MSA
The Safety Company

Operating Manual

ALTAIR 5 – Multi Gas Detector
ALTAIR 5IR – Multi Gas Detector

CE

Order No.: 10094177/00 Y-HLS

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 ALTAIR 5**

Complies with the provisions of the council directive 94/9/EC (ATEX).
This declaration is based on the EC-Type Examination Certificate

FTZU 08 ATEX 0340 X

in accordance with Annex III of the ATEX Directive 94/9/EC.
Quality Assurance Notification issued by Ineris of France, Notified Body number 0080, in accordance with Annex IV of the ATEX Directive 94/9/EC.
We additionally declare that this product is in conformance with the EMC Directive 2004 / 108/ EC in accordance with the standards

DIN EN 50270: 2007 Typ 2, DIN EN 61000 - 6 - 3 :2007

Dr. A. Schubert

MSA AUER GmbH
Dr. Axel Schubert
R & D Instruments

Berlin, April 2009

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Contents

1. Instrument Safety

1.1. Correct Use

The ALTAIR 5 and ALTAIR 5 IR Multigas Detectors are for use by trained and qualified personnel. They are designed to be used when performing a hazard assessment to:

- Assess potential worker exposure to combustible and toxic gases and vapours as well as low level of oxygen.
- Determine the appropriate gas and vapour monitoring needed for a workplace.

The ALTAIR 5 and ALTAIR 5 IR Multigas Detectors can be equipped to detect:

- Combustible gases and certain combustible vapours
- Oxygen-deficient or oxygen-rich atmospheres
- Specific toxic gases for which a sensor is installed.

The ALTAIR 5 and ALTAIR 5 IR Multigas Detectors are designed to:

- Detect gases and vapours in air only
- Detect only specified toxic gases for which a sensor is installed (available sensors see Chapter 6).

While the instrument can detect up to 25 % oxygen in ambient air, it is approved for use only up to 21 % oxygen.

- Read and follow all instructions carefully.
- Perform a blocked flow test before each day's use if equipped with an integral pump.
- Check calibration before each day's use and adjust if necessary.
- Check calibration more frequently if exposed to silicone, silicates, lead-containing compounds, hydrogen sulphide, or high contaminant levels.
- Recheck calibration if unit is subjected to physical shock.
- Use only to detect gases/vapours for which a sensor is installed.
- Do not use to detect combustible dusts or mists.
- Make sure adequate oxygen is present.
- Do not block sensors.
- Never block the pump inlet except to perform a sampling safety test.
- Have a trained and qualified person interpret instrument readings.
- Do not remove battery pack from instrument while in a hazardous location.
- Do not recharge Li Ion battery in a combustible location.
- Do not replace alkaline batteries in a combustible location.
- Do not alter or modify instrument.
- Use only MSA-approved sampling lines.

- Do not use silicone tubing or sampling lines.
- Wait sufficient time for the reading; response times vary, based on gas and length of sampling line.
- Do not use the instrument with integral pump for prolonged periods in an atmosphere containing a concentration of fuel or solvent vapours that may be greater than 10%LEL.

It is imperative that this operating manual be read and observed when using the product. In particular, the safety instructions, as well as the information for the use and operation of the product, 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.

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.

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

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

Perform a blocked flow test (see chapter 4.2) before each day's use if equipped with an integral pump.

MSA recommends to check the instrument's functionality (see chapter 3.6) and carry out a routine inspection each day before use.

Perform calibration check (see chapter 3.8) before each day's use to verify proper instrument operation. Adjust calibration if the readings are not within the specified limits.

Check calibration more frequently if the unit is subjected to physical shock or high levels of contaminants. Also, check calibration more frequently if the tested atmosphere contains the following materials, which may desensitise the combustible gas sensor and reduce its readings:

- Organic silicones
- Silicates
- Lead-containing compounds
- Hydrogen sulphide exposures over 200 ppm or exposures over 50 ppm for one minute.

- The minimum concentration of a combustible gas in air that can ignite is defined as the Lower Explosive Limit (LEL).
  A combustible gas reading of "100" or "5.00" indicates the atmosphere is above 100 % LEL or 5.00 %vol CH_4, and an explosion hazard exists.
  Move away from hazardous area immediately.
- Do not use the ALTAIR 5 Multigas Detector to test for combustible or toxic gases in the following atmospheres as this may result in erroneous readings:
  - Oxygen-deficient or oxygen-rich atmospheres
  - Reducing atmospheres
  - Furnace stacks
  - Inert environments
  - Atmospheres containing combustible airborne mists/dusts.

Measurement in the above atmospheres (except oxygen-rich atmospheres) can be done with the infrared sensor in the ALTAIR 5 IR.

- Do not use the ALTAIR 5 and ALTAIR 5 IR Multigas Detectors to test for combustible gases in atmospheres containing vapours from liquids with a high flash point (above 38 °C, 100°F) as this may result in erroneously low readings.
- Do not block sensor openings as this may cause inaccurate readings. Do not press on the face of the sensors, as this may damage them and cause erroneous readings. Do not use compressed air to clean the sensor holes, as the pressure may damage the sensors.
- Allow sufficient time for unit to display accurate reading. Response times vary based on the type of sensor being utilised (see chapter 5.5, "Performance Specifications"). Additionally, when using a sample pump, allow a minimum of 1 second per foot (3 seconds per metre) of sample line to allow the sample to be drawn through the sensors.
- Sampling lines made from 1.57 mm (0.062 inch) inner diameter tubing provide fast transport times to the instrument; however, they must be limited to 15 m (50 feet) in length.

- MSA does not recommend the use of sampling lines in monitoring for reactive toxic gases (Cl_2, ClO_2, NH_3).
- All instrument readings and information must be interpreted by someone trained and qualified in interpreting instrument readings in relation to the specific environment, industrial practice and exposure limitations.

Risk of explosion: Do not recharge instrument in hazardous area.

Do not replace batteries in hazardous area.

Observe proper battery maintenance

Use only battery chargers made available by MSA for use with this instrument; other chargers may damage the battery pack and the unit. Dispose of in accordance with local health and safety regulations.

Be aware of environmental conditions

A number of environmental factors may affect the oxygen sensor readings, including changes in pressure, humidity and temperature.

Pressure and humidity changes affect the amount of oxygen actually present in the atmosphere.

Be aware of the procedures for handling electrostatically sensitive electronics

The instrument contains electrostatically sensitive components. Do not open or repair the unit without using appropriate electrostatic discharge (ESD) protection. The warranty does not cover damage caused by electrostatic discharges.

Be aware of the product regulations

Follow all relevant national regulations applicable in the country of use.

Be aware of the warranty regulations

The warranties made by Mine Safety Appliances Company with respect to the product are voided if the product is not used and maintained 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 service.

1.4. Warranty

ITEM	WARRANTY PERIOD
Chassis and electronics	Two years*
COMB, O_2, H2S, CO sensors	Two years*
Cl_2 , ClO_2, NH_3, HCN, NO_2, PH_3, SO_2 sensors	One year*
Infrared Sensor	Two years*

*For extended warranty offerings please contact MSA

1.4.1 Warranty

This warranty does not cover filters, fuses, etc. Certain other accessories not specifically listed here may have different warranty periods. This warranty is valid only if the product is maintained and used in accordance with Seller's instructions and/or recommendations.

The Seller shall be released from all obligations under this warranty in the event repairs or modifications are made by persons other than its own or authorised service personnel or if the warranty claim results from physical abuse or misuse of the product. No agent, employee or representative of the Seller has any authority to bind the Seller to any affirmation, representation or warranty concerning this product. Seller makes no warranty concerning components or accessories not manufactured by the Seller, but will pass on to the Purchaser all warranties of manufacturers of such components.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY, AND IS STRICTLY LIMITED TO THE TERMS HEREOF. SELLER SPECIFICALLY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE.

1.4.2 Exclusive Remedy

It is expressly agreed that Purchaser's sole and exclusive remedy for breach of the above warranty, for any tortious conduct of Seller, or for any other cause of action, shall be the replacement at Seller's option, of any equipment or parts thereof, which after examination by Seller is proven to be defective.

Replacement equipment and/or parts will be provided at no cost to Purchaser, F.O.B. Seller's Plant. Failure of Seller to successfully replace any nonconforming equipment or parts shall not cause the remedy established hereby to fail of its essential purpose.

1.4.3 Exclusion of Consequential Damage

Purchaser specifically understands and agrees that under no circumstances will seller be liable to purchaser for economic, special, incidental or consequential damages or losses of any kind whatsoever, including but not limited to, loss of anticipated profits and any other loss caused by reason of nonoperation of the goods. This exclusion is applicable to claims for breach of warranty, tortious conduct or any other cause of action against seller.

2. Description

2.1. Instrument Overview

Figure 2-1 Instrument view

1	*Alarm LEDs (2)*	9	▼ *Button*
2	MSA Ink *Communication*	10	*Belt Clip*
3	*Sensor Inlets*	11	*Charging Connection*
4	*Pump Cap*	12	*Screws*
5	*Horn*	13	*Pump inlet*
6	*Display*	14	*Filter*
7	▲ *Button*	15	*Pump cap screw*
8	⏻ *Button*	16	*Charge Status LED*

The instrument monitors gases in ambient air and in the workplace.

The ALTAIR 5 is available with a maximum of four sensors, which can display readings for five separate gases (one Dual Toxic Sensor provides both CO and H_2S sensing capabilities in a single sensor).

The detector is available in a diffusion or pumped configuration. When using the pump instrument, do not remove the pump cap (item 4 on figure 2-1).

The ALTAIR 5 IR is available with a maximum of five sensors, which can display readings for six separate gases (one Dual Toxic Sensor provides both CO and H_2S sensing capabilities in a single sensor).

The ALTAIR 5 and ALTAIR 5 IR detectors are available with either a monochrome or colour display.

While the instrument can detect up to 25 % oxygen in ambient air, it is approved for use only up to 21 % oxygen.

The alarm levels for the individual gases are factory-set and can be changed through the instrument Setup Menu. These changes can also be made through MSA Link Software. Ensure that the latest version of the MSA Link software has been downloaded from MSA's website www.msanet.com.

2.2. Device Hardware Interfaces

Instrument operation is dialog driven from the display with the aid of the three function buttons (see Figure 2-1).

2.2.1 Button Definitions

The ALTAIR 5 and ALTAIR 5 IR uses three buttons for user operation. Each button can function as a "soft key", as defined immediately above the button.

Button	Description
⏻	The ⏻ button is used to turn instrument ON or OFF and to confirm user action selections.
▼	The ▼ Button is used to page down through data screens or to decrease the values in Set-up mode. Holding this button for 3 seconds while in Normal Measure Mode will activate the InstantAlert alarm.
▲	The ▲ button is used to reset peak, STEL TWA and alarms (where possible) or perform calibration in measuring mode. It is also used as page up or to increase the values in set-up mode.

When the ▲ button and the ▼ button are pressed simultaneously while in normal measure mode, the Options Setup Mode displays.

2.2.2 LED Definitions

LED	Description
GREEN	The Safe LED flashes once every 15 seconds to notify the user that the instrument is ON and operating under the conditions defined in chapter 3.7. This option can be turned OFF through the MSA Link software.
RED	The red LEDs are visual indications of an alarm condition or any type of error in the instrument.

2.2.3 Vibrating Alarm

The instrument is equipped with a vibrating alarm.

2.2.4 Backlight

The backlight automatically activates when ⏻ button is pressed. The backlight remains ON for the duration of user-selected timeout. This ON/OFF duration can be set through MSA Link software.

2.2.5 Horn

The horn provides an audible alarm.

