70-00582-01 A

Instruction Manual

Cardiac Science 5300 and Cardiac Science 5350 Vital Signs Monitor

CARDIAC science

CARDIAC SCIENCE 5300 AND CARDIAC SCIENCE 5350 VITAL SIGNS MONITOR INSTRUCTION MANUAL

70-00582-01 A

Important: Be sure to fully read this manual before using the Cardiac Science 5300 and 5350 Vital Signs Monitor to ensure correct and safe use. After you have read this manual, store it near the monitor so that it can be used for reference.

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Cardiac Science Corporation
3303 Monte Villa Parkway
Bothell, WA 98021, USA
(800) 426 0337 (USA and Canada)
(425) 402 2000
techsupport@cardiacscience.com
www.cardiacscience.com

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1 Safety

Contents

Thank you very much for choosing a Cardiac Science 5300 or 5350 vital signs monitor.

This chapter contains important safety and care information.

Cardiac Science provides customer service and technical support.

- To order additional product or accessories, contact Customer Care.
- For assistance with the product or installation, contact Technical Support.

Customer Care
(800) 426 0337 (USA)
(425) 402 2000 (USA and Canada)
care@cardiacscience.com

Technical Support
(800) 426 0337 (USA)
(425) 402 2000 (USA and Canada)
techsupport@cardiacscience.com
http://websupport.cardiacscience.com/webchat/

Intended use

The Cardiac Science 5300/5350 Vital Signs Monitor is intended to monitor a single patient's vital signs in the hospital, acute care settings, outpatient surgery, healthcare practitioner facilities or in an environment where patient care is provided by qualified healthcare personnel who will determine when use of this device is indicated, based upon their professional assessment of the patient's medical condition. The patient populations include adult, pediatric and neonatal. The device is capable of monitoring:

- Pulse rate (via oximetry data)
- Non-invasive pressure (systolic, diastolic and mean oscillometric (NIBP)
- Temperature
- Blood Oxygen Saturation (SpO_2 via finger oximeter)

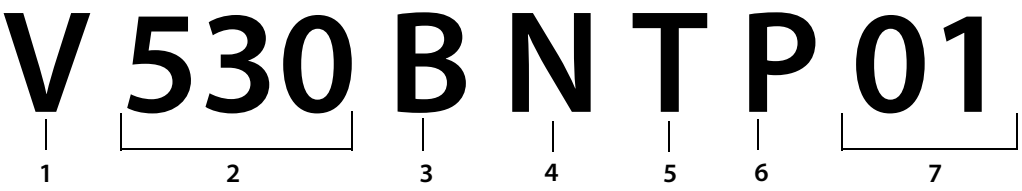
This device is intended for use by qualified healthcare personnel trained in its use.

Vital signs monitor orderable part number legend

Vital Signs Monitor

Models: 5300, 5350, 5500

All parts will have a part number with a maximum of 10 digits following this scheme:



1	Family	V—Vital Signs
2	Model	530—Standard 535—with Alarms, Intervals 550—with ECG
3	NIBP	0—None B—NIBP
4	SpO_2	0—None N—Nellcor SpO_2 M—Masimo SpO_2 R—Refurbished
5	Temperature	0—None T—Temperature
6	Printer	0—None P—Printer
7	Future	01—Reserved for future use

For Example:

- V530BNTP01—Cardiac Science 5300 Vital Signs Monitor Standard with NIBP, Nellcor $Sp0_2$, Temperature, Printer
- V535B0TP01—Cardiac Science 5350 Vital Signs Monitor, Alarms, Intervals, NIBP, Temperature, Printer
- V550BMTP01—Cardiac Science 5500 Vital Signs Monitor, ECG, Masimo, Temperature, Printer

	Part Number	NIBP	SpO_2 Nellcor®	SpO_2 Masimo®	Temp	Recorder	Alarm	Interval
Cardiac Science 5350	V535BNTP01	X	X		X	X	X	X
	V535BMTP01	X		X	X	X	X	X
	V535BN0P01	X	X			X	X	X
	V535BM0P01	X		X		X	X	X
	V535B0TP01	X			X	X	X	X
	V535B00P01	X				X	X	X
	V535BNT001	X	X		X		X	X
	V535BMT001	X		X	X		X	X
	V535BN0001	X	X				X	X
	V535BM0001	X		X			X	X
	V535B0T001	X			X		X	X
	V535B00001	X					X	X
Cardiac Science 5300	V530BNTP01	X	X		X	X		
	V530BMTP01	X		X	X	X		
	V530BN0P01	X	X			X		
	V530BM0P01	X		X		X		
	V530B0TP01	X			X	X		
	V530B00P01	X				X		
	V530BNT001	X	X		X			
	V530BMT001	X		X	X			
	V530BN0001	X	X					
	V530BM0001	X		X				
	V530B0T001	X			X			
	V530B00001	X						

Warnings and cautions

Safety alert descriptions

The symbols shown below identify potential hazard categories. The definition of each category is as follows:

DANGER!

This alert identifies hazards that will cause serious personal injury or death.

WARNING!

This alert identifies hazards that may cause serious personal injury or death.

Caution

This alert identifies hazards that may cause minor personal injury, product damage, or property damage.

General warnings and cautions

WARNING!

Only properly trained medical personnel should use this device. Do not allow patients to operate this device.

WARNING!

If the monitor cannot take a measurement or the measurement readings seem dubious, check the condition of the patient first.

WARNING!

If any abnormality is found in the patient or the device, take appropriate measures, such as stopping the device, to ensure the safety of the patient.

Caution

Before use, thoroughly read this Instruction Manual and the manuals supplied with accessories and options to ensure correct use.

Caution

When any of the following occur, remove all accessories (cuffs, probes, etc.) from the patient, turn the power OFF, and unplug the AC adapter cable from the AC socket.

- There is smoke or a strange odor leaking out of the device.
- The device has been dropped or impacted by an object.
- Liquid or foreign matter gets inside the device.
- If you think the device may be broken.

Caution

If there is condensation on the device, dry it thoroughly before turning the power ON.

Caution

Follow your facility's procedures and applicable regulations when disposing of anything that has been used on patients.

Caution

Observe the following points when using a defibrillator.

- Have everyone in the area stand back from the patient and from any cords and devices connected to the patient. Otherwise, they could receive an electrical shock from the energy conducted by the defibrillator.
- Stand as far away as possible from the electrodes mounted on the chest section when applying the defibrillation or switch the electrodes to an appropriate position. Applying defibrillation with the defibrillator paddles touching the electrodes will cause burns.

Caution

Observe the following points when using electrosurgical/cautery equipment.

- If the electrode and ground pad are not properly mounted, they may cause burns where they are attached to the patient.

For details, carefully read the cautions in the electrosurgical/cautery equipment operation manual.

- Noise from the electrosurgical/cautery equipment may cause incorrect measurements to be displayed.

Caution

Always carry out pre-work inspections and maintenance inspections.

Caution

Do not open, disassemble or alter the device.

Caution

The 5300/5350 series conforms to the requirements of the EMC standard (IEC 60601-1-2:2001), so it can be used at the same time as other electrical simulators. However, it may be affected by electrical scalpels and microwave treatment devices and there may be an impact on measurement precision for patients using cardiac pacemakers and the like.

Check the operation of this device during and after use of such equipment and with such patients.

Installation

DANGER!

Do not take or use the device in locations where combustible anesthetics or flammable gases are used or in high-pressure oxygen rooms or inside oxygen tents.

WARNING!

Use with the specified AC voltage and frequency.

WARNING!

Use a grounded AC outlet for the power supply and ground this device.

WARNING!

Do not connect a grounding wire to a gas pipe or water pipe.

WARNING!

For accessories mounted on the patient, optional parts, and consumables, use only those supplied or specified by Cardiac Science.

WARNING!

Do not plug the AC adapter cable into an AC outlet (or unplug it) with wet hands.

Caution

Do not install this device in the following locations:

- Locations where gases and flames are used
- Locations where the air includes dust, salt, or sulfur
- Locations exposed to prolonged direct sunlight
- Locations where water and steam may come into contact with device
- Locations that vibrate or are subject to sharp impacts
- Locations near heating equipment
- Locations where chemicals are stored
- This device can not be used in any room in which noise-generating apparatuses are used (such as an MRI room, CT room, X-ray room, etc.)

Caution

Do not place anything on this device.

Caution

Before moving this device, remove all accessories from the patient, turn the power OFF, and unplug the AC adapter cable.

Caution

Observe the following cautions when connecting this device with other equipment:

- Ensure that the connected equipment is in accordance with the IEC60601-1 or IEC safety standards.
- Employ additional protective measures (e.g., additional protective earthing) as necessary.

Caution

This device meets the restricted level of leakage current required for medical devices. Therefore, this device cannot be connected to a device that would give a combined total of leakage current beyond the restricted level. Do not connect devices that do not meet medical safety standards.

NIBP

WARNING!

Do not wrap the cuff around any of the following locations. Doing so can cause an accident.

- Anywhere on the four limbs that a venous pulse is secured, such as where there is an IV or blood transfusion
- Any limb with an artificial dialysis shunt

WARNING!

When the cuff hose is bent or blocked, there could still be air in the cuff even though the pressure display reads 0mmHg. This may block the blood flow in the arm, which may in turn cause peripheral function disorders.

Caution

Never set the measurement mode to **Adult/Pediatric** when using a neonate/infant cuff. Doing so could cause the cuff to be inflated to a dangerously high pressure.

Caution

Check at least every eight hours to see that there is no abnormality or damage to the area measured. If there is, change the measurement site, as failure to do so may lead to patient perspiration-related inflammation or damage.

Caution

With any patient whom the doctor has pointed out as having a tendency to bleed or hyper-coagulate, circulatory obstruction due to a thrombus or clot, hemorrhage may occur after measurement.

Caution

Do not measure continuously for a long time. This can cause extremity function obstruction.

Caution

If the cuff is touched or the patient moves, the device may interpret that the inflation pressure is insufficient and inflate to high pressure.

Caution

In the following cases, pressurization may rupture the cuff bladder:

- If a cuff is used with a frayed cuff cover.
- If a blood pressure measurement starts with the cuff not wrapped around an arm.
- If the cuff measurement interval is not set to OFF when cuff is removed from the patient.

Caution

Always follow your facility's infection control procedures and applicable regulations when disposing of anything that has been used on patients.

SpO_2

Caution

Do not look at the light from the SpO_2 sensor for a long period of time.

Caution

If the adhesive tape irritates the patient's skin, stop using it.

Caution

Do not fasten sensors with tape. This can cause hemostasis or edema.

Caution

- The SpO_2 sensor should be checked every two to three hours, and the sensor location changed when abnormality is observed. For a patient with extremity or circulatory obstruction, failure to change the sensor location can cause a rash low-temperature burn, or other problems.
- SpO_2 sensors (single-patient use only) can be reused only with the same patient.
- Do not insert the finger too far into the sensor. Doing so could cause injury.

Caution

This device has no alarm function for SpO_2. (5300 only)

Caution

For models with Masimo® SpO_2

Possession or purchase of this device does not convey any express or implied license to use the device with unauthorized sensors or cables which would, alone or in combination with this device, fall within the scope of one more of the patents relating to this device.

Temperature

Caution

For best product performance and measurement accuracy, use only accessories supplied or recommended by Cardiac Science. Use accessories according to the manufacturer's directions for use.

Caution

Never reuse a probe cover. Doing so would create a danger of infection.

Caution

When measuring in the mouth cavity, be careful not to damage any mucous membrane.

Caution

To avoid injury, only use probes according to the manufacturer's directions for use.

Caution

Be careful when using probes for children and neonates.

Caution

When measuring in the mouth cavity, make sure the patient does not swallow the probe or probe cover.

Caution

If the body temperature is measured without the probe cover, there is a danger of infection, allergic reaction or injury of the person being measured. Do not measure body temperature without using a probe cover.

Alarm (Cardiac Science 5350 only)

Caution

Set the alarm volume loud enough to be heard adequately in the actual use environment.

Caution

If the alarm sounds, first check the patient's condition.

Caution

For the alarm range, set the value appropriate to the patient to whom this device is attached.

Internal Battery

DANGER!

In the following cases, battery solution could erupt out of the battery and cause heating, fire, and rupture:

- If the battery is thrown into a fire or overheated
- If the battery is disassembled or altered
- If a battery that is leaking, deformed, or discolored is used
- If the battery unit is subject to strong mechanical shock
- If the battery is forced into the device main unit
- If the + and – terminals of the battery are connected with a metal needle or the like
- If the battery is carried together with a metal object, such as a metal necklace or hair pin
- If the battery is charged in any manner other than that specified

DANGER!

If battery solution comes into contact with skin or clothing, wash it off with clean water. If battery solution comes into contact with the eye, rinse the eye out thoroughly with clean water and seek immediate medical attention. There is a danger of loss of eyesight.

Caution

Keep water off the battery and do not allow it to become wet. If the battery gets wet, rust may be generated and leakage may then occur.

Caution

Do not leave the battery unused for a prolonged period of time (more than two years). Doing so could cause battery solution leakage.

Caution

Do not leave a battery mounted in the main unit if the use time between charges has become short or the battery has stopped working. Doing so could result in battery solution leaking within the battery unit causing corrosion and fire.

Caution

The battery used in the battery unit is a lead acid battery. Follow local government ordinances and recycling instructions regarding disposal or recycling of batteries.

Maintenance

Caution

Before conducting maintenance work, turn the power OFF and unplug the AC adapter cable from the AC socket to prevent electric shock.

Caution

Do not soak the main unit or accessories in any medical liquid. Also, keep liquids out of the main unit and accessories.

Caution

When using disinfectant solutions, follow the manufacturer's directions.

Caution

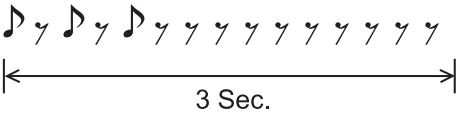
After cleaning, allow complete drying before plugging in.

Caution

Using this device with the ventilation port blocked could cause a breakdown.

Clean this device with care.

Other labels

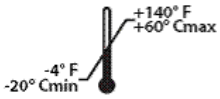
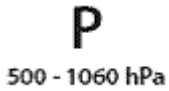
Symbol	Description
	This symbol appearing in the text indicates that a highest-priority alarm sounds in association with the error content. When the alarm sounds, switch the power OFF, then ON again. Highest-priority rhythm.  Continues to sound until power is cut off.
	This symbol appearing in the text indicates that a high-priority alarm sounds in association with the error content. Take appropriate measures if the alarm sounds. At this time, the measurement reading will be displayed flashing. The format of the high-priority alarm is as follows.  This alarm is sounded twice at 8 second intervals.
	This symbol appearing in the text indicates that a medium-priority alarm sounds in association with the error content. Measurement is prevented if this alarm sounds. Check the patient and the machine. The measurement reading will be displayed flashing. The format of the medium-priority alarm is as follows.  This alarm is sounded twice at 24 second intervals.

Symbols and labels

Cardiac Science Corporation products display one or more of these symbols and warning labels for your protection.

Symbol	Description
SYS	Systolic Pressure
MAP	Mean Arterial Pressure
DIA	Diastolic Pressure
PR	Pulse Rate
SpO_2	Arterial Oxygen Saturation by Pulse Oximeter
TEMP	Temperature
	This shows the type BF device with defibrillator protection.
	This shows the type BF device.
	See warnings and cautions
	Consult accompanying instructions
	Alarm Mute
	Cuff Start/Stop
	Cuff Interval (5350 only)
	Clear Display (5300 only)
	Menu switching
	Measurement mode (Adult/Pediatric)
	Measurement mode (Neonate)
	Current time
	Elapsed time

Symbol	Description
	Record Start/Stop
	Power ON
	Power OFF
	Internal battery
	Body temperature measurement terminal
	Cuff connection terminal
	External input/output terminal
 or 	Indoor use only
	Manufacturer
	Manufacture date
 or 	Orderable part number
 or 	Serial number
	Sold by prescription only
	Direct current
	Keep upright
	Fragile
	Use by date

Symbol	Description
	Keep dry
	Handle with care
	Please recycle
	Contains no latex
	Temperature limitations, do not exceed the given temperature limits.
	Relative humidity limits
	Pressure limitations
	UL Classified WITH RESPECT TO ELECTRICAL SHOCK, FIRE, AND MECHANICAL HAZARDS ONLY (For Canada and the U. S.)

2 Outline

Contents

Configured products

Before using the 5300/5350 series monitor be sure to check that all of the accessories are included and that the main unit and accessories are not damaged. If, for some reason, the contents are not complete, please contact Cardiac Science.

Main unit

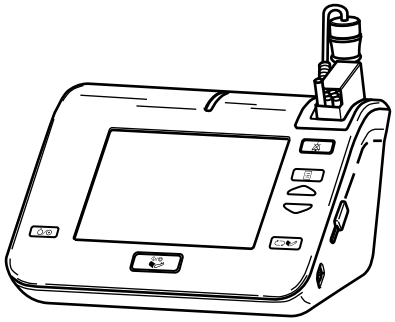
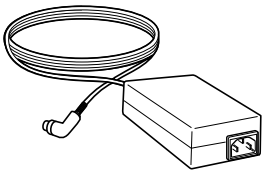
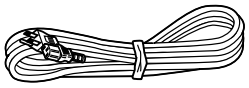


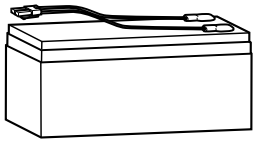
Figure 2-1: **Vital signs monitor**



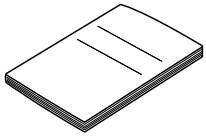
AC ADAPTER



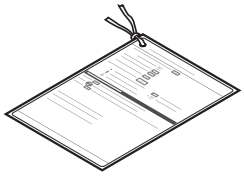
AC ADAPTER CABLE



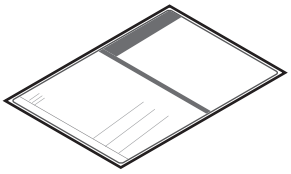
INTERNAL BATTERY



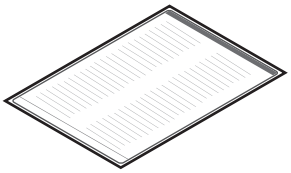
INSTRUCTION MANUAL



QUICK GUIDE



REGISTRATION CARD



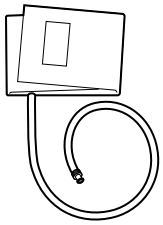
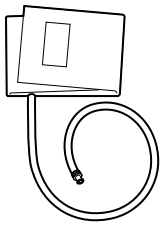
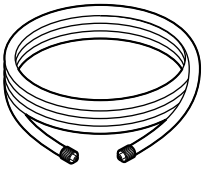
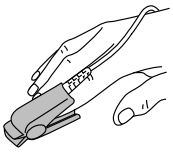
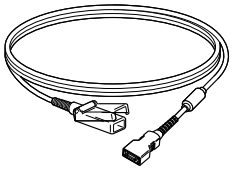
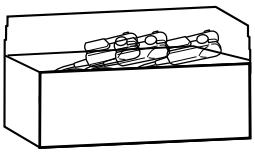
END USER TERMS and CONDITIONS

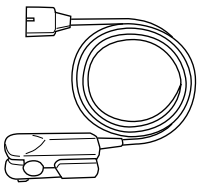
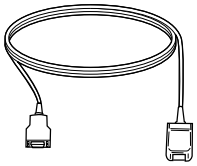
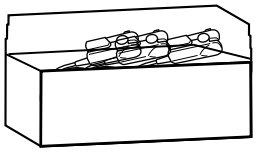
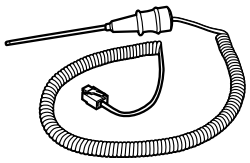
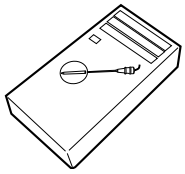
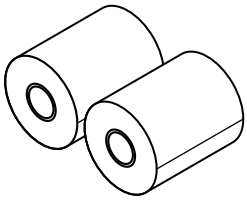
ACCESSORY RE-ORDER FORM

SERVICE MANUAL on CD

Standard accessories for main unit

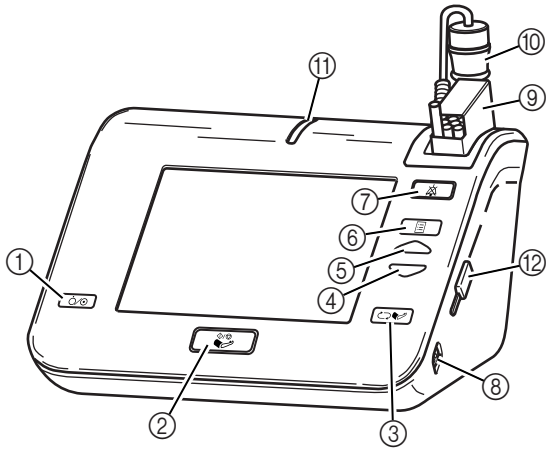
The standard accessories for this main unit are one each of the following items.

	Item	Description
NIBP MEASUREMENT		Reusable Cuff, Adult
		Reusable Cuff, Large Adult
		Rectus Cuff Hose, Adult 10 feet
SpO_2 MEASUREMENT Models with Nellcor® SpO_2		DURASENSOR® Patient Weight: 40kg or over
		EXTENSION CABLE
		NELLCOR DISPOSABLE SAMPLE PACK

	Item	Description
Models with Masimo® SpO_2		SpO_2 SENSOR Patient Weight: 30kg or over
		EXTENSION CABLE
		MASIMO DISPOSABLE SAMPLE PACK
TEMPERATURE MEASUREMENT Models with Body Temperature Measurement		TEMPERATURE PROBE (Oral/ Axillary)
		TEMPERATURE PROBE COVERS
Note: Do not use any probe or probe cover other than those specified.		
OTHER Models with Recorder		ROLL PAPER(2pcs)

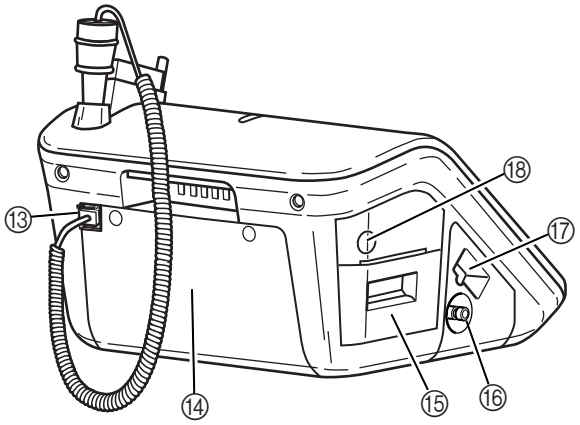
Names and functions of parts

Main unit



1	**Power** Switch	Switches the power ON/OFF. To switch OFF the power, hold down this switch for 3 seconds.
2	**Cuff Start/Stop**	Starts and stops cuff measurement.
3	**Cuff Interval** (5350 only)	The interval for cuff measurement can be set.
3	**Clear Display** (5300 only)	Clear the measurement value display.
4	**Back** Switch	When changing a device setting, this moves the setting value for the selected item to the next alternative back.
5	**Forward** Switch	When changing a device setting, this moves the setting value for the selected item to the next alternative forward.
6	**Menu/Enter** Switch	This is used for making settings.
7	**Alarm Silence** Switch	Silences the alarm.
8	Power Connector	The AC adapter is connected here.
9	Temperature Probe Cover *1	Store the temperature probe cover box here.
10	Temperature Probe*1	Store the temperature probe here.
11	Alarm Lamp	Lights up or flashes when an alarm occurs
12	USB Port	To read patient ID, connect BAR CODE READER here. (BAR CODE READER is an option.) To use a BAR CODE READER, refer to the manual *Bar Code Reader Instruction Manual*.

*1: Only models with body temperature measurement.



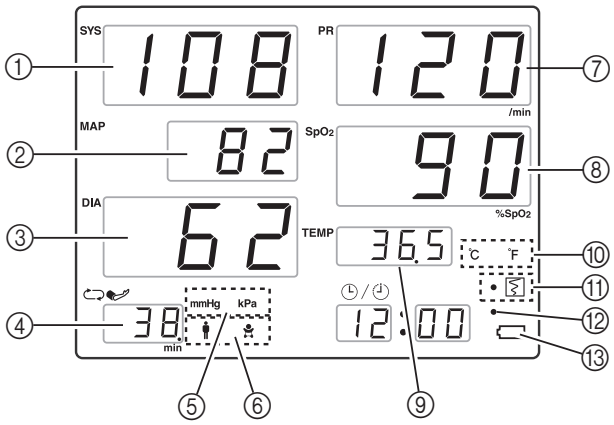
13	Temperature Measurement *1	The body temperature measurement probe is connected here.
14	Internal Battery Cover	Remove this cover when mounting or replacing the internal battery.
15	Roll Paper Holder *2	The roll paper is placed here.
16	Non-Invasive Blood Pressure Measurement (NIBP)	The air hose for the cuff measurement is connected here.
17	Pulse Oximeter (SpO_2)*3	The SpO_2 cable is connected here.
18	Record switch*2	Starts and stops recorder printing.

*1: Only models with body temperature measurement.

*2: Only models with recorder.

*3: Only models with SpO_2.

Explanation of display



1	SYS LED	Displays the Systolic Pressure.
2	MAP LED	Displays the Mean Arterial Pressure.
3	DIA LED	Displays the Diastolic Pressure.
4	INT LED (5350 Only)	Displays the Cuff Interval. (For the setting method, see *Monitoring using cuff intervals* on page 4-11.)
5	NIBP Unit Icon	Displays the Blood Pressure Unit.
6	NIBP Patient Icon	Displays the Blood Pressure Measurement mode. Select either: (Adult / Pediatric) or (Neonate). (For the setting method, see *Selecting the measurement mode* on page 4-4.)
7	PR LED	Displays the Pulse Rate.
8	SpO_2 LED	Displays the SpO_2.
9	TEMP LED	Displays the Body Temperature.
10	TEMP Unit Icon	Displays the Body Temperature Unit.
11	Recorder Indicator	Displays details if an error occurs in the Recorder. (For details, see *Recorder error* on page 9-11.)
12	Battery Indicator	Displays the charge status of the internal battery. (For details, see Chapter 11, *Internal Battery*.)
13	Battery Icon	Displays the operability status of the internal battery. (For details, see Chapter 11, *Internal Battery*.)

