Operator's Manual

HBP-T105/S series

(Patient Monitor)

EU representative
EC REP **OBELIS S.A**
Bd. Général Wahis, 53, 1030 Brussels, Belgium

Local distributor

Manufacturer
Mediana Co., Ltd.
Wonju Medical Industry Park, 1650-1 Donhwa-ri,
Munmak-eup, Wonju-si, Gangwon-do, Korea

Part Number: A7194-1
Revised Date: 1111

CE 0434

CLASSIFIED C UL US
PATIENT MONITOR
32MX
E252514
UL60601-1
CAN/CSA C22.2 NO.601.1

Important

- Be sure to fully read this manual before using the HBP-T105/S series 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.

Caution

- Limited Warranty
  - Mediana is committed to distributing the highest quality products equipped with unsurpassed speed, accuracy, reliability, quality, and comfort.
  - Every COLIN® HBP-T105/S monitor purchased through Mediana or one of our dealers is warranted to be free from defects in material and workmanship for a period of two (2) years from date of purchase. Accessories and the rechargeable battery are warranted to be free from defects in materials and workmanship for a period of ninety (90) days from date purchase.

- Exclusions
  - This warranty does not extend to any products (or parts thereof) that have been subject to misuse, neglect or accident; that have been damaged by causes external to the product, including but not limited to failure of or faulty electrical power; that have been used or operated in any way other than described in the Instruction Manual; to which any nonstandard accessory attachment has been affixed; on which the serial number has been removed or made illegible; or that has been modified or improperly disassembled, serviced or reassembled by anyone other Mediana, unless authorized by Mediana.
  - Mediana makes no warranty (a) with respect to any consumable or disposable products that are not warranted products, (b) with respect to any product purchased from a person other than Mediana or an Mediana authorized distributor, or (c) with any respect to any product sold under a brand name other than COLIN®.
  - Mediana will not be responsible for the safety, reliability, and/or performance of the product if: (a) assembly operations, extension, readjustments, modifications, or repairs are carried out by persons other than Mediana or persons authorized by Mediana to perform repair service on Mediana's behalf; or (b) the electrical installation does not comply with the requirements of the applicable national and international standards, including requirements of the IEC; or (c) the product is not used in accordance with Mediana's instruction for use.
  - In the event of a proven defect in the product, Mediana may be liable for injury or death of any actual person, or damage to property, to the extent, but only to the extent, that such liability is mandated under laws applicable to manufacturers in general and to manufacturers of the product category to which the product belongs and to the extent such damage is proven to have been caused by the defect.
  - Mediana's sole responsibility shall be to repair or replace the product within the terms stated in this Limited Warranty Statement. Mediana SHALL NOT BE LIABLE FOR ANY LOSS OR DAMAGE OF ANY KIND, INCLUDING INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING DIRECTLY OR INDIRECTLY FROM ANY BREACH OF ANY WARRANTY, EXPRESS OR IMPLIED, OR ANY OTHER FAILURE OF THIS

    PRODUCT. ALL IMPLIED WARRANTIES, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED TO THE DURATION OF THE APPLICABLE WRITTEN WARRANTY, WHICH SHALL SUPERSEDE ALL OTHER ORAL OR WRITTEN WARRANTIES.

- Service limitations
  - Maintenance and repair services performed by user personnel on the equipment covered in this manual apply only to products that are out of warranty. All warranty repairs must be performed only by qualified service technicians authorized by Mediana. A comprehensive technical service manual for the COLIN® HBP-T105/S containing specific information about operation, calibration, parts listing, and schematics can be obtained by contacting the Mediana Technical Service Department at +82 33-742-5400

- Shipping Procedures
  - If Mediana reasonably determines that a repair or replacement is covered by this Warranty, Mediana shall bear the costs of shipping a loaner product and the repaired or replacement product to Purchaser. Purchaser shall pay all other shipping cost. Risk of loss or damage during shipments under this Warranty shall be borne by party shipping the product.
  - Products shipped by Purchaser under this Warranty shall be suitably packaged to protect the product. If Purchaser ships a product to Mediana in unsuitable packaging, any physical damage present in the product on receipt by Mediana (and not previously reported) will be presumed to have occurred in transit and will be the responsibility of the Purchaser.

- Returning the Unit
  Prior to returning a unit for any reason, please:
  - Call Mediana Technical Service at +82 33-742-5400, explain problems observed, verify the warranty and obtain a Return of Merchandise Authorization (RMA) number.
  - Remove all accessories from the unit, unless directed otherwise by an Mediana representative.
  - Package the monitor appropriately to prevent damage during transit. If a loaner unit was requested, use that packaging for the monitor being returned.
  - Ship to:
    Mediana Co., Ltd
    Attn: RMA Number_____(the number provided when you called)
    Wonju Medical Industry, 1650-1
    Donghwa-ri, Munmak-eup, Wonju-si, Gangwon-do, Korea
    (Zip: 220-801)

- Optional Extended Limited Warranty
  - If an extended warranty was purchased at time of sale, it will cover only components manufactured by Mediana, not the SpO_2 module, thermometry module, or recorder.

- Responsibility for loaned Equipment
  - Purchaser is responsible for any damage to or loss of any loaner equipment while it is at Purchaser's location. Purchaser must return loaner equipment within 10 days after receiving the repaired or replaced product or receiving notice from Mediana that the product returned by Purchaser is not covered by the warranty. If Purchaser does not return loaner equipment within 20 days after the return due date, Purchaser agrees to pay Mediana the reasonable value of the loaner equipment or reasonable daily rental fee, whichever Mediana selects.

Notes

- No part of this instruction manual shall be reproduced without permission.
- The contents of this manual are subject to change without notice.
- The contents of this manual should be correct. If, for some reason, there are any questionable points, please do not hesitate to contact Mediana.
- The manual will be replaced it any pages are missing or collation is incorrect.

Trademark

Product brand names shown in this manual are likely to be the trademark or registered trademark of the company concerned.

COLIN® is registered trademarks of Omron Healthcare Co., Ltd.
In March, 2010, Omron Colin Medical was purchased by Mediana and is now operating under the name Mediana. Colin brand professional medical devices are now represented worldwide by Mediana, based in Korea, and Omron is no longer affiliated with the Colin business except in Japan.

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PREVIEW

Thank you for choosing an HBP-T105/S series monitor.
This manual contains operational information for the HBP-T105/S series monitors.
Please be sure to read this Instruction Manual thoroughly to fully understand device operation, cautions, performance and limitations.

INTENDED USE

The HBP-T105/S series 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.

Model \ Spec.		NIBP	SpO_2		Temp	Recorder	Alarm	Interval
			Nellcor®	Masimo®				
HBP-T105	NXTP ne	X	X		X	X	X	X
	NXTP ma	X		X	X	X	X	X
	NXP ne	X	X			X	X	X
	NXP ma	X		X		X	X	X
	NTP	X			X	X	X	X
	NP	X				X	X	X
	NXT ne	X	X		X		X	X
	NXT ma	X		X	X		X	X
	NX ne	X	X				X	X
	NX ma	X		X			X	X
	NT	X			X		X	X
	N	X					X	X
HBP-T105S	NXTP ne	X	X		X	X		
	NXTP ma	X		X	X	X		
	NXP ne	X	X			X		
	NXP ma	X		X		X		
	NTP	X			X	X		
	NP	X				X		
	NXT ne	X	X		X			
	NXT ma	X		X	X			
	NX ne	X	X					
	NX ma	X		X				
	NT	X			X			
	N	X						

Nellcor® is a registered trademark of Nellcor Puritan Bennett Incorporated.

Masimo® is a registered trademark of Masimo Corporation.

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Symbols and Safety Terms

Safety symbols and terms pointing out incorrect or potentially unsafe use are shown in this manual and on the actual products. The symbols and meanings are shown below, so please read thoroughly and familiarize yourself with them.

DANGER indicates an imminently hazardous situation, which, if not avoided, will result in death or serious injury.

WARNING indicates a potentially hazardous situation, which, if not avoided, will result in death or serious injury.

CAUTION indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury.

Other Labels

Note

This indicates necessary information that should be taken into account when using the device.

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 the 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

|←――2Sec.――→| 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

|←――――――3Sec.――――――→| 24 second intervals.

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

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

If any abnormality appears in the patient or the device, take appropriate measures, such as stopping the measurement and/or turning off the device, to ensure the safety of the patient.

⚠CAUTION

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

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.

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

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

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 move the electrodes to an appropriate position. Applying defibrillation with the defibrillator paddles touching the electrodes will cause burns.

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.

Always perform pre-work inspections and maintenance inspections.

Do not open, disassemble or alter the device.

⚠CAUTION

The HBP-T105/S 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 similar equipment. Check the operation of this device during and after use of such equipment and with such patients.

If the patient shows symptoms of skin irritation or allergic reaction to any component, discontinue use immediately.

The device can be damaged or cause injury if it falls. Do not pull on cables or accessories while attached to the device. There is a risk of the device falling or toppling.

In order to save battery power, turn off the device when it is not in use. You can also set "Battery Operation Selection" to "SAVE". When the "Battery Operation Selection" is set to "SAVE", the device automatically shuts down after 30 minutes of non-use.

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 only.

Use a grounded AC outlet for the power supply to ensure the device is grounded.

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

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

Do not plug the AC adapter cable onto 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.)

Do not place anything on this device.

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

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.
- Use additional protective measures (e.g., additional protective grounding) as necessary.

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

⚠CAUTION

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

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 inflate to a dangerously high pressure.

To ensure an accurate blood pressure measurement, it is recommended to take the blood pressure on the upper arm.

Measurements taken on the thigh may not be as accurate as on the upper arm.

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.

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

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

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

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

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

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.

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

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

- 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.

This device has no alarm function for SpO_2. (HBP-T105S only)

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 Mediana. Use accessories according to the manufacturer's directions for use.

Never reuse a probe cover. Reusing a probe cover creates a danger of infection.

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

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

To prevent injury, use special care when using temperature probes for children and infants.

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

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

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

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

For the alarm range, set the value appropriate to the patient to whom this device is attached. (HBP-T105 only)

Internal Battery

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 is subject to strong mechanical shock.
- If the battery is forced into the device.
- 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.

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.

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.

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

Do not leave a battery mounted in the device 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 device causing corrosion and fire.

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

Maintenance

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

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

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

After cleaning, allow the components to dry completely before plugging the AC adapter cable into the AC socket.

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

EXPLANATION OF ACRONYMS AND SYMBOLS

SYS	: Systolic Pressure
MAP	: Mean Arterial Pressure
DIA	: Diastolic Pressure
PR	: Pulse Rate
SpO_2	: Arterial Oxygen Saturation by Pulse Oximeter
TEMP	: Temperature

Meaning of the Symbols

Symbol	Description
	This shows the type BF device with defibrillator
	This shows the type BF device.
	See warnings and cautions
	Refer to manual
	Alarm Mute
	CUFF Start/Stop
	Cuff Interval (HBP-T105 only)
	Clear Display (HBP-T105S only)
	Menu switching
	Record Start/Stop

Symbol	Description
	Measurement mode
	Measurement mode (Neonate)
	Current time
	Elapsed time
	Power ON
	Power OFF
	Internal battery
	Body temperature measurement
	Cuff connection terminal
	External input/output terminal
	Indoor use only

1. Outline

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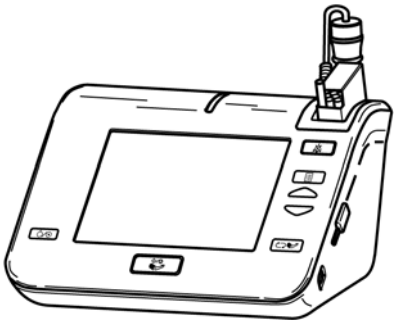
CONFIGURED PRODUCTS

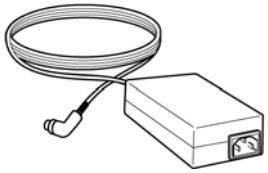
Before using the HBP-T105/S series monitor be sure to check that all of the accessories are included and that the main unit and accessories are not damaged. If, for some reason, the contents are not complete, please contact Mediana.

Main Unit

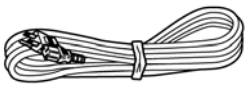


PATIENT MONITOR

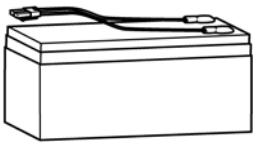
Standard Accessories for Main Unit



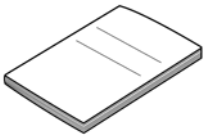
AC ADAPTER
HBP-AC-14V4



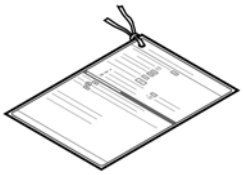
AC ADPATER CABLE
C0440004A



INTERNAL BATTERY
HBP-BAT-3212U

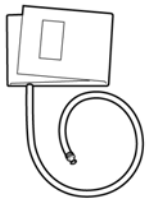


INSTRUCTION
MANUAL 105-OM

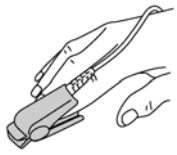


QUICK GUIDE
HBP-QMANU

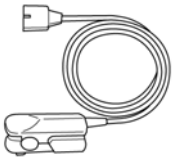
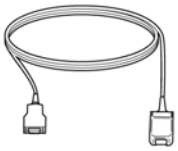
NIBP MEASUREMENT

	
Reusable Cuff, Adult C030107 A-NLR	Rectus Cuff Hose, Adult HOSE ADULT PII

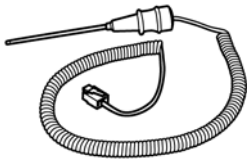
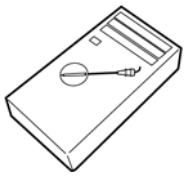
SpO2 MEASUREMENT Models with Nellcor® SpO2

	
DURASENSOR℗ DS-100A Patient Weight: 40kg or over	EXTENSION CABLE DOC-10

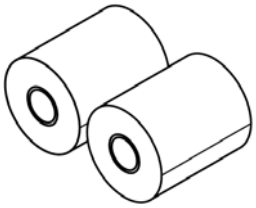
Models with Masimo® SpO2

	
SpO_2 SENSOR LNCS DC-1 Patient Weight: 30kg or over	EXTENSION CABLE LNC-10

TEMPERATURE MEASUREMENT Models with Body Temperature Measurement

	
TEMPERATURE PROBE (Oral/axillary) (Alaris℗ IVAC℗ X2887A)	TEMPERATURE PROBE COVER (Alaris℗ IVAC℗ XP850)

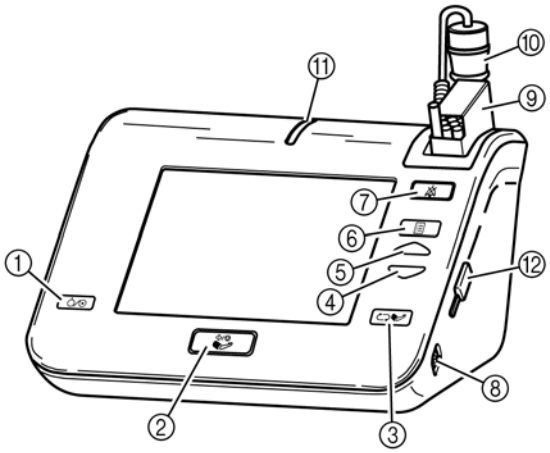
OTHER Models with Recorder


ROLL PAPER (2pcs) 105-PAP

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

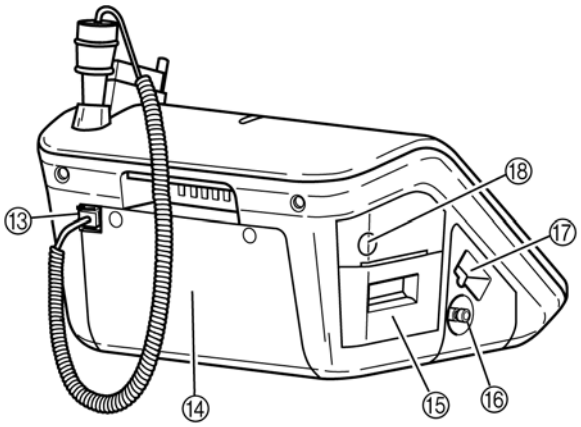
NAMES AND FUNCTIONS OF PARTS

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 (HBP-T105 only)	The interval for cuff measurement can be set.
3	Clear Display (HBP-T105 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 "HBP-BCRD-A series Bar Code Reader Instruction Manual".

*1: Only models with body temperature measurement.



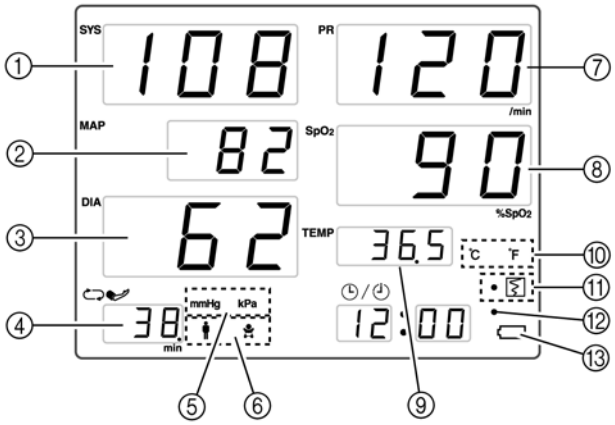
13	Temperature Measurement *1	The body temperature measurement probe is connected here.
14	Internal Battery Cover	Remove this cover when mounting or replacing the internal battery.
15	Roll Paper Holder *2	The roll paper is placed here.
16	Non-Invasive Blood Pressure Measurement (NIBP)	The air hose for 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 recording.

*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 (HBP-T105 Only)	Displays the Cuff Interval. (For the setting method, see Page 25.)
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 Page 19.)
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 Page 78.)
12	Battery Indicator	Displays the charge status of the internal battery. (For details, see Page 103.)
13	Battery Icon	Displays the operability status of the internal battery. (For details, see Page 104.)

