

ECO SENSORS, INC.

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

INSTALLATION / OPERATION MANUAL

REV: D OCT-19-2002

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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
Relay	Ctrl	Off

Selection: “On or 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 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

Note: Consult factory for parts not listed above

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).

INSTRUMENT SERIAL NUMBER: _____

PURCHASE DATE: _____

PURCHASED FROM: _____

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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 multi-meter 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 voltage 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
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"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 multi-meter 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 voltage 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
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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”.

1.0 GENERAL

The PAC-44 series systems are rugged, microprocessor based, programmable 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.

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.

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.....

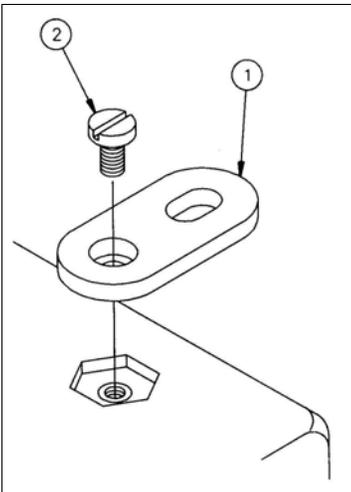
- Environment: a) Temperature: 0 deg. C. to + 40 deg. C (32 deg. F to 104 deg. F.)
 b) Humidity: 0 to 95% Rh
- Fuses: System primary: Automatic resetting thermal fuse rated 1.5 amps
 Switching power supply secondary: replaceable 2.0 amp
- Certifications: CSA field inspected for low voltage safety
- Options: 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

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"

7.7 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	

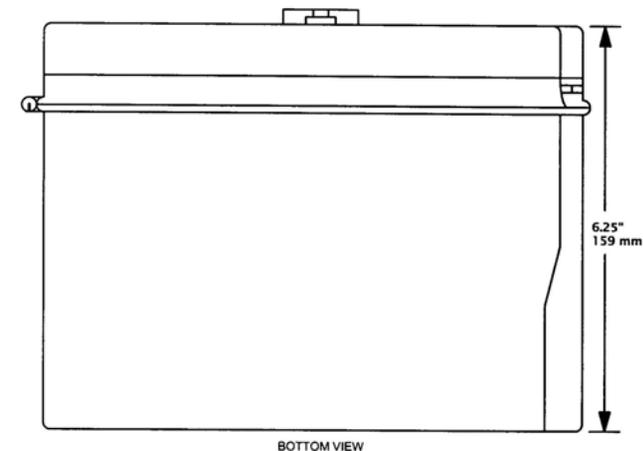
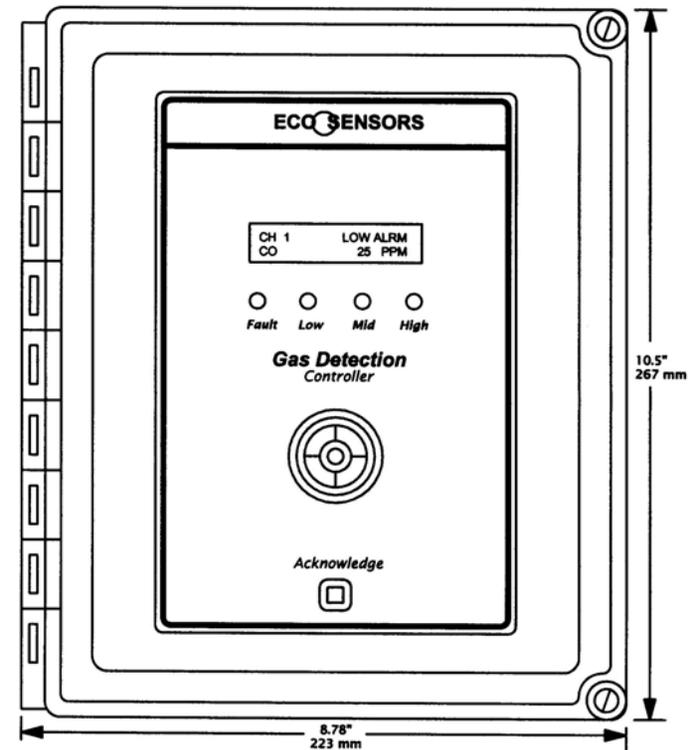
“2113” Monitor Channel Number: This code allows the user to assign the channel number the relay will monitor with regards to gas or fault alarms, if the input channels have been set up for “zone”. To achieve this, input code “2113”, then depress push-button “3” to increment or “1” to decrement through 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	

