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Section

1

Introduction

1.1 System Description

The *Interscan* SQ Series Sequential Monitoring System is designed to meet the needs of multiple location gas monitoring where continuous monitoring at each location is not a requirement. Sampling is achieved by drawing the gas sample from each location one at a time for short durations (typically 1-5 minutes each depending on gas being sampled and application conditions) in a sequential cycle the duration of which is equal to the number of locations multiplied by the sample duration or *dwell time* for each location or *sample point*.

The SQ series monitoring system consists of the Interscan gas sensor, sample draw pneumatics, a **P**rogrammable **L**ogic **C**ontroller (PLC), a touch screen **H**uman **M**achine **I**nterface (HMI) and various alarm and system fault output devices as well as Modbus/TCIP communications via an Ethernet port.

In basic operation sample air is drawn into the system and through the Interscan gas sensor via a diaphragm sample pump and related pneumatics. PLC controlled solenoid valves control which sample point is currently active in the sequential cycle and provides for concurrent “pre-sampling” or “purging” of the next point in the cycle via a second diaphragm pump (purge pump).

The sensor’s electrical output is sent via the sensor circuit board to the PLC which processes the sensor’s output and produces a digital readout in PPM (parts per million) on the HMI. The PLC also compares the current gas level to 3 preset alarm levels and activates alarm relay outputs and HMI displays when the gas level exceeds any of these user set levels. Also available are two 4-20 mA current loop analog outputs corresponding to gas concentration and active point identification.

The HMI provides for display of gas concentration level, active sample point indication, sample and purge flow rates and any current and past alarm and/or system fault conditions. It also provides the user control of the pumps, setting of alarm levels and manipulation of various maintenance modes for the system. In many of these modes, informational messages on the screen will instruct the user on actions to take for a given procedure or problem. There are also information “tutorial” screens

available by pressing the **INFO** button found on most operational screens. These information screens provide brief descriptions of functions and features for quick reference during operation.

ALL INTERSCAN MONITORS ARE CALIBRATED AT THE FACTORY PRIOR TO SHIPMENT. There is no need to calibrate the monitor at initial startup. See sections 5 & 6 for maintenance requirements.

1.2 Basic System Components

FIG 1-1 below shows the location of all major components for the system which are described in table 1-1.

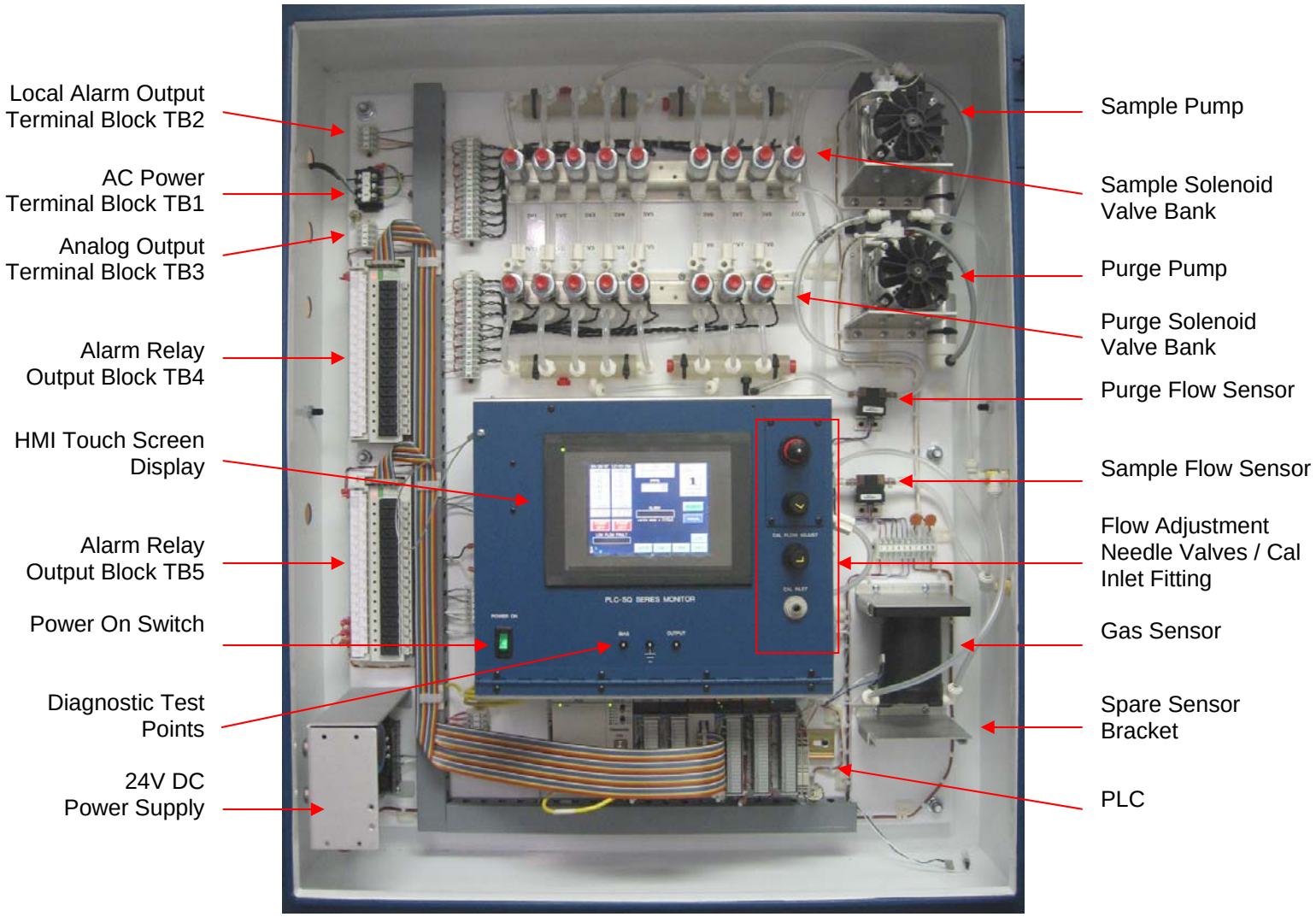


FIG 1-1

Local Alarm Output Terminal Block – Termination point for optional audible and visual alarm indicators. (See section 4.2 of the system **Installation Manual** for wiring detail.)

AC Power Terminal Block – Termination point for incoming AC power. (See section 4.1 of the system **Installation Manual** for wiring detail.)

Analog Output Terminal Block – Termination point for gas concentration analog output and point identification analog output. (See section 4.3 of the system **Installation Manual** for wiring detail.)

Alarm Relay Output Block TB4 – Termination points for all dedicated LO and HI alarm normally open relay contacts. (See section 4.4 of the system **Installation Manual** for wiring detail.)

HMI Touch Screen Display – Provides display of gas concentration, sample & purge flow and alarm/system fault status. Facilitates control of all pneumatics, alarm functionality and operation/maintenance modes.

Alarm Relay Output Block TB5 – Termination points for all dedicated HI-HI and all common LO, HI and HI-HI alarm normally open relay contacts as well as common system fault relay contacts. (See section 4.4 of the system **Installation Manual** for wiring detail.)

Power On/Off Switch – Controls AC power to the system. Lights GREEN when power is ON.

Diagnostic Test Points – Troubleshooting voltage measurement points for Sensor Bias voltage and output voltage to the PLC.

24V DC Power Supply – Provides 24V DC power to the solenoid valves, alarm relays and HMI Touch screen.

Sample Pump – Draws Sample air into the system and through the *Interscan* gas sensor.

Sample Solenoid Valve Bank – 2 way solenoid valves that control which of the 8 sample points are open to the SAMPLE pump and gas sensor.

Purge Pump – Draws "pre-sample" air into the system one point ahead of the sample point being monitored to provide fresh sample to the sensor at each sequential point advance.

Purge Solenoid Valve Bank – 2 way solenoid valves that control which of the 8 sample points are open to the PURGE pump..

Purge Flow Sensor – Flow sensing device with voltage output sent to the PLC to facilitate proper PURGE flow rate display at the HMI Touch Screen.

Sample Flow Sensor – Flow sensing device with voltage output sent to the PLC to facilitate proper SAMPLE flow rate display at the HMI Touch Screen.

Flow Adjustment Valves / CAL Inlet Fitting – Controls for adjusting the Sample flow rate to the proper level for both Sample and Zero/Cal modes. Bulkhead Fitting for introduction of Cal gas during Calibration.

Gas Sensor – Electrochemical sensor tuned to respond to the system's target gas. Converts gas sample to a low level electric current for processing at the PLC.

Spare Sensor Bracket – Location for storage of an optional spare sensor. Connection leads provided for keeping the spare sensor "on bias" and ready to use

PLC – Programmable Logic Controller. Controls all system components and communicates with the HMI Touch Screen.

TABLE 1-1

1.3 System Configuration

The specific setup details for your unit are detailed below.

GAS – Carbon Monoxide

FULL SCALE RANGE – 0-500 PPM

SAMPLE POINTS – 8

SETUP PARAMETERS

DWELL TIME – 2 Minutes

CAL DURATION – 5 Minutes

ZERO DURATION – 5 Minutes

AUTO ZERO INTERVAL – 4 Hours

ALARM DELAY – 3 seconds

LEVEL 1 PASSWORD – 1233

OPTIONAL FEATURES INCLUDED

AUTO ZERO – User Disabled (See section 4.2.3)

MODBUS/TCIP COMMUNICATIONS (see attached special section)

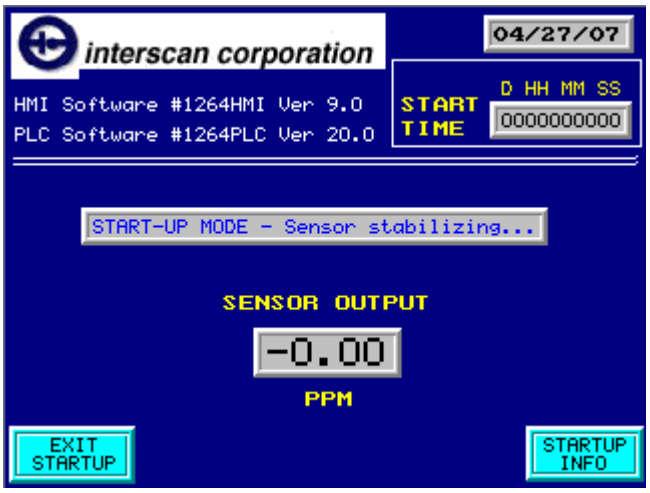
Section

2

System Startup

2.1 Startup Mode

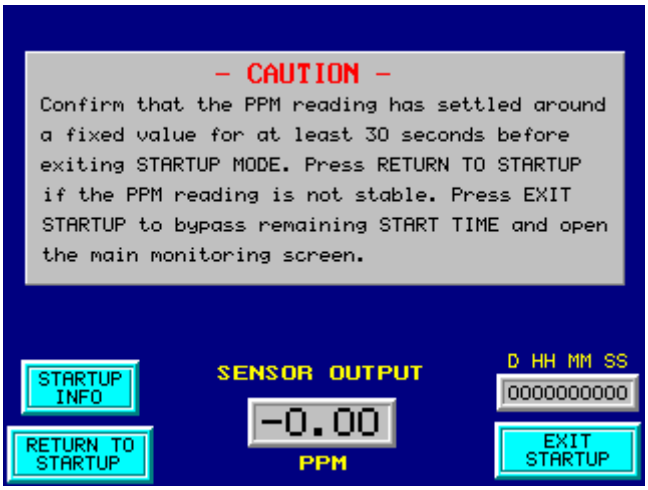
Once installation is complete according to the directions given in the **SQ Series INSTALLATION MANUAL**, the unit is ready for startup. Open the enclosure door and toggle the **POWER ON** switch to the ON position so the switch is lit. The HMI will go through its diagnostic check which will be followed by the STARTUP MODE screen shown below.



During STARTUP MODE, the sensor is allowed to stabilize while it charges to its bias voltage. As this occurs, the SENSOR OUTPUT PPM display will show either a positive or negative value that will decay toward zero while the sensor stabilizes. The factory set startup duration is 24 hours with the amount of remaining time for stabilization displayed on the START TIME counter in the upper right corner of the STARTUP MODE display.

The actual amount of time required for full sensor stabilization will depend primarily on how long the unit was un-powered prior to startup. For initial startup, it is recommended that the full 24 hour duration be allowed to elapse even if the sensor appears stabilized before this time. Should the unit ever be powered down for short durations after initial startup and use, the full startup duration may not be needed for full sensor stabilization. The **EXIT STARTUP** button provides the user the ability to bypass the full STARTUP MODE duration and advance to sampling mode without the need to wait for

the STARTUP TIMER to elapse.. Pressing the **EXIT STARTUP** button will call up the following warning screen.



If at this point the user determines that the sensor is fully stabilized he may bypass startup by pressing **EXIT STARTUP** or if he determines that more time is required, he may return to STARTUP MODE by pressing **RETURN TO STARTUP**. The **STARTUP INFO** button calls up an informational screen describing STARTUP MODE.

2.2 Sensor Ready

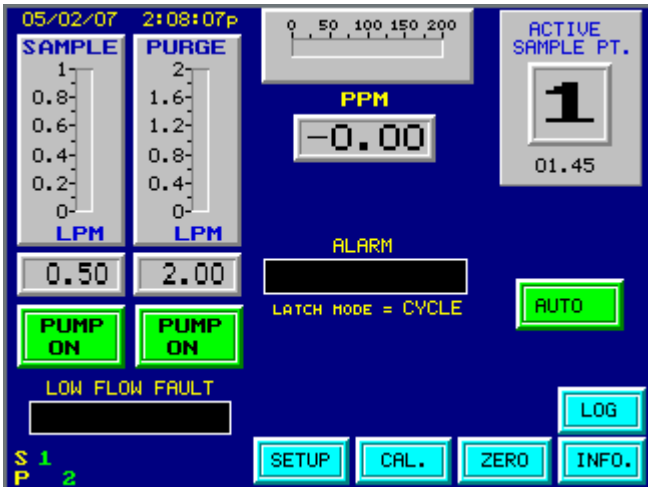
On INITIAL startup, when the STARTUP TIMER has fully elapsed or the user manually exits STARTUP MODE, the SENSOR READY screen shown below will appear. The SENSOR READY screen directs the user to read the next section of the manual and perform the “PRE-SAMPLING” routine to ready the unit for sampling.

NOTE: The SENSOR READY screen ONLY appears after the INITIAL startup. If the unit is powered down and restarted, the SENSOR READY screen will be skipped and the display will advance to the main screen at the end of STARTUP MODE.

