



# Ultima<sup>®</sup> Relay Module

instruction manual

## WARNING

**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 1-412-967-3228.

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

(L) Rev 2

814935

## 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.

# Chapter 1

## General Information

This manual describes the Ultima Relay Module. The Ultima Relay Module is designed to enable the Ultima Gas Monitor to control other equipment via the Ultima Relay Module's internal relays. The Ultima Relay Module must be used with the Ultima Gas Monitor.

There are four relays inside this module: three alarm relays and one trouble relay. These relays activate upon a command from the Ultima Gas Monitor. When the Monitor detects an alarm condition, it directs the Ultima Relay Module to activate the appropriate relay. Similarly, if a fault condition is detected, the Trouble or Fault Relay is activated.

The 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.

All Ultima Relay 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 local codes and practices.

### Unpacking Your Unit

Upon receipt, ensure that your package contains:

- Ultima Relay Module (P/N 813703 - See FIGURE 1-1)
- Ultima Relay Module Instruction Manual (P/N 814935)

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

### Identifying Your Unit

The label on the outside of the shipping carton identifies the module. Look on the label to verify that the unit you have is correct. If it is not correct, contact MSA.

The Ultima Relay Module can only operate with an Ultima Gas Monitor revision 1.5 and Ultima Controller revision 1.5 or above. The revision number can be verified when power is applied to the Controller and the Ultima Gas Monitor. The relays however, can interface with any type of equipment that accepts a dry contact.

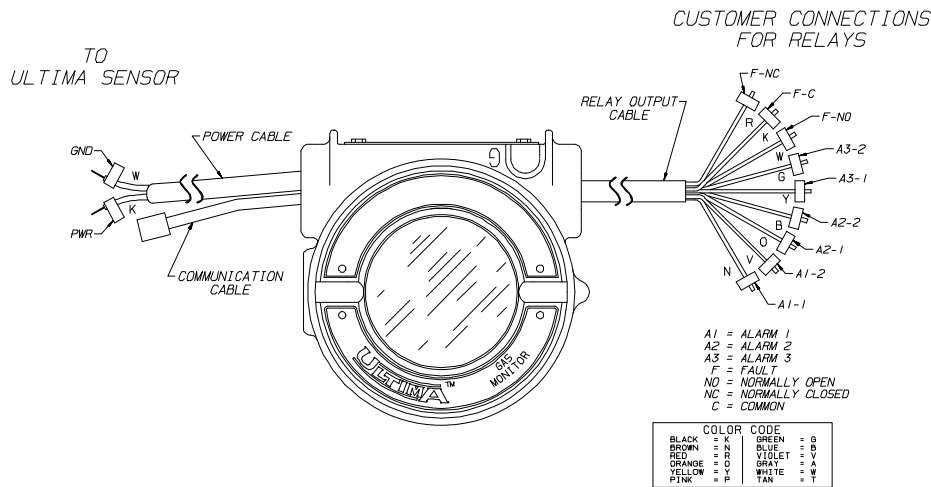


Figure 1-1.  
Ultima Relay Module

## Mounting Your Ultima Gas Monitor and Ultima Relay Module

The Ultima Gas Monitor and Ultima Relay Module must be mounted together, within 18 inches of one another. Generally, the Ultima Gas Monitor with Ultima Relay Module should be mounted close to the area where a leak or gas is expected. Follow the mounting procedures listed in your Ultima Gas Monitor Instruction Manual (P/N 813161). The Ultima Relay Module must be mounted to the right of the Ultima Gas Monitor (FIGURE 1-2). The Ultima Relay Module cannot be mounted further than 18 inches away from the Ultima Gas Monitor.

### ⚠ CAUTION

**Maximum length of communication cable is 18" (45.7 cm); otherwise, the Ultima Relay Module will not operate properly.**

If your Ultima Gas Monitor is an explosion-proof model, the Ultima Relay Module must also be explosion-proof. The Relay 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). Follow all applicable practices and use appropriate conduit and cable glands when installing the Ultima Relay Module in a hazardous area.

