Accutorr Plus®

Service Manual

Datascope®

INTRODUCTION

Chapters

1. Operation
2. Theory of Operation
3. Specifications
4. Repair Information
5. Schematics
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FOREWORD

This Service Manual (P/N 0070-00-0429) is intended as a guide, for technically qualified personnel, to use during repair and calibration procedures for the Accutorr Plus (part number 0998-00-0444-XX). **NOTE:** See the serial number label on the rear panel of the unit for part number identification. This manual also includes information on the Recorder and Predictive Temperature Modules.

The information in this manual has been divided into the eight chapters listed above.

This publication may have been updated to reflect product design changes and/or manual improvements. Any such changes to this manual would be accomplished by supplying replacement pages and instructions for inserting or affixing them into the manual.

NOTE

Unauthorized servicing may void the remainder of the warranty. Check with the factory or with a local authorized Datascope representative to determine the warranty status of a particular instrument.

NOTE: This product is year 2000 compliant.

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1.0 OPERATION

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1.1 INTRODUCTION

This section of the Service Manual (P/N 0070-00-0429) is provided as a review of the Accutorr Plus NIBP, the Accutorr Plus NIBP with Trend Screen and the Accutorr Plus NIBP with Trend Screen and SpO_2 functions and operation. The reader is encouraged to refer to the Operating Instructions, P/N 0070-00-0428, for more complete details.

1.2 CONTROLS AND INDICATORS

This section of the Service Manual identifies and describes each control and display of the Datascope Accutorr Plus NIBP, the Accutorr Plus NIBP with Trend Screen and the Accutorr Plus NIBP with Trend Screen and SpO_2. For step-by-step operating instructions see Chapter 1.3, "Operation".

The following is a list of all controls, connectors and indicators, their item number and the page number. The item number refers to the call outs on the drawings within this chapter. The page number refers to the page where the description of the item can be found.

1.2.1 Front Panel

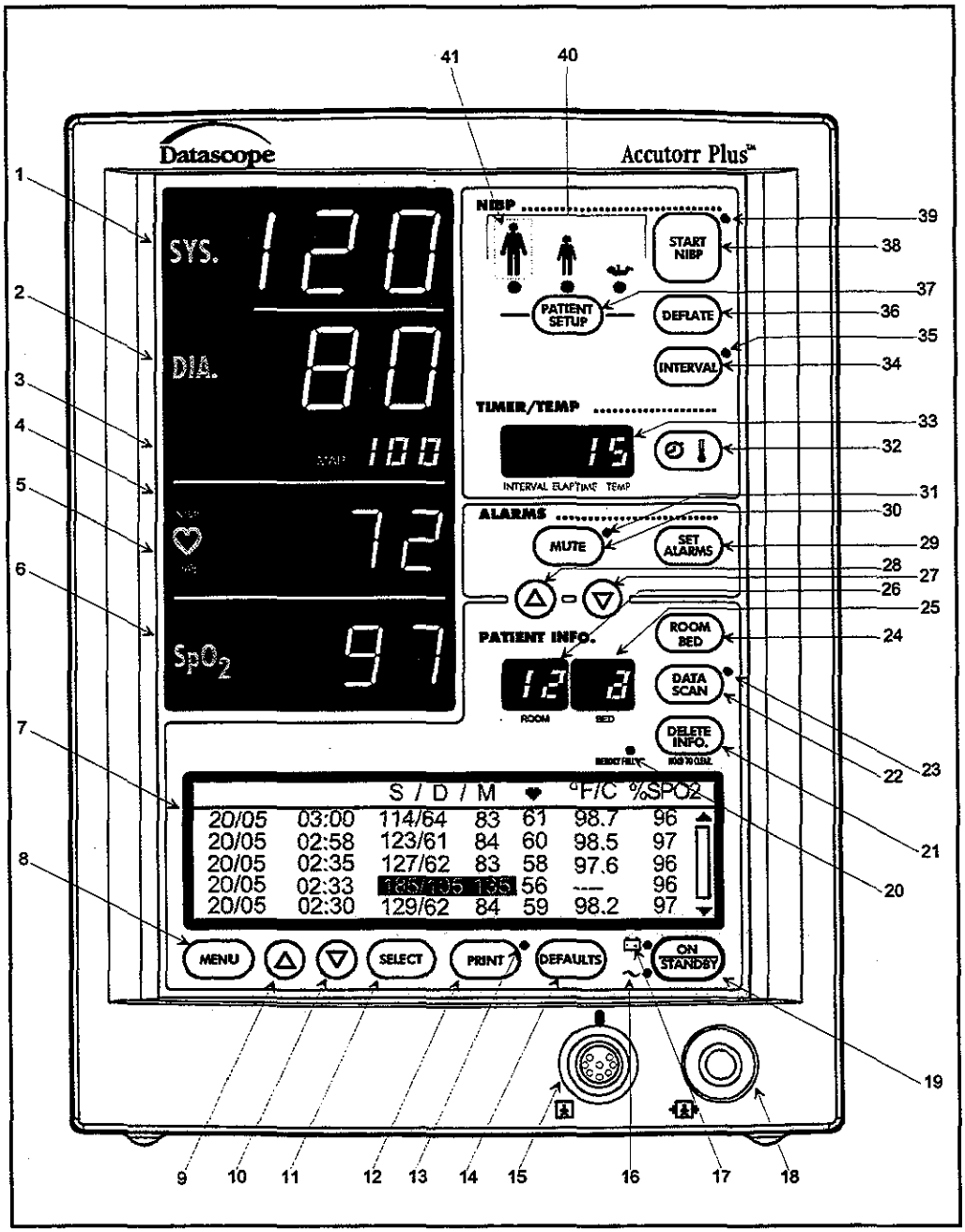

Figure 1-1 Front Panel - Accutorr Plus NIBP with Trend Screen and Datascope SpO_2

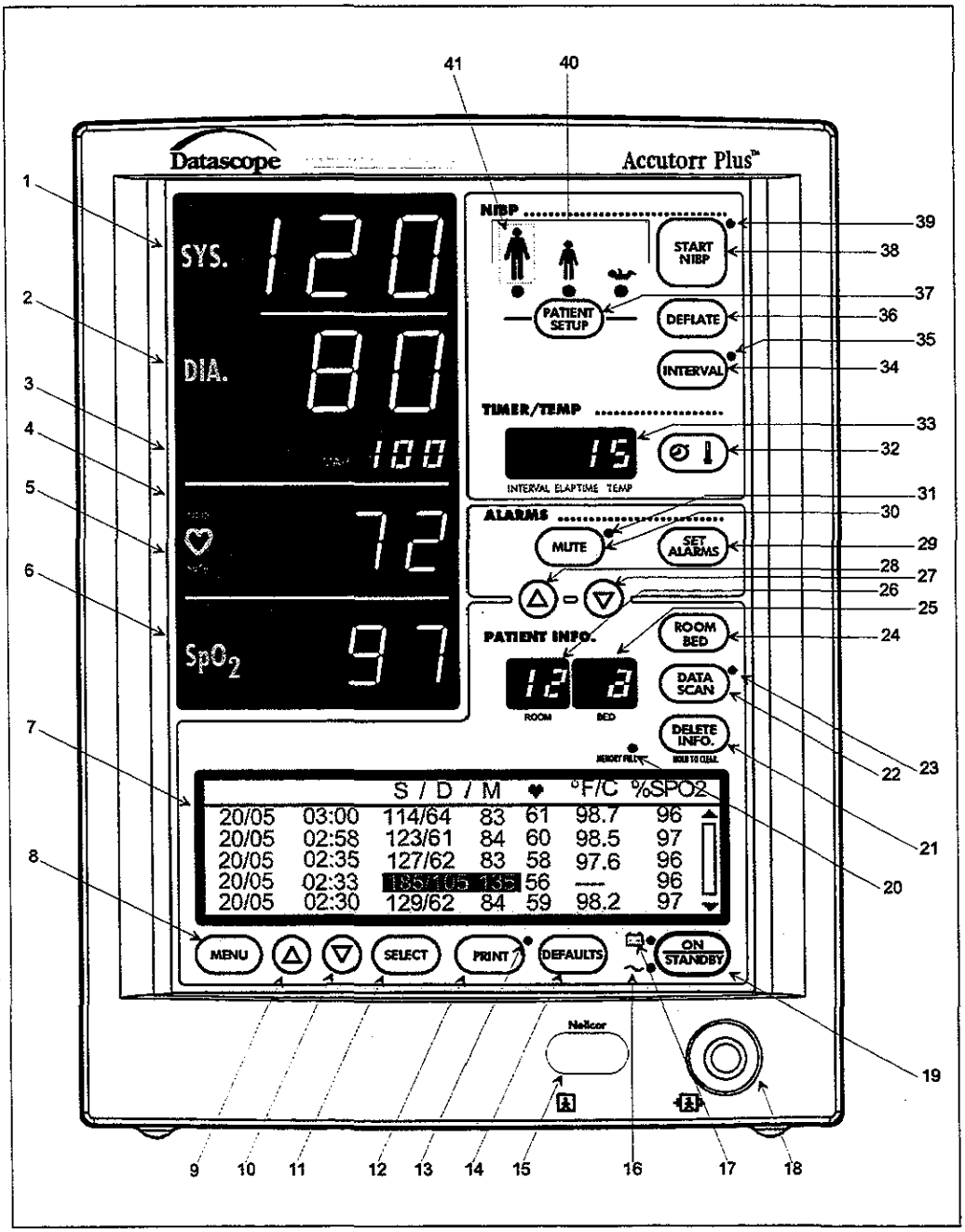

Figure 1-2 Front Panel - Accutorr Plus NIBP with Trend Screen and Nellcor® or Masimo SpO_2

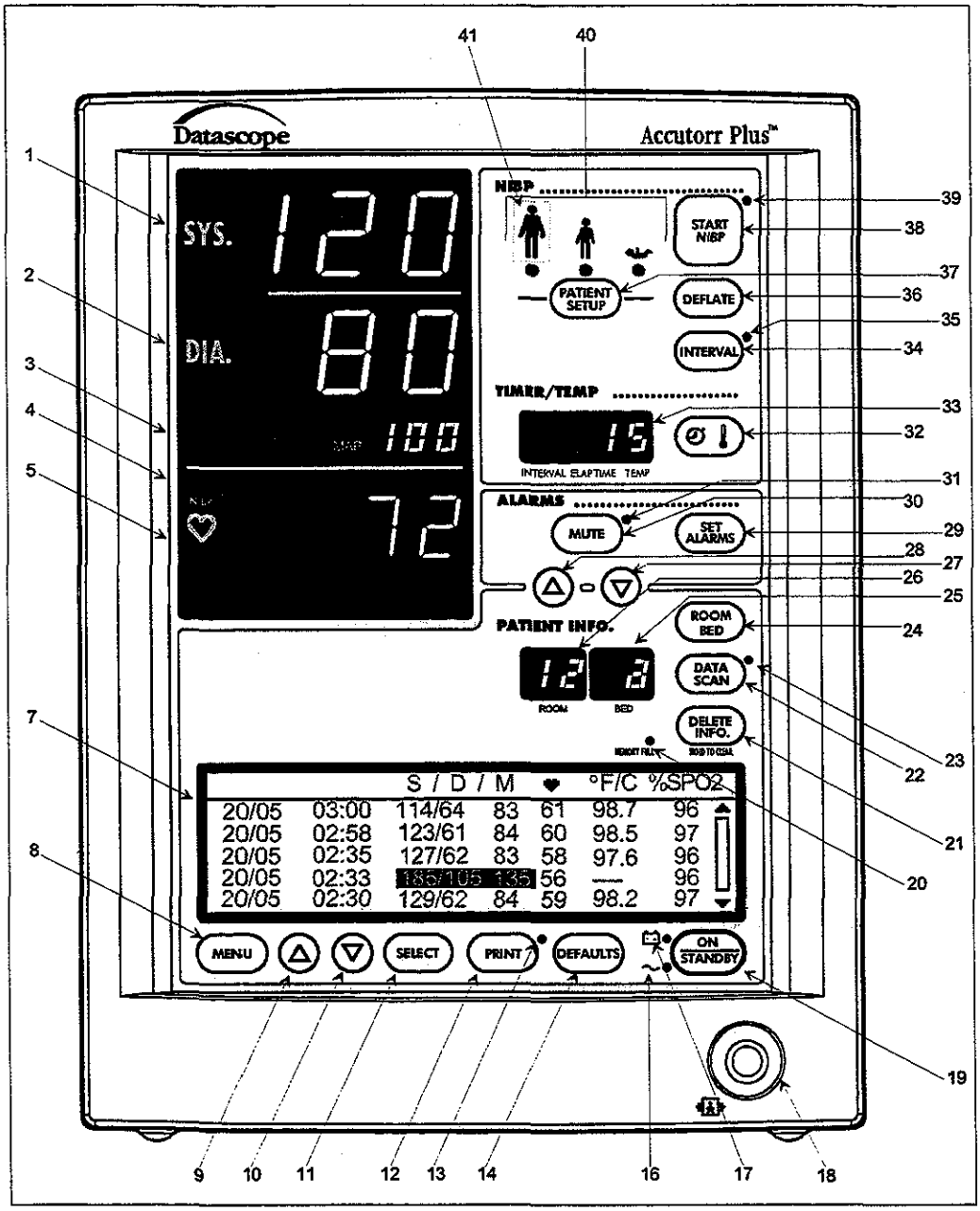

Figure 1-3 Front Panel - Accutorr Plus NIBP with Trend Screen

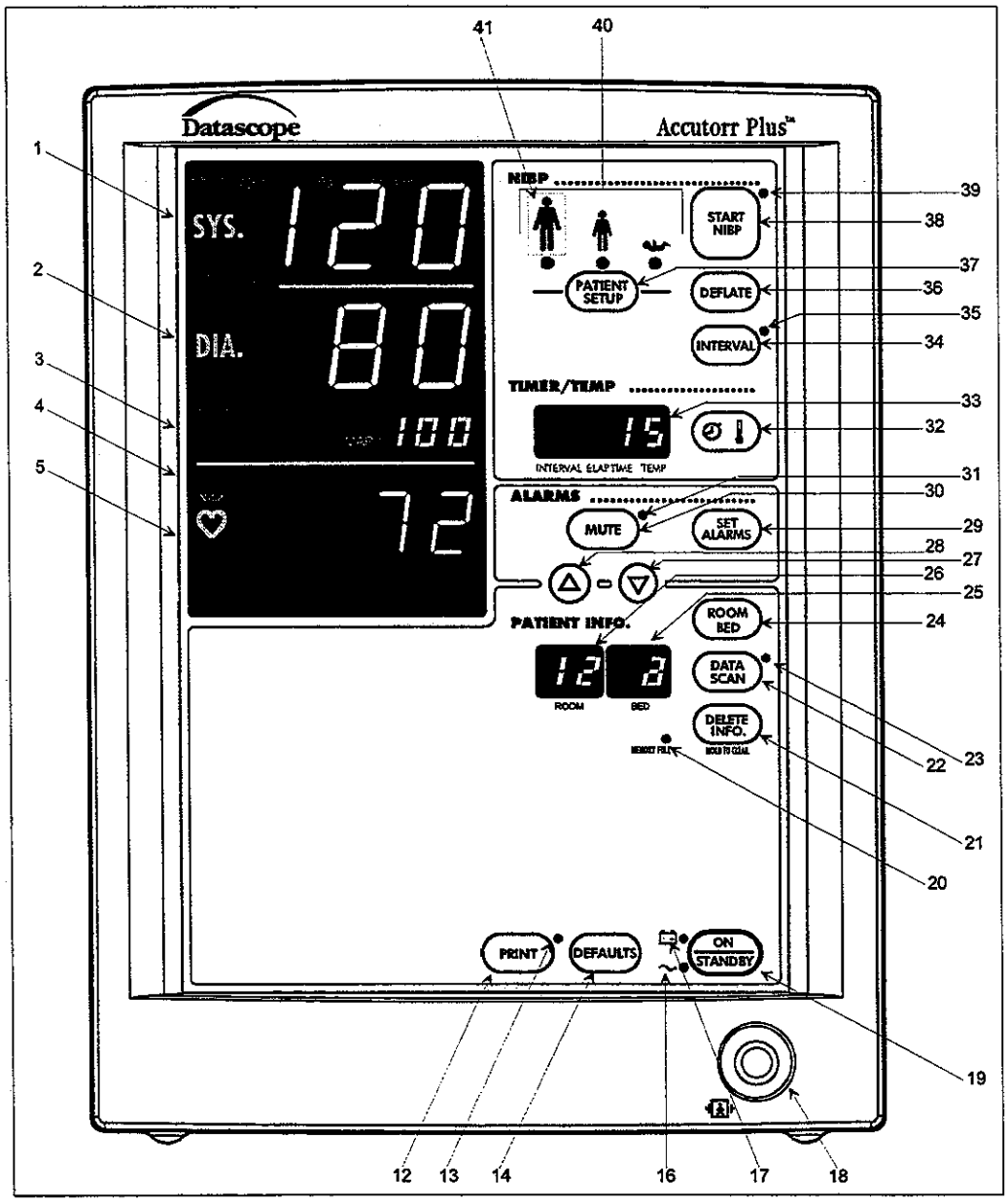

Figure 1-4 Front Panel - Accutorr Plus NIBP

1. **NIBP Systolic Display**

   Displays the systolic blood pressure data from NIBP measurements. It is also used to display NIBP error codes and systolic alarm limits.

