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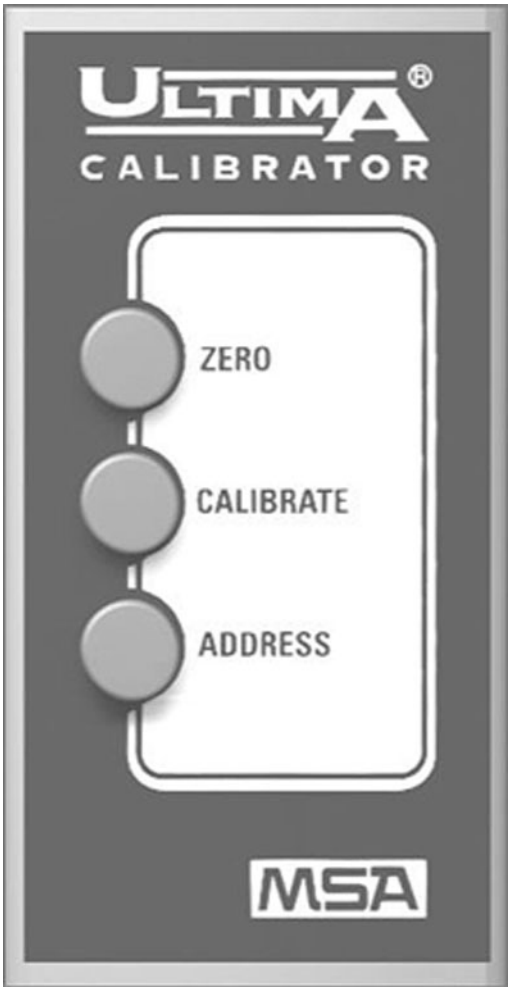
Ultima/Ultima® X Series Controller and Calibrator

Instruction Manual



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Instruction Manual

WARNING

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

The warranties made by Mine Safety Appliances Company with respect to these products are voided if the products are 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.

IIn 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.

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

Notice !

Like any piece of complex equipment, this product will do the job it is designed to do, only if it is used and serviced in accordance with the manufacturer's instructions. This manual must be carefully read by all individuals who have or will have the responsibility for using or servicing the product.

The warranties made by MSA AUER GmbH 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 your employees by following them. The product has to be controlled and serviced regularly by competent and authorized personnel. The results of the inspections and services have to be recorded.

Before choosing and using this product, it is required to assess whether this product is suitable for the application intended. Choice and use are beyond the control of MSA AUER GmbH. Therefore, the liability of MSA AUER GmbH covers only the consistent quality of this product. Instruments and components which have been tested and certified shall only be maintained and used in accordance with the relevant instructions in the certificates.

Modifications on instruments and components and the use of defective or incomplete instruments or components are not permissible. Apart from MSA AUER GmbH, authorized workshops can carry out maintenance work. These workshops are responsible to obtain the latest technical information on the instruments and components from MSA AUER GmbH. The above does not alter statements regarding the warranties and conditions of sale and deliveries of MSA AUER GmbH.

Table of Contents

Section 1

Section 2

Section 3

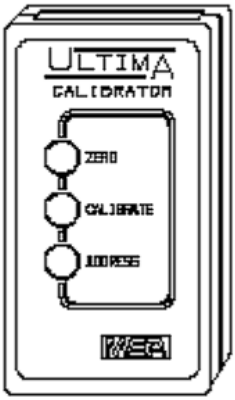
Section 1

General Information

This manual describes the Operation and use of the ULTIMA Controller and ULTIMA Calibrator for the ULTIMA/ULTIMA X Series Gas Monitors. It is strongly recommended that this entire manual be read before using the Controller or the ^^Calibrator.

The Controller and Calibrator use an Infrared (IR) LED to transmit to an IR receiver in the ULTIMA/ULTIMA X Series Gas Monitor.

The ULTIMA/ULTIMA X Calibrator (FIGURE 1-1):



- Is a hand-held, self-contained unit powered by two internal AAA batteries
- Allows one person, non-intrusive calibration of an ULTIMA/ULTIMA X Series Gas Monitor, enabling the Monitor to be calibrated at the unit without opening the enclosure
- Is an intrinsically safe product for use in hazardous areas (see Marking,Certificates and Approvals according to the Directive 94/9/EC).
- Can select the multiplex address of an ULTIMA/ULTIMA X Series Gas Monitor set up in the multiplex mode (if your monitor is so equipped)
- Requires no adjustments
- Features simple, three-button Operation
- Provides Auto power ON/OFF.

Three Function Operation
The Ultima Calibrator is equipped with three buttons for the following functions:

1. ZERO Button:
   - Performs a zero function on the ULTIMA/ULTIMA X Series Gas Monitor; periodically, the monitor may require only a zero adjustment.
2. CALIBRATE Button:
   - Performs a zero and span calibration function on the ULTIMA/ULTIMA X Series Monitor; During a complete calibration, the ULTIMA Gas Monitor requires both a zero and span check gas.
3. ADDRESS Button:
   - Displays or changes the multiplex address on the ULTIMA/ULTIMA X Series Monitor, if so equipped.

To Operate:

- All ULTIMA Calibrator operations are performed by simply pointing the Calibrator at the ULTIMA/ULTIMA X Series Gas Monitor display from a distance of no greater than six inches (FIGURE1-2).

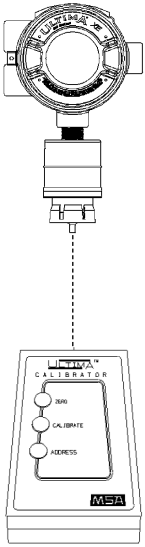


Figure 1-2.
Pointing the Calibrator at the ULTIMA Gas Monitor Display

Communication to the ULTIMA/ULTIMA X Series Gas Monitor is made via a one way, digitally encoded IR link to ensure tamper-proof and reliable nonintrusive communication.

The ULTIMA/ULTIMA X Controller
(FIGURE1-3):

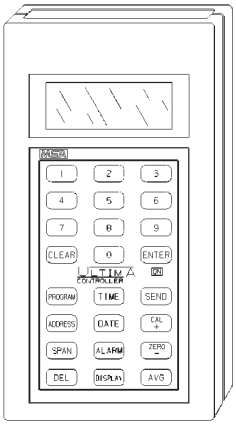


Figure 1-3.
Ultima/Ultima X Controller

- Allows non intrusive calibration of an ULTIMA/ULTIMA X Series Gas Monitor, enabling the Monitor to be calibrated at the unit without opening the enclosure
- Is a hand-held, self-contained unit powered by two internal AA batteries
- Is an intrinsically safe product for use in hazardous areas (see Marking, Certificates and Approvals according to the Directive 94/9/EC).
- Is approved with a covering leather

- Can select the following on an ULTIMA/ ULTIMA X Gas Monitor:
  - Set Monitor time and date
  - Set the average interval
  - Set/display span gas value
  - Set/display alarms
  - Display minimum, maximum, and average gas readings
  - Enable calibration Output Signal
  - Configure auto-calibration feature
  - Display previous calibration date
  - Set/display address
  - Mimic Calibrator
  - Set/Display Range (ULTIMA X Series units only)

Setting up the Controller

Using the ID CODE Feature
Controller Operation can be password-protected to prevent Operation by unauthorised personnel. All Ultima Controller units are shipped from the factory with Password ID disabled.

To Enable or Change the Password ID
1. With the unit OFF, press and hold the ENTER button for approximately five seconds, until the display prompts: ID KEY ####.

2. Use the NUMBER buttons:
   - To CHANGE password ID by entering the old ID number (go to Step 3)
   - To ENABLE a password ID by entering 9999.

3. Press the ENTER button.
   - The display prompts: NEW KEY ####.

4. Enter the desired four-digit ID and press the ENTER button.
   - The unit enters the READY mode and saves the I D password required for future Operation.

To Disable the Password ID
1. With the unit OFF, press and hold the ENTER button until the display prompts: ID KEY ####.

2. Using the NUMBER buttons, enter the old ID number.

3. After entering the four-digit number, press the ENTER button.
   - The display prompts: NEW KEY ####.

4. Enter 9999 and press the ENTER button.
   - The unit enters the READY mode and disables the password ID function for future Operation.

NOTE:
If the ID password is set and forgotten, contact an MSA service representative.

Turning the Controller ON
Press the ENTER button.
- Unit performs a self-test and displays the firmware version for several seconds
- If unit displays the ULTIMA READY or ULTIMA X READY prompt, it is ready for use
- If unit displays the ID CODE prompt, enter the user-selected password ID (see “Using the ID CODE Feature”).

Turning the Controller OFF
- The unit turns OFF automatically approximately 100 seconds after the last button is pressed
- To manually turn OFF the unit, press and hold the CLEAR button for five seconds.

NOTE:
A dual beep tone sounds when CLEAR button is pressed.

Setting the Controller for an ULTIMA or ULTIMA X Series Instrument

The ULTIMA Controller features the capability to transmit to both the ULTIMA and ULTIMA X Series instruments. To select the target instrument:

1. Turn unit ON to place into the READY mode.
   - Display prompts: ULTIMA READY or ULTIMAX READY. (see "Turning the Controller ON.")