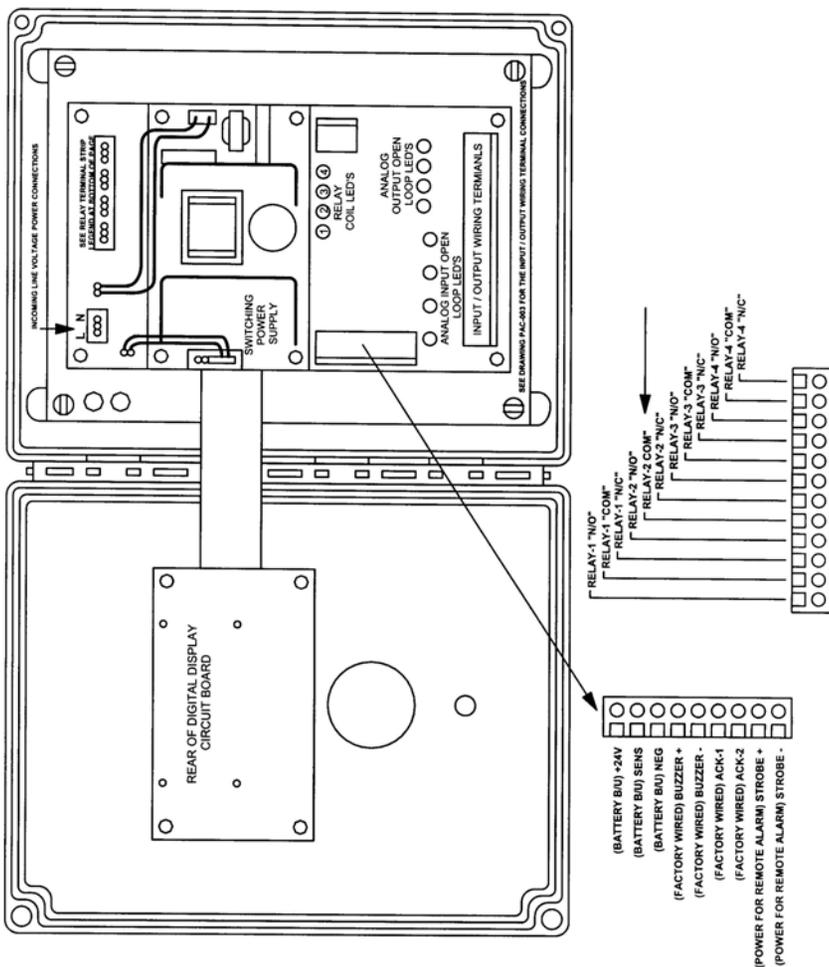
“2323” Setting Relay Alarm Level: This code allows the user to select the alarm state to activate each relay. To achieve this, input code “2323”, then depress push-button “3” to increment or “1” to decrement through the choices. Depress push-button “2” to scroll to the next channel. Once this function 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	

4.0 SYSTEM ENCLOSURE EXTERIOR DIMENSIONAL DRAWING



4.1 SYSTEM ENCLOSURE INTERIOR LAYOUT DRAWING



4.2 WIRING

Line voltage power to system: Take caution when drilling holes for installing conduit connections to avoid damaging internal system components. An 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.**

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”

7.6 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, then input code “2131”, 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.

