



Gas and Flame Detection

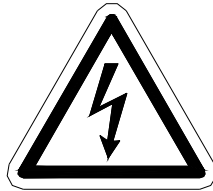
Operation and Maintenance Manual

C2 / TX Wireless Site Manager for GASMAX/TX Wireless Gas
Monitors

AUTHORIZED DISTRIBUTOR

GasDetectorsUSA.com - Houston, Texas USA

sales@GasDetectorsUSA.com - 832-615-3588



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.

ATTENTION: POUR DES RAISONS DE SÉCURITÉ, CET ÉQUIPEMENT DOIT ÊTRE UTILISÉ, ENTRETENU ET RÉPARÉ UNIQUEMENT PAR UN PERSONNEL QUALIFIÉ. ÉTUDIER LE MANUE D'INSTRUCTIONS EN ENTIER AVANT D'UTILISER, D'ENTRETENIR OU DE RÉPARER L'ÉQUIPEMENT.

REVISION HISTORY

Revision 1.0	10/1/13	Preliminary release (Updated 11/22/13)
Revision 1.1	3/11/14	Update for Version 1.02 Firmware & MODBUS Option

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P/N 1200-0866-02

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1 SAFETY INFORMATION

Important – Read Before Installation

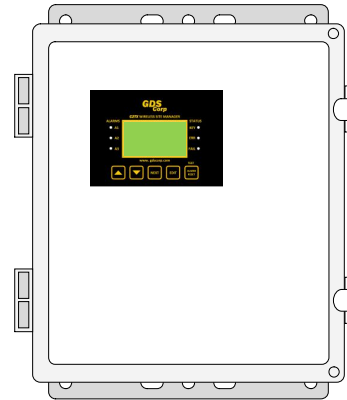
Users should have a detailed understanding of C2/TX Wireless Site Manager operating and maintenance instructions. Use the C2/TX Wireless Site Manager only as specified in this manual or detection of gases and the resulting protection provided may be impaired. Read the following WARNINGS prior to use.

WARNINGS

- Shock Hazard - Disconnect or turn off power before servicing this instrument.
- NEMA 4X wall mount models should be fitted with a locking mechanism after installation to prevent access to high voltages by unauthorized personnel.
- This equipment is suitable for use in Class I, Division 2, Groups A, B, C and D or non-hazardous locations only.
- WARNING- EXPLOSION HAZARD- SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2.
- WARNING- EXPLOSION HAZARD- DO NOT REPLACE FUSE UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.
- WARNING- EXPLOSION HAZARD- DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.
- Use a properly rated CERTIFIED AC power (mains) cable installed as per local or national codes.
- For DC powered units, DC power must be from a SELV rated source.
- A certified AC power (mains) disconnect or circuit breaker should be mounted near the controller and installed following applicable local and national codes. If a switch is used instead of a circuit breaker, a properly rated CERTIFIED fuse or current limiter is required to be installed as per local or national codes. Markings for positions of the switch or breaker should state (I) for on and (O) for off.
- Clean using only a damp cloth with no solvents.
- Equipment not used as prescribed within this manual may impair overall safety.

2 GENERAL INFORMATION

The GDS Corp C2/TX Wireless Site Manager and matching GASMAX/TX Wireless Gas Monitors work together seamlessly to deliver highly reliable, cost effective, customer-friendly solutions for wireless gas detection. Featuring simplified wireless setup, advanced extended-range frequency hopping spread-spectrum technology, hardware and software data encryption and flexible output options, the C2/TX is ideal for small to medium sized wireless installations for toxic or hydrocarbon combustible gases. The C2/TX supports up to thirty-two single or sixteen dual channel GASMAX/TX wireless gas monitors.

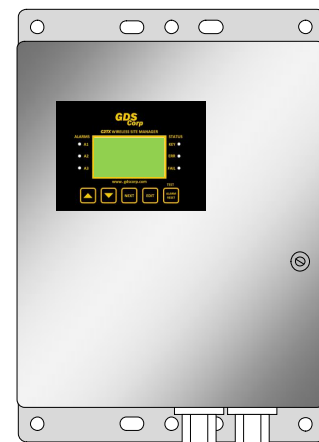


Whereas previous generation wireless systems required users to select and coordinate channel frequencies, system and device identification codes and encryption options, the new C2/TX and GASMAX/TX wireless systems simplify the process by condensing all network settings into a single letter and device ID to a single number, making it extremely easy to configure, add to or troubleshoot a wireless system in the field.

In addition to easy setup, the C2/TX provides eight standard SPDT relays, which can be programmed to indicate alarm conditions as well as sensor fault and gas detector low battery warnings. An optional cellular modem interface and cloud software package enables the C3/TX to generate text messages or email warnings, so long as the controller is within range of a cellular communications tower.

Key features:

- Monitor up to 32 single or 16 dual channel GASMAX/TX monitors
- Automatic channel configuration based on data from each monitor
- Large LCD shows values, bar-graph and packet received info
- Eight standard 5A SPDT common relays
- Optional Wi-Fi, Data Logger and MODBUS serial interface
- Operates on either 110/220VAC or 12-24VDC; optional 50W supply
- Magnetic and touch keys for easy access to menus
- NEMA 4X polycarbonate, painted steel and stainless steel enclosures
- Suitable for use in Class I Division 2 Hazardous Areas



3 SPECIFICATIONS

Power Input	Internal AC supply: 110/220VAC, 50/60 Hz input, 20 watts steady state (40W max inrush) to TB5; If AC power, a maximum of 10 watts is available on TB3 and analog board "24VDC" terminals to power external devices External DC supply: 10-30VDC applied to TB1 (can be supplied as backup) Optional internal 50 watt AC power supply available for driving GDS-IR sensors or other high-wattage loads (requires extended enclosure)
Power Requirements	Basic controller - 3.0 watts Interface module – Add 1.5 watts
Display	64 x128 pixel LCD with alphanumeric display of alarm status and gas values
Input	Wireless – Up to 32 channel wireless 900 MHz or 2.4 GHz
Output	Standard – eight programmable SPST dry contact relays, 5A resistive six programmable SPST dry contact relays, 5A resistive (8 total)
RF Section (900 MHz)	Frequency range from 902 to 928 MHz. Receiver sensitivity -100 dBm. Radio certified to FCC Part 15.247.
RF Section (2.4 GHz)	Frequency range from 2.406 GHz to 2.472 GHz. Receiver sensitivity -100 dBm. Radio certified to FCC Part 15.247.
Temperature	-25°C to +60°C Operating; 0 to 90% relative humidity
Altitude	Maximum operating 6200 ft / 2000 m
Housing	Aluminum housing (2) with epoxy paint standard; #316 stainless steel optional
Dimensions	Compact enclosure Extended enclosure NEMA 7
Approvals	CSA C22.2 No 1010.1 and ISA S82.02; CSA C22.2 No 152 for combustibles; UL 1604 / C22.2 No 213 (Div 2 Groups A,B,C,D); EN55011 & EN61000 (CE Mark).
Warranty	Two years on electronics

4 OPERATION

The C2/TX Wireless Site Manager is designed to receive, process, display and generate alarm and status outputs based on wireless data packets transmitted by GASMAX/TX wireless gas monitors. In addition, the C2/TX monitors each active channel and generates a “communications error” indication if a data packet is not received within a specified time.

Every five minutes or less (user configurable) each GASMAX/TX gas monitor transmits a **standard data packet** that contains information on current measured gas concentration, Alarm 1, Alarm 2, Alarm 3 status and Low Battery status bits. If the programmed Alarm 1 level is exceeded, the transmission frequency increases to **ten transmissions per minute** and remains at that rate until the gas level falls back below the alarm point. As each packet is received by the C2/TX, the alarm and battery status bits are processed by the local microprocessor and used to determine if an Alarm 1, Alarm 2 or Alarm 3 condition exists. Likewise, if a communications fault occurs, or if a Low Battery warning is received, the internal FAULT and LOW BATT status bits are set.

On power-up and periodically thereafter, each GASMAX/TX gas monitor transmits a **verbose data packet** that contains ‘static’ channel-specific information, including zero and span settings, tag name characters and engineering units characters. This information is stored by the C2/TX for display and retransmission across the optional Wi-Fi or serial MODBUS interface. The result is that channel-specific information need not be entered separately in both the gas detector and receiver, saving time and reducing the chance of programming errors.

Each of the eight programmable relays can be set to respond to Alarm 1, Alarm 2 or Alarm 3 conditions, as well as FAULT, LOW BATT or “none’. Furthermore, each relay can be set for Failsafe (“Normally open held closed”), Latching and Acknowledge operation, and can be assigned any selection of channel inputs.

An optional Communications & Data Logging Board (CDLB) provides RS-232 and RS-485 serial MODBUS, data logger with USB interface and 802.11b/g Wi-Fi connection with built-in web server.

IMPORTANT: ALARM LEVELS, TAG NAMES, ENGINEERING UNITS AND OTHER CHANNEL-SPECIFIC INFORMATION IS PROGRAMMED AT THE GASMAX/TX GAS MONITOR AND IS *NOT* ENTERED AT THE C2/TX WIRELESS SITE MANAGER.

5 WIRELESS SYSTEM BASICS

SYSTEM ARCHITECTURE

GDS Corp wireless uses discrete Frequency-Hopping Spread-Spectrum radios to communicate gas and alarm level information wirelessly between gas detectors and controllers. FHSS radios transmit individual data packets using different discrete frequencies in a pseudorandom sequence (“Hop Pattern”) known to both transmitter and receiver. Unlike Direct-Sequence Spread Spectrum (DSSS) used for short distance 802.11 b/g “WiFi” and certain mesh networks, FHSS technology provides an ideal balance between power consumption, transmission distance and resistance to interference.

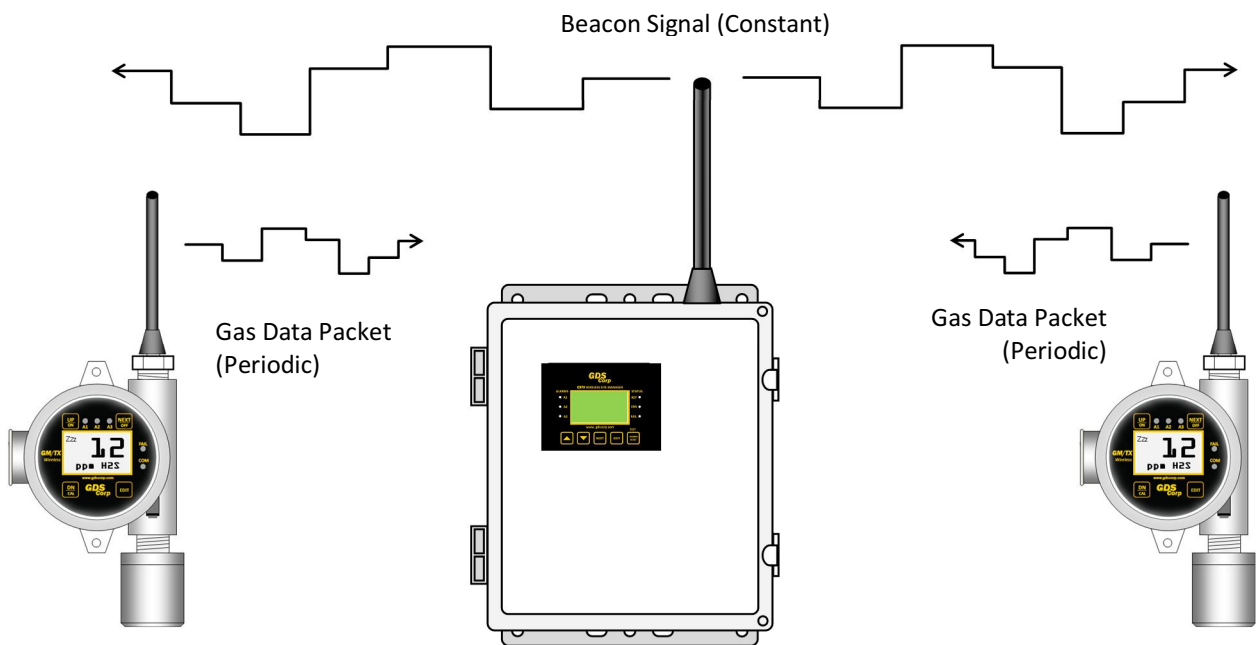


Figure 5-1: GDS Corp Wireless System Architecture

In each GDS Corp system, one device is configured as the “beacon server”. This device transmits a modulated carrier signal that all other radios use to synchronize their frequency-hopping pattern. Knowledge of the selected hopping pattern programmed into the radio and synchronization data from the beacon enables each radio to know when to transmit, and on what frequency. Multiple networks can exist in the same frequency band so long as their choice of pseudorandom hopping pattern is unique. GASMAX/TX monitors support 26 unique network identifiers.