2. Press the DISPLAY button once.
   - Display prompts: 0=ULTMA 1=ULTMX.

3. Enter "0" to set the Controller for an ULTIMA instrument or "1" to set the Controller for an ULTIMA X Series instrument.
   a. If your entry is valid, the Controller will display "ULTIMA READY" or "ULTIMAX READY".
   b. If your entry is invalid, it will not be accepted. Start this procedure again to change the Controller type.

Setting the Internal TIME of the Controller

The ULTIMA/ULTIMA X Controller features an internal real time clock for time/date stamping. To set the real time clock:

NOTE:
Momentarily pressing the TIME button displays the current hours and minutes. Press the CLEAR button to return to the READY mode.

1. Place unit in the READY mode
   - Display prompts: "ULTIMA READY" or "ULTIMAX READY". (see "Turning the Controller ON.")

2. Press and hold TIME button until the HH:MM prompt appears.

3. Using the NUMBER buttons, enter the current time in 24-hour format (e.g.: 4:00 P.M. = 16:00). (Leading zeros are required.)
   a. If your entry is valid, press ENTER button to save this time.
   b. If your entry is invalid, it will not be accepted; re-enter the correct time or press the CLEAR button to cancel and Start over.
   - The DEL button allows for correction during entry.

Setting the Internal DATE of the Controller

NOTE:
Momentarily pressing the DATE button displays the current date.

1. Place unit in the READY mode.
   - Display prompts: "ULTIMA READY" or "ULTIMAX READY".

2. Press and hold the DATE button until the MM-DD-YYYY prompt appears. (Leading zeros are required.)

3. Enter the current date using the NUMBER buttons.
   a. If your entry is valid, press ENTER button to save that date.
   b. If your entry is invalid, it will not be accepted; re-enter date or press the CLEAR button to cancel and Start this procedure again.
   - The DEL button allows for correction during entry.

When Sending a Command to the ULTIMA/ULTIMA X Series Gas Monitor

1. The Controller must be READY prior to any key press.

2. To change any function on the ULTIMA/ ULTIMA X Series Gas Monitor, point the top of the Controller directly at the clear face of the sensor (FIGURE 1-2) and press the desired sequence of Controller buttons. (Controller must be pointed at sensor when final button of sequence is pressed.)
   - The top surface of the Controller must be within six inches of the sensor face to enable reception
   - Each button pressed is acknowledged by a short beep
   - The CLEAR button is acknowledged by a double beep
   - When invalid responses are entered, the Controller resets to the READY mode or re-prompts user for a correct entry.

Note on Resetting latched Alarms

When an ULTIMA/ULTIMA X Gas Monitor has an active latched alarm (indicated by a flashing alarm display):

- An infrared (IR) remote device (such as the ULTIMA Calibrator or ULTIMA Controller) may be used to reset this alarm.
- If an ULTIMA/ULTIMA X Series Gas Monitor has an active latched alarm, the next IR command it receives from a calibration device will reset the latched alarm (if it is not beyond the alarm threshold). The intended IR command will be ignored and interpreted as an 'alarm reset'. When the latching alarm function is inactive, other valid IR commands may be use.

Section 2

Calibration

The ULTIMA/ULTIMA X Series Gas Monitor provides non-intrusive Calibration through the use of the ULTIMA Controller/Calibrator.

When calibrating any ULTIMA/ULTIMA X Series Gas Monitor which has any accessory attached to it, refer to the accessory manual for complete Calibration instructions. Some accessories for the ULTIMA/ULTIMA X Series Gas Monitor include:

- ULTIMA Sampling Module
- ULTIMA Auto-Cal Module.

While factory Calibration is Standard practice for the ULTIMA/ULTIMA X Series Gas Monitors, it is recommended to perform an INITIAL Calibration when first placing the unit into Operation. Refer to the “Initial Calibration” portion of this Chapter. It is good practice to read the appropriate Calibration instructions before attempting an actual Calibration. Also, identify and become familiar with all of the Calibration components. During the Calibration, it is necessary to quickly apply the span gas to the unit. Prior connection of the Calibration components will aid in ease of unit Calibration.

Equipment Required

Two Calibration kits (numbered 40 and 41; see FIGURES 2-1 and 2-2) are available from MSA for diffusion ULTIMA/ULTIMA X Series Gas Monitors. Kit 40 and 41 are housed in a convenient carrying case and contain all items necessary (less gas) for a complete and accurate Calibration.

These Kits do not calibrate ULTIMA Sampling Modules or an ULTIMA/ULTIMA X Series unit equipped with a flow cap. For flow or sample module Systems, refer to the ULTIMA Aspirated Sampling Module Manual (P/N 710200) or to the ULTIMA DC Pump Sampling Module Manual (P/N 710201).

NOTE:
The Calibration procedure for the sample draw ULTIMA X Monitor is the same as the procedure for the diffusion version, except Calibration gas is applied to the Calibration entry port of the inlet flow block and the cal kit for pumped units provides a flow matching regulator.

The check or calibration gases can also be carried in the case. See TABLE 2-1 for the appropriate zero and span gas cylinders for your ULTIMA/ULTIMA X Series Gas Monitor.

TABLE 2-1 shows the recommended calibration kit for ULTIMA and ULTIMA X Series Gas Monitors. Cal Kit 41 uses 0.25 LPM regulator and a rubber boot to contain the calibration gas. Cal Kit 40 uses a 1.5 LPM regulator and no rubber calibration boot. If Cal Kit 41 is recommended and the application is such that the rubber cal boot cannot be used (such as for a remote sensor application), Cal Kit 40 may be used. However, any time Cal Kit 40 is used, ambient wind conditions must be minimised to avoid a calibration with increased sensitivity.

NOTE:
The ULTIMA XIR uses Cal Kit 40 and does require a calibration cap.This calibration cap (P/N 10041533) is shipped with the product.

⚠ WARNING

For zero calibration you have to use always zero gas when zeroing the ULTIMA X Monitor; otherwise, improper calibration could occur.

Span Gas Values
The ULTIMA/ULTIMA X Monitor is factory-shipped with a preset span gas value (TABLE 2-1). This span gas value can be changed via the ULTIMA Controller; otherwise, the span gas must correspond to preset concentrations. See Section 3 to change the span gas value.

⚠ WARNING

The span gas value of ULTIMA Gas Monitor combustible models are pre-set to one of the broad categories shown in TABLE 2-1. Typical gases or vapours are listed under each category given in TABLE 2-2.

Always calibrate for the least sensitive gas or vapour (higher number category) expected to be measured (TABLE 2-2); otherwise, instrument readings may be incorrect.

Table 2-1. Factory-set Span Values				
GAS TYPE	**RANGE**	**SPAN GAS PRESET VALUES**	**MSA RP CYLINDER P/N**	**CALI-BRATION KIT**
CARBON MONOXIDE	0-100 PPM	60 PPM	710882	40
	0-500 PPM	300 PPM	1 0027938	
SULFUR DIOXIDE	0-25 PPM	10 PPM	1 0028070	
HYDROGEN SULFIDE	0-10 PPM	5 PPM	710414	
	0-50 PPM	40 PPM	1 0028062	
	0-100 PPM			
NITRIC OXIDE	0-100 PPM	50 PPM	1 0028074	
NITROGEN DIOXIDE	0-10 PPM	5 PPM	710332	41
CHLORINE	0-5 PPM	2 PPM	710331	
HYDROGEN CYANIDE	0-50 PPM	10 PPM	1 0028072	
HYDROGEN CHLORIDE[6])	0-50 PPM	40 PPM	1 0028060	
CHLORINE DIOXIDE(4)	0-3 PPM	1 PPM	710331	
OXYGEN	0-5%	5%	493580	40
	0-25%	20.8%	10028028 [2]	
NATURAL GAS[3]	0-100% LEL	25% LEL[1]	1 0028034	
PETROLEUM VAPORS[3] (GASOLINE)	0-100% LEL	40% LEL[1]		
GENERAL SOLVENTS[3]	0-100% LEL	55% LEL[1]		
NON-METHANE IR	0-100%	29% LEL[1]		
METHANE IR	0-100% LEL	50% LEL[6]	1 0028032	
PHOSPHINE	2.0 PPM	0.5 PPM	710533	41
ARSINE	2.0 PPM	1.0 PPM		
GERMANE	3.0 PPM	2.5 PPM		
SILANE	25 PPM	5 PPM	10014897	
DIBORANE	50 PPM	15 PPM		
FLUORINE	5.0 PPM	4.0 PPM	710331	
BROMINE	5.0 PPM	2.5 PPM		
AMMONIA	0-50 PPM	25 PPM	1 0028076	40
HYDROGEN	0-1000 PPM	500 PPM	1 0022386	
ETO (7)	0-10 PPM	4.0 PPM	1 0028070	
CARBON DIOXIDE IR	0-2%	1 .5%	807386	

NOTES:
1 CALIBRATED WITH PROFANE (.6% GAS BY VOLUME)
2 NOT REQUIRED FOR STANDARD CALIBRATION PROCEDURE
3 FOR COMBUSTIBLE GAS, IT IS GOOD PRACTICE TO CALIBRATE UNIT WITH GAS TO BE DETECTED
4 CL02 IS CALIBRATED WITH CL2 OR USE CLO2 CALIBRATOR KIT (P/N 710420)
5 HCL IS CALIBRATED WITH H2S
6 METHANE IR IS CALIBRATED WITH 50% LEL METHANE.
7 ETO IS CALIBRATED WITH SO2.

