Metwork Network Ultima[®] Display Module

instruction manual

THIS MANUAL MUST BE CAREFULLY READ BY ALL INDIVIDUALS WHO HAVE OR WILL HAVE THE RESPONSIBILITY FOR USING OR SERVICING THE PRODUCT. Like any piece of complex equipment, the unit will perform as designed only if it is installed, used and serviced in accordance with the manufacturer's instructions. OTHERWISE IT COULD FAIL TO PERFORM AS DESIGNED AND PERSONS WHO RELY ON THIS PRODUCT FOR THEIR SAFETY COULD SUSTAIN SEVERE PERSONAL INJURY OR DEATH.

The warranties made by Mine Safety Appliances Company with respect to the product are voided if the product is not used and serviced in accordance with the instructions in this manual. Please protect yourself and others by following them. We encourage our customers to write or call regarding this equipment prior to use or for any additional information relative to use or repairs.

In the U.S., to contact your nearest stocking location, dial toll-free 1-800-MSA-INST. To contact MSA International, dial 1-412-967-3354.

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Manufactured by MSA INSTRUMENT DIVISION P.O. Box 427, Pittsburgh, Pennsylvania 15230

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MSA Instrument Warranty

- 1. Warranty- Seller warrants that this product will be free from mechanical defect or faulty workmanship for a period of eighteen (18) months from date of shipment or one (1) year from installation, whichever occurs first, provided it is maintained and used in accordance with Seller's instructions and/or recommendations. This warranty does not apply to expendable or consumable parts whose normal life expectancy is less than one (1) year such as, but not limited to, non-rechargeable batteries, sensor elements, filter, lamps, fuses etc. The Seller shall be released from all obligations under this warranty in the event repairs or modifications are made by persons other than its own or authorized service personnel or if the warranty claim results from physical abuse or misuse of the product. No agent, employee or representative of the Seller has any authority to bind the Seller to any affirmation, representation or warranty concerning the goods sold under this contract. Seller makes no warranty concerning components or accessories not manufactured by the Seller, but will pass on to the Purchaser all warranties of manufacturers of such components. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY, AND IS STRICTLY LIMITED TO THE TERMS HEREOF. SELLER SPECIFICALLY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE.
- 2. Exclusive Remedy- It is expressly agreed that Purchaser's sole and exclusive remedy for breach of the above warranty, for any tortious conduct of Seller, or for any other cause of action, shall be the repair and/or replacement at Seller's option, of any equipment or parts thereof, which after examination by Seller is proven to be defective. Replacement equipment and/or parts will be provided at no cost to Purchaser, F.O.B. Seller's Plant. Failure of Seller to successfully repair any nonconforming product shall not cause the remedy established hereby to fail of its essential purpose.
- 3. Exclusion of Consequential Damage- Purchaser specifically understands and agrees that under no circumstances will seller be liable to purchaser for economic, special, incidental or consequential damages or losses of any kind whatsoever, including but not limited to, loss of anticipated profits and any other loss caused by reason of nonoperation of the goods. This exclusion is applicable to claims for breach of warranty, tortious conduct or any other cause of action against seller.

General Warnings and Cautions

A WARNINGS

- 1. The Network Ultima Display Modules described in this manual must be installed, operated and maintained in strict accordance with their labels, cautions, warnings, instructions, and within the limitations stated.
- To prevent ignition of hazardous atmospheres, the cover of an explosion-proof model of the Network Ultima Display Module must be kept tightly closed when power is applied. Before removing cover for maintenance or calibration, ensure the surrounding atmosphere is and remains free of toxic or combustible gases until cover is closed.
- 3. Use only genuine MSA replacement parts when performing any maintenance procedures provided in this manual. Failure to do so may seriously impair instrument performance. Repair or alteration of the Network Ultima Display Module, beyond the scope of these maintenance instructions or by anyone other than an authorized MSA service personnel, could cause the product to fail to perform as designed and persons who rely on this product for their safety could sustain serious personal injury or death.
- 4. The general-purpose model of the Network Ultima Display Module can be a source of ignition resulting in an explosion if mounted in an area where a flammable mixture of combustible gas and air is present. If such a location must be monitored, install only the explosion-proof model and follow all national and local codes and practices for installation in these areas.
- 5. This device contains transmitter module FCC ID:OUR9XSTREAM. The enclosed device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

In order to comply with the FCC RF exposure requirements, this unit may be used only with Approved Antennas that have been tested with this radio. A minimum separation distance of 20 cm must be maintained from the antenna to any nearby persons. Changes or modifications to the radio or antenna could void the user's authority to operate this product.

Failure to follow the above can result in serious personal injury or death.

A CAUTIONS

- 1. Do not connect equipment to the relay rated higher than the relay ratings. Relay operation may fail as a result.
- 2. The Network Ultima Display Module must not be painted. If painting is done in an area where a Network Ultima Display Module is located, care must be exercised to ensure that paint is not deposited on the front glass cover. Any paint on the glass cover may obscure the indicators within the module.
- 3. Protect the Network Ultima Display Module from extreme vibration. Improper operation may result in over-heating.

Failure to follow the above can result in personal injury and/or equipment damage.

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The Network Ultima Display Module is equipped with an LCD display to enable the user to remotely view network status conditions and gas levels of various sensors.

Network Ultima Display Modules:

- Ultima Plus Display (Wired unit) is rated explosion-proof
- Ultima RF Display (Wireless unit) is rated for general-purpose.

All Wired Network Ultima Display Modules are rated explosion-proof, certified for Classification I, Groups B, C and D, Division I Hazardous Locations. When using this module in these hazardous locations, follow all NEC electrical codes for installation.

All Wireless Network Ultima Relay Modules are rated as general-purpose instruments. Follow NEC electrical codes for installation.

The Network Ultima Display Module is shipped ready for installation with external wiring harnesses. These harnesses provide direct connections to the module, eliminating the need for the enclosure to be opened.

The Network Ultima Display Module is designed to connect to an integrated system of wired or wireless compatible devices (or "network").

NOTE: The Network Ultima Display Module can only be used with an Ultima *Plus* network.

You must be familiar with the Chapter 5 network parameters if you intend to use the Network Ultima Display Module:

- in your own digital network or
- in a setup other than the Network Ultima Display Module default setup.

The Network Ultima Display Module provides long-distance interconnect ability for:

- many Network Ultima Gas Monitors and/or Network Ultima Relay Modules
- other network compatible devices.

This Manual:

- is to be used with, and often refers to, the Network Ultima Gas Monitor Instruction Manual (P/N 710471) and/or Network Ultima Relay Module (P/N 711203 or P/N 10044954).
- contains a description of network variables for the Network Ultima Display Module.

Unpacking Your Unit

Upon receipt, ensure that your package contains:

- Network Ultima Display Module (P/N 10010863 see FIGURE 1-1) or Wireless Display Module (P/N 10044953)
- Network Ultima Display Module Instruction Manual (P/N 10011531)

Look through packing material inside shipping container for any items that may have been shipped with the Network Ultima Display Module.

Identifying Your Unit

The label on the outside of the shipping carton identifies the module. Verify that the unit you have is correct; if it is not correct, contact MSA.

Mounting Your Network Ultima Display

- The Wired Network Ultima Display Module enclosure is rated for Class I, Groups B, C, and D, Division I hazardous area locations, only when installed according to the National Electrical Code (NEC).
- The Wireless Relay Module enclosure is rated for general-purpose areas.
- Follow all applicable practices and use appropriate conduit and cable glands when installing the Wired Communications Network Ultima Display Module in a hazardous area.

Use one of the following three methods to mount the Network Ultima Display Module.

Three Mounting Methods

 Mount the Network Ultima Display Module via the 3/4-inch NPT threads located on either port of the condulet. Install one end of a rigid condulet by threading the condulet into the threads. Ensure that the wires coming out of the port are accessible through the condulet.





Figure 1-1. Network Ultima Display Module (Wired Version Shown)

- Mount the Network Ultima Display Module via the optional mounting strap (P/N 697281) which is attached to the rear holes of the module.
- For mining applications, mount the module via the optional hanger bracket (P/N 814513) that can be attached to the rear holes of the Network Ultima Display Module.

Network Ultima Display Module Electrical Connections

Typically, there is no need to open the module during the installation because there are no:

- Internal jumpers (with the exception of the Propane/Methane jumper in an IR unit)
- Potentiometers
- Dip switches or other types of adjustments (with the exception of the Channel Selection switch in a Wireless unit).

All electrical connections to the Network Ultima Display Module can be made via the factory-installed wiring harness (See FIGURE 1-1). These harnesses are marked to clearly identify all signal connections. There are two cables coming from the Wired Network Ultima Display Module:

- a power and communication cable: (route to the proper power source and network connections)
- fault relay cable: normally closed (white), normally open (red), and common (black).

