GDS Corp

Gas and Flame Detection

Operation and Maintenance Manual

C2-WWT Triple-Gas Sample Draw Monitor

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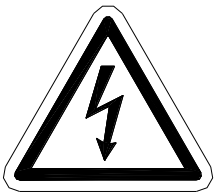


CAUTION: FOR SAFETY REASONS THIS EQUIPMENT MUST BE OPERATED AND SERVICED BY QUALIFIED PERSONNEL ONLY. READ AND UNDERSTAND INSTRUCTION MANUAL COMPLETELY BEFORE OPERATING OR SERVICING.

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	8/20/17	Initial Release

P/N 1200-0979-01

CONTENTS

TABLE OF FIGURES

1 SAFETY INFORMATION

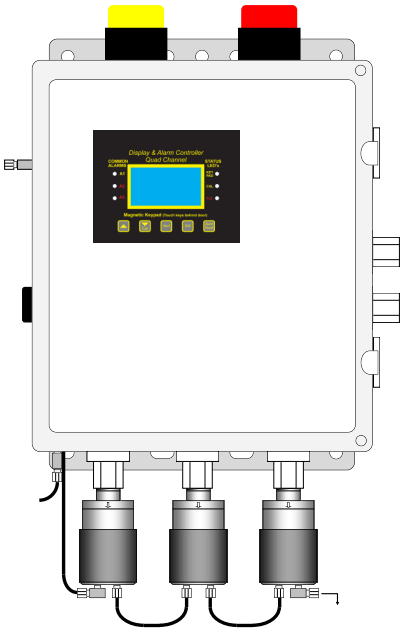
Important – Read Before Installation

Users should have a detailed understanding of C2-WWT Sample Draw Monitor operating and maintenance instructions. Use the C2-WWT Sample Draw Monitor 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.
- Hydrogen Sulfide gas is highly dangerous. Use caution!
- This equipment is suitable for use in non-hazardous locations only.
- Use a properly rated AC power (mains) cable installed as per local or national codes.
- 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-WWT Triple-Gas Sample Draw Monitor is designed to pull a sample from a remote location and measure the amount of hydrogen sulfide, oxygen, methane and other hydrocarbons for dangerous or toxic conditions. The C2-WWT Triple-Gas Sample Draw Monitor is equipped with a Fault and three alarm levels per channel with features such as ON / OFF delays, latching relays and alarm Acknowledge. A dedicated horn driver circuit for a local audible annunciator is also standard. Eight standard 5-amp alarm relays are configurable via the "alarm voting" menu to make relays trip based upon various alarm combinations. Real-Time Clock and Calendar are also standard. An integrated RS-485 (Modbus RTU) port is available for sending data to PC's, PLC's, DCS's, or other GDS Corp controllers. A 128 x 64 pixel graphic LCD readout displays monitored data as bar graphs, 30-minute trends and engineering units.

Key features include:

- Supports two toxic and one infrared sensor; monitor hydrogen sulfide, oxygen and methane levels simultaneously
- Carbon monoxide, sulfur dioxide and carbon dioxide sensors also available
- Large LCD shows values, bar-graph and trend data
- Eight 5A SPDT programmable relays
- Monitored flow with fault indication
- Operates on 110/220VAC
- Easy replacement of external sensors
- Built-in calibration procedure
- Alarm RESET silences horn without clearing alarms
- Relay voting logic and override capability
- Magnetic and touch keys for easy access to menus
- NEMA 4X polycarbonate enclosure
- Separate ½" NPT conduit entries for high voltage and low voltage signals

3 C2-WWT TRIPLE-GAS MONITOR SPECIFICATIONS

Power Input	110/220VAC, 50/60Hz
	Power consumption less than 20 watts
Sensors	Ch 1: GDS-49 sensor transmitter for Hydrogen Sulfide, 0-100 ppm
	Ch 2: GDS-49 sensor transmitter for Oxygen depletion, 0-25% by volume
	Ch 3: GDS-50 sensor transmitter with Infrared Methane Sensor , 0-100% LEL
Display & User Interface	64 x128 pixel LCD with alphanumeric display of alarm status and gas values
	Five magnetic switches / physical pushbuttons for menu access and calibration
Output	Eight programmable SPST dry contact relays, 5A resistive
	Optional RS-485 MODBUS two-wire serial interface
Temperature	-25°C to +55°C Operating; 0 to 90% relative humidity non-condensing
Altitude	Maximum operating 6200 ft / 2000 m
Housing	Non-metallic polycarbonate enclosure
Dimensions	See Drawings and Dimensions
Approvals	For use in general purpose areas only
Warranty	Two years on electronics, one year on sensors

4 C2-WWT OPERATION

The C2-WWT Triple-Gas Sample Draw Monitor is designed to monitor remote locations for hazardous levels of hydrogen sulfide (H2S), methane or other hydrocarbons and deficient oxygen levels. The unit is self-contained and includes multiple sensors, display controller, DC sample pump, loss-of-flow warning switch.

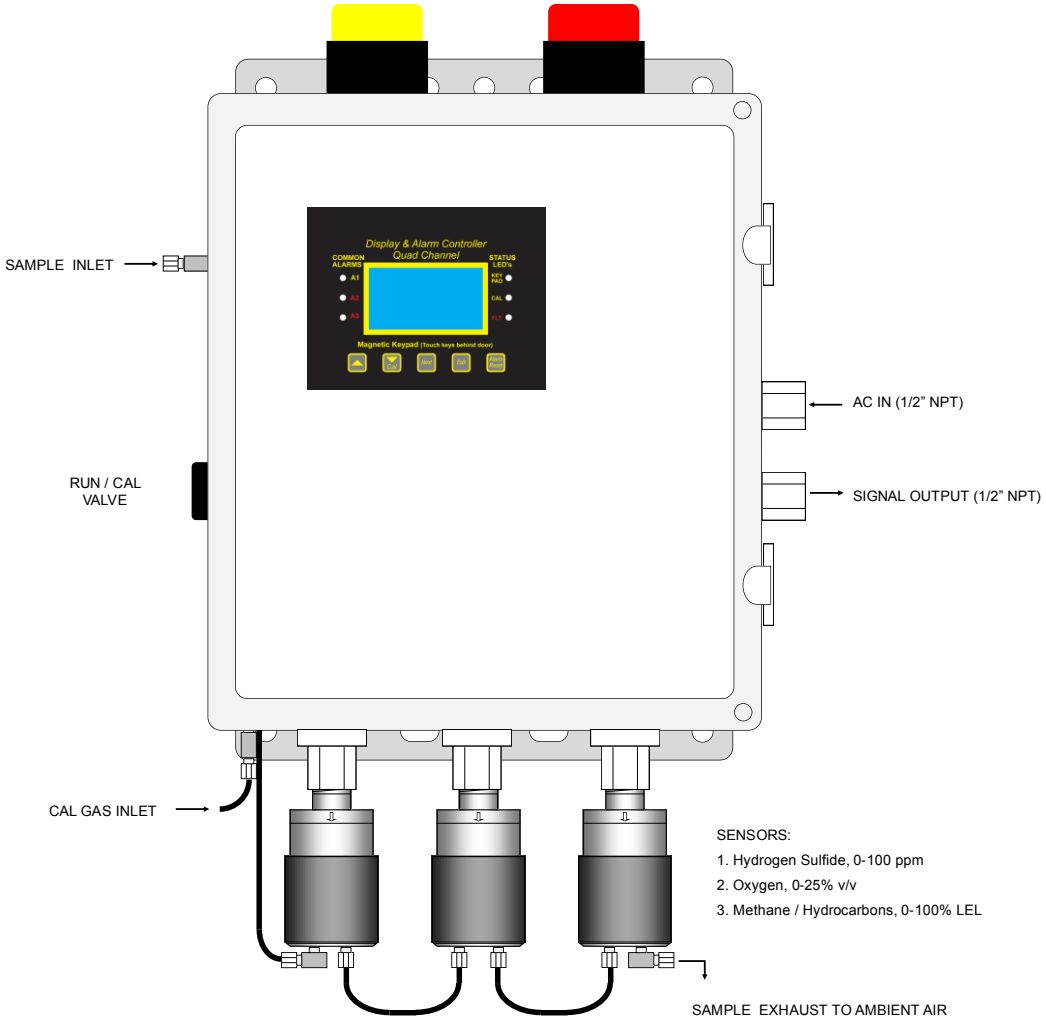


Figure 4-1: C2-WWT Triple-Gas Sample Draw Monitor

During normal operation with the Run/Cal valve set to RUN, ambient air is drawn into the C2-WWT via the Sample Inlet bulkhead fitting, disposable filter and Run / Cal valve. Sample is then forced through the low

flow warning switch and into the three sensor heads. Sample gas exits the unit at the exhaust port of the third sensor head.

If the Run / Cal valve is set to the CAL position, sample is drawn instead from the Cal Gas Inlet bulkhead fitting.

