OUR MISSION

Design - Manufacture - Sell: Highest quality products for the preservation of life and property.

Provide: Best customer service available.
1. **WARNINGS AND CAUTIONARY STATEMENTS**

Failure to observe certain procedures or conditions may lead to personal injury and/or impair the performance of the instrument. For maximum safety and performance, please read and understand the warnings and cautions listed below.

- Sudden changes in atmospheric pressure may cause temporary fluctuations in the oxygen reading.
- Recharge the Ni-Cad battery pack in a nonhazardous location only.
- Do not recharge alkaline batteries in or out of the unit.
- Oxygen and toxic gas alarms are set according to different criteria and their alarms indicate different conditions (see Gas Level Alarms).
- Unit is tested for intrinsic safety only in explosive gas/air (21 percent oxygen) mixtures.
- Oxygen deficient atmospheres may cause readings of combustible gas lower than actual concentrations.
- Verify calibration of the combustible gas sensor after use where the combustible gas content causes the instrument to latch in the OVER-RANGE alarm condition.
- Silicone compound vapors may cause desensitization of the combustible gas sensor and may cause readings of combustible gas to be lower than actual gas concentrations. If the instrument has been used in an area where silicone vapors were previously present, always verify the instrument’s calibration before next use to ensure accurate measurements.
- High Over-Range (+OR) combustible gas readings may indicate an explosive concentration of combustible gas.
- Before each day’s use, sensitivity must be tested on a known concentration of pentane or methane equivalent to 25 to 50% of full scale concentration. Accuracy must be within + or - 20% of actual concentration. Accuracy may be corrected by referring to Section 8 of the manual.
- Any rapid upscale reading followed by a declining or erratic reading may indicate a gas concentration beyond the upper scale limit which may be hazardous.
2. UNPACKING THE INSTRUMENT

The shipping box should contain the following items. Account for each item before discarding the box.

<table>
<thead>
<tr>
<th>QUANTITY</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1010-0022</td>
<td>MG140 Multi-Gas Monitor</td>
</tr>
<tr>
<td>1</td>
<td>1704-1872</td>
<td>Rechargeable Ni-Cad Battery Pack</td>
</tr>
<tr>
<td>or</td>
<td>1704-1872</td>
<td>Replaceable Cell 9-Volt Battery Pack</td>
</tr>
<tr>
<td>1</td>
<td>1704-1872</td>
<td>MG140 Instrument Manual</td>
</tr>
<tr>
<td>1</td>
<td>1704-2946</td>
<td>Maintenance Tool</td>
</tr>
<tr>
<td>1</td>
<td>1705-0831</td>
<td>Calibration Cup</td>
</tr>
<tr>
<td>1</td>
<td>1704-4157</td>
<td>Teflon-Lined Tygon Tubing</td>
</tr>
<tr>
<td>1</td>
<td>1600-0026</td>
<td>Training Video</td>
</tr>
<tr>
<td>1</td>
<td>1810-2252</td>
<td>Battery Charger (Nicad only)</td>
</tr>
</tbody>
</table>

After unpacking, if any listed item is missing, contact either your local distributor of Industrial Scientific products, or call Industrial Scientific Corporation at 1-800-DETECTS (338-3287) in the United States and Canada, or 412-788-4353.

3. MG140 OVERVIEW AND FEATURES

The MG140 Multi-Gas Monitor is designed to simultaneously monitor oxygen levels and the presence of combustible gases, hydrogen sulfide and carbon monoxide. The unit is capable of monitoring the oxygen (O₂) content of ambient air from 0 to 30 percent in increments of 0.1 percent. The unit accommodates a combustible gas sensor that continually monitors the presence of combustible gases, allowing the unit to display a reading expressed as a percentage of the lower explosive limit (LEL) or percent of volume methane.

### Gas | Abbreviation | Display Range (parts per million unless otherwise indicated) | Measurement Increments (parts per million unless otherwise indicated)
--- | --- | --- | ---
Combustible Gases | LEL | 0 to 100% | 1%
Oxygen | O₂ | 0 to 30% | 0.1%
Methane | CH₄ | 0 to 5% | 0.1%
Carbon Monoxide | CO | 0 to 999 | 1
Hydrogen Sulfide | H₂S | 0 to 999 | 1

The unit is composed of an enamel coated two-piece stainless steel case sealed by a rubber gasket. Gas readings and all instrument functions are shown on the LCD display screen on the front of the unit. Directly under the screen are four function keys, two of which are hidden. The key marked “ON/OFF/MODE” turns the unit on and off, and allows the user to step through the modes described in Section 5, Basic Operation Modes.

The key marked with an “E” and a light bulb icon also serves a dual purpose: illuminating the display and entering data. Pressing this key in any mode illuminates the display screen for approximately 12 seconds. While setting options in the instrument, the E-key also functions as an enter key.

