GENERAL DYNAMICS
Canada

Operator's Manual
Document No. 763764

4WARN
Sentry 3000
Biological Detection System

WARNING

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Technical Assistance

Technical Assistance for the 4WARN Sentry 3000 may be obtained by contacting General Dynamics Canada by the following means:

1. By phone at 1-866-66-4WARN (1-866-664-9276).

2. By email at 4WARNService@gdcanada.com

3. By mail:

> General Dynamics Canada
> 1020 68th Avenue North East
> Calgary, Alberta
> Canada
> T2E 8P2
> Attention: Integrated Sensor Systems Service Department

IMPORTANT NOTE:

General Dynamics Canada will not accept contaminated equipment back for repair and/or service. The Customer is obligated to certify that the equipment is clean when returning for maintenance or repair. General Dynamics Canada reserves the right to have an independent laboratory of General Dynamics' choice certify that the unit is clean prior to return for repair or service. All such costs shall be at the Customer's expense.

IMPORTANT SAFETY PRECAUTIONS

1. Under normal operation, the 4WARN Sentry 3000 System must be operated with the enclosure lid closed and latched.

2. Only authorized, trained technical personnel should operate and maintain the 4WARN Sentry 3000 Biological Detection System.

3. The system operates on voltages of 100 to 240 VAC, 50 - 60 Hz. Do not apply power that does not fall within this range.

4. The system must be grounded. This equipment is provided with a cord having an equipment grounding conductor and a grounding plug. The plug must be plugged into an appropriate outlet that is properly installed and grounded in accordance with local codes and ordinances.

5. Place the equipment on a stable surface such that it will not topple over.

6. If placed outside in windy conditions, the equipment must be strapped down to prevent wind gusts from blowing the unit over.

7. Always unplug the unit when not in use.

8. The 4WARN Sentry 3000 Biological Detection System must be protected from water immersion.

9. Remove electrical power and disconnect power cable from source power before performing the maintenance procedures in this guide.

10. Do not remove any component from the detector unit except the replaceable components described in this guide.

11. Do not remove any panels to expose electrical components. Only the HEPA filter compartment may be accessed by the user.

12. Do not use a wet cloth to clean interior components.

13. Do not block ventilation louvers.

14. Do not block sensor or sampler air intakes.

15. Do not lift the unit by the sensor or sampler stacks. Lift only using the case carrying handle.

16. If using an extension cord with the system, use a cord with minimum 16-gauge wire and a maximum length of 60 metres.

17. Live Agent Contamination: if the unit is exposed to live agent, the entire system must be treated as bio-hazard material.

IMPORTANT SAFETY PRECAUTIONS

18. **Do not open the equipment. This system as packaged is classified as a Class 1 Laser product. Note that the equipment contains a Class 3b laser that is isolated from the user. Only trained General Dynamics Canada personnel are qualified to maintain the laser.**

<div style="border: 2px solid black; background-color: #FFFF99; text-align: center;">

WARNING!

**CLASS 3B LASER INSTALLED IN DETECTOR
THE LASER MUST NOT BE EXPOSED,
DISASSEMBLED OR TAMPERED WITH BY THE
USER! TAMPERING MAY RESULT IN
PERMANENT EYE DAMAGE!**

</div>

19. **Always transport the 4WARN Sentry 3000 unit by the carrying handle. Never lift or transport the 4WARN Sentry 3000 unit by the intake stack or the sampling stack, as these fittings are not designed to support such force.**

20. **General Dynamics Canada will not accept contaminated equipment back for repair and/or service. The Customer is obligated to certify that the equipment is clean when returning for maintenance or repair. General Dynamics Canada reserves the right to have an independent laboratory of General Dynamics' choice certify that the unit is clean prior to return for repair or service. All such costs shall be at the Customer's expense.**

Other Important Information

Interference

This equipment has been tested and found to comply with part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial or residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/ TV technician for help.

The supplied cables must be used for this equipment to comply with relevant FCC Regulations

NOTE: This device must be operated as supplied by General Dynamics Canada Ltd.. Any changes or modifications made to the device without the express written approval of General Dynamics Canada Ltd. may void the user's authority to operate the device.

The device operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC RF Radiation Exposure

This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

TABLE OF CONTENTS

Product Features

- Real time generic detection of aerosolized biological agents.
- Autonomous, event driven dry sampling of bio-aerosol enabling laboratory verification and forensics.
- Minimal operating costs as continuous real-time air monitoring is performed without the use of consumables.
- Fully automated operation requiring no user intervention or specialized training.
- Remote control and monitoring via the System Management Software (SMS).
- Ethernet and wireless communications (can be configured for redundant communications).
- Integrated GPS for positional data reporting.
- Expandable to accept other sensors (chemical, radiological, meteorological).
- Rugged weather resistant case.
- Easily deployed and operated by one person.
- Minimal set-up time (< 5 minutes).

4WARN SENTRY 3000 Packing List

The contents of this kit include:

Item	Equipment	Qty	Part Number
1	Sentry 3000 detector including:	1	718866-901
2	120 VAC power cord	1	719234-001
3	RF antenna	1	719362-001
4	GPS antenna	1	719360-001
5	Air intake cap (attached to Sentry)	1	718997-001
6	Sampler intake cap (attached to Sentry)	1	718997-001
7	Laptop computer with power adapter	1	719167-001
8	DGR-115 Freewave modem with antenna and power adapter	1	719363-001
9	Serial Cable	1	719181-001
10	Air intake stack	1	718996-001
11	Sample Cartridge	1	718993-001
12	Sample Filters	100	719910-001
13	HEPA filter (spare)	1	717754-001
14	Test beads	1	719180-001
15	Ethernet Cable	1	720421-001
16	Sentry carrying case	1	719166-001
17	SMS carrying case	1	719165-001
18	Operators Manual	1	763764
19	Freewave Modem Users Guide	1	N/A
20	Dell System Manual and CDs	1	N/A
21	Tool kit consisting of:	1	720271-901
22	Tool Bag (set of 3)	1	720206-001
23	Pliers, needle nose	1	720205-001
24	Adjustable wrench, 6"	1	720294-001
25	Allen key, 2.5 mm	1	720203-001
26	Allen key, $^3/_{32}$"	1	720202-001
27	Flathead screwdriver	1	720201-001

4WARN Sentry 3000 System Description

Overview

The 4WARN Sentry 3000 is a portable biological detection system intended for real-time monitoring, detection, and sampling of aerosolized biological agents. The primary components of the system include:

- Sentry 3000 detector including the biological agent sensor and associated proprietary detection software;
- Laptop including the proprietary System Management Software (SMS).

The Sentry 3000 unit is interfaced to the SMS via either wired link, wireless link or both. The SMS provides remote control and monitoring of the detector unit. Communications between the Sentry 3000 and the laptop is achieved via either Ethernet cable or wireless serial modem. In redundant communications mode, the system is configured with both Ethernet and serial modems. In the event of a communications failure, the system automatically reverts to the communication mode previously not in use.

FIGURE 1. 4WARN Sentry 3000 Detector and SMS

4WARN Sentry 3000 Detector Description

The Sentry 3000 detector is a real-time biological agent detector utilizing fluorescence technology. The detector consists of a detection cell, central processing, integral Global Positioning System (GPS) receiver, Radio Frequency (RF) modem, power conversion/distribution and an air movement system. The components are packaged in a ruggedized weather resistant case with external antenna interfaces (BNC and TNC), a power (100-240 VAC) interface and an Ethernet (RJ-45) interface. The system also has an space for an external spare (RS-232) for peripheral expansion (e.g., a chemical sensor, radiological sensor or a meteorological system). The external interfaces are described in the following table.

Interface	Connector Type	Description
Power	3-prong AC receptacle	100-240 VAC grounded connector
Ethernet	RJ-45 bulkhead	Network connector
Modem Antenna	TNC bulkhead	Transmit/receive, maximum transmit power = 1 watt.
GPS Antenna	BNC bulkhead	Active receive antenna. 5 VDC between center pin and shield.

4WARN Sentry 3000 SMS Description

The SMS provides for remote control and monitoring of the Sentry 3000. A detailed description is contained in this section.

1. The SMS software is launched by left clicking on the CCS icon on the desktop (Figure 2.).

FIGURE 2. BAM Desktop Icon

SMS presents a password panel as shown in Figure 3. Enter the user ID and password (provided to the Customer separately). Users may be added or deleted as described in the Password Management section of this manual.
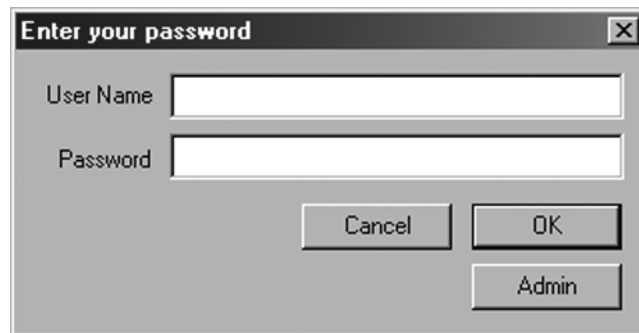

FIGURE 3. Password Panel

2. SMS presents a Main Command and Control System (CCS) Panel as shown in Figure 3. and automatically detects all Sentry 3000 detectors (up to 6) connected to it. Each Sentry is represented by an icon as shown in Figure 4 (shown as "L1" here).
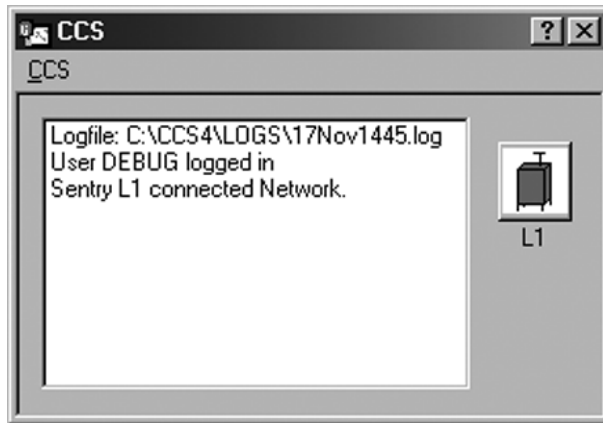
FIGURE 4. CCS Main Panel

The Sentry icon appears as one of three colour combinations described in Table I:

TABLE I.