TRANSMISSION DISTANCE

In order for reliable wireless communication to occur, transmitter power output, antenna 'gain' and receiver sensitivity must exceed the 'free space loss' attenuation experienced by radio signals as they travel between transmitter and receiver. This gain or loss is measured in decibel-milliwatts (dBm) and is a function of both distance and frequency. Typical free space loss at 900 MHz is -71 dBm at 300 ft / 100 meters and -91 dBm at 3000 ft / 300 meters, and for 2.4 GHz the free space loss is -80 dBm at 300 ft / 100 meters and -100 dBm at 3000 ft / 1000 meters.

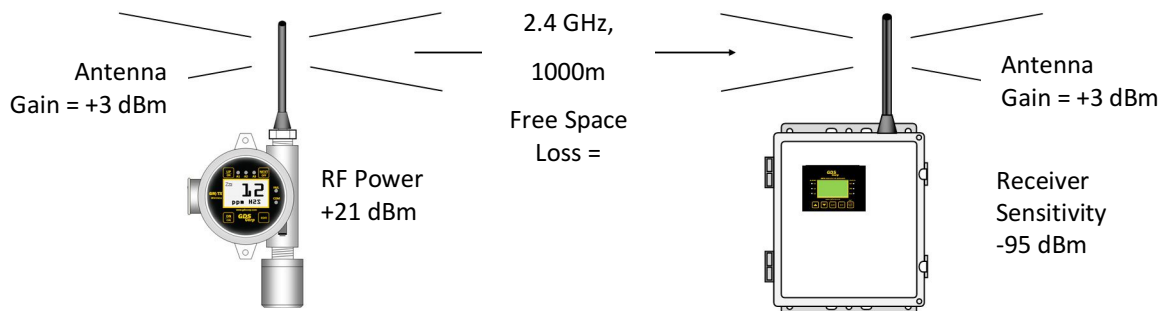


Figure 5-2: RF Transmission Margin

In a typical 2.4 GHz system shown above, for example, the transmitter power output is +21 dBm, each antenna provides an additional gain of +3 dBm and the receiver sensitivity is -95 dBm. Therefore, the total system gain is $21+3+3-(-95) = 122$ dBm. Since a reliable system requires a margin of +20 dBm, this system will work if the free space loss between the transmitter and receiver is less than 102 dBm, suggesting a distance of approximately 1000 meters. However, this calculation does not take into account additional losses due to intervening structures or foliage.

To minimize free-space loss, the combined height of the transmitter antenna and receiver antenna should exceed the diameter of the "RF Transmission Zone" (see Fig. 5-3) and at least 60% of the area inside the zone should be free of obstacles. Although both 900 MHz and 2.4 GHz signals can travel around or through most towers or buildings, structures such as large metal tanks or solid metal buildings may attenuate the signal to the point where reception is marginal.

Raising the antenna at either end of the path will improve signal strength and reduce transmission errors. GDS Corp recommends placing the GASMAX/TX at least 5 feet above the surrounding terrain, and even more if possible. However, note that the standard antenna transmits its maximum signal strength in a

relatively flat ‘donut-shaped’ pattern which may affect the performance of GASMAX/TX monitors located in close proximity to an elevated C2/TX Site Manager or receiver/controller.

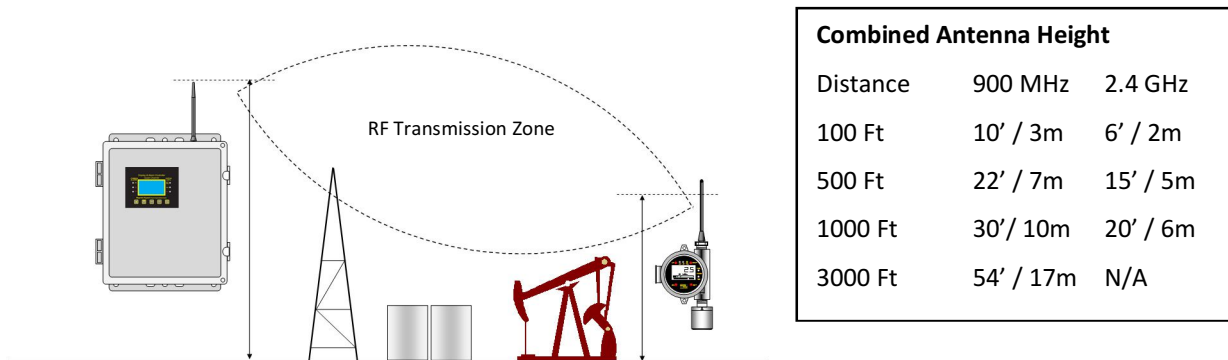


Figure 5-3: RF Transmission Zone

GDS Corp always recommends that a wireless survey be completed at the site to ensure the integrity of the wireless communications link. Special care should be taken to account for moveable obstacles such as cranes, railroad cars, trucks, containers, and any other large ‘structures’ that could end up being placed – temporarily – in a location that blocks the wireless signal.

MONOPOLE AND COLLINEAR OMNI-DIRECTIONAL ANTENNAS

Monopole “rubber duck” antennas are the most commonly used antennas for portable and semi-portable equipment where extreme range or directional reception is required. When mounted vertically, they provide good ‘omnidirectional’ reception and transmission from all horizontal directions, and are generally rugged and when sealed properly against moisture can provide years of quality service.

Collinear antennas are more sophisticated and combine several vertical antennas that operate in parallel to increase signal gain by focusing the reception pattern in a more horizontal plane.

Rubber duck and collinear antennas provide best performance when installed with at least 1 to 2 “wavelengths” away from walls or steelwork. Since wavelength proportional to frequency, 900 MHz signals have a wavelength to approximately 12 inches and 2.4 GHz signals have a wavelength of about 3 inches. **Therefore, 900 MHz antennas should be installed with at least 2 feet of clearance and 2.4GHz antennas at least 6 inches of clearance from walls or structures.** Antennas may be mounted with less clearance but output will be reduced; this may not matter if the distances involved are short. It is important the antenna mounting bracket to well connected to “earth” or “ground” for good lightning surge protection.

Rubber duck or collinear antennas emit RF energy in 'vertical polarization', where the electric fields oscillate in the vertical plane and the magnetic fields oscillate in the horizontal plane. Transmitting and receiving antennas should always be oriented such that the polarization is the same.

YAGI DIRECTIONAL ANTENNAS

Yagi antennas are directional along the central beam of the antenna. The folded element is towards the back and the antenna should be "pointed" in the direction of the transmission. Yagi antennas should also be mounted with at least 1 to 2 wavelengths of clearance from other objects. The polarity of the antenna is the same as the direction of the orthogonal elements. For example, if the elements are vertical the Yagi transmits with vertical polarity.

In networks spread over wide areas, it is common for a central receiver / controller to have an omni-directional antenna (such as a collinear) and the remote GAMAX/TX monitors to have Yagi directional antennas. In this case, as the omni-directional antenna will be mounted with vertical polarity, then the Yagi's must also have vertical polarity (see Fig. 5-3). Care needs to be taken to ensure the Yagi is aligned correctly to achieve optimum performance.

Two Yagi antennas can be used for a point-to-to link. In this case they can be mounted with the elements horizontally to give horizontal polarity. There is a large degree of RF isolation between horizontal and vertical polarity (~30dB) so this installation method is recommended if there is a large amount of interference from another system close by transmitting in vertical polarity.

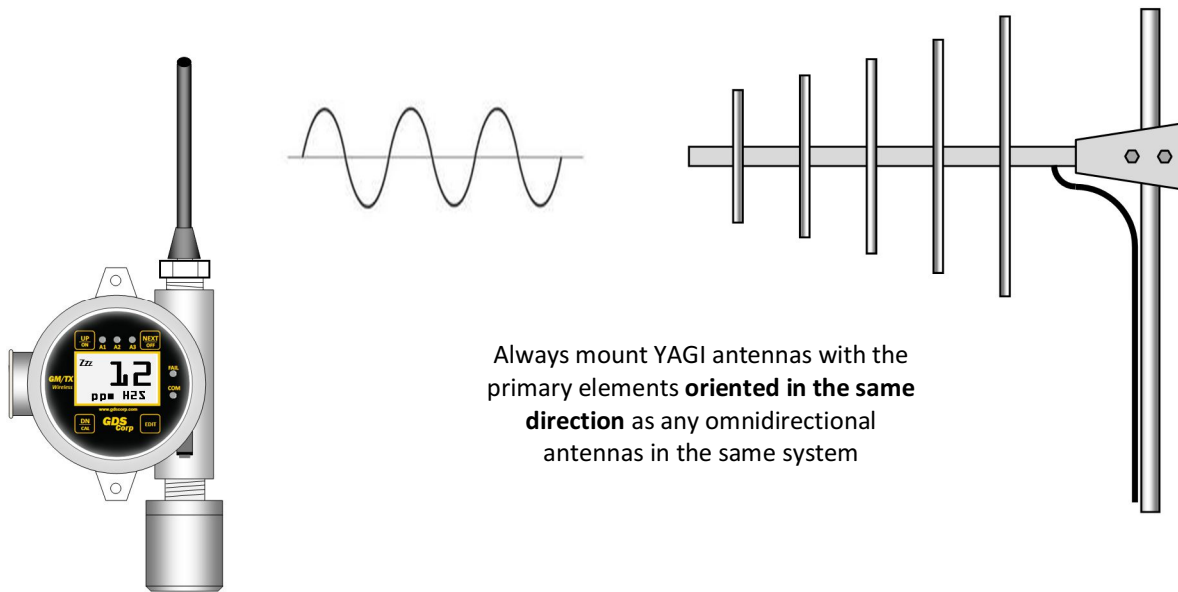


Figure 5-4: Vertically Polarized Omni-Directional and YAGI Antennas

COAXIAL CABLES

When installing a coaxial cable between the GASMAX/TX and a remote antenna, constructing a loop of cable below the antenna is always recommended. The loop allows water to drip off the bottom of the U instead of into the connection, reduces installation strain and provides spare cable length in case later the original connectors need to be replaced.

Avoid installing coax cables together in long parallel paths. Leakage from one cable to another has a similar effect as mounting an antenna near another antenna.

SURGE PROTECTION & GROUNDING

Voltage surges primarily enter the GASMAX/TX via the antenna connection as a result of electrical discharge in the atmosphere. Electrical energy follows the most direct path to earth and the best protection is achieved by “draining” the surge energy to earth via an effective earth ground. Wireless devices should have a solid connection to earth via a ground stake or ground grid if the soil has poor conductivity. Solid connection means a large capacity conductor (not a small wire) with no coils or sharp bends. All other devices connected to the GASMAX/TX, such as remote sensors, should be grounded to the same ground point if possible. There can be significant resistance between different ground points leading to very large voltage differences during lightning activity. As many wireless units are damaged by earth potential surges due to incorrect grounding as direct surge voltage.

It is very difficult to protect against direct lightning strikes but the probability of a direct strike at any one location is very small. Unfortunately, power line surges and electromagnetic energy in the air can induce high voltage surges from lightning activity several miles away.