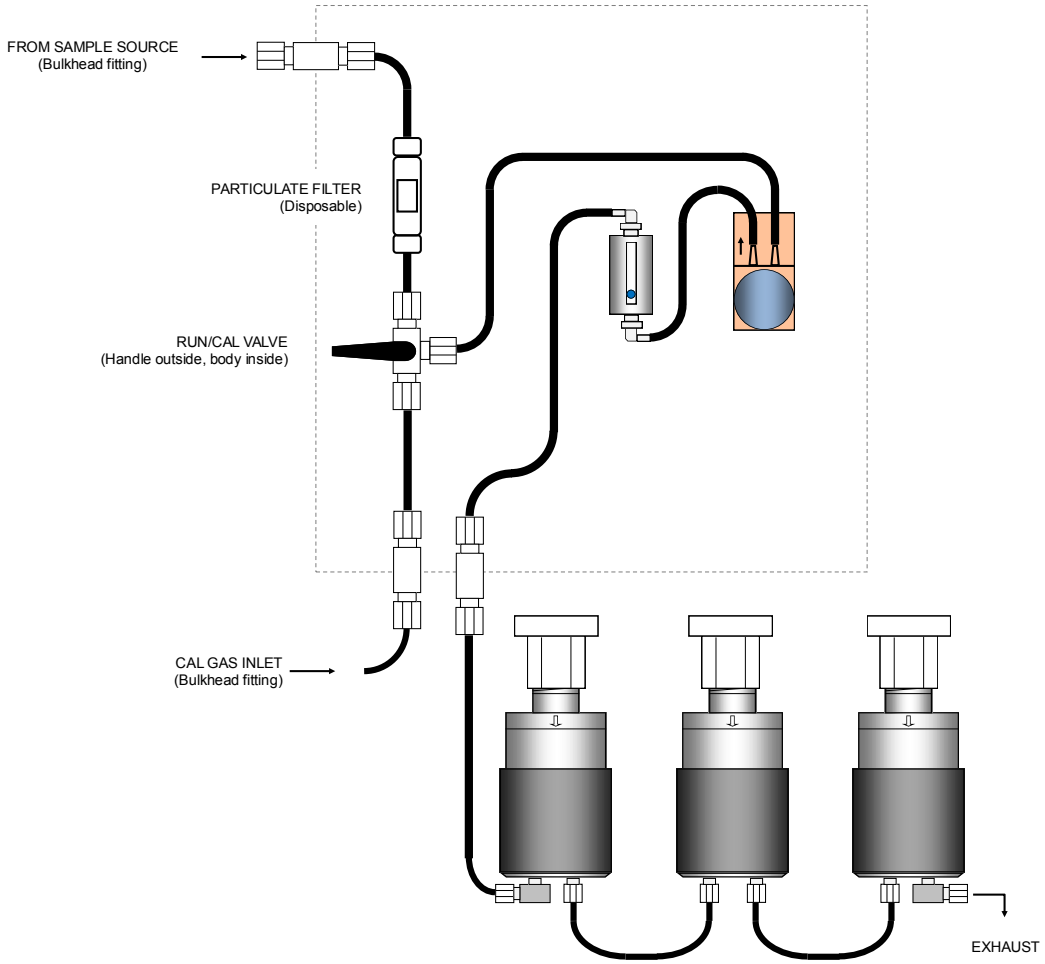


Figure 4-2: C2-WWT Triple-Gas Sample Draw Gas Flow Overview

Gas concentration measurement information from the three sensors is processed by the C2-WWT microprocessor into engineering values which are displayed on the LCD and compared against user-adjustable alarm levels. Sample data, alarm events and other data is then stored in the on-board MODBUS

database. The results of the comparison are used to determine which (if any) alarm indication LEDS and relays should be activated.

The C2-WWT also includes a built-in calibration procedure as well as sensor and system diagnostics to help maintain maximum performance and a safe environment.

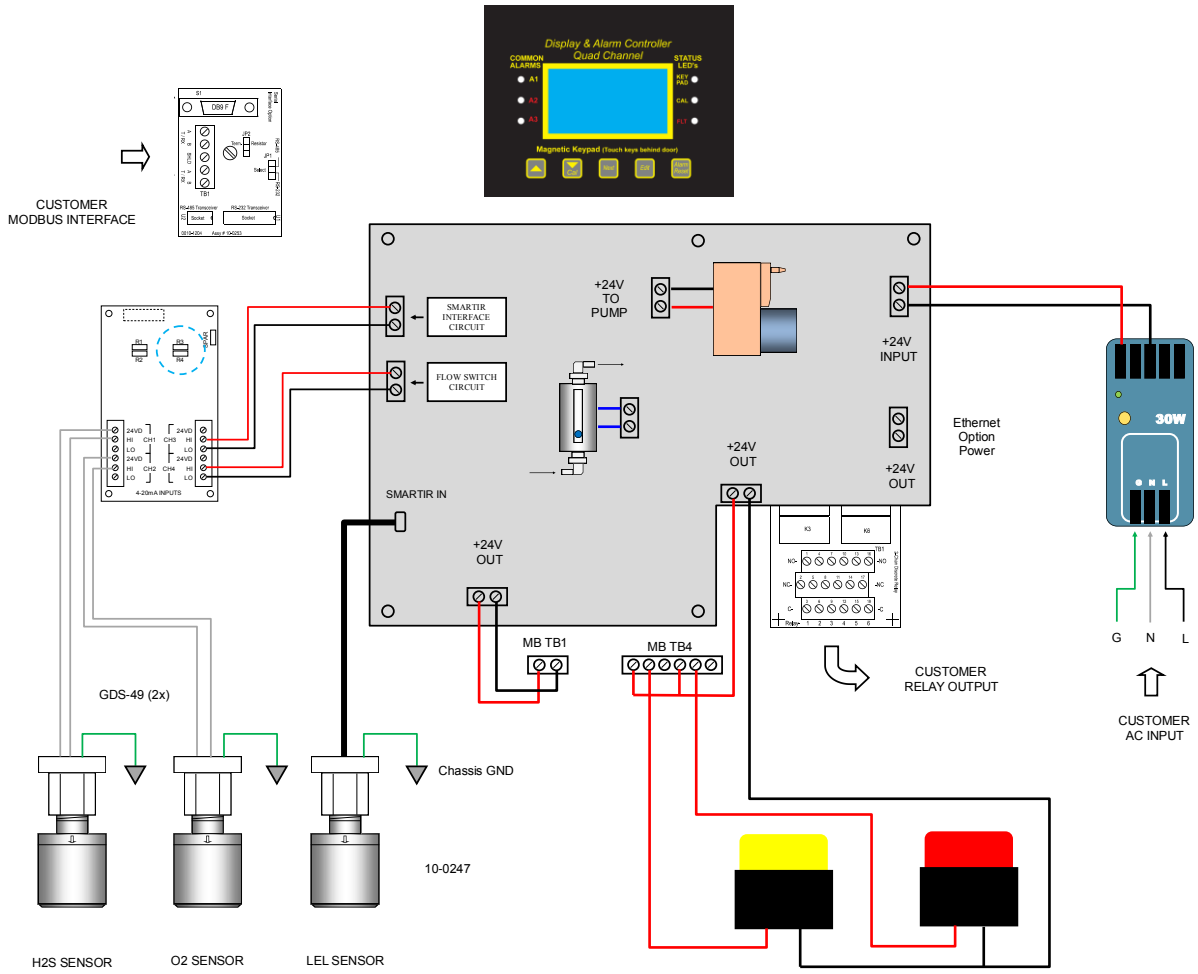


Figure 4-3: C2-WWT Triple-Gas Sample Draw Wiring Diagram

5 INSTALLATION

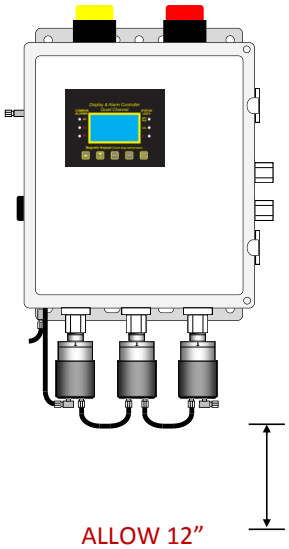
SELECTING A LOCATION

The C2-WWT Sample Draw Monitor should be mounted near a location that includes a source of AC power and suitable visibility for locally-mounted warning strobes. Entry gates, central control rooms, outdoor instrument shelters and free-standing poles are ideal locations. The monitor should not be mounted in direct sunlight and should be kept away from sources of vibration or shock.

MOUNTING THE C2-WWT SAMPLE DRAW MONITOR

The C2-WWT Sample Draw Monitor offers three types of mounting: wall mount, magnetic mount and pole mount. Hardware for wall mount, pole mount and magnetic mount is available. Contact GDS Corp for more details.

NOTE: WHEN SELECTING A LOCATION, BE SURE TO LEAVE AT LEAST 12" OF FREE SPACE BELOW THE C2-WWT FOR SENSOR HEAD REMOVAL AND SENSOR REPLACEMENT.



ALLOW 12" FOR SENSOR MAINTENANCE

SAMPLE TUBING

Install tubing between the C2-WWT and the sample pickup source. For ambient pressure duct sampling, GDS Corp offers a duct sampling kit that allows the sample to be returned to the pickup point.

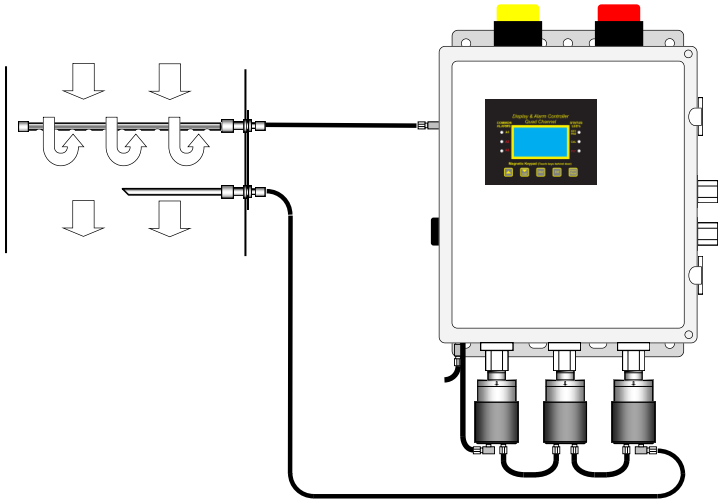


Figure 5-1: Sample Draw with Sample Return

The sample can also be configured to exhaust to ambient air as shown below. In either case, make SURE that the pressure at the point where the sample exhaust occurs is within 2” of water column of ambient atmospheric pressure. Backpressure on the sensors will result in incorrect readings.