2. **NIBP Diastolic Display**

   Displays the diastolic blood pressure data from NIBP measurements. It is also used to display diastolic alarm limits.

3. **NIBP MAP Display**

   Displays the mean arterial pressure (MAP) information from NIBP measurements. During a measurement, it will display the cuff pressure. It is also used to display the MAP alarm limits and the inflation pressure when selecting the initial inflation pressure.

4. **Pulse Rate Display**

   Displays the pulse rate information from either the NIBP measurement or the SpO2 reading (Accutorr Plus model with SpO_2). It is also used to display pulse rate alarm limits.

5. **NIBP/SpO_2 Pulse Rate Indicator**

   When the pulse rate displayed is based on an NIBP measurement, then NIBP is illuminated. When the pulse rate displayed is based on an SpO_2 measurement (Accutorr Plus model with SpO_2), then SpO_2 is illuminated.

6. **SpO_2 Display (Accutorr Plus model with SpO_2)**

   Displays the %SpO_2 measurement information. This area is also used to display the %SpO_2 alarm limits.

7. **Liquid Crystal Display (LCD) (Accutorr Plus models with Trend Screen)**

   The Liquid Crystal Display (LCD) is used to display previous measurements (trend list) for the selected patient, or a menu that controls the beep volume and alarm volume.

8. **Menu Key (Accutorr Plus models with Trend Screen)**

   This key is used to toggle between the trend list screen and the menu screen in the LCD. When the back light in the LCD is off, pressing this key turns it on. This key is also used to adjust the LCD contrast. Press and hold the key for two beeps to enter the adjustment mode. Use the Arrow keys (9 and 10) to change the contrast.

9. **LCD Up Arrow Key (Accutorr Plus models with Trend Screen)**

   This key is used to scroll the trend data so that more recent measurements are displayed in the LCD. When the back light in the LCD is off, pressing this key turns it on. This key is also used to adjust the LCD contrast when in the adjustment mode. Use the Menu key (8) to enter the adjustment mode.

10. **LCD Down Arrow Key (Accutorr Plus models with Trend Screen)**

    This key is used to scroll the trend data so that older measurements are displayed in the LCD. When the back light in the LCD is off, pressing this key turns it on. This key is also used to adjust the LCD contrast when in the adjustment mode. Use the Menu key (8) to enter the adjustment mode.

11. **Select Key (Accutorr Plus models with Trend Screen)**

When the menu screen is displayed in the LCD, this key is used to select the menu items. When the back light in the LCD is off, pressing this key turns it on.

12. **Print Key**

Press this key to print all stored information for the selected patient. Press to stop a printing that is in process. Press and hold this key (2 single beep tones, approx. 3 seconds) to change the print mode between Continuous and Request. When in the Continuous mode, the PRINT Indicator LED is illuminated. When loading in a new roll of recorder paper, press this key to feed the paper through the printer.

13. **Print Indicator**

This indicator is illuminated when continuous printing of measurements is selected.

14. **Defaults Key**

Press and hold this key (2 single beep tones, approx. 3 seconds) to reset all parameters back to the hospital default settings. This includes alarms, inflation pressure, interval, etc... When in the process of making a change to a setting, you can return to the original setting by momentarily pressing this key. To enter the User Configuration, press and hold this key (1 beep tone), while turning the unit on. See section 1.3.15 for details on default settings and User Configuration.

15. **SpO_2 Connector (Accutorr Plus model with Datascope, Nellcor® or Masimo SpO_2)**

This connector is used to attach Datascope, Nellcor® or Masimo SpO_2 sensors.

16. **AC Power Indicator**

This green LED illuminates whenever AC power is applied to the unit.

17. **Battery Indicator**

This green LED illuminates whenever the unit is operating on battery power. The LED will flash when the battery requires charging. When the LED begins flashing, approximately 30 minutes of battery time remain on the Accutorr Plus NIBP (20 minutes on the Accutorr Plus NIBP with Trend Screen and 10 minutes on the Accutorr Plus NIBP with Trend Screen and SpO_2).

18. **NIBP Connector**

This connector is used to attach specified NIBP hoses.

19. **On/Standby Key**

This key is used to activate the unit, enabling it to begin taking measurements. The unit does not have to be "ON" for the internal battery to charge. However, the unit does need to be plugged into an AC receptacle for the battery to be charging.

20. **Memory Full Indicator**

This LED indicator flashes when 80 - 99 of the 100 available entries of trend are used. This LED is on continuously when 100 are used. Delete measurements manually using the DELETE INFO. key or the unit will automatically delete the oldest measurement for the current patient. **NOTE:** The unit will also automatically delete data that is 24 hours old.

21. **Delete Info. Key**

Press the Data Scan key to enable the Delete Info. key (Accutorr Plus without Trend and SpO_2 only). Once enabled, press and hold this key (1 beep tone, approx. 3 seconds) to delete the most recent reading when it is displayed. When displaying any measurement, press and hold this key (2 beep tones, approx. 6 seconds) to delete all information for the currently selected patient. Press and hold at power up to delete all information for all patients.

22. **Data Scan Key**

Press this key (1 beep tone) to view previous measurements for the selected patient on the Accutorr Plus NIBP and to enable the Delete Info. key (Accutorr Plus without Trend and SpO_2 only). The LED indicator next to the key illuminates. On the Accutorr Plus NIBP, use the Patient Info. Up & Down Arrow keys (27 & 28) to scroll through the stored measurements for the selected patient. On all models of the Accutorr Plus, press and hold this key (2 beep tones, approx. 6 seconds) to scan all of the rooms and beds for stored measurements. Press the Data Scan key again to stop on a particular room/bed. Press the Data Scan key again to exit this view mode.

23. **Data Scan Indicator**

This LED indicator is illuminated when viewing prior data.

24. **Room/Bed Number Key**

Press this key to change the displayed Room/Bed. After pressing this key use the Patient Info. Up & Down Arrow keys (27 & 28) to change the Room/Bed. This key is also used when selecting a User Configuration item.

25. **Bed Letter Display**

This display is used to show the current patient bed letter. It is also used to display status codes for NIBP, SpO_2 and Temperature and to display User Configuration items.

26. **Room Number Display**

This display is used to show the current patient room number. It is also used to display status codes for NIBP, SpO_2 and Temperature, indicates which alarm is being set (Hi or Lo), and displays a User Configuration item.

27. **Patient Info. Down Arrow Key**

This key is used to decrement the alarm limits when they are shown on the LED displays and to decrement the hours, minutes, month, day and year in the clock set mode. This key is also used to change the Room/Bed, to scroll through previous data and to change initial inflation pressure.

28. **Patient Info. Up Arrow Key**

This key is used to increment the alarm limits when they are shown on the LED displays and to increment the hours, minutes, month, day and year in the clock set mode. This key is also used to change the Room/Bed, to scroll through previous data and to change initial inflation pressure.

29. Set Alarms Key

This key is used to select the NIBP and SpO_2 (Accutorr Plus model with SpO_2) alarms to be changed. Repeated presses of this key sequences through the choices of Systolic Hi, Systolic Lo, Diastolic Hi, Diastolic Lo, Map Hi, Map Lo, Pulse Rate Hi, Pulse Rate Lo, SpO_2 Hi and SpO_2 Lo. After the last available parameter, the next press returns the unit to normal operation. Once the desired parameter is flashing, use the Patient Info. Up & Down Arrow keys (27 & 28) to increment or decrement the alarm values.

30. Mute Key

Press this key (one beep tone), to silence the current alarm tone for 2 minutes. If a new alarm is detected during the 2 minutes, a new alarm tone will sound. Press and hold (2 beep tones, approx. 3 seconds) to permanently silence all alarm tones. Press this key again (1 beep tone), to activate alarm tones.

31. Mute Indicator

This LED indicator is illuminated when the alarm tone has been silenced permanently and when the alarm volume is set to OFF.

32. Timer/Temp Key

This key is used to switch between viewing the elapsed time or the temperature in the Interval/Elap. Time/Temp Display. When viewing stored measurements on the Accutorr Plus NIBP, press this key to switch between viewing the temperature and time of the measurement.

33. Interval/Elap. Time/Temp Display

This displays the time, in minutes since the last successful NIBP measurement (Elap. Time is illuminated). When the Interval key is pressed, the Elap. Time changes to the current Interval setting (Interval is illuminated). When the Predictive thermometer probe is removed from its holder, the Elap. Time changes to Temp (Temp is illuminated). Either "85.0" (°F) or "29.4" (°C) will display; this is an internal self test feature. As the Predictive thermometer is taking a measurement, the display will flash as the number increases. When the final temperature measurement is determined, the display will no longer flash and a beep tone is generated. When the AccuTemp IR thermometer is used, the temperature is not displayed until after the measurement is taken and the thermometer is placed back into its holder. This display will also show the current time and date when setting the clock.

34. Interval Key

Press to enter the set time interval mode. An interval is set for automatic NIBP measurement cycles. To sequence through the interval choices of: OFF (——, when set to display graphics), CONT (Continuous), 1, 2.5, 5, 10, 15, 20, 30, 60, 120 and 240 minutes, repeatedly press the Interval key. When the desired interval is displayed in the Interval/Elap. Time/Temp Display the TIMER/TEMP key may be pressed to enter the interval setting or, the displayed setting will be entered when 15 seconds have elapsed without pressing the Patient Info. Up or Down arrow keys (27 & 28).

35. Interval Indicator

When an interval setting is selected, except for Off, the Interval Indicator flashes. When the interval mode is activated the Interval Indicator illuminates continuously.

36. **Deflate Key**

Press this key to stop an NIBP measurement that is in progress and deflate the cuff. A new measurement cycle will not be allowed for 10 seconds following the use of this key. The Start NIBP LED indicator is illuminated when a new measurement can begin. Press this key while in the interval mode to suspend the interval operation.

37. **Patient Setup Key**

Press this key (1 beep tone) to select the patient size. Each time the key is pressed the patient size will change. The choices will cycle from Adult, Pediatric, Neonate, Adult, Pediatric, Neonate, etc...

PRECAUTION: *It is the users responsibility, when changing the room/bed, to assure the patient size and alarm settings are set as required.*

This key is also used to view the cuff inflation pressure for an NIBP measurement. Press and hold (2 beep tones, approx. 3 seconds) to display the current inflation pressure in the MAP display. Use the Patient Info. Up & Down Arrow keys (27 & 28) to change the cuff pressure.

38. **Start NIBP Key**

Press this key to initiate an NIBP measurement. If a measurement is already in progress, a new measurement can not be initiated until a minimum of 10 seconds after the end of the one in progress (30 seconds when in the interval mode). The Start NIBP LED indicator is illuminated when a measurement can begin.

39. **Start NIBP Indicator**

This LED indicator is illuminated when the Accutorr Plus is ready to initiate an NIBP measurement.

40. **Patient Size Indicators**

One of theses LEDs illuminates to indicate the selected patient size.

41. **Hidden Key**

To enter the Service Diagnostics mode, press and hold this key (1 beep tone) while the Accutorr Plus is powering on and running the self tests (all "8"s displayed in the LEDs). The Service Diagnostics mode is used to initiate various performance tests that are to be done by technical service personnel only. To exit Service Diagnostics, power down the Accutorr Plus by pressing the On/Standby key.

1.2.2 Rear Panel

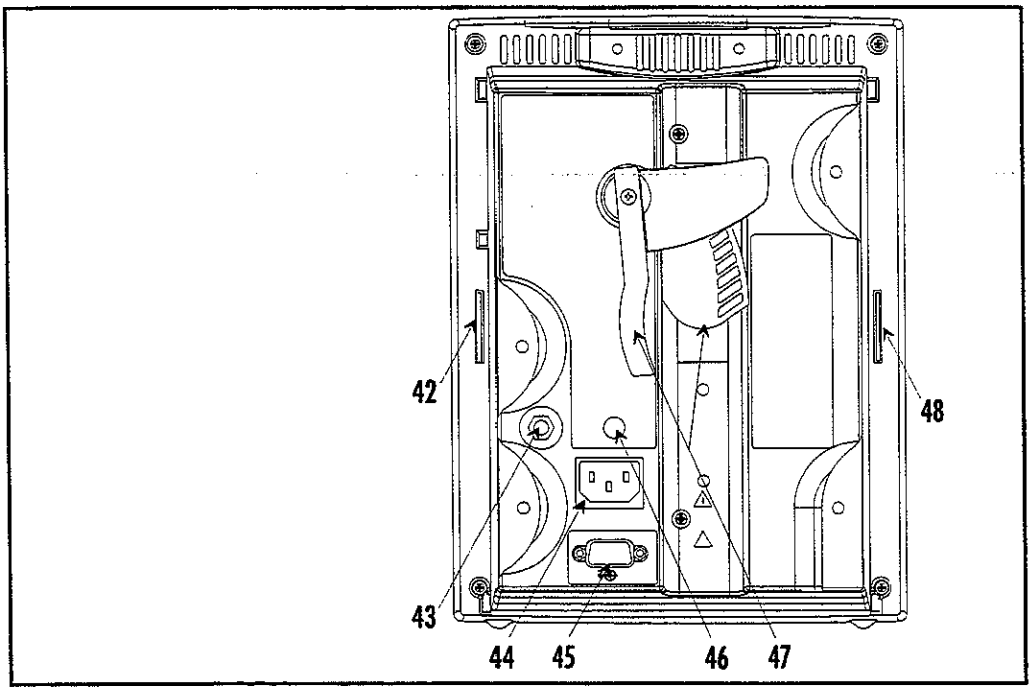

Figure 1-5 Rear Panel - All Units

42. Thermometer Module Connector

Used to attached one of the optional Datascope thermometer modules (PTM or AccuTemp IR).

43. Equipotential Lug

Provides equipotential bonding between hospital equipment.

44. AC Power Connector

Allows for A.C. power cord connection.

45. Communications Connector

Provides compatible communications to external devices and hospital's information system.

46. Datascope Connector

Used by Datascope Technical Service Personnel.

47. Pole Mounting Handle and Cam

Provides the ability to quickly mount the Accutorr Plus to a rolling pole.

48. Recorder Module Connector

Used to connect the optional Datascope recorder module.