Note: Some models of the lineup lack some LEDs, icons, and indicators.

3 Preparation

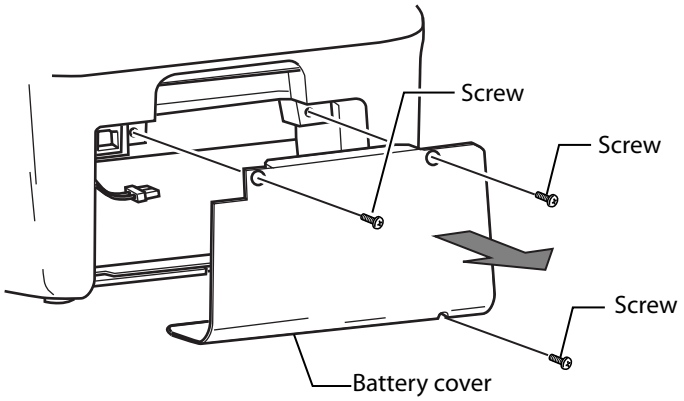
Contents

Preparations before use

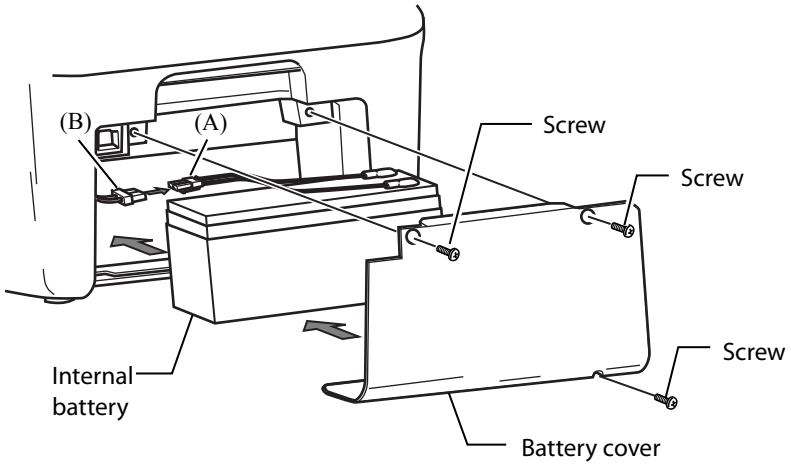
Installing the internal battery

Before connecting the power supply, use the following procedure to install the internal battery in the rear of the main unit.

1. Loosen the three screws and remove the battery cover.



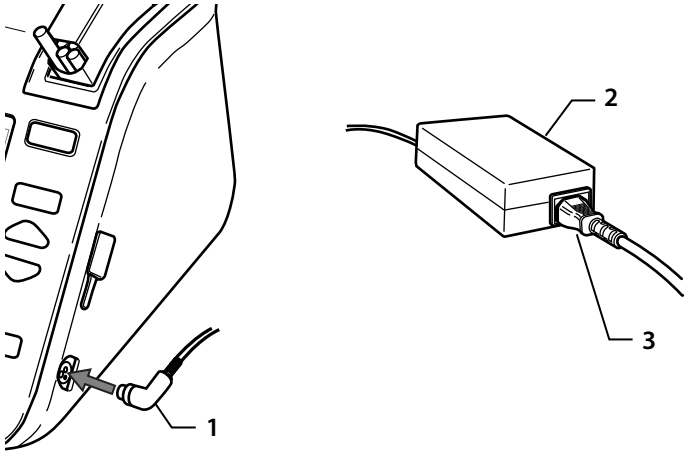
2. Connect connector (A) of the internal battery to connector (B) of the main unit. When inserting the connector, be careful to insert it in the correct direction. These connectors are designed so that they can not be inserted with the polarity reversed.
3. Fit the internal battery into the rear of the main unit.
4. Use the three screws to fasten the battery cover in its original place.



Connecting the power supply

Connect the power supply with the following procedure.

1. Connect the power supply connector of the AC adapter to the main unit.
2. Plug the AC adapter cable plug side into a medical 3-pole wall socket with ground connector.



1 Power supply connector of the AC adapter
2 AC adapter
3 AC adapter cable

Charging the internal battery

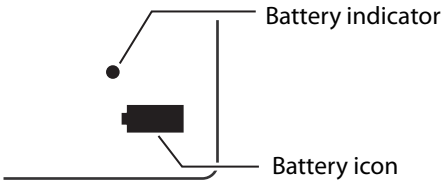
When you connect the power supply, charging of the internal battery starts.

Completely charge the battery before starting to use this device.

Caution

In order to maintain the battery charge, Cardiac Science recommends leaving the monitor plugged into AC power when it is not in use. If the monitor is not plugged in, the battery may lose its charge over time, even when powered off. If the battery discharges completely, the battery will fail.

When the charge is complete, the battery indicator changes from orange to green.



Battery indicator

When starting to charge	Orange
When charge complete	Green
Battery not loaded	OFF

Battery icon

Running on AC power supply	Battery loaded	OFF
	Battery not loaded	Red
Running on battery	Battery remaining Over about 30%	Green
	Battery remaining Under about 30%	Orange (Flashing)
	Battery remaining Under about 5%	Red (Flashing rapidly)

Moving the device

When moving this device, carry it with both hands, holding the bottom with one hand.

Checking and revising the date and time

About Utility Mode

To check the date and time, it is necessary to put the unit into **Utility Mode**. For details on **Utility Mode**, see *Utility Mode* on page 10-11.

The time is checked in Hour set mode and the date is checked in Year set mode.

Press the **Menu/Enter** switch until you reach the desired setting screen.

Checking and revising the time

When the mode becomes Hour set mode, the "Hour" flashes and the current time is displayed as below.

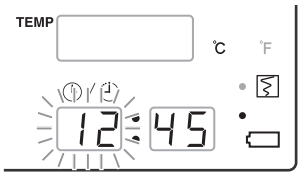


Figure 3-1: **Display example: 12:45**

- If the current time is correct, continue on to check the current date with Year set mode.
- If it is necessary to revise the current time, do so with the following procedure.

1. Change the value with the **Forward** or **Back** switch.
2. Enter the setting value with the **Menu/Enter** switch and move to the next setting item.

Checking and revising the date

When the mode becomes Year set mode, the "Year" flashes and the current date is displayed as below.

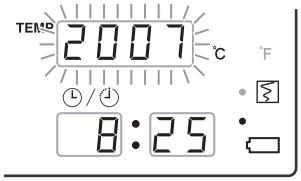


Figure 3-2: **Display example: August 25, 2007**

- If it is necessary to revise the current date, do so with the following procedure.

1. Change the value with the **Forward** or **Back** switch.
2. Enter the setting value with the **Menu/Enter** switch and move to the next setting item.

Exiting the setting screen

To end **Utility Mode** and return to the basic screen, switch the power OFF, then ON again.

4 Non-Invasive Blood Pressure Measurement

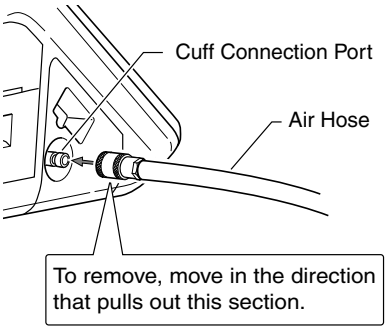
Contents

Measurement preparation

Connecting the air hose

Connect the air hose to the **Cuff Connection Port**.

Insert securely in the direction of the arrow until it clicks into place.



On the end of the air hose, install the cuff appropriate for the patient.

Cuff selection

The use of a patient-suitable cuff is an important factor for obtaining correct measurement results. Carefully select a patient-suitable cuff from among those shown below.

Reusable Cuff	Color	Measurement mode	Air hose
Infant (Pediatric)	Brown	Adult	Rectus Cuff Hose Adult 10 feet
Child / Small Adult	Green		
Adult	Blue		
Large Adult	Red		
Thigh	Black		

Disposable Cuff	Size	Measurement mode	Air hose
Infant (Pediatric)	8-14 cm	Adult	Rectus Cuff Hose Adult 10 feet
Child / Small Adult	14-24 cm		
Adult	27-46 cm		
Large Adult	46-63 cm		
Thigh	38-50 cm		

Disposable Cuff	Size	Measurement mode	Air hose
Disposable Neonatal Cuff, #1	3-6 cm	Neo	Rectus Cuff Hose Neonatal 10 feet
Disposable Neonatal Cuff, #2	4-8 cm		
Disposable Neonatal Cuff, #3	6-11 cm		
Disposable Neonatal Cuff, #4	7-13 cm		
Disposable Neonatal Cuff, #5	8-15 cm		

Note: The blood pressure reading will be low in comparison to the actual reading if an oversized cuff is used; likewise, the reading will tend to be high if an undersized cuff is used.

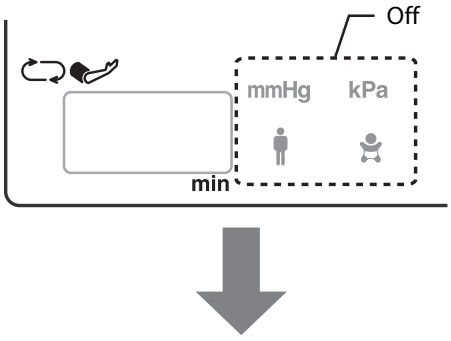
Check before start of blood pressure measurement

When you switch on the main unit power, check that the blood pressure automatically stabilizes.

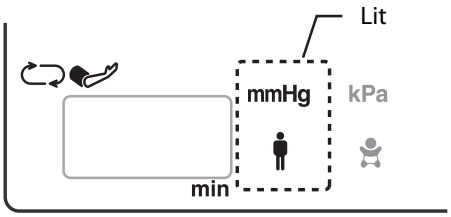
After the check ends, the NIBP UNIT ICON and NIBP PATIENT ICON are lit up.

Check that these icons are lit up before starting blood pressure measurement.

Pressure stability check underway



After completion of pressure stability check



Example: When **Adult/Pediatric** and **mmHg** are set

Selecting the measurement mode

About Utility Mode

In order to select the measurement mode, it is necessary to put this unit into **Utility Mode**.

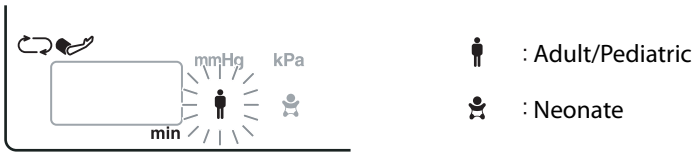
For details on **Utility Mode**, see *Utility Mode* on page 10-11).

Measurement mode selection screen

The measurement mode is selected on the **Measurement Mode (Adult/Neonate) Selection** screen.

Press the **Menu/Enter** switch until the **Measurement Mode (Adult/Neonate) Selection** screen appears.

When the **Measurement Mode (Adult/Neonate) Selection** screen appears, either the Adult/Pediatric or the Neonate icon flashes.



Selecting the measurement mode

Use the **Forward** or **Back** switch to make the icon for the desired measurement mode flash.

- When using a disposable cuff for a neonate or infant with a cuff width of 5 cm or less, align the cursor with **Neonate**.
- When using any other cuff, select **Adult/Pediatric**.

Entering the measurement mode

When you have selected the measurement mode, press the **Menu/Enter** switch.

When you do, the selection screen display moves to the next setting item.

Exiting the selection screen

To end **Utility Mode** and return to the basic screen, switch the power OFF, then ON again.

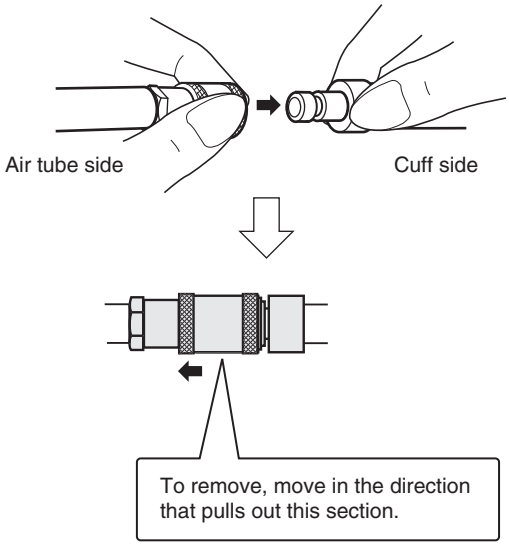
Cuff connection

Connect the cuff hose to the air hose.

Adult/Pediatric cuffs

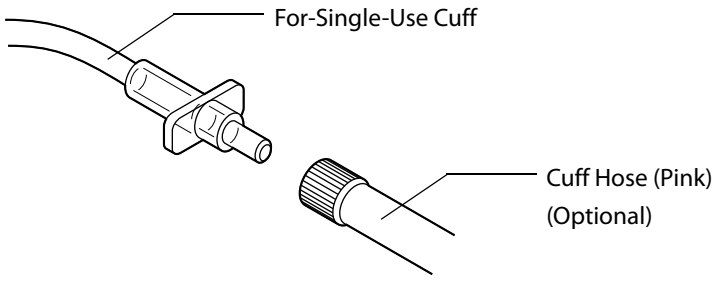
Insert in the direction of the arrow.

Insert securely until it clicks into place.



Neonatal/Infant for-single-use cuff

Firmly insert the for-single-use cuff hose connector into the cuff hose connector.

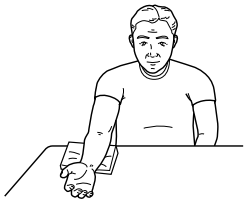


Note: Make sure that the connectors are tightly connected, as air leaks will prevent accurate measurement.

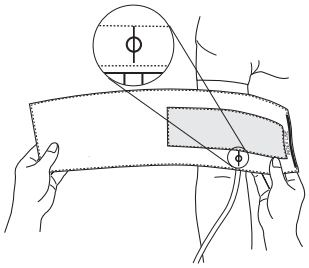
How to apply the cuff

Attaching the cuff

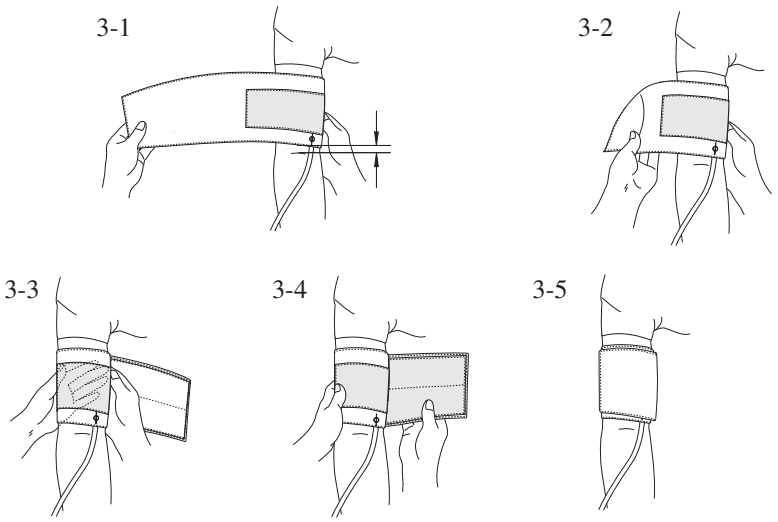
1. Place the hand of the patient with the palm of hand facing upward.



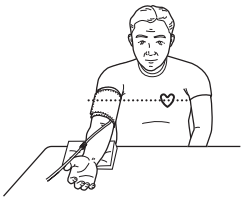
2. Align the Artery Position Mark ⌖ with the brachial artery.



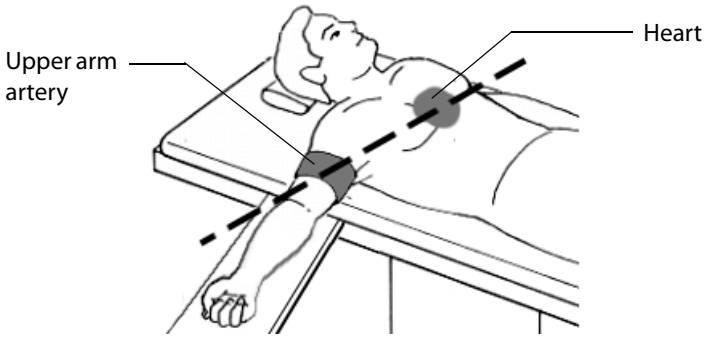
3. Wrap the cuff snugly using both hands and securely fasten it with the hook and loop tape. At this time, the lower edge of the cuff must be placed 1/2" to 1" above the inner side of elbow joint.
   - If the INDEX is positioned outside the RANGE, select the cuff suitable for the patient's arm circumference and wrap it again.
   - Wrap the cuff so that you can insert only two fingers between the cuff and arm above and below the cuff.(Adult)
   - Wrap the cuff so that you can insert only one finger between the cuff and arm above and below the cuff.(Child/Infant)



4. Keep the level of the cuff at the same level as the heart during the measurement.

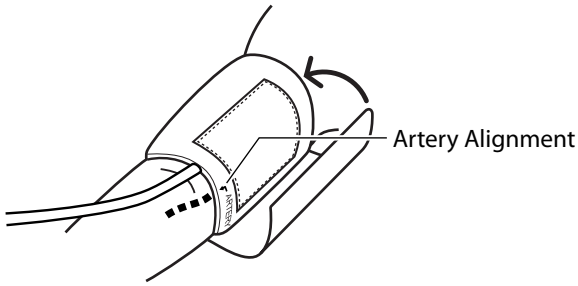


5. Maintain the height of the cuff-wrapped upper arm artery to that of the heart's right ventricle during measurements.



Attaching neonatal cuff

Select a cuff to suitably fit the patient by wrapping the cuff edge around the arm and seeing that it fits well into the cuff size indicator as shown in the diagram below. The hose should be brought out from the peripheral side without bending.



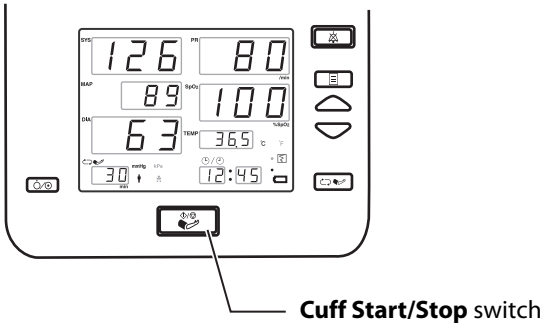
Note: Caution concerning relationship between cuff and heart height

- The blood pressure reading will be incorrect if the height of the cuff (side position, etc.) and the heart differ. A 4 in. difference may cause the blood pressure reading to differ by a maximum of 7 to 8 mmHg.

Manual measurement

Commencing a measurement

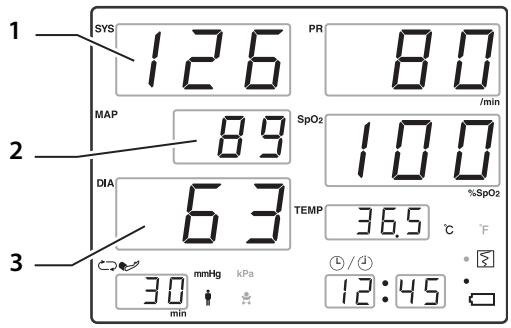
Press the **Cuff Start/Stop** switch. Monitor will inflate to the initial inflation pressure value, then measure.



- Re-measure if the measurement cannot be performed.
- If pressurization is insufficient, the pressure will automatically increase until the correct pressure is reached (this may occur even during a measurement).
- To interrupt a measurement, press the **Cuff Start/Stop** switch.

Display of the measurement results

When the measurement is complete, the measured value is displayed and the air in the cuff is rapidly exhausted. The measured value disappears after 180 minutes if there is no subsequent measurement.



1 Systolic Pressure
2 Mean Blood Pressure
3 Diastolic Pressure

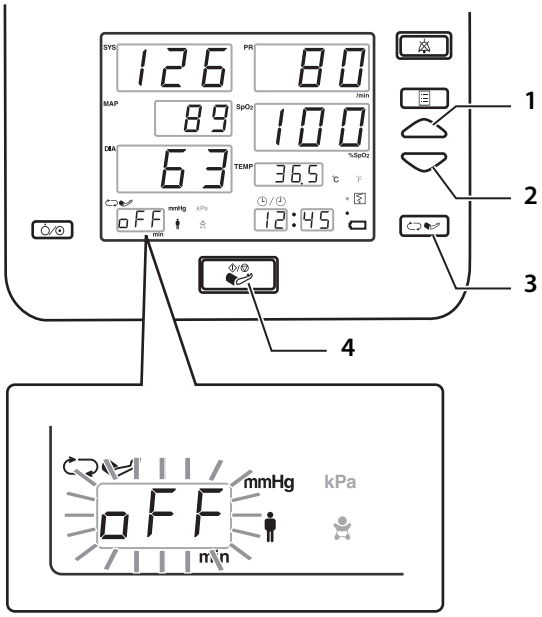
Note: Blood pressure measurement involves constriction of the arm. Some patients will find that subcutaneous hemorrhaging leads to temporary blemishes. Such blemishes will heal with time, but we suggest the following be tried if the blemishes concern patients.

- Wrap a thin piece of cloth or towel around the arm and then wrap the cuff over the cloth. Be careful not to use too thick of a piece of cloth, as this prevents sufficient constriction of the arm, which will cause the blood pressure measurement to be high.

Automatic measurement (Cardiac Science 5350 only)

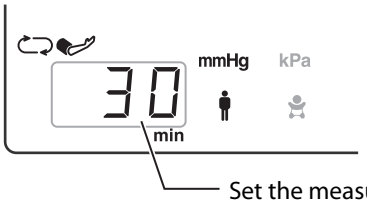
Monitoring using cuff intervals

1. When you press the **Cuff Interval** switch, the cuff measurement interval setting value flashes.



1	**Forward** switch
2	**Back** switch
3	**Cuff Interval** switch
4	**Cuff Start/Stop** switch

2. Use the **Forward** or **Back** switch to change the measurement interval. Available intervals are: off, con, 1, 2, 2.5, 3, 5, 10, 15, 20, 30, 45, 60, 90, 120, and 180 minutes.



Set the measurement interval.
(Display example: 30-minute interval)

3. If you do not press a switch for 10 seconds or press **Cuff Start/Stop**, **Alarm Silence** or **Cuff Interval**, **Setting Mode** ends and the display returns to the basic screen.

Inflation pressure value

The first time is 180 mmHg for an adult in case of Smart Inflation OFF or 120 mmHg for a neonate.

From the second time on, it is the previous systolic pressure value + an appropriate value.

However, if manual measurement is made during the measurement interval, the inflation pressure value is 180 mmHg if the measurement mode is adult and 120 mmHg if the measurement mode is neonate.

Smart clock cuff measurements

Measurements are synchronized with the time display. For example, in the case of a five-minute interval, the measurement will automatically commence when the time display reads **00**, **05**, **10**, etc.

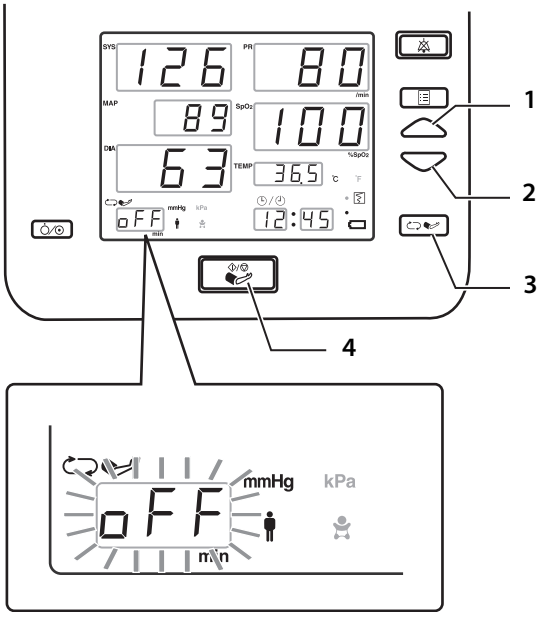
Note: For patient safety, beware of the following when the time interval is one minute.

- The measurement interval will automatically become 2.5 minutes after 12 minutes have elapsed.
- If the monitor is turned off, the cuff measurement interval becomes 2.5 minutes.

Continuous measurement (Cardiac Science 5350 only)

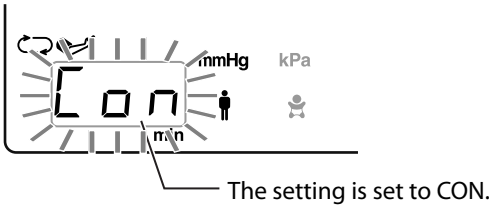
Continuous measurements (CON)

1. When you press the **Cuff Interval** switch, the cuff measurement interval setting value flashes.



1	**Forward** switch
2	**Back** switch
3	**Cuff Interval** switch
4	**Cuff Start/Stop** switch

2. Use the **Forward** or **Back** switch to set the setting to **CON**.



3. If you do not press a switch for 10 seconds or press **Cuff Start/Stop**, **Alarm Silence** or **Cuff Interval**, **Setting Mode** ends and the display returns to the basic screen. (Settings are not finalized until you press the **Cuff Start/Stop** switch.)
4. Pressing the **Cuff Start/Stop** switch starts measurement.

Inflation pressure value

The initial inflation pressure value is 180 mmHg for an adult, 120 mmHg for a neonate. From the second time on, it is the previous systolic pressure value + an appropriate value.

Note: For patient safety, beware of the following for continuous measurements:

- The measurement interval will automatically become 2.5 minutes after 12 minutes have elapsed.
- If the monitor is turned off, the cuff measurement interval becomes 2.5 minutes.
- After a setting is made, if 5 minutes pass without the **Cuff Start/Stop** switch being pressed, the cuff measurement interval becomes 2.5 minutes.

Quick SYS

This device has a function for estimating the systolic pressure during the second and subsequent measurements in continuous measurement in adult mode.

