GD-4000
Digital Hazardous Gas Monitor

INSTALLATION & OPERATION MANUAL

07-01-21
Firmware Version: 1.01

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I. INTRODUCTION

The GD-4000 (meter) series of microprocessor based transmitters are used to monitor and transmit a 4-20mA analog signal for gas detection applications. There are multiple set-points for each sensor (channel) which can be individually assigned to the relays present on the instrument.

The Sensors provided can be for a number of different gasses, but Chlorine and Sulfur Dioxide are the most commonly used. The sensors are composed of a 3 electrode electro-chemical cell and transmitter board housed inside a small enclosure. Besides periodic re-calibration, sensors should be maintenance free for their lifetime. It is the responsibility of the end user to replace sensors after their specified lifetime or after they fail to calibrate.

I.a Warnings

CAUTION
Electrical connections should only be undertaken by suitably qualified personnel.

WARNING
POSSIBLE PROCESS UPSETS
All equipment controlled by this product must be secured before any maintenance or repair work. Adjusting or removing this product while it is in the system may upset the process being controlled, possibly causing injury, property damage, or death.

WARNING
ELECTRICAL SHOCK HAZARD
Equipment powered by AC line voltage presents a potential electric shock hazard to the user. Make sure that the system power is disconnected from the system before attempting electrical connections or service. In instances where troubleshooting must be performed under a "power on" condition, make certain that the immediate area is dry and well lighted; the test leads are properly insulated; and all other safety precautions be observed to prevent a potential electrical shock hazard.

CAUTION
Some of the IC devices used in the instrument are static sensitive and may be damaged by improper handling. When servicing the instrument electronics, use of a grounded wrist strap is recommended to avoid accidental damage to the IC chips on the instrument.

CAUTION
Grounding of this instrument should be in accordance with national and local electrical codes. If the instrument is not grounded line voltage may be present on the instrument ground plane which may possibly result in personal injury during maintenance or repair.

Caution
The gas sensor elements are vulnerable to solvent vapors. Exposure to these vapors will poison the sensing element and render the sensor unusable.

II. SPECIFICATIONS

Power Supply	115/230 VAC Switch select-able.
Power Consumption	12W
Display	Back-lit 3.5” color touchscreen.
Interface	As above
Relays	Ten standard. Mechanical (AC or DC), Rating (standard) 250 V ac @ 3A, 32 V dc @ 3A
Mounting sensors	Wall mount, 5/16” for the GD-4000 and 3/32” for the
Sensor(s)	Electrochemical gas sensor with integral 4-20 mA signal board housed in a separate NEMA 4X enclosure.
Sensor Cable ft	15’ standard, longer lengths may be ordered up to 1000
Temperature range	41-113 ºF, 5-45 ºC
Analog Output	Four Isolated, 4 to 20mA, 650 ohm drive. Represents gas concentration in standard configuration.
Digital Output	RS-232/485 serial
Instrument Range:	Standard range is 0-30 ppm, Alarm indicator allows up to 9999 limited by sensor range.
Sensor Location:	As close as possible to the possible gas leak location.
Speed of Response:	Cl_2: T_{80} < 60 sec. @ 20º C / 68º F SO_2: T_{90} < 15 sec. @ 20º C / 68º F **Refer to the full technical specifications at the end of this manual for more information.**
Sensor Limitations:	Sensors are cross-sensitive to a number of gasses. Refer to the full technical specifications for more information.
Electronics Enclosure:	NEMA 4X

Sensor Lifespan:	2 years in air, repeated exposure to target gas can lower sensitivity and reduce practical lifespan.
Optional accessories:	Profibus communications Ethernet/ Wi-Fi connectivity BBU-1000 External battery backup

III. Installation and startup

Before opening the box the equipment was shipped in, inspect it for damage. If damage occurred during shipping file a claim with the carrier.

Packing List:

- GD-4000 instrument (may also be referred to as PS-2000)
- One to Four remote sensor(s) depending on how the instrument was ordered
- One packet of cable glands / strain reliefs and terminal blocks inside the GD-4000 enclosure

Note: Full wiring diagrams and board Legends are at the end of the manual.

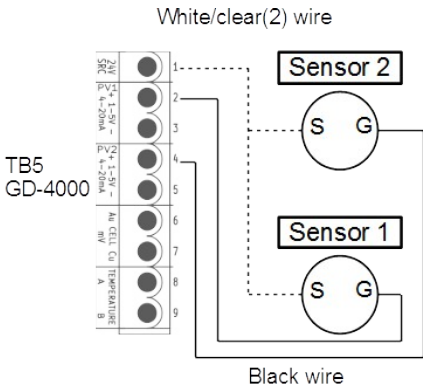
Installation:

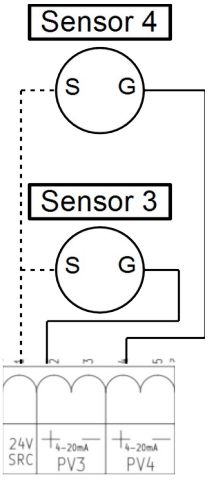
1. Choose locations for indicator and alarm units. Consider the behavior of the target gas. For example, chlorine is heavier than air so it would be suitable to mount a chlorine sensor a foot or two from the ground. The GD-4000 should be mounted around chest or eye level.
2. Bolt the GD-4000 and gas sensor enclosures to the wall through their mounting feet. 5/16" diameter bolts are suitable for the GD-4000 and 3/32" are suitable for the gas sensor enclosures.
3. Wire the cable from the GD-1000 to the sensor (see below).
   Sensor 1 wiring:
   1. Clear/white connects to TB5-1 (24V SRC)
   2. Black connects to TB5-2 (PV1+)

   Sensor 2 wiring:
   3. Clear/white connects to TB5-1 (24V SRC). This is the same as sensor one.
   4. Black connects to TB5-4 (PV2+)

   Sensor 3 Wiring (Daughter card)
   5. Clear/White connects to TB21-1
   6. Black connects to TB21-2 (PV3+)

   Sensor 4 Wiring (Daughter card)
   7. Clear/White connects to TB21-1
   8. Black connects to TB21-4 (PV4+)
4. Select the appropriate supply voltage (115V/230V) by S1 (upper left of the GD-4000 main board).
5. A qualified electrician should wire main power to TB1.
6. The red lights on the sensors should turn on if correctly installed and the unit has power. Remove the calibration nozzles from the sensors and store them.
7. After an initial calibration verification, the unit is operational.





TB21
daughter card

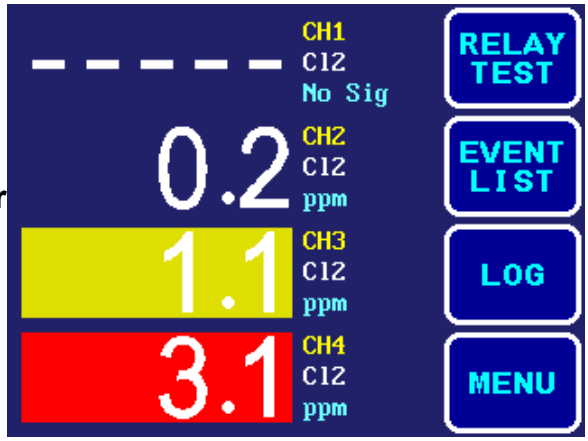
IV. General Operation

The GD-4000 uses a touchscreen interface. A full menu tree is present at the end of this manual. Areas of the screen that can be interacted with are highlighted in borders.

Note: After the power-on screens show the company name, firmware version, check-sum, and the time and date, the stabilize delay timer is displayed. Alarms associated with the gas sensors are inhibited, which are loss of signal and set point alarms (danger and critical). One can exit this screen by pressing ESC. The stabilization delay timer will continue counting down, which is indicated on the main screen display. "ALMINH" is briefly displayed on the sensors status. During the stabilize delay timer count down, any gas concentration values displayed are not considered valid. The 4-20mA analog outputs are held to 4mA.

IV.a Main Operating Screen

Each sensor(channel/chX) has a dedicated output position on the operating screen. The measured value of the sensor is reported to the left, while status and configuration information is listed on the right. In order from top to bottom, **Sensor Number, Sensor gas and status, Unit of Measure or failure** is reported. **Danger** and **Critical** set-points are highlighted in yellow or red respectively when they are exceeded. **Sensor gas** will strobe between "DGR" or "CRT" depending on what set-point has been exceeded. Sensor failure is reported as "No Sig".