2.3 Pre-Sampling Setup

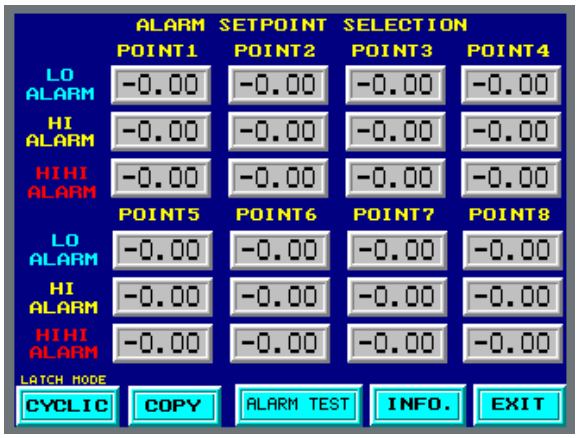
Once STARTUP MODE is fully complete, the unit is ready for final setup as detailed below.

1) From the SENSOR READY screen press **EXIT** (or from the STARTUP MODE MANUAL EXIT SCREEN, press **EXIT STARTUP)** to open the MAIN MONITORING screen shown below. When this screen opens, the SAMPLE PUMP and PURGE PUMP will automatically start and sequential sampling will begin.



2) To best facilitate pre-sampling setup, set the sequencing mode to MANUAL by pressing the **AUTO** button. This will toggle the sequencing mode to MANUAL. Allow the pumps to run for several minutes until the SAMPLE FOW RATE has stabilized. Longer tubing runs will require more time for flow rate stabilization (up to 3 minutes).
3) When the flow rate is stable, set the SAMPLE FLOW ADJUST valve (middle knob) on the right side of the front panel for the recommended flow rate as shown on the label located below the CAL INLET fitting on the display panel, typically 0.50 LPM.. Turn the valve clockwise to lower the value and counter-clockwise to raise the value. Turn the valve slowly as there will be a slight lag in the updating of the display reading and small moves may affect greater than expected value changes. There may be slight fluctuation in the flow rate display reading once set. This is OK as long as the variance is no more than 0.05 LPM. **DO NOT ADJUST THE SAMPLE BLEED CONTROL** as this setting is factory optimized for the components in your system.

4) From the MAIN MONITORING screen press **SETUP** to open the USER SETUP screen.
5) From the USER SETUP screen press **ALARM SETUP** to open the ALARM SETPOINT SELECTION screen shown below.



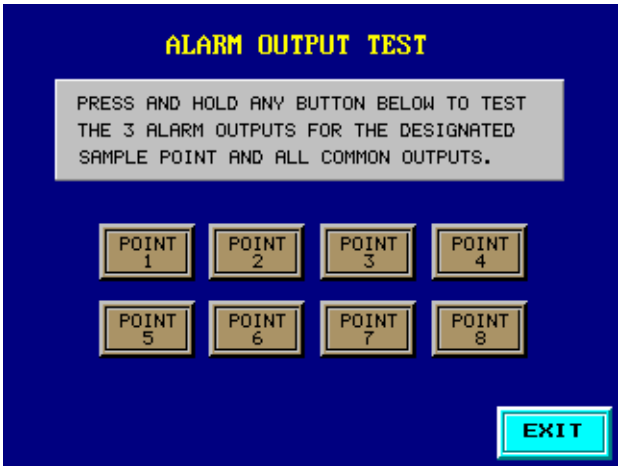
6) Alarm levels are typically factory set at ¼, ½, and ¾ of the full scale measuring range. Change the alarm set levels as desired as follows.
7) Touch the LO ALARM display field for POINT 1. In the pop up window that appears, enter the desired value for the set level selected and press the back arrow key (enter) in the bottom right corner of the entry window. Repeat for the HI and HI-HI alarm levels for POINT 1. If you do not intend to use all alarm levels, set the unused levels to the full scale level (max value) for your system (see section 1.3).
8) If the remaining points are to have the same values as POINT 1, press the **COPY** key to duplicate the POINT 1 values across all points. If different values are to be used, enter them all manually in the same manner as for POINT 1.
9) Select the ALARM LATCH MODE as desired by pressing the LATCH MODE button to toggle between the following 2 options (see section 3.4 for more on Alarm functionality)

CYCLIC LATCH - Causes all active alarm outputs and indicators to latch through one complete sequential cycle. If, after the sequence returns to the alarmed point the alarm condition is no longer present, that alarm's indicators and outputs will automatically clear. Alarms can also be manually cleared at any time by the user by pressing the ALM RST button.

SOLID LATCH – All alarm outputs and indicators will remain latched until manually reset by the operator by pressing the ALM RST button.

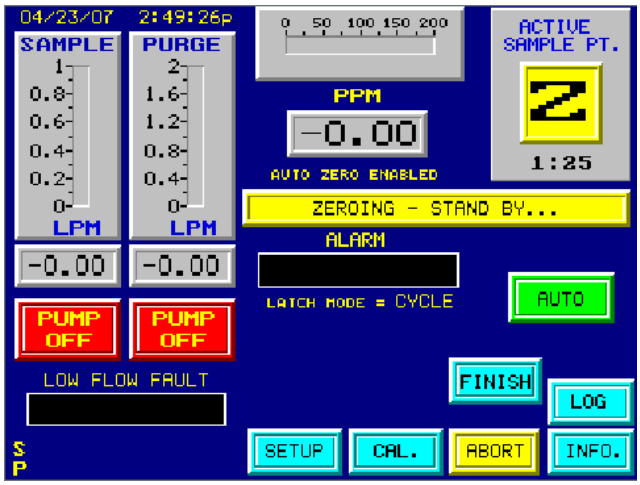
The factory setting for LATCH MODE is **CYCLIC.**

10) Once all alarm levels are set as needed, you may test the dedicated relay outputs from the ALARM SETUP screen if desired by pressing the **ALARM TEST** button. This will take you to the screen shown below. Follow the directions on the screen.



11) Once finished with ALARM TEST, press the **EXIT** button to return to the ALARM SET POINT SELECTION screen, press **EXIT** to return to the USER SETUP screen then **EXIT** again to return to the MAIN MONITORING screen.

12) At the MAIN MONITORING screen, perform a MANUAL ZERO procedure by pressing the **ZERO** button at the bottom of the main screen. The **ZERO** button will change to **ABORT,** the ACTIVE SAMPLE PT. display will show a flashing **Z** and a message bar will appear below the PPM display directing the user through the routine (see screen shot below). The ACTIVE SAMPLE POINT TIMER will now display the time remaining in the zero cycle. For CO units, the pump will shut off while the sensor stabilizes to “no flow” conditioning. For other gas units, the pump will remain on and flow diverted through the ZERO AIR inlet. For “pump on” zeroing, adjust the **CAL FLOW ADJUST** control (lower knob) on the right edge of the front panel for a flow rate reading equal to that set in step 3 above.



13) When the timer elapses, a **FINISH** button will appear and the message will read **"SENSOR STABLE? PRESS FINISH"**. If the PPM reading appears stable (i.e. is settled around a fixed value for at least 30 seconds), press the **FINISH** button to complete the routine. The **ABORT** button may be used at any time to stop the routine without any changes. See section 4.2 for more on the MANUAL ZERO procedure.
14) Once the MANUAL ZERO procedure is finished, press the MANUAL button to toggle the system back to AUTO SEQUENCE MODE. The system is now operational.

Section

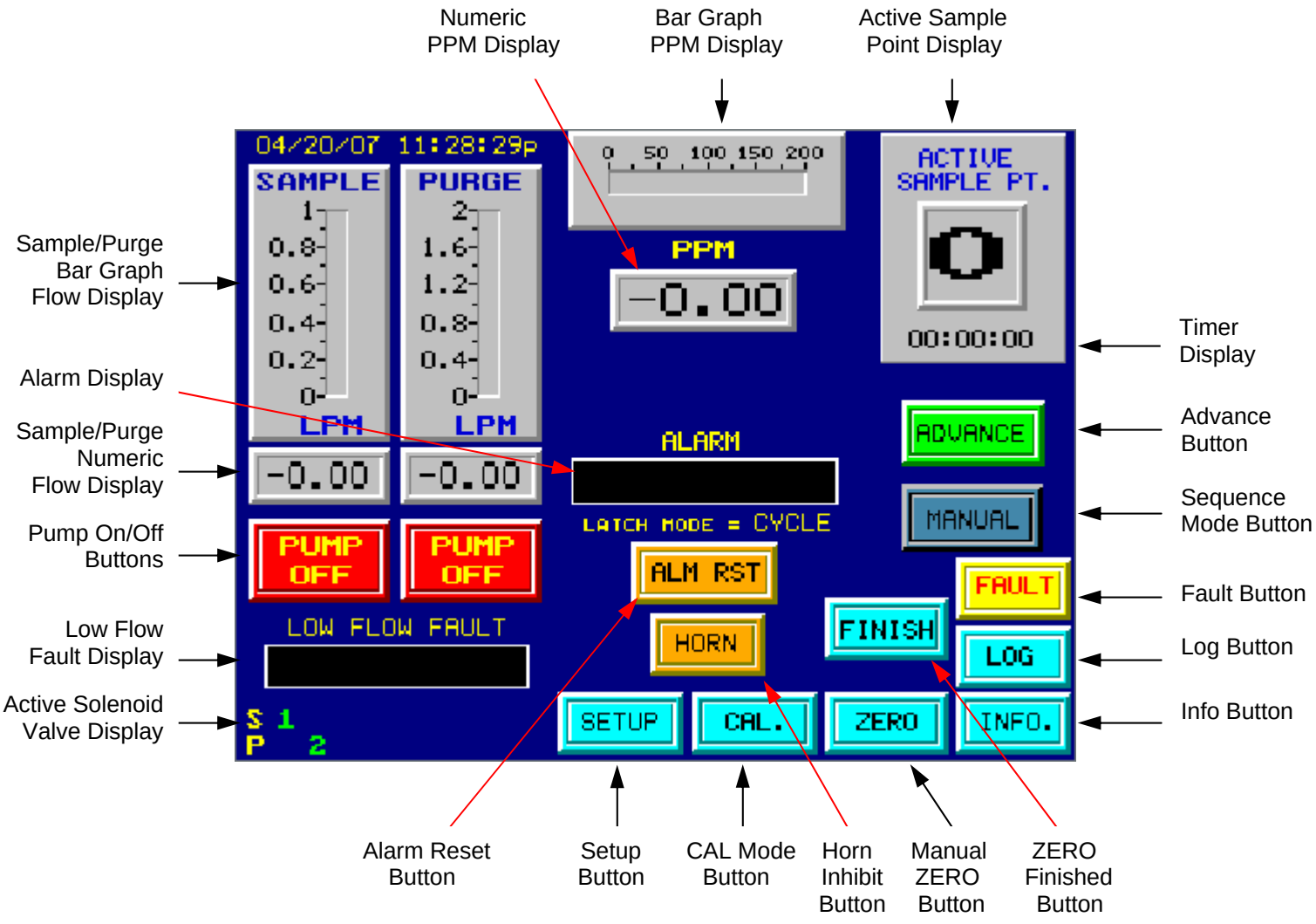
3

Basic Operation

This section will describe some of the basic control features found on the touch screen HMI.

3.1 Main Monitoring Screen

The Main Monitoring screen shown below is the primary display/control screen from which all other control and display screens can be accessed. Not all items shown will be visible at all times. See table 2-1 on the following page for descriptions of the various displays and buttons.



(1) Numeric PPM display – Numeric display of PPM concentration for the active sample point.

(2) Bar Graph PPM display – Bar graph display of the PPM concentration for the active sample point relative to the full scale range of the system.

(3) Active Sample Point display – Numeric display indicates which sample point is currently being sampled.

(4) Timer display – Typically indicates the amount of time left in the sample duration for the currently sampled point. Also displays the ZERO DURATION for both MANUAL and AUTO ZERO cycles.

(5) Sequence Mode button – Displays which sequence mode is currently active. Toggles between AUTO and MANUAL sequence modes when pressed. See section 3.2

(6) Manual / Advance button – Used in Manual Sequence Mode to advance through the sequential cycle. Pressing the button once advances ahead one sample point. Button not visible in AUTO sequence mode. See section 3.2

(7) FAULT Button/Display – Indicates an active FAULT condition. Pressing this button opens the FAULT DISPLAY screen for fault management. Button is hidden when no fault conditions are present. See section 4.4

(8) LOG button – Opens the alarm and system fault history page. See section 4.5

(9) INFO button – Opens a help screen that allows access to a variety of informational screens describing system functions. See section 3.6

(10) ZERO button – Initiates the MANUAL ZERO procedure. See section 4.2

(11) FINISH button – Used to finalize the Manual Zero procedure. Only visible at the end of the Zero routine. See section 4.2

(12) CAL button – Opens the CALIBRATION screen for access to CALIBRATION mode. See section 5

(13) SETUP button – Opens the USER SETUP screen. Provides access to all user adjustable variable functions. See section 4.1

(14) Alarm display window – Provides numeric indication of points presently in an alarm condition. Alarm level indicated by variable color of display digits. See section 3.4.4

(15) ALM RST button – Resets latched alarm outputs and display indicators. Button only visible when there are latched alarms. See section 3.4.6

(16) HORN button – Acknowledge button for audible alarm output. Silences horn until next alarm condition occurs. Button is not visible when horn output is not active. See section 3.4.5

(17) Active Solenoid Valve Display – Indicates via numeric display which sample valve (S) and purge valve (P) is currently energized. See section 3.3.4

(18) Low Flow Fault Display – Provides numeric display of points being skipped due to low flow fault condition(s). See section 4.4.1

(19) Pump ON/OFF buttons – Controls on/off status of SAMPLE and PURGE pumps. Lit GREEN when pump is on and RED when pump is off. See section 3.3

(20) Numeric Flow rate displays – Numeric reading of SAMPLE and PURGE flow rates displayed in Liters Per Minute (LPM). See section 3.3

(21) Bar Graph Flow Rate Displays – Bar graph displays showing SAMPLE and PURGE flow rates. See section 3.3

TABLE 3-1

3.2 Sequencing Modes

3.1.2 AUTO SEQUENCE MODE

Auto Sequence mode is the default mode for the system that is automatically activated following startup mode. In this mode, sample is drawn sequentially from each of the sample inlets via the SAMPLE PUMP and SAMPLE FLOW CONTROL VALVES into the gas sensor with sample duration determined by the user adjustable DWELL TIME (see section 4.1.1 for info on setting the dwell time). The **Active Sample Point Display** indicates which sample point is presently active and the **Timer Display** shows the remaining dwell time left for the active point.

The PURGE FLOW CONTROL VALVES are energized in such fashion as to always remain one point ahead of the SAMPLE FLOW CONTROL VALVES allowing for “pre-sampling” of the next point in the sequence. This allows for shorter dwell times by reducing the amount of time required for sample to be drawn into the sensor upon sequential advance to the next point in the cycle.

AUTO SEQUENCE MODE is indicated by the green **AUTO** button located just below the **Active Sample Point Display.** Pressing this button toggles the system between AUTO SEQUENCE MODE and MANUAL SEQUENCE MODE.

