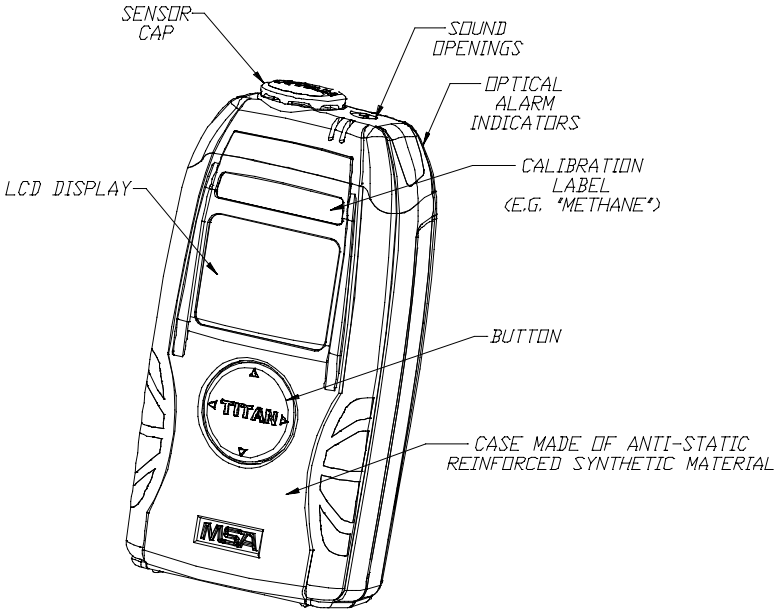
MSA Titan™ Combustible Gas Detector



Operating Manual

In North America, to contact your nearest stocking location, dial toll-free 1-800-MSA-2222. To contact MSA International, dial 1-412-967-3354 or 1-800-MSA-7777.

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

(L) Rev 0 **10031221**

⚠ WARNING

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

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

⚠ CAUTION

For safety reasons, this equipment must be operated by qualified personnel only. Read and understand the instruction manual completely before operating.

This instrument consists of subassemblies which are electrostatically sensitive. Opening the instrument for maintenance or repair is to be carried out by authorized personnel only. Avoid unprotected touching of the subassemblies, which could cause electrostatic discharge. Warranty is void if damages to subassemblies are caused by electrostatic discharge.

Table of Contents

Chapter 1
Instrument Safety and Certifications

The Titan Combustible Gas Detector is for use by trained and qualified personnel. It is designed to be used when performing a hazard assessment to:

- Assess potential worker exposure to combustible gases and vapors
- Determine the appropriate combustible gas and vapor monitoring needed for a workplace.

The Titan Combustible Gas Detector is equipped to detect Combustible gases and certain combustible vapors.

⚠ WARNING

- Read and follow all instructions carefully.
- Bump check before each use.
- Calibrate when bump check fails.
- Check calibration more frequently if exposed to silicone, silicates, lead-containing compounds, hydrogen sulfide, or high contaminant levels.
- Recheck calibration if unit is subjected to physical shock.
- Check sample system (if used) for proper operation before each days use.
- Use only to detect gases/vapors for which sensor is installed.
- Do not use to detect combustible dusts or mists.
- Make sure adequate oxygen is present.
- Do not block sensors.
- Do not place end of sampling line (if used) in liquids.
- Response times vary, based on gas/vapor and length of sampling line (if used).
- Have a trained, qualified person interpret instrument readings.
- Do not replace alkaline cells in a hazardous area.
- Do not recharge NiMH battery packs in a hazardous area.
- Do not alter or modify instrument.

INCORRECT USE CAN CAUSE SERIOUS PERSONAL INJURY OR DEATH.

Safety Limitations and Precautions

Carefully review the following safety limitations and precautions before placing this instrument in service:

- The Titan Combustible Gas Detector is designed to detect combustible gases and vapors in air only.
- Perform the following checks before each day's use to verify proper instrument operation:
    - Bump check (see Chapter 3, "Using the Titan Combustible Gas Detector"). Calibrate if the readings are not within the specified limits.
    - Check sampling system (if used) for proper operation. To check for leaks in the flow system, close inlet of the instrument with one finger of the left hand; then, depress the aspirable bulb. Immediately seal the aspirator bulb outlet with one finger of the right hand. As long as both fingers are held in place, the bulb should remain deflated. If the bulb fills, there is a leak in the flow system which includes: the filament, aspirator bulb, or inlet and outlet fitting gaskets. To check the aspirator exhaust valve for leakage, close inlet of the instrument with one finger of the left hand; then depress the aspirator bulb. The bulb should not completely inflate in less than six seconds.
- 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 desensitize the combustible gas sensor and reduce its readings:
    - Organic silicones
    - Silicates
    - Lead-containing compounds
    - Hydrogen sulfide 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" indicates the atmosphere is above 100% LEL and an explosion hazard exists. In such cases, the instrument LockAlarm feature activates. Move away from contaminated area immediately.

- Do not use the Titan Combustible Gas Detector to test for combustible 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 or dusts.
- Do not use the Titan Combustible Gas Detector to test for combustible gases in atmospheres containing vapors from liquids with a high flash point [above 100^{o}F (38^{o}C)] 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 used (see Chapter 7, "Performance Specifications"). Additionally, when using a sampling pump, allow a minimum of 0.7 seconds per foot of sample line to allow the sample to be drawn through to the sensors.
- Keep the probe tip (if used) above liquid surfaces; otherwise, liquid may enter the system and block the sample flow, causing inaccurate readings and/or internal damage.
- 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.
- Replace alkaline cells or recharge NiMH battery-pack in non-hazardous area only. Use only battery chargers listed in this manual; other chargers may damage the battery pack and the unit. Dispose of batteries in accordance with local health and safety regulations.
- Do not alter this instrument or make any repairs beyond those specified in this manual. Only MSA-authorized personnel may repair this unit; otherwise, damage may result.