6 HARDWARE OVERVIEW

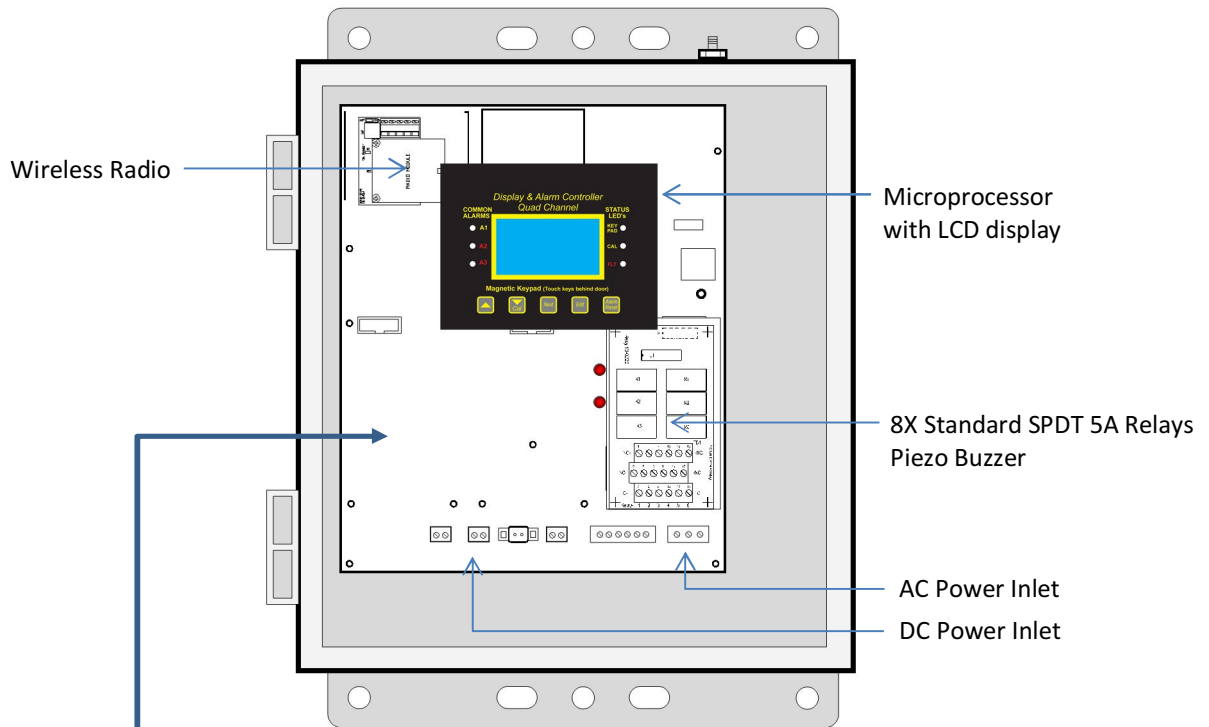


Figure 6-1: C2/TX Site Manager Overview

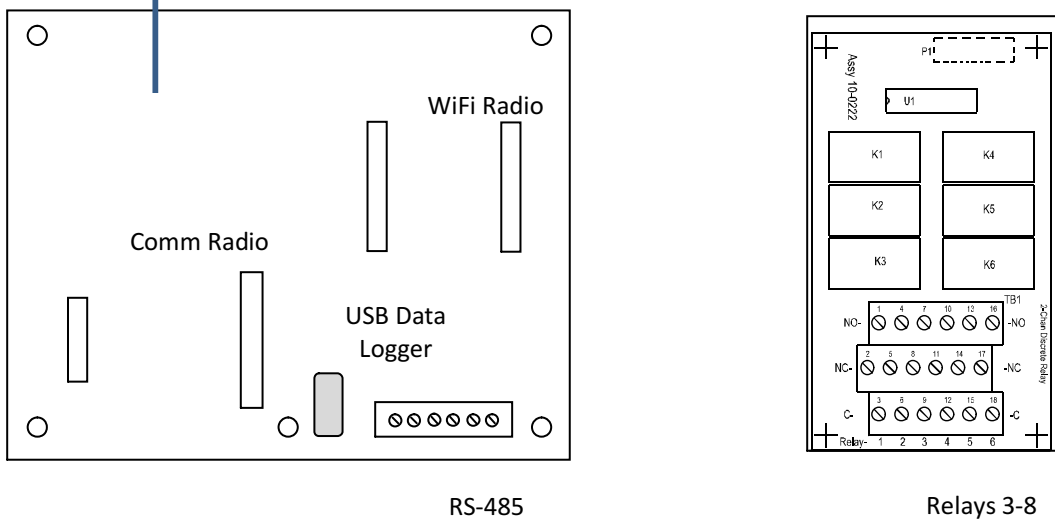


Figure 6-2: C2/TX Comm Option & Standard Relay Boards

MAIN SYSTEM BOARD

The C2/TX Wireless Site Manager main system board includes the radio module, power supply, AC and DC power and function expansion connectors and 8x standard relays. The CPU/Display assembly attaches to the main system board on standoffs and connects via a ribbon cable to connector S1.

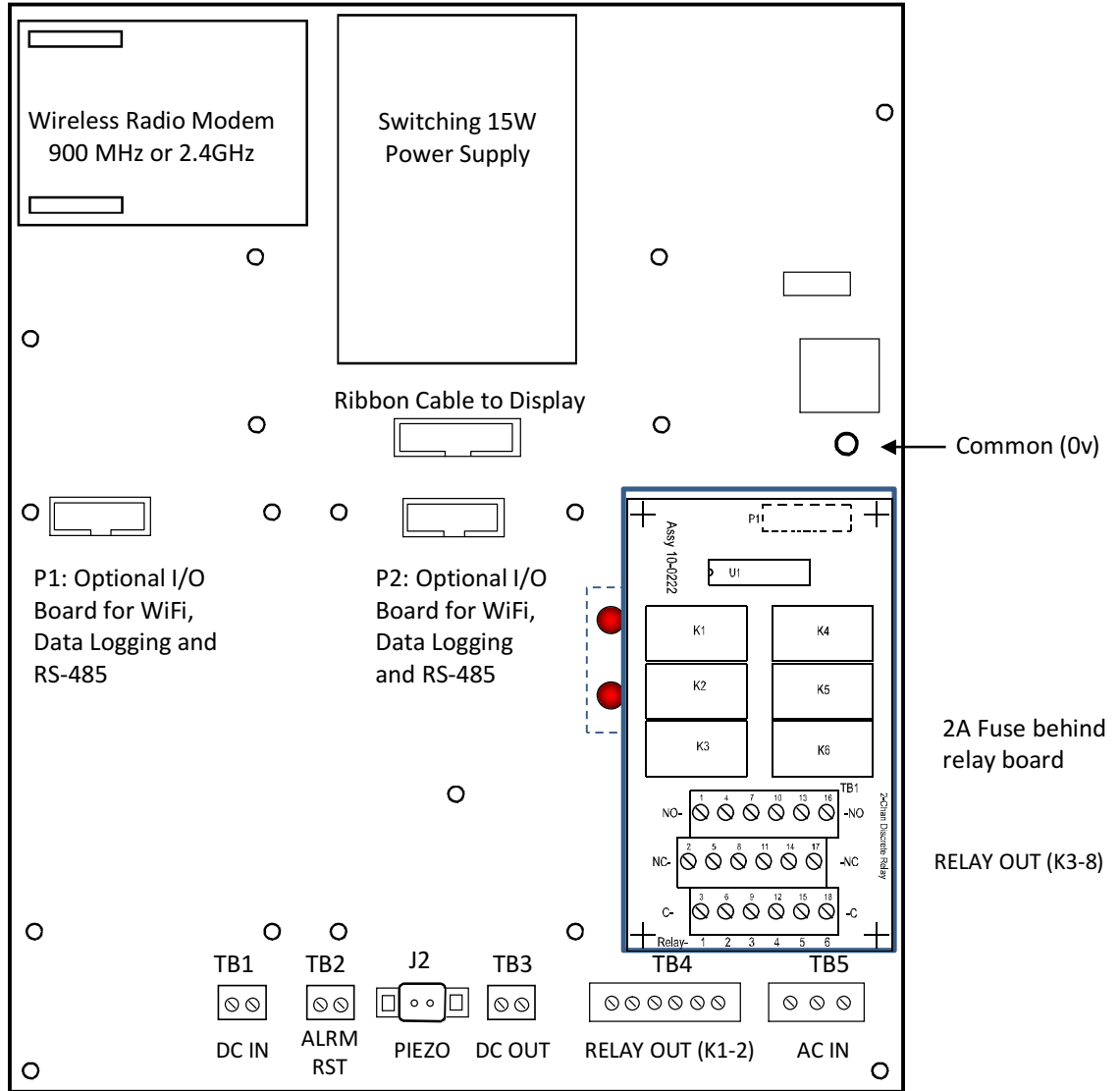


Figure 6-3: C2/TX Wireless Site Manager Motherboard

I/O CONNECTOR P1

I/O connector P2 is reserved for the optional Communications & Data Logging Expansion board. The CDLE board provides a 802.11 b/g WiFi interface, solid state data logger and RS-485 and RS-232 serial interfaces.

I/O CONNECTOR P2

I/O connector P2 is reserved for the optional Communications & Data Logging Expansion board. The CDLE board provides a 802.11 b/g WiFi interface, solid state data logger and RS-485 and RS-232 serial interfaces.

TERMINAL BLOCKS

TB1 is used when the C2/TX is powered by an external DC power supply or solar power system.

J2 is a 2-pin polarized connector for powering the audible large piezo buzzer.

TB2 offers field terminals for a remote Alarm Reset normally-open pushbutton switch.

TB3 provides a convenient connection point for external devices that require 24VDC. DC output is limited to 350 mA if using the internal DC supply. See Figure 5-1 for a more detailed description of the DC input and output options.

TB4 provides field wiring terminals for relays K1 and K2. Indicator LEDs for Relay 1 and Relay 2 are located on the main system board.

TB5 provides a connection to the onboard 100-240 VAC power supply (if the 50W optional supply is not installed).

Relay Out (Relay 3-8) provides connections to the six SPDT relays mounted on the relay expansion board.

IMPORTANT: AC OR DC POWER SUPPLIES TO RELAYS ON THE SIX-CHANNEL RELAY EXPANSION BOARD **MUST BE THE SAME FOR EACH RELAY.** EXAMPLE: 24VDC SHOULD NOT BE THE POWER SWITCHED BY ONE RELAY AND 115VAC BY OTHERS.

IMPORTANT: ALL MECHANICAL (DRY CONTACT) RELAYS ARE RATED AT 5 AMP FOR 28 VDC AND 250 ~VAC RESISTIVE LOADS. APPROPRIATE DIODE (DC LOADS) OR MOV (AC LOADS) SNUBBER DEVICES **MUST BE INSTALLED WITH INDUCTIVE LOADS** TO PREVENT RFI NOISE SPIKES.

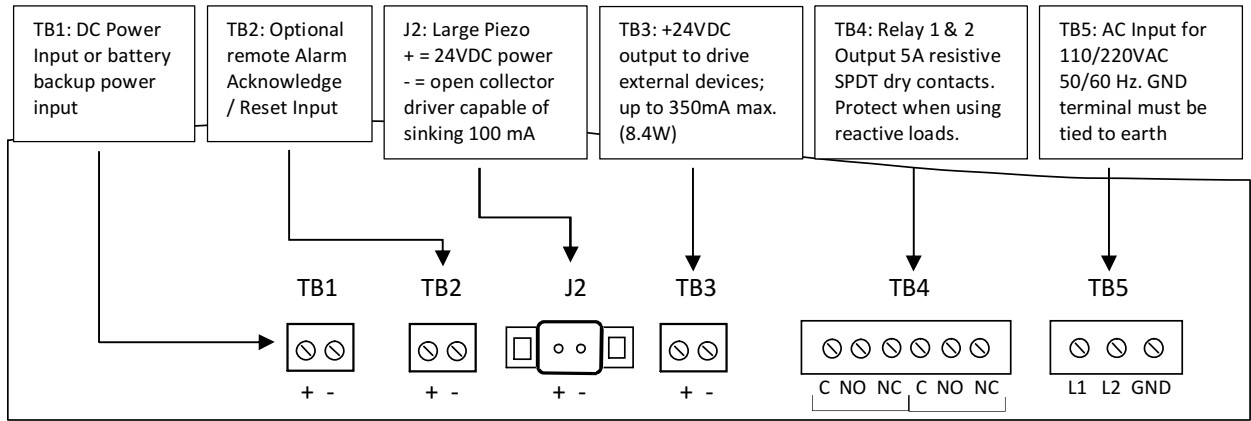


Figure 6-4: Main System Board User Connections Detail

DISPLAY / CPU MODULE

The Display & CPU module mounts on the motherboard using standoffs and connects to the system via a short ribbon cable. The display includes a 128 x 64 pixel bit-mapped LCD, six LED indicators, five physical pushbuttons and a low volume piezo buzzer. Display contrast can be adjusted via the LCD Contrast potentiometer at the lower left corner of the display PCB.

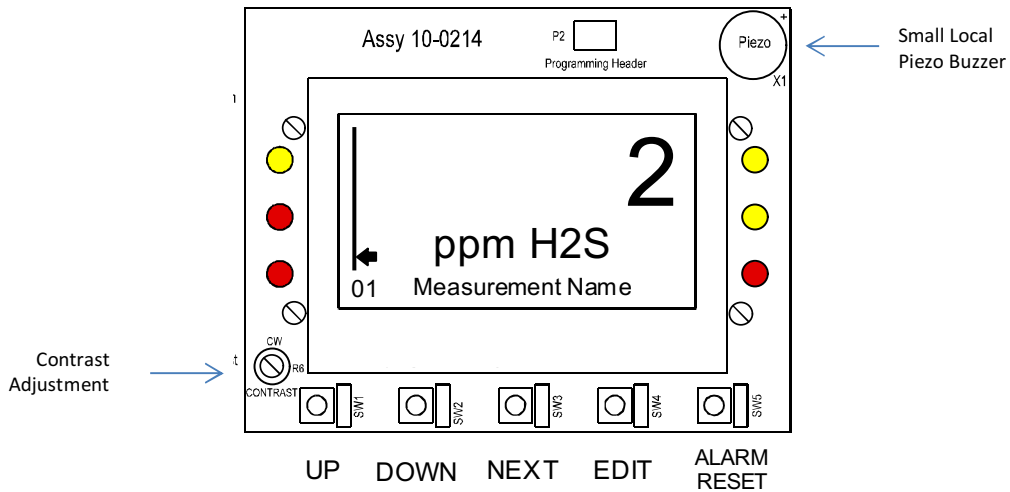


Figure 6-5: Display / CPU Module

OPTIONAL 50W POWER SUPPLY

Some applications may require DC power in excess of the 10 watts available from the universal power supply located on the system board. C2/TX Wireless Site Managers can be equipped with a DIN-rail mounted 50 watt DC supply rated for Class I Division 2 hazardous areas. This would be useful if the controller needs to power local strobe lights or large horn sounders.