Above the MODE key and the E-key are hidden “-” and “+” keys that can be felt as raised bumps on the printed panel on the face of the unit. These keys are used to enter values for various instrument setting and to scroll through lists of options in the function menus described in Section 7, Changing Instrument Settings.

The two holes in the front of the unit above and below the MODE and E keys are the alarm speakers.

The MG140 includes these additional features:
- Microprocessor-controlled calibration sequence for accurate calibration
- Illuminated display for viewing in low light conditions
- Choice of power sources (powered by either a rechargeable nickel-cadmium battery pack or a battery pack that accepts 9-volt alkaline cells)
- Plug-in sensors that can be changed without special tools or soldering equipment
4. BASIC OPERATION

The battery shipped with the unit may or may not be sufficiently charged to permit normal instrument operation. See Charging the Battery Pack if charging is necessary.

4.1 TURNING THE MG140 ON

Press and hold the MODE key. The instrument will display “HOLD” on its screen and emit a short beep approximately once per second.

When “RELEASE” is displayed on the display screen (after five beeps), release the MODE key and the instrument will begin its startup routine. Refer to Startup Routine for additional information.

NOTE: The Canadian Standards Association has assessed only the combustible gas portion of this instrument for performance.
4.2 Turning the MG140 Off

From any mode of operation, press and hold the MODE key. The instrument will display “HOLD” on its screen and emit a short beep approximately once per second.

When “RELEASE” is displayed on the display screen (after five beeps), release the MODE key and the instrument will turn off.

4.3 Startup Routine

Every time the instrument is turned on, it will execute the following startup routine before it is ready to operate:

- **Instrument and software identification** – the name of the instrument and its software revision are displayed.
- **Battery condition** – the screen will display “BATTERY NORMAL” if the battery is sufficiently charged for normal operation, or “BATTERY LOW” if the battery should be charged.
- **Sensor Configuration** – shows the position of the four gas readings on the display.
- **Countdown** – the instrument will countdown from 9 to 0. While the instrument is counting down, setup options can be accessed. See Changing Instrument Settings for additional information.

When the countdown reaches zero, the unit will automatically enter Reading Mode and begin continuous gas level monitoring.

5. Basic Operation Modes

The following basic features of the MG140 can be accessed by pressing the MODE key. Each time the MODE key is pressed, the instrument will advance to the next feature in the sequence in which they appear below.

5.1 Reading Mode

The MG140 defaults to Reading Mode as soon as the startup routine is complete. In this mode, the instrument displays the gas concentration level recorded by each sensor. Sensor positions are identified during the instrument startup routine and are marked on the face of the unit around the display screen.

**NOTE:** Once the instrument has entered Reading Mode after the startup sequence, it will automatically monitor gas levels and signal alarms based on these levels, regardless of which operating mode is selected.

Reading mode also identifies the battery level of the instrument. An eight-segment battery indicator appears to the right of the lower left sensor reading. The segments disappear two at a time as battery power is used to visually indicate current battery power. Refer to Battery Alarms and Basic Maintenance and Repair for additional information about the instrument battery.

**NOTE:** If no action is taken in any of the following basic operation modes after advancing from Reading Mode, the instrument will automatically return to the Reading Mode after about 8 seconds.

5.2 Zero Mode

Zero Mode allows the user to establish the zero point from which the instrument measures gas levels. In this mode, the user can also calibrate all installed sensors. For detailed instructions on zeroing and calibrating the instrument sensors, refer to Sensor Zero and Calibration.

5.3 Peak Mode

Peak Mode displays the lowest measured level of oxygen and the highest measured levels of combustible and toxic gases recorded since the peak memory was last cleared.

**NOTE:** Peak measurements do not clear when the instrument is turned off. Peak memory must be manually cleared in the Peak Clear Mode (see below).

5.4 Peak Clear Mode

Peak Clear Mode allows the peak measurement memory to be cleared.

Press the E-key on the face of the instrument to clear peak measurements of all sensors from the instrument memory. After pressing E, the instrument will automatically return to Peak Mode to indicate that the peak levels have been reset.
6. **ALARMS AND OTHER INDICATORS**

The MG140 signals the operator of dangerous gas levels, low battery conditions, and individual sensor failure by a system of visual and audible alarms, described below.

### 6.1 Fault Indication

The fault indication alarm signals that at least one of the installed sensors failed the system test. Reasons for this fault include the following:

- A newly installed sensor has not yet been calibrated (sensors require calibration before they can be operated).
- A sensor has temporarily become disconnected from the circuit board and requires re-seating and re-calibration.
- A sensor’s span reading is 50% or less of the setspan value and requires replacement (see Sensor Zeroing and Calibration for more information).