Date of Instrument Manufacture

The date of manufacture of your Titan Combustible Gas Detector is written on a label on the main printed circuit board.

Marking, Certificates and Approvals

The Titan Combustible Gas Detector has been successfully tested by DMT - Deutsche Montan Technologie - for electrical safety according to the European Standards:

1. EN 50 014 - December 1999

2. EN 50 018 - August 1996

3. EN 50 020 - August 1996

Based on the directive 94/9/EC ATEX 100a), an EC type examination certificate without measuring function has been issued.

MANUFACTURER	MSA AUER GmbH Thiemannstrasse 1 D-12059 Berlin
AUTHORIZED REPRESENTATIVE	Mine Safety Appliances Company 1000 Cranberry Woods Drive Cranberry Township, PA 16066 USA
INSTRUMENT	Titan Combustible Gas Detector
INSTRUMENT LABELING	Ex IIG EEx ia d IIC T3/T4 Alkaline T3/T4 -20 to +50 °C NiMH T3/T4 -20 to +50/40 °C
EC-TYPE EXAMINATION CERTIFICATE	DMT/BVS 01 ATEX E001X
QUALITY ASSURANCE NOTIFICATION	CE 0080
EMC CONFORMANCE (89/336/EEC)	EN 50081-2, EN 50270-2

Declaration of Conformity

MANUFACTURED BY:

MSA AUER GmbH
Thiemannstrasse 1
D-12059 Berlin

This is to declare that the…

MSA Titan Combustible Gas Detector

complies with the provisions of the council directive 94/9/EC (ATEX)This declaration is based on the EC-Type Examination Certificate BVS 01 ATEX E 001X

BVS/DMT, of Germany, 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 and

Annex VII of the ATEX Directive 94/9/EC

We additionally declare that this product is in conformance with the EMC Directive 89/336/EEC in accordance with EN 50270-2 and EN50081-2

MSA AUER GmbH

Berlin, January 2001

Dr. Axel Schubert, R & D Instruments

Electronic Interference

The Titan Combustible Gas Detector is in conformance with the EMC Directive 89/336/EEC in accordance with EN 50081-2 and EN 50270-2.

This instrument generates, uses, and can radiate radio frequency energy. Operation of this instrument may cause interference, in which case, the user may be required to take corrective action.

This device is test equipment and is not subject to FCC technical regulations. However, it has been tested and found to comply with the limits for a Class A digital device specified in Part 15 of the FCC regulations.

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the CRTC.

There is no guarantee that interference will not occur. If this instrument is determined to cause interference to radio or television reception, try the following corrective measures:

- Reorient or relocate the receiving antenna
- Increase separation between the instrument and the radio/TV receiver
- Consult an experienced radio/TV technician for help.

Chapter 2
Quick Start

It is your responsibility to know how to use the Titan Combustible Gas Detector. When used properly, it will alert you to the presence of combustible gases and vapors. These conditions are displayed on the face of the instrument. See FIGURE 2-1 for an explanation of the flags and numbers of the Titan Combustible Gas Detector.

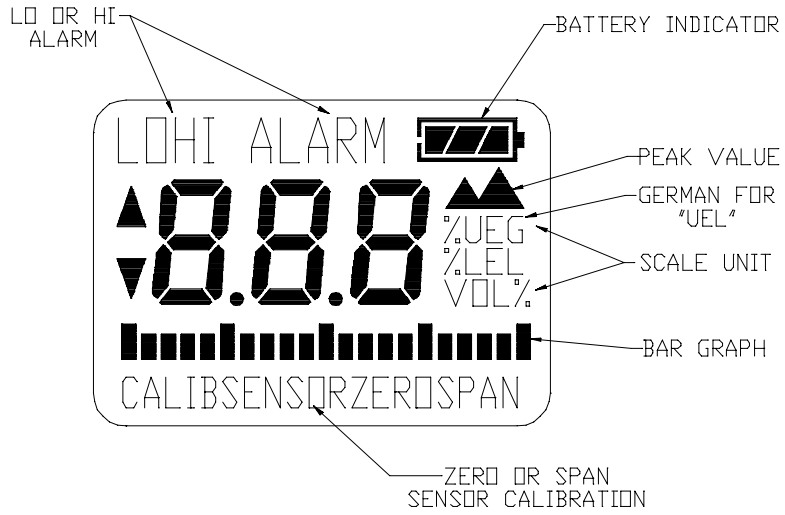


Figure 2-1. Understanding the Display

Turning ON the Titan Combustible Gas Detector

To turn ON the Titan Combustible Gas Detector:

1. Install the battery pack (if not already installed).
2. Push the button on the front of the unit.

The instrument then performs a Self-test where the:

- display check occurs (every segment on the display momentarily illuminates)
- display back light illuminates
- audible alarm sounds
- alarm lights illuminate.

Once the Self-test is complete, the instrument enters the Measure mode and is ready for use.

Turning OFF the Titan Combustible Gas Detector

To turn OFF the Titan Combustible Gas Detector:

- Push and hold the button for five seconds.
    - After two seconds, "OFF" displays and the bar graph disappears to indicate instrument turn-OFF.

