MSA
The Safety Company

Operating Manual

ULTIMA® X
Gas Monitors with X³ ™ Technology

Addendum

Order No.: 10082867/00

MSA AUER GmbH
D-12059 Berlin
Thiemannstrasse 1

Germany

Declaration of conformity

Manufactured by: Mine Safety Appliances Company
1000 Cranberry Woods Drive
Cranberry Township, PA 16066 USA

The manufacturer or the European Authorized Representative:

MSA AUER GmbH, Thiemannstraße 1, D-12059 Berlin

declares that the product: **MSA ULTIMA® XE / X$^{3\ TM}$**

based on the EC-Type Examination Certificate:

DMT 02 ATEX E 202 X

complies with the ATEX directive 94/9/EC, Annex III. Quality Assurance Notification complying with Annex IV of the ATEX Directive 94/9/EC has been issued by INERIS of France, Notified Body number: 0080 .

The product is in conformance with the EMC directive 89/336/EC, changed by Directive 91/263/EC, 92/31/EC, 93/68/EC, with the following harmonized norms or normative documentation:

EN 50 270 Type 2* EN 61 000 - 6 - 3

* EN 61000-4-6: occasional transmission error can appear.
A fault check has to be used at the receiver unit.

We further declare that the product complies with the provisions of LVD Directive 73/23/EC as amended by Directives 93/68/EC, with the following harmonized norms or normative documentation:

EN 61 010

Dr. A. Schubert

MSA AUER GmbH
Dr. Axel Schubert
R & D Instruments

Berlin, February 2007

Marking, Certificates and Approvals according to the Directive 94/9/EC (ATEX).

Manufacturer:	Mine Safety Appliances Company 1000 Cranberry Woods Drive Cranberry Township, PA 16066 USA
Product:	ULTIMA® XE / X^3 ™
Type of protection:	EN 50 014, EN 50 018
Performance:	none
	ULTIMA XE/ X^3 MAIN: UB = 19V - 30V, Int.Relais + LEDs, Digital I/O = 0-5V ,3- wire, (GND, Signal+ , Signal -)
Marking:	**ULTIMA® XE / X^3 ™**
	II 2G EEx d IIC T5 -40°C ≤ Ta ≤ +60°C
Sensors:	ULTIMA XE, ULTIMA XIR: unchanged Maximum 1x ULTIMA XIR and 2x ULTIMA XE
EC-Type Examination Certificate:	DMT 02 ATEX E 202 X
Quality Assurance Notification:	0080
Year of Manufacture:	see Label
Serial Nr.:	see Label

EMC Conformance according to the Directive 89/336/EC

EN 50 270 Typ 2* EN 61 000 - 6 - 3

* EN 61000-4-6: occasional transmission error can appear.
A fault check has to be used at the receiver unit.

Contents

1. Safety Regulations

1.1. Correct Use

This ULTIMA® X$^{3\ TM}$ manual is an Addendum to the ULTIMA X Series Operating Manual (Order No.: 10050078). When installing, commissioning, calibrating or maintaining the ULTIMA® X$^{3\ TM}$ Gas Monitor both manuals are required.

The ULTIMA® X$^{3\ TM}$ Gas Monitors are fixed gas monitors for measuring toxic and combustible gases as well as oxygen. They are suitable for outdoor and indoor applications without limitations, e.g. offshore industry, chemical and petrochemical industry, water and sewage industry. Using sensors, the instruments test the ambient air and trigger the alarm as soon as the gas exceeds a specific concentration level.

It is imperative that this operating manual be read and observed when using the ULTIMA® X$^{3\ TM}$ Gas Monitors. In particular, the safety instructions, as well as the information for the use and operation of the apparatus, must be carefully read and observed. Furthermore, the national regulations applicable in the user's country must be taken into account for a safe use.

Alternative use, or use outside this specification will be considered as non-compliance. This also applies especially to unauthorised alterations to the apparatus and to commissioning work that has not been carried out by MSA or authorised persons.

Danger!

This product is supporting life and health. Inappropriate use, maintenance or servicing may affect the function of the device and thereby seriously compromise the user’s life.

Before use the product operability must be verified. The product must not be used if the function test is unsuccessful, it is damaged, a competent servicing/maintenance has not been made, genuine MSA spare parts have not been used.

1.2. Liability information

MSA accepts no liability in cases where the product has been used inappropriately or not as intended. The selection and use of the product are the exclusive responsibility of the individual operator.

Product liability claims, warranties also as guarantees made by MSA with respect to the product are voided, if it is not used, serviced or maintained in accordance with the instructions in this manual.

1.3. Safety and Precautionary Measures to be Adopted

Attention!

The following safety instructions must be observed implicitly. Only in this way can the safety and health of the individual operators, and the correct functioning of the instrument, be guaranteed.

1. The instruments are used to detect gases or vapours in air. The concentration of gases or vapours in steam or inerted and oxygen-deficient atmospheres cannot be measured with this instrument. For oxygen deficiency measurements, use the oxygen sensor.
2. Protect the ULTIMA® X$^{3\,TM}$ Gas Monitor from extreme vibration. Do not mount the sensing head in direct sunlight as this may cause overheating of the sensor.
3. Electrochemical sensors are sealed units which contain a corrosive electrolyte. Should a sensor develop leakage, it must be immediately removed from service and disposed of properly. Caution must be exercised so that the electrolyte does not contact skin, clothing or circuitry otherwise personal injury (burns) and/or equipment damage may result.
4. To ensure the ULTIMA® X$^{3\,TM}$ Gas Monitor is operating correctly, it must be checked with a known concentration of test gas. Therefore, calibration checks must be carried out regularly as part of the routine inspection of the instrument.
5. As with all gas monitors of these types, high levels of, or long exposure to, certain compounds in the tested atmosphere could contaminate the sensor. In atmospheres were the ULTIMA® X$^{3\,TM}$ Gas Monitor may be exposed to such materials, calibration must be performed frequently to ensure that the operation is dependable and display indications are accurate.
6. The ULTIMA® X$^{3\,TM}$ Gas Monitor must not be painted. If painting is done in an area where a monitor is located, care must be exercised to ensure that paint is not deposited on the sintered metal flashback arrestor in the gas sensor inlet, if so equipped. Such paint deposits would interfere with the gas diffusion process.

2. Description

The ULTIMA® X$^{3\,TM}$ instruments are housed in a flameproof enclosure and are calibrated at the factory ready for installation.

The instrument components vary somewhat depending on the particular model. All models are provided with either ¾“ NPT or M25 x 1.5 cable entries.

2.1. General View Gas Monitor

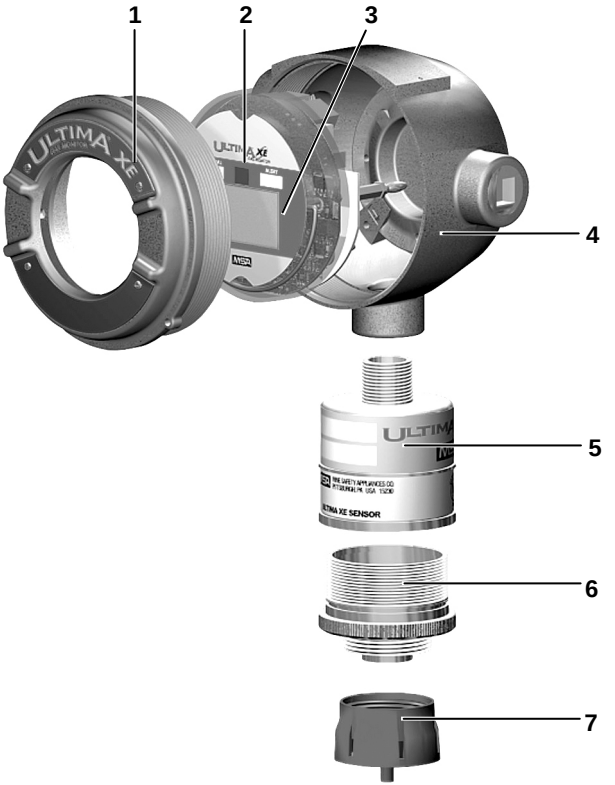


Fig. 1 ULTIMA – Gas Monitor (ULTIMA XE shown here)

1 Housing cover with viewing window

2 Sensor electronics with optional LEDs and display

3 Display

4 Housing (flameproof enclosure)

5 Sensor housing

6 Sensor module

7 Sensor Guard

2.2. Components

Display

The display cycles through each connected sensor showing the gas type, gas concentration and sensor number.