3.1.3 MANUAL SEQUENCE MODE

MANUAL SEQUENCE MODE allows the user to manually step through the sample point sequence. Pressing the AUTO button switches the system from AUTO to MANUAL mode in which a green ADVANCE button will appear just above the AUTO / MANUAL button which changes to blue. Pressing the ADVANCE button will cycle through the sample point sequence one point at a time for each button push. To return to AUTO SEQUENCE MODE, press the AUTO / MANUAL button once to toggle the system back to AUTO mode.

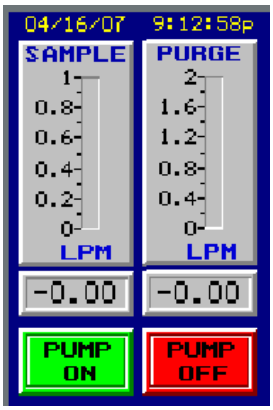
3.3 Pneumatic Control

3.3.1 SAMPLE & PURGE PUMP CONTROL

The SAMPLE and PURGE PUMPS are controlled by the 2 buttons under the flow rate displays on the left side of the HMI touch screen as shown below. When either pump is off, the button will be colored red and indicate “OFF” and when on, will be colored green and indicate “ON”. Pressing the button will toggle between the on and off states. The pumps will automatically start when the monitor exits STARTUP MODE.

3.3.2 FLOW RATE DISPLAY & CONTROL

The SAMPLE and PURGE flow rates are displayed on the 2 bar graphs above the PUMP buttons as well as on the numeric displays located just below the bar graphs as shown to the right. The flow rates are displayed in Liters Per Minute or LPM. The Sample flow rate is controlled by both the **SAMPLE BLEED** and **SAMPLE FLOW ADJUST** needle valves located on the display panel to the right of the HMI touch screen. (see FIG 3-1 below) **All user flow rate adjustment should be made using the SAMPLE FLOW ADJUST valve. The SAMPLE BLEED valve setting is factory preset and SHOULD NOT BE CHANGED.**



Sample Bleed Control
DO NOT ADJUST!

SAMPLE Flow Adjust

CAL Flow Adjust

CAL Inlet

FIG 3-1

To adjust the SAMPLE flow rate, turn the **SAMPLE FLOW ADJUST** knob clockwise to lower the value or counter-clockwise to raise the value. There may be a slight lag between turning the knob and seeing a change in the flow rate and small moves may affect greater than expected value changes as you get closer to the target value. There may be slight fluctuation in the flow rate display reading once set. This is OK as long as the variance is no more than 0.05 LPM.

The PURGE flow rate is not flow controlled and the pump is allowed to run at maximum vacuum. This flow rate will vary depending on the length of the sample tubing runs and may be higher than the maximum display capability. An accurate reading of the PURGE flow rate is not critical but should always read at least **1.5LPM**

3.3.3 RECOMMENDED SAMPLE FLOW RATES

The recommended flow rate for the majority of Interscan gas sensors is **0.50 Liters Per Minute (LPM).** The exceptions are Formaldehyde sensors which require a flow rate of **0.75 LPM** and Chlorine Dioxide sensors which require a flow rate of **0.20 LPM.** All units will have a recommended flow rate label located below the CAL INLET fitting on the display panel that indicates the recommended flow rate for the system.

3.3.4 ACTIVE SOLENOID VALVE DISPLAY

The SAMPLE and PURGE solenoid valves control which sample points are open to the SAMPLE and PURGE pumps. At any given time, the ACTIVE SOLENOID VALVE DISPLAY in the lower left corner of the HMI Touch Screen indicates which valves are open in each valve bank. The yellow S designates the SAMPLE bank and the P designates the PURGE bank. The green numbers indicates which point's valve is open in each bank.

3.4 Alarms

The SQ series sequential monitor is equipped with 3 user programmable alarm levels, LO, HI and HI-HI for each of the sample points. These alarm levels can be individually set anywhere in the scale range of the system. Alarms actuate after a factory set sequential carryover delay to eliminate false alarms caused by sensor response carryover from previously sampled points as

well as an alarm actuation delay to minimize false alarming due to RFI signal interference. All alarms are latching as described in section 3.4.8.

3.4.1 VISUAL ALARM OUTPUT

A common alarm 24V DC output is provided for use with an optional VISUAL ALARM INDICATOR. This output will be activated on any LO, HI or HI-HI alarm condition. When provided, the visual alarm indicator will be a blue or red flashing incandescent tower style light that mounts to the top left side of the unit enclosure and wires to **TB2** according to the wiring instructions detailed in section 4.2 of the SQ Series INSTALLATION MANUAL.

3.4.2 AUDIBLE ALARM OUTPUT

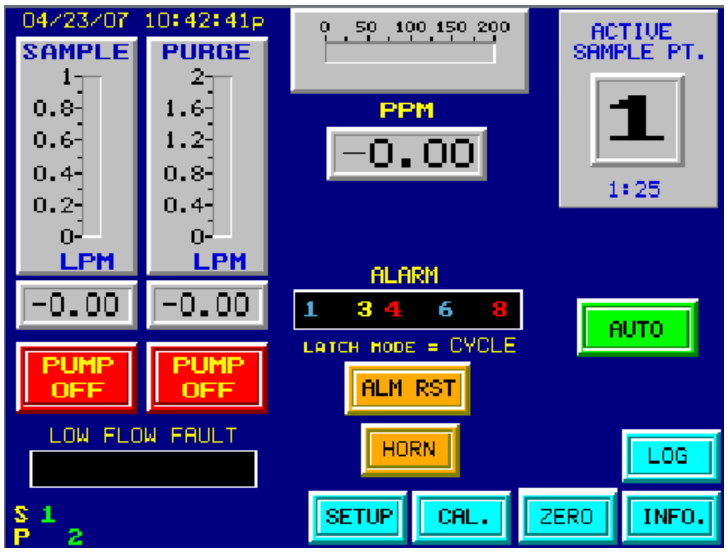
A common alarm 24V DC output is provided for use with an optional AUDIBLE ALARM DEVICE. This output will be activated by any LO, HI or HI-HI alarm condition and will pulse at a rate dependant on the alarm level as follows:
LO ALARM – SLOW pulse
HI ALARM – MEDIUM pulse
HI-HI ALARM – FAST pulse.
When provided, the audible alarm indicator will be a either a factory installed piezo style horn mounted in the top left corner of the enclosure next to the visual alarm or a vibrartory style horn that mounts to the top right side of the unit enclosure and wires to **TB2** according to the wiring instructions detailed in section 4.2 of the SQ Series INSTALLATION MANUAL.

3.4.3 ALARM RELAY OUTPUTS

Dedicated Normally Open relay contacts are provided for each of the 3 alarm levels at each sample point. Additional Common Normally Open relay contacts are provided for each of the 3 alarm levels common to all sample points. These contacts are terminated at the relay blocks **TB4** and **TB5** located along the left edge of the unit chassis as detailed in section 4.4 of the system INSTALLATION MANUAL.

3.4.4 ALARM DISPLAY

The ALARM DISPLAY is a numeric display field located in the middle of the HMI Touch Screen. When an alarm condition occurs, a number corresponding to the currently active sample point will be displayed on the ALARM DISPLAY bar. Each alarm level has a distinct color associated with it – LO = BLUE / HI = YELLOW / HI-HI = RED. See example below in which points 1 and 6 are shown in LO alarm, point 3 is in HI alarm and points 4 and 8 are in HI-HI alarm.



3.4.5 HORN BUTTON

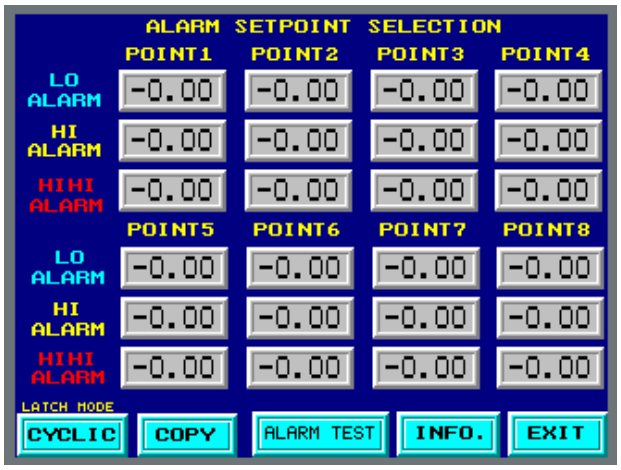
The **HORN** button will appear on the HMI Touch Screen below the alarm display any time the AUDIBLE ALARM output is active and the horn (when provided) is sounding. Pressing this button will inhibit the output and silence the horn until the next occurring alarm condition.

3.4.6 RESETTING ALARMS

When any alarm condition occurs and an alarm is latched, the **ALR RST** button will appear below the alarm display on the HMI Touch Screen. Pressing this button will clear all active alarm outputs and displays until the next occurring alarm condition.

3.4.7 PROGRAMMING THE ALARM SET POINT LEVELS

The alarm set point levels are set at the ALARM SETPOINT SELECTION screen shown below which can be accessed from the main screen by pressing the **SETUP** button to enter the USER SETUP SCREEN and then pressing the **ALARM SETUP** button.



Alarm levels are typically factory set at ¼, ½, and ¾ of the full scale measuring range. These levels can be changed as desired according to the following procedure:

1) Touch the LO ALARM display field for POINT 1. In the pop up window that appears, enter the desired value for the set level selected and press the back arrow key (enter) in the bottom right corner of the entry window to confirm the value.

2) Repeat for the HI and HI-HI alarm levels for POINT 1. If you do not intend to use all alarm levels, set the unused levels to the full scale level (max value) for your system.

3) If the remaining points are to have the same values as POINT 1, press the **COPY** key to duplicate the POINT 1 values across all points. If different values are to be used, enter them all manually in the same manner as for POINT 1.

3.4.8 ALARM LATCH MODE

When an alarm occurs, the display and outputs associated to that alarm will latch according to one of 2 user selectable modes as described below. These modes are selectable via the LATCH MODE select button in the lower left corner of the ALARM SETPOINT SELECTION screen.

CYCLIC LATCH - Causes all active alarm outputs and indicators to latch through one complete sequential cycle. If, after the sequence returns to the alarmed point the alarm condition is no longer present, that alarm's indicators and outputs will

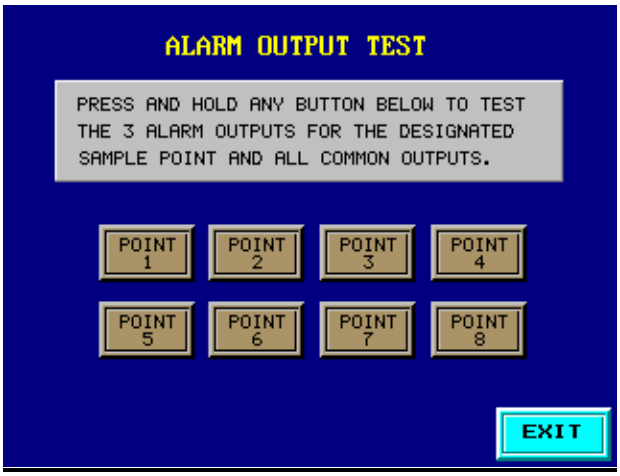
automatically clear. Alarms can also be manually cleared by the user at any time by pressing the ALM RST button.

SOLID LATCH – All alarm outputs and indicators will remain latched until manually reset by the operator by pressing the ALM RST button.

The factory setting for LATCH MODE is **CYCLIC.**

3.4.9 ALARM TEST SCREEN

The ALARM TEST screen, shown below, facilitates manual user actuation of the alarm output relays and can be accessed from either the ALARM SETPOINT SELECTION screen or the USER SETUP screen by pressing the **ALARM TEST** button. Once on this screen, follow the onscreen directions to test the alarm relay outputs. Each button controls the 3 dedicated outputs for the selected sample point as well as the common and audible/visual alarm outputs.



3.5 Analog Outputs

2 independent 4-20 mA current output loops are provided for remote tracking of both gas concentration and active sample point identification.

3.5.1 GAS CONCENTRATION OUTPUT

The gas concentration analog output is an isolated 4-20 mA signal that tracks the full scale range of the monitor such that **0.0 ppm = 4.0 mA** and **Full Scale ppm = 20.0 mA.** The output terminates at TB3-1 and TB3-2 located along the upper left edge of the unit chassis. (see section 4.3 of the system INSTALLATION MANUAL for wiring details).

3.5.2 ACTIVE SAMPLE POINT IDENTIFICATION OUTPUT

The active sample point identification analog output is an isolated 4-20 mA signal that tracks the active sample point number via a stepping current output according to the table below:

POINT 1	4.00 mA	POINT 5	13.04 mA
POINT 2	6.26 mA	POINT 6	15.30 mA
POINT 3	8.52 mA	POINT 7	17.56 mA
POINT 4	10.78 mA	POINT 8	19.82 mA

The output terminates at TB3-3 and TB3-4 located along the upper left edge of the unit chassis. (see section 4.3 of the system INSTALLATION MANUAL for wiring details).