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2. Preparation

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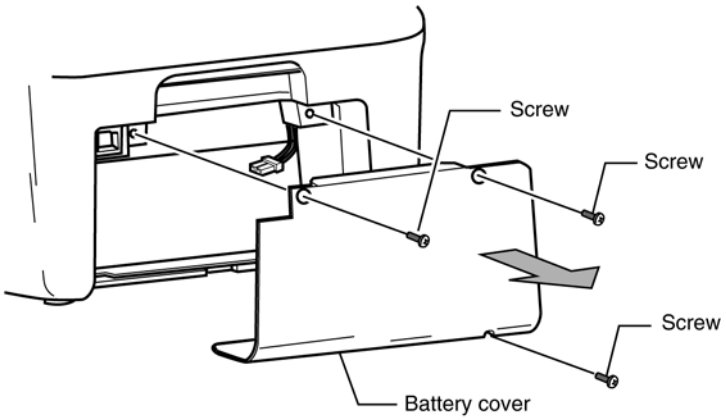
PREPARATIONS BEFORE USE

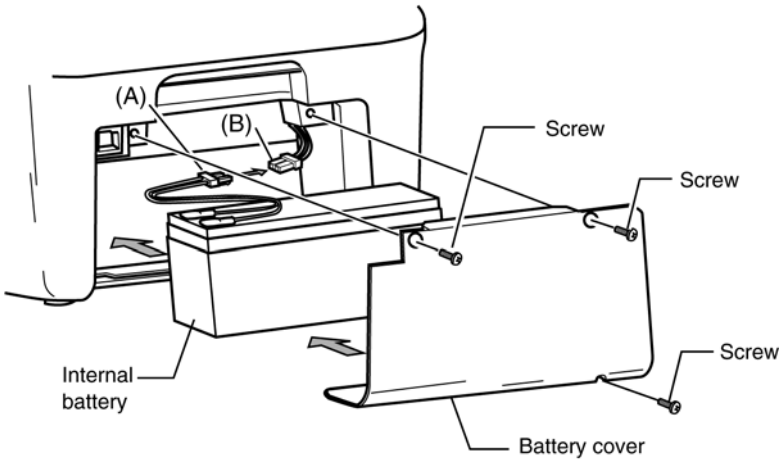
Installing the Internal Battery

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

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



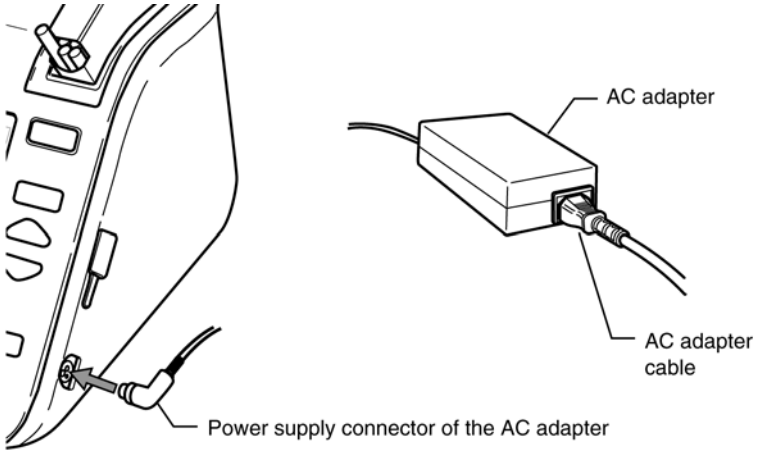
2. Connect connector (A) of the internal battery to connector (B) of the device. When inserting the connector, be careful to insert it in the correct direction. These connectors are designed so that they cannot be inserted with the polarity reversed.
3. Fit the internal battery into the rear of the device.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



Connecting the Power Supply

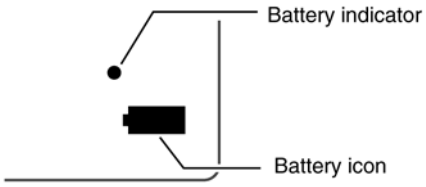
Connect the power supply with the following procedure.

1. Connect the power supply connector from the AC adapter to the device.
2. Plug the AC adapter cable plug side into a medical three-prong socket with ground connector.



Charging the Internal Battery

When you connect the power supply, charging of the internal battery starts (Page 103).
Completely charge the battery before using this device.
When the charge is complete, the battery indicator changes from orange to green.



Battery indicator

Battery is starting to charge	Orange
Battery charge is complete	Green
Device is running on battery power, or, if on AC power, battery is not installed or battery is in an abnormal condition	OFF

Battery icon

Running on AC power supply	Battery installed	OFF
	Battery not installed	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)

Note	· In order to maintain the battery charge, Mediana recommends leaving the device plugged into AC power when it is not in use. If the device 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 battery is in an abnormal condition (the battery icon is off), immediately stop using the device and replace the battery with a new one. When the new battery is loaded, ensure the battery icon displays green, indicating the battery is in a normal condition.

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

The date and time can be checked in "Utility Mode".
For details on "Utility Mode", see "9. Setup" "Utility Mode" (Page 89).
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.

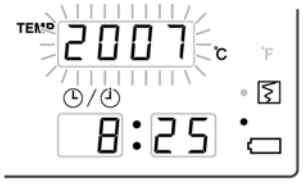
Display example: 12:45

• 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.



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.

3. Non-Invasive Blood Pressure Measurement

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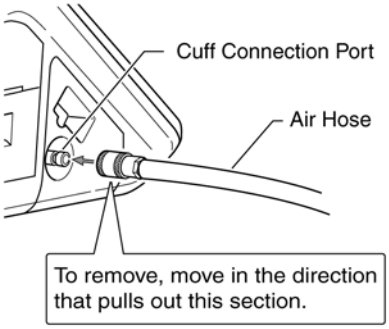
MEASUREMENT PREPARATION

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.

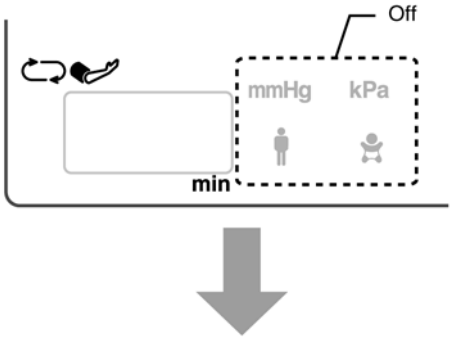
CUFF		Part #	Measurement mode	Air hose
Reusable Cuffs (With Rectus Fitting)	Infant	C030101A-NLR	Adult/ Pediatric	Rectus Cuff Hose Adult (10 feet) HOSE ADULT PII
	Child/ Small Adult	C030103A-NLR		
	Adult	C030107A-NLR		
	Large Adult	C030109A-NLR		
	Long Ault	XC030115A-NLR		
	Thigh	C030111A-NLR		
Disposable Cuff (With Luer Fitting)	Large Adult	C0400011B	Adult/ Pediatric	Rectus Cuff Hose Adult (10 feet) GOSE ADULT PII
	Adult	C0400013B		
	Small Adult	C0400015B		
	Child	C0400019B		
	Long Adult	C0400021B		
	Thigh	C0400023B		
Disposable Cuff (With Slip Luer Fitting)	Neonatal #1	C0400001B	Neo	Rectus Cuff Hose Neonatal (10 feet) HOSE NEO PII
	Neonatal #2	C0400003B		
	Neonatal #3	C0400005B		
	Neonatal #4	C0400007B		
	Neonatal #5	C0400009B		

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.

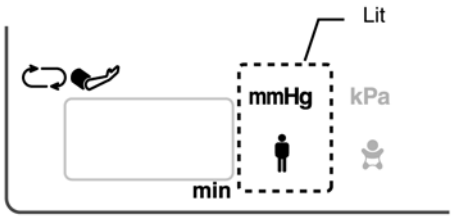
Check before Start of Blood Pressure Measurement

When you switch on the device 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

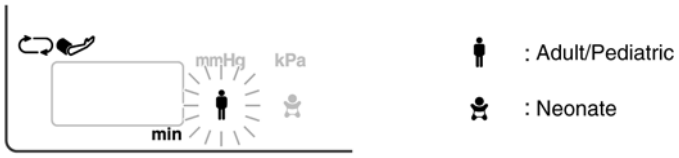
Selecting the Measurement Mode

About Utility Mode

The measurement mode can be selected in "Utility Mode".
For details on "Utility Mode", see "9. Setup" "Utility Mode" (Page 89).

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.

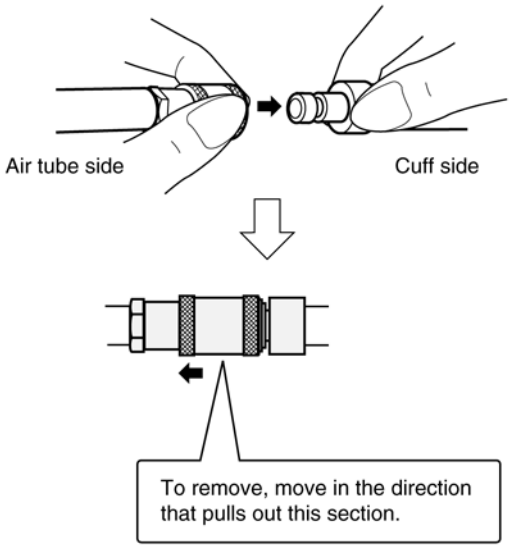
Exiting the selection screen

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.

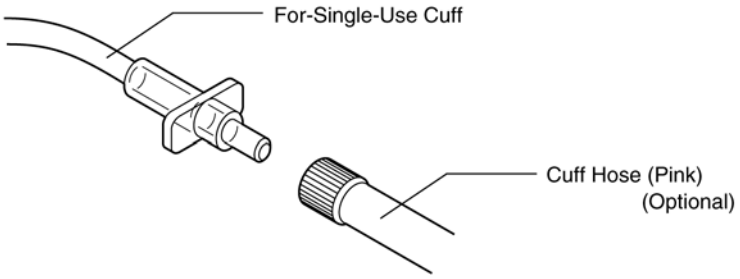
Adult/Pediatric Cuffs

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.



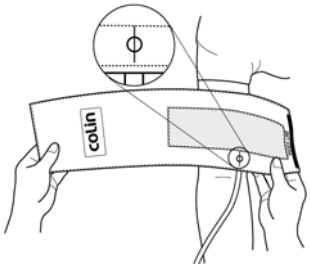
Note	Make sure that the connectors are tightly connected, as air leaks will prevent accurate measurement.

HOW TO APPLY THE CUFF

Attaching the Cuff

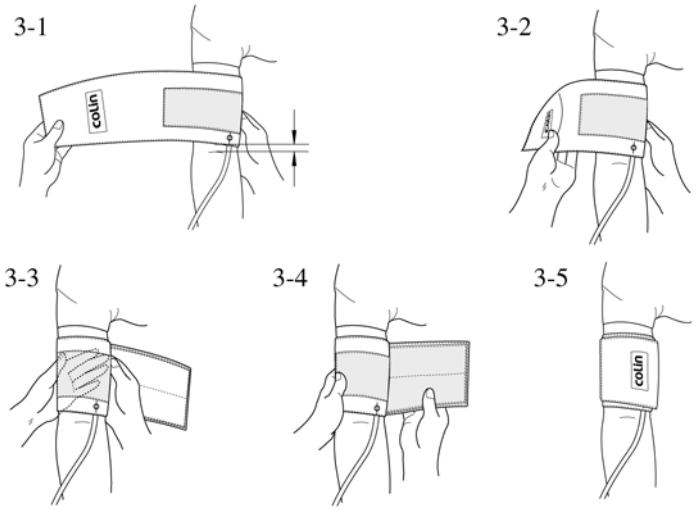
1. Place the hand of the patient with the palm of hand facing upward.

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



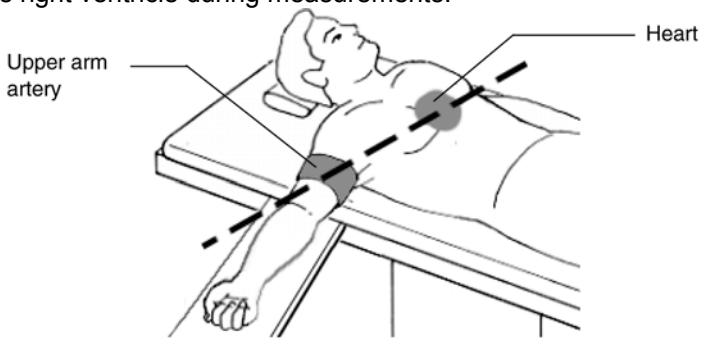
3. Wrap the cuff snugly using both hands and securely fasten it with the hook and loop tape. At this time, the lower edge of the cuff must be placed 1/2" to 1" above the inner side of elbow joint.

■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)



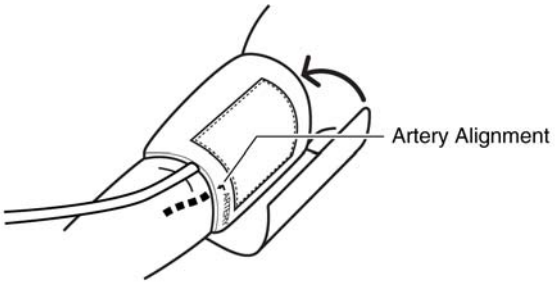
4. Keep the level of the cuff at the same level as the heart during the measurement.

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

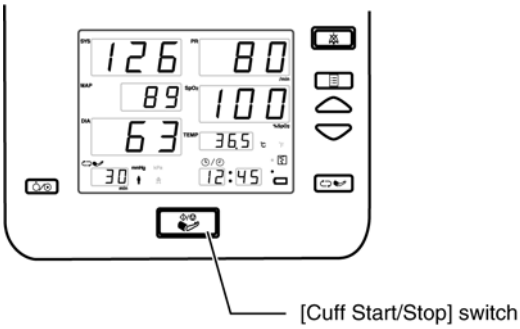


Note	Caution concerning relationship between cuff and heart height ■ The blood pressure reading will be incorrect if the height of the cuff (side position, etc.) and the heart differ. A 4 in. difference may cause the blood pressure reading to differ by a maximum of 7 to 8 mmHg.

MANUAL MEASUREMENT

Commencing a Measurement

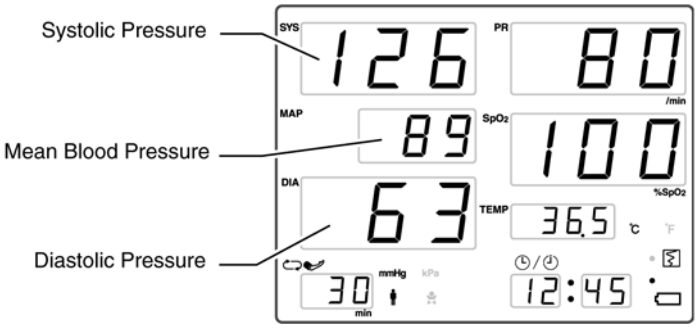
Press the [Cuff Start/Stop] switch. The device will inflate to the initial inflation pressure value, then measure.



- 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.



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.

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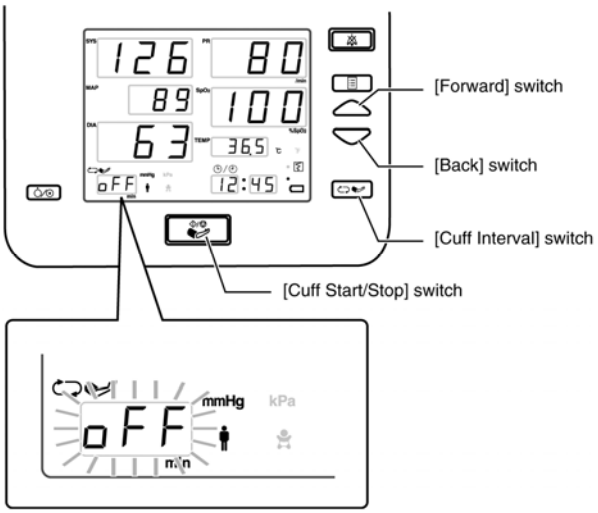
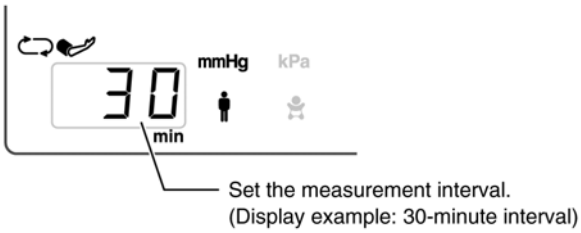
AUTOMATIC MEASUREMENT (HBP-T105 only)

Monitoring Using Cuff Intervals

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



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.



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 device is turned off , the cuff measurement interval becomes 2.5 minutes.

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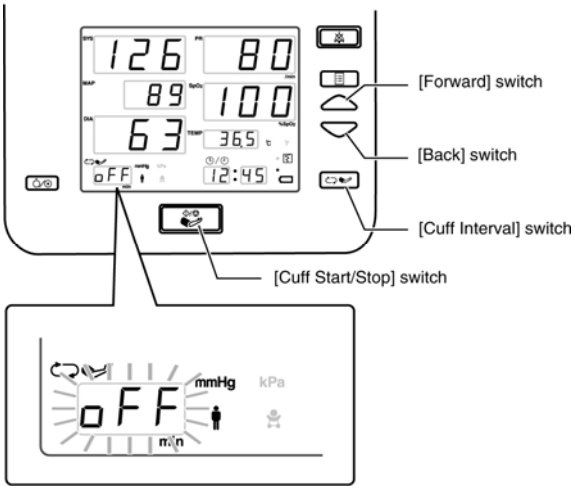
CONTINUOUS MEASUREMENT (HBP-T105 only)

Continuous Measurements (CON)

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



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.

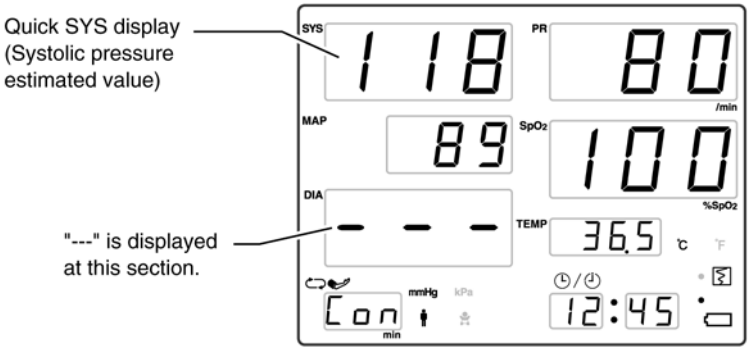
Note	For patient safety, beware of the following for continuous measurements: ■ The measurement interval will automatically become 2.5 minutes after 12 minutes have elapsed. ■ If the device is turned off, the cuff measurement interval becomes 2.5 minutes. ■ After a setting is made, if 5 minutes pass 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.

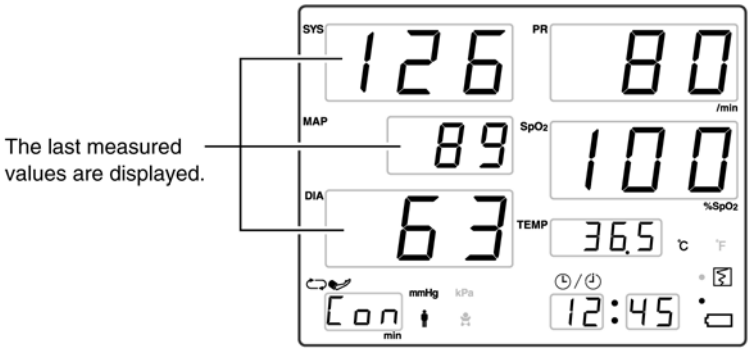
When Quick SYS is working

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".



When Quick SYS is not working

When Quick SYS is not working (when the systolic pressure cannot 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. (HBP-T105 only)
For the HBP-T105S, 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 cannot be used when Smart Inflation is "ON" or when high-speed measurement is enabled.

