



**GREER  
SYSTEMS**

## **IC Series Precision Gas Detector Version 1.5**

### **Introduction of Operation and Communications**

Common Features and Designs for Both Solid State and Electrochemical Detectors  
Refer to your Specific Version manual for information and Calibration Procedures

**Manual 204-0118-50  
Revision 1.15  
03/16/10**

#### **Introduction:**

Thank You for your purchase of an IC gas detector with integrated serial communications. This precision monitoring solution provides the service-oriented features required for dependable operation and field serviceability. Optimized software provides lockout control, automated calibration procedures, and sensor swap out and conditioning modes. Onboard serial communications provides real-time PPM concentration, span and zero values, step-by-step onscreen calibration, sensor change-out procedures, total detector runtime and sensor element PPM exposure, plus much more. The onboard LED's provides visual indication of the detectors status using Greer Systems' VeriCheck™ system that provides detector status and current milliamp output at a glance.

The IC series (Intelligent Communications) of detectors were a re-design of the long proven AS series detectors, similar in design, but boasting harden enclosure and sensors housings for extreme conditions, IC series can be equipped with self regulating heaters to keep the detector dry and clear of ice in the worst of operating conditions

ICEE is defined as Intelligent Communication Ammonia Electrochemical

ICES is defined as Intelligent Communication Ammonia Solid State

When specifying other Gases the Third Letter designates the specific Gas Code

CC is not used in IC series as Contact Closures are Standard in all IC models

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Your IC(E) model gas detector utilizes an electrochemical sensor element that is particularly sensitive to the stated gas. This sensitivity manifests itself in a large change in the sensors output in the presence of the target gas. As in any electrochemical gas detector product, it is vitally important that the end user or service organization realize that regular checks, re-zeroing and maintenance is an integral part of electrochemical based sensing technology. Your IC units' serial feature has been designed to assist you in this task.

Your IC detector will provides a linear output signal of 4 to 20 milliamps, representative of the gas concentration present. The circuitry is designed so that the output will never rise above 20 milliamps, regardless of the saturation of the sensor by the gas it is detecting. The circuit will also prevent the output from going below 4 milliamp, except during a power or sensor failure or when the electrochemical sensor is about to expire.

Dual contact closures are provided with software selectable trip points.

Your IC Series gas detector offers serial communications via the on-board DB9 connector. This feature allows access to the service-oriented functions needed for dependable operation and field serviceability via serial equipped device.

### **The IC Series provides the following standard features:**

1. User-Selectable 0-100 or 0-250 PPM Range
2. Linear 4-20 milliamp output proportional to the level of target gas sensed
3. Onboard Isolated/Non-Isolated output option to integrate into any industry standard controller or BAS.
4. Dual FORM-C contact closures with user selectable trip points.
5. Onboard Serial Communications utilizing a standard DB9 connections for quick and simple hookup
6. Service Oriented Software Package provides step by step instructions for service tasks such as calibration, sensor change out procedures, sensor count and operation timer.
7. VeriCheck™ system provides critical detector information at a glance without the need for a meter or computer.

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## COMMUNICATIONS

### Serial Communications:

All IC Series gas detectors feature onboard serial communications that provides access to the advanced features of the detector. The features available are:

1. Real-time PPM values
2. Cell reaction, span, and zero values
3. Selectable PPM range (0-100, 0-250 PPM)
4. Contact closure state and set points
5. Total hours of Detectors operation
6. Total hours of sensor element operation
7. Total hours the sensor has been exposed to the target gas
8. Access to Service Modes

### VeriCheck™ System:

The VeriCheck™ system provides critical real-time detector status without the need for meters or serial hosts. The LED state will provide the following information: (see page )

1. Mode of operation
2. Milliamp Output
3. Contact closure state
4. Detectors range
5. Specific faults

**MODES** The IC Series provides 4 different operational modes, 3 service modes and 5 fault modes

### Operational Modes

1. Startup Mode
2. Operation Mode
3. Suspect Mode
4. Fault Mode

### Service Modes

1. Calibration Mode
2. Lockout Mode
3. Sensor Swap Mode

### Fault Modes

1. Sensor Zero Fault
2. Sensor Calibration Fault
3. Prolonged Exposure Fault
4. High Exposure Fault
5. Time Expiration Fault

