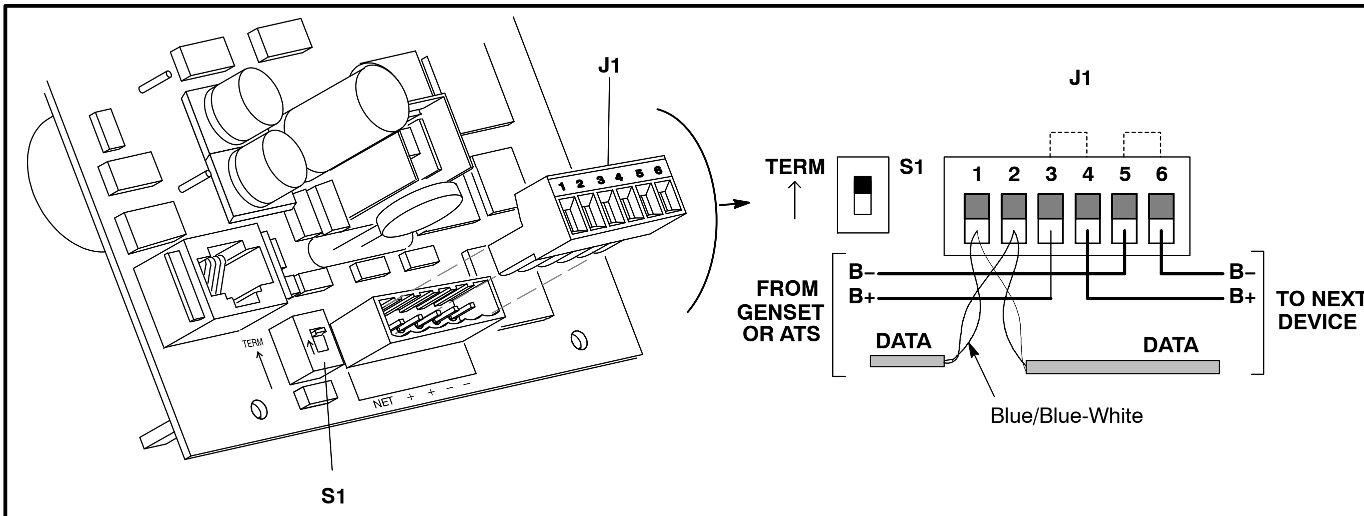


FIGURE 15-5. ANNUNCIATOR WIRING AND TERMINATION

Conduit

When installing conduit, observe the following precautions:

1. Before beginning conduit installation, cover all components to prevent accidental entry of metal shavings.
2. If using rigid conduit, install at least 2 feet (0.6m) of flexible conduit between the rigid conduit and the Genset to absorb vibration.
3. Always follow local code and use correct materials when installing cable. There is no technical limitation associated with single conduit for both network and power supply wiring, but some authorities may require separate conduit for data and DC lines.

   NOTE: The second twisted-pair (orange/orange-white) may be used for DC wiring. See wiring distance limits for 22 AWG (Table 15-1).

4. Always run DC wiring in separate conduit from AC power lines to avoid interference that could cause control problems.

   ⚠ CAUTION ***Installation debris can cause equipment failure. Cover all equipment before drilling to prevent entry of metal shavings.***

Inserts

Pre-printed labels for the lamps are located on a removable insert. The Annunciator is shipped with pre-printed NFPA 110 inserts for English and Spanish. To create your own custom insert, turn the English or Spanish insert over and label each lamp line individually. Place the insert completely into the slot at the top of the Annunciator.

Creating Custom Inserts

A custom insert can be created by using a table in Microsoft Word. To create a custom insert:

1. Create a table in a Microsoft Word document as follows (See Figure 15-6):

Column 1:	1.9”
Column 2:	0.9”
Rows 1–20, 22:	18pt
Row 21:	10pt
Merge:	Row 22 (after setting column widths)

2. Recommended Font: Arial 12 pt, bold
3. Enter description for each lamp.
4. If possible, print directly to a transparency.

   [Or, print to paper and use a copy machine to transfer to a transparency.]

5. Insert standard NFPA 110 insert backwards to show “blank” side.
6. Insert transparency in front of the “blank” insert.
7. Align as needed.

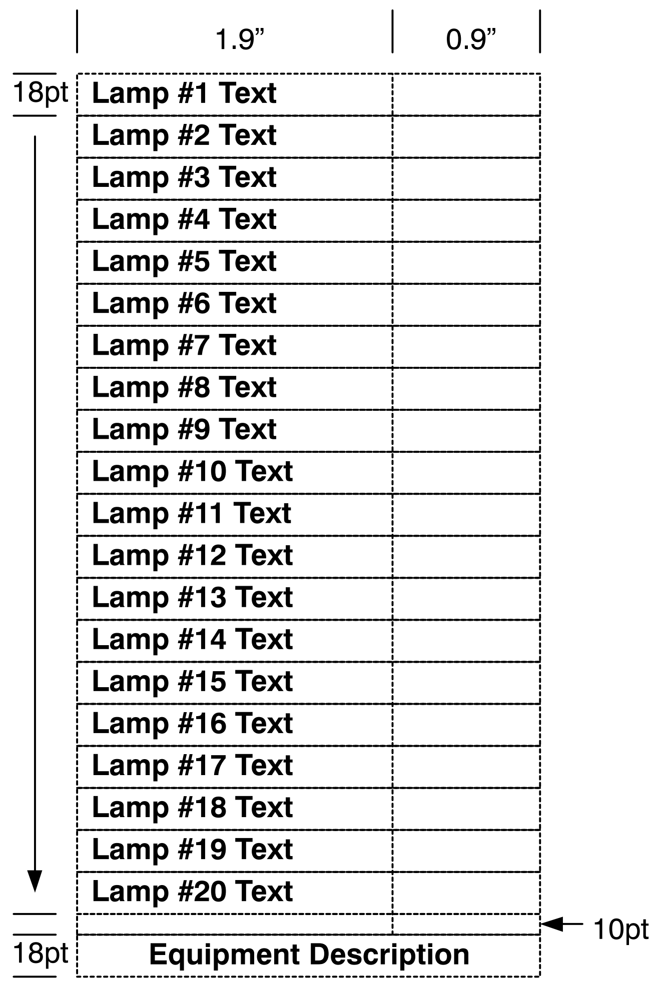


FIGURE 15-6. CUSTOM INSERT

The wide blank label at the bottom of the insert allows for identifying the Genset and/or ATS being monitored.

SELF-INSTALLATION

Self-installation guidelines and information on how to self-install a network is included in *Section 3*.

Configuration

When using the self-installation method, the Annunciator is configured with switch S2 only. Switch S2 sets the *Node Address, Annunciation Set,* and *Horn* operation. *Node Address* and *Annunciation Set* configuration apply only to self-installed devices.

NOTE: Lamps cannot be individually configured when self-installed.

Node Address

Each node on a self-installed network must have a unique address. Switches 1 through 4 of S2 are used to set the *Node Address* of the Annunciator. The default binary node address is 0100 (decimal address = 4), which is an “OK” LED pulse rate of 4.

The switches are oriented so that switch S2-1 is the most significant bit (MSB) of the *Node Address.* Thus, S2-1 has a value of “8” when it is ON. S2-2 has a value of 4, S2-3 has a value of 2, and S2-4 has a value of 1.

Example: To set up a *Node Address* of 3, set switch node configuration switch S2 as follows: S2-1 OFF, S2-2 OFF, S2-3 ON and S2-4 ON (binary setting 0011=0+0+2+1=3 decimal). See Figure 15-7 and Table 15-2.

TABLE 15-2. SETTING THE NODE ADDRESS (S2-1–4)

S2-1 (8)	S2-2 (4)	S2-3 (2)	S2-4 (1)	Address (binary)	Address (decimal)
OFF	OFF	OFF	OFF	0000	0[1]
OFF	OFF	OFF	ON	0001	1
OFF	OFF	ON	OFF	0010	2
OFF	OFF	ON	ON	0011	3
				↓	↓
ON	ON	ON	ON	1111	15

Note 1: “0” (zero) is not a valid Address.

Be sure to assign each node in the network a unique address. The *Node Address* can be verified by counting the number of pulses of the “OK” LED (DS22). See Figure 15-7.

NOTE: If the Annunciator is installed using LonMaker, switches S2-1 thru S2-4 have no bearing on the Node Address.

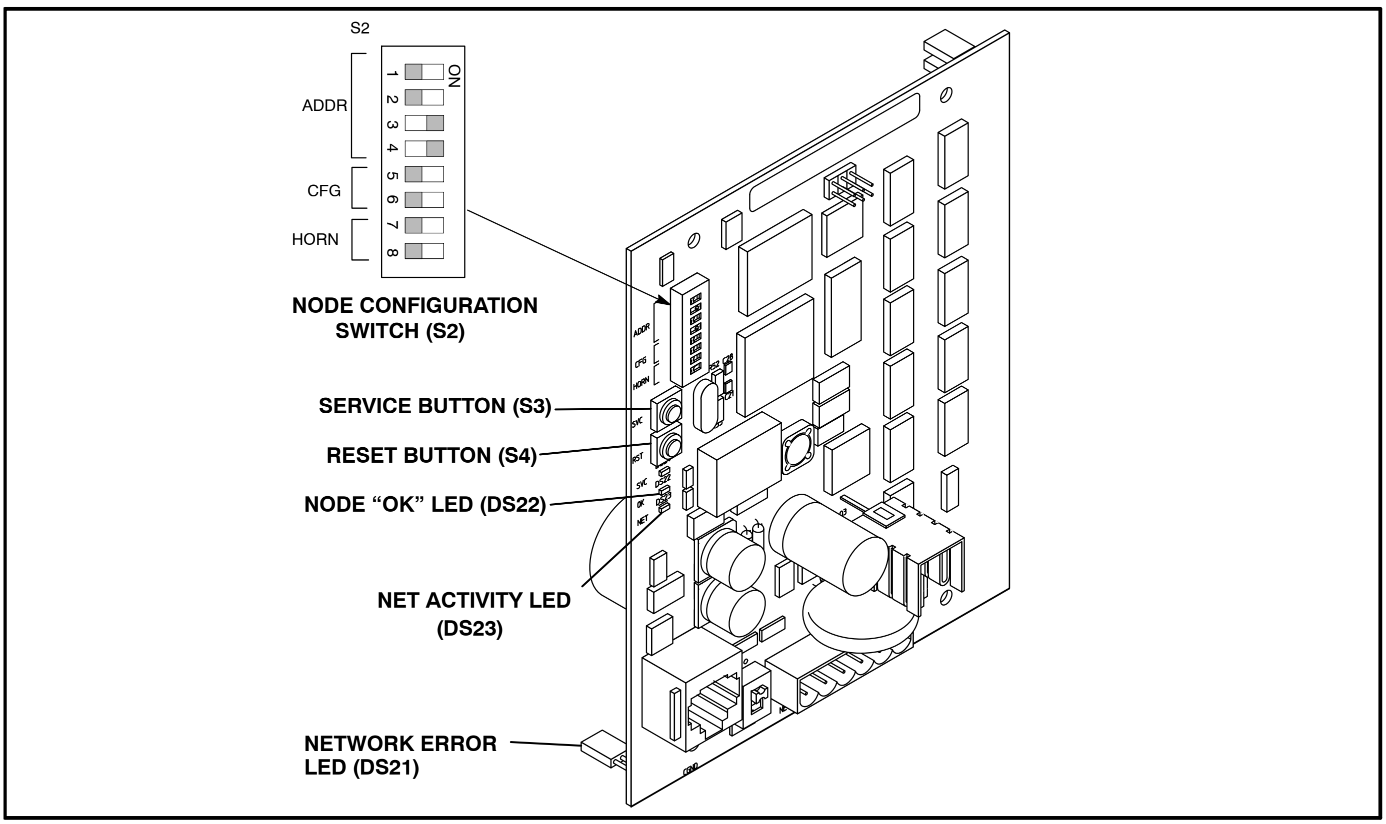


FIGURE 15-7. ANNUNCIATOR SWITCHES AND LEDs (EXAMPLE OF NODE ADDRESS = 3)

Annunciation Set

For self-installation, the LONWORKS System Annunciator may be configured for 1 of 4 Annunciations Sets: *NFPA 110, Genset Extended* or *Genset Custom, ATS Extended*. Up to 4 Annunciators may be self-installed without requiring LonMaker. However, each Annunciator must be configured for a different *Annunciation Set* (*NFPA 110, Genset Extended, Genset Custom or ATS Extended*). See Table 15-3 to configure switches S2-5 and S2-6.

Tables 15-4 and 15-5 shows the contents of each Annunciator Set.

When changing the desired *Annunciation Set*, rebind to the Genset and/or ATS to the network. See *Binding*.

TABLE 15-3. SETTING THE ANNUNCIATION SET

S2-5	S2-6	ANNUNCIATION SET	CONFIG. VALUE*
OFF	OFF	NFPA 110	0
OFF	ON	Genset Extended	1
ON	OFF	Genset Custom	2
ON	ON	ATS Extended	3

* Note: Annunciation Set Configuration flashes out the value shown at the end of the Lamp Test.

Refer to Tables 15-4 and 15-5 to see annunciation set functions.

TABLE 15-4. AVAILABLE ANNUNCIATOR SETS FOR THE GENSET*

NFPA 110	FAULT CODE	EXTENDED	CUSTOM**	8-POINT	4-POINT
Common Alarm	1483	Check Genset	User-defined Fault 1	Check Genset	Check Genset
Genset Supplying Load	2333	Ground Fault	User-defined Fault 2	Genset Supplying Load	Genset Supplying Load
Genset Running	1465	High AC Voltage	User-defined Fault 3	Genset Running	Genset Running
Genset Not In Auto	1463	Low AC Voltage	User-defined Fault 4	Not In Auto	Not In Auto
High Battery	442	Under Frequency	User-defined Fault 5	High/Low Engine Temp	
Low Battery	441	Overload	User-defined Fault 6	Low Oil Pressure	
Charger AC Failure	1311 or 1312	Overcurrent	User-defined Fault 7	Low Coolant Level	
Fail To Start	359	Short Circuit	User-defined Fault 8	Low Fuel Level	
Low Engine Temp	1435	Reverse kW	User-defined Fault 9		
Pre-High Engine Temp	146	Reverse kVAR	User-defined Fault 10		
High Engine Temp	151	Fail to Sync	User-defined Fault 11		
Pre-Low Oil Pressure	143	Fail to Close	User-defined Fault 12		
Low Oil Pressure	415	Load Demand	User-defined Fault 13		
Overspeed	234	Genset CB Tripped	User-defined Fault 14		
Low Coolant Level	197	Utility CB Tripped	User-defined Fault 15		
Low Fuel Level	1439 (Day Tank) or 1441 (Main Tank)	Emergency Stop	User-defined Fault 16		
User-defined *** Fault 1 Fault 2 Fault 3 Fault 4					

* A CCM-G does not support a Genset Extended Annunciation set.
** Must be set for Genset/ATS with InPower
*** PCC2100 or PCC3200 only

TABLE 15-5. AVAILABLE ANNUNCIATOR SETS FOR THE ATS

NFPA 110	EXTENDED	8-POINT	4-POINT
Common Alarm	Source1 Available	Source1 Available	Source1 Available
Genset Supplying Load	Source2 Available	Source2 Available	Source2 Available
	Source1 Connected	Source1 Connected	Source1 Connected
ATS Not In Auto	Source2 Connected	Source2 Connected	Source2 Connected
	Check ATS	ATS Common Alarm	
	ATS Not In Auto	ATS Not In Auto	
Charger AC Failure	Test/Exercise	Test/Exercise	
	Low ATS Battery	Low ATS Battery	
	Load Shed		
	Transfer Inhibit		
	Retransfer Inhibit		
	Fail To Close		
	Fail To Disconnect		
	Fail To Sync		
	Bypass to Source 1		
	Bypass to Source 2		

Lamps

The lamps are not configurable when the Annunciator is self-installed. They are fixed based on the Annunciator Set chosen. See Table 15-7 for default lamp configurations. When LonMaker is used to install the Annunciator, the lamps default to the NFPA 110 settings, but may be reconfigured.

Horn

Switch S2-7 enables the horn (see Figure 15-7). If enabled, switch S2-8 is used to control the horn volume. The horn settings take place immediately and the node does not have to be reset.

TABLE 15-6. HORN SETTINGS

S2-7	S2-8	HORN
OFF	OFF	Disabled
ON	OFF	Enabled – *Soft*
ON	ON	Enabled – *Loud*

15-7. LAMP SETTINGS

	NFPA 110		GENSET EXTENDED		GENSET CUSTOM		ATS EXTENDED	
S2 SWITCH SETTING	S2-5 OFF	S2-6 OFF	S2-5 OFF	S2-6 ON	S2-5 ON	S2-6 OFF	S2-5 ON	S2-6 ON
LAMP	**COLOR**	**HORN**	**COLOR**	**HORN**	**COLOR**	**HORN**	**COLOR**	**HORN**
1	Red	No	Red*	Yes	Red	Yes	Green	No
2	Amber	No	Amber	Yes	Red	Yes	Amber	No
3	Green	No	Red	Yes	Red	Yes	Green	No
4	Red*	Yes	Red	Yes	Red	Yes	Amber	No
5	Amber	Yes	Red	Yes	Red	Yes	Red*	Yes
6	Amber	Yes	Amber	Yes	Red	Yes	Red*	Yes
7	Amber	Yes	Red	Yes	Red	Yes	Amber	No
8	Red	Yes	Red	Yes	Red	Yes	Red	Yes
9	Amber	Yes	Red	Yes	Red	Yes	Amber	No
10	Amber	Yes	Red	Yes	Red	Yes	Amber	No
11	Red	Yes	Amber	Yes	Red	Yes	Amber	No
12	Amber	Yes	Red	Yes	Red	Yes	Red	Yes
13	Red	Yes	Red	Yes	Red	Yes	Red	Yes
14	Red	Yes	Red	Yes	Red	Yes	Red	Yes
15	Red	Yes	Red	Yes	Red	Yes	Amber	No
16	Amber	Yes	Red	Yes	Red	Yes	Amber	No
17	Green	Yes	Red	Yes	Red	Yes	Red	Yes
18	Amber	Yes	Red	Yes	Red	Yes	Red	Yes
19	Amber	Yes	Red	Yes	Red	Yes	Red	Yes
20	Red	Yes	Red	Yes	Red	Yes	Red	Yes

*Flashing

Indicates default settings for LonMaker installation

Logical Installation

After configuring S2 as desired and the Annunciator is *physically* connected to the Genset and/or ATS, the Annunciator is ready to be *logically* connected to a Genset and/or ATS. Logically connecting to another device is referred to as *binding*. Binding may be done at any time after all nodes are installed, connected, and powered.

1. Make sure the Annunciator, Genset, and/or ATS LonWorks modules are all powered and all are connected to the twisted-pair data bus.

2. Make sure S2-1, S2-2, S2-3, and S2-4 on the Annunciator are configured for the desired address. Each device on the network must have a unique address.

3. Make sure S2-5 and S2-6 are configured for the desired annunciation. Each Annunciator on the network must be configured differently.

4. Make sure S2-7 and S2-8 on the annunciator are configured for the desired horn settings.

5. Install the front panel assembly into enclosure or panel.

6. The front panel *Network Status* lamp should be on (amber) indicating it is powered but not bound.

7. Press and hold the Service button (S3) (see Figure 15-7) until the *Network Status* lamp (see Figure 15-1) begins flashing (amber).

8. Release the Service button.

At this time, the Annunciator will self-install and bind to the Genset and/or ATS. If it is able to bind to either a Genset or ATS, the *Network Status* lamp turns green. If no Genset or ATS devices are detected, the lamp remains amber. If lamp remains amber, verify data connections to Genset and/or ATS.

Binding Sequence

Logically connecting to another device is referred to as *binding*. *Binding* may be done when all the nodes are installed, connected, and powered.

Binding the node must occur in the proper sequence. Logically install the genset first, followed by the transfer switch, and then the annunciator(s) and other network accessories.

NOTE: The Genset and ATS must be Cummins Inc. devices that are able to self-install in the network. Each device on the network must have a unique address.

Verify Binding

To verify the genset has installed itself properly and is bound to the ATS, disconnect the J1 data cable from the engine interface board. The "Network Error" LED (DS21) (see Figure 15-7) should turn on (red) within 10 seconds. This indicates communications have failed and that the device was properly bound.

Reconnect the twisted pair cable and confirm that DS21 turns off within ten seconds.

Removing Bindings

If unresolved system errors occur, the bindings can be removed and then re-installed to reset the system. The bindings can also be removed if the network is being changed or the device is being moved to another network.

To remove all bindings from the device, change the *Node Address* (S2) to 0 (zero) and logically re-install the device.

The node will remove all bindings at this time, including the genset and annunciator bindings. The NODE "OK" LED (DS22) will not flash when the *Node Address* is 0, nor will it attempt to bind to a genset.

Re-Binding

Re-Binding the node must occur in the proper sequence. Logically install the genset first, followed by the transfer switch, and then the annunciator(s), DIMs, and other network accessories.

To re-bind an annunciator, DIM, or ATS to the genset node, press and hold the Service pin for two seconds.

LonMaker Installation

The LonWorks System Annunciator can be installed with LonMaker. The CPG Device Stencil is required. To install with LonMaker:

1. Run **LonMaker**. Refer to *Section 4*.

2. Install the Device Stencil.

3. Create a new site (or update an existing site).

4. Define, install and bind devices.

5. Verify system operation.

The Annunciator is defined and installed like any other device in LonMaker.

Network Variables

The Annunciator lamps may be controlled in a number of ways. They may be individually controlled with one binding for one lamp or they may be controlled in groups of 16, 8, or 4. Table 15-8 shows possible bindings to the various Annunciator inputs. Any combination may be used.

Example

A single annunciator is used to show the status of 2 Gensets and the source status of an ATS. Using LonMaker, the bindings shown in Figure 15-8 could be made to accomplish this.

TABLE 15-8. NETWORK VARIABLES WITH TYPICAL SYSTEM BINDINGS

NETWORK VARIABLE	TYPE	LAMP(S)	TYPICAL BINDINGS: GENSET	TYPICAL BINDINGS: ATS
nvi16PointAnnunA	SNVT_state	1 ... 16	*nvoAnnunNFPA110* *nvoAnnunCustom* *nvoAnnunExtended*	
nvi16PointAnnunB	SNVT_state	1 ... 16		*nvoAnnunNFPA110* *nvoAnnunExtended*
nvi8PointAnnunA *nvi8PointAnnunB*	SNVT_state	1 ... 8 9 ... 16	*nvoAnnun8Point*	*nvoAnnun8Point*
nvi4PointAnnunA *nvi4PointAnnunB* *nvi4PointAnnunC* *nvi4PointAnnunD* *nvi4PointAnnunE*	SNVT_state	1 ... 4 5 ... 8 9 ... 12 13 ... 16 17 ... 20	*nvoAnnun4Point* *nvoAnnunCustom*[2]	*nvoAnnun4Point*
nviLamp [0 .. 20]*	SNVT_switch	1 ... 20	*nvoCustomStatus [0 .. 7]* *nvoFaultStatus* *nvoNotInAuto* *nvoRunStatus*	*nvoFaultStatus* *nvoNotInAuto* *nvoSrc1Available* *nvoSrc1Connected* *nvoSrc2Available* *nvoSrc2Connected* *nvoTestStatus*

*Note1 nviLamp 0 is not used

Note2 nvoAnnunCustom is autobound to nvi4PointAnnunE in NFPA 110 annunciation set for PCC 2100 and PCC 3200 only. Only the first four events of nvuAnnunCustom are used.

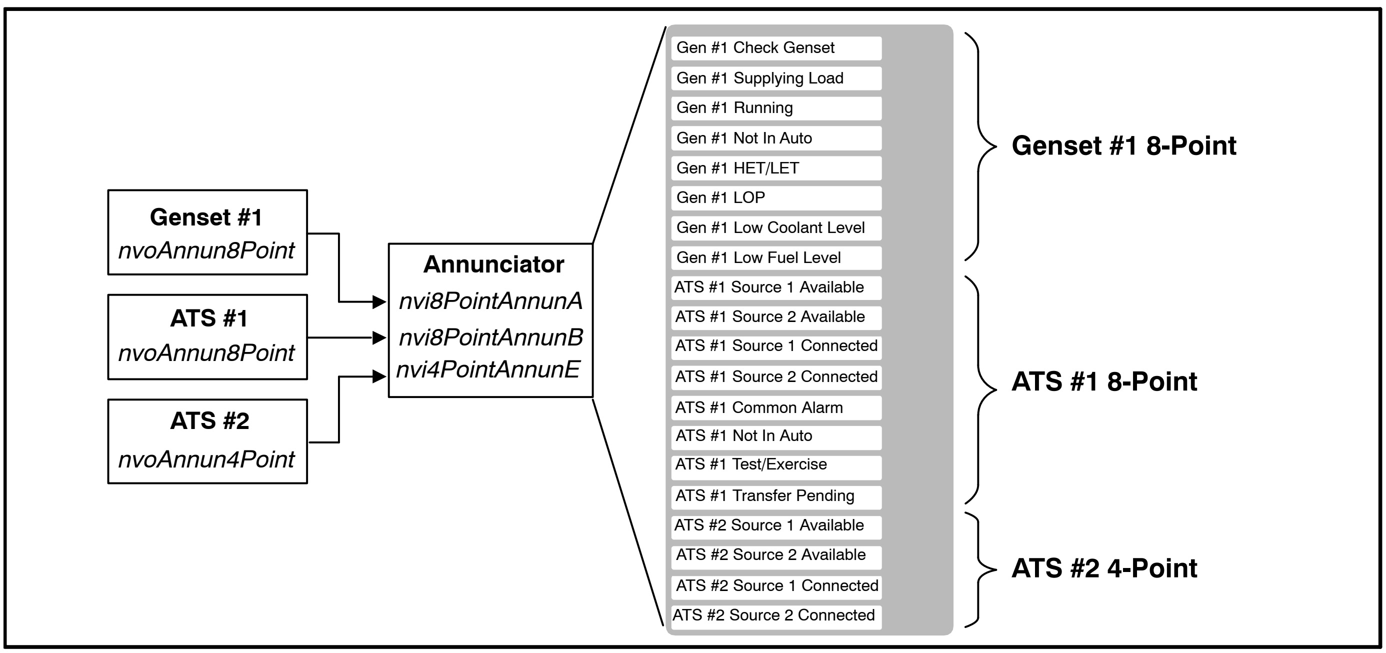


FIGURE 15-8. EXAMPLE SYSTEM BINDINGS

Configuration

When the Annunciator is installed with LonMaker, only the lamps and horn may be configured. LonMaker assigns the *Node Address*, and the *Annunciation Set* is set by binding Annunciator inputs. The horn is configured using switch S2-7 and S2-8.

Status Lamps

The 20 Status lamps may be individually configured using the Annunciator Configuration Plug-In, which may be launched while running LonMaker. The lamps may be configured for *color*, *horn,* and *flash* (see Figure 15-9). To set or change a lamp's configuration in LonMaker:

1. Right click on the annunciator and select "Configure" to launch the Configuration Plug-in.
2. Select the "Annunciator" tab.
3. Set "Color," "Horn," and "Flash" for each lamp (see Figure 15-9).
4. Select "Apply" to activate the changes.
5. Select "OK" to exit.

Changes will take effect immediately. The *Network Status* lamp cannot be configured.

If you are installing additional annunciators, the lamp configurations can be saved (File → Save) and applied to any or all of the annunciators.

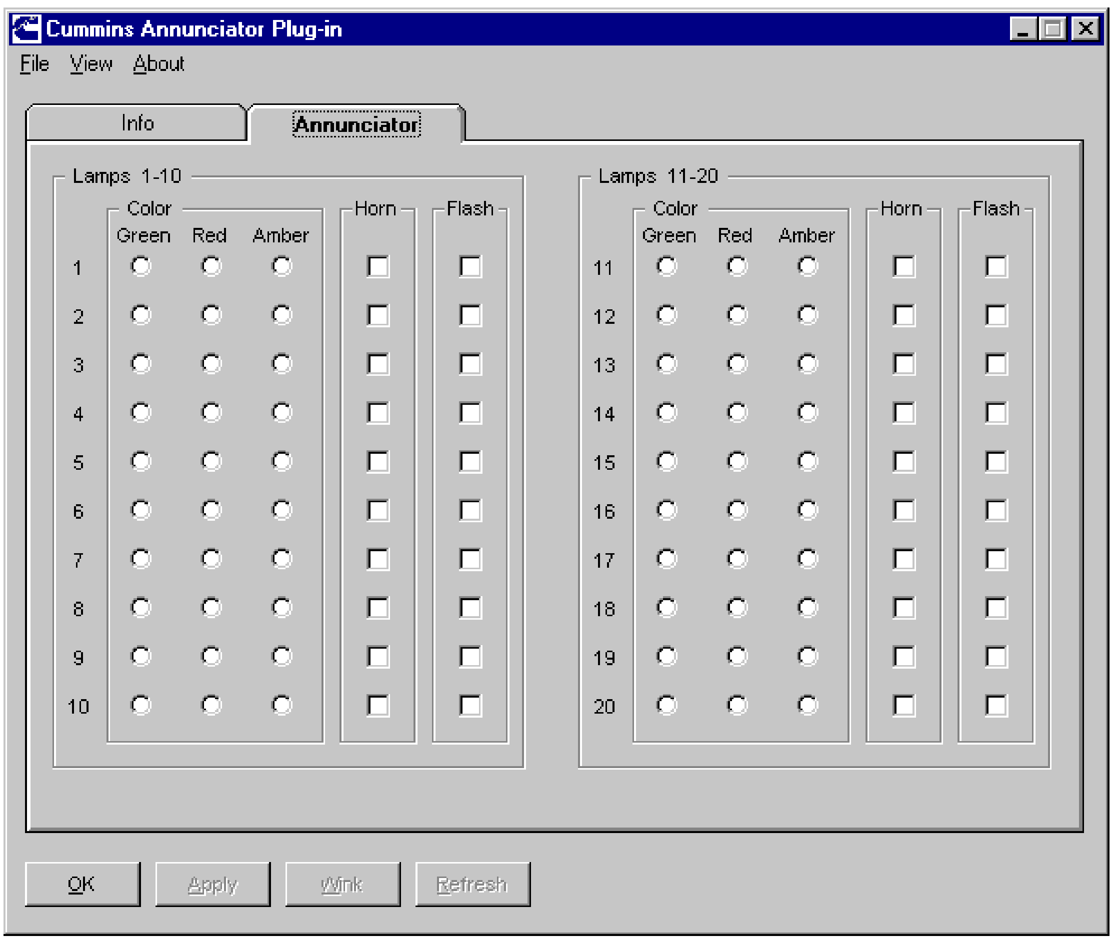


FIGURE 15-9. CONFIGURING ANNUNCIATOR LAMPS IN LONMAKER

OPERATION

Status Lamps

A lamp that is steady-on green or steady-on amber with no alarm indicates normal operation. Amber lamps with a sounding alarm are alerting to potential problems with the Genset. Steady-on or flashing red lamps with an alarm indicate a problem with the Genset or ATS that requires immediate attention.

Horn

Switch S2-7 enables the horn. If enabled, switch S2-8 is used to control the horn volume. The horn settings take place immediately and the node does not have to be reset.

TABLE 15-9. HORN SETTINGS

S2-7	S2-8	HORN
OFF	OFF	Disabled
ON	OFF	Enabled – *Soft*
ON	ON	Enabled – *Loud*

Silence/Lamp Test

The *Silence/Lamp Test* button on the front panel may be used to:

- Silence an alarm
- Test the lamps

If the horn is on, pressing the *Silence/Lamp Test* button will silence the horn. The horn will not turn on again until another alarm condition is present.

When the horn is off, pressing the *Silence/Lamp Test* button triggers a lamp test in which the annunciator cycles all lamps (green, red, amber) On and Off (500ms each); then returns to normal operation.

Network Status Lamp

The front panel *Network Status* lamp indicates the status of communications with all devices “bound” to the Annunciator. If communications have failed at any input, the *Network Status* lamp flashes red and the horn will activate (if enabled). The lamp remains flashing red until communication with all devices has been restored.

The *Network Activity* LED (DS23) pulses whenever an update has been received by the Annunciator. When the Annunciator is bound, the *Network Activity* LED pulses regularly, indicating that updates are being received from the network. The location of DS23 is shown in Figure 15-7.

TABLE 15-10. NETWORK STATUS LAMP INDICATIONS

NETWORK STATUS LAMP	INDICATION
Off	No power or unit failure.
Amber	No inputs are “bound”.
Green	Annunciator is “bound” and all inputs are functioning normal.
Red – Flashing	Annunciator is “bound” but at least one device is not communicating.

TROUBLESHOOTING

WARNING ***Many troubleshooting procedures present hazards that can result in severe personal injury or death. Only trained and experienced service personnel with knowledge of high voltage power generating systems should perform service procedures.***

Troubleshooting Pre-Checks

Annunciator

Verify that the power supply voltage is between 8 and 30 VDC at the network annunciator terminal strip J1. Refer to Figure 15-5 for wiring connection information.

Reset the node to make sure selections have been activated (S4).

Verify the “OK” LED (DS22) is flashing at 1 Hz. (If self-installed it will flash the *Node Address*.)

If bound, verify the “NET” LED (DS23) flashes periodically.

Verify the horn is configured as desired.

Installation

Verify each device on the network has a unique *Node Address* by counting pulses of the “OK” LED.

Verify the correct *Annunciation Set* has been selected (S2-5 and S2-6).

Verify Annunciator is bound. The *Network Status* lamp is green when bound. Press and hold the *Silence/Lamp Test* button or service pin for 2 seconds to bind or rebind.

Network

Verify power at each device (varies by device).

Verify data bus is securely connected at each device and the network is properly terminated at one point.

Verify that the distance between any two nodes on a channel and the termination does not exceed 1312 feet (400 meters) and the total amount of wire in a channel does not exceed 1640 feet (500 meters).

Troubleshooting LSA Components

Status Lamps

Some or all lamps fail to light:

- Verify power to node is acceptable.
- Verify *Node Status* lamp is green. (Indicates all bindings are functioning).
- Verify node is reinstalled after changing *Annunciation Set.*
- Verify correct *Annunciation Set* (self-installation only) has been selected. Annunciation Set Configuration flashes out the value shown at the end of the Lamp Test (refer to Table 15-3).

Lamps are wrong color:

- If self-installed, lamp color cannot be changed.
- If installed using LonMaker, configure lamp as desired using the Annunciator Configuration Plug-in.

Network Status Lamp

Off

- Node has no power or has failed.

Amber

- Node has power but is not bound. Bind Annunciator, either with LonMaker or *Silence/Lamp Test* button or service pin.

Flashing Red

- Communications to at least one input has failed.
- Verify "NET ACTIVITY LED" (DS23) is pulsing about once every 5 seconds.
- Verify all external devices are powered and connected.
- If an external device has been replaced or removed from the system, re-bind the Annunciator.

Silence/Lamp Test Button

Lamp Test occurs each time the generator starts:

- Input voltage is dropping below 8 VDC, causing the Lamp Test. This is normal operation and no corrective action is required.

Lamp Test fails to complete:

- Annunciator is too far from power source. Decrease distance or increase gauge of power wiring.

Lamp Test fails to sound horn:

- Verify the horn is enabled (S2-7).

Cannot silence or run Lamp Test:

- Verify ribbon cable to J3 of PCB is connected. Short leads of J3 to test. If fails, replace the Annunciator.

Horn

Horn is off when lamp lights

- Verify the horn is enabled (S2-7).
- If self-installed, individual horn settings are not configurable.
- If installed with LonMaker, configure lamp as desired using the Annunciator Configuration Plug-in.

Horn is too loud/soft:

- Verify the horn volume is set as desired (S2-8).

LonMaker

Cannot communicate after installing:

Cannot view lamp configuration:

- Set *nviMfgTest* = 6 to activate all *Status* lamps in their configured state.

NETWORK INSTALLATION

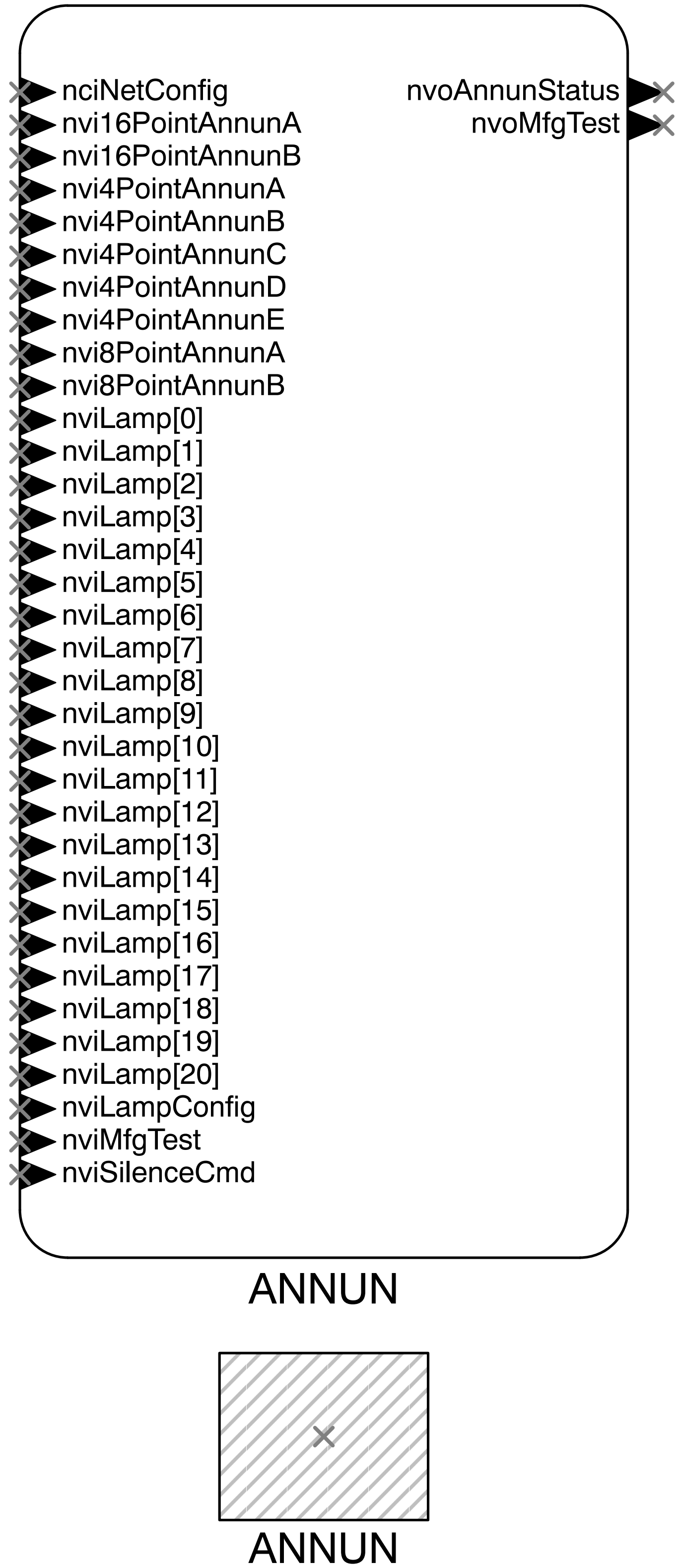
Sections 3 and 4 provide a detailed description of the network installation process. Read sections 1 and 2, before constructing the network. Sections 3 and 4 provide the following step-by-step installation procedures:

1. Setting up Network Installation Tools
2. Starting LonMaker Software
3. Using LonMaker Software
4. LonMaker Network Setup
5. Connecting Devices with LonMaker
6. Installing Devices with LonMaker
7. Testing Devices and Verifying Installation

NETWORK VARIABLES

The functional block showing the network variables for the LSA is shown in Figure 15-10. Additional details on these variables is included in Appendix F.

NOTE: nci network variables with a black connector are configurable in InPower™ .



NOTE: nci variables with a black-filled traingle symbol are configurable using InPower.

FIGURE 15-10. ANNUNCIATOR FUNCTIONAL BLOCK

SWITCHES AND LEDS

The Service switch is used during installation (when prompted by the LonMaker program). The Terminator switch must be set to the appropriate position at installation. Switches are described in Table 15-11. LED indicators are described in Table 15-12.

TABLE 15-11. LSA SWITCHES

Ref	Name	Type	Description
S2	NODE ADDRESS and Config	Slide	The switches are used to set a unique address for the node and for configuration when self-installed. The default node address is 0100.
S3	SERVICE	Momentary push	Used at the time of logical installation to identify the device to the installation software. Pressing S3 will light DS24 LED.
S4	RESET	Momentary push	Resets the Neuron Chip processor. Must be pushed after install action.
S5	TERMINATOR	Slide	Switch is set to position opposite of text “TERM” from factory. One device in an FT-10 network must be terminated.

TABLE 15-12. LSA LED INDICATORS

Ref	Color	Name	Description
DS1	Red/ Orange/ Green	Lamp 1	Annunciator Lamp 1. Activity depends on the configuration and variable bindings.
DS2	Red/ Orange/ Green	Lamp 2	Annunciator Lamp 2. Activity depends on the configuration and variable bindings.
DS3	Red/ Orange/ Green	Lamp 3	Annunciator Lamp 3. Activity depends on the configuration and variable bindings.
DS4	Red/ Orange/ Green	Lamp 4	Annunciator Lamp 4. Activity depends on the configuration and variable bindings.
DS5	Red/ Orange/ Green	Lamp 5	Annunciator Lamp 5. Activity depends on the configuration and variable bindings.
DS6	Red/ Orange/ Green	Lamp 6	Annunciator Lamp 6. Activity depends on the configuration and variable bindings.
DS7	Red/ Orange/ Green	Lamp 7	Annunciator Lamp 7. Activity depends on the configuration and variable bindings.
DS8	Red/ Orange/ Green	Lamp 8	Annunciator Lamp 8. Activity depends on the configuration and variable bindings.
DS9	Red/ Orange/ Green	Lamp 9	Annunciator Lamp 9. Activity depends on the configuration and variable bindings.
DS10	Red/ Orange/ Green	Lamp 10	Annunciator Lamp 10. Activity depends on the configuration and variable bindings.

TABLE 15-12. LSA LED INDICATORS (CONT.)

Ref	Color	Name	Description
DS11	Red/ Orange/ Green	Lamp 11	Annunciator Lamp 11. Activity depends on the configuration and variable bindings.
DS12	Red/ Orange/ Green	Lamp 12	Annunciator Lamp 12. Activity depends on the configuration and variable bindings.
DS13	Red/ Orange/ Green	Lamp 13	Annunciator Lamp 13. Activity depends on the configuration and variable bindings.
DS14	Red/ Orange/ Green	Lamp 14	Annunciator Lamp 14. Activity depends on the configuration and variable bindings.
DS15	Red/ Orange/ Green	Lamp 15	Annunciator Lamp 15. Activity depends on the configuration and variable bindings.
DS16	Red/ Orange/ Green	Lamp 16	Annunciator Lamp 16. Activity depends on the configuration and variable bindings.
DS17	Red/ Orange/ Green	Lamp 17	Annunciator Lamp 17. Activity depends on the configuration and variable bindings.
DS18	Red/ Orange/ Green	Lamp 18	Annunciator Lamp 18. Activity depends on the configuration and variable bindings.
DS19	Red/ Orange/ Green	Lamp 19	Annunciator Lamp 19. Activity depends on the configuration and variable bindings.
DS20	Red/ Orange/ Green	Lamp 20	Annunciator Lamp 20. Activity depends on the configuration and variable bindings.
DS21	Red/ Orange/ Green	NET-WORK ERROR	Red indicates a network error (failed network integrity test) Green indicates the network is operating normally (passed network integrity test) Orange indicates the device is not bound.
DS22	Green	OK	**1 Hz BLINKING (1/2 second on/1/2 second off)** indicates that the LSA's processor is executing the application code. When self-installed, the OK LED pauses after blinking the number of times that match the node address (for example, if the node address is 2, the LED blinks twice, stays off for 1 second, and then repeats).
DS23	Green	NET-WORK ACTIVITY	Flashes momentarily when a device communicates over the network.
DS24	Amber	SERVICE	Indicates various states of the annunciator node. It will be ON if S2 is pressed and held. States without S2 pressed: **OFF** = All OK. annunciator has application image and is installed in a network. **ON** = Annunciator is application-less or has experienced a error that prevents Neuron Chip from executing application code. **1/2 Hz BLINKING (1 second on/1 second off)** = Annunciator has an application, but has not been logically installed in a network. **FLASHING** once every 2–3 seconds = Annunciator is experiencing an error condition causing a watchdog timeout reset (fatal error).

16. Controls Communications Module / Genset

ABOUT THIS SECTION

This section describes the Controls Communications Module (CCM) and its functional role in the PowerCommand network. This module is used to monitor and control both gensets and automatic transfer switches. This section describes the CCM and applications involving gensets. This section also describes the physical mounting and wiring of this module and provides procedures for the *logical* installation and connection of the CCM-G on the network. Section 17 describes automatic transfer switch applications.

In network terms, "logical installation and connection" refers to programming the various devices (or nodes) on the network so that they can communicate with one another. This communication takes the form of passing network variables from one device to another. The process of assigning connections (linking an output variable of one device to an an input variable of another device) is called "binding."

In addition to functional and physical descriptions, this section provides definitions of the network input and output variables assigned to the CCM-G.

DESCRIPTION

CAUTION ***Electrostatic discharge will damage circuit boards. To prevent damage, do not handle circuit boards unless you are adequately grounded with a wrist strap. Use a protective shipping bag for storing or transporting circuit boards.***

The CCM-G can be used to monitor and control a genset. It provides a PowerCommand® Network interface for remote monitoring and control. The relay outputs on the CCM-G provide a limited amount of control of the monitored equipment from the network. For example, these outputs can be used to remotely start a genset.

PowerCommand is a registered trademark of Cummins Inc.
Detector and InPower are trademarks of Onan Corporation.
LonMaker is a trademark of Echelon Corporation.

Refer to Table 16-1 for the maximum distance between the CCM-G and the current transformers (CTs). Use the part number on the CTs or contact an authorized parts distributor with the genset model and spec number to determine if a CT kit is required. If a CT kit is needed, install it before performing the CCM-G installation. Refer to the instructions provided with the CT kit.

When each of the steps in this installation are complete, the CCM-G is ready for connection to a network. Refer to *Section 2* for instructions on network wiring and *Section 4* for network software installation.

CCM-G Inputs

The CCM-G has 16 channels of analog input and 32 digital inputs. Most of the analog channels are configured for monitoring signals found on a genset (AC volts, current, phase, oil temp, oil pressure, coolant temp, exhaust temp, etc., see Appendix D, Figure E-2). The spare analog inputs are for signal monitoring (4-20 mA, 0-1 mA, 0-5V). The sensor inputs are used for monitoring temperature or pressure. The three temperature inputs accept RTD values between 80 and 2200 ohms. The pressure input can be used generically with any sensor that provides 0-9 VDC.

The 32 discrete inputs permit monitoring of numerous status/fault conditions. These inputs must be referenced back to either analog ground (J7) through dry contacts or through a pulldown resistor when active "OPEN" input is +5 to +36 VDC (see notes 6 and 17 in sheet 2 of Figure E-2).

The values of the analog and discrete inputs are read from the network.

CCM-G Outputs

The CCM-G has eight 250 volt, 3 amp Form-C relay outputs (see Figure 16-1). The relays are controlled from the network and are used to transmit start/stop/reset control signals and five customer-defined events.

External devices that are wired to these relays should be fused appropriately to prevent damage to the CCM-G.

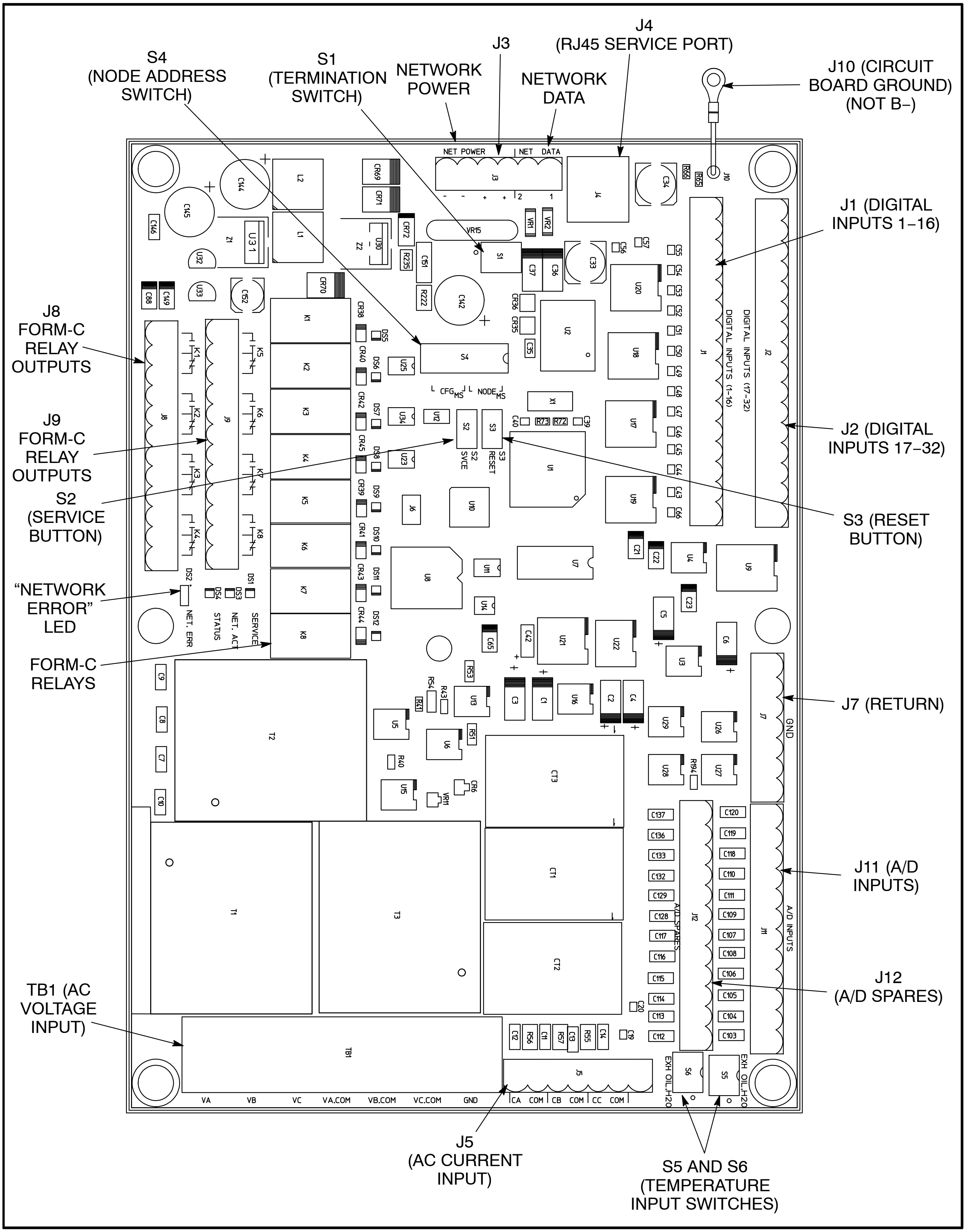


FIGURE 16-1. GENERATOR SET CONTROL COMMUNICATIONS MODULE

CCM-G Power Supply

For genset applications, the 12- or 24-volt genset starting battery(ies) are used to power the CCM-G. See the wire size chart in sheet 1 of Figure E-5. The genset must have a battery charger capable of maintaining the starting battery(ies) with the CCM-G load.

Refer to *Section 2* for a detailed description of *Network Power* and *Network Power Wire Sizing* requirements.

Standard Displays

Solid state indicators are provided to aid in diagnosis of module operating status. These include a service LED for the Neuron® chip, a running LED on the main processor, and LEDs to show when the relays are activated.

PHYSICAL INSTALLATION

Location

Mount the CCM-G control box as close as possible to the genset so the wire size can be kept to a minimum.

The CCM-G is preassembled inside an enclosure that is designed for wall mounting (see Figure 16-2).

Choose a clean, vibration-free mounting surface near the genset. Avoid locations that are hot, damp or dusty. The temperature range must not exceed −40°F (−40°C) to 158°F (70°C).

Refer to *Section 2 (Network Hardware and Wiring)* for network topology and maximum network length.

Control Box Mounting

Figure 16-3 shows the CCM-G mounting box outline dimensions. The outside dimensions do not include clearance for wire connections. When the mounting location and wire routing are determined (see Wiring Connections section), make holes in the control box for AC, DC, and data wire routing. Be careful not to damage the CCM-G module. If the CCM-G is removed during mounting, make sure the ground lead is reconnected to the mounting stud when reinstalling the CCM-G.

⚠ CAUTION ***Installation debris can cause equipment failure and damage. Use extreme care to keep drill chips and filings out of the CCM-G control box. Use tools carefully to prevent damage to components.***

Make sure that no wires, plumbing, gas or exhaust lines run behind the wall before drilling the mounting holes.

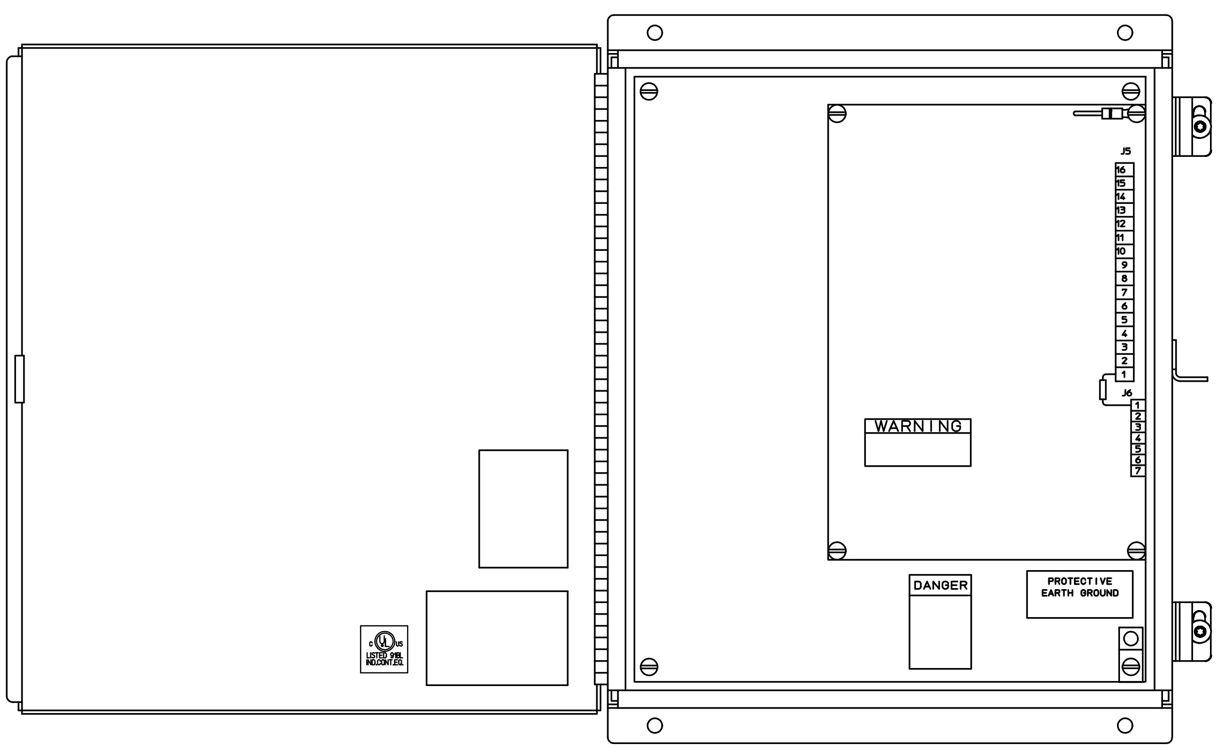


FIGURE 16-2. CONTROLS COMMUNICATIONS MODULE (CCM-G) CONTROL BOX

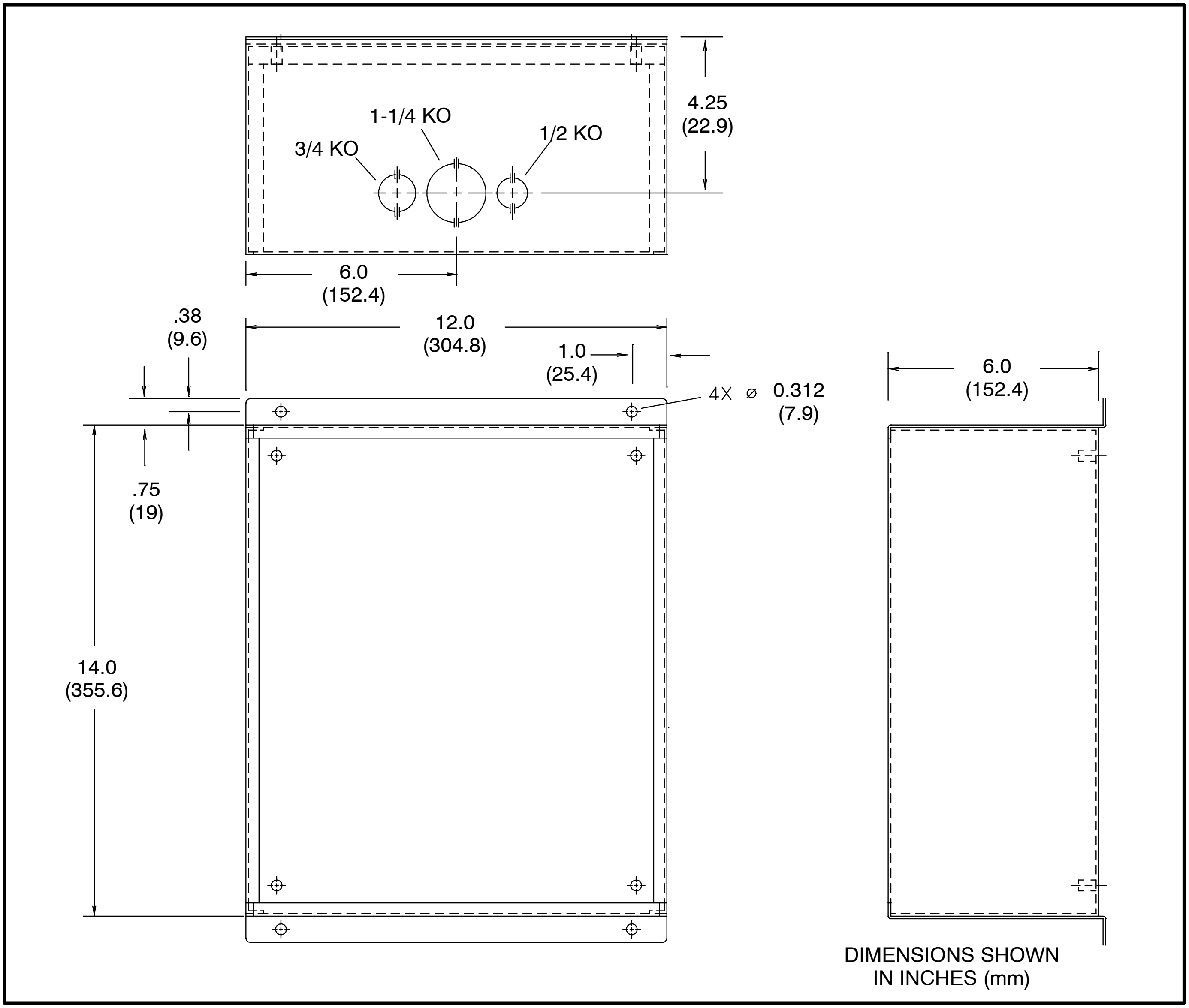


FIGURE 16-3. CCM-G BOX MOUNTING

WIRE AND CONDUIT

Measure the distance, one way, between the CCM-G mounting location and the genset control. Refer to the wire size chart in sheet 1 of Figure E-5 to determine the appropriate wire gauge for CT wires, power supply wires and monitor and control wires (see Table 16-1 for additional CT wire information). Use stranded wire with a minimum insulation rating of 600V and a temperature rating of 221°F (105°C).

Run a conduit for the AC wire connections and a separate conduit for the DC wire connections between the CCM-G and the genset control. Install at least 2 feet (610 mm) of flexible conduit on both lines at the genset control box connection to allow for genset vibration during operation. Round off or cover the ends of the conduit to prevent sharp edges from cutting the insulation. Use waterproof conduit if it will be exposed to moisture.

The number of leads pulled through each conduit will be determined by the type of genset control and the desired monitor and control features selected. Refer to the table in sheet 1 of Figure E-5 for a list of the possible AC and DC connections. Number both ends of each lead for identification before pulling the wire through the conduit.

Grounding must comply with all codes. Mount the enclosed grounding lug inside the mounting box (refer to the instructions provided with the lug). Make sure the paint is removed from the ground lug mounting location to provide a good ground.

TABLE 16-1. CT WIRE SIZE VS. DISTANCE

			MAXIMUM DISTANCE BETWEEN CCM-G AND CTs IN FEET (M) BLANK ROWS INDICATE THAT A CT KIT IS REQUIRED CONTACT YOUR AUTHORIZED PARTS DISTRIBUTOR		
CT Number	Application	Ratio	#12 AWG	#14 AWG	#16 AWG
			FEET (M)	FEET (M)	FEET (M)
302−1984−02	Genset(DK)	25/5			
302−1984−02	Genset(DK)	50/5			
302−1984−03	Genset(DK)	100/5			
302−1984−03	Genset(DK)	50/5			
302−1984−04	Genset(DK)	150/5			
302−1984−04	Genset(DK)	75/5			
302−1984−05	Genset(DK)	100/5			
302−1984−05	Genset(DK)	200/5			
302−1868−01	Genset(DG)	25/5			
302−1868−01	Genset(DG)	50/5			
302−1868−02	Genset(DG)	100/5			
302−1868−02	Genset(DG)	50/5			
302−1868−03	Genset(DG)	150/5			
302−1868−03	Genset(DG)	75/5			
302−1868−04	Genset(DG)	100/5			
302−1868−04	Genset(DG)	200/5			
302−1868−05	Genset(DG)	150/5			
302−1868−05	Genset(DG)	300/5			
302−1868−06	Genset(DG)	200/5			
302−1868−06	Genset(DG)	400/5			
302−1868−07	Genset(DG)	250/5			
302−1868−07	Genset(DG)	500/5			
302−1868−08	Genset(DG)	375/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1868−08	Genset(DG)	750/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1868−09	Genset(DG)	400/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1868−09	Genset(DG)	800/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1868−10	Genset(DG)	1000/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1868−10	Genset(DG)	500/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1868−11	Genset(DG)	1200/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1868−11	Genset(DG)	600/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1868−12	Genset(DG)	1500/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1868−12	Genset(DG)	750/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1794−01	Genset(DF)	150/5			
302−1794−01	Genset(DF)	75/5			
302−1794−02	Genset(DF)	100/5			

TABLE 16-1. CT WIRE SIZE VS. DISTANCE (Continued)

			MAXIMUM DISTANCE BETWEEN CCM-G AND CTs IN FEET (M) BLANK ROWS INDICATE THAT A CT KIT IS REQUIRED CONTACT YOUR AUTHORIZED PARTS DISTRIBUTOR		
CT Number	Application	Ratio	#12 AWG	#14 AWG	#16 AWG
			FEET (M)	FEET (M)	FEET (M)
302−1794−02	Genset(DF)	200/5			
302−1794−03	Genset(DF)	150/5			
302−1794−03	Genset(DF)	300/5			
302−1794−04	Genset(DF)	200/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1794−04	Genset(DF)	400/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1794−05	Genset(DF)	250/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1794−05	Genset(DF)	500/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1794−06	Genset(DF)	300/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1794−06	Genset(DF)	600/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1794−07	Genset(DF)	375/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1794−07	Genset(DF)	750/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1794−08	Genset(DF)	400/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1794−08	Genset(DF)	800/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1794−09	Genset(DF)	1000/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1794−09	Genset(DF)	500/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1794−10	Genset(DF)	600/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1794−10	Genset(DF)	1200/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1794−11	Genset(DF)	750/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1794−11	Genset(DF)	1500/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1794−12	Genset(DF)	1000/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1794−12	Genset(DF)	2000/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1794−13	Genset(DF)	1500/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1794−13	Genset(DF)	3000/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1794−14	Genset(DF)	2000/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1794−14	Genset(DF)	4000/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1794−15	Genset(DF)	3000/5	30 (9.1)	20 (6.1)	14 (4.1)
302−1794−15	Genset(DF)	6000/5	30 (9.1)	20 (6.1)	14 (4.1)
302−2034−02	Genset(DNA)	100/5			
302−2034−03	Genset(DNA)	30/1			
302−1417	Genset(ES)	150/5			
302−1845−XX is the same as 302−1868−XX (Example: 302−1845−02 refer to 302−1868−02 row for distances) 302−2055−XX is the same as 302−1794−XX (Example: 302−2055−02 refer to 302−1794−02 row for distances) 302−2056−XX is the same as 302−1868−XX (Example: 302−2056−02 refer to 302−1868−02 row for distances)					

NOTES: 1. This table is for copper wire at 50°C (122°F). Derate the distance by 0.4% per °C over 50°C.
2. Minimum wire gauge for NEC compliance is AWG 14Wiring Connections

WIRING CONNECTIONS

This section describes connecting the CCM-G to a genset with a Detector or DK type of control. Figures E-5 show the interconnect wiring diagram specifically for the CCM-G to Detector or DK control. (Figure E-5 applies to both 7-light and 12-light Detector controls. Connections for Low Fuel, Low Engine Temp, Fault 1 and Fault 2 are not available from the 7-light control.)

Figure E-2 provides basic CCM-G interconnect wiring diagram information; review the notes on sheet 2 of Figure E-2 and use these drawings for reference.

WARNING ***Accidental starting of the generator set while working on it can cause severe injury or death. Disconnect the battery cables to prevent accidental starting. Be sure to move the generator set operation selector switch to Stop, disconnect the battery charger, disconnect the starting battery (negative [–] lead first).***

WARNING ***Ignition of explosive battery gases can cause severe personal injury. Do not smoke or cause any spark or flame while servicing batteries.***

CAUTION ***Always disconnect a battery charger from its AC source before disconnecting the battery cables. Otherwise, disconnecting the cables can result in voltage spikes high enough to damage the DC control circuits of the generator set.***

1. Before making any wiring connections, make sure the genset cannot be started by moving the RUN/STOP/REMOTE switch to STOP. Disconnect the power to the battery charger and disconnect the starting battery (negative [–] battery cable[s] first).
2. Refer to Figure E-5 for point-to-point wiring information and component and terminal locations. Follow standard wiring practices. Properly secure wire terminals. Secure wires in the terminal blocks to 2 inch-lbs. (0.23 N•m). Observe wire gauge requirements for CT wires, power supply wires and monitor and control wires.
3. The table in sheet 1 of Figure E-5 identifies the DC and AC connections. The DC leads must be run inside a separate conduit from the AC leads.

   It may be easiest to start at the top of the table with the DC connections and make all the connections inside the CCM-G control box. Then move to the genset control to complete the wiring. Make sure that each lead is marked and pay close attention to the associated notes in the wiring table. Some connections are for jumpers inside the CCM-G only.
4. When making connections inside the genset control, provide enough wire so that the leads can be secured to the existing harness. Leads that connect to components on the control panel door should be routed near the hinges and be secured to the existing leads.
5. Connect the data wire to the CCM-G and provide an adequate length of twisted pair wire for future connection to a junction box. Tighten the tamperproof control box mounting screws securely to prevent tampering.
6. The module is now ready for network wiring. Network wiring must be done by a trained network installer. Refer to *Section 2* for instructions on network wiring the CCM-G and for installation and connection of this module to the network.
7. Set the Temperature Input switches (see Figure 16-1) to either “EXH” (80–390 ohm exhaust temperature RTD) or “OIL.H2O” (500–2200 ohm oil/water temperature RTD). See Table 16-3.
8. If the CCM-G is terminated, the termination switch S1 must be set (see Figure 16-1). This is accomplished by moving it to the ON or TERM position.

   NOTE: For free topology, only one device on each segment must be terminated. The device terminator switch can be used for this type of termination. Multidrop bus topology requires termination at each end of the bus using multidrop bus terminators (Onan P/N 300–5729).
9. When the network installation is complete, reconnect battery (negative [–] battery cable[s] last), reconnect battery charger and return the genset control switch to the Remote position.

SELF-INSTALLATION

Self-installation guidelines and information on how to self-install a network is included in *Section 3*.

Requirements

This procedure can be used to logically install the CCM-G when the following requirements are met.

Self-installation is limited to one PowerCommand Genset or CCM-G, one PowerCommand Automatic Transfer Switch (ATS) or CCM-T, and no more than four annunciators or five DIMs. The CCM-G can be autobound by an ATS and up to two annunciators and two DIMs, but by no more than a total of three annunciators and DIMs.

With networks containing a transfer switch, the genset CCM-G must be logically installed before the transfer switch is logically installed and before the annunciators, DIMs, and other network devices are logically installed.

NOTE: The CCM-G must be installed first.

If these requirements are not met, the system must be installed with LonMaker™ . Refer to “LonMaker Installation” on page 16-10.

Node Address

Each node on a self-installed network must have a unique address. Switches 1 through 4 of switch S4 are used to set the *Node Address* (see Figure 16-4). The default node address is 0001, which is a “STATUS” LED pulse rate of 1.

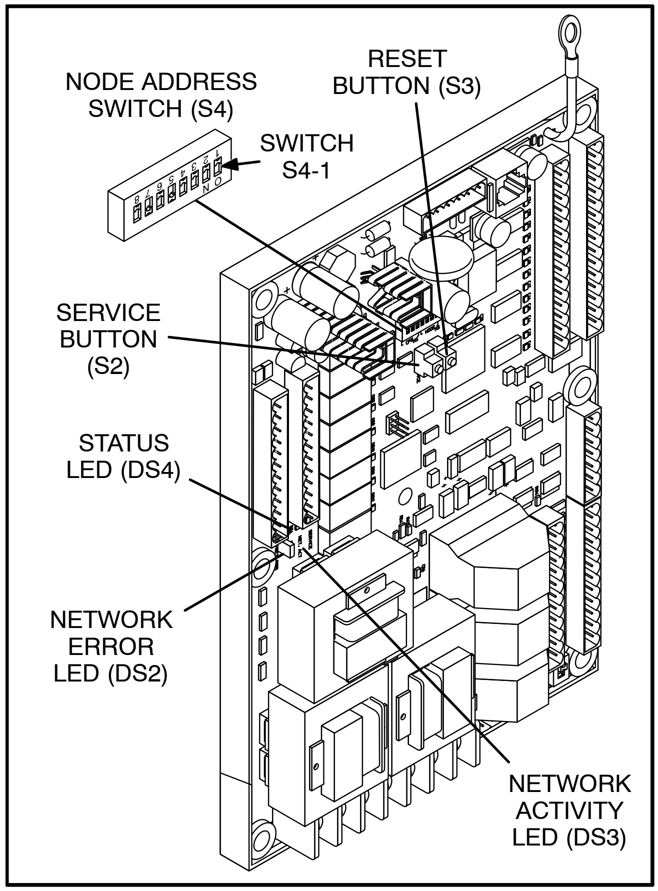


FIGURE 16-4. NODE ADDRESS SWITCH

The switches are oriented so that switch S4-1 is the most significant bit (MSB) of the *Node Address.* Thus, S4-1 has a value of "8" when it is ON. S4-2 has a value of 4, S4-3 has a value of 2, and S4-4 has a value of 1. For example, to set the *Node Address* to 9, set switch S4 to 1001 (8+0+0+1=9). See Table 16-2.

TABLE 16-2. SETTING THE NODE ADDRESS (S4)

S4-1 (8)	S4-2 (4)	S4-3 (2)	S4-4 (1)	Address (binary)	Address (decimal)
OFF	OFF	OFF	OFF	0000	0[1]
OFF	OFF	OFF	ON	0001	1
OFF	OFF	ON	OFF	0010	2
				↓	↓
ON	ON	ON	ON	1111	15

NOTE 1. "0" (zero) is not a valid *Node Address*.

Be sure to assign each node in the network a unique address.

After the device has been physically installed, the *Node Address* can be verified by counting the number of pulses of the "STATUS" LED (DS4) (see Figure 16-4). Make sure each device has a unique node address.

After the genset has been installed, a DIM, annunciator, or ATS may bind to the genset. Because the genset does not execute the binding function, the genset must be installed first.

Logical Installation

After the CCM-G is *physically* connected to the network, it is ready to be *logically* installed.

1. Make sure the CCM-G node and other network devices are powered and connected to the twisted-pair data bus.
2. Make sure S4-1, S4-2, S4-3, and S4-4 on the CCM-G are configured for the desired node address. Each device on the network must have a unique address.
3. Make sure the network is terminated.
4. Press and hold the *Service* button (S2) (see Figure 16-4) for approximately two seconds until the *Status* LED (DS4) begins flashing.
5. Release the *Service* button.

Binding Sequence

Logically connecting to another device is referred to as *binding*. *Binding* may be done when all the nodes are installed, connected, and powered.

Binding the node must occur in the proper sequence. Logically install the genset first, followed by the transfer switch, and then the annunciator(s) and other network accessories.

NOTE: The genset (CCM-G) and ATS module must be Cummins Inc. devices which are able to self-install in the network. Each device on the network must have a unique address.

Verify Binding

To verify the genset has installed itself properly and is bound to the ATS, disconnect the twisted-pair data cable at J30. The "Network Error" LED (DS2) (see Figure 16-4) should turn on (red) within 10 seconds. This indicates communications have failed and that the device was properly bound.

Reconnect the twisted pair cable and confirm that DS2 turns off within 10 seconds.

If no error is produced, use InPower™ to verify the *Test Interval* (located in the LonWorks device folder from the Adjustments directory) is set for 10.0 seconds. Also check the wiring and Address of each node. Repeat the Self-Installation steps to re-initiate *binding*.

Remove Bindings

If unresolved system errors occur, the bindings can be removed and then re-installed to reset the system. The bindings can also be removed if the network is being changed or the device is being moved to another network.

To remove all bindings from the device, change the *Node Address* (S4) to 0 (zero) and logically re-install the device.

The node will remove all bindings at this time, including the genset and annunciator bindings. The "STATUS" LED will not flash when the *Node Address* is 0, nor will it attempt to bind to a genset.

Re-Binding

Re-Binding the node must occur in the proper sequence. Logically install the genset first, followed by the transfer switch; and then the annunciator(s), DIMs, and other network accessories.

To re-bind an annunciator, DIM, or ATS to the genset node, press and hold the Service pin for two seconds.

LONMAKER INSTALLATION

The CCM-G can be manually installed with LonMaker. The Device Stencil is required.

LonMaker installation is required to use PowerCommand Software (PCW II). Self-installation does not require LonMaker.

To install using LonMaker:

1. Run LonMaker. See *Section 4*.
2. Install the Device Stencil.
3. Create a new site (or update an existing site).
4. Define, install, and bind devices.
5. Verify system operation.

The CCM-G is defined and installed like any other device in LonMaker.

NETWORK TOPOLOGY, DATA MEDIA, AND NETWORK POWER

Refer to *Section 2* for information on the network topology and data transmission media. Also refer to *Section 2* for network power supply wiring calculation procedures.

NETWORK DATA MEDIA AND POWER WIRING

WARNING ***AC voltages and currents present an electrical shock hazard that can cause severe personal injury or death. Only trained, experienced personnel are to perform the following procedures.***

Connections

Network data and power wiring connections are made at connector J3.

Conduit

When installing conduit, observe the following precautions:

1. Before beginning conduit installation, cover all components to prevent accidental entry of metal chips.
2. If using rigid conduit, install at least 2 feet (610 mm) of flexible conduit between the rigid conduit and generator set to absorb vibration.
3. Always run DC circuit wiring in a separate metal conduit from AC power cables to avoid inducing currents that could cause problems within the control.
4. Data wire can be run without conduit if it is adequately protected. Do not run data wire in conduit with network power wiring or other non-power−limited circuits. Make sure wiring meets all applicable wiring codes.

CAUTION ***Installation debris can cause equipment failure and damage. Use extreme care to keep drill chips and filings out of the components when mounting or connecting conduit. Screwdrivers should be used carefully to prevent damage to components.***

NETWORK INSTALLATION

Sections 4 and *5* provide a detailed description of the network installation process. Read *Sections 1* and *2* before constructing the network. *Sections 4* and 5 provide the following step-by-step installation procedures:

1. Setting up Network Installation Tools
2. Starting LonMaker Software
3. Using LonMaker Software
4. LonMaker Network Setup
5. Connecting Devices with LonMaker
6. Installing Devices with LonMaker
7. Testing Devices and Verifying Installation

SWITCHES AND LEDS

The Service switch (S2) is used during installation (when prompted by the LonMaker program). The Terminator switch (S1) must be set to the appropriate position at installation. Switches are described in Table 16-3.

LEDs are described in Table 16-4.

TABLE 16-3. CCM-G SWITCHES

Ref	Name	Type	Description
S1	TERMINATOR	slide	Switch is set to position opposite of text “TERM” from factory. Set the switch towards the text “TERM” to terminate.
S2	SERVICE	momentary push	Used at time of logical installation to identify device to the installation software. Pressing S2 will light the DS1 LED.
S3	RESET	momentary push	Resets the Neuron Chip processor. Must be pressed after Install action.
S4	NODE CONFIGURATION	slide	Switches 1 through 4 are used to set a unique address for the node. The default node address is 0001. Switches 5 through 8 are not used and should be set to the “OFF” position.
S5	TEMP#2 SELECT	slide	When the input is driving the sender, selects whether temperature input#2 RTD is 500−2200 ohm or 80−390 ohm. Set to “OIL/H2O” for 500−2200 ohm. Set to “EXH” for 80−390 ohm.
S6	TEMP#3 SELECT	slide	When the input is driving the sender, selects whether temperature input#3 RTD is 500−2200 ohm or 80−390 ohm. Set to ”OIL/H2O” for 500−2200 ohm. Set to “EXH” for 80−390 ohm.

TABLE 16-4. CCM-G LED INDICATORS

Ref	Color	Name	Description
DS1	Amber	SERVICE	Indicates various states of the CCM-G node. It will be ON if S2 is pressed and held. States without S2 pressed: **OFF** = All OK. CCM-G has application image and is installed in a network. **ON** = CCM-G is applicationless or has experienced a error which prevents Neuron Chip from executing application code. **1/2 Hz BLINKING (1 second on / 1 second off)** = CCM-G has an application, but has not been logically installed in a network. **FLASHING (momentarily)** once every 2–3 seconds = CCM-G is experiencing an error condition causing a watchdog timeout reset.
DS2	Red/ Orange/ Green	NETWORK ERROR	Red indicates a network error (failed network integrity test) Green indicates the network is operating normally (passed network integrity test) Orange indicates the device is not bound.
DS3	Green	NETWORK ACTIVITY	Flashes momentarily when a device communicates over the network.
DS4	Green	STATUS	**1/2 Hz BLINKING (1 second on / 1 second off)** to indicate that the CCM-G's processor is executing the application code. **In the future,** may be used to indicate other conditions for troubleshooting purposes. It also indicates the Node Address when the module is self-installed. (For example, if the node address is 2, it blinks twice, pauses for a second, and then repeats.)
DS5	Green	K1	Turns on when K1 is energized.
DS6	Green	K2	Turns on when K2 is energized.
DS7	Green	K3	Turns on when K3 is energized.
DS8	Green	K4	Turns on when K4 is energized.
DS9	Green	K5	Turns on when K5 is energized.
DS10	Green	K6	Turns on when K6 is energized.
DS11	Green	K7	Turns on when K7 is energized.
DS12	Green	K8	Turns on when K8 is energized.