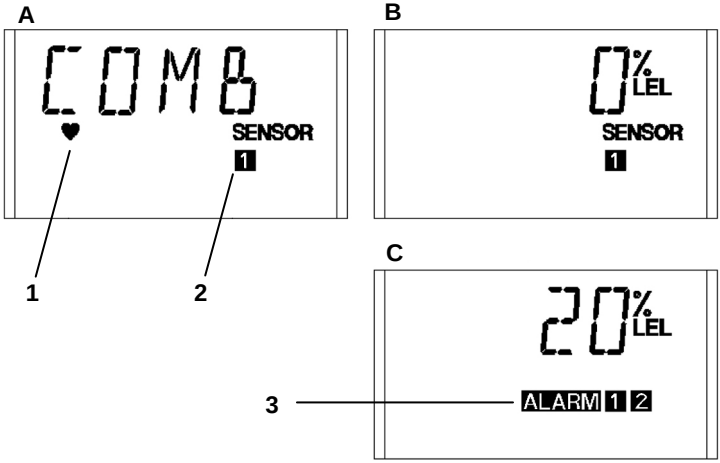


Fig. 2 Sensor Display View

A	*Gas Type Display*	*1*	*Heartbeat - acknowledges communications activity from ModBUS or IR Controller/Calibrator command*
B	*Gas Concentration Display*	*2*	*Sensor Number*
C	*Gas Concentration Display with Alarm Indication*	*3*	*Alarm Levels*

Gas alarm conditions are shown by ALARM and the corresponding number of the alarm level that is activated.

The display will latch on a gas alarm or fault condition and requires to be reset by the user to resume cycling.

If multiple conditions exist, acknowledging one condition will reveal subsequent alarm/fault conditions. Display cycling of sensors will resume when all conditions have been reset

Relays

The ULTIMA® X$^{3\ TM}$ continues to monitor for all gas alarms and faults and will activate the relays even when the display is latched/locked by a previous alarm condition. The ULTIMA® X$^{3\ TM}$ is shipped with all gas alarm relays configured for 3 alarm levels common to all sensors. Using the ULTIMA/ULTIMA X Controller (→ Section 4.1) or ModBUS command each relay can be assigned to one sensor, providing one level of alarm for each.

The relays have Single Pole Double Throw (SPDT) contacts rated at 30 V DC or 250 V AC (5 A).

The relays may be configured as:

- Normally energised/de-energised
- Increasing/decreasing level alarm
- Latching/non-latching.

Sensor

A sensors gas type, alarm levels and relay configuration are automatically recognised when connected to a ULTIMA® X$^{3\ TM}$ Gas Monitor,. When a sensor is removed, a "Sensor Missing" scrolling message is displayed; this can be corrected by:

- Reconnecting a sensor to that position or
- Manually taking the sensor 'off-line' via:
  - ULTIMA/ULTIMA X Controller, by sending a sensor disable command or
  - ModBUS command write to a control register.

A missing or unused sensor position returns a gas value of -99.9 in response to a ModBUS request for gas level value starting at address base +207.

3. Installation

ULTIMA® X$^{3\,TM}$ Gas Monitors should be installed where gas leaks are expected. The installed location depends on the density of the gas being monitored, higher for gases lighter than air and lower for gases heavier than air. The display on the front of the instrument must always be clearly visible and have an unobstructed view.

Before beginning the installation, with the help of the shipping documents and the sticker on the shipment carton, check that the delivered components are complete and correct.

3.1. Instructions for installation

- ULTIMA® X$^{3\,TM}$ Gas Monitors must be installed with the toxic, oxygen or combustible catalytic sensor inlet points downwards to avoid clogging of the gas inlet by particles or liquids. Infrared combustible gas sensors must be installed with the sensor horizontal to prevent accumulation of dirt or moisture on the optics.
- Instruments from the ULTIMA® X$^{3\,TM}$ Gas Monitors must not be painted. When painting, always make sure that no paint falls on the sensor inlet fitting. Paint deposits can prevent the gas diffusion process where gas from the atmosphere diffuses into the sensor. In addition, any solvents in the paint may activate the alarm.
- Instruments from the ULTIMA® X$^{3\,TM}$ Gas Monitors must be protected from external vibrations and direct sunlight.

For details of the instrument cabling and electrical connection (→ Appendix A-1) and the installation drawings in the ULTIMA X Series Operating Manual (Order No. 10050078).

3.2. Installation with Mounting Kit

ULTIMA® X$^{3\ TM}$ Gas Monitors are installed at the place of installation on a mounting plate.

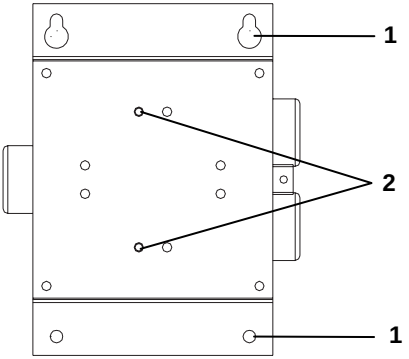


Fig. 3 Mounting plate

1 Wall mounting fixing holes

2 Instrument fixing holes

Use Ø6 x 20 mm screws and suitable plugs for attaching the mounting plate to the wall.

M6 x 20 screws will also be required for fixing the mounting plate to the ULTIMA® X$^{3\ TM}$ Gas Monitor enclosure.

When preparing the assembly, make sure that the mounting arrangement is correct for the particular instrument type.

Mount the instrument as follows:

(1) Using the mounting plate as a template, mark the holes for the four fixing screws.

(2) Drill four holes of appropriate diameter.

(3) Attach mounting plate to the Gas Monitor enclosure with M6 x 20 screws.

(4) Attach Gas Monitor with mounting plate, using four Ø6 x 20 screws, at the place of installation.

During assembly, the ULTIMA® X$^{3\ TM}$ Gas Monitor enclosure can be rotated 360°, to ensure easy access to any of the four cable entries. For correct positioning of the display, the electronics assembly can be installed in any of the four self-aligning positions.

3.3. Electrical connection for ULTIMA X$^{3\ TM}$ instruments

Attention!

The ULTIMA X$^{3\ TM}$ instruments must be installed only in compliance with the applicable regulations, otherwise safe operation of the instrument is not guaranteed.

Ensure all sources of electrical power are disconnected before connecting any wires to the ULTIMA® X$^{3\ TM}$ Gas Monitor.

When using ModBUS communication a network can consist of up to 31 monitors. Each monitor can support up to three sensors. Total number of sensors is 93.

Power

Maximum power cable length depends on sensor configuration and wire gauge (→ Appendix A-2).