The calculation between the LEL and the Vol% for the calibration gas value has to be done according the local regulation.

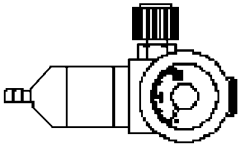
The Span gas values can be set between

For LEL = 1% to 100%
For oxygen = 0,1 Vol% to 25 Vol%

The upper of the measuring range for LEL and oxygen can be set between
For LEL = 5% to 100%
For oxygen = 0.5 Vol% to 25 Vol%

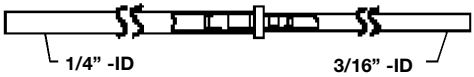
Item 1 – Tubing (P/N 711112)
– 3/16" ID side connects to item 3
– 1/4" ID side connections to sensor

Item 2 – Zero Cap (P/N 710535)

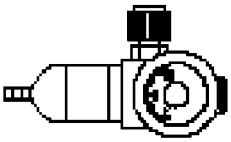


Item 3 – 1,5 LPM Flow Controller (P/N. 478358)

Figure 2-1.
Calibration Kit 40 Contents (Your Kit may also include one or two gas cylinders)



Item 1 – Tubing (P/N 711112)
– 3/16" ID side connects to item 3
– 1/4" ID side connections to sensor



Item 2 – 0,25 LPM Flow Controller (P/N 478359)

Item 3
– Calibration Cap
(P/N 710411

Item 4
– Zero Cap
(P/N 813774)

Item 5
– Calibration Cap
(P/N 10020030)

Item 6
– Zero Cap
(P/N 710535)

Figure 2-2.
Calibration Kit Contents (Your Kit may also include one or two gas cylinder)

Table 2-2 is not valid for ATEX Applications

Table 2-2. Calibration Guide for Combustible Gas Sensor			
CATEGORY 31 : NATURAL GAS			
To detect the following gases, recalibrate with 0.6% Propane and set the span gas value accordingly			
Acetaldehyde	23	Hydrogen	16
Acetylene	24	MAPP Gas	20
Butadiene. 1. 3	25	Methane	20
Carbon Monoxide	20	Methanol	20
Ethane	24	Methylene Chloride	24
Ethylene	25	Monomethyl Amine	22
Ethylene Dichloride	22	Trigonox B	22
CATEGORY 32: PETROLEUM VAPOURS To detect the following gases, set span point at 40% LEL with 0.6% Propane applied to sensor			
1.1.1 -Trichloroethane	32	Ethylene Oxide	36
Acetic Acid	28	Freon 152A	28
Acetone	37	Gasoline	35
Acrolein	28	Hexane	40
Acrylonitrile	26	Isoprene	33
Allyl Chloride	30	Methyl Acetate	34
Benzene	37	Methyl Chloride	32
Butane (n)	36	Methyl Propane [2]	29
Butane (iso)	32	Methyl t-Butyl Ether	35
Butanol (iso)	38	Pentane (n)	36
Butene-1	34	Pentane (iso)	36
Butene-2	37	Pentene	35
Butyl Acetate (n)	28	Propane	29
Butylene	33	Propanol (n)	36
Butyraldehyde	30	Propanol (iso)	37
Chlorobenzene	38	Propylene	33
Cyclohexane	37	Propylene Oxide	33
Dimethoxyethane	26	Tetrahydrofuran	30
Dioxane. 1. 4	39	Toluene	39
Epichlorhydrin	33	Trichloroethylene	35
Ethanol	30	Triethylamine	38
Ether. Diethyl	37	Vinyl Acetate	34
Ether. Dimethyl	30	Vinyl Chloride	32

CATEGORY 33: FOR CATALYTIC TYPE 1S GENERAL SOLVENTS To detect the following gases, recalibrate with 0.6% Propane and set the span gas value accordingly			
Amyl alcohol	43	JP-4	41
Butanol (n)	48	Methyl Cellosolve	49
Butyl Acrylate	46	Methyl Ethyl Ketone	52
Cellosolve	42	Methyl Isobutyl Ketone	53
Di isopropylamine	42	Methyl Methacrylate	40
Diethylamine	41	Naphtha. VMSP	53
Ethyl Acetate	43	Getane (iso)	52
Ethyl Acrylate	52	Propyl Acetate	45
Ethyl Benzene	41	Styrene	42
Heptane	42	Xylene	50
Hexene	42		

Table 2-2.
Calibration Guide for Combustible Gas Sensor

CATEGORY 34: ULTIMA IR METHANE To detect the following gases, recalibrate with 2.5% methane and set the span gas value accordingly:			
Acetone	86	Isoproponal	25
Butadiene, 1, 3	80	MEK	53
Cyclohexane	14	Methane	50
Ethanol	17	Methanol	14
Ethyl Acetate	34	Methyl Formate	13
Ethylene	95	Propylene	39
Heptane	14	Toluene	64
Hexane	14	Xylenes	53
IsoButanol	20		
CATEGORY 35: ULTIMA IR NON-METHANE To detect the following gases, recalibrate with 0.6% propane and set the span gas value accordingly:			
Butane	31	IsoButane	33
Butyl Acetate	48	IsoButanol	47
Cyclohexane	37	IsoPropanol	52
Cyclopentane	32	Methanol	27
Dimethyl Ether	25	Methyl Formate	35
Ethane	30	Pentane	31
Ethanol	36	Propane	29
Ethylene Oxide	72	Propyl Acetate	51
Heptane	36	Propyl Alcohol	31
Hexane	37	Propylene Oxide	26

CATEGORY 38: ULTIMA XIR METHANE					
To detect the following gases, recalibrate with 25% methane and set the span gas value accordingly:					
Methane		50			
CATEGORY 39: ULTIMA XIR NON-METHANE					
To detect the following gases, recalibrate with the stated % propane and set the span gas value accordingly:					
Butane,	0.6% propane	28	Hexane	0.6% propane	41
Cyclopentane,	0.6% propane	30	Pentane	0.6% propane	33
Ethane,	0.6% propane	25	Propane	0.6% propane	29
Ethylene,	0.1% propane	28			

Example:
If measuring gases or vapours that appear in TABLE 2-2, Category 2 and Category 3, you should calibrate to the Category 3 span value (55% LEL) with 0.6% Propane by volume applied.

If the gas or vapour you are measuring does not appear in the TABLE 2-2 categories, consult MSA for the proper setting. If you wish to calibrate to the specific LEL of the gas or vapour being measured, the expected span gas value of the ULTIMA/ULTIMA X Series Gas Monitor can be changed by the ULTIMA Controller.

ULTIMA/ULTIMA X Series Gas Monitor Calibration

WARNING

To ensure a fully functional sensor, perform Calibration checks and adjustments at initial start-up and at regular intervals.

As with any type of gas monitor, the only true check of its Performance is to apply gas directly to the sensor. The frequency of the calibration gas tests depends on the operating time and chemical exposures of the sensors. New sensors should be calibrated more often until the calibration records prove sensor stability. The calibration frequency can then be reduced to the schedule set by the safety officer or plant manager.

In some cases, it may be necessary to perform only a zero function of the Gas Monitor in lieu of a full zero and span procedure. Check with your safety officer or safety engineer to determine if only a zero function is necessary.

NOTES:
- If this is the first calibration or, if the sensor element has been changed or replaced, see Chapter 2, “Initial Calibration.”
- If this is an oxygen sensor, see Chapter 2, “Oxygen Calibration.”
- If this is an XIR sensor, see Section 2, “XIR Calibration”
- Apply power to the unit at least 1 hour before calibrating.
- Due to the unstable nature of Chlorine Dioxide (CLO_2), Chlorine gas is used as a calibration Simulant. If using the MSA calibration System and gas cylinder (P/N 710331), the response ratio is 2:1. In other words, the 2 ppm sample of Chlorine should be set to read 1 ppm of CLO_2. The default value for the calibration gas on the CLO_2 ULTIMA/ULTIMA X Series Gas Monitor is 1 ppm.
- For CL2 and CLO2 calibration, do not mix regulators. Use only one regulator for each of these gases. They will not work properly if one regulator is used for multiple gases.
- Due to the reactivity of HCL with flow System components, gas can be used as a calibration Simulant. If using the MSA calibration System and gas cylinder (P/N 467898, 10 ppm in Nitrogen) the span value should be set to 40 ppm of HCL (the default span value of HCL).

INITIAL Calibration

When a new sensor is placed in the ULTIMA Gas Monitor, an INITIAL Calibration must be performed. When a new sensor is placed in the ULTIMA X Gas Monitor, an INITIAL Calibration is also needed. This procedure enables the unit to gather data about the sensor to make accurate decisions for the CHANGE SENSOR function and the CAL FAULT function to work properly.

Additionally, INITIAL Calibration should only be used when a regular calibration will not clear a fault condition due to use of incorrect cal gas or other similar Situation.

Initial calibration is accomplished by:

- pressing the ZERO and CALIBRATE buttons simultaneously on the ULTIMA Calibrator
- pressing and holding the SPAN button on the ULTIMA Controller
  - The Controller display shows "Do Init Cal 1=y"
  - Press 1 while pointing the Controller at the ULTIMA/ULTIMA X Series display.