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## OPERATIONAL MODES

### Startup Mode:

Startup mode provides protection during initial startup of your detector. When a cold sensor element is activated, its output reacts briefly as it would in the presence of the target gas. This would result in a false milliamp reading and can active contact closure if not compensated by the Startup mode. Startup Mode holds the detector in its “clean “ state by locking the output at 4milliamps and the contact closures in the normally open state. The microprocessor monitors the sensors condition and automatically engages normal operation when the sensor reaches a state equivalent to 7 milliamp. Startup Mode is indicated via serial display and the VeriCheck™ system.

### Operation Mode:

Operation mode provides active signaling via the output and contact closures when the target gas is detected. In Operation Mode, the VeriCheck™ system will display 3 sets of information: Detector range, real-time milliamp output, and contact closure state.

### Suspect Mode:

Suspect mode provides early warning of possible sensor expiration. Suspect Mode is engaged when the microprocessor detects a minimal reaction span from the sensor. This indicates that the sensor is close to depleting its electrolyte and should be replaced soon. Suspect Mode is designed to provide sufficient warning time to allow for scheduling a work order or acquiring a sensor element from factory. In Operation Mode, the unit will continue to monitor and operate, but the specific high PPM value should be considered suspect. Suspect Mode is indicated via serial display and the VeriCheck™ system.

### Fault Mode:

Fault mode provides early warning of a sensor condition or event that is outside the systems operational parameters. Depending on the type of fault (Critical or Passive), the unit may or may not remain active and monitoring. The specific Fault Mode is indicated via serial display and the VeriCheck™ system. (See Fault Modes on Page 5)

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### SERVICE MODES

#### Calibration Mode:

Calibration mode is a software feature that provides unit isolation for sensor calibration without triggering events in your control or monitoring system. In Calibration Mode, the detectors output is locked at 4 milliamps and holds the contact closures in their default state. Step-by-step instructions are provided via the serial output to guide service personnel through the process and verify proper completion of each step. Alternatively, the unit provides the same (limited) feature via the VeriCheck™ system should a serial reader/host is not available. As a backup/safety feature, this mode provides an abort option that instructs the unit to return to Operation Mode using the old calibration values. For safety reasons (if unit is inadvertently left in this mode), the Safety Interlock will automatically activate the unit after 1 hour using the old calibration values.

#### Lockout Mode:

Lockout Mode provides detector isolation for servicing without triggering events in your control or monitoring system. In Lockout Mode, the detectors output is locked at 4 milliamps and holds the contact closures in their default state. For safety reasons (if unit is inadvertently left in this mode), the Safety Interlock will automatically activate the unit after 24 hours. The detector displays remaining time (via the serial output) until the Safety Interlocks engage the unit.

#### Sensor Swap Mode:

Sensor Swap Mode provides detector isolation for changing you detectors sensor element without triggering events in your control or monitoring system. In Sensor Swap Mode, the detectors output is locked at 4 milliamps and holds the contact closures in their default state. Step-by-step instructions are provided via the serial output to guide service personnel through the process and provide a 24-hour sensor conditioning cycle to properly bias the sensor element. Alternatively, the unit provides the same (limited) feature via the VeriCheck™ system should a serial reader/host is not available. As a backup/safety feature, this mode provides an abort option that instructs the unit to return to Operation Mode using the old calibration values. When the sensor conditioning cycle is complete, the unit will engage the Calibration Mode to properly complete this procedure. The detector displays remaining time (via the serial output) until the sensor element is ready for calibration.

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### FAULT MODES

#### **Sensor Zero Fault-Critical**

Indicates a ZERO or clean air value that is outside the units operational parameters. This usually indicates an improper calibration or ZERO setting in a contaminated area. This is a critical fault and will stop operation of the detector.

#### **Sensor Calibration Fault-Critical**

Indicates a SPAN or exposed value that is outside the units operational parameters. This usually indicates an improper calibration or SPAN setting using the wrong target gas or PPM levels. All ICE calibrations require 100PPM-calibrated gas. This is a critical fault and will stop operation of the detector.