Gas Monitor Remote Sensor Distance

Maximum transmitter-to sensor distance is 15 m. For wiring requirements observe the:

- installation drawings (→ Appendix A-1)
- cable lengths and cross-sections (→ Appendix A-2)
- ModBUS communications wiring (→ Appendix A-3)

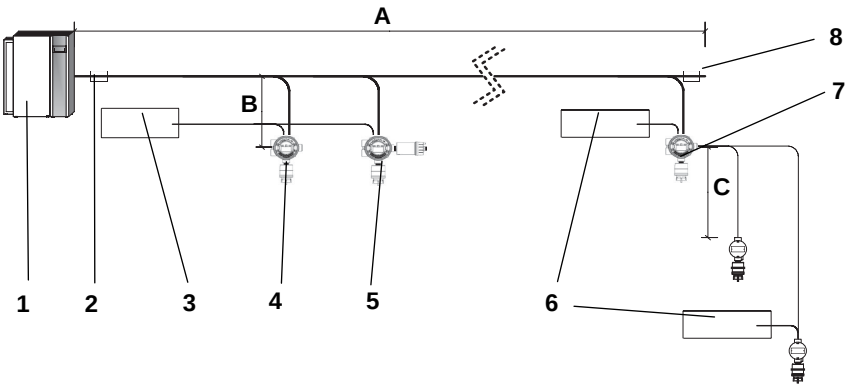


Fig. 4 Typical ModBUS Network Topography

A Communications Cable Trunk

B Communications Cable Branch

C Communications and Power Cables remote sensor

1 ModBUS Master Device

2 COM line termination device

3 DC or AC Power Source

4 Device 1

5 Device 2

6 Local DC or AC Power Source

7 Device n

8 COM line termination device

4. Operation

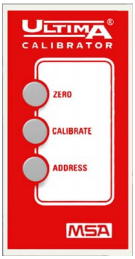
4.1. Hand-held Controller and Calibrator

The intrinsically safe ULTIMA/ULTIMA X Series Controller and Calibrator are used to calibrate and change or view the configuration of ULTIMA® X$^{3\ TM}$ Gas Monitors.

All firmware versions of the Calibrator will work with the ULTIMA® X$^{3\ TM}$ Gas Monitors but the Controller must have firmware version 3.03 or later.

A Controller firmware upgrade kit is available (→ Ordering Information in the ULTIMA X Series Operating Manual).

ULTIMA/ULTIMA X Calibrator



A simple to use three button device with a non-invasive IR interface to the ULTIMA® X$^{3\ TM}$ Gas Monitor to perform the following functions:

- Zero
- Calibration (zero and span)
- Address change (for specific models)

(→ ULTIMA/ULTIMA X Series Controller and Calibrator Operating Manual).

ULTIMA/ULTIMA X Controller

The ULTIMA/ULTIMA X Series Controller with a non-invasive IR interface provides all the functions of the Calibrator plus access to the following features:

- Three alarm levels and relays
- Date of last successful calibration
- Change the factory-set test gas value
- Change the upper measuring range limit
- Display of minimum, maximum and average gas concentration

(→ ULTIMA/ULTIMA X Series Controller and Calibrator Operating Manual).

4.2. ModBUS Addressing

Baud rate and data format defaults are adjustable by using a hand-held Controller or ModBUS command.

Each ULTIMA® X[3] TM Gas Monitor is a slave on the communications network and must have a unique address.

The ModBUS slave address has a valid range of 1-247. The default value is 247. This address may be set using a ULTIMA/ULTIMA X Controller or Calibrator or a ModBUS Controller. The Calibrator address range is limited to 0-32, for other addresses use the Controller.

ULTIMA/ULTIMA X Controller:

- "ADDRESS" – Send an address command with the desired value.

ULTIMA/ULTIMA X Calibrator:

- Press "ADDRESS" button once to display the current setting.
- The "ZERO" increments the address number.
- The "SPAN" button decrements the address number.
- Press "ADDRESS" button again to save the new addresses.

Fore more information → ULTIMA/ULTIMA X Series Controller and Calibrator Operating Manual.

ModBUS Controller:

- Write address to the corresponding register in the data table.

4.3. ModBUS Communications

The communications protocol is ModBUS RTU over an RS-485 hardware network. The default settings for communications parameters are 19200 baud and even parity. The stop bits are fixed at 1 stop bit. For data types that are larger than one word, the most significant word is located in the first register (big-endian).

4.4. Supported ModBUS Function Codes

Function number	Description
3	Read Holding Registers
5	Write Single Coil
6	Write Single Register
16	Write Multiple Registers

4.5. ModBUS Memory Map Overview

The ModBUS port allows for access to a significant amount of information which may be necessary for your system integration requirements. As a minimum, the gas readings and fault status registers should be polled.

Description	Start Address	End Address	Size in words	Access
ModBUS Data Table Start Base Address	1000	1000	1	Read/Write
Factory Configuration Data	Base +1	Base +18	18	Read Only
User Configuration Data	Base +101	Base +148	48	Read/Write
Status Information	Base +201	Base +253	53	Read Only
Control Words	Base +301	Base +302	2	Read/Write

4.6. ModBUS Base Address (Read/Write)

The ModBUS base address register is located at address 1000 and has a default value of 40000. This may be changed by writing a new value within the permissible range to that address. Subsequent addresses must take this new base address into consideration. The base address may be changed by writing to address 1000, regardless of its contents.

Description	Address	Possible Value
ModBUS Data Table Base Address	1000	1000 - 60000 (default 40000)

For systems that use five-digit addressing, 4XXXX:

- If the first digit is an internal system requirement and does not appear in the communications packet, write the value 1000 to address 41000.

  The base address is now 41000 and the first valid address is 41001.
- If all five digits appear in the communications packet, the default base address is 40000 and the first valid address is 40001.

For systems that use six-digit addressing, 4XXXXX:

- The first digit is an internal system requirement and does not appear in the communications packet. The base address is 440000, and the first valid address is 440001.

4.7. ModBUS Factory Configuration Data (Read Only)

Description	Address	Possible Value
Device Type	Base +1	3 (ULTIMA X3 US); 4 (ULTIMA X3 Europe)
Firmware Version	Base +2 00.00 to 99.99	0..32767 integer divide by 100 for range
Relays Option Installed	Base +3	0 - Relays not installed 1 - Relays installed
Reserved for future use	Base +4	
Sensor 1, Date of Mfg Year,	Base +5	20XX
Sensor 1, Date of Mfg Month,	Base +6	1 … 12
Sensor 1, Date of Mfg Day,	Base +7	1 … 31
Sensor 2, Date of Mfg Year,	Base +8	20XX
Sensor 2, Date of Mfg Month,	Base +9	1 … 12
Sensor 2, Date of Mfg Day,	Base +10	1 … 31
Sensor 3, Date of Mfg Year,	Base +11	20XX
Sensor 3, Date of Mfg Month,	Base +12	1 ... 12
Sensor 3, Date of Mfg Day,	Base +13	1 … 31
Full Scale Range Sensor 1	Base +14	Single Precision Float
Full Scale Range Sensor 2	Base +16	Single Precision Float
Full Scale Range Sensor 3	Base +18	Single Precision Float

5. Calibration

Before the actual calibration, completely read all the calibration instructions.

Identify all calibration components and become familiar with them.

It is recommended that all calibration components are connected before starting a calibration as it is necessary to apply test gas to the instrument during a 30 second countdown.

ULTIMA® X$^{3\ TM}$ Gas Monitors are calibrated at the factory. Nevertheless, it is recommended to recalibrate the instrument after installation. The frequency of calibration depends on the duration of use and the chemical exposure of the sensor. New sensors must be calibrated frequently until it is clear from the calibration data that they have stabilised. From then onwards, the frequency of calibration can be reduced and adapted to the plan stipulated by the safety officer or plant manager.