- The ULTIMA display should show "SET APPLY ZERO GAS"
- The ULTIMA X Series display should show "APPLY ZERO GAS"
- The remainder of the procedure is now the same as that for a regular calibration.
- The presence of the words "SET" (on ULTIMA units only) and "ICAL" (on both ULTIMA and ULTIMA X Series units) on the display distinguish INITIAL Calibration from a regular calibration. If the word "ICAL" does not appear, the user may abort the calibration by pressing any button on the Calibrator while aiming at the unit; then, retry the above procedure.

NOTE:
The calibration process can be aborted at any time during the 30-second Countdown simply by pressing the ZERO, CAL or ADDRESS button on the Controller/Calibrator while aiming at the unit.

- The display leads the user through the zero and span routines as in a regular calibration.

NOTE:
This procedure should be initiated only when a new sensor element is installed. Otherwise, the sensor end-of-life indication may not be accurate.

Regular Calibration

A regular calibration includes a "zero" and "span" as described in the following procedures. If the user chooses to only perform a "zero", they may do so by pressing the ZERO button instead of the CALIBRATE or CAL button as described in step 3.

- For oxygen units, skip to Step 3.

Zeroing

1. Using Zero Gas Cylinder:
   a. Locate the Zero Gas Cylinder and the Calibration Kit Flow Controller.

   b. Screw the Flow Controller onto the top of the Zero Gas cylinder.

   c. Locate the Calibration Kit Tube Assembly.

   d. Push the smaller end of the Tube Assembly over the Flow Controller gas outlet and ensure tubing completely covers the gas outlet.

   e. When using Cal Kit 40, connect the other end of the tubing over the SensorGard inlet.

      When using Cal Kit 41, (or Cal Kit 40 with the ULTIMA XIR), locate the Cal Cap with a hole for tubing and push the tubing through the hole in the bottom of the cap. Then, connect the end of the tubing over the sensor inlet and push the calibration cap over the entire sensor inlet (see FIGURE 2-7).

Note:
The calibration cap (P/N 10041533) for the ULTIMA XIR is shipped with the product and is not contained in the calibration kit.

   f. Turn ON the gas flow by turning the knob on the flow Controller.

2. Point the ULTIMA Controller/Calibrator at the ULTIMA/ULTIMA X Monitor display and press the Controller/Calibrator CAL/CALIBRATE button.

The display shows:

- A Countdown from 30 to 0 seconds
- APPLY ZERO GAS.

NOTE:
The zero or calibration process can be aborted at any time during the 30-second Countdown interval; simply press the ZERO, CAL or ADDRESS button on the Controller/Calibrator while aiming it at the unit.

NOTE:
The 30-second Countdown interval is omitted for oxygen units. It is electronically zeroed.

3. After the 30 second Countdown:
   - The display alternates between “CAL” and a value (example: 0 PPM). This value is the actual reading of the gas concentration the sensor is detecting. The engineering units (PPM, % or %LEL) are predetermined by the type of sensor installed and are not changeable.

   - Once the gas value is stable, the alternating display stops. If the calibration is successful, the display will show END.

1) Turn OFF the gas flow by turning the flow Controller knob.

2) Remove the tubing from the Flow Controller.
   - If the calibration Output Signal is enabled during calibration, it will be held at the lockout value for an additional two minutes or until after the span routine if performing a full calibration.

   c. If a CAL FAULT flag appears on the unit, this indicates:
   - An unsuccessful attempt to zero or calibrate the ULTIMA/ULTIMA X Series Gas Monitor
   - The ULTIMA/ULTIMA X Series Gas Monitor is operating with the calibration parameters defined before the calibration was attempted.
   - See Troubleshooting Guidelines found in the ULTIMA manual (P/N 10046690).

   To extinguish the CAL FAULT flag, a complete successful calibration procedure must be performed.

The ULTIMA/ULTIMA X Series Gas Monitor allows automatic zero adjustment only within a pre-defined range. It cannot make corrections outside this range, such as when an empty or wrong cylinder of gas is applied or failure to begin gas flow within the allotted 30-second Countdown occurs.

• If only a ZERO was performed, the procedure is complete and the user should return the calibration equipment to the cal kit. If a CAL was performed, the gas monitor will continue to the “span” sequence as described in the following section.

Spanning

4. During a regular calibration, the ULTIMA/ ULTIMA X Series Gas Monitor automatically begins the span Countdown after a successful zeroing of the unit. The span Countdown is 30 seconds (FIGURES 2-3 and 2-4).

Figure 2-3
ULTIMA Unit Apply SPAN Gas Flag

   - The span process can be aborted at any time during the Countdown by simply pressing the ZERO, CAL or ADDRESS button on the Controller/Calibrator while aiming it at the unit.

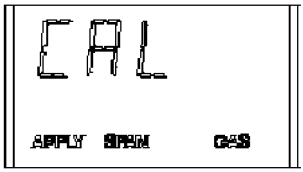


Figure 2-4

5. Locate the span gas cylinder and the Calibration Kit Flow Controller.

6. Screw the Flow Controller onto the top of the span gas cylinder.

7. Locate the Calibration Kit Tube Assembly.

8. Push the smaller end of the Tube Assembly over the gas outlet of the Flow Controller and ensure that the tubing completely covers the gas outlet.

9. When using:
   a. Cal Kit 40, connect the other end of the tubing over the SensorGard inlet (FIGURE 2-5).
   b. Cal Kit 41(or Cal Kit 40 with the ULTIMA XIR), locate the Cal Cap with hole for tubing and push the tubing through the hole in the bottom of the cap. Then, connect the end of the tubing over the sensor inlet and push the calibration cap over the entire sensor inlet (see FIGURE 2-7).

10. Turn ON the gas flow by turning the flow Controller knob.
    - It is good practice to have all calibration components previously assembled.
    - Ensure that any calibration gases are applied during the 30-second count down period.

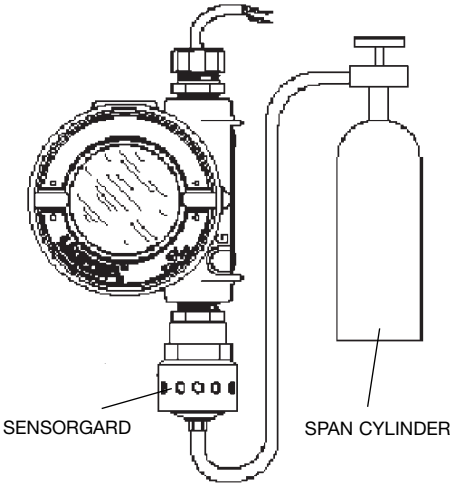


Figure 2-5
Span Set-up (ULTIMA unit shown)

- If CAL FAULT displays on the ULTIMA/ ULTIMA X Series Gas Monitor before the user is able to apply the gas, a stable gas condition was reached, causing the unit to use a wrong reading as a span indication.
- It is necessary to restart the calibration process to clear this condition.

11. After the 30 second Countdown:
    - The display alternates between “CAL” and a value. (for example: 60 PPM for 0 to 100 ppm carbon monoxide). This value is the actual reading of the gas concentration the sensor is detecting. The engineering units (PPM, % or %LEL) are predetermined by the type of sensor installed and are not changeable.
    - Once the gas value is stable, the alternating display stops. If the calibration is successful, the display will show END for approximately two seconds. (FIGURE 2-6).

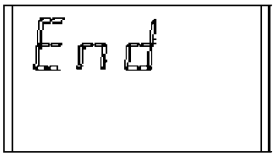


Figure 2-6
ULTIMA X Series Unit Calibration End Display

- No user adjustments are necessary.
- The display will show the span gas value while the span gas is flowing to the unit. (For example, it may read 60 PPM or 25 % or 60 % LEL).

12. Turn OFF the gas flow by turning the knob on the flow Controller.

If the calibration Output Signal is enabled during calibration, it will be held at the lockout value for two additional minutes after END is displayed.

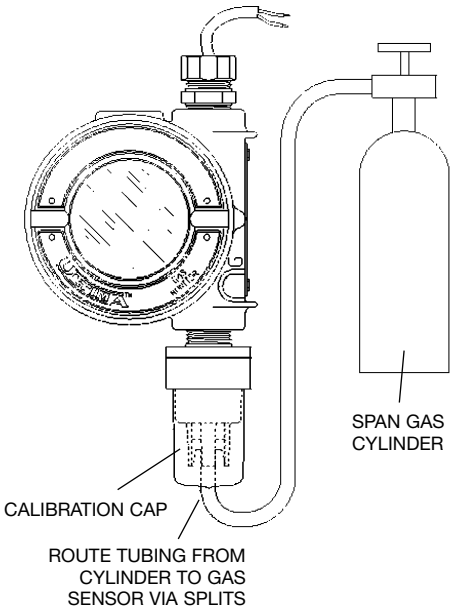


Figure 2-7.
Span Gas Connection (Ultima unit shown)

- When the span gas is removed from the sensor, the sensor reading may take several minutes to return to zero; this is normal sensor Operation.
- If a CAL FAULT flag appears on the unit, this indicates:
    - An unsuccessful attempt to calibrate the ULTIMA/ULTIMA X Series Gas Monitor
    - The ULTIMA/ULTIMA X Series Gas Monitor is operating with the calibration parameters defined before the calibration was attempted.