When turned on, the instrument signals a fault by the following:

- **Audible indicator** – The instrument emits a short beep approximately every 1.2 seconds.
- **Display indicator** – When the instrument is in Reading Mode, the position of the sensor that is causing the fault appears blank on the screen.

Correcting a faulted sensor requires replacing the sensor, reseating the sensor on the circuit board, and/or calibrating the sensor to allow it to operate. Refer to Sensor Zeroing and Calibration and Replacing Toxic Gas Sensors for further instructions.

### 6.2 Gas Level Alarms

**IMPORTANT:** Oxygen and combustible/toxic gas alarms are set according to different criteria and their alarms indicate different conditions.

Combustible/toxic gas level alarms represent increasing concentrations of combustible and/or toxic gases. The low-level alarm (see below) signals that a certain concentration of gas is present and that caution should be exercised. The high-level alarm (see below) signals that gas concentrations have reached potentially hazardous levels and that actions should be taken accordingly.

Oxygen level alarms delineate a range of acceptable concentrations of oxygen around the 21 percent normally found in ambient air. The low level of this range signals an oxygen deficiency, while the high level of this range signals an oxygen enrichment. Because either of these conditions represent a serious hazard, both high and low oxygen readings trigger high-level alarms to signal that oxygen concentrations are outside the acceptable range.

Refer to Specifications for the default low and-high level alarm setpoints for each type of sensor; refer to Changing Instrument Settings for instructions on changing these setpoints.

### 6.3 Low-Level Alarm

When the instrument detects that a gas being monitored (with the exception of oxygen) has reached the low-level setting, the instrument signals a low-level alarm as follows:

- **Visual indicator** – The display backlight of the instrument will flash.
- **Audible indicator** – The instrument emits a short beep approximately every 1.5 seconds.
- **Display indicator** – The reading of the sensor in alarm will flash on the display of the instrument.
6.3 HIGH-LEVEL ALARM

When the instrument detects that a gas being monitored has reached the high-level setting (or in the case of oxygen, when the level reaches either the low- or high-range limits), the instrument signals a high-level alarm as follows:

- **Visual indicator** – A red LED will flash through the display screen and the display backlight of the instrument will remain on continuously during the alarm.
- **Audible indicator** – The instrument emits a continuous warbling tone.
- **Display indicator** – The reading of the sensor in alarm will flash on the display of the instrument.

Refer to Specifications for specific gas measurement ranges.

**NOTE:** When the instrument detects that a gas being monitored is exceeding the upper limit of its measuring range, the display will show “+OR” in the position of the gas reading to report an out-of-range condition.

6.4 BATTERY ALARMS

6.4.1 BATTERY INDICATOR

Battery life is indicated by the eight-segment indicator displayed in the Reading Mode on the bottom of the display. The segments disappear two at a time as battery power is used to visually indicate current battery power.

6.4.2 LOW BATTERY WARNING

When approximately 1 hour of instrument operation energy remains in the battery, the instrument emits a short beep every 15 seconds. In addition, the battery indicator will be replaced by a flashing “B” on the display.

**NOTE:** If battery power is low on startup, the instrument will display “BATTERY LOW” during the startup sequence.

6.4.3 BATTERY FAILURE

When the battery has insufficient charge to operate the instrument, the instrument will display “BATTERY FAIL” on the screen and emit a short beep once per second.

**NOTE:** When battery failure occurs, the instrument stops gas monitoring functions.

Refer to Basic Maintenance and Repair for battery recharging and replacement instructions.

7. CHANGING INSTRUMENT SETTINGS

The MG140 allows the user to customize the instrument’s settings to suit a particular situation or application. There are five setup options that may be changed:

- **Setspan** – Establishes the gas concentration that will be used to calibrate the instrument.
- **Alarms** – Specifies the gas concentration that will trigger low- and high-level alarms.
- **Battery** – Allows the user to select what type of battery pack is installed in the unit.
- **Code** – Allows a security code to be set to prevent accidental or unauthorized changes of these settings.

**NOTE:** Setup options can only be entered during the count-down in the startup routine.

Change setup options as follows:

1. Turn the instrument off, if it is already on, and then on again.
2. When the display shows the countdown in progress, simultaneously press the hidden - and + keys located above the ON/OFF/MODE and E-keys.

If a security code had not been designated by an operator (all new instruments have security codes set to zero), the instrument will allow the user to choose which setup option to change.

If a security code has been designated, the CODE prompt will appear. Use the hidden - and + buttons to change the value on the display to match the security code. When the correct security code has been set on the display, press the E-key to enter the code. Refer to Code for additional information.

When the correct code is entered, the instrument will allow the user to choose which setup option to change.
3. Use the + key to advance to the setup option that you want to access. Press the E-key to access the option that appears on the display.

Press the MODE key when finished to go to Reading Mode for normal operation of the instrument.

