About This Program

The purpose of this program is to take you on a brief in-service of SmartMonitor 2 functions and features. You will learn how to perform the basic operations. Detailed information about the functions described here is also provided in the SmartMonitor 2 Professional Operators Manual.

This program is intended to provide supplemental training for health care professionals who are involved in the setup and use of the SmartMonitor 2.

Preparation

To complete this program, the following items are needed:

- SmartMonitor 2 Self-Study Program
- SmartMonitor 2
- Patient Cable
- Lead Wires
- Electrodes
- Power Supply
- PCMCIA (PC) Card
- Simulator
- Direct Connect Cable
- Computer with Synergy-E™ Software (version 2.0)
- SmartMonitor 2 Professional Operators Manual (optional)
- Pencil/Pens
- #1 Phillips Head Screwdriver

You may also wish to refer to the Synergy-E version 2.0 operators manual.
In-Service Objectives

- The user of this program will become familiar with the basic features of the SmartMonitor 2.

- Upon completion of this program, the user will be able to:
  - Identify components needed for the SmartMonitor 2 operation
  - Program the SmartMonitor 2 with parameters prescribed by the physician.
  - Properly set up the infant
  - Understand basic troubleshooting
  - Download patient data

Timing

This program is designed as a self-study course and should take the user approximately 60 minutes to complete.
Welcome to the SmartMonitor 2 self-study program. This program provides a quick tour of the Smart Monitor 2. In the demonstration you will follow precise directions and answer questions related to the actions you perform. In the back of this program you will find answers to the questions. Upon completion of this demonstration, the caregiver will be able to appreciate the features and benefits of the SmartMonitor 2.

SmartMonitor 2 is an apnea monitor designed to monitor and record the baby’s breathing (respiration) and heart (cardiac) activity. It alerts the caregiver if either of these activities exceeds the limits prescribed by the physician.

SmartMonitor 2 receives signals via electrodes attached to the patient and directly connected to the monitor, or from devices connected to the auxiliary inputs of the monitor. The monitor records and stores waveforms from patient events and logs equipment events in memory for review and analysis by a Heath Care Professional.

Smart Monitor 2 also records up to four analog outputs of other devices that detect signals such as oximetry, airflow and pH via auxiliary connections. Most external devices with an analog output of −1.25 to +1.25 volts can be interfaced with SmartMonitor 2 via an auxiliary box (p/n H4010).

The Synergy-E™ (host) software is used for retrieval of data recorded by the SmartMonitor 2. Once downloaded, the recorded data can be scored and analyzed.

The system also has some unique features including:

- 2 MB Internal Memory Capacity
- Universal picture symbols to simplify patient training
- Small and light weight for increased portability
- Ability to program the monitor manually or via a computer
- Optional internal modem
- Automated downloads via the Synergy-E Automatic Retrieval Center
- PCMCIA card for faster download capability
When you receive the SmartMonitor 2, make sure that you have all the necessary items and that they are not damaged. Immediately report anything missing or damaged to Respironics. The standard package should include the following:

1. SmartMonitor 2
2. Soft Carrying Case (not shown here)
3. Power cord/battery charger
4. Parent’s Guide
5. Patient Cable
6. 1 pair of Electrodes
7. 1 pair of Safety Lead Wires
8. 1 Electrode Belt
9. Symbol Reference Card (not shown)

Model 4003 also includes a 2 to 1 phone jack adapter and a phone line.
First we will look at the key features of the SmartMonitor 2. You will notice the buttons:

**Power Button** – The gray POWER button turns the SmartMonitor 2 on.

**Reset Button** – The blue RESET button is used for a number of functions.

- Resets the alarm lights on the SmartMonitor 2.
- Silences the Memory Full (or Memory Almost Full) and Low Battery Warning alarms.
- Answers a ringing modem phone call in order to download when monitor is in monitoring mode.
- The RESET button will not silence patient or loose lead alarms.

Now let’s turn the monitor on and off.

**TURN THE MONITOR ON:**
- Press and then release the gray POWER button.

**TURN THE MONITOR OFF:**
- Press and hold the blue RESET button.
- Press and then release the gray POWER button.
- Wait 2 seconds, then release the RESET button.

