Critical Environment Technologies Canada Inc.

"PDC" *Series* Programmable Digital Controllers & "DST" Series Digital Sensor / Transmitters

INSTALLATION / OPERATION MANUAL

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IMPORTANT NOTICES

READ AND UNDERSTAND THIS OPERATION MANUAL PRIOR TO INSTALLING OR USING THIS INSTRUMENT. THE MANUFACTURER IS NOT RESPONSIBLE FOR ERRORS AND PROBLEMS RESULTING FROM THE USE OF THE WRONG TYPE AND GUAGE WIRE/CABLE OR PROGRAMMING CHANGES MADE BY UNTRAINED OR UNAUTHORIZED INSTALLERS OR END USERS.

THIS EQUIPMENT SHOULD BE INSPECTED AND MAINTAINED BY A QUALIFIED AND TRAINED TECHNICIAN. FOR MORE INFORMATION REFER TO OTHER SECTIONS OF THIS MANUAL.

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

THIS MANUAL INCLUDES INSTALLATION, OPERATION AND TROUBLE-SHOOTING DETAILS AND SPECIFICATIONS FOR THE PDC SERIES CONTROLLER AS WELL AS THE DST SERIES DIGITAL SENSOR / TRANSMITTERS, WHICH ARE USED EXCLUSIVELY WITH THE PDC CONTROLLER.

WARNINGS

- **THE TYPE AND GUAGE OF WIRING AND PROPER INSTALLATON OF THE SAME IS CRITICAL TO THE PROPER OPERATION OF A COMPLETE PDC GAS DETECTION SYSTEM**
- **ANY PROGRAMMING CHANGES SHOULD BE MADE ONLY BY TRAINED AND AUTHORIZED TECHNICIANS**
- **DISCONNECT POWER BEFORE SERVICING**
- **CAUTION: MORE THAN ONE LIVE CIRCUIT**
- **SUPPLY: 90 TO 250 VAC, 47 TO 63 HZ**
- **CERTIFIED FOR ELECTRICAL SHOCK AND ELECTRICAL FIRE HAZARD ONLY (CSA / UL CERTIFIED)**
- **SENSOR LIFE SPAN AND ACCURACY IS DEPENDENT UPON MANY THINGS INCLUDING APPLICATION AND CALIBRATION MAINTENANCE. REFER TO THE CALIBRATION SECTION OF THIS MANUAL FOR CALIBRATION MAINTENANCE FREQUENCY**

WARRANTY POLICY

CRITICAL ENVIRONMENT TECHNOLOGIES CANADA INC. WARRANTS THE PDC CONTROLLERS AND DST TRANSMITTERS TO BE FREE FROM DEFECTS IN MATERIALS AND WORKMANSHIP FOR A PERIOD OF TWO (2) YEARS FROM THE DATE OF SHIPMENT FROM OUR FACILITY. ELECTROCHEMICAL SENSOR ELEMENTS, OTHER THAN HVAC CARBON MONOXIDE (CO) ARE WARRANTED FOR ONE (1) YEAR FROM THE DATE OF SHIPMENT FROM OUR FACILITY. HVAC CO SENSORS ARE WARRANTED FOR TWO YEARS. WARRANTY REPLACEMENT FOR ALL ELECTROCHEMICAL SENSORS IS ON A "PRO-RATED" BASIS. THE WARRANTY STATUS MAY BE EFFECTED IF ANY OF THIS EQUIPMENT HAS NOT BEEN INSTALLED PROPERLY OR MAINTAINED AS PER THE INSTRUCTIONS INDICATED IN THIS MANUAL OR HAS BEEN ABUSED OR DAMAGED IN ANY WAY. THIS INSTRUMENT IS ONLY TO BE USED FOR PURPOSES STATED HEREIN. WARRANTY DOES NOT INCLUDE THIRD PARTY TROUBLE-SHOOTING COSTS OR FREIGHT TO OR FROM OUR FACILITY. OUR LIABILITY IS LIMITED TO REPLACEMENT OR REPAIR OF THE EQUIPMENT WE MANUFACTURE.

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1.0 GENERAL

PDC series systems are configurable, digital, microprocessor based, controllers for use in non-hazardous (non-explosion rated) environments for commercial and industrial applications. They are available in several basic configurations. One to eight analog channels, one to sixteen digital channels, one to thirty-two digital channels, one to sixty-four digital channels, one to ninety-six digital channels, one to one hundred and twenty digital channels.

NOTE: Only the first eight system channels can be utilized for analog inputs.

A basic system provides one common set of LED indicating lights for "Power", "Fail", "Low (Warning) Gas Alarm", "Mid Gas Alarm, "High Gas Alarm", an integral audible alarm with silence push-button, scrolling, backlit, 2-line LCD digital display, eight dry contact relays, user configurable circuit and RS485, 4-wire "multi-drop" wiring. An eight channel version is also available for use with conventional analog transmitters.

A good selection of electrochemical, MOS (Metal Oxide Semi-conductor) solid-state, and catalytic sensor / transmitters (digital and analog) are available for use within the PDC series controllers.

2.0 CONTROLLER SPECIFICATIONS

Physical: Standard:

a) Dimensions: 12.0" Wide X 12.0" High X 4.0" Deep (311 mm Wide X 311 mm High X 106 mm (Deep)

b) Weight: 3.49 pounds (1.585 kg)

Water/dust tight:
a) Dimensions: TBA

b) Weight: TBA

Materials: Standard: Rugged 18 gauge powder painted metal with hinged, secured key-lock door and Lexan door label. General purpose rating.

Water/dust tight: Fiberglass reinforced polyester

Visual: **a)** Common set of LED indicating lights for:

* Power (*green)*
* Fail *(red)*
* Low (Warning) Gas Alarm *(amber)*
* Mid (Intermediate) Gas Alarm *(red)*
* High Gas Alarm *(red)*

b) Two-line, sixteen character, backlit LCD digital display for sensor/channel information, quantitative readings and alarm status.

c) Amber colored LED relay coil status indicators (8-leads)

d) Red colored LED "loop" indicators for analog version (8-leads)

Audible: Integral, door mounted sonalert with silence push-button. Rated 90 dB @ 10'

Environment: **a)** Temperature: 0 deg. C. to +40 deg. C. (32 deg. F. to 104 deg. F.)

b) Humidity: 0 to 95% non-condensing

Power: 90 to 250 VAC, 47 to 63 Hz

Current Load: Maximum allowable system current load: 1.36 Amps @ 24 VDC (power supplied to remote transmitters)

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

Outputs: **a)** Strobe: 24VDC alarm level activated **MAXIMUM 400 mA** (global alarm control)

b) Auxiliary: 24VDC alarm level activated **MAXIMUM 400 mA** (global alarm control)

2.0 CONTROLLER SPECIFICATIONS, CONT'D…..

Fuses: Replaceable: Primary: 1.5 amp, Power supply: 2.0 amp

Options:
a) BACnet Output Module
b)Remote mounted 4" diameter strobe light
c) Remote mounted combination strobe light/siren alarm
d) Remote mounted 5" industrial horn (115VAC)
e) Water/dust tight, corrosion resistant system enclosure
f) Remote relay module
g) Remote analog output module
h) Remote annunciator (remote display)
i) Remote power supply

2.1 WIRING SPECIFICATIONS & INSTALLATION INSTRUCTIONS

PDC controller: should be installed in a locked electrical room to prevent vandalism. There are three knockouts located along the top edge and three along the bottom edge of the control enclosure for conduit entry. Use caution when punching out knock outs to avoid contact and damage to circuit boards.

Wiring specifications: are critical to the proper operation of a digital system. The wiring consists of a 2-conductor, 14 gauge, stranded wire for 24V power and COM **plus** 2-conductor, 18 gauge, shielded, low capacitance, "twisted-pair" for communications (Data-A and Data-B).

All wiring must be installed in conduit according to local electrical codes. System problems arising from the installation and/or use of wire or cable not specified herein are not covered under warranty.

Wiring connections: for the DST transmitters and CAN Network bridges **must** be "daisy-chained". This means four wires going into the device and connected to the "IN" side of the wiring terminal strip and four wires connected to the "OUT" side of the wiring terminal strip and going out of the device and on to the next device. This is the **only** acceptable method of termination. Double check to ensure the data-A and data-B lines of the BUS wiring are not crossed from transmitter to transmitter.

Wiring shield: from the 2-conductor, shielded, twisted-pair portion of the wiring **must** be connected to the PDC negative connection located at the bottom right corner of the PDC board "BATT BACK-UP" terminal strip. At each DST or CAN, the shields **must** be connected together but not to common or ground. Installed correctly, this creates a continuous shield from the PDC to the last transmitter on the wiring run. At the last DST transmitter on the wiring run, the shield **must** be left floating. **It is grounded at one point only and that is the PDC controller**.

DST digital transmitters: DST transmitters are digital gas transmitters with built-in sensors for various gases. **Carbon Monoxide (CO)** sensor versions should be installed at **4' to 6'** from the floor. The DST digital transmitters with **Propane (C3H8)** sensors should be installed at **6"** from the floor. The DST digital transmitters with **Nitrogen Dioxide (NO2)** sensors should be installed at **4' to 6'** from the floor. Consult the manual for mounting heights for other gas sensor types. Conduit can enter the DST enclosures from the back of the base or from the top or bottom of the base. Take care when installing conduit to avoid damaging the electronic circuits. Problems arising from damage to circuit board during installation are not covered under warranty.

CAN Network bridges: CAN network bridges act as "repeaters" for the data communications by reassembling the data (correcting any potential corruption that may have occurred in the data along the wiring run) and sending it on to the DST or PDC. They **MUST** be installed every 1000' of wire (cable). If the distance is longer than 2000' communication problems could occur. The installer must also consider any loops and corners in calculating this distance for a total of no more than 2000'. Conduit can enter the CAN enclosures from the back of the base or from the top or bottom of the base. Take care when installing conduit to avoid damaging the electronic circuits. Problems arising from damage to circuit board during installation are not covered under warranty.

Remote power supplies: Remote power supplies are used to "boost" the 24VDC power wiring to compensate for voltage drops created by extra resistance from long wiring runs. It is critical that the DST transmitters receive at least 20 to 24 VDC. The power supply **MUST** be installed at approximately 2/3 of the way along any one wiring run. Example: If a specific wiring run from the PDC controller is 2500' to the last DST, the power supply must be installed at approximately the 1600' area. The power supply "boosts" the voltage to transmitters "down line" from it as well as increasing voltage to the "up line" transmitters closest to it.

NOTE: The remote power supply requires 120VAC line voltage power. The output from this power supply is a regulated 24VDC and it **MUST** be parallel connected, at a DST transmitter, to the 24VDC supply wires coming from the PDC controller. This means the positive output of the remote power supply must be connected to the positive 24V line of the BUS wiring and the negative output of the remote power supply must be connected to the "COM" line of the BUS wiring.

Jumpers: must be placed on the correct terminals of the PDC controller as well as the last (end-of-line termination) DST transmitter on any wiring run. Jumpers must also be utilized in the CAN network bridges. Jumpers can be found in a plastic bag attached to the inside of the PDC controller. Correct jumper placement is critical to good communication along the BUS wiring system. Reference the jumper placement examples on pages 12 of this manual.

3.0 INSTALLATION

Standard: Four 3/16" diameter mounting holes can be located at the corners inside the enclosure base. Take caution when using installing tools inside system enclosure to avoid damaging internal components.

Water/dust tight: These enclosures are optional and are supplied with four mounting feet that must be attached by the installer. A liquid tight conduit fitting must be used to maintain the water tight state of this enclosure.

Security: PDC should be installed inside a locked electrical, mechanical or instrumentation room. In the event that it is installed in a less secure area, the enclosure has a key locking, hinged door.

NOTE-1: Care should be taken to avoid installing controllers in areas that present a lot of potential for EMI (electromagnetic interference) and RFI (radio frequency interference). The system metal enclosure will provide a certain amount of RFI protection. Damage to controller circuitry from over exposure to large amounts of EMI and RFI are not covered under warranty.

NOTE-2: The PDC controller is available configured for either eight analog inputs, or sixteen, thirty-two, sixty-four, ninety-six or one hundred and twenty digital inputs. PDC circuit boards can be supplied for analog transmitters or for digital transmitters or for both. The digital output terminal strip is required if the PDC is to communicate to a remote annunciator panel.

NOTE-3: The preferred installation involves installing the transmitter with the lowest ID code number representing channel-1 on the controller, the next consecutive ID code number representing channel-2 on the controller and so on. **THIS IS HOW THE CONTROLLER IS ALWAYS PROGRAMMED AT THE FACTORY. ID addresses 1 to 8 are reserved for analog transmitters. ID addresses 9 to 128 are reserved for digital transmitters.**

Sensor Head Mounting Heights

Carbon Monoxide: 4' to 6' from the floor
Nitrogen Dioxide: 4' to 6' from the floor (garage applications)
Propane: 6" from the floor
Methane / Hydrogen: On or near the ceiling
Refrigerants (Freons): 6" from the floor or near the most probable leak source
Ammonia: On or near the ceiling
Chlorine: 6" from the floor
Ozone: 6" to 24" from the floor
Oxygen: 4' to 6' from the floor
Hydrogen Sulphide: 3" to 5" from the floor
Sulphur Dioxide: 6" from the floor
Nitric Oxide: 4' to 6' from the floor
Ethylene Oxide: 6" to 12" from the floor (application dependent)

Environment

If sensor heads or controller are to be installed in a wet environment optional water/dust tight, corrosion resistant enclosures are available. If sensor may be subject to splashed liquid, optional splash guards are available. **TO MAINTAIN WATER/DUST TIGHT RATING OF ENCLOSURES, LIQUID TIGHT CONDUIT FITTINGS MUST BE UTILIZED. FOLLOW INSTALLATION INSTRUCTIONS CAREFULLY. CORROSION DAMAGE FROM IMPROPERLY INSTALLED ENCLOSURES IS NOT COVERED UNDER WARRANTY.**

3.1 WIRING

Line Voltage Power to System: Three knock-outs have been provided along the top edge and three along the bottom edge of the enclosure base for conduit and wire entry. ***Take caution when "punching" out metal knockouts and installing conduit connections to avoid damaging internal system components.*** The interior of the PDC is divided into two general sections with regards to voltages. The "line voltage section" is located at the top right corner and right hand side of the enclosure interior. The "low voltage section" is located across the bottom and up the left side of the system enclosure.

A large terminal strip and ground studs have been provided, at the top right corner of system enclosure interior, to secure line power and ground wires. Take note of power requirements as listed in "CONTROLLER SPECIFICATIONS" on page-4.

Low Voltage Power to Sensor / Transmitters:

Analog System: If an analog system has been selected, wiring should consist of 2-conductor 14-16 gauge wire for 24V nominal supply to remote sensor / transmitters. If wiring runs are more than 2000', use 14 gauge stranded wire. The 24V supply can be daisy-chained to the remote sensors. The wiring terminal strip for the 24V supply can be found at the bottom left edge (low voltage section) of the circuit board. The analog signal loop consists of one signal wire for each sensor. These wires can usually be 16 to 18 gauge. Signal wires should be shielded if they are not to be run within conduit. The wiring terminal strip for the signal wires can be found at the left lower side (low voltage section) of the circuit board. Refer to section 4.3, page-12 for a detailed wiring drawing.