Cable connections for Wireless Display Units are:

- one power cable consisting of a white ground lead and a black power lead.
- fault relay cable as described above.

It is not necessary to use the provided power and communication cable. If your installation requirements need a direct connection, the Network Ultima Display Module can be opened and wired directly. The communication cable for wired communication must meet Ultima *Plus* System cable requirements.

Cable Requirements

- In all installations but Pennsylvania mining installations, it is recommended that the following cable be used to carry the information over the network for a Wired system:
 - non-plenum cable (MSA P/N 655548) or (Anixter P/N 192453) or
 - plenum cable (MSA P/N 655770).
- · For Pennsylvania mining installations:
 - use cable (MSA P/N 655267 or Anixter P/N 182453).
- 1-4

 do not use any other cable type. Using other types of cable will cause the network and the sensor to fail.

A WARNING

Do not use any cable other than: (MSA P/N 655548) or (Anixter P/N 192453) OR (MSA P/N 655770) OR, for Pennsylvania mining installations: (MSA P/N 655267) or (Anixter P/N 182453). Using other cable types will cause sensor and network failure, and could result in personal injury and/or death to individuals relying on the sensor or network.

- In all Wired installations, the end of the cable run must be equipped with a terminator. Your particular cable run may need two terminators; generally, two terminators are required for longer cables. Consult systems manual for additional cabling information.
- All wiring connections should be made by following the appropriate wiring code(s).

When installing in a hazardous area, be sure to install your Network Ultima Display Module according to National Electrical and local procedural codes. Failure to do so can result in serious personal injury or death. Wireless units are general-purpose units only.

TABLE 1-1 shows maximum cable length when using only the toxic gas Wired Network Ultima Gas Monitors. Other options, such as combustible Network Ultima Gas Monitor, Network Ultima Relay, Network Ultima Display or control modules may shorten the cable run, due to the higher power requirements.

Table 1-1. Maximum Cable Length (Wired Units)		
WIRING TOPOLOGY	MAXIMUM DISTANCE WITHOUT REPEATER	ADDITIONAL DISTANCE PER REPEATER
Doubly-terminated bus topology	8850 feet	8850 feet
Free topology	1640 feet	1640 feet



Network Topologies (FIGURE 1-2)

Bus Topology Networks

- A Bus Topology Network may be used to maximize cable length; two Bus Topology Network Termination Assemblies (P/N SK3108-12) or Bus Topology Network Termination Module (P/N 10015477) must be installed, one at each end of the cable.
- TABLE 1-1 specifies the maximum length of the communication pair; cable stub length must not exceed 9.5 feet.
- Maximum cable length is also determined by the network power pair, which is a function of the:
 - number of devices connected to the power pair and their operating parameters
 - · minimum operating voltage for each device
 - maximum current required to operate each device
 - · loop resistance of the power pair conductors
- Repeaters and additional power supply may be used to extend the distance.

Free Topology Networks

- A Free Topology Network provides the most wiring flexibility.
- TABLE 1-1 specifies maximum length, including all cable stubs.



Figure 1-2. Network Topologies

- One Free Topology Network Termination Assembly (P/N SK3108-14) or Free Topology Termination Module (P/N 10015476) must be installed anywhere on the network or near the Data Center PC.
- Repeaters and additional power supply may be used to extend the distance.
- TABLE 1-2 shows the maximum separation distance when using the Wireless Ultima with Digital Output Gas Monitor. Other conditions, such as non-line-of-site or antenna mounting height may shorten the separation distance.

Table 1-2. Maximum Separation Distance				
WIRELESS TOPOLOGY ANTENNA MOUNTING HEIGHT (FEET) MAXIMUM DISTANCE				
Wireless	10	5280		

Wireless Topology

- A Wireless Topology Network provides the most flexibility and is similar to the Free Topology Network
- TABLE 1-2 specifies the maximum separation distance from any two devices in a Wireless Topology Network.

Installing the Power and Communication Cable

- When using the wiring harness provided with the Network Ultima Display, see FIGURE 1-1.
- TABLE 1-3 lists the wire color connections for power and communication cable for Wired units.
- TABLE 1-4 lists the wire color connections for the power cable for the Wireless units.

Table 1-3. Fault Relay Wire Harness (Wired Units)				
WIRE COLOR	RELAY CONTACTS	TERMINATION BLOCK CONNECTIONS		
W	FAULT-NORMALLY CLOSED	J2-NC		
R	FAULT-NORMALLY OPEN	J2-NO		
К	FAULT-COMMON	J2-COM		

Chapter 1, General Information

Table 1-4. Wire Harness Assembly (Wireless Units)					
PART NO.	COLOR	LABEL	FUNCTION		
1	BLACK	PWR	POWER		
1	WHITE	GND	POWER GROUND		

If the wiring harness is not used, the Network Ultima Display Module must be disassembled for wiring:

1. Unscrew the Network Ultima Display Module cover and set it aside.

A WARNING

Before removing the cover of an explosion-proof Network Ultima Display Module, verify that the surrounding area does not contain a flammable mixture of combustible gas and air, since a source of ignition is exposed; otherwise, an explosion may occur if a metal object contacts the circuitry and produces sparks.

- 2. Remove the two screws securing the front panel printed circuit board within the Network Ultima Display Module.
- 3. Remove top board from Network Ultima Display Module.
- 4. If this is a Wireless unit, remove the two standoffs securing the network printed circuit board to the unit.
- 5. If this is a Wireless unit, carefully remove the network printed circuit board from the unit (two power and two network connections are connected to the board).
- 6. Route the cable through the port of the Network Ultima Display Module (see FIGURE 1-3).
- Install the communication and/or power cable to the terminal block on the bottom printed circuit board of the Network Ultima Display Module (see FIGURE 1-4).
- 8. If this is a Wireless unit, re-install the network printed circuit board removed in step 5 above.
- 9. Re-install the top board removed above.
- Re-install the two screws to secure the top board within the Network Ultima Display Module. Do not over-tighten the screws.





Figure 1-3. Typical Installation for Power and Relay Connections (Wired Shown)



11. Install the cover of the Network Ultima Display Module.

A WARNING

Do not let the cover remain off of an explosion-proof Network Ultima Display Module. Since a source of ignition is exposed, an explosion may occur if a metal object contacts the circuitry and produces sparks in an atmosphere of combustible gas.

Fault Relay Connections

- When using the wiring harness provided with the Network Ultima Display Module, see FIGURE 1-1 for relay connection. If the wiring harness is not used, the Network Ultima Display Module must be disassembled for wiring:
 - 1. Unscrew the Network Display Module cover and place it aside.

Before removing the cover of an explosion-proof Network Ultima Display Module, verify that the surrounding area does not contain a flammable mixture of combustible gas and air, since a source of ignition is exposed; otherwise, an explosion may occur if a metal object contacts the circuitry and produces sparks.

- 2. Remove the two screws securing the front printed circuit board assembly and remove the printed circuit board.
- 3. The fault relay connections are made via a removable, three-position terminal block, J2, of the second board.

TABLE 1-5 lists the fault relay connections provided by the terminal block.

Table 1-5. Fault Relay Wire Harness				
WIRE COLOR	RELAY CONTACTS	TERMINATION BLOCK CONNECTIONS		
W	FAULT-NORMALLY CLOSED	J2-NC		
R	FAULT-NORMALLY OPEN	J2-NO		
К	FAULT-COMMON	J2-COM		

 Remove the wiring harness provided by unscrewing the screw securing the wire to the terminal block. When all wires are loose, remove entire cable from the terminal blocks and discard.

- 5. Determine the necessary relay functions and route the new cable through the opening of the Network Ultima Display Module to the wiring terminal blocks. Install the wires as appropriate. Identification of each wire will help in the testing of the functions of this relay.
- 6. Once wiring is complete, re-install the front-panel printed circuit board assembly. Re-install the screws and secure the cover.

Do not allow the cover to remain off of an explosion-proof Network Ultima Display Module. Since a source of ignition is exposed, an explosion may occur if a metal object contacts the circuitry and produces sparks in an atmosphere of combustible gas.

Optional RESET Push-button Terminals

General

A user-supplied momentarily-closed, normally-open push-button can be connected to the push-button terminals located on the second printed circuit board (see FIGURE 1-4). The RESET push-button allows the user to:

- acknowledge the new alarms and, as a result, release the locked screen that shows the new alarm conditions from the Network Ultima Gas Monitor module
- configure it as a remote RESET push-button that unlatches the Network Ultima Gas Monitor module latching-type alarm(s) from the location of the Network Ultima Display module
- configure it as a remote ACKNOWLEDGE push-button that clears the Network Ultima Relay module relays (see Chapter 5, "Alarm Acknowledge Send Function").