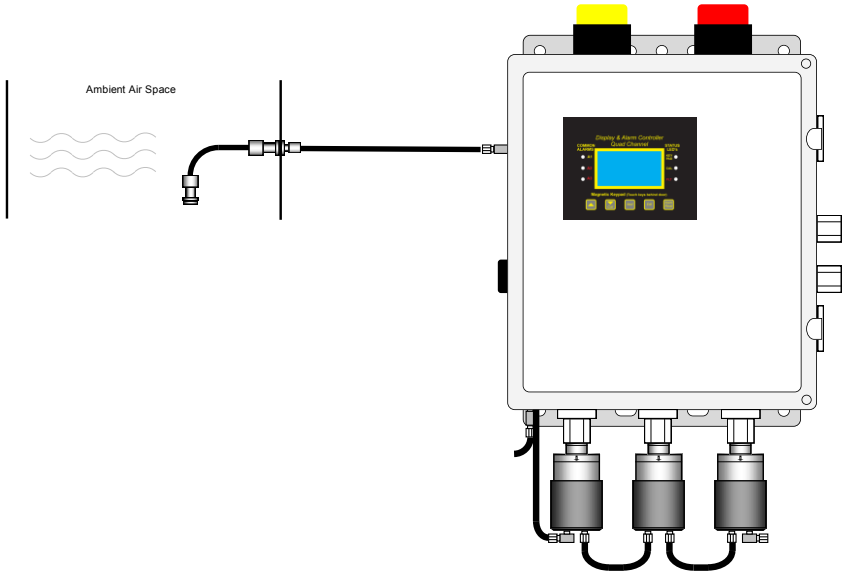


Figure 5-2: Sample Draw with Ambient Exhaust

The C2-WWT has been tested with 500 ft of ¼” OD / 1/8” ID flexible tubing. For that length of tubing, the delay between sample pickup and measurement is approximately 3 minutes.

NOTE: IF AMBIENT EXHAUST IS TO BE USED, BE SURE TO EXHAUST THE SAMPLE TO A SAFE AREA, AS TOXIC OR COMBUSTIBE GASES MAY BE PRESENT.

NOTE: MAKE SURE THAT THE EXHAUST PORT IS NOT BLOCKED. BLOCKED OR RESTRICTED EXHAUST WILL RESULT IN INCORRECT SENSOR READINGS

NOTE: BOTH FLEXIBLE AND STAINLESS-STEEL RIGID TUBING CAN BE USED FOR SAMPLE DRAW. TUBING LARGER THAN ¼" OD MAY RESULT IN LONGER SAMPLE READING DELAYS, AND TUBING SMALLER THAN 1/8" ID IS PRONE TO BLOCKAGE.

NOTE: IF USING IN AN ENVIRONMENT WHERE LIQUID IS PRESENT, BE SURE TO USE A FLOAT PROBLE TO ELIMINATE THE POSSIBILITY OF LIQUID DRAW INTO THE UNIT. DRAWING LIQUID INTO THE FILTER, PUMP OR FLOW SWITCH WILL REQUIRE DISASSEMBLY AND CLEANING.

AC POWER WIRING

Connect AC power to the power supply as shown below. Do NOT connect AC power to the L, N and G terminals on the system motherboard.

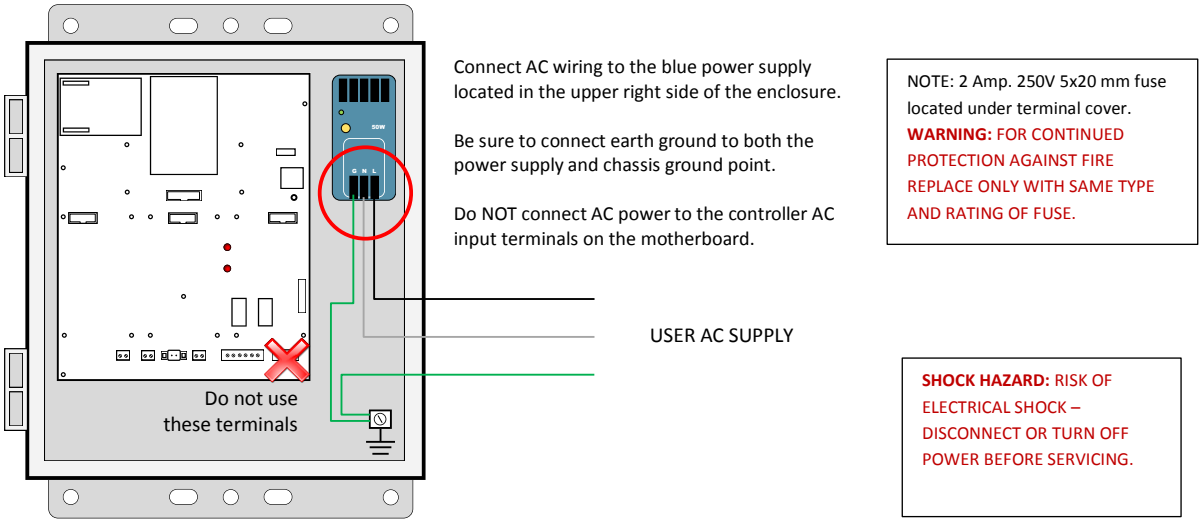
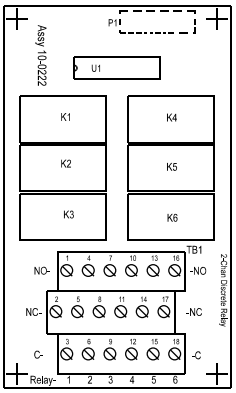


Figure 5-3: Power Supply Input Detail

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

RELAY OUTPUT WIRING

The C2-WWT Sample Draw Monitor has two standard 5A SPDT relays with terminals on the motherboard and six additional SPDT relays on the #10-0222 relay expansion board. All relays are programmable for normal or FAILSAFE (“normally open held closed”) and support voting and channel & alarm specific overrides. See Relay Setup menu for more details.



1	RY1	NO
2	RY1	NC
3	RY1	COMMON
4	RY2	NO
5	RY2	NC
6	RY2	COMMON
7	RY3	NO
8	RY3	NC
9	RY3	COMMON

10	RY4	NO
11	RY4	NC
12	RY4	COMMON
13	RY5	NO
14	RY5	NC
15	RY5	COMMON
16	RY6	NO
17	RY6	NC
18	RY6	COMMON

Figure 5-4: 6X Relay Output Board

An easy way to test a specific relay is to toggle the normal / FAILSAFE setting (Find in *System – Relay Setup*).

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 10-0222 DISCRETE RELAY PCB OPTION MUST BE THE SAME FOR EACH RELAY. **DO NOT MIX +24V and 110VAC LOADS.**

MODBUS / RS-232 & RS-485 INTERFACE

The #10-0253 Modbus option PCB adds both RS-232 and RS-485 Modbus RTU slave ports. Figure 6-6 shows this optional PCB which mounts to connectors on the upper left corner of the C2-WWT motherboard. TB1 provides two pair of corresponding “A” and “B” MODBUS terminals and a floating terminal for shield continuation. This makes it easy to multi-drop controllers onto a single RS-485 cable without doubling wires in the same screw terminals. To access the RS-232 interface, connect a mating connector to the DB9 connector S1.

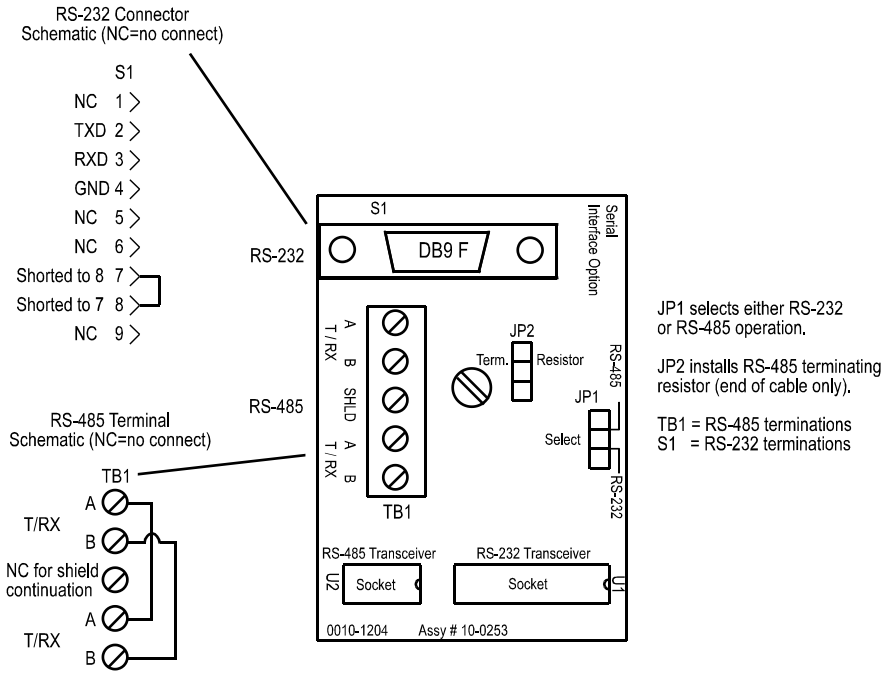


Figure 5-5: MODBUS Serial Interface

6 OPERATION & MAINTENANCE

C2-WWT USER CONTROLS

The user interface for the C2-WWT Sample Draw Monitor consists of five buttons arranged across the bottom of the display. From left to right, these are “UP”, “DOWN / CAL”, “NEXT”, “EDIT” and “RESET”. With the cover in place, a magnetic wand is 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 (See Section 9) Setup mode will exit automatically if no keys are pressed within 5 minutes. Press “DOWN / CAL” to initiate the built-in calibration process for any given channel (See Section 7). Press “RESET” to acknowledge (clear) an alarm.

