smiths

Smiths Detection

APD 2000®

USERS' MANUAL

November 2003

APD 2000®

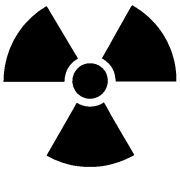
USERS' MANUAL

November 2003

Version 2.0

WARNING

RADIATION HAZARD



The APD 2000® contains a 10 millicurie Nickel 63 radioactive source. Do not attempt to open the APD 2000® housing. The use of this device is regulated by General License Provisions of the U.S. Nuclear Regulatory Commission, Agreement State or Licensing State under requirements outlined in appendix A of this manual.

PER LICENSING AGREEMENT, RADIATION WIPE TEST MUST BE PERFORMED EVERY 6 MONTHS. SEE APPENDIX B FOR WIPE TEST INSTRUCTIONS.

SAFETY PRECAUTIONS

Do not attempt to open the APD 2000® housing.

If the housing is broken or cracked, wrap the APD 2000® in a plastic bag and pack it in its original shipping container. Call Smiths Detection - Edgewood, Inc. at (410) 510-9141 and ask to speak to the APD 2000® program manager for further instructions.

WARNING

Exposure to chemical warfare agents is extremely dangerous. In any emergency event where CW agent contamination may be present, wear proper protective clothing, including mask, until you are sure that the area is clear.

WARNING

Do not start up the APD 2000® in an explosive atmosphere. An arc of electricity could cause an explosion.

WARNING

The confidence sample contains chemicals that may be irritating to the eyes, mucous membranes, and upper respiratory tract. Use the confidence sample only in a well ventilated area and avoid prolonged breathing of the vapor. Do not use if cracked or broken.

SEE APPENDIX C FOR MATERIAL SAFETY DATA SHEETS FOR CONFIDENCE SAMPLE CHEMICALS.

WARNING

An APD 2000® contaminated by CW agents or radiation can cause death or injury. If you suspect the APD 2000® has been contaminated, do not perform SHUTDOWN. Instead, perform DECONTAMINATION (see para 2.9).

TABLE OF CONTENTS

QUICK USERS' GUIDE

This guide is designed for operators who are already trained in first response techniques and in the use of the APD 2000®.

BEFORE YOU BEGIN

Survey the Environment

WARNING

Do not start up the APD 2000® in an explosive atmosphere. An arc of electricity could cause an explosion.

- Make sure you are in a clean environment. Always work from a clean to a contaminated area and minimize time spent in contaminated areas.
- Be aware of wind conditions. Try to stay upwind of suspected contamination.
- Know potential interferents in your environment.

Install Batteries

1. Remove APD 2000® and batteries from transit case.

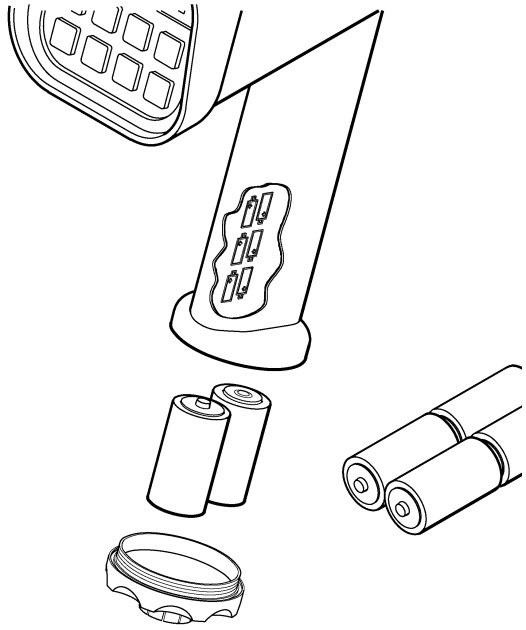
CAUTION

Never take the transit case into a contaminated area. To prevent contamination of the case, leave it in a clean area.

2. Install six high quality alkaline "C" batteries as shown on diagram inside battery compartment.

NOTE

Under normal conditions (70 °F), the batteries will last for up to 7 hours. Battery life will decrease as the temperature drops. At 43°F, average battery life will be less than 3 hours, and at 32°F it can be 1 hour or less.



INSTALL FILTERED NOZZLE STANDOFF

1. Remove nozzle protective cap and store it on battery cap retainer.

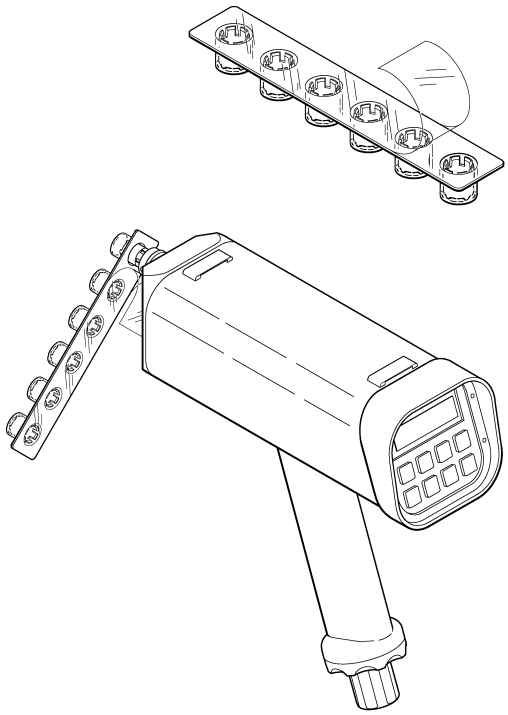
CAUTION

Do not touch the APD 2000® nozzle or the filtered nozzle standoff; touching could contaminate them. Try to install the filtered nozzle standoff quickly to prevent dust from entering the unit.

2. Remove filtered nozzle standoff package from transit case. Peel covering from package until one filter is exposed.

3. Press nozzle into exposed filter as shown.

4. Lay covering back in place over package.



START-UP / CONFIDENCE TEST

1. Press and hold POWER button (1) until APD 2000® appears on display.

2. Wait for APD 2000® to complete SELF TEST and STNDBY (approximately 3 minutes).

3. When display shows READY CW, unit is ready for confidence testing.

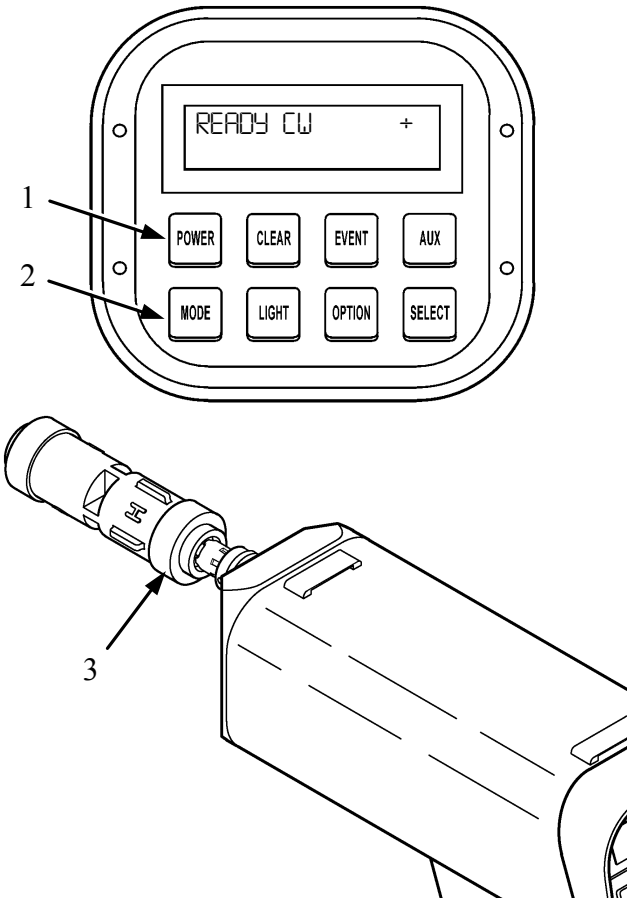
4. Press H end of confidence sample (3) to nozzle for **no longer than 1 second**. Make sure to press hard enough to open plunger at end of confidence sample.

5. Verify that horn sounds and display shows ALARM CW.

6. When display returns to READY CW, repeat steps 4 and 5 using G end of confidence sample.

7. Allow unit to clear until READY CW appears on the display.

The APD 2000® is now ready to operate.



OPERATING THE UNIT

When the APD 2000® display shows **READY CW** or **READY CWVX** (**Agent** mode), it is monitoring the environment for the chemical warfare agents. To change the Agent mode to pepper spray or mace, press the **MODE** key (1) until **READY IRRT** (2) appears on the display.

The following function keys are the only ones needed for most APD 2000® operations

POWER – Turns the unit on and off.

CLEAR – Toggles internal purging function on and off.

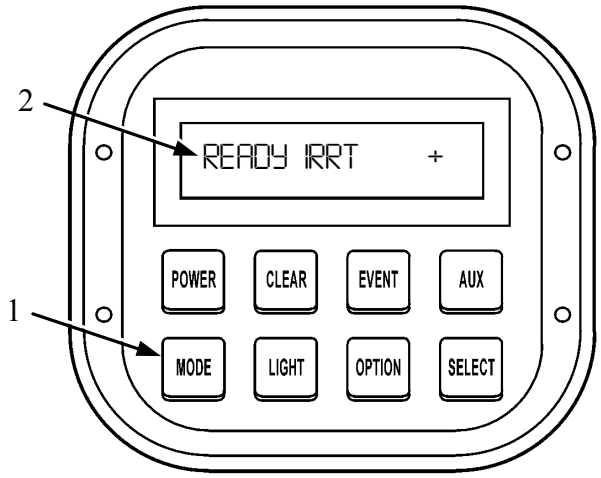
MODE – Changes Agent mode (CW, CWVX, IRRT, and TEST).

LIGHT – Turns display backlight on and off.

SELECT – When the APD 2000® alarms, silences the horn.

NOTE

The remaining function keys (EVENT, AUX, and OPTION) are for advanced operations by specially trained users (see chapter 3).



SHUTDOWN

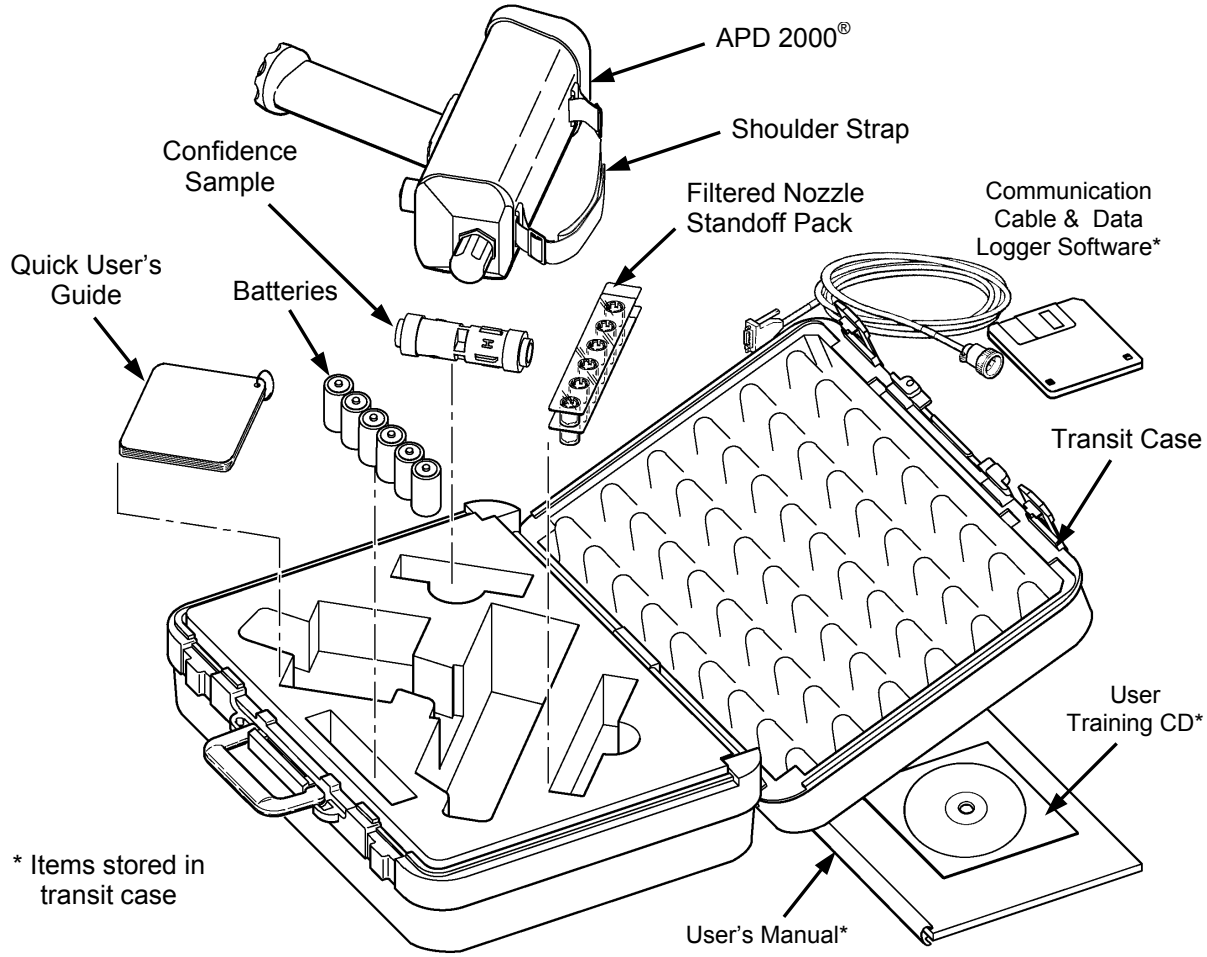
- Make sure environment is clean and APD 2000® is not alarming. If unit is alarming, indicated by ALARM on the display, wait for it to clear.

WARNING

An APD 2000® contaminated by CW agents or radiation can cause death or injury. If you suspect the APD 2000® has been contaminated, do not perform SHUTDOWN. Instead, perform DECONTAMINATION (see para 2.9).

- Press and hold POWER button for about 1 second. When POWER DOWN… appears on display, release POWER button.
- Remove nozzle standoff. Treat as hazardous waste if CW agents have been detected.
- Cover nozzle with protective cap.
- Remove batteries from handle.
- Return unit and batteries to transit case. Dispose of weak or dead batteries.

MAJOR COMPONENTS OF THE APD 2000®



APD 2000®. Monitors environment and detects chemical agents (GA, GB, GD, VX, HD, HN, L) and irritants (pepper spray and mace). Identifies threat and provides an audible and visual warning. As an option, the APD 2000® can be used as a radiation detector.

Shoulder Strap. Used to carry APD 2000® during a mission.

Batteries. Six C size alkaline batteries power the APD 2000®.

Filtered Nozzle Standoff. Prevents dust, rain, or contaminants, such as dirt and smoke, from entering the APD 2000® and causing false alarms. Particulate filters come in packs of six filters.

Confidence Sample. Test simulant used to ensure the APD 2000® is operational.

Communications Cable. Provides for connection of the APD 2000® to a PC. Used with the Datalogger Software (see para. 3).

User Training CD. Contains User Training presentation as well as Instructor's Guide, Student Notes, Quick User's Guide, and Users' Manual.

Transit Case. Houses and protects all APD 2000® components and spare parts during transport and storage.

1 INTRODUCTION

1.1 PURPOSE OF EQUIPMENT

The APD 2000® is a portable, hand-held monitor and detector designed for emergency first response to hazardous chemical spills and terrorist attacks. The APD 2000® simultaneously detects nerve and blister agents, and it recognizes pepper spray and mace. As options, the APD 2000® can monitor radiation levels and identify hazardous compounds.

The APD 2000® comes packed in its transit case with six "C" batteries, two packages of six filtered nozzle standoffs, a confidence sample, a Quick User's Guide, and this manual (see opposite page). The instructions in this manual cover only the items illustrated on the opposite page.

1.2 SCOPE OF THIS MANUAL

This manual provides operating instructions for the APD 2000®, information on the safe use and care of the equipment, troubleshooting procedures, and directions for contacting the manufacturer for warranty work, repairs, and service. The manual assumes that the reader has been trained in first response to emergencies in which chemical agent, irritant and/or radiation is alleged, suspected, or known to be present.

1.3 PRINCIPLES OF OPERATION

The APD 2000® automatically detects and identifies chemical warfare agents or irritants such as mace and pepper spray and provides a warning that agents or irritants are present in the atmosphere. The APD 2000® detects and identifies agents based on a technology called ion mobility spectrometry (IMS). An internal pump draws air into the APD 2000® through the nozzle on the front of the unit. The air passes by a heated membrane inside the APD 2000® and then exits back into the atmosphere through the nozzle. Any agent or irritant vapor in the air passes through the heated membrane and is drawn into a closed air sampling system called the cell assembly. In the cell assembly, the vapor molecules are ionized by a weak radiation source (Ni-63). Agent ions in the cell assembly are swept down a drift tube towards a collector electrode. During travel, they become separated according to their mass, and an electronic signature is produced for each ion based on the time required to reach the collector electrode.

A microprocessor analyzes the signatures and determines if they have the characteristics of chemical warfare agents or irritants. If there is a "match," the APD 2000® sounds an alarm, and provides a visual readout of the agent or irritant name and relative concentration.

The APD 2000® can be used as a monitor that continuously reports changes in the agent concentration. To protect the cell assembly from becoming saturated with agent, a backflush pump reverses the airflow in the unit if the agent concentration becomes too high. Air is drawn in through the nozzle and circulated through an activated charcoal filter inside the APD 2000®, providing a source of clean air for clearing contamination from the unit's interior. This process, called clear down, continues until the relative concentration is reduced to a medium or low level.

The APD 2000® can also be used as a point sampling detector that alarms when agent is detected and then purges itself of contamination within 5 minutes. In this mode, the clear down process continues until all contamination is purged from the unit. Whether operating as a point sampling detector or a monitor, the APD 2000® cannot detect agent or irritants while the backflush pump is on.

1.4 FEATURES AND SPECIFICATIONS

Features

- Lightweight, ergonomic design.
- Detects chemical warfare agents and civilian threats such as pepper spray and mace.
- Gives actual agent identity under most environmental conditions.
- Powered by six alkaline C batteries (ac, or 9 to 18 Vdc [optional]).
- Provides superior interferent resistance.
- Selectable operating modes.
- Easy to read visual display and audible alarm.
- Logging of all detection and monitoring events.