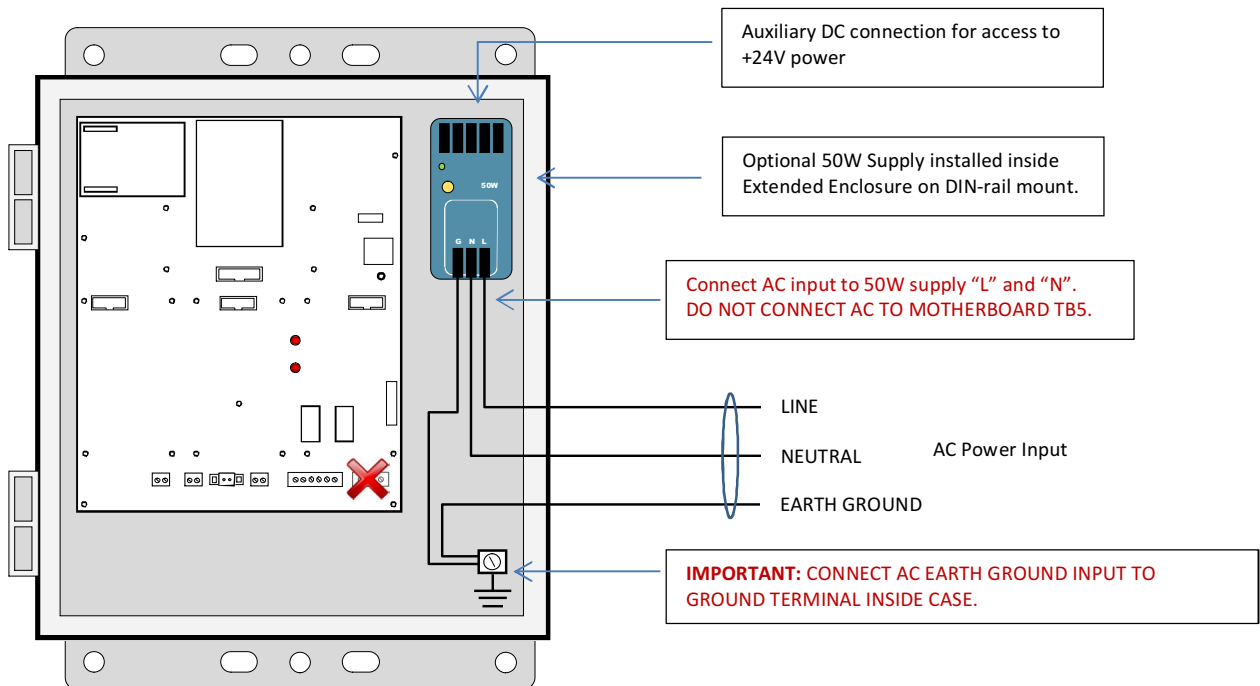


Figure 6-6: Optional 50W Power Supply Wiring

IMPORTANT: WHEN USING THE OPTIONAL 50W POWER SUPPLY, DC POWER IS NOT AVAILABLE FROM MOTHERBOARD CONNECTOR TB3. IF +24VDC IS REQUIRED FOR LIGHTS OR HORNS, CONNECT DC WIRING TO THE UNUSED (+) AND (-) CONNECTIONS ON THE TOP TERMINAL BLOCK OF THE 50W SUPPLY.

7 INSTALLATION

SELECTING A LOCATION

The C2/TX Wireless Site Manager should be mounted in a location with good line-of-sight access for wireless gas detectors, suitable visibility for any locally-mounted warning strobe or horn, and access to AC or DC power. Entry gates, central control rooms, outdoor instrument shelters and free-standing poles are ideal locations. Since the C2/TX Wireless Site Manager can operate on 12VDC power, it can be easily mounted to hardware supporting temporary or permanently installed solar panels. Hardware for wall mount, pole mount and magnetic mount is available. The controller should not be mounted in direct sunlight and should be kept away from sources of vibration or shock.

MOUNTING THE C2/TX WIRELESS SITE MANAGER

The C2/TX Site Manager Controller offers three types of mounting: wall mount, magnetic mount and pole mount. See Chapter 13 for detailed dimensions for each type of enclosure.

POWER & RELAY WIRING

The Motherboard PCB contains a 24 VDC universal input (100-240 VAC) switching power supply with up to 350mA available at the TB3 Auxiliary Power Output terminals. If AC power is unavailable, or if a DC battery back-up supply is needed, TB1 provides terminals for DC power input. Blocking diodes isolate internal and external DC supplies as shown in Figure 5-1.

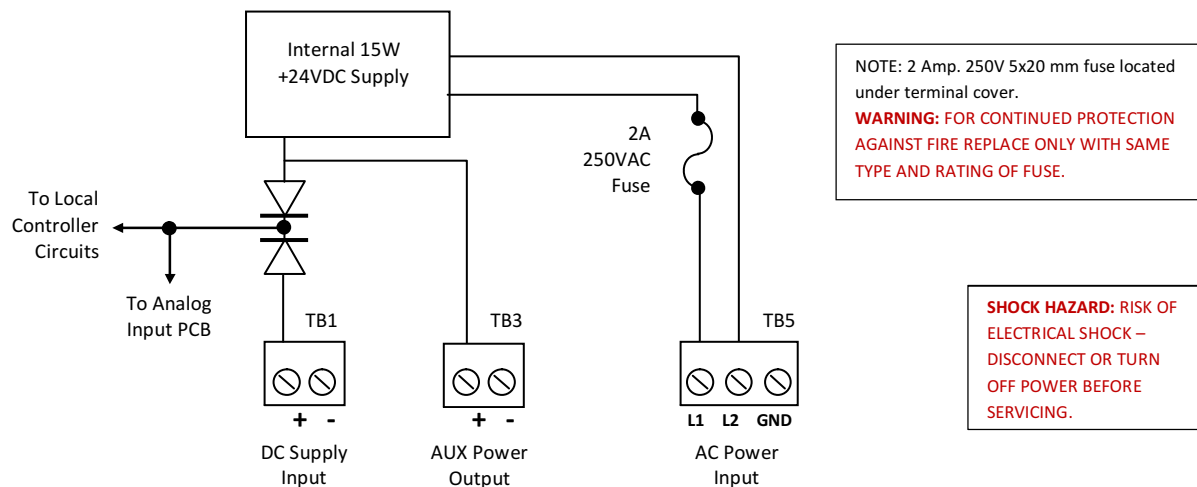


Figure 7-1: Power Supply Input Detail

NOTE: A CERTIFIED AC POWER (MAINS) DISCONNECT OR CIRCUIT BREAKER SHOULD BE MOUNTED NEAR THE CONTROLLER AND INSTALLED FOLLOWING APPLICABLE LOCAL AND NATIONAL CODES. IF A SWITCH IS USED INSTEAD OF A CIRCUIT BREAKER, A PROPERLY RATED CERTIFIED FUSE OR CURRENT LIMITER IS REQUIRED TO BE INSTALLED AS PER LOCAL OR NATIONAL CODES. MARKINGS FOR POSITIONS OF THE SWITCH OR BREAKER SHOULD STATE (I) FOR ON AND (O) FOR OFF.

ANTENNA PROTECTION

When installing a C2/TX Wireless Site Manager in an outdoor location, it is important to properly waterproof the antenna connection to keep moisture away from the RF signal path.

GDS Corp recommends a three-step process – First, wrap the antenna connection with a length of black electricians tape; second, cover the tape with approximately 20” of self-fusing ethylene-propylene insulating tape (ex: 3M type 23, p/n 1000-2314), followed by a final coat of PVC electricians tape over the entire connection. Even a small amount of moisture can completely attenuate the microvolt signals received from GASMAX/TX wireless gas monitors.

USE IN HAZARDOUS AREAS

The C2/TX Site Manager is suitable for use in Class I Division 2 hazardous areas. Certified under CSA C22.2 No 1010.1 and ISA S82.02; CSA C22.2 No 152 for combustibles; UL 1604 / C22.2 No 213 (Div 2 Groups A,B,C,D); EN55011 & EN61000 (CE Mark).

8 INITIAL SETUP

WIRELESS GAS MONITOR INPUT

To create a wireless network using GASMAX/TX wireless gas monitors, perform the following steps in order:

	GASMAX/TX Gas Monitor	C2/TX Wireless Site Manager
1		Apply AC or DC power to the C2/TX Wireless System Manager
2		Select the desired network identifier ("A" through "Z")
3		If the C2/TX is the primary or only controller in the network, select RF Mode = "Server"
4		If using 900 MHz radios, set the desired transmit power output
5		Enable the desired number of wireless channels in the C2/TX
6	Turn on the GASMAX/TX by holding a magnetic wand over UP/ON key for several seconds	
7	Configure the network identifier ("A" thru "Z") to match that chosen for the C2/TX or system controller. <i>Find in "Device Setup – RF Link"</i>	
8	Configure the RTU # (device ID) for a unique value <i>Find in "Device Setup – RF Link"</i>	
9	Program channel tag name (if desired) <i>Find in "Channel Setup"</i>	
10		Select C2/TX channel and set Remote Address to match device ID on GASMAX/TX
11	Hold magnetic wand over UP key to force initial transmission	Confirm reception of wireless transmission and valid gas detector reading
xx	Repeat for Each GASMAX/TX	Repeat for each GASMAX/TX
12		Program relays and alarm conditions for desired outputs
	Perform end-to-end test using calibration or test gas	

RELAY OUTPUT

The C2/TX Site Manager has two standard 5A SPDT relays with terminals on the motherboard (Relay 1 and 2) and six additional SPDT relays on the relay expansion board (Relays 3 thru 8). All relays can be programmable for normal or FAILSAFE (“normally open held closed”) and support voting and channel & alarm specific overrides. See Relay Setup menu for more details.

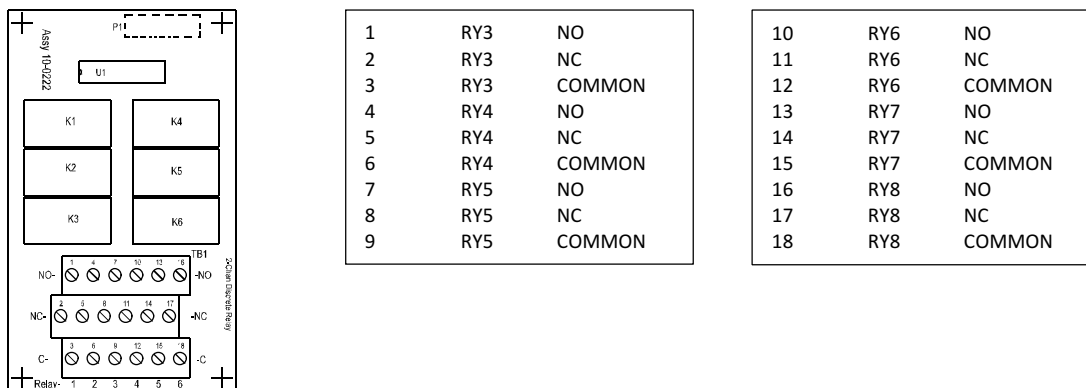


Figure 8-1: Relay Output Board

An easy way to test a specific relay is to toggle the normal / FAILSAFE setting.

IMPORTANT: ALL MECHANICAL (DRY CONTACT) RELAYS ARE RATED AT 5 AMP FOR 28 VDC AND 250 ~VAC RESISTIVE LOADS. APPROPRIATE DIODE (DC LOADS) OR MOV (AC LOADS) SNUBBER DEVICES **MUST BE INSTALLED WITH INDUCTIVE LOADS** TO PREVENT RFI NOISE SPIKES.

IMPORTANT: AC OR DC POWER SUPPLIES TO RELAYS ON THE RELAY EXPANSION BOARD MUST BE THE SAME FOR ALL RELAYS. **DO NOT MIX +24V and 110VAC LOADS.** IT IS OK TO SWITCH 110VAC ON RELAYS 1 AND 2 AND 24VDC ON RELAYS 3-8.

COMMUNICATIONS AND DATA LOGGING EXPANSION OUTPUT

Information on the Communications & Data Logging Expansion board will be available in a future release of the C2/TX manual.

9 OPERATION & MAINTENANCE

C2/TX USER CONTROLS

The user interface for the C2/TX Site Manager consists of a high resolution LCD display, six LED indicators arranged on each side of the LCD display and five buttons arranged across the bottom of the display. From left to right, these are “UP”, “DOWN”, “NEXT”, “EDIT” and “ALARM RESET”. ***With the cover in place, a magnetic wand can be used to activate the buttons; with the cover removed there are physical pushbuttons that perform the same function.*** Press the “NEXT” key to switch display screens, or press the “EDIT” key to access the main user setup menu. Setup mode will exit automatically if no keys are pressed within 5 minutes. Press “ALARM RESET” to acknowledge an existing alarm or clear a latched alarm relay if the alarm condition is no longer valid.

