GDS Corp

Gas and Flame Detection

Operation and Maintenance Manual

GDS-78XP Process Monitor for Hazardous Area Applications

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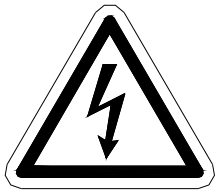

CAUTION: FOR SAFETY REASONS THIS EQUIPMENT MUST BE OPERATED AND SERVICED BY QUALIFIED PERSONNEL ONLY. READ AND UNDERSTAND INSTRUCTION MANUAL COMPLETELY BEFORE OPERATING OR SERVICING.

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 2.0	5/20/14	Revised and Updated for GASMAX CX

P/N 1200-0712-02

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1 SAFETY INFORMATION

Important – Read Before Installation

Users should have a detailed understanding of GDS-78XP operating and maintenance instructions. Use the GDS-78XP 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

- The GDS-78XP process monitor described in this manual must be installed, operated and maintained in accordance with information contained herein. Installation in any hazardous area must comply with all applicable restrictions, requirements and guidelines for said hazardous areas. It is the end user customer's final decision to ensure that the GDS-78XP is suitable for the intended use.
- The GDS-78XP is designed and constructed to measure the level of certain gases in backgrounds that contain free oxygen. Accuracy in atmospheres containing steam or inert gases cannot be guaranteed.
- Do not paint enclosure, transmitter or sensor assembly.
- Do not operate the GDS-78XP if its enclosure is damaged or cracked or has missing components. Make sure the cover, internal PCB's and field wiring are securely in place before applying power.
- Do not expose the GDS-78XP to electrical shock or continuous severe mechanical shock. Protect the GDS-78XP from dripping liquids and high power sprays.
- Calibrate with known target gas at start-up and check on a regular schedule, at least every 90 days. More frequent inspections are encouraged to spot problems such as dirt, oil, paint, grease or other foreign materials in the sample tubing or in the sensor head.
- Periodically test for correct operation of the system's alarm events by exposing the sample extraction point to a calibration gas concentration above the High Alarm set point.
- Use only for applications described within this manual.

WARRANTY

GDS Corp. UPS products carry a 2-year limited repair or replacement warranty on electronics and workmanship and one year warranty on sensors. GDS Corp. reserves the right to void warranty claims based on evidence of misuse, abuse, or misapplication. Warranty period starts on date of shipment.

IF YOU HAVE QUESTIONS

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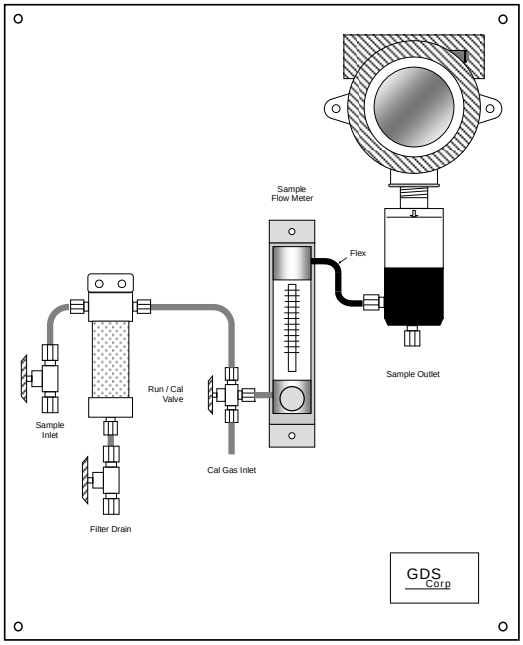
2 OVERVIEW

INTRODUCTION

Thank you for choosing the GDS Corp GDS-78XP Process Gas Monitor for Hazardous Area Applications. The GDS-78XP Process Gas Monitor is designed to provide continuous monitoring for gas sample streams that are compatible with standard electrochemical, infrared and photoionization sensors. The GDS-78XP combines the industry-proven reliability and performance of GDS Corp GASMAX gas monitors with high quality sample conditioning and flow measurement components to deliver cost-effective solutions for process monitoring applications.



The GDS-78XP is designed to operate with samples from pressurized sources between +1 psig and +3000 psig depending on sample conditioning hardware.

EXPLOSION PROOF INSTALLATION

The GDS-78XP is designed for use in Class 1 Division 1 hazardous areas. Installation in these areas should follow best industry standard practices and all appropriate electrical codes. Generally, these codes require rigid metal conduit, poured seals and other installation elements necessary to ensure safety. For maximum protection against RF interference or electrical surge, the GDS-78XP enclosure and interconnecting conduit must be properly grounded.

INTRINSICALLY SAFE INSTALLATION

The GDS-78XP is not designed or certified for use as an Intrinsically Safe device.

3 HARDWARE

OVERVIEW

The GDS-78XP uses low cost, reliable electrochemical sensors to detect hydrogen sulfide, mercaptan, THT and other trace gases in process streams that contain little or no oxygen. As electrochemical sensors require oxygen to operate, the GDS-78XP alternatively exposes the sensor to the process flow and then purges the sensor with ambient air to maintain the sensor in a sensitive, oxygenated state.

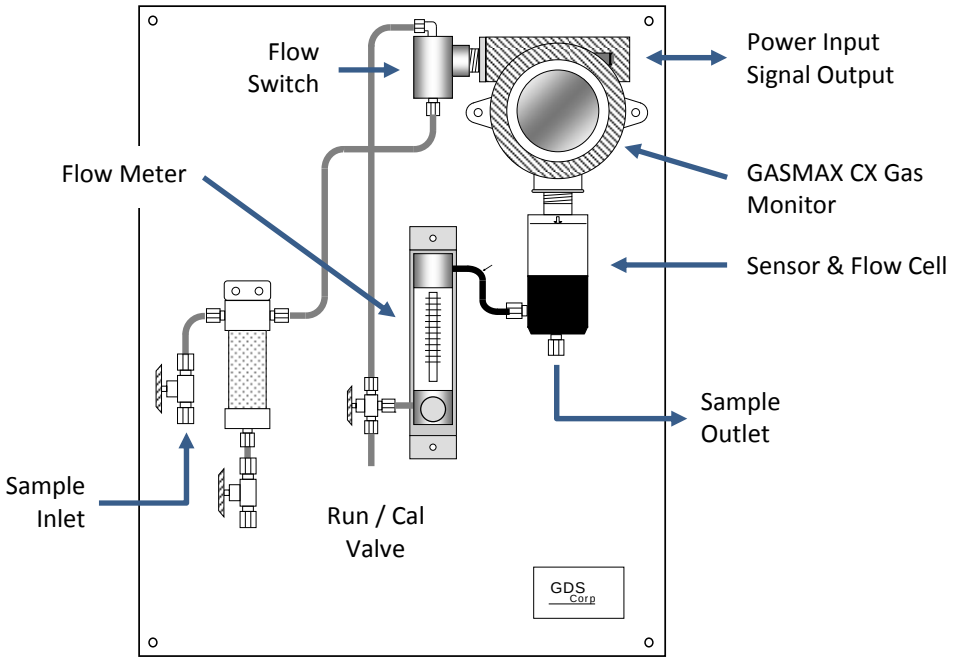


Figure 3-1: GDS-78XP Process Monitor with XP Flow Switch

At the beginning of each sequence, the GDS-78XP performs **Conditions the Sensor** by allowing a small sample of gas to enter the

SENSOR CONSIDERATIONS

For toxic gases the GDS-78XP supports a wide range of electrochemical ("echem") sensors. These sensors use chemical reactions to sense the presence of gases such as hydrogen sulfide, sulfur dioxide and many others. Each sensor contains an amount of chemical electrolyte that reacts with the target gas to create free electrons that are amplified and measured. Once the electrolyte is depleted, sensor output will diminish and the sensor must be replaced.

IMPORTANT: TOXIC SENSORS ARE SUBJECT TO ACCELERATED DETERIORATION IF POWER IS NOT APPLIED WITHIN 3 MONTHS OF SHIPMENT FROM GDS CORP.

For combustible gases the GDS-78XP supports both a traditional catalytic bead ("cat bead") sensor and the GDS-IR infrared sensor.

Catalytic bead sensors 'burn' combustible gas using a catalyst that operates at high temperature. An increase in temperature indicates the presence of gas. Catalytic bead sensors can detect any combustible gas, but the fact that the active bead is in direct contact with the gas can result in damage or reduced sensitivity if the gas contains chemicals that deactivate or temporarily inhibit the operation of the catalyst. Catalytic material is used each time the sensor is exposed to combustible gas and as a result the sensor will lose sensitivity over time.

Infrared sensors use the fact that hydrogen-carbon bonds found in all hydrocarbon gases absorb infrared light at certain frequencies. The sensor is designed such that the target passes between the source and detector, and a reduction in detector output indicates the presence of gas. Infrared sensors cannot be poisoned or damaged by chemicals in the target gas and typically have a long life. GDS-IR sensors carry a 5 year warranty on the electronics and a 12 year warranty on the IR source.

IMPORTANT: INFRARED SENSORS CANNOT DETECT COMBUSTIBLE LEVELS OF HYDROGEN GAS

Photoionization detectors (PID sensors) are used to detect volatile organic compounds such as benzene or toluene. PID sensors use high energy ultraviolet light to partially ionize complex molecules and measure the resulting free electrons. Each VOC has a different 'ionization potential (IP)' energy level that is measured in 'electron-volts', or eV, and a given PID sensor will detect all compounds present with IP values that are equal to or lower than the rated eV of the PID sensor lamp. PID sensor lamps eventually wear out and can be factory refurbished.

4 INSTALLATION

SELECTING A LOCATION

Install the GDS-78XP in a suitable location, as close as possible to the point of intended sample extraction. The GDS-78XP back plate is an industry standard size and features mounting holes that can be used to securely attach the monitor to a bulkhead or wall. Make sure there is sufficient clearance to install the sample inlet tubing and sample outlet tubing. Also make sure that the Run / Cal valve can operate freely and that access to the Cal Port is not blocked for any reason.

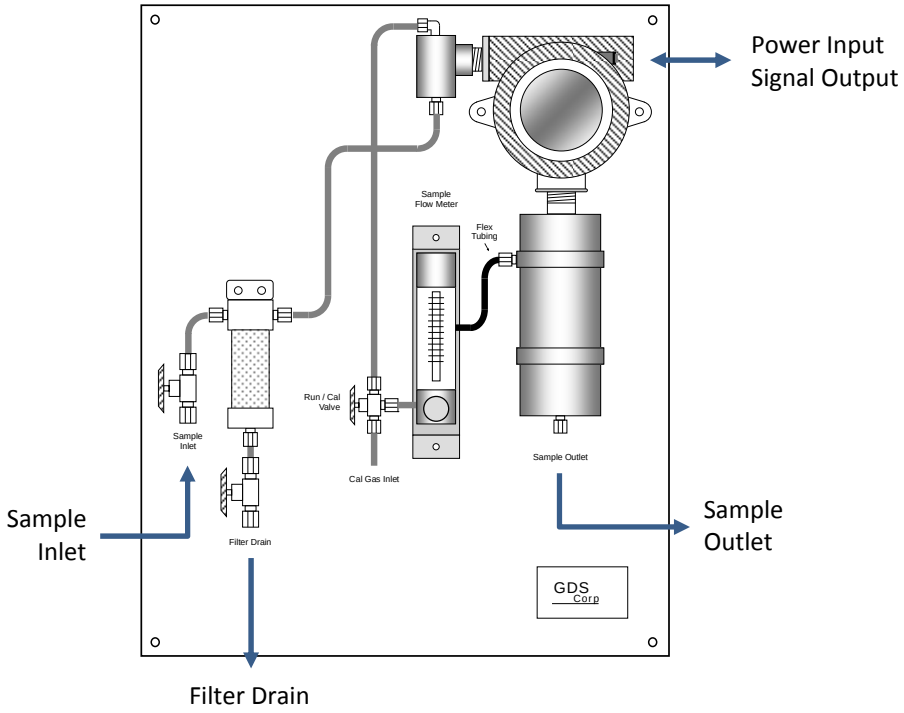


Figure 4-1: GDS-78XP Process Monitor with XP Flow Switch and GDS-IR Sensor

ETHERNET CONNECTION

The GASMAX CX gas monitor includes a standard RJ-45 Ethernet connection on the main I/O board. Both fixed IP and DHCP-based dynamic IP addressing is supported. The GASMAX CX supports a full range of MODBUS / TCP accessible register (see Chapter 10) as well as a built-in web server with data display and gas detector configuration page. See Figure 5-2.

USER POWER & SIGNAL CONNECTIONS

To access the power and signal wiring, remove the cover from the explosion proof enclosure. Connect a source of +24VDC to TB1 pins 1 (+) and 4 (-) as shown below. Analog 4-20mA signal output is connected to TB1 pin 2. Channel 2 output on pin 3 is not used in this application.

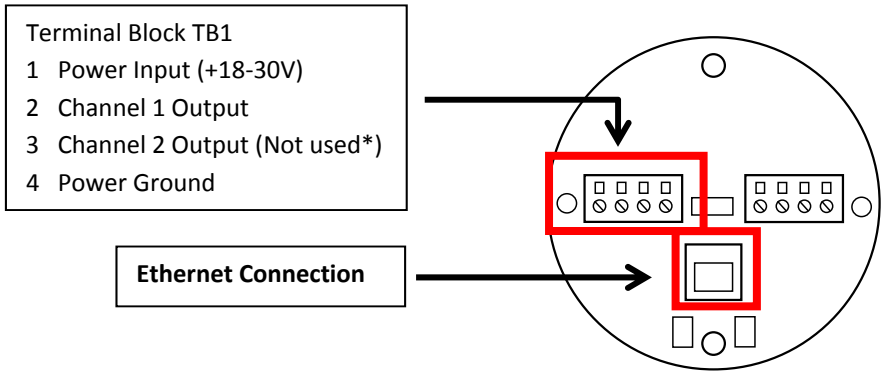


Figure 4-2: GDS-78XP Power, Signal & Ethernet Wiring

RELAY CONNECTIONS (OPTIONAL)

The optional GASMAX CX Relay / dual MODBUS RTU slave interface is connected "piggyback" to the back of the GASMAX CX Display Assembly and supplies three level alarm relays, a FAULT relay and dual RS-485 Modbus RTU serial ports.