1.2.3 Predictive Thermometer Module (PTM)

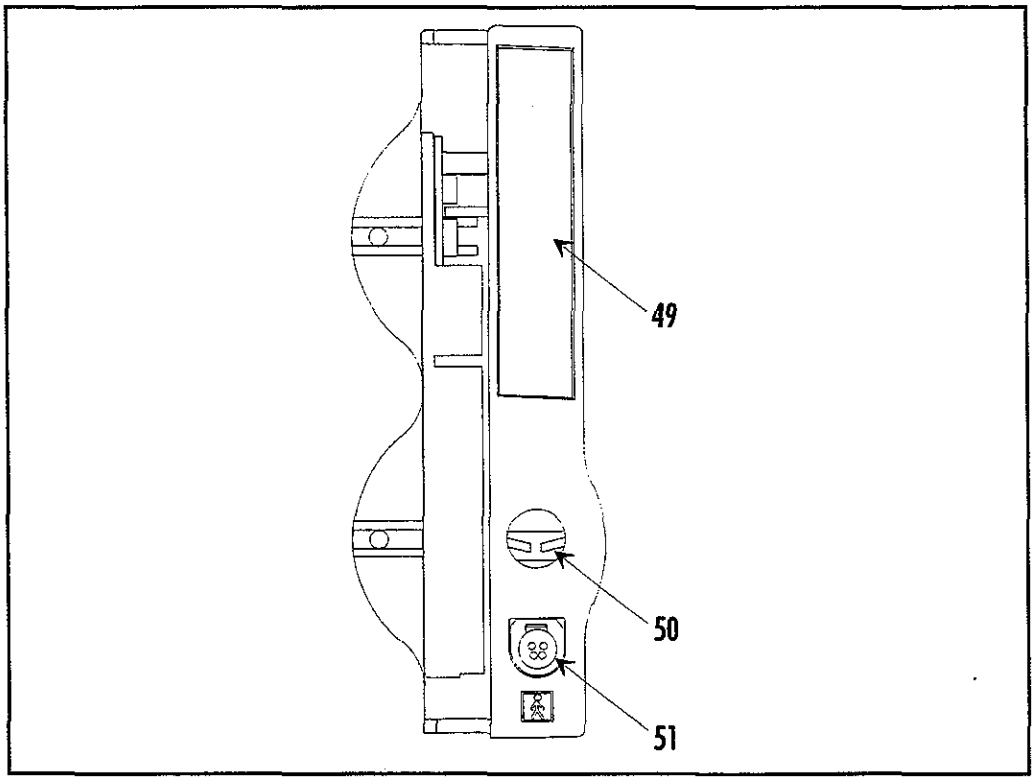

Figure 1-6 Predictive Thermometer Module

49. **Probe Cover Holder**

    Used to store a box of probe covers.

50. **Probe Chamber**

    Used to store the temperature probe when not in use.

51. **Probe Connector**

    Used to connect the thermometer probe to the PTM module.

1.2.4 Recorder Module

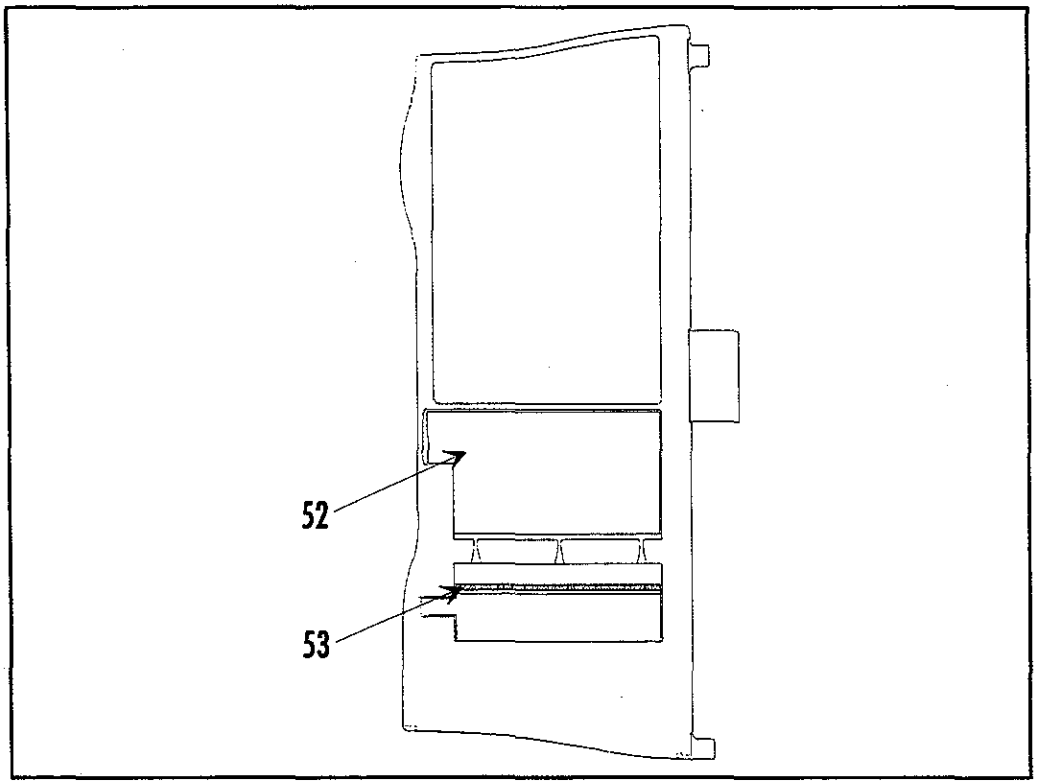

Figure 1-7 Recorder Module

52. Paper Door

Open this door when loading recorder paper.

53. Paper Tear Edge

The paper tear edge is used to tear off printed recorder strips. The edge can be removed in the event of a paper jam that needs to be cleared.

1.3. OPERATION

This section of the Service Manual provides guidelines and step-by-step instructions for proper operation of the Accutorr Plus NIBP, Accutorr Plus NIBP with Trend Screen, and the Accutorr Plus NIBP with Trend Screen and SpO_2. The numbers in parentheses ( ) refer to the items described in Section 1.2, "Controls and Indicators". When a described feature refers to a particular model, it will be noted. When the name Accutorr Plus is used, it refers to all 5 models.

1.3.1 SETTING-UP / TURNING POWER ON

1. Before turning the power on, check the rear panel for voltage requirements. Confirm proper voltage is available.

2. Before turning the power on, connect any required modules (recorder, thermometer). For instructions on connecting modules, see section 1.3.17.

   Upon installation of any optional modules, a test is required after power up (step 5). For the recorder, press the print key and the recorder will feed the paper to verify proper function. For the Predictive thermometer, remove the probe from its holder and verify 85.0 (29.4) appears in the Interval/Elap. Time/Temp display.

3. If additional communications capabilities are required, attach a communications interface cable to the rear panel COMMUNICATIONS CONNECTOR (45) and to the corresponding interface connector on the peripheral instrument.

4. Attach the AC power cord into the rear panel AC POWER CONNECTOR (44) and into a grounded (3-prong) Hospital Grade AC receptacle. Do not use an adapter to defeat the ground. The green AC POWER INDICATOR (16) illuminates, indicating AC power has been applied. The internal battery charges automatically when AC power is applied.

   WARNING: When attached to other products ensure that the total chassis leakage currents of all units (combined) do not exceed 100μA.

5. Press the ON/STANDBY key (19) to activate the unit. If it is required to enter the User Configuration mode, press and hold the DEFAULTS key (14) while the unit is powering on. See section 1.3.15 for more details on the User Configuration mode.

6. The unit begins a countdown from 20 and performs internal diagnostic tests. Any status codes are displayed in the appropriate LED. See section 1.3.16 for a list of status codes. At the end of power up, all of the displays (including the LCD on the Accutorr Plus models with Trend Screen) illuminate and then blank, except the Bed Letter and Room Number displays (25 & 26) which does not blank. A beep tone will sound during the power up sequence to confirm the operation of the audio indicator. If the time and date need to be set, see section 1.3.13 for instructions.

7. On an Accutorr Plus models with Trend Screen, adjust the contrast on the LCD if necessary. To adjust the contrast, press and hold the MENU key (8) (2 beep tones, approx. 3 seconds). Use the LCD UP & LCD Down ARROW keys (9 & 10) to adjust the contrast. See section 1.3.8, Setting the LCD Contrast, for more details.

1.3.2 PATIENT SETUP AND ROOM/BED ASSIGNMENT

1.3.2.1 Selecting the Patient Size

The Patient Size is selected using the PATIENT SETUP key (37).

1. Press the PATIENT SETUP key (37) to select the Patient size. Three choices are available: Adult, Pediatric and Neonate. Each time the key is pressed the patient size changes. The indicator under the graphic of the patient size illuminates to indicate which size is selected. The factory default setting for the Patient size is Adult. See section 1.3.15, "User Configuration" to set a custom default setting. NOTE: Do not press and hold the PATIENT SETUP key to change the patient size. Pressing and holding this key, enter the initial cuff inflation pressure change mode.

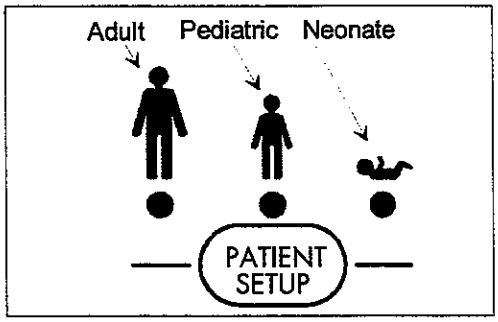

Figure 1-8 - Patient Size Graphics and Indicators

1.3.2.2 Cuff Inflation Pressure

The initial cuff inflation pressure depends on the Patient Size setting. The initial cuff inflation pressures are listed in the table below. The initial cuff inflation pressures can be modified from the default (custom or factory) settings. When the Accutorr Plus is powered down, these modifications are deleted.

1. To change the initial cuff inflation pressure, press and hold the PATIENT SETUP key (37) (2 beep tones, approx. 3 seconds). The current initial cuff pressure for the selected patient size displays in the MAP display.
2. Use the Patient Info. Up and Down Arrow keys (27 & 28) to change the pressure.
3. Once the desired pressure is displayed, press the PATIENT SETUP key (37) to enter this value. NOTE: Waiting 15 seconds will also enter this value.

PATIENT SIZE SETTING	INITIAL FACTORY DEFAULT CUFF INFLATION VALUES	LOWEST SELECTABLE PRESSURE	HIGHEST SELECTABLE PRESSURE	INCREMENT
Adult	180 mmHg	100 mmHg	260 mmHg	5 mmHg
Pediatric	140 mmHg	60 mmHg	160 mmHg	5 mmHg
Neonate	100 mmHg	40 mmHg	120 mmHg	5 mmHg

NOTE: The default patient size and initial cuff inflation pressure can be customized. See section 1.3.15, "User Configuration" for details on how to set custom defaults.

1.3.2.3 Room Number and Bed Letter

To monitor more than one patient, assign each patient to a particular room number and bed letter. Use the ROOM/BED key (24) to set the room number from 0 to 99 and the bed letter as a, b, c or d. On initial power up (no stored patient data), the room number and bed letter default to 0,a.

1. Press the ROOM/BED key (24). The ROOM LED flashes indicating that the room number can now be changed.

2. Press the Patient Info. Up or Down Arrow key (27 & 28) to increment or decrement the room number.

3. Press the ROOM/BED key again. The BED LED flashes.

4. Press the Patient Info. Up or Down Arrow key (27 & 28) to increment or decrement the bed letter.

5. Press the ROOM/BED key a third time to exit this mode, or do not press the key for 15 seconds.

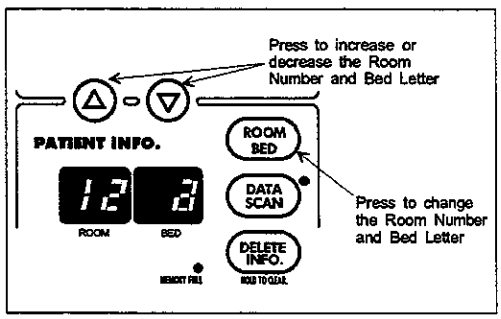

Figure 1-9 - Room Number and Bed Letter Keys and Indicators

Once measurements have been taken, and the unit is powered off and on, the room number and bed letter will default to the lowest room and bed where data is currently stored.

1.3.3 MANUAL NIBP MEASUREMENTS AND GENERAL NIBP MEASUREMENT INFORMATION

1. Select a pressure cuff that is appropriate for the size of the patient. Use the chart below as a guideline.

Limb Circumference (cm)	Description / Cuff Name	Datascope Part Number
Disposable Cuffs - Latex Free		
30 - 45	Large Adult	0683-07-0001-01
24 - 36	Adult	0683-07-0001-02
18 - 27	Child	0683-07-0001-03
16 - 25	Small Child	0683-07-0001-04
Disposable Neonatal Cuffs (box of 10)		
Approximate Limb Circumference:		
Size 0: 5 - 8 cm		0683-03-0004-01
Size 1: 7 - 10 cm		0683-03-0001-01
Size 2: 9 - 13 cm		0683-03-0002-01
Size 3: 12 - 17 cm		0683-03-0003-01
Color Coded Cuffs - Reusable Cuffs**		
45 - 66	Thigh - Tan*	0998-00-0003-36
30 - 47	Large Adult - Gray	0998-00-0003-35
24 - 36	Adult - Brown	0998-00-0003-34
18 - 27	Child - Red	0998-00-0003-33
6 - 11	New Born - Blue	0998-00-0003-31
	Infant	0998-00-0003-32

A cuff that is too small for the limb will result in erroneously high readings. The correct size of the pressure cuff for a given patient has, among other considerations, a direct bearing on the accuracy of the obtained NIBP measurements. Base your selection of the cuff size on the limb circumference of the patient. The table above indicates the available Datascope cuffs for use with the Accutorr Plus. The design dimensions of the cuffs and their intended uses are based on recommendations of the American Heart Association.

NOTE: The cuffs that are used with the Accutorr Plus use special snap on connectors. Adapter hoses are available to connect older style cuff connectors. See Optional Accessories, Section 5.2 in the Operating Instructions for a detailed list of cuffs and adapter hoses.

WARNING: Use only Datascope cuffs. Use of other than Datascope cuffs may result in erroneous measurements.

The pressure on the limb may not fall to zero between measurements if the cuff is wrapped too tightly. Therefore, assure that the cuff is properly applied.

The skin is sometimes fragile (i.e., on pediatrics, geriatrics, etc.). In these cases, a longer timer interval should be considered to decrease the number of cuff inflations over a period of time. NOTE: In extreme cases, a thin layer of soft roll or webril cotton padding may be applied to the limb in order to cushion the skin when the cuff is inflated. This measure may affect NIBP performance and should be used with caution.

* *When using the thigh cuff, this product may not comply with product specifications listed in chapter 3.*

** *The limb circumferences of the color coded cuffs adhere to the AHA guidelines for size. They also incorporate index and range lines to assist in cuff selection. The cuff bladder and hose contain Natural Latex rubber. The bladder has a dacron cover.*

2. Attach the cuff hose to the NIBP cuff connector (18). To do this, hold the hose behind the knurled pressure fitting (female). Push onto the male connector until a click is heard. To remove, hold the knurled female fitting and pull firmly to release.

3. Apply the cuff to the patient. To reduce errors, the cuff should fit snugly, but with enough room for two fingers to be placed between the cuff and the patient's arm (on adults), and with little or no air present within the cuff. Cuff should fit loosely on neonates. Apply the cuff so that the center of the inflation bag (bladder) is over the brachial artery. Be sure that the INDEX line on the cuff falls between the two RANGE lines. If not, a larger or smaller cuff is required. Be sure the cuff lies directly against the patient's skin. For best results, the cuff should be placed on the arm at heart level and no clothing should come between the patient and the cuff. **NOTE:** Avoid compression or restriction of the pressure hose.
NOTE: The NIBP cuff should not be placed on a limb that is being utilized for any other medical procedure. For example, an I.V. catheter.