#### **Prolonged Exposure Fault-Passive**

Indicates a recorded sensor value or state that is outside the unit's operational parameters. This usually indicates a constant leak source that is consuming the sensor elements electrolyte package. This is a passive fault and the detector will continue operation.

#### **High Exposure Fault-Passive**

Indicates a recorded sensor value or state that is outside the unit's operational parameters. This usually indicates a severe leak condition or gas event has occurred. This is a passive fault and the detector will continue operation.

#### **Time Expiration Fault-Passive**

Indicates a recorded sensor runtime that is outside the sensor elements projected lifetime in clean air. This usually indicates an expired sensor element or an improper sensor swap has been performed. This is a passive fault and the detector will continue operation.

## Installation

Your IC unit consists of a 5" X 5" X 3" painted aluminum NEMA-4 rated enclosure with gasket cover. The electronics are mounted on the base of the enclosure. All wiring is to terminal screws or a removable plug-in style connector.

Your sensor element is mounted in a 3/4" inch adapter and installed through a standard 3/4 inch hole. A terminal strip is provided on the circuit board for connection of the sensor, power and output signals. The sensor must be installed in a non-condensing environment. The operating temperature of the sensor element and the electronics must be maintained between -10°F and 125°F. A low temperature product is available (model ICEE-H for Ammonia) contact your Dealer or Greer Systems for more information.

The input power wire connected to the 12-24 Volt AC/DC inputs must provide a minimum of 12 Volts AC or 15 DC as 1.0 amp measured at the IC terminal strip. A 4 conductor stranded cable is recommended. Maximum cable lengths are listed below. Greer Systems recommends the use of 2 twisted pairs with a shield whenever possible.

Cable Length	Wire Size
Less than 10'	20 AWG stranded 4 conductor*
Less than 1,000'	18 AWG stranded 4 conductor, 2 twisted pairs, shield with drain*

*\*Under no circumstances should the IC low voltage signal wires be in a common conduit, tray, etc. with power wiring over 48 Volts. If a shielded cable is used, the shield or drain must be terminated only at the monitor's location.*

Multiple IC Detectors may be powered from a common 12-24 Volt AC/DC power supply including Greer Systems controllers.

Each unit's input power must be wired with same polarity, i.e. every IC's Pin 3 (marked PWR2) must be connected to the same terminal of the supply transformer, and every Pin 4 (PWR1) must be connected to the second terminal of the supply. If DC supplies are used, all system must have positive on Pin 4 (PWR1) and negative on Pin 3 (PWR2)-. A field-mounted transformer may be used near the sensor assembly to provide local 12-24 Volt AC/DC power for the unit.

*Caution: Regardless of the source, the power transformed for the IC(s) should not be used to power other devices.*

### Initial Detector Warm up

**Some** Electro Chemical sensors require an initial 24-hour conditioning/biasing cycle on installation. Although the unit can operate in just a few hours, linearity and displayed PPM values may be suspect. Upon initial startup, place the detector in Sensor Swap Mode. This will lockout the detector and provides a 24-hour conditioning cycle for the sensor element. When Sensor Swap Mode is complete and the unit activates Calibration Mode, simply type '**ABORT**' to exit this cycle as your detector is sent to you calibrated in our controlled environment.

To bypass the 24hr timer, re-boot or remove the power from the detector, when powering up, the detector will default to operation mode.

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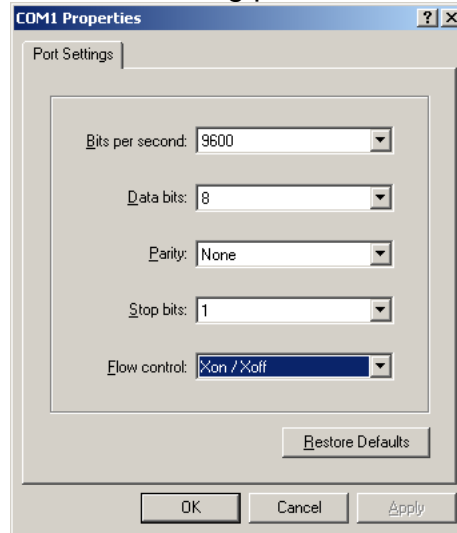
## Establishing Communications

The IC Series gas detector communicates via standard RS-232C serial protocol accessible by any serial communications software, such as HyperTerminal available on all Windows based computers. Hookup is established by utilizing a standard DB9 serial cable.