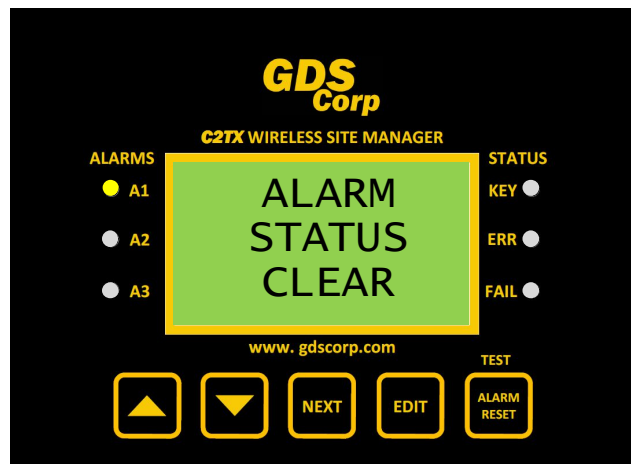


Figure 9-1: C2/TX Site Manager Front Panel

A set of alarm and status indication LEDs appear on the left and right side of the LCD display. LEDs on the left indicate an alarm condition in any channel. Alarm LEDs will flash for new alarms and will become steady after an alarm RESET is commanded. Status LEDs on the right side indicate a key entry, a communications error (“COMM ERR”) condition and a sensor FAULT condition.

C2/TX DISPLAY SCREENS

When there are no alarms present, the C2/TX displays the message ALARM STATUS CLEAR. When this screen is visible, the user can be sure that no alarms are present in the received from any GASMAX/TX gas monitor.

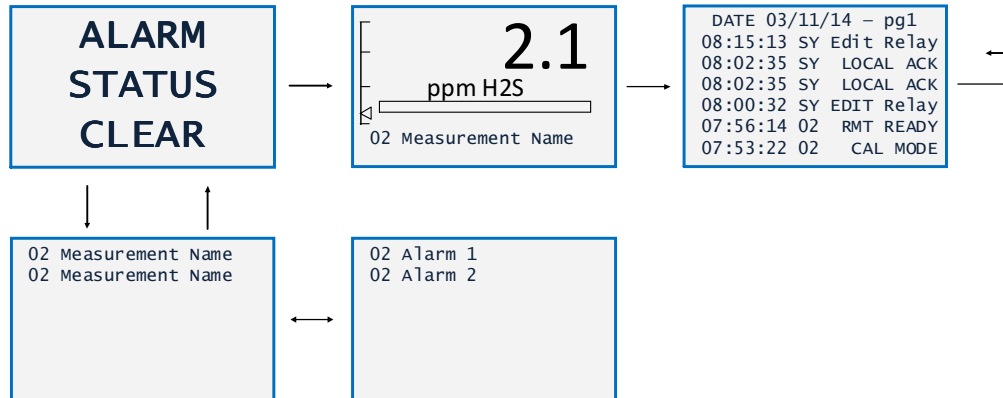


Figure 9-2: C2/TX Display Screens

Pressing the NEXT key will bring up the channel-specific Engineering Units / Bargraph display shown in Figure 8-2. The UP and DOWN keys can be used to select any enabled channel. Pressing NEXT again will display the event log, followed by the alarm screen.

If any alarms are present, the Alarm Status Clear message will be replaced by an Alarm Display screen that will alternate between the channel and tag name and specific alarm condition.

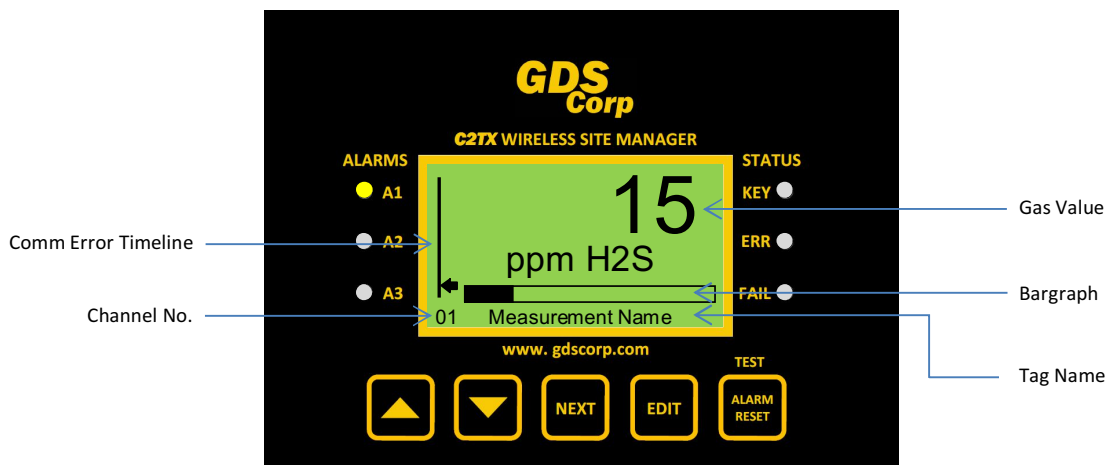


Figure 9-3: Engineering Units / Bargraph Display Screen

The Engineering Units / Bargraph display shows the current reading in calibrated engineering units, the engineering units value in text form, a bargraph that gives the current reading in percent of scale, and the Comm Error Timeline.

The Comm Error Timeline (ECT) indicates the amount time since the last received transmission. Each time a data packet is successfully received, the ECT pointer moves the bottom of the screen, and proceeds to move upwards at a fixed rate. If the pointer reaches the top of the screen, a COMM ERROR is generated for the specific channel.

Pressing the NEXT key brings up the **Channel Alarm Status Screen**. The Channel Alarm Status screen shows all active channel numbers but flashes any with an alarm condition. Use the UP/DOWN keys to point to a channel in alarm and the NEXT brings up that channel's Engineering Units / Bargraph screen to provide more detailed information about the alarm.

Pressing the NEXT key again brings up the **EVENT LOG Screen**. The Event Log shows a list of events and the time and date they occurred. These events can include Power On, Alarm IN or OUT for any programmed alarm, Relay IN or CLR, Fault, Low Battery and other. Use the UP or DOWN keys to scroll through the Event Log. Pressing NEXT again restores the Engineering Units / Bargraph screen.

NORMAL MAINTENANCE

Normal maintenance for the C2/TX Site Manager controller primarily involves checking the display for alarm or communications problems. A periodic inspection of the interior is recommended to determine if water or dust is entering the enclosure.

GDS Corp recommends a full 'end to end' test be performed periodically, where gas is applied to the sensor and the desired output strobe or horn operation is confirmed.

10 USER SETUP MENUS

The SETUP menu is reached by pressing **EDIT** with any data display present. This is the entry-level screen to ALL *Channel, System, Communications* and *Security* menus. Use the **UP/DOWN** keys to move the pointer to the desired menu and press the **EDIT** key to select the sub-menu.

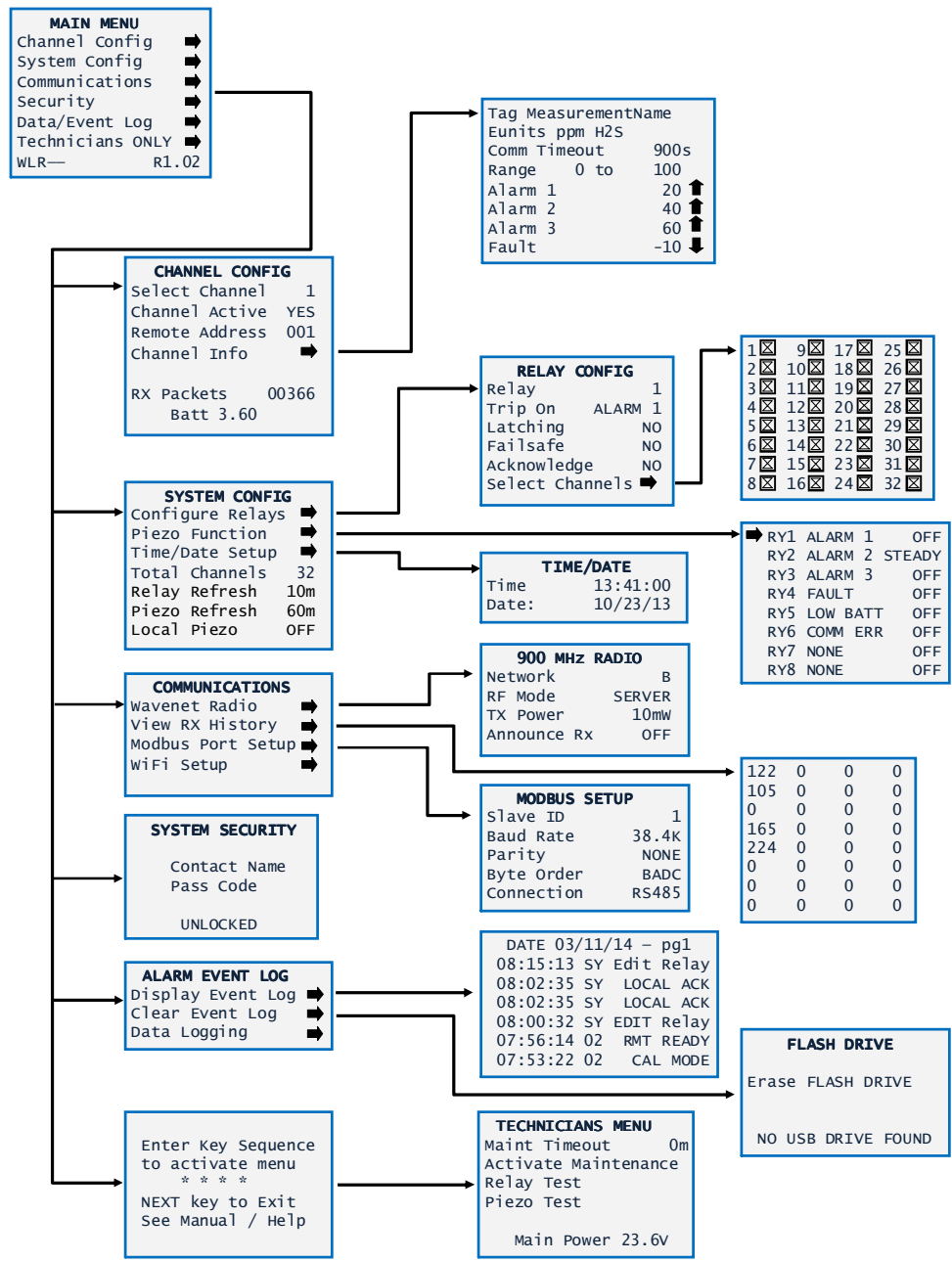


Figure 10-1: C2/TX Site Manager Controller Main Menu Tree

When entering a menu, a pointer controlled by the UP/DOWN keys indicates the selected variable. Some are simple YES/NO or ON/OFF entries and can be toggled by pressing the EDIT key. Others may have ASCII

characters or numeric values. To change an ASCII or numeric value, select the entry and press the EDIT key. This places a cursor under the item; use the UP/DOWN keys to scroll through each allowed entry and use the NEXT key to move the cursor to the next position within a field. When the field is complete, press EDIT to clear the cursor and load the field into non-volatile memory. Use the NEXT key to move up the menu tree and return to display mode.

CHANNEL CONFIG MENU

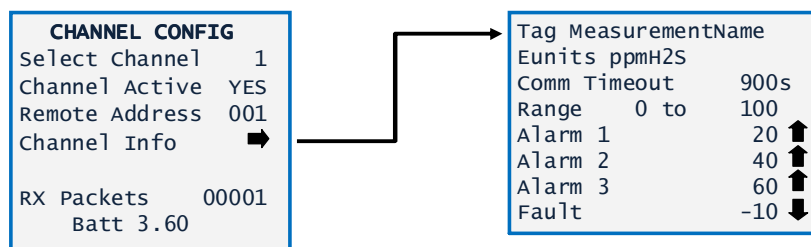


Figure 10-2: Channel Configuration Menu

Select Channel: To change the viewed channel, move the cursor to point to Select Channel and press EDIT to show the desired channel. The C2/TX supports channel values between 1 and 32.

Channel Active determines if the selected channel is enabled (YES) or disabled (NO). If a channel is enabled, and no gas detector is present, the channel will generate a COMM ERROR after the comm error timeout value expires.

Remote Address is set to the numeric address of the remote GASMAX/TX monitor assigned to this channel. Remote values can be set to any value between 0 and 240.

Channel Info: Displays the channel information received from the GASMAX/TX in the most recent verbose data packet received by the C2/TX. This information is configured at the gas detector and is not adjustable in the C2/TX menu. Values include tag name, engineering units description, zero and span values and alarm 1, 2, 3 and Fault levels.

IMPORTANT: CHANNEL TAG NAME, ENGINEERING UNITS, ZERO, SPAN, ALARM AND FAULT LEVELS ARE SET AT THE GASMAX/TX AND ARE NOT CONFIGURABLE ON THE C2/TX WIRELESS SITE MANAGER.

RX Packets: Displays a running count of the number of data packets received by the C2/TX. Useful for troubleshooting and setup.

Batt: Shows the most recent battery voltage value transmitted by the GASMAX / TX gas monitor assigned to the current channel.

SYSTEM CONFIG MENU

This menu covers items that are system specific instead of channel-specific and include relay setup, piezo buzzer settings and internal clock time & date.

