

Critical Environment Technologies

**PAC-44 SERIES CONFIGURABLE
GAS DETECTION CONTROLLER**



INSTALLATION / OPERATION MANUAL

REV: E MAR-20-2003

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IMPORTANT NOTICE

READ AND UNDERSTAND THIS OPERATION MANUAL PRIOR TO USING THIS INSTRUMENT.

THIS INSTRUMENT SHOULD BE INSPECTED AND PROGRAMMED BY QUALIFIED AND TRAINED TECHNICIANS.

THIS INSTRUMENT HAS NOT BEEN DESIGNED TO BE INTRINSICALLY SAFE. FOR YOUR SAFETY, DO NOT INSTALL IT IN CLASSIFIED HAZARDOUS AREAS (EXPLOSION-RATED ENVIRONMENTS).

CAUTION: Disconnect power before servicing

INSTRUMENT SERIAL NUMBER: _____

PURCHASE DATE: _____

PURCHASED FROM: _____

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1.0 GENERAL

The PAC-44 series systems are rugged, microprocessor based, configurable controllers for use in non-hazardous (non-explosion rated) environments for commercial and industrial applications. They can be configured for use with one to four remote analog transmitters. They can also be configured with one integral electrochemical sensor and up to three remote analog transmitters.

A standard system provides an LCD digital display, a common set of LED indicating lights for fail, low, mid and high alarms, audible alarm with silence button, four analog inputs, four analog outputs and four dry contact relays.

A large selection of "AST" series analog transmitters, utilizing electrochemical, catalytic, infrared and MOS (Metal Oxide Semiconductor) sensor elements, are available for use with this controller.

The PAC-44 controller will also accommodate other manufactured brands of two-wire or three-wire analog transmitters.

Other models: PAC-44-L (Top mounted 4" diameter red strobe light)
 PAC-44-H (Top mounted 103 dB industrial horn)

2.0 SPECIFICATIONS

Physical: a) Dimensions: 8.78" (223 mm) Wide X 10.5" (267 mm) High X 6.25" (159 mm) Deep

 b) Weight: 6.33 pounds (2.87 kg)

Construction: Water/dust tight, corrosion resistant fiberglass with hinged, secured door and Lexan door label

Power: 90 to 240 VAC, 47 to 63 Hz.

Current Load: Maximum allowable system current load is 1.36 Amps @ 24 VDC

Relays: Standard: Four only S.P.D.T. dry contact relays rated 5 amps @ 240 VAC each

Output Signal: Linear, analog 4 - 20 mA or 0 - 10 VDC, jumper selectable

Visual: a) Common set of LED indicating lights for: Fault Alarm (red), Low (Warning) Gas Alarm (amber), Mid Gas Alarm (red), High Gas Alarm (red)

 b) 16-character, two-line, back-lit LCD digital display

 c) Amber colored, LED light, relay coil status indicators (internal)

 d) Red colored, LED light "open loop" indicators for analog inputs and analog outputs (internal)

2.0 SPECIFICATIONS, CONT'D.....

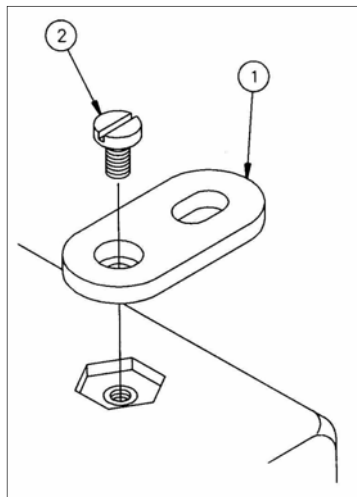
- Environment:
- a) Temperature: 0 deg. C. to + 40 deg. C (32 deg. F to 104 deg. F.)
 - b) Humidity: 0 to 95% Rh
- Fuses:
- System primary: Automatic resetting thermal fuse rated 1.5 amps
 - Switching power supply secondary: replaceable 2.0 amp
- Certifications:
- CSA field inspected for low voltage safety
- Options:
- a) Top mounted red strobe light (user programmable)
 - b) Water tight audible alarm & silence push-button
 - c) Top mounted audible alarm (103 dB horn)
 - d) Battery back-up system
 - e) Internal, programmable data logger
 - f) Internal sensor (one electrochemical toxic or Oxygen sensor)

3.0 INSTALLATION

Four removable mounting feet are supplied in a plastic bag inside the enclosure c/w mounting bolts. These should be secured to the rear, outside corners of the enclosure base. The mounting feet can be loosened off and rotated to two different mounting positions, straight up vertically from the enclosure base or at a 45 degree angle from the corner of the enclosure base.

For security, the PAC-44 controller should be installed inside a locked electrical, mechanical or instrumentation room.