7.1 SETSPAN

When calibrating a sensor, the instrument must know what concentration of gas is being applied to correctly identify that concentration and to establish the scale to which lesser concentrations can be accurately compared and measured (refer to Sensor Zeroing and Calibration for additional information).

The SETSPAN option allows you to set the instrument to accept a given concentration of gas supplied to the instrument during calibration.

Change the setspan for the gas sensors as follows:

1. From Setup, access the SETSPAN option by pressing E when “SETSPAN” appears on the display.

2. Prior to changing sensor setspan values, you may first change whether the combustible sensor will measure percent LEL or percent methane (CH4). Use the + key to toggle between the two possible configurations. The display will show “LEL, and CH4” if it is set to display percent Methane. Use the MODE key to select the configuration shown on the display and exit the combustible gas sensor configuration option. You may also press the MODE key prior to selecting a value to leave the instrument in its original configuration.

3. Use the + key to advance to a gas sensor whose setspan you wish to change and press the E-key.

4. Use the hidden - and + keys to change the setspan of the sensor to the desired value.

5. Press E-key to enter the value displayed as the sensor’s setspan.

6. Use the + key and E-key to select another sensor to change its setspan or press the MODE key to return to SETSPAN MODE.

Press the MODE key again to return to the Reading Mode for normal operation of the instrument.

7.2 ALARMS

The ALARMS option allows the user to set the gas concentrations at which the instrument will signal low and high alarms during normal operation. Refer to Specifications for the gas concentrations at which the instrument is preset to signal alarm.

Change the alarm value for a gas as follows:

1. From Setup, access the ALARMS option by pressing the hidden + key until “ALARMS” appears on the display and then press the E-key.

2. Use the hidden + key to advance the display through the low and high alarm values of the available sensors.

3. When the alarm value of the sensor you want to change is displayed, press the E-key to select it. The letters of the gas sensor identifier will blink to indicate that it has been selected.

4. Use the hidden - and + keys to change the alarm value to the desired alarm value.

5. Press E to enter the value shown as the alarm value.

6. The instrument will return to displaying the low- and high-level alarm values of the available sensors. Use the + and E-keys to select another alarm value to change, or press the MODE key twice to return to the Reading Mode for normal operation of the instrument.

7.3 BATTERY

The BATTERY option allows the user to select the type of battery installed in the unit. The setting configures the battery indicator to accurately display the discharge rate of the selected battery type.

Change the battery setting as follows:

1. From Setup, access the BATTERY option by pressing the hidden + key until “BATTERY” appears on the display and then press the E-key.

2. Press the hidden + key to toggle between “NCD/Li” for Ni-Cad or lithium batteries and “ALKALINE” for alkaline batteries.

3. Press the E key to select battery type shown.

4. Press the Mode key twice to return to Reading Mode for normal operation of the instrument.
To protect the setspan, alarm, and calibration settings from accidental (or unauthorized changes), the CODE option allows the user to designate a security code. This code will then be requested before access to setup and calibration options is allowed.

Designate a security code for the instrument as follows:

1. From Setup, access the CODE option by pressing the hidden + key until “CODE” appears on the display, and then press the E-key.
2. Use the hidden - and + keys to change the “0” that appears to any number up to three digits.
3. When the number on the screen is the number you want to set as the security code, press the E-key to enter the number.
4. Press the MODE key to return to Reading Mode for normal operation of the instrument.

NOTE: Setting the code number to zero disables the security code feature.

To detect varying concentrations of gases, the instrument must be periodically adjusted to ensure that it is providing accurate readings. This process of adjustment consists of the following two steps:

- **Zeroing** – Allowing the sensor to detect ambient air that is without the presence of toxic or combustible gas. This allows the instrument to set the zero point (bottom) of the measurement scale for the toxic gas sensors.

- **Calibration** – Applying a known concentration of gas to the sensor to allow the instrument to associate a known point on the measurement scale with a detected concentration of gas.

Using these settings as references, the instrument can then accurately measure concentrations of gases which fall within the measuring ranges of the individual sensors. Both zeroing and sensor calibration are simple procedures that can be performed by the user, provided the right calibration gases are available.

When zeroing the instrument, it is important that the ambient air:

- Has zero concentration of the toxic or combustible gases for the sensors that are installed in the instrument.
- Has approximately 21 percent oxygen (as is found in normal air).

If the instrument must be zeroed in ambient air that does not possess these attributes, “zero grade air” should be applied to the instrument from a gas cylinder in the same manner as toxic gases are applied during toxic sensor calibration. Refer to Calibrating the Toxic Gas Sensors for information about applying gases to the instrument from gas cylinders.

**NOTE:** Because zeroing takes place in a known concentration of oxygen, zeroing the instrument also calibrates the oxygen sensor.