Specifications

Agents Detected:
GA, GB, GD, VX, HD, HN,
Lewisite (L), Pepper Spray, Mace

Sensitivity	Response Time
V – 4 ppb	30 seconds
G – 15 ppb	30 seconds
H – 300 ppb	15 seconds
L – 200 ppb	15 seconds

For high concentrations of these agents, detection time is 10 seconds

Radiation detection:

Gamma and x-ray	50 KeV to 6 MeV
Dose	0.1 mrem to 1000 rem
Dose rate:	1 mrem/hr to 1000 rem/hr
Response:	see para. 2.7.3

Self test:
BIT for electronic, pneumatic, and
power conditions

Temperature:
Operation – 22° to 126°F (-30 to 52°C)
(radiation detection accurate to 113°F, 45°C)
Storage: -80° to 160°F (-62° to 71°C)

Weight:
6 pounds (<3 kg)
including batteries

Operator Service:
5 minutes per 24 hours of operation

Size:
4" x 3 ½" x 11" (10 x 9 x 28 cm)
(excluding handle)

Power:
6 high quality alkaline "C" batteries,
ac, or 9 to 18 Vdc (optional)

1.5 APD 2000® OPTIONS

Available options for the APD 2000® include:

- Radiation monitoring (see para. 2.7.3)
- Remote communication*

* For information, contact manufacturer (see para 1.7) .

1.6 SAFETY, CARE, AND HANDLING

1.6.1 Rules and Regulations.

The APD 2000® contains a 10 millicurie Nickel 63 radioactive source. The use of this device is regulated by General License Provisions of the U.S. Nuclear Regulatory Commission, Agreement State, or Licensing State under requirements outlined in appendix A of this manual.

1.6.2 Emergency Procedures.

WARNING

Exposure to chemical warfare agents is extremely dangerous. In any emergency event where CW agent contamination may be present, wear proper protective clothing, including mask, until you are sure that the area is clear.

1.6.3 Fire.

In a fire emergency, the basic concern is airborne contamination carried out of flames by heated air and in smoke. Fire fighting personnel should stand upwind of the fire and should wear portable air systems. After the fire has been extinguished, debris must be surveyed for the presence of equipment containing Ni-63 sources as well as contamination that may have been spread by burning. Wipes must be taken and evaluated by a liquid scintillation spectrometer (or equivalent) to detect the presence of contamination. Follow-up evaluation of wipes on suitable laboratory equipment must be made.

1.7 CONTACTING THE MANUFACTURER

If you have questions about the use or care of your APD 2000®, you can contact the Smiths Detection Customer Service Center by phone or in writing as shown below. Address any correspondence to the attention of the APD 2000® Program Manager. Please make sure you know the model number and serial number of your unit before calling. This information is located on a label on the bottom of the unit behind the battery compartment. You may record the information in the space provided for your convenience.

MODEL # _____

SERIAL # _____

PHONE: (410) 510-9141

ADDRESS **Smiths Detection – Edgewood, Inc.**
2202 Lakeside Boulevard
Edgewood, MD 21040

EMAIL **APD2000.help@smithsdetection.com**

For **warranty** and **scheduled maintenance** or **repair** information, see appendix D. For spare part information, see appendix E.

NOTE

The APD 2000® should be returned to the manufacturer for maintenance whenever it continuously fails the confidence test.

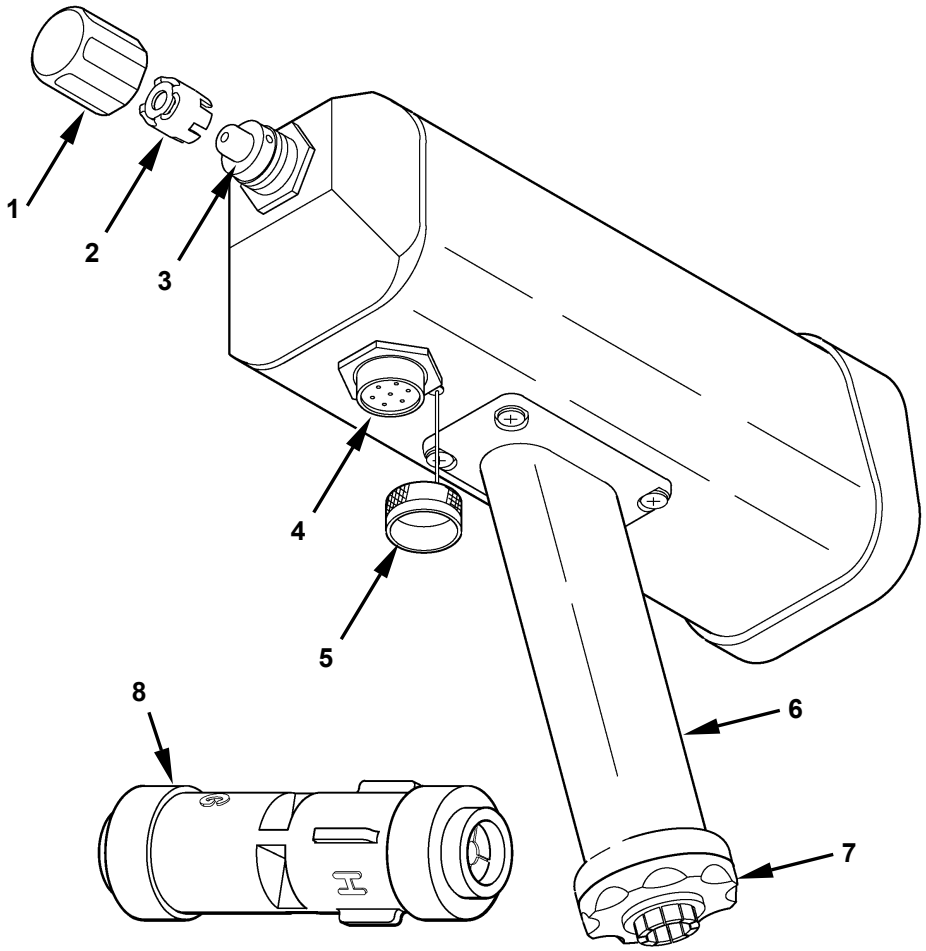
2 OPERATING THE APD 2000®

This chapter provides step-by-step instructions for operating the APD 2000®. It is organized as follows:

2.1 Controls and Indicators	Defines all of the parts of the APD 2000®, including the function keys and display.
2.2 APD 2000® Menu Tree	Provides an overview of the options available to the user through the APD 2000® menus.
2.3 Common Sense Operation	Directions for operating the APD 2000® in environments that may contain interferents and extreme conditions, including cold or hot temperatures and dusty or wet conditions.
2.4 Preparation for Use	Important information about the APD 2000® start-up environment. Also provides instructions for installing the batteries and filtered nozzle standoff.
2.5 Initial Power On	Instructions for powering up the APD 2000®. Also describes the start-up sequence.
2.6 Confidence Test	Procedure for performing the confidence test. This test exposes the unit to simulants to ensure that the APD 2000® is detecting both nerve and blister CW agents.
2.7 General Use	Typical operating scenarios for the APD 2000®. This paragraph explains the difference between the monitor and detect modes, and describes what happens when the unit alarms or malfunctions.
2.8 Shutdown	Instructions for powering down the APD 2000®.
2.9 Decontamination	Directions for Nuclear, Biological, and Chemical decontamination of the unit after use.

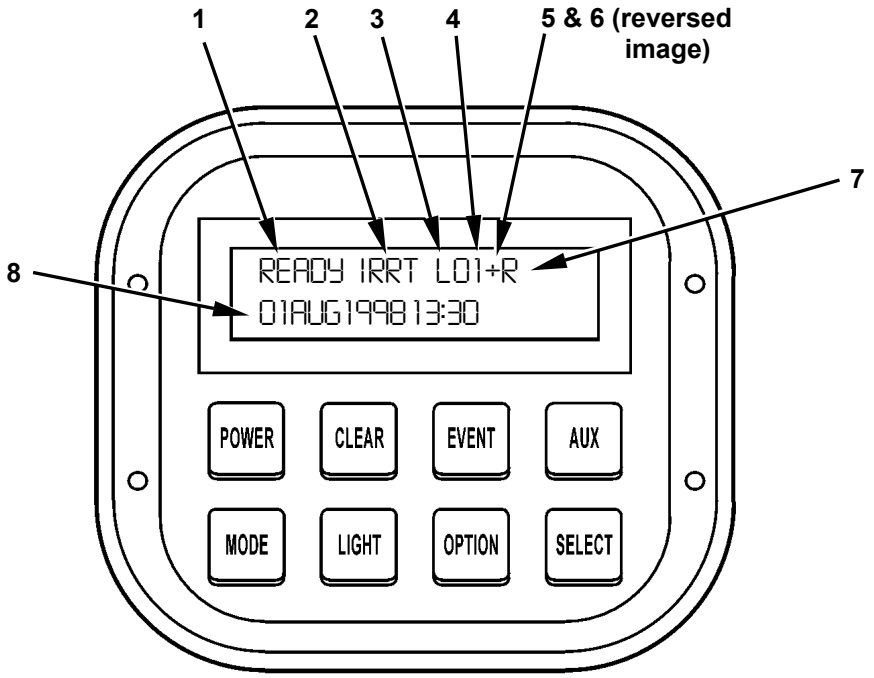
2.1 CONTROLS AND INDICATORS

APD 2000®



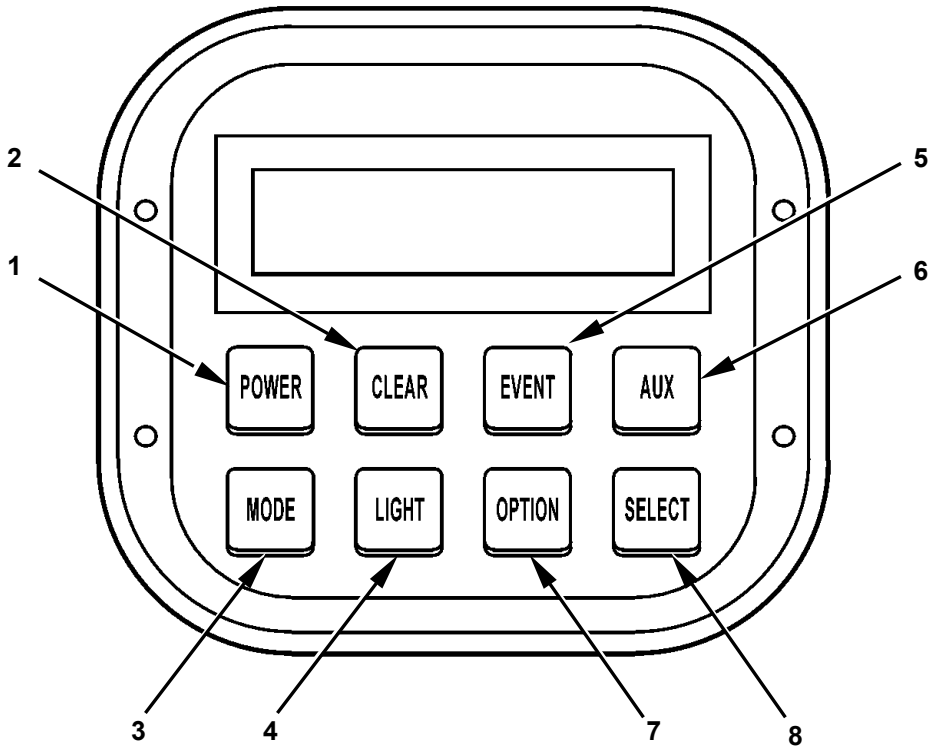
ITEM	CONTROL OR INDICATOR	FUNCTION
1	Nozzle protective cap	Covers nozzle when unit is not in use
2	Filtered nozzle standoff	Prevents dust from entering nozzle during operation.
3	Nozzle	Inlet through which outside air is drawn into and expelled from APD 2000®.
4	Auxiliary port	Provides input for external power source and/or remote communications interface to a personal computer.
5	Auxiliary port cap	Covers auxiliary port when not in use.
6	Battery compartment	Holds six C size alkaline batteries.
7	Battery compartment cap	Seals battery compartment and secures batteries in place.
8	Confidence sample	Test simulant used to ensure that the APD 2000® is fully operational (see para. 2.6, Confidence Test).

APD 2000® Display



ITEM	CONTROL OR INDICATOR	FUNCTION
1	Status indicator	Shows current status (STNDBY, READY, ALARM, AUTO CAL, CLEARING, UPLOADING).
2	Agent mode indicator	Indicates selected agent mode (chemical warfare agents [CW], agent VX [CWVX], or irritants [IRRT].
3	Log indicator	Indicates that the APD 2000®'s data logging capability is activated.
4	Event number	The two-digit numerical marker assigned to a data log entry when the EVENT key is pressed.
5	Polarity indicator **+** **-**	Indicates type of agent, irritant or test simulant unit is currently testing for as follows: **Positive** – nerve agents, pepper spray, and G simulant **Negative** – blister agents, mace, and H simulant. The steady cycling of the + and – indicators is a positive indication that the APD 2000® is working.
6	Backflush indicator **+** **-**	Polarity symbol has a reverse image (dark background, light symbol) when the backflush pump is on
7	RAD indicator	Indicates that the APD 2000®'s radiation (RAD) capability is activated.
8	Data Line	During STANDBY, READY, and AUTO CAL, shows current date and time. During ALARM, shows alarm information (class [NERV, BLST, or IRRT], agent or irritant name, and relative concentration). Scrolls through menus and options when OPTION and SELECT keys are used.

APD 2000® KEYPAD

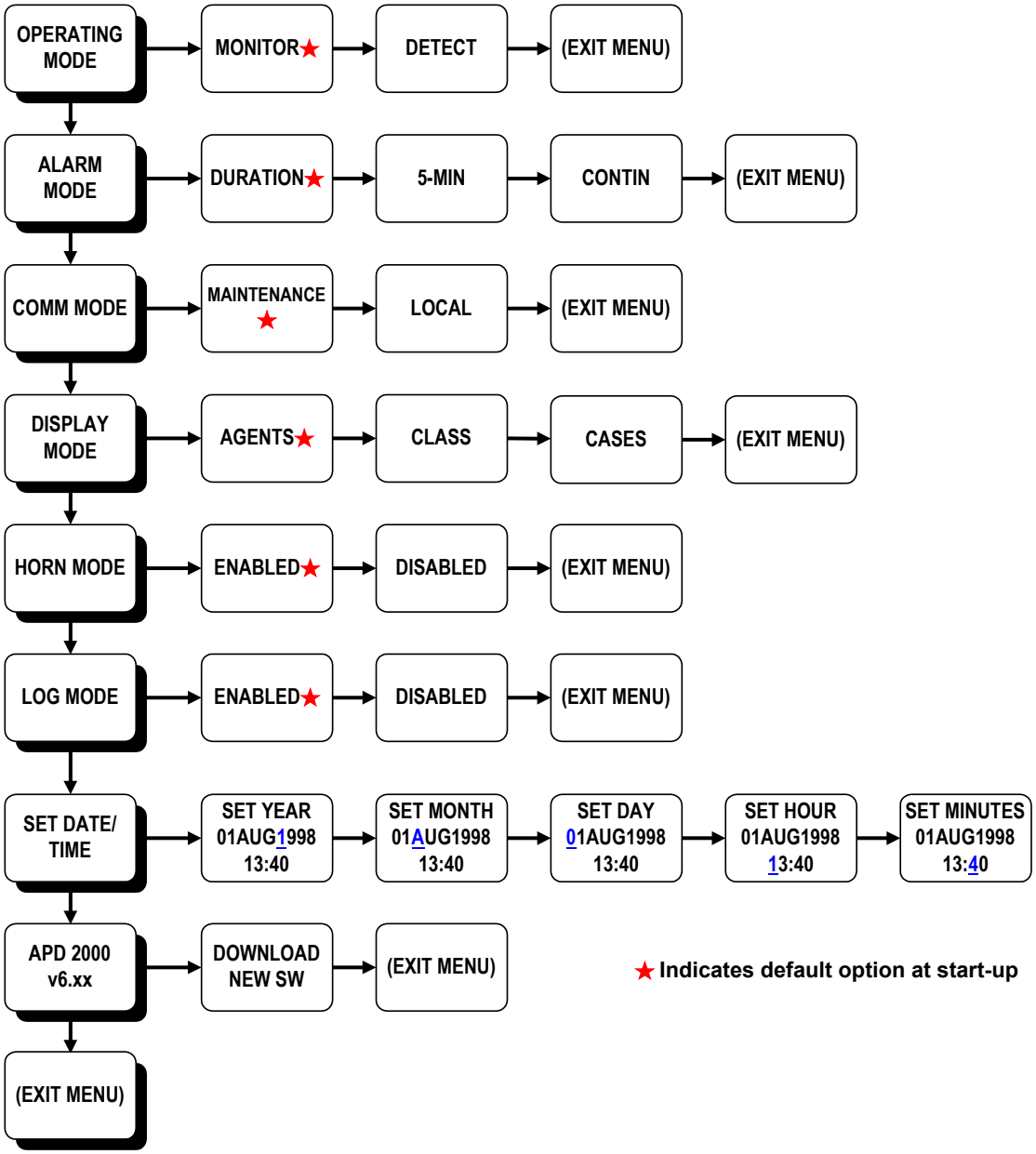


ITEM	CONTROL OR INDICATOR	FUNCTION
1	POWER	APD 2000® ON/OFF switch.
2	CLEAR	Turns on the backflush pump which draws clean filtered air into the unit to purge it of contaminants. The unit continues in this mode until the CLEAR key is pressed again. While clearing down, the unit cannot detect chemical agents or irritants.
3	MODE	Switches Agent mode: CW (chemical warfare agent), CWVX (agent VX), IRRT (pepper spray/mace).
4	LIGHT	Toggles display backlight on and off.
5	EVENT	When data logging is activated, assigns an event number to a data log entry.
6	AUX	Enables auxiliary capabilities. When the radiation (RAD) capability is installed, enables the radiation detection capability. The unit will continue to function as a chemical detector as well.
7	OPTION	Activates menus and cycles through options (see 3, Advanced Features).
8	SELECT	Silences horn during an alarm. Also, when menus are activated, used to select currently displayed menu option (see 3, Advanced Features).

2.2 APD 2000® MENU TREE

2.2.1 Overview

Controlled through the OPTION and SELECT keys, the APD 2000® uses a "menu tree" approach (see figure below) which allows the operator to browse through the system modes in increasing levels of detail and change the options.



Menu options. Top level menus are listed in the left column of the figure. The menu options extend to the right from the appropriate top level menu. Each of the menu options is briefly explained on the following pages. Options with an asterisk (*) are the default settings.

2.2.1 Overview (continued)

OPERATING MODE – The APD 2000® has two operating modes.

MONITOR – Operates as a monitor. Provides continuous alarm concentration updates. When the agent concentration is high, the unit goes into automatic backflush to expedite clearing down. This mode allows for monitoring of the changing conditions of the agent cloud.

