Critical Environment Technologies™

Operation Manual

Rev. A | 2019.09

CXT Explosion Proof Transmitter

www.critical-environment.com

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1 POLICIES

1.1 Important Note

Read and understand this manual prior to using this instrument. Carefully read the warranty policy, service policy, notices, disclaimers and revisions on the following pages.

This product must be installed by a qualified electrician or trained technician and according to instructions indicated in this manual. This instrument should be inspected and calibrated regularly by a qualified and trained technician. For more information, refer to sections *10 Maintenance* and *8 Calibration* of this manual.

This instrument is designed to be intrinsically safe and can be used in classified hazardous areas (explosion-rated environments).

INSTRUMENT SERIAL NUMBER:

_____

PURCHASE DATE:

_____

PURCHASED FROM:

_____

1.2 Warranty Policy

• Disconnect power before servicing
• Supply: 24 V

Critical Environment Technologies Canada Inc. (CETCI), also referred to as the manufacturer, warrants this instrument, (excluding sensors, battery packs, batteries, pumps and filters) to be free from defects in materials and workmanship for a period of **two years from the date of purchase from our facility.** The sensors have a warranty period of **one year on a pro-rated basis from the date of purchase from our facility**. If the product should become defective within this warranty period, we will repair or replace it at our discretion.

The warranty status may be affected if the instrument has not been used and maintained per the instructions in this manual or has been abused, damaged, or modified in any way. This instrument is only to be used for purposes stated herein. The manufacturer is not liable for auxiliary interfaced equipment or consequential damage.

Due to ongoing research, development, and product testing, the manufacturer reserves the right to change specifications without notice. The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of this data.

All goods must be shipped to the manufacturer by prepaid freight. All returned goods must be pre-authorized by obtaining a Returned Merchandise Authorization (RMA) number. Contact the manufacturer for a number and procedures required for product transport.

1.3 Service Policy

CETCI maintains an instrument service facility at the factory. Some CETCI distributors / agents may also have repair facilities; however, CETCI assumes no liability for service performed by anyone other than CETCI personnel.

Repairs are warranted for 90 days after date of shipment (sensors have individual warranties).

Should your instrument require non-warranty repair, you may contact the distributor from whom it was purchased or you may contact CETCI directly.

Prior to shipping equipment to CETCI, contact our office for an RMA #. All returned goods must be accompanied with an RMA number.

If CETCI is to do the repair work, you may send the instrument, prepaid, to:

Attention: Service Department
Critical Environment Technologies Canada Inc.
Unit 145, 7391 Vantage Way
Delta, BC, V4G 1M3

Always include your Returned Merchandise Authorization (RMA) number, address, telephone number, contact name, shipping / billing information, and a description of the defect as you perceive it. You will be contacted with a cost estimate for expected repairs, prior to the performance of any service work.

For liability reasons, CETCI has a policy of performing all needed repairs to restore the instrument to full operating condition.

Pack the equipment well (in its original packing if possible), as we cannot be held responsible for any damage incurred during shipping to our facility.

1.4 Copyrights

This manual is subject to copyright protection; all rights are reserved. Under international and domestic copyright laws, this manual may not be copied or translated, in whole or in part, in any manner or format, without the written permission of CETCI.

1.5 Disclaimer

Under no circumstances will CETCI be liable for any claims, losses or damages resulting from or arising out of the repair or modification of this equipment by a party other than CETCI service technicians, or by operation or use of the equipment other than in accordance with the printed instructions contained within this manual or if the equipment has been improperly maintained or subjected to neglect or accident. Any of the forgoing will void the warranty.

1.6 Revisions

This manual was written and published by CETCI. The manufacturer makes no warranty or representation, expressed or implied including any warranty of merchantability or fitness for purpose, with respect to this manual.

All information contained in this manual is believed to be true and accurate at the time of printing. However, as part of its continuing efforts to improve its products and their documentation, the manufacturer reserves the right to make changes at any time without notice. Revised copies of this manual can be obtained by contacting CETCI or visiting www.critical-environment.com.

Should you detect any error or omission in this manual, please contact CETCI at the following address:

Critical Environment Technologies Canada Inc.
Unit 145, 7391 Vantage Way, Delta, BC, V4G 1M3, Canada
Toll Free: +1.877.940.8741
Telephone: +1.604.940.8741
Fax: +1.604.940.8745
Email: marketing@cetci.com
Website: www.critical-environment.com

In no event will CETCI, its officers or employees be liable for any direct, special, incidental or consequential damages resulting from any defect in any manual, even if advised of the possibility of such damages.

2 INTRODUCTION

2.1 General Description

Thank you for purchasing our CXT Explosion Proof Transmitter for electrochemical, infrared and catalytic sensor.

The CXT is a fixed-point monitor designed to provide continuous monitoring of hazardous gases in the workplace. Monitored values are displayed in their engineering units as well as graphically such as bar graphs or 30-minute trends (see Figure 1).

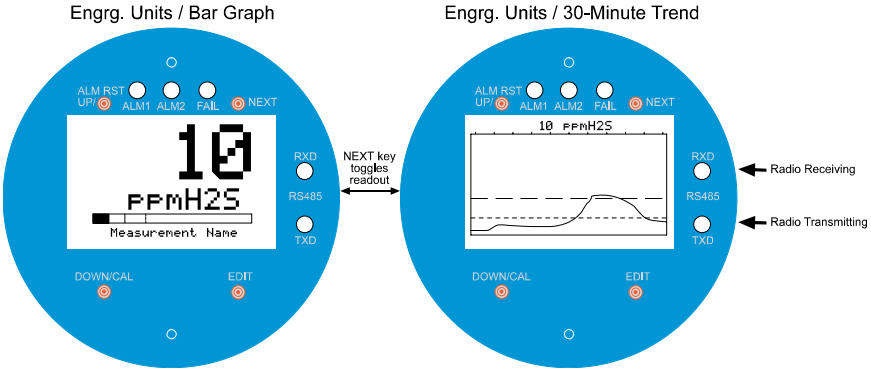

Figure 1: Engineering Units Data Displays: Bar Graph (Left), 30-Minute Trend (Right)

Input types include electrochemical toxic and oxygen sensors, catalytic bead combustible sensors, MOS solid-state sensors, as well as various millivolt, volt and 4 - 20 mA inputs. Sensors supplied by the factory include an 8-wire Smart Sensor interface capable of configuring data uploads to the CXT. Traditional 3-wire simple sensors, without the smart interface, are also supported by the CXT. Its advanced microcontroller electronics and superior graphic LCD operator interface offer enhanced diagnostics and fault analysis not possible in competing products. The CXT provides a standard 4 - 20 mA output signal for connection to control systems or other alarm instrumentation. Available options include an Alarm Relay / RS-485-Modbus board or an isolated 4 - 20 mA output. Non-volatile memory retains all configuration data during power interruptions. The magnetic, non-intrusive calibration can be easily performed by a single person without opening the enclosure. A standard Real Time Clock and Calendar feature allows data logging of calibrations and alarm events for recall to the LCD readout or over the serial port.

Only periodic calibration checks are needed to assure dependable performance. The operator

interface is very intuitive with the LCD displaying data both graphically as bar-graphs / trends as well as in engineering units (Figure 1). Additional features include:

- No potentiometer or jumper settings required. All setup is completed through display menus accessed via the LCD / magnetic keypad operator interface without opening the enclosure.
- Field adjustable alarm levels may be high, low, fault, fail-safe, latching and acknowledgeable.
- New alarms cause front LEDs to flash and become steady after acknowledgement.
- CAL MODE advises when to apply gas during calibrations.
- One half-hour trend screen shows rate of change of gas exposures.
- Sensor life bar-graph automatically updates after each SPAN calibration.
- Modular design allows for efficient installation as well as plug in sensors that allow a change in target gas after installation
- New smart sensors are recognized by the CXT and prompt users to either upload new configuration data or continue with data from the previous smart sensor.
- Sensors are industry proven for fast response and long life.

2.2 Safety Information

IMPORTANT: Users should have a detailed understanding of CXT operating and maintenance instructions. Use the CXT only as specified in this manual otherwise the detection of gases and resulting protection provided may be impaired. Read the following **WARNINGS** prior to use.

WARNING: Calibrate with known target gas at start-up and check on a regular schedule, at least every 90 days. More frequent inspections are encouraged to spot problems such as dirt, oil, paint, grease or other foreign materials on the sensor head.

WARNING: Do not use the CXT if its enclosure is damaged or cracked or has missing components.

WARNING: Make sure the cover, internal PCBs, antenna, and field wiring connections are securely in place before operation.

WARNING: Use only a sensor assembly compatible with the CXT and approved by CETCI, Inc.

WARNING: Periodically test for correct operation of the system's alarm events by exposing the monitor to a targeted gas concentration above the High Alarm set point.

WARNING: Do not expose the CXT to electrical shock or continuous severe mechanical shock.

WARNING: Protect the CXT from dripping liquids and high power sprays.

WARNING: Use only for applications described within this manual.

CAUTION: Do not paint the sensor assembly or the transmitter.

CAUTION: For safety reasons this equipment must be operated and serviced by qualified personnel only. Read and understand instruction manual completely before operating or servicing.