Zero the instrument as follows:

1. From the Reading Mode, press the MODE key until the display shows the ZERO mode.
2. Press the E-key to begin zeroing. The screen will display “ZEROING”.

The screen will display a three-digit number identified as “O2 SPAN”. This is the span reading of the oxygen sensor.

A span reading identifies the sensitivity life left in the sensor. Sensor responsiveness to gas concentrations decreases with age and use. A span reading tests the sensor to determine if its sensitivity is acceptable with respect to the setspan of the sensor (the known quantity of gas that is being applied during calibration). Span readings are interpreted as follows:

- If the span reading of the sensor is 71 percent or greater of the sensor setspan, the sensor sensitivity is acceptable.
- If the span reading is between 51 and 70 percent of the sensor setspan, the sensor sensitivity is acceptable. If the span reading is between 51 and 70 percent of the sensor setspan, the instrument will signal a marginal sensor by flashing the sensor reading value for the sensor that is marginal. The sensor is still acceptable for use but should be replaced as soon as possible to ensure accuracy.

- If the span reading is between 51 and 70 percent of the sensor setspan, the instrument will signal a marginal sensor by flashing the sensor reading value for the sensor that is marginal. The sensor is still acceptable for use but should be replaced as soon as possible to ensure accuracy.
Calibrate the toxic/combustible sensors as follows:

NOTE: If the E-key is not pressed, the unit will return to the Reading Mode after about 8 seconds. If you do not wish to calibrate the instrument at this time, you may also press the MODE key to return to the Reading Mode.

1. Press the E key at the GO/CAL prompt.

The unit will display the first sensor to be calibrated along with the span gas value, and the message “APPLY CAL GAS” will scroll across the bottom of the display.

2. Slide the calibration cup over the unit, connect the calibration gas cylinder for the first sensor, and open cylinder valve.

When the instrument senses a concentration greater than 50% of the setspan value, the display will show the current span value for that sensor, and the message “CAL IN PROCESS” will scroll across the bottom of the display.

NOTE: The unit will wait for 5 minutes to sense that the calibration gas has been applied before aborting and failing calibration.

When calibration of the sensor has been successfully completed, the instrument will automatically advance to the next sensor to be calibrated. The sensor name with the setspan value will be displayed, and the message “APPLY CAL GAS” will scroll across the bottom of the display.

NOTE: You may calibrate only selected sensors if desired by pressing the MODE key to step out of Calibration Mode after the last sensor you wish to calibrate has successfully calibrated.

3. Turn off the previous calibration gas, attach the appropriate calibration gas cylinder to the calibration cup line, and open the valve.

4. Repeat this procedure for the remaining sensor.

When all the sensors have been successfully calibrated, the sensor configuration will be shown on the display. Sensor identifiers will flash to warn of any sensors with marginal span values.

NOTE: If the E-key is not pressed, the unit will return to the Reading Mode after about 8 seconds.

For example, because an oxygen sensor setspan is 21 percent, an oxygen span reading

• Of 14.9 or greater would be acceptable
• Between 10.5 and 14.8 would be marginal but the sensor could still be used
• Under 10.5 would fail and require sensor replacement

3. After displaying the oxygen span reading, the instrument will display “GO CAL”. If you are not calibrating the combustible or toxic gas sensors at this time, you may press the MODE key to return to normal Reading Mode (the instrument will automatically return to the Reading Mode after approximately 8 seconds). If you are calibrating the combustible or toxic gas sensor, press the E-key and refer to Calibrating the Toxic/Combustible Gas Sensors for further instructions.

8.2 CALIBRATING THE TOXIC/COMBUSTIBLE GAS SENSORS

During sensor calibration, a known concentration of gas is applied to the instrument with the calibration cup and a cylinder containing the appropriate gas. The gases may be combined in a single cylinder to speed the calibration procedure.

IMPORTANT: Check the label on the calibration gas cylinder to ensure (1) that the cylinder contains the correct concentrations of gas or gases, and (2) that the expiration date of the cylinder has not passed.

After the instrument has been zeroed, its screen will display “GO CAL”.

Calibrate the toxic/combustible sensors as follows:

NOTE: If the E-key is not pressed, the unit will return to the Reading Mode after about 8 seconds. If you do not wish to calibrate the instrument at this time, you may also press the MODE key to return to the Reading Mode.

1. Press the E key at the GO/CAL prompt.

The unit will display the first sensor to be calibrated along with the span gas value, and the message “APPLY CAL GAS” will scroll across the bottom of the display.

2. Slide the calibration cup over the unit, connect the calibration gas cylinder for the first sensor, and open cylinder valve.

When the instrument senses a concentration greater than 50% of the setspan value, the display will show the current span value for that sensor, and the message “CAL IN PROCESS” will scroll across the bottom of the display.

NOTE: The unit will wait for 5 minutes to sense that the calibration gas has been applied before aborting and failing calibration.