Selection of the RESET Button (not provided by MSA)

The RESET push-button can be acquired locally during installation of the Display Module. The RESET push-button ratings, however, must meet or exceed the area classification where the button is to be used. Install an explosion-proof push-button with the appropriate rating in an area classified as a hazardous area.



Do not install a push-button that is rated for a general-purpose area in a location classified as a hazardous area; otherwise, an explosion may occur, as sparks may be produced when the button is pressed.

The RESET push-button must be a normally-open type with a momentary contact when pushed. The electrical ratings must be at least 1 amp at 250 volts AC. TABLE 1-6 lists several sources of push buttons; you may select one listed or obtain one from an alternative supplier.

Table 1-6. RESET Push-button Vendors

VENDOR NAME	CATALOG NUMBER	DESCRIPTION
Appleton Electric Co.	EFDB175-U1	Explosion-proof push-button
Crouse Hindes, Inc.	NCS2110	General-purpose push-button

Installing the Optional RESET Push-button

The optional RESET push-button is wired to the terminal block on the lower printed circuit board within the Network Ultima Display Module. The following procedure must be performed:

1. Unscrew the Network Ultima Display Module cover and place it aside.

Before removing the cover on an explosion-proof Network Ultima Display Module, verify that the surrounding area does not contain a flammable mixture of combustible gas and air, since a source of ignition is exposed; otherwise, an explosion may occur if a metal object contacts the circuitry and produces sparks.

- 2. Remove the two screws securing the front printed circuit board assembly and remove the printed circuit board.
- The RESET push-button wiring connection is made via a removable terminal block J1, positions 3 and 4 (FIGURE 1-5). Route the push-button wires through the opening of the Network Ultima Display Module to terminal block J1.
- 4. Once wiring is complete, re-install the front panel printed circuit board assembly, noting that the connector extending from the back side of the printed circuit board must mate with the connector on the lower board. Re-install the screws and secure the cover.





Figure 1-5. Installing Optional Reset Push Button (Second PC Board)

A WARNING

Do not allow the cover to remain off of an explosion-proof Network Ultima Display Module. Since a source of ignition is exposed, an explosion may occur if a metal object contacts the circuitry and produces sparks in an atmosphere of combustible gas.

Chapter 2, Configuration

Chapter 2 Configuration

Network Configuration

- There are three configuration types for the Network Ultima Display Module; determine your configuration type and refer to the noted chapters for instruction:
 - pre-configured (see Chapter 3)
 - auto-configured (see Chapter 4)
 - data center configured (see Chapter 5) -(Wired units only).
- The network can be any topology; however, to maximize distance, bus topology is recommended (see Installation Outline Drawing 10000005940 for Wired units or 10000015957 for Wireless units).
- Each Network Ultima Display is considered a node on the network with communication between nodes at a reliable, efficient (78 KB/s Wired or 19.5 KB/s Wireless) rate. In peer-to-peer communications:
 - each node can communicate with every other network node
 - no central supervisory controllers or computers are needed.
- Network protocol is embedded in each Network Ultima Display Module's firmware for completely transparent operation. The protocol:
 - manages the internal communication within the module
 - constructs and delivers all network communication.
- To ensure the most reliable network communication, each Network Ultima Display Module contains built-in:
 - data collision detection
 - avoidance capabilities.



Chapter 3 Pre-configured Units

General

- Pre-configured units are factory-set to communicate with designated Network Ultima Gas Monitors.
- In this configuration, the user simply:
 - installs all of the Network Ultima Gas Monitors, Network Ultima Display Modules, and Ultima Relay Modules on the network
 - applies power.
- No additional set-up is necessary.

Start-up

Applying Power

- 1. Apply power.
 - Verify power by observing that all LEDs and all LCD pixels turn ON momentarily.
 - The green STATUS LED continues to intermittently flash, indicating proper communication.



Figure 3-1. Typical Basic Group System for Pre-configured Units

Chapter 3, Pre-configured Units

- Verify that the LCD displays the External Mode Initial screen before proceeding with the Normal Scan Display screen (see Appendix A, "Display Screen Modes").
- 2. Verify proper system operation by activating the alarm points on the Network Ultima Gas Monitors.



Figure 3-2. Typical Multiple Group System for Pre-configured Units

Chapter 4 Auto-Configured Units

Start-up

Applying Power

- 1. Apply power.
 - Verify power by observing that all LEDs turn ON momentarily.
 - Only the green STATUS LED continues to intermittently flash.
 - Verify that the LCD displays the Local Mode Initial screen before proceeding with the Normal Scan Display screen (see Appendix A, "Display Screen Modes").
- 2. Verify proper system operation by activating the alarm points on the Ultima sensors.

General

This auto-configure feature enables:

- the user to configure the system without the use of a Personal Computer (PC)
- the unit to install up to eight Network Ultima Gas Monitors and configure them as members of a Group
- one Network Ultima Display "Master" unit to control the Group
- up to seven Network Ultima Relay "Slave" units to be installed as a member of the Group by the "Master" unit on the Wired Network and three Network Ultima Relay "Slave" units on a Wireless network
- the user to replace an inoperative Network Ultima Gas Monitor or Network Ultima Relay in the Group
- the user to re-assign members from one Group to another.

Basic Stand-alone System

The most basic stand-alone system contains a number of Ultima Gas Monitors and a master Network Ultima Display Module.



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Figure 4-1. Typical Basic Group System for Auto-configured Units

 The master Network Ultima Display Module contains all of that particular group's sensor information necessary to install the group in the Auto-configure Mode.

Multiple Module System

The user can also create a group with a Network Ultima Display Module and multiple Network Ultima Relay Modules and Network Ultima Gas Monitor modules.

- The Master Network Ultima Display Module also contains all of the "slave" Network Ultima Relay Module information necessary to install the group in the Auto-configure Mode.
- Each Network Ultima Gas Monitor in a stand-alone system can be set for up to three levels of alarms.
- Each Network Ultima Display Module is made up of:
 - three alarm indicators
 - one fault relay that:
 - is normally energized
 - de-energizes if any fault condition exists (see Appendix A).
- Each Alarm Relay of the slave Network Ultima Relay Modules can be logically connected to (and driven by) up to eight Network Ultima Gas Monitors.
- The combined Alarm Setpoints for each level of these Network Ultima Gas Monitors form a logical OR on each of the three Alarm Relays of the slave Network Ultima Relay Module.
 - For instance, if one or more Network Ultima Gas Monitor's reading exceed their first alarm setpoints, the first relay of
- 4-2



Figure 4-2. Typical Multiple Group System for Auto-configured Units

the Network Ultima Relay Module will activate and will not clear unless the gas readings for all of the Network Ultima Gas Monitors go back to the normal level.

- The same logical OR function applies to the other two relays of the Network Ultima Relay Module, with respect to the second and the third alarm setpoints.
- Any gas reading, alarms, and the previous calibration date of any Network Ultima Gas Monitor can be monitored on the Network Ultima Display Module.

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Detection for Fault Conditions

- In local mode, the network variable nv_op_status from Network Ultima Gas Monitor are bound directly to the Network Display. This variable consists of operational and error status for the Network Ultima Gas Monitor and is updated and propagated on the network when any of its value changes state. Any error status of the Network Ultima Gas Monitor is treated as a fault condition on the Network Display.
- To detect line cut, communication failure, or device failure, an active polling feature is built-in on the Network Display. In Local mode, the Network Display is set to poll every Network Ultima Gas Monitor in its group.

Sub-Systems

Sub-Systems are made up of several Network Ultima Gas Monitors networked together and control several Network Ultima Relay units. The Network Ultima Gas Monitors can detect high gas readings and send an alarm to the Network Ultima Relay unit(s). When the user presses the alarm acknowledge push-button, the Network Ultima Display Unit sends the alarm acknowledge to all Network Ultima Gas Monitors in the group.

The Network Ultima Display unit collects information such as gas reading, alarms, and previous calibration dates of all Network Ultima Gas Monitors in the group.

An Auto-configured Multiple Group system can include up to five groups (five masters). Any one group on a multiple group system may have a Network Ultima Relay Module configured as a master of the group that does not include or require a Network Ultima Display (see FIGURE 4-2)

When multiple groups are connected in one wired network, the user can move one Network Ultima Gas Monitor or slave Network Ultima Relay Module to a different group without disconnecting the unit.

- The Master Network Ultima Display Module must remain within its group and cannot be moved to a different group.
- To remove a member from the group, the Network Ultima Master Network Ultima Display Module must be initialized and the group re-configured without that particular member (see "Initializing the Master Network Ultima Display" later in this Chapter).

Clearing Alarms

The alarms are acknowledged in one of three ways:

- via the Ultima Controller
- · via the Ultima Calibrator
- via an optionally-installed push-button.