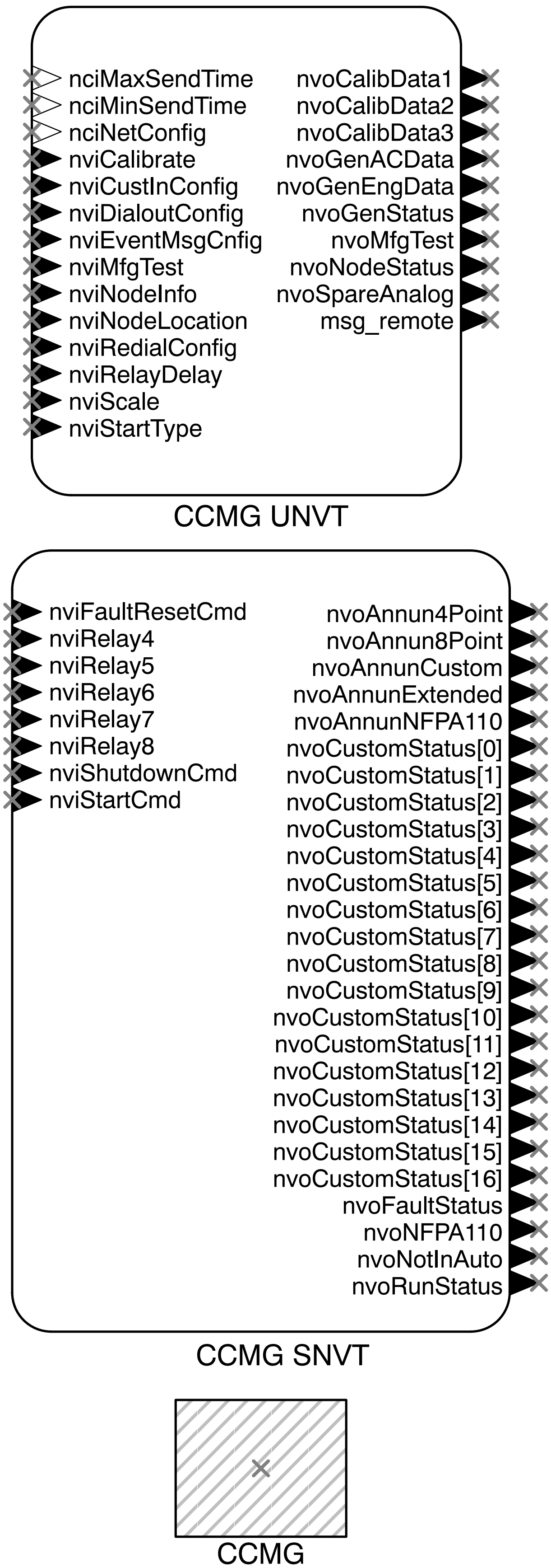
NETWORK VARIABLES

Table 16-5 shows the correlation between actual inputs and outputs for the CCM-G and the CCM-G's connectable network variables based on CCM-Genset Interconnect Drawing Figure E-5 (located in Appendix D).

TABLE 16-5. ACTUAL INPUTS AND OUTPUTS FOR THE CCM-G

Signal	CCM-G Network Variable		Options Required
	Name	Active State	
DISCRETE INPUTS			
Common Alarm	nvoAnnunNFPA110.bit0	Open (0)	Standard
Low Fuel Level	nvoAnnunNFPA110.bit15	Closed (1)	Not available on Detector-7 Lite
Low Engine Temperature	nvoAnnunNFPA110.bit8	Closed (1)	Not available on Detector-7 Lite
High Battery Voltage	nvoAnnunNFPA110.bit4	Closed (1)	Not available on Detector-7 Lite
Low Battery Voltage	nvoAnnunNFPA110.bit5	Closed (1)	Not available on Detector-7 Lite
Overcrank	nvoAnnunNFPA110.bit7	Closed (1)	Standard
Overspeed	nvoAnnunNFPA110.bit13	Closed (1)	Standard
High Engine Temperature	nvoAnnunNFPA110.bit10	Closed (1)	Standard
Low Oil Pressure	nvoAnnunNFPA110.bit12	Closed (1)	Standard
Pre-High Engine Temperature	nvoAnnunNFPA110.bit9	Closed (1)	Standard
Pre-Low Oil Pressure	nvoAnnunNFPA110.bit11	Closed (1)	Standard
Genset Running	nvoAnnunNFPA110.bit2	Closed (1)	Standard
Switch in Off	nvoAnnunNFPA110.bit3	Open (0)	Standard
Customer Input 1	nvoCustomStatus[1]	Configurable	None
Customer Input 2	nvoCustomStatus[2]	Configurable	None
Customer Input 3	nvoCustomStatus[3]	Configurable	None
Customer Input 4	nvoCustomStatus[4]	Configurable	None
Customer Input 5	nvoCustomStatus[5]	Configurable	None
Customer Input 6	nvoCustomStatus[6]	Configurable	None
Customer Input 7	nvoCustomStatus[7]	Configurable	None
Customer Input 8	nvoCustomStatus[8]	Configurable	None
Customer Input 9	nvoCustomStatus[9]	Configurable	None
Customer Input 10	nvoCustomStatus[10]	Configurable	None
Customer Input 11	nvoCustomStatus[11]	Configurable	None
Customer Input 12	nvoCustomStatus[12]	Configurable	None
Customer Input 13	nvoCustomStatus[13]	Configurable	None
Customer Input 14	nvoCustomStatus[14]	Configurable	None
Customer Input 15	nvoCustomStatus[15]	Configurable	None
Customer Input16	nvoCustomStatus[16]	Configurable	None
RELAY OUTPUTS			
Remote Start	nviStartCmd		Standard
Remote Reset/Lamp Test	nviFaultResetCmd		Standard
Shutdown	nviShutdownCmd		Standard

Note: There are other network variables that can also access these inputs.



nvoAnnunCustom
SNVT state for 16 customer inputs that ARE NOT used with the CCMG

nvoAnnunExtended
SNVT state for 16 customer inputs that ARE used with the CCMG

nvoCustomStatus
SNVT switches for 16 customer inputs that ARE NOT used with the CCMG

FIGURE 16-5. GENSET CONTROLS COMMUNICATIONS MODULE FUNCTIONAL BLOCK

17. Controls Communications Module / ATS

ABOUT THIS SECTION

This section describes the Controls Communications Module (CCM) used for monitor and control in automatic transfer switch applications (CCM-T). This section describes the physical mounting and wiring of this module, and provides procedures for the *logical* installation and connection of the CCM-T on the network.

In network terms, "logical installation and connection" refers to programming the various devices (or nodes) on the network so that they can communicate with one another. This communication takes the form of passing network variables from one device to another. The process of assigning connections—linking an output variable of one device to an an input variable of another device—is called "binding."

In addition to functional and physical descriptions, this section provides definitions of the network input and output variables assigned to the CCM-T.

The CCM-T must be installed by trained and experienced generator set and transfer switch service personnel only or equipment failure and damage can result.

⚠ CAUTION ***Electrostatic discharge will damage circuit boards. To prevent damage, do not handle circuit boards unless you are adequately grounded with a wrist strap. Use a protective shipping bag for storing or transporting circuit boards.***

PRE-INSTALLATION

For transfer switches equipped without meters, a Current Transformer (CT) kit is required to monitor the current and power factor over the network. Contact an authorized parts distributor with the Model and Spec letter of the transfer switch to determine the kit number.

For transfer switches equipped with meters, refer to the part number on the existing CTs. Check Table 1 for the maximum distance between the CCM-T and the CTs. If the distance shown is not adequate or no distance is given, a CT kit is needed. See Table 17-1. If the part number on the existing CT is unknown, contact an authorized parts distributor with the Model and Spec letter of the transfer switch to determine the CT number.

If a CT kit is needed, install the kit before installing the CCM-T. Refer to the instructions provided with the CT kit.

DESCRIPTION

A CCM-T is used to monitor and control an automatic transfer switch. The CCM-T interfaces with the PowerCommand® Network for remote monitoring and control. Relay outputs on the CCM-T provide control of the transfer switch from the network.

CCM-T Inputs

The CCM-T has 16 channels of analog input and 32 digital inputs (see sheets 3 and 4 of Figure E-4). Most of the analog channels are configurable for monitoring analog signals such as AC volts, current, power factor, temp, pressure, coolant temp, etc). The spare analog inputs are used for signal monitoring (4-20 mA, 0-1 mA, 0-5V). The sensor inputs are used for monitoring temperature or pressure. Temperature inputs accept RTD values between 80 and 2200 ohms. The pressure input can be used generically with any sensor that provides 0-9 VDC.

The 32 discrete inputs permit monitoring of numerous status/fault conditions. These inputs must be referenced back to either analog ground (J7) through dry contacts or through a pulldown resistor when the active "OPEN" input is +5 to +36 VDC (see notes 6 and 17 in sheet 2 of Figure E-2).

The values of the analog and discrete inputs are read from the network.

CCM-T Outputs

The CCM-T has eight 250 volt, 3 amp Form-C relay outputs (see Figure 17-1). The relays are controlled from the network and are used to transmit Remote Test, Transfer Inhibit, Re-Transfer Inhibit, Load Shed control signals, and four customer-defined events.

External devices that are wired to these relays should be fused appropriately to prevent damage to the CCM-T.

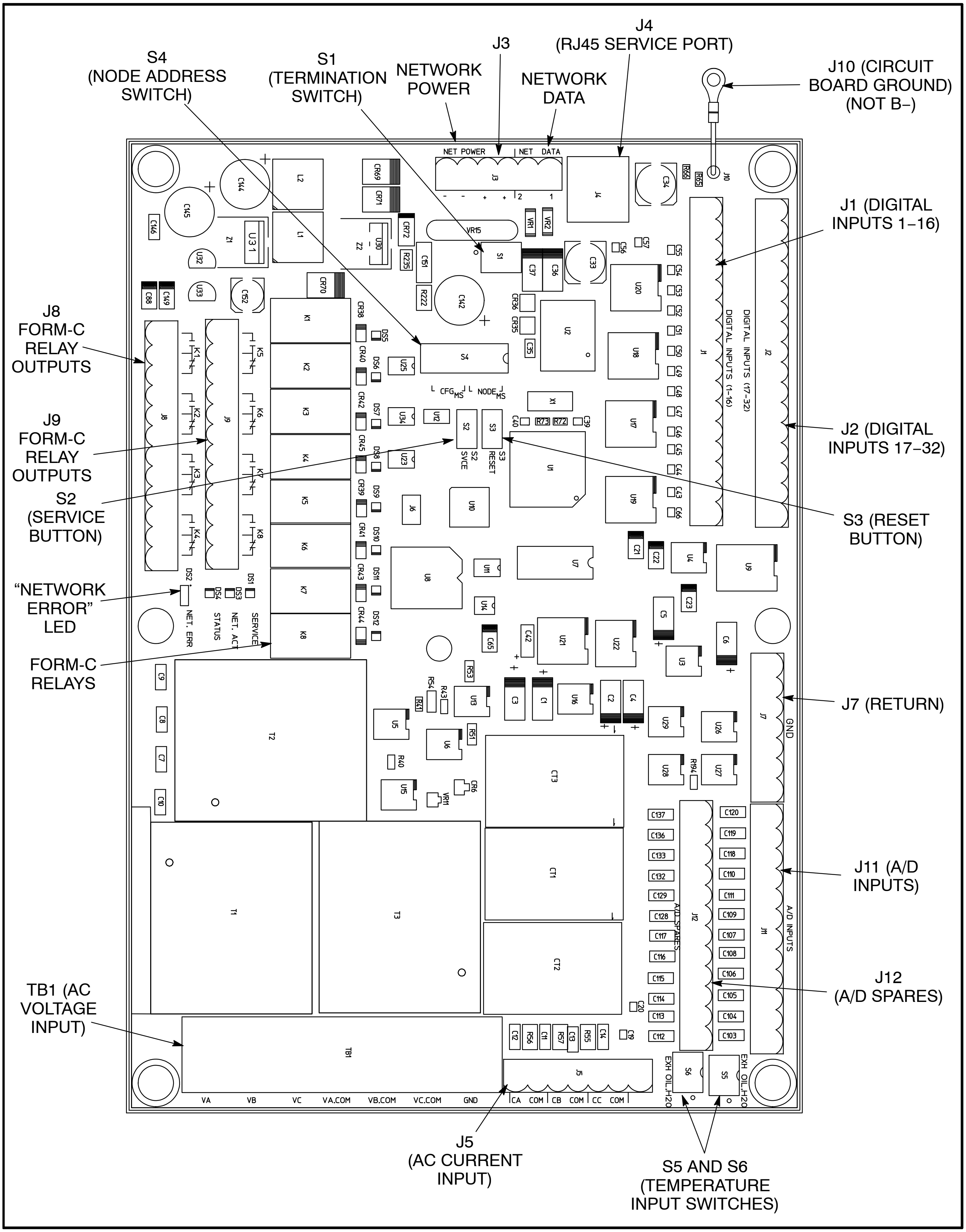


FIGURE 17-1. ATS CONTROL COMMUNICATION MODULE

CCM-T Power Supply

The CCM-T power supply consists of a sealed 12-volt battery and a battery charger. These parts are included in the kit and are located inside the CCM-T control box. Supply a 120 VAC, 50 Hz or 60 Hz power source to the battery charger at TB2 (see Figure 17-2).

The battery should be replaced every two years. Make a note in the Maintenance section of the *ATS Operator's Manual*, or add this information to a master maintenance schedule for the facility. Maintain power to the circuit during battery replacement by connecting the new battery in parallel with the power supply circuit, then disconnect the old battery. If a low battery condition is being monitored, this will prevent a low battery alarm signal.

120 VAC is needed to power the battery charger. If 120 VAC is not available, kits listed in Table 17-1 are available for obtaining the voltage from the ATS. Install the enclosed 3-amp fuse in the location shown in Figure 17-2. An arc may occur when the fuse is installed; this is normal.

TABLE 17-1. TRANSFORMER KITS

Kit Number	Voltage
300−4870−01	208V, 240V, 480V
300−4870−02	347V, 380V, 416V
300−4870−03	600V

Standard Displays

Solid state indicators are provided to aid in diagnosis of module operating status. These include a service LED for the Neuron® chip, a running LED on the main processor, and LEDs to show when the relays are activated.

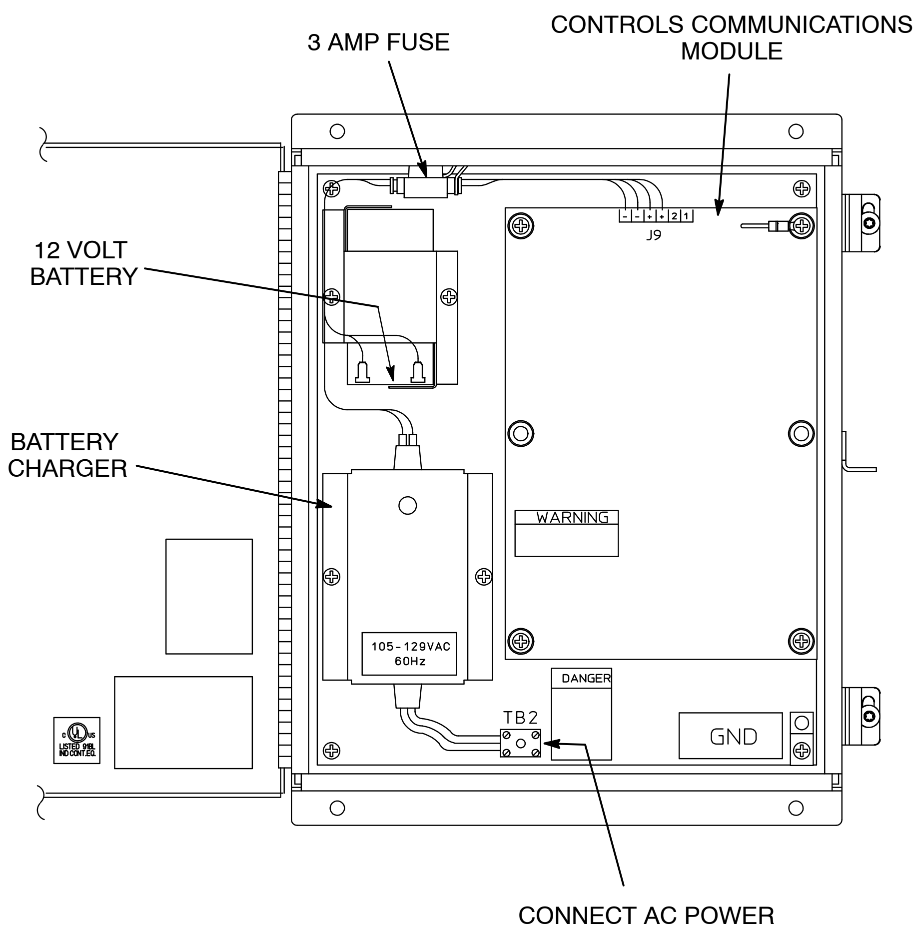


FIGURE 17-2. CONTROL COMMUNICATION MODULE FOR ATS APPLICATIONS

PHYSICAL INSTALLATION

Mounting the CCM-T

Mount the CCM-T control box as close as possible to the Automatic Transfer Switch (ATS) to keep the wire size to a minimum.

The CCM-T is preassembled inside an enclosure that is designed for wall mounting. Choose a clean, vibration-free mounting surface near the transfer switch. Avoid locations that are hot, damp or dusty. The temperature range must not exceed the range of −40°F to 158°F (−40°C – 70°C).

Refer to *Section 2* for network topology and maximum network length.

Control Box Mounting

Outer dimensions (see Figure 17-3) of the CCM-T do not include clearance for wire connections. When the mounting location and wire routing are determined (see Wiring Connections section), make holes in the control box for AC, DC, and data wire routing. Be careful not to damage the CCM-T module. If the CCM-T is removed during mounting, make sure the ground lead is reconnected to the mounting stud when reinstalling the CCM-T.

⚠ CAUTION ***Installation debris can cause equipment failure and damage. Use extreme care to keep drill chips and filings out of the CCM-T control box. Use tools carefully to prevent damage to components.***

Make sure that no wires, plumbing, gas, or exhaust lines run behind the wall before drilling the mounting holes.

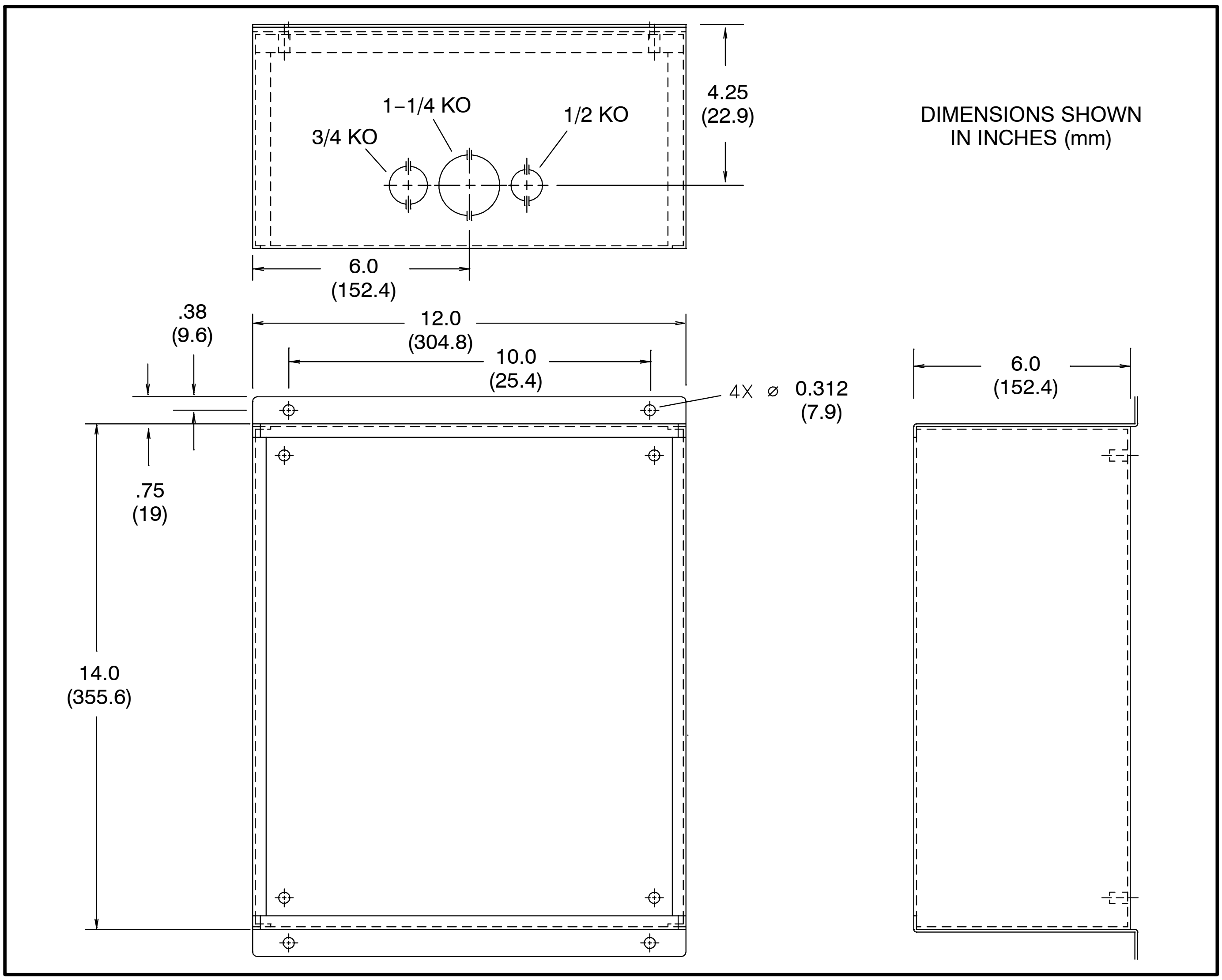


FIGURE 17-3. CCM-T MOUNTING FOOTPRINT

WIRE AND CONDUIT

Measure the wiring distance, one way, between the CCM-T mounting location and the ATS connection points. Refer to notes 7 and 8 in sheet 1 of Figure E-4 to determine the appropriate wire gauge for CT, monitor and control wires (see Table 17-2 for additional CT wire information). Use stranded wire with a minimum insulation rating of 600V and a temperature rating of 105°C.

Run a conduit for the AC wire connections and a separate conduit for the DC wire connections between the CCM-T and the ATS. Round off or cover the ends of the conduit to prevent sharp edges from cutting the insulation. Use waterproof conduit if the CCM-T installation will be exposed to moisture.

The number of leads pulled through each conduit will be determined by the features available on the ATS and the desired monitor and control features selected. Refer to Figure E-4 for a list of the possible AC and DC connections. Number both ends of each lead for identification before pulling the wire through the conduit.

Grounding must comply with all codes. Use the grounding lug located inside the CCM-T control box.

TABLE 17-2. CURRENT TRANSFORMER WIRE SIZE vs. DISTANCE CHART

EXISTING CTs MAXIMUM DISTANCE BETWEEN CT AND CCM-T (A CT KIT IS REQUIRED IF THE DISTANCE IS BLANK)					
CT LIST	RATIO	AWG 12 FEET (m)	AWG 14 FEET (m)	AWG 16 FEET (m)	NOTES
302−0209	250/5				1-Turn
302−1392	150/5				1-Turn
302−1393	300/5				1-Turn
302−1394	400/5	30 (9.1)	20 (6.1)	14 (4.1)	1-Turn
302−1395	750/5	30 (9.1)	20 (6.1)	14 (4.1)	1-Turn
302−1396	1000/5	30 (9.1)	20 (6.1)	14 (4.1)	1-Turn
302−1809	500/5	30 (9.1)	20 (6.1)	14 (4.1)	1-Turn
302−1810	1200/5	30 (9.1)	20 (6.1)	14 (4.1)	1-Turn
302−1811	200/5				1-Turn
302−1820−13	1500/5	30 (9.1)	20 (6.1)	14 (4.1)	1-Turn
302−1820−15	2000/5	30 (9.1)	20 (6.1)	14 (4.1)	1-Turn
302−1820−16	2500/5	30 (9.1)	20 (6.1)	14 (4.1)	1-Turn
302−1821	50/5				1-Turn
302−1822	75/5				1-Turn
302−1830−04	2000/5	30 (9.1)	20 (6.1)	14 (4.1)	1-Turn
302−1830−05	2500/5	30 (9.1)	20 (6.1)	14 (4.1)	1-Turn
302−1830−06	3000/5	30 (9.1)	20 (6.1)	14 (4.1)	1-Turn
300−4812−05	250/5	30 (9.1)	20 (6.1)	14 (4.1)	1-Turn
300−4812−01	150/5	30 (9.1)	20 (6.1)	14 (4.1)	1-Turn
300−4812−06	300/5	30 (9.1)	20 (6.1)	14 (4.1)	1-Turn
300−4812−04	200/5	30 (9.1)	20 (6.1)	14 (4.1)	1-Turn
300−4812−01	150/5	30 (9.1)	20 (6.1)	14 (4.1)	3-Turns
300−4812−01	150/5	30 (9.1)	20 (6.1)	14 (4.1)	2-Turns

NOTES: 1. This table is for copper wire at 50°C (122°F). Derate the distance by 0.4% per °C over 50°C.

2. The number of turns in the notes column refers to the number of times a lead passes through the CT. In some cases, more than one turn is used to compensate for the difference in the replacement CT ratio. (Example: If 2-turns are required, the lead must pass through the CT once and then loop around the CT and pass through a second time.)

WIRING CONNECTIONS

Figure E-4 shows the interconnect wiring diagram for connecting the ATS to the CCM-T. Refer to the notes on these drawings.

WARNING ***The transfer switch presents a shock hazard that can cause severe personal injury or death unless all AC power is removed. Disconnect both the Normal and the Emergency power sources from the transfer switch. Be sure to move the generator set operation selector switch to Stop, disconnect the battery charger, disconnect the starting battery (negative [–] lead first), and disconnect AC line power before beginning the installation.***

WARNING ***Ignition of explosive battery gases can cause severe personal injury. Do not smoke or cause any spark or flame while servicing batteries.***

CAUTION ***Always disconnect a battery charger from its AC source before disconnecting the battery cables. Otherwise, disconnecting the cables can result in voltage spikes high enough to damage the DC control circuits of the generator set.***

1. Disconnect both the Normal and the Emergency power sources from the transfer switch.
2. If a generator set provides Emergency power, make sure that the generator set cannot be started by moving the selector switch to Stop. The selector switch is located on the generator set control panel on two-wire start systems and inside the transfer switch cabinet door on three-wire start systems. If there is an external battery charger, disconnect it from its AC power source. Then disconnect the set starting battery(ies) (negative [–] lead first).
3. Remove the accessory panel cover on the back of the cabinet door.
4. Refer to the interconnect wiring diagrams (Figure E-4). Note that sheet 1 of Figure E-4 is for switches without meters and sheet 2 of Figure E-4 is for switches with meters. Locate the wiring termination points inside the transfer switch. Identify which installed options are available for monitoring and control.
5. Refer to the outline drawing provided with the transfer switch to locate and make knockouts for the wire routing to the CCM-T. Plan the wire routing so the monitor and control leads from the CCM-T follow the existing harness leads. Provide adequate wire protection at the knockout. Follow standard wiring practices. Wiring must meet all applicable codes.
6. Observe minimum wire gauge requirements for CT, monitor and control wiring. Connect the monitor and control wires to the locations shown in sheets 1 and 2 of Figure E-4. Provide enough wire so that the leads can be secured to the existing harness.

   The CT wiring shown in sheet 1 of Figure E-4 is for transfer switches that do not have meters. If monitoring features require CTs (i.e. current, power factor, etc.), a separate CT kit is required. See Table 17-1.
7. Set the Temperature Input switches (see Figure 17-1) to either “EXH” (80–390 ohm exhaust temperature RTD) or “OIL.H2O” (500–2200 ohm oil/water temperature RTD). Descriptions of the CCM-T switches are included in Table 17-4.
8. If the CCM-T is terminated, the termination switch S1 must be set (see Figure 17-1). This is accomplished by moving it to the ON or TERM position.

   NOTE: For free topology, only one device on each segment must be terminated. The device terminator switch can be used for this type of termination. Multidrop bus topology requires termination at each end of the bus using multidrop bus terminators (Onan P/N 300–5729).
9. Position and secure the accessory panel cover.
10. Close and lock the cabinet door.
11. Connect the data wire to the CCM-T and provide an adequate length of twisted pair wire for future connection to a junction box or other network module. Tighten the tamperproof control box mounting screws securely to prevent tampering.
12. Connect the normal AC power source, connect the generator set starting battery(ies) (negative [–] lead last), and return the generator set control switch to the Remote position. Connect the battery charger, if applicable.
13. The CCM-T is now ready for network wiring. Network wiring must be done by a trained network installer. Refer to the *Section 2* for instructions on network and power wiring the CCM-T and for installation and connection of this module to the network.

SELF-INSTALLATION

Self-installation guidelines and information on how to self-install a network is included in *Section 3*.

Requirements

This procedure can be used to logically install the CCM-T when the following requirements are met.

Self-installation is limited to one PowerCommand ATS or CCM-T, one PowerCommand Genset or CCM-G, and no more than four annunciators and five DIMs. The CCM-T can autobind to a genset and be autobound by up to two annunciators and two DIMs, but by no more than a total of three annunciators and DIMs.

With networks containing a genset, the transfer switch CCM-T must be logically installed after the genset is logically installed and before the annunciator(s) and DIMs are logically installed.

If these requirements are not met, the system must be installed with LonMaker™ . Refer to “LonMaker Installation” on 17-8.

Node Address

Each node on a self-installed network must have a unique address. Switches 1 through 4 of switch S4 are used to set the *Node Address* (see Figure 17-4). The default node address is 0010, which is a “STATUS” LED pulse rate of 2.

The switches are oriented so that switch S4-1 is the most significant bit (MSB) of the *Node Address.* Thus, S4-1 has a value of “8” when it is ON. S4-2 has a value of 4, S4-3 has a value of 2, and S4-4 has a value of 1. For example, to set the *Node Address* to 9, set switch S4 to 1001 (8+0+0+1=9). See Table 17-3.

Be sure to assign each node in the network a unique address.

After the device has been physically installed, the *Node Address* can be verified by counting the number of pulses of the “STATUS” LED (DS4). See Figure 17-4. Make sure each device has a unique node address.

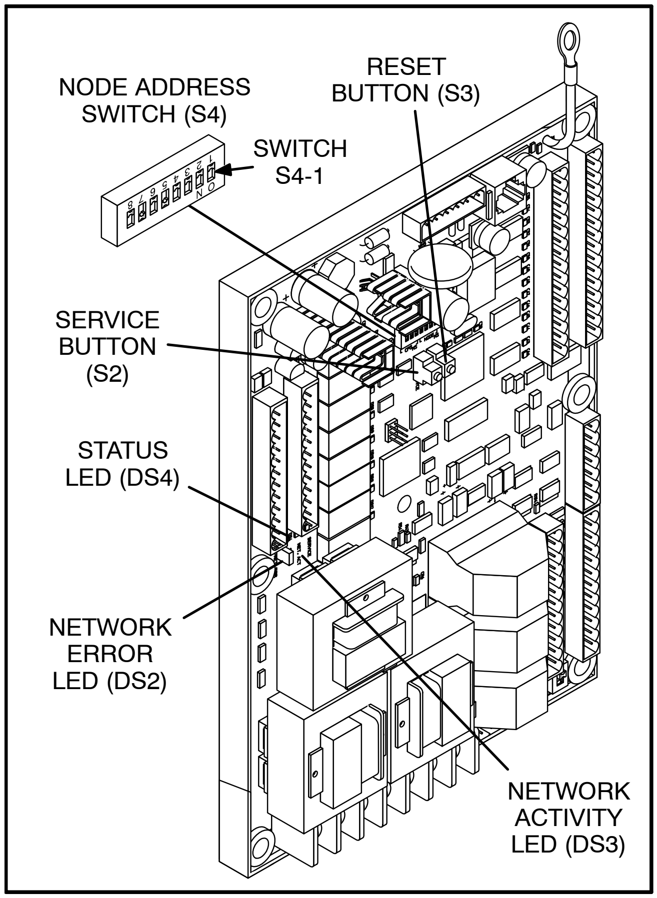


FIGURE 17-4. NODE ADDRESS SWITCH

TABLE 17-3. SETTING THE NODE ADDRESS (S4)

S4-1 (8)	S4-2 (4)	S4-3 (2)	S4-4 (1)	Address (binary)	Address (decimal)
OFF	OFF	OFF	OFF	0000	0[1]
OFF	OFF	OFF	ON	0001	1
OFF	OFF	ON	OFF	0010	2
				↓	↓
ON	ON	ON	ON	1111	15

NOTE1. “0” (zero) is not a valid *Node Address*.

Logical Installation

After the ATS is *physically* connected to the genset, the CCM-T is ready to be *logically* connected to the genset. Logically connecting to another device is referred to as *binding*. *Binding* may be done at any time once all nodes are installed, connected, and powered.

NOTE: The genset and ATS must be FT-10 devices which are able to self-install in the network. Each device on the network must have a unique address.

1. Make sure the genset node is powered, connected to the twisted-pair data bus, and that it has been logically installed **first**.
2. Make sure the CCM-T node is powered and connected to the twisted-pair data bus.
3. Make sure S4-1, S4-2, S4-3, and S4-4 on the CCM-T are configured for the desired address. Each device on the network must have a unique address.
4. Make sure the network bus is terminated.
5. Press and hold the Service button (S2) see (Figure 17-4), for approximately two seconds until the *Status* LED (DS4) begins flashing.
6. Release the *Service* button.

The CCM-T will install itself and search for a Cummins Inc. FT-10 genset device. If found, the CCM-T will update its node address and bind to the genset *Start Inputs* and *Status*. An FT-10 annunciator or DIM can now install itself and bind to the ATS.

Binding Sequence

Logically connecting to another device is referred to as *binding*. *Binding* may be done when all the nodes are installed, connected, and powered.

Binding the node must occur in the proper sequence. Logically install the genset first, followed by the transfer switch, and then the annunciator(s) and other network accessories.

NOTE: The genset module and ATS (CCM-T) must be Cummins Inc. devices which are able to self-install in the network. Each device on the network must have a unique address.

Verify Binding

To verify the ATS has installed itself properly and is bound to the genset, disconnect the twisted-pair data cable at J30. The "Network Error" LED (DS2) (Figure 17-4) should turn on (red) within 10 seconds. This indicates communications have failed and that the device was properly bound.

Reconnect the twisted pair cable and confirm that DS2 turns off within 10 seconds.

If no error is produced, use InPower™ to verify the *Test Interval* (located in the LonWorks folder from the Adjustments directory) is set for 10.0 seconds. Also check the wiring and Address of each node. Repeat the Self-Installation steps to re-initiate *binding*.

Remove Bindings

If unresolved system errors occur, the bindings can be removed and then re-installed to reset the system. The bindings can also be removed if the network is being changed or the device is being moved to another network.

To remove all bindings from the device, change the *Node Address* (S4) to 0 (zero) and logically re-install the device.

The node will remove all bindings at this time, including the genset and annunciator bindings. The "STATUS" LED will not flash when the *Node Address* is 0, nor will it attempt to bind to a genset.

Re-Binding

Re-Binding the node must occur in the proper sequence. Logically install the genset first, followed by the transfer switch, and then the annunciator(s) and DIMs.

To re-bind an annunciator or DIM to the transfer switch node, press and hold the Service pin for two seconds.

LONMAKER INSTALLATION

The CCM-T can be installed with LonMaker. The Device Stencil is required. To install using LonMaker:

1. Run LonMaker. See *Section 3*.
2. Install the Device Stencil.
3. Create a new site (or update an existing site).
4. Define, install and bind devices.
5. Verify system operation.

The CCM-T is defined and installed like any other device in LonMaker.

NETWORK TOPOLOGY AND DATA MEDIA

Refer to *Section 2* for information on the network topology and data transmission media.

NETWORK POWER

The CCM-T receives its network power from a sealed 12-volt battery and a battery charger. These components are included in CCM control box. A separate 120 VAC source is needed to power the battery charger. If a utility outlet is not available, a transformer kit is available for obtaining the voltage from the ATS. Refer to the transformer kit for transformer installation and power supply wiring information.

NETWORK DATA MEDIA AND POWER WIRING

WARNING ***AC voltages and currents present an electrical shock hazard that can cause severe personal injury or death. Only trained, experienced personnel are to perform the following procedures.***

Connections

Network data connections are made at connector J9.

Conduit

When installing conduit, observe the following precautions:

1. Before beginning conduit installation, cover all components to prevent accidental entry of metal chips.
2. If using rigid conduit, install at least 2 feet (610 mm) of flexible conduit between the rigid conduit and generator set to absorb vibration.
3. Always run DC circuit wiring in a separate metal conduit from AC power cables to avoid inducing currents that could cause problems within the control.
4. Data wire can be run without conduit if it is adequately protected. Do not run data wire in conduit with network power wiring or other non-power-limited circuits. Make sure wiring meets all applicable wiring codes.

CAUTION ***Installation debris can cause equipment failure and damage. Use extreme care to keep drill chips and filings out of the components when mounting or connecting conduit. Screwdrivers should be used carefully to prevent damage to components.***

NETWORK INSTALLATION

Sections 3 and *5* provide a detailed description of the network installation process. Read *Sections* 1 and 2 before constructing the network. *Sections 3* and *5* provide the following step-by-step installation procedures:

1. Setting up Network Installation Tools
2. Starting LonMaker Software
3. Using LonMaker Software
4. LonMaker Network Setup
5. Connecting Devices with LonMaker
6. Installing Devices with LonMaker
7. Testing Devices and Verifying Installation

SWITCHES AND LEDS

The Service switch (S4) is used during installation (when prompted by the LonMaker program). The Terminator switch must be set to the appropriate position at installation. Switches are described in Table 17-4.

LEDs are described in Table 17-5.

NETWORK VARIABLES

Table 17-6 shows the correlation between actual inputs and outputs for the CCM and the CCM's network variables based on CCM-ATS Interconnect Drawing Figures E-9 thru and E-12 (located in Appendix E).

Refer to the connectable network variable outputs in Tables 10-6 and 10-7 (*Section* 10) and the connectable network variable inputs in Table 10-8 (Section 10) during the logical installation of CCM on the network.

TABLE 17-4. CCM-T SWITCHES

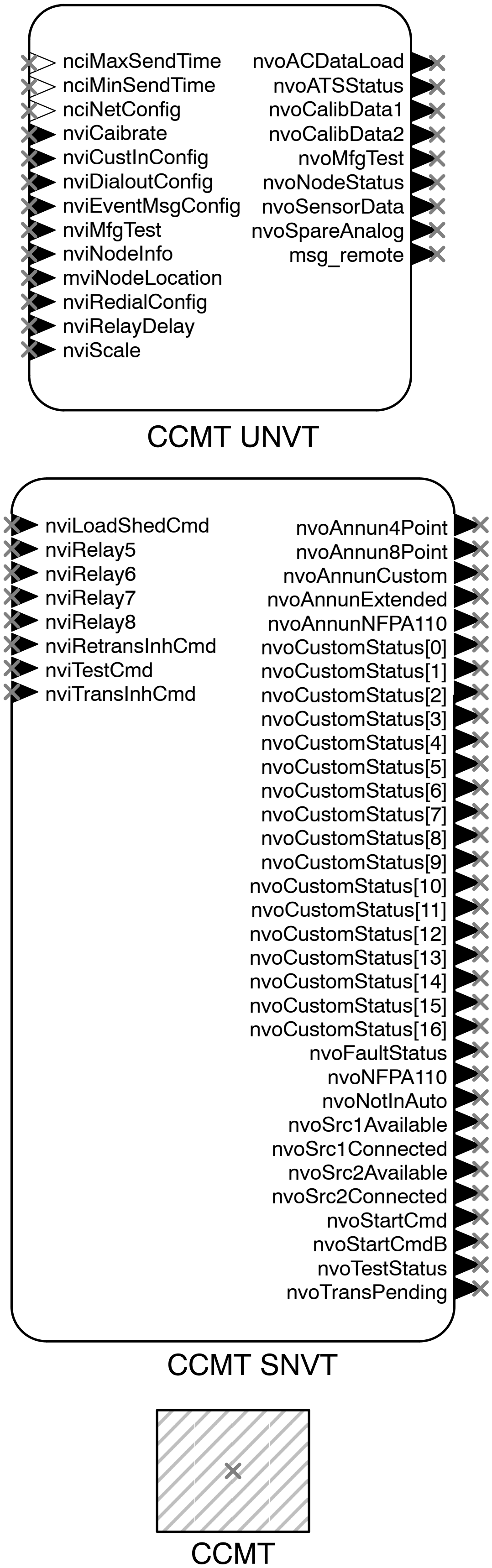
Ref	Name	Type	Description
S1	TERMINATOR	slide	Switch is set to position opposite of text "TERM" from factory. Set the switch towards the text "TERM" to terminate.
S2	SERVICE	momentary push	Used at time of logical installation to identify device to the installation software. Pressing S2 will light the DS1 LED.
S3	RESET	momentary push	Resets the Neuron Chip processor. Must be pressed after Install action.
S4	NODE CONFIGU-RATION	slide	Switches 1 through 4 are used to set a unique address for the node. The default node address is 0010. Switches 5 through 8 are not used and should be set to the "OFF" position.
S5	TEMP#2 SELECT	slide	When the input is driving the sender, selects whether temperature input#2 RTD is 500−2200 ohm or 80−390 ohm. Set to "OIL/H2O" for 500−2200 ohm. Set to "EXH" for 80−390 ohm.
S6	TEMP#3 SELECT	slide	When the input is driving the sender, selects whether temperature input#3 RTD is 500−2200 ohm or 80−390 ohm. Set to "OIL/H2O" for 500−2200 ohm. Set to "EXH" for 80−390 ohm.

TABLE 17-5. CCM-T LED INDICATORS

Ref	Color	Name	Description
DS1	Amber	SERVICE	Indicates various states of the CCM-G node. It will be ON if S2 is pressed and held. States without S2 pressed: **OFF** = All OK. CCM-G has application image and is installed in a network. **ON** = CCM-G is applicationless or has experienced a error which prevents Neuron Chip from executing application code. **1/2 Hz BLINKING (1 second on / 1 second off)** = CCM-G has an application, but has not been logically installed in a network. **FLASHING (momentarily)** once every 2–3 seconds = CCM-G is experiencing an error condition causing a watchdog timeout reset.
DS2	Red/ Orange/ Green	NETWORK ERROR	Red indicates a network error (failed network integrity test) Green indicates the network is operating normally (passed network integrity test) Orange indicates the device is not bound.
DS3	Green	NETWORK ACTIVITY	Flashes momentarily when a device communicates over the network.
DS4	Green	STATUS	**1/2 Hz BLINKING (1 second on / 1 second off)** to indicate that the CCM-G's processor is executing the application code. **In the future,** may be used to indicate other conditions for troubleshooting purposes. It also indicates the Node Address when the module is self-installed. (For example, if the node address is 2, it blinks twice, pauses for a second, and then repeats.)
DS5	Green	K1	Turns on when K1 is energized.
DS6	Green	K2	Turns on when K2 is energized.
DS7	Green	K3	Turns on when K3 is energized.
DS8	Green	K4	Turns on when K4 is energized.
DS9	Green	K5	Turns on when K5 is energized.
DS10	Green	K6	Turns on when K6 is energized.
DS11	Green	K7	Turns on when K7 is energized.
DS12	Green	K8	Turns on when K8 is energized.

TABLE 17-6. ACTUAL INPUTS AND OUTPUTS FOR THE CCM-T

Signal	CCM Network Variable		Options Required
	Name	Active State	
DISCRETE INPUTS			
Normal Available	nvoAnnunExtended.bit0	Closed (1)	Signal Module
Emergency Available	nvoAnnunExtended.bit1	Closed (1)	Signal Module
Normal Connected	nvoAnnunExtended.bit2	Closed (1)	Auxiliary Relay
Emergency Connected	nvoAnnunExtended.bit3	Closed (1)	Auxiliary Relay
Test/Exercise Mode	nvoAnnunExtended.bit6	Closed (1)	Signal Module
Backup Source Failure	nvoNodeStatus.inputs[0].bit5	Closed (1)	Signal Module
Low Genset Battery Voltage	nvoAnnunNFPA110.bit5	Closed (1)	10A Battery Charger, TB3 Extension
High Genset Battery Voltage	nvoAnnunNFPA110.bit.4	Closed (1)	10A Battery Charger, TB3 Extension
Elevator Transfer Signal	nvoTransPending.state	Closed (1)	Signal Module
Battery Charger Failure	nvoAnnunNFPA110.bit.6	Closed (1)	10A Battery Charger, TB3 Extension
Bypass to Normal	nvoAnnunExtended.bit14	Closed (1)	Bypass Transfer Switch Only
Bypass to Emergency	nvoAnnunExtended.bit15	Closed (1)	Bypass Transfer Switch Only
Customer Input 1	nvoCustomStatus[1]	Configurable	None
Customer Input 2	nvoCustomStatus[2]	Configurable	None
Customer Input 3	nvoCustomStatus[3]	Configurable	None
Customer Input 4	nvoCustomStatus[4]	Configurable	None
Customer Input 5	nvoCustomStatus[5]	Configurable	None
Customer Input 6	nvoCustomStatus[6]	Configurable	None
Customer Input 7	nvoCustomStatus[7]	Configurable	None
Customer Input 8	nvoCustomStatus[8]	Configurable	None
Customer Input 9	nvoCustomStatus[9]	Configurable	None
Customer Input 10	nvoCustomStatus[10]	Configurable	None
Customer Input 11	nvoCustomStatus[11]	Configurable	None
Customer Input 12	nvoCustomStatus[12]	Configurable	None
Customer Input 13	nvoCustomStatus[13]	Configurable	None
Customer Input 14	nvoCustomStatus[14]	Configurable	None
Customer Input 15	nvoCustomStatus[15]	Configurable	None
Customer Input16	nvoCustomStatus[16]	Configurable	None
RELAY OUTPUTS			
Load Shed	nviLoadShedCmd		Load Shed from Emergency Option
Transfer Inhibit	nviTransInhCmd		Standard
Remote Test	nviTestCmd		Standard
Retransfer Inhibit	nviRetransInhCmd		Standard



nvoAnnunCustom
SNVT state for 16 customer inputs that ARE NOT used with the CCMT

nvoAnnunExtended
SNVT state for 16 customer inputs that ARE used with the CCMT (1−5, 11−14 only)

nvoCustomStatus
SNVT switches for 16 customer inputs that ARE NOT used with the CCMT (Inputs 17−32)

FIGURE 17-5. ATS CONTROLS COMMUNICATIONS MODULE FUNCTIONAL BLOCK

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18. Network Router

ABOUT THIS SECTION

This section describes the PowerCommand LONWORKS Network Router and its use in a PowerCommand Network. It also describes the physical mounting and wiring of the Router, and provides procedures for the *logical* installation and connection of a Router within the network.

DESCRIPTION

A router connects two LONWORKS communications channels and routes messages between them.

A router can be used in a PowerCommand™ Network to extend the physical length a single channel network beyond the distance and node limits. Each free topology FT-10 segment has a maximum total wire length of 1640 feet (500 meters) and 64 nodes. An FT-10 channel includes two or more segments, has a maximum length of 8858 feet (2700 meters), and can contain up to 128 nodes.

A router can also be used in three ways to connect channels using different transceivers. The three ways routers can be commissioned are:

- Configured – This type of router sends signals on only if devices are on the other channel. It includes a table of devices located on each channel.
- Learning – This type of router starts out as a repeater; it learns which devices are on each channel and ends up as a configured router.
- Repeater – This type of router is used to extend the segment/channel length from 500 to 2700 meters.

See Figure 18-1 for an outline drawing of the LONWORKS Router enclosure. Figure 18-2 shows the inside of the enclosure. Details on the router module are shown in Figure 18-3.

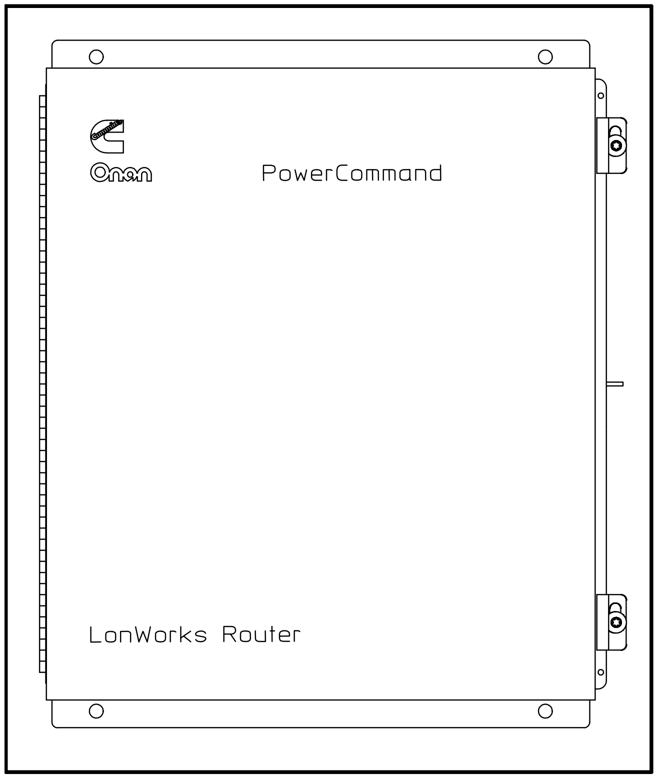


FIGURE 18-1. LONWORKS ROUTER

PowerCommand is a registered trademark of Cummins Inc.
LONWORKS and Neuron are registered trademarks of Echelon Corp.
LonMaker is a trademark of Echelon Corporation.

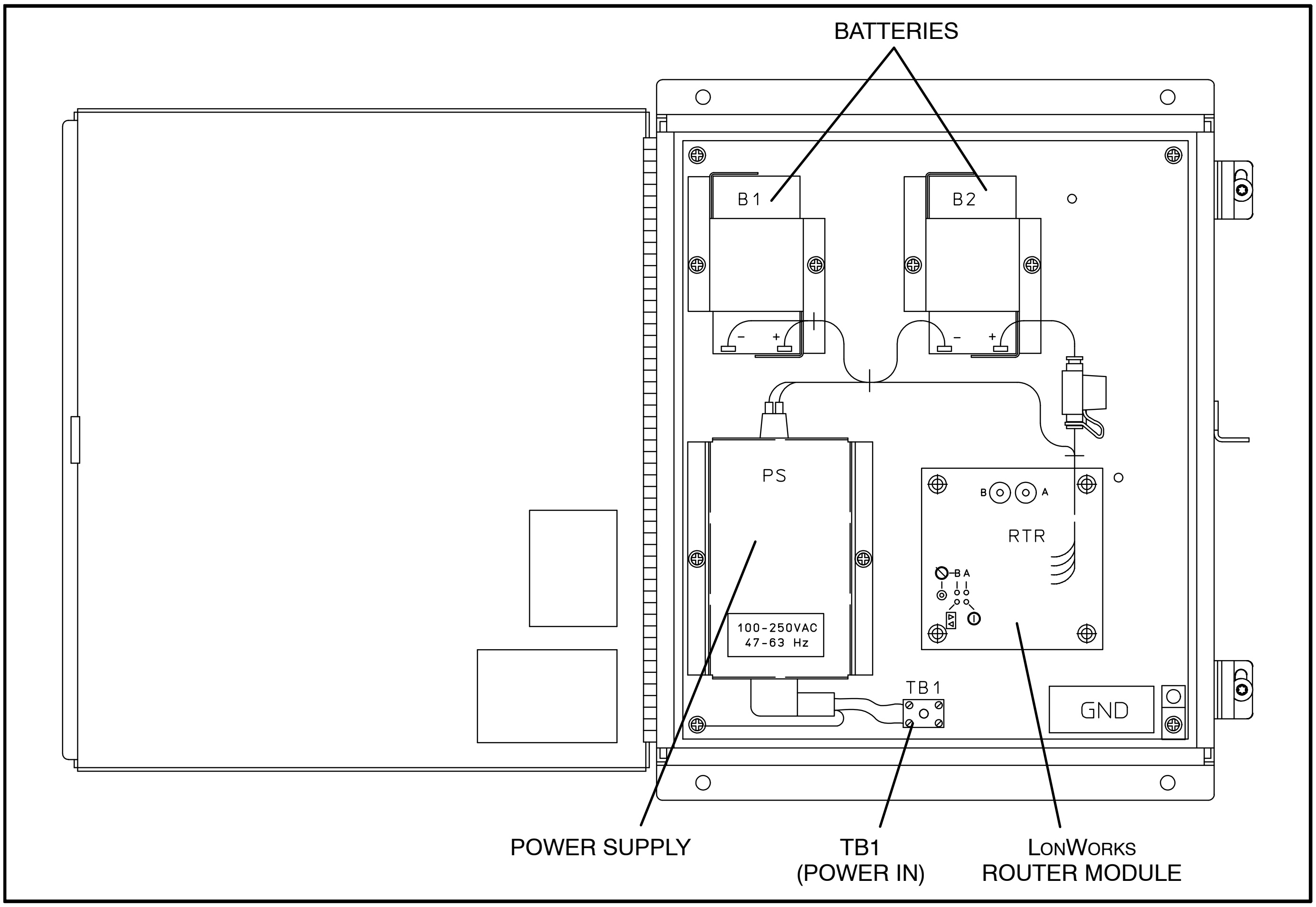


FIGURE 18-2. LONWORKS ROUTER OUTLINE DRAWING

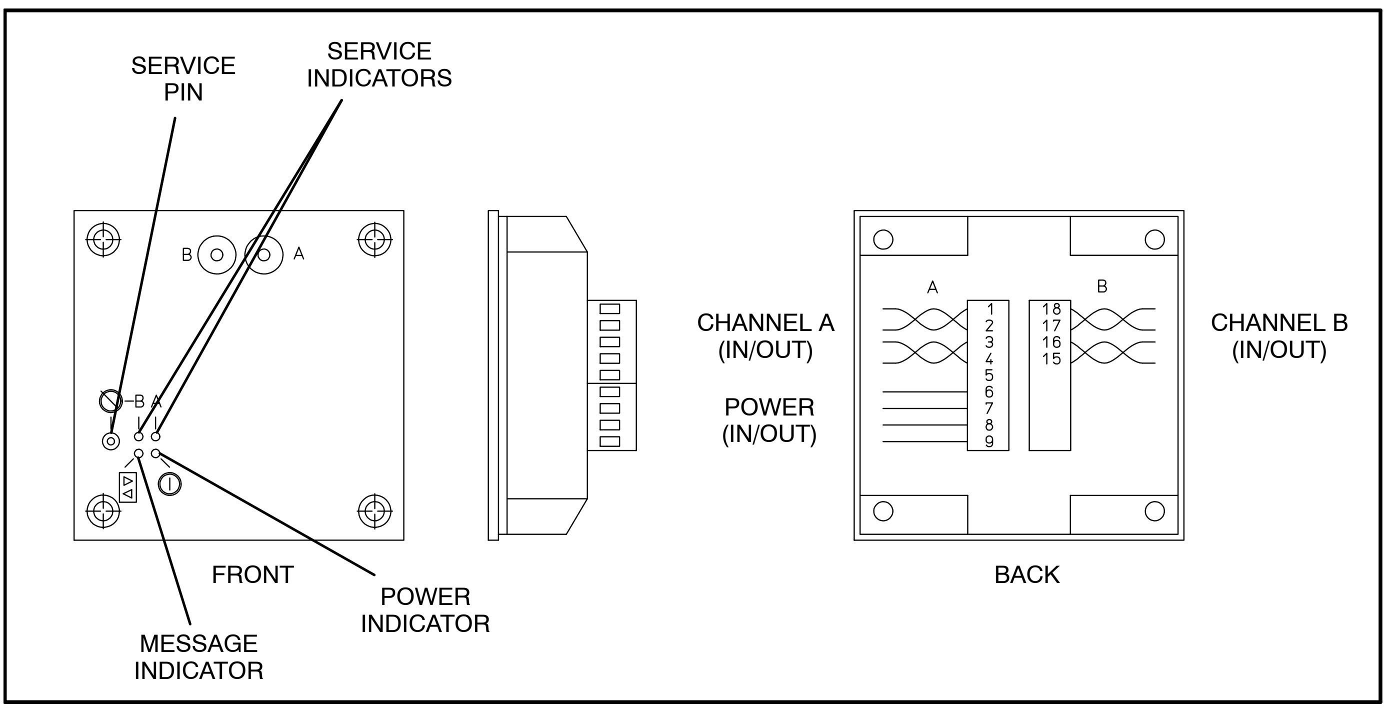


FIGURE 18-3. LONWORKS ROUTER MODULE DETAIL

INSTALLATION

CAUTION ***Improper router and network terminator installation causes unreliable network operation and equipment failure. An FT-10 network requires a single termination. Routers may be installed anywhere in a network.***

Installing a router in an existing network requires another channel and separate physical bus. Each channel requires proper termination. An FT-10 channel requires a single termination. Each additional router requires one more channel with its own bus. A router may be installed anywhere within the network. See Figure 18-4 for a typical installation when the router connects two channels.

Refer to *Section 2* for information on network topology, wiring, and software installation. Refer to the *LonMaker™ Installation Tool Users Guide* (provided with LonMaker software) for logical installation information.

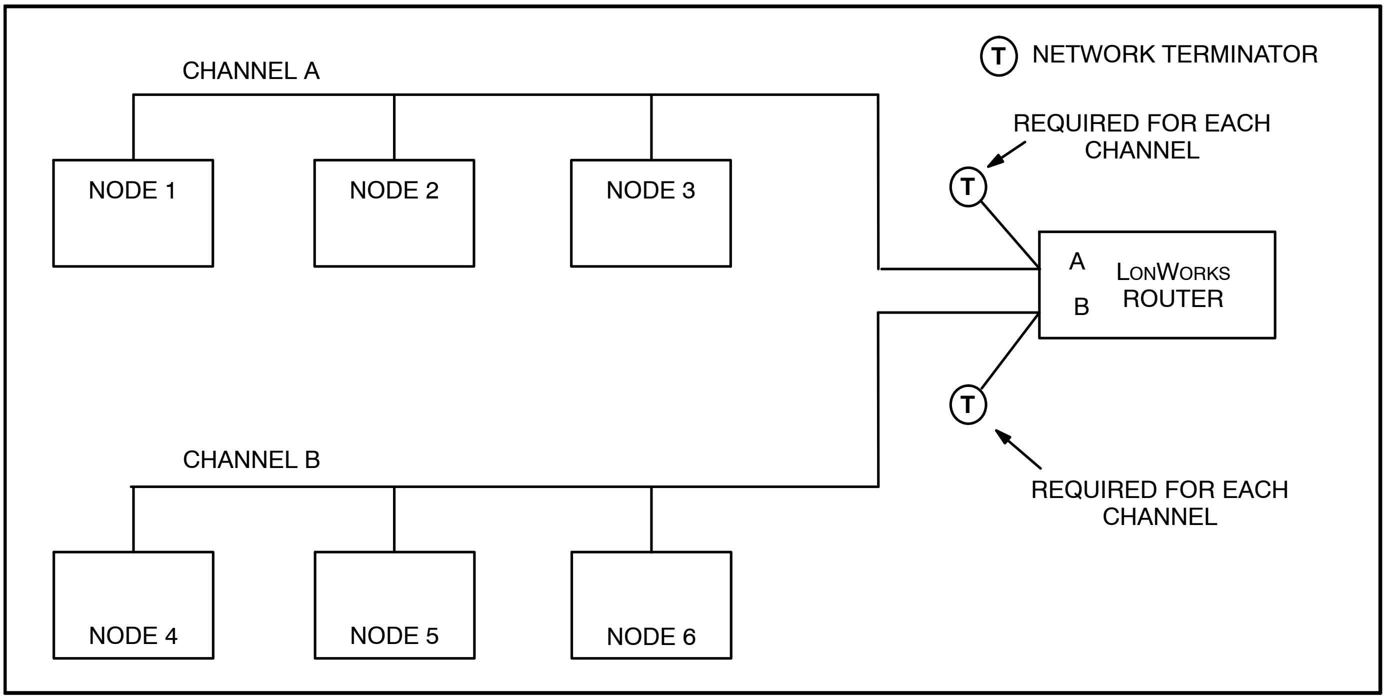


FIGURE 18-4. ROUTER USED TO NETWORK CHANNELS A AND B

LOCATION

Refer to the site network installation drawing (see Appendix D) for the router location. Refer to *Section 2* for network topology and maximum network length. **All wiring must follow a specific network topology and must fall within distance limits.**

Choose a clean, vibration-free mounting surface. Avoid locations that are hot, damp or dusty. The temperature range must not exceed 32 to 122°F (0°C to 50°C).

MOUNTING

Figure 18-5 shows the router outline dimensions and mounting hole locations. The router can be mounted to a wall or other flat surface.

CAUTION ***Make sure that no wires, plumbing, gas, or exhaust lines run behind the mounting area before drilling the mounting holes.***

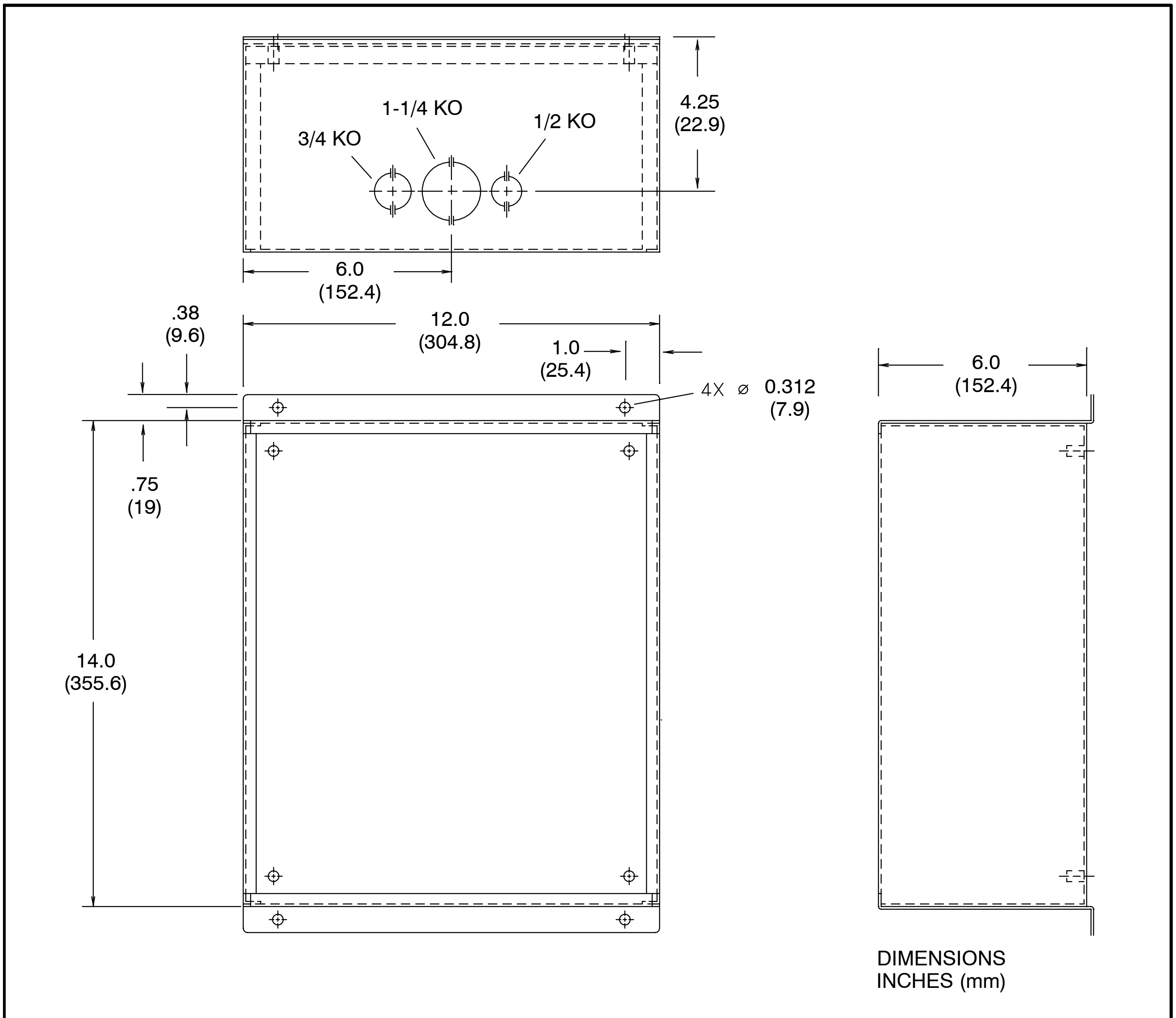


FIGURE 18-5. ROUTER MOUNTING DETAILS

WIRING

Figure 18-4 shows a typical router installation. Each additional router requires another channel with its own bus. Each FT-10 segment requires one terminator circuit. Each FT-10 segment has a maximum total wire length of 1640 feet (500 meters) and 64 nodes. Refer to *Section 2* for more information on wiring.

Routers do not include a terminator circuit. Two network terminators are included with the router kit. FT-10 segments require one termination. Refer to Figure 18-2 for the router connection points.

Because FT-10 channels require different termination circuits than TP-78 networks, make sure the proper terminator is selected for the circuit. Look at the Echelon sticker to differentiate the two terminators. The FT-10 terminator is Echelon P/N 44100 (Onan P/N 300−5669).

⚠CAUTION ***Do not route wires over hot, sharp, or abrasive surfaces.***

Power

1. Install a three amp fuse in the fuse holder (see Figure 18-2).
2. Connect AC power to TB1. Input power can be 100 to 250 VAC (47 to 63 Hz). The power supply furnishes power to the router module and charges the 12V batteries. The batteries supply power for at least 12 hours when AC power is removed.

Network Connection

The channel may be terminated at the Router with a network terminator. One device on each network segment must be terminated.

To terminate a network segment, connect the network terminator and the network twisted-pair cable in the two-position network connector. The network terminator has three leads: two data and one ground. The ground lead (green/yellow) is not used and should be clipped.

Use NEMA Level IV stranded twisted-pair cable to connect the router to the network bus. Each segment of the network must be terminated. If the router is to be the termination point for this segment, a terminator is provided.

Network data lines and terminator leads are polarity insensitive. Connect one stranded twisted-pair lead with one terminator lead and the other stranded twisted-pair lead with the other terminator lead.

Network Stranded Twisted Pair Wiring

Connect the network stranded twisted pair to the router.

1. Remove the two screws that hold the router in the enclosure.
2. Carefully pull the router from the enclosure.
3. Route the network stranded twisted pair cable through the enclosure and electrical box (bottom left).
4. Connect the stranded twisted pair to the appropriate router channel terminals. See Figure 18-3. If the router is not at the end of the bus, connect each stranded twisted pair cable (from the previous device and to the next device) to the router.
5. Connect a network terminator to the router if the router is to be terminated.
6. Replace the router in the electrical box and replace the screws.
7. Connect the ground wire to the grounding lug in the lower right.

BATTERY AND REPLACEMENT

The router includes two 12V lead acid batteries (Onan P/N 416-1032). Replace the batteries every two years.

1. Disconnect the AC power.
2. Remove the fuse from the fuse holder.
3. Disconnect the leads to the batteries.
4. Remove the two screws holding each battery cover.
5. Remove the batteries.
6. Replace the batteries.
7. Replace the batteries in the battery covers and the battery covers.
8. Replace the fuse and connect the AC power.

Verify that the batteries are operational by removing AC power and verifying that the green LED on router module stays lit.

LOGICAL INSTALLATION

The following describes the steps required to logically install a router on the network. For more detailed information, refer to the *LonMaker User's Guide*.

1. On the LonMaker network drawing, either create the two channels that you want the router to connect or confirm that they already exist on the drawing. To create a channel, drag a channel shape onto the drawing from the LonMaker Basic Shapes stencil, give it a name, and select the transceiver type.
2. Drag a router shape from the LonMaker stencil to the drawing. The New Router Wizard is displayed.
3. Enter a name for the router in the Router Name text box.
4. Select the Commission Device check box if you wish to commission the device when the definition is complete.
5. Select Next to proceed to the next window.
6. For each of the two channels, select the transceiver type and channel name. Select Next to proceed to the next channel.
7. *Optional:* Enter a location of up to six characters. This description is not used by LonMaker but may be useful in network recovery if you lose your LonMaker drawing and database.
8. Although a Ping Interval can be specified, it is recommended that it be left at “Never” (the default). Refer to the *LonMaker User's Guide* for more information.
9. *Optional:* Enter a router description. This is for documentation purposes only.
10. Select Next to proceed.
11. In the Router Type drop-down box, select “Configured.” Refer to the *LonMaker User's Guide* for more information.
12. Setting Authentication to “False” and Priority for both channels to “Disabled” is recommended. Refer to the *LonMaker User's Guide* for more information.
13. Select Finish. If you chose to commission the device, the Commission dialog box will be displayed. Commission the router the same way all other devices in the network are commissioned. Refer to the *LonMaker User's Guide* or *Section 4* for more information.

19. Etherlon Router

ABOUT THIS SECTION

This section describes the installation of the PowerCommand® Etherlon Router. The PowerCommand Etherlon Router(s) connect one FT-10 Network LONWORKS® channel to one Ethernet channel. The Etherlon Router should be installed by qualified service personnel and a LAN system administrator.

The Etherlon Router must be used in conjunction with one or more Ethernet channels. Etherlon Router provide a connection between multiple LONWORKS channels. The router supports *Unicast*, *Unicast/Replicated* and *Multicast* IP addressing while supporting 10Base-T and AUI media.

The following table lists the power supply needed for the Etherlon router kits.

KIT	POWER SUPPLY
541−0867−01	None (DC power cord included in kit)
541−0867−02	US 120V, 60 Hz
541−0867−03	EUR 220V, 50 Hz
541−0867−04	UK 220V, 50 Hz

SAFETY PRECAUTIONS

Read these instructions completely and become familiar with safety warnings, cautions and procedures before starting the installation.

CAUTION ***The Etherlon Router is to be used only in an office environment. Do not mount routers inside transfer switches or on generator sets. Environments around this equipment can cause premature failure of the router.***

CAUTION ***Improper router and network terminator installation causes unreliable network operation and equipment failure.***

CAUTION ***Do not use Etherlon Routers to communicate critical system control such as Start/Stop Commands or Emergency Stop Commands. Heavy Ethernet traffic can affect performance of the LONWORKS network.***

SITE REQUIREMENTS

Before installing the Etherlon Router, verify the following:

1. A unique IP address has been assigned for each router. This is typically done by the LAN system administrator.
2. The IP addressing mode has been determined. The system administrator can help determine the best addressing mode for the installation.
3. Access to an Ethernet LAN hub.
4. An appropriate AC outlet is present.
5. PC or laptop with LonMaker™ for Windows® being used to configure the network.

Choose a clean, vibration-free mounting surface. Avoid locations that are hot, damp or dusty, and that may be subject to extreme temperatures.

HARDWARE INSTALLATION

The router is self-contained, but may require termination of the LONWORKS network for proper operation. Each LONWORKS segment must always be terminated.

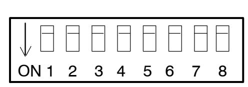
WARNING ***The supplied terminator will not work in multi-drop bus networks. Use multi-drop terminator P/N 300−5729 (Echelon P/N 44101) for multi-drop bus topology.***

DIP Switch Settings

The router must be configured for the Ethernet media. DIP switches 7 and 8 on the rear of the router are provided to select the Ethernet media (port) being used.

DIP SWITCH SETTINGS

7	8	Media	Connector
UP	UP	10Base-T	RJ−45
DN	DN	AUI (Fiber)	Dsub−15 (female)



NOTE: DIP switches 1−6 are not used.

PowerCommand is a registered trademark of Cummins Inc.
LONWORKS IS a registered trademark of Echelon Corp.
LonMaker is a trademark of Echelon Corporation.
Windows is a registered trademark of Microsoft Corp.

Cycle power on the router after the DIP switches have been set correctly to reconfigure the router.

Mounting

Two wall mount brackets and screws are provided for mounting the router to a wall or other flat surface. To mount the router to a wall or panel:

⚠ CAUTION ***Make sure no wires, plumbing, gas, or exhaust lines run behind the mounting area before drilling the mounting holes. Attach mounting brackets to router using the screws provided.***

1. Drill four holes in a wall or panel forming a 3.50" x 6.13" rectangle.
2. Attach mounting brackets to base of router using screws provided.
3. Mount the router with attached brackets to the wall or panel and secure with fasteners (not provided).

Ethernet Network

⚠ CAUTION ***Do not connect the Etherlon Router to the LAN at this time. The router should only be connected after it has been configured and tested.***

The Etherlon Router will be connected to the LAN using the appropriate Ethernet port. Consult with the LAN administrator on limitations and requirements of the Ethernet topology. Ethernet topology varies with the media type and are not covered in these instructions.

Make sure the DIP switches have been set correctly for the Ethernet media being used.

PowerCommand Network

Connect the Etherlon Router to the PowerCommand Network channel (or bus) using the 2-pin pluggable connector on the front of the router (see Figure 19-1). Use one of the RJ-45 connectors for the Ethernet connection. Leave the other one open.

Power

Power is provided to the Etherlon Router via the AC power supply. The power supply provides 24 VDC to the router. The router may be powered from 16 to 30 VDC and consumes 6W (maximum).

The PWR LED lights (green) when the correct power is applied.

⚠ CAUTION ***Because AC power may be lost during a power outage, the router may not be operational during the outage. Thus, critical emergency power system control signals should not be run through the Etherlon Router.***

NETWORK CONNECTION

The channel may be terminated at the Etherlon Router with a network terminator. One device on each network segment must be terminated.

To terminate a network segment, connect the network terminator and the network twisted-pair cable in the two-position network connector. The network terminator has three leads: two data and one ground. The ground lead (green/yellow) is not used and should be clipped.

Use NEMA Level IV (or greater) stranded twisted-pair cable to connect the router to the network bus. Each segment of the network must be terminated. If the router is to be the termination point for this segment, a terminator is provided (see Figure 19-1).

Network data lines and terminator leads are polarity insensitive. Connect one stranded twisted-pair lead with one terminator lead and the other stranded twisted-pair lead with the other terminator lead. Figure 19-1 shows the network terminator and twisted-pair cable connected to the router.

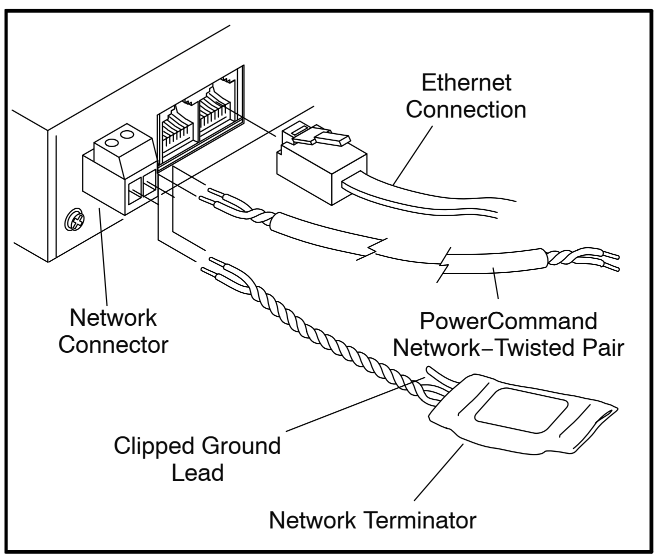


FIGURE 19-1. NETWORK CONNECTION AND TERMINATOR

ETHERNET CONFIGURATION

The Etherlon Router must be configured for operation within the LAN. This includes assigning an IP address, subnet mask, network interface and IP addressing mode. The LAN system administrator should determine these settings. Each Etherlon Router requires its own unique IP address.

For installations utilizing two routers, the *Unicast* addressing mode is used. For installations with two or more routers, either *Unicast-Replicated* or *Multicast* is used.

NOTE: Not all Ethernet LANs support *Multicast* addressing. Consult with the system administrator.

IP Configuration

Once the IP settings (address, subnet mask, network interface, addressing mode) for each router have been assigned, the router is ready for configuration. Each router is configured by downloading a preformatted text file.

A single file is used to configure all routers in the installation. Sample files are provided in the Network Support Files vx_x.zip file (*.EL). This procedure requires using DOS.

1. Load the appropriate sample file(s) and "Ethercon.exe" to your PC, either by opening Network Support Files vx_x with WinZip or by running the self-extracting executable file.

2. Copy the appropriate sample file to a new file.

   e.g. MY_SITE.EL

3. Edit MY_SITE.EL to assign the correct subnet mask network interface and IP addresses for each Etherlon Router in the system.

4. Apply power to each router. Connect the network interface to the *first* Etherlon Router in the system. The *first* router should correspond to "member1" in the *.EL file.

5. Run the ETHERCON.EXE utility program by double-clicking the file name from Windows Explorer to download the configuration to "member1".

6. Press the CSVC pushbutton on the "member1" router. The ETHERCON utility downloads the configuration for "member1" to that router.

   NOTE: The ETHERCON utility confirms whether the configuration was successful or not.

7. Connect the network interface to the next router that corresponds to "member2".

8. Run the ETHERCON utility program to download the configuration to "member2".

9. Press the CSVC pushbutton on "member2" router. The ETHERCON utility downloads the configuration for "member2" to that router.

10. Repeat steps 7 thru 9 until all routers are successfully configured.

POWERCOMMAND CONFIGURATION

After the Etherlon Routers have been configured for operation within the LAN, install them into the LonWorks network, using LonMaker for Windows. Use the router shape from the CPG FTT-10 Device stencil or the LonMaker Basic Shapes stencil.

Refer to the *Section 2* for network installation instructions.

Channels

Each channel must be defined in LonMaker. LonMaker represents the Ethernet LAN as a "channel" since network messages will be transmitted over the LAN.

Using LonMaker, drag a channel shape into the network drawing for the entire Ethernet LAN. For the transceiver type, select "Custom." Then, define unique channels for each LonWorks channel. The channel type for each LonWorks channel must be "FTT-10." The system must have one Ethernet channel and at least two FT-10 channels (see Figure 19-2).

⚠ CAUTION ***When attaching the network interface to the network, be sure to identify the correct channel the network interface is connected to. Failure to attach to the correct channel can cause failure of the Etherlon Router. Refer to Figures 19-1 and 19-2.***

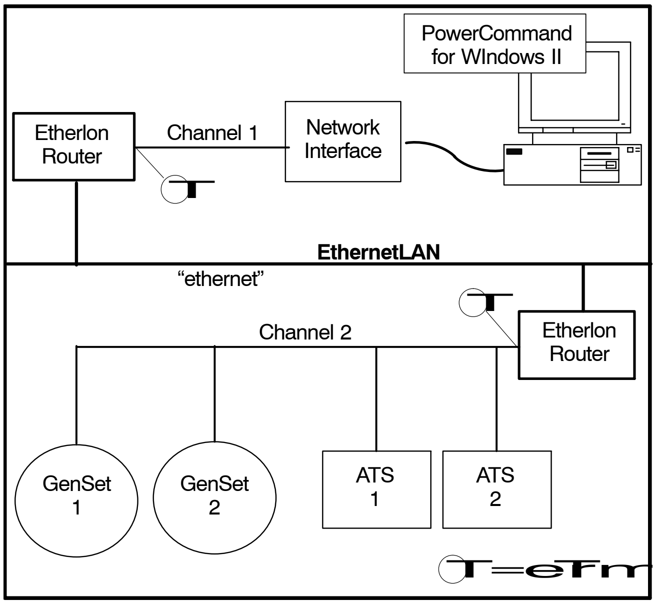


FIGURE 19-2. TYPICAL POWERCOMMAND/ ETHERNET SYSTEM

Devices

A router always connects 2 channels: A and B. Channel A must always be the Ethernet LAN, e.g. "ethernet" and channel B must always be the LonWorks channel.

Define other devices in the system as required.

Installation

CAUTION ***When attaching the network interface to the network, be sure to identify the correct channel the network interface is connected to. Failure to attach to the correct channel can cause failure of the Etherlon Router. Refer to Figures 19-1 and 19-2.***

After all devices have been defined and the network interface is attached to the correct channel, the devices may be installed.

However, a device may not be installed until a path exists (via routers) to the device. Install routers before installing those devices on 'remote 'channels'.

When commissioning the Etherlon Routers, press the RSVC pushbutton to identify the device to be installed (Figure 19-3).