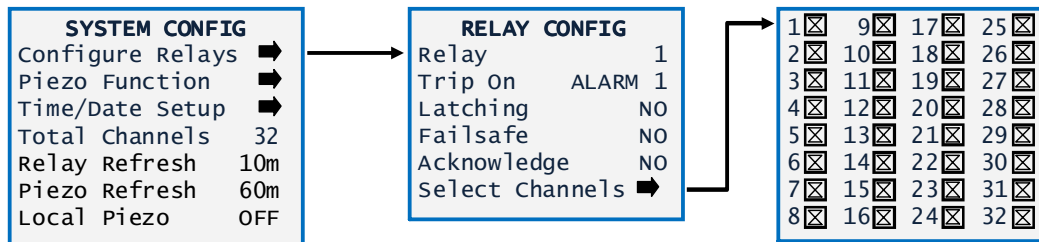


Figure 10-3: System Config – Relay Config Menu

Relay Setup Menu: The menu shown allows the user to configure the eight standard relays. Select the relay to be configured by pointing the arrow at the top menu item and pressing EDIT. The field will scroll through all eight possible choices.

Trip On: Each relay can be set to trip (activate) on Alarm 1, Alarm 2, Alarm 3, Fault, Low Battery, Communications Error or None.

Latching: If set to YES, the relay will latch on activation and remain active until acknowledged by pressing the Alarm Reset button. If the alarm condition is no longer present, the relay will deactivate. If the alarm condition is still present, pressing the Alarm Reset button will have no effect. If set to NO, the relay will activate whenever an alarm condition is present and will deactivate when the alarm condition no longer exists.

Failsafe: If set to YES, the relay to be energized when its input condition is false and will de-energize when the alarm condition is true. The primary benefit of Failsafe is that loss of power places the relay contacts into the alarm condition. Failsafe settings cause the relay to be continuously activated are not recommended when using solar or battery power.

Acknowledge: If set to YES, the relay will clear when the Alarm Reset button is pressed, irrespective of the current alarm condition. If set to NO, the alarm output cannot be silenced if the alarm condition is present. This is useful for audible warning devices that need to be silenced once the alarm is recognized. In general, audible devices should be set for ACK = YES, and visual devices set for ACK = NO.

Select Channels: Each relay can be set to monitor any combination of active channels. To assign a relay to monitor a specific channel, make sure there is an 'X' in the box associated with that channel. In the example shown, Relay 1 is for non-latching, normal mode and is set to activate if any of the 32 channels receives a data packet from its associated gas detector with the Alarm 1 status bit set.

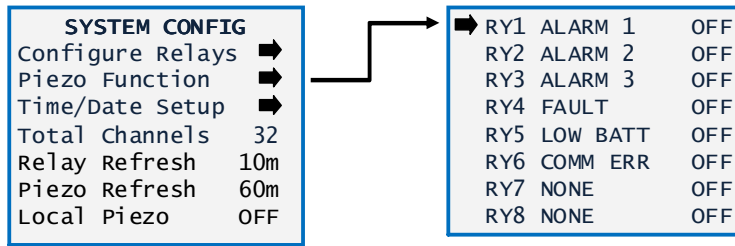


Figure 10-4: System Config - Piezo Function Menu

Piezo Function Menu: The Piezo FUNCTION group determines behavior of the 100dB front mounted piezo as related to the eight relays. Choices are OFF, Chirp, Pulse and Steady. In the example above, relays one through six have been set for Alarm 1, Alarm 2, Alarm 3, Fault, Low Batt and Comm Error. If RY5 LOW BATT were set to ON, the piezo would sound whenever RY5 would be active. The piezo can be set to activate on any or all of the programmed relay conditions.

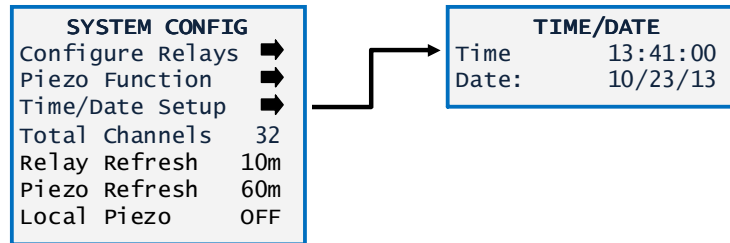


Figure 10-5: System Config – Time/Date Menu

Time & Date: The C2/TX Site Manager controller is equipped with a 24-hour clock and calendar. Time of day must be entered in 24 hour mode. For example, 6:00:00 PM = is indicated as 18:00:00. Be sure to adjust the time setting to match the current time when installing the controller for the first time, and note that the time value must be updated for changes due to Daylight Savings Time.

Total Channels: Determines total number of available channels between 1 (min) and 32 (max). For example, if this menu is set for 10, then only 10 channels are available in the CHANNEL CONFIG menu.

Relay Refresh: Time setting to *reactivate* alarms that have been silenced (acknowledged), even though the alarm condition is still present. It can be set from 0 to 120 minutes with 0 turning the Refresh function OFF. Refresh will re-activate the relay after this timer expires. This feature is useful for silencing audible devices but then automatically activating them again if the alarm condition remains after a period of time.

Piezo Refresh: Piezo refresh is identical to Relay Refresh. The main piezo sounder is always acknowledgeable.

Local Piezo: When set to ON, the small piezo on the Display Board will mimic the larger piezo wired to the main system board. This can be useful for testing the operation of the louder device even though it is disconnected. When set to OFF the small piezo on the Display board will only sound as keys are pressed.

COMMUNICATIONS MENU

The communications menu allows the user to setup the wireless radio, MODBUS port and WiFi radio. The menu also includes a diagnostics screen that displays a count of wireless data packets received.

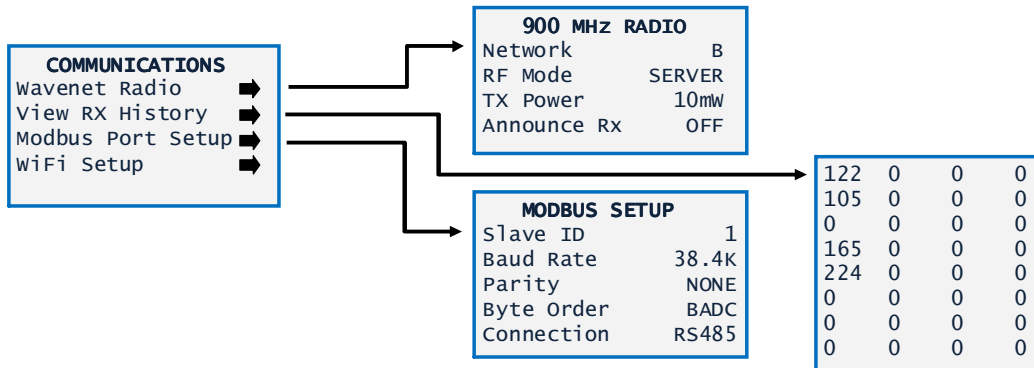


Figure 10-6: Communications - Configure Radio Menu

Network: The C2/TX and GASMAX/TX utilize frequency hopping spread spectrum (FHSS) radios to achieve maximum range while minimizing power consumption. FHSS allows multiple radios and multiple networks to share the same frequency range without creating interference or communications errors.

The C2/TX and GASMAX/TX can be set to communicate on one of 26 different “frequency hopping patterns”, each assigned a unique letter (“A” through “Z”). Each pattern uses a unique combination of frequencies, hopping channels and system identification codes to ensure that radios assigned to one network (“A”) do not interfere with radios assigned to a different network (“D”).

NOTE: IN ORDER TO COMMUNICATE, ALL DEVICES IN THE NETWORK MUST HAVE THEIR NETWORK CONFIGURED FOR THE SAME LETTER IDENTIFIER.

RF Mode: RF Mode sets the condition of the C2/TX as either SERVER or CLIENT. There should only be one wireless device configured as the SERVER in any given network. The SERVER transmits a periodic beacon signal that synchronizes each radio’s hopping pattern, thereby reducing the amount of power necessary to initiate wireless transmissions. Devices configured as a SERVER should be DC powered and not battery powered, since the beacon transmission occurs continuously.

TX Power: 900 MHz radios can be programmed to transmit at power levels of 10mW, 200mW, 400mW and 1 watt. 2.4GHz radios have a fixed 50mW transmit power and this option will not be visible if a 2.4 GHz radio is installed.

Announce RX: When set to YES, the small local piezo buzzer will beep whenever a wireless data packet is received. This is helpful during network setup and debugging.

RX History shows a count of the number of packets received from each wireless gas detector. Press ALARM RESET while viewing this screen to reset the count for all channels back to zero.

Slave ID is used to set the slave ID for the optional MODBUS serial port. Default is "1".

Baud Rate for the MODBUS serial port is adjustable and can be set for values between 9600 and 115K baud.

Parity for the MODBUS serial port is adjustable and can be set for EVEN, ODD or NONE.

Byte Order is used to adjust the order of bytes when transmitting 32 bit values. Default is "BACD", where A, B, C and D refer to the 8 bit data bytes. If a 32 bit number is organized as "ABCD", then "BACD" indicates that the upper 16 bits ("A" and "B") are sent first, followed by the second 16 bits ("C" and "D"), and inside each 16 bit word, the byte order is swapped.

Connection determines if the port used is the RS-485 two-wire interface or the RS-232 serial interface.

SECURITY MENU

A 4-digit Pass Code entered and confirmed in this menu item locks all menus. Viewing menus is not denied but attempts to edit variables flashes the Locked message on the LCD. Authorized individuals locking the system should first enter a name, phone #, or other contact information into the 12 character field on the top line of the Security screen. To lock or unlock the system the correct 4 digit authorization number must be entered into the Pass Code field. It is very important to remember the 4 digit code since the factory must be consulted if it is lost.

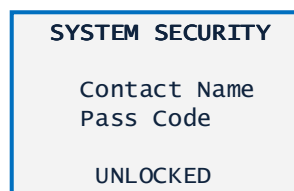
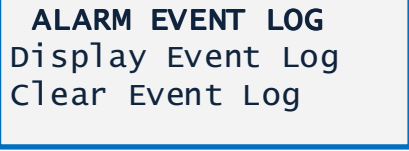


Figure 10-7: Security Menu

ALARM EVENT LOG MENU

The Event Log menu allows access to the internal time and date-stamped event log.



ALARM EVENT LOG
Display Event Log
Clear Event Log

Figure 10-8: Alarm Event Log Menu

Display event log will bring up the Event Log on the LCD display. The Event Log shows date in “mm/dd/yy” format, time in “hh/mm/ss” format and the associated event. If the event is channel specific then “CHx” will precede the event. For example, “071713 16:41:31 CH1 A2I” indicates that on July 17th, 2013, at 4:16:31 pm, Channel 1 Alarm 2 was recorded as “IN”.

Use the UP and DOWN keys to scroll through the Event Log. To exit the Event Log press the NEXT key.

Clear Event Log will clear all data from the Event Log. There is no ‘are you sure?’ message.

11 MODBUS REGISTERS

The C2/TX Site Manager optional Communications and Data Logging expansion board offers a full complement of user-accessible MODBUS registers to provide a complete snapshot of the device configuration and current status. This includes all real-time data, preset zero, span and calibration values and user-programmable text.