NOTE

Relative agent concentrations are provided as numeric values that are roughly equivalent to the following:

0 – 25	below alarm threshold
26 – 50	low
51 – 75	medium
76 – 100	high

DETECT - Operates as a point sample detector. The unit alarms when agent is detected then goes into backflush and clears down. The APD 2000® is ready to detect agent again within 5 minutes.

(EXIT MENU) – Exits the menus and returns to the current APD 2000® state (STNDBY or READY). Note that this option is available from each menu.

ALARM MODE – The APD 2000® provides three alarm options. These options are for use in DETECT MODE only, and they describe what happens when the unit alarms and the horn is not silenced by pressing the SELECT key. If you do silence the horn, the alarm will only continue until the APD 2000® clears down.

DURATION – The unit remains in alarm until clear down is complete.

5-MIN – The APD 2000® remains in alarm for 5 minutes (even if the unit clears down in less than 5 minutes).

CONTIN – After it has cleared down, the APD 2000® remains in alarm indefinitely until the horn is silenced by pressing the SELECT key.

2.2.1 Overview (continued)

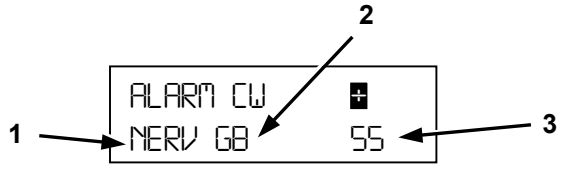
COMM MODE– The APD 2000® has two communication options.

MAINTENANCE - Provides an interface through the COMM port to a PC. The unit sends responses (such as signature data and status information) to a series of commands. This mode is used for diagnostic purposes.

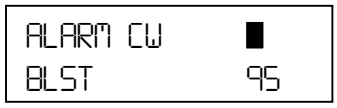
LOCAL - Provides an interface through the COMM port to a PC. The unit sends an ASCII status record that is used for monitoring the status of the APD 2000®. This mode is used for diagnostic purposes.

DISPLAY MODE – This option allows you to select the type of information the unit will display during an alarm.

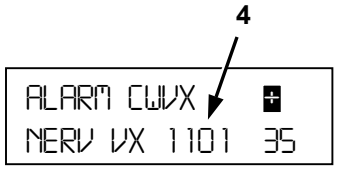
AGENT - Displays the class (NERV, BLST, IRRT) (1), name (2), and relative concentration (3) of the threat (see example below).



CLASS - Displays the class and relative concentration (see example below) of the threat.



CASES - Displays the class, name, and relative concentration of the threat as well as a numeric code (4) that is used for diagnostic purposes (see example below).



HORN MODE – Two options are available for the horn.

ENABLED – Horn will sound when agent is detected.

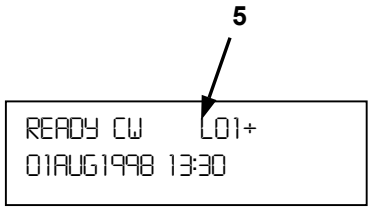
DISABLED – Horn will not sound when agent is detected.

2.2.1 Overview (continued)

LOG MODE – Allows the operator to enable or disable the automatic storing of data into the data log history (APD 2000®'s internal memory).

ENABLED – APD 2000® will store a data entry into the instrument's data log history when an alarm occurs, the radiation rate or cumulative dose changes, or the user marks an event. If no other significant change in status occurs, an event is recorded every 5 minutes. The Log indicator (5) appears on the display.

DISABLED – Events are not saved in the instrument's internal memory.



SET DATE/TIME – This option allows you to set the clock on the APD 2000® (see para 2.2.2.2 for instructions).

APD2000 v6.xx – This menu shows the current version of the APD 2000® operating software; it also provides one option.

DOWNLOAD NEW SW – This option allows the software version to be upgraded. The APD 2000® should be returned to the manufacturer for upgrades (see para 1.7).

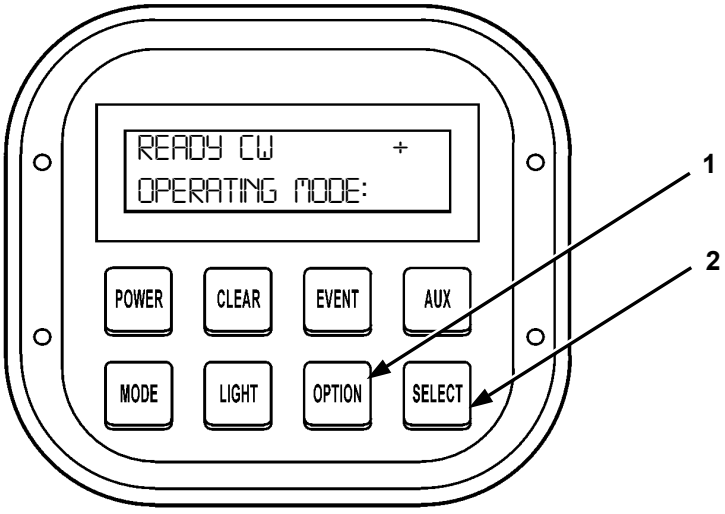
2.2.2 Selecting Modes and Options.

After the APD 2000® has completed start-up and passed the confidence test, it is ready for use. The default operating mode is Monitor. In Monitor mode, the unit tracks changes in the environment such as different agents and variations in concentration.

For instructions for changing the Operating mode or any of the menu options, go to paragraph 2.2.2.1. For instructions for changing the date and time, go to paragraph 2.2.2.2.

2.2.2.1 Changing Menu Options

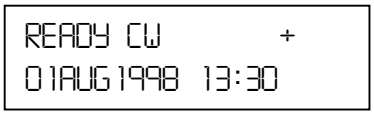
1. Press OPTION (1) to activate menus. The display will appear as shown below. (Each time you press OPTION, the display will step through the next top level menu.)



2. Press SELECT key (2) to select the displayed menu.

The first option will be the current option. In this case, the default operating mode, "MONITOR" is the current option.

3. Press OPTION to scroll through the menu options. When the desired option is displayed, press SELECT. The option will be selected and the APD 2000® will return to its current state (see display below).

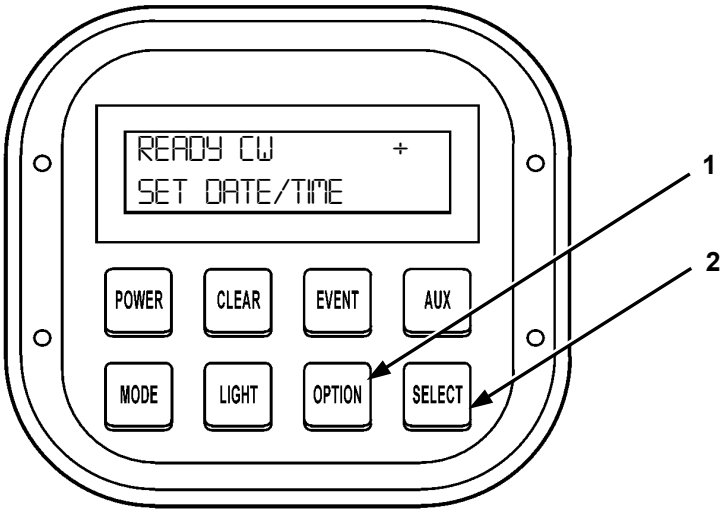


2.2.2 Selecting Modes and Options (continued)

2.2.2.2 Set Date And Time

Verify that the date and time are correct at power on (see para 2.5). Follow the steps below to change the date and time.

1. Press OPTION key (1) to activate menus. Continue pressing OPTION key until display appears as shown.



2. Press SELECT key (2) to select the displayed option. The display will appear as shown below. The underscore indicates the data field being edited.

```
SET YEAR      +
01AUG_1998  13:40
```

3. Press OPTION until the desired number appears in the first data field. Press SELECT to select the number and move to the next data field.

4. Continue changing the date and time using the OPTION and SELECT keys. When the last data field is selected for the minutes, the APD 2000® will return to its current state. If the current state is STNDBY, READY, or ALARM, the date and time will appear on the display data line as shown.

```
READY CW      +
22 SEP 1998  13:40
```

2.3 COMMON SENSE OPERATION

Special procedures must be used to operate the system during extreme conditions. In general, equipment that is kept clean will give the best performance and last longer.

CAUTION

Always use a clean filtered nozzle standoff when running the APD 2000®. To avoid contaminating the nozzle, do not touch the nozzle or the white filter area of the filtered nozzle standoff.

2.3.1 Interferents

There are a few vapors present in the atmosphere that can, in some circumstances, give a false response in the APD 2000®. The situations most likely to give a false response are in enclosed spaces or when sampling near strong vapor sources, such as,

(a) In a maintenance shop or engine test bay.

(b) Downwind from, or in, dense smoke and fumes.

(c) In enclosed spaces where there are vapor sources known to give false responses.

Get to know your local environment during training periods. Determine if, for example, there are any responses in particular areas of your work place. Some of the types of vapors that can give false readings are:

- **Cleaning compounds**. Some cleaning compounds and disinfectants contain additives which give them a pleasant smell. Some of these additives, such as menthol and methyl salicylate (MS, also known as oil of wintergreen) can give false responses. Cleaning materials are often spread over large surface areas and, therefore, provide a considerable vapor source, particularly in enclosed spaces.

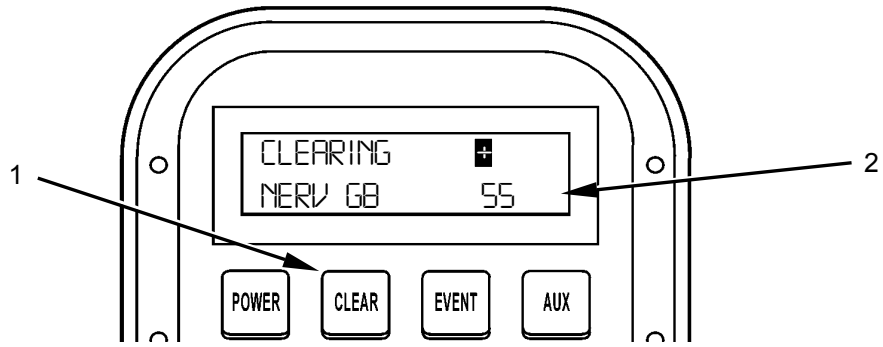
- **Aromatic vapors**. Included in this group of materials are perfumes and food flavorings. Some brands of aftershave and perfume can give a response when the APD 2000® is held close to the skin. Some sweets such as peppermints and cough lozenges and menthol cigarettes can cause a response if the breath is exhaled directly into the APD 2000® nozzle.

- **Smoke and fumes**. The exhaust from some motors and the fumes from some explosives and propellants can cause the APD 2000® to respond.

  If you suspect that your APD 2000® is giving a false reading:

  (a) Check for obvious vapor sources - smoke, etc., and known sources of interferences.

(b) If a false response occurs, the APD 2000® may not be operable in the immediate area. Remove the source of interferent (if possible), or press the CLEAR key (1) to force the unit to clear down and remove the APD 2000® from the area. When you are in a clean environment, let the unit continue to clear down until the alarm indications (2) no longer appear on the display. Press the CLEAR key (1) again to return to the READY state.



2.3.2 Operation in blowing sand or dust

During operation in blowing sand or dust, check the filtered nozzle standoff for collection of sand or dust. If any residue is visible, remove and replace the filter with a new filter.

2.3.3 Operation in temperatures below 40°F (4°C)

The APD 2000® may require a longer warm-up period in temperatures below 40° F. During periods of extreme cold, it is best to store the APD 2000® and its batteries in a heated building or vehicle until it is needed.

2.3.4 Operation in temperatures above 100°F (38°C)

In temperatures above 100° F, keep the APD 2000® out of direct sunlight whenever possible. Do not store the APD 2000® in the sun. Avoid exposing the unit to sudden changes in temperature, such as moving it directly from an air conditioned area to an area of extreme heat.

2.3.5 Operation in wet conditions

CAUTION

Do not immerse the APD 2000® in water or any other liquid.

The APD 2000® may be operated safely during rainy or wet conditions with a filtered nozzle standoff installed. Avoid getting the nozzle wet.

2.4 PREPARATION FOR USE

2.4.1 Survey the Environment

- Make sure that you are in a clean environment. Always work from a clean to a contaminated area and minimize time spent in contaminated areas.
- Be aware of wind conditions. Try to approach suspected contamination from the upwind direction.
- Know potential interferents in your environment.

CAUTION

Never carry the transit case into a contaminated area. The foam cushioning inside the case could become contaminated.

Never change the batteries in a contaminated area. The battery compartment could become contaminated.

2.4.2 Installing the Batteries

NOTE

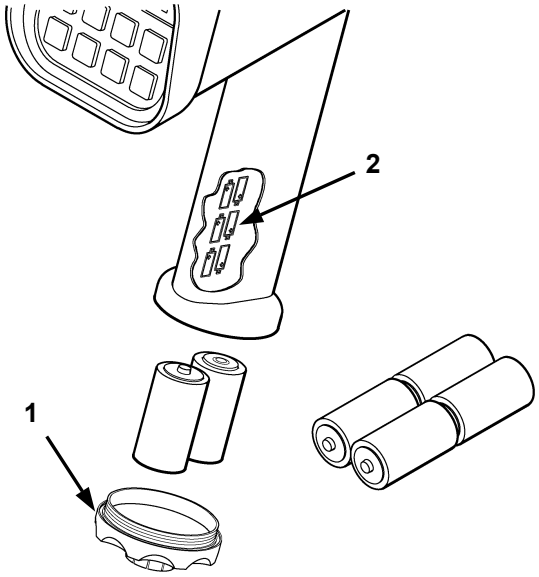
Expected battery life for the APD 2000® is up to 7 hours of operation at room temperature (70°F). Battery life will decrease as the temperature drops. At 43°F, average battery life will be less than 3 hours, and at 32°F it can be 1 hour or less. The use of the display backlight and frequent alarms will also contribute to shorter battery life. Rechargeable batteries are not recommended for use in the APD 2000®, since they vary widely by brand and technology. To maximize battery life, Smiths Detection recommends that you use the display backlight only in conditions of low visibility, use high quality alkaline batteries such as Duracell, and change all batteries at the same time.

1. Remove APD 2000® and six C batteries from transit case.

NOTE

Battery diagram is inside battery compartment.

2. Remove battery cap (1) and install batteries as shown on diagram (2) inside battery compartment.
3. Replace battery cap.

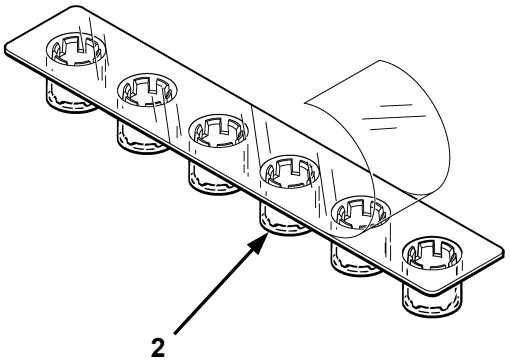


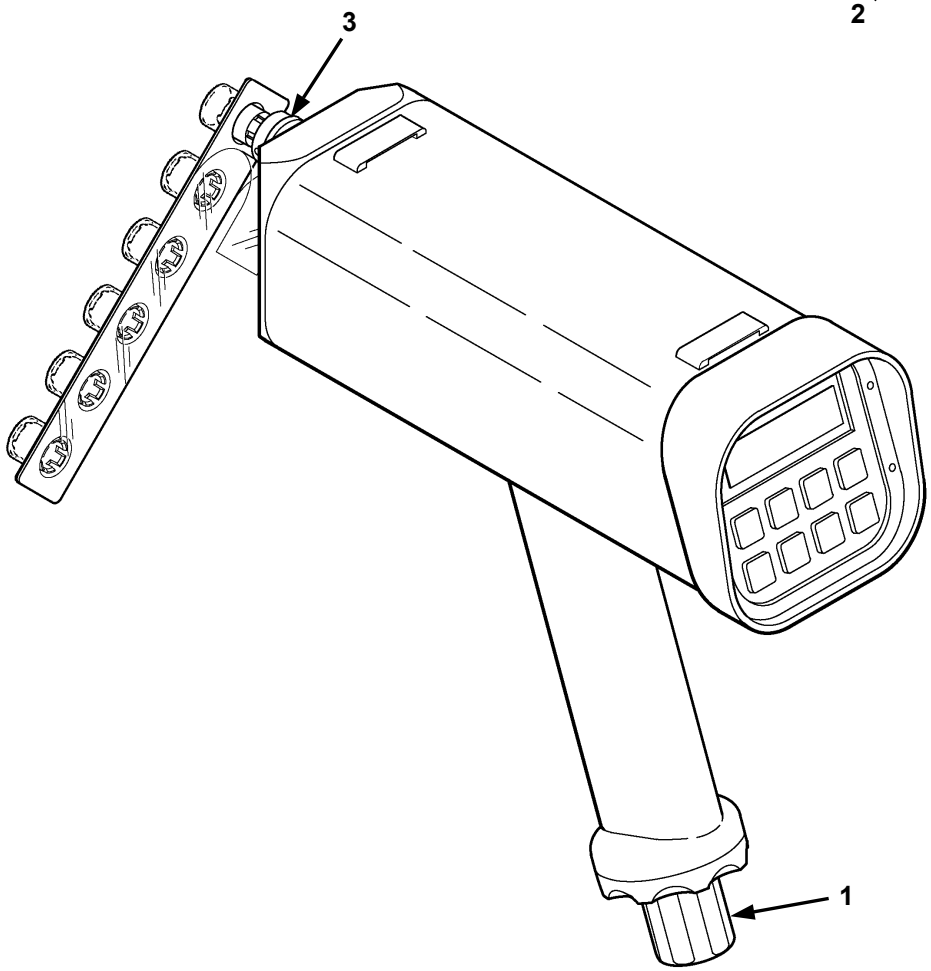
2.4.3 Installing the filtered nozzle standoff

CAUTION

Always use a clean filtered nozzle standoff when running the APD 2000®. To avoid contaminating the nozzle, do not touch the nozzle or the white filter area of the filtered nozzle standoff. Try to install the filtered nozzle standoff quickly to prevent dust from entering the unit.

1. Remove nozzle cap (1) and snap it onto battery cap retainer as shown.
2. Remove filtered nozzle standoff package (2) from transit case. Peel back covering from package until one filter is exposed.
3. Press nozzle (3) into exposed filter to install as shown.
4. Lay covering back in place over package.