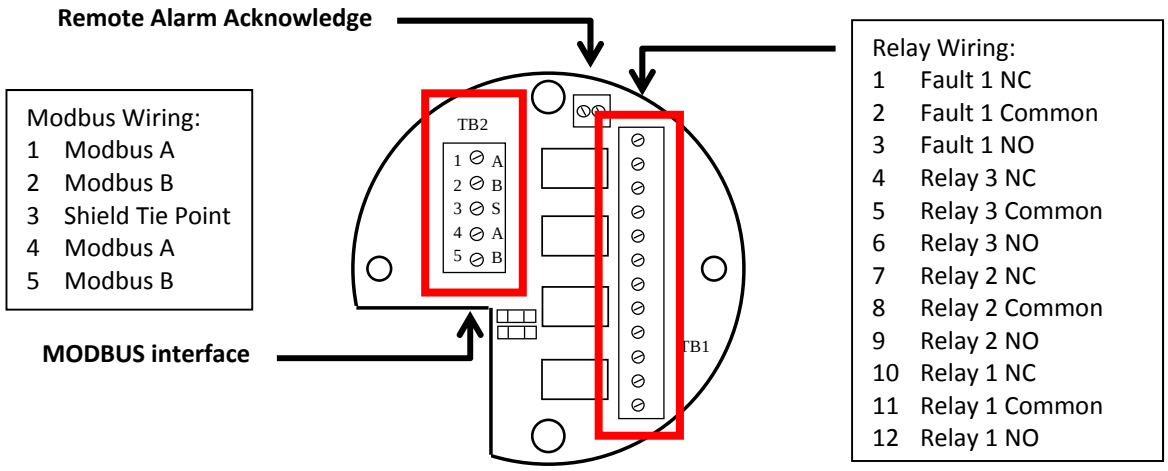


Figure 4-3: RELAY / MODBUS Connections

Relays K1, K2 and K3 provide a contact closure if the Alarm 1 ("K1") or Alarm 2 ("K2") or Alarm 3 ("K3") limits are exceeded. Alarms can be programmed to trigger above or below a certain value, work as normal or 'failsafe' and can be made to latch if desired. Relay K3 indicates a FAULT condition in the sensor, microprocessor or flow system.

Remote Alarm Reset can be used to acknowledge an Alarm 2 relay contact closure. Wiring from any remote pushbutton to TB3 should be shielded and protected from noise spikes to prevent false Alarm Reset commands.

WARNING: RELAY CONTACTS ARE RATED FOR RESISTIVE LOADS ONLY! INDUCTIVE LOADS MAY CAUSE ARCING WHICH SHORTENS LIFE AND MAY INTERFERE WITH SENSOR DATA.

MODBUS CONNECTIONS (OPTIONAL)

The dual optional GDS-78XP MODBUS RTU interface allows remote controllers or PLCs to monitor most aspects of operation, including real-time data, range and alarm setpoints and alarm and fault status bits. The GDS-78XP interface supports 9600 Baud RS-485 differential signaling only.

Access to each MODBUS RS-485 interface is via TB2 on the optional Relay / MODBUS board mounted on the back of the GASMAX CX display module

MODBUS system architecture requires that the devices in any MODBUS loop be connected in a daisy-chain layout. This minimizes signal reflections and improves signal noise margin. A MODBUS Termination Jumper installs a load resistor across the MODBUS signal lines and should only be set to "A" (ON) at the last device in the string.

Cable selection for MODBUS systems is important for both signal integrity and power distribution. For MODBUS data signals, GDS Corp recommends 20GA to 24GA twisted shielded cable. Daisy-chain power distribution may require larger gauge wire since it is critical that the supply voltage for the GDS-78XP at the far end of the string not fall below 20VDC during power-up.

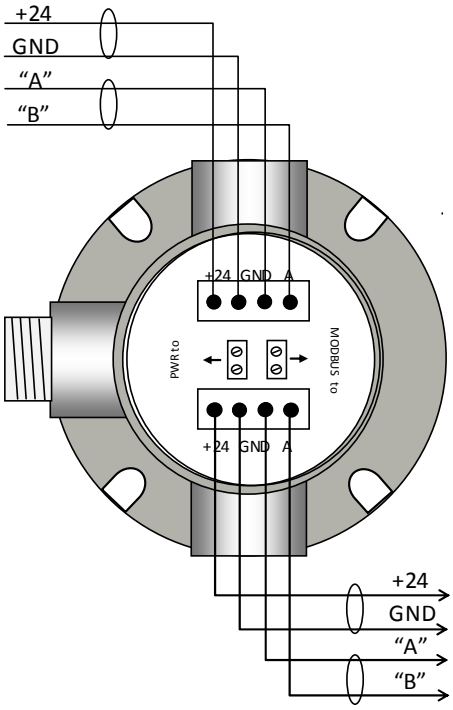


Figure 4-4: MODBUS Wiring Junction Box

Note that while the GDS-78XP has two sets of wiring terminals for MODBUS "A" and "B" signals, daisy-chain power wiring requires that two wires be installed in the "+24" and "GND" terminals on the GDS-78XP I/O Power Supply board. This can be difficult if wire sizes are larger than #18GA. For these reasons, if MODBUS is required GDS Corp recommends the addition of the MODBUS Wiring Junction Box (see Fig. 5-7). This option minimizes the need to access wiring inside the GDS-78XP, provides individual wire landing points for incoming and outgoing MODBUS and power wiring and shields, and makes it easy to temporarily disconnect the GDS-78XP power or MODBUS connections without affecting any other MODBUS device.

AC HEATER (OPTIONAL)

The 200 watt AC-powered heater is recommended for outdoor applications where ambient temperatures may fall below freezing for extended periods of time. The heater is available in either 110VAC or 230VAC models. Access to the heater wiring is via a separate ¾" NPT fitting on the bottom of the heater junction box. Note that all high voltage AC wiring must be kept separate from lower voltage DC and signal lines.

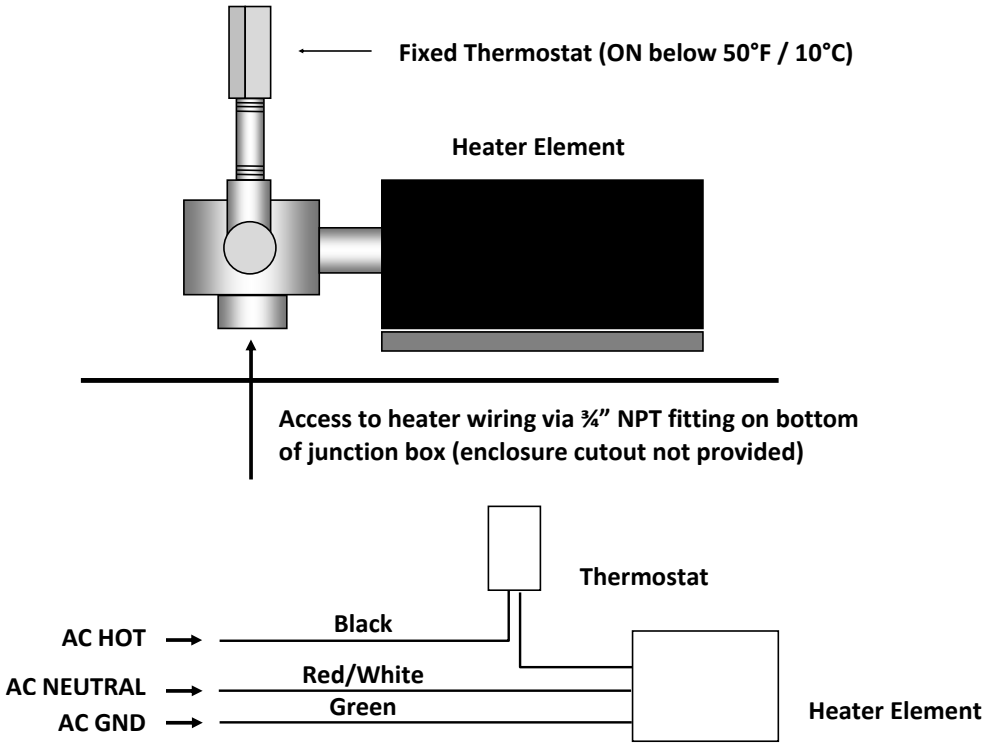


Figure 4-5: 200W AC Heater Wiring

Local codes and good wiring practice require an AC shutoff switch within sight of the heater assembly for maintenance and testing. **IMPORTANT: Keep all electrical fittings tight while circuits are alive.**

SAMPLE INLET

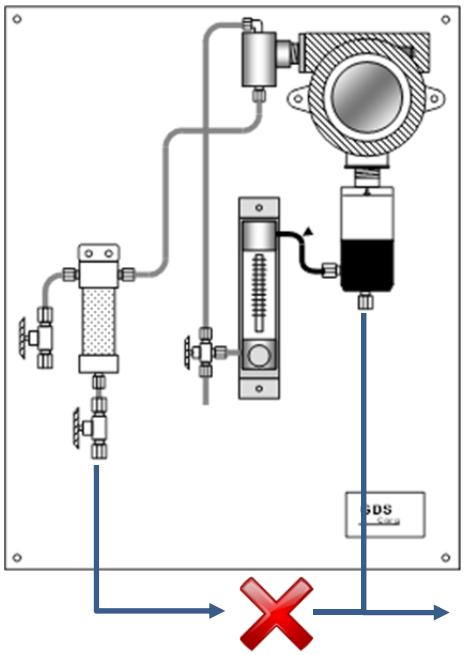
Attach a length of tubing to the Sample Inlet using the supplied ¼" compression fitting. The GDS-78XP uses a variable area flow meter or high pressure regulator to monitor and control sample flow. For option #1, inlet pressure must be maintained between 1.0 psig and 50 psig, and must remain within ±10% of the nominal value. Excessive changes in sample inlet pressure will proportionally change the sample flow rate; rates below or above the desired 0.5 liter per minute rate may cause incorrect readings. If the optional low-flow switch is included, flow rates

below the desired value will cause the FAULT relay to activate (if installed). Options #2 and #3 employ a high pressure regulator and maintain a fixed flow rate over a wide range of inlet pressures.

FILTER DRAIN & FILTER BYPASS

All GDS-78XP configurations include a coalescing filter with stainless steel drain valve. The drain valve should be opened periodically to release any built-up liquid that may have been trapped inside the filter. Conversely, the filter drain valve may be left 'cracked open' to allow moisture (and sample gas) to escape on a continuous basis.

Models with the combination coalescing and membrane filter include a bypass valve that should be opened slightly to maintain a constant flow of sample across the membrane element to carry away moisture and particulates captured by the filter.



Filter Drain Recommendations

1) Including a length of clear tubing in the filter drain line makes it easy to monitor the drain for the presence of moisture
2) Filter drain and filter bypass drain can be combined in the same manifold
3) Filters in sample draw units should only be drained during sample purge or purge / hold times to keep ambient air from being drawn into the GDS-78XP by the sample pump

IMPORTANT: DO NOT TIE SAMPLE EXHAUST TO A COMMON EXHAUST MANIFOLD. MAINTAIN A SEPARATE SAMPLE EXHAUST LINE TO AMBIENT AIR.

Figure 4-6: Filter Drain & Exhaust Tubing Recommendations

NOTE: IF SUFFICIENT PRESSURE EXISTS IN THE INPUT LINE, LEAVING THE FILTER DRAIN VALVE 'CRACKED' OPEN WILL ALLOW SAMPLE GAS TO FLOW FROM THE PICKUP POINT TO THE GDS-78XP ON A CONTINUOUS BASIS, ENSURING THAT FRESH SAMPLE IS ALWAYS AVAILABLE AT THE SENSOR.

SAMPLE EXHAUST

Changes in ambient pressure will affect the output from all electrochemical sensors, and allowing the sample to exhaust directly to atmosphere will minimize these affects. Long runs of tubing connected to the sample outlet may increase the backpressure inside the sensor flow cell and cause higher than normal readings. Hydrogen sulfide, for example, is a heavy gas and will tend to 'back up' inside sample exhaust lines that extend vertically for too great a distance.

IMPORTANT: DO NOT RESTRICT SAMPLE EXHAUST OUTLET. PRESSURE IN THE SAMPLE FLOW CELL MAY DAMAGE THE SENSOR AND WILL RESULT IN INCORRECT READINGS.

IMPORTANT: WHEN INSTALLING THE GDS-78XP OUTDOORS, MAKE SURE SAMPLE EXHAUST IS PROTECTED BY A SCREEN OR FILTER TO KEEP INSECTS FROM ENTERING THE EXHAUST PORT AND NESTING IN THE SENSOR FLOW CELL.

DANGER: MAKE SURE EXHAUST GAS IS DIRECTED AWAY FROM PERSONNEL AND EQUIPMENT, ESPECIALLY SUMPS OR LOW-LYING AREAS WHERE HEAVY GASES, SUCH AS HYDROGEN SULFIDE, CAN BUILD UP OVER TIME. **HYDROGEN SULFIDE OR OTHER TOXIC GASES ARE DEADLY AND EXPOSURE CAN RESULT IN INJURY OR DEATH.**

INSTALLATION SUMMARY: DO'S AND DON'TS

- Select an installation location that protects the unit from shock, vibration and damage
- Always mount the GDS-78XP vertically to ensure proper operation of the low flow switch
- Make sure the power wiring is appropriate for the DC load and distance
- Keep DC signal wiring and AC heater wiring separate
- Make sure sample conditioning is appropriate to the quality of the sample
- Observe maximum inlet length recommendations
- Always provide an independent sample exhaust line
- Make sure that exhaust gas is directed away from personnel and vented to a safe area where exhaust gas can dissipate
- If mounting the unit outdoors, protect all exposed vents or intakes with screens or filters to keep insects, moisture or dirt from entering the device.

5 SETUP & OPERATION

FLOW SETUP

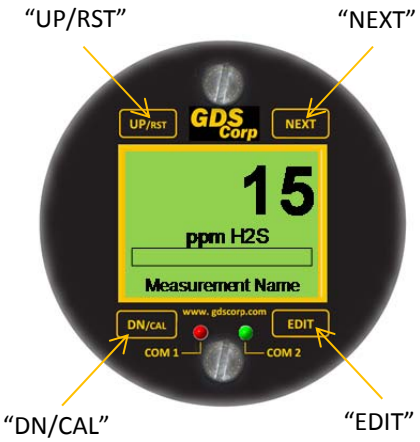
Once hardware installation is completed, apply power to the GDS-78XP and verify that the GASMAX display is operational. Open the inlet valve and adjust the flow meter for approximately ½ scale, or about 0.5 liters per minute. If the flow meter does not indicate proper flow, check the inlet tubing for restrictions or blockage. If full scale flow cannot be obtained, check the sample outlet tubing for blockage. See Table 1 for recommended flow meter settings for gases of different density.

To check the Low Flow switch (if installed), set the Run / Cal valve to the CAL position. After ten seconds the display should flash RED and the message “FAULT” should appear.