A set of alarm 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, an ‘in calibration’ condition and a FAULT condition.

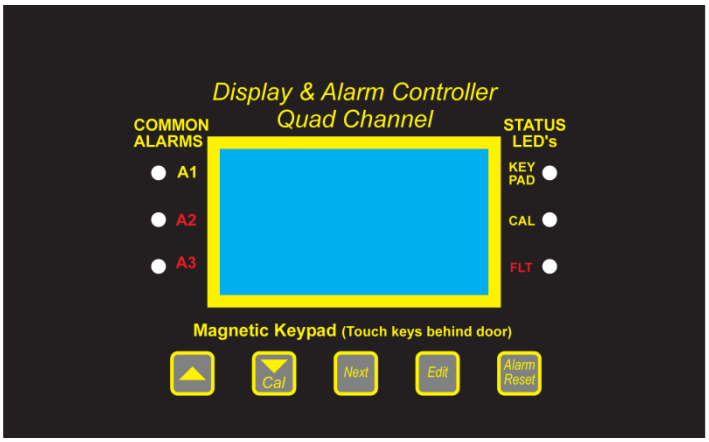


Figure 6-1: C2-WWT Front Panel

C2-WWT DISPLAY SCREENS

The LCD screen can show three different data display formats. The **Engineering Units** screen shows data from all four channels simultaneously, and includes a live reading, engineering units text and individual alarm status (“A1”, etc). The **Bar Graph** screen also shows all four channels of data in real time using individual real-time bar graphs with ‘tick mark’ indicators for alarm levels. In addition, the **Trend Screen** can be used to view the most recent 30 minute trend for any specific channel. Press the “NEXT” button to switch screens (See Fig. 6-2).

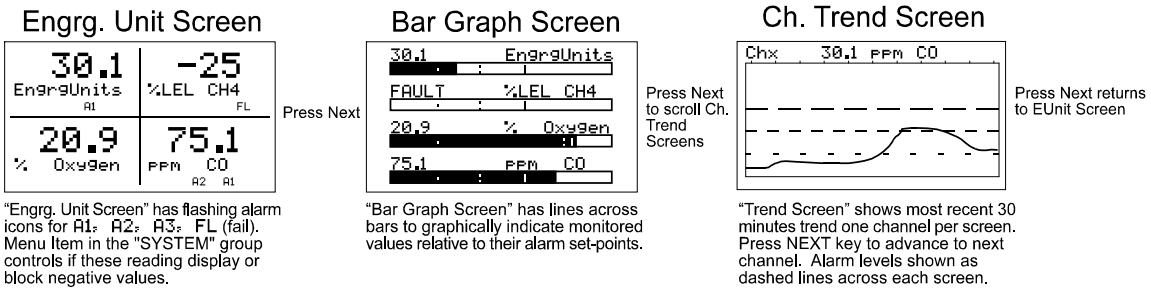


Figure 6-2: C2-WWT Data Display Screens

ENGINEERING UNIT SCREEN

The C2-WWT Engineering Unit screen shown at left in Figure 8-2 allows each channel's value and its 10-digit Eunits tag to be viewed simultaneously. A1, A2, A3, FL icons at lower right of each reading flash if ALARM 1, 2, 3 or FAULT alarms activate for this channel.

BAR GRAPH SCREEN

Values are displayed graphically as bar graphs with alarm levels indicated by vertical dashed lines across each bar. The bar graph screen is very useful for emphasizing current reading relative to the channel's alarm set-point. Live readings and their Eunits tag appear above each bar graph.

TREND SCREEN

The ST-90 also provides 30-minute trend screens for each channel as shown in Figure 1.2. Live readings and their Eunits tag are displayed across the top of each trend screen. Channel numbers are shown in the upper right and are selected by the NEXT key. A1. A2 and A3 alarm levels appear as horizontal dashed lines across the screen.

NORMAL MAINTENANCE

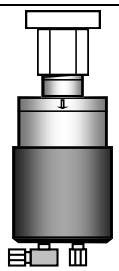
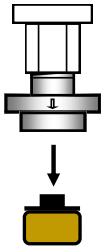
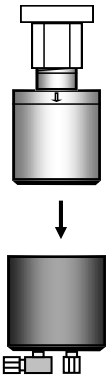
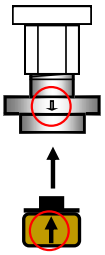
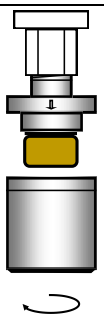
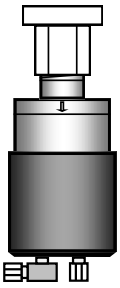
Normal maintenance for the C2-WWT primarily involves regularly schedule calibration of the gas sensors and a periodic inspection of the display for alarm or communications problems. A inspection of the interior is recommended to determine if water or dust is entering the enclosure.

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.

SENSOR REPLACEMENT

When a sensor can no longer be calibrated, or does not respond to gas, it must be replaced. Toxic sensors have a typical life span of one to two years under normal operation. In cases where high levels of toxic gas are often present, the life span of toxic sensors can be reduced significantly. Normally, infrared sensors have a much longer life span so long as they are not exposed to high levels of corrosive gases such as H2S.

To replace a toxic or combustible sensor on the C2-WWT Triple-Gas Sample Draw Monitor, follow the steps below:

<table>
<tr>
<td> 
1) Disconnect tubing from quick-connect fittings
2) Loosen set-screw on back of flow cell</td>
<td> 
5) Carefully remove sensor by pulling straight down (Do NOT rotate)</td>
</tr>
<tr>
<td> 
3) Remove flow cell from sensor head by pulling straight down</td>
<td> 
6) Install new sensor by aligning arrow on sensor with arrow on sensor head and pushing straight up</td>
</tr>
<tr>
<td> 
4) Unscrew sensor head</td>
<td> 
7) Reinstall sensor head and flow cell and reconnect tubing</td>
</tr>
</table>

7 CALIBRATION

The built-in CAL MODE is designed to make calibration quick, easy and error free. Follow the steps below to calibrate each sensor.

NOTE: SENSORS MUST BE CALIBRATED ONE AT A TIME, BUT A COMMON CALIBRATION GAS THAT INCLUDES H2S, METHANE AND REDUCED OXYGEN MAY BE USED TO SPAN ALL THREE SENSORS.

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

- Before you begin, verify that you have the appropriate zero air and calibration gas and that the pre-programmed Cal Span Value matches the gas concentration.
- To enter the CAL MODE from any data display, press the dual purpose DOWN / CAL key then use the UP/DOWN keys to select the channel to calibrate.
- Stimulate the monitor to be calibrated with an appropriate ZERO calibration standard. Observe the screen's live reading and *when it is stable press the EDIT key* to perform the ZERO calibration.
- If the ZERO calibration is successful, CAL MODE automatically proceeds to the SPAN check.
- Apply the SPAN calibration standard that matches the pre-programmed as the Cal Span Value. *After the reading is stable, press the EDIT key* to perform a SPAN calibration.
- If the SPAN calibration is successful, the display flashes "REMOVE CAL GAS" and starts the CAL DELAY.
- CAL MODE will be complete after the end of the CAL DELAY.

The flow chart in Figure 7-1 illustrates the above procedure. **UP**, **CAL**, **NEXT** & **EDIT** labels indicate keystrokes (**CAL/DOWN** is a dual purpose key). The CAL MODE information screen (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 set point calibration values may also be edited from this screen. Holding the **UP** key, for 5 seconds during CAL MODE, displays this screen.

When calibrating the C2-WWT Sample Draw Monitor, use the Run/Cal valve located on the left side of the enclosure to switch between the sample source (UP) and cal gas inlet fitting (DOWN) located on the bottom left side of the enclosure.

Set Unity Gain may be used at any time to cancel incorrect calibrations and start again. Unity means Offset = 0.00 and Gain = 1.00.

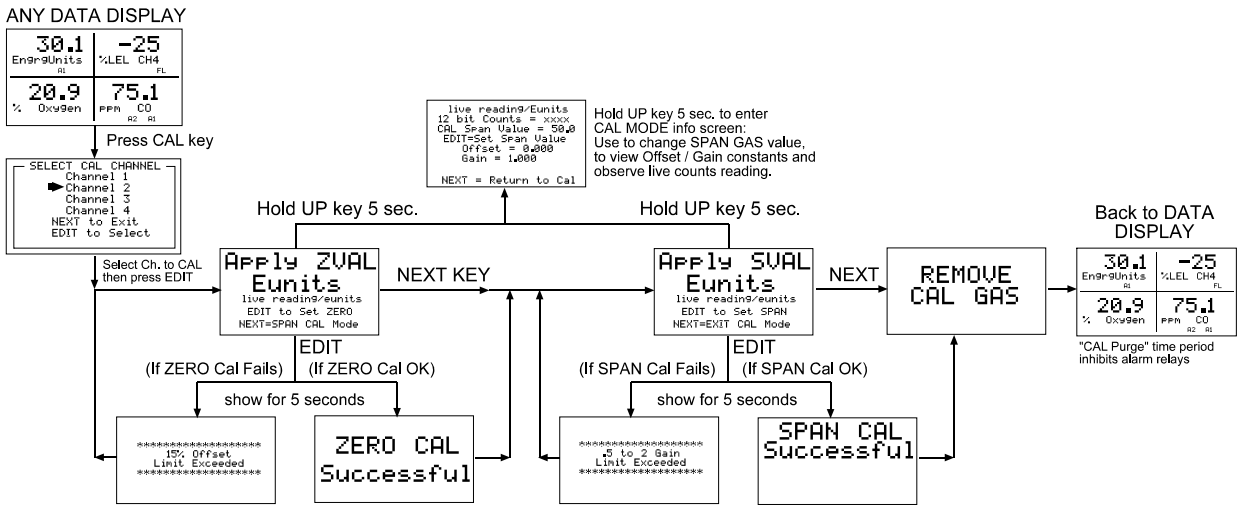


Figure 7-7-1: C2-WWT Calibration Flowchart

8 USER SETUP MENUS

All C2-WWT setup variables are stored in non-volatile memory and can be modified by the end user to match a particular application. Press the EDIT key at any time to access the main SETUP menu.