3.1 WIRING

Digital System: If a digital system has been selected, refer to "**WIRING SPECIFICATIONS AND INSTALLATION INSTRUCTIONS" on page 5.** The wiring terminal strip for the digital system can be found at the bottom middle edge of the circuit board. Refer to section 4.1, page-10 for a detailed wiring drawing.

NOTE-1: Do not use solid-core wire at circuit board terminals. Solid-core wire has memory and can tear a soldered terminal right off the circuit board. This is not covered under warranty.

NOTE-2: Common, accepted wire colors for positive, negative and signal VDC wires are: Red for positive, Black for negative and White or Yellow for signal.

NOTE-3: 14 gauge wire should be utilized for longer wire runs to minimize voltage drop.

NOTE-4: All wiring must be "daisy-chain" installed. All four wires must go to the input terminal of a digital transmitter or CAN network bridge and must exit the output terminal strip to go onto the next transmitter or CAN network bridge.

NOTE-5: It is imperative that a termination jumper is placed on the last transmitter on the wiring run (end-of-line). The jumper terminates the resistor installed on the DST circuit board. The resistor installed on the PDC circuit board provides termination at the beginning of the wiring run. A jumper termination is also required for any CAN network bridges installed. Consult "**JUMPER SETTINGS AND WIRING EXAMPLES"** below.

Relay Wiring: Both analog and digital systems are supplied with dry contact relays for control of remote devices such as exhaust fan and make up air fan contactors, etc. The relay wiring terminal strips are located along the right side (line voltage side) of the circuit board. *Take note of the maximum relay specifications as listed in section 2.0 when connecting load devices.* With regards to fans, relays should be used to control fan starters or contactors and **NOT** the fan motor directly. If device to be controlled is a higher voltage or current than the system relays are capable of handling, use a heavier rated, external dry contact relay to handle the heavier load and use the relay contacts inside the PDC to activate the coil on the external relay.

NOTE: STAR-WIRING CONFIGURATIONS **CANNOT** BE USED ON THIS SYSTEM. PROBLEMS ARISING FROM USING SUCH A WIRING CONFIGURATION **ARE NOT** THE RESPONSIBILOITY OF CETCI.

3.2 JUMPER SETTINGS AND WIRING EXAMPLES

The PDC circuit design is such that the relay coils can be selected as "normally energized" or "normally de-energized". Unless advised, the factory default is "normally energized" in non gas alarm condition. Thus, control wiring should be connected to *"COM" and "N/C".* In the event of a hardware, wiring or sensor failure (solid-state sensor only), the relay coil changes state and the device being controlled operates continuously until the fault condition is corrected. Consult the programming sheet supplied with the controller for the factory program that was set up.

Example-2: One run of system wiring at approximately 1800' from the PDC controller out to a number of DST transmitters with one CNB network bridge installed at the 2000' point along the BUS wiring. ***One*** jumper is placed at "J5" jumper pin location for ("IN") **or** ("OUT") inside the PDC controller, depending on which wiring terminal strip is utilized. The "IN" or the "OUT" can be used for the system wiring. They are paralleled inside the circuit. ***One*** jumper is placed at the "J2" jumper pin location and ***one*** jumper is placed at the "J3" jumper pin location inside the CNB bridge. ***One*** jumper is placed at the "J2" jumper pin location inside the DST transmitter located at the end of the system wiring run.

Example-3: Two runs of system wiring, one from the "IN" and one from the "OUT" wiring terminals inside the PDC. Each wiring run is 1000' long. ***No*** jumper is to be used at the "J5" jumper pin location inside the PDC. ***One*** jumper is placed at the "J2" jumper pin location inside the DST transmitter located at the end of each of the system wiring runs.

Example-4: Two runs of system wiring, one from the "IN" and one from the "OUT" wiring terminals inside the PDC. Each wiring run is 1000' long. Two CNB bridges are required. ***No*** jumper is to be used at the "J5" jumper pin location inside the PDC. ***One*** jumper is placed at the "J2" jumper pin location inside the CNB bridge and ***One*** jumper is placed at the "J3" jumper pin location inside the CNB bridge. ***One*** jumper is placed at the "J2" jumper pin location inside the DST transmitter located at the end of each system wiring run.

The "T" drop can be achieved but requires a CNB bridge for every "T" drop. ***One*** jumper is placed at the "J3" jumper pin location only inside the CNB bridge. ***One*** jumper is placed at the "J2" jumper pin location inside the DST transmitter located at the end of the system wiring run.

NOTE: " T" DROPS ARE **NOT RECOMMENDED** FOR PDC SYSTEM WIRING.

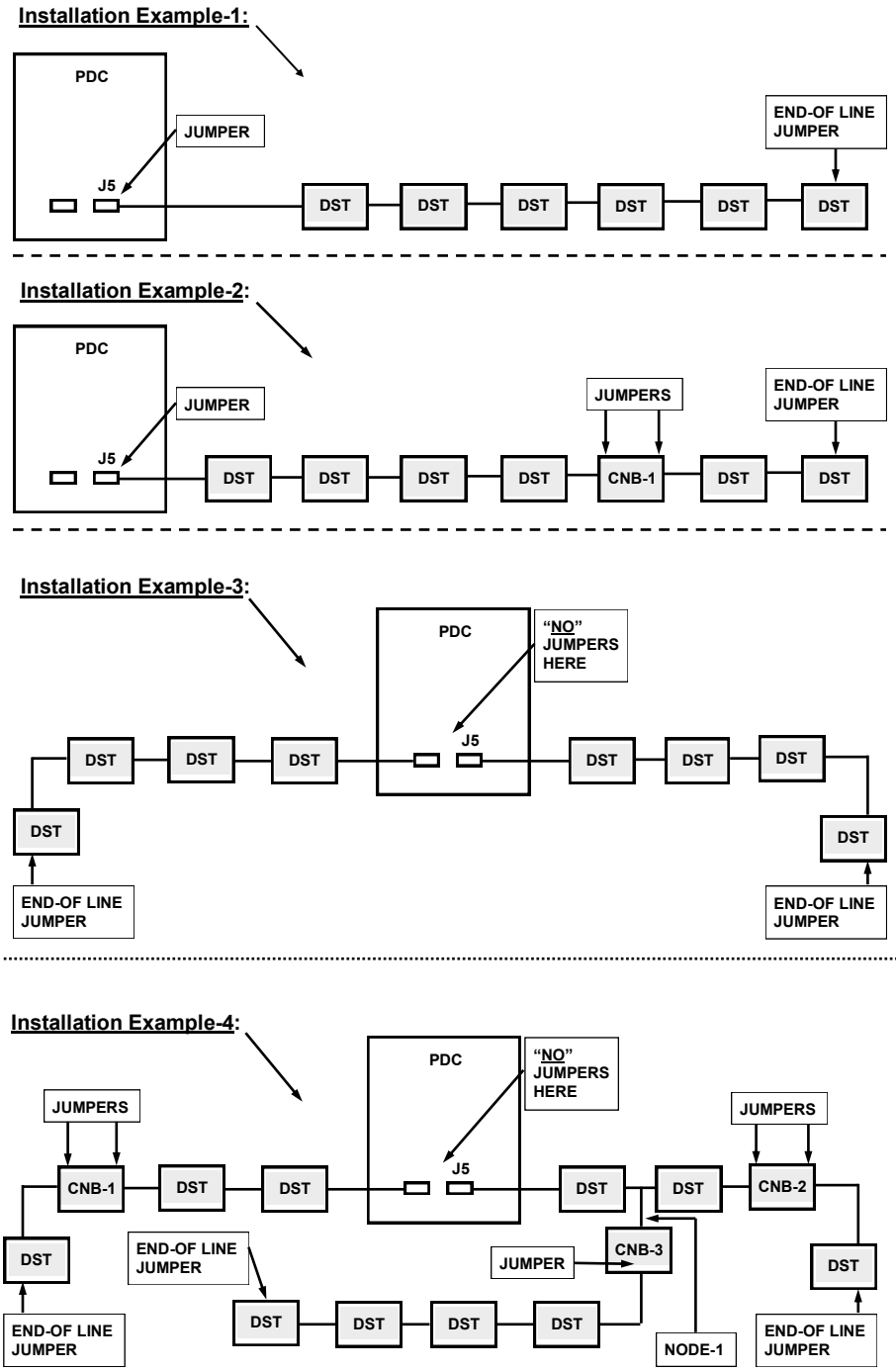
Termination jumpers are required in various areas to ensure communication is established between the PDC controller and the various transmitters and peripheral devices.

3.2 JUMPER SETTINGS AND WIRING EXAMPLES, CONT'D…..

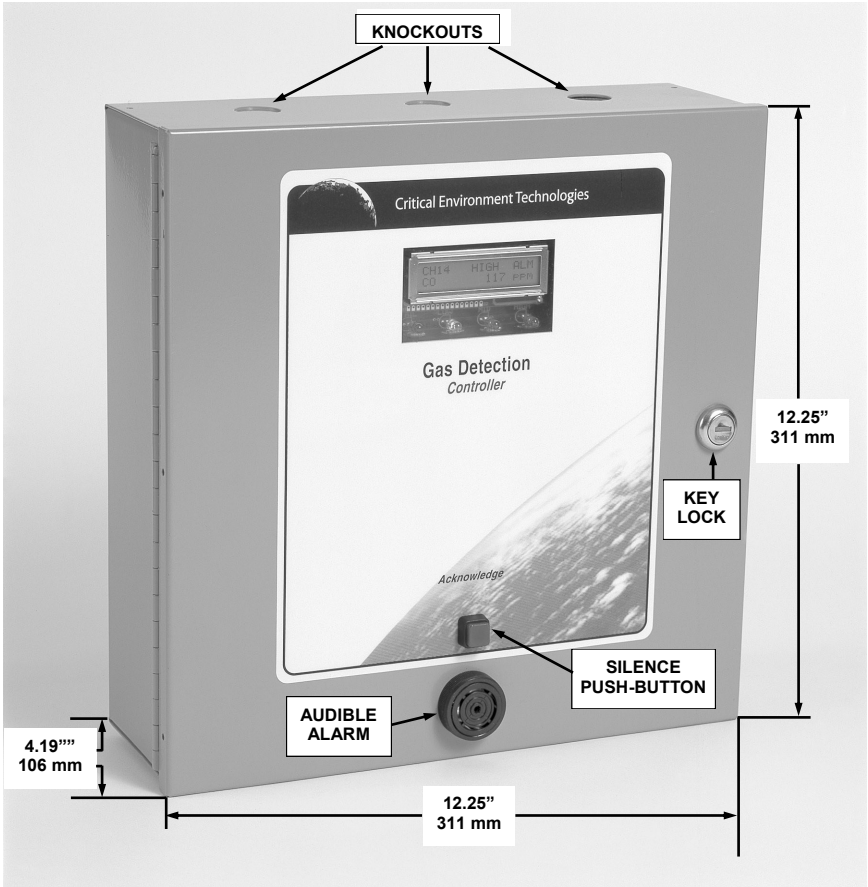
System wiring can originate at the "CAN-IN" or "CAN-OUT" wiring terminals of the PDC. They are parallel connected internally. System wiring can also originate at both and run in two directions to save on conduit and wire.

Several installation examples are described below with correct jumper positions indicated. See the page-12 for diagram layouts to match the examples described below.

Example-1: One run of system wiring at or under 2000' from the PDC controller out to a number of DST transmitters with no CNB bridges required and no remote power supply required. ***One*** jumper is placed at "J5" jumper pin location for ("IN") **or** ("OUT") inside the PDC controller, depending on which wiring terminal strip is utilized. The "IN" or "OUT" terminals can be used for system wiring. They are paralleled inside the circuit. ***One*** jumper is placed at the "J2" jumper pin location inside the DST transmitter located at the end of the system wiring run.