4. If required, select the patient size with the PATIENT SETUP key (37). On initial power up, the configurable default setting is used. Otherwise, the last selected patient size is used. Initial default cuff inflation pressures depend on the Patient Size setting. See section 1.3.2.2 for details on changing the initial cuff inflation pressure.

5. Press the START NIBP key (38) to begin an NIBP measurement. A beep is sounded after a completed measurement.

   NOTE: Inflate the cuff only after proper application to the patient's limb. Cuff damage can result if the cuff is left unwrapped and then inflated.

   The cuff begins to inflate to the selected cuff pressure. After reaching the selected pressure, the cuff begins to slowly deflate and the Accutorr Plus collects oscillometric pulsations.

   If the initial cuff inflation is found to be inadequate, the unit retries with a higher inflation pressure (+50 mmHg in the adult mode; +50 in the pediatric mode; +40 mmHg in the neonate mode). A triple beep tone is generated. NOTE: Any time there is an unsuccessful NIBP measurement, a triple beep tone is generated and the Diastolic, Systolic, NIBP HR, MAP and Timer/Temp LED's will be replaced with dashes.

   Have the patient remain still to avoid unnecessary motion artifact. After the cuff pressure drops below the diastolic pressure, the results of the measurement are displayed and the cuff is vented to atmosphere.

   If an error code displays in the Systolic Display or a status code in the Room/Bed Display, refer to Section 1.3.16, Status and Error Codes, for its explanation. A successful measurement clears a status code. To clear a status code, press the ROOM/BED NUMBER key (24).

6. When required, press the DEFLATE key (36) to interrupt a measurement. The cuff will deflate.

NOTE: Once the initial measurement is taken for a room/bed, the Accutorr Plus will continue to use the selected patient size.

NOTE: Check the patient's limb for any indications of circulation impairment.

1.3.3.1 NIBP Pressure Limit Fail Safe

If the cuff is over-pressurized, it will automatically deflate and the status code 8812 *(STOP - CUFF OVERPRESSURE)* or error code 987 *(STOP - HARDWARE OVERPRESSURE)* will be displayed in the Room/Bed or display.

The unit must be turned off and back on again to reset the hardware overpressure switch (error code 987) before any new measurements can be taken.

1.3.3.2 Cuff Inflation Time

If the cuff pressure does not attain 20 mmHg within 40 seconds of the start of inflation or if the target pressure is not reached within another 60 seconds, then the cuff is deflated and status codes will be displayed in the Room/Bed display. See section 1.3.16 for a list of error and status codes.

1.3.3.3 Automatic Adjustment of Cuff Inflation Pressure (Adaptive Inflation)

The unit adjusts the inflation pressure according to the previous reading of the systolic pressure. After the first successful measurement, the inflation pressure is the previous systolic +50 mmHg in the adult mode and +50 mmHg in the pediatric mode and +40 mmHg in the neonate mode.

To view the current inflation pressure, press and hold (2 beep tones, approximately 3 seconds) the Patient Setup Key (37). The current inflation pressure is shown in the MAP display. If required, use the Patient Info. Up & Down Arrow keys (27 & 28) to change the inflation pressure.

It is also possible to permanently override this adjustment in the User Configuration. See section 1.3.15 for details.

1.3.4 AUTOMATIC NIBP MEASUREMENTS (Interval Mode)

The Accutorr Plus can be set to automatically take NIBP measurements. On initial power up, the interval setting will default to OFF. The User Configuration mode can be used to set custom defaults for the Interval Mode. See section 1.3.15, User Configuration for details.

Follow Steps 1 - 4 in the Manual Procedure, Section 1.3.3, to select, attach and apply the cuff and to adjust the initial cuff inflation pressure.

5. Press the INTERVAL key (34). The current selection is displayed in the Interval/ Elap.Time/Temp. display (33). Press the INTERVAL key to scroll to the next available interval selection. The selections are: Off (—- when set to graphic display), CONT (continuous), 1, 2.5, 5, 10, 15, 20, 30, 60, 120 and 240 minutes. When an interval setting is selected, except for Off, the Interval Indicator (35) flashes. When the interval mode is activated the Interval Indicator illuminates continuously.

6. The displayed interval time is entered when the INTERVAL key has not been pressed for 15 seconds
   or,
   when the TIMER/TEMP key (32) is pressed, which changes the display back to Elap. Time
   or,
   when the START NIBP key (38) is pressed, which initiates an NIBP measurement, activates the Interval Mode, and changes the display back to Elap. Time.

7. If the START NIBP key (38) has not already been pressed, press to take a measurement and to activate the interval mode. NOTE: If the interval time is changed, the START NIBP key does not need to be pressed for the new interval to initiate. When the new time interval has elapsed, a measurement will be taken.

NOTE: When the NIBP continuous interval is chosen, the Accutorr Plus will take back to back (one right after the other) blood pressure readings. As a safety precaution, a five minute limit is placed on continuous measurements. After 5 minutes, the NIBP interval will automatically switch to measurements taken once every 5 minutes. This is done to reduce the chance of surface vessel rupture (petechia).

1.3.4.1 Canceling an Automatic NIBP Measurement

To cancel a scheduled measurement, press the DEFLATE key (36). This will suspend the timed NIBP measurements until the START NIBP key (38) is pressed. The interval indicator will flash. See section 1.3.4.4 for more details on the start and deflate function. **NOTE:** Pressing the DEFLATE key (36) will also end a measurement cycle that is already in progress.

To take an immediate measurement and to reactivate the Interval mode, press the START NIBP key (38). The next timed measurement will be taken at the time set by the interval. For example, if the interval was set to 30 minutes, the next timed measurement will be 30 minutes after the START NIBP key was pressed. NOTE: If the Interval mode is no longer required, set the interval to "OFF" prior to pressing the START NIBP key. See section 3.4 for details on changing the interval mode.

NOTE: If the DEFLATE key (36) is pressed, it will take 10 seconds before another measurement can be taken. The START NIBP INDICATOR (39) will be illuminated, when ready.

NOTE: When in the Interval mode and the Room/Bed is changed, the interval mode is suspended (interval indicator flashes) until the NIBP Start key is pressed.

1.3.4.2 Changing the Interval Setting

If the interval time is changed while the Accutorr Plus is in the interval mode, the new interval time is used once it is entered. For example: The interval time is set to 60 minutes. Thirty minutes have elapsed since the last timed automatic measurement and the interval time is changed to 10 minutes. Once the interval time is entered, the Accutorr Plus will take an automatic NIBP measurement in 10 minutes and then once every 10 minutes.

1.3.4.3 Effects of Changing the Room Number and/or Bed Letter on the Interval Setting

When the Room Number and/or Bed Letter is changed, the interval setting will remain the same. NOTE: The interval setting can be changed if required. Also, if an NIBP measurement is in progress, the measurement will stop and the cuff will deflate. The timed interval measurements will not activate again (interval indicator flashes) until the START NIBP key (38) is pressed.

1.3.4.4 START and DEFLATE Functions

The START NIBP and DEFLATE functions have the following effects on the timed measurement sequence.

- INTERVAL mode is active and the START NIBP key (38) is pressed causing an unscheduled measurement to be taken. Taking this unscheduled measurement does not affect the timing of the interval cycle, therefore, the scheduled measurements will still be taken as if there were no interruptions. Only one measurement is taken for each measurement cycle - even if the unscheduled measurement coincides with the scheduled measurement.
- INTERVAL mode is active and the DEFLATE key (36) is pressed. The INTERVAL INDICATOR (35) flashes. No additional measurements will be taken until the START NIBP key (38) is pressed. If a timed measurement is in progress, the measurement is suspended and the cuff deflates.
- INTERVAL mode is active and the interval time is changed. The measurement cycle is reset with the new interval. A measurement will be taken after the new interval time has elapsed.

1.3.5 ALARMS

The Accutorr Plus provides "HI" and "LO" alarm limit settings for systolic, diastolic, MAP, pulse rate and SpO_2. An alarm violation occurs when one or more patient parameters equals or falls outside the limits that have been specified.

1.3.5.1 Setting Alarm Limits

The Factory Default for all parameter alarms, except Low SpO_2, is OFF. The Low SpO_2 factory default is 86. The User Configuration mode can be used to set custom defaults. See section 1.3.15, User Configuration for details. The factory and custom defaults for alarms can be changed as required to accommodate the needs of individual patients. The SET ALARMS key (29) and the Patient Info. Up and Down Arrow keys (27 & 28) are used to set alarm values.

1. Press the SET ALARMS key (29) (1 beep) to enter into the alarm set mode.

   The first time this key is pressed, all NIBP displays blank except for the systolic display which shows the current high systolic alarm value. The word HI is displayed in the Interval/Elap. Time/Temp display (33). When the unit has been configured to display graphics, the symbol ≡≡≡≡ is displayed. When the graphic is displayed, the top lines blink. This indicates the high alarm is selected.

   The second time the SET ALARMS key (29) is pressed the Systolic LO parameter is selected. The word LO is displayed in the Interval/Elap. Time/Temp display (33). When the unit has been configured to display graphics, the symbol ≡≡≡≡ is displayed. When the graphic is displayed, the bottom lines blink. This indicates the low alarm is selected.
   Each time the SET ALARMS key (29) is pressed a new parameter is selected for alarm setting (all other displays blank). The order they are available is: Systolic HI, Systolic LO, Diastolic HI, Diastolic LO, MAP HI, MAP LO, Pulse Rate HI, and Pulse Rate LO, SpO_2 HI and SpO_2 LO. When all of the available parameters have been selected, the next press of the SET ALARMS key returns the Accutorr Plus to normal operation.

2. To change an alarm limit setting, use the Patient Info. Up & Down Arrow keys (27 & 28). The Up arrow increments the alarm limit setting. The Down arrow decrements the alarm limit setting.

   To cancel all of the changed alarm values while still in progress of changing, press the DEFAULTS key (14) (1 beep tone).

   If the SET ALARMS or Arrow keys have not been pressed for 15 seconds, the Accutorr Plus returns to normal operation and saves any alarm limit changes.

   NOTE: If the patient size is changed, the alarm settings will change to the default settings for the new patient size.

Alarm Limit Table

PARAMETER	RANGE	UNITS	FACTORY DEFAULT	UNITS OF INCREMENT
Systolic High				
Adult	Off, 60-260			
Pediatric	Off, 60-160	mmHg	Off	5
Neonate	Off, 50-125			
Systolic Low				
Adult	Off, 55-150			
Pediatric	Off, 55-130	mmHg	Off	5
Neonate	Off, 45-115			
Diastolic High				
Adult	Off, 40-200			
Pediatric	Off, 40-150	mmHg	Off	5
Neonate	Off, 35-100			
Diastolic Low				
Adult	Off, 30-120			
Pediatric	Off, 30-50	mmHg	Off	5
Neonate	Off, 25-50			
MAP High				
Adult	Off, 90-200			
Pediatric	Off, 90-150	mmHg	Off	5
Neonate	Off, 60-110			
MAP Low				
Adult	Off, 40-100			
Pediatric	Off, 40-70	mmHg	Off	5
Neonate	Off, 30-70			
Pulse Rate High				
Adult	Off, 100-245			
Pediatric	Off, 100-245	bpm	Off	5
Neonate	Off, 100-245			
Pulse Rate Low				
Adult	Off, 35-120			
Pediatric	Off, 35-150	bpm	Off	5
Neonate	Off, 75-200			
SpO2 High				
Adult	Off, 61-99			
Pediatric	Off, 61-99	%SpO2	Off	1
Neonate	Off,61-99			
SpO2 Low				
Adult	60-95			
Pediatric	60-95	%SpO2	86	1
Neonate	60-95			

1.3.5.2 Alarm Violations

An alarm condition exists if the parameter is equal to or is outside the high/low limit range that has been set. When an alarm limit is violated, the following actions occur:

- The LEDs for the parameter in an alarm condition flashes.
- The parameter in an alarm condition is in reverse video on the LCD (Accutorr Plus models with Trend Screen).
- The alarm tone is sounded (unless muted with the MUTE key (30)).
- The parameter(s) that was in an alarm condition will be in brackets [ ] when printed on the recorder.

1.3.5.3 How to Mute Alarms

When an NIBP alarm exists, press the MUTE key (30) (1 beep tone) to silence the alarm tone for 2 minutes. The alarm tone will return after two minutes, unless a new measurement has been taken and is within the alarm limits.

When an SpO_2 alarm exists, press the MUTE key (30) (1 beep tone) to silence the alarm tone for two minutes. The alarm tone will return after two minutes, unless the SpO_2 value changes and is within the alarm limits. If during that two minutes the measured SpO_2 value changes to a value that is within the acceptable range, and then returns to a value that is outside the set alarm limit, the alarm tone will return before the two minutes elapse. Example (within 2 minutes): • SpO_2 low alarm limit has been set to 90. • SpO_2 is measured at 89; the alarm tone sounds and the SpO_2 display flashes. • The MUTE key is pressed. • SpO_2 is measured at 88; there is no alarm tone, but the SpO_2 display flashes. • SpO_2 is measured at 91; no alarm tone sounds and the display stops flashing. • SpO_2 is measured at 89; the alarm tone sounds and the SpO_2 display flashes.

Press and hold the MUTE key (30) (2 beep tones, approx. 3 seconds) to permanently silence the alarm tone. The MUTE LED (31) illuminated. The LEDs for the alarming parameter will continue to flash. To reactivate the alarm tone function, press the MUTE key (30) again.

1.3.5.4 Alarms and Changing the Room Number and/or Bed Letter

When changing the rooms and beds, the alarm settings will change if the final room/bed displayed is a different patient size than the original room/bed. When a new patient size is detected, the alarm settings change to the defaults for the different patient size. See section 1.3.15 for information on custom defaults.

The table below describes 6 measurements in different rooms/beds and different patient sizes, and the effect on the alarm settings.

Measurement Order	Room/Bed	Patient Size	Alarm Settings
1	1/a	Adult	Have been manually set.
2	1/b	Adult	Remain the same.
3	2/a	Pediatric	Changed to defaults for a pediatric size patient.
4	3/a	Adult	Changed to defaults for an adult size patient.
5	4/a	Adult	Remain the same.
6	1/a	Adult	Remain the same. If the alarm settings that were set from the 1st measurement are required, they need to be set again manually.

NOTE: The alarm settings can be changed, if necessary, when changing the room/bed and the patient size is the same.

PRECAUTION: *It is the users responsibility, when changing the room/bed, to assure the patient size and alarm settings are as required.*

1.3.6 TO VIEW AND DELETE STORED DATA (Trend Mode)

All models of the Accutorr Plus are capable of storing up to 100 entries of measurement data. Each time a successful NIBP measurement is made, the data is automatically stored in memory. When a temperature measurement is made between two minutes before and two minutes after an NIBP measurement, it is stored as the same entry with the NIBP measurement. If a temperature measurement is made outside this time, it is stored as a separate entry. When either NIBP or temperature measurements are stored and SpO_2 information is available, then the SpO_2 data is also stored.

When 80 entries are stored into trend memory, the MEMORY FULL Indicator (20) will flash. When 100 entries are stored into trend memory, the MEMORY FULL Indicator (20) will illuminate continuously. Once 100 entries are stored, old data can be deleted manually for any patient; or when new data is available, the Accutorr Plus will automatically delete the oldest data for the currently displayed patient.
NOTE: The unit will also automatically delete data that is 24 hours old.

The Accutorr Plus NIBP uses the Systolic, Diastolic, MAP, and Temp displays to view stored data. The Accutorr Plus models with Trend Screen use the LCD to display up to 5 measurements at a time. The stored data that is viewed is for the currently selected patient (indicated by the room number/bed letter).

1.3.6.1 To View the Stored Measurements on the Accutorr Plus NIBP

1. Press the DATA SCAN key (22) (1 beep tone). The DATA SCAN Indicator (23) illuminates.

2. Press the Patient Info. Up and Down Arrow keys (27 & 28) to view stored data for the current patient. The stored data is displayed in the Systolic, Diastolic, MAP, Pulse Rate and Temp displays.