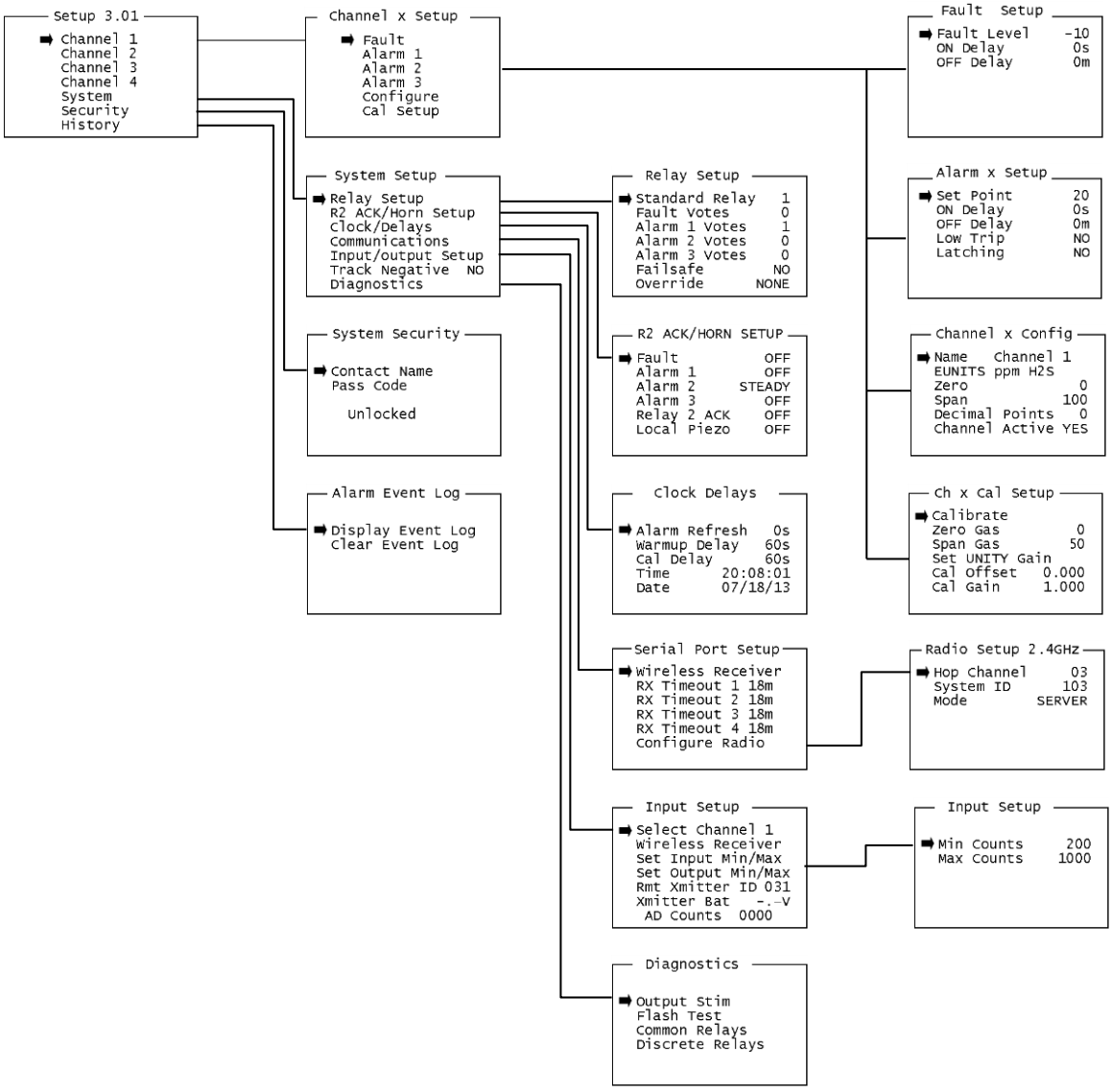


Figure 8-1: C2-WWT Controller Main Menu

Upon 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, such as

Channel ID and Eunits fields may have many ASCII character possibilities. EDIT places a cursor under the item and UP/DOWN scrolls through each allowed entry. The NEXT key moves the cursor to the next position within a field. When the field is complete, EDIT clears the cursor and loads the field into non-volatile memory where it is retained indefinitely. Without a cursor present, the NEXT key closes open menus in reverse order and returns the LCD to the data display.

MAIN SETUP MENU

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

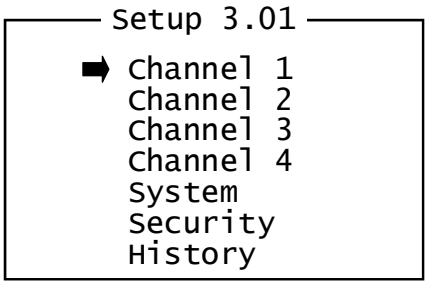


Figure 8-2: Main Setup Menu

NOTE : CHANNEL 4 IS RESERVED FOR SYSTEM FLOW FAULT DETECTION AND INDICATION

CHANNEL CONFIGURATION MENUS

The CHANNEL menu allows configuration of all variables for the selected channel. These are Fault, Alarm 1, Alarm 2, Alarm 3, Configure and CAL Setup.

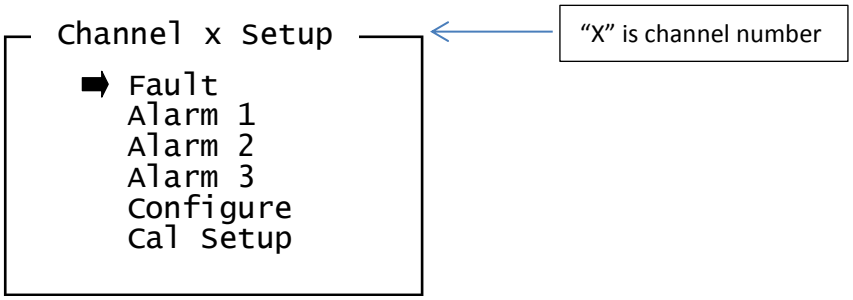


Figure 8-3: Channel Menu

Alarm Menu: Alarms 1, 2 and 3 have identical menus. The only difference between each is A1 front panel LED indicators are yellow while A2 and A3 are red. Typical applications often have A1 set at a WARN level, A2 at a HIGH level and A3 at a higher SHUT DOWN level. However, it is important to understand there is no functional difference between A1, A2 and A3 since their configuration menus are identical. The Fault menus are identical to A1, A2 and A3 except that Fault alarms are always Low Trip (alarm activates as input goes below the set point) and Fault alarms may not be set for latching operation.

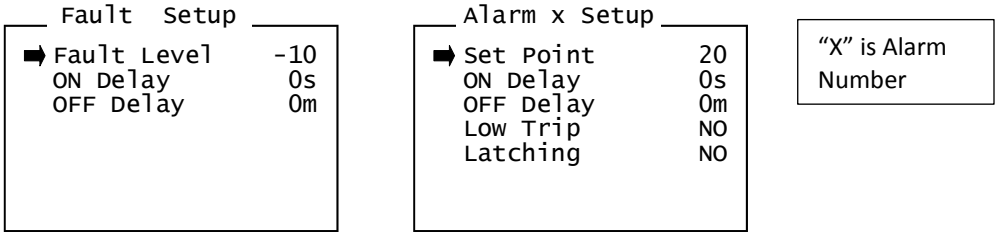


Figure 8-4: Alarm Menu

Set Point is entered in engineering units and determines the value where the alarm trips. For example, if a channel monitors 0-50 ppm H2S and the desired alarm level is 10 ppm, the correct entry is 10.00. A one percent dead band prevents alarm chatter. This means after tripping an alarm the input must move at least 1% of full scale back through the setpoint for the alarm to auto reset.

ON Delay / OFF Delay entries allow ON and OFF time delays affecting how long the trip-point must be surpassed before an alarm event transition occurs. ON delays are limited to 10 seconds while OFF delays may be as long as 120 minutes. Delays are useful in many applications to prevent nuisance alarms and unwanted cycling into and out of alarm conditions.

Low Trip is set for NO for increasing alarms or YES for decreasing alarms to determine if the alarm activates upon exceeding or falling below the set-point.

Latching determines either manual or automatic alarm reset operation. YES requires a manual Alarm Reset to unlatch the alarm even though an alarm condition no longer exists. YES also causes this alarm's common relay, front panel LED, and optional discrete relay to latch. NO allows all outputs for this alarm to automatically reset after the alarm condition clears.

Channel Configure: Allows the user to program the Name and EUNIT 10 digit ASCII fields, defines the measurement range with ZERO & SPAN entries, sets the number of Decimal Points visible and determines if the channel is Active.

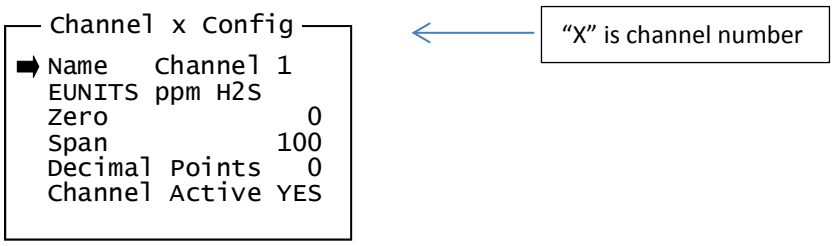


Figure 8-5: Channel Configuration Menu

Name and Eunits: Allows the user to enter the 10 character channel Name and engineering unit ASCII fields. Name should describe the channel's data in user terminology such as tag # or other description. Eunits should define the units of measure for what this channel is to display.