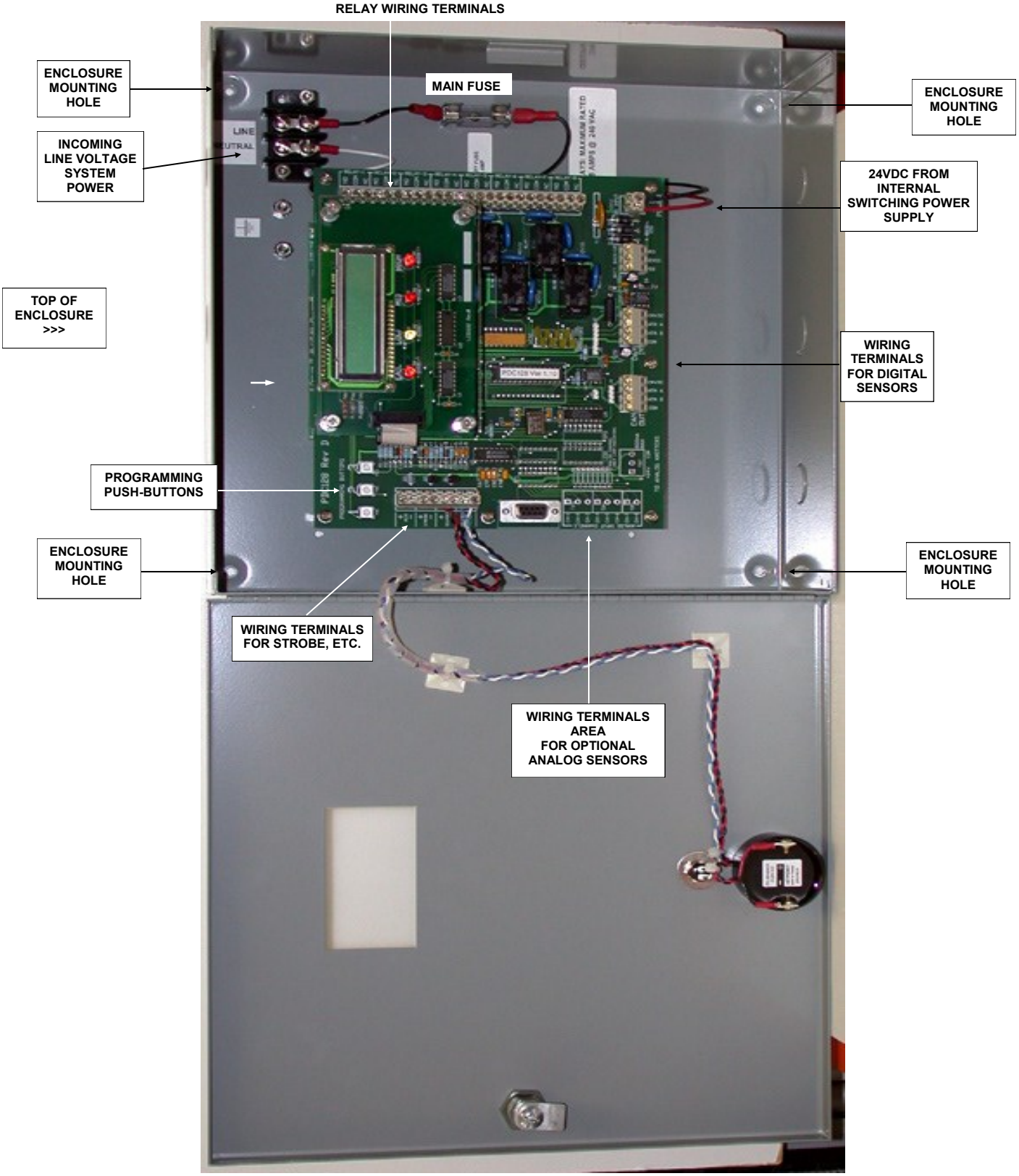
4.0 ENCLOSURE OUTER DIMENSIONS



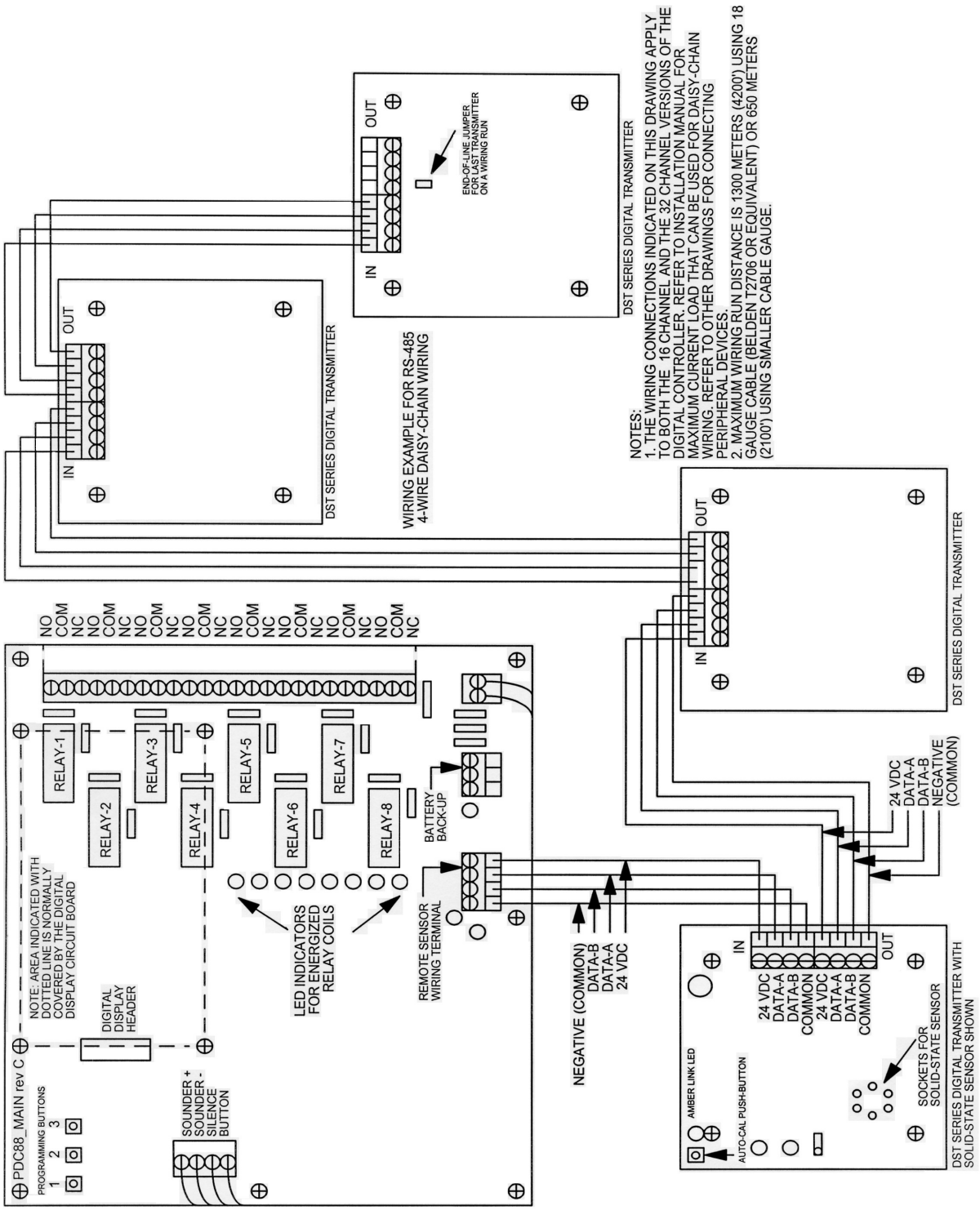
NOTE-1: Three knockouts can be found along the top edge and three along the bottom edge of the system enclosure

NOTE-2: Standard enclosure is powder painted, 18-gauge steel with locking, hinged door. Optional water/dust tight, corrosion resistant enclosures for harsher environments are available. Consult your local authorized distributor for more details.

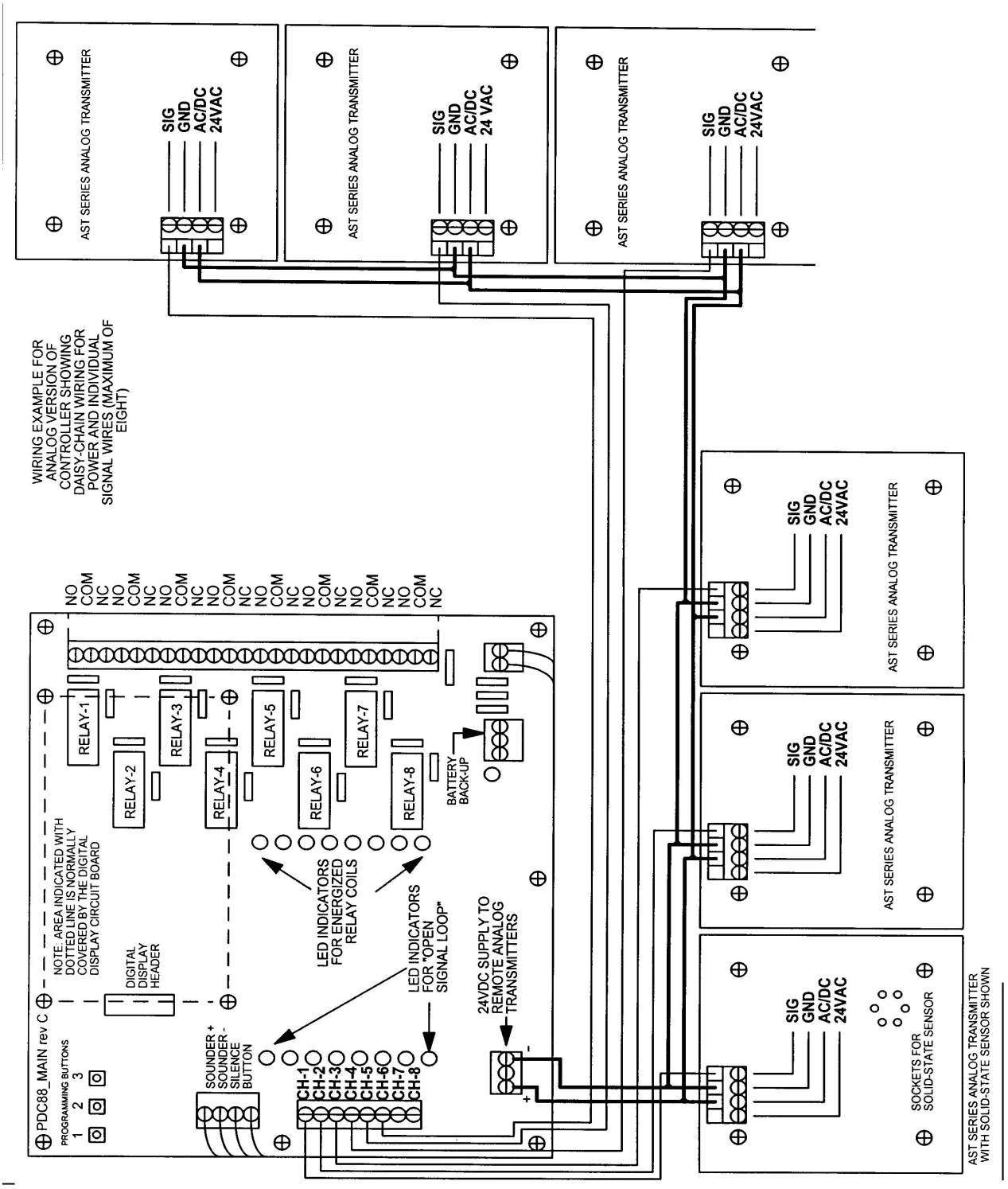
4.1 ENCLOSURE INTERIOR LAYOUT PHOTO



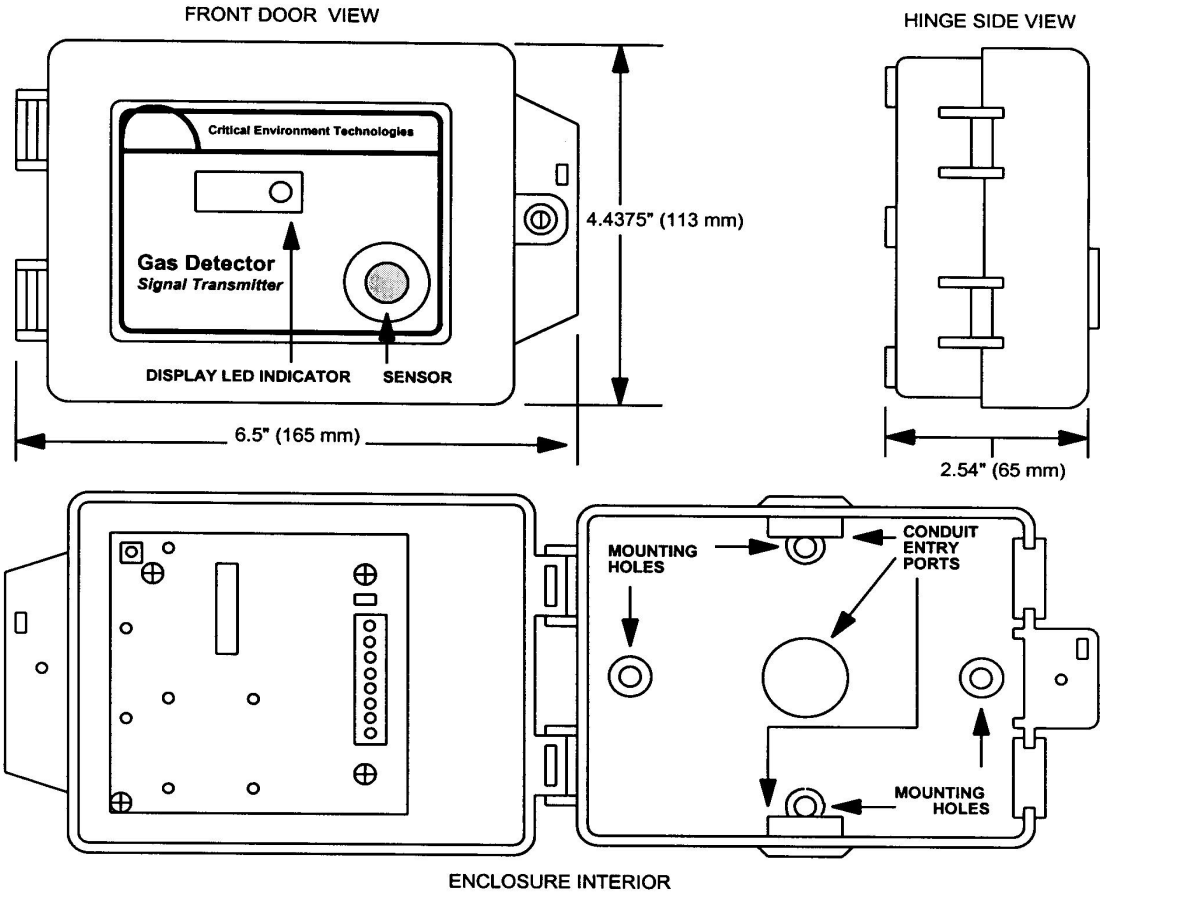
4.2 WIRING CONNECTIONS DRAWING (*DIGITAL)*

