CAPNOGARD®

User's Manual

$ETCO_2$ Monitor

Model 1265

September 15, 2006

Catalog No. 5555-23-D

Respironics Critical Care

Customer Service: 1-800-345-6443 or 724-387-4000

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Revision History

25-May-92	Revision 00.
28-Apr-93	Revision 01. This manual is based on revision 2.1 software.
18-Jun-93	Revision 02 (DN-N1246).
20-Sep-94	Revision 03. Updated to include revision 1.9, 2.8, and Disposable Adult Airway Adapter, CAPNOSTAT® III illustrations.
20-Jun-99	Revision 04. Updated to include new sampling adapter, foam wraps, and revised Seiko printer information.
30-Jan-04	Revision A. CO_N0900. Update company information, sensors, printer, Accessories, Service Policy, Guarantee
23-Jul-04	Revision B. CO_N1278.
09-Aug-05	Revision C. CO_N2388.
15-Sep-06	Revision D. CO_N3331.

Trademarks and Patents

The Model 1265 monitor and its sensors and accessories are covered by the following US patents: 4,859,858 4,859,859 4,914,720 4,958,075 5,146,092 5,153,436 5,206,511 5,251,121 5,369,277 5,793,044 5,616,923 5,693,944. Other patents pending.

Guarantee

Equipment manufactured or distributed by Respironics, Inc. is fully guaranteed, covering materials and workmanship, for a period of one year from the date of shipment, except for certain disposable products and products with stated guarantees other than one year. Respironics reserves the right to perform guarantee service(s) at its factory, at an authorized repair station, or at the customer's installation.

Respironics' obligations under this guarantee are limited to repairs, or at Respironics' option, replacement of any defective parts of our equipment, except fuses, batteries, and calibration gasses, without charge, if said defects occur during normal service.

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Improper use, mishandling, tampering with, or operation of the equipment without following specific operating instructions will void this guarantee and release Respironics from any further guarantee obligations.

Customer Service & Product Support:

USA and Canada
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Caution: Federal (U.S.A.) law restricts this device to sale, distribution, or use by or on the order of a licensed medical practitioner.

Service Policy

The Respironics Hospital Services Group provides depot service for monitors and 24-hour a day access to technical support through its Technical Support Department in Murrysville, PA. (Outside the U.S., primary technical support is handled through our qualified international sales and service distributors.)

Contact the Technical Support Department by telephone toll free at 800-345-6443 ext 5; by facsimile at 724-387-5236; or by e-mail at service@respironics.com for technical inquiries or clinical@respironics.com for clinical inquiries After hours telephone support requests (before 8:00 AM and after 5:00 PM Eastern Time) will be responded to promptly by the Technical Support on-call staff. After hours facsimile and e-mail requests will be answered the next business day. It is suggested that any person calling in for technical support have the equipment available for product identification and preliminary troubleshooting.

Respironics reserves the right to repair or replace any product found to be defective during the warranty period. Repair may be provided in the form of replacement exchange parts or accessories, on-site technical repair assistance or complete system exchanges. Repairs provided due to product abuse or misuse will be considered "non-warranty" and invoiced at the prevailing service rate. Exchanged materials are expected to be returned to Respironics within 10 days for full credit. Return materials should be cleaned as necessary and sent directly to Respironics referencing the RA number provided. (Transferring return materials to a local sales or dealer representatives does not absolve you of your return responsibility.).

If the customer requires the return of their original product, the exchange material will be considered "loaner material" and exchanged again after the customer equipment is repaired.

Please contact Technical Support for information on these additional programs and services:

- Technical & Clinical Training
- Test Equipment and Test Kits
- Service Contract / Parts Insurance Plans
- On-Site Service Support

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Contents

Section 1 *Introduction*

The CAPNOGARD $ETCO_2$ Monitor, Model 1265, is a lightweight, easy to use, capnograph designed for use in a variety of clinical settings. It provides reliable measurement, display and alerts for, end tidal carbon dioxide ($ETCO_2$) and respiration rate. A sampling system is included to allow monitoring of non-intubated patients.

Numerical and waveform information is presented on a bright Cold Cathode Display (CCD) with user adjustable contrast to optimize viewing angles. A simple menu system allows user selection of measurement and display options. Alerts are menu programmable or automatic.

Separate 24 hour trends for $ETCO_2$ and respiration rate are updated every 8 seconds. Trend "events" and audible alarm status (Audio Off) are also stored in trend memory.

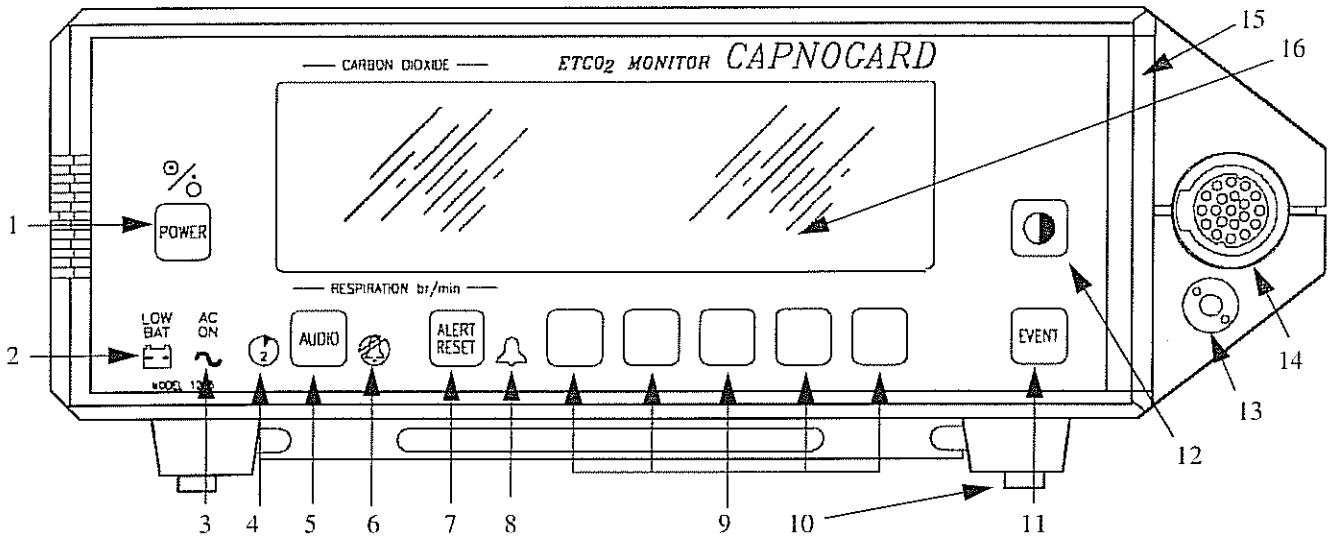
CAPNOGARD has a serial port (RS232) for interfacing to external equipment. The monitor can be powered from the AC Mains or from its rechargeable two-hour battery.

CO_2 Principles of Operation

CAPNOGARD measures carbon dioxide and respiratory rate with a unique solid-state device called a CAPNOSTAT CO_2 Sensor. The CAPNOSTAT CO_2 Sensor is placed onto an Airway Adapter and the airway adapter is placed in the patient's airway circuit—typically between the ventilator elbow and the patient wye (See "CAPNOSTAT CO_2 Sensor" on page 17). Infrared light is generated in one side of the "U" shaped sensor and then beamed through the windows of the airway adapter to a detector in the other side of the sensor. Carbon dioxide, flowing in the airway adapter as a result of respiration, absorbs some of this light energy. The monitor relates the amount of detected energy to the amount of CO_2 in the sample cell (the airway adapter). This results in a capnogram display and numerical values for CO_2 and respiration rate. CAPNOGARD uses an adaptive digital detection algorithm system incorporating highly accurate digital filters and adaptive thresholds to cover a wide range of monitoring situations including, rebreathing, neonatal respiratory rates and CO_2 levels, and adult OR and ICU conditions without the operator having to change monitor settings.

Respiration is calculated by measuring the time interval between detected peaks of the CO_2 waveform. The inverse of this measurement is displayed as respiratory rate. Certain rebreathing circuits, or the presence of artifact such as cardiogenic oscillations, may cause CAPNOGARD to react to non-respiratory CO_2 fluctuations as if they were breaths—this condition affects only the numerical displays, the Capnogram display continues to provide an accurate picture of the CO_2 waveform. A Respiratory Rate Editor can be enabled to make the instrument more selective in its differentiation of waveforms caused by breathing and those introduced by artifact. As a result, when the editor is in use, the monitor will adapt slowly to sudden changes in respiratory rate.

Front Panel Controls and Connectors



1. **POWER** %. Press to turn the CAPNOGARD on or off.
2. **LOW BATT**. Illuminates when CAPNOGARD is on battery power and less than 30 minutes of operating power is available.
3. **AC ON** ∿. If illuminated, CAPNOGARD is connected to AC mains power and charging the internal battery.
4. (Two Minute Suspend). Illuminates when the **AUDIO** key is pressed. Indicates that audio has been suspended for two minutes (provided audio muting has not been disabled in the ALERT OPTIONS menu).
5. **AUDIO**. Press and release to start Two Minute Suspend or Audio Off. Press and hold for three seconds to start Audio Off.
6. (Audio Off). Flashes when **AUDIO** key is pressed for three seconds. Indicates audible alerts have been disabled.
7. **ALERT RESET**. Press to turn off alert indicators. Alerts will reactivate if still valid.
8. (Alert Indicator). Flashes when an alert or alarm condition exists.
9. Softkeys. Performs the action annotated in the message center above each key.
10. Rubber Feet.
11. **EVENT**. Press to mark an event in trend memory.
12. ◐ (Contrast). Press and hold to vary the contrast.
13. Sampling System Inlet Connector. Accepts Sampling System tubing for side stream sampling.
14. CO_2 Input Connector. Plug the CAPNOSTAT CO_2 Sensor into this connector.
15. Red Alert Bar. Flashes when an alert or alarm condition exists.
16. Display Center; $ETCO_2$ and Respiration values, waveform, softkey commands, and messages are displayed here.

Symbols:

Patient isolation: Identifies connection as type BF

Attention: Consult manual for detailed information.

Pb Indicates heavy metal content, specifically lead. Found on the internal battery and monitor enclosure. Refer to qualified service personnel when battery replacement is required.

Recyclable item. Found on the internal battery. Refer to qualified service personnel when battery replacement is required.

Mains fuse rating for replacement fuses.

Compliant with the WEEE/RoHS recycling directives. Separate collection. Ensure that spent batteries are collected separately when disposed of. Refer to qualified service personnel when battery replacement is required.

Equipotentiality: Connection to monitor chassis

POWER Key

Press the POWER key to turn the CAPNOGARD on or off.

AC Mains Operation

CAPNOGARD uses AC Mains (line cord) power if available and automatically switches to battery operation if AC Mains power is removed or not present. An illuminated AC ON indicator means the CAPNOGARD is connected to AC Mains power and the internal battery is being charged.

To power CAPNOGARD from AC Mains (line cord) power; Plug the line cord into the rear panel AC input connector. Set the rear panel POWER switch to expose the "I" (on). Plug the other end of the line cord to a properly grounded three-wire outlet.

CAUTION

Ensure the AC ON indicator is illuminated when operation from AC mains is desired, otherwise power for the monitor is drawn from the internal battery. This can result in the monitor shutting itself off if the battery is allowed to drop to the low battery state. See "Battery Operation" on page 3.

Battery Operation

CAPNOGARD uses battery power if the line cord is disconnected or the rear panel POWER switch is set to expose the "0" (off). CAPNOGARD can operate up to two hours from its internal battery.

While on battery power, CAPNOGARD displays a battery icon to the right of the numerical Respiration display. indicates a fully charged battery, a half charge, and indicates less than 30 minutes of battery life remain. Note: The battery icon may appear fully charged for the first minute after switching to battery power: wait one minute for the icon to truly reflect battery charge.

When approximately 15 minutes of battery life remain, the front panel LOW BAT indicator starts to flash. Reconnect the monitor to the AC Mains to recharge the battery. The monitor can be operated from the AC Mains while the battery is being recharged. The battery will be fully recharged in 12-15 hours.

If the monitor continues operating on battery power while in the low battery state (indicator flashing), the message BATTERY VERY LOW PLUG IN AC POWER is displayed. If the monitor is allowed to continue operation while in the very low battery state, the monitor shuts itself off to prevent damage to the battery and monitor.

NOTE

This alert cannot be silenced by pressing the AUDIO key. The monitor must be connected to AC Mains power to silence the alert condition and recharge the battery. See "AC Mains Operation" on page 3.

AUDIO Key

Audible alarms can be silenced in two ways; temporarily or permanently.

- Two Minute Alarm Suspend: Press the AUDIO key. The (two minute suspend) indicator illuminates and audible alerts are silenced for two minutes. After two minutes, the indicator turns off and audible alerts are again allowed to sound. To cancel the two minute suspend before the two minutes have elapsed, press the AUDIO key again and the condition will be cancelled.

- Permanent Audio Off: Press and hold the **AUDIO** key until the (audio off) indicator starts flashing[1]. No audible alerts will be generated. To cancel the audio off condition, press the **AUDIO** key again; it will stop flashing and audible alerts are again allowed to sound.

ALERT RESET Key

An alert occurs if $ETCO_2$ or respiration rate exceeds the displayed alert limits. Alerts are also generated by conditions such as NO RESP. When an alert occurs, the (alert) indicator flashes, and the violated limit displays and the red alert bar may flash and an alarm may sound. Once the alert condition is fixed, and other flashing displays may continue even though the audible alarms stop.

Press the **ALERT RESET** key to stop an alert condition that is not currently active. Any alert messages, flashing indicators or audible alerts will be disabled. Currently active alerts will be reset and again become active once any time-out period has elapsed.

In certain conditions such as NO RESP, pressing **ALERT RESET** will reset (silence) the audible alerts until monitoring is resumed and the monitor again displays end tidal and respiration rate values.

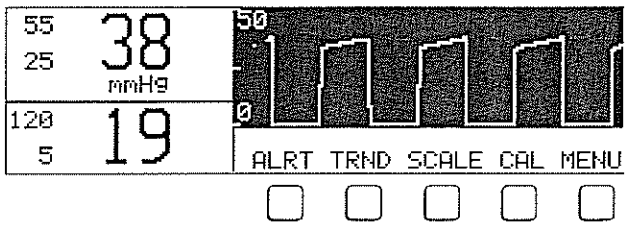
The Menu SOFTKEYS

The Menu Center display area is located just above the five unmarked "softkeys". Softkeys perform the action displayed above each key. For example; above the rightmost softkey in the Main (or Base) Menu is a **MENU** key. Press **MENU** and new menu and softkey functions are displayed. (Press **RUN** to return to the Main Menu.)

NOTE

RUN always displays the Main Menu. **NEXT** and **PREV** (previous) move through the menus one level at a time. The Main Menu will reappear if no key is pressed for one minute. The time out is extended to five minutes if trends are displayed.

The Main (or Base) Menu is comprised of the following keys:



- **ALRT** - Set alert limits, either manually or with Auto Alerts.
- **TRND** - Trend page menus and displays.
- **SCALE** - Capnogram sweep speed and vertical scale controls
- **CAL** -Airway Adapter calibration menus
- **MENU** -Access CO2 OPTIONS (O_2/$N_2$0 compensation, sampling pump on/off) and SYSTEM OPTIONS (audible alert volume, bright/dim display, CO_2 averaging time) menus.

[1]If AUDIO OFF DISABLED appears when the user activates AUDIO OFF, refer to "Audio Mute" on page 42.

EVENT Key

Press the EVENT key to place an "event" marker into the monitor's trend memory. Pressing the **EVENT** key while in the Main Menu will freeze the waveform for sixty seconds, the message WAVEFORM FROZEN appears on the display. To return to the real time display before the sixty second timeout pres the **RUN** softkey. Pressing the **EVENT** softkey in menus other than the Main Menu will not freeze the waveform, the event will however be recorded in trend memory. Events are stored in trend memory for use in printouts and trend data examination. The message EVENT MARKED is displayed each time an event is marked.

When the CAPNOGARD is configured for operation with a printer and the **EVENT** key is pressed PRINT WAVEFORM? will be displayed for approximately 60 seconds. Pressing the **PRINT** key during this time will cause a printout of the waveform. The duration of this printout will be the 10 second interval immediately preceding the pressing of the **EVENT** key.

When the CAPNOGARD is configured for operation with the *NovaCARD* Data Archive System and the **EVENT** key is pressed STORE WAVEFORM? will be displayed for 60 seconds. Pressing the **STORE** key will store the waveform to the *NovaCARD*. Pressing **ID** will bring up the patient ID menu. The **ERASE** softkey will erase the card. Pressing **RUN** will return to real time display

CONTRAST Key

Press the ◑ (contrast) key to adjust the display for optimum viewing.

Red Alert Bar

The Red Alert Bar flashes when an alert occurs. The bar can be set to "latched", where the bar flashes until the presses **ALERT RESET**; "unlatched", the bar stops flashing when the alerting parameter returns inside its limits; or "off", where the bar will not turn on at all.

CAPNOSTAT CO_2 Sensor Input Connector

The CAPNOSTAT CO_2 Sensor plugs into this connector.

CAUTION

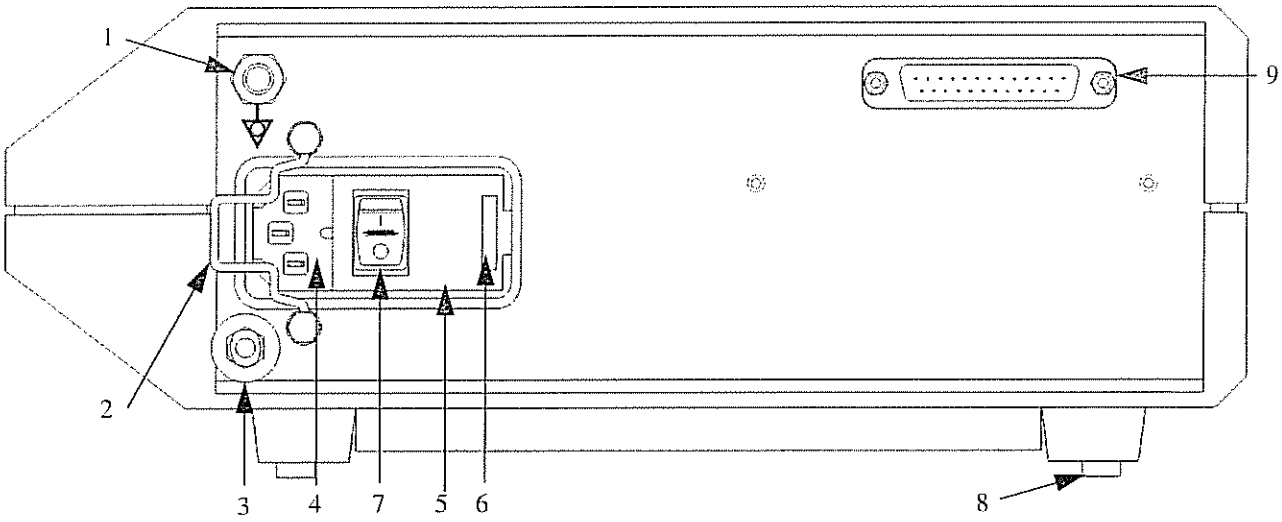
Connect only a Catalog No. 7067 or 7167, CAPNOSTAT CO_2 Sensor to the CAPNOGARD. Do not use other sensors with the CAPNOGARD.

An INCOMPATIBLE CO2 SENSOR display message indicates a non-compatible sensor is connected.

Sampling System Inlet Connector

The Sampling Airway Adapter tubing plugs into this connector.

Rear Panel Controls and Connectors



1. Grounding Stud: Chassis ground point.
2. Line Cord Clip: This clip can be set around the line cord strain relief so that the cord cannot be pulled out of the connector.
3. Sampling System Exhaust: exhaust port for sampling system pump.
4. Line Cord Connector: The AC (Mains) line cord attaches to the monitor here.
5. Fuse Compartment: The AC (Mains) line fuse(s) are inside this compartment. Pry open with small screwdriver.
6. AC Mains Voltage: The currently selected AC Mains input voltage is identified here.
7. AC Mains Power Switch: With switch in "O" position, AC Mains voltage does not enter monitor. With switch in "I" position, AC Mains voltage is allowed into monitor to power unit and/ or charge internal battery.
8. Rear Feet: Rubber tipped rear feet (2).
9. Serial Output Connector: Serial (RS232) data output here for use with optional analog output module, and other RS232 interfaces. A female 25-pin "D" connector serves as the interface connector.