   Consecutive presses or pressing and holding the UP or DOWN arrow will allow the stored measurements to continuously wrap around. When the measurements wrap, a double beep tone will sound. If a temperature measurement is not available for the NIBP measurement that is displayed, then - - - - is shown in the Interval/Elap. Time/Temp display (33). To view the time of measurements, press the TIME/TEMP key (32).

3. To exit the view stored data mode, press the DATA SCAN key (22) (1 beep).

1.3.6.2 To View the Stored Measurements on the Accutorr Plus NIBP with Trend Screen and the Accutorr Plus NIBP with Trend Screen and SpO_2

The stored measurements on the Accutorr Plus models with Trend Screen are displayed in the LCD. Up to 5 stored measurements are displayed at one time. Measurements are displayed in time order, with the newest measurement at the top. A scroll bar with one or both arrows will display on the side of the LCD when more measurements are available to view. When only one arrow displays, more measurements are only available in the direction of the arrow.

1. To view more measurements press the LCD Up or Down Arrow key (9 & 10).

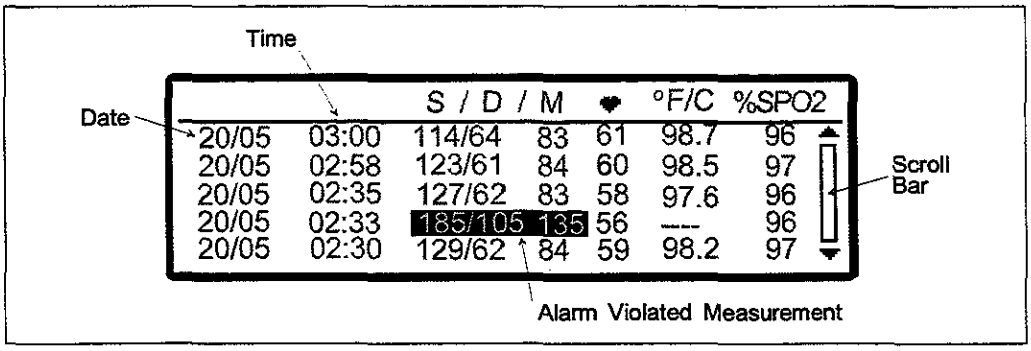

Figure 1-10 - LCD Trend List Display

1.3.6.3 To Delete the Stored Measurements on all Models of the Accutorr Plus

While viewing stored data, you can delete the most recent measurement or all of the stored measurements for the currently displayed patient.

1. Select a room/bed where stored information can be deleted. (See section 1.3.2.3 for details on selecting a room/bed.) If it is the currently displayed room/bed, go to step 2. When you are uncertain what rooms/beds have stored data, press and hold the DATA SCAN key (22) (2 beep tones, more than 3 seconds). The Accutorr Plus will scan through all of the rooms/beds that have data stored. To stop on a Room/Bed as the Accutorr Plus is scanning, press the DATA SCAN key (22). NOTE: The Accutorr Plus will scan through the rooms/bed with stored data only once.

2. On the Accutorr Plus NIBP only, when the desired room/bed is displayed, press the DATA SCAN key (22) (1 beep tone). The DATA SCAN Indicator (23) illuminates.

3. When the most recent stored data is displayed, press and hold the DELETE INFO. key (21) (1 beep tone, approx. 3 seconds) to delete this measurement.

4. When viewing any of the stored measurements, press and hold the DELETE INFO. key (21) (2 beep tones, approx. 6 seconds) to delete all stored measurements for the current patient. When all data is cleared the patient size will be the default selection.

5. On the Accutorr Plus NIBP only, press the DATA SCAN key (22) (1 beep tone) to exit the delete data mode.

NOTE: *The unit will also automatically delete data that is 24 hours old.*

NOTE: To delete all information for all patients, press and hold the DELETE INFO. key (21) while powering on the unit.

1.3.7 SETTING THE ALARM VOLUME AND BEEP VOLUME

The LCD on the Accutorr Plus models with Trend Screen is used to display the Trend List as described in section 1.3.6. It is also used to display a menu which is used to set the alarm volume and the SpO_2 beep volume. The MENU key (8), the LCD Up and Down Arrow keys (9 & 10), and the SELECT key (12) are used to set these volumes. The User Configuration mode can be used to set custom defaults for the alarm volume and beep volume. See section 1.3.15, User Configuration for details.

1. Press the MENU key (8) to display the menu. The menu is shown in figure 3-4. The alarm volume is initially highlighted when the menu is displayed. The highlighting indicates this item can be changed.

2. Press the LCD Up and Down Arrow keys (9 & 10) to change the current selection for the alarm volume. The selections are: OFF, 1, 2, 3, 4, and 5 with 5 being the loudest.

3. Press the SELECT key (11) to move the highlighting to SpO_2 beep volume.

4. Press the LCD Up and Down Arrow keys (9 & 10) to change the current selection for the SpO_2 volume. The selections are: OFF, 1, 2, 3, 4, and 5 with 5 being the loudest.

5. Press the MENU key (8) again to exit the menu and return to the Trend screen.

NOTE: Any changes made to the alarm volume or the SpO_2 volume will be erased when the unit is turned off and then back on again.

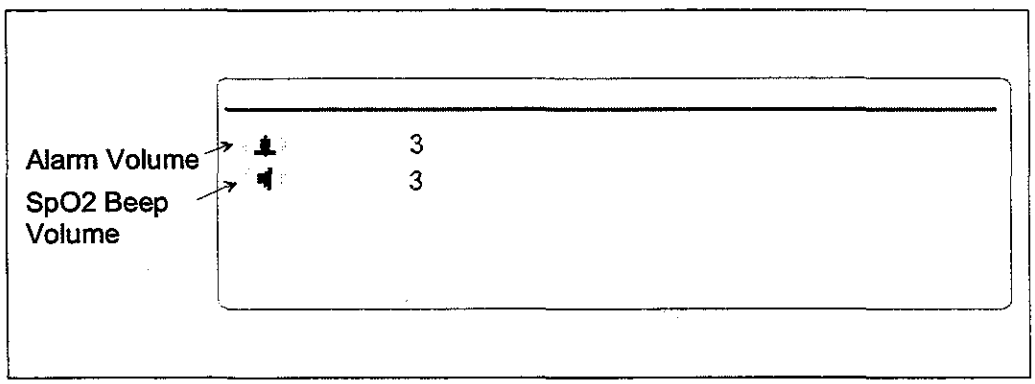

Figure 1-11 Menu

1.3.8 SETTING THE LCD CONTRAST (View Angle Adjustment)

The LCD on the Accutorr Plus models with Trend Screen can be adjusted for optimum viewing. The MENU key (8) and the LCD Up and Down Arrow keys (9 & 10) are used to adjust the contrast.

1. Press and hold the MENU key (8) (2 beep tones, approx. 3 seconds). A beep tone is generated when the key is first pressed and the display changes to the menu. When a second beep tone is generated, release the key.

2. To quickly adjust the contrast, press and hold either the LCD Up or Down Arrow key (9 or 10). For fine adjustment, momentarily press either the LCD Up or Down Arrow key.

3. The LCD contrast adjustment is saved by either pressing the MENU key (8) again or not pressing either the LCD UP or Down Arrow keys (9 & 10) for 15 seconds.

NOTE: The contrast setting will be the same each time the unit is turned on, unless readjusted by the user.

1.3.9 DISPLAY TIME OUT MODE

To conserve power, most displays will blank at user selected times. The LCD illumination time out can be set between 3 and 15 minutes. The LED display time out can be set between 5 and 60 minutes. Since the Accutorr Plus can be powered from either an AC or DC source, the user configuration allows the setting of separate times for each type of power source. See User Configuration, section 1.3.15 for more information on setting the time out minutes.

To turn on the LCD light, press the MENU key (8). To turn on the LED displays, press any key.

1.3.10 SpO_2 MEASUREMENTS (Accutorr Plus model with SpO_2)

To obtain SpO_2 measurements and SpO_2 Heart Rate from the Accutorr Plus model with SpO_2: See Section 3.10.1 for units with Datascope SpO_2; for units with Nellcor SpO_2 see section 3.10.2; for units with Masimo SpO_2 see section 1.3.10.3)

CAUTION: Do not place the sensor on an extremity with an invasive catheter or blood pressure cuff in place.

CAUTION: A pulse oximeter should not be used as an apeana mnitor.

CAUTION: A pulse oximeter should be considered an early warning device. As a trend towards patient deoxygenation is indicated, blood samples should be analyzed by a laboratory co-oximeter to completely understand the patient's condition.

CAUTION: Ensure proper routing of the patient cable to avoid entanglement and/or strangulation

NOTE: In the event you are unable to obtain a reading, or the reading is inaccurate, check the patients vital signs by alternate means and consider the following:

- If your patient is poorly perfused, try applying the sensor to another site (i.e. A different finger or toe).
- Check that the sensor is properly aligned.
- In electrosurgery, make sure the sensor is not too close to ESU devices or cables.
- Check to make sure the site area is clean / non-greasy. Clean the site and sensor if needed. Nail polish and fungus should be removed.

1.3.10.1 Datascope Pulse Oximetry Sensors

A. Introduction

A wide range of Datascope sensors are available for connection to the Accutorr Plus model with SpO_2. The sensors cover both short-term and long-term monitoring needs on patients ranging from infants to large adults.

The DATASENSOR is intended for short-term adult monitoring.

The FLEXISENSOR® SD, available in five different sizes, provides both short-term and long-term monitoring for large adults, adult ear, adults, pediatrics, and infants. The FLEXISENSOR® SD is used when the DATASENSOR is not convenient or suitable.

The ear sensor is intended for long-term adult monitoring. A range of disposable bandages are available for use with the FLEXISENSOR® SDs. They are available in 2styles, SENSOR GUARD™ (used for large adults, adults and pediatrics), and Coban with SENSOR GUARD™ (used for infants).

Use of the sensors does not cause any penetration of the skin, nor is there any electrical contact or transfer of excessive heat to the patient.

The sensor is composed of a dual light emitting diode (LED) (emitter) and a photo diode (detector). The emitter discharges two colors (wave lengths) of light into the patient's extremity (finger, toe, ear). The detector receives the light not absorbed by the blood or tissue components. The Accutorr Plus model with SpO_2 then uses the

relative absorption of the two light wavelengths to compute and display SpO_2 (functional saturation) and Pulse Rate measurements.

The key benefits of the sensors are:

- **Electro-Surgical Noise (ESU) Rejection** - The sensor configuration of both the DATASENSOR and the FLEXISENSOR® SD provide uninterrupted monitoring and absence of false alarms during the use of ESU (ESU can be set at any power level). This design prevents electro-surgical noise entering the monitor, via the sensor, and interfering with unit operation.
- **Monitoring Restless Patients** - Motion artifact rejection is achieved in several ways.
  1. The sensor design used with their recommended bandages assures a snug fit of the sensor to the patient.
  2. Light emitting diodes (LEDs) and detectors gather a strong signal from the patient.
  3. When in the presence of motion, the software adjusts the "averaging-period", increasing it to a maximum of 15 seconds during motion, and automatically reducing it during quiet periods to obtain a fast response. This combination reduces the number of monitoring interruptions and false alarms from patient motion.
- **Tracking of Weak Peripheral Pulse Levels** - Many patients suffer poor peripheral perfusion due to hypothermia, hypovolemia, reduced cardiac output, etc. The Accutorr Plus model with SpO_2 is designed to automatically increase its gain to track patients with poor peripheral perfusion.
- **Rejection of Ambient Light** - Many monitoring situations involve high levels of ambient light, i.e.., operating room lights, neonatal phototherapy, heat warmers, etc. The Accutorr Plus model with SpO_2, the sensors, and the bandages each contribute to the rejection of ambient light. The monitor automatically measures and corrects for high levels of ambient light. The enclosed design of the DATASENSOR prohibits the interference of high levels of ambient light on adults with sensor operation. The opaque material used in the composition of the bandages, which are used with the FLEXISENSOR® SD, helps keep out ambient light.
- **Patient Comfort** - The FLEXISENSOR® SD line is designed to work with a disposable bandage of two styles (SENSOR GUARD TM and Coban) which conform comfortably and safely to the particular patient's anatomy.

B. Sensor Selection and Application

Selection of a specific sensor is based on the patient's size, physical condition, and expected monitoring duration. General guidelines for the selection of a sensor are provided in the Sensor Selection Table, page 3-25. Instructions for the application of a sensor to a patient are provided in each sensor package. For optimal DATASENSOR and FLEXISENSOR® placement ensure that cable side is placed in the correct position. See figures below.

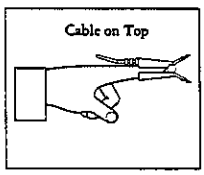

Figure 1-12 Datasensor or Durasensor Placement

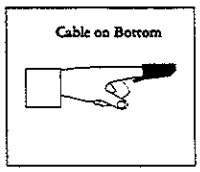

Figure 1-13 Flexisensor® Placement

C. Sensor Connection to the Accutorr Plus model with SpO_2

1. Align the cable connector on the sensor assembly with the SpO_2 Connector (15) on the Accutorr Plus model with SpO_2.

2. Push the cable connector into the SpO_2 Connector (15). Confirm that the cable connector is securely in place.

3. The digital SpO_2 values and SpO_2 pulse rate will be displayed in the SpO_2 and pulse Rate LED's.

4. If desired, adjust the beep volume. See section 3.7, Setting the Alarm Volume and Beep Volume, for details on adjusting the beep volume.

D. Sensor Inspection

Before use, always inspect sensors, cables, and connectors for damage, i.e., cuts and abrasions. Do not use the sensor, cable or connector if damaged. Replace with a good working sensor.

For long sensor life:

- Do not drop on the floor, or give other sharp shocks to the sensor(s). Between use, store the sensors in the accessory pouch, or coil the sensor cable and store on the side of the Accutorr Plus rolling stand using the optional cable retainer. For accessory part number information see Section 5.2, "Optional Accessories".
- Avoid running any cart, bed, or any piece of equipment over the sensor cable.
- Avoid strong pulls on the sensor cable (10 lbs/4kg).
- Watch for cracks in the DATASENSOR housing.
- Watch for cracks, cuts, rips, fogging, or signs of moisture in the FLEXISENSOR® SD

E. Sensor Performance

For the BEST performance:

- DO NOT PLACE any sensor on an extremity with an arterial catheter or blood pressure cuff in place. Placement of an arterial catheter or blood pressure cuff on an extremity may obstruct normal blood flow. False pulse rate information may result if the FLEXISENSOR® SD is placed on that same extremity. Place the sensor on the limb opposite the site of the arterial catheter or blood pressure cuff.
- Encourage the patient to remain still. Patient motion may affect the sensor's performance. If it is not possible for the patient to remain still, replace the sensor bandage on the FLEXISENSOR® SD to assure good adhesion, or change the site of the DATASENSOR.
- Check the DATASENSOR site every 2 hours and check the FLEXISENSOR® SD site every 8 hours for indications of skin abrasions, sensor displacement, sensor damage, or circulation impairment. Check the sensor site every 4 hours if the ear clip is used. If necessary, remove and reapply the sensor. If any of the above mentioned indications occur, immediately remove the sensor and find an alternate site. NOTE: Check the sensor site more frequently on infant and active patients.

- Incorrect placement can also reduce the acquired sensor signal, and therefore compromise performance. Select an alternate site (toe) or use a FLEXISENSOR® SD if the sensor can not be placed on the patient's finger correctly or if the fingernails interfere with the acquisition of a reliable signal.
- Use of the DATASENSOR is not recommended for long-term monitoring (4-6 hours). For monitoring situations exceeding 4-6 hours, either reposition the DATASENSOR every 2-4 hours to a different site (finger/toe) or use a FLEXISENSOR® SD with its appropriate bandage.
- Do not over-tighten the sensor bandages. Excessive pressure on the monitoring site can affect SpO_2 readings and may reduce readings below true SpO_2. Excessive pressure can also result in pressure necrosis and other skin damage.
- Sensor configuration provides virtually uninterrupted monitoring during following situations:

  Electro-cautery Noise - Electro-cautery noise rejection is designed into the sensors.