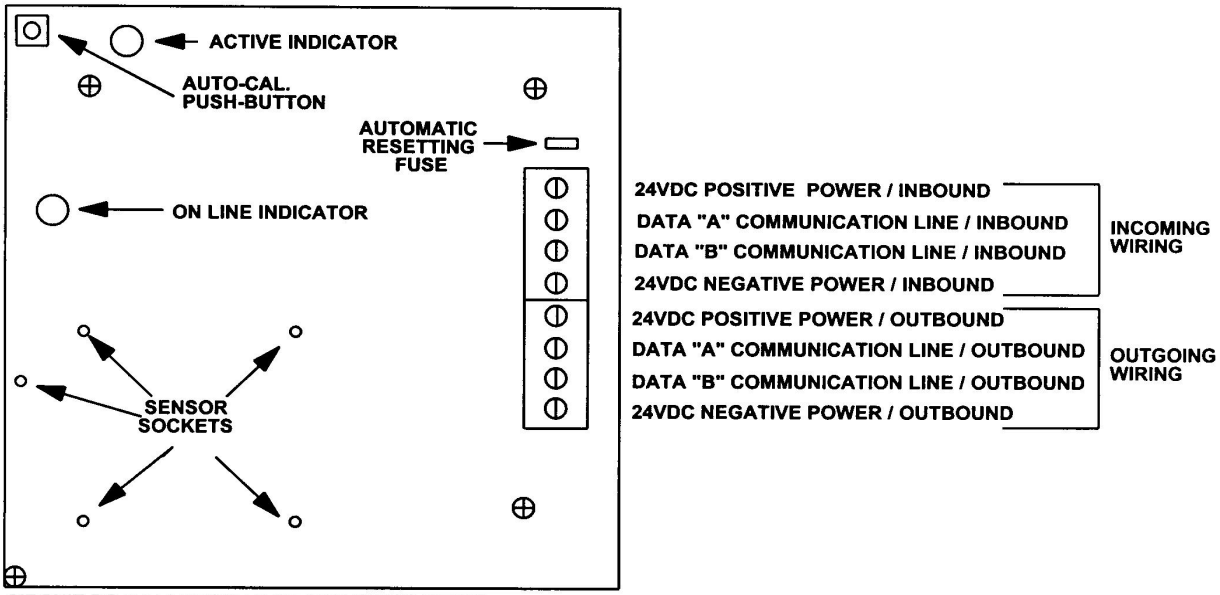


4.3 WIRING CONNECTIONS DRAWING (*ANALOG*)



4.4 DST DIGITAL ELECTROCHEMICAL SENSOR / TRANSMITTER DRAWING

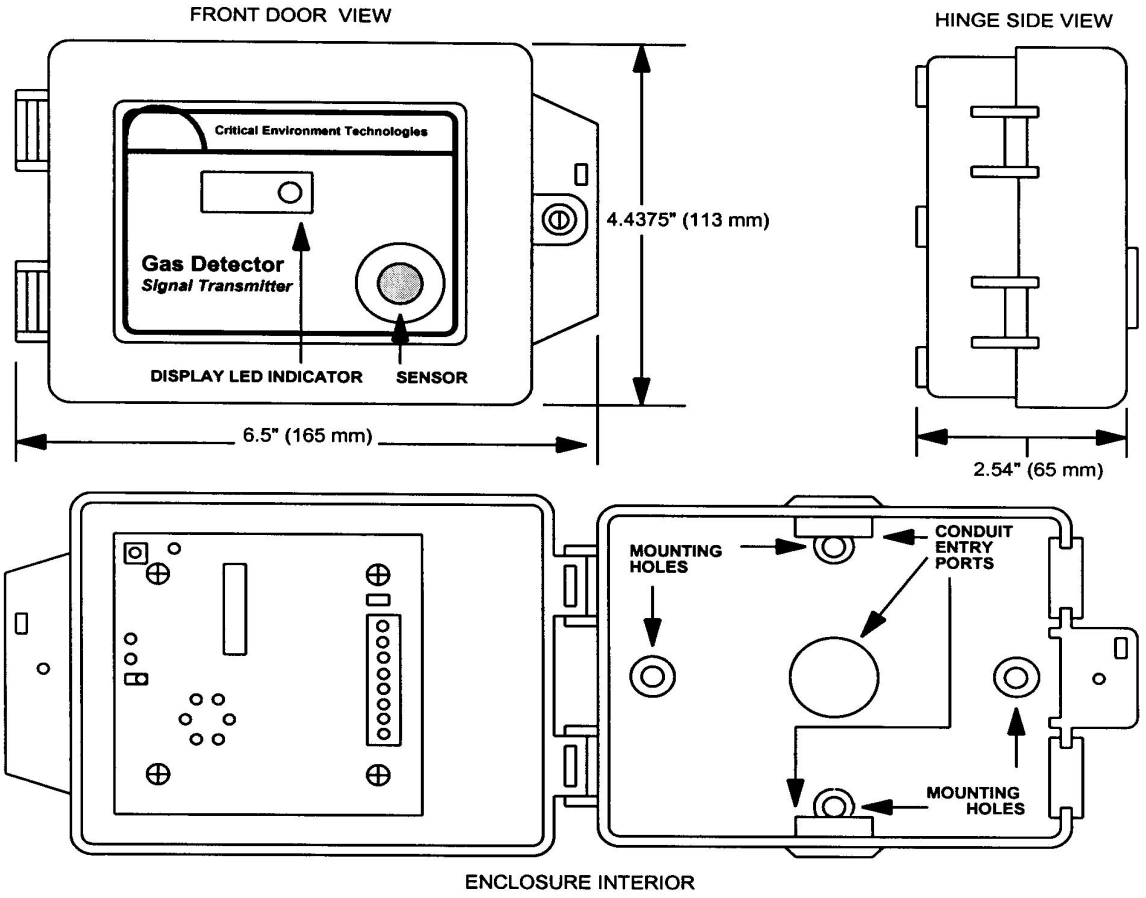


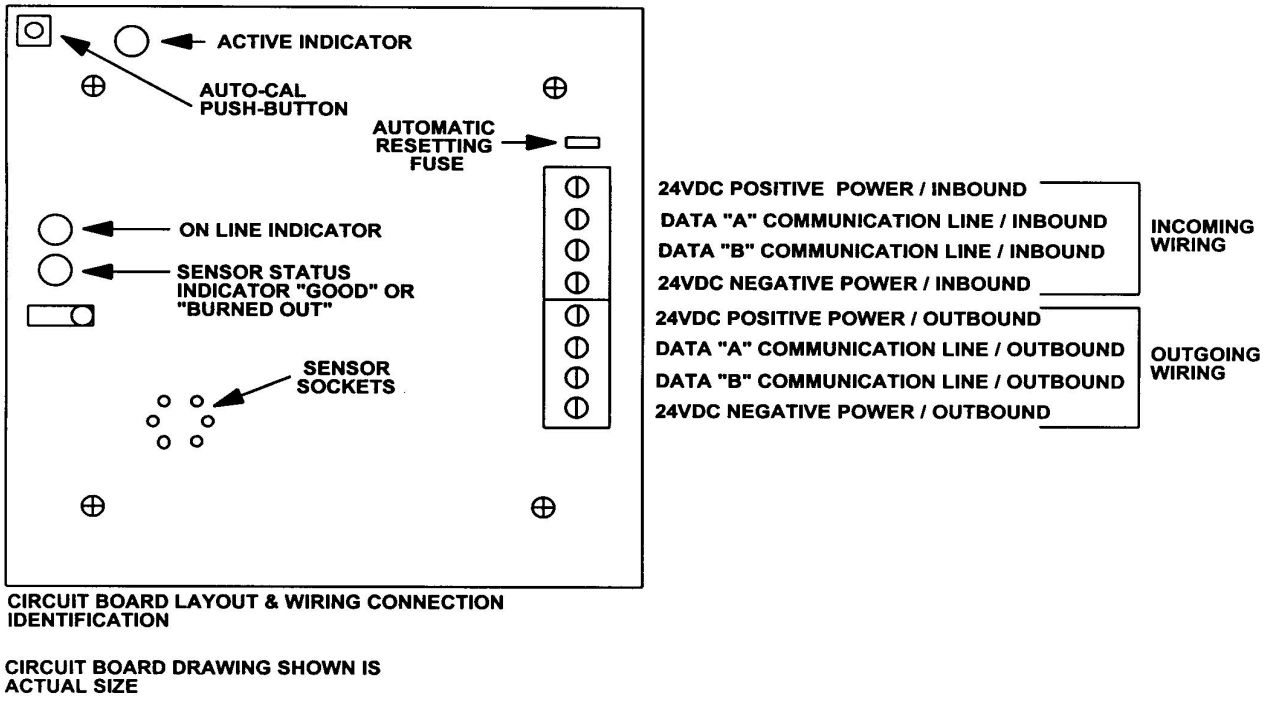


CIRCUIT BOARD LAYOUT & WIRING CONNECTION IDENTIFICATION

CIRCUIT BOARD DRAWING SHOWN IS ACTUAL SIZE

4.5 DST DIGITAL SOLID-STATE SENSOR / TRANSMITTER DRAWING

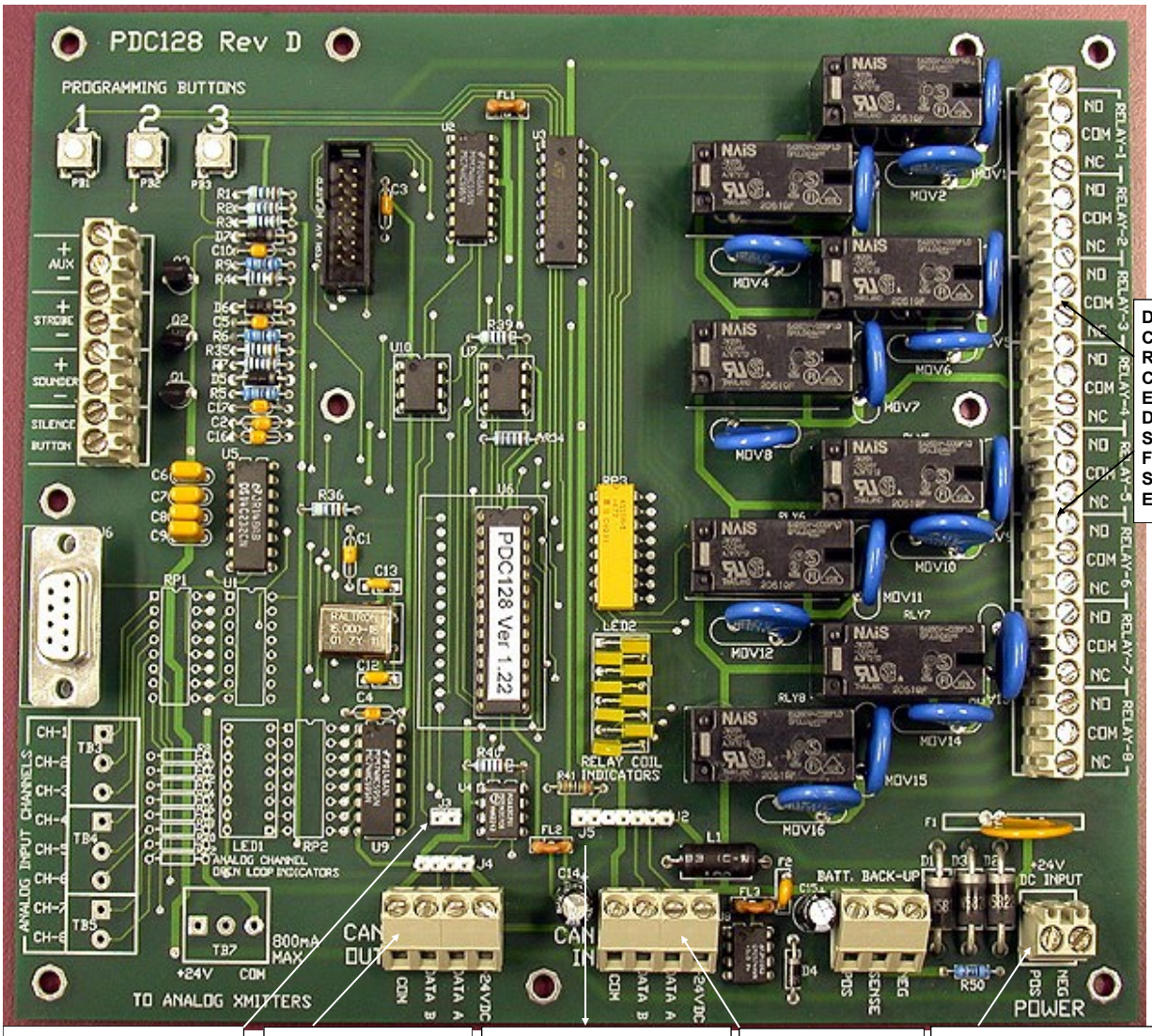




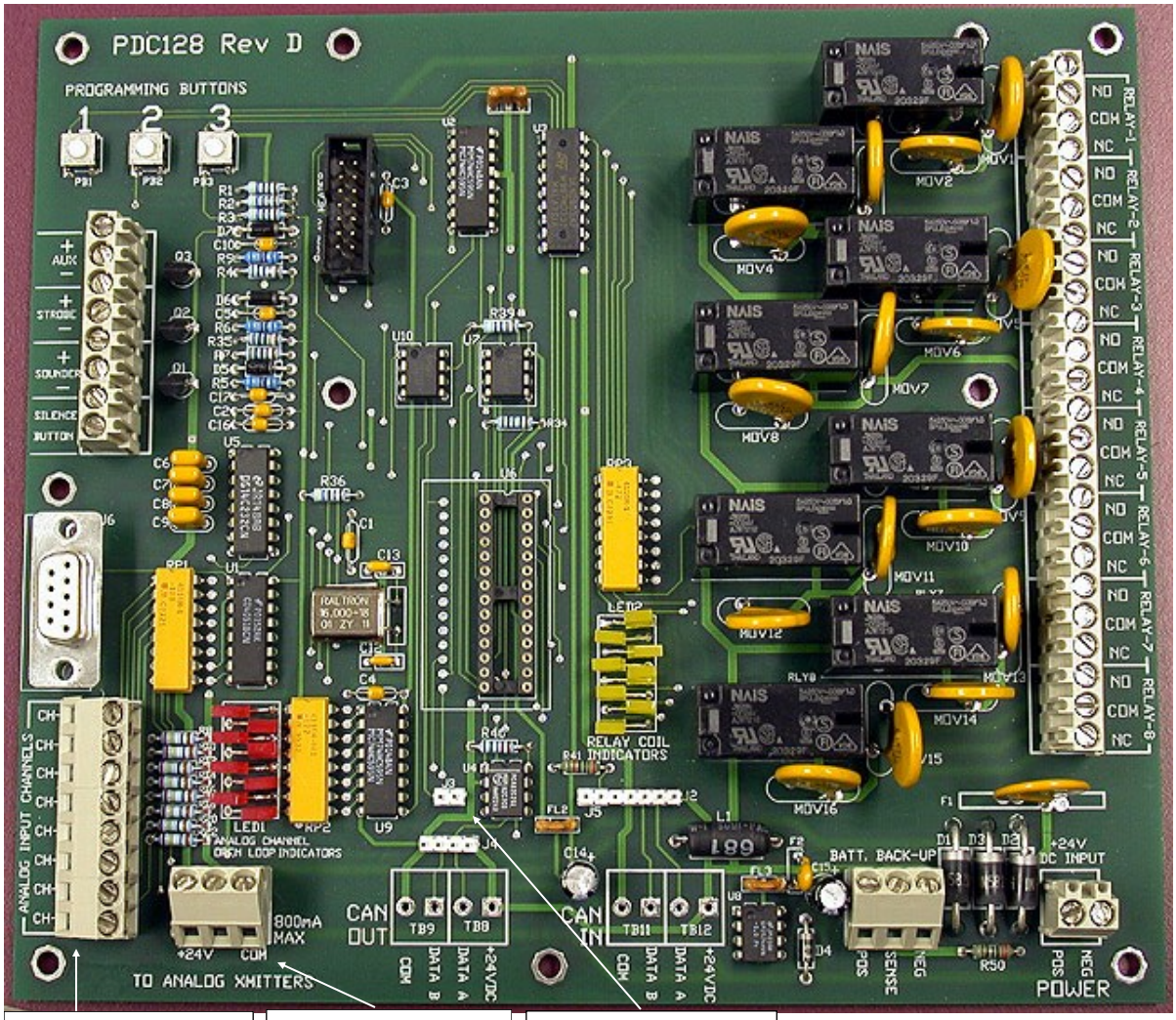
CIRCUIT BOARD LAYOUT & WIRING CONNECTION IDENTIFICATION