AC Mains Power Module

The AC Mains line cord plugs into the Power Input Module and is held in place with the line cord retaining clip. The monitor's voltage setting (i.e., 115 VAC) is displayed on the module. When the power switch is set to expose the "I", AC Mains line voltage will power the monitor and recharge the battery (if the line cord is connected). If the power switch is set to expose the "O", AC Mains line voltage is prevented from reaching the monitor's power supply and the monitor must operate from its internal battery.

Sampling System Exhaust Connector

This port is provided so that gas analyzed with the Sampling Airway Adapter and tubing can be scavenged as needed.

Data Communications Port

The "RS232C/Novametrix Accessories" connector provides an interface to external equipment such as a printer and other external optional accessories.

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Section 2 *Patient Safety*

Indications and Usage

The CAPNOGARD $ETCO_2$ Monitor, Model 1265, is intended to be used for monitoring end tidal CO_2 and respiration rate in all critical monitoring environments including ventilatory support, patient transport and anesthesia. CAPNOGARD is designed to monitor all patients including adult, pediatric and neonatal.

The following factors can influence CO_2 measurement; nitrous oxide, elevated oxygen levels, barometric pressure, water vapor and halogenated agents.

For maximum patient and operator safety, you must follow the following warnings and cautions.

Warnings

WARNING

Indicates a potentially harmful condition that can lead to personal injury

- **Explosion Hazard:** Do NOT use CAPNOGARD in the presence of flammable anesthetics. Use of this instrument in such an environment may present an explosion hazard.
- **Electrical Shock Hazard:** Always turn CAPNOGARD off and remove the AC power cord before cleaning it. Do NOT use a damaged sensor or one with exposed electrical contacts. Refer servicing to qualified service personnel.
- **Failure of Operation:** If the monitor fails to respond as described, do not use it until the situation has been corrected by qualified personnel.
- Do not operate CAPNOGARD when it is wet due to spills or condensation.
- Do not operate CAPNOGARD if it appears to have been dropped or damaged.
- Keep CAPNOGARD and its accessories clean.
- Never sterilize or immerse the monitor in liquids.
- Connect the line cord only to a grounded hospital-grade outlet. CAPNOGARD should be connected to the same electrical circuit as other equipment in use on the patient. Outlets on the same circuit can be identified by the hospital engineering department.
- The CAPNOGARD is not intended to be used as a primary diagnostic apnea monitor and/or recording device.
- A "NO RESPIRATION" alert is not generated when the CAPNOSTAT CO_2 Sensor is not connected to the monitor.
- The CAPNOGARD has no protection against the ingress of water.
- The use of portable and mobile radio frequency (RF) communications equipment can affect this and other pieces of medical equipment.
- The use of accessories, sensors and cables other than those specified by Respironics may increase emissions or decrease immunity of the equipment.

Cautions

CAUTION

Indicates a condition that may lead to equipment damage or malfunction.

- Do not operate CAPNOGARD when it is wet due to spills or condensation.
- Do not operate CAPNOGARD if it appears to have been dropped or damaged.
- Never sterilize or immerse the monitor in liquids.
- Do not sterilize or immerse sensors except as directed in this manual.
- Tension should not be applied to the sensor cable.
- Do not store the monitor or sensors at temperatures less than 14° F (-10° C) or greater than 131° F (55° C).
- Do not operate the monitor or sensors at temperatures less than 50° F (10° C) or greater than 104° F (40° C).
- Observe precautions for electrostatic discharge (ESD) and electromagnetic interference (EMI) to and from other equipment.
- Where electromagnetic devices (i.e., electrocautery) are used, patient monitoring may be interrupted due to electromagnetic interference. Electromagnetic fields up to 3 V/m will not adversely affect system performance.
- Sudden erratic changes in equipment performance that do not correlate to the physiological condition of the patient may be signs that the monitor is experiencing electromagnetic interference.
- The monitor should not be used adjacent to or stacked with other equipment; if adjacent or stacked use is necessary, the equipment should be observed to verify normal operation in the configuration in which it will be used.
- The CAPNOGARD monitor complies with IEC 60601-1-2:2001, providing reasonable protection against electromagnetic interference in a typical medical installation. The equipment generates, uses and can radiate electromagnetic interference (EMI), and if not installed and used in accordance with the instructions, may cause interference with other devices in the vicinity. If interference does occur, correct it using one or more of the following measures:
    - Move the receiving device or increase separation between the equipment.
    - Consult Respironics or members of the hospital's engineering department for more information.
- If required by national or local codes, connect the CAPNOGARD monitor to the hospital equalization connector with an equipotential cable.
- The CAPNOGARD monitor is not intended for use in a hyperbaric chamber or an MRI (Magnetic Resonance Imaging) environment.
- Caution: Federal (U.S.A.) law restricts this device to sale, distribution, or use by or on the order of a licensed medical practitioner.

Notes

NOTES

Indicates points of particular interest or emphasis for more efficient or convenient operation.

- Components of this product and its associated accessories which have patient contact are free of latex.
- After the life cycle of our equipment and all accessories has been met, disposal of the equipment should be accomplished following the national requirements. Contact the local Respironics representative for questions concerning disposal.
- The CAPNOGARD contains no user serviceable parts. Refer servicing to qualified service personnel. A technical Service Manual is available for use by technical personnel.
- Accessories equipment connected to the analog and digital interfaces must be certified to the respective IEC standards: IEC 60950 for data processing equipment and IEC 60601-1 for medical equipment. Furthermore, all configurations shall comply with the system standard IEC 60601-1-1.

Section 3 Monitor Setup

This section explains how to turn the CAPNOGARD on and off. It also explains AC Mains and battery power operation.

Monitor Power Up

1. Verify CAPNOSTAT CO_2 Sensor integrity.

   Ensure the sensor and cable is physically intact with no broken, frayed or damaged components.

2. Plug the CAPNOSTAT CO_2 Sensor into the front panel input connector.

CAUTION

Connect only a Catalog No. 7067 or 7167 CAPNOSTAT CO_2 Sensor to CAPNOGARD. Do not use other CO_2 sensors with the CAPNOGARD.

3. To turn CAPNOGARD on, press the **POWER** key.

   Ensure all displays and indicators illuminate briefly. Ensure a "beep" sounds to indicate that the audio is working. Verify a "Self Test in progress" appears followed by the main menu.

4. Press the ◑ (contrast) key to adjust the display for optimum viewing.

5. Press **YES** to erase or press **NO** to retain stored trend information.

   "ERASE STORED TRENDS?" is briefly displayed after power on. Press **YES** to erase the trend data stored during previous monitoring episodes. To keep the stored trend data intact, press the **NO** key (or don't press any key and let the menu time out).

Monitor Power Down

To turn CAPNOGARD off, press the **POWER** key.

AC Mains Operation

CAPNOGARD uses AC Mains (line cord) power if available and automatically switches to battery operation if AC Mains power is removed or not present. An illuminated AC ON ∿ indicator means the CAPNOGARD is connected to AC Mains power and the internal battery is being charged.

To power CAPNOGARD from AC Mains (line cord) power: Plug the line cord into the rear panel AC input connector. Set the rear panel POWER switch to expose the "I" (on). Plug the other end of the line cord to a properly grounded three-wire outlet.

Battery Operation

CAPNOGARD uses battery power if the line cord is disconnected or the rear panel POWER switch is set to expose the "O" (off). CAPNOGARD can operate up to two hours from its internal battery.

While on battery power, CAPNOGARD displays a battery icon to the right of the numerical Respiration display. indicates a fully charged battery, a half charge, and indicates less than 30 minutes of battery life remain. Note: The battery icon may appear fully charged for the first minute after switching to battery power: wait one minute for the icon to truly reflect battery charge.

When approximately 15 minutes of battery life remain, the front panel LOW BAT indicator starts to flash. Reconnect the monitor to the AC Mains to recharge the battery. The monitor can be operated from the AC Mains while the battery is being recharged. The battery will be fully recharged in 12-15 hours.

If the monitor continues operating on battery power while in the low battery state (indicator flashing), the message BATTERY VERY LOW PLUG IN AC POWER is displayed. If the monitor is allowed to continue operation while in the very low battery state, the monitor will alert, then shut itself off to prevent damage to the battery and monitor.

NOTE

This alert cannot be silenced by pressing the **AUDIO** key. The monitor must be connected to AC Mains power to silence the alert condition and recharge the battery. See "Introduction" on page 5.

Keyclick Volume

CAPNOGARD can respond to each key press with an audible tone, a "keyclick", assuring the user that the monitor recognized a key was pressed.

To alter the keyclick volume:

1. Press and hold the **MENU** key for 3-seconds. CO2 SETUP OPTIONS appears.
2. Press the **NEXT** key. MONITOR OPTIONS 1 appears.
3. Press **KLCK** (keyclick). KEYCLICK VOLUME appears.

   The current keyclick volume setting (0-7) is displayed between the up and down arrows. A "0" setting means the keyclick feature is turned off.
4. Press ↑ or ↓ to increase or decrease the keyclick volume setting.

   Each key press will cause a keyclick tone to sound.
5. Press **RUN** to return to the Main Menu.

Display Brightness

CAPNOGARD has two user selectable display brightness settings.

To select a display brightness setting:

1. Press the **MENU** key. CO2 OPTIONS appears.
2. Press the **NEXT** key. SYSTEM OPTIONS appears.
3. Press the **LITE** key to switch the backlight between its bright and dim settings.
4. Press **RUN** to return to the Main Menu.

Display Colors

The default CAPNOGARD display (white text on a blue background and a blue wave over a white background) can be changed. This display colors feature (coupled with the bright and dim backlight settings) allows CAPNOGARD to provide a very visible display over a wide range of lighting conditions.

To change the display colors:

1. Press and hold the **MENU** key for 3 seconds. CO2 SETUP OPTIONS appears.
2. Repeatedly press the **NEXT** key until MONITOR OPTIONS 1 appears.
3. Press **INV** (invert) and the display colors are inverted.

   The two display modes are:
   White text on blue background with a blue wave on white background (default), and
   blue text on a white background with a white wave on a blue background.
4. When the display is as desired, press **RUN** to return to the Main Menu.

Setting the Clock/Calendar

CAPNOGARD contains a clock/calendar feature that operates even when the monitor is turned off. This feature allows CAPNOGARD to "time stamp" trend data as well as data that is output to external devices such as printers.

Unlike other monitor settings, the clock/calendar cannot be reset to factory defaults by powering up with the Alert Reset key pressed. The clock/calendar must be reset manually.

To view/alter the current time and date setting:

1. Press and hold the **MENU** key for 3 seconds. CO2 SETUP OPTIONS appears.
2. Repeatedly press the **NEXT** key until MONITOR OPTIONS 2 appears.
3. Press **CLOCK** and the clock/calendar setup menu appears.

   The current hour setting is flashing.
4. Each press of the **SEL** (select) key selects a new item to highlight (flash).
5. Press ↑ or ↓ to increase or decrease the setting of the highlighted item.
6. When the time and date are correct, press **SET**. MONITOR OPTIONS 2 appears.
7. Press **RUN** to return to the Main Menu.

Display Monitor Software Revision Level

To check the revision level and date of CAPNOGARD's system software:

1. Press and hold the **MENU** key for 3 seconds. CO2 SETUP OPTIONS appears.
2. Repeatedly press the **NEXT** key until MONITOR OPTIONS 1 appears.
3. Press the **VER#** (version) softkey. The software version number appears.
4. Press the **NEXT** key. The date of the software version appears.
5. Press the **NEXT** key. MONITOR OPTIONS 1 appears.
6. Press **RUN** to return to the Main Menu.

Section 4 CAPNOSTAT CO_2 Sensor

This section explains how to select an airway adapter based on the patient to be monitored, how to connect the airway adapter to the CAPNOSTAT CO_2 Sensor[1] and to the patient's airway circuit, and how and when to calibrate the airway adapter and sensor.

Airway Adapter Selection

Select an airway adapter based on the patient and monitoring situation.

- Adult Airway Adapter (Catalog No. 7007)
  For patients with Endotracheal Tube diameters greater than 4.0 mm.
- Single Patient Use Adult Airway Adapter (Catalog No. 6063)
  For single patient use with Endotracheal Tube diameters greater than 4.0 mm.
- Single Patient Use Adult Airway Adapter with Mouthpiece (Catalog No. 6421)
  For single patient use for measuring CO_2 on non-intubated adult or pediatric patients.
- Neonatal Airway Adapter (Catalog No. 7053)
  For patients with Endotracheal Tube diameters less than or equal to 4.0 mm.
- Single Patient Use Neonatal Airway Adapter (Cat. No. 6312)
  For monitoring intubated patients with an ET tube size of 4.0 or smaller.
- Sampling Airway Adapter with tubing (Catalog No. 5843)
  For non-intubated patients when used in conjunction with a nasal sampling cannula.

Adult Airway Adapter

The Adult Airway Adapter (Catalog No. 7007) should be used when monitoring patients with Endotracheal Tube diameters greater than 4.0 mm. Alternatively, the Single Patient Use Adult Airway Adapter (Catalog No. 6063) may be used. See "Single Patient Use Adult Airway Adapter" on page 19.

1. Verify the windows are clean and dry. Clean or replace the adapter if necessary.
2. Snap the airway adapter into the CAPNOSTAT CO_2 Sensor.
   Align the arrow on the bottom of the airway adapter with the arrow on the bottom of the CAPNOSTAT CO_2 Sensor. Press the sensor and airway adapter together until they "click".
3. If necessary, perform an adapter calibration. Otherwise, skip this step.
   Adapter Calibration needs to be performed each time you switch airway adapter types—for example; if you switch from using an Adult to a Neonatal adapter, but not if you switch from an

1Both CAPNOSTAT CO_2 Sensors Catalog numbers 7067 and 7167 can be used.

Adult adapter to another Adult adapter. Adapter Calibration should also be performed if the monitor displays ADAPTER CAL?.

To perform an Adapter Calibration:

3a. Press **CAL**. PLACE ON ADPT IN RM AIR message appears.

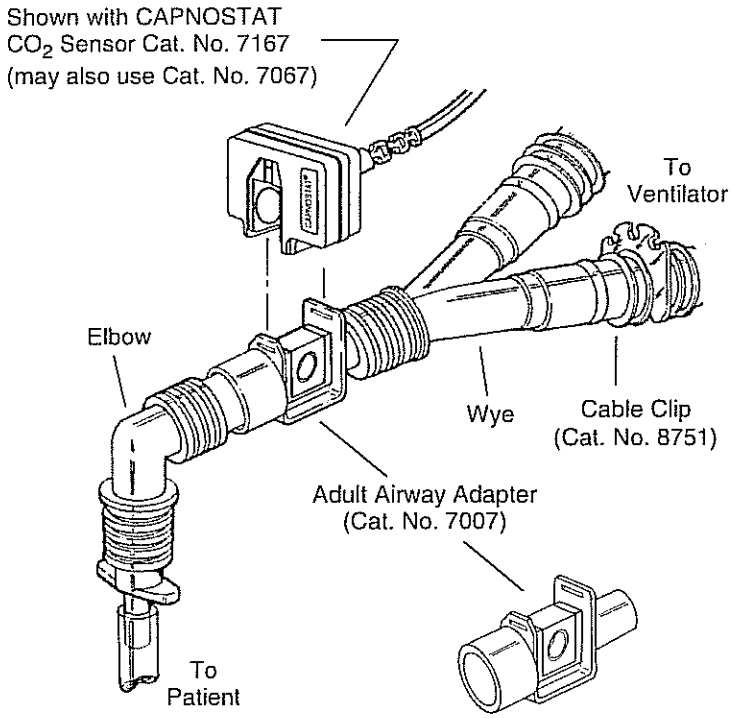
3b. Place the sensor and airway adapter away from all sources of CO_2, including the patient's—and your own—exhaled breath, and ventilator exhaust valves.

3c. Press **START**. TIME REMAINING counts down and the Main Menu reappears. The actual calibration will typically take less than 15 seconds.

NOTE

If the monitor detects changing CO_2 levels (breaths) during an adapter calibration, BREATHS DETECTED? is displayed followed by PLACE ON ADPT IN RM AIR. To continue, remove the source of CO_2, wait 30 seconds, and press **START**.

4. When using the Adult Airway Adapter, place the CAPNOSTAT CO_2 Sensor/Airway Adapter assembly at the proximal end of the airway circuit between the elbow and the ventilator circuit wye.



NOTE

- For optimal results, do NOT place the airway adapter between the ET tube and the elbow, as this may allow patient secretions to block the adapter windows.
- Position the Airway Adapter with its windows in a vertical and NOT a horizontal position: This helps keep patient secretions from "pooling" on the windows. If pooling does occur, the airway adapter may be removed from the circuit, rinsed with water and reinserted into the circuit.

- To prevent "rain-out" and moisture from draining into the Airway Adapter, do NOT place the Airway Adapter in a gravity-dependent position.

5. Check that the connections have been made correctly by verifying a proper CO_2 waveform (capnogram) on the monitor display.
6. The sensor cable should face away from the patient.

   To secure the sensor cable safely out of the way, attach Sensor Cable Holding Clips to the airway tubing, then connect the sensor cable to the clips (Cat. No. 8751).
7. See "Monitoring CO_2 and Respiratory Rate" on page 31.

Single Patient Use Adult Airway Adapter

The Single Patient Use Adult Airway Adapter (Catalog No. 6063) should be used when monitoring patients with Endotracheal Tube diameters greater than 4.0 mm. Alternatively, the reusable Adult Airway Adapter (Catalog No. 7007) may be used. See "Adult Airway Adapter" on page 17.

WARNING

The Single Patient Use Adult Airway Adapter is intended for single patient use. Do not re-use or sterilize the adapter as system performance may be compromised.

1. Remove the adapter from the package. Verify the adapter is intact.
2. Snap the Single Patient Use airway adapter into the CAPNOSTAT CO_2 Sensor. It will click into place when properly seated.
3. Perform an adapter calibration.

   Adapter Calibration needs to be performed each time you switch airway adapter types—for example; if you switch from using a Neonatal to a Single Patient Use Adult adapter, but not if you switch from one Single Patient Use Adult adapter to another Single Patient Use Adult adapter. Adapter Calibration should also be performed if the monitor displays ADAPTER CAL?.

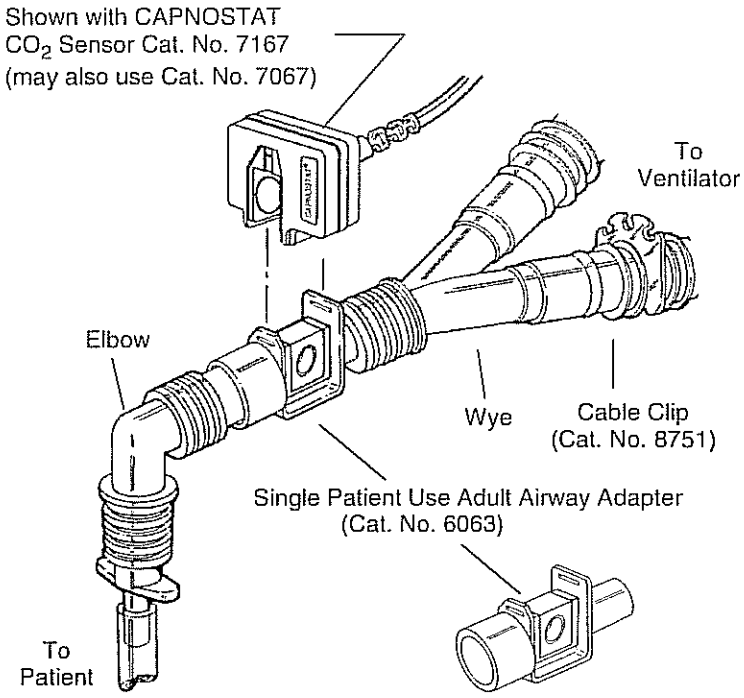
To perform an Adapter Calibration:

3a. Press **CAL**. PLACE ON ADPT IN RM AIR message appears.
3b. Place the sensor and airway adapter away from all sources of CO_2, including the patient's—and your own—exhaled breath, and ventilator exhaust valves.
3c. Press **START**. TIME REMAINING counts down and the Main Menu reappears. The actual calibration will typically take less than 15 seconds.

NOTE

If the monitor detects changing CO_2 levels (breaths) during an adapter calibration, BREATHS DETECTED? is displayed followed by PLACE ON ADPT IN RM AIR. To continue, remove the source of CO_2, wait 30 seconds, and press **START**.

4. Install the CAPNOSTAT CO_2 Sensor/Airway Adapter assembly at the proximal end of the airway circuit between the elbow and the ventilator circuit wye.