**Step 1:** Select your COM port

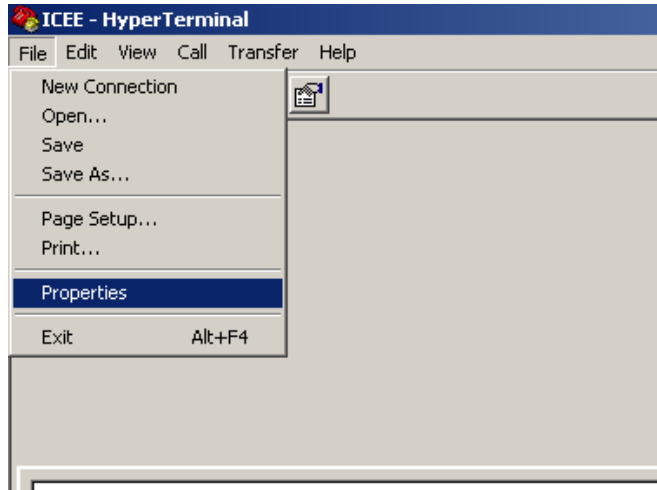


**Step 2:** Set your serial terminal to the following parameters and select 'OK':

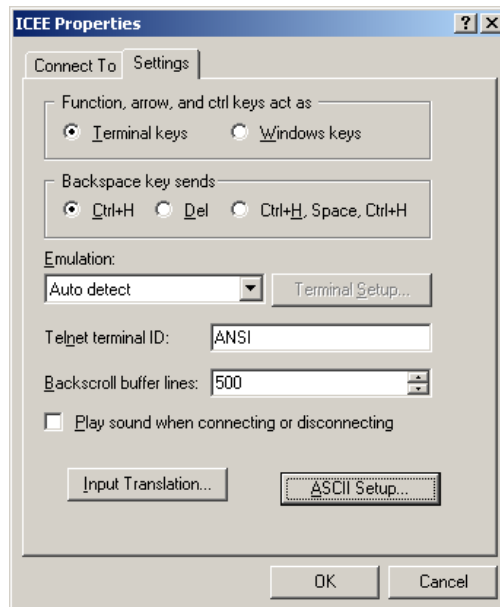


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**Step 3:** From your terminal window select File, Properties

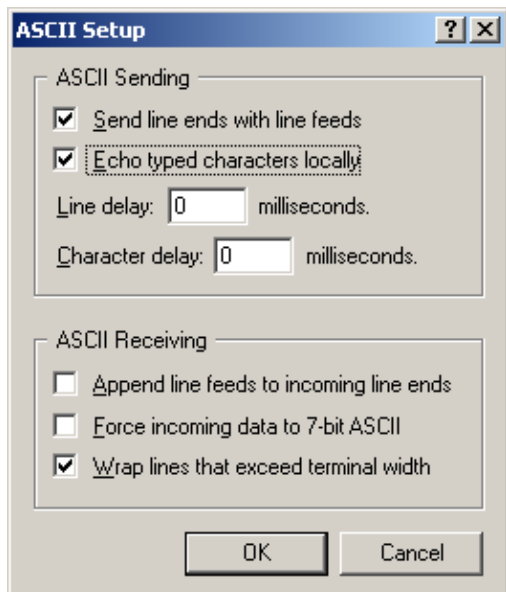


**Step 4:** Select the 'Settings' tab and select 'ASCII Setup'



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**Step 5:** Check the box next 'Send line ends with line feeds' and 'Echo typed characters locally'. Then select 'OK'



After establishing connection with the IC unit, type ? for a list of available commands.