It is also important to understand the sibling alarm. If the monitor is turned off incorrectly, a continuous alarm will sound. To correct the sibling alarm, follow the instructions above on how to **TURN THE MONITOR OFF.**
Patient Input Connector – The patient input connector is for the Patient Cable.

Respiration Light – The green respiration light blinks with each breath the SmartMonitor 2 detects.

Apnea Light – The red apnea light will illuminate if the SmartMonitor 2 detects a pause in breathing outside the limit prescribed by the physician.

Heart Lights - The green heart light blinks with each heartbeat the SmartMonitor 2 detects.
- The red low heart rate light (bradycardia), identified by a heart with a down arrow, illuminates when SmartMonitor 2 detects a heart rate lower than the limit prescribed by the physician.
- The red high heart rate light (tachycardia), identified by a heart symbol with an arrow pointing up, illuminates when the SmartMonitor 2 detects a heart rate higher than the limit prescribed by the physician.

Speaker The SmartMonitor 2 speaker allows you to hear any alarm that sounds during monitoring.

System Indicators - The lights across the bottom of the front panel are known as the system indicators.
- Power Light indicates that the SmartMonitor 2 is turned on.
- Charging light indicates the SmartMonitor 2 is plugged into AC power and the battery is charging.
- Low Battery Light indicates the battery power is low and needs to be charged.
- Memory Full Light blinks to indicate that the SmartMonitor 2 memory is 50 to 80% full and remains on continuously when the memory is full.
- Loose connection light indicates an electrode, cable, or lead wire connection is loose.
Side Panel Features

Self-Test Connector
– Use the Self-Test Connector when performing a Functional Self Test.

Back Panel
Now turn the SmartMonitor 2 around and look at the back of the monitor. The key components are:

Remote Alarm Connector (optional) – The Remote Alarm allows you to hear the audible alarms from a different room.

Modem (optional) – A modem may be used to transfer data, by connecting a phone line to the modem connector in the Model 4003.

I/O Connector – This is a multi-purpose connection that is used when the SmartMonitor 2 is interfaced to a SmartRecorder, Auxiliary Box or computer.

Power Connector – This is where the power supply for the SmartMonitor 2 is connected.

Bottom Panel
Turn the SmartMonitor 2 over to the bottom. You will need a Phillips head screwdriver to remove the covers on the bottom of the monitor.
Battery Compartment – Located on the lower portion of the monitor. Battery connection is located in this compartment. The battery must be connected to operate the monitor.

PC Card/LCD Display Cover – Located on the mid-region of the monitor is the PCMCIA card slot. The PC card can be used to transfer data from the monitor.

The LCD Display is used to setup the physician prescribed parameters.

The Up, Down and Enter Buttons – These are used to program monitor settings as well as move from one program menu to another.

Mind Stretch

GO TO Learning Verification Exercises and COMPLETE
Exercise 1: Overview of the SmartMonitor 2
Setting Up the SmartMonitor 2

Before the monitor is given to a new patient it needs to be programmed correctly. This setup can be done manually using the keypad and LCD display on the bottom of the monitor, or computer. For this exercise, we will use the manual method.

Navigating through the Menus

The SmartMonitor 2 has four menu paths. They are “All Menus”, “Alarm Menu”, “Recording Menu” and the “System Menu”. Once you have done an initial setup, the Alarm and Recording menus will be the menus you will use most frequently. On the following page is the menu flow for the SmartMonitor 2.
The buttons found beneath the display door are used to navigate through the menus. Let’s practice moving through these menus.

- Attach the power cord to the back of the SmartMonitor 2 and plug it into an electrical outlet.
- Turn the SmartMonitor 2 on, by pressing the **POWER** button.
- After a short delay, the display will read:

  **INITIALIZING PLEASE WAIT**
  then
  **MENU MODE? ENTER PROPER KEY SEQUENCE**

- A password is required to enter the Menu Mode. Press the buttons in the following sequence within 10 seconds”

  ▼ (down) arrow, ▲ (up) arrow, ▲ (up) arrow, ENTER, ENTER, ENTER

- The display now reads: **SMARTMONITOR 2 MENU SELECTION**.