CIRCUIT BOARD DRAWING SHOWN IS ACTUAL SIZE

5.0 MAIN CIRCUIT BOARD PHOTO (DIGITAL)



5.1 MAIN CIRCUIT BOARD PHOTO (ANALOG)

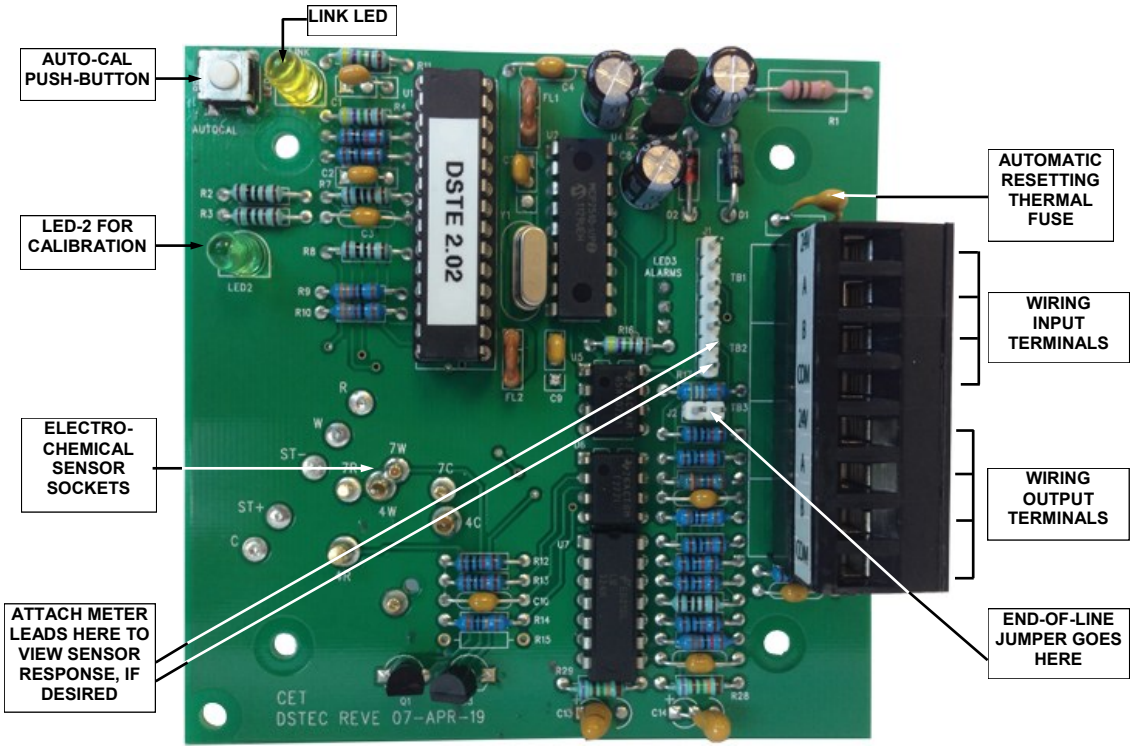


WIRING TERMINAL STRIP FOR INDIVIDUAL ANALOG SIGNAL WIRES FROM ANALOG TRANSMITTERS

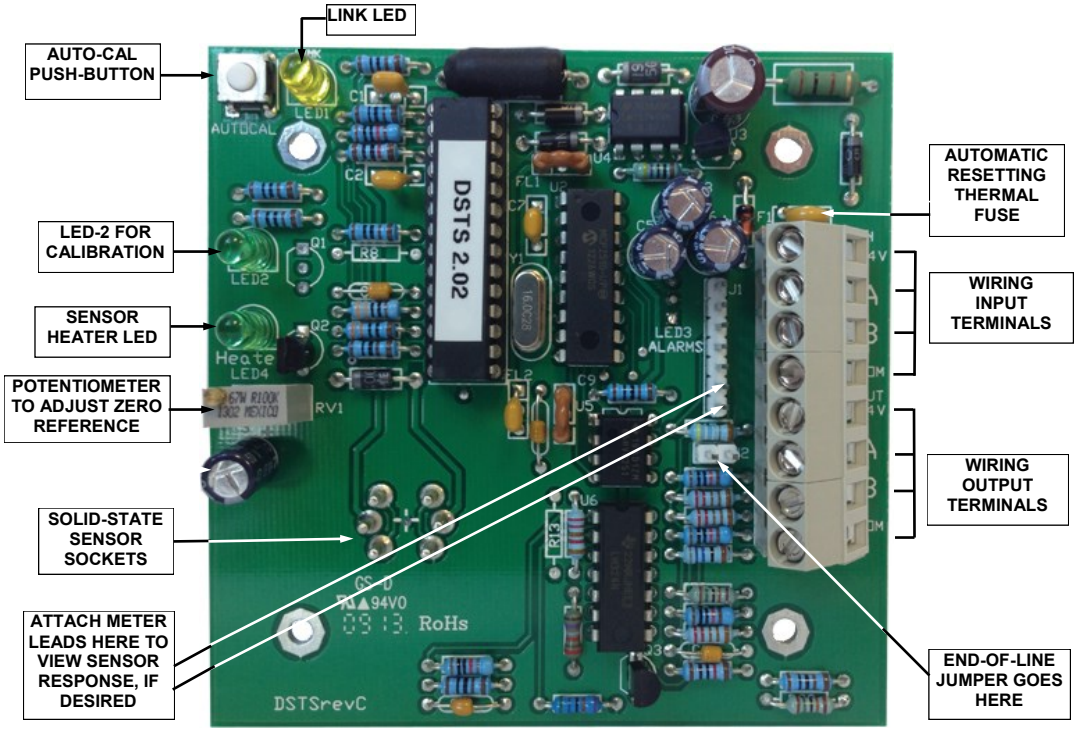
WIRING TERMINAL STRIP SUPPLYING 24VDC TO ANALOG TRANSMITTERS

"J3" JUMPER LOCATION FOR "SYSTEM RESET"

5.2 DST CIRCUIT BOARD PHOTO (ELECTROCHEMICAL)



5.3 DST CIRCUIT BOARD PHOTO (SOLID-STATE)



6.0 SYSTEM OPERATION

Powering up: **Double check wiring connections** at both the PDC controller and the remote mounted DST series digital transmitters or AST series analog transmitters **prior** to powering up the system. Any system that has been damaged because of incorrect wiring is not covered under warranty. ***Important*:** Ensure "end-of-line" jumpers are installed on any transmitters at the end of a wiring run. Reference photos on preceding page for location.

Upon power up, the display will indicate the model series and software version number. Example: "PDC128 ver. # 1.29". The system will immediately start to scroll through all enabled channels, displaying the channel number, alarm status, gas sensor type, and concentration of gas being detected at that particular moment.

Fault Conditions: The micro processor initiates a check of all installed transmitters and performs a self-diagnostics. If one or more of the model DST digital transmitters are not communicating with the main controller, the microprocessor will attempt to communicate with it a number of times. If communication has not been established after approximately six to ten minutes, the display will indicate a "com error", example: "CH 001 Com Error CO - 0 ppm". The display will scroll through all channels and display their individual status, including channels with com errors. If corrections are made to deal with "com errors", it will take up to 4-minutes (for 128-channel systems) before any further communication errors are displayed.

The system software has a "watch-dog" designed into it. The watch-dog is designed to monitor the microprocessor for problems. If the watch-dog detects that the microprocessor has locked up for any reason, it automatically resets it. If the watch dog detects more than three system resets, on the fourth reset, the display will indicate "System Error". A system error is designed to let the user know that something is interfering with the basic operation of the controller.

When a system error has occurred, the auxiliary output (marked "+AUX-"), is activated to provide 24VDC power for an external alarm, if it has been programmed to do this (code "2121"). A system error can be reset by depressing the acknowledge push-button for seven seconds.

Normal Operation: During normal operation the LCD display scrolls through all enabled channels, pausing for approximately 1.5 seconds per id number, displaying the channel number, alarm status, gas type and concentration at that moment.

When an alarm condition occurs, the appropriate alarm level LED on the front panel illuminates and any relays programmed to be activated at the same gas alarm level will de-energize (fail-safe operation) or energize (non fail-safe operation). At high alarm condition, the audible alarm is also activated. It can be silenced by depressing the acknowledge push-button momentarily. If the user has programmed a time delay, each relay will be activated according to the type and duration of delay programmed. The amber colored LEDs located on the main circuit board just to the left of the bottom relay provide a visual indication of the relay coil status. If the coil is energized, the LED is illuminated.

The PDC circuit design also employs the use of filtering devices, mounted on the board beside the relays. These devices are designed to capture EMI (electromagnetic interference) and dump it to ground so it does not interfere with the operation of the microprocessor. It will not stop all EMI but does provide a substantial amount of protection for the main circuit.

If the "strobe" output has been utilized, any 24VDC powered alarm device connected to this terminal strip will be activated by low alarm by default. If the user prefers this alarm to be activated by another gas alarm level, it can be changed by inputting code "2333" and selecting "mid" or "high". This is a universal alarm meaning that any channel in gas alarm will activate it. 12VDC powered alarm devices can also be utilized by requesting the optional miniature 12VDC output circuit board at the time of ordering.

IMPORTANT NOTE: The current capacity of this output is 400 mA.

Battery Back-Up:

It is recommended that the user purchase an "off-the-shelf" UPS system and use it to provide back up battery power to the system. If the user decides on this option, the UPS must be connected to the line voltage input terminal strip of the PDC. CETCI has a standard UPS system available that has been tested with a PDC system.

Power Failure: In the event of a system power failure, first check to ensure that the system primary fuse has not "blown", prior to performing other trouble-shooting functions (reference system interior photo on page-10). The system primary fuse is located just below the incoming power terminal strip (upper right side of system enclosure base). The PDC also has two other fuses for secondary protection. One is located in the switching power supply module underneath the main circuit board. This is a glass, soldered fuse.

The second is an automatic resetting thermal fuse that can be located at the bottom right side of the main circuit board just above the 24VDC input power terminal. This fuse does not have to be replaced. In the unlikely event that this fuse "blows", disconnect one of the 24VDC wires from the switching power supply at the 2-pole wire terminal and allow the thermal fuse about 5 minutes to cool down, then re-connect the wire (reference system interior photo on page-10). The fuse automatically resets itself after it cools down.

In the event of a power failure, any system relays configured as fail-safe will de-energize and if power is intact at devices controlled by the system relays, these devices will be operating continuously until system power has been restored.

Trouble-Shooting: Reference the trouble-shooting section of the manual for more details.

7.0 SYSTEM PROGRAMMING– GENERAL

System Configuration: The PDC controller is completely configurable by the end user. Reference the following pages for more details regarding the configuration of a system.

Programming: 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 upper left corner of the circuit board. 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.

The PDC controller has an extensive menu system that allows the user maximum flexibility, through programming, to achieve a wide range of system functions. ***Important:*** 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”, “Output Control” “Other Codes”. 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 relay outputs for controlling other devices. Other codes provide the user with other functions to customize their system.

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

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

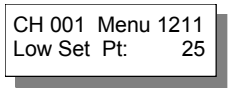
WARNING: CHANGING PROGRAMMING CODES MAY RESULT IN SYSTEM PROBLEMS. DO NOT ATTEMPT WITHOUT CONSULTING THE FACTORY.

7.1 SYSTEM PROGRAMMING– *INPUT* CODES

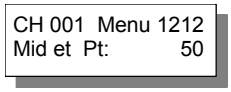
CODE	DESCRIPTION	
1211	Low Alarm Set Point	
1212	Mid Alarm Set Point	
1213	High Alarm Set Point	
2211	Low Alarm Ascending / Descending	
2212	Mid Alarm Ascending / Descending	
2213	High Alarm Ascending / Descending	
3211	Channel Enable / Disable	NEVER DISABLE ALL CHANNELS
3212	Add new Channels setting all channels	(default sensor CO 200 ppm)
1311	Add new Channels keeping sensor type	
3213	Changing Analog Channels 4-20 mA or Volts	
1231	Changing sensor type from list of configured sensors	(page 23)
1223	Setting sensor direction	(common Negative sensors are NO2 and Oxygen)
3312	Zero Mask Number	(used to reduce bounce at Zero reading)
3322	Fault Level Cutoff	(Set fault level for Analog transmitters)
3233	Test Channel Select	
1323	Unlock code	(some codes require unlock code before using)
1221	AutoNull	(DST Electrochemical sensors)
1222	Modify Calibration Gas Concentration	(i.e. 100 ppm CO)
2133	Set Low Input Range	(NULL Value normally 0 for most sensors)
2233	Set High Input Range	(SPAN Value i.e. 200 ppm CO)
2131	Calibrate Low Input Range @ 4 mA A/D	(Analog Channels 1 - 8)
2231	Calibrate High Input Range @ 20 mA A/D	(Analog Channels 1 - 8)

7.2 INPUT CODE DESCRIPTIONS

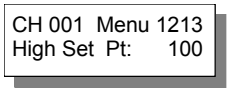
1211 "LOW ALARM SET POINT": This code allows the user to set or change the system low alarm set point. This is the point at which the low alarm LED illuminates and any relays designated as "LOW" are de-energized. To achieve this, enter code "1211" and the LCD indicates the channel number (it always starts at channel-1), the menu number you just entered and the existing low alarm set point. Use the button "1" to decrement this value or button "3" to increment this value. Press button "2" to accept this value and the LCD advances to the next channel. Repeat this procedure for any channels to be changed then press button "2" at the last channel to scroll out of the menu and the LCD goes back to normal operating state.



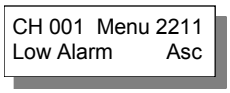
1212 "MID ALARM SET POINT": This code allows the user to set or change the system mid alarm set point. This is the point at which the mid alarm LED illuminates and any relays designated as "MID" are de-energized. To achieve this, enter code "1212" and the LCD indicates the channel number (it always starts at channel-1), the menu number you just entered and the existing mid alarm set point. Use the button "1" to decrement this value or button "3" to increment this value. Press button "2" to accept this value and the LCD advances to the next channel. Repeat this procedure for any channels to be changed then press button "2" at the last channel to scroll out of the menu and the LCD goes back to normal operating state.



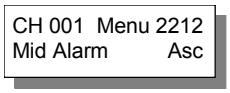
1213 "HIGH ALARM SET POINT": This code allows the user to set or change the system high alarm set point. This is the point at which the high alarm LED illuminates, any relays designated as "HIGH" are de-energized and the front door mounted audible alarm is activated. To achieve this, enter code "1211" and the LCD indicates the channel number (it always starts at channel-1), the menu number you just entered and the existing low alarm set point. Use the button "1" to decrement this value or button "3" to increment this value. Press button "2" to accept this value and the LCD advances to the next channel. Repeat this procedure for any channels to be changed then press button "2" at the last channel to scroll out of the menu and the LCD goes back to normal operating state.



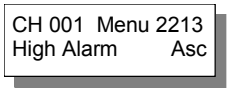
2211 'LOW ALARM ASCENDING / DESCENDING: This code allows the user to set the low alarm response for each channel to be ascending or descending to suit their specific application. To achieve this, input code 2211 and the LCD indicates "CH 01 Menu 2211, Low Alarm Asc". Use button '1" to change to descending "DESC" or button '3" to change to ascending "ASC". Press button "2" to accept change and the LCD will indicate "Finished".



2212 "MID ALARM ASCENDING / DECSENDING": This code allows the user to set the mid alarm response for each channel to be ascending or descending to suit their specific application. To achieve this, input code 2212 and the LCD indicates "CH 01 Menu 2212, Mid Alarm Asc". Use button '1" to change to descending "DESC" or button '3" to change to ascending "ASC". Press button "2" to accept change and the LCD will indicate "Finished".

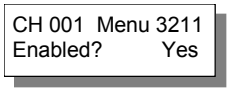


2213 "HIGH ALARM ASCENDING / DECSENDING": This code allows the user to set the high alarm response for each channel to be ascending or descending to suit their specific application. To achieve this, input code 2213 and the LCD indicates "CH 01 Menu 2213, High Alarm Asc". Use button '1" to change to descending "DESC" or button '3" to change to ascending "ASC". Press button "2" to accept change and the LCD will indicate "Finished".



NOTE: This code tells the PDC to respond by activating the LEDs and relays to either the descending alarm (eg: Oxygen sensors) or ascending alarms 9eg: CO sensors).

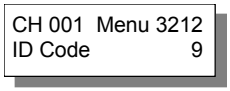
3211 "CHANNEL ENABLE / DISABLE: This code allows the user to enable or disable one or more channels. The channels that have been disabled have not been removed from the enumerated channels on the system, they have simply been ignored by the microprocessor. Disabled channels ***WILL NOT*** be displayed during normal or alarm modes of operation. To achieve this, enter "3211" and the display will look like the box below. Use the "1" or "3" button to select "No" or "Yes" then push the "2" button to scroll to the next channel.



7.2 INPUT CODE DESCRIPTIONS, CONT'D…..

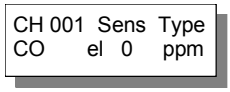
3212 " INPUT ADDRESS": This code is used to initiate and configure the system. First ensure all external devices such as DST transmitters, CAN network bridges, external relay boards or external analog output boards are installed and wired. To achieve this, enter "3212" and the display will look like the box below. Use the "1" or "3" button to scroll down or up to set the desired ID code number then push the "2" button to scroll to the next channel. Alternatively, the user can simply press the "Auto Cal" push-button on each DST in order of their placement on the system. The ID number will increment to the next ID number. The ID number showing when the user presses the auto cal button will become the new ID number of that particular DST. Once the user has set or changed the ID numbers for all channels, they must set the last channel ID number to "Done" by repeatedly pressing the "1" button, then press "2" button to complete this menu function. The display will then indicate "Reinitializing Finished".