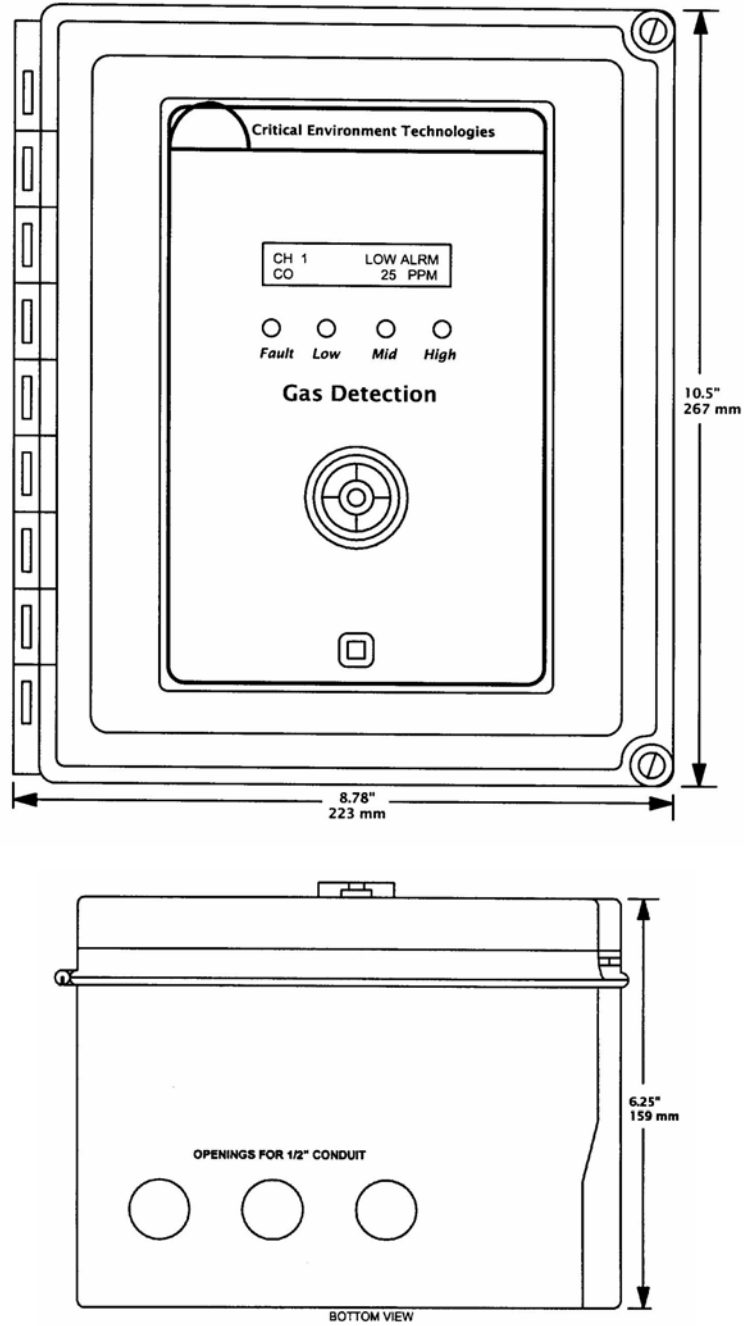
3.1 INSTALLATION "FEET" DRAWINGS



1) PLASTIC MOUNTING FOOT

2) SECURING BOLT

4.0 SYSTEM ENCLOSURE EXTERIOR DIMENSIONAL DRAWING



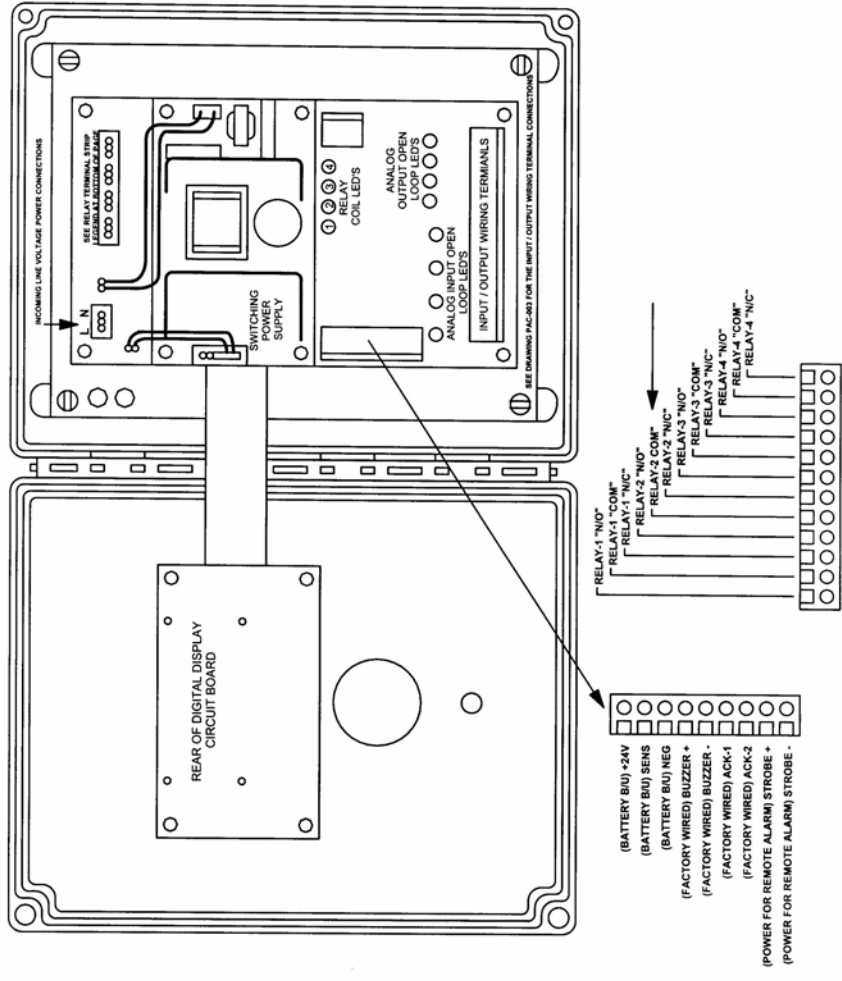
4.1 SYSTEM ENCLOSURE CONDUIT ENTRY OPENINGS



Three conduit entry openings, for 1/2" conduit, have been provided along the bottom edge of the system enclosure. See photos above (with protective plugs inserted) and below (with plugs removed). To access the openings, remove the protective plugs. If a fourth opening is required, it will have to be drilled on site. Take caution to avoid damaging internal components when drilling any holes in the enclosure.



4.2 SYSTEM ENCLOSURE INTERIOR LAYOUT DRAWING



4.3 WIRING

Line voltage power to system: *Take caution when drilling holes for installing additional conduit connections to avoid damaging internal system components.* The input wiring terminal strip for line voltage (line and neutral) can be located at the top left corner of the circuit board. A ground stud is located on the metal mounting plate directly beside this terminal strip. **Reference minimum and maximum system voltage specifications on page-5 of this manual.**

Transmitter wiring: Three-wire transmitters are wired to “POS”, “NEG”, and “SIG” terminals. Two-wire transmitters are wired to “POS” and “SIG” terminals. Note: The drawing on page-10 indicates wiring connections for three-wire transmitters.

4.3 WIRING, CONT'D.....

Relay wiring: All system are supplied with dry contact relays for control of remote devices such as contactors for exhaust fans, contactors for make up air fans, horns, etc. The relay wiring terminal strip is located along the top right edge of the circuit board. **Reference the relay specifications on page-5 of this manual before connecting load devices.**

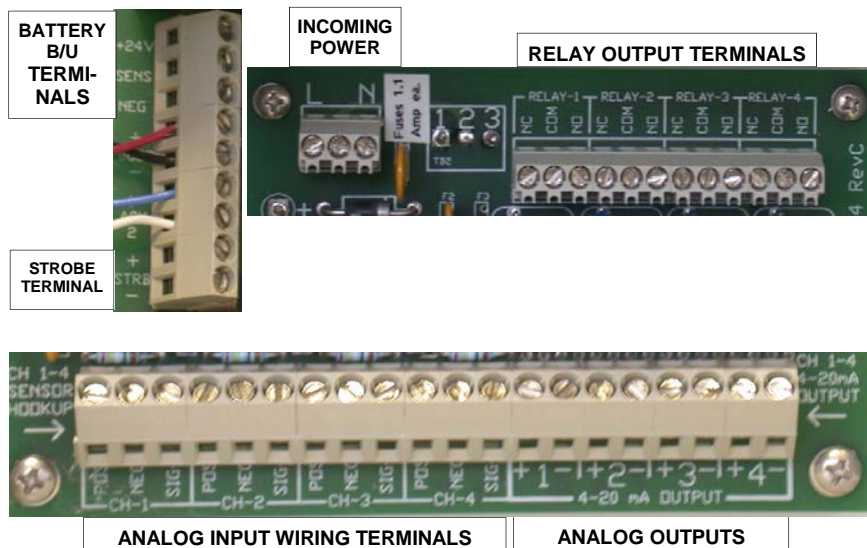
Note-1: With regards to fans, the system relays should be used to control the fan starters or contactors and NOT the fan motor directly.

Note-2: The PAC-44 circuit design is such that the relay coils can be selected as normally energized (fail-safe) or not normally energized. Unless advised, the factory default is normally energized in non alarm state. Thus, control wiring should be connected to "COM" and "N/C" terminals. Fail-safe selection means that in the event of a failure / fault condition, the relay coil changes state and the devices being controlled, operate continuously until the fault condition is corrected.