2.3. On-Screen Indicators

2.3.1 Monochrome Display

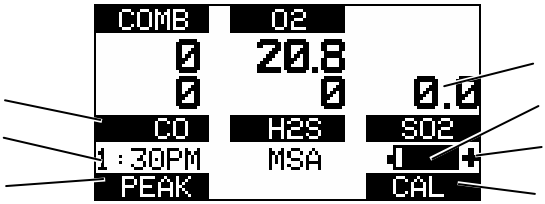


Figure 2-2 Monochrome Display

1 *Gas Type*
2 *Current Time*
3 *"Soft Key" ▼*
4 *Gas Concentration*
5 *Battery Condition*
6 *Motion Alert Icon ON*
7 *"Soft Key" ▲*

COMB	COMB - Gas Concentration Unit
O2	O_2 Sensor – Indicates the O_2 channel use.
CO	CO Sensor – Indicates the CO channel use.
H2S	H_2S Sensor – Indicates the H_2S channel use.
SO2	SO_2 Sensor – Indicates the fifth sensor channel if installed
PEAK	

2.3.2 Colour Display

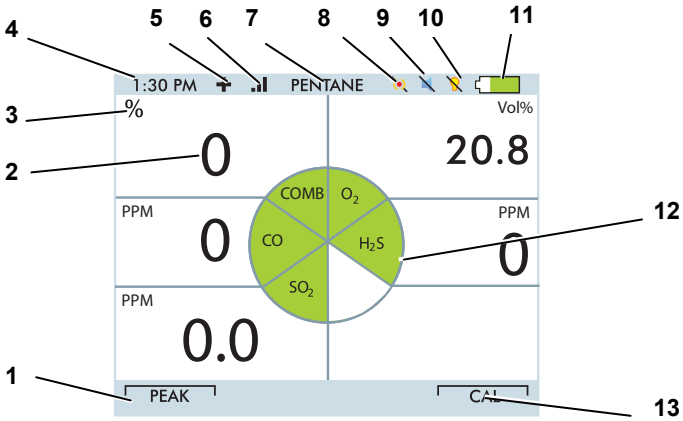


Figure 2-3 Colour display

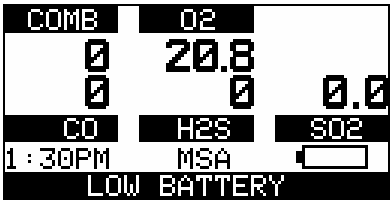
1		*"Soft Key" ▼*	*8*		*Vibration off*
2		*Numeric Indicator*	*9*		*Horn off*
3		*Gas Concentration Units*	*10*		*LED off*
4		*Current Time*	*11*		*Battery Condition*
5	+	*Motion Alert symbol ON*	*12*		*Gas Type*
6		*Wireless strength signal*	*13*		*"Soft Key" ▲*
7		*Combustible Gas type*			

2.3.3 Battery Life Indicator

The battery condition icon continuously displays in the upper right-hand corner of the colour display and in the lower right hand corner of the monochrome display. A bar represents the charging level of the battery,
if the battery is discharged only the battery icon outline remains.

Battery Warning

Warning!
If battery shutdown alarm activates, stop using the instrument as it no longer has enough power to indicate potential hazards, and persons relying on this product for their safety could sustain serious personal injury or death.



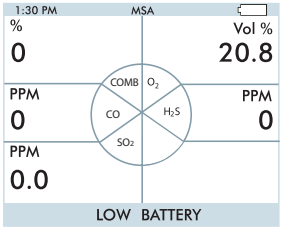


Figure 2-4 Battery Warning

The nominal run-time of the instrument (COMB, O_2, H_2S, with pump and monochrome display) at room temperature is 14 hours. Actual run-time will vary depending on ambient temperature and alarm conditions.

A Low Battery Warning indicates that a nominal 30 minutes of operation remain before the battery's charge is depleted.

The duration of remaining instrument operation during a Low Battery Warning depends on ambient temperatures, battery condition alarm status.

When the instrument goes into battery warning the:

- battery life indicator continuously blinks
- alarm sounds
- alarm LEDs flash
- display shows "LOW BATTERY"
- instrument continues to operate until it is turned OFF or battery shutdown occurs.

Battery Shut Down

Warning!
If battery shutdown alarm activates, stop using the instrument as it no longer has enough power to indicate potential hazards, and persons relying on this product for their safety could sustain serious personal injury or death.

The instrument goes into battery shutdown mode 60 seconds before final shutdown (when the batteries can no longer operate the instrument):

- "BATTERY ALARM" and battery life indicator flash on the display
- Alarm sounds and lights flash
- No other pages can be viewed; after approximately one minute, the instrument automatically turns OFF.

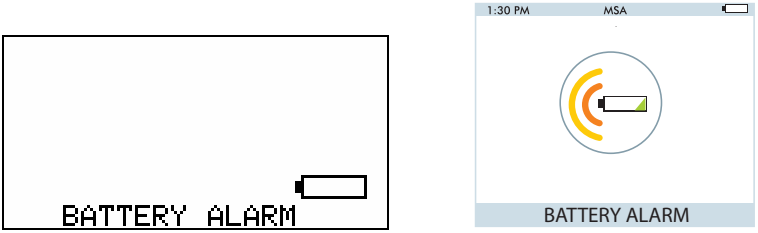


Figure 2-5 Battery Shut Down

When battery shutdown condition occurs:

(1) Leave the area immediately.

(2) Recharge or replace the battery pack.

Battery Charging

Warning!
Risk of explosion: Do not recharge instrument in hazardous area.

Attention!
Use of any charger, other than the charger supplied with the instrument, may damage or improperly charge the batteries.

- The charger is capable of charging a completely depleted pack in less than six hours in normal, room-temperature environments.

Allow very hot or cold instruments to stabilise for one hour at room temperature before attempting to charge.

- Minimum and maximum ambient temperature to charge the instrument is 10°C/50°F and 35°C/95°F.
- For best results, charge the instrument at room temperature.

To Charge the Instrument

- Firmly insert the charger connector into the charge port on the back of the instrument.
- An LED in the battery pack is used to indicate on the charge status. Red = charging, Green = charged, Amber = fault
- If a problem is detected during charging (LED turns amber). Disconnect the charger momentarily to reset the charge cycle.

2.3.4 Confirmation Beep

This confirmation beep activates every 30 seconds by momentarily beeping the horn and flashing the alarm LEDs under the following conditions:

- Confirmation beep is enabled
- Instrument is on normal Measure Gases page
- Instrument is not in battery warning
- Instrument is not in gas alarm.

2.4. Viewing Optional Displays

The Main Screen appears at instrument turn-ON.

Optional displays can be viewed by pressing the ▼ button to move to the screen as indicated by the "soft key".

(For the monochromatic display the name of the page is displayed, for the colour version it is represented by an icon.)

2.4.1 Peak Readings (PEAK page)

Monochromatic display	Colour display
PEAK	▲

This page shows the highest levels of gas recorded by the instrument since turn-ON or since peak readings were reset.

To reset the peak readings:

(1) Access the PEAK page.

(2) Press the ▲ button.

2.4.2 Minimum Readings (MIN page)

Monochromatic display	Colour display
MIN	▼

This page shows the lowest level of oxygen recorded by the instrument since turn-ON or since the MIN reading was reset.

To reset the MIN readings:

(1) Access the MIN page.

(2) Press the ▲ button.

2.4.3 Short Term Exposure Limits (STEL page)

Warning!
If the STEL alarm activates, leave the contaminated area immediately; the ambient gas concentration has reached the preset STEL alarm level. Failure to follow this warning will cause over-exposure to toxic gases and persons relying on this product for their safety could sustain serious personal injury or death.

Monochrome display	Colour display
STEL	

This page shows the average exposure over a 15-minute period.

When the amount of gas detected by instrument is greater than the STEL limit:

- Alarm sounds, alarm lights flash.
- Alarm LEDs flash
- "STEL ALARM" message flashes.

To reset the STEL:

(1) Access the STEL page.

(2) Press the ▲ button.

The STEL alarm is calculated over a 15-minute exposure.

STEL calculation examples:

Assume the instrument has been running for at least 15 minutes:

15-minute exposure of 35 ppm:

$$\frac{(15 \text{ minutes} \times 35 \text{ ppm})}{15 \text{ minutes}} = 35 \text{ ppm}$$

10-minute exposure of 35 ppm and 5 minutes exposure of 15 ppm:

$$\frac{(10 \text{ minutes} \times 35 \text{ ppm}) + (5 \text{ minutes} \times 5 \text{ ppm})}{15 \text{ minutes}} = 25 \text{ ppm}$$

2.4.4 Time Weighted Average (TWA page)

Warning!
If the TWA alarm activates, leave the contaminated area immediately; the ambient gas concentration has reached the preset TWA alarm level. Failure to follow this warning will cause over-exposure to toxic gases and persons relying on this product for their safety could sustain serious personal injury or death.

This page shows the average exposure since the instrument was turned ON or since the TWA reading was reset. When the amount of gas detected is greater than the eight-hour TWA limit:

Monochrome display	Colour display
TWA	

- Alarm sounds,
- Alarm LEDs flash
- "TWA ALARM" message flashes.

To reset the TWA:

(1) Access the TWA page.

(2) Press the ▲ button.

The TWA alarm is calculated over an eight-hour exposure.

TWA calculation examples:

1-hour exposure of 50 ppm:

$$\frac{\text{(1 hour x 50 ppm) + (7 hours x 0 ppm)}}{\text{8 hours}} = 6.25 \text{ ppm}$$

4-hour exposure of 50 ppm and 4-hour exposure of 100 ppm:

$$\frac{\text{(4 hours x 50 ppm) + (4 hours x 100 ppm)}}{\text{8 hours}} = 75 \text{ ppm}$$

12-hour exposure of 100 ppm:

$$\frac{\text{(12 hours x 100 ppm)}}{\text{8 hours}} = 150 \text{ ppm}$$

2.4.5 Date Display

Current date appears on the display in the format: **MMM-DD-YY.**

2.4.6 Last Cal Page

Displays the instrument's last successful calibration date in the format: **MMM-DD-YY**

2.4.7 Cal due page

Displays the days until the instrument's next calibration is due (user selectable).

2.4.8 Motion Alert Page

To activate or deactivate the Motion Alert feature, press the ▲ button while the Motion Alert Activation page is displayed. When the Motion Alert feature is active, the ✚ symbol will appear. The instrument will enter pre-alarm when no motion is detected for 20 seconds. This condition can be cleared by moving the instrument.

After 30 seconds of no motion, the full Motion Alert alarm is triggered. This alarm can only be cleared by pressing the ▲ button. For further information see 3.4.

2.5. Sensor Missing Alarm

The instrument enters the Sensor Missing alarm if the instrument detects that an enabled sensor is not properly installed in the instrument.

For the toxic sensors, the Sensor Missing feature is checked when the instrument is turned ON.

The combustible and IR Sensor Missing features are continually monitored.

Monochromatic display	Colour display
SENSOR MISSING	SENSOR MISSING

If a sensor is detected as missing, the following occurs:

- "SENSOR MISSING" flashes on the display.
- The flag above the sensor detected as missing flashes on the display.
- Alarm sounds and lights flash.
  - The alarm can be silenced by pressing the ▲ button; no other pages can be viewed.
  - If there is a sensor error the instrument will not be operable.

2.6. Monitoring Toxic Gases

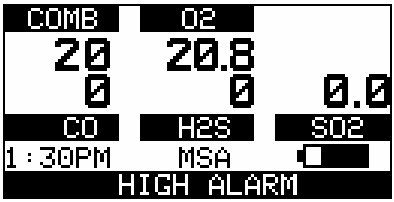
The instrument can monitor the concentration of a variety of toxic gases in ambient air. Which toxic gases are monitored depends on the installed sensors.

The instrument displays the gas concentration in parts per million (ppm) or mg/m^3 on the Measuring page.

> **Warning!**
> If an alarm is triggered while using the instrument, leave the area immediately.
> Remaining on site under such circumstances can cause serious personal injury or death.

The instrument has four gas alarms:

- HIGH Alarm
- LOW Alarm
- STEL Alarm
- TWA Alarm



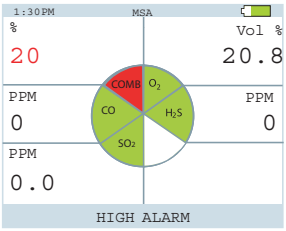


Figure 2-11 Alarm Conditions (here High Alarm)

If the gas concentration reaches or exceeds the alarm setpoint, the instrument:

- the alarm message displays and flashes in combination with the corresponding gas concentration
- backlight turns on
- alarm sounds
- alarm LEDs flash
- vibrating alarm triggers

2.7. Monitoring the Oxygen Concentration

The instrument monitors the oxygen concentration in ambient air. The alarm setpoints can be set to activate on two different conditions:

- Enriched - oxygen concentration > 20.8 % or
- Deficient - oxygen concentration < 19.5 %.

While the instrument can detect up to 25% oxygen in the ambient air, it is approved for use only up to 21% oxygen-content.

When the alarm setpoint is reached for either of the above conditions:

- the alarm message displays and flashes in combination with the corresponding gas concentration
- backlight turns on
- alarm sounds
- alarm LEDs flash
- vibrating alarm triggers

The LOW alarm (oxygen deficient) is latching and will not reset when the O_2 concentration rises above the LOW setpoint. To reset the alarm press the ▲ button. If the alarm is latching, the ▲ button silences the alarm for five seconds.