GASMAX CX DISPLAY

There are four magnetic switches on the face of the GASMAX CX, arranged in a quadrant around the LCD display. Starting in the upper left and proceeding clockwise these are labeled UP, NEXT, EDIT and DN/CAL. To activate, or “press” a magnetic switch, swipe the magnet near the switch. For the balance of this manual, the term “press” will be used to describe activation of any key via the magnetic wand.

Below the LCD display, two LEDs monitor the MODBUS RS-485 or Ethernet network interface. Flashing indicates sent or received data.



Pressing the **NEXT** key momentarily causes the GDS-78XP display to sequence display and trend screens. The Display Screen (shown) shows the calibrated engineering units, analog bar graph, tag (measurement) name and engineering units (“ppm”). The Trend Screen displays a graph that shows the most recent 30 minutes of data as well as alarm levels.

Pressing the **DOWN/CAL** key, followed by the EDIT key, initiates Calibration Mode. For a detailed description of calibration, see Chapter 6.

Pressing the **EDIT** key activates the USER MENU mode (See Chapter 9). During USER MENU mode, the UP, DN and NEXT keys are used to select and confirm menu entries. The USER MENU allows the operator to view the Event Log and channel parameters and change system settings such as alarm levels and real time clock day and date.

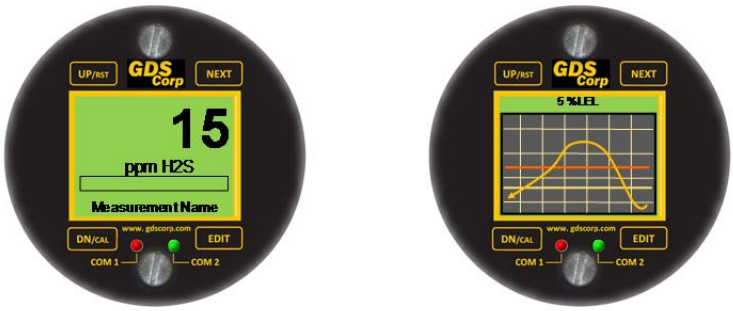


Figure 5-1: GDS-78XP GASMAX Display Sequence: Display Screen & Trend Screen

ALARM SETUP

Using a magnetic wand, select the GASMAX Main Menu by placing the magnet next to the EDIT switch located on the lower right side of the GASMAX II display. Select Channel 1 and then ALARMs to adjust the desired level, polarity, on/off delays and other alarm-related settings.

NOTE: ALARM SETTINGS ONLY AFFECT THE GASMAX LCD DISPLAY COLOR IF LOCAL RELAYS ARE NOT INSTALLED. LOCAL ALARM SETTINGS WILL HAVE NO EFFECT ON ALARM SETTINGS AT ANY REMOTE DEVICE THAT MONITORS THE GDS-78XP 4-20MA OUTPUT.

6 CALIBRATION

Calibration is critically important to ensure correct operation of the GDS-78XP. The built-in CAL MODE function is designed to make calibration quick, easy and error free; a successful ZERO and SPAN calibration requires only four keystrokes. During CAL MODE zero and span, the sensor output is disconnected and the GDS-78XP transmits a fixed mA value, called the CAL MARKER, to notify the receiving device that a calibration is in progress. During the following CAL PURGE DELAY time, the GDS-78XP transmits a fixed 4.0 mA signal to prevent external alarms during calibration. In the case of Oxygen sensors, during CAL PURGE DELAY the output simulates a typical atmospheric reading of 20.8%. CAL MODE automatically exits if no keystrokes are detected after 5 minutes.

Follow these GDS-78XP calibration guidelines:

- Calibration accuracy is only as good as the calibration gas accuracy. GDS Corp calibration gases are traceable to NIST (National Institute of Standards and Technology).
- **Never use calibration gas that has passed its expiration date.**
- Check the SPAN GAS VALUE setting and make sure it matches the calibration gas. (See Fig. 6-2)
- Always use a GDS Corp calibration cup that completely surrounds the sensor head.
- Be sure to use ZERO AIR, a mixture of 21% oxygen and 79% nitrogen, as a zero reference unless you are certain that no target gas exists in the area. Ambient gas may result in an 'elevated zero' condition that will cause a FAULT to occur once the ambient gas is no longer present.
- **Always calibrate a new sensor before depending on the device for personnel or equipment safety**
- Calibrate on a regular schedule. GDS Corp recommends a full calibration every 3 months, with periodic 'bump tests' on a more frequent basis to ensure that the sensor has not been affected by temperature extremes or the presence of incompatible gases.

CALIBRATION PROCEDURE

Before beginning calibration, make sure you have the following items: A cylinder of calibration gas, fixed flow regulator and a length of flexible tubing. A cylinder of 'zero air' may be necessary if the absence of target gas cannot be confirmed in the sample area.

To calibrate a GDS-78XP sample draw:

1. If using Zero Air, set the Run/Cal valve to the CAL position (pointing to the right) and connect the cylinder of zero air to the GDS-78XP calibration port. Turn on the regulator and verify flow on the flow meter. Otherwise, allow the current sample to continue to flow into the GDS-78XP.
2. Press the DOWN / CAL key and within 5 seconds press the EDIT key to enter CAL MODE.

3. The screen will display “APPLY ZERO”. Allow a few seconds for the reading to stabilize and press the EDIT key to complete the ZERO calibration. A “ZERO CAL SUCCESSFUL” message should appear.
4. If not already done, set the Run/Cal value to the CAL position and connect the cylinder of span gas.
5. When the “APPLY SPAN” message appears, turn on the regulator and verify flow on the flow meter. After the reading is stable, (approximately 1-2 minutes) press the EDIT key to complete the SPAN GAS calibration. If the SPAN calibration is successful, the display flashes REMOVE CAL GAS and starts the CAL PURGE delay.
6. Immediately shut off the regulator and set the Run/Cal valve to RUN. At the end of the CAL PURGE delay, the GDS-78XP output is re-enabled and the unit is fully operational.

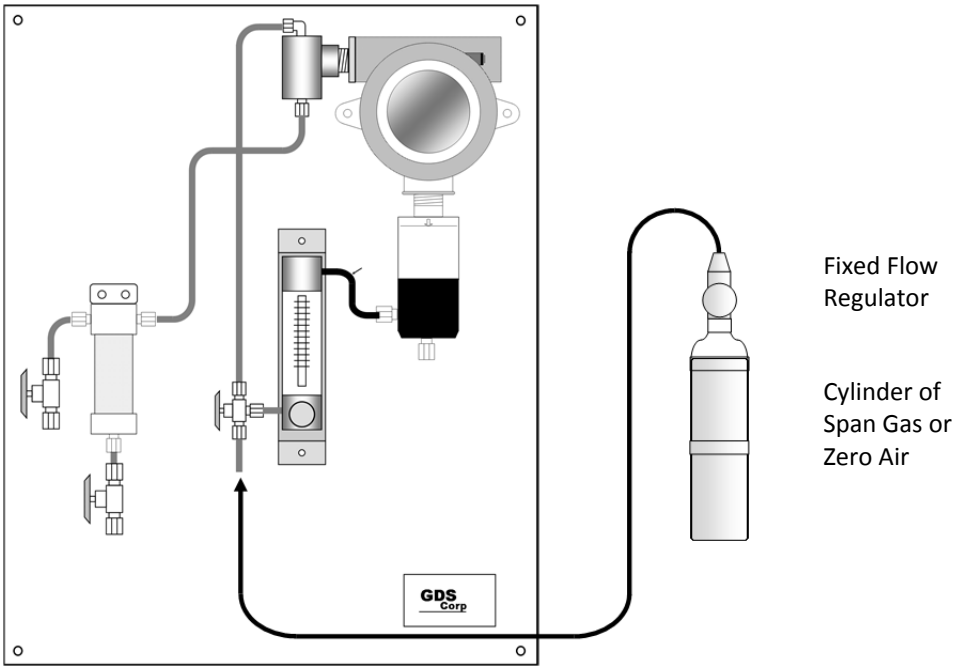


Figure 6-1: GDS-78XP Calibration Setup

7 MAINTENANCE

Once setup is complete, user intervention is not required and the GDS-78XP automatically measures and outputs the gas concentration on a continuous basis.

NORMAL MAINTENANCE

Standard maintenance for the GDS-78XP consists of periodic checks on flow settings and sensor calibration. Each time a toxic sensor is calibrated, a Sensor Life reading will appear that gives an approximate indication of the remaining sensitivity. Sensor Life is not necessarily linear and a rapid reduction in the senor life reading can be due to temperature extremes, high levels of target gas, the presence of certain gases that 'poison' toxic sensors and other environmental factors.

Always check the flow meter for the presence of moisture. In the event that moisture or liquid is drawn in the GDS-78XP, the entire unit should be disassembled and cleaned. In some cases the flow meter or flow switch may need to be replaced. If liquid is drawn into the GDS-78XP, always inspect the sensor for signs of damage.

FAULT AND OVERRANGE CONDITIONS

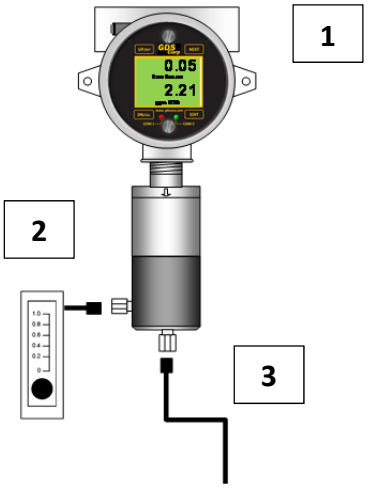
The GASMAX CX gas detector continuously monitors the sensor for fault or overrange conditions. The fault setting is user adjustable and is typically set for -5% to -10% of scale (default). Electrochemical sensors that show fault are defective and should be replaced. Bridge-type sensors, such as catalytic bead or PID sensors allow the zero value to be adjusted and can often be rebalanced to normal operation. However, if this happens regularly then the sensor may be defective or the gas stream may contain one or more compounds that affect the sensor.

In the event of an overrange condition, the 4-20mA output will exceed 20mA and the display will indicate OVERRANGE or FAULT.

SENSOR REPLACEMENT

If a sensor shows FAULT, does not respond to gas or can no longer be calibrated, it should be replaced.

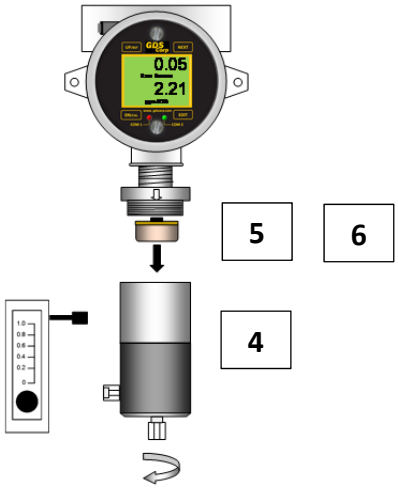
Use type 10-98XX-Ryyyy sensors, where the XX is gas type (Fig. 3-1) and yyyy is range (25 = “0025”).



Step 1: Turn off DC power.

Step 2: Disconnect the sample inlet tube at the sensor flow cell

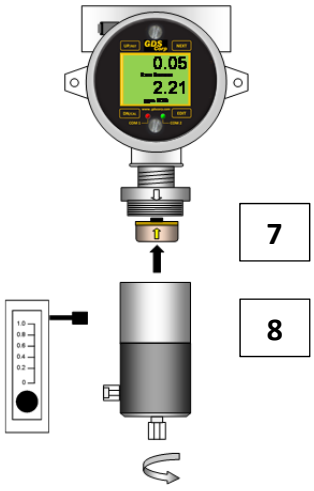
Step 3: Disconnect the sample exhaust tube at the flow cell.



Step 4: Unscrew the sensor flow cell and sensor head cover

Step 5: Pull straight down to remove the existing sensor.

Step 6: Compare the new sensor with the old sensor and verify identical part numbers



Step 7: Install the new sensor by aligning the arrow on the sensor with the arrow on the sensor head and pushing straight up.

Step 8: Reassemble the sensor head cover and flow cell and reattach the sample inlet and outlet tubing.

Step 9: Apply power, allow the sensor to warm up for several hours.

Step 10: Perform a complete calibration.

8 TROUBLESHOOTING GUIDELINES

Fault Indication on Output Channel

- Fault or Overrange on power-up. Certain toxic sensors indicate off-scale low or high at power up and quickly drift towards zero. This is normal behavior.
- Continuous Fault indication. Remove sensor and examine for moisture or discoloration. Replace sensor if wet or discolored. Fault indication generally indicates sensor useful life is exhausted.
- Sensors left unpowered for more than 3 months are subject to accelerated degradation and may demonstrate a permanent loss of sensitivity.
- Value shows -25% of scale – indicates **SENSOR FAULT** from GASMAX monitor.
- Value shows +105% of scale – indicates an **OVERRANGE** condition, where the sample gas caused the sensor to read more than 100% of scale.

Sensor Fails Calibration

- Sensor reading during zero calibration exceeds upper limit of zero – sensor is defective and should be replaced.
- Sensor reading during span calibration too low – sensor may be defective. However, it may be possible to *temporarily* continue operation by increasing PREAMP GAIN.

GDS-78XP and Receiving Device Displayed Values Don't Match

- Check that zero and full scale range values match between GDS-78XP and receiving device (controller). Use DIAGNOSTICS menu to force the OUTPUT channel (Ch2) to 12mA and verify half-scale reading on remote controller.
- Check for high impedance shorts to ground on 4-20mA wiring.
- If 4-20mA output is off-scale low or high and cannot be adjusted using DIAGNOSTICS mode, IO/Power Supply board may be defective and should be replaced.

Controller MODBUS Data Incorrect

- Verify that MODBUS master is requesting data from correct data register (31002).
- Verify that controller MIN and MAX count settings are correct. MIN counts should be "800" which corresponds to 4mA and MAX counts should be "4000" which corresponds to 20 mA.
- Verify that the GDS-78XP MODBUS address matches the address programmed into the controller's channel configuration.

Controller Showing MODBUS COMM ERROR

- Check for incorrect MODBUS polarity (swap "A" and "B" if unsure; no damage will occur).

- Verify that MODBUS master is requesting data from correct MODBUS address.
- Verify that MODBUS master is requesting data from register 31002.
- Verify that there are no other MODBUS slave devices with identical MODBUS address.

GDS-78XP Display Blank

- Verify DC power at IO/Power Supply board, TB2, terminals 1 (+24) and 4 (Gnd).
- Verify ribbon cable connected between IO/Power Supply board and Display Assembly.