  Motion Artifact - The monitor's software adjusts the "averaging period" increasing it during motion and reducing it during inactivity. This decreases the number of monitoring interruptions and false alarms.

  Weak Peripheral Pulses - The monitor's gain is automatically increased to track pulses on patients with decreased peripheral perfusion.

Datascope SpO_2 Sensor Selection Table

Sensors		Large Adult (LA)	Adult (A)	Pediatric (P)	Infant (I)	Adult Ear (AE)	Datasensor
Approximate Patient Weight		>80kg/ >176 lbs	0 - 90kg/ 66 - 198 lbs	10 - 40kg/ 22 - 88 lbs	4.5 - 10kg/ 10 - 22 lbs	>40kg/ >88 lbs	40+ kg/ 90+ lbs
Where Used		Fingers, Toes	Fingers, Toes	Fingers, Toes	Feet, Palms, Big Toes	Adult Ear	Fingers, Toes
Long or Short Term Monitoring		Long & Short Term	Long & Short Term	Long & Short Term	Long & Short Term	Long & Short Term	Short Term
Electro-Surgical Interference Suppression (ESIS)		Included	Included	Included	Included	Included	Included
Reusable		Yes Up to 20 Uses	Yes Up to 20 Uses	Yes Up to 20 Uses	Yes Up to 20 Uses	Yes Up to 20 Uses	Yes 6-Months
Bandage Type		Adhesive, Disposable	Adhesive, Disposable	Adhesive, Disposable	Non-Adhesive*	Adhesive	Disposable
Part #'s**	Sensors	0998-00-0076-06	0998-00-0076-05	0998-00-0076-04	0998-00-0074-03	0998-00-0074-05	0600-00-0026-01 (3' sensor cable)***
	Bandages	0683-00-0409-01	0683-00-0409-02	0683-00-0409-03	0683-00-0415	N/A	N/A

* *<Non-adhesive bandages are recommended for premature infants to minimize prenatal skin damage.*

** *See Accessories, Chapter 5, for more detailed information.*

*** *Additional choices: 0060-00-0026-02 (10' sensor cable), 0020-00-0071-01 (3' sensor cable plus 7' extension cable).*

1.3.10.2 Sequence for establishing SpO_2 with Nellcor® Pulse Oximetry*

** This feature applicable only if available or installed on your unit.*

1.Select the appropriate sensor for the patient from Page 3-28

2. Plug the sensor directly into the SpO_2 connector (15) or if necessary, use a Nellcor® SC10 extension cable. **NOTE:** Do not place the sensor on an extremity with an invasive catheter or blood pressure cuff in place.

CAUTION: *When equipped with Nellcor® SpO_2, use only Nellcor® oxygen transducers including Nellcor® Oxisensor™ patient dedicated adhesive sensors. Use of other oxygen transducers may cause improper oximeter performance.*

CAUTION: *Tissue damage or inaccurate measurements may be caused by incorrect sensor application or use, such as wrapping it too tightly, applying supplemental tape, failing to inspect the sensor site periodically, or failing to position it appropriately. Carefully read the sensor directions for use, the Accutorr Plus operating instructions, and all precautionary information before use.*

CAUTION: *Excessive ambient light may cause inaccurate measurements. Cover the sensor with opaque materials.*

CAUTION: *Inaccurate readings may be caused by incorrect sensor application or use; significant levels of dysfunctional hemoglobins, (i.e. carbohemoglobins or methemoglobin); or intra-vascular dyes such as indocyanine green methylene blue; exposure to excessive illumination, such as surgical lamps (especially ones with a Xenon light source), bilirubin lamps, florescent lights, infrared heating lamps, or direct sunlight; excessive patient movement; venous pulsations; electro-surgical interference; and placement of a sensor on an extremity that has a blood pressure cuff, arterial catheter, or intra-vascular line.*

CAUTION: *In certain situations in which perfusion and signal strength are low, such as in patients with thick or pigmented skin, inaccurately low SpO_2 readings will result. Verification of oxygenation should be made, especially in preterm infants and patients with chronic lung disease, before instituting any therapy or interventation.*

CAUTION: *If the sensor or patient cable is damaged in any way, discontinue use immediately. To prevent damage do not soak or immerse the sensor in any liquid solution. DO NOT ATTEMPT TO STERILIZE.*

3. The digital SpO_2 value and SpO_2 Pulse Rate will be displayed on the SpO_2 and Pulse Rate LED's.

4. If desired, adjust the beep volume. See Section 3.7, "Setting the Alarm Volume and Beep Volume", for details on adjusting the beep volume.

1.3.10.2.1 NELLCOR® Sensors

NELLCOR® provides a family of sensors suitable for a wide variety of clinical settings and patients. Specific sensors have been developed for neonates, infants, children, and adults. OXISENSOR™ oxygen transducers are sterile adhesive sensors with optical components mounted on adhesive tape. OXIBAND® oxygen transducers and the DURAFORM™ oxygen transducer system are reusable sensors that are applied with disposable adhesive. The DURASENSOR® DS-100A adult digit oxygen transducer is a reusable sensor with its optical components mounted in a plastic casing. The NELLCOR® RS-10 reflectance oxygen transducer is an adhesive sensor for application to forehead or temple.

NOTE: NELLCOR®, OXIBAND® and DURASENSOR® are registered trademarks of NELLCOR® Incorporated. OXISENSOR™ and DURAFORM™ are trademarks of NELLCOR Incorporated.

A. Selecting a Sensor

Sensors are designed for specific sites on patients with designated weight ranges. To select the appropriate sensor, consider the patient's weight, level of activity, adequacy of perfusion, which sensor sites are available, whether sterility is required, and the anticipated duration of monitoring.

B. Cleaning and Re-Use

Do not immerse any OXISENSOR™, DURASENSOR®, OXIBAND®, or DURAFORM™ oxygen transducer, the NELLCOR® RS-10 oxygen transducer, or any NELLCOR® adhesive in water or cleaning solution. Clean DURASENSOR®, OXIBAND®, and DURAFORM™ oxygen transducers, and the NELLCOR® RS-10 oxygen transducer by wiping with a disinfectant such as 70% alcohol. Do not sterilize by irradiation, steam, or ethylene oxide. Use a new OXIBAND® adhesive wrap or FORM-A adhesive bandage for each patient. Do not re-sterilize OXISENSOR™ oxygen transducers.

C. Performance Considerations

To insure optimal performance, use an appropriate sensor, apply it as directed, and observe all warnings and cautions.

If excessive ambient light is present, cover the sensor site with opaque material. Failure to do so may result in inaccurate measurements. Light sources that can affect performance include surgical lights, especially those with a xenon light source, bilirubin lamps, fluorescent lights, infrared heating lamps, and direct sunlight. If poor perfusion affects instrument performance, and the patient weighs more than 50 kg (110 lbs.), consider using the OXISENSOR™ R-15 adult nasal oxygen transducer. Because the R-15 obtains its measurements from the nasal septal anterior ethmoid artery, an artery supplied by the internal carotid, this sensor may obtain measurements when peripheral perfusion is relatively poor. For low peripheral perfusion, consider using the NELLCOR® RS-10 reflectance oxygen transducer, which is applied to the forehead or temple.

If patient movement presents a problem:

- Verify that the sensor is properly and securely applied.
- Use a new sensor with fresh adhesive backing.
- Move the sensor to a less active site.
- Use a type of sensor that tolerates some patient motion, such as the OXISENSOR™ D-25, D-20, N-25, or I20 oxygen transducer.

NELLCOR® SENSOR FAMILY						
SELECTION GUIDE	**D25/D25L Adult**	**R-15 Adult**	**N-25 Neonatal**	**I-20 Infant**	**D-20 Pediatric**	**RS-10 Adult**
Patient Size	>30 kg	>50 kg	<3 kg >40 kg	1-20 kg	10-50 kg	>40 kg
Duration of Use	Short or Long Term	Short or Long Term	Short or Long Term	Short or Long Term	Short or Long Term	Short Term
Sterility	Sterile[1]	Sterile[1]	Sterile[1]	Sterile[1]	Sterile[1]	Non-sterile
Patient Activity	Limited Activity	Inactive	Limited Activity	Limited Activity	Limited Activity	Limited Activity
	OXISENSOR adult digit oxygen transducer	OXISENSOR adult nasal oxygen transducer	OXISENSOR neonatal oxygen transducer	OXISENSOR infant digit oxygen transducer	OXISENSOR pediatric digit oxygen transducer	RS-10 reflectance oxygen transducer

[1] *In an unopened, undamaged package.*

All NELLCOR® accessories and sensors must be purchased form NELLCOR® Inc., 25495 Whitehall Street, Hayward, Ca. 94545. To contact NELLCOR®, call 1-800-NELLCOR.

D. Automatic Calibration of NELLCOR® Sensors

The oximetry subsystem incorporates automatic calibration mechanisms. It is automatically calibrated each time it is turned on, at periodic intervals thereafter, and whenever a new sensor is connected. Also, the intensity of the sensor's LEDs is adjusted automatically to compensate for differences in tissue thickness.

Each sensor is calibrated when manufactured; the effective mean wavelength of the red LED is determined and encoded into a calibration resistor in the sensor plug. The instrument's software reads this calibration resistor to determine the appropriate calibration coefficients for the measurements obtained by that sensor.

1.3.10.3 Sequence for establishing SpO_2 with Masimo Set® Pulse Oximetry*

** This feature applicable only if available or installed on your unit.*

1. Select the appropriate sensor for the patient from the table below. All sensors below are non-sterile and can be used during patient movement.

MASIMO® SENSOR FAMILY			
SELECTION	**PART NUMBER**	**PATIENT SIZE**	**DISPOSABLE/ REUSABLE**
LNOP® - Adt Adult Disposable Finger Sensor	0600-00-0043-01	> 30 kg.	Disposable
LNOP® -Pdt Pediatric/ Slender Digit Disposable Sensor	0600-00-0044-01	10 to 50 kg.	Disposable
LNOP® - Neo Neonatal Disposable Sensor	0600-00-0045-01	< 10 kg.	Disposable
LNOP® - Neo Pt Neonatal Pre-term Disposable Sensor	0600-00-0046-01	< 1 kg.	Disposable
LNOP® - DCI Adult Reusable Finger Sensor	0600-00-0047	> 30 kg.	Re-usable
PC12 Patient Cable Extension	0012-00-1099-02	All	Re-usable

2. Attach the PC12 Patient Cable (P/N 0012-00-1099-02) to the sensor and plug the other end of the patient cable into the SpO_2 connector (15)

   NOTE: Do not place the sensor on an extremity with an invasive catheter or blood pressure cuff in place.

   NOTE: Ensure proper routing of patient cable to avoid entanglement and/or strangulation.

CAUTION: When equipped with MASIMO® SpO_2, use only MASIMO® oxygen transducers including MASIMO LNOP® patient dedicated adhesive sensors and MASIMO PC12® Patient Cable. Use of other oxygen transducers may cause improper oximeter performance.

CAUTION: Tissue damage or inaccurate measurements may be caused by incorrect sensor application or use, such as wrapping it too tightly, applying supplemental tape, failing to inspect the sensor site periodically, or failing to position it appropriately. Carefully read the sensor directions for use, the Accutorr Plus operating instructions, and all precautionary information before use.

CAUTION: Excessive ambient light may cause inaccurate measurements. Cover the sensor site with opaque material.

CAUTION: Inaccurate measurements may be caused by incorrect sensor application or use; significant levels of dysfunctional hemoglobins, (e.g., carboxyhemoglobin or methemoglobin); or intra-vascular dyes such as indocyanine green methylene blue; exposure to excessive illumination, such as surgical lamps (especially ones with a xenon light source), bilirubin lamps, fluorescent lights, infrared heating lamps, or direct sunlight; excessive patient movement; venous pulsations; electro-surgical interference; and placement of a sensor on an extremity that has a blood pressure cuff, arterial catheter, or intra-vascular line.

CAUTION: In certain situations in which perfusion and signal strength are low, such as in patients with thick or pigmented skin, inaccurately low SpO_2 readings will result. Verification of oxygenation should be made, especially in preterm infants and patients with chronic lung disease, before instituting any therapy or intervention.

CAUTION: Many patients suffer from poor peripheral perfusion due to hypothermia, hypovolemia, severe vasoconstriction, reduced cardiac output, etc. These symptoms may cause a loss in vital sign readings.

CAUTION: The site should be checked at least every eight (8) hours (every four (4) hours with the Adult re-usable finger sensor). Ensure proper adhesion, skin integrity, and proper alignment. Nail polish and fungus may effect readings. Exercise extreme caution with poorly perfused patients. Skin erosion and pressure necrosis can be caused when sensors are not frequently monitored. Assess the site every two (2) hours with poorly perfused patients.

CAUTION: If the sensor or patient cable is damaged in any way, discontinue use immediately. To prevent damage do not soak or immerse the sensor in any liquid solution. Do not attempt to sterilize.

3. The digital SpO_2 value and SpO_2 Pulse Rate will be displayed on the SpO_2 and Pulse Rate LED's.

4. If desired, adjust the beep volume. See Section 3.7, "Setting the Alarm Volume and Beep Volume", for details on adjusting the beep volume.

1.3.10.3.1 MASIMO® Sensors and Patient Cable

MASIMO® provides a family of sensors suitable for a wide variety of clinical settings and patients. Specific sensors have been developed for neonates, infants, children, and adults. All sensors are indicated for continuous non invasive monitoring of arterial oxygen saturation (SpO_2) and pulse rate. The LNOP® - DC1 Adult Re-usable Finger Sensor can also be used for "spot check" applications if needed. All sensors are intended for "single-patient use only" except for the LNOP® - DC1 Adult "Re-usable" Finger Sensor.

A. Selecting a Sensor

Sensors are designed for specific sites on patients with designated weight ranges. To select the appropriate sensor, consider the patient's weight, level of activity, adequacy of perfusion, which sensor sites are available and the anticipated duration of monitoring.

B. Cleaning and Re-use

The sensor may be reattached to the same patient if the emitter and detector windows are clear and the adhesive still adheres to the skin. The adhesive can be partially rejuvenated by wiping with an alcohol wipe and allowing the sensor to thoroughly air dry prior to replacement on the patient.

C. Performance Considerations

To insure optimal performance, use an appropriate sensor, apply it as directed, and observe all warnings and cautions.

If excessive ambient light is present, cover the sensor site with opaque material. Failure to do so may result in inaccurate measurements. Light sources that can affect performance include surgical lights, especially those with a xenon light source, bilirubin lamps, fluorescent lights, infrared heating lamps, and direct sunlight.

Special Features

D. Automatic Calibration

The oximetry subsystem incorporates automatic calibration mechanisms. It is automatically calibrated each time it is turned on, at periodic intervals thereafter, and whenever a new sensor is connected. Also, the intensity of the sensor's LEDs is adjusted automatically to compensate for differences in tissue thickness.

Each sensor is calibrated when manufactured; the effective mean wavelength of the red LED is determined and encoded into a calibration resistor in the sensor plug. The instrument's software reads this calibration resistor to determine the appropriate calibration coefficients for the measurements obtained by that sensor.

E. Oximetry Sensitivity Mode and Post Averaging Time

The Accutorr Plus sensitivity mode for SpO_2 is set to normal and the averaging of the saturation, pulse rate, and signal strength measurements for SpO_2 is set to 8 seconds

1.3.11 TEMPERATURE MEASUREMENT (optional)

NOTE: For information on the optional AccuTemp IR Thermometer Module see the Operating Instructions manual that is provided with the thermometer, part number 0070-00-0346.