Verification

Before connecting the Etherlon Routers to the LAN, connect the routers to a properly operating Ethernet hub (using standard Ethernet cables). Or, connect the routers directly to each other using an Ethernet type cross-over cable.

Using LonMaker, attach to the correct channel. Communicate with each router using the "Test" function. Verify each router is responding and no errors are generated. The ETH TX and ETH RX LEDs should flash as messages are transmitted over the Ethernet channel.

Once operation has been verified, install the routers in their correct location. Verify PowerCommand for Windows is able to communicate with all devices in the system.

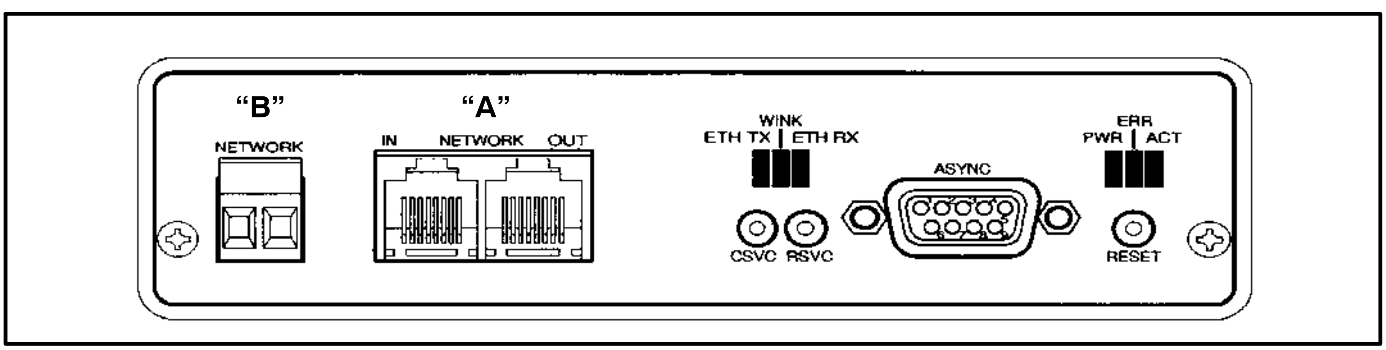


FIGURE 19-3. ETHERLON ROUTER (FRONT)

20. ModLon II Gateway

ABOUT THIS SECTION

The Modlon II Gateway will be obsoleted in October 2016 and replaced with the PowerCommand Lon Gateway (A054V134). The PowerCommand Lon Gateway is currently available for purchase and will supersede any orders for the Modlon II Gateway after it has been obsoleted. Software and LonMaker stencils for the PowerCommand Lon Gateway are available on InCal for download.

This section describes the installation of the ModLon II Gateway.

In addition to physical connections, this section includes information on binding and register mapping of the following modules to a ModLon II Gateway.

- Controls Communications Module – Genset (CCM-G)
- Controls Communications Module – ATS (CCM-T)
- Digital I/O Module (DIM)
- PCC 3100 Genset Communications Module (GCM)
- PCC 3200 Genset LonWorks® Card (GLC)
- PCC 2100 Network Communications Module (NCM)
- PowerCommand® Automatic Transfer Switch (ATS) Network Communications Module (NCM)

REQUIRED SOFTWARE

The following software is required to incorporate this kit into your network.

- LonMaker™ for Windows®
- Device Monitoring Software – The communication parameters of the ModLon II Gateway are configurable through LonMaker for Windows. Choose appropriate software that will communicate with user's chosen parameters.

  If ModScan® software is selected to monitor devices, see the "Optional Software" listed below and the information included under "Using ModScan Software," starting on page 20-15.
- WinZip® – Software used to decompress downloaded files.

OPTIONAL SOFTWARE

- ModScan Software – Used to verify communications between the PCC network devices and the ModLon.

  A fully functional demo version of ModScan software can be downloaded from the Internet at http://www.Win-Tech.com. Click on the "Free Trial Demos" button. Under "Win32 ModBus® Applications," click on the ModScan32.zip file and select an appropriate file location to store the software.

DESCRIPTION

The ModLon II Gateway provides a direct Echelon LonWorks network interface to any device that can communicate:

- ModBus RTU

  OR
- ModBus ASCII

This module translates LonWorks network protocol into ModLon ASCII or RTU. Figure 20-1 is a block diagram of the ModLon II Gateway.

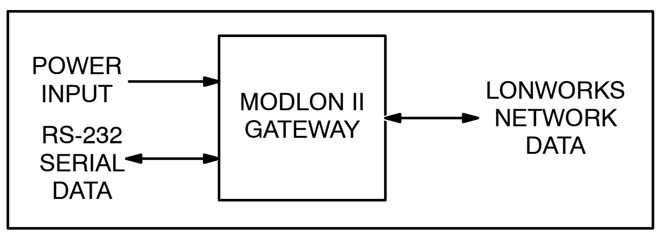


FIGURE 20-1. MODLON II GATEWAY BLOCK DIAGRAM

Refer to *Section 2* for instructions on network topology, wiring, and software installation.

The ModLon II Gateway (see Figure 20-2) has a network connector on the front for connection to network data and a DB9 connector on the top for connection to an RS-232 port.

Externally the ModLon II Gateway has a DC power connector input, a Service (SVC) pushbutton, Service (SVC) LED, Reset (RST) pushbutton, MODBUS LED, OK LED, LON LED, Termination Switch, and a Template Selection Dipswitch.

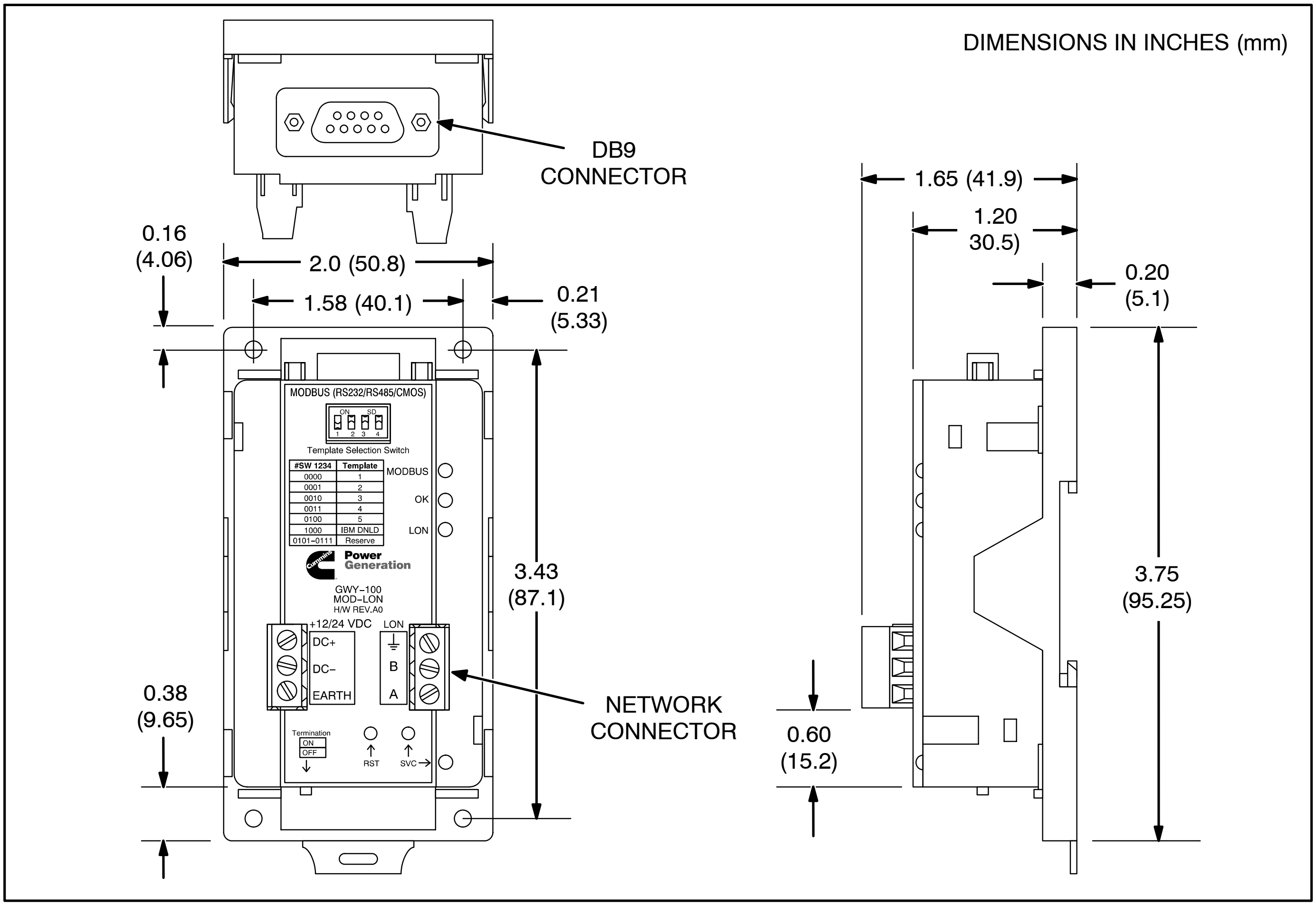


FIGURE 20-2. MODLON II GATEWAY OUTLINE DRAWING

Termination Switch

The termination switch is located on the bottom of the ModLon II Gateway (see Figure 20-3). The termination switch is a doubly terminated bus topology termination circuit.

FT-10 Networks can be configured as either multi-drop bus topology (as TP/XF-78 networks are configured) or free topology. Networks configured as a multi-drop bus must be terminated at each end of the bus with a multi-drop bus terminator circuit. Free topology networks must have one free topology type terminator somewhere in the network. The ModLon II has a multi-drop bus terminator. Place the terminator in the “On” position to use this terminator in a multi-drop bus network. If the ModLon II is installed in a free topology network, place the terminator in the “Off” position.

NOTE: Power Command FT-10 devices (CCMs, DIMs, NCMs, GCMs) have free topology terminators. If an FT-10 network is used in a multi-drop bus topology network, use the bus topology terminator (300−5729) to terminate the network. Refer to *Section 2* for more information on network topology termination.

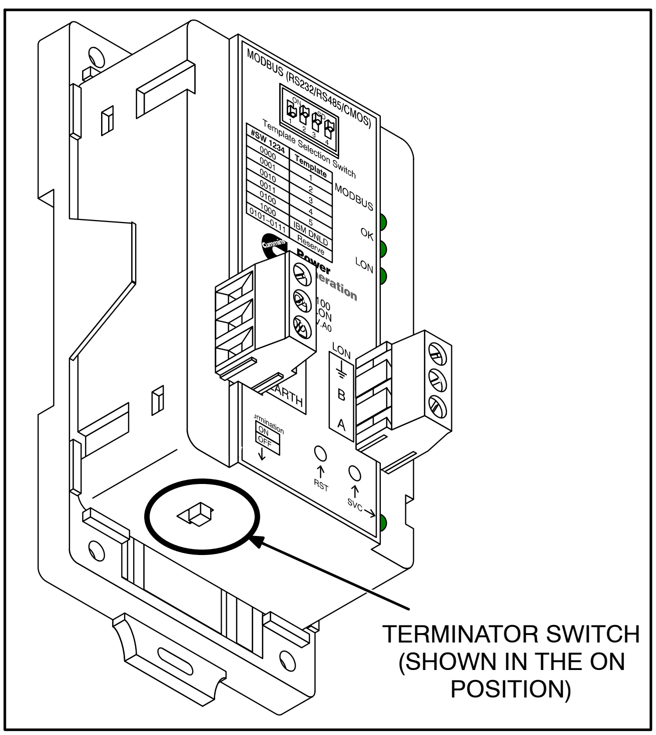


FIGURE 20-3. MODLON II GATEWAY TERMINATOR SWITCH

MODLON II GATEWAY INSTALLATION

If there is a site network installation drawing, refer to it for the ModLon II Gateway location. If a site network installation drawing is not available, refer to *Section 2* for network topology and maximum network length. **All wiring must follow a specific network topology and must fall within distance limits.** Refer to individual instruction sheets for information on installing additional network devices.

Choose a clean, flat, vibration-free mounting surface. Avoid locations that are hot, damp, or dusty. The temperature range must not exceed −4°F (−20°C) to 140°F (60°C).

Power Supply

The ModLon II Gateway has a DC power connector (see Figure 20-5) that connects to a power supply from one of the network devices. The ModLon must have a 9−32 VDC power input to function properly.

Locate the ModLon II Gateway near a network device. If the ModLon II Gateway must remain powered during an electrical power failure, use an uninterruptable power supply (UPS). Refer to *Section 13* for UPS information. If more than one device will be connected to the UPS, purchase a multi-outlet adapter or multi-outlet extension cord.

NETWORK TOPOLOGY AND DATA MEDIA

Refer to *Section 2* for information on the network topology and data transmission media.

WARNING ***AC voltages and currents present an electrical shock hazard that can cause severe personal injury or death. Only trained, experienced personnel are to perform the following procedures.***

Connections

Network data connections are made at the network connector (LON connector) for LonWorks network data and at a DB9 connector for connection to an RS-232 port. (Connectors and the cable supplied with the ModLon II Gateway are shown in Figure 20-5.)

Template Selection Dipswitch

The Template Selection Dipswitch (see Figure 20-4) sets the state for the ModLon. Dipswitch settings are listed in Table 20-1.

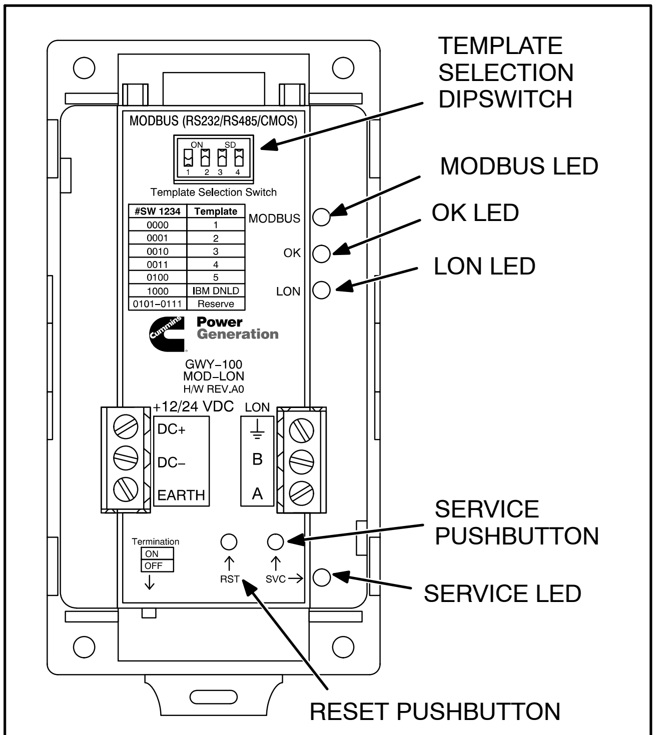


FIGURE 20-4. MODLON II GATEWAY DIPSWITCH, PUSHBUTTONS, AND LEDS

TABLE 20-1. DIPSWITCH SETTINGS

#SW 1 2 3 4	Template	Figure Ref.
0 0 0 0	1 (FT-10)	20-9
0 0 0 1	2 (FT-10)	20-10
0 0 1 0	3 (FT-10)	20-11
0 0 1 1	4 (FT-10)	20-12
0 1 0 0	5 (TP/XF-78)	20-13
1 0 0 0	Download	–

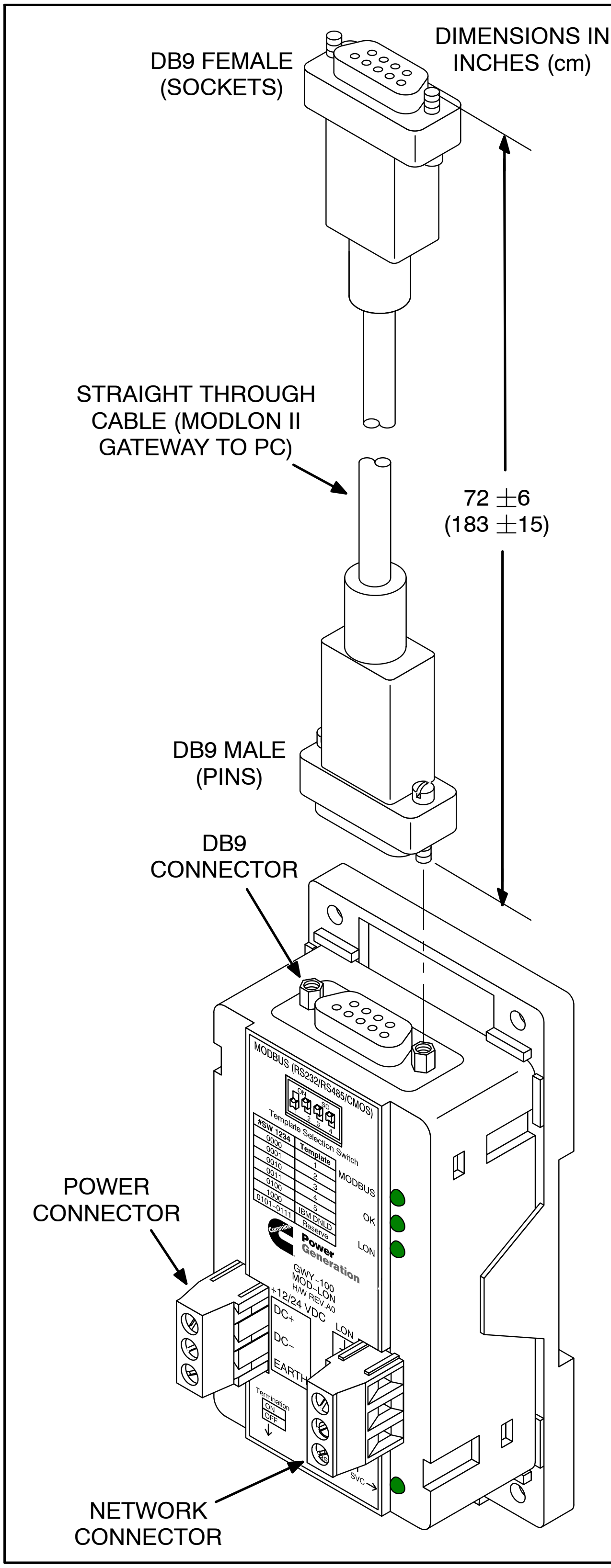


FIGURE 20-5. MODLON II CONNECTIONS

Switch and LEDs

The ModLon II Gateway includes two pushbuttons and four status LEDs (see Figure 20-4).

Service Pushbutton and Service LED

The Service (SVC) pushbutton is used during installation (when prompted by the LonMaker program). **It is important to press the service switch on the ModLon II Gateway that is part of the permanent site. The service switch should only be pressed during installation.**

The green Service LED lights when the service push button is pressed. The LED blinks when the ModLon II Gateway is unconfigured and is off if the ModLon II Gateway is configured. The LED remains on if an unrecoverable error is detected.

Reset Pushbutton

The Reset (RST) pushbutton should not be used during or after installation for any reason.

Status LEDs

The ModLon has three status LEDs (MODBUS, OK, and LON) on the front panel. The MODBUS and LON LEDs indicate communication status on the two ports, whereas the OK LED indicates the ModLon mode.

TABLE 20-2. LED FUNCTIONS

MODBUS LED	
Status	**Description**
Momentary Flashing while communicating with Network/Software	Communication occurring with the MODBUS port
Off	No Communication on the MODBUS port
OK LED	
Status	**Description**
Off	No Power to ModLon
Fast Blinking	ModLon is waiting for download
Steady on	ModLon is On
LON LED	
Status	**Description**
Off	No communication on LON
Momentary Flashing while communicating with Network/Software	Communication occurring with the network and the LON

NETWORK INSTALLATION

Read the “Introduction” and “Network Hardware and Wiring” sections of this manual (*Sections 1* and *2*) before constructing the network.

ModLon Configuration

Configuration variable nciNodeCfg allows the user to set the ModLon variables baud rate, parity, data bits, stop bits, mode selection, and device ID through LonMaker for Windows (see Table 20-3). This variable has to be set according to the specifications of the FT-10 or TP/XF-78 network.

TABLE 20-3. VARIABLE SETTINGS

Byte	Variable	Setting
8–6	Baud Rate	1200 – 115200
5	Parity	0 – None 1 – Odd 2 – Even
4	Data Bits	7 or 8
3	Stop Bits	1 or 2
2	Mode Selection	0 – ASCII 1 – RTU
1	Device ID	1
0	Not used	Not used

STANDARD BAUD RATES	B_8	B_7	B_6
1200	0	12	0
2400	0	24	0
9600	0	96	0
14400	1	44	0
19200	1	92	0
38400	3	84	0
57600	5	76	0
115200	11	52	0

The two settings shown below are the default settings, FT-10 and TP-78, for the first ModLon unit.

For example, the old ModLon unit setup in FT-10 configurations would be:

Baud Rate:	38,400
Parity:	0
Data Bits:	8
Stop Bit:	1
Mode Selection:	1 (RTU)
Device ID:	1

B_8	B_7	B_6	B_5	B_4	B_3	B_2	B_1	B_0
3	84	0	0	8	1	1	1	0
0	96	0	2	7	1	0	1	0

Refer to Figure 20-6 and Figure 20-7 for examples of the ModLon II unit being configured as the default parameters of the first ModLon in LonMaker.

To set *nciModLonCfg*, right click on the ModLon stencil and select Browse. Change the values of the nciModLonCfg in the Browse window accordingly and click on Set Value. You will get an error message (see Figure 20-8) that can be ignored; click Close and refresh the Browse screen to confirm the new values. Make sure to note that the ModLon is configured the same as in the ”Using ModScan Software” section (starting on page 20-15).

NOTE: The default configuration for ModLon II is ASCII Mode. The configuration should be changed to RTU Mode, using LonWorks (see Figure 20-6).

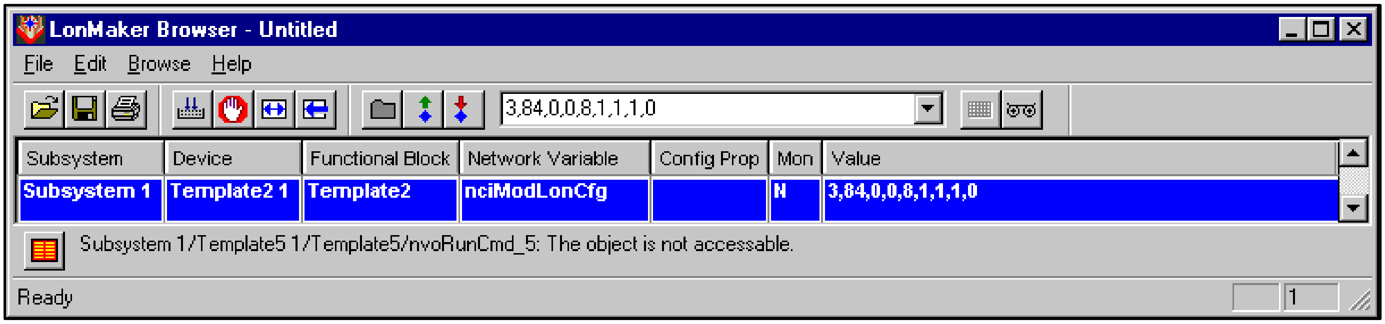


FIGURE 20-6. nciModLonCfg SETTINGS FOR FT-10 NETWORK

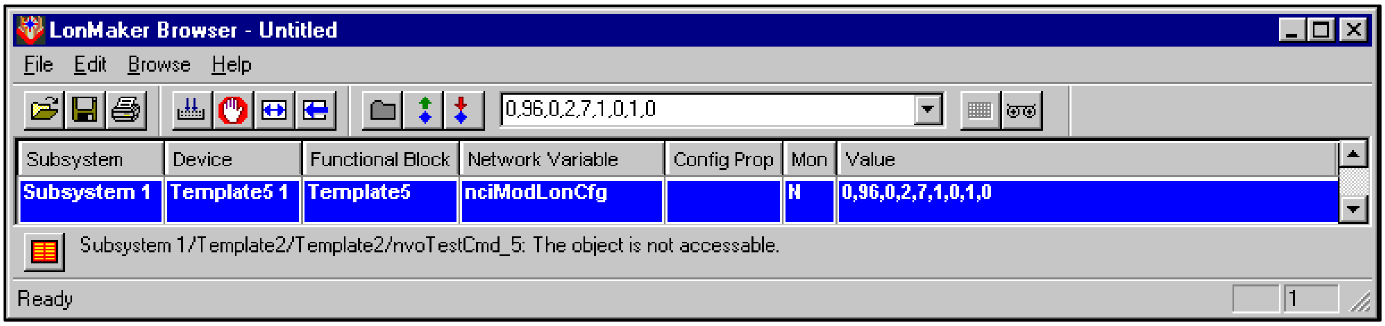


FIGURE 20-7. nciModLonCfg SETTINGS FOR TP/XF-78 NETWORK

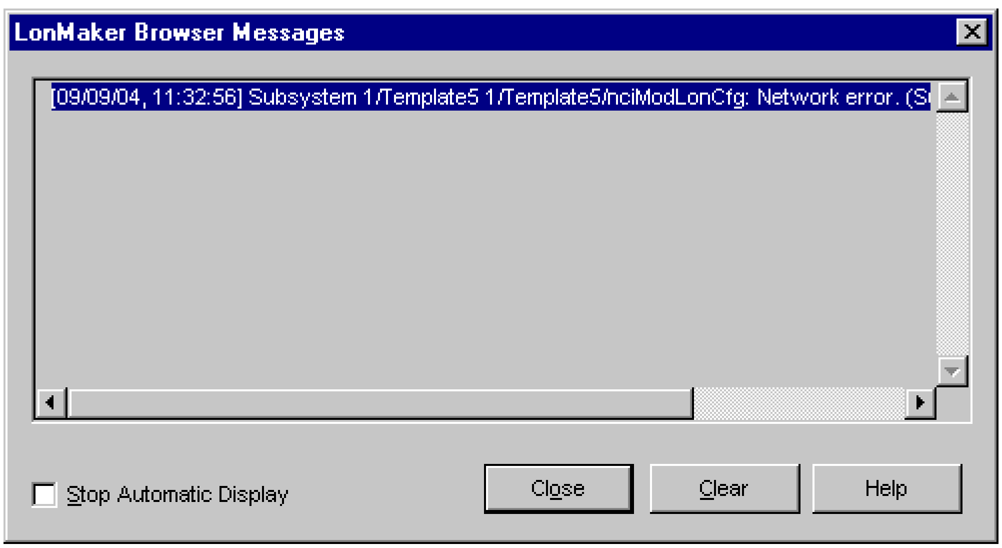


FIGURE 20-8. ERROR MESSAGE WHEN CHANGING THE MODLON II CONFIGURATION

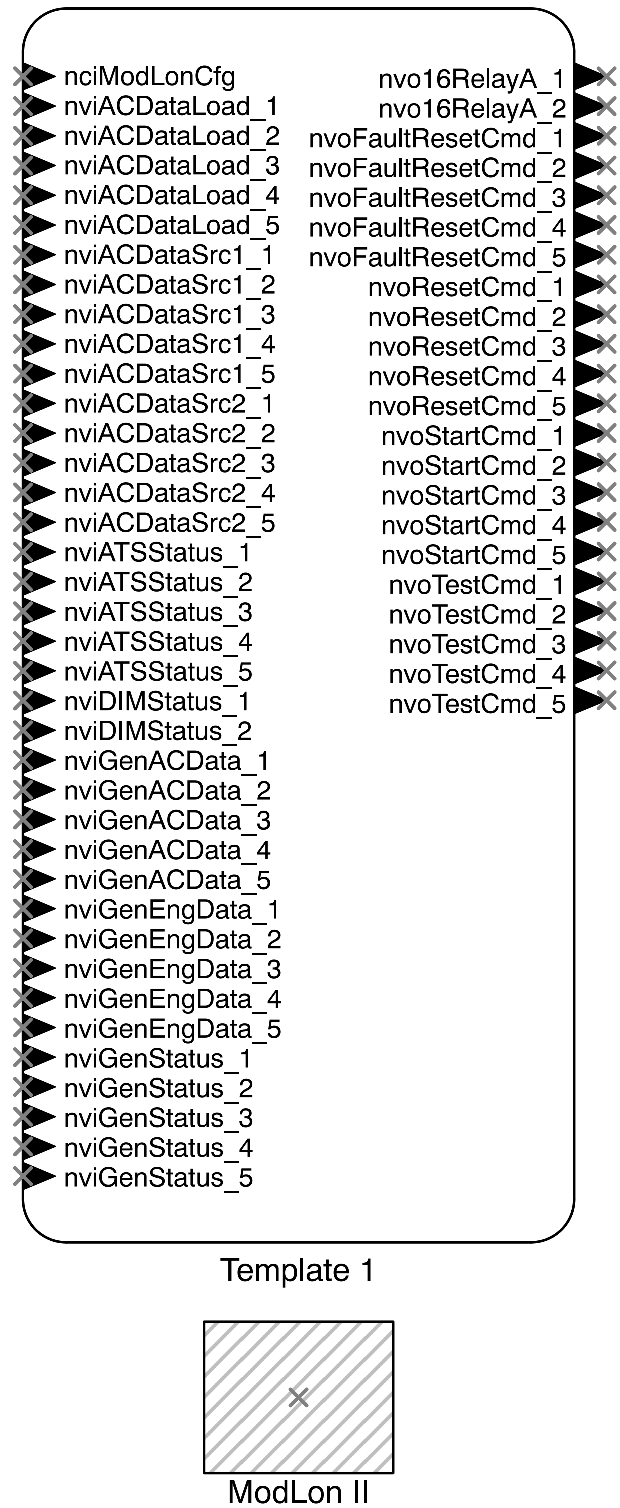
FT-10 Networks

The "Using LonMaker for Windows" section of this manual (*Section 4*) provides a detailed description of the network installation process, including the following step-by-step installation procedures:

11. Setting up Network Installation Tools
12. Registering Plug-Ins
13. Using LonMaker for Windows Software
14. LonMaker for Windows Network Setup
15. Adding Devices with LonMaker for Windows
16. Installing Bindings with LonMaker for Windows
17. Installing Software Upgrades to an Existing Network

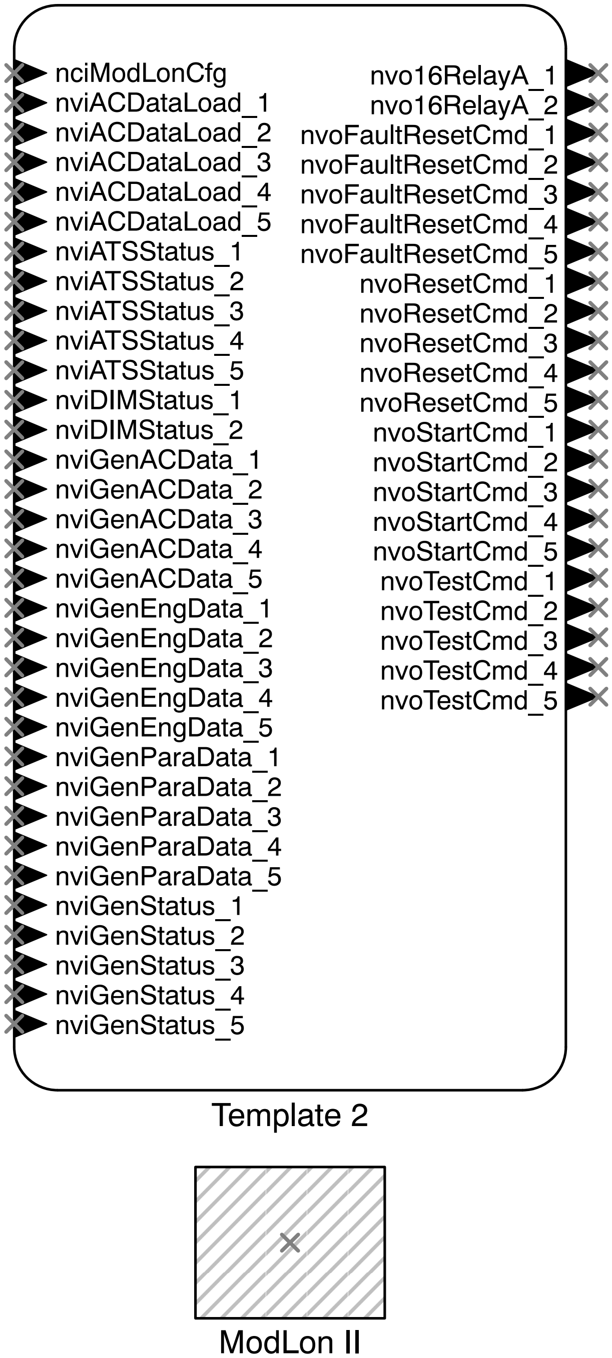
The ModLon II includes five possible ModLon options, four that are the same as the old FT-10 ModLon and the fifth option mimics the TP/XF-78 register maps. A device template is available in LonMaker for Windows for each of these templates.

Possible bindings to a ModLon II Gateway are shown in Tables 20-4 (Template 1), 20-5 (Template 2), 20-6 (Template 3), 20-7 (Template 4), and 20-8 (Template 5).



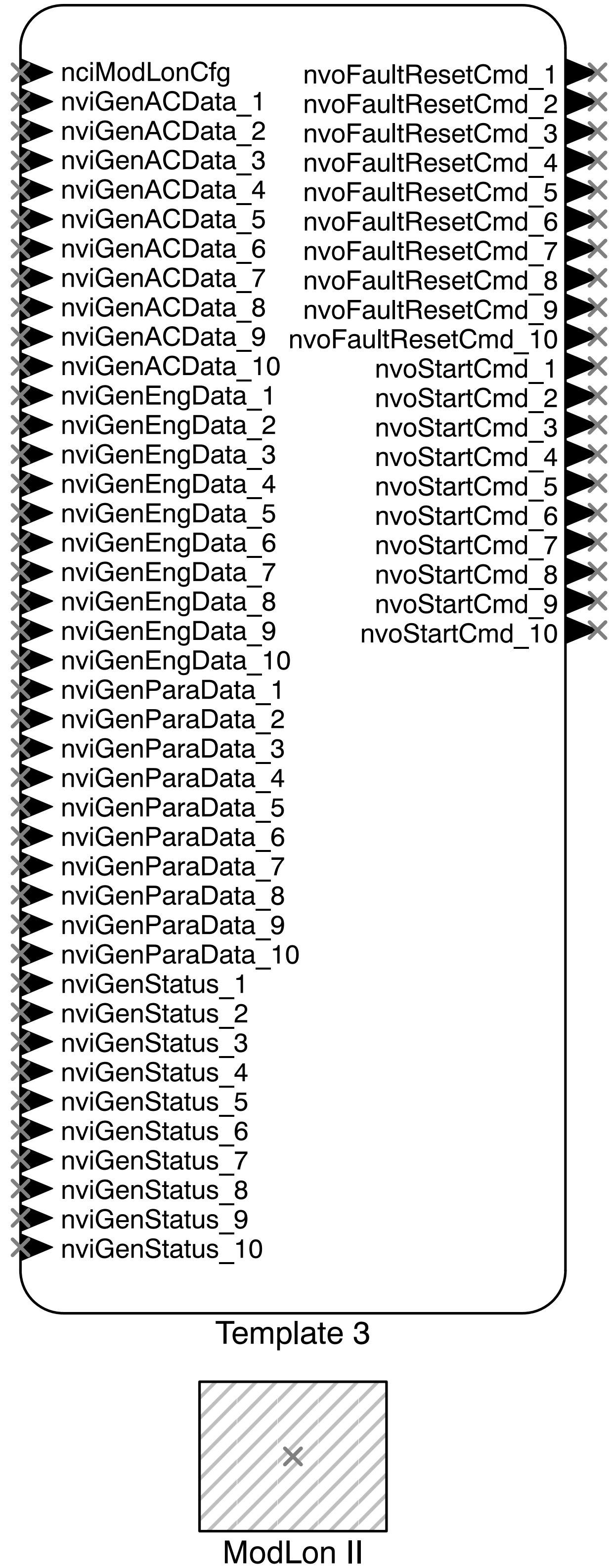
NOTE: nciModLonCfg is configurable through LonMaker.

FIGURE 20-9. MODLON TEMPLATE 1



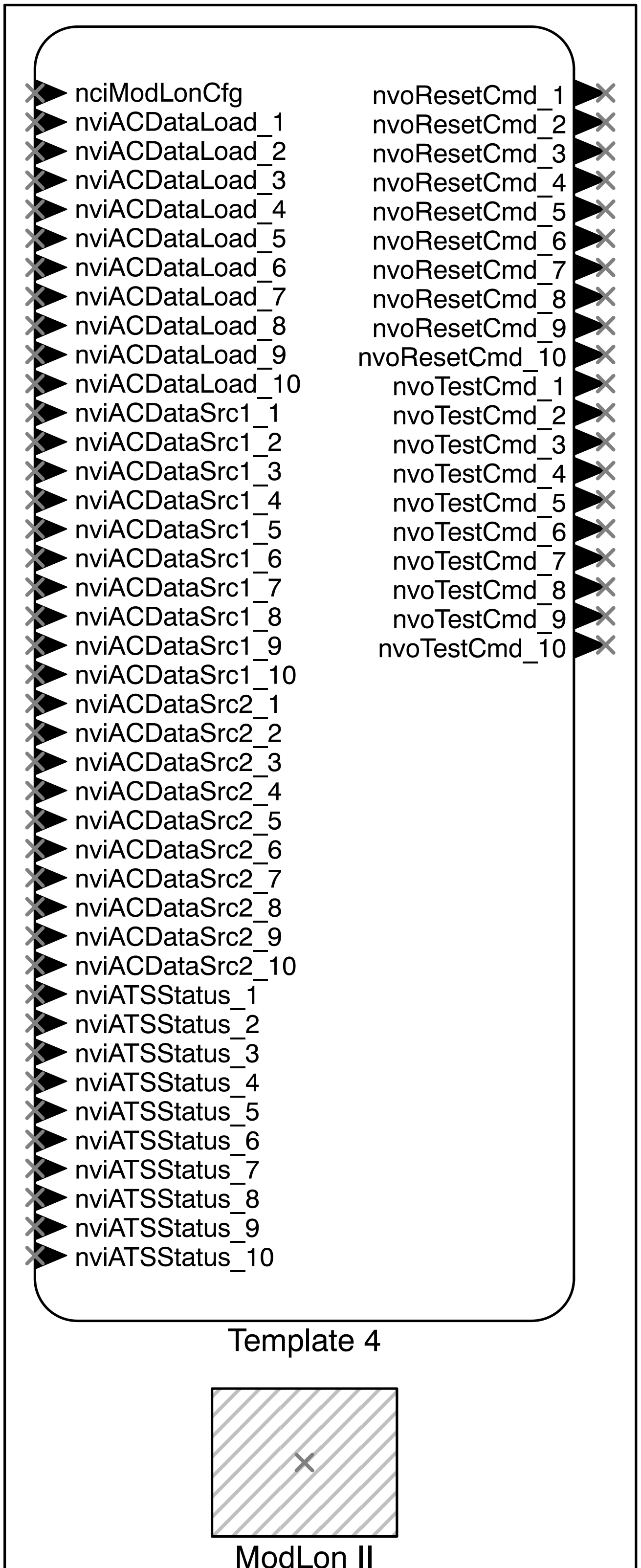
NOTE: nciModLonCfg is configurable through LonMaker.

FIGURE 20-10. MODLON TEMPLATE 2



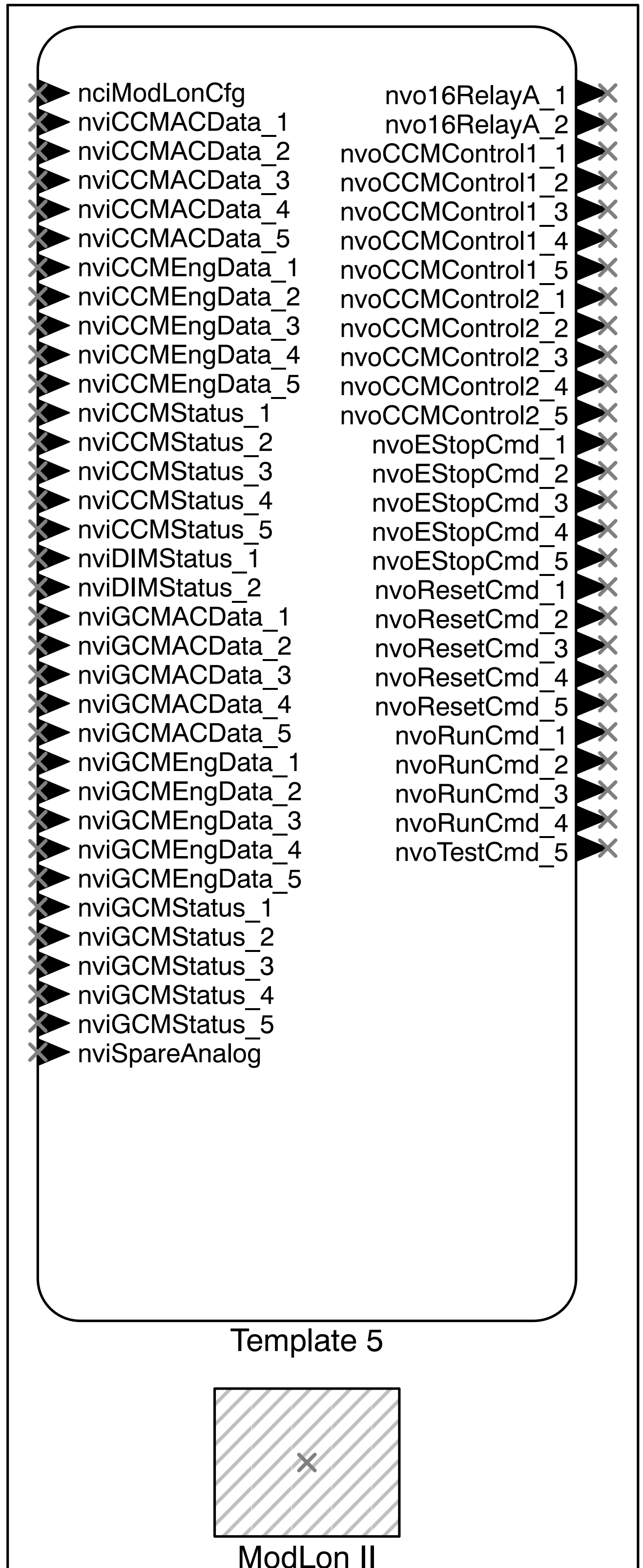
NOTE: nciModLonCfg is configurable through LonMaker.

FIGURE 20-11. MODLON TEMPLATE 3



NOTE: nciModLonCfg is configurable through LonMaker.

FIGURE 20-12. MODLON TEMPLATE 4



NOTE: nciModLonCfg is configurable through LonMaker.

FIGURE 20-13. MODLON TEMPLATE 5

TABLE 20-4. FT-10 NETWORK MODLON BINDINGS – TEMPLATE 1

CCM-G ModBus Interface:

Possible bindings to a ModLon Interface:

PCC w/CCM-G		ModLon		
nviStartCmd	←	*nvoStartCmd[..]*	*General*	**Control**
nviFaultResetCmd	←	*nvoFaultResetCmd[..]*		
nvoGenStatus	→	*nviGenStatus[..]*	*General*	**Monitor**
nvoGenACData	→	*nviGenACData[..]*		
nvoGenEngData	→	*nviGenEngData[..]*		

CCM-T ModBus Interface (ModLon):

Possible bindings to the ModLon Interface:

CCM-T		ModLon		
nviTestCmd	←	*nvoTestCmd[..]*	*"Load Shed"* *"Test"* *"Transfer Inhibit"*	**Control**
nvoACDataLoad	→	*nviACDataLoad[..]*	*General*	**Monitor**
nvoATSStatus	→	*nviATSStatus[..]*		

DIM ModBus Interface (ModLon):

Possible bindings to a ModLon Interface:

ModLon		DIM		
nvo16RelayA[..]	→	*nvi16RelayA*	*16 Relays*	**Control**
nviDIMStatus[..]	←	*nvoIOStatus*	*Node*	**Status**

TABLE 20-5. FT-10 NETWORK MODLON BINDINGS – TEMPLATE 2

CCM-G ModBus Interface (ModLon):

Possible bindings to a ModLon Interface:

PCC w/CCM-G		**ModLon**		
nviStartCmd	←	*nvoStartCmd[..]*	*General*	**Control**
nviFaultResetCmd	←	*nvoFaultResetCmd[..]*		
nvoGenStatus	→	*nviGenStatus[..]*	*General*	**Monitor**
nvoGenACData	→	*nviGenACData[..]*		
nvoGenEngData	→	*nviGenEngData[..]*		
nvoGenParaData	→	*nviGenParaData[..]*		

CCM-T ModBus Interface (ModLon):

Possible bindings to the ModLon Interface:

CCM-T		**ModLon**		
nviTestCmd	←	*nvoTestCmd[..]*	*“Load Shed”* *“Test”* *“Transfer Inhibit”*	**Control**
nvoATSStatus	→	*nviATSStatus[..]*		
nvoACDataLoad	→	*nviACDataLoad[..]*		

DIM ModBus Interface (ModBus):

Possible bindings to a ModLon Interface:

ModLon		**DIM**		
nvo16RelayA[..]	→	*nvi16RelayA*	*16 Relays*	**Control**
nviDIMStatus[..]	←	*nvoIOStatus*	*Node*	**Status**

TABLE 20-6. FT-10 NETWORK MODLON BINDINGS – TEMPLATE 3

CCM-G ModBus Interface (ModLon):

Possible bindings to a ModLon Interface:

PCC w/CCM-G		ModLon		
nviStartCmd	←	*nvoStartCmd[..]*	*General*	**Control**
nviFaultResetCmd	←	*nvoFaultResetCmd[..]*		
nvoGenStatus	→	*nviGenStatus[..]*	*General*	**Monitor**
nvoGenACData	→	*nviGenACData[..]*		
nvoGenEngData	→	*nviGenEngData[..]*		
nvoGenParaData	→	*nviGenParaData[..]*		

TABLE 20-7. FT-10 NETWORK MODLON BINDINGS – TEMPLATE 4

CCM-T ModBus Interface (ModLon):

Possible bindings to the ModLon Interface:

CCM-T		ModLon		
nviTestCmd	←	*nvoTestCmd[..]*	*"Load Shed"* *"Test"* *"Transfer Inhibit"*	**Control**
nvoACDataLoad	→	*nviACDataLoad[..]*	*General*	**Monitor**
nvoATSStatus	→	*nviATSStatus[..]*		

Template 5

This template uses the same register map as the TP-78 devices. This will allow for upgrading from TP-78 Networks with FT-10 devices with out having to change the monitoring software. The "Network Installation – Using LonMaker for Windows" section of this manual (*Section 4*) provides a detailed description of the network installation process, including the following step-by-step installation procedures:

1. Setting up Network Installation Tools
2. Starting LonMaker Software
3. Using LonMaker Software
4. LonMaker Network Setup
5. Connecting Devices with LonMaker
6. Installing Devices with LonMaker
7. Testing Devices and Verifying Installation

Possible bindings to a ModLon II Gateway are shown in Table 20-8.

The ModLon is an FT-10 Device. Therefore when it is connected to a TP/XF-78 device or network, it must be separated by a router. However, if you are using just the topology of the TP/XF-78 template for an FT-10 network, there is no need to separate the ModLon with a router.

TABLE 20-8. TP/XF-78 NETWORK MODLON BINDINGS – TEMPLATE 5

GCM ModBus Interface (ModLon):

Possible bindings to a ModLon Interface:

PCC w/GCM		ModLon		
nviRunCmd	←	*nvoRunCmd[..]*	*General*	**Control**
nviResetCmd	←	*nvoResetCmd[..]*		
nviEmerStopCmd	←	*nvoEStopCmd[..]*		
nvoStatus	→	*nviGCMStatus[..]*	*General*	**Monitor**
nvoGenData	→	*nviGCMACData[..]*		
nvoGenEngData	→	*nviGCMEngData[..]*		

CCM ModBus Interface (ModLon):

Possible bindings to the ModLon Interface:

CCM		ModLon		
nviRelayControl4	←	*nvoCCMControl1[..]*	*"Load Shed"* *"Test"* *"Transfer Inhibit"*	**Control**
nviRelayControl5		*nvoCCMControl2[..]*		
nviRelayControl6				
nvoACDataLoad (CCM-T) *nvoGenACData (CCM-G)*	→	*nviCCMACData[..]*	*General*	**Monitor**
nvoNodeStatus	→	*nviCCMStatus[..]*		
nvoSensorData	→	*nviCCMEngData[..]*		
nvoSpareAnalog	→	*nviSpareAnalog*		

DIM ModBus Interface (ModBus):

Possible bindings to a ModLon Interface:

ModLon		DIM		
nvo16RelayA[..]	→	*nvi16RelayA*	*16 Relays*	**Control**
nviDIMStatus[..]	←	*nvoNodeStatus*	*Node*	**Status**

USING MODSCAN SOFTWARE

ModScan is a tool that can help you verify communications between the PowerCommand Network devices you have installed and the ModLon.

Notes

The following notes apply to using ModScan with FT-10 and TP/XF-78 networks.

Genset Control

- Start/Stop – When this register is set to “1,” the genset starts, synchronizes, and closes its breaker. As long as this register remains a “1,” the genset will continue to run. When this register is set to “0,” the genset stops.
- Fault Reset – This should be a momentary signal of about 2 seconds duration. Entering a “1” in the fault reset register resets any non-active warning and, If there is not a remote start on the genset, it resets any non-active shutdown except the Emergency Stop.
- Emergency Stop (TP/XF-78 networks only) – When this register is set to “1,” the emergency stop is active at the PowerCommand control. The emergency stop cannot be rest until this register is set to “0.” After the register is reset to “0,” the emergency stop must be reset at the PowerCommand control. It cannot be reset remotely.

Miscellaneous

- Fault State – As part of Gen Status State, digital value 4 (Fault State 1) = shutdown with an active run command (cannot be remotely reset) and digital value 5 (Fault State 2) = shutdown with no active run command (can be remotely reset).
- Fault Text (TP/XF-78 networks only) – These are 8 words (16 ASCII characters, 2 characters per word) that spell out the actual active fault.
- Genset Status Error – This a value that is not supported by the genset and therefore, has no meaning or function.

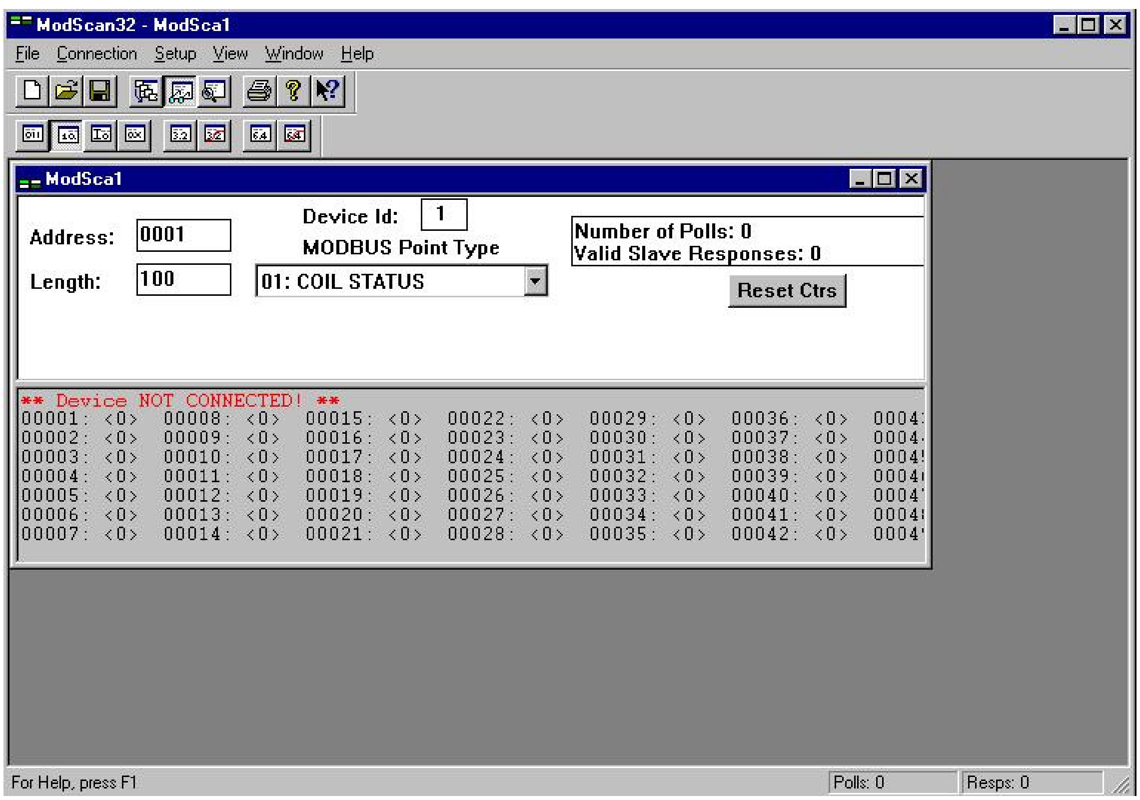


FIGURE 20-14. MAIN MODSCAN SCREEN

Use ModScan software after this kit has been incorporated into your network. An RS-232 straight-through cable must be installed between the PC serial port and the RS-232 connector on the ModLon II Gateway. Figure 20-15 shows the initial screen displayed upon launching the program.

1. From the tool bar, select Connection → Connect. The Connection Details dialog box is displayed (see Figure 20-16). The Device ID is 1.

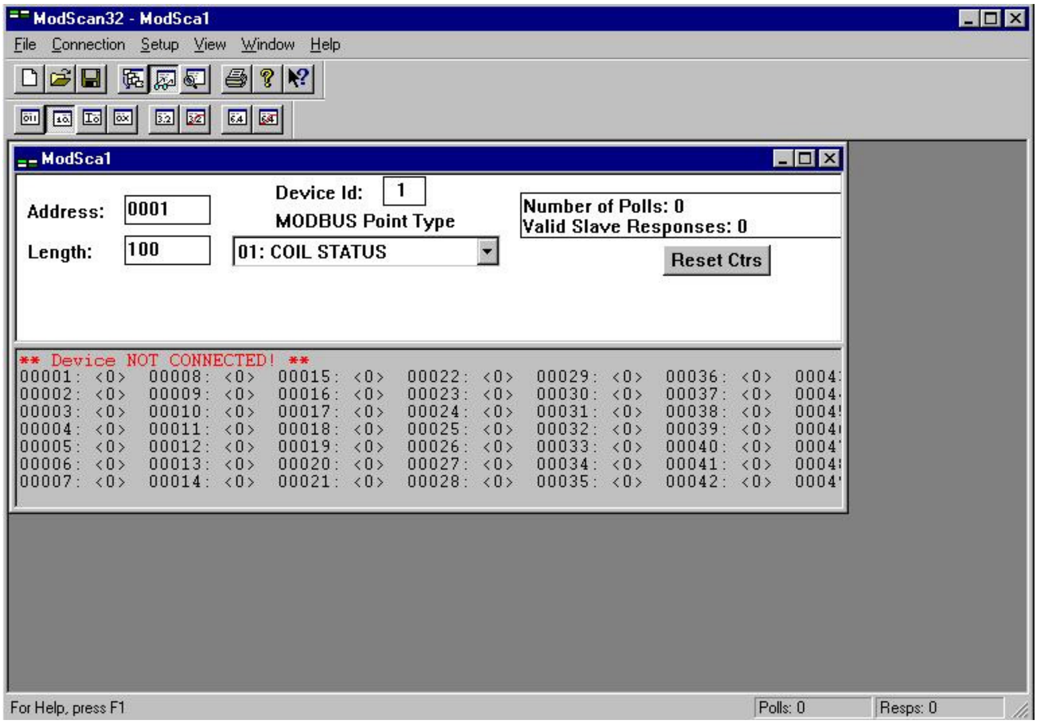


FIGURE 20-15. MAIN MODSCAN SCREEN

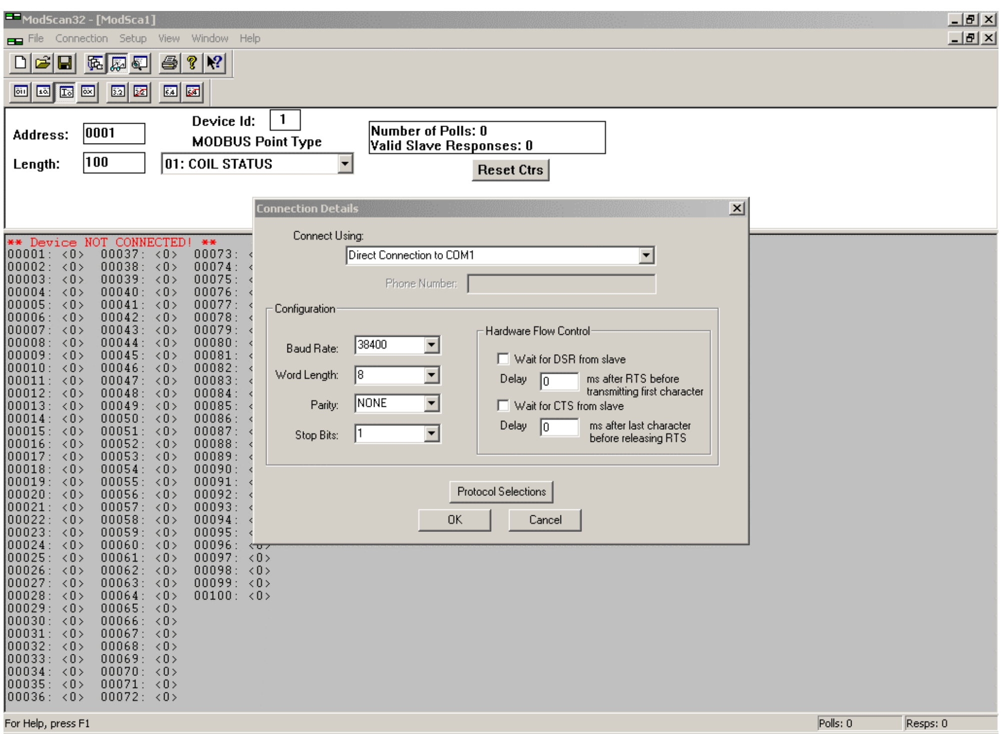


FIGURE 20-16. FT-10 NETWORK CONNECTION DETAILS DIALOG BOX

2. Use the pull down menu under "Connect Using" to select the comm port you wish to use.

   For FT-10 networks, a typical configuration would be set to Baud Rate: 38400, Word Length: 8, Parity: None,and Stop Bits: 1, as shown in Figure 20-16. Use the pull down menus to change these settings as necessary.

3. Click on the "Protocol Selections" button and change the Transmission Mode to "RTU" (see Figure 20-17). Click "OK."

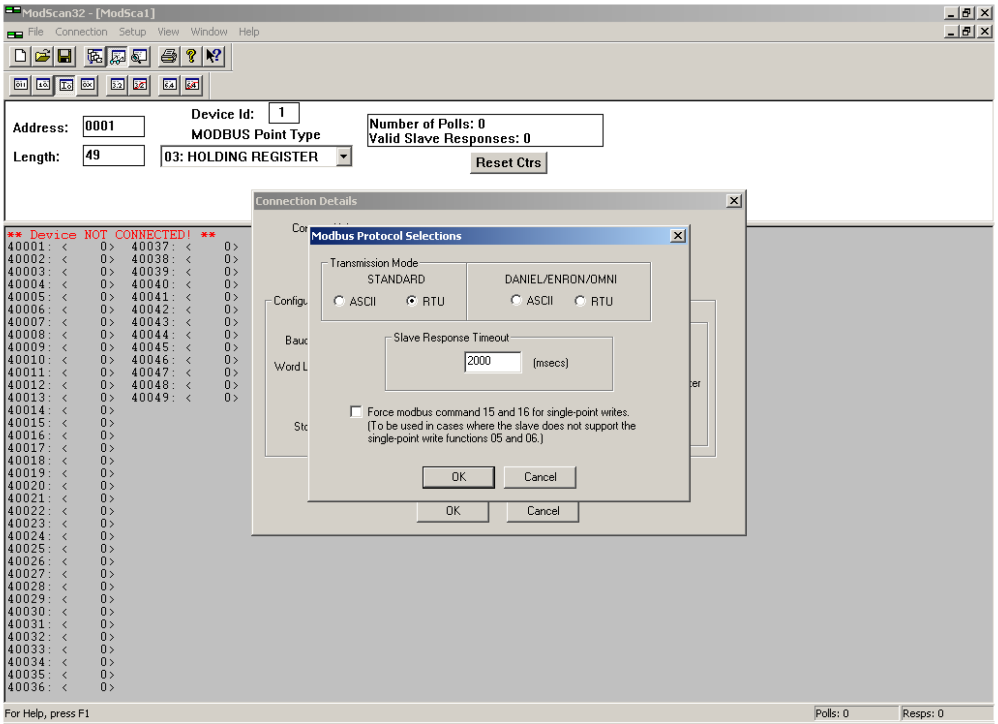


FIGURE 20-17. MODBUS PROTOCOL SELECTION DIALOG BOX

4. Click “OK” on the two open dialog boxes.

   You should notice in the upper right of the dialog box, the “Number of Polls” counter incrementing.

5. On the main ModScan screen (see Figure 20-18), Change the Address to 0001, the Length to 49 (ModLon Mapping Template 1 or 65 (ModLon Mapping Template 2, ModLon Mapping Template 3), and the Device ID to 1. From the MODBUS Point Type pull down menu, select “03: HOLDING REGISTER.”

   The “Valid Slave Responses” should now be incrementing as the data on the screen is updated. The following are register addresses for Genset #1.

   40036 is Oil Pressure

   40037 is Oil Temp.

   40038 is Coolant Temp. (L)

   40039 is Misc. Temp 1

   40040 is Misc. Temp 2

   40041 is Fuel Rate

   40042 is Engine RPM

   40043 is Engine Starts

   40044 is Eng Runtime (high)

   40045 is Eng Runtime (low)

   40046 is Total kwh (high)

   Refer to the register mapping information (Tables 20-9 thru 20-16) to view different pieces of data.

6. On the main ModScan menu (see Figure 20-19), change the Length to 49.

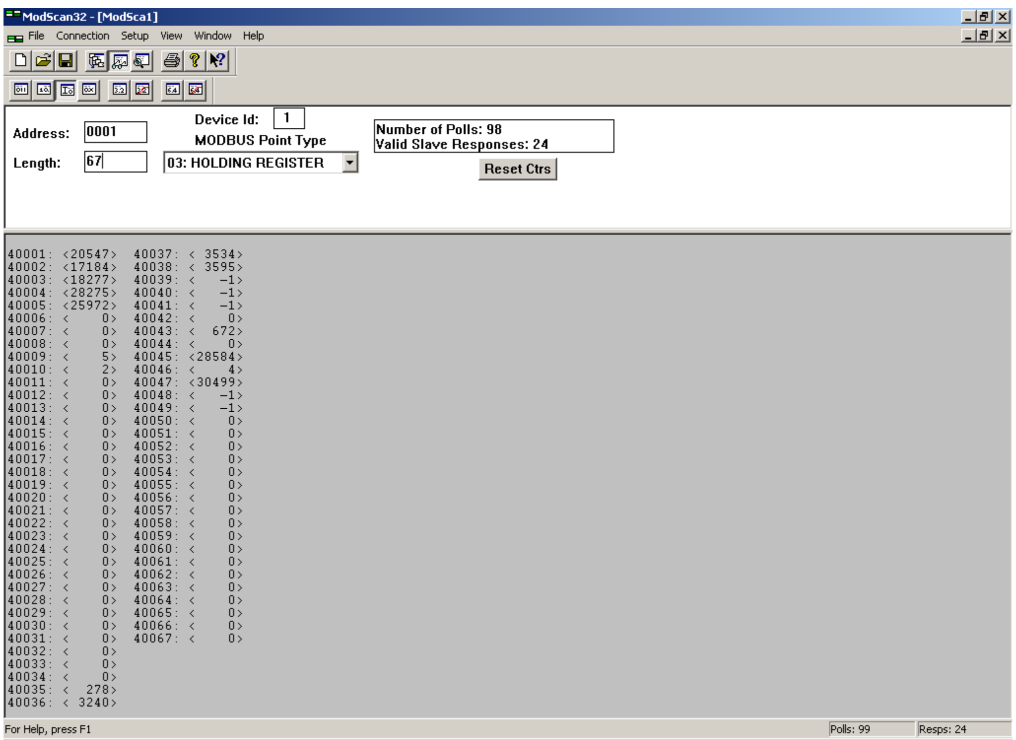


FIGURE 20-18. MODBUS POINT TYPE = HOLDING REGISTER

⚠WARNING ***Accidental starting of the generator set can cause severe personal injury or death. During step 7, a "start" command is sent to the genset. If the genset Run/Off/Auto switch is in the Auto position, the genset WILL start.***

7. To output a value from the ModLon to a network device, double click on register 40050. The Write Register dialog box is displayed (see Figure 20-19).

   NOTE: For more information on using the Write Register dialog box, see "ModLon II Write Commands" on this page.

   If you enter a value of "1" and select "Update," Genset #1 starts and runs. If you double click on register 40050 again, enter a value of "0," and selecting "Update;" the Genset stops.

8. Review the mapping register information for other coils that you can manipulate.

By changing the Length on the main ModScan screen back to 49, the data registers will again update.

ModLon II Write Commands

The ModLon II is a single write device. It does not allow for multiple writes. When sending write commands via ModBus the ModLon II must fully complete the write command on the LonWorks side before another ModBus write command can be implemented. Therefore the ModBus write commands must be about 625 ms apart. This time may increase depending on network configurations that use routers and depending on the number and type of channels used.

Writing ModBus Commands faster than 625 ms can cause the ModLon II to lock up and to recover, power must be cycled to the device or the Reset button must be pushed.

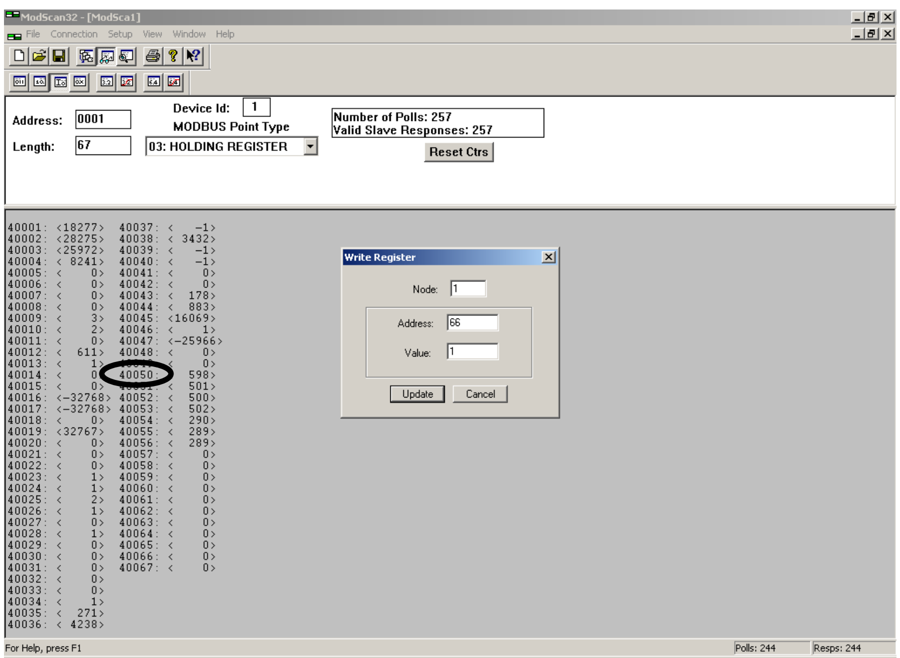


FIGURE 20-19. WRITE COIL DIALOG BOX

TABLE 20-9. MODLON REGISTER MAPPING INFORMATION – FT-10 NETWORK (TEMPLATE 1) SINGLE POWERCOMMAND GENSET (CCM-G) (SHEET 1 OF 2)

Structure	Data Point	ModBus Registers					Scaling		
		GEN[0]	GEN[1]	GEN[2]	GEN[3]	GEN[4]	Multiplier	Offset	Units
nvoGenStatus	Name [0,1]	40001	40101	40201	40301	40401			
	Name [2,3]	40002	40102	40202	40302	40402			
	Name [4,5]	40003	40103	40203	40303	40403			
	Name [6,7]	40004	40104	40204	40304	40404			
	Name [8,9]	40005	40105	40205	40305	40405			
	Name [10,11]	40006	40106	40206	40306	40406			
	Name [12,13]	40007	40107	40207	40307	40407			
	Name [14,15]	40008	40108	40208	40308	40408			
	Device Type	40009	40109	40209	40309	40409			
	Control Switch	40010	40110	40210	40310	40410			
	State[1]	40011	40111	40211	40311	40411			
	Fault Code*	40012	40112	40212	40312	40412			
	Fault Type[2]	40013	40113	40213	40313	40413			
	Percent kW	40014	40114	40214	40314	40414	0.5		%
	Total kW	40015	40115	40215	40315	40415			
	NFPA 110[3]	40016	40116	40216	40316	40416			
	Extended[4]	40017	40117	40217	40317	40417			
nvoGenACData	Frequency	40018	40118	40218	40318	40418	0.1		Hz
	Total pf	40019	40119	40219	40319	40419	0.00005		PF
	Total kva	40020	40120	40220	40320	40420	1.0		KVA
	Total kW	40021	40121	40221	40321	40421	1.0		KW
	Total kvar	40022	40122	40222	40322	40422	1.0		KVAR
	Volts ab	40023	40123	40223	40323	40423	1.0		Volts
	Volts bc	40024	40124	40224	40324	40424	1.0		Volts
	Volts ca	40025	40125	40225	40325	40425	1.0		Volts
	Volts a	40026	40126	40226	40326	40426	1.0		Volts
	Volts b	40027	40127	40227	40327	40427	1.0		Volts
	Volts c	40028	40128	40228	40328	40428	1.0		Volts
	Amps a	40029	40129	40229	40329	40429	1.0		Amps
	Amps b	40030	40130	40230	40330	40430	1.0		Amps
	Amps c	40031	40131	40231	40331	40431	1.0		Amps
	Percent Amps a	40032	40132	40232	40332	40432	0.5		%
	Percent Amps b	40033	40133	40233	40333	40433	0.5		%
	Percent Amps c	40034	40134	40234	40334	40434	0.5		%
* Fault codes are listed in the genset Operator's/Service Manuals.							Data = Multiplier x (Register + Offset)		

TABLE 20-9. MODLON REGISTER MAPPING INFORMATION – FT-10 NETWORK (TEMPLATE 1) SINGLE POWERCOMMAND GENSET (CCM-G) (SHEET 2 OF 2)

Structure	Data Point	ModBus Registers					Scaling		
		GEN[0]	GEN[1]	GEN[2]	GEN[3]	GEN[4]	Multiplier	Offset	Units
nvoGenEngData	Battery Voltage	40035	40135	40235	40335	40435	0.1		Volts DC
	Oil Pressure	40036	40136	40236	40336	40436	0.1		KPA
	Oil Temp (see Note 2)	40037	40137	40237	40337	40437	0.1		Deg Kelvin
	Coolant Temp	40038	40138	40238	40338	40438	0.1		Deg Kelvin
	Misc Temp 1 (see Note 4)	40039	40139	40239	40339	40439	0.1		Deg Kelvin
	Misc Temp 2 (see Note 4)	40040	40140	40240	40340	40440	0.1		Deg Kelvin
	Fuel Rate (see Note 3)	40041	40141	40241	40341	40441	0.01		GPH
	Engine RPM	40042	40142	40242	40342	40442	1.0		RPM
	Engine Starts	40043	40143	40243	40343	40443	1.0		starts
	Eng Runtime (High) (see Notes 1 and 5)	40044	40144	40244	40344	40444			
	Eng Runtime (Low)	40045	40145	40245	40345	40445	0.1		Sec
	Total kwh (High) (see Note 1)	40046	40146	40246	40346	40446			
	Total kwh (Low)	40047	40147	40247	40347	40447	1.0		kwh
	Total Fuel (High) (see Notes 1 and 3)	40048	40148	40248	40348	40448			
	Total Fuel (Low)	40049	40149	40249	40349	40449	0.01		Gal
Genset Control	Start/Stop	40050	40150	40250	40350	40450			
	Reset	40051	40151	40251	40351	40451			
* Fault codes are listed in the genset Operator's/Service Manuals.							Data = Multiplier x (Register + Offset)		

NOTES:

1. For the Data Points Engine Runtime, the Total kwh and Total Fuel for the two registers designated as high and low are put together as an unsigned double integer. This is accomplished by multiplying the value in the high register by 65536 and adding it to the value in the low register. Most software packages automatically perform this calculation if the value is simply identified as an unsigned double integer.
2. Value not supported in the 3200 controller.
3. Value not supported in the 3100 controller.
4. Value not supported.
5. With 3100 and 2100 controllers, the units are hours. With the 3200 controller, the units are seconds. The multiplier is always 0.1

For all 3100 controllers, the values given are based on using EEPROM firmware, version 2.0 or greater. The values for Engine Runtime and Total kwh are not available on QST-30 gensets.