NOTE

- For optimal results, do NOT place the airway adapter between the ET tube and the elbow, as this may allow patient secretions to block the adapter windows.
- Position the Airway Adapter with its windows in a vertical and NOT a horizontal position: This helps keep patient secretions from "pooling" on the windows. If pooling does occur, the airway adapter may be removed from the circuit, rinsed with water and reinserted into the circuit.
- To prevent "rain-out" and moisture from draining into the Airway Adapter, do NOT place the Airway Adapter in a gravity-dependent position.

Single Patient Use Airway Adapter with Mouthpiece

The single patient use airway adapter with mouthpiece (Catalog No. 6421) can be used for measuring CO_2 on non-intubated adult or pediatric patients.

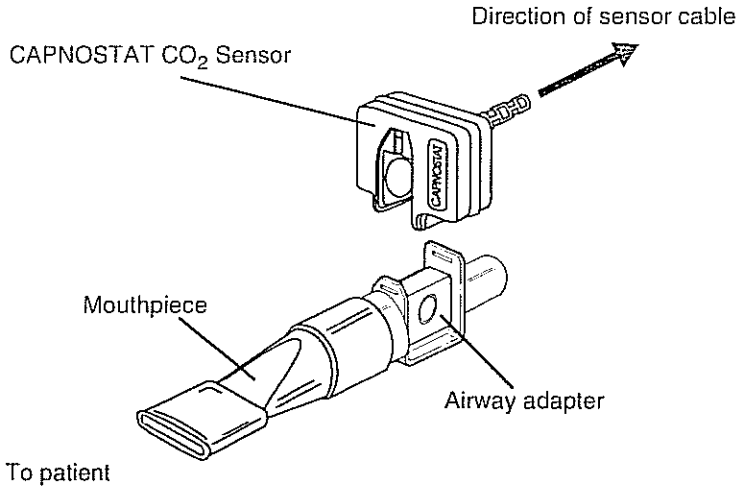
CAUTION

The airway adapter with mouthpiece is intended for single patient use. Do not re-use or sterilize the adapter, as system performance will be compromised.

Instructions for use:

1. Verify that the adapter and mouthpiece are intact and securely fastened to each other.

2. Press the CAPNOSTAT CO_2 Sensor onto the airway adapter. It will click into place when properly seated. The CAPNOSTAT CO_2 Sensor cable should be facing away from the mouthpiece.



3. Perform an airway zero only if prompted by the monitor.

   An airway zero is not needed if a single patient use adapter was previously used. An airway zero should be performed only if the monitor displays "ADAPTER CAL?".

   To perform an airway zero:

   3a. Press **CAL**. "PLACE ON ADPT IN RM AIR" message appears.

   3b. Place the sensor and airway adapter away from all sources of CO_2, including the patient's —and your own—exhaled breath, and ventilator exhaust valves.

   3c. Press **START**. "TIME REMAINING" counts down and the Main Menu reappears. The actual airway zero will typically take less than 15 seconds.

4. Patient should seal mouth completely around the mouthpiece, then breathe normally.

NOTE

If the monitor detects changing CO_2 levels (breaths) during an adapter calibration, BREATHS DETECTED? is displayed followed by PLACE ON ADPT IN RM AIR. To continue, remove the source of CO_2, wait 30 seconds, and press **START**.

Neonatal Airway Adapter

The Neonatal Airway Adapter (Catalog No. 7053) should be used when monitoring patients with Endotracheal Tube diameters less than or equal to 4.0 mm.

1. Verify the windows are clean and dry. Clean or replace the adapter if necessary.
2. Snap the airway adapter into the CAPNOSTAT CO_2 Sensor.

   Align the arrow on the bottom of the airway adapter with the arrow on the bottom of the CAPNOSTAT CO_2 Sensor. Press the sensor and airway adapter together until they "click".
3. If necessary, perform an adapter calibration. Otherwise, skip this step.

Adapter Calibration needs to be performed each time you switch airway adapter types—for example; if you switch from using an Adult to a Neonatal adapter, but not if you switch from one Neonatal adapter to another Neonatal adapter. Adapter Calibration should also be performed if the monitor displays ADAPTER CAL?.

To perform an Adapter Calibration:

3a. Press **CAL** PLACE ON ADPT IN RM AIR message appears.

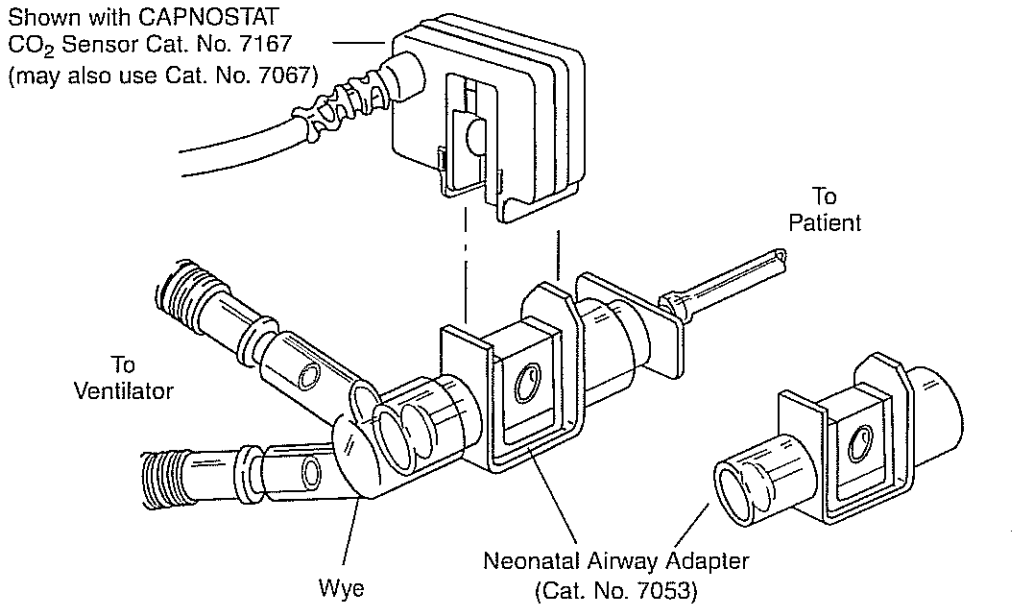
3b. Place the sensor and airway adapter away from all sources of CO_2, including the patient's—and your own—exhaled breath, and ventilator exhaust valves.

3c. Press **START**. TIME REMAINING counts down and the Main Menu reappears. The actual calibration will typically take less than 15 seconds.

NOTE

If the monitor detects changing CO_2 levels (breaths) during an adapter calibration, BREATHS DETECTED? is displayed followed by PLACE ON ADPT IN RM AIR. To continue, remove the source of CO_2, wait 30 seconds, and press **START**.

4. When using the Neonatal Airway Adapter, place the CAPNOSTAT CO_2 Sensor/Airway Adapter assembly between the endotracheal tube and the ventilator circuit wye.



NOTE

- For optimal results, do NOT place the airway adapter between the ET tube and the elbow, as this may allow patient secretions to block the adapter windows.
- Position the Airway Adapter with its windows in a vertical and NOT a horizontal position: This helps keep patient secretions from "pooling" on the windows. If pooling does occur, the airway adapter may be removed from the circuit, rinsed with water and reinserted into the circuit.
- To prevent "rain-out" and moisture from draining into the Airway Adapter, do NOT place the Airway Adapter in a gravity dependent position.

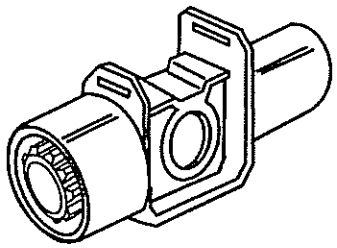
- For routine performance of airway care, separate the system between the ET tube and the airway adapter. Lavage and suctioning of the airway can then be performed without fluids and mucous accumulating on the neonatal airway adapter windows.

5. Check the connections have been made correctly by verifying a proper CO_2 waveform (capnogram) on the monitor display.
6. The sensor cable should face away from the patient.
7. See "Monitoring CO_2 and Respiratory Rate" on page 31.

Single Patient Use Neonatal Airway Adapter

The single patient use Neonatal Airway Adapter (Catalog No. 6312) should be used when monitoring intubated patients with an ET tube size of 4.0 or smaller with the CAPNOSTAT mainstream CO_2 sensors (Catalog Nos. 7067 or 7167).

Deadspace: The added deadspace due to the presence of the adapter is less than .5 cc.



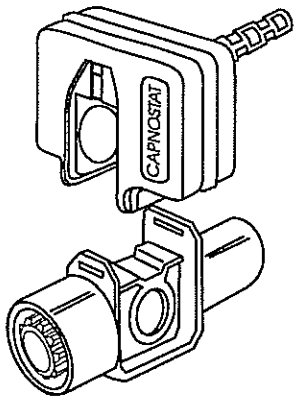
CAUTION

The neonatal airway adapter is intended for single patient use. Do not re-use or sterilize the adapter, as system performance will be compromised.

Instructions for use:

1. Verify that the airway adapter is intact.

2. Align the arrow on the airway adapter with the arrow on the CAPNOSTAT CO_2 Sensor and press together. It will "click" into place when properly seated.



3. Perform an airway zero only if prompted by the monitor. An airway zero is not needed if a single patient use neonatal adapter had previously been used. An airway zero should be performed only if the monitor displays "ADAPTER CAL?" otherwise, skip this step.

   To perform an airway zero:

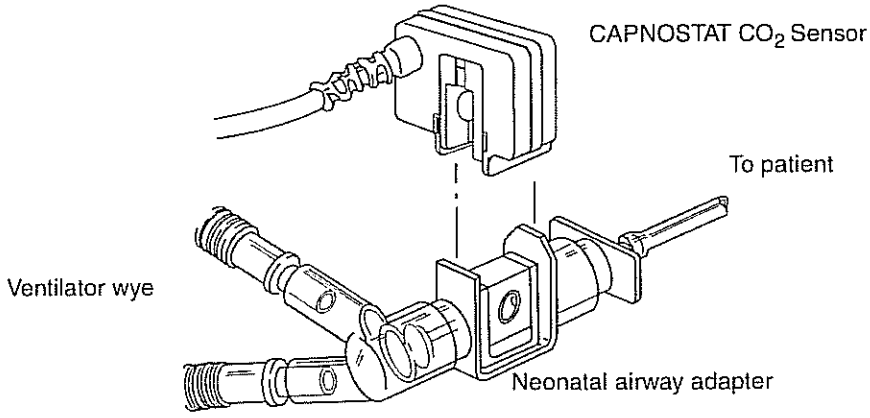
   3a. Press **CAL**. "PLACE ON ADPT IN RM AIR" message appears.

   3b. Place the sensor with airway adapter away from all sources of CO_2, including the patient's —and your own—exhaled breath and ventilator exhaust valves.

   3c. Press **START**. "TIME REMAINING" counts down and the Main Menu reappears. The actual airway zero will typically take less than 15 seconds.

   If the monitor detects changing CO_2 levels (breaths) during an airway zero, "BREATHS DETECTED?" is displayed followed by "PLACE ADPT IN RM AIR". To continue, remove the source of the CO_2, wait 30 seconds and press **START**.

4. Install at the proximal end of the circuit between the ET tube and the ventilator wye. The cable of the CAPNOSTAT CO_2 Sensor should be facing away from the patient.



NOTE

- Position the airway adapter with its windows in a vertical and NOT a horizontal position: This helps keep patient secretions from "pooling" on the windows. If pooling does occur, the airway adapter may be removed from the circuit, rinsed with water and reinserted into the circuit.
- For routine performance of airway care, separate the system between the ET tube and the airway adapter. Lavage and suctioning of the airway can then be performed without fluids and mucous accumulating on the neonatal airway adapter windows.

5. Ensure the integrity of the patient breathing circuit after insertion of the airway adapter by verifying a proper CO_2 waveform (capnogram) on the monitor display.

Sampling Airway Adapter

The Sampling Airway Adapter with tubing (Catalog No. 5843) should be used in conjunction with a nasal sampling cannula to monitor non-intubated patients, and to provide sidestream monitoring of pediatric tracheostomy patients.

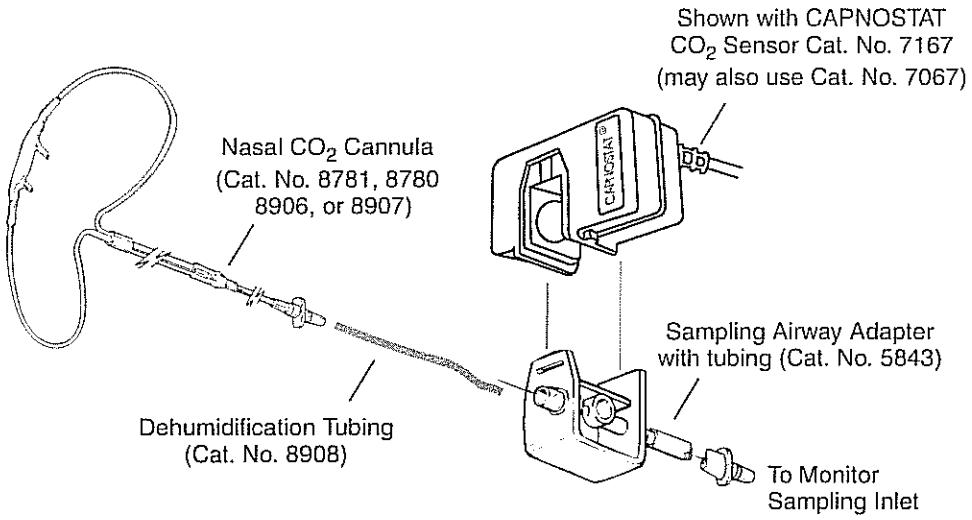
Non-Intubated Patients

1. Verify the windows are clean and dry. Clean or replace the adapter if necessary.
2. Snap the airway adapter into the CAPNOSTAT CO_2 Sensor.

   Align the arrow on the bottom of the airway adapter with the arrow on the bottom of the CAPNOSTAT CO_2 Sensor. Press the sensor and airway adapter together until they "click".
3. Connect the sampling tubing to the Sampling Inlet port located on the front of the monitor.
4. Connect a Dehumidification Tubing Set to the Sampling Airway Adapter.

   Use of the Nafion® Dehumidification Tubing Set (Cat. No. 8908) is optional. Its use is recommended—especially during high humidity or lengthy monitoring episodes.

5. Connect a Nasal CO_2 Sampling Cannula to the Dehumidification Tubing Set. (Or to the Sampling Airway Adapter if not using the dehumidification tubing).



Cat. No.	Cannula Type
8781	Nasal CO_2 Sampling Cannula—Adult
8780	Nasal CO_2 Sampling Cannula—Pediatric
8906	Nasal CO_2 Sampling and O_2 Delivery Cannula—Adult
8907	Nasal CO_2 Sampling and O_2 Delivery Cannula—Pediatric

6. Ensure the sampling pump is turned on—the pump icon ( ) is displayed.

   To turn the sampling pump on (or off):

   6a. Press the **MENU** softkey and CO2 OPTIONS appears.

   6b. Press **PUMP** and SET SAMPLING PUMP appears.

   6c. Press **ON** to turn the sampling pump on (or press **OFF** to turn the pump off).

7. If necessary, perform an adapter calibration. Otherwise, skip this step.

   Adapter Calibration is necessary when the pump is first turned on; in order to set the sampling system alert thresholds, and to compensate for the unique optical characteristics of the sampling airway adapter. After the first sampling adapter calibration, subsequent patient setups using sampling adapters do not require adapter calibration—so long as the pump is not turned off and similar cannula/dryer tubing combinations are used. Adapter Calibration should also be performed if the monitor displays CAL CO2 CANNULA.

   To perform a Sampling Adapter Calibration:

   7a. Press **CAL** and CO2 CANNULA ATTACHED ? appears.

   7b. Verify the cannula (and dryer tubing, if used) is attached to the adapter, and the adapter tubing is attached to the monitor.

   7c. Press **CONT** (continue) and PLACE ON ADPT IN RM AIR appears.

   7d. Place the cannula away from all sources of CO_2, including the patient's—and your own—exhaled breath, and ventilator exhaust valves.

7e. Press **START**. TIME REMAINING counts down and the Main Menu reappears. The actual calibration will typically take less than 15 seconds.

NOTE

If the monitor detects changing CO_2 levels (breaths) during an adapter calibration, BREATHS DETECTED? is displayed followed by PLACE ON ADPT IN RM AIR. To continue, remove the source of CO_2, wait 30 seconds, and press **START**.

8. If using a Nasal CO_2 Sampling and O_2 Delivery Cannula, attach the O_2 tubing to the administration device and set the device to the prescribed O_2 setting.

9. Position the cannula on the patient.

   Insert the cannula tips into the nostrils, pass the cannula tubing over the ears, then slide the retaining sleeve up the tubing toward the neck to a comfortable fit under chin.

10. Check the connections have been made properly by verifying a proper CO_2 waveform (capnogram) on the monitor display.

11. Using the CAPNOSTAT CO_2 Sensor holding clip, secure the sensor in a convenient place (such as the on the patient's clothing or bedding).

NOTE

If possible, position the Sampling Adapter with its windows in a vertical, and NOT a horizontal position, this helps keep moisture from "pooling" on the windows. If pooling does occur, the airway adapter may be removed from the circuit, rinsed with water and reinserted into the unit.

To prevent "rain-out" and moisture from draining into the Sampling Adapter, do NOT place the Sampling Adapter in a gravity dependent position.

12. Use the twist clips to connect the sensor cable and sampling tubing together, then place them out of the way.

13. See "Monitoring CO_2 and Respiratory Rate" on page 31.

Calibration

Sensor Calibration

The CAPNOSTAT CO_2 Sensor does NOT need to be calibrated at each monitor power up.

Calibration of a particular CAPNOSTAT CO_2 Sensor is necessary only when (1), the monitor requests calibration, and (2), the first time a particular CAPNOSTAT CO_2 Sensor is connected to a particular monitor—as is the case the first time you power up your CAPNOGARD and CAPNOSTAT.

Once calibrated, CAPNOGARD can be turned off and on, and the CAPNOSTAT CO_2 Sensor can be unplugged and reconnected, without having to recalibrate. However, if a second CAPNOSTAT CO_2 Sensor is connected in place of the original, the new sensor must be calibrated—and if at a later time the original CAPNOSTAT CO_2 Sensor is reconnected, it too will then have to be recalibrated.

To perform a CAPNOSTAT CO_2 Sensor calibration;

1. Verify the CAPNOGARD is turned on and the CAPNOSTAT CO_2 Sensor is plugged in.
2. Place the CAPNOSTAT CO_2 Sensor sensor onto the ZERO cell. A TIME REMAINING counter is displayed.

   The sensor cable should face away from the CAPNOGARD. If WAIT FOR SENSOR appears, the CAPNOSTAT CO_2 Sensor is not at operating temperature (as might be the case if the monitor was just turned on or the CAPNOSTAT just plugged in). The TIME REMAINING message indicates that the sensor is being calibrated and will usually appear within about one to two minutes. The actual calibration will take typically less than 15 seconds.
3. After the timer counts down, PLACE ON REF CELL appears.
4. Remove the sensor from the ZERO cell and place it on the REF (reference) cell.

   The sensor cable should face away from the CAPNOGARD.
5. CHECKING CALIBRATION is displayed.
6. Within several seconds CALIBRATION VERIFIED should appear. Remove the sensor from the cell. The sensor is ready for use.

   If NOT CALIBRATED appears, return the sensor to the ZERO cell and calibration is restarted. If NOT CALIBRATED appears again, or if CALIBRATION ERROR appears, remove the sensor from use and contact Respironics Customer Service.

Calibration Verification

The user can, at any time, quickly and easily verify CAPNOGARD/CAPNOSTAT calibration—and should do so periodically. Calibration verification is also warranted (and easily achieved) if clinical assessment of patient status by alternate means leads to questions of monitor accuracy.

To verify calibration;

1. Verify the CAPNOGARD is turned on and the CAPNOSTAT CO_2 Sensor is plugged in.
2. Place the CAPNOSTAT CO_2 Sensor onto the REF (reference) cell.

   The reference cell is the one farthest from the face of the monitor. The sensor cable should face away from the CAPNOGARD.
3. Press the **CAL** key. CHECKING CALIBRATION is displayed.

If WAIT FOR SENSOR appears, the sensor is not at operating temperature (as might be the case if the monitor was just turned on or the sensor just plugged in). CHECKING CALIBRATION will usually appear within about one minute.

4. Within several seconds CALIBRATION VERIFIED should appear. Remove the sensor from the cell. The sensor is ready for use.