Icon Color	Description
Green	System is OK and monitoring.
Half green, half yellow	System Fault
Red	Bio Alarm (alarms are discussed in the Alarm Handling Section)

4. Clicking on "CCS" presents a menu as shown in 5. Functions of each menu item are described in Table II.
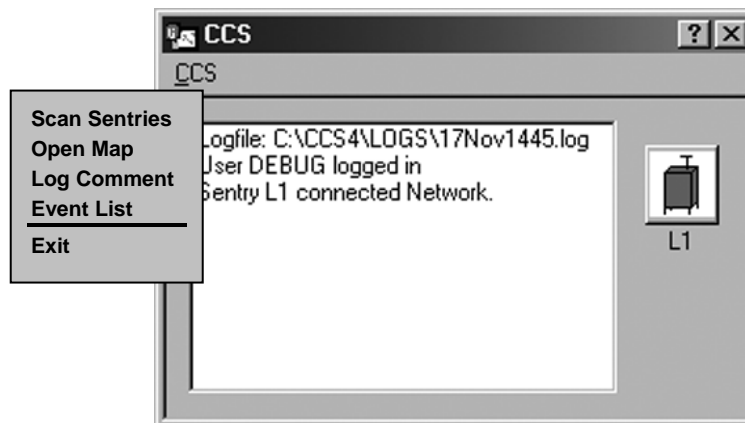

FIGURE 5. CCS Menu

TABLE II.

Function	Description
Scan Sentries	Opens the IP Address Range dialog to define the range of IP Addresses to search for Sentries and scans the network for additional Sentries that may have been added to the network after SMS start up.
Open Map	Opens a window to select optional maps. Once a map is selected and loaded, the SMS automatically places an icon on the map at the location of the Sentry as determined by the Sentry's built-in GPS receiver.
Log Comment	Allows the operator to enter a comment in the log file.
Event List	Displays an event list showing Sentry ID and biological alarms, including alarm on and off times, for each Sentry.
Exit	Exits the SMS application.

5. Clicking on the Sentry icon presents a menu as shown in Figure 6. Functions of each menu item are described in Table III.
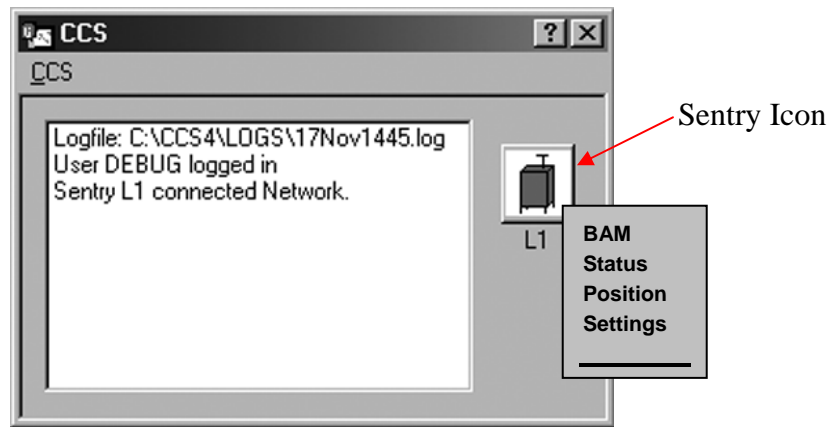

FIGURE 6. Sentry Menu

TABLE III.

Function	Description
BAM	Launches the Biological Agent Monitor as described later in this section.
Status	Launches the status panel as described later in this section.
Position	Launches the GPS panel as described later in this section.
Settings	Launches the settings panel as described later in this section.

6. To change the defined range of IP addresses to scan on startup, enter the lower and higher IP addresses into the panel shown in Figure 7. Use the 255.25.255.255 format. The first 3 parts of the IP addresses must be the same.
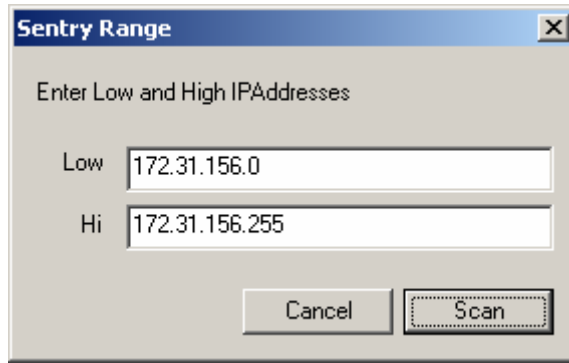
FIGURE 7. IP Address Dialog.

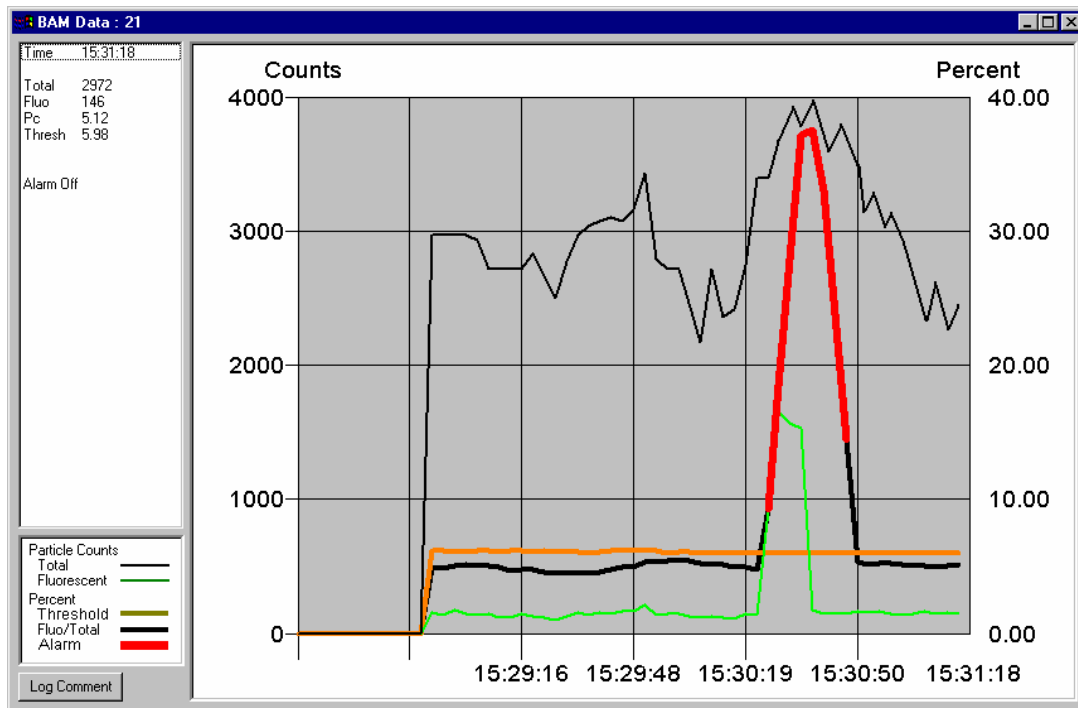7. Selecting BAM presents the following display.

FIGURE 8. BAM Data Window

The BAM panel updates every 3 seconds providing the operator with real time monitoring of air particles. The graph displays total counts, fluorescence counts, threshold, percent fluorescence and alarm. An alarm condition exists when the percent fluorescence crosses the threshold, in which case the operator is presented with an alarm panel (Figure 21) and the percent fluorescence line on the graph turns thick red for the duration of the alarm.

A description of each line plotted on the graph is included in Table IV.

TABLE IV.

Graph Line	Description
Total	Total particles falling in the range of 1-10 microns that are being counted by the Sentry.
Fluorescent	Fluorescent particles falling in the range of 1-10 microns that are being counted by the Sentry.
Threshold	Threshold as determined by the algorithm. If exceeded a biological alarm condition exists.
Fluo/Total	Percentage of fluorescent particles to total particles. Used by the algorithm to determine if a biological agent is present.
Alarm	Indicates a biological agent has been detected.

8. Selecting Status on the menu presents the operator with a panel (Figure 9) that provides remote control and monitoring of several components. Table V describes the functionality of this panel.
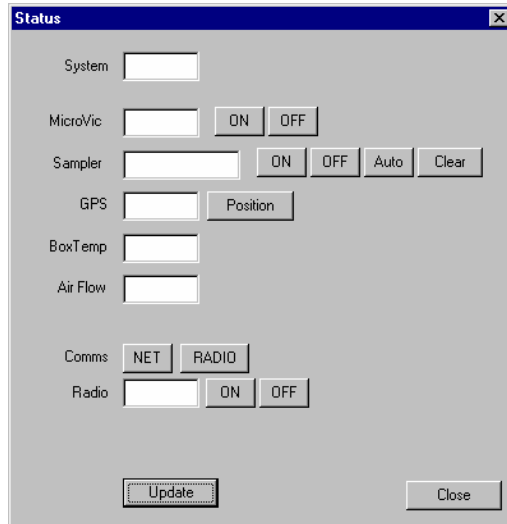
FIGURE 9. Status Window

TABLE V.