Note: Relay Test is normally absent as it is disabled in factory default configuration
Note: The audible alarm will sound only when the main screen is displayed is so it will not activate during calibration, alarm set point adjustments, etc. This is the reason many screens will time out and return to a previous screen until the main screen is again displayed. The danger and critical set point outputs will remain active regardless of the screen that is displayed with one exception: All sensor alarms are deactivated during calibration (i.e., when one is accessing one of the calibration screens or menus). The 4-20mA outputs are forced to 4mA during the sensor calibration.

IV.b Relay Test

This option is normally disabled by default. When enabled, a separate screen will be displayed that allows relays to be triggered manually for troubleshooting and diagnostics.

Caution: If the relays are left connected to external devices during this test, the external devices or alarms will trigger by engaging the test.

IV.c Event List

This screen displays any active alarms or status alerts. As events are generated, the list will scroll from top to bottom

IV.d Event Log Menu

This menu displays events on a sensor by sensor(channel/chX) basis. This menu is also where the time and date are set. The time and date should be set during installation. Onboard power storage will persist the time and date settings through power interruptions but there is no guarantee this will be the case over the time-frame of shipping, storage, and final installation.

Event Log Detail: Any sub-menu of the event log can be accessed for a list of events related to that selection.

IV.e Main Menu

The main menu screen contains all user configurable aspects of the alarm indicator.

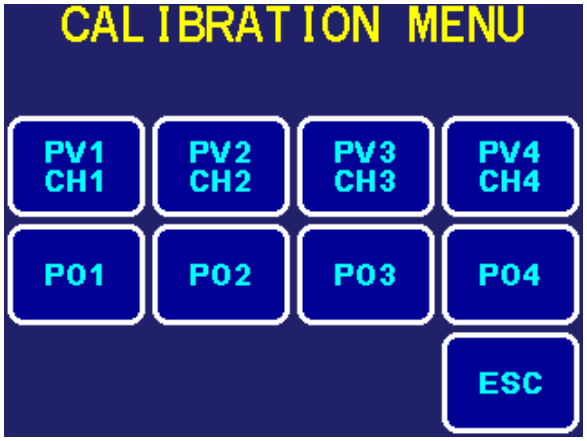
User Adj: User interface adjustments are located in this menu including color scheme and beeper volume

Info: This menu displays instrument firmware version

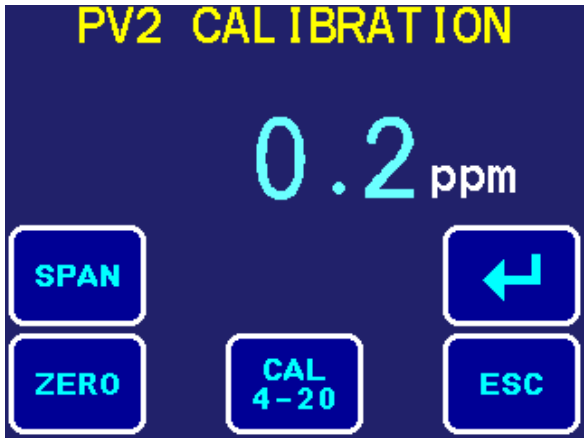
Set Point: This menu is password protected using the set point password (default 0000) accessible through the configuration menu. Danger and critical set-points are adjustable on a sensor by sensor basis. Up and down arrows navigate channel set-points. Pressing adj allows the up and down arrows to change the value then pressing enter(left arrow) saves the changes.

Setup: This menu is password protected(default 0000) and allows the calibration, configuration, and passwords to be set. Refer to the parameter list and calibration procedure sections of the manual for more information. The values in the calibration and configuration menus all follow the pattern of using the up and down arrows to navigate followed by pressing adjust to change them and then using the left arrow to save.
Note: The warning for alarm status being held applies to all sub-menus of this screen.

Calibration(CAL): This screen allows access to the calibration of both the sensor inputs (PVx/CHx) and the 4-20 mA DC outputs (POx) of the instruments.

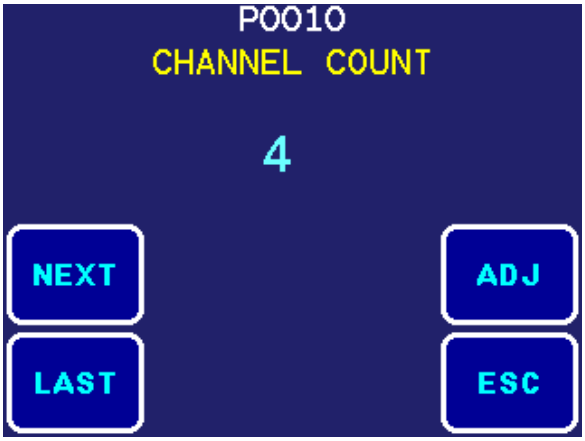


Process Variable/Channel Calibration: For the full sensor calibration procedure refer to the section of the manual that is specifically dedicated to that process. Using a calibration gas or a 4-20 mA DC signal generator is supported.



Process Output Calibration: This menu allows the 4 mA DC signal and 20 mA DC signal to be calibrated. It also allows a test of the outputs at 10 different select-able values from 4 mA to 20 mA.

Configuration(CONF): This menu lists the various operational parameters of the instrument. This list includes number of active channels, relay and alarm assignments, and alarm timings. For a full parameter list and description refer to the section of this manual dedicated to that information.



IV.f Configuration Parameter List

Below is a list of parameters in the configuration menu, listed in the format of their parameter number, descriptions, and their default values.
Note: All relays are dry contacts and any inductive load attached to a relay should have a snubber installed across the relays to extend their life

P0010 Channel Count: 4
Four channels are enabled by default.

P0020 Units of Measure: ppm
Choices are as follows: ppm, mgL,

P0100 Channel 1 Gas Type: Cl_2
Standard gas types are as follows: Cl_2, ClO_2, H_2S, CO, NH_3, O_3, SO_2.

P0101 Channel 1 Maximum Signal Span: 30.0 ppm
Adjusts the value for a full 20 mA DC signal from the sensor. Changing the decimal point is also available. This is preset to match standard factory calibrated sensors. If the gas sensor range is re-calibrated in the field this should be adjusted to match. This parameter also restricts the maximum value for set-points. The adjustment range is from 10 to 5000 graduations (not including decimal point). Decimal point selections are 0, 0.0, 0.00, & 0.000. Default is 30.0 (ppm)

P0102 Channel 1 Averaging: 0.5 seconds
Sets the display rate update for channel 1. Higher values will result in a slower, more stable indicator reading. The selections are 0.1s, 0.2s, 0.5s, 1s, 2s, 3s, 5s, 8s, or 10s. Default is 0.5 sec.

P0103 Channel 1 instrument Full Signal: 30.0

Sets the indicator output (PO1) full scale. By default 30 ppm will result in a 20 mA DC signal from the alarm indicator. A reading of 0 ppm will always result in a 4 mA DC output signal. The adjustment range is 10 to 5000 graduations (not including decimal point). Default is 30.0 in ppm.

P020X through P040X Channels 2 through 4: Identical to channel 1 settings
These settings allow for a combination of sensors with different target gases for each channel.

P0500 Latching Acknowledgment: Off
If set to ON, the audible alarms (internal beeper and external horn) are not automatically cleared when the alarm condition no longer exists (e.g., danger or critical alarm).
Press ACK on-screen or temporarily activate IN1 via an external push button to silence the alarm.

P501 Set Point Delay: 3 seconds
This parameter sets the danger and critical set point alarm activation delay to avoid false alarms. The range is from zero (0) to 3600 seconds.

P0510 Channel 1 Danger Relay Assignment: K1
This parameter sets the relay output for the channel one, danger level set point. Choices are K1 through K10, and OFF. The relay can be shared with any other alarm. The default relay is K1 and is shared with all channels.

P0511 Channel 1 Critical Relay Assignment: K2
Identical to P0510 but applies to CH1 critical set-point.

P0520 Channel 2 Danger Relay Assignment: K1
Identical to P0510 but applies to CH2 danger set-point. (by default shared with CH1 danger relay).

P0521 Channel 2 Critical Relay Assignment: K3
Identical to P0510 but applies to CH2 critical set-point.