   If NOT CALIBRATED appears, remove the sensor from the Reference cell and place it on the Zero cell. Calibration is automatically started and, several seconds later, PLACE ON REF CELL should appear. Place the sensor onto the reference cell and within several seconds CALIBRATION VERIFIED should appear.

Adapter Calibration

Adapter Calibration compensates for the optical differences between the Adult, Neonatal and Sampling Airway Adapters.

Adapter Calibration needs to be performed each time you switch airway adapter types—for example if you switch from using an Adult to a Neonatal adapter, but not if you switch from an Adult adapter to another Adult adapter. Adapter Calibration should also be performed if the monitor displays ADAPTER CAL? or CAL CO2 CANNULA.

Refer to "Adult Airway Adapter" on page 17, "Neonatal Airway Adapter" on page 21, and "Sampling Airway Adapter" on page 25 for specific Adapter Calibration details.

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Section 5 *Monitoring CO_2 and Respiratory Rate*

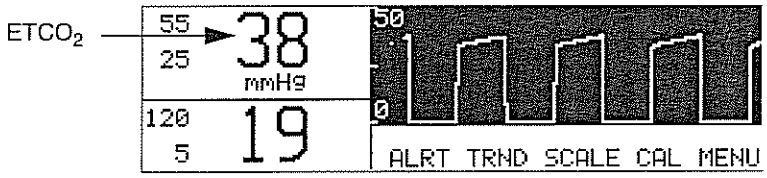
When the CAPNOSTAT CO_2 Sensor and an airway adapter are connected to the patient's airway circuit, CAPNOGARD displays $ETCO_2$, respiratory rate, a capnogram and inspired CO_2 if present,

Carbon Dioxide

CAPNOGARD's carbon dioxide display reflects the maximum concentration of CO_2 detected during respiration. This maximum CO_2 concentration usually occurs at the end of expiration, thus the term "End Tidal CO_2" or $ETCO_2$.

End Tidal CO_2

CAPNOGARD measures $ETCO_2$ in the range of 0-99 mmHg. The system is accurate to ±2 mmHg from 0-40 mmHg, and to within 5% of the reading from 40-99 mmHg.

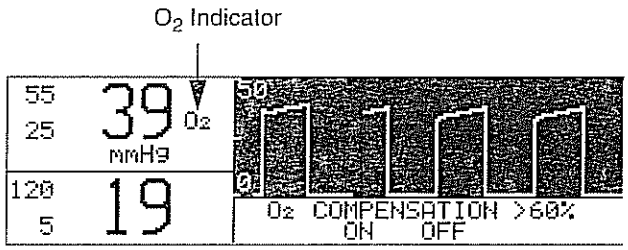


Audible and visible high and low limit alerts are provided for $ETCO_2$. See "Alerts" on page 39.

Oxygen Compensation

Unless compensated for, the presence of oxygen at elevated concentrations affects the measurement of the concentration of CO_2. Typically, uncompensated levels of oxygen in excess of 60% tend to decrease the displayed CO_2 value by approximately 5% of reading.

CAPNOGARD allows the user to enable O_2 Compensation if oxygen levels in excess of 60% are introduced to the airway circuit. O_2 Compensation should be turned off if the O_2 concentration is less than 60%. When O_2 Compensation is active, "O2" is displayed to the right of the CO_2 display.



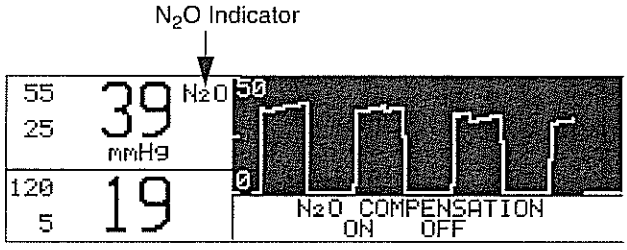
To turn O_2 Compensation on or off:

1. Press the **MENU** key. CO2 OPTIONS appears.
2. Press the **O2** key. O2 COMPENSATION >60% appears.
   The current setting flashes.
3. Press **ON** or **OFF** as desired.
   Press **ON** to activate O_2 Compensation. The O2 icon is displayed.
   Press **OFF** to turn off O_2 Compensation. The O2 icon display is removed.
4. Press **RUN** to return to the Main Menu.

Nitrous Oxide Compensation

Unless compensated for, the presence of nitrous oxide affects the measurement of the concentration of CO_2. Typically, uncompensated levels of nitrous oxide in concentrations of 50-70% tend to increase the displayed CO_2 value by approximately 5% of reading.

CAPNOGARD allows the user to enable N_2O Compensation if nitrous oxide is introduced to the airway circuit. N_2O Compensation should be turned off if nitrous oxide is not present. When N_2O Compensation is active, "N2O" is displayed to the right of the CO_2 display.



To turn nitrous oxide compensation on or off:

1. Press the **MENU** key. CO2 OPTIONS appears.
2. Press the **N2O** key. N2O COMPENSATION appears.
   The current setting flashes.
3. Press **ON** or **OFF** as desired.
   Press **ON** to activate N_2O Compensation. The N2O icon is displayed.
   Press **OFF** to turn off N_2O Compensation. The N2O icon display is removed.
4. Press **RUN** to return to the Main Menu.

Barometric Pressure Compensation

Barometric pressure changes (changes in base altitude from sea level) can affect the CO_2 value. CAPNOGARD is shipped from the factory with barometric pressure compensation set at 760 mmHg (sea level). If the monitor is used in an area with a different normal barometric pressure, the compensation should be changed to the new pressure value. Normal day-to-day barometric pressure variations should not require adjustment of the monitor's barometric pressure setting.

NOTE

Monitors with version 1.9 software do not support automatic barometric pressure compensation. These monitors can be identified by an "L" in the serial number suffix. Refer to the appropriate section below regarding the variation of version 1.9 software.

To compensate for barometric pressure:

1. Press and hold the **MENU** key for 3 seconds. CO2 SETUP OPTIONS appears.
2. Press the **BARO** (barometric pressure) key. BAROMETRIC PRESSURE appears.
   The current barometric pressure setting (560-800 mmHg) is displayed, and the current selection MANUAL or AUTO will flash.
3. Press **AUTO** or **MANUAL** as desired.
   Press **AUTO** to select automatic barometric pressure compensation. The monitor will briefly display AUTOMATIC BARO PRESSURE COMPENSATION SELECTED.
   Press **MANUAL** to manually enter barometric pressure compensation. Press ↑ or ↓ to increase or decrease the barometric pressure setting. Rounding to the closest setting results in less than a 0.15% error in the CO_2 value.
4. Press **RUN** to return to the Main Menu.

To compensate for barometric pressure, with revision 1.9 software;

1. Press and hold the **MENU** key for 3 seconds. CO2 SETUP OPTIONS appears.
2. Press the **BARO** (barometric pressure) key. BAROMETRIC PRESSURE = XXX mmHg appears.
   XXX will be the current barometric pressure setting (560-800 mmHg).
3. Press ↑ or ↓ as desired.
   Press ↑ or ↓ to increase or decrease the barometric pressure setting. Rounding to the closest setting results in less than a 0.15% error in the CO_2 value.
   Pressing the **PREV** key will display the CO2 SETUP OPTIONS menu.
4. Press **RUN** to return to the Main Menu.

$ETCO_2$ Calculation

CAPNOGARD is configured when shipped from the factory to display the highest $ETCO_2$ value measured during the most recent ten seconds of patient monitoring. This sliding ten second calculation period can be extended to 20 seconds. One breath averaging, where the $ETCO_2$ value of each breath is displayed, can also be selected. $ETCO_2$ calculation does not affect Respiratory Rate.

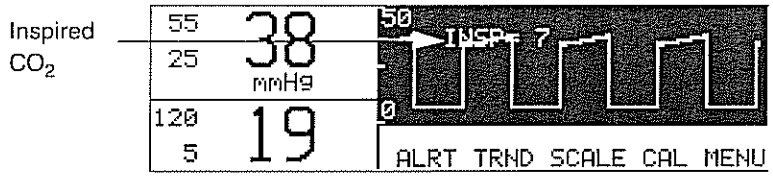
To view or alter the $ETCO_2$ calculation time:

1. Press the **MENU** key. CO2 OPTIONS appears.

2. Press the **NEXT** key. SYSTEM OPTIONS appears.
3. Press the **AVG** (averaging) key. SELECT ETCO2 AVERAGING appears.
   The current setting flashes.
4. Press **1BR**, **10s**, or **20s** as desired.
   Press **1BR** to select breath-by-breath $ETCO_2$ display.
   Press **10s** to display the highest $ETCO_2$ value within the most recent 10 seconds.
   Press **20s** to display the highest $ETCO_2$ value within the most recent 20 seconds.
5. Press **RUN** to return to the Main Menu.

Inspired CO_2

CO_2 concentrations measured during inspiration are typically close to 0 mmHg. Rebreathing, whether intentional or not, tends to raise the minimum concentration of CO_2. CAPNOGARD automatically displays "Inspired CO_2" if the minimum detected concentration of CO_2 is in excess of 3 mmHg for periods longer than 15 seconds. CAPNOGARD displays Inspired CO_2 in the form of "INSP=XX", where XX is the concentration of CO_2. There are no alerts for Inspired CO_2.



CO_2 Display Units

CAPNOGARD can display CO_2 values in any of three units of measure, millimeters of Mercury (mmHg), kilo Pascals (kPa), or percent (%).

To change the CO_2 display unit of measure:

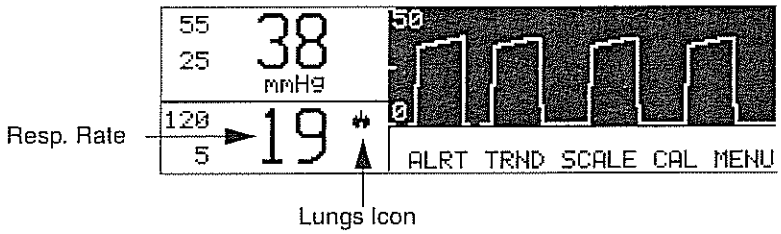
1. Press and hold the **MENU** key for 3 seconds. CO2 SETUP OPTIONS appears.
2. Press the **UNITS** key. SET CO2 DISPLAY UNITS appears.
   The current CO_2 display unit of measure flashes.
3. Press **mmHg**, **kPa** or **%** as desired.
   mmHg. Display CO_2 in millimeters of Mercury.
   kPa. Display CO_2 in kilo Pascals
   %. Display CO_2 in percent.
4. If the units are changed, UNIT CHANGE ERASES TREND appears.
   Press **CONT** (continue) or **CANCEL** as desired.
   CONT. Change the units display and erase all stored trend data.
   CANCEL. Do not change the display units. Leave stored trend data intact.
   If no key is pressed, the menu times out, and **CANCEL** is selected automatically.
5. Press **RUN** to return to the Main Menu.

Respiratory Rate

CAPNOGARD's Respiratory Rate display is the result of averaging the inverse of the eight most recently detected time intervals between CO_2 waveforms.

CAPNOGARD measures Respiratory Rate in the range of 0-150 br/min. The display is accurate to ±1 br/min. The monitor provides audible and visible high and low limit alerts for Respiratory Rate. See "Alerts" on page 39.

With each breath, an icon of a pair of lungs, flashes beside the Respiration display.

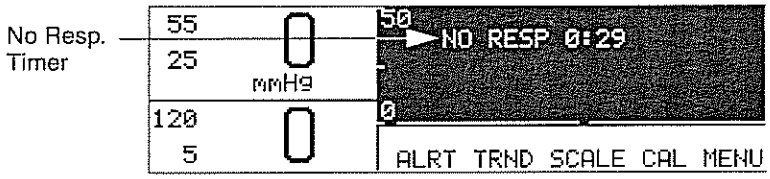


Respiratory Interval Alert

CAPNOGARD is equipped with a Respiratory Interval Alert. The "No Respiration" interval alert time is selectable[1]. The time duration during which no respiration is detected before an alert condition is initiated, can be from 10 seconds to 60 seconds in 5 second increments. See "Selecting the Respiratory Interval Alert Timer Duration" on page 36.

If no respiration is detected during the programmed time duration:

- The CO_2 and Respiration displays are set to zero
- The 🔔 indicator and Red Alert Bar (unless disabled by the user) starts to flash
- An audible alert sounds (unless audio has been disabled)
- A NO RESP (no respiration) timer appears in the capnogram display area and shows the time in minutes and seconds (10 minute maximum) since the last detected respiration.



If respiration resumes:

- CO_2 and Respiration displays will reflect patient status
- Audible and visible alerts will be reset, at the third breath
- The NO RESP timer will disappear, at the third breath

1The "No Respiration" interval alert is selectable in software version 2.8 and newer. Earlier versions are set at 20 seconds. Monitors with version 2.8 software are identified by a "CC" in the serial number suffix.

If, during a Respiratory Interval Alert, the user presses **ALERT RESET**:

- The audible alert and Red Alert Bar are reset
- The 🔔 indicator continues to flash and the NO RESP timer remains displayed.

The Respiratory Interval Alert will not activate until the monitor detects some initial respiration and displays a non-zero Respiratory Rate. This keeps the alert from activating before the sensor is connected to the patient's airway.

Selecting the Respiratory Interval Alert Timer Duration

To select the Respiratory Interval Alert Timer duration:

1. From the Main Menu press **MENU**.
2. When the CO2 OPTIONS screen appears press **NEXT**.

   The SYSTEM OPTIONS menu will appear.
3. From the SYSTEM OPTIONS menu press **AVG**.
4. From the AVERAGING SELECTIONS screen select "No Resp".
5. The NO RESPIRATION TIMER screen will appear.

   From the NO RESPIRATION TIMER screen select the time by using the arrow keys. The time is selectable from 10 seconds to 60 seconds in 5-second increments.

   Press **PREV** to return to the previous menu (AVERAGING SELECTIONS). Pressing the **PREV** softkey will return to the previous screen without saving changes in the no respiration timer.
6. When the desired time is displayed, press the **RUN** softkey to return to the Main Menu.

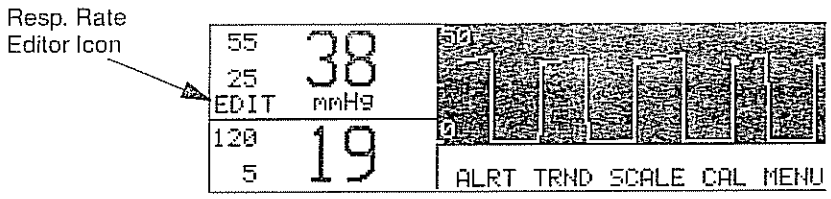
   The displayed time will be saved and the monitor will return to the Main Menu.

Respiratory Rate Editor

Certain rebreathing circuits, or the presence of artifact such as cardiogenic oscillations, may cause CAPNOGARD's adaptive digital detection algorithm to react to non-respiratory CO_2 fluctuations as if they were breaths. This condition may cause the monitor's numerical Respiratory Rate display to show values greater than the actual Respiratory Rate. The Capnogram display continues to provide an accurate CO_2 signal.

The Respiratory Rate Editor can be enabled by the user to add additional adaptive waveform duration and amplitude criteria to the detection algorithm. Use of the Respiratory Rate Editor makes the monitor more selective in its differentiation of waveforms caused by breathing and those introduced by artifact. As a result, when the editor is in use, the monitor will adapt slowly to sudden changes in respiratory rate.

To insure the maximum possible sensitivity to changing respiratory rates, it is recommended that the Respiratory Rate Editor be used only in situations in which non-respiratory CO_2 fluctuations, visible in the Capnogram display, are observed to affect the numerical Respiratory Rate display. When the Respiratory Rate Editor is active, "EDIT" is displayed below the $ETCO_2$ Alert Limits.

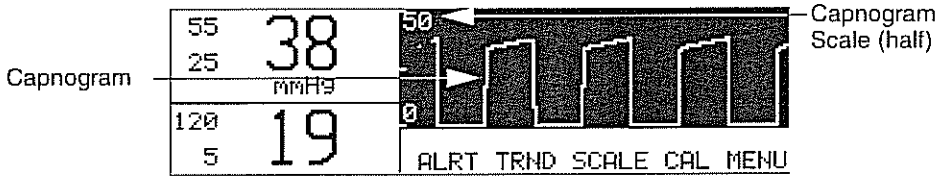


To turn the Respiratory Rate Editor on or off:

1. Press and hold the **MENU** key for 3 seconds. CO2 SETUP OPTIONS appears.
2. Press the **EDIT** key. RESP RATE EDITOR appears.
   The current status of the Respiratory Rate Editor flashes.
3. Press **ON** or **OFF** as desired.
   ON. Turn on Respiratory Rate Editor on.
   OFF. Turn the Respiratory Rate Editor off.
4. Press **RUN** to return to the Main Menu.

Capnogram

CAPNOGARD displays a capnogram, a graphic representation of the concentration of CO_2 as a function of time. The user can change the speed at which the capnogram is drawn across the display. The user can also change the capnogram's vertical scale.



Capnogram Speed

To change the capnogram's sweep speed:

1. Press the **SCALE** key. CAPNOGRAM CONTROLS appears.
2. Press the **mm/s** key. SWEEP SPEED mm/sec appears.
   The current setting flashes.
3. Select the **6.5**, **13** or **26** mm/sec as desired.
   At 6.5 mm/sec the capnogram shows approximately 12 seconds of data.
   At 13 mm/sec the capnogram shows approximately 6 seconds of data.
   At 26 mm/sec the capnogram shows approximately 3 seconds of data.
4. Press **RUN** to return to the Main Menu.

Capnogram Scale

To change the capnogram's vertical scale:

1. Press the **SCALE** key. CAPNOGRAM CONTROLS appears.
2. Press the **SCALE** key.

   The capnogram's vertical scale changes from 0-50 to 0-75 to 0-100 mmHg with each key press.
3. Press **RUN** to return to the Main Menu.

Selecting the Instantaneous CO_2 Mode

In the instantaneous CO_2 mode the instantaneous CO_2 value will be displayed and OFF icons will appear in the $ETCO_2$ and Respiration Limits screen section. This indicates that the $ETCO_2$ alert limits and the respiration alert limits are not active while in the instantaneous mode. When in instantaneous mode, the Respiration display will show "INST". When this option is selected, the Respiration value will not be shown and the Respiratory Interval Alert Timer will also be disabled. See "Respiratory Interval Alert" on page 35.

To select the instantaneous CO_2 mode:

1. From the Main Menu press **MENU**.
2. When the CO2 OPTIONS screen appears press **NEXT**.
3. From the SYSTEM OPTIONS menu press **AVG**.
4. From the AVERAGING SELECTIONS screen press **CO2**.
5. The SELECT ETCO2 AVERAGING screen will appear. Press **INST**, the monitor will return to the previous menu AVERAGING SELECTIONS.

   Selecting **INST** will activate the Instantaneous mode. "INST" will appear under the $ETCO_2$ limits, and both respiration and $ETCO_2$ limit alert will be deactivated, "OFF" will appear in the limits field.

   Selection of **1BR** (Single Breath), **10s** (10 seconds), or **20s** (20 seconds) will select the $ETCO_2$ mode and use the selected averaging time. The currently set alert limits will still be active, unless the respiration alerts were deactivated in the SET ALERT LIMITS screen.

Section 6 Alerts

Overview

CAPNOGARD provides several alert options.

- Alert limits can be adjusted automatically with the Auto Alerts feature or manually from within the menu system.
- Limit alerts require user action to be reset; they can also be configured to automatically reset.
- Alert limit settings are retained in memory and restored each time the monitor is turned on; the monitor can also be set to power up each time using default settings.
- Audible alerts are delayed 10 seconds from the occurrence of a limit alert; the delay can also be eliminated to allow instant activation.
- Audible alert volume can be adjusted.
- Audible alerts can be temporarily suspended for two minutes.
- Audible alerts can be suppressed using the Audio Off feature. Furthermore, the Audio Off feature can itself be disabled for use in situations where suppressing audible alerts is undesired.
- The Alert Bar stops flashing automatically if the parameter that caused a limit alert returns within its limits or the Alert Bar can instead be set to continue flashing until the user presses the **ALERT RESET** key, or the Alert Bar can be turned off.

Limit Alerts

CAPNOGARD provides audible and visible **limit alerts** for End Tidal Carbon Dioxide and Respiratory Rate. Each parameter has separate **alert limits**.

Limit Alerts are audible and visible signals generated by the CAPNOGARD in response to $ETCO_2$ or Respiratory Rate values that violate the Alert Limits.

Alert Limits are the maximum and minimum allowable values for $ETCO_2$ and Respiratory Rate. Alert Limits are displayed as the small numbers to the left of the CO_2 and Respiration rate displays.