1311 " RECONFIGURE INPUT ADDRESS": This code is used to change the and configure the system. First ensure all external devices such as DST transmitters, CAN network bridges, external relay boards or external analog output boards are installed and wired. To achieve this, enter "1311" and the display will look like the box below. Use the "1" or "3" button to scroll down or up to set the desired ID code number then push the "2" button to scroll to the next channel. Once the user has set or changed the ID numbers for all channels, they must set the last channel ID number to "Done" by repeatedly pressing the "1" button, then press "2" button to complete this menu function. The display will then indicate "Reinitializing Finished".



3213 "ANALOG CHANNEL 4-20 MA OR VOLTS": This code allows the user to select the Analog sensor type Voltage or Current being used on a particular channel. To achieve this, enter "3213" Use the "1" or "3" button to scroll down or up through the selections provided then push the "2" button to scroll to the next channel.

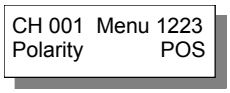
1231 "GAS SENSOR TYPE": This code allows the user to select the type of sensor being used on a particular channel. The decimal and units of measurement are automatically selected for each sensor type. To achieve this, enter "1231" and the LCD will look like the box below. Use the "1" or "3" button to scroll down or up through the selections provided then push the "2" button to scroll to the next channel. Once the user has selected the sensor type, the software will load the default measurement range and alarm set point values into the configuration settings. This function applies to the following applications:



a) If remote analog transmitters (AST) are connected to the system, they must be installed in the order in which they are set up on the PDC system so the 4 - 20 mA incoming signal from each transmitter is displayed as the correct value. If the AST transmitters have been installed in a different order than what was factory programmed, the installer or user must change the gas sensor type for each channel to match the order they were installed in the field.

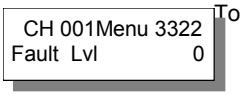
b) If the installer uses code 3212 to realign the remote DST digital transmitters with the PDC and he does not push the white button on the DST in the proper order, they overwrite the factory ID programmed into each DST. Code 1231 must be used to change the gas sensor type for each channel.

1223 "SET SENSOR DIRECTION": This code allows the user to change the sensor direction if a sensor is being changed in an existing DST. Example changing from a positive response sensor (CO) to a negative response sensor (NO2). This MUST be changed when performing this function with then two sensors indicated. The same function also applies to other sensors. Consult the CETCI factory service department if you must make this change in the field. To achieve this, input code '1223" and the LCD indicates "CH 001, Menu 1223, Polarity and POS or NEG (depending on which sensor was supplied from the factory)". Use "1"button to change to "NEG: and "3" button to change to "POS". Press "2" button to accept the change. The LCD indicates "Wait" while it writes the new value to the system memory, then indicates 'Finished".



3312 "SET ZERO MASK NUMBER": Contact Factory

3322 "FAULT LEVEL CUT OFF": This code allows the user to select the current cut off value below which the PDC will indicate a fault condition. The cut off limit is a count value between 0 and 255. To determine the desired count value, use the following formula.

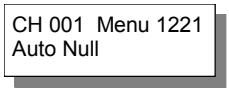


Count value = desired current value X 51 Example: 3.1 mA X 51 = 158 count value. Once the desired count value has been determined, enter code "3322" and the LCD will look like the box below. Use button "1" to decrement the value and button "3" to increment the value. Push button "2" to accept the value and return to normal scrolling.

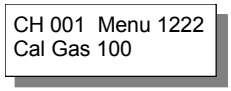
7.2 INPUT CODE DESCRIPTIONS, CONT'D…..

1221 "AUTO NULL": This code allows the user to force the remote DST (digital signal transmitter) to null and reset to zero with clean air flowing. To achieve this, enter code "1221"and the LCD indicates "Channel-1, Menu 1221 and Auto Null". Press button "2" to accept this and the LCD briefly indicates "NULL". Press button "3" to scroll to the next channel, if more than one channel has been enabled. If not, the LCD indicates "\Finished".

Note: If you are not flowing clean air over the sensor, ensure that the background air is clean. If there is a slight background level of target gas, the auto null function will null adjust the transmitter anyway, assuming it is clean.

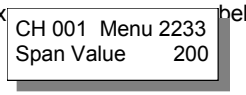


1222 "MODIFY CALIBRATION GAS CONCENTRATION": This code allows the user to change the calibration span gas value to match the value of cylinder span gas they are using to calibrate the sensor. To achieve this, enter code '1222". The LCD indicates CH 001, Menu 1222, and Cal Gas Value. Use button "1" tp decrement this value or button '3" to increment this value. Press "2" button to accept the change. The LCD then indicates "Wait" while it writes the new value to the system memory, then indicates 'Finished".

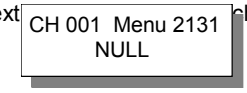


2133 "SET LOW INPUT RANGE" (NULL VALUE): This code allows the user to change or set the null value represented and displayed when the PDC receives a 4.00 mA incoming signal for a specific channel. To achieve this, input code 2133 and the LCD indicates "CH 001, Menu 2133, Null Value = 0". Press button "1" to decrement this value or button "3" to increment this value. Press button "2" to accept the change.

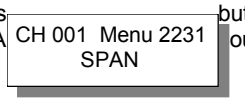
2233 "SET HIGH INPUT RANGE (SPAN VALUE): This **<u>menu pertains to the analog channels only</u>** and allows the user to select the span value range. This is the reported value that appears on the display with a 20.0 mA analog input signal. To achieve this, enter "2233" and the display will look like the box below. Use the "1" or "3" button to decrement or increment then push the "2" button to scroll to the next channel.



2131 "CALIBRATE LOW INPUT RANGE: This code is used to calibrate the analog input channels "low input", for accuracy. Eg; a 4.00 mA input source sets that channel for "0". To achieve this, first connect a 4.00 mA source to analog channel-1, then input code 2131 and the LCD indicates "CH 001, Menu 2131, NULL". Press button "3" and the LCD momentarily indicates "0" as it adjusts the input for channel-1 to "0". Press button "2" to scroll to the next channel and repeat the procedure, remembering to move the accurate 4.00 mA source to the next channel.

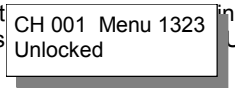


2231 "CALIBRATE HIGH INPUT RANGE": This code is used to calibrate the analog input channels "high input", for accuracy. Eg; a 20.0 mA input source sets that channel for "200" (example for CO sensor). To achieve this, first connect a 20.0 mA source to analog channel-1, then input code 2231 and the LCD indicates "CH 001, Menu 2231, SPAN". Press button "3" and the LCD momentarily indicates 2000" as it adjusts the input for channel-1 to "200". Press button "2" to scroll to the next channel and repeat the procedure, remembering to move the accurate 20.00 mA source to the next channel.



NOTE: An accurate 4.00 mA current source is required to complete this procedure. If an accurate source is not used, the LCD will indicate values that do not correspond to the incoming signal.

1323 "UNLOCK CODE": This code is used to unlock the firmware for specific codes. Some codes are a little more important than others and the user is informed by the fact that they must input the unlock code to access and change them. To achieve this, input code 1323 and the LCD indicates Unlocked" momentarily.



7.2 INPUT CODE DESCRIPTIONS, CONT'D…..

GAS SENSOPR TYPE - CODE 1231 - GAS SENSOR LISTING

DISPLAY INDICATION	GAS TYPE	SENSOR TYPE	UNITS OF MEASURE
CO el 200 ppm	Carbon Monoxide	Electrochemical	ppm
C3H8 ss 50 %LEL	Propane	Solid-state	% LEL (0-50% LEL range)
C3H8 ct 100 %LEL	Propane	Catalytic	% LEL (0-100% LEL range)
CH4 ss 50 %LEL	Methane	Solid-state	% LEL
CH4 ct 100 %LEL	Methane	Catalytic	% LEL (0-100% LEL range)
NO2 el 10.0 ppm	Nitrogen Dioxide	Electrochemical	ppm (1 decimal)
CL2 el 5.0 ppm	Chlorine	Electrochemical	ppm
CL2 el 20.0 ppm	Chlorine	Electrochemical	ppm
NH3 el 500 ppm	Ammonia	Electrochemical	ppm
O2 el 25.0 %Vol	Oxygen	Electrochemical	% Volume (1 decimal)
O2 ga 100.0 %Vol	Oxygen	Electrochemical	% Volume (1 decimal)
O3 el 2.00 ppm	Ozone	Electrochemical	ppm (1 decimal)
O3 el 1.00 ppm	Ozone	Electrochemical	ppm (2 decimals)
CO2 ir 2000 ppm	Carbon Dioxide	Infrared	ppm
CO2 ir 5000 ppm	Carbon Dioxide	Infrared	ppm
CO2 ir 5.0 %Vol	Carbon Dioxide	Infrared	% Volume
CO2 ir 20.0 %Vol	Carbon Dioxide	Infrared	% Volume
CO2 ir 100.0 %Vol	Carbon Dioxide	Infrared	% Volume
R11 ss 2000 ppm	R11 refrigerant	Solid-state	ppm
R12 ss 2000 ppm	R12 refrigerant	Solid-state	ppm
R22 ss 2000 ppm	R22 refrigerant	Solid-state	ppm
R123 ss 1032 ppm	R123 refrigerant	Solid-state	ppm
R134A ss 2000 ppm	R134A refrigerant	Solid-state	ppm
R134A ir 1032 ppm	R134A refrigerant	Solid-state	ppm
R507 ss 2000 ppm	R507 refrigerant	Solid-state	ppm
R407A ss 2000 ppm	R407A refrigerant	Solid-state	ppm
R408A ss 2000 ppm	R408A refrigerant	Solid-state	ppm
R404A ss 2000 ppm	R404A refrigerant	Solid-state	ppm
R410A ir 1032 ppm	R410A refrigerant	Solid-state	ppm
TOL ss 500 ppm	Toluene	Solid-state	ppm
TOL ct 100 ppm	Toluene	Catalytic	ppm
JERTA1 ir 100 %LEL	JET	Infrared	% LEL (0-100% LEL range)
FUEL ss 50 %LEL	Fuel	Solid-state	% LEL (0-50% LEL range)
C4H10 ss 100 %LEL	C4H10	Solid-state	% LEL (0-100% LEL range)
Alco ct 100 %LEL	Alcohol	Catalytic	% LEL (0-100% LEL range)
H2 ct 100 %LEL	Hydrogen	Catalytic	% LEL (0-100% LEL range)
H2 ss 50 %LEL	Hydrogen	Solid-state	% LEL (0-50% LEL range)
H2 el 2000 ppm	Hydrogen	Electrochemical	ppm
C4H8 ss 1000 ppm	C4H8	Solid-state	ppm
N2O el 1000 ppm	N2O	Electrochemical	ppm
TVOC ss 500 ppm	TVOC	Solid-state	ppm
NO el 100 ppm	Nitric Oxide	Electrochemical	ppm
H2S el 50 ppm	Hydrogen Sulphide	Electrochemical	ppm
HCN el 20.0 ppm	Hydrogen Cyanide	Electrochemical	ppm
HCL el 20.0 ppm	Hydrogen Chloride	Electrochemical	ppm
ETO el 20.0 ppm	ETO	Electrochemical	ppm
SO2 el 20.0 ppm	Sulphur Dioxide	Electrochemical	ppm
HF el 10.0 ppm	Hydrogen Fluoride	Electrochemical	ppm
HF el 10.0 ppm	Formaldehyde	Electrochemical	ppm
Temp 0.0 F	Temperature	Customer Supplied	degrees F
Temp 0.0 C	Temperature	Customer Supplied	degrees C
Humid 0 %RH	Relative Humidity	Customer Supplied	% Relative Humidity
Press 0 psi	Pressure	Customer Supplied	pounds per sq. inch

NOTE: Care must be taken to select the correct sensor type with regards to decimal points desired. There can be several menu items with the same sensor type but different sensitivity and default alarm points.

NOTE-4: The ascending/descending set points are not set in this menu item. They are all assumed to be ascending. If a descending alarm point is required (O2) the user must configure that using the menu items that follow.

7.3 SYSTEM PROGRAMMING - *OUTPUT* CODES

CODE	DESCRIPTION	
2331	NORMAL RELAY ACTIVATE (GAS ALARM)	(ALL , SENS , NONE)
2112	SETTING GAS ALARM CHANNELS FOR RELAY MONITORING	(2331 set to SENS)
2323	SETTING RELAY GAS ALARM ACTIVATION LEVEL	(LOW , MID , HIGH)
2321	SETTING RELAY COIL STATE FAIL SAFE	(DE-ENERGIZE ON POWER LOSS)
2313	SETTING RELAY COIL LATCHING STATE	(PUSH BUTTON RELEASE)
2311	SETTING RELAY “ON” TIME DELAY VALUE	
2312	SETTING RELAY “OFF” TIME DELAY VALUE	
3221	RELAY CHANNEL ENABLE	
3132	RELAY TOGGLE	(RELAY TEST FUNCTION)
2332	FAULT RELAY ACTIVATE	(ALL , SENS , NONE)
2113	SETTING FAULT ALARM CHANNELS FOR RELAY MONITORING	(2332 set to SENS)
3222	EXTERNAL RELAY MODULE CODE ID ASSIGNMENT	(ACTIVATE RRM)
2333	STROBE OUTPUT ACTIVATION LEVEL	(LOW , MID , HIGH)
2122	STROBE OUTPUT AT FAULT ALARM	(YES , NO)
3131	BUZZER AUDIBLE ACTIVATION LEVEL	(LOW , MID , HIGH)
2121	BUZZER AUDIBLE ALARM AT FAULT CONDITION	(YES , NO)
3133	AUXILIARY OUTPUT ACTIVATION LEVEL	(LOW , MID , HIGH)
2123	AUXILIARY OUTPUT AT FAULT ALARM	(YES , NO)
3313	AUXILIARY OUTPUT FOR SYSTEM ALARM	(YES , NO)
3232	REMOTE ANALOG OUTPUT ADDRESS INITIALIZATION	(ACTIVATE RAO)
3231	CHANNEL ENABLE 4 - 20 MA ANALOG OUTPUT MODULE	
3112	MONITORING CHANNEL(S) FOR 4 - 20 MA OUTPUT MODULE	
1321	SETTING LOW (NULL VALUE) FOR 4 - 20 mA OUTPUT MODULE	
1322	SETTING HIGH (SPAN VALUE) 4 - 20 mA OUTPUT MODULE	
1331	CALIBRATING LOW (NULL) OF 4 - 20 mA OUTPUT MODULE	
1332	CALIBRATING HIGH (SPAN) OF 4 - 20 mA OUTPUT MODULE	
3332	VOLTMETER ON ANALOG CHANNELS	(1.0 4 MA - 5.0 20 MA)
3123	INITIALIZE SYSTEM DEFAULTS	
1113	FACTORY DEFAULTS	
3311	ENABLE / DISABLE REMOTE DISPLAY MODULE	
3223	UART ENABLE	
3113	UART CATCHER OR PROTONODE (BACNET)	
3331	WDT (WATCH DOG TIMER) TEST	

7.4 OUTPUT CODE DESCRIPTIONS

2331 "NORMAL RELAY ACTIVATE (GAS ALARM)": This menu item is used to select the type of alarms which will activate each relay. There are 3 choices in this menu item; "Sense", "All" or "None". In the "Sense" mode, any channel listed in menu item 2112, which goes into alarm, will cause a specific relay to activate. The maximum number of channels that can be associated with any one relay is 32. In the "All" mode, any channel that is in alarm will cause a specific relay to activate. In the "None" mode, no channel alarms will activate a specific relay. To achieve this, enter "2331" and the display will look like the box below. Use the "1" or "3" button to scroll down or up through the choices then push the "2" button to scroll to the next relay and eventually out of this menu code function. If you are not configuring all the relays, use the "2" button to scroll to the end of this menu and the display will indicate "Finished".

```
RL 001  Menu 2331
Normal Act     Sens
```