P0530 Channel 3 Danger Relay Assignment: K1
Identical to P0510 but applies to CH3 danger set-point. (by default shared with CH1 danger relay)

P0531 Channel 3 Critical Relay Assignment: K4
Identical to P0510 but applies to CH3 critical set-point.

P0540 Channel 4 Danger Relay Assignment: K1
Identical to P0510 but applies to CH4 danger set-point. (by default shared with CH1 danger relay)

P0541 Channel 4 Critical Relay Assignment: K5
Identical to P0510 but applies to CH4 critical set-point.

P0611 Channel 1 Sensor Failure Relay Assignment: K6
The failure relay is activated for any condition that is regarded as a hardware problem.

- loss of signal for any channel after fifteen seconds and the fail delay time.

This alarm will not activate the horn output or the auto-dialer output unless the relay selected matches the relay assignments for those other functions. Choices are K1 through K10, and OFF. The relay can be shared with any other alarm.

P0612-0614 Chanel 2-4 Sensor Failure Relay Assignment: K6
Identical to P0611 but for channels 2-4.

P0620 Auto-Dialer Relay: K7
The auto-dialer relay output is energized after an adjustable delay when a channel's danger or critical set point has been met or exceeded. A failure condition does not activate the auto-dialer output (see parameter P0610 for more information). Set the failure relay to the same relay as "A-DIAL RLY" if the site should auto-dial for all failure conditions. Choices are K1 through K10, and OFF. The relay can be shared with any other alarm.

P0621 Analog Dialer Delay: 30
This parameter sets the auto-dialer activation delay to avoid false alarms. This delay is added to the set point delay (P0501) time. The range is from zero (0) to 3600 seconds. The default setting is 30 sec.

P0630 Common Alarm Relay 1: K8
The common alarm relay output is energized after an adjustable delay (P0631) when any channel's danger or critical set point has been met or exceeded or if a sensor signal loss occurs. Choices are K1 through K10, and OFF. The relay can be shared with any other alarm.

P0631 Common Alarm Relay Delay 1: 20 sec
This parameter sets the common alarm activation delay to avoid false alarms. This delay is added to the set point delay (P0501) time. The range is from zero (0) to 3600 seconds. The default setting is 20 sec.

P0640 Common Alarm Relay 2: K9
The common alarm relay output is energized after an adjustable delay (P0641) when any channel's danger or critical set point has been met or exceeded or if a sensor signal loss occurs. Choices are K1 through K10, and OFF. The relay can be shared with any other alarm.

P0641 Common Alarm Relay Delay 2: 20 sec
This parameter sets the common alarm activation delay to avoid false alarms. This delay is added to the set point delay (P0501) time. The range is from zero (0) to 3600 seconds. The default setting is 20 sec.

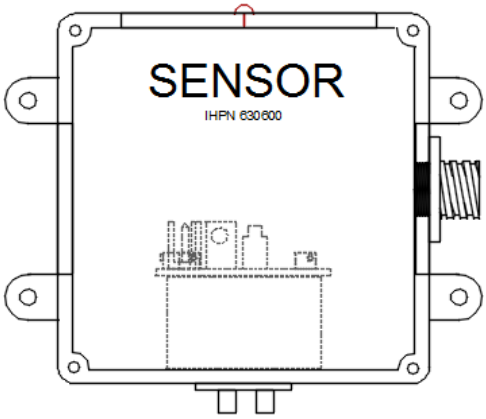
P0650 Integrated Audible Alarm Enable: On

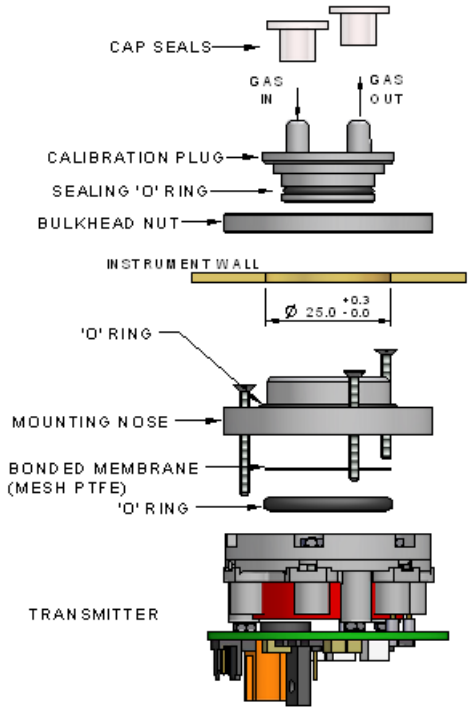
This parameter silences the internal 103dB beeper. It is typically used during field installation and testing. This parameter should be set to "On" during normal operation.

P0652 Show Relay Test: Off
Setting this parameter to on allows the relay test screen to be accessed from the main menu. It is disabled by default and is intended mainly for use in troubleshooting. After alarms are connected to the various relays accidentally triggering a relay test becomes a concern.

V. Sensor Calibration(input)

Gas sensor transmitters are supplied pre-calibrated, and the sensitivity of the device should not drift by more than 2% of full signal per month. Potentiometers for routine span and zero adjustment are located on the circuit board inside the gas sensor enclosure. The circuit board has an additional coarse gain potentiometer, which may also be used to calibrate the transmitter. This should not, however, be needed for routine re-calibration, and so should be avoided. The standard mounting system allows easy zeroing and aspiration using the calibration plug provided. With the plug in place and sealing caps fitted, the sensor is completely isolated from the atmosphere. With sealing caps removed, calibration gas can be supplied through one inlet and
exhausted through the other.





V.a Calibration using Target Gas

For maximum accuracy, the sensor should be calibrated using a gas mixture in the range where most measurements are to be made. Where this is not possible, a mixture towards the top of the sensor range should be chosen. Calibration gases exceeding the range of the sensor must not be used as this may not provide an accurate calibration.
Electrochemical gas sensors need a certain amount of oxygen to function. Generally, a few thousand ppm oxygen is sufficient. However, as calibration normally involves exposing the sensing face of the sensor to gas for a relative short period of time, a calibration gas need not contain oxygen – a sufficient amount is

supplied from the ambient air, for a limited time. In most cases, a five minute exposure time is sufficient to achieve a stable calibration signal.

A minimum flow rate is required to ensure accurate calibration - it also means that the response from a sensor is equivalent in configurations where gas is flowing over the sensor and those where the sample is allowed to diffuse into the sensor. The minimum flow rate which is required will be different depending on the sensor type – these are shown in the table below.

Gas Type	Option	Minimum Flow Rate
Carbon Monoxide, CO	All options	150 ml/min
Hydrogen Sulfide, H_2S	All options	400 ml/min
Sulfur Dioxide, SO_2	3ST/F 3SH	400 ml/min 1000 ml/min
Nitric Oxide, NO	All options	400 ml/min
Nitrogen Dioxide, NO_2	All options	1000 ml/min
Chlorine, Cl_2	All options	1000 ml/min
Hydrogen, H_2	All options	150 ml/min
Hydrogen Chloride, HCl	All options	1000 ml/min

Procedure

IMPORTANT: The gas sensor should be calibrated to the meter using the gas calibration procedure on this page.

The gas sensor calibration allows one to calibrate the gas sensor input using air (zero ppm or mg/L) and a calibration gas, which is within the gas sensor range.

- Make sure the calibration plug is installed with both caps removed to permit a 0 ppm (mg/L) and a calibration gas of known concentration to be passed over the sensor.

- Enter calibration mode from the main operating display by pressing Menu→Setup(PW 0000)→CAL
- Select the channel you are working with by pressing one of the PVx/CHx buttons. The active gas sensor input will be displayed. The value displayed is in ppm & mg/l (both are equivalent).
- Apply a zero ppm (mg/L), concentration to the sensor and allow sufficient time for the display to stabilize. The display may not settle to a zero ppm (mg/L)reading.
- Press the ZERO push button to store the zero reference. This value is not adjustable to any non-zero value
- Make sure both calibration caps are removed and apply a known ppm (mg/l) concentration gas to the sensor through the calibration nozzle and allow sufficient time for the display to stabilize.
- Press the SPAN push button to select the SPAN adjustment mode.
- Set the correct gas concentration value by using the up or down arrow push buttons.
- Press enter(left arrow) to accept the new span value, and the display will again display the active gas concentration value.
- To permanently store calibration, press the enter push button. Press ESC to restore the original calibration.
- The user is returned to the calibration menu. Select the other channel or press ESC until the main screen is displayed.