For complete calibration details please refer to the “ULTIMA/ULTIMA X Series Operating Manual” (Order No.: 10050078).

Connect power to the ULTIMA X Gas Monitor at least one hour before attempting a calibration.

Carry out the calibration during commissioning as well as at regular intervals. This ensures optimum operation of the sensor.

ULTIMA® X$^{3\ TM}$ scans all connected sensors. To calibrate a sensor the command from the Calibrator/Controller, ModBUS controller or Push-Button must be received when the required sensor number is displayed on the ULTIMA® X$^{3\ TM}$.

Calibration is performed using the:

- ULTIMA/ULTIMA X Controller/Calibrator (→ Section 4.1)
- Reset-Push-Button (→ Section 5.1)
- ModBUS Controller

5.1. Optional RESET button

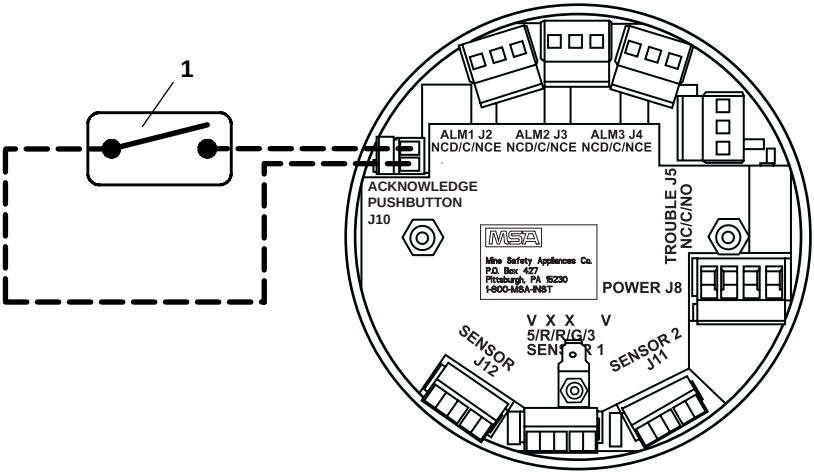


Fig. 5 RESET Button Wiring

1 Normally Open Switch

The RESET push button must be installed remotely and not directly into the Ultima X cable gland entry. The switch must be fitted in an approved junction box and be ATEX approved for hazardous area use.

The optional RESET button is to allow latching relays to be reset at the gas monitor location.

The RESET push-button must be a normally open type with a momentary contact when pressed and have electrical ratings of at least 1 A at 250 V AC.

Latching relays can be configured using the ULTIMA/ULTIMA X Series Controller.

In the "latching" configuration, when the RESET button is pressed, any latched alarm will be reset providing the gas concentration that activated the alarm is below the alarm set-point. In the "non- latching" configuration, the RESET button has no effect on the alarms.

The RESET function can also be executed by an infrared command from the ULTIMA/ULTIMA X Series Controller (→ ULTIMA/ULTIMA X Series Controller and Calibrator Operating Manual).

Calibration with RESET button

To calibrate the instrument using the RESET button, proceed as follows:

(1) Press and hold RESET button until the heart symbol appears on the display.

(2) Release RESET button.

- At this point any recoverable alarms will be acknowledged.

(3) Press the RESET button again within 3 seconds of releasing it and hold until the required calibration is displayed (→ table below).

Type of calibration	Display	Holding time for RESET button
Zero calibration	CAL ZERO	5 seconds
Span calibration	CAL SPAN	10 seconds
Initial calibration	iCAL	20 seconds

(4) Release RESET button when the desired type of calibration is displayed.

During the 30 seconds countdown, the zeroing or span calibration can be aborted at any time by pressing and holding the RESET push button until the heart symbol is displayed.
When the push button is released the calibration will be aborted.

For calibration details refer to the ULTIMA/ULTIMA X Operating Manual (Order No.: 10050078).

5.2. ModBUS Port

Refer to ModBUS data table definition in Appendix B.

Warning!

During the calibration process, the processor is in maintenance mode, all alarming is inhibited for all sensors, and the transmitter will not alert user to potential dangerous situations.

During the calibration of a sensor, a ModBUS request for the gas level returns the actual value. The other sensors on the specific gas monitor are not active. A gas level of -99.9 will be returned to indicate this.

5.3. ModBUS Communications

Baud rate and data format defaults per data table specifications are adjustable by using a:

- ULTIMA/ULTIMA X Controller or
- ModBUS command.

Each transmitter is a slave on the communication network and must have a unique address and serial format compatible with transmitter configuration.

6. Maintenance

The ULTIMA X Series Gas Monitors constantly perform a self check. If a problem is detected, the appropriate error message is displayed.

For more and detailed information refer to ULTIMA/ULTIMA X Operating Manual (Order No.: 10050078).

Attention!

Use only genuine MSA replacement parts when performing any maintenance procedures provided in the manual. Repair or alteration of the ULTIMA® X$^{3\ TM}$ Gas Monitor, beyond the scope of these instructions or by anyone other than authorised MSA service personnel may seriously impair instrument performance.

7. Technical Data

7.1. Dimensions, weight

XE enclosure	
Dimensions W x H x D (mm)	162 x 262 x 100
Weight	approx. 5 kg

7.2. Performance Specifications

Gas types		Combustible gases, oxygen and toxic gases	
Temperature range	Toxic gases and oxygen	Operating range	0°C to 40°C
		Extended range *)	-20°C to +50°C
		Operating range NH_3 *)	0°C to 30°C
		Extended range NH_3, CL_2, CLO_2 *)	-10°C to 40°C
		Calibrate within operating temperature the range.	
	Combustible gas, catalytic and IR	Local and remote sensor	-40°C to +60°C-
Zero drift		Less than 5% per year, typically	
Span drift		Less than 10% per year, typically	
Noise		Less than 1% FS	

*) In the extended temperature range, the sensor may not meet all the specified performance parameters.

8. Order Information

Designation	Part No.	
	¾" thread	25 mm thread
Enclosure without connecting terminals	10044308	10044382
Enclosure with connecting terminals	10044381	10044383

LED/Relay Options	
ULTIMA X^3 MBUS - PCB, no Relays, no LEDs	10062613
ULTIMA X^3 MBUS - PCB, no Relays, with LEDs	10062614
ULTIMA X^3 MBUS - PCB, with Relays, no LEDs	10062615
ULTIMA X^3 MBUS - PCB, with Relays, with LEDs	10062616

For more and detailed information about accessories and spare sensors refer to ULTIMA/ULTIMA X Operating Manual (Order No.: 10050078).

Appendix A Electrical installation

A-1. Installation Drawings

The cabling and electrical installation must be carried out based on the instrument types used.

Electrical installation details are given in the appropriate drawings. Please refer to ULTIMA/ULTIMA X Operating Manual (Order No.: 10050078).

A-2. Cable Lengths and Power Consumption

Cable length

Maximum power cable length depends on sensor configuration and wire gauge.

Sensor Configuration			Maximum Power Cable Length (metres) (with Nominal 24-V DC Transmitter Supply)					
CAT	IR	EChem	1.5 mm^2 Cable [4.2 Ω per 300 m]		2.5 mm^2 Cable [2.6 Ω per 300 m]		4 mm^2 Cable [1.8 Ω per 300 m]	
			No Relays	Relay Option	No Relays	Relay Option	No Relays	Relay Option
0	0	3	1370	1065	2285	1675	3040	2285
0	2	1	605	45	835	760	1215	1065
0	1	2	910	685	1370	1065	1905	150
1	0	2	1065	835	1675	1295	225	1825
1	1	1	605	450	835	760	1215	1065
2	0	1	760	560	1065	910	1520	1215
3	0	0	605	455	835	760	1140	1065

As only one zener barrier can be installed in an ULTIMA® X$^{3\ TM}$ enclosure, only one 'reactive' toxic gas sensor can be used with an ULTIMA® X$^{3\ TM}$ Gas Monitor.