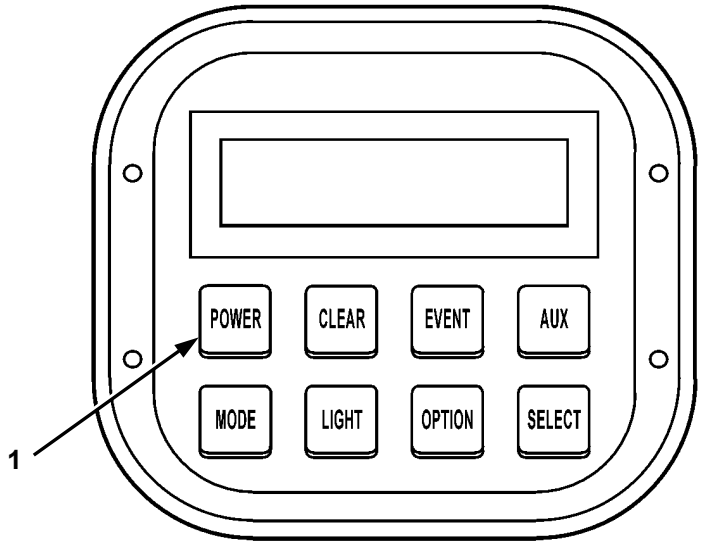


2.5 POWER-ON

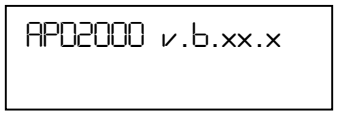
CAUTION

Before starting the APD 2000®, make sure that the nozzle protective cap has been removed and a clean filtered nozzle standoff is installed.

1. Press the POWER button (1) on the keypad.



2. The display will show the following information in sequence.

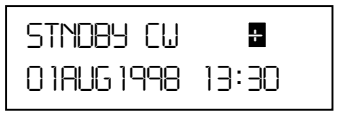


The software version installed in the unit.

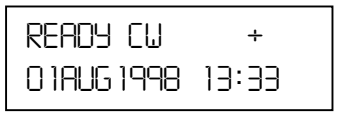
The horn sounds two beeps

2.5 POWER-ON (continued)

Checks electronic, pneumatic, and power conditions.



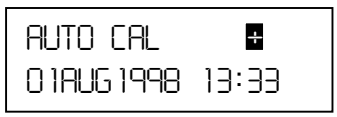
The unit is in backflush. and the polarity symbol cycles in reverse video (dark background/light text). This lasts approximately 2 ½ minutes. Verify that the date and time at the bottom of the display are correct. See chapter 3, Advanced Features for directions for setting the date and time.



The unit is ready for use. In its default mode, the APD 2000® monitors the environment for the presence of CW agents. To ensure the unit is operating properly, perform a confidence test (para 2.6).

NOTE

After the APD 2000® has been running for a while, the message AUTO CAL may occasionally appear on the display. This may be caused by changes in the environment (for example, temperature, humidity, or interferents). When this happens, do nothing. The APD 2000® is merely going through a renormalization process. The display will return to READY and the unit will be ready to continue its mission within 20 seconds.



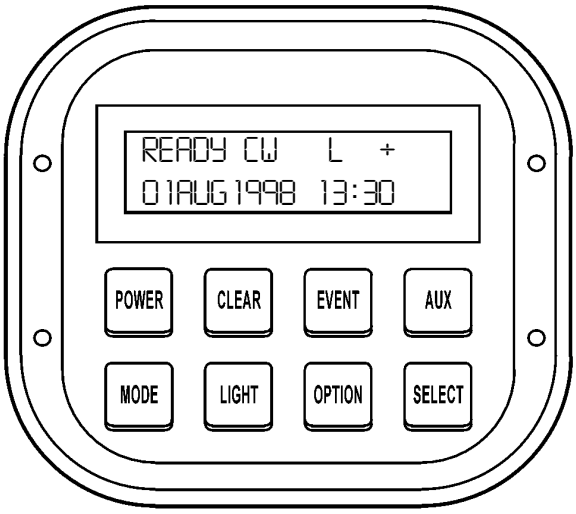
2.6 CONFIDENCE TEST

The confidence test ensures that the APD 2000® is fully operational. The H end of the confidence sample tests the unit's response to blister agents and the G end to nerve agents. Following each response, the APD 2000® goes into backflush and purges itself of simulant within 5 minutes.

NOTE

Make sure that a filtered nozzle standoff is installed on the nozzle. Run the confidence test every time you power up the APD 2000®.

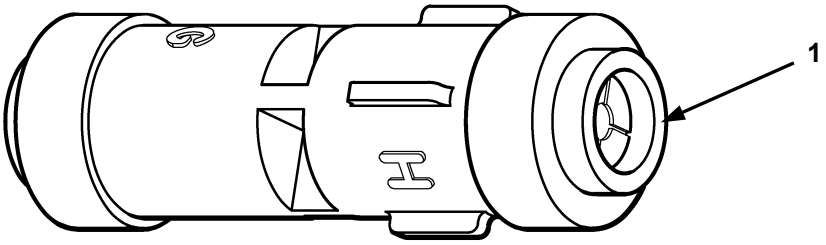
1. When display shows READY CW, the unit is ready for confidence testing.



WARNING

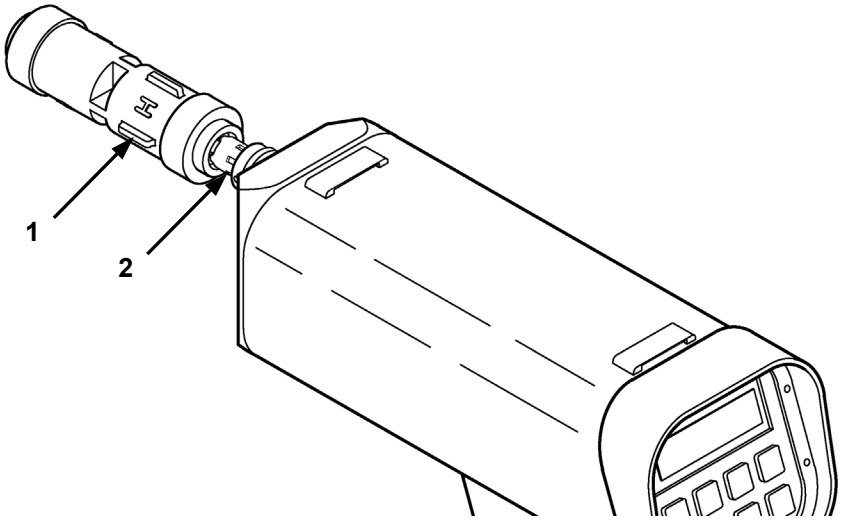
The confidence sample contains chemicals that may be irritating to the eyes, mucous membranes, and upper respiratory tract. Use the confidence sample only in a well ventilated area and avoid prolonged breathing of the vapor. Do not use if cracked or broken. See appendix C for material safety data sheets on confidence sample chemicals.

2. Locate H end of confidence sample (1).



2.6 CONFIDENCE TEST (continued)

3. Press H end of confidence sample (1) to nozzle (2) for no longer than 1 second. Press hard enough to open plunger at end of confidence sample. Remove confidence sample from nozzle.



4. Verify that horn sounds and display appears as shown. Polarity symbol may be + or -. Silence the horn by pressing the SELECT key.

NOTE

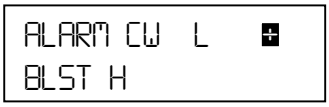
If APD 2000® does not alarm within 10 seconds of removing the confidence sample from the nozzle, repeat test, increasing time of exposure in 1-second increments until a maximum of 5 seconds of exposure.

A fully operational APD 2000® may fail a confidence test if it has not been used for some time. If this occurs, let the APD 2000® run for approximately 20 minutes and then repeat the test.

If the unit re-alarms immediately after clearing down from a confidence test alarm, there may be simulant liquid on the filtered nozzle standoff. Change the standoff.

2.6 CONFIDENCE TEST (continued)

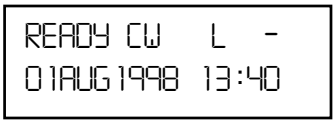
5. Verify that APD 2000® goes into backflush, indicated by reverse image polarity symbol.



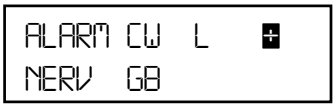
CAUTION

Do not switch the APD 2000® off while it is alarming to agent or simulant, or while it is in backflush following agent or simulant detection. Wait until it has completely cleared down (indicated by the word READY on the display). Switching the APD 2000® off during backflush will extend the start-up time on future use.

6. Verify that the display returns to READY CW.



7. Repeat steps 1 through 5 using G simulant. Verify that APD 2000® goes into clear down and display appears as shown. Polarity symbol will cycle between + and -.



NOTE

During confidence testing, , the APD 2000® may occasionally alarm BLST H in addition to NERV GB, which is not an equipment malfunction. In addition, when the ambient air is at low humidity, or there is a newly installed dry sieve pack or an excessively high concentration of G simulant, the APD 2000® may also alarm BLST H, which also is not an equipment malfunction. This condition will gradually reduce at higher humidity conditions or over time as the sieve pack absorbs moisture.

8. Verify that display returns to READY CW.

The APD 2000® is now ready for use. Go to para 2.7 for operating procedures.

NOTE

If the APD 2000® does not pass the confidence test, return it to the manufacturer (see appendix D) for service.

2.7 GENERAL USE

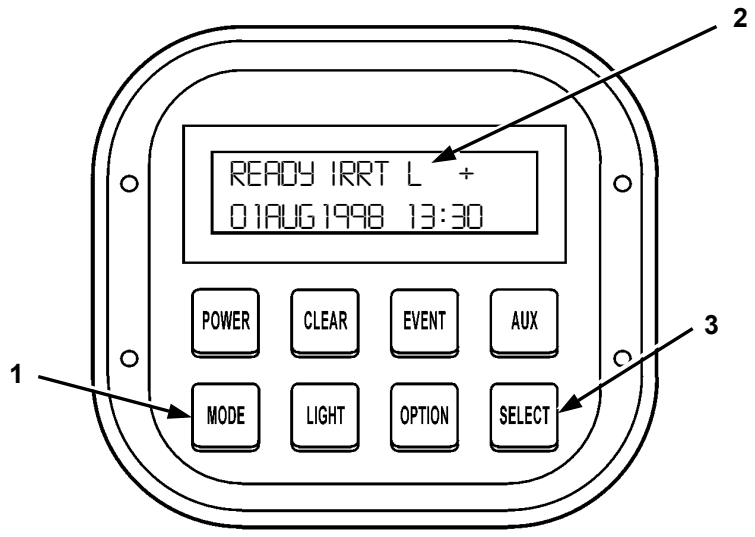
2.7.1 Agent Modes

The APD 2000® has three modes for selecting Agents and Irritants to identify. Each mode is exclusive; the instrument can only detect and identify the agent(s) or irritant(s) specific to the selected mode as shown in the table:

AGENT MODE	AGENT/IRRITANT TYPE	SPECIFIC AGENT/IRRITANT
CW	Nerve and Blister agents	GA, GB, GD, HD, HN, and Lewisite (L)
CWVX	Nerve	VX
IRRT	Irritants	Pepper spray and mace

To change the current Agent mode:

1. Press MODE key (1) until desired mode (2) appears on display.



2. Press SELECT key (3) to change to the displayed mode.

   The display above indicates that IRRT is the current Agent mode, and the unit can only detect and identify irritants such as pepper spray and mace.

2.7 GENERAL USE (CONTINUED)

2.7.2 Operating Modes

2.7.2.1 Monitor Mode

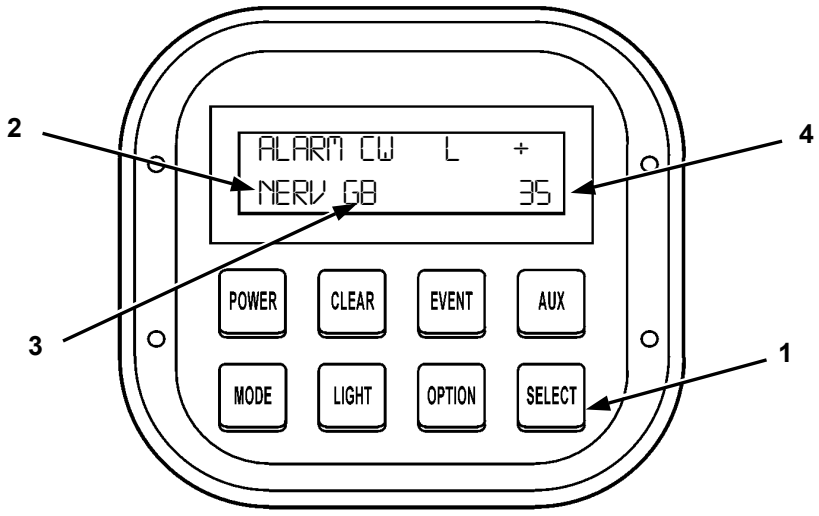
Monitor mode is the default operating mode for the APD 2000®. In this mode, the unit alarms to the presence of agent or irritants and, at the same time, continues to sample the environment for additional threats and for changes in the concentration of agent. It reports this information through continuous updates to the display.

If the concentration becomes too high, the APD 2000® goes into backflush and clear down. This feature protects the unit from damage caused by agent or irritant saturation. During clear down, the unit updates the information on the display. When the concentration is reduced to medium or low, the backflush pump is turned off and the unit resumes its monitoring activity.

When the APD 2000® alarms in monitor mode, it provides the following signals:

1. The horn beeps until it is silenced (press SELECT key (1)) or the agent dissipates.

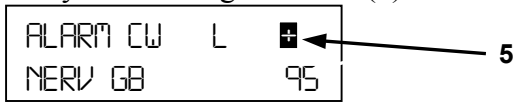
2. In the default display mode, the display appears as shown. The class (2), name (3), and relative concentration (4) may change as the unit monitors changes in the environment.



NOTE

If more than one agent of the same class is detected, or the APD 2000® is unable to determine the agent name, the display shows only the class (NERV or BLST).

3. If the concentration becomes too high, the APD 2000® goes into automatic backflush and clear down, as shown by the clearing indicator (5).



The unit updates the display to show the change in agent concentration and continues its monitoring mission throughout clear down.

2.7 GENERAL USE (CONTINUED)

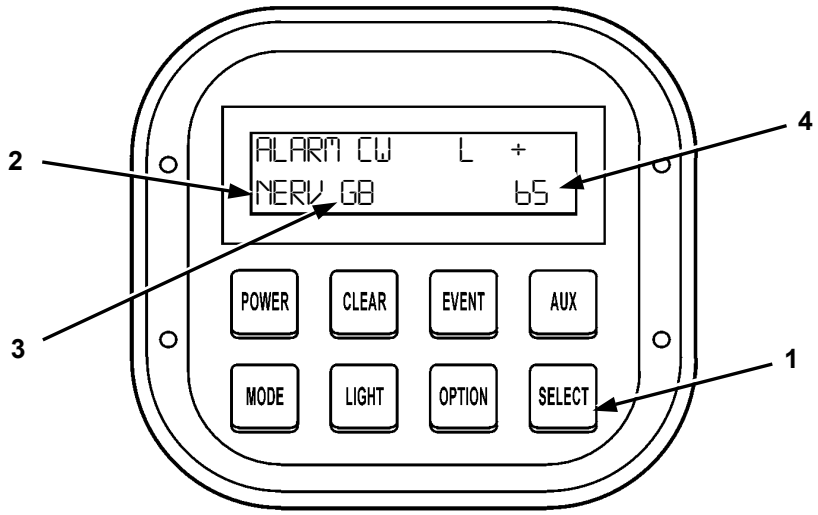
2.7.2.2 Detect Mode

In detect mode, the APD 2000® functions as a point sampling detector. Once it detects agent, it alarms immediately and then goes into automatic backflush and clear down. The unit cannot detect agent during clear down.

When the APD 2000® alarms in detect mode, it provides signals very similar to the signals it provides in monitor mode.

1. The horn beeps until it is silenced (press SELECT key (1)) or the cause of the alarm dissipates.

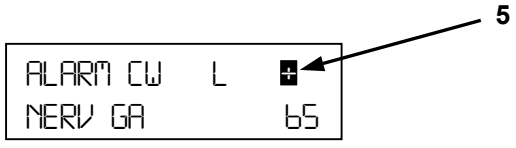
2. In the default display mode, the display appears as shown. The class (2), name (3), and relative concentration (4) appear on the display. The display may change if more than one agent is detected.



NOTE

If more than one agent of the same class is detected or the APD 2000® is unable to determine the agent name, the display shows only the class (NERV or BLST).

3. Immediately following agent detection, the APD 2000® goes into automatic backflush and clear down, as shown by the clearing indicator (5). It cannot detect agent while it is clearing down.



When clear down is complete (usually within 5 minutes), the unit resumes its detection mission.

2.7 GENERAL USE (CONTINUED)

2.7.3 Radiation Detection

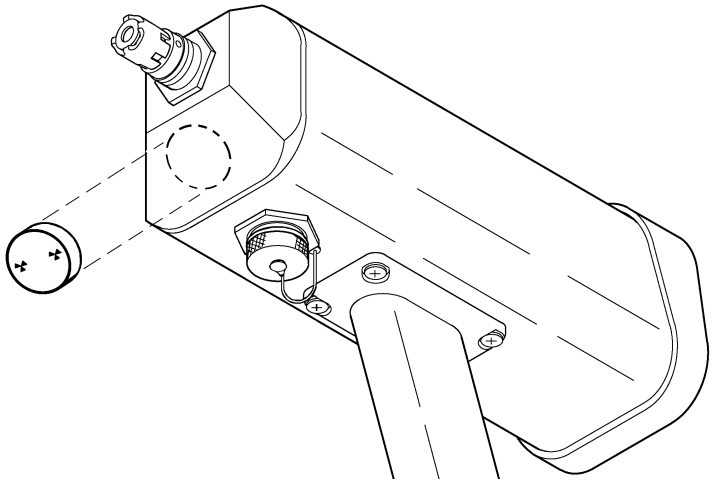
WARNING

The Radiation Detection capability may not provide accurate readings or alarm at temperatures above 45°C (113°F).

If your APD 2000® has the radiation option installed, the RAD indicator (1) will appear on the display when you turn the unit on and it reaches the STNDBY state. When the APD 2000® alarms to radiation, it provides the following signals:

NOTE

Using a Cs-137 check source at about 9.9 micro curies on the surface of the APD 2000®, the unit will achieve the alarm setpoint of about 3 mrem/hr in approximately 25 seconds.