False oxygen alarms can occur due to changes in barometric pressure (altitude) or extreme changes in ambient temperature.

It is recommended that an oxygen calibration be performed at the temperature and pressure of use. Be sure that the instrument is in known fresh air before performing a calibration.

2.8. Monitoring Combustible Gases

The instrument can monitor the concentration of a variety of combustible gases in ambient air. Which combustible gases are monitored depends on the installed sensors.

The instrument displays the gas concentration in % LEL or % CH_4 on the Measuring page until another page is selected or the instrument is turned OFF.

The instrument has two alarm setpoints:

- HIGH Alarm
- LOW Alarm

If the gas concentration reaches or exceeds the alarm setpoint, the instrument:

- backlight turns on
- displays and flashes the alarm message either LOW alarm or the HIGH alarm
- enters an alarm state.

When gas reading exceeds 100% COMB or 5.00% CH_4, the instrument enters a Lockalarm state and displays “XXX” in place of the actual reading. This state can only be reset by turning the instrument OFF and ON.

Warning!

A combustible gas reading of "XXX” indicates the atmosphere is above 100 % COMB or 5.00 %vol CH_4 and an explosion hazard exists. Move away from the contaminated area immediately.

In such cases, the instrument LockAlarm feature activates.

3. Operation

Instrument operation is dialog driven from the display with the aid of the three function buttons (see chapter 2.2.1).

3.1. Environmental Factors

A number of environmental factors may affect the gas sensor readings, including changes in pressure, humidity and temperature. Pressure and humidity changes affect the amount of oxygen actually present in the atmosphere.

Pressure Changes

If pressure changes rapidly (e.g., stepping through airlock) the oxygen sensor reading may temporarily shift, and possibly cause the detector to go into alarm. While the percentage of oxygen may remain at or near 20.8 vol%, the total amount of oxygen present in the atmosphere available for respiration may become a hazard if the overall pressure is reduced by a significant degree.

Humidity Changes

If humidity changes by any significant degree (e.g., going from a dry, air conditioned environment to outdoor, moisture laden air), oxygen readings can be reduced by up to 0.5 %, due to water vapour in the air displacing oxygen.

The oxygen sensor has a special filter to reduce the effects of humidity changes on oxygen readings. This effect will not be noticed immediately, but slowly impacts oxygen readings over several hours.

Temperature Changes

The sensors have built-in temperature compensation. However, if temperature shifts dramatically, the sensor's reading may shift.

3.2. Turning ON and Fresh Air Setup

Instrument operation is dialog driven from the display with the aid of the three Function buttons (see chapter 2.2.1).

For more information, see the flow charts in chapter 7.

Turn the instrument ON with the ⏻ button.

The instrument performs a self test:

During the self test, the instrument checks alarm LEDs, audible alarm vibrating alarm and for missing sensors.
In case of a missing sensor, the instrument displays the Sensor Missing screen (see 2.5) and alarms until it is turned OFF.
Otherwise, the turn-ON sequence continues.

The instrument displays:

- Startup logo
- Software version, instrument name and serial number, company name, department and user names
- Sampling safety test (if equipped with an integral pump)
- Combustible gas type and sensor units (monochrome display only)
- Alarm setpoints Low Alarm
- Alarm setpoints High Alarm
- Alarm setpoints STEL Alarm
- Alarm setpoints TWA Alarm
- Settings for calibration cylinder
- Current date
- Last calibration date (optional)
- CAL due date (optional). If the calibration due date is activated, the message "**CAL DUE; X DAYS**" appears on the instrument display.
  - X = the number of days until a calibration is due, user selectable for 1 to 180 days.

  If the number of days until calibration is due reaches 0, an alert occurs and "**CAL DUE, NOW"** displays.
  - Press the ▲ button to clear the alert and continue with the instrument warm-up period.
- Sensor warm-up period
- Fresh Air Setup option (optional).

Refer to flowchart in Appendix, chapter 7.1

3.2.1 Sampling Safety Test

This test is only available for instruments that are equipped with an integral pump.

Upon startup, an alarm (visual, audible and vibrating) is triggered and the customer is prompted to block the pumps/sampling system of the instrument within 30 seconds.

When the instrument detects a pump flow block, it will display a PASS message. The startup sequence will be resumed.

If the instrument does not detect a pump flow block, it will display an error message.

The instrument will shut off after the customer acknowledges this message by pressing the ▲ button.

Check your sampling system if this occurs and contact MSA as needed.

Users can check the operation of the sampling system anytime during operation by blocking the sampling system to generate a pump alarm.

Warning!

Do not use the pump, sample line, or probe unless the pump alarm activates when the flow is blocked. Lack of an alarm is an indication that a sample may not be drawn to the sensors, which could cause inaccurate readings.

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

Never let the end of the sampling line touch or go under any liquid surface. If liquid is drawn into the instrument, readings will be inaccurate and instrument could be damaged. We recommend the use of an MSA sample probe containing a special membrane filter, permeable to gas but impermeable to water, to prevent such an occurrence.

3.2.2 Fresh Air Setup (FAS)

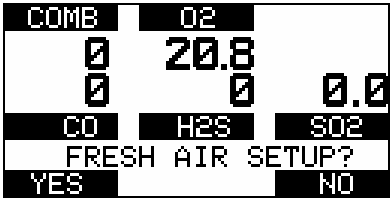
The **F**resh **A**ir **S**etup (FAS) is for automatic ZERO calibration of the instrument.

The FAS has limits. If a hazardous level of gas is present, the instrument ignores the FAS command and the instrument alarm activates.

The Fresh Air Setup is not available for the CO_2 sensor.

Warning!

Do not activate the Fresh Air Setup unless you are certain you are in fresh, uncontaminated air; otherwise, inaccurate readings can occur which can falsely indicate that a hazardous atmosphere is safe. If you have any doubts as to the quality of the surrounding air, do not use the Fresh Air Setup feature. Do not use the Fresh Air Setup as a substitute for daily calibration checks. The calibration check is required to verify span accuracy. Failure to follow this warning can result in serious personal injury or death.



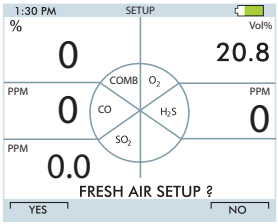


Figure 3-1 Fresh Air Setup

The instrument displays a blinking "FRESH AIR SETUP?", prompting the user to perform a Fresh Air Setup:

(1) Press the ▲ button to bypass the Fresh Air Setup.
- The Fresh Air Setup is skipped and the instrument goes to the Measuring page (Main page).

(2) Press the ▼ button to perform the Fresh Air Setup.
- The instrument starts the FAS sequence and the FAS screen displays.
- A progress bar shows the user how much of the FAS has been completed.
- At the end of the FAS, the instrument displays either "FRESH AIR SETUP PASS" or "FRESH AIR SETUP FAIL".

3.3. Measurement Mode (Normal Operation)

The following options pages can be executed from the Normal Operation screen (for further information see chapter 7.5):

Peak Page		This page shows the peak readings for all sensors.
Min Page		This page shows the minimum reading for the oxygen sensor.
STEL Page		This page shows the calculated STEL readings of the instrument.
TWA Page		This page shows the calculated TWA readings of the instrument.
Date Page		This page shows the date.
Last Cal Date		This page shows the date of the last calibration. If the instrument does not have a valid calibration, it will display "**LAST CAL INVALID**".
Cal Due		This page shows the set date for the next calibration
Motion Alert	+	Once Motion Alert has been enabled in the Instrument Settings, this page allows the Motion Alert Feature to be activated or deactivated.

Using the three instrument buttons, the user can navigate through each sub-menu in a top/down sequence.

Refer to chapter 2.4 and 7.5 in the appendix for assistance on navigating through these screens.

3.4. Instrument Setup

The instrument allows the user to access and modify the following parameters through direct button interface:

- Calibration Options
- Alarm Options
- Instrument Options

These menus can be accessed only from the measure page by pressing and holding the ▼ and ▲ buttons simultaneously until you are prompted for a password.

The operation is as follows:

(1) Turn the instrument ON and wait until the measure page appears.

(2) Press the ▼ and ▲ buttons simultaneously.

- The default password is "672".

Monochrome display

Colour display

(3) Enter the first digit by pressing the ▼ or ▲ button and confirm with the ⏻ button.

- The cursor jumps to the second digit.

(4) Enter the second as well as the third digit.

- Incorrect password: instrument returns to the Main Page.
- Correct password: user can set the instrument options.

The password can be changed with a PC through the MSA Link software.

The following Options are available by pressing the ▼ and ▲ buttons**:**

- Calibration Options - see chapter 3.4.1
- Alarm Options - see chapter 3.4.2
- Instrument Options - see chapter 3.4.3

3.4.1 Calibration Options

Monochrome display

CALIBRATION OPTIONS

Colour display

CALIBRATION OPTIONS

The Calibration Options menu allows the user to:

- modify the calibration cylinder settings (CYLINDER SETUP)
- enable/disable calibration due and to set the number of days (CAL DUE OPTIONS)
- enable/disable the option to show the last cal date at turn on and (LAST CAL DATE)
- enable/disable the option for password protected calibration (CAL PASSWORD)

Press

- the ▼ button go to next page
- the ▲ button to go previous page
- the ⏻ button to enter setup.

Setting Calibration Cylinder

This option has a dialog similar to the span calibration dialog.

The display shows all active sensors.

(1) Press the ⏻ button to enter setup.
- The screen for the first calibration cylinder displays.

(2) Press
- the ▼ or ▲ button to change the value.
- the ⏻ button to confirm the setup.

With this confirmation the instrument automatically moves to the next cylinder setting.

(3) Repeat the sequence for changing the required settings for all necessary gas values.

After the last setting is performed, the instrument returns to the Calibration Options menu.

Setting Cal Due Options

(1) Press the ⏻ button to enter setup.

(2) Press the ▼ or ▲ button to enable/disable this option.

(3) Press the ⏻ button to confirm.

(4) After confirmation the instrument prompts the user to enter the number of days for the reminder.

(5) Change number of days by pressing the ▼ or ▲ button.

(6) Press the ⏻ button to go to the next menu.

Setting Last Cal Date

(1) Press the ⏻ button to enable/disable this option.

(2) Press the ▼ button to go to the next page.

(3) Press the ▲ button to go to the previous page.

Setting Calibration Password

(1) Press the ⏻ button to enable/disable this option.

(2) Press the ▼ button to go to the next page.

(3) Press the ▲ button to go to the previous page.

Back To Main Menu

(1) Press the ⏻ button to go to Instrument Setup Menu

- The Cal Options screen displays

(2) Press the ▼ button to go to the next (Alarm options) or the ▲ button to exit the Setup menu.

Use of the GALAXY Automated Test System is an alternate approved method for calibrating ALTAIR 5 and ALTAIR 5 IR instruments.

3.4.2 Alarm Options

Monochrome display

ALARM OPTIONS

Colour display

ALARM OPTIONS

The Alarm Options Menu allows the user to:

- enable/disable the vibrating alarm
- enable/disable the audible alarm
- enable/disable the Alarm LED
- enable/disable the Motion Alert Feature
- set Sensor Alarms.

Press

- the ▼ button go to next page
- the ▲ button to go previous page
- the ⏻ button to enter setup.

Setting Vibrating Alarm

Press the ⏻ button to enable/disable this option.

Setting Horn

Press ⏻ button to enable/disable this option.

Setting LEDs

Press ⏻ button to enable/disable this option.

Setting Motion Alert

Press ⏻ button to enable/disable this option.

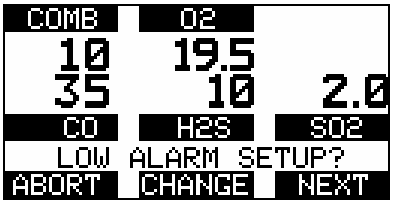
Setting Sensor Alarms

This page allows modifying the preset alarm values of:

- LOW Alarm
- HIGH Alarm
- STEL Alarm
- TWA Alarm.

(1) Press the ⏻ button to enter Sensor Alarm setup.

- LOW Alarm Setup screen displays.



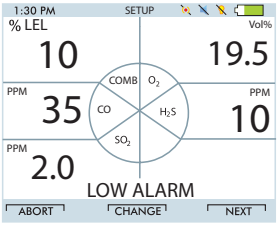
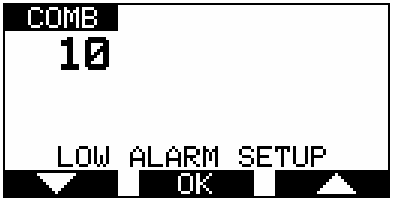


Figure 3-5 Sensor Alarm Setup

(2) Press
the ▼ button to abort the operation or
the ▲ button to go to next alarm setup or
the ⏻ button to change the alarm setpoints.