[1]State	
Digital Value	**Description**
0	Stopped
1	Start Pending
2	Warmup at Idle
3	Running
4	Cooldown at Rated
5	Cooldown at Idle

[2]Fault Type	
Digital Value	**Description**
0	Normal
1	Warning
2	Derate
3	Shutdown with Cooldown
4	Shutdown

[3]NFPA110	
Description	**Bit**
Normal Power	0 (MSB)
Genset Supplying Load	1
Genset Running	2
Not in Auto	3
High Battery Voltage	4
Low Battery Voltage	5
Charger AC Failure	6
Fail to Start	7
Low Coolant Temperature	8
Pre-High Engine Temperature	9
High Engine Temperature	10
Pre-Low Oil Pressure	11
Low Oil Pressure	12
Overspeed	13
Low Coolant Level	14
Low Fuel Level	15 (LSB)

[4]Extended	
Description	**Bit**
Check Genset	0 (MSB)
Ground Fault	1
High AC Voltage	2
Low AC Voltage	3
Under Frequency	4
Overload	5
Overcurrent	6
Short Circuit	7
Reverse KW	8
Reverse KVAR	9
Fail to Sync	10
Fail to Close	11
Load Demand	12
Genset Circuit Breaker Tripped	13
Utility Circuit Breaker Tripped	14
Emergency Stop	15 (LSB)

TABLE 20-10. MODLON REGISTER MAPPING INFORMATION – FT-10 NETWORK (TEMPLATE 1) AUTOMATIC TRANSFER SWITCH CONTROL COMMUNICATIONS MODULE (CCM-T) (SHEET 1 OF 2)

Structure	Data Point	ModBus Registers					Scaling		
		NCM[0]	NCM[1]	NCM[2]	NCM[3]	NCM[4]	Multiplier	Offset	Units
nvoATSStatus	Name [0,1]	41001	41101	41201	41301	41401			
	Name [2,3]	41002	41102	41202	41302	41402			
	Name [4,5]	41003	41103	41203	41303	41403			
	Name [6,7]	41004	41104	41204	41304	41404			
	Name [8,9]	41005	41105	41205	41305	41405			
	Name [10,11]	41006	41106	41206	41306	41406			
	Name [12,13]	41007	41107	41207	41307	41407			
	Name [14,15]	41008	41108	41208	41308	41408			
	Device Type	41009	41109	41209	41309	41409			
	Mode[1]	41010	41110	41210	41310	41410			
	State[2]	41011	41111	41211	41311	41411			
	Fault Code	41012	41112	41212	41312	41412			
	Fault Type[3]	41013	41113	41213	41313	41413			
	Percent Amps	41014	41114	41214	41314	41414	0.5		%
	Total kW	41015	41115	41215	41315	41415			
	NFPA 110[4]	41016	41116	41216	41316	41416			
	Extended[5]	41017	41117	41217	41317	41417			
nvoACDataLoad	Frequency	41018	41118	41218	41318	41418	0.1		Hz
	Total pf	41019	41119	41219	41319	41419	0.00005		PF
	Total kva	41020	41120	41220	41320	41420	1.0		KVA
	Total kW	41021	41121	41221	41321	41421	1.0		KW
	Total kvar	41022	41122	41222	41322	41422	1.0		KVAR
	Volts ab	41023	41123	41223	41323	41423	1.0		Volts
	Volts bc	41024	41124	41224	41324	41424	1.0		Volts
	Volts ca	41025	41125	41225	41325	41425	1.0		Volts
	Volts a	41026	41126	41226	41326	41426	1.0		Volts
	Volts b	41027	41127	41227	41327	41427	1.0		Volts
	Volts c	41028	41128	41228	41328	41428	1.0		Volts
	Amps a	41029	41129	41229	41329	41429	1.0		Amps
	Amps b	41030	41130	41230	41330	41430	1.0		Amps
	Amps c	41031	41131	41231	41331	41431	1.0		Amps
	Percent Amps a	41032	41132	41232	41332	41432	0.5		%
	Percent Amps b	41033	41133	41233	41333	41433	0.5		%
	Percent Amps c	41034	41134	41234	41334	41434	0.5		%
							Data = Multiplier x (Register + Offset)		

TABLE 20-10. MODLON REGISTER MAPPING INFORMATION – FT-10 NETWORK (TEMPLATE 1) AUTOMATIC TRANSFER SWITCH CONTROL COMMUNICATIONS MODULE (CCM-T) (SHEET 2 OF 2)

Structure	Data Point	ModBus Registers					Scaling		
		NCM[0]	NCM[1]	NCM[2]	NCM[3]	NCM[4]	Multiplier	Offset	Units
nvoACDataSrc1	Frequency	41035	41135	41235	41335	41435	0.1		Hz
	Total pf	41036	41136	41236	41336	41436	0.00005		PF
	Total kva	41037	41137	41237	41337	41437	1.0		KVA
	Total kW	41038	41138	41238	41338	41438	1.0		KW
	Total kvar	41039	41139	41239	41339	41439	1.0		KVAR
	Volts ab	41040	41140	41240	41340	41440	1.0		Volts
	Volts bc	41041	41141	41241	41341	41441	1.0		Volts
	Volts ca	41042	41142	41242	41342	41442	1.0		Volts
	Volts a	41043	41143	41243	41343	41443	1.0		Volts
	Volts b	41044	41144	41244	41344	41444	1.0		Volts
	Volts c	41045	41145	41245	41345	41445	1.0		Volts
	Amps a	41046	41146	41246	41346	41446	1.0		Amps
	Amps b	41047	41147	41247	41347	41447	1.0		Amps
	Amps c	41048	41148	41248	41348	41448	1.0		Amps
	Percent Amps a	41049	41149	41249	41349	41449	0.5		%
	Percent Amps b	41050	41150	41250	41350	41450	0.5		%
	Percent Amps c	41051	41151	41251	41351	41451	0.5		%
nvoACDataSrc2	Frequency	41052	41152	41252	41352	41452	0.1		Hz
	Total pf	41053	41153	41253	41353	41453	0.00005		PF
	Total kva	41054	41154	41254	41354	41454	1.0		KVA
	Total kW	41055	41155	41255	41355	41455	1.0		KW
	Total kvar	41056	41156	41256	41356	41456	1.0		KVAR
	Volts ab	41057	41157	41257	41357	41457	1.0		Volts
	Volts bc	41058	41158	41258	41358	41458	1.0		Volts
	Volts ca	41059	41159	41259	41359	41459	1.0		Volts
	Volts a	41060	41160	41260	41360	41460	1.0		Volts
	Volts b	41061	41161	41261	41361	41461	1.0		Volts
	Volts c	41062	41162	41262	41362	41462	1.0		Volts
	Amps a	41063	41163	41263	41363	41463	1.0		Amps
	Amps b	41064	41164	41264	41364	41464	1.0		Amps
	Amps c	41065	41165	41265	41365	41465	1.0		Amps
	Percent Amps a	41066	41166	41266	41366	41466	0.5		%
	Percent Amps b	41067	41167	41267	41367	41467	0.5		%
	Percent Amps c	41068	41168	41268	41368	41468	0.5		%
Control	Test	41069	41169	41269	41369	41469			
	Reset	41070	41170	41270	41370	41470			
							Data = Multiplier x (Register + Offset)		

[1]Mode	
Digital Value	**Description**
0	Test
1	Utility/Genset
2	Utility/Utility
3	Genset/Genset

[2]State	
Digital Value	**Description**
0	Neutral Position
1	Source 1 Connected
2	Source 2 Connected
3	Source 1 and 2 Connected

[3]Fault Type	
Digital Value	**Description**
0	No Faults
1	Warning

[4]NFPA 110	
Description	**Bit**
Source 1 Connected	0 (MSB)
Source 2 Connected	1
N/A	2
Not In Auto	3
N/A	4
N/A	5
Charger AC Failure	6
N/A	7
N/A	8
N/A	9
N/A	10
N/A	11
N/A	12
N/A	13
N/A	14
N/A	15 (LSB)

[5]Extended	
Description	**Bit**
Source 1 Available	0 (MSB)
Source 2 Available	1
Source 1 Connected	2
Source 2 Connected	3
ATS Common Alarm	4
Not In Auto	5
Test / Exercise in Progress	6
Low Battery Voltage	7
Load Shed	8
Transfer Inhibit	9
Retransfer Inhibit	10
Fail to Close	11
Fail to Disconnect	12
Fail to Synchronize	13
Bypass to Source 1	14
Bypass to Source 2	15 (LSB)

TABLE 20-11. MODLON REGISTER MAPPING INFORMATION – FT-10 NETWORK (TEMPLATE 1) DIGITAL INPUT/OUTPUT MODULE (DIM)

Structure	Data Point	ModBus Register	
		DIM[0]	DIM[1]
nvoNodeStatus	Relay 1	41501	41601
	Relay 2	41502	41602
	Relay 3	41503	41603
	Relay 4	41504	41604
	Relay 5	41505	41605
	Relay 6	41506	41606
	Relay 7	41507	41607
	Relay 8	41508	41608
	Relay 9	41509	41609
	Relay 10	41510	41610
	Relay 11	41511	41611
	Relay 12	41512	41612
	Relay 13	41513	41613
	Relay 14	41514	41614
	Relay 15	41515	41615
	Relay 16	41516	41616
	Input 1	41517	41617
	Input 2	41518	41618
	Input 3	41519	41619
	Input 4	41520	41620
	Input 5	41521	41621
	Input 6	41522	41622
	Input 7	41523	41623
	Input 8	41524	41624
Control	nvi16RelayA	41525	41625

TABLE 20-12. MODLON REGISTER MAPPING INFORMATION – FT-10 NETWORK (TEMPLATE 2) PARALLELING POWERCOMMAND GENSET (CCM-G) (SHEET 1 OF 2)

Structure	Data Point	ModBus Registers					Scaling		
		GEN[0]	GEN[1]	GEN[2]	GEN[3]	GEN[4]	Multiplier	Offset	Units
nvoGenStatus	Name [0,1]	40001	40101	40201	40301	40401			
	Name [2,3]	40002	40102	40202	40302	40402			
	Name [4,5]	40003	40103	40203	40303	40403			
	Name [6,7]	40004	40104	40204	40304	40404			
	Name [8,9]	40005	40105	40205	40305	40405			
	Name [10,11]	40006	40106	40206	40306	40406			
	Name [12,13]	40007	40107	40207	40307	40407			
	Name [14,15]	40008	40108	40208	40308	40408			
	Device Type	40009	40109	40209	40309	40409			
	Control Switch	40010	40110	40210	40310	40410			
	State[1]	40011	40111	40211	40311	40411			
	Fault Code*	40012	40112	40212	40312	40412			
	Fault Type[2]	40013	40113	40213	40313	40413			
	Percent kW	40014	40114	40214	40314	40414	0.5		%
	Total kW	40015	40115	40215	40315	40415			
	NFPA 110[3]	40016	40116	40216	40316	40416			
	Extended[4]	40017	40117	40217	40317	40417			
nvoGenACData	Frequency	40018	40118	40218	40318	40418	0.1		Hz
	Total pf	40019	40119	40219	40319	40419	0.00005		PF
	Total kva	40020	40120	40220	40320	40420	1.0		KVA
	Total kW	40021	40121	40221	40321	40421	1.0		KW
	Total kvar	40022	40122	40222	40322	40422	1.0		KVAR
	Volts ab	40023	40123	40223	40323	40423	1.0		Volts
	Volts bc	40024	40124	40224	40324	40424	1.0		Volts
	Volts ca	40025	40125	40225	40325	40425	1.0		Volts
	Volts a	40026	40126	40226	40326	40426	1.0		Volts
	Volts b	40027	40127	40227	40327	40427	1.0		Volts
	Volts c	40028	40128	40228	40328	40428	1.0		Volts
	Amps a	40029	40129	40229	40329	40429	1.0		Amps
	Amps b	40030	40130	40230	40330	40430	1.0		Amps
	Amps c	40031	40131	40231	40331	40431	1.0		Amps
	Percent Amps a	40032	40132	40232	40332	40432	0.5		%
	Percent Amps b	40033	40133	40233	40333	40433	0.5		%
	Percent Amps c	40034	40134	40234	40334	40434	0.5		%
* Fault codes are listed in the genset Operator's/Service Manuals.							Data = Multiplier x (Register + Offset)		

TABLE 20-12. MODLON REGISTER MAPPING INFORMATION – FT-10 NETWORK (TEMPLATE 2) PARALLELING POWERCOMMAND GENSET (CCM-G) (SHEET 2 OF 2)

Structure	Data Point	ModBus Registers					Scaling		
		GEN[0]	GEN[1]	GEN[2]	GEN[3]	GEN[4]	Multiplier	Offset	Units
nvoGenEngData	Battery Voltage	40035	40135	40235	40335	40435	0.1		Volts DC
	Oil Pressure	40036	40136	40236	40336	40436	0.1		KPA
	Oil Temp (see Note 2)	40037	40137	40237	40337	40437	0.1		Deg Kelvin
	Coolant Temp	40038	40138	40238	40338	40438	0.1		Deg Kelvin
	Misc Temp 1 (see Note 4)	40039	40139	40239	40339	40439	0.1		Deg Kelvin
	Misc Temp 2 (see Note 4)	40040	40140	40240	40340	40440	0.1		Deg Kelvin
	Fuel Rate (see Note 3)	40041	40141	40241	40341	40441	0.01		GPH
	Engine RPM	40042	40142	40242	40342	40442	1.0		RPM
	Engine Starts	40043	40143	40243	40343	40443	1.0		Starts
	Eng Runtime (High) (see Notes 1 and 5)	40044	40144	40244	40344	40444			
	Eng Runtime (Low)	40045	40145	40245	40345	40445	0.1		Sec
	Total kwh (High) (see Note 1)	40046	40146	40246	40346	40446			
	Total kwh (Low)	40047	40147	40247	40347	40447	1.0		KWH
	Total Fuel (High) (see Notes 1 and 3)	40048	40148	40248	40348	40448			
	Total Fuel (Low)	40049	40149	40249	40349	40449	0.01		Gal
nvoGenParaData	Frequency	40050	40150	40250	40350	40450	0.1		Hz
	Volts ab	40051	40151	40251	40351	40451	1.0		Volts
	Volts bc	40052	40152	40252	40352	40452	1.0		Volts
	Volts ca	40053	40153	40253	40353	40453	1.0		Volts
	Volts a	40054	40154	40254	40354	40454	1.0		Volts
	Volts b	40055	40155	40255	40355	40455	1.0		Volts
	Volts c	40056	40156	40256	40356	40456	1.0		Volts
	Customer Faults	40057	40157	40257	40357	40457			
	Network Faults	40058	40158	40258	40358	40458			
	Custom	40059	40159	40259	40359	40459			
	ES State[5]	40060	40160	40260	40360	40460			
	Load Share State[6]	40061	40161	40261	40361	40461			
	Load Govern State kw[7]	40062	40162	40262	40362	40462			
	Load Govern State kvar[8]	40063	40163	40263	40363	40463			
	Genset CB Position[9]	40064	40164	40264	40364	40464			
	Utility CB Position[10]	40065	40165	40265	40365	40465			
Genset Control	Start/Stop	40066	40166	40266	40366	40466			
	Reset	40067	40167	40267	40367	40467			
* Fault codes are listed in the genset Operator's/Service Manuals.							Data = Multiplr x (Reg + Offset)		

NOTES:

1. For the Data Points Engine Runtime, the Total kwh and Total Fuel for the two registers designated as high and low are put together as an unsigned double integer. This is accomplished by multiplying the value in the high register by 65536 and adding it to the value in the low register. Most software packages automatically perform this calculation if the value is simply identified as an unsigned double integer.
2. Value not supported in the 3200 controller.
3. Value not supported in the 3100 controller.
4. Value not supported.
5. With 3100 and 2100 controllers, the units are hours. With the 3200 controller, the units are seconds. The multiplier is always 0.1.
   For all 3100 controllers, the values given are based on using EEPROM firmware, version 2.0 or greater. The values for Engine Runtime and Total kwh are not available on QST-30 gensets.

[1]State	
Digital Value	**Description**
0	Stopped
1	Start Pending
2	Warmup at Idle
3	Running
4	Cooldown at Rated
5	Cooldown at Idle

[2]Fault Type	
Digital Value	**Description**
0	Normal
1	Warning
2	Derate
3	Shutdown with Cooldown
4	Shutdown

[3]NFPA 110	
Description	**Bit**
Normal Power	0 (MSB)
Genset Supplying Load	1
Genset Running	2
Not in Auto	3
High Battery Voltage	4
Low Battery Voltage	5
Charger AC Failure	6
Fail to Start	7
Low Coolant Temperature	8
Pre-High Engine Temperature	9
High Engine Temperature	10
Pre-Low Oil Pressure	11
Low Oil Pressure	12
Overspeed	13
Low Coolant Level	14
Low Fuel Level	15 (LSB)

[4]Extended	
Description	**Bit**
Check Genset	0 (MSB)
Ground Fault	1
High AC Voltage	2
Low AC Voltage	3
Under Frequency	4
Overload	5
Overcurrent	6
Short Circuit	7
Reverse KW	8
Reverse KVAR	9
Fail to Sync	10
Fail to Close	11
Load Demand	12
Genset Circuit Breaker Tripped	13
Utility Circuit Breaker Tripped	14
Emergency Stop	15 (LSB)

[5]ES State	
Digital Value	**Description**
0	Standby
1	Dead Bus Close
2	Synchronizing
3	Load Share
4	Load Govern

[6]Load Share State	
Digital Value	**Description**
0	Not in Load Share
1	Track Load
2	Ramp Load
3	Ramp Unload
4	Load Demand Shutdown

[7]Load Govern State KW	
Digital Value	**Description**
0	Not Applicable
1	Ramp Load
2	Track Target Load
3	Ramp Unload
4	Ramp Unload Done

[8]Load Govern State KVAR	
Digital Value	**Description**
0	Not Applicable
1	Ramp Load
2	Track Target Load
3	Ramp Unload
4	Ramp Unload Done

[9]Genset CB Position	
Digital Value	**Description**
0	Open
1	Closed
2	Unavailable
3	Inhibit

[10]Utility CB Position	
Digital Value	**Description**
0	Open
1	Closed
2	Unavailable
3	Inhibit

TABLE 20-13. MODLON REGISTER MAPPING INFORMATION – FT-10 NETWORK (TEMPLATE 2) AUTOMATIC TRANSFER SWITCH CONTROL COMMUNICATIONS MODULE (CCM-T)

Structure	Data Point	ModBus Registers					Scaling		
		NCM[0]	NCM[1]	NCM[2]	NCM[3]	NCM[4]	Multiplier	Offset	Units
nvoATSStatus	Name [0,1]	41001	41101	41201	41301	41401			
	Name [2,3]	41002	41102	41202	41302	41402			
	Name [4,5]	41003	41103	41203	41303	41403			
	Name [6,7]	41004	41104	41204	41304	41404			
	Name [8,9]	41005	41105	41205	41305	41405			
	Name [10,11]	41006	41106	41206	41306	41406			
	Name [12,13]	41007	41107	41207	41307	41407			
	Name [14,15]	41008	41108	41208	41308	41408			
	Device Type	41009	41109	41209	41309	41409			
	Mode[1]	41010	41110	41210	41310	41410			
	State[2]	41011	41111	41211	41311	41411			
	Fault Code	41012	41112	41212	41312	41412			
	Fault Type[3]	41013	41113	41213	41313	41413			
	Percent Amps	41014	41114	41214	41314	41414	0.5		%
	Total kW	41015	41115	41215	41315	41415			
	NFPA 110[4]	41016	41116	41216	41316	41416			
	Extended[5]	41017	41117	41217	41317	41417			
nvoACDataLoad	Frequency	41018	41118	41218	41318	41418	0.1		Hz
	Total pf	41019	41119	41219	41319	41419	0.00005		PF
	Total kva	41020	41120	41220	41320	41420	1.0		KVA
	Total kW	41021	41121	41221	41321	41421	1.0		KW
	Total kvar	41022	41122	41222	41322	41422	1.0		KVAR
	Volts ab	41023	41123	41223	41323	41423	1.0		Volts
	Volts bc	41024	41124	41224	41324	41424	1.0		Volts
	Volts ca	41025	41125	41225	41325	41425	1.0		Volts
	Volts a	41026	41126	41226	41326	41426	1.0		Volts
	Volts b	41027	41127	41227	41327	41427	1.0		Volts
	Volts c	41028	41128	41228	41328	41428	1.0		Volts
	Amps a	41029	41129	41229	41329	41429	1.0		Amps
	Amps b	41030	41130	41230	41330	41430	1.0		Amps
	Amps c	41031	41131	41231	41331	41431	1.0		Amps
	Percent Amps a	41032	41132	41232	41332	41432	0.5		%
	Percent Amps b	41033	41133	41233	41333	41433	0.5		%
	Percent Amps c	41034	41134	41234	41334	41434	0.5		%
Control	Test	41035	41135	41235	41335	41435			
	Reset	41036	41136	41236	41336	41436			
							Data = Multiplier x (Register + Offset)		

[1]Mode	
Digital Value	**Description**
0	Test
1	Utility/Genset
2	Utility/Utility
3	Genset/Genset

[2]State	
Digital Value	**Description**
0	Neutral Position
1	Source 1 Connected
2	Source 2 Connected
3	Source 1 and 2 Connected

[3]Fault Type	
Digital Value	**Description**
0	No Faults
1	Warning

[4]NFPA 110	
Description	**Bit**
Source 1 Connected	0 (MSB)
Source 2 Connected	1
N/A	2
Not In Auto	3
N/A	4
N/A	5
Charger AC Failure	6
N/A	7
N/A	8
N/A	9
N/A	10
N/A	11
N/A	12
N/A	13
N/A	14
N/A	15 (LSB)

[5]Extended	
Description	**Bit**
Source 1 Available	0 (MSB)
Source 2 Available	1
Source 1 Connected	2
Source 2 Connected	3
ATS Common Alarm	4
Not In Auto	5
Test / Exercise in Progress	6
Low Battery Voltage	7
Load Shed	8
Transfer Inhibit	9
Retransfer Inhibit	10
Fail to Close	11
Fail to Disconnect	12
Fail to Synchronize	13
Bypass to Source 1	14
Bypass to Source 2	15 (LSB)

TABLE 20-14. MODLON REGISTER MAPPING INFORMATION – FT-10 NETWORK (TEMPLATE 2) DIGITAL INPUT/OUTPUT MODULE (DIM)

Structure	Data Point	ModBus Register	
		DIM[0]	DIM[1]
nvoNodeStatus	Relay 1	41501	41601
	Relay 2	41502	41602
	Relay 3	41503	41603
	Relay 4	41504	41604
	Relay 5	41505	41605
	Relay 6	41506	41606
	Relay 7	41507	41607
	Relay 8	41508	41608
	Relay 9	41509	41609
	Relay 10	41510	41610
	Relay 11	41511	41611
	Relay 12	41512	41612
	Relay 13	41513	41613
	Relay 14	41514	41614
	Relay 15	41515	41615
	Relay 16	41516	41616
	Input 1	41517	41617
	Input 2	41518	41618
	Input 3	41519	41619
	Input 4	41520	41620
	Input 5	41521	41621
	Input 6	41522	41622
	Input 7	41523	41623
	Input 8	41524	41624
Control	nvi16RelayA	41525	41625

TABLE 20-15. MODLON REGISTER MAPPING INFORMATION – FT-10 NETWORK (TEMPLATE 3 AND 4) PARALLELING PCC GENSET (CCM-G) (SHEET 1 OF 3)

Structure	Data Point	ModBus Registers										Scaling		
		GEN[0]	GEN[1]	GEN[2]	GEN[3]	GEN[4]	GEN[5]	GEN[6]	GEN[7]	GEN[8]	GEN[9]	Multiplier	Offset	Units
nvoGenStatus	Name [0,1]	40001	40101	40201	40301	40401	40501	40601	40701	40801	40901			
	Name [2,3]	40002	40102	40202	40302	40402	40502	40602	40702	40802	40902			
	Name [4,5]	40003	40103	40203	40303	40403	40503	40603	40703	40803	40903			
	Name [6,7]	40004	40104	40204	40304	40404	40504	40604	40704	40804	40904			
	Name [8,9]	40005	40105	40205	40305	40405	40505	40605	40705	40805	40905			
	Name [10,11]	40006	40106	40206	40306	40406	40506	40606	40706	40806	40906			
	Name [12,13]	40007	40107	40207	40307	40407	40507	40607	40707	40807	40907			
	Name [14,15]	40008	40108	40208	40308	40408	40508	40608	40708	40808	40908			
	Device Type	40009	40109	40209	40309	40409	40509	40609	40709	40809	40909			
	Control Switch	40010	40110	40210	40310	40410	40510	40610	40710	40810	40910			
	State[1]	40011	40111	40211	40311	40411	40511	40611	40711	40811	40911			
	Fault Code*	40012	40112	40212	40312	40412	40512	40612	40712	40812	40912			
	Fault Type[2]	40013	40113	40213	40313	40413	40513	40613	40713	40813	40913			
	Percent kW	40014	40114	40214	40314	40414	40514	40614	40714	40814	40914	0.5		%
	Total kW	40015	40115	40215	40315	40415	40515	40615	40715	40815	40915			
	NFPA 110[3]	40016	40116	40216	40316	40416	40516	40616	40716	40816	40916			
	Extended[4]	40017	40117	40217	40317	40417	40517	40617	40717	40817	40917			
nvoGenACData	Frequency	40018	40118	40218	40318	40418	40518	40618	40718	40818	40918	0.1		Hz
	Total pf	40019	40119	40219	40319	40419	40519	40619	40719	40819	40919	0.00005		PF
	Total kva	40020	40120	40220	40320	40420	40520	40620	40720	40820	40920	1.0		KVA
	Total kW	40021	40121	40221	40321	40421	40521	40621	40721	40821	40921	1.0		KW
	Total kvar	40022	40122	40222	40322	40422	40522	40622	40722	40822	40922	1.0		KVAR
	Volts ab	40023	40123	40223	40323	40423	40523	40623	40723	40823	40923	1.0		Volts
	Volts bc	40024	40124	40224	40324	40424	40524	40624	40724	40824	40924	1.0		Volts
	Volts ca	40025	40125	40225	40325	40425	40525	40625	40725	40825	40925	1.0		Volts
	Volts a	40026	40126	40226	40326	40426	40526	40626	40726	40826	40926	1.0		Volts
	Volts b	40027	40127	40227	40327	40427	40527	40627	40727	40827	40927	1.0		Volts
	Volts c	40028	40128	40228	40328	40428	40528	40628	40728	40828	40928	1.0		Volts
	Amps a	40029	40129	40229	40329	40429	40529	40629	40729	40829	40929	1.0		Amps
	Amps b	40030	40130	40230	40330	40430	40530	40630	40730	40830	40930	1.0		Amps
	Amps c	40031	40131	40231	40331	40431	40531	40631	40731	40831	40931	1.0		Amps
	Percent Amps a	40032	40132	40232	40332	40432	40532	40632	40732	40832	40932	0.5		%
	Percent Amps b	40033	40133	40233	40333	40433	40533	40633	40733	40833	40933	0.5		%
	Percent Amps c	40034	40134	40234	40334	40434	40534	40634	40734	40834	40934	0.5		%
* Fault codes are listed in the genset Operator's/Service Manuals.												Data = Multiplier x (Register + Offset)		

TABLE 20-1. MODLON REGISTER MAPPING INFORMATION – FT-10 NETWORK (TEMPLATE 3 AND 4) PARALLELING PCC GENSET (CCM-G) (SHEET 2 OF 3)

Structure	Data Point	ModBus Registers										Scaling		
		GEN[0]	GEN[1]	GEN[2]	GEN[3]	GEN[4]	GEN[5]	GEN[6]	GEN[7]	GEN[8]	GEN[9]	Multiplier	Offset	Units
nvoGen EngData	Battery Voltage	40035	40135	40235	40335	40435	40535	40635	40735	40835	40935	0.1		Volts DC
	Oil Pressure	40036	40136	40236	40336	40436	40536	40636	40736	40836	40936	0.1		KPA
	Oil Temp (see Note 2)	40037	40137	40237	40337	40437	40537	40637	40737	40837	40937	0.1		Deg Kelvin
	Coolant Temp	40038	40138	40238	40338	40438	40538	40638	40738	40838	40938	0.1		Deg Kelvin
	Misc Temp 1 (see Note 4)	40039	40139	40239	40339	40439	40539	40639	40739	40839	40939	0.1		Deg Kelvin
	Misc Temp 2 (see Note 4)	40040	40140	40240	40340	40440	40540	40640	40740	40840	40940	0.1		Deg Kelvin
	Fuel Rate (see Note 3)	40041	40141	40241	40341	40441	40541	40641	40741	40841	40941	0.01		GPH
	Engine RPM	40042	40142	40242	40342	40442	40542	40642	40742	40842	40942	1.0		RPM
	Engine Starts	40043	40143	40243	40343	40443	40543	40643	40743	40843	40943	1.0		Starts
	Eng Runtime (High) (see Notes 1 and 5)	40044	40144	40244	40344	40444	40544	40644	40744	40844	40944			
	Eng Runtime (Low)	40045	40145	40245	40345	40445	40545	40645	40745	40845	40945	0.1		Sec
	Total kwh (High) (see Note 1)	40046	40146	40246	40346	40446	40546	40646	40746	40846	40946			
	Total kwh (Low)	40047	40147	40247	40347	40447	40547	40647	40747	40847	40947	1.0		KWH
	Total Fuel (High)) (see Notes 1 and 3)	40048	40148	40248	40348	40448	40548	40648	40748	40848	40948			
	Total Fuel (Low)	40049	40149	40249	40349	40449	40549	40649	40749	40849	40949	0.01		Gal

NOTES:

1. For the Data Points Engine Runtime, the Total kwh and Total Fuel for the two registers designated as high and low are put together as an unsigned double integer. This is accomplished by multiplying the value in the high register by 65536 and adding it to the value in the low register. Most software packages automatically perform this calculation if the value is simply identified as an unsigned double integer.
2. Value not supported in the 3200 controller.
3. Value not supported in the 3100 controller.
4. Value not supported.
5. With 3100 and 2100 controllers, the units are hours. With the 3200 controller, the units are seconds. The multiplier is always 0.1

For all 3100 controllers, the values given are based on using EEPROM firmware, version 2.0 or greater. The values for Engine Runtime and Total kwh are not available on QST-30 gensets.

TABLE 20-1. MODLON REGISTER MAPPING INFORMATION – FT-10 NETWORK (TEMPLATE 3 AND 4) PARALLELING PCC GENSET (CCM-G) (SHEET 3 OF 3)

Structure	Data Point	ModBus Registers										Scaling		
		GEN[0]	GEN[1]	GEN[2]	GEN[3]	GEN[4]	GEN[5]	GEN[6]	GEN[7]	GEN[8]	GEN[9]	Multiplier	Offset	Units
nvoGenParaData	Frequency	40050	40150	40250	40350	40450	40550	40650	40750	40850	40950	0.1		Hz
	Volts ab	40051	40151	40251	40351	40451	40551	40651	40751	40851	40951	1.0		Volts
	Volts bc	40052	40152	40252	40352	40452	40552	40652	40752	40852	40952	1.0		Volts
	Volts ca	40053	40153	40253	40353	40453	40553	40653	40753	40853	40953	1.0		Volts
	Volts a	40054	40154	40254	40354	40454	40554	40654	40754	40854	40954	1.0		Volts
	Volts b	40055	40155	40255	40355	40455	40555	40655	40755	40855	40955	1.0		Volts
	Volts c	40056	40156	40256	40356	40456	40556	40656	40756	40856	40956	1.0		Volts
	Customer Faults	40057	40157	40257	40357	40457	40557	40657	40757	40857	40957			
	Network Faults	40058	40158	40258	40358	40458	40558	40658	40758	40858	40958			
	Custom	40059	40159	40259	40359	40459	40559	40659	40759	40859	40959			
	ES State[5]	40060	40160	40260	40360	40460	40560	40660	40760	40860	40960			
	Load Share State[6]	40061	40161	40261	40361	40461	40561	40661	40761	40861	40961			
	Load Govern State kw[7]	40062	40162	40262	40362	40462	40562	40662	40762	40862	40962			
	Load Govern State kvar[8]	40063	40163	40263	40363	40463	40563	40663	40763	40863	40963			
	Genset CB Position[9]	40064	40164	40264	40364	40464	40564	40664	40764	40864	40964			
	Utility CB Position[10]	40065	40165	40265	40365	40465	40565	40665	40765	40865	40965			
Genset Control	Start/Stop	40066	40166	40266	40366	40466	40566	40666	40766	40866	40966			
	Reset	40067	40167	40267	40367	40467	40567	40667	40767	40867	40967			
* Fault codes are listed in the genset Operator's/Service Manuals.												Data = Multiplr x (Reg + Offset)		

[1]State	
Digital Value	**Description**
0	Stopped
1	Start Pending
2	Warmup at Idle
3	Running
4	Cooldown at Rated
5	Cooldown at Idle

[2]Fault Type	
Digital Value	**Description**
0	Normal
1	Warning
2	Derate
3	Shutdown with Cooldown
4	Shutdown

[3]NFPA 110	
Description	**Bit**
Normal Power	0 (MSB)
Genset Supplying Load	1
Genset Running	2
Not in Auto	3
High Battery Voltage	4
Low Battery Voltage	5
Charger AC Failure	6
Fail to Start	7
Low Coolant Temperature	8
Pre-High Engine Temperature	9
High Engine Temperature	10
Pre-Low Oil Pressure	11
Low Oil Pressure	12
Overspeed	13
Low Coolant Level	14
Low Fuel Level	15 (LSB)

[4]Extended	
Description	**Bit**
Check Genset	0 (MSB)
Ground Fault	1
High AC Voltage	2
Low AC Voltage	3
Under Frequency	4
Overload	5
Overcurrent	6
Short Circuit	7
Reverse KW	8
Reverse KVAR	9
Fail to Sync	10
Fail to Close	11
Load Demand	12
Genset Circuit Breaker Tripped	13
Utility Circuit Breaker Tripped	14
Emergency Stop	15 (LSB)

[5]ES State	
Digital Value	**Description**
0	Standby
1	Dead Bus Close
2	Synchronizing
3	Load Share
4	Load Govern

[6]Load Share State	
Digital Value	**Description**
0	Not in Load Share
1	Track Load
2	Ramp Load
3	Ramp Unload
4	Load Demand Shutdown

[7]Load Govern State KW	
Digital Value	**Description**
0	Not Applicable
1	Ramp Load
2	Track Target Load
3	Ramp Unload
4	Ramp Unload Done

[8]Load Govern State KVAR	
Digital Value	**Description**
0	Not Applicable
1	Ramp Load
2	Track Target Load
3	Ramp Unload
4	Ramp Unload Done

[9]Genset CB Position	
Digital Value	**Description**
0	Open
1	Closed
2	Unavailable
3	Inhibit

[10]Utility CB Position	
Digital Value	**Description**
0	Open
1	Closed
2	Unavailable
3	Inhibit

TABLE 20-16. MODLON REGISTER MAPPING INFORMATION – FT-10 NETWORK (TEMPLATE 3 AND 4) AUTOMATIC TRANSFER SWITCH CONTROL COMMUNICATIONS MODULE (CCM-T) (SHEET 1 OF 2)

Structure	Data Point	ModBus Registers										Scaling		
		NCM[0]	NCM[1]	NCM[2]	NCM[3]	NCM[4]	NCM[5]	NCM[6]	NCM[7]	NCM[8]	NCM[9]	Multiplier	Offset	Units
nvoATSStatus	Name [0,1]	40001	40101	40201	40301	40401	40501	40601	40701	40801	40901			
	Name [2,3]	40002	40102	40202	40302	40402	40502	40602	40702	40802	40902			
	Name [4,5]	40003	40103	40203	40303	40403	40503	40603	40703	40803	40903			
	Name [6,7]	40004	40104	40204	40304	40404	40504	40604	40704	40804	40904			
	Name [8,9]	40005	40105	40205	40305	40405	40505	40605	40705	40805	40905			
	Name [10,11]	40006	40106	40206	40306	40406	40506	40606	40706	40806	40906			
	Name [12,13]	40007	40107	40207	40307	40407	40507	40607	40707	40807	40907			
	Name [14,15]	40008	40108	40208	40308	40408	40508	40608	40708	40808	40908			
	Device Type	40009	40109	40209	40309	40409	40509	40609	40709	40809	40909			
	Mode[1]	40010	40110	40210	40310	40410	40510	40610	40710	40810	40910			
	State[2]	40011	40111	40211	40311	40411	40511	40611	40711	40811	40911			
	Fault Code	40012	40112	40212	40312	40412	40512	40612	40712	40812	40912			
	Fault Type[3]	40013	40113	40213	40313	40413	40513	40613	40713	40813	40913			
	Percent Amps	40014	40114	40214	40314	40414	40514	40614	40714	40814	40914	0.5		%
	Total kW	40015	40115	40215	40315	40415	40515	40615	40715	40815	40915			
	NFPA 110[4]	40016	40116	40216	40316	40416	40516	40616	40716	40816	40916			
	Extended[5]	40017	40117	40217	40317	40417	40517	40617	40717	40817	40917			
nvoACDataLoad	Frequency	40018	40118	40218	40318	40418	40518	40618	40718	40818	40918	0.1		Hz
	Total pf	40019	40119	40219	40319	40419	40519	40619	40719	40819	40919	0.00005		PF
	Total kva	40020	40120	40220	40320	40420	40520	40620	40720	40820	40920	1.0		KVA
	Total kW	40021	40121	40221	40321	40421	40521	40621	40721	40821	40921	1.0		KW
	Total kvar	40022	40122	40222	40322	40422	40522	40622	40722	40822	40922	1.0		KVAR
	Volts ab	40023	40123	40223	40323	40423	40523	40623	40723	40823	40923	1.0		Volts
	Volts bc	40024	40124	40224	40324	40424	40524	40624	40724	40824	40924	1.0		Volts
	Volts ca	40025	40125	40225	40325	40425	40525	40625	40725	40825	40925	1.0		Volts
	Volts a	40026	40126	40226	40326	40426	40526	40626	40726	40826	40926	1.0		Volts
	Volts b	40027	40127	40227	40327	40427	40527	40627	40727	40827	40927	1.0		Volts
	Volts c	40028	40128	40228	40328	40428	40528	40628	40728	40828	40928	1.0		Volts
	Amps a	40029	40129	40229	40329	40429	40529	40629	40729	40829	40929	1.0		Amps
	Amps b	40030	40130	40230	40330	40430	40530	40630	40730	40830	40930	1.0		Amps
	Amps c	40031	40131	40231	40331	40431	40531	40631	40731	40831	40931	1.0		Amps
	Percent Amps a	40032	40132	40232	40332	40432	40532	40632	40732	40832	40932	0.5		%
	Percent Amps b	40033	40133	40233	40333	40433	40533	40633	40733	40833	40933	0.5		%
	Percent Amps c	40034	40134	40234	40334	40434	40534	40634	40734	40834	40934	0.5		%
												Data = Multiplier x (Register + Offset)		

TABLE 20-16. MODLON REGISTER MAPPING INFORMATION – FT-10 NETWORK (TEMPLATE 3 AND 4) AUTOMATIC TRANSFER SWITCH CONTROL COMMUNICATIONS MODULE (CCM-T) (SHEET 2 OF 2)

Structure	Data Point	ModBus Registers										Scaling		
		NCM[0]	NCM[1]	NCM[2]	NCM[3]	NCM[4]	NCM[5]	NCM[6]	NCM[7]	NCM[8]	NCM[9]	Multiplier	Offset	Units
nvoACDataSrc1	Frequency	40035	40135	40235	40335	40435	40535	40635	40735	40835	40935	0.1		Hz
	Total pf	40036	40136	40236	40336	40436	40536	40636	40736	40836	40936	0.00005		PF
	Total kva	40037	40137	40237	40337	40437	40537	40637	40737	40837	40937	1.0		KVA
	Total kW	40038	40138	40238	40338	40438	40538	40638	40738	40838	40938	1.0		KW
	Total kvar	40039	40139	40239	40339	40439	40539	40639	40739	40839	40939	1.0		KVAR
	Volts ab	40040	40140	40240	40340	40440	40540	40640	40740	40840	40940	1.0		Volts
	Volts bc	40041	40141	40241	40341	40441	40541	40641	40741	40841	40941	1.0		Volts
	Volts ca	40042	40142	40242	40342	40442	40542	40642	40742	40842	40942	1.0		Volts
	Volts a	40043	40143	40243	40343	40443	40543	40643	40743	40843	40943	1.0		Volts
	Volts b	40044	40144	40244	40344	40444	40544	40644	40744	40844	40944	1.0		Volts
	Volts c	40045	40145	40245	40345	40445	40545	40645	40745	40845	40945	1.0		Volts
	Amps a	40046	40146	40246	40346	40446	40546	40646	40746	40846	40946	1.0		Amps
	Amps b	40047	40147	40247	40347	40447	40547	40647	40747	40847	40947	1.0		Amps
	Amps c	40048	40148	40248	40348	40448	40548	40648	40748	40848	40948	1.0		Amps
	Percent Amps a	40049	40149	40249	40349	40449	40549	40649	40749	40849	40949	0.5		%
	Percent Amps b	40050	40150	40250	40350	40450	40550	40650	40750	40850	40950	0.5		%
	Percent Amps c	40051	40151	40251	40351	40451	40551	40651	40751	40851	40951	0.5		%
nvoACDataSrc2	Frequency	40052	40152	40252	40352	40452	40552	40652	40752	40852	40952	0.1		Hz
	Total pf	40053	40153	40253	40353	40453	40553	40653	40753	40853	40953	0.00005		PF
	Total kva	40054	40154	40254	40354	40454	40554	40654	40754	40854	40954	1.0		KVA
	Total kW	40055	40155	40255	40355	40455	40555	40655	40755	40855	40955	1.0		KW
	Total kvar	40056	40156	40256	40356	40456	40556	40656	40756	40856	40956	1.0		KVAR
	Volts ab	40057	40157	40257	40357	40457	40557	40657	40757	40857	40957	1.0		Volts
	Volts bc	40058	40158	40258	40358	40458	40558	40658	40758	40858	40958	1.0		Volts
	Volts ca	40059	40159	40259	40359	40459	40559	40659	40759	40859	40959	1.0		Volts
	Volts a	40060	40160	40260	40360	40460	40560	40660	40760	40860	40960	1.0		Volts
	Volts b	40061	40161	40261	40361	40461	40561	40661	40761	40861	40961	1.0		Volts
	Volts c	40062	40162	40262	40362	40462	40562	40662	40762	40862	40962	1.0		Volts
	Amps a	40063	40163	40263	40363	40463	40563	40663	40763	40863	40963	1.0		Amps
	Amps b	40064	40164	40264	40364	40464	40564	40664	40764	40864	40964	1.0		Amps
	Amps c	40065	40165	40265	40365	40465	40565	40665	40765	40865	40965	1.0		Amps
	Percent Amps a	40066	40166	40266	40366	40466	40566	40666	40766	40866	40966	0.5		%
	Percent Amps b	40067	40167	40267	40367	40467	40567	40667	40767	40867	40967	0.5		%
	Percent Amps c	40068	40168	40268	40368	40468	40568	40668	40768	40868	40968	0.5		%
Control	Test	40069	40169	40269	40369	40469	40569	40669	40769	40869	40969			
	Reset	40070	40170	40270	40370	40470	40570	40670	40770	40870	40970			
												Data = Multiplr x (Reg + Offset)		

[1]Mode	
Digital Value	**Description**
0	Test
1	Utility/Genset
2	Utility/Utility
3	Genset/Genset

[2]State	
Digital Value	**Description**
0	Neutral Position
1	Source 1 Connected
2	Source 2 Connected
3	Source 1 and 2 Connected

[3]Fault Type	
Digital Value	**Description**
0	No Faults
1	Warning

[4]NFPA 110	
Description	**Bit**
Source 1 Connected	0 (MSB)
Source 2 Connected	1
N/A	2
Not In Auto	3
N/A	4
N/A	5
Charger AC Failure	6
N/A	7
N/A	8
N/A	9
N/A	10
N/A	11
N/A	12
N/A	13
N/A	14
N/A	15 (LSB)

[5]Extended	
Description	**Bit**
Source 1 Available	0 (MSB)
Source 2 Available	1
Source 1 Connected	2
Source 2 Connected	3
ATS Common Alarm	4
Not In Auto	5
Test / Exercise in Progress	6
Low Battery Voltage	7
Load Shed	8
Transfer Inhibit	9
Retransfer Inhibit	10
Fail to Close	11
Fail to Disconnect	12
Fail to Synchronize	13
Bypass to Source 1	14
Bypass to Source 2	15 (LSB)

TABLE 20-17. MODLON REGISTER MAPPING INFORMATION – TEMPLATE 5 (TP/XF-78 MAPPING) POWERCOMMAND GENSET

Structure	Data Point	ModBus Registers					Scaling		
		GCM[0]	GCM[1]	GCM[2]	GCM[3]	GCM[4]	Multiplier	Offset	Units
Status	state[1]	41001	41101	41201	41301	41401			
	Extended[4]	41002	41102	41202	41302	41402			
	fault_type[2]	41003	41103	41203	41303	41403			
	fault_code*	41012	41112	41212	41312	41412			
	Percent_kw	41026	41126	41226	41326	41426	0.5		&
AC Data (Load)	volts_a	41014	41114	41214	41314	41414			VAC
	volts_b	41015	41115	41215	41315	41415			VAC
	volts_c	41016	41116	41216	41316	41416			VAC
	freq	41017	41117	41217	41317	41417	0.1		Hz
	amps_a	41018	41118	41218	41318	41418			A
	amps_b	41019	41119	41219	41319	41419			A
	amps_c	41020	41120	41220	41320	41420			A
	total_pf	41024	41124	41224	41324	41424	0.00005		
	total_kw	41025	41125	41225	41325	41425			kW
Engine Data	oil_press	41029	41129	41229	41329	41429	0.1		KPA
	oil_temp (see Note 2)	41030	41130	41230	41330	41430	0.1		Deg Kelvin
	Coolant temp	41031	41131	41231	41331	41431	0.1		Deg Kelvin
	Misc Temp 1 (see Note 4)	41033	41133	41233	41333	41433	0.1		Deg Kelvin
	Misc Temp 2 (see Note 4)	41034	41134	41234	41334	41434	0.1		Deg Kelvin
	battery_volts	41035	41135	41235	41335	41435	0.1		VDC
	Engine runtime (low)	41036	41136	41236	41336	41436	0.1		h
	Engine runtime (high)	41037	41137	41237	41337	41437	1000		h
	engine_starts	41038	41138	41238	41338	41438			
	engine_rpm	41039	41139	41239	41339	41439	0.1		rpm
Genset Control	Start/Stop	41040	41140	41240	41340	41440			
	Reset	41041	41141	41241	41341	41441			
	Emergency Stop	41042	41142	41242	41342	41442			
* Fault codes are listed in the genset Operator's/Service Manuals.							*Data = Multiplier x (Register + Offset)*		

NOTES:

1. For the Data Points Engine Runtime, the Total kwh and Total Fuel for the two registers designated as high and low are put together as an unsigned double integer. This is accomplished by multiplying the value in the high register by 65536 and adding it to the value in the low register. Most software packages automatically perform this calculation if the value is simply identified as an unsigned double integer.
2. Value not supported in the 3200 controller.
3. Value not supported in the 3100 controller.
4. Value not supported.
5. With 3100 and 2100 controllers, the units are hours. With the 3200 controller, the units are seconds. The multiplier is always 0.1. For all 3100 controllers, the values given are based on using EEPROM firmware, version 2.0 or greater. The values for Engine Runtime and Total kwh are not available on QST-30 gensets.

[1]State	
Digital Value	**Description**
0	Power Up
1	Stopped
2	Cranking
3	Running
4	Shutdown with Run
5	Shutdown without Run

[2]Status				
Data Point	**Bit**	**PCC 2100**	**PCC 3100**	**PCC 3200**
Common Alarm	0 (LSB)	N/A	X	N/A
Load Dump	1	N/A	X	N/A
Genset CB Position	2	N/A	X	N/A
Leading Power Factor	3	X	X	X
Ready To Load	4	N/A	X	N/A
Control Switch – Run	5	X	X	X
Control Switch – Auto	6	X	X	X
Genset Start Delay	7	N/A	X	N/A
Genset Stop Delay	8	N/A	X	N/A
Load Demand	9	N/A	X	N/A
Paralleling Genset	10	N/A	X	N/A
Remote Start	11	N/A	N/A	N/A
Right Coolant Sensor	12	N/A	N/A	N/A
Exhaust 1 Installed	13	N/A	X	N/A
Exhaust 2 Installed	14	N/A	X	N/A
Genset CB Inhibit	15 (MSB)	N/A	X	N/A

[3]Fault Type	
Digital Value	**Description**
0	Normal
1	Warning
2	Shutdown

TABLE 20-18. MODLON REGISTER MAPPING INFORMATION – TEMPLATE 5 (TP/XF-78 MAPPING) DIGITAL INPUT/OUTPUT MODULE

Structure	Data Point	ModBus Register	
		DIM[0]	DIM[1]
Node Status	relay 1, relay 2	42001	42101
	relay 3, relay 4	42002	42102
	relay 5, relay 6	42003	42103
	relay 7, relay 8	42004	42104
	relay 9, relay 10	42005	42105
	relay 11, relay 12	42006	42106
	relay 13, relay 14	42007	42107
	relay 15, relay 16	42008	42109
	input 1, input 2	42009	42109
	input 3, input 4	42010	42110
	input 5, input 6	42012	42112
	input 7, input 8	42013	42113
Relay Control	All 16 Relays	42011	42111

TABLE 20-19. MODLON REGISTER MAPPING INFORMATION – TEMPLATE 5 (TP/XF-78 MAPPING) CONTROLS COMMUNICATION MODULE

Structure	Data Point	ModBus Register					Scaling		
		CCM[0]	CCM[1]	CCM[2]	CCM[3]	CCM[4]	Multiplier	Offset	Units
Node Status	inputs 1..16	40001	40101	40201	40301	40401			
	inputs 17..32	40002	40102	40202	40302	40402			
	relay 1, relay 2	40003	40103	40203	40303	40403			
	relay 3, relay 4	40004	40104	40204	40304	40404			
AC Data (Load)	volts_a	40005	40105	40205	40305	40405			VAC
	volts_b	40006	40106	40206	40306	40406			VAC
	volts_c	40007	40107	40207	40307	40407			VAC
	freq	40008	40108	40208	40308	40408	0.1		Hz
	amps_a	40009	40109	40209	40309	40409			A
	amps_b	40010	40110	40210	40310	40410			A
	amps_c	40011	40111	40211	40311	40411			A
	percent_amps_a	40012	40112	40212	40312	40412	0.5		%
	percent_amps_b	40013	40113	40213	40313	40413	0.5		%
	percent_amps_c	40014	40114	40214	40314	40414	0.5		%
	total_pf	40015	40115	40215	40315	40415	0.00005		
	total_kw	40016	40116	40216	40316	40416			kW
	percent_kw	40017	40117	40217	40317	40417	0.005		%
	total_kvar	40018	40118	40218	40318	40418			kVAR
	total_mwh	40019	40119	40219	40319	40419			MWh
Engine Data (Genset Only)	Coolant temp	40020	40120	40220	40320	40420	0.1		Deg Kelvin
	Oil temp	40021	40121	40221	40321	40421	0.1		Deg Kelvin
	Misc temp1 (See Note 4)	40022	40122	40222	40322	40422	0.1		Deg Kelvin
	oil_press	40023	40123	40223	40323	40423	0.1		KPA
	battery_volts	40026	40126	40226	40326	40426	0.1		VDC
Spare Analog	spare2	40024	40124	40224	40324	40424	0.1		User-Defined
Relay Control	Control1	40027	40127	40227	40327	40427			
	Control2	40028	40128	40228	40328	40428			
							Data = Multiplier x (Register + Offset)		

NOTES:

1. For the Data Points Engine Runtime, the Total kwh and Total Fuel for the two registers designated as high and low are put together as an unsigned double integer. This is accomplished by multiplying the value in the high register by 65536 and adding it to the value in the low register. Most software packages automatically perform this calculation if the value is simply identified as an unsigned double integer.
2. Value not supported in the 3200 controller.
3. Value not supported in the 3100 controller.
4. Value not supported.
5. With 3100 and 2100 controllers, the units are hours. With the 3200 controller, the units are seconds. The multiplier is always 0.1. For all 3100 controllers, the values given are based on using EEPROM firmware, version 2.0 or greater. The values for Engine Runtime and Total kwh are not available on QST-30 gensets.

ModLon II with LonWorks Troubleshooting Guide

GENERAL

This appendix provides information on how to set up the ModLon II with LonWorks and includes some general solutions to problems that may arise. When using the ModLon II with LonWorks, always make sure that the communication configurations are set correctly.

MODLON II WITH LONWORKS

The first step is to make sure that the name of the ModLon II stencil template is the same as the name of the xif template and that it also matches the dipswitch setting on the ModLon II gateway. For example, if you are using xif Template3, make sure that the stencil is also Template3 and that the ModLon II dipswitch is set to 0010.

After dragging the stencil into the work space, the Enter Device Name dialog box shown in Figure 20-20 is displayed.

Click on the “Next” button to view the Specify Device Template dialog box (see Figure 20-21).

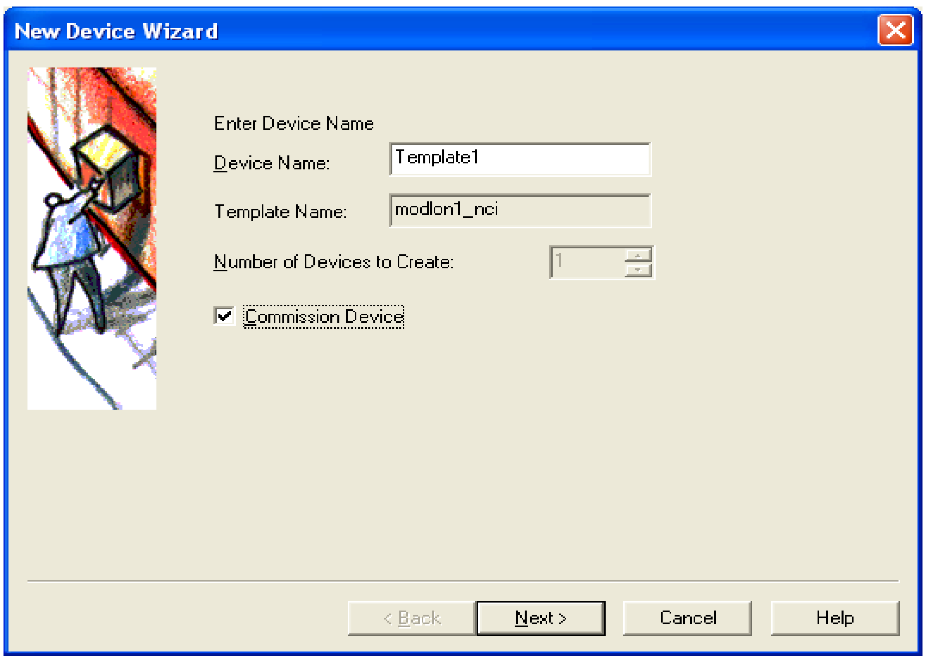


FIGURE 20-20. ENTER DEVICE NAME DIALOG BOX

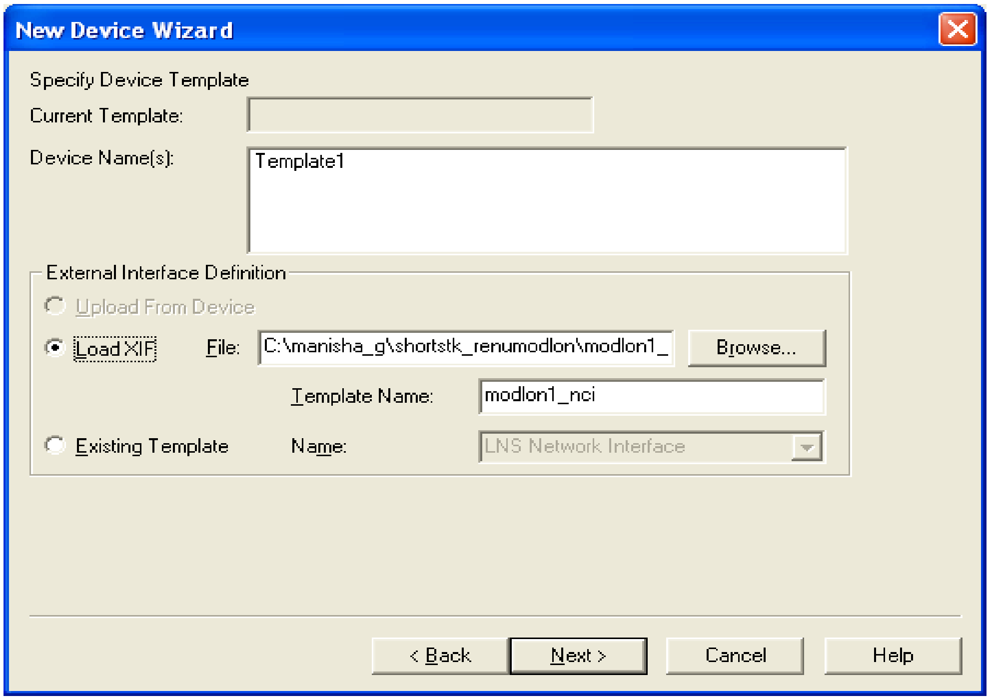


FIGURE 20-21. SPECIFY DEVICE TEMPLATE DIALOG BOX

If it is necessary to change a template name so that they both match, IT IS IMPORTANT to note that you will have to change the xif file by browsing to the one that was installed by using the LonWorks Support Files.zip file. The example used here is the Template1.xif located at:

C:\LonWorks\Import\Cummins\FTT−10 Devices\ModLonII\Template1.xif

NOTE: The location of the LonWorks directory installed by the LonWorks Support Files.zip file should be in the same root directory that LonMaker for Windows was installed.

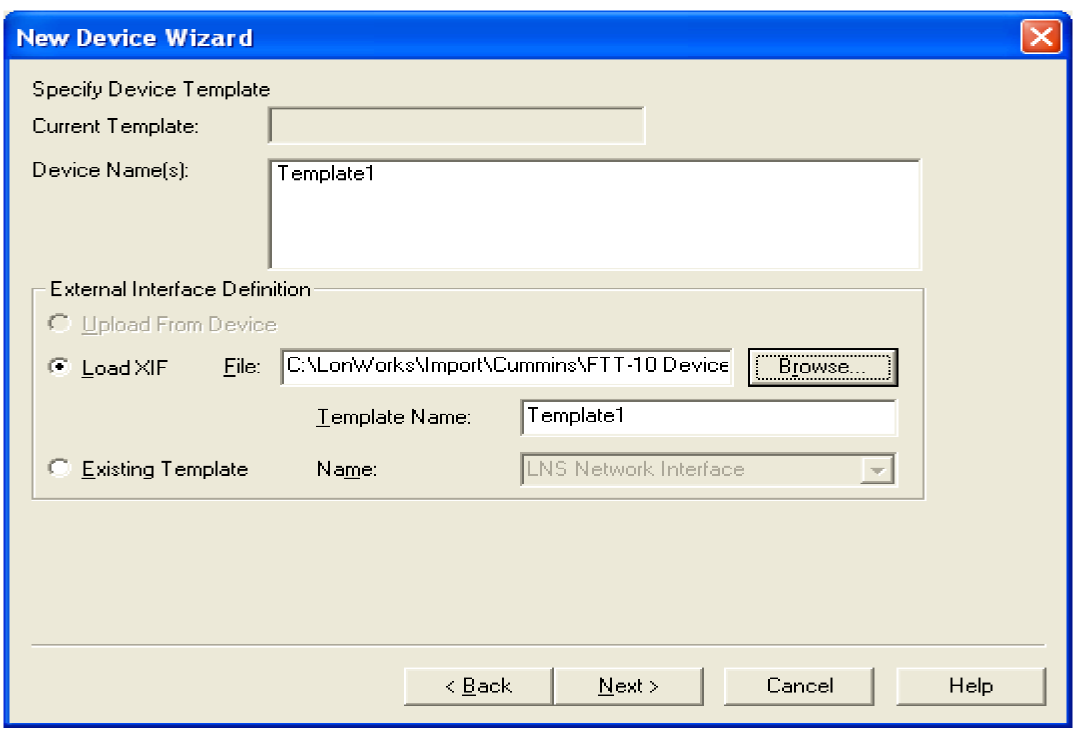


FIGURE 20-22. SELECTING THE APPROPRIATE XIF FILE

The rest of the windows will have the same function that the rest of the devices normally use. It will not be necessary to load the ModLonII.nxe file unless there is an "Application Error" with the ModLon (see the next section).

TROUBLESHOOTING

1. Make sure that the stencil template, xif template, and the ModLon II dipswitch settings all match. If you decide to change the dipswitch setting, it is important to:

    1. Decommission the device

    A. Disconnect the power

    B. Change the dipswitch setting

    C. Reconnect the power.

2. If an "Applicationless" error (see Figure 20-23) occurs while trying to commission the ModLon II, it will be necessary to load the ModLon II.nxe file to the device. Just commission the device and load the ModLon II.nxe file. Make sure that the xif file is the same as the stencil drawing.

3. If the error message "Cannot Communicate with Device" is displayed while commissioning the ModLon II, it is most likely because it was already commissioned under a different template and was not decommissioned while on-line. This error message is also displayed if one of the steps in #1 above was not followed.

    When this error occurs, the "Cannot Communicate with Device" error message is displayed and the Service light of the ModLon II **does not** blink at a slow steady pace. The simplest fix is to make sure that the Stencil Template and the Template.xif names are the same. It is always important to decommission the device, disconnect the power, and then reconnect the power to the ModLon before switching it to a different template.

MODLON II WRITE COMMANDS

The ModLon II is a single write device; it does not allow for multiple writes. When sending write commands via the ModBus, the ModLon II must fully complete the write command on the LonWorks side before another ModBus write command can be implemented. Therefore, ModBus write commands must be about 625 ms apart. This time may increase, depending on network configurations that use routers and depending on the number and types of channels being used.

Writing ModBus commands faster than 625 ms can cause the ModLon II to lock up. To unlock it, either cycle power to the device or else press the Reset button.

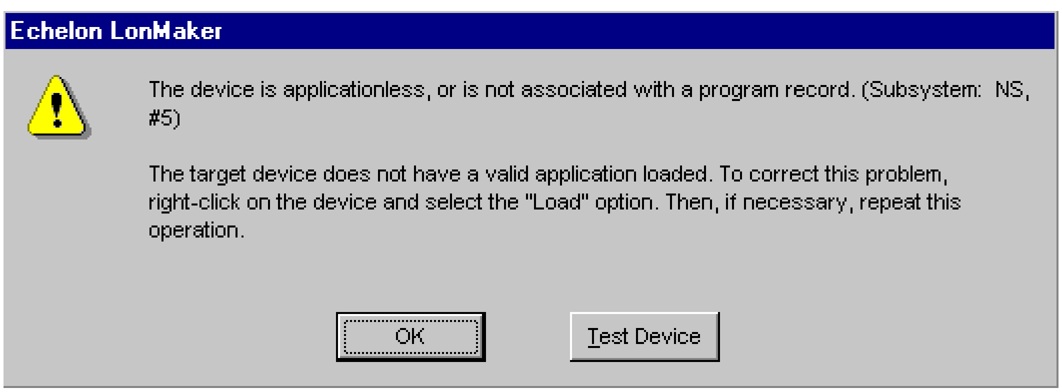


FIGURE 20-23. "THE DEVICE IS APPLICATIONLESS" ERROR MESSAGE

Communication Cables / DB9 Connection

RS-232 COMMUNICATIONS

The communications cable (part number 338−4629) is for communicating, via the DB9 connection of the ModLon II, to the com port of the PC in ModBus protocol. The communications cable has only three wires for RS-232 communications. ModLon II DB9 connection details are shown in Table 20-20.

TABLE 20-20. COMMUNICATIONS CABLE PIN DETAILS

DB9 Male Connection ModLon II	DB9 Female Connection PC
2	2
3	3
5	5

All of the communication protocols are listed in Table 20-21.

RS-485 COMMUNICATIONS

Due to the large number of devices that use different RS-485 wiring topologies for communicating, the end user is responsible for creating an interconnection cable for RS-485 communications between the ModLon II and the device.

A 4-wire RS-485 communications cable can be converted to a 2-wire RS-485 communications cable by shorting the RX+ and the TX− wires together as shown in Figure 20-24.

NOTE: If the shield is attached to earth on the device, leave the shield open on the ModLon II end. If the shield is connected to the signal ground on the device, connect the shield to the signal ground on the ModLon end.

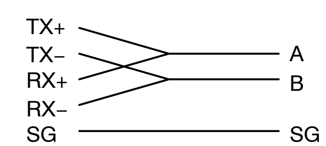


FIGURE 20-24. CONVERTING THE RS-485 COMMUNICATIONS CABLE

TABLE 20-21. MODLON II DB9 CONNECTOR FUNCTIONS

Pin	Name	Signal Protocol	Function
1	TX+	RS-485	Differential Transmit +, also referred to as TXA
2	TXD	RS-232	Transmit
3	RXD	RS-232	Receive
4	RX+	RS-485	Differential Receive +, also referred to as RXA
5	GND	SG	Signal ground, common to all signals
6	5 VDC	−	DO NOT USE
7	−	−	−
8	TX−	RS-485	Differential Transmit −, also referred to as TXB
9	RX−	RS-485	Differential Receive −, also referred to as RXB

Appendix A. Glossary of Network Terms

Attaching – Term used in this manual to describe connecting the PC, used for network installation and service, to the PowerCommand® Network via the Installation Gateway.

Autobinding – An automated process for making logical connections on the network. Each node on a self-installed network must have a unique address. Certain requirements as to node type, quantity, and installation sequence must be considered when autobinding. If these requirements cannot be met, the network must be installed using LonMaker.

Binding – The process of making the logical connections on the network (also called connecting). This involves connecting network variable outputs to network variable inputs using LonWorks® software.

Bound – A network communication technique whereby a node automatically receives a network variable from a sender node whenever the sender node sends it out. The sending is completely controlled by the sender node. The network variables involved are said to be "bound."

Controls Communications Module (CCM) – A module for monitoring genset or transfer switch parameters. It also provides some control capability. There are two kit versions: CCM-G that can be used on gensets that do not have a PowerCommand Control, and CCM-T that can be used to monitor and control transfer switches. (Refer to the CCM-G or CCM-T sections of this manual for application information.)

Channel – A Channel is the physical communications media that connects the devices and the properties of these media (such as transmission speed). Most PowerCommand network installations will have only one channel (twisted-pair wiring and 78 KBaud transmission speed). In a large network, there may be multiple channels and each channel may or may not be of the same media type. Channels are linked together using Routers.

Configured/Unconfigured – The term configured, as used in this manual, refers to a module that has been logically installed with LonMaker™ Software. A "network image" (address and binding information) is stored in the node. A module that has not been logically installed with LonMaker is referred to as being unconfigured. The service LED will blink on an unconfigured module.

Connecting Devices – Connecting refers to the process of assigning connections—linking an output variable of one device to an an input variable of another device. This process is also called "binding."

Digital I/O Module (DIM) – A network module with four discrete customer inputs, and eight 5A, 125V Form-C relay contact outputs. The four customer inputs are available on the network to control other devices or to indicate status. The eight relays are controlled by other devices on the network. There is also an optional expansion module with four additional inputs and eight additional relay contact outputs.

Distributed Control System – A collection of nodes that interact to control a system whose components are spread out over some distance. Each node has intelligence for operating its own particular component of the system. Different parts of the system communicate status and control information with one another to form a distributed control system. Typically they communicate on a peer-to-peer level. This is different from a type of system where all control and interaction between components is dictated by one central control (this type of system typically communicates in a master/slave arrangement).

A distributed control system can be more robust than a central control type because failure of one node will not shut down the whole system. The other working nodes will still interact. If a central control fails, the whole system shuts down.

Domain – A domain is a network concept that allows independently functioning networks to share resources, such as transmission media. A domain designation provides an ID number to identify the devices that can communicate within that domain. A network must have at least one domain. PowerCommand network installations will usually have only one specified domain.

PowerCommand is a registered trademark of Cummins Inc.
Echelon, Neuron, and LonWorks are registered trademarks of Echelon Corporation.
LonMaker is a trademark of Echelon Corporation.

Free Topology (FT) Network – A network that consists of devices connected to a communications channel in a multi-dropped fashion where only a single termination is required. The communication channel can assume a bus, star, ring, or mixed architecture.

Free Topology Transceiver (FTT) – A transceiver on devices that are used in an FT network. Devices with this transceiver are transformer isolated, are polarity insensitive, have a 78 kbps bit rate, and are designed for use when external power is provided.

Functional Block – A collection of network variables and configuration properties used together to perform one task.

Gateway – A device that acts as interface between two different communication protocols. The SLTA-10 Gateway is an example that translates LonWorks protocol into a protocol that a PC can understand. Other gateway devices may translate between LonWorks protocol and other systems such as SCADA, building automation systems, UNIX systems, etc.

Genset Communications Module (GCM) – The GCM provides a communications gateway between the PCC 3100 and the network. The GCM communicates with the PCC 3100 over a serial data link. The GCM gets data from the PCC 3100 such as volts, current, engine speed, oil temp, etc. and then sends it out on the network if another network node is bound to it or is requesting data. The GCM also provides some direct local control and monitoring of the PCC 3100. It monitors for "Not-In-Auto", and both High and Low Battery voltage (when the PCC 3100 is asleep) then sends it out on the network if another network node is bound to it or is requesting data.

Genset LonWorks Card (GLC) – The GLC provides a communications gateway between the PCC 3200 and the network. The GLC communicates with the PCC 3200 over a serial data link. The GLC gets data from the PCC 3200 such as volts, current, engine speed, oil temp, etc. and then sends it out on the network if another network node is bound to it or is requesting data. The GLC also provides some direct local control and monitoring of the PCC 3200. It monitors for "Not-In-Auto", and both High and Low Battery voltage (when the PCC 3200 is asleep) then sends it out on the network if another network node is bound to it or is requesting data.

Junction Box/Terminator (JBT) – A device that provides connection points for network power and data wires. It also contains a network terminator circuit that should not be used in an FT-10 network.

Cummins Inc. has created a junction box/terminator potted assembly. It provides two 6-position pluggable terminal blocks for data and power, two RJ45 jacks for temporary 24AWG stub connections, a switch to connect the data lines to a terminator circuit and a switch to select either a pass thru or a local loop connection between the data lines on the terminal blocks. FT-10 networks should not use the Local Loop connection.

LonWorks System Annunciator (LSA) – An application which combines an annunciator panel and LonWorks communications. This module is available in two versions: one has an oversize cover for flush mounting and the other has a smaller cover for surface mounting. The module can be modified for custom annunciation applications.

Manchester Encoding – a method of representing 1's and 0's on a media which results in polarity insensitive wiring.

Master/Slave – A type of communication protocol whereby one device controls all communication on the channel. This is the master. The slaves are all of the other devices. The slave devices talk only when the master tells them they can. An example of this is a computer and a printer. The printer is the slave device. See Peer-to-Peer.

Media – The hardware level of communications. This defines two things: 1) what the electrical signal levels will be and 2) over what they will travel. Examples of media are: RS-232, RS-485, transformer coupled twisted pair, radio frequency, fiber optic, coax, infrared, and power line. Note that the media does not define what "language" (protocol) nodes will use to communicate information with one another.

Modem – (MOdulator DEModulator) A device that adapts a terminal or computer to a telephone line. It converts the computer's digital pulses into audio frequencies (analog) for the telephone system and converts the frequencies back into pulses at the other side. The modem also dials the line, answers the call and controls transmission speed.

Modules (Nodes) – Modules (sometimes called nodes or devices) are the various hardware modules on the network, such as the Digital I/O Module, the Controls Communications Module, and the Genset Communications Module.

Multidrop Bus Topology – The wiring arrangement used for TP-78 network data. The bus that starts at one point and ends at another. The topology allows “drops” (or stubs) off of the bus up to 10 feet (3 m) from the bus. One or more “Drops” can be made any place along the bus (hence “multi-drop”).

Network – A collection of Nodes that communicate with one another over a distance. The PowerCommand network communication is implemented transformer coupled twisted pair data wire. The “language” that is “spoken” on the network is called the protocol.

Network Communications Module (NCM) – The NCM provides a communications gateway between the PCC 2100 or PCC ATS and the network. The NCM communicates with the PCC 2100 or PCC ATS over a serial data link. The NCM gets data from the PCC 2100 or PCC ATS such as volts, current, engine speed, oil temp, etc. and then sends it out on the network if another network node is bound to it or is requesting data. The NCM also provides some direct local control and monitoring of the PCC 2100 or PCC ATS. It monitors for “Not-In-Auto”, and both High and Low Battery voltage (when the PCC 2100 or PCC ATS is asleep) then sends it out on the network if another network node is bound to it or is requesting data.

Network Data – A signal that carries messages between nodes. In this network, it is a Manchester encoded digital signal. Manchester encoding makes the signal insensitive to polarity (i.e. the two data wires may be connected in either polarity). The signal is transformer-coupled to the network data wire at a rate of 78 k bits/sec. Transformer coupling into twisted pair wire gives excellent noise immunity. (It is far superior to either RS-232 or RS-485 for example.) Shorting of the wire pair will cause no permanent damage, but communications will be affected. Opens prevent nodes on each side of the open from communicating, but nodes on one side of the open will still communicate. An unpowered node will not prevent other powered nodes from communicating.

Network Data Wire – Twisted pair communications wire that carries the network data communication signals. The wire must meet UL Level IV requirements (as listed in UL’s document: “UL’s LAN Cable Certification Program”). These requirements specify the transmission line characteristics for the wire (attenuation, characteristic impedance, crosstalk, etc.). These characteristics are critical to maintaining a good signal. The cable does not need to be shielded.

Network Power – B+ is used to power remote network devices such as the Digital I/O Module, Network Annunciator and Controls Communications Module. For limited distances, this may be supplied by the genset battery. For greater distances, an auxiliary battery will be needed to prevent module power loss during cranking.

Network Power Wire – Wire used to run power to nodes that do not have a local source of power (e.g. Digital I/O Module, Network Annunciator Module , etc.). The wire gauge must be chosen for the number and type of nodes and the maximum distance from the power source to a load node. Refer to the *Network Power* section for data on wire selection.

Network Variable (NV) – Network Variables send a value with defined units from one device (the output) to another (the input). Each network variable is either an input or an output. Also see *Connecting Devices.*

Data that can be accessed or driven through the network. Examples would be: Genset voltages, genset start/stop, etc. Some NVs are used purely for monitoring purposes. Others are used for control between devices.

LonMaker recognizes device inputs and outputs as network variables (NVs) and message tags. This is because inputs and outputs for a LonWorks network are not hard-wired connections, they are programmable software values.

Neuron Chip – A communIcations processor developed by Echelon® Corporation for use in distributed control systems. The Neuron® chip firmware implements a sophisticated communications protocol, allowing nodes to communicate through the passing of network variables. The Neuron chip also has I/O to support modest application circuits.

Node – A module that can communicate over the network data wire to other modules. A module containing a Neuron chip.

Pass Thru – Refers to a junction box connection where the network bus comes to a connector and then continues straight on through. It is merely a point for splicing wires. The CPG junction box/terminator provides this function.

Peer-to-Peer – A type of communication protocol whereby any device on the communication channel can communicate with any other device at any time. That is, no one device is the master of the communication medium. The PowerCommand Network is a peer-to-peer type network.

Plug-Ins – Applications that can be used within the LonMaker tool to configure device.

Polling – A network communication technique whereby a node asks another node for its current value of a network variable. The node doing the asking forces the other node to send out that network variable.

Protocol – The protocol is a language that each node on the network knows how to speak and interpret. It is not to be confused with communications media. The media is the hardware level of the communications. The protocol is what allows devices to exchange messages with one another. A protocol can be very simple or very complex. Echelon's LonTalk Protocol, used in the Neuron Chip, is very sophisticated.

RJ45 Connector – An 8-position phone jack connector. Some nodes connect to the network via an RJ45 connector. Network data is brought in on positions 1 and 2 (the two left-most positions as the plug is viewed from the contact side (as opposed to the side with the latch).

Router – A router is a device that connects one channel to another. Routers are not required when there is only one channel in a network.

A router can also be used to extend the network or extend the number of modules on the network.

SLTA-10 Gateway – A network device that acts as a gateway between a PC or modem and the network. The SLTA-10 Gateway allows software running on a PC to access, poll, and control all devices on a network. The PowerCommand Software uses this device to access the network.

The SLTA-10 Gateway connects to network data through a two-position connector. Connecting to it requires a stranded twisted pair cable. The SLTA-10 Gateway receives its power from AC utility power.

Standby Uninterruptible Power Supply – See Uninterruptible Power Supply

Stencil – A collection of master shapes (including functional blocks) used by Visio® that can be used to create a network drawing. A copy of the master shape is made when it is dragged into the network drawing.

Stub – A branch off of the network bus.

Terminator – A circuit that is required at one location in a network segment. This circuit acts to optimize the transmission line characteristics (minimizes signal reflections). It is critical that the network segment be properly terminated. Without a terminator, network communications can be severely hampered. Even if the network appears to be working, messages are likely getting lost or unnecessarily repeated, increasing network traffic. Noise immunity is also greatly reduced. Each network module except the SLTA-10 Gateway has a terminator built in. On CPG-designed nodes, a slide switch is used to connect the terminator circuit to the network data lines. Junction boxes also contain built in terminators but should not be used in an FT-10 network.

Topology – The physical wiring arrangement for the network data communications. Example topologies are bus, ring (e.g. Token Ring), star and mixed. The network data described in this document communicates on a free topology.

Twisted Pair Communications Cable – A cable containing typically one, two or four twisted wire pairs. The cable is specified according to its characteristic impedance, maximum operating frequency, attenuation, capacitance, and cross-talk. These are all important parameters for reliable data transmission.

Single pair cable will contain one white/blue and one blue wire. This would only carry network data. Two pair cable will contain one pair of white/blue & blue and one pair of white/orange & orange. The blue pair would carry network data. the orange pair could be used in local loop configurations. Four pair cable will contain paired colors of blue, orange, green and brown. Again, blue is primary for network data. Orange, Green and Brown can be used for network data — may be used for a local loop.

The wire comes as either 22 AWG or 24 AWG, plenum or PVC insulation, and with or without a drain/shield. The PowerCommand Network does not require the use of shielded cable. Plenum vs. PVC insulation will be chosen based on code requirements for fire resistance. If network power is being run in the cable, then the cable must be in conduit.

Uninterruptible Power Supply (UPS) – A backup power supply used when the electrical power fails or drops to an unacceptable level. Small UPS systems provide power to operate equipment for a number of minutes. There are two main types of UPS: an online UPS that provides a constant source of electrical power from the battery and an offline UPS, also known as a standby UPS, that switches to battery power a few milliseconds after detecting a power failure.

CPG has two optional standby UPS units that can be used to provide backup power for a modem and network gateway module.

- 300–5674–01 (420 VA)
- 300–5674–02 (700 VA)

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Appendix B. Application Notes

DETERMINING SENDER SETTINGS

The following examples can be used to determine sender settings for unknown senders. Refer to the service manual of the equipment being monitored for important safety precautions.

WARNING ***Severe personal injury or death can result from working on equipment while it is operating. Refer to the service manual of the equipment being monitored for important safety precautions.***

***Example 1:* Unknown Coolant Temperature Sender**

The CCM's *Temperature 1* input will be monitoring an unknown engine temperature sender. You would like to find *Sender Voltage, Meter Reading* and *Sender Gain* for the sender. The customer prefers English (Imperial) units.

1. Start the genset (with no load).
2. Wait for the engine temperature to reach steady−state.
3. Measure the DC voltage at the sender (VDC). Voltage (no load) = 2.92 VDC
4. What is the engine temperature (degrees F)?

   Temperature (no load) = 172 °F
5. Increase the load on the genset to at least 50% load.
6. Wait for the engine temperature to reach steady−state.
7. Measure the DC voltage at the sender (VDC). Voltage (load) = 3.23 VDC
8. What is the engine temperature (degrees F)? Temperature (load) = 197 °F
9. Enter the following values for *Temperature 1*:
   Sender Voltage = Voltage (no load) = 2.92
   Meter Reading = Temperature (no load) =172
   Sender Gain = 80.65

$$\text{SENDER GAIN} = \frac{\text{TEMPERATURE (LOAD)} - \text{TEMPERATURE (NO LOAD)}}{\text{VOLTAGE (LOAD)} - \text{VOLTAGE (NO LOAD)}} = \frac{197 - 172}{3.23 - 2.92} = 80.65$$

FIGURE B-1. DETERMINING TEMPERATURE SENDER SETTINGS (EXAMPLE 1)

Example 2: Unknown Oil Pressure Sender

The CCM's *Oil Pressure* input will be monitoring an unknown oil pressure sender. You would like to find *Sender Voltage, Meter Reading* and *Sender Gain* for the sender. The customer prefers Metric units.

1. With the genset <u>not</u> running, measure the DC voltage at the sender (VDC).
   Voltage (not running) = 5.71 VDC
2. Start the genset (no load).
3. Wait for the oil pressure to reach steady−state.
4. Measure the DC voltage at the sender (VDC). Voltage (running) = 4.13 VDC
5. What is the oil pressure (kPa)? Oil Pressure (running) = 360 kPa
7. Enter the following values for *Oil Pressure*:
   Sender Voltage = Voltage (running) = 4.13
   Meter Reading = Oil Pressure (running) = 360
   Sender Gain = − 227.85

$$\text{SENDER GAIN} = \frac{\text{PRESSURE (RUNNING)} - \text{PRESSURE (NOT RUNNING)}}{\text{VOLTAGE (RUNNING)} - \text{VOLTAGE (NOT RUNNING)}} = \frac{360 - 0}{4.13 - 5.71} = -227.85$$

FIGURE B-2. DETERMINING PRESSURE SENDER SETTINGS (EXAMPLE 2)

Example 3**: **Unknown Oil Pressure Sender

The CCM's *Oil Pressure* input will be monitoring an unknown oil pressure sender. You would like to find *Sender Voltage, Meter Reading* and *Sender Gain* for the sender. The customer prefers English (Imperial) units.

1. With the genset running and the oil pressure at 30 psi, measure the DC voltage at the sender (VDC).
   Voltage (at 30 psi) = 4.7 VDC
2. With the genset running and the oil pressure at 50 psi, measure the DC voltage at the sender (VDC).
   Voltage (at 50 psi) = 2.5 VDC
3. Enter the following values for *Oil Pressure*:
   Sender Voltage = Voltage (30 psi) = 4.7
   Meter Reading = Oil Pressure = 30 (psi)
   Sender Gain = – 9.1

$$\text{SENDER GAIN} = \frac{\text{PRESSURE (30 psi)} - \text{PRESSURE (50 psi)}}{\text{VOLTAGE (30 psi)} - \text{VOLTAGE (50 psi)}} = \frac{30 - 50}{4.7 - 2.5} = -9.1$$

FIGURE B-3. DETERMINING PRESSURE SENDER SETTINGS (EXAMPLE 3)

Example 4: **Unknown Fuel Level Sender**

The CCM's *Analog channel Spare 1* (0 to 5 volts) input will be monitoring fuel level in a 100 gallon (378.5 liter) fuel tank with an unknown sender. You would like to find *Sender Voltage, Meter Reading* and *Sender Gain* for the sender. The customer prefers English (Imperial) units.

1. Measure the DC voltage at the sender (VDC).
   Voltage with the fuel tank empty = 1.92 VDC
2. The fuel gauge reads 0 gallons (0 liters).
3. Fill the fuel tank with 100 gallon (378.5 liters) of fuel and measure the DC voltage at the sender (VDC).
   Voltage (full tank) = 0.24 VDC
4. The fuel gauge reads 100 gallons (378.5 liters).
5. Enter the following values for *Spare 1*:
   Sender Voltage = Voltage (full tank) = 0.24
   Meter Reading = Fuel Gauge (full tank) =100
   Sender Gain = – 59.5

$$\text{SENDER GAIN} = \frac{\text{FUEL LEVEL (EMPTY)} - \text{FUEL LEVEL (FULL)}}{\text{VOLTAGE (EMPTY)} - \text{VOLTAGE (FULL)}} = \frac{0 - 100}{1.92 - 0.24} = -59.5$$

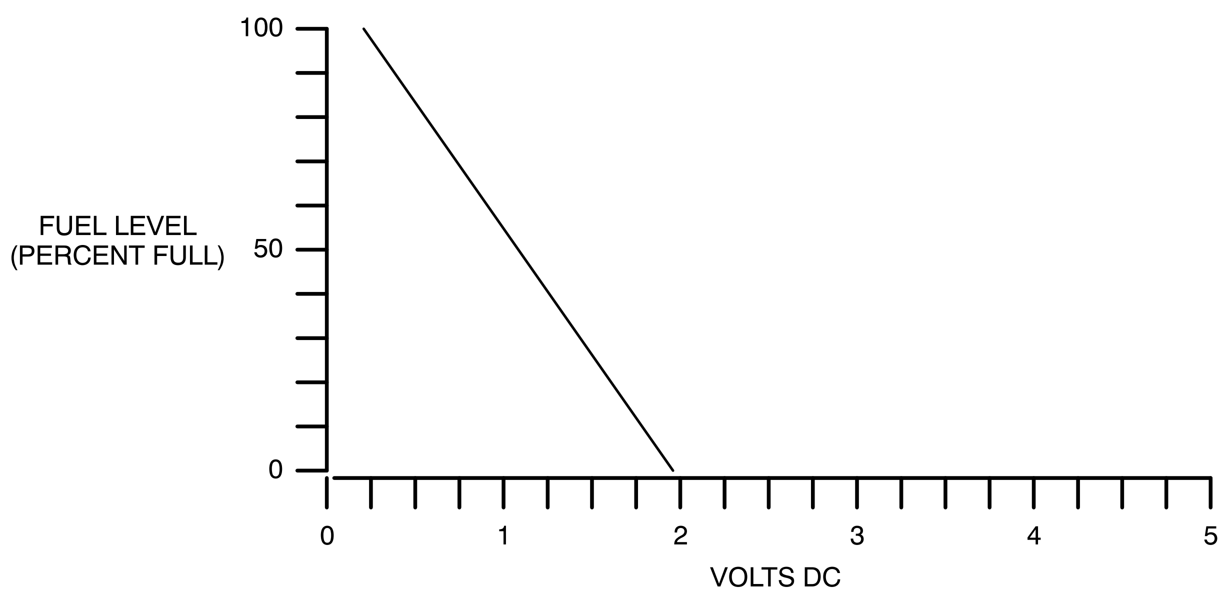

FIGURE B-4. DETERMINING SPARE 1 SENDER SETTINGS (EXAMPLE 4)

Appendix C. Network Troubleshooting

INTRODUCTION

This section provides a troubleshooting information to help diagnose PowerCommand® Network problems. Refer the *Error Message and Troubleshooting Section,* in the LonMaker™ Users Guide, for problems with LonMaker that are not covered here.