When calibration of the sensor has been successfully completed, the instrument will automatically advance to the next sensor to be calibrated. The unit will display the sensor name along with the setspan value, and the message APPLY CAL GAS will scroll across the bottom of the display.

3. Turn off the previous calibration gas, attach the appropriate calibration gas cylinder to the calibration cup line, and open the valve.

4. Repeat this procedure for the remaining sensor.

When all the sensors have been successfully calibrated, the sensor configuration will be shown on the display. Sensor identifiers will flash to warn of any sensors with marginal span values.

NOTE: You may calibrate only selected sensors if desired by pressing the MODE key to step out of Calibration Mode after the last sensor you wish to calibrate has successfully calibrated.

After displaying the sensor configuration, the instrument will automatically return to the Reading Mode.
9. **Basic Maintenance and Repair**

9.1 **Cleaning**

Wipe the outside of the instrument with a soft, clean cloth. Never use any solvents or cleaning solutions of any type.

9.2 **Charging the Battery Pack**

Battery life depends upon a number of factors such as ambient temperature and the number and duration of alarm activations. Generally, however, the instrument will operate continuously for approximately 10 hours on a fully charged Ni-Cad battery pack, and approximately 11 hours on a fully charged alkaline battery pack.

**WARNING:** Recharge the Ni-Cad battery pack only in nonhazardous locations. Recharging in the presence of combustible gases could cause an explosion or fire.

**WARNING:** Do not recharge alkaline batteries in or out of the unit. This may cause a fire, explosion, and/or severe damage to the instrument.

To charge the battery with the charger provided, plug the lead on the charging adapter into the charging jack on the upper left side of the rear of the unit. The LED on the charger should glow to indicate that the battery is charging. Do not operate the unit in a hazardous location while it is charging.

As with all Ni-Cad batteries, repeated charging when the unit is only partially drained will build up a “chemical memory” in the battery, which effectively reduces its overall capacity.

At least once every 30 charging cycles fully discharge the battery by letting it run until “BATTERY FAIL” is indicated on the screen and the unit emits a short beep once per second (see **Battery Alarms**).

9.3 **Replacing the Battery Pack**

1. Using a flat-bladed screwdriver, unscrew the large battery cover screw on the rear of the unit and remove the cover.

2. Carefully pull the battery pack straight out of the unit using the plastic tab provided.

3. Insert the new battery pack with the contacts facing toward the instrument. Push the battery straight back to seat.

4. To replace the cover, line up with the edges of the instrument and hook the flange on the bottom of the cover into the bottom of the opening on the instrument and press down. While holding the cover down, tighten the battery cover screw.

9.4 **Replacing the Sensors**

The position of the sensors are unique and cannot be interchanged with one another or with any other location.

Replace a sensor as follows:

1. Remove the battery pack as described above (see **Replacing the Battery Pack**).

2. Remove the two Phillips-head screws: one on the back of the unit next to the charging jack, and the other underneath the battery.

3. While holding one half of the unit in each hand, separate the case halves until the are just clear of one another. Place the front cover face down next to the instrument.

**NOTE:** The case halves are connected by a flex cable. Be careful when separating the case halves that you do not damage the flex cable.

4. Before removing a sensor, note the position of any visible connection pins. Remove the desired sensor by pulling straight up.

5. Insert the new sensor.
6. Lower the empty case half over the side containing the
circuit board. Be sure the lineup pins pass through the
holds in the circuit board. Make sure the rubber gasket
between the case halves fits around both halves of the
instrument case and is not pinched.

7. Install and tighten the two case screws removed in
step 2.

8. Install the battery pack and battery cover as described
above.

9. Calibrate any sensors that were removed or replaced
according to the procedure described under Sensor
Zeroing and Calibration.

9.5 Replacing the Sensor Filter Membrane

If the unit is exposed to dirt, water, or other contaminant’s,
replace the felt filter membrane as follows:

1. Remove the battery cover as described above (see
Replacing the Battery Pack).

2. Open the unit case as described above (see Replacing
the Toxic Gas Sensors).

3. Remove the oxygen sensor and combustible sensor
seals.

4. Carefully peel the self-adhesive filter membrane pads
from the inside of the case.

5. Clean the case grills using a soft, clean cloth.

6. Apply new self-adhesive membrane pads over the case
grills, ensuring that they cover the case openings
completely.

7. Carefully remove the adhesive from the oxygen and
combustible seals and install them in the appropriate
locations in the case top.

8. Reassemble the unit case as described above (see
Replacing the Toxic Gas Sensors).

9. Refit the battery and battery cover (see Replacing the
Battery Pack).

NOTE: The oxygen and combustible detector seals must
be replaced when replacing the sensor filter
membrane.