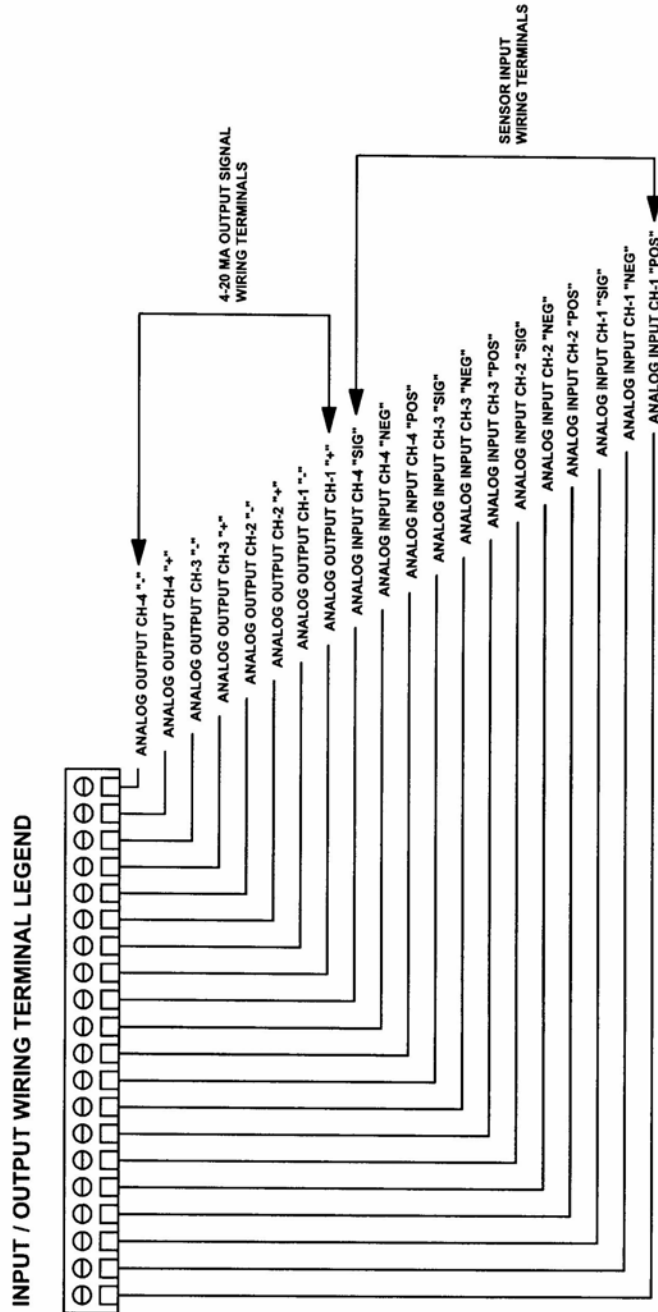
Note-3: The PAC-44 controller utilizes a fused, switching power for total system power. The power supply is located directly on top of the main circuit board and has a clear, Lexan plastic plate secured on top of it. This helps to protect the power supply from damage from tools, etc. that may be dropped onto it during installation or servicing.

Note-4: DO NOT USE SOLID-CORE WIRE AT ANY OF THE CIRCUIT BOARD TERMINAL STRIPS. Heavy gauge, solid-core wire has memory because of the thickness of the wire and, over time, can literally pull a soldered terminal strip right off the circuit board.

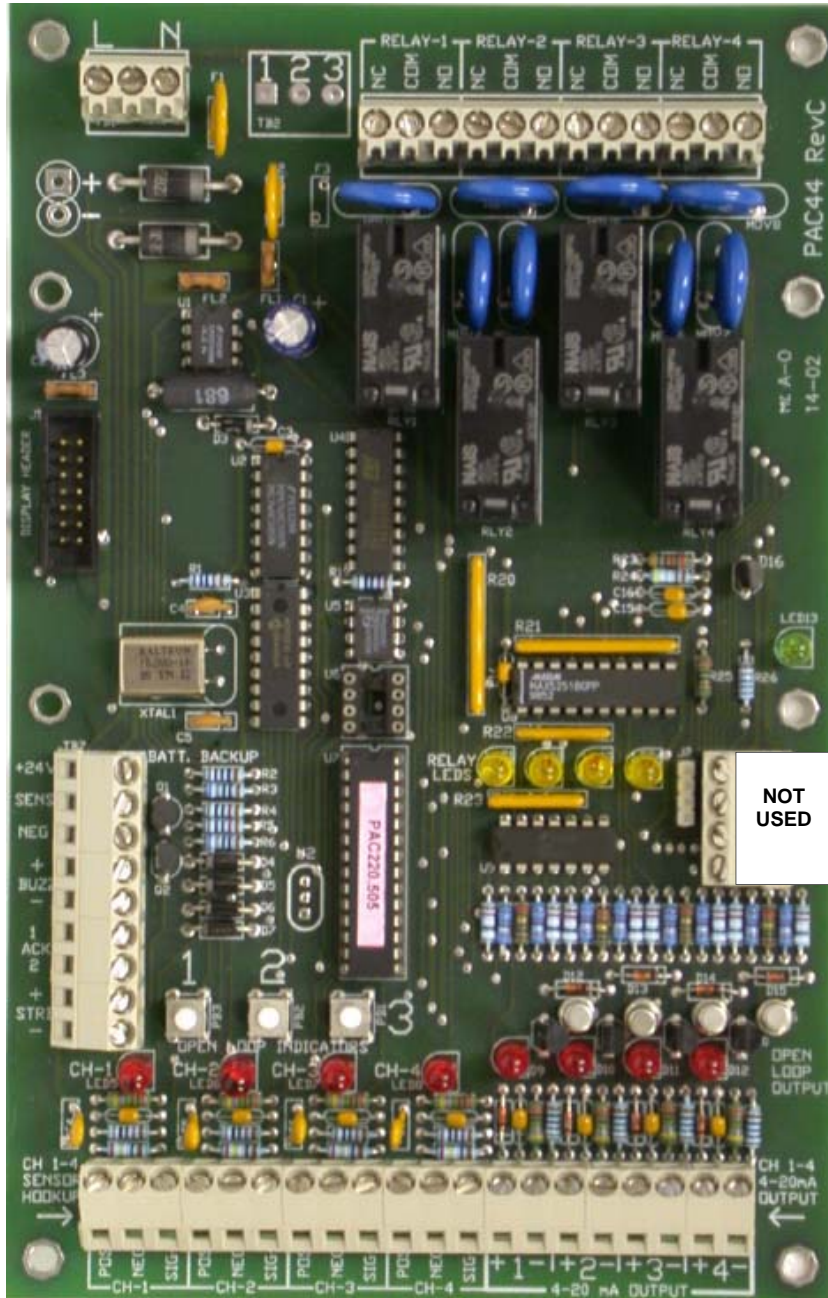
4.4 WIRING TERMINAL STRIP PHOTOS



4.5 WIRING CONNECTIONS DRAWING



5.0 MAIN CIRCUIT BOARD PHOTO



NOTE: PHOTO SHOWN IS WITH SWITCHING POWER SUPPLY REMOVED TO EXPOSE ENTIRE CIRCUIT BOARD

6.0 SYSTEM OPERATION

Powering Up: Double check wiring connections prior to powering up the system.