**NOTE:** IC units require statements to have all capital letters. We recommend turning on your PC's caps lock.

Example: Type in all capital letters **INFO**

Below is an example of the IC unit's response:

**INFO**

<b>ZERO = 7</b>	<i>this is sensors clean value.</i>
<b>SPAN = 121</b>	<i>this is sensors exposed value</i>
<b>CELL = 6</b>	<i>this is sensors real-time value</i>
<b>RELAY 1 = 35</b>	<i>this is relay 1's trip point, 35 ppm</i>
<b>RELAY 1 IS NOT TRIPPED</b>	<i>Relay 1 status</i>
<b>RELAY 2 = 100</b>	<i>this is relay 2's trip point, 100 ppm</i>
<b>RELAY 2 IS NOT TRIPPED</b>	<i>Relay 2 Status</i>

<b>OPERATIONAL MODE IS NORMAL</b>	<i>displays active mode</i>
<b>RANGE IS 100 PPM</b>	<i>this shows the units range has been set @ 100 ppm.</i>
<b>FAULT CONDITIONS ARE:</b>	
<b>NO FAULTS PRESENT</b>	<i>if unit is in Fault Mode, fault is displayed here</i>

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## CONFIGURING YOUR DETECTOR

### Changing sensor range:

The IC detector is capable of scaling its outputs within 2 user selectable ranges, 100 and 250 PPM. Factory default is 250 PPM. To alter your detector's range type '**RANGE100**' or '**RANGE250**' (enter) <CR>. Verify settings by typing '**INFO**'

### Setting Contact Closures:

The IC detector has two (2) FORM C contact closures with user selectable set points. To alter your contact closures set points type '**R1=**' for relay 1 or '**R2=**' for relay 2 followed by your 3 digit set point. Verify settings by typing '**INFO**'

Example: To set relay 1 to a 50 PPM set point type '**R1=050**'

*NOTE: you must use a 3-digit set point. Values under 100 must include a leading zero.*

### Sensor Element Change-Out Procedures

*NOTE: Sensor element change-out requires a replacement electrochemical element (PN 010-2100-01). Additionally, calibration requires the use of calibrated span gas and zero gas at a constant flow rate. The Greer Systems' Calibration Kit (PN 010-0122-15) provides all of the required equipment to calibrate your detector.*

1. While the detector is in Operation Mode, enter Sensor Swap Mode by typing '**SENSOR**' and pressing enter. The detector's output and contact closures will lock into their default clean state. The unit will reset the sensor element run timers.
2. The detector is now ready for sensor element change-out as indicated by the serial output and Amber LED state. The system has started a 24-hour countdown cycle to provide sufficient time to condition and bias the electrochemical sensor element. Change the sensor element utilizing the instruction set provided with the sensor element.
3. After the 24-hour conditioning cycle has expired, the detector will automatically enter Calibration mode, indicated by the flashing Green and Amber LED state (ready for ZERO setting, step #2 in Calibration Procedures).

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### Calibration Procedures

NOTE: Proper calibration requires the use of calibrated span gas and zero gas at a constant flow rate. The Greer Systems' Calibration Kit (PN 010-0122-15) provides all of the required equipment to calibrate your detector.

1. While the detector is in Operation Mode, type "**CALIBRATION**" and press the ENTER key <CR>.
2. The detector is now ready for a zero or clean air setting indicated by the flashing Green and Amber LED state. Install the sensor adaptor cup over the sensor element and open the flow regulator to the zero gas bottle. After 30 to 60 seconds, type '**ZERO**' and press the ENTER key <CR>. The detector will store the zero value indicated by the display '**ZERO CALIBRATION FACTOR BEING STORED**' and the Amber LED state. If clean value is within parameters, the unit will display '**ZERO PASS**' and continue to the Span Mode. If the clean value is outside parameters, the unit will display '**ZERO FAIL**' go into Fault Mode. In this case check your zero gas, procedures, and start over at step 1.
3. The sensor is now ready for a span or exposed setting indicated by the pulsing Green and Red LED state. Install the sensor adaptor cup over the sensor element and open the flow regulator to the 100PPM NH<sub>3</sub> bottle. Expose the sensor element for 2 minutes, and then type "**SPAN**" and press the ENTER key <CR>. The LED will illuminate Red on SPAN entry and display '**SPAN CALIBRATION FACTOR BEING STORED**' via the serial display. If the exposed value is within parameters, the unit will continue to the Startup Mode. If the exposed value is outside parameters, the unit will go into either a SENSOR CAL FAULT or SUSPECT SPAN FAULT. In this case check your span gas, procedures, and start over at step 1.
4. Remove sensor cup
5. After a brief rest period, the detector will engage Operation Mode