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.

CH 1	Menu	2231	Selection: N/A
	Span	20.0	

4.2 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.**

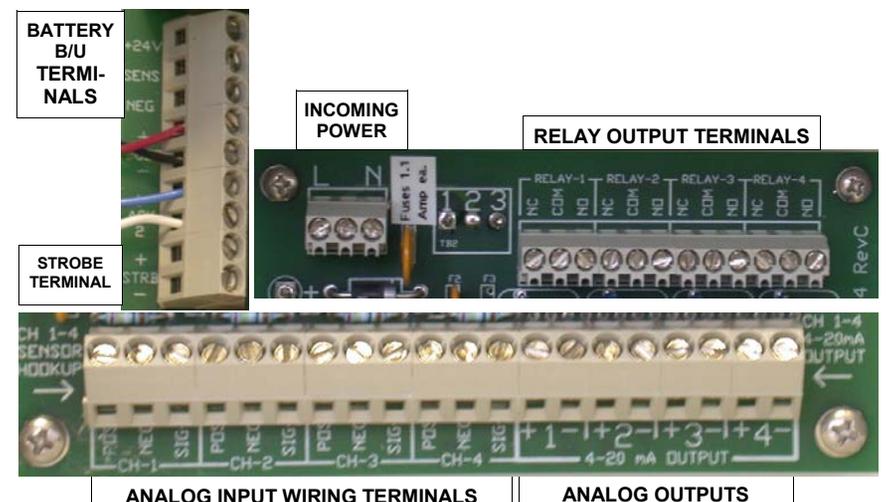
Note-1: With regards to fans, the system relays should be used to control the fan starters or contactors and NOT the fan motor directly.

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.

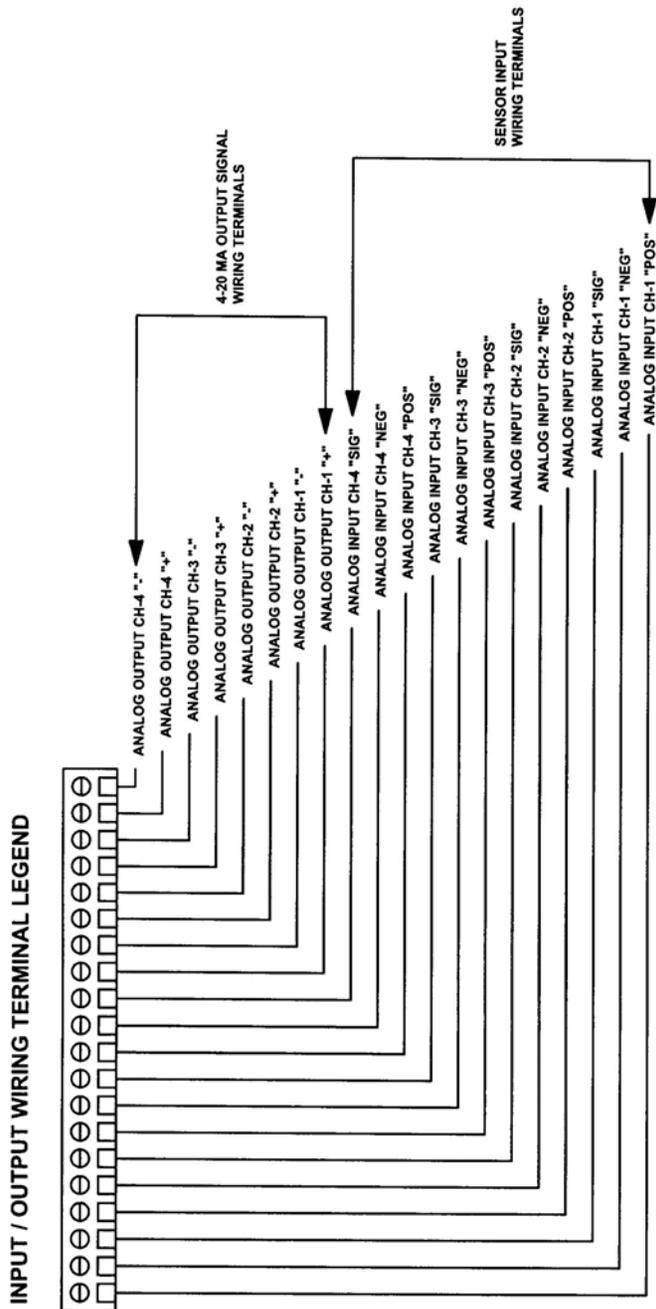
Note-3: The PAC-44 controller utilizes a fused, switching power for total system power. The power supply is located directly on top of the main circuit board and has a clear, Lexan plastic plate secured on top of it. This helps to protect the power supply from damage from tools, etc. that may be dropped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