CAUTION

The Limit Alert functions described below assume that the CAPNOGARD is using factory default alert parameters. You may experience other results if you are not using the default settings. Refer especially to "Limit Alerts—Delayed/Instant" on page 66.

If $ETCO_2$ or Respiratory Rate violates an alert limit setting:

- The violated alert limit display starts to flash.
- The red 🔔 (bell-shaped) indicator next to the **ALERT RESET** key starts to flash.

If the parameter returns within its limits before 10 seconds elapse;

- The 🔔 indicator and the violated limit display stop flashing

If the limit alert lasts for longer than 10 seconds:

- An audible alarm will sound
- The Alert Bar to the right of the display starts to flash
- The violated limit becomes latched

If the parameter returns within limits after 10 seconds of continual alerting;

- The audible alarm will turn off
- The Alert Bar will stop flashing
- The 🔔 indicator and violated limit display continue to flash until the user presses the **ALERT RESET** key (this allows the user to determine which limit was violated).

Auto Alert Limits

Auto Alerts allow bracketing of the alert limits based on recent patient data.

To set Auto Alert Limits:

1. Press the **ALRT** softkey. SET ALERT LIMITS appears.
2. Press the **AUTO** softkey. CAPNOGARD sets the alert limits automatically.

   AUTO LIMITS SET is displayed. The limits reflect the patient's current status.

   If **AUTO** is pressed prior to the first three breaths, NOT ENOUGH DATA TO SET ETCO2 LIMITS is displayed. When this happens, the limits are not changed. Wait until several breaths have been collected and then press **AUTO** again.

WARNING

Once the limit values are set, the user should periodically confirm patient status by alternate means and not rely solely on alerts generated when a limit is violated.

3. SET ALERT LIMITS reappears. Press **RUN** to return to the Main Menu.

$ETCO_2$ Auto Alert Limits

The auto alert limits for $ETCO_2$ are derived from the average of the three most recent $ETCO_2$ values recorded before **AUTO** was selected. The average then falls into one of two ranges that define the high and low limits. Those ranges are;

$ETCO_2$ Average[A]	High Limit	Low Limit
1 - 40 mmHg	+ 25% of value	- 25% of value
> 40 mmHg	+ 10 mmHg	- 10 mmHg

A. If $ETCO_2$ is displayed as kPa or percent (not mmHg), the limits are based on the equivalent of mmHg.

For example, if the average of the three most recent $ETCO_2$ values recorded before **AUTO** was pushed was 32 mmHg, the upper alert limit is set to 40 (32 + 25% = 32 × 1.25 = 40) and the lower alert limit is set to 24 (32 - 25% = 32 × 0.75 = 24). If the average $ETCO_2$ value was 45 mmHg, the upper limit would be set to 55 (45 + 10 = 55) and the lower limit would be set to 35 (45 - 10 = 35).

Respiratory Rate Auto Alert Limits

The auto alert limits for respiratory rate are derived from the average of the three most recent respiratory rate values recorded before **AUTO** was selected. The average then falls into one of three ranges that define the high and low limits. Those ranges are;

Respiration Rate Average	High Limit	Low Limit
1 - 15	+ 7 br/min	- 50% of value
16 - 40	+ 10 br/min	- 7 br/min
> 40	+ 15 br/min	- 10 br/min

For example, if the average of the three most recent respiration rate values recorded before **AUTO** was pushed was 28 br/min, the upper alert limit is set to 38 (28 + 10 = 38) and the lower alert limit is set to 21 (28 - 7 = 21). If the average respiratory rate is 12 br/min, the upper limit would be set to 19 (12 + 7 = 19) and the lower limit would be set to 6 (12 - 50% = 12 × 0.50 = 6).

Setting Alert Limits Manually

The user can manually adjust alert limits.

CAUTION

Care should be exercised to ensure clinically reasonable alert limit settings are selected. Respironics does not recommend the setting of limit values to such a wide span as to effectively render the alert limit feature useless. Once the limit values are properly set, the user should periodically confirm patient status by alternate means and not rely solely on alerts generated when a limit is violated.

Alert limit adjustment ranges are:

- $ETCO_2$ - High 100-5, Low 95-0
- Respiratory Rate - High 150-5, Low 145-0
- Respiratory Rate alerts can be turned off by setting the High limit above 150 or the Low limit below 0. If the Respiratory Rate limits are off, the limits display OFF and no Respiratory Rate limit alerts are generated.

To manually set the alert limits:

1. Press the **ALRT** key. SET ALERT LIMITS appears.
2. Press **SEL** (select) to move "◀" to the limit to be changed.
3. Press ↑ or ↓ to increase or decrease the selected limit.

   Press and release the arrow keys to change the limit value up or down by one.
   Press and hold the arrow keys to make the value change more rapidly.

NOTE

CAPNOGARD will not allow a parameter's high and low alert limits to be set to within 5 digits of each other. For example, using default values, if the lower Respiratory Rate limit is increased to 116, the upper limit will change from 120 to 121 in order to maintain the 5 digit difference between limits.

4. Once all limits are set as desired, press **RUN**.

Alert Volume

The volume of the monitor's audible alert is user-adjustable. The alert volume feature cannot be used to eliminate audible alerts because the alert is still audible at its lowest setting. Use the Two Minute Suspend or Audio features to silence audible alerts. See "AUDIO Key" on page 3.

To vary the audible alert volume:

1. Press the **MENU** key. CO2 OPTIONS appears.
2. Press the **NEXT** key. SYSTEM OPTIONS appears.
3. Press the **AUDIO** softkey. ALERT VOLUME appears.

   An audible tone sounds and the current alert volume setting (1-7) is displayed between the up and down arrows.
4. Press ↑ or ↓ to increase or decrease the alert volume setting.
5. Press **RUN** to return to the Main Menu.

Audio Mute

In situations where preventing the occurrence of audible alarms by use of the Audio Off feature is not desired, the monitor can be set to disallow use of Audio Off.

Once the monitor is set to disallow use of Audio Off, AUDIO OFF DISABLED is briefly displayed in the Message Center each time the user tries to enable Audio Off.

NOTE

Unlike Audio Off, the Two Minute Suspend feature, which temporarily silences the audible alarms for two minutes and then reactivates them, is a separate feature and is not affected by the status of Audio Mute feature.

To enable or disable the monitor's ability to permanently silence the audible alarms:

1. Press and hold the **MENU** key for 3 seconds. CO2 SETUP OPTIONS is displayed.
2. Repeatedly press the **NEXT** key until ALERT OPTIONS 1 appears.
3. Press **MUTE** and ALLOW AUDIO OFF appears.

   The current setting flashes.

4. Press **YES** or **NO** as desired.

   YES. The user can use Audio Off to permanently silence audible alerts.
   NO. The user cannot use Audio Off. AUDIO OFF DISABLED is displayed instead.

NOTE

Once the decision to allow or disallow the user to use Audio Off is made, that choice remains in effect, even if the monitor is turned off and on, until changed by the user.

5. ALERT OPTIONS 1 reappears. Press **RUN** to return to the Main Menu.

Limit Alerts—Latched/Unlatched

Alerts caused by parameters violating an alert limit setting are normally "Latched". Once a latched alert is active for 10 seconds, even if the parameter then returns within its limits, the violated alert limit display and the 🔔 indicator continue to flash until the user presses the **ALERT RESET** key. This indicates which parameter caused the alert.

CAPNOGARD also supports "Unlatched" alerts that automatically stop the flashing of the violated alert limit display and the 🔔 indicator as soon as the alerting parameter returns within its limits. The user does not have to press the **ALERT RESET** when unlatched alerts are in use.

To select Latched or Unlatched alerts:

1. Press and hold the **MENU** key for 3 seconds. CO2 SETUP OPTIONS is displayed.
2. Repeatedly press the **NEXT** key until ALERT OPTIONS 1 appears.
3. Press **LATCH** and ALERTS LATCHED appears.

   The current setting flashes.
4. Press **YES** or **NO** as desired.

   YES provides latched alerts that require the user to press **ALERT RESET** to clear them.
   NO provides unlatched alerts that reset automatically without user intervention.

NOTE

Once the choice of Latched or Unlatched alerts is made, that choice will remain in effect, even if the monitor is turned off and on, until changed by the user.

5. ALERT OPTIONS 1 reappears. Press **RUN** to return to the Main Menu.

Alert Limit Settings—Retained/Defaults

When CAPNOGARD is turned on, it restores the (Retained) alert limit settings that were in effect when the monitor was last turned off. However, the monitor can be configured to use default alert limit values at each power up instead.

To use Retained or Default alert limit settings at power up;

1. Press and hold the **MENU** key for 3 seconds. CO2 SETUP OPTIONS is displayed.

2. Repeatedly press the **NEXT** key until ALERT OPTIONS 1 appears.
3. Press **DFLT** (default) and RETAIN ALERT LIMITS appears.

   The current setting flashes.
4. Press **YES** or **NO** as desired.

   YES. CAPNOGARD powers up using the alert limit settings from the previous use.
   NO. At power up, uses default alert limits; $ETCO_2$ 55-25, Respiratory Rate 120-5.

NOTE

Once the choice of Retained or Default alert limit settings is made, that choice will remain in effect, even if the monitor is turned off and on, until changed by the user.

5. ALERT OPTIONS 1 reappears. Press **RUN** to return to the Main Menu.

Limit Alerts—Delayed/Instant

When a parameter violates an alert limit, the violated limit display and the 🔔 indicator start to flash immediately, but the audible alarm and Alert Bar (if enabled) are delayed 10 seconds. This delay helps avoid "nuisance" alarms because if during that first ten seconds the parameter returns within its limits, the alert is cancelled.

The 10 second audible and Alert Bar delay can be eliminated if the user desires the monitor activate audible and Alert Bar alerts as soon as an alert limit is violated. Eliminating the delay also has the effect of latching the alert as soon as it occurs. See "Limit Alerts—Latched/Unlatched" on page 43.

To select or eliminate the 10 second audible and Alert Bar delay for limit alerts:

1. Press and hold the **MENU** key for 3 seconds. CO2 SETUP OPTIONS is displayed.
2. Repeatedly press the **NEXT** key until ALERT OPTIONS 2 appears.
3. Press **DELAY** and 10 SEC LIMIT ALERT DELAY appears.

   The current setting flashes.
4. Press **YES** or **NO** as desired.

   YES. Audible and Alert Bar alerts for violated alert limits are delayed 10 seconds.
   NO. Audible and Alert Bar alerts occur as soon as an alert limit is violated.

CAUTION

Once the Alert Delay setting is selected, that choice remains in effect, even if the monitor is turned off and on, until changed by the user.

5. ALERT OPTIONS 2 reappears. Press **RUN** to return to the Main Menu.

Alert Bar Settings

The Alert Bar to the right of the monitor display can be set to operate in three different modes. The Alert Bar can be Latched, Unlatched, or turned off altogether.

A "Latched" Alert Bar starts to flash as soon as a limit alert occurs. If the alerting parameter returns within its limits before 10 seconds elapse, the Alert Bar turns off. If the alert condition lasts for more than 10 seconds, the flashing Alert Bar becomes "latched" and will continue to flash, even if the alerting parameter returns within its limits, until the user presses the **ALERT RESET** key.[1]

An "Unlatched" Alert Bar starts flashing 10 seconds after an alert limit violation occurs and turns off as soon as the alerting parameter returns within its limits, regardless of the duration of the alert.

The Alert Bar will not flash under any condition if it has been turned "Off".

NOTE

The red 🔔 (bell shaped) indicator to the left of the **ALERT RESET** key will always flash whenever a limit alert occurs. Unlike the Alert Bar, 🔔 cannot be turned off.

To turn the Alert Bar on (latched or unlatched) or off:

1. Press and hold the **MENU** key for 3 seconds. CO2 SETUP OPTIONS is displayed.
2. Repeatedly press the **NEXT** key until ALERT OPTIONS 2 appears.
3. Press **BAR** and ALERT BAR LATCHED appears.

   The current setting flashes.
4. Press **YES** or **NO** or **OFF** as desired.

   YES. Alert Bar starts to flash as soon as a limit alert occurs.
   NO. Alert Bar starts flashing 10 seconds after an alert limit violation occurs.
   OFF. Alert Bar will not flash under any condition.

NOTE

Once the Alert Bar setting is selected, that choice remains in effect, even if the monitor is turned off and on, until changed by the user.

5. ALERT OPTIONS 2 reappears. Press **RUN** to return to the Main Menu.

1However, if Unlatched Alerts are selected (See "Limit Alerts—Latched/Unlatched" on page 43), the Alert Bar will turn off once the alerting parameter returns within its limits.

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Section 7 Trend Memory Display

Overview

CAPNOGARD maintains trend information for $ETCO_2$ and Respiratory Rate. Trend memory is continually and automatically updated. Trend memory can hold up to 24 hours of data. The data is battery-backed, so turning the monitor off and on does not destroy or erase trend memory contents. Trend memory features include:

- Graphical trend memory displays are user selectable. Any 12 hour, 8 hour, 2 hour, or 30 minute portion of trend data can be viewed on-screen in graphical format.
- $ETCO_2$ only or $ETCO_2$ and Respiratory Rate graphical displays are available.
- $ETCO_2$ and Respiratory Rate graphical display scales are user selectable.
- Histogram trend memory displays are user selectable. Any 12 hour, 8 hour, 2 hour, or 30 minute portion of trend data can be viewed on-screen in histogram format.
- User selected "Events" can be marked and stored in trend memory. These events appear on-screen when viewing the graphical trend displays.
- Trend memory data in graphical and histogram formats can be output to a printer.
- The user can erase stored trend memory at any time via the trend menus.

NOTE

CAPNOGARD continues patient monitoring while trends are displayed. Any latched alert that occurs while viewing trend data causes the Main Menu to reappear. Also, if no keys are pressed for 5 minutes, the Main Menu replaces the trend display.

Graphical Trend Display

To display trend memory:

1. Press the **TRND** softkey. DRAWING TREND PLEASE WAIT is briefly displayed.

   The most recent 12 hours of $ETCO_2$ data is then graphically displayed.

   New trend data is continually collected and enters the graph from the right—pushing older already displayed data towards the left. (If less than 12 hours of data have been collected, the graph will be shortened accordingly.)

   Dotted vertical lines indicate times when the monitor was turned off.

   The flashing dashed vertical line in the trend is called the cursor. Press the **<-** (arrow left) key to move the cursor towards older data. Press the **->** (arrow right) key to move the cursor towards more recent data.

   Information displayed in the status line above the graph is specific to the data at the cursor location. The status line includes the following information:

- The date and time the data at the cursor was stored in trend memory. The time is stored in 24 hour format. (e.g., 13:30:00 = 1:30 p.m.)
- The $ETCO_2$ (E), Inspired CO_2 (I), and Respiratory Rate (R) values at the time the data was stored.
- If a trend "Event" was marked at the time indicated by the cursor, an "E" appears in the right corner of the status line. This space is blank if no event was marked.

2. Move the cursor by pressing the <- or -> (arrow keys) to the desired time.
3. Press the **EXPAND** softkey.

   Successive presses of the **EXPAND** key cause the 8 hour, 2 hour and 30 minute trends to be displayed. Press **EXPAND** again to return to the 12 hour trend display.
4. Use the arrow keys to move the cursor to the desired location in the trend.
5. Press the **RUN** key to return to the Main Menu.

Dual Trend Displays

When the **TRND** key is pushed, only $ETCO_2$ data is displayed. CAPNOGARD can display both $ETCO_2$ and Respiratory Rate trend data simultaneously.

To select dual $ETCO_2$ and Respiratory Rate trend displays:

1. Press the **TRND** softkey. Wait for the trend to be displayed.
2. Press the **NEXT** key. TREND OPTIONS appears.
3. Press **VIEW**. TREND VIEW appears.
4. Press **DUAL** or **ETCO2** as desired.

   Press **DUAL** to display both $ETCO_2$ and Respiratory Rate trends.
   Press **ETCO2** to display only $ETCO_2$ trend data.

Selecting Trend Display Scales

$ETCO_2$ and Respiratory Rate graphical trend display scales can be changed by the user.

To change the $ETCO_2$ and/or Respiratory Rate graphical trend display scales:

1. Press the **TRND** softkey. Wait for the trend to be displayed.
2. Press the **NEXT** key. TREND OPTIONS appears.
3. Press **VIEW**. TREND VIEW appears.
4. Press **SCAL** (scale). TREND SCALE appears.
5. Press **CO2** or **RESP** as desired.

   Press **CO2** to change the $ETCO_2$ trend display scale.
   Press **RESP** to change the Respiratory Rate display scale.
6. Press HALF or FULL as desired.

   HALF. Selects 0-50 mmHg for $ETCO_2$ or 0-75 br./min for Respiratory Rate.
   FULL. Selects 0-100 mmHg for $ETCO_2$ or 0-150 br./min for Respiratory Rate.
   The selected parameter is retained in memory even when the monitor is turned off.

Histogram Trend Display

Histogram displays provide a neatly tabulated and easily interpreted summary of $ETCO_2$ and Respiratory Rate trend memory data.

CAPNOGARD's histogram display reflects the currently selected graphical trend expansion setting. For example, if the graphic trend display is set to 12 hours, the resulting histogram will also reflect that 12 hours; and if the graphic display is set to 30 minutes, the resulting histogram only uses those 30 minutes as the basis for its tabulations.

Histogram displays reflect only active monitoring time; the time the CAPNOSTAT spends on the Zero and Reference Cells is NOT reflected in the histogram display.

To activate a histogram trend display:

1. Press the **TRND** softkey. Wait for the trend to be displayed.
2. Move the cursor by pressing the **<-** or **->** (arrow keys) to the desired time.
3. Press the **EXPAND** softkey to select the desired trend duration.
4. Press the **NEXT** key. TREND OPTIONS appears.
5. Press the **VIEW** key. TREND VIEW appears.
6. Press the **HIST** (histogram) key to display the histogram.

The top line of the histogram display shows the start and stop dates and times (in 24 hour format) used to tabulate the data.

$ETCO_2$ data is tabulated on the left side of the display and Respiratory Rate data is displayed on the right half. Data for each parameter is tabulated into six categories. Each category represents a range of possible values. For each category, a bar graph is drawn showing the percentage of the total time the parameter was within the category. To the right of the bar graphs are numerical tabulations also showing how long the parameter was within that category.

Trend Data Compression

Data is stored into trend memory every eight seconds.

CAPNOGARD can display any 12 hour, 8 hour, 2 hour, or 30 minute portion of its 24 hour trend memory. Since the size of the trend display is a fixed width, the monitor must compress the trend data to fit onto the display—the more data present, the more it must be compressed to fit onto the display. The CAPNOGARD trend display is approximately 200 pixels (picture-element) wide. Each horizontal pixel (data point) is equivalent to the following times;

1 data point per 8 seconds in a 30 minute trend
1 data point per 32 seconds in a 2 hour trend
1 data point per 128 seconds (approx. 2 minutes) in an 8 hour trend
1 data point per 192 seconds (approx. 3 minutes) in an 12 hour trend

The monitor determines the trend duration and compresses that amount of data to fit the screen—older data to the left, the most recent to the right.

Because of data compression, data at any horizontal pixel may look like a vertical bar.

For CO_2, the upper extent of the bar represents the maximum $ETCO_2$ value and the bottom of the bar the maximum Inspired CO_2 value stored during that particular compression period. The $ETCO_2$ value displayed above the graph represents the maximum $ETCO_2$ value stored over the compression period.

For Respiratory Rate, the upper extent of the bar represents the maximum value and the bottom of the bar the minimum value stored during that particular compression period. The Respiratory Rate value displayed above the graph represents the minimum Respiratory Rate value stored over the compression period.

Erase Trend Memory

Trend information is retained in memory even if CAPNOGARD is turned off.

Each time the monitor is turned on the message ERASE STORED TRENDS? is displayed. The user can select **YES** to erase the contents of trend memory or press **NO** to keep the previously stored trend data intact. If trend information is not erased at power up, new data will be appended to the old data already in memory. Additionally, the user can at any time, enter the trend menu and erase stored trend information.

To erase stored trend information from within the trend menus:

1. Press the **TRND** key. Wait for the trend to be displayed.
2. Press the **NEXT** key. TREND OPTIONS appears.
3. Press the **ERASE** key. ERASE STORED TRENDS? appears.
4. Press **YES** or NO as desired.

   YES. Erase stored trend memory data. TRENDS ERASED is briefly displayed.
   NO. Keep stored trend memory data intact. TRENDS RETAINED is briefly displayed.

Trend Print

If PRINTER INTERFACE is selected in the MONITOR OPTIONS 2 portion of the menu system, a **PRNT** key is displayed in the TREND OPTIONS menu.

