

DYNASCOPE 8000 Series Patient Monitor

DS-8200 system

Ver. 02

Operation Manual



- * Before using the product,
please read this manual thoroughly.
- * Store this manual where it can be
always referred to.

This manual is for the DS-8200 System Version 02.



Federal Law restricts this device to sale by or on the order of a physician.

CAUTION

- Only physician or persons instructed by physicians are allowed to use the equipment.
- The information contained in this document is subject to change without notice due to improvement in the equipment.

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If this manual has pages missing or out of order, contact Fukuda Denshi for replacement.

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Preface

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Preface

Introduction

Thank you for purchasing this product. Read the "Safety Precautions" thoroughly before use to ensure correct and safe use of the product.

Before using or installing this product, read this manual thoroughly.

Important Notice

For Safe Operation of the Equipment

- (1) Before using this equipment, read this operation manual.
- (2) Fukuda Denshi cannot predict all the dangers which may be caused by misusage of this product or environmental condition.
- (3) For using this equipment, there are many items that "should be performed", "should not be performed", and "cannot be performed". It is not possible to cover all these items in this manual or warning labels. Therefore, it is necessary to also follow the general safety precaution other than the items described in this manual.
- (4) To prevent accidents, usage other than intended, or usage, cleaning, and maintenance not described in this manual should not be performed.
- (5) When using this equipment, follow the respective regulation to minimize the probability of accidents.

Intended Use of this Equipment

This equipment is designed for the following <Intended Use>.

<Intended Use>

The Fukuda Denshi DynaScope Model DS-8000 Series Patient Monitor provides a simple and reliable method to display and document the continuous hemodynamic, cardiovascular observations that are typically required of critically ill patients. The target populations of the system are adult, pediatric, and neonatal patients, who may be located in a hospitals ICU, CCU, OR, ER, recovery or other critical care area, with the exception of the ST segment, arrhythmia analysis, and SpHb for which the target populations are adult and pediatric only excluding neonates. The DS-8000 Series monitor can also be used to follow patients whose treatment requires close observation of specific physiological parameters. These patients may be in a clinic or other healthcare environment under the care of a physician.

The availability of DS-LAN connection, through either a built in Ethernet LAN or external telemetry transmitter, allows remote monitoring when combined with Fukuda Denshi Central Station Monitors.

Parameters such as ECG, heart rate, respiration, non-invasive blood pressure (NIBP), pulse rate, arterial oxygen saturation (SpO₂), carboxyhemoglobin saturation (SpCO), methemoglobin saturation (SpMet), and total hemoglobin concentration (SpHb), plethysmograph, temperature, invasive blood pressure (IBP), cardiac output, carbon dioxide concentration (CO₂), nitrous oxide concentration (N₂O), oxygen concentration (O₂), anesthetic agent concentration (AG), and Spirometry may be monitored individually or in any grouping required by the clinician.

The Fukuda Denshi DynaScope Model DS-8000 Series Patient Monitor is not recommended for home use, when it has not been ordered by a physician.

This equipment is intended for monitoring one patient. It is not intended for monitoring multiple patients.

For specification of this equipment, refer to "Chapter 14 Specification" of this Operation Manual.

The operation and maintenance of this equipment should be performed by well-trained and authorized personnel. Also, your local regulation must be followed. If this equipment is used for the purpose other than intended, or if the user does not follow the safety instructions, the following hazard may result.

- ♦ Hazard to the Life and Health of the Patient or the User
- ♦ A Problem Related to Medical Practice
- ♦ Damage to the Equipment

Copyright

- (1) The copyright of this manual is owned by Fukuda Denshi. No part of this document may be copied or transmitted in any form without the prior written permission of Fukuda Denshi Co., Ltd.
- (2) This manual includes the description for the optional equipments that can be connected.
- (3) The illustration in this manual may differ with the actual equipment.
- (4) If you lose or damage this manual, contact your nearest sales representative. Using the equipment without this manual may cause accidents.
- (5) When handing over this equipment, make sure to also pass this manual to the next owner.

Maintenance, Repair, Replacement

Fukuda Denshi is liable for the safety, reliability, and performance of its equipment only if;

- ♦ Maintenance, modifications, and repairs are carried out by authorized personnel or organization.
- ♦ Components are used in accordance with Fukuda Denshi operating instructions.

A full technical description of the DS-8200 System is available from your local Fukuda Denshi sales representative.

Contact

If you need more detailed information, please contact following.