Notes:

- Be sure to store the calibration plug in a safe place so another calibration can be carried out at a later time.
- The sensor should be calibrated at least twice a year.

The sensor life expectancy is two years when exposed to air (see the GAS SENSOR SPECIFICATIONS FROM THE MANUFACTURER section).

V.b Virtual Calibration (4-20 mA DC Generator)

IMPORTANT: The gas sensor should be calibrated to the meter using the gas calibration procedure on the previous page.

The user can calibrate or check the (milliampere) mA signal input. Enter the mA calibration mode from the main operating display by pressing Menu→Setup(PW 0000)→CAL, and then select PVx/CHx for the channel you wish to work with and use the CAL 4-20 option. **This mode also sets the gas calibration to zero (4mA) and sensor full-scale/SPAN (20mA).**

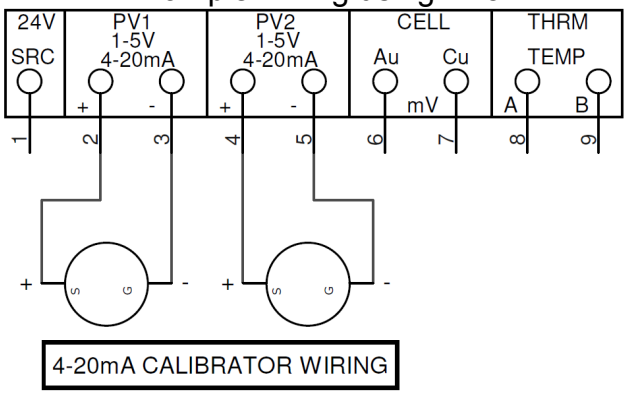
NOTE: When this screen and sub screens are accessed, the sensor alarms are deactivated and the analog outputs are forced to 4mA.

Procedure

- Connect the calibrator to channel one or two and enter the mA calibration mode. See the **4-20mA POWERED (ACTIVE) CALIBRATOR WIRING** wiring diagram below.

- Apply a 4mA signal. Allow time for the reading to settle.
- Press 4mA to set the display to 4.00mA.
- Apply a 20mA signal. Allow time for the reading to settle.
- Press 20mA to set the display to 20.00mA.
- Repeat the 4mA and 20mA cal points if desired.
- **Press enter(left arrow) to accept and store the new calibration, or press ESC to restore the original calibration.**

Example Wiring using TB5



4-20mA CALIBRATOR WIRING

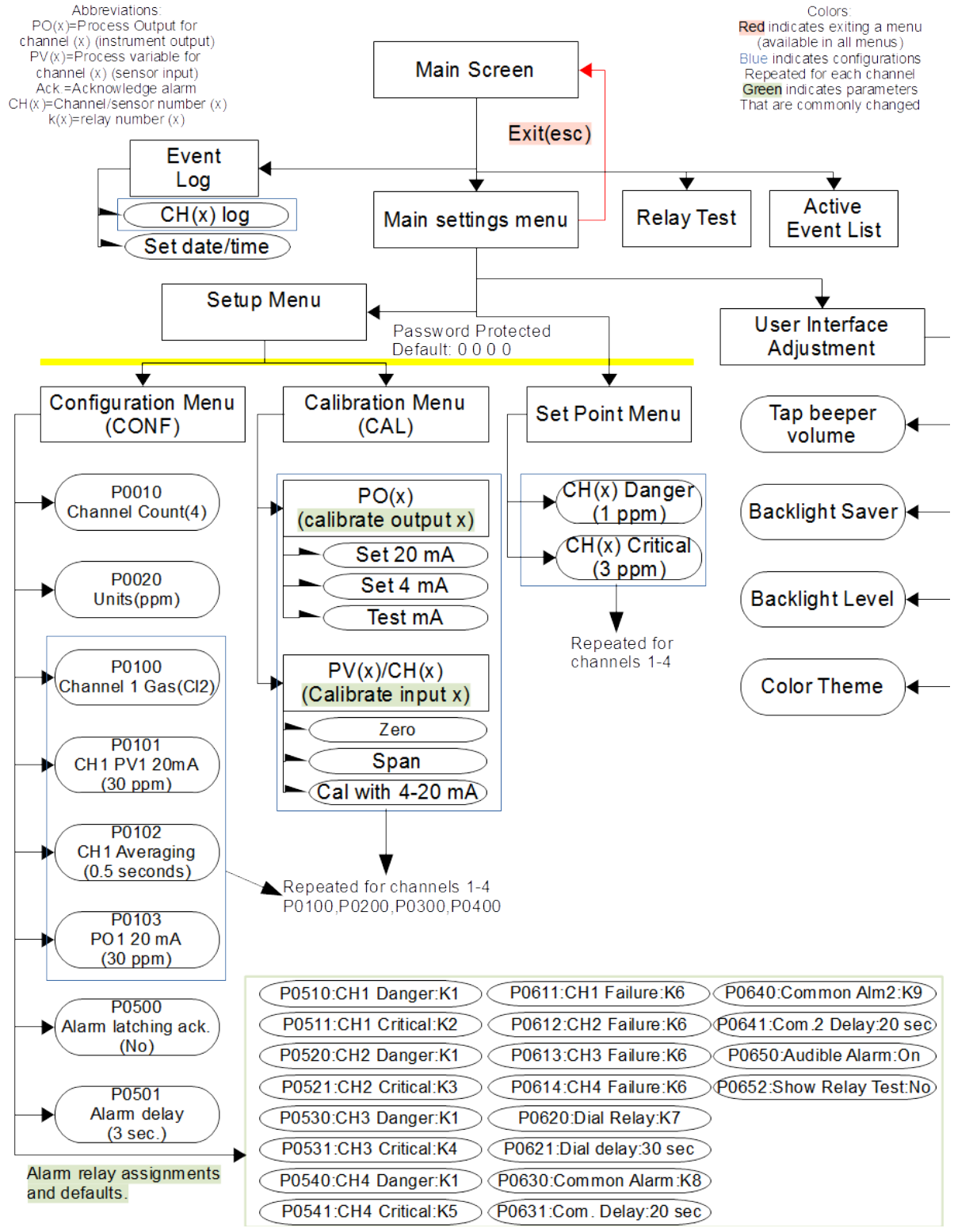
V.c Output Calibration (4-20 mA DC)

The user can calibrate the 4-20 mA DC outputs by following the below procedure. From the main screen press MENU→Setup(PW 0000)→CAL, then select one of the process output (POx) for the channel you want to work with.

To calibrate the process output (POx), one must connect either a DMM (mA input) or other device that can read the current output. The device should have, at least, 0.01mA precision.

- Enter the Output POx calibration screen from the calibration menu.
- Press the set 4mA button and the mA meter should read around 4.00mA.
- Use the up and down arrow buttons to set the output to exactly 4.00mA.
- Press enter(left arrow) to accept the new value or ESC to discard the new value.
- Press the set 20mA button; the mA meter should read around 20.00mA.
- Use the up and down arrow buttons to set the output to exactly 20.00mA.
- Press ENT to accept the new value or ESC to discard the new value.
- The two points are not interactive so one should not need to readjust each point again.
- Press the ESC push button to go back to the POx selection menu.