- Press the ▲ (up) arrow once to display the Menu options.

- Press the **ENTER** button once to activate the field. The displayed field will blink.

- Use the ▲ (up) arrow or ▼ (down) arrow to browse through the three types of menus. Press the **ENTER** button to select **ALL Menus**. “All menus” will stop blinking.

This same method is used for selecting other menus or field settings.

- Now turn the monitor off using the proper key sequence.

**Turn the Monitor Off:**

- Press and hold the blue **RESET** button

- Press and then release the gray **POWER** button.

- Wait 2 seconds, then release the **RESET** button.
Before initial use of Smart Monitor 2, it is important that you program the monitor through the system set up menu with your preferred system settings.

To enter the System Set-Up menu press the power button to turn the monitor on. At the “MENU MODE? ENTER PROPER KEY SEQUENCE” screen, Press ▲ (up) arrow 3 times then Press the ENTER key 3 times.

The System Set-Up Menu allows you to access the following menu selections that are normally accessed only with system initialization:

- Date Format
- Memory Full Alert
- Memory Full Audible
- Modem Speed – Monitor
- Modem Speed – Host

Practice makes perfect...

GO TO Learning Verification Exercises and COMPLETE Exercise 2: Navigating through the Menus
Entering Patient Information

Now we will program the SmartMonitor 2 with parameter settings. This is how you will set parameters that will be prescribed by the physician.

- Turn the monitor on – Once you see menu mode, Enter proper key sequence.

- Enter menu mode using proper key sequence. ▼ (down) arrow, ▲ (up) arrow, ▲ (up) arrow, ENTER, ENTER, ENTER.

- Use the ▲ (up) or ▼ (down) arrow to browse through the menus. From the menu options screen, select the All Menus.

- Press ▲ (up) arrow until PATIENT NAME appears.

- Press ENTER to activate the field; the first letter will begin to flash.

- Use the ▲ (up) and ▼ (down) arrows to browse through the alphabet. Press Enter to select a letter. Press Enter twice to place a space between the first and last name.

- Once all the letters of your name are entered browse through the alphabet until the ^ (caret) appears and press ENTER. To end the field, use the ▲ (up) arrow to move to the next field.

- Next is the PATIENT ID field. It has the same format as the PATIENT NAME but with numbers. Follow the instructions above and enter a Patient ID# of 011065. Remember to browse to the ^ (caret) when you are finished. Press Enter on the ^ . Use the ▲ (up) arrow to move to the next field.

- Use the ▲ (up) and ▼ (down) arrows to browse through the following menu parameters. Remember the following key sequence:
  - Use the ▲ (up) and ▼ (down) arrows to scroll through the parameters.
  - Press Enter to activate the field and the selection will begin to flash.
  - Use the ▲ (up) and ▼ (down) arrows to browse the field settings.
  - Press Enter to lock in your setting.
**Parameter Selection:** | **Field Selection:**
---|---
Apnea Alarm | 20 sec
Bradycardia Alarm | 80 bpm
Brady Alarm Delay | 5 sec
Tachycardia Alarm | 230 bpm
Tachy Alarm Delay | 5 sec

**Parameter Selection:** | **Field Selection:**
---|---
Record Mode | Event
Apnea Record Limit | 16 Sec
Brady Record Limit | Off
Pre/Post Time | 30/15
Record Impedance? | Yes
Record Heart Rate? | Yes
Record ECG? | Yes
Record Auxiliary 1 | No
Record Auxiliary 2 | No
Record Auxiliary 3 | No
Record Auxiliary 4 | No
Computer Phone Number | 1234546
When To Call | 1/5/02 14:00
Dial If Memory Full | Yes

- Now turn the monitor off.

Congratulations, you have gone through the most common functions involved when setting up a monitor for patient use. If you are not comfortable with this, redo this exercise with another name, ID etc.