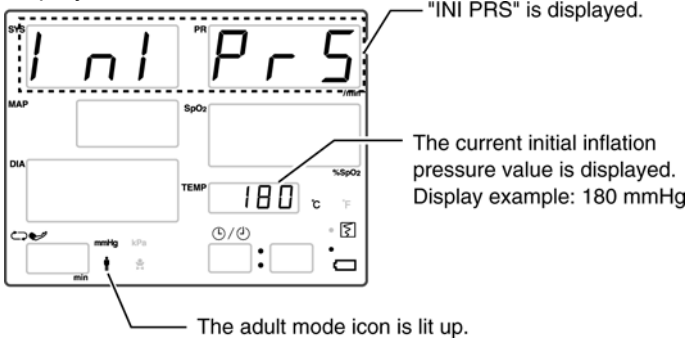
Initial Inflation Pressure Value Setting

About Utility Mode

The initial inflation pressure value can be set in "Utility Mode".
For details on "Utility Mode", see "9. Setup" "Utility Mode" (Page 89).
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.



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

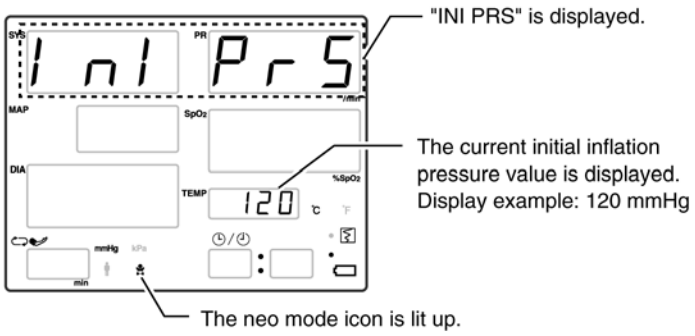
When you have selected the desired value, press the [Menu/Enter] switch to enter that value.

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:



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

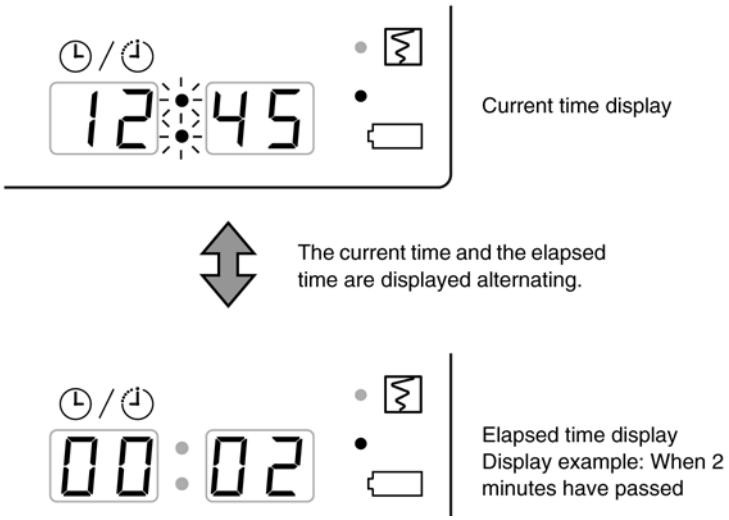
When you have selected the desired value, press the [Menu/Enter] switch to enter that value.
When you do, the setting screen display moves to the next setting item.

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. (HBP-T105 only)

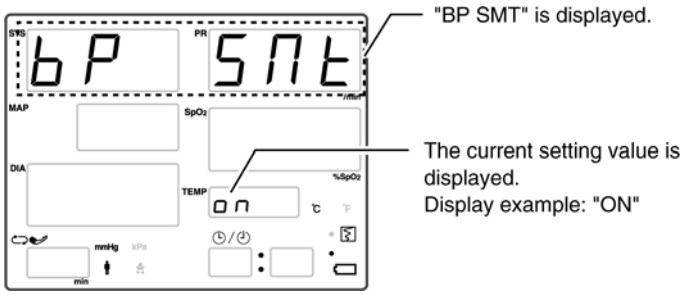
■ When the "Cuff Interval" is set to 2 minutes or more. (HBP-T105 only)
■ Smart Inflation is set to "ON".
(The HBP-T105S has no interval condition.)

About Utility Mode

Smart Inflation can be switched ON or OFF in "Utility Mode".
For details on "Utility Mode", see "9. Setup" "Utility Mode" (Page 89).

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.



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.
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 cannot 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.

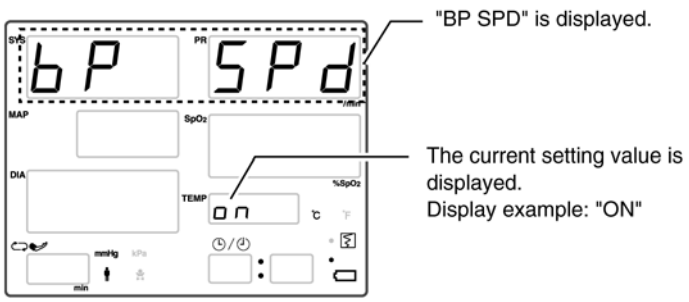
About Utility Mode

High speed measurement can be switched ON or OFF in "Utility Mode".
For details on "Utility Mode", see "9. Setup" "Utility Mode" (Page 89).

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.



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.
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 cannot 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

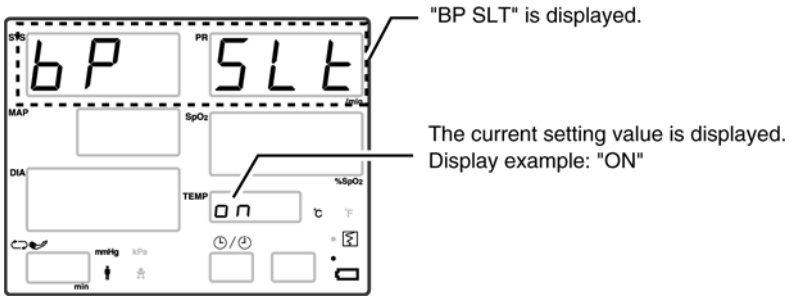
When this function is switched "ON", the pump sound is suppressed.

About Utility Mode

BP silent mode can be switched ON or OFF in "Utility Mode".
For details on "Utility Mode", see "9. Setup" "Utility Mode" (Page 89).

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:



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

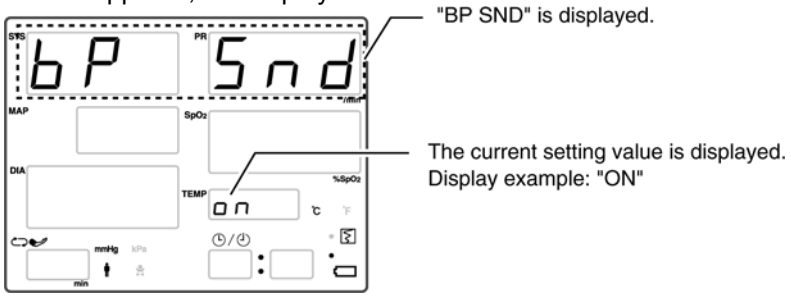
When this function is switched "ON", when blood pressure measurement ends, the "notice sound" is issued.

About Utility Mode

The blood pressure measurement end sound can be switched ON or OFF in "Utility Mode".
For details on "Utility Mode", see "9. Setup" "Utility Mode" (Page 89).

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.



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.
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.

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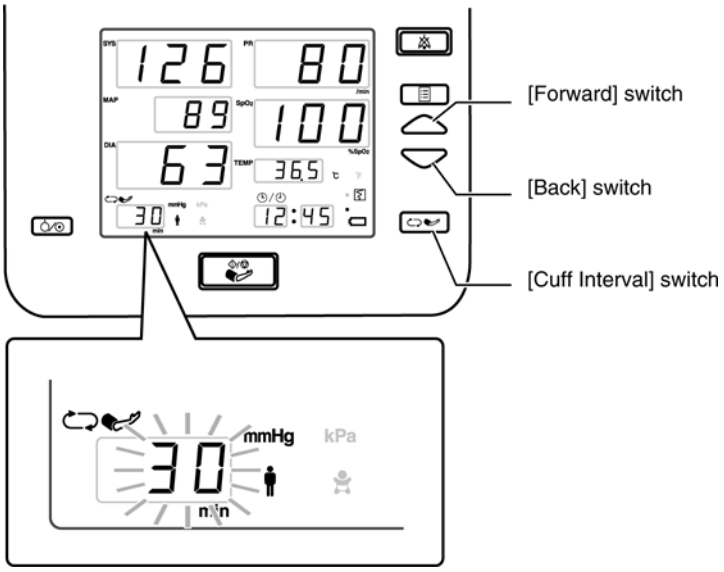
AFTER MEASUREMENT

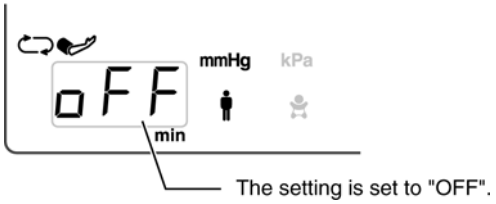
When measurement ends, remove the cuff from the patient and use the procedure below to switch the “Cuff Measurement Interval” to “OFF”. For details about how to check the data, see “6.List screen” (Page 57) or “8.Recorder” (Page 69).
The HBP-T105S has no interval setting.

Cuff measurement interval OFF (HBP-T105 only)

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



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. (HBP-T105S only)
  (This is not applicable when NIBP and SpO_2 measurements are simultaneously taken.)
  After measurement starts with the “Cuff Interval” set to “OFF”. (HBP-T105S only)
  (This is not applicable when NIBP and SpO_2 measurements are simultaneously taken.)

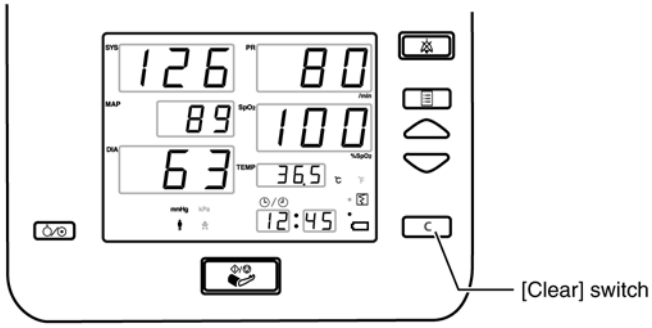
Clear Display (HBP-T105S only)

Clear measurement value display

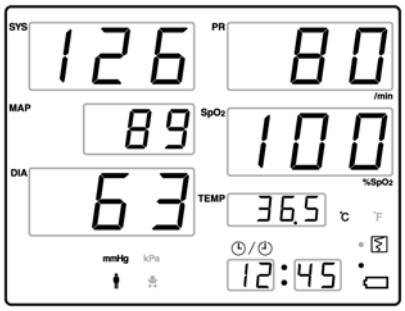
Each time you press the [Clear] switch, the measurement value display is cleared. Press this when the patient is changed.

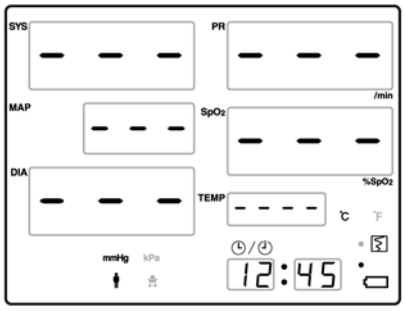
Usage method

Press the [Clear] switch.



Display





4. Pulse Oximeter (SpO_2)

(Only models with SpO_2)

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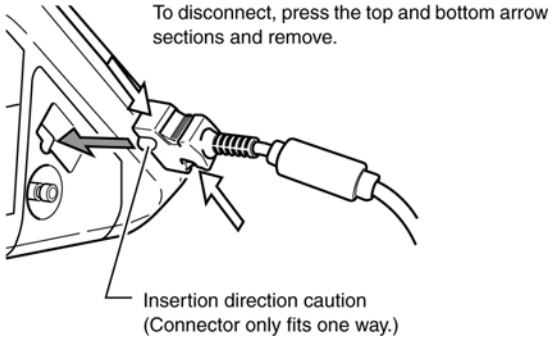
MEASUREMENT PREPARATION

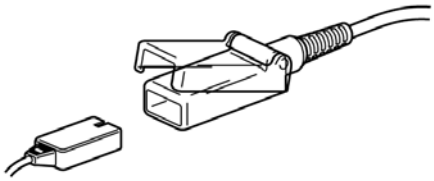
Connecting the SpO_2 Sensor

Models with Nellcor® SpO_2

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

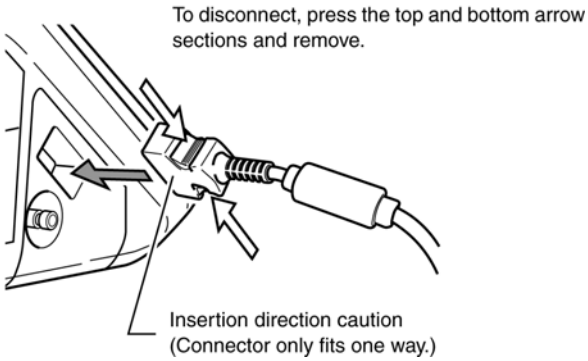


2. Insert the SpO_2 sensor onto the extension cable, lower the cover, and lock it.

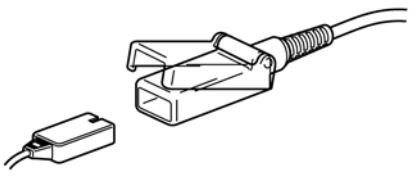


Models with Masimo® SpO_2

1. Plug the 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.



OXISENSOR® is a registered trademark of Nellcor Puritan Bennett Incorporated.

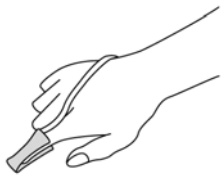
SpO_2 Sensor Selection

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.

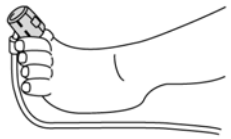
For Nellcor® model

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

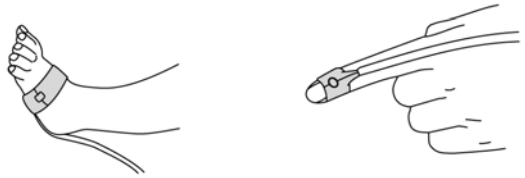
CHILD FINGER OXISENSOR® MAX-P
Disposable finger sensor for patients weighing from 10 to 50kg.



INFANT OXISENSOR® MAX-I
Disposable sensors for Infants weighing from 3 to 20kg.

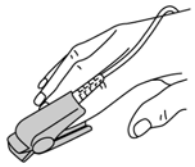


NEONATAL OXISENSOR® MAX-N
Disposable sensor for Neonates weighing 3 kg or less, use on a leg or arm. Or for use on the index finger for adults weighing over 40kg.

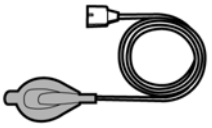


ADULT NASAL OXISENSOR® MAX-R
Disposable nasal sensor for adults weighing over 50kg.

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



MAX-FAST®
For Patient's forehead



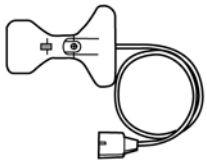
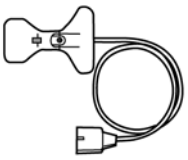
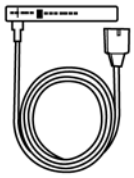
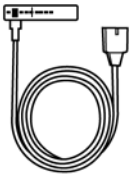
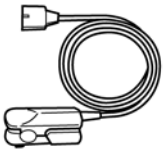
- The DURASENSOR® DS-100A is a short-term usage sensor that can be used repeatedly.
- The OXISENSOR® sensors are single-patient use only. These sensors can be reused on the same patient only while the tape remains adhesive.
- Read the included instruction manual thoroughly before using OXISENSOR® attachments.
- 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.

Nellcor is a registered trademark of Nellcor Puritan Bennett Incorporated.
DURASENSOR is a registered trademark of Nellcor Puritan Bennett Incorporated.
MAX-FAST is a registered trademark of Mallinckrodt Inc.

For Masimo® SpO_2

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

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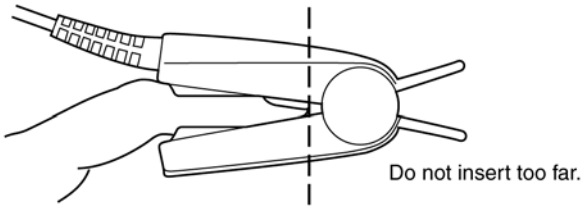
ATTACHING SpO_2 SENSOR

Reusable SpO_2 Sensor

For a reusable SpO_2 sensor, carefully read the instruction manual that comes with the sensor.
The SpO_2 sensor for the Nellcor® model is shown below as an example.

- Open the SpO_2 sensor and fit it securely on a fingertip. Have the cable on the fingernail side.

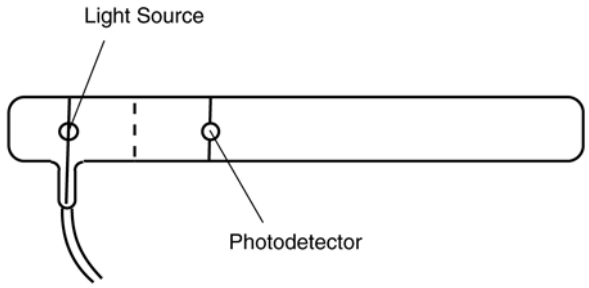


- Check that the clip is not pressing too hard and creating excess pressure on the finger.
  Be particularly careful of the finger tip.
  If the Clip is pressing too hard, the sensor can be mounted on the little finger.

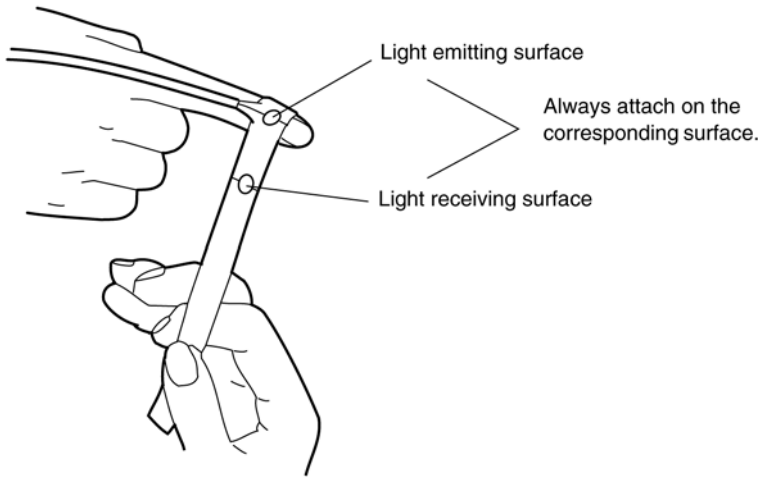
Disposable SpO_2 Sensor

For disposable SpO_2 sensor, 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.