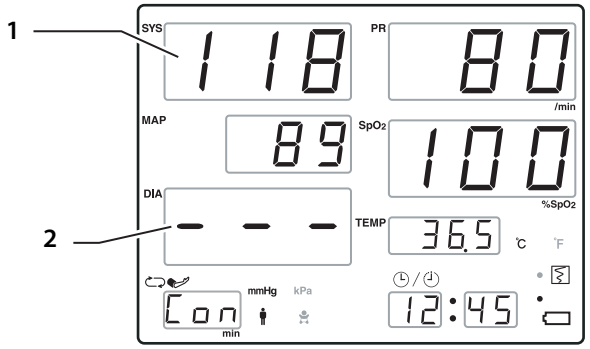
This function is called Quick SYS.

There are some cases in which Quick SYS does not work (i.e., when the systolic pressure cannot be estimated).

Not displayed when high-speed measurement is enabled.

When Quick SYS is working

When Quick SYS is working (when the systolic pressure can be estimated), the estimated systolic pressure value is displayed at **SYS** and "---" is displayed at **DIA**.

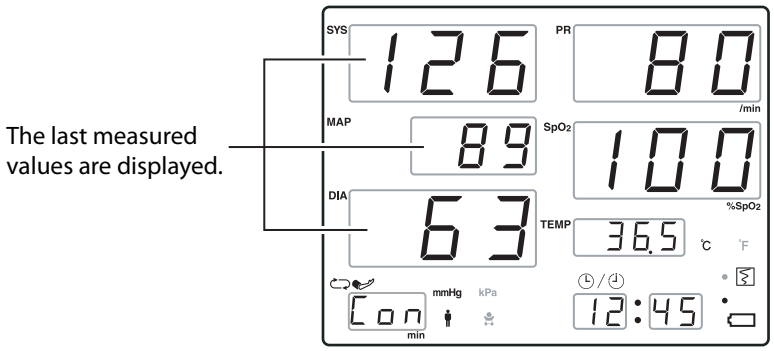


1 Quick SYS display
(Systolic pressure estimated value)

2 "---" is displayed at this section.

When Quick SYS is not working

When Quick SYS is not working (when the systolic pressure can not be estimated), the last measured values are displayed at **SYS**, **MAP**, and **DIA**.



When measurement ends

The measurement results are displayed.

The value displayed for Quick SYS is an estimated value, so it does not necessarily match the measured systolic pressure.

Other functions

Initial inflation value

The Initial Inflation Pressure is the inflation value applied when the **Cuff Interval** and **Smart Inflation** is set to OFF when the **Cuff Start/Stop** switch is pressed and the blood pressure is measured. (5350 only)

For the 5300, this is the inflation value when **Smart Inflation** is set to OFF.

- Adult mode—You can select from 140 mmHg, 180 mmHg, and 220 mmHg. (The factory setting is 180 mmHg.)
- Neo mode—You can select from 80 mmHg, 120 mmHg, and 140 mmHg. (The factory setting is 120 mmHg)

The initial inflation value can not be used when **Smart Inflation** is ON or when high-speed measurement is enabled.

Initial inflation pressure value setting

About Utility Mode

In order to set the initial inflation pressure value, it is necessary to put this unit into **Utility Mode**.

For details on **Utility Mode**, see *Utility Mode* on page 10-11

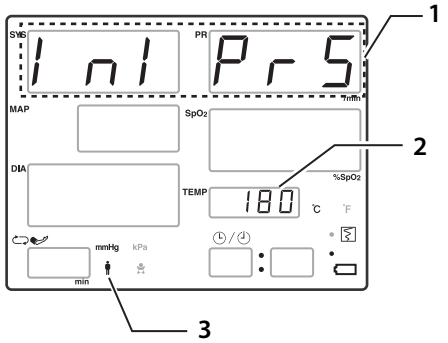
There are two settings for the initial inflation pressure value, adult and neonate.

Adult Initial inflation pressure value setting screen

The adult mode initial inflation pressure setting is made on the **Adult Initial Inflation Pressure Setting** screen.

Press the **Menu/Enter** switch until you reach the **Adult Initial Inflation Pressure Setting** screen.

When you reach the **Adult Initial Inflation Pressure Setting** screen, the display becomes as follows.



1 INI PRS is displayed.
2 The current initial inflation pressure value is displayed.
Display example: 180 mmHg
3 The adult mode icon is lit up.

Changing the adult initial inflation pressure value

Use the **Forward** or **Back** switch to change the initial inflation pressure value.

Entering the adult initial inflation pressure value

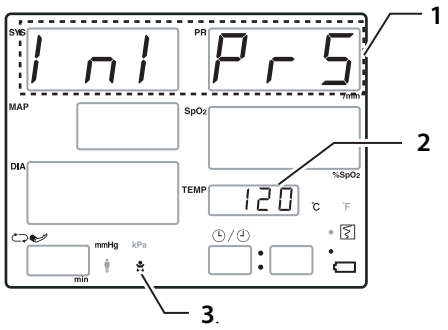
When you have selected the desired value, press the **Menu/Enter** switch to enter that value.

Exiting the setting screen

To end **Utility Mode** and return to the basic screen, switch the power OFF, then ON again.

Neonate initial inflation pressure value setting screen

The neonate mode initial inflation pressure value setting is made on the **Neonate Initial Inflation Pressure Setting** screen. Press the **Menu/Enter** switch until you reach the **Neonate Initial Inflation Pressure Setting** screen. When you reach the **Neonate Initial Inflation Pressure Setting** screen, the display becomes as follows:



1 INI PRS is displayed.

2 The current initial inflation pressure value is displayed.
Display example: 120 mmHg

3 The neo mode icon is lit up.

Changing the neonate initial inflation pressure value

Use the **Forward** or **Back** switch to change the initial inflation pressure value.

Entering the neonate initial inflation pressure value

When you have selected the desired value, press the **Menu/Enter** switch to enter that value.

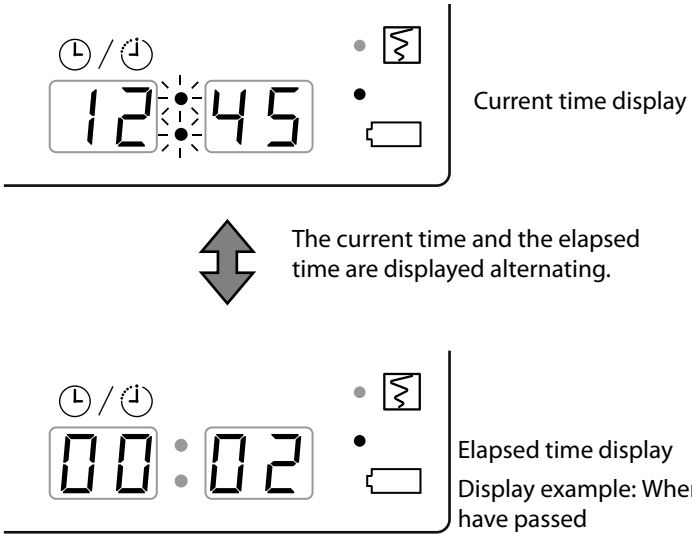
When you do, the setting screen display moves to the next setting item.

Exiting the setting screen

To end **Utility Mode** and return to the basic screen, switch the power OFF, then ON again.

Elapsed time

Displays the elapsed time since the most recent blood pressure measurement was obtained. The elapsed time is displayed after 1 minute has passed.



When 180 minutes have passed, the elapsed time display ends.

Smart Inflation™

Smart Inflation™ means that the cuff pressure appropriate to the patient's blood pressure value is automatically estimated and the cuff pressure raised to that pressure.

Smart Inflation operates in the following cases:

- When the measurement mode is set to **Adult/Pediatric**
- When the **Cuff Interval** is set to OFF and the **Cuff Start/Stop** switch is pressed and the blood pressure is measured manually. (5350 only)
- When the **Cuff Interval** is set to 2 minutes or more. (5350 only)
- Smart Inflation is set to ON.

(The 5300 has no interval condition.)

About Utility Mode

In order to switch Smart Inflation ON/OFF, it is necessary to put this unit into **Utility Mode**.

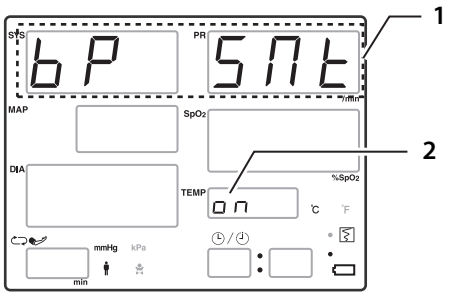
For details on **Utility Mode**, see *Utility Mode* on page 10-11.

Smart Inflation ON/OFF selection screen

Smart Inflation is switched ON/OFF on the **Smart Inflation ON/OFF Selection** screen.

Press the **Menu/Enter** switch until the **Smart Inflation ON/OFF Selection** screen appears.

When the **Smart Inflation ON/OFF Selection** screen appears, the display becomes as follows.



1 BP SMT is displayed.

2 The current setting value is displayed.

Display example: ON

Smart Inflation selection

Use the **Forward** or **Back** switch to switch Smart Inflation ON/OFF.

Entering the Smart Inflation selection

When you have selected **ON** or **OFF**, press the **Menu/Enter** switch to enter that value.

When you do, the selection screen display moves to the next setting item.

Exiting the selection screen

To end **Utility Mode** and return to the basic screen, switch the power OFF, then ON again.

Note: The Smart Inflation function detects oscillometric signals during the cuff pressure rise and estimates the pressure rise value, so there may be errors in the estimate in cases such as the following:

- When the patient's pulse is weak, when measuring through thick clothing, and any other case in which an adequate oscillometric signal can not be detected.
- When noise, for example from body movement, is mixed in with the oscillometric signal.

High speed measurement (default setting is OFF)

This is a high speed measurement function that can measure more quickly than conventional blood pressure measurement. The time the blood vessel is occluded is shorter, so the discomfort due to the measurement and any potential damage to subcutaneous tissue is reduced.

This function is only available when the measurement mode is set to **Adult/Pediatric**.

When high-speed measurement is set, Smart Inflation is always used.

About Utility Mode

In order to switch high speed measurement ON/OFF, it is necessary to put this unit into **Utility Mode**.

For details on **Utility Mode** *Utility Mode* on page 10-11.

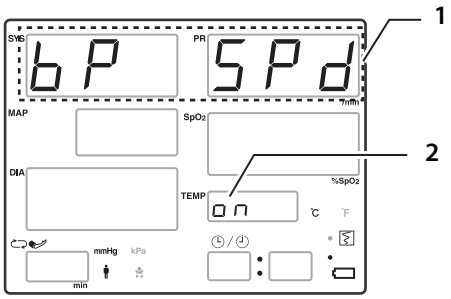
Note: Default setting is set to OFF.

High speed measurement ON/OFF selection screen

High speed measurement is switched ON/OFF on the **High Speed Measurement ON/OFF Selection** screen.

Press the **Menu/Enter** switch until the **High Speed Measurement ON/OFF Selection** screen appears.

When the **High Speed Measurement ON/OFF Selection** screen appears, the display becomes as follows.



1 BP SPD is displayed.

2 The current setting value is displayed.
Display example: ON

High speed measurement selection

Use the **Forward** or **Back** switch to high speed measurement ON/OFF.

Entering the high speed measurement selection

When you have selected **ON** or **OFF**, press the **Menu/Enter** switch to enter that value.

When you do, the selection screen display moves to the next setting item.

Exiting the selection screen

To end **Utility Mode** and return to the basic screen, switch the power OFF, then ON again.

Note: The high speed measurement function can not be used in the following cases:

- When the pulse amplitude is low and the heartbeat is 40/min or less
- When there is a lot of body movement.
- When there is an irregular pulse.

BP silent mode

When this function is switched ON, the pump sound is suppressed.

About Utility Mode

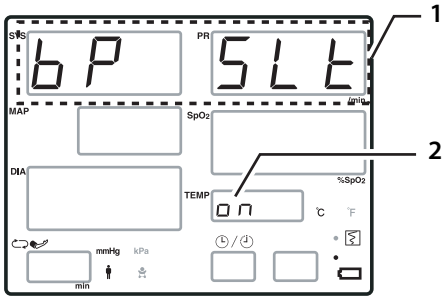
In order to switch BP silent mode ON/OFF, it is necessary to put this unit into **Utility Mode**.

For details on **Utility Mode**, see *Utility Mode* on page 10-11.

BP silent mode ON/OFF selection screen

Press the **Menu/Enter** switch until the **BP Silent Mode Selection** screen appears.

When the **BP Silent Mode Selection** screen appears, the display becomes as follows:



1 BP SLT is displayed.

2 The current setting value is displayed.
Display example: ON

BP silent mode selection

Use the **Forward** or **Back** switch to select ON or OFF.

Entering the BP silent mode selection

When you have selected **ON** or **OFF**, press the **Menu/Enter** switch to enter the selection.

When you do, the selection screen display moves to the next setting item.

Exiting the selection screen

To end **Utility Mode** and return to the basic screen, switch the power OFF, then ON again.

Blood pressure measurement end sound

When this function is switched ON, when blood pressure measurement ends, the "notice sound" is issued.

About Utility Mode

In order to switch blood pressure measurement end sound ON/OFF, it is necessary to put this unit into **Utility Mode**.

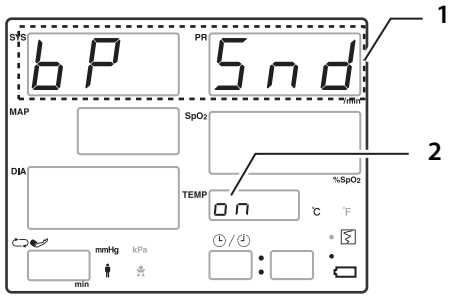
For details on **Utility Mode**, see *Utility Mode* on page 10-11.

Blood pressure measurement end sound ON/OFF selection screen

Blood pressure measurement end sound is switched ON/OFF on the **Blood Pressure Measurement End Sound ON/OFF Selection** screen.

Press the **Menu/Enter** switch until the **Blood Pressure Measurement End Sound ON/OFF Selection** screen appears.

When the **Blood Pressure Measurement End Sound ON/OFF Selection** screen appears, the display becomes as follows.



1 BP SND is displayed.
2 The current setting value is displayed.
Display example: ON

Blood pressure measurement end sound selection

Use the **Forward** or **Back** switch to blood pressure measurement end sound ON/OFF.

Entering the blood pressure measurement end sound selection

When you have selected **ON** or **OFF**, press the **Menu/Enter** switch to enter that value.

When you do, the selection screen display moves to the next setting item.

Exiting the selection screen

To end **Utility Mode** and return to the basic screen, switch the power OFF, then ON again.

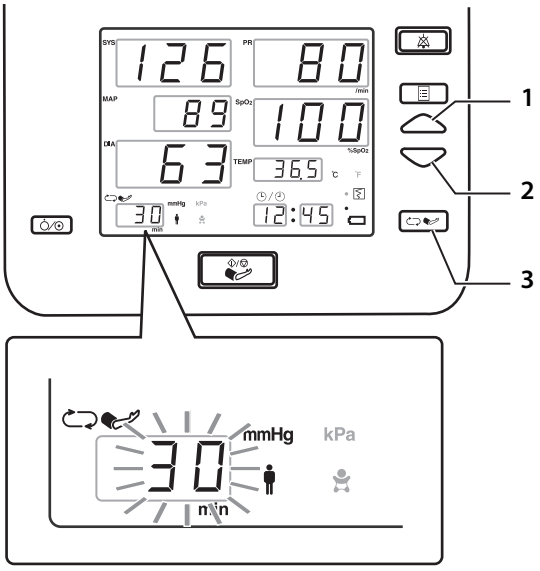
After measurement

When measurement ends, remove the cuff from the patient and use the procedure below to switch the **Cuff Measurement Interval** to OFF. For details about how to check the data, see Chapter 7, *List Screen* or Chapter 9, *Recorder*.

The 5300 has no interval setting.

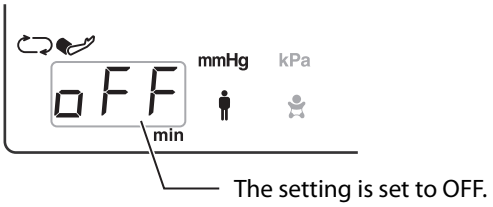
Cuff measurement interval OFF (Cardiac Science 5350 only)

1. When you press the **Cuff Interval** switch, the cuff measurement interval setting value flashes.



1 **Forward** switch
2 **Back** switch
3 **Cuff Interval** switch

2. Use the **Forward** or **Back** switch to set the setting to OFF.



3. If you press the **Cuff Interval** switch or wait for 10 seconds without pressing any other switch, **Setting Mode** ends and the display returns to the basic screen.

Clear display

In the following cases, the display is automatically cleared.

- When measurement ends. (5300 only)
  (This is not applicable when NIBP and SpO_2 measurements are simultaneously taken.)
- After the measurement starts with the **Cuff Interval** set to OFF. (5350 only)
  (This is not applicable when NIBP and SpO_2 measurements are simultaneously taken.)

Clear display (Cardiac Science 5300 only)

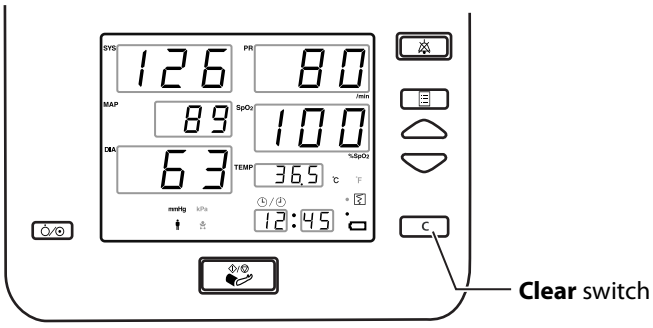
Clear measurement value display

Each time you press the **Clear** switch, the measurement value display is cleared.

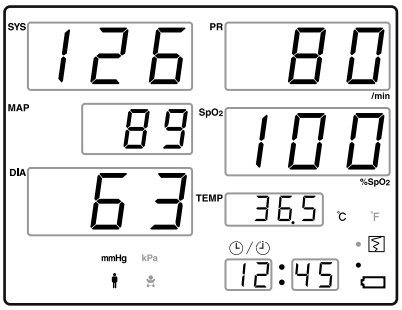
Press this when the patient is changed.

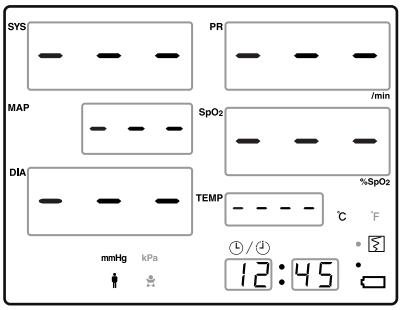
Usage method

Press the **Clear** switch.



Display





5 Pulse Oximeter (SpO_2)

(Only models with SpO_2)

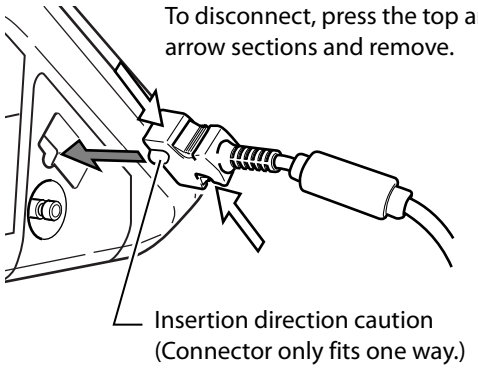
Contents

Measurement preparation

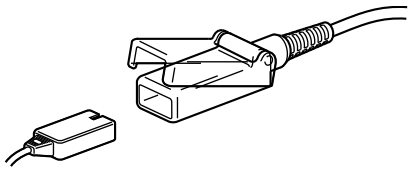
Connecting the SpO_2 sensor

Models with Nellcor® SpO_2

1. Plug the DOC-10 extension cable into the SpO_2 connector on the side of the device.

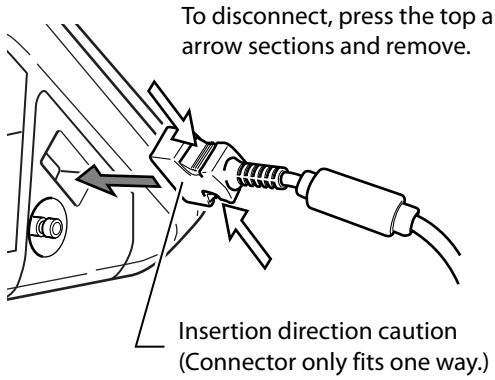


2. Insert the OXISENSOR® onto the extension cable, lower the cover, and lock it.

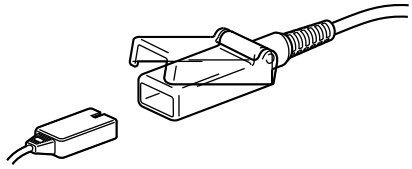


Models with Masimo® SpO_2

1. Plug the LNC-10 extension cable into the SpO_2 connector on the side of the device.



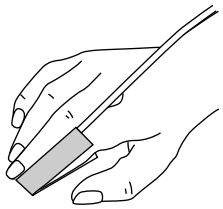
2. Insert the SpO_2 sensor onto the extension cable, lower the cover, and lock it.



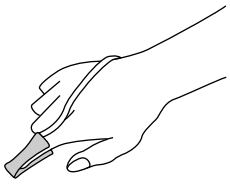
SpO_2 sensor selection

The use of a patient-suitable sensor is an important factor for obtaining correct measurement results. Carefully select a patient-suitable sensor from among those shown below.

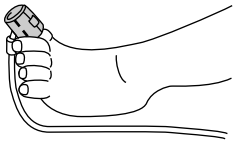
For Nellcor® model



ADULT FINGER OXISENSOR® MAX-A
Disposable sensor should be applied to adults weighing over 30kg.

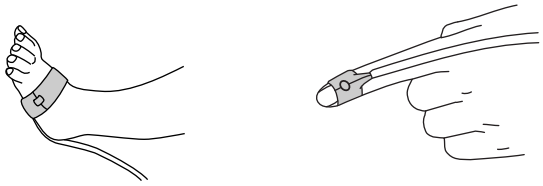


CHILD FINGER OXISENSOR® MAX-P
Disposable finger sensor for patients weighing from 10 to 50kg.



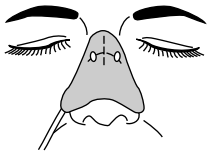
INFANT OXISENSOR® MAX-I

Disposable sensors for Infants weighing from 3 to 20kg.



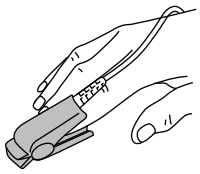
NEONATAL OXISENSOR® MAX-N

Disposable sensor for Neonates weighing 3 kg or less, use on a leg or arm. Or for use on the index finger for adults weighing over 40kg.

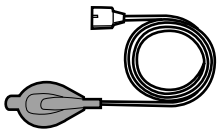


ADULT NASAL

OXISENSOR® MAX-R Disposable nasal sensor for adults weighing over 50kg.



DURASENSOR® DS-100A Reusable sensor should be applied to adults weighing over 40kg.



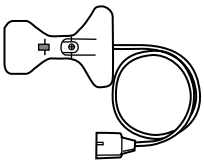
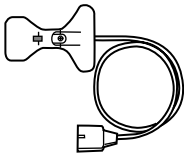
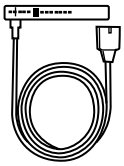
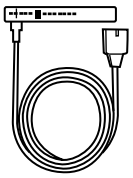
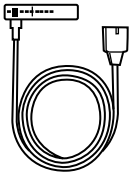
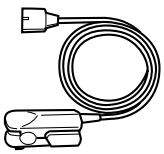
MAX-FAST®
For Patient's forehead

- The DURASENSOR® DS-100A is a short-term usage sensor that can be used repeatedly.
- The OXISENSOR® sensors are single-patient use only. These sensors can be reused on the same patient only while the tape remains adhesive.
- Read the included instruction manual thoroughly before using OXISENSOR® attachments.
- Do not immerse in water or cleaning solutions. Do not resterilize.

Note: Do not use any SpO_2 sensor other than those specified.

Purchase of this instrument confers no express or implied license under any Nellcor patent to use this instrument with any oximetry sensor that is not manufactured or licensed by Nellcor.

For Masimo® SpO_2

	SpO_2 SENSOR LNCS Adtx Patient Weight: 30kg or over
	SpO_2SENSOR LNCS Pdtx Patient Weight: 10 to 50kg
	SpO_2 SENSOR LNCS Neo-L Patient Weight: < 3kg or > 40kg
	SpO_2SENSOR LNCS NeoPt-L Patient Weight: 1kg or less
	SpO_2SENSOR LNCS Inf-L Patient Weight: 3 to 20kg
	SpO_2 SENSOR LNCS DC-I Patient Weight: 30kg or over

- The LNCS DC-I is a short-term reusable finger sensor.
- The other disposable sensors can be reused on the same patient only while the tape remains adhesive.

Note: Do not use any SpO_2 sensor other than those specified.

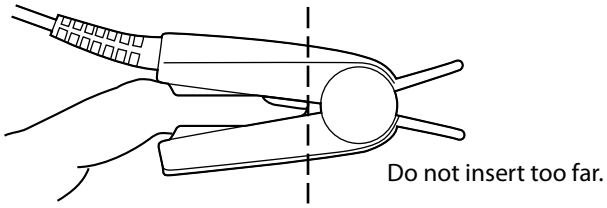
Attaching SpO_2 sensor

Reusable SpO_2 sensor

For a reusable SpO_2 sensor, carefully read the instruction manual that comes with the sensor. (For Nellcor® models, the DURASENSOR® DS-100A; for Masimo® models, the SpO_2 SENSOR LNCS DC-I).

The SpO_2 sensor for the Nellcor® model is shown below as an example.

- Open the DURASENSOR® and fit it securely on a finger tip. Have the cable on the fingernail side.



- Check that the clip is not pressing too hard and creating excess pressure on the finger.

  Be particularly careful of the finger tip.

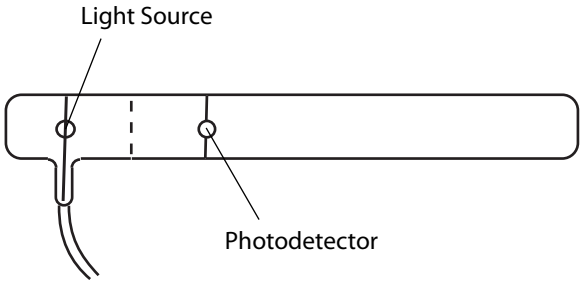
  If the clip is pressing too hard, the sensor can be mounted on the little finger.