- (1) Fukuda Denshi Co., Ltd., Head Office

3-39-4 Hongo, Bunkyo-ku, Tokyo, Japan
Phone:+81-3-5684-1455 Fax:+81-3-3814-1222
E-mail: info@fukuda.co.jp
Home Page: <http://www.fukuda.com>

- (2) Sales Representative

Write the name, address, phone, fax number of your local sales representative.

(Name of Sales Representative, Address, Phone/Fax)

About This Manual

Expression Used in This Manual

Meaning of the Symbols

| Type of Precaution | Description |
|---|---|
|  DANGER | Failure to follow this message may cause immediate threat of death or serious injury. |
|  WARNING | Failure to follow this message may result in death or serious injury. |
|  CAUTION | Failure to follow this message may cause injury or failure to the equipment. |
| NOTE | "Note" is used to emphasize important information. |
| REFERENCE | "Reference" is used to provide useful information. |
|  | Indicates the reference page for the procedure and precaution. |
| * | Used in a table which indicates that there is detailed explanation outside the table. |

Indications for the Screens and Keys

The keys displayed on the monitor screen are indicated by [].
(Ex.: [Display Config.], [Manual Printing], etc.)

The expressions displayed on the monitor screen are indicated by " " .
(Ex.: "Volume", "Admit/Discharge", etc.)

The messages displayed on the screen are indicated by < >.
(Ex: <Searching>, <Alarm Suspend>, etc.)

Composition of This Manual

The operation manual is composed of the following chapters.

| Chapter Title | Description |
|--|--|
| Preface | Outline and purpose of this manual (Important Notice, About This Manual) |
| Safety | Warning, Precautions for Safety |
| 1. General Description | Composition, features, menu configuration of this equipment |
| 2. Name of Parts and Their Functions | Name and function of each part, external appearance |
| 3. Operation Procedure and Screen Examples | Operation procedure, home display, window, procedure to return to the previous display, user key setup |
| 4. Preparation | Installing the recording paper, power ON/OFF, time/date, daily checks |
| 5. Admit/Discharge | Entering patient information (name, age, etc.) at admittance, discharging the patient, user mode selection, suspend monitoring |
| 6. Alarm Function | General description of alarm function, alarm-related setups |
| 7. Monitoring | Measurement condition setup of the monitoring parameters, size/scale setup, etc. Setup of the stop watch, connector |
| 8. Review Function | Arrhythmia analysis, 12-lead analysis, trend, recall, NIBP list, ST measurement, hemodynamics, lung function, alarm history, other bed display, full disclosure waveform |
| 9. Printing | Recorder output function |
| 10. System Configuration | Setup of the display configuration, tone/volume, color, etc. |
| 11. Troubleshooting | Message list, maintenance and troubleshooting of this equipment |
| 12. Setup Item/Default Value | Setup details and default value |
| 13. Accessories | List of accessories and optional accessories of this equipment |
| 14. Specification | Specification and performance of this equipment |

The maintenance manual is composed of the following chapters.

| Chapter Title | Description |
|---------------------------------------|---|
| Preface | Outline and purpose of this manual (Important Notice, About This Manual) |
| Safety | Warning, Precautions for Safety |
| 1. Installation of the Unit | Precautions about the operating environment, system construction, trolley usage |
| 2. Network System Construction | Network connection and setup |
| 3. Using the CF card / SD card | Procedure to use the CF card / SD card |
| 4. Connection to the External Devices | External equipment connection and setup |
| 5. Initial Settings | Initial setup, administrator setup, alarm/measurement setup, user I/F, user mode registration |
| 6. Setup Item/Default Value | Default and backup of setup items |
| 7. Replacement Parts | Precautions about the periodic replacement parts, consumable parts |
| 8. Cleaning/Disinfecting/Storing | Procedure to handle, clean, store this equipment |
| 9. Maintenance Check | Daily and periodic checks, self-diagnosis function, software version software install |

Safety

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Safety

About the Safety Precautions

The Meaning of Each Safety Precaution

Read this manual thoroughly before use to ensure correct and safe use of the product.