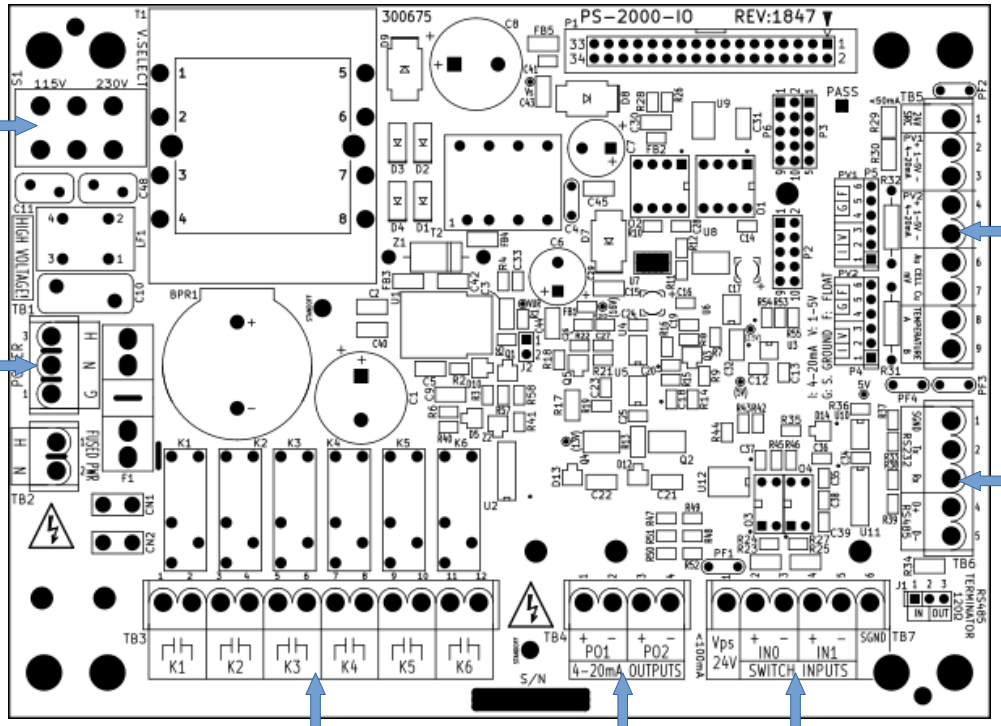
VI. Menu Tree


Abbreviations:
PO(x)=Process Output for channel (x) (instrument output)
PV(x)=Process variable for channel (x) (sensor input)
Ack.=Acknowledge alarm
CH(x)=Channel/sensor number (x)
k(x)=relay number (x)
Colors:
Red indicates exiting a menu (available in all menus)
Blue indicates configurations Repeated for each channel
Green indicates parameters That are commonly changed
Main Screen
Exit(esc)
Event Log
CH(x) log
Set date/time
Main settings menu
Relay Test
Active Event List
Setup Menu
Password Protected
Default: 0 0 0 0
User Interface Adjustment
Configuration Menu (CONF)
Calibration Menu (CAL)
Set Point Menu
Tap beeper volume
Backlight Saver
Backlight Level
Color Theme
P0010 Channel Count(4)
P0020 Units(ppm)
P0100 Channel 1 Gas(Cl2)
P0101 CH1 PV1 20mA (30 ppm)
P0102 CH1 Averaging (0.5 seconds)
P0103 PO1 20 mA (30 ppm)
P0500 Alarm latching ack. (No)
P0501 Alarm delay (3 sec.)
PO(x) (calibrate output x)
Set 20 mA
Set 4 mA
Test mA
PV(x)/CH(x) (Calibrate input x)
Zero
Span
Cal with 4-20 mA
Repeated for channels 1-4 P0100,P0200,P0300,P0400
CH(x) Danger (1 ppm)
CH(x) Critical (3 ppm)
Repeated for channels 1-4
Alarm relay assignments and defaults.
P0510:CH1 Danger:K1
P0511:CH1 Critical:K2
P0520:CH2 Danger:K1
P0521:CH2 Critical:K3
P0530:CH3 Danger:K1
P0531:CH3 Critical:K4
P0540:CH4 Danger:K1
P0541:CH4 Critical:K5
P0611:CH1 Failure:K6
P0612:CH2 Failure:K6
P0613:CH3 Failure:K6
P0614:CH4 Failure:K6
P0620:Dial Relay:K7
P0621:Dial delay:30 sec
P0630:Common Alarm:K8
P0631:Com. Delay:20 sec
P0640:Common Alm2:K9
P0641:Com.2 Delay:20 sec
P0650:Audible Alarm:On
P0652:Show Relay Test:No

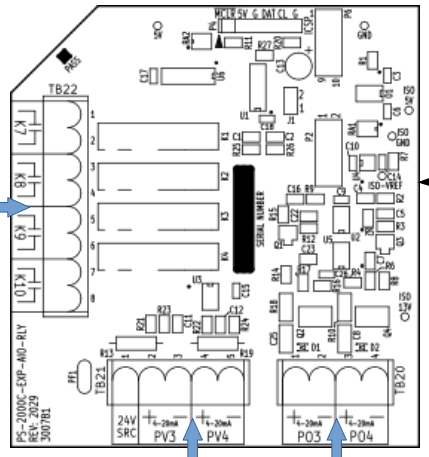
VII.

GD-4000 Wiring Diagram

GD-4000 Wiring Diagram



PN: 110482

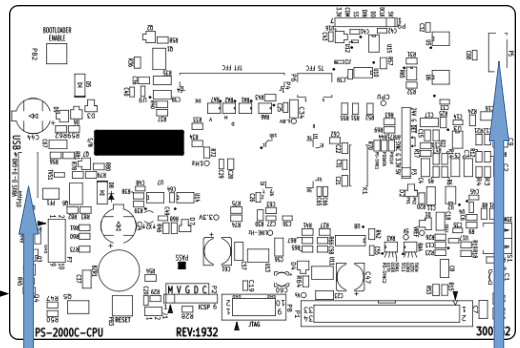


PN: 110603

TB22, K7-K10

PS-2000C-EXP-AO-RLY
Daughter card CH3-4

PS-2000 Display



PN: 110543

USB

Flash Memory

TB21, Sensor Inputs PV3,4

TB20, PO3, PO4

GD-4000 Terminal Legend

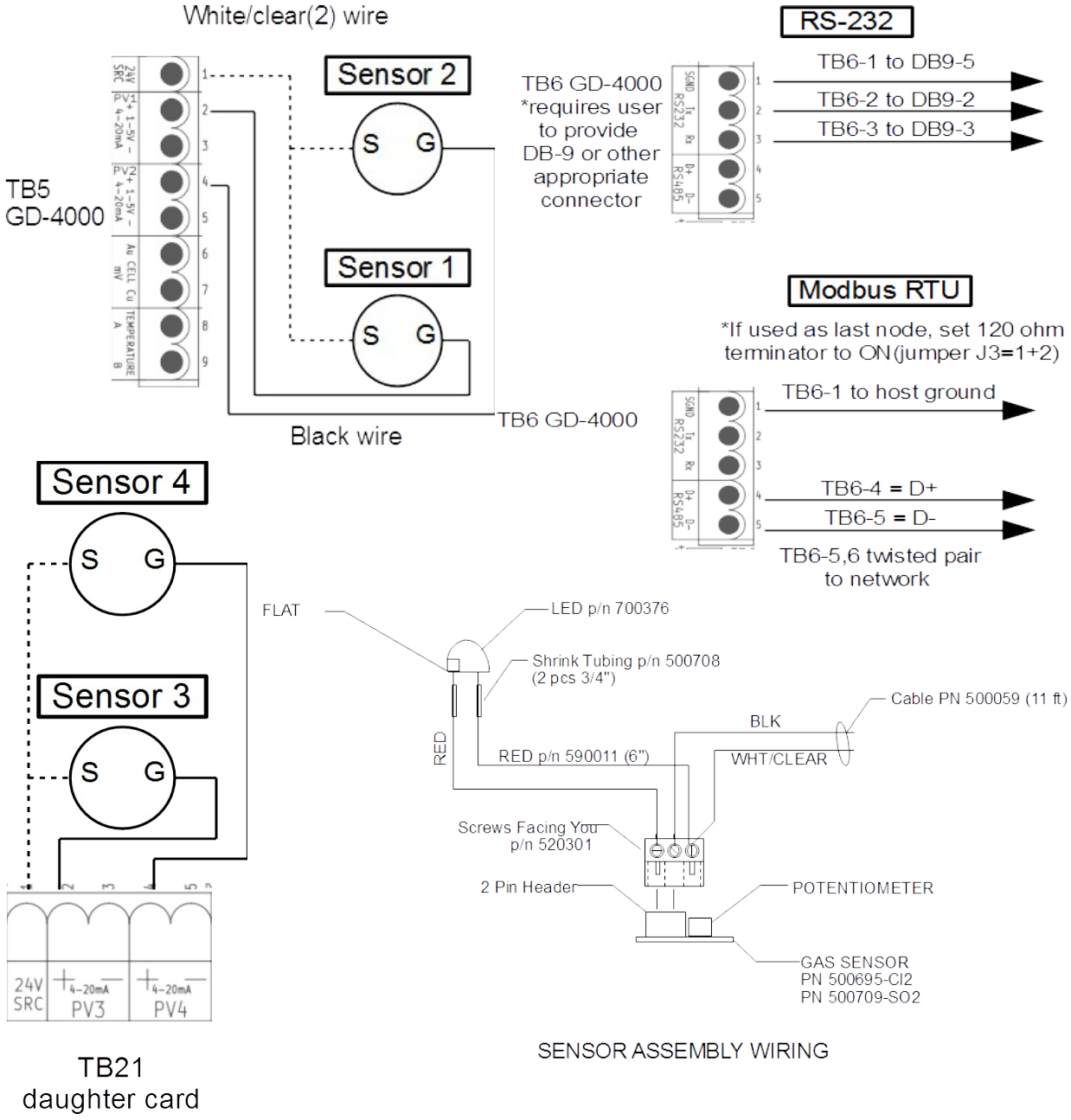
GD-4000/PS-2000 Main Board			
Terminal	Position	Function	Notes/Default
S1	115/230	Power Supply Selection	115V
TB1	H	Power Hot	
	N	Power Neutral	
	G	Power Ground	
TB3	K1/1,2	Relay 1	PV1-4 Danger
	K2/3,4	Relay 2	PV1 Critical
	K3/5,6	Relay 3	PV2 Critical
	K4/7,8	Relay 4	PV3 Critical
	K5/9,10	Relay 5	PV4 Critical
	K6/11,12	Relay 6	Sensor Failure
TB4	PO1/+-/1,2	Process Output 1 4-20 mA DC	650 Ohm.
	PO2/+-/3,4	Process Output 2 4-20 mA DC	650 Ohm.
TB7	Vps 24V/1	Voltage Power Supply	
	IN0/+-/2,3	Switch input 0	
	IN1/+-/4,5	Switch input 1	
	SGND/6	Signal ground / Common	
TB5	24V source/1	DC power for sensors	
	PV1/+-/2,3	Process Variable1(input)4-20	
	PV2/+-/4,5	Process Variable2(input)4-20	
	Position 7-9	Not used in GD-4000 application	
TB6	RS232 SGND,Rx,Tx	Serial Comm. Signal ground, receive, transmit	
	RS485 D+,D-	Modbus Data	