10. Replacement Parts

The following items numbers refer to the exploded view
drawing on pages 24 and 25.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>PART NUMBER</th>
<th>DESCRIPTION (QTY)</th>
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<td>1</td>
<td>1707-7199</td>
<td>Main PCB</td>
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<td>2</td>
<td>1707-3115</td>
<td>Sensor PCB</td>
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<td>3</td>
<td>1707-7702</td>
<td>Key Pad</td>
</tr>
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<td>4</td>
<td>1707-7785</td>
<td>Case Top</td>
</tr>
<tr>
<td>5</td>
<td>1707-7793</td>
<td>Case Bottom</td>
</tr>
<tr>
<td>6</td>
<td>1707-3859</td>
<td>Battery Cover Bracket</td>
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<td>7</td>
<td>1707-4253</td>
<td>Battery Cover Bracket Spacer</td>
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<td>8</td>
<td>1707-2356</td>
<td>Buzzer Adapter</td>
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<td>9</td>
<td>1704-9967</td>
<td>Sensor PCB Support</td>
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<td>10</td>
<td>1703-1782</td>
<td>Case Gasket</td>
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<td>11</td>
<td>1704-2151</td>
<td>Charging Jack</td>
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<td>12</td>
<td>1704-9817</td>
<td>Charging Socket Spring</td>
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<td>13</td>
<td>1705-1254</td>
<td>Contact Rivet</td>
</tr>
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<td>14</td>
<td>1707-2364</td>
<td>Buzzer Seal</td>
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<td>15</td>
<td>1707-2455</td>
<td>Buzzer Membrane</td>
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<tr>
<td>16</td>
<td>1702-3516</td>
<td>Oxygen Sensor</td>
</tr>
<tr>
<td>17</td>
<td>1705-0788</td>
<td>LEL Sensor</td>
</tr>
<tr>
<td>18</td>
<td>1707-8148</td>
<td>CO/H2S Sensor</td>
</tr>
<tr>
<td>19</td>
<td>1705-0245</td>
<td>Water Barrier, Buzzer</td>
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<tr>
<td>20</td>
<td>1704-9919</td>
<td>Seal, Oxygen Sensor</td>
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<tr>
<td>21</td>
<td>1704-9920</td>
<td>Seal, LEL Sensor</td>
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<tr>
<td>22</td>
<td>1704-9876</td>
<td>Wrist Strap</td>
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<tr>
<td>23</td>
<td>1704-9988</td>
<td>External Alarm Contact</td>
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<tr>
<td>24</td>
<td>1705-0273</td>
<td>Screw, 4-40 x.0188, Phillips</td>
</tr>
<tr>
<td>25</td>
<td>1707-8197</td>
<td>Battery Cover</td>
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<tr>
<td>26</td>
<td>1707-8015</td>
<td>Sensor Filter Membrane</td>
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<tr>
<td>27</td>
<td>1705-0277</td>
<td>o-ring, 0.250 ID</td>
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<td>28</td>
<td>1704-1708</td>
<td>O-ring, 0.301 ID</td>
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<td>29</td>
<td>1702-8473</td>
<td>External Alarm Jack Plug</td>
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<td>30</td>
<td>1706-8701</td>
<td>Battery Spacer</td>
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<tr>
<td>31</td>
<td>1705-0453</td>
<td>Screw, 2-56 x 0.188, Phillips</td>
</tr>
<tr>
<td>32</td>
<td>1703-1774</td>
<td>Screw, 4-40 x 0.25, Phillips</td>
</tr>
</tbody>
</table>
11. SPECIFICATIONS

**CASE:**  Stainless Steel, Enamel Cased

**DIMENSIONS:**  4.75 x 2.75 x 2 inches (121 x 70 x 51 mm)

**WEIGHT:**  26 ounces (738 grams)

**MEASURING RANGE:**
- **Combustible Gases (LEL):** 0 to 100% LEL in 1% increments
- **Oxygen (O₂):** 0 to 30% of volume in 0.1% increments
- **Methane (CH₄):** 0 to 5.0% in 0.1% increments
- **Carbon Monoxide (CO):** 0 to 999 PPM (parts per million) in 1 PPM increments
- **Hydrogen Sulfide (H₂S):** 0 to 999 PPM (parts per million) in 1.0 PPM increments