- Alarm Value for the first Sensor displays.



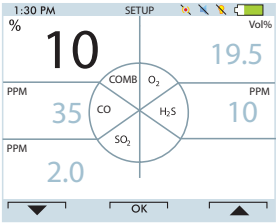


Figure 3-6 Sensor Alarm Setup

(3) Set values for Sensor Alarm by pressing the ▼ or ▲ button.
(4) Press the ⏻ button to confirm set values.
(5) Repeat setting for all other sensors.
(6) Press the ▲ button to return to the Alarm Options menu.
(7) Repeat setting for all other alarm types.

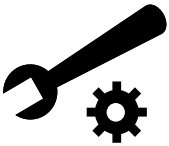
60% L.E.L. or 3.0% volume of methane is the maximum High Alarm set point that can be programmed by the user.

The combustible alarm can be turned OFF by the user in the instrument setup. When the combustible alarm is turned OFF, the only indicator to the user that the combustible alarm is turned OFF occurs during power up of the instrument at which a startup screen will indicate that the combustible alarm is turned OFF. When turned ON, the combustible high alarm is latching. The combustible alarm can be silenced momentarily by pressing the ▲button. However, if the gas concentration causing the alarm is still present, the unit will go back into alarm.

3.4.3 Instrument Options

Monochrome display

ALARM OPTIONS



Colour display

ALARM OPTIONS

The Instrument Options menu allows modifying different instrument options:

- Sensor Setup (enable/disable the channel)
- Language Setup
- Time Date Setup
- Datalog Intervals
- Stealth Mode
- Confirmation Beep
- Display Contrast (monochrome only)
- Backlight Options.

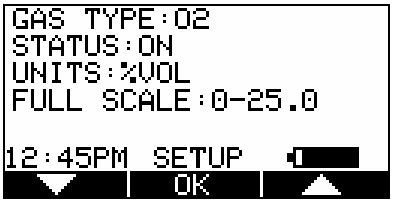
Press

- the ▼button go to next page
- the ▲button to go previous page
- the ⏻ button to enter setup.

Setting Sensor Options

(1) Press the ⏻ button to enter setup.

- Following screen displays:



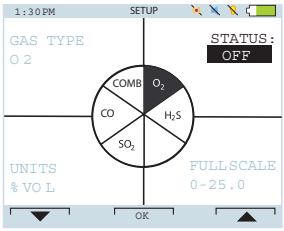


Figure 3-8 Sensor Options

(2) Press the ▼ button to select sensor, press the ⏻ button to make changes.

- The sensor information is displayed and the sensor can be enabled or disabled.

Other operations such as changing the gas type (Methane, Butane, Propane etc. for the combustible sensor) and units (ppm to mg/m^3) are only possible using the MSA Link software.

(3) Change status by pressing the ▼ or ▲ button.

(4) Press the ⏻ button to confirm and advance to next screen (next sensor).

(5) Perform the sequence for all other sensors.

- After setting up the last sensor the instrument goes to the next Setup Page.

Language Setup

This option is for setting the language of the instrument.

(1) Press the ⏻ button to enter setup.

(2) Change language by pressing the ▼ or ▲ button.

(3) Confirm with the ⏻ button.

- The instrument goes to the next Setup Page.

Time and Date Setup

This option is for setting the instrument time and date. The instrument first prompts to set the time and then it prompts for the date.

The time can be set up for either regular AM/PM or military time (through MSA Link software). AM/PM time is the default setting.

(1) Press the ⏻ button to enter setup.
(2) Change hours by pressing the ▼ or ▲ button.
(3) Confirm with the ⏻ button.
(4) Change minutes by pressing the ▼ or ▲ button.
(5) Confirm with the ⏻ button.
    - The instrument goes to the Set Date Page.
(6) Change month, date and year by pressing the ▼ or ▲ button and confirming with the ⏻ button.
    - The instrument goes to the next Setup Page.

Setting Datalog Intervals

This option is for setting the intervals at which all the readings will be logged.

(1) Press the ⏻ button to enter setup.
(2) Change interval by pressing the ▼ or ▲ button.
(3) Confirm with the ⏻ button.
    - The instrument goes to the next Setup Page.

Setting Stealth Mode

Stealth mode disables the visual, audible and vibrating alarms.

(1) Press the ⏻ button to change mode (ON/OFF).
(2) Press the ▼ button to go to the next page or the ▲ button to return to previous page.

Setting Confirmation Beep

(1) Press the ⏻ button to change mode (ON/OFF).
(2) Press the ▼ button to go to the next page or the ▲ button to return to previous page.

Setting the Contrast (monochrome display)

(1) Press ▼ or ▲ button to adjust the contrast levels.
(2) Press ⏻ button to confirm the contrast level.

Setting Backlight

(1) Press the ⏻ button to enter setup.
(2) Change option by pressing the ▼ or ▲ button.
(3) Press the ⏻ button to enter.
(4) Change timeout by pressing the ▼ or ▲ button.
(5) Press ⏻ button to confirm timeout.

Back To Main Menu

There are three options at this point:

the ▼ button	Sensor Options menu
the ▲ button	Previous Setup page in the Instrument Options menu
the ⏻ button	Instrument Options menu

3.5. Data Logging

Connecting Instrument to PC

(1) Switch ON the ALTAIR 5 and align the Datalink Communication port on the ALTAIR 5 to the IR interface of the PC.
(2) Start the MSA Link software on the PC and start connection by clicking the connect icon.

See MSA Link documentation for detailed instructions.

3.6. Function Tests on the Instrument

Alarm Test

(1) Turn ON the instrument. The user should verify that:
- alarm LEDs flash
- horn sounds briefly
- vibrating alarm triggers briefly.

3.7. Safe LED

The instrument is equipped with a green "SAFE LED". This green SAFE LED flashes every 15 seconds under the following conditions:

- the green SAFE LED is enabled
- instrument is on the normal Measure Gases page
- combustible reading is 0% LEL or 0%CH_4
- Oxygen (O_2) reading is 20.8%
- Toxic sensor readings are 0 ppm
- no gas alarms are present (low or high)
- instrument is not in Low Battery warning or alarm
- Toxic sensor, STEL and TWA readings are 0 ppm.

3.8. Calibration Check

The calibration check is simple and should only take about one minute. Perform this calibration check before each day's use for each installed sensor.

(1) Turn ON the ALTAIR 5 or ALTAIR 5 IR Multigas Detector in clean, fresh air.

(2) Verify that readings indicate no gas is present.

(3) Attach regulator (supplied with calibration kit) to the cylinder.

(4) Connect tubing (supplied with calibration kit) to the regulator.

(5) Attach other end of tubing to the instrument.

(6) Open the valve on the regulator, if so supplied.

- The reading of the ALTAIR 5 or ALTAIR 5 IR Multigas Detector display should be within the limits stated on the calibration cylinder or limits determined by your company.
- If necessary, change cylinder to introduce other calibration.
- If readings are not within these limits, the ALTAIR 5 Multigas Detector requires recalibration (see chapter 3.9).

3.9. Calibration

The ALTAIR 5 can be calibrated either manually using this procedure or automatically using the GALAXY test stand. Refer to 7.7 of the appendix.

Calibration must be performed using a flow regulator with a flow rate set to 0.25 litres per minute for diffusion instrument. For instruments with an integral pump, the demand regulator is recommended.

Warning!

Attention! Special conditions with toxic gases!

If the instrument is to be checked or calibrated for toxic gases, prerequisites are required; otherwise, incorrect calibration would result in incorrect instrument operation.

Reactive toxic gases (e.g., chlorine, ammonia, chlorine dioxide) have the property of diffusing into the rubber and plastic tubes so that the volume of test gas available in the instrument would no longer be sufficient to correctly perform instrument calibration.

For this reason, when calibrating the instrument with toxic gases, certain prerequisites are required:

- A special pressure regulator
- Short connection tubes between the pressure regulator and the instrument (approximately one inch)
- Connection tubes made from a material that does not absorb the test gases (e.g., PTFE).

NOTE: If using normal tubes and pressure regulators, expose them to the required test gas for an extended time period. Keep these materials dedicated for use with that test gas only; do not use them for other gases.

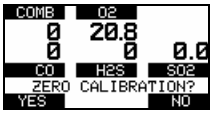
For example, for chlorine, allow the entire contents of a test gas cylinder to flow through the pressure regulator and tubes before using to calibrate the instrument. Mark these materials for use with chlorine only.

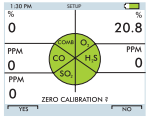
The phosphine (PH_3) sensor used in the ALTAIR 5/ALTAIR 5 IR is highly cross-sensitive to hydrogen sulphide (H_2S) gas. Do not use calibration gas that contains H_2S on an instrument that is configured with a PH_3 sensor.

3.9.1 Zero calibration

(1) Press the ▲button in Normal Measurement page.

- ZERO screen displays.

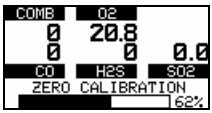


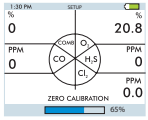


To skip the ZERO procedure and move directly to the calibration span procedure, push the ▲button. If no button is pushed for 30 seconds, the instrument prompts user to perform a SPAN calibration before instrument returns to the Normal Measurement page.

(2) Press the ▼button to confirm the ZERO screen, i. e. to execute zero calibration.

- LEDs flash
- "ZERO CALIBRATION" blinks
- ZERO calibration starts.
- A progress bar shows the user how much of the calibration has been completed.



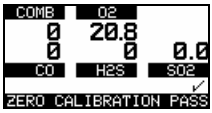


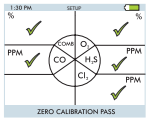
- After the ZERO calibration is completed the instrument displays either

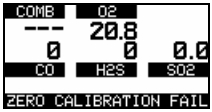
"ZERO CALIBRATION PASS"

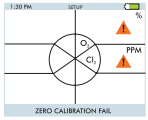
or

"ZERO CALIBRATION FAIL".

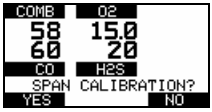


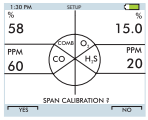






- Only if the instrument passes the zero calibration the SPAN screen displays.





3.9.2 Span Calibration

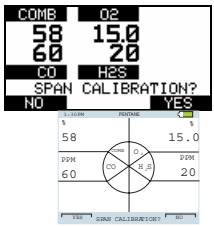
To skip the Span calibration procedure, push the ▲ button.

If no button is pushed for 30 seconds, the instrument returns to the Measuring mode without calibrating the instrument.

Because of the different combinations of gases it is possible to perform single-channel calibration for the exotic sensors.

(1) The span screen displays.

(2) Connect the appropriate calibration gas to the instrument.



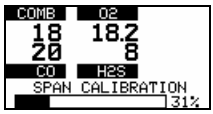
(3) Attach the calibration cap to the instrument, diffusion only.

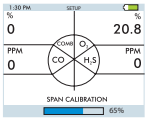
- Ensure that the calibration cap is correctly oriented, if equipped.
- Connect one end of tubing to the cylinder regulator (supplied in the calibration kit).
- Connect other end of the tubing to the calibration cap or pump inlet.

(4) Open the valve on the regulator.

(5) Press the ▼ button to calibrate (span) the instrument.

- LEDs flash
- "SPAN CALIBRATION" blinks
- SPAN calibration starts.
- A progress bar shows the user how much of the calibration has already been completed.





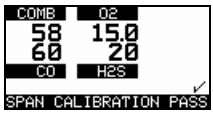
- After the SPAN calibration is completed, the instrument displays either

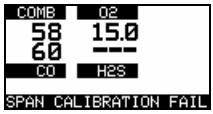
"SPAN CALIBRATION PASS"

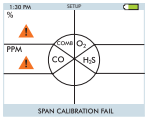
or

"SPAN CALIBRATION FAIL"

- The instrument returns to Measuring mode.







3.9.3 Finishing Calibration

(1) Close the valve on the regulator.

(2) Remove the calibration cap or tube from pump inlet.

The calibration procedure adjusts the span value for any sensor that passes the calibration test. Sensors that fail calibration are left unchanged.
Since residual gas may be present, the instrument may briefly go into an exposure alarm after the calibration sequence is completed.

3.9.4 Autocalibration Failure

If the instrument cannot calibrate one or more sensor(s), it goes into the Calibration Failure page and remains in alarm for 10 seconds.