Variable Name	Alias	Read FC	Write FC	Notes
MODBUS Coils	TBD	1	N/A	Coil definition to be added in future release
GM/TX Output Binary []	31001-31032	4	N/A	12 bit value; 800 = 4mA, 4000 = 20mA
Product ID	32001	4	N/A	Product identifier
Firmware Version	32002	4	N/A	Product Firmware Version
Custom Feature 1	32003	4	N/A	Factory use only
Custom Feature 2	31004	4	N/A	Factory use only
WiFi Found	32030	4	N/A	Optional WiFi radio detected
USB Found	32031	4	N/A	USB interface detected
Relay Status []	32100-32107	4	N/A	Relay status, one register per relay
GM/TX Battery Voltage []	33001-33064	4	N/A	MODBUS floating point
GM/TX Output Float []	33065-33128	4	N/A	MODBUS floating point
GM/TX Output ASCII []	33129-33224	4	N/A	6 character packed ASCII
GM/TX Comm Status []	33225-33256	4	N/A	TBD
GM/TX Sensor Life []	33257-33288	4	N/A	Binary
GM/TX Comm Timeout []	33289-33320	4	N/A	Binary
GM/TX Alarm 1 Status []	33449-33480	4	N/A	Binary, 1 = Alarm, 0 = no alarm
GM/TX Alarm 2 Status []	33481-33512	4	N/A	Binary, 1 = Alarm, 0 = no alarm
GM/TX Alarm 3 Status []	33513-33544	4	N/A	Binary, 1 = Alarm, 0 = no alarm
GM/TX Fault Status []	33545-33576	4	N/A	Binary, 1 = Alarm, 0 = no alarm
GM/TX In Cal Status []	33577-33608	4	N/A	Binary, 1 = Alarm, 0 = no alarm
GM/TX Low Battery []	33609-33640	4	N/A	Binary, 1 = Alarm, 0 = no alarm
GM/TX Cal Purge []	33641-33672	4	N/A	Binary, 1 = Alarm, 0 = no alarm
GM/TX Warmup []	33673-33704	4	N/A	Binary, 1 = Alarm, 0 = no alarm
GM/TX Edit Mode []	33705-33736	4	N/A	Binary, 1 = Alarm, 0 = no alarm

GM/TX Missing Sensor []	33737-33768	4	N/A	Binary, 1 = Alarm, 0 = no alarm
GM/TX Cal Error []	33769-33800	4	N/A	Binary, 1 = Alarm, 0 = no alarm
GM/TX Data Error []	33801-33832	4	N/A	Binary, 1 = Alarm, 0 = no alarm
GM/TX Channel Status []	33833-33864	4	N/A	Binary, 1 = Alarm, 0 = no alarm
<hr/>				
Alarm 1 Status	34000-34001	4	N/A	A1 Status (Packed bits)
Alarm 2 Status	34002-34003	4	N/A	A2 Status (Packed bits)
Alarm 3 Status	34004/34005	4	N/A	A3 Status (Packed bits)
Fault Status	34006/34007	4	N/A	Fault Status (Packed bits)
Low Battery	34008/34009	4	N/A	Low Battery Indication (Packed bits)
Cal Mode ("IN CAL")	34010/34011	4	N/A	Detector in cal mode (Packed bits)
Post-Calibration Delay	34012/34013	4	N/A	Detector in post-cal delay (Packed bits)
Warm-up	34014/34015	4	N/A	Detector in warm-up (Packed bits)
Edit Mode	34016/34017	4	N/A	Detector menu modified (Packed bits)
Missing Sensor	34018/34019	4	N/A	Sensor removed / missing (Packed bits)
Calibration Error	34020/34021	4	N/A	Error in last calibration (Packed bits)
Data Error	34022/34023	4	N/A	Data error (Packed bits)
Channel Status Bits ("OR")	34024/34025	4	N/A	"OR" of all status bits (Packed bits)
Channel Enabled	34026/34027	4	N/A	Channel ON (Packed bits)
Channel Comm Error	34028/34029	4	N/A	Channel in Comm Error (Packed bits)
<hr/>				
COM1 Mode	40030	3	N/A	TBD
COM1 Baud rate	40031	3	N/A	TBD
COM 1 Parity	40032	3	N/A	TBD
COM1 Slave ID	40033	3	N/A	TBD
COM 1 Byte Order	40034	3	N/A	TBD
<hr/>				
COM2 Mode	40040	3	N/A	TBD
COM2 Parity	40041	3	N/A	TBD
COM2 Byte Order	40042	3	N/A	TBD
<hr/>				
Network SSID	40050-40066	3	N/A	ASCII, Network SSID
Network Key	40067-40073	3	N/A	ASCII, Network key
Network Host Name	40074-40083	3	N/A	ASCII, Host Name
<hr/>				
WiFi IP Address	40100-40101	3	N/A	Details available in future version
WiFi Gateway	40102-40103	3	N/A	Details available in future version
WiFi Net Mask	40104-40105	3	N/A	Details available in future version
IP Address	40106-40107	3	N/A	Details available in future version
DHCP Start Address	40108-40109	3	N/A	Details available in future version
DHCP End Address	40110-40111	3	N/A	Details available in future version

DHCP Server	40120	3	N/A	Details available in future version
DHCP Client	40121	3	N/A	Details available in future version
WiFi Band	40122	3	N/A	Details available in future version
WiFi Mode	40123	3	N/A	Details available in future version
WiFi Channel	40124	3	N/A	Details available in future version
WiFi TX Power	40125	3	N/A	Details available in future version
WiFi Data Rate	40126	3	N/A	Details available in future version
WiFi Broadcast SSID	40127	3	N/A	Details available in future version
WiFi Authorization Mode	40128	3	N/A	Details available in future version
WiFi Encryption Mode	40129	3	N/A	Details available in future version
WiFi Default Key	40130	3	N/A	Details available in future version
WiFi Key Length	40131	3	N/A	Details available in future version
WiFi Key WEP Format	40132	3	N/A	Details available in future version
WiFi Key WPA Format	40133	3	N/A	Details available in future version
GM/TX Tag Info []	40401-40656	3	N/A	ASCII string, 16 packed char per channel
GM/TX Eunits Info []	40657-40816	3	N/A	ASCII string, 10 packed char per channel
Channel Enabled []	41000-41031	3	N/A	Binary, 1 = Enabled, 0 = disabled
GM/TX Channel ID []	41032-41063	3	N/A	Binary, 1 to 32
GM/TX Decimal Points []	41064-41095	3	N/A	Binary, 0, 1 or 2
GM/TX Zero Value []	41096-41159	3	N/A	MODBUS 32 bit floating point
GM/TX Span Value []	41160-41223	3	N/A	MODBUS 32 bit floating point
GM/TX Alarm 1 Setpoint []	41224-41287	3	N/A	MODBUS 32 bit floating point
GM/TX Alarm 2 Setpoint []	41288-41351	3	N/A	MODBUS 32 bit floating point
GM/TX Alarm 3 Setpoint []	41352-41415	3	N/A	MODBUS 32 bit floating point
GM/TX Fault Setpoint []	41416-41479	3	N/A	MODBUS 32 bit floating point

12 TROUBLESHOOTING GUIDE

C2 / TX Display Blank

- Lack of AC or DC power to the C2/TX Wireless Site Manager
- Display / CPU board ribbon cable not plugged in
- Motherboard fuse blown or defective

Channel Data Readings Appear Incorrect

- Confirm that the GASMAX/TX gas detector RTU # (device ID) and C2/TX Channel Remote Address value match.

C2 / TX Comm Error for ONE Remote Wireless GASMAX Monitor

- C2/TX and GASMAX/TX network identifier do not match
- C2/TX specified channel Remote Address and GASMAX/TX RTU # (device ID) do not match
- GASMAX/TX not in range or not receiving Beacon signal transmission
- C2/TX RF Mode not set to SERVER, or no SERVER available in network
- GASMAX/TX or C2/TX antenna damaged or disconnected
- GASMAX/TX battery low or depleted

C2 / TX Comm Error for ALL Remote Wireless GASMAX Monitor

- C2/TX and GASMAX/TX monitors network identifiers do not match
- Wireless radio mode not set for SERVER, or no SERVER present in the network
- Antenna malfunction or moisture in coaxial cable connections

C2 / TX Alarm Relay Does Not Activate

- Relay programming incorrect
- Channel alarm thresholds set improperly
- Relay set for FAILSAFE

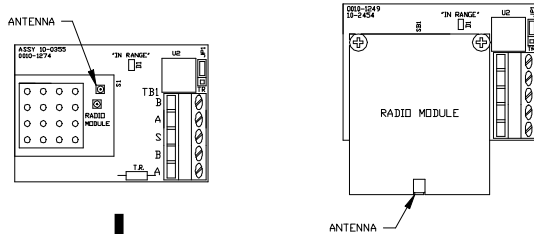
13 SPARE PARTS

Wireless Options

10-0328	900 MHz radio module
10-0355	2.4 GHz radio module

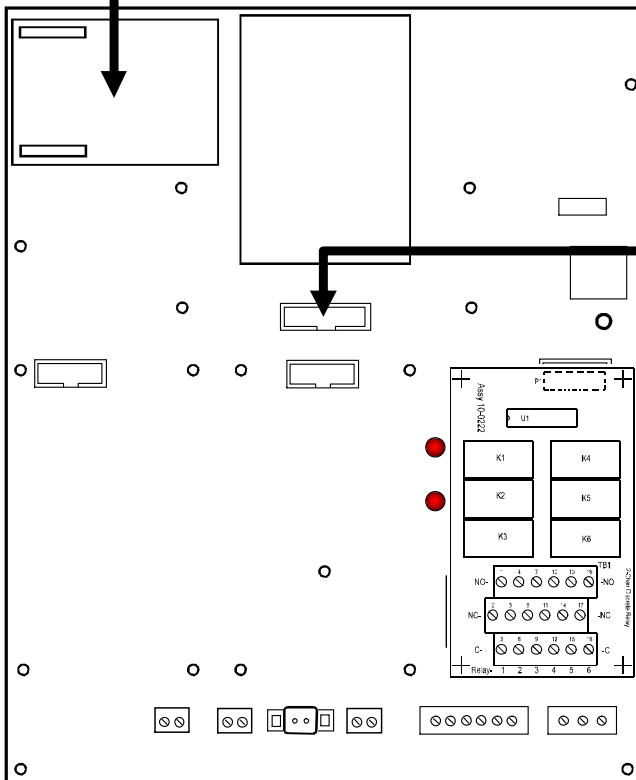
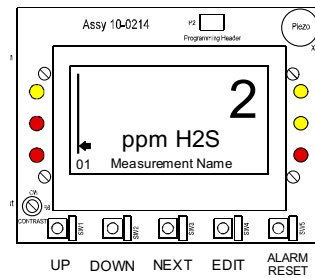
Antenna

1000-2189	900 MHz
1000-2300	2.4 GHz



Display / CPU

10-0214/TX CPU Board with LCD



Motherboard

1000-1992	Fuse, 2.5A
10-0337	Piezo buzzer
10-0215	Main system board
10-0222	Relay expansion board
10-0410	Comm & data logging board

Figure 13-1: C2/TX Site Manager Spare Parts

14 DRAWINGS AND DIMENSIONS

The C2/TX Site Manager “Type 1” or “Type 5” enclosure is a NEMA 4X polycarbonate wall mount enclosure designed for medium duty applications. Type 5 includes the optional sunshield.

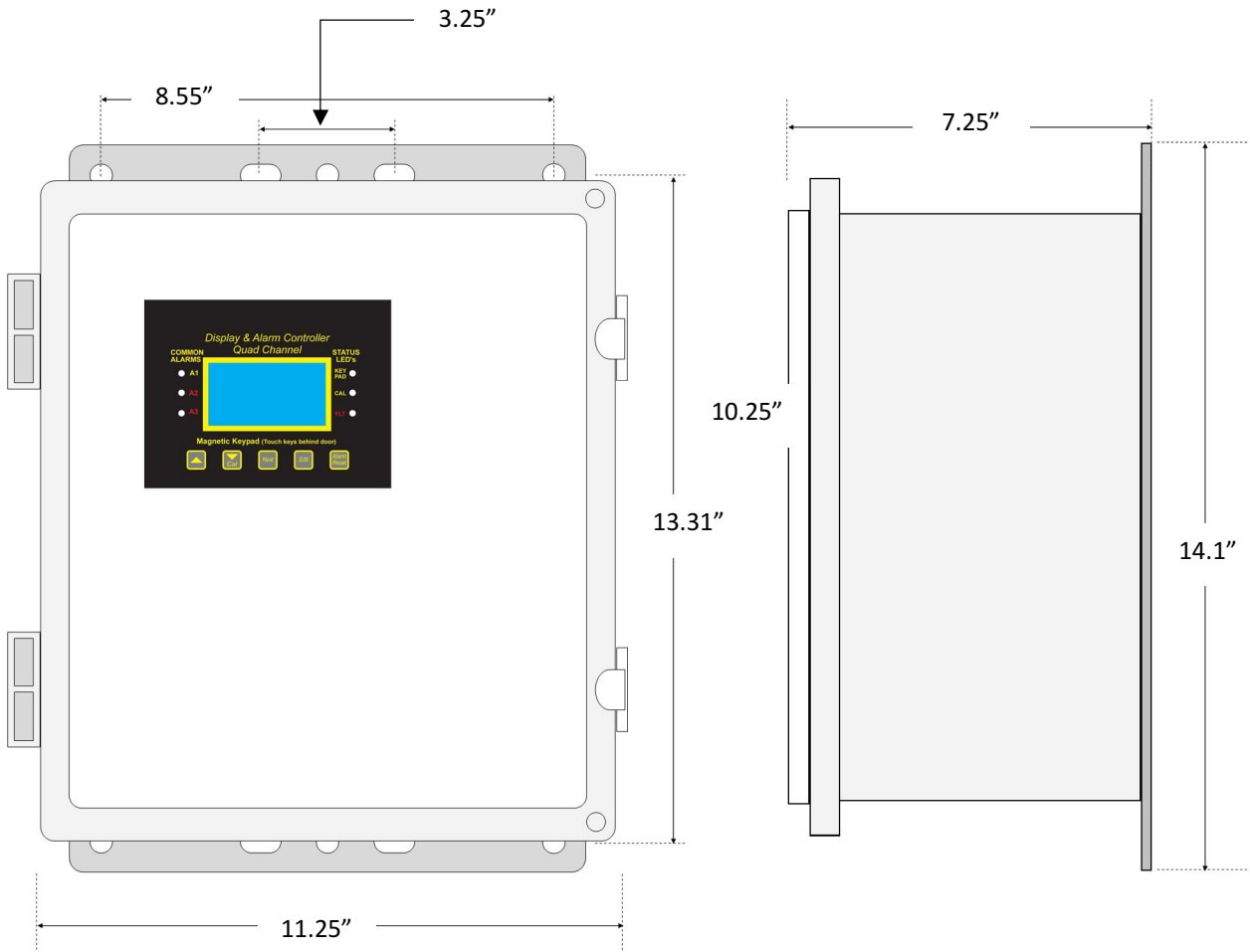


Figure 14-1: NEMA 4X Polycarbonate Enclosure

IMPORTANT: NON-METALLIC ENCLOSURES ARE NOT GROUNDED BY METAL CONDUIT. FOR INTERNAL GROUND POINTS TO BE GROUNDED TO EARTH, THE TB5 – GND TERMINAL MUST HAVE A PROPER EARTH GROUND CONNECTION.