Chapter 3
Using the Titan Combustible Gas Detector

Turning ON the Titan Combustible Gas Detector

Installing the battery pack (FIGURE 3-1)

1. Slide the battery pack toward the top of the instrument.
2. Swing the battery pack up and into the body of the instrument.
3. Secure the battery pack by installing the screws in the bottom of the battery pack and instrument.
    - The screw must be snug to ensure that the battery pack properly seals to the instrument. Do not over-tighten.
4. Once the battery pack is installed, the Titan Combustible Gas Detector will turn ON.

Figure 3-1. Battery Pack Installation

The instrument now performs the following Self-test where the:

- Display check occurs
  (every segment on the display momentarily illuminates)
- Display back light illuminates
- Audible alarm sounds
- Alarm lights illuminate
- Internal instrument diagnostic occurs
  (any detected internal errors appear on the display).

When Self-test ends, the instrument displays the setup:

- Low Alarm Level shows for three seconds
- High Alarm Level shows for three seconds
- Battery Capacity shows for three seconds
- Sensor Warm-up shows for 12 seconds
- Fresh Air Setup shows for five seconds
- Gas Concentrations appear on the display.

Fresh Air Setup (FAS)

(for automatic zero adjustment of the Titan Combustible Gas Detector sensor)

NOTE: The Fresh Air Setup (FAS) function has safety limits. If a hazardous level of gas is present, the Titan Combustible Gas Detector ignores the FAS command and goes into alarm.

⚠ 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 bump checks. The bump check is required to verify span accuracy. Failure to follow this warning can result in serious personal injury or death.

Persons responsible for the use of the Titan Combustible Gas Detector must determine whether or not the Fresh Air Setup

option should be used. The user's abilities, training and normal work practices must be considered when making this decision.

1. Turn ON the Titan Combustible Gas Detector.
    - Once the instrument self- check is complete and the setup is displayed, FAS flashes for five seconds.
2. To perform a Fresh Air Setup, push the button while the FAS flashes.
3. To skip the FAS, wait five seconds.
    - If the button is not pushed, the option of performing an FAS stops flashing after the five seconds have expired.

Battery Life Indicator

- The battery condition icon is continuously displayed in the upper-right corner of the screen, regardless of the selected page.
- As the battery charge dissipates, segments of the battery icon go blank until only the outline of the battery icon remains.

Battery Warning

A Battery Warning indicates that a nominal 20 minutes of operation remain before instrument batteries are completely depleted.

NOTE: Duration of remaining instrument operation during Battery Warning depends on:

- Ambient temperatures
  (The battery warning is likely to be shorter in colder temperatures, particularly with alkaline batteries)
- Whether the battery warning is reset
  (it comes ON again every five minutes).

When the Titan Combustible Gas Detector goes into Battery Warning, the:

- Battery Life indicator flashes
- Alarm sounds
- Alarm lights flash.

To silence the Battery Warning, push the button.

- Once the battery warning is silenced, the alarm reactivates in approximately five minutes.
- The Titan Combustible Gas Detector continues to operate until the instrument is turned OFF or battery shutdown occurs.

Battery Shut Down

When the batteries can no longer operate the instrument, the instrument goes into Battery Shutdown mode:

- Battery Indicator remains ON
- Alarm sounds continuously
- Alarm lights flash
- After approximately five minutes, the instrument automatically turns OFF.

⚠ WARNING

When Battery Shutdown condition sounds, stop using the instrument; it can no longer alert you of potential hazards since it does not have enough power to operate properly. You must:

1. Leave the area immediately.
2. Turn OFF the instrument if it is ON.
3. Report to the person responsible for maintenance.
4. Replace or recharge the battery pack.
Failure to follow this procedure could result in serious personal injury or death.

For Alkaline Battery packs, replace batteries when the "Battery Low" or "Battery Shutdown" alarms occur. When replacing alkaline batteries, replace ALL batteries with fresh ones at the same time. Do not mix new and partially-discharged batteries. If the batteries are improperly replaced or improperly mixed, the "Battery Low" and "Battery Shutdown" alarms may fail to function, which could result in serious personal injury or death.

Do not use rechargeable batteries in Alkaline Battery Packs. The Alkaline battery warning and alarm set points are not optimized for rechargeable batteries. The low battery warning and alarm could occur too quickly to be noticed. Using rechargeable batteries in the Alkaline battery pack could result in serious personal injury or death.

NOTE: The instrument recognizes the type of installed battery pack (rechargeable NiMH or alkaline) and automatically adjusts the low battery warning and alarm setpoints.

⚠ CAUTION

During "Battery Low" condition, prepare to exit the work area since the instrument could go into "Battery Shutdown" at any time, resulting in loss of sensor function. Depending on the age of the batteries, ambient temperature and other conditions, the instrument "Battery Low" and "Battery Shutdown" times could be shorter than anticipated.

⚠ WARNING

Recharge or replace the batteries when the "Battery Low" or "Battery Shutdown" conditions occur.

Do not reuse a NiMH battery without recharging, even if the battery regains some charge after a period of non-use.

Bump Check

The bump check is simple and should only take about one minute. Perform this check before each use.

1. Turn ON the Titan Combustible Gas Detector in clean, fresh air.
2. Verify that readings indicate no gas is present.
3. Attach calibration cap to the Titan Combustible Gas Detector.
4. Attach regulator (supplied with calibration kit) to the cylinder.
5. Connect tubing (supplied with calibration kit) to the regulator.
6. Attach other end of tubing to the calibration cap.
7. Open the valve on the regulator.
   - The regulator flow rate is 0.25 lpm.
   - The reading on the Titan Combustible Gas Detector display should be within limits stated on the calibration cylinder.
   - If necessary, change cylinder to introduce other calibration gases.