PS-2000C-EXP Daughter Card			
Terminal	Position	Function	Notes/Default
TB22	K7/1,2	Relay 7	Autodial
	K8/3,4	Relay 8	Comm. Alm1.
	K9/5,6	Relay 9	Comm Alm 2
	K10/7,8	Relay 10	Ext. Horn
TB20	PO3/+-/1,2	Process Output 3 4-20	650 Ohm.
	PO4/+-/3,4	Process Output 4 4-20	650 Ohm.
TB21	24V source/1	DC power for sensors	
	PV3/+-/2,3	Process Variable3(input)4-20	
	PV4/+-/4,5	Process Variable4(input)4-20	

PS-2000 Display			
Terminal	Position	Function	Notes/Default
USB	P10	Firmware update by USB	
Flash	P5	Data Upload/download card	Micro-flash

*All relays are dry contacts, rated 3A 250 V AC, 3 A 32 V DC.
*All relay functions are re-assignable and can be shared between alarms.
*Any relay wired to an inductive load should have a snubber(RC circuit) installed to extend it's functional life.

Wiring Detail Reference



VIII. Troubleshooting

Instrument does not light.	• Check that 115 VAC (230VAC if used) is reaching TB1. • Check that the ribbon cable to the display is plugged in at both ends and fully seated. • Make sure power is disconnected and then remove fuse and check for continuity. • Check “V SELECT” switch is set for the input voltage in use. **Never change this switch with the power on!**
Instrument lights but does not show anything on the display.	• Check everything but the fuse in the “Instrument does not light” section.
Light on sensor does not light but instrument powers up.	• Check instrument wiring. See “Normal wiring” for TB5/21 in the diagram section. • Measure between “24V and PVx “. It should be between 22 & 24 V DC. • Go to “Checking sensor wiring”
Light on sensor lights but instrument doesn’t respond to chlorine exposure.	• Remove any cap seals from the sensor. • Remove the calibration plug for faster response time. See the sensor data sheet for details. • Check instrument wiring(see above). The black wire from the sensor must be on PVx “+”. If it’s on a “-“ terminal this problem will result. • Go to “Checking sensor wiring”
Checking sensor wiring.	• Open sensor box (4 screws). The circuit board mounts to the sensor on three gold pins. Be sure the board is on all three pins and fully seated. • Check that the orange plug has not pulled loose from the sensor. • The sensor has a two-pin orange header but has a three-pin plug. From left to right with the screws facing you the wires are red, black, then red & white twisted together. The terminal with the red & white is the one not connected to the two-pin header (see GAS SENSOR INTERNAL WIRING above). • Check for broken wires on the L.E.D. The side of the L.E.D. with the flat is the one that goes to the leftmost terminal on the three-pin plug. • If no problems were found go to “Verify indicator operation”.
Verify indicator operation.	• Disconnect the sensor. Wire a 4-20mA generator as shown under “4-20mA POWERED (ACTIVE) CALIBRATOR WIRING” in the diagram section. • Injecting 4mA will give a 0ppm reading and 20mA will give a 30ppm (or full-scale) reading if the unit was setup for a standard Cl_2 sensor.
Instrument shows high or drifting readings when first powered up but settles to a stable reading within a minute or two.	• This is not a problem. The sensors need to stabilize when first powered up. The alarms are disabled until the stabilize delay timer disappears from the screen. This takes about two minutes.

IX. Options

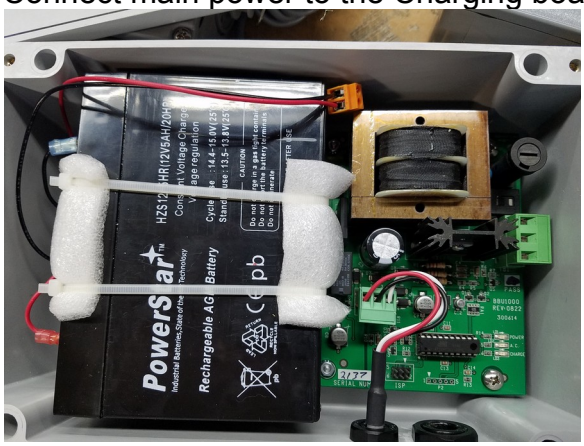
IX.a BBU-1000 External Battery Backup

The BBU-1000 provides an alternate source of power for the instrument in case of power interruptions. This unit is an externally mounted device with it's own dedicated power input for the integrated battery charge maintainer and must be wired to the GD-4000 separately during installation.

The BBU-1000 includes:
-NEMA 4X enclosure
-PS-2000C-BBU card factory installed in the GD-4000
-Battery maintenance and charging module
-12 V 5 Amp-Hour Sealed Lead acid battery for 10 hrs of operation of GD4000
-5 feet of cable to connect to the GD-4000

Installation of BBU-1000

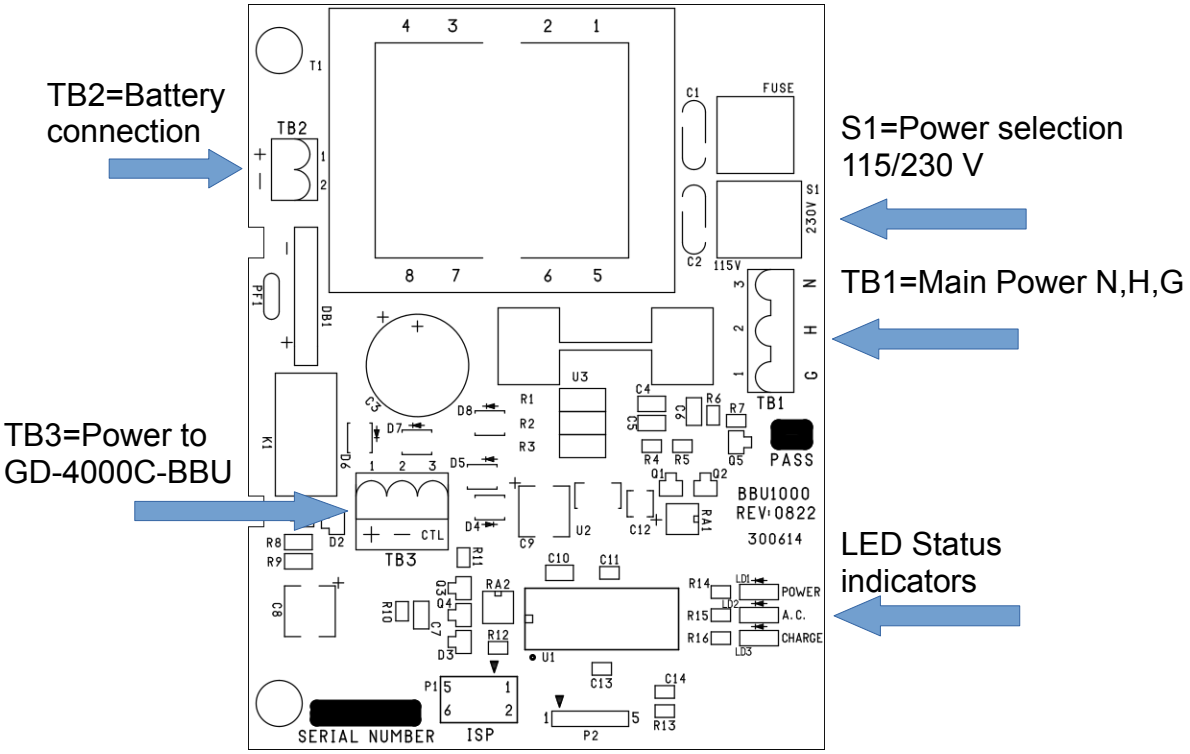
-Find a suitable place on the wall near the GD-4000 to install the enclosure and anchor to the wall with 5/16" screws.
-Connect the battery to the charging board on TB-2.
-Select 115/230 V supply using switch 1(S1).
-Connect the output (TB3) to the PS-2000C-BBU board in the GD-4000 enclosure
-Connect main power to the Charging board on TB-3 of charging board