3.6 INFO Screens

Pressing the **INFO** button on the main monitoring screen opens the main INFO screen shown at the right where tutorial information screens on a variety of system functions can be accessed. Pressing any topic button on the main INFO screen will open another screen containing information on that topic. **These tutorial screens are for quick reference and are NOT intended to replace a thorough reading of this manual!**

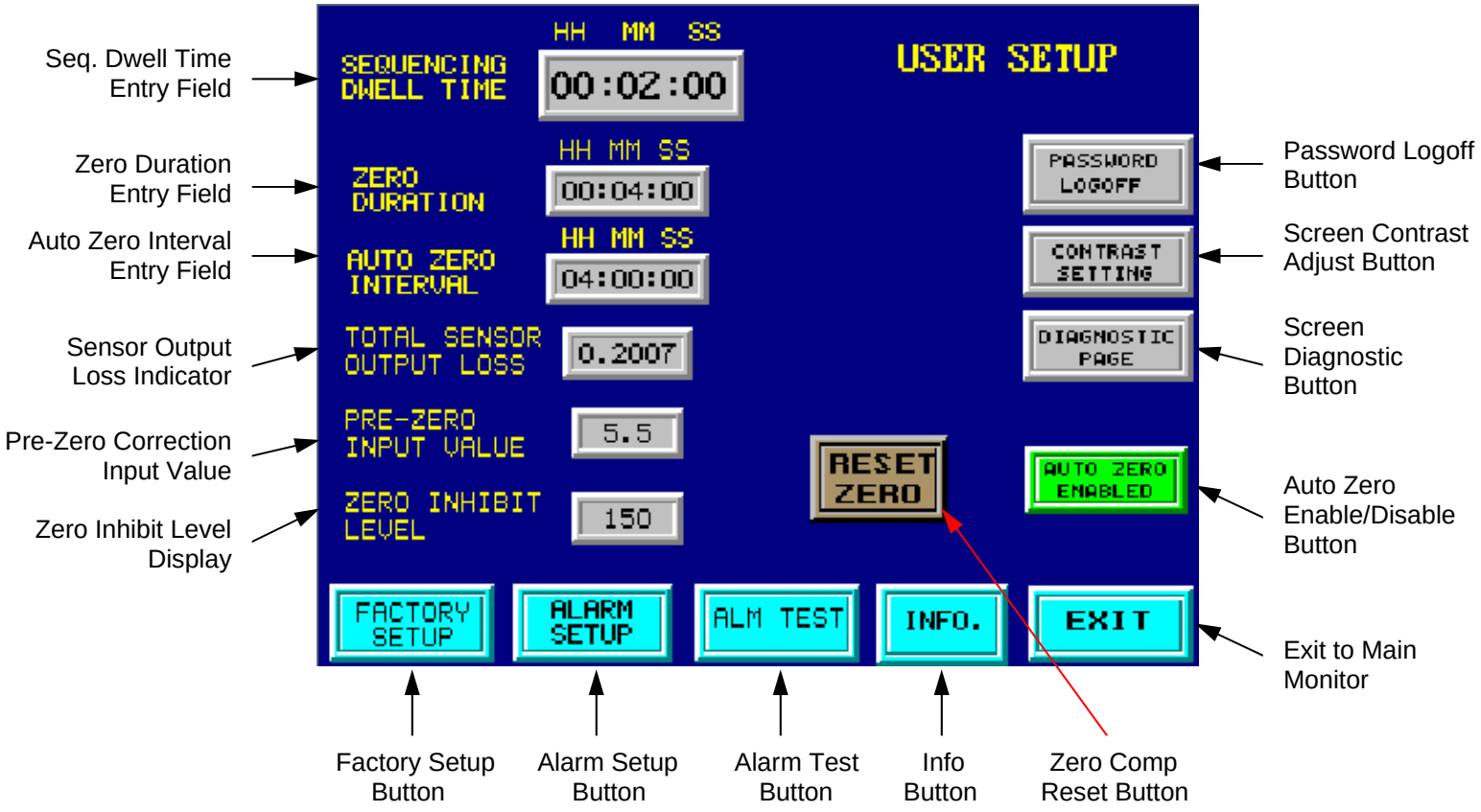
Section

4

Advanced System Functions

4.1 User Setup Screen

The USER SETUP screen shown below provides access to various parameters and options that the user can vary, control or view. Table 3-2 below details the function of the various buttons and displays. To enter the USER SETUP screen from the MAIN MONITORING screen, press the **SETUP** button.



Sequencing Dwell Time entry field – Facilitates level 1 password protected input of Sequencing Dwell Time value. See section 4.1.1 **Zero Duration Entry Field** – Facilitates level 1 password protected input of the Zero Duration time. Only visible when AUTO ZERO is factory enabled. See section 4.2.3 **Auto Zero Interval Entry Field** – Facilitates level 1 password protected input of the AUTO ZERO INTERVAL time. Only visible when AUTO ZERO is factory enabled. See section 4.2.3 **Sensor Output Loss indicator** – Diagnostic display. See section 4.1.2 **Pre-Zero Input Value** – Diagnostic display. See section 4.1.2 **Zero Inhibit Level Display** – Diagnostic display. See section 4.1.2. **FACTORY SETUP button** – Facilitates Level 2 password protected access to Factory Setup screens. See section 4.1.3 **ALARM SETUP button** – Opens the ALARM SETUP screen as described in section 3.4	**ALARM TEST button** – Opens the ALARM TEST screen as described in section 3.4.9 **INFO button** – Opens the master info screen. See section 3.6 **RESET ZERO button** – Resets the Zero Compensation offset to the default value of 0V PLC input = 0.0 ppm. See section 4.2.4 **EXIT button** – Returns to the Main Monitoring screen. **AUTO ZERO Enable / Disable Button** – Allows the user to toggle the AUTO ZERO feature on and off. Will not be visible if AUTO ZERO is not available on the unit. See section 4.2.3 **Screen Diagnostic button** – Accesses a screen diagnostic page (for troubleshooting ONLY) **Screen Contrast Adjust button** – Accesses a contrast setting screen to adjust the display to different lighting conditions. See section 4.5 **Password Logoff button** – Resets password login status to OFF after accessing any password protected parameters cancelling the 5 minute login access window.

TABLE 3-2

4.1.1 SEQUENTIAL DWELL TIME ENTRY

The sequential DWELL TIME determines the duration of sampling at each sample point. The factory setting for the DWELL TIME or your unit is indicated in section 1.3. This value can be changed by the user on the USER SETUP screen by pressing the **SEQUENCING DWELL TIME** display field. This will open a password entry window. Press the 0-9 key to display the numeric entry pad then enter the Level 1 password indicated in section 1.3. Once the password is entered, touch the DWELL TIME display field again and a numeric entry field will open at which the user may enter the desired dwell time in hours/minutes/seconds format and save by pressing the arrow key (enter) in the bottom right corner of the entry window.

Dwell time should be considered carefully as too little time will result in incomplete sensor response and too much time will result in an overly long total sequential cycle duration. Factors to consider include the length of sample tubing runs for each point and the related sample draw time from inlet to sensor, as well as the response time of the sensor. The factory set DWELL TIME was chosen taking these factors into account and is the recommended time based on the known factors for your application.

4.1.2 DIAGNOSTIC DISPLAYS

There are 3 available diagnostic display fields on the USER SETUP screen for use in troubleshooting. These displays are detailed below:

TOTAL SENSOR OUTPUT LOSS – Indicates the amount of decay in sensor output since the initial calibration for the sensor. This value can help when troubleshooting potential sensor related problems.

PRE-ZERO INPUT VALUE – Indicates raw PLC input value independent of zero compensation correction.

ZERO INHIBIT LEVEL – Indicates the factory setting for the ZERO INHIBIT level. For user reference when assessing ZERO INHIBIT conditions that may occur.

4.1.3 FACTORY SETUP BUTTON

The **FACTORY SETUP** button allows password protected access to all of the factory setup parameters. Password is generally only made available to users for extreme troubleshooting circumstances or when setup alterations are necessary in the field. Contact the *Interscan systems dept.* should you feel factory setup access is required. (see end of manual for *Interscan* contact information).

4.1.4 SCREEN CONTRAST ADJUST BUTTON

This button provides access to a display contrast adjustment screen. The screen contains a series of color bars with buttons for making the overall display brighter (top button) and darker (second button from top) and an exit button (bottom button) along the right edge of the screen. Touching an adjustment button raises or lowers the contrast levels by one increment. Pressing the exit button returns to the previous screen.

4.2 Zeroing The Monitor

Zeroing provides a means to compensate for the sensor's natural "background current", a slight amount of output from the sensor when no target gas is present causing a positive or negative display reading when the display should read zero. This output can fluctuate due to sensor aging and changes in ambient temperature causing "zero drift". Zeroing should be performed with regular maintenance cycles and additionally as needed to ensure accurate sample readings.

Zeroing is accomplished by exposing the sensor to a "zero air" condition by diverting sample through a scrubbing filter that scrubs out any gases the sensor might respond to. The sensor is allowed time to stabilize to this condition after which the display is adjusted for a zero reading. (For CO units, zeroing is carried out by shutting the pump off and allowing the sensor to stabilize to a "no flow" condition prior to adjusting the display).

Certain sampling conditions will inhibit zeroing until such conditions are no longer present. A list of these conditions is shown below:

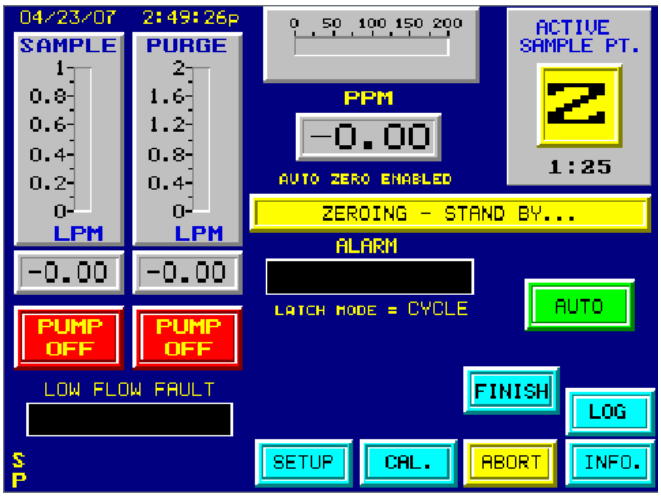
Latched Alarms are present – Alarms must be reset manually before zeroing can be performed.

PPM reading is above a factory set "ZERO INHIBIT" level – Sensor must recover to below the ZERO INHIBIT level before zeroing can be performed. ZERO INHIBIT level is displayed on the USER SETUP screen.

The Pump is off – The pump must be running for zeroing to commence (CO units exempt)

4.2.1 MANUAL ZERO PROCEDURE

To initiate the MANUAL ZERO procedure, press the **ZERO** button at the bottom edge of the HMI Touch Screen. Once pressed, the sample and purge valves will close, the purge pump will turn off (for CO units, the sample pump will also turn off), and the CAL/ZERO valve will open diverting zero air to the sensor. On the screen, the ACTIVE SAMPLE PT. display will change to a yellow flashing **Z,** the TIMER DISPLAY will show the ZERO DURATION time



counting down, the **ZERO** button will change to a yellow **ABORT** button and the message bar will appear with text guiding the user through the procedure. (see ZERO MODE screen shot above). During this time, the Flow Rate should be adjusted to the recommended value using the **CAL FLOW ADJUST** control (lower needle valve knob) on the right side of the display panel (CO Units excluded).

Once the ZERO DURATION timer elapses, a **FINISH** button will appear and the message bar will instruct the user to "PRESS FINISH" after confirming sensor output stability to finalize the routine and automatically adjust the display reading. The unit will then be returned to its previous operational mode.

4.2.2 MANUAL ZERO MODE MESSAGES

Below is a list of the messages that may be displayed during MANUAL ZERO MODE and the proper response to each message:

"ZEROING – STAND BY…"	Indicates the sensor is stabilizing to the zero air condition. Wait for the next message.
"IN ALARM – ABORT ZERO"	Indicates a latched alarm is present. Press **ABORT** to exit ZERO MODE. Reset latched alarms before returning to ZERO MODE.
"HI PPM – ABORT ZERO"	Indicates the PPM value exceeds the factory set ZERO INHIBIT level (see USER SETUP page). Press **ABORT** to exit ZERO MODE then wait for ppm level to drop below the ZERO INHIBIT level before returning to ZERO MODE.
"PUMP OFF – CANNOT ZERO"	Indicates the SAMPLE pump needs to be turned on before zeroing can commence. Press the SAMPLE PUMP ON/OFF button to turn the pump on.
"SENSOR STABLE? – PRESS FINISH".	Indicates ZERO DURATION timer has elapsed. Confirm that the ppm reading is stable and not steadily rising or falling then press the **FINISH** button to complete the ZERO routine.
"ZERO LIMIT – CANNOT ZERO"	Indicates a ZERO LIMIT FAULT has occurred during zeroing. Press **ABORT** to exit ZERO MODE then address the ZERO LIMIT FAULT (see section 4.4.2 for more on ZERO LIMIT FAULTS.)

Table 3-3

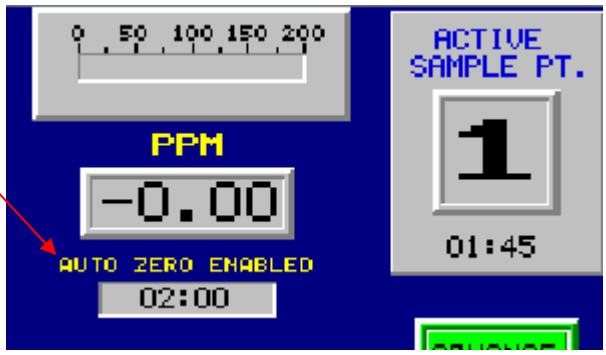
4.2.3 AUTO ZERO

In addition to the MANUAL ZERO procedure, many units will be provided with the AUTO ZERO option. When enabled, AUTO ZERO provides for periodic automatic zeroing of the monitor with timing determined by the AUTO ZERO INTERVAL (time between zero cycles) and the ZERO DURATION (length of the zero cycle). The PLC will interrupt normal sampling when the AUTO ZERO INTERVAL timer elapses and enter ZERO MODE for the preset ZERO DURATION after which the unit will return to the previous sampling mode after the zero correction is made.

Because this feature does interrupt normal sampling, it's best to use it only in applications where significant and regular zero drift is occurring. It is usually employed on lower range systems where zero drift is more pronounced and/or applications where extreme temperature fluctuations may exist.

AUTO ZERO can be enabled and disabled from the USER SETUP SCREEN by pressing the **AUTO ZERO ENABLED/DISABLED** button. If the button is lit GREEN and reads ENABLED, pressing the button will disable the feature. If the button is lit RED and reads DISABLED, pressing the button will enable the feature.

When AUTO ZERO is enabled, the main screen will indicate "AUTO ZERO ENABLED" just below the PPM Display with the ZERO INTERVAL timer displayed just below the enabled designation as shown to the right. The time shown on the timer is the time remaining until the next zero cycle.



AUTO ZERO will be inhibited by the same conditions that can inhibit MANUAL ZERO. See section 4.2.2 for a description of these conditions.

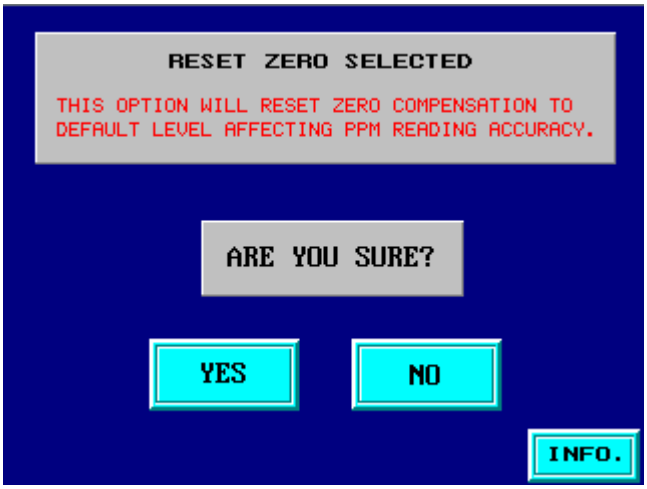
The factory set ZERO INTERVAL and ZERO DURATION times were chosen based on known sensor characteristics and are the recommended values. Should it become necessary in the field to change these values, the preset times can be altered by the user at the USER SETUP screen by pressing either of the associated parameter display fields. This will open a password entry window. Press the 0-9 key to display the numeric entry pad then enter the Level 1 password indicated in section 1.3. Once the password is entered, touch the desired entry field again and a numeric entry field will open at which the user may enter the desired value for the parameter

selected in hours/minutes/seconds format and save by pressing the arrow key (enter) in the bottom right corner of the entry window.