Subsystem	Button	Description
System	N/A	Status is presented as ON or FAULT.
MicroVic	N/A	Status of the concentrator is presented as: ON – operating OFF – not operating FAULT - power not in expected state.
	ON	Turns the MicroVic on.
	OFF	Turns the MicroVic off.
Sampler	N/A	Status of the Sampler is presented as On or Off, Fault or Sample Ready (appears when sampling is complete).
	ON	Turns the Sampler on. The sampler will remain on for the time specified in the settings panel (default is 600 seconds).
	OFF	Turns the Sampler off.
	AUTO	Puts the sampler in automatic mode. When in this mode the sampler automatically turns on when a biological alarm occurs. Selecting this again takes the Sentry out of automatic mode.
	CLEAR	Resets the sampler after a sample has been taken. **NOTE: CLEAR must be selected to take another sample. The sampler will not start again until cleared.**
GPS	N/A	Status of GPS is displayed as: • NO FIX – GPS has not located satellites.

TABLE V.

Subsystem	Button	Description
		• FIX – GPS has acquired satellites. • MANUAL – displayed when a manual fix is entered (described later in this manual). • ERROR – displayed when data is not being received from the GPS
	POSITION	POSITION displays the GPS panel shown in Figure 9.
Box Temp	N/A	Displays the internal temperature of the Sentry 3000. Should be between 15°C to 35°C for normal operation.
Air Flow	N/A	Displays the air flow status. This should be between 0.7 and 1.3.
Comms	RADIO	Selects the modem as the communications interface between the Sentry 3000 and the laptop.
	NET	Selects the Ethernet as the communications interface between the Sentry 3000 and the laptop.
Radio	N/A	Status of the radio is presented as: • ON • OFF • ERROR – displayed if the radio stops accepting data.
	ON	Turns the modem on.
	OFF	Turns the modem off.

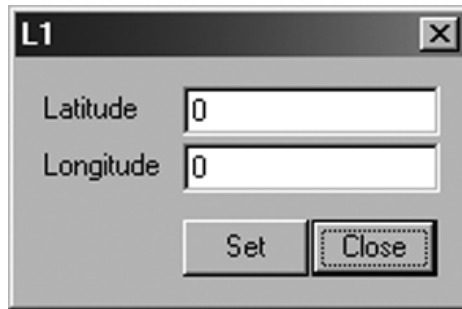9. Selecting POSITION on the menu shown in Figure 6 presents the panel shown in Figure 10.

FIGURE 10. GPS Window

Table VI describes the functionality of the GPS panel.

TABLE VI.

Function	Button	Description
Latitude	N/A	Displays the latitude coordinate of the Sentry as determined by the internal GPS receiver.
Longitude	N/A	Displays the longitude coordinate of the Sentry as determined by the internal GPS receiver.
Manually set coordinates	SET	Allows the operator to enter manual coordinates as follows (if for example the Sentry is located inside and the GPS is not able to acquire a fix): Enter latitude in the space provided. Enter longitude in the space provided. Select SET.
Close window	CLOSE	Closes the GPS panel.

10. Selecting SETTINGS on the menu shown in Figure 6 presents the password panel discussed previously. Upon successful log in, the panel shown in Figure 11 appears. Users may be added or deleted for the settings panel as described in the Password Management section of this manual.
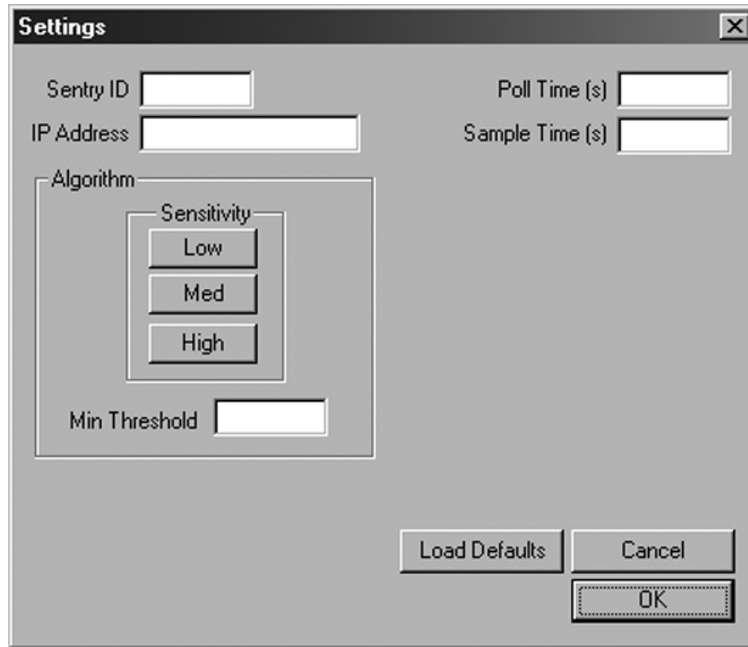
CSD/112183

FIGURE 11. Settings Panel

Table VII describes the functionality of the Settings panel.

TABLE VII.

Setting	Button	Description
Sentry ID	N/A	Displays the unique identifier of the Sentry 3000.
IP Address	N/A	Displays the IP address of the Sentry 3000. The IP address can be changed by entering a new address in the space provided. The IP address uses the 255.25.255.255 format.
Poll Time	N/A	Displays the time interval (in seconds) in which system status is sent from the Sentry 3000 to the laptop. Poll time can be changed by entering a new time in the space provided. It is recommended that this not be changed by the user.
Sample Time	N/A	Displays the time the sampler remains on in seconds. Sample time can be changed by entering a new time in the space provided.
Algorithm	LOW	Sets the sensitivity of the system to low. GD CANADA STRONGLY RECOMMENDS THAT THESE SETTINGS NOT BE ALTERED UNLESS GD CANADA IS CONSULTED.
	MED	Sets the sensitivity of the system to medium. GD CANADA STRONGLY RECOMMENDS

TABLE VII.

Setting	Button	Description
	HIGH	THAT THESE SETTINGS NOT BE ALTERED UNLESS GD CANADA IS CONSULTED.
		Sets the sensitivity of the system to high. GD CANADA STRONGLY RECOMMENDS THAT THESE SETTINGS NOT BE ALTERED UNLESS GD CANADA IS CONSULTED.
Min Threshold	N/A	Displays the current threshold limit used by the algorithm to determine the presence of a biological agent. GD CANADA STRONGLY RECOMMENDS THAT THIS SETTING NOT BE ALTERED UNLESS GD CANADA IS CONSULTED.
Load Defaults	LOAD DEFAULTS	Restores all setting parameters to the factory defaults.
Cancel	CANCEL	Exits the panel without saving changes.
OK	OK	Exits the panel and saves changes.

Password Management

From the password panel shown in Figure 2, select Admin to manage the list of users. You must have Admin privileges to access the User List dialog, shown in Figure 12.

FIGURE 12. User List Panel

When the User List dialog opens, it displays a list of all users and their access level (User or Admin). You can add or delete users from here.

To add a new user, select Add User. This will open the Add User dialog (Figure 13). Enter a user name. Enter the password twice for confirmation. To make this user an administrator of this 4WARNsystem, check the Give User Admin Privileges check box. Select OK. The user will be added to the user list.
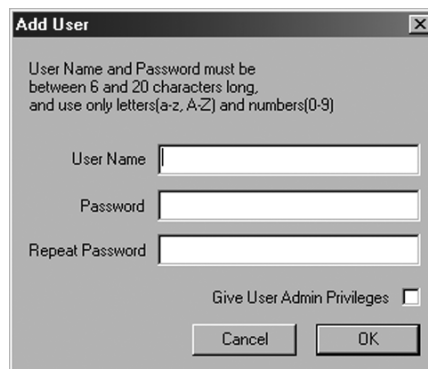

FIGURE 13. Add User Panel

To delete a current user, select the user's name in the list and click Delete User. You will be asked to confirm the deletion.

System Set-up

Refer to Figures 14 to 20 for this set-up procedure.

Sentry Set-up

1. Remove the Sentry 3000 from the shipping case and open the lid.

2. Remove the air intake stack, modem antenna and GPS antenna from the stowed position inside the Sentry 3000.

3. Remove the RF modem, serial cable, Ethernet cable and sampling cartridge from the transit case.

4. Unscrew the air intake cap and sampler cap from their respective ports.

5. Disassemble the sampler cartridge and place a sample filter in the cartridge. Reassemble cartridge.

6. Screw the air intake stack on to the air intake stack receiver.

7. Push the sampling cartridge all the way down on the sampler receiver.

8. Screw the air intake stack cap onto the air intake stack.

9. Screw the sampler stack cap onto the sensor sampler cartridge.

10. Verify that the HEPA filter is installed in the filter compartment.

11. Ensure that the concentrator and sampler override switches in the filter compartment are off (refer to Figure 20.)

12. If GPS is required, connect the GPS antenna to J4 on the RF Connector. Place the antenna in the desired location. Ensure that the antenna has clear view of the horizon.