3 INSTRUMENT SPECIFICATIONS

3.1 Technical Specifications

GAS TYPE	
Electrochemical	Ammonia (NH_3), Carbon Monoxide (CO), Hydrogen (H_2), Hydrogen Sulphide (H_2S), Nitrogen Dioxide (NO_2), Oxygen (O_2), Sulphur Dioxide (SO_2)
Infrared	Carbon Dioxide (CO_2), Butane (C_4H_{10}), Ethanol (C_2H_6O), Hexane (C_6H_{14}), Methane (CH_4), Propane (C_3H_8), Toluene (C_7H_8)
Catalytic	Acetylene (C_2H_2), Butane (C_4H_{10}), Ethylene (C_2H_4), Hydrogen (H_2), Methane (CH_4), Propane (C_3H_8), Pentane (C_5H_{12})
PID	VOCs

MECHANICAL	
Enclosure	Durable cast aluminum explosion proof (IP66), Division 1 & 2, Class 1, Groups A, B, C, D
Size	12.7 cm x 12.7 cm / 5.0" x 5.0"

ELECTRICAL	
Power Requirement	10 - 30 VDC, 250 mA @ 24 VDC
Power Consumption	With a typical 0.5 watt Bridge Sensor: 100 mA @ nominal 24 VDC Toxic/Oxygen Sensors without relay, 2-wire 4-20 mA operation): 25 mA max @ nominal 24 VDC Relays / RS485 Modbus® Option Board: 40 mA per relay (120 mA total with all 3 energized); RS-485 use adds 20 mA
Loop Resistance	750 ohms maximum in 3-wire mode (at nominal 24 VDC power)
Power Safety Mode	Fully automatic system reset. All programmed parameters retained.

INPUT / OUTPUT	
Outputs	4-20 mA or Modbus® RTU RS-485

Alarm Relays	Three configurable form C (SPDT) relays rated for 5 amp at 30 VDC or 240 VAC RESISTIVE. Relay 1 and Relay 2 level alarms may be configured for HIGH or LOW trip, for normally energized (Failsafe) or normally de-energized and for latching or non-latching. Relay 3 is always normally energized for failsafe operation; therefore, loss of power to the unit will be indicated as a "FAULT" condition.

USER INTERFACE

Display	LCD graphic display for gas readings, 30 minute trend, bar graphing, engineering units, and backlight. 64 x 128 pixel.
Front Panel	5 Indicator lights; AL1, AL2, Fail, In Cal, and RS-485 TXD and RXD 64 x 128 Pixel LCD graphic display for gas readings, 30 minute trend, bar graphing, engineering units, and backlight
Security Mode	Locks out critical parameters
Memory	Non-volatile E2 memory retains configuration values on power outages.
Calibration	Non-intrusive calibration

ENVIRONMENTAL *(sensor dependant)*

Operating Temperature	-40°C to 65°C (-40°F to 149°F)
Operating Humidity	0 - 90% RH non-condensing

CERTIFICATION

NRTL CSA certified for Division 1 & 2 hazardous area installations for explosion proof Class 1, Groups A, B, C, D. Designed to meet CSA C22.2 No.152 for combustible monitors and ISA 92.0.01 Part 1 for toxic monitors. Models with electrochemical sensor types NH3 and NO2 are Division 2 and come with a splash guard. All other models are Division 1.

CAUTION: Relays are rated for RESISTIVE loads. Inductive loads, such as contactor coils or motors may cause contact arcing, which emits RFI into the sensor signals. Use appropriate snubbers and MOVs across inductive loads and keep wiring away from signal wires.

4 SENSOR SPECIFICATIONS

4.1 Sensor Specifications

Ammonia (NH_3)	
Type	Electrochemical
Range	0 - 500 ppm
Resolution	1 ppm
Default Span Point	25 ppm
Default Low Alarm	25 ppm
Default High Alarm	50 ppm
Response Time (T_{90})	< 75 seconds

Carbon Dioxide (CO_2)	
Type	Infrared
Range	0 - 5%
Resolution	0.1%
Default Span Point	2.5%
Default Low Alarm	1.5%
Default High Alarm	2.5%
Response Time (T_{90})	< 50 seconds

Carbon Monoxide (CO)	
Type	Electrochemical
Range	0 - 1,000 ppm
Resolution	1 ppm
Default Span Point	100 ppm
Default Low Alarm	35 ppm
Default High Alarm	70 ppm
Response Time (T_{90})	< 50 seconds

Hydrogen (H_2)

Type	Electrochemical
Range	0 - 1,000 ppm
Resolution	1 ppm
Default Span Point	100 ppm
Default Low Alarm	50 ppm
Default High Alarm	100 ppm
Response Time (T_{90})	< 180 seconds

Hydrogen Sulphide (H_2S)

Type	Electrochemical
Range	0 - 500 ppm
Resolution	1 ppm
Default Span Point	25 ppm
Default Low Alarm	10 ppm
Default High Alarm	20 ppm
Response Time (T_{90})	< 75 seconds

Methane (CH_4)

Type	Catalytic
Range	0 - 100% LEL
Resolution	1%
Default Span Point	25% LEL
Default Low Alarm	10% LEL
Default High Alarm	20% LEL
Response Time (T_{90})	< 45 seconds

Methane (CH_4)

Type	Infrared
Range	0 - 100% LEL
Resolution	1%
Default Span Point	25% LEL
Default Low Alarm	10% LEL
Default High Alarm	20% LEL
Response Time (T_{90})	< 60 seconds

Nitrogen Dioxide (NO_2)

Type	Electrochemical
Range	0 - 99.9 ppm
Resolution	0.1 ppm
Default Span Point	5 ppm
Default Low Alarm	1 ppm
Default High Alarm	2 ppm
Response Time (T_{90})	< 60 seconds

Oxygen (O_2)

Type	Electrochemical
Range	0 - 25%
Resolution	0.1%
Default Span Point	20.9%
Default Low Alarm	19.5%
Default High Alarm	18.5%
Response Time (T_{90})	< 30 seconds

Phosphine (PH_3)	
Type	Electrochemical
Range	0 - 5 ppm
Resolution	0.01 ppm
Default Span Point	1 ppm
Default Low Alarm	0.3 ppm
Default High Alarm	0.6 ppm
Response Time (T_{90})	< 60 seconds

Propane (C_3H_8)	
Type	Catalytic
Range	0 - 100% LEL
Resolution	1%
Default Span Point	25% LEL
Default Low Alarm	10% LEL
Default High Alarm	20% LEL
Response Time (T_{90})	< 60 seconds

Sulphur Dioxide (SO_2)	
Type	Electrochemical
Range	0 - 99.9 ppm
Resolution	0.1 ppm
Default Span Point	5 ppm
Default Low Alarm	2 ppm
Default High Alarm	4 ppm
Response Time (T_{90})	< 45 seconds

5 INSTALLATION INSTRUCTIONS

5.1 Sensor Location

Factors such as air movement, gas density in relation to air, emission sources and environmental variables affect correct sensor location. Air movement by fans, prevailing winds and convection should be carefully evaluated to determine if a leak is more likely to raise gas levels in certain areas within the facility. Vapor density of a gas determines if it will rise or fall in air when there are no significant currents. Lighter than air gases should have the monitors mounted 12 - 18 inches (30 - 45 centimeters) above the potential gas leak and heavier than air gases should be the same distance below the point of leakage. Even though the CXT is designed for rugged service, sensors should be protected from water, snow, shock, vibration, and dirt.

5.2 Mounting the Enclosure

The CXT standard enclosure is a cast aluminum explosion-proof (NEMA 7) enclosure as shown in Figure 2.

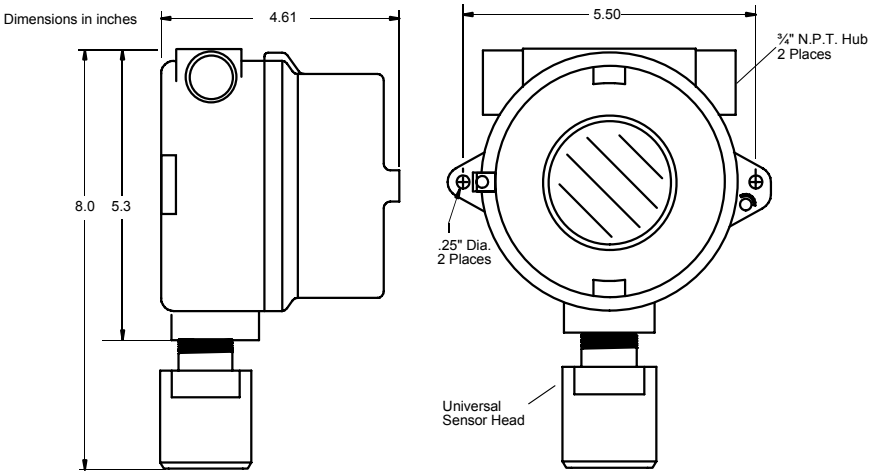

Figure 2: CXT Explosion-Proof Housing

Modular design simplifies the installation of the CXT. A top Display Assembly is mounted with captive thumbscrews and is easily removed to access field-wiring terminals. An optional Alarms/ Modbus board mounts piggyback to the back of the Display Assembly. The enclosure is equipped with two threaded, ¾" NPT conduit fitting outlet and pre-drilled mounting flanges.

WARNING: Qualified personnel should perform the installation according to applicable electrical codes, regulations and safety standards. Insure that correct cabling and seal fitting practices are implemented. Install the CXT to a wall or bracket using the predrilled mounting flanges with I.D. 0.25 on 5.5 inch centers (Figure 2). If conduit is rigid and able to support the weight of the CXT, the mounting bolts may be omitted.

WARNING: The sensor should never be installed pointing upwards.