To extinguish the CAL FAULT flag, a complete calibration procedure must be performed.

The ULTIMA/ULTIMA X Series Gas Monitor allows automatic zero and span adjustments only within a pre-defined range. It cannot make corrections outside this range, such as when an empty or wrong cylinder of gas is applied or failure to begin gas flow within the allotted 30-second Countdown occurs.

13. After a successful calibration, remove the tubing from the Flow Controller and remove the Flow Controller from the cylinder; return all items to their appropriate location in the Calibration Kit.

OXYGEN Calibration

NOTE:
If this is the first calibration after the sensor element is replaced, perform an "Initial Calibration."

Oxygen calibration is slightly different from other gases. When the ZERO function is performed, the 30-second Countdown is omitted because the ULTIMA/ULTIMA X Series unit performs the zero electronically. No calibration cap or zero gas is necessary.

To meet the specification stated, it is necessary to span the oxygen ULTIMA/ULTIMA X Series Gas Monitor with the Calibration Kit and an oxygen cylinder. The concentration of oxygen in air varies slightly due to changing relative humidity and pressure levels. These variations in oxygen levels are detected by the oxygen ULTIMA/ULTIMA X Series Gas Monitor. To meet the reproducibility specification, it is necessary to use a calibration gas cylinder. This ensures the same concentration of oxygen for every calibration.

25% Oxygen ULTIMA/ULTIMA X Series Gas Monitor

For the SPAN function, ambient air is generally adequate for the 25% oxygen ULTIMA/ULTIMA X Series Gas Monitor as the expected default span value is 20.8%. Therefore, when the display prompts "APPLY SPAN GAS" it would be adequate to simply allow the Countdown to occur without applying gas.

NOTE:
If the sensor is located in an area of normally low or enriched oxygen, then a 20.8% oxygen sample must be applied when the display prompts: "APPLY SPAN GAS".

XIR Calibration

Although a full calibration (zero and span) can be performed on the ULTIMA XIR Gas Monitor, a no-gas calibration is sufficient to properly calibrate the monitor. A zero adjustment is all that is required for a full calibration. Normally, any degradation of the sensor's performance is associated with slight drifts in its zero response which, in turn, will adversely affect its span performance. Restoring the sensor's zero is typically sufficient to restore its span performance. A zero adjustment is performed by pressing the ZERO button on the Calibrator or Controller and following the "Zeroing" instructions given earlier in this chapter. After completing the zeroing function, perform a span check to ensure proper operation. If the span check is unsuccessful, perform a full calibration.

NOTE:
For calibration of an XIR sensor operating with a Flow Cap, temporarily replace the Flow Cap with the sensor Guard (packaged with the instrument) and perform the following procedure.

⚠ WARNING

The Calibration Cap must be removed from the XIR sensor guard after completing the Zeroing and/or Spanning procedure; otherwise, the sensor cannot perform properly.

Section 3

Controller - Detailed Operation

Viewing the Ultima Gas Monitor Display Modes

Table 3-1. (see "Procedures") The Controller Can Change the Ultima Gas Monitor Display to Show:			
DISPLAY		DEFAULT	TO CHANGE, SEE PROCEDURE #
Current gas concentration reading		N/A	N/A
Minimum gas concentration reading over last time average interval		N/A	1
Maximum gas concentration reading over last average time interval		N/A	1
Average gas concentration reading over last average time interval		N/A	1
Time interval for minimum, maximum & average gas reading		1 HOUR	1
Zero gas concentration value		N/A	N/A
Sensor Range		N/A	3
Gas Table Value		1	4
Span gas concentration value		see TABLE 1	2
Alarm 1 , 2, 3 setpoints		DISABLED ULTIMA	5
		ENABLED ULTIMA X	5
IF ENABLED:			
Alarm 1	10% full-scale		
Alarm 2	20% full-scale		
Alarm 3	30% full-scale		5
Oxygen Alarm 1	19.5%**		
Oxygen Alarm 2	18.0%**		
Oxygen Alarm 3	22.0%		

Table 3-1. (see "Procedures") The Controller Can Change the Ultima Gas Monitor Display to Show:		
DISPLAY	DEFAULT	TO CHANGE, SEE PROCEDURE #
Current time	E ASTERN STANDARD TIME	6
Current date	CURRENT DATE	7
Calibration signal Status	OFF	8
Calibration interval and Future calibrate time	30 DAYS & 00:00	9
Future calibrate date	DISABLED*	10
Sensor address (MUX frequency Output only)	1	11
Viewing the previous successful calibrate date	N/A	12
Calibrating/checking 4-20mA (Ultima X only)	N/A	13
Resetting the ULTIMA X	N/A	14
Alert Option (Ultima X only)	OFF	15
Setting Sensor Swap Delay (ULTIMA X only)	ON	16
* The date is set to 12/31/94, which disables auto-calibration (Ultima only). ** Indicates negative or downward acting alarms		

To View the Status of the Ultima Gas Monitor

To view any of the display modes listed above, such as current time or date, perform the following:

1. Turn the unit ON by pressing the ENTER button; wait until the READY prompt displays.

2. Press the SEND button. The display prompts: SEND?

3. Press the DISPLAY button.
   - The display prompts: Sel Dsp Item ±.

4. Press the + or - button to scroll through the available list as described above.

5. When the desired choice appears on the display, aim the Controller at the sensor and press the ENTER button.

NOTE:
These readings are only displayed on the ULTIMA Gas Monitor and the ULTIMA X for only five seconds. The display then returns to the actual gas concentration.

Procedures (see TABLE 3-1)

Procedure 1. Setting the Average Time Interval
The average, minimum and maximum gas concentration values are gathered over the last time interval set by the Controller. This procedure is used to change the time interval used for the average, minimum, and maximum gas concentration value calculations of the ULTIMA Sensor and ULTIMA X .

To Change the Average Time Interval
1. Press the SEND button.
   - The display prompts: SEND?

2. Press the AVG button.
   - The display prompts: Set Avg Term ±

3. Press the + or - button to scroll through the available list:
   - Every 1 Hour
   - Every 8 Hours
   - Every 24 Hours.

4. When the desired time interval is displayed, aim the Controller at the sensor and press the ENTER button.
   - The Ultima Gas Monitor will show the time interval selected for five seconds
   - The Ultima Gas Monitor time interval is now set to the desired selection.
   - The Ultima Gas Monitor display shows the average, minimum, or maximum gas concentration reading over the selected interval. This reading is updated at the end of the selected average interval.

Procedure 2. Setting the Span Value

ULTIMA Monitors are shipped with TABLE 2-1 default span gas values. MSA calibration cylinders are available for most of these pre-set span gas concentrations; if an alternate span gas value is needed, ULTIMA Monitor span calibration value must be changed.

To Change the Calibration Span Gas Value of the ULTIMA Sensor

1. Press the SEND button.
   - The display prompts: SEND?

2. Press the SPAN button.
   - The display prompts: Span Gas Type ±

3. Press the + or - button to scroll through the available gas list. One of the following gases will correspond to the range of your ULTIMA Gas Monitor. Check the sensor housing label.

NOTE:
If your gas type or range is not shown on the Controller display, you may use the custom range Option on the menu.

4. When the selection matching your sensor type is found, press the ENTER button.
   - The display prompts: SpanVal ###.

NOTE:
If the custom range Option was selected, a decimal point may be implied, since this range can be used for decimal point and non-decimal point ULTIMA units. When sending a value to an Ultima unit that indicates a decimal point, enter the data assuming an implied decimal point (e.g., “009” is interpreted as “00.9”).

5. Using the NUMBER buttons, enter the desired three-digit value.
   (Leading zeros are required.)
   - Corrections can be made using the DEL button.

6. After the value is entered, aim the Controller at the sensor and press the ENTER button.
   - The ULTIMA Gas Monitor will show the new span gas value for five seconds
   - If the span gas concentration value is higher than the full scale range of that gas, the Controller will not send that value to the ULTIMA Gas Monitor; re-enter a span gas concentration value lower than or equal to full scale value.
   - The ULTIMA Gas Monitor desired span gas value is now changed to the selected concentration.

To Change the Calibration Span Gas Value of the ULTIMA X Series Sensor

1. Press the SEND button.
   - The display prompts: SEND?

2. Press the SPAN button.
   - The display prompts: Span Option ±

3. Press the + or - button until the display prompts: ULTIMA X SpanVal

4. Press the Enter button.
   - The display prompts: SpanVal ####.##

5. Using the NUMBER buttons, enter the desired value (ATM style, lagging zeros are required).

6. After the value is entered, aim the Controller at the sensor and press the ENTER button.
   - The ULTIMA X Series Gas Monitor shows the new span gas value.
   - If the span gas concentration value is higher than the full scale range, the ULTIMA X Series Gas Monitor will display the current span value setpoint.
   - The ULTIMA X Series Gas Monitor span gas value is now changed to the selected concentration.

Procedure 3.