2112 "SETTING GAS ALARM CHANNELS FOR RELAY MONITORING": In this menu item the user can select the channel(s) which will be monitored for gas alarm conditions for each relay. Any channel included in this list, which goes into gas alarm will cause a specific relay to activate as long as the menu item "2331" has been set to "Sense". The maximum number of channels that can be associated with any one relay is 32. The choices are from 1 to 128 or "none". To achieve this, enter "2112" and the display will look like the box below. The first number displayed indicates the first channel on the monitored list for that relay. Pressing "2" repeatedly allows the user to view which channels are listed for monitoring by each relay. When the display indicates "done", this means you are at the end of the list. If you wish to add more channels, use the button "3" to increment to that channel number. Once you have added all the channels to be associated with that relay, press button "2" until the display once again indicates "done" then press button '2" once more to scroll to the next relay. Repeat this procedure until all desired channels have been associated with specific relays. At the last relay (8), press button '2" to scroll out of the menu and the display will indicate "Finished".

```
RL 001  Menu 2112
Mon Channel      1
```

2323 "SETTING RELAY GAS ALARM ACTIVATION LEVEL": This menu item allows the user to select the gas alarm activation level for each relay. The choices are "Low", "Mid" or "High" gas alarm. To achieve this, enter "2323" and the display will look like the box below. Use the "1" or "3" button to scroll down or up through the choices then push the "2" button to scroll to the next relay. If you are not configuring all the relays, use the "2" button to scroll to the end of this menu and the display will indicate "Finished".

```
RL 001  Menu 2323
Act Level        Low
```

2321 "SETTING RELAY COIL STATE FAIL SAFE": This menu function sets the relays to "normally energized" or "not normally energized" state when the circuit is in non-gas-alarm state. Normally energized is what we designate as "Fail-safe". To achieve this, enter "2321" and the display will look like the box below. Use the "1" or "3" button to select "No" or "Yes" then push the "2" button to scroll to the next relay. If you are not configuring all the relays, use the "2" button to scroll to the end of this menu and the display will indicate "Finished".

```
RL 001   Menu 2321
Fail Safe ?      Yes
```

2313 "SETTING RELAY COIL LATCHING STATE": This menu item sets the "latching" state of a relay. If a relay has been set to latching, it will not de-energize once the gas or fault alarm condition is removed. The only way to clear the relay is to press and hold the acknowledge push-button for approximately 7 seconds. To achieve this, enter "2313" and the display will look like the box below. Use the "1" or "3" button to select "No" or "Yes" then push the "2" button to scroll to the next relay. If you are not configuring all the relays, use the "2" button to scroll to the end of this menu and the display will indicate "Finished".

```
RL 001  Menu 2313
Latching?        No
```

2311 "SETTING RELAY "ON" TIME DELAY VALUE": This menu function allows the user to select the "ON" time delay *(delay on Make)* for each relay on the system. The "ON" delay is the amount of time after an alarm has been initiated until the relay is activated. The number displayed is in minutes, so 0.1 = 6 seconds. If the alarm goes away before the relay is activated, the relay will not activate. If a fault alarm is assigned to a specific relay and a fault occurs, the "On" delay has no affect and the relay will be activated immediately. To achieve this, enter "2311" and the display will look like the box below. Use the "1" or "3" button to scroll down or up through the values then push the "2" button to scroll to the next relay. If you are not configuring all the relays, use the "2" button to scroll to the end of this menu and the display will indicate "Finished". The delay time increments at a rate of 0.1 minutes per step change. Example: 0.6 minutes = 36 seconds.

```
RL 001  Menu 2311
On Delay         0.0
```

```
RL 001  Menu 2312
Off Delay        0.0
```

2312 "SETTING RELAY "OFF" TIME DELAY VALUE": This menu function allows the user to select the "OFF" time delay *(delay on Break)* for each relay on the system. The "OFF" delay is the amount of time the relay stays activated after an alarm is removed. The number displayed is in minutes, so 0.1 = 6 seconds. The delay is also in effect for fault relay activation. To achieve this, enter "2312" and the display will look like the box below. Use the "1" or "3" button to scroll down or up through the values then push the "2" button to scroll to the next relay. If you are not configuring all the relays, use the "2" button to scroll to the end of this menu and the display will indicate "Finished". The delay time increments at a rate of 0.1 minutes per step change. Example: 0.6 minutes = 36 seconds.

3221 "RELAY ENABLE / DISABLE": This code allows the user to enable or disable a specific relay. The choices are "Yes" or "No". To achieve this, enter "3221" and the display will look like the box below. Use the "1" or "3" button to select 'No" or "Yes" then push the "2" button to scroll to the next relay. If you are not configuring all the relays, use the "2" button to scroll to the end of this menu and the display will indicate "Finished".

```
RL 001  Menu 3221
Enabled?        Yes
```

3132 "RELAY TOGGLE": This menu item allows the user to toggle each of the relays manually. The user simply enters "3132" and the display will look like the box below. **NOTE**: When this code is first entered, the system automatically de-energizes all relays. The user must first re-energize all relays prior to the toggle function. To achieve this, push the "2" button and select "energized", then use the "3" to scroll to the next relay and once again push the "2" and so on until you have re-energized all eight relays. Once you have re-energized relay-8, push the "1" button to scroll back to relay-1.

```
RL 001  Menu 3132
Relay  Ctrl      off
```

2332 "RELAY FAULT ACTIVATION": This menu item is used to select the type of faults which will activate each relay. There are 4 choices in this menu; "Sense", "All", "All+" or "None". The "Sense" mode allows any channel, listed in menu item 2113, which goes into fault to cause the relay to activate. In the "All" selection, any channel that is in fault condition will cause the relay to activate. In the "All+" mode, any channel which is in fault or a system fault will cause a specific relay to activate. The maximum number of channels that can be associated with any one relay is 32. To achieve this, enter "2332" and the display will look like the box below. Use the "1" or "3" button to scroll down or up through the choices then push the "2" button to scroll to the next relay. If you are not configuring all the relays, use the "2" button to scroll to the end of this menu and the display will indicate "Finished".

```
RL 001  Menu 2332
Fault   Act      All
```

2113 "SETTING FAULT ALARM CHANNELS FOR RELAY MONITORING": In this menu item the user can select the channel(s) which will be monitored for fault alarm conditions for each relay. Any channel included in this list, which goes into fault alarm will cause a specific relay to activate as long as the menu item "2331" has been set to "Sense". The maximum number of channels that can be associated with any one relay is 32. The choices are from 1 to 128 or "none". To achieve this, enter "2113" and the display will look like the box below. The first number displayed indicates the first channel on the monitored list for that relay. Pressing "2" repeatedly allows the user to view which channels are listed for monitoring by each relay. When the display indicates "done", this means you are at the end of the list. If you wish to add more channels, use the button "3" to increment to that channel number. Once you have added all the channels to be associated with that relay, press button "2" until the display once again indicates "done" then press button '2" once more to scroll to the next relay. Repeat this procedure until all desired channels have been associated with specific relays. At the last relay (8), press button '2" to scroll out of the menu and the display will indicate "Finished".

```
RL 001  Menu 2113
Mon Channel      1
```

3222 "EXTERNAL RELAY MODULE CODE ID ASSIGNMENT": This code allows the user to add a remote relay module to a PDC system by setting the digital ID (address) so the PDC will recognize it. The device must be installed, wired and powered up to accomplish this. To achieve this, input code "3222" and the LCD will look like the box below. At this point, someone must walk over and push the small white button located on the bottom left corner of all the remote relay module board. The ID code-1 indicate on the LCD will automatically advance to "2". If more than one relay module has been installed, walk to the next relay module and press the small white button on it. This causes the ID code to advance to "2". Repeat this procedure for each installed relay module. Next, use the "1" button to scroll down to "Done" on the LCD then push the "2" button. The LCD indicates 'Wait" while it acknowledges the new ID coded device(s).

```
RL 001  Menu 3222
ID code          1
```

NOTE: If an external relay module is attached to the system, it must be activated within the PDC system before it will respond to any communication from the PDC. Reference section 9.0, page-31 for more details.

7.4 OUTPUT CODE DESCRIPTIONS, CONT'D…..

2333 "STROBE OUTPUT ACTIVATION LEVEL": This code controls the gas alarm level at which the "strobe" output (24VDC @ 400 mA maximum) is activated (upper left side of main board). The choices are a universal Low, Mid or High gas alarm. To achieve this, input code '2333" and the display will look like the box below. Use button "1" or button '3" to scroll through the selections then push button "2" to accept the change. The LCD indicates "Wait".

```
ST       MENU 2333
Strobe Lvl       High
```

2123 "ACTIVATING STROBE OUTPUT AT FAULT ALARM": This code allows the user to determine if the strobe output (24VDC) should be activated with a PDC fail condition. To achieve this input code "2123". The LCD looks like the box below. Use button "1" to select 'No" or button '3" to select "Yes". Next, push button "2" to accept the change

```
ST 001    Menu 2122
Fault Act          No
```

3131 "ON-BOARD AUDIBLE ACTIVATION LEVEL": This menu item allows the user to select the alarm level which will trigger the audible alarm on the front enclosure door. The choices are low, mid or high alarm. To achieve this, input "3131" and use the "1" or "3" button to decrement or increment through the choices**.** Press the "2" button to exit this menu item. Once the audible alarm has been activated, it can be silenced by momentarily pressing the "Acknowledge" button of the enclosure front door. The audible will cease to make noise as long as there is a qualified alarm present. Once the alarm(s) have dropped below the activation threshold, the audible will be activated again. System default is to high alarm setting.

```
BUZZ     Menu 3131
Buzzer  Lvl     HIGH
```

2122 "ACTIVATING THE INTERNAL AUDIBLE ALARM AT FAULT CONDITION": This code allows the user to determine if the internal audible alarm should be activated with a PDC fail condition. To achieve this input code "2122". The LCD looks like the box below. Use button "1" to select 'No" or button '3" to select "Yes". Next, push button "2" to accept the change.

```
BUZ 001 Menu 2121
Fault Act          No
```

3133 "AUXILIARY OUTPUT ACTIVATION LEVEL": This code controls the gas alarm level at which the auxiliary output (24VDC @ 400 mA maximum) is activated. The choices are a universal Low, Mid or High gas alarm. To achieve this, input code '3133" and the display looks like the box below. Use button '1" or button "3" to scroll through the choices. Push button "2" to accept the change.

```
Aux       Menu 3133
Aux  Act  Lvl  High
```

2121 "ACTIVATING AUXILIARY OUTPUT AT FAULT ALARM": This code allows the user to determine if the auxiliary output (24VDC) should be activated with a PDC fail condition. To achieve this input code "2121". The LCD looks like the box below. Use button "1" to select 'No" or button '3" to select "Yes". Next, push button "2" to accept the change.

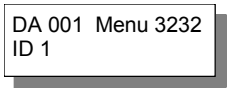
```
AUX       Menu 2123
Fault Act          No
```

3313 "ENABLE AUXILIARY OUTPUT FOR SYSTEM ALARM": This menu code is used to set the "Aux" (auxiliary) output terminal to provide 24VDC to activate an external alarm to act as a PDC system alarm. This will be activated in the event that the firmware "watchdog" has already automatically reset the microprocessor three times because of a problem. On the fourth time, the auxiliary output will be activated. Maximum current available through this terminal for driving an external alarm is 400 mA.

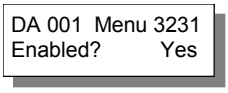
```
AUX001 Menu 3313
Aux=WDT Ext   Yes
```

7.4 OUTPUT CODE DESCRIPTIONS, CONT'D…..

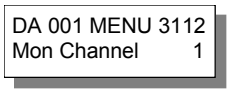
3232 "REMOTE ANALOG OUTPUT ADDRESS INITIALIZATION": This code allows the user to add remote analog output module(s) to a PDC system by setting the digital ID (address) so the PDC will recognize it. The device must be installed, wired and powered up to accomplish this. To achieve this, input code "3232" and the LCD will look like the box below. At this point, someone must walk over and push the small white button located on the bottom left corner of all the remote analog output module boards. The ID code-1 indicate on the LCD will automatically advance to "2". If more than one analog output module has been installed, walk to the next output module and press the small white button on it. This causes the ID code to advance to "2". Repeat this procedure for each installed output module. Next, use the "1" button to scroll down to "Done" on the LCD then push the "2" button. The LCD indicates 'Wait" while it acknowledges the new ID coded device(s).



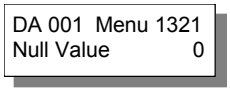
3231 "ENABLE 4 - 20 MA ANALOG OUTPUT MODULE": This code allows the user to enable or disable any analog output modules (M/N RAO-8) attached to the system. To achieve this, input code '3231 and the LCD looks like the box below. Use button "1" to select "No" or button "3" to select "3". Then push button "2" to scroll to DAC 002 and perform the same operation. Pressing button "2" after DAC 008 moves the user out of the menu and back to normal scrolling.



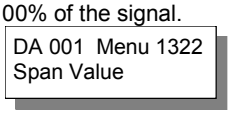
3112 "MONITORING CHANNEL(S) FOR 4 - 20 MA OUTPUT MODULE": This code allows the user to select which channels each 4-20 mA output of the analog output module will monitor. To achieve this enter "3112" and the LCD will look like the box below. Press "2" to select the first channel to monitor. If no other channels are to be monitored by this output, push button "2" again until the LCD indicates "done". Press button "2" once again to scroll to analog output 2. Repeat these steps for each output channel.



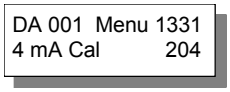
1321 "SETTING LOW (NULL VALUE) FOR 4 - 20 mA OUTPUT MODULE": This code allows the user to set a value representing the 4.00 mA output. Example: Typically 4.00 mA would represent "0" ppm or "0" % LEL gas, so the user would set this value to "0". To achieve this, input code "1321" and the LCD will look like the box below. Use the "1" button to decrement the value or the "3" button to increment the value. When you have set the value to the desired number, push the '2" button and the menu scrolls to the next DAC output. Once you have set a value for all eight outputs, the display will indicate "wait" then go back to normal monitoring and scrolling all enabled channels. The settable scale is 0 to 100 representing 0 to 100% of the signal. **NOTE:** DAC = Digital to Analog Converter



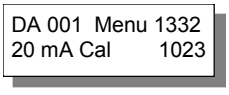
1322 "SETTING HIGH (SPAN VALUE) 4 - 20 mA OUTPUT MODULE": This code allows the user to set a value representing the 20.0 mA output. Example: Typically 20.0 mA could represent "200" ppm or "100" % LEL gas, so the user would set this value to "200" or "100". To achieve this, input code "1322" and the LCD will look like the box below. Use the "1" button to decrement the value or the "3" button to increment the value. When you have set the value to the desired number, push the '2" button and the menu scrolls to the next DAC output. Once you have set a value for all eight outputs, the display will indicate "wait" then go back to normal monitoring and scrolling all enabled channels. The settable scale is 0 to 100 representing 0 to 100% of the signal.