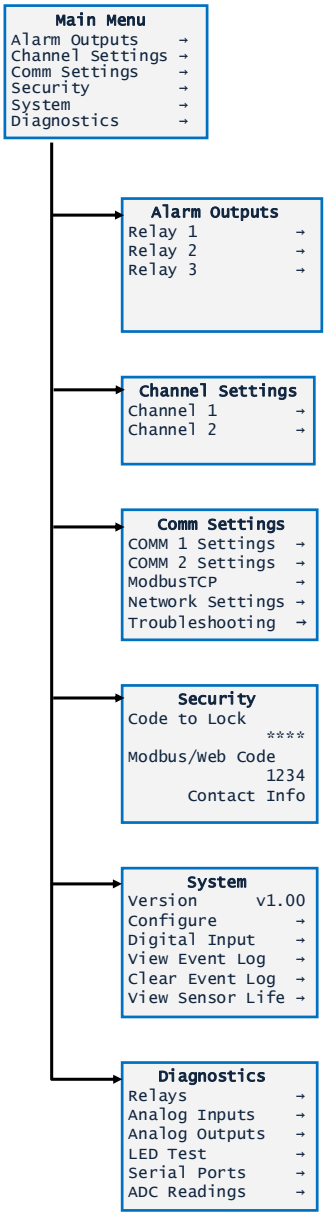
9 SPECIFICATIONS

Model	GDS-78XP Process Monitor for Low Oxygen Applications
Power Input	24VDC ± 5% at < 10 watts
Display	High resolution color LCD with engineering units, bargraph and 30-minute trend
Sensor Types	Electrochemical sensors for toxic gases, infrared sensors for combustibles or CO2
Sample Conditioning	Sample conditioning option #1: 1.0 psig to 50 psig; inlet pressure must remain constant with ±10% of nominal value; 0.1 micron coalescing filter with high quality glass flow meter Sample conditioning option #2: 10 psig to 3000 psig; stainless steel filter with 0.1 micron coalescing element and high pressure regulator. Sample conditioning option #3: 10 to 1500 psig; stainless steel combination coalescing and membrane filter with 0.1 micron coalescing element and high pressure regulator.
Accuracy	+/- 5% of full scale (typical)
Standard Output	Three-wire 4-20mA current source outputs with fault and overrange indication. Maximum loop resistance is 750 ohms with standard 24VDC supply. Ethernet RJ-45 with built-in MODBUS/TCP interface and web server Optional Relay / MODBUS interface with 3x 5A SPDT programmable alarm relays.
Temperature (operating)	0°C to +50°C standard (no enclosure) -20°C to +50°C with NEMA 4X enclosure and optional 200W AC heater. Heater thermostat is set to 50°F and is not user-adjustable.
Temperature (inert)	-20°C to +55°C In cold weather, GDS Corp recommends turning on the AC heater (if installed) for several hours before applying DC power
Memory	On-board non-volatile memory retains all user settings
Materials	Instrument housings: Aluminum Tubing & fittings 316 stainless steel
Dimensions	Painted steel plate: 12.8” x 14.8” x 8”, NEMA 4x non-metallic enclosure, 24” x 24” x 8”
Approvals	GASMAX CX Gas Monitor CSA Certified Class I, Div 1 & 2 Groups B, C, D. Sequencer enclosure CSA certified for use in Class I Div 1 areas. Flame arrestors UL certified for use in Class 1 Div 1 areas.
Warranty	Two years on electronics

10 USER MENUS

The GASMAX CX gas monitor used in the GDS-78XP has a menu-driven user interface that allows the operator to review and adjust a wide range of settings. In the GDS-78XP, channel 1 of the GASMAX CX measures the "raw sensor" gas level and channel 2 provides continuous display, output and alarming on the stored value retained in the sequencer memory.

To access the Main Menu, activate the EDIT key with a magnetic wand.



Alarm Output Menu – contains settings that control the four optional alarm relays (if installed). These setting include relay programming, on and off delay, failsafe mode and specific input override.

Channel Settings Menu – contains settings specific to each channel. These include tag names, range, calibration settings and alarm levels.

Comm Settings Menu – contains settings specific to the Ethernet network interface, MODBUS/TCP interface and optional RS-485 serial ports (if installed).

Security Settings Menu – allows the user to restrict operation for some or all of the features as well as provide a programmed contact name.

System Settings Menu – contains settings that are unit specific. These include unit name. time and date, warm-up and calibration delay settings, and Event Log.

Diagnostics Menu – comprehensive set of tools that can be used to activate relays, simulate output values and test serial ports.

Figure 10-1: Main Menu Tree

Alarm OUTPUTS Menu

The Alarm Outputs Menu controls the four optional alarm relays (if installed). These setting include relay programming, acknowledge, failsafe mode and specific input override options.

NOTE: The Alarm / Modbus board containing the 3x alarm relays and 1x fault relay is optional on the GDS-78XP.

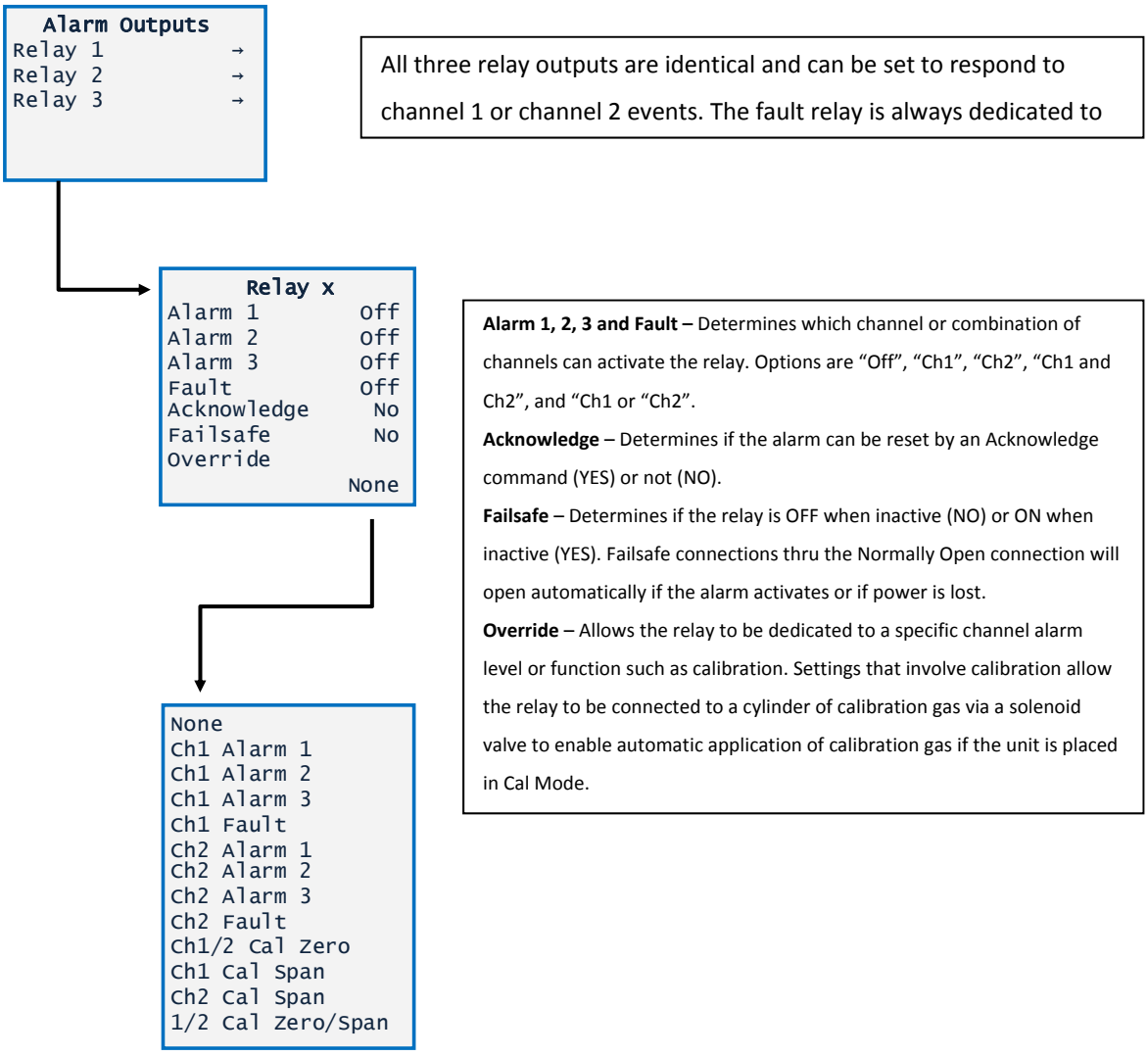
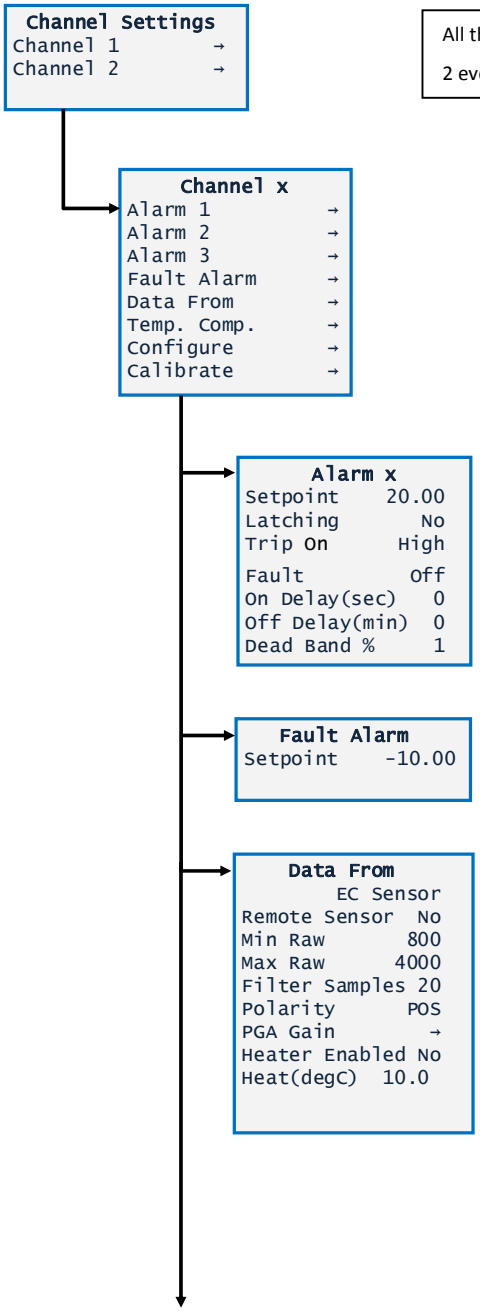


Figure 10-2: Alarm Outputs Menu Tree

Channel Settings Menu

The Channel Settings Menu allows the user to adjust individual channel or sensor-specific features. Data in the Channel Settings Menu is uploaded from Smart Sensors, and written back to any local Smart Sensor if changed in the menu.



All three relay outputs are identical and can be set to respond to channel 1 or channel 2 events. The fault relay is always dedicated to fault events.

Both channel setup menus are identical so only one is shown.

Alarm X menu (all three alarm setting menus are identical)

Set Point is the engineering unit value where the alarm trips. It may be negative or positive.

Latching YES causes the alarm to remain active even after the event clears. NO clears the alarm automatically.

Trip On HIGH causes the alarm to activate if the value goes above the setpoint. Trip On LOW activates the alarm if the value goes below the setpoint.

On / Off Delay adjusts the time delay between the time when the event occurs and when the alarm is activated.

Deadband prevents alarm cycling when the value is close to the alarm level.

Fault Alarm setpoint is typically set at -10% of full scale.

Data From Menu

Data From determines the source of the data for this channel.

Min Raw / Max Raw – Set the range of the input A/D converter. Normally set to 800 (min) and 4000 (max). Useful if a sensor's output does not provide a full range signal.

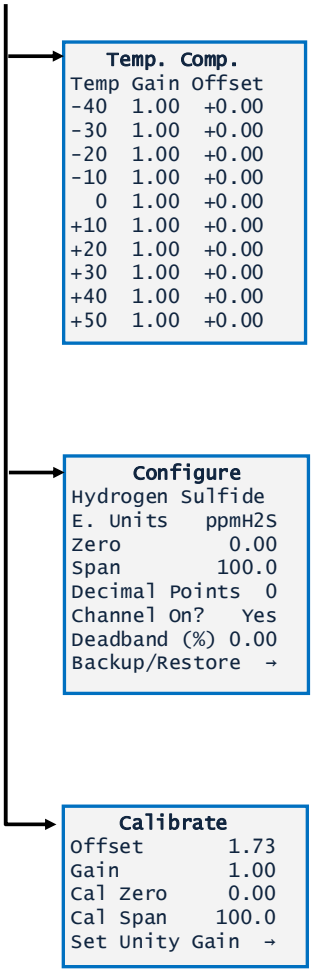
Filter Samples – Number of samples used by the smoothing filter.

PGA Gain – sets the analog amplification level in the smart sensor interface circuit. **WARNING: Changing PGA gain resets calibration data.**

Heater Enabled – Determines if the internal sensor heater is ON or OFF.

Heat(degC) – Heater thermostat setting.

Figure 10-3: Channel Settings Menu Tree (1)



Temperature Compensation compensates for changes in sensor output (gain) and zero value (offset) as sensor temperature changes. Individual values for gain and offset can be entered for eleven points ranging from minus 40C to +60C. Gain and offset values are linearly interpolated between points by the internal microprocessor.

NOTE: These values are typically set by the sensor manufacturer and should not be changed.

Configure Menu

Measurement Name – User-programmable character string to describe the channel. Otherwise called "tag name".

E. Units – User-programmable character string that describes the engineering units value.

Zero – Channel zero value, typically "0".

Span– Channel full scale value. Max value is "9999".

Decimal Points – Determines the number of displayed digits to the right of the decimal point.

Channel On? – Channel ON or OFF setting. An "OFF" channel will have no effect on any alarm or output value.

Deadband (%) – The value, around zero, for which the screen will show "0.0". Eliminates display of small values around zero due to sensor drift.

Calibrate Menu

Offset – Shows the computed offset value based on the latest calibration.

Gain – Shows the computed gain value based on the latest calibration.

Cal Zero – The value for the zero point calibration

Cal Span – The value for span calibration, typically 50% of full scale.