Remote Sensor Power Consumption

Sensor Type	Maximum Power Consumption
CAT	4.5 W
XIR	5.0 W
E-Chem	1.5 W

RS485 Communications

Characteristics of the three-core cable:

- Cross Sectional Area 0.5 mm^2
- A = Transmit + / Receive +
- B = Transmit - / Receive -
- C = Common (GND)
- Maximum cable length: Trunk - 1000 m, Branch - 18 m
- Line Termination 120 Ω

A-3. Connection Drawings

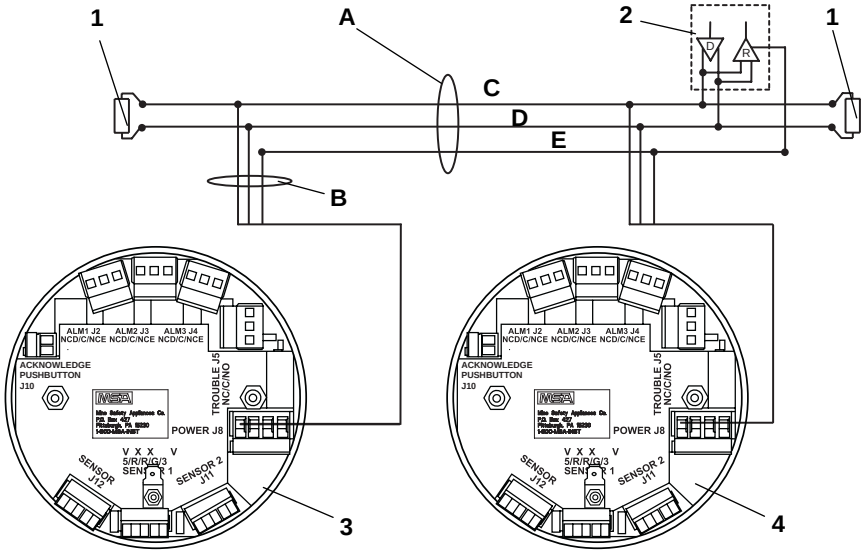


Fig. 6 Typical Communications Wiring Scheme

A	*Network Trunk*	*1*	*Line Terminal*
B	*Network Branch*	*2*	*Master*
C	*Transmit + / Receive +*	*3*	*Slave 1*
D	*Transmit - / Receive -*	*4*	*Slave n*
E	*Common*		

Appendix B ModBUS User Configuration Data

B-1. ModBUS User Configuration Data (Read/Write)

Description	Address	Possible Values
ModBUS Slave Address	Base +101	1 ... 247
Baud Rate Code	Base +102	0 – 1200, 1 – 2400 2 – 4800, 3 – 9600 4 – 19200 (default)
Parity Code	Base +103	0 – Even (default), 1 – Odd, 2 - None
For future use	Base +104	
For future use	Base +105	
For future use	Base +106	
Full Scale Range, Sensor 1	Base +107	Single Precision Float
Full Scale Range, Sensor 2	Base +109	Single Precision Float
Full Scale Range, Sensor 3	Base +111	Single Precision Float
Span Gas Value, Sensor 1	Base +113	Single Precision Float
Span Gas Value, Sensor 2	Base +115	Single Precision Float
Span Gas Value, Sensor 3	Base +117	Single Precision Float
Alarm 1 Setpoint, Sensor 1	Base +119	Single Precision Float
Alarm 1 Setpoint, Sensor 2	Base +121	Single Precision Float
Alarm 1 Setpoint, Sensor 3	Base +123	Single Precision Float
Alarm 2 Setpoint, Sensor 1	Base +125	Single Precision Float
Alarm 2 Setpoint, Sensor 2	Base +127	Single Precision Float
Alarm 2 Setpoint, Sensor 3	Base +129	Single Precision Float
Alarm 3 Setpoint, Sensor 1	Base +131	Single Precision Float
Alarm 3 Setpoint, Sensor 2	Base +133	Single Precision Float
Alarm 3 Setpoint, Sensor 3	Base +135	Single Precision Float
Alarm Function Word 1	Base +137	0 ... 32767, see detail below
Alarm Function Word 2	Base +138	0 ... 32767, see detail below
Average Time Interval	Base +139	1,8 or 24
Current Date - Year	Base +140	20XX
Current Date - Month	Base +141	1.12
Current Date - Day	Base +142	1 ... 31
Current Time - Hour	Base +143	1 ... 24
Current Time - Minute	Base +144	0 ... 59
Current Time - Second	Base +145	0 ... 59
Sensor 1 (XIR), Gas Table Number	Base +146	1 Methane, 2 Propane; 3 Ethane, 4 Butane; 5 Pentane, 6 Hexane; 7 Cyclopentane, 8 Ethylene
Sensor 2 (XIR), Gas Table Number	Base +147	1 Methane, 2 Propane; 3 Ethane, 4 Butane; 5 Pentane, 6 Hexane; 7 Cyclopentane, 8 Ethylene
Sensor 3 (XIR), Gas Table Number	Base +148	1 Methane, 2 Propane; 3 Ethane, 4 Butane; 5 Pentane, 6 Hexane; 7 Cyclopentane, 8 Ethylene

B-2. Alarm Function Codes - Word 1 (Read/Write at Address Base +137)

Name	Bits	Function Description
Alarm 1 Enable, Sensor 1,	0	1 - Enable, 0 - Disable
Alarm 1 Enable, Sensor 2,	1	1 - Enable, 0 - Disable
Alarm 1 Enable, Sensor 3	2	1 - Enable, 0 - Disable
Alarm 2 Enable, Sensor 1	3	1 - Enable, 0 - Disable
Alarm 2 Enable, Sensor 2	4	1 - Enable, 0 - Disable
Alarm 2 Enable, Sensor 3	5	1 - Enable, 0 - Disable
Alarm 3 Enable, Sensor 1	6	1 - Enable, 0 - Disable
Alarm 3 Enable Sensor 2	7	1 - Enable, 0 - Disable
Alarm 3 Enable Sensor 3	8	1 - Enable, 0 - Disable
Alarm 1 Direction, Sensor 1,	9	1 - Increasing, 0 - Decreasing
Alarm 1 Direction, Sensor 2	10	1 - Increasing, 0 - Decreasing
Alarm 1 Direction, Sensor 3	11	1 - Increasing, 0 - Decreasing
Alarm 2 Direction, Sensor 1	12	1 - Increasing, 0 - Decreasing
Alarm 2 Direction, Sensor 2	13	1 - Increasing, 0 - Decreasing
Alarm 2 Direction, Sensor 3	14	1 - Increasing, 0 - Decreasing
Not used	15	

B-3. Alarm Function Codes - Word 2 (Read/Write at Address Base +138)