*Pen to paper...*

GO TO Learning Verification Exercises and COMPLETE Exercise 3: Entering Patient Information
Typical setup of the SmartMonitor 2 on an infant is as follows:

- Connect the Patient Cable to the SmartMonitor 2.
- The white lead wire connects to the “RA” socket on the Patient Cable. The black lead wire connects to the “LA” socket on the Patient Cable.
- Connect the pin end of each lead wire into the electrodes.
- Do not use oils, lotion, or powder on the area of skin that the electrodes will touch.
- Attach the electrodes to the belt. Place the electrode with the white lead wire on the baby’s right side. Place the electrode with the black lead wire on the baby’s left side.
- When the belt is wrapped around the baby, the electrode should be located on each side of the chest, (underneath the armpit, just below or lined up with the nipples).
- Ensure that the lead wires and the Patient Cable are leading down and away from baby’s face and neck.
- Wrap the belt around the baby’s chest. The belt should be snug enough so that you can only insert one of your fingers (with your hand lying flat against baby) between the belt and baby. If you need to shorten the belt, cut off part of one end.

**Simulator Setup**

For the purpose of this self-study we will be using the 5000 simulator as our patient. (If you do not have a simulator available you may simulate alarms with the monitor self-test procedure described in the Professional Operators Manual).

Connect the SmartMonitor 2 Patient Cable and Lead wires as described above.

- Using the Three Lead ECG/RESP connector, insert the pin end of the white lead wire into the post labeled “RA” on the Simulator. Insert the pin end of the black lead wire into the post labeled “LA”. Tighten both post caps on the Simulator.
• Set the Simulator Controls as follows:

<table>
<thead>
<tr>
<th>Simulator Setting</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ECG Beats/Min</td>
<td>100</td>
</tr>
<tr>
<td>ECG AMPL/MV</td>
<td>0.5</td>
</tr>
<tr>
<td>RESP. Breaths/Min</td>
<td>30</td>
</tr>
<tr>
<td>Variation OHMS</td>
<td>1</td>
</tr>
<tr>
<td>Base Impedance OHMS</td>
<td>200</td>
</tr>
</tbody>
</table>

• Turn the Simulator POWER on.

• Ensure that the SmartMonitor 2 is receiving power from the electrical outlet.

• Turn the SmartMonitor 2 on to begin monitoring. The audible alarm will sound briefly and all front panel lights will illuminate. The lights will go out and the green heart and respiration lights will blink at the rate indicator by the simulator.

Apply the knowledge...

GO TO Learning Verification Exercises and COMPLETE
Exercise 4: Patient Set-Up
Monitoring a Baby

From the previous exercise, let’s simulate monitoring a baby (both the simulator and the monitor should be turned on – (see pages 14-15).

- Turn the variation OHMS knob on the simulator to zero (this will simulate an apnea event). Watch for the respiration light on the SmartMonitor 2.
- Once the alarm begins, try to silence the alarm by pressing the Reset button on the monitor.
- Turn the variation ohms knob back to 1.0.
- Once the alarm stops, press the blue reset button to turn the apnea light off.
- Change the setting for the ECG on the simulator to 75 bpm. Wait for the alarm to sound, and then try to silence the alarm by pressing the Reset button.
- Increase the ECG setting back to 100 bpm.
- Once the alarm stops, press the reset button to turn the low heart rate light off.
- Change the setting for the ECG on the simulator to 240 bpm. Wait for the alarm to sound, and then try to silence the alarm by pressing the Reset button.
- Decrease the ECG setting back to 100 bpm.
- Once the alarm stops, press the Reset button to turn the high heart rate light off.
- Pull either the black or white lead wire from the patient cable. See if you can silence the Loose Connection alarm by pressing the Reset button.
- Turn the SmartMonitor 2 off to stop the study.

*Remember: In order for a patient or loose connection alarm to be silenced, the problem must be resolved. The Reset button will not silence these alarms.

Data collection & review...

GO TO Learning Verification Exercises and COMPLETE
Exercise 5: Monitoring Mode
There are three ways of downloading to Synergy-E™: via the PC card, Direct Connect and Modem. We will discuss all three.

Downloading Data via PC Card

When downloading to a PC Card you will use the LCD display and keypad located on the bottom panel. The password differs from entering patient information. This allows you to download data to the PC Card without access to changing the setting parameters prescribed by the physician.