Zero / Span: Allows the user to configure the measurement range displayed. For example, if a channel's input is 4-20mA from a transmitter monitoring 0 to 10 ppm chlorine, then the Zero value should equal 0.000 and the Span value equal 10.00. Four digits must be entered so trailing 0's may appear here that are not displayed on other data screens.

Decimal Points: Resolution of the displayed channel value is configured by setting the number digits trailing the decimal point. Displayed readings are limited to a maximum of four digits with a polarity sign. Auto-ranging displays the highest resolution allowed by this menu's decimal point entry. For example, a range of 0 to 100 ppm and two decimal points reads 0.00 at 0 ppm and 100.0 at 100ppm. This may be undesirable due to the high resolution at zero unless the sensor's output is extremely stable. If decimal points are limited to one, the 0 ppm reading becomes 0.0 and the 100ppm reading remains 100.0. Resolution may be limited further by setting decimal points to 0 where in the above example, 0 ppm reads 0 and 100 ppm reads 100.

Channel Active: OFF causes the controller to not process inputs applied to this channel. As a result, no alarms are tripped nor are data displayed. Inactive channels have a line drawn through them on the Setup screen to indicate it is turned off.

CAL Setup Menu: The C2-WWT CAL MODE feature supports pushbutton calibration of zero and span values. This feature should be utilized only when there are no other zero/span controls within the monitoring system since it is inappropriate to calibrate a signal at more than one point. Therefore, if calibration is to be performed at another transmitter or monitoring device, the local CAL MODE feature should not be used.

CAL SETUP menu allows entering the correct zero and span gas set-point values needed to calibrate the channel. These are entered in the same engineering units as input range.

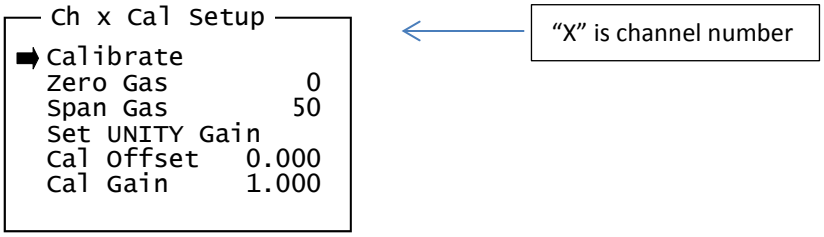


Figure 8-6: Calibration Setup Menu

Zero Gas: Value to be used for lower calibration point. For gas detectors, this value is most always set to zero. However, in some cases, for instance oxygen sensors, the lower calibration point may be set for 2% or 5% instead of 0%.

Span Gas: Value to be used for upper calibration point. GDS Corp recommends that span calibration be set for a point between 25% and 75% of full scale.

Set UNITY Gain: Clears the results from all previous calibrations and resets CAL Gain to 1.000 and CAL Offset to 0.000. Useful if installing a new sensor or if a recent calibration was done incorrectly.

SYSTEM SETUP MENUS

This menu covers items that are system specific instead of channel-specific, and include standard and optional relay setup, real-time clock and programmable delays, MODBUS ports and input/output setup parameters.

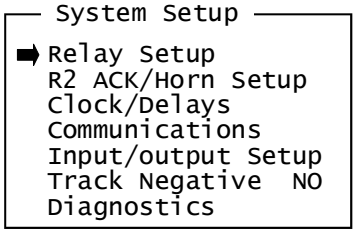


Figure 8-7: System Setup Menu

Relay Setup Menu: The menu shown allows the user to configure both the two standard motherboard relays and the six optional relays on the #10-0222 discrete relay option board. 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 relays (2 standard and 6 optional if installed).

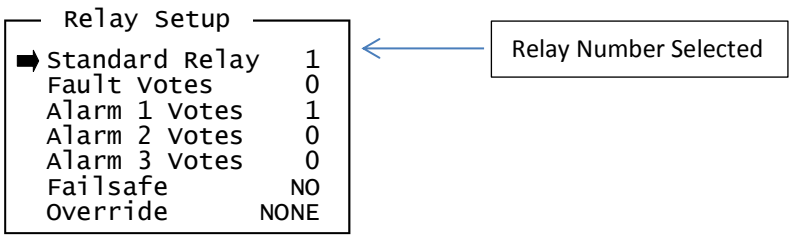


Figure 8-8: Relay Setup Menu

Votes Menus: The Fault, Alarm 1, Alarm2 and Alarm 3 Votes menu adds additional "voting" flexibility by controlling channel alarm combinations that will trip the selected relay. Each Votes entry establishes the quantity of channel alarms that must be active to trigger the relay. As illustrated above, Standard Relay 1 activates when any 2 channels have Alarm 1 active, OR any one channel has an Alarm 2 condition, OR if Channel 1 Alarm 2 alarm is active. Fault Votes and Alarm 3 Votes values are 0 therefore Fault and Alarm 3 conditions will not affect this relay.

Failsafe: Failsafe set for YES causes this relay to be energized when its voting requirements are false (no alarm condition) and de-energized when the alarm vote requirements are true. The primary benefit of Failsafe is loss of power places the relay contacts into the alarm condition.

Override: The Override menu allows entering one of the 16 different alarms that will trip this relay regardless of the Votes entries. There are four alarms per channel and four channels. Any one of these 16 alarms may be used as the Override. This feature is useful when one channel's alarm has more significance than the others.

R2 ACK/Horn Setup Menu: The Relay 2 ACK / Horn Setup menu controls how each alarm type will affect the onboard horn driver connected to J2 on the motherboard. Choices are OFF, STEADY or PULSE. Warning level alarms might be set to pulse the horn with high alarms set for steady. Personnel then know which alarm level is present by hearing the pulsing or steady horn.

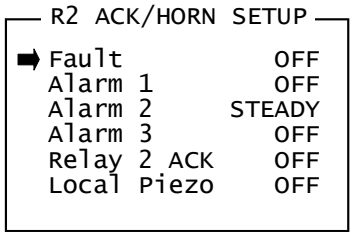


Figure 8-9: R2 ACK/HORN Setup Menu

Relay 2 ACK: Relay 2 Acknowledge set to ON allows Relay 2 to be deactivated during alarm conditions by an Alarm Reset. This is useful if another audible device is being driven by the relay. The acknowledge feature is not available for Relay 1 since it is often used for driving a warning light and Relay 2 for driving a horn. It could be dangerous if an operator acknowledged the horn AND the light since no indication of the high alarm condition remains.

Local Piezo: Local Piezo set to ON causes the tiny local piezo adjacent to the LCD to mimic the J2 horn output.

Clock Delays Menu: The C2-WWT includes timers that accommodate inputs that may require varying times to stabilize after power is applied or after calibration is complete.

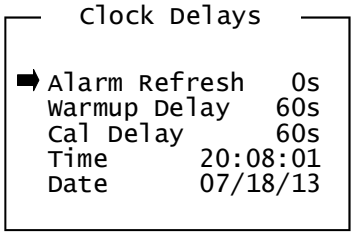


Figure 8-10: Clock / Delays Menu

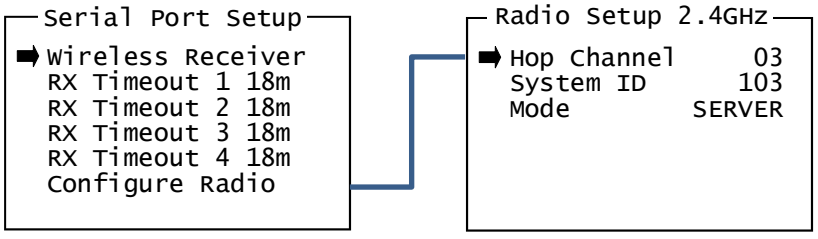
Alarm Refresh Delay: Alarm Refresh menu allows reactivation of Acknowledged alarms after the time period expires. This feature is used primarily to restart audible alarm devices after having been silenced by an acknowledge function (via serial port or pressing the Alarm Reset button). An entry of 0 seconds effectively disables the Alarm Refresh function.

Warm-Up Delay: Warm Up Delay determines how long alarm relays remain disabled after power is applied.

Cal Delay: Cal Delay determines how long alarm relays are inhibited after completing a calibration.

Time and Date: The C2-WWT 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.

Comm Setup Menu: The C2-WWT includes an optional RS-485 serial MOBDUS port that can be configured for MODBUS Master or MODBUS Slave.



If an RS-485 Serial MODBUS interface card is installed, the following menu items are available:

Modbus Master allows the communication port to poll any MODBUS slave device using the MODBUS RTU protocol. This setting is also utilized for Wireless MODBUS Master.

Modbus Slave allows the communication port to be polled by any Modbus master device using the MODBUS RTU protocol. The slave port is addressable, allowing multiple controllers to be connected to a single RS-485 cable. A converter is available to add Ethernet TCP/IP network capability.

Poll Rate sets the time between each MODBUS master transmission. Default is 250 milliseconds.

Timeout set the maximum time that the C2-WWT will wait for a response from a given MODBUS slave device. A COMM ERROR is indicated if the number of sequential missed replies exceeds a pre-programmed value.