- If the reading is not within these limits, the Titan Combustible Gas Detector requires calibration. See Chapter 5, "Setup and Calibration."

Measuring Gas Concentrations

The Titan Combustible Gas Detector is designed to detect combustible gases and vapors in the atmosphere.

NOTE: When sampling with accessory sampling lines, the shortest possible length should be used to minimize the time needed to obtain a valid reading.

- Alarms sound when concentrations reach:
  - Alarm Set point or
  - 100% LEL (Lower Explosive Limit).
- When the combustible gas indication reaches the LO-ALARM set point:
  - Alarm sounds
  - Alarm lights flash
  - LO ALARM flag above the concentration flashes.
- To silence the alarm, press the button.

  NOTE: The alarm will stay silent if the alarm condition has cleared.
- When the combustible gas indication reaches the HI-ALARM setpoint:
  - Alarm sounds
  - Alarm lights flash
  - HI ALARM flag above the concentration flashes.
- It is not possible to silence the alarm until the gas concentration is below the LO ALARM setpoint. If the gas concentration goes below the LO ALARM press the button to silence the alarm.

NOTE: The alarm remains ON if the alarm condition has cleared. You must reset the HI ALARM.

- When the combustible gas indication reaches 100% LEL:
  - The LockAlarm™ circuit locks the combustible gas reading and alarm
  - Alarm sounds

- Alarm lights flash
- "100" appears on the display and flashes.

- This alarm cannot be reset with the button.

⚠ WARNING

If the 100% LEL alarm condition is reached, you may be in a life-threatening situation; there is enough gas in the atmosphere for an explosion to occur. In addition, any rapid up-scale reading followed by a declining or erratic reading can also be an indication that there is enough gas for an explosion. If either of these indications occur, leave and move away from the contaminated area immediately. Failure to follow this warning can result in serious personal injury or death.

- After moving to a safe, fresh-air environment, reset the alarm by turning OFF the instrument and turning it ON again.

Viewing Peak Reading (PEAK)

- The PEAK flag appears below the Battery indicator on the display to show the highest level of gas recorded by the Titan Combustible Gas Detector since turn-ON.
- To view the Peak Reading:
  1. Press the button.
     - The back light turns ON.
  2. Press the button again.
     - The PEAK flag appears
  3. View the PEAK Reading for five seconds.

Chapter 4
Setting up the Titan Combustible Gas Detector

Power Systems

The Titan Combustible Gas Detector is supplied with:

- a replaceable cell, alkaline battery pack or
- an optional NiMH battery pack
- an optional NiMH battery pack with a vibrating alarm.

The nominal run times by battery type:

- Alkaline: 13 hours
- NiMH: 11 hours

NOTE: In colder temperatures, battery output may be severely reduced. See TABLE 4-1 for capacity reductions expected for alkaline batteries at these temperatures.

Table 4-1. Capacity Reductions Expected for AA Alkaline Batteries at Colder Temperatures

TEMPERATURE	EXPECTED CAPACITY REDUCTION
70°F (21°C)	None
32°F (0°C)	25%
14°F (-10°C)	60%

Battery Pack Removal

To remove the battery pack from the Titan Combustible Gas Detector (FIGURE 4-1).

1. Remove the screw from the bottom of the battery pack.
2. Gently pull out the pack by lifting the bottom out of its recess; then, slide it down.

Battery Charging

- Charge only NiMH battery packs.

Figure 4-1. Battery Pack Removal

- Charge the Titan NiMH battery packs by using the Delta Fast Charger in non-hazardous areas only (FIGURE 4-2).

⚠ CAUTION

This instrument is designed for use only with the battery charger listed in this manual. Use of other battery chargers may result in damage to the battery pack and instrument. Dispose of used batteries in accordance with local health and safety regulations.

- Prior to charging, the Titan Combustible Gas Detector must be turned OFF, or its battery pack removed.
- In normal, room-temperature environments, the charger is capable of charging a completely depleted pack in three hours .

NOTE: Allow very cold battery battery packs to stabilize for 1/2-hour at room temperature before attempting to charge.

Figure 4-2. Battery Pack Charging

To Charge the Battery Pack

- Connect the charger (P/N _____) cable to the charging stand.
- Charger status is indicated by the LED color:
    - **Red**
      Charging is in process.
    - **Green**
      Charging is complete; the pack is fully charged and ready for use.
    - **Red Flashing**
      Failure mode; remove battery pack from charger.
    - **LED OFF**
      No battery pack connected.

To Charge the Battery Pack in a Vehicle

1. Connect the input cable assembly to the vehicle lighter and the input to the charger assembly.
2. Connect the charger (P/N _____) cable to the charging stand.

- Charger status is indicated by the LED color:
    - **Red**
      Charging is in process.
    - **Green**
      Charging is complete; the pack is fully charged and ready for use.
    - **Red Flashing**
      Failure mode; remove battery pack from charger.
    - **LED OFF**
      No battery pack connected.
- Once the battery pack is charged, it can be disconnected from the charger and ready for immediate use.

Alkaline Battery Pack

NOTE: Replace alkaline batteries in non-hazardous areas only.

- The Titan Replaceable battery pack can be used as a:
    - Full-time battery pack or
    - Backup power source.

See TABLE 4-2 for batteries approved for use in the Titan Combustible Gas Detector alkaline battery pack.