NOTE

Smiths Detection uses a 10.0 micro curie Cs-137 Radioisotope Disk source supplied by:

Spectrum Techniques
Oak Ridge, TN
http://www.spectrumtechniques.com/
Phone: 865-482-9937

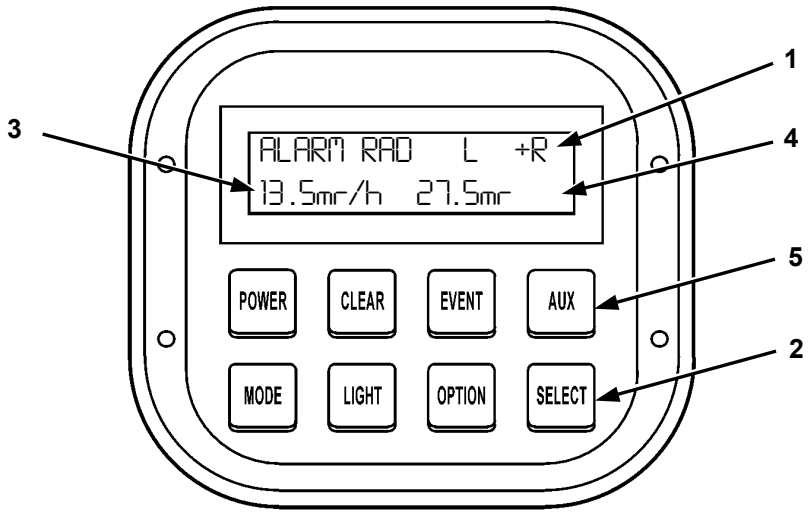
2.7 GENERAL USE (CONTINUED)

1. The horn beeps until it is silenced (press SELECT key [2]).

2. The display appears as shown. The amount of radiation detected is shown on the display data line.

a. The first number (3) shows the radiation rate in millirems per hour (mrem/hr).

b. The second number (4) shows the dose (cumulative amount of radiation detected) in millirems (mrem), since the RAD option was enabled.



3. The APD 2000® will continue to alarm as long as radiation is present.

4. To turn the RAD option off, press the AUX key (5). The AUX key toggles the radiation option on and off.

When the RAD option is turned on again, the cumulative radiation number (4) will be reset to zero.

During a radiation alarm, the APD 2000® can still detect and alarm to chemical threats. When simultaneous radiation and chemical alarms occur, the display cycles between the alarms.

2.7 GENERAL USE (CONTINUED)

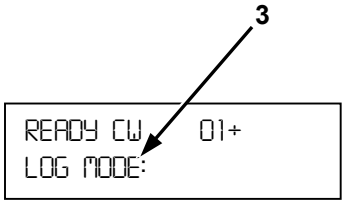
2.7.4 Data Logging

Data logging allows you to save a history of alarms, status, sample data and other operating characteristics for later uploading and analysis on a PC (see para 3). This history is retained in the APD 2000®'s internal memory even when the unit is turned off.

By default, automatic data logging is enabled on startup. The log indicator (1) appears on the display whenever data logging is enabled.

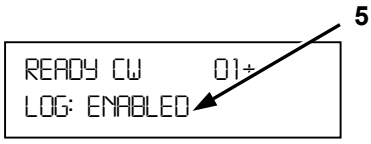
To Enable/Disable Data Logging:

1. Press OPTION key (2) until LOG MODE (3) appears on display.

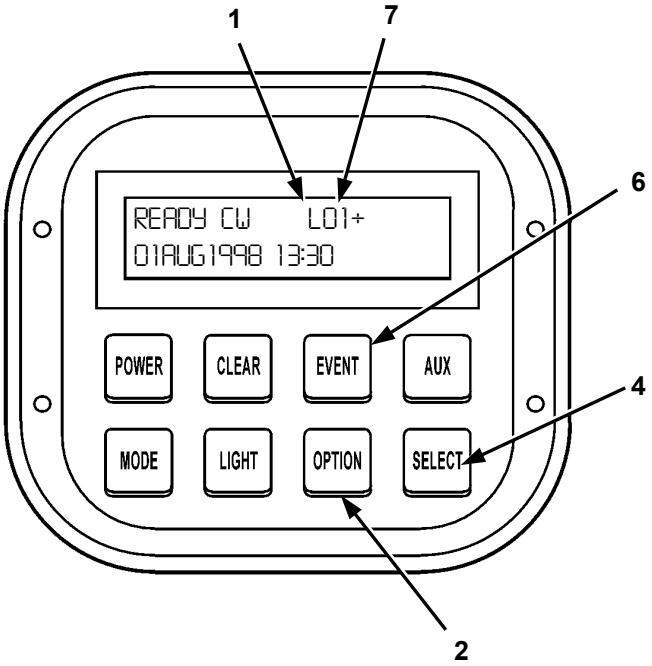


2. Press SELECT key (4)

3. Press OPTION key (2) until desired setting ((ENABLED or DISABLED (5)) appears on display.



4. Press SELECT key (4) to choose setting.



2.7 GENERAL USE (CONTINUED)

While data logging is enabled, the APD 2000® stores a data entry into its internal memory whenever an alarm occurs, the radiation rate or cumulative dose changes, the user marks an event or, if no other significant change in status occurs, every 5 minutes.

The mark an event:

1. Press the EVENT key (6).

2. A two-digit **Event** number (7) appears on the display for 3 seconds.

The event numbers range from "01" to "99", and are incremented every time an event is marked. The event number will roll over from "99" to "01" if necessary. The event number is reset back to "01" whenever the unit is turned off, or whenever data logging is disabled by selecting the disable option under LOG MODE menu option.

The data log history can be retrieved or cleared from the APD 2000® internal memory by using the APD 2000® Datalogger Software (see para 3). While the data log is being retrieved, the display shows that the unit is currently uploading information. While uploading, the APD 2000® will not be able to detect agents or irritants, change agent modes, mark events, or add new entries into the APD.

2.7 GENERAL USE (CONTINUED)

2.7.5 Malfunction alert

(1) If the APD 2000® malfunctions, a fault message appears on the display. The fault messages are listed below with a brief explanation.

NOTE

All of the fault messages are nonfatal. The APD 2000® will continue to operate to the maximum extent possible even with a fault message displayed.

AUTO CAL ERR - Indicates that the APD 2000® cannot calibrate within 5 minutes of STNDBY or an AUTO CAL message.

FLOW ERR – Indicates an obstruction in the airflow.

LOW FLOW – Indicates a partial obstruction in the airflow.

HIGH FLOW – Indicates a problem with the airflow.

RAD ERR – Indicates a malfunction with the radiation detector.

POWER LOW - Indicates either a weak battery(s) or dc input is below the minimum requirement.

POWER HIGH - Indicates dc input is above the maximum requirement.

INIT DIAG ERR - Indicates an internal diagnostic error.

The following fault messages indicate that the APD 2000® could not properly store information into the data log history:

LOG ERR

LOG MEMRY ERR

LOG WRITE ERR

LOG OVRUN ERR

(2) If there is a fault message on the APD 2000® display, refer to para 4 for the Troubleshooting Guide.

2.8 SHUTDOWN

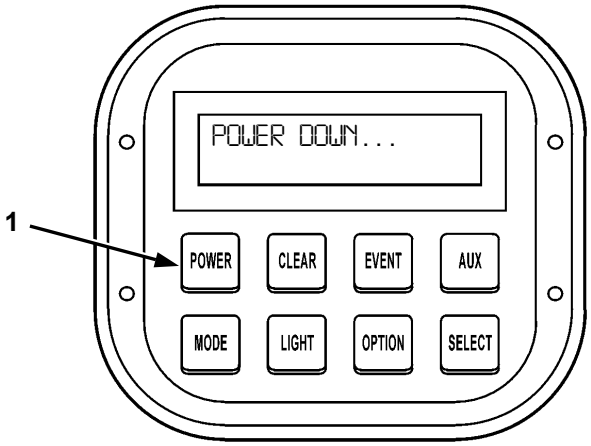
WARNING

An APD 2000® contaminated by CW agents or radiation can cause death or injury. If you suspect the APD 2000® has been contaminated, do not perform SHUTDOWN. Instead, perform DECONTAMINATION (see para 2.9).

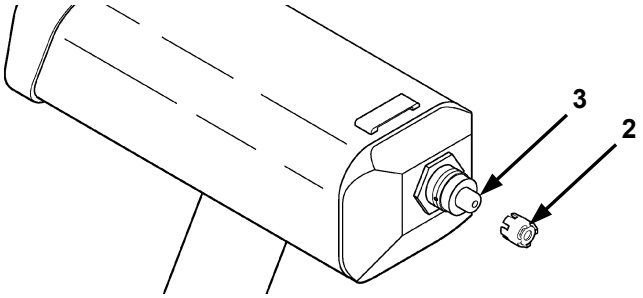
CAUTION

Do not remove power from the APD 2000® while it is alarming to agent or simulant or while it is clearing down following agent or simulant detection. Wait until it has completely cleared down (indicated by the word READY on the display. Switching the unit off at this time could extend the warm-up time on future use.

1. Press and hold POWER button (1) until POWER DOWN… appears on display. Release POWER button to shut unit down.



2. Remove filtered nozzle standoff (2) from nozzle (3) and discard.



2.8 SHUTDOWN (continued)

CAUTION

Do not touch the nozzle with your hands or attempt to wipe it off with a cloth or paper product that is dirty or that may have solvents or contaminants on it.

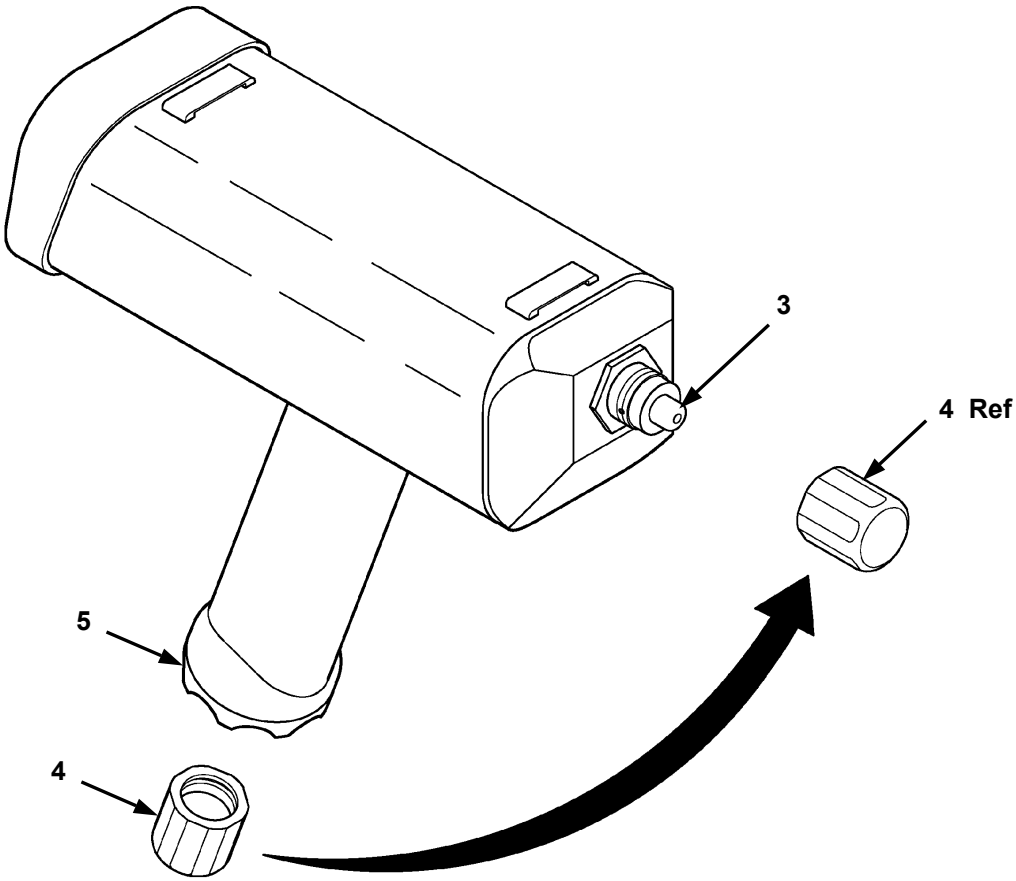
Do not put a damp or dirty nozzle protective cap over the nozzle. Doing so could increase start-up time, reduce sensitivity, or cause damage to the APD 2000®.

3. Inspect nozzle (3) for moisture. Wipe off moisture with a clean, dry paper towel or napkin.

4. Remove nozzle protective cap (4) from battery cap (5) retainer and place it over nozzle (3).

5. Remove battery cap (5) from battery compartment and remove batteries. Replace battery cap.

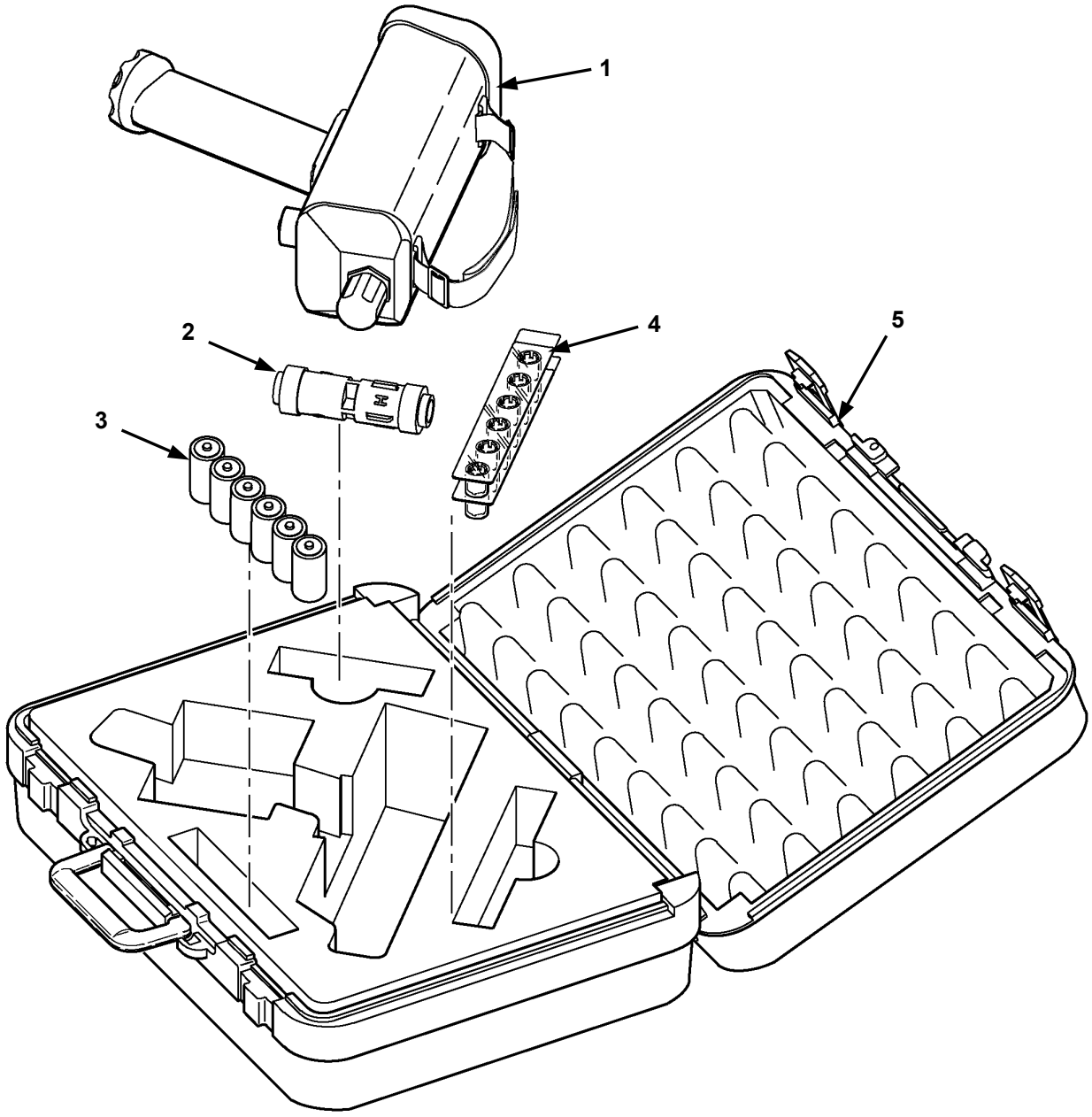
6. Discard weak or spent disposable batteries.



2.8 SHUTDOWN (continued)

7. Return APD 2000® (1), confidence sample (2), usable batteries (3), and filtered nozzle package (4) to transit case (5) for storage.

8. At first opportunity, replenish supplies in transit case.



2.9 DECONTAMINATION

NUCLEAR

For radiological contamination, brush, wipe, or vacuum contamination from equipment. The contamination is not destroyed — just moved from one place to another. Control runoff as contaminated waste.

Biological and Chemical.

If you suspect that the APD 2000® or its accessories are contaminated, perform the decontamination procedures described below.

CAUTION

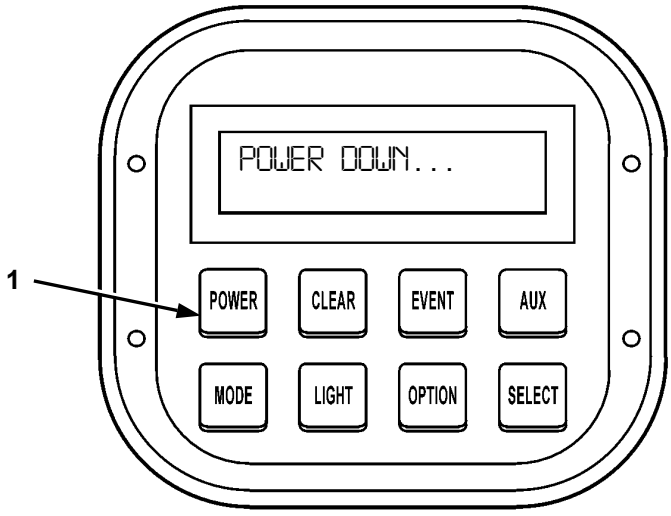
Do not decontaminate the APD 2000® or its accessories with M258A1 or M280 decontamination kits. These kits may cause false positives and temporarily render the APD 2000® inoperative.

Decontaminate NBC gloves with hot soapy water or M291 Skin Decontamination Kit.

Limit your work area to avoid spreading contamination.