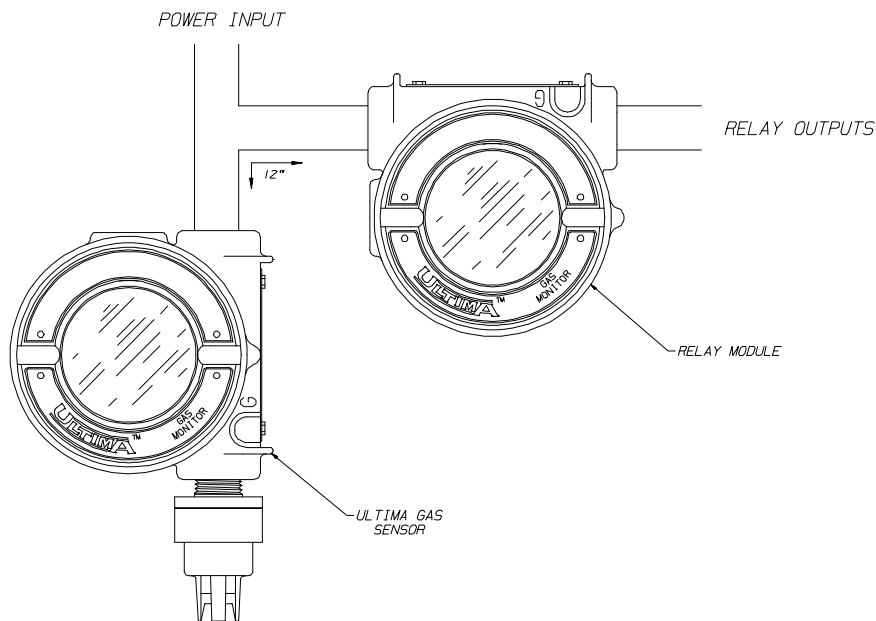


Figure 1-2.  
Typical Installation for Power and Relay Connections

### Mounting The Ultima Relay Module

Use one of the following three methods to mount the Ultima Gas Ultima Relay Module.

#### Three Mounting Methods

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

Whichever mounting method is employed, ensure that the wiring harness from the Ultima Relay Module is able to reach the Ultima Gas Monitor.

## Ultima Relay Module Electrical Connections

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

- Internal jumpers
- Potentiometers
- Dip switches or other types of adjustments

All electrical connections to the relay 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 three cables coming from the Ultima Relay Module: a power cable, a relay output cable and a communication cable.

The communication cable must be routed to the Ultima Gas Monitor, the power cable to an adequate power source, and the relay output cable to any control equipment. It is not necessary to use the provided power or relay cable. If your installation requirements need a direct connection, the Ultima Relay Module can be opened and wired directly. The provided communication cable must be used.

### WARNING

**Maximum length of communication cable is 18" (45.7 cm); otherwise, the Ultima Relay Module will not operate properly.**

### Installing the Communication Cable

To install the communication cable to the Ultima Gas Monitor:

1. Unscrew the Ultima Gas Monitor cover and set it aside.

### WARNING

**Before removing the cover of an explosion-proof Ultima Gas Monitor, 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 Ultima Gas Monitor.
3. Remove the two boards sandwiched together from the Ultima Gas Monitor.

4. Route the communication cable through the port of the Ultima Gas Monitor (see FIGURE 1-2).
5. Install the communication cable to its mate on the bottom printed circuit board of the Ultima Gas Monitor.
6. Re-install the two boards removed above.
7. Re-install the two screws to secure the two boards within the Ultima Gas Monitor. Do not overtighten screws.
8. Install the cover of the Ultima Gas Monitor.