Disposable SpO_2 sensor

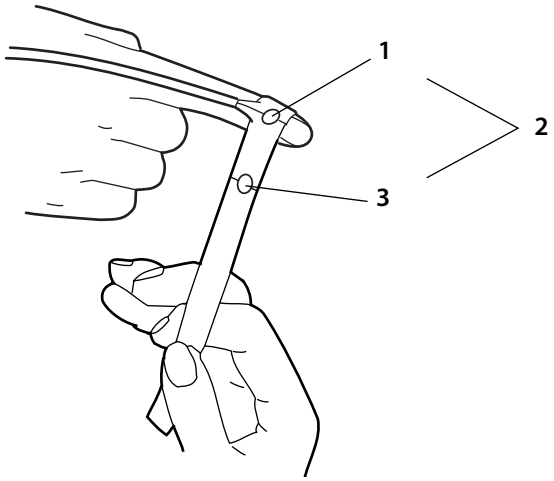
For disposable SpO_2 sensors, carefully read the instruction manual that comes with the sensors.

The example below uses a Nellcor® OXISENSOR®.

- Peel off the protective film from the sticky surface.



- Attach being aware that accurate measurement is made possible by the light emitting section and the light receiving section working together as a pair. When attaching to a finger, have the light emitting surface on the nail side.

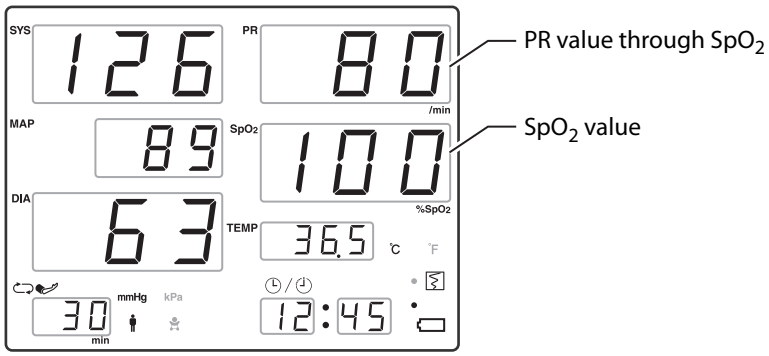


1 Light emitting surface
2 Always attach on the corresponding surface.
3 Light receiving surface

Measurement

Screen display example

The measurement reading is displayed when this sensor is connected to the main unit.



Note: If the SpO_2 sensor has been dropped or subjected to strong physical shock, check for faults before use.

Note: Select the sensor appropriate for the patient.

Note: The device may display meaningless measurement readings when the SpO_2 sensor is detached from measurement site and when light intensity changes (when a person walks by and temporarily blocks out light).

Note: In the following cases, measurement is not possible or correct measurement is not possible.

- Insufficient peripheral circulation, acute cases of low blood pressure, low temperature (due to insufficient blood flow in the body part being measured).
- The patient is moving.
- When cardiac massage is performed or when there are weak but continuous vibrations (spasm, venous pulsation, etc.).
- During blood pressure measurements if the SpO_2 sensor is placed on the same arm as the cuff.
- If selection and attachment of the SpO_2 sensor are not correct.
- Patients with carbon monoxide poisoning and heavy smokers. (Functional disorders of hemoglobin such as carboxyhemoglobin and methemoglobin cannot be differentiated.)
- When there is much of a high reagent color component within the arteries (indocyanine green, methylene blue, etc.).
- When there is nail polish, colored cream, or other pigmented substance that interferes with light where the sensor is mounted.
- When there is strong light, such as direct illumination or direct sunlight. (Block off the light.)
- Measurements on patients using a heart-lung machine (since there is no pulsebeat).

After measurement

For details about how to check the data, see Chapter 7, *List Screen* or *Recorder* on page 9-1.

Clear display

- When using on a different patient, press the **Clear** switch. (see *Clear display* on page 4-26) (5300 only)

In the following cases, the display is automatically cleared.

- After measurement starts. (5300 only)
- After measurement starts with the **Cuff Interval** set to OFF. (5350 only)

6 Temperature Measurement

(Only models with body temperature measurement)

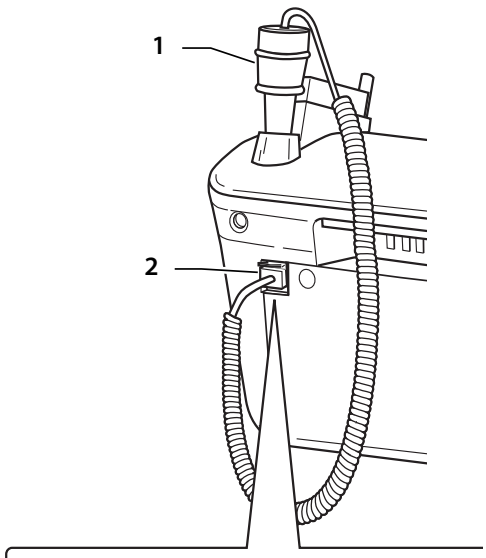
Contents

Measurement preparation

Connecting the body temperature probe

Connect the body temperature probe connector to the body temperature probe connection port on the rear of the main unit.

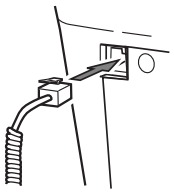
Be careful to insert the connector in the correct direction. It can only be inserted with the correct orientation.



1 Body temperature probe

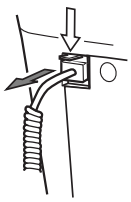
2 Body temperature probe connector

3



3 To connect the connector, push in until the connector clicks into place.

4



4 To disconnect the connector, while restraining the upper section, lock, pull out.

Note: Do not use any probe or probe cover other than those specified.

Measurement

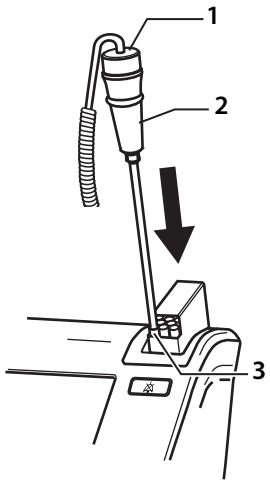
Mounting the probe cover

Always mount the probe cover before using the body temperature probe.

Securely plug the tip of the body temperature probe all the way into the probe cover.

If the cover is not securely mounted, there is a danger of it coming loose or coming off in use.

Also, be careful not to press the probe cover removal button by mistake during use.



1 Probe cover removal button
2 Body temperature probe
3 Probe cover

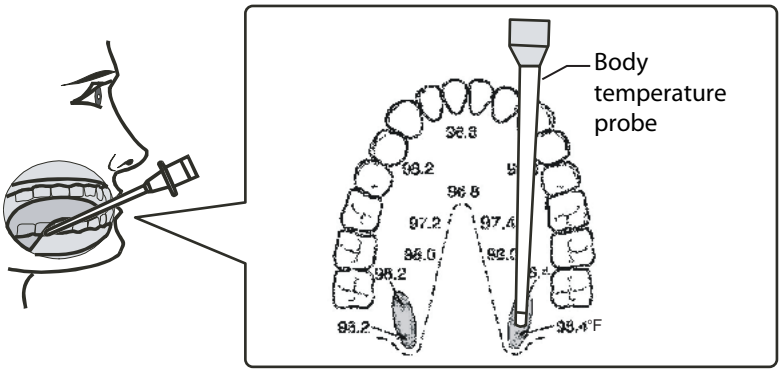
Mounting the body temperature probe

For oral measurement

Place the tip of the probe in the hollow under the tongue.

After about 10 seconds, the body temperature can be measured.

- Hold the probe in such a way that its tip is touching the skin during body temperature measurement.
- During body temperature measurement, do not change the position of the body temperature probe or have the patient hold it.

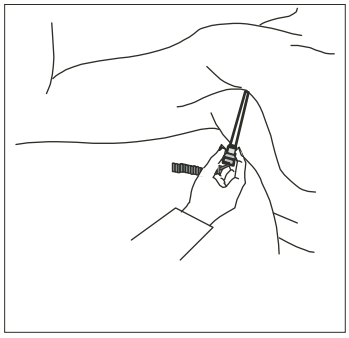


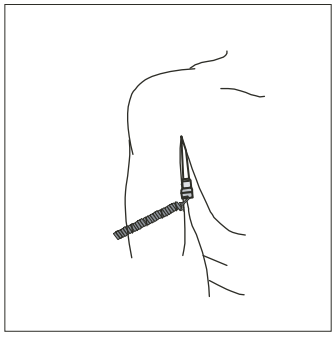
For armpit measurement

Put the tip of the body temperature probe into the patient's armpit and have the patient sandwich it in place.

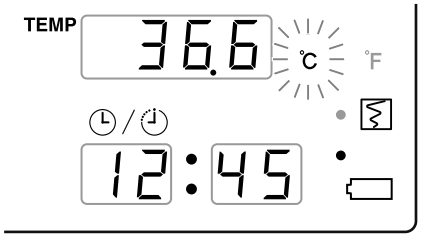
After about 10 seconds, the body temperature can be measured.

- Hold the body temperature probe position constant and in such a way that its tip is touching the patient's skin during body temperature measurement.





Body temperature measurement mode



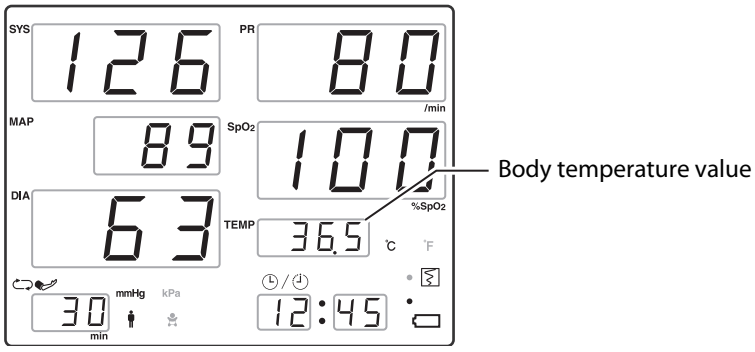
Body temperature measurement has two built-in measurement methods, estimated and actual measurement. Measurement always starts with the estimated measurement, but under the conditions below, measurement automatically switches to actual measurement. From that point in time, the body temperature unit display flashes. Observe the display until the value stops changing (3-5 minutes), indicating the final temperature.

Note: An estimated measurement switches to an actual measurement under the following condition.

- The ambient temperature when starting measurement is lower than 16.0°C (60.8°F) or higher than 33.3°C (91.9°F).
- The probe temperature fails to reach the standard temperature (34.4°C/94°F) within 7 seconds from starting the measurement.
- Failed to estimated body temperature after 60 seconds when the measurement was started.

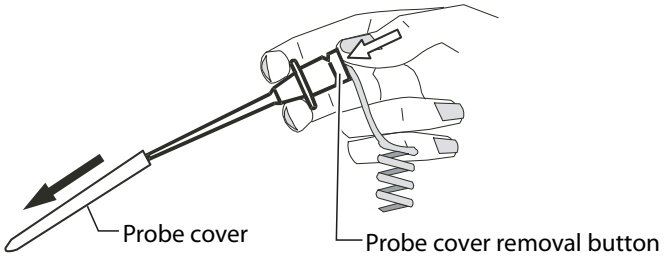
Note: If an unusually high or low temperature reading is obtained, confirm the reading using another temperature measuring device before beginning any treatment.

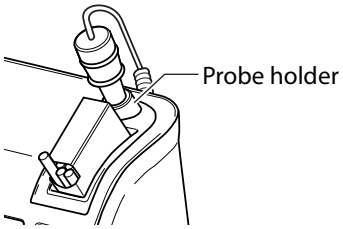
Screen display example



Exiting measurement

After the end of measurement, hold the body temperature probe in the same way as in the instructions for a syringe, press the probe cover removal button, and dispose of the used probe cover in a waste container.





Return the body temperature probe to the probe holder on the top of the main unit.

After measurement

For details about how to check the data, see Chapter 7, *List Screen* or Chapter 9, *Recorder*.

Clear display

- When using on a different patient, press the **Clear** switch. (Page 3-18)(5300 only)

In the following cases, the display is automatically cleared.

- When an estimated measurement ends. (5300 only)
  (This is not applicable when TEMP and SpO_2 measurements are simultaneously taken.)
- After the measurement starts with the **Cuff Interval** set to OFF. (5350 only)
  (This is not applicable when TEMP and SpO_2 measurements are simultaneously taken.)

7 List Screen

Contents

This can display past measurements (List Data) stored in memory.

Explanation list screen

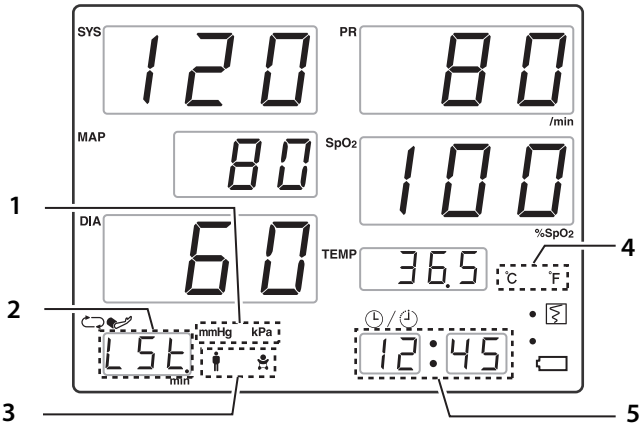
To list the display, either press the **Forward** or **Back** switch while the basic screen is displayed.

Forward switch—Each time this switch is pressed, one old list data is displayed in reverse chronological order.

Back switch—Each time this switch is pressed one new list data is displayed.

The search will stop once you reach the oldest data or the newest data, regardless of which key is pressed.

The Cuff Interval LED alternates between displaying "LST", which indicates list display, and displaying the current list data number.



1 Displays the current measurement unit.
2 Alternately displays the list number and "LST".
3 Displays Adult/neonate indication for list data.
4 Displays the current measurement unit.
5 Displays the time the list data was stored.

List display isn't displayed in the following cases:

- When measuring the blood pressure.
- When measuring the SpO_2.
- When measuring the body temperature.
- When the alarm is activated.
- When there is no list data.

List data count

A maximum of 400 data items can be stored in memory.

Data older than the last 400 data items is overwritten by newer data, in order from the oldest data.

List save timing

The measurement reading is saved in the list as follows:

- When measurement with the cuff is completed (including error).
- When an alarm occurs with each measurement reading (5350 only).
- When SpO_2 measurement starts.
- When estimated body temperature ends.

Deleting list data

In order to delete list data, it is necessary to put this unit into **Setting Mode** by pressing the **Menu/Enter** switch.

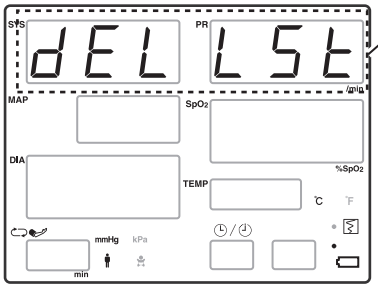
For additional information on **Setting Mode**, see *Setup* on page 10-1).

Delete list screen

List data deletion is set on the **Delete List** screen.

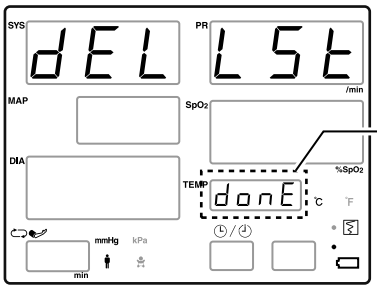
Press the **Menu/Enter** switch until the **Delete List** screen appears.

When the **Delete List** screen appears, the display becomes as follows.



DEL LST is displayed.

Hold down the **Alarm Silence** switch for at least 3 seconds.



DONE is displayed.

Exiting the setting screen

If you do not press a switch for 10 seconds or press **Cuff Start/Stop** or **Alarm Silence**, **Setting Mode** ends and the display returns to the basic screen.

Exiting list display

The list display ends once the following condition takes place.

- 10 seconds passes without any key operation.
- If a switch other than the **Forward** or **Back** switch is pressed.
- If the alarm is activated.
- If blood pressure measurement is started.

8 Alarms

(Cardiac Science 5350 only)

Contents

Alarm settings (Cardiac Science 5350 only)

About setting mode

In order to set an alarm, it is necessary to put this unit into **Setting Mode** by pressing the **Menu/Enter** switch.

For additional information on **Setting Mode**, see *Setup* on page 10-1.

Alarm setting screens

Press the **Menu/Enter** switch until the **Alarm Setting** screen you want to change appears.

Here are the following types of **Alarm Setting** screens:

1. SYS upper limit
2. SYS lower limit
3. DIA upper limit
4. DIA lower limit
5. PR upper limit
6. PR lower limit
7. SpO_2 upper limit
8. SpO_2 lower limit

When an **Alarm Setting** screen is displayed, the display appears as follows:

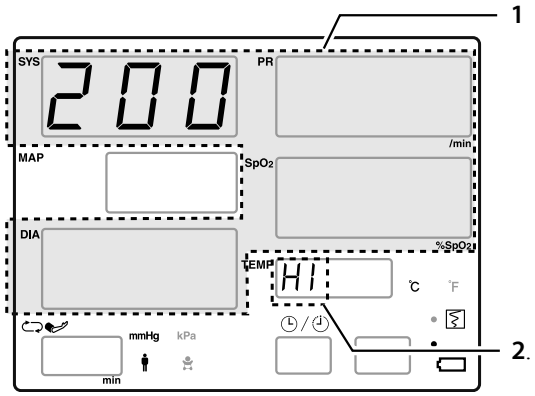


Figure 8-1: **Example of the SYS upper limit Display**

1 The current setting value is displayed. The display positions are
- SYS upper limit/lower limit: SYS display section
- DIA upper limit/lower limit: DIA display section
- PR upper limit/lower limit: PR display section
- SpO2 upper limit/lower limit: SpO2 display section.

2 When setting upper limit: HI
When setting lower limit: LO is displayed.

Changing the alarm setting value

Use the **Forward** or **Back** switch to change the alarm setting value.

Entering the alarm setting value

When you have made the desired change, press the **Menu/Enter** switch to enter it.

When you do, the setting screen display moves to the next setting item.

Exiting the setting screen

If you do not press a switch for 10 seconds or press **Cuff Start/Stop** or **Alarm Silence**, **Setting Mode** ends and the display returns to the basic screen.

Alarm operations (Cardiac Science 5350 only)

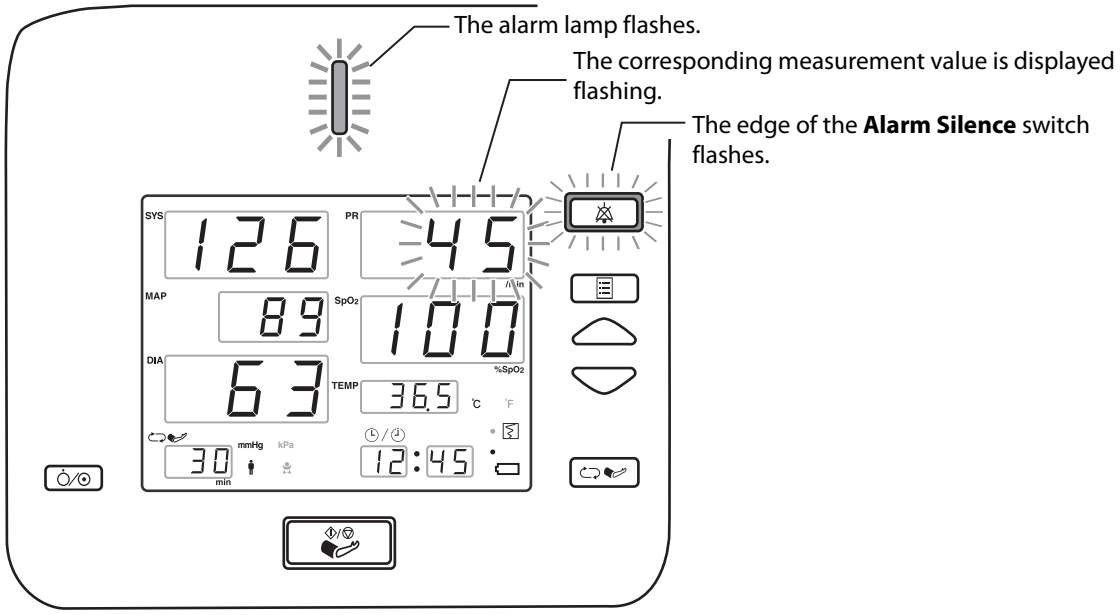
Alarm triggering

If the patient's measurement exceeds the value set for an alarm, an alarm is triggered.

When an alarm is triggered:

- The alarm sounds.
- The alarm lamp flashes.
- The edge of the **Alarm Silence** switch flashes.
- The corresponding measurement value is displayed flashing.
- The data is automatically stored in the list.

The alarm sounds.



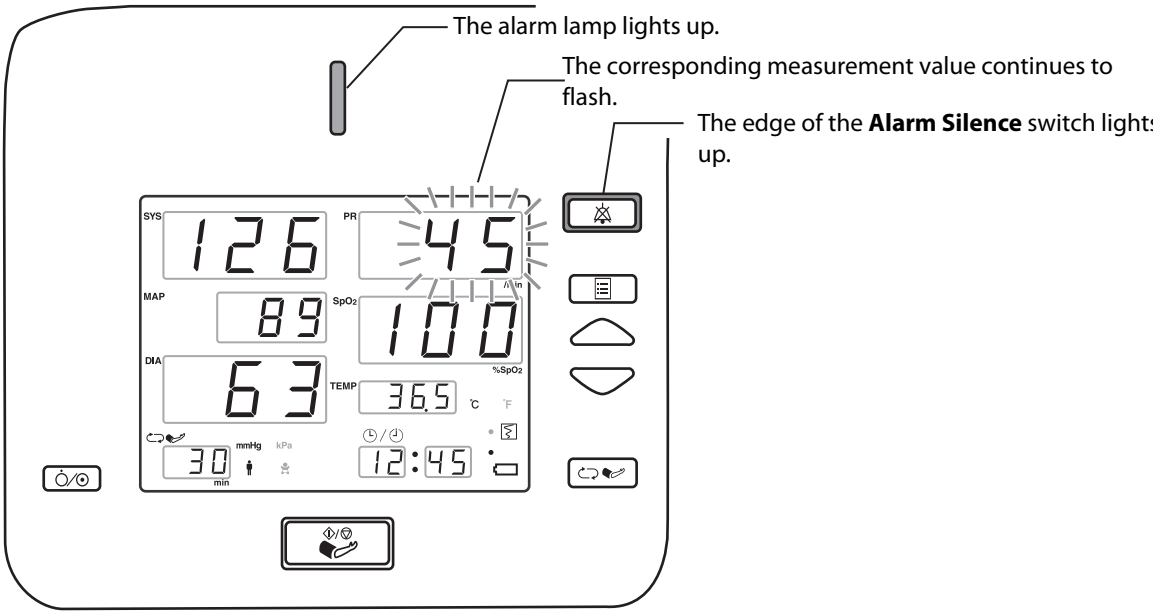
The data is automatically stored in the list.

Silencing an Alarm

Press the **Alarm Silence** switch.

- The alarm sound stops.
- The alarm lamp lights up.
- The edge of the **Alarm Silence** switch lights up.
- The corresponding measurement value continues to flash.

The alarm sound stops.



Recovering from an alarm

- If an alarm (other than for a cuff measurement value) set with the alarm settings is silenced but the alarm status has not ended within two minutes of the last time that alarm was silenced, that alarm sounds again.
- If some other alarm (connection check or the like) is silenced, even if the alarm status has not ended within two minutes, that alarm does not sound again.

For either type of alarm, if an alarm has ended, then occurs again, the alarm sounds.

Extinguishing an alarm

When the patient's measurement value returns into the monitoring range, the above display returns to normal.

Alarm setting range

The following shows the alarm setting ranges.

Parameter			Lower Limit					Upper Limit					
			Setting range			Default	Sound	Setting range			Default	Sound	Step
NIBP	SYS	mmHg	50	~	250	70		60	~	260	200		
	SYS (Neo)		30	~	120	50		40	~	130	130		
	DIA		30	~	230	30		40	~	240	160		10
	DIA (Neo)		10	~	90	10		20	~	100	100		
PR		/min	25	~	255	40		30	~	260	180		5
PR (Neo)			25	~	255	50		30	~	260	200		
SpO_2		%SpO_2	70	~	99	90		71	~	100	100		1
SpO_2 (Neo)			70	~	99	85		71	~	100	100		

High-priority alarm

Note: No alarm is issued until the measured value exceeds the upper alarm setting or falls below the lower alarm setting.

Note: For details on the alarm sound see *Other labels* on page 1-12.

9 Recorder

(Only models with recorder)

Contents

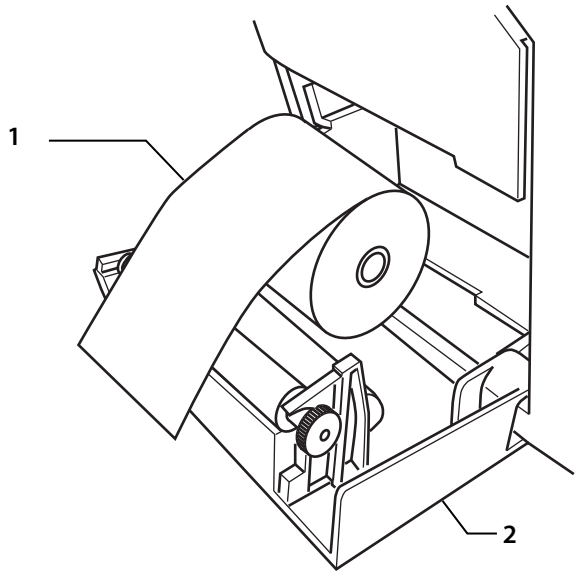
Preparations before use

Setting up the roll paper

Open the recorder cover and set the roll paper in the direction shown in the figure below.

(The recorder will not record if the paper is loaded reversely, so be careful to load the paper in the correct direction.)