4.3 WIRING TERMINAL STRIP PHOTOS



4.4 WIRING CONNECTIONS DRAWING



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.....

“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	Selection: “Asc or Desc”
Low	Alarm	Asc		

“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	Selection: “Asc or “Desc”
Mid	Alarm	Asc		

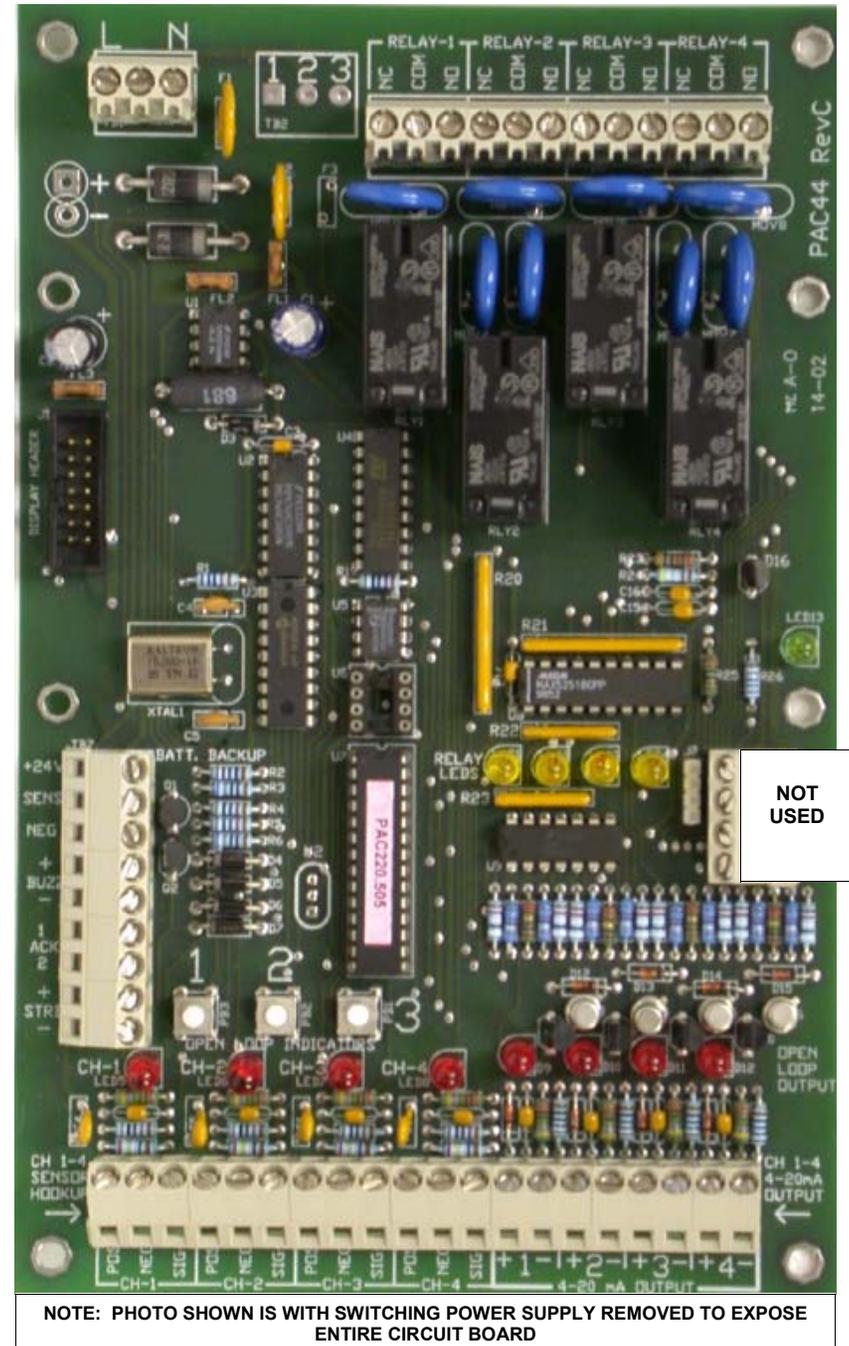
“2213” High Alarm Ascending or Descending: This code allows the user to select a descending (Desc) or ascending (Asc) high alarm set point for one or more channels. To achieve this, input code “2213”, then depress push-button “3” for ascending or “1” for descending. Depress push-button “2” to scroll 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	Selection: “Asc or Desc”
High	Alarm	Asc		