Table 4-2. Batteries Approved for use in the Titan Combustible Gas Detector Alkaline Battery Pack

BATTERY	UL/C-UL	EUROPE		IEC	
		T3	T4	T3	T4
Duracel MN1500	●		●		●
Varta 4006	●	●		●	

To Replace the Batteries

1. Remove battery pack from the instrument by removing the screw located in the bottom of the battery pack.
2. Gently lift the pack out of its recess and pull it out of the unit.
3. Loosen the two screws that hold the plastic battery cover to the battery pack.
4. Remove the plastic cover, exposing the replaceable batteries.
5. Remove the depleted batteries.

   NOTE: Follow local regulations regarding battery disposal.
6. Install the new batteries, observing the direction of the positive (+) battery terminal.
   - The instrument will not operate if any or all cells are reversed.
7. Replace the plastic battery cover and tighten the screw.
8. Re-install the battery pack in the instrument.

Figure 4-3. Alkaline Battery Replacement

Chapter 5
Set Up and Calibration

Accessing the Instruments Setup

The Instrument Setup mode allows the user to change internal values such as:

- Scale unit:
    - % LEL
    - Vol% or
    - % UEG.
- Alarm setpoints
- Calibrating value.

The button is used like a joy-stick (FIGURE 5-1):

- Press the top portion of the button to increase the value.
- Press the bottom portion of the button to decrease the value.
- Press the right portion of the button to go forward and to accept (Acc).
- Press the left portion of the button to go backward or to escape.

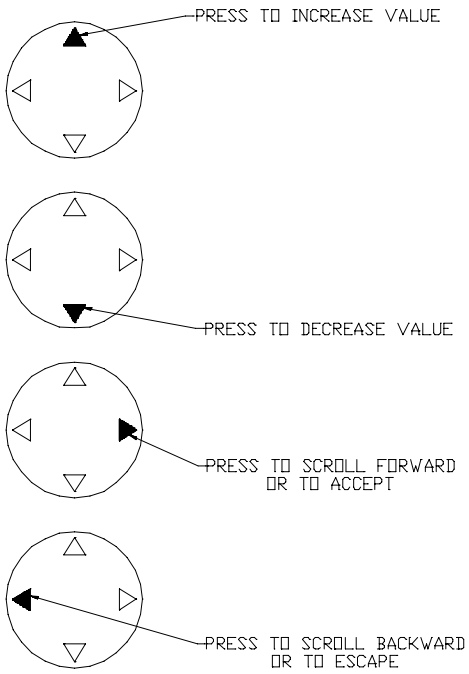


Figure 5-1. Instrument Setup Button

To Access Instrument Setup Mode

1. Turn the instrument ON by pushing and holding the button until CAL appears on the display.
2. To enter the Set-up mode, release the button.
   - Now you can change the scale unit and alarm levels.

Changing Scale Unit (FIGURE 5-2)

To change the setup from "% UEG" to "% LEL", press the bottom portion of the button and scroll to "% LEL".

Changing the Alarm Level

1. Press the right portion of the button to go to the LO ALARM selection (FIGURE 5-2).
   - The display shows the current alarm level.

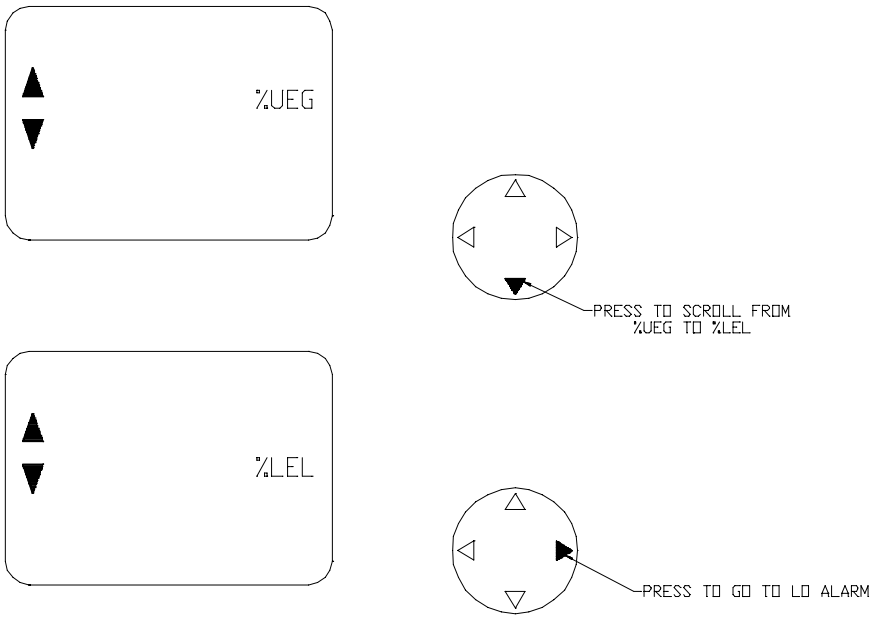


Figure 5-2. Changing Scale Unit and Accessing LO Alarm

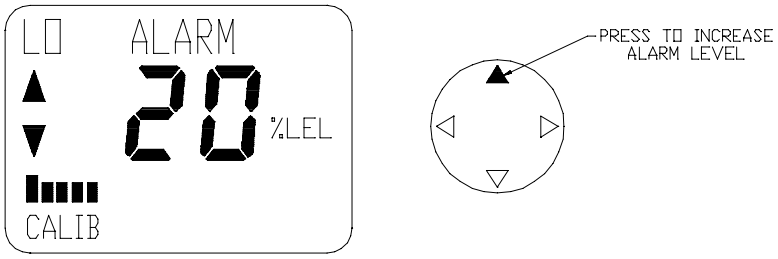


Figure 5-3. Changing the Alarm Level

- The CALIB flag appears on the bottom line of the display.