Be sure to follow the precautions indicated below, as these are important messages related to safety.

| Type of Precaution | Description |
|--------------------|---|
| DANGER | Failure to follow this message may cause immediate threat of death or serious injury. |
| WARNING | Failure to follow this message may result in death or serious injury. |
| CAUTION | Failure to follow this message may cause injury or failure to the equipment. |

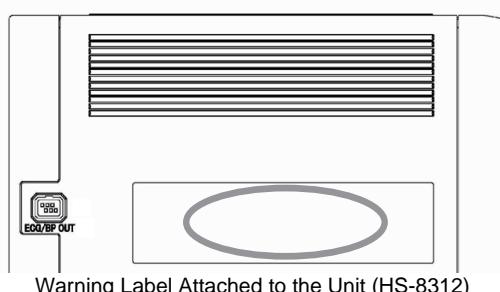
Warning Labels Attached to the Unit

Make sure to read the warning label attached to the equipment and comply with the requirements while operating the equipment.



- Do not damage or erase the warning label attached to the equipment.
This warning label contains descriptions important for handling and operating the equipment properly and safely. A damaged label may compromise safe operation.

Super Unit (HS-8312M / HS-8312N)



Warning Label Attached to the Unit (HS-8312)

| |
|---|
| DANGER Risk of explosion if used in the presence of flammable anesthetics. |
| CAUTION Before connecting, read instruction manual. |
| CAUTION To reduce the risk of electric shock, do not remove the cover. Refer servicing to qualified service personnel. |

Warning Label

Graphic Symbols

Refer to the following for the meaning of the symbol indicated on the equipment.

| Symbol | Description |
|--------|--|
| | Follow operating instructions (Warning); indicated in blue. Failure to follow operating instructions could place the patient or operator at risk. |
| | Follow operating instructions (Information). Indicates the need to refer to the related accompanying documents before operation. |
| | General precaution |
| | Potential Equalization Terminal Indicates the terminal to equalize the potential difference when interconnecting the devices. |
| | Protective Earth Indicates the protective earth inside the equipment. |
| | Alternating Current (Main Power Input Indicator) |
| | Indicates that the equipment is in normal operation. |
| | Indicates that the equipment is in standby mode. |
| | Electrostatic Sensitive Part Directly touching this connector part with hands should be avoided. |
| | Type CF Applied Part with Defibrillation-Proof Indicates the degree of protection against electric shock is Type CF Applied Part with defibrillation-proof. |
| | Type BF Applied Part with Defibrillation-Proof Indicates the degree of protection against electric shock is Type BF Applied Part with defibrillation-proof. |
| | Signal Output |
| | GAS Input |
| | GAS Output |
| | Signal Input/Output |
| | Battery |
| | Waterproof Standard Indicates this equipment complies with IPX1. (Combination of LC-8210, HSB-80, HS-8000 and BS-8210: IPX1, Other situation: IPX0) |

Precautions for Safe Operation of Medical Electrical Equipment



CAUTION

- ♦ Users should have a thorough knowledge of the operation before using this equipment.
-

□ Precautions about the Location of Installation and Storage of the Equipment

- ♦ Set the monitor to the user's intended position where the user can easily recognize the visual and audible monitoring conditions. Normally it is recommended to set at a distance of 1m from the user.
- ♦ Install or store in a place where the equipment will not be exposed to splashing water.
- ♦ Install or store in a place where the equipment will not be adversely affected by atmospheric pressure, temperature, humidity, ventilation, sunlight, dust or atmosphere containing salt or sulfur.
- ♦ Place the equipment on a stable surface where there is no inclination, vibration, or shock (including during transportation).
- ♦ Do not install or store in an area where chemicals are stored or gasses are evolved.
- ♦ Verify the power frequency, voltage and allowable current (or power consumption).
- ♦ Ensure the grounding is proper by connecting the accompanying power cable to the hospital grade outlet.

□ Precautions Before Using the Equipment

- ♦ Verify the power voltage. Charge the battery pack fully before operating the system with the battery pack.
- ♦ Check the cable connection and polarity to ensure proper operation of the equipment.
- ♦ Make sure the power system has adequate earth ground.
- ♦ Ensure that all cables are firmly and safely connected.
- ♦ Pay special attention when the equipment is used in conjunction with other equipment as it may cause erroneous diagnosis and danger.

□ Precautions During Using the Equipment

- ♦ Always observe the equipment and patient to ensure safe operation of the equipment.
- ♦ If any abnormality is found on the equipment or patient, take appropriate measures such as ceasing operation of the equipment in the safest way for the patient.
- ♦ Do not allow the patient to come in contact with the equipment.
- ♦ On start-up of the system, verify that the start-up tone generates and alarm indicator lights.
- ♦ For the connectors which are not Type BF, CF applied part, do not touch them and the patient at the same time.