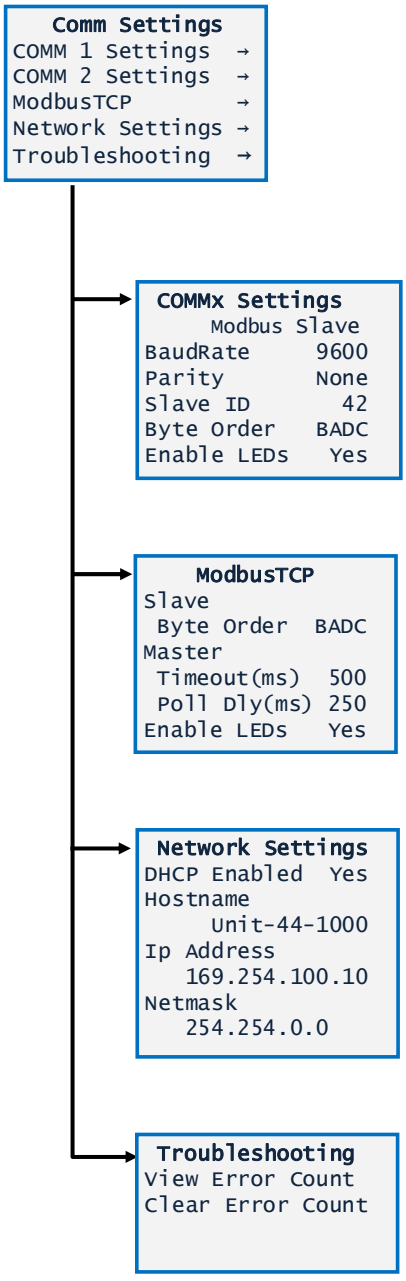
Set Unity Gain – Clears gain and offset to "1.00" and "0.00" respectively.

WARNING: Set Unity Gain resets calibration data.

Figure 10-4: Channel Settings Menu Tree (2)

Comm Settings Menu

The Comm Settings Menu allows the user to configure the Ethernet interface, MODBUS/TCP slave and two optional RS-485 serial interfaces.



Comm X Menu (both comm port setting menus are identical)

Type ("Modbus Slave") determines whether the MODBUS port is a master or slave.

Baud Rate – Sets the baud rate for the serial port. Options are 9600, 19200, 38400, 57600 and 115200 baud.

Slave ID - Sets the MODBUS slave ID for the serial port.

Byte Order – sets the byte order for words larger than 16 bits.

Enable LEDs – If YES, front panel LEDs indicate MODBUS transmission.

MODBUS TCP Menu

Slave Settings:

Byte Order – sets the byte order for words larger than 16 bits.

Master Settings:

Timeout – Length of time (in mSec) that master will wait for a reply before indicating a comm timeout.

Poll Delay – Length of time (in mSec) between sequential read requests.

Enable LEDs – if YES, front panel LEDs indicate MODBUS / TCP transmission

Network Settings Menu

DHCP Enabled – If YES, uses a remote DHCP server to establish a network address. If NO, uses fixed address.

Hostname – Character string that defines device network name

IP Address – Network address. If DHCP enabled, will show address assigned by DHCP server. If DHCP disabled, is IP address programmed by user.

Net mask – Network mask value. See above.

Gateway – Network gateway value. See above.

Troubleshooting Menu

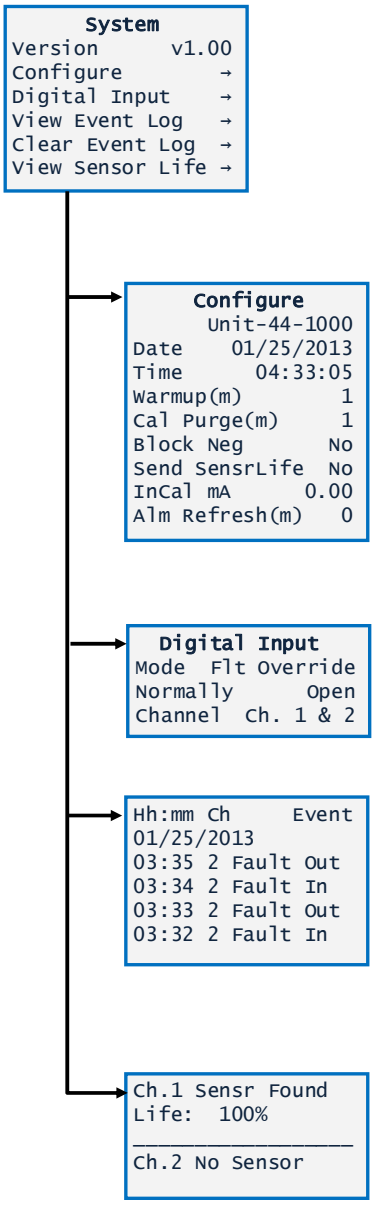
View Error Count – View a menu that tracks the number of network errors

Clear Error Count – Resets number of network errors to zero.

Figure 10-5: Comm Settings Menu

System Settings Menu

The Comm Settings Menu allows the user to configure the Ethernet interface, MODBUS/TCP slave and two optional RS-485 serial interfaces.



Configure Menu

Date & Time – Sets the system date and time. Used for display and event log entries.

Warm Up Delay – Sets length of time (in minutes) from power on to output signals active. During Warmup Delay the 4-20mA outputs are set to 4mA.

Cal Purge Delay - Sets length of time (in minutes) that outputs are disabled following a zero or span calibration

Block Negative – If YES, blocks screen from showing negative values.

Send Sensor Life – If YES, enables transmission of sensor life data across 4-20mA output (see GASMAX CX manual for more details).

InCal mA – Sets the 4-20mA output value to be transmitted during a calibration sequencer. Enables remote devices to track "In Cal" status.

Alarm Refresh – See GASMAX CX manual.

Digital Input Menu

Mode – Determines action if digital input (fault ack input) is activated.

Normally – If Normally OPEN the action will occur if the contacts close; if normally CLOSED the event will occur if the contacts open.

Channel – Determines which channel output is affected.

Event Log

Event Log Format – The event log includes the date, time and list of events that occur. Events include cold boot, system boot, alarm reset, remote alarm reset, log cleared, config edit, A1, A2 and A3 in and out, fault in and out, calibration in and out, calibration fail, communications error, config error and marker event.

Clear Event Log – Clears all entries in the event log.

View Sensor Life Menu

Life – Computed value based on initial stored 'gain' value when sensor was first calibrated. If new gain equals original gain, sensor life = 100%. If new gain equals twice original gain, sensor life = 0%.

Figure 10-6: System Settings Menu Tree

Diagnostics Menu

The Diagnostics page provides tools for use during setup or testing. Tests for optional features are not available if the feature is not installed.

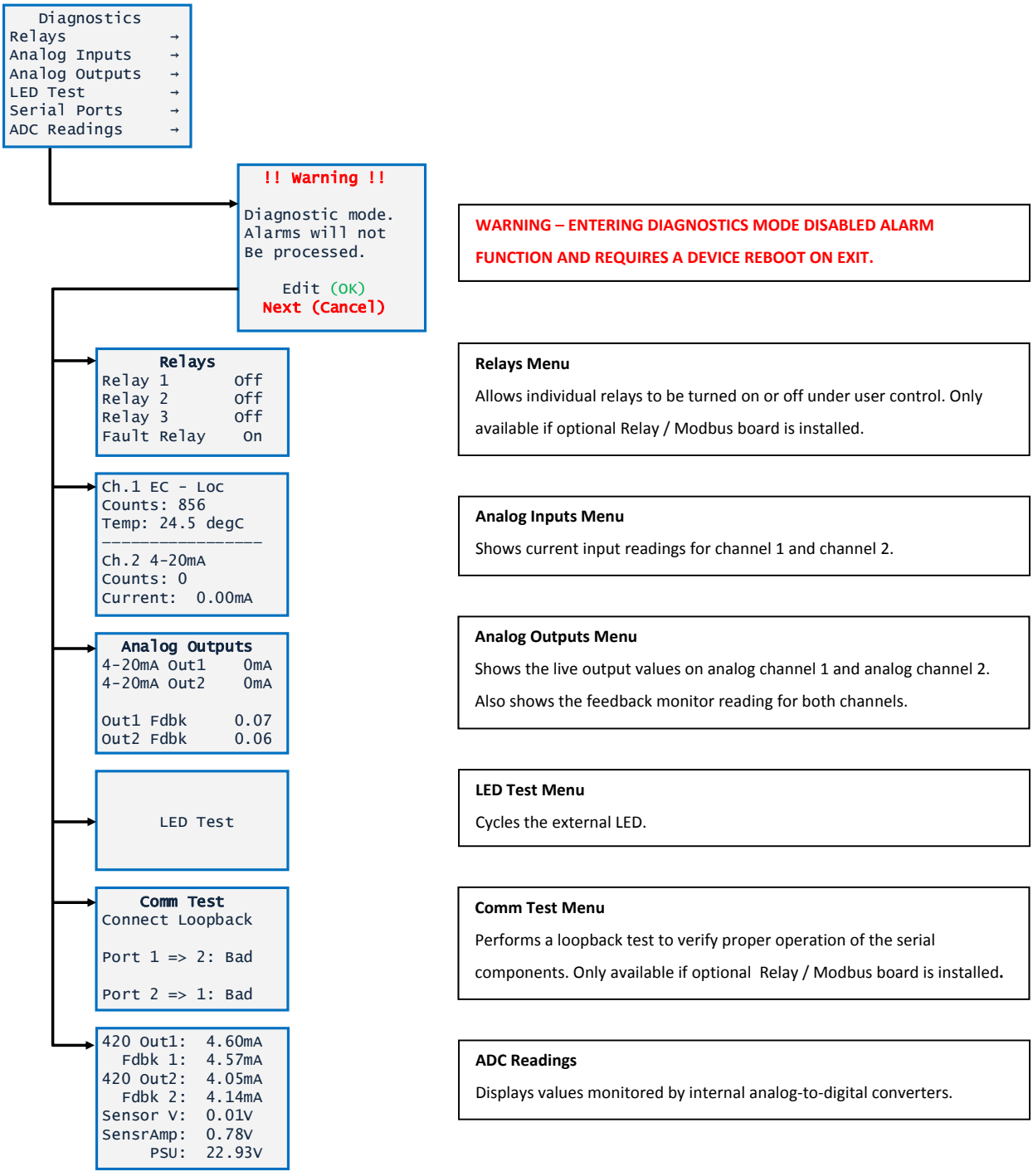


Figure 10-7: Diagnostics Menu Tree

11MODBUS REGISTERS

The GDS-78XP features a full complement of user-accessible MODBUS registers that can provide a complete snapshot of the gas detector configuration. This includes all real-time data, preset zero, span and calibration values and user-programmable text.

Variable Name	Alias	Read	Write	Notes
Ch 1 Analog Output Raw	31001	4	N/A	12 bit value; 800 = 4mA, 4000 = 20mA
Ch 2 Analog Output Raw	31002	4	N/A	12 bit value; 800 = 4mA, 4000 = 20mA
Ch 1 A2D Raw Counts	31003	4	N/A	12 bit value from A/D converter
Ch 2 A2D Raw Counts	31004	4	N/A	12 bit value from A/D converter
Ch 1 Sensor Life	31009	4	N/A	16 bit signed integer ranging from -1 to 100 where -1 indicates Cal Required
Ch 2 Sensor Life	31010	4	N/A	16 bit signed integer ranging from -1 to 100 where -1 indicates Cal Required
Ch 1 Sensor Temp	31011	4	N/A	16 bit integer from 1 to 4095 scaled for -55°C to +125°C
Ch 2 Sensor Temp	31012	4	N/A	16 bit integer from 1 to 4095 scaled for -55°C to +125°C
Ch 1 4-20mA Out FP	31210	4	N/A	32 bit floating point
Ch 2 4-20mA Out FP	31212	4	N/A	32 bit floating point
Ch 1 Output Feedback FP	31214	4	N/A	32 bit floating point
Ch 2 Output Feedback FP	31216	4	N/A	32 bit floating point
12V Input FP	31218	4	N/A	32 bit floating point
Sensor Volts FP	31220	4	N/A	32 bit floating point
Bridge Amp FP	31222	4	N/A	32 bit floating point
Bridge Out FP	31224	4	N/A	32 bit floating point
Product ID	32001	4	N/A	Factory use only
Version	32002	4	N/A	Factory use only
Custom Feature	32003	4	N/A	Factory use only
Customer ID	32004	4	N/A	Factory use only
Lock Status	32005	4	N/A	
Boot Year	32006	4	N/A	Last power-up time & date
Boot Month	32007	4	N/A	Last power-up time & date
Boot Day	32008	4	N/A	Last power-up time & date
Boot Hour	32009	4	N/A	Last power-up time & date
Boot Minute	32010	4	N/A	Last power-up time & date
Boot Second	32011	4	N/A	Last power-up time & date
SR 1 State	32020	4	N/A	True if relay #1 active
SR 2 State	32021	4	N/A	True if relay #2 active
SR 3 State	32022	4	N/A	True if relay #3 active

FR State	32023	4	N/A	True if fault relay active
Warmup	32025	4	N/A	True if unit in warm-up
SR 1 Flashing	32026	4	N/A	True if relay #1 flashing
SR 2 Flashing	32027	4	N/A	True if relay #2 flashing
SR 3 Flashing	32028	4	N/A	True if relay #3 flashing
FR Flashing	32029	4	N/A	True if fault relay flashing
DI State	32034	4	N/A	Digital input status
Ch 1 Fixed Point	33001	4	N/A	Compatible with GASMAX II
CH 2 Fixed Point	33002	4	N/A	Compatible with GASMAX II
Ch 1 Floating Point	33010	4	N/A	32 bit IEEE 754 float
Ch 1 Value String	33012	4	N/A	6 character string, zero terminated
Ch 1 Temperature Float	33015	4	N/A	Sensor temperature
Ch 1 A1 Status	33017	4	N/A	True if alarm 1 active
Ch 1 A1 Flashing	33018	4	N/A	True if alarm 1 indicator flashing
Ch 1 A2 Status	33019	4	N/A	True if alarm 2 active
Ch 1 A2 Flashing	33020	4	N/A	True if alarm 2 indicator flashing
Ch 1 A3 Status	33021	4	N/A	True if alarm 3 active
Ch 1 A3 Flashing	33022	4	N/A	True if alarm 3 indicator flashing
Ch 1 Fault Status	33023	4	N/A	True if fault active
Ch 1 Comm Error	33024	4	N/A	True if comm error
Ch 1 Config Error	33025	4	N/A	True if config error
Ch 1 I/O Error	33026	4	N/A	True if input/output error
Ch 1 Cal Flag	33027	4	N/A	True if calibration in progress
Ch 1 Marker Flag	33028	4	N/A	True if marker active
Ch 1 Linearize	33029	4	N/A	True if linearization table active
Ch 1 Err Flashing	33030	4	N/A	True if channel error
Ch 2 Floating Point	33040	4	N/A	32 bit IEEE 754 float
Ch 2 Value String	33042	4	N/A	6 character string, zero terminated
Ch 2 Temp Float	33045	4	N/A	Sensor temperature
Ch 2 A1 Status	33047	4	N/A	True if alarm 1 active
Ch 2 A1 Flashing	33048	4	N/A	True if alarm 1 indicator flashing
Ch 2 A2 Status	33049	4	N/A	True if alarm 2 active
Ch 2 A2 Flashing	33050	4	N/A	True if alarm 2 indicator flashing
Ch 2 A3 Status	33051	4	N/A	True if alarm 3 active
Ch 2 A3 Flashing	33052	4	N/A	True if alarm 3 indicator flashing
Ch 2 Fault Status	33053	4	N/A	True if fault active
Ch 2 Comm Error	33054	4	N/A	True if comm error
Ch 2 Config Error	33055	4	N/A	True if config error
Ch 2 I/O Error	33056	4	N/A	True if input/output error
Ch 2 Cal Flag	33057	4	N/A	True if calibration in progress