Use of this feature is no longer supported.

Trend and NovaCARD Data Archive System

If NOVACARD INTERFACE is selected in the MONITOR OPTIONS 2 portion of the menu system, a **CARD** key is displayed in the TREND OPTIONS menu.

After connecting the *NovaCARD* Writer Module and installing a *NovaCARD*, press the **CARD** key and the NOVACARD MENU will appear. From this menu trend data can be stored to the memory card, patient information can be entered or changed, or the *NovaCARD* can be erased.

See the "NovaCARD User's Manual" for more information.

Section 8 *Menu Tree*

The menu flow diagrams of the *CAPNOGARD* are listed in the following pages; each menu is shown with the associated softkeys.

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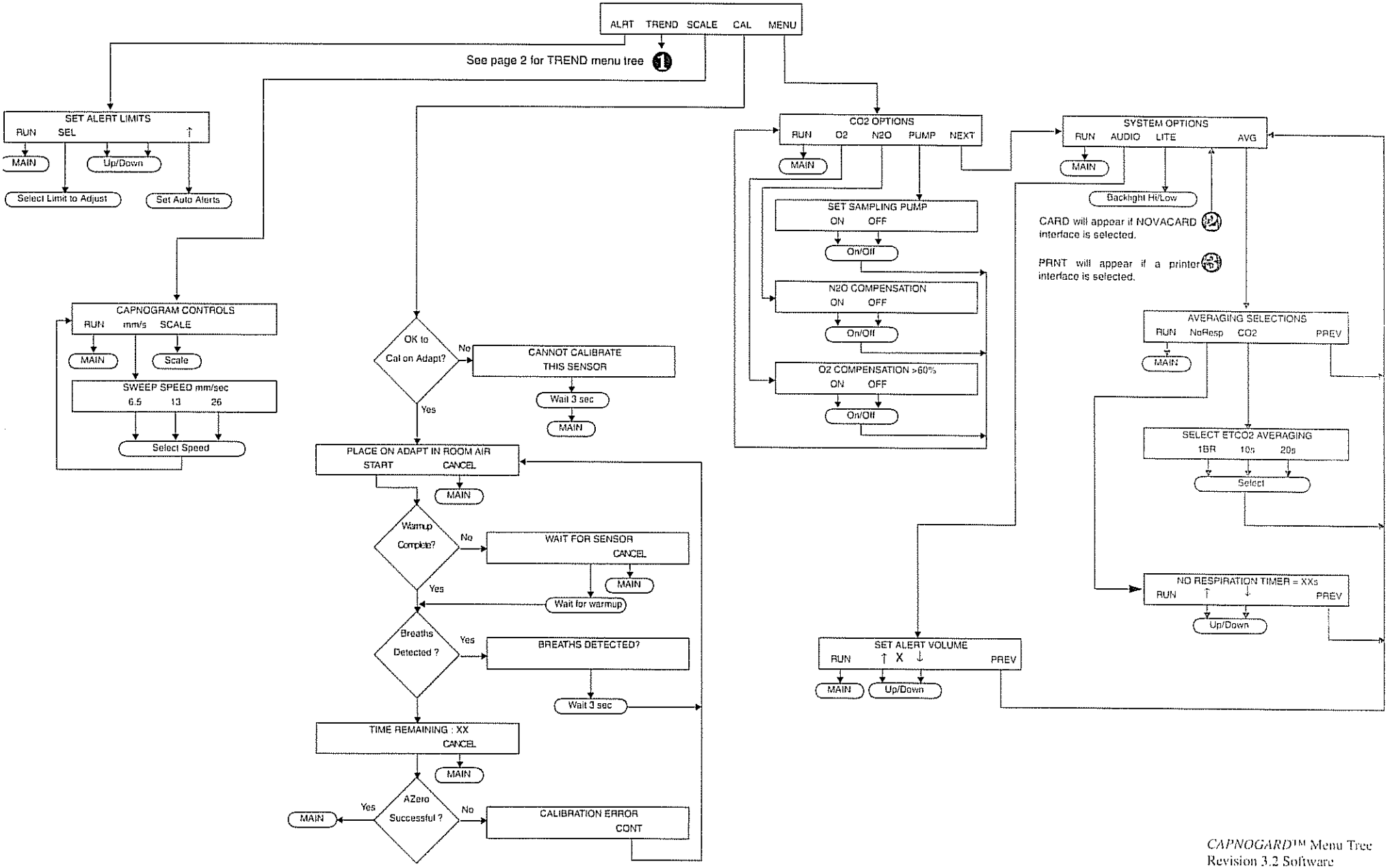

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Revision 3.2 Software
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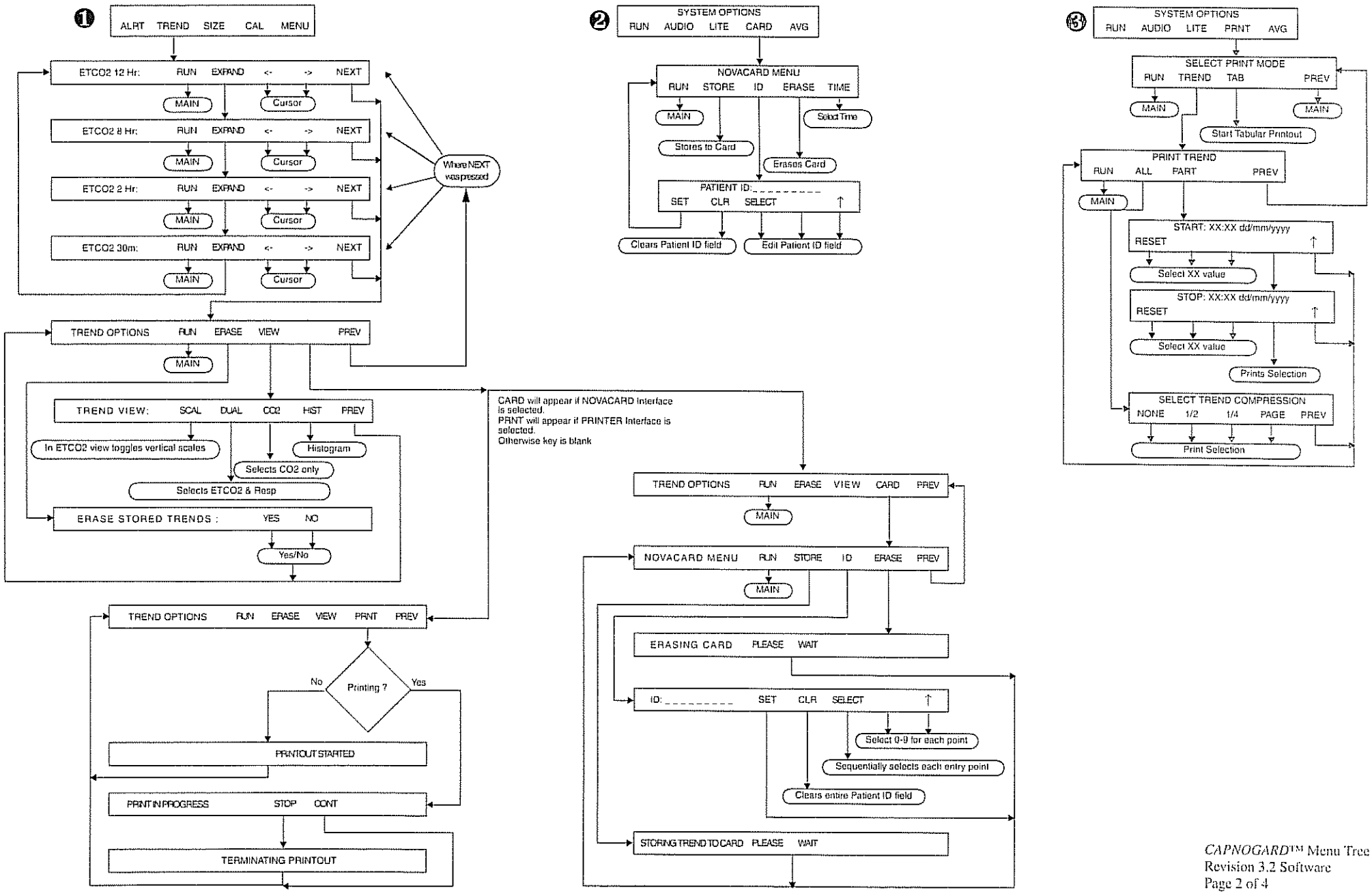
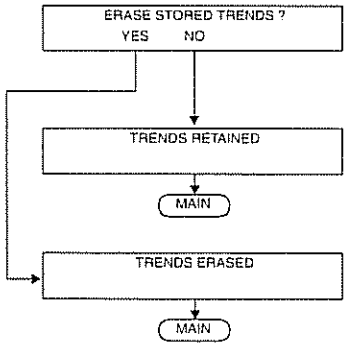
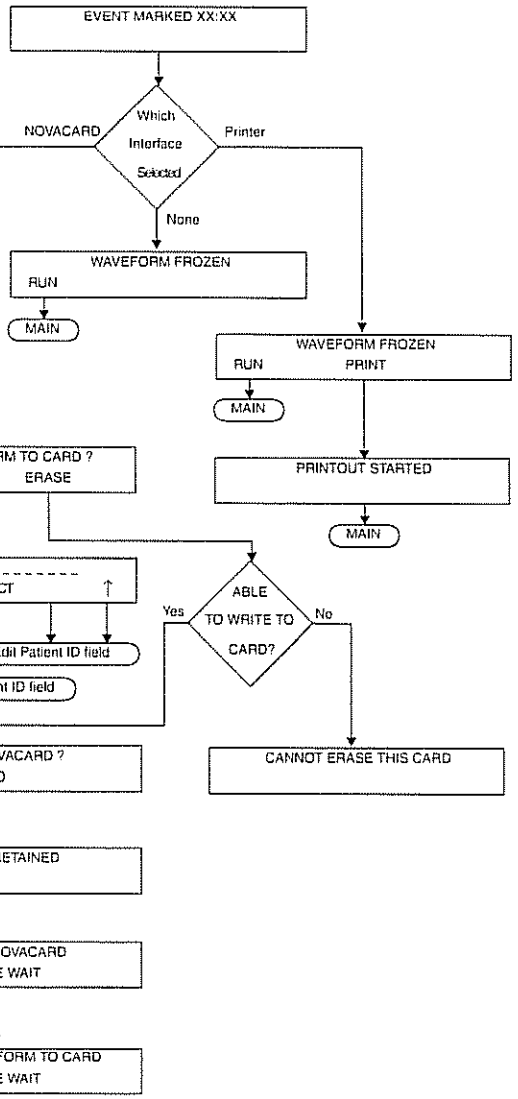

1
ALRT TREND SIZE CAL MENU
ETCO2 12 Hr: RUN EXPAND <- -> NEXT
ETCO2 8 Hr: RUN EXPAND <- -> NEXT
ETCO2 2 Hr: RUN EXPAND <- -> NEXT
ETCO2 30m: RUN EXPAND <- -> NEXT
MAIN
Cursor
Where NEXT was pressed
TREND OPTIONS RUN ERASE VIEW PREV
TREND VIEW: SCAL DUAL CO2 HIST PREV
In ETCO2 view toggles vertical scales
Histogram
Selects CO2 only
Selects ETCO2 & Resp
ERASE STORED TRENDS : YES NO
Yes/No
CARD will appear if NOVACARD Interface is selected.
PRNT will appear if PRINTER Interface is selected.
Otherwise key is blank
TREND OPTIONS RUN ERASE VIEW PRNT PREV
Printing ?
No
Yes
PRINTOUT STARTED
PRINT IN PROGRESS STOP CONT
TERMINATING PRINTOUT
2
SYSTEM OPTIONS
RUN AUDIO LITE CARD AVG
NOVACARD MENU
RUN STORE ID ERASE TIME
Select Time
Stores to Card
Erases Card
PATIENT ID: _ _ _ _ _ _ _ _
SET CLR SELECT
Clears Patient ID field
Edit Patient ID field
TREND OPTIONS RUN ERASE VIEW CARD PREV
NOVACARD MENU RUN STORE ID ERASE PREV
ERASING CARD PLEASE WAIT
ID: _ _ _ _ _ _ _ _ SET CLR SELECT
Select 0-9 for each point
Sequentially selects each entry point
Clears entire Patient ID field
STORING TREND TO CARD PLEASE WAIT
3
SYSTEM OPTIONS
RUN AUDIO LITE PRNT AVG
SELECT PRINT MODE
RUN TREND TAB PREV
Start Tabular Printout
PRINT TREND
RUN ALL PART PREV
START: XX:XX dd/mm/yyyy
RESET
Select XX value
STOP: XX:XX dd/mm/yyyy
Prints Selection
SELECT TREND COMPRESSION
NONE 1/2 1/4 PAGE PREV
Print Selection

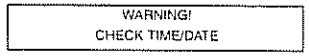
This menu is displayed for approximately 8 seconds on power-up, if neither key is pressed the Main Menu will appear.



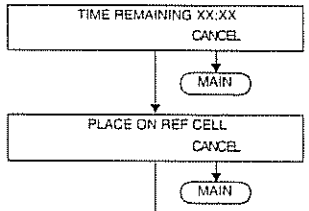
Pressing the EVENT key while in the Main Menu



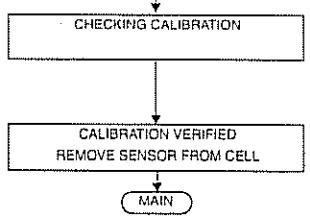
If mains and battery power is removed from the main board, when power is reapplied and the monitor is turned on this will appear for 3 seconds on power-up.



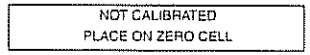
Placing Capnostat on Zero Cell



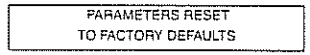
Placing Capnostat on Reference Cell after zero calibration.



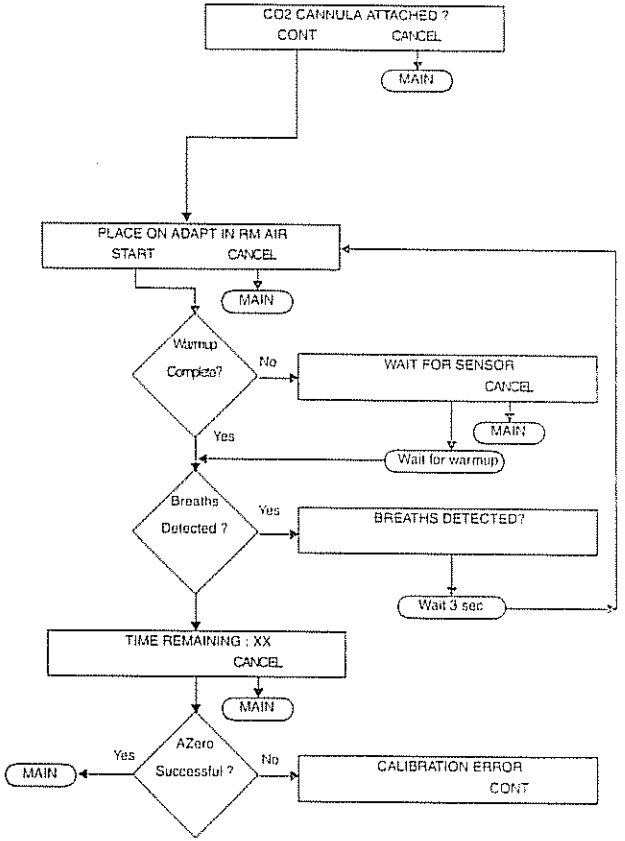
Place Capnostat on Reference Cell without Zero calibration first.

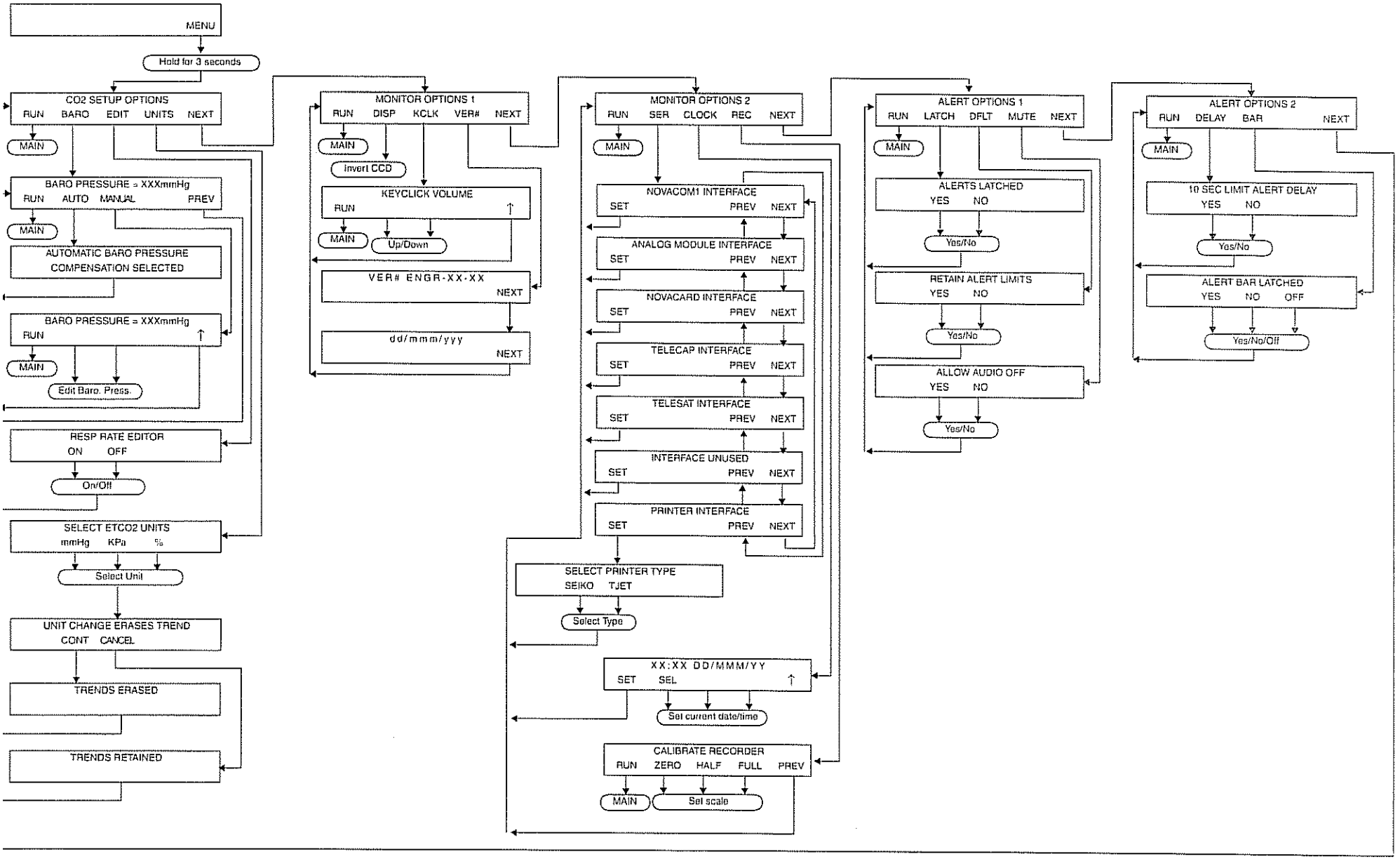


Appears when monitor is powered up for factory default settings.



When the pump is turned on in the SET SAMPLING PUMP menu CAL CO2 CANNULA will appear on the display. Pressing the CAL key will produce the following menu sequence.