NOTE: For information on the Welch Allyn Sure Temp Thermometer, see the Operating Instructions manual that is provided with the thermometer, Welch Allyn part number 70873-0000D

An optional Predictive Thermometer Module (PTM) is available to connect to the Accutorr Plus. The Predictive Thermometer provides temperature measurements in approximately 30 seconds. The Predictive Thermometer module takes oral, rectal or axillary temperatures.

For instructions on how to connect the temperature module see section 1.3.17.

Patient temperature depends upon the site measured. Predictive Thermometers are typically substituted for mercury thermometers to measure oral, rectal and axillary sites. While correlation among these various sites is generally good, actual temperature differences among sites will vary by patient and physiological activity. Consequently, attempts to estimate the temperature of one site based on the temperature of any other site (e.g., rectal temperature vs. axillary temperature) have met with less than favorable results.

WARNING: It is essential that a single use disposable probe cover is used when taking temperature measurements.

1.3.11.1 Predictive Thermometer Measurements

When the predictive thermometer probe is removed from its holder, the Interval/Elap. Time/Temp display shows 85°F (29.4°C). This is an internal self test feature. Once the probe is in place in the patient and the probe detects a temperature greater then 85°F (29.4°C) , the Time/Temp display will begin flashing. When the temperature measurement is complete, the display will stop flashing and a beep tone is sounded. NOTE: After a measurement allow 60 seconds for the tip to cool before proceeding with the next measurement.

1.3.11.2 How to Apply Probe Cover (PTM)

1. To open probe cover box, remove the "tear out" tab on the end of the box top.
2. Place the box of probe covers into the holder of the thermometer module with the opening to the bottom.
3. Remove the probe from its chamber in the thermometer. This turns on the thermometer.
4. Insert the probe into a probe cover in the box, and push firmly on the cap of the probe handle until you feel the probe cover "snap" into place.

PRECAUTION: Use only Datascope recommended probe covers. Use of any other probe cover may result in erroneous readings or damage to the probe.

1.3.11.3 How to take Oral, Rectal, and Axillary Temperatures

1. ORAL TEMPERATURES - Using the BLUE oral probe assembly, place the probe tip firmly in the sublingual pocket next to the frenulum linguae (the vertical fold of tissue in the middle of the tongue) toward the back of the mouth. NOTE: Accurate temperatures can only be obtained in the "heat pocket" at this location. Temperatures in other locations in the mouth may vary by two degrees F (one degree C) or more. Hold the probe steady in this location. The patient's mouth must be closed for the measurement. The thermometer reading will begin to flash, then will indicate the rising temperature as the measurement proceeds.

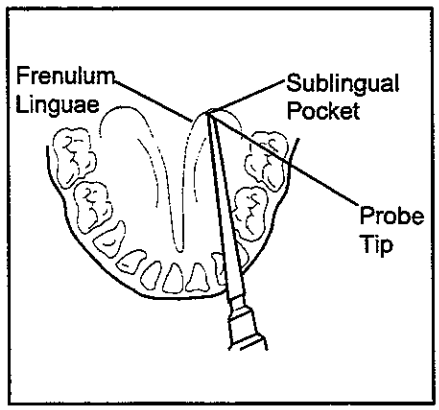

Figure 1-14 Probe Placement for Oral Temperatures

2. The display will stop flashing and a beep tone is generated when the final temperature has been reached. The final reading will be displayed for approximately 1 minute.

3. Remove the probe from the patient's mouth, and discard the used probe cover by pressing on the button on the probe handle. Discard the used probe cover according to standard hospital procedures.

4. After the Accutorr Plus records the patient's temperature, replace the probe in the probe chamber (50). Wait at least 60 seconds before taking another temperature to allow probe to cool down.

5. RECTAL TEMPERATURES - Use a RED rectal probe assembly. Install a probe cover as instructed for oral temperatures, and insert the probe into the patient's rectum. To insure proper tissue contact, angle the probe slightly after insertion. Insertion depth is recommended at ½" to 3/4" for adults and 1/4" to ½" for children. A lubricant may be used if desired. The measurement will proceed similarly to the oral measurement, and the final reading will be displayed when the display stops flashing.

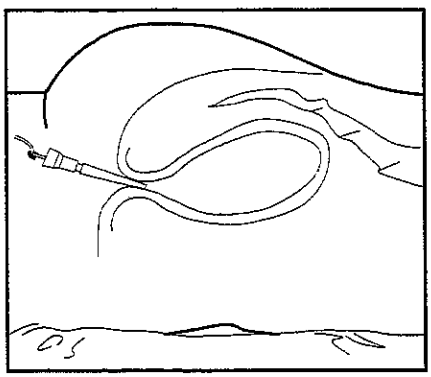

Figure 1-15 Probe Placement for Rectal Temperatures

6. AXILLARY TEMPERATURES - Using the RED rectal probe, install a new probe cover in the normal manner. Have the patient raise his/her arm. Place the probe tip in the axilla, pressing gently to assure good contact. Have the patient lower his/her arm, holding the probe in position almost parallel to the arm. The measurement will proceed similarly to the oral measurement, and the final reading will be displayed when the display stops flashing.

NOTE: It is important that the tip of the probe does not come into contact with a heat source (i.e., hands or finger) prior to taking a temperature. If this should happen, allow at least 5 seconds for the tip to cool before proceeding with the reading.

NOTE: The thermometer will turn itself off about 3 minutes after turning it on, or when the probe is returned to the probe chamber (50). Always store the probe in the chamber, or disconnect it completely to obtain maximum battery life.

NOTE: The thermometer will not take a reading if the patient temperature is less than 6°F (3.3°C) above the ambient temperature.

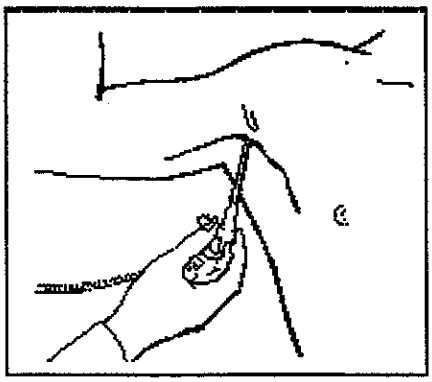

Figure 1-16 Probe Placement for Axillary Temperatures

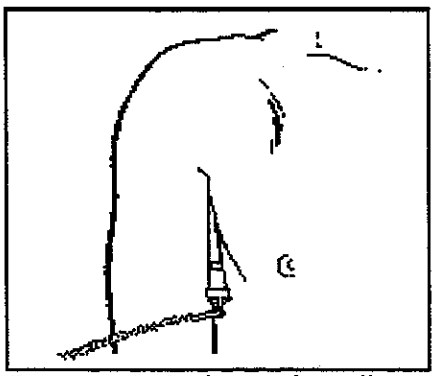

Figure 1-17 Probe Placement for Axillary Temperatures

1.3.11.4 Storing Temperature Measurements

Predictive temperature measurements are automatically stored in the trend memory. AccuTemp IR temperature measurements are stored in the trend memory only if the AccuTemp thermometer is returned to the Accutorr Plus within 60 seconds of the reading. Welch Allyn Sure Temp Thermometer measurements are not stored in the trend memory.

When a temperature measurement is completed within 2 minutes before or after an NIBP measurement, it is stored as occurring at the same time as the NIBP measurement. If more than one temperature measure is taken during this ±2 minutes, then only the last temperature measurement is stored.

When a temperature measurement is taken outside of this ±2 minutes, then it is stored as an individual item. Also, when temperature measurements are taken within two minutes of each other, the newer measurement replaces the older measurement. When more than 2 minutes passes between temperature measurements, then each measurement will be stored.

1.3.12 RECORDER (optional)

The Accutorr Plus can provide a permanent record of patient data using the PRINT key (12). There are two print modes available. They are Continuous Print or Request Print. In the Continuous Print mode the printer will print each time there is a valid NIBP or Temperature measurement. In the Request Print mode the printer will print all of the stored information for the displayed patient.

1. Attach the Recorder Module as shown in section 1.3.17.

2. Press the PRINT key (12) (1 beep tone) to generate a Request printing. The recorder will print all stored measurements for the currently displayed patient. Press the PRINT key (1 beep tone) while a printing is in progress, to stop the printing.

3. Press and hold the PRINT key (12) (2 beep tones, approx. 3 seconds) to switch the print mode between Continuous and Request. When in the Continuous mode the Print LED (13) is illuminated.

NOTE: When a printing is in progress and the PRINT key is pressed or Room Number and/or Bed Letter is changed, the printing will stop.

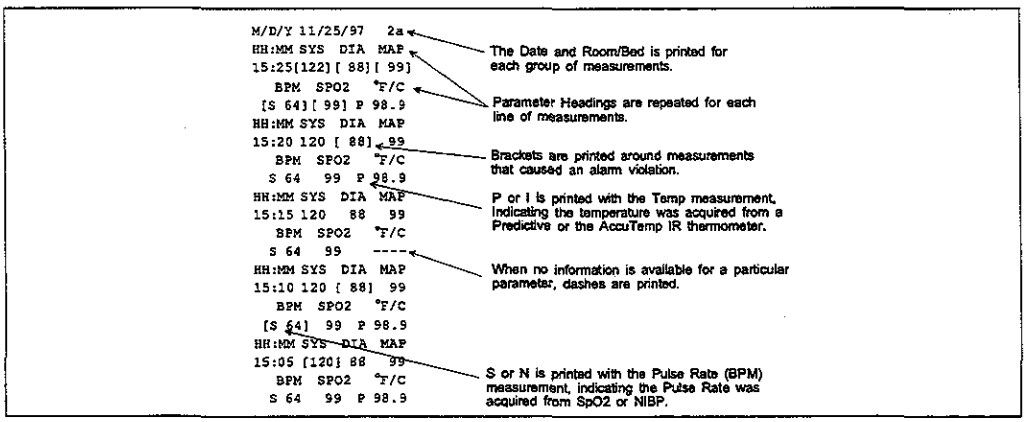

Figure 1-18 Recorder Strip Sample

When the Predictive thermometer is used, "P" is printed next to the temperature measurement. When the IR thermometer is used, "I" is printed next to the temperature measurement. When NIBP is used to obtain a pulse rate measurement, "N" is printed next to the pulse rate measurement. When SpO_2 is used to obtain a pulse rate measurement, "S" is printed next to the pulse rate measurement. If data is not available for any given parameter, "---" is printed under that parameter. Parameter values that violated alarm limits are indicated by the brackets "[ ]".

1.3.13 HOW TO SET THE CLOCK (Date and Time)

The clock can be set during normal operation or in the User Configuration. See section 1.3.15, for details on entering the User Configuration. The Timer/Temp key (32), Interval/Elap. Time/Temp Display (33), and the Up and Down arrow keys (27 & 28) are used to set the time and date. **PRECAUTION:** Changing any part of the time or date will cause all stored patient information (trend data) to be permanently erased. Viewing the time or date does NOT cause data to be erased.

1. Press and hold the Timer/Temp key (32) (2 beep tones, approx. 6 seconds). The hour digit only displays.
2. Press the Patient Info. Up or Down Arrow key (27 or 28) to change the number. NOTE: The Accutorr Plus always displays time in a 24 hour format.
3. Press the Timer/Temp key (32) to activate the minute display.
4. Press the Patient Info. Up or Down Arrow key (27 or 28) to change the number. Continue pressing the Timer/Temp key and the Arrow keys to set the month, day, and year (in that order).
5. After the year has been selected, the next press of the Timer/Temp key (32) exits the clock set mode and enters the new information.

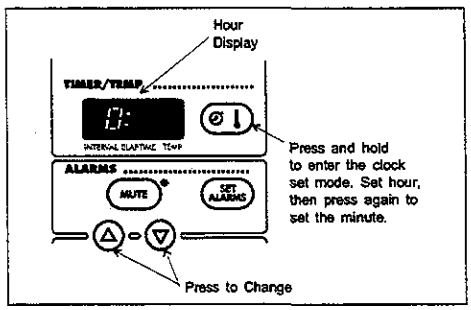

Figure 1-19 - Setting the Hour

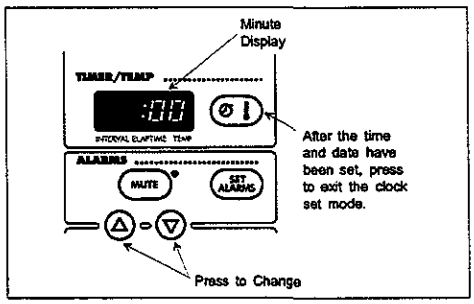

Figure 1-20 - Setting the Minute

To cancel a changed value while that value is still displayed, press the DEFAULTS key (14) for less than 3 seconds.

If the TIMER/TEMP or Arrow keys have not been pressed for 15 seconds, the Accutorr Plus returns to normal operation and saves any Time/Date changes.

When the clock is displayed, it displays real-time (current time). When the clock is displayed while viewing previous data, frozen time is displayed. When frozen time is displayed, the colon between the hours and minutes is illuminated continuously. When real-time is displayed the colon between the hours and minutes flashes.

1.3.14 BATTERY OPERATION

When the Accutorr Plus is powered from the battery, the Battery Indicator (17) is illuminated continuously.

To conserve power, most displays will blank (time out) at user selected times. The LCD illumination time out can be set between 3 and 15 minutes. The LED displays time out can be set between 5 and 60 minutes. Since the Accutorr Plus can be powered from either an AC or DC source, the user configuration allows the setting of separate times for each type of power source. See User Configuration, section 3.15 for more information on setting the time out minutes.

When the battery charge is low, but not below the cutoff voltage, the battery LED will flash and the recorder will not operate. When the LED begins to flash on Sealed lead acid units, approximately 30 minutes of battery time remain for the Accutorr Plus NIBP, 20 minutes for the Accutorr Plus NIBP with Trend Screen and 10 minutes for the Accutorr Plus NIBP with Trend Screen and SpO_2. Units with Lithium ion batteries will provide approximately 10 minutes of low battery warning time.

When the battery charge drops below the cutoff voltage the Accutorr Plus will automatically turn off. Patient information will be retained for later use.

Battery run time for the Accutorr Plus NIBP is approximately 5 hours with a Sealed lead acid battery or 8 hours with a Lithium ion battery using a new fully charged battery at 25 °C with a NIBP measurement taken every 5 minutes and the recorder not in use. Battery run time for the Accutorr Plus NIBP with Trend Screen is approximately 3 hours for a Sealed lead acid battery or 8 hours for a Lithium ion battery using a new fully charged battery at 25 °C with a NIBP measurement taken every 5 minutes and the recorder not in use. Battery run time for the Accutorr Plus NIBP with Trend Screen and Datascope SpO_2 is approximately 1.5 hours for a Sealed lead acid battery or 3.5 hours for a Lithium ion battery using a new fully charged battery at 25 °C with a NIBP measurement taken every 5 minutes continuous SpO_2 measurement and the recorder not in use. Battery run time for the Accutorr Plus NIBP with Trend Screen and Masimo or Nellcor SpO_2 is approximately 2 hours for a Sealed lead acid battery or 4.5 hours for a Lithium ion battery using a new fully charged battery at 25 °C with a NIBP measurement taken every 5 minutes continuous SpO_2 measurement and the recorder not in use.

The Accutorr Plus automatically recharges the battery, when required, when the unit is plugged into an AC receptacle. Maximum battery recharge time is 8 hours for Sealed lead acid or 2 hours for Lithium ion.

CAUTION: To avoid loss of patient data (trend), do not replace the battery unless the Accutorr Plus is connected to an AC receptacle. Hospital defaults and the time are unaffected by battery replacement.

1.3.15 USER CONFIGURATION

The User Configuration Mode allows the operator the opportunity to set custom default settings. These custom default settings will be used each time the Accutorr Plus is turned on. Once the User Configuration Mode is entered, the only way to exit this mode is to turn off the Accutorr Plus using the ON/STANDBY key (19).

