CW Sentry™ 3G

24/7 Continuous Chemical Agent Detection

Operation and Service Manual

Version 3.0 (11-05)

P/N M120000CD

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Warning! THIS MANUAL MUST BE CAREFULLY READ BY ALL INDIVIDUALS WHO HAVE OR WILL HAVE THE RESPONSIBILITY FOR USING OR SERVICING THE PRODUCT. Like any piece of complex equipment, this instrument will perform as designed only if it is used and services in accordance with the manufacture's instructions. OTHERWISE, IT COULD FAIL TO PERFORM AS DESIGNED AND PERSONS WHO RELY ON THIS PRODUCT FOR THEIR SAFTEY COULD SUSTAIN SEVERE PERSONAL INJURY OR DEATH.

Chapter 1 - Introduction

1.1 CW Sentry 3G™ Overview

The CW Sentry™ 3G is a third generation chemical warfare area monitor. It is a versatile instrument that detects trace level of CW (Chemical Warfare) agents and TICs (Toxic Industrial Chemicals). The CW Sentry™ 3G uses a SAW (Surface Acoustic Wave) microsensor array for the detection of nerve and blister agents and it can be equipped with optional electrochemical cells for the determination of TICs. The electrochemical cells extend the analysis range of the instrument for halogen and hydride gases, choke and blood chemical agents. This combination of sensor technologies provide for a wide threat analysis capability and maintaining excellent specificity.

The CW Sentry™ 3G uses a 30-second analysis cycle for the detection of chemical agents. The key benefit of the analysis cycle is instrument specificity for detecting chemical agents with a very low incidence of false positives.

System alarms are reported by both RS232c communication and switch closures. The CW Sentry™ 3G is easily adapted to building control and security monitoring software systems.

1.1.1 Warning & Cautions

In the text of the manual you will see various warning and cautions. Please review all sections with these carefully. If you have questions as to the definition or meaning of warning or caution indication seek assistance from MSI immediately.

A warning symbol indicates an operation that could cause personal injury if precautions are not followed.

A caution symbol indicates an operation that could cause instrument damage if precautions are not followed.

1.1.2 Contact Information

For all matters concerning the CW Sentry™ 3G contact Microsensor Systems, Inc. at the following address.

Microsensor Systems, Inc.
62 Corporate Court
Bowling Green, KY 42103
Telephone 1-270-745-0099
Telephone 1-866-745-0099
Fax 1-270-745-0095
E-mail sales@microsensorsystems.com

1.1.3 Quality Assurance

Microsensor Systems, Inc. is ISO 9001:2000 accredited company and all aspects of the design, development, manufacturing and support are governed by these standards.

1.1.4 Warranty

To activate your warranty please complete and return the warranty card to MSI. The return of this card updates our database with end user contact information. This is important so MSI may communicate with you regarding updated product safety information and system firmware upgrades.

CW Sentry™ 3G is warranted to be free from defects in materials and workmanship for a period on one year from date of purchase. This warranty may be voided if the product has been abused or treated in a negligent manner.

Microsensor Systems sole liability under a warranty claim is limited to the repair or replacement of the product at is repair facility located in Bowling Green, KY. The customer is responsible for shipping the instrument the instrument pre-paid to the repair facility.

1.2 Theory of Operation

The CW Sentry™ 3G is an area monitor. It uses a high velocity fan to transport the sample to the instrument. This sampling system is designed to collect a representative sample by transporting a large amount of air into the monitor. This air stream is then sampled by the sensor module located inside the instrument enclosure. The sensor data is reported via the RS232c to a data collection PC.

1.2.1 SAW Sensor Detector Operation

SAW chemical sensors are small solid state devices that are extremely sensitive to minute changes in mass. These devices are coated with different polymers that act as a sponge to selectively absorb air contaminates. These polymers respond rapidly and reversibly to air contaminates. The CW Sentry™ 3G uses an array of 3 coated SAW sensors. The SAW polymers chosen are selected to provide a response pattern or fingerprint that is unique to the chemicals or chemical class of interest. Using a SAW array provides for excellent chemical discrimination that allows the CW Sentry™ 3G to be highly specific for the chemical agents of interest and reject other common environmental chemicals that could cause false positive alarms often associated with other monitoring technologies.

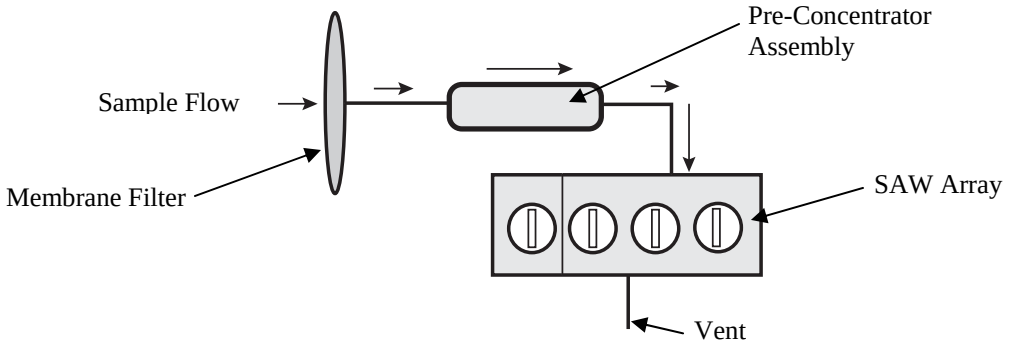


Figure 1.1 – SAW Sensor Array Configuration

1.2.2 Electrochemical Detector Operation

The CW Sentry™ 3G may be configured with a four cell electrochemical array. The electrochemical cells are semi-selective and provide a rapid response to target gases they were designed to detect. Electrochemical cells use an electrolyte that is sealed behind a gas permeable membrane. Gases and vapors diffuse through the membrane and dissolve in the electrolyte. Subsequent oxidation/ reduction processes release electrons that are collected at an electrode. The resulting signal is an electrical current which is proportional to the amount of gas or vapor detected

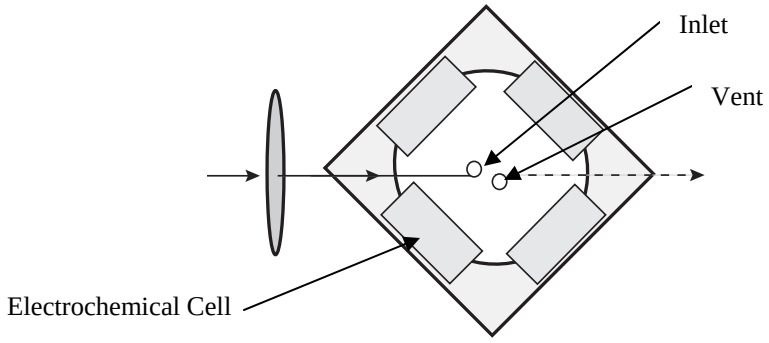


Figure 1.2 – Electrochemical Cell Configuration

1.5 System Components

The CW Sentry™ 3G can be broken down into two major components and eleven sub-assemblies.

The first major component is the exterior case. This is a gray fiberglass that measures 24.75 x 19.5 x 9.5 inches. It contains the following sub components:

- Inlet Baffle Filter
- Power Supply
- Data Output Ports
- Vent Fan.
- Sample Exhaust

The second major component is the sensor engine assembly. This is a gray metal box located inside the exterior case that measures 9.23 x 8 x 6 inches. It contains the following sub components:

- Sensor Module Filter
- Two or Four Sample Pumps
- Vapor Diffusion Check Source
- Thermoelectric Cooler
- SAW Sensor Array.
- Optional Electrochemical Cell Assembly

1.6 Performance Specifications

CW Sentry™ 3G System Specification

Weight: 40 pounds (18.2Kg)
Dimensions: 24.75 x 19.5 x 9.5 (62.9 x 49.5 x 24.2cm)
Sensor Technologies: Surface Acoustic Wave Microsensor Array, Electrochemical Cell Array
Analysis Time
SAW Sensors: 30 Second Analysis Cycle
Electrochemical: 5 Second Analysis Cycle
Warm Up Time: Less than 5 minutes at 25º C
CWA Alarm Thresholds: Adjustable
CWA Detection Thresholds: Detects at the ECt50 level for mild effect for Nerve Agents (G) and Blister Agents (H)
TIC Alarm Thresholds: Hydrogen Cyanide - Blood Agent - 5.0 ppm, Phosgene - Choke Agent - 0.3 ppm, Hydride Gas - 0.5 ppm, Halogen Gas - 10.0 ppm
Data Output: RS232 serial - Optional Ethernet
Operating Temperature:-20º to 50º C, -4º to 122º F
Operating Humidity: 0 to 95% non-condensing
Power Supply: 90-240v, 50/60 Hz (60 watts)
Warranty: One year parts and labor

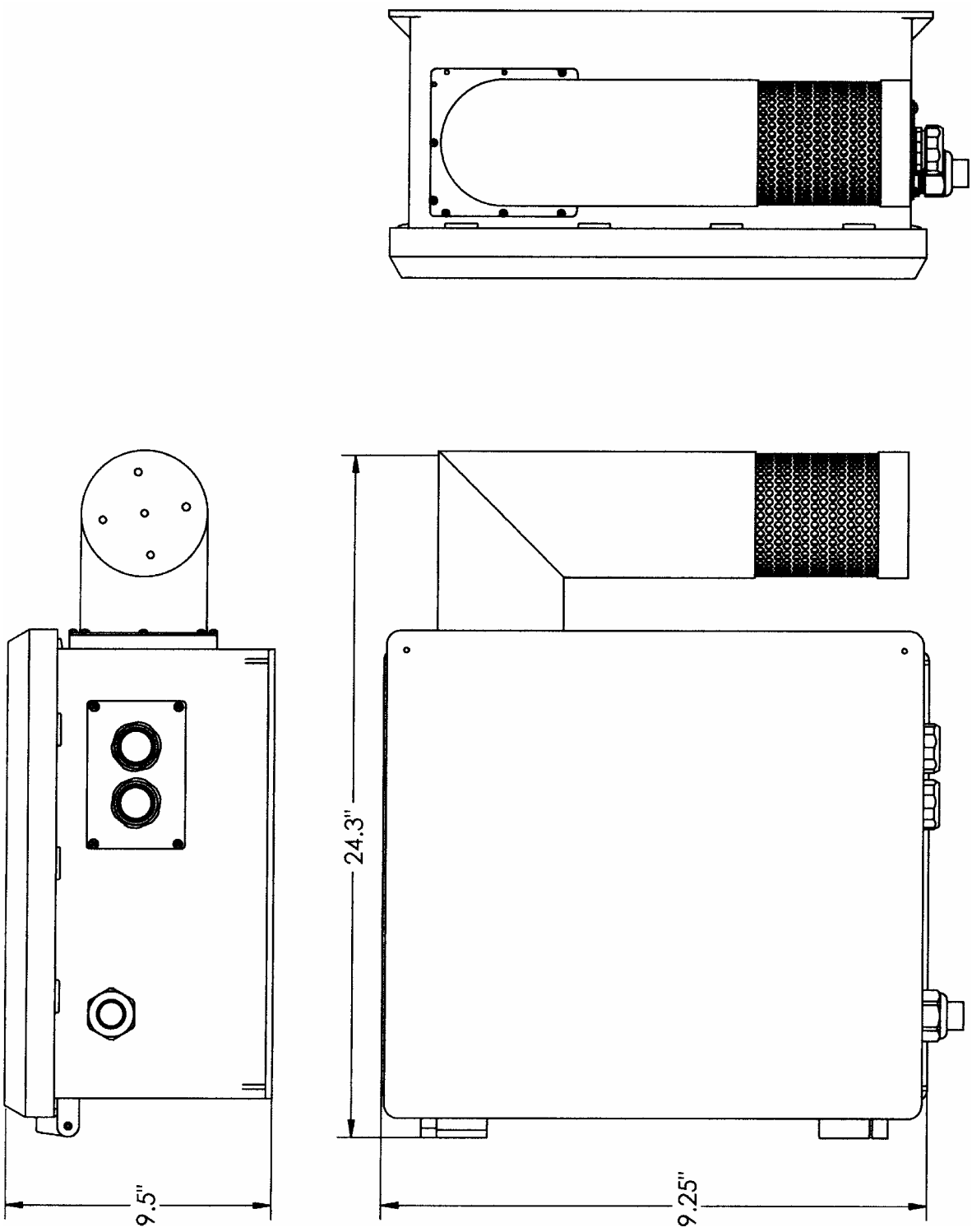


Figure 3 - CW Sentry 3G Instrument Dimensions

Chapter 2 Installation and Set-Up

2.1 Shipping Configuration

The CW Sentry™ 3G is shipped in two separate boxes, to reduce the possibility of shipping damage. Upon receipt of the CW Sentry™ 3G, the shipping containers should be inspected for physical damage or watermarks. Should any damage be detected, contact the shipping company immediately to file a shipping claim.

Warning! OPEN THE PACKAGES CAREFULLY, remove the contents, and perform a visual inspection. Retain all package materials until the installation of the CW Sentry™ 3G is completed.

Inspect the contents of the boxes to ensure that you have received the following:

Box 1:
Sensor Module which is enclosed in a gray metal box with a display panel on top.
User's Manual (P/N M120000M)
Qty (4) - 1/4"- 28 x 1/2" flat head machine screws
Power Cord

Box 2:
CW Sentry™ 3G gray fiberglass external case

Box 3:
External System Vent Assembly

Contact Microsensor Systems, Inc. (MSI) at (866) 745-0099 or sales@microsensorsystems.com if you have any questions about your order. Our normal business hours are Monday through Friday, 8 am to 5 pm CT.

2.2 Site Requirements

The CW Sentry™ 3G samples external air and is not watertight. While it is designed to be water and weather resistant, it must be installed in a location that protects it from severe water hazards, excessive routine chemical vapor exposures and temperature extremes. The instrument is rated for operation at external temperatures of -20º to 50º C and at relative humidity between 0% and 95%, non-condensing.