Upon application of line voltage power to the system, the LCD display will momentarily indicate the software version number then immediately display the system status and start to scroll through all programmed channels. The display indicates pertinent information for each programmed channel for approximately 3 seconds before scrolling to the next channel. The information displayed is: Channel number, Alarm status (top line), Gas type, Actual gas concentration (bottom line). Any relays programmed as fail-safe will energize (an audible "click" can be heard).

The display can indicate "ppm" (parts per million) for toxic sensors, % LEL (Lower Explosive Level) for combustible gases and vapors or % Vol. (percent volume) for Oxygen or other gases. **Note:** If the fault LED (red) illuminates shortly after system power up, allow approximately 20 to 30 seconds for the sensor to stabilize and output the appropriate signal. If the fault condition does not go away after approximately 30 seconds, it may indicate a wiring problem between the controller and one or more of the remote analog sensor/transmitters.

All PAC-44 controllers are shipped, tested and programmed to customer job requirements, assuming project details have been provided to CETCI prior to shipment of the system. If project details have not been provided, all systems are tested and shipped out with a generic program, addressing the number and type of sensors ordered and one general zone for all sensors and relays. A label on the inside of the PAC-44 enclosure door indicates factory default programming. A programming sheet, unique to the controller supplied can also be found inside the enclosure.

The "AST" series remote analog transmitters are available for use with the PAC-44 controllers. The "TSM" series miniature sensor/transmitters are available for use as one optional, internal sensor for toxic gases or Oxygen. All sensor/transmitters supplied are pre-calibrated and ready for installation.

Signals: Eight only 4-20 mA "open loop" LED (red) indicators are provided for the PAC-44 inputs and outputs. They are located along the lower section of the circuit board, just above the lower wiring terminal strips. The four open loop indicators located just above the channel 1 to 4 analog input wiring terminal strips, provide indication of a good or bad analog signal to each channel. The four open loop indicators located just above the 4-20 mA output wiring terminal strips, provide indication of a good or bad analog signal connection to remote devices.

One or more of these red LEDs will illuminate if one or more of the 4-20 mA signal loops are not connected properly or the connection is broken. This could also indicate a burned out sensor element from a remote analog transmitter with a solid-state or catalytic sensor element. It could also indicate an expired Oxygen sensor element from an integral Oxygen sensor or remote Oxygen sensor/transmitter.

Alarms: Upon detection of a gas concentration above a preset level for any of the alarm set points, the low, mid or high alarm LED will illuminate and the appropriate relay will be activated, assuming relays have been enabled, properly programmed, and any programmed time delays have timed out. In the event of a fault alarm condition, the fault LED (red) will illuminate, the audible alarm will sound and any relays programmed to respond to a fault condition will be activated.

6.0 SYSTEM OPERATION, CONT'D.....

The audible alarm will also sound in the event of a high level alarm. This can be silenced by depressing the acknowledge/silence push-button located on the front enclosure door just below the audible alarm.

Note-1: The operation of any of the relays is subject to any user programmed time delays and/or latching functions. More information is provided further on in this manual with regards to these two features.

Note-2: If more than one alarm condition occurs, the display will automatically scroll only through channels that are in alarm condition. The scroll rate for channels in alarm condition is slightly faster than the normal scroll rate. The scroll pattern is from the most serious alarm condition to the lesser alarm condition. Fault is considered to be the most serious alarm condition followed by high gas alarm, mid gas alarm and finally low gas alarm.

Fault Alarms: Upon detection of a fault condition, the red fault LED is illuminated, the audible alarm sounds and any relays programmed to respond to fault condition are activated.

Programming: The PAC-44 circuit is completely programmable on site without the need for a computer. Any changes in the system operation can be made quickly and easily by means of the push-button programming feature. Three small, momentary push-buttons can be located on the lower left center area of the circuit board (just above the analog input terminal strips). These push-buttons can be used to enter a large selection of four digit codes to access a wide range of system functions and features. For more detailed information on system programming, consult the programming section of this manual.

Battery back-up: The PAC-44 system has been designed to accept an optional battery back up system to provide uninterrupted power to the gas detectors in the event of a power failure. The wiring input terminal strip for wires coming from the battery back up system are located at the top of the wiring terminal strip which is located on the lower left side of the circuit board, just to the left of the programming push-buttons.

In the event of a system failure fault alarm, first check to ensure that the system primary fuse has not "blown", prior to performing other trouble shooting tasks. The system primary fuse is an automatic resetting thermal fuse and is located just to the right of the incoming power terminal strip. If the fuse is hot to the touch, this indicates that it has "blown". This fuse will not reset itself until the power or wiring problem has been rectified.

System alarm: The software installed in the PAC-44 controller has a "watchdog timer" built into it. The watchdog timer watches the microprocessor and if it encounters an interruption that causes it to veer off track and cause a fault condition, the watchdog timer automatically resets the microprocessor so the user does not have to deal with the problem. The system alarm is activated on the LCD display after the fourth watchdog timer reset. The display will indicate "SYSM ALRM". The system will continue to work properly, however, this display will continue to indicate the alarm message. The user should contact their supplier about this problem. To clear this alarm, depress and hold the acknowledge push-button for 10 seconds.

7.0 SYSTEM PROGRAMMING / GENERAL

The PAC-44 controller has an extensive menu system that allows the user maximum flexibility, through programming, to achieve a wide range of system functions. Please carefully read through the programming section before attempting to make programming changes.

The system menu structure is broken into three major sections, "Input Control", "Relay Output Control" and "Analog Output Control". Input control allows the user to program all the desired parameters for the sensor input channels. Output control allows the user to program all the desired parameters for the relays and analog outputs for controlling external devices and sending signals to remote devices.

The following table indicates available programmable functions and the input codes for each. Detailed descriptions for each can be found on the following pages.

Note: Holding down a button for more than 2 seconds will allow the user to scroll very quickly.

7.1 SYSTEM PROGRAMMING - INPUT CODES

| <u>CODE</u> | <u>DESCRIPTION</u> | <u>PAGE</u> |
|----------------------------------|--|-------------|
| <u>Input Set Up</u> | | |
| 3211 | Channel Enable or Disable | 16 |
| 1122 | Decimal Points | 16 |
| 1112 | Zoning | 17 |
| 1231 | Gas Sensor Type | 17 |
| 1232 | Units of Measure | 17 |
| 2211 | Low Alarm Ascending / Descending | 18 |
| 2212 | Mid Alarm Ascending / Descending | 18 |
| 2213 | High Alarm Ascending / Descending | 18 |
| 1211 | Low Alarm Set Point | 19 |
| 1212 | Mid Alarm Set Point | 19 |
| 1213 | High Alarm Set Point | 19 |
| <u>Input Channel Calibration</u> | | |
| 2133 | Set Low Input Range (Null Value) | 19 |
| 2233 | Set High Input Measurement Range (Span Value) | 20 |
| 2131 | Calibrate Low Input Range (4 mA source required) | 20 |
| 2231 | Calibrate High Input Range (20 mA source required) | 20 |