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### Clearing Ambient readings

*NOTE: The AS600 series employs an onboard diagnosis of the sensor element during calibration and re-zeroing. Re-Zeroing is a function that allows for field adjustment of the clean air 4-milliamp signal. We highly recommend using a calibrated zero gas (PN 011-0128-15) for calibration.*

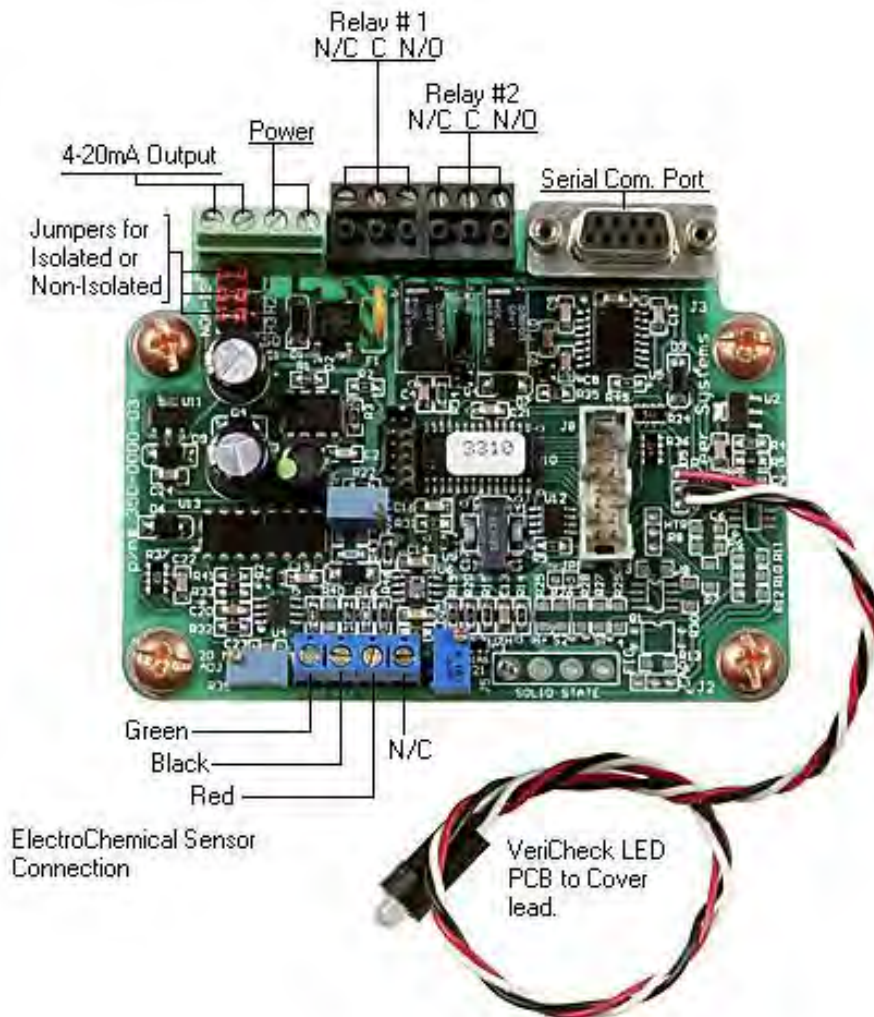
1. Verify the ambient conditions around the detector. Area should clear of any ammonia vapors.
2. While the detector is in Operation Mode, type '**ZERO**' and depress the enter key to set the units zero value.
3. The detector will store the zero value indicated by the display '**ZERO CALIBRATION FACTOR BEING STORED**' and the Amber LED state. If clean value is within parameters, the unit will display '**ZERO PASS**'. If the clean value is outside parameters, the unit will display '**ZERO FAIL**' go into Fault Mode. In this case check your area closely, and start over at step 1. A full calibration may be required to clear the fault.
4. The detector is now in operation mode with a new baseline value, as indicated by the VeriCheck LED state indicating a functional status.