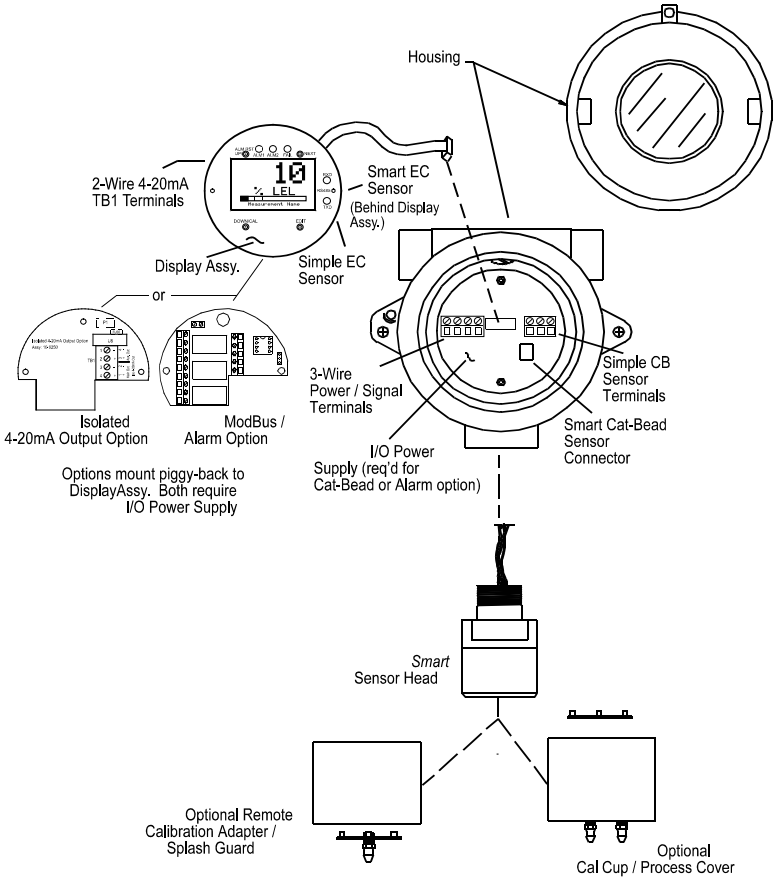

Figure 3: Outline Drawing (Standalone & Wired Version)

WARNING: Qualified personnel should perform the installation according to applicable electrical codes, regulations and safety standards. Ensure correct cabling and sealing fitting practices are implemented. Install the CXT to a wall or bracket using the predrilled mounting flanges with ID 0.25 on 5" centers (Figure 3).

CAUTION: The sensor head (not shown in Figure 4) should never be installed pointing upwards.

CETCI offers a square aluminum plate, with a magnet on each corner, to bolt to the back of the instrument enclosure. The Magnetic Mount securely attaches the assembly to solid steel structure that is at least 6" wide.

5.3 Transmission Range: 4 - 20 mA Signals

The distance 4 - 20 mA signals can travel is dependent upon several factors including the cable gauge, DC power supply voltage level and input impedance of the receiving device.

NOTE: CXT Controllers have 4 - 20 mA input resistance of 100 ohms.

5.4 System Grounding

Direct grounding of the CXT enclosure via a good electrical connection to a well designed grounding system is essential. This will protect your system, reduce the damage that can occur during lightning strikes and reduce noise.

5.5 3-Wire 4 - 20 mA Mode Installation

CXT is equipped with the I/O Power Supply and Alarms / Modbus® option are NRTL certified as suitable for Div 1 and 2 Groups B, C, and D explosion proof installations with the IS Sensor Head or with any sensor head with an equivalent CSA certification.

3-wire sourcing transmitters require an additional dedicated 24 VDC wire. The 4 - 20 mA loop current is then delivered, or sourced, from the transmitter output and the receiver device must not provide 24 VDC from its input terminal. When the CXT is equipped with the bottom I/O Power Supply board shown in Figure 4, the 2-wire 4 - 20 mA output is disabled and one of the boards' 3-wire outputs must be used. TB2 terminal 2 is for electrochemical toxic / oxygen 3-wire 4 - 20 mA output signals while the TB2 terminal 3 is for LEL 3-wire 4 - 20 mA output signals.

WARNING: CXT is equipped with the I/O Power Supply board only operate as 3 or 4-wire 4 - 20 mA transmitters and are not compatible with 2-wire intrinsically-safe installations. Such units should not be combined with IS Sensor Heads without flame arrestors unless the area is classified as non-hazardous.

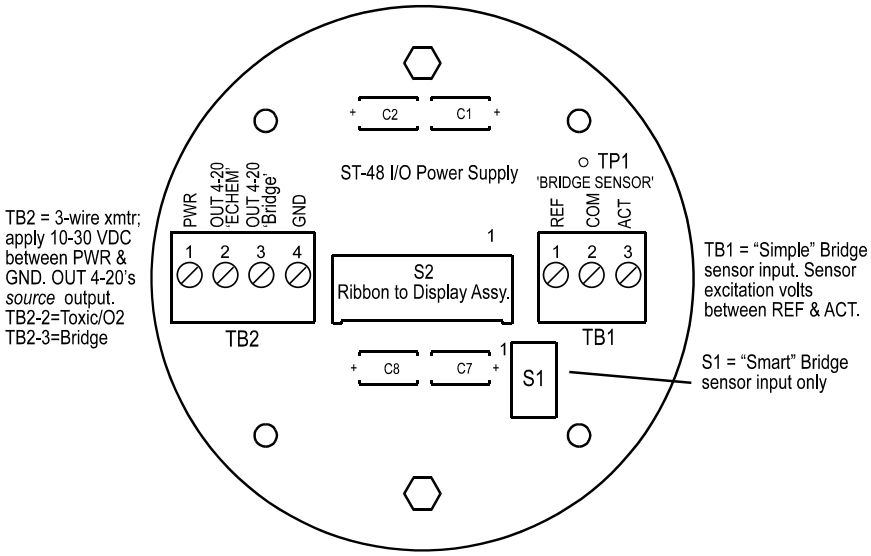

Figure 4: I/O Power Supply / 3-Wire 4 - 20 mA Assembly

Step 1:
Unscrew the cover on the CXT explosion-proof enclosure.

Step 2:
Loosen the 2 thumbscrews holding the display assembly in place and remove it (refer to Figure 4). A small ribbon cable is attached with sufficient length to allow access to the I/O PCB mounted in the bottom of the enclosure.

Step 3:
Power and signal connections are to TB2 where 24 VDC, Signal and Common wires must be connected. A blocking diode protects the CXT if polarity of the power supply is reversed, but it will not operate.

Step 4:
Reassemble the CXT. Follow the procedures and recommendations in the receiver and power supply manuals to complete the installation.

Step 5:
Be sure the CXT enclosure and conduit are properly grounded. Apply power and observe that the CXT functions.

5.6 Alarms / RS485 Modbus® Option Installation

The optional Alarms / RS485 Modbus® board supplies two level alarm relays: a FAULT relay and an RS485 Modbus® RTU slave port (Figure 5). This board is "piggybacked" behind the Display Assembly as shown in Figure 4. Addition of this option requires 3-wire mode, 4 - 20 mA operation and thereby requires the I/O Power Supply board (Figure 4). This is because relays and RS485 circuits require much more power than 2-wire 4 - 20 mA loops can deliver.

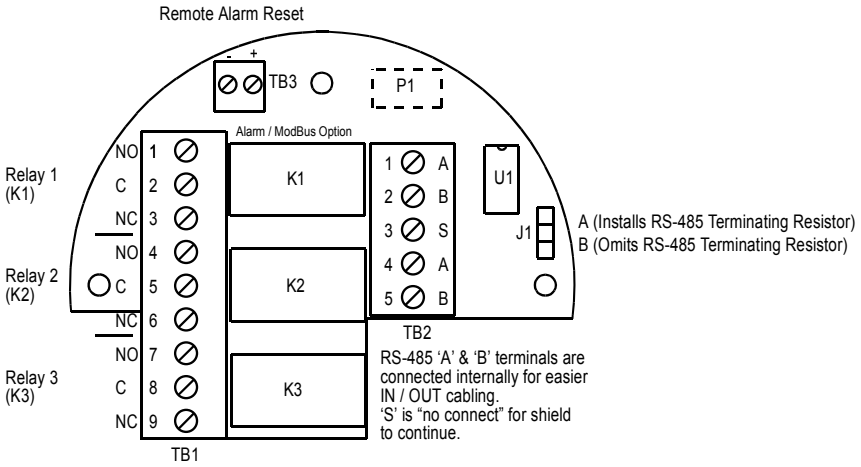

Figure 5: Alarm Relays / Modbus® Option

CAUTION: Alarm relays have dry contacts and power must be supplied from an external source. Contacts are rated for RESISTIVE loads. Inductive loads, such as contactor coils or motors, may cause contact arcing, which shortens life and emits RFI into the sensor signals. Use appropriate arcing snubbers and MOVs across inductive loads and keep wiring away from signal wires. External wiring to TB3 (Remote Alarm Reset) should be shielded and protected from noise spikes to prevent false Alarm Reset.

Step 1:
Unscrew the cover on the CXT explosion-proof enclosure.

Step 2:
Loosen the two thumbscrews holding the display assembly in place and remove.

Step 3:
A small ribbon cable is attached with sufficient length to access the back of the Display assembly where the Alarms / RS485 Modbus® board option is located. It is possible to use only relays, only RS485, or both. Relay terminals are labeled NO (normally open), NC (normally closed) and C (common, or the pole).

These designators correspond to the shelf, or de-energized, state of the relays. The FAULT relay is always failsafe, meaning it is energized when there is not a fault condition and therefore its action is reverse of the designators.

Step 4:
RS485 Modbus® networks should be wired as shown in Figure 6. Each CXT connected represents an RTU and must have a unique RTU address. RTU addresses are assigned in the Modbus® setup menu described in Section 8.9.

Step 5:
Cabling must be a "daisy chain" as opposed to a "star" pattern for reliable operation.

Step 6:
The "end of line" unit should have J1 installed in the 'A' position for terminating resistor installation. All others should have J1 in the 'B' position.

NOTE: Front panel Rx/Tx LEDs are helpful troubleshooting tools.