After setting the roll paper in place, bring the leading edge of the roll paper so that it sticks out slightly from the gap at the top of the recorder cover, then close the recorder cover.



1 Roll paper
(The outside is the color generating surface.)
2 Recorder cover

Note: Do not use with the recorder cover left open.

Note: The final meter of roll paper contains a red line. When this becomes visible, replace with specified roll paper.

Note: The roll paper is thermosensitive, so the roll paper may color and recording may fade.

- Examples of coloration causes: glues, felt pens containing organic solvents, adhesives
- Examples of fading causes: sunlight, ultraviolet rays, fluorescent pens, tapes, transparent case for storage, desk pads

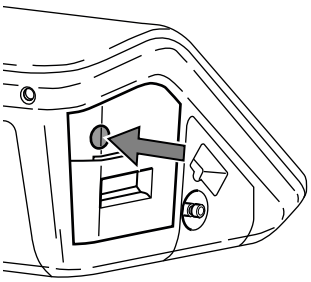
For the above reasons, make a copy when storing as a document of permanent record.

Note: Please use only roll paper from Cardiac Science. If you use other paper, the printing may be thin or it may cause a paper jam or other breakdown.

Manual recording

List types

Press the **Record** switch. The measurement data is recorded.

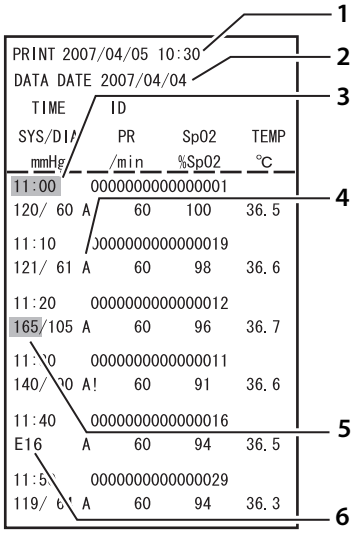


The recorded list will be one of the three types below. You can set the type you want.

For details about how to set the list type, see *List record pattern selection* on page 9-7.

- Simple List Recording (LST 1)(Default)
- Detailed List Recording (LST 2)
- Measurement Value Recording (OSCL)
- All list recording

Simple list recording (LST 1)



1 Time when the **Record** switch was pressed

2 Date of the head data in the recorded list data

3 For the following data, the time section is displayed shaded to make later identification easier.

Data for manual blood pressure measurement (5350 only)

4 NIBP measurement information

When the blood pressure values are displayed, the NIBP information changes as below.

- !—The body moved during measurement.
- A—The measurement mode was measured as an **Adult/Pediatric**.
- N—The measurement mode was measured as a **Neonate**.

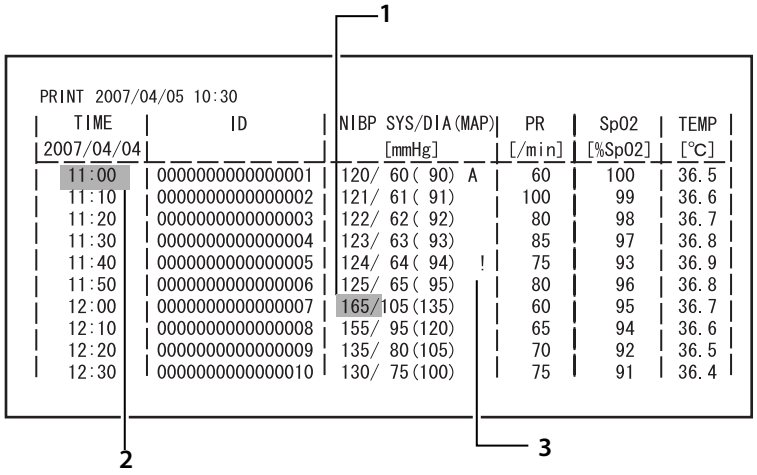
5 The shading shows when an alarm occurred.(5350 only)

6 An error code is printed when an error occurs.

- Patient IDs are recorded only if there are IDs in the list data. If an ID is not entered or the patient changes, then the ID section is left blank or printed as “Unknown.”. The ID section is not recorded unless the user enters an ID at least once after powering on.
- The SpO_2 data is displayed only for models with SpO_2 measurement.
- The TEMP data is displayed only for models with body temperature measurement.
- The latest 10 data items are printed on one page.

Note: Inputting an ID requires the optional bar code reader.

Detailed list recording (LST 2)



1 The shading shows when an alarm occurred. (5350 only)

2 For the following data, the time section is displayed shaded to make later identification easier.

Data for manual blood pressure measurement (5350 only)

3 NIBP measurement information

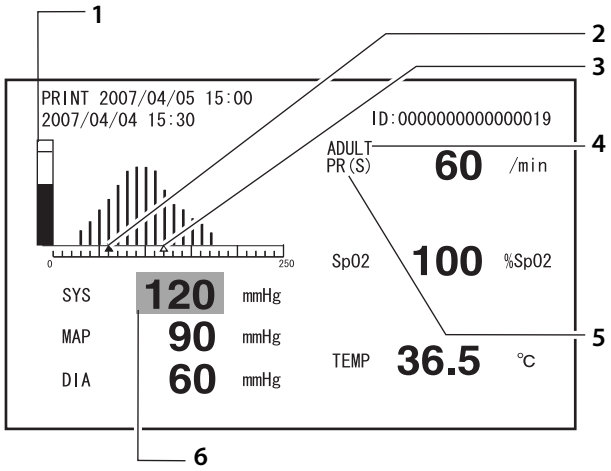
When the blood pressure values are displayed, the NIBP information changes as below.

- !— The body moved during measurement.
- A—The measurement mode was measured as an **Adult/Pediatric**.
- N—The measurement mode was measured as a **Neonate**.

- Patient IDs are recorded only if there are IDs in the list data. If an ID is not entered or the patient changes, then the ID section is left blank or printed as “Unknown.”. The ID section is not recorded unless the user enters an ID at least once after powering on.
- The SpO_2 data is displayed only for models with SpO_2 measurement.
- The TEMP data is displayed only for models with body temperature measurement.
- The latest 10 data items are printed on one page.
- When any of the NIBP unit (mmHg/kPa), TEMP unit (°C/°F) or measurement mode (Adult/Neonate) changes, it starts to print from next page.

Note: Inputting an ID requires the optional bar code reader.

Measurement value recording (OSCL)



1 This level meter shows the strength of the pulse wave

2 DIA

3 SYS

4 Adult—The measurement mode was measured as an **Adult/Pediatric**.
NEO—The measurement mode was measured as a **Neonate**.

5 PR(S)—SpO_2 measurement value
PR(N)—NIBP measurement value

6 The shading shows when an alarm occurred.
(5350 only)

- If there is no NIBP measurement value, this printing is not executed.
- Records the measurement value data being displayed at the moment.
- An ID is recorded only if there is an ID when recording starts.
- Patient IDs are recorded only if there are IDs in the list data. If an ID is not entered or the patient changes, then the ID section is left blank or printed as “Unknown.”. The ID section is not recorded unless the user enters an ID at least once after powering on.
- The SpO_2 data is recorded only for models with SpO_2 measurement.
- The TEMP data is recorded only for models with body temperature measurement.

Note: The SpO_2 measurement value printed is the data for when cuff measurement starts.

Note: Inputting an ID requires the optional bar code reader.

All list recording

If you hold down the record switch for 3 seconds or longer, the entire list is printed. Up to 400 items can be printed in a list.

As an exception, when you select **OSCL** as the list type, **LST1** list will be printed automatically in the all list recording.

List record pattern selection

About Utility Mode

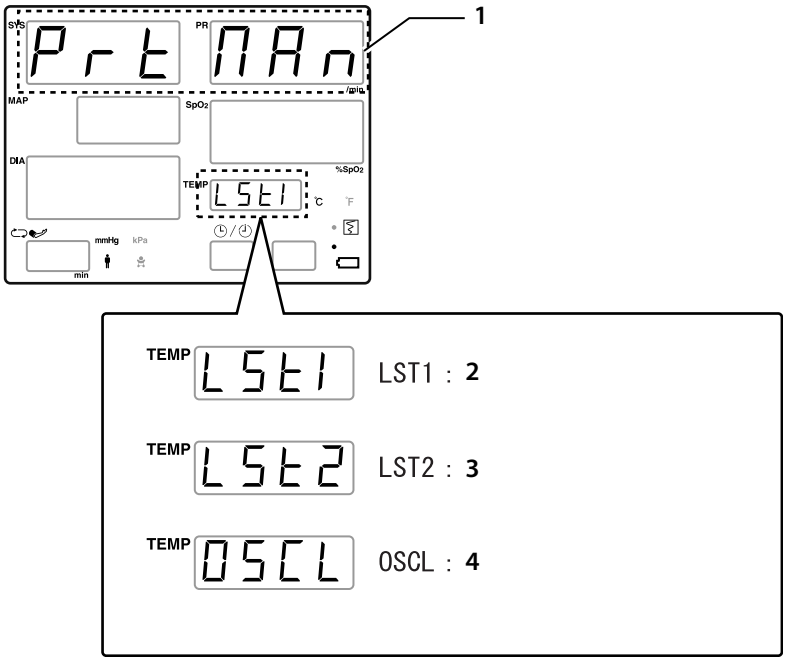
In order to select the list record pattern, it is necessary to put this unit into **Utility Mode**. For details on **Utility Mode**, see *Utility Mode* on page 10-11.

List record pattern selection screen

The list record pattern is selected on the **List Record Pattern Selection** screen.

Press the **Menu/Enter** switch until the **List Record Pattern Selection** screen appears.

When the **List Record Pattern Selection** screen appears, the display becomes as follows:



1 PRT MAN is displayed

One of these displays:

2 Simple list recording

3 Detailed list recording

4 Measurement value recording

List record pattern selection

Use the **Forward** or **Back** switch to select the record pattern.

Entering the list record pattern

When you have selected the desired type, press the **Menu/Enter** switch to enter that type. When you do, the selection screen display moves to the next setting item.

Exiting the selection screen

To end **Utility Mode** and return to the basic screen, switch the power OFF, then ON again.

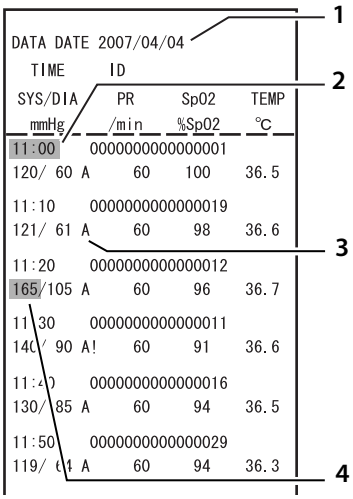
Automatic recording

When the measurement record selection becomes anything other than OFF in **Utility Mode**, the measurement value at the moment measurement ends is recorded.

The recorded list will be one of the two types below. You can select the desired type with a setting. (For details on how to make this setting, please see *Measurement record selection* on page 9-10.)

- Simple List Recording (LST)
- Measurement Value Recording (OSCL)

Simple list recording (LST)



1 Date of the head data in the recorded list data

2 For the following data, the time section is displayed shaded to make later identification easier.

Data for manual blood pressure measurement (5350 only)

3 NIBP measurement information.

When the blood pressure values are displayed, the NIBP information changes as below.

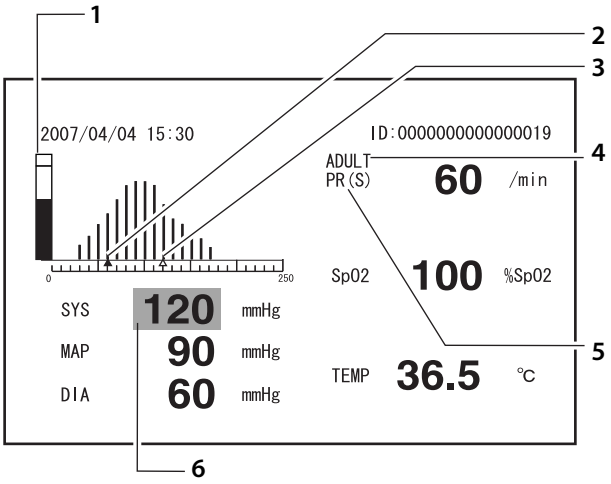
- !—The body moved during measurement.
- A—The measurement mode was measured as an **Adult/Pediatric**.
- N—The measurement mode was measured as a **Neonate**.

4 The shading shows when an alarm occurred. (5350 only)

- Patient IDs are recorded only if there are IDs in the list data. If an ID is not entered or the patient changes, then the ID section is left blank or printed as “Unknown.”. The ID section is not recorded unless the user enters an ID at least once after powering on.
- The SpO_2 data is displayed only for models with SpO_2 measurement.
- The TEMP data is displayed only for models with body temperature measurement.

Note: Inputting an ID requires the optional bar code reader.

Measurement value recording (OSCL)



1 This level meter shows the strength of the pulse wave

2 DIA

3 SYS

4 Adult—The measurement mode was measured as an **Adult/Pediatric**.
NEO—The measurement mode was measured as a **Neonate**.

5 PR(S)—SpO_2 measurement value
PR(N)—NIBP measurement value

6 The shading shows when an alarm occurred.
(5350 only)

- If there is no NIBP measurement value, this printing is not executed.
- Records the measurement value data being displayed at the moment recording starts.
- An ID is recorded only if there is an ID when recording starts.
- Patient IDs are recorded only if there are IDs in the list data. If an ID is not entered or the patient changes, then the ID section is left blank or printed as “Unknown.”. The ID section is not recorded unless the user enters an ID at least once after powering on.
- The SpO_2 data is recorded only for models with SpO_2 measurement.
- The TEMP data is recorded only for models with body temperature measurement.

Note: The SpO_2 measurement value printed is the data for when cuff measurement starts.

Note: Inputting an ID requires the optional bar code reader.

Measurement record selection

About Utility Mode

In order to select the recording for measurement, it is necessary to put this unit into **Utility Mode**.

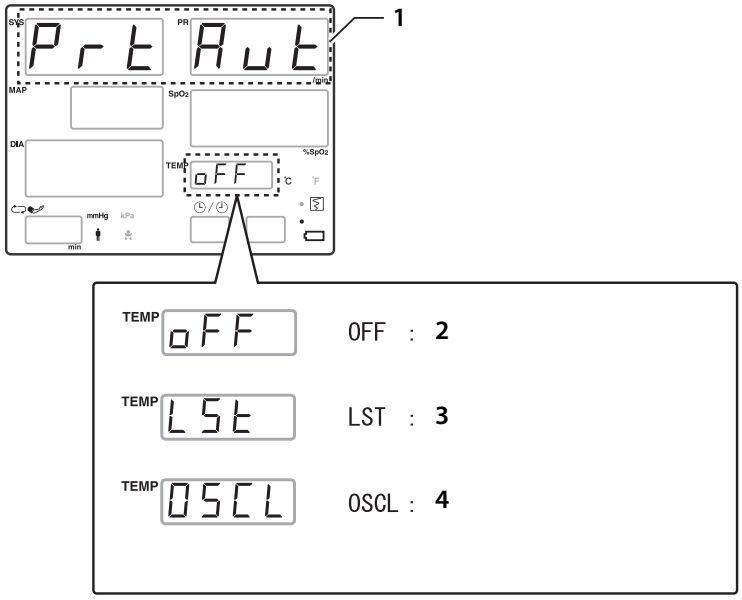
For details on **Utility Mode**, see *Utility Mode* on page 10-11.

Measurement record selection screen

This function will print measurement data automatically at the end of the measurement.

Press the **Menu/Enter** switch until the **Measurement Record Selection** screen appears.

When the **Measurement Record Selection** screen appears, the display becomes as follows.



1 PRT AUT is displayed

One of these displays:.

2 Do not record

3 Simple list recording

4 Measurement value recording

Selecting the recording for measurement

Use the **Forward** or **Back** switch to select the recording for measurement.

Entering the recording for measurement

When you have selected the desired value, press the **Menu/Enter** switch to enter that value.

When you do, the selection display moves to the next setting item.

Exiting the selection screen

To end **Utility Mode** and return to the basic screen, switch the power OFF, then ON again.

Deleting list data

Refer to Chapter 7, *List Screen*.

Recorder error

Recorder errors are detected and announced with the RECORDER INDICATOR.

RECORDER INDICATOR status	Error details	Solution
 Lit	Out of paper	Load paper.
 Flashing rapidly	Hardware error	A device error was detected. Switch the power OFF, then ON again. If the error recurs repeatedly, stop using this device and contact Cardiac Science Technical Support.
 Flashing somewhat rapidly	Head voltage error	
 Flashing slowly	Head temperature error	

If the paper runs out during printing, reload paper. The printing does not resume automatically. Press the **Record** switch. Note that the printing starts over from the beginning.

10 Setup

Contents

How to setup

For adjusting settings, there are two modes: **Setting Mode** and **Utility Mode**.

Settings in Setting Mode

The following settings are made in **Setting Mode**:

1. SYS upper limit alarm setting*
2. SYS lower limit alarm setting*
3. DIA upper limit alarm setting*
4. DIA lower limit alarm setting*
5. PR upper limit alarm setting*
6. PR lower limit alarm setting*
7. SpO_2 upper limit alarm setting (only for models with SpO_2 measurement)*
8. SpO_2 lower limit alarm setting (only for models with SpO_2 measurement)*
9. Alarm volume setting
10. Pulse rate volume setting (only for models with SpO_2 measurement)
11. Cuff measurement interval selection*
12. Delete list

Settings in Utility Mode

The following settings are made in **Utility Mode**:

1. Measurement mode (Adult/Neonate) selection
2. Adult initial inflation pressure value setting
3. Neonate initial inflation pressure value setting
4. Smart Inflation ON/OFF selection
5. High speed measurement ON/OFF selection (Default is OFF)
6. BP silent mode selection
7. Blood pressure measurement end sound ON/OFF selection
8. Measurement record selection (only for models with recorder)
9. List record pattern selection (only for models with recorder)
10. External output selection
11. Battery operation selection
12. Hour setting
13. Minute setting

14. Year setting
15. Month setting
16. Day setting
17. Date format selection (only for models with recorder)
18. Map display ON/OFF selection
19. LAN group number setting**
20. LAN bed number setting**
21. Default setting

*5350 only

**Only when External output is selected.

Setting Mode

Setting procedure

1. To enter setting mode, press the **Menu/Enter** switch.

   The system goes into **Setting Mode**.

Menu/Enter switch

2. Press the **Menu/Enter** switch until the desired setting screen appears.

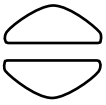
   Each time you press the **Menu/Enter** switch, the setting screen changes in the following order.

   1 **SYS upper limit alarm setting***
   2 **SYS lower limit alarm setting***
   3 **DIA upper limit alarm setting***
   4 **DIA lower limit alarm setting***
   5 **PR upper limit alarm setting***
   6 **PR lower limit alarm setting***
   7 **SpO_2 upper limit alarm setting** (only for models with SpO_2 measurement)*
   8 **SpO_2 lower limit alarm setting** (only for models with SpO_2measurement)*
   9 **Alarm volume setting**
   10 **Pulse rate volume setting** (only for models with SpO_2 measurement)
   11 **Cuff measurement interval selection***
   12 **Delete List**

   For example, to access the **SYS Upper Limit Alarm Setting**, press the **Menu/Enter** switch until that screen appears.

   *5350 only

3. Use the **Forward** or **Back** switch to change the contents of the setting.



Forward switch

Back switch

4. Press the **Menu/Enter** switch to enter the setting contents.

   The setting content is entered and the display moves to the next setting item.

5. Exit **Setting Mode**:

   If you do not press a switch for 10 seconds or press **Cuff Start/Stop** or **Alarm Silence**, **Setting Mode** ends and the display returns to the basic screen.

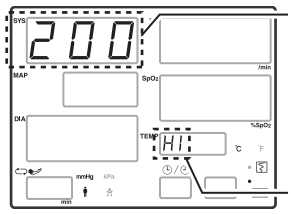
Note: Setting operations can not be carried out when an alarm is being triggered. Press the **Alarm Silence** switch to stop the alarm sound, then carry out the operation. If an alarm occurs during a setting operation, the setting operation is stopped and the display returns to the basic screen. In this case, the setting value at that time is finalized. (5350 only)

Setting method for each item

1. SYS upper limit alarm setting (5350 only)

   This sets the SYS upper limit alarm value.

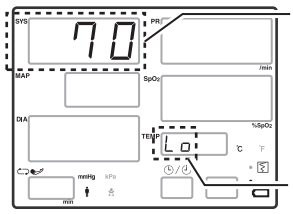
   For details, see *Alarm settings (Cardiac Science 5350 only)* on page 8-2.



2. SYS lower limit alarm setting (5350 only)

   This sets the SYS lower limit alarm value.

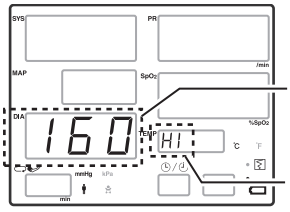
   For details, see *Alarm settings (Cardiac Science 5350 only)* on page 8-2.



3. DIA upper limit alarm setting (5350 only)

   This sets the DIA upper limit alarm value.

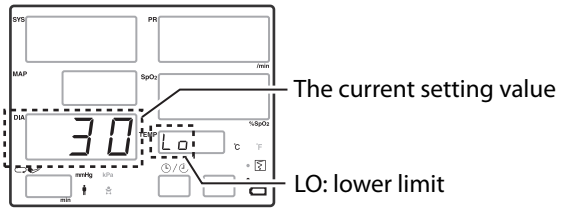
   For details, see *Alarm settings (Cardiac Science 5350 only)* on page 8-2.



4. DIA lower limit alarm setting (5350 only)

   This sets the DIA lower limit alarm value.

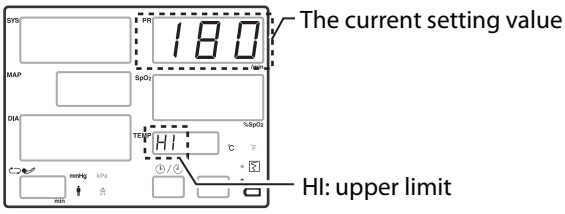
   For details, see *Alarm settings (Cardiac Science 5350 only)* on page 8-2.



5. PR upper limit alarm setting (5350 only)

   This sets the PR upper limit alarm value.

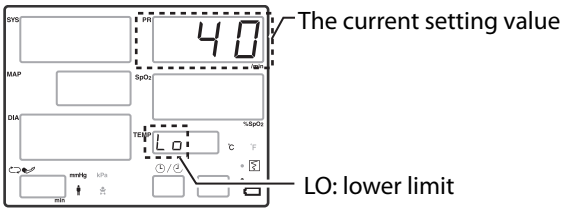
   For details, see *Alarm settings (Cardiac Science 5350 only)* on page 8-2.



6. PR lower limit alarm setting (5350 only)

   This sets the PR lower limit alarm value.

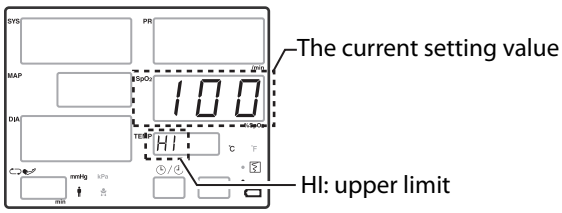
   For details, see *Alarm settings (Cardiac Science 5350 only)* on page 8-2.



7. SpO_2 upper limit alarm setting (5350 only)

   This sets the SpO_2 upper limit alarm value.

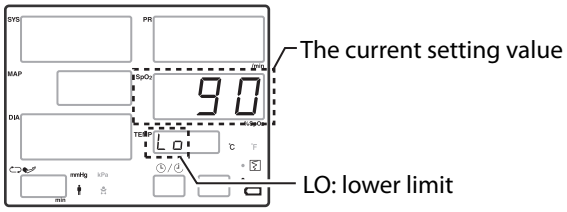
   For details, see *Alarm settings (Cardiac Science 5350 only)* on page 8-2.



8. SpO_2 lower limit alarm setting (5350 only)

   This sets the SpO_2 lower limit alarm value.

   For details, see *Alarm settings (Cardiac Science 5350 only)* on page 8-2.



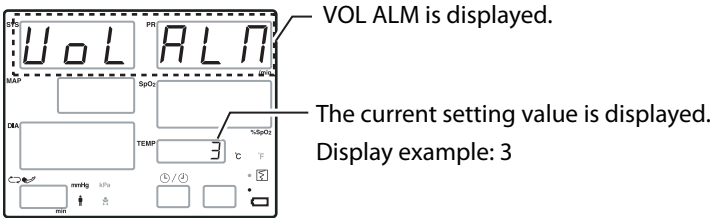
9. Alarm volume setting

   This sets the alarm volume.

   - Alarm volume setting screen

     Press the **Menu/Enter** switch until the **Alarm Volume Setting** screen appears.

     When the **Alarm Volume Setting** screen appears, the display becomes as follows:



   - Changing the setting value

     Use the **Forward** or **Back** switch to change the setting value.

   - Entering the setting value

     When you have selected the setting value, press the **Menu/Enter** switch to enter the value.

     When you do, the setting screen display moves to the next setting item.

   - Exiting the setting screen

     If you do not press a switch for 10 seconds or press **Cuff Start/Stop** or **Alarm Silence**, **Setting Mode** ends and the display returns to the basic screen.

10. Pulse rate volume setting

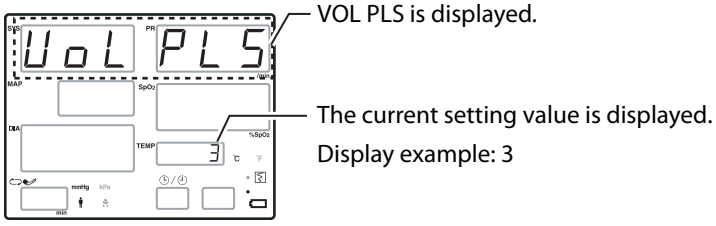
This sets the pulse rate volume.

The setting procedure is as follows:

- Pulse rate volume setting screen

  Press the **Menu/Enter** switch until the **Pulse Rate Volume Setting** screen appears.

  When the **Pulse Rate Volume Setting** screen appears, the display becomes as follows:



- Changing the setting value

  Use the **Forward** or **Back** switch to change the setting value.