*If the sensor element has drifted too far since its last calibration, the detector enters a fault mode (indicated by the red LED). A full calibration of the detector is required to return the detector to operational status.*

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## Location of Controls

### Interior PCB Layout and Designation



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## VeriCheck™ System Legend

The VeriCheck™ system displays a set of information and then repeats that information set separated by a 3 second pause.

### Operational display set

Provides 3 sets of information: Range, milliamp output, and contact closure state.

**Set 1:** Amber pulse for a range setting of 100PPM

Red pulse for a range setting of 250PPM

**Set 2:** Pulsing green indicating milliamp output

**Set 3:** Amber Pulse if Contact Closure 1 is tripped

Red Pulse if Contact Closure 2 is tripped

**Startup Mode:** Solid Green

**Suspect Mode:** Same as operational display, except milliamp output set is displayed in Amber instead of Green

**Calibrate Mode- Zero:** Pulsing Green and Amber

**Calibrate Mode- Span:** Pulsing Green then Red

**Sensor Swap Mode:** Solid Amber

**Lockout Mode:** Solid Red

**Fault- Sensor Cal:** 2 red pulses

**Fault- Sensor Zero:** 3 red pulses

**Fault- Output Maxed for > 1 hour:** 4 red pulses

**Fault- Sensor Exposed/Expired:** 5 red pulses

**Fault- Time Expired:** 6 red flashes



## LIMITED WARRANTY CONTROL SYSTEMS; GAS DETECTOR SYSTEMS

Greer Systems LLC warrants to its DEALERS and to its DEALER'S customer that all control systems, which include but are not limited to the Building Master™ 3000, 4000 and Control Center systems, and all gas detectors and gas detection controllers, which include but not limited to the AP-100, MZ-500, AS-200-O, AS-400, AS-600 and/or manufactured by Greer Systems LLC shall be free from defects in materials and workmanship for a period of three (3) years. All other products manufactured by Greer Systems LLC shall carry a one (1) year warranty subject to the terms and conditions outlined below. Products sold by but not manufactured by Greer Systems LLC are covered by their respective manufacturers' warranties. *Disposable sensor elements which expire based on exposure to gas, such as those found on the AS-200, AS-400 and AS-600 series of electrochemical gas detectors, are not covered by any Greer Systems LLC warranty.*

All warranty periods begin with the date of shipment as determined by the date of delivery to the common carrier.

Greer Systems LLC shall, at its sole discretion, repair, correct or replace any products or parts shown to its satisfaction to be defective in materials or workmanship provided that the DEALER;

Provides written notice to Greer Systems LLC, that sets forth the alleged defect and pertinent delivery dates showing that the products are covered under warranty, prior to expiration of the applicable warranty period as set forth above.

Obtains from Greer Systems LLC, PRIOR TO RETURN, a Return Material Authorization (RMA) number that shall be printed on the shipping container and referenced in all correspondence with DEALER.

Returns the defective material to Greer Systems LLC, at its principal place of business, freight prepaid.

All repairs shall be performed by Greer Systems LLC at its principal place of business.

Greer Systems LLC, shall examine the returned materials and determine if the defects are covered under the warranty as stated. If the material does not qualify under the terms of the warranty Greer Systems LLC, will contact the DEALER with an explanation. If the returned products do qualify then the materials will be repaired in the manner determined by Greer Systems LLC, as appropriate.

When the material has been repaired and tested Greer Systems LLC, will return the material to the DEALER freight prepaid together with the following charges:

If the materials are less than one (1) year old there will be no charge and the DEALER will pay only the shipping costs from Greer Systems LLC, to the DEALER.

If the materials are more than one (1) year old but less than three (3) years old the DEALER will pay a \$45.00 handling charge plus shipping costs.

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