If a wireless radio module is installed, the following menu items are available:

Configure Radio allows the user to set the wireless radio parameters

Hop Channel for 900 MHz radios may be set from 1-32 and assigns the pseudo-random radio frequency hopping pattern. Hop Channel settings for 2.4 GHz radios may be set from 0 to 39, where the lower 20 settings include the EU "low band" frequencies from 2.408 through 2.435 GHz, and the upper 20 settings include the EU "high band" frequencies from 2.444 through 2.472 GHz. Different Hop Channel designations may be used to prevent radios in one network from listening to transmissions of another. Installations with more than one Server network should also have different hop channels for each network. **All devices in the same network must have identical hop channel settings to communicate.**

System ID may be set from 1-255 and is similar to a password character or network number and makes network eavesdropping more difficult. **All devices the same network must have identical system ID values to communicate.**

TX Power for 900 MHz models may be set to 10 mW, 200 mW, 400 mW or 1 watt. **Unless there are gas monitors in the immediate vicinity, TX Power should be set for 1 watt.** For 2.4 GHz radios, TX Power is fixed at 50 mW.

Mode may be set for CLIENT or SERVER. There should only be one SERVER in any given network. The radio designated as SERVER should be powered and should be within range of all radios on the network.

Wireless Receiver or Wireless MODBUS selects radio function. Wireless Receiver is used when receiving data from GASMAX TX or GASMAX ECx wireless gas monitors. Wireless MODBUS is used if the C2-WWT is part of a wireless MODBUS network.

If Wireless Receiver is selected, the following menu item is available:

RX Timeout determines the maximum amount of time that can pass without the successful reception of a transmitted gas packet before a Communications Error (COM ERR) is generated. A different value can be programmed for each channel.

If Wireless MODBUS is selected, the following menu item is available:

Slave ID sets the C2-WWT MODBUS slave ID value. Remote MODBUS master devices use this slave ID value to address this specific C2-WWT.

Input / Output Setup Menu: The system Input / Output menu allow setting the input A/D (analog to digital) counts and the output D/A (digital to analog) counts for each of the four channels as well as the input type (analog or wireless). Use the Set Channel entry to scroll to the desired channel using the EDIT key. The live A/D counts value for the channel selected is also shown on the bottom of this screen.

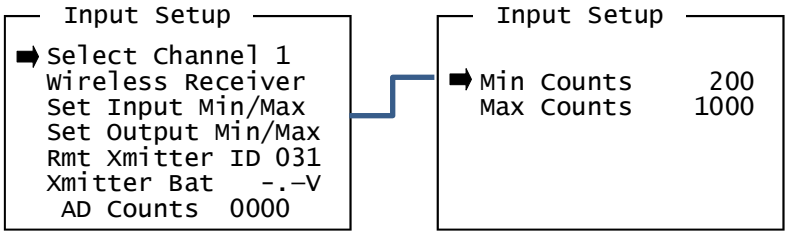


Figure 8-11: Analog Setup Menu

The default setting for A/D counts is 400 for Min and 2000 for Max. This is based upon a 0-20mA input providing 0-2000 counts, or, 100 counts per mA input.

INPUT Min / Max Counts entries in the INPUT SETUP menus define the input A/D counts range for Zero and Span readings. The default settings for each analog channel are 400 to 2000 counts. Standard inputs yield 400 counts at 4mA and 2000 counts at 20mA but, for example, if a special application requires the Zero reading at 6mA input and the Span reading at 18mA input the correct A/D Min / Max Raw counts would be 600 to 1800.

OUTPUT Min / Max Counts entries in the OUTPUT SETUP menus define the output D/A counts range for Zero and Span readings. OUTPUT SETUP menus are only used when the C2-WWT is equipped with the optional 4-20mA output option. Ideally, 200 to 1000 yields a 4-20mA output but very slight modifications may be needed to provide precise 4mA and 20mA values for each channel.

Input Type selects the source of the channel's input data. Options include ANALOG and WIRELESS.

If setting is WIRELESS the following two items are shown:

RMT Xmitter ID sets the value of a remote MODBUS or wireless device "Remote ID" associated with the currently selected channel

Xmitter Batt indicates the battery voltage of a remote GASMAX TX or GASMAX ECx wireless gas monitor currently associated with this channel.

Diagnostics Menu: The Diagnostics menu provides an easy way to activate alarms or test controller subsystems.

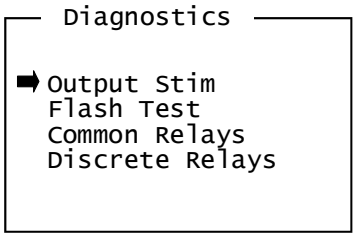


Figure 8-12: Diagnostics Menu

Output Stim: Used to force the 4-20mA output channels to specific values without applying gas or input stimulus. Useful when performing initial system checkout or when troubleshooting.

Flash Test: Tests non-volatile FLASH memory.

Common Relays: Used to activate either of the two standard SPDT relays.

Discrete Relays: Used to activate one of the six optional discrete relays if the discrete relay board is installed.

NOTE: ALARM PROCESSING DOES NOT OCCUR WHILE IN DIAGNOSTICS MODE!

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.

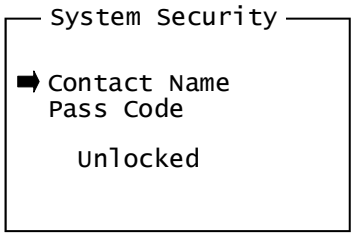


Figure 8-13: Security Menu

HISTORY 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".

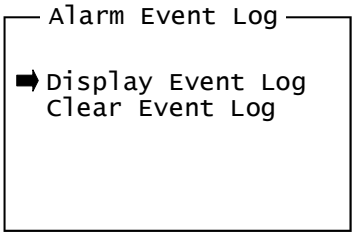


Figure 8-14: Alarm Event Menu

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.

9 MODBUS REGISTERS

The C2-WWT features a full complement of user-accessible MODBUS registers to provide a complete snapshot of the controller's configuration and current status. This includes all real-time data, preset zero, span and calibration values and user-programmable text.

LIST OF C2-WWT MODBUS VARIABLES

Variable Name	Alias	Read FC	Write FC	Notes
Alarm Ack / Reset	*2001*	*1*	*5*	*Reverts to FALSE after TRUE write*
Ch 1 Fault	12001	2	N/A	Modbus Coils (read only)
Ch 1 Alarm 1	12002	2	N/A	
Ch 1 Alarm 2	12003	2	N/A	
Ch 1 Alarm 3	12004	2	N/A	
Ch 2 Fault	12005	2	N/A	
Ch 2 Alarm 1	12006	2	N/A	
Ch 2 Alarm 2	12007	2	N/A	
Ch 2 Alarm 3	12008	2	N/A	
Ch 3 Fault	12009	2	N/A	
Ch 3 Alarm 1	12010	2	N/A	
Ch 3 Alarm 2	12011	2	N/A	
Ch 3 Alarm 3	12012	2	N/A	
Ch 4 Fault	12013	2	N/A	
Ch 4 Alarm 1	12014	2	N/A	
Ch 4 Alarm 2	12015	2	N/A	
Ch 4 Alarm 3	12016	2	N/A	
Standard Relay 1	12017	2	N/A	
Standard Relay 2	12018	2	N/A	
Optional Relay 1	12019	2	N/A	
Optional Relay 2	12020	2	N/A	
Optional Relay 3	12021	2	N/A	
Optional Relay 4	12022	2	N/A	
Optional Relay 5	12023	2	N/A	
Optional Relay 6	12024	2	N/A	
Input Fault Relay	12025	2	N/A	

Product ID	30001	4	N/A	Read Only, returns “1000”
Firmware Version	30002	4	N/A	Read Only, returns version / 100
Ch 1 D2A Post CAL	31001	4	N/A	12 bit value; 800 = 4mA, 4000 = 20mA
Ch 2 D2A Post CAL	31002	4	N/A	12 bit value; 800 = 4mA, 4000 = 20mA
Ch 3 D2A Post CAL	31003	4	N/A	12 bit value; 800 = 4mA, 4000 = 20mA
Ch 4 D2A Post CAL	31004	4	N/A	12 bit value; 800 = 4mA, 4000 = 20mA
Ch 1 Status Word	31005	4	N/A	See Channel Status bit definition
Ch 2 Status Word	31006	4	N/A	See Channel Status bit definition
Ch 3 Status Word	31007	4	N/A	See Channel Status bit definition
Ch 4 Status Word	31008	4	N/A	See Channel Status bit definition
System Status Word	31009	4	N/A	See System Status bit definition
Alarm Status Word	31010	4	N/A	See Alarm Status bit definition
LED Blink Status Word	31011	4	N/A	See LED Blink bit definition
Relay Status Word	31012	4	N/A	See Relay Status bit definition
Sympathy Register	40004	N/A	6	Contact factory
Ch 1 User Info	40401 - 40405	3	N/A	10 ASCII characters (2 per register)
Ch 2 User Info	40406 – 40410	3	N/A	10 ASCII characters (2 per register)
Ch 3 User Info	40411 - 40415	3	N/A	10 ASCII characters (2 per register)
Ch 4 User Info	40416 – 40420	3	N/A	10 ASCII characters (2 per register)
Ch 1 EUNITS	40421 – 40425	3	N/A	10 ASCII characters (2 per register)
Ch 2 EUNITS	40426 – 40430	3	N/A	10 ASCII characters (2 per register)
Ch 3 EUNITS	40431 – 40435	3	N/A	10 ASCII characters (2 per register)
Ch 4 EUNITS	40436 – 40440	3	N/A	10 ASCII characters (2 per register)
Ch 1 ASCII Reading	40441 – 40443	3	N/A	6 ASCII characters (2 per register)
Ch 2 ASCII Reading	40444 – 40446	3	N/A	6 ASCII characters (2 per register)
Ch 3 ASCII Reading	40447 – 40449	3	N/A	6 ASCII characters (2 per register)
Ch 4 ASCII Reading	40450 – 40452	3	N/A	6 ASCII characters (2 per register)
Firmware Version	40453 – 40455	3	N/A	4 ASCII characters (2 per register)
Ch 1 Zero Real	41001	3	N/A	Real value without decimal point
Ch 1 Zero Divisor	41002	3	N/A	Divisor = 1, 10, 100 or 1000