Note: The battery is shipped disconnected from the charging board
Note: The GD-4000 should not be wired into main power if the BBU-1000 is installed

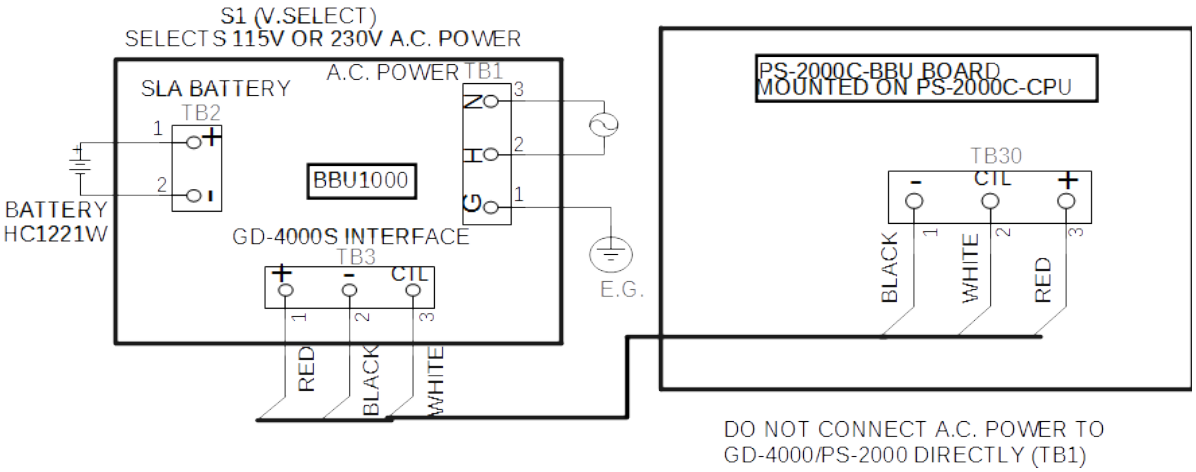
After installation the following parameters are available in the GD-4000:
P9800 Battery backup: BBU-1000
This parameter sets the type of battery backup used. Options are BBU-1000 or "off"

BBU Continued



LED Status indicator codes

POWER	DESCRIPTION	A.C. LED	CHARGE LED
AC	Battery is charging	ON	ON
AC	Battery is not charging	ON	OFF
AC	Battery is “float” charging	ON	OFF
AC	Battery circuit is shorted	FLASHING	FLASHING
AC	Battery is not connected.	ON	FLASHING
DC	Battery is powering the GD-4000	OFF	OFF



X. Sensor Specifications

Chlorine(Cl_2) Sensor Specifications

Key Features & Benefits

- Robust 3-Series packaging
- Industry standard 4-20 mA output

Technical Specifications

MEASUREMENT

Sensor Type Used	3CLH
Filter	None
Output	4-20 mA d.c.
Response Time (T_{80})*	<60 Seconds at 20°C
Resolution	0.1 ppm
Zero Shift (-20°C to +40°C)*	< -0.2 ppm equivalent
Repeatability	2% of signal
Linearity	Linear

ELECTRICAL

Power Supply Required	10 - 35 VDC single-ended
Output Impedance	4 MΩ
Calibration	Via built-in span and zero potentiometers

MECHANICAL

Mounting	Via mounting nose supplied
Weight	58 g including mounting accessory
Position Sensitivty	None

ENVIRONMENTAL

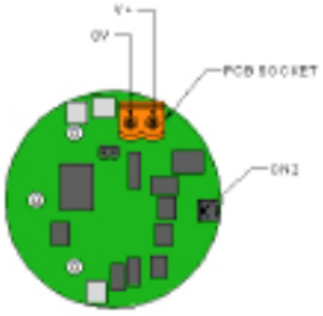
Operating Temperature Range	-20°C to +50°C
Recommended Storage Temp	0°C to 20°C
Temperature Compensation	None
Operating Pressure Range	Atmospheric ± 10%
Pressure Coefficient	No data
Operating Humidity Range	15 - 90% RH non-condensing

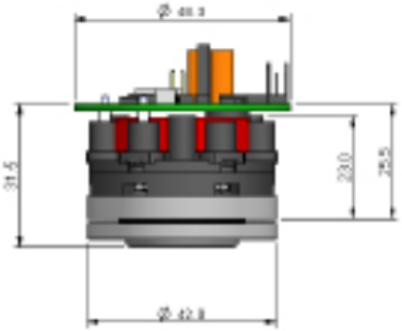
LIFETIME

Long Term Sensitivity Drift*	<2% signal loss/month
Expected Operating Life	Two years in air
Storage Life	6 months in CTL container
Standard Warranty	12 months from date of despatch

*** Specifications are valid at 20°C, 50% RH and 1013 mBar, using City Technology recommended circuitry. Performance characteristics outline the performance of sensors supplied within the first 3 months. Output signal can drift below the lower limit over time.**

Product Dimensions





All dimensions in mm
All tolerances ±0.15 mm unless otherwise stated

RANGES AVAILABLE

3CLH CiTiceL 4-20 mA Transmitters are available with the following precalibrated ranges, and can be recalibrated to intermediate ranges.

Range	Order Code
0-5 ppm	TH3A-1A
0-10 ppm	TH3B-1A
0-20 ppm	TH3C-1A
0-30 ppm	TH3D-1A
0-50 ppm	TH3E-1A
0-100 ppm	TH3F-1A
0-200 ppm	TH3G-1A

Poisoning

CiTiceLs are designed for operation in a wide range of environments and harsh conditions. However, it is important that exposure to high concentrations of solvent vapours is avoided, both during storage, fitting into instruments and operation.
When using sensors with printed circuit boards (PCBs), degreasing agents should be used before the sensor is fitted. Do not glue directly on or near the CiTiceL as the solvent may cause crazing of the plastic.

Cross Sensitivity Table

Whilst CiTiceLs are designed to be highly specific to the gas they are intended to measure, they will still respond to some degree to various other gases. The table below is not exclusive and other gases not included in the table may still cause a sensor to react.

IMPORTANT NOTE : The cross sensitivity data shown below does not form part of the product specification and is supplied for guidance only. Values quoted are based on tests conducted on a small number of sensors and any batch may show significant variation. For the most accurate measurements, an instrument should be calibrated using the gas under investigation.

Gas	Concentration Used (ppm)	3CLH (ppm Cl_2)
Carbon Monoxide, CO	300	0
Hydrogen Sulfide, H_2S	15	≈ -1.5
Sulfur Dioxide, SO_2	5	0
Nitric Oxide, NO	35	0
Nitrogen Dioxide, NO_2	5	≈ 5
Hydrogen, H_2	100	0
Hydrogen Cyanide, HCN	10	0
Hydrogen Chloride, HCl	5	0
Ethylene, C_2H_4	100	0

to indicate sensor response to gases other than the target gas. Sensors may behave differently with changes in ambient conditions and any batch may show significant variation from the values quoted.