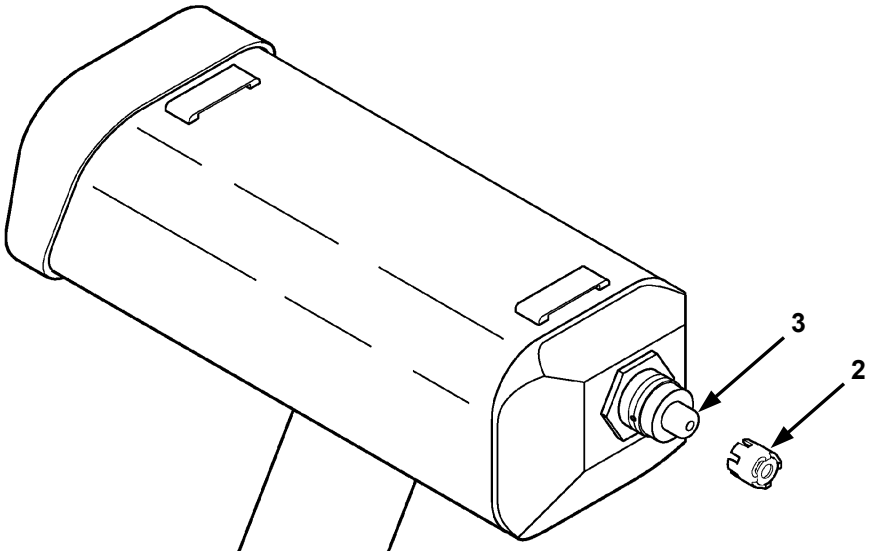
APD 2000® and Confidence Sample:

1. Press and hold POWER key (1) until POWER DOWN… appears on display. Release POWER button to shut unit down.



2.9 DECONTAMINATION (continued)

2. Remove filtered nozzle standoff (2) from nozzle (3). Discard filtered nozzle standoff as contaminated waste.



3. Decontaminate NBC gloves.

4. Lightly dampen cloth swipe with water and wipe APD 2000® nozzle thoroughly. Discard cloth swipe as contaminated waste.

5. Decontaminate NBC gloves.

CAUTION

Do not get nozzle wet with soap and water to avoid contamination to the interior of the APD 2000®.

6. Remove nozzle protective cap from battery cap retainer and install over nozzle.

7. Decontaminate the APD 2000® and confidence sample with a cloth and hot soapy water. Wipe both dry with a clean cloth or let air dry.

8. Decontaminate NBC gloves.

9. Check effectiveness of decontamination with M256-series detector kit, M8/M9 detector paper or, if available, another APD 2000®.

10. If the APD 2000® and/or confidence sample are still contaminated, repeat steps 7 through 9 until decontamination is complete.

2.9 DECONTAMINATION (continued)

11. Remove nozzle protective cap from nozzle and install a new filtered nozzle standoff on the nozzle.

12. Press POWER button to turn APD 2000® on. The unit will purge itself of any internal contamination.

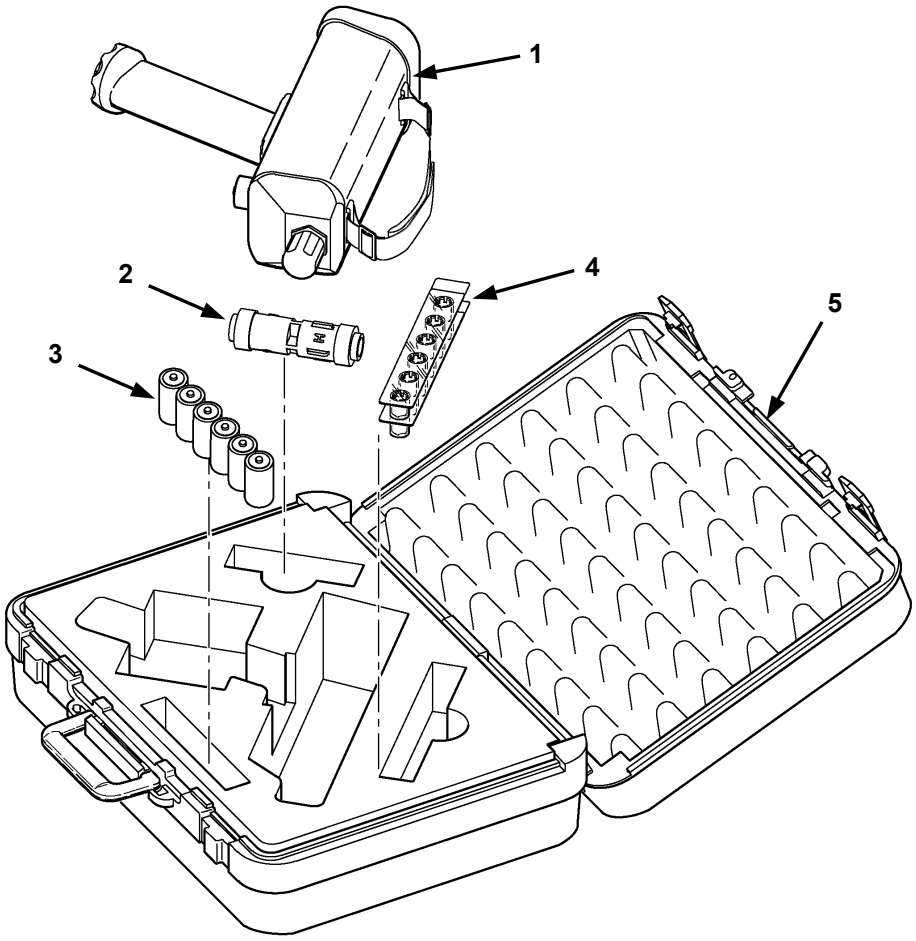
13. Let APD 2000® run until display returns to READY CW. Press and hold POWER button until POWER DOWN… appears on display. Release POWER button to shut unit down.

14. Remove the nozzle protective cap from the battery cap retainer and place it over nozzle .

15. Check the filtered nozzle package for contamination using an M256-series detector kit, M8/M9 detector paper, or, if available, another APD 2000®. Discard contaminated items as contaminated waste.

16. Decontaminate NBC gloves.

When decontamination is complete, return APD 2000® (1), confidence sample (2), usable batteries (3), and filtered nozzle package (4) to transit case (5) for storage. If necessary, replenish supplies in transit case.



2.9 DECONTAMINATION (continued)

Carrying Harness:

1. Press and hold POWER button until POWER DOWN… appears on display. Release POWER button to shut unit down.
2. Remove filtered nozzle standoff. Discard filtered nozzle standoff as contaminated waste.
3. Decontaminate NBC gloves.
4. Remove carrying harness from APD 2000®. Decontaminate carrying harness by submerging in hot soapy water. Rinse carrying harness thoroughly and let air dry.
5. Decontaminate NBC gloves.
6. Check effectiveness of carrying harness decontamination with M256-series detector kits, M8/M9 detector paper, or, if available, another APD 2000®.
7. If the carrying harness is still contaminated, repeat steps 4 through 6 until decontamination is complete.

3 APD 2000® DATALOGGER SOFTWARE

3.1 INTRODUCTION

The APD 2000® Datalogger Software allows users to collect, review, and archive data from the APD 2000®. Using this system, users can retrieve background, alarm, and event data from an APD 2000® in the field and store it on a PC for analysis.

3.2 SYSTEM REQUIREMENTS

Processor	486 or higher
Operating System	Windows 3.1, 95 or 98 or higher
Pointing Device	Mouse or Track ball
Other	Serial Port Available as COM1 or COM2

3.3 INSTALL THE SOFTWARE

1. Insert the Datalogger Software install disk in the floppy disk drive.

2. For Windows 3.1, from the Program Manager select Run from the File menu and type a:\setup in the dialog box.

3. For Windows 95 or higher, select Run from the Start menu and type a:\setup in the dialog box.

4. Follow the directions on the screen.

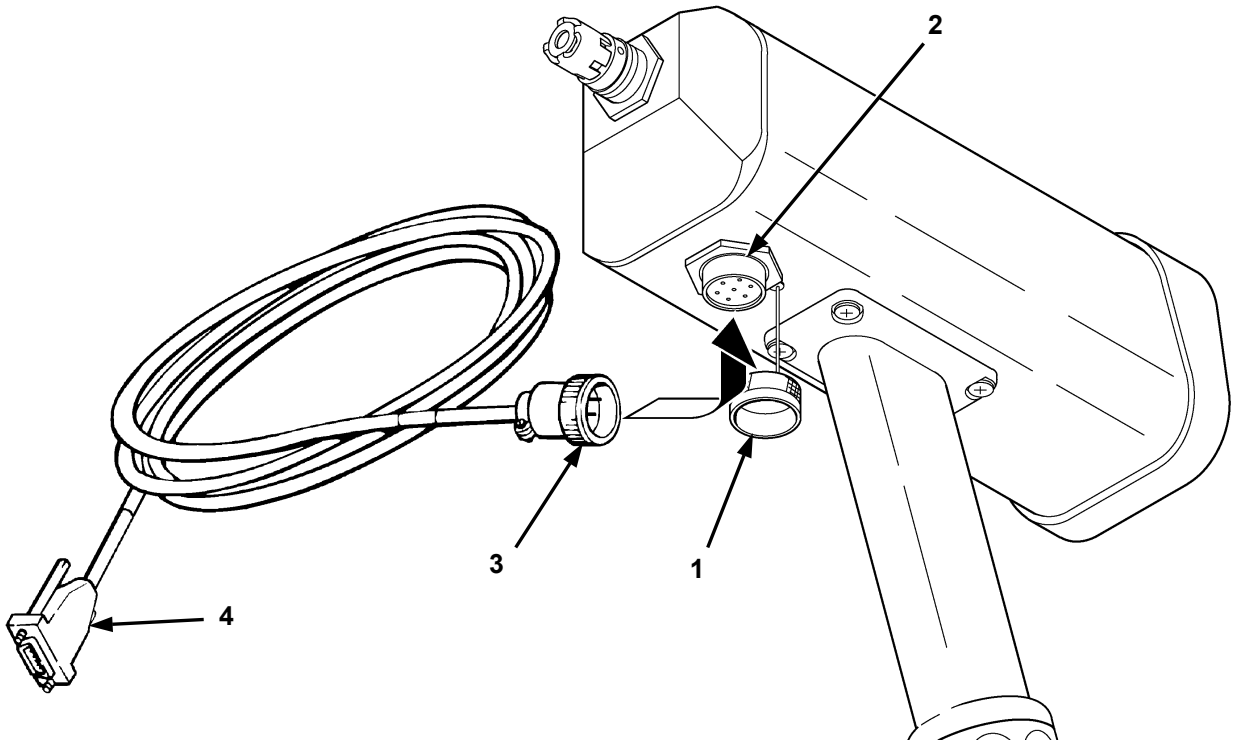
3.4 CONNECT APD 2000® TO PC

1. Remove the cap (1) from the APD 2000® auxiliary port (2).

NOTE

The communications cable connector is keyed so that it can only fit into the auxiliary port one way.

2. Connect communications cable connector (3) to auxiliary port (2) and screw connector down until fully seated.



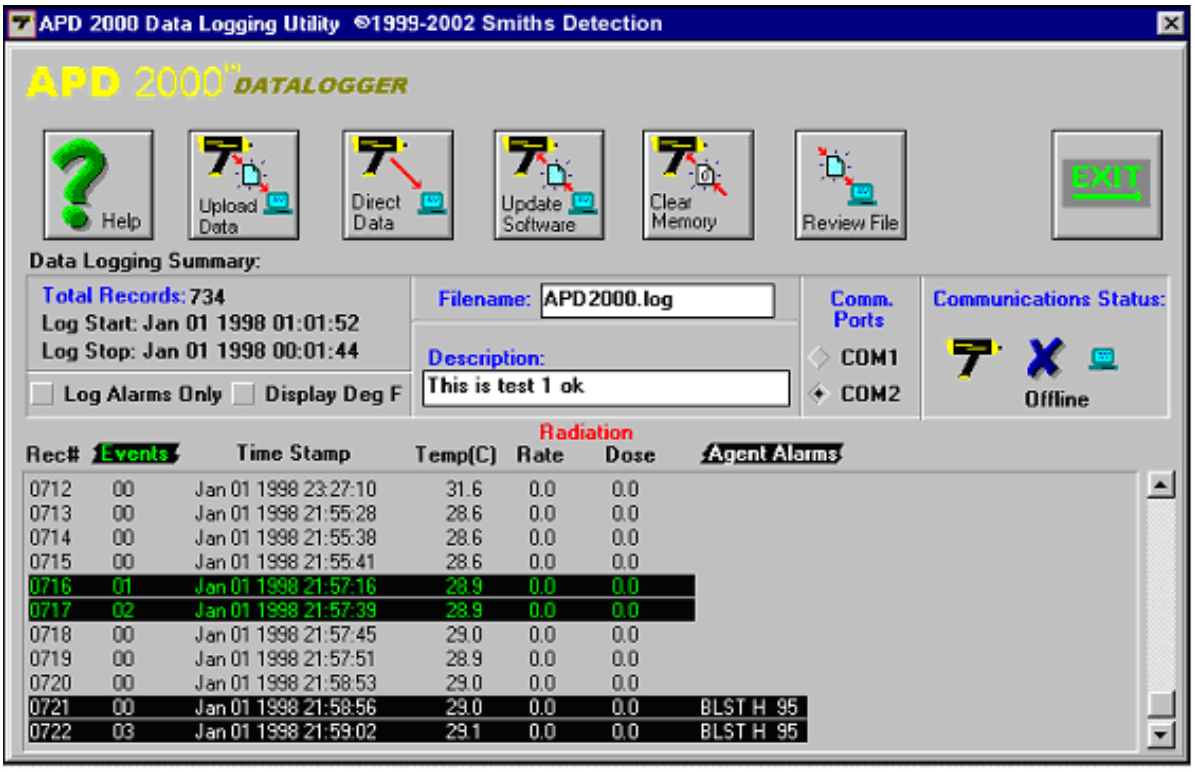
3. Connect other end of communications cable (4) to COM port on PC.

4. Turn on APD 2000®.

5. Launch Datalogger Software.

3.5 OPERATING THE SOFTWARE

The Datalogger software screen appears as shown below. Explanations of the available features and options are also provided.



Help

Displays the Application Help.

Upload Data

This button uploads collected data from the APD 2000® to the PC. Data will be stored in the filename indicated by the filename field. The APD 2000® must be connected to the PC and data must have been collected in the Datalogging mode. As each record is uploaded, it will be displayed in the main list box. Collected data can take up to 10 minutes to upload if the data buffer on the detector is full.

Direct Data

This button allow the user to collect data from the APD 2000® real time. To use this option, the APD 2000® must be directly connected to the PC using the serial cable. The APD 2000® is polled every five seconds and the current status including alarms, temperature and time is collected and stored in a file. The user will see each collected data point scroll by as data is collected. Collected data is stored in the file located in the filename box.

Update Software

This button updates the operating firmware in the APD 2000®. To update the software, put the APD 2000® in the download new software mode by selecting APD2000 v 6.xx - DOWNLOAD NEW SW from the Menu Tree (see para. 2.2.1). Press the Update Software button. The updated software should be present in the "a:" disk drive. If your computer has another drive assignment, switch to that drive and select the desired file. APD 2000® firmware has a 'HEX' filetype. The download will start as a DOS operating session and automatically return to the main window.

Clear Memory

This button will clear the datalogging memory of the APD 2000® for another run. Make sure any data in the APD 2000® is uploaded before executing this option.

Review File

This button allows the user to select a data file that has been previously captured and saved. The data will be displayed in the main review window.

Exit

This button causes the application to exit.

Total Records

This section displays the total records collected or in the file and the start and end times for the data.

Filename

Enter the name of the filename where collected data will be saved. If a filename already exists, data will be appended to it. Up to 10,000 records may be saved in a single file.

Description

A short (less than 80 character) description may be entered for data files that are being uploaded or captured in direct mode.

Comm Ports:

Select either COM1: or COM2: to reflect the port where the communications cable is installed. Clicking on this option will also reset the selected port to restore communications.

Communications Status

This animation box shows if communications is present between the PC and the APD 2000®. A moving link shows data is moving properly between the PC and APD 2000®. A blue 'X' shows the link is broken.

Log Alarms Only
If this button is checked, only alarm information is saved to the data file. If a file is being reviewed, this option will screen out non-alarm information.

Display Deg F
If this box is checked, all displayed data will be shown in degrees F.

Data List Box
This list box displays collected data from the APD 2000® in a color-coded format. Normal background data is shown as black text against a gray background. An alarm is shown as red text against a black background. Events are shown as green text against a black background. Data can be scrolled using the scroll bar located to the right of the window.

Exporting Files
Data files collected with the Datalogger software may be exported easily to almost all spreadsheets and word processors. Data in the files is stored in a text readable, comma separated format. When importing into a spreadsheet simply select "comma delimited" during the import process to align the data into different columns.

4 TROUBLESHOOTING GUIDE

This Troubleshooting Guide is designed to help you find and possibly correct some faults you may encounter while operating the APD 2000®. It is not intended to be an all-inclusive repair manual. In some cases, you will have to return the unit to the manufacturer for repair.

Symptoms that have the same possible cause and corrective action are grouped together.

Symptom	Possible Cause	Corrective Action
AUTO CAL ERR FLOW ERR LOW FLOW or HIGH FLOW or APD 2000® fails to purge itself within 5 minutes of starting clear down following confidence test or alarm	Cap on nozzle	Remove cap
	Nozzle obstructed	Clear obstruction
	Filtered nozzle standoff clogged	Replace filtered nozzle standoff (see para 2.4.3)
		Return unit to manufacturer

NOTE

Expected battery life for the APD 2000® is up to 7 hours of operation at room temperature (70°F). Battery life will decrease as the temperature drops. At 43°F, average battery life will be less than 3 hours, and at 32°F it can be 1 hour or less. The use of the display backlight and frequent alarms will also contribute to shorter battery life. Rechargeable batteries are not recommended for use in the APD 2000®, since they vary widely by brand and technology. To maximize battery life, Smiths Detection recommends that you use the display backlight only in conditions of low visibility, use high quality alkaline batteries such as Duracell, and change all batteries at the same time.

POWER LOW	Batteries weak	Replace six C batteries (see para 2.4.2).
	External power supply set to Low	Reset power supply
	Defective power supply.	Replace power supply.
POWER HIGH	External power supply set to High	Reset power supply
	Defective power supply	Replace power supply.
	APD 2000® malfunction	Return APD 2000® to manufacturer.

Symptom	Possible Cause	Corrective Action
	NOTE	
	In the case of a RAD ERR, the unit can still function as a chemical detector.	
RAD ERR	Radiation detector malfunction	Use AUX key to disable then re-enable radiation capability. Repeat twice. Shut APD 2000® down (para 2.8), then restart unit (para 2.5). Repeat twice. If problem continues, return APD 2000® to manufacturer.
INT DIAG ERR	Internal diagnostic error	Return APD 2000® to manufacturer.
Unit realarms constantly	Contaminated filtered nozzle standoff	Replace filtered nozzle standoff.
	Contaminated nozzle	See para 2.9 for directions for decontaminating nozzle.
	Contaminated room/area	Remove APD 2000® from area.
	NOTE	
	The APD 2000® should be run at least every six months. A fully operational APD 2000® may fail a confidence test if it has not been used for some time. If this occurs and you are sure the confidence sample is not defective, let the APD 2000® run for approximately 20 minutes and repeat the test. If the unit still fails the test, let it run for an additional 20 minutes. Repeat the confidence test once more (a total of three attempts). If the unit still fails the test, return it to the manufacturer (see appendix D).	
Unit fails to alarm to confidence sample	Confidence sample out of simulant	Replace confidence sample and repeat test.
	APD 2000® needs servicing.	Return APD 2000® to manufacturer.
The following fault messages indicate that the APD 2000® could not properly store information into the data log history: LOG ERR LOG MEMRY ERR LOG WRITE ERR LOG OVRUN ERR	Data Logging Malfunction	Disable data logging using the LOG MODE menu option If problem continues, return unit to manufacturer
If any of these messages appear on the APD 2000® display, disable data logging using the menu options, wait until the error message disappears from the display, then re-enable data logging. If the error continues or repeats, return the unit to the manufacturer for repair. Note that the unit can still be used for detection with Data Logging disabled, but must be returned to the manufacturer for repair of the Data Logging feature.		