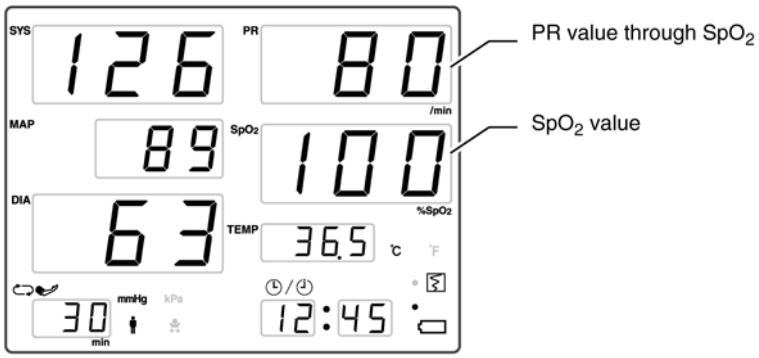
- Attaching being aware that accurate measurement is made possible by the light emitting section and the light receiving section working together as a pair. When attaching to a finger, have the light emitting surface on the nail side.



MEASUREMENT

Screen Display Example

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



Note

- If the SpO_2 sensor has been dropped or subjected to strong physical shock, check for faults before use.
- Select the sensor appropriate for the patient.
- 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).
- 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 disfferentiated.)
  - 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 “6. List screen” (Page 57) or “8. Recorder” (Page 69).

Clear display

- When using on a different patient, press the [Clear] switch. (Page 36) (HBP-T105S only)

In the following cases, the display is automatically cleared.

- After measurement starts. (HBP-T105S only)
- After measurement starts with the “Cuff Interval” set to “OFF”. (HBP-T105S only)

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5. Temperature Measurement

(Only models with body temperature measurement)

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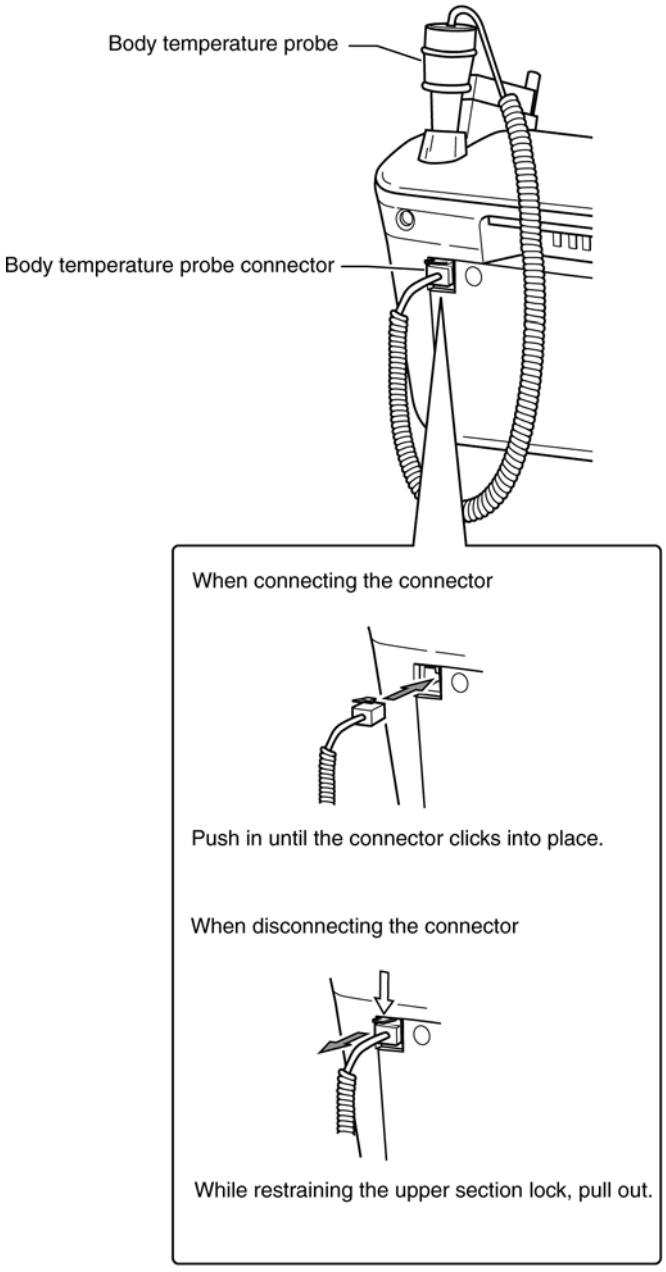
MEASUREMENT PREPARATION

Connecting the Body Temperature Probe

Connect the body temperature probe connector to the body temperature probe connection part on the rear of the device.
Be careful to insert the connector in the correct direction. It can only be inserted with the correct orientation.



Note	■ Do not use any probe or probe cover other than those specified. ■ For oral and axillary temperature measurements, use the probe with a blue cap. For rectal measurements, use the probe with a red cap.

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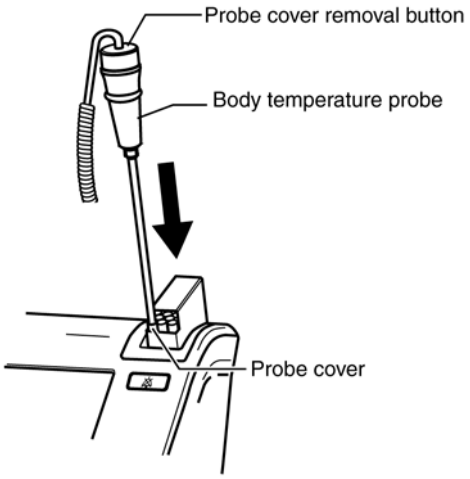
MEASUREMENT

Mounting the Probe Cover

Always mount the probe cover before using the body temperature probe. A probe cover is required to take a temperature measurement.

- Press the probe firmly into the probe cover, being careful not to press the probe cover release on the top of the probe.
  If the cover is not securely mounted, there is a danger of it coming loose or coming off in use.

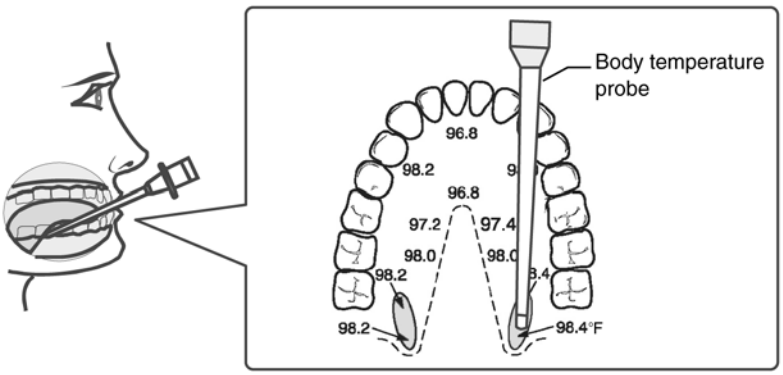


Mounting the Body Temperature Probe

For oral measurement

Use the probe with a blue cap.
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.

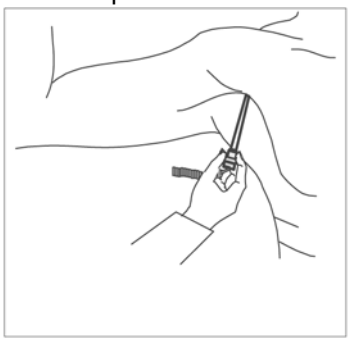


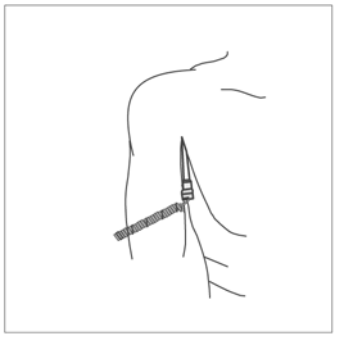
For axillary measurement

Use the probe with a blue cap.

Put the tip of the body temperature probe into the patient's axillary and have the patient hold it in place by pressing with the arm.

- 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.





For rectal measurement

Use the probe with a red cap.

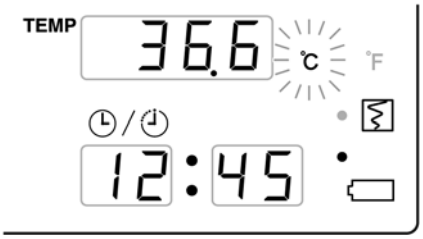
Insert the probe into the patient's rectum.

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

- To ensure proper tissue contact, angle the probe slightly after insertion. Recommended insertion depth is 1/2 inch to 3/4 inch for adults and 1/4 inch to 1/2 inch for children.

Note	Use a lubricant for insertion.

Body temperature measurement mode

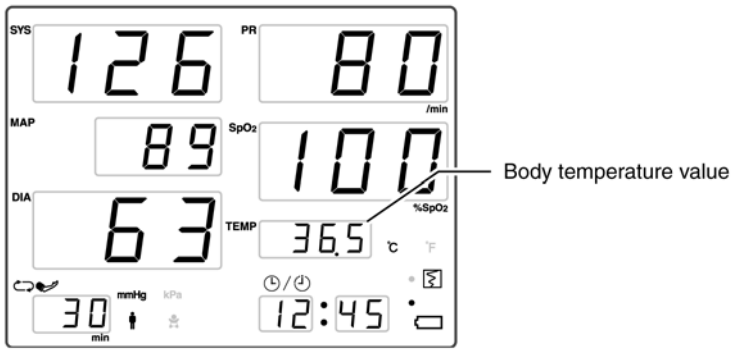


Body temperature measurement has two built-in measurement methods, estimated and actual measurement. Measurement always starts with the estimated measurement, but under the conditions below, measurement automatically switches to actual measurement. From that point in time, the body temperature unit display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

Note

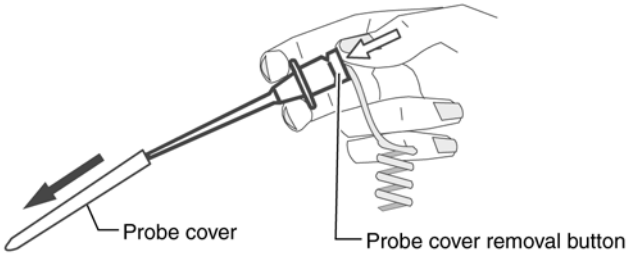
- An estimated measurement switches to an actual measurement under the following condition.
  - The ambient temperature when starting measurement is lower than 16.0˚C (60.8˚F) or higher than 33.3˚C (91.9˚F).
  - The probe temperature fails to reach the standard temperature (34.4˚C/94˚F) within 10 seconds from starting the measurement.
  - Failed to estimated body temperature after 60 seconds when the measurement was started.
- If an unusually high or low temperature reading is obtained, confirm the reading using another temperature measuring device before beginning any treatment.

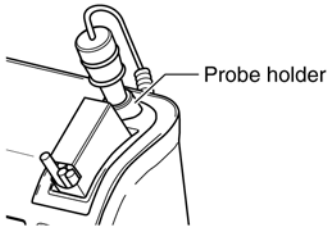
Screen Display Example



Existing 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 device.

After measurement

For details about how to check the data, see “6. List screen” (Page 57) or “8. Recorder” (Page 69).

Clear display

- When using on a different patient, press the [Clear] switch. (Page 36) (HBP-T105S only)

In the following cases, the display is automatically cleared.

- When an estimated measurement ends. (HBP-T105S only)
  (This is not applicable when TEMP and SpO_2 measurements are simultaneously taken.)
- After measurement starts with the “Cuff Interval” is set to “OFF”. (HBP-T105S only)
  (This is not applicable when TEMP and SpO_2 measurements are simultaneously taken.)

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6. List Screen

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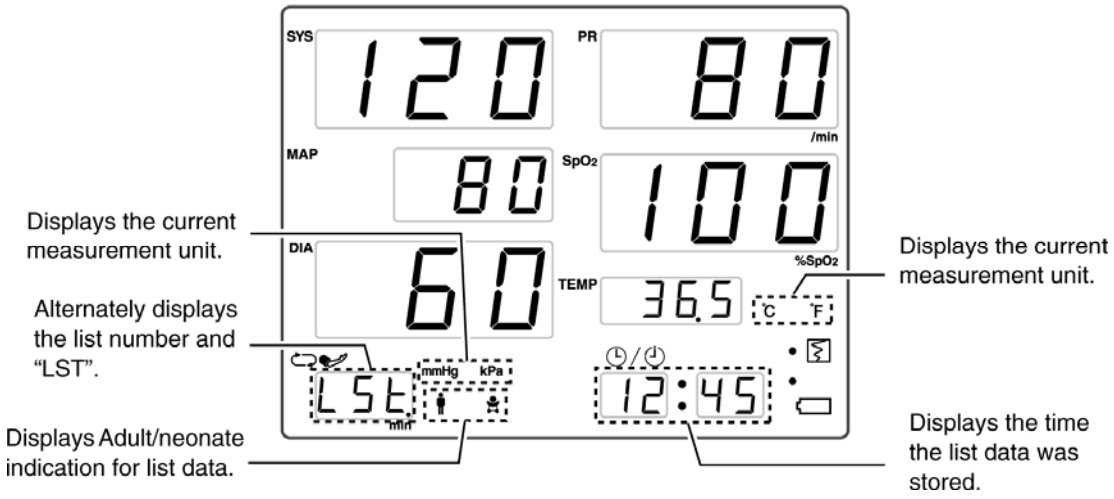
LIST SCREEN

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

Explanation List Screen

To list the display, press either 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.



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 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 such measurement reading (HBP-T105 only)

When SpO_2 measurement starts.

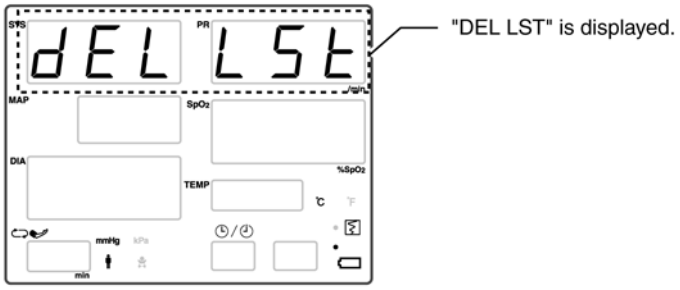
- When estimated body temperature ends.

Deleting List Data

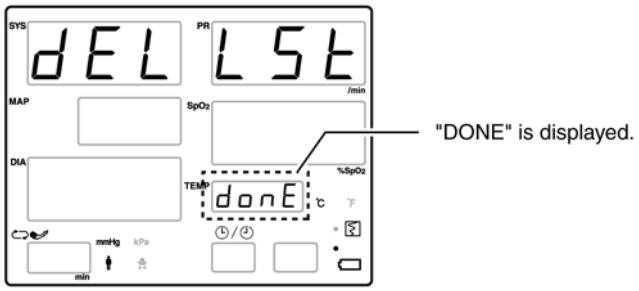
List data can be deleted in “Setting Mode”, which is selected by pressing the [Menu/Enter] switch.
For additional information on “Setting Mode”, see “9. Setup” “Setting Mode” (Page 83)

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.



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



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.

7. Alarms

(The HBP-T105S only)

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ALARM SETTINGS (HBP-T105 only)

About Setting Mode

An alarm can be set in “Setting Mode”, which is selected by pressing the [Menu/Enter] switch.
For additional information on “Setting Mode”, see “9. Setup” “Setting Mode” (Page 83).

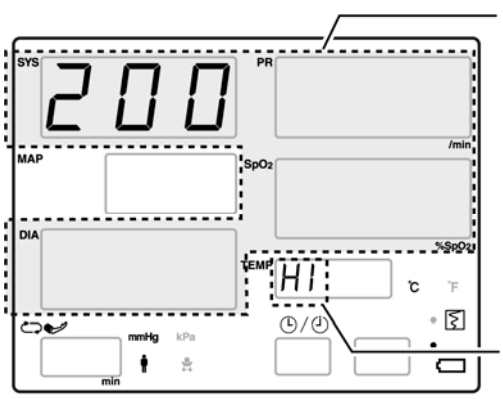
Alarm Setting Screens

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:

(Display example: SYS upper limit)



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
SpO_2 upper limit/lower limit: SpO_2 display section.

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.

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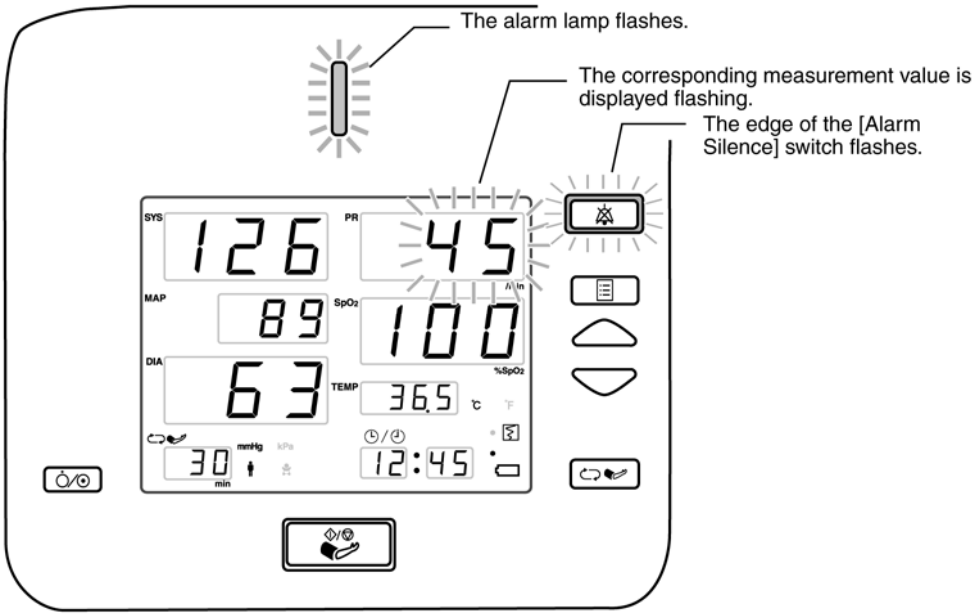
ALARM OPERATIONS (HBP-T105 only)

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.

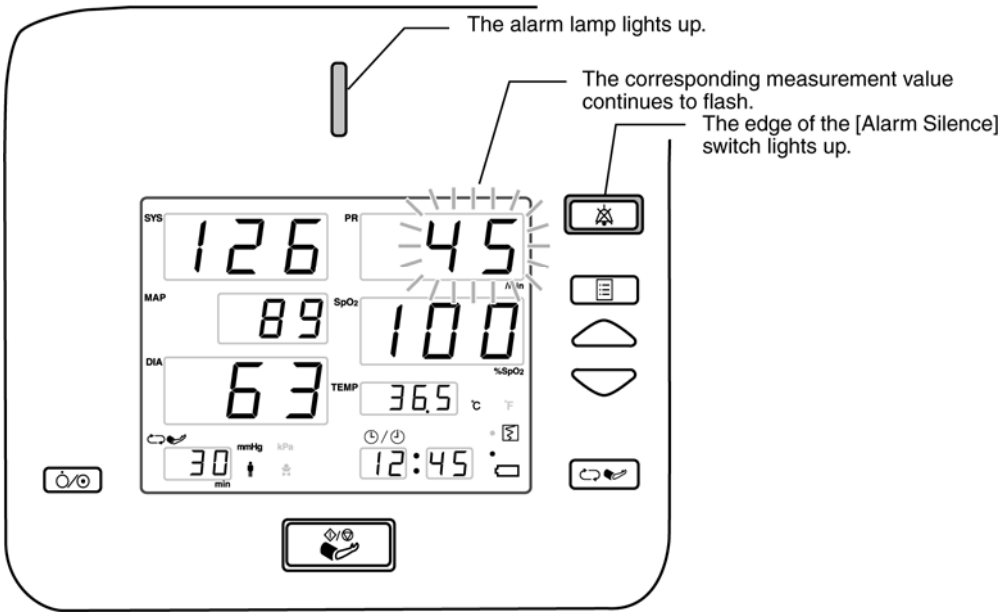


Silencing an Alarm

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			Step
			Setting range	Default	Sound	Setting range	Default	Sound	
NIBP	SYS	mmHg	50 ~ 250	70		60 ~ 260	200		10
	SYS (Neo)		30 ~ 120	50		40 ~ 130	130		
	DIA		30 ~ 230	30		40 ~ 240	160		
	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. ■ For details on the alarm sound see “Other Labels”→(Page 4).