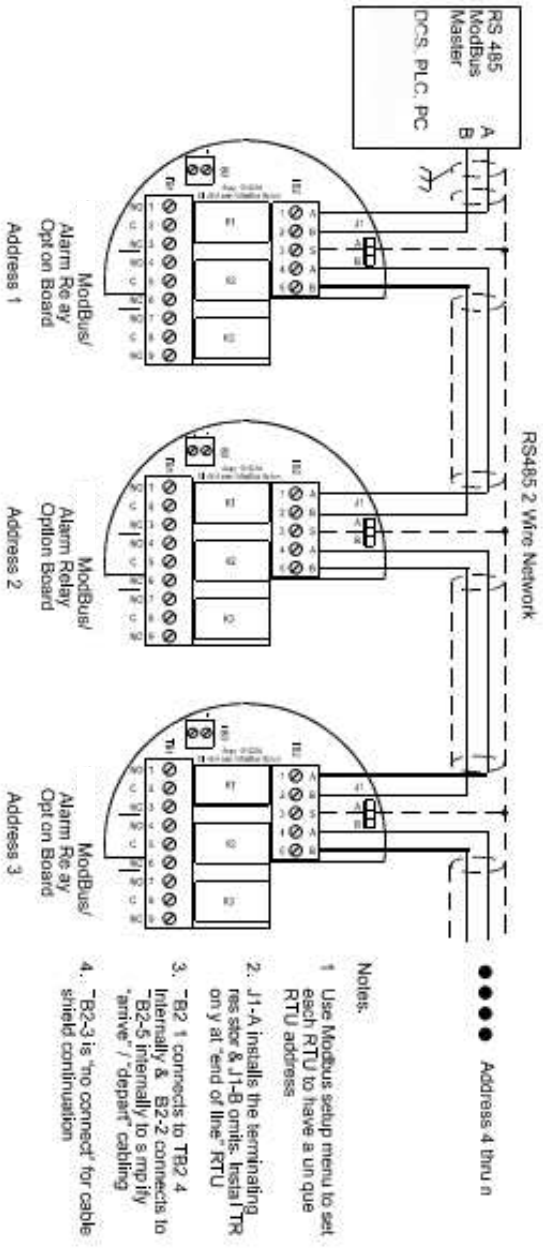

Figure 6: RS485 Modbus Wiring

5.7 Isolated 4 - 20 mA Output Option

The optional isolated 4 - 20 mA option as shown in Figure 7 provides dual 4 - 20 mA outputs that are electrically isolated from sensor inputs and the 24 VDC power source. Each 4 - 20 mA output shares the same common terminal and are not isolated from one another. This board is "piggybacked" behind the Display Assembly as seen in Figure 3. Addition of this option requires 4-wire mode 4 - 20 mA operation and thereby requires the use of an I/O Power Supply board (Figure 4).

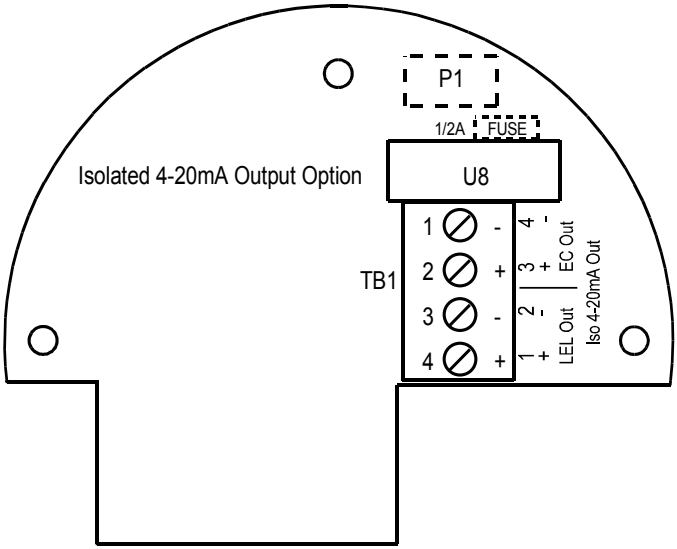

Figure 7: Isolated 4 - 20 mA Output Option

5.8 Sensor Installation

The CXT Smart Sensor interface uses proven electrochemical technology for toxic / oxygen and catalytic bead for LEL. In addition, a tiny memory IC is incorporated into CXT factory supplied smart sensors allowing them to contain the entire database of CXT parameters onboard the replaceable Smart Sensor assembly (Figure 8).

Electrochemical and catalytic bead smart sensors both plug into the Smart Sensor Head that connects to CXT electronics with its 8-conductor Smart Sensor Interface cable (Figure 8).

CAUTION: Smart sensor heads with electrochemical toxic / oxygen sensors must connect to S1 located on the back of the Display Assembly as seen in Figure 3. Smart sensor heads with catalytic bead combustible sensors must connect to S1 located on the optional I/O PCB assembly (Figure 4).

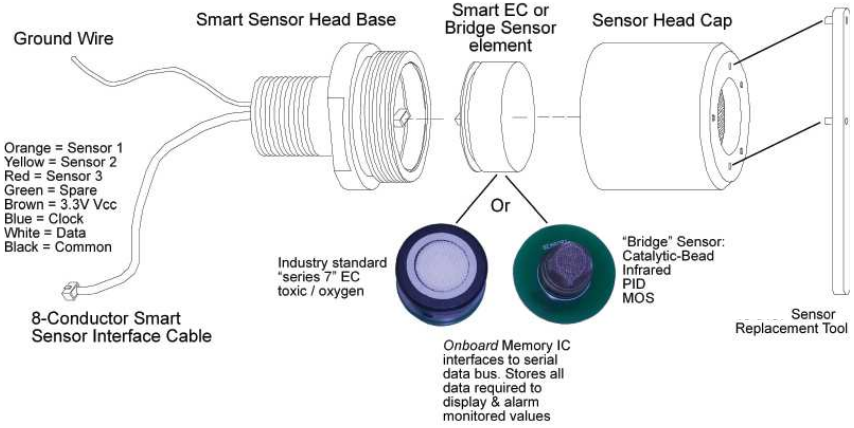

Figure 8: Smart Sensor Head Assembly

Smart Sensors are automatically recognized by the CXT. The Smart Sensor identification screen in Figure 9 is shown after power-up, upon installation of a new smart sensor or by viewing INPUT type in the SENSOR SETTINGS / INFO menu in Section 8.4.

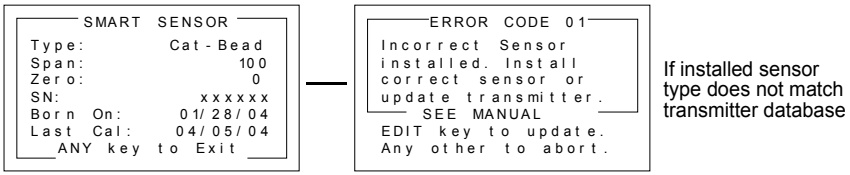

Figure 9: Smart Sensor Info / ERROR Screens

6 INTIAL START-UP

6.1 Model Name

When power is applied to the CXT it will briefly show a 10-digit ASCII model and company name during start-up. The name can be edited in the Transmitter Configuration menu by editing the Model field.

Figure 10 shows how to access the menu for setting the 10-digit ASCII model name which is displayed briefly after power is applied to the CXT (RF shown). To access from any data display, press and hold the NEXT key for 5-seconds until the screen appears requesting a special key sequence (4-UP keystrokes).

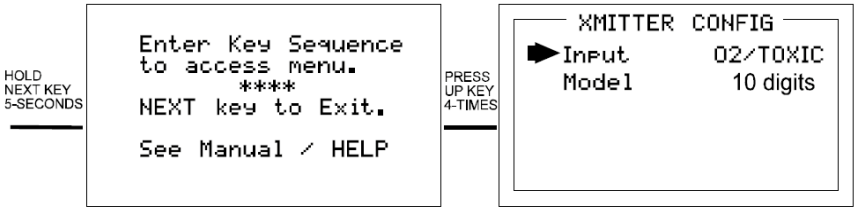

Figure 10: Transmitter Configuration Menu

6.2 Initial Toxic / Oxygen Sensor Monitor Start-Up

CXT Toxic / Oxygen Monitors, which are factory equipped with a local Simple or Smart electrochemical sensor, rarely require adjustments (other than routine calibrations) to provide accurate readings. However, after installation the following check should be performed to ensure proper operation. In addition, alarm levels, Measurement Name ASCII fields and other variables may require attention by users in order to best serve their application.

6.3 Initial Toxic / Oxygen Sensor Monitor "Span" Check

Prior to the initial Routine Sensor Calibration described in Section 7.1, a coarse SPAN gas reading verification (or bump test) should be performed after installation. Apply an upscale gas value of at least 25% of full scale to the sensor. For example, if 0 - 100 ppm H2S is the measurement range, apply at least 25 ppm, but not more than 100 ppm. Remember that this is only a coarse check and precision calibrations are performed in Routine Sensor Calibrations described in the following Section 7.1.

7 OPERATING INSTRUCTIONS

7.1 Routine Sensor Calibrations

Calibration is the most important function for ensuring correct operation of the CXT. The CAL MODE (flow chart shown in Figure 12) is designed to make calibration quick, easy and error free. The 4 - 20 mA output indicates CAL MODE by transmitting 1.5 mA for 3-wire installations. It then transmits 4 mA during the subsequent CAL PURGE delay to prevent external alarms during calibration. Local CXT alarm relays (if equipped) are inhibited during CAL MODE. CAL MODE automatically exits if no keystrokes are detected after 5 minutes.