The CW Sentry™ 3G is configured in a NEMA fiberglass enclosure for a wall-mount installation. (The CW Sentry™ 3G can also be mounted on a horizontal surface, if the inlet and air vent are ported downward to prevent ingress of rain.) The dimensions of the CW SentryTM 3G are 24.75" x 19.5" x 9.5" (inches), and the assembly weighs 40 pounds. It is very important that the wall or structure to which the CW Sentry™ 3G is attached is able to support its weight. The wall should be rated to hold at least 75 pounds. The external case has four 5/16" holes for mounting. If mounted vertically, the holes are 12" apart, center to center, horizontally, and 18-11/16" apart, center to center, vertically.

The CW Sentry™ 3G should be located in an area visible and accessible to the equipment operators. The mounting area should provide 12" of clearance on all sides of the unit. This will allow room to fully open the door of the external case, providing access to the sensor module service panel, power switch, interface cabling, and the replaceable inlet filter/baffle.

2.2.1 Mounting the of CW Sentry™ 3G Enclosure

Open the door of the external case and remove the foam packaging material from inside the CW Sentry™ 3G. This material is placed inside the CW Sentry™ 3G to prevent shipping damage.

Attach the external vent pipe to the side of the CW Sentry™ 3G, over the fan outlet as shown in Figure 2.1. Install the vent pipe so that it will point down when the CW Sentry™ 3G is mounted in its final location. Install the provided 6-32 socket-head screw first, using the provided hex key, at the restricted-access location behind the down-turn of the vent pipe. Use the provided 6-32 machine screws to complete the mounting of the external vent pipe.

Mount the CW Sentry™ 3G external case to the wall or other intended location. (Mounting hardware for this step is not provided with the CW Sentry™ 3G). The external vent pipe should be pointing down.

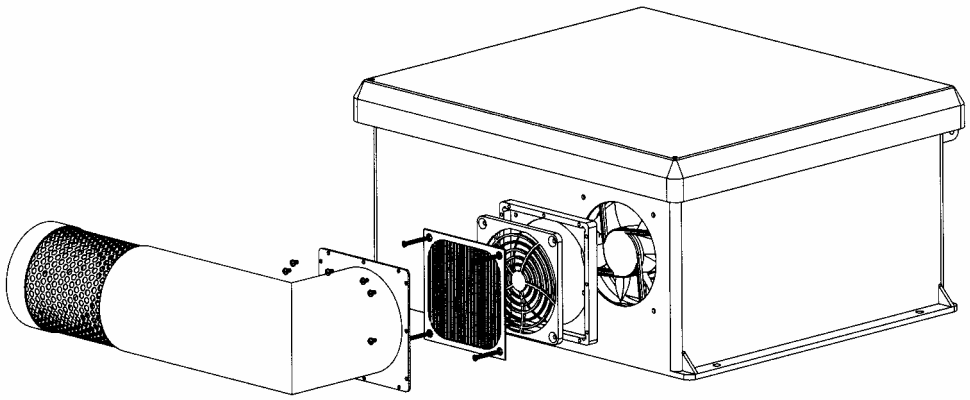


Figure 2.1 - CW Sentry™ 3G Exhaust Vent

2.2.2 Mounting and Connecting the Sensor Module

Warning! For normal wall-mount locations, it is usually easier to first attach the external case to the wall, then to mount the sensor module in the external case.

Warning! Do not mount the CW Sentry™ 3G while power is connected.

1. Remove the yellow inlet caps from both Sensor Module inlets as illustrated in Figure 6. Attach the Membrane filter to the SAW inlet.

2. Open the door of the CW Sentry™ 3G fiberglass external case by unscrewing the two Phillips head retaining screws in the door.

3. Mount the CW Sentry™ 3G Sensor Module to the steel baseplate of the CW Sentry™ 3G fiberglass case. Insert the provided 1/ 4” x 28 flat head mounting screws through the sensor module mounting rails and tighten the screws into the corresponding threaded inserts in the baseplate of the fiberglass case as illustrated in Figure 2.2.

4. Connect the 25-conductor ribbon cable (labeled Cable A) to the 25-pin DB connector on the side of the Sensor Module. (This cable connects to J2 of the power routing PCB mounted on the external case baseplate.) See Figure 2.3.

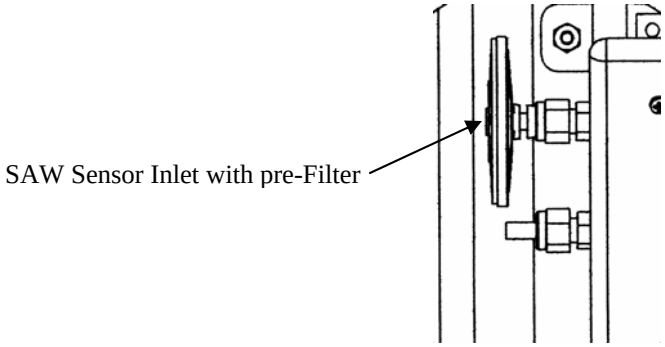


Figure 2.2 - SAW Inlet Sample Position

5. Connect the mating 4-conductor inline connectors (labeled Cable B) between the thermoelectric cooler on the end of the Sensor Module and the power routing printed circuit board (which is mounted on the external case base plate, connectors J5 and J7).

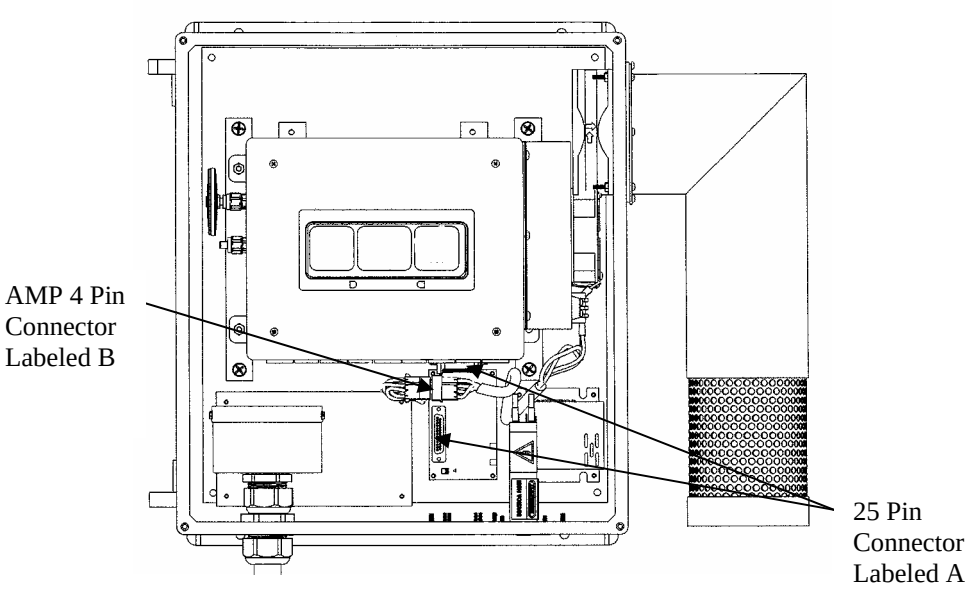


Figure 2.3 - Sensor Mounting Positions Locations

2.3 System Power

System Power Requirements:
Line voltage: 85 to 264 Volts AC at 47 to 400 Hz
Line Current: 2 AMP circuit

The CW Sentry™ 3G uses a switching power supply that is configured to accept either 110 or 220 Volt line supplies. We recommended that a dedicated power circuit be provided to for the CW Sentry™ 3G. Often it is advisable to condition the power source via a UPS or battery backed UPS. Using a battery backed UPS provides the additional advantage of emergency power and avoids the possibility of short power interruptions.

The power cord is a grounded IEC type 239. The IEC end plugs directly into the power entry receptacle located on the bottom of the CW Sentry™ 3G. The pronged end can then be plugged into a power outlet. Before plugging the power cord into the power mains, make sure the CW Sentry™ 3G power switch is in the OFF position.

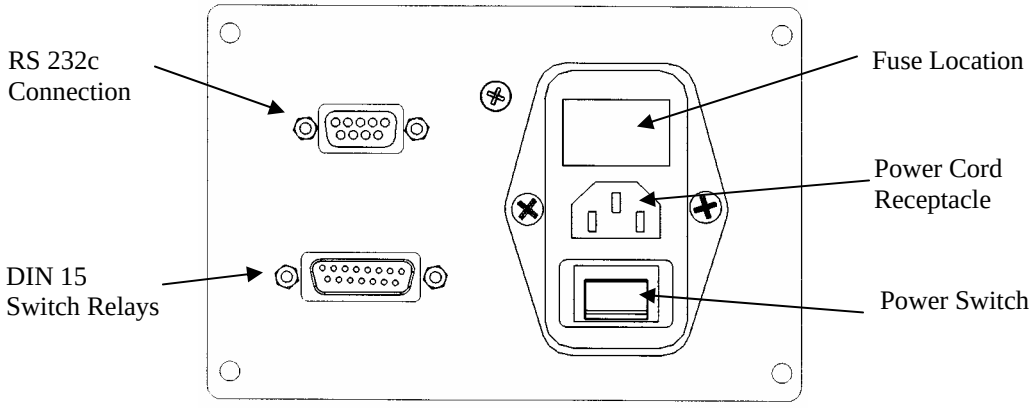


Figure 2.4 - CW Sentry 3G Power Inlet Panel IEC Power Cord Connection

2.4 System Communication Guidelines

The CW Sentry™ 3G is configured to report data via a 9 pin RS232c serial port located on the power inlet panel. When this is enabled, the CW Sentry™ 3G communicates directly to a personal computer. Every 30 seconds the CW Sentry™ 3G will transmit a data report indicating time/date and analysis condition. The RS232c port allows two way communications.

The CW Sentry™ 3G also has a switch relay 15 pin din connector located directly below the RS 232c. These relay switches are normally open in and closed in an alarm condition. The contact specifications are 125VAc and 100VDc at 1 Amp.

Chapter 3 Operation

3.1 Powering the CW Sentry™ 3G

The CW Sentry™ 3G is uses a switching power supply that is configured to accept either 110 volt or 220 volt line supply. The power can be routed through an IEC type 236 power cord or conduit depending on the configuration of the instrument. It is important to make sure the power switch is in the OFF position when connecting AC power to the CW Sentry™ 3G.

Warning! Make sure the CW Sentry™ 3G is properly grounded by observing all electrical codes as the installation location requires. The CW Sentry™ 3G is supplied with an ISC 239 grounded plug for that purpose.

Warning! For 110 volt installations, a 2 amp fuse is required. For 220 volt installations a 1 amp fuse is required. These fuses are located directly above the power switch in either configuration.

It is advisable to condition the power source if possible. Using a external Universal Power supply (UPS) provides the additional advantage of emergency power and avoids the possibility of short power interruptions or small line voltage variations.

3.2 Start Up Test Sequence

In order to confirm proper instrument function, it is recommended that the lid to the external case be left open to monitor the initial self-diagnostics.

Activate the power switch on the power entry panel. Upon initial power-up the sample transport fan will activate. All the light-emitting diodes (LEDs) on the front panel display of the Sensor Module will activate simultaneously and then sequentially turn off. The SYSTEM OK LED should then begin flashing. After about 60 seconds the “ALL CLEAR” green LED should illuminate. The CW Sentry™ 3G will then begin operation and will perform a system self diagnostics.

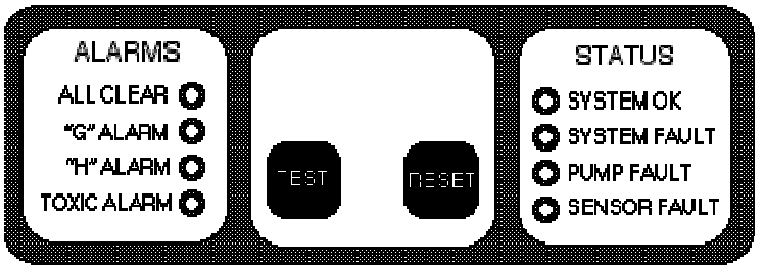


Figure 3.1 - CW Sentry™ 3G Sensor Module Display Panel

3.3 Sample Flow Path

The CW Sentry™ 3G uses a high velocity fan located on the upper right hand side of the exterior case to transport the sample to the instrument. The gas or vapors pass thought the inlet filter to remove large particles. The gases are then drawn in through the sensor module filter to remove finer dust and particulates. The sample is then drawn into the concentrator, then heated and passed into the SAW sensor array and exhausted by the sampling pump. The filters described above are illustrated below:

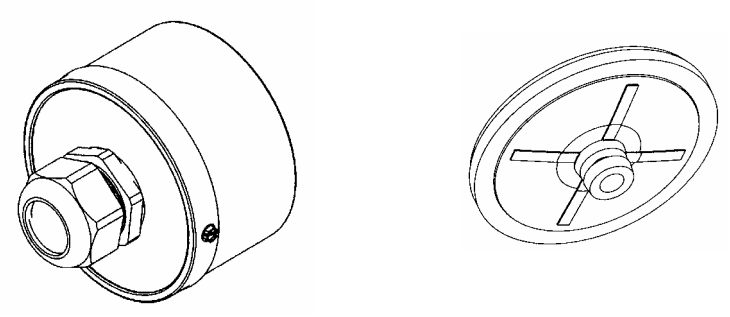


Figure 3.2 - Baffle Filter and Teflon Filter

The air is vented from the sensor engine and exhausted by the fan to the exterior of the case. The Sample Exhaust Assembly is designed to prevent the introduction of water or cleaning fluids into the instrument. The air flow from the fan also acts to remove heat from the CW Sentry™ 3G.