SAFETY NOTE
This sensor is designed to be used in safety critical applications. To ensure that the sensor and/or instrument in which it is used, are operating properly, it is a requirement that the function of the device is confirmed by exposure to target gas (bump check) before each use of the sensor and/or instrument. Failure to carry out such tests may jeopardize the safety of people and property.

Sulfur Dioxide(SO_2) Sensor Specifications

Technical Specifications

MEASUREMENT

Sensor Type Used	3SH
Filter	None
Output	4-20 mA d.c.
Response Time (T_{90})*	<15 Seconds at 20°C
Resolution	0.1 ppm
Zero Shift (-20°C to +40°C)	<0.1 ppm equivalent
Repeatability	2% of signal
Linearity	Linear

ELECTRICAL

Power Supply Required	10 - 35 VDC single-ended
Output Impedance	4 MΩ
Calibration	Via built-in span and zero potentiometers

MECHANICAL

Mounting	Via mounting nose supplied
Weight	58 g including mounting accessory
Position Sensitivty	None

ENVIRONMENTAL

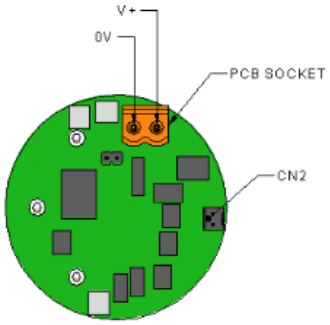
Operating Temperature Range	-20°C to +50°C
Recommended Storage Temp	0°C to 20°C
Temperature Compensation	None
Operating Pressure Range	Atmospheric ± 10%
Pressure Coefficient	No data
Operating Humidity Range	15 - 90% RH non-condensing

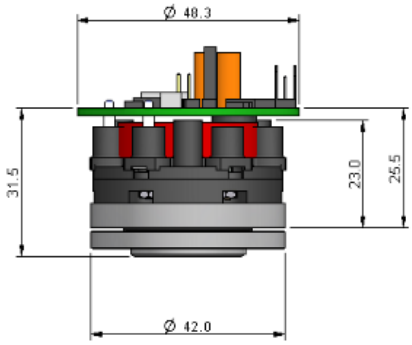
LIFETIME

Long Term Sensitivity Drift*	<2% signal loss/month
Expected Operating Life	Two years in air
Storage Life	6 months in CTL container
Standard Warranty	12 months from date of despatch

*** Specifications are valid at 20°C, 50% RH and 1013 mBar, using City Technology recommended circuitry. Performance characteristics outline the performance of sensors supplied within the first 3 months. Output signal can drift below the lower limit over time.**

Product Dimensions





All dimensions in mm
All tolerances ±0.15 mm unless otherwise stated

RANGES AVAILABLE

T3SH Transmitters are available with the following precalibrated ranges, and can be recalibrated to intermediate ranges.

Range	Order Code
0-5 ppm	TD9A-1A
0-10 ppm	TD9B-1A
0-20 ppm	TD9C-1A
0-30 ppm	TD9D-1A
0-100 ppm	TD9F-1A

Poisoning

CiTiceLs are designed for operation in a wide range of environments and harsh conditions. However, it is important that exposure to high concentrations of solvent vapours is avoided, both during storage, fitting into instruments and operation.
When using sensors with printed circuit boards (PCBs), degreasing agents should be used before the sensor is fitted. Do not glue directly on or near the CiTiceL as the solvent may cause crazing of the plastic.

Cross Sensitivity Table

Whilst CiTiceLs are designed to be highly specific to the gas they are intended to measure, they will still respond to some degree to various other gases. The table below is not exclusive and other gases not included in the table may still cause a sensor to react.

IMPORTANT NOTE : The cross sensitivity data shown below does not form part of the product specification and is supplied for guidance only. Values quoted are based on tests conducted on a small number of sensors and any batch may show significant variation. For the most accurate measurements, an instrument should be calibrated using the gas under investigation.

Gas	Concentration (ppm)	3SH (ppm SO_2)
Carbon Monoxide, CO	300	<3
Hydrogen Sulfide, H_2S	15	≈ 20
Nitrous Oxide, N_2O	35	0
Nitrogen Dioxide, NO_2	5	≈ -6
Chlorine, Cl_2	1	≈ -0.5
Hydrogen, H_2	100	0
Hydrogen Cyanide, HCN	10	≈ 5
Hydrogen Chloride, HCl	5	≈ 0.5
Ethylene, C_2H_4	100	0

SAFETY NOTE
This sensor is designed to be used in safety critical applications. To ensure that the sensor and/or instrument in which it is used, are operating properly, it is a requirement that the function of the device is confirmed by exposure to target gas (bump check) before each use of the sensor and/or instrument. Failure to carry out such tests may jeopardize the safety of people and property.

Warranty

Standard Warranty

Eagle Microsystems warrants our products and accessories to be free from defects in material and workmanship for a period of twelve (12) months from date of start up or eighteen (18) months from date of shipment, whichever occurs first. Eagle Microsystems, in its sole discretion, shall determine warrantability of the alleged defect. Eagle Microsystems' liability, under this guarantee, shall be limited to repairing or replacing defective equipment during this period except as noted below.

1. Any other products purchased from another manufacturer and incorporated into Eagle Microsystems products shall be warranted only to the extent that it is warranted by the original manufacturer. Examples are motors, vibrators, sensors etc.

Eagle Microsystems' liability under this guarantee shall be limited to repairing or replacing defective equipment during this period. Determination of whether damage or failure is warrantable shall be at the sole discretion of Eagle Microsystems. As a condition of this guarantee, such defects must be brought to Eagle Microsystems attention for verification as soon as possible, and, if required, returned to the Eagle Microsystems factory. Eagle Microsystems shall not be liable for transportation, installation or costs incurred in the removal of said equipment for repair or replacement, or for damages from delay, loss of use or any other related damages or costs of any kind. Eagle reserves the right to improve the equipment to incorporate latest designs.

This warranty shall not apply to any product or accessory which has been modified or repaired independent of Eagle Microsystems direction or control. This warranty shall become null and void if inspection by Eagle Microsystems reveals the equipment was misused, neglected or damaged by any cause other than normal and reasonable use.

Notes:

PS-2000 ROUTING TICKET

SO#:		DATE:	
PROGRAM:	GD-4000-STD	SERIAL #:	
VERSION:	1.0	PCB REV:	
Sensor 1,2 Types:		Sensor 1,2 SN:	
Sensor 3,4 Types:		Sensor 3,4 SN:	

ENGINEERING	Default	Cust.	PROGRAMMING	Default	Cust.
P0501 Setpoint Dly.:	3 sec		P0010 Channel ct.	4	
P0510 CH1 Danger	K1		P0020 Units	ppm	
P0511 CH1 Critical	K2		P0100 CH 1 Gas	Cl2	
P0520 CH2 Danger	K1		P0101 Gas Max	30	
P0521 CH2 Critical	K3		P0102 CH1 Avg.	0.5	
P0530 CH3 Danger	K1		P0103 Gas Level	30	
P0531 CH3 Critical	K4		P0200 CH 2 Gas	Cl2	
P0540 CH4 Danger	K1		P0201 Gas Max	30	
P0541 CH4 Critical	K5		P0202 CH2 Avg.	0.5	
P060 Sensor Fail	K6		P0203 Gas Level	30	
P0611 Fail delay	10 sec		P0300 CH 3 Gas	Cl2	
P0620 Dial Relay	K7		P0301 Gas Max	30	
P0621 Dial Delay	30 sec		P0302 CH3 Avg.	0.5	
P0630 Common 1	K8		P0303 Gas Level	30	
P0631 Com1 Dly.	20 sec		P0400 CH 4 Gas	Cl2	
P0640 Common 2	K9		P0401 Gas Max	30	
P0641 Com2 Dly.	20 sec		P0402 CH4 Avg.	0.5	
P0652 Show Rly. Test	No		P0403 Gas Level	30	

HARDWARE INSTALLED OPTIONS

Enclosure window		PS-2000 ExL Enclosure		BBU-1000 power card		PS-2000-c-exp-aio-rly	X

S1(Voltage select)		
230/115 V		

J1(120 Ω terminator)		
In/Out		

TECH:_____