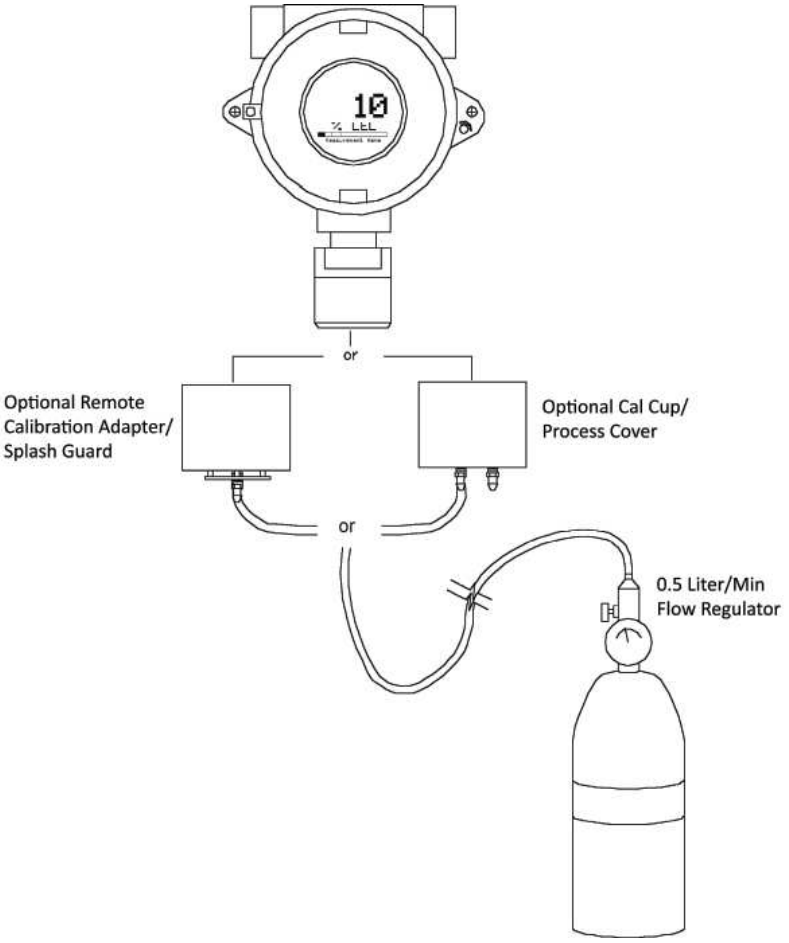

Figure 11: Calibration Gas Input

Follow these CXT calibration guidelines:

- Calibration accuracy is only as good as the calibration gas accuracy. CETCI recommends calibration gases with NIST (National Institute of Standards & Technology) traceable accuracy to increase the validity of the calibration.
- Do not use a gas cylinder beyond its expiration date.
- Calibrate a new sensor before use.
- Allow the sensor to stabilize before starting calibration (approximately 5 minutes).
- Calibrate on a regular basis. (CETCI recommends once every 3 months, depending on use and sensor exposure to poisons and contaminants.)
- Calibrate only in a clean atmosphere, which is free of background gas.

Use the following step-by-step procedure to perform ZERO and SPAN calibrations.

The flow chart in Figure 12 illustrates the following procedure. UP, CAL, NEXT and EDIT labels indicate keystrokes using the magnetic wand. The CAL MODE information screen (located on the top of the chart) is available for advanced users to see Offset/Gain calibration constants and live analog to digital converter (A/D) counts. Span Gas calibration values may also be edited from this screen. Holding the UP key for 5 seconds during CAL MODE displays this screen.

Calibration history records are logged and may be viewed in the Sensor Information menu (see Section 8.4).

7.1.1 ZERO and SPAN Calibrations

Step 1:
To enter the CAL MODE from either of the data displays, press the DOWN/CAL key and within 5 seconds press the EDIT key.

Step 2:
Using the Cal-Cup, apply a clean ZERO gas or be sure there is no background target gas in the monitored area. After the reading is stable, (approximately 1 minute) press the EDIT key to perform a ZERO calibration.

Step 3:
If the ZERO calibration is successful, press the NEXT key to proceed to the SPAN check. Once ZERO CAL is successful, the unit automatically proceeds to SPAN CHECK. If NEXT is pressed now, it will

exit the CAL routine. However, if NEXT is pressed when first in CAL, it will skip ZERO CAL and go to SPAN CHECK.

Step 4:
Apply the correct SPAN gas at 0.5 liters/min. After the reading is stable (approximately 1 minute), press the EDIT key to perform a SPAN calibration.

WARNING: The SPAN gas used must match the value specified since this is what the CXT will indicate after a successful SPAN calibration. The Cal Span Value may be edited if it becomes necessary to apply a different gas concentration (see Cal Span Value in Section 8.2).

Step 5:
Once the SPAN calibration is successful, the display flashes "REMOVE CAL GAS" and starts the CAL PURGE delay.

Step 6:
CAL MODE will be complete after the end of the CAL PURGE delay.

7.2 Alarm Operation

CXT has front panel LED indicators for Alarm 1, Alarm 2 and Alarm 3. An optional Relay / Modbus® board adds K1, K2, and K3 relays for these alarms.

CAUTION: CXT Alarm LED indicators function even without the presence of the Relay option. With 3-Wire 4 - 20 mA operation, alarm LEDs flash when new and becomes steady after the operator selects ACKNOWLEDGE by pressing the UP / RESET key.

7.3 Alarm 3 - Understanding Fault / Level Operation

The "A3" alarm is typically dedicated to FAULT conditions indicating sensor failures or "out of measurement range" conditions. However, some applications require a third level alarm. The A3 menu is identical to A1 and A2 and may be set to trip at an upscale level value. A3 will also trip with missing or failed sensors regardless of the level value.

CAUTION: Missing or failed sensors always trip Alarm 3 and relay K3 (if equipped). This is true even with A3 configured as a level alarm and it must be realized that A3 level alarm events might be caused by the monitored level or by a missing or failed sensor.

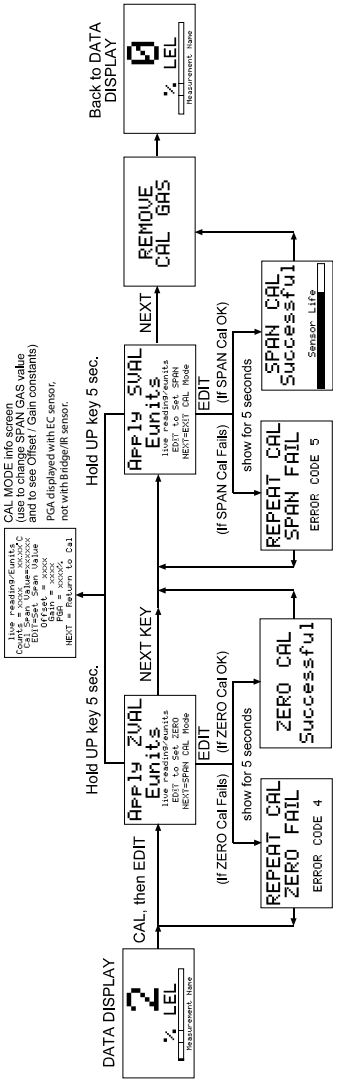

Figure 12: Cal-Mode Flow Chart and Menus

8 SETUP MENU CONFIGURATION

8.1 Menus Database Configuration

All CXT configuration variables are stored in its menu database. Many menu items will contain default values from the factory and require changes to better match a user's particular application. CXTmenus may be configured from the magnetic keypad.

The CXT's configuration menus are shown below.

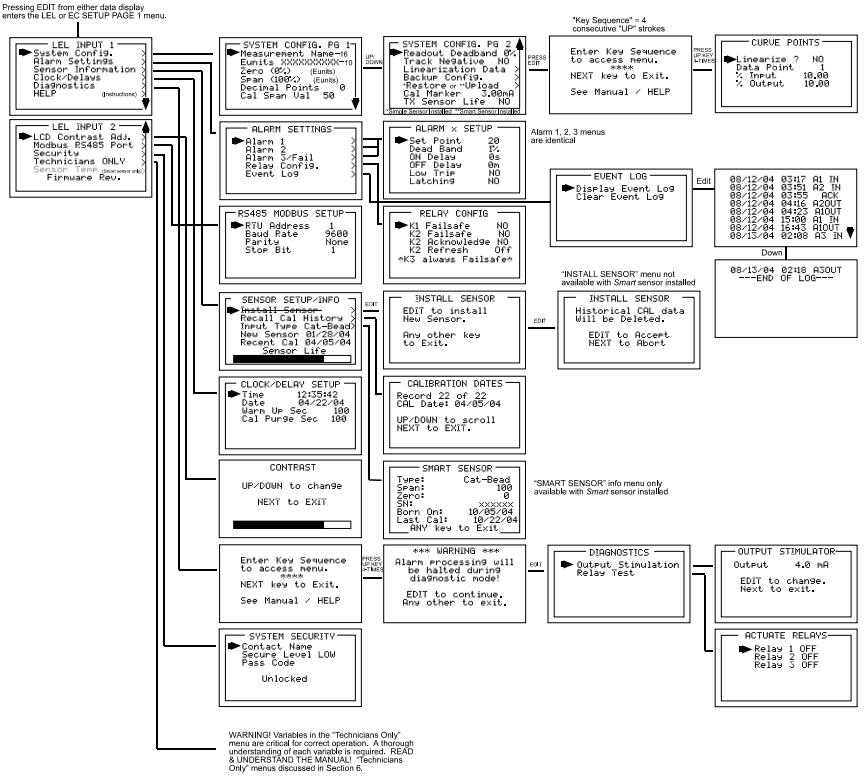

Figure 13: Configuration Menu Tree

8.1.1 Configuration Using the Magnetic Wand

Passing the magnetic wand past the EDIT key from either data display screen displays SETUP PAGE 1 as shown in Figure 14. The UP / DOWN keys maneuver the pointer while EDIT enters sub-levels of menu items. All SETUP menu items have at least one page of sub-menus. Items with sub-menus are indicated by the > symbol (right arrow) at the end of each line. Edit menu

items by:

- pointing to them
- pressing the EDIT key to display the cursor
- pressing UP/DOWN to change that character
- pressing NEXT to move the cursor
- pressing EDIT again to load the new item and remove the cursor.