Ch 2 Marker Flag	33058	4	N/A	True if marker active
Ch 2 Linearize	33059	4	N/A	True if linearization table active
Ch 2 Err Flashing	33060	4	N/A	True if channel error
Alarm Reset	40001	N/A	3	Write to acknowledge alarm
System Name	40010	4	N/A	16 character ASCII text
Date Year	40020	3	N/A	Current time & date
Date Month	40021	3	N/A	Current time & date
Date Day	40022	3	N/A	Current time & date
Date Hour	40023	3	N/A	Current time & date
Date Minute	40024	3	N/A	Current time & date
Date Second	40025	3	N/A	Current time & date
Refresh Time	40026	3	N/A	Alarm refresh (minutes)
Warmup Time	40027	3	N/A	Warm up delay (minutes)
Cal Purge Time	40028	3	N/A	Cal purge delay (minutes)
Block Negative Flag	40029	3	N/A	True if prohibit display of neg values
Comm 1 Function	40030	3	N/A	MODBUS serial port #1
Comm 1 Baud Rate	40031	3	N/A	MODBUS serial port #1
Comm 1 Parity	40032	3	N/A	MODBUS serial port #1
Comm 1 Slave ID	40033	3	N/A	MODBUS serial port #1
Comm 1 Timeout	40034	3	N/A	MODBUS serial port #1
Comm 1 Poll Delay	40035	3	N/A	MODBUS serial port #1
Comm 1 Byte Order	40036	3	N/A	MODBUS serial port #1
Comm 1 Wireless T/O	40037	3	N/A	MODBUS serial port #1
Comm 1 LED Enable	40038	3	N/A	MODBUS serial port #1
Comm 2 Function	40040	3	N/A	MODBUS serial port #2
Comm 2 Baud Rate	40041	3	N/A	MODBUS serial port #2
Comm 2 Parity	40042	3	N/A	MODBUS serial port #2
Comm 2 Slave ID	40043	3	N/A	MODBUS serial port #2
Comm 2 Timeout	40044	3	N/A	MODBUS serial port #2
Comm 2 Poll Delay	40045	3	N/A	MODBUS serial port #2
Comm 2 Byte Order	40046	3	N/A	MODBUS serial port #2
Comm 2 Wireless T/O	40047	3	N/A	MODBUS serial port #2
Comm 2 LED Enable	40048	3	N/A	MODBUS serial port #2
DHCP Enabled	40050	3	N/A	Ethernet port; DHCP or fixed address
Host Name	40051	3	N/A	Ethernet port: 16 ASCII characters
IP Address	40066	3	N/A	Ethernet port: xxx.xxx.xxx.xxx
Net Mask	40070	3	N/A	Ethernet port: xxx.xxx.xxx.xxx
Gateway IP	40074	3	N/A	Ethernet port: xxx.xxx.xxx.xxx
Modbus TCP Byte Order	40080	3	N/A	MODBUS/TCP function

Modbus TCP Timeout	40081	3	N/A	MODBUS/TCP timeout (mSec)
Modbus TCP Poll Delay	40082	3	N/A	MODBUS/TCP poll delay (mSec)
Save Config	40095	N/A	3	Write command to save local config
Config Changed	40096	3	N/A	True if config changed since last read
Security Unlock	40099	3	N/A	TBD
Relay 1 A1 Votes	40101	3	N/A	Alarm relay #1 configuration
Relay 1 A2 Votes	40102	3	N/A	Alarm relay #1 configuration
Relay 1 A3 Votes	40103	3	N/A	Alarm relay #1 configuration
Relay 1 Fault Votes	40104	3	N/A	Alarm relay #1 configuration
Relay 1 Override	40105	3	N/A	Alarm relay #1 configuration
Relay 1 Ack	40107	3	N/A	Alarm relay #1 configuration
Relay 1 Failsafe	40108	3	N/A	Alarm relay #1 configuration
Relay 2 A1 Votes	40111	3	N/A	Alarm relay #2 configuration
Relay 2 A2 Votes	40112	3	N/A	Alarm relay #2 configuration
Relay 2 A3 Votes	40113	3	N/A	Alarm relay #2 configuration
Relay 2 Fault Votes	40114	3	N/A	Alarm relay #2 configuration
Relay 2 Override	40115	3	N/A	Alarm relay #2 configuration
Relay 2 Ack	40117	3	N/A	Alarm relay #2 configuration
Relay 2 Failsafe	40118	3	N/A	Alarm relay #2 configuration
Relay 3 A1 Votes	40121	3	N/A	Alarm relay #3 configuration
Relay 3 A2 Votes	40122	3	N/A	Alarm relay #3 configuration
Relay 3 A3 Votes	40123	3	N/A	Alarm relay #3 configuration
Relay 3 Fault Votes	40124	3	N/A	Alarm relay #3 configuration
Relay 3 Override	40125	3	N/A	Alarm relay #3 configuration
Relay 3 Ack	40127	3	N/A	Alarm relay #3 configuration
Relay 3 Failsafe	40128	3	N/A	Alarm relay #3 configuration
Force Sensor Upload	40141	3	N/A	Binary
Digital Input Mode	40150	3	N/A	Alarm ack or flow switch input
Digital Input Type	40151	3	N/A	Alarm ack or flow switch input
Digital Input Mode	40152	3	N/A	Alarm ACK or flow switch input
Send Sensor Life	40153	3	N/A	True if transmit sensor life value
Contact Info String	40160	3	N/A	16 ASCII characters (2 per register)
Ch 1 Measurement Name	40401	3	N/A	16 ASCII characters (2 per register)
Ch 2 Measurement Name	40409	3	N/A	16 ASCII characters (2 per register)
Ch 1 EUNITS	40423	3	N/A	10 ASCII characters (2 per register)
Ch 2 EUNITS	40428	3	N/A	10 ASCII characters (2 per register)
Ch 1 Preamp gain	40433	3	N/A	Contact factory
Ch 2 Preamp gain	40434	3	N/A	Contact factory

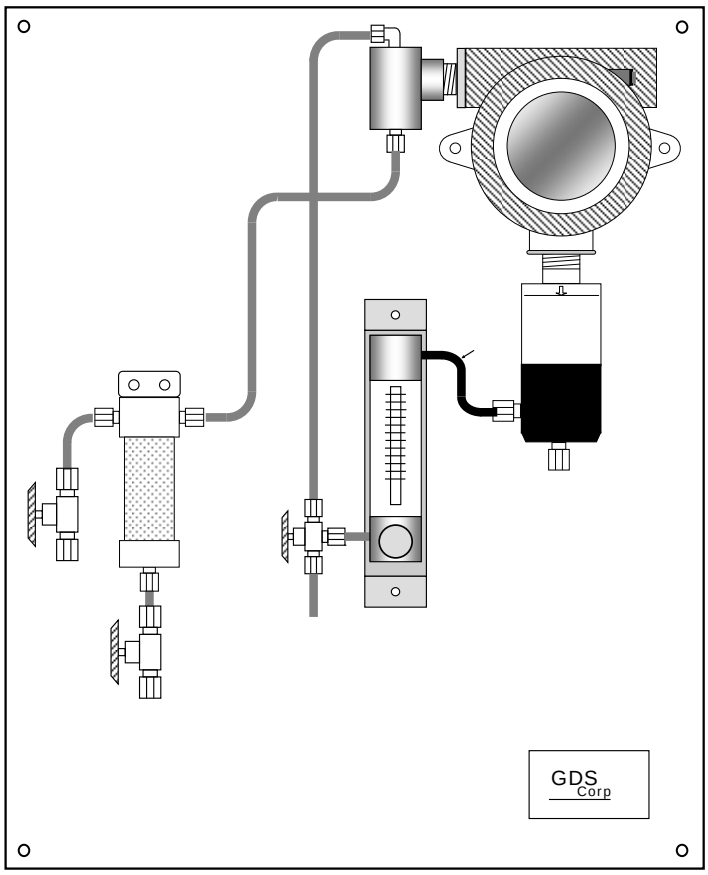
Ch 1 Cal Zero	42001	3	N/A	Modbus 32 bit IEEE 754 Floating Pt
Ch 1 Cal Span	42003	3	N/A	Modbus 32 bit IEEE 754 Floating Pt
Ch 1 Zero Value	42005	3	N/A	Modbus 32 bit IEEE 754 Floating Pt
Ch 1 Span Value	42007	3	N/A	Modbus 32 bit IEEE 754 Floating Pt
Ch 1 Fault Value	42009	3	N/A	Modbus 32 bit IEEE 754 Floating Pt
Ch 1 Alarm 1 Setpoint	42011	3	N/A	Modbus 32 bit IEEE 754 Floating Pt
Ch 1 Alarm 2 Setpoint	42013	3	N/A	Modbus 32 bit IEEE 754 Floating Pt
Ch 1 Alarm 3 Setpoint	42015	3	N/A	Modbus 32 bit IEEE 754 Floating Pt
Ch 1 Manual Gain	42017	3	N/A	Modbus 32 bit IEEE 754 Floating Pt
Ch 1 Manual Offset	42019	3	N/A	Modbus 32 bit IEEE 754 Floating Pt
Ch 2 Cal Zero Value	42021	3	N/A	Modbus 32 bit IEEE 754 Floating Pt
Ch 2 Cal Span Value	42023	3	N/A	Modbus 32 bit IEEE 754 Floating Pt
Ch 2 Zero Value	42025	3	N/A	Modbus 32 bit IEEE 754 Floating Pt
Ch 2 Span Value	42027	3	N/A	Modbus 32 bit IEEE 754 Floating Pt
Ch 2 Fault Value	42029	3	N/A	Modbus 32 bit IEEE 754 Floating Pt
Ch 2 Alarm 1 Setpoint	42031	3	N/A	Modbus 32 bit IEEE 754 Floating Pt
Ch 2 Alarm 2 Setpoint	42033	3	N/A	Modbus 32 bit IEEE 754 Floating Pt
Ch 2 Alarm 3 Setpoint	42035	3	N/A	Modbus 32 bit IEEE 754 Floating Pt
Ch 2 Manual Gain	42037	3	N/A	Modbus 32 bit IEEE 754 Floating Pt
Ch 2 Manual Offset	42039	3	N/A	Modbus 32 bit IEEE 754 Floating Pt
Ch 1 Alarm 1 Latch	43001	3	N/A	False = NO, True = YES
Ch 1 Alarm 1 Trip	43002	3	N/A	False = HIGH, True = LOW
Ch 1 Alarm 1 On Delay	43003	3	N/A	Activation delay in seconds
Ch 1 Alarm 1 Off Delay	43004	3	N/A	Deactivation delay in minutes
Ch 1 Alarm 1 Hysteresis	43005	3	N/A	Percent of scale
Ch 1 Alarm 2 Latch	43011	3	N/A	False = NO, True = YES
Ch 1 Alarm 2 Trip	43012	3	N/A	False = HIGH, True = LOW
Ch 1 Alarm 2 On Delay	43013	3	N/A	Activation delay in seconds
Ch 1 Alarm 2 Off Delay	43014	3	N/A	Deactivation delay in minutes
Ch 1 Alarm 2 Hysteresis	43015	3	N/A	Percent of scale
Ch 1 Alarm 2 Color	43016	3	N/A	TBD
Ch 1 Alarm 3 Latch	43021	3	N/A	False = NO, True = YES
Ch 1 Alarm 3 Trip	43022	3	N/A	False = HIGH, True = LOW
Ch 1 Alarm 3 On Delay	43023	3	N/A	Activation delay in seconds
Ch 1 Alarm 3 Off Delay	43024	3	N/A	Deactivation delay in minutes
Ch 1 Alarm 3 Hysteresis	43025	3	N/A	Percent of scale
Ch 1 Alarm 3 Color	43026	3	N/A	TBD
Ch 1 Alarm 3 Enabled	43027	3	N/A	False = NO, True = YES
Ch 1 Data From	43031	3	N/A	Selection
Ch 1 Min Raw	43032	3	N/A	Binary (800)

Ch 1 Max Raw	43033	3	N/A	Binary (4000)
Ch 1 Remote ID	43034	3	N/A	Binary
Ch 1 Interface	43035	3	N/A	Binary
Ch 1 Byte Order	43036	3	N/A	Byte order
Ch 1 Alias	43037	3	N/A	Binary, 32 bit, 2x
Ch 1 IP Address	43039	3	N/A	Binary, 4x unsigned bytes
Ch 1 Port	43041	3	N/A	Binary, 32 bit, 2x
Ch 1 Remote Sensor	43043	3	N/A	Binary
Ch 1 DP	43079	3	N/A	Number of decimal points
Ch 1 Enable	43080	3	N/A	False = NO, True = YES
Ch 1 Deadband	43081	3	N/A	Modbus 32 bit IEEE 754 Floating Pt
Ch 1 Marker Enable	43083	3	N/A	False = NO, True = YES
Ch 1 Marker Percent	43084	3	N/A	Modbus 32 bit IEEE 754 Floating Pt
Ch 1 Marker Info	43086	3	N/A	6 ASCII characters
Ch 1 Marker Life	43089	3	N/A	Binary
Ch 1 Filter Count	43090	3	N/A	Binary, 0 to 60
Ch 1 Radio Reg	43091	3	N/A	Binary
Ch 1 Coefficient	43092	3	N/A	Binary
Ch 1 Bridge Voltage	43093	3	N/A	Modbus 32 bit IEEE 754 Floating Pt
Ch 1 Balance	43095	3	N/A	Binary
Ch 1 Heater Enable	43096	3	N/A	False = NO, True = YES
Ch 1 Heater Setpoint	43097	3	N/A	Modbus 32 bit IEEE 754 Floating Pt
Ch 1 Temp Comp -40	43099	3	N/A	32 bit FP Gain, 32 bit FP Offset
Ch 1 Temp Comp -30	43103	3	N/A	32 bit FP Gain, 32 bit FP Offset
Ch 1 Temp Comp -20	43107	3	N/A	32 bit FP Gain, 32 bit FP Offset
Ch 1 Temp Comp -10	43111	3	N/A	32 bit FP Gain, 32 bit FP Offset
Ch 1 Temp Comp 0	43115	3	N/A	32 bit FP Gain, 32 bit FP Offset
Ch 1 Temp Comp +10	43119	3	N/A	32 bit FP Gain, 32 bit FP Offset
Ch 1 Temp Comp +20	43123	3	N/A	32 bit FP Gain, 32 bit FP Offset
Ch 1 Temp Comp +30	43127	3	N/A	32 bit FP Gain, 32 bit FP Offset
Ch 1 Temp Comp +40	43131	3	N/A	32 bit FP Gain, 32 bit FP Offset
Ch 1 Temp Comp +50	43135	3	N/A	32 bit FP Gain, 32 bit FP Offset
Ch 1 Temp Comp +60	43139	3	N/A	32 bit FP Gain, 32 bit FP Offset
Ch 1 Sensor Type	43143	3	N/A	TBD
Ch 1 Send Sensor Life	43144	3	N/A	False = NO, True = YES
Ch 1 Cal mA Setting	43145	3	N/A	Modbus 32 bit IEEE 754 Floating Pt
Ch 1 Local Cal	43147	3	N/A	False = NO, True = YES
Ch 1 AI Range	43148	3	N/A	TBD
Ch 2 Alarm 1 Latch	43201	3	N/A	False = NO, True = YES
Ch 2 Alarm 1 Trip	43202	3	N/A	False = HIGH, True = LOW