APPENDIX A
RADIOACTIVE MATERIAL GENERAL LICENSE

smiths

Smiths Detection – Edgewood, Inc.
2202 Lakeside Boulevard
Edgewood, MD 21040
Ph: 410.510.9100

RADIOACTIVE MATERIAL GENERAL LICENSE

This Smiths Detection device contains a 10 millicurie Nickel 63 radioactive source. The use of this device is regulated by General License Provisions of the U.S. Nuclear Regulatory Commission, Agreement State or Licensing State under requirements substantially the same as those outlined below.

CODE OF MARYLAND REGULATIONS C.22.d

(1) A general license is hereby issued to commercial and industrial firms and to research, educational and medical institutions, individuals in the conduct of their business, and State or local government agencies to own, receive, acquire, possess, use or transfer in accordance with the provisions of C.22 (d) (2), (3), and (4), radioactive material, excluding special nuclear material, contained in devices designed and manufactured for the purpose of detecting, measuring, gauging or controlling thickness, density, level, interface locations, radiation, leakage, or qualitative or quantitative chemical composition, or for producing light or an ionized atmosphere.

(2) The general license in C.22 (d) (1) applies only to radioactive material contained in devices which have been manufactured and labeled in accordance with the specifications contained in a specific license issued by the Agency pursuant to C.28 (d) or in accordance with the specifications contained in a specific license issued by the U.S. Nuclear Regulatory Commission, an Agreement State or a Licensing State, which authorizes distribution of devices to persons generally licensed by the U.S. Nuclear Regulatory Commission, an Agreement State or a Licensing State and the device has been manufactured and installed so that:

(i) The dose rate is the radiation beam of the device at 18 inches (0.46 meters) from the radiation source with the device shutter in the open position does not exceed 125 millirem (1.25 mSv) per hour; and

(ii) There is not an accessible airgap of 18 inches (0.46 meters) or greater between the radiation source and detector which would allow insertion of a 12 inch (0.30 meters) diameter sphere into the radiation beam 5/.

(3) Any person who owns, receives, acquires, possesses, uses, or transfers radioactive material in a device pursuant to the general license in C.22 (d) (1):

(i) shall assure that all labels affixed to the device at the time of receipt, and bearing a statement that removal of the label is prohibited, are maintained theron and shall comply with all instructions and precautions provided by such labels;

(ii) shall assure that the device is tested for leakage of radioactive material and proper operation of the "on-off" mechanism and indicator, if any, at no longer than 6-month intervals or at such other intervals as are specified in the label, however,

(a) devices containing only krypton need not be tested for leakage of radioactive material, and

(b) devices containing only tritium or not more than 100 microcuries (3.7 MBq) of other beta- and/or gamma-emitting material or 10 microcuries (0.37 MBq) of alpha-emitting material and devices held in storage in the original shipping container prior to initial installation need not be tested for any purpose;

5/ Regulations under the Federal Food, Drug, and Cosmetic Act authorizing the use of radioactive control devices in food production require certain additional labeling thereon which is found in 21 CFR 179.21.

(iii) shall assure that the tests required by C.22 (d) (3) (ii) and other testing, installation, servicing, and removal from installation involving the radioactive material, its shielding or containment, are performed:

(a) in accordance with the instructions provided by the labels, or

(b) by a person holding an applicable specific license from the Agency, the U.S. Nuclear Regulatory Commission, an Agreement State or a Licensing State to perform such activities;

(iv) shall maintain records showing compliance with the requirements of C.22 (d) (3) (ii) and (iii). The records shall show the results of tests. The records also shall show the dates of performance of, and the names of persons performing, testing, installation, servicing, and removal from installation concerning the radioactive material, its shielding or containment. Records of tests for leakage of radioactive material required by C.22 (d) (3) (ii) shall be maintained for 2 years after the next required leak test is performed or until the sealed source is transferred or disposed of. Records of tests of the "on-off" mechanism and indicator required by C.22 (d) (3) (ii) shall be maintained for 2 years after the next required test of the "on-off" mechanism and indicator is performed or until the sealed source is transferred or disposed of. Records which are required by C.22 (d) (3) (iii) shall be maintained for a period of 2 years from the date of the recorded event or until the device is transferred or disposed of;

(v) upon the occurrence of a failure of or damage to, or any indication of a possible failure of or damage to, the shielding of the radioactive material or the "on-off" mechanism or indicator, or upon the detection of 0.005 microcurie (185 Bq) or more removable radioactive material, shall immediately suspend operation of the device until it has been repaired by the manufacturer or other person holding an applicable specific license from the Agency, the U.S. Nuclear Regulatory Commission, an Agreement State or a Licensing State to repair such devices, or disposed of by transfer to a person authorized by an applicable specific license to receive the radioactive material contained in the device and, within 30 days, furnish to the Agency a report containing a brief description of the event and the remedial action taken;

(vi) shall not abandon the device containing radioactive material;

(vii) except as provided in C.22 (d) (3) (viii), shall transfer or dispose of the device containing radioactive material only by transfer to a specific licensee of the Agency, the U.S. Nuclear Regulatory Commission, an Agreement State or a Licensing State whose specific license authorizes him to receive the device and within 30 days after transfer of a device to a specific licensee shall furnish to the Agency a report containing identification of the device by manufacturer's name and model number and the name and address of the person receiving the device. No report is required if the device is transferred to the specific licensee in order to obtain a replacement device;

(viii) shall transfer the device to another general licensee only:

(a) where the device remains in use at a particular location. In such case the transferor shall give the transferee a copy of this regulation and any safety documents identified in the label on the device and within 30 days of the transfer, report to the Agency the manufacturer's name and model number of device transferred, the name and address of the transferee, and the name and/or position of an individual who may constitute a point of contact between the Agency and the transferee; or

(b) where the device is held in storage in the original shipping container at its intended location of use prior to initial use by a general licensee; and

(ix) shall comply with the provisions of D.1201 and D.1202 of these regulations for reporting radiation incidents, theft, or loss of licensed material, but shall be exempt from the other requirements of Parts D and J of these regulations.

(4) The general license in C.22 (d) (1) does not authorize the manufacture of devices containing radioactive material.

(5) The general license provided in C.22 (d) (1) is subject to the provisions of A.4 through A.9, C.31, C.40, C.50, and Part T of these regulations.

APPENDIX B

RADIATION WIPE TEST INSTRUCTIONS

Perform radiation wipe test on your APD 2000® every 6 months as follows:

1. Obtain proper Radiation Wipe Test Kit from local radiation authority, authorized laboratory, or Smiths Detection - Edgewood, Inc. (See para. 1.7 for information on contacting Smiths Detection.)

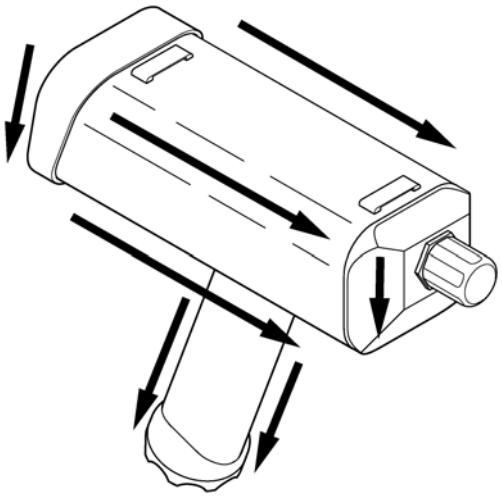
CAUTION

Read and follow all safety precautions and directions provided with the Radiation Wipe Test Kit.

2. Wipe the device as shown in the figure.

NOTE

Wipe **all** external areas of the device with filter paper maintaining an even pressure. Avoid wiping same area twice. Take care to wipe into corners and cavities to cover maximum surface area.



3. Mail wipes to a qualified radiation analysis laboratory.

4. You, as customer, are responsible to keep records of all Wipe Tests done on the APD 2000® under the NRC General License Agreement. Records must be retained for a minimum of 2 years.

5. The possession and use of this device is authorized under a General License issued by the State of Maryland (COMAR 10, 14, 02, 01 Sec C.22(d)). If you are using the device outside the State of Maryland, you are regulated by the U.S. Nuclear Regulatory Commission or another Agreement or Licensing State under requirements substantially the same.

APPENDIX C
CONFIDENCE SAMPLE CHEMICALS
MATERIAL SAFETY DATA SHEETS

Material Safety Data Sheet

1. CHEMICAL PRODUCT & COMPANY IDENTIFICATION

24-Hour Emergency Phone Number: 989-636-4400

Product: DOWANOL* DPM GLYCOL ETHER

Product Code: 22345

Effective Date: 10/09/01 Date Printed: 12/17/01 MSD: 000045

The Dow Chemical Company, Midland, MI 48674

Customer Information Center: 800-258-2436

2. COMPOSITION/INFORMATION ON INGREDIENTS

Dipropylene glycol monomethyl ether	CAS# 034590-94-8	99%

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

****

* Clear, colorless liquid. Slight ether odor. Combustible. *

****

POTENTIAL HEALTH EFFECTS (See Section 11 for toxicological data.)

EYE: May cause slight transient (temporary) eye irritation. Corneal injury is unlikely.

SKIN: Prolonged exposure not likely to cause significant skin irritation. Prolonged skin contact with very large amounts may cause drowsiness.

INGESTION: Single dose oral toxicity is considered to be extremely low. Small amounts swallowed incidental to normal handling operations are not likely to cause injury; swallowing amounts larger than that may cause injury.

INHALATION: Excessive exposure may cause irritation to upper respiratory tract. Signs and symptoms of excessive exposure may be anesthetic or narcotic effects.

SYSTEMIC (OTHER TARGET ORGAN) EFFECTS: Observations in animals include minor liver or kidney effects. Signs and symptoms of excessive exposure may be anesthetic or narcotic effects.

(Continued on page 2 , over)

TERATOLOGY (BIRTH DEFECTS): Birth defects are unlikely. Exposures having no adverse effects on the mother should have no effect on the fetus.

4. FIRST AID

EYE: Flush eyes with plenty of water.

SKIN: Wash off in flowing water or shower.

INGESTION: If swallowed, seek medical attention. Do not induce vomiting unless directed to do so by medical personnel.

INHALATION: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, oxygen should be administered by qualified personnel. Call a physician or transport to a medical facility.

NOTE TO PHYSICIAN: No specific antidote. Supportive care. Treatment based on judgment of the physician in response to reactions of the patient.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES
FLASH POINT: 175F, 79.4C
METHOD USED: TCC
AUTOIGNITION TEMPERATURE: Not determined.

FLAMMABILITY LIMITS
LFL: 1.1 vol% @ 100C
UFL: 14 vol% @ 150C

HAZARDOUS COMBUSTION PRODUCTS: During a fire, smoke may contain the original material in addition to unidentified toxic and/or irritating compounds. Hazardous combustion products may include and are not limited to: carbon monoxide, carbon dioxide.

OTHER FLAMMABILITY INFORMATION: Violent steam generation or eruption may occur upon application of direct water stream to hot. liquids. Spills of these organic liquids on hot fibrous insulations may lead to lowering of the autoignition temperatures possibly resulting in spontaneous combustion.

EXTINGUISHING MEDIA: Water fog or fine spray, carbon dioxide,

(Continued on page 3)

dry chemical, foam. Alcohol resistant foams (ATC type) are preferred if available. General purpose synthetic foams (including AFFF) or protein foams may function, but much less effectively.

MEDIA TO BE AVOIDED: Do not use direct water stream.

FIRE FIGHTING INSTRUCTIONS: Keep people away. Isolate fire area and deny unnecessary entry. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage. Burning liquids may be extinguished by dilution with water. Do not use direct water stream. May spread fire.

PROTECTIVE EQUIPMENT FOR FIRE FIGHTERS: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, pants, boots, and gloves). If protective equipment is not available or not used, fight fire from a protected location or safe distance.

6. ACCIDENTAL RELEASE MEASURES (See Section 15 for Regulatory Information)

PROTECT PEOPLE: Isolate area.

PROTECT THE ENVIRONMENT: Contain liquid to prevent contamination of soil, surface water or ground water.

CLEANUP: Clean up residual with non-combustible absorbent material and wash with water. Collect material in suitable and properly labeled open containers.

7. HANDLING AND STORAGE

HANDLING: Containers, even those that have been emptied, can contain vapors. Do not cut, drill, grind, weld, or perform similar operations on or near empty containers.

STORAGE: Store in carbon steel, stainless steel, Teflon.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: Local exhaust ventilation may be necessary for some operations.

PERSONAL PROTECTIVE EQUIPMENT

(Continued on page 4 , over)

EYE/FACE PROTECTION: Use safety glasses. Where contact with this material is likely, chemical goggles are recommended because eye contact may cause discomfort even though it is unlikely to cause injury.

SKIN PROTECTION: For brief contact, no precautions other than clean body-covering clothing should be needed. Use gloves impervious to this material when prolonged or frequently repeated contact could occur.

RESPIRATORY PROTECTION: When airborne exposure guidelines and/or comfort levels may be exceeded, use an approved air-purifying respirator.

EXPOSURE GUIDELINES: Dipropylene glycol methyl ether: ACGIH TLV and OSHA PEL are 100 ppm TWA, 150 ppm STEL. PELs are in accord with those recommended by OSHA, as in the 1989 revision of PELs.

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Clear, colorless liquid
ODOR: Slight ether.
VAPOR PRESSURE: 0.41 mmHg @ 25C
VAPOR DENSITY: 5.14
BOILING POINT: 374F, 190C
SOLUBILITY IN WATER: Infinitely
SPECIFIC GRAVITY: 0.951 @ 25/25C
VOLATILE ORGANIC COMPOUNDS (VOC) CONTENT: 951 g/L or 7.91 lb/gal as per Rule 443.1 of California SCAQMD

10. STABILITY AND REACTIVITY

CHEMICAL STABILITY: Stable under recommended storage conditions. See Storage Section.

CONDITIONS TO AVOID: Avoid static discharge. Flammable vapors can be released at elevated temperatures.

INCOMPATIBILITY WITH OTHER MATERIALS: Avoid contact with oxidizing materials.

HAZARDOUS DECOMPOSITION PRODUCTS: Does not normally decompose. Hazardous decomposition products depend upon temperature, air supply and the presence of other materials.

(Continued on page 5)

HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL INFORMATION (See Section 3 for Potential Health Effects. For detailed toxicological data, write or call the address or non-emergency number shown in Section 1)

SKIN: The LD50 for skin absorption in rabbits is > 20 ml/kg.

INGESTION: The oral LD50 for rats is 5.4 ml/kg.

MUTAGENICITY: In vitro mutagenicity studies were negative.

12. ECOLOGICAL INFORMATION (For detailed Ecological data, write or call the address or non-emergency number shown in Section 1)

ENVIRONMENTAL FATE

MOVEMENT & PARTITIONING: Bioconcentration potential is low (BCF less than 100 or Log Pow less than 3). Log octanol/water partition coefficient (log Pow) is estimated using the Pomona-Med Chem structural fragment method to be -0.064.

DEGRADATION & PERSISTENCE: Material is readily biodegradable. Passes OECD test(s) for ready biodegradability. Material is ultimately biodegradable. Reaches more than 70% mineralization in OECD test(s) for inherent biodegradability. Biodegradation under aerobic static laboratory conditions is moderate (BOD20 or BOD28/ThOD between 10 and 40%). Biodegradation rate may increase in soil and/or water with acclimation.
20-Day biochemical oxygen demand (BOD20) is 0.65 p/p.
Degradation is expected in the atmospheric environment within minutes to hours.
Biodegradation reached in CO2 Evolution Test (Modified Sturm Test, OECD Test No. 301 B) after 28 days: 34%.
Biodegradation reached in Modified OECD Screening Test (OECD Test No. 301 E) after 28 days: 72.9%.

ECOTOXICITY: Material is practically non-toxic to aquatic organisms on an acute basis (LC50 greater than 100 mg/L in most sensitive species).
Acute LC50 for emerald shiner (Notropis atherinoides) is greater than 150 mg/L.
Acute LC50 for fathead minnow (Pimephales promelas) is greater than 10000 mg/L.
Acute LC50 for water flea (Daphnia magna) is 1919 mg/L.
Acute LC50 for brown shrimp (Crangon crangon) is greater than

(Continued on page 6 , over)

1000 mg/L.
The 21 day no-observed effect concentration level (NOEC) (reproduction) for water flea (Daphnia magna) is >0.5 mg/L.
Growth inhibition threshold in bacteria is 4168 mg/L.

13. DISPOSAL CONSIDERATIONS (See Section 15 for Regulatory Information)

DISPOSAL: DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal methods must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. THE DOW CHEMICAL COMPANY HAS NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION 2 (Composition/Information On Ingredients).

FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: recycler, reclaimer, incinerator or other thermal destruction device.

As a service to its customers, Dow can provide names of information resources to help identify waste management companies and other facilities which recycle, reprocess or manage chemicals or plastics, and that manage used drums. Telephone Dow's Customer Information Center at 800-258-2436 or 517-832-1556 for further details.

14. TRANSPORT INFORMATION

DEPARTMENT OF TRANSPORTATION (D.O.T.): For DOT regulatory information, if required, consult transportation regulations, product shipping papers, or your Dow representative.

CANADIAN TDG INFORMATION: For TDG regulatory information, if required, consult transportation regulations, product shipping papers, or your Dow representative.

15. REGULATORY INFORMATION (Not meant to be all-inclusive--selected regulations represented)

NOTICE: The information herein is presented in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied is given. Regulatory requirements

(Continued on page 7)

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are subject to change and may differ from one location to another; it is the buyer's responsibility to ensure that its activities comply with federal, state or provincial, and local laws. The following specific information is made for the purpose of complying with numerous federal, state or provincial, and local laws and regulations. See other sections for health and safety information.

U.S. REGULATIONS

SARA 313 INFORMATION: To the best of our knowledge, this product contains no chemical subject to SARA Title III Section 313 supplier notification requirements.