The PowerCommand Network can be used to remotely operate power transfer equipment (e.g., transfer switches, paralleling systems) and start and stop generator sets. All of the safety precautions for that equipment must observed. Refer to the Operator's Manual for the equipment that is being monitored and controlled by the network for important safety precautions. Review the Safety Precautions listed in the front of this manual for important safety information.

Most network problems are related to poor or improper wiring connections. Make a thorough inspection of the network wiring to make sure that good connections are made and the modules are wired correctly. Correct all wiring problems before proceeding with troubleshooting.

If Plug-Ins are used to configure the network **or** make changes, make sure each of the modules has been **reset**.

Refer to specific module sections to review the LED indicator location and descriptions. The SERVICE and STATUS indicator LEDs can be used as a visual aid in diagnosing problems.

WARNING ***Power equipment presents a shock hazard that can cause severe personal injury or death. The PowerCommand Network allows remote operation of equipment. PowerCommand Software for Windows can remotely start and stop a genset or exercise a transfer switch. Network modules can independently control other network modules and operate other electrical devices such as fans or pumps etc. Make certain that all appropriate personnel are notified before remotely operating equipment and make them aware of any equipment that can be energized automatically.***

USING LONMAKER FOR WINDOWS TROUBLESHOOTING

LonMaker for Windows provides information of maintaining networks (Section 6 of the LonMaker User's Guide) and visual troubleshooting aides in Visio.

Refer to *Section 6* of the LonMaker User's Guide for instructions on replacing devices and routers, decommissioning devices and resyncronizing your network.

This section provides a troubleshooting information to help diagnose PowerCommand Network problems. Refer the *Error Message and Troubleshooting Section,* in the LonMaker Users Guide, for problems with LonMaker that are not covered here.

To troubleshoot a device using Visio, click on the **View** menu, and select **Toolbars – Format Shape** (see Figure D-1). This feature adds a toolbar that displays the status of the device. A drop-down list shows all of the colors and fill patterns that are used to identify the status of the device. Use these and other LonMaker features while you are attached to the network, to monitor the device.

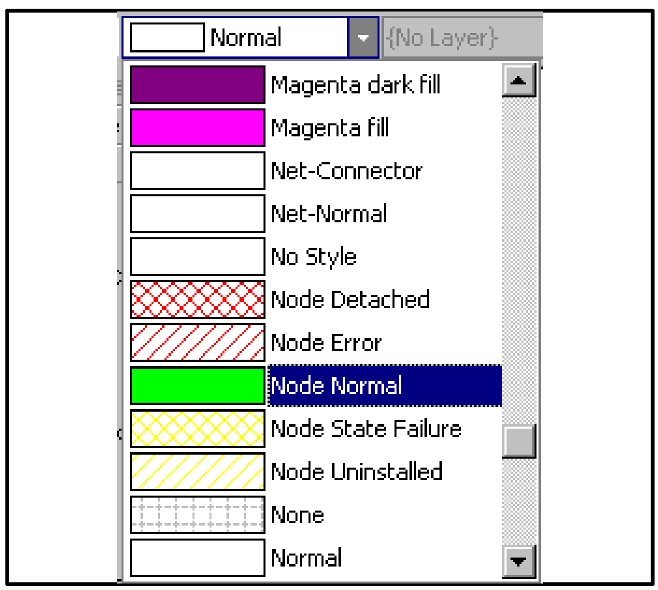

FIGURE D-1. DEVICE STATUS IN VISIO

PowerCommand is a registered trademark of Cummins Inc.
LonMaker is a trademark of Echelon Corporation.

To troubleshoot a self-installed network, make sure you have followed the guidelines and instructions listed in *Section 3*. Use the LonMaker Browser to communicate with the device. Once communications have been established, you can press the Service pin for two seconds to initiate self-installation. Decommissioning the device before pressing the Service pin will override any self-installation.

TABLE C-1. MODULES AND MISCELLANEOUS PROBLEMS/ERROR CODES

PROBLEM "MESSAGE"	CORRECTIVE ACTION
1. Any Module type – Code will not load into module during install. "The device whose service pin was pressed (or NID...) is not of the correct type..." (C 22) – or similar message.	1a. Wrong module type. 1b. Pressing the wrong service pin. 1c. Cycle power to the module and retry install. 1d. Refer to LonMaker Users Guide, *Error Message and Troubleshooting* section.
2. CCM Relays will not toggle.	2. Reset the CCM.
3. CCM/GCM alarms not dialing out.	3a. Check configuration with InPower. 3b. Reset module.
4. GCM not responding to Start/Stop command.	4a. Reset the GCM.
5. NGM Password not working (wrong/old password being accepted by NGM.)	5a. Cycle power on the NGM to initialize the new password.
6. Self-installation not working on a device that was used in another network.	6. Use LonMaker Browser to communicate with the device. Once communications have been established, press the Service pin for two seconds to initiate self-installation.

Appendix D. Wiring Diagrams

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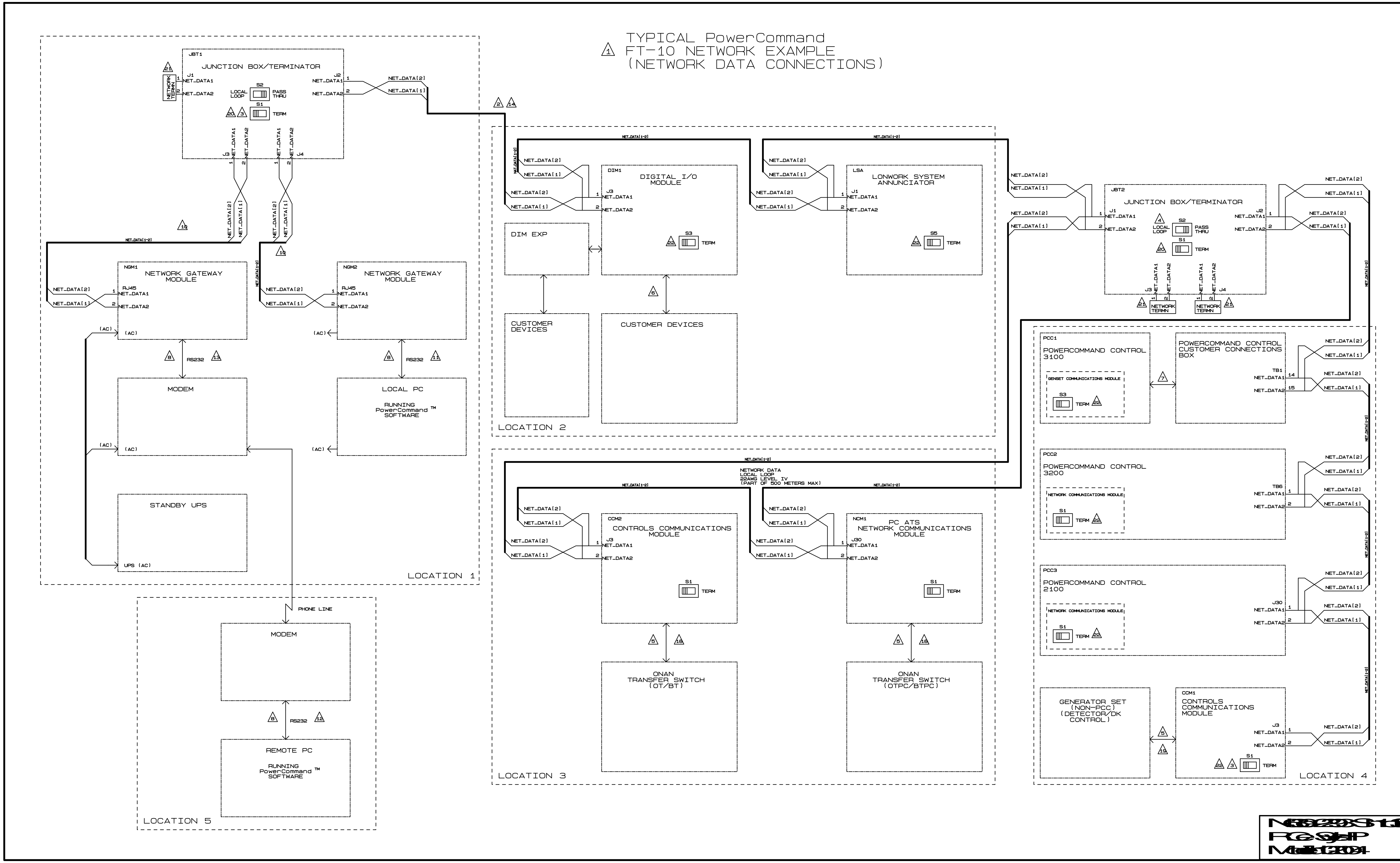


FIGURE E-1. POWERCOMMAND NETWORK INTERCONNECTION WIRING DIAGRAM (Sheet 1 of 3)

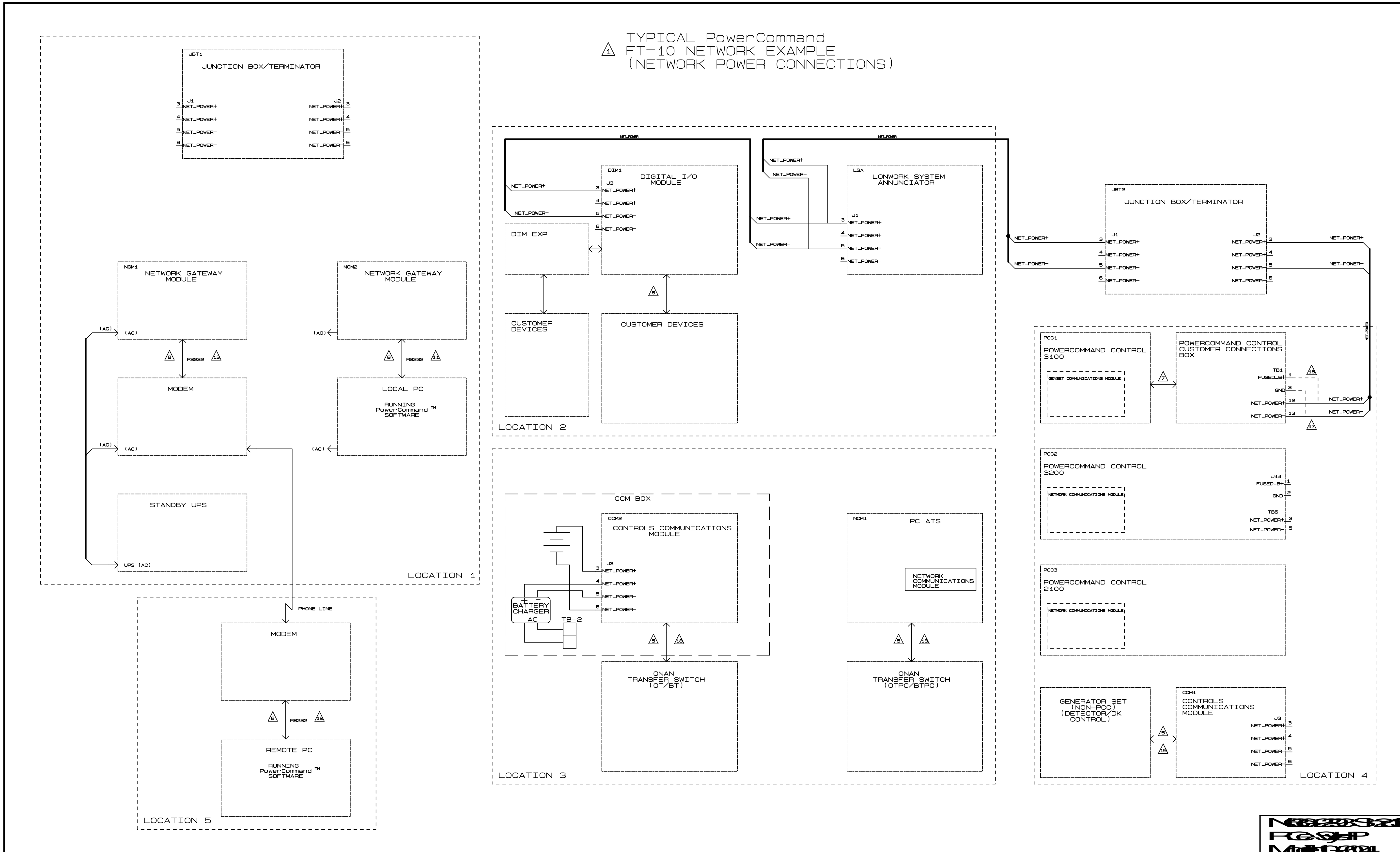


FIGURE E-1. POWERCOMMAND NETWORK INTERCONNECTION WIRING DIAGRAM (Sheet 2 of 3)

TYPICAL PowerCommand
FT-10 NETWORK EXAMPLE

SPECIFICATIONS

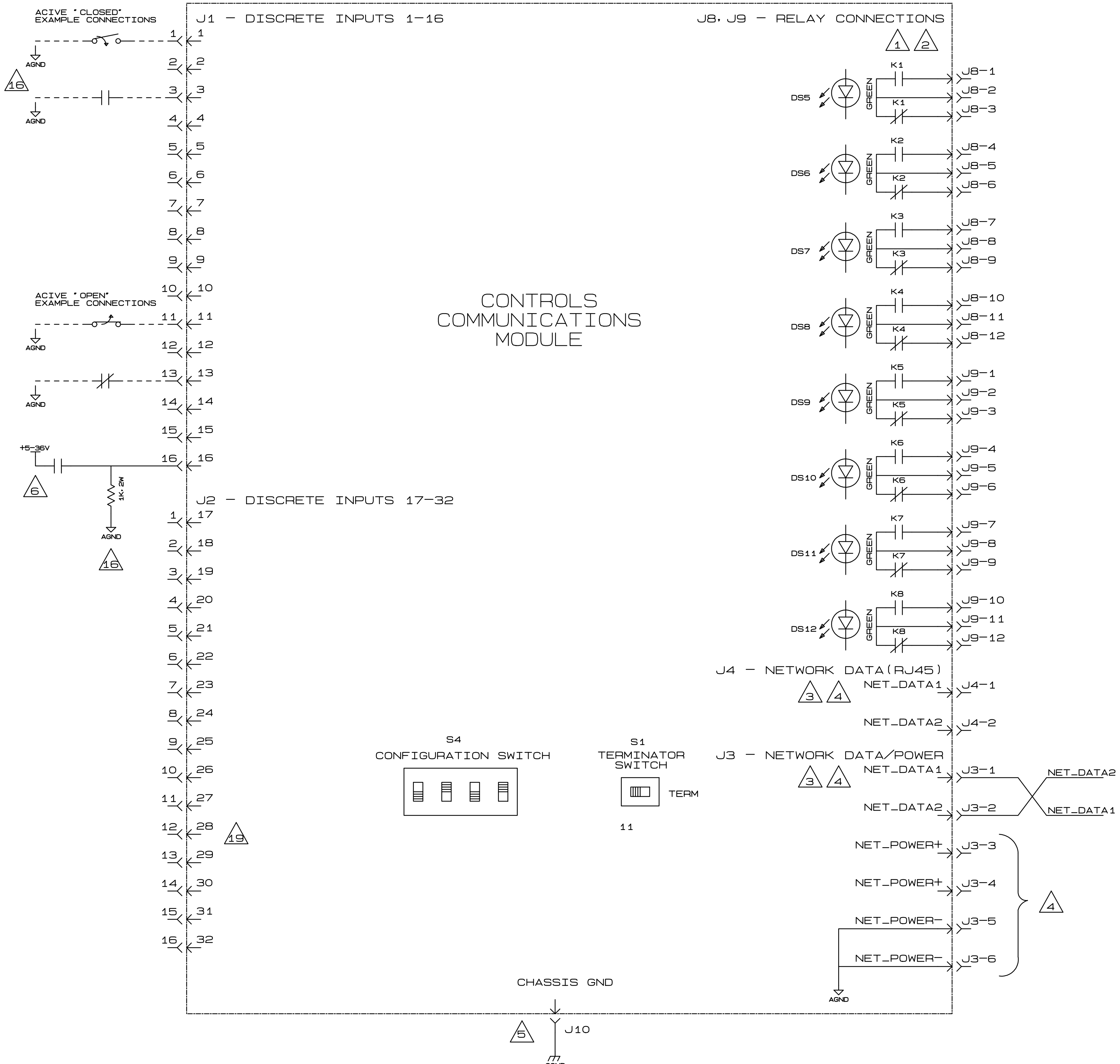
1. NET DATA
   - 1.1 TYPE = ECHELON LONTALK™
     FT10
     TRANSFORMER COUPLED
   - 1.2 WIRING TOPOLOGY = FREE TOPOLOGY
   - 1.3 POLARITY = POLARITY INSENSITIVE
   - 1.4 MAX CHANNEL LENGTH = 500 METERS
   - 1.5 TERMINATION = ONE TERMINATOR REQUIRED PER SEGMENT
   - 1.6 MAX NUMBER OF NODES = 64 PER SEGMENT
     128 PER CHANNEL
2. NET DATA WIRE
   - 2.1 TYPE
     - 2.1.1 UNSHIELDED 22AWG UL LEVEL IV STRANDED
   - 2.2 COLOR CODES
     - 2.2.1 BLUE/WHITE = PRIMARY WIRE PAIR FOR DATA
     - 2.2.2 GREEN/WHITE = SECONDARY WIRE PAIR FOR DATA (USE WITH LOCAL LOOP)
3. CONNECTIONS
   - 3.1 TYPE
     - 3.1.1 ONAN NODES = 6 POSITION PLUGGABLE SCREW TERMINAL BLOCK
     - 3.1.2 ONAN JUNCTION BOX/TERMINATOR = PLUGGABLE SCREW TERMINAL BLOCK AND RJ45
     - 3.1.3 NETWORK GATEWAY(SLTA-10) = 2 POSITION PLUGGABLE SCREW TERMINAL BLOCK
4. NET POWER
   - 4.1 REFER TO THE POWERCOMMAND NETWORK INSTALLATION AND OPERATION MANUAL, 0900-0529, FOR DETAILS.

NOTES

1. THIS IS A SAMPLE APPLICATION REPRESENTING DEVICE TYPES AND TYPICAL NETWORK WIRING ARRANGEMENTS. REFER TO THE POWERCOMMAND NETWORK INSTALLATION AND OPERATION MANUAL, 0900-0529, FOR DETAILS.
2. NETWORK DATA WIRE SHALL BE 22AWG LEVEL IV STRANDED TWISTED PAIR COMMUNICATIONS CABLE (MAXIMUM TOTAL NETWORK LENGTH 500 METERS). NETWORK DATA WIRING TOPOLOGY IS CRITICAL TO RELIABILITY. REFER TO THE POWERCOMMAND NETWORK INSTALLATION AND OPERATION MANUAL, 0900-0529, FOR DETAILS. REFER TO ECHELON'S FTT-10A LONWORKS FREE TOPOLOGY TRANSCEIVER USER'S GUIDE FOR MORE IMFORMATION ON WIRING LIMITATIONS.
3. TO ENSURE RELIABLE COMMUNICATIONS, SET TERMINATOR SWITCH TO "TERM" ON ONE DEVICE PER CHANNEL. ALL OTHERS SET TO POSITION OPPOSITE OF "TERM".
4. S2 ON JUNCTION BOX SHOULD BE SET TO "PASS-THRU" ONLY AND THE JBT SHOULD NOT BE TERMINATED IN AN FTT-10 NETWORK.
5. FOR GENERIC CUSTOMER CONNECTION DETAILS FOR THE CONTROLS COMMUNICATIONS MODULE(CCM), REFER TO INTERCONNECT DIAGRAM 0630-2390 AND POWERCOMMAND NETWORK INSTALLATION AND OPERATION MANUAL, 0900-0529.
6. FOR GENERIC CUSTOMER CONNECTION DETAILS FOR THE DIGITAL I/O MODULE(DIM), REFER TO INTERCONNECT DIAGRAM 0630-2276 AND POWERCOMMAND NETWORK INSTALLATION AND OPERATION MANUAL, 0900-0529.
7. FOR CUSTOMER CONNECTION DETAILS FOR THE POWERCOMMAND CONTROL(PCC), REFER TO SYSTEM DIAGRAM 0612-2389(NON-PARALLELING) OR 0612-2388 (PARALLELING).
8. FOR CONNECTION DETAILS BETWEEN MODEMS, NETWORK GATEWAY MODULES(NGM), AND PC'S, REFER TO POWERCOMMAND NETWORK INSTALLATION AND OPERATION MANUAL, 0900-0529.
9. FOR GENERIC CUSTOMER CONNECTION DETAILS FOR THE LONWORK SYSTEM ANNUNCIATOR (LSA), REFER TO INTERCONNECT DIAGRAM 0630-2293 AND POWERCOMMAND NETWORK INSTALLATION AND OPERATION MANUAL, 0900-0529.
10. ONAN PART NUMBER 0338-3240(10 FT PATCH CABLE WITH RJ45 PLUGS AT THE ENDS).
11. ONAN PART NUMBER 0338-3277(6 FT NULL MODEM CABLE, DB9P TO DB9S).
12. ONAN PART NUMBER 0338-3278(6 FT STANDARD MODEM CABLE, DB9S TO DB25P).
13. ONAN PART NUMBER 0338-3279(6 FT MODEM CABLE, DB9P TO DB25P).
14. ONAN PART NUMBER 0334-1351(PLENUM) OR 0334-1350(PVC).
15. NETWORK POWER WIRING SHALL BE SIZED IN ACCORDANCE WITH THE CHART LOCATED IN THE POWERCOMMAND NETWORK INSTALLATION AND OPERATION MANUAL, 0900-0529.
16. IF NO B+ IS PRESENT AT TB1-12 & TB1-13, USE TB1-1 & TB1-3(EARLY SPECS OF PCC DO NOT HAVE B+ AT TB1-12 & TB1-13).
17. NET_POWER IS FUSED AT 10A. FUSE IS LOCATED ON GOVERNOR MODULE.
18. FOR SPECIFIC INTERCONNECT DIAGRAM REFER TO 0630-2385.
19. FOR SPECIFIC INTERCONNECT DIAGRAM REFER TO 0630-2384.
20. THE TERMINATOR SWITCHES ON THESE JBTs ARE ONLY FOR USE IN A MULTI-DROP BUS NETWORK USING ONLY TP/XF-78 DEVICES
21. THESE TERMINATOR DEVICES ARE USED ONLY IN A MULTI-DROP BUS FT-10 NETWORK, AND THERE MUST BE TWO OF THEM TO OBTAIN THE 4,600 FOOT NETWORK DISTANCE AND 44 DEVICES.
22. WHEN THE NETWORK DEVICES ARE USED IN A FREE-TOPOLOGY NETWORK, THE NETWORK DISTANCE IS LIMITED TO 500 METERS (1625 FT) AND 64 DEVICES.

[illegible]

FIGURE E-1. POWERCOMMAND NETWORK INTERCONNECTION WIRING DIAGRAM (Sheet 3 of 3)



SPECIFICATIONS

1. NET POWER
   1.1 INPUT VOLTAGE = 5-36VDC (OPERATING RANGE)
   1.2 INPUT CURRENT = 150mA @ 36VDC
   200mA @ 24VDC
   400mA @ 12VDC
   1.25A @ 5VDC
   1.3 INPUT CURRENT(MAX) = 2.4A @ 3.5VDC
   1.4 INPUT CONNECTIONS = J3-3,4(NET POWER+)
   J3-5,6(NET POWER-)

2. NET DATA
   2.1 TYPE = ECHELON LONTALK
   FT10
   2.2 INPUT CONNECTIONS = J3-1(NET DATA1)
   J3-2(NET DATA2)
   J4-1(RJ45-NET DATA1)
   J4-2(RJ45-NET DATA2)
   (J4(RJ45), SERVICE/INSTALLATION USE ONLY)

3. DISCRETE INPUTS
   3.1 TYPE = DISCRETE
   3.2 NUMBER = 32
   CONNECT TO DRY CONTACTS ONLY
   RETURN TO ANALOG GROUND(J7)
   3.3 OUTPUT CURRENT = 0.5mA SOURCE (INPUTS 1-24, CLOSED)
   0.05mA SOURCE (INPUTS 25-32, CLOSED)
   3.4 VOLTAGE THRESHOLDS (TO ACTIVATE) = 1V (FOR ACTIVE "CLOSED")
   4V (FOR ACTIVE "OPEN")
   3.5 INPUT CONNECTIONS = J1(INPUT 1-16)
   J2(INPUT 17-32)
   J7(ANALOG GROUND)

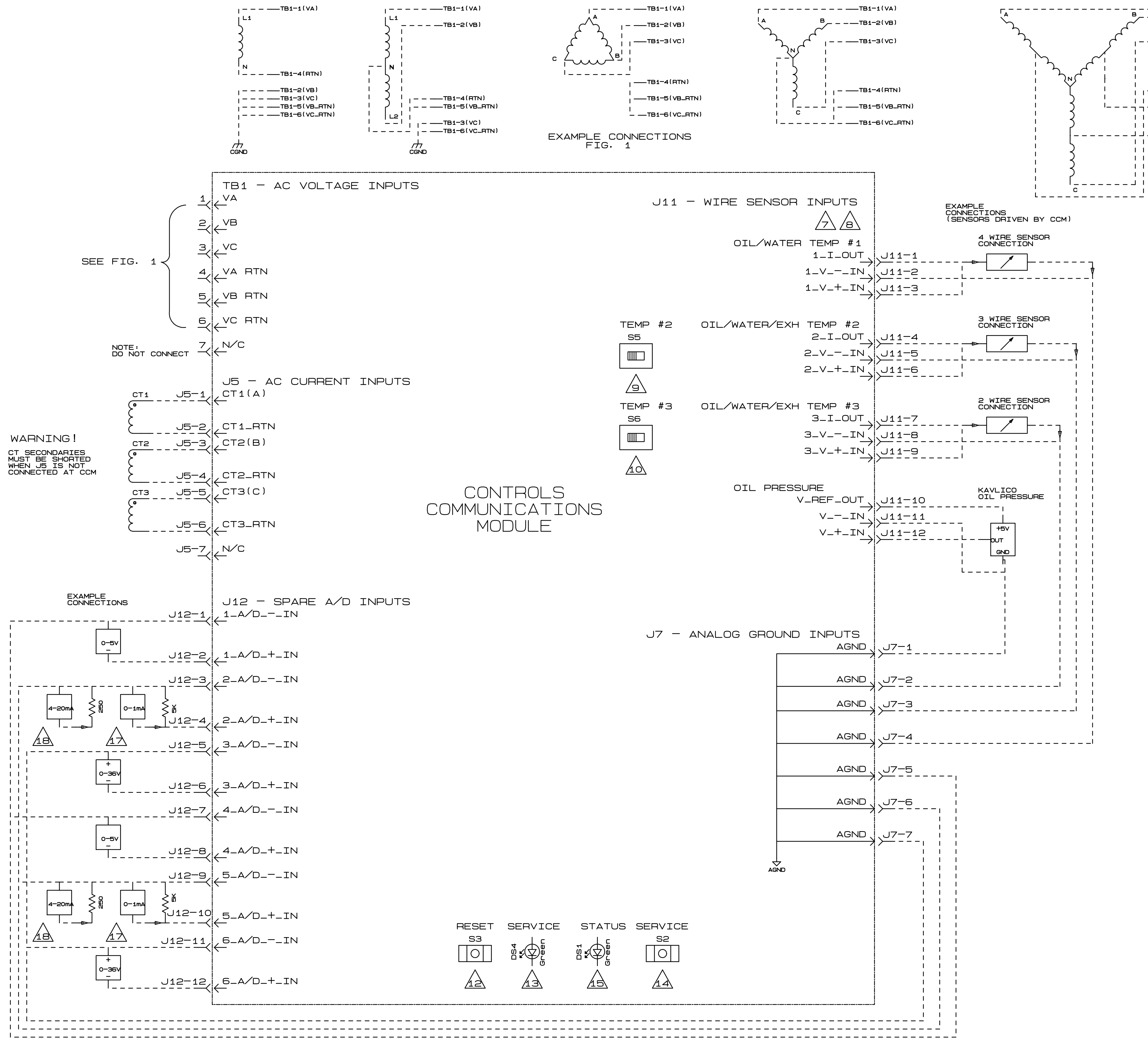
4. RELAY OUTPUTS
   4.1 TYPE = NON-LATCHING
   4.2 NUMBER = 8 (K1, K2, K3, K4, K5, K6, K7, K8)
   4.3 CONTACTS = 1 FORM C
   3A @ 30VDC
   3A @ 250VAC
   4.4 OUTPUT CONNECTIONS = J8, 9-3, 6, 9, 12(N/C CONTACTS)
   J8, 9-2, 5, 8, 11(COMMON)
   J8, 9-1, 4, 7, 10(N/O CONTACTS)

5. 3 PHASE VOLTAGE INPUTS
   5.1 INPUT VOLTAGE = 0-600VAC(LINE-TO-LINE) OR 0-347VAC(LINE-TO-NEUTRAL)
   5.2 INPUT CONNECTIONS = TB1-1, 2, 3(VA, VB, VC)
   TB1-4, 5, 6(VA RTN, VB RTN, VC RTN)
   TB1-7(DO NOT CONNECT)
   5.3 MAXIMUM VOLTAGE BETWEEN ANY LINE(TB1-1 TO 6)
   AND CHASSIS GND(J10) = 0-600VAC

6. 3 PHASE CURRENT INPUTS
   6.1 INPUT CURRENT = 0-5A AC
   6.2 INPUT CONNECTIONS = J5-1, 3, 5(CT1, CT2, CT3)
   J5-2, 4, 6(CT1 RTN, CT2 RTN, CT3 RTN)
   J5-7(DO NOT CONNECT)
   6.3 BURDEN = 1.1 VA

7. RTD TEMPERATURE INPUTS
   7.1 NUMBER = 3
   7.2 TYPE = 1 FIXED, 2 SWITCH SELECTABLE
   7.3 INPUT VOLTAGE RANGE(READ) = 0-9VDC
   7.4 DRIVE CURRENT = 2mA OR 8mA
   7.5 INPUT CONNECTIONS(READ) = J11-2, 5, 8(V-IN)
   J11-3, 6, 9(V+IN)
   7.6 INPUT CONNECTIONS(DRIVE) = J11-1, 4, 7(IOUT)

FIGURE E-2. CONTROLS COMMUNICATIONS MODULE INTERCONNECTION WIRING DIAGRAM (Sheet 1 of 2)



SPECIFICATIONS

9. OIL PRESSURE INPUT
   9.1 NUMBER = 1
   9.2 TYPE = FIXED
   9.3 INPUT VOLTAGE RANGE(READ) = 0-9VDC
   9.4 INPUT CONNECTIONS(READ) = J11-11(V-IN)
   J11-12(V+IN)
   9.5 DRIVE VOLTAGE = 5VDC
   9.6 DRIVE CURRENT = 8mA(MAX)
   9.7 INPUT CONNECTIONS(DRIVE) = J11-10(VOUT)
   (DESIGNED FOR USE WITH KAVLICO CAPACITIVE SENSOR, 0-100 PSIG, 0.5-4.5VDC)

10. SPARE ANALOG INPUTS(1,2,4,5)
    10.1 NUMBER = 4
    10.2 INPUT VOLTAGE = 0-5VDC
    10.3 INPUT CURRENT = 0-1mA OR 4-20mA(WITH EXTERNAL RESISTOR)
    10.4 INPUT CONNECTIONS = J12-1,3,7,8(A/D-IN)
    J12-2,4,8,10(A/D+IN)

11. SPARE ANALOG INPUT(3,6)
    11.1 NUMBER = 2
    11.2 INPUT VOLTAGE = 0-36VDC
    11.3 INPUT CURRENT = 0-1mA OR 4-20mA(WITH EXTERNAL RESISTOR)
    11.4 INPUT CONNECTIONS = J12-5,11(A/D-IN)
    J12-6,12(A/D+IN)

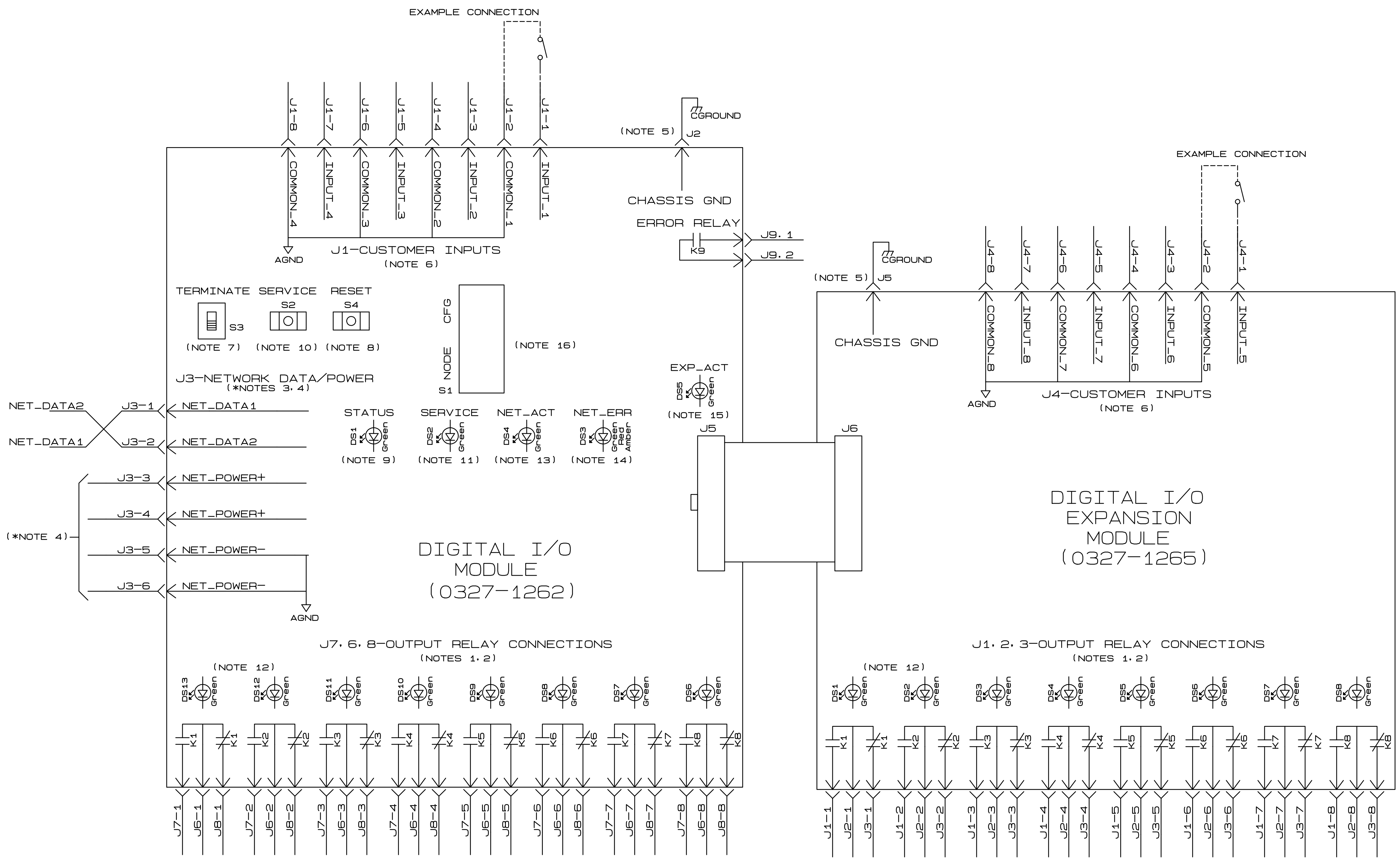
12. ANALOG GROUND INPUTS
    12.1 NUMBER = 7
    12.2 INPUT CONNECTIONS = J7-1-7
    12.3 ELECTRICALLY COMMON WITH J3-5,6

13. ENVIRONMENTAL
    13.1 STORAGE TEMPERATURE = -40 TO 85 C
    13.2 OPERATING TEMPERATURE = -40 TO 70 C
    13.3 HUMIDITY = 95% RH (NON-CONDENSING)

NOTES:

1. ALL RELAYS ARE SHOWN IN RESET OR DE-ENERGIZED POSITION.
2. RELAY OUTPUTS ARE CONTROLLED VIA THE NETWORK.
3. REFER TO INTERCONNECTION PRINT(0630-2293).
4. REFER TO POWERCOMMAND NETWORK INSTALLATION AND OPERATION MANUAL(0900-0529).
5. CONNECT J10 RING TERMINAL TO A GOOD EMI EARTH GROUND. USE AN "EXTERNAL TOOTH" LOCKWASHER BETWEEN RING AND GROUNDING SURFACE.
6. INSERT 1K OHM(2W) "PULLDOWN" RESISTOR BETWEEN INPUT TERMINAL AND J7(GND) WHEN ACTIVE "OPEN" INPUT IS 5-36VDC.
7. SENSOR #1 FIXED FOR A 500-2200 OHM RTD INPUT (OIL/WATER TEMP, 2mA).
8. SENSOR #2 & #3 SWITCH SELECTABLE FOR A 500-2200 OHM RTD INPUT (OIL/WATER TEMP, 2mA) OR A 80-390 OHM RTD INPUT (EXHAUST TEMP, 8mA).
9. TEMP #2 SELECT SWITCH(500-2200 OHM OR 80-390 RTD INPUT).
10. TEMP #3 SELECT SWITCH(500-2200 OHM OR 80-390 RTD INPUT).
11. S1, WHEN SET TO TERMINATE, WILL TERMINATE THE TWISTED PAIR NETWORK BUS. DATA LINES MUST BE TERMINATED WHEN THE CCM IS PHYSICALLY LOCATED AT THE END OF THE NETWORK BUS.
12. S3, RESET PUSH-BUTTON SWITCH, WILL MANUALLY RESET THE CCM.
13. DS4, STATUS LED(GREEN), INDICATES INDICATES CCM PROCESSOR IS RUNNING.
14. S2, SERVICE PUSH-BUTTON SWITCH, USED TO GENERATE NETWORK MANAGEMENT MESSAGE FOR NODE LOGICAL INSTALLATION.
15. DS1, SERVICE STATUS LED(AMBER), INDICATES INSTALLATION AND ERROR STATUS.
16. CUSTOMER INPUT RETURN CONNECTED TO J7(ANALOG GROUND) OR NET POWER-.
17. 5K OHM YIELDS 0-5VDC. LOWER RESISTANCE IF CURRENT SOURCE CANNOT DRIVE TO THIS VOLTAGE (THIS WILL REDUCE SENSOR RESOLUTION).
18. 250 OHM YIELDS 5VDC FULL SCALE. LOWER RESISTANCE IF CURRENT SOURCE CANNOT DRIVE TO THIS VOLTAGE (THIS WILL REDUCE SENSOR RESOLUTION).
19. WHEN RUNNING CCM-G CODE (0541-0811), J2-12 (DISCRETE INPUT 28), GENSET RUNNING SIGNAL MUST BE GROUNDED

FIGURE E-2. CONTROLS COMMUNICATIONS MODULE INTERCONNECTION WIRING DIAGRAM (Sheet 2 OF 2)



SPECIFICATIONS

1. NET POWER
 1.1 INPUT VOLTAGE = 8-40VDC
  (OPERATING RANGE)
 1.2 INPUT CONNECTIONS = J3-3(NET POWER+)
  J3-5(NET POWER-)
 1.3 OUTPUT CONNECTIONS = J3-4(NET POWER+)
  J3-6(NET POWER-)

2. NET DATA
 2.1 TYPE ECHELON LONTALK™
  78Kb TWISTED PAIR
  TRANSFORMER COUPLED
 2.2 INPUT CONNECTIONS = J3-1(NET DATA1)
  J3-2(NET DATA2)

3. CUSTOMER INPUTS
 3.1 TYPE = DISCRETE
 3.2 NUMBER = 4 : 8 WITH EXPANSION BOARD
  CONNECT TO DRY CONTACTS ONLY
  RETURN TO COMMON OF SAME NUMBERED INPUT
 3.3 OUTPUT = 5VDC (OPEN)
  5mA SOURCE MAX (CLOSED)
 3.8 INPUT CONNECTIONS = J1-1(INPUT 1) 1262 board
  J1-2(COMMON 1) 1262 board
  J1-3(INPUT 2) 1262 board
  J1-4(COMMON 2) 1262 board
  J1-5(INPUT 3) 1262 board
  J1-6(COMMON 3) 1262 board
  J1-7(INPUT 4) 1262 board
  J1-8(COMMON 4) 1262 board
  J4-1-8 on 1265 board

4. OUTPUT RELAYS
 4.1 TYPE = NON-LATCHING
 4.2 NUMBER = 8 : 16 WITH EXPANSION BOARD
 4.3 CONTACTS = 1 FORM C
  .5A, 250VAC 1262 board
  1A, 125VAC 1265 board
  2A, 30VDC
  (RATINGS LIMITED BY UL TEST)
 4.4 OUTPUT CONNECTIONS = J8(N/C CONTACTS) 1262 board
  J6(COMMON) 1262 board
  J7(N/O CONTACTS) 1262 board
  J3(N/C CONTACTS) 1265 board
  J2(COMMON) 1265 board
  J1(N/O CONTACTS) 1265 board

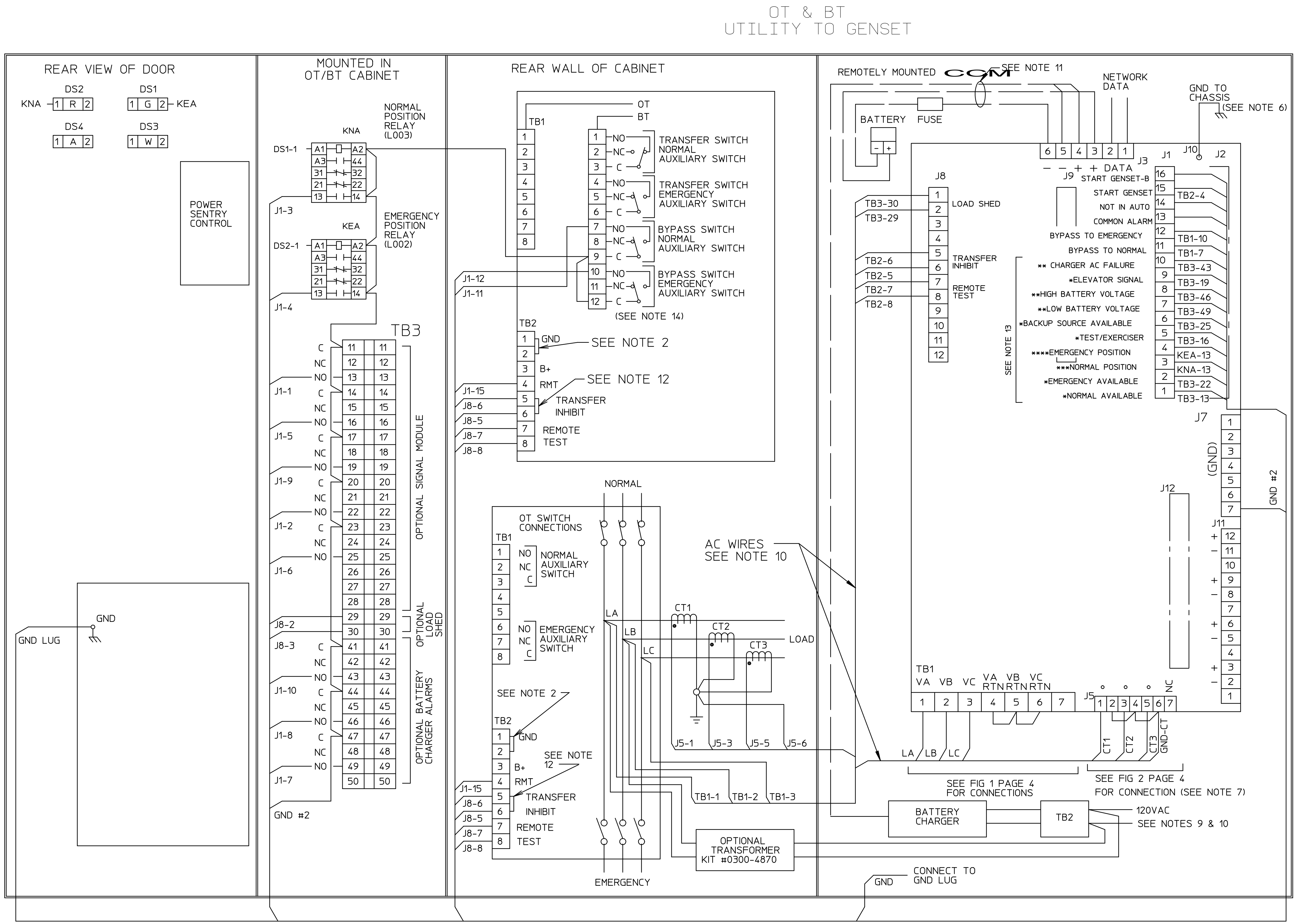
5. ENVIRONMENTAL
 5.1 STORAGE TEMPERATURE = -40 TO 85 °C
 5.2 OPERATING TEMPERATURE = -40 TO 85 °C
 5.3 HUMIDITY = 45 TO 85% RH

6. NETWORK ERROR RELAY
 6.1 TYPE = NON-LATCHING
 6.2 NUMBER = 1
 6.3 CONTACTS = 1 FROM A (NORMALLY OPEN)
  1 AMP, 250V AC, 30V DC
 6.4 OUTPUT CONNECTIONS = J9 - 1 (NORMALLY OPEN)
  J9 - 2 (COMMON)

NOTES

1. ALL RELAYS SHOWN IN RESET OR DE-ENERGIZED POSITION. DO NOT MAINTAIN THE LAST STATE WHEN POWER IS LOST.
2. OUTPUT RELAYS ARE CONTROLLED VIA THE NETWORK.
3. REFER TO INTERCONNECTION PRINT (0630-2293).
4. REFER TO POWERCOMMAND NETWORK INSTALLATION AND OPERATION MANUAL(900-0529).
5. CONNECT J2 RING TERMINAL TO A GOOD EARTH GROUND. USE AN 'EXTERNAL TOOTH' LOCKWASHER BETWEEN RING AND GROUNDING SURFACE.
6. DO NOT APPLY VOLTAGE TO CUSTOMER INPUTS 1-8 (J1 AND J4)
7. S3, WHEN SET TO TERMINATE , WILL TERMINATE THE TWISTED PAIR BUS. DATA LINES MUST BE TERMINATED WHEN THE DIM IS PHYSICALLY LOCATED AT THE END OF THE NETWORK BUS.
8. S4, RESET PUSH-BUTTON SWITCH, WILL MANUALLY RESET THE DIM.
9. DS1, STATUS LED(GREEN), INDICATES DIM PROCESSOR IS RUNNING.
10. S2, SERVICE PUSH-BUTTON SWITCH, USED TO GENERATE NETWORK MANAGEMENT MESSAGE FOR NODE LOGICAL INSTALLATION.
11. DS2, SERVICE LED(AMBER), INDICATES THE INSTALLATION AND ERROR STATUS.
12. DS6-DS13(GREEN) ON THE DIM BOARD INDICATE WHICH RELAYS ARE ENERGIZED. DS1-DS8(GREEN) ON THE EXPANSION BOARD INDICATE WHICH RELAYS ARE ENERGIZED.
13. DS4, NET_ACT LED(GREEN), INDICATES NETWORK ACTIVITY.
14. DS3, NET_ERR LED(GREEN,RED,AMBER), INDICATES NETWORK CONNECTION. IF IT IS RED, THE DIM IS NOT CONNECTED TO THE NETWORK. IF IT IS AMBER, IT IS CONNECTED, BUT NOT BOUND. IF IT IS GREEN, THE DIM IS CONNECTED AND BOUND.
15. DS5, EXP_ACT LED(GREEN), INDICATES COMMUNICATION BETWEEN MAIN AND EXPANSION BOARD.
16. S1, CONFIGURATION SWITCH, USED TO CONFIGURE DEVICE FOR SELF-INSTALLATION. SEE SECTION 3.

FIGURE E-3. DIGITAL I/O MODULE INTERCONNECTION WIRING DIAGRAM
(Sheet 1 of 1)



WITHOUT METERS

NOTES:

1. ALL RELAYS ARE SHOWN IN RESET OR DE-ENERGIZED POSITION.
2. WHEN PROVIDING REMOTE START VIA THE NETWORK, PLACE JUMPER BETWEEN TB2-1 AND TB2-2, AND CONNECT TB2-4 TO J1-15.
3. LIST OF OPTIONS SHOWN ON DRAWING

LOAD SHED	M007
BATTERY CHARGER 10 AMP	K002 OR K003
EMERGENCY AUXILIARY RELAY	L002
NORMAL AUXILIARY RELAY	L003
METERS OR CT KIT	N002 OR KIT
BATTERY CHARGER ALARMS	N002
SIGNAL MODULE	M001

4. REFER TO INTERCONNECTION PRINT (0630-2293) FOR SYSTEM CONNECTION.
5. REFER TO POWER COMMAND NETWORK INSTALLATION AND OPERATION MANUAL (0900-0529).
6. CONNECT J10 RING TERMINAL TO A GOOD EMI EARTH GROUND. USE AN "EXTERNAL TOOTH" LOCKWASHER BETWEEN TERMINAL AND GROUNDING SURFACE.
7. MAX WIRING DISTANCE FROM CURRENT TRANSFORMER TO CCM (ONE WAY) SEE TABLE ON SHEET 4.
8. MAX WIRING DISTANCE FOR ALL OTHER WIRING IS 1000 FT USING #16 AWG WIRE.
9. CONNECT TO 120VAC-POLARITY INSENSITIVE. IF NOT AVAILABLE USE KIT #0300-4870
10. SEPARATE CONDUIT IS REQUIRED FOR AC WIRING.
11. WIRING HAS BEEN PRE-INSTALLED.
12. FOR NETWORK CONTROL OF TRANSFER INHIBIT REMOVE JUMPER.
13. * SIGNAL AVAILABLE WHEN SIGNAL MODULE M001 IS INSTALLED.
    ** SIGNAL AVAILABLE WHEN 10 AMP BATTERY CHARGER K2 OR K3 IS INSTALLED ALONG WITH BATTERY CHARGER ALARM N002.
    *** SIGNAL AVAILABLE WHEN NORMAL POSITION RELAY (L003) IS INSTALLED.
    **** SIGNAL AVAILABLE WHEN EMERGENCY POSITION RELAY (L002) IS INSTALLED.
    L002 AND L003 ARE USED INSTEAD OF THE AUXILIARY SWITCHES ON TRANSFER SWITCH, BECAUSE OF THE LOW CURRENT REQUIREMENTS OF THE CCM.
14. TRANSFER SWITCH SHOWN CLOSED TO NORMAL BYPASS SWITCH SHOWN IN NEUTRAL POSITION.

FIGURE E-4. CCM-T INTERCONNECTION WIRING DIAGRAM (Sheet 1 of 4)

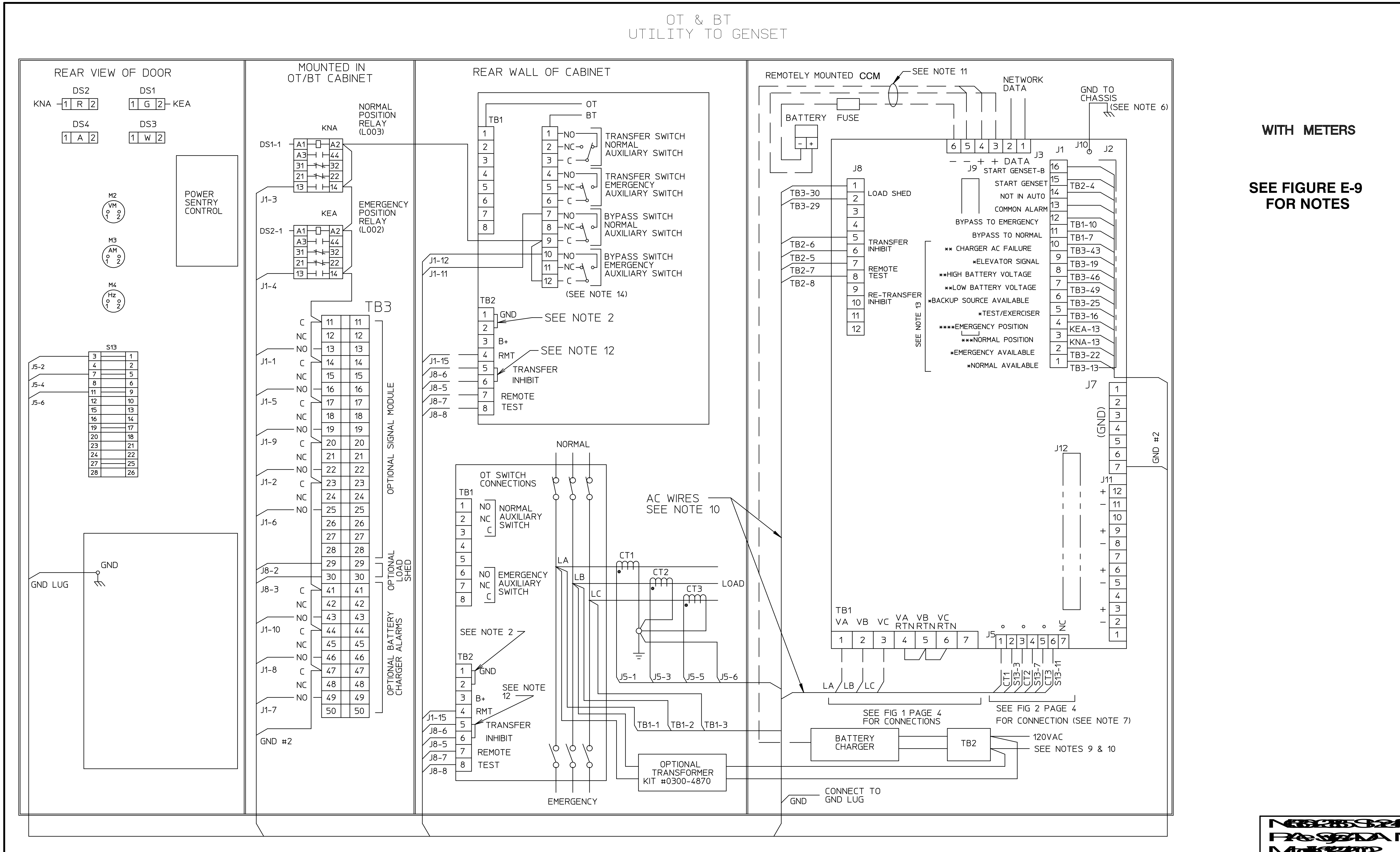


FIGURE E-4. CCM-T INTERCONNECTION WIRING DIAGRAM (Sheet 2 of 4)

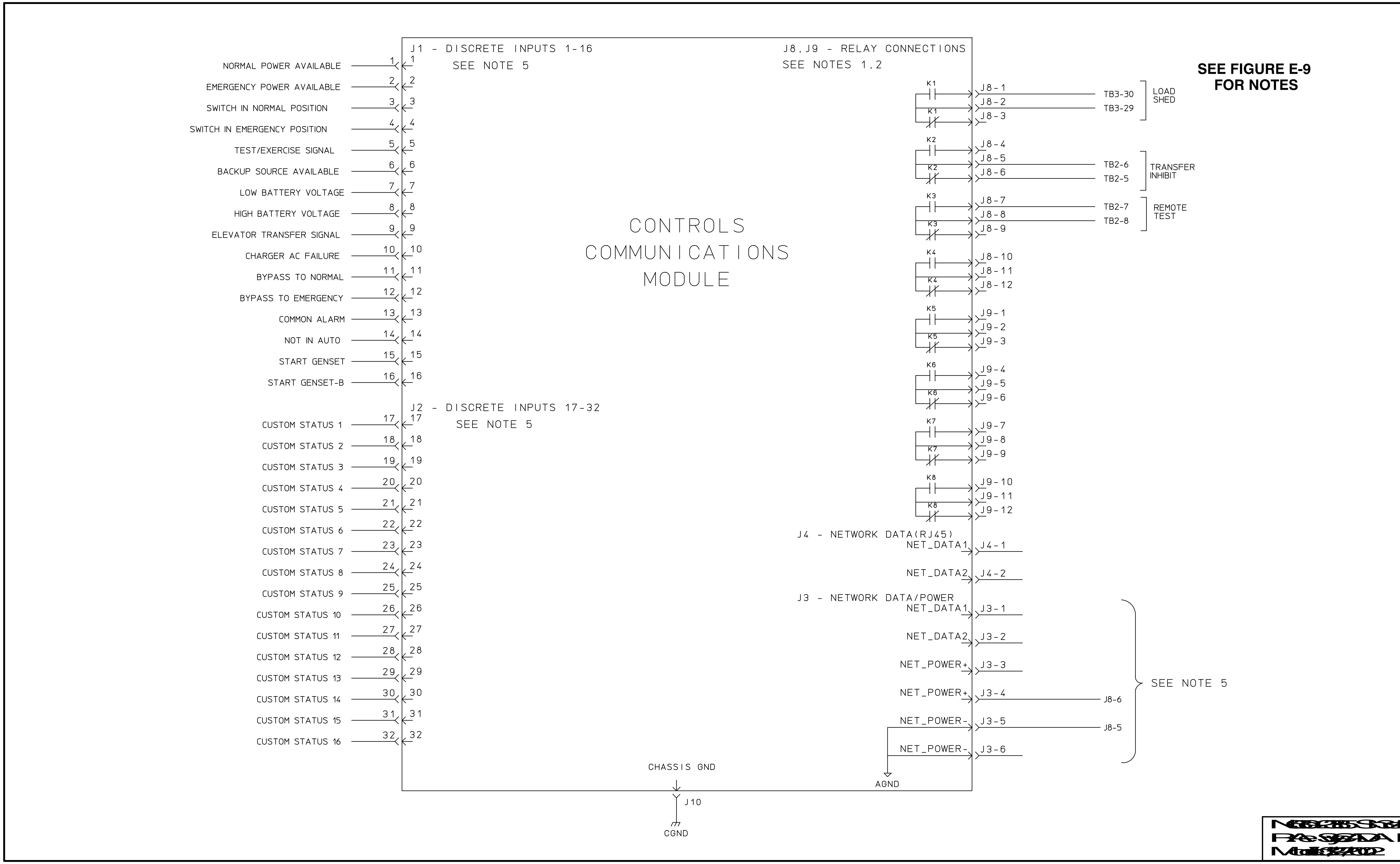


FIGURE E-4. CCM-T INTERCONNECTION WIRING DIAGRAM (3 of 4)

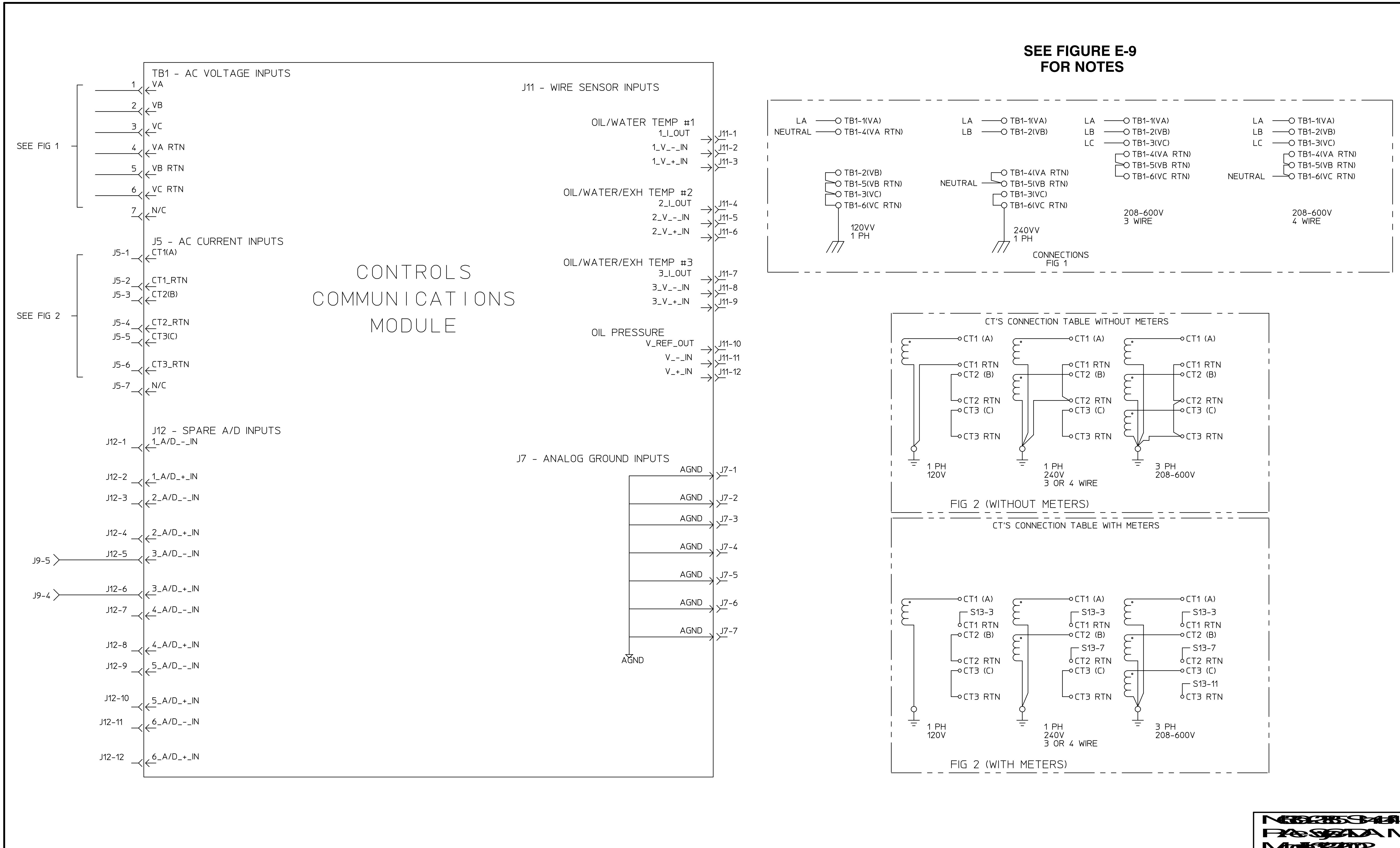
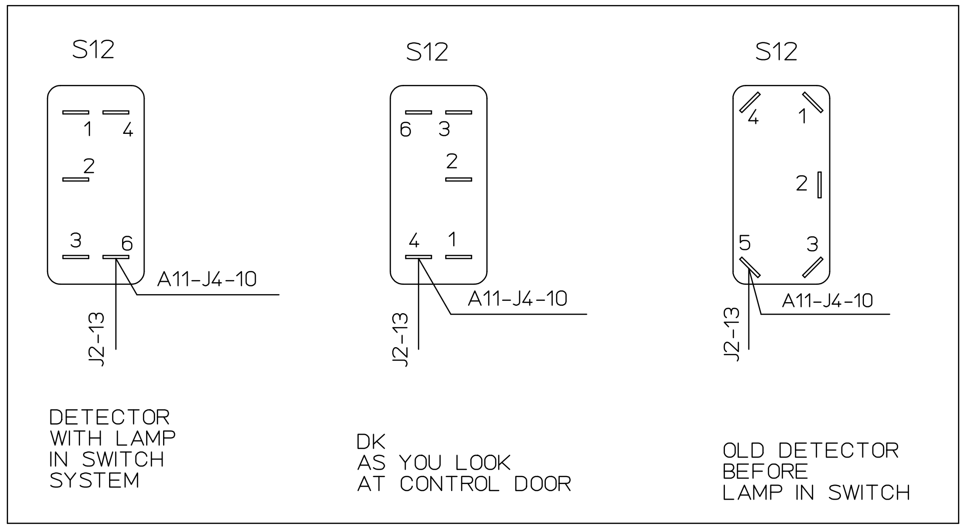
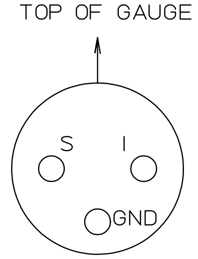


FIGURE E-4. CCM-T INTERCONNECTION WIRING DIAGRAM (4 of 4)

J2-13 CONNECTION ⚠2



TOP OF GAUGE



ON DK, REMOVE GAUGE BOARD BEFORE CONNECTING WIRE TO "S" TERMINAL

WIRE SIZE	DISTANCE IN FEET ONE WAY			
AWG	A 12/24V	B 12 VOLT	B 24 VOLT	C
24	500	----	----	----
22	700	----	----	----
18	1500	20	175	----
16	3000	35	250	14
14	----	55	400	20
12	----	90	650	30

FOR CT'S USE COLUMN C
FOR B+, GND USE COLUMN B
FOR ALL ELSE USE COLUMN A
⚠4

NOTES:

⚠1 IF SET IS EQUIPPED WITH TIME DELAY START/STOP MODULE, THE START SIGNAL FROM CCM-J8-1 SHOULD BE CONNECTED TO A15-TB1-5. IF NOT EQUIPPED THE START SIGNAL WILL BE CONNECTED TO A11-TB1-6.

⚠2 S12 IDENTIFICATION:

DK CONTROL...S12, AS YOU LOOK AT THE CONTROL DOOR OPEN, IS LOCATED ON YOUR LEFT. YOU NEED TO CONNECT THE RESET POWER LEAD TO TERMINAL NUMBER 4. TERMINAL 4 WILL BE LOCATED TO THE OUTSIDE EDGE OF THE CONTROL ON THE LEFT.

CHECK TO SEE THAT IT IS CONNECTED TO A11-J4-10. REMOVE THE FASTON, CONNECT THE PIGGY BACK AND REPLACE THE FASTON.

DETECTOR IDENTIFCATION...IF YOUR CONTROL HAS A RESET SWITCH WITH INDICATOR LAMP IN IT, S12 WILL BE TO YOUR RIGHT WITH THE DOOR OPEN. YOU NEED TO CONNECT THE RESET POWER LEAD TO TERMINAL NUMBER 6.

TERMINAL 6 WILL BE ON THE RIGHT HAND SIDE OF THE SWITCH AT THE BOTTOM. CHECK TO SEE THAT IT IS CONNECTED TO A11-J4-10. REMOVE THE FASTON, CONNECT THE PIGGY BACK AND REPLACE THE FASTON.

IF YOUR CONTROL DOES NOT HAVE AN INDICATOR LAMP IN THE RESET SWITCH, S12 WILL BE LOCATED TO YOUR RIGHT WITH THE DOOR OPEN. YOU NEED TO CONNECT THE RESET POWER LEAD TO TERMINAL NUMBER 5.

TERMINAL 5 WILL BE ON THE LEFT HAND SIDE OF THE SWITCH AT THE BOTTOM. CHECK TO SEE THAT IT IS CONNECTED A11-J4-10. REMOVE THE FASTON, CONNECT THE PIGGY BACK AND REPLACE THE FASTON.

⚠3 THE GAUGE SIGNAL CIRCUIT SHOULD BE CONNECTED TO THE "S" TERMINAL OF THE GAUGE.
DK CONTROL...THE "S" TERMINAL IS LOCATED TO THE RIGHT SIDE OF THE GAUGE WITH THE DOOR OPEN.

REMOVE THE GAUGE BOARD ON THE WATER TEMP GAUGE AND CONNECT THE SIGNAL WIRE THEN REPLACE THE GAUGE BOARD. CHECK TO SEE THAT THE EXISTING WIRE IS MARKED M12-S OR M11-S.

DETECTOR CONTROL...THE "S" TERMINAL IS LOCATED TO THE LEFT SIDE OF THE GAUGE WITH THE DOOR OPEN. CHECK TO SEE THAT THE EXISTING WIRE IS MARKED M12-S OR M11-S. CONNECT THE SIGNAL WIRE AND TIGHTEN THE NUT.

⚠4 USE COLUMN "C" FOR DETERMINING WIRE SIZES BASED ON DISTANCE FOR CT'S. USE COLUMN "B" FOR DETERMINING WIRE SIZES BASED ON DISTANCE FOR B+ AND GND CIRCUITS. COLUMN "A" CAN BE USED FOR ALL OTHER CIRCUITS.

NOTE THAT THE DISTANCE IS MEASURED IN FEET FROM THE SET TO THE CCM BOARD ONE WAY ONLY.

STRANDED WIRE IS PREFERED FOR VIBRATION RESISTANCE.

⚠5 REMOVE WIRE FROM TB21-28,29,30 AND REMOVE THE SPADE LUG. RELUG WITH SPLICE AND CONNECT WIRE TO CCM BOARD TERMINAL J5-1,J5-3,J5-5. CONNECT ADDITIONAL WIRE FROM TB21-28,29,30 AND CONNECT TO CCM BOARD TERMINAL J5-2,J5-4,J5-6.

⚠6 CT CIRCUITS MUST BE FULLY CONNECTED BEFORE STARTING SET. ELECTRICAL HAZARD OR DAMAGE TO EQUIPMENT COULD RESULT.

⚠7 WHEN CCM IS USED WITH A 7 LIGHT CONTROL THESE CONNECTIONS WILL NOT BE AVAILABLE.

⚠8 FOR DELTA WIRED SETS, TIE ALL RETURNS TOGETHER. NO CONNECTION IS MADE TO TB21-26. LEAVE FLOATING.

⚠9 IF SENDER READINGS ARE REQUIRED WHEN GENSET IS NOT RUNNING, THE FOLLOWING CONNECTIONS MAY BE NECESSARY: (DETECTOR ONLY) REMOVE THE WIRE M12-I (TEMP GAUGE) AND SAFELY TIE THE LEAD BACK INTO THE HARNESS. INSTALL A JUMPER FROM A11-TB1-7 (B+ FUSED) TO M12-I.

⚠10 WHEN THE INPUT IS ACTIVE "OPEN" (5-36VDC), YOU MUST CONNECT A 1K,2W PULL-DOWN RESISTOR BETWEEN J2-13 AND J7-3 (AGND). FOR DK AND DETECTOR SETS, A11-J4-10 IS ACTIVE "OPEN" 12V - 24V.

NOTES	FROM		TO	OPTIONAL CONNECTIONS	COLOR
	DC CONNECTIONS				
⚠1	J8-1	START	A11-TB1-6	A15-TB1-5	
	J8-2	CCM B+	J9-3		
	J8-4	RESET	A11-TB2-5		
	J8-5	GND	J9-6		
	J8-7	SHUTDOWN	A11-TB2-16		
	J8-8	GND	J1-6		
⚠3	J11-12	OP GAUGE	M11-S		
⚠3 ⚠9	J11-3	WT GAUGE	M12-S		
	J11-11	GND	J3-2		
	J11-2	GND	J6-2		
	J1-2	FAULT2	A11-TB2-2		
	J1-1	FAULT1	A11-TB2-4		
	J2-16	LO COOL LVL			
	J2-15	CHRGR AC FAIL			
	J2-14	SW RUN			
⚠2 ⚠10	J2-13	SW OFF	S12-??		
	J2-12	RUN	A11-TB1-3		
	J2-11	PLOP	A11-TB2-11		
	J2-10	PHET	A11-TB2-10		
	J2-9	LOP	A11-TB2-9		
	J2-8	HET	A11-TB2-8		
	J2-7	OS	A11-TB2-7		
	J2-6	OC	A11-TB2-6		
⚠7	J2-5	LO BATTERY			
⚠7	J2-4	HI BATTERY			
⚠7	J2-3	LET	A11-TB2-13		
⚠7	J2-2	LOW FUEL	A11-TB2-15		
⚠10	J2-1	COM ALARM	A11-TB1-4		
	J2-1	1K,2W RSTR	J6-1		
	J12-5	SENSED GND	A11-TB1-5		
	J12-6	SENSED B+	A11-TB1-7		
⚠4	J3-4	CCM B+	A11-TB1-7		
⚠4	J3-5	CCM GND	A11-TB1-5		
	AC CONNECTIONS				
	TB1-1	VA GEN8	TB21-22		
	TB1-2	VB GEN7	TB21-23		
	TB1-3	VC GEN6	TB21-25		
	TB1-4	NEUTRAL	TB21-26		
	TB1-5	NEUTRAL	TB1-4		
	TB1-6	NEUTRAL	TB1-5		
	J10 GND LUG IN BOX		GND LUG IN BOX CONTROL GND STUD		
⚠4 ⚠5	J5-1	CT21-(+)	CT21		
⚠4 ⚠5	J5-2	CT21-(-)	TB21-28		
⚠4 ⚠5	J5-3	CT22-(+)	CT22		
⚠4 ⚠5	J5-4	CT22-(-)	TB21-29		
⚠4 ⚠5	J5-5	CT23-(+)	CT23		
⚠4 ⚠5	J5-6	CT23-(-)	TB21-30		

FIGURE E-5. CCM-G INTERCONNECTION WIRING DIAGRAM (1 of 2)

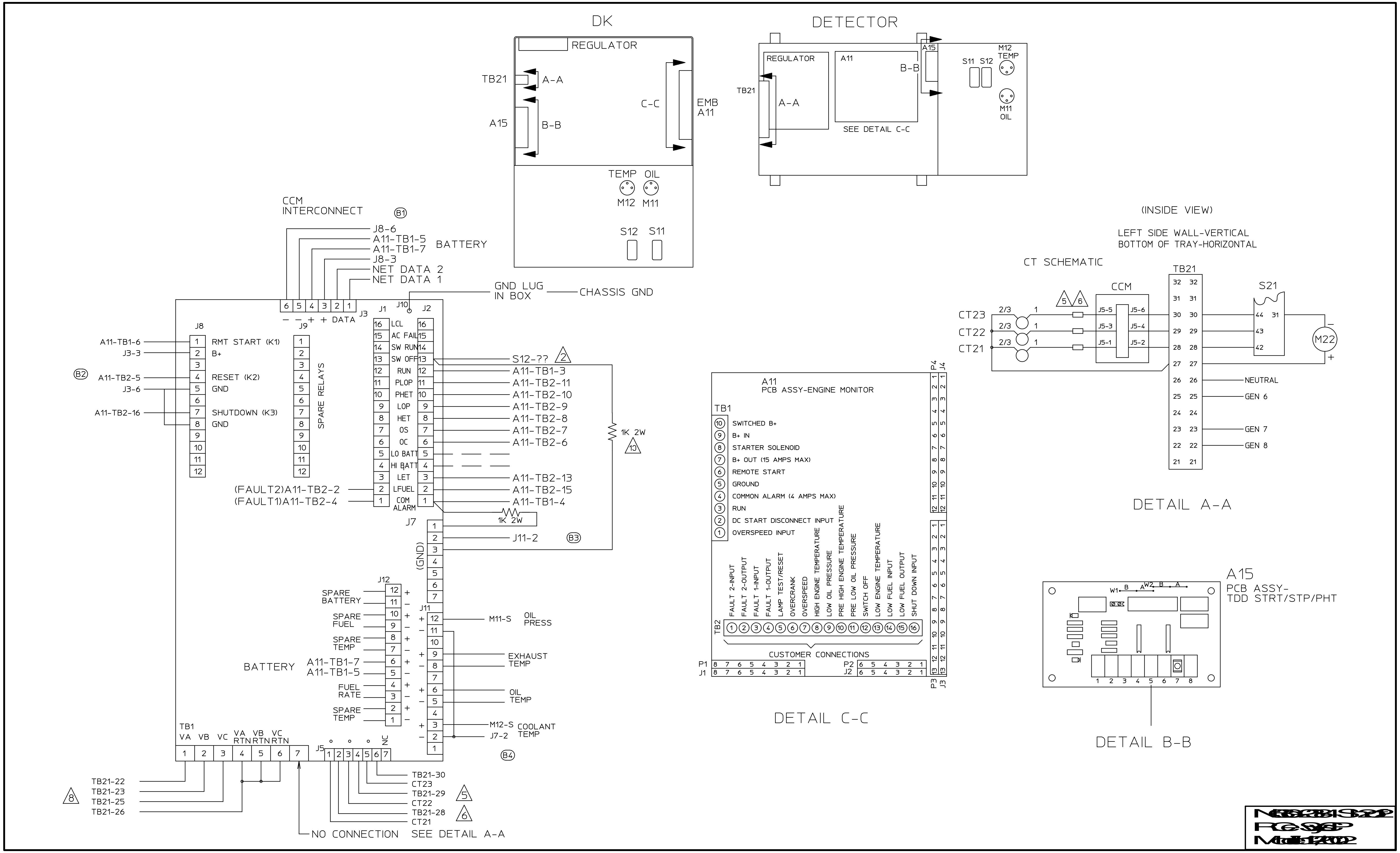


FIGURE E-5. CCM-G INTERCONNECTION WIRING DIAGRAM (2 of 2)

Appendix E. Bindings

Genset Applications Control Communications Module (CCM-G) Bindings

Annunciator – LonWorks System Annunciator (LSA)

Possible bindings to a LonWorks System Annunciator:

Genset w/CCM-G		LonWorks Annunciator		
nvoAnnunNFPA110 *nvoAnnunCustom* *nvoAnnunExtended*	→	*nvi16PointAnnunA*	*16 Lamps*	**Monitor**
nvoAnnun8Point	→	*nvi8PointAnnunA..B*	*8 Lamps*	
nvoAnnun4Point	→	*nvi4PointAnnunA..E*	*4 Lamps*	
nvoRunStatus *nvoFaultStatus* *nvoNotInAuto* *nvoCustomStatus[1..16]*	→	*nviLamp[1..20]*	*Single Lamp*	

ATS – CCM (CCM-T)

Possible bindings to an Automatic Transfer Switch with a CCM:

CCM-G		CCM-T		
nviStartCmd	←	*nvoStartCmd* *nvoStartCmdB*	*General*	**Control**
nviStartType	←	*nvoStartType*		
nvoCustomStatus[1..16]	→	*nviLoadShedCmd* *nviRetransInhCmd* *nviTestCmd* *nviTransInhCmd*		
nviRelay4..8	←	*nvoStartCmd* *nvoStartCmdB* *nvoTestStatus* *nvoFaultStatus*		

Digital I/O Module (DIM)

Possible bindings to the 'new' Digital I/O Module (v1.03):

CCM-G		DIM		
nvoAnnunCustom	→	*nvi16RelayA*	*Custom Annun*	**Monitor**
nvoAnnunExtended			*Extended Annun*	
nvoAnnunNFPA110	→	*nvi16RealyB*	*NFPA110 Annun*	

Genset Applications Control Communications Module (CCM-G) Bindings (continued)

ATS – PowerCommand (OTPC/BTPC)

Possible bindings to a PowerCommand OTPC/BTPC Automatic Transfer Switch:

PCC w/CCM-G		PowerCommand ATS		
nviStartCmd	←	*nvoStartCmd* *nvoStartCmdB*	*General*	**Control**
nviStartType	←	*nvoStatType*		
nvoGenStatus	→	*nviScr1Status* *nviSrc2Status*	*General*	**Monitor**
nvoCustomStatus[1..16]	→	*nviLoadShedCmd* *nviRetransInhCmd* *nviTestCmd* *nviTransInhCmd*	*General*	**Control**
nviRelay1..8	←	*nvoLoadSequence1..8*	*Load Sequence*	
nviRelay1..8	←	*nvoStartCmd* *nvoStartCmdB* *nvoTestStatus* *nvoFaultStatus*	*General*	
nviRelay1..8	←	*nvoFaultStatus* *nvoNotInAuto*	*General*	

Modbus Interface (ModLon)

Possible bindings to an 'original' Modbus interface (v1):

Genset w/CCM-G		ModLon		
nviRunCmd	←	*nvoRunCmd[..]*	*General*	**Control**
nviResetCmd	←	*nvoResetCmd[..]*		
nviEmerStopCmd	←	*nvoEStopCmd[..]*		
nvoStatus	→	*nviCCMGStatus[..]*	*General*	**Monitor**
nvoGenData	→	*nviCCMGACData[..]*		
nvoEngineData	→	*nviCCMGEngData[..]*		

Possible bindings to a 'new' Modbus interface (v2):

Genset w/CCM-G		ModLon		
nviStartCmd	←	*nvoStartCmd[..]*	*General*	**Control**
nviFaultResetCmd	←	*nvoFaultResetCmd[..]*		
nvoGenACData	→	*nviGenACData[..]*	*General*	**Monitor**
nvoGenEngData	→	*nviGenEngData[..]*		
nvoGenStatus	→	*nviGenStatus[..]*		

Network Gateway Module

Possible bindings to a Network Gateway Module (SLTA-10):

Genset w/CCM-G		Network Gateway Module		
msg_remote	→	*msg_in*	*Remote Dialout*	**Alarms**

Automatic Transfer Switch Control Communications Module (CCM-T) Bindings

ATS – PowerCommand (OTPC/BTPC)
Possible bindings to a PowerCommand OTPC/BTPC Automatic Transfer Switch:

CCM-T		PowerCommand ATS		
nvoStartCmd	→	*nviStartCmd*	*Dual Standby*	**Control**
nvoCustomStatus[1..16]	→	*nviLoadShedCmd* *nviRetransInhCmd* *nviTestCmd* *nviTransInhCmd*		
nviRelay5..8	←	*nvoLoadSequence1..8*	*Load Sequence*	
nviRelay5..8	←	*nvoStartCmd* *nvoStartCmdB* *nvoTestStatus* *nvoFaultStatus*	*General*	

Digital I/O Module (DIM)
Possible bindings to the 'new' Digital I/O Module (v1.03):

CCM-T		DIM		
nvoAnnunCustom	→	*nvi16RelayA*	*Custom Annun*	**Monitor**
nvoAnnunExtended			*Extended Annun*	
nvoAnnunNFPA110	→	*nvi16RealyB*	*NFPA110 Annun*	

Genset – CCM (CCM-G)
Possible bindings to a Genset equipped with a CCM:

CCM-T		Genset w/CCM		
nvoStartCmd(B)	→	*nviStartCmd*	*"Start"*	**Control**
nvoCustomStatus[1..16]	→	*nviFaultResetCmd* *nviStartCmd* *nviShutdownCmd*	*General*	
nviRelay5..8	←	*nvoCustomStatus[1..16]* *nvoFaultStatus* *nvoNotInAuto* *nvoRunStatus*	*General*	

Genset – PCC 3100
Possible bindings to a PowerCommand 3100 genset:

CCM-T		Genset w/PCC 3100		
nvoStartCmd(B)	→	*nviStartCmd*	*General*	**Control**
nvoCustomStatus[1..16]	→	*nviCustFault1..4* *nviFaultResetCmd* *nviGenCBInhCmd* *nviLoadDemandCmd* *nviShutdownCmd* *nviStartCmd*		
nviRelay5..8	←	*nvoFaultStatus* *nvoNotInAuto* *nvoRunStatus*	*General*	

Automatic Transfer Switch Control Communications Module (CCM-T) Bindings (continued)

Annunciator – LonWorks System Annunciator (LSA)

Possible bindings to a LonWorks System Annunciator:

CCM-T		LonWorks Annunciator		
nvoAnnunCustom	→	*nvi16PointAnnunA*	*16 Lamp Annun*	**Monitor**
nvoAnnunExtended				
nvoAnnunNFPA110	→	*nvi16PointAnnunB*		
nvoAnnun8Point	→	*nvi8PointAnnunA..B*	*8 Lamp Annun*	
nvoAnnun4Point	→	*nvi4PointAnnunA..E*	*4 Lamp Annun*	
nvoCustomStatus[1..32]	→	*nviLamp[1..20]*	*Single Lamp*	
nvoFaultStatus				
nvoNotInAuto				
nvoScr1Available				
nvoScr1Connected				
nvoScr2Available				
nvoScr2Connected				
nvoTestStatus				

Genset – PCC 3200

Possible bindings to a PowerCommand 3200 genset:

CCM-T		Genset w/PCC 3200		
nviTestCmd	←	*nvoSystemTestCmd*	*General*	**Control**
nvoStartCmd(B)	→	*nviStartCmd*		
nvoCustomStatus[1..16]	→	*nviFaultResetCmd*		
		nviGenCBInhCmd		
		nviLoadDemandCmd		
		nviNetworkFault1..4		
		nviRampLoadCmd		
		nviShutdownCmd		
		nviSpeedAdjCmd		
		nviStartCmd		
		nviStartType		
		nviSyncEnableCmd		
		nviUtilCBInhCmd		
nviRelay5..8	←	*nvoCustStatus[0..7]*		
		nvoFaultStatus		
		nvoNotInAuto		
		nvoRunStatus		

Modbus Interface (ModLon)

Possible bindings to a Modbus interface:

CCM-T		ModLon		
nviTestCmd	←	*nvoCCMTestCmd[..]*	*"Test"* **Control**	
nvoATSStatus	→	*nviCCMATSStatus[..]*	*General*	**Monitor**
nvoACDataLoad	→	*nviCCMACDataLoad[..]*		

Network Gateway Module

Possible bindings to a Network Gateway Module (SLTA-10):

CCM-T		Network Gateway Module		
msg_remote	→	*msg_in*	*Remote Dialout*	**Alarms**

Digital I/O Module (DIM) Bindings

Annunciator – LonWorks System Annunciator (LSA)

Possible bindings to a LonWorks System Annunciator:

LonWorks Annunciator		**DIM**		
nviLamp[x]	←	*nvoCustomStatus[0..8]*	*Single*	**Control**
nvi8PointAnnunA..B	←	*nvoAnnun8Point*	*Group*	

ATS – CCM (CCM-T)

Possible bindings to an Automatic Transfer Switch with a CCM:

CCM-T		**DIM**		
nvoAnnunCustom *nvoAnnunExtended* *nvoAnnunNFPA110*	→	*nvi16RelayA..B*	*16 Relays*	**Control**
nvoAnnun8Point	→	*nvi8RelayA..B*	*8 Relays*	
nvoAnnun4Point	→	*nvi4RelayA..D*	*4 Relays*	
nvoFaultStatus *nvoNotInAuto* *nvoTestStatus* *nvoScr1Available* *nvoScr2Available* *nvoScr1Connected* *nvoScr2Connected* *nvoTransPending*	→	*nviRelayCmd[1..16]*	*Single Relays*	

ATS – PowerCommand (OTPC/BTPC)

Possible bindings to a PowerCommand OTPC/BTPC Automatic Transfer Switch:

PowerCommand ATS		**DIM**		
nvoLoadControl	→	*nvi8RelayA*	*Load Sequence*	**Control**
nvoAnnunCustom *nvoAnnunExtended* *nvoAnnunNFPA110*	→	*nvi16Relaya..B*	*16 Relays*	
nvoAnnun8Point	→	*nvi8RelayA..B*	*8 Relays*	
nvoAnnun4Point	→	*nvi4RelayA..D*	*4 Relays*	
nvoFaultStatus *nvoNotInAuto* *nvoTestStatus* *nvoScr1Available* *nvoScr2Available* *nvoScr1Connected* *nvoScr2Connected* *nvoTransPending*	→	*nviRelayCmd[1..16]*	*Single Relay*	

Digital I/O Module (DIM) Bindings (continued)

Genset – CCM (CCM-G)

Possible bindings to a Genset equipped with a CCM:

Genset w/CCM		DIM		
nvoAnnunCustom *nvoAnnunNFPA110*	→	*nvi16RelayA..B*	*16 Relays*	**Control**
nvoAnnun8Point	→	*nvi8RelayA..B*	*8 Relays*	
nvoAnnun4Point	→	*nvi4RelayA..D*	*4 Relays*	
nvoCustomStatus[1..16] *nvoFaultStatus* *nvoNotInAuto* *nvoRunStatus*	→	*nviRelayCmd[1..16]*	*Single Relay*	

Genset – PCC 3100

Possible bindings to a PowerCommand 3100 genset:

PCC 3100 Genset		DIM		
nvoAnnunCustom *nvoAnnunExtended* *nvoAnnunNFPA110*	→	*nvi16RelayA..B*	*16 Relays*	**Control**
nvoAnnun8Point	→	*nvi8RelayA..B*	*8 Relays*	
nvoAnnun4Point	→	*nvi4RelayA..D*	*4 Relays*	
nvoFaultStatus *nvoNotInAuto* *nvoRunStatus*	→	*nviRelayCmd[1..16]*	*Single Relays*	

Genset – PCC 3200

Possible bindings to a PowerCommand 3200 genset:

PCC 3200 Genset		DIM		
nvoAnnunCustom *nvoAnnunExtended* *nvoAnnunNFPA110*	→	*nvi16RelayA..B*	*16 Relays*	**Control**
nvoAnnun8Point	→	*nvi8RelayA..B*	*8 Relays*	
nvoAnnun4Point	→	*nvi4RelayA..D*	*4 Relays*	
nvoCustomStatus[0..7] *nvoFaultStatus* *nvoNotInAuto* *nvoRunStatus*	→	*nviRelayCmd[1..16]*	*Single Relays*	

Digital I/O Module (DIM) Bindings (continued)

Genset – PCC 2100

Possible bindings to a PowerCommand 2100 genset (for self-installed networks only):

PCC 2100 Genset		DIM		
nvoAnnunCustom *nvoAnnunExtended* *nvoAnnunNFPA110*	→	*nvi16RelayA..B*	*16 Relays*	**Control**
nvoAnnun8Point	→	*nvi8RelayA..B*	*8 Relays*	
nvoAnnun4Point	→	*nvi4RelayA..D*	*4 Relays*	
nvoCustomStatus[0..4] *nvoFaultStatus* *nvoNotInAuto* *nvoRunStatus*	→	*nviRelayCmd[1..16]*	*Single Relay*	
nviNetworkFault1..8	←	*nvoCustomStatus[0..7]*		

Modbus Interface (ModLon)

Possible bindings to a Modbus interface:

ModLon		DIM		
nvoSNVTState[..]	→	*nvi16RelayA*	*16 Relays*	**Control**
nviDIMStatus[..]	←	*nvoNodeStatus*	*Node*	**Status**

Network Gateway Module

There are no possible bindings to a Network Gateway Module.