Sensors that could not be calibrated are indicated by dashed lines on the concentration display.

If a sensor repeatedly fails calibration after the full calibration procedure in this manual has been performed, replace the combustible sensor.

3.10. Instrument Shutdown

For instrument shutdown press and hold the ⏻ button.

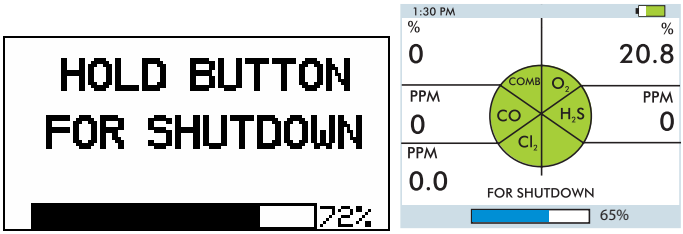


Figure 3-10 Instrument Shutdown

The instrument displays a blinking "HOLD BUTTON FOR SHUTDOWN" and a progress bar shows the user how much longer to hold the button to complete the shutdown.

4. Maintenance

If irregularities occur during operation, use the displayed error codes to determine appropriate next steps.

Warning

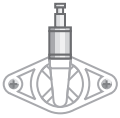
Repair or alteration of the ALTAIR 5 or ALTAIR 5 IR Multigas Detector, beyond the procedures described in this manual or by anyone other than a person authorised by MSA, could cause the instrument to fail to perform properly. Use only genuine MSA replacement parts when performing any maintenance procedures described in this manual. Substitution of components can seriously impair instrument performance, alter intrinsic safety characteristics or void agency approvals.

FAILURE TO FOLLOW THIS WARNING CAN RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

Monochrome display

PUMP ERROR

Colour display



PUMP ERROR

For all other errors the error code is shown, accompanied with the error icon for the colour display.

Monochrome display

ERROR CODE

Colour display

ERROR CODE

4.1. Troubleshooting

Problem	Description	Reaction
Alternating display		
ERROR TEMP	Temperature is below -40 °C (-40 °F) or above 75 °C (167 °F).	Return to normal temperature range and recalibrate. Contact MSA
ERROR ADC	Sensor measurement error	Contact MSA
ERROR COMB	Combustible sensor power supply error.	Contact MSA
ERROR MEM	External Memory error	Contact MSA
ERROR PROG	Program error	Contact MSA
ERROR RAM	RAM error	Contact MSA
	LOW BATTERY	Battery warning
	BATTERY ALARM	Battery is completely discharged. Shutdown sequence will begin.
Instrument does not turn ON	Battery fully discharged	Remove from service as soon as possible and recharge or replace battery pack.

4.2. Verifying Pump Operation

Users can check operation of the sampling system any time during operation by blocking the sampling system to generate a pump alarm.

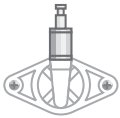
Once gas readings are displayed, plug the free end of the sampling line or probe.

- The pump motor shuts down and an alarm sounds.
- PUMP ERROR will flash on the display.

Monochrome display

PUMP ERROR

Colour display



PUMP ERROR

When the pump inlet, sample line or probe is blocked, the pump alarm must activate.

If the alarm does not activate:

a. Check the sample line and probe for leaks.

b. Once leak is fixed, recheck pump alarm by blocking the flow.

(5) Press the ▲ button to reset the alarm and restart the pump.

During operation, a pump alarm may occur when the:

- Flow system is blocked
- Pump is inoperative
- Sample lines are attached or removed.

To Clear Pump Alarm

(1) Correct any flow blockage.

(2) Press the ▲ button.

- The Pump will now restart.

4.3. Replacing the Battery

Warning!
Never replace the battery in a hazardous area. There is a risk of injury arising from the electric current.

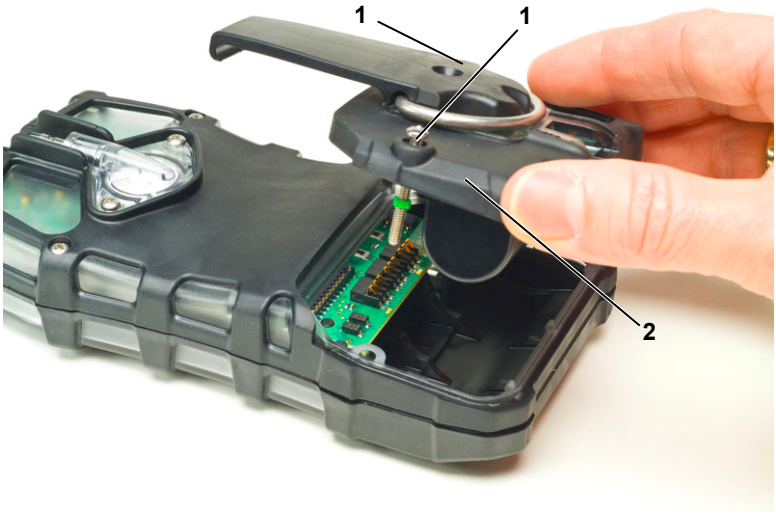


Figure 4-2 Battery Replacement

1 Captive screw *2 Battery pack*

(1) Unscrew the two captive screws on the rear of the instrument.

(2) Pull the battery pack out of the instrument by gripping the sides and lifting it up and away from the instrument.

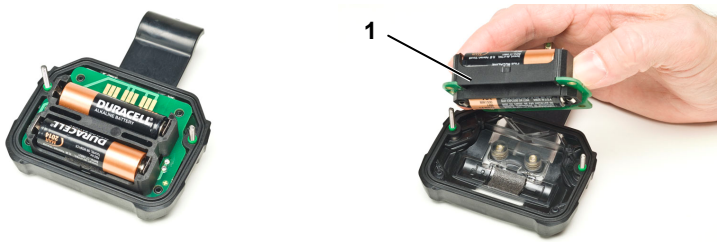


Figure 4-3 Battery Replacement

1 Battery holder

(3) For alkaline battery packs (ALTAIR 5 only):

- Remove the battery holder circuit board from the instrument
- Replace the 3 cells, using only those listed on the label. Be sure to observe proper polarity on the cells.
- Place the battery holder circuit board back in the instrument and reinstall the door.
- Tighten the 2 screws.

4.4. Live Maintenance Procedure - Replacing or Adding a Sensor

Before handling the PC board, the user must be properly grounded; otherwise, static charges could damage the electronics. Such damage is not covered by the warranty. Grounding straps and kits are available from electronics suppliers.

Warning

Remove and reinstall sensors carefully, ensuring that the components are not damaged; otherwise instrument, intrinsic safety may be adversely affected, wrong readings could occur, and persons relying on this product for their safety could sustain serious personal injury or death.

To add a sensor to an instrument that is not already equipped with a full array of sensors, remove the sensor plug from in front of the formerly unused sensor housing.

While instrument case is open, do not touch any internal components with metallic/conductive objects or tools. Damage to the instrument can occur.

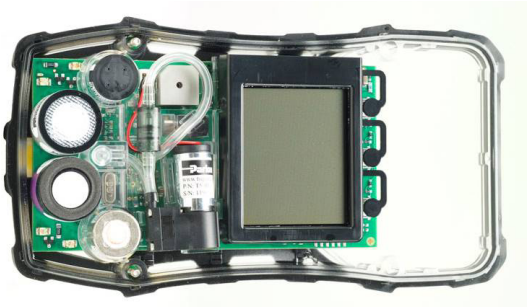


Figure 4-4 Sensor Replacement

(1) Verify that the instrument is turned OFF.
(2) Remove the battery pack.
(3) Remove the two remaining case screws, and remove the case front.
(4) Gently remove the sensor to be replaced.
- Using fingers only, gently remove the tox, combustible or oxygen sensor.

(5) Carefully align the new sensor contact pins with the sockets on the printed circuit board.
(6) Press the new sensor into place.
- Ensure groove in combustible sensor is aligned with notch in sensor slot.
- If a sensor is not to be installed, ensure that a sensor plug is installed properly in its place.

(6) If replacing sensor filter at this time:
- Carefully peel off old filter taking care not to damage the inside of the case.
- On new filter peel off backing exposing adhesive. Note proper orientation of filter and apply to inside of front case adhesive side against case.
- Press filter into place taking care not to damage filter surface.

(7) Reinstall the sensor gasket in the case front.

Ensure sensor gasket is properly installed.

(8) Re-install the screws.
(9) Go into the sensor setup and turn ON the sensor. If necessary calibrate instrument before use.

Allow sensors to stabilise at least 30 minutes before calibration.

To replace the IR sensor please contact your local MSA service centre.

Warning!
Calibration is required after a sensor is installed; otherwise, the instrument will not perform as expected and persons relying on this product for their safety could sustain serious personal injury or death.

4.5. Replacing the Filter (for instruments with integral pump)

(1) Turn off the instrument.

(2) Unscrew the two captive screws from the clear filter cover on the back of the instrument to access the filter.

(3) Carefully lift out the O-ring and the filter disk.

(4) Place the new filter disk in the recess.

(5) Replace the O-ring in the recess.

(6) If the instrument is used in dusty environments, the fibrous dust filters supplied in Maintenance Kit 10094829 may be used in addition to the filter disk. Place the fibrous dust filter in the clear filter cover.

Caution!
If the instrument is configured for a reactive toxic gas (Cl2, ClO2, NH3), use only the filters supplied in the Reactive Gas Maintenance Kit 10099533..

(7) Re-install the clear filter cover on the back of the instrument.

4.6. Cleaning the Instrument

Clean the exterior of the instrument regularly using only a damp cloth.
Do not use cleaning agents.

4.7. Storage

When not in use, store the instrument in a safe, dry place between 18 °C and 30 °C (65°F and 86°F). After storage, always recheck instrument calibration before use. If not to be used in 30 days remove battery pack.

4.8. Shipment

Pack the instrument in its original shipping container with suitable padding. If the original container is unavailable, an equivalent container may be substituted.

5. Technical Specifications/Certifications

5.1. Technical Specifications

Weight	0.45 kg (1 lb) - instrument with battery and clip (ALTAIR 5)
Weight (with IR Sensor)	0.52 kg/1.15 lb
Dimensions (cm)	17 x 8.87 x 4.55 pumped, without belt clip (ALTAIR 5) 17 x 8.87 x 4.01 diffusion, without belt clip (ALTAIR 5)
Dimensions (with IR Sensor)	17 x 8.94 x 4.88 cm
Alarms	LEDs, audible alarm, vibrating alarm
Volume of audible alarm	95 dB typical
Displays	Monochrome Colour
Battery types	Rechargeable Li ION battery Replaceable AA alkaline (ALTAIR 5 only) Li ION battery can not be charged in Ex area.
Instrument run time	14 + hours at 25 °C (77°F) ALTAIR 5 12+ HOURS at 25 °C (77°F) ALTAIR 5IR
Charging time	≤ 6 hours The maximum safe area charging voltage Um = 6.7 Volts D.C.
Temperature range	-20 °C to 50 °C (-4°F – 122°F) Monochrome display -10° C to 50 °C (14°F – 122°F) Colour display -20°C to 40°C (- 4°F – 104°F) for instruments with NH3 or ClO_2 sensors
Humidity range	15 - 90% relative humidity, non-condensing, 5 - 95% RH intermittent
Atmospheric pressure range	80 kPa to 120 kPa (11.6 to 17.4 PSIA)
Ingress protection	IP 65
Measuring methods	Combustible gases: Catalytic sensor Oxygen and Toxic gases Electrochemical sensor
Warranty	Standard two years. Extended options available (see full warranty for specific limitations).