Press NEXT to exit the sub-menu. To view SETUP PAGE 2, press the DOWN key with the pointer aimed at the bottom item on PAGE 1.

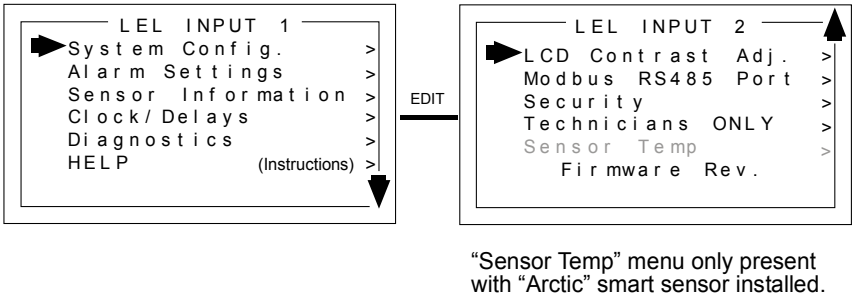

Figure 14: Setup Menu Entry

8.2 system Configuration Menus

The System Config. group consists of two pages of menus as shown in Figure 15. Each item's description follows in this section.

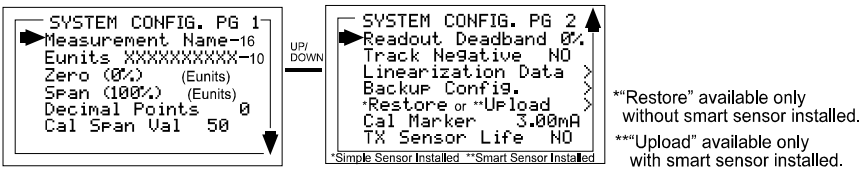

Figure 15: System Configuration Menus

Menu Item	Description
Measurement Name	May be edited to contain virtually any 16-character ASCII field. It is typically used to describe the monitored point by user tag # or other familiar terminology.
Eunits	Engineering Units - May have up to a 10 character ASCII field. Many common gases have pre-configured Eunits based upon the sensor type. Each may be edited in this menu as described in Configuration Using the Magnetic Wand in Section 8.2.
Zero (0%)	Defines the reading to be displayed when 4 mA (0%) is the CXT output.
Span (100%)	Defines the reading to be displayed when 20 mA (100%) is the CXT output. The highest reading allowed is 9999. Included is a negative polarity sign and one decimal point. Polarity is only indicated for negative readings.
Decimal Points	Sets the resolution of the LCD readings and may be for 0, 1 or 2. Example: ZERO readings for 0, 1, and 2 DPs respectively are 0, 0.0, and 0.00.
Cal Span Value	Sets which upscale value must be applied when performing Span Calibrations.
Readout Deadband	Allows for forcing of low values to continue to read zero. This is useful when there are small amounts of background gases that cause fluctuating readouts above zero. The highest amount of deadband allowed is 5%. The 4 - 20 mA output is not affected by this menu item.
Track Negative	(Default set to NO) Causes negative values to read the **Zero (0%)** value in data displays. The CAL MODE readout displays negative values regardless of this setting and negative values below the Fault set point will still cause the Fault alarm to trip. The 4 - 20 mA output always locks at 4 mA when the reading is negative.

Linearization Data	Allows nonlinear signals to be linearized by entering the correct curve into the CXT (Figure 16). If Linearize is set for NO, the CURVE POINTS menu data is not used and no linearization is applied. When YES, the CURVE POINT entries are used and a straight-line approximation is calculated between each of the 9 entries. 0% input always provides 0% output and 100% input always provides 100% output. To prevent accidental data entry a special keystroke sequence of 4 consecutive UP keys is required to enter this menu.

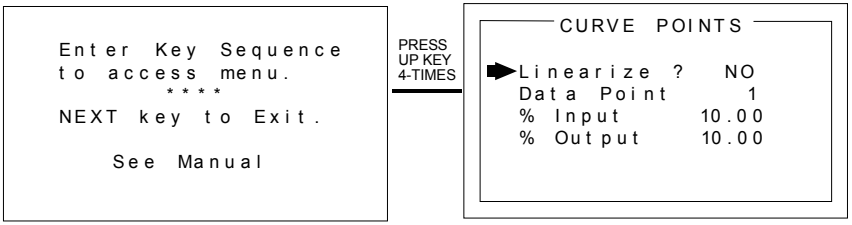

Figure 16: Linearization Menu

Menu Item	Description
Backup Config.	Allows users to store the entire, current CXT menu database into non-volatile memory for restoration later, in the case that incorrect values are accidentally entered or uploaded.
Restore Config.	Restores the CXT menu database to the values from the most recent Backup Configuration. This menu item is only available if a smart sensor is not installed. The special keystroke sequence of 4 consecutive UP keys is also required to perform backup and restore operations.
Upload Sensor Data	Allows manual uploading of the entire smart sensor database to the CXT from the smart sensor.
Cal Marker	Allows setting of the 4 - 20 mA output value during ZERO and SPAN calibrations at a level to prevent alarm trips by calibration values. Three-wire models may be set from 0 - 20 mA.

TX Sensor Life	(Default is set for YES) Causes the CXT 4 - 20 mA output to transmit a sensor life value after successful calibrations during the CAL PURGE delay (see Section 7.1). Normal operation is such that the CXT transmits 4 mA during the CAL PURGE delay. But with TX Sensor Life = YES it transmits 4 mA for the first 10-seconds, then for 5-seconds transmits a value between 4 mA and 5 mA, with 4 mA equal to 0% sensor life and 5 mA equal to 100% sensor life (see Figure 17). The output then returns to 4 mA for the remainder of the CAL PURGE delay. For example, if after a calibration the sensor life is 75%, the CXT transmits 4.75 mA during the 5-second interval.

NOTE: TX Sensor Life should always be set for NO unless the 4 - 20 mA receiver is capable of interpreting the sensor life signal.

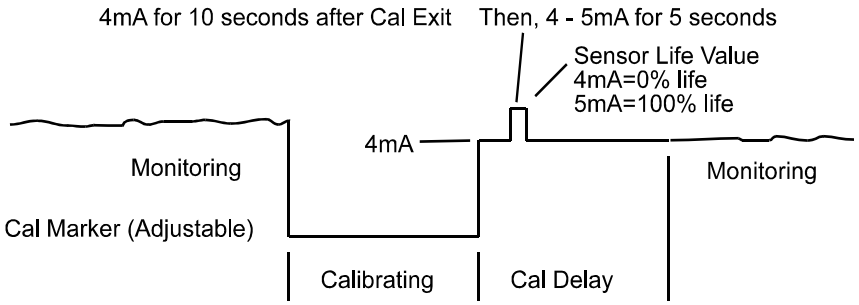

Figure 17: Transmit Sensor Life Timing Diagram

8.3 Alarm Settings

The Alarm Settings page has the Alarm 1, 2, 3 Setups, Relays and Event Log submenus shown in Figure 18. Alarm 1, Alarm 2 and Alarm 3/Fail menus are identical and therefore described only once in this section.

IMPORTANT: Alarm functions and their associated LEDs are active without the Relay / Modbus® option installed.

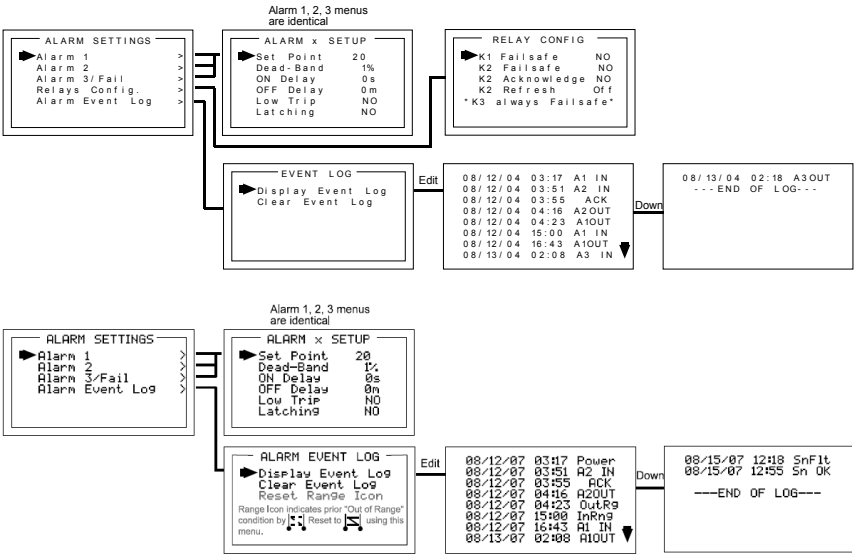

Figure 18: Alarm Settings Menus

Menu Item	Description
Set Point	Enters the engineering unit value where the alarm trips. It may be negative and trip when monitored values fall out of range in this direction. A3 has a default negative 5% of range Set Point with Low Trip set for YES. This makes it function as a FAULT alarm and trip when the monitored value is more than 5% "out of range".
Dead-Band	Has a minimum value of 1% and a maximum value of 10%. It is useful for preventing alarm cycling of 0 - 100 ppm, if Dead-Band equals 5% and the set point is 20 ppm, after tripping at 20 ppm the value must drop below 15 ppm to reset.
ON Delay	Allows entering a maximum 10 second delay before this alarm becomes active. This is useful for preventing nuisance alarms caused by brief spikes beyond the set point.