7.2 SYSTEM PROGRAMMING - OUTPUT CODES

| <u>CODE</u> | <u>DESCRIPTION</u> | <u>PAGE</u> |
|----------------------------|--|-------------|
| <u>Relay Output Set Up</u> | | |
| 3221 | Relay Enable or Disable | 21 |
| 2311 | Time Delay "On Make" | 21 |
| 2312 | Time Delay "On Break" (Minimum Run Time) | 21 |
| 2331 | Setting Relay Gas alarm Activation | 21 |
| 2332 | Setting Relay Fault Condition Activation | 22 |
| 2112 | Monitor Zone Number | 22 |
| 2113 | Monitor Channel Number | 22 |
| 2323 | Setting Relay Alarm Level State | 22 |
| 2321 | Setting Relay Coil State | 23 |
| 2313 | Setting Relay Latching State | 23 |
| 2333 | Strobe Light Activation | 23 |

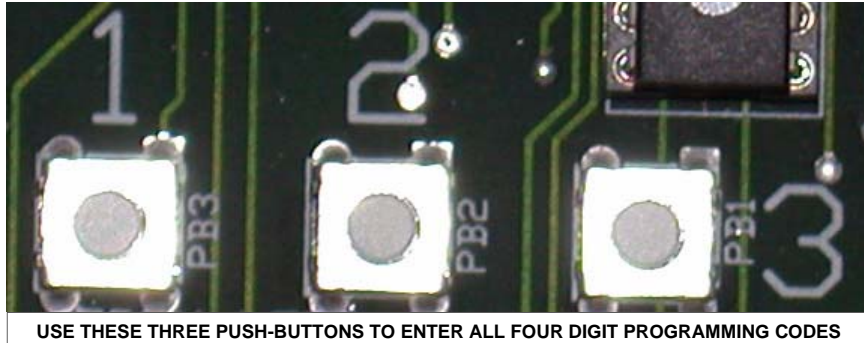
7.3 SYSTEM PROGRAMMING - ANALOG OUTPUT CODES

| <u>CODE</u> | <u>DESCRIPTION</u> | <u>PAGE</u> |
|-----------------------------------|--|-------------|
| <u>Analog Output Setup</u> | | |
| 3231 | Channel Enable or Disable | 24 |
| 3112 | Monitor Input Channel | 24 |
| 1321 | Setting Analog Output Low Range | 24 |
| 1322 | Setting Analog Output High Range | 24 |
| <u>Output Channel Calibration</u> | | |
| 1331 | Calibration of Analog Output Lower Limit | 25 |
| 1332 | Calibration of Analog Output Upper Limit | 25 |

7.4 OTHER CODES

| <u>CODE</u> | <u>DESCRIPTION</u> | <u>PAGE</u> |
|-------------|-----------------------|-------------|
| 3132 | Relay Toggle | 26 |
| 1323 | Unlock | 26 |
| 3123 | Reset System Defaults | 26 |

7.5 PROGRAMMING PUSH-BUTTONS PHOTO



7.6 SYSTEM PROGRAMMING - INPUT CODE DESCRIPTION

“3211” Channel Enable / Disable: This code allows the user to select the number of channels to be activated. This is determined by the number of remote analog devices to be connected to the controller. To achieve this, input code “3211”, then depress push-button “3” to enable a channel or push-button “1” to disable a channel. Depress push-button “2” to scroll to the next channel. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels. The system will ignore the “inactive” channels during normally scrolling. Active channels are channels that have been switched on and inactive channels are channels that have been switched off.

Note: This code also allows the user to take a channel “off line” to remove and service a sensor, if required, while the other channels are being monitored and displayed normally. Power is still live at the inactive channel terminal strip even though the channel is offline.

| | | | |
|---------|------|------|------------------------|
| CH 1 | Menu | 3211 | Selection” “Yes or No” |
| Enabled | ? | Yes | |

“1122” Decimal: This code allows the user to add up to three decimal points to the displayed value. To achieve this, input code “1122”, then depress push-button “3” to select 1, 2 or 3 decimals. To add or remove decimal points, depress push-button “3” to increment or push-button “1” to decrement the number. Depress push-button “2” to scroll to the next channel. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels.

| | | | |
|---------|------|------|---------------------------|
| CH 1 | Menu | 1122 | Selection: “0, 1, 2 or 3” |
| Decimal | Pts | 0 | |

7.6 SYSTEM PROGRAMMING - INPUT CODES, CONT'D.....

“1112” Zoning: This code allows the user to selectively group one or more channels (sensors) with one or more relays for selective output control. To achieve this, input code “1112”, then depress push-button “3” to increment or push-button “1” to decrement the number. Depress push-button “2” to scroll to the next channel. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels.

| | | | |
|-------|------|------|---------------------------|
| CH 1 | Menu | 1112 | Selection: “1, 2, 3 or 4” |
| Input | Zone | 1 | |

“1232” Units of Measure: This code allows the user to select the units of measure to be displayed for each sensor connected to each channel. To achieve this, input code “1232”, and the LCD display will indicate the units last selected for that channel. Next, depress push-button “3” to scroll up through the choices or push-button “1” to scroll down through the choices. Depress push-button “2” to scroll to the next channel. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels.

| | | | |
|-------|------|------|--|
| CH 1 | Menu | 1232 | Selection: “ppm, % LEL, % Vol., % rH, °C, °F, PSI” |
| Units | | ppm | |

“1231” Sensor Type: This code allows the user to select a specific sensor gas type to be displayed for each channel. This information tells the user exactly which gas is being monitored for and which type of sensor technology has been selected to detect it. Example “CO” (Carbon Monoxide), “el” (electrochemical). To achieve this, input code “1231”, then depress push-button “3” or “1” to scroll through the selection. Depress push-button “2” to scroll to the next channel. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels.

| | | | |
|------|------|------|---|
| CH 1 | Menu | 1231 | Selection: “CO % LEL, CO el, CO ss, CO2 ir, C3H8 ss, C3H8 ct, NH3 ss, NH3 el, NO el, NO2 el, O2 el, O3 el, R11 ss, R12 ss, R22 ss, R123 ss, R134A ss, R507 ss, R407A ss, R408A ss, R404A ss, HP62 ss, HP80 ss, CH4 ss, CH4 ct, CI2 el, Temp, Humid, Press, H2 ct, H2 ss, H2 el, Alco ct, Tol ct, ETO el, H2S el, SO2 el, HCN el, O2 ga, |
| CO | | el | |

Interpretation:

| | |
|---|------------------|
| el = electrochemical | Tol = Toluene |
| ss = solid-state | Alco = Alcohol |
| ct = catalytic (pellistor for combustibles) | ir = infrared |
| ga = galvanic (Oxygen high range) | Press = pressure |
| Temp = Temperature | |
| Humid = Humidity (rH relative humidity) | |

7.6 SYSTEM PROGRAMMING - INPUT CODES, CONT'D.....

“2211” Low Alarm Ascending or Descending: This code allows the user to select a descending (Desc) or ascending (Asc) low alarm set point for one or more channels. To achieve this, input code “2211”, then depress push-button “3” for ascending or “1” for descending. Depress push-button “2” to scroll to the next channel. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels.

| |
|-----------------------|
| CH 1 Menu 2211 |
| Low Alarm Asc |

 Selection: “Asc or Desc”

“2212” Mid Alarm Ascending or Descending: This code allows the user to select a descending (Desc) or ascending (Asc) mid alarm set point for one or more channels. To achieve this, input code “2212”, then depress push-button “3” for ascending or “1” for descending. Depress push-button “2” to scroll to the next channel. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels.

| |
|-----------------------|
| CH 1 Menu 2212 |
| Mid Alarm Asc |

 Selection: “Asc or “Desc”

“2213” High Alarm Ascending or Descending: This code allows the user to select a descending (Desc) or ascending (Asc) high alarm set point for one or more channels. To achieve this, input code “2213”, then depress push-button “3” for ascending or “1” for descending. Depress push-button “2” to scroll to the next channel. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels.

| |
|-----------------------|
| CH 1 Menu 2213 |
| High Alarm Asc |

 Selection: “Asc or Desc”

Note-1: A descending alarm is typically set for Oxygen sensors. Although, application dependent, Oxygen can have both descending low alarm and ascending high alarm.