1. To enter the User Configuration Mode, press and hold the DEFAULTS key (14) while turning the unit ON. Release after the third beep.
2. To select a User Configuration item number, press the ROOM/BED key (24) to display the desired User Configuration Number in the ROOM and BED displays (25 & 26). See table below for User Configuration Numbers. The current default setting for that item displays.
3. Press the NIBP START key (38) to be able to change the default value. The default setting flashes.
4. Press the Patient Info. Up or Down Arrow key (27 or 28) to change the default setting.
5. Press the START NIBP key (38) to enter the changed default setting.
6. Repeat step 2 for additional choices.

The following table list the functions that can be configured in the user configuration mode.

User Configuration Number	Function	Description	Factory Default
1a	Clock Set	Setting the date and time. See section 1.3.13 for details on setting the clock.	
1b	Date Format	Set the format as M/D/Y (1231)* or D/M/Y (3112)*	D/M/Y (3112)*
2	Reserved for future use.		
3	Text / Symbols	Set the description of which alarm limit is being set, Hi and Lo or the graphic ≡≡ ≡≡ . Also change the Interval of OFF to ——.	The word "Hi" which will then use Hi and Lo as the indicators. OFF for Interval.
4	Patient Size	Set the default patient size to be Adult, Pediatric and Neonate.	Adult
5a	Time Out, LEDs and LCD Characters when unit is powered from AC mains.	Set how long the numeric information is displayed, when no keys have been pressed, in the LEDs and LCD before they are blanked to conserve energy. The choices are: 5, 15, 30 or 60 minutes. **NOTE:** The information is not erased.	15 minutes
5b	Time Out, LEDs and LCD Characters when unit is powered from the internal battery.	Set how long the numeric information is displayed, when no keys have been pressed, in the LEDs and LCD before they are blanked to conserve energy. The choices are: 5, 15, 20 or 30 minutes. **NOTE:** The information is not erased.	5 minutes

**1231 represents 12 months/31 days and 3112 represents 31 days/12 months.*

User Configuration Number	Function	Description	Factory Default
5c	Time Out, Light in the LCD when the unit is powered from AC mains.	Set how long the light will stay on, when no keys are pressed, in the LCD. The choices are: 3, 5, 10 or 15 minutes.	3 minutes
5d	Time Out, Light in the LCD when the unit is powered from the internal battery.	Set how long the light will stay on, when no keys are pressed, in the LCD. The choices are: 3, 5, 10 or 15 minutes.	3 minutes
6a	Adult Initial Inflation Pressure	Set the initial cuff inflation pressure for an adult size patient. The choices are: 100 to 260 mmHg at 5 mmHg increments.	180 mmHg
6b	Pediatric Initial Inflation Pressure	Set the initial cuff inflation pressure for a pediatric size patient. The choices are: 60 to 180 mmHg at 5 mmHg increments.	140 mmHg
6c	Neonate Initial Inflation Pressure	See the initial cuff inflation pressure for a neonate size patient. The choices are: 40 to 120 mmHg at 5 mmHg increments.	100 mmHg
7	Adaptive Inflation	Choices are ON or OFF. If User Configuration #3 is set to display graphics, the choices are -I- or -O-.	ON
8	Interval Setting	Set the NIBP Interval Time. The choices are: OFF (or ——), Cont. (Continuous), 1, 2.5, 5, 10, 15, 20, 30, 60, 120, and 240 minutes.	OFF (or ——)
9a	Adult Alarm Limits	Set the default alarm limit values for an Adult size patient. See Section 1.3.5 for details on setting alarm limits.	OFF, except SpO_2 low which is 86
9b	Pediatric Alarm Limits	Set the default alarm limit values for a Pediatric size patient. See Section 1.3.5 for details on setting alarm limits.	OFF, except SpO_2 low which is 86
9c	Neonate Alarm Limits	See the default alarm limit values for an Neonate size patient. See Section 1.3.5 for details on setting alarm limits.	OFF, except SpO_2 low which is 86
10a	Alarm Volume	Set the volume of an alarm signal. The choices are: 1, 2, 3, 4 & 5. 5 is the loudest.	4
10b	SpO_2 Volume	Set the volume of the SpO_2 beep. The choices are: Off (or ——), 1, 2, 3, 4 & 5. 5 is the loudest.	OFF
11	Continuous Print	Choices are ON or OFF. If User Configuration #3 is set to display graphics, the choices are -I- or -O-.	OFF
12	Reset to Factory Defaults	To change all of the User Configuration items back to the Factory Defaults, while in User Config. #12, press and hold the START NIBP key for 3 seconds.	

1.3.16 STATUS AND ERROR CODES

The Accutorr Plus uses the various displays on the front panel to display the operational status. Status and error codes listed below can generally be resolved by the user however, some error codes, which are marked with an asterisk (*), may require resolution by a qualified technical service person. These codes with their descriptions are listed on the back of the Quick Reference card. NOTE: Status codes 8810 through 8858 can be cleared from the Room and Bed displays by pressing the Room/Bed key (24).

Status and Error Code Table

TYPE	CODE	DESCRIPTION	REASON
NIBP	8810	Retry - Unable to Measure	Motion artifact, cycle time-out, weak pulsations or no pulsations. A triple beep tone is generated.
	8811	Retry - Pump Higher	Insufficient cuff pressure. A triple beep tone is generated.
	8812	Stop - Cuff Overpressure	Excessive cuff pressure detected by the software. A triple beep tone is generated.
	8813	Stop - Unable to Measure	4 successive measurement attempts failed. A triple beep tone is generated.
TEMP (PTM)	8830	Check Probe	Tissue contact may have been lost.
	8831	Replace Probe	Defective probe or connection.
	8832	Battery Low	The 9V battery needs replacement.
SpO_2	8850	No Sensor	No sensor connected.
	8851	Sensor Off	Sensor not on patient. (Datascope and Masimo SpO_2 only)
	8852	Interference	Interference on signal. (Datascope and Masimo SpO_2 only)
	8853	Pulse Search	Unit cannot find signal. (Nellcor SpO_2 Module will report "Pulse Search" -8853- when the sensor is not on the patient.)
	8854	Weak Pulse	Weak pulse detected. (Datascope and Masimo SpO_2 only)
	8855	No Pulse	No pulse detected. (Datascope SpO_2 only)
	8856	Check Sensor	Sensor problem. (Datascope and Masimo SpO_2 only)
	8857	PR<30	Pulse rate is less than 30 bpm. (Datascope SpO_2 only)
	8857	PR<21	Pulse rate is less than 21 bpm. (Nellcor SpO_2 only)
	8857	PR<26	Pulse rate is less than 26 bpm. (Masimo SpO_2 only)
	8858	PR>249	Pulse rate is greater than 249 bpm. (Nellcor SpO_2 only)
	8858	PR>239	Pulse rate is greater than 239 bpm. (Masimo SpO_2 only)
	8858	PR>250	Pulse rate is greater than 250 bpm. (Datascope SpO_2 only)
SYSTEM	984*	NIBP Hardware Failure	NIBP A/D failure detected.
	985*	NIBP Overpressure Circuit not Programmed	The overpressure circuit is not set to the current patient size.
	986*	NIBP Overpressure Circuit not Tracking	The two pressure transducers are not tracking each other.
	987*	Stop - Hardware Overpressure	Excessive cuff pressure detected by hardware over-pressure sensor. A triple beep tone is generated.
	988*	TEMP Bad Calibration	Thermometer needs calibration.
	990*	TEMP Illegal Mode	Thermometer switch is set wrong.
	991*	TEMP Module Failed	Thermometer internal failure.
	995*	SpO_2 Uncalibrated	SpO_2 fails calibration check.
	996*	SpO_2 Failure	SpO_2 failed self-test.

1.3.17 HOW TO ATTACH OPTIONAL THERMOMETER and RECORDER MODULES

The Accutorr Plus can be configured with a Recorder Module and Thermometer Module.

To Attach the Recorder Module:

Looking at the rear panel of the unit, the Recorder Module is attached to the right side of the Accutorr Plus.

1. Insure that the Accutorr Plus is OFF.
2. Insert the tab on the Recorder Module into the Recorder Module Connector (48) on the Accutorr Plus. Push firmly to seat properly.
3. Use the 2 screws provided to secure the Recorder Module to the Accutorr Plus.

To Attach the Thermometer Module:

Looking at the rear panel of the unit, the Thermometer Module is attached to the left side of the Accutorr Plus.

1. Insure that the Accutorr Plus is OFF.
2. Insert the tab on the Thermometer Module into the Thermometer Module Connector (42) on the Accutorr Plus. Push firmly to seat properly.
3. Use the 2 screws provided to secure the Thermometer Module to the Accutorr Plus.

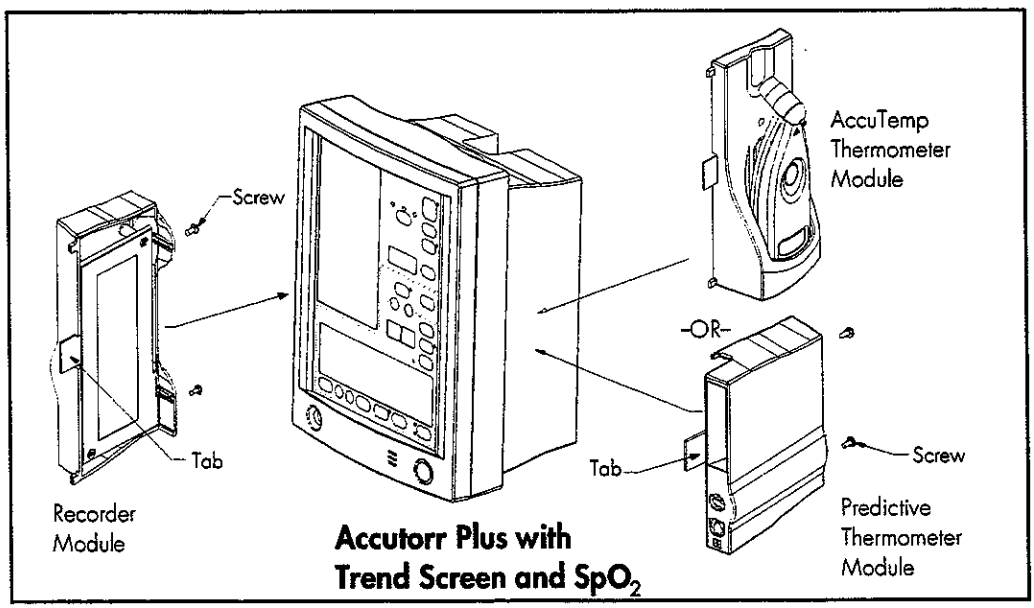

Figure 1-21 Attaching Optional Modules

1.3.18 PLACEMENT OF THE QUICK REFERENCE CARD

The Quick Reference card provides abbreviated descriptions of front panel keys on one side, and on the other side provides descriptions of the status codes. To attach the Quick Reference card, thread the NIBP hose through the two holes in the card.

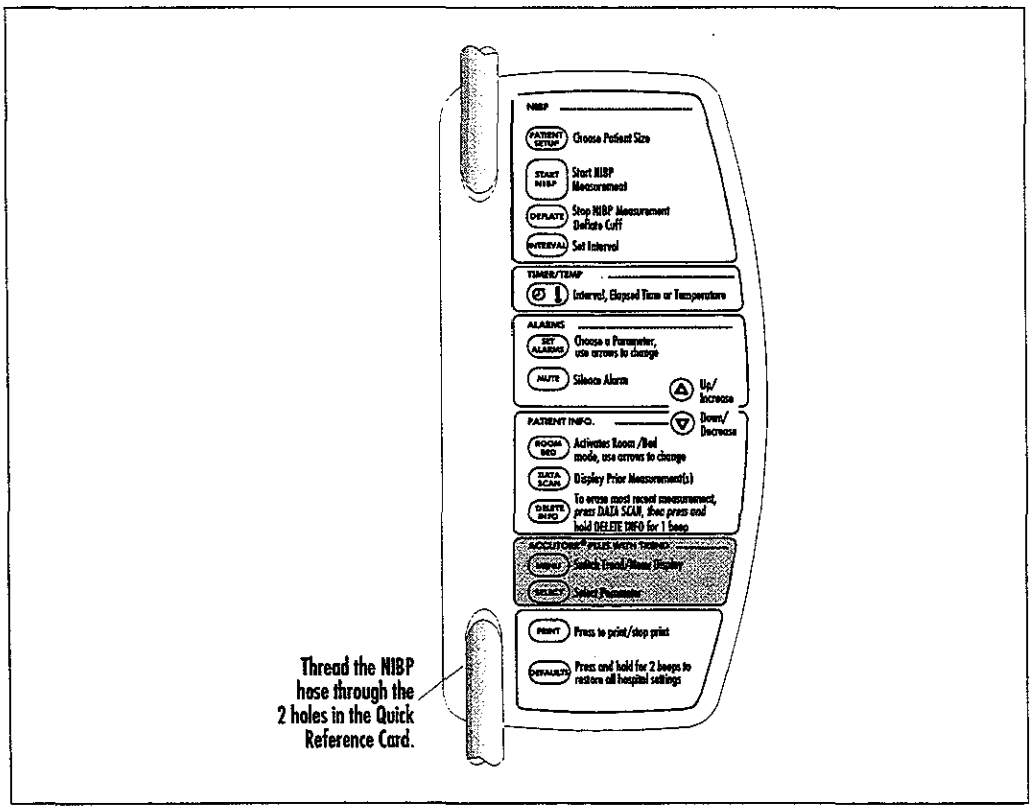

Figure 1-22 Placement of Quick Reference Label

NOTE: The card shown in figure 1-22 is a sample to show how to attach the card. The actual card may differ.

1.3.19 PLACEMENT OF RECORDER PAPER LOADING LABEL

The Recorder Paper Loading label is designed to be placed on the recorder module. Attach label as shown in the figure below.

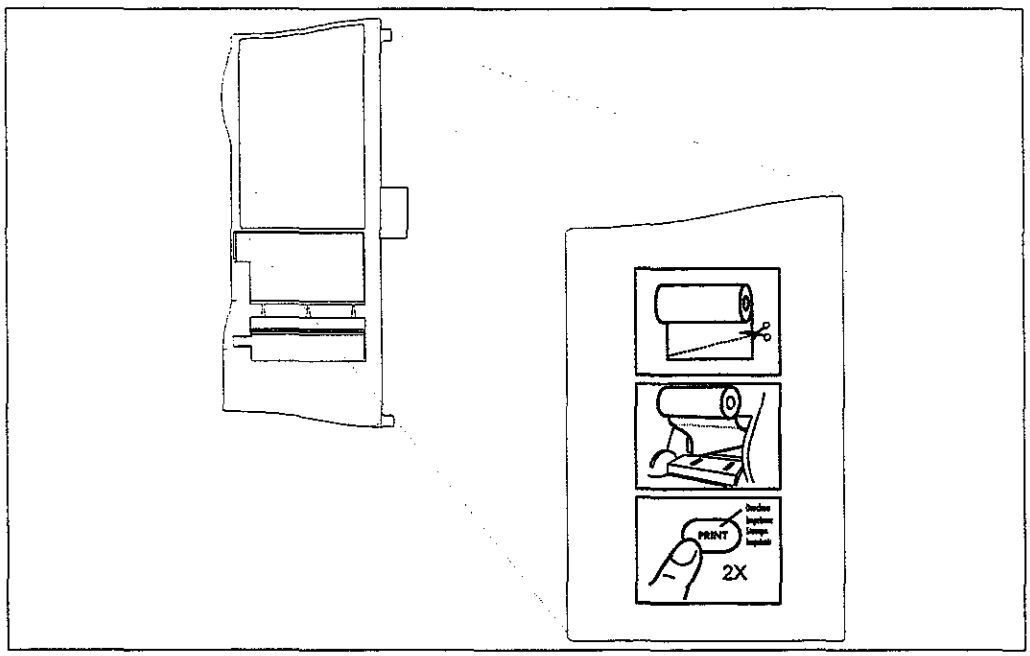

Figure 1-23 Placement of Recorder Paper Loading Label