2. To increase the alarm level, press the top portion of the button (FIGURE 5-3).

To Change the HI ALARM Level

1. Press the right portion of the button to change the HI ALARM level (FIGURE 5-4).
2. To increase the alarm level, press the top portion of the button (FIGURE 5-4).
3. To decrease the alarm level, press the bottom portion of the button (FIGURE 5-4).
4. To accept the change, press the right portion of the button.
   - The display will change to "Acc" (FIGURE 5-4) .
5. Press the right portion of the button to accept (FIGURE 5-5).

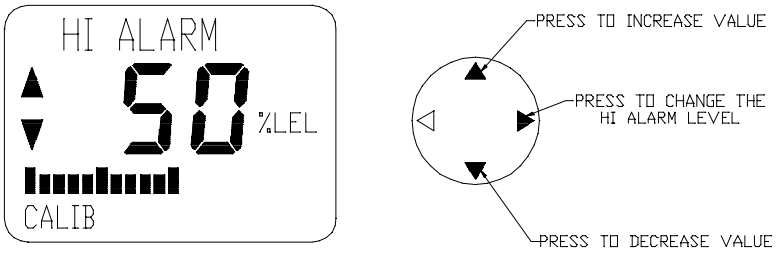


Figure 5-4. Changing the HI ALARM Level

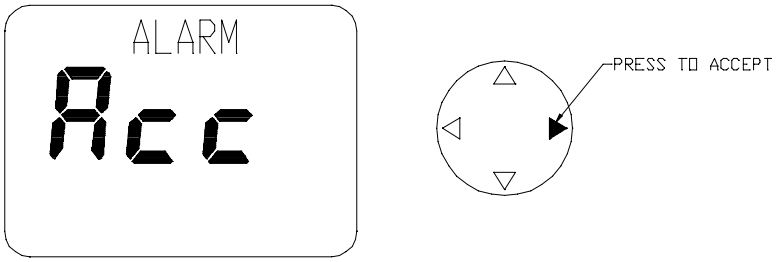


Figure 5-5. Accepting the Change

Accessing the Calibration Mode

- After finishing the Alarm Setup, the unit accesses the Calibration mode.
- The ZERO flag appears on the bottom line on the display (FIGURE 5-6).
- While the Titan Combustible Gas Detector zero calibrates, the bar graph goes to the middle position.

1. Press the right portion of the button to go to Span calibration (FIGURE 5-6).
2. Plug the calibration cap on the Titan Combustible Gas Detector (FIGURE 5-7).
3. Connect the hose with the regulator and the calibration cap (FIGURE 5-7).
4. Open the valve on the regulator.
    - The value on the display increases.
    - The bar graph increases.

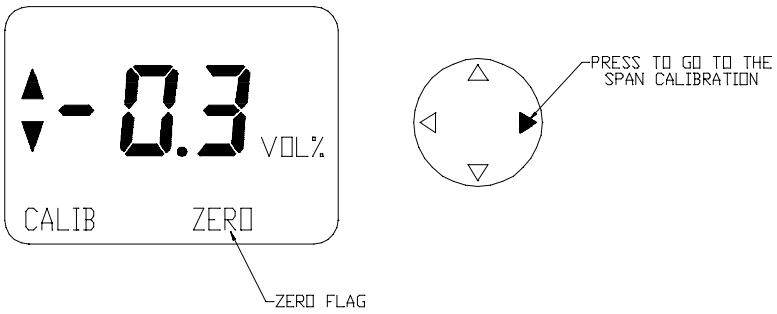


Figure 5-6. Accepting the Change

- When the display shows a stable reading, the bar graph (FIGURE 5-8) goes to the middle position.

5. Press the top or bottom portion of the button to obtain the correct value (FIGURE 5-8).
6. Press the right portion of the button to finish the calibration.
7. When "Acc" displays, press the right portion of the button to accept the calibration.

Figure 5-7. Calibration Setup

NOTE: To skip calibration and return to the Measure mode, push the left portion of the button. If button is not pushed during a 10-minute interval, the instrument automatically returns to the Measure mode.

8. Remove the calibration cap or tubing from the Titan Combustible Gas Detector.
9. Close the valve on the regulator.

NOTE: Since residual gas may be present, the instrument may briefly go into an exposure alarm after the calibration sequence is completed.

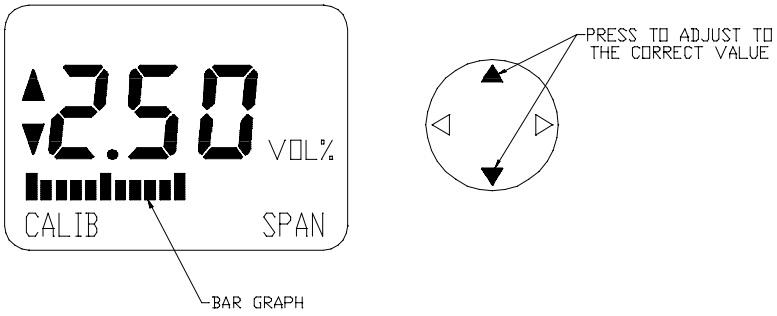


Figure 5-8. Accepting the Change

Calibration Failure

If the Titan Combustible Gas Detector cannot calibrate the sensor, the instrument goes into an alarm which remains until the button is pushed. A sensor that could not be calibrated is indicated by the SENSOR flag on the bottom line.

- Check the calibration setup and verify that the right gas concentration is being used.