Note-2: CO2 can only have ascending gas alarms.

7.6 SYSTEM PROGRAMMING - INPUT CODES, CONT'D.....

“1211” Low Alarm Set Point: This code allows the user to select or change a low alarm set point for each channel. To achieve this, input code “1211”, then depress push-button “3” to increment or “1” to decrement the value. Depress push-button “2” to scroll to the next channel. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels

| | |
|---------------------------------|--------------------------|
| CH 1 Menu 1211 Low Set Pt: 5 | Selection: “0 to 10,000” |
|---------------------------------|--------------------------|

“1212” Mid Alarm Set Point: This code allows the user to select or change a mid alarm set point for each channel. To achieve this, input code “1212”, then depress push-button “3” to increment or “1” to decrement the value. Depress push-button “2” to scroll to the next channel. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels

| | |
|----------------------------------|--------------------------|
| CH 1 Menu 1212 Mid Set Pt: 50 | Selection: “0 to 10,000” |
|----------------------------------|--------------------------|

“1213” High Alarm Set Point: This code allows the user to select or change a high alarm set point for each channel. To achieve this, input code “1213”, then depress push-button “3” to increment or “1” to decrement the value. Depress push-button “2” to scroll to the next channel. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels

| | |
|--------------------------------|--------------------------|
| CH 1 Menu 1213 High Set 100 | Selection: “0 to 10,000” |
|--------------------------------|--------------------------|

Note: Carbon Dioxide (CO₂) is the only gas sensor type that provides alarm set point selection from “0 to 50,000”.

“2133” Set Low Range Input: This code allows the user to set the low input measurement range for each channel (default value is “0”). This is a locked function. To achieve this, first input the software unlock code, then input code “2133”, then depress push-button “3” to increment or “1” to decrement the value. Depress push-button “2” to scroll to the next channel. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels.

| | |
|-------------------------------|------------------------|
| CH 1 Menu 2133 Range Low 0 | Selection: “0 to 1000” |
|-------------------------------|------------------------|

7.6 SYSTEM PROGRAMMING - INPUT CODES, CONT'D.....

“2233” Set High Range Input: This code allows the user to set the high input measurement range for each channel. This is a locked function. To achieve this, first input the software unlock code, then input code “2233”, then depress push-button “3” to increment or “1” to decrement the value. Depress push-button “2” to scroll to the next channel. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels.

| | | | |
|--------------|-------------|-------------|--------------------------|
| CH 1 | Menu | 2233 | Selection: “0 to 10,000” |
| Range | High | 200 | |

Note: Carbon Dioxide (CO₂) is the only gas sensor type that provides a measurement range selection from “0 to 50,000”.

“2131” Calibrate Low Input Range: This code allows the user to actually calibrate the low analog input for each channel. An accurate, known source of 4.00 mA is required to perform this function. This is a locked function. To achieve this, first input the software unlock code “1323”, then input code “2131” and depress push-button “2” and the display will indicate the analog voltage supplied to the channel in question. Depress push-button “3” to scroll to the next channel. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels. **Note:** For a more detailed description of this procedure refer to page 29 of this manual.

| | | | |
|-------------|-------------|-------------|----------------|
| CH 1 | Menu | 2131 | Selection: N/A |
| Null | 4.0 | | |

“2231” Calibrate High Input Range: This code allows the user to actually calibrate the high analog input for each channel. An accurate, known source of 20.0 mA is required to perform this function. This is a locked function. To achieve this, first input the software unlock code, then input code “2231”, then depress push-button “2” and the display will indicate the analog voltage supplied to the channel in question. Depress push-button “3” to scroll to the next channel. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels. **Note:** For a more detailed description of this procedure refer to page 29 of this manual.

| | | | |
|-------------|-------------|-------------|----------------|
| CH 1 | Menu | 2231 | Selection: N/A |
| Span | 20.0 | | |

7.7 SYSTEM PROGRAMMING - RELAY OUTPUT CODES

“3221” Relay Enable or Disable: This code allows the user to enable or disable any of the four system relays. To achieve this, input code “3221”, then depress push-button “3” for enable or “1” for disable. Depress push-button “2” to scroll to the next channel. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels.

| | |
|-------------------------------------|------------------------|
| RL 1 Menu 3221 Enabled ? | Selection: “Yes or No” |
|-------------------------------------|------------------------|

“2311” Time Delay on “Make”: This code allows the user to set a time delay period before one or more relays are activated in the event of a gas alarm. There is no time delay available for a fault condition. To achieve this, input code “2311”, then depress push-button “3” to increment or “1” to decrement the time. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels.

Note: A relay assigned to activate in the event of a gas alarm will activate immediately unless an off delay is programmed. If an off time delay has been programmed, the relay will deactivate after the off delay has expired.

| | |
|--|----------------------------------|
| RL 1 Menu 2311 On Delay 0.0 | Selection: “0.0 to 10.0” minutes |
|--|----------------------------------|

“2312” Time Delay on “Break”: This code allows the user to set a time delay period before each relay is deactivated. To achieve this, input code “2312”, then depress push-button “3” to increment or “1” to decrement the time. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels.

Note: All time delays are +/- 6 seconds timing tolerance

| | |
|---|----------------------------------|
| RL 1 Menu 2312 Off Delay 0.0 | Selection: “0.0 to 10.0” minutes |
|---|----------------------------------|

“2331” Setting Relay Gas Alarm Activation: This code allows the user to select the normal activation for each relay in the event of a gas alarm. To achieve this, input code “2331”, then depress push-button “3” to increment or “1” to decrement through the choices. Depress push-button “2” to scroll to the next channel. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels.

| | |
|---|------------------------------------|
| RL 1 Menu 2331 Normal Act Zone | Selection: “Zone, All, None, Sens” |
|---|------------------------------------|

7.7 SYSTEM PROGRAMMING - RELAY OUTPUT CODES, CONT'D.....

“2332” Setting Relay Fault Activation: This code allows the user to assign one or more relays to respond to fault alarm conditions. To achieve this, input code “2332”, then depress push-button “3” to increment or “1” to decrement through the choices. Depress push-button “2” to scroll to the next channel. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels.

| | | | |
|-------|------|------|------------------------------------|
| RL 1 | Menu | 2332 | Selection: “Zone, All, None, Sens” |
| Fault | Act | All | |

“2112” Monitor Zone Number: This code allows the user to assign the zone number the relay will monitor with regards to gas or fault alarms, if the input channels have been set up for “zone”. To achieve this, input code “2112”, then depress push-button “3” to increment or “1” to decrement through the choices. Depress push-button “2” to scroll to the next channel. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels.