AUTO ZERO time values should be considered carefully. Too little ZERO DURATION time will result in false zero settings and too much time may interrupt sampling for unnecessarily long periods. Shorter ZERO INTERVALS will result in more frequent zeroing and interruption of sampling while longer intervals may result in greater amounts of zero drift between zero cycles. Contact the *Interscan Service Dept.* for advice on AUTO ZERO setup.

4.2.4 RESETTING ZERO COMPENSATION

There may be cases such as when replacing an old sensor or when troubleshooting that it may be necessary to reset the zero compensation offset to the default setting (0V input at PLC = 0 PPM displayed). This can be accomplished in the USER SETUP screen by pressing the **ZERO RESET** button. Pressing this button will open the confirmation screen shown below. Press **YES** to proceed with the reset or **NO** to return to the previous screen with no change.



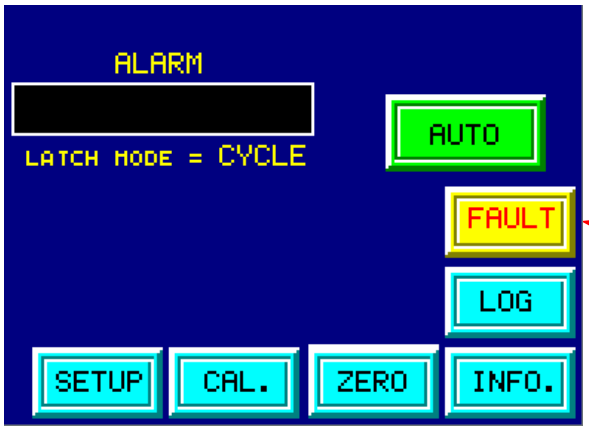
Resetting the zero compensation to default may result in alarm activity depending on where the alarms are set. ALWAYS manually re-zero the unit before resuming sampling after resetting zero compensation.

4.3 Cal Mode

CAL MODE facilitates the CAL procedure which is part of the recommended regular maintenance for the system. Pressing the **CAL** button on the main screen opens the CAL METHOD SELECTION screen from which the user will be directed by on screen messaging as to how to proceed through the procedure. See section 5 for details on CAL MODE.

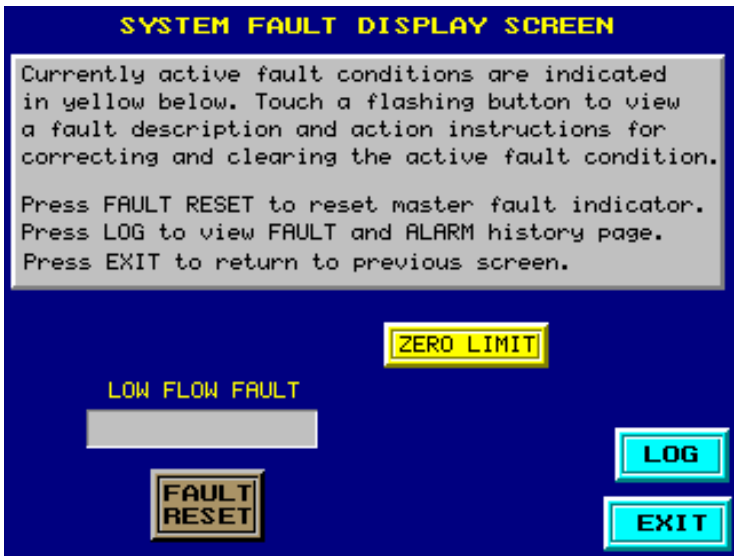
4.4 System Faults

A SYSTEM FAULT condition is an indication of a problem in the monitor that may require some maintenance or repair. FAULT conditions will be indicated by the flashing FAULT button on the main screen as shown at the right as well as by actuation of the COMMON FAULT RELAY OUTPUT (output B on TB5) and the FAULT VISUAL INDICATOR OUTPUT (TB2-3/TB2-4 - see sections 4.2 and 4.4 of the system INSTALLATION MANUAL.)



Fault Indicator Button

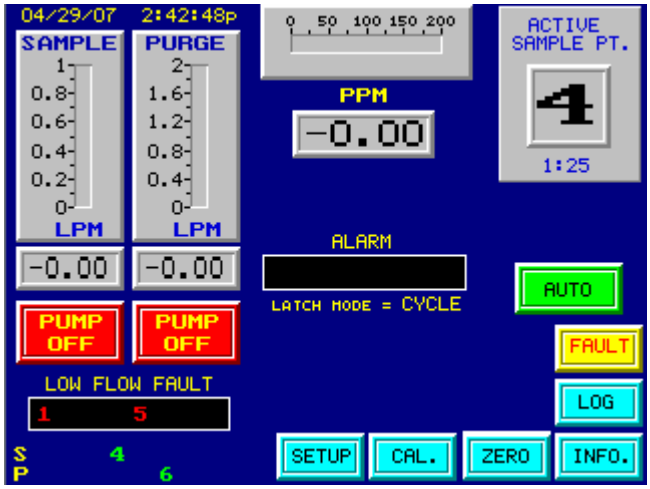
When a FAULT condition occurs, pressing the **FAULT** button will open the SYSTEM FAULT DISPLAY SCREEN shown below (ZERO LIMIT FAULT example shown) which will indicate which fault has occurred and instruct on what actions to take. Follow the onscreen directions to manage the fault condition and clear the fault indication.



4.4.1 LOW FLOW FAULT

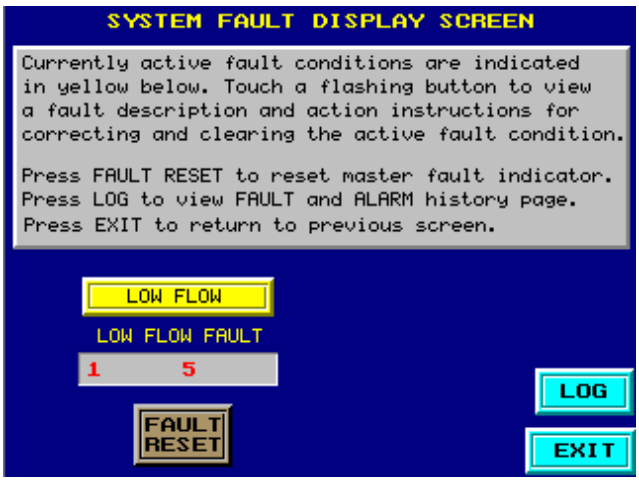
The LO FLOW FAULT is an indication of a drop in flow rate below a factory set fault level. This is typically the result of a clogged or blocked inlet filter or sample line obstruction (sharp bend or kink in the inlet tubing) but can also occur if the flow rate is incorrectly set below the fault trigger level. LOW FLOW conditions cause decreased sensor accuracy or even damage to the sensor from increased vacuum in the line in cases of inlet blockage.

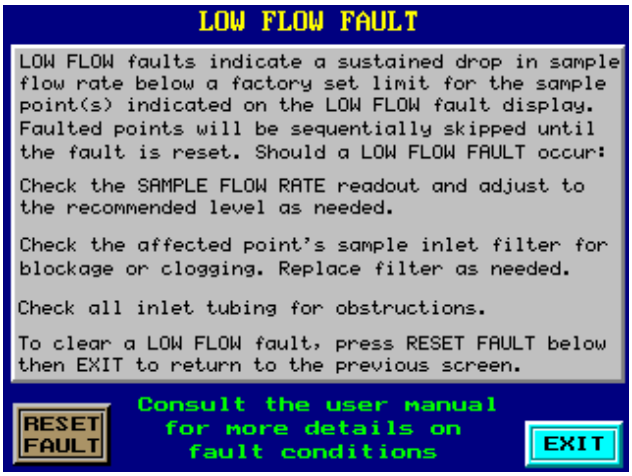
For units operating at the recommended **0.50 LPM** flow rate, the LOW FLOW FAULT trigger level will be **0.35 LPM.** If the flow rate drops below this level for more than 5 seconds, a LOW FLOW FAULT will occur for the point being sampled. This will be indicated on the HMI Touch Screen by the flashing **FAULT** button and a numeric indication corresponding to the faulted point on the **LOW FLOW FAULT** display as shown on the right (points 1 and 5 shown as faulted examples). Additionally, all fault relay outputs will energize including the optional FAULT TOWER LIGHT indicator.



LOW FLOW FAULTS will affect the sample sequencing by causing the faulted points to be skipped in the sequential cycle. In the example above, points 1 and 5 will be skipped by both the SAMPLE and PURGE valve sequencing until the faults are cleared.

Pressing the **FAULT** button during a LOW FLOW FAULT condition will open the SYSTEM FAULT DISPLAY SCREEN which will display a flashing yellow LOW FLOW FAULT button as well as general fault action instructions shown below left. Pressing the LOW FLOW FAULT button will open an instruction screen describing what to do about the fault condition as shown below right. It is recommended that the causes of the fault conditions be assessed and eliminated before clearing the fault indications. The fault message/display screens can be exited without clearing the faults by pressing the **EXIT** buttons to return to the main screen. The main screen **FAULT** button will still be displayed though it will no longer be flashing and all fault relay outputs will remain active until the faults are cleared.

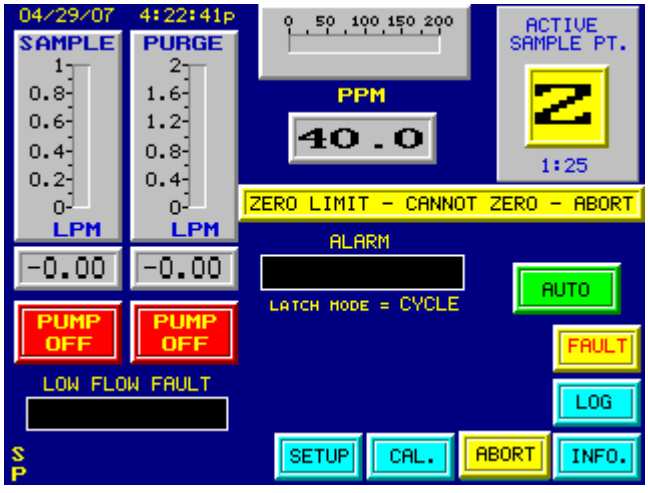




Once the cause of the fault has been determined and rectified, press the **RESET FAULT** button from either LOW FLOW FAULT instruction screen or the SYSTEM FAULT DISPLAY SCREEN. This will clear the on screen LOW FLOW FAULT display indicators as well as the main screen FAULT button indicator and all fault relay outputs. Refer to section 7 of this manual or contact the *Interscan service dept* should assistance be required in determining the cause of a LOW FLOW FAULT.

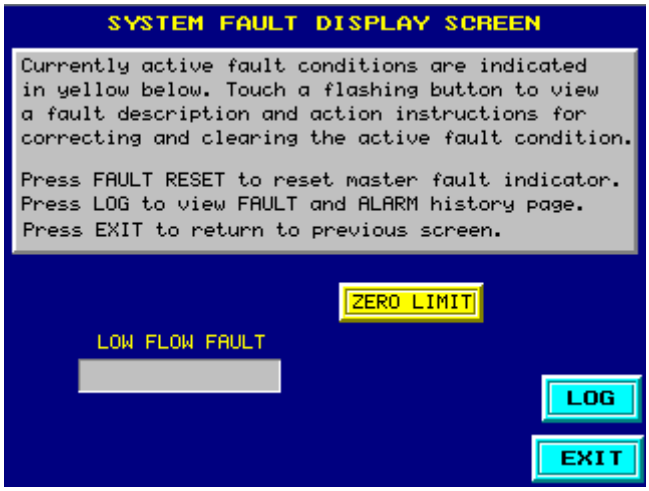
4.4.2 ZERO LIMT FAULT

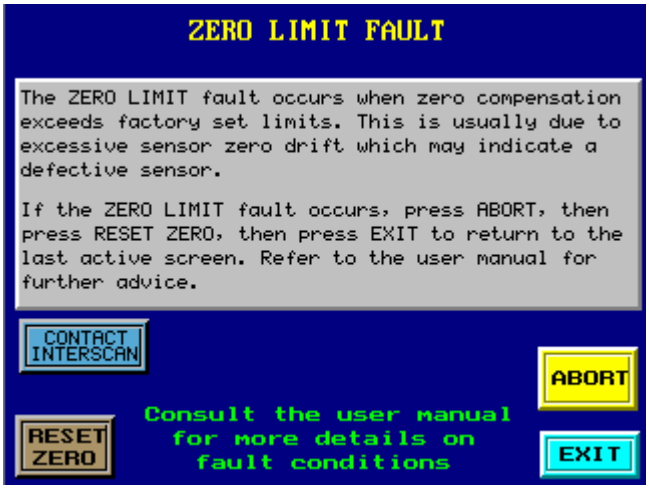
The ZERO LIMIT FAULT occurs during manual or auto zeroing when the cumulative amount of zero offset correction necessary to obtain a ZERO PPM reading exceeds the factory set zero offset limit. This is typically a sign of a faulty sensor that is exhibiting excessive zero drift. Frequently this results from inadequate sensor maintenance (see section 6.2) or may just be a sign of a worn out sensor. Generally, when this fault occurs, the sensor will need to be replaced as zeroing cannot be accomplished with the sensor connected and as such, sampling will be inaccurate.



When a ZERO LIMIT FAULT occurs during a zero mode cycle, the message bar will indicate "ZERO LIMIT – CANNOT ZERO - ABORT" and the **FAULT** button will appear as shown above.

Additionally, all fault relay outputs will energize including the optional FAULT TOWER LIGHT indicator. At this point the user can either advance to the SYSTEM FAULT DISPLAY SCREEN from ZERO MODE by pressing the **FAULT** button or abort the ZERO MODE first by pressing the **ABORT** button and then opening the SYSTEM FAULT DISPLAY SCREEN by pressing the **FAULT** button. The SYSTEM FAULT DISPLAY SCREEN will display the **ZERO LIMIT** button as shown below left. Pressing this button will open the ZERO LIMIT information screen shown below right which instructs on fault causes and how to clear the fault indication.





The fault cannot be cleared until ZERO MODE has been aborted which can be done by pressing the **ABORT** button either from the main screen or the ZERO LIMIT information screen as shown above. Once aborted, the **RESET ZERO** button will be visible on the ZERO LIMIT info screen which when pressed will reset the zero compensation to its default setting (0V input at the PLC = 0 PPM displayed) and clear all fault displays and relay outputs.

NOTE: Resetting zero compensation may result in alarm activity depending on where the alarm level(s) are set. ALWAYS manually re-zero the unit before resuming sampling after resetting zero compensation.