Chapter 6
Warranty, Maintenance and Troubleshooting

MSA Portable Instrument Warranty

1. **Warranty-**

ITEM	WARRANTY PERIOD
Chassis and electronics	Lifetime (MSA will support product for five years after production ends)
All sensors, unless otherwise specified	Two years
Rechargeable batteries	Two years

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 authorized service personnel or if the warranty claim results from physical abuse or misuse of the product. No agent, employee or representative of the Seller has any authority to bind the Seller to any affirmation, representation or warranty concerning 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.**

2. Exclusive Remedy- It is expressly agreed that Purchaser's sole and exclusive remedy for breach of the above warranty, for any tortious conduct of Seller, or for any other cause of action, shall be the repair and/or replacement at Seller's option, of any equipment or parts thereof, which after examination by Seller is proven to be defective. Replacement equipment and/or parts will be provided at no cost to Purchaser, F.O.B. Seller's Plant. Failure of Seller to successfully repair any nonconforming product shall not cause the remedy established hereby to fail of its essential purpose.

3. **Exclusion of Consequential Damages-** 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.

Cleaning and Periodic Checks

As with all electronic equipment, the Titan Detector will operate only if it is properly maintained.

⚠ WARNING

Repair or alteration of the Titan Detector, beyond the procedures described in this manual or by anyone other than a person authorized 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.

Cleaning and Routine Care

Periodically clean the Titan Detector case with a soft damp cloth. On diffusion instruments: clean sensor holes on the instrument front if they are blocked with dirt.

1. Remove the sensor cap.
2. Clean the sensor cap holes with a paper clip, wire, or similar device. The holes may also be cleaned with oil-free compressed air.
3. Replace sensor membrane with a new one.

⚠ WARNING

Do not attempt to clean the sensor cap while it is in place; sensor damage may occur. The top of the sensor is very fragile; do not touch or apply pressure to the top of any sensor. If a sensor is damaged, it can cause the unit to give false readings.

Storage

- When not in use, store your Titan Detector in a safe, dry place between 23^{o} and 104^{o} F (-5^{o} and 40^{o}C).
- The Titan Detector with the NiMH rechargeable battery pack can be stored on charge indefinitely.

⚠ WARNING

After storage, always recheck instrument calibration before use. During storage, sensors may drift or become inoperative and may not provide warnings of dangers to the health and lives of users.

Shipment

1. Remove battery pack before shipment. When returning the Titan Detector for repairs, disconnect the normally used battery pack from unit, and include it in the container.
2. Pack the Titan Detector in its original shipping container with suitable padding. If the original container is unavailable, an equivalent container may be substituted. Seal instrument in a plastic bag to protect it from moisture. Use sufficient

padding to protect it from the rigors of handling. Damage due to improper packaging or damage in shipment is not covered by the instrument's warranty.

Troubleshooting

The Titan Detector will operate reliably for years when cared for and maintained properly. If the instrument becomes inoperative, follow the Troubleshooting Guidelines in TABLE 6-1; these represent the most likely causes of a problem. You may return inoperative instruments to MSA for repair.

- **MSA Instrument Division**
  Repair and Service Department
  1000 Cranberry Woods Drive
  Cranberry Township, PA 16066-5207
  1-800-MSA-INST

To contact MSA International, please call:

- **1-412-967-3000 or 1-800-MSA-7777**

The instrument displays an error code if it detects a problem during startup or operation. See TABLE 6-1 for a brief description of the error and proper corrective action. When an inoperative component is located by using the guidelines, it may be replaced by using one of the following "Repair Procedures":

Table 6-1. Troubleshooting Guidelines

PROBLEM	REPLACE			
	BATTERY PACK	DISPLAY MODULE	SENSOR	MAIN ELECTRONICS
Does not turn ON	●			●
Does not complete a Self-Test				●
Display segments missing or stuck		●		
"ERR" message after battery installation			●	●
"ERR" message during use				●
Battery pack does not charge	●			
Combustible sensor does not calibrate			●	
In all of the above cases, and for many other problems, you may return the Titan Detector to MSA for repairs.				

Repair Procedures

Battery Pack Replacement

Remove the Battery Pack

1. Remove the two battery mounting screws on the back of the instrument.
2. Pull out the battery pack by gripping it at the edge of the battery pack case and pulling it away from the unit.

Replace the Battery Pack

3. Insert the front of the battery pack under the lip on the case and snap the bottom of the battery pack into the case.
4. Install and tighten the battery mounting screw.

Sensor Replacement (FIGURE 6-1)

1. Verify that the instrument is turned OFF; remove battery pack.
2. Remove the sensor cover screw and cover.
3. Gently lift out the sensor to be replaced; properly dispose of sensor.
4. Carefully align the new sensor contact pins with the sockets on the printed circuit board.

Figure 6-1. Sensor Replacement

5. Press the new sensor into place.
6. Replace the sensor cap.
7. Re-install the screws to hold down the sensor cap.

⚠ WARNING

Verification of calibration response is required; otherwise, the instrument will not perform as required, and persons relying on this product for their safety could sustain serious personal injury or death.

Main Electronics Board Replacement

⚠ CAUTION

Before handling the circuit boards, ensure you are properly grounded; otherwise, static charges from your body could damage the electronics. Such damage is not covered by the warranty. Grounding straps and kits are available from electronics suppliers.

1. Turn OFF the power.
2. Remove the battery pack.
3. Remove the sensor cap and sensor.
4. Remove the two remaining case mounting screws from the internal top part of the case.
5. Tilt the circuit board up at a 90 degree angle to remove the circuit board.
6. Carefully position the circuit board in the case.
7. Replace and secure the circuit board with the two mounting screws.
8. Replace the battery pack and mounting screw securing the battery pack.
9. Completely recalibrate the Titan Detector.