13. Connect the power cable to J1 "PWR" of the power/data connector panel.

NOTE:
The laptop should be on and booted-up prior to turning on the Sentry 3000 detector. This ensures that the Sentry boots up quickly. If the laptop is not connected to the Sentry, it may take a few minutes for the Sentry to boot up.

Communication Interface Set-up

1. Determine the mode of communications between the Sentry and the SMS laptop. There are three methods of communications with the Sentry including Ethernet, wireless serial modem and a redundant mode. The system automatically detects which method (wired or wireless) is used once the system is turned on.

    i.   For Ethernet communications, configure as per Figure 16.

    ii. For the wireless communications, configure as per Figure 17. Note that the modems are factory configured. No setup is necessary.

    iii. For redundant communications, make all connection in accordance Figures 16 and 17.

2. Determine if multiple Sentries are required. Configure the Sentries and SMS according to the desired communication mode as follows:

    i. Network via Ethernet (refer to Figure 18)
        a. Connect a network hub (not supplied with the system) to the laptop and apply power to the hub.
        b. Connect each Sentry to the hub via user supplied straight CAT6 Ethernet cables
    ii. Network via modem
        a. Place each Sentry in the desired location and apply power.
        b. Connect a modem to the SMS laptop in accordance with Figure 17 and apply power to the modem. Until the Sentry is powered up, all LEDs on the modem will be solid red indicating no communications.

Laptop Set-up

1. Set up computer in desired location and connect as per communications interface section.
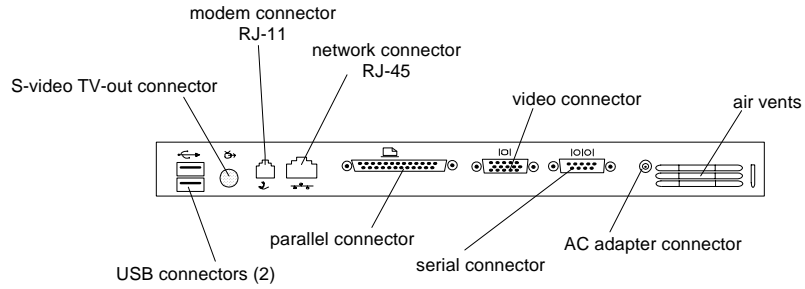
Power Up

1. Apply power to the laptop and allow to boot up.

2. Apply power to the Sentry (or Sentries) by toggling the main power switch on. Note that the fans will start as soon as power is applied and will shut down after the Sentry 3000 boots up if the internal temperature is below 25°C.

3. Observe that the Power LED illuminates on the status indicators inside the Sentry (or Sentries). (Note that the Processor LED will blink at 1 Hz and the concentrator will turn on once the Sentry 3000 successfully boots up). The state of the status indicators (Figure 15) should be as follows once boot-up is complete:
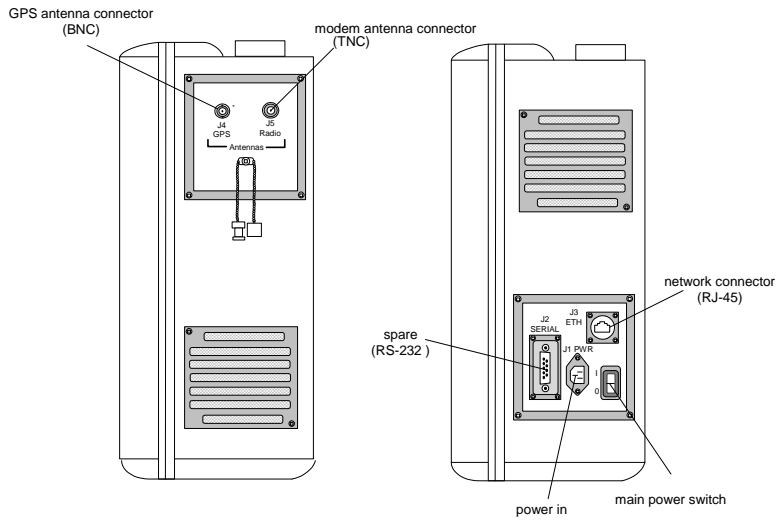
TABLE VII.

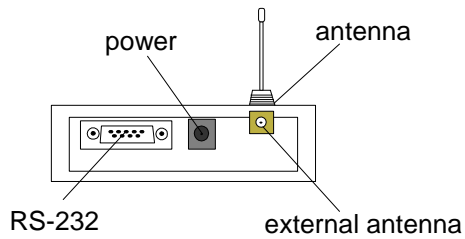| LED	Color	Function
Fluorescence	Yellow	Flickering - Indicates the presence of biological particles in the laser path Off - No biological activity
Particle	Yellow	Flickering - Indicates the presence of background particles in the laser path
Air Flow	Green	On - Indicates that the air-flow rate is correct Off - Indicates a low air-flow rate.
Processor	Flashing Green	Flashes at a 1-Hz rate indicating that the embedded processor is operating
UV Laser	Green	On – Indicates that the UV laser is operating within specified operating limits. Off – Indicates that the UV laser is in a fault state.
Power	Green	On – Indicates that main power is present in the unit Off – Indicates no power–check circuit breaker and input power connection

4. If using modem communications, note the status of the LEDs (Figure 15). Carrier Detect will be solid green. Transmit and Clear To Send will be blinking red at a constant rate indicating a communications link has been established between the Sentry 3000 and SMS.

5. Close the Sentry 3000 lid and place the unit in the upright position.

SMS Laptop Connectors

modem connector
RJ-11

network connector
RJ-45

S-video TV-out connector

video connector

air vents

parallel connector

AC adapter connector

serial connector

USB connectors (2)

Sentry 3000 Connectors

GPS antenna connector
(BNC)

modem antenna connector
(TNC)

J4
GPS

J5
Radio

Antennas

network connector
(RJ-45)

J3
ETH

spare
(RS-232)

J2
SERIAL

J1 PWR

power in

main power switch
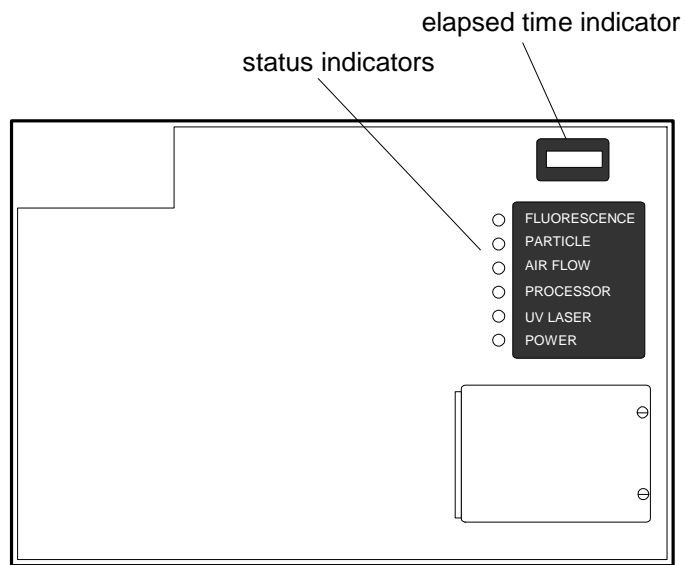
Modem Connectors

power

antenna

RS-232

external antenna

FIGURE. 14 – 4WARN Sentry 3000 System Connectors
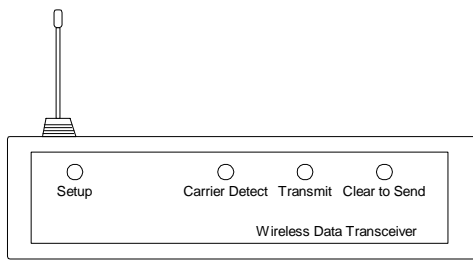
Modem Indicators

Sentry 3000 Indicators

FIGURE 15. Sentry 3000 Indicators

cross-over network cable (RJ-45)

J3
ETH

J2
SERIAL

J1 PWR

I
0

SMS laptop computer

laptop power adapter
(supplied with laptop)

100-240 VAC, 50-60 Hz main power
(cable supplied with Sentry 3000)