Ch 2 Alarm 1 On Delay	43203	3	N/A	Activation delay in seconds
Ch 2 Alarm 1 Off Delay	43204	3	N/A	Deactivation delay in minutes
Ch 2 Alarm 1 Hysteresis	43205	3	N/A	Percent of scale
Ch 2 Alarm 2 Latch	43211	3	N/A	False = NO, True = YES
Ch 2 Alarm 2 Trip	43212	3	N/A	False = HIGH, True = LOW
Ch 2 Alarm 2 On Delay	43213	3	N/A	Activation delay in seconds
Ch 2 Alarm 2 Off Delay	43214	3	N/A	Deactivation delay in minutes
Ch 2 Alarm 2 Hysteresis	43215	3	N/A	Percent of scale
Ch 2 Alarm 2 Color	43216	3	N/A	TBD
Ch 2 Alarm 3 Latch	43221	3	N/A	False = NO, True = YES
Ch 2 Alarm 3 Trip	43222	3	N/A	False = HIGH, True = LOW
Ch 2 Alarm 3 On Delay	43223	3	N/A	Activation delay in seconds
Ch 2 Alarm 3 Off Delay	43224	3	N/A	Deactivation delay in minutes
Ch 2 Alarm 3 Hysteresis	43225	3	N/A	Percent of scale
Ch 2 Alarm 3 Color	43226	3	N/A	TBD
Ch 2 Alarm 3 Enabled	43227	3	N/A	False = NO, True = YES
Ch 2 Data From	43231	3	N/A	Selection
Ch 2 Min Raw	43232	3	N/A	Binary (800)
Ch 2 Max Raw	43233	3	N/A	Binary (4000)
Ch 2 Remote ID	43234	3	N/A	Binary
Ch 2 Interface	43235	3	N/A	Binary
Ch 2 Byte Order	43236	3	N/A	Byte order
Ch 2 Alias	43237	3	N/A	Binary, 32 bit, 2x
Ch 2 IP Address	43239	3	N/A	Binary, 4x unsigned bytes
Ch 2 Port	43241	3	N/A	Binary, 32 bit, 2x
Ch 2 Remote Sensor	43243	3	N/A	Binary
Ch 2 DP	43279	3	N/A	Number of decimal points
Ch 2 Enable	43280	3	N/A	False = NO, True = YES
Ch 2 Deadband	43281	3	N/A	Modbus 32 bit IEEE 754 Floating Pt
Ch 2 Marker Enable	43283	3	N/A	False = NO, True = YES
Ch 2 Marker Percent	43284	3	N/A	Modbus 32 bit IEEE 754 Floating Pt
Ch 2 Marker Info	43286	3	N/A	6 ASCII characters
Ch 2 Marker Life	43289	3	N/A	Binary
Ch 2 Filter Count	43290	3	N/A	Binary, 0 to 60
Ch 2 Radio Reg	43291	3	N/A	Binary
Ch 2 Coefficient	43292	3	N/A	Binary
Ch 2 Bridge Voltage	43293	3	N/A	Modbus 32 bit IEEE 754 Floating Pt
Ch 2 Balance	43295	3	N/A	Binary
Ch 2 Heater Enable	43296	3	N/A	False = NO, True = YES
Ch 2 Heater Setpoint	43297	3	N/A	Modbus 32 bit IEEE 754 Floating Pt

Ch 2 Temp Comp -40	43299	3	N/A	32 bit FP Gain, 32 bit FP Offset
Ch 2 Temp Comp -30	43303	3	N/A	32 bit FP Gain, 32 bit FP Offset
Ch 2 Temp Comp -20	43307	3	N/A	32 bit FP Gain, 32 bit FP Offset
Ch 2 Temp Comp -10	43311	3	N/A	32 bit FP Gain, 32 bit FP Offset
Ch 2 Temp Comp 0	43315	3	N/A	32 bit FP Gain, 32 bit FP Offset
Ch 2 Temp Comp +10	43319	3	N/A	32 bit FP Gain, 32 bit FP Offset
Ch 2 Temp Comp +20	43323	3	N/A	32 bit FP Gain, 32 bit FP Offset
Ch 2 Temp Comp +30	43327	3	N/A	32 bit FP Gain, 32 bit FP Offset
Ch 2 Temp Comp +40	43331	3	N/A	32 bit FP Gain, 32 bit FP Offset
Ch 2 Temp Comp +50	43335	3	N/A	32 bit FP Gain, 32 bit FP Offset
Ch 2 Temp Comp +60	43339	3	N/A	32 bit FP Gain, 32 bit FP Offset
Ch 2 Sensor Type	43343	3	N/A	TBD
Ch 2 Send Sensor Life	43344	3	N/A	False = NO, True = YES
Ch 2 Cal mA Setting	43345	3	N/A	Modbus 32 bit IEEE 754 Floating Pt
Ch 2 Local Cal	43347	3	N/A	False = NO, True = YES
Ch 2 AI Range	43348	3	N/A	TBD
				Registers 45001-45022 added in V1.03
Ch 1 Value	45001	3	N/A	800 = “0”, 4000 = Full Scale
Ch 2 Value	45002	3	N/A	800 = “0”, 4000 = Full Scale
Ch 1 Value	45003/04	3	N/A	MODBUS 32 bit floating point
Ch 2 Value	45005/06	3	N/A	MODBUS 32 bit floating point
Ch 1 Alarm 1 Status	45007	3	N/A	“1” = Fault
Ch 1 Alarm 2 Status	45008	3	N/A	“1” = Fault
Ch 1 Alarm 3 Status	45009	3	N/A	“1” = Fault
Ch 1 Fault Status	45010	3	N/A	“1” = Fault
Ch 2 Alarm 1 Status	45011	3	N/A	“1” = Fault
Ch 2 Alarm 2 Status	45012	3	N/A	“1” = Fault
Ch 2 Alarm 3 Status	45013	3	N/A	“1” = Fault
Ch 2 Fault Status	45014	3	N/A	“1” = Fault
Ch 1 Sensor Life	45015	3	N/A	0-100 binary
Ch 2 Sensor Life	45016	3	N/A	0-100 binary
Ch 1 Sensor Temp	45017	3	N/A	Binary 0 - 4095
Ch2 Sensor Temp	45018	3	N/A	Binary 0 - 4095
Ch 1 Sensor Temp	45019/20	3	N/A	MODBUS 32 bit floating point
Ch 2 Sensor Temp	45021/22	3	N/A	MODBUS 32 bit floating point

12 SPARE PARTS



Display:
10-0387
I/O Board:
10-0390
Optional Relays & MB
10-0388

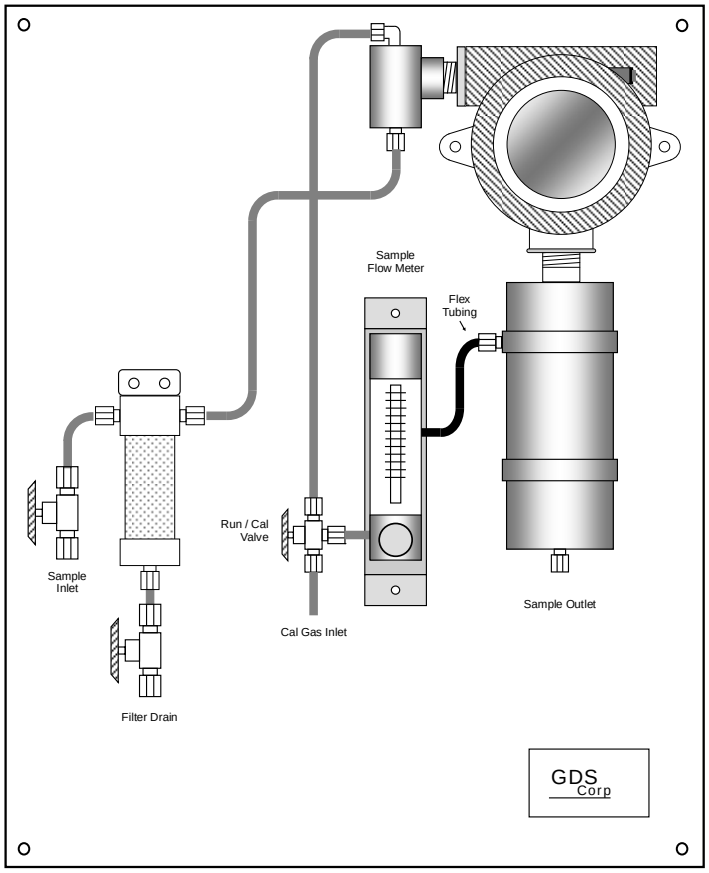
Sensor Head:
10-0247
Sensor:
10-98xx Smart Sensor
Flow Cell:
10-0205

Filter, Pyrex
2000-0139
Filter Element
2000-0140

Run/Cal Valve
1200-0037

Flow Meter
1200-0451
Flow Switch
1200-0224

Figure 12-1: Sample Conditioning Option 1 with Flow Switch (Spare parts)



Display:
10-0387
I/O Board:
10-0390
Optional Relays & MB
10-0388

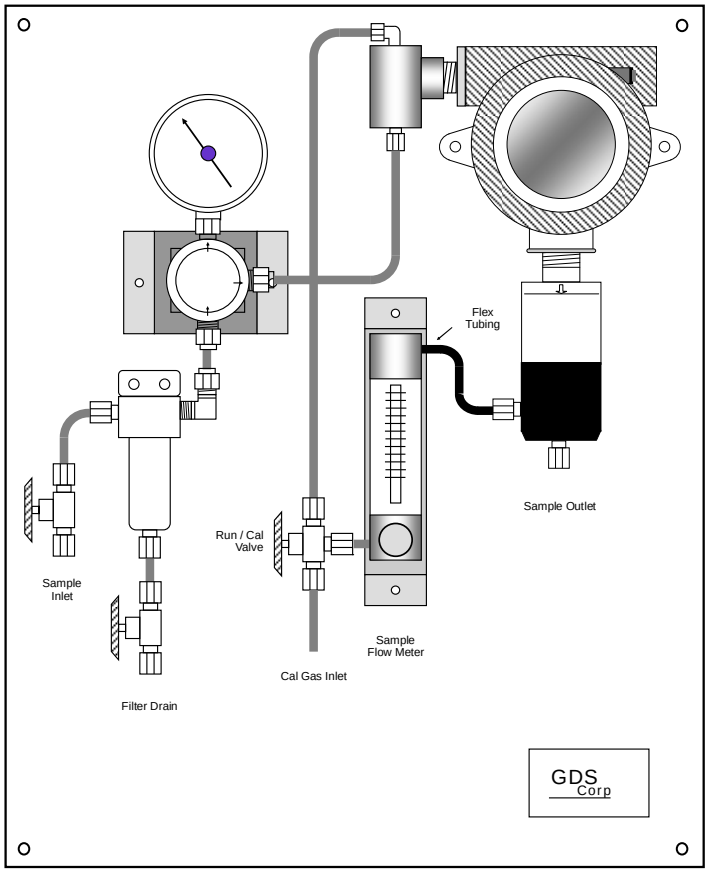
Sensor Head:
N/A
Sensor:
GDS-IR
(specify gas)
Sensor Flow Cell:
10-0271

Filter, Pyrex
2000-0139
Filter Element
2000-0140

Run/Cal Valve
1200-0037

Flow Meter
1200-0451
Flow Switch
1200-0224

Figure 12-2: Sample Conditioning Option 1 with Flow Switch & GDS-IR (Spare parts)



Display:
10-0387
I/O Board:
10-0390
Optional Relays & MB
10-0388

Sensor Head:
10-0247
Sensor:
10-98xx Smart Sensor
Flow Cell:
10-0205

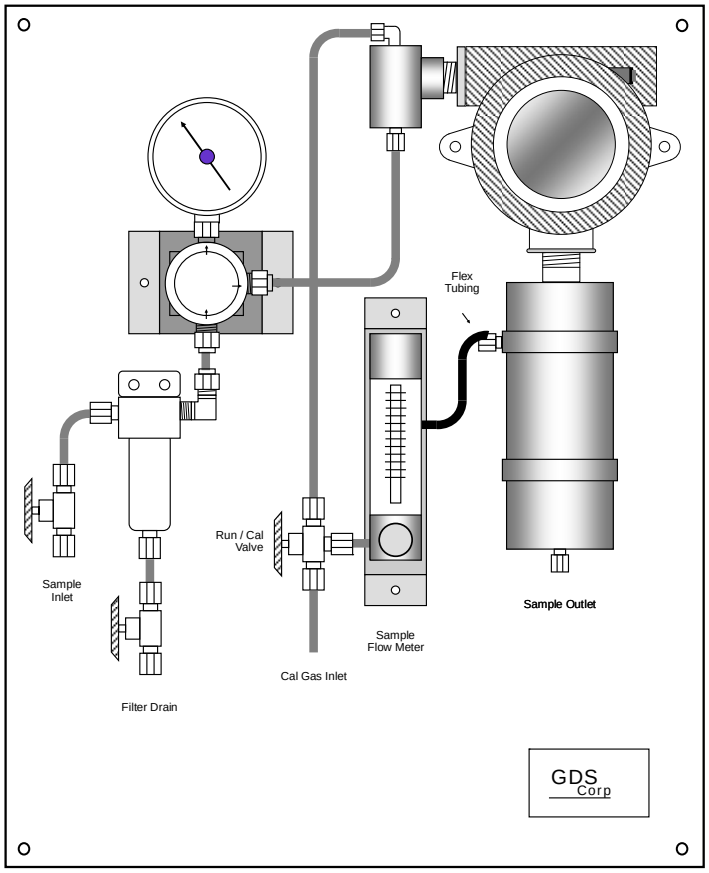
Regulator
1200-0043
Pressure Gauge
1200-0044