Measuring range	H_2S	CO	O_2	Combustible
	0-200 ppm	0-1000 ppm	0-25 % Vol.	0-100% LEL 0-5.00% CH4

Measuring range	SO_2	NO_2	NH_3	*PH_3
	0-20.0 ppm	0-20 ppm	0-100 ppm	0-5.00 ppm
	HCN	**Cl_2**	**ClO_2***	
	0-100 ppm	0-20.0 ppm	0-1.00 ppm	

*check with MSA for sensor availability

5.2. Factory-set Alarm thresholds

Sensor	LOW alarm	HIGH alarm	STEL	TWA
COMB	10 % LEL	20 % LEL	--	--
CO	25 ppm	100 ppm	100 ppm	25 ppm
H_2S	10 ppm	15 ppm	15 ppm	10 ppm
O_2	19.5 %	23.0 %	--	--
SO_2	2.0 ppm	5.0 ppm	50 ppm	2.0 ppm
NO_2	2.0 ppm	5.0 ppm	5.0 ppm	2.0 ppm
NH_3	25 ppm	50 ppm	35 ppm	25 ppm
PH_3	0.3 ppm	1.0 ppm	1.0 ppm	0.3 ppm
Cl_2	0.5 ppm	1.0 ppm	1.0 ppm	0.5 ppm
ClO_2	0.1 ppm	0.3 ppm	0.8 ppm	0.1 ppm
HCN	4.5 ppm	10.0 ppm	10 ppm	4.5 ppm
CO_2	0.5 % Vol	1.5 %	0.5 %	1.5 %
IR Propane (LEL)	15 % LEL	30 % LEL		
IR Butane (25 % Vol)	15 % LEL	30 % LEL		
IR Methane (25 % Vol)	8% Vol	15 % Vol		
IR Propane (25 % Vol)	8% Vol	15 % Vol		
IR Butane (25 % Vol)	8% Vol	15 % Vol		

5.3. IR sensors

Gases	Display range	Smallest resolution	Response time at 20°C		Reproducibility of the zero point	Reproducibility of the measured value[1)]
			t_{50}	t_{90}		
CO_2	0 – 5 % Vol	0.01 % Vol	≤ 12 s	≤ 36 s	≤ ± 0.05 % Vol	≤ ±5%
CO_2	0 – 10 % Vol	0.01 % Vol	≤ 12 s	≤ 35 s	≤ ± 0.1 % Vol	≤ ±4%
CO_2	0 – 50 % Vol	0.5 % Vol	≤ 14 s	≤ 36 s	≤ ± 1.0 % Vol	≤ ±4%
C_3H_8	0 – 100% LEL	1 % LEL	≤ 11 s	≤ 32 s	≤ ± 3 % LEL	≤ ±8%
C_3H_8	0 – 25 % Vol	0.5 % Vol	≤ 12 s	≤ 35 s	≤ ± 0.5 % Vol	≤ ±4%
C_3H_8	0 – 100 % Vol	1 % Vol	≤ 12 s	≤ 36 s	≤ ± 3 % Vol	≤ ±8%
C_4H_{10}	0 – 100% LEL	1 % LEL	≤ 11 s	≤ 32 s	≤ ± 3 % LEL	≤ ±8%
C_4H_{10}	0 – 25 % Vol	0.5 % Vol	≤ 12 s	≤ 35 s	≤ ± 0.5 % Vol	≤ ±4%
C_4H_{10}	0 – 100 % Vol	1 % Vol	≤ 12 s	≤ 36 s	≤ ± 3 % Vol	≤ ±8%
CH_4	0 – 25 % Vol	0.5 % Vol	≤ 12 s	≤ 35 s	≤ ± 0.5 % Vol	≤ ±5%
CH_4	0 – 100 % Vol	1 % Vol	≤ 11 s	≤ 34 s	≤ ± 5 % Vol	≤ ±10%

1) Data in % of measurement range

Sensor	Min. alarm setpoint	Max. alarm setpoint	Default calibration values
COMB	5% LEL	60% LEL	58% LEL
CO	20 ppm	950 ppm	60 ppm
CO_2 / MB 0-5 % Vol	0.20 % Vol	5.00 % Vol	
CO_2 / MB 0-10 % Vol	0.20 % Vol	8.00 % Vol	
H_2S	5 ppm	175 ppm	20 ppm
O_2	5.0%	24%	15.0%
SO_2	2.0 ppm	17.5 ppm	10.0 ppm
NO_2	2.0 ppm	17.5 ppm	10.0 ppm
NH_3	15 ppm	75 ppm	25 ppm
PH_3	0.3 ppm	3.75 ppm	0.50 ppm
Cl_2	0.5 ppm	17.5 ppm	10.0 ppm
ClO_2	0.1 ppm	0.9 ppm	0.8 ppm
HCN	4.5 ppm	20.0 ppm	10.0 ppm

EX sensors	Min	Max
IR Propane (LEL)	9 % LEL	80 % LEL
IR Butane (LEL)	9 % LEL	80 % LEL
IR Methane (25 % Vol) [1)]	2.5 % Vol	25 % Vol
IR Propane (25 % Vol) [1)]	5.0 % Vol	25 % Vol
IR Butane (25 % Vol) [1)]	5.0 % Vol	25 % Vol

1) No alarm thresholds are adjustable for the IR sensors methane, propane and butane in the measurement range 0 to 100 Vol. %.

This instrument is not approved for use in atmospheres containing >21 % oxygen.

5.4. Certifications

See instrument label for the approvals that apply to your specific unit.

USA and Canada

USA	
UL	**Exia** Class I, Div. 1, Groups A, B, C, D, Class II, F, G Ambient temperature: -4°F to +122°F; T4
Canada	
SA	**Exia** Class I, Div. 1, Groups A, B, C, D Ambient temperature: -20°C to +50°C; T4
ONLY THE COMBUSTIBLE DETECTION PORTION OF THIS INSTRUMENT HAS BEEN ASSESSED FOR PERFORMANCE BY THE CANADIAN STANDARDS ASSOCIATION (C.S.A.).	

Other Countries

Australia	Ex ia S (Zone O) IIC T4 Ambient temperature: 122°F

European Community

The product ALTAIR 5 complies with the following directives, standards or standardised documents:

Directive 94/9/EC (ATEX)	:	II 2G Ex ia d IIC T4 Ex -20 °C ≤ Ta ≤ +50 °C EN 50 014, EN 50 020, EN 50291, EN 45544-1, EN 45544-2
Directive 89/336/EC (EMC)	:	EN 50 270 Type 2, EN 61 000-6-3

CE 0080

5.5. Performance Specification

Sensor	Range	Resolution	Reproducibility	Response time
Combustible Gas	0 to 100 % COMB or 0 to 5 % CH_4	1 % COMB or 0.05 vol% CH_4	normal temperature range: 3 % COMB, 0 % to 50 % COMB reading or 0.15 % CH_4, 0.00 % to 2.50 % CH_4 5 % COMB, 50 % to 100 % COMB reading or 0.25 % CH_4, 2.50 % to 5.00 % CH_4	90 % of final reading in less or equal than 30 sec (normal temperature range)
			extended temperature range: 5 % COMB, 0 % to 50 % COMB reading or 0.25 % CH_4, 0.00 % to 2.50 % CH_4 8 % COMB, 50 % to 100 % COMB reading or 0.40 % CH_4, 2.50 % to 5.00 % CH_4	
Oxygen	0 – 25% 0_2	0.1% 0_2	0.7% 0_2 for 2 – 25% 0_2	90% of final reading 30 seconds (normal temperature range 3 minutes (extended temperature range)

Sensor	Range	Resolution	Reproducibility	Response time
Carbon Monoxide	0 - 1000 ppm CO	1 ppm CO, for 0 to 500 ppm CO	normal temperature range: ± 5 ppm CO or 10 % of reading, whichever is greater 0 to 300 ppm CO ± 15 % >300 ppm CO	60 second (normal temperature range)
			extended temperature range: ± 10 ppm CO or 20 % of reading, whichever is greater	
Hydrogen Sulphide	0 - 200 ppm H_2S	1 ppm H_2S, for 3 to 200 ppm H_2S	normal temperature range: ± 2 ppm H_2S or 10 % of reading, whichever is greater 0 to 100 ppm H_2S ± 15 % >100 ppm H_2S	60 second (normal temperature range)
			extended temperature range: ± 5 ppm H_2S or 10 % of reading, whichever is greater	
Sulphur Dioxide	0 - 20. ppm SO_2	0.1 ppm SO_2		
Nitrogen Dioxide	0 - 20. ppm NO_2	0.1 ppm NO_2		
Ammonia	0 - 100. ppm NH_3	1 ppm NH_3		
Phosphine	0 - 5.0 ppm PH_3	0.05 ppm PH_3		
Hydrogen Cyanide	0 - 30.0 ppm HCN	0.5 ppm HCN		
Chlorine	0 - 20.0 ppm Cl_2	0.1 ppm Cl_2		
Chlorine Dioxide	0 - 1.00 ppm ClO_2	0.02 ppm ClO_2		

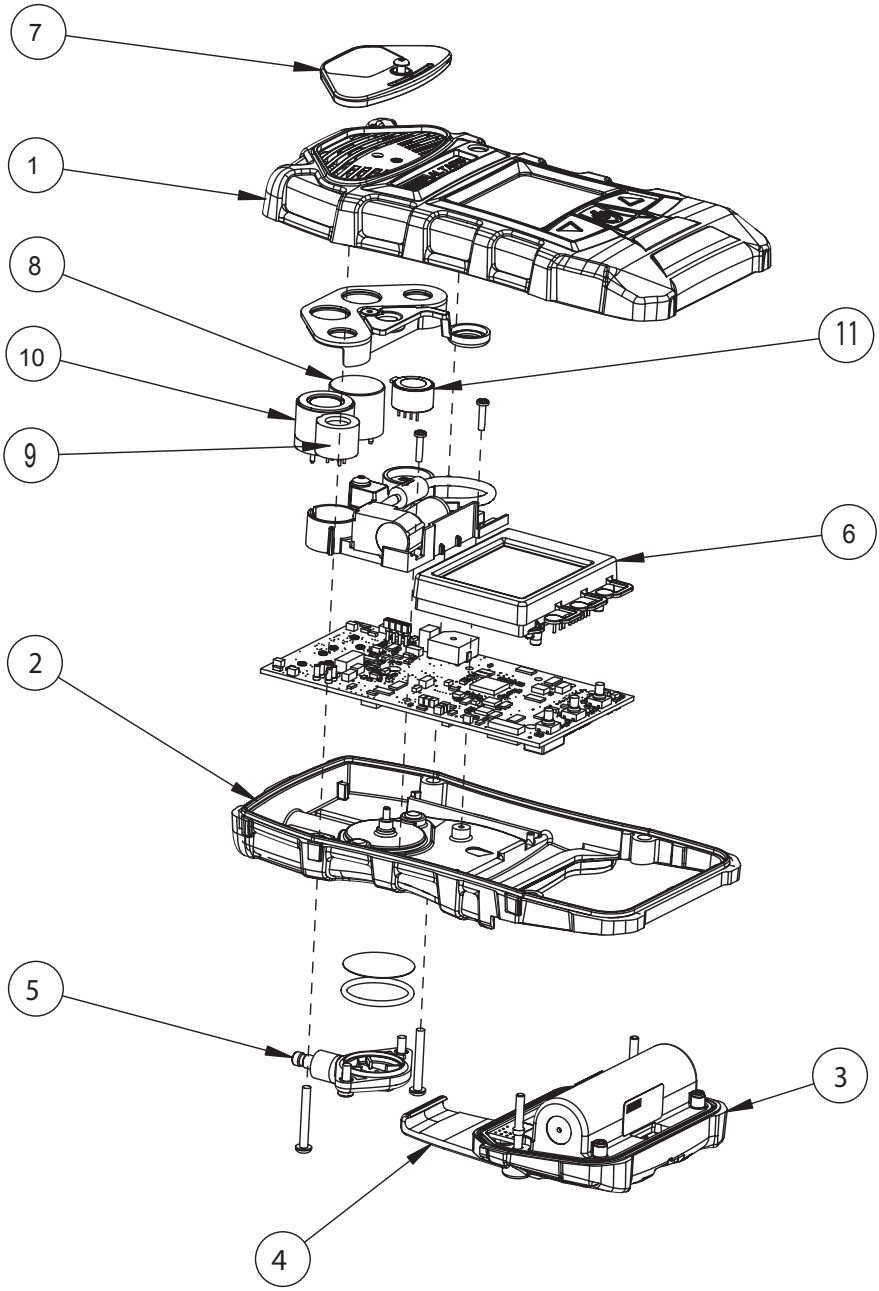
6. Order Information

Description	Part No.
Gas	
Cylinder 34L, 300 ppm CO	10029494
Cylinder 34L, 40 ppm H_2S	10011727
Cylinder 34L, 50 ppm NH_3	10011937
Cylinder 34L, 10 ppm Cl_2	10011939
Cylinder 34L, 5 ppm SO_2	10011938
Cylinder 34L, 10 ppm NO_2	10029521
Cylinder 34L, 0.5 ppm PH_3	10029522
Cylinder 34L, 2 ppm Cl_2 (To calibrate ClO_2 sensor)	711082
Cylinder 34L, 10 ppm HCN	711072
Cylinder 34L, 300 ppm CO	10029494
Cylinder 34L, 40 ppm H_2S	10011727
Cylinder 34L, 50 ppm NH_3	10011937
Cylinder 34L, 10 ppm Cl_2	10011939
Four Gas RP (1.45 % CH_4, 15.0% O_2, 60 ppm CO, 20 ppm H_2S)	10053022
Four Gas RP (1.45 % CH_4, 15.0% O_2, 300 ppm CO, 10 ppm H_2S)	10024230
Three Gas RP (1.45 % CH_4, 15.0% O_2, 300 ppm CO)	10024231
Three Gas RP (0.986 % C_3H_8, 15.0% O_2, 300 ppm CO)	10044001
Four Gas RP (0.986 % C_3H_8, 15.0% O_2, 300 ppm CO, 10ppm H_2S)	10044002