OFF Delay	Allows entering a maximum 120 minute delay before clearing an alarm after the alarm condition is gone. This is useful for continuing an alarm function, such as operation of an exhaust fan, for a period of time after the alarm condition clears.
Low Trip	(Default set to YES) Causes the alarm to trip as the value falls below the set point.
Latching	(Default set to YES) Causes the alarm to remain active even after the condition is gone and only reset when the UP / RESET key is pressed from a data display.

8.4 Relay Configuration (If Equipped)

Relay Config has the submenu shown in Figure 19. The optional relay PCB must be installed to access this menu or a "HARDWARE NOT PRESENT" message appears.

Menu Item	Description
K1 / K2 Failsafe	(Default set for YES) Means that the relay de-energizes during alarm and energizes with no alarm. This is useful for signaling alarm when CXT power is lost. K3 is a FAULT alarm and is always failsafe.
K2 Acknowledge	(Default set for YES) Means that the UP / RESET key (RESET key during either data display) will set K2 to the normal state EVEN when an Alarm 2 condition exists. This is useful for silencing an audible device, driven from K2, during the alarm condition.
K2 Refresh	(Default set for ON) Causes an acknowledged Alarm 2 condition to reactivate K2 if it continues beyond the designated Refresh interval (0 - 99 minutes). This feature insures against forgotten alarms after an Acknowledge.

Figure 19: Relay Configuration Menu

8.5 Sensor Information

Sensor Information has the **SENSOR SETUP / INFO** menus shown in Figure 20.

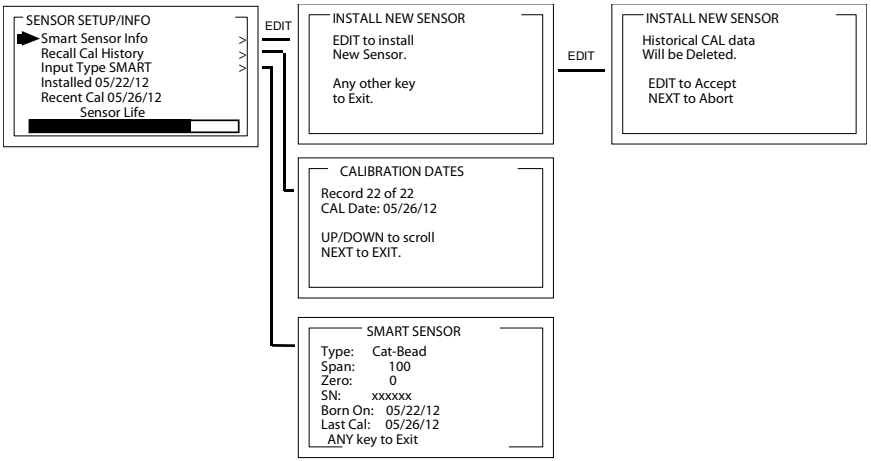

Figure 20: Sensor Information Menus

Menu Item	Description
Install New Sensor	Should always be performed when a new simple sensor is installed. This deletes historical CAL data and sets sensor life to 100% after initial calibration of the new simple sensor. The CXT Smart sensor interface will automatically detect new smart sensors and this menu is therefore not available with a smart sensor connected.
Recall Cal History	Recalls each successful calibration. These dates may be reviewed by scrolling with the UP / DOWN keys.

Input Type	Indicates which type of input or sensor the CXT is configured to accept and is pre-configured at the factory. There are four Input Type possibilities consisting of bridge, EC negative, EC positive, and 4 - 20 mA (all are Smart Sensors). Smart Sensors upload sensor type and other data to the CXT and may be viewed on the SMART SENSOR information screen.
New Sensor	Displays the date when a new sensor was last installed.
Recent Cal	Displays the most recent calibration date.

8.6 Clock / Delay Setup

The CXT is equipped with a Real Time Clock and Calendar Time and Date and must be set to correctly match its location. They are set at the factory in a 24 hour format but may require adjustment to match the location's time and date after shipment. Follow the procedure in Configuration Using the Magnetic Wand in Section 8.2.

Warm Up and Cal Purge time delays are also available to prevent unwanted alarm trips. Figure 21 shows the menu for these items.

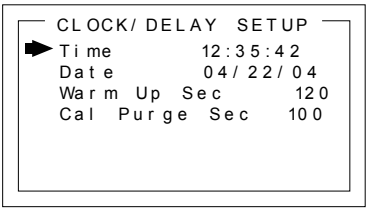

Figure 21: Clock and Calendar / Delay Timer Menu

8.7 System Security

The **SYSTEM SECURITY** menu in Figure 26 offers two levels of protection. A **LOW** level allows CAL MODE sensor calibrations but requires the 4-digit **Pass Code** prior to altering menus. **HIGH** level locks the entire menu database and CAL Mode until the correct **Pass Code** is entered. **LOW** and **HIGH** security levels always allow viewing of configuration menus but they may not be changed. Contact Name is a 12 character ASCII field available for displaying a phone # or name of personal who know the **Pass Code**. Lost **Pass Codes** may be recovered by entering the locked security menu and holding the UP key for 5 seconds. The 4-digit code appears near the bottom of the screen.

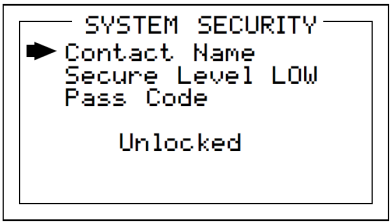

Figure 22: System Security Menu

8.8 LCD Contrast Adjustment

LCD Contrast Adj. May be set for optimum viewing using the menu shown in Figure 23.

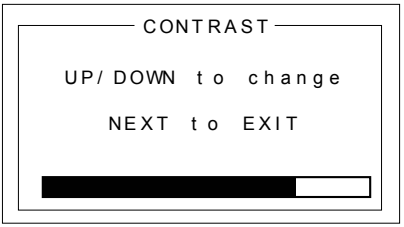

Figure 23: LCD Contrast Adjust Menu

8.9 HELP Screen

The **HELP** screen contains several pages of information describing how to operate the CXT. This is the bottom menu on page 1 of the **SETUP** screen.

8.10 Diagnostics

IMPORTANT: Gas monitoring and alarm processing are not performed while using the Diagnostics menus. **Access requires a special key sequence of four consecutive UP keystrokes.**

There are two **Diagnostics** menus useful for driving outputs without exposing the sensor to the target gas. The **OUTPUT SIMULATION** menu allows for setting of the 4 - 20 mA output to virtually any desired value. This is useful for checking responses of devices receiving the CXT's 4 - 20 mA output. The **ACTIVATE RELAYS** menu allows for tripping of the alarm relays (if equipped) without tripping alarm set-points with the target gas.

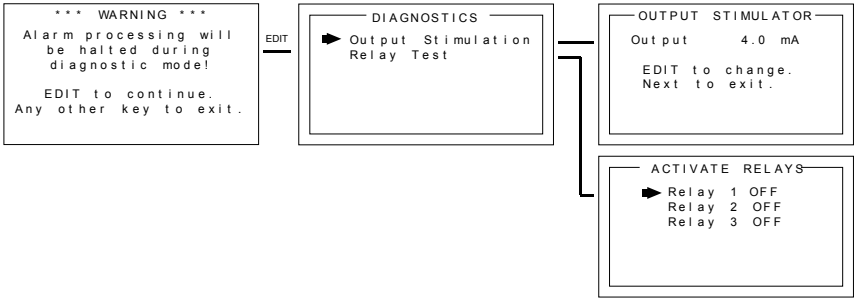

Figure 24: Diagnostics Menus

8.11 RS485 / Modbus® Setup

The **RS485 MODBUS SETUP** menu allows setting the RTU address (if RS485 equipped) for each CXT on the RS485 network. Each CXT must have a different RTU address when communicating on the same 2-wire cable. Baud rate, parity and stop bits are fixed at industry standard values of:

- Baud Rate: 9600
- Parity: None
- Stop Bits: 1

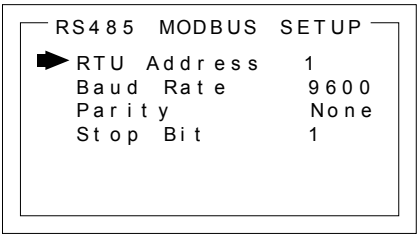

Figure 25: Modbus® RS485 Setup Menu

8.12 Modbus® Register and Function Code Summary

The following tables identify CXT Modbus® register locations and function codes. “Chan 1” designations represent the EC channel while “Chan 2” represents the LEL / 4 - 20 mA Input channel.

8.12.1 Read Only Discretes

VARIABLE	ALIAS	READ FUNCTION CODE	WRITE FUNCTION CODE
Chan 1 Alarm 1	2001	2	NA
Chan 1 Alarm 2	2002	2	NA
Chan 1 Fault	2003	2	NA
Chan 2 Alarm 1	2004	2	NA
Chan 2 Alarm 2	2005	2	NA
Chan 2 Fault	2006	2	NA
K1	2007	2	NA
K2	2008	2	NA
K3	2009	2	NA
Chan 1 Cal Mode	2010	2	NA
Chan 2 Cal Mode	2011	2	NA

8.12.2 Read / Write Coils

VARIABLE	ALIAS	READ FUNCTION CODE	WRITE FUNCTION CODE
Alarm Ack/Reset	12001	1	5

NOTE: After writing a TRUE to this register, it resets back to FALSE automatically.