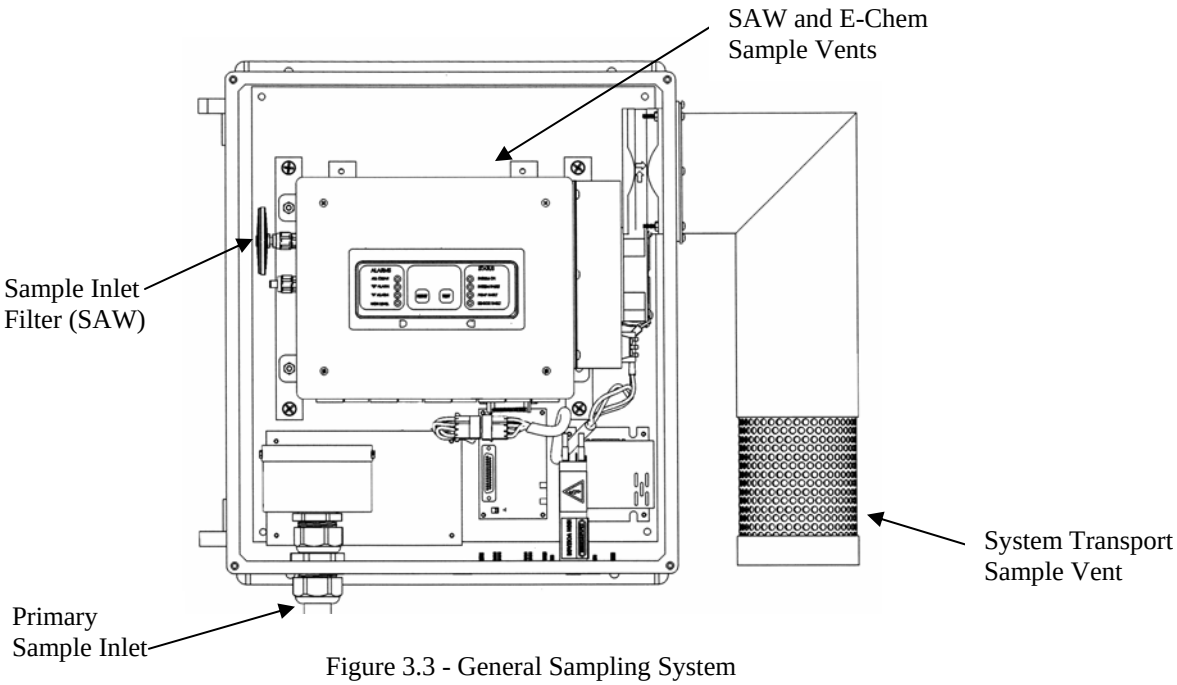


Figure 3.3 - General Sampling System

Warning! Blocking vent fan exhaust airflow may damage the instrument due to overheating.

3.4 Data Transmission

The CW Sentry™ 3G operates on a 30 second cycle. It reports the sensor frequency information on a ½ second data transmission rate. Additionally, at the end of each run the CW Sentry™ 3G will transmit a one line report that indicates the alarm condition, the peak sensor frequencies of each channel, peak locations and a systems status.

3.5 Remote Location Sampling

The nominal air flow into the sample inlet is approximately 80 to 100 liters per minute. The CW Sentry™ 3G can be configured to allow a pipe run of up to 20 feet of 3/4" OD CPVC. This will reduce the sample inlet flow to 20 liters per minute. Therefore it is recommended that the short possible length of sample tubing be used. As a general rule if a branched sampling configuration be desired the branches should be of equal length to maintain equal flow rates at each entry point.

Warning! Sample inlet flow of less than 20 liters per minute will increase the response time of agent detection.

3.6 Vapor Simulant Test Function

The CW Sentry™ 3G has the ability to challenge the SAW detector with a simulant vapor (DMMP) to measure the performance of the instrument. The internal Vapor Diffusion Check Source or check source can be operated via software or by manually pressing the TEST button on the Sensor Engine.

Test the operation of the check source in the following ways.

Press the TEST button located on the Sensor module panel display, or using a computer configured to communicate with the CW Sentry™ 3G, transmit the function (Control-T). Either of these two action will enable the CW Sentry™ 3G to begin a simulant test.

If you are using Microsensor Systems Data View software program, confirm that the software program is set to communicate with a CW Sentry™ 3G, as follows. Click on the "Settings" button and open the "Select Device" window. In the "Device" window, select "CWSentry". Then click on "OK". Click on the tools button and open the (send commands to device) window. Select (System Test) from the pull-down menu. Then click on (Send.) button.

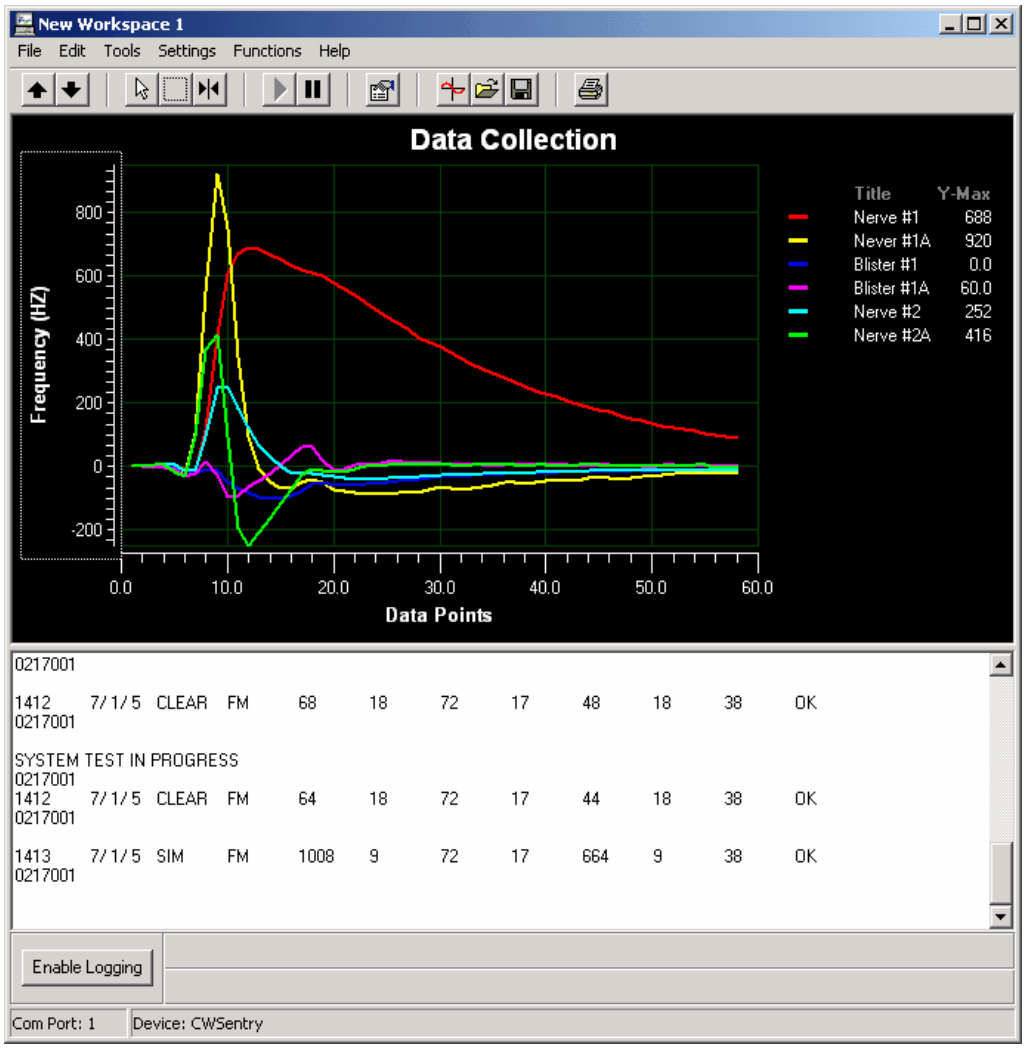


Figure 3.3 - Simulant Run on Data View

During the next cycle, the CW Sentry™ 3G will perform a DMMP (Dimethyl Methyl Phosphonate) "injection" into the sample stream. After the command activation, the CW Sentry™ 3G will complete the current analysis cycle, the RS 232c will send the following message (SYSTEM TEST IN PROGRESS) and all the LED's on the sensor module panel will flash in a counter clockwise order. The next cycle should display a (SIM) alarm and the instrument will return to a normal operation. During the check source test function the alarm relays are disabled.

Should the CW Sentry™ 3G not alarm on the first test cycle it will run 6 more regular analysis cycles and then re-activate the check source again following the same pattern. If after the second try the CW Sentry™ 3G does not alarm it will return to normal operation. If this occurs, the check the simulant check source for its expiration date, it may have expired. If that is not the case, please contact Microsensor Systems, Inc. Service department of assistance.

Chapter 4 Remote Computer Operation

4.1 Connecting to the RS 232c

There are several software choices for communication to the CW Sentry™ 3G. Software such as ProComm Plus, HyperTerminal and Microsensor Systems Dataview will allow serial communication. The easiest to operate and install is Microsensor Systems Dataview. This program was written to facilitate communication between the CW Sentry™ 3G and a Windows based PC. It allows for uncomplicated communication and collection of data reports. All of the various commands used to communicate with the CW Sentry™ 3G are predefined.

Should you choose to use another serial communication program it must be installed as per the manufactures directions on the hard drive of the PC.

The correct serial communication configuration is; 9600 baud, N – 8 – 1. The communication software programs vary how this information is entered. The CW Sentry™ 3G requires a serial communication cable. It is best if the cable is DIN 9 (male) DIN 9 Female. Adapters can be used to configure other cable to connect to the DIN sockets. If adapters are used make sure that they are not configured for null modem operation. Figure 4.1 illustrates the DataView baud rate communication menu.

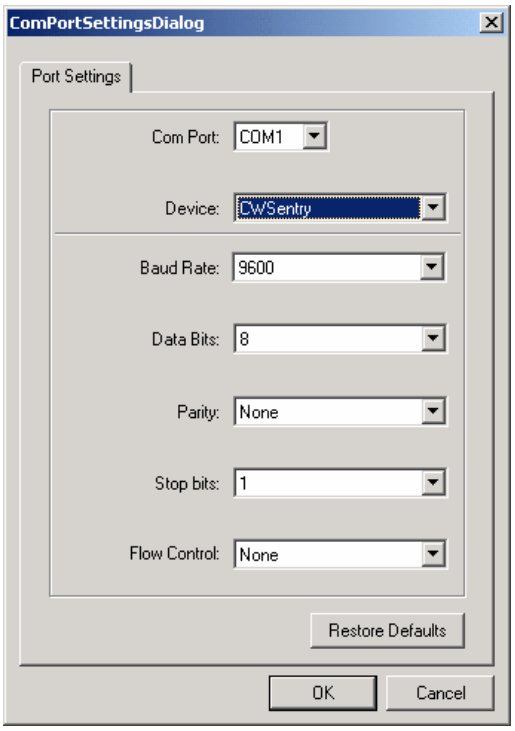


Figure 4.1- DataView Com Port Setting Menu

4.2 Data View Software

Microsensor Systems Dataview is an easy to use software program that enables communication with the CW Sentry™ 3G. Dataview is designed operate on Microsoft Windows 98 and higher operating systems. Dataview workspace allows the user to save data files, view the real time data plots and send report commands. The general workspace is illustrated below.

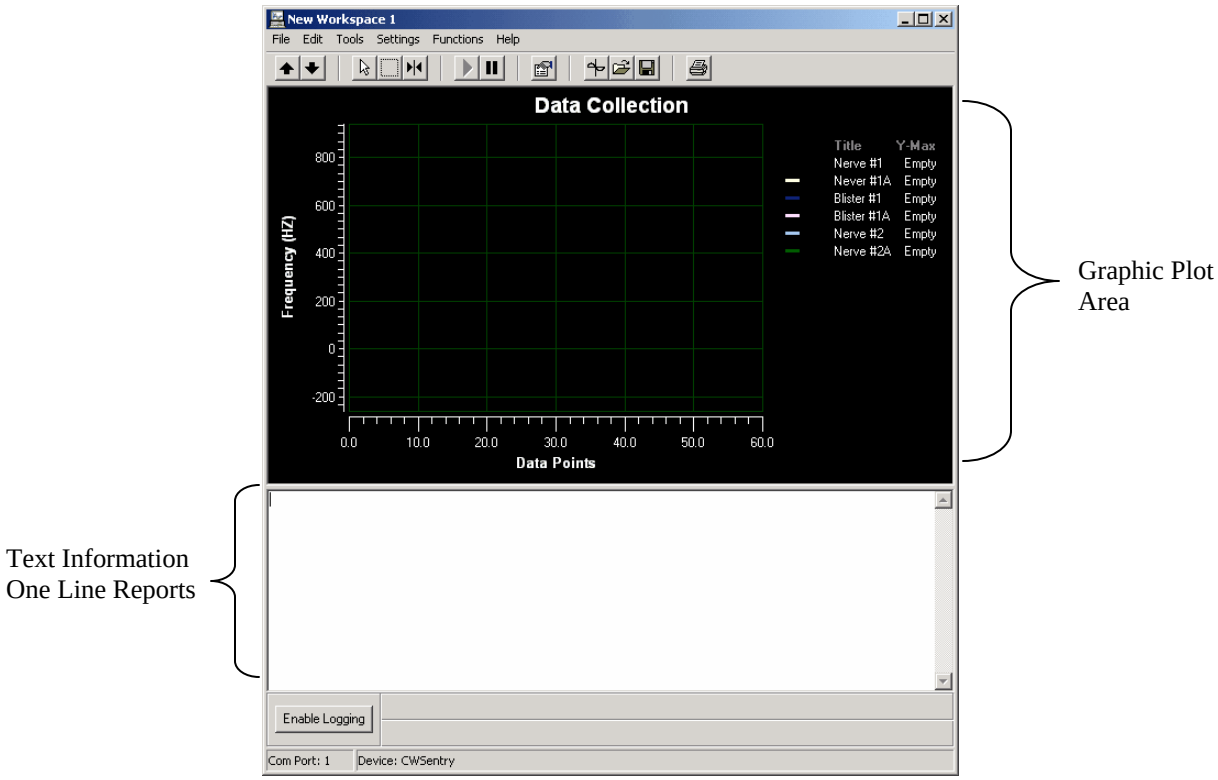


Figure 4.2 - DataView General Workspace Illustration

To view the graphical plot real time sensor the data points function must be enabled in the CW Sentry™ 3G system parameters. This real time plot information will appear in the black area of the workspace. You can define and label the x and y axis ordinates as well as title the graph by using the plot setting menu. Directly below the plot area is a grey window that receives the real time data transmissions. This workspace receives all ASCII communication from the CW Sentry™ 3G. The one line analysis report will appear in this location along with the sensor data points. You can suppress the data points by putting you cursor in the data box area, clicking the right mouse button and scrolling down to suppress the data point transmission. This will allow the one line reports and report functions to appear with no data points. The graphical plot will still remain active displaying the data points. This is often very useful to prevent scrolling of the data area to review the CW Sentry™ 3G.