Setting the Range on an Ultima X Series Sensor

1. Press the SEND button.
   - The display prompts: SEND?

2. Press the SPAN button.
   - The display prompts: Span Option ±

3. Press the + or - button until the display prompts: ULTIMA X Range.

4. Press the Enter button.
   - The display prompts: Range ####.##

5. Using the NUMBER buttons, enter the desired value (ATM style, lagging zeros are required).

6. After the value is entered, aim the Controller at the sensor and press the ENTER button.
   - The ULTIMA X Series Gas Monitor will show the new full scale gas value.
   - If the span gas concentration value is higher than the full scale range limit or below the minimum range limit, the ULTIMA X Series Gas Monitor displays the current range value.
   - The ULTIMA X Series Gas Monitor range value is now changed to the selected limit.

Procedure 4

Setting the Gas Table on an ULTIMA XIR Sensor
This feature changes the response curve to the specific target gas selected. After completion of Procedure 4, the appropriate span value listed in TABLE 2-2 must also be reset in accordance with Procedure 2.

1. Press the SEND button.
   - The display prompts: SEND?

2. Press the SPAN button.
   - The display prompts: Span Option +.

3. Press the + or - button until the display prompts: ULTIMA X GasTble.

4. Press the ENTER button.
   - The display prompts: GasTble ###.

5. Using the NUMBER buttons, enter the desired value (leading zeros are required).

Gas Table Selection	
001	Methane
002	Propane
003	Ethane
004	Butane
005	Pentane
006	Hexane
007	Cyclopentane
008	Ethylene

6. After the value is entered, aim the Controller at the sensor and press the ENTER button.
   - The ULTIMA XIR Series Gas Monitor will reset after receiving a valid gas table value (otherwise, the ULTIMA X Monitor will indicate that changing the gas table value has been unsuccessful).
   - The ULTIMA XIR Gas Monitor gas table value is now changed to the selected value.

Procedure 5.

Setting the Three Ultima Gas Monitor Alarm Setpoint Values

The ULTIMA Gas Monitor has three alarm levels. The relay module can be connected directly to the ULTIMA Gas Monitor to provide three levels of relays and a normally energised trouble relay. The three levels of alarm will also be displayed on the ULTIMA Gas Monitor LCD display even if an ULTIMA Gas Monitor relay module is not used.

- Alarm #1 must be set at a lower or equal value than Alarm #2
- Alarm #2 must be set lower or equal than Alarm #3
- On the oxygen unit:
  - Alarms #1 and #2 are negative or downward acting
  - Alarm #3 is positive or upward acting
  - Alarms #1, #2 and #3 can be set to any value; they are independent of one another.

To set the three levels of alarm:

1. Press the SEND button.
   - The display prompts: SEND?

2. Press the ALARM button.
   - The display prompts: 0=SetPt 1=OnOff

3. To set the alarm values, press the 0 button.
   - The display prompts: Alm Gas Type ±.

4. Press the + or - button to scroll through the available list:

NOTE:
If your gas type or range is not shown on the Controller display, you may use the custom range Option on the menu.

5. When the selection matching your sensor type is found, press the ENTER button. (Invalid entries are ignored.)
   - The display prompts: Alm Set Point #.

6. Using the NUMBER buttons, enter the desired alarm setpoint 1, 2 or 3; then, press the ENTER button. (Invalid entries are ignored.)
   - The display prompts: SetPVal ###

NOTE:
If the custom range Option was selected, a decimal point may be implied, since this range can be used for decimal point and non-decimal point ULTIMA units. When sending a value to an ULTIMA unit that indicates a decimal point, enter the data assuming an implied decimal point (e.g., “009” is interpreted as “00.9”).

7. Enter the desired value in an appropriate range for the gas type used. (Leading zeros are required.)
   - The DEL button can be used to delete number entries before the ENTER button is pressed
   - The ULTIMA Gas Monitor will show the new alarm setpoint value and the Status of that setpoint [enabled (ON) or disabled (OFF)].

NOTE:
The combustible alarm setpoint value cannot be set greater than 60% LEL.

8. Aim the Controller at the sensor and press the ENTER button.
   - If the alarm setpoint value is greater than the full scale gas concentration value, the Controller will not change the setpoint value; re-enter an alarm setpoint value lower than or equal to the full scale gas concentration value
   - Repeat this procedure for each alarm level.

Setting the Three ULTIMA X Series Gas Monitor Alarm Setpoint Values

The ULTIMA X Series Gas Monitor has three alarm levels. The relay Option provides:
- three levels of relays and
- a normally-energised trouble relay.

The three levels of alarm display on the ULTIMA X Series LCD display even if the relay Option is not installed.

To set the three levels of alarm:
1. Press the SEND button.
   - The display prompts: SEND?
2. Press the ALARM button.
   - The display prompts: 0=SetPt 1=OnOff.
3. To set the alarm values, press the 0 button.
   - The display prompts: Alm Set Point #.
4. Using the NUMBER buttons, enter the desired alarm setpoint 1, 2 or 3; then press the ENTER button. (Invalid entries are ignored.)
   - The display prompts: SetPVal ####.##.
5. Using the NUMBER buttons, enter the desired value (ATM style, lagging zeros are required).

The DEL button can be used to delete number entries before the ENTER button is pressed.

- The ULTIMA X Series Gas Monitor will show the new alarm setpoint value and the Status of the setpoint:
  - enabled (LATCH/UNLATCH, INCR/DECR, ENER/DENERG) or
  - disabled (OFF).

NOTE:
The combustible alarm setpoint value cannot be set greater than 60% LEL.

6. Aim the Controller at the sensor and press the ENTER button.
   - If the alarm setpoint value is greater than the full scale gas concentration value, the Controller will not change the setpoint value; re-enter an alarm setpoint value lower than or equal to the full scale gas concentration value.
   - Repeat this procedure for each alarm level.

Enabling/Disabling and Setting the Mode of the Three ULTIMA Alarm Setpoints

1. Press the SEND button.
   - The display prompts: SEND?
2. Press the ALARM button.
   - The display prompts: 0=SetPt 1=OnOff.
3. Press the 1 button.
   - The display prompts: Alm Gas Type ±.
4. Press either the + or - button to scroll through the list:
5. When the selection matching your sensor type is found, press the ENTER button.
   - The display prompts: Alm Set Point #.
6. Using the NUMBER buttons, enter the desired alarm setpoint 1, 2 or 3; then, press the ENTER button. (Invalid entries are ignored.)
   - The DEL button can be used to delete number entries before the ENTER button is pressed
   - display prompts: AlmSPnt 1=E 0=D.

7. To Disable the chosen setpoint, aim the Controller at the sensor and press the 0 button.
   - The ULTIMA Gas Monitor will show both the Status (OFF) and the alarm setpoint value.

8. To Enable the chosen setpoint, press the 1 button
   - The display prompts: Latched 0=N 1=Y.

Aim the Controller at the sensor:

a. Press the 0 button to enable the alarm in unlatched mode or
b. Press the 1 button to enable the alarm in latched mode.
   - The ULTIMA Gas Monitor will show both the Status (on U if unlatched or on L if latched) and the alarm setpoint value.

Enabling/Disabling and setting the Mode of the Three ULTIMA X Series Alarm Setpoints

1. Press the SEND button.
   - The display prompts: SEND?.

2. Press the ALARM button.
   - The display prompts: 0=SetPt 1=OnOFF.

3. Press the 1 button.
   - The display prompts: Alm Set Point #.

4. Using the NUMBER buttons, enter the desired alarm setpoint 1, 2, or 3; then, press the ENTER button. (Invalid entries are ignored.)
   - The DEL button can be used to delete number entries before the ENTER button is pressed.
   - The display prompts: AlmSPnt 1=E 0=D.

5. To Disable the chosen setpoint, aim the Controller at the sensor and press the 0 button.
   - The ULTIMA X Series Gas Monitor will show both the Status (OFF) and the alarm setpoint value.

6. To enable the chosen setpoint, press the 1 button.
   - The display prompts: Latched 0=N 1=Y.

7. To set the alarm as a latching alarm, press the 1 button; to set the alarm as unlatching, press the 0 button. (Invalid entries are ignored.)
   - The display prompts: 0=DOWN 1=UP.

8. To set the alarm as a downward acting alarm, press the 0 button; to set the alarm as an upward acting alarm, press the 1 button. (Invalid entries will be ignored.)
   - The display prompts:
     0 = NONEN
     1 = ENGZD.

9. Aim the Controller at the sensor.
   a. Press the 0 button to enable the alarm as a non-energised alarm.
   b. Press the 1 button to enable the alarm as an energised alarm.

- The ULTIMA X Series Gas Monitor will show the alarm setpoint value and the Status:
  - LATCH/UNLATCH, INCR/DECR, ENER/DENERG.

Procedure 6.

Setting the Current Time

The ULTIMA Gas Monitor is factory-set to Eastern Standard Time. To change it in the Controller and in the ULTIMA Gas Monitor:

1. Press and hold the TIME button.
   - The display prompts: ##:##

2. Using the number keys, enter the correc time in the 24 hour format (e.g., 4:00 P.M. = 16:00). (Leading zeros required.)

3. Press the ENTER button.

To update the Ultima Gas Monitor internal clock:

1. Press the SEND button.

2. Aim the Controller at the sensor and press the TIME button.

NOTE:
Time and date are updated with this command.