Genset Communications Module (GCM) Bindings

Annunciator – LonWorks System Annunciator (LSA)				
Possible bindings to a LonWorks System Annunciator:				
PCC w/GCM		**LonWorks Annunciator**		
nvoAnnunNFPA110 *nvoAnnunCustom* *nvoAnnunExtended*	→	*nvi16PointAnnunA*	*16 Lamps*	**Monitor**
nvoAnnun8Point	→	*nvi8PointAnnunA..B*	*8 Lamps*	
nvoAnnun4Point	→	*nvi4PointAnnunA..E*	*4 Lamps*	
nvoRunStatus *nvoFaultStatus* *nvoNotInAuto*	→	*nviLamp[1..20]*	*Single Lamp*	
ATS – CCM (CCM-T)				
Possible bindings to an Automatic Transfer Switch with a CCM:				
PCC w/GCM		**CCM-T**		
nvoStartCmd(B)	→	*nviStartCmd*	*General*	**Control**
nvoCustomStatus[1..16]	→	*nviCustFault1..4* *nviFaultResetCmd* *nviGenCBInhCmd* *nviLoadDemandCmd* *nviShutdownCmd* *nviStartCmd*		
nviRelay5..8	←	*nvoFaultStatus* *nvoNotInAuto* *nvoRunStatus*	*General*	
ATS – PowerCommand (OTPC/BTPC)				
Possible bindings to a PowerCommand OTPC/BTPC Automatic Transfer Switch:				
PCC w/GCM		**PowerCommand ATS**		
nviStartCmd	←	*nvoStartCmd* *nvoStartCmdB*	*General*	**Control**
nvoGenStatus	→	*nvoSrc1Status* *nvoSrc2Status*	*General*	**Monitor**
Genset – CCM (CCM-G)				
Possible bindings to a Genset equipped with a CCM:				
CCM-G		**PCC w/GCM**		
nvoCustomStatus[1..16]	→	*nviCustFault1..4* *nviFaultResetCmd* *nviGenCBInhCmd* *nviLoadDemandCmd* *nviShutdownCmd* *nviStartCmd*	*General*	**Control**
nviRelay4..8	←	*nvoFaultStatus* *nvoNotInAuto* *nvoRunStatus*	*General*	

Genset Communications Module (GCM) Bindings (continued)

Genset – PCC 3100

There are no expected bindings to another PowerCommand 3100 genset.

Genset – PCC 3200

There are no expected bindings to another PowerCommand 3100 genset. However, the Genset Status data will be broadcast by the GCM to a PowerCommand 3200 genset. This is done without a binding.

Modbus Interface (ModLon)

Possible bindings to a Modbus interface:

PCC w/GCM		ModLon		
nviStartCmd	←	*nvoStartCmd[..]*	*General*	**Control**
nviFaultResetCmd	←	*nvoFaultResetCmd[..]*		
nvoGenACData	→	*nviGenACData[..]*	*General*	**Monitor**
nvoGenEngData	→	*nviGenEngData[..]*		
nvoGenParaData	→	*nviGenParaData[..]*		
nvoGenStatus	→	*nviGenStatus[..]*		

Network Gateway Module

Possible bindings to a Network Gateway Module (SLTA-10):

PCC w/GCM		Network Gateway Module		
msg_remote	→	*msg_in*	*Remote Dialout*	**Alarms**

Genset LonWorks Card (GLC) Bindings

Annunciator – LonWorks System Annunciator (LSA)

Possible bindings to a LonWorks System Annunciator:

PCC 3200 w/GLC		LonWorks Annunciator		
nvoAnnunNFPA110 *nvoAnnunCustom* *nvoAnnunExtended*	→	*nvi16PointAnnunA*	*16 Lamp Annun*	**Monitor**
nvoAnnun8Point	→	*nvi8PointAnnunA..B*	*8 Lamps*	
nvoAnnun4Point	→	*nvi4PointAnnunA..E*	*4 Lamps*	
nvoRunStatus *nvoFaultStatus* *nvoNotInAuto* *nvoCustomStatus[0..7]*	→	*nviLamp[1..20]*	*Single Lamp*	

ATS – CCM (CCM-T)

There are no bindings to a transfer switch equipped with a CCM.

ATS – PowerCommand (OTPC/BTPC)

Possible bindings to a PowerCommand OTPC/BTPC Automatic Transfer Switch:

PCC 3200 w/GLC		PowerCommand ATS		
nvoSystemTestCmd	→	*nviTestCmd*	*General*	**Control**
nviStartCmd	←	*nvoStartCmd* *nvoStartCmdB*		
nviStartType	←	*nvoStartType* *nvoStartCmdB*		
nviSpeedAdjCmd	←	*nvoSpeedAdjCmd*	*'Passive' Paralleling*	
nviSyncEnableCmd	←	*nvoSyncEnableCmd*	*'True' Paralleling*	
nvoGenStatus	→	*nviSrc1Status* *nviSrc2Status*	*General*	**Monitor**
nviGenConnected	←	*nvoSrc2Connected*	*Paralleling*	
nviUtilConnected	←	*nvoSrc1Connected*		

Digital I/O Module (DIM)

Possible bindings to the 'new' DIM (self-installed networks only):

PCC 3200 w/GLC		DIM		
nvoAnnunCustom *nvoAnnunExtended* *nvoAnnunNFPA110*	→	*nvi16RelayA..B*	*16 Relays*	**Control**
nvoAnnun8Point	→	*nvi8PointAnnunA..B*	*8 Relays*	
nvoAnnun4Point	→	*nvi4PointAnnunA..E*	*4 Relays*	
nvoCustomStatus[0..7] *nvoFaultStatus* *nvoNotInAuto* *nvoRunStatus*	→	*nviRelayCmd[1..16]*	*Single Relay*	

Genset LonWorks Card (GLC) Bindings (continued)

Genset – CCM (CCM-G) There are no bindings to a genset equipped with a CCM.				
Genset – PCC 3100 There are no bindings to a PowerCommand 3100 genset.				
Genset – PCC 3200 There are no bindings to another PowerCommand 3200 genset.				
Modbus Interface (ModLon) Possible bindings to a Modbus interface:				
PCC 3200 w/GLC		**ModLon**		
nviStartCmd	←	*nvoStartCmd[..]*	*General*	**Control**
nviFaultResetCmd	←	*nvoFaultResetCmd[..]*		
nvoGenACData	→	*nviGenACData[..]*	*General*	**Monitor**
nvoGenEngData	→	*nviGenEngData[..]*		
nvoGenParaData	→	*nviGenParaData[..]*		
nvoGenStatus	→	*nviGenStatus[..]*		
Network Gateway Module Possible bindings to a Network Gateway Module (SLTA-10):				
PCC 3200 w/GLC		**Network Gateway Module**		
msg_remote	→	*msg_in*	*Remote Alarm Dialout*	**Alarms**

PCC 2100 Genset Network Communications Module (NCM) Bindings

Annunciator – LONWORKS System Annunciator (LSA)

Possible bindings to a LONWORKS System Annunciator:

PCC 2100 w/NCM		LONWORKS Annunciator		
nvoAnnunNFPA110 *nvoAnnunCustom* *nvoAnnunExtended*	→	*nvi16PointAnnunA*	*16 Lamp Annun*	**Monitor**
nvoAnnun8Point	→	*nvi8PointAnnunA..B*	*8 Lamps*	
nvoAnnun4Point	→	*nvi4PointAnnunA..E*	*4 Lamps*	
nvoRunStatus *nvoFaultStatus* *nvoNotInAuto* *nvoCustomStatus[0..4]*	→	*nviLamp[1..20]*	*Single Lamp*	

Annunciator – Network Annunciator Module (NAM)

The old NAM is no longer supported.

ATS – CCM (CCM-T)

There are no bindings to a transfer switch equipped with a CCM.

ATS – PowerCommand (OTPC/BTPC)

Possible bindings to a PowerCommand OTPC/BTPC Automatic Transfer Switch:

PCC 2100 w/NCM		PowerCommand ATS		
nviStartCmd	←	*nvoStartCmd* *nvoStartCmdB*	*General*	**Control**
nviSpeedAdjCmd	←	*nvoSpeedAdjCmd*	*'Passive' Paralleling*	
nvoGenStatus	→	*nviSrc1Status* *nviSrc2Status*	*General*	**Monitor**

Digital I/O Module (DIM)

Possible bindings to the 'new' DIM:

PCC 2100 w/NCM		DIM		
nvoAnnunCustom *nvoAnnunExtended* *nvoAnnunNFPA110*	→	*nvi16RelayA..B*	*16 Relays*	**Control**
nvoAnnun8Point	→	*nvi8RelayA..B*	*8 Relays*	
nvoAnnun4Point	→	*nvi4RelayA..D*	*4 Relays*	
nvoCustomStatus[0..4] *nvoFaultStatus* *nvoNotInAuto* *nvoRunStatus*	→	*nviRelayCmd[1..16]*	*Single Relay*	
nviNetworkFault1..8	←	*nvoCustomStatus[0..7]*		

Genset – CCM (CCM-G)

There are no bindings to a genset equipped with a CCM.

PCC 2100 Genset Network Communications Module (NCM) Bindings (continued)

Genset – PCC 3100				
There are no bindings to a PowerCommand 3100 genset.				
Genset – PCC 3200				
There are no bindings to another PowerCommand 3200 genset.				
Modbus Interface (ModLon)				
Possible bindings to a Modbus Interface:				
PCC 2100 w/NCM		**ModLon**		
nviStartCmd	←	*nvoControlCmd[..]*	*General*	**Control**
nviFaultResetCmd	←	*nvoControlCmd[..]*		
nvoGenStatus	→	*nviGenStatus[..]*	*General*	**Monitor**
nvoGenACData	→	*nviGenACData[..]*		
nvoGenEngData	→	*nviGenEngData[..]*		
nvoATSStatus	→	*nviATSStatus[..]*	*AMF*	
Network Gateway Module				
Possible bindings to a Network Gateway Module (SLTA-10):				
PCC 2100 w/NCM		**Network Gateway Module**		
msg_remote	→	*msg_in*	*Remote Alarm Dialout*	**Alarms**

PowerCommand ATS (OTPC/BTPC) Network Communications Module (NCM) Bindings

Annunciator – LonWorks System Annunciator (LSA)

Possible bindings to a LonWorks System Annunciator:

PowerCommand ATS		LonWorks Annunciator		
nvoAnnunNFPA110	→	*nvi16PointAnnunB*	*16 Lamp Annun*	**Monitor**
nvoAnnunExtended	→	*nvi16PointAnnunA*		
nvoAnnun8Point	→	*nvi8PointAnnunA..B*	*8 Lamps*	
nvoAnnun4Point	→	*nvi4PointAnnunA..E*	*4 Lamps*	
nvoRunStatus *nvoNotInAuto* *nvoSrc1Available* *nvoSrc1Connected* *nvoSrc2Available* *nvoSrc2Connected* *nvoTestStatus*	→	*nviLamp[1..20]*	*Single Lamp*	

ATS – CCM (CCM-T)

There are no expected bindings to an OTPC/BTPC ATS equipped with a CCM.

ATS – PowerCommand (OTPC/BTPC)

Possible bindings to a PowerCommand OTPC/BTPC Automatic Transfer Switch:

PowerCommand ATS		PowerCommand ATS		
nvoStartCmd	→	*nviStartCmd*	*DualStandby*	**Control**
nviStartCmd	←	*nvoStartCmd*		

Digital I/O Module (DIM)

Possible bindings to the ‘new’ DIM:

PowerCommand ATS		DIM		
nvoLoadControl	→	*nvi8RelayA* *nvi8RelayB* *nvi4RelayA* *nvi4RelayB* *nvi4RelayC* *nvi4RelayD*	*Group*	**Load Sequence**
nvoLoadSequence1..8	→	*nviRelay[1..16]*	*Single*	
nvoAnnunExtended	→	*nvi16RelayA*	*Extended*	**Monitor**
nvoAnnunNFPA110	→	*nvi16RelayB*	*NFPA110*	

Genset – CCM (CCM-G)

Possible bindings to a Genset equipped with a CCM:

PowerCommand ATS		Genset w/CCM		
nvoStartCmd *nvoStartCmdB*	→	*nviStartCmd*	*“Start”*	**Control**
nviSrc1Status *nviSrc2Status*	←	*nvoGenStatus*	*General*	**Monitor**

PowerCommand ATS (OTPC/BTPC) Network Communications Module (NCM) Bindings (continued)

Genset – PCC 3100

Possible bindings to a PowerCommand 3100 genset:

PowerCommand ATS		PCC 3100 Genset		
nvoStartCmd	→	*nviStartCmd*	*General*	**Control**
nvoStartCmdB				
nviSrc1Status	←	*nvoGenStatus*	*General*	**Monitor**
nviSrc2Status				

Genset – PCC 3200

Possible bindings to a PowerCommand 3200 genset:

PowerCommand ATS		PCC 3200 Genset		
nviTestCmd	←	*nvoSystemTestCmd*	*General*	**Control**
nvoStartCmd	→	*nviStartCmd*		
nvoStartCmdB				
nvoStartType	→	*nviStartType*		
nvoStartTypeB				
nvoSpeedAdjCmd	→	*nviSpeedAdjCmd*	*'Passive' Paralleling*	
nvoSyncEnableCmd	→	*nviSyncEnableCmd*	*'True' Paralleling*	
nviSrc1Status	←	*nvoGenStatus*	*General*	**Monitor**
nviSrc2Status				
nvoSrc2Connected	→	*nviGenConnected*	*Paralleling*	
nvoSrc1Connected	→	*nviUtilConnected*		

Modbus Interface (ModLon)

Possible bindings to a Modbus interface:

PowerCommand ATS		ModLon		
nviTestCmd	←	*nvoCCMTestCmd[..]*	*General*	**Control**
nviFaultResetCmd				
nvoATSStatus	→	*nviCCMATSStatus[..]*	*General*	**Monitor**
nvoACDataLoad	→	*nviCCMACDataLoad[..]*		
nvoACDataSrc1	→	*nviCCMACDataSrc1[..]*		
nvoACDataSrc2	→	*nviCCMACDataSrc2[..]*		

Network Gateway Module

Possible bindings to a Network Gateway Module (SLTA-10):

PowerCommand ATS		Network Gateway Module		
msg_remote	→	*msg_in*	*Remote Dialout*	**Alarms**

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Appendix F. Network Variables

NETWORK VARIABLE TYPES

This section provides information on the following types of FT-10 network variables:

- Message Tags (msg) – used to send large messages (over 30 bytes) (see Table F-1).
- Network configuration input (nci) – used to adjust device settings with a configuration Plug-In (see Table F-2). nci variables are LONMARK® compliant.
- Network variable input (nvi) – input variable which produces a physical output from a device (see Table F-3). Input variables make a device do something.
- Network variable output (nvo) – output variable produced by some physical input to a device (see Table F-4). Output variables tell another device what the original device is doing.

Tables F-2, F-3, and F-4 include the following variable operating types.

- Standard Network Variable Type (SNVT):
  - SNVT State – An array of 16 bits used as one variable to report on or control a set of variables. They can be either inputs or outputs. Each bit in the variable has a specific meaning. A SNVT State variable is used to show the status of something. They are often configurable with InPower™ software.
  - SNVT Switch – Input or output variable that has a value part and a state part. A SNVT Switch variable causes something to happen. In most cases, only the state part is used by CPG.
  - Standard Configuration Protocol Type (SCPT) – a specialized SNVT used to configure a device.
- User-defined Network Variable Type (UNVT) – CPG-defined variables used with DMC and other monitoring software products. UNVT variables are used to report on the state or status of a large number of engine or generator parameters.

The tables in this section refer to the following FT-10 devices:

- GCM – Genset Communications Module used with PCC 3100 controls
- GLC – Genset LONWORKS Card used with PCC 3200 controls
- PCC 2100 NCM – Network Communications Module used with PCC 2100 controls
- PowerCommand® ATS NCM – Network Communications Module used with a PowerCommand ATS (OTPC/BTPC)
- CCM-G – Control Communications Module used with gensets equipped with a Detector™ or DK type of control
- CCM-T – Control Communications Module used with a non-PCC transfer switch
- DIM – Digital I/O Module
- LSA – LONWORKS® System Annunciator

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Message Tags

Table F-1 is a list of all Message Tags used with the FT-10 PowerCommand network.

TABLE F-1. MESSAGE TAGS

NAME	COMMUNICATES WITH	DESCRIPTION	USED BY
msg_in	GCM, GLC, PCC 2100 NCM, PC ATS NCM, CCM-G, CCM-T	The name for an incoming message object that is built into Neuron C. It does not need to be declared in the application and cannot be removed. All explicit messages (GOAL, Network Management, Service Pin Messages, etc.) are received by msg_in.	Network Gateway
msg_local		Used to set a GOAL response to a network interface. It is needed because every outgoing message must reference a message tag name. Since outgoing messages use explicit addressing, this message tag is not actually used to deliver the message.	InPower (GOAL protocol)
msg_remote	Network Gateway	Used to send alarms to remote host PCs (PCs that are connected through a modem) through an SLTA-10 which uploads it to the host. The msg_remote tag may only be bound to one SLTA-10. Alarm delivery to up to five hosts is accomplished using the phone directory located in the SLTA-10. Remote alarm delivery is initiated once the alarm has been broadcast to the domain.	Bound to msg_in

Configuration Inputs

Table F-2 includes information on all Configuration Inputs used with the FT-10 PowerCommand network.

TABLE F-2. NETWORK CONFIGURATION INPUTS

VARIABLE	OPERATING TYPE	DEVICE RECEIVED BY	DESCRIPTION
nciMaxSendTime	SCPTmaxSendTime (SNVT_time_sec)	GCM, GLC, PCC 2100 NCM, PC ATS NCM, CCM-G, CCM-T	This configuration network variable is required for the LONMARK generator functional profile. It is declared in the node but not used. *nciMinSendTime* is used to set the logical Update Interval in the controller. Valid range: 1.0 – 3600.0 seconds (values outside of this range disable updates)
nciMinSendTime	SCPTminSendTime (SNVT_time_sec)	DIM, GCM, GLC, PCC 2100 NCM, PC ATS NCM, CCM-G, CCM-T	For CCM-G and CCM-T, this network variable input sets the interval at which the genset communications module reads the analog inputs and propagates network variable outputs. Setting this variable to zero disables reading the analog inputs and propagation. For all other FT-10 network devices, this network variable sets the maximum time that will expire before the analog network variable outputs are propagated. Setting this variable to zero disables automatic updates. Valid range: 1.0 – 3600.0 seconds (values outside of this range disable updates). The default is 2.0 seconds.
nciNetConfig	SNVT_config_src	GCM, GLC, PCC 2100 NCM, DIM, LSA, PC ATS NCM, CCM-G, CCM-T	This configuration variable sets the mode of the node installation. When set to “LOCAL” (default) and the DIP switch setting is non-zero, the device will self-install by pressing the Service pin for two seconds. This input is required for self-installation. When set to “EXTERNAL,” the device is configured for installation by a network management tool. Valid Range: 0 (LOCAL), 1 (EXTERNAL) **NOTE:** For firmware with the following title AnnA03, CCMTA04, CCMGA05, DimA02, PCAtsA05, 2100A05, 3100A04, 3200A04 or newer, self-installation is executed by holding the Service button for two seconds. If the firmware is an older version, then the variable nciNetConfig must be set to “local” through LonMaker Browser for self-installation.
nciNodeConfig1	UNVT_gcm_cfg1 (30 bytes)	GCM	Used to configure the faults for *nvoAnnunCustom*. Only 15 lamps (2–16) may be configured. The first lamp (lamp1) of *nvoAnnunCustom* is reserved for “Check Genset” (common alarm). **Field** **Type** **Size** **Description** lamp2 u16 2 Fault code for *nvoAnnunCustom.bit1* ... ... lamp16 u16 2 Fault code for *nvoAnnunCustom.bit15* Valid Range: 0–500

Variable Inputs

Table F-3 includes information on all Variable Inputs used with the FT-10 PowerCommand network.

TABLE F-3. NETWORK VARIABLE INPUTS

VARIABLE	OPERATING TYPE	DEVICE RECEIVED BY	DESCRIPTION
nvi4PointAnnunA	SNVT_state	LSA	Input that allows other devices to control annunciator lamps 1 thru 4 with a single variable update (bit 0 relates to lamp 1). Each bit of the structure must be OR'd with all other network variable input (fields) which control each lamp. bit x = 0 (Off) or 1 (On)
nvi4PointAnnunB	SNVT_state	LSA	Input that allows you to control annunciator lamps 5 thru 8 with a single variable update (bit 0 relates to lamp 5). Each bit of the structure must be OR'd with all other network variable input (fields) which control each lamp. bit x = 0 (Off) or 1 (On)
nvi4PointAnnunC	SNVT_state	LSA	Input that allows you to control annunciator lamps 9 thru 12 with a single variable update (bit 0 relates to lamp 9). Each bit of the structure must be OR'd with all other network variable input (fields) which control each lamp. bit x = 0 (Off) or 1 (On)
nvi4PointAnnunD	SNVT_state	LSA	Input that allows you to control annunciator lamps 13 thru 16 with a single variable update (bit 0 relates to lamp 13). Each bit of the structure must be OR'd with all other network variable input (fields) which control each lamp. bit x = 0 (Off) or 1 (On)
nvi4PointAnnunE	SNVT_state	LSA	Input that allows you to control annunciator lamps 17 thru 20 with a single variable update (bit 0 relates to lamp 17). Each bit of the structure must be OR'd with all other network variable input (fields) which control each lamp. bit x = 0 (Off) or 1 (On)
nvi4RelayA	SNVT_state	DIM	Input that allows you to control relays 1 through 4 with a single variable update.
nvi4RelayB	SNVT_state	DIM	Input that allows you to control relays 5 through 8 with a single variable update.
nvi4RelayC	SNVT_state	DIM	Input that allows you to control relays 9 through 12 with a single variable update.
nvi4RelayD	SNVT_state	DIM	Input that allows you to control relays 13 through 16 with a single variable update.
nvi8PointAnnunA	SNVT_state	LSA	Input that allows you to control annunciator lamps 1 thru 8 with a single variable update (*bit0* relates to lamp 1). Each bit of the structure must be OR'd with all other network variable input (fields) which control each lamp. bit x = 0 (Off) or 1 (On)
nvi8PointAnnunB	SNVT_state	LSA	Input that allows you to control annunciator lamps 9 thru 16 with a single variable update (**bit0* relates to lamp 9). Each bit of the structure must be OR'd with all other network variable input (fields) which control each lamp. bit x = 0 (Off) or 1 (On)
nvi8RelayA	SNVT_state	DIM	Input that allows you to control relays 1 thru 8 with a single variable update.
nvi8RelayB	SNVT_state	DIM	Input that allows you to control relays 9 thru 16 with a single variable update (bit 0 controls relay 1).
nvi16PointAnnunA	SNVT_state	LSA	Input that allows you to control annunciator lamps 1 thru 16 with a single variable update (*bit0* controls lamp 1). This input must be connected to a **genset** network variable. State = 0 (Off) or 1 (On)
nvi16PointAnnunB	SNVT_state	LSA	Input that allows you to control annunciator lamps 1 thru 16 with a single variable update (bit 0 controls lamp 1). This input must be connected to a **transfer switch** network variable. State = 0 (Off) or 1 (On)
nvi16RelayA	SNVT_state	DIM	Input sent by a genset that allows you to control all 16 relays with a single variable update. Each bit of the structure must be evaluated for each update. *bit0* (MSB) controls Relay 1.
nvi16RelayB	SNVT_state	DIM	Input sent by an ATS that allows you to control all 16 relays with a single variable update. Each bit of the structure must be evaluated for each update. This input is only necessary for an NFPA-110 relay configuration. *bit0* (MSB) controls Relay 1. OR'd with *nvi16RelayA*.
nviCalibrate	UNVT_ccm_cfg1a	CCM-G, CCM-T	Used by Manufacturing to calibrate the analog inputs.
nviCustFault1...4	SNVT_switch (2 bytes	GCM	Input used by the Master Control that allows you to control *Customer Fault 1...4* via the network (in addition to being hardwired). When the *state* = 1 (active), the GCM writes the value of *Customer Fault 1..4* to 1. When the *state* = 0 (inactive), the GCM writes the value of *Customer Fault1..4* to 0 State = 0 (Inactive) or 1 (Active)

TABLE F-3. NETWORK VARIABLE INPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE RECEIVED BY	DESCRIPTION
nviCustInConfig	UNVT_ccm_cfg2 (8 bytes)	CCM-G, CCM-T	Variable used by a configuration tool to configure the active and dialout settings for the discrete (status) inputs. Valid Range: 0 – Active Low, 1 – Active High 0 – Don't Dialout, 1 – Dialout For additional information on how to configure this variable, see Table F-3a for a CCM-G or Table F-3b for a CCM-T.

Table F-3a. CCM-G Variable nviCustInConfig

Field	Type	Size	Description	Input	Default
active[0] *bit0 (LSB)* … *bit7*	u8 (bit–field)	1	Active States for **J4.1–8** Custom Status 1 … Custom Status 8	 J4.1 … J4.8	0 – All Active Low
active[1] *bit0 (LSB)* … *bit7*	u8 (bit–field)	1	Active States for **J4.9–16** Custom Status 9 … Custom Status 16	 J4.9 … J4.16	0 – All Active Low
active[2] *bit0* *bit1* *bit2* *bit3* *bit4* *bit5* *bit6* *bit7*	u8 (bit–field)	1	Active States for **J5.1–8** Common Alarm Low Fuel Low Engine Temp Customer Fault 1 Customer Fault 2 Fail To Start Overspeed High Engine Temp	 J5.1 J5.2 J5.3 J5.4 J5.5 J5.6 J5.7 J5.8	0 – All Active Low
active[3] *bit0* *bit1* *bit2* *bit3* *bit4* *bit5* *bit6* *bit7*	u8 (bit–field)	1	Active States for **J5.9–16** Low Oil Pressure Pre-High Engine Temp Pre-Low Oil Pressure Genset Running Switch In Off Switch In Run Charger AC Failure Low Coolant Level	 J5.9 J5.10 J5.11 J5.12 J5.13 J5.14 J5.15 J5.16	0 – All Active Low
notify[0]	u8 (bit–field)	1	Notify Settings for **J4.1–8**		0 – All Don't Notify
notify[1]	u8 (bit–field)	1	Notify Settings for **J4.9–16**		0 – All Don't Notify
notify[2]	u8 (bit–field)	1	Notify Settings for **J5.1–8**		0 – All Don't Notify
notify[3]	u8 (bit–field)	1	Notify Settings for **J5.9–16**		0 – All Don't Notify

Table F-3b. CCM-T Variable nviCustInConfig

Field	Type	Size	Description	Input	Default
active[0] *bit0* *bit1* *bit2* *bit3* *bit4* *bit5* *bit6* *bit7*	u8 (bit–field)	1	Active States for **J4.1–8** Source 1 Available Source 2 Available Source 1 Connected Source 2 Connected Test/Exercise Active Not Used Low Battery Voltage High Battery Voltage	 J4.1 … J4.8	0 – All Active Low
active[0] *bit0* *bit1* *bit2* *bit3* *bit4* *bit5* *bit6* *bit7*	u8 (bit–field)	1	Active States for **J4.9–16** Transfer Pending Charger AC Failure Not Used Not Used Common alarm Not In Auto Not Used Not Used	 J4.9 … J4.16	0 – All Active Low
active[2] *bit0* … *bit7*	u8 (bit–field)	1	Active States for **J5.1–8** Custom Status 1 … Custom Status 8		0 – All Active Low
active[2] *bit0* … *bit7*	u8 (bit–field)	1	Active States for **J5.9–16** Custom Status 9 … Custom Status 16		0 – All Active Low
notify[0]	u8 (bit–field)	1	Notify Settings for **J4.1–8**		0 – All Don't Notify
notify[1]	u8 (bit–field)	1	Notify Settings for **J4.9–16**		0 – All Don't Notify
notify[2]	u8 (bit–field)	1	Notify Settings for **J5.1–8**		0 – All Don't Notify
notify[3]	u8 (bit–field)	1	Notify Settings for **J5.9–16**		0 – All Don't Notify

TABLE F-3. NETWORK VARIABLE INPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE RECEIVED BY	DESCRIPTION
nviDialoutConfig	UNVT_DialConfig	GCM, GLC, PCC 2100 NCM, PC ATS NCM, CCM-G, CCM-T	Variable used by a Service Tool or the Configuration Plug-In to configure the dialout function for the device. **Field** / **Type** / **Size** / **Description** *dialout_break* / unsigned char / 1 / Allow communications break to initiate dialout *conn_timeout* / u16 / 2 / Time out in seconds *dialout_site_1* / unsigned char / 1 / Enable/disable dialout to site 1 *dialout_site_2* / unsigned char / 1 / Enable/disable dialout to site 2 *dialout_site_3* / unsigned char / 1 / Enable/disable dialout to site 3 *dialout_site_4* / unsigned char / 1 / Enable/disable dialout to site 4 *dialout_site_5* / unsigned char / 1 / Enable/disable dialout to site 5
nviEmerStopCmd	SNVT_switch (2 bytes)	GCM, GLC, PCC 2100 NCM	Input sent by the Master Control, CCM-T, or PowerCommand ATS that is used in conjunction with *nviShutdownCmd* to shut down the genset. When activated, this input will unconditionally emergency stop the PCC genset. This input is optional for LonMark gensets. State = 0 (Clear) or 1 (Shutdown)
nviEventMsgCnfig	UNVT_ccm_cfg3a (21 bytes)	CCM-G, CCM-T	Variable used by a Service Tool or the Configuration Plug-In to configure the fault message type and text for the discrete (status) inputs. **Field** / **Type** / **Size** / **Description** *Fault_type* / u16 / 2 / 0 – Event, 1 – Warning, 2 – Shutdown *fault_text[0..15]* / char / 16 / Any 16-character string *input* / u16 / 2 / Discrete Input (1–32) *ReadWrite* / U8 / 1 / 0 – Read, 1 – Write
nviFaultResetCmd	SNVT_switch (2 bytes)	GCM, GLC, PCC 2100 NCM, PC ATS NCM, CCM-G	Input used to clear or acknowledge the current fault(s). State = 0 (Does Nothing) or 1 (Reset/Acknowledge Faults)
nviGenCBInhCmd	SNVT_switch (2 bytes)	GCM, GLC	Input sent by the Master Control that opens the genset circuit breaker or inhibits it from closing (paralleling gensets only). State = 0 (Enable Gen CB) or 1 (Inhibit Gen CB)
nviGenConnected	SNVT_switch (2 bytes)	GLC	Input used by the Master Control, the PC ATS NCM, and the CCM-T to inform the genset that it is connected to the load. When the *state* field is set true (connected), the device informs the controller that the genset is connected to the load. When the *state* field is set false, the device informs the controller that the genset is not connected to the load. The status of the genset and utility connection is needed for the genset to determine its mode of operation (for example, load govern, voltage/frequency govern). State = 0 (Genset not Connected to Load), 1 (Genset Connected to Load)
nviLamp[0]...[20]	SNVT_switch	LSA	Input that allows you to control the annunciator lamps individually. When the *state* field is set true, the corresponding lamp turns on. When the *state* field is set false, the corresponding lamp turns off if inputs for the lamp are not true. State = 0 (Off) or 1 (On) nviLamp[0] is a non-functional place holder that is not used.
nviLampConfig	UNVT_LampConfig (4 bytes)	LSA	Input that allows you to configure each lamp (status and error) individually. All data should be validated before applying the requested configuration. **Field** / **Valid Range** / **Notes** Lamp / 1–20 / 0 – Not used. 1–20 – Status Lamp Color / 1–3 / 1 – Green, 2 – Red, 3 – Amber Horn / 0–1 / 0 – No, 1 – Yes (Sound Horn) Flash / 0–1 / 0 – No, 1 – Yes (Flash Lamp)
nviLoadDemandCmd	SNVT_switch (2 bytes)	GCM, GLC	Input used by the Master Control that shuts down the genset due to over-capacity and allows a Master Control to start and stop the genset as the load changes. When the *state* field is set true (shutdown the genset), the GCM/GLC instructs the controller to shut down due to load demand after a pre-programmed stop delay. When the *state* field is set false, the the GCM/GLC removes the load demand shutdown. State = 0 (Clear Load Demand [Run]) or 1 (Load Demand [Stop])
nviLoadShedCmd	SNVT_switch (2 bytes)	PC ATS NCM, CCM-T	Input used by the genset, Master Control, and ModLon to instruct the ATS to shed and restore its load. When the *state* field is set true (load shed), the ATS is moved to the neutral position. When the *state* field is set false (load restore), the ATS operates normally. State = 0 (Load Restore) or 1 (Load Shed)
nviMasterStatus	UNVT_master_status (24 bytes)	GLC, PCC 2100 NCM, PC ATS NCM	Input that allows the genset to monitor the Master Control status. The input is monitored to monitor a single Master Control. The GLC/NCM must poll the input to get updates. It polls the input when *System Data* is active. When an update is received, the device only writes the Master status to the controller if *System Data* is active. The data is written as it is received to row #1 of the table. The controller adds a time-stamp to the data. For additional information on how to configure this variable, see Table F-3c below.

Table F-3c. VARIABLE nviMasterStatus

Data Field	Type	Description	Notes
device_type	u16	Device Type	TBD – Master Control
fault_code	u16	Fault Code	TBD
fault_type	u8	Fault Type (System Alarm)	0 – Okay (None) 1 – Alarm 2 – Shutdown 255 – Unknown
mode	u8	Operating Mode/State	0 – Not In Auto 1 – Ready (Auto) 2 – Normal Source Failure 3 – Test/Exercise 4 – Peak Shave 5 – Base Load 255 – Unknown
percent_kw_load	u8 (SNVT_lev_cont)	Load kW / Gen Rating	< 250 – Load percent / 2 % 251 – >125% 255 – Unknown
percent_kw_gen	u8 (SNVT_lev_cont)	Gen kW / Gen Rating	< 250 – Load percent / 2 % 251 – >125% 255 – Unknown
gen_kw	s16	Total Genset kW	65535 – Unknown
load_kw	s16	Total Load kW	65535 – Unknown
util1_kw	s16	Utility1 kW	< 0 – Exporting 65535 – NA
util2_kw	s16	Utility2 kW	< 0 – Exporting 65535 – NA
util1_volts	u16 (SNVT_volt_ac)	Utility1 Voltage (VLL–ave)	65535 – NA
util2_volts	u16 (SNVT_volt_ac)	Utility2 Voltage (VLL–ave)	65535 – NA
extended *.bit0 (MSB)* *.bit1* *.bit2* *.bit3* *.bit4* *.bit5* *.bit6* *.bit7* *.bit8* *.bit9* *.bit10* *.bit11* *.bit12* *.bit13* *.bit14* *.bit15*	u16 (SNVT_state)	 Normal Available Emergency Available Normal Connected Emergency Connected System Alarm Not In Auto System Test–Exercise Remote Start Load Demand Check Station Battery Check Generator Low Fuel (Main Tank) Bus Overload Bus Under Frequency Utility Main CB Fail Generator Main CB Fail	Master Extended Annunciation
custom *.bit0–15*	u16 (SNVT_state)	Custom-defined	Master Custom Annunciation

TABLE F-3. NETWORK VARIABLE INPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE RECEIVED BY	DESCRIPTION
nviMfgTest	unsigned int (1 byte)	All	Input used for development and manufacturing testing.
nviNetworkFault1...4	SNVT_switch (2 bytes)	GLC	Input that informs the genset of network faults. State = 0 (Inactive) or 1 (Active)

TABLE F-3. NETWORK VARIABLE INPUTS (CONTINUED)

<table>
<tr><th>VARIABLE</th><th>OPERATING TYPE</th><th>DEVICE RECEIVED BY</th><th>DESCRIPTION</th></tr>
<tr><td>nviNetworkFault1...8</td><td>SNVT_switch
(2 bytes)</td><td>PCC 2100 NCM</td><td>Input that informs the genset of network faults.
State = 0 (Inactive) or 1 (Active)</td></tr>
<tr><td>nviNodeInfo</td><td>UNVT_node_info2
(25 bytes)</td><td>GCM, GLC, PCC 2100 NCM, PC ATS NCM, CCM-G, CCM-T</td><td>Input used by the Plug-In that configures the name tag and device type. The name tag is used for sending alarms to PowerCommand for Windows® II (PCW II) and sharing data with other nodes in the system (GCM, GLC, PCC 2100 NCM, and CCM-G: nvoGenStatus; PC ATS NCM and CCM-T: nvoATSStatus). The name tag must be set to the device name in LonMaker for Windows in order to show alarms in PCW II.
Field Type Size Description Default
device_type[0..7] char 8 Device Type “CCM0206”
name_tag[0..15] char 16 Name identifier used for alarms “CCM Genset”
phase char 1 0 – Three phase, 1 – Single phase 0
Upon node reset or update of nviNodeInfo,
→ nvoGenStatus.name_tag = nviNodeInfo.name_tag
or
→ nvoATSStatus.name_tag = nviNodeInfo.name_tag</td></tr>
<tr><td>nviNodeLocation</td><td>UNVT_node_loc
(24 bytes)</td><td>GLC, GCM, PCC 2100 NCM, PC ATS NCM, CCM-G, CCM-T</td><td>Input used by the Plug-In to configure the node’s site id. The site id is used for sending alarms to PowerCommand for Windows (PCW II). The name tag must be set to the device name in LonMaker™ for Windows in order to show alarms in PCW II. The configuration tool writes the user-defined site id to this input. This input is required by InPower.
Field Type Size Description Default
site_id[0..7] char 8 Site identifier for alarms “SITE_ID”
location[0..15] char 16 Not used null</td></tr>
<tr><td>nviOverrideCmd</td><td>SNVT_switch
(2 bytes)</td><td>PC ATS NCM</td><td>Input used to instruct the transfer switch to override (bypass) any delays or inhibits (except load shed).When the state field is set true (override), the NCM sets nviOverrideCmd.state = 0. When the state field is set false, the NCM does nothing. This input is optional for LonMark compliance.
State = 0 (Does Nothing) or 1 (Override)</td></tr>
<tr><td>nviRampLoadCmd</td><td>SNVT_switch
(2 bytes)</td><td>GLC</td><td>Input sent by the Master Control that allows the Master Control to ramp load or ramp unload the genset load. When the state field is set true (ramp load), the GLC instructs the controller to load the genset. When the state field is set false (ramp unload), the GLC instructs the controller to unload the genset.
State = 0 (Ramp Load) or 1 (Ramp Unload)</td></tr>
<tr><td>nviRedialConfig</td><td>UNVT_node_redial
(3 bytes)</td><td>GCM, GLC, PCC 2100 NCM, PC ATS NCM, CCM-G, CCM-T</td><td>Input used by the Plug-In to configure the dialout operation (including dialout attempts and retry delay) of the node. Setting the attempts to “0” disables all remote dialouts. The retry_delay configures the delay between retries in seconds.
Field Type Size Description Range (Default)
attempts u8 2 Total number of retries 0–255 (10)
delay u16 (sec) 2 Delay between dialout retries 0–65535 (60)</td></tr>
<tr><td>nviRelay4...8</td><td>SNVT_switch
(2 bytes)</td><td>CCM-G</td><td>Input used to individually control relays 4 through 8.
State = 0 (Off) or 1 (On)</td></tr>
<tr><td>nviRelay5...8</td><td>SNVT_switch
(2 bytes)</td><td>CCM-T</td><td>Input used to individually control relays 5 through 8.
State = 0 (Off) or 1 (On)</td></tr>
<tr><td>nviRelayCmd[0]...[16]</td><td>SNVT_switch</td><td>DIM</td><td>Inputs that allow for activation of individually controlled relays. When the state field is set true, the corresponding relay will activate. When the state field is set false, the corresponding relay will deactivate if all other inputs controlling that relay are also off.
State = 0 (Off) or 1 (On)
nviRelayCmd[0] is a non-functional place holder that is not used.</td></tr>
<tr><td rowspan="2">nviRelayDelay</td><td>UNVT_RelDelay_24
17 bytes</td><td>DIM</td><td rowspan="2">Non-volatile network variable you can use to configure the activation delay for:
DIM – Each relay
CCM-G – Relays 4–8
CCM-T – Relays 5–8.
Each of these relays can be configured to delay up to 255 seconds before activating.
Valid Range: 0–255 seconds</td></tr>
<tr><td>UNVT_RelDelay_8
9 bytes</td><td>CCM-G, CCM-T</td></tr>
</table>

TABLE F-3. NETWORK VARIABLE INPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE RECEIVED BY	DESCRIPTION
nviResetCmd	SNVT_switch (1 byte)	GCM, GLC, PCC 2100 NCM	Input used to reset the genset. This input clears or acknowledges the current genset fault(s). This input performs the same function as *nviFaultResetCmd*. Range = 0 (Nothing) or 1 (Reset Genset Fault)
nviRetransInhCmd	SNVT_switch (2 bytes)	PC ATS NCM, CCM-T	Input used to disable the ATS from transferring back to Source 1. When set true (retransfer inhibit), nvi*RetransferInhCmd* = 1. When set false (retransfer enable), nvi*RetransferInhCmd* = 0. State = 0 (Enable Retransfer) or 1 (Inhibit Retransfer)
nviRunCmd	SNVT_switch (2 bytes)	GCM	Input used in conjunction with *nviStartCmd* to start and stop the genset. The two inputs are OR'd together to determine the state of *Network Start*. In order to stop the genset, all devices bound to *nviStartCmd* must agree to "stop" and *nviRunCmd* must be set to 0 (Stop). This input is required for LonMark Generator Set compliance. When *nviRunCmd* = 1 (start), the GCM will start the genset. When *nviRunCmd* = 0 (stop), the GCM will: 1. Poll all devices which are connected to *nviStartCmd*. (All devices connected to this input must agree that the genset should stop before the GCM instructs the controller to stop.) 2. If any response to the poll is 1 (start) when the poll is completed, set *nviRunCmd* = 1. 3. If all nodes respond and all responses are 0 (stop) and *nviRunCmd* = 0 (stop), the genset stops. 4. In the case where the poll fails, the GCM assumes that the node responded with 1 (start). Range = 0 (Stop) or 1 (Start)
		GLC, PCC 2100 NCM	Input used to start and stop the genset. When the *state* field is set true, the GLC/NCM sets the logical address true in the controller. When the *state* field is set false, the GLC/NCM is set false in the controller. If the poll fails, the GLC/NCM assumes that the node responded with 0 (Stop). Range = 0 (Stop) or 1 (Start)
nviScale	UNVT_ccm_cfg1a (8 bytes)	CCM-G, CCM-T	Used by manufacturing to scale the analog inputs.
nviShutdownCmd	SNVT_switch (2 bytes)	GCM, GLC, PCC 2100 NCM, CCM-G	Input sent by the Master Control, PowerCommand ATS, or CCM-T that instructs the controller to immediately (unconditionally without any time delay) shut down the genset (if it is running) or inhibit it from running (if it is stopped). If necessary, the device will wake up the controller before instructing the controller to shutdown. When the *state* field is set false, the device polls all other devices connected to this input before instructing the controller. All devices connected to this input must agree that the shutdown should be removed before the shutdown command is removed. This input has a similar operation as *nviEmerStopCmd* and is equivalent to a 'run override' or a 'run inhibit' command. State = 0 (Clear Shutdown) or 1 (Shutdown Genset)
nviSilenceCmd	SNVT_switch	LSA	Input that allows you to silence the annunciator horn remotely. When the *state* field is set true, the horn will turn off. Setting the *state* field false does nothing. This input displays 'momentary' behavior by automatically resetting the *state* to false when it is set true (silence). State = 0 (Off) or 1 (Silence)
nviSpeedAdjCmd	SNVT_switch (2 bytes)	GLC, PCC 2100 NCM	Input sent by a PowerCommand ATS that increases the nominal speed of the genset by 0.5 Hz. This input allows a PowerCommand transfer switch to perform a closed transition with a non-paralleling genset. When the *state* field is set true, the GLC/NCM increases the nominal genset frequency setpoint by 0.5 Hz. When the *state* field is set false, the GLC/NCM returns the genset to its correct nominal frequency. State = 0 (Set to Nominal Frequency) or 1 (Increase Frequency by 0.5 Hz)
nviSrc1Status	UNVT_gen_status (30 bytes)	PC ATS NCM	Input sent by the genset that is used to allow the transfer switch to view the status of Source 1. The input is limited to monitor only one genset. When an update is received, the NCM writes the current status of Source 1 to the controller. The data is written as received. This input can only be used when Source 1 is a genset. (Typically, Source 1 is the utility power.) See Table F-3d below.

Table F-3d. PC ATS NCM Variables nviSrc1Status and nviSrc2Status

Field	Type	Logical Address	Notes
name_tag	char[16]	Network Configuration	ASCII string
device_type	u16	NA	3 – PCC 3200 5 – PCC 3100 11 – PCC 2100
control_switch	u8	Control Switch Position	0 – Off 1 – Run\Manual 2 – Auto 255 – Unknown
state	u8	Genset Run Sequence State	0 – Stopped 1 – Start Pending 2 – Warmup /Idle 3 – Running 4 – Cooldown /Rated 5 – Cooldown /Idle 255 – Unknown
fault_code	u16	NA	Varies by device.
fault_type	u8	NA	1 – Warning 2 – Derate 3 – Shutdown w/cooldown 4 – Shutdown 255 – Unknown
percent_kw	u8 (SNVT_lev_cont)	% Application Total kW	Clamp, see *nvoRunStatus*
total_kw	s16	Total kW	
nfpa110	u16 (SNVT_state)	NA	See *nvoAnnunNFPA110*
extended	u16 (SNVT_state)	NA	See *nvoAnnunExtended*

TABLE F-3. NETWORK VARIABLE INPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE RECEIVED BY	DESCRIPTION
nviSrc2Status	UNVT_gen_status (30 bytes)	PC ATS NCM	Input sent by the genset and used to allow the transfer switch to view the status of Source 2. The input is limited to monitor a single genset. When an update is received, the NCM writes the current status of Source 2 to the controller. The data is written as it is received. This input is only used when Source 2 is a genset. For data, see Table F-3d.
nviStartCmd	SNVT_switch (2 bytes)	All	If *state* = 1, the genset starts. For a GLC, this is dependent on the state of nviStartType. This variabled is OR'd with nviRunCmd on certain devices. Setting *state* = 0 stops the genset only if all devices bound to this variable and nviRunCmd have their state set to 0. Range = 0 (Stop) or 1 (Start)
nviStartType	SNVT_switch (2 bytes)	GCM, PCC 2100 NCM, CCM-G	This input is declared but not used. It is required for auto-binding.
		GLC	Input sent by the Master Control or the PowerCommand ATS that sets the start type of the PCC 3200 genset. When the *state* field is set true, the GLC is configured for a 'test' (non-emergency) when a 'start' command is received. When *state* field is set false, the controller is configured for 'emergency' when a 'start' command is received. The GLC uses the last update of *nviStartType* to configure the controller. The input defaults to 0 (emergency start). The GLC automatically resets the input to 'emergency' after each 'start' command is written to the controller. State = 0 (Emergency Start) or 1 (Non-Emergency Start [Test])
nviSyncEnableCmd	SNVT_switch (2 bytes)	GLC	Input used by a PowerCommand transfer switch to enable a paralleling genset to synchronize to the normal (utility) bus. When the *state* field is set true (enable sync mode), the GLC instructs the controller to enable synchronizing. When the *state* field is set false, the GLC instructs the controller to disable synchronizing. State = 0 (Disable Synchronizer) or 1 (Enable Synchronizer)
nviTestCmd	SNVT_switch (2 bytes)	PC ATS NCM, CCM-T	Input sent by the Master Control or ModLon that is used to allow a network device to test the ATS. In the case where not all devices respond, the NCM will use only those devices which have responded. This input is required for LonMark compliance. State = 0 (End Test) or 1 (Start Test)
nviTransInhCmd	SNVT_switch (2 bytes)	PC ATS NCM, CCM-T	Input used by the Master Control to disable the ATS from transferring to Source 2. State = 0 (Enable Transfer) or 1 (Inhibit Transfer)

TABLE F-3. NETWORK VARIABLE INPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE RECEIVED BY	DESCRIPTION
nviUtilCBInhCmd	SNVT_switch (2 bytes)	GLC	Input sent by the Master Control and used to open the utility circuit breaker or inhibit it from closing (paralleling gensets only). When the *state* field is set true (inhibit), the GLC instructs the controller to inhibit the utility circuit breaker. When the *state* field is set false, the GLC removes the utility circuit breaker inhibit. State = 0 (Enable Util CB) or 1 (Inhibit Util CB)
nviUtilConnected	SNVT_switch (2 bytes)	GLC	Input sent by the Master Control, PowerCommand ATS, and CCM-T that informs the genset that the utility is connected to the load. When the *state* field is set true (utility connected), the GLC, in return, informs the controller the utility is connected to the load. When the *state* field is set false, the GLC, in return, informs the controller the utility is no longer connected to the load. The status of the genset and utility connection is needed for the genset to determine its mode of operation (e.g. load govern, load share, dead bus, etc.). This input is given highest priority when processing. State = 0 (Utility not Connected to Load) or 1 (Utility Connected to Load)

Variable Outputs

Table F-4 includes information on all Variable Outputs used with the FT-10 PowerCommand network.

TABLE F-4. NETWORK VARIABLE OUTPUTS

VARIABLE	OPERATING TYPE	DEVICE SENT BY	DESCRIPTION
nvoACDataLoad	UNVT_ac_data (31 bytes)	PC ATS NCM	Output used to provide the current AC data of the load for the Master Control. For more information, see the appropriate table below.
		CCM-T	Output used to provide the instantaneous AC data of the genset for the Master Control. The CCM-T does not calculate any values (for example, volts LL, volts LN). For more information, see Table F-4a for an PC ATS NCM or Table F-4b for a CCM-T.

Table F-4a. PC ATS NCM Variable *nvoACDataLoad*

Field	Type	Data Source
freq	u16 (SNVT_freq_hz)	Load Frequency
total_pf	s16 (SNVT_pwr_fact)	Load Total PF
total_kva	s16	Load Total kVA
total_kw	s16	Load Total kW
total_kvar	s16	Load Total kVAR
volts_ab	u16 (SNVT_volt_ac)	Load Volts L1−L2
volts_bc	u16 (SNVT_volt_ac)	Load Volts L2−L3
volts_ca	u16 (SNVT_volt_ac)	Load Volts L3−L1
volts_a	u16 (SNVT_volt_ac)	Load Volts L1−N
volts_b	u16 (SNVT_volt_ac)	Load Volts L2−N
volts_c	u16 (SNVT_volt_ac)	Load Volts L3−N
amps_a	u16 (SNVT_amp_ac)	Load Amps L1
amps_b	u16 (SNVT_amp_ac)	Load Amps L2
amps_c	u16 (SNVT_amp_ac)	Load Amps L3
percent_amps_a	u8 (SNVT_lev_cont)	Load Amps %L1
percent_amps_b	u8 (SNVT_lev_cont)	Load Amps %L2
percent_amps_c	u8 (SNVT_lev_cont)	Load Amps %L3

Table F-4b. CCM-T Variable *nvoACDataLoad*

Field	Type	Data Source
freq	u16 (SNVT_freq_hz)	IO_6
total_pf	s16 (SNVT_pwr_fact)	Analog Inputs 6–8 IO_5 (lead/lag)
total_kva	s16 (1 kVA)	Analog Inputs 0–8
total_kw	s16 (1 kW)	Analog Inputs 0–8
total_kvar	s16 (1 kVAR)	Analog Inputs 0–8
volts_ab	u16 (SNVT_volt_ac)	Not Supported
volts_bc	u16 (SNVT_volt_ac)	Not Supported
volts_ca	u16 (SNVT_volt_ac)	Not Supported
volts_a	u16 (SNVT_volt_ac)	Analog Input 0
volts_b	u16 (SNVT_volt_ac)	Analog Input 1
volts_c	u16 (SNVT_volt_ac)	Analog Input 2
amps_a	u16 (SNVT_amp_ac)	Analog Input 3
amps_b	u16 (SNVT_amp_ac)	Analog Input 4
amps_c	u16 (SNVT_amp_ac)	Analog Input 5
percent_amps_a	u8 (SNVT_lev_cont)	Not Supported
percent_amps_b	u8 (SNVT_lev_cont)	Not Supported
percent_amps_c	u8 (SNVT_lev_cont)	Not Supported

TABLE F-4. NETWORK VARIABLE OUTPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE SENT BY	DESCRIPTION
nvoACDataSrc1	UNVT_ac_data (31 bytes)	PC ATS NCM	Output used by the Master Control to provide the AC data of Source 1. All data in this structure is obtained by polling the controller. For more information, see Table F-4c below.

Table F-4c. PC ATS NCM Variable *nvoACDataSrc1*

Field	Type	Logical Address
freq	u16 (SNVT_freq_hz)	Source 1 Frequency
total_pf	s16 (SNVT_pwr_fact)	NA
total_kva	s16	NA
total_kw	s16	NA
total_kvar	s16	NA
volts_ab	u16 (SNVT_volt_ac)	Source 1 Volts L1−L2
volts_bc	u16 (SNVT_volt_ac)	Source 1 Volts L2−L3
volts_ca	u16 (SNVT_volt_ac)	Source 1 Volts L3−L1
volts_a	u16 (SNVT_volt_ac)	Source 1 Volts L1−N
volts_b	u16 (SNVT_volt_ac)	Source 1 Volts L2−N
volts_c	u16 (SNVT_volt_ac)	Source 1 Volts L3−N
amps_a	u16 (SNVT_amp_ac)	NA
amps_b	u16 (SNVT_amp_ac)	NA
amps_c	u16 (SNVT_amp_ac)	NA
percent_amps_a	u8 (SNVT_lev_cont)	NA
percent_amps_b	u8 (SNVT_lev_cont)	NA
percent_amps_c	u8 (SNVT_lev_cont)	NA

TABLE F-4. NETWORK VARIABLE OUTPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE SENT BY	DESCRIPTION
nvoACDataSrc2	UNVT_ac_data (31 bytes)	PC ATS NCM	Output used by the Master Control to provide the AC data of Source 2. All data in this structure is obtained by polling the controller. For more information, see Table F-4d below.

Table F-4d. PC ATS NCM Variable *nvoACDataSrc2*

Field	Type	Logical Address
freq	u16 (SNVT_freq_hz)	Source 2 Frequency
total_pf	s16 (SNVT_pwr_fact)	NA
total_kva	s16	NA
total_kw	s16	NA
total_kvar	s16	NA
volts_ab	u16 (SNVT_volt_ac)	Source 1 Volts L1–L2
volts_bc	u16 (SNVT_volt_ac)	Source 1 Volts L2–L3
volts_ca	u16 (SNVT_volt_ac)	Source 1 Volts L3–L1
volts_a	u16 (SNVT_volt_ac)	Source 1 Volts L1–N
volts_b	u16 (SNVT_volt_ac)	Source 1 Volts L2–N
volts_c	u16 (SNVT_volt_ac)	Source 1 Volts L3–N
amps_a	u16 (SNVT_amp_ac)	NA
amps_b	u16 (SNVT_amp_ac)	NA
amps_c	u16 (SNVT_amp_ac)	NA
percent_amps_a	u8 (SNVT_lev_cont)	NA
percent_amps_b	u8 (SNVT_lev_cont)	NA
percent_amps_c	u8 (SNVT_lev_cont)	NA

TABLE F-4. NETWORK VARIABLE OUTPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE SENT BY	DESCRIPTION
nvoAnnun4Point	SNVT_state (2 bytes)	GCM, GLC, PCC 2100 NCM	Output used to annunciate a “short” genset status to the annunciator. Alarms are set when the event is active and reset when the event is inactive. **Field** **Alarm** **Latch** **Fault or Condition (Data Source)** *bit0* Check Genset N Common Warning or Shutdown Alarm *bit1* Genset Supplying Load N Genset Connected *bit2* Genset Running N Ready to Load (Genset Available) *bit3* Not In Auto N Not In Auto *bit4..15* Not Used –
		CCM-G	Output used to annunciate a “short” genset status to the annunciator. **Field** **Description** **Discrete Input** *bit0* Check genset 17 *bit1* Genset Supplying Load Not Supported *bit2* Genset Running 28 *bit3* Not In Auto 29,30 *bit4..15* Not Used
		PC ATS NCM, CCM-T	Output used to annunciate a “short” ATS status to the annunciator. None of these events are “latched” by the NCM/CCM-T; thus each bit is set when the event is active and reset when the event is inactive. **Field** **Description** **Discrete Input** *bit0* Source 1 Available 1 *bit1* Source 2 Available 2 *bit2* Source 1 Connected 3 *bit3* Source 2 Connected 4 *bit4..15* Not Used Not Supported
nvoAnnun8Point	SNVT_state (2 bytes)	DIM	Output used by the annunciator to provide the state of the 8 discrete inputs. Only *bits0..7* are used. **Field** **Description** *bit0* State of Input 1 *bit1* State of Input 2 *bit2* State of Input 3 *bit3* State of Input 4 *bit4* State of Input 5 *bit5* State of Input 6 *bit6* State of Input 7 *bit7* State of Input 8 *bit8..15* Not Used

TABLE F-4. NETWORK VARIABLE OUTPUTS (CONTINUED)

<table>
<tr><th>VARIABLE</th><th>OPERATING TYPE</th><th>DEVICE SENT BY</th><th>DESCRIPTION</th></tr>
<tr><td rowspan="3">nvoAnnun8Point (Continued)</td><td rowspan="3">SNVT_state
(2 bytes)</td><td>GCM, GLC, PCC 2100 NCM</td><td>Output used to annunciate a simplified genset status to the annunciator. Some of these events are “latched” by the GCM/GLC and remain set until the corresponding event is inactive <u>and</u> the genset is reset. Alarms that are not latched are set when the event is active and reset when the event is inactive.
<table>
<tr><th>Field</th><th>Alarm</th><th>Events</th></tr>
<tr><td>bit0</td><td>Check Genset</td><td>Common Warning or Shutdown Alarm</td></tr>
<tr><td>bit1</td><td>Genset Supplying Load</td><td>Genset Connected</td></tr>
<tr><td>bit2</td><td>Genset Running</td><td>Ready to Load (Genset Available)</td></tr>
<tr><td>bit3</td><td>Not In Auto</td><td>Not In Auto</td></tr>
<tr><td>bit4</td><td>High/Low Engine Temp</td><td>See nvoAnnunNFPA.bit8,9,10</td></tr>
<tr><td>bit5</td><td>Low Oil Pressure</td><td>See nvoAnnunNFPA110.bit11,12</td></tr>
<tr><td>bit6</td><td>Low Coolant Level</td><td>See nvoAnnunNFPA110.bit14</td></tr>
<tr><td>bit7</td><td>Low Fuel Level</td><td>See nvoAnnunNFPA110.bit15</td></tr>
<tr><td>bit8..15</td><td>Not Used</td><td></td></tr>
</table></td></tr>
<tr><td>PC ATS NCM</td><td>Output to annunciate a ‘simplified’ ATS status to the annunciator. None of these events are “latched” by the NCM; thus each bit is set when the event is active and reset when the event is inactive.
<table>
<tr><th>Field</th><th>Description</th><th>Latched</th><th>Event(s)</th></tr>
<tr><td>bit0</td><td>Source 1 Available</td><td>N</td><td>Source 1 Available</td></tr>
<tr><td>bit1</td><td>Source 2 Available</td><td>N</td><td>Source2 Available</td></tr>
<tr><td>bit2</td><td>Source 1 Connected</td><td>N</td><td>Source1 Connected</td></tr>
<tr><td>bit3</td><td>Source 2 Connected</td><td>N</td><td>Source2 Connected</td></tr>
<tr><td>bit4</td><td>ATS Common Alarm</td><td>N</td><td>ATS Common Alarm</td></tr>
<tr><td>bit5</td><td>Not In Auto</td><td>N</td><td>Not In Auto – Common</td></tr>
<tr><td>bit6</td><td>Test/Exercise in Progress</td><td>N</td><td>Exercise or Test in Progress</td></tr>
<tr><td>bit7</td><td>Low ATS Battery</td><td>Y</td><td>Low Battery – Controller
Low Battery – Network</td></tr>
<tr><td>bit8..15</td><td>Not Used</td><td>–</td><td></td></tr>
</table></td></tr>
<tr><td>CCM-G</td><td>Output to annunciate a shortened NFPA-110 status to the annunicator.
<table>
<tr><th>Field</th><th>Description</th><th>Discrete Input</th></tr>
<tr><td>bit0</td><td>Check Genset</td><td>17</td></tr>
<tr><td>bit1</td><td>Genset Supplying Load</td><td>Not Supported</td></tr>
<tr><td>bit2</td><td>Genset Running</td><td>28</td></tr>
<tr><td>bit3</td><td>Not In Auto</td><td>29,30</td></tr>
<tr><td>bit4</td><td>High/Low Engine Temp</td><td>See nvoAnnunNFPA110.bit8,9,10</td></tr>
<tr><td>bit5</td><td>Low Oil Pressure</td><td>See nvoAnnunNFPA110.bit11,12</td></tr>
<tr><td>bit6</td><td>Low Coolant Level</td><td>See nvoAnnunNFPA110.bit14</td></tr>
<tr><td>bit7</td><td>Low Fuel Level</td><td>See nvoAnnunNFPA110.bit15</td></tr>
<tr><td>bit8..15</td><td>Not Used</td><td></td></tr>
</table></td></tr>
<tr><td>nvoAnnun8Point (Continued)</td><td>SNVT_state
(2 bytes)</td><td>CCM-T</td><td>Output to annunciate a ‘simplified’ ATS status to the annunicator. None of these events are “latched” by the CCM-T; thus each bit is set when the event is active and reset when the event is inactive.
<table>
<tr><th>Field</th><th>Description</th><th>Discrete Input</th></tr>
<tr><td>bit0</td><td>Source 1 Available</td><td>1</td></tr>
<tr><td>bit1</td><td>Source 2 Available</td><td>2</td></tr>
<tr><td>bit2</td><td>Source 1 Connected</td><td>3</td></tr>
<tr><td>bit3</td><td>Source 2 Connected</td><td>4</td></tr>
<tr><td>bit4</td><td>ATS Common Alarm</td><td>13</td></tr>
<tr><td>bit5</td><td>Not In Auto</td><td>14</td></tr>
<tr><td>bit6</td><td>Test/Exercise in Progress</td><td>5</td></tr>
<tr><td>bit7</td><td>[Low Battery]</td><td>Not Supported</td></tr>
<tr><td>bit8..15</td><td>NA</td><td>Not Supported</td></tr>
</table></td></tr>
</table>

TABLE F-4. NETWORK VARIABLE OUTPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE SENT BY	DESCRIPTION
nvoAnnunCustom	SNVT_state (2 bytes)	All	nvoAnnunCustom is factory set as 16 “nulls.” To use nvoAnnunCustom, the 16 faults must be set using the InPower service tool software before binding with LonMaker for Windows or creating a self-installed network.
		GCM	Output used to annunciate a customer-defined set of genset faults to the annunciator. All faults are “latched” by the GCM and remain set until the corresponding event is inactive <u>and</u> the genset is reset. Upon receiving an active event announcement, the GCM updates the Event table and processes the event. A list of GCM faults is listed in Table F-5 (all faults are “latched”). Upon receiving an inactive common warning/shutdown event, the GCM updates the Event table. For each record, if the event has been cleared, the GCM again compares the event code against those of the custom annunciation; if the event code matches, that bit is reset. **Field Description Latch Fault or Condition (Data Source)** *bit0* Fault 1 Y Common Alarm (*Genset Data.Status {bit0}*) *bit1* Fault 2 Y Configurable ... ... *bit15* Fault 16 Y Configurable
		GLC	Output used to annunciate a customer-defined set of genset faults to the annunciator. All faults are “latched” by the GLC and remain set until the corresponding event becomes inactive <u>and</u> the genset is reset. A list of GLC events is listed in Table F-6. **Field Description Latch Event(s) Default** *bit0* Fault 1 Y Event Code must be configured 0 ... ... *bit16* Fault 16 Y Event Code must be configured 0
nvoAnnunCustom (Continued)	SNVT_state (2 bytes)	PCC 2100 NCM	Output used to drive a customer-defined set of genset faults to the annunciator. The bits may be “latched” (clear or fault reset) or “unlatched” (follow status of event). The NCM supports unlatched events *Not In Auto* (1463), *Load Demand* (1341), and *Ready to Load* (1465). All other fault codes are considered latched. A list of PCC 2100 events is listed in Table F-7. **Field Description Event(s) Default** *bit0* Custom Annunciation Fault 1 Event Code must be configured 0 ... ... *bit15* Custom Annunciation Fault 16 Event Code must be configured 0
		CCM-G	Output used to annunciate a customer-defined set of genset faults to the annunciator. The bits correspond to the [calibrated] state of Discrete Inputs 1 though 16. CCM-G faults are listed in Table F-8. **Field Description Discrete Input** *bit0* Custom Status 1 1 ... ... *bit15* Custom Status 16 16
		CCM-T	Output used to annunciate a customer-defined set of transfer switch faults to the annunciator. The bits correspond to the [calibrated] state of Discrete Inputs 17 though 32. CCM-T events are listed in Table F-9. **Field Description Discrete Input** *bit0* Custom Status 1 17 ... ... *bit15* Custom Status 16 32

TABLE F-4. NETWORK VARIABLE OUTPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE SENT BY	DESCRIPTION
nvoAnnunExtended	SNVT_state (2 bytes)	GCM	Output used to annunciate the extended genset alarms to the annunciator. All extended alarms are “latched” by the GCM and remain set until the corresponding event becomes inactive and the genset is reset. **Field Description Latch Fault or Condition (Data Source)** *bit0* Check Genset N Common Alarm *bit1* Ground Fault – Not supported *bit2* High AC Voltage Y High AC Voltage *bit3* Low AC Voltage Y Low AC Voltage *bit4* Under Frequency Y Under Frequency *bit5* Overload Y Overload *bit6* Overcurrent Y Overcurrent Warning or Shutdown *bit7* Short Circuit Y Short Circuit *bit8* Reverse kW Y Reverse kW *bit9* Reverse kVAR Y Loss of Field *bit10* Fail to Sync Y Fail to Sync *bit11* Fail to Close Y [Gen CB] Fail to Close *bit12* Load Demand N Load Demand *bit13* Genset CB Tripped – Not supported *bit14* Utility CB Tripped – Not supported *bit15* Emergency Stop Y Emergency Stop

TABLE F-4. NETWORK VARIABLE OUTPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE SENT BY	DESCRIPTION
nvoAnnunExtended (Continued)	SNVT_state (2 bytes)	GLC	Output used to annunciate the extended genset alarms to the annunciator. All extended alarms are “latched” by the GLC and remain set until the corresponding event is inactive and the genset is reset. A list of GLC events is listed in Table F-6. **Field Description Latch Event(s)** *bit0* Check Genset N Common Warning or Shutdown Alarm *bit1* Ground Fault Y Ground Fault *bit2* High AC Voltage Y High AC Voltage *bit3* Low AC Voltage Y Low AC Voltage *bit4* Under Frequency Y Under Frequency *bit5* Overload Y Overload *bit6* Overcurrent Y Overcurrent Warning or Shutdown *bit7* Short Circuit Y Short Circuit *bit8* Reverse kW Y Reverse kW *bit9* Reverse kVAR Y Reverse kVAR *bit10* Fail to Sync Y Fail to Sync *bit11* Fail to Close Y [Gen CB] Fail to Close *bit12* Load Demand N Load Demand Stop *bit13* Genset CB Tripped Y Genset CB Tripped *bit14* Utility CB Tripped Y <configurable> *bit15* Emergency Stop Y Local or Remote Emergency Stop
		PCC 2100 NCM	Output used to annunciate the extended genset alarms to the annunciator. All extended alarms are “latched” by the device and remain set until the corresponding event becomes inactive and the genset is reset. **Field Description Fault or Condition (Data Source)** *bit0* Check Genset Common Warning or Shutdown Alarm *bit1* Ground Fault Must be configured by user *bit2* High AC Voltage High AC Voltage *bit3* Low AC Voltage Low AC Voltage *bit4* Under Frequency Under Frequency *bit5* Overload Overload *bit6* Overcurrent Overcurrent Warning or Shutdown *bit7* Short Circuit Short Circuit *bit8* Reverse kW Reverse kW *bit9* Reverse kVAR Reverse kVAR *bit10* Fail to Sync Not Supported *bit11* Fail to Close Fail to Close – Genset CB or Utility CB *bit12* Load Demand Not Supported *bit13* Genset CB Tripped Must be configured by user *bit14* Utility CB Tripped Must be configured by user *bit15* Emergency Stop Emergency Stop – Local Emergency Stop – Remote

TABLE F-4. NETWORK VARIABLE OUTPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE SENT BY	DESCRIPTION
nvoAnnunExtended (Continued)	SNVT_state (2 bytes)	PC ATS NCM	Output used to annunciate the extended ATS alarms to the annunciator. Some extended events are “latched” by the NCM and the corresponding bit remains set until the event becomes inactive and the transfer switch is reset. Those bits which are not latched are reset when the corresponding event becomes inactive. **Field** **Description** **Latched** *bit0* Source 1 Available N *bit1* Source 2 Available N *bit2* Source 1 Connected N *bit3* Source 2 Connected N *bit4* ATS Common Alarm N *bit5* Not In Auto N *bit6* Test/Exercise in Progress N *bit7* Low ATS Battery N *bit8* Load Shed Y *bit9* Transfer Inhibit N *bit10* Retransfer Inhibit N *bit11* Fail to Close N *bit12* Fail to Disconnect Y *bit13* Fail to Sync Y *bit14* Bypass to Source 1 N *bit15* Bypass to Source 2 N
		CCM-T	Output used to annunciate the extended ATS alarms to the annunciator. Some extended events are “latched” by the CCM-T and the corresponding bit remains set until the event becomes inactive and the transfer switch is reset. Those bits which are not latched are reset when the corresponding event becomes inactive. **Field** **Description** **Discrete Input** *bit0* Source 1 Available 1 *bit1* Source 2 Available 2 *bit2* Source 1 Connected 3 *bit3* Source 2 Connected 4 *bit4* ATS Common Alarm 13 *bit5* Not In Auto 14 *bit6* Test/Exercise in Progress 5 *bit7..13* NA Not Supported *bit14* Bypass to Source 1 11 *bit15* Bypass to Source 2 12
nvoAnnunExtended (Continued)	SNVT_state (2 bytes)	CCM-G	Output used to annunciate the extended genset alarms to the annunciator. All extended alarms are “latched” by the CCM-G and remain set until the event becomes inactive and the genset is reset. **Field** **Discrete Input** *bit0* 17 *bit1* 18 *bit2* 19 *bit3* 20 *bit4* 21 *bit5* 22 *bit6* 23 *bit7* 24 *bit8* 25 *bit9* 26 *bit10* 27 *bit11* 28 *bit12* 29 *bit13* 30 *bit14* 31 *bit15* 32

TABLE F-4. NETWORK VARIABLE OUTPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE SENT BY	DESCRIPTION
nvoAnnunNFPA110	SNVT_state (2 bytes)	GCM, GLC, PCC 2100 NCM	Output used to annunciate the NFPA-110 alarms to the annunciator. Some of the NFPA-110 alarms are “latched” by the NCM and remain set until the corresponding event becomes inactive and the genset is reset. Alarms that are not latched are set when the event is active and reset when the event is inactive. *bit0* is the MSB. **Field Description Event(s)** *bit0* Check Genset — Common Warning or Shutdown Alarm *bit1* Genset Supplying Load — Genset Connected *bit2* Genset Running — Ready To Load (Genset Available) *bit3* Not In Auto — Not In Auto *bit4* High Battery Voltage — High Battery Voltage *bit5* Low Battery Voltage — Low Battery Voltage, Weak Battery, Dead Battery *bit6* Charger AC Failure — Must be configured by user. *bit7* Fail To Start — Fail to Start, Fail to Crank *bit8* Low Coolant Temperature — Low Coolant Temperature *bit9* Pre-High Engine Temperature — High Engine Temperature Warning, High Oil Temperature Warning *bit10* High Engine — High Engine Temperature Shutdown *bit11* Pre-Low Oil Pressure — Low Oil Pressure Warning *bit12* Low Oil Pressure — Low Oil Pressure Shutdown *bit13* Overspeed — Overspeed, Overfrequency *bit14* Low Coolant Level — Low Coolant Level Warning, Low Coolant Level Shutdown *bit15* Low Fuel Level — Must be configured by user.