| | | | |
|----------|------|------|---------------------------|
| RL 1 | Menu | 2112 | Selection: “1, 2, 3 or 4” |
| Mon Zone | | 1 | |

“2113” Monitor Channel Number: This code allows the user to assign the channel number the relay will monitor with regards to gas or fault alarms, if the input channels have been set up for “zone”. To achieve this, input code “2113”, then depress push-button “3” to increment or “1” to decrement through the choices. Depress push-button “2” to scroll to the next channel. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels.

| | | | |
|----------|------|------|---------------------------|
| RL 1 | Menu | 2113 | Selection: “1, 2, 3 or 4” |
| Mon Zone | | 1 | |

“2323” Setting Relay Alarm Level: This code allows the user to select the alarm state to activate each relay. To achieve this, input code “2323”, then depress push-button “3” to increment or “1” to decrement through the choices. Depress push-button “2” to scroll to the next channel. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels.

| | | | |
|------|-------|------|-------------------------------|
| RL 1 | Menu | 2323 | Selection: “Low, Mid or High” |
| Act | Level | Low | |

7.7 SYSTEM PROGRAMMING - RELAY OUTPUT CODES, CONT'D.....

“2321” Setting Relay Coil State: This code allows the user to select the normal state of the relay in non-alarm condition (normally energized or normally de-energized). To achieve this, input code “2321”, then depress push-button “3” to increment or “1” to decrement through the choices. Depress push-button “2” to scroll to the next channel. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels.

| |
|------------------------|
| RL 1 Menu 2321 |
| Fail Safe ? Yes |

Selection: “Fail Safe-Yes or No”

Note: The definition of “Fail-Safe”, for the purposes of this manual, means to keep the relay coil in a normally energized state in non-alarm condition.

“2313” Setting Relay Latching State: This code allows the user to select if one or more of the system relays should “latch” when activated by a gas alarm or fault alarm condition. Latching means that when the relay state changes because it was activated by an alarm condition, it is held in this changed state. To achieve this, input code “2313”, then depress push-button “3” to increment or “1” to decrement through the choices. Depress push-button “2” to scroll to the next channel. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels.

Note: The user must depress and hold the acknowledge push-button for approximately 10 seconds to release the latched relays.

| |
|-----------------------|
| RL 1 Menu 2313 |
| Latching ? No |

Selection: “No or Yes”

“2333” Strobe Light Activation: The system circuit provides 24 VDC voltage output to power a strobe light (see photo on page-9). This code allows the user to select which alarm level activates the strobe light. The alarm level selected is common to all channels. To achieve this, input code “2333”, then depress push-button “3” to advance through the choices. Once this function is finished, depress push-button “2” and the system will automatically start to scroll through all “active” channels.

Note: Strobe always activates with all fault alarms.

| |
|-----------------------|
| ST 1 Menu 2333 |
| Act Level Low |

Selection: “Low, Mid or High”

7.8 SYSTEM PROGRAMMING - ANALOG OUTPUT CODES

“3231” Output Channel Enable or Disable: This code allows the user to enable or disable any of the four system analog output channels. To achieve this, input code “3231”, then depress push-button “3” for enable or “1” for disable. Depress push-button “2” to scroll to the next channel. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels.

| | | |
|-----------|------|------|
| AC 1 | Menu | 3231 |
| Enabled ? | Yes | |

 Selection: “Yes or No”

“3112” Monitor Input Channel: This code allows the user to select the input channel each analog output channel will monitor. Each output can monitor only one input channel. To achieve this, input code “3112”, then depress push-button “3” to increment or “1” to decrement to the desired channel. Depress push-button “2” to scroll to the next channel. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels.

| | | |
|-------------|------|------|
| AC 1 | Menu | 3112 |
| Mon Channel | 1 | |

 Selection: “1, 2, 3 or 4”

“1321” Setting Analog Output Low Range: This code allows the user to select the low range measurement for each channel. Default is 4.0 mA = “0”. This is a locked function. To achieve this, first input the software unlock code, then input code “1321”, then depress push-button “3” to increment or “1” to decrement the value. Depress push-button “2” to scroll to the next channel. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels.

| | | |
|-----------|------|------|
| AC 1 | Menu | 1321 |
| Range Low | 0 | |

 Selection: “0 to 1000”

“1322” Setting Analog Output High Range: This code allows the user to select the high range measurement for each channel. Default is 20.0 mA = “full sensor measurement scale”. This is a locked function. To achieve this, first input the software unlock code, then input code “1322”, then depress push-button “3” to increment or “1” to decrement the value. Depress push-button “2” to scroll to the next channel. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels.

| | | |
|------------|------|------|
| AC 1 | Menu | 1322 |
| Range High | 200 | |

 Selection: “0 to 10,000”

Note: Carbon Dioxide (CO₂) is the only gas sensor type that provides a measurement range selection from “0 to 50,000”.

7.8 SYSTEM PROGRAMMING - ANALOG OUTPUT CODES, CONT'D.....

“1331” Calibrate Analog Output Low Limit: This code provides the user with a method to calibrate the low limit for each analog output channel. An accurate digital multimeter is required. First attach meter leads to channel-1 output terminal strip. Set the meter to the DC mA scale. This is a locked function. To proceed, first input the software unlock code. Next, input code “1331”. The current output will be displayed on your digital multi-meter.

To calibrate this channel, depress push-button “3” to increment to “1” to decrement the value to achieve “4.00” mA on your meter. Depress push-button “2” to scroll to the next channel. Move only the positive meter lead to channel-2 and repeat the last step to once again achieve a reading of 4.00 mA on your meter. Repeat the last two steps for the last two channels, if they have been enabled for use. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels.

| | |
|------------------------|----------------|
| AC 1 Menu 1331 Null | Selection: N/A |
|------------------------|----------------|

“1332” Calibrate Analog Output High Limit: This code provides the user with a method to calibrate the high limit for each analog output channel. An accurate digital multimeter is required. First attach meter leads to channel-1 output terminal strip. Set the meter to the DC mA scale. This is a locked function. To proceed, first input the software unlock code. Next, input code “1332”. The current output will be displayed on your digital multi-meter.

To calibrate this channel, depress push-button “3” to increment to “1” to decrement the value to achieve “20.00” mA on your meter. Depress push-button “2” to scroll to the next channel. Move only the positive meter lead to channel-2 and repeat the last step to once again achieve a reading of 20.00 mA on your meter. Repeat the last two steps for the last two channels, if they have been enabled for use. Once this function is finished, continue to depress push-button “2” until you reach the last channel and the system will automatically start to scroll through all “active” channels.

| | |
|------------------------|----------------|
| AC 1 Menu 1332 Span | Selection: N/A |
|------------------------|----------------|

7.9 SYSTEM PROGRAMMING - OTHER CODES

“3132” Toggle Relays: This code allows the user to toggle the system relays to confirm activation of controlled devices without having to apply test gas on the sensors to achieve the same. This is a locked function. To achieve this, first input the software unlock code, then, input code “3132”. The display will indicate that the relay is “off” and all the relay coil amber LEDs will be go out. Depress push-button “2” to toggle relay-1. This can be confirmed by the audible “click” from the relay as well as the amber relay coil LED going on and off as you depress “2”. Next, depress “3” to scroll to the next relay and repeat the last step. Continue on to the last two relays by repeating the last two steps or hold down “3” to scroll to the end.

| | | | |
|-------|------|------|------------------------|
| RL 1 | Menu | 3132 | Selection: “On or Off” |
| Relay | Ctrl | Off | |

“1323” Unlock Code: This code is provided as a safe guard to help ensure that the user reads this manual before proceeding with the modification of certain key functions. The code functions that are locked, are so indicated in the explanation under each code description. Simply enter “1323” then the code for the function that is to be changed. The display will indicate “Unlocked”.