- Make sure the SmartMonitor 2 is OFF.
- Remove the PC card/LCD cover from the bottom of the monitor.
- With the front of the PC Card facing you slide it into the slot on the side panel of the SmartMonitor 2. The PC Card logo should be on the bottom edge of the card facing upward.
- Press the POWER button ON. After a short delay, the display will read: INITIALIZING PLEASE WAIT
  Then,
  MENU MODE? ENTER PROPER KEY SEQUENCE

  - Press the ENTER key within 10 seconds:
  - The display will read SMARTMONITOR 2 MENU SELECTION.
  - Press the ▼ (down) arrow until you see “Move Data to Card?”.
  - Press the ENTER button. The word NO will begin to blink. Press the ▼ (down) arrow until you see YES.
  - Press the ENTER button. The display will now show “Transferring Data…”. Once the transfer is complete the display will change to “Data Transferred”.

Note: If the PCMCIA card already contains data, the monitor will prompt “Overwrite Data?”.

** The PCMCIA card can only hold one patient download at a time.

- Once the data transfer is complete turn Smart Monitor 2 off. Then remove the PC card from the PC card slot.
- Press the button found to the right of the card on the bottom panel of the monitor – to remove the PC card.

Note: Do not remove the PC Card without turning the monitor off

Now the data needs to be transferred from the PC card to Synergy-E™. We will briefly discuss this here. Refer to the Synergy-E Operators Manual for more information.
- Insert the PC Card into the PC Card slot on your computer.
- Open the Synergy-E software program.
- Click on **File**.
- Click on **Import-Flash Card**.
Downloading Data by Direct Connect

You can also transfer data via Direct Connect to Synergy-E™. We will briefly discuss this here. Refer to Synergy-E™ Operators Manual for more information.

- Connect the Direct-Connect Cable (p/n H4006) into the I/O Connector on the monitor and the other end into the COM port on the computer. **Important:** You must connect the cable to the monitor before you turn the monitor on.
- Place the Monitor in Communications Mode by pressing and holding the blue RESET button.

- Push and release the POWER button to turn the monitor ON. Wait until the monitor alarms constantly.

- Release the RESET button and briefly press and release the RESET button again. (The SmartMonitor® 2 will beep every 10 seconds while in communications mode).

- Start the Synergy-E (version 2.0) software.

- Click on the Communications icon.

- The Patient Information box appears. Enter the Patient data. Patient Name is required. Then, click on OK.

- Use the drop down list to select the appropriate Direct Connect COM port, then click on CONNECT.

- Click on Retrieve Data.

- After the data is downloaded, a message is displayed that states that “Retrieval Done. Disconnect now?” Click on YES to Disconnect.
Data can be transferred via modem to Synergy-E™ while the baby is still being monitored/or with the monitor in communications mode. We will briefly discuss both options here. Refer to Synergy-E operator’s manual for more information.

- Connect the phone cable to the modem port of the monitor and plug into the phone jack in the wall.

- Make sure the power supply is connected to SmartMonitor® 2.

- Have the monitor turned on and in monitoring mode.

- From the Synergy-E software click on the Communications icon.

- The Patient Information box appears. Enter the patient data and then click on OK.

- Select the modem from the drop down list under Direct or Modem Connection using.

- Type in the phone number for the monitor. (Add any necessary prefixes such as “9”). Click on Connect.

- After the phone rings once on the monitor end, press the Reset button, and hold until the phone stops ringing. The modem will answer the phone and connect to Synergy-E.

- Click on Retrieve Data.

- After the data is retrieved disconnect. The monitor will continue monitoring until turned off. The monitor will alarm a series of roadrunner beeps to alert caregiver the download is complete.

- The monitor can also be downloaded via modem even if the baby is not being monitored. To do this, put the monitor in communications mode (See instructions under Downloading Data by Direct Connect). Follow the instructions above; with the exception of pressing the Reset button. When the monitor is in communications mode, the modem will answer automatically when receiving a phone call.

*Remember that SmartMonitor 2 must be connected to electrical power for all types of modem downloads.
Knowledge builds business...

GO TO Learning Verification Exercises and COMPLETE
Exercise 6: Downloading SmartMonitor 2

Congratulations, you have successfully completed this introduction into the SmartMonitor 2. You have gone through the basic functions of setting up the SmartMonitor 2, setting up the patient, monitoring and finally downloading it for review.