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8. Recorder

(Only models with recorder)

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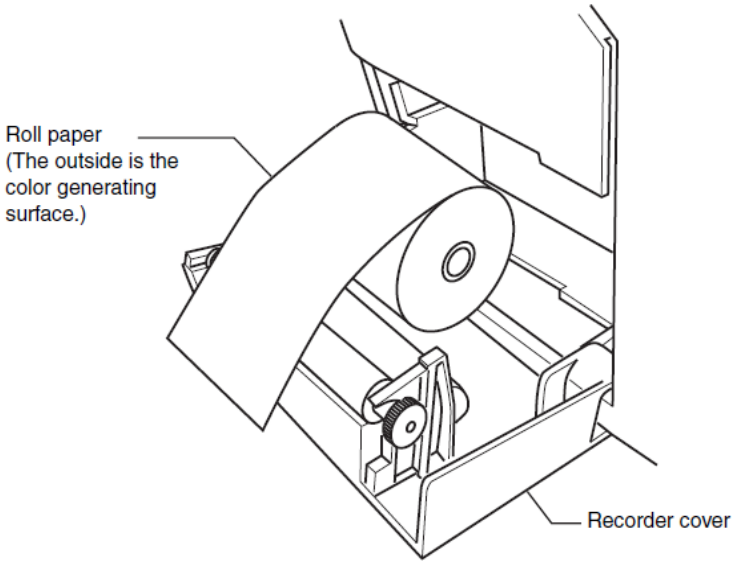
PREPARATIONS BEFORE USE

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.



Note	■ Do not use with the recorder cover left open. ■ The final meter of roll paper contains a red line. When this becomes visible, replace with specified roll paper. ■ 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. ■ Please use only roll paper from Mediana. If you use other paper, the recording may be thin or it may cause a paper jam or other breakdown.

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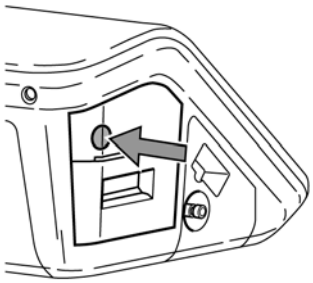
MANUAL RECORDING

Press the [Record] switch. The measurement data is recorded.

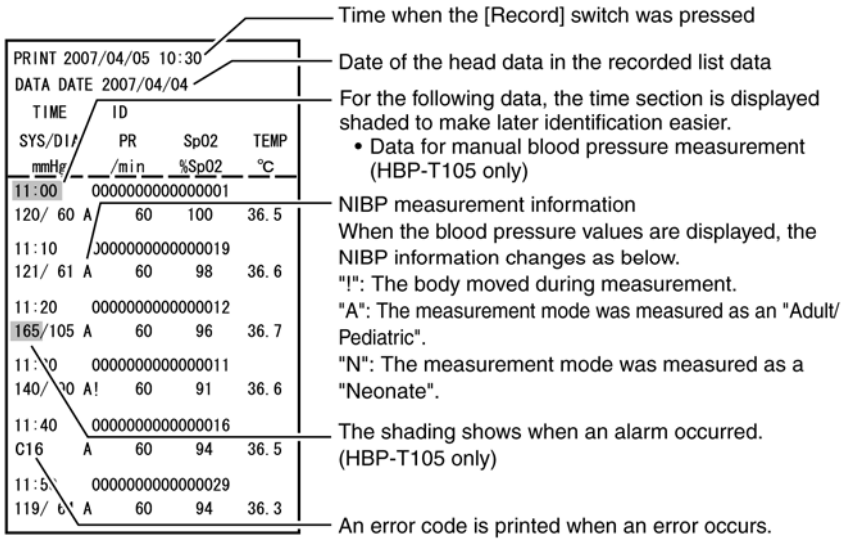


Record Pattern

The record pattern will be one of the types below. You can select the desired type with a setting. (For details on how to make this setting, please see Page 74.)

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

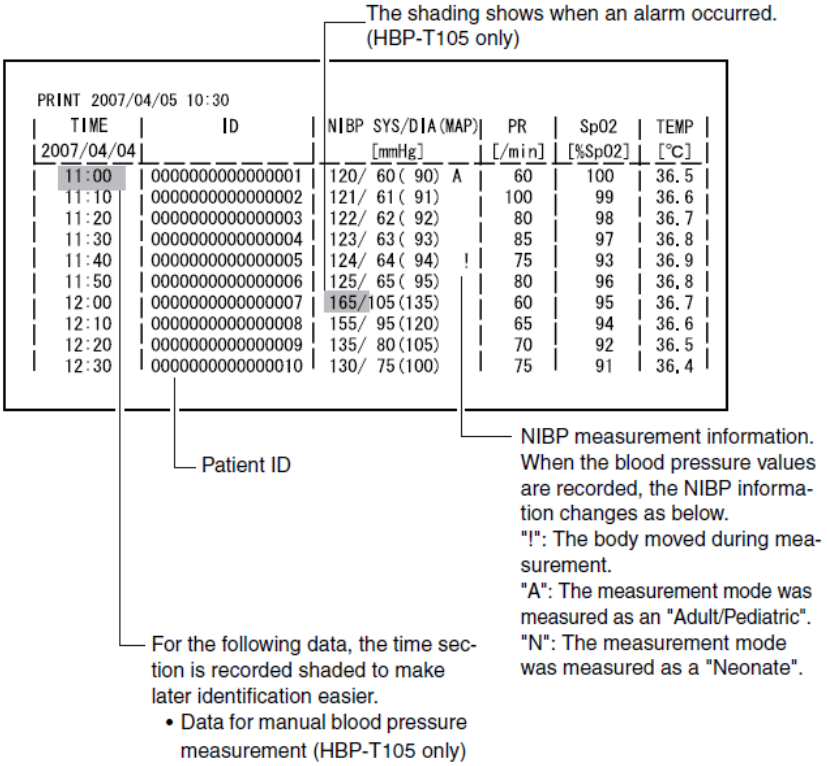
Simple list recording (LST 1)



- 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 recorded as “Unknown”.
- 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.
- The latest 10 data items are recorded on one page.

Note	Inputting an ID required the optional bar code reader.

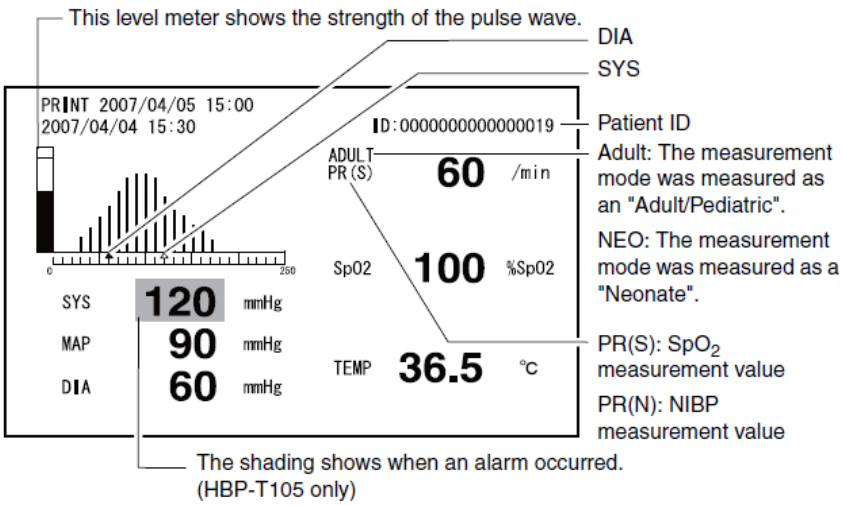
Detailed list recording (LST 2)



- 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 recorded 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.
- 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 record from next page.

Note	Inputting an ID requires the optional bar code reader

Measurement value recording (OSCL)



- If there is no NIBP measurement value, this recording 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.
- If an ID is not entered or the patient changes, then the ID section is left blank or recorded as “Unknown”.
- 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 recorded is the data for when cuff measurement starts. ■ 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 recorded. Up to 400 items can be recorded in a list.
As an exception, when you select “OSCL” as the list type, “LST1” list will be recorded automatically in the all list recording.

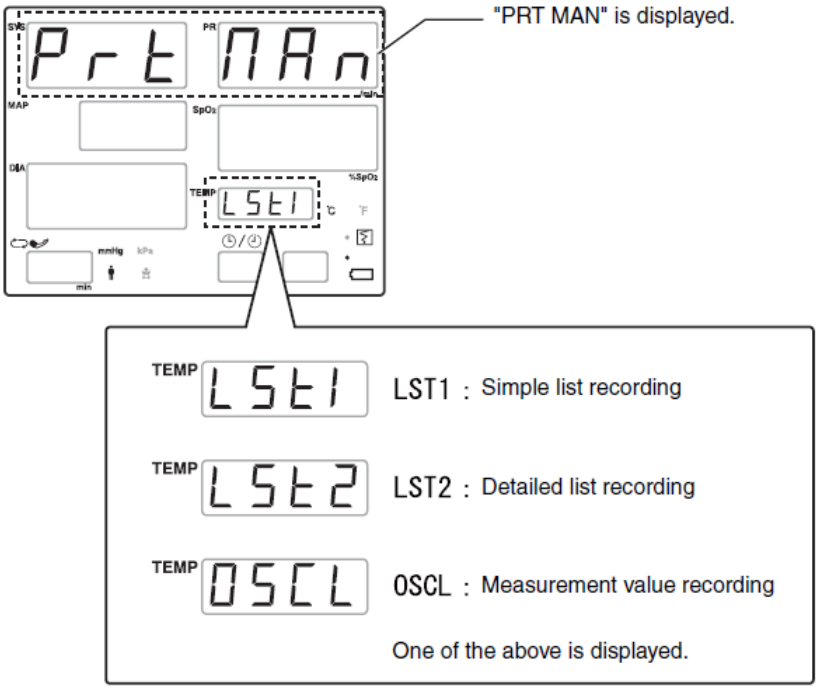
List Record Pattern Selection

About Utility Mode

The list record pattern can be selected in “Utility Mode”.
For details on “Utility Mode”, see “9. Setup” “Utility Mode” (Page 89).

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:



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 selecting screen

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

AUTOMATIC RECORDING

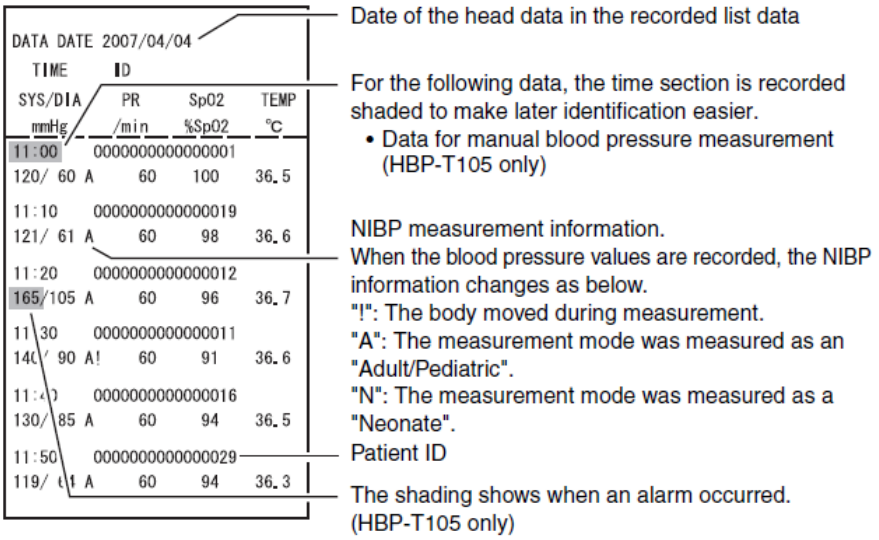
When the measurement record selection becomes anything other than “OFF” in “Utility Mode”, the measurement value at the moment measurement ends is recorded.

Record Pattern

The record pattern will be one of the types below. You can select the desired type with a setting.
(For details on how to make this setting, please see Page 77.)

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

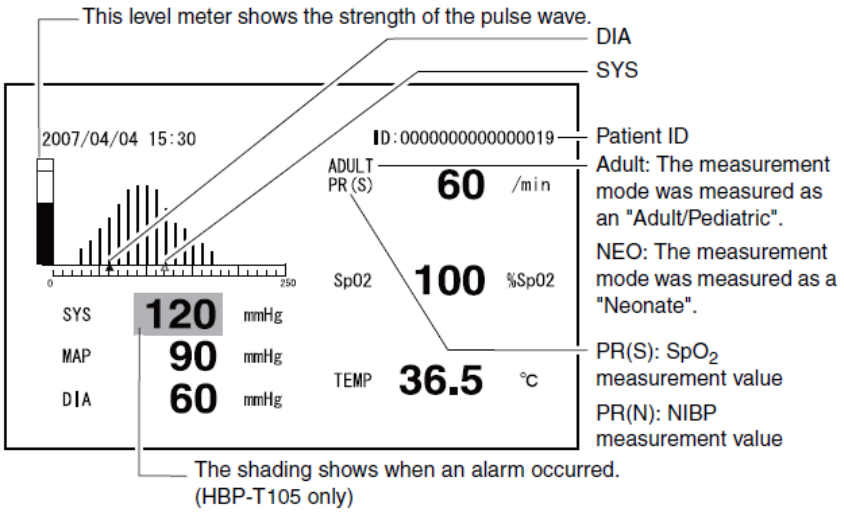
Simple list recording (LST)



- 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 recorded as “Unknown”.
- 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	Inputting an ID requires the optional bar code reader.

Measurement value recording (OSCL)



- If there is no NIBP measurement value, this recording 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.
- If an ID is not entered or the patient changes, then the ID section is left blank or recorded as “Unknown”.
- 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 recorded is the data for when cuff measurement starts. ■ Inputting an ID requires the optional bar code reader.

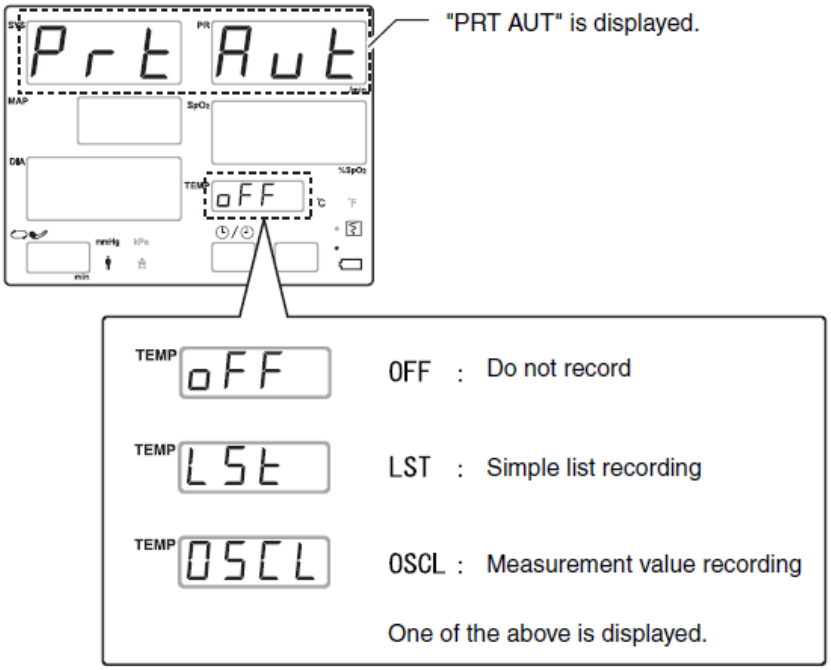
Measurement Record Selection

About Utility Mode

Recording for measurement can be selected in “Utility Mode”.
For details on “Utility Mode”, see “9. Setup” “Utility Mode” (Page 89).

Measurement record selection screen

This function will record 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.



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 type, press the [Menu/Enter] switch to enter that type.
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 6 “List Screen” (Page 57).

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 OMRON Technical Service.
 Flashing somewhat rapidly	Head voltage error	
 Flashing slowly	Head temperature error	

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

9. Setup

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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 end sound ON/OFF selection.
6. BP silent mode selection
7. Blood pressure measurement end sound ON/OFF selection
8. Measurement record selection (only for models with recorder) (Automatic Recording)
9. List record pattern selection (only for models with recorder) (Manual Recording)
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

*HBP-T105 only

**Only when External output is selected.

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SETTING MODE

Setting Procedure

1. How to enter setting mode

Press the [Menu/Enter] switch.
The system goes into “Setting Mode”.


[Menu/Enter] switch

2. Setting screen selection

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_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

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

* HBP-T105 only

3. Changing the setting contents

Use the [Forward] or [Back] switch to change the contents of the setting.


[Forward] switch
[Back] switch

4. Entering the setting contents

Press the [Menu/Enter] switch.
The setting content is entered and the display moves to the next setting item.

5. Exiting Setting Mode

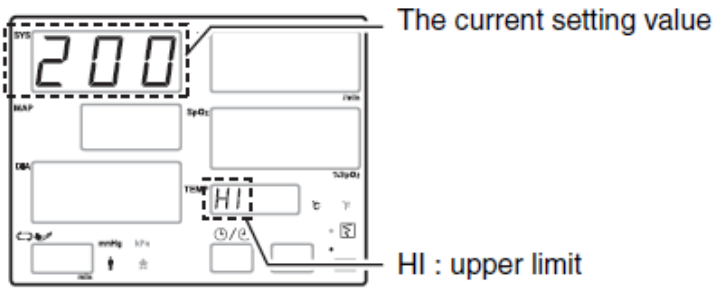
If you do not press a switch for 10 seconds or press [Cuff Start/Stop] or [Alarm Silence], “Setting Mode” ends and the display returns to the basic screen.

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. (HBP-T105 only)

Setting Method for Each Item

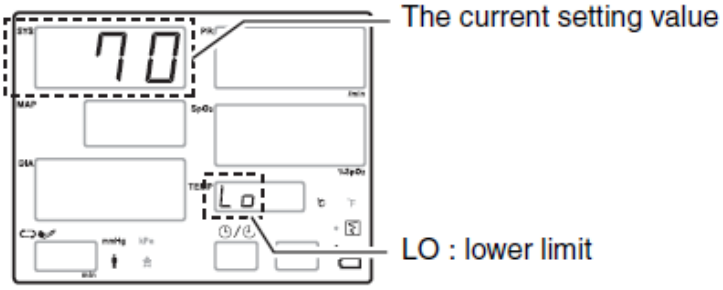
1. SYS upper limit alarm setting (HBP-T105 only)

This sets the SYS upper limit alarm value.
For details, see “7. Alarms” “Alarm Setting” (Page 61).