- The ULTIMA Gas Monitor will display the current time and date for five seconds.

Procedure 7.

Setting the Current Date

The Ultima Gas Monitor is factory-set to the current date. To change it in the Controller and in the ULTIMA Gas Monitor:

1. Press and hold the DATE button to enter the correct date.
   - The display prompts: MM-DD-YYYY

2. Use number keys to enter correct date (leading zeros required):
   - MM = Months
   - DD = Date
   - YYY = year

3. Press the ENTER button

To update the Ultima Gas Monitor internal date

1. Press the SEND button.

2. Aim the Controller at the sensor and press the DATE button.

NOTE:
Time and date are updated with this command.

- The Ultima Gas Monitor will display the current time and date for five seconds.

Procedure 8.

Enabling/Disabling ULTIMA Gas Monitor Calibration Output Signal

The ULTIMA Gas Monitor is shipped with the calibration Output Signal disabled. This means that the Output Signal will track the gas concentration value during the calibration process. In some applications, it may be desirable to enable or lock the calibration Output Signal to a pre-determined Output value to prevent activation of alarm devices. For frequency and MÜX models, this value is 12 kHz, which is recognised by MSA Model 6000 Instruments as a calibration Signal. 4 to 20 milliamp Output Signal models are locked to 3.75mA during this process (however, oxygen models lock at 21 m A).

NOTE:
See Procedure 15, Setting the Alert Option on an ULTIMA X Series Sensor, for details on oxygen sensors calibration Signals.

For the MSA Model 5000 and Toxgard Instruments, manually place the Instrument in the Calibration Mode.

To enable or disable the calibration Output Signal:

1. Press the SEND button.
   - The display prompts SEND?

2. Press the CAL button.
   - The display prompts: Sel Cal Action ±.

3. Press either the + or - button and scroll to the CalSIG Enable display message.

4. Press the ENTER button.
   - The display prompts: En Cal 0=N 1=Y.

5. To enable calibration Signal Output, aim the Controller at the sensor and press the 1 button.
   - The command is sent immediately
   - The ULTIMA Gas Monitor will flash: Sig ON
   - The ULTIMA X Series Gas Monitor will display: CAL SIG ON.

6. To disable the calibration signal, aim the Controller at the sensor and press the 0 button.
   - The command is sent immediately
   - The ULTIMA Gas Monitor will flash Sig OFF
   - The ULTIMA X Series Gas Monitor will display: CAL SIG OFF.

Procedure 9.

Setting the Number of Days Between ULTIMA Gas Monitor Auto-calibration Periods

With the use of the ULTIMA Gas Monitor auto-calibration module, the ULTIMA Gas Monitor is capable of automatically applying zero and span gas to itself. This provides a complete calibration of the sensor without operator intervention. If the ULTIMA Gas Monitor auto-calibration module is connected, the ULTIMA Gas Monitor must be programmed to calibrate itself between 1 to 128 day intervals.

1. Press the SEND button.
   - The display prompts: Send?

2. Press the CAL button.
   - The display prompts: Sel Cal Action ±.

3. Press either the + or - button and scroll to the DaysPerAutoCal display message.

4. Press the ENTER button.
   - The display prompts: CalTerm ### dy

5. Enter the three-digit period desired (from 1 day to 128 days). (Leading zeros are required.)

6. Aim the Controller at the sensor and press the ENTER button.
   - The ULTIMA Gas Monitor will show the number of days between auto-calibrations for five seconds
   - The ULTIMA Gas Monitor is now programmed to auto-calibrate at the desired interval.

Setting the Time that Ultima Gas Monitor Auto-calibration is to begin

1. Press the SEND button.
   - The display prompts SEND?
2. Press the CAL button.
   - The display prompts: Sel Cal Action ±.
3. Press either the + or - button and scroll to the StartHr of Cal display message.
4. Press the ENTER button.
   - The display prompts: CalHour HH.
5. Enter the two-digit hour desired (from 0 to 23 hours YPM = 16 hours). (Leading zero is required.)
6. Aim the Controller at the sensor and press the ENTER button.

- The ULTIMA Gas Monitor will display the hour selected
- The ULTIMA Gas Monitor is now programmed to auto-calibrate at the desired time.

Procedure 10.

Setting the Date of the Next Scheduled ULTIMA Gas Monitor Calibration

To disable the auto-calibration of the ULTIMA Gas Monitor, set the date of the next calibration to 12/31/94.

1. Press the SEND button.
   - The display prompts: SEND?
2. Press the CAL button.
   - the display prompts: Sel Cal Action ±.
3. Press either the + or - button and scroll to the NextCal Date display message.
4. Press the ENTER button.
   - the display prompts: MM-DD YYYY.
5. Enter a valid eight-digit date (month-day-year).
6. Aim the Controller at the sensor and press the ENTER button. (Leading zeros are required.)
   - The ULTIMA Gas Monitor will display the future date auto-calibration will start
   - The ULTIMA Gas Monitor is now programmed to auto-calibrate on the desired date.

Procedure 11.

Changing the MUX Address

1. Viewing the current Mux Address, aim the Controller at the ULTIMA Gas Monitor.
2. Press the ADDRESS button.
   - The current address of the sensor is displayed.

NOTE:
Additional pressing of the ADDRESS button will increment the address.

To Change the Address
1. Press the SEND button.
2. Press the ADDRESS button.
3. Enter the number of the address to be set.
4. Aim the Controller at the ULTIMA Gas Monitor and press the ENTER button.
   - The ULTIMA Gas Monitor will display the new address for five seconds.

Procedure 12.

Viewing the Previous Successful Calibration Date

1. Press the SEND button.
   - The display prompts: SEND?
2. Press the DISPLAY button.
   - The display prompts: SeL Dsp Item +
3. Press the + or - button to scroll and find: Prev. Cal Date.
4. Aim the Controller at the ULTIMA Gas Monitor and press the ENTER button.
   - The ULTIMA Gas Monitor will display the last previously successful calibration date.

Procedure 13.

Calibrating/Checking the 4-20mA ULTIMA X Series Outputs

1. Press the SEND button.
   - The display prompts SEND?.
2. Press the CAL button.
   - The display prompts: Sel Cal Action ±.

3. Press the + or - button until the display prompts: 4-20; then, press the ENTER button.
   - The display prompts: 0=4mA 1=20mA.

4. To Calibrate/Check the 4mA Output press the 0 button, to Calibrate/Check the 20mA Output press the 1 button.
   - The display prompts:
     0 = Check
     1 = Adjust.

5. To CHECK, aim the Controller at the sensor and press the ENTER button.
   - The display toggles between gas value and CAL.
   - The 4 - 20mA Output will be set as selected (4mA or 20mA).
   - The 4 - 20mA Output stays in a CAL Output for 1 minute.

6. To ADJUST, press the 1 button.
   - The display prompts: + =INC - =DEC.

7. To increase the current 4mA or 20mA setpoint, aim the Controller at the sensor and press the + button. To decrease the current 4mA or 20mA setpoint, press the - button.
   - The display toggles between gas value and CAL.
   - The adjusted 4 - 20mA Output will be set to the adjusted 4mA or 20mA Output level.
   - The 4 - 20mA Output stays in a CAL Output for 1 minute.

8. Repeat the procedure to continue to adjust the Output.

NOTE:
Adjusting the 4mA Output changes the 20mA setting. Always re-adjust the 20mA Output after adjusting the 4mA Output. Adjusting the 20mA Output will not change the 4mA Output setting.

Procedure 14.

Resetting the ULTIMA X Series Monitors

1. Press the SEND button.
   - The display prompts: SEND?.

2. Press the SEND button.
   - The display prompts: 0=RstDt 1=RstSn.

3. To reset the datasheets, press the 0 button.
   a. The display prompts: RstData 0=N 1=Y.

NOTE:
Resetting the datasheets loads the factory defaults for the attached sensor. The user must reconfigure the Instrument for their desired settings.

A successful calibration must also be performed after resetting the datasheets.

To reset the Instrument, press the 1 button.
   a. The display prompts: RstSnsr 0=N 1=Y.

4. Aim the Controller at the sensor and press the 0 button to cancel, or press the 1 button to reset.

Procedure 15.

Setting the Alert Option on an ULTIMA X Series Sensor

The Alert Option allows the operator to set the ULTIMA X unit to operate as shown in TABLE 3-2.

Table 3-2. Alert Operation Settings

	ALERT OPTION	
	ON	OFF
CALIBRATION	Fault relay de-energised	Fault relay energised
POWER ON RESET (Countdown)	Fault relay de-energised	Fault relay energised
4-20 CAL mA (Oxygen)	3.75mA	21mA
4-20 POR mA (Oxygen)	3.75mA	21mA

1. Press the SEND button.
   - The display prompts: SEND?.

2. Press the CAL button.
   - The display prompts: Sel Cal Action ±.

3. Press the + or - button until the display prompts: Alert Option.

4. Press the ENTER button.
   - The display prompts: AlrtOpt 0=N 1=Y.

5. Aim the Controller at the Sensor and press either the 0 or 1 button.
   - The ULTIMA X Series Gas Monitor Alert Option is now changed to the selected Operation.

Procedure 16.