Dataview is designed to send control function commands to the CW Sentry™ 3G. This is a useful to obtain the various reports without having to type the control function commands. Should you want to send other commands that are not part of the general command menu you will have to put the cursor over the white area of the function box press the left mouse button and the type the control function command and click send button. To use this feature, click the Tools tab at the top of the screen and select “Send Commands to Device”.

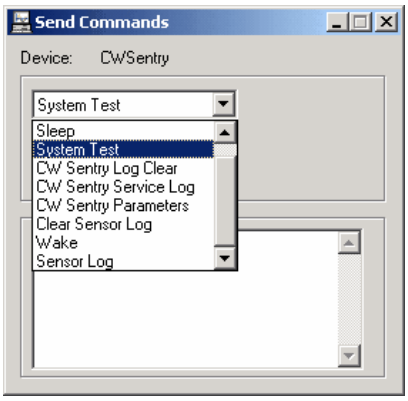


Figure 4.3 – Send Commands Menu

Dataview is designed to allow you to save both the report data (ASCII text) as well as the graphical plot data. If you want to enable CW Sentry 3G data logging click the function box located on the lower right hand area of the workspace. A box will appear called "Logging Options" will indicate the storage location directory and allow you to select a file name. You can choose to collect both the text log and data plots by checking the appropriate box. Data plots are collected in a separate file for each sample analysis. The software will automatically increment the root file name as the following example indicates:

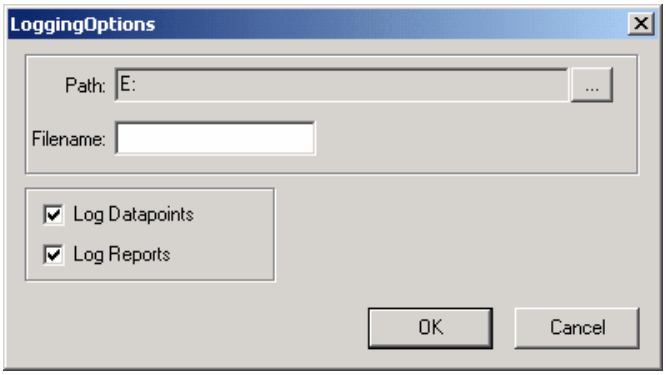


Figure 4.4 – Data Logging Options Menu

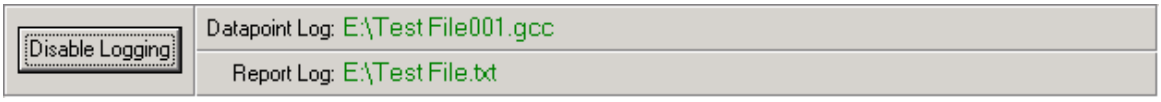


Figure 4.5 DataView General Workspace Data Log File Menu

Dataview has an extensive help function embedded in the software that defines all the software functions. Understanding and using Dataview will allow you to better diagnose system status and correct actions.

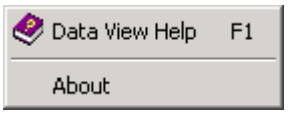


Figure- 4.7 DataView Help Menu

4.2.1 Data Reports

The CW Sentry™ 3G offers a variety of data reports and maintains a record of past events and current status of operations. This information is accessed via the RS232c communications port. To configure a computer to the CW Sentry™ 3G see section 4.2.

All of the CW Sentry™ 3G monitors are factory configured to report one-line reports. This report is the 30-second SAW sensor analysis data burst.

You can access several control functions via your computer keyboard to gain additional instrument information. The reports available are Service Log, Status Report and Statistic Report. These reports will provide you historical information of system faults, test actions, sub assembly operation and most recent alarms. This information will help guide you through the maintenance process and provide you a good idea of system performance.

4.2.2 Clone Files

The clone function is designed to uplink a pre-formatted text file to the CW Sentry™ 3G. The system parameters file and the system clocks are the only files that can be received. Using the clone function is a rare event and should not be done unless these is a specific reason to change the system parameters. For setting the system clock it is best to use the DataView software as this will set the clock automatically to the pre-set of time of you computer. You can adjust this value for different time zones before sending.

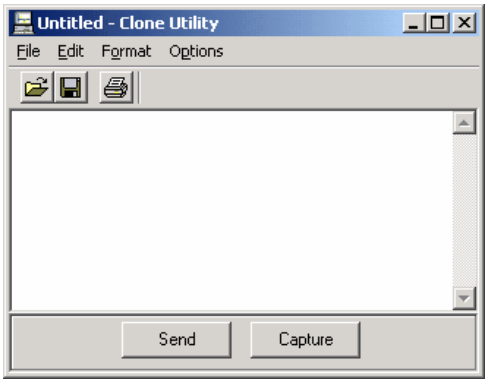


Figure 4.6 - Clone Utility Menu

4.3 Command Functions

Below is a table of CW Sentry™ 3G control functions. By use of these function commands you can control the CW Sentry™ 3G to perform actions and collect data information. These commands can be sent at any time by pressing the control key and the function letter. The CW Sentry™ 3G will then transmit the report and continue running the analysis cycle.

Action	Control Function	Command to CWSP
Sleep	Cntl P	Power off to sensor module
Wake	Cntl W	Turns on the sensor module
Status Report	Cntl R	System operational status
Service Log	Cntl B	CWSP events/actions
Clear Service Log	Cntl G	Starts Log Over
Data Log	LOG or (shift #)	Transmit the data log
Clear Data Log	CLR or (shift $)	Clear the data log of values
CWS Statistic Report	Cntl D	History of system faults
Clear CWSP Statistic Report	Cntl E	Starts Statistic Report Over
Simulant Test	Cntl T	Tests sensor array with DMMP*
Zero CWSP Run Counter	Cntl Z	Resets Analysis Run Log
CWSP Parameters	Cntl X	CWSP System Set Up Commands
Clear Fault	Cntl F	Software Override of System Fault

4.3.1 Status Report

The Status Report contains current system statuses, faults, failures pressures; case temperatures supply voltage run hours and information about last alarm conditions. Below is an example of the Status Report. Each reference letter is defined below. The report can be generated by transmitting (Cntl R) command.

(Note: the red letters do not appear on the report and are used for illustration location purposes only.)

```
REF   MESSAGE            INFORMATION

 A    SYSTEM ID:         0333012
 B    STATUS:
      07/04/03           0700  CLEAR
      07/04/03           0700  CLR ECHEM
 C    SYSTEM RUNNING
            SYSTEM OK
 D    INTERNAL CASE TEMP:      31 C
 E    EXTERNAL CASE TEMP:      29 C
 F    SAW PUMP PRESSURE:       490
 G    ECHEM PUMP PRESSURE:     1
 H    MANIFOLD PRESSURE:       4
 I    SUPPLY VOLTAGE:     12
 J    RUN TIME: 167 DAYS, 2 HRS 49 MIN
 K    LAST SAW ALARM:          06/09/03    0500  LOW G
 L    LAST ECHEM ALARM:        06/01/03    1623  CLR ECHEM
```

A – System ID is the unit serial number. This is a seven digit number that identifies the CW Sentry™ 3G and catalogs all product information. The CW Sentry™ 3G serial number label contains 9 digits as the product identification. The first two are the product line code identifier. This is not transmitted with the data reports. The remaining numbers are as indicated left to right (2 digits), the year, week (2 digits), and

the unit number of fabrication (3 digits), the above example, 033012, 03 is the year 2003, 30 is the week and 012 is the 12th unit produced that week.

B – System Status – This reports the last run analysis conditions. This will be current information at the time the (Cntl R) command is transmitted. There are two status reports one for the SAW sensor module and the other for the electrochemical cell sensor module.

C – System Running – This indicates if the CW Sentry 3G is operational. Should a system run fault be indicated it will reported here. Typical examples of the run faults are, CONC, SAW 1, 2 or 3 etc.

D – Internal Case Temperature - The readout provides the CW Sentry case temperature inside the NEMA box. The typical value of this temperature follows closely to the ambient condition.

E – External Case Temperature- This measures the case temperature inside the CW Sentry 3G. Generally, this value will read hotter than the ambient value.

F – SAW Pump Pressure - This is a unit less value indicating the SAW pump is operational. This value is typically reported between 350 and 600 for a normally operating pump.

G – E-Chem Pump Pressure - This is a unit less value indicating the E-Chem pump is operational. This value is typically reported between 350 and 600 for a normally operating pump.

H – Manifold Pressure – This measures the vacuum in the sample transport system into the sensor array. A value around 4 is acceptable.

I – Supply Voltage - The CWSP voltage supply displays between 8 and 12 volts.

J – Run Time – This report keep track to the total run time of the CW Sentry 3G.

K – Last SAW Alarm - This is the last SAW sensor alarm for chemical agent reported. This is often useful reference should the data log been accidentally cleared.

L – Last E-chem Alarm - This is the last electrochemical sensor alarm that the CW Sentry 3G reported.

4.3.2 CWS Statistic Reports

This report can be generated by transmitting a (Cntl D) to the CW Sentry™ 3G. This report indicates the cumulative failures recorded by the CW Sentry™ 3G. This will keep a running tally of all faults recorded. These reports are appended to the one line data reports of the CW Sentry™ 3G.

The user can clear this report by transmitting a (Cntl E)

There are two fields for this report the first field describes the subject item and the second field after the colon indicated the number of times the fault has occurred.

(Note: the red letters do not appear on the report and are used for illustration location purposes only.)

```
CWS STATISTIC
STATISTICS LAST CLEARED       01/23/03    1120
REF    MESSAGE                NUMBER OF FAULTS
A      SAW PUMP 1 FAULTS:           0
B      SAW PUMP 2 FAULTS:           0
C      ECHEM PUMP 1 FAULTS:         0
D      ECHEM PUMP 2 FAULTS:         0
E      VOLTAGE FAULTS:              0
F      MANIFOLD FAULTS:             0
G      CONCENTRATOR FAULTS:         0
H      CASE TEMPERATURE FAULTS:     0
I      SAW 1 FAULTS:                0
J      SAW 2 FAULTS:                0
K      SAW 3 FAULTS:                0
L      EHCEM FAULTS:                0
M      ECHEM EXPIRED                0
```

A & B- These values monitor the SAW pumps failure status. This monitors a loss of flow or reduced performance of the pump.

C & D- These values monitor the electrochemical pumps failure status. This monitors a loss of flow or reduced performance of the pump.

E- This monitors the number of times that power has been interrupted to the CW Sentry 3G causing the system to recycle upon return of electrical power. This is a useful indication of power supply instability, which is not desirable.

F- The Manifold Faults feature is not implemented.

G – This monitors the concentrator faults. Should a value appear here the concentrator is defective. This usually requires visual and or resistance measurement examination of the concentrator leads. This usually indicates a short in the concentrator assembly, which will require the replacement of the assembly.

H – This monitors the number of times the case temperature fails to meet specified operating conditions.

I & J & K – This indicates SAW sensor failures. Failure of these devices requires factory service of the sensor module.

L – This report indicates that the electrochemical sensor has failed.

M – This reports that the electrochemical expiration dates.

4.3.3. Sensor Log

The datalog from the sensor engine can be accessed by entering “LOG<cr>”. Only alarm events are saved in the data log report.

The format is the same as the one line reports from the SAW sensor and the electrochemical sensor reports. If the datalog is empty, the CW Sentry™ 3G will respond with the following message:

DATALOG EMPTY

Chapter 5 Routine Maintenance

5.1 Preventive Maintenance Schedule

The CW Sentry™ 3G requires periodic maintenance. This maintenance is limited in scope and is necessary to perform otherwise a degradation in the system capability could occur.

When opening and closing the CW Sentry™ 3G fiberglass case make sure that the door is completely secured. Failure to properly secure the door will change the sample transport patterns by causing a leak in gasket that seals the instrument door. It is important that the sample transport occur through the primary inlet filter. System leaks may cause delayed detection of agents.

The typical maintenance interval runs on a three-month schedule. The following chart indicates the items that must be replaced in the first year of operation.

CW Sentry™ 3G Projected Maintenance Schedule[1]

Part Description	Part Number	3 months	6 months	9 months	12 months
Inlet Baffle	M1700020	X	X	X	X
Sensor Module Filter SAW Only[2]	M1700040	X	X	X	X
SAW Sample Pump[3]	M3240020			X	
E-Chem Sample Pump[3]	M3240020			X	
Vapor Simulant Check Source	M2100500		X		X
SAW Array Module[4]	M2110080				X
E-Chem Array	M2120130				X

[1] The following maintenance schedule is recommend for typical system installation.

[2] In known atmospheres where high levels of particulate matter are present this schedule should be accelerated to a one-month filter replacement.

[3] Sample pumps are to be replaced upon CW Sentry™ 3G fault indication. The CW Sentry™ 3G has a back up pump that will automatically engage allowing the defective pump replacement to be deferred if desired.

[4] The SAW Array Module is designed to operate for 1 year.

5.2 System Performance Check

It is desirable to check the CW Sentry™ 3G on a regular basis. The following tests provide diagnostic information to help maintain the CW Sentry™ 3G.

5.2.1 System Inlet Sample Flow

This is an important system check for the composite sampling system. Should the transport flows are below specification the instrument response time will increase. This measurement is an important diagnostic of the ambient particulate contamination. It is recommended that these flow be measure and recorded over time. This will allow you to adjust the filter replacement interval. Extremely dirty environments may require more frequent filter replacements.

1. Check sample inlet flow at the left-hand bottom of the instrument.

2. Use the Flow Meter Kit P/N _____
3. Flow at the inlet should between 20 to 80 liter/min.
4. If flow is less than 15 liter/min the system transport system is dirty and the Baffle filter needs to be replaced and the sampling pipe may need to be cleared particulate obstructions.