SARA HAZARD CATEGORY: This product has been reviewed according to the EPA "Hazard Categories" promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

An immediate health hazard
A fire hazard

TOXIC SUBSTANCES CONTROL ACT (TSCA):

All ingredients are on the TSCA inventory or are not required to be listed on the TSCA inventory.

The CAS Number for TSCA is 034590-94-8

STATE RIGHT-TO-KNOW: This product is not known to contain any substances subject to the disclosure requirements of

New Jersey
Pennsylvania

OSHA HAZARD COMMUNICATION STANDARD:

(Continued on page 8 , over)

REGULATORY INFORMATION (CONTINUED)

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) RATINGS:

Health	0
Flammability	2
Reactivity	0

CANADIAN REGULATIONS
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WHMIS INFORMATION: The Canadian Workplace Hazardous Materials Information System (WHMIS) Classification for this product is:

B3 - combustible liquid with a flash point between 37.8C and 93.3C
Refer elsewhere in the MSDS for specific warnings and safe handling information. Refer to the employer's workplace education program.

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CPR STATEMENT: This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

- - - - -

HAZARDOUS PRODUCTS ACT INFORMATION: This product contains the following ingredients which are Controlled Products and/or on the Ingredient Disclosure List (Canadian HPA section 13 and 14):

COMPONENTS:	CAS #	AMOUNT(%w/w)
DIPROPYLENE GLYCOL MONOMETHYL ETHER	034590-94-8	99%

16. OTHER INFORMATION

MSDS STATUS: Revised Section 15.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) RATINGS:

Health	0
Flammability	2
Reactivity	0

MATERIAL SAFETY DATA SHEET

Date Printed: 10/15/2003
Date Updated: 06/30/2003
Version 1.4

Section 1 - Product and Company Information

Product Name	METHYL SALICYLATE, 99+%
Product Number	240826
Brand	ALDRICH
Company	Sigma-Aldrich
Street Address	3050 Spruce Street
City, State, zip, Country	SAINT LOUIS MO 63103 US
Technical Phone:	314 771 5765
Emergency Phone:	414 273 3850 Ext. 5996
Fax:	800 325 5052

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
METHYL SALICYLATE	119-36-8	No

Formula C8H803
Synonyms o-Anisic acid,Benzoic acid, 2-hydroxy-, methyl ester,Betula,Betula oil,Exagien,Flucarmit, Gaultheria oil, artificia1,Gaultheria oil, o-Hydroxybenzoic acid, methyl ester, 2-Hydroxybenzoic acid methyl ester, Methylester kyseliny salicylove (Czech), Methyl o-hydroxybenzoate,Methyl salicylate, Natural wintergreen oil,Oil of wintergreen, Salicylic acid, methyl ester, Synthetic birch sweet oil, Synthetic wintergreen oi1,Teaberry oil, Wintergreen oi1,Wintergreen oil, synthetic
RTECS Number: V04725000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Harmful.

Harmful if swallowed. Irritating to eyes, respiratory system and skin.

Possible sensitizer. Target organ(s): Central nervous system. Liver.

HMIS RATING

HEALTH: 2*
FLAMMABILITY: 1
REACTIVITY: 1

NFPA RATING

HEALTH: 2
FLAMMABILITY: 1
REACTIVITY: 1

*additional chronic hazards present

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE
If swallowed, wash out mouth with water provided person is conscious. Call a physician.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If breathing becomes difficult, call a physician.

DERMAL EXPOSURE
In case of contact, immediately wash skin with soap and copious amounts of water.

EYE EXPOSURE
In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

FLASH POINT
204.8 °F 96 °C Method: closed cup

AUTOIGNITION TEMP
453 °C

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Water spray. Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP
Absorb on sand or vermiculite and place in closed containers for disposal. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Do not breathe vapor. Avoid contact with eyes, skin, and clothing. Avoid prolonged or repeated exposure.

STORAGE
Suitable: Keep tightly closed.

SPECIAL REQUIREMENTS
Heat and light sensitive.

Section 8 – Exposure Controls / PPE

ENGINEERING CONTROLS
Safety shower and eye bath. Mechanical exhaust required.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Government approved respirator.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES
Wash thoroughly after handling.

Section 9 – Physical/Chemical Properties

Appearance — Physical State: Clear liquid
Color: Slightly yellow-green

Property	Value	At Temperature or Pressure
Molecular Weight	152.15 AMU	
PH	N/A	
BP/BP Range	219 - 221 °C	
MP/MP Range	-8 - -7 °C	
Freezing Point	N/A	
Vapor Pressure	1 **mmHg**	54 °C
Vapor Density	5.26 g/l	
Saturated Vapor Conc.	N/A	
SG/Density	1.184 g/cm3	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Surface Tension	N/A	
Partition Coefficient	Log KOW: 2.55	
Decomposition Temp.	N/A	
Flash Point	204.8 °F 96 °C	Method: closed cup
Explosion Limits	N/A	
Flammability	N/A	
Autoignition Temp	453 °C	
Refractive Index	1.537	
Optical Rotation	N/A	
Miscellaneous Data	N/A	
Solubility	Solubility in Water:Insoluble. Other Solvents: ETHANOL, GLACIAL ACETIC ACID	

N/A = not available

Section 10 - Stability and Reactivity

STABILITY
Stable: Stable.

Conditions to Avoid: Sensitive to heat. Sensitive to light.
Materials to Avoid: Strong bases, Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Skin Contact: Causes skin irritation.
Skin Absorption: Readily absorbed through skin. May be harmful if absorbed through the skin.
Eye Contact: Causes eye irritation.
Inhalation: Material is irritating to mucous membranes and upper respiratory tract. May be harmful if inhaled.
Ingestion: Harmful if swallowed.

SENSITIZATION
Sensitization: Prolonged or repeated exposure may cause allergic reactions in certain sensitive individuals.

TARGET ORGAN(S) OR SYSTEM(S)
Central nervous system. Liver. Ears. Kidneys. Eyes.

SIGNS AND SYMPTOMS OF EXPOSURE
Mild chronic salicylate intoxication is termed salicylism. Symptoms include: headache, dizziness, ringing in the ears, difficulty in hearing, dimness of vision, mental confusion, lassitude, drowsiness, sweating, thirst, hyperventilation, nausea, vomiting, and occasionally diarrhea. A more severe degree of salicylate intoxication is characterized by more pronounced CNS disturbances (including generalized convulsions and coma), skin eruptions, and marked alterations in acid-base balance.

TOXICITY DATA

Oral
Man
101 mg/kg
LDLO
Remarks: Behaviora1:Convulsions or effect on seizure threshold.
Gastrointestina1:Nausea or vomiting.

Oral
Man
1329 mg/kg
LDLO
Remarks: Behaviora1:Convulsions or effect on seizure threshold.
Behaviora1:Coma. Blood: Hemorrhage.

Oral
Child
228 mg/kg
LDLO
Remarks: Lungs, Thorax, or Respiration:Dyspnea
Gastrointestina1:Nausea or vomiting.

Oral

Child
700 mg/kg
LDLO
Remarks: Peripheral Nerve and Sensation:Flaccid paralysis without anesthesia (usually neuromuscular blockage). Behaviora1:General anesthetic. Lungs, Thorax, or Respiration:Dyspnea.

Oral
Woman
355 mg/kg
LDLO
Remarks: Behaviora1:Coma. Lungs, Thorax, or Respiration:Respiratory stimulation. Gastrointestina1:Nausea or vomiting.

Oral
Infant
1480 mg/kg
LDLO
Remarks: Lungs, Thorax, or Respiration:Respiratory stimulation Gastrointestina1:Nausea or vomiting.

Oral
Human
506 mg/kg
LDLO

Oral
Rat
887 mg/kg
LD50
Remarks: Behaviora1:Somnolence (general depressed activity).

Oral
Mouse
1110 mg/kg
LD50

Oral
Dog
2100 mg/kg
LD50
Remarks: Lungs, Thorax, or Respiration:Other changes. Gastrointestinal:Hypermotility, diarrhea. Gastrointestina1:Nausea or vomiting.

Oral
Rabbit
1300 mg/kg
LD50

Oral
Guinea pig
700 mg/kg
LD50

IRRITATION DATA

Skin
Rabbit
500 mg

24H
Remarks: Moderate irritation effect

Eyes
Rabbit
500 mg
24H
Remarks: Mild irritation effect

Skin
Guinea pig
100 %
Remarks: Severe irritation effect

Eyes
Guinea pig
100 %
Remarks: Severe irritation effect

CHRONIC EXPOSURE - TERATOGEN
Result: Laboratory experiments have shown teratogenic effects.

Species: Rat
Dose: 500 MG/KG
Route of Application: Intraperitoneal
Exposure Time: (11-12D PREG)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Specific Developmental Abnormalities: Urogenital system.

Species: Rat
Dose: 500 MG/KG
Route of Application: Subcutaneous
Exposure Time: (10D PREG)
Result: Specific Developmental Abnormalities: Musculoskeletal system. Specific Developmental Abnormalities: Body wall. Specific Developmental Abnormalities: Central nervous system.

Species: Rat
Dose: 500 MG/KG
Route of Application: Subcutaneous
Exposure Time: (10D PREG)
Result: Specific Developmental Abnormalities: Hepatobiliary system. Specific Developmental Abnormalities: Eye, ear. Specific Developmental Abnormalities: Craniofacial (including nose and tongue).

Species: Hamster
Dose: 1750 MG/KG
Route of Application: Oral
Exposure Time: (7D PREG)
Result: Specific Developmental Abnormalities: Central nervous system.

Species: Hamster
Dose: 5250 MG/KG
Route of Application: Skin
Exposure Time: (7D PREG)
Result: Specific Developmental Abnormalities: Central nervous system.

CHRONIC EXPOSURE - REPRODUCTIVE HAZARD

Species: Rat
Dose: 36450 MG/KG
Route of Application: Oral
Exposure Time: (MULTIGENERATIONS)
Result: Effects on Newborn: Live birth index (# fetuses per litter; measured after birth). Effects on Newborn: Viability index (e.g., # alive at day 4 per # born alive). Effects on Newborn: Weaning or lactation index (e.g.,# alive at weaning per # alive at day 4).

Species: Rat
Dose: 400 MG/KG
Route of Application: Intraperitoneal
Exposure Time: (12D PREG)
Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).

Section 12 - Ecological Information

No data available.

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT
Proper Shipping Name: None
Non-Hazardous for Transport: This substance is considered to be non-hazardous for transport.

IATA
Non-Hazardous for Air Transport: Non-hazardous for air transport.

Section 15 - Regulatory Information

EU ADDITIONAL CLASSIFICATION
Symbol of Danger: Xn
Indication of Danger: Harmful.
R: 22 36/37/38
Risk Statements: Harmful if swallowed. Irritating to eyes, respiratory system and skin.
S: 26 36
Safety Statements: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing.

US CLASSIFICATION AND LABEL TEXT
Indication of Danger: Harmful.
Risk Statements: Harmful if swallowed. Irritating to eyes, respiratory system and skin.
Safety Statements: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing.

US Statements: Possible sensitizer. Target organ(s): Central nervous system. Liver.

UNITED STATES REGULATORY INFORMATION

SARA LISTED: No
TSCA INVENTORY ITEM: Yes

CANADA REGULATORY INFORMATION

WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: Yes
NDSL: No

Section 16 - Other Information

DISCLAIMER

For R&D use only. Not for drug, household or other uses.

WARRANTY

APPENDIX D

WARRANTY INFORMATION, SCHEDULED MAINTENANCE, AND REPAIRS

APD 2000® Warranty

Smiths Detection - Edgewood, Inc., (Smiths Detection) warrants that the hardware product you purchased from Smiths Detection or from an authorized Smiths Detection distributor, is free from defects in materials and/or workmanship under normal use consistent with the APD 2000® User's Manual during the warranty period. The warranty period is for one year commencing on the date of purchase. The date of the invoice for the hardware product is your proof of the date of purchase. This warranty extends only to you, the original purchaser. It is not transferable to anyone who subsequently purchases the hardware product. This warranty does not cover spares or consumable items such as filters and sieve packs.

Smiths Detection may make exceptions to the nontransferability on a case-by-case basis. You may request an exception in writing to the Smiths Detection Contracts Manager. Should such an exception be approved, you will be informed in writing. A copy of Smiths Detection's exception approval should be retained by both you, the original purchaser, and the subsequent purchaser.

During the warranty period, Smiths Detection will, at no additional charge, repair or replace defective parts with new parts or, at the option of Smiths Detection, serviceable used parts. All exchanged parts and products replaced under this warranty will become the property of Smiths Detection. If, after repeated efforts, Smiths Detection is unable to restore the product to good working order, the product will be replaced by a functioning unit.

This limited warranty does not extend to any product not purchased from Smiths Detection or from a Smiths Detection authorized distributor without written exception from Smiths Detection. This limited warranty also does not extend to any product that has been damaged or rendered defective (a) as the result of accident, misuse, or abuse; (b) by operation, maintenance, or storage outside the usage parameters stated in the APD 2000® Instruction Manual; (c) by the use of parts not manufactured or sold by Smiths Detection; (d) by modifications/alterations to the product or integration/interface with non-Smiths Detection product; or (e) as a result of service by anyone other than Smiths Detection. Smiths Detection is not responsible for damage to or the loss of any parts or accessories to this product.

EXCEPT AS EXPRESSLY SET FORTH IN THIS WARRANTY, SMITHS DETECTION EXPRESSLY DISCLAIMS ALL IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. SMITHS DETECTION DOES NOT WARRANTY, GUARANTEE, OR MAKE ANY REPRESENTATION REGARDING THE USE OF, OR THE RESULTS OF THE USE OF, THE PRODUCT IN TERMS OF CORRECTNESS, ACCURACY, RELIABILITY, CURRENTNESS, OR OTHERWISE. SMITHS DETECTION'S RESPONSIBILITY TO REPAIR OR REPLACE A DEFECTIVE PRODUCT IS THE SOLE AND EXCLUSIVE REMEDY PROVIDED TO THE BUYER FOR BREACH OF THIS WARRANTY. SMITHS DETECTION EXPRESSLY DISCLAIMS ALL WARRANTIES NOT STATED IN THIS LIMITED WARRANTY. NO ORAL OR WRITTEN INFORMATION OR ADVICE GIVEN BY SMITHS DETECTION OR ITS DISTRIBUTORS, AGENTS, OR EMPLOYEES SHALL CREATE A WARRANTY OR IN ANY WAY INCREASE THE SCOPE OF THIS WARRANTY. ANY IMPLIED WARRANTIES THAT MAY BE IMPOSED BY LAW ARE LIMITED TO THE TERMS OF THIS EXPRESS WARRANTY. OTHER THAN THE LIABILITY SET FORTH ABOVE IN THIS EXPRESS WARRANTY, SMITHS DETECTION SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, CONSEQUENTIAL, INCIDENTAL, OR ANY OTHER TYPES OF DAMAGES, LOSS, INJURY OR DEATH, OR FOR ANY LOSS OF DATA, USE, PROFITS, OR GOODWILL RESULTING FROM OR CAUSED BY THE USE, OPERATION, FAILURE, MALFUNCTION, OR DEFECT OF ANY ITEM DELIVERED.

How to Obtain Warranty, Maintenance, or Repair Service

You should return the APD 2000® to the manufacturer for maintenance whenever it continuously fails the confidence test. This can be arranged through purchase of a Maintenance Agreement from Smiths Detection. Maintenance actions not covered under a Maintenance Agreement will be invoiced in accordance with the work performed. Cost estimates for the work will be provided upon request.

To return your product for warranty repair, scheduled maintenance, or repair, please follow the steps below:

1. Call the Smiths Detection Customer Service Center at 410-510-9141. Prior to placing your call, please determine your product model and product serial number (located on a label directly behind the battery compartment), and prepare a detailed description of the problem.

2. A technician will contact you within 24 hours with either a corrective action you can perform or instructions to return the unit to Smiths Detection. If the technician determines that a hardware problem exists that is covered by the warranty and that your product must be returned for repair, you will be issued a Return Authorization Number (RAN). Be sure to record this number.

3. For warranty service, Smiths Detection will supply you with a prepaid shipping number so the product can be received at Smiths Detection the following business day. Smiths Detection must receive your call prior to 4 p.m. EST Monday through Friday to ensure next day delivery to Smiths Detection.

   For scheduled maintenance or repair service, the method of shipment is at your discretion.

4. It is your responsibility to download any data you have stored in memory before returning the product to Smiths Detection. Smiths Detection is not responsible for any damage to or loss of any data or other information stored on or in any part of any product returned to Smiths Detection for repair.

5. Be sure to remove all features, parts, options, alterations, and attachments not under warranty service prior to returning the Product to Smiths Detection. Smiths Detection is not liable for any loss of or damage to these items.

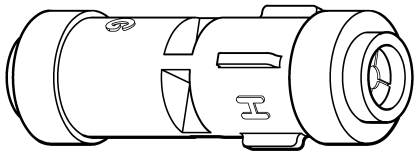
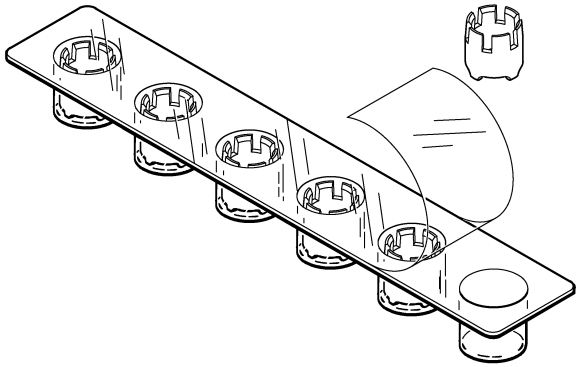
6. Package the unit in its original shipping container, and return the APD 2000® using the addresses below.

   Smiths Detection – Edgewood, Inc.
   2202 Lakeside Boulevard
   Edgewood, MD 21040

Smiths Detection will make every attempt to repair and/or replace the unit within a reasonable amount of time. If Smiths Detection determines that damage exists that is not covered by the warranty, you will be contacted to determine whether such damage should be repaired by Smiths Detection for a charge or whether the APD 2000® should be returned to you as received by Smiths Detection. Should you have an APD 2000® maintenance agreement, Smiths Detection will repair the unit under the maintenance agreement, if covered, with no additional charge to you. All repairs will be made in accordance with this warranty (or the maintenance agreement, if applicable).

APPENDIX E

APD 2000® SPARE PARTS

ITEM	PART NUMBER	UNIT OF ISSUE
Confidence Sample 	442-642	1
Filtered Nozzle Standoff 	2450204	6 filters per pack Min. order = 5 packs

For pricing and availability, please contact:

Smiths Detection – Edgewood, Inc.
2202 Lakeside Boulevard
Edgewood, Maryland 21040 USA

Phone: 410-510-9141
Fax: 410-510-9498