Ch 1 Span Real	41003	3	N/A	
Ch 1 Span Divisor	41004	3	N/A	
Ch 1 Fault Real	41005	3	N/A	
Ch 1 Fault Divisor	41006	3	N/A	
Ch 1 Alarm 1 Real	41007	3	N/A	
Ch 1 Alarm 1 Divisor	41008	3	N/A	
Ch 1 Alarm 2 Real	41009	3	N/A	
Ch 1 Alarm 2 Divisor	41010	3	N/A	
Ch 1 Alarm 3 Real	41011	3	N/A	
Ch 1 Alarm 3 Divisor	41012	3	N/A	
Ch 2 Zero Real	41013	3	N/A	Real value without decimal point
Ch 2 Zero Divisor	41014	3	N/A	Divisor = 1, 10, 100 or 1000
Ch 2 Span Real	41015	3	N/A	
Ch 2 Span Divisor	41016	3	N/A	
Ch 2 Fault Real	41017	3	N/A	
Ch 2 Fault Divisor	41018	3	N/A	
Ch 2 Alarm 1 Real	41019	3	N/A	
Ch 2 Alarm 1 Divisor	41020	3	N/A	
Ch 2 Alarm 2 Real	41021	3	N/A	
Ch 2 Alarm 2 Divisor	41022	3	N/A	
Ch 2 Alarm 3 Real	41023	3	N/A	
Ch 2 Alarm 3 Divisor	41024	3	N/A	
Ch 3 Zero Real	41025	3	N/A	Real value without decimal point
Ch 3 Zero Divisor	41026	3	N/A	Divisor = 1, 10, 100 or 1000
Ch 3 Span Real	41027	3	N/A	
Ch 3 Span Divisor	41028	3	N/A	
Ch 3 Fault Real	41029	3	N/A	
Ch 3 Fault Divisor	41030	3	N/A	
Ch 3 Alarm 1 Real	41031	3	N/A	
Ch 3 Alarm 1 Divisor	41032	3	N/A	
Ch 3 Alarm 2 Real	41033	3	N/A	
Ch 3 Alarm 2 Divisor	41034	3	N/A	
Ch 3 Alarm 3 Real	41035	3	N/A	
Ch 3 Alarm 3 Divisor	41036	3	N/A	

Ch 4 Zero Real	41037	3	N/A	Real value without decimal point
Ch 4 Zero Divisor	41038	3	N/A	Divisor = 1, 10, 100 or 1000
Ch 4 Span Real	41039	3	N/A	
Ch 4 Span Divisor	41040	3	N/A	
Ch 4 Fault Real	41041	3	N/A	
Ch 4 Fault Divisor	41042	3	N/A	
Ch 4 Alarm 1 Real	41043	3	N/A	
Ch 4 Alarm 1 Divisor	41044	3	N/A	
Ch 4 Alarm 2 Real	41045	3	N/A	
Ch 4 Alarm 2 Divisor	41046	3	N/A	
Ch 4 Alarm 3 Real	41047	3	N/A	
Ch 4 Alarm 3 Divisor	41048	3	N/A	

CHANNEL STATUS WORD BIT DEFINITION

Channel Status Word	Bit 0	Reserved
	Bit 1	Alarm 1 Below (1), Alarm 2 Above (0)
	Bit 2	Alarm 2 Below (1), Alarm 3 Above (0)
	Bit 3	Alarm 3 Below (1), Alarm 3 Above (0)
	Bit 4	Wireless Input Selected
	Bit 5	Alarm 1 Latch (1), Alarm 3 not latch (0)
	Bit 6	Alarm 2 Latch (1), Alarm 3 not latch (0)
	Bit 7	Alarm 3 Latch (1), Alarm 3 not latch (0)
	Bit 8	Reserved
	Bit 9	Channel Disabled (1), Channel Active (0)
	Bit 10	Channel Cal Bit (1), Normal (0)
	Bit 11-15	Reserved

SYSTEM STATUS WORD BIT DEFINITION

System Status Word	Bit 0	Track Negative (1), do not display negative values (0)
	Bit 1	Wireless receiver mode (1), wireless MODBUS (0)
	Bit 2-14	Reserved
	Bit 15	Security Lock Enabled (1), not locked (0)

ALARM STATUS WORD BIT DEFINITION

Alarm Status Word	Bit 0	Ch 1 Fault (1 = active)
	Bit 1	Ch 1 Alarm 1
	Bit 2	Ch 1 Alarm 2
	Bit 3	Ch 1 Alarm 3
	Bit 4	Ch 2 Fault (1 = active)

	Bit 5	Ch 2 Alarm 1
	Bit 6	Ch 2 Alarm 2
	Bit 7	Ch 2 Alarm 3
	Bit 8	Ch 3 Fault (1 = active)
	Bit 9	Ch 3 Alarm 1
	Bit 10	Ch 3 Alarm 2
	Bit 11	Ch 3 Alarm 3
	Bit 12	Ch 4 Fault (1 = active)
	Bit 13	Ch 4 Alarm 1
	Bit 14	Ch 4 Alarm 2
	Bit 15	Ch 4 Alarm 3

LED BLINK STATUS WORD BIT DEFINITION

LED Blink Status Word	Bit 0	Ch 1 Fault (1 = blinking, 0 = steady)
	Bit 1	Ch 1 Alarm 1
	Bit 2	Ch 1 Alarm 2
	Bit 3	Ch 1 Alarm 3
	Bit 4	Ch 2 Fault (1 = blinking, 0 = steady)
	Bit 5	Ch 2 Alarm 1
	Bit 6	Ch 2 Alarm 2
	Bit 7	Ch 2 Alarm 3
	Bit 8	Ch 3 Fault (1 = blinking, 0 = steady)
	Bit 9	Ch 3 Alarm 1
	Bit 10	Ch 3 Alarm 2
	Bit 11	Ch 3 Alarm 3
	Bit 12	Ch 4 Fault (1 = blinking, 0 = steady)
	Bit 13	Ch 4 Alarm 1
	Bit 14	Ch 4 Alarm 2
	Bit 15	Ch 4 Alarm 3

RELAY STATUS WORD BIT DEFINITION

Relay Status Word	Bit 0	Standard Relay 1 (1 = energized, 0 = de-energized)
	Bit 1	Standard Relay 2 (1 = energized, 0 = de-energized)
	Bit 2	Optional Relay 1 (1 = energized, 0 = de-energized)
	Bit 3	Optional Relay 2 (1 = energized, 0 = de-energized)
	Bit 4	Optional Relay 3 (1 = energized, 0 = de-energized)

	Bit 5	Optional Relay 4 (1 = energized, 0 = de-energized)
	Bit 6	Optional Relay 5 (1 = energized, 0 = de-energized)
	Bit 7	Optional Relay 6 (1 = energized, 0 = de-energized)
	Bit 8	Common Fault (no relay, bit value only)
	Bit 9-15	Reserved

10 TROUBLESHOOTING GUIDE

C2-WWT DISPLAY BLANK

- Lack of AC power
- Display / CPU board ribbon cable not plugged in
- Motherboard fuse blown or defective

C2-WWT DISPLAY SHOWS FAULT ON CHANNELS 1, 2 OR 3

- Faulty sensor (output drifted below zero)
- No sensor installed
- Sensor head wiring disconnected

C2-WWT DISPLAY SHOWS FAULT ON CHANNELS 4

- Flow blocked or end of line filter clogged
- Sample pump wiring disconnected
- Flow switch wiring disconnected
- Sample pump failed

REMOTE CHANNEL DATA READINGS APPEAR INCORRECT

- Channel zero and span settings do not set to match sensor zero and span settings (if using 4-20mA input)
- Channel Min/Max counts settings not set properly (if using MODBUS).
- Data input on wrong channel.

C2-WWT ALARM RELAY DOES NOT ACTIVATE

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

11 DRAWINGS AND DIMENSIONS

The C2-WWT non-metallic enclosure is a NEMA 4X polycarbonate wall mount case designed for medium duty applications.

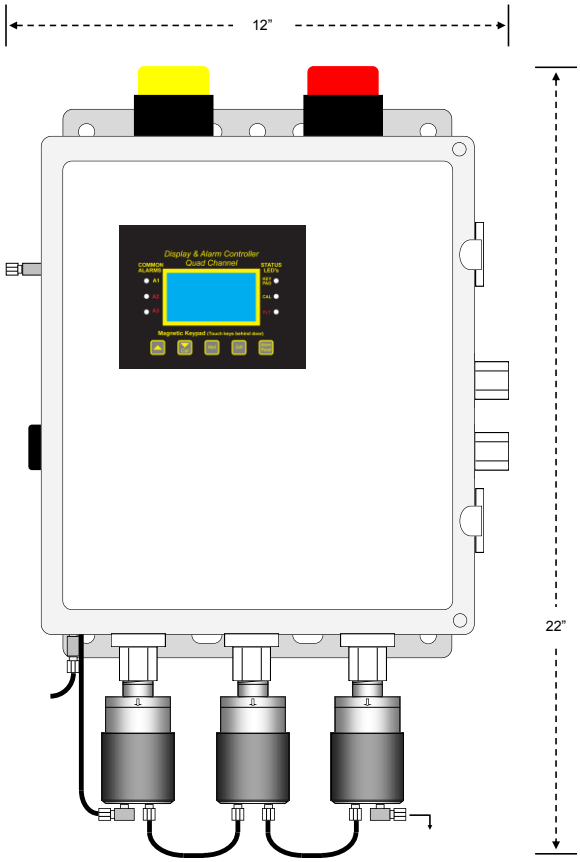


Figure 11-1: NEMA 4X Polycarbonate Enclosure

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.


GDS
Corp
Gas and Flame Detection