**⚠ CAUTION**

**Do not let the cover remain off of an explosion-proof Ultima Gas Monitor. 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.**

### Installing the Power Connection

The power cable has two conductors within it. The Ultima Relay Module must be connected to a DC source between 7 and 30 VDC. Refer to FIGURE 1-1 for conductor identification.

If the Ultima Gas Monitor is powered from a power supply or MSA Instrumentation, it is possible to wire the Ultima Relay Module in parallel with the Ultima Gas Monitor.

If the Ultima Gas Monitor is a two-wire connection, a separate power supply will be necessary to operate the Ultima Relay Module. FIGURE 1-2 gives a typical installation diagram.

### Relay Connections

There are four relays within the Ultima Gas Monitor: three alarm relays and one fault relay. The alarm relays are single pole, single throw (SPST) type, while the fault relay is a single pole, double throw (SPDT) type.

If an inductive load such as a solenoid or motor is to be controlled, a surge suppression device may be needed. When such loads are switched, contact sparking and electro-magnetic interference may be generated. This can shorten relay contact life and possibly create noise problems within the Ultima enclosure.

To avoid such problems, it is recommended to install a \*Quencharc<sup>®</sup> across the contacts or load. This device is available from MSA as P/N 630413.

\* Registered trademark of ITW Paktron

When using the wiring harness provided with the module, refer to FIGURE 1-1 for relay connection. TABLE 1-1 lists the color of the wire and the associated relay function.

Table 1-1. Wire Color and Associated Relay		
WIRE COLOR	RELAY	TERMINAL BLOCK CONNECTIONS
N - BROWN	ALARM 1	TB1-1
V - VIOLET	ALARM 1	TB1-2
O - ORANGE	ALARM 2	TB2-1
B - BLUE	ALARM 2	TB2-2
Y - YELLOW	ALARM 3	TB3-1
G - GREEN	ALARM 3	TB3-2
W - WHITE	FAULT - NORMALLY OPEN	TB4-1
K - BLACK	FAULT - COMMON	TB4-2
R - RED	FAULT - NORMALLY CLOSED	TB4-3

If the wiring harness is not used, the Ultima Relay Module must be disassembled for wiring. The following procedure must be performed:

1. Unscrew the Ultima Relay Module cover and place it aside.

**⚠ WARNING**

**Before removing the cover of an explosion-proof Ultima Gas Monitor, 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 three screws securing the front printed circuit board assembly and remove the printed circuit board.
3. The relay connections are made via one of the four terminal blocks labeled TB1, TB2, TB3, TB4 (FIGURE 1-3). TABLE 1-1 lists the relay connections provided by each terminal block.
4. 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 relay functions necessary and route the new cable through the opening of the Ultima Relay Module to the wiring terminal blocks. Install the wires as

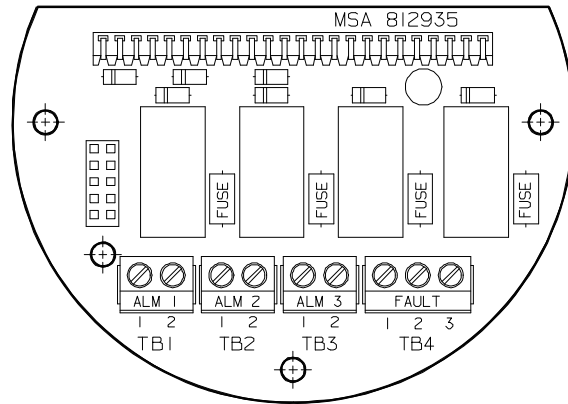


Figure 1-3.  
Terminal Block Locations

appropriate. Identification of each wire will help in the testing of the functions of these relays.

6. 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.

**⚠ WARNING**

**Do not let the cover remain off of an explosion-proof Ultima Relay 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.**

### Installing the Optional RESET Pushbutton

**General**

The optional RESET pushbutton is used to locally (at the sensor location) reset or deactivate any alarm relays. This may silence any alarm horns or turn off any type of equipment connected to the relays of the Ultima Relay Module. For a complete description of operation of the RESET pushbutton, see Chapter 2.