Configuring the Network Ultima Display Module

A Minimum Configuration Consists of:

- one Master Network Ultima Display
- one Network Ultima Gas Monitor.

A Maximum Configuration Consists of:

- 64 units combined in one wired network
- five different Groups in one wired network, each of which may consist of up to:
 - seven Wired/three Wireless Network Ultima Relay Modules
 - eight Network Ultima Gas Monitors
 - one Master Network Ultima Display
- a sixth Group in the same wired network:
 - designated as a "parking lot"
 - consisting of non-configured Network Ultima Relay and/or Network Ultima Gas Monitor units).

Configuring the Master Network Ultima Display requires the use of three buttons on the Ultima Controller or Ultima Calibrator:

- 1. CAL button
 - Press three times to enter or exit the Auto Configuration mode menu
 - Use this CAL button to elect the Menu option.

2. ADDRESS button

- Once user has placed the Master Display in the Auto Configuration mode:
 - While pointing the Ultima Controller to the device that is to be added to the group, use this button to send address information from the Network Ultima Gas Monitor or Slave Network Ultima Relay Module intended to be configured as a Group member.
- 3. ZERO button



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- Use this button to acknowledge alarms at the Master Network Ultima Display or at the Slave Network Ultima Relay Modules (while on Run-time mode only)
- Use this ZERO button to move cursor to different options on the Configure Menu.
- **NOTE:** Network Ultima Displays are factory-set with the Auto-configure feature enabled (Local Mode). For monitoring with a PC, the Network Ultima Display must be reconfigured from Local Mode to External Mode, using the Network Tools software on the PC. See Chapter 5 for more information on the Data Center System.

To Create Group Number One

1. Assign a Master Network Display:

- a. Point the Controller or Calibrator at the Ultima Network Display.
- b. Press the CAL button three times to place the Network Ultima Display in the Auto-configure mode.
 - The yellow STATUS LED on the Display:
 - flashes if it has no Members or
 - remains ON if it has at least one Member assigned to its Group.
 - If there is no response, it is configured as External Mode for use in the Data Center System
 - Display shows the Configure Menu.
- **NOTE:** If the Master Display receives no input within 30 minutes, it leaves auto-configure mode.
- 2. Add a Network Ultima Gas Monitor to Group Number One:
 - a. On the Master Network Ultima Display Screen, select Install Member option from the Configure Menu (see Appendix A).
 - b. Point the Controller or Calibrator at the first Network Ultima Gas Monitor and press the ADDRESS button:
 - Network Ultima Gas Monitor sends its address information to the Master Network Ultima Display.
- 4-6

- Green STATUS LED on Master Network Ultima Display flickers once if it received address information from the first Sensor.
- Master Network Ultima Display assigns that Network Ultima Gas Monitor as Member One of Group One.
- All LCD segments of the Member One, Group One Sensor turn ON to show that Network Ultima Gas Monitor is:
 - installed in that Group
 - reporting to that Master.
- Network Ultima Gas Monitor goes through a normal power-up sequence.
- A three-digit address displays on the Network Ultima Gas Monitor:

The first digit indicates the type of unit:

1 = Network Ultima Gas Monitor

The second digit indicates the Member Number:

1 = first member of Group

2 = second member of Group, etc.

The third digit is the Group Number (Wired Unit): 1 = first Group

2 =second Group, etc.

After Sensor Number One is installed as a Member, the address is:

- 111 =This is a **Network Ultima Gas Monitor**.
 - This is the first Network Ultima Gas Monitor of the Group. This is the **first Network Ultima Gas Monitor** of Group One.
 - c. Once the first Network Ultima Gas Monitor displays all LCD segments, configure Network Ultima Gas Monitor number two by repeating step 2.

After Sensor number two is installed as a Member, the address is:

 121 =This is a Network Ultima Gas Monitor. This is the second Network Ultima Gas Monitor of the Group (Wired Unit).

This is the second Network Ultima Gas Monitor of **Group One**.

d. Repeat this procedure for each Network Ultima Gas Monitor to be installed in the Group.

3. Assign a Slave Network Ultima Relay Module to Group One:

- a. On the Master Network Ultima Display Screen, select Install Member option from the Configure Menu (see Appendix A).
- b. Point the Controller or Calibrator at the desired Network Ultima Relay and press the ADDRESS button.
 - All Network Ultima Relay LEDs flash twice to indicate that this particular Network Ultima Relay Module is installed.
 - It is now a Slave Network Ultima Relay Module.
- c. Repeat this procedure for each Slave Network Ultima Relay to be installed in the group.
- 4. Remove the Master Network Ultima Display from the Auto Configuration Mode:
 - a. Select Exit from the Configure Menu.
 - **NOTE:** For normal operation, always remove the Master Network Ultima Display from the Auto-configuration Mode.
- 5. Verify that all sensors are installed:
 - a. Disconnect any equipment attached to the Slave Network Ultima Relay contacts.

If relays are wired to external devices (e.g., horns, exhaust fans, etc.), these devices may activate during initial start-up procedures. User may desire to test external devices or prevent activation by disconnecting all equipment from relay contacts and reconnecting when start-up is completed.

- b. Apply span gas to exceed the default threshold.
- c. Observe the Network Ultima Gas Monitor LCD.
 - The 1, 2 and/or 3 Alarm Flag(s) display.
- d. Observe the Network Ultima Display Module for:
 - Gas Reading displays
- 4-8

- The corresponding 1, 2 and/or 3 Alarm(s) displays.
- e. If these Alarm Flags do not display, repeat the entire Auto Configuration procedure for that sensor.
- f. Observe the Slave Network Ultima Relay:
 - the corresponding 1, 2, and/or 3 alarms display
 - the corresponding relays snap.
- g. Turn OFF the span gas.

To Create Group Number Two on a Wired System:

- 1. Repeat the procedures given under "To Create Group Number One."
- 2. Place the second Master Network Ultima Display Module in the Auto-configure mode.
 - The second Master Network Ultima Display Module will detect the existence of the Master Network Ultima Display of Group One or other groups on the network and assign itself as Master of Group Number Two, or another unused Group Number.
- **NOTE:** For proper operation, only one Master Network Ultima Display Module can be placed in Auto-configure Mode at any one time on the network.

To Create Group Number Two on a Wireless System:

- 1. Remove power from the unit.
- 2. Unscrew the Network Ultima display Module cover and set it aside.
- 3. Using a small screwdriver, set the switched on the bottom printed circuit board to the desired channel as shown in TABLE 4-1. The switches are accessible without any disassembly of the unit.

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Table 4-1. Wireless Channel Selection				
SW-1	SW-2	SW-3	CHANNEL #	
OFF	OFF	OFF	0	
ON	OFF	OFF	1	
OFF	ON	OFF	2	
ON	ON	OFF	3	
OFF	OFF	ON	4	
ON	OFF	ON	5	
OFF	ON	ON	6	
ON	ON	ON	INVALID	

- 4. Re-install the Network Ultima Display Module cover.
- 5. Reconnect power to the unit.

NOTE: Power must be cycled to activate the changes.

- 6. Label the unit with the channel selected.
- 7. Repeat the same procedure for all displays, relays, and sensors to be bound as a network.
- 8. Repeat procedures given under "To Create Group Number One".

Initializing the Master Network Ultima Display

The Master Network Ultima Display must be initialized when the following conditions occur:

- One or more members in the group are removed from operation.
- The Master Network Ultima Display and its group members are removed and re-assigned to different group(s) on the network.

Using the SEND ID Push-button

To initialize the Master Network Ultima Display and its group members by using the SEND ID push-button (see FIGURE 1-1):

- 1. Turn OFF power to the Master Network Ultima Display unit.
- 2. Hold down the SEND ID push-button while restoring the power; release the SEND ID push-button when the Network Ultima Display unit starts flashing all LEDs for several seconds.
 - **NOTE:** If the Master Network Display unit was previously configured with members, it will try to communicate and initialize the members, before clearing its internal configuration information.

Using the Ultima Controller or the Ultima Calibrator

To initialize the Master Network Ultima Display and its group members in a non-intrusive way, the Ultima Controller or the Ultima Calibrator can be used as follows:

- 1. Point the Ultima Controller or Ultima Calibrator at the Master Network Ultima unit and press the CAL button three times to enter the Auto-configuration mode.
- 2. Select the Clear All option and select the Proceed option (see Appendix A).
 - The Master Network Ultima Display unit flashes all LEDs for several seconds.
 - **NOTE:** If the Master Network Display unit was previously configured with members, it will try to communicate and initialize the members, before clearing its internal configuration information.
 - **NOTE:** The non-configured Network Ultima Gas Monitor units are placed in the Group 6 parking lot.
 - This is shown on the LCD when their addresses are displayed as "116."
 - These units will no longer send their gas reading and alarm status to the Network Ultima Display or to the Slave Network Ultima Relay units; therefore, no relay will be activated.