□ Precautions After Using the Equipment

- ♦ Unplug all the cables from the patient before turning off the power.
- ♦ When unplugging the cables, make sure to pull from the connector part of the cable and avoid applying excessive force.
- ♦ Clean the accessories and cables, and keep them together in one place.
- ♦ Keep the equipment clean to ensure proper operation for the next use.

□ Precaution when Equipment Failure Occurs

- ♦ If the equipment is damaged and in need of repair, the user should not attempt service. Label the unit "OUT OF ORDER" and contact our service representative.

□ Precaution about Disassembling/Remodeling the Equipment

- ♦ Do not disassemble or remodel the equipment.
- ♦ If water or other liquids enter the equipment, cease using the equipment and contact your nearest service representative.

□ Precautions about Maintenance Check

- ♦ Make sure to periodically check the equipment, accessories and cables.
- ♦ When reusing the equipment which was left unused for a while, always check that the equipment operates properly and safely before use.

□ Precautions when Using with Other Equipment

- ♦ To prevent patient from burn injury, verify proper attachment of patient ground plate, ECG electrode type when using the electrosurgical knife, and verify paste volume, output energy when using the defibrillator. Also, verify that each equipment is properly grounded.

Precautions about the Maintenance

⚠ WARNING

- ♦ Never open the housing while the equipment is in operation or connected to hospital grade outlet as it may result in electric shock.

⚠ CAUTION

Precautions about Safety Check

- ♦ For safe operation of the equipment, regular inspection and maintenance are required. Once a year, check all cables, devices, and accessories for damage, earth impedance, earth and leakage currents, and all alarm functions. Also, ensure that all safety labels are legible. Maintain a record of these safety inspections.
- ♦ Immediate maintenance has to be carried out for the following case.
 - ♦ When the equipment was subjected to extreme mechanical stress, e.g. after a heavy fall.
 - ♦ When the equipment was subjected to liquid spill.
 - ♦ When the monitoring function is interrupted or disturbed.
 - ♦ When parts of the equipment enclosure are cracked, removed, or lost.
 - ♦ When any connector or cable shows signs of deterioration.

Precautions about the Network System

Medical Telemetry

⚠ CAUTION

Precautions about the Installation

- ♦ The medical institution (hereinafter referred as "Institution") must decide the telemetry installation plan for the medical institution in order to prevent interference between transmitters (telemetry based on destination country's radio law). When telemetry has already been installed and been used, radio format, frequency, and antenna power are required to be examined to prevent interference.
- ♦ When using telemetry which requires zone location, the institution is to set up the zones as an operation unit for each transmitter to prevent electronic interference between telemetry throughout the Institution.
- ♦ When using telemetry which requires zone location, display and identify each prepared zone in the equipment.
- ♦ When laying receiver antenna for each transmitter, the Institution has to examine the installation so that

electronic interference does not occur.

- Based on the above examination result, the Institution should place each receiver antenna as required.

CAUTION Precautions about the Management

- The institution appoints a person to manage the wireless channels for the whole medical institution. And when using telemetry which requires zone location, the Institution should nominate a person to manage the wireless channels in each zone (a "Zone Manager"). However, when using such telemetry in a local medical institution, one person can perform both functions.
- Select a telemetry manager who understands the characteristics and functionality of telemetry systems, and is skilled in operating telemetry.
- When installing telemetry, the Overall Manager and the Zone Manager have to understand the precautions for use of the telemetry in advance.
- The Overall Manager takes responsibility of wireless channel management and transmitter storage for the whole Institution by giving proper instruction.
- The Overall Manager should create a management log (hereinafter referred to as the "log"), which contains a list of the management status of the wireless channels for the whole Institution. When changing a wireless channel, register it in the log and give proper instructions to the Zone Manager or to the user.
- The Zone Manager assumes responsibility for managing the wireless channels, storing, and managing telemetry.
- The Zone Manager assigns the transmitter to the user, and provides enough education for use inside the zone.
- The telemetry user verifies operation of the transmitter/receiver before use.
- The telemetry user, if using the telemetry in a zone location, follows the instructions of the Zone Manager for the zone and gives instructions to the patient if required.
- When interference or breakdown occurs in telemetry communication, the user is required to inform the zone manager and the overall manager of the problems. The Zone Manager and Overall Manager are to deal with the problem properly and/or contact their nearest Fukuda Denshi representative for service.

Precautions when Using with