Name	Bits	Function Description
Alarm 3 Direction, Sensor 1	0	1 - Increasing, 0 - Decreasing
Alarm 3 Direction, Sensor 2	1	1 - Increasing, 0 - Decreasing
Alarm 3 Direction, Sensor 3	2	1 - Increasing, 0 - Decreasing
Alarm 1 Latch Status, Sensor 1	3	0 - Non-Latching, 1 - Latching
Alarm 1 Latch Status, Sensor 2	4	0 - Non-Latching, 1 - Latching
Alarm 1 Latch Status, Sensor 3	5	0 - Non-Latching, 1 - Latching
Alarm 2 Latch Status, Sensor 1	6	0 - Non-Latching, 1 - Latching
Alarm 2 Latch Status, Sensor 2	7	0 - Non-Latching, 1 - Latching
Alarm 2 Latch Status, Sensor 3	8	0 - Non-Latching, 1 - Latching
Alarm 3 Latch Status, Sensor 1	9	0 - Non-Latching, 1 - Latching
Alarm 3 Latch Status, Sensor 2	10	0 - Non-Latching, 1 - Latching
Alarm 3 Latch Status, Sensor 3	11	0 - Non-Latching, 1 - Latching
Relay State NO-Alarm	12	1 - Normally Energised, 2 - Normally De-Energised
Relay State NO-Alarm	13	1 - Normally Energised, 2 - Normally De-Energised
Relay State NO-Alarm	14	1 - Normally Energised, 2 - Normally De-Energised
Not used	15	

B-4. ModBUS Device Status (Read only)

Description	Address	Possible Values
General Status-Bits	Base +201	0..32767, see details below
Fault-Status-Bits	Base +202	0..32767, see details below
Reserve	Base +203	
Gas-Type - Sensor 1	Base +204	See Appendix B-10 for detail
Gas-Type - Sensor 2	Base +205	See Appendix B-10 for detail
Gas-Type - Sensor 3	Base +206	See Appendix B-10 for detail
Gas-Level - Sensor 1	Base +207	Single Precision Float
Gas-Level - Sensor 2	Base +209	Single Precision Float
Gas-Level - Sensor 3	Base +211	Single Precision Float
Engineering Units - Sensor 1	Base +213	See Appendix B-15 for detail
Engineering Units - Sensor 2	Base +214	See Appendix B-15 for detail
Engineering Units - Sensor 3	Base +215	See Appendix B-15 for detail
Calibration Step	Base +216	0. 30s Countdown to Start ZERO
		1. Waiting for ZERO
		2. 30s Countdown to Start SPAN
		3. Waiting for SPAN
		4. Calibration Aborted
		5. ZERO Cal Fault
		6. SPAN Cal Fault
		7. Calibration Completed Successfully
Temperature - Sensor 1	Base +217	Signed Integer
Temperature - Sensor 2	Base +218	Signed Integer
Temperature - Sensor 3	Base +219	Signed Integer
Min Gas Reading over average Interval - Sensor 1	Base +220	Single Precision Float
Min Gas Reading over average Interval - Sensor 2	Base +222	Single Precision Float
Min Gas Reading over average Interval - Sensor 3	Base +224	Single Precision Float
Max Gas Reading over average Interval - Sensor 1	Base +226	Single Precision Float
Max Gas Reading over average Interval - Sensor 2	Base +228	Single Precision Float
Max Gas Reading over average Interval - Sensor 3	Base +230	Single Precision Float
Avg Gas Reading over average Interval - Sensor 1	Base +232	Single Precision Float
Avg Gas Reading over average Interval - Sensor 2	Base +234	Single Precision Float
Avg Gas Reading over average Interval - Sensor 3	Base +236	Single Precision Float
Date of Last Cal Year, Sensor 1	Base +238	20XX
Date of Last Cal Month, Sensor 1	Base +239	1 ... 12
Date of Last Cal Day, Sensor 1	Base +240	1 ... 31

Description	Address	Possible Values
Date of Last Cal Year, Sensor 2	Base +241	20XX
Date of Last Cal Month, Sensor 2	Base +242	1 ... 12
Date of Last Cal Day, Sensor 2	Base +243	1 ... 31
Date of Last Cal Year, Sensor 3	Base +244	20XX
Date of Last Cal Month, Sensor 3	Base +245	1 ... 12
Date of Last Cal Day, Sensor 3	Base +246	1 ... 31
Drift Counter - Sensor 1	Base +247	0 ... 20
Drift Counter - Sensor 2	Base +248	0 ... 20
Drift Counter - Sensor 3	Base +249	0 ... 20
ULTIMA X Internal Error Code	Base +250	For further implementation
Internal Error Code - Sensor 1	Base +251	For further implementation
Internal Error Code - Sensor 2	Base +252	For further implementation
Internal Error Code - Sensor 3	Base +253	For further implementation
Information Flags 1	Base +254	See Appendix B-13
Information Flags 2	Base +255	See Appendix B-13
Information Flags 3	Base +256	See Appendix B-13
Information Flags 4	Base +257	See Appendix B-13
Alternate Gas Reading Sensor 1	Base +258	See Appendix B-13
Alternate Gas Reading Sensor 2	Base +259	See Appendix B-13
Alternate Gas Reading Sensor 3	Base +256	See Appendix B-13

B-5. ModBUS General Status Bits (Read only at Address Base +201)

Name	Bit	Function Description
Device Fault (any fault)	0	Set for all fault conditions
Calibration Active - Sensor 1	1	Set during calibration
Calibration Active – Sensor 2	2	Set during calibration
Calibration Active – Sensor 2	3	Set during calibration
Warm up Mode	4	Set during startup
Low Alarm Active	5	Set while alarm relay is active
Mid Alarm Active	6	Set while alarm relay is active
High Alarm Active	7	Set while alarm relay is active
For future use	8	
For future use	9	
For future use	10	
For future use	11	
For future use	12	
For future use	13	
For future use	14	
Not used	15	

B-6. ModBUS Fault Status Bits (Read only at Address Base +202)

Name	Bit	Function Description
Fault Relay Active	0	Set when any fault is detected
Sensor Missing - Sensor 1	1	Set when any fault is detected
Sensor Missing - Sensor 2	2	Set when any fault is detected
Sensor Missing - Sensor 3	3	Set when any fault is detected
Calibration Fault - Sensor 1	4	Set when any fault is detected
Calibration Fault - Sensor 2	5	Set when any fault is detected
Calibration Fault - Sensor 3	6	Set when any fault is detected
Power Fail Fault - Sensor 1	7	Set when any fault is detected
Power Fail Fault - Sensor 2	8	Set when any fault is detected
Power Fail Fault - Sensor 3	9	Set when any fault is detected
Power Fail Fault - Main Unit +5V DC	10	Set when any fault is detected
Sensor End of life - Sensor 1	11	Set when any fault is detected
Sensor End of life - Sensor 2	12	Set when any fault is detected
Sensor End of life - Sensor 3	13	Set when any fault is detected
ULTIMA X Configuration Reset	14	Set when a datasheet reset occurs
Not used	15	

B-7. Control Words (Read/Write)

Description	Address	Possible Values
Command Word 1	Base +301	0 to 32767, See Appendix B-8
Command Word 2	Base +302	0 to 32767, See Appendix B-9

B-8. ModBUS Command Word 1 (Read at Address Base +301, Write Coils 1 through 16)

Name	Bits	Coil	Function Description
Start Full ICAL Calibration - Sensor 1	0	1	Rtn's fault if any Calibration in progress
Start Full ICAL Calibration - Sensor 2	1	2	Rtn's fault if any Calibration in progress
Start Full ICAL Calibration - Sensor 3	2	3	Rtn's fault if any Calibration in progress
Start Standard Full Calibration - Sensor 1	3	4	Rtn's fault if any Calibration in progress
Start Standard Full Calibration - Sensor 2	4	5	Rtn's fault if any Calibration in progress
Start Standard Full Calibration - Sensor 3	5	6	Rtn's fault if any Calibration in progress
Start Standard Zero Calibration - Sensor 1	6	7	Rtn's fault if any Calibration in progress
Start Standard Zero Calibration - Sensor 2	7	8	Rtn's fault if any Calibration in progress
Start Standard Zero Calibration - Sensor 3	8	9	Rtn's fault if any Calibration in progress
Start UCAL Calibration - Sensor 1	9	10	Rtn's fault if any Calibration in progress
Start UCAL Calibration - Sensor 2	10	11	Rtn's fault if any Calibration in progress
Start UCAL Calibration - Sensor 3	11	12	Rtn's fault if any Calibration in progress
Step UCAL	12	13	1 to step
Abort Calibration (any)	13	14	1 to abort
For future use	14	15	
Not used	15	16	