- Entering the setting value

  When you have selected the setting value, press the **Menu/Enter** switch to enter the value.

  When you do, the setting screen display moves to the next setting item.

- Exiting the setting screen

  If you do not press a switch for 10 seconds or press **Cuff Start/Stop** or **Alarm Silence**, **Setting Mode** ends and the display returns to the basic screen.

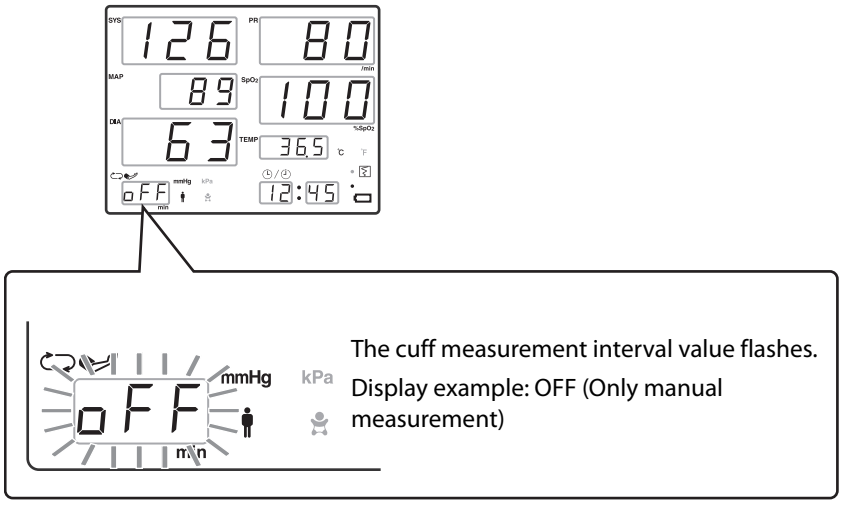
11. Cuff measurement interval selection (5350 only)

This sets the cuff measurement interval. (5350 only)

- Cuff measurement interval selection screen

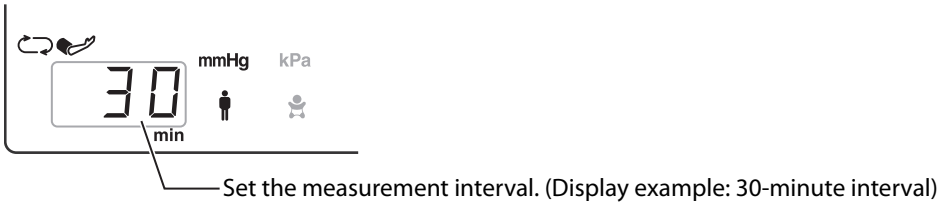
  Press the **Menu/Enter** switch until the **Cuff Measurement Interval Selection** screen appears, or press the **Cuff Interval** switch.

  When the **Cuff Measurement Interval Selection** screen appears, the display becomes as follows:



- Selecting the value

  Use the **Forward** or **Back** switch to change the value.



  Available intervals are: off, con, 1, 2, 2.5, 3, 5, 10, 15, 20, 30, 45, 60, 90, 120, and 180 minutes.

- Entering the selection

  When you have selected the value, press the **Menu/Enter** switch to enter the selection.

  When you do, the selection screen display moves to the next setting item.

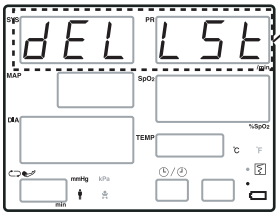
- Exiting the selection screen

  If you do not press a switch for 10 seconds or press **Cuff Start/Stop** or **Alarm Silence**, **Setting Mode** ends and the display returns to the basic screen.

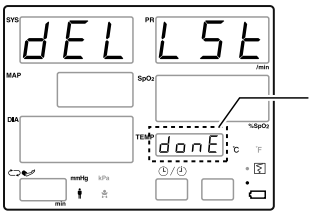
12. Delete list

The list data is erased.

For details, see *Deleting list data* on page 7-4.



Hold down the **Alarm Silence** switch for at least 3 seconds.



Utility Mode

Setting procedure

1. To enter **Utility Mode**, hold down the **Cuff Start/Stop** switch and press the **Power** switch.

   The device goes into **Utility Mode**.

2. Press the **Menu/Enter** switch  until the desired setting screen appears.

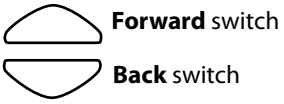
   (Some screens are only displayed if the corresponding option is installed.)

   Press the **Menu/Enter** switch until you reach the desired setting screen.

1	Measurement mode (Adult/Neonate) selection
2	Adult initial inflation pressure value setting
3	Neonate initial inflation pressure value setting
4	Smart Inflation ON/OFF selection
5	High speed measurement ON/OFF selection (Default is OFF)
6	BP silent mode selection
7	Blood pressure measurement end sound ON/OFF selection
8	Measurement record selection (only for models with recorder)
9	List record pattern selection (only for models with recorder)
10	External output switching
11	Battery operation selection
12	Hour setting
13	Minute setting
14	Year setting
15	Month setting
16	Day setting
17	Date format selection (only for models with recorder)
18	Map display ON/OFF selection
19	LAN group number setting**
20	LAN bed number setting**
21	Default setting
	** May not display depending on the External output switching.

For example, to make the **List Record Pattern Selection**, press the **Menu/Enter** switch until you reach that screen.

3. Use the **Forward** or **Back** switch to change the contents of the setting



4. Press the **Menu/Enter** switch to enter the setting contents.

   The setting content is entered and the display moves to the next setting item.

5. To exit **Utility Mode** and return to the basic screen, switch OFF the power for the main unit, then switch it ON again.

Setting method for each item

1. Measurement mode (Adult/Neonate) selection

   Adult: Set to this value when using reusable or disposable cuffs for adult and pediatric patients.

   Neonate: Set to this value when using the disposable cuffs for neonates.

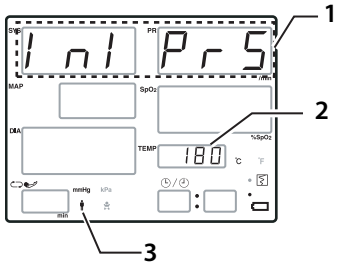
   For details, see *Selecting the measurement mode* on page 4-4.

2. Adult initial inflation pressure value setting

   This is the inflation pressure value applied when the **Cuff Interval** and **Smart Inflation** are set to OFF, the **Cuff Start/Stop** switch is pressed and the blood pressure is measured. (5350 only)

   For the 5300, this is the inflation value when **Smart Inflation** is set to OFF.

   For details, see *Initial inflation value* on page 4-16.



1 INI PRS is displayed.

2 The current initial inflation pressure value is displayed.

Display example: 180 mmHg

Available value: 140, 180, 220mmHg

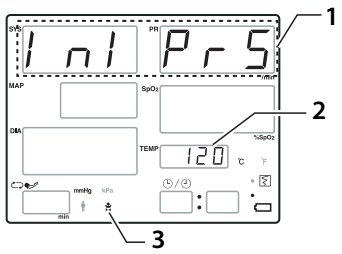
3 The adult mode icon is lit up.

3. Neonate initial inflation pressure value setting

   This is the inflation pressure value applied when the **Cuff Interval** and **Smart Inflation** are set to OFF, the **Cuff Start/Stop** switch is pressed and the blood pressure is measured. (5350 only)

   For the 5300, this is the inflation value when **Smart Inflation** is set to OFF.

   For details, see *Initial inflation pressure value setting* on page 4-16.



   1 INI PRS is displayed.

   2 The current initial inflation pressure value is displayed.

   Display example: 120 mmHg

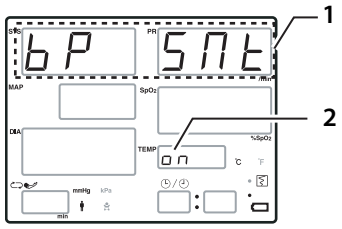
   Available value: 80, 120, 140mmHg

   3 The adult mode icon is lit up.

4. Smart Inflation ON/OFF selection

   When this function is switched ON, the cuff pressure appropriate to the patient's blood pressure value is automatically estimated and the cuff pressure raised to that pressure.

   For details, see *Smart Inflation*™ on page 4-19.



   1 BP SMT is displayed.

   2 The current setting value is displayed.

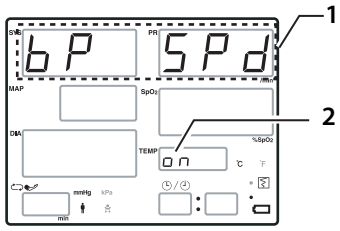
   Display example: ON

5. High Speed measurement ON/OFF selection (Default is OFF)

   When this function is switched ON, blood pressure is measured in a shortened time.

   When this function is used, the time the blood vessel is occluded is shorter, so potential discomfort due to the measurement and possible damage to subcutaneous tissue is reduced.

   For details, see *High speed measurement (default setting is OFF)* on page 4-21.

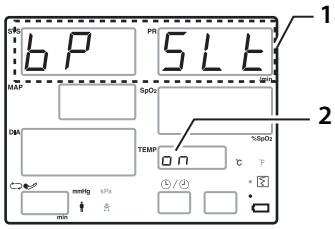


   1 BP SPD is displayed.
   2 The current setting value is displayed.
   Display example: ON

6. BP silent mode selection

   When this function is switched ON, the pump sound is suppressed.

   For details, see *BP silent mode* on page 4-22

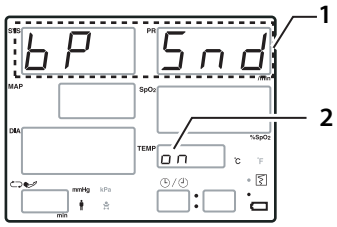


   1 BP SLT is displayed.
   2 The current selection is displayed.
   Display example: ON

7. Blood pressure measurement end sound ON/OFF selection

   When this function is switched ON, a sound is played when blood pressure measurement ends.

   For details, see *Blood pressure measurement end sound* on page 4-24.



1 BP SND is displayed.

2 The current selection is displayed.

Display example: ON

8. Measurement record selection

This selects the list record pattern for measurement.

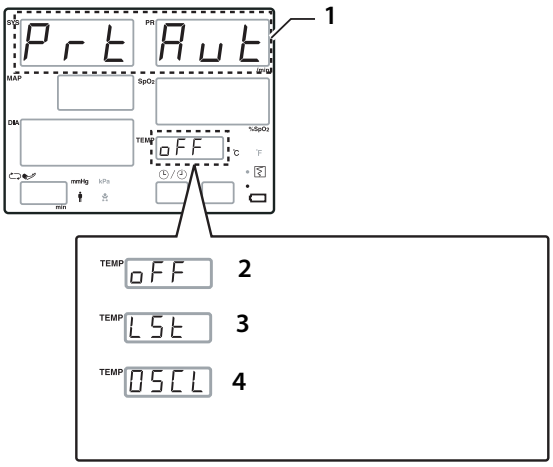
OFF—Do not record.

LST—Simple list recording

OSCL—Measurement value recording

Select any one of the above.

For details, see *Automatic recording* on page 9-8.



1 PRT AUT is displayed

One of these displays:.

2 OFF—Do not record

3 LST—Simple list recording

4 OSCL—Measurement value recording

9. List record pattern selection

This selects the list record pattern for manual recording.

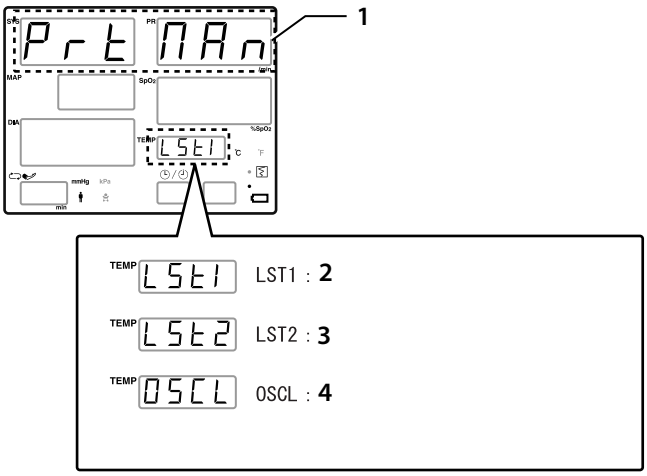
LST1: Simple list recording

LST2: Detailed list recording

OSCL: Measurement value recording

Select any one of the above.

For details, see *Manual recording* on page 9-3.



1 PRT MAN is displayed

One of these displays:.

2 LST—Simple list recording

3 LST2—Detailed list recording

4 OSCL—Measurement value recording

10. External output selection

This screen makes settings related to external output selection.

Contact Cardiac Science Technical Support when making these selections.

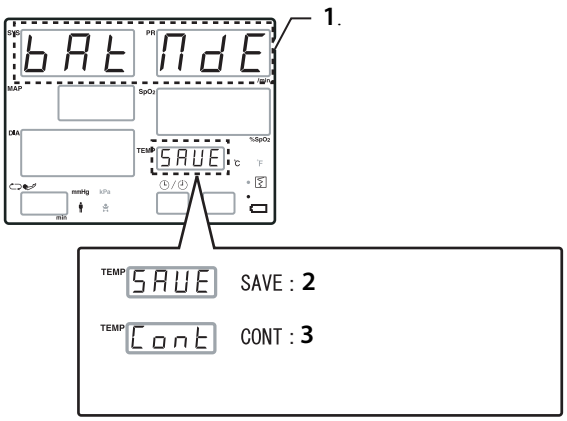
11. Battery operation selection

When this function is switched to SAVE, the LED screen turns off after 3 minutes of no activity. If any operation is carried out or an alarm is generated, the display resumes.

- Battery operation selection screen

  Press the **Menu/Enter** switch until the **Battery Operation Selection** screen appears.

  When the **Battery Operation Selection** screen appears, the display becomes as follows:



1 BAT MDE is displayed

One of these displays:.

2 SAVE—Power saving mode

3 CONT—Continuous mode

- Selecting SAVE/CONT

  Use the **Forward** or **Back** switch to select **SAVE** or **CONT**.

- Entering the selection

  When you have selected **SAVE** or **CONT**, press the **Menu/Enter** switch to enter the selection.

  When you do, the selection screen display moves to the next setting item.

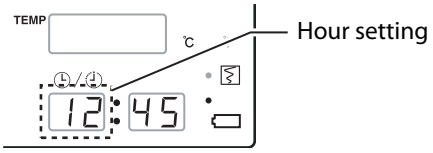
- Exiting the selection screen

  To end **Utility Mode** and return to the basic screen, switch the power OFF, then ON again.

12. Hour setting

    This sets the hour for the clock.

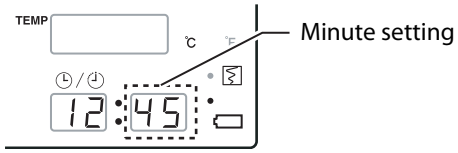
    For details, see *Checking and revising the date and time* on page 3-5.



13. Minute setting

    This sets the minute for the clock.

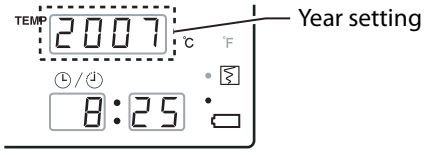
    For details, see *Checking and revising the date and time* on page 3-5.



14. Year setting

    This sets the year for the clock.

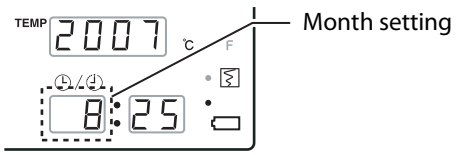
    For details, see *Checking and revising the date and time* on page 3-5.



15. Month setting

    This sets the month for the clock.

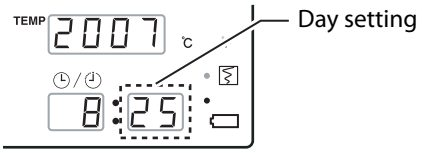
    For details, see *Checking and revising the date and time* on page 3-5.



16. Day setting

    This sets the day for the clock.

    For details, see *Checking and revising the date and time* on page 3-5.



17. Date format selection

    The date format for printing can be selected from the following.

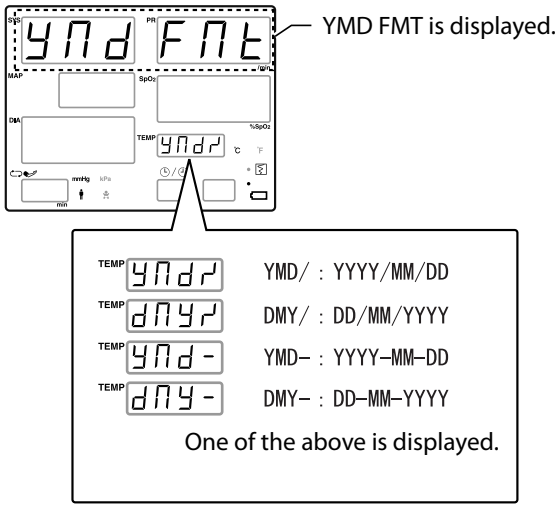
YMD/:YYYY/MM/DD	DMY/:DD/MM/YYYY
YMD-:YYYY-MM-DD	DMY-:DD-MM-YYYY

    The setting procedure is as follows:

- Date format selection screen

  Press the **Menu/Enter** switch until the **Date Format Selection** screen appears.

  When the **Date Format Selection** screen appears, the display becomes as follows:



- Selecting the date format

  Use the **Forward** or **Back** switch to select the date format.

- Entering the date format

  When you have selected the date format, press the **Menu/Enter** switch to enter the selection.

  When you do, the selection screen display moves to the next setting item.

- Exiting the selection screen

  To end **Utility Mode** and return to the basic screen, switch the power OFF, then ON again.

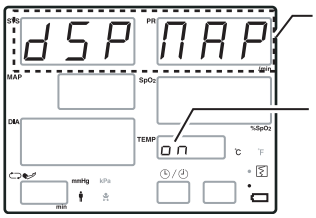
18. MAP display ON/OFF selection

When this function is switched OFF, the MAP is not displayed during blood pressure measurement. Nor is it printed.

- MAP display ON/OFF selection screen

  Press the **Menu/Enter** switch until the **MAP Display ON/OFF Selection** screen appears.

  When the **MAP Display ON/OFF Selection** screen appears, the display becomes as follows:



- Selecting ON/OFF

  Use the **Forward** or **Back** switch to select ON or OFF.

- Entering the selection

  When you have selected ON or OFF, press the **Menu/Enter** switch to enter the selection.

  When you do, the selection screen display moves to the next setting item.

- Exiting the selection screen

  To end **Utility Mode** and return to the basic screen, switch the power OFF, then ON again.

19. LAN group number setting

This screen makes settings related to LAN group numbers.

Contact Cardiac Science Technical Support when making these settings.

(May not display depending on the External output switching.)

20. LAN bed number setting

This screen makes settings related to LAN bed numbers.

Contact Cardiac Science Technical Support when making these settings.

(May not display depending on the External output switching.)

21. Default setting

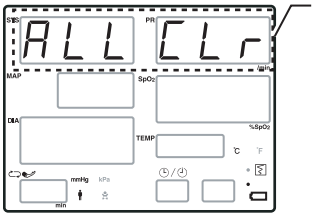
All the setting values are set to their factory-set values.

For details on the factory settings, see *Default setting* on page A-19.

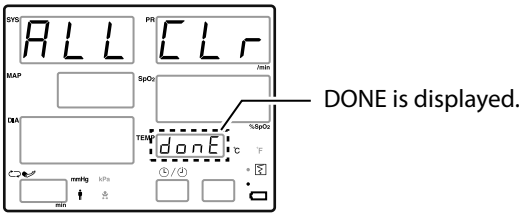
- Default setting screen

  Press the **Menu/Enter** switch until the **Default Setting** screen appears.

  When the **Default Setting** screen appears, the display becomes as follows:



  Hold down the **Alarm Silence** switch for at least 3 seconds.



- Exiting the setting screen

  To end **Utility Mode** and return to the basic screen, switch the power OFF, then ON again.

11 Internal Battery

Contents

About the internal battery

When the accessory battery unit is mounted in the main unit, the device can be run by battery. Also, even when using the AC power supply, if the AC power supply should be disconnected for any reason, the device switches automatically to battery operation. This makes continuous monitoring possible even without AC power.

This battery is a lead acid battery.

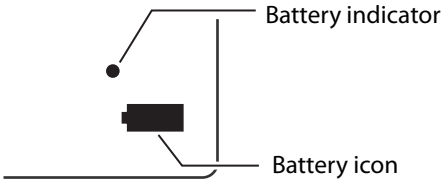
Caution

In order to maintain the battery charge, Cardiac Science recommends leaving the monitor plugged into AC power when it is not in use. If the monitor is not plugged in, the battery may lose its charge over time, even when powered off. If the battery discharges completely, the battery will fail.

When using the internal battery for the first time

When using the internal battery for the first time, it is necessary to mount it in the main unit and charge it. Following the instructions in*Installing the internal battery* on page 3-2 and "*Charging the internal battery* on page 3-4, install and charge the battery.

Battery indicator and battery icon



Charging types and battery indicator display

When the device's AC adapter is connected to the main unit and the AC adapter cable is plugged into an AC socket, the battery unit is charged whether the main unit power is ON or OFF. However, the charging type depends on the state of the battery as explained below.

Charging types	Device power supply	Battery indicator display	Features
Normal charge	OFF	Orange	It takes about 6 hours to fully charge a battery that was completely discharged.
Trickle charge	ON or OFF	Green	Charging with a small current just enough to compensate for the battery's self-discharge (when the battery is fully charged)

Battery icon display

The battery icon display shows the usage state.

Power Supply	Battery icon display	Battery state
Running on AC power supply	Off	Charging (Battery indicator: Orange)
		Fully charged state (Battery indicator: Green)
	Red	Battery not connected/battery abnormality (Battery indicator: Off)
Running on battery	Green	Adequate charge (Battery remaining over about 30%)
	Orange (Flashing) The alarm sounds. 	State in which the remaining operating time has run low (Battery remaining under about 30%)
	Red (Flashing rapidly) The alarm sounds. 	If this state occurs, the power supply is automatically cut off after about 1 minute. (Battery remaining under about 5%)

Battery low

When the battery is running low and it becomes impossible to run the unit on the battery, the battery indicator flashes red and the alarm sounds.

- Connect the AC adapter to the main unit and the AC adapter cable to an AC outlet and charge immediately.
- The alarm can be silenced with the **Alarm Silence** switch.

Battery not mounted

If the battery is not mounted, the E90 error is displayed when the power is switched ON.

- The alarm can be silenced with the **Alarm Silence** switch.
- The unit can be used with the AC adapter but clock data and settings data are not stored.

Operating time

With a new battery, the operating time is about 6 hours when the battery has been fully charged.

- When operating under the following conditions:
  - Ambient temperature: 25°C
  - Cuff blood pressure measurement interval: 15 minutes (4 times/hour)
  - Recorder: Not used
  - Battery operation: SAVE

  When the operating time even for a fully charged battery falls below 3 hours, it is necessary to replace the battery.

Battery and ambient temperature

- The battery operating time depends on the ambient temperature.

  If the ambient temperature during use is lower than 10°C or higher than 30°C, the operating time may be 20-30% shorter than at normal temperature.
- Always charge the battery in a location with an ambient temperature of 0 to 40°C. Charging the battery outside this temperature range can cause battery fluid leakage, heat generation, etc. This can also reduce performance and service life.

Warranty

The internal battery is a consumable part, so it is not covered by the limited warranty.

A Appendix

Contents

Error code table

System error code table

Error code	Priority	Sound		Contents	Check items
		Type	Stop		
E01	High		Possible	ROM checksum error	An error was detected in the main unit's internal ROM. Switch the power for the main unit OFF, then ON again. If this does not solve the problem, there is a possibility that the device is broken. Immediately stop using monitor and contact Cardiac Science Technical Support.
E02				RAM error	An error was detected in the main unit's internal RAM. Switch the power for the main unit OFF, then ON again. If this does not solve the problem, immediately stop using monitor and contact Cardiac Science Technical Support.
E81	High		Possible	Battery is discharged.	An error was detected. Charge the battery. If this does not solve the problem, immediately stop using monitor and contact Cardiac Science Technical Support.
E90	High		Possible	Either no internal battery is mounted or it cannot be detected.	Either no internal battery is mounted or it cannot be detected. Check the internal battery cable connection.

Error code	Priority	Sound		Contents	Check items
		Type	Stop		
E91	High		Possible	Internal voltage error	An internal voltage error was detected. A device error was detected. Switch the power OFF, then ON again. If the error recurs repeatedly, stop using this device and contact Cardiac Science Technical Support.
E92				Internal temperature error	The temperature in the device has risen. Check the ambient temperature. If the temperature has risen even though the device is being used within the usage temperature range, stop using this device and contact Cardiac Science Technical Support.
E93	Medium		Possible	Backup error	The backup memory was initialized. All data are erased and returned to factory defaults.
E94	High		Possible	RTC error	An error was detected in the main unit's internal clock IC. Switch the power for the main unit OFF, then ON again. If this does not solve the problem, immediately stop using it and contact Cardiac Science Technical Support.
E95	High		Possible	Sound IC error	A sound function error was detected. Switch the power OFF, then ON again. If the error recurs repeatedly, stop using this device and contact Cardiac Science Technical Support.
E96	Medium		Possible	Serial communication error	An external communication function error was detected. Switch the power OFF, then ON again. If the error recurs repeatedly, stop using this device and contact Cardiac Science Technical Support.
E99	High		Possible	System error	A device error was detected. Switch the power OFF, then ON again. If the error recurs repeatedly, stop using this device and contact Cardiac Science Technical Support.

Non-Invasive Blood Pressure (NIBP) measurement section error code list

Re-measure error

- Repeat the measurement when a measurement is not possible and this error code is displayed.
- Measurements can be automatically repeated up to two times. If a measurement is still not possible after two repeat measurements, the measurements will cease. Note that a measurement can be automatically repeated three times when the error code E14 is displayed.

"Cuff measurement not possible" error

- This message is displayed when a measurement is not possible even with the two re-measurements or when error contents (E03 or E11) prevent re-measure.
- When measurements are repeated, at the point where 160 seconds (80 seconds in neonatal mode) have elapsed from the initial measurement to the end of the last measurement, the E17 error code is displayed and measurement becomes impossible.