Replacing a Non-functioning Unit in a Group

To replace a non-functioning Network Ultima Gas Monitor or Slave Network Ultima Relay unit in a group:

- 1. Remove the failed unit from the network.
- 2. Allow the Master Network Ultima Relay unit to detect the loss of communication with the removed unit.
 - This may take up to three minutes and 20 seconds.
- 3. Mount the replacement unit on the network.
- 4. Perform the complete "Add a Network Ultima Gas Monitor to Group Number One" procedure or the "Assign a Slave Network Ultima Relay to Group One" procedure given earlier in this chapter.
- **NOTE:** The Master Network Ultima Display unit keeps track of the address of the failed unit and assigns the same address to the replacement unit.

Chapter 5 Data Center Configured Units (Wired Units Only)

General

This chapter:

- provides a more in-depth description of network operation and setup for the Network Ultima Display module
- deals strictly with the External mode operation of the Network Ultima Display module [where the module and other network devices are set up and configured by using a personal computer (PC)].

The External mode operation of the Network Ultima Display module permits a more flexible configuration and binding setup not available in Local mode operation. To perform this task, the user must be familiar with configuration software tools such as LonMaker for Windows.

Software and Hardware Requirements

- PC equipped with LonWorks interface adapter, (i.e., SLTA-10 network adapter or PCLTA-10 network card)
- · Echelon's LonMaker for Windows software
- External interface file (XIF) for Network Ultima Display module, NDSP.XIF file.

Initial Configuration Setting

The Network Ultima Display module is factory-set with:

- · Auto-configure feature enabled and
- Local mode operation.

For Data Center applications, the Network Ultima Display module must be reconfigured to its External mode operation:

- Using a PC, install and commission the module.
- Set the network configuration variable nciNetConfig to the value CFG_EXTERNAL (1).



Once set, the module:

- is prevented from operating in Local Mode
- Auto-Configure option is disabled.

Features

When configuring the Network Ultima Display in the External mode, the user may choose to use some or all of the following features by performing the appropriate network variable binding task:

Multiple Sensor Display Function

- Up to eight Network Ultima Gas Monitor modules can be bound to one Network Ultima Display module, which displays their:
 - gas readings
 - alarm states
 - gas types and
 - last calibration dates on eight separate screens.

Alarm Acknowledge Send Function:

- Alarm acknowledge command issued at the Network Ultima Display module may be selectively bound to some or all of the Network Ultima Gas Monitor modules.
- This allows the use of the Ultima Controller or the Ultima Calibrator to acknowledge latching-type alarm(s) remotely located from the Network Ultima Display modules.
- Optionally, this same acknowledge command can be performed via a customer-installed, momentarily-closed, and normally-open push-button.

Remote Display Function:

- A Data Center PC (set up to monitor other Network Ultima Gas Monitor modules in the system) can periodically send information from any of those Gas Monitor modules to the Network Ultima Display module.
 - Information from this remote Network Ultima Gas Monitor module is then displayed as RMT on the screen of the Network Ultima Display module.



Remote Alarm Acknowledge Function:

- A network command can be sent to the Network Ultima Display module to:
 - acknowledge alarm(s) and
 - unlock the screen that displays the new alarm(s).
 - **NOTE:** Optionally, this input command can be originated from a bound network variable of a network device.

Detection for Fault Conditions

- In External mode, the binding of several network variables is mandatory (See "Restrictions and Rules," Note 1, later in this chapter). These mandatory bound network variables are used as heartbeat(s). A missed heartbeat is used to detect a fault condition.
- In External mode, the system can be set to include several Network Display and/or Network Relay to be actively polling the Network Ultima Gas Monitor devices that are bound to them. The maximum number of devices that can be enabled for polling is dependent upon the size of the system (See "Restrictions and Rules" later in this chapter). In any case, Network Ultima Display units that are not enabled for polling will still be able to detect any of the above fault conditions by means of the missed heartbeat detection.

Network Ultima Display Network Variables

All variables can be polled, and those labeled as inputs can be written by the network. Per Inter-operability Guidelines, the network interface incorporates:

- Mandatory Node Object Variables
- Mandatory Closed Loop Actuator Object Variables.

All variables are associated with one of these two objects and are classified as either:

- configuration type variables or
- non-configuration type variables.

Node Object (Type 0) Variables

- The network can monitor these functions within the node.
- For initial Network Ultima Display setup, only mandatory variables and certain optional variables must be configured.

• Mark the supported status bits in the status mask per TABLE 5-1.

	Table 5-1. Node Object (Type 0) Variables					
NV INDEX	NV VARIABLE FORMAT		COMMENTS			
9	nviRequest	SNVT_obj_request	Used to request object modes. Only RQ_NORMAL, RQ_UPDATE_STATUS, and RQ_REPORT_MASK are supported.			
10	nvoStatus	SNVT_obj_status	Used to indicate status of various node objects.			
14	nciNetConfig	SNVT_config_src	Installation mode. Auto-configure feature is enabled when equal to CFG_LOCAL (0). Must be set to CFG_EXTERNAL (1) when used with a PC. Factory default = CFG_LOCAL (0).			
11	nciMaxStsSendT	SNVT_elapsed_tm	Maximum send time for nvoStatus that can be used for heartbeat. Factory default = 0 (disabled).			

nviRequest Variable

- This input structure (SNVT #92) to the node is used to request a mode for an object within the node.
- Valid requests include:
 - an ID to identify the object; ID is 0.
 - a mode command.
- Valid mode commands for the node object are:
 - RQ_NORMAL
 - to enable the object and report object status
 - RQ_UPDATE_STATUS
 - to report object status only
 - RQ_REPORT_MASK

to report the supported bits in the object status variable structure.

• Unsupported requests to the node return invalid_request status.

nvoStatus Output Variable

- This structure (SNVT #93) is used to report the status for any object on a node.
- A report mask request causes this variable to output with a mask indicating which bits are valid in the object status structure.
- Valid bits in the Node Object (Type 0) Status for the node object are:
 - invalid_id and invalid_request bits (mandatory)
 - open circuit
 - (top display board missing)
 - out_of_service
 - (top display board missing or other unusual conditions)
 - comm_failure (failed communication to network)
- All other bits are disabled for the node object.

nciNetConfig Configuration Variable

- This input configuration variable (SNVT #69) to the node is used to determine if the node will be self-installing or installed with an external network manager, such as a PC.
- Must be set to CFG_EXTERNAL for Data Center configuration.

nciMaxStsSendT Configuration Variable

- used to control the maximum time period before the node automatically transmits the current value of the nvoStatus output network variable.
- provides a heartbeat output to indicate a healthy node.
- provides sequentially-returned status of each object in the node with one object status per expiration of the timer.
 - This output may be disabled by setting all fields to zero.
 - Default value is 0.

Closed Loop Actuator Object (Type 4) Variables

The nviRequest variable is used to request status of the Closed Loop Actuator Object (type 4) Variables of the Network Ultima Display module.

- Valid requests for the Closed Loop Actuator object are:
 - an ID to identify the object; ID is 4
 - a mode command.
- Valid mode commands for the node object are:
 - RQ_NORMAL
 - to enable the object and report object status
 - RQ_UPDATE_STATUS
 - to report object status only
 - RQ_REPORT_MASK to report the supported bits in the object status variable structure.
 - RQ OVERRIDE
 - to override the Fault relay function.
 - When in the override mode, the Fault relay is no longer controlled by any fault conditions existing on the module.
 - Instead, the Fault relay state follows the state of nviTrouble network variable.
 - On power-up or reset, the module defaults to the Override mode Disable.
 - RQ_RMV_OVERRIDE

to remove the Override mode.

- Unsupported requests to the node return: "invalid_request" status.
- A report mask request causes the nvoStatus variable to output with a mask, indicating which bits are valid in the Closed Loop Actuator Object Status structure.
- Valid bits in the Network Ultima Display Object Status are:
 - invalid_id and invalid_request bits (mandatory)
 - in_override bit.
- All other bits are disabled.

Other Network Variables

See TABLE 5-2 for other network variables specific to the Network Ultima Display module.