For IR Sensors	
Cylinder 34L, 15% Vol CO_2	10029499
Cylinder 34L, 2.5% Vol CO_2	10060618
Cylinder 34L, 1% Vol Propane	10029476
Cylinder 34L, 8% Vol Propane	10078013
Cylinder 34L, 50% Vol Propane	10029475
Cylinder 34L, 0.5% Vol Butane	10078011
Cylinder 34L, 8% Vol Butane	10078012
Cylinder 34L, 20% Vol Methane	10022595
Cylinder 34L, 50% Vol Methane	10029500

Description	Part No.
Universal Pump Probe, Europe	10047596
Calibration Assembly (Cap, Tube)	1009385
Pressure reduction valve 0.25 l/min	478359
Demand regulator for exotics	10079801
Demand Regulator	710288
MSA Link USB dongle	10082834
MSA Link Datalogging Software	10088099
Shoulder Strap	474555
Holster, leather, ALTAIR 5/ALTAIR 5 IR	10099648

Replacement parts



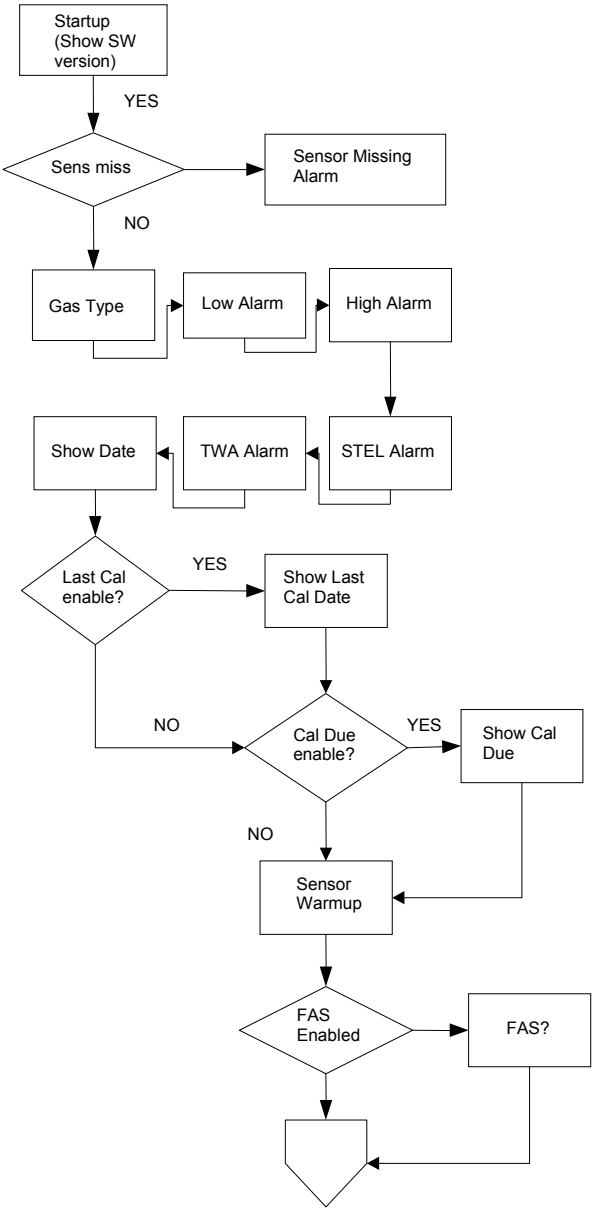
No.	Description	Part No.
1	Case assembly, upper, with label	10095081
	Case assembly, upper, reactive gas (Cl_2, Cl_2O, NH_3) with label	10095082
2	Case, lower, pumped, ALTAIR 5	10083583
	Case, lower, diffusion, ALTAIR 5	10083582
	Case, lower, ALTAIR 5 IR	10088611
3	Battery pack, rechargeable, EU/Aus, ALTAIR 5	10083508
	Battery pack, alkaline, EU/Aus, ALTAIR 5	10093415
	Battery pack, rechargeable, EU/Aus, ALTAIR 5 IR	10093416
4	Kit, belt clip replacement, (ALTAIR 5 rechargeable)	10094830
5	Filter cover assembly	10083591
6	Display assembly, monochrome	10083589
	Display assembly, colour	10099650
7	Kit, pump cap replacement	10095051
8	Sensor, HCN	10080220
	Sensor, Cl_2	10102094
	Sensor, ClO_2	10080222
	Sensor, SO_2	10080223
	Sensor, NO_2	10080224
	Sensor, NH_3	10080225
	Sensor, PH_3	10080226
9	Sensor, COMB	10089116
10	Sensor, O_2	10089163
11	Sensor, CO-H_2S	10089117
	Sensors, CO-H_2S, O_2, COMB	10095052

No.	Description	Part No.
	Kit, maintenance (includes filters, o-ring, screws)	10094829
	Kit, maintenance, reactive gas (Cl_2, ClO_2, NH_3) (includes filters, o-ring, screws)	10099533
	Charging Cradle c/w power supply (EU)	10093057
	Charging Cradle (Australia)	10093056
	Vehicle Charger Cradle c/w 12/24V power supply	10099397

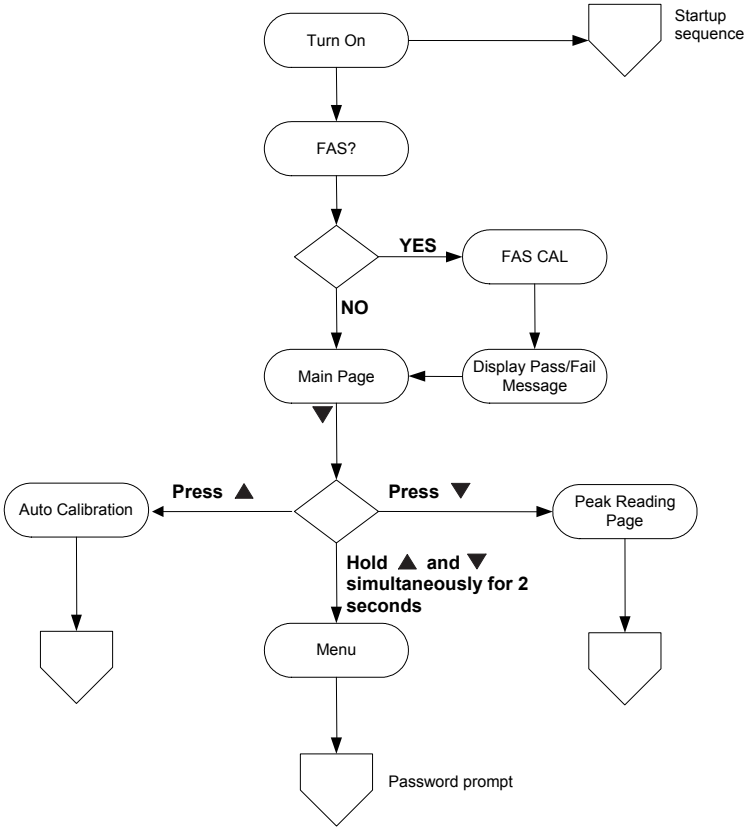
Description	Part No.
IR sensors	
IR sensor HC 0-25 % Vol Butane	10062201
IR sensor HC 0-25 % Vol Propane	10062202
IR sensor HC 0-25 % Vol Methane	10070759
IR sensor HC 0-100 % Vol Methane	10062205
IR sensor HC 0-100 % Vol Butane	10070756
IR sensor HC 0-100 % Vol Propane	10062207
IR sensor HC 0-100 % LEL Propane	10062208
IR sensor HC, 0 -100 % LEL Butane	10071381
IR sensor 0- 5 % Vol CO_2	10070758
IR sensor 0-10 % Vol CO_2	10062209
IR sensor 0-50 % Vol CO_2	10070757

7. Appendix – Flow Charts

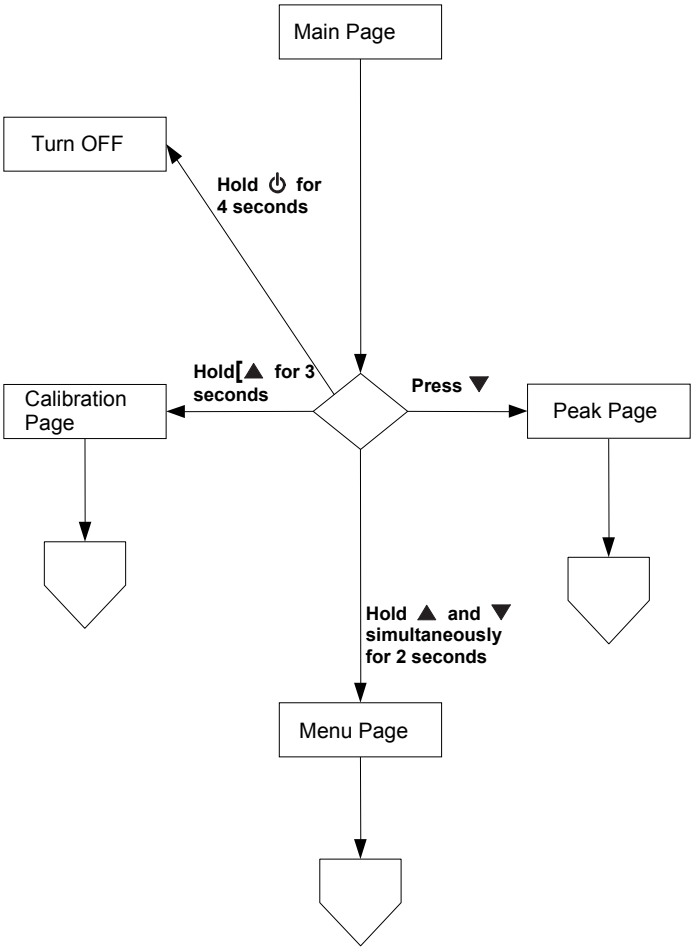
7.1. Start Up Sequence (Power ON)