MENU
Hold for 3 seconds
CO2 SETUP OPTIONS
RUN BARO EDIT UNITS NEXT
MAIN
BARO PRESSURE = XXXmmHg
RUN AUTO MANUAL PREV
MAIN
AUTOMATIC BARO PRESSURE COMPENSATION SELECTED
BARO PRESSURE = XXXmmHg
RUN
MAIN
Edit Baro. Press.
RESP RATE EDITOR
ON OFF
On/Off
SELECT ETCO2 UNITS
mmHg KPa %
Select Unit
UNIT CHANGE ERASES TREND
CONT CANCEL
TRENDS ERASED
TRENDS RETAINED
MONITOR OPTIONS 1
RUN DISP KCLK VER# NEXT
MAIN
Invert CCD
KEYCLICK VOLUME
RUN
MAIN
Up/Down
VER# ENGR-XX-XX
NEXT
dd/mmm/yyy
NEXT
MONITOR OPTIONS 2
RUN SER CLOCK REC NEXT
MAIN
NOVACOM1 INTERFACE
SET PREV NEXT
ANALOG MODULE INTERFACE
SET PREV NEXT
NOVACARD INTERFACE
SET PREV NEXT
TELECAP INTERFACE
SET PREV NEXT
TELESAT INTERFACE
SET PREV NEXT
INTERFACE UNUSED
SET PREV NEXT
PRINTER INTERFACE
SET PREV NEXT
SELECT PRINTER TYPE
SEIKO TJET
Select Type
XX:XX DD/MMM/YY
SET SEL
Set current date/time
CALIBRATE RECORDER
RUN ZERO HALF FULL PREV
MAIN
Set scale
ALERT OPTIONS 1
RUN LATCH DFLT MUTE NEXT
MAIN
ALERTS LATCHED
YES NO
Yes/No
RETAIN ALERT LIMITS
YES NO
Yes/No
ALLOW AUDIO OFF
YES NO
Yes/No
ALERT OPTIONS 2
RUN DELAY BAR NEXT
MAIN
10 SEC LIMIT ALERT DELAY
YES NO
Yes/No
ALERT BAR LATCHED
YES NO OFF
Yes/No/Off

Section 9 *Status Messages*

Various status messages may appear on the *CAPNOGARD* display. These messages are listed in the following table with an explanation of the probable causes.

Message Displayed	Possible Explanation
	$ETCO_2$ SECTION
CO2 SENSOR FAULTY 1	Try different sensor. If problem persists, a hardware error with the monitor most likely exists, or sensor is defective.
CO2 SENSOR FAULTY 2	The values stored inside the sensor's EEPROM failed the checksum test. Check that the sensor is properly plugged in. If problem persists, return the sensor to the factory for servicing.
CANNOT CALIBRATE THIS SENSOR	Occurrence of any of the following conditions - sensor is unplugged, over temperature, faulty, incompatible, or calibrator faulty.
CO2 SENSOR WARM-UP	The CO_2 sensor has not reached proper operating temperature. A cold sensor may take a few minutes to warm up; less time is necessary for a sensor at room temperature. Maximum warm-up time should be five minutes. Wait for sensor to stabilize, if error persists try different sensor. Other monitor functions are not affected.
WAIT FOR SENSOR	The sensor is unplugged, under temperature, over temperature, or temperature is stabilizing. Other monitor functions are not affected.
CHECK AIRWAY ADAPTER ADAPTER CAL?	Usually caused by blockage of the optical path of the sensor, or when the airway adapter is removed. May also be caused by failure to perform adapter calibration to correct for adapter type. Clean airway adapter if necessary, check calibration. Perform adapter calibration; if problem persists, perform zero calibration. Perform another adapter calibration if using another adapter.
CONNECT CO2 SENSOR	CO_2 sensor not plugged into the monitor. This message will be displayed until a sensor is plugged into the CO2 input connector.
CO2 SENSOR OVER-TEMP	Sensor temperature is greater than 50 degrees Celsius. Check that sensor is not exposed to excess heat. If message persists, a hardware problem is likely.
INCOMPAT. CO2 SENSOR	The EEPROM inside the sensor contains a code that identifies the format of the information contained in the EEPROM. If the code is not recognized by the monitor's software this message will occur. If this message occurs return the sensor to the factory for servicing.

Message Displayed	Possible Explanation
PLACE ON ZERO CELL	A calibration error has been detected, or a new sensor has been connected. Place the sensor on the zero cell to recalibrate.
CO2 ADAPTER CAL ERR	Error detected during Adapter cal. This will occur if Airway Adapter is not connected or if CO_2 gas is present in the Airway Adapter during airway zero. Perform an adapter calibration to correct; if problem persists, a possible hardware error exists.
ETCO2 OUT OF RANGE	The value being calculated is greater than 100 mmHg. If error persists, check calibration and perform a zero calibration if necessary.
NOT CALIBRATED PLACE ON ZERO CELL	An uncalibrated sensor has been placed on the reference cell before having been zero calibrated on the zero cell.
CHECK SAMPLING LINE	The monitor has detected a leak in the sampling system.
SAMPLE LINE BLOCKED	Indicates line blockage in the sampling system.
CAL CO2 CANNULA	Displayed when sampling system pump is turned on. Calibration necessary for proper operation of sensor and pump current monitoring.
BARO. PRESSURE ERROR	Monitor detects invalid readings from the barometric pressure measuring circuit.
MONITOR	
AUDIO OFF DISABLED	Displayed if user tries to enable Audio Off mode (by pressing and holding the **AUDIO** key) while the "Allow Audio Off" portion of the Options Menu is set to "No".
NOVAMETRIX MEDICAL SYSTEMS INC. CAPNOGARD SELF TEST IN PROGRESS.	Monitor is performing power-up system diagnostic tests that check the system RAM and ROM. If a failure in testing RAM is encountered, the monitor will flash three front panel LEDs. If a failure in ROM is encountered the two outer LEDs will flash. The monitor will not function in either case.
PARAMETERS RESET TO FACTORY DEFAULTS	Displayed when monitor is turned on while pressing the **ALERT RESET** key. Monitor is now using factory default settings. This message will also appear if new software has been installed. The monitor will perform a self test and check the RAM and ROM then reset to the factory default settings.
BATTERY VERY LOW PLUG IN AC POWER	Monitor is running on battery power and the battery power has been depleted. Connect line cord to AC Mains power source and set the rear panel switch to "I". Monitor's rear panel fuse has blown, monitor switched over to battery power and has depleted battery life.
WARNING! CHECK TIME/DATE	Displayed for approximately two seconds on power up if both AC Mains and battery power are removed from the main board. Set proper Time/Date to eliminate message from appearing on power up.

Section 10 External Devices

CAPNOGARD supports specific external RS232 serial devices: computer interface (*NOVACOM1*), Analog Module, and Memory Card (*NovaCARD*)[1]. and Telecap. Several printers are also supported and are discussed in "Using a Printer" on page 57.

NOVACOM1 Interface

The *NOVACOM1* interface is designed to output data in formats easily read by a computer or data logging device. The computer interface provides the user several communication modes to choose from. The communication format is 9600 baud, 8 bits, no parity, 1 stop bit and XON/XOFF handshaking.

Mode 1 — Real Time

In Real Time mode, the end tidal CO_2, respiratory rate and inspired CO_2 values for the $ETCO_2$ section are continually transmitted at one second intervals.

To enter Real Time mode, the computer must send an ASCII "1" character. The CAPNOGARD will echo back the "1" followed by a <cr><lf>, and enable real time communication. The data format is,

```
ME***R***I**Y**<cr><lf>
```

where;
M - Event Marker identifier, "M"= event marked, "-"= no event,
E - an identifier for the a 3-digit ASCII CO_2 value to follow,
R - an identifier for the 3-digit ASCII Resp. rate value to follow,
I - an identifier for the 2-digit ASCII Inspired CO_2 value to follow,
Y - an identifier for a 2-digit ASCII CO_2 status (message) value
*** - a 3-digit ASCII value,
** - a 2-digit ASCII value,
<cr><lf> - a carriage return, line-feed sequence.

CAUTION

If the units parameter is set to Kpa or % in the CO2 SETUP OPTIONS menu then the E*** and I** will include decimal characters and be in an E**.* format for End Tidal value, and I*.* for Inspired. This is an additional ASCII character in the sequence.

1.Telecap and printer interface mode are no longer supported.

The Y** (CO_2) values correspond to CAPNOGARD display messages (e.g., "Check Airway Adapter"). The messages corresponding to the displayed numbers are shown below.

Y** where ** is:	Capnometer messages
00	No Error
01	N/A
02	Connect CO_2 Sensor
03	CO_2 Sensor Overtemp
04	CO_2 Sensor Faulty
05	Incomp CO_2 Sensor
06	Calibrator Faulty
07	CO_2 Sensor Warm-up
08	(same as above)
09	Place on Zero Cell
10	(same as above)
11	CO_2 Zero Cal Error
12	N/A
13	CO_2 Adapter Cal Error
14	Cal on Airway Adpat
15	Check Airway Adapt
16	(same as above)
17	$ETCO_2$ Out of Range
18	N/A
19	Baro Press Error
20	Check Sampling Line
21	Sample Line Blocked

To exit Real Time mode, the computer must send an "x" or "X" character. The CAPNOGARD will echo the "x" and then stop real time communication.

Mode 3 — CO_2 Waveform

In CO_2 Waveform mode, the end tidal value, respiratory rate, inspired CO_2 and CO_2 error messages, are continually transmitted at one second intervals. CO_2 waveform data is also continually transmitted 48 times per second.

To enter CO_2 Waveform mode, the computer must send an ASCII "3" character. The CAPNOGARD will echo the "3" followed by a <cr><lf> and then enable communication. The data format is,

ME***R***I**Y**<cr><lf> (sent once a second)
c++<cr><lf> (sent 48 times a second)

where;
M - Event Marker identifier, "M"= event marked, "-"= no event,
E - an identifier for a 3-digit ASCII CO_2 value to follow,
R - an identifier for a 3-digit ASCII Resp. rate value to follow,
I - an identifier for the 2-digit ASCII Insp. CO_2 value to follow,
Y - an identifier for a 2-digit ASCII CO_2 status (error) value

*** - a 3-digit ASCII value,
** - a 2-digit ASCII value,
c - an identifier for a 2-digit waveform data point to follow,
++ - a 2-digit ASCII value (in the range 0-99),
<cr><lf> is a carriage return, line-feed sequence.

The Y** (CO_2-Error message) value represents the current status of the parameter. A value of "00"is returned if no error is active. Refer to "Mode 1 — Real Time" on page 59 for a complete list of error messages.

To exit CO_2 Waveform mode, the computer must send an ASCII "x" or "X" character. The CAPNOGARD will echo "x" and stop communication.

Mode 6 — Trend Download

Trend data is transmitted as a succession of records. The record size for CAPNOGARD is 24 bytes of hexadecimal ASCII data. A record can be one of two types, an INFO record or a DATA record. The INFO record contains monitor information such as time of day, date, limit settings, and units. The DATA record contains $ETCO_2$, respiration rate, inspired CO_2 values, event marker, audio disable indication.

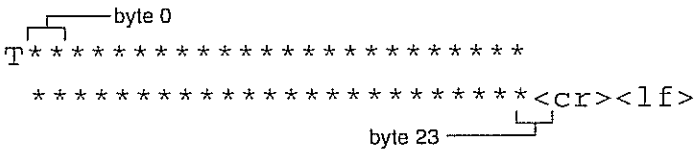
The first record sent is always an INFO record. This record reflects the oldest data in the buffer, then records would continue being sent in chronological order from the oldest record to the newest record. In normal monitoring use, an INFO record would be followed by 15 data records, followed by another INFO record and then another 15 data records, etc. Turning the monitor off, or changing the limits will disrupt this sequence. When this occurs, a new INFO record will be sent and indicate the time and date, along with the current limits. At this point, unless another exception occurs, the next INFO record will be followed by 15 DATA records.

An INFO record can be distinguished from a DATA record by the first byte of the record. The first byte of an INFO record is FF, the first byte of a DATA record is 00-C8 (0-200 decimal), or FB (pen lift or no data available). Any other values are not applicable. The DATA record uses 8 data points per parameter, at 8 second resolution, for a total of 64 seconds of trend data per data record.

To request trend download, the computer must send an ASCII "6" character. The monitor echoes back the "6" character and transmits the first INFO record.

The Mode 6 data format is:

INFO record;



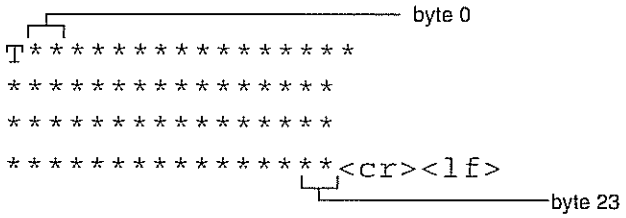
where:
T- Trend mode identifier
**-INFO byte, starting at byte 0 and ending at byte 23 (see below)

byte -0	flag byte = FF for INFO record
byte-1	information type (FE-power on, FD-limit change, FC-time stamp)
byte-2	model code = 1
byte-3	CO2 units (0=mmHg, 1=Kpa, 2=%)
byte-4	seconds 00-36 (0-59 decimal)
byte-5	minute 00-36 (0-59 decimal)

byte-6	hour 00-17 (0-23 decimal)
byte-7	day 01-1F (1-31 decimal)
byte-8	month 01-0C (1-12 decimal)
byte-9	year 00-63 (0-99 decimal)
byte-10	End Tidal limit, high
byte-11	End Tidal limit, low
byte-12	Resp. Rate limit, high
byte-13	Resp. Rate limit, low
byte-14 through byte-23	unused

<cr> - carriage return
<lf> - line feed

DATA record:



T - Trend mode identifier
**-DATA byte, starting at byte 0 and ending at byte 23 (see below)

byte 0-7	8 byte ETCO2 data, range: units mmHg 0-100, units Kpa 0-133,units % 0-133, 251-no data available over period (pen lift)
byte 8-15	8 byte respiration rate data, range: 0-150, 251 - no data available over period.
byte 16-23	8 byte inspired data, range: 0-30, 31 - no data available over period. EVENT marker on if MSB is set. AUDIO off is 2nd MSB is set.

<cr> - carriage return
<lf> - line feed

Mode d — Date and Time

Date and Time mode causes the CAPNOGARD to transmit, on request, the date and time as calculated by the monitor's internal calendar clock.

To request the date and time, the computer must send an ASCII "d" character. The monitor echoes back the "d" character and sends the date and time on the same line. The Mode d data format is;

d•MMM/DD/YY•hh:mm:ss<cr><lf>

where:

d - the echoed command character
▫ - is an ASCII space character
MMM - a 3-character month (Jan, Dec),
DD - a 2-digit ASCII day (01, 31),
YY - the last 2-digits of the year (1990 is 90),
hh - a 2-digit hour based on a 24 hour clock (00, 23),
mm - a 2-digit minute,
ss - a 2-digit second,
<cr><lf> is a carriage return, line-feed sequence.

Mode c — Clear Trends

Clear Trends mode allows the user to remotely clear the CAPNOGARD trend memory This action has the same result as the monitor's Clear Trend function in that trend memory and the Trend Page displays are cleared.

Note: Use this remote Clear Trends function with care as there is no way to undo the clear command once issued.

To clear the CAPNOGARD trend memory, the computer must send an ASCII "c" character. The CAPNOGARD will echo the "c" followed by a <cr><lf> and then the trend memory will be cleared.

Selecting NOVACOM1 Interface

To configure the CAPNOGARD to work with the NOVACOM1 computer Interface:

1. Press and hold the **MENU** key for 3 seconds. CO2 SETUP OPTIONS appears.
2. Repeatedly press the **NEXT** key until MONITOR OPTIONS 2 appears.
3. Press the **SER** (serial interface) key and the currently selected interface appears.
4. Press **PREV** (previous) or **NEXT** to select NOVACOM1 INTERFACE.
5. Press the **SET** key.
   The NOVACOM1 Interface is selected.
6. Press **RUN** to return to the Main Menu.

Selecting Analog Module Interface

To configure the CAPNOGARD to work with the Analog Module.

1. Press and hold the **MENU** key for 3 seconds. CO2 SETUP OPTIONS appears.
2. Repeatedly press the **NEXT** key until MONITOR OPTIONS 2 appears.
3. Press the **SER** (serial interface) key and the currently selected interface appears.
4. Press **PREV** (previous) or **NEXT** to select ANALOG MODULE INTERFACE.
5. Press the **SET** key.
   The Analog Module interface is selected.
6. Press **RUN** to return to the Main Menu.

Connecting the Analog Module

The CAPNOGARD must be configured for Analog Module Interface to operate with the Analog Output Module. See "Selecting Analog Module Interface" on page 63.

1. Connect the Analog Output Module to the monitor's rear panel RS232 connector.
2. Tighten the two spring loaded screws that secure the Analog Module to the rear panel.
3. Connect the interface cable to the Analog Module's 25 pin connector.

   The Interface Cable PN: 6045-00 connects to the 15 pin D connector on the Analog Module then terminates to six twisted-pair wires. The six twisted-pair wires on the open end of the interface cable correspond to channels 0-5 as listed below. Connect these wires to the analog recorder.

Channel	Parameter	Pin No.	Wire Pair	Specifications
0	End Tidal Value	1	Black/White	10 mv=1 Torr
1	Resp. Rate	3	Brown/White	7mv=1 breath/min
2	Capnogram	5	Red/White	10mv=1 Torr
3	Not used in CAPNOGARD			
4				
5				
-	Alert Output	15	-	active low

The White wire on all twisted pairs is the reference (ground).

Calibrating External Recorder

To set up external devices such as strip chart recorders by outputting zero, mid, and full scale reference voltages for each parameter. The Analog Module Interface must be programmed in order to proceed. See "Selecting Analog Module Interface" on page 63 and "Connecting the Analog Module" on page 64.

1. Press and hold the **MENU** key for 3 seconds. CO2 SETUP OPTIONS appears.
2. Repeatedly press the **NEXT** key until MONITOR OPTIONS 2 appears.
3. Press the **REC** key. CALIBRATE RECORDER appears.

   If the Analog Module has not been programmed as a serial interface, the **REC** key will not appear. See "Selecting Analog Module Interface" on page 63.
4. Press **ZERO**, **HALF**, or **FULL** as desired.

   Press **ZERO** for zeroing all channels, this will program zero volts on all parameter channels.

   Press **HALF** for half scale, each parameter will be set to 0.5 volts.

   Press **FULL** for full scale, each parameter will be set to 1.0 volts.
5. Press **RUN** or **PREV** as desired.

   Press **RUN** to return to the Main Menu.

   Press **PREV** to return to MONITOR OPTIONS 2 menu.

The NovaCARD Data Archive System

The CAPNOGARD can store patient trend information and waveforms into a memory card through the use of the *NovaCARD* Data Archive System. The *NovaCARD* Writer Module connects to CAPNOGARD's rear panel RS232 connector; see "Selecting NovaCARD Interface" on page 65. The information stored in the memory card can then be read by a computer using the *NovaCARD* Reader.

For more information on the *NovaCARD* Data Archive System, refer to the *NovaCARD* User's Manual (Cat. No. 6065-23).

Selecting NovaCARD Interface

To configure the CAPNOGARD to operate with the *NovaCARD* Data Archive System:

1. Press and hold the **MENU** key for 3 seconds. CO2 SETUP OPTIONS appears.
2. Repeatedly press the **NEXT** key until MONITOR OPTIONS 2 appears.
3. Press the **SER** (serial interface) key and the currently selected interface appears.
4. Press **PREV** (previous) or **NEXT** to select NOVACARD INTERFACE.
5. Press **RUN** to return to the Main Menu.

   When NOVACARD INTERFACE is selected, a **CARD** softkey is added to the SYSTEM OPTIONS menu. A STORE WAVEFORM TO CARD? prompt appears when the **EVENT** key is pressed and the waveform is frozen.

Connecting the NovaCARD Writer Module

The CAPNOGARD must be configured for *NovaCARD* Interface to operate with the *NOVACARD* Data Archive System. See "Selecting NovaCARD Interface" on page 65.

1. Connect the *NovaCARD* Writer Module to the RS-232 connector on the rear of the monitor.
2. Tighten the two spring-loaded screws that secure the module to the rear panel.

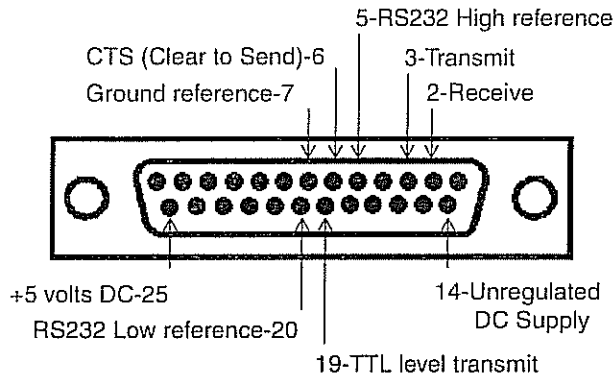
   Ensure that there are no cards inserted at this time, to allow access to the spring-loaded mounting screws.

TeleCap and Printer Interfaces

These menu options are no longer supported and should not be selected.

Rear Panel RS232C Pinout

The pinout diagram for the RS232C connector on the CAPNOGARD monitor's rear panel is shown below



Section 11 Maintenance

This section contains CAPNOGARD monitor and accessory maintenance information.

Cleaning and Disinfection

Follow the cleaning and disinfection instructions listed below to clean and/or disinfect the monitor and its accessories.