**POWER SOURCE:** Rechargeable, replaceable nickel-cadmium battery pack, or replaceable cell alkaline battery pack

**BATTERY LIFE:**  Ni-Cad: Approximately 10 Hours
  Alkaline: Approximately 11 Hours

**READOUT:**  Alpha-Numeric Liquid Crystal Type

**OPERATING TEMPERATURE RANGE:**  -20ºC to 55ºC (-4ºF to 131ºF)

**HUMIDITY RANGE:**  15% to 99% RH (Non-condensing)

**STORAGE TEMPERATURE:**  0ºC to 20ºC (32ºF to 68ºF)

12. DEFAULT ALARM SETTINGS

<table>
<thead>
<tr>
<th>GAS</th>
<th>LOW ALARM</th>
<th>HIGH ALARM</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEL</td>
<td>10%</td>
<td>20%</td>
</tr>
<tr>
<td>O₂</td>
<td>19.5%</td>
<td>23.5%</td>
</tr>
<tr>
<td>CH₄</td>
<td>1.0%</td>
<td>1.5%</td>
</tr>
<tr>
<td>CO</td>
<td>35 PPM</td>
<td>70 PPM</td>
</tr>
<tr>
<td>H₂S</td>
<td>10 PPM</td>
<td>20 PPM</td>
</tr>
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</table>

13. OPTIONAL PARTS AND ACCESSORIES

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>DESCRIPTION (QTY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1705-0788</td>
<td>Combustible Sensor</td>
</tr>
<tr>
<td>1702-3516</td>
<td>Oxygen Sensor</td>
</tr>
<tr>
<td>1707-8148</td>
<td>CO/H₂S Sensor</td>
</tr>
<tr>
<td>1810-2252</td>
<td>115 VAC Compact Economy Charger</td>
</tr>
<tr>
<td>1810-2251</td>
<td>115 VAC Two-Unit Compact Charger</td>
</tr>
<tr>
<td>1810-1873</td>
<td>115 VAC One-Unit Dual Rate Charger</td>
</tr>
<tr>
<td>1810-2255</td>
<td>115 VAC Four-Unit Dual Rate Charger</td>
</tr>
<tr>
<td>1810-2004</td>
<td>230 VAC One-Unit Trickle Charger</td>
</tr>
<tr>
<td>1810-1972</td>
<td>230 VAC One-Unit Dual Rate Charger</td>
</tr>
<tr>
<td>1810-1915</td>
<td>12VDC Two-Unit Dual Rate Charger</td>
</tr>
<tr>
<td>1810-0048</td>
<td>Sp 100 Sampling Pump with Hose</td>
</tr>
<tr>
<td>1810-1428</td>
<td>4 foot Polycarbonate Probe</td>
</tr>
<tr>
<td>1704-1872</td>
<td>Rechargeable Nicad Battery Pack</td>
</tr>
<tr>
<td>1810-2160</td>
<td>Leather Carrying Case for MG140</td>
</tr>
<tr>
<td>1810-3937</td>
<td>Cylinder, CalGas, CO, H₂S, O₂, Pentane (34 liter)</td>
</tr>
<tr>
<td>1810-1766</td>
<td>Flow Regulator with Pressure Gauge for all 58 &amp; 103L Cylinders except Ammonia</td>
</tr>
<tr>
<td>1705-0831</td>
<td>Calibration Cup</td>
</tr>
</tbody>
</table>
14. Warranty

Industrial Scientific Corporation warrants the MG140 to be free from defects in material and workmanship for two years from the date of purchase, except where otherwise stated in writing in Industrial Scientific literature accompanying the product.

All other Industrial Scientific products are warranted to be free from defects in material and workmanship for a period of eighteen (18) months from the date of shipment, or one (1) year from the date of first use, whichever occurs first, except where otherwise stated in writing in Industrial Scientific literature accompanying the product.

Limitation of Liability

Industrial Scientific makes no other warranties, either expressed or implied, including but not limited to the warranties of merchantability or fitness for particular purpose.

Should the product fail to conform to the above warranty, Buyer’s only remedy and Industrial Scientific’s only obligation shall be, at Industrial Scientific’s sole option, replacement or repair of such non-conforming goods or refund of the original purchase price of the non-conforming goods. In no event will Industrial Scientific be liable for any other special, incidental or consequential damages, including loss of profit or loss of use, arising out of the sale, manufacture or use of any products sold hereunder whether such claim is pleaded in contract or in tort, including strict liability in tort.

It shall be an express condition to Industrial Scientific’s warranty that all products be carefully inspected for damage by Buyer upon receipt, be properly calibrated for Buyer’s particular use, and be used, repaired, and maintained in strict accordance with the instructions set forth in Industrial Scientific’s product literature. Repair or maintenance by non-qualified personnel will invalidate the warranty, as will the use of non-approved consumables or spare parts. As with any other sophisticated product, it is essential and a condition of Industrial Scientific’s warranty that all personnel using the products be fully acquainted with their use, capabilities and limitations as set forth in the applicable product literature.

Buyer acknowledges that it alone has determined the intended purpose and suitability of the goods purchased. It is expressly agreed by the parties that any technical or other advice given by Industrial Scientific with respect to the use of the goods or services is given without charge and at Buyer’s risk; therefore, Industrial Scientific assumes no obligations or liability for the advice given or results obtained.