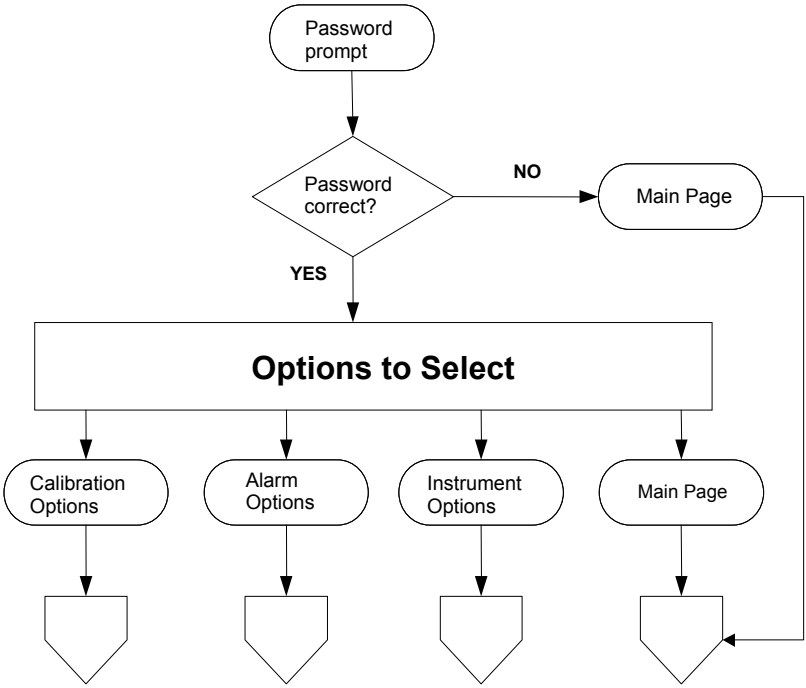
7.2. Normal Operation



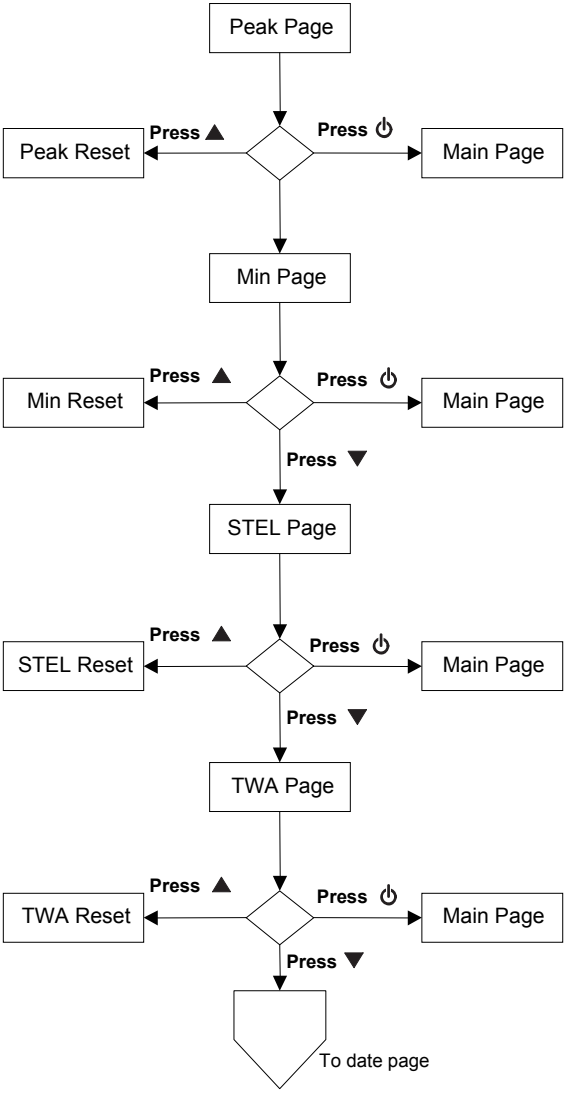
7.3. Options from Main Page

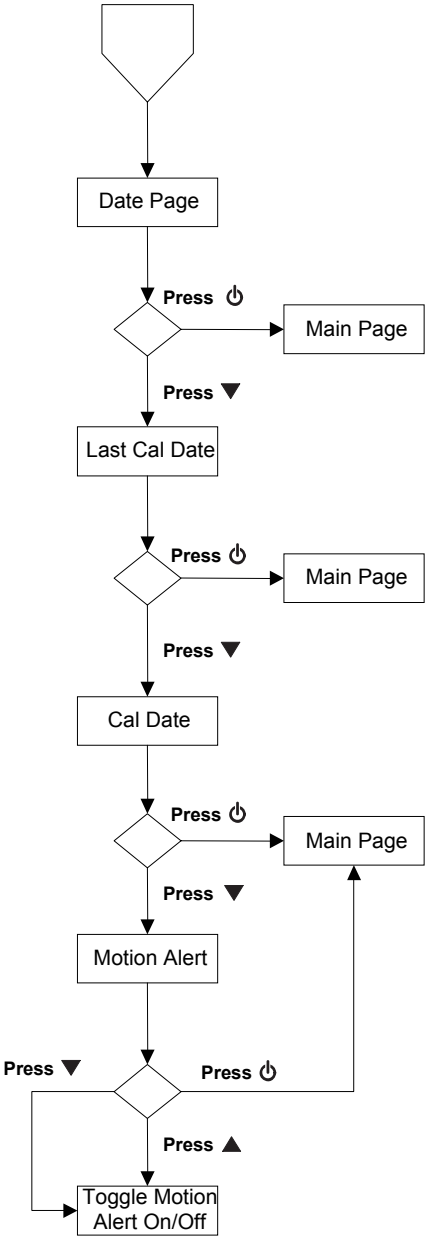


7.4. Password Protected Options

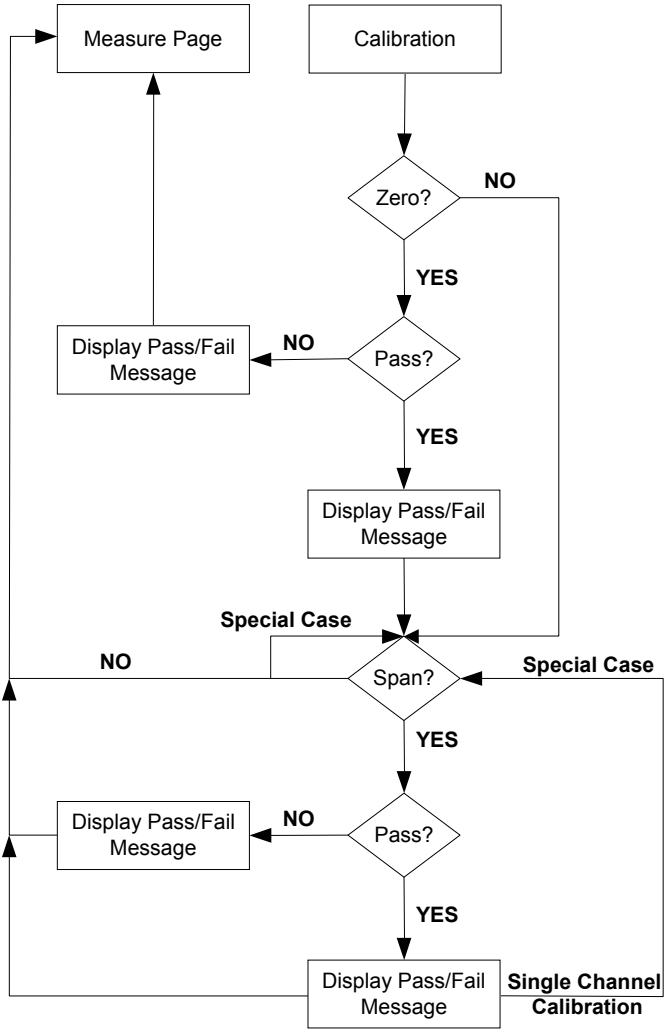


7.5. Menu Sequence from Main page

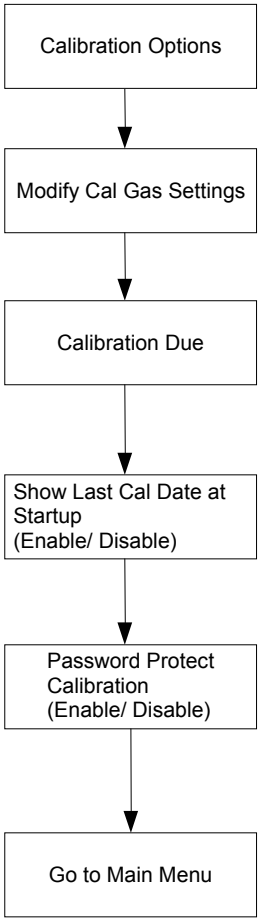



Date Page
Press
Main Page
Press
Last Cal Date
Press
Main Page
Press
Cal Date
Press
Main Page
Press
Motion Alert
Press
Press
Press
Toggle Motion Alert On/Off

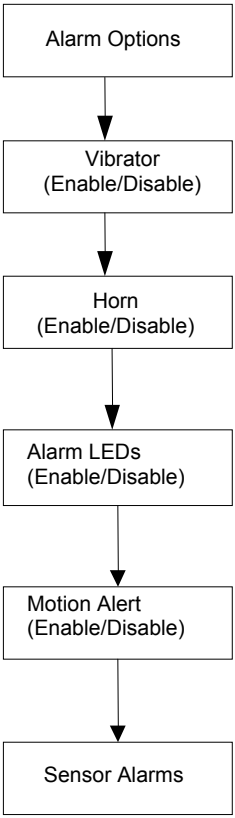
7.6. Calibration Sequence



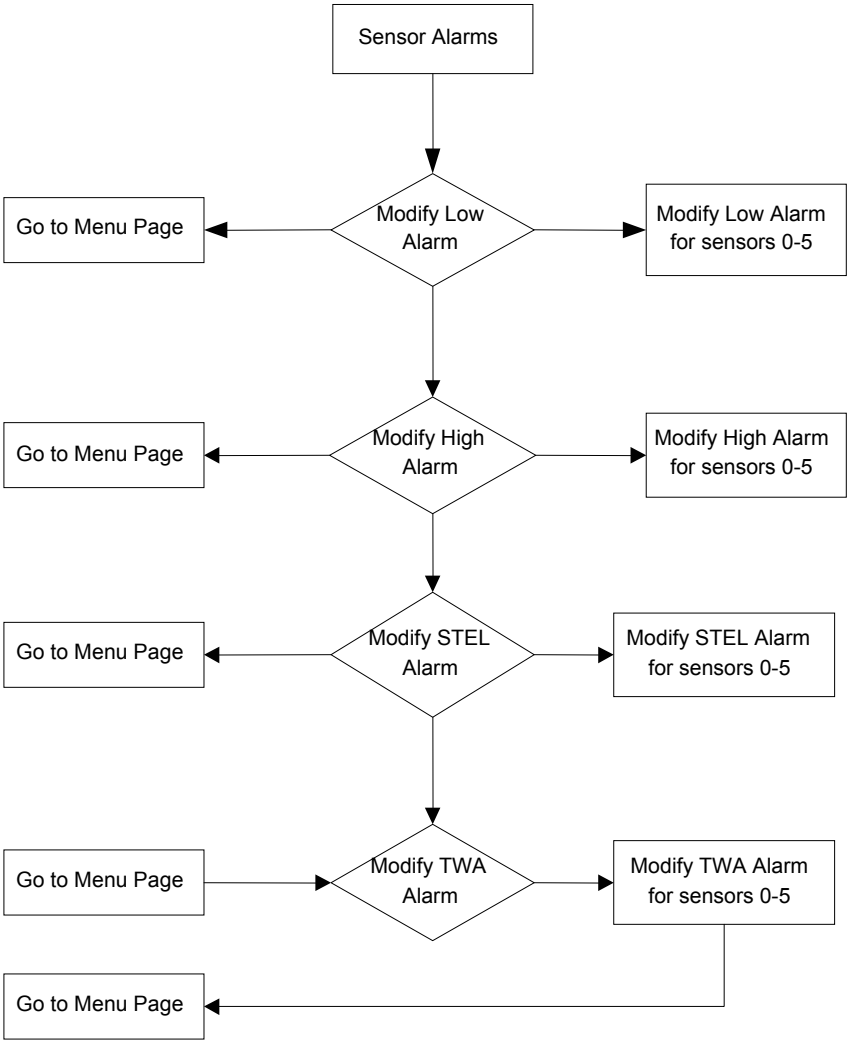
7.7. Calibration Options



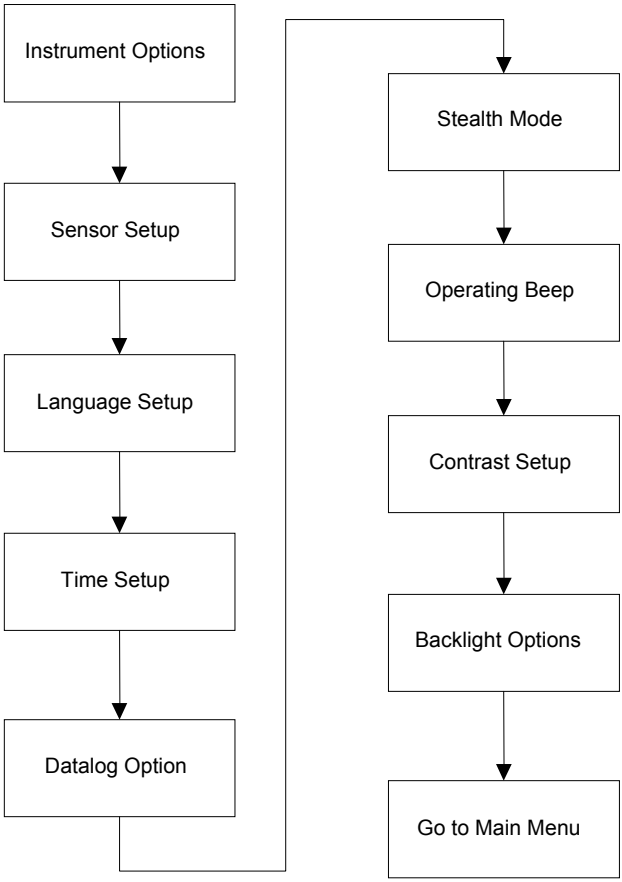
7.8. Alarm Options



7.8.1 Sensor Alarm Options



7.9. Instrument Options



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