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.

5.0 MAIN CIRCUIT BOARD PHOTO



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.

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
Input	Zone	1

Selection: “1, 2, 3 or 4”

“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
Units	ppm	

Selection: “ppm, % LEL, % Vol., % rH, °C, °F, PSI”

“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
CO	el	

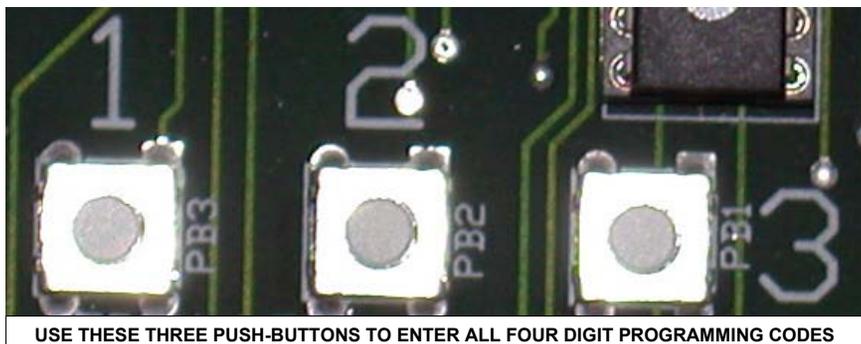
Selection: “CO % LEL, CO el, CO ss, CO2 ir, C3H8 ss, C3H8 ct, NH3 ss, NH3 el, NO el, NO2 el, O2 el, O3 el, R11 ss, R12 ss, R22 ss, R123 ss, R134A ss, R507 ss, R407A ss, R408A ss, R404A ss, HP62 ss, HP80 ss, CH4 ss, CH4 ct, Cl2 el, Temp, Humid, Press, H2 ct, H2 ss, H2 el, Alco ct, Tol ct, ETO el, H2S el, SO2 el, HCN el, O2 ga,

Interpretation:

el = electrochemical
 ss = solid-state
 ct = catalytic (pellistor for combustibles)
 ga = galvanic (Oxygen high range)
 Temp = Temperature
 Humid = Humidity (rH relative humidity)

Tol = Toluene
 Alco = Alcohol
 ir = infrared
 Press = pressure

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	
Enabled	?	Yes	Selection “Yes or No”

“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	
Decimal	Pts	0	Selection: “0, 1, 2 or 3”

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