1331 "CALIBRATING LOW (NULL) OF 4 - 20 mA OUTPUT MODULE": This code allows the user to calibrate the "Null" (4.00 mA) output of the DAC. To achieve this, the user must use an accurate digital multi-meter.

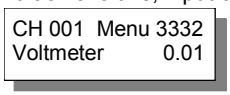


1332 "CALIBRATING HIGH (SPAN) OF 4 - 20 mA OUTPUT MODULE": This code allows the user to calibrate the "Span" (20.0 mA) output of the DAC. To achieve this, the user must use an accurate digital multi-meter.

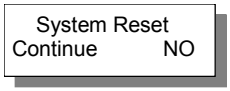


7.4 OUTPUT CODE DESCRIPTIONS, CONT'D…..

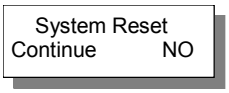
3332 "MESSURE ANALOG INPUT VOLTAGES": This code allows the user to measure the analog input without having a external volt meter To achieve this, input code "3332" and the LCD looks like the box below. Use button "3" to increment channels to monitor.



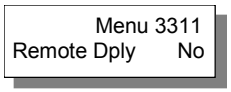
3123 "INITIALIZE SYSTEM DEFAULTS": This menu item resets the system configuration back to the original setup. It should ***not*** be attempted unless the user has been thoroughly trained in the programming of PDC system software and understands the consequences. The entire PDC must be re-programmed after using this menu code. To achieve this, first enter "1323" the unlock code then enter "3123" and the display will look like the box below. Use the '1" or "3" button to select "yes" or "no". Use the "2" button to scroll out of this menu function. If the user selects yes, the system will be reinitialized and the display will indicate "No Channels Enabled". This indicates to the user that the entire system must be re-programmed before use.



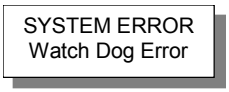
1113 "FACTORY DEFAULTS": This menu item resets the system configuration back to the factory defaults. It should ***not*** be attempted unless the user has been thoroughly trained in the programming of PDC system software and understands the consequences. The PDC must be re-programmed after using this menu code. To achieve this, first enter "1323" the unlock code then enter "1113" and the display will look like the box below. Use the '1" or "3" button to select "yes" or "no". Use the "2" button to scroll out of this menu function. If the user selects yes, the system will be reinitialized and the display will indicate "CH 001 OK". This will be the same as if a new Firmware ship had been installed.

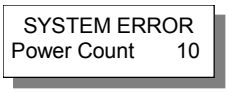


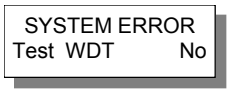
3311 "ENABLE / DISABLE REMOTE DISPLAY MODULE": This code allows the user to add one or more remote display module(s) (Remote Annunciator) to the PDC BUS system. The remote annunciator simply reproduces the information indicated on the PDC LCD and LED lights as well as activating it's own audible alarm when the PDC main internal audible alarm is activated. The user can silence the audible with the on board silence push button. To achieve this, input code "3311" and the LCD looks like the box below. Use button "1" to select "No" or button "3" top select "Yes". Push button "2" to accept the change and the LCD indicates "Finished".



3331 "WDT (WATCH DOG TIMER) TEST": This code allows the user to view information about specific problems that may have occurred with the PDC system. It also displays a power counts indicating if the microprocessor has experienced any fluctuations from brown outs or power outages. It identifies specific problems that have occurred. To view this, input code 3331 and the display will look like the box below. It then quickly indicates the power count box then the last box is indicated asking the user if they want to test the Watch Dog Timer. Use button "3" to change to Yes or button "1" to change to No then press button "2" and the display indicates 'finished".







8.0 CALIBRATION OF DST SENSOR / TRANSMITTERS

Frequency: All sensors require regular calibration maintenance to ensure accuracy and indeed to confirm that they have not expired. Electrochemical sensors installed in applications such as parking facilities should be gas calibrated a minimum of once per year. A frequency of once every six months is preferred.

Sensors installed in applications that must specially meet the need for Occupational Health & Safety standards should be gas calibrated once every six months. These sensors should be gas tested once per month with a known concentration of target gas.

Analog: Refer to calibration details provided in the installation/operation manual supplied with the AST analog transmitter.

Note: All sensors are shipped pre-calibrated from the factory. If the end user absolutely wants to perform a calibration on the digital sensors, then follow the "manual-cal" procedure on the next page.

Digital: The DST transmitter is equipped with an "Auto Cal" feature to simplify the calibration procedure. For proper calibration, the correct span gas concentration value must be entered into the DST (code "1222"). This is accomplished at the PDC controller.

To change this value, depress push-button #1 to decrement the value or push-button #3 to increment the value. Holding the push-button will scroll the numbers quickly. Once the correct value is achieved, depress push-button #2 to accept the value and take you to the next active channel. Repeat this procedure for all active channels.

NOTE-1: The "Auto-Cal" function will not activate if a background gas level above "5" is detected.

NOTE-2: The green power LED showing through the door of the DST is a multi-function, tri-colour LED. Different colours are utilized for different functions.

At the transmitter, open the enclosure door and ensure the amber "Link" LED is illuminated. Prepare for "Auto-Cal" by applying zero air to the sensors for approximately 2-minutes or inserting the calibration adapter plug with both caps attached for approximately 5-minutes, to ensure sensor is not responding to any background gas. The first step in the auto calibration function is "Auto-Null".

Next, depress the "Auto-Cal" push-button. The green LED (LED-2) located internally (upper left side of board) on the DST circuit board will illuminate and the green power LED will begin to flash amber.

At this point, begin flowing span gas. When the DST recognizes the gas flow, the internal green LED is illuminated and the front green LED will flash alternately amber and red. After a 3-minute timed sequence, the outer LED will illuminate as solid red at the alarm level set for that channel and the transmitter will save the calibration data and resume normal operation. During the calibration procedure, the DST will not transmit the gas value information to the PDC.

Do not press the "Auto-Cal" push-button again unless you want to abort the calibration function. In the event that the push-button is pressed again, the calibration function will be aborted, however, the new null value will be retained and entered. The new null value will not affect any previous saved calibration values.

The digital display for the channel being calibrated on the PDC controller will not show any numbers until the auto-cal process is complete.

Depending on the concentration of calibration span gas utilized, the PDC controller may indicate an alarm condition immediately after completion of the auto-cal function as the sensor recovers from the exposure to span gas.

NOTE-1: "IMPORTANT" When calibrating solid-state sensors only, remember to humidify the span gas. CETCI calibration kits contain a humidification chamber specifically for this purpose. Remove the sponge from the chamber and wet it thoroughly with water. Wring out the excess water so the sponge is quite damp and place the sponge back into the chamber. Connect to cylinder regulator and flow span gas as per instructions on previous page. If the monitored environment is in a very humid climate, simply do not wring out as much water, leaving the sponge wetter. DO NOT USE THE HUMIDIFICATION CHAMBER WHEN CALIBRATING ELECTROCHEMICAL SENSORS.

NOTE-2: If the DST does not see gas for more than 60 seconds, the auto-cal function will automatically terminate and not affect any previous calibration performed.

NOTE-3: The sensors utilized in the DST solid-state version have a heated element. If the sensor burns out, a fault condition is created at the PDC controller. As a quick trouble-shooting reference, the solid-state sensor DST circuit board has a green LED (as indicated in the photo on page-21) which goes out. This indicates the fault condition was caused by a burned out sensor element.

9.0 PERIPHERAL DEVICES

Extra Relays: If the target application will require more than eight relay contacts, optional remote relay modules (M/N RRM-8) can be purchased and attached to the system wiring run. Each module provides eight only S.P.D.T. dry contact relays rated 5 amps @ 240 VAC. The extra relays can be programmed from the system codes. The RRM-8 can be remotely installed and wired directly into the BUS wiring. It receives it's power from the PDC. After installation, double check wiring then refer to page-28, code "3222" for specific instructions to set up this device. This procedure MUST be followed or the PDC will not recognize this device.

Analog Output Signal: Optional analog output modules (M/N RAO-8) can be purchased and attached to the system wiring run. Each module provides eight only individual analog output signals 4 - 20 mA. The analog outputs can be programmed from the system codes. (Consult factory for details). The RAO-8 can be remotely installed and wired directly into the BUS wiring. It receives it's power from the PDC. After installation, double check wiring then refer to page-28, code "3232" for specific instructions to set up this device. This procedure MUST be followed or the PDC will not recognize this device.

Remote Annunciation: This peripheral device (M/N RAP-128) provide the user with a remote display, alarm lights and audible alarm. It can be installed remotely from the PDC and wires directly into the BUS wiring system. It receives it's power from the PDC through the BUS wiring. When the PDC controller goes into alarm and the audible is activated, the audible on the remote annunciator is also activated. The user can use the local silence button to silence it. Silencing the local audible does not affect the audible alarm on the PDC controller. This device has no digital ID and therefore will display data received from the PDC without any setup procedure.

10.0 ADDING ANALOG TRANSMITTERS TO AN EXISTING DIGITAL SYSTEM

If the user wishes to add analog transmitters (AST series) to an existing system that has only digital transmitters (DST series) connected, the following procedure must be followed:

1) Open all the doors of all DST digital transmitters.

2) At the PDC controller, Input code "3212" and the display will indicate "CH-1 ID #9". Using the "1" button, scroll down to ID code #1. Press "2" button to accept this. The display will automatically scroll to the next channel (channel-2) and display the assigned ID number which should be "10"). At this point, the user must walk around and push the auto cal button on each DST digital transmitter in the order that he wishes them to appear in the scrolling display.

11.0 MODEL AND PART NUMBERS

MODEL NUMBERS	DESCRIPTION
PDC-A0808	Analog system with 8 inputs and 8 relays
PDC-D1608	Digital system with 16 inputs and 8 relays
PDC-D3208	Digital system with 32 inputs and 8 relays
PDC-D6408	Digital system with 64 inputs and 8 relays
PDC-D9608	Digital system with 96 inputs and 8 relays
PDC-D12808	Digital system with 128 inputs and 8 relays
RPS-24V	Switching power supply module c/w wall mount enclosure (Maximum 1.7 amp current load each)
RRM-8	Relay module c/w wall mount enclosure (8-relays each)
RAO-8	Analog output module c/w wall mount enclosure (8-analog outputs each)

PART NUMBERS	DESCRIPTION
PDC-EN	Standard metal locking enclosure c/w Lexan label (does not include audible alarm or silence push-button)
PDC-LEDM	LED digital display module
PDC-LCDM	LCD digital display module
PDC-SPSB	Switching power supply circuit board
PDC-MBA	Main analog mother board circuit board
PDC-MBD	Main digital mother board circuit board
DST-ETB	Electrochemical digital transmitter circuit board
DST-STB	Solid-state digital transmitter circuit board

NOTE: Consult factory for a more extensive list of part numbers.

12.0 TROUBLE-SHOOTING

If after 10 min of operation there are errors in the system the following check list should be carried out.

1) Check that there is adequate power on the system.
   a) 120VAC (main control board)
   b) 24VDC line on the system wiring run (at each DST)

2) Check that all the link (amber) lights are “on” (DST’s and other external circuit boards).

3) Check that there are no open loops on the analog inputs (analog systems only).

4) Check that the wiring is correct at the system wiring terminals and analog inputs .

5) Check that there is proper termination on **both ends** of the system wiring run. This includes each node.

NOTE: A node is a branch circuit where a bridge has been installed on the bus.

With the POWER “OFF” check the following

1) Check that there in infinite resistance between the 24VDC and the ground (COM) on the system wiring.

2) Check that remote power supplies inputs have been correctly wired (parallel) to the system at a DST or CNB bridge.

3) Check that there is infinite resistance between the signal lines data-A and data-B and the ground (COM) on the system wiring.

4) Check that there is infinite resistance between the Signal lines data-A and data-B.

NOTE: If termination (jumpers) has been placed on the CNB bridges or DSTs then the resistance should be either 60 ohms or 30 ohms depending on the value on the termination resistor.

With the POWER OFF

1) Checking the Signal lines data-A and data-B: In order to check that the data-A and data-B wires are correctly wired to the proper inputs the following procedure can be used

a) Remove all termination jumpers.

b) At one end of the branch circuit tie the data-A line (short) to the common (COM). This can be accomplished by pulling the A line out of its position in the terminal block and inserting it, along with the common wire into the COM position on the terminal block

c) Measure the resistance across the data-A line and the COM at the other end of the branch circuit. This should be short (zero resistance). IF NOT then there is a break in either the data-A line or the COM wire.

d) Measure the resistance between the data-B line and the COM. This should be infinite resistance. IF NOT then there is a cross in the wires some where.

e) Replace the data-A wire back into the data-A position on the terminal block.

f) Carry out the same procedure with the data-B wire. The resistance between the data-B wire and the COM at the other end of the node should be zero and the resistance between the COM wire and the data-A wire should be infinite.

g) Reconnect the data-B wire to the data-B position in the terminal block and replace the termination jumpers.

h) Check that there are no shorts between the 24VDC and COM.

I) Check that there is either infinite resistance between data-A line and COM and the data-B line and COM. If there are termination jumpers installed this should be either 60 or 30 ohms depending on the termination resistors installed.

12.0 TROUBLE-SHOOTING, CONT'D…..

With the POWER ON

1) Check the voltage on the 24VDC line. A reading of anywhere between 24.0 VDC to 20.0VDC is acceptable. Anything below 20.0 VDC is unacceptable.

2) Set the controller into 3323 mode

Check the voltage between the data-A line and COM. This should be roughly 2.5 volts. Check this voltage at both ends of the node. A reading of anywhere between 2.0 VDC to 3.0VDC is acceptable.

Check the voltage between the data-B line and COM. This should be roughly 2.5 volts. Check this voltage at both ends of the node. A reading of anywhere between 2.0 VDC to 3.0VDC is acceptable.

Hardware:

1) Check that all the link lights (amber) are "on" at the DSTs and all external circuit boards, with the system in normal operation

2) Check that the analog inputs are on channels 1 through 8. (if any are enabled)

3) Check that the external relays operate correctly.

a) Enter menu item 3132

b) Toggle each relay.

NOTE: Each external relay board adds 8 relays to the system so check that there are the correct number of relays indicated.

With the POWER ON

4) Insure that the DST's are correctly associated with the correct channel number.

a) Enter the menu code 3323

b) Cycle through the analog channels (1 – 8) (if there are any)

c) Cycle to the first DST channel

d) Check the DST to ensure that the amber link light is illuminated for each channel

e) Either press the autocal button on the DST or enter 1221 then select the channel number associated with each DST

f) Check that each DST is working correctly

g) Enter the menu item 3233

h) Scroll to the first DST in the list.

i) Flow some value of gas on to the DST

j) Check the value displayed on the screen

12.0 TROUBLE-SHOOTING, CONT'D…..

Software

1) Check System Error/WDT Test Menu 3331. The display will indicate what the source of the error is then a number. Next it will ask if you wish to test the WDT.

2) Stack Overflow – Software error call factory

3) Stack Underflow– Software error call factory

4) Brown Out – There has been a problem with the power. Check power.

5) Watch dog time out. The unit has encountered a software problem call factory

6) External relay board problem. A problem with an external relay had occurred. Check operation of external relay boards with menu item 3132.

7) Power Count - The power count indicates the number of watchdog time outs that have occurred. When the unit has had 4 watchdog time outs the unit will display "SYSTEM ERROR"

NOTE: Powering the system off then on again will clear out all errors and reinitialize the system

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