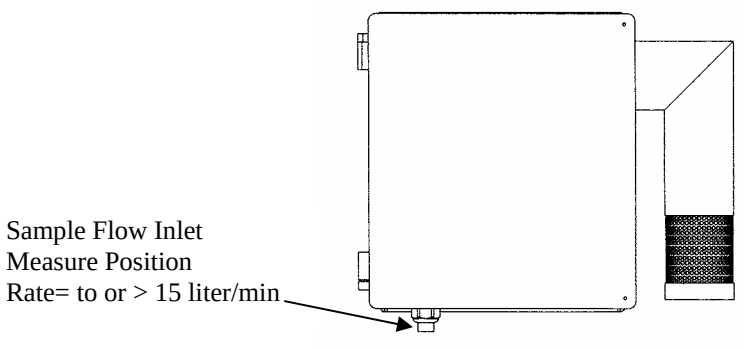


Figure 5.1 – Sample Inlet Flow Diagram

5.2.2 System Simulant Check

This test is designed to check the entire CW Sentry 3G. This check will present the CW Sentry 3G with a sample of DMMP at the system inlet validate the fan transport system and sensor module.

Prepare simulant dose tube with DMMP.

1. Cut Kimwipe ExL tissue into a 3"x 6" rectangle.
   (Kimwipe ExL – Kimberly Clark, Part Number 34155)
2. Insert the Kimwipe tissue into the middle of the 12" Teflon tube via the open inlet away from the screen.
3. Dose the Kimwipe with 2ml of DMMP. (Dispense the DMMP slowly to wet the Kimwipe tissue.)
4. Connect the Teflon DMMP transfer tube to the PVC inlet tube via the Tygon tube connection sleeve.
5. Connect the assembly for 30 seconds and remove.
6. The CW Sentry 3G should alarm with 60 seconds from the removal of the Teflon DMMP transfer tube.
7. This alarm should be reported as either a "G" alarm or "SIM" Alarm.

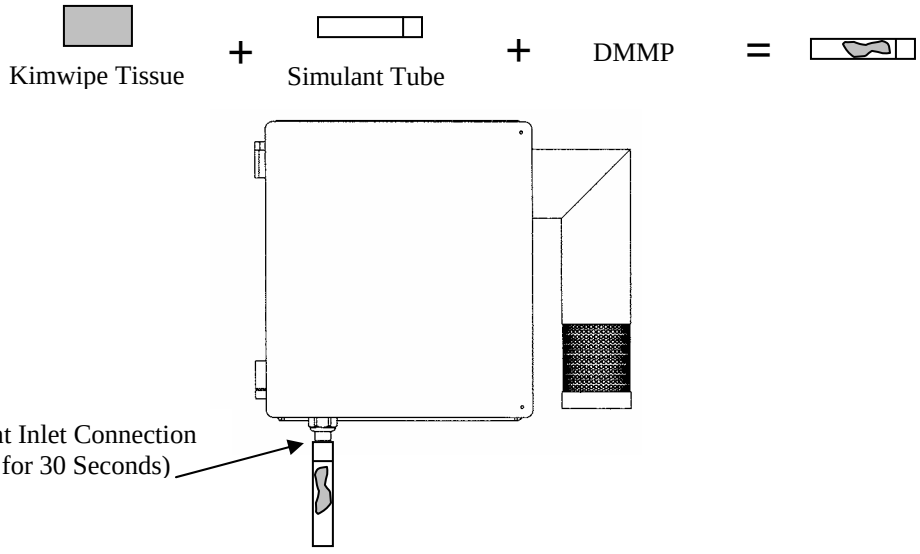


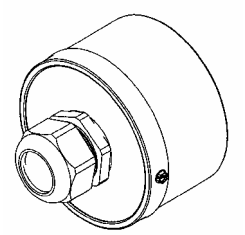
Figure 5.2 – DMMP Simulant Source Preparation and Connection to Instrument Inlet

5.2 Inlet Baffle Filter

This is the primary filter to the inlet of the CW Sentry™ 3G. This filter is designed to remove particulate matter from the air stream through magnetic attraction and a 400-mesh filter screen. This filter is designed to remove particulate matter at the >10 micron size level.

To access this filter the CW Sentry™ 3G fiberglass door case must be opened. The filter is located in the left-hand bottom of the instrument. The filter is a silver can assembly that attaches to the CW Sentry™ 3G by a removable pipefitting. To remove this part the fitting must be rotated in a counterclockwise fashion. It is re-installed by follow the opposite disassembly procedure.

When opening and closing the CW Sentry™ 3G fiberglass case make sure that the door is completely secured. Failure to properly secure the door will change the sample transport patterns by causing a leak in gasket that seals the instrument door. It is important that the sample transport occur through the primary inlet filter. System leaks may cause delayed detection of agents.



Inlet Baffle Filter P/N M1700020

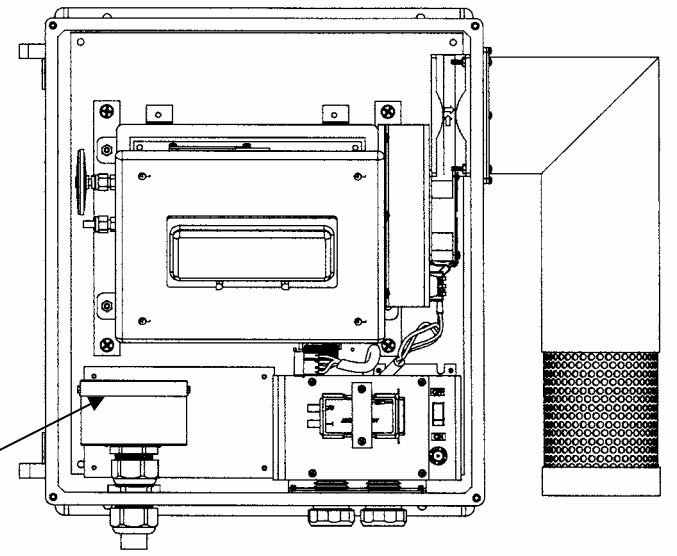


Figure 5.3 – CW Sentry™ 3G Inlet Baffle

5.3 Sensor Module Filter (SAW Only)

This filter is connected directly to the inlet of the SAW sensor module. It is a Teflon membrane filter that has a very large surface area. This filter material is pure white and located inside of a translucent circular plastic housing about 5 cm in diameter. The filter assembly can not be cleaned and should be discarded when removed.

5.3.1 SAW Sensor Vent Flow Check (SAW Only System)

This measurement allows the SAW sensor array flow to be verified. When this flow is below specification the CWS3G may not accurately report the presence of chemical agent.

1. Open CWS3G main door.
2. Measure SAW Sensor vent flow on the right top of the sensor module
3. Flow of the SAW vent 150 to 240ml/min. If less than 150ml/min replace inlet filter.

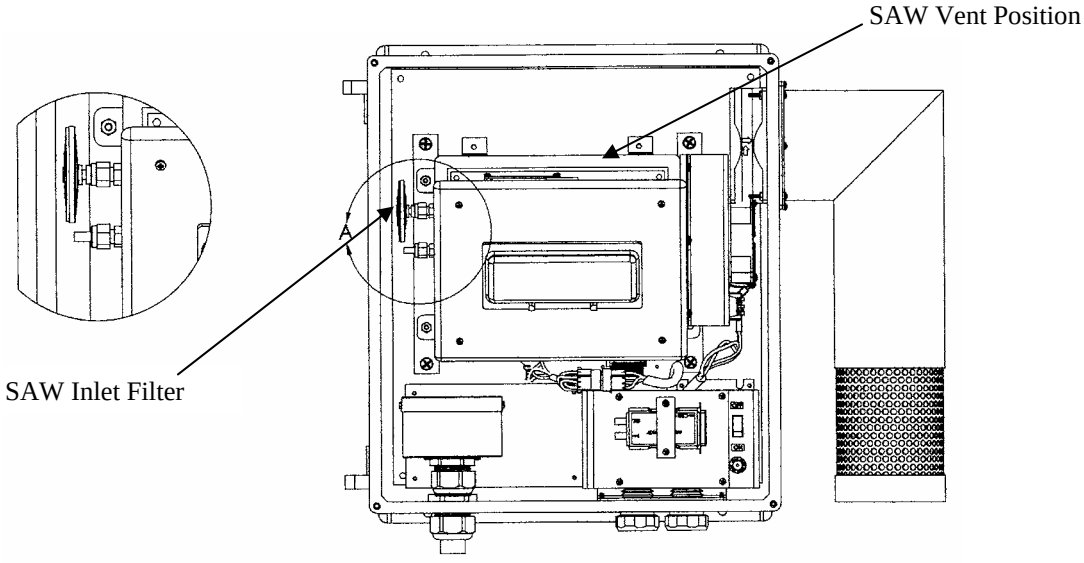


Figure 5.4 – SAW Sensor Inlet Filter and Vent Location

5.3.1.5 SAW and Electrochemical Cell Array Flow Measurement

This measurement allows the SAW sensor array and electrochemical cell array flow to be verified. When this flow is below specification the CWS3G may not accurately report the presence of chemical agent.

4. Open CWS3G main door.
5. Measure SAW Sensor vent flow on the right top of the sensor module
6. Flow of the SAW vent 150 to 240ml/min. If less than 150ml/min replace inlet filter.
7. Flow of the electrochemical cell vent 150 to 240ml/min. 150 to 240ml/min

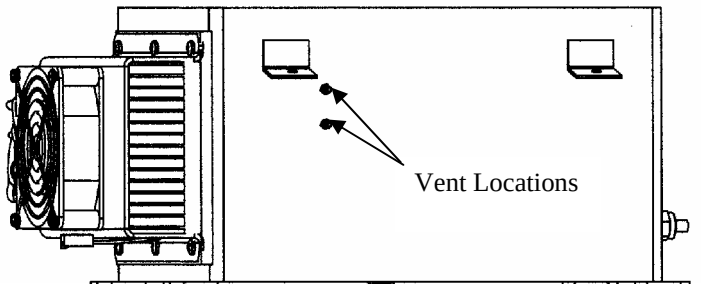


Figure 5.5 – CW Sentry™ 3G SAW and E-Chem Vent Positions

5.3.2 SAW Inlet Filter Replacement

The Sensor Module filter is located on the left-hand side of the Sensor Module Assembly inside the CW Sentry™ 3G fiberglass case. This filter is attached by compression to the ¼" sample inlet.

Inspect the Teflon filter for dust and debris. This filter is pure white Teflon when new. You should see a gray discoloration with use. The discoloration could be different depending on the environment in which it is sampling. This discoloration or collection of dust should appear on only one side of the filter. If you see breakthrough of debris to the other side of the Teflon membrane it is possible that the material has propagated to the inlet of the concentrator. If this breakthrough has occurred, you may need to replace the SAW Array Sensor Assembly due to possible contamination.

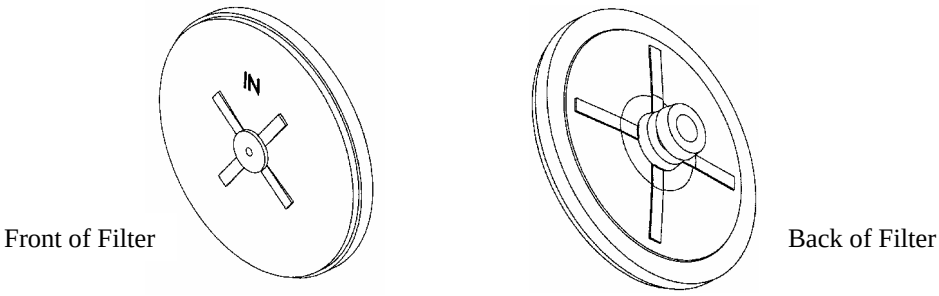


Figure 5.6 – SAW Inlet Filter

To remove the filter, gently pry it off. It should release and a new filter must be replaced in the sample inlet location before returning the CW Sentry™ 3G to operation.

1) Command the CWS3G into the sleep mode.
   a) This will turn off the SAW sensor array pump and prevent particulates from entering the sample inlet.
2) Replace the Teflon Inlet Filter P/N M1700020 with a new one.
   a) Note if the filter appears colored that is particulate matter collected on the membrane. (The Teflon filter is pure white).
3) Wake the CWS3G.
   a) The SAW Sensor Array will return to operation.
4) Re-measure the flow at the sample SAW Sample Vent.
   a) Flow should fall into the range of 150 to 240ml/min.
5) If the flow does not fall into this range measure the flow at the inlet.
6) Remove the Teflon filter
7) Attach the flow meter to the inlet and observe the flow rate.
8) Flow rate at the inlet should be between 240 to 280 ml/min
9) If the flow rate does not meet this specification switch to sample pump to #2 by pressing the switch to activate #2 on the main sensor PCB.
10) If flow returns to specification replace pump #1
11) If flow does not return to required flow rate a non field repairable fault has occurred. Call MSI for assistance

5.4 Removing the Sensor Engine

There maybe several reasons to remove the sensor engine of the CW Sentry™ 3G The replacement of the vapor diffusion check source is easier to accomplish when the engine is removed from the exterior case.

1) To remove the sensor engine, first turn off instrument power.

2) Disconnect the 4 conductor inline connector between the thermoelectric cooler and the power routing printed circuit board.

3) Disconnect the 25 conductor ribbon cable from the 25 pin DB connector on the right side of the sensor engine. This can be traced to J2 on the power routing board.

4) Remove the four ¼ x 28 flat head mounting screws from the threaded inserts in the back of the fiberglass case.