TABLE F-4. NETWORK VARIABLE OUTPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE SENT BY	DESCRIPTION
nvoAnnunNFPA110 (Continued)	SNVT_state (2 bytes)	PC ATS NCM	Output used to annunciate the NFPA-110 states to the annunciator. All NFPA-110 data is obtained through event announcements. The corresponding bit is set when the event is active and reset when the event is inactive. The network variable must be declared first to make sure it is assigned index 0. **Field** **Description** **Latched** *bit0* ATS Common Alarm N *bit1* Genset Supplying Load N *bit2* NA – *bit3* Not In Auto N *bit4..bit5* NA – *bit6* Charger AC Failure Y *bit7..bit15* NA –
		CCM-G	Output used to annunciate the NFPA-110 alarms to the annunciator. *bit0* (Normal Power) and *bit1* (Genset Supplying Load) are not supplied by the genset (with CCM). **Field** **Description** **Hardware Input** *bit0* Check Genset 17 *bit1* Genset Supplying Load Not supported *bit2* Genset Running 28 *bit3* Not In Auto 29,30 *bit4* High Battery Voltage 20 *bit5* Low Battery Voltage 21 *bit6* Charger AC Failure 31 *bit7* Fail to Start 22 *bit8* Low Coolant Temperature 19 *bit9* Pre-High Engine Temperature 26 *bit10* High Engine Temperature 24 *bit11* Pre-Low Oil Pressure 27 *bit12* Low Oil Pressure 25 *bit13* Overspeed 23 *bit14* Low Coolant Level 32 *bit15* Low Fuel Level 18
nvoAnnunNFPA110 (Continued)	SNVT_state (2 bytes)	CCM-T	Output used to annunciate the NFPA-110 states to the annunciator. All NFPA-110 data is obtained through event announcements. The corresponding bit is set when the event is active and reset when the event is inactive. The network variable must be declared first to make sure it is assigned index 0. **Field** **Description** **Discrete Input** *bit0* ATS Common Alarm 13 *bit1* Genset Supplying Load 4 (Source 2 connected) *bit2* NA Not supported. *bit3* Not In Auto 14 *bit4* High Gen Battery Voltage 8 *bit5* Low Gen Battery Voltage 7 *bit6* Charger AC Failure 10 *bit7..bit15* NA Not supported.

TABLE F-4. NETWORK VARIABLE OUTPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE SENT BY	DESCRIPTION
nvoAnnunStatus	UNVT_AnnunStatus (24 bytes)	LSA	Output proved to determine the status of the annunciator node. An external device can be used to read the lamp states (including color), error state, horn state, and state of the terminator switch. **Field** / **Type** / **Range** *Lamp[0..20]* / structure (8 bit field) *bit7 (MSB)* / – flashing (1) / 0 – No Flash, 1 – Flash *bit2–6* / – not used (5) / NA *bit0–1* / – color (2) / 0 – Off, 1 – Green, 2 – Red, 3 – Amber *network* / same structure as *.lamp* / where: 1 – green/solid (Bound, OK); 3 – amber/solid (Not Bound); 130 – red/flashing (Bound/Error) *horn* / u8 / 0 – Off, 1 – On *term_switch* / u8 / 0 – Off, 1 – On
nvoATSStatus	UNVT_ats_status (30 bytes)	PCC 2100 NCM	Output used to provide the current operating status of this transfer switch for other devices on the network network (GLC gensets, PowerCommand transfer switches and Master Control). This output may be connected to many devices. The output is propagated regularly at the interval defined by the network configuration variable *nciMinSendTime*. Data for this output is obtained through event announcement and polling. See Table F-4e below.

Table F-4e. PCC 2100 NCM Variable *nvoATSStatus*

Data Field	Type	Logical Address (Event)	Notes
name_tag	char[16]	Device Name Tag	
device_type	u16	NA	11 – (PCC 2100)
mode[1]	u8	AMF Mode	0 – Inactive 1 – Active 255 – Unknown
active_id	u8 (enum)	Active Transition Type	0 – None 1 – Engine Start A (Src2) 2 – Engine Start B (Src1) 3 – Normal to Emergency (TDNE) 4 – Emergency to Normal (TDEN) 5 – Engine Cooldown A (TDECA) 6 – Engine Cooldown B (TDECB) 7 – Program Transition (TDPT) 8 – Transfer Pend/ Elevator (TDEL) 255 – Unknown
fault_code	u16	NA	0xFFFF – Unknown
fault_type	u8	NA	0 – No Fault 1 – Warning 2 – Derate 3 – Shutdown w/cooldown 4 – Shutdown 255 – Unknown
percent_amps[2]	u8 (SNVT_lev_cont)	NA	255 – Unknown
total_kw	s16	NA	0xFFFF – Unknown
nfpa110	u16 (SNVT_state)	(Events)	See *nvoAnnunNFPA110*
extended	u16 (SNVT_state)	(Events)	See Table F-4f below.

[1] This is read once at node reset when reding the NCM configuration trims.
[2] The value returned by the controller must be clamped to the range of the SNVT by the NCM.

Table F-4f. PCC 2100 NCM Variable *nvoATSStatus.extended*

.extended	Description	Event(s)
bit0 (MSB)	Source1 Available	Utility Available
bit1	Source2 Available	Ready To Load (Genset Available)
bit2	Source1 Connected	Utility Connected
bit3	Source2 Connected	Genset Connected
bit4	ATS Common Alarm	Not Supported
bit5	ATS Not In Auto	Not Supported
bit6	Test In Progress	AMF Test
bit7	ATS Low Battery	Not Supported
bit8	Load Shed	Not Supported
bit9	Transfer Inhibit	Genset CB Inhibit
bit10	Retransfer Inhibit	Utility CB Inhibit
bit11	Fail To Close	Fail To Close – Genset Fail To Close – Utility
bit12	Fail To Disconnect	Fail To Open – Genset Fail To Open – Utility
bit13	Fail To Sync	Not Supported
bit14	Bypass To Source 1	Not Supported
bit15	Bypass To Source 2	Not Supported

TABLE F-4. NETWORK VARIABLE OUTPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE SENT BY	DESCRIPTION
nvoATSStatus (Continued)	UNVT_ats_status (30 bytes)	PC ATS NCM	Output used to provide the current operating status of this transfer switch for other devices on the network network (GLC gensets, PowerCommand transfer switches and Master Control). This output may be connected to many devices. The output is propagated regularly at the interval defined by the network configuration variable *nciMinSendTime*. Data for this output is obtained through event announcement and polling. See table F-4g below.

Table F-4g. PC ATS NCM Variable *nvoATSStatus*

Data Field	Type	Logical Adrs (Event)	Notes
name_tag	char[16]	Device Name Tag	
device_*type*	u16	NA	10 – PC ATS NCM
mode[1]	u8	ATS Configuration	0 – Test 1 – Utility/Gen 2 – Utility/Utility 3 – Gen/Gen 255 – Unknown
active_id	u8 (enum)	Active Time Delay	0 – None 1 – Engine Start A (Src2) 2 – Engine Start B (Src1) 3 – Normal to Emergency (TDNE) 4 – Emergency to Normal (TDEN) 5 – Engine Cooldown A (TDECA) 6 – Engine Cooldown B (TDECB) 7 – Program Transition (TDPT) 8 – Transfer Pend/Elevator (TDEL) 255 – Unknown
fault_code	u16	NA	Varies by device
fault_type	u8	NA	0 – No Fault 1 – Warning Fault 255 – Unknown
percent_amps[2]	u8 (SNVT_lev_cont)	Load Amps % Total	<250 – *percent_amps* / 2% 251 – >125% 255 – Unknown
total_kw	s16	Load Total kW	
nfpa110	u16 (SNVT_state)	(Events)	See *nvoAnnunNFPA110*
extended	u16 (SNVT_state)	(Events)	See *nvoAnnun*Extended

[1] This is read once at node reset when reding the NCM configuration trims.
[2] The value returned by the controller must be clamped to the range of the SNVT by the NCM.

TABLE F-4. NETWORK VARIABLE OUTPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE SENT BY	DESCRIPTION
nvoATSStatus (Continued)	UNVT_ats_status (30 bytes)	CCM-T	Output used to provide the current operating status of the ATS. Fault code field show the current, most severe fault of the ATS. See Table F-4h below.

Table F-4h. CCM-T Variable *nvoATSStatus*

Data Field	Type	Data Source	Notes	Default
name_tag	char[16]	nviNodeInfo.name_tag[16]		“CCM ATS”
device_type	u16	Hardcoded	7 – ATS w/CCM	7
mode	u8	NA	Not Supported	0xFF
active_td	u8	NA	Not Supported	0xFF
fault_code	u16	Discrete Input	1..32	0xFFFF
fault_type	u8	Discrete Configuration	0 – No Fault 1 – Warning 4 – Shutdown	0
percent_amps	u8 (SNVT_lev_cont)	NA	Not Supported	0xFF
total_kw	s16	nvoACDataLoad.total_kw		0x7FFF
nfpa110	u16 (SNVT_state)	nvoAnnunNFPA110	Synchronize on change	0
extended	u16 (SNVT_state)	nvoAnnunExtended	Synchronize on change	0

TABLE F-4. NETWORK VARIABLE OUTPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE SENT BY	DESCRIPTION
nvoCalibData1	UNVT_ccm_data (16 bytes)	CCM-G, CCM-T	Output used by manufacturing to view calibrated analog values. It contains the calibrated values of analog channels 0 though 7.
nvoCalibData2	UNVT_ccm_data (16 bytes)	CCM-G, CCM-T	Output used by manufacturing to view calibrated analog values. It contains the calibrated values of analog channels 8 though 15.
nvoCalibData3	UNVT_ccm_data (6 bytes)	CCM-G	Output used by manufacturing to view calibrated analog values. It contains the calibrated values of analog channels 16 though 18.
nvoCustFault1...4	SNVT_switch 2 bytes)	GCM	Outputs sent by the Master Control to provide the status of control *Customer Faults 1..4*. State = 0 (Fault Inactive) or 1 (Fault Active)
nvoCustomStatus[0..4]	SNVT_switch (2 bytes)	PCC 2100 NCM	Output used by the annunciator that allows you to define individual faults that you would like to annunciate or share with other equipment. These are intended to be the same as the control's front panel LEDs. When the *state* field is true (1), the fault which has be assigned to the status variable is either active or unacknowledged. When the *state* field is false (0), this fault is either inactive or has been acknowledged. The value field is not used. State: 0 (Fault Inactive) or 1 (Fault Active)
nvoCustomStatus[0..7]	SNVT_switch (2 bytes)	GLC	Outputs used by the annunciator that allow you to define individual faults that you would like to annunciate or share with other equipment. When the *state* field is true, the fault which has be assigned to the status variable is either active or the genset has not been reset. When the *state* field is false, this fault is either inactive or has been acknowledged. Thus, all custom status outputs are 'latched' until the genset is reset. State = 0 (Fault Inactive) or 1 (Fault Active)
nvoCustomStatus[0..8]	SNVT_switch (2 bytes)	DIM	Outputs used by all other devices to provide user-defined network status to the network. *nvoCustomStatus[0]* is a non-functional place holder that is not used. State = 0 (Inactive) or 1 (Active)
nvoCustomStatus [0..16]	SNVT_switch (2 bytes)	CCM-G	Output used by the annunciator to provide user-defined status to the network. Only the *state* field is used. The active state is configured with *nviCustInConfig.active[0..1]*. Discrete inputs 1..16. *nvoCustomStatus[0]* is a non-functional place holder that is not used. State = 0 (Inactive) or 1 (Active)
		CCM-T	Output used by the annunciator to provide user-defined status to the network. Only the *state* field is used. The active state is configured with *nviCustInConfig.active[2..3]*. Discrete inputs 17..32. *nvoCustomStatus[0]* is a non-functional place holder that is not used. State = 0 (Inactive) or 1 (Active)
nvoFaultStatus	SNVT_switch (2 bytes)	GCM, GLC, PCC 2100 NCM, CCM-G, CCM-T, PC ATS NCM	Output used by the annunciator to provide the device fault status. When the *state* field is true, the device has an active warning or shutdown alarm. When the *state* field is false, the device has no active faults or has been reset. State = 0 (No Faults) or 1 (Warning for Shutdown)
nvoGenACData	UNVT_ac_data (31 bytes)	GCM, GLC, PCC 2100 NCM, CCM-G	Output used to provide the instantaneous AC data of the genset for the Master Control. For a CCM-G, this output is also used by ModLon. For a GCM, GLC, and PCC 2100 NCM see Table F-4i. For a CCM-G, see Table F-4j.

Table F-4i. GCM, GLC, and PCC 2100 NCM Variable *nvoGenACData*

Field	Type	Notes
freq	u16 (SNVT_freq_hz)	
total_pf	s16 (SNVT_pwr_fact)	If Leading PF, total_pf = −Total PF
total_kva	s16 (1 kVA)	
total_kw	s16 (1 kW)	
total_kvar	s16 (1 kVAR)	
volts_ab	u16 (SNVT_volt_ac)	
volts_bc	u16 (SNVT_volt_ac)	
volts_ca	u16 (SNVT_volt_ac)	
volts_a	u16 (SNVT_volt_ac)	
volts_b	u16 (SNVT_volt_ac)	
volts_c	u16 (SNVT_volt_ac)	
amps_a	u16 (SNVT_amp_ac)	
amps_b	u16 (SNVT_amp_ac)	
amps_c	u16 (SNVT_amp_ac)	
percent_amps_a	u8 (SNVT_lev_cont)	Clamp at 125%.
percent_amps_b	u8 (SNVT_lev_cont)	Clamp at 125%.
percent_amps_c	u8 (SNVT_lev_cont)	Clamp at 125%.

Table F-4j. CCM-G Variable *nvoGenACData*

Field	Type	Data Source	Notes	Default
freq	u16 (SNVT_freq_hz)	IO_6		0xFFFF
total_pf	s16 (SNVT_pwr_fact)	Analog Inputs 6−8 IO_5 (leading/lag)	Negative if leading 0 if *freq = 0.0*	0x7FFF
total_kva	s16 (1 kVA)	Analog Inputs 0−8	0 if *freq = 0.0*	0x7FFF
total_kw	s16 (1 kW)	Analog Inputs 0−8	0 if *freq = 0.0*	0x7FFF
total_kvar	s16 (1 kVAR)	Analog Inputs 0−8	0 if *freq = 0.0*	0x7FFF
volts_ab	u16 (SNVT_volt_ac)		Not Supported	0xFFFF
volts_bc	u16 (SNVT_volt_ac)		Not Supported	0xFFFF
volts_ca	u16 (SNVT_volt_ac)		Not Supported	0xFFFF
volts_a	u16 (SNVT_volt_ac)	Analog Input 0		0xFFFF
volts_b	u16 (SNVT_volt_ac)	Analog Input 1		0xFFFF
volts_c	u16 (SNVT_volt_ac)	Analog Input 2		0xFFFF
amps_a	u16 (SNVT_amp_ac)	Analog Input 3		0xFFFF
amps_b	u16 (SNVT_amp_ac)	Analog Input 4		0xFFFF
amps_c	u16 (SNVT_amp_ac)	Analog Input 5		0xFFFF
percent_amps_a	u8 (SNVT_lev_cont)		Not Supported	0xFF
percent_amps_b	u8 (SNVT_lev_cont)		Not Supported	0xFF
percent_amps_c	u8 (SNVT_lev_cont)		Not Supported	0xFF

TABLE F-4. NETWORK VARIABLE OUTPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE SENT BY	DESCRIPTION
nvoGenAvailable	SNVT_switch (2 bytes)	PCC 2100 NCM	Output used by the annunciator to report that the genset is available (ready to load). When the *state* field is true (1), the genset is available. then the *state* field is false (0), the genset is not available. This output is nearly identical to *nvoRunStatus*. State = 0 (Genset Not Available) or 1 (Genset Available)
nvoGenConnected	SNVT_switch (2 bytes)	PCC 2100 NCM	Output used by the GLC and Annunciator to report that the genset is connected to the load (Genset contact is closed). When the *state* field is true (1), the genset is connected to the load. When the *state* field is false (0), the genset is not connected to the load. State = 0 (Genset Not Connected) or 1 (Genset Connected)
nvoGenData	UNVT_ac_data (30 bytes)	GCM, GLC, PCC 2100 NCM	Output used II to provide instantaneous AC data of the genset. See Table F-4k.

Table F-4k. GCM, GLC, and PCC 2100 NCM Variable *nvoGenData*

Field	Type	Notes	Default
volts_a	u16 (SNVT_volt_ac)	Re-use	0
volts_b	u16 (SNVT_volt_ac)	Re-use	0
volts_c	u16 (SNVT_volt_ac)	Re-use	0
freq	u16 (SNVT_freq_hz)	Re-use	0
amps_a	u16 (SNVT_amp_ac)	Re-use	0
amps_b	u16 (SNVT_amp_ac)	Re-use	0
amps_c	u16 (SNVT_amp_ac)	Re-use	0
percent_amps_a	s16 (SNVT_lev_percent)	Clamp at 125%.	0
percent_amps_b	s16 (SNVT_lev_percent)	Clamp at 125%.	0
percent_amps_c	s16 (SNVT_lev_percent)	Clamp at 125%.	0
total_pf	s16 (SNVT_pwr_fact)	Re-use	0
total_kw	s16 (kW)	Re-use	0
percent_kw	s16 (SNVT_lev_percent)	Clamp at 125%.	0
total_kvar	s16 (kVAR)		0
total_mwh	u16 (MWh)		0

TABLE F-4. NETWORK VARIABLE OUTPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE SENT BY	DESCRIPTION
nvoGenEngData	UNVT_gen_eng1 (30 bytes)	GCM, GLC, PCC 2100 NCM, CCM-G	Output used to provide the current operating data of the genset for the Master Control. It mainly contains engine and genset historical information. The spare temperature fields may be used for ambient, alternator, exhaust or intake temperatures. This output is used by the Master Control and, with a CCM-G, and ModLon. For a GCM, see Table F-4l. For a GLC, see Table F-4m. For a PCC 2100, see Table F-4n. For a CCM-G, see Table F-4o.

Table F-4l. GCM Variable *nvoGenEngData*

Field	Type	Notes	Default
battery_volts	s16 (SNVT_volt)		0x7FFF
oil_press	s16 (SNVT_press)		0x7FFF
oil_temp	u16 (SNVT_temp)		0xFFFF
coolant_temp	u16 (SNVT_temp)		0xFFFF
misc_temp1	u16 (SNVT_temp)	If not installed set to default.	0xFFFF
misc_temp2	u16 (SNVT_temp)	If not installed set to default.	0xFFFF
fuel_rate	u16 (SNVT_flow)	Not Supported	0xFFFF
engine_rpm	u16 (SNVT_rpm)		0xFFFF
engine_starts	u16 (SNVT_count)	'Successful' Starts	0xFFFF
engine_runtime	u32 (0.1 h)		0xFF..FF
total_kwh	u32 (kWh)		0xFF..FF
total_fuel	u32 (0.01 gal)	Not Supported	0xFF..FF

Table F-4m. GLC Variable *nvoGenEngData*

Field	Type	Data Source	Notes	Default
battery_volts	s16 (SNVT_volt)	Battery Voltage	Always valid	0x7FFF
oil_press	s16 (SNVT_press)	Oil Press Analog Input In Engineering Units Oil Pressure Sensor Status	0 = Valid, 1 = Invalid If 'Invalid', set to Default	0x7FFF
oil_temp	u16 (SNVT_temp)	Oil Temperature Oil Temp Sensor Status	If 'Invalid', set to Default 0 = Valid, 1 = Invalid	0xFFFF
coolant_temp	u16 (SNVT_temp)	Coolant Temperature Coolant Temp Sensor Status	If 'Invalid', set to Default 0 = Valid, 1 = Invalid	0xFFFF
misc_temp1	u16 (SNVT_temp)	Intake Temperature Intake Temp Sensor Status	If 'Invalid', set to Default 0 = Valid, 1 = Invalid	0xFFFF
misc_temp2	u16 (SNVT_temp)	Fuel Temperature Fuel Temp Sensor Status	If 'Invalid', set to Default 0 = Valid, 1 = Invalid	0xFFFF
fuel_rate	u16 (SNVT_flow)	Fuel Consumption Rate		0xFFFF
engine_rpm	u16 (SNVT_rpm)	Filtered Time Engine Speed		0xFFFF
engine_starts	u16 (SNVT_count)	Total Number Runs	'Successful' Starts	0xFFFF
engine_runtime	u32 (0.1 sec)	Engine Running Time		0xFF..FF
total_kwh	u32 (kWh)	Total kWh		0xFF..FF
total_fuel	u32 (0.01 gal)	Cumulative Fuel Consumption		0xFF..FF

Table F-4n. PCC 2100 NCM Variable *nvoGenEngData*

Field	Type	Data Source	Notes	Default
battery_volts	s16 (SNVT_volt)	Battery Voltage	Always valid	0x7FFF
oil_press	s16 (SNVT_press)	Oil Pressure Oil Pressure Sensor Status	If 'Invalid', set to Default 0 = Valid, 1 = Invalid	0x7FFF
oil_temp	u16 (SNVT_temp)	Oil Temperature Oil Temp Sensor Status	If 'Invalid', set to Default 0 = Valid, 1 = Invalid	0xFFFF
coolant_temp	u16 (SNVT_temp)	Coolant Temperature Coolant Temp Sensor Status	If 'Invalid', set to Default 0 = Valid, 1 = Invalid	0xFFFF
misc_temp1	u16 (SNVT_temp)		Not Supported	0xFFFF
misc_temp2	u16 (SNVT_temp)		Not Supported	0xFFFF
fuel_rate	u16 (0.01 gph)		Not Supported	0xFFFF
engine_rpm	u16 (SNVT_rpm)	Engine Speed		0xFFFF
engine_starts	u16 (SNVT_count)	Total Number of Runs		0xFFFF
engine_runtime	u32 (0.1 hr)	Total Engine Running Time		0xFF..FF
total_kwh	u32 (kWh)	Genset Total kWh		0xFF..FF
total_fuel	u32 (0.01 gal)		Not Supported	0xFF..FF

Table F-4o. CCM-G Variable *nvoGenEngData*

Field	Type	Data Source	Notes	Default
battery_volts	s16 (SNVT_volt)	Analog Input 15	Scaled to SNVT	0x7FFF
oil_press	s16 (SNVT_press)	Analog Input 12	Scaled to SNVT	0x7FFF
oil_temp	u16 (SNVT_temp)	Analog Input 10	Scaled to SNVT	0xFFFF
coolant_temp	u16 (SNVT_temp)	Analog Input 9	Scaled to SNVT	0xFFFF
misc_temp1	u16 (SNVT_temp)	Analog Input 11	Scaled to SNVT	0xFFFF
misc_temp2	u16 (SNVT_temp)	Analog Input 13	Scaled to SNVT	0xFFFF
fuel_rate	u16 (0.01 gph)	Analog Input 14	Scaled to SNVT	0xFFFF
engine_rpm	u16 (SNVT_rpm)		Scaled to SNVT	0xFFFF
engine_starts	u16 (SNVT_count)		Not Supported	0xFFFF
engine_runtime	u32 (0.1 sec)		Not Supported	0xFF..FF
total_kwh	u32 (kWh)		Not Supported	0xFF..FF
total_fuel	u32 (0.01 gal)		Not Supported	0xFF..FF

TABLE F-4. NETWORK VARIABLE OUTPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE SENT BY	DESCRIPTION
nvoGenParaData	UNVT_gen_para (26 bytes)	GCM	Output used by the Master Control to provide the bus AC data and paralleling state of a paralleling genset for the Master Control. The genset provides all voltages. The Interval defined by *nciMinSendTime*. See Table F-4p below.

Table F-4p. GCM Variable *nvoGenParaData*

Field	Type	Notes	Default
freq	u16 (SNVT_freq_hz)	Bus Hz	0xFFFF
volts_ab	u16 (SNVT_volt_ac)	Bus Volts	0xFFFF
volts_bc	u16 (SNVT_volt_ac)	Bus Volts	0xFFFF
volts_ca	u16 (SNVT_volt_ac)	Bus Volts	0xFFFF
volts_a	u16 (SNVT_volt_ac)	Bus Volts	0xFFFF
volts_b	u16 (SNVT_volt_ac)	Bus Volts	0xFFFF
volts_c	u16 (SNVT_volt_ac)	Bus Volts	0xFFFF
customer_faults *.bit0* *.bit1* *.bit2* *.bit3*	u16 (SNVT_state)	 Customer Fault 1 Customer Fault 2 Customer Fault 3 Customer Fault 4	All 0
network_faults	u16 (SNVT_state)	Not Supported	All 0
custom	u16 (SNVT_state)		All 0
es_state	u8 (enum)	0 – Standby 1 – Dead Bus Close 2 – Synchronize 3 – Load Share 4 – Load Govern 255 – Unknown	0xFF
ls_state	u8	Not Supported	0xFF
lg_state_kw	u8	Not Supported	0xFF
lg_state_kvar	u8	Not Supported	0xFF
gen_cb	u8	0 – Open 1 – Closed 2 – Not Avail. (Single) 3 – Inhibited 255 – Unknown	0xFF
util_cb	u8	Not Supported	0xFF

TABLE F-4. NETWORK VARIABLE OUTPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE SENT BY	DESCRIPTION
nvoGenParaData (Continued)	UNVT_gen_para (27 bytes)	GLC	Output used by the Master Control to provide the bus AC data and paralleling state of a paralleling genset for the Master Control. The PCC 3200 genset provides all voltages. The Interval defined by *nciMinSendTime and* each event announcement. See Table F-4q below.

Table F-4q. GLC Variable *nvoGenParaData*

Field	Type	Notes	Default
freq	u16 (SNVT_freq_hz)	Bus Hz	0xFFFF
volts_ab	u16 (SNVT_volt_ac)	Bus Volts	0xFFFF
volts_bc	u16 (SNVT_volt_ac)	Bus Volts	0xFFFF
volts_ca	u16 (SNVT_volt_ac)	Bus Volts	0xFFFF
volts_a	u16 (SNVT_volt_ac)	Bus Volts	0xFFFF
volts_b	u16 (SNVT_volt_ac)	Bus Volts	0xFFFF
volts_c	u16 (SNVT_volt_ac)	Bus Volts	0xFFFF
customer_faults *.bit0* *.bit1* *.bit2* *.bit3*	u16 (SNVT_state)		All 0
network_faults *.bit0* *.bit1* *.bit2* *.bit3*	u16 (SNVT_state)		All 0
network_faults *.bit0* *.bit1* *.bit2* *.bit3*	u16 (SNVT_state)		All 0
custom	u16 (SNVT_state)	See *nvoAnnunCustom*	All 0
es_state	u8	0 – Standby 1 – Dead Bus Close 2 – Synchronize 3 – Load Share 4 – Load Govern 255 – Unknown	0xFF

Table F-4q. GLC Variable *nvoGenParaData*

Field	Type	Notes	Default
ls_state	u8	0 – Not in Load Share 1 – Track Load 2 – Ramp Load 3 – Ramp Unload 4 – Load Dmd Shutdn 255 – Unknown	0xFF
lg_state_kw	u8	0 – Not Applicable 1 – Ramp Load 2 – Track Target 3 – Ramp Unload 4 – Ramp Unload Done 255 – Unknown	0xFF
lg_state_kvar	u8	0 – Not Applicable 1 – Ramp Load 2 – Track Target 3 – Ramp Unload 4 – Ramp Unload Done 255 – Unknown	0xFF
gen_cb (See note)	u8	0 – Open 1 – Closed 2 – Unavailable 3 – Inhibit 255 – Unknown	0xFF
util_cb (See note)	u8	0 – Open 1 – Closed 2 – Unavailable 3 – Inihibit 255 – Unknown	0xFF

NOTE: The GLC must reconcile the value of the 2 logicals to determine the field value as follows:

CB Inhibit Sw	CB Position Status	.gen_cb/.util_cb
Inactive (0)	0..2	*CB Position Status (0..2)*
Active (1)	X	*Inhibit (3)*

TABLE F-4. NETWORK VARIABLE OUTPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE SENT BY	DESCRIPTION
nvoGenStatus	UNVT_gen_status (30 bytes)	GCM	This output used by the Master Control, PCC 3200, and PC ATS NCM (PowerCommand Transfer Switch) is used to provide the current operating status of this genset for other gensets or PowerCommand transfer switches. See Table F-4r below.

Table F-4r. GCM Variable *nvoGenStatus*

Field	Type	Notes
name_tag	char[16]	ascii string
device_type	u16	5 – PCC
control_switch	u8	0 – Off 1 – Run\Manual 2 – Auto 255 – Unknown
state	u8	0 – Stopped 1 – Start Pending 2 – Warmup /Idle 3 – Running 4 – Cooldown /Rated 5 – Cooldown /Idle 255 – Unknown
fault_code	u16	Varies by device.
fault_type	u8	1 – Warning 2 – Derate 3 – Shutdown w/cooldown 4 – Shutdown 255 – Unknown
percent_kw	u8 (SNVT_lev_cont)	Clamp at 125%.
total_kw	s16	
nfpa110	u16 (SNVT_state)	
extended	u16 (SNVT_state)	

TABLE F-4. NETWORK VARIABLE OUTPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE SENT BY	DESCRIPTION
nvoGenStatus (Continued)	UNVT_gen_status (30 bytes)	GLC	Output used to provide the current operating status of this genset for other PCC 3200 gensets or PowerCommand transfer switches. See Table F-4s below.

Table F-4s. GLC Variable *nvoGenStatus*

Field	Type	Notes
name_tag	char[16]	ascii string
device_type	u16	3 – PCC 3200
control_switch	u8	0 – Off 1 – Run\Manual 2 – Auto 255 – Unknown
state	u8	0 – Stopped 1 – Start Pending 2 – Warmup /Idle 3 – Running 4 – Cooldown /Rated 5 – Cooldown /Idle 255 – Unknown
fault_code	u16	Varies by device.
fault_type	u8	1 – Warning 2 – Derate 3 – Shutdown w/cooldown 4 – Shutdown 255 – Unknown
percent_kw	u8 (SNVT_lev_cont)	Clamp, see *nvoRunStatus*
total_kw	s16	
nfpa110	u16 (SNVT_state)	See *nvoAnnunNFPA110*
extended	u16 (SNVT_state)	See *nvoAnnunExtended*

TABLE F-4. NETWORK VARIABLE OUTPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE SENT BY	DESCRIPTION
nvoGenStatus (Continued)	UNVT_gen_status (30 bytes)	PCC 2100 NCM	Output used to provide the current operating status of this genset for other PCC 2100 gensets or PowerCommand transfer switches. This output may be connected to many PCC 2100 gensets or PowerCommand transfer switches. See Table F-4t below.

Table F-4t. PCC 2100 NCM Variable *nvoGenStatus*

Field	Type	Notes
name_tag	char[16]	ascii string
device_type	u16	11 – PCC 2100
control_switch	u8	0 – Off 1 – Run\Manual 2 – Auto 255 – Unknown
state	u8	0 – Stopped 1 – Start Pending 2 – Warmup /Idle 3 – Running 4 – Cooldown /Rated 5 – Cooldown /Idle 255 – Unknown
fault_code	u16	Varies by device.
fault_type	u8	0 – No Fault 1 – Warning 2 – Derate 3 – Shutdown w/cooldown 4 – Shutdown 255 – Unknown
percent_kw	u8 (SNVT_lev_cont)	Clamp, see *nvoRunStatus*
total_kw	s16	
nfpa110	u16 (SNVT_state)	See *nvoAnnunNFPA110*
extended	u16 (SNVT_state)	See *nvoAnnunExtended*

TABLE F-4. NETWORK VARIABLE OUTPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE SENT BY	DESCRIPTION
nvoGenStatus (Continued)	UNVT_gen_stat_05 (30 bytes)	CCM-G	Output used by the Master Control, ModLon, and PowerCommand ATS to provide the overall operating status of the genset. The fault_code and fault_type fields will contain the most severe active fault. See Table F-4u below.

Table F-4u. CCM-G Variable *nvoGenStatus*

Field	Type	Data Source	Notes	Default
name_tag	char[16]	*nviNodeInfo.namg_tag[16]*	ascii string	0
device_type	u16	NA	6 – Genset w/CCM	6
control_switch	u8	Discrete Input 29,30 29 –> Switch In Off 30 –> Switch In Run	0,0 –> 2 (Auto) 0,1 –> 1 (Run/Manual) 1,0 –> 0 (Off) 1,1 –> 3 (Unknown)	0
state	u8	Discrete Input 28	0 –> 0 (Stopped) 1 –> 3 (Running)	0
fault_code	u16	Discrete Input #	0 –> None 1..32 –> Input 1–32	0
fault_type	u8	*nvoEventMsgCnfig*	0 – None 1 – Warning 4 – Shutdown	0
percent_kw	u8 (SNVT_lev_cont)		Not Supported	0xFF
total_kw	s16	*nvoGenACData.total_kw*		0x7FFF
nfpa110	u16 (UNVT_st_nfpa110)	nvoAnnunNFPA110		0
extended	u16 (UNVT_st_gen_ext)	Discrete Input 17	Only *bit0* is supported	0

TABLE F-4. NETWORK VARIABLE OUTPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE SENT BY	DESCRIPTION
nvoInfo	UNVT_gcm_info (18 bytes)	GCM, GLC, PCC 2100 NCM	Output used to acquire genset model information. This output is configured as 'polled' only. The GCM/GLC/NCM polls for this data once at reset. For a GCM, see Table F-4v. For a GLC or a PCC 2100 NCM, see Table F-4w.

Table F-4v. GCM Variable *nvoInfo*

Field	Type	Notes	Default
model	SNVT_char_ascii[4]	Read ONCE at reset.	0
rated_kw	u16 (SNVT_power_kilo)	Read ONCE at reset.	0
rated_voltage	u16 (VLL)	Read ONCE at reset.	0
sw_version	char[4]	Read ONCE at reset.	0
sw_date	char[6]	Read ONCE at reset.	0

Table F-4w. GLC and PCC 2100 NCM Variable *nvoInfo*

Field	Type	Notes	Default
model	SNVT_char_ascii[4]	Not Supported	0
rating	u16 (SNVT_power_kilo)	Not Supported	0
selected_voltage	u16 (VLL)	Not Supported	0
fw_version	char[4]	ASCII	0
fw_date	char[6]	Not Supported	0

TABLE F-4. NETWORK VARIABLE OUTPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE SENT BY	DESCRIPTION
nvoIOStatus	UNVT_dim_io_stat (24 bytes)	DIM	Output sent to the annunciator and is used to provide discrete input status. **Field** **Type** **Notes** **Default** *relay[0]* u8 State of Relay 1 0 ... *relay[15]* u8 State of Relay 16 0 *input1* u8 State of Input 1 0 *input2* u8 State of Input 2 0 *input3* u8 State of Input 3 0 *input4* u8 State of Input 4 0 *Input5* u8 State of Input 5 0 *Input6* u8 State of Input 6 0 *Input7* u8 State of Input 7 0 *Input8* u8 State of Input 8 0
nvoLoadControl	SNVT_switch (2 bytes)	PC ATS NCM	Output used by the ATS and DIM provided to allow the PowerCommand transfer switch to sequence the loading of either source with a single binding. This allows the transfer switch to 'gently' apply load to a source, avoiding full step loading. This output serves the same purpose as *nvoLoad-Sequence1..8*, but does so with a single output where the individual bits are used to sequence the load. State = 0 (Enable Load) or 1 (Disable Load)
nvoLoadDumpCmd	SNVT_switch (2 bytes)	GCM, GLC, PCC 2100	Output used by the Master Control to reduce the load on the genset. When the *state* field is true, the genset requests that its load be reduced. When the *state* field is false, the current load for the genset is acceptable. State = 0 (Load OK) or 1 (Remove Load)
nvoLoadSequence1...8	SNVT_switch (2 bytes)	PC ATS NCM	These outputs used by PowerCommand ATS, CCM-T, or DIM (relay module) are used to allow the PowerCommand transfer switch to sequence the loading of either source. This allows the transfer switch to 'gently' apply load to a source, avoiding full step loading. When the *state* field is true, the transfer switch is inhibiting the device from loading. When the *state* field is false, the device may be loaded. The *value* field is not used. The *state* field of the network variable will be determined from *fault_status* of the event announcement. State = 0 (Enable Load) or 1 (Disable Load)
nvoMfgTest	UNVT_mfgtest_05	All	Output used for development and manufacturing testing.
nvoNFPA110	SNVT_state (2 bytes)	GCM, GLC, PCC 2100 NCM, PC ATS NCM, CCM-G, CCM-T	Output only used to provide NFPA-110 alarms to a relay expansion card (for example, DIM) when the device is self-installed. The relay expansion card creates the binding from *nvoNFPA110*.
nvoNodeStatus	UNVT_dim_status (20 bytes)	DIM	Output used to provide discrete operating data of the genset. See Table F-4x below.
	UNVT_key_status (12 bytes)	PC ATS NCM	Output used to provide discrete operating data of the transfer switch. See Table F-4y below.
	UNVT_ccm_status1 (12 bytes)	CCM-G, CCM-T	Output used to provide discrete operating data of the genset. For a CCM-G, see Table F-4z below. For a CCM-G, see Table F-4aa below.

Table F-4x. DIM Variable *nvoNodeStatus*

Field	Type	Notes	Default
relay[0]	u8	State of Relay 1	0
...			
relay[15]	u8	State of Relay 16	0
input1	u8	State of Input 1	0
input2	u8	State of Input 2	0
input3	u8	State of Input 3	0
input4	u8	State of Input 4	0

Table F-4y. PC ATS NCM Variable *nvoNodeStatus*

Field	Type	Bit	Event (Network Variable)	Default
inputs[0]	u8 (bit−field) inputs 1−8	0 (LSB) 1 2 3 4 5..7	Source1 Available Source2 Available Source1 Connected Source2 Connected Test/Exercise In Progress Not Used	0
inputs[1]	u8 (bit−field) inputs 9−16	0 (LSB) 1 2 3 4..7	Transfer Pending Charger AC Failure1 Bypass To Source1 Bypass To Source2 Not Used	0
inputs[2]	u8 (bit−field) inputs 17−24	0 (LSB) 1 2..7	Start Command A (Source 2) Start Command B (Source 1) Not Used	0
inputs[3]	u8 (bit−field) inputs 25−32	0 (LSB) 1 2 3 4[1] 5[1] 6[1] 7	ATS Common Alarm[1] Load Shed Transfer Inhibit Retransfer Inhibit Fail To Close − Transfer Fail To Close − Retransfer Low Battery − Controller Low Battery − NCM Network Error[1]	0
relay1	SNVT_switch	NA	(=*nviRelayControl1*)	Note 2
relay2	SNVT_switch	NA	(=*nviRelayControl2*)	Note 2
relay3	SNVT_switch	NA	(=*nviRelayControl3*)	Note 2
relay4	SNVT_switch	NA	0 (momentary)	0
1. These fields are latched and cleared on Fault Reset event. 2. The default value of these fields are initialized by reading the corresponding logical address.				

Table F-4z. CCM-G Variable *nvoNodeStatus*

Field	Type	Notes	Default
inputs[0]	u8 (bit–field)	Custom Status (Inputs 1..8)	0
inputs[1]	u8 (bit–field)	Custom Status (Inputs 9..16)	0
inputs[2]	u8 (bit–field)	Genset Status (Inputs 17..24)	0
inputs[3]	u8 (bit–field)	Genset Status (Inputs 25..32)	0
relay1	u8 (boolean)	Start/Stop (Relay1)	0
relay2	u8 (boolean)	Fault Reset (Relay2)	0
relay3	u8 (boolean)	Shutdown (Relay3)	0
relay4	u8 (boolean)	Spare (Relay4)	0
relay5	u8 (boolean)	Spare (Relay5)	0
relay6	u8 (boolean)	Spare (Relay6)	0
relay7	u8 (boolean)	Spare (Relay7)	0
relay8	u8 (boolean)	Spare (Relay8)	0

Table F-4aa. CCM-T Variable *nvoNodeStatus*

Field	Type	Notes	Default
inputs[0]	u8 (bit–field)	ATS Status (Inputs 1..8)	0
inputs[1]	u8 (bit–field)	ATS Status (Inputs 9..16)	0
inputs[2]	u8 (bit–field)	Custom Status (Inputs 17..24)	0
inputs[3]	u8 (bit–field)	Custom Status (Inputs 25..32)	0
relay1	u8 (boolean)	Load Shed (Relay1)	0
relay2	u8 (boolean)	Transfer Inhibit (Relay2)	0
relay3	u8 (boolean)	Remote Test (Relay3)	0
relay4	u8 (boolean)	Spare (Relay4)	0
relay5	u8 (boolean)	Spare (Relay5)	0
relay6	u8 (boolean)	Spare (Relay6)	0
relay7	u8 (boolean)	Spare (Relay7)	0
relay8	u8 (boolean)	Spare (Relay8)	0

VARIABLE	OPERATING TYPE	DEVICE SENT BY	DESCRIPTION
nvoNotInAuto	SNVT_switch (2 bytes)	GCM, GLC, PCC 2100 NCM, CCM-G	Output used to provide the status of the genset's front panel switch. When the *state* field is true, the genset's front panel switch is not in the "Auto" position. When the *state* field is false, the genset's front panel switch is in the "Auto" position. Unlike faults, this output is set when the event is active and cleared when the event becomes inactive. State = 0 (In Auto) or 1 (Not In Auto)
		PC ATS NCM, CCM-T	Output used by the annunciator to report the readiness of the transfer switch. When the *state* field is true, the transfer switch's control switch is not in the 'Auto' position. When the *state* field is false, the transfer switch panel switch is in the 'Auto' position. The *value* field is not used. State = 0 (In Auto) or 1 (Not In Auto)
nvoRelayCustom	SNVT_state (2 bytes)	PCC 2100 NCM	Output used to drive a customer-defined set of genset faults to the DIM. The bits may be "latched" (clear on fault reset) or "unlatched" (follow status of event). The NCM supports unlatched events *Not In Auto* (1463), *Load Demand* (1341) and *Ready To Load* (1465). All other fault codes are considered latched. This output must be set up using the service tool.
nvoRunStatus	SNVT_switch	GCM, GLC, PCC 2100 NCM	Output used by the annunciator to provide the genset's running status and percent load. When the *state* field is true, the genset is running and ready to accept load. When the *state* field is false, the genset is not ready to accept load. The *value* field is used to provide the percent of rated load on the genset. The device regularly transmits this output to provide the run status and loading of the genset. This output is required for LONMARK Generator Set compliance. State = 0 (Stopped) or 1 (Running – Ready to Load) Value (GCM) = 0–251 (255 = Unknown)
		CCM-G	Output used by the annunciator to provide the genset's running status. When the *state* field is true, the genset is running and ready to accept load. When the *state* field is false, the genset is not ready to accept load. The *value* field is not used. This output is required for LONMARK Generator Set compliance. State = 0 (Stopped) or 1 (Running – Ready to Load) Value = 0xFF (Unknown)
nvoSensorData	UNVT_ccm_sensor1 (14 bytes)	CCM-T	Output used to provide analog data (battery voltage). This output is configured as 'polled' only. **Field** **Type** **Analog Input** **Notes** **Default** *spare1* SNVT_lev_percent 9 0 *spare2* SNVT_lev_percent 10 0 *spare3* SNVT_lev_percent 11 0 *spare4* SNVT_lev_percent 12 0 *spare5* SNVT_lev_percent 13 0 *spare6* SNVT_lev_percent 14 0 *battery_volts* SNVT_volt 15 0
nvoSpareAnalog	UNVT_spareAnalog (6 bytes)	CCM-G, CCM-T	Output used to provide spare analog input data. This output is configured as 'polled' only. **Field** **Type** **Default** *spare_1* s16 (SNVT_lev_percent) 0 *spare_2* s16 (SNVT_lev_percent) 0 *spare_3* s16 (SNVT_lev_percent) 0
nvoSpeedAdjCmd	SNVT_switch (2 bytes)	PC ATS NCM	Output is used to instruct a non-paralleling PCC 3200 or PCC 2100 genset (Source 2) to increase its nominal frequency set point by 0.5 Hz. This will allow the PowerCommand ATS to perform a 'passive' closed transition back to normal power. The frequency differential forces the two sources to match phase, allowing the transfer switch to perform a closed transition back to Source 1 (normal power). When the *state* field is true, the transfer switch is requesting the genset increase its nominal frequency by 0.5 Hz. When the *state* field is false, the genset should restore its nominal rated frequency. The *value* field is not used. The *state* field of the network variable is determined from *fault_status* of the event announcement. State = 0 (Nominal Speed) or 1 (Increase Speed)
nvoSrc1Available	SNVT_switch (2 bytes)	PC ATS NCM, CCM-T	Output is used by the annunciator to report that Source 1 is available for loading. When the *state* field is true, Source 1 is within rated voltage and frequency. When the *state* field is false, Source 1 is not within rated voltage and frequency. The *value* field is not used. The *state* field of the network variable will be determined from *fault_status* of the event announcement. This output is required for LONMARK compliance. State = 0 (Source 1 Not Available) or 1 (Source 1 Available)
nvoSrc1Connected	SNVT_switch (2 bytes)	PC ATS NCM, CCM-T	Output is used by PCC 3200 genset and the annunciator to report that Source 1 is connected to the load. When the *state* field is true, Source 1 is connected to the load. When the *state* field is false, Source1 is not connected to the load. State = 0 (Source 1 Not Connected) or 1 (Source 1 Connected)

TABLE F-4. NETWORK VARIABLE OUTPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE SENT BY	DESCRIPTION
nvoSrc2Available	SNVT_switch (2 bytes)	PC ATS NCM, CCM-T	Output is used by the annunciator to report that Source 2 is available for loading. When the *state* field is true, Source 2 is within rated voltage and frequency. When the *state* field is false, Source 2 is not within rated voltage and frequency. The *value* field is not used. The *state* field of the network variable will be determined from *fault_status* of the event announcement. This output is required for LONMARK compliance. State = 0 (Source 2 Not Available) or 1 (Source 2 Available)
nvoSrc2Connected	SNVT_switch (2 bytes)	PC ATS NCM, CCM-T	Output is used by the annunciator to report that Source 2 is connected to the load. When the *state* field is true, Source 2 is connected to the load. When the *state* field is false, Source 1 is not connected to the load. The value field is not used. This output is required for LONMARK compliance. State = 0 (Source 2 Not Connected) or 1 (Source 2 Connected)
nvoStartCmd	SNVT_switch (2 bytes)	PC ATS NCM, CCM-T	Output is used start a genset (which is Source 2). When the *state* field is true, the transfer switch is requesting the genset to start. When the *state* field is false, the transfer switch is requesting the genset to stop. The *value* field is not used. This output is required for LONMARK compliance. State = 0 (Stop) or 1 (Start)
nvoStartCmdB	SNVT_switch (2 bytes)	PC ATS NCM, CCM-T	Output is used to start a genset (which is Source 1). This output is only for when an ATS is used in a genset-to-genset application. When the *state* field is true, the transfer switch is requesting the genset to start. When the *state* field is false, the transfer switch is requesting the genset to stop. The *value* field is not used. This output is optional for LONMARK compliance. State = 0 (Stop) or 1 (Start)
nvoStartType	SNVT_switch (2 bytes)	PC ATS NCM	Output used with a PCC 3200 genset. This output is used to configure the PCC 3200 genset for emergency or non-emergency start. It will not start or stop the genset. This output only configures the start mode. When the *state* field is true, the PCC 3200 genset will be configured for a non-emergency or test start. When the *state* field is false, the PCC 3200 genset will be configured for an emergency or fast start. The *value* field is not used. State = 0 (Emergency) or 1 (Non-Emergency)
nvoStartTypeB	SNVT_switch (2 bytes)	PC ATS NCM	Output used with a PCC 3200 genset. This output is only for when an ATS is used in a genset-to-genset application. This output is used to configure the PCC 3200 genset for emergency or non-emergency start. It will not start or stop the genset. It must be used in conjunction with *nvoStartCmdB*. This output only configures the start mode. When the *state* field is true, the PCC 3200 genset will be configured for a non-emergency or test start. When the *state* field is false, the PCC 3200 genset will be configured for an emergency of fast start. The *value* field is not used. State = 0 (Emergency) or 1 (Non-Emergency)
nvoStatus	UNVT_gcm_status	GCM, GLC, PCC 2100 NCM	Output used to provide the operating status of the genset. The *fault_type*, *fault_text*, and *fault_code* fields are event driven. This output is configured as 'polled' only. For a GCM, see Tables F-4ab and F-4ac below. For a GLC or an NCM, see Table F-4ad below.

Table F-4ab. GCM Variable *nvoStatus*

Field	Type	Notes	Default
state[1]	u16 (enum)	0 – Power Up 1 – Stopped 2 – Cranking 3 – Running 4 – Shutdown (Run cmd) 5 – Shutdown (No Run cmd)	0
status[2]	u16 (bit–field)		0
fault_type[3]	u16 (enum)	1 – Warning 2 – Shutdown	0
fault_text[16][4]	char		0
fault_code	u16	0 – No Fault 1 .. 65535 – Fault Code	0
error	u8 (boolean)	Not Supported	0

Table F-4ac. Status Field for GCM *nvoStatus*

Bit(s)	Description	Notes
bit0	Common Alarm	Least Significant Bit
bit1	Load Dump	
bit2	Genset CB Position	
bit3	Leading PF	Use when for Total PF
bit4	Ready To Load	
bit5	Control Switch−Run	Neither−> Off
bit6	Control Switch−Auto	
bit7	Genset Start Delay	
bit8	Genset Stop Delay	
bit9	Load Demand	
bit10	Paralleling Installed	Paralleling Genset
bit11	Remote Start	Not Used
bit12	Right Coolant Installed	Not Used
bit13	Exhaust 1 Installed	Exhaust 1 is installed
bit14	Exhaust 2 Installed	Exhaust 2 is installed
bit15	Genset CB Inhibit	

Table F-4ad. GLC and PCC 2100 NCM Variable *nvoStatus*

Field	Type	Notes	Default
state[1]	u16	0 – Power Up 1 – Stopped 2 – Cranking 3 – Running 4 – Shutdown (Run cmd) 5 – Shutdown (No Run cmd)	0
status[2] *.bit3* *.bit5* *.bit6* *others*	u16 (bit–field)	 Leading PF Switch in ‘Run’ (1) Switch in ‘Auto’ (2) Not Supported	0
fault_type[3]	u16	1 – Warning 2 – Shutdown	0
fault_text[16][4]	char	(Faults only) See below	0
fault_code	u16	(Faults only) 0 – No Fault 1 .. 65535 – Fault Code	0
error	u8 (boolean)	Not Supported	0

Indicating Leading PF for PCW

Alt Total Power Factor	{bit3}
< 0 – Leading	1
≥ 0 – Lagging	0

Translating Control Switch Position

Control Switch Position	nvoStatus.status	
	{bit5}	{bit6}
0 – Off	0	0
1 – Manual / Run	1	0
2 – Auto	0	1

Use the following table to determine *nvoStatus.fault_type*.

Translating Fault Type

[Event] fault_type	nvoStatus.fault_type
0 – Event (None)	Do not update
1 – Warning	1 – Warning
2 – Derate	1 – Warning
3 – Shutdown w/cooldown	2 – Shutdown
4 – Shutdown	2 – Shutdown

TABLE F-4. NETWORK VARIABLE OUTPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE SENT BY	DESCRIPTION
nvoSyncEnableCmd	SNVT_switch (2 bytes)	PC ATS NCM	Output used to instruct a paralleling PCC 3200 genset (Source 2) to synchronize to the bus (Source 1) Once the two sources are in phase, the PowerCommand ATS performs a closed transition back to Source 1 (normal). When the *state* field is true, the transfer switch is requesting the genset to start synchronizing to the bus. When the *state* field is false, the genset should no longer attempt to synchronize to the bus. The *value* field is not used. State = 0 (Disable Synchronizer) or 1 (Enable Synchronizer)
nvoSystemTestCmd	SNVT_switch (2 bytes)	GLC	Output used by the Master Control, PowerCommand ATS, and CCM-T to initiate a system or transfer switch test from the genset. When a user selects the system test command from the genset front panel or tool, the genset announces a system test event. When the *state* field is true, the genset is requesting a system test. When the *state* field is false, the genset is canceling the system test. The *value* field is used to test with or without load. State = 0 (End Test) or 1 (System Test)
nvoTestStatus	SNVT_switch (2 bytes)	PCC 2100 NCM	Output used by the annunciator to provide the Power Transfer Control (PTC) module test status for the genset. When the *state* field is true, the genset's PTC module is testing. When the *state* field is false, the genset is not running a test. The *value* field is not used. State = 0 (No Test) or 1 (Test)
		PC ATS NCM, CCM-T	Output used by the annunciator to provide the test or exercise status of the genset. When the *state* field is true, the ATS is running a test or exercise. When the *state* field is false, no test or exercise is active. The *value* field is not used. State = 0 (No Test) or 1 (Test)
nvoTransPending	SNVT_switch (2 bytes)	PC ATS NCM, CCM-T	Output used to inform other devices on the network that a power source transfer is pending (to either source). This output is equivalent to the 'Elevator Signal'. When the *state* field is true, the transfer switch is preparing for a transfer. When the *state* field is false, the transfer switch has completed the transfer. The *value* field is not used. The *state* field of the network variable will be determined from *fault_status* of the event announcement. State = 0 (No Transfer Pending) or 1 (Transfer Pending)
nvoUtilACData	UNVT_ac_data (31 bytes)	PCC 2100 NCM	Output used by ModLon to provide the instantaneous ac data of the genset for the Master Control. See the table below.

PCC 2100 NCM Variable *nvoUtilACData*

Field	Type	Notes	Default
freq	u16 (SNVT_freq_hz)	AMF Only	0xFFFF
total_pf	s16 (SNVT_pwr_fact)	Not Supported	0x7FFF
total_kva	s16 (1 kVA)	Not Supported	0x7FFF
total_kw	s16 (1 kW)	Not Supported	0x7FFF
total_kvar	s16 (1 kVAR)	Not Supported	0x7FFF
volts_ab	u16 (SNVT_volt_ac)		0xFFFF
volts_bc	u16 (SNVT_volt_ac)		0xFFFF
volts_ca	u16 (SNVT_volt_ac)		0xFFFF
volts_a	u16 (SNVT_volt_ac)	Not Supported	0xFFFF
volts_b	u16 (SNVT_volt_ac)	Not Supported	0xFFFF
volts_c	u16 (SNVT_volt_ac)	Not Supported	0xFFFF
amps_a	u16 (SNVT_amp_ac)	Not Supported	0xFFFF
amps_b	u16 (SNVT_amp_ac)	Not Supported	0xFFFF
amps_c	u16 (SNVT_amp_ac)	Not Supported	0xFFFF
percent_amps_a	u8 (SNVT_lev_cont)	Not Supported	0xFF
percent_amps_b	u8 (SNVT_lev_cont)	Not Supported	0xFF
percent_amps_c	u8 (SNVT_lev_cont)	Not Supported	0xFF

TABLE F-4. NETWORK VARIABLE OUTPUTS (CONTINUED)

VARIABLE	OPERATING TYPE	DEVICE SENT BY	DESCRIPTION
nvoUtilAvailable	SNVT_switch (2 bytes)	PCC 2100 NCM	Output used to report that utility is available for loading (within rated voltage and frequency). When the *state* field is true (1), utility power is available. When the *state* field is false (0), utility power is not available. The *value* field is not used. State = 0 (Utility Not Available) or 1 (Utility Available)
nvoUtilConnected	SNVT_switch (2 bytes)	PCC 2100 NCM	Output used to report that the utility is connected to the load (Utility contact is closed). When the *state* field is true (1), the utility is connected to the load. When the *state* field is false (0), the utility is not connected to the load. The *value* field is not used. State = 0 (Utility Not Connected) or 1 (Utility Connected)

TABLE F-5. PCC FAULTS AND CORRESPONDING GCM OUTPUTS

Fault Description	Event Code	Set Variable(s)
Customer Fault 1	260	*nvoGenParaData.customer_faults.bit0*
Customer Fault 3	262	*nvoGenParaData.customer_faults.bit2*
Customer Fault 4	263	*nvoGenParaData.customer_faults.bit3*
Emergency Stop	102	*nvoAnnunExtended.bit15*
Fail To Close	226	*nvoAnnunExtended.bit11*
Fail To Start (Overcrank)	222	*nvoRemoteAnnun1 {bit11}* *nvoAnnunNFPA110.bit7*
Fail To Sync	224	*nvoAnnunExtended.bit10*
Ground Fault (Customer Fault 2)	261	*nvoGenParaData.customer_faults.bit1* *nvoAnnunExtended.bit1*
High AC Voltage	301	*nvoAnnunExtended.bit2*
High Battery Voltage	231	*nvoAnnunNFPA110.bit4* *nvoRemoteAnnun1 {bit0}*
High Coolant Temp Shutdown	212	*nvoRemoteAnnun1 {bit8}* *nvoAnnunNFPA110.bit10* *nvoAnnun8Point.bit4*
High Coolant Temp Warning	211	*nvoRemoteAnnun1 {bit7}* *nvoAnnunNFPA110.bit9* *nvoAnnun8Point.bit4*
Loss of Field (Reverse kVAR)	337	*nvoAnnunExtended.bit9*
Low AC Voltage	303	*nvoExtended.bit3*
Low Battery Voltage Weak Battery	230 232	*nvoRemoteAnnun1 {bit1}* *nvoAnnunNFPA110.bit5*
Low Coolant Level Shutdown Low Coolant Level Warning	215 214	*nvoRemoteAnnun1 {bit15}* *nvoAnnunNFPA110.bit14* *nvoAnnun8Point.bit6*
Low Coolant Temp	210	*nvoRemoteAnnun1 {bit9}* *nvoAnnunNFPA110.bit8* *nvoAnnun8Point.bit4*
Low Fuel – Day Low Fuel – Main	240 241	*nvoRemoteAnnun1 {bit14}* *nvoAnnunNFPA110.bit15* *nvoAnnun8Point.bit7*
Low Oil Pressure Shutdown	201	*nvoRemoteAnnun1 {bit6}* *nvoAnnunNFPA110.bit12* *nvoAnnun8Point.bit5*
Low Oil Pressure Warning	200	*nvoRemoteAnnun1 {bit5}* *nvoAnnunNFPA110.bit11* *nvoAnnun8Point.bit5*
Overcurrent Shutdown Overcurrent Warning	321 320	*nvoAnnunExtended.bit6*
Overload	330	*nvoAnnunExtended.bit5*
Overspeed	223	*nvoRemoteAnnun1 {bit10}*
Mag Pickup	220	*nvoAnnunNFPA110.bit13*

TABLE F-5. PCC FAULTS AND CORRESPONDING GCM OUTPUTS (CONTINUED)

Fault Description	Event Code	Set Variable(s)
Reverse kW	335	*nvoAnnunExtended.bit8*
Short Circuit	322	*nvoAnnunExtended.bit7*
Under Frequency	313	*nvoAnnunExtended.bit4*

TABLE F-6. GLC REQUIRED CONTROLLER EVENTS

Event Name	Event Code	For
Unlatched Events		
Common Warning or Shutdown Alarm	1483	*[Check Genset]* *nvoFaultStatus.state* *nvoAnnunExtended.bit0* *nvoAnnun8Point.bit0* *nvoAnnun4Point.bit0*
Load Demand Stop	1341	*nvoAnnunExtended.bit12*
Load Dump Command	1464	*nvoLoadDumpCmd.state*
Not In Auto	1463	*nvoNotInAuto.state* *nvoAnnunNFPA110.bit3* *nvoRemoteAnnun1 {bit12}* *nvoAnnun8Point.bit3* *nvoAnnun4Point.bit3*
Ready To Load	1465	*nvoRunStatus.state* *nvoAnnunNFPA110.bit2* *nvoRemoteAnnun1 {bit2}* *nvoAnnun8Point.bit2* *nvoAnnun4Point.bit2*
System Test	TBD	*nvoSystemTestCmd.state*
Latched Events		
Charger AC Failure	<config>	*nvoAnnunNFPA110.bit6* *nvoRemoteAnnun1 {bit13}*
Controller Not Responding	1476	*(Controller Integrity)*
Customer Fault 1	1311	*nvoGenParaData.customer_faults.bit0*
Customer Fault 2	1312	*nvoGenParaData.customer_faults.bit1*
Customer Fault 3	1317	*nvoGenParaData.customer_faults.bit2*
Customer Fault 4	1318	*nvoGenParaData.customer_faults.bit3*
Emergency Stop – Local	1433	*nvoAnnunExtended.bit15*
Emergency Stop – Remote	1434	
Fail To Close (Gen CB)	1452	*nvoAnnunExtended.bit11*
Fail To Start (Overcrank) Fail To Crank	359 1438	*[Fail To Start]* *nvoAnnunNFPA110.bit7* *nvoRemoteAnnun1 {bit 11}*
Fail To Synchronize	1457	*nvoAnnunExtended.bit10*
Genset CB Tripped	1328	*nvoAnnunExtended.bit13*
Ground Fault	1462	*nvoAnnunExtended.bit1*
High AC Voltage	1446	*nvoAnnunExtended.bit2*
High Battery Voltage	442	*nvoAnnunNFPA110.bit4* *nvoRemoteAnnun1 {bit0}*
High Coolant Temperature Shutdown High Intake Manifold Temperature Shutdown High Oil Temperature Shutdown	151 155 214	*[High Engine Temperature]* *nvoAnnunNFPA110.bit10* *nvoRemoteAnnun1 {bit8}* *nvoAnnun8Point.bit4*

TABLE F-6. GLC REQUIRED CONTROLLER EVENTS (CONTINUED)

Event Name	Event Code	For
High Coolant Temperature Warning High Intake Manifold Temperature Warning High Oil Temperature Warning	146 488 421	*[Pre−High Engine Temperature]* *nvoAnnunNFPA110.bit9* *nvoRemoteAnnun1 {bit7}* *nvoAnnun8Point.bit4*
Low AC Voltage	1447	*nvoAnnunExtended.bit3*
Low Battery Voltage Weak Battery Dead Battery	441 1442 1443	*[Low Battery Voltage]* *nvoAnnunNFPA110.bit5* *nvoRemoteAnnun1 {bit1}*
Low Coolant Level Warning Low Coolant Level Shutdown Low Coolant Pressure Warning Low Coolant Pressure Shutdown	197 235 233 228	*[Low Coolant Level]* *nvoAnnunNFPA110.bit14* *nvoRemoteAnnun1 {bit15}* *nvoAnnun8Point.bit6*
Low Coolant Temperature Engine Cold	152 1435	*[Low Coolant Temperature]* *nvoAnnunNFPA110.bit8* *nvoRemoteAnnun1 {bit9}* *nvoAnnun8Point.bit4*
Low Fuel − Day Tank Low Fuel − Main Tank Low Fuel Pressure	1439 1441 482	*nvoAnnunNFPA110.bit15* *nvoRemoteAnnun1 {bit14}* *nvoAnnun8Point.bit7*
Low Oil Pressure Shutdown	415	*[Low Oil Pressure]* *nvoAnnunNFPA110.bit12* *nvoRemoteAnnun1 {bit6}* *nvoAnnun8Point.bit5*
Low Oil Pressure Warning	143	*[Pre−Low Oil Pressure]* *nvoAnnunNFPA110.bit11* *nvoRemoteAnnun1 {bit5}* *nvoAnnun8Point.bit5*
Network Battery Low	Phase 4	*(Network Power Supply)*
Network Error	1468	*(Network Integrity)*
Network Fault 1	1313	*nvoGenParaData.network_faults.bit0*
Network Fault 2	1314	*nvoGenParaData.network_faults.bit1*
Network Fault 3	1315	*nvoGenParaData.network_faults.bit2*
Network Fault 4	1316	*nvoGenParaData.network_faults.bit3*
Network Wink	1337	*(Network Wink)*
Overcurrent Warning Overcurrent Shutdown	1471 1472	*nvoAnnunExtended.bit6*
Overload	1444	*nvoAnnunExtended.bit5*
Overspeed Overfrequency Speed Sensor Failure	234 1449 115	*nvoAnnunNFPA110.bit13* *nvoRemoteAnnun1 {bit10}*
Reverse kVAR	1461	*nvoAnnunExtended.bit9*
Reverse kW	1459	*nvoAnnunExtended.bit8*

TABLE F-6. GLC REQUIRED CONTROLLER EVENTS (CONTINUED)

Event Name	Event Code	For
Short Circuit	1445	*nvoAnnunExtended.bit7*
Underfrequency	1448	*nvoAnnunExtended.bit4*
Utility CB Tripped (See Configuration)	<config>	*nvoAnnunExtended.bit14*

TABLE F-7. PCC 2100 REQUIRED CONTROLLER EVENTS

Event Name	Event Code	For
AMF Test	TBD	*nvoATSStatus.extended.bit6* *nvoTestStatus.state*
Common Warning or Shutdown Alarm	1483	*nvoAnnunExtended.bit0* *nvoAnnun8Point.bit0* *nvoAnnun4Point.bit0* *nvoFaultStatus.state*
Customer Fault 1 Customer Fault 2 Customer Fault 3 Customer Fault 4 Network Fault 1 Network Fault 2 Network Fault 3 Network Fault 4 Network Fault 5 Network Fault 6 Network Fault 7 Network Fault 8	1311 1312 1317 1318 1313 1314 1315 1316 TBD TBD TBD TBD	*nvoAnnunNFPA110.bit6 (Charger AC Failure)* *nvoAnnunNFPA110.bit14 (Low Coolant Level)* *nvoAnnunNFPA110.bit15 (Low Fuel Level)* *nvoAnnunExtended.bit1 (Ground Fault)* *nvoAnnunExtended.bit13 (Gen CB Tripped)* *nvoAnnunExtended.bit14 (Utility CB Tripped)*
Emergency Stop – Local Emergency Stop – remote	1433 1434	*nvoAnnunExtended.bit15*
Fail To Close – Genset Contact Fail To Close – Utility Contact	1452 TBD	*nvoATSStatus.extended.bit11*
Fail To Open – Genset Contact Fail To Open – Utility Contact	1453 TBD	*nvoATSStatus.extended.bit12*
Fail To Start (Overcrank) Fail To Crank	359 1438	*nvoAnnunNFPA110.bit7*
Genset CB Inhibit	TBD	*nvoATSStatus.extended.bit9*
Genset Connected	TBD	*nvoAnnunNFPA110.bit1* *nvoAnnun8Point.bit1* *nvoAnnun4Point.bit1* *nvoGenConnected.state*
Ground Fault	1462	*nvoAnnunExtended.bit1*
High AC Voltage	1446	*nvoAnnunExtended.bit2*
High Battery Voltage	442	*nvoAnnunNFPA110.bit4}*
High Coolant Temperature Shutdown	151	*nvoAnnunNFPA110.bit10* *nvoAnnun8Point.bit4*
High Coolant Temperature Warning High Oil Temperature Warning	146 421	*nvoAnnunNFPA110.bit9* *nvoAnnun8Point.bit4*
Low AC Voltage	1447	*nvoAnnunExtended.bit3*
Low Battery Voltage Weak Battery Dead Battery	441 1442 1443	*nvoAnnunNFPA110.bit5*

TABLE F-7. PCC 2100 REQUIRED CONTROLLER EVENTS (CONTINUED)

Event Name	Event Code	For
Low Coolant Level	197 235	*nvoAnnunNFPA110.bit14* *nvoAnnun8Point.bit6*
Low Coolant Temperature	152	*nvoAnnunNFPA110.bit8* *nvoAnnun8Point.bit4*
Low Oil Pressure Shutdown	415	*nvoAnnunNFPA110.bit12* *nvoAnnun8Point.bit5*
Low Oil Pressure Warning	143	*nvoAnnunNFPA110.bit11* *nvoAnnun8Point.bit5*
Network Error	1468	*(Network Integrity)*
Network Wink	1337	*(Network Wink)*
Not In Auto	1463	*nvoNotInAuto.state* *nvoAnnunNFPA110.bit3* *nvoAnnun8Point.bit3* *nvoAnnun4Point.bit3*
Overcurrent Warning Overcurrent Shutdown	1471 1472	*nvoAnnunExtended.bit6*
Overload	1444	*nvoAnnunExtended.bit5*
Overload Underfrequency	1444 1448	*nvoLoadDumpCmd.state* *(must be config'd)*
Overfrequency Warning	1449	*nvoAnnunNFPA110.bit13*
Ready To Load (Genset Available)	1465	*nvoAnnunNFPA110.bit2* *nvoAnnun8Point.bit2* *nvoAnnun4Point.bit2* *nvoGenAvailable.state* *nvoRunStatus.state*
Reverse kVAR	1461	*nvoAnnunExtended.bit9*
Reverse kW	1459	*nvoAnnunExtended.bit8*
Short Circuit	1445	*nvoAnnunExtended.bit7*
Underfrequency	1448	*nvoAnnunExtended.bit4*
Utility Available	TBD	*nvoATSStatus.extended.bit0* *nvoUtilAvailable.state*
Utility CB Inhibit	TBD	*nvoATSStatus.extended.bit10*
Utility Connected	TBD	*nvoAnnunNFPA110.bit0* *nvoATSStatus.extended.bit2* *nvoUtilConnected.state*

TABLE F-8. CCM-G EVENTS AND CORRESPONDING NETWORK OUTPUTS

Fault Code (Input)	Description	Address	Bit	Hardware	Corresponding Network Variable(s)
1	Custom Status 1	0xD010	0	J4.1	*nvoAnnunCustom.bit0* *nvoCustomStatus[1].state* *nvoNodeStatus.inputs[0] {bit 0}*
2	Custom Status 2		1	J4.2	*nvoAnnunCustom.bit1* *nvoCustomStatus[2].state* *nvoNodeStatus.inputs[0] {bit 1}*
3	Custom Status 3		2	J4.3	*nvoAnnunCustom.bit2* *nvoCustomStatus[3].state* *nvoNodeStatus.inputs[0] {bit 2}*
4	Custom Status 4		3	J4.4	*nvoAnnunCustom.bit3* *nvoCustomStatus[4].state* *nvoNodeStatus.inputs[0] {bit 3}*
5	Custom Status 5		4	J4.5	*nvoAnnunCustom.bit4* *nvoCustomStatus[5].state* *nvoNodeStatus.inputs[0] {bit 4}*
6	Custom Status 6		5	J4.6	*nvoAnnunCustom.bit5* *nvoCustomStatus[6].state* *nvoNodeStatus.inputs[0] {bit 5}*
7	Custom Status 7		6	J4.7	*nvoAnnunCustom.bit6* *nvoCustomStatus[7].state* *nvoNodeStatus.inputs[0] {bit 6}*
8	Custom Status 8		7	J4.8	*nvoAnnunCustom.bit7* *nvoCustomStatus[8].state* *nvoNodeStatus.inputs[0] {bit 7}*

TABLE F-8. CCM-G EVENTS AND CORRESPONDING NETWORK OUTPUTS (CONTINUED)

Fault Code (Input)	Description	Address	Bit	Hardware	Corresponding Network Variable(s)
9	Custom Status 9	0xD020	0	J4.9	*nvoAnnunCustom.bit8* *nvoCustomStatus[9].state* *nvoNodeStatus.inputs[1] {bit 0}*
10	Custom Status 10		1	J4.10	*nvoAnnunCustom.bit9* *nvoCustomStatus[10].state* *nvoNodeStatus.inputs[1] {bit 1}*
11	Custom Status 11		2	J4.11	*nvoAnnunCustom.bit10* *nvoCustomStatus[11].state* *nvoNodeStatus.inputs[1] {bit 2}*
12	Custom Status 12		3	J4.12	*nvoAnnunCustom.bit11* *nvoCustomStatus[12].state* *nvoNodeStatus.inputs[1] {bit 3}*
13	Custom Status 13		4	J4.13	*nvoAnnunCustom.bit12* *nvoCustomStatus[13].state* *nvoNodeStatus.inputs[1] {bit 4}*
14	Custom Status 14		5	J4.14	*nvoAnnunCustom.bit13* *nvoCustomStatus[14].state* *nvoNodeStatus.inputs[1] {bit 5}*
15	Custom Status 15		6	J4.15	*nvoAnnunCustom.bit14* *nvoCustomStatus[15].state* *nvoNodeStatus.inputs[1] {bit 6}*
16	Custom Status 16		7	J4.16	*nvoAnnunCustom.bit15* *nvoCustomStatus[16].state* *nvoNodeStatus.inputs[1] {bit 7}*

TABLE F-8. CCM-G EVENTS AND CORRESPONDING NETWORK OUTPUTS (CONTINUED)

Fault Code (Input)	Description	Address	Bit	Hardware	Corresponding Network Variable(s)
17	Common Alarm	0XD030	0	J5.1	*nvoAnnun8Point.bit0* *nvoAnnun4Point.bit0* *nvoFaultStatus.state* *nvoGenStatus.extended.bit0* *nvoNodeStatus.inputs[2] {bit 0}*
18	Low Fuel Level		1	J5.2	*nvoAnnunNFPA110.bit15* *nvoAnnun8Point.bit7* *nvoNodeStatus.inputs[2] {bit 1}*
19	Low Engine Temp		2	J5.3	*nvoAnnunNFPA110.bit8* *nvoAnnun8Point.bit4* *nvoNodeStatus.inputs[2] {bit 2}*
20	High Battery Voltage		3	J5.4	*nvoAnnunNFPA110.bit4* *nvoNodeStatus.inputs[2] {bit 3}*
21	Low Battery Voltage		4	J5.5	*nvoAnnunNFPA110.bit5* *nvoNodeStatus.inputs[2] {bit 4}*
22	Fail To Start		5	J5.6	*nvoAnnunNFPA110.bit7* *nvoNodeStatus.inputs[2] {bit 5}*
23	Overspeed		6	J5.7	*nvoAnnunNFPA110.bit13* *nvoNodeStatus.inputs[2] {bit 6}*
24	High Engine Temp		7	J5.8	*nvoAnnunNFPA110.bit10* *nvoAnnun8Point.bit4* *nvoNodeStatus.inputs[2] {bit 7}*

TABLE F-8. CCM-G EVENTS AND CORRESPONDING NETWORK OUTPUTS (CONTINUED)

Fault Code (Input)	Description	Address	Bit	Hardware	Corresponding Network Variable(s)
25	Low Oil Pressure	0XD040	0	J5.9	*nvoAnnunNFPA110.bit12* *nvoAnnun8Point.bit5* *nvoNodeStatus.inputs[3] {bit 0}*
26	Pre−High Engine Temp		1	J5.10	*nvoAnnunNFPA110.bit9* *nvoAnnun8Point.bit4* *nvoNodeStatus.inputs[3] {bit 1}*
27	Pre−Low Oil Pressure		2	J5.11	*nvoAnnunNFPA110.bit11* *nvoAnnun8Point.bit5* *nvoNodeStatus.inputs[3] {bit 2}*
28	Genset Running		3	J5.12	*nvoAnnunNFPA110.bit2* *nvoAnnun8Point.bit2* *nvoAnnun4Point.bit2* *nvoGenStatus.state* *nvoNodeStatus.inputs[3] {bit 3}*
29	Switch In Off (Not In Auto)		4	J5.13	*nvoGenStatus.control_switch* *nvoAnnunNFPA110.bit3* *nvoAnnun8Point.bit3* *nvoAnnun4Point.bit3* *nvoNotInAuto.state* *nvoNodeStatus.inputs[3] {bit 4}*
30	Switch In Run (Not In Auto)		5	J5.14	*nvoGenStatus.control_switch* *nvoAnnunNFPA110.bit3* *nvoAnnun8Point.bit3* *nvoAnnun4Point.bit3* *nvoNotInAuto.state* *nvoNodeStatus.inputs[3] {bit 5}*
31	Charger AC Failure		6	J5.15	*nvoAnnunNFPA110.bit6* *nvoNodeStatus.inputs[3] {bit 6}*
32	Low Coolant Level		7	J5.16	*nvoAnnunNFPA110.bit14* *nvoAnnun8Point.bit6* *nvoNodeStatus.inputs[3] {bit 7}*

TABLE F-9. CCM-T EVENTS AND CORRESPONDING NETWORK OUTPUTS

Fault Code (Input)	Description	Address	Bit	Hardware	Corresponding Network Variable(s)
1	Source 1 Available	0XD010	0	J4.1	*nvoSrc1Available.state* *nvoAnnunExtended.bit0* *nvoAnnun8Point.bit0* *nvoAnnun4Point.bit0* *nvoNodeStatus.inputs[0] {bit0}*
2	Source 2 Available		1	J4.2	*nvoSrc2Available.state* *nvoAnnunExtended.bit1* *nvoAnnun8Point.bit1* *nvoAnnun4Point.bit1* *nvoNodeStatus.inputs[0] {bit1}*
3	Source 1 Connected		2	J4.3	*nvoSrc1Connected.state* *nvoAnnunNFPA110.bit0* *nvoAnnunExtended.bit2* *nvoAnnun8Point.bit2* *nvoAnnun4Point.bit2* *nvoNodeStatus.inputs[0] {bit2}*
4	Source 2 Connected		3	J4.4	*nvoSrc2Connected.state* *nvoAnnunNFPA110.bit1* *nvoAnnunExtended.bit3* *nvoAnnun8Point.bit3* *nvoAnnun4Point.bit3* *nvoNodeStatus.inputs[0] {bit3}*
5	Test/Exercise		4	J4.5	*nvoTestStatus.state* *nvoAnnunExtended.bit6* *nvoAnnun8Point.bit6* *nvoNodeStatus.inputs[0] {bit4}*
6	Backup Available?		5	J4.6	*nvoNodeStatus.inputs[0] {bit 5}*
7	Low Battery Voltage		6	J4.7	*nvoAnnunNFPA110.bit5* *nvoNodeStatus.inputs[0] {bit 6}*
8	High Battery Voltage		7	J4.8	*nvoAnnunNFPA110.bit4* *nvoNodeStatus.inputs[0] {bit 7}*

TABLE F-9. CCM-T EVENTS AND CORRESPONDING NETWORK OUTPUTS (CONTINUED)

Fault Code (Input)	Description	Address	Bit	Hardware	Corresponding Network Variable(s)
9	Transfer Pending (Elevator Signal)	0XD020	0	J4.9	*nvoTransPending.state* *nvoNodeStatus.inputs[1] {bit0}*
10	Charger AC Failure		1	J4.10	*nvoAnnunNFPA110.bit6* *nvoNodeStatus.inputs[1] {bit1}*
11	Bypass To Source 1		2	J4.11	*nvoNodeStatus.inputs[1] {bit 2}* *nvoAnnunExtended.bit14*
12	Bypass To Source 2		3	J4.12	*nvoNodeStatus.inputs[1] {bit 3}* *nvoAnnunExtended.bit15*
13	ATS Common Alarm		4	J4.13	*nvoFaultStatus.state* *nvoAnnunExtended.bit4* *nvoAnnun8Point.bit4* *nvoNodeStatus.inputs[1] {bit4}*
14	Not In Auto		5	J4.14	*nvoNotInAuto.state* *nvoAnnunNFPA110.bit3* *nvoAnnunExtended.bit5* *nvoAnnun8Point.bit5* *nvoNodeStatus.inputs[1] {bit5}*
15	Start Genset A (Source 2)		6	J4.15	*nvoStartCmd.state* *nvoNodeStatus.inputs[1] {bit 6}*
16	Start Genset B (Source 1)		7	J4.16	*nvoStartCmdB.state* *nvoNodeStatus.inputs[1] {bit 7}*

TABLE F-9. CCM-T EVENTS AND CORRESPONDING NETWORK OUTPUTS (CONTINUED)

Fault Code (Input)	Description	Address	Bit	Hardware	Corresponding Network Variable(s)
17	Custom Status 1	0xD030	0	J5.1	*nvoAnnunCustom.bit0* *nvoCustomStatus[1].state* *nvoNodeStatus.inputs[2] {bit 0}*
18	Custom Status 2		1	J5.2	*nvoAnnunCustom.bit1* *nvoCustomStatus[2].state* *nvoNodeStatus.inputs[2] {bit 1}*
19	Custom Status 3		2	J5.3	*nvoAnnunCustom.bit2* *nvoCustomStatus[3].state* *nvoNodeStatus.inputs[2] {bit 2}*
20	Custom Status 4		3	J5.4	*nvoAnnunCustom.bit3* *nvoCustomStatus[4].state* *nvoNodeStatus.inputs[2] {bit 3}*
21	Custom Status 5		4	J5.5	*nvoAnnunCustom.bit4* *nvoCustomStatus[5].state* *nvoNodeStatus.inputs[2] {bit 4}*
22	Custom Status 6		5	J5.6	*nvoAnnunCustom.bit5* *nvoCustomStatus[6].state* *nvoNodeStatus.inputs[2] {bit 5}*
23	Custom Status 7		6	J5.7	*nvoAnnunCustom.bit6* *nvoCustomStatus[7].state* *nvoNodeStatus.inputs[2] {bit 6}*
24	Custom Status 8		7	J5.8	*nvoAnnunCustom.bit7* *nvoCustomStatus[8].state* *nvoNodeStatus.inputs[2] {bit 7}*

TABLE F-9. CCM-T EVENTS AND CORRESPONDING NETWORK OUTPUTS (CONTINUED)

Fault Code (Input)	Description	Address	Bit	Hardware	Corresponding Network Variable(s)
25	Custom Status 9	0xD040	0	J5.9	*nvoAnnunCustom.bit8* *nvoCustomStatus[9].state* *nvoNodeStatus.inputs[3] {bit 0}*
26	Custom Status 10		1	J5.10	*nvoAnnunCustom.bit9* *nvoCustomStatus[10].state* *nvoNodeStatus.inputs[3] {bit 1}*
27	Custom Status 11		2	J5.11	*nvoAnnunCustom.bit10* *nvoCustomStatus[11].state* *nvoNodeStatus.inputs[3] {bit 2}*
28	Custom Status 12		3	J5.12	*nvoAnnunCustom.bit11* *nvoCustomStatus[12].state* *nvoNodeStatus.inputs[3] {bit 3}*
29	Custom Status 13		4	J5.13 J5.14	*nvoAnnunCustom.bit12* *nvoCustomStatus[13].state* *nvoNodeStatus.inputs[3] {bit 4}*
30	Custom Status 14		5	J5.15	*nvoAnnunCustom.bit13* *nvoCustomStatus[14].state* *nvoNodeStatus.inputs[3] {bit 5}*
31	Custom Status 15		6	J5.16	*nvoAnnunCustom.bit14* *nvoCustomStatus[15].state* *nvoNodeStatus.inputs[3] {bit 6}*
32	Custom Status 16		7	J5.16	*nvoAnnunCustom.bit15* *nvoCustomStatus[16].state* *nvoNodeStatus.inputs[3] {bit 7}*
1468	Network Error	NA		–	*nvoNodeStatus.relay4* *nvoNodeStatus.inputs[0] {bit 5}*

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Appendix G. Using LonMaker for Windows Browser with TP/XF-78 Devices

BASIC PROCEDURE

The LonMaker for Windows browser can write all the information to the devices that the PowerCommand Configuration Tool (PCT) can do. By using this method, TP/XF-78 devices can be configured without using PCT or creating the network with LonMaker for DOS. If you are using PowerCommand for Windows (PCW) 1.1 to monitor the network, you will still need to use PCT and LonMaker for DOS.