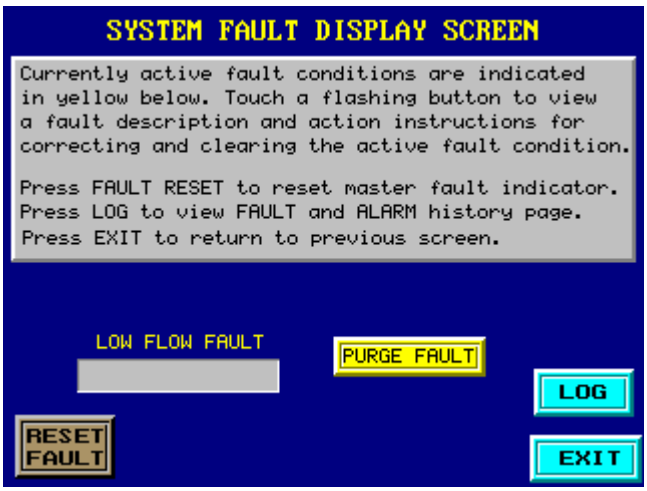
Refer to section 7 of this manual or contact the *Interscan service dept* should assistance be required in determining the cause of or actions required for a ZERO LIMIT FAULT.

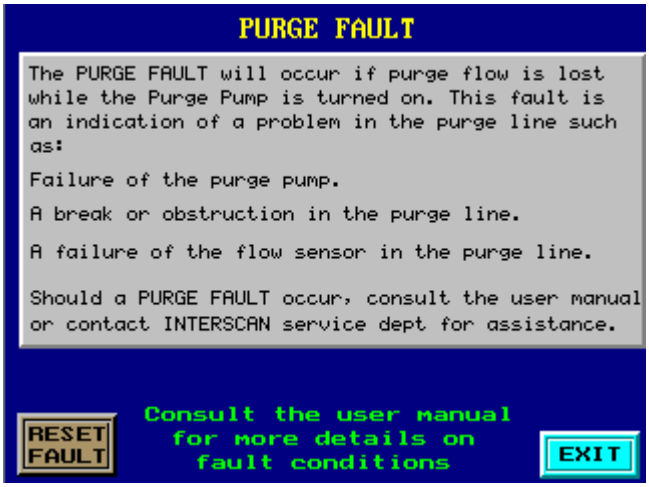
NOTE: The ZERO LIMIT FAULT inhibits normal sampling until the fault is manually reset. If AUTO ZERO is employed, external local and/or remote system fault indication is advised if the monitor status is not to be checked <u>locally</u> on a regular basis.

4.4.3 PURGE FAULT

The PURGE FAULT indicates a loss of purge flow to the PURGE FLOW SENSOR that measures the flow rate in the purge line. This would most likely be the result of PURGE PUMP failure or an opening in the purge line internally.

When a PURGE FAULT occurs, the flashing **FAULT** button will appear on the main screen and all fault relay outputs will energize including the optional FAULT TOWER LIGHT indicator. Pressing the **FAULT** button will open the SYSTEM FAULT DISPLAY screen which will display the flashing PURGE FAULT button as shown below left. Pressing this button will open the PURGE FAULT info screen shown below right.



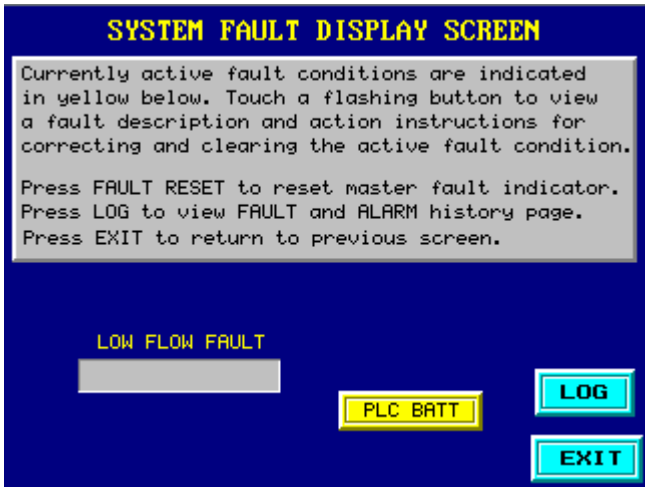


Once the cause of the fault has been determined and rectified, press the **RESET FAULT** button from either PURGE FAULT instruction screen or the SYSTEM FAULT DISPLAY SCREEN. This will clear the on screen PURGE FAULT display button as well as the main screen FAULT button indicator and all fault relay outputs. Refer to section 7 of this manual or contact the *Interscan service dept* should assistance be required in determining the cause of a PURGE FAULT.

4.4.4 PLC BATTERY FAULT

The volatile memory in the PLC (alarm set points, alarm history etc.) is protected in the event of a power outage by an internal battery. The battery voltage is monitored by the PLC and when it falls below a nominal level, a PLC BATTERY FAULT will occur indicating that the battery must be replaced. THIS WILL NOT AFFECT NORMAL OPERATION OF THE UNIT providing AC power is maintained and the unit is not manually turned off.

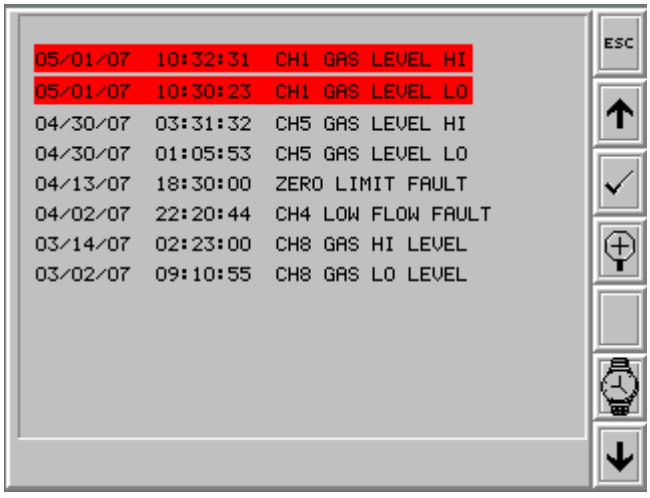
When a PLC BATTERY FAULT occurs, the flashing **FAULT** button will appear on the main screen and all fault relay outputs will energize including the optional FAULT TOWER LIGHT indicator. Pressing the **FAULT** button will open the SYSTEM FAULT DISPLAY screen which will display the flashing PLC BATTERY FAULT button as shown below left. Pressing this button will open the PLC BATTERY FAULT info screen shown below right.



In the case of a PLC BATTERY FAULT, contact the *Interscan Service Dept.* to order a new battery and installation instructions.

4.5 Alarm & Fault History

All alarm and system fault activity is logged on a history page where the individual event(s) and the date/time of occurrence can be viewed. Pressing the **LOG** button on the main screen opens this history screen. A sample of the screen is shown to the right.



Events highlighted in red are currently active while events without a background occurred at some time in the past. The buttons along the right side of the screen facilitate various viewing options for the screen as detailed below:

 Scrolls up through the list when there are more events than will fit on the screen.

 Scrolls down through the list when there are more events than will fit on the screen.

 Facilitates zooming in and out to view more events (distant zoom) or to view larger text (close up zoom). Pressing the button cycles through 5 zoom levels.

 Changes data format of event display. Pressing the button increments through 4 different formats including event only, event/time/date etc.

Returns to previous screen.

4.6 Sensor Protection (Optional Feature)

In some gas sampling applications, it is necessary to protect the sensor from high concentrations of the gas being sampled. In these cases, the automatic SENSOR PROTECTION feature will be factory enabled. When enabled, the sample pump will automatically shut down when the PPM level exceeds the full scale range of the unit and restart after the PPM level decays below approximately 85% of the full scale range. If after restart the high gas concentration is still present, the sensor output will rise to the shutoff level and the pump will again be turned off. This on/off cycle will repeat until the source of the high gas concentration is eliminated. All alarms will continue to function while the pump is off in this condition.

Section

5

System Calibration

5.1 Introduction

All *Interscan* instruments are calibrated at the Factory prior to shipment. Calibration at instrument startup is not required.

Calibration is required periodically to compensate for the natural decrease in the *Interscan* sensor's "sensitivity" or output relative to the amount of target gas present in the sample. The primary causes of sensitivity decrease are long term exposure to the target gas and **excessive** loss of water by evaporation due to time and temperature (see section 6 for more on sensor maintenance). Frequency of calibration is strictly determined by application, type of target gas and installation conditions. A good rule of thumb is once every quarter but in conditions where gas exposure is high or environmental conditions are moderate to extreme, more frequent calibration may be required.

The instrument is calibrated by one of 2 methods –

GAS CALIBRATION – In this method, a known concentration of gas is introduced to the system, the sensor is allowed to respond to the Cal Gas and the display scaling is updated to adjust for any loss in output since the last calibration. Since this method relies on the cal gas standard as the reference for adjustment, the calibration gas and delivery method must be accurate. The sources of gas standards include commercially available gas mixtures diluted with air or nitrogen in cylinders or permeation devices. See section 5.2 below for more on gas standards.

ECS CALIBRATION – *Interscan*'s "Electronic Calibration Service (ECS) permits the user to calibrate the instrument without the use of cal gas. Calibration is accomplished by replacing the existing sensor with a spare "ECS Certified" sensor kept on hand in the spare sensor position and entering numeric values at the HMI touch screen as indicated on the ECS documentation that accompanies the sensor.

5.2 Calibration Gas Standards

5.2.1 GAS BLENDS IN CYLINDERS

Low concentration gas mixtures (in air or nitrogen) are available with few exceptions, in pressurized cylinders. The major concern in using commercially available mixes of certain active gases is reliability. The analysis results shown on the label are applicable only at the time the analysis was performed. Concentration stability with time varies widely as a function of the gas mix, its container, and the manufacturer. *Interscan* should be consulted for recommendations on commercially available gas mixtures for the particular gas required.

5.2.1 PERMEATION DEVICES

An alternative calibration method is the use of permeation devices containing the gas liquefied under pressure. Permeation of the gas in nanogram-per-minute rates permits the generation of a desired concentration in an air or nitrogen carrier.

Varying the temperature, flow rate, and emission rate characteristics gives a fairly wide range of gas concentrations. Many gases in a low ppm range are ideally suited to the permeation device technique. It is important to remember to keep the permeation device flow rate higher than the recommended flow rate for the *Interscan* monitoring system.

Consult the permeation device manufacturer for complete operation and procedure information.

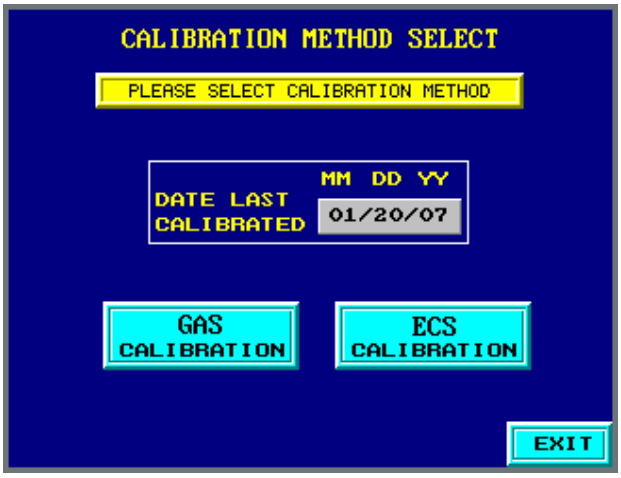
5.3 Sample Bag

Whatever the source of calibration standard, the recommended method of gas collection and delivery is via a proper sample bag, which is then attached to the calibration inlet. The calibration gas is drawn through the sensor by the sample pump. Contact *Interscan* for recommendations on the type of sample bag to use.

IMPORTANT! If calibrating from a self pressurized source, DO NOT APPLY A PRESSURE IN EXCESS OF 4 PSI TO THE CAL INLET AS THIS MAY DAMAGE THE SENSOR AND VOID THE WARRANTY!!

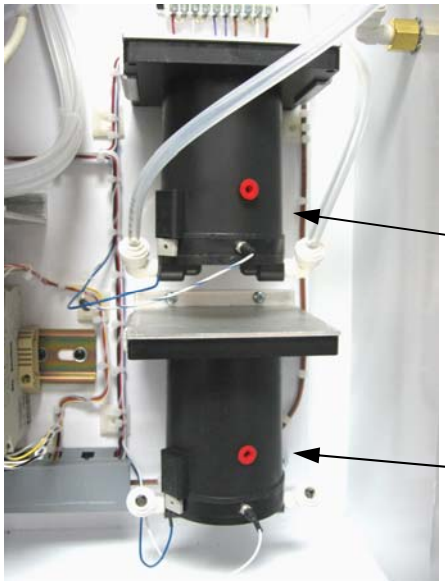
5.4 Calibration Procedure

Calibration is performed by entering CAL MODE from the HMI touch screen. From the main monitoring screen, press the **CAL** button. This will open the CALIBRATION METHOD SELECT screen shown below. From this screen, press the button for the desired calibration method or press **EXIT** to return to the main screen.



NOTE: If there are latched alarms present when entering the CALIBRATION METHOD SELECT screen, the message bar will read “IN ALARM – CANNOT CALIBRATE”. In this case, press **EXIT** to return to the main screen and reset the latched alarms before returning to CAL mode.

5.4.1 ECS CALIBRATION



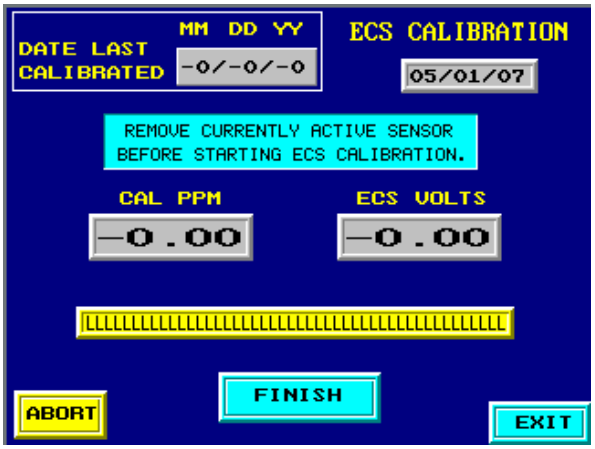
ECS CALIBRATION makes use of a spare factory certified sensor kept on hand in the spare position below the active sensor as shown on the right. The spare sensor is connected to its own bias circuit to keep the sensor charged and ready for use thus minimizing stabilization time when the sensor is made active. This sensor should be accompanied by an ECS certificate that details the entry values that will be used to perform the ECS calibration.

Selecting ECS CALIBRATION will open the confirmation screen shown below on the left. If you wish not to proceed from this point, press **NO** to return to the CALIBRATION METHOD SELECT screen. If

you are sure you want to proceed with ECS CAL, press **YES.** The screen shown below on the right will open. (some buttons shown will not appear until a few steps into the routine). The pumps will now shut down and all sequencing will stop.