### **Selection of the RESET Button**

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

**⚠ WARNING**

**Do not install a pushbutton 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 pushbutton 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 1-2 lists several sources of pushbuttons; you may select one listed or obtain one from an alternative supplier.

<b>Table 1-2. RESET Pushbutton Vendors</b>		
<b>VENDOR NAME</b>	<b>CATALOG NUMBER</b>	<b>DESCRIPTION</b>
Appleton Electric Co.	EFDB175-U1	Explosion-proof pushbutton
Crouse Hinds, Inc.	NCS2110	General-purpose pushbutton

### **Installing the Optional RESET Pushbutton**

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

1. Unscrew the Ultima Relay Module cover and place it aside.

**⚠ WARNING**

**Before removing the cover on an explosion-proof Ultima Relay 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 three screws securing the front printed circuit board assembly and remove the printed circuit board.

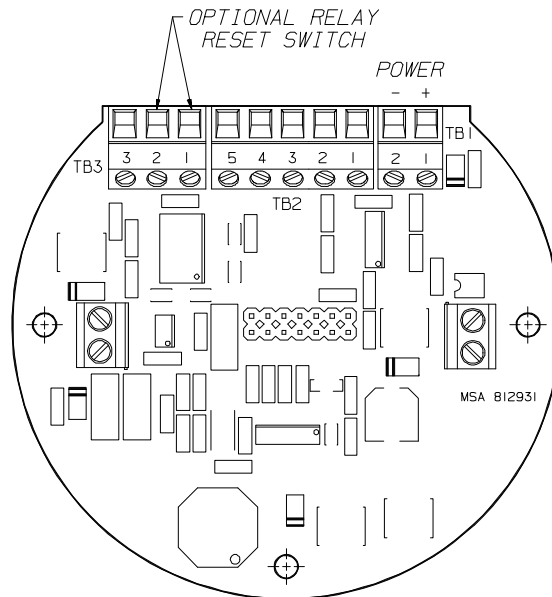


Figure 1-4.  
Installing Optional Reset Push Button

3. The RESET pushbutton wiring connection is made via terminal block TB3, positions 1 and 2 (FIGURE 1-4). Route the pushbutton wires through the opening of the relay module to terminal block TB3.
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.

**⚠ WARNING**

**Do not let the cover remain off of an explosion-proof Ultima Relay 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 Start-up

## General Description

Once the relays within the Ultima Relay Module are configured, they will activate when an alarm condition is detected at the Ultima Gas Monitor. Similarly, the trouble relay will de-energize when a trouble condition is detected.

The alarms are disabled at the factory; to enable or configure the alarms, you need the Ultima Controller (P/N 809086). The Ultima Controller will configure the relays via the Ultima Gas Monitor.

The Trouble relay is configured normally energized; this is common practice so the relay will de-activate into a fail-safe condition if a trouble or power outage occurs.

Apply power to the Ultima Gas Monitor and the Ultima Relay Module. Refer to the Ultima Gas Monitor Instruction Manual (P/N 813161) for an explanation of the Ultima Gas Monitor initial response.

Refer to the Ultima Controller instruction manual (P/N 813379) for complete configuration information.

## Front Panel Description

The front panel is shown in FIGURE 2-1.