115 VAC, 60 Hz
main power
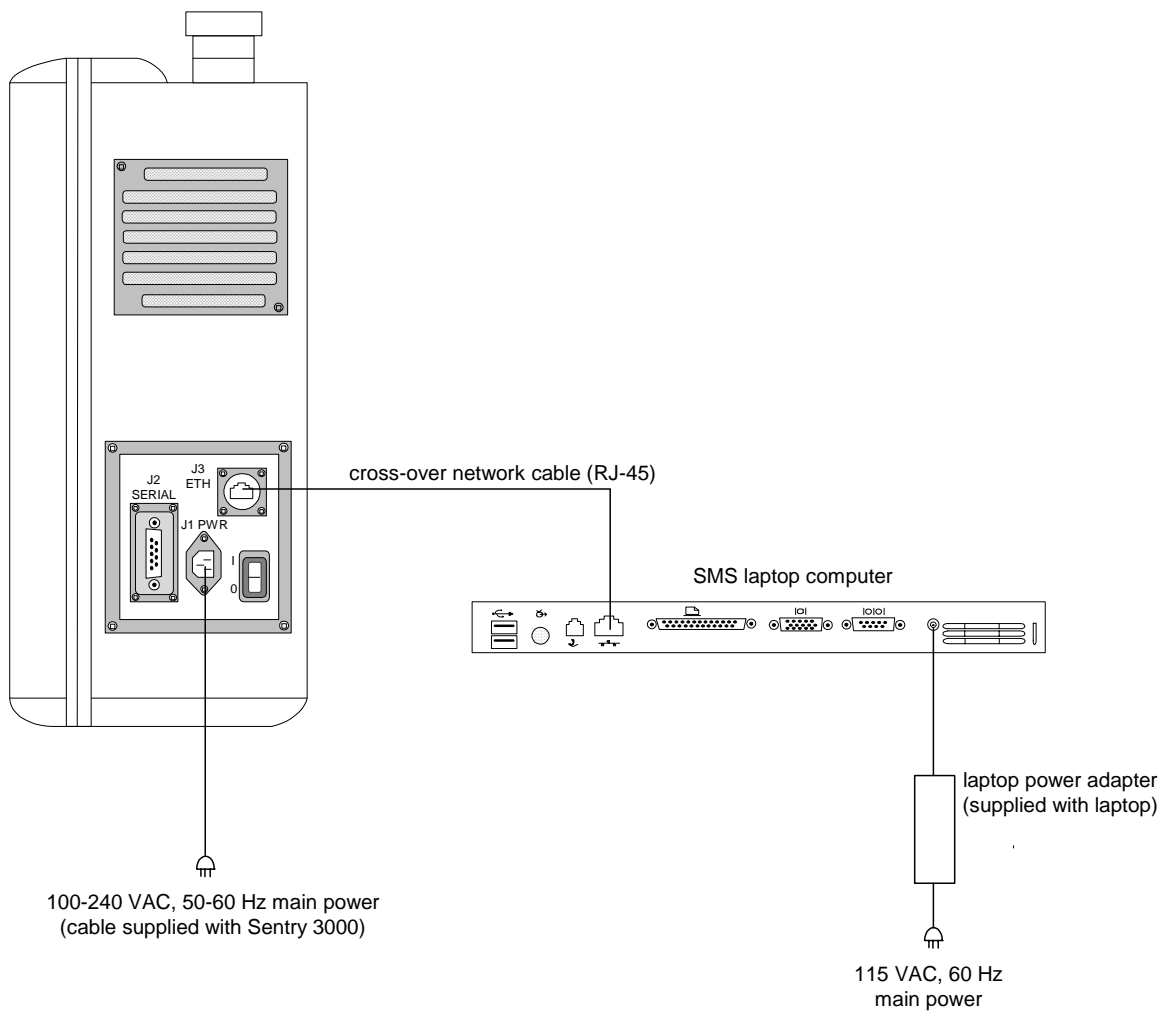
FIGURE 16. 4WARN Sentry 3000 Network Communications Configuration

GPS antenna

modem antenna

J4
GPS

J5
Radio

Antennas

wireless RF modem

RS-232 Cable

SMS laptop computer

4WARN Sentry 3000

laptop power adapter
(supplied with laptop)

100-240 VAC, 50-60 Hz main power
to connector panel on opposite side
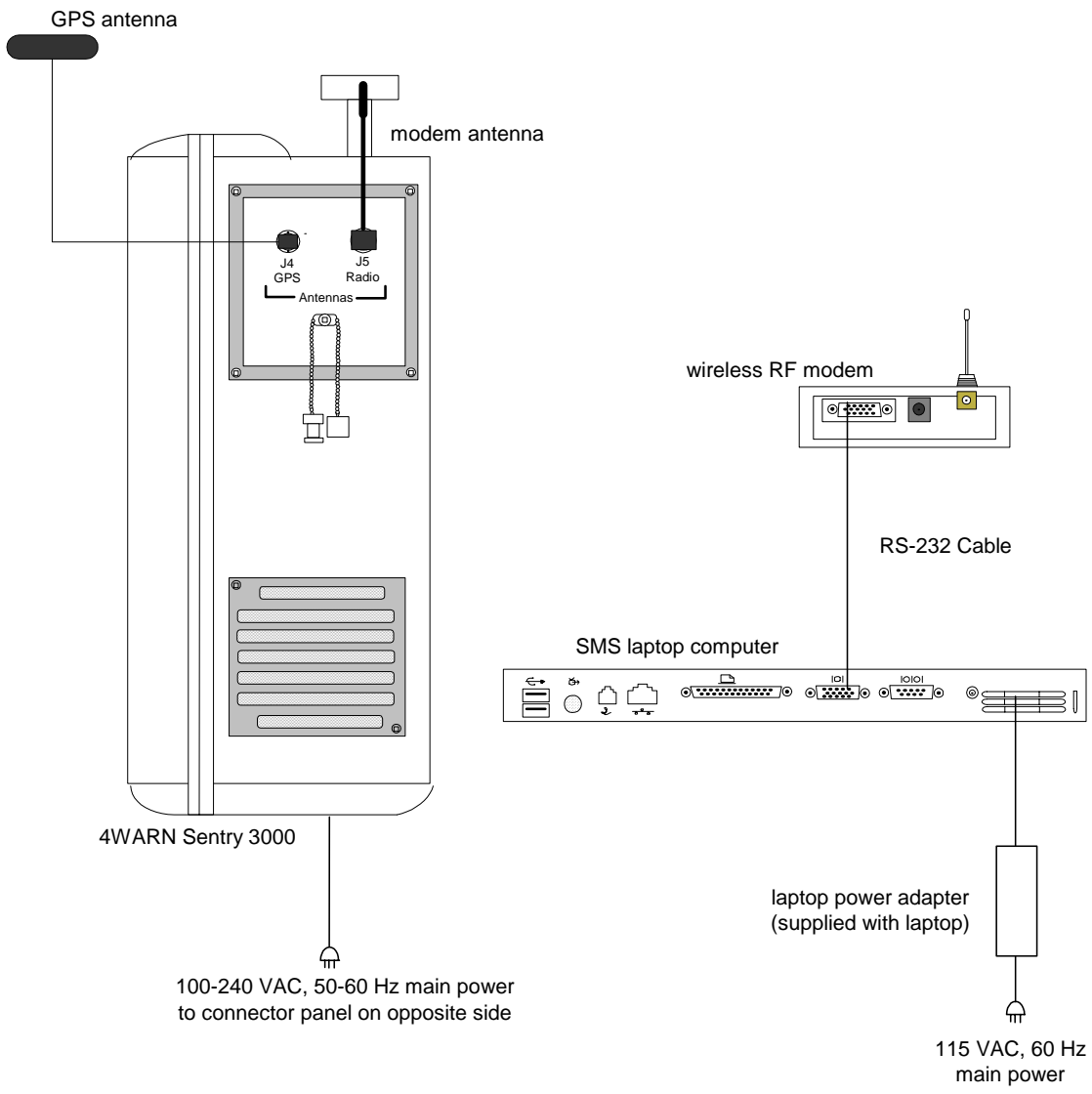
115 VAC, 60 Hz
main power

FIGURE 17.   4WARN Sentry 3000 Wireless Communications Configuration

100-240 VAC, 50-60 Hz main power
(cable supplied with Sentry 3000)

straight network cable
CAT6 (RJ-45)

Note: up to 6 Sentry 3000 detectors can be networked. Each must have a unique IP address.

J2 SERIAL
J3 ETH
J1 PWR

straight network cable
CAT6 (RJ-45)

Network Hub

network cable (RJ-45)

SMS laptop computer

100-240 VAC, 50-60 Hz main power
(cable supplied with Sentry 3000)

laptop power adapter
(supplied with laptop)

115 VAC, 60 Hz
main power

FIGURE 18. 4WARN Sentry 3000 Networked Configuration

Air intake stack cap   Sample cartridge   Sampler cap

Air intake stack

Air intake receiver

Sampler receiver
(under cartridge)

RF connector panel (details
shown in Figure 10)

Carrying handle

Front View

Intake fan

Exhaust fan

Power/Data connector panel
(details shown in Figure 10)

Back View

FIGURE. 19 Sentry 3000 External Components

Elapsed time indicator

Status indicators

Stowage Compartment
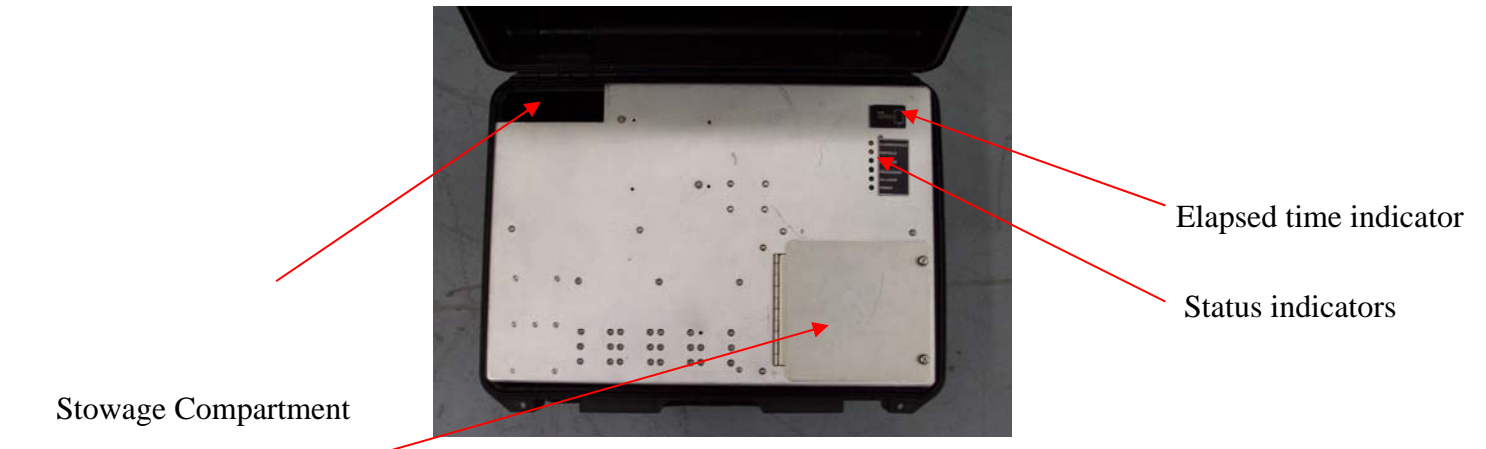
Access panel to filter
compartment (see DETAIL
"A" for components inside
filter compartment)