“3123” Reset System Defaults: This code allows the user to reset all the programmed functions to the factory default settings. This can help if the user finds themselves in a position where they may have “messed up” the programming and cannot figure out how to get everything working properly again. To achieve this, first input the software unlock code, then input code “3123”. Depress push-button “2” and the display will indicate “finished” and the system will now be reset to factory settings. Factory default settings are for a basic system with Carbon Monoxide sensors.

8.0 CALIBRATION

1) Gas calibration takes place at the remote mounted analog transmitters. If the user does not wish to experience alarm conditions during calibration, the alarms can be delayed by inputting a temporary time delay to all channels and all levels of alarm. Use codes “2311” and “2312” to accomplish this. Important: Remember to remove the time delays after calibration is finished.

2) Calibration of the main circuit board is not required unless the main EEPROM has been changed or a new main circuit board has been installed. To accomplish this, the user will require an accurate current source of 4 to 20 mA (available from CETCI) and a digital multi-meter. Both analog input and analog output channels must be calibrated. The following procedure must be completed, step-by-step. Note: The terminals referred to in the following procedure are located along the bottom edge of the main circuit board.

Note: Reference set-up photo on page-29.

8.0 CALIBRATION, CONT'D.....

a) Attach the negative (common) wire from the current source to any negative (-) terminal. Attach the positive to channel-1 input "SIG" (signal) terminal.

b) Plug power pack connector into the 4-20 mA source. Plug the power pack into any 120VAC wall outlet. Connect meter leads from digital multi-meter in series with the current source and set the scale to DCA.

c) Adjust the current source to read 4.00 mA on the meter display.

d) Calibrating Low Input Range:

1) Input unlock code "1323", then input code "2131". The PAC display will indicate channel-1 "null".

2) At this point, push button "2" twice to set the 4.00 mA value. Each time button "2" is pushed, it will display "set", confirming the procedure has been successful.

3) Next push button "3" to scroll to channel-2, move the positive lead from the current source to channel-2 "SIG" terminal and once again, push button "2" twice to set the 4.00 mA value. Repeat this procedure for all four channels.

4) Once you have calibrated all four input channels low input range, the system will go back to the scroll mode.

e) Calibrating High Input Range:

1) First, move the positive lead from the current source to channel-1 "SIG" terminal.

2) Next, input unlock code "1323", then input code "2231". The PAC display will indicate channel-1 "span".

3) Next adjust the current source to read 20.0 mA on the meter display. Push button "2" twice to set the 20.0 mA value. Each time button "2" is pushed, it will display "set", confirming the procedure has been successful

4) Next push button "3" to scroll to channel-2, move the positive lead from the current source to channel-2 "SIG" terminal and once again, push button "2" twice to set the 20.0 mA value. Repeat this procedure for all four channels. Once you have calibrated all four input channels low input range, the system will go back to the scroll mode.

f) Calibrating Low Output Range:

1) Remove current source and attach negative meter lead to channel-4 negative terminal. Attach positive meter lead to channel-1 "POS" terminal.

8.0 CALIBRATION, CONT'D.....

2) Input unlock code "1323", then input code "1331". The PAC display will indicate channel-1 and display the current output value. Using button "1" or button "3", toggle the value down or up to read 4.00 mA. Push button "2" once to set the value and the display will automatically move to the next channel.

3) Move the positive meter lead to channel-2 "POS" and once again use button "1" or button "3" to toggle the value down or up to 4.00 mA. Repeat this process for the remaining channels.

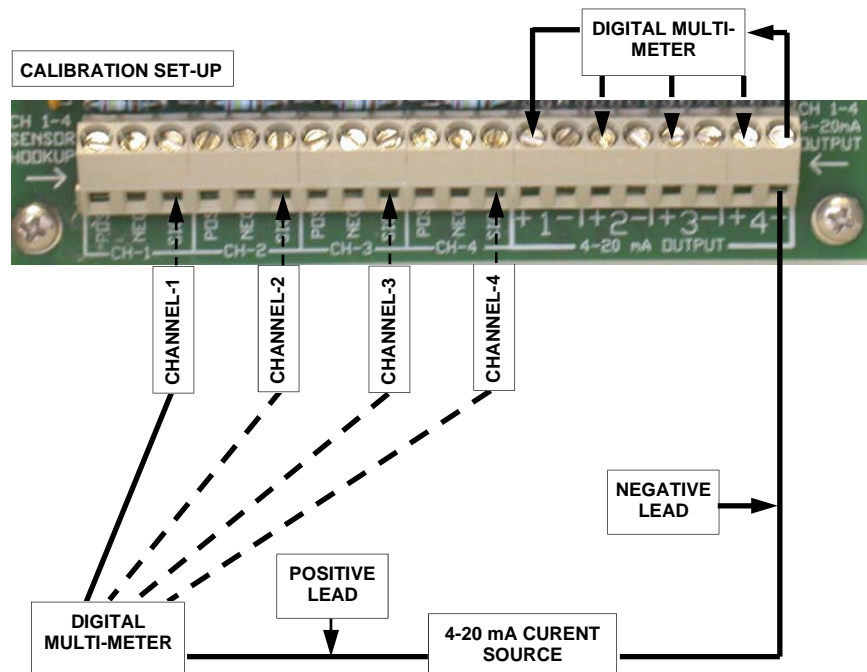
g) Calibrating High Output Range:

1) Move positive meter lead back to channel-1 "POS" terminal.

2) Input unlock code "1323", then input code "1332". The PAC display will indicate channel-1 and display the current output value. Using button "1" or button "3", toggle the value down or up to read 20.0-0 mA. Push button "2" once to set the value and the display will automatically move to the next channel.

3) Move the positive meter lead to channel-2 "POS" and once again use button "1" or button "3" to toggle the value down or up to 20.0 mA. Push button "2" once to set the value and the display will automatically move to the next channel. Repeat this process for the remaining channels.

4) Remove all calibrating equipment, calibration of all channels is now complete.



8.1 REPLACEMENT PART NUMBERS

| <u>PART NUMBER</u> | <u>DESCRIPTION</u> |
|--------------------|---|
| PAC-44-EN | Fiberglass enclosure with Lexan label, audible alarm, silence |
| PAC-SPS | Switching power supply |
| PAC-MCB | Main circuit board |
| PAC-DDB | LCD digital display board c/w ribbon cable |
| XXXX | 90 Db audible alarm (door mounted) |
| XXXX | Silence push-button (door mounted) |
| XXXX | Top mounted, 4" diameter, red strobe light |
| XXXX | Top mounted 103 dB industrial horn |

Note-1: Consult factory for parts not listed above

Note-2: All enclosures ordered after March 15, 2003 are supplied with three openings along bottom edge for 1/2" conduit. Any systems purchased prior to March 15, 2003, were supplied with enclosures that were not pre-machined with openings for conduit entry.