Setting the Sensor Swap Delay on an ULTIMA X Sensor

- The ULTIMA X Series Gas Monitor is shipped with the Sensor Swap Delay enabled. This means that the 4-20mA Output Signal and the FAULT relay will hold off a fault indication for 60 seconds after the sensor missing indication is displayed on the instrument. This setting allows the operator to exchange sensor modules without a FAULT indication.

- This feature can be disabled to provide an immediate FAULT error condition. To change it, use the Controller to perform the following Steps:

1. Press the SEND button.
   - The display prompts: SEND?

2. Press the CAL button.
   - The display prompts: Sel Cal Action +.

3. Press the + or - button until the display prompts: Sensor SwapDly.

4. Press the ENTER button.
   - The display prompts: SwapDly 0=N 1=Y.

5. Aim the Controller at the sensor and press either the 0 or 1 button.

Programming the Controller
The Controller can be programmed to set up or group or repeat all of your ULTIMA Gas Monitors in one particular way. There are nine possible programs (1 through 9). However, program #9 is solely used to link or combine five of the remaining eight programs. These programs are useful to eliminate duplicate keystrokes or to ensure the same configuration at each mounting site.

Removing Existing Programs
It is good practice to remove the existing programs before attempting to initiate a new one.

1. Press and hold the 0 button.
   - The display prompts: Clr Prgs 0=N 1=Y

2. Press 1 to remove all programs.

Adding a New Program
There are eight programs available, 1 through 8. Each program will accept one ULTIMA Gas Monitor command. To enter a new program:

1. Press and hold the PROGRAM button until the display prompt reads: ENTER PRGM #.

2. Enter the program number (1 through 8).

NOTE:
A dual beep tone is heard for each entry during the Calibrator programming mode.

3. Press the ENTER button.

4. Enter the keystrokes of the single ULTIMA Gas Monitor function desired. When all of the keystrokes are entered, the Controller will save them and display: SAVING- for three seconds.

5. Repeat Steps 1 through 4, using a different program number to program additional ULTIMA Gas Monitor functions.

Linking or Combining Programs
It is often necessary to send multiple programs to the ULTIMA Gas Monitor. Program #9 allows the linking or combining of five of the eight programs.

To Link Programs
1. Press and hold the PROGRAM button until the display prompts: ENTER PRGM #.

2. Enter program #9 by pressing the 9 key.
   - A dual beep tone sounds.

3. Press the ENTER button.
   - The display will prompt: LINK #.

4. Enter the program numbers (1 through 8) to be combined or linked.
   - Only five programs can be linked.

5. Press the ENTER button.
   - The Controller will save this sequence.

NOTE:
Empty programs can be linked but will not be sent.

To Use Programs 1 through 8
1. Press the PROGRAM button.
   - The display will prompt: PROGRAM #.

2. Enter the desired program number (1 through 8).

3. Aim the Controller at the ULTIMA Gas Monitor and press the ENTER button.
   - The ULTIMA Gas Monitor will respond immediately.

To use Program #9
1. Press PROGRAM key.

2. Enter number 9.

3. Aim the Controller at the ULTIMA Gas Monitor and press the ENTER button.
   - The ULTIMA Gas Monitor will respond to the first program.

4. Press the 0 key to resend the first program or press 1 to send the next programs linked; if there are no other programs linked, press the 1 key to end.

To use Program #0
Program #0 is used to send the previous command. Resending the last command is useful if it involved a number of keystrokes. Program #0 will resend all of the commands except for the following:
- ZERO
- CAL
- ADDRESS
- INITIAL CAL OR INITIAL CALIBRATION
- SET TIME on the Calibrator
- SET DATE on the Calibrator

To resend any command except for those listed above:
1. Press the PROGRAM key.

2. Press the “0” key. (This is the number zero key, not the key labelled ZERO.)

3. Aim the Controller at the ULTIMA Gas Monitor and press ENTER.

If the last command is one of the three listed above, it will not send that command; instead, the Controller will send the preceding command.

Section 4

Maintenance

WARNING

The ULTIMA Controller and Calibrator is an intrinsically safe product for use in hazardous areas (see Marking, Certificates and Approvals according to the Directive 94/9/EC). All maintenance procedures must be performed in a non-hazardous area.

Covering leather
The ULTIMA Controller is approved with a covering leather

Batteries
- The ULTIMA Controller is approved for use with two “AA” cells.
- The ULTIMA Calibrator is approved for use with two “AAA” cells.
- The authorized battery type is listed under “ Marking, Certificates and Approvals according to the Directive 94/9/EC”.

Determining a Low Battery Condition on the ULTIMA Controller

To Determine if Battery Replacement is Necessary
1. Turn the Controller unit ON.
   - After the unit completes its initialisation, the display shows ID CODE, READY or ready.
2. If the display shows the ID CODE message, enter the correct code (see “Using the I D CODE Feature”) to reach the ready prompt.

3. The READY display is the low battery indicator:

WARNING

- If READY appears (upper case letters), the batteries are OK
- If ready appears (lower case letters), the batteries are weak and must be replaced.

Replacing the Batteries
The replacing of batteries is not allowed in hazardous areas

To Install New Batteries in the ULTIMA Controller

1. Turn OFF the ULTIMA Controller.
2. Remove the four screws from the rear of the case and carefully pull the rear cover away from the unit.
3. Remove the two weak batteries from the battery holder and dispose of properly.
4. Observing the proper polarity as shown on the plastic holder, install two new batteries in the holder.
5. If either end-cover was removed during removal of the back cover, reinsert it in its original location. (The dark IR lens must be at the top.)
6. If the dark IR lens at the top of the unit is dirty, clean with soapy water and dry before reinstalling it.
   - The lens must be clean for proper Operation.
7. With both lenses in place, replace the rear cover and re-install the four case screws.
8. Turn unit ON to verify Operation.

NOTE:
Changing the Controller batteries does not effect the internal real time clock or stored programs; therefore, the time and date values remain as previously set.

Determining a Low Battery Condition on the ULTIMA Calibrator

1. Turn unit ON by pressing any button.
   - Low battery results in a double beep for each key press
   - Normal battery results in a single beep for each key press.

To Install New Batteries in the ULTIMA Calibrator

1. Turn OFF the Calibrator and remove the four screws from the rear of the ULTIMA Calibrator unit.
2. Remove the two AAA batteries from their holders.
3. Observing the proper polarity as shown on the plastic holder, install two new batteries in the holder.
4. Re-install the back cover of the Calibrator.
5. Press any Calibrator button and listen for beep to ensure unit is operational.

Service

There are no internal adjustments to be made in the ULTIMA Controller. For any Service work, return to the unit to MSA:

see last Page

WARNING

Repair or alteration of these units, beyond the scope of these maintenance instructions or by anyone other than authorised MSA service personnel, could cause the products to fall to perform as designed.

This instrument contains a battery with hazardous materials!

Mark NiMH

Directions for disposal:
According to regulations conceming batteries (in Germany - Batt. V - dated March 27th, 1998) the user is obliged to return to the distributor waste batteries that contain hazardous materials, or to return to the manufacturer instruments which contain such permanently installed batteries.

Commercially available batteries should be returned to the distributor or public waste disposal service. Dezember 1998

Troubleshooting Guidelines		
PROBLEM	POSSIBLE CAUSE	POSSIBLE SOLUTION
	Dead batteries	Replace batteries
CONTROLLER OR CALIBRATOR INOPERATIVE	Dirty lens	Clean the dark red lens on the front end of the Controller or Calibrator
	Too much ambient light	Reduce the ambient light to the ULTIMA or ULTIMA X Series Gas Monitor by creating a light shield

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 :		**MSA Controller**
Type of protection :		EN 50 014 , EN 50 020
Special Conditions for safe use :		The instrument has to be used with his leather bag
Marking :		 II 2G EEx ib IIC T4
Battery Type :		**Duracell MN 1500 AA**
EC-Type Examination Certificate:		INERIS 03 ATEX 0130 X
Quality Assurance Notification:		0080
Year of Manufacture :		see Label
Serial Nr. :		see Label

EMC Conformance according to the Directive 89/336/EC

EN 61000 - 6 - 3

MSA AUER

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 Controller**

based on the EC-Type Examination Certificate :

INERIS 03 ATEX 0130 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 61000 - 6 - 3

MSA AUER GmbH
Dr. Axel Schubert
R & D Instruments

Berlin, July 2003

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 :	**MSA Calibrator**
Type of protection :	EN 50 014 , EN 50 020
Marking :	II 2G EEx ib IIC T3,T4,T5
Battery Type :	T3 : Duracell Ultra M3 MN 2400 T4 : Varta High Energy 4903 T5 : Energizer Ultra + E92
EC-Type Examination Certificate:	INERIS 03 ATEX 0129 X
Quality Assurance Notification:	0080
Year of Manufacture :	see Label
Serial Nr. :	see Label

EMC Conformance according to the Directive 89/336/EC

EN 61000 - 6 - 3

MSA AUER

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 Calibrator**

based on the EC-Type Examination Certificate :

INERIS 03 ATEX 0129 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 61000 - 6 - 3

Dr. A. Schubert

MSA AUER GmbH
Dr. Axel Schubert
R & D Instruments

Berlin, July 2003