B-9. ModBUS Command Word 2 (Read at Address Base +302, Write Coils 17 through 32)

Name	Bits	Coil	Function Description
Sensor Swap Delay	0	17	1 - Enable, 0 - Disable
Alarm Option Enable	1	18	1 - Enable, 0 - Disable
Acknowledge or Reset Latched Alarms (ACK)	2	19	1 to initiate (same functionality as RESET Button or IR command)
Reset Main Board and Sensors	3	20	1 to initiate
For future use	4	21	
For future use	5	22	
Reset Data Sheet - Sensor 1	6	23	1 to initiate
Reset Data Sheet - Sensor 2	7	24	1 to initiate
Reset Data Sheet - Sensor 3	8	25	1 to initiate
Disable Sensor 1	9	26	1 to disable
Disable Sensor 2	10	27	1 to disable
Disable Sensor 3	11	28	1 to disable
For future use	12	29	
For future use	13	30	
For future use	14	31	
Not used	15	32	

B-10. Gas Type

Sensor Type Value	Sensor Type
2	IRIS
3	Custom IRIS 0-10000 PPM
12	O_2 25.0%, 0.1%, MSA 10019727, 20.8%
13	COMB-1S 100% LEL, 1% LEL, 25% LEL (0.6% Propane)
14	COMB-1S 100%LEL, 1% LEL, 40% LEL
15	COMB-1S 100%LEL, 1% LEL, 55% LEL
16	COMB-1S-NL 100%LEL, 1% LEL, 25% LEL
17	COMB-1S-NL 100%LEL, 1% LEL, 40% LEL
18	COMB-1S-NL 100%LEL, 1% LEL, 55% LEL
275	CLO_2 3.0 PPM, 0.1 PPM, MSA 7CLH, 1.0 PPM
19	COMB-1S-100% LEL, 10% LEL, 31% LEL
20	COMB-1S-100% LEL, 1% LEL, 49% LEL
21	COMB-1S-100% LEL, 1% LEL, 68% LEL
22	Tankerguard
101	IRIS - start
to	IRIS - cont.
150	IRIS - finish
257	257 CO 100 PPM, 1 PPM, MSA 25E/F, 60 PPM
258	CO 500 PPM, 1 PPM, MSA 25E/F, 300 PPM
259	SO_2 25 PPM, 1 PPM, CTL 7ST/F, 10 PPM
260	H_2S 10.0 PPM, 0.1 PPM, MSA HS25B, 5.0 PPM
261	H_2S 50.0 PPM, 0.1 PPM, MSA HS25B, 40 PPM
262	H_2S 100 PPM, 1 PPM, MSA HS25D, 40 PPM
263	NO 100 PPM, 1 PPM, CTL 7NT, 50 PPM
264	NO_2 10.0 PPM, 0.1 PPM, MSA ND25C, 5.0 PPM
265	SCL_2 5.0 PPM, 0.1 PPM, MSA CL25B, 2.0 PPM
266	HCN 50 PPM, 1 PPM, MSA HN25C, 10 PPM
267	HCL 50 PPM, 1 PPM, MSA HL25C, 40 PPM
276	NH_3 100 PPM, 1 PPM, SENSORIC, 25 PPM
277	H_2 1000 PPM, 10 PPM, CTL 7HYT, 300 PPM
279	PHOSPHINE, 2.0 PPM, 0.1 PPM CTL 7SH, 0.5 PPM
280	ARSINE, 2.0 PPM, 0.1 PPM, CTL 7SH, 1.0 PPM
281	SILANE, 25 PPM, 1 PPM, CTL 7SH, 5 PPM
282	GERMANE, 3.0 PPM, 0.1 PPM, CTL 7SH, 2.5 PPM
283	DIBORANE, 50 PPM, 1 PPM, CTL 7SH, 15 PPM
284	FLUORINE, 5.0 PPM, 0.1 PPM, MSA 7CLH, 4.0 PPM
285	HF
286	BROMINE, 5.0 PPM, 0.1 PPM, MSA 7CLH, 2.5 PPM
287	ETO, 10.0 PPM, 0.1 PPM, 5 PPM
288	O_2 10.0%, 0.1% MSA 10019727, 5.0%
289	NH_4 1000
290	CLO_2 0.02 resolution
291	H_2S 500

B-11. Sensor Engineering Units

Unit Label Value	Unit Label
0	None
1	% LEL
2	%
3	PPM
4	Future Expansion

B-12. Information Flags Word 1 (Read at Address Base +254)

Name	Bits	Function Description
Sensor 1 Disabled	0	0 = enabled, 1 = disabled
Sensor 2 Disabled	1	0 = enabled, 1 = disabled
Sensor 3 Disabled	2	0 = enabled, 1 = disabled
Alarm 1 - Sensor 1	3	0 = clear, 1 = set
Alarm 2 - Sensor 1	4	0 = clear, 1 = set
Alarm 3 - Sensor 1	5	0 = clear, 1 = set
Alarm 1 - Sensor 2	6	0 = clear, 1 = set
Alarm 2 - Sensor 2	7	0 = clear, 1 = set
Alarm 3 - Sensor 2	8	0 = clear, 1 = set
Alarm 1 - Sensor 3	9	0 = clear, 1 = set
Alarm 2 - Sensor 3	10	0 = clear, 1 = set
Alarm 3 - Sensor 3	11	0 = clear, 1 = set
Cal Fault Condition Sensor 1	12	0 = clear, 1 = Span
Cal Fault Condition Sensor 2	13	0 = clear, 1 = Span
Cal Fault Condition Sensor 3	14	0 = clear, 1 = Span
Not used	15	

B-13. Information Flags Word 2 (Read at Address Base +255)

Name	Bits	Function Description
Configuration Reset	0	Set if TRUE
Fault RAM Main	1	Set if TRUE
FAULT FLASH MAIN	2	Set if TRUE
EEPROM WRITE ERROR	3	Set if TRUE
MUX FAULT	4	Set if TRUE
FAULT INCOMPATIBLE Sensor 1	5	Set if TRUE
FAULT INCOMPATIBLE Sensor 2	6	Set if TRUE
FAULT INCOMPATIBLE Sensor 3	7	Set if TRUE
Quick under range sensor 1	8	Set if TRUE
Quick under range sensor 2	9	Set if TRUE
Quick under range sensor 3	10	Set if TRUE
Under range sensor 1	11	Set if TRUE
Under range sensor 2	12	Set if TRUE
Under range sensor 3	13	Set if TRUE
Alex Enabled	14	0 = enabled, 1 = disabled
Swap Delay	15	0 = enabled, 1 = disabled

B-14. Information Flags Word 3 (Read at Address Base +256)