Access Panel

HEPA filter
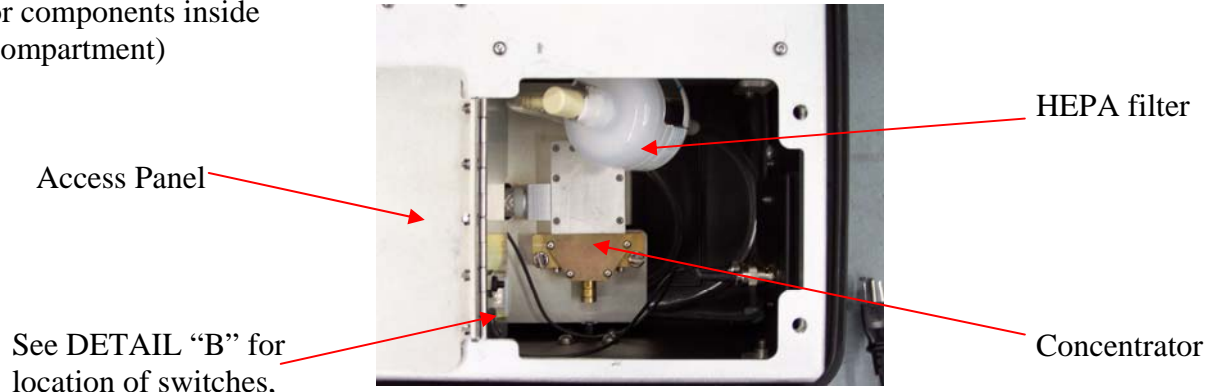
See DETAIL "B" for
location of switches,
breaker and connector.

Concentrator

DETAIL "A"

Concentrator Override Switch

Breaker

Sampler Override Switch

Spare connector (J6)
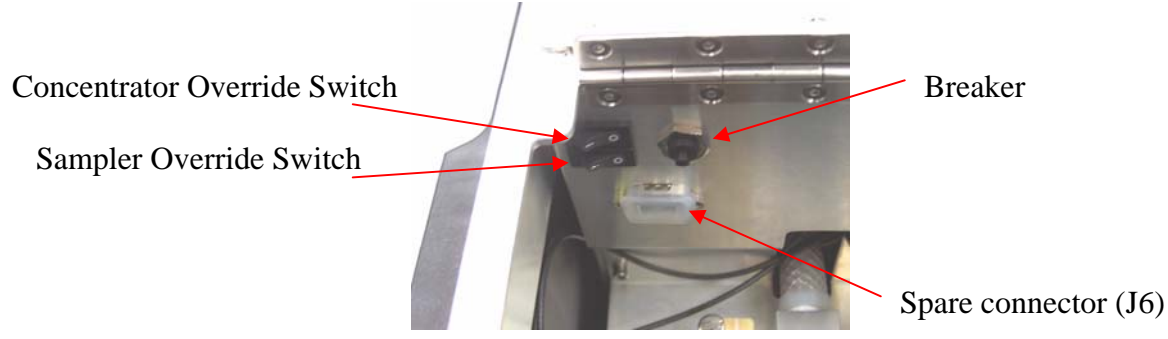
DETAIL "B"

FIGURE. 20 Sentry 3000 Internal Components

System Operation

1. Set up the system in accordance with the System Set Up section of this manual.
2. Launch CCS by clicking on the CCS3k.exe icon and enter user ID and password.
3. Ensure that the Sentry 3000 icon (or icons if multiple Sentries are connected) is displayed on the main SMS window indicating that SMS is communicating with the Sentry(s).
4. If using modem communications, note status of the LEDs. Carrier Detect will be solid green. Transmit and Clear To Send will be blinking red in a somewhat random fashion indicating data is being sent through the modems.
5. The Sentry is now monitoring for biological agents.
6. Click on the Sentry icon and select BAM if monitoring real-time data is required.
7. If manual sampling is required, select STATUS on the Sentry 3000 icon menu and then select sample ON whenever a sample is required. The sampler will run for the duration specified on the settings panel. Upon completion of sampling, SAMPLE READY will appear in the status panel. Go to step 9.
8. If automatic sampling is required, select STATUS on the Sentry 3000 icon menu and then select AUTO sample on the STATUS panel. Ensure sampler status is displayed as AUTO. Sampler will now turn on automatically upon detection of a biological agent. The sampler will run for the duration specified on the settings panel. Upon completion of sampling, SAMPLE READY will appear in the status panel.
9. Once sampling is complete and SAMPLE READY is displayed (manual or automatic mode), the sampler is inhibited from further sampling until CLEAR is selected on the status panel.

NOTE
It is important to note that the setting on the status panel must be set to AUTO in order for the sampler to automatically collect a sample immediately after an "Event" is detected.

System Shutdown and Storage

Shut down SMS as described in the following section.

1. To shut down the SMS, exit from SMS by selecting EXIT on the menu shown in Figure 5.
2. Turn off the laptop.
3. Turn off the Sentry detector.
4. Remove the network and power cables from the Sentry. Apply the protective cap to the network connector.
5. Remove the GPS and modem antennas and attach the connector caps to the connectors.
6. Stow power and Ethernet cables inside the Sentry transit case.
7. Stow modem in the Sentry transit case.
8. Stow GPS and modem antennas inside the Sentry storage compartment.
9. Remove the air intake cap from the air intake stack and stow the stack inside the Sentry storage compartment (Figure 20.).
10. Attach the air intake stack cap to the air intake receiver.
11. Remove the sampler cartridge assembly from the receiver and unscrew the sampler cap from the cartridge.
12. Remove and discard sample element (assuming it is unused). If a sample has been taken, refer to the Sample Collection section of this manual.
13. Attach the sampler cartridge cap to the sampler receiver.
14. Disconnect serial cable from modem and laptop and remove antenna from modem. Stow modem, antenna, serial cable and laptop in the SMS transit case.

Sample Collection

The Sentry 3000 Biological Detection Unit is equipped with a built in sampling capability. The samples are collected on the sample filter element within the sampling cartridge (Figure 21).

The sampler stack assembly is removed from the unit by pulling it off. The cap for the sampler stack is removed by unscrewing it from the sample cartridge. It is recommended that the entire cartridge assembly including element be sent for laboratory analysis id a bio sample has been taken. This will prevent potential sample contamination in the event the filter is removed in the field.

The sampler cartridge must be handled and delivered to a lab, in accordance with local laws and regulations regarding handling of bio-hazardous material.
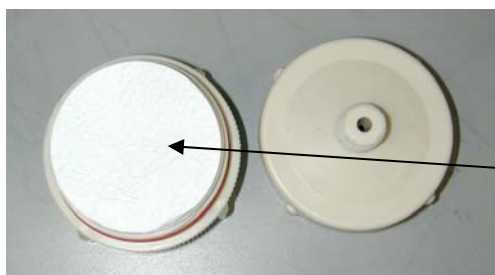
assembled cartridge
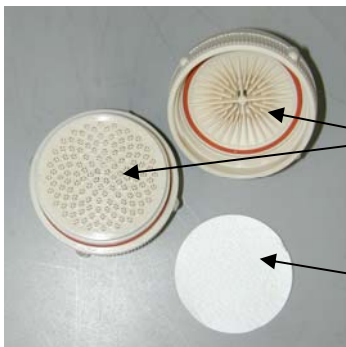
disassembled cartridge
(disassemble by unscrewing top
from bottom)

filter element

Filter element installed on bottom
part of filter. Complete installation
by screwing top part of cartridge on
to the bottom.