The screen will instruct the user to first remove the active sensor and the yellow message bar will display instructions to guide the user you through the ECS CAL routine which is detailed below. Pressing ABORT at any time during ECS calibration will cancel the routine with no changes at which point pressing **EXIT** will return the display to the main monitoring screen.

See section 6.2.2 for sensor removal instructions.



ECS CALIBRATION PROCEDURE

1) Remove the existing sensor from the unit and set aside for return to *Interscan* for re-certification.

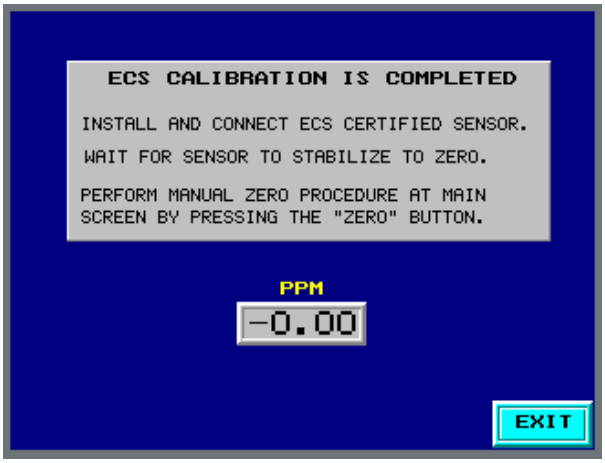
2) Press the **CAL PPM** display field

3) In the numeric entry window that opens, type in the CALL PPM value shown on the ECS certificate that accompanies the sensor being installed. Press the “enter” key (back arrow key in the lower right corner of the entry window) to confirm the value. If you make a mistake, you can simply press the display field again and enter a new value.

4) Press the **ECS VOLTS** display field.

5) In the numeric entry window that opens, type in the ECS VOLTAGE value shown on the ECS certificate that accompanies the sensor being installed. Press the “enter” key (back arrow key in the lower right corner of the entry window) to confirm the value. If you make a mistake, you can simply press the display field again and enter a new value.

6) Once the ECS VOLTS value is entered, a **FINISH** button will appear. Press this button to finalize the calibration. This will open the ECS CAL COMPLETE window shown below.



7) Disconnect the spare sensor from its bias leads and move this sensor to the active sensor location. Connect the active sensor leads, insert tubing into the sensor elbows and secure the sensor to the bracket. Be sure to cover the spare sensor banana plug to protect it from shorting until the next spare sensor is installed.

8) Allow the new active sensor 5-10 minutes to stabilize. (If the new sensor has not been in the unit on bias, more time will be required for stabilization, up to several hours.)

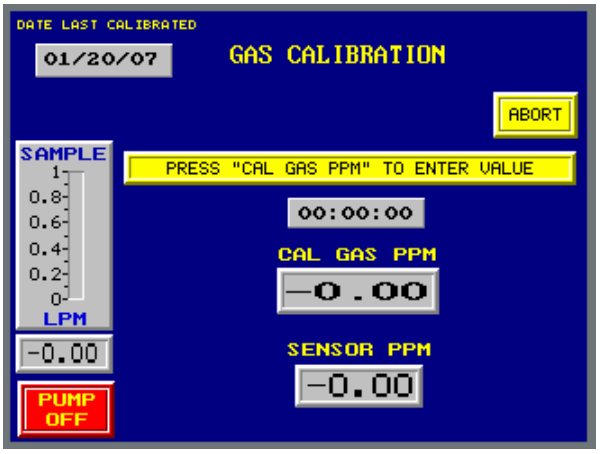
9) Once the sensor reading is stable, press the **EXIT** button to exit CALIBRATION MODE and return the system to the main monitoring screen.

10) Perform the MANUAL ZERO procedure before resuming sampling. See section 4.2.1 for instructions on the MANUAL ZERO procedure.

11) Once zeroed, the unit is ready to resume sampling.

5.4.2 GAS CALIBRATION

Selecting GAS CALABRATION from the CALIBRATION METHOD SELECT screen will call up the GAS CALIBRATION screen shown to the right. The pumps will now shut down and all sequencing will stop. The yellow message bar will display instructions to guide you through the routine. Pressing ABORT at any time during GAS calibration will cancel the routine with no changes at which point pressing **EXIT** will return the display to the main monitoring screen.

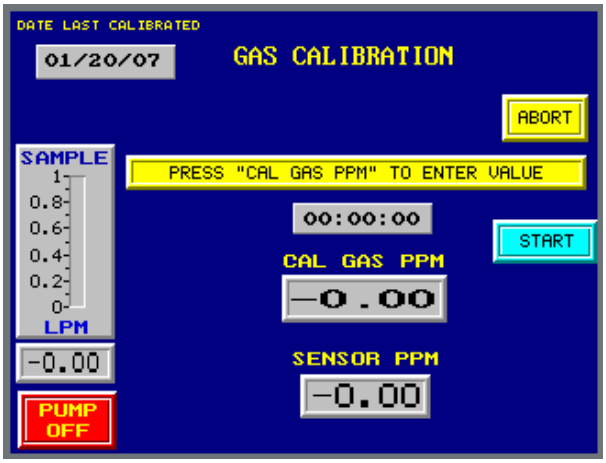


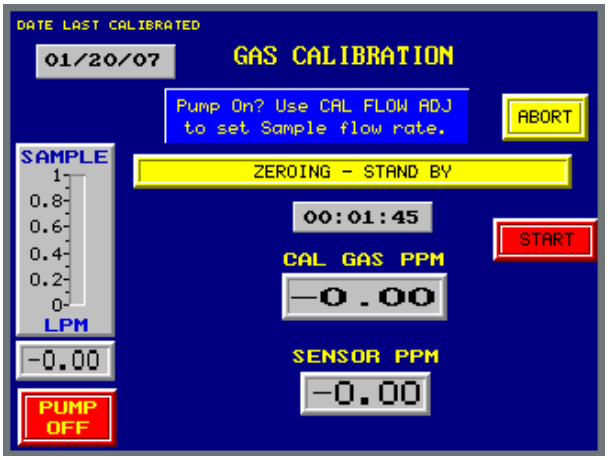
GAS CALIBRATION PROCEDURE

1) Press the **CAL PPM** display field.

2) In the numeric entry window that opens, type in the CAL PPM value for the Cal Gas being used. Press the "enter" key (back arrow key in the lower right corner of the entry window) to confirm the value. If you make a mistake, you can simply press the display field again and enter a new value.

3) Once the CAL PPM value has been entered, a **START** button will appear as shown below left.



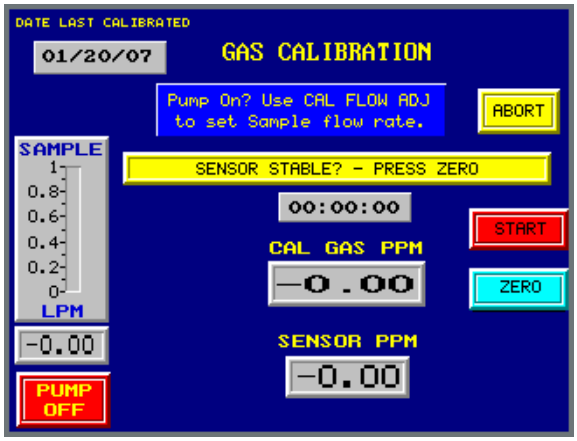


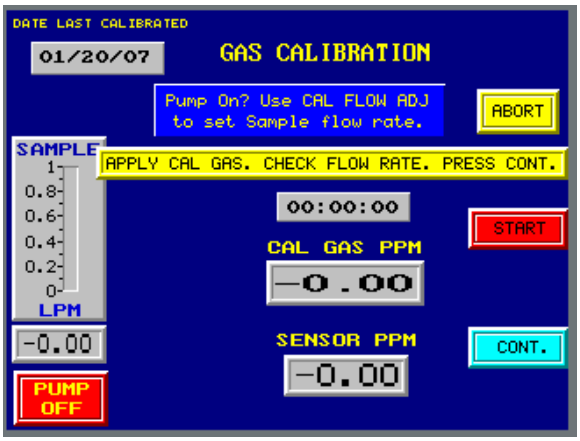
4) Pressing the **START** button will start the ZERO routine during which time the screen will display the messages shown in the screen shot above right and the **START** button will turn red. If the pump is not running, press the **PUMP ON/OFF** button to start the pump and adjust the **CAL FLOW ADJUST** control as needed to establish the recommended flow rate.

NOTE I: **DO NOT USE THE SAMPLE FLOW ADJUST CONTROL FOR ZERO/CAL MODE FLOW RATE ADJUSTMENT. Doing so will require re-adjusting the SAMPLE FLOW rate upon exiting CAL MODE.**

NOTE II: CO monitors do NOT utilize the pump during the ZERO routine. The "PUMP ON?" Message will not display during zeroing for CO units and the SAMPLE PUMP will not run.

The ZERO DURATION timer will count down while the sensor stabilizes to zero conditioning. When the timer fully elapses, a **ZERO** button will appear and the message bar will prompt the user to confirm that the sensor reading is stable and to complete the zero routine by pressing the **ZERO** button. See screen shot below left.



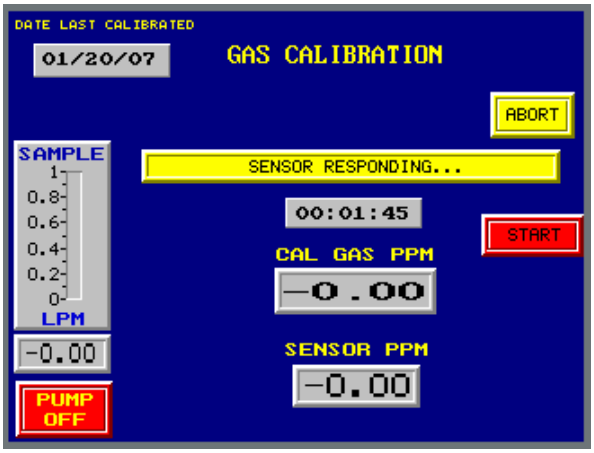


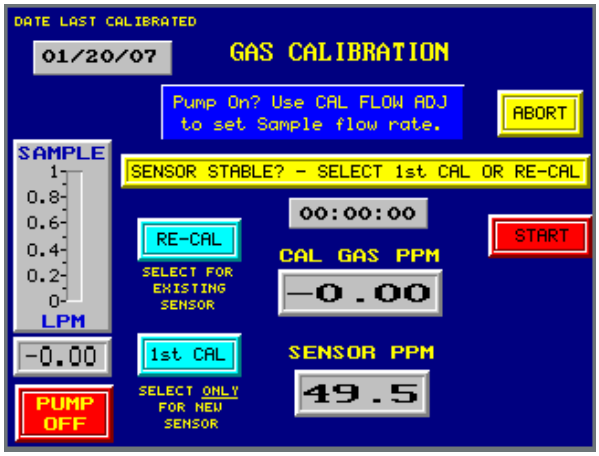
5) Confirm that the PPM reading is stable and not steadily rising or falling. Once confirmed, press the **ZERO** button to set the zero compensation correction and adjust the PPM reading to **0.0 PPM.**

6) The message bar will now prompt the user to apply the Cal Gas, check/adjust the flow rate as needed and press the now visible **CONT.** button to proceed as shown in the screen shot above right. (CO units will now see the "PUMP ON?" message. The user should now confirm the pump is on and the flow rate is correct and adjust as needed per on screen instructions.)

7) The Cal gas sample delivery source should now be connected to the CAL INLET fitting on the lower right side of the front display panel. IF CALIBRATING WITH A SELF PRESSURIZED SOURCE, PRESSURE MUST BE LIMITED TO **4 PSI!** Once the source has been connected, check that the flow rate reads the recommended value (see the Flow Rate label under the CAL INLET fitting) and press the **CONT.** button.

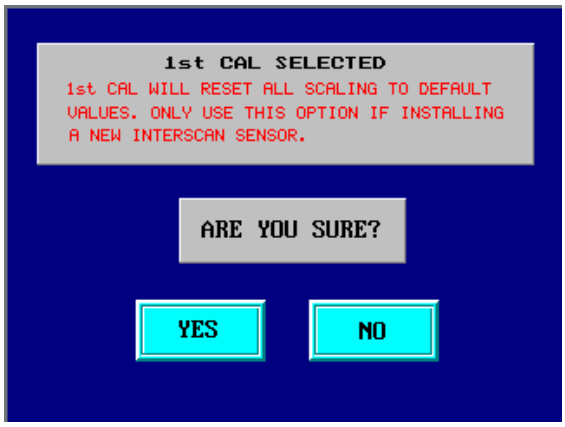
8) The message bar will now indicate that the sensor is responding to the Cal gas being delivered as shown below left. The CAL DURATION timer will begin counting down. Observe the PPM display and confirm that the reading begins rising after several seconds. If this fails to occur, confirm that the cal source is properly connected.





9) When the CAL DURATION timer elapses, the message bar will read "SENSOR STABLE? – SELECT 1st CAL OR RE-CAL" and the **RE-CAL** and **1st CAL** buttons will appear as shown in the above right screen shot. Confirm that the PPM reading has stabilized and is not continuing to rise before continuing.

10) If calibrating an existing sensor, press **RE-CAL** If calibrating a NEW sensor, skip to step 11. Pressing **RE-CAL** will call up the CAL COMPLETED screen shown below on the left. (if a CAL LIMIT WARING screen appears, see section 5.4.3. below). At this point, remove the Cal Gas sample from the CAL INLET and wait for the sensor output to stabilize to zero. Once the sensor has stabilized, press **EXIT** to return to the main screen and resume sampling.

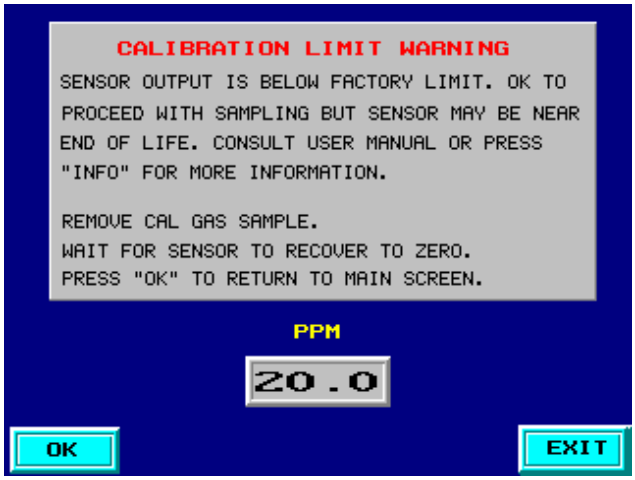


NOTE: EXITING CAL BEFORE THE SENSOR HAS RECOVERED MAY RESULT IN FALSE ALARMS AS CAL MODE INHIBITS ALARM ACTIVITY AND PPM LEVEL MAY BE ABOVE ALARM LEVELS PRIOR TO EXITING CAL MODE.