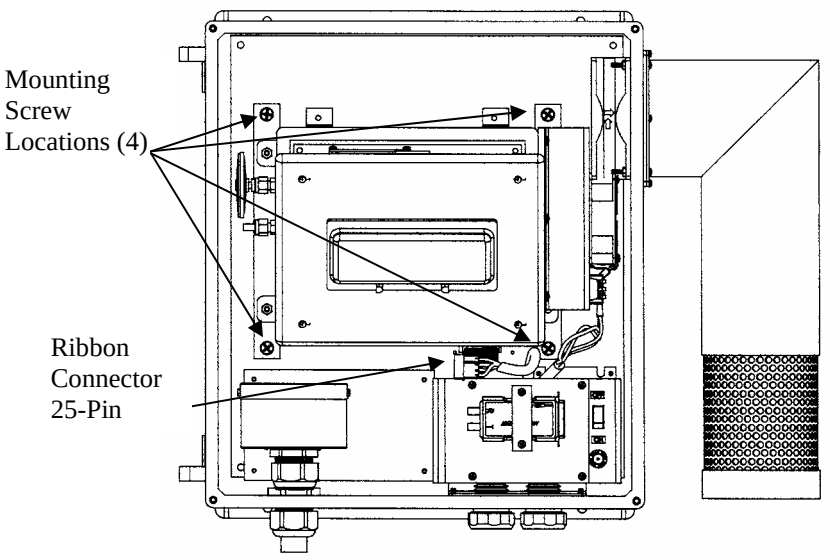


Figure 5.7 – CW Sentry™ Mounting Screw and Ribbon Connector

5.5 Installing the Sensor Engine

1) To re-install the sensor engine, first make sure the instrument power is turned off.

2) Tighten the four ¼ x 28 flat head mounting screws into the threaded inserts in the back of the case. Connect the 25 conductor ribbon cable to the 25 pin DB connector on the side of sensor engine. This cable can be traced to J2 on the power routing printed circuit board on the lower part of the fiberglass case.

3) Connect the 4 conductor inline connector between the thermoelectric cooler and on the end of the sensor engine and the power routing printed circuit board.

5.6 Sample Pump Replacement

The sample pump draws air from the CW Sentry™ 3G fiberglass case onto the sensor array found in the Sensor Module assembly. There are two pumps located in the lower left hand side of the Senor Module Assembly.

1) Turn off instrument power. Open the gray metal box (Sensor Module Assembly) and locate the pumps.

2) Disconnect the Molex connector from the electronic board at either J-4 or J-5 depending on which pump is to be replaced.

3) Remove the two pieces of silicon tubing from the pump body. Note the position or orientation of the tubing.

4) Remove the pump from the clamp holding it to the Sensor Module.

5) Remove the caps from the new sampling pump.

6) Install the pump into the clamp in the Sensor Module.

7) Reconnect the silicone tubing in the correct positions on the pump body.

8) Plug the Molex connector into either J-4 or J-5 on the electronics board.

9) Turn on the instrument power.

If necessary, reset pump circuit on the electronic board marked S2 or S4. When closing the sensor engine pay close attention to the tubing bundle to ensure that there are no crimps or kinks in the tubing.

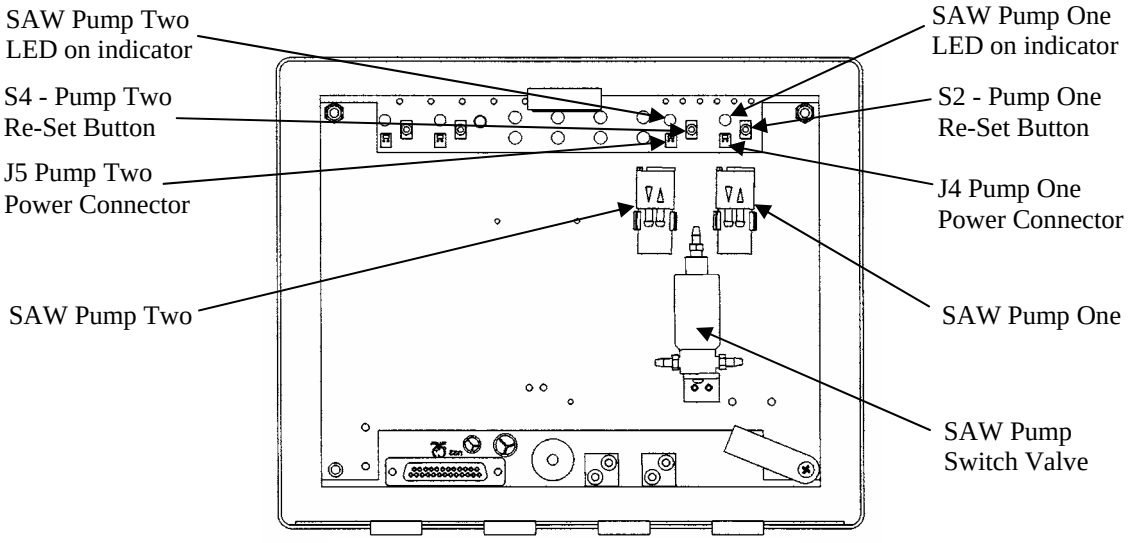


Figure 5.8 – SAW Module Pneumatics

5.7 Electrochemical Sample Pump Replacement

The Electrochemical Sample pump is found only on CW Sentry™ 3G that have four electrochemical cells for the detection of blood, choke, hydride and halogen gases. CW Sentry™ 3G units for nerve and blister only or with a single electrochemical cell will not have a separate sampling pump.

The Electrochemical Sample pump draws air from the CW Sentry™ 3G fiberglass case onto the electrochemical array found in the Sensor Module assembly. There are two pumps located in the lower middle of the Sensor Module Assembly.

1) Turn off instrument power. Open the gray metal box (Sensor Engine Assembly) and locate the pumps.

2) Disconnect the Molex connector from the electronic board at either J-7 or J-8 depending on which pump is to be replaced.

3) Remove the two pieces of silicon tubing from the pump body. Note the position or orientation of the tubing.

4) Remove the pump from the clamp holding it to the Sensor Module.

5) Remove the caps from the replacement sampling pump.

6) Install the pump into the clamp in the Sensor Module.

7) Reconnect the silicone tubing in the correct positions on the pump body.

8) Plug the Molex connector into either J-7 or J-8 on the electronics board.

9) Turn on the instrument power.

If necessary, reset pump circuit on the electronic board marked S1 or S3. When closing the sensor engine pay close attention to the tubing bundle to ensure that there are no crimps or kinks in the tubing.

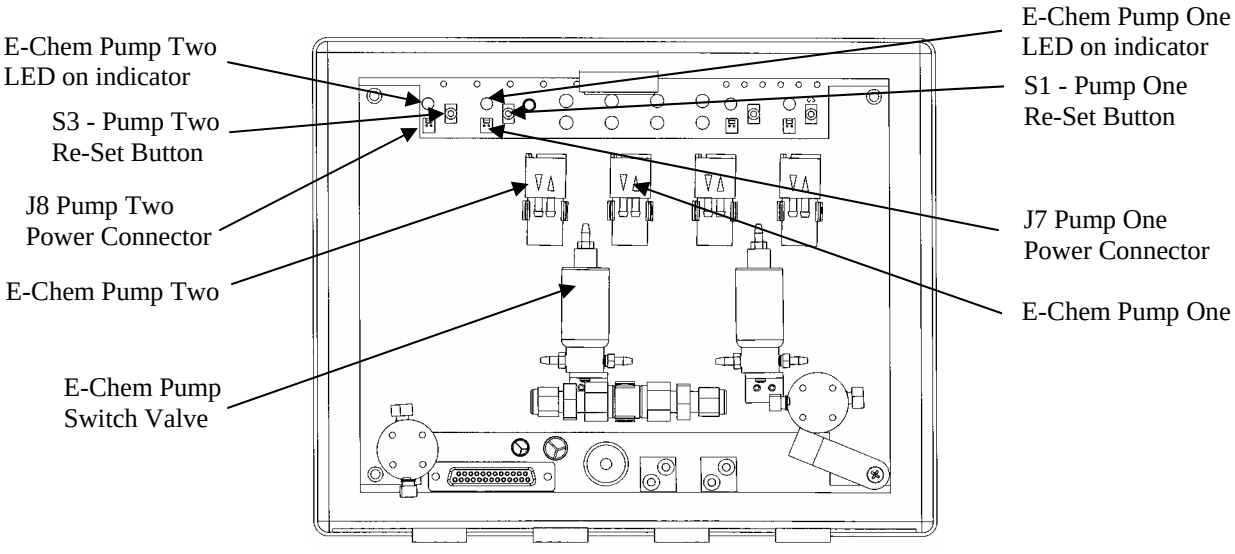


Figure 5.9 – Electrochemical Module Pneumatics

5.9 Vapor Diffusion Check Source Replacement

The Vapor Diffusion Check Source is a black rectangular plastic/metal component located in the Sensor Engine.

1) Turn the instrument power off. Open the exterior case and remove the Sensor Engine from the CW Sentry™ 3G.

2) Carefully remove the old check source from the inlet manifold and disconnect the power wire from J-11 on the interface board.

3) Mount the replacement check source next to the SAW module on the engine mounting plate using the hook and loop adhesive strip supplied with the check source.

4) Connect the nickel transfer tube on the new check source the manifold using the two o-rings provided with the assembly. A .004 o-ring is placed against the fitting and a .003 o-ring is placed on the outside. This allows the tube to be held snugly when the manifold fitting is tightened. The tube must be inserted fully into the manifold until the tapered end of the tubing seats against the inside wall of the manifold channel prior to tightening. Failure to fully insert the tube will result in unreliable performance.

5) Thread the power wire through the spiral wire protector to the lid. Connect the wire to J-11 on the interface board.

6) Turn the instrument on and allow it to warm up. Test the operation of the new check source.

7) Activate the check source as described in section 3.5 of this manual.

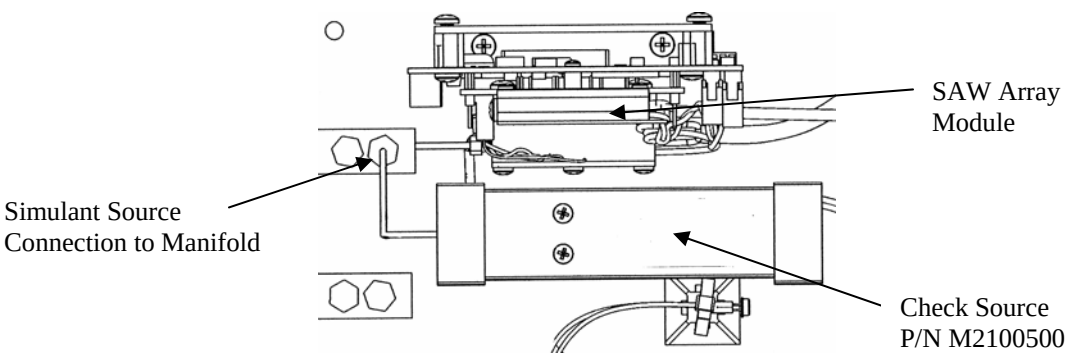
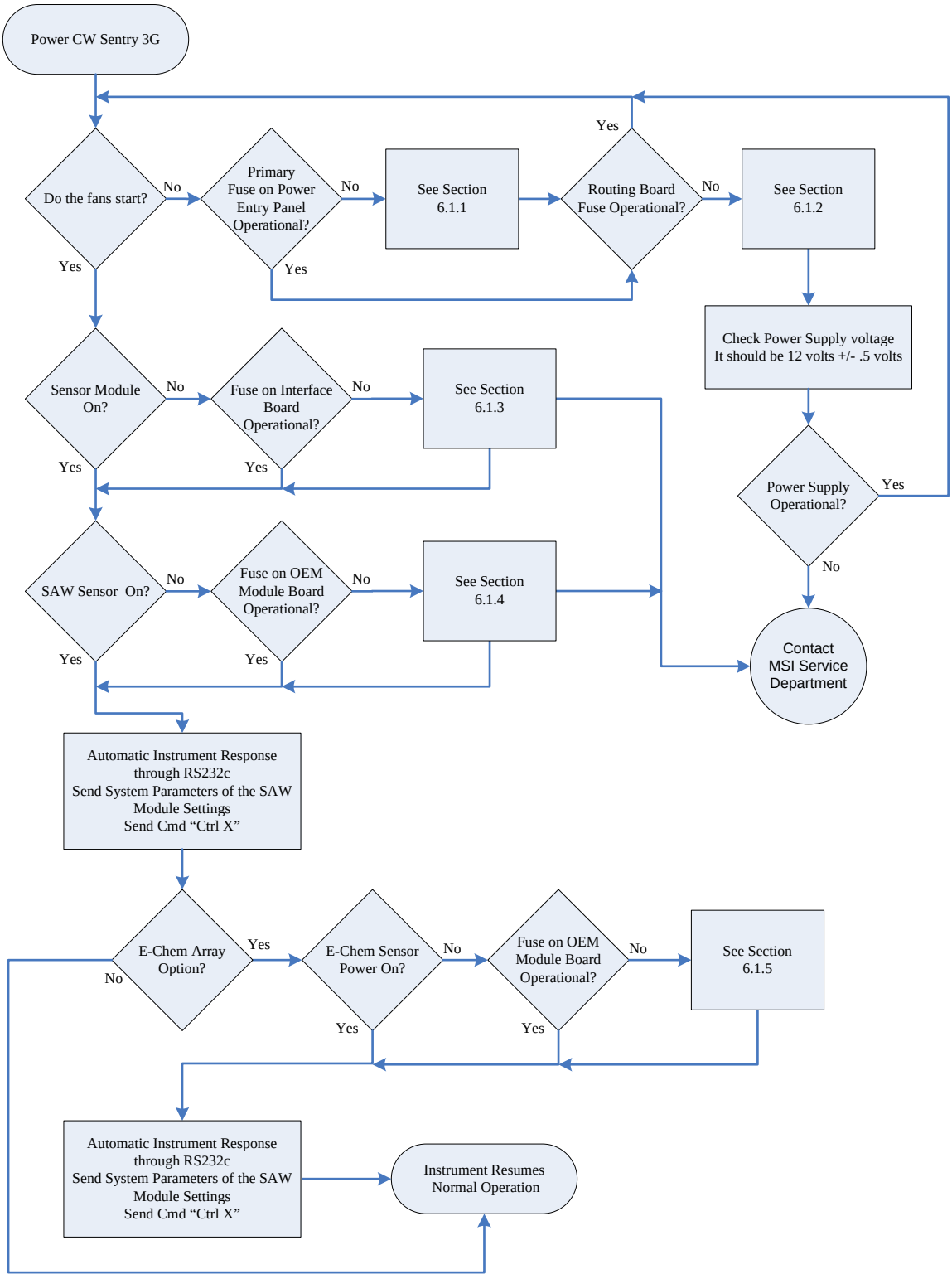