FIGURE 21. Sample Cartridge

Alarm Handling

1. In the event of a biological alarm:
   a. An alarm panel is displayed as shown in Figure 22. The panel stays on the screen until cleared by the operator. The operator may clear the alarm panel by left clicking on CLOSE.   If the operator wishes to save the ATP45 data, this must be done as described below before closing this window.
   b. SMS sounds an audible alarm. The alarm persists until the alarm panel is cleared by clicking CLOSE.
   c. The Sentry icon will turn red for the duration of the alarm. The icon reverts back to green automatically when the bio alarm clears.
   d. The Fluo/Total line on the graph will change from black to thick red for the duration of the alarm. The line reverts back to black automatically when the bio alarm clears.
   e. If set to auto sample, the sampler starts and continues for the duration set in the settings panel.
2. The alarm panel provides the following information:
   a. Sentry 3000 identifier.
   b. Date and time of the alarm.
   c. Latitude and longitude of the Sentry 3000.
   d. Wind speed and direction (provided only if optional meteorological equipment is installed on the Sentry 3000.
3. Selecting VIEW ATP45 displays the alarm information in ATP45 format as shown in Figure 23.   The information may be saved by clicking on SAVE. The data is saved in the C:\CCS directory.
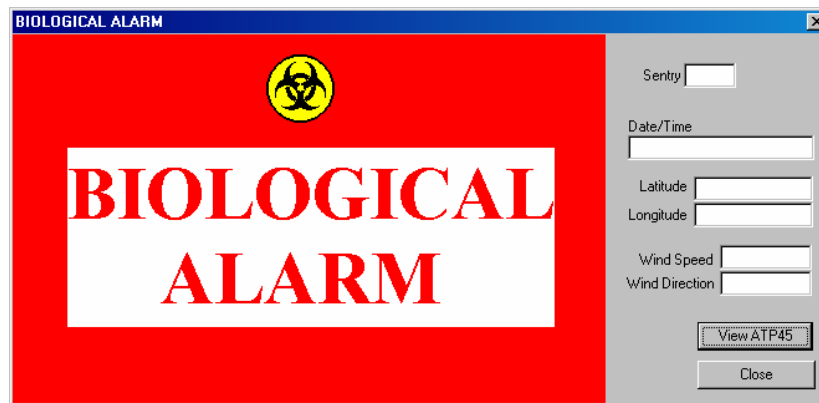

FIGURE 22. Alarm Panel

FIGURE 23. ATP45 Panel

Log Files

1. Each time the BAM is started, a log file is automatically generated in the C:\CCS directory.
2. The log file is saved under a file name containing the date and time. See Figure 26.
3. The log file contains the following information
    a. Total Counts
    b. Fluorescence Particle Counts
    c. Percent Fluorescence
    d. Short Average (a smoothed average).
4. The log file can be viewed at a later time by launching the Replay application. The icon is located on the desktop and is shown in Figure 24. This brings up the Replay main panel shown in Figure 25.
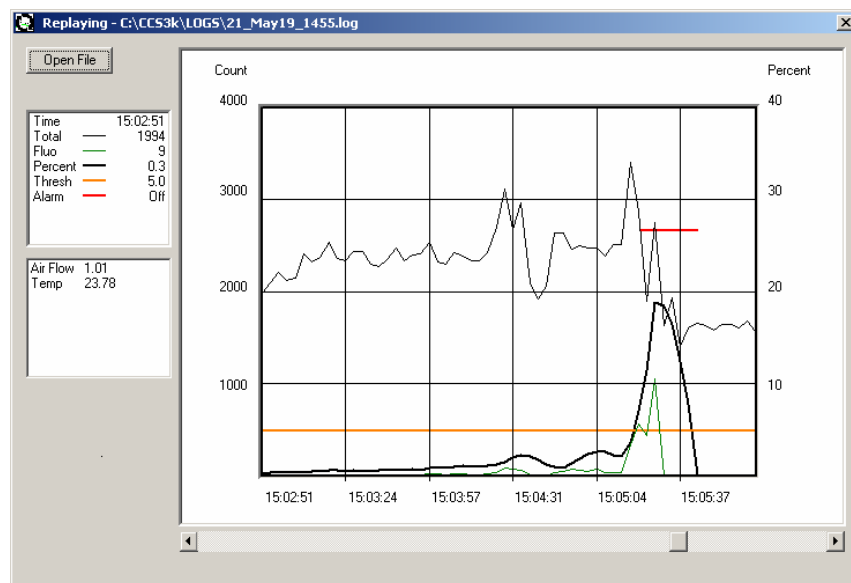

FIGURE 24. Replay Icon

FIGURE 25. Replay Main Panel

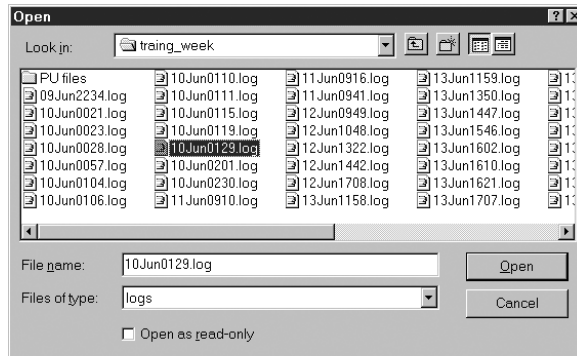5. To select a log file, click the Open File button, then select a log file (see Figure 26).

FIGURE 26. Log File Selection

Navigate to the folder containing the log file, then select it. Once the file is selected and loaded, the scroll bar shown on Figure 25 can be used to view different time frames of the log file.

Maintenance

WARNING!

Turn off and disconnect main AC power from the power source prior to performing the maintenance procedures in this guide.

TABLE VI. Maintenance Schedule

Item	Maintenance Schedule
HEPA Filter Replacement	Every 1000 hours of operation or more frequently depending on the environment the unit is operating in. The operator needs to track operational time using the elapsed time indicator in the Sentry.
Intake Stack	Every 500 hours or as required by the environment.
Concentrator Cleaning	Every 500 hours or as required by the environment.
General Cleaning	As required.
Confidence Test	A confidence test may be performed anytime the user wishes to confirm that the system is operational.

HEPA Filter Replacement

1. Disconnect the quick connect fasteners on each end of the filter.
2. Remove from the holder.
3. Connect the quick connect fittings on each end of a new filter to the tubing.
4. Snap filter into the filter holder.

Air Intake Stack Cleaning

1. Periodically inspect the intake stack air opening. If required, remove the stack cap and clean the screen of debris using a vacuum.
2. If necessary, wash the components in a mild solution of soap and water.
3. Rinse thoroughly with clear water.
4. Dry thoroughly.

Concentrator Cleaning

1. Remove intake stack, lay unit on its side and open the lid and the HEPA filter compartment access cover.
2. Remove the HEPA filter.
3. Remove the short flexible tubes between concentrator output and the sensor input and the concentrator input and air intake output by carefully pulling the tubing off the hose barbs (Figure 27).
4. Remove the two (2) hex cap screws located at the top corners of the concentrator intake adapter that secure the concentrator and adapter to the mounting plate (Figure 27).
5. Pull the concentrator and adapter away from the mounting plate and turn it enough to allow for access to the four (4) hex cap screws that secure the intake adapter to the top of the concentrator (Figure 28).
6. Remove the four (4) hex cap screws and the adapter (Figure 28).
7. Pull the concentrator as far forward as possible, grasp the concentrator exhaust hose barb with a wrench and unscrew the concentrator from the exhaust hose barb (Figure 27).
8. Remove the four hex screws that secure the exhaust port to the main body of the concentrator and carefully remove the exhaust port (Figure 28). Take care not to damage or misplace the O-ring.
9. Remove the eight hex screws that secure the two halves of the concentrator together and carefully separate the halves of the concentrator (Figure 27). Take care not to damage or misplace the O-ring.
10. Wash using hot soapy water, followed by a thorough rinse with clear water.
11. Using oil/water free pressurized air, carefully blow-dry the inside surfaces of the concentrator chamber.
12. Re-assemble and re-install the concentrator by performing steps 9 through 1 in reverse order.

Step 3 - Remove tube from bottom of the concentrator (behind filter)

Step 4 - Remove these two hex screws

Step 9 - Remove 8 hex screws

Step 7 – Concentrator exhaust hose barb fitting.

Step 3 - Remove tube from this barb connection

FIGURE 27. Concentrator Cleaning

Step 5,6 - Remove these 4 screws. (Note concentrator shown here still attached to frame.)