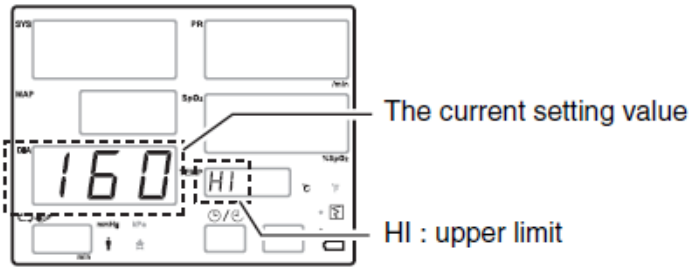
2. SYS lower limit alarm setting (HBP-T105 only)

This sets the SYS lower limit alarm value.
For details, see “7.Alarm” “Alarm Setting” (Page 61).



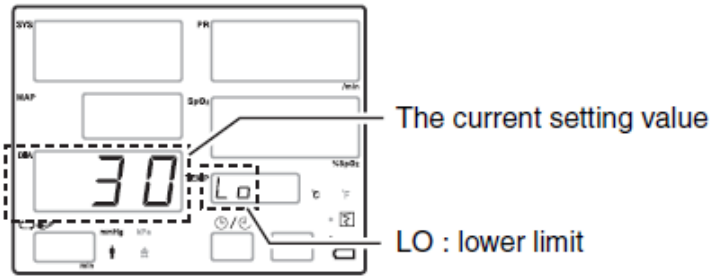
3. DIA upper limit alarm setting (HBP-T105 only)

This sets the DIA upper limit alarm value.
For details, see “7.Alarms” “Alarm Setting” (Page 61).



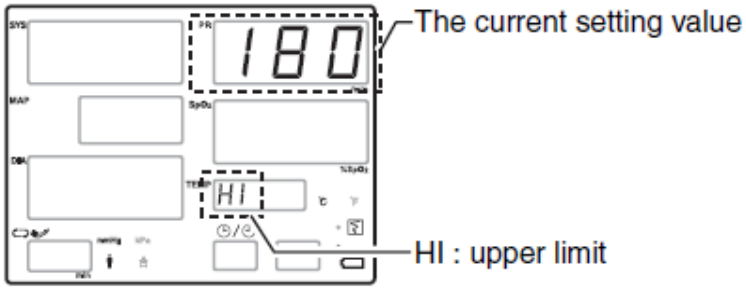
4. DIA lower limit alarm setting (HBP-T105 only)

This sets the DIA lower limit alarm value.
For details, see “7.Alarms” “Alarm Setting” (Page 61).



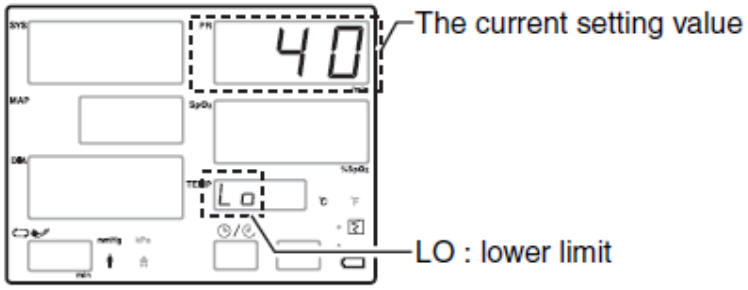
5. PR upper limit alarm setting (HBP-T105 only)

This sets the PR upper limit alarm value.
For details, see “7.Alarms” “Alarm Setting” (Page 61).



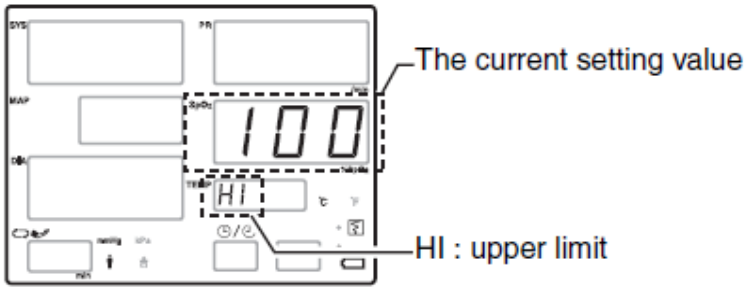
6. PR lower limit alarm setting (HBP-T105 only)

This sets the PR lower limit alarm value.
For details, see “7.Alarms” “Alarm Setting” (Page 61).



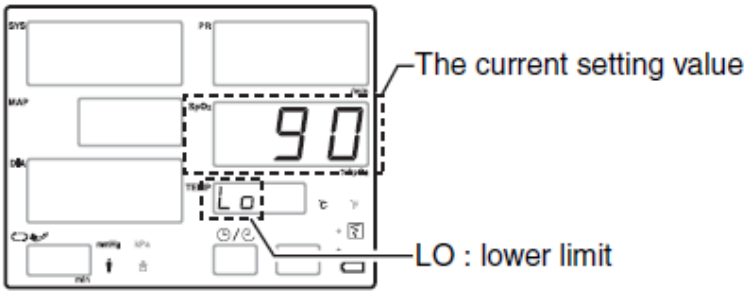
7. SpO_2 upper limit alarm setting (HBP-T105 only)

This sets the SpO_2 upper limit alarm value.
For details, see “7.Alarms” “Alarm Setting” (Page 61).



8. SpO_2 lower limit alarm setting (HBP-T105 only)

This sets the SpO_2 lower limit alarm value.
For details, see “7.Alarms” “Alarm Setting” (Page 61).

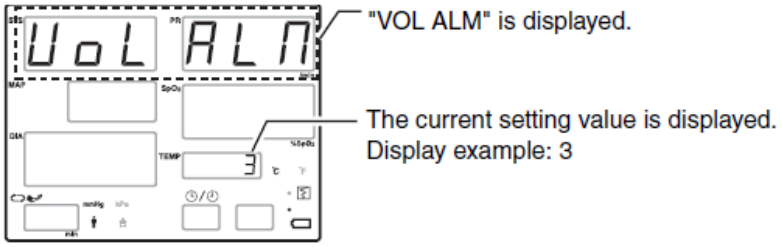


9. Alarm volume setting

This sets the alarm volume.

Clear measurement value display

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.

Clear measurement value display

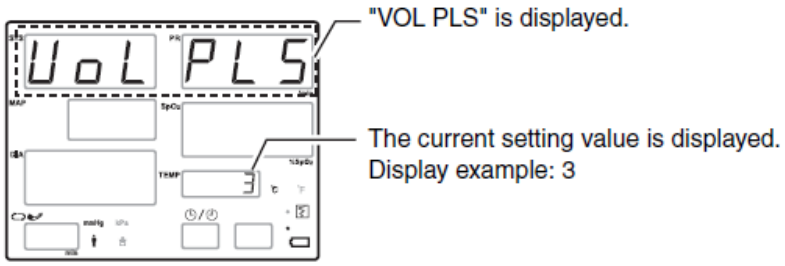
When you have selected the setting value, press the [Menu/Enter] switch to enter the value.
When you do, the setting screen display moves to the next setting item.

Clear measurement value display

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 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

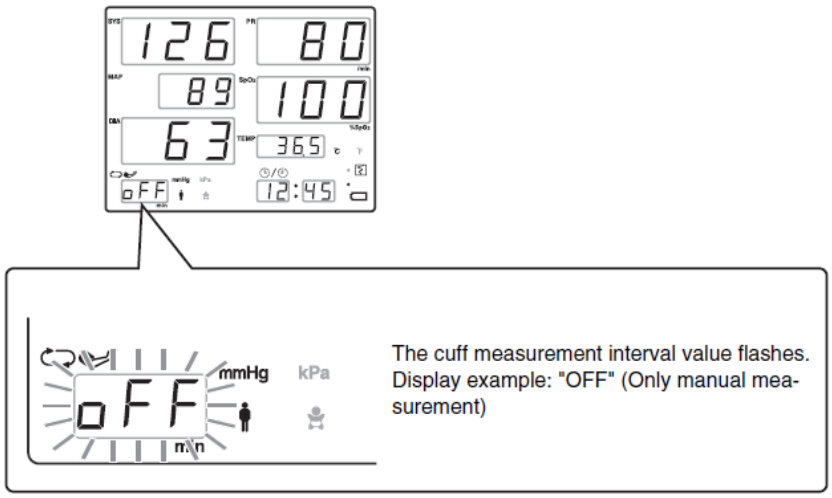
If you do not press a switch for 10 seconds or press [Cuff Start/Stop] or [Alarm
Silence], “Setting Mode” ends and the display returns to the basic screen.

11. Cuff measurement interval selection (HBP-T105 only)

This sets the cuff measurement interval.

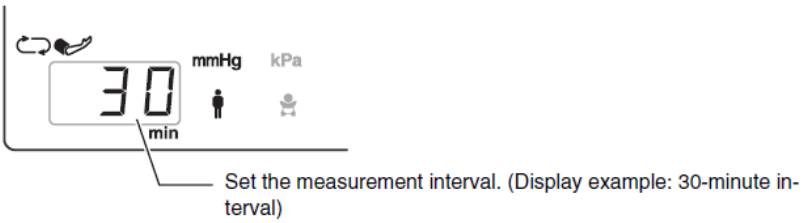
Cuff measurement interval selection screen

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

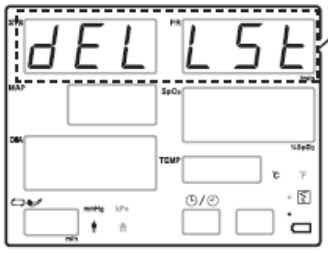
When you have selected the value, press the [Menu/Enter] switch to enter the selection.
When you do, the selection screen display moves to the next setting item.

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.

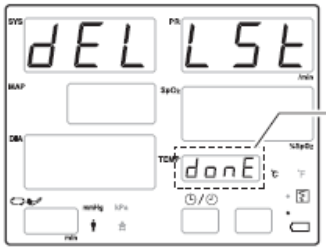
12. Delete list

The list data is erased.
For details, see “6. List Screen” “Deleting List Data” (Page 57).



"DEL LST" is displayed.

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



"DONE" is displayed.

UTILITY MODE

Setting Procedure

1. How to enter Utility Mode

Switch the power “OFF”.
While holding down the [Cuff Start/Stop] switch, press the [Power] switch.
The device goes into “Utility Mode”.

2. Setting screen selection

Each time the [Menu/Enter] switch is pressed, the setting screen switches in order to as follows:
(Some screens are only displayed if the corresponding option is installed.)

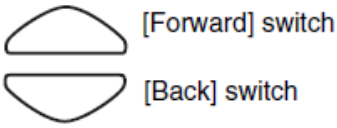

[Menu/Enter] switch

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) (Automatic Recording)
9. List record pattern selection (only for models with recorder) (Manual Recording)
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

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

**May not display depending on the External output selection.

3.	Charging the setting contents	Change the setting contents with the [Forward] switch or the [Back] switch. 
4.	Entering the setting contents	Press the [Menu/Enter] switch. The setting content is entered and the display moves to the next setting item.
5.	Exiting Utility Mode	To end “Utility Mode” and return to the basic screen, switch “OFF” the power for the device, then switch it “ON” again.

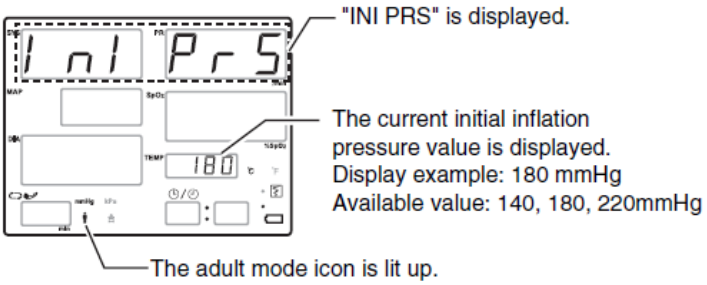
Setting Method for Each Item

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 “3. Non-Invasive Blood Pressure Measurement (NIBP)” “Selecting the Measurement Mode” (Page 19).

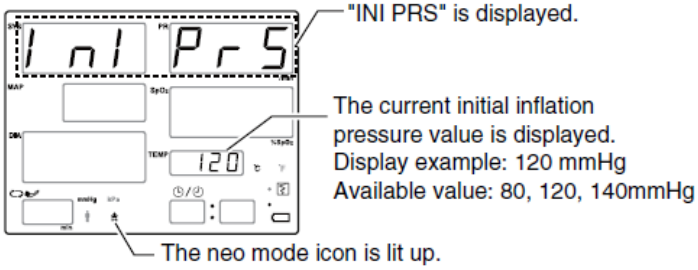
2. Adult initial inflation pressure value setting

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. (HBP-T105 only)
For the HBP-T105S, this is the inflation value when “Smart Inflation” is set to “OFF”.
For details, see “3. Non-Invasive Blood Pressure Measurement (NIBP)” “Other Function – Initial Inflation Pressure value” (Page 29).



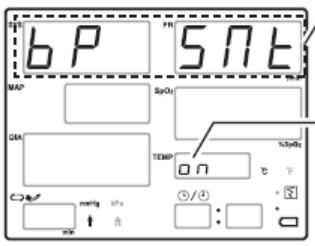
3. Neonate initial inflation pressure value setting

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. (HBP-T105 only)
For the HBP-T105S, this is the inflation value when “Smart Inflation” is set to “OFF”.
For details, see “3. Non-Invasive Blood Pressure Measurement (NIBP)” “Other Function – Initial Inflation Pressure Value” (Page 29).



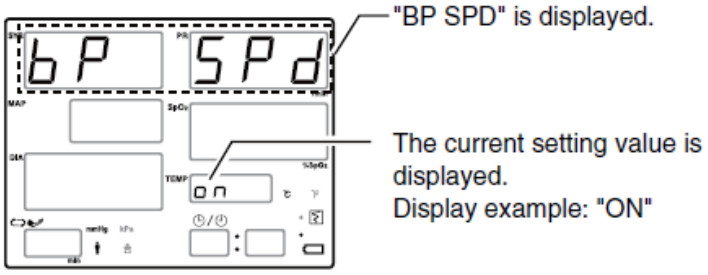
4. Smart Inflation ON/OFF selection

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 “3. Non-Invasive Blood Pressure Measurement (NIBP)” “Smart Inflation” (Page 31).



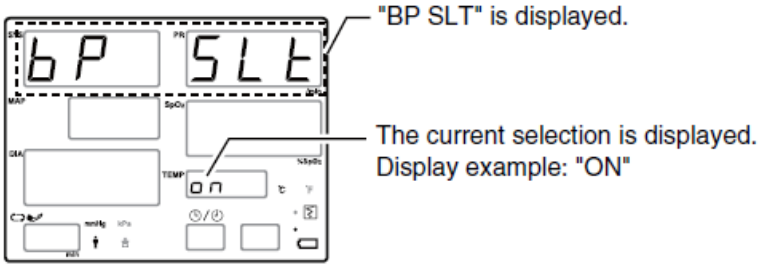
5. High Speed measurement ON/OFF selection (Default is OFF)

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 “3. Non-Invasive Blood Pressure Measurement (NIBP)” “High Speed Measurement” (Page 32).



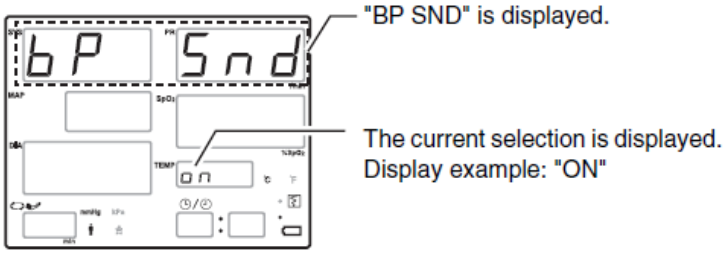
6. BP silent mode selection

When this function is switched “ON”, the pump sound is suppressed.
For details, see “3. Non-Invasive Blood Pressure Measurement (NIBP)” “BP Silent Mode” (Page 33).



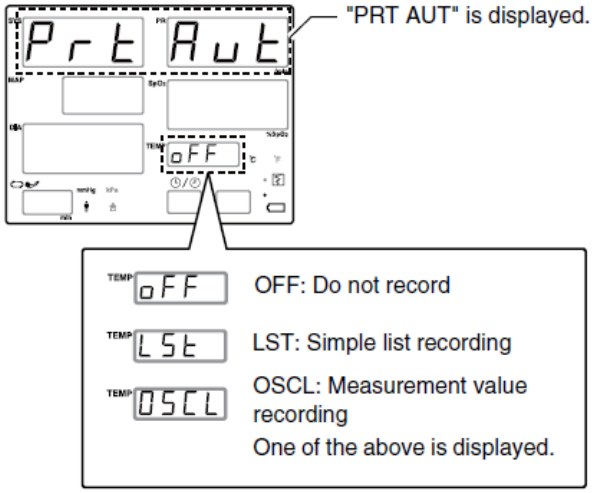
7. Blood pressure measurement end sound ON/OFF selection

When this function is switched “ON”, a sound is played when blood pressure measurement ends.
For details, see “3. Non-Invasive Blood Pressure Measurement (NIBP)” “Blood Pressure Measurement End Sound” (Page 33).



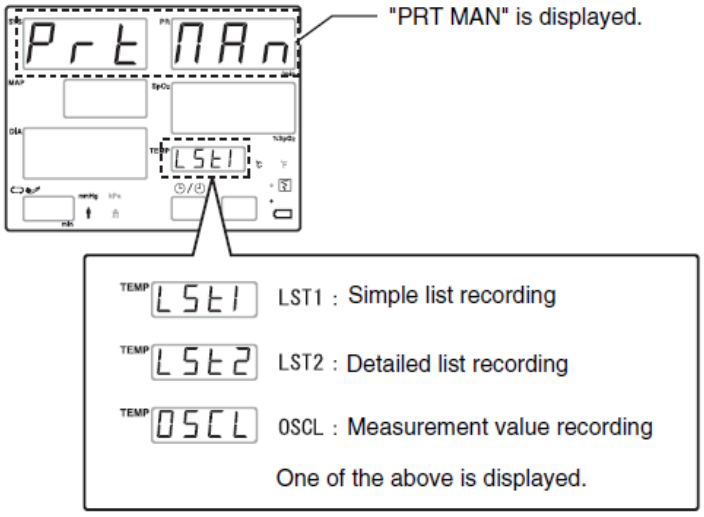
8. measurement record selection (Automatic Recording)

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 “8. Recorder” “Automatic Recording” (Page 75).



9. List record pattern selection (Manual Recording)

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 “8. Recorder” “Manual Recording” (Page 71).