	Table 5-2. Other Network Variables					
	VARIABLE NAMES	FORMAT	SEE NOTE	COMMENTS		
1-3	nviAlarm[3]	SNVT_lev_disc	1	Up to eight output network variables can be grouped and bound to each nviAlarm[0], nviAlarm[1], and nviAlarm[2]. Each variable forms an OR function.		
4-6	nvoAlarmState[3]	SNVT_lev_disc		Reflects outputs of the OR functions for nviAlarm[x]. ST_OFF (0) = normal ST_ON (4) = alarm		
24	nviCalDate	SNVT_time_stamp	1	Up to eight inputs can be grouped and bound to this variable. Previous calibration date		
7	nviTrouble	SNVT_lev_disc		For Fault relay manual override. Fault Detect function must be disabled prior to using manual override (nciMaxRecT = zeroes) ST_OFF (0) = de-energized (fault) ST_ON (4) = energized (normal)		
8	nvoTroubleFb	SNVT_lev_disc		Fault relay Feedback state. When it is bound and nciMaxSendT is not zero, this variable becomes a heartbeat sent to the bound device. ST_OFF (0) = energized (normal) ST_ON (4) = de-energized (fault)		
12	nciMaxSendT	SNVT_elapsed_tm		Maximum send time for nvoTroubleFb that can be used as heartbeat. Default = 55 seconds		
13	nciMinSendT	SNVT_elapsed_tm		Minimum send time between network variable transmissions Default = 200 milliseconds for Wired Units, 5 seconds for Wireless Units		
15	nciMaxRecT	SNVT_elapsed_tm		Maximum time between receiving updates of nviAlarm[] before causing the Fault condition. Set to zeroes to disable the Fault Detect function. Default = 2 minutes and 20 seconds		
0	nvoAlmAck	SNVT_lev_disc	2	Feedback state of nviAlmReset and/or the push-button, indicating the alarm acknowledge command is received. Reverts back to default after five seconds. ST_OFF (0) = default ST_ON (4) = acknowledged		

Table 5-2. Other Network Variables NV INDEX VARIABLE NAMES SEE NOTE FORMAT COMMENTS Alarm acknowledge input to reset the Fault relay and its 18 nviAlmReset SNVT_lev_disc 2,4 alarming, locked screen ST_OFF (0) = default ST_ON (4) = acknowledge Up to eight output network variables can be grouped and bound to this variable. 22 nviValue SNVT_count_f 1 Gas sensor value in ppm or % Up to eight output network variables can be grouped and bound to this variable. Gas sensor type in ascii: 00 COMBUSTIBLE, 100 %LEL, 1% 01 CO, 100 PPM, 1 PPM 02 CO, 500 PPM, 1 PPM 03 SO₂, 25 PPM, 1 PPM 04 H₂S, 10.0 PPM, 0.1 PPM 05 H₂S, 50.0 PPM, 0.1 PPM 06 H₂S, 100 PPM, 1 PPM 07 NO, 100 PPM, 1 PPM 08 NO₂, 10.0 PPM, 0.1 PPM 09 CL2, 5.0 PPM, 0.1 PPM 09 CL2, 5.0 PPM, 0.1 PPM 04 HCN, 50 PPM, 0.1 PPM 05 HCL 100 PPM, 1 PPM 05 HCL 100 PPM, 1 PPM 06 CO₂, 25.0 %, 0.1 PPM 07 COMBUSTIBLE, 100 %LEL, 1% 0F COMBUSTIBLE, 100 %LEL, 1% 0F COMBUSTIBLE-NOLOCK, 100 %LEL, 1% nviGasType SNVT char ascii 23 100 %LEL, 1% 10 COMBUSTIBLE-NOLOCK, 100 %LEL, 1% 11 COMBUSTIBLE-NOLOCK, 11 COMBUSTIBLE-NOLOCK, 100 %LEL, 1% 12 CLO₂, 3.0 PPM, 0.1 PPM 13 NH₃, 100 PPM, 1 PPM 14 H₂ 1000 PPM, 10 PPM 15 HCN, 50.0 PPM, 0.1 PPM 16 PHOSPHINE 2.0 PPM 17 ARSINE 2.0 PPM 18 SILANE 25 PPM 19 GERMANE 3.0 PPM 19 GERMANE 3.0 PPM 1A DIBORANE 50 PPM **1B FLUORINE 5.0 PPM** 1C HF 50 PPM, 0.1 PPM 1D BROMINE 5.0 PPM 1E CS₂ 50 PPM 1F ETO 10.0 PPM

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	Table 5-2. Other Network Variables					
	VARIABLE NAMES	FORMAT	SEE NOTE	COMMENTS		
25	nviRMTValue	SNVT_count_f	3	One of the variables to be displayed on the RMT screen as part of the Remote Display function. External mode use only.		
26	nviRMTGasType	SNVT_char_ascii	3	One of the variables to be displayed on the RMT screen as part of the Remote Display function. External mode use only.		
27-29	nviRMTAlarm[3]	SNVT_lev_disc	3	One of the variables to be displayed on the RMT screen as part of the Remote Display function. External mode use only.		
30	nviRMTSubnet	SNVT_char_ascii	3	One of the variables to be displayed on the RMT screen as part of the Remote Display function. External mode use only.		
31	nviRMTNodelD	SNVT_char_ascii	3	One of the variables to be displayed on the RMT screen as part of the Remote Display function. External mode use only		
32	nviRMTCalDate	SNVT_time_stamp	3	One of the variables to be displayed on the RMT screen as part of the Remote Display function. External mode use only		
33	nviLCDBackLt	SNVT_lev_disc		Remotely controls the backlight. ST_OFF = OFF ST_ON = ON		
34	nciLCDMode	SNVT_state	4	bit 0 backlight turns ON on any IR cmd bit 1 backlight flashes on new alarm bit 2 backlight default to ON bit 3 disable nviLCDBackLt bit 4-14 (reserved) bit 15 enables active polling (External mode only)		
16	nvoGroupSize	SNVT_count		Total number of nodes bound to nviAlarm[]		
17	nvoGroupNumber	SNVT_count		For Local Mode only. Valid value is 1 5. Default = 0		
19-21	nciNumNodes[3]	SNVT_char_ascii	5	nciNumNodes[1] represents the total number of sensors bound and polled in External mode; nciNumNodes[0] and nciNumNodes[2] are reserved for Local mode use only.		

Table 5-2. Other Network Variables				
	VARIABLE NAMES	FORMAT	SEE NOTE	COMMENTS
35	nciPollT	SNVT_elapsed_ tm	4	Time interval between polling (in seconds), if enabled. Default = 2 seconds for Wired Units, 10 seconds for Wireless Units.
36	nviOpStatus	op_status_t	1	Used to bind variable nv_op_status from Ultima with Digital Output Gas Monitor. Only nv_op_status.error bit is monitored.

Restrictions and Rules

Note 1: Mandatory Bound Network Variables from Network Ultima Gas Monitor

For the Network Ultima Display module to properly operate and display on-screen information, the module must contain the variable binding from each of the Network Ultima Gas Monitor (NUGM) modules (TABLE 5-3):

Table 5-3. Mandatory Bound Network Variables from Network Ultima Gas Monitor					
HUB (SC	HUB (SOURCES) TARGET (DESTINATION)				
DEVICES	NV	DEVICE	NV		
NUGMs (S1S8)	nv_alarm_state_1	NUD	nviAlarm[0]		
NUGMs (S1S8)	nv_alarm_state_2	NUD	nviAlarm[1]		
NUGMs (S1S8)	nv_alarm_state_3	NUD	nviAlarm[2]		
NUGMs (S1S8)	nvoValue	NUD	nviValue		
NUGMs (S1S8)	nv_prev_cal_date	NUD	nviCalDate		
NUGMs (S1S8)	nv_op_status	NUD	nviOpStatus		

Up to eight Network Ultima Gas Monitor modules can be bound to the network variables of the Network Ultima Display module (TABLE 5-3). In this configuration, any error status generated at the Network Ultima Gas Monitor will also be monitored as a fault condition at the Network Ultima Display module.

NOTES: The network variable containing gas type information from the Network Ultima Gas Monitor is polled by the Network Ultima Display module; therefore, it does not need to be bound.

The total number of Network Ultima Gas Monitor modules that are bound to the Network Ultima Display module must be programmed and stored in the non-volatile configuration network variable nciNumNodes[1].

Note 2: Optional Bound Variables

Three Network Ultima Display (NUD) network variables:

- nviAlmReset
- nvoAlmAck and

• nvoTroubleFb

may be bound to Network Ultima Gas Monitor (NUGM) and/or Network Ultima Relay (NUR) modules, depending on the application requirements. TABLE 5-4 describes the use of bound variables between various devices.

Table 5-4. Optional Bound Variables				
HUB (HUB (SOURCES) TARGET (DESTINATION)		PURPOSE	
DEVICE	NV	DEVICE	NV	
NUD	nvoAlmAck	NUGM	nviAlmAck	Allows user to remotely acknowledge Network Ultima Gas Monitor's latched alarm(s) by using the Controller or the Calibrator, or by pressing the Alarm Reset push-button at the Network Ultima Display location.
NUD	nvoAlmAck	NUR	nviAlmReset	Allows user to remotely reset Network Relay module's alarm relays by using the Controller or the Calibrator, or by pressing the Alarm Reset push-button at the Network Ultima Display location.
NUR	nvoAlmAck	NUD	nviAlmReset	Allows user to remotely reset Network Display module's alarming, locked screen by using the Controller or the Calibrator, or by pressing the Alarm Reset push-button at the Network Ultima Relay location.
NUD	nvoTroubleFb	NUR	nviAlarm[x]	Network Ultima Relay monitors the Network Ultima Display's Trouble Fault condition and activates its relay when a fault condition occurs.