⚠ WARNING

Verification of calibration response is required; otherwise, the instrument will not perform as required, and persons who rely on this product for their safety could sustain serious personal injury or death.

Chapter 7
Performance Specifications

Table 7-1. Certifications

HAZARDOUS LOCATIONS	US	UL 913 for Class 1, Div. 1, Groups A, B, C and D
	CANADA	CSA C22.2 No. 157 for Class 1, Div. 1, Groups A, B, C and D
	EUROPE	EN 50014/EN 50018/EN 50020 II2G EEx ia d IIC T3/T4 Alkaline AA: Varta/Duracell T3/T4 -20°C to +50°C NiMH T3/T4 -20 to +50/+40°C
	AUSTRALIA	AS/NZS 60079-11 Ex ia s IICT4 (T3 Varta Alkaline AA) -20°C to +50°C min.
		AS/NZS 61779-1
EMC/RFI	US	47 CFR, part 15
	EUROPE	EN 50270-2 EN 50081-2
	AUSTRALIA	C-tick emissions (CSPR11)
PERFORMANCE	CANADA	CSA C22.2 No. 152
	EUROPE	IEC 529 IP54 min.
	AUSTRALIA	AS/NZS 61779 -1/61779-4
SAFETY	EUROPE	CE: LVD (low voltage directive), EN61010-1 for chargers and accessories requiring greater than 50 VAC or 75 VDC
ATEX	EUROPE	CE EX II 2G EExiadIIC (T3 Varta Alkaline AA) -20°C to +50°C
		Directive 94/9/CE
		CE: EMC/RFI

Table 7-2. Instrument Specifications

TEMPERATURE RANGE	Normal	-20 to 50° C	
	Extended**	-20 to 50° C	
WARM-UP TIME		20 seconds	
MEASUREMENT METHOD	Combustible Gas	Catalytic Sensor	
FACTORY-SET ALARM SETPOINTS	High Alarm	LEL	10% LEL
	Low Alarm		--

Table 7-3. COMBUSTIBLE GAS - Typical Performance Specifications

RANGE	0 to 100% LEL
RESOLUTION	1% LEL or 0.1% Vol
REPRODUCIBILITY	3% LEL to 50% LEL reading or 5% LEL to full-scale reading
RESPONSE TIME	90% of final reading in 30 seconds (normal temperature range) (diffusion mode)]

Table 7-4. COMBUSTIBLE GAS - Cross Reference Factors for Titan Detector

COMBUSTIBLE GAS	MULTIPLY %LEL READING BY	COMBUSTIBLE GAS	MULTIPLY %LEL READING BY
Acetone	1.1	Methylcyclohexane	1.1
Acetylene	0.7	Methyl Ethyl Ketone	1.1
Acrylonitrile[1]	0.8	Methyl Tertiary Butyl Ether	1.0
Benzene	1.1	Mineral Spirits	1.1
Butane	1.0	iso-Octane	1.1
1,3 Butadiene	0.9	n-Pentane	1.0
n-Butanol	1.8	Propane	0.8
Carbon Disulfide[1]	2.2	Propylene	0.8
Cyclohexane	1.1	Styrene[2]	1.9
2,2 Dimethylbutane	1.2	Tetrahydrofuran	0.9
2,3 Dimethylpentane	1.2	Toluene	1.1
Ethane	0.7	Vinyl Acetate	0.9
Ethyl Acetate	1.2	VM&P Naptha	1.6
Ethyl Alcohol	0.8	0-Xylene	1.2
Ethylene	0.7	RESPONSE NOTES:	
Formaldehyde[2]	0.5	1. The compounds may reduce the sensitivity of the combustible gas sensor by poisoning or inhibiting the catalytic action.	
Gasoline (unleaded)	1.3	2. These compounds may reduce the sensitivity of the combustible gas sensor by polymerizing on the catalytic surface.	
Heptane	1.1	3. For an instrument calibrated on Pentane, multiply the displayed %LEL value by the conversion factor above to get the true %LEL.	
Hydrogen	0.6	4. These conversion factors should be used only if the combustible gas is known.	
n-Hexane	1.3	5. These conversion factors are typical for a Titan Combustible gas Detector. Individual units may vary by ± 25% from these values.	
Isobutane	0.9		
Isobutyl Acetate	1.5		
Isopropyl Alcohol	1.1		
Methane	0.5		
Methanol	0.6		
Methyl Isobutyl ketone	1.1		

Chapter 8
Replacement and Accessory Parts

Table 8-1. Accessory Parts List	
PART	**PART NO.**
Titan Detector, pentane calibrated	10031500
LEL sensor	10024248
NiMH battery pack	10029053
NiMH Battery pack, vibrating	10029052
Alkaline battery pack	10029054
Charger, NiMH 12/24 VDC/115 VAC	
Accessories	
Sampling line, 1.5 m Teflon, coiled, non-conductive	710465
Sampling line, 1.5 m Teflon, conductive	10021925
Sampling line, 3 m Teflon, conductive	10021926
Sampling line, 5 m Teflon, conductive	10021927
Manual aspirator module	10020545
Gas miser regulator, model RP	710288
Flow regulator	467895
Calibration gas, pentane	804532
Calibration kit, model incl. 0.25 lpm regulator and hose	477149
Charger	

Table 8-2. Replacement Parts List		
FIGURE	**PART/COMPONENT**	**PART NO.**
	Belt clip	
	Sensor cap assembly, incl screw	10031505
	LED cap	10031504
	Calibration cap, incl screw	10031973
	Front case assembly	
	Printed circuit board assembly, incl display	