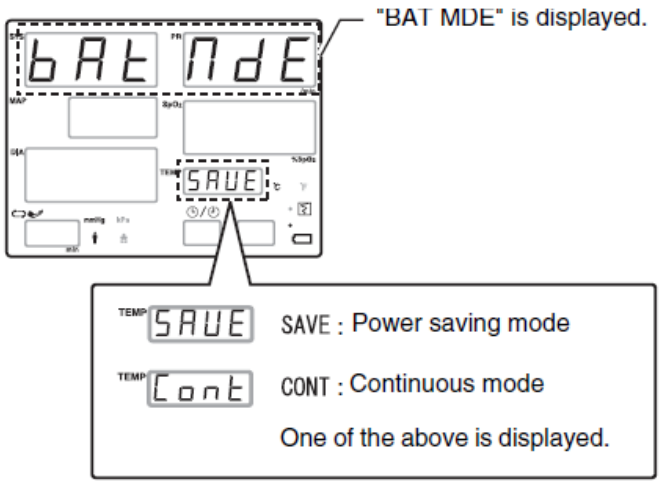


10. External output selection — This screen makes settings related to external output selection.

11. List record pattern selection (Manual Recording) — When the “SAVE” option is selected, the device enters a save mode after three minutes of no activity. If any operation is carried out (for example a measurement update or nay operator action) or an alarm is generated, the save mode ends and the display resumes. If there is no activity after 30 minutes in save mode, then the device automatically shuts down.

Note	If the HBP-T105 is set to interval measurements (page 25) then the device will not trigger the save mode.

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:

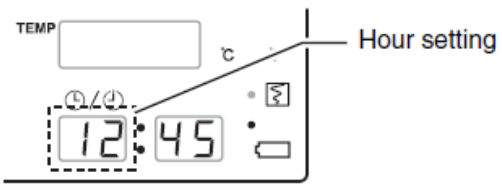


Selecting SAVE/CONT — Use the [Forward] or [Back] switch to select “SAVE” or “CONT”.

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.

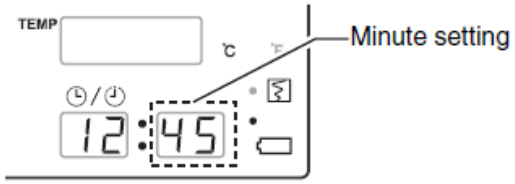
Exiting the selection screen — To end “Utility Mode” and return to the basic screen, switch the power “OFF”, then “ON” again.

12. “HOUR” setting — This sets the hour for the clock.
For details, see “2.Preparations Before Use” “Checking and Revising the Date and Time” (Page 14).



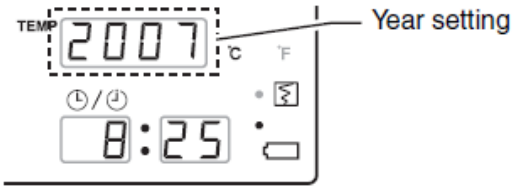
13. External output selection

This sets the minute for the clock.
For details, see “2.Preparations Before Use” “Checking and Revising the Date and Time” (Page 14).



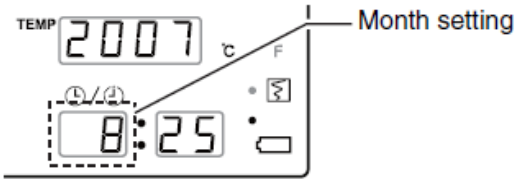
14. External output selection

This sets the year for the clock.
For details, see “2.Preparations Before Use” “Checking and Revising the Date and Time” (Page 14).



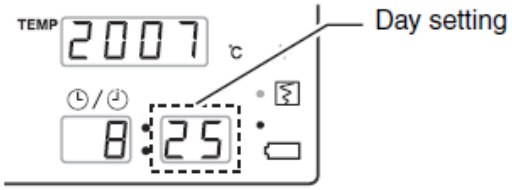
15. External output selection

This sets the month for the clock.
For details, see “2.Preparations Before Use” “Checking and Revising the Date and Time” (Page 14).



16. External output selection

This sets the day for the clock.
For details, see “2.Preparations Before Use” “Checking and Revising the Date and Time” (Page 14).



17. Date format selection

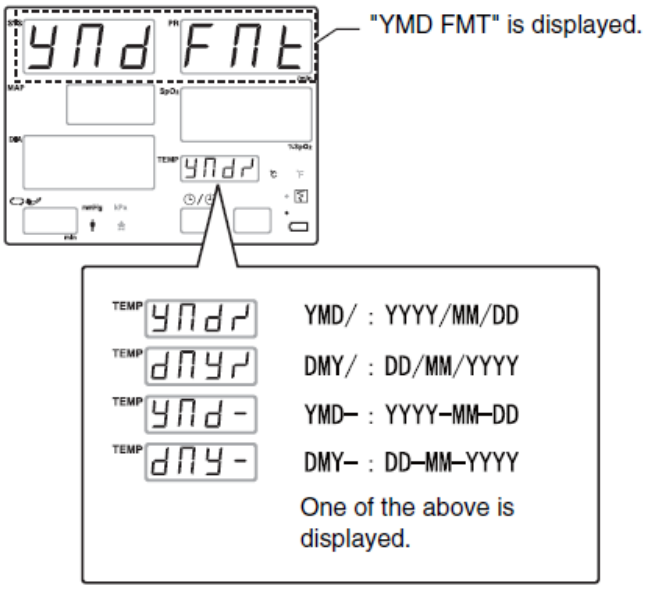
The date format for recording can be selected from the following.

1	YMD/:YYYY/MM/DD	2	DMY/:DD/MM/YYYY
3	YMD-:YYYY-MM-DD	4	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

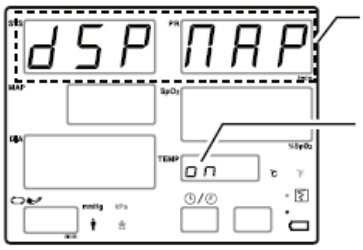
To end “Utility Mode” and return to the basic screen, switch the power “OFF”, then “ON” again.

18. MAP display ON/OFF selection

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

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”, the “ON” again.

19. LAN group number setting

This screen makes settings related to LAN group numbers.
Contact Mediana Technical Service when making these settings.
(May not display depending on the External output selection.)

20. MAP display ON/OFF selection

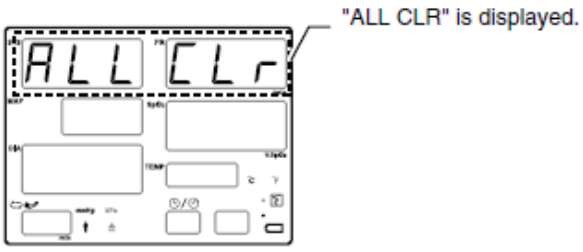
This screen makes settings related to LAN bed numbers.
Contact Mediana Technical Service when making these settings.
(May not display depending on the External output selection.)

21. Default setting

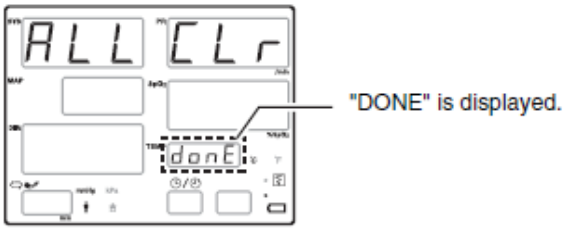
All the setting values are set to their factory-set values.
For details on the factory settings, see "Default Setting" (Page 127).

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.

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10. Internal Battery

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INTERNAL BATTERY

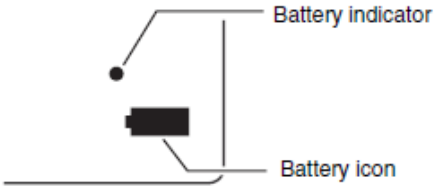
About the Internal Battery

When the battery is installed in the device, 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.

When Using the Internal Battery for the First Time

When using the internal battery for the first time, it is necessary to install it in the device and charge it. Following the instructions in "Preparations Before Use" (Page 11) "Installing the Internal Battery" and "Charging the Internal Battery", 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 device and the AC adapter cable is plugged into an AC socket, the battery is charged whether the device 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)
Not Charging	ON or OFF	OFF	Abnormal battery voltage is detected. Immediately stop using the device and replace the battery with a new one.

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 device on the battery, the battery indicator flashes red and the alarm sounds.

- Connect the AC adapter to the device 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 device 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 (77°F)
  - 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 (50°F) or higher than 30°C (86°F), 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 (32 to 104°F). 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.

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11. Appendix

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ERROR CODE TABLE

System Error Code Table

Error code	Priority	Sound		Contents	Check items
		Type	Stop		
E01	Highest		Possible	ROM checksum error	An error was detected in the device's internal ROM. Switch the power for the device "OFF", then "ON" again. If this does not solve the problem, there is a possibility that the device is broken. Immediately stop using device and contact Mediana Technical Service.
E02				RAM error	An error was detected in the device's internal RAM. Switch the power for the device "OFF", then "ON" again. If this does not solve the problem, immediately stop using device and contact Mediana Technical Service.
E81	Highest		Possible	Battery is discharged	An error was detected. Charge the battery. If this does not solve the problem, immediately stop using device and contact Mediana Technical Service
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.
E91	Highest		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 Mediana Technical Service.
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 Mediana Technical Service.

Error code	Priority	Sound		Contents	Check items
		Type	Stop		
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 device's internal clock IC. Switch the power for the device "OFF", then "ON" again. If this does not solve the problem, immediately stop using it and contact Mediana Technical Service.
E95	High	-	-	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 Mediana Technical Service.
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 Mediana Technical Service.
E99	Highest		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 Mediana Technical Service.

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	High		Possible	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 Mediana Technical Service.
E09				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 Mediana Technical Service.
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.
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				

*For HBP-T105S, the alarm does not sound.

Error code	Priority	Sound		Possible Causes	Check items
		Type	Silence		
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				
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				

* For HBP-T105S, the alarm does not sound.

Error code	Priority	Sound		Possible Causes	Check items
		Type	Silence		
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				
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				

* For HBP-T105S, the alarm does not sound.

Error code	Priority	Sound		Possible Causes	Check items
		Type	Silence		
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 device	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 Mediana Technical Service.

* For HBP-T105S, the alarm does not sound.

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

  Example: E12 (remeasurement) 

- In case of E10 to E21, the error code may not be displayed depending on the setting
  In case of E11 to E21, it can be checked at “Lost 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 Mediana Technical Service.
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 HBP-T105S, 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 Mediana Technical Service.
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 Mediana Technical Service.
E39	High		Possible	Internal module abnormality • A breakdown was detected in the device's internal module. • Communication with the device'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 Mediana Technical Service.

- 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 device. 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 Mediana Technical Service.
E41	Low	None	-	Temperature is T ≤ 26.6°C 42.3° ≤ 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 Mediana Technical Service.
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 Mediana Technical Service.
E49				Internal module abnormality • A breakdown was detected in the device's internal module. • Communication with the device'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 Mediana Technical Service.

- 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

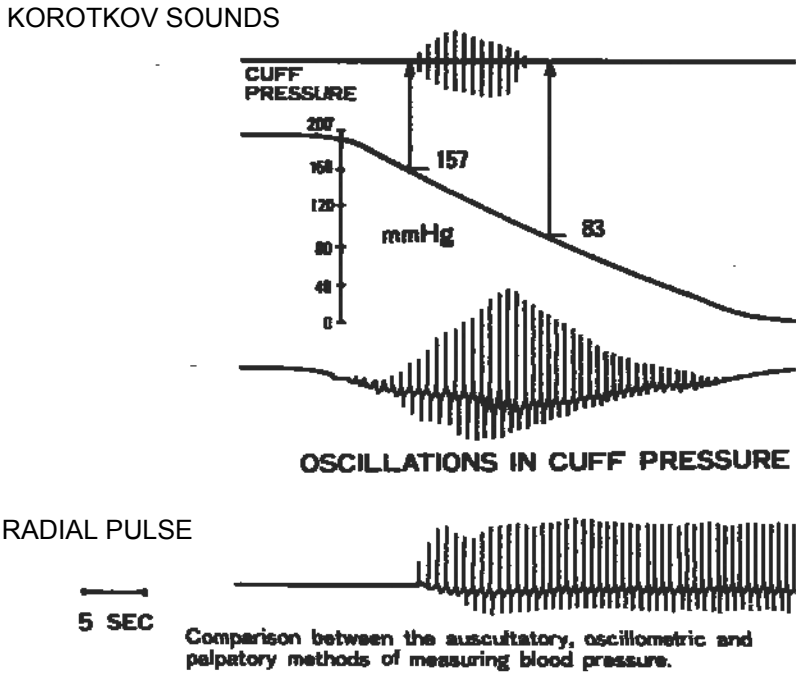
Oscillometric method

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

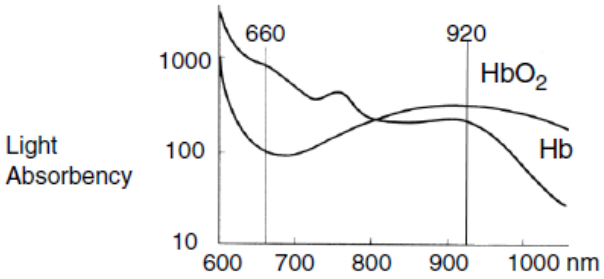
Pulse oximetry method

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

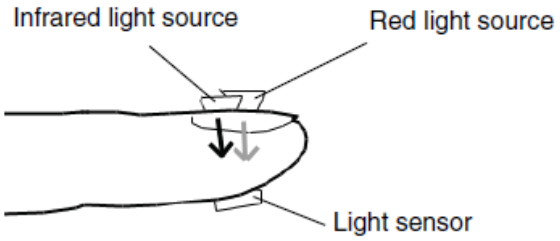
$$SpO_2\ (\%) = 100 \times \frac{HbO_2}{HbO_2 + Hb}$$

HbO_2: Oxidized hemoglobin
Hb: Reduced hemoglobin

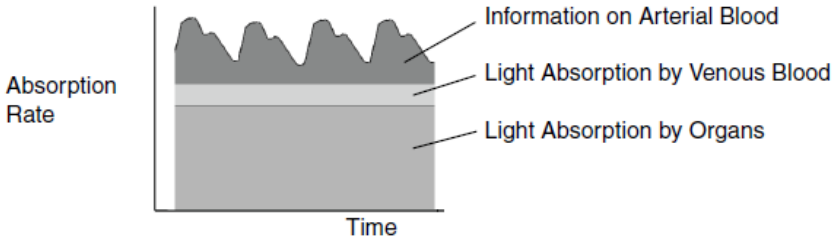
Usually, an artery with a high ratio of oxidized hemoglobin is red while a low ratio will cause the venous blood to look blackish. This is easily understood when the light absorbency coefficient of wavelengths for each hemoglobin type are viewed.



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

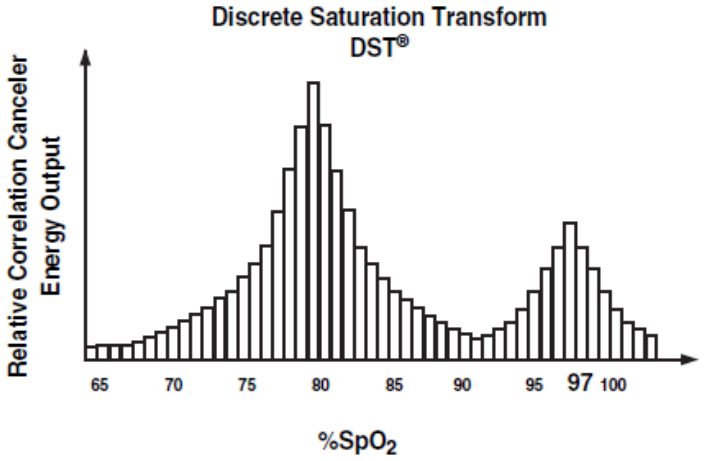
Again, R is the ratio of two arterial pulse-added absorbance signals and its value is used to find the saturation SpO_2 in an empirically derived equation into the oximeter's software. The values in the empirically derived equation are based upon human blood studies against a laboratory co-oximeter on healthy adult volunteers in induced hypoxia studies.

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

$$N' = S(660) - S(905) \times R$$

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.

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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" "Default setting". For details, see Page 101.

The backups are as follows.
Items with "O": Settings are retained even if the power is switched off.
Items with "△": If the operator sets a value for this setting lower than the factory setting value, the setting returns to the factory setting value after the more than 30 seconds power OFF and the Utility Mode setting.

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	Back up
Alarm*	NIBP	SYS	Upper limit	200 mmHg	O
			Lower limit	70 mmHg	△
		SYS (Neo)	Upper limit	130 mmHg	O
			Lower limit	50 mmHg	△
		DIA	Upper limit	160 mmHg	O
			Lower limit	30 mmHg	O
		DIA (Neo)	Upper limit	100 mmHg	O
			Lower limit	10 mmHg	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	△
	SpO_2 (Neo)		Upper limit	100 %SpO_2	O
			Lower limit	85 %SpO_2	△

*HBP-T105 only

Setting item			Factory settings	Back up
NIBP*	Measurement Mode		Adult	O
	Blood pressure unit		mmHg	O
	Init. Pres.	Adult	180 mmHg	O O
		Neo	120 mmHg	O O
		High speed Measurement	OFF	O O
		Smart Inflation	ON	O O
	NIBP Interval*		OFF	O O
	BP silent mode		ON	O 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 select		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

* HBP-T105 only.

MAINTENANCE

Maintenance Inspection and Safety Management

Medical equipment including the HBP-T105/S 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

- 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
- AC ADAPTER, AC ADAPTER CABLE

* Only when the optional recorder is installed.
** Only for models with the optional SpO_2.

Device Maintenance

Note	■ Always unplug the power cord from the wall socket prior to conducting maintenance work, as there is a danger of electric shock. ■ Do not soak the device or accessories in any liquid. Also, keep liquids out of them. ■ When using disinfecting solutions, be sure to follow manufacturer instructions. ■ After cleaning the device, dry it completely before turning the power ON. ■ Do not use solvents (such as thinner and benzene) or abrasive cleaning powders for cleaning, as these may damage the surface of the device. ■ Do not sterilize the device 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: 25˚C (77˚F)
- Cuff blood pressure measurement interval: 15 minutes (4 times/hour)
- Recorder: Not used
- Battery operation : SAVE

Service

The device 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 service manual. Qualified service personnel in the user's institution should perform periodic inspections of the device. If service is necessary, contact qualified service personnel or Mediana Technical Service

Note	■ Do not put solutions on the accessories or wet the connectors. ■ When using disinfecting solutions, be sure to follow manufacturer instructions. ■ Do not use solvents (such as thinner and benzene) or abrasive cleaning powders for cleaning, as these may damage the surface of accessories. ■ Do not sterilize the accessories with autoclave or high-density ozone.

Cleaning and disinfection — Cleaning and disinfecting should be performed in accordance with hospital policy after use on each individual patient. See the following explanation for details.

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.

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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 device 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 device.