• Refer to the Instruction Manuals for Network Ultima Gas Monitor and Network Ultima Relay for more information on their network variables.

Note 3:Remote Display Function

The Data Center computer must be set up to:

- retrieve the data from the remote Network Ultima Gas Monitor module
- periodically relay the data to the Network Ultima Display module.

Before the Network Ultima Display can activate the remote display screen, these network variables must be initialized in the following order:

- nviRMTSubnet (acts as a screen switch, together with nviRMTNodeID)
- nviRMTNodeID (acts as a screen switch, together with nviRMTSubnet)
- nviRMTAlarm[0]
- nviRMTAlarm[1]
- nviRMTAlarm[2]
- nviRMTValue
- nviRMTGasType
- nviRMTCalDate.

Once the Remote Display screen is active, any of the above variables [except for switch variables (nviRMTSubnet and nviRMTNodeID)] may be sent in any order, or as needed when it changes.

The nviRMTSubnet and nviRMTNodeID variables represent the address information for the remote Network Ultima Gas Monitor module.

- When any of their values are changed, it acts as a signal to switch the remote display screen to show information from a different remote Network Ultima Gas Monitor module.
- Until the process of the Data Center sending information from a different remote unit is complete:
 - information from the previous remote Network Ultima Gas Monitor module remains on the display screen.
 - This makes it possible for the Network Ultima Display module to display information from multiple remote Network Ultima Gas Monitor modules simultaneously being monitored by the Data Center computer.

• To refresh the screen with information from different remote Network Ultima Gas Monitor modules, the Data Center computer must be set up to periodically update all of the above variables in the correct order.

Note 4: Optional Polling Feature

- By default, if the Network Ultima Display module detects missing heartbeats from the Network Ultima Gas Monitor modules after a period of time (as set by nciMaxRecT variable), it will generate a fault condition.
- In addition to heartbeat detect, the Network Ultima Display module may also be configured to actively poll the Network Ultima Gas Monitor modules in order to detect a loss of communication. Configuration network variables nciLCDMode (bit 15) and nciPolIT must be set accordingly to enable this polling feature.

The collective number of the active polling devices in the system create a considerable amount of additional network traffic, which may cause unforeseeable detrimental effect to the performance of the system as a whole in detecting critical alarm conditions. As a general rule, no more than three (3) active polling devices are allowed in a system or in each sub-system group of a multi-group system. Extra care, thorough fine-tuning and functional verification of the network system performance must be performed by a qualified network application engineer, should additional active polling devices be required in the system. Failure to comply with this warning can result in interruption of signal.

Note 5: Mandatory Assignment of nciNumNodes[1]

- To create a system using an External mode, pc and network tool software, the user must assign a value to nciNumNodes[1]. The configuration network variable nciNumNodes[1] must be set to a non-zero integer number, equal to the total number of the Network Ultima Gas Monitor modules that are bound to (and polled by) the Network Ultima Display.
- If the value is left at zero or set to a number smaller than the actual total number of bound Network Gas Monitor units, the Network Display will use its internal counter to detect failed units. As a backup, this RAM-based counter is maintained and incremented during runtime solely based on the total number of the unique addresses of the Network Ultima Gas Monitor units that the Network Display receives. The Network Display, with its



heartbeat detection scheme, will then be able to detect failed NUGM unit based on the larger value of the two variables, provided that ALL units successfully send their initial alarm states after power-up. On the other hand, if these bound NUGM units that are not accounted for in nciNumNodes[1] value shall fail and have not send any messages since the initial power-up of the Network Display, the Network Display will not be able to detect them as missing and failed units. Thus, it is critical to set the nciNumNodes[1] value, accordingly.

NOTE: While nciNumNodes[] is of SNVT_char_ascii format, the value assigned to nciNumNodes[1] must be an integer number represented in hexadecimal, not in character string. In External mode, when there are eight (8) Network Ultima Gas Monitor units bound to Network Ultima Display, for example, one must assign a value of 8 in decimal to nciNumNodes[1], not a character '8' which has an ASCII code value of 38 in hexadecimal (or 56 in decimal).

Chapter 6, Specifications

Chapter 6 Specifications

Table 6-1. Performance Specifications		
TEMPERATURE RANGE	-20 to +50°C (-4 to +122°F)	
HUMIDITY	15 to 95% RH, non-condensing	
HAZARDOUS AREA RATING	EXPLOSION-PROOF MODELS	Class I, Div. 1, Groups B, C &D
	7-30 VDC	160 mA at 7 VDC
POWER INPUT	(WIRED UNITS)	35 mA at 30 VDC
	7-30 VDC	280 mA at 7 VDC
	(WIRELESS UNITS)	160 mA at 12 VDC
		90 mA at 24 VDC
RELAYS	FAULT (NORMALLY ENERGIZED)	SPDT (Single pole, double throw)
RELAY RATINGS	AT 110 VOLTS AC NON-INDUCTIVE	5 Amps
	AT 30 VOLTS DC, NON-INDUCTIVE	5 Amps
	SIZE (WIRED UNITS)	9 x 6 x 5 inches (228.5 x 152.4 x 127 cm)
PHYSICAL	SIZE (WIRELESS UNITS)	18" long x 5.750" wide x 5.375" high (457.2 mm x 146.05 mm x 136.525 mm)
	WEIGHT (WIRED UNITS)	4.5 pounds (2.041 kilograms)
	WEIGHT (WIRELESS UNITS)	9.14 pounds (4.15 kilograms)

Chapter 7 Maintenance

Under normal operating conditions, the Network Ultima Display Module requires no maintenance. However, periodical testing of the relays may be done to ensure that complete system operation is possible.

Troubleshooting Guidelines

SYMPTOMS	POSSIBLE CAUSES	CORRECTIVE ACTION
Alarms do not activate	Ultima alarms not enabled or communication lost	 Enable alarms at the Network Ultima Gas Monitor
		2. Check wiring
		3. Check power supply
		4. Check antenna & location
No communication between the Network Ultima Display Module and Ultima Gas Monitor	Faulty wiring or lack of power	 Check wiring between the Network Ultima Gas Monitor and the Network Ultima Display Module
		2. Check power wiring or power supply
		 Check wiring within the Network Ultima Display Module
		4. Check antenna & location
YELLOW FAULT ON	Communication lost	1. Check network communication
		 Check the display for Network Ultima Gas Monitor module(s) that are in fault
		 Check the Network Ultima Gas Monitor module(s) for error condition
		4. Check antenna & location
RED FAULT Steady ON	Memory interrupted	1. Consult factory
RED FAULT flashing	Improper configuration	 If set for External mode, reconfigure unit using a PC
		2. If set for Local mode, consult factory

Chapter 5, Maintenance

SYMPTOMS	POSSIBLE CAUSES	CORRECTIVE ACTION
YELLOW STATUS steady ON or flashing	Stuck in Auto-Configure mode	1. Check the RESET push-button
	RESET push-button switch may be shorted	switch. It may be shorted. (applicable to Local mode only)
Error condition(s) at the Network Ultima Gas Monitor does not generate FAULT condition at the Network Display	Incomplete binding. NviOpStatus network variable is not bound properly	 Check binding parameters using a PC (applicable to External mode only)

Obtaining Replacement Parts

To obtain replacement parts, address the order or inquiry to:

Mine Safety Appliances Company Instrument Division P.O. Box 427, Pittsburgh, PA 15230-0427

or call toll-free: 1-800-MSA-INST

Table 7-1. Replacement Parts	
PART	PART NO.
Processor (bottom) PC Board	10011289
Display (top) PC Board	10010844
Wireless Repl	acement Parts
Antenna with Grip Kit	10046422
Printed circuit Board Assembly, Lonworks INTFC Display RF	10043297
Printed circuit Board Assembly, Ultima Wireless with Modem	10041737

Ultima RF Module Antenna Replacement

- 1. Remove the cover from the stainless steel enclosure.
- 2. Remove two screws from the top printed circuit board assembly.
- 3. Top Circuit Board(s) Removal
 - **NOTE:** Note orientation of all printed circuit boards and connectors for proper re-assembly of unit.
 - a. Sensor Module:

The top two printed circuit boards are connected together and plugged into a third (termination) board; pull and remove all boards together.