Filter, Stainless
2000-0147
Filter Element
2000-0140

Run/Cal Valve
1200-0037

Flow Meter
1200-0451
Flow Switch
1200-0224

Figure 12-3: Sample Conditioning Option 2 with Flow Switch (Spare parts)



Display:

10-0387

I/O Board:

10-0390

Optional Relays & MB

10-0388

Sensor Head:

N/A

Sensor:

GDS-IR

(specify gas)

Sensor Flow Cell:

10-0271

Regulator

1200-0043

Pressure Gauge

1200-0044

Filter, Stainless

2000-0147

Filter Element

2000-0140

Run/Cal Valve

1200-0037

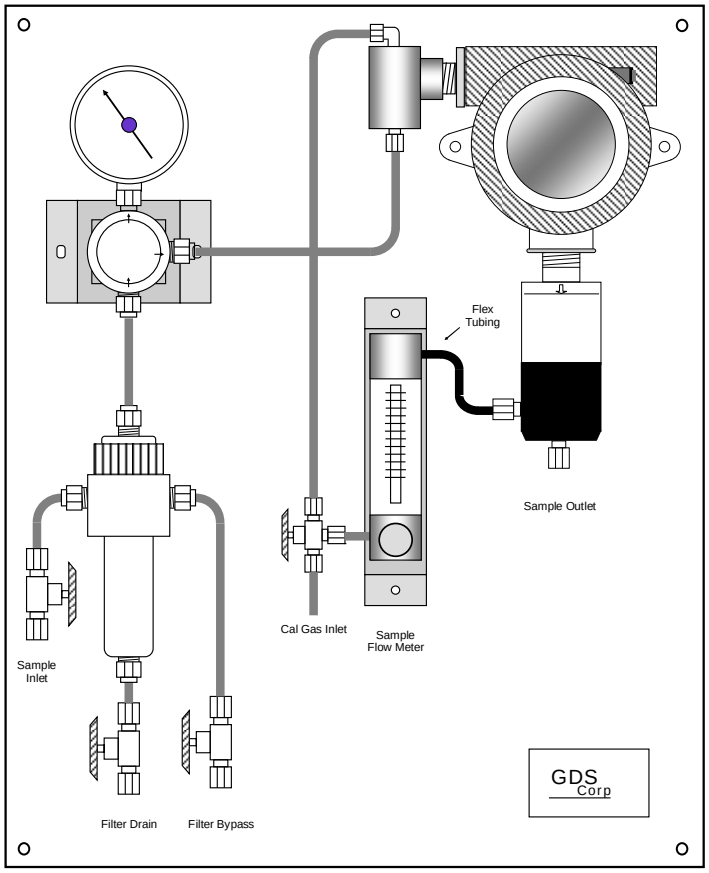
Flow Meter

1200-0451

Flow Switch

1200-0224

Figure 12-4: Sample Conditioning Option 2 with Flow Switch & GDS-IR (Spare parts)



Display:
10-0387
I/O Board:
10-0390
Optional Relays & MB
10-0388

Sensor Head:
10-0247
Sensor:
10-98xx Smart Sensor
Flow Cell:
10-0205

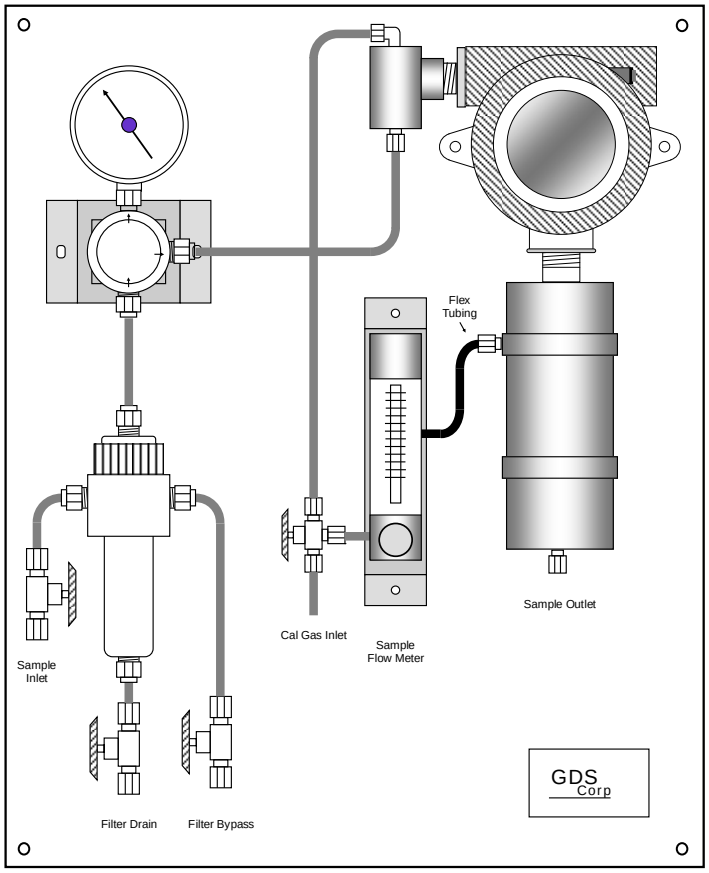
Regulator
1200-0043
Pressure Gauge
1200-0044

Filter, Combination
1200-0167
Filter Element Kit
1200-0169

Run/Cal Valve
1200-0037

Flow Meter
1200-0451

Figure 12-5: Sample Conditioning Option 3 with Flow Switch (Spare parts)



Display:
10-0387
I/O Board:
10-0390
Optional Relays & MB
10-0388

Sensor Head:
N/A
Sensor:
GDS-IR
(specify gas)
Sensor Flow Cell:
10-0271

Regulator
1200-0043
Pressure Gauge
1200-0044

Filter, Combination
1200-0167
Filter Element Kit
1200-0169

Run/Cal Valve
1200-0037

Flow Meter
1200-0451

Figure 12-6: Sample Conditioning Option 3 with Flow Switch & GDS-IR (Spare parts)

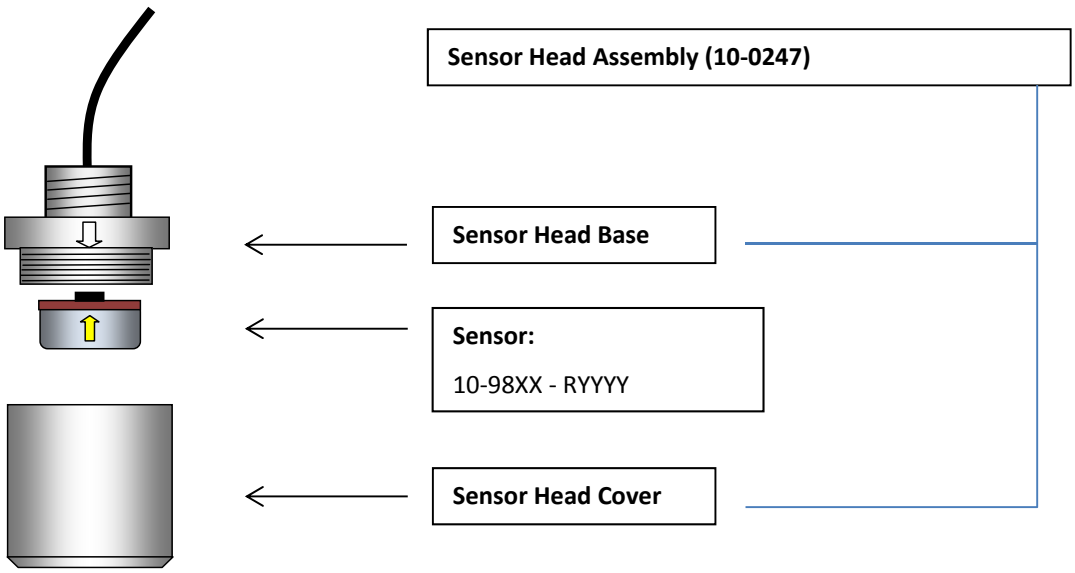


Figure 12-7: GDS-78XP Sensor Head Exploded View

13 DRAWINGS AND DIMENSIONS

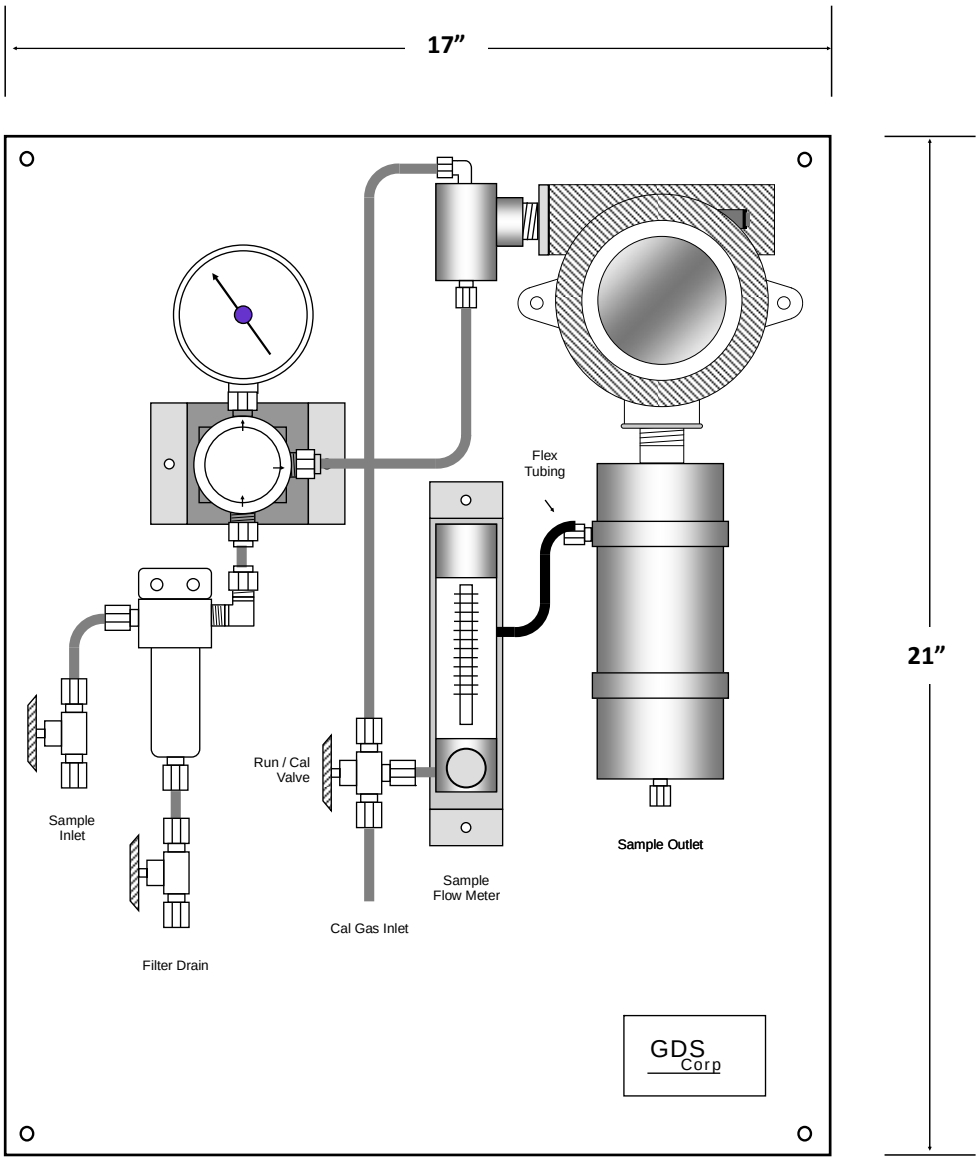


Figure 13-1: GDS-78XP Dimensions (Plate)

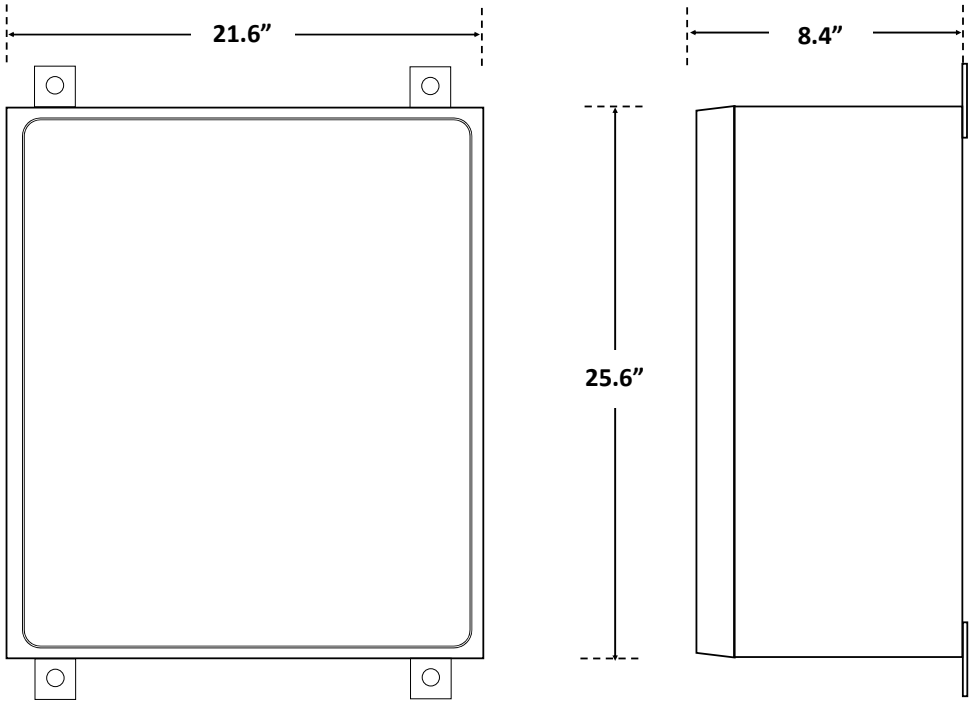


Figure 13-2: GDS-78XP Dimensions (NEMA 4X Stainless Enclosure)