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")

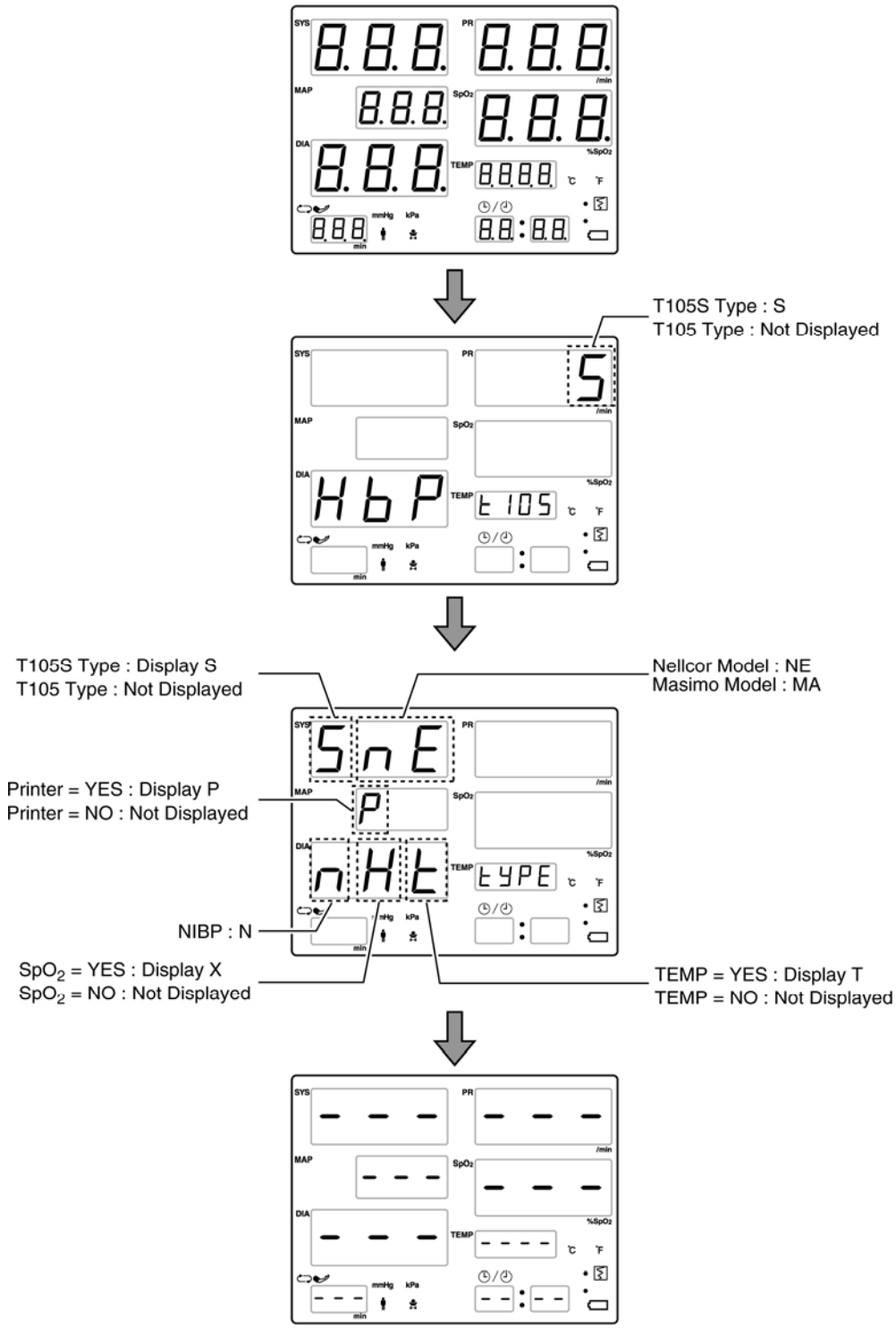
Arterial oxygen saturation by pulse oximeter (SpO_2) measurement section**
- Attach the SpO_2 sensor to a finger, and check that the value is displayed.

Recorder*	■ 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.

POWER ON DISPLAY

Once the power is turned “ON”, the following display will appear in order in roughly 2 second intervals.



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MAINTENANCE CHECKS

Before conducting safety checks, be sure to implement the items in the "Device Maintenance" (Page 128) and "Accessory Care" (Page 129) sections.

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 Mediana. ■ 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 device.
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 & 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.

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TROUBLESHOOTING

If the device is not functioning properly, check the following before contacting Mediana Technical Service.

Main Unit

Power cannot be turned ON		
	Cause	Action
	The AC adapter cable is disconnected or loose.	Check the AC adapter cable connections.

The device heats up		
	Cause	Action
	Check to see if item(s) have been placed on or very neat the device. The device may be malfunctioning if it is so hot it is unbearable to touch.	Provide ventilation around the device.

Non-Invasive Blood Pressure Measurement (NIBP)

Pressure does not rise after [Cuff Start/Stop] switch is pressed.

	Cause	Action
	Cuff hose connection is loose.	Check air hose connection
	Cuff air is leaking. Hose is kinked if pressure is displayed.	Replace cuff. Check for kinked and remove them.

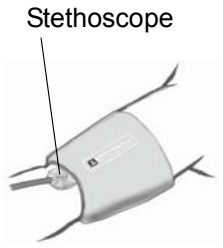
Measurement failure

	First, give patient a physical examination. Next, read error codes on display screen and check selections using the “Error Code Table” (Page 109) 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.)

Measurement readings unreliable



Cause	Action
Air discharge is fast.	Check for loss cuff hose connection.
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)

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)

No temperature measurement

	Cause	Action
	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

	Cause	Action
	Patient's mouth was open.	Ask patient to keep mouth closed during measurement.
	Improper probe placement	Verify placement of probe as shown on page 51. 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 Cushion Envelope	Corrugated Paper Corrugated Paper Vinyl
Main Unit and Accessories	Enclosure Internal parts Chassis Battery	ABS General Electronic Parts Aluminum and Iron Lead-acid
Option Module (Bar code Reader)	Enclosure Trigger Button Internal parts	PC POM General Electric Parts
Option Module (External Output Unit)	Enclosure Internal parts	ABS General Electric Parts

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SPECIFICATION

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 (0.98 in/sec)
Paper width	58 mm (2.28 in)
Valid width	54 mm (2.13 in)

General standard	93/42/EEC as amended by 2007/47/EC Medical Device Directive EN ISO13485:2003 Quality System - Medical Devices – Requirements for regulating purposes EN ISO14971:2009 Application of risk management to Medical devices IEC 60601-1:1988+A1:1991+A2:1995, EN 60601-1-:1996 Medical electrical equipment-Part1:General requirements for safety IEC60601-1-4:2000, EN60601-1-4:1996+A1:1999 Collateral standard for Programmable medical systems IEC60601-1-6:2010, EN60601-1-6:2007 Collateral standard for Usability ISO10993-1:2009, EN ISO10993-1:2009 Biological evaluation of medical devices – Part 1: Evaluation and testing ISO10993-5:2009, EN ISO10993-5:2009 Biological evaluation of medical devices – Part 5: Tests for in vitro cytotoxicity IEC60601-2-49:2001, EN60601-2-49:2001 (HBP-T105 only) Particular requirements for the Safety of Multifunction patient monitoring equipment IEC62304:2006, EN62304:2006 Software life cycle processes IEC62366:2007, EN62366:2008 Medical devices - Application of usability engineering to medical devices
Labeling standard	EN1041:2008 Information supplied by the Manufacturer with Medical devices EN980:2008 Graphical symbols for use in the labeling of Medical devices
Alarm standard	IEC60601-1-8:2006, EN60601-1-8:2007 (HBP-T105 only) Alarm systems requirements, tests and guidance in medical electrical equipments

Protection Class	Class I Internal powered equipment
Degree of Protection	SpO2 Type BF with defibrillator protection  NIBP Type BF with defibrillator protection  Temperature Type BF 
Mode of Operation	Continuous
MDD	Class II a (HBP-T105S only) Class II b (HBP-T105 only)

Output Terminals (Optional)

Serial Port	RS232C Conformity Serial interface D-sub 15 pin connector
Reference Standards	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 Mediana Technical Service.

Environmental Conditions

Power supply	
AC ADAPTER	
Input voltage range	AC 100V to 240V
Rated Current	4.28A
Frequency	50 / 60 Hz
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 1060 hPa
Storage and transportation	
Temperature range	-20 to 60°C (-4 to 140°F)
Humidity range	10 to 95% (not condensed)
Atmospheric pressure	500 to 1060 hPa
EMC: Reference standard	IEC60601-1-2:2001 EN60601-1-2:2001+A1:2006 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 299 mmHg
Neonatal mode	0 to 149 mmHg
Pressure display accuracy	Less than ±3mmHg
NIBP measurement range	
Adult/pediatric mode	
SYS	60 to 250 mmHg
MAP	45 to 235 mmHg
DIA	40 to 200 mmHg
Pulse rate	40 to 200/min
Neonatal mode	
SYS	40 to 120 mmHg
MAP	30 to 100 mmHg
DIA	20 to 90 mmHg
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
Neonatal mode			
	SYS upper	limit	40 to 130 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+A2:2009
Non-invasive sphygmomanometers
General requirements

EN1060-3:1997+A2:2009
Non-Invasive sphygmomanometers -
Part3: Supplementary requirements for electro-mechanical blood pressure
measuring systems.

EN1060-4:2004
Non-invasive sphygmomanometers-Test procedures to determine the overall
system accuracy of automated noninvasive sphygmomanometers

ANSI/AAMI SP-10:1992, 2002
Electronic or automated
Sphygmomanometers

IEC60601-2-30:1999
EN60601-2-30: 2000
(HBP-T105 only)
Particular requirements for the safety, including essential performance, of
automatic cycling indirect blood pressure monitoring equipment

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" digits. 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.
Reference Standard:	EN ISO9919:2009 Medical electrical equipment – Particular requirements for the basic safety and essential performance of pulse oximeter equipment for medical use

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	71 to 100% SpO_2	
	Default	100% SpO_2	
SpO_2 lower	limit	70 to 99% SpO_2	
	Default	90% SpO_2	
Pulse rate upper	limit	30 to 260/min	
	Default	180/min(adult) 200/min(Neo)	
Pulse rate lower	limit	25 to 255/min	
	Default	40/min(adult) 50/min(Neo)	
Alarm delay time			
Maximum delay time	10 sec		
Average delay time	10 sec		

Pulse Oximeter (Models with Nellcor® 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" digits. 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. Saturation (%SpO_2) - During No Motion Conditions Adult/pediatric 70 to 100% ±2digits 0 to 69% Unspecified Neonatal 70 to 100% ±3digits 0 to 69% Unspecified Saturation (%SpO_2) - During Motion Conditions Adult/pediatric 70 to 100% ±3digits 0 to 69% Unspecified Neonatal 70 to 100% ±3digits 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 30 sec	
Defibrillator protection	Protected	
Alarm range		
SpO_2 upper	limit	71 to 100% SpO_2
	Default	100% SpO_2
SpO_2 lower	limit	70 to 99% SpO_2
	Default	90% SpO_2
Pulse rate upper	limit	30 to 260/min
	Default	180/min(adult) 200/min(Neo)
Pulse rate lower	limit	25 to 255/min
	Default	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 - # 2887A Rectal- # 2888A
Modes:	Predictive- Measurement complete within 10 seconds of tissue contact Monitoring- Continuous temperature measurement
Display resol:	±0.1°C (±0.2°F)
Display range:	Predictive Mode 35.6 ~ 41.1°C (96.1~105.9°F) Monitoring Mode 26.7 ~ 42.2°C (80.1~107.9°F)
Accuracy:	Monitoring Mode ±0.1°C (±0.2°F)
Scale:	Selectable from °F to °C
Reference Standard:	EN12470-4:2002 Performance of Electrical Thermometers for continuous Measurement ASTM E1112-00:2006 Standard specification for electronic thermometer for intermittent determination of patient temperature

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 HBP-T105/S in an electromagnetic environment as described below.
The user should check that the HBP-T105/S is used in such an environment.

Electromagnetic Emissions:
(IEC60601-1-2)

Emission Test	Compliance	Electromagnetic Environment
RF emission CISPR 11	Group 1	The HBP-T105/S 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 HBP-T105/S is suitable for use in all establishments.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations/flicker IEC 61000-3-2	Class 5	

Electromagnetic Immunity
(IEC60601-1-2)

Immunity test	**IEC60601-1-2 test level**	**Compliance level**	**Electromagnetic environment - guidance**
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	±6 kV 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 %.
Electric 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	<5 % U_T for 0.5 cycle	Mains power quality should be that of a typical commercial or hospital environment. If the user of the HBP-T105/S requires continued operation during power mains interruptions, it is recommended that the HBP-T105/S be powered from an uninterruptible power supply or a battery.
	40 % U_T for 5 cycles	40 % U_T for 5 cycles	
	70 % U_T for 25 cycles	70 % U_T for 25 cycles	
	<5 % U_T for 5 sec.	<5 % U_T for 5 sec.	
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.			

Immunity test	IEC60601-1-2 test level	Compliance level	Electromagnetic environment - guidance
			Portable and mobile RF communications equipment should be used no closer to any part of the HBP-T105/S, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommend separation distance** $d = 1,2\sqrt{P}$ $d = 1,2\sqrt{P}$ 80 MHz to 800 MHz $d = 2,3\sqrt{P}$ 800 MHz to 2,5 GHz
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz 80% AM (2Hz)	3 Vrms	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).
Radiated RF IEC 61000-4-3	3 Vrms 800 MHz to 2,5 GHz 80% AM (2Hz)	3 V/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: 

Note1: At 80 MHz and 800 MHz, the higher frequency range applies.
Note2: 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 HBP-T105/S is used exceeds the applicable RF compliance level above, the HBP-T105/S should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the HBP-T105/S.

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

Recommended Separation Distances:

Recommended separation distance between portable and mobile RF communications equipment and the HBP-T105/S

The HBP-T105/S is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the HBP-T105/S can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the HBP-T105/S as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter W	Separation distance according to frequency of transmitter m		
	150 kHz to 80 MHz $d = 1,2\sqrt{P}$	80 MHz to 800 MHz $d = 1,2\sqrt{P}$	800 kHz 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

For transmitters rated at a maximum output power not listed above, the recommended separation distance *d* in metres (m) can be determined 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.

Note1: At 80MHz and 800MHz, the separation distance for the higher frequency range applies

Note2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

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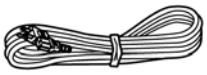
OPTIONAL ACCESSORIES

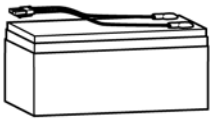
Optional Accessories

Accessories for consumption and options may be required from the start, depending on conditions of use. In view of this, please order the necessary accessories.

AC ADAPTER
HBP-AC-14V4

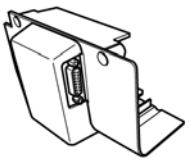


AC ADAPTER
CABLE
C0440004A

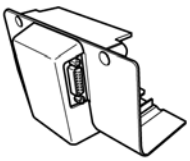


INTERNAL BATTERY
HBP-BAT-3212U

BAR CODE READER
HBP-BCRD-A



RS-232 PORT
(with TEMP)
HBP-T105-IOT



RS-232 PORT
(without TEMP)
HBP-T105-IO

QUICK GUIDE
HBP-QMANU

NIBP optional Accessory

Name	Parts Name	Parts Code	QTY
Reusable Cuffs (With Rectus Fitting)	Infant	C030101A-NLR	5
	Child/Small Adult	C030103A-NLR	5
	Adult	C030107A-NLR	5
	Large Adult	C030109A-NLR	5
	Long Adult	XC030115A-NLR	1
	Thigh	C030111A-NLR	5
Disposable Cuff for Adult or Child (With Luer Fitting) *1	Infant	C0400011B	10
	Child/Small Adult	C0400013B	10
	Adult	C0400015B	10
	Large Adult	C0400019B	10
	Long Adult	C0400021A	10
	Thigh	C0400023A	10
Disposable Cuff for Neonatal (With Slip Luer Fitting) *2	Neonatal #1	C0400001B	10
	Neonatal #2	C0400003B	10
	Neonatal #3	C0400005B	10
	Neonatal #4	C0400007B	10
	Neonatal #5	C0400009B	10
Cuff Assortment Pack	Rectus Reusable Assortment Pack Includes: Adult Cuff Child/Small Adult Infant Cuff Large Adult Cuff	C030191A-NLR	
	Disposable Assortment Pack Includes: 3 Adult Cuffs 2 Child Cuffs 2 Large Adult Cuffs 2 Small Adult Cuffs	C0400081A	
Cuff Hoses	Rectus Cuff Hose, Adult (10 feet)	HOSE ADULT PII	1
	Rectus Cuff Hose, Neonatal (10 feet)	HOSE NEO PII	1
Conversion adapter	HBP-ADAPT-10500	10-500 adapter	1

*1 “HOSE ADULT PII” and “10-500 adapter” are required.
*2 “HOSE NEO PII” are required.

For Nellcor® SpO_2

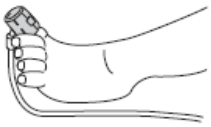
Except for DURASENSOR®, products below are for single-patient use only. When in use, they are connected to the standard accessory extension cable (DOC-10).

Pulse oximeter optional accessory

ADULT FINGER
OXISENSOR®
MAX-A
Patient Weight: 30 kg or over

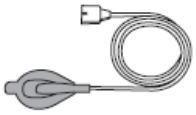
CHILD FINGER
OXISENSOR®
MAX-P
Patient Weight: 10 - 50 kg

ADULT NASAL
OXISENSOR®
MAX-R
Patient Weight: 50 kg or over

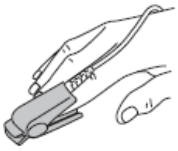


INFANT
OXISENSOR®
MAX-I
Patient Weight: 3- 20 kg

NEONATAL
OXISENSOR®
MAX-N
Patient Weight: 3 kg or less /40kg or over



MAX-FAST®
For Patient's forehead



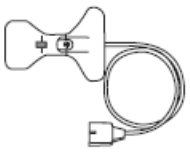
DURASENSOR®
DS-100A
Patient Weight: 40kg or over

EXTENSION CABLE
DOC-10

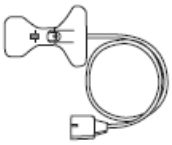
For Masimo® SpO_2

Except for LNCS DC-I, products below are for single-patient use only. When in use, they are connected to the extension cable (LNC-10).

Pulse oximeter optional accessory



SpO_2 SENSOR
LNCS Adtx
Patient Weight: 30kg or over



SpO_2 SENSOR
LNCS Pdtx
Patient Weight: 10 - 50kg

SpO_2 SENSOR
LNCS Neo-L
Patient Weight: < 3kg or > 40kg

SpO_2 SENSOR
LNCS NeoPt
Patient Weight: 1kg or less

SpO_2 SENSOR
LNCS DC-I
Patient Weight: 30kg or over

EXTENSION CABLE
LNC-10

Masimo® is a registered trademark of Masimo Corporation.

Temperature optional accessory (Only models with body temperature measurement)

Blue

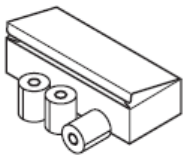
TEMPERATURE PROBE (Oral/axillary) (Alaris® IVAC® X2887A)

Red

TEMPERATURE PROBE (Rectal) (Alaris® IVAC® X2888A)

TEMPERATURE PROBE COVER (Alaris® IVAC® XP850)

Optional accessory (Only models with recorder)



ROLL PAPER (10 Rolls) HBP-T105-PAPER