CAUTION: NONMETALLIC ENCLOSURE DOES NOT PROVIDE GROUNDING BETWEEN CONDUIT CONNECTIONS. USE GROUNDING TYPE BUSHINGS AND JUMPER WIRES. ALL FIELD WIRING MUST HAVE INSULATION SUITABLE FOR AT LEAST 250V.

The C2/TX Site Manager “Type 2” or “Type 6” enclosure is a NEMA 4X Painted Carbon Steel wall mount extended enclosure designed for non-corrosive installations. Type 6 includes the optional sunshield.

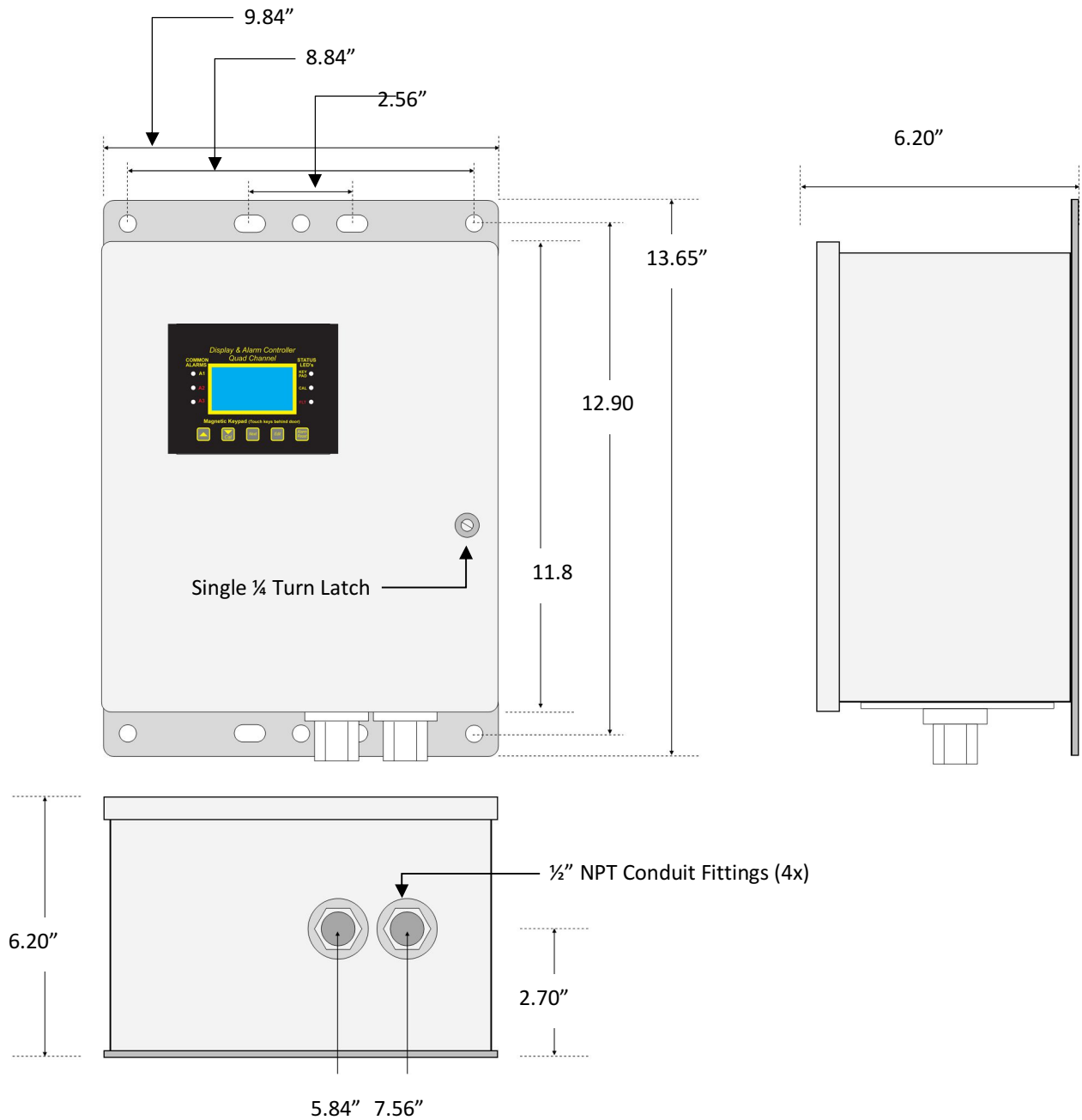


Figure 14-2: NEMA 4X Painted Steel Wall Mount

The C2/TX Site Manager “Type 3” or “Type 7” enclosure is a 316 Stainless Steel NEMA 4X wall mount extended enclosure designed for corrosive installations. Type 7 includes the optional sunshield.

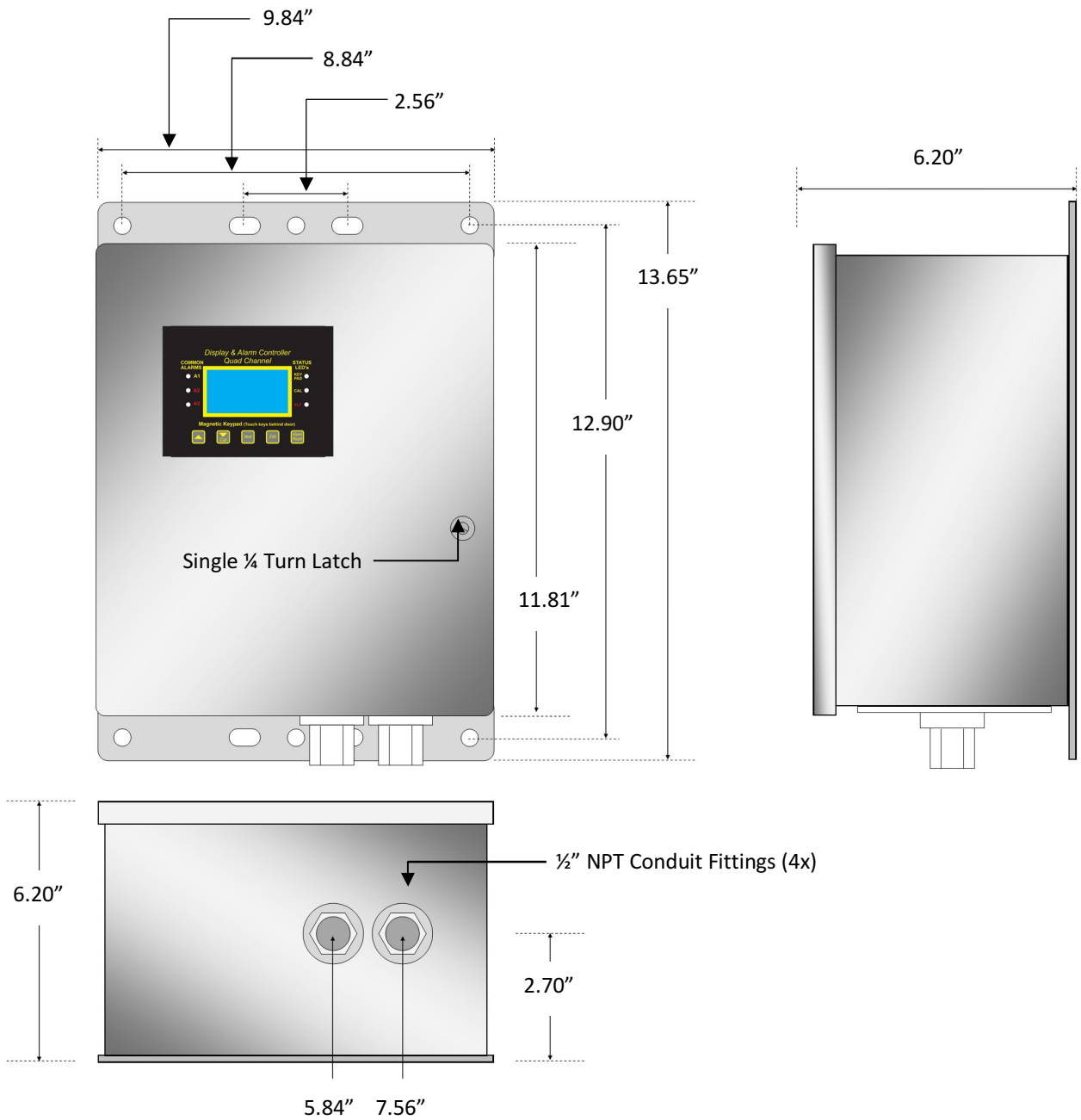


Figure 14-3: NEMA 4X Stainless Steel Enclosure

The C2/TX Site Manager "Type 4" enclosure is a cast aluminum NEMA 7 explosion-proof wall mount designed and rated for hazardous areas. Includes a Class 1 Division 1 rated antenna coupler.

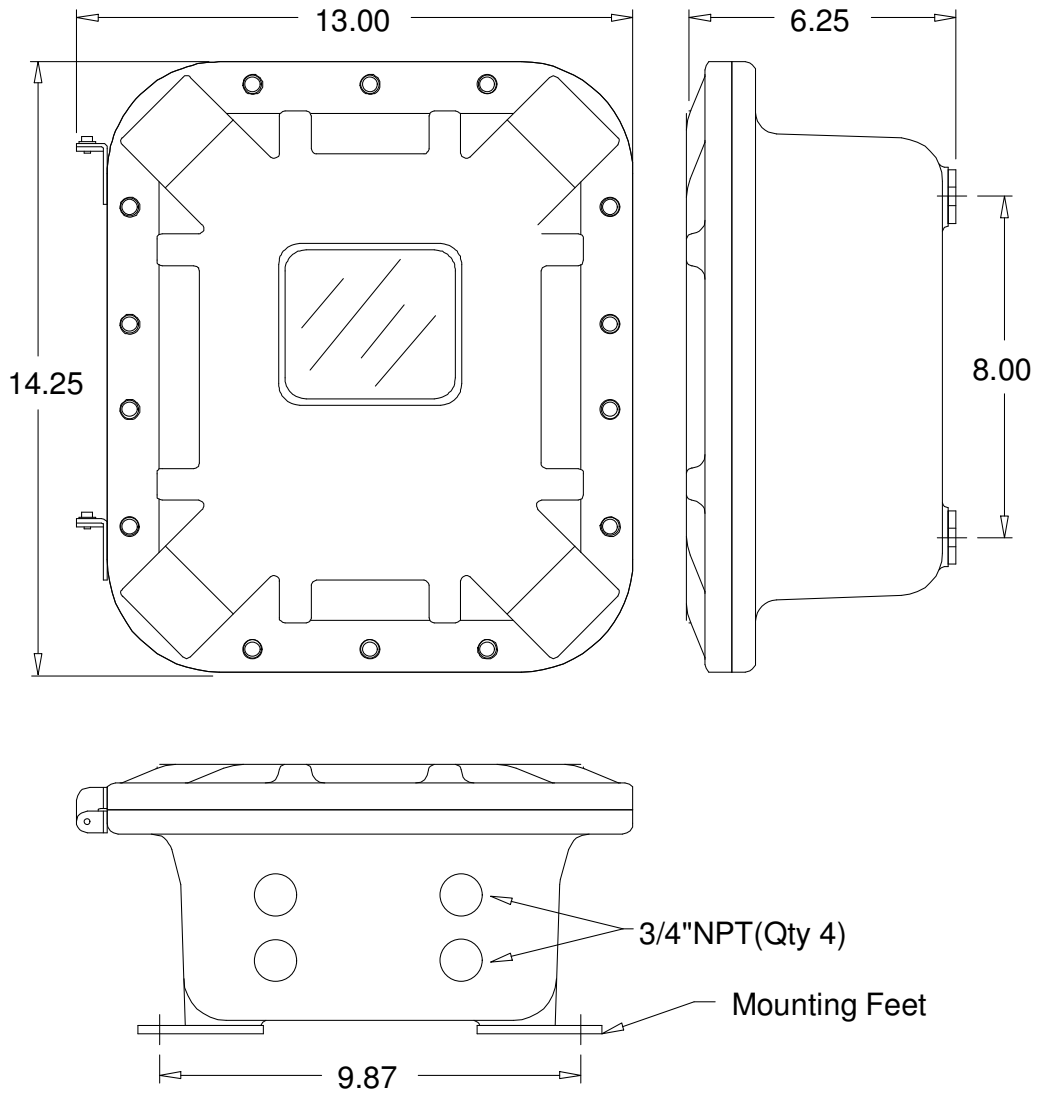


Figure 14-4: NEMA 7 Explosion Proof Enclosure