Error Code	Priority	Sound		Possible Causes	Check items
		Type	Silence		
E03				BPM pressure sensor fault	Pump operated for ten seconds, however pressure does not change. Check the connection of the cuff hose. The problem may be due to a fault if no improvement is apparent. Cease use immediately in this case and contact Cardiac Science Technical Support.
E09	High		Possible	Fault detected in accordance with safety monitoring to BPM IEC standards.	A potentially dangerous situation was detected during measurement. It is possible that the situation was detected incorrectly due to vibration being applied to the cuff and cuff hose from an external source, or occurrence of a blockage. Check the patient and conditions of measurement, and measure again with the cuff. Cease use immediately if the E09 error recurs and contact Cardiac Science Technical Support.

Error Code	Priority	Sound		Possible Causes	Check items
		Type	Silence		
E10	Low	None	-	Readings outside NIBP range [Adult] SYS < 60, SYS >250 MAP < 45, MAP >235 DIA < 40, DIA >200 [Neo] SYS < 40, SYS >120 MAP < 30, MAP >100 DIA < 20, DIA >90	Check the condition of the patient.

- In case of E10, NIBP measurement value and the error code are displayed alternately.

Error Code	Priority	Sound		Possible Causes	Check items
		Type	Silence		
E11*	High		Possible	Pressure rise not completed within required time. Required time: 60 seconds (adult), 20 seconds (neonate)	The cuff pressure rise was not completed even though the pump was operated for longer than the usual time. There is a possibility that the cuff hose may not be securely connected or the cuff may not be wrapped around an arm. Check cuff and cuff hose. This error possibly occurs in the case of large cuffs that are applied loosely. When the error still occurs even after checking above, there is a possibility that the cuff is torn and air is leaking. Replace it with a new one.

* For 5300, the alarm does not sound.

Error Code	Priority	Sound		Possible Causes	Check items
		Type	Silence		
E12*	1st through 2nd time Low (Re-measure)	None (Re-measure)	Possible	Cannot compute a measured value despite cuff pressure being below specified pressure. Specified pressure: 10mmHg (adult), 5mmHg (neonate)	Blood pressure could not be measured even after cuff pressure decreased. It is possibly because pulse was not strong enough for measurement, or because change of pulse amplitude could not be obtained. Check to make sure cuff is not wrapped around thick clothing. After wrapping cuff around properly, measure again.
	3rd time High				
E13*	1st through 2nd time Low (Re-measure)	None (Re-measure)	Possible	Deflation speed too slow due to patient movement and noise.	Measurement failed because patient frequently moved during measurement. Tell the patient to stay still, then measure again.
	3rd time High				
E14*	1st through 3rd time Low (Re-measure)	None (Re-measure)	Possible	Insufficient pressurizing value to compute patient blood pressure.	Measurement failed because of insufficient pressurizing. There is a possibility that standard cuff pressure might be detected incorrectly due to noises, motion artifact or vibration from outside. Check to make sure cuff is not wrapped around thick clothing, the patient stays still and that the cuff is free from outside vibrations, measure again.
	4th time High				

* For 5300, the alarm does not sound.

Error Code	Priority	Sound		Possible Causes	Check items
		Type	Silence		
E15*	1st through 2nd time Low (Re-measure)	None (Re-measure)	Possible	Too many faults due to arrhythmia and noise.	Blood pressure could not be measured because oscillation graph was not normal.There is a possibility that motion artifact or vibration from outside may be interrupting the measurement. Check whether patient stays still and cuff is free from outside vibration, then measure again.
	3rd time High				
E16*	1st through 2nd time Low (Re-measure)	None (Re-measure)	Possible	Abnormal change in measured pulse.	Blood pressure could not be measured because noise interrupted pulse waveform signal.There is a possibility that motion artifact, or vibration from outside may be interrupting the measurement. Check whether patient stays still and cuff is free from outside vibration, measure again.
	3rd time High				
E17*	High		Possible	Measurement time has exceeded specified time. Specified time: 160 seconds (adult), 80 seconds (neonate)	The measurement time exceeds the expected time, so the measurement was ended in order to avoid patient discomfort. There is a possibility that measurement is being repeated over and over due to air leaking from the cuff or air hose.
E18*	1st through 2nd time Low (Re-measure)	None (Re-measure)	Possible	Specified number of pulses exceeded (too many pulses detected). Specified number of pulses: 100 pulses (same for adult and neonate)	Pulse waveform signals for more than 100 beats are detected during measurement. There is a possibility that noises might interrupt signal. Motion artifact or vibration from outside possibly affected cuffs. Check whether a patient stays still and cuff is free from outside vibration, measure again.
	3rd time High				

* For 5300, the alarm does not sound.

Error Code	Priority	Sound		Possible Causes	Check items
		Type	Silence		
E19*	1st through 2nd time Low (Re-measure)	None (Re-measure)	Possible	Cuff pressure has exceeded the specified pressure for patient safety. Specified pressure: 300mmHg (adult), 150mmHg (neonate)	During measurement, the cuff pressure exceeded the expected pressure. There is a possibility that the patient moved or strong pressure from outside might be added to the cuff. Considering above, measure again.
	3rd time High				
E20*	High	None (Re-measure)	Possible	Maximum value for measured pulse too low.	Amplitude of pulse obtained from cuff is too weak. This error possibly occurs when cuffs are wrapped around loosely in ASO patients or when cuffs are wrapped around thick clothing. Wrap cuff around properly, then, measure again.
					
E21*	1st through 2nd time Low (Re-measure)	None (Re-measure)	Possible	Cuff is too large or too small.	Patient to be measured and cuff size used do not match. This error may occur if the blood pressure measurement mode setting is incorrect, if the cuff has been applied tightly in the adult mode, loosely in the neonatal mode or if the arm has been bent during measurement. Check the measurement mode setting and application of the cuff, and measure again.
	3rd time High				
E29	High		Possible	A problem with the cuff blood-pressure module built into the unit	A problem with the BP measurement function has been detected. The BP measurement function does not operate. If switching power OFF/ON has no effect it is possible that a fault has occurred. Contact Cardiac Science Technical Support.

* For 5300, the alarm does not sound.

For remeasurement, a period is displayed at the error code.

Figure 1: **Example: E12 (remeasurement)**

- In the case of E10 to E21, the error code may not be displayed depending on the setting. In the case of E11 to E21, it can be checked at "List screen" or "Recorder".
- The number of remeasurements is counted irrespective of which error code is detected.

SpO_2 error code table

Error Code	Priority	Sound		Possible Causes	Check Items
		Type	Silence		
E30	Medium		Possible	SpO_2 sensor not connected.	Sensor not connected. If connected, the cable or connector may be damaged. Replace with a new cable. If replacing the cable has no effect the problem may be within the device. In this case, cease use immediately and contact Cardiac Science Technical Support.
E31*	High		Possible	Low signal level. Pulse wave cannot be recognized properly.	Signal obtained from sensor is weak. SpO_2 could not be measured. There may be a problem with fitting of the SpO_2 sensor, or blood flow at the sensor site may be unsatisfactory. Check the condition of the patient and fitting of the sensor, or replace the sensor, and measure again.
E32*	Medium		Possible	SpO_2 sensor has come off patient.	Sensor is not in contact with patient. SpO_2 could not be measured. Fit the sensor correctly to the patient, and measure again.
E33	Low	None	-	Pulse signal detection in progress	Do not move the sensor mounting location.
E34	Low	None	-	The current measurement has been affected by patient movement.	SpO_2 could not be measured due to signal noise thought to be due to body movement. Ensure that the patient remains at rest, and measure again.
E35*	Medium		Possible	Outside of pulse count measurement range	Check the condition of the patient. Also, do not move the sensor mounting location.
E36	Low	None	-	Pulse signal weak	Check the condition of the patient. Also, check that the sensor is correctly mounted.

*For 5300, the alarm does not sound.

Error Code	Priority	Sound		Possible Causes	Check Items
		Type	Silence		
E37	Medium		Possible	Sensor breakdown	Replace the sensor. If replacing the sensor does not solve the problem, stop using SpO_2 measurement and contact Cardiac Science Technical Support.
E38	Low	None	-	Internal module initializing	Do not move the sensor mounting location. If this state continues for longer than one minute, stop using SpO_2 measurement and contact Cardiac Science Technical Support.
E39	High		Possible	Internal module abnormality A breakdown was detected in the main unit's internal module. Communication with the main unit's internal module was cut off. An impossible measurement value was obtained.	A problem with the SpO_2 measurement has been detected. The SpO_2 measurement function does not operate. If switching power OFF/ON has no effect it is possible that a fault has occurred. Cease use immediately and contact Cardiac Science Technical Support.

*For 5300, the alarm does not sound.

- In case of some errors, for example E33, E34, E36, the SpO_2 measurement value and the error code are displayed alternately. The SpO_2 measurement value is displayed for about 9 seconds and the error code for about 1 second.
- In case of the SpO_2 errors, for example, E31, E32, E33, E36, during blood pressure measurement, it is possible that the blood pressure and SpO_2 are being measured on the same arm, so no alarm sounds.

  However, for continuous measurement, the alarm does sound.
- In case of E30 to E36, E38, the error code may not be displayed depending on the setting.
- If E30-38 occurs before the first measurement value is obtained, either there is no sound or no display.

Body temperature error code table

Error Code	Priority	Sound		Possible Causes	Check items
		Type	Silence		
E40	Medium		Possible	Temperature probe is not connected. The measured temperature is lower than 0.0°C or higher than 50.0°C.	Sensor not connected to the main unit. If connected, the cable may be damaged. Replace with a new cable. If replacing the cable has no effect the problem may be within the device. In this case, cease use immediately and contact Cardiac Science Technical Support.
E41	Low	None	-	Temperature is $T \leq 26.6°C$ $42.3°C \leq T$	A measurement reading outside the measurement range was obtained. It is possible that the temperature in the vicinity of the sensor is extremely low (less than 14.5°C) or extremely high (more than 45.5°C). Adjust the ambient temperature and measure again.
E42	Medium		Possible	Probe breakdown	Replace the probe. If replacing the probe does not solve the problem, stop using body temperature measurement and contact Cardiac Science Technical Support.

Error Code	Priority	Sound		Possible Causes	Check items
		Type	Silence		
E43	High		Possible	Heater abnormality	An abnormality was detected in the body temperature measurement heater. Replace the body temperature probe with a new one. If replacing the probe does not solve the problem, switch the power OFF, then ON again. If this does not solve the problem, there is a possibility that the device has broken down, so immediately stop using it and contact Cardiac Science Technical Support.
E49				Internal module abnormality A breakdown was detected in the main unit's internal module. Communication with the main unit's internal module was cut off. An impossible measurement value was obtained.	An abnormality was detected in the body temperature module. Switch the power OFF, then ON again. If this does not solve the problem, there is a possibility that the device has broken down, so immediately stop using it and contact Cardiac Science Technical Support.

*For 5300, the alarm does not sound.

- In case of E40, E41, the error code may not be displayed depending on the setting.
- If E40-42 occurs before the first measurement value is obtained, either there is no sound or no display.

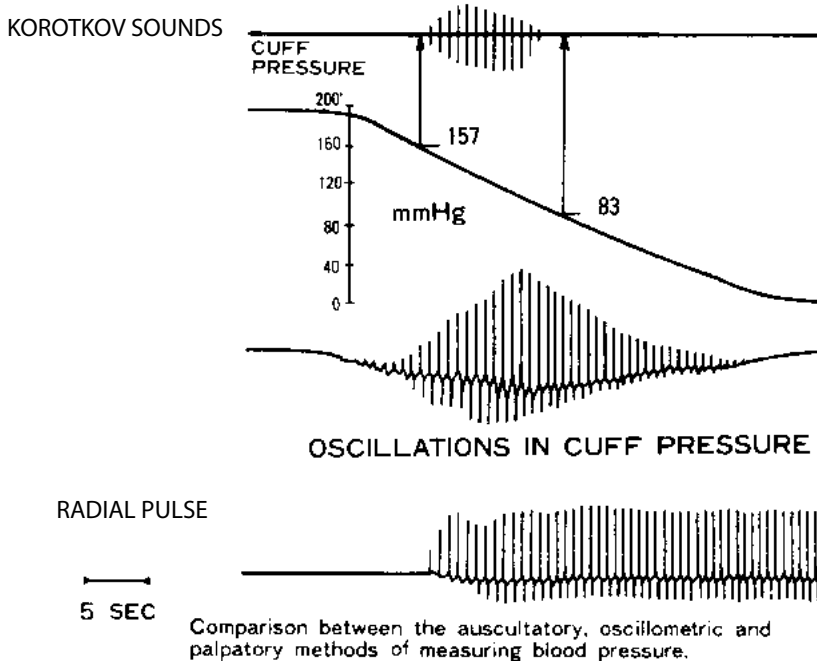
Principles

Non-invasive pressure measurement principles

Oscillometric method

The beat in the pulsation generated by the contraction of the heart is captured as the pressure inside the cuff to measure the blood pressure. If the cuff wrapped around the upper arm is pressurized sufficiently, the blood flow stops, but the beat of the pulsation is present and the pressure inside the cuff receives this and oscillates. Next, as the pressure inside the cuff gradually decreases, the oscillation of the pressure within the cuff gradually increases and reaches a peak. As the pressure within the cuff decreases further, the oscillation decreases from its peak. The pressure within the cuff and the relationship with the increase and decrease of the oscillation within the cuff in this series of processes are stored into memory, calculations are carried out, and the blood pressure value is determined. The pressure within the cuff when the oscillation increases drastically is the systolic pressure and the pressure within the cuff when the oscillation decreases drastically is the diastolic pressure. Also, the pressure within the cuff when the oscillation peaks is taken as the average pulsation pressure.

The oscillometric method does not determine the blood pressure value instantly like a microphone type automatic blood pressure gauge with the auscultation method, but rather determines it from the series of change curves as explained above. Therefore, it is not easily affected by external noise, an electric scalpel or other electro surgical instruments.



Comparison between the auscultatory, oscillometric and palpatory methods of measuring blood pressure.

L.A. Geddes,

"The Direct and Indirect Measurement of Blood Pressure",

Year Book Medical Publishers, Inc. 1970

Basic principles of SpO_2 measurement

Pulse oximetry method

The ratio of oxidized hemoglobin linked to oxygen in arterial blood and reduced hemoglobin that is not linked is known as the SpO_2 ratio and the pulse oximeter method is used to measure that ratio.

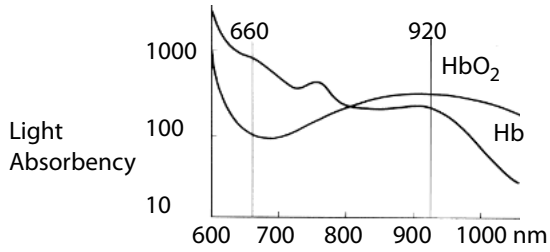
Functional saturation

$$SpO_2\ (\%) = 100 \times \frac{HbO_2}{HbO_2 + Hb}$$

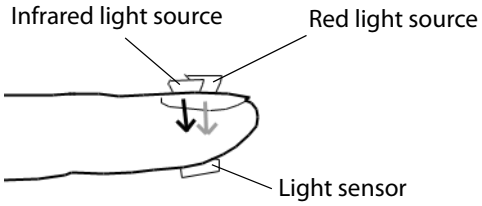
HbO_2: Oxidized hemoglobin

Hb: Reduced hemoglobin

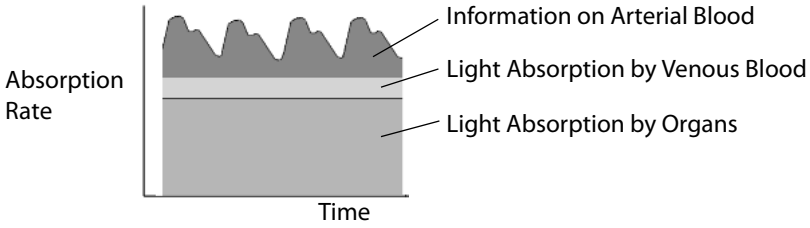
Usually, an artery with a high ratio of oxidized hemoglobin is red while a low ratio will cause the venous blood to look blackish. This is easily understood when the light absorbency coefficient of wavelengths for each hemoglobin type are viewed.



Here, an infrared beam at a wavelength of 920 nm and a red beam at a wavelength of 660 nm are alternately flashed ON and OFF and transmitted through the measurement section (in this case, a finger). The light-volume ratio of these transmitted lights is calculated to enable measurement of the level of oxygen saturation.



However, the lights transmitted through the measurement site also contain data other than the arterial blood targeted for measurement.



At this time, the data for diastole of the heart chamber includes data other than arterial blood data, so this reading is used as the standard reading for measurements. Next, the absorbency of inflow light by arterial blood during systole of the heart chamber changes. Subtraction of the standard reading from the systolic reading provides a reading that is the level of oxygen saturation for arterial blood.

Principle of operation (for Masimo® model)

Principle of operation

The Masimo® SET MS board pulse oximeter is based on three principles:

1. Oxyhemoglobin and deoxyhemoglobin differ in their absorption of red and in infrared light (spectrophotometry).
2. The volume of arterial blood in tissue and the light absorbed by the blood changes during the pulse (plethysmograpby).
3. Arterio-venous shunting is highly variable and that fluctuating absorbance by venous blood is a major component of noise during the pulse.

The Masimo® SET MS board pulse oximeter as well as traditional pulse oximetry determines SpO_2 by passing red and infrared light into a capillary bed and measuring changes in light absorption during the pulsatile cycle. Red and infrared light-emitting diodes (LEDs) in oximetry sensors serve as the light sources, a photodiode serves as the photodetector.

Traditional pulse oximetry assumes that all pulsations in the light absorbance signal are caused by oscillations in the arterial blood volume. This assumes that the blood flow in the region of the sensor passes entirely through the capillary bed rather than through any arterio-venous shunts. The traditional pulse oximeter calculates the ratio of pulsatile absorbance (AC) to the mean absorbance (DC) at each of two wavelengths, 660nm and 905nm:

S(660)=AC(660)/DC(660)

S(905)=AC(905)/DC(905)

The oximeter then calculates the ratio of these two arterial pulse-added absorbance signals:

R=S(660)/S(905)

This value of R is used to find the saturation SpO_2 in a look-up table built into the oximeter's software. The values in the look-up table are based upon human blood studies against a laboratory co-oximeter on healthy adult volunteers in induced hypoxia studies.

The Masimo® SET MS board pulse oximeter assumes that arterio-venous shunting is highly variable and that fluctuating absorbance by venous blood is the major component of noise during the pulse. MS board decomposes S(660) and S(905) into an arterial signal plus a noise component and calculates the ratio of the arterial signals without the noise:

S(660)=S1+N1

S(905)=S2+N2

R=S1/S2

Again, R is the ratio of two arterial pulse-added absorbance signals and its value is used to find the saturation SpO_2 in an empirically derived equation into the oximeter's software.

The values in the empirically derived equation are based upon human blood studies against a laboratory co-oximeter on healthy adult volunteers in induced hypoxia studies.

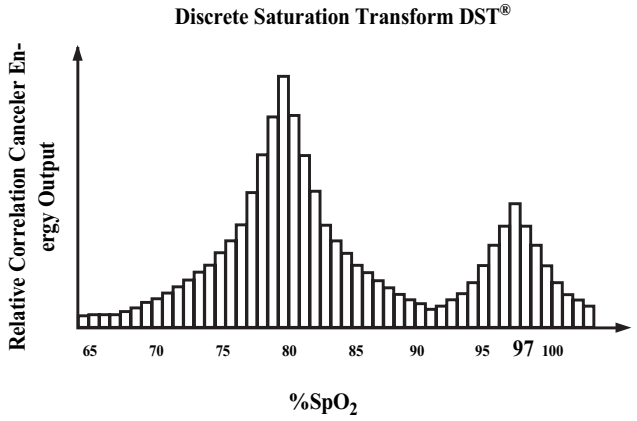
The above equations are combined and a noise reference (N') is determined:

N' = S(660)- S(905) x R

If there is no noise N' = 0; then S(660) = S(905) x R, which is the same relationship for the traditional pulse oximeter.

The equation for the noise reference is based on the value of R, the value being sought to determine the SpO_2. The MS board software sweeps through possible values of R that correspond to SpO_2 values between 1% and 100% and generates an N' value for each of these R-values. The S(660) and S(905) signals are processed with each possible N' noise reference through an adaptive correlation canceler (ACC) which yields an output power for each possible value of R (i.e., each possible SpO_2 from 1% to 100%).

The result is a Discrete Saturation Transform (DST®) plot of relative output power versus possible SpO_2 value as shown in the following figure where R corresponds to SpO_2 = 97%:



The DST plot has two peaks: the peak corresponding to the higher saturation is selected as the SpO_2 value. This entire sequence is repeated once every two seconds on the most recent four seconds of raw data. The MS board SpO_2 therefore corresponds to a running average of arterial hemoglobin saturation that is updated every two seconds.

DST® is a registered trademark of Masimo Corporation.

Default setting

The setting items, factory settings, and backup information for this device are listed in the table below.

All settings can be returned to their factory-set values with **Utility Mode** see *Default setting* on page 10-22.

The backups are as follows.

Items with O—Settings are retained even if the power is switched off.

Items with Δ—If the operator sets a value for this setting lower than the factory setting value, the setting returns to the factory setting value when the system is powered off for more than 30 seconds or when the **Utility Mode** is used to restore the default settings.

Operation following interruption of the power supply

When power is lost for less than or equal to 30 seconds, the alarm settings prior to the power loss are restored automatically.

When power is lost for more than 30 seconds, some settings return to factory defaults mentioned above, and others to the last settings used.

Setting item				Factory settings	Backup
Alarm*	NIBP	SYS	Upper limit	200mmHg	O
			Lower limit	70mmHg	Δ
		SYS (Neo)	Upper limit	130mmHg	O
			Lower limit	50mmHg	Δ
		DIA	Upper limit	160mmHg	O
			Lower limit	30mmHg	O
		DIA (Neo)	Upper limit	100mmHg	O
			Lower limit	10mmHg	O
	PR		Upper limit	180/min	O
			Lower limit	40/min	O
	PR (Neo)		Upper limit	200/min	O
			Lower limit	50/min	O
	SpO_2		Upper limit	100%SpO_2	O
			Lower limit	90%SpO_2	Δ
	SpO_2 (Neo)		Upper limit	100%SpO_2	O
			Lower limit	85%SpO_2	Δ

*5350 only

Setting item			Factory settings	Backup
NIBP	Measurement Mode		Adult	O
	Blood pressure unit		mmHg	O
	Init. Pres.	Adult	180mmHg	O
		Neo	120mmHg	O
		High speed Measurement	OFF	O
		Smart Inflation	ON	O
	NIBP Interval *		OFF	O
	BP silent mode		ON	O
Temperature	Display unit		°F	O
Sound	Alarm volume *		3	O
	Pulse rate volume		3	O
	Sound when blood pressure measurement ends		ON	O
Recorder	Recording for blood pressure measurement		OFF	O
	List record pattern		Simple list recording	O
System	External output switching		HL7	O
	Battery operation		SAVE	O
	Date format		YYYY/MM/DD	O
	MAP display		ON	O
	LAN group number		1	O
	LAN bed number		A	O

*5350 only

Maintenance

Maintenance inspection and safety management

Medical equipment including the 5300/5350 series must be maintained to ensure functionality and to secure the safety of patients and operators.

Daily checks and maintenance should be performed by the operator.

In addition, qualified personnel are necessary to maintain the performance and the safety, and to conduct periodic inspections. We recommend that the verification test be performed at least once a year.

Managing consumables

Disposable products used on a daily basis and products such as cuff hoses that are attached to patients are consumables. A stock of such products (spares) should be maintained for replacement purposes (wire breaks, etc.).

Daily consumables

- Main unit: Roll Paper*
- Non-invasive blood pressure (NIBP) measurement section: Disposable cuffs
- Arterial Oxygen Saturation by Pulse Oximeter (SpO_2) measurement section: Disposable SpO_2 sensors**

Recommended spare accessories

- Non-invasive blood pressure (NIBP) measurement section: Reusable cuffs
- Arterial Oxygen Saturation by Pulse Oximeter (SpO_2) measurement section: Extension cables, Reusable sensors**
- Body temperature measurement section: Body temperature probes
- Main unit: AC ADAPTER, AC ADAPTER CABLE

* Only when the optional recorder is installed.

** Only for models with the optional SpO_2.

Device maintenance

Note: Do not soak the main unit or accessories in any liquid. Also, keep liquids out of them.

Note: When using disinfecting solutions, be sure to follow manufacturer instructions.

Note: Do not use solvents (such as thinner and benzene) or abrasive cleaning powders for cleaning, as these may damage the surface of the device.

Note: Do not sterilize the main unit with autoclave or gases (EOG, formaldehyde gas, high-density ozone, etc.).

Cleaning and disinfecting

Cleaning and disinfecting should be performed in accordance with your facility's infection control practice and OSHA regulations.

Surface cleaning

Use a well-wrung, soft cloth with diluted neutral detergent or diluted disinfecting alcohol added to wipe off surface dirt. Note, however, that connectors should not be wiped or wetted in any way.

Removing dust

Use a moistened cotton bud to remove dust that has accumulated on the vent ports.

Battery maintenance

When the operating time even for a fully charged battery falls below 3 hours, it

is necessary to replace the battery.

- When operating under the following conditions:
  - Ambient temperature: 25oC
  - Cuff blood pressure measurement interval: 15 minutes (4 times/hour)
  - Recorder: Not used
  - Battery operation: SAVE

Service

The monitor requires no routine service other than cleaning, battery maintenance, and service activity which is mandated by the user's institution. For more information, refer to the monitor service manual. Qualified service personnel in the user's institution should perform periodic inspections of the monitor. If service is necessary, contact qualified service personnel or Cardiac Science Technical Support.

Accessory care

Non-Invasive Blood Pressure Measurement (NIBP)

Cuff and air hose Wipe clean with 70% diluted ethyl alcohol or 30 to 50% diluted isopropyl alcohol. Keep liquids out of the inside of the cuff and the air hose. If liquids do get in, the inside of the cuff may stick.