Step 8 - Remove 4 hex screws from exhaust port (only two shown here).
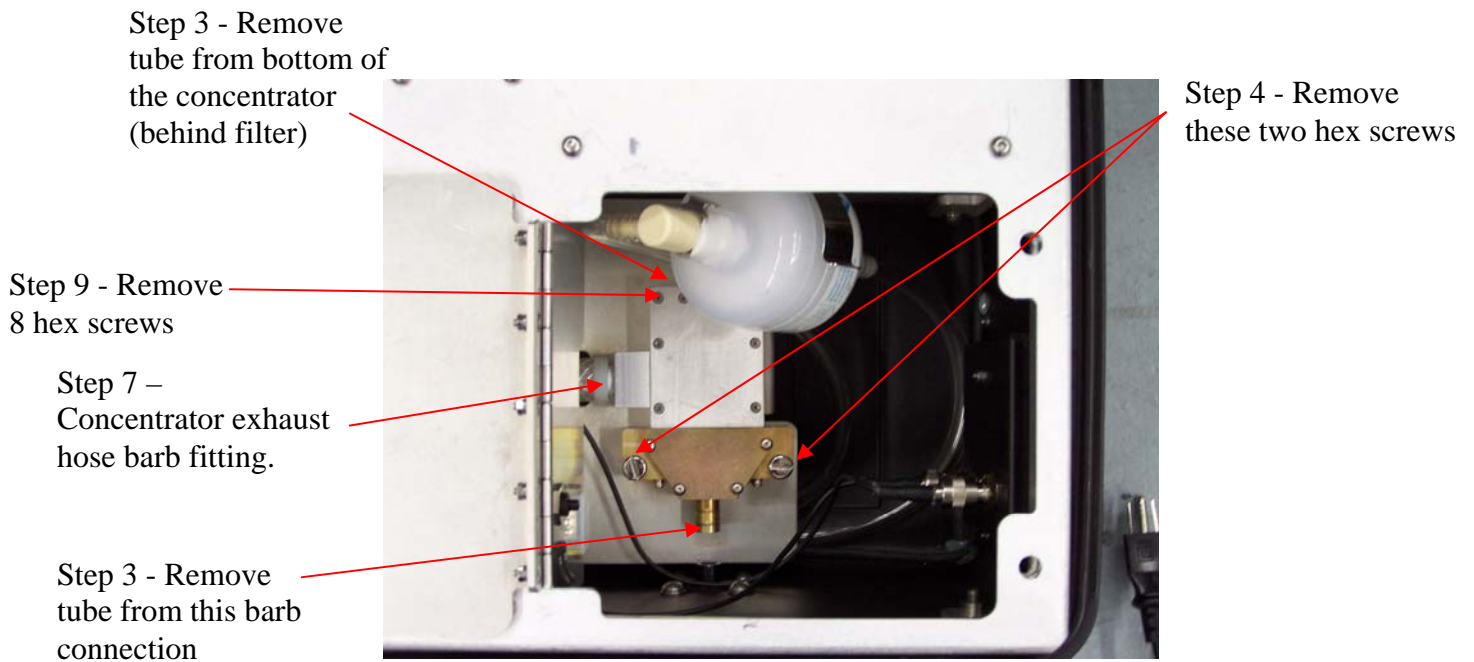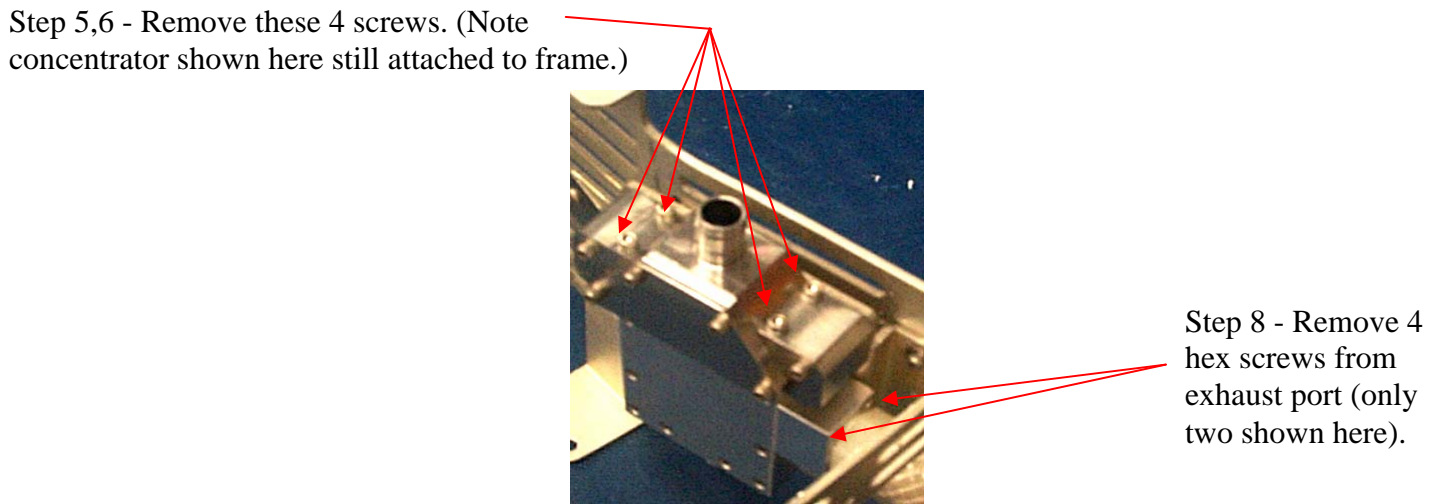
FIGURE 28. Concentrator Cleaning

General Cleaning Procedure

1. Wipe exterior with damp cloth.
2. Periodically inspect cooling fan louvers and vacuum debris out.
3. Periodically inspect interior and vacuum dust debris out as required.

<div style="border: 2px solid black; background-color: yellow; text-align: center;">

WARNING!

**Do not use a wet cloth to clean interior components.
Use a dry cloth only and/or vacuum.**

</div>

Confidence Test Solution Preparation

You will need:
- 50-ml tube
- Eyedropper
- Aluminum foil
- 200 ml of distilled water
- Concentrated PSL bead stock
- Spray tool and air can

To begin, prepare an initial dilution as follows.

1. Retrieve the concentrated PSL bead stock (this stock should be kept from freezing and away from direct light exposure. It is recommended that the stock be kept covered in the refrigerator to extend shelf life).

2. Fill the tube with approximately 20 ml of distilled water.

3. Using the eyedropper, place 5 drops of bead solution in the 50-ml tube and the remainder back in the stock solution bottle.

4. Gently shake the tube, fill to 50 ml, and cap the tube.

5. Prepare more tubes (steps 2 to 5) until the eyedropper is empty, then dispose of the eyedropper.

6. Cover all tubes with aluminum foil, to prevent direct exposure to light.

The above procedure creates tubes with 400% strength calibrant solution. For normal confidence tests, gently shake and pour the 400% strength mixture (one tube) with three 50-ml tubes of distilled water in the spray tool reservoir. The result is 200 ml of 100% strength calibrant. This mixture can be used several times provided the reservoir is kept away from extended periods of exposure to direct light.

Confidence Test Procedure

A confidence test uses a harmless solution of fluorescent beads to verify that the system is detecting fluorescence. The beads are sprayed in the vicinity of the sensor intake stack. The system detects the presence of fluorescence particles, displays the results on the BAM Data panel and normally results in an alarm state. The procedure follows:

1. Prepare a confidence test solution as per the procedure in this section of the guide.

2. Attach the spray tool to an air can, and gently shake the reservoir. Standing approximately 1 meter away, spray towards the concentrator inlet for 5 to 10 seconds, and then stop.

3. Using the BAM panel, observe the sensors reaction. If properly operating, total, gated and fluorescent counts should increase significantly and an alarm will be generated. Repeat if results are not achieved.

4. Clear the alarm.

Sampler and Concentrator Over-ride Switches

A switch (Figure 16) is provided on the inside of the filter compartment to turn the sampler on and off if required. This switch should normally be in the off position.

A second switch (Figure 16) is provided in the unit to force the concentrator pump on in the event it is required to do so. This switch should normally be in the off position.

Troubleshooting

Symptom	Probable Cause	Corrective Action
No activity on the BAM	• Loss of communications • Loss of power	• Check connections of network cable. Verify modems are operational (check LEDs on SMS modem) • Check power connection and power source. Check breaker inside Sentry filter compartment and reset if necessary.
Sentry will not turn on or suddenly turns off.	• Tripped breaker.	• Reset breaker.
Particle counts very low as indicated by the BAM.	• Concentrator blower motor failed. • Concentrator plugged • HEPA filter plugged. • Air intake stack plugged. • Laser power failure	• Return to manufacturer for motor replacement. • Clean concentrator • Replace HEPA filter. • Clean air intake stack. • (Note that a laser failure is relayed to the operator by a message displayed on the SMS) Return to manufacturer for service.
Continuous high particle counts as indicated by the BAM.	• Object caught in the slit vanes in the concentrator or build up of fluorescent beads in concentrator.	• Clean Concentrator
Air Flow Low as indicated by the grapher or the status LED.	• Circulation pump failed. • Concentrator plugged. • HEPA filter plugged. • Air intake stack	• Return to manufacturer for pump replacement. • Clean concentrator. • Replace HEPA filter. • Clean air intake stack.

Symptom	Probable Cause	Corrective Action
	plugged.	
Internal Temp out of range.	• Ambient temperature too high.	• Move system to area where ambient temperature complies with the operating limits.
	• Air circulation fans failed.	• Check air flow of input and output fans by placing hand near louver. If no airflow, return to manufacturer for service.

For technical assistance, contact General Dynamics Canada by phone or email:

Phone: 1-403-295-6700 (ask for 4WARN Service) or (403) 730-1381 between the hours of 0800 to 1630 Mountain Standard Time

Email: 4WARNService@gdcanada.com .

Specifications

<u>Product Specifications:</u>

Technology: Fluorescence Particle Detection

Concentrator: MicroVic, 33 litres/minute (1 ft^3/minute)

Consumables: Dry sample filter element (as required)
                                Exhaust HEPA filter (periodic replacement)

Communications: Wired: Ethernet cross over
                                Wireless: 902-928 MHz, FHSS

Installation Category: Category II in accordance with CAN/CSA-C22.2 No.
                                1010.1-92, Clause 3.7

Pollution Degree: 2 in accordance with CAN/CSA-C22.2 No. 1010.1-92,
                                Clause 3.7

<u>Technical Specifications:</u>

Sensitivity   20 ACPLA within 20 seconds

AC Power Requirements: 100-240 VAC, 50-60 Hz (mains supply voltage fluctuations
                                are not to exceed +/- 10% percent of the nominal supply voltage)

AC Power Consumption: 1.5 amps at 120 VAC

Dimensions: 53.8 cm x 40.6 cm x 21.1 cm (L x W x H)
                                21.2 in x 16.0 in x 8.3 in (L x W x H)

Weight: 17.2 kg / 38 lbs

Standards (all pending):   FCC Part 15 Class B, Subpart C; CSA; CE; CB; UL

Environmental Specifications:

Temperature: Operating: 0°C to +30°C (32°F to +86°F)

Rain: EN 60529 for IP Code Second Numeral 3 (spraying water)

Dust: EN 60529 for IP Code First Numeral 5 (dust test)

Humidity: 95% RH maximum, non-condensing

Altitude: 2000 meters maximum

Shock: Resistant to drop impact from 46 cm (18 inches).