1. Include the Cummins resource files in the LNS resource file catalog.

   This step is not absolutely necessary but it will make the process easier. The resource files allow you to read and write to the variables in a user defined format, such as integers or character strings. Without using the format files, you would be required to write to individual bytes.

   a. Save the following four resource files in your PC.
      Cummins.enu
      Cummins.typ
      Cummins.fpt
      Cummins.fmt
      The recommended location is c:\LonWorks\Types\User\Cummins\.

   b. From the Windows "Start" button, start Echelon's "LNS Resource File Catalog Utility" (see Figure G-1).

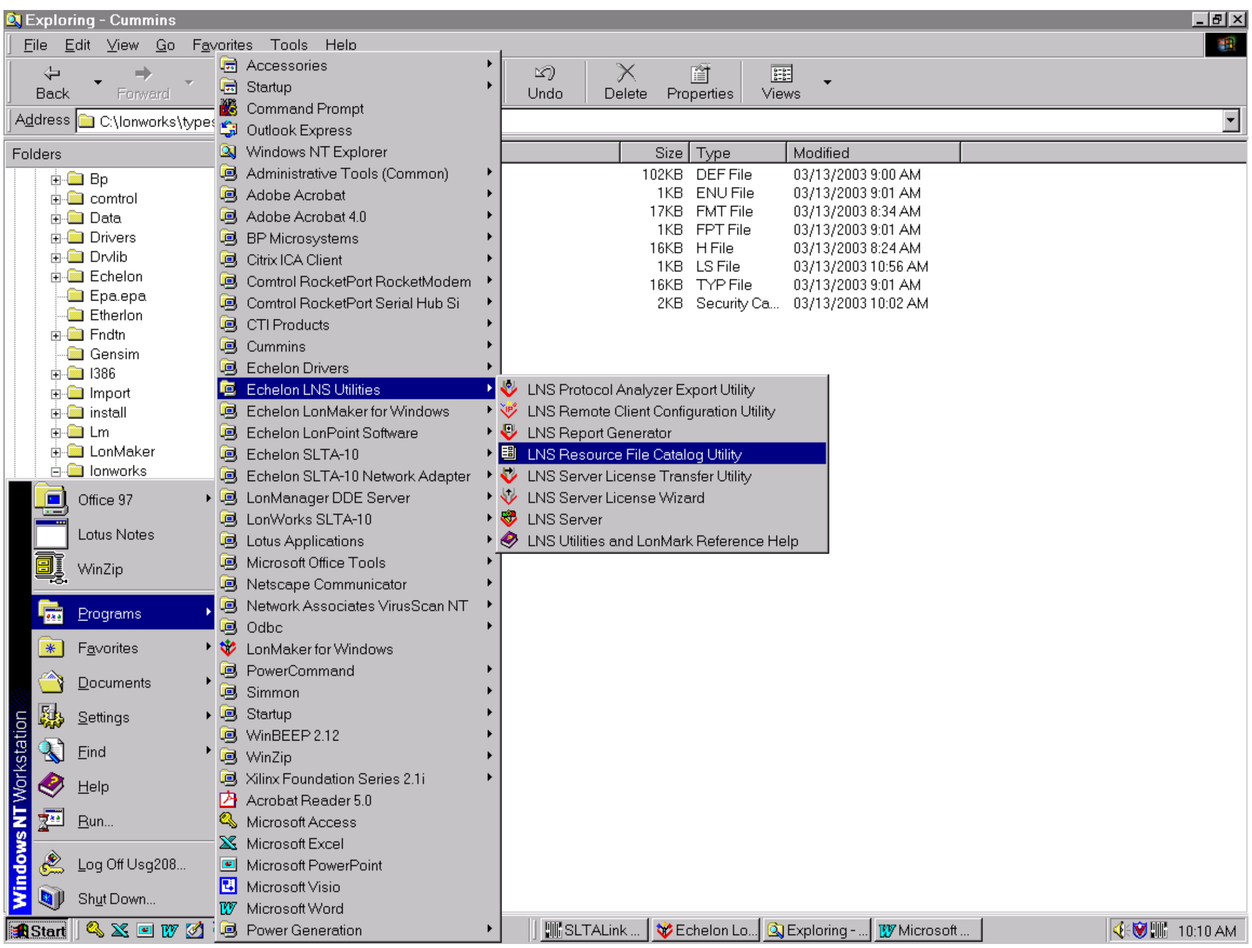


FIGURE G-1. STARTING THE LNS RESOURCE FILE CATALOG UTILITY PROGRAM

c. Navigate to the directory in which the resource files are stored (c:\Lonworks\Types\" in this example.) Select "OK" (see Figure G-2).

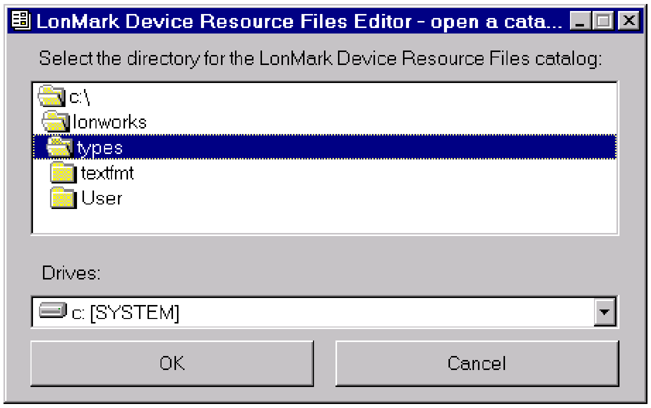


FIGURE G-2. NAVIGATING TO THE RESOURCE FILES DIRECTORY

d. Select "Add A New Directory" (see Figure G-3).

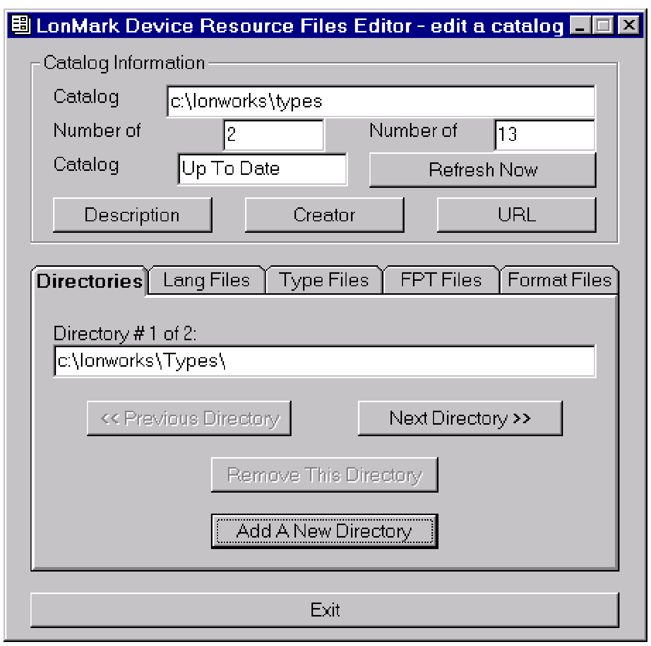


FIGURE G-3. ADDING A DIRECTORY

e. Navigate to the directory in which you've just created the new resource files. Select "OK" (see Figure G-4).

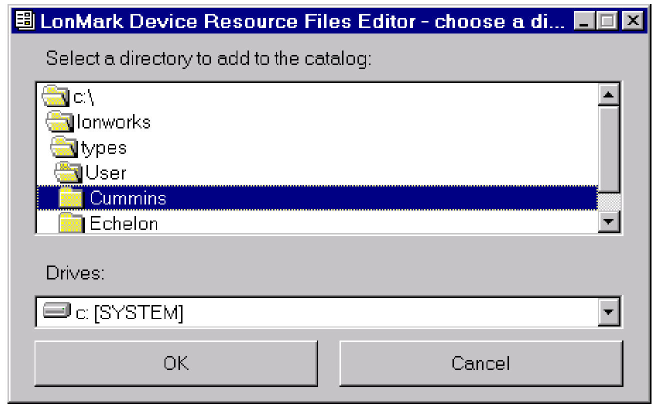


FIGURE G-4. NAVIGATING TO THE NEW DIRECTORY

f. Select "Refresh Now" (see Figure G-5).

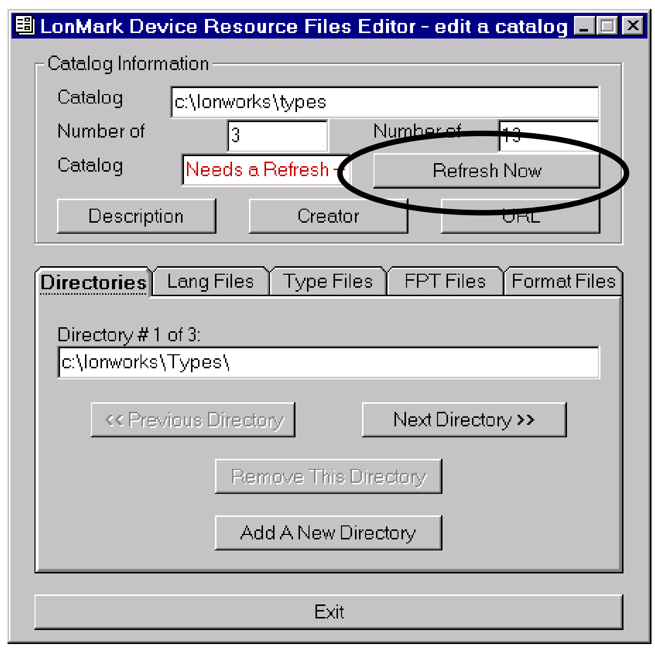


FIGURE G-5. "REFRESH NOW" BUTTON

g. Select the "Format Files" tab and confirm that "Cummins.fmt" is included by selecting the "Next Format File" button until "Cummins.fmt" appears (see Figure G-6). Do the same with "Type Files" and confirm that "Cummins.TYP" appears.

2. Create the network with LonMaker for Windows (see page 4-3).

3. Open the LonMaker Browser by right clicking on the device to be configured.

4. Select variables to be modified, change format (optional) and modify the variables.

   a. To change format, right click on the variable in the browser and select "Change Format" (see Figure G-7).

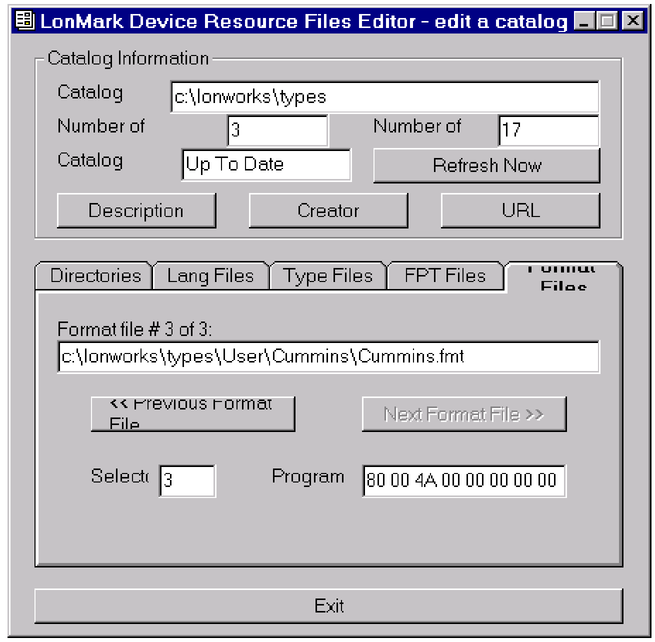


FIGURE G-6. FORMAT FILES TAB

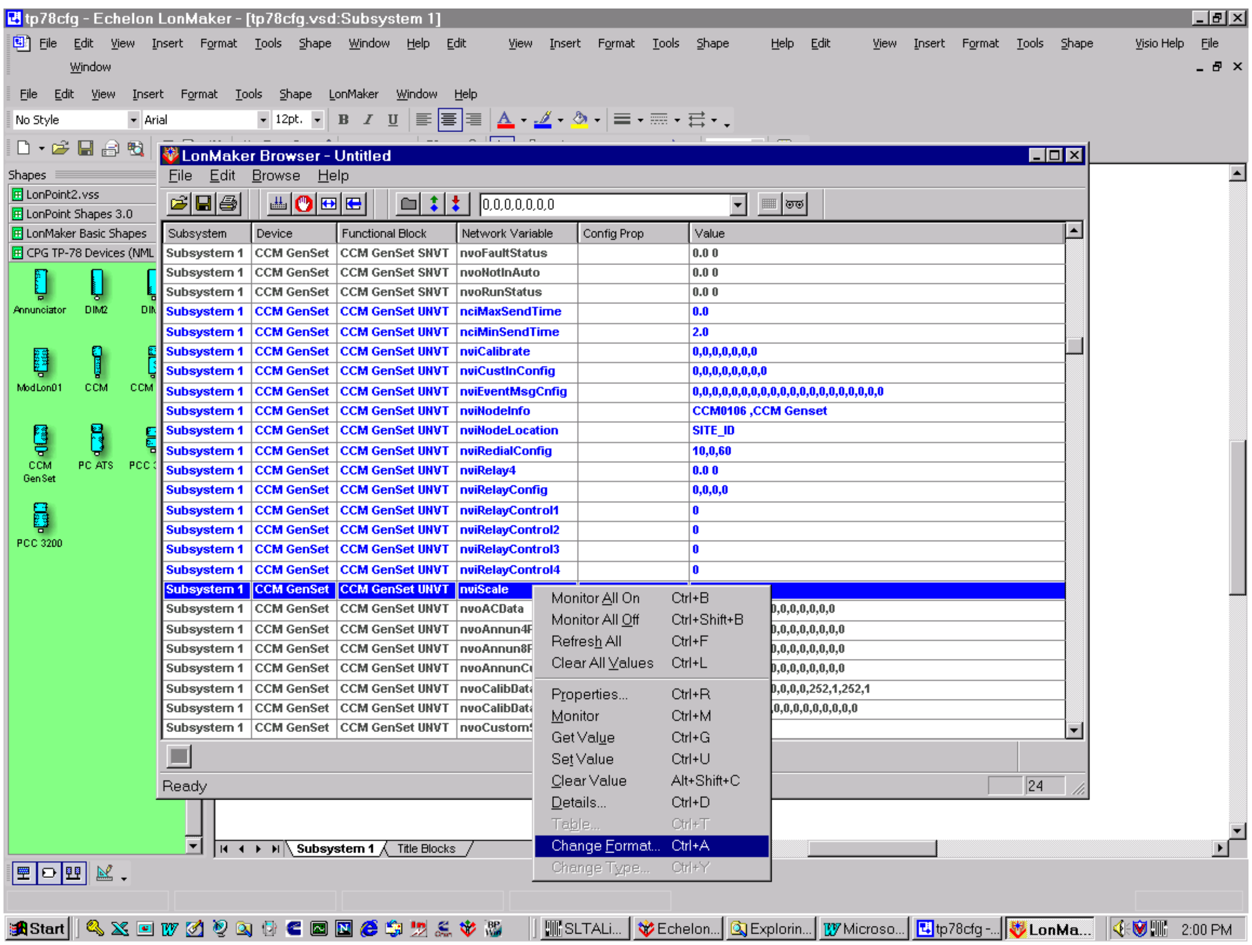


FIGURE G-7. CHANGING FORMAT

b. Select the Cummins.fmt format file and select the desired format and click the “Apply” button (see Figure G-8).

5. Change the variable by selecting it and then writing the new values for each of the fields in the text box at top of the window, and then clicking on the red down arrow icon to the left of the text box (see Figure G-9). All numbers should be rounded to the nearest whole number (no decimals).

   The PCT parameters listed on the following pages can be modified in this manner. Note that not all of the parameters set by PCT are written to the device. Some are written only to a .csv file to be used by PCW 1.

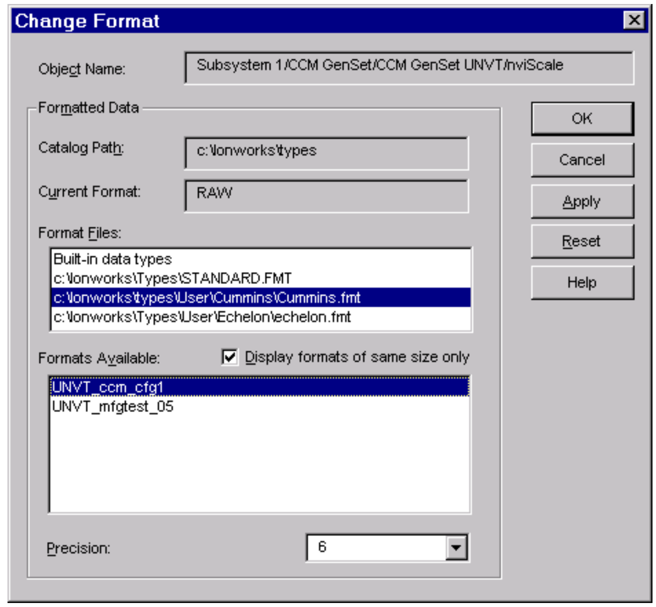


FIGURE G-8. SELECTING THE CUMMINS.FMT FORMAT FILE

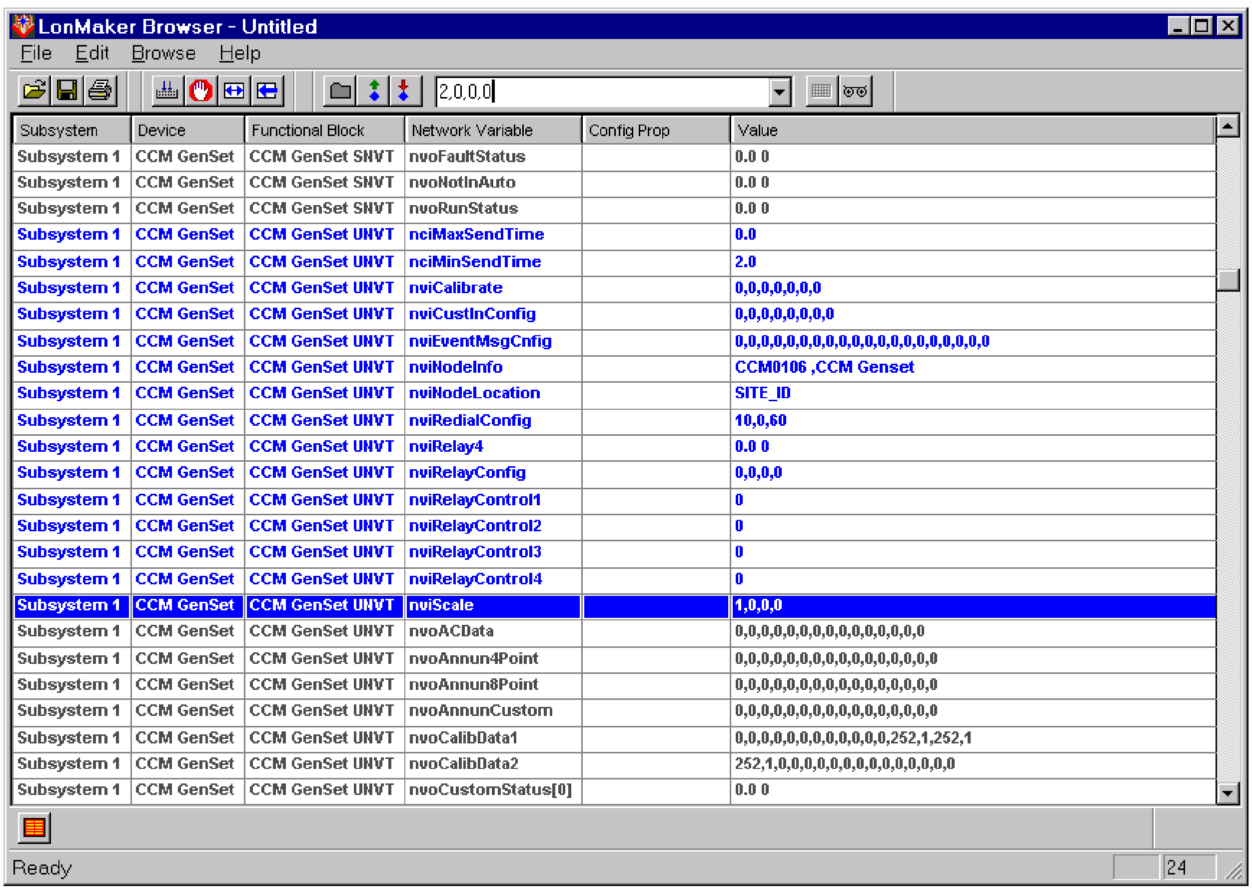


FIGURE G-9. SELECTING A VARIABLE TO BE CHANGED

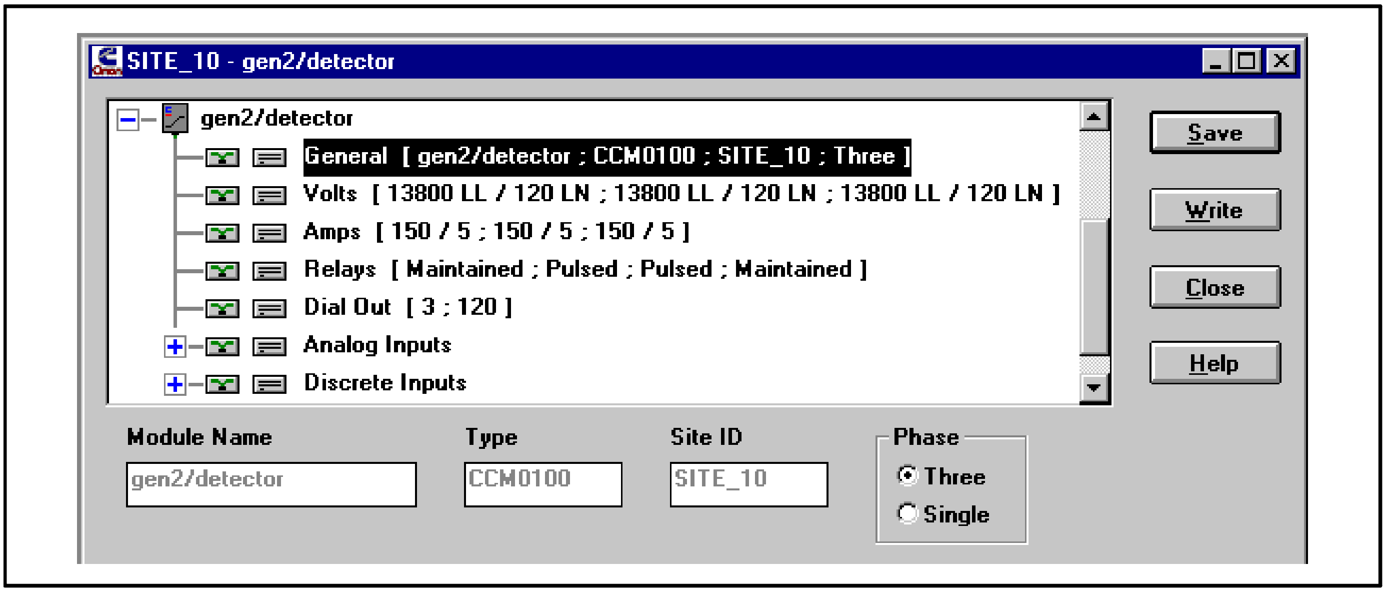


FIGURE G-10. CONFIGURE CCM – GENERAL

CONTROLS COMMUNICATIONS MODULE

CCM – General

This parameter contains general information about the module. *Module Name*, *Type*, and *Site ID* are not configurable. They are needed for properly sending alarms and they need to be written to the module. *Phase* is the only configurable field. Phase information is needed for calculating voltages. Select Three if the CCM is monitoring three-phase voltages or Single if the CCM is monitoring single-phase voltages.

Module Name is read from the site directory. This is the device name defined by the user in LonMaker.

Change the format of nviNodeInfor to UNVT_node_info. Write the following:

nviNodeInfo.name_tag = *name*

name_tag is the second field. If the first field has null characters in it (ascii 0) the second field may not show up in the browser. Change to raw data type, replace the nulls with spaces (ascii 32) and change back to UNVT_node_info. Note the above screen shot shows nviNodeInfo after the format has been changed to UNVT_node_info. If the raw data type is used, the variable will be displayed as shown in Figure G-11.

Note that the 8th field has the number 32. This is the ASCII representation for a space. The browser may have spaces represented by the number 0, which is a null character. If any of the first 8 numbers are 0, change them to 32 before changing the format.

If raw data type is used, then the name tag is stored in bytes 8 thru 23. Type in the ascii representation of each character.

Type is read from the site directory. It is not written to the device.

Site ID is specified by the User when creating the site.

Change the format of nviNodeLocation to UNVT_node_loc. Write the following:

nviNodeLocation.site_id = (site id)

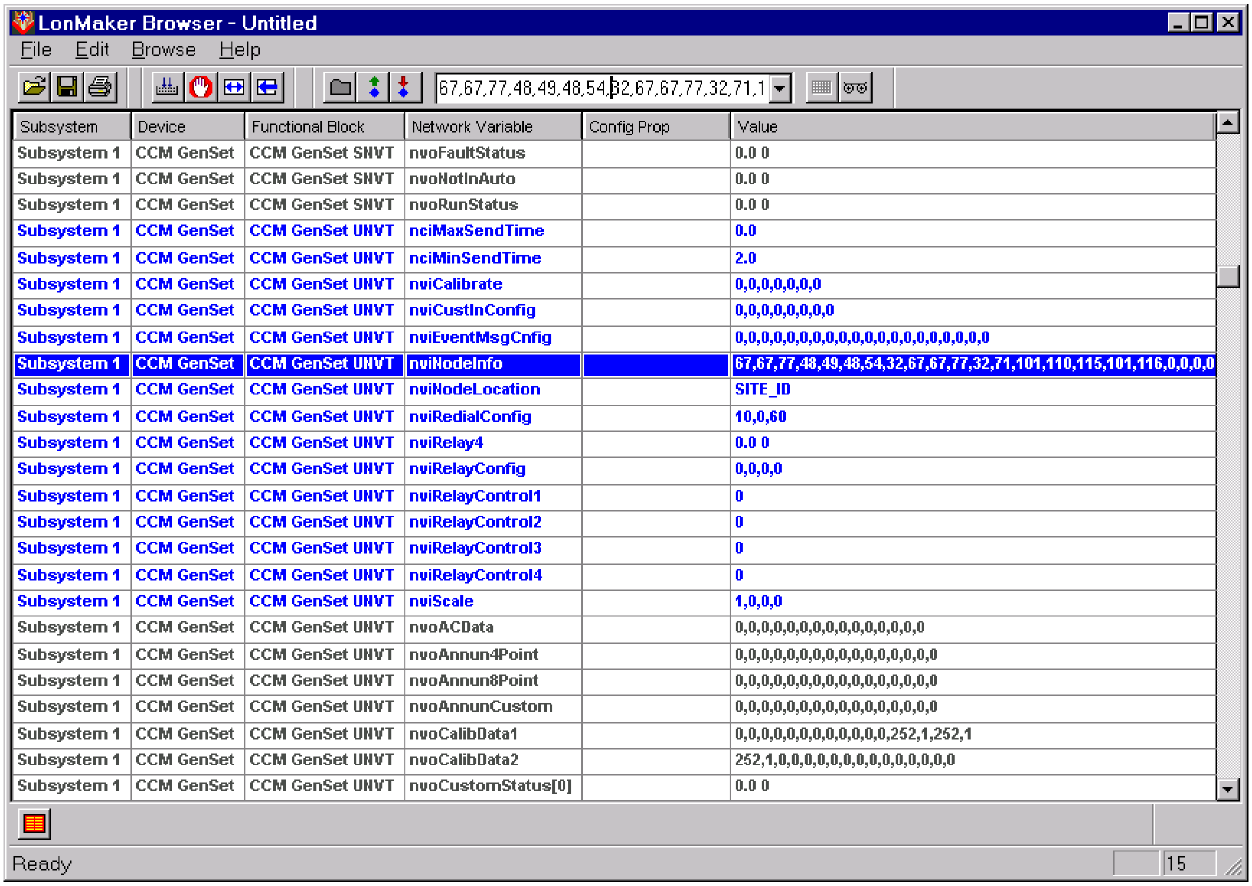
The site id is the first field.

If raw data type is used, then site id is stored in bytes 0 thru 7. Type in the ascii representation of each character.

Phase selects the number of phases for the voltage of the equipment that is being monitored. Click on the radio button to select the desired phase setting. Match the phase setting with configuration of the equipment being monitored by the CCM.

Like any configurable field, the Phase selection can be made before going to a site. The new data can be saved ahead of time, but the computer running PCT must be attached to the site before writing to the network module.

Phase is not written to the device.



Subsystem	Device	Functional Block	Network Variable	Config Prop	Value
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nvoFaultStatus		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nvoNotInAuto		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nvoRunStatus		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nciMaxSendTime		0.0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nciMinSendTime		2.0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviCalibrate		0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviCustInConfig		0,0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviEventMsgCnfig		0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviNodeInfo		67,67,77,48,49,48,54,32,67,67,77,32,71,101,110,115,101,116,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviNodeLocation		SITE_ID
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRedialConfig		10,0,60
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelay4		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelayConfig		0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelayControl1		0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelayControl2		0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelayControl3		0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelayControl4		0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviScale		1,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nvoACData		0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nvoAnnun4Point		0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nvoAnnun8Point		0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nvoAnnunCustom		0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nvoCalibData1		0,0,0,0,0,0,0,0,0,0,0,0,252,1,252,1
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nvoCalibData2		252,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nvoCustomStatus[0]		0.0 0

FIGURE G-11. CHANGING A DEVICE NAME

CCM – Voltage Scaling

This parameter contains information on external Potential Transformers (PTs) which may be used to step down the line voltages. Secondary refers to the voltage applied to the CCM. For each phase, enter the nominal *Primary* and *Secondary* voltages and units (volts L-N or volts L-L) of the PTs. If the CCM is directly monitoring the line voltage (external PTs are not used), enter the nominal line voltage in the *Primary* and *Secondary* fields.

Valid PT ratios (*Primary:Secondary*) are 0 to 138. Valid values for Secondary are 1 to 425 Volts LN (736 Volts LL).

This function accounts for external transformer turns ratios.

Change the format of nviScale to UNVT_ccm_cfg1. Write the following:

nviScale.Channel (byte 0) = 0

nviScale.Multiplier (bytes 1 and 2) = 236.6 x Phase A.Primary LN/Phase A.Secondary LN

nviScale.Divider (bytes 3 and 4) = 512
(byte 3 = 2, byte 4 = 0)

nviScale.Offset (bytes 5 and 6) = 0

Repeat with Channel = 1 for Phase B, and Channel = 2 for Phase C.

Channel is the first field, Multiplier is the second filed, Divider is the third field, and Offset is the fourth field.

Note that to calculate the multiplier, line-to-neutral values must be used. Divide line-to-line values by 1.732 to convert to line-to-neutral.

Example: The CCM is monitoring the load-side of a Transfer Switch (3-phase, 13,800 volts LL). External PTs are used to step-down the line voltage from 13,800 Volts L-L to 120 Volts LN.

General: Select Three.
Volts: *For each phase:* Enter 13800 for *Primary* and select LL. Enter 120 for *Secondary* and select LN.

Primary voltage = 13,800 volts L-L
Secondary voltage = 120 volts L-N

Multiplier = 236.6 x (13,800 / 1.732) / 120 = 15,709 (rounded to the nearest whole number)
Divider = 512
Offset = 0

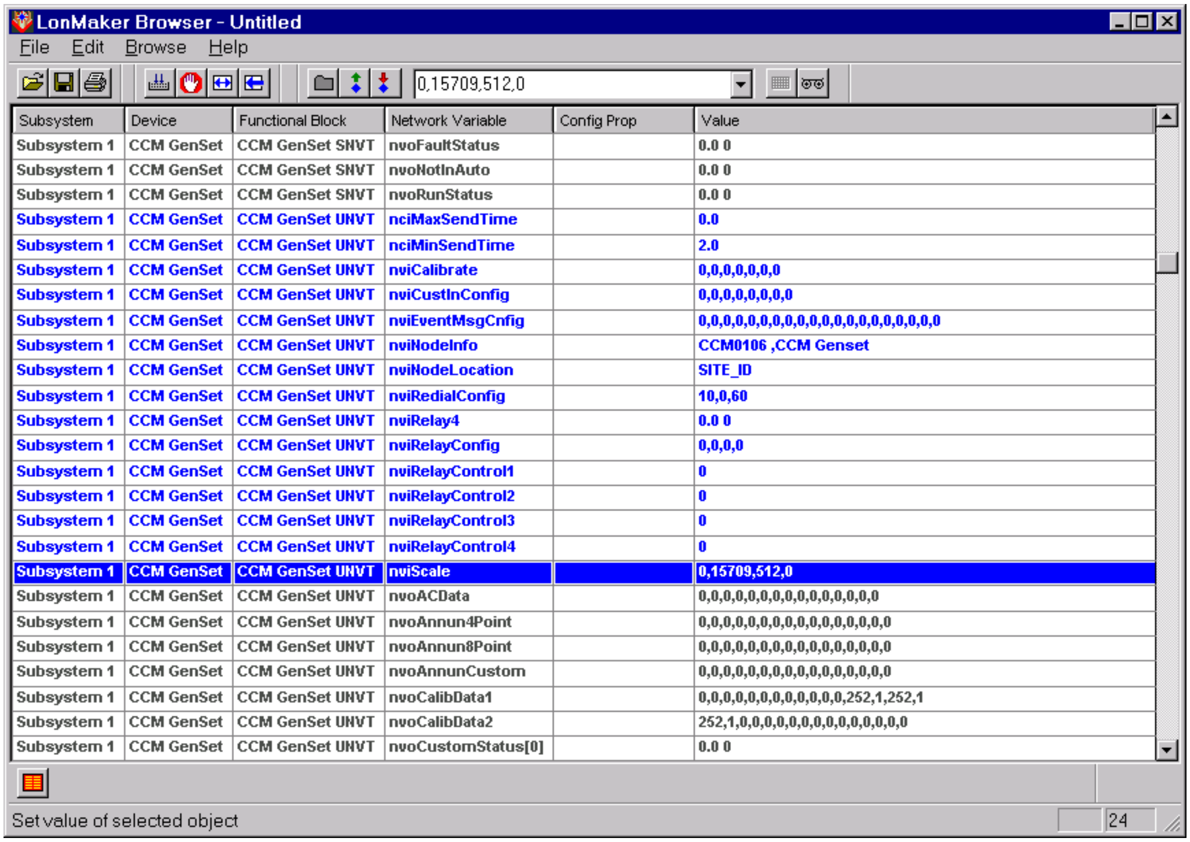
Set Channel = 0 for Phase A.

Enter 0,15709,512,0 for nviScale. See Figure G-12.

Repeat setting Channel = 1 for Phase B and Channel = 2 for Phase C.

If raw data type is used, then byte 0 is the channel, bytes 1 and 2 are the multiplier, 3 and 4 are the divider, and 5 and 6 are the offset. Bytes 1, 3, and 5 are the most significant bytes and bytes 2, 4, and 6 are the least significant bytes. The most significant byte of a two byte number is calculated by dividing the number by 256 and discarding the remainder. The least significant byte is the remainder. For example, if the number is 513, the most significant byte is 2 and the least significant byte is 1 (513/256 = 2 with a remainder of 1).

When viewing the module in PowerCommand for Windows, if the displayed voltages are higher (on average) than the measured line voltages, decrease the *Primary* value(s). Likewise, if the displayed voltages are lower (on average) than the measured voltages, increase the *Primary* value(s).



LonMaker Browser - Untitled

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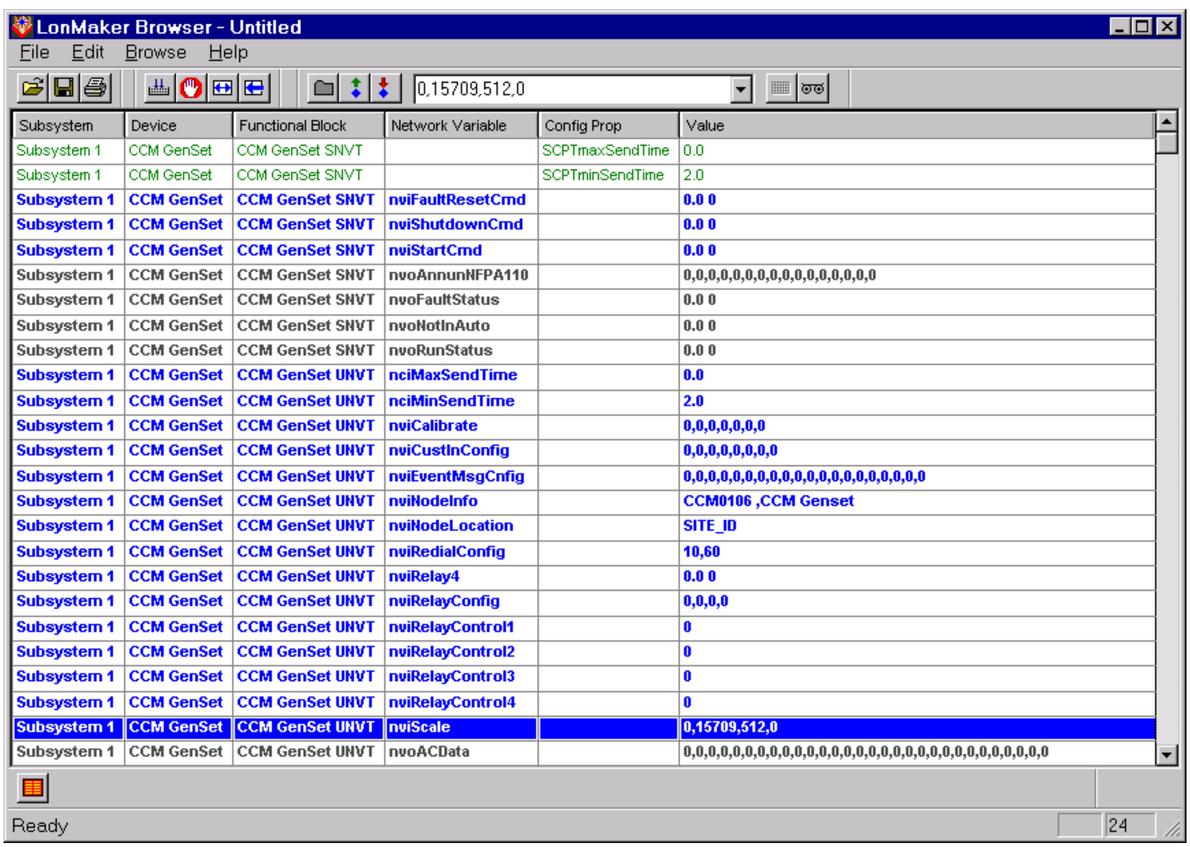
0,15709,512,0

Subsystem	Device	Functional Block	Network Variable	Config Prop	Value
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nvoFaultStatus		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nvoNotInAuto		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nvoRunStatus		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nciMaxSendTime		0.0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nciMinSendTime		2.0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviCalibrate		0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviCustInConfig		0,0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviEventMsgCnfig		0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviNodeInfo		CCM0106 ,CCM Genset
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviNodeLocation		SITE_ID
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRedialConfig		10,0,60
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelay4		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelayConfig		0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelayControl1		0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelayControl2		0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelayControl3		0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelayControl4		0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviScale		0,15709,512,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nvoACData		0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nvoAnnun4Point		0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nvoAnnun8Point		0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nvoAnnunCustom		0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nvoCalibData1		0,0,0,0,0,0,0,0,0,0,0,0,252,1,252,1
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nvoCalibData2		252,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nvoCustomStatus[0]		0.0 0

Set value of selected object 24

FIGURE G-12. VOLTAGE SCALING



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0,15709,512,0

Subsystem	Device	Functional Block	Network Variable	Config Prop	Value
Subsystem 1	CCM GenSet	CCM GenSet SNVT		SCPTmaxSendTime	0.0
Subsystem 1	CCM GenSet	CCM GenSet SNVT		SCPTminSendTime	2.0
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nviFaultResetCmd		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nviShutdownCmd		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nviStartCmd		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nvoAnnunNFPA110		0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nvoFaultStatus		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nvoNotInAuto		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nvoRunStatus		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nciMaxSendTime		0.0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nciMinSendTime		2.0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviCalibrate		0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviCustInConfig		0,0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviEventMsgCnfig		0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviNodeInfo		CCM0106 ,CCM Genset
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviNodeLocation		SITE_ID
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRedialConfig		10,60
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelay4		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelayConfig		0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelayControl1		0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelayControl2		0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelayControl3		0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelayControl4		0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviScale		0,15709,512,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nvoACData		0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0

Ready 24

FIGURE G-13.

CCM – Current Scaling

This parameter contains information on external Current Transformers (CTs) which must be used to step-down the line currents. *Secondary* refers to the current winding connected to the CCM. For each phase, enter the nominal *Primary:Secondary* CT ratio.

Valid CT ratios (*Primary:Secondary*) are 0 to 10,720. Valid values for Secondary are 1 to 5 (Amps).

This function accounts for current transformer turns ratios.

Change the format of nviScale to UNVT_ccm_cfg1. Write the following:

nviScale.Channel (byte 0)= 3

nviScale.Multiplier (bytes 1 and 2) = 6.104 x Phase A.Primary/Phase A Secondary

nviScale.Divider (bytes 3 and 4) = 1023 (byte 3 = 3, byte 4 = 255)

nviScale.Offset (bytes 5 and 6) = 0

Repeat with Channel = 4 for Phase B, and Channel = 5 for Phase C,

Channel is the first field, Multiplier is the second filed, Divider is the third field, and Offset is the fourth field.

If raw data type is used, then byte 0 is the channel, bytes 1 and 2 are the multiplier, 3 and 4 are the divider, and 5 and 6 are the offset. Bytes 1, 3, and 5 are the most significant bytes and bytes 2, 4, and 6 are the least significant bytes. The most significant byte of a two byte number is calculated by dividing the number by 256 and discarding the remainder. The least significant byte is the remainder. For example, if the number is 1023, the most significant byte is 3 and the least significant byte is 255 (1023/256 = 3 with a remainder of 255).

When viewing the module in PowerCommand for Windows, if the displayed currents are higher (on average) than the measured line currents, decrease the Primary value(s). Likewise, if the displayed currents are lower (on average) than the measured currents, increase the Primary value(s).

CCM – Relays

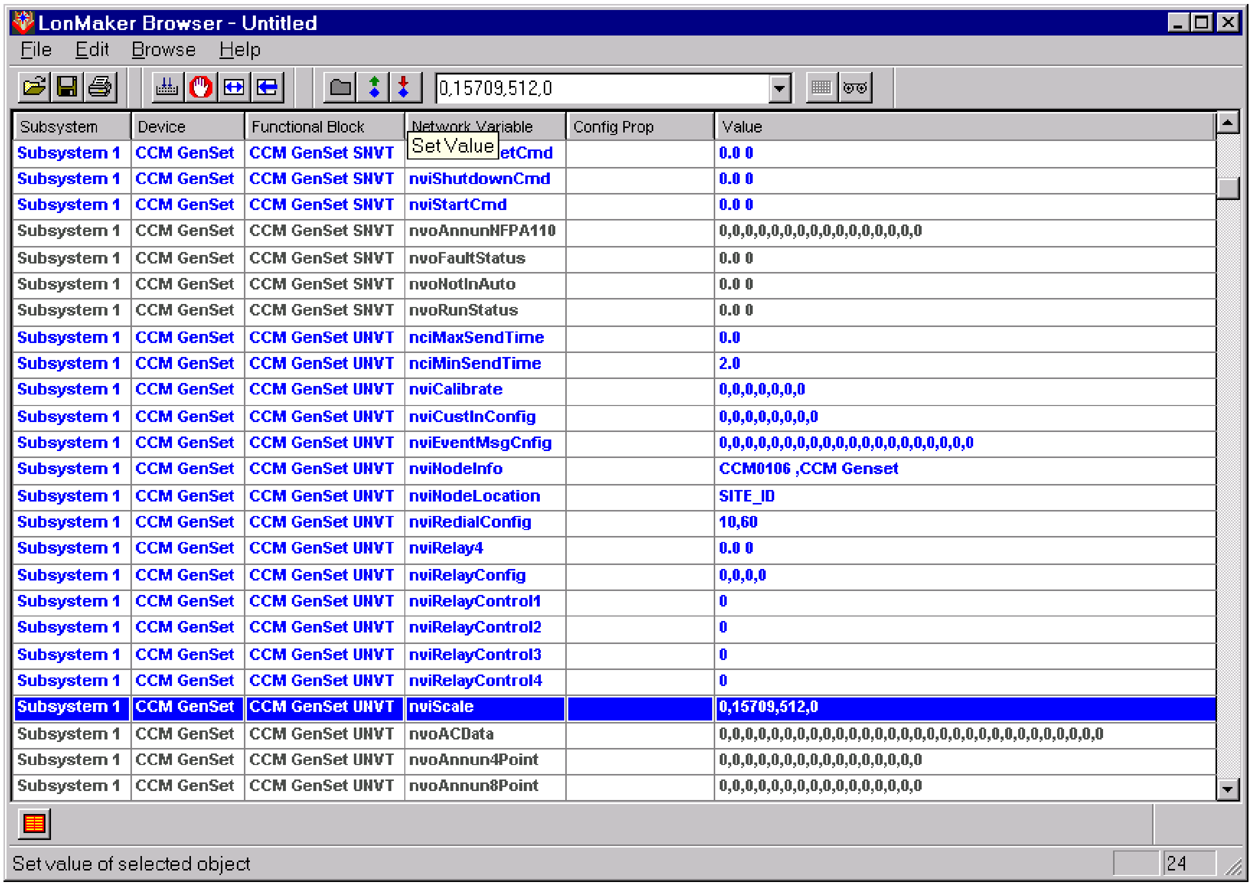
This parameter configures the four CCM on-board relays (K1–K4). Each relay may be configured as *Maintained* or *Pulsed*. To configure the relays, click on the radio button below each relay to select the desired setting.

If configured as *Maintained*, when activated the relay is energized indefinitely. The relay remains energized until de-activated.

If configured as *Pulsed*, when activated the relay is energized for approximately 1 second, then it is de-energized. This is useful for signaling an alarm which has its own timing circuit (like a pulsed alarm input on a paralleling system). Or for resetting equipment that requires a pulsed contact closure.

This configures CCM relays to be pulsed or maintained ("Generic" CCM only).

Change the format of nviScale to UNVT_ccm_cfg3. Each of the four fields corresponds to one relay. For each relay, write 1 for maintained or 2 for pulsed.



Subsystem	Device	Functional Block	Network Variable	Config Prop	Value
Subsystem 1	CCM GenSet	CCM GenSet SNVT	etCmd		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nviShutdownCmd		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nviStartCmd		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nvoAnnunNFPA110		0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nvoFaultStatus		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nvoNotInAuto		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nvoRunStatus		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nciMaxSendTime		0.0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nciMinSendTime		2.0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviCalibrate		0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviCustInConfig		0,0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviEventMsgCnfig		0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviNodeInfo		CCM0106 ,CCM Genset
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviNodeLocation		SITE_ID
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRedialConfig		10,60
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelay4		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelayConfig		0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelayControl1		0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelayControl2		0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelayControl3		0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelayControl4		0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviScale		0,15709,512,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nvoACData		0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nvoAnnun4Point		0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nvoAnnun8Point		0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0

FIGURE G-14.

CCM – Dial Out

This parameter configures the re-dial operation when sending an alarm. *Dial Attempts* controls the number of times the module will attempt to deliver an alarm. *Dial Attempts* must be between 1 and 255. The CCM will automatically retry sending an alarm if the first attempt fails (busy, no dial tone, etc.)

Redial Delay (in seconds) controls the delay between *Dial Attempts*. *Redial Delay* must be between 10 and 65,535 (seconds).

This configures redial operation.

Change the format of nviScale to UNVT_node_redial. Write the following:

nviRedialConfig.attempts (byte 0)
nviRedialConfig.delay (bytes 1 and 2)

Attempts is the first field and Delay is the second field.

If raw data type is used, then byte 0 is the attempts and bytes 1 and 2 are the delay. Byte 1 is the most significant byte and byte 2 is the least significant byte. The most significant byte of a two byte number is calculated by dividing the number by 256 and discarding the remainder. The least significant byte is the remainder. For example, if the number is 1023, the most significant byte is 3 and the least significant byte is 255 (1023/256 = 3 with a remainder of 255).

CCM – Analog Inputs

Analog inputs provide for scaling of analog channels.

All 7 analog input configurations are grouped together in their own parameter set. To view or edit any one of the 7 configurations, click on the plus symbol (+) or double click on the parameter set name (*Analog Inputs*). When expanded, all 7 analog input configurations are listed with their current settings. To contract the set, click on the minus symbol (–) or double click on *Analog Inputs*. (Refer to Appendix B, “Determining Sender Settings” section, for reference.)

CCM – Temperature 1, Temperature 2, Temperature 3

These parameters configure the I/O characteristic of analog inputs *Temperature 1*, Temperature 2 and *Temperature 3*. These inputs can be used to monitor various temperature senders. Select the desired input to configure and edit the *Sender Voltage*, *Meter Reading* and *Sender Gain* fields to yield meaningful temperature values.

Sender Voltage is the DC voltage of the sender at a known operating point. Valid values are 0 to +9 (VDC).

Meter Reading is the gauge value of the sender at the same known operating point. Valid values vary with *Sender Gain* (Units may vary).

Sender Gain is the relational slope of Meter Reading to Sender Voltage. Valid values are −838 to +838 (Units/VDC).

Refer to Table G-1 for sample temperature sender settings.

These values are only nominal. Verify these values yield acceptable readings. If not, refer to Appendix C for determining the specific sender characteristics.

Change the format of nviScale to UNVT_ccm_cfg1. Write the following:

nviScale.Channel (byte 0) = 9

nviScale.Multiplier (bytes 1 and 2) = 10.01 x Sender Gain

nviScale.Divider (bytes 3 and 4) = 1023 (byte 3 = 3, byte 4 = 255)

nviScale.Offset (bytes 5 and 6) = (Meter Reading / Sender Gain – Sender Voltage) x 1023/10.01

Repeat with Channel = 10 for Temperature 2 and 11 for Temperature 3.

Channel is the first field, Multiplier is the second filed, Divider is the third field, and Offset is the fourth field.

If raw data type is used, then byte 0 is the channel, bytes 1 and 2 are the multiplier, 3 and 4 are the divider and 5 and 6 are the offset. Bytes 1, 3, and 5 are the most significant bytes and bytes 2, 4, and 6 are the least significant bytes. The most significant byte of a two byte number is calculated by dividing the number by 256 and discarding the remainder. The least significant byte is the remainder. For example, if the number is 1023, the most significant byte is 3 and the least significant byte is 255 (1023/256 = 3 with a remainder of 255).

TABLE G-1. TEMPERATURE SENDER GAIN SETTINGS

	SENDER	SENDER VOLTAGE	METER READING	SENDER GAIN
TEMP (OIL/COOL)	Detector/DK (Imperial)	3 (VDC)	200 (°F)	−34.5 (°F/VDC)
	Detector/DK (Metric)	3 (VDC)	93.3 (°C)	−19.2 (°C/VDC)
	500−2200 Ω RTD (Imperial)	3 (VDC)	176 (°F)	97.1 (°F/VDC)
	500−2200 Ω RTD (Metric)	3 (VDC)	80 (°C)	53.9 (°C/VDC)
TEMP (EXHAUST)	80−390 Ω RTD (Imperial)	2 (VDC)	752 (°F)	700 (°F/VDC)
	80−390 Ω RTD (Metric)	2 (VDC)	400 (°C)	388.8 (°C/VDC)

CCM – Oil Pressure

This parameter configures the I/O characteristic of analog input *Oil Pressure*. This input can be used to monitor various oil pressure senders. Select *Oil Pressure* and edit the *Sender Voltage*, *Meter Reading* and *Sender Gain* fields to configure the input to yield meaningful pressure values.

Sender Voltage is the DC voltage of the sender at a known operating point. Valid values are 0 to +9 (VDC).

Meter Reading is the gauge value of the sender at the same known operating point. Valid values vary with Sender Gain (Units may vary).

Sender Gain is the relational slope of Meter Reading to Sender Voltage. Valid values are −838 to +838 (Units/VDC).

Refer to Table G-2 for sample oil pressure sender settings.

These values are only nominal. Verify these values yield acceptable readings. If not, refer to Appendix C for determining the specific sender characteristics.

Change the format of nviScale to UNVT_ccm_cfg1. Write the following:

nviScale.Channel (byte 0) = 9

nviScale.Multiplier (bytes 1 and 2) = 10.01 x Sender Gain

nviScale.Divider (bytes 3 and 4) = 1023 (byte 3 = 3, byte 4 = 255)

nviScale.Offset (bytes 5 and 6) = (Meter Reading / Sender Gain – Sender Voltage) x 1023/10.01

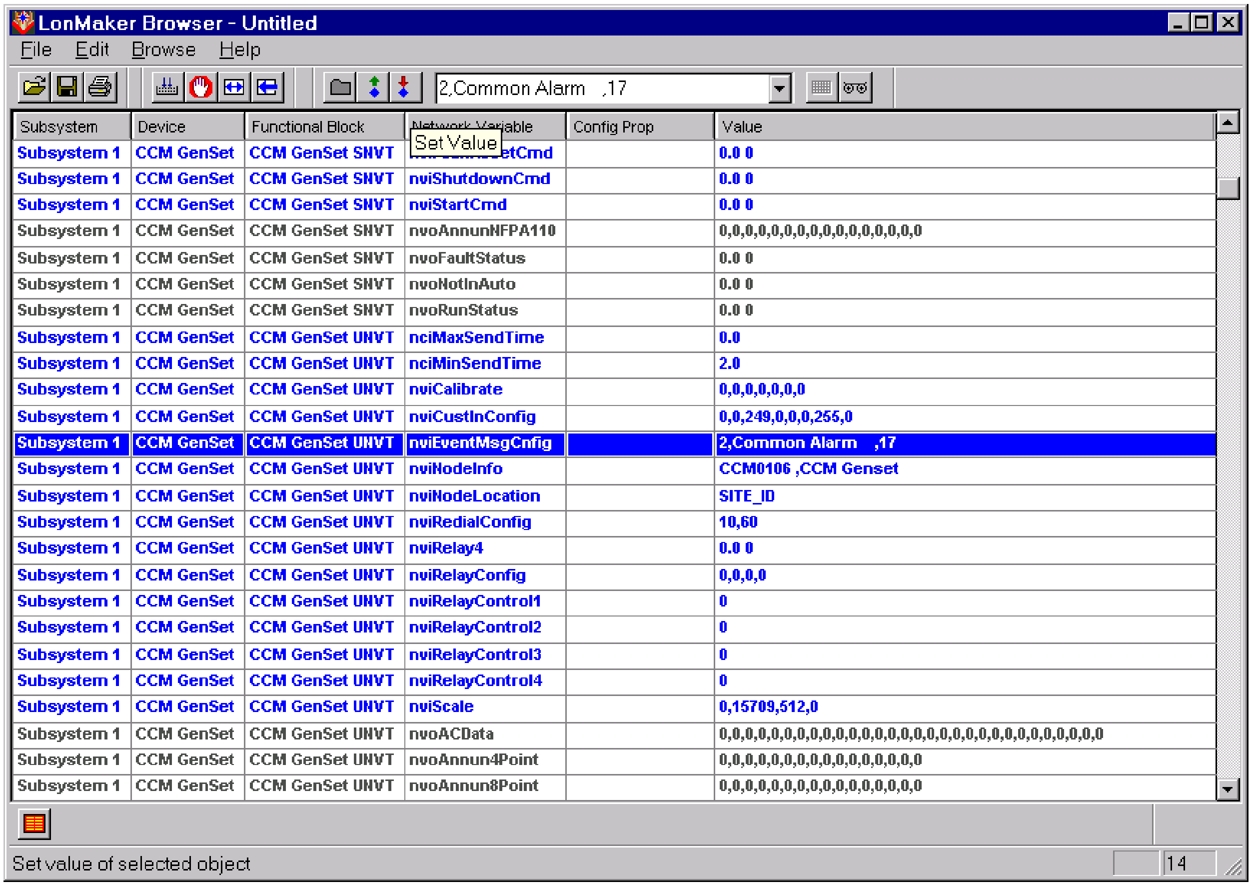
Repeat with Channel = 12 for Oil Pressure.

Channel is the first field, Multiplier is the second filed, Divider is the third field, and Offset is the fourth field.

If raw data type is used then byte 0 is the channel, bytes 1 and 2 are the multiplier, 3 and 4 are the divider and 5 and 6 are the offset. Bytes 1, 3, and 5 are the most significant bytes and bytes 2, 4, and 6 are the least significant bytes. The most significant byte of a two byte number is calculated by dividing the number by 256 and discarding the remainder. The least significant byte is the remainder. For example, if the number is 1023, the most significant byte is 3 and the least significant byte is 255 (1023/256 = 3 with a remainder of 255).

TABLE G-2. PRESSURE SENDER GAIN SETTINGS

	SENDER	SENDER VOLTAGE	METER READING	SENDER GAIN
PRESSURE	Detector/DK (Imperial)	3.75 (VDC)	50 (PSI)	−36 (PSI/VDC)
	Detector/DK (Metric)	3.75 (VDC)	344.8 (kPa)	−248.2 (kPa/VDC)
	Kavlico (Imperial)	2.5 (VDC)	50 (PSI)	25 (PSI/VDC)
	Kavlico (Metric)	2.5 (VDC)	344.8 (kPa)	172.4 (kPa/VDC)



LonMaker Browser - Untitled
File Edit Browse Help
2,Common Alarm ,17
Set Value

Subsystem	Device	Functional Block	Network Variable	Config Prop	Value
Subsystem 1	CCM GenSet	CCM GenSet SNVT	etCmd		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nviShutdownCmd		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nviStartCmd		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nvoAnnunNFPA110		0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nvoFaultStatus		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nvoNotInAuto		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nvoRunStatus		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nciMaxSendTime		0.0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nciMinSendTime		2.0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviCalibrate		0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviCustInConfig		0,0,249,0,0,0,255,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviEventMsgCnfig		2,Common Alarm ,17
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviNodeInfo		CCM0106 ,CCM Genset
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviNodeLocation		SITE_ID
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRedialConfig		10,60
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelay4		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelayConfig		0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelayControl1		0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelayControl2		0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelayControl3		0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelayControl4		0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviScale		0,15709,512,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nvoACData		0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nvoAnnun4Point		0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nvoAnnun8Point		0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0

Set value of selected object
14

FIGURE G-15.

CCM – Spare 1, Spare 2

These parameters configure the I/O characteristic of analog inputs Spare 1 and Spare 2. These can be used to monitor customer-defined 0–5 VDC analog voltages. Select the desired input to be configured and edit the *Sender Voltage*, *Meter Reading* and *Sender Gain* fields to yield meaningful values.

Sender Voltage is the DC voltage of the sender at a known operating point. Valid values are 0 to +5 (VDC).

Meter Reading is the gauge value of the sender at the same known operating point. Valid values vary with Sender Gain (Units may vary).

Sender Gain is the relational slope of *Meter Reading* to *Sender Voltage*. Valid values are –503 to +503 (Units/VDC) .

Change the format of nviScale to UNVT_ccm_cfg1. Write the following:

nviScale.Channel (byte 0) = 13

nviScale.Multiplier (bytes 1 and 2) = 65.04 x Sender Gain

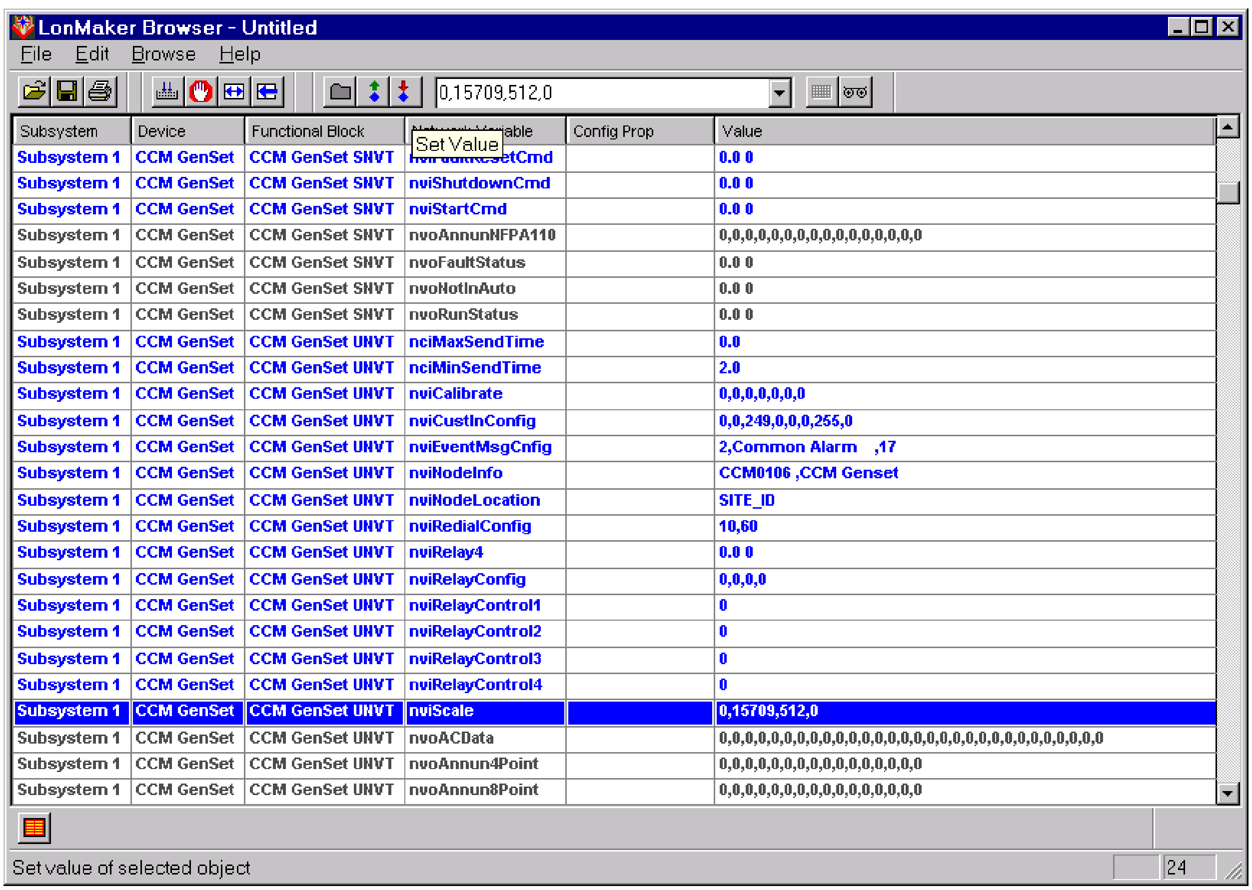
nviScale.Divider (bytes 3 and 4) = 1023 (byte 3 = 3, byte 4 = 255)

nviScale.Offset (bytes 5 and 6) = (Meter Reading / Sender Gain – Sender Voltage) x 1023/6.504

Repeat with Channel = 14 for spare 2

Channel is the first field, Multiplier is the second filed, Divider is the third field, and Offset is the fourth field.

If raw data type is used, then byte 0 is the channel, bytes 1 and 2 are the multiplier, 3 and 4 are the divider, and 5 and 6 are the offset. Bytes 1, 3, and 5 are the most significant bytes and bytes 2, 4, and 6 are the least significant bytes. The most significant byte of a two byte number is calculated by dividing the number by 256 and discarding the remainder. The least significant byte is the remainder. For example, if the number is 1023, the most significant byte is 3 and the least significant byte is 255 (1023/256 = 3 with a remainder of 255).



Subsystem	Device	Functional Block	Network Variable	Config Prop	Value
Subsystem 1	CCM GenSet	CCM GenSet SNVT	[illegible]etCmd		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nviShutdownCmd		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nviStartCmd		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nvoAnnunNFPA110		0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nvoFaultStatus		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nvoNotInAuto		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet SNVT	nvoRunStatus		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nciMaxSendTime		0.0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nciMinSendTime		2.0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviCalibrate		0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviCustInConfig		0,0,249,0,0,0,255,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviEventMsgCnfig		2,Common Alarm ,17
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviNodeInfo		CCM0106 ,CCM Genset
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviNodeLocation		SITE_ID
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRedialConfig		10,60
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelay4		0.0 0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelayConfig		0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelayControl1		0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelayControl2		0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelayControl3		0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviRelayControl4		0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nviScale		0,15709,512,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nvoACData		0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nvoAnnun4Point		0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
Subsystem 1	CCM GenSet	CCM GenSet UNVT	nvoAnnun8Point		0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0

FIGURE G-16.

CCM – Spare 3

This parameter configures the I/O characteristic of analog input Spare 3. Because it allows 0 to 36 VDC, Spare 3 is typ[ically used to monitor battery voltage, but it may monitor any 0 to 36 VDC signal. Select *Spare 3* and edit the *Sender Voltage*, *Meter Reading*, and *Sender Gain* fields to yield meaningful values.

Sender Voltage is the DC voltage of the sender at a known operating point. Valid values for Spare 3 are 0 to +36 (VDC).

Meter Reading is the gauge value of the sender at the same known operating point. Valid values vary with Sender Gain (Units may vary).

Sender Gain is the relational slope of *Meter Reading* to *Sender Voltage*. Valid values are –85 to +85 (Units/VDC) .

> ***Example:*** The CCM is monitoring a 24V Detector/DK Genset. The customer would like to view all data in English (Imperial) units.
>
> ***Spare 3:*** Enter 24.0 for *Sender Voltage*, 24.0 for *Meter Reading* and 1.00 for *Sender Gain*.

Change the format of nviScale to UNVT_ccm_cfg1. Write the following:

nviScale.Channel (byte 0)= 15

nviScale.Multiplier (bytes 1 and 2) = 384.2 *Sender Gain

nviScale.Divider (bytes 3 and 4) = 1023 (byte 3 = 3, byte 4 = 255)

nviScale.Offset (bytes 5 and 6) = (Meter Reading / Sender Gain – Sender Voltage) * 1023/38.42

Channel is the first field, Multiplier is the second filed, Divider is the third field, and Offset is the fourth field.

If raw data type is used, then byte 0 is the channel, bytes 1 and 2 are the multiplier, 3 and 4 are the divider, and 5 and 6 are the offset. Bytes 1, 3, and 5 are the most significant bytes and bytes 2, 4, and 6 are the least significant bytes. The most significant byte of a two byte number is calculated by dividing the number by 256 and discarding the remainder. The least significant byte is the remainder. For example, if the number is 1023, the most significant byte is 3 and the least significant byte is 255 (1023/256 = 3 with a remainder of 255).

CCM – Discrete Inputs

All 32 discrete input configurations are grouped together in their own parameter set. To view or edit any one of the 32 configurations, click on the plus symbol (+) or double click on the parameter set name *Discrete Inputs*. When expanded, all 32 analog input configurations are listed with their current settings. To contract the set, click on the minus symbol (–) or double click on *Discrete Inputs*.

These parameters configure the 32 discrete customer inputs. The inputs are used to monitor equipment status and send alarms to a remote or local PC if the status becomes active. If the input is also used to send an alarm (*Notify*), the *Event Type* and *Event Text* must be configured. The *Active State* of each input must be configured.

Event Type: This field configures the level of an alarm/event. *Event Type* only applies when *Notify* is "Yes".

Event: This will force the event message to be immediately logged at the host. This is useful for logging system events that do not require acknowledgment by a user. An Event will not send a popup alarm.

Warning: This may force a pop-up message at the remote PC (if remote PC is configured as such). The alarm requires acknowledgment by a user before it is logged.

Shutdown: This may force a pop-up message at the remote PC (if remote PC is configured as such). The alarm requires acknowledgment by a user before it is logged.

Active State: This field configures the state of the input which is considered "active". Some input signals are active when they go to ground while others are active when they go to B+. The Active State field allows the user to configure the input for either scenario. The *Active State* of each input must be configured.

Closed: The input is activated when the input is shorted to ground.

Open: The input is activated when the input is removed from ground.

Notify: This field configures the module to send an alarm when the input is activated or not to. If a user would like notification of this input becoming active, select "Yes". If this input does not require notification when activated, then select "No". If "No", *Event Type* and *Event Text* need not be configured.

Event Text: This field configures the text message which will be sent when the input is activated. *Event Text* only applies when *Notify* is "Yes". The message may be 16 alpha-numeric characters including spaces. Enter a meaningful message describing the state of the input.

> ***Example 1:*** The CCM is monitoring a Detector/DK Genset. The customer would like to be notified (via pop-up message at their office PC) on any change of the Genset status.
>
> Open the TEMPLATE site. Drag the DETECTOR w/CCM template onto the CCM in the site you are configuring and drop. Confirm the copy command. Select *Discrete Inputs* and click on Write to complete this configuration.
>
> ***Example 2:*** The CCM is monitoring a non-Onan Genset. The Genset has 2 output signals available: "Running" and "Genset Fault". The "Running" output is normally closed while the "Genset Fault" output is normally open. The customer would like to be notified (via pop-up message at their office PC) on any change of the Genset status.
>
> ***Input 1:*** Select "Warning" for *Event Type*, "Closed" for *Active State*, "Yes" for *Notify* and enter "Running" for Event Text.
>
> ***Input 2:*** Select "Warning" for *Event Type*, "Open" for *Active State*, "Yes" for *Notify* and enter "Genset Fault" for *Event Text*.

Configuration: This defines the Event type, active state, event text, and notify setting for each of the 32 discrete inputs.

Change the format of nviCustInConfig to UNVT_ccm_cfg2. Change the format of nviEventMsgConfig to UNVT_ccm_cfg3. Write the following:

> nviCustInConfig.active[0] = Active state of Inputs 1 – 8 (1 is LSB) Closed = 0, Open = 1
>
> nviCustInConfig.active[1] = Active state of Inputs 9 – 16 (9 is LSB) Closed = 0, Open = 1
>
> nviCustInConfig.active[2] = Active state of Inputs 17 – 24 (17 is LSB) Closed = 0, Open = 1
>
> nviCustInConfig.active[3] = Active state of Inputs 25 – 32 (25 is LSB) Closed = 0, Open = 1
>
> nviCustInConfig.notify[0] = Notify Setting of Inputs 1 – 8 (1 is LSB) No = 0, Yes = 1
>
> nviCustInConfig.notify[1] = Notify Setting of Inputs 9 – 16 (9 is LSB) No = 0, Yes = 1
>
> nviCustInConfig.notify[2] = Notify Setting of Inputs 17 – 24 (17 is LSB) No = 0, Yes = 1
>
> nviCustInConfig.notify[3] = Notify Setting of Inputs 25 –32 (25 is LSB) No = 0, Yes = 1
>
> nviEventMsgConfig.fault_type: 0 for Event, 1 for Warning, 2 for Shutdown
>
> nviEventMsgConfig.fault_text[0..15]: Any 16 character string
>
> nviEventMsgConfig.input = Input number.

For nviCustInConfig, active[0] through active[3] are fields 1 thru 4, notify[0] through notify[3] are fields 5 thru 8.

For nviEventMsgConfig, fault_type is the first field, fault_text consists of the next 16 characters, and input is the last field.

As an example, see Figure G-17 where inputs 17 thru 24 are configured. Inputs 18 and 19 are configured to be active closed and the rest are active open. The active state of inputs 17 thru 24 are set by the third field of nviCustInConfig, with Input 24 controlled by the most significant bit in that field and input 17 controlled by the least significant bit. To calculate the value to insert in that field, use the following formula:

```
nviCustInConfig.active[2] =    128*Input 24
                             +  64*Input 23
                             +  32*Input 22
                             +  16*Input 21
                             +   8*Input 20
                             +   4*Input 19
                             +   2*Input 18
                             +   1*Input 17
```

where Input X = 1 if that input is active open, and X = 0 if it is active closed. In this example, inputs 18 and 19 are active closed and the rest are active open. Therefore,

> nviCustInConfig.active[2] =
> 128+64+32+16+8+0+0+1=249

Similarly, the notify bits for these 8 inputs are in field 7. The bit should be set to 1 if an alarm is to be sent when this event is active; otherwise it should be set to 0. In this example, all 8 inputs are set for notify.

> nviCustInConfig.notify[2] =
> 128+64+32+16+8+4+2+1=255

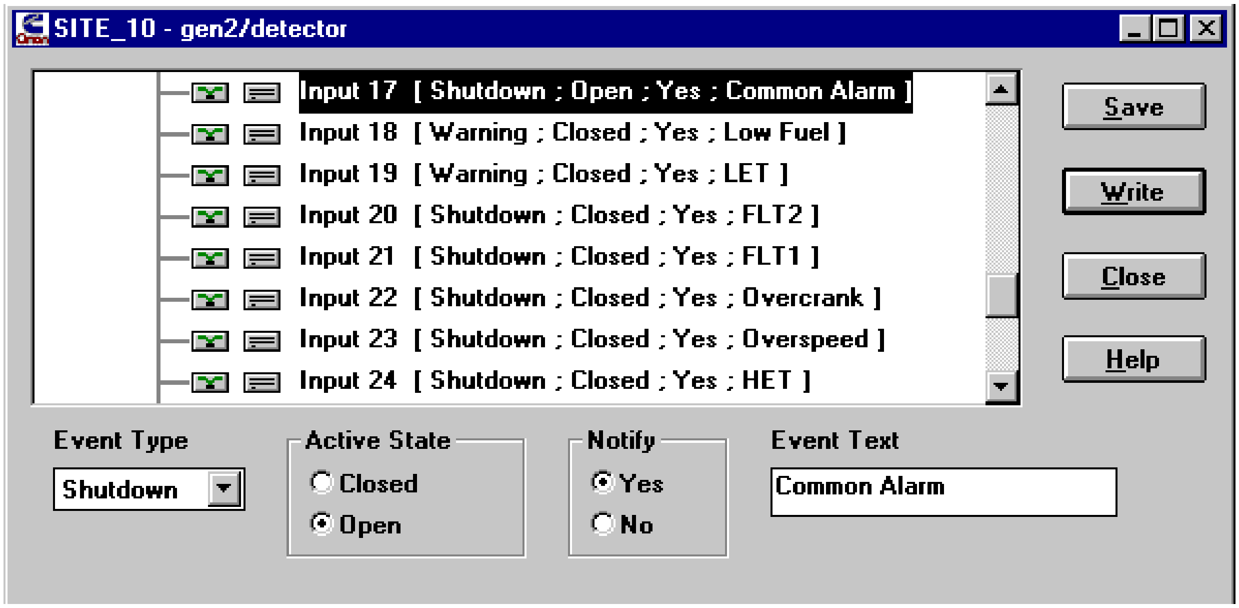


FIGURE G-17. CONFIGURE CCM – DISCRETE INPUTS

For event text, nviEventMsgConfig must be written for each event. To set up event text for 16 inputs, you must write to nviEventMsgConfig 16 times. In the example, input 17 is configured as a shutdown, with “Common Alarm” as the text. The screen shot in Figure G-15 illustrates how this should be written. Notice that there are trailing spaces after “Common Alarm”. Because this field must have 16 characters, spaces need to be added to any shorter text strings.

If raw data type is used for nviEventMsgConfig, bytes 0 and 1 are fault type, bytes 2 – 17 are fault text, and bytes 18 and 19 are input numbers.

Notes:

Module name, Site ID, dialout attempts, and redial delay are all configured for the GCM in the same way as they are for the CCM.

Configure the NGM (SLTA-10) using LinkManager.

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Appendix H. Index