Arterial Oxygen Saturation by pulse oximeter measurement (SpO_2)

Sensor and extension cable Clean the interface cable with 30-50% isopropyl alcohol or 70% ethyl alcohol.

Temperature probe

It is good practice to periodically clean the instrument surface by wiping it with a soft cloth dampened with a mild detergent and warm water. Refer to Housekeeping, Central Service or Infection Control departments in your facility for further information. You may use the following cleaning solutions: Cidex®, Betadine®, 10% solution of bleach (9 parts water, one part bleach), 3% Hydrogen peroxide.

Cidex® is a registered trademark of Johnson & Johnson.
Betadine® is a registered trademark of Purdue Products, L.P.

Checking before use

Each day

Prior to daily use, the following points should be checked:

Before turning ON the power, check for the following

- Is there any deformation or damage due to the unit or accessories being dropped?

External appearance	• The device is not dirty. • The device is not wet.
AC ADAPTER	• The AC ADAPTER is firmly connected to the connector on the main unit.
AC ADAPTER CABLE	• There are no heavy objects laying on the AC ADAPTER CABLE. • The AC ADAPTER CABLE is not damaged (core-wire exposure, breaks, etc.).

After turning ON the power, check for the following

- There is no smoke or odor coming from the device.

External appearance	• The device is not making any unusual noises.
Time check	• The time display is correct. Care must be taken because if the time is incorrect, the records kept will be incorrect.
Alarm volume check	• The alarm volume is at an appropriate level.
Non-invasive blood pressure (NIBP) measurement section	• Make sure that a suitable cuff is attached (one that fits the circumference of the patient's arm). • The air hose and cuff are firmly connected. • The measurement mode is correctly set in accordance with the patient. ("Adult" or "Neo")
Arterial oxygen saturation by pulse oximeter (SpO_2) measurement section**	• Attach the SpO_2 sensor to a finger, and check that the value is displayed.
Printer *	• Press the **Record** switch and check that the instrument is recording.

Non-Invasive blood pressure measurement (NIBP)	**1.** The person checking the cuff should wrap the cuff around arm, perform cuff measurement and check to see that blood pressure is in the vicinity of normal measurements. **2.** While measurement is in progress, bend the relevant arm and move body to halt discharge and during this halt check that cuff pressure does not drop.
Arterial oxygen saturation by pulse oximeter measurement (SpO_2)**	• Check to see that a normal reading is displayed when the SpO_2 sensor is placed on the patient's finger. If the measurement reading seems dubious, replace the sensor with a new one and compare the difference in measurement readings. If the difference is large, use the new sensor.
Temperature measurement ***	• Place probes in a beaker of water (26°C to 41°C/80°F to 106°F) and check that the temperature difference is within ±0.2°C(0.4°F).

* Only for models with the optional recorder.

**Only for models with the optional SpO_2.

***Only for models with the optional temperature.

Maintenance checks

Before conducting safety checks, be sure to implement the items in the *Device maintenance* on page A-22 and *Accessory care* on page A-23.

Before turning ON the power

External appearance	• The device is not misshapen due to being dropped or other impacts. • The device is not wet. • Cords are not damaged and connections are not loose. • The sensors attached to the patient are only those supplied or specified by Cardiac Science. • The roll paper is the specified type and enough stock is maintained.
AC ADAPTER	• The AC ADAPTER is firmly connected to the connector on the main unit.
AC ADAPTER CABLE	• Check to see that the AC ADAPTER CABLE is completely connected. • When plugging into a 3-pin wall socket, do not use a 3pin-2pin adapter. • The AC ADAPTER CABLE is not damaged (core-wire exposure, breaks, etc.).

After turning ON the power

External appearance	• There is no smoke or odor coming from the device. • The device is not making any unusual noises.
Switches and lamps	• Press each switch and check that it works. • Do items light up that should light up when a switch is pressed?
Alarm volume check	• Is the warning sound clearly audible?
Time	• Check to see that the time is correct.

Troubleshooting

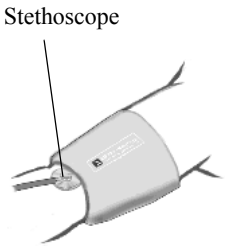
If the device is not functioning properly, check the following before contacting Cardiac Science Technical Support.

Main unit

Symptom	Cause	Action
Power cannot be turned ON	The AC adapter cable is disconnected or loose.	Check the AC adapter cable connections.
Main unit heats up	Check to see if item(s) have been placed on or very near the device. The main unit may be malfunctioning if it is so hot it is unbearable to touch.	Provide ventilation around the device.

Non-Invasive Blood Pressure Measurement (NIBP)

Symptom	Cause	Action
Pressure does not rise after **Cuff Start/Stop** switch is pressed.	Cuff hose connection is loose.	Check air hose connection.
	Cuff air is leaking. Hose is kinked if pressure is displayed.	Replace cuff. Check for kinks and remove them.
Measurement failure	First, give patient a physical examination. Next, read error codes on display screen and check selections using the *Error code table* on page A-2 in this manual.	
Abnormal measurement readings	The following are possible causes. Re-measure while physically examining patient. • Body moved (shivering due to cold, etc.). • Arrhythmia occurred. • Noise in cuff. (Nearby person touched patient or heart massage was being performed.)	

Symptom	Cause	Action
	Air discharge is fast.	Check for loose cuff hose connection.
Measurement readings unreliable  	Perform measurement in tandem with stethoscope examination of pulse. Place stethoscope on artery and listen while watching Blood Pressure Monitor pressure display.	
	Blood pressure fluctuates greatly due to physiological reactions. Check the following items, as one of them may be the cause. • Patient was agitated. (Cuff was painfully tight or patient was nervous of treatment.) • Cuff size and/or cuff wrapping were incorrect. • Cuff was wrapped at a position on the upper arm not parallel to the heart. • Patient blood pressure was unstable due to alternating pulse and respiration fluctuations, etc.	

Arterial Oxygen Saturation by pulse oximeter measurement (SpO_2)

Symptom	Cause Action
Measurement not possible	• Check the patient, as shock, poor peripheral circulation due to low blood pressure or constriction of arteries at sensor attachment point may be possible causes. • Check to see if sensor has become detached. • Check to see if sensor attachment is over tight. • Check to see if the artery catheter and vein line are attached on the same arm. • If the sensor is attached to the same arm as the cuff, sensor measurement will not be possible while cuff measurement is in progress.
Measurement reading unreliable	Try checking the following. • When there is fluctuation in the blood other than the pulse, there may be a mistake in the display. Fluctuation other than pulse can be due to cardiac massage, weak continuous vibration from the outside (technician noise, etc.), patient spasm or other body movement, venous pulse, etc. • Attach sensor correctly to ensure accurate measurement readings. Also, use patient-suitable sensor. • Pulse oximeter cannot identify functional disorder hemoglobin such as carboxyhemoglobin and methemoglobin. Therefore, measurement discrepancies will occur for patients suffering from carbon monoxide poisoning or who are heavy smokers. • Measurement discrepancies will occur for patients with coloring reagents (indocyanine green, methylene blue, etc.) in arteries. • Discrepancies may occur due to intense light such as theater lighting or direct sunlight, so, if this is the case, filter/block light source. • If sensor becomes detached or light intensity changes due to somebody blocking out light source as he/she walks by, etc., erroneous measurement readings may be displayed.

Problems with E-Temp

(Verify against error messages for further information)

Symptom	Cause	Action
No temperature measurement	Disconnected probe or cable	Connect probe or change, if defective.
	Probe out of well on power-up	Insert probe into probe well, then try measurement again.
	Defective Probe	If "E40" message is shown, this normally indicates a defective probe. Replace probe, and place new probe into, and out, and back into probe well to reset message.
Temperature reading unreasonable	Patient's mouth was open.	Ask patient to keep mouth closed during measurement.
	Improper probe placement	Verify placement of probe as shown on Mounting the body temperature probe6-4. Unlike slower temperature measurement techniques, this fast measurement requires the user to make sure the probe is placed directly against the sublingual artery in the back, center of the tongue.

Disposal

Description

As there is a risk of environmental pollution, follow your applicable Federal, state and local legal regulations regarding disposal or recycling of this equipment and batteries.

The main constituents of each part are listed in the table below. As there is a risk of infection, do not recycle patient attachments such as cuffs and sensors, but dispose of them as instructed by your facility's procedures and applicable regulations.

Name	Part	Material(s)
Package	Box	Corrugated Paper
	Cushion	Corrugated Paper
	Envelope	Vinyl
Main Unit and Accessories	Enclosure	ABS
	Internal parts	General Electronic Parts
	Chassis	Aluminum and Iron
	Battery	Lead-acid
Option Module (Bar Code Reader)	Enclosure	PC
	Trigger Button	POM
	Internal parts	General Electric Parts
Option Module (External Output Unit)	Enclosure	ABS
	Internal parts	General Electric Parts

Specifications

General

Measurement Parameter	NIBP SpO_2 *1 Temperature *2 *1:Only models with SpO_2 *2:Only models with body temperature measurement	
Dimension	Main unit:239(W)x150(H)x239(D)mm (9.41x5.90x9.41in) AC ADAPTER:150(W)x47(H)x75(D)mm (5.90x1.85x2.95in)	
Weight	Main Unit with Recorder:	2.1kg (4.63lbs)
	No recorder:	1.9kg (4.19lbs)
	AC ADAPTER:	0.5kg (1.11lbs)
	Internal Battery:	1.5kg (3.31lbs)
Display	NIBP(SYS)	7 segment Red LED x 3
	NIBP(MAP)	7 segment Red LED x 3
	NIBP(DIA)	7 segment Red LED x 3
	Pulse Rate	7 segment Green LED x 3
	$\%SpO_2$	7 segment Orange LED x 3
	TEMP	7 segment Green LED x 4
	Cuff Interval	7 segment Green LED x 3
	TIME	7 segment Green LED x 4
	Blood pressure unit display	Green Flat LED
	Measurement mode display	Green Flat LED
	Recorder display	Red Flat LED
	Battery Charging Indicator	Green/Orange/Red Flat LED
Volume (Sound pressure range)	Alarm Signals	40 to 53 dB

Recorder	Print method	Thermal line head
	Resolution	8 dot/mm
	Print speed	25 mm/sec (0.98in/sec)
	Paper width	58 mm (2.28in)
	Valid width	54 mm (2.13in)
UL Classified	WITH RESPECT TO ELECTRICAL SHOCK, FIRE AND MECHANICAL HAZARDS ONLY.	
Safety Standards	IEC 60601-1-1:2000 EN 60601-1-1:2001 Medical electrical equipment-Part1:General requirements for safety	
Protection Class	Class I Internal powered equipment	
Degree of Protection	SpO_2	Type BF with defibrillator protection 
	NIBP	Type BF with defibrillator protection 
	Temperature	Type BF 
Mode of Operation:	Continuous	
MDD Classification:	Class II a (5300 only) Class II b (5350 only)	

Output terminals (optional)

Serial Port:	RS232C Conformity Serial interface D-sub 15pin connector
Reference Standard:	IEC 60601-1-1:2000 EN 60601-1-1:2001 Medical electrical equipment. Part 1: General requirements for safety - 1. Collateral standard: Safety requirements for medical electrical systems

Accessory equipment connected to the output terminals must be in compliance with the respective nationally harmonized IEC standards (i.e., IEC 60950 for data processing equipment, IEC 60065 for video equipment, IEC 61010-1 for laboratory equipment, and IEC 60601-1 for medical equipment.)

Furthermore all configurations shall comply with the system standard IEC 60601-1-1. Everybody who connects additional equipment to the signal input part or signal output part configures a medical system, and is therefore responsible that the system complies with the requirements of the system standard IEC 60601-1-1. If in doubt, consult your technical services department or Cardiac Science Technical Support.

Environmental conditions

Power supply		
AC ADAPTER	Input voltage range	AC 100V to 240V
	Rated Current	4.28A
	Frequency	50 / 60Hz
	Output voltage range	DC 14V±5%
	AC Plug	NEMA5-15P
Battery	Type	12V, 3.2Ah
	Measurement Time	6 hours maximum When operating under the following conditions: • Ambient temperature: 25°C (77°F) • Cuff blood pressure measurement interval: 15 minutes • Recorder: Not used • Battery operation: SAVE
Operational temperature and humidity	Temperature range	0 to 40°C (32 to 104°F)
	Humidity range	30 to 85% (not condensed)
	Atmospheric pressure	700 to 1060hPa
Storage and transportation	Temperature range	-20 to 60°C (-4 to 140°F)
	Humidity range	10 to 95% (not condensed)
	Atmospheric pressure	500 to 1060hPa
EMC: Reference standard	IEC60601-1-2:2001 Medical electrical equipment Part1: General requirements for safety. 2.Collateral Standard Electromagnetic compatibility-Requirements and tests. EN55011:1998 Group1 Class B	

Non-Invasive Blood Pressure (NIBP)

Measurement technology	Oscillometric	
Measurement method	Dynamic Linear Deflation method	
Pressure display range	Adult/pediatric mode	0 to 299mmHg
	Neonatal mode	0 to 149mmHg
Pressure display accuracy	Less than ±3mmHg	
NIBP measurement range	Adult/pediatric mode	SYS 60 to 250mmHg MAP 45 to 235mmHg DIA 40 to 200mmHg Pulse rate 40 to 200/min
	Neonatal mode	SYS 40 to 120mmHg MAP 30 to 100mmHg DIA 20 to 90mmHg Pulse rate 40 to 240/min
NIBP accuracy	Maximum mean error within ±5mmHg Maximum standard deviation within ±8mmHg	
Pulse rate accuracy	±2% or ±2 beats	
Defibrillator protection	Protected	
Alarm range	Adult/pediatric mode	
	SYS upper	limit 60 to 260 mmHg Default 200 mmHg
	SYS lower	limit 50 to 250 mmHg Default 70 mmHg
	DIA upper	limit 40 to 240 mmHg Default 160 mmHg
	DIA lower	limit 30 to 230 mmHg Default 30 mmHg
	Pulse rate upper	limit 30 to 260/min Default 180/min
	Pulse rate lower	limit 25 to 255/min Default 40/min

Alarm range	Neonatal mode		
	SYS upper	limit	40 to130 mmHg
		Default	130 mmHg
	SYS lower	limit	30 to 120 mmHg
		Default	50 mmHg
	DIA upper	limit	20 to 100 mmHg
		Default	100 mmHg
	DIA lower	limit	10 to 90 mmHg
		Default	10 mmHg
	Pulse rate upper	limit	30 to 260/min
		Default	200/min
	Pulse rate lower	limit	25 to 255/min
		Default	50/min
Reference Standard:	EN1060-1:1995+A1:2002 Non-invasive sphygmomanometers General requirements EN1060-3:1997+A1:2005 Non-Invasive sphygmomanometers - Part3: Supplementary requirements for electro-mechanical blood pressure measuring systems. ANSI/AAMI SP-10:2002		

Pulse oximeter (models with Nellcor® SpO_2)

Measurement method	2 wave length pulse wave type
Measurement range	70 to 100%SpO_2
Pulse rate	20 to 250/min
Accuracy Specifications	Accuracy specifications are based on controlled hypoxia studies with healthy non-smoking adult volunteers over the specified saturation SpO_2 range(s). Pulse oximeter SpO_2 readings were compared to SaO_2 values of drawn blood samples measured by hemoximetry. All accuracies are expressed as ± "X". Pulse oximeter equipment measurements are statistically distributed; about two-thirds of pulse oximeter measurements can be expected to fall in this accuracy (ARMS) range. Because scatter and bias of pulse oximeter SpO_2 and blood SaO_2 comparisons commonly increase as the saturation decreases, and accuracy specifications are calculated from data spanning the stated range, different accuracy values may result when describing partially overlapping ranges. Oxygen saturation accuracy can be affected by certain environmental, equipment, and patient physiologic conditions that influence readings of SpO_2, SaO_2, or both. Accordingly, observations of clinical accuracy may not achieve the same levels as those obtained under controlled laboratory conditions.
	70%-100% MAX-A ±2 MAX-N ±2 MAX-P ±2 MAX-I ±2 MAX-FAST® ±2 MAX-R2 ±3.5 DS-100A ±3
Range of Peak Wavelength	Pulse oximeter sensors contain LEDs that emit red light at a wavelength of approximately 660nm and infrared light at a wavelength of approximately 920nm. The total optical power of the sensor LEDs is less than 15mw.

Population	Healthy and recruited from local population. Comprised of both men and women, subjects spanned a range of skin pigmentations and ranged in age from 18-50 years old. MAX-N Clinical functionality has been demonstrated on a population of hospitalized neonate patients. The observed SpO_2 accuracy was 2.5% in a study of 42 patients with ages of 1 to 23 days, weight from 750 to 4,100 grams, and 63 observations made spanning a range of 85 to 99% SaO_2. For more information visit: http://www.nellcor.com		
Pulse rate accuracy	±3/min		
Display update	Less than 30sec.		
Defibrillator protection	Protected		
Alarm range	SpO_2 upper	limit Default	71 to 100%SpO_2 100%SpO_2
	SpO_2lower	limit Default	70 to 99%SpO_2 90%SpO_2
	Pulse rate upper	limit Default	30 to 260/min 180/min (adult) 200/min (Neo)
	Pulse rate lower	limit Default	25 to 255/min 40/min (adult) 50/min (Neo)
Alarm delay time	Maximum delay time	10 sec	
	Average delay time	10 sec	

Pulse oximeter (models with Masimo® SpO_2)

Measurement method	2 wave length pulse wave type	
Measurement range	1 to 100%SpO_2	
Pulse rate	25 to 240/min	
Accuracy Specifications	Accuracy specifications are based on controlled hypoxia studies with healthy non-smoking adult volunteers over the specified saturation SpO_2 range(s). Pulse oximeter SpO_2 readings were compared to SaO_2 values of drawn blood samples measured by hemoximetry. All accuracies are expressed as ± "X". Pulse oximeter equipment measurements are statistically distributed; about two-thirds of pulse oximeter measurements can be expected to fall in this accuracy (ARMS) range. Because scatter and bias of pulse oximeter SpO_2 and blood SaO_2comparisons commonly increase as the saturation decreases, and accuracy specifications are calculated from data spanning the stated range, different accuracy values may result when describing partially overlapping ranges. Oxygen saturation accuracy can be affected by certain environmental, equipment, and patient physiologic conditions that influence readings of SpO_2, SaO_2, or both. Accordingly, observations of clinical accuracy may not achieve the same levels as those obtained under controlled laboratory conditions.	
	Saturation (%SpO_2)	During No Motion Conditions
	Adult/pediatric	70 to 100% ±2 0 to 69% Unspecified
	Neonatal	70 to 100% ±3 0 to 69% Unspecified
	Saturation (%SpO_2)	During Motion Conditions
	Adult/pediatric	70 to 100% ±3 0 to 69% Unspecified
	Neonatal	70 to 100% ±3 0 to 69% Unspecified
Range of Peak Wavelength	Pulse oximeter sensors contain LEDs that emit red light at a wavelength of approximately 660nm and infrared light at a wavelength of approximately 905nm.	

Population	Healthy and non-smoker. Comprised of both men and women, subjects spanned a range of skin pigmentations and ranged in age from 21-40 years old. For more information visit: http://www.masimo.com/cpub/clinpubs.htm		
Pulse rate accuracy	±3/min		
Display update	Less than 30sec		
Defibrillator protection	Protected		
Alarm range	SpO_2 upper	limit Default	71 to 100%SpO_2 100%SpO_2
	SpO_2 lower	limit Default	70 to 99%SpO_2 90%SpO_2
	Pulse rate upper	limit Default	30 to 260/min 180/min (adult) 200/min (Neo)
	Pulse rate lower	limit Default	25 to 255/min 40/min (adult) 50/min (Neo)
Alarm delay time	Maximum delay time	10 sec	
	Average delay time	10 sec	

E-Temp

(Models with body temperature measurement)

Method:	TurboTemp® Electronic Predictive Thermometer	
Probe types:	Oral/Axillary	
Modes:	Predictive- Measurement complete within 7 seconds of tissue contact Monitoring- Continuous temperature measurement	
Display resol	±0.1°C (±0.2°F)	
Display range	Predictive Mode Monitoring Mode	35.6 ~ 41.1°C (96.1~105.9°F) 26.7 ~ 42.2°C (80.1~107.9°F)
Accuracy:	Monitoring Mode	±0.1°C (±0.2°F)
Accuracy test method:	ASTM E 1112-00:2006	
Scale:	Selectable from °F to °C	

This thermometer conforms to all of the requirements established in ASTM standard E 1112.

Full responsibility for conformance of this product to the specification is assumed by Cardiac Science.

FCC STATEMENT

POTENTIAL FOR RADIO/TELEVISION INTERFERENCE (for U.S.A. only)
This product has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules.

These limits are designed to provide reasonable protection against harmful interference in a residential installation. The product generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

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

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

POTENTIAL FOR RADIO/TELEVISION INTERFERENCE (for Canada only)

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus as set out in the interference-causing equipment standard entitled "Digital Apparatus", ICES-003 of the Canadian Department of Communications.

Cet appareil numerique respecte les limites de bruits radioelectriques applicables aux appareils numeriques de Clase B prescrites dans la norme sur le materiel brouilleur: "Appareils Numeriques", ICES-003 edictee par le minister des communications.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Manufacturer's declaration

Use the 5300/5350 in an electromagnetic environment as described below.

The user should check that the 5300/5350 is used in such an environment.

Electromagnetic Emissions: (IEC60601-1-2)

Table 1: Guidance and manufacturer's declaration - electromagnetic emissions

Emissions Test	Compliance	Electromagnetic Environment - Guidance
RF emissions CISPR 11	Group 1	The 5300/5350 uses RF energy only for internal functions. Therefore, this RF emission is extremely weak and there is little chance of it creating any kind of interference whatsoever with nearby electronic equipment.
RF emissions CISPR 11	Class B	The 5300/5350 is suitable for use in all establishments.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations/flicker IEC 61000-3-3	Class 5	

Electromagnetic Immunity: (IEC60601-1-2)

Table 2: Guidance and manufacturer's declaration - electromagnetic immunity

Immunity Test	IEC 60601 test level	Compliance Level	Electromagnetic Environment - Guidance
Electrostatic discharge (ESD) IEC 61000-4-2	± 6kV contact ± 8 kV air	± 6kV contact ± 8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/ burst IEC 61000-4-4	±2 kV for power supply lines ±1 kV for input/ output lines	±2 kV for power supply lines ±1 kV for input/ output lines	Mains power quality should be that of a typical commercial or hospital environment
Surge IEC 61000-4-5	± 1 kV normal mode ±2 kV common mode	± 1 kV normal mode ±2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment
Voltage dips, short interruptions and voltage variations on power supply IEC 61000-4-11	<5% U_T for 0.5 cycle <40% U_T for 5 cycles <70% U_T for 25 cycles <5% U_T for 5 sec.	<5% U_T for 0.5 cycle <40% U_T for 5 cycles <70% U_T for 25 cycles <5% U_T for 5 sec.	Mains power quality should be that of a typical commercial or hospital environment. If the user of the 5300/5350 requires continued operation during power mains interruptions, it is recommended that the 5300/5350 be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) Magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment

NOTE: U_T is the A.C. mains voltage prior to application of the test level.

Table 3: Guidance and manufacturer's declaration - electromagnetic immunity

Immunity Test	IEC 60601 test level	Compliance Level	Electromagnetic Environment - Guidance
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz 80% AM (2Hz)	3 Vrms	Portable and mobile RF communications equipment should be used no closer to any part of the 5300/5350, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommend separation distance $d = 1.2\sqrt{P}$ 80 MHz to 800 MHz: $d = 1.2\sqrt{P}$ 800 MHz to 2.5 GHz: $d = 2.3\sqrt{P}$ where *P* is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and *d* is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,[a] should be less than the compliance level in each frequency range.[b] Interference may occur in the vicinity of equipment marked with the following symbol: 
Radiated RF IEC 61000-4-3	3 Vrms 800 MHz to 2.5 GHz 80% AM (2Hz)	3 V/m	

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

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

[a] Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the 5300/5350 is used exceeds the applicable RF compliance level above, the 5300/5350 should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the 5300/5350.

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

Recommended Separation Distances

Recommended separation distance between portable and mobile RF communications equipment and the 5300/5350

The 5300/5350 is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the 5300/5350 can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the 5300/5350 as recommended below, according to the maximum output power of the communications equipment.

Table 4: Recommended separation distances

	Separation distance according to frequency of transmitter (m)		
Rated maximum output power of transmitter (W)	**150 kHz to 80 MHz** $d = 1.2\sqrt{P}$	**80 MHz to 800 MHz** $d = 1.2\sqrt{P}$	**800 MHz to 2.5 GHz** $d = 2.3\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

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

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

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

Cardiac Science Corporation • 3303 Monte Villa Parkway, Bothell, WA 98021 USA • 425.402.2000 • US toll-free 800.426.0337 • Fax: 425.402.2001 • info@cardiacscience.com

Orders and Customer Care (US and International) • 425.402.2000 • US toll-free 800.426.0337 • Fax: 425.402.2001 • care@cardiacscience.com

Technical Support • (US) Fax: 425.402.2022 • technicalsupport@cardiacscience.com• http://websupport.cardiacscience.com/webchat/ • (International) internationalsupport@cardiacscience.com

Cardiac Science International A/S • Kirke Vaerloesevej 14, DK-3500 Vaerloese, Denmark • +45.4438.0500 • Fax: +45.4438.0501 • international@cardiacscience.com

United Kingdom • The Manse, 39 Northenden Road, Sale, Manchester, M33 2DH, United Kingdom • +44.161.926.0000 • uk@cardiacscience.com

France • Parc de la Duranne, 565, Rue René Descartes, F-13857 Aix-en-Provence Cedex 3, France • +33.4.88.19.92.92 • france@cardiacscience.com

Central Europe (D, A, CH) • Oskar-Schindler-Strasse 3, D-50769 Köln, Germany • +49.0.221.33734.300 • centraleurope@cardiacscience.com
China • 6/F South Building, 829, Yi Shan Road, Shanghai 200233, China • +86.21.6495.9121 • china@cardiacscience.com

Omron Colin Medical Corp
5850 Farinon Drive
San Antonio, TX 78249

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