11) If calibrating a new sensor, press **1st CAL**. This will call up the FIRST CAL CONFIRM screen shown above on the right. If not ready to proceed, press the **NO** button to return to the previous screen. If certain of FIRST CAL selection, press the **YES** button to advance to the CAL COMPLETED screen shown above on the left. Remove the Cal Gas sample from the CAL INLET and wait for the sensor output to stabilize. Once stabilized, press **EXIT** to return to the main screen.

5.4.3 CAL LIMIT WARNING

If after completing a calibration the sensor output has fallen below a factory set percentage of its original value, the CAL LIMIT warning screen shown below will appear at the end of the cal routine. The CAL LIMIT warning is an indication that the sensor output has decayed to a point at which the sensor may be near its end of life and replacement should be considered.



Generally, if the sensor is still responding to gas and its response time is not overly slow (i.e. sensor responds fully to cal gas within the allotted CAL DURATION time), the sensor is still usable and this screen can be exited as directed to resume normal sampling. A significantly slowed response time however usually indicates a sensor at the end of its life and coupled with a CAL LIMIT WARNING is the best indication that it's time to replace the sensor. **Contact the INTERSCAN SERVICE DEPARTMENT for advice on sensor status should a CAL LIMIT WARNING occur.**

Section

6

Maintenance

All Interscan monitors require periodic maintenance to ensure accurate gas monitoring as well as maximized sensor life. This section details recommended maintenance procedures.

6.1 Inlet Particulate Filter

All *Interscan* monitors utilize an inlet particulate filter to keep particulate matter from entering the sensor and pneumatics. Multi-point monitors will be provided with SAMPLE POINT STATIONS, one for each monitored location with the appropriate type filter attached. The particulate filters should be checked and changed periodically to ensure optimum flow performance. Frequent LOW FLOW faulting or need for upward adjustment of the sample flow rate may indicate a clogged particulate filter. Periodic replacement on a field-determined time interval (for your particular installation) is the best approach. If regular maintenance checks reveal heavily packed or clogged filters, more frequent inspection is indicated. Types of filters employed and maintenance procedures are detailed in the following sections.

6.1.1 MILLIPORE TEFLON FILTER

The Millipore inlet particulate filters are used for most gas applications OTHER THEN Carbon Monoxide monitoring. For CO applications, see section 6.1.2 below.

The Millipore inlet filter is a thin Teflon disc element housed in the round plastic housing shown at right. To inspect or change the filter element, unscrew the outer section of the round filter housing attached to the sample point station revealing the filter element disc. If the disc is noticeably dirty or clogged, replace it with a new one. It is also a good idea to inspect the inside of the inlet port and clean as necessary.

Insert the new filter element with the dull side facing out from the housing. Carefully screw the outer housing back on to the inner housing making sure the element stays flush against the inner housing surface.

6.1.2 KOBY CHARCOAL FILTER

The Koby charcoal filter utilized primarily in Carbon Monoxide monitoring applications is shown at right. This filter is a sealed canister design and as such cannot be visually inspected. As such it is recommended that the filter be replaced once per quarter for optimum performance. To replace the filter, simply unscrew the filter canister from the bulkhead fitting attached to the SAMPLE POINT STATION, discard and screw the new filter in place.

6.2 Sensor Maintenance

Sensors in continuous monitoring systems under continuous operation lose water by evaporation. Optimum performance requires that this water be replaced periodically. This is done by injecting **distilled** or **deionized** water into the sensor via the fill hole (covered by the red plug) using the plastic 10 ml syringe provided.

6.2.1 SENSOR WEIGHT

Water loss in the *Interscan* sensor is determined by weight loss. *Interscan* recommends sensor weight loss not be allowed to exceed 25 grams, or weight GAIN to exceed 10 grams. It is recommended that the sensor be weighed every 6 weeks. The sensor can be weighed by removing the sensor from the system and comparing the current weight of the sensor, with its original weight (in grams) shown on the label on underside of the sensor base.

6.2.2 SENSOR REMOVAL

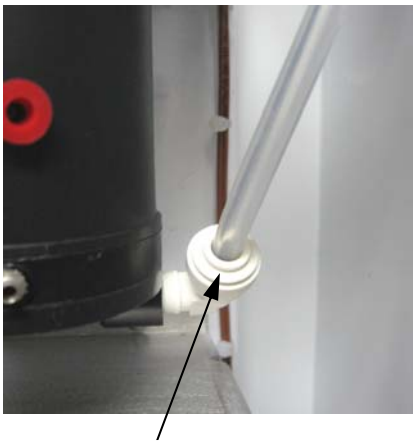
To remove the sensor, turn power to the unit off and disconnect the banana plug and block connector from the sensor as shown below.

Disconnect the tubing from the sensor by pushing in on the inner collar on the sensor elbow fittings while simultaneously pulling out on the tubing. Unscrew the 2 screws holding the sensor base to the slide in bracket and slide the sensor away from the bracket. See photos below.

For Formaldehyde and Hydrazine sensors, remove the sensor body from the sensor base by loosening the clamp screw and lifting the sensor body away from the base. **NOTE: DO NOT REMOVE ANTHING ELSE FROM THE SENSOR!**

Banana Plug – Be sure to cover to prevent shorting.

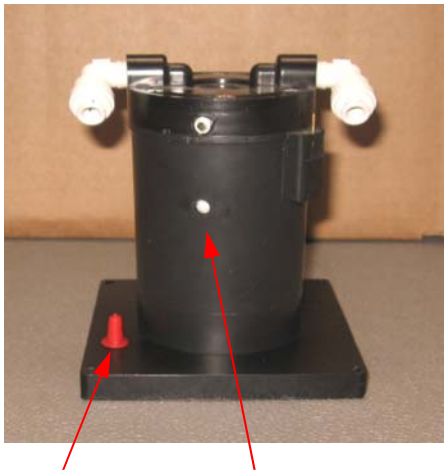
Block Connector. Gently pull away from sensor pin.



Tube Fitting inner collar. Press in while pulling out on the tubing.

6.2.3 SENSOR REFILLING PROCEDURE

1. Remove the red fill plug from the side of the sensor. Using the syringe supplied in the maintenance package, inject an amount of **distilled** or **deionized** water in cc's equal to the weight loss in grams via the fill hole. EX: 10g weight loss requires adding 10cc of water. Inject the water slowly to allow it to flow into the reservoir matrix. **DO NOT OVERFILL!** If at any time during the fill process you observe droplets trickling out of the fill hole, STOP FILLING, remove the syringe and replace the fill plug.
2. If the sensor has gained weight up to 10g, no action is required. NEVER remove water from the sensor as this will remove electrolyte as well and damage the sensor. If weight gain exceeds 10g, contact the *Interscan Service Dept.* for instructions.



Fill Plug Fill Hole

Adding water with syringe.

3. Re-install sensor in the slide in bracket and secure with the 2 thumb screws. Reconnect the tubing by pushing the end of the tubing into the elbow fitting and pulling back gently to ensure a tight seal. Reconnect the banana plug and block connector.
4. Once the sensor is fully installed, switch power to the unit ON and allow 15 minutes to 1 hour for stabilization in STARTUP MODE. Once a stable PPM reading is confirmed, press the **EXIT STARTUP** button to bypass the remaining startup duration. Read the text on the warning screen that appears the press **EXIT STARTUP** again if certain the sensor is stabilized.
5. Perform a MANUAL ZERO by pressing the **ZERO** button and following the on screen directions. See section 4.2 for instructions on zeroing the monitor.
6. Once zeroed, the unit is ready for operation.

6.3 HMI Touch Screen Faceplate Replacement

Continued use of the HMI Touch Screen will cause wear of touch surface over time. A replacement faceplate is provided with the unit. To replace the Touch Screen faceplate, use an "Exacto" type knife to pry away the old faceplate starting in a corner. Remove the center and mid-frame protective sheets from the new faceplate then peel away the adhesive backing to expose the adhesive on the edges of the faceplate. Carefully place the new faceplate over the inset where the old faceplate had been situated and press into place.

Section

7

Troubleshooting

A high percentage of service problems often result from little things you can find and fix yourself. Always consult with the *Interscan Service Dept.* for problems not on this list or if suggested corrective actions fail to fix the problem. ALWAYS turn power off before working inside the unit.

Symptom	Corrective Action or Probable Cause
No power	• Check that power switch is on. • Turn power off and check main fuse (F1) located behind the display panel on the left side of the unit chassis. If fuse is blown, replace with AGC-2A and turn power back on. If fuse continues to blow, contact the *Interscan* Service Dept.
Can't achieve 0.50 LPM flowrate.	• Determine if this is true for ALL sample points. • If so, check all tubing connected to the sample pump, sample flow sensor, flow control needle values and gas sensor for breaks or leaks. • Check sample flow sensor for visible wiring or tubing interruptions. • If only isolated sample points are affected, check inlet filter(s) for blockage. • Check all sample tubing for kinks.
Liquid in exhaust line tubing.	• Sensor may have leaked electrolyte. Consult with Interscan service dept. for sensor, and affected component replacement.

Symptom	Corrective Action or Probable Cause
Frequent Low Flow Faulting.	• Check for proper flow rate in sampling mode and adjust as necessary using the SAMPLE FLOW ADJUST knob. • Check inlet filters for clogging or blockage • Check sample tubing runs for kinks or obstructions.
Purge Fault.	• Check that purge pump is running. If not and pump status button is ON, pump may be faulty. • Check all tubing connected to the purge pump for visible breaks or leaks. • Check purge flow sensor for visible wiring or tubing interruptions.
No response to gas	• Check all sensor electrical and tubing connections and ensure that nothing is loose. • Check for solid connection of circuit board connector to sensor circuit board (sensor circuit boards are located behind the display panel to the left of the HMI display). • Confirm that the proper flow rate is displayed during sampling AND calibration. • Check for a voltage at the OUTPUT and ground test points on the display panel when sensor should be responding. • Check the BIAS voltage at the test points on the display panel and confirm that it is correct according to table 7-1 below.
Cannot Zero (ZERO LIMIT FAULT)	• Check the Bias voltage at the test points on the display panel and confirm that it is correct according to table 7-1 below. • Press the RESET ZERO button on the USER SETUP screen then perform a MANUAL ZERO as directed in section 4.2 • Can the unit be zeroed with the sensor unplugged? • If YES, Sensor may be bad. Contact the *Interscan* service dept. • If NO, sensor electronics may be faulty. Contact the *Interscan* service dept.

TABLE 7-1 BIAS VOLTAGES

GAS	BIAS VOLTAGE RANGE
CO	665 - 687 mV
EtO	390 - 410 mV
HCl / HCN	480 - 500 mV
MMH / HZ	240 - 260 mV
HCHO	190 - 210 mV
SO_2	540 - 560 mV
Cl_2	-790 - -810 mV
ClO_2	-790 - -810 mV
NO_2	-790 - -810 mV
NO / NO_X	340 - 360 mV
H_2S	490 - 510 mV

Section

8

Warranty

Interscan Corporation warrants continuous monitoring systems of its manufacture (sensors, batteries, fuses, lamps, tubing, fittings, filters, and scrubbers excepted) to be free from defects in material and workmanship for a period of one year from date of shipment.

Interscan Corporation warrants sensors of its manufacture to be free from defects in material and workmanship for a period of six months from date of shipment.

Interscan Corporation's sole obligation under this warranty is limited to repairing or replacing, at its option, any item covered under this warranty, when such item is returned intact, prepaid to the factory (or designated service center).

This warranty does not apply to any of our products which have been repaired or altered by unauthorized persons, or which have been subject to misuse, negligence, or accident, incorrect wiring by others, installation or use not in accordance with instructions furnished by the manufacturer, or which have had the serial numbers altered, effaced or removed. The sensors are factory sealed and must not be opened or modified in the field for the warranty to remain in effect. This warranty is in lieu of all other warranties, whether expressed or implied.

This warranty does not apply to any of our products, that have had any program and/or software changes incurred, without written authorization from *Interscan Corporation*.

Additionally, warranty on any component shall not exceed the manufacturer's warranty given to *Interscan Corporation*.

Section

9

Return Authorization

All returns for repairs require a **"RETURN AUTHORIZATION NUMBER"** issued by the *Interscan* Service Department.

This is done primarily to cause the user to contact the factory directly. The reason for this is that a high percentage of service problems are resolved over the telephone, avoiding the need for returning the instrument or part. In other cases, the Service Department may ask for the return of the circuit board only.

Should return of the instrument or part be advised by the Service Department, the **"RETURN AUTHORIZATION NUMBER"** will expedite prompt return of the repaired unit.

For service information please contact:

Interscan Corporation

Service Department, Extension 121

(800) 458-6153 (USA & Canada)

(818) 882-2331

FAX # 818-341-0642

Section
10

Parts List

10.1 PROGRAMMABLE CONTROLLER

PLC CPU	1 ea	FP2-C1/Panasonic
8 Ch. Analog Input	1 ea	AD8VI/Panasonic
4 Ch. Analog Output	1 ea	DA4/Panasonic
32ch. Transistor Output	1 ea	Y32T/Panasonic
16 Ch. Relay Output	1 ea	Y16R/Panasonic
6 Ch. Relay Output	1 ea	Y6R/Panasonic
16 ch. DC Input	1 ea	X16D2/Panasonic
7 Slot Base	1 ea	FP2-BP07/Panasonic

10.2 OPERATOR CONTROL PANEL

5.7” Color Touch Screen	1 ea	Cimrex 69

10.3 SENSOR COMPONENTS

CO Sensor	1 ea	114-LD/Interscan
Sensor Board (custom)	1 ea	ISC-2CS1000-HWL

10.3 PNEUMATICS

Diaphragm Pump	2 ea	UN828 KNI/Neuberger
Flow Sensor	2 ea	AWM3300V/Honeywell
Charcoal Filter	8 ea	417-00006

Tubing, ¼ OD Polyethylene	40 ft.	418-00001
Solenoid Valve, 24VDC	17 ea	428-00004
Needle Vlv, Sample Bleed	1ea	431-00021
Needle Vlv, Sample Flow	1ea	VCL-TT-2AA/Aalborg
Needle Vlv, Cal Flow	1ea	VCL-TT-2AA/Aalborg

10.3 MISCELLANEOUS COMPONENTS

24V Power Supply	1ea	518-00005
± 15V Power Supply	1ea	ISC1515.1
Relay Block, 16 Ch.	2ea	RT1-OD16-24V-S/Panasonic
Relay, 24VDC	32ea	JQ1A-24V/Panasonic
Fuse F1, 3A Fast Blow	1ea	515-00007
Fuse F2, ¼ A Slow Blow	1ea	515-00011
Fuse F3, 2A Fast Blow	1ea	515-00006

Section

11

Wiring Diagrams