Name	Bits	Function Description
Overrange Flag Sensor 1	0	Set if TRUE
Overrange Flag Sensor 2	1	Set if TRUE
Overrange Flag Sensor 3	2	Set if TRUE
LOC Flag Sensor 1	3	Set if TRUE
LOC Flag Sensor 2	4	Set if TRUE
LOC Flag Sensor 3	5	Set if TRUE
Parameter Fault Sensor 1	6	Set if TRUE
Parameter Fault Sensor 2	7	Set if TRUE
Parameter Fault Sensor 3	8	Set if TRUE
Warm Up Sensor 1	9	Set if TRUE
Warm Up Sensor 2	10	Set if TRUE
Warm Up Sensor 3	11	Set if TRUE
Sensor Configuration Reset 1	12	Set if TRUE
Sensor Configuration Reset 2	13	Set if TRUE
Sensor Configuration Reset 3	14	Set if TRUE
Not Used	15	

B-15. Information Flags Word 4 (Read at Address Base +257)

Name	Bits	Function Description
Underrange Average Interval Sensor 1	0	Set if TRUE
Underrange Average Interval Sensor 2	1	Set if TRUE
Underrange Average Interval Sensor 3	2	Set if TRUE
Overrange Average Interval Sensor 1	3	Set if TRUE
Overrange Average Interval Sensor 2	4	Set if TRUE
Overrange Average Interval Sensor 3	5	Set if TRUE
Sensor Warning Sensor 1	6	Set if TRUE
Sensor Warning Sensor 2	7	Set if TRUE
Sensor Warning Sensor 3	8	Set if TRUE
Not Used	9	
Not Used	10	
Not Used	11	
Not Used	12	
Not Used	13	
Not Used	14	
Not Used	15	

B-16. Alternate Gas Readings (Read and Write at Address Base +258 to Base +260)

Description	Value
Normal Gas Detection	400 - 2000
Fault	230
Overrange	2110
Suppressed	305
Disabled	0

Appendix C Option for internal relay

C-1. Relay connections

All electrical connections to the internal relays can be made directly on the printed board (see Figure 4). When connecting the relays to motors, fluorescent lamps or other inductive loads, it is necessary to suppress any sparks or inductive feedback that may occur at the relay contact. These effects may damage the instrument and make it inoperative.

One way to reduce these effects is to install a "Quencharc®", available from MSA as part number 630413, across the load being switched.

Attention!
Before connecting the cable to ULTIMA® X$^{3\,TM}$ Gas Monitors, disconnect or isolate , the monitor power source otherwise there is danger of electric shock.

To connect the relay, the ULTIMA® X$^{3\,TM}$ Gas Monitor must be opened. Proceed as described below:

(1) Remove the ULTIMA® X$^{3\,TM}$ Gas Monitor enclosure cover.

To enable correct connection of all plugs note there location before removing them.

(2) Pull the terminal plugs to release them from the now accessible printed board.

(3) Feed the cable (not included) into the enclosure and connect it to the appropriate terminal plugs.

(4) Make sure that each cable conductor is connected correctly to ensure proper functioning of the control unit.

(5) If installing a RESET push-button:

- Feed a 2-core cable to the J10 terminal plug (→ Fig. 3).

  To avoid electrical interference due to relay cables, this cable must only be supplied with DC power.

- Connect the 2-core cable to the two connections of the J10 terminal plug.
- Identify the cable to allow proper connection at the push-button
- Route the cable to the push-button switch and connect the cable to it.

(6) Re-install the connector plugs to the correct printed circuit board locations.

Make sure the connector terminal plugs are completely pushed in to the printed circuit board sockets.

(7) Pull the cable from the instrument to remove any excess slack.

To avoid unwanted electrical noise it is important not to have any excess wire or cable inside the enclosure

(8) Replace the ULTIMA® X$^{3\ TM}$ Gas Monitor cover.

MSA in Europe

[www.msa-europe.com & www.msa-gasdetection.com]

Northern Europe

Netherlands
MSA Nederland
Kernweg 20, 1627 LH Hoorn
Phone +31 [229] 25 03 03
Telefax +31 [229] 21 13 40
E-Mail info@msaned.nl

Belgium
MSA Belgium
Duwijckstraat 17, 2500 Lier
Phone +32 [3] 491 91 50
Telefax +32 [3] 491 91 51
E-Mail msabelgium@msa.be

Great Britain
MSA Britain
East Shawhead
Coatbridge ML5 4TD
Scotland
Phone +44 [12 36] 42 49 66
Telefax +44 [12 36] 44 08 81
E-Mail info@msabritain.co.uk

Norway
MSA NORDIC
Florasvingen 6
1890 Rakkestad
Phone +47 47 85 47 43
Telefax +47 69 22 11 08
E-Mail info@msanordic.se

Sweden
MSA NORDIC
Kopparbergsgatan 29
214 44 Malmö
Phone +46 [40] 699 07 70
Telefax +46 [40] 699 07 77
E-Mail info@msanordic.se

MSA SORDIN
Rörläggarvägen 8
331 53 Värnamo
Phone +46 [370] 69 35 50
Telefax +46 [370] 69 35 55
E-Mail info@sordin.se

Southern Europe

Italy
MSA Italiana
Via Po 13/17
20089 Rozzano [MI]
Phone +39 [02] 89 217 1
Telefax +39 [02] 82 59 228
E-Mail info-italy@msa-europe.com

Spain
MSA Española
Narcís Monturiol, 7
Pol. Ind. del Sudoeste
08960 Sant-Just Desvern
[Barcelona]
Phone +34 [93] 372 51 62
Telefax +34 [93] 372 66 57
E-Mail info@msa.es

France
MSA GALLET
Zone Industrielle Sud
01400 Châtillon sur Chalaronne
Phone +33 [474] 55 01 55
Telefax +33 [474] 55 47 99
E-Mail message@msa-gallet.fr

Eastern Europe

Poland
MSA Poland
ul. Wschodnia 5A
05-090 Raszyn k/Warszawy
Phone +48 [22] 711 50 33
Telefax +48 [22] 711 50 19
E-Mail mee@msa-europe.com

Czech Republic
MSA AUER Czech
Pikartská 1337/7
716 07 Ostrava-Radvanice
Phone +420 [59] 6 23 22 22
Telefax +420 [59] 6 23 26 75
E-Mail info@msa-auer.cz

Hungary
MSA AUER Hungaria
Francia út 10
1143 Budapest
Phone +36 [1] 251 34 88
Telefax +36 [1] 251 46 51
E-Mail info@msa-auer.hu

Romania
MSA AUER Romania
Str. Virgil Madgearu, Nr. 5
Ap. 2, Sector 1
014135 Bucuresti
Phone +40 [21] 232 62 45
Telefax +40 [21] 232 87 23
E-Mail office@msa-auer.ro

Russia
MSA AUER Russia
Leninsky Prospekt 2
9th Floor, office 14
119 049 Moscow
Phone +7 [495] 544 93 89
Telefax +7 [495] 544 93 90
E-Mail msa-moscow@
msa-europe.com

Central Europe

Germany
MSA AUER
Thiemannstrasse 1
12059 Berlin
Phone +49 [30] 68 86 0
Telefax +49 [30] 68 86 15 17
E-Mail info@auer.de

Austria
MSA AUER Austria
Kaplanstrasse 8
3430 Tulln
Phone +43 [22 72] 63 360
Telefax +43 [22 72] 63 360 20
E-Mail info@msa-auer.at

Switzerland
MSA Schweiz
Eichweg 6
8154 Oberglatt
Phone +41 [43] 255 89 00
Telefax +41 [43] 255 99 90
E-Mail info@msa.ch

European International Sales

[Africa, Asia, Australia,
Latin America, Middle East]
MSA EUROPE
Thiemannstrasse 1
12059 Berlin
Phone +49 [30] 68 86 55 5
Telefax +49 [30] 68 86 15 17
E-Mail contact@msa-europe.com

MSA
The Safety Company