Monitor

- Turn the monitor off and unplug the line cord from the AC power source before cleaning.
- The monitor can be cleaned and disinfected with solutions such as a 70% isopropyl alcohol or 10% bleach solution. Then wipe down with a water-dampened clean cloth to rinse. Dry before use.
- Do not immerse the monitor.
- Do not attempt to sterilize the monitor.

CAPNOSTAT CO_2 Sensor

- Clean the sensor surface with a damp cloth.
- Ensure the sensor windows are clean and dry.
- Do not immerse the CAPNOSTAT CO_2 Sensor.
- Do not attempt to sterilize the CAPNOSTAT CO_2 Sensor.

Reusable Adult Airway Adapter

- The Adult Airway Adapter (Cat. No. 7007) may be cleaned by rinsing in a warm soapy solution, followed by soaking in a liquid disinfectant, or pasteurized, or cold sterilized (gluteraldehyde). It should then be rinsed out with sterile water and dried.
- The Adult Airway Adapter (Cat. No. 7007) may be sterilized using steam autoclave or ETO (ethylene oxide) gas methods. Be sure to use appropriate aeration times.
- Before reusing the adapter, ensure the windows are dry and residue-free, and that the adapter has not been damaged during handling or by the cleaning and sterilization process.

Reusable Neonatal Airway Adapter

- The Neonatal Airway Adapter (Cat. No. 7053) may be cleaned by rinsing in a warm soapy solution, followed by soaking in a liquid disinfectant, or pasteurized, or cold sterilized (gluteraldehyde). It should then be rinsed out with sterile water and dried.
- The Neonatal Airway Adapter (Cat. No. 7053) may be sterilized using ETO (ethylene oxide) gas methods. Be sure to use appropriate aeration times.
- Before reusing the adapter, ensure the windows are dry and residue-free, and that the adapter has not been damaged during handling or by the cleaning and sterilization process.

External Sampling System Components

- The Nasal Sampling Cannulas are single-patient use.
- The Sampling Airway Adapter with tubing (Cat. No. 5843) may be cleaned by rinsing in a warm soapy solution, followed by soaking in a liquid disinfectant. It should then be rinsed out with sterile water and dried.

Single Patient Use Airway Adapters

- Treat all single patient use airway adapters in accordance with hospital protocol for single patient use items.

Internal Sampling System Components

Acceptable fluids for cleaning/sterilizing the internal pneumatic parts of the Sampling System include; Isopropyl alcohol, Cidex™ or equivalent, or a 5.25% water solution by weight of sodium hypochlorite (bleach).

CAUTION

Do not attempt to pump cleaning/sterilizing liquid with the sampling pump. This may cause accelerated wear on the pump bearings. Always flush liquids with a syringe as described in the following instructions.

To clean/sterilize the pumping system;

1. Turn the monitor off and disconnect the line cord.
2. Remove both the Sampling Inlet tubing set and the Sampling Exhaust tubing (if any).
3. Attach an exhaust port line (1/8 inch or 3/16 inch I.D. tubing) from the Sampling Exhaust port to a suitable container located below the bottom level of the monitor.
4. Use a 60 cc catheter tip syringe. Fit it to the Sampling Inlet connector. Flush the sterilizing solution slowly through the pumping system. Push the entire 60 cc of solution through the Sampling Inlet. Repeat this process two (2) more times—a total of 180 cc of solution.
5. Remove the syringe and leave the cleaning/sterilizing fluid within the sampling pump system for 30 minutes. This will disinfect. Follow sterilant manufacturers instructions for sterilization times.
6. After 30 minutes, fill the syringe with distilled water and flush the system three (3) times. Allow the cleaning/sterilization solution and distilled water to drain through the Sampling Exhaust output.
7. Push several syringes of air slowly through the system to ensure that most of the liquid has been drained.

8. Follow this with at least three (3) more pushes of distilled water, followed by at least two (2) more pushes of air to ensure that most of the distilled water has been drained.
9. Remove the syringe from the unit. Do not connect the Sampling Inlet tubing. Connect the line cord and turn the monitor on. Allow the sampling pump to operate for several minutes. This will help to remove any trapped water.
10. Connect a Sampling Tubing set to the Sampling Inlet.
11. Block the open end of the tubing with your finger. Alternate blocking and unblocking the tubing end at least ten (10) times. Use a quick, brisk motion when blocking and unblocking the tubing. Keep the tubing blocked and unblocked for several seconds at a time.
12. Repeat the same blocking and unblocking action with your finger on the Sampling Exhaust port.
13. Allow the Sampling System to run for at least 30 minutes without the Sampling Assembly tubing and the Sampling Exhaust tubing (if any) connected. This will speed dry the system pneumatics.
14. Once these cleaning/sterilization instructions have been completed, normal Sampling System operation can be resumed. See "Sampling Airway Adapter" on page 25.

Maintenance Schedules

When the monitor powers-up, a self test is performed which checks the internal electronics of the monitor. If this self test fails, remove the monitor from use and contact qualified service personnel.

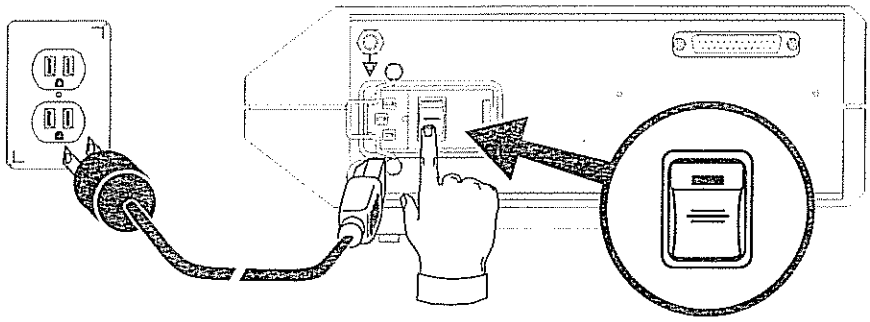
The monitor should undergo routine inspection and safety checks on a quarterly basis or according to hospital protocol. The CAPNOGARD Service Manual (Catalog No. 5555-90) contains procedures and safety test instructions, component parts lists, circuit diagrams, theory of operation and other information to assist qualified service personnel in servicing the monitor.

Battery Maintenance

If the monitor has not been used or powered by AC Mains for an extended time[1] (3 months or more) allow the battery to charge for 12 hours before use. The monitor may not power up on battery power if the battery is not sufficiently charged. Allow the battery to charge for 12 hours before initial use, refer to the following diagram for charging instructions.

1 The internal battery may slowly discharge over long periods of non-use.

To charge the battery, connect the line cord to an AC source and set the rear panel power switch ON (I). Check that the front panel ∿ icon is green. Charge the battery for 12 hours.



If the battery requires replacement refer to the CAPNOGARD Service Manual (Catalog No. 5555-90) for instructions. Have this procedure performed by qualified service personnel only, there are no user serviceable parts inside the monitor.

WEEE/RoHS Recycling Directives

Waste electrical and electronic equipment and restriction of the use of certain hazardous substances in electrical and electronic equipment (WEEE/RoHS) recycling directives.

Compliant with the WEEE/RoHS recycling directives.

If you are subject to the WEEE/RoHS directives, refer to www.respironics.com for the passport for recycling this product.

Section 12 Specifications

General

Specifications for the CAPNOGARD $ETCO_2$ Monitor, Model 1265, are listed for informational purposes only, and are subject to change without notice.

Capnograph

- Principle of Operation: Non-Dispersive Infrared (NDIR) absorption, dual wavelength ratiometric-True Single Beam Optics
- Sensor Type: "Mainstream" system eliminates the need for and cost of sample lines, water traps, and waste gas scavenging
- Warm-up Time: Operational in 30 seconds, 20 minutes to full specification
- Response Time: Less than 75 ms
- Calibration: Simple one step calibration (less than 20 seconds)
- O_2/N_2O Compensation: Operator selectable
- Barometric Pressure Compensation: Automatic and manual over-ride (range 560-800 mmHg)[1]
- CAPNOSTAT® CO_2 Sensor and Airway Adapter:
  Weight: Less than 2 oz. (57 grams) without cable
  Sensor Size: 1 3/4 x 1 1/2 x 3/4 inches, 10 foot cable (4.45 x 3.81 x 1.91 cm, 3.05 m cable)
  Construction: Durable high performance plastic, ultra-flexible cable
  Shock Resistant: Sensor will withstand a 6 foot drop to a tile floor
- Airway Adapter: Disposable or reusable, less than 5 cc deadspace, meets ANSI Z-79
- End Tidal CO_2
  Range: 0-100 mmHg, CO_2 partial pressure
  Accuracy: 0-40 mmHg ± 2 mmHg, 41-100 mmHg 5% of reading
  Stability: ± 2 mmHg
  Display Resolution: 0-50 mmHg scale 0.9 mmHg, 0-75 mmHg scale 0.6 mmHg
- Respiratory Rate
  Range: 0-150 br./min
  Accuracy: ± 1 br./min

1. Monitors with version 1.9 software do not have automatic barometric pressure compensation, pressure compensation is manually selectable from 560-800 mmHg. Monitors with version 1.9 software are identified by an "L" in the serial number suffix.

Monitor Specifications

- Operating Environment: 50-104° F (10-40° C), 0-90% relative humidity (non-condensing)
- Size: Height 3.3 in. (8.38 cm), Width 9 in. (22.86 cm), Depth 8 in. (20.32 cm)
- Weight: 8 pounds (3.63 kg)
- Power: 100-120/200-240 V~, 50-60 Hz, 40VA
- Fuse Rating: F2X: 0.5 A 250 V~T 100-120 V~ or F2X: 250 mA 250 V~T 200-240 V~
- Battery: Lead-acid gel-cell, 2 hour life (on-screen life indicator), recharge 12 hours
- Display: SuperBright™ 1.5 x 5 inch (3.08 x 12.7 cm) Cold Cathode Display (CCD)

Additional Features

- Alert Limits: Operator selectable, automatic or menu selected High and Low limits for $ETCO_2$ and Respiratory Rate. Visible alert is immediate, audible alert occurs 10 seconds after violation of set limit
- 2-Minute Suspend: When **AUDIO** key is pressed, deactivates audible alerts for two minutes. Indicated by illuminated 2 minute LED
- Audio Off: Press and hold **AUDIO** key for 3 seconds to deactivate audible alerts. Indicated by flashing Audio Off LED
- Trend Memory: 24 hour trend memory capacity. Battery backed. On-screen 12 hr., 8 hr., 2 hr., or 30 minute graphical and histogram displays. User defined Events are stored in memory. Trend and Histogram information can be printed.
- Digital Data Output: Serial (RS232) data output.
- Analog Output Module (Optional): Provides outputs for strip chart recorder applications CO_2 10 mV/Torr, Respiratory Rate 7 mV/br./min., Capnogram 0-1.0 V max.
- Sampling System: Standard. Allows gas sampling of non-intubated patients.
- Neonatal Airway Adapter: Less than 0.5 cc deadspace
- Internal Real Time Clock
- Alert Bar
- *NovaCARD* Interface for data archiving (optional)

Section 13 *Electromagnetic Compatibility*

Medical equipment needs special precautions regarding electromagnetic compatibility (EMC) and needs to be installed and put into service according to the EMC information provided in this document.

The CAPNOGARD® monitor, Model 1265 complies with IEC 60601-1-2:2001, providing reasonable protection against electromagnetic interference in a typical medical installation. The equipment generates, uses and can radiate electromagnetic interference (EMI), and if not installed and used in accordance with the instructions, may cause interference with other devices in the vicinity.

If interference does occur, correct it using one or more of the following measures:

- Move the receiving device or increase separation between the equipment.
- Consult Respironics or members of the hospital's engineering department for more information.

Warnings

Warning: Indicates a potentially harmful condition that can lead to personal injury

- The use of portable and mobile radio frequency (RF) communications equipment can affect this and other pieces of medical equipment.
- The use of accessories, sensors and cables other than those specified by Respironics may increase emissions or decrease immunity of the equipment.
- The monitor should not be used adjacent to or stacked with other equipment; if adjacent or stacked use is necessary, the equipment should be observed to verify normal operation in the configuration in which it will be used.

Cautions

Caution: Indicates a condition that may lead to equipment damage or malfunction.

- Observe precautions for electrostatic discharge (ESD) and electromagnetic interference (EMI) to and from other equipment.
- Where electromagnetic devices (i.e., electrocautery) are used, patient monitoring may be interrupted due to electromagnetic interference. Electromagnetic fields up to 3 V/m will not adversely affect system performance.
- Sudden erratic changes in equipment performance that do not correlate to the physiological condition of the patient may be signs that the monitor is experiencing electromagnetic interference.

Electromagnetic Emissions

Guidance and manufacturer's declaration - Electromagnetic emissions		
The Model 1265 is intended for use in the electromagnetic environment specified below. The customer or user of the Model 1265 should assure that it is used in such an environment.		
Emissions Test	**Compliance**	**Electromagnetic environment - guidance**
RF emissions CISPR 11	Group 1	The Model 1265 uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby equipment.
RF emissions CISPR 11	Class A	Class A: The Model 1265 is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

Electromagnetic Immunity

Guidance and manufacturer's declaration - Electromagnetic immunity			
The Model 1265 is intended for use in the electromagnetic environment specified below. The customer or user of the Model 1265 should assure that it is used in such an environment.			
Immunity Test	**IEC 60601 test level**	**Compliance level**	**Electromagnetic environment - guidance**
Electrostatic Discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	±4 kV contact ±4 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines ±1 kV for input/ output lines	±2 kV for power supply lines ±1 kV for input/ output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±1 kV differential mode ±2 kV common mode	±1 kV differential mode ±2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5% U_T (>95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycle 70% U_T (30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 sec.	<5% U_T (>95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycle 70% U_T (30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 sec.	Mains power quality should be that of a typical commercial or hospital environment. If the user of the Model 1265 requires continued operation during power interruptions, it is recommended that the Model 1265 be powered from an uninterruptible power supply or a battery.

Guidance and manufacturer's declaration - Electromagnetic immunity (Continued)			
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE: U_T is the a.c. mains voltage prior to the application of the test level			

Guidance and manufacturer's declaration - Electromagnetic immunity

The Model 1265 is intended for use in the electromagnetic environment specified below. The customer or user of the Model 1265 should assure that it is used in such an environment.

Immunity Test	IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
			Portable and mobile RF communications equipment should be used no closer to any part of the Model 1265, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommended separation distance:**
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	3 Vrms 150 kHz to 80 MHz	$d = \left[\frac{3.5}{V_1}\right]\sqrt{P}$
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.5 GHz	3 V/m 80 MHz to 2.5 GHz	$d = \left[\frac{3.5}{E_1}\right]\sqrt{P}$ $d = \left[\frac{7}{E_1}\right]\sqrt{P}$ where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strength from fixed RF transmitters, as determined by an electromagnetic site survey[a], should be less than the compliance level in each frequency range.[b] Interference may occur in the vicinity of equipment marked with the following symbol: 

NOTE 1: At 80 MHz and 800MHz, the higher frequency range applies.

NOTE 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

a. Field strengths from transmitters, such as base stations for radio (cellular, cordless) telephones and land mobile radios. amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the Model 1265 is used exceeds the applicable RF compliance level above, the equipment should be observed to verify normal operation. If abnormal operation is observed, additional measures may be necessary, such as reorienting or relocating the Model 1265.

b. Over the frequency range of 150 kHz to 80MHz, field strengths should be less than 3 V/m.

Recommended separation distances between portable and mobile RF communications equipment and the Model 1265

The Model 1265 is intended for use in the electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the Model 1265 can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the Model 1265 as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter (Watts)	Separation distance according to the frequency of transmitter (meters)		
	150 kHz to 80 MHz $d = \left[\frac{3.5}{V_1}\right]\sqrt{P}$	80 MHz to 800 MHz $d = \left[\frac{3.5}{E_1}\right]\sqrt{P}$	800 MHz to 2.5 GHz $d = \left[\frac{7}{E_1}\right]\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.37	0.37	0.74
1	1.2	1.2	2.3
10	3.7	3.7	7.4
100	12	12	23

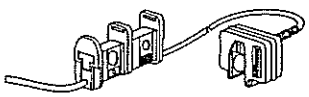
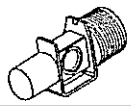
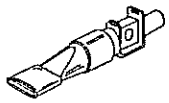
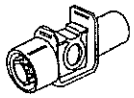
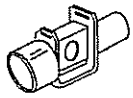
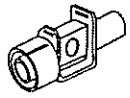
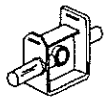
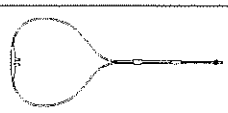
For transmitters rated at a maximum output power not listed above, the recommended separation distance *d* in meters (m) can be estimated by using the equation applicable to the frequency of the transmitter, where *P* is the maximum power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1: At 80 MHz and 800MHz, the separation distance for the higher frequency range applies.

NOTE 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

Section 14 Accessories

CAPNOGARD™ Capnograph

Catalog No.	Description
	CAPNOGARD®
5555-00	***CAPNOGARD®* Capnograph Monitor**, Model 1265 includes CAPNOSTAT® CO_2 Sensor (7167)
	CAPNOSTAT® CO_2 SENSOR
7167-00	**CAPNOSTAT® CO_2 Sensor** 
	SINGLE-PATIENT USE CO_2 AIRWAY ADAPTERS
6063-00	**Single-Patient Use Adult Airway Adapters** (10 per box) 
6421-00	**Single-Patient Use Adult Airway Adapters** with mouthpiece (10 per box) 
6312-00	**Single-Patient Use Neonatal Airway Adapters** (10 per box) 
	REUSABLE CO_2 AIRWAY ADAPTERS
7007-01	**Adult Airway Adapters** (1 per box)
7007-00	**Adult Airway Adapters** (10 per box) 
7053-01	**Neonatal Airway Adapters** (1 per box)
7053-00	**Neonatal Airway Adapters** (10 per box) 
	CO_2 SAMPLING ADAPTER AND ACCESSORIES
5843-01	**Sampling Airway Adapters** with tubing (1 per box)
5843-00	**Sampling Airway Adapters** with tubing (10 per box) 
8781-00	**Nasal CO_2 Sampling Cannula—Adult,** Single Patient Use (10 per box)
8780-00	**Nasal CO_2 Sampling Cannula—Pediatric,** Single Patient Use (10 per box) 

Catalog No.	Description
8906-00	**Nasal CO_2 Sampling and O_2 Delivery Cannula—Adult,** Single Patient Use (10 per box)
8907-00	**Nasal CO_2 Sampling and O_2 Delivery Cannula—Pediatric,** Single Patient Use (10 per box)
9675-00	**Sidestream Sampling Kit** Includes Elbow-airway-adapter, Filter and 10 ft. Sample Line (10 per bag)
9906-00	**Replacement Filters** for Sidestream Sampling Kit (50 per bag)
3121-00	**Sampling Tubing Kit** Used to connect Single Patient Use Sampling Adapter to monitor (10 per bag)
5816-34	**Nasal CO_2 Sampling Starter Kit,** includes one each Sampling Airway Adapter with Tubing (5843), Nasal CO_2 Sampling Cannula—Adult (8781), & Dehumidification Tubing (8908)
8908-00	**Dehumidification Tubing** (10 per box)
	CAPNO$_2$mask™
9960PED-00	***CAPNO$_2$mask***™ - Pediatric O_2 Delivery/CO_2 Mainstream Monitoring Mask (10 per bag)
9960STD-00	***CAPNO$_2$mask***™ - Adult Standard O_2 Delivery/CO_2 Mainstream Monitoring Mask (10 per bag)
9960LGE-00	***CAPNO$_2$mask***™ - Adult Large O_2 Delivery/CO_2 Mainstream Monitoring Mask (10 per bag)
	OUTPUT OPTIONS—ANALOG, DIGITAL & PRINTER
5963-00	**Analog Output Module** for *CAPNOGARD®, CO_2SMO®, and CO_2SMO Plus!®*
6045-00	**Cable,** for 5963-00 Analog Output Module (open ended, 6 ft)
5334-00	**Cable,** Serial Output to Personal Computer (PC with 25-pin connector)
5335-00	**Cable,** Serial Output to Personal Computer (PC with 9-pin connector)
	ACCESSORIES
420022	***CAPNOGARD®* Model 1265 Inservice Video,** VHS video tape (NTSC format)
7106-10	**Transport Pouch,** for Models 515/520A/860/1265/7100
7104-10	**Side Accessory Pouch,** (included with monitor)
8751-00	**CAPNOSTAT® CO_2 Sensor Cable Holding Clips** (50 per box)
600026	**Power Cord,** (included with monitor)
6934-00	**Cable Management Straps,** for use with the CAPNOSTAT® CO_2 Sensor. Organizes and holds multiple cables and tubings (package of 5).