8.12.3 Read Only Registers

VARIABLE	ALIAS	READ FUNCTION CODE	WRITE FUNCTION CODE
D2A Raw Chan 1[1]	31001	4	NA
D2A Raw Chan 2[1]	31002	4	NA
A2D Raw Chan 1[2]	31003	4	NA
A2D Raw Chan 2[2]	31004	4	NA

Chan 1 Status[3]	31005	4	NA
Chan 2 Status[3]	31006	4	NA
Alarm Status Word[4]	31007	4	NA
Transmitter Status Word[5]	31008	4	NA
Chan 1 Sensor Life[6]	31009	4	NA
Chan 2 Sensor Life[6]	31010	4	NA
Chan 1 Sensor Temperature[7]	31011	4	NA
Chan 2 Sensor Temperature[7]	31012	4	NA

[1] Calibrated 10-bit value representing the D2A value of 0 to 1023 for -25 to 105% FS (200 = 0% and 1000=100%). IMPORTANT: Read registers 31001/31002 to create readings that match CXT display values!

[2] 10-bit value representing the A2D value of 0 to 1023 before calibration constants are applied.

[3] 16-bit status words; bit assignment for each channel. See below.

ALARM1_BELOW	BIT0
ALARM2_BELOW	BIT1
ALARM3_BELOW	BIT2
ALARM1_LATCH	BIT3
ALARM2_LATCH	BIT4
ALARM3_LATCH	BIT5
ALARM3_ACTIVE	BIT6
CHANNEL_DISABLED	BIT7
CHANNEL_CAL	BIT8
CHANNEL_LINEARIZE	BIT9
FAULT_RELAY_LATCH	BIT10
DISPLAY_NEGATIVE	BIT11
TRANSMIT SENSOR LIFE ENABLED	BIT12

[4] 16-bit status word; bit assignment for system status. See below.

CH1_ALM1	BIT0
CH1_ALM2	BIT1
CH1_FAULT	BIT2
CH2_ALAM1	BIT4

CH2_ALM2	BIT5
CH2_FAULT	BIT6
K1_STATUS	BIT8
K2_STATUS	BIT9
K3_STATUS	BIT10

[5] 16-bit status word; bit assignment for system status. See below.

CHAN_1_ACTIVE	BIT0
CHAN_2_ACTIVE	BIT1
SECURE_LEVEL	BIT2
MARKER Tx LED	BIT3
K1_FAILSAFE	BIT12
K2_FAILSAFE	BIT13
K2_ACK	BIT14
LOCK	BIT15

[6] 16-bit signed integer ranging from –1 to 100 where -1 indicates Cal Required.

[7] 16-bit integer ranging from 1 to 4095 scaled for –55 to +125 degrees C.

8.12.4 Memory Floating Point

VARIABLE	ALIAS	READ FUNCTION CODE	WRITE FUNCTION CODE
FP Value Chan 1	33001	4	NA
FP Value Chan 2	33002	4	NA

NOTE: Returned as 15-bit plus sign 2's complement with ± 5% over/under-range applied. Consider over / under-range when scaling values to be displayed at the workstation. The following equation may be used to determine a value for display.

Display Value = [{ MODBUS Value [(Span Value -Zero Value) 1.1] } / 32767]
+ { Zero Value - [(Span Value - Zero Value) 0.05] }

8.12.5 Memory ASCII Strings

VARIABLE	ALIAS	READ FUNCTION CODE	WRITE FUNCTION CODE
User Info Chan 1[1]	40401-40408	3	NA
User Info Chan 2[1]	40409-40416	3	NA

Chan 1 ASCII Reading[2]	40417-40419	3	NA
Chan 2 ASCII Reading[2]	40420-40422	3	NA
EUNITS Chan 1[3]	40423-40427	3	NA
EUNITS Chan 2[3]	40428-40432	3	NA

[1] 16 ASCII characters (2 per register) assigned to the unit identifier read as bytes.

[2] 6 ASCII characters (2 per register) reflecting the display readout.

[3] 10 ASCII characters (2 per register) assigned to the engineering units read as bytes.

8.12.6 Byte Variables

VARIABLE	ALIAS	READ FUNCTION CODE	WRITE FUNCTION CODE
Pre-Amp / Gain Ch1[1]	40433	3	NA
Pre-Amp / Gain Ch2[1]	40434	3	NA

[1] 2 bytes representing Pre Amp (HiByte) and PGA (LoByte) settings. (Note: this reference is for **8.12.6 Byte Variables** table on previous page)

8.12.7 Firmware Version

VARIABLE	ALIAS	READ FUNCTION CODE	WRITE FUNCTION CODE
Version[1]	40435-40436	3	NA

[1] 4 ASCII characters (2 per register) reflecting the firmware version.

8.12.8 Memory Reals

NOTE: Real value represents float value without the decimal point such as 123.4 is returned as 1234. Decimal divisor is returned as 1, 10, 100, or 1000 for decimal position of 1, 2, 3, or 4, where 123.4 would return the value 10.

VARIABLE	ALIAS	READ FUNCTION CODE	WRITE FUNCTION CODE
Chan 1 Cal Zero Real	41001	4	NA
Chan 1 Cal Zero Divisor	41002	4	NA

Chan 1 Cal Span Real	41003	4	NA
Chan 1 Cal Span Divisor	41004	4	NA
Chan 1 Zero Real	41005	4	NA
Chan 1 Zero Divisor	41006	4	NA
Chan 1 Span Real	41007	4	NA
Chan 1 Span Divisor	41008	4	NA
Chan 1 Fault Real	41009	4	NA
Chan 1 Fault Divisor	41010	4	NA
Chan 1 Alarm 1 Real	41011	4	NA
Chan 1 Alarm 1 Divisor	41012	4	NA
VARIABLE	**ALIAS**	**READ FUNCTION CODE**	**WRITE FUNCTION CODE**
Chan 1 Alarm 2 Real	41013	4	NA
Chan 1 Alarm 2 Divisor	41014	4	NA
Chan 1 Alarm 3 Real	41015	4	NA
Chan 1 Alarm 3 Divisor	41016	4	NA
Chan 1 Manual Gain Real	41017	4	NA
Chan 1 Manual Gain Divisor	41018	4	NA
Chan 1 Manual Offset Real	41019	4	NA
Chan 1 Manual Offset Divisor	41020	4	NA
Chan 2 Cal Zero Real	41021	4	NA
Chan 2 Cal Zero Divisor	41022	4	NA
Chan 2 Cal Span Real	41023	4	NA
Chan 2 Cal Span Divisor	41024	4	NA

Chan 2 Zero Real	41025	4	NA
Chan 2 Zero Divisor	41026	4	NA
Chan 2 Span Real	41027	4	NA
Chan 2 Span Divisor	41028	4	NA
Chan 2 Fault Real	41029	4	NA
Chan 2 Fault Divisor	41030	4	NA
Chan 2 Alarm 1 Real	41031	4	NA
Chan 2 Alarm 1 Divisor	41032	4	NA
Chan 2 Alarm 2 Real	41033	4	NA
Chan 2 Alarm 2 Divisor	41034	4	NA
VARIABLE	**ALIAS**	**READ FUNCTION CODE**	**WRITE FUNCTION CODE**
Chan 2 Alarm 3 Real	41035	4	NA
Chan 2 Alarm 3 Divisor	41036	4	NA
Chan 2 Manual Gain Real	41037	4	NA
Chan 2 Manual Gain Divisor	41038	4	NA
Chan 2 Manual Offset Real	41039	4	NA
Chan 2 Manual Offset Divisor	41040	4	NA

8.12.9 Binary Cal Data

VARIABLE	ALIAS	READ FUNCTION CODE	WRITE FUNCTION CODE
Chan 1 A2D MIN[1]	41041	4	NA
Chan 1 A2D MAX[1]	41042	4	NA
Chan 1 D2A MIN[1]	41043	4	NA
Chan 1 D2A MAX[1]	41044	4	NA

Chan 2 A2D MIN[1]	41045	4	NA
Chan 2 A2D MAX[1]	41046	4	NA
Chan 2 D2A MIN[1]	41047	4	NA
Chan 2 D2A MAX[1]	41048	4	NA

[1] Min and Max calibration points for the A / D and D / A converters.

8.13 System Security

The **SYSTEM SECURITY** menu offers two levels of protection. A **LOW** level allows CAL MODE sensor calibrations but requires the 4-digit **Pass Code** prior to altering menus. **HIGH** level locks the entire menu database and the CAL Mode until the correct **Pass Code** is entered. **LOW** and **HIGH** security levels always allow viewing of configuration menus but they may not be changed. **Contact Name** is a 12 character ASCII field available for displaying a phone # or name of personnel who know the **Pass Code**. Lost **Pass Codes** may be recovered by entering the locked security menu and holding the UP key for 5 seconds. The 4-digit code appears near the bottom of the screen.

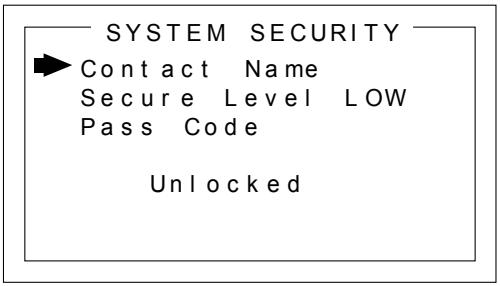

Figure 26: System Security Menu

NOTES

Distributed by:
Kenelec Scientific Pty Ltd
1300 73 22 33
sales@kenelec.com.au
www.kenelec.com.au

Critical Environment Technologies Canada Inc.
Unit 145, 7391 Vantage Way, Delta, BC, V4G 1M3, Canada
Toll Free: +1.877.940.8741
Tel: +1.604.940.8741
Fax: +1.604.940.8745

www.critical-environment.com

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