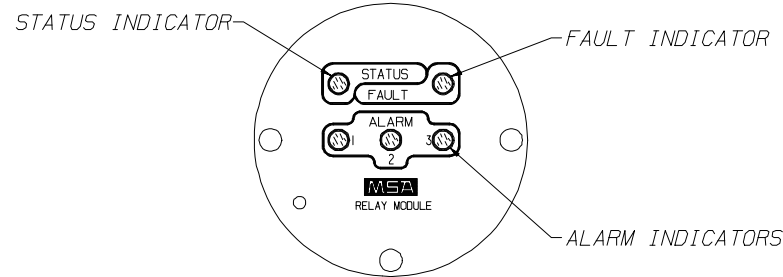


Figure 2-1.  
Front Panel

### **Status Indicator**

During normal operation, the Status Indicator will flash between green and red to indicate that communication is present between the Ultima Gas Monitor and the Ultima Relay Module. If this flashing does not occur, refer to the Chapter 4, Maintenance "Troubleshooting Guidelines" in this manual for possible solutions.

### **Fault Indicator**

The Fault Indicator will remain ON or flash, depending on the particular fault detected.

#### ***Fault Indicator STEADY ON indicates:***

- Ultima Relay Module losing communication with the Ultima Gas Monitor for longer than two minutes *or*
- Ultima sensor is not connected properly *or*
- Ultima Gas Monitor internal fault *or*
- An inoperative relay

#### ***Fault Indicator PULSED (once/minute) indicates:***

- Improper calibration of the Ultima Gas Monitor *or*
- Multiplex Ultima Gas Monitor with address not set properly *or*
- Ultima Gas Monitor CAL displayed (see the Ultima Gas Monitor instruction manual - P/N 813161)

### **Alarms 1, 2, 3**

These LEDs will illuminate when the Ultima Gas Monitor detects an alarm condition. These indicators will remain on as long as the gas condition exceeds the value set within the Ultima Gas Monitor. Depending on the relay latch mode of the Ultima Gas Monitor, the indicators may remain ON or turn OFF when the gas condition abates.

### **Optional Reset Pushbutton**

A RESET button is an optional feature to allow latching relays to be reset. Latching relays can be configured on the Ultima Monitor via the Ultima Controller. Refer to the Ultima Controller manual for explicit instructions.

In a latching configuration: when the RESET button is pushed and an alarm is latched, all alarm indicators will de-activate for 15 seconds. After 15 seconds, alarm indicators will be reactivated if an alarm condition still exists. If the alarm condition has abated and the RESET button is pushed, the alarm indicators will turn OFF.

**In a non-latching configuration:** the RESET button has no effect on the alarms.

# Chapter 3

## Specifications

<b>Table 3-1. Performance Specifications</b>		
<b>TEMPERATURE RANGE</b>	-20 to +50°C (-4 to +122°F)	
<b>HUMIDITY</b>	15 to 95% RH, non-condensing	
<b>HAZARDOUS AREA RATING</b>	EXPLOSION-PROOF MODELS	Class I, Div. 1, Groups B, C & D
<b>POWER INPUT</b>	7-30 VDC	
<b>RELAYS</b>	ALARMS (3 TOTAL, 1 PER ALARM)	SPST (Single pole, single throw)
	FAULT (NORMALLY ENERGIZED)	SPDT (Single pole, double throw)
<b>RELAY RATINGS</b>	AT 110 VOLTS AC OR DC, NON-INDUCTIVE	.6 A
	AT 30 VOLTS DC, NON-INDUCTIVE	2 A
<b>PHYSICAL</b>	SIZE	9 x 6 x 5 inches (228.5 x 152.4 x 127 cm)
	WEIGHT	4.5 pounds (2.041 kilograms)

## Chapter 4 Maintenance

Under normal operating conditions, the Ultima Relay 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.	1. Enable alarms at the Ultima Gas Monitor.
		2. Check wiring.
		3. Check power supply.
No communication between the relay module and Ultima Gas Monitor.	Faulty wiring or lack of power.	1. Check wiring between Ultima Gas Monitor and relay module.
		2. Check power wiring or power supply.
		3. Check wiring within the Ultima Gas Monitor Relay Module.

### 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**

PART	PART NO.
Relay Board (PCB)	812935
Power Supply Board (PCB)	812931
Processor Board (PCB)	812933