- b. **Display/Relay Module:** Remove the top printed circuit board by unplugging it from the second (network) board
- 4. Removing the Next Printed circuit board from the Mounting Plate:
 - a. **Sensor Module:** Remove the two mounting screws holding the termination board to the metal mounting plate; do not remove the metal standoffs from the termination board.
 - b. **Display/Relay Module:** Remove the network board from the mounting plate by removing the two metal standoffs.
- 5. Unplug the antenna MMCX connector from the modem by pulling upwards.
- 6. Loosen the antenna grip and remove the antenna.
- 7. Replace the antenna grip with the new grip from the replacement kit.
- 8. Insert the new antenna into the grip and tighten with six inches of antenna extending from the grip.
- 9. Plug the antenna into the modem; be careful to route the antenna cable as shown in FIGURE 7-1.
- 10. Re-assemble the termination/network board to the mounting plate; be sure to plug in any connectors that were disconnected.
- 11. Re-assemble the top board assembly by plugging it in and fastening with the proper screws.

Chapter 5, Maintenance



Figure 7-1. Routing the Antenna Cable



Appendix A Modes and User Interface

Normal Run-time Mode Screens

(FIGURE A-1) POWER-UP Screen:

- Shows either "EXTERNAL MODE" or "LOCAL MODE."
- Held ON until initial power-up procedure is complete.
- Messages may be flashed on screen.

(FIGURE A-2) NORMAL, SCANNED Display Screen:

- Shows "SUBNET" for External mode, or "GROUP" for Local mode.
- Held ON for five seconds before displaying the next screen.
- Repeated ADDRESS commands issued using the Controller to page the screen to the next pages.

(FIGURE A-3) ALARMING Display Screen:

- Screen is locked until unlocked by one of the following:
 - using the Controller ZERO command
 - pressing the RESET push-button
 - using network command.
- Backlight LED is flashing until unlocked.
- Once unlocked, if another sensor is also in alarm condition, the screen jumps to that sensor's page.



Figure A-1. POWER-UP Screen



Figure A-2. NORMAL, SCANNED **Display Screen**



Figure A-3. ALARMING Display Screen

Appendix A, Display Modes and User Interface

(FIGURE A-4) SCREEN LOCKED Display Screen

- Enters this screen from NORMAL, SCANNED Display Screen when CALIBRATE command is issued using the Controller.
- Screen is manually locked until unlocked by one of the following:
 - a new alarm condition from any of the bound Network Ultima Gas Monitor modules
 - ADDRESS command issued using the Controller to unlock screen and resume automatic paging.

matic paging.



LEL

(FIGURE A-5) FAULT Display Screen: Figure A-4. SCREEN LOCKED Display screen

- In addition to the FAULT LED, this screen shows specifically which Network Ultima Gas Monitor is in fault.
- This screen retains the last reading.
- The Fault condition may be caused by any of these conditions:
 - Network cable breakage
 - communication loss to the module
 - error condition exists on the module
 - loss of power to the module.

(FIGURE A-6) UN-BOUND Display Screen:

• Displayed only when there is no sensor bound to the Network Ultima Display module.



Figure A-5. FAULT Display Screen



Figure A-6. UN-BOUND Display Screen

GROUP

1

(FIGURE A-7) WINK Display Screen:

- "WINKED" message is displayed for 10 seconds to indicate that the Data Center is sending a "wink" command.
- backlight is flashing.

(FIGURE A-8) SEND ADDRESS ID Display Screen:

 Neuron ID for this Network Display unit is sent out on the network when the Calibrator ADDRESS key is pressed for the first time. (See NORMAL, SCANNED Display Screen for responses upon consecutive ADDRESS commands.)

ADDR: 7 WINKED Figure A-7. WINK Display Screen

L /. LEL



Configuration Mode Screens

(FIGURE A-9) CONFIGURE MAIN MENU screen

Figure A-8. SEND ADDRESS ID Display Screen

- Enters this screen when CALIBRATE command is pressed three times from the NORMAL, SCANNED Display Screen.
- Shows the group members of four sensors (4S) and three relay modules (3R).
- Shows the cursor ">" on the menu option.
- Upon receiving the Controller or Calibrator ZERO command, moves the cursor to the next option.
- Upon receiving the Controller or Calibrator CALIBRATE command, executes the option.
- Automatically exits out of this screen if idle for 30 minutes.



Figure A-9. CONFIGURE MAIN MENU screen

Appendix A, Display Modes and User Interface

(FIGURE A-10) WAITING FOR ADDRESS screen

- Enters this screen when "INSTALL MEMBER" option is selected from CONFIGURE MAIN MENU screen.
- Waiting to receive neuron ID sent by member that is to be installed. This occurs when user presses the SEND ID push-button or issues a Controller or Calibrator ADDRESS command at that member's site.

INSTALLING MEMBER:	
>EXIT	
PRESS SEND ID	
BUTTON OR ISSUE	
ADDR IR CMD AT	
MEMBER LOCATION	
STATUS: READY	

Figure A-10. WAITING FOR ADDRESS screen

• Upon receiving a Controller or Calibrator CALIBRATE command, cancels the option.

(FIGURE A-11) INSTALLING Screen

- Enters this screen from the WAITING FOR ADDRESS screen, when a neuron ID is received.
- Displays "INSTALLING" status while installing a new member.
- Upon receiving a Controller or Calibrator CALIBRATE command, cancels and exits to the CONFIGURE MAIN MENU screen.

(FIGURE A-12) FAILED INSTALLING Screen

- Displays "FAILED" status when the installation of the new member fails.
- Upon receiving a Controller or Calibrator CALIBRATE command, exits to the CONFIGURE MAIN MENU screen.

INSTALLING MEMBER: >EXIT PRESS SEND ID BUTTON OR ISSUE ADDR IR CMD AT MEMBER LOCATION STATUS: INSTALLING

Figure A-11. INSTALLING Screen

INSTALLING MEMBER:	
>EXIT	
PRESS SEND ID	
BUTTON OR ISSUE	
ADDR IR CMD AT	
MEMBER LOCATION	
STATUS: FAILED	

	Figure A-12.
FAILED	INSTALLING Screen

(FIGURE A-13) COMPLETED Screen

- The member installation procedure is complete and the new member is installed.
- Upon receiving a Controller or Calibrator CALIBRATE command, exits to the CONFIGURE MAIN MENU screen.
- Within seconds, the screen reverts to the WAITING FOR ADDRESS screen, ready to install the next member.

INSTALLING MEMBER:
>EXIT
PRESS SEND ID
BUTTON OR ISSUE
ADDR IR CMD AT
MEMBER LOCATION
STATUS: COMPLETED

Figure A-13. COMPLETED Screen

(FIGURE A-14) CLEAR ALL Screen

- Enters this screen when "CLEAR ALL" option is selected from CONFIGURE MAIN MENU screen.
- Upon receiving a Controller or Calibrator ZERO command, moves the cursor to the next option.
- Upon receiving a Controller or Calibrator CALIBRATE command, executes the option.

(FIGURE A-15) CLEARING Screen

- Displays "CLEARING" status while initiating its database.
- If the Network Ultima Display module was previously configured with members, it will try to communicate and initialize the members before clearing its internal configuration information.



Figure A-15. CLEARING Screen

A-5

CLEAR ALL: >EXIT PROCEED STATUS: READY

Figure A-14. CLEAR ALL Screen Appendix A, Display Modes and User Interface

GREEN Status Indicator

- During normal operation, the GREEN Status Indicator flashes to indicate communication between the Network Ultima Gas Monitor and the Network Ultima Display module.
- If this flashing does not occur, see Chapter 7, Maintenance -"Troubleshooting Guidelines" for possible solutions.

YELLOW Status Indicator

- The YELLOW Status Indicator is either flashing or steady ON to indicate that the module is in Configure Mode of the Local mode operation.
- Flashing YELLOW Status Indicator indicates that the group contains no member.

YELLOW Fault Indicator STEADY ON

- The YELLOW Fault Indicator STEADY ON indicates a fault condition caused by any of the following conditions that exist on at least one or more Network Ultima Gas Monitor modules being monitored:
 - communication loss to the module(s)
 - Network cable breakage between the Network Ultima Display and any of the Network Ultima Gas Monitor modules
 - Error condition exists on any of the Network Ultima Gas Monitor modules
 - loss of power to any of the Network Ultima Gas Monitor modules
- Fault relay is de-energized.
- The display will show the specific modules that are in fault; see Chapter 7, Maintenance "Troubleshooting Guidelines" for possible solutions.

YELLOW Fault Indicator FLASHING

- YELLOW Fault Indicator FLASHING indicates:
 - Fault condition is acknowledged
 - Fault relay is reset.

Appendix A, Display Modes and User Interface

RED Fault Indicator STEADY ON or FLASHING

- RED Fault Indicator STEADY ON or FLASHING indicates:
 - Internal memory problem
 - unconfigured unit
 - inoperative unit.