Figure 5.10 – Vapor Check Source

Chapter 6 Diagnostics

6.1 System Start Up Diagnostic Event Chart



6.1.1 Primary Fuse Replacement

Parts Required: Fuse, 250V 2A (5mm x 20mm) P/N – MS114241
Tools Required: Flat Blade Screwdriver

1) Turn off power switch and unplug power cord from the power entry module.
2) Insert screwdriver tip under lip of fuse holder in the power plug socket and slide fuse holder out (away) from assembly.
3) Remove two fuses from holder and install replacements.
4) Insert fuse holder into power entry module ensuring voltage arrow on fuse holder matches on the power entry module.
5) Plug power cord into the power entry module.
6) Turn on main power switch

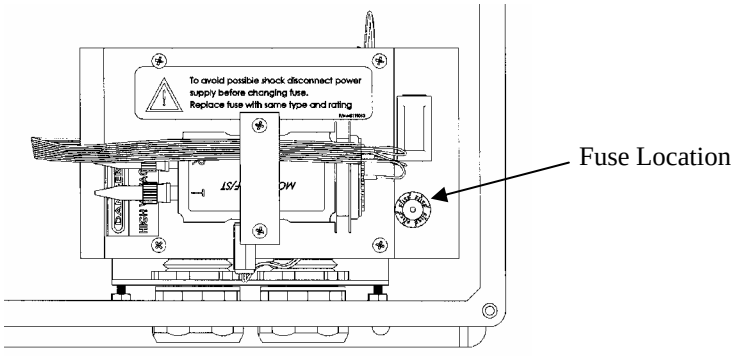


Figure – 6.1 CW Sentry™ 3G Conduit Configuration

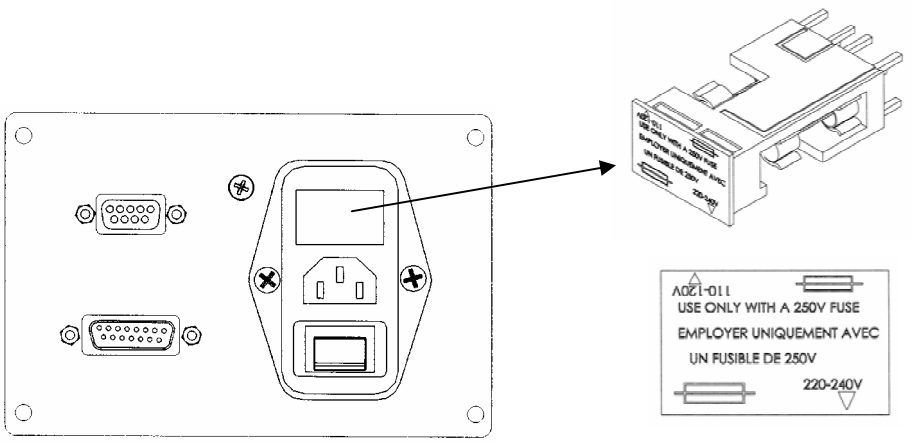


Figure – 6.2 CW Sentry™ 3G IEC Configuration

6.1.2 Routing Board Fuse

Part Required: Fuse, 125V 8A (5mm x 20mm) P/N – M3210120
Tools Required: #2 Phillip Screwdriver

1) Turn OFF main power switch and unplug power cord from the power entry module.
2) Loosen two lid screws on the CW Sentry™ 3G case and open the access door.
3) Remove the DB25 cable from the sensor module. This will allow access to the fuse location.
4) Remove the fuse cover located as indicated in figure 6.3 position (F1) on the routing board. The routing board is located under the sensor engine between the power supply and temperature controller.
5) Remove the fuse from the holder with a twisting action and install a new fuse.
6) Replace the fuse holder lid onto the fuse assembly.
7) Reconnect the DB-25 cable A to the sensor engine.
8) Close the CW Sentry™ 3G front door carefully sealing the enclosure making sure the screws are secured. When closing the sensor engine pay close attention to the tubing bundle to ensure that there are no crimps or kinks in the tubing.
9) Plug the power cord into the power entry module and turn ON the CW Sentry™ 3G.

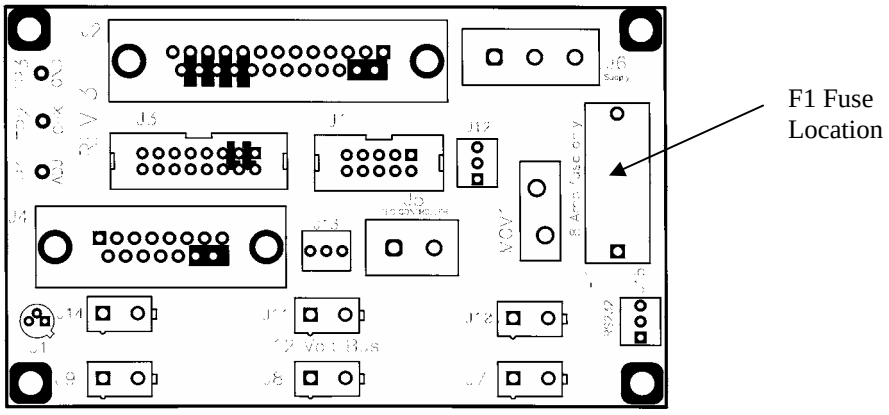


Figure 6.3 - Routing Fuse Board

6.1.3 Interface Board Fuse

Parts Required: Fuse Fast NANO SMF 2A 125V P/N- M3210190
Tools Required: #2 Phillips screwdriver and Needle Nose Pliers

1) Turn off main power switch and unplug power cord from the power entry module.
2) Loosen the two lid screws on the CW Sentry™ 3G case and open the access door.
3) Loosen the two Phillips screws securing the sensor engine access panel located on the top of the module.
4) Carefully open the door. This will rotate down exposing the sensor engine motherboard and allow access to the SAW and electro chemical modules.
5) Locate position (F1) on the motherboard. This is illustrated on Figure 6.4.
6) Remove the fuse chip with the needle nose pliers.
7) Replace the new fuse chip.
8) Carefully close the sensor engine access door.
9) Close the CW Sentry™ 3G front door carefully sealing the enclosure making sure the screws are secured.
10) Plug the power cord into the power entry module and turn ON the CWSP. When closing the sensor engine pay close attention to the tubing bundle to ensure that there are no crimps or kinks in the tubing.

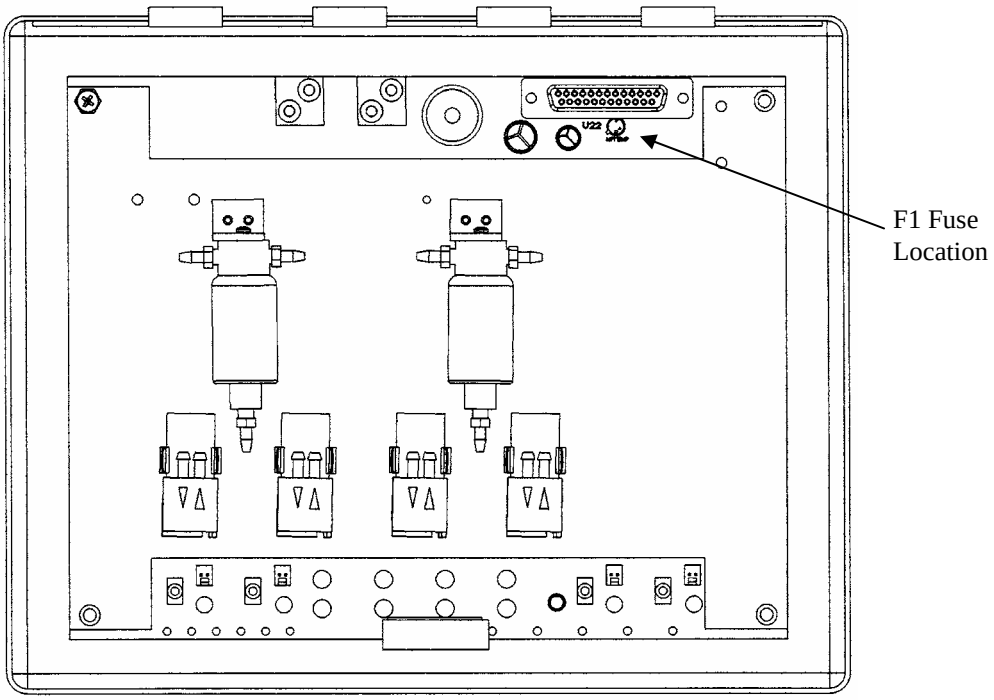


Figure 6.4 - Interface Board Fuse Location

6.1.4 Fuse Chips on Routing Board

Parts Required: Fuse, 1.5A SM Fast Acting P/N M3210030
O-Ring Buna Size P/N M3320190

Tools Required: #2 Phillips Screwdriver 12" in length
5/16 inch Open End Wrench

1) Turn OFF main power switch and unplug power cord from the power entry module.
2) Loosen two lid screws on the CW Sentry™ 3G case and open the access door.
3) Remove the check source to gain access to the SAW module.
4) Loosen the two Phillips screws securing the sensor engine access panel located on the top of the module.
5) Unscrew the nylon 5/16 inch fitting connecting the SAW module to the gold inlet manifold block and remove the two o-rings from the manifold block.
6) Loosen two 6x32 Phillip head screws from the OEM module between the circuit board and the mounting plate. The SAW sensor module is located in the sensor engine on the base plate upper left location.
7) With needle nose pliers, remove the fuse, location (F2) for the SAW sensor and (F1) location for the XCHEM sensor located on the left side of the sensor engine module between the 10 pin box connector and the sensor board.
8) Put the SAW module inlet tube into the 5/16 inch fitting and slide the two new o-rings onto the SAW module inlet tube.
9) Slide the SAW module inlet tube into the intake manifold block and start the 5/16 inch fitting (leaving loose) and carefully install (2) 6x32 Phillip head screws. Tighten the 5/16" fitting.
10) Reinstall the check source with 2 new o-rings.
11) Close the CW Sentry™ 3G front door carefully sealing the enclosure making sure the screws are secured. When closing the sensor engine pay close attention to the tubing bundle to ensure that there are no crimps or kinks in the tubing.
12) Plug the power cord into the power entry module and turn on the power switch.

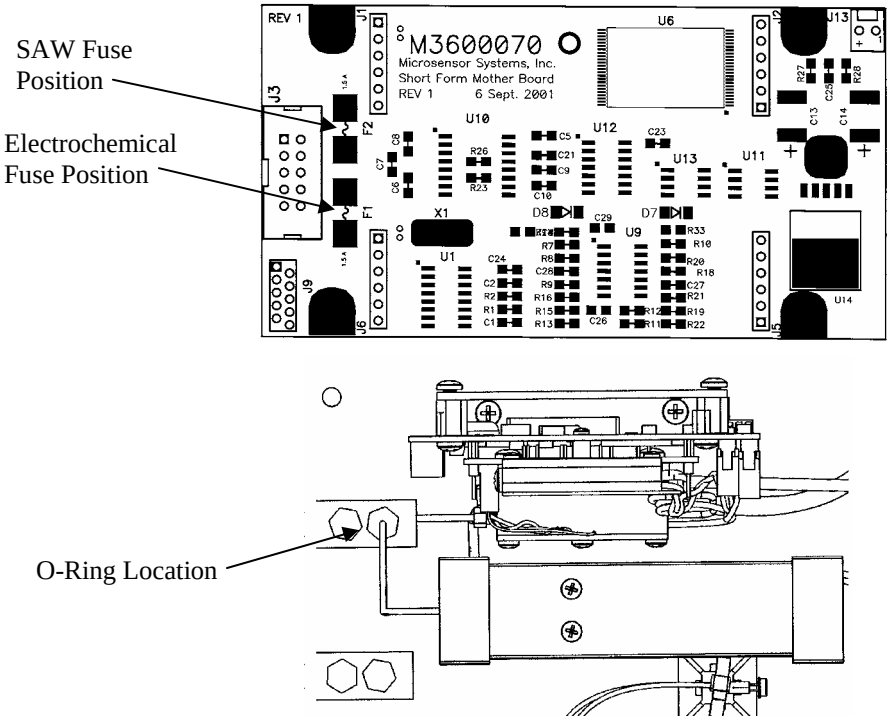


Figure 6.5 - Fuse Chips on Routing Board and O-Ring Location

6.2 CW Sentry™ 3G Diagnostic LED's

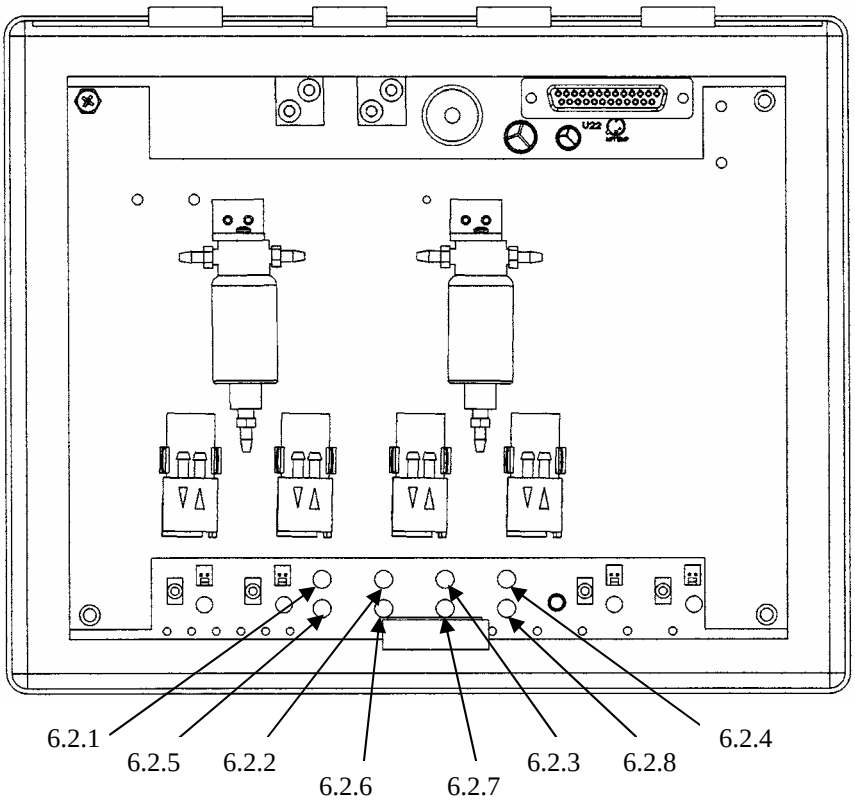


Figure 6.6 – Diagnostic LEDs

6.2.1 Reset

This LED will illuminate when the reset button in the service is pressed. If it is illuminated at any other time, call MSI for service.

6.2.2 Manifold Pressure Fault

This manifold pressure function is disabled. If the LED is illuminated, there could be an incorrect value in the CW Sentry™ 3G parameter file. Call MSI for the appropriate clone file and further instructions.

6.2.3 Electrochemical Fault

If this LED is illuminated there could be several causes. The electrochemical cells could be expired. To verify this, check the expiration label on the electrochemical cell array located next to the saw array.

The fuse for the echem portion could be blown. This fuse is located on the Short Form Motherboard and is labeled F1.

The white ribbon cable connecting the Short Form Motherboard and the Echem Motherboard could be disconnected at either end. If so, call MSI for further instructions.

6.2.4 Internal Case Temperature Fault

If this LED is illuminated there could be several causes.

The instrument has been off for an extended period of time and the ambient temperature is outside the operating temp of the CW Sentry™ 3G. If this is the case, allow several minutes for the Thermoelectric Cooler (TEC) to bring the internal temp into the normal operating range.

The CWS parameter file is corrupted. Verify that the Reference Voltage listed in the CW Sentry™ 3G parameter file matches the measured voltage at TP4 (VCC test point). Also, verify that the Case Temp in the CW Sentry™ 3G parameter file has a value of {“10” / “55”}. If not, call MSI for the correct clone file and further instructions.

The TEC could be defective. To verify this, first check the electrical connections between the TEC and the Routing Board. If they are disconnected at any point, reconnect the wires and cycle the power. If no disconnected wires are found, verify that one or both fans on the TEC are running. If neither fan is running, the TEC is defective. Call MSI for service.

The internal case temperature sensor could be defective. Call MSI for service.

6.2.5 Saw Fault

If this LED is illuminated, one or more of the saws is out of spec. Call MSI for service.

6.2.6 Concentrator Fault

Check the connection to make sure it is securely connected. If the connection is correct then the concentrator has a short and must be replaced. Call MSI for service.

6.2.7 Voltage Fault

If this LED is illuminated, verify that the Reference Voltage listed in the CWS parameter file is the same as the measured voltage. If they do match, call MSI for service. If they do not match, call MSI for the correct clone file and further instructions.

6.2.8 System Test Fault

This function is not enabled in the current version of software.

Appendix A

(SAW Only Configuration) P/N 1200010

The CW Sentry™ 3G is designed to automatically transmit status information (analysis results) after each sample analysis. This information is transmitted in a one line report using the RS232c protocol and is generated every thirty seconds by the SAW sensor module.

(Data Field # in bold text below)

1	**2**	**3**		**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1149	2/11/ 5	CLEAR	FM	48	38	136	37	32	25	38/278	OK
1149	2/11/ 5	CLEAR	FM	40	38	96	37	28	38	38/278	OK
1150	2/11/ 5	CLEAR	FM	32	38	100	37	24	38	38/283	OK

Field definitions for Report format:

Field 1	Time[1]: *hhmm*	Where *hh* = Hour and *mm* = minute
Field 2	Date[2]: *mm/dd/yy*	Where *mm* = month, *dd* = date and *yy* = year
Field 3	Alarm Field	Alarm identification and level or clear Possible combinations: CLEAR SIM (Simulant) LOW G, MED G, HI G, (Nerve Agent) LOW H, MED H, HI H, (Blister Agent) LOW UNK, MED UNK, HI UNK (Unknown TIC Vapor)
Field 4-9	Sensor Data	Field 4 = Sensor 1 value Field 5 = Sensor 1 data point value Field 6 = Sensor 2 value Field 7 = Sensor 2 data point value Field 8 = Sensor 3 value Field 8 = Sensor 3 data point value
Field 10	Temperatures *st/et*	Where *st* = sensor temperature and e*t* = (external temperature)*10 (reported in degrees C)
Field 11	Status Field	If system is running without faults then “OK” is reported. If a fault is detected the text “FAULT” will replace “OK”. Fault messages are as indicated: Sensor 1 = S1 Sensor 2 = S2 Sensor 3 = S3 Temperature = TEMP Concentrator = CONC

Appendix B

(SAW Array and Single Electrochemical Sensor) P/N 1200020 and M2100025

The CW Sentry™ 3G has two formats of data one for the SAW sensors and the other for the electrochemical cell. SAW sensor data is automatically reported after each sample analysis. This information is transmitted in a one line report using the RS232c protocol and is generated every thirty seconds by the SAW sensor module. The CW Sentry™ 3G reports electrochemical information on a change-of-state basis. If an alarm is detected or an alarm condition is cleared, a report is generated.

(Data Field # in bold text below)

1	**2**	**3**		**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1149	2/11/ 5	CLEAR	FM	48	38	136	37	32	25	38/278	OK
1149	2/11/ 5	CLEAR	FM	40	38	96	37	28	38	38/278	OK
1150	2/11/ 5	CLEAR	FM	32	38	100	37	24	38	38/283	OK

Field definitions for Report format:

Field 1	Time[1]: *hhmm*	Where *hh* = Hour and *mm* = minute
Field 2	Date[2]: *mm/dd/yy*	Where *mm* = month, *dd* = date and *yy* = year
Field 3	Alarm Field	Alarm identification and level or clear Possible combinations: CLEAR SIM (Simulant) LOW G, MED G, HI G, (Nerve Agent) LOW H, MED H, HI H, (Blister Agent) LOW UNK, MED UNK, HI UNK (Unknown TIC Vapor)
Field 4-9	Sensor Data	Field 4 = Sensor 1 value Field 5 = Sensor 1 data point value Field 6 = Sensor 2 value Field 7 = Sensor 2 data point value Field 8 = Sensor 3 value Field 8 = Sensor 3 data point value
Field 10	Temperatures *st/et*	Where *st* = sensor temperature and e*t* = (external temperature)*10 (reported in degrees C)
Field 11	Status Field	If system is running without faults then “OK” is reported. If a fault is detected the text “FAULT” will replace “OK”. Fault messages are as indicated: Sensor 1 = S1 Sensor 2 = S2 Sensor 3 = S3 Temperature = TEMP Concentrator = CONC

Electrochemical Report

The following is a breakdown of the electrochemical sensor data report.

(Data Field # in bold text below)

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
2251	10/ 1/ 0	LOW CHOK FM	0	0	0	34	UNIT 1

Field 1	Time[1]: *hhmm*	Where *hh* = Hour and *mm* = minute
Field 2	Date[2]: *mm/dd/yy*	Where *mm* = month, *dd* = date and *yy* = year
Field 3	Alarm Field	Alarm identification and level or clear ALL CLEAR LOW TOX, MED TOX, HI TOX (TOX refers to HCN or $COCl_2$)
Field 4-6	Sensor Data	Field 4 = 0 Field 5 = 0 Field 6 = 0
Field 7	Temperature	
Field 8		Unit identification number (Serial Number or other identifier)

Appendix C

(SAW Array and Electrochemical Array) P/N 1200030

The CW Sentry™ 3G has two formats of data one for the SAW sensors and the other for the electrochemical cell. SAW sensor data is automatically reported after each sample analysis. This information is transmitted in a one line report using the RS232c protocol and is generated every thirty seconds by the SAW sensor module. The CW Sentry™ 3G reports electrochemical information on a change-of-state basis. If an alarm is detected or an alarm condition is cleared, a report is generated.

(Data Field # in bold text below)

1	**2**	**3**		**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1149	2/11/ 5	CLEAR	FM	48	38	136	37	32	25	38/278	OK
1149	2/11/ 5	CLEAR	FM	40	38	96	37	28	38	38/278	OK
1150	2/11/ 5	CLEAR	FM	32	38	100	37	24	38	38/283	OK

Field definitions for Report format:

Field 1	Time[1]: *hhmm*	Where *hh* = Hour and *mm* = minute
Field 2	Date[2]: *mm/dd/yy*	Where *mm* = month, *dd* = date and *yy* = year
Field 3	Alarm Field	Alarm identification and level or clear Possible combinations: CLEAR SIM (Simulant) LOW G, MED G, HI G, (Nerve Agent) LOW H, MED H, HI H, (Blister Agent) LOW UNK, MED UNK, HI UNK (Unknown TIC Vapor)
Field 4-9	Sensor Data	Field 4 = Sensor 1 value Field 5 = Sensor 1 data point value Field 6 = Sensor 2 value Field 7 = Sensor 2 data point value Field 8 = Sensor 3 value Field 8 = Sensor 3 data point value
Field 10	Temperatures *st/et*	Where *st* = sensor temperature and e*t* = (external temperature)*10 (reported in degrees C)
Field 11	Status Field	If system is running without faults then “OK” is reported. If a fault is detected the text “FAULT” will replace “OK”. Fault messages are as indicated: Sensor 1 = S1 Sensor 2 = S2 Sensor 3 = S3 Temperature = TEMP Concentrator = CONC

Electrochemical Report

The following is a breakdown of the electrochemical sensor data report.

(Data Field # in bold text below)

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
2251	10/ 1/ 0	LOW CHOK FM	0	0	0	34	UNIT 1

Field 1	Time[1]: *hhmm*	Where *hh* = Hour and *mm* = minute
Field 2	Date[2]: *mm/dd/yy*	Where *mm* = month, *dd* = date and *yy* = year
Field 3	Alarm Field	Alarm identification and level or clear ALL CLEAR LOW HALO, MED HALO, HI HALO (HALO refers Halogen Class) LOW HYDR MED HYDR, HI HYDR (HYDR refers Hydride Class) LOW BLOD, MED BLOD, HI BLOD (BLOD refers Blood, HCN) LOW CHOK MED CHOK, HI CHOK (CHOK refers Choke, $COCL_2$)
Field 4-6	Sensor Data	Field 4 = 0 Field 5 = 0 Field 6 = 0
Field 7	Temperature	
Field 8		Unit identification number (Serial Number or other identifier)

Appendix D System Parameter Report

Warning! Modification of the CW Sentry™ 3G parameters file should only be done with factory approval. Modifying these parameters can effect the pre-set application and is not recommended.

CW Sentry™ 3G System Parameters Report

Upon initial power up the CW Sentry™ 3G will automatically transmit a System Parameters Report. The System Parameters report details the system operating values that control the CW Sentry™ 3G This report can be captured and modified and then re-sent to the CW Sentry™ 3G to effect system operational changes. Changes to the System Parameters Report should only be performed with assistance from MSI's Service Department.

<ff>CWS
ID=UNIT 1
Mo=9
Dy=12
Yr=01
Hr=10
Min=30
Sec=11
Manifold<tab>11<tab>111
Supply<tab>8<tab>14
SawPumpMin=300
EchemPumpMin=20
CaseTemp<tab>33<tab>333
ChkSrc=5
ResetTime=0
RefVolt=4500
XmitDataPoints=1
<ff>

SAW Sensor Engine System Parameters

This report is transmitted from the sensor module. These values control the cycle time, concentrator heat and pump parameters.

MSI
Sec=0
Min=57
Hr=6
Mo=7
Day=2
Yr=02
Saw1=1 (1=enables/0=disables test of SAW sensor 1)
Saw2=1 (1=enables/0=disables test of SAW sensor 2)
Saw3=1 (1=enables/0=disables test of SAW sensor 3)
Echem=0 (1=enables/0=disables the on board ECHEM cell)
Xechem=1 (1=enables/0=disables the handle ECHEMs)
Runmode=F (F= FAST)
Spkr=1 (1=enables/0=disables speaker)
Rpt=1 (not used)
Datapts=0 (1=enables/0=disables data points)

Datalog=1 (1=enables/0=disables datalog)
Battalrm=6500 (Battery Alarm Level)
Battfalt=6000 (Battery Shut Down Level)
Th1=1000 (Fast Mode Alarm Threshold)
Th2=1000 (Not Used)
Th3=25 (Not Used)
Ratio1=45 (Used by Detection Algorithm)
Ratio2=40 (Used by Detection Algorithm)
Ratio3=60 (Not Used)
FAST
Ct=40
Winstart=10
Winstop=17
Conc1temp=25 (Heater Setpoint)
Conc2temp=20 (Heater Low Limit Set Point)

Pump1	1	4
Pump2	10	41
Pump3	41	41
Conc1	4	10
Conc2	0	0

HISENS
Ct=240
Winstart=161
Winstop=168
Conc1temp=0
Conc2temp=0

Pump1	1	155
Pump2	161	241
Pump3	241	241
Conc1	155	161
Conc2	0	0

PURGE
Ct=10
Winstart=15
Winstop=20
Conc1temp=0

Appendix E

CW Sentry 3G Replacement Part List

Part Description	Part Number
Engine CWS3G	M2120040
Routing Board	M2200160
Fan, External Case	MS214011
Cable, Fan Power	M2210040
Thermo-Cooler Controller MPT-5000	M3260030
Cable, Routing to MPT-5000	M2210090
Cable, Routing Box	M2210070
Cable, Main Power	M2210050
Power Supply	M2210020
Cable, Power CWS3G Sensor Engine	M2210340
Fuse, Power Supply	M3210210
Fuse, Routing Board	M3210120
Filter, Sensor Inlet	M1700040
Filter, Baffle Inlet	M1700020
Pump, Sample	M3240020
Valve, Latching 3-Way	MS211002
Check Source, CWS3G (New Style)	M2100500
Assembly I/O Panel	M2210030
Fuse, 1A (110v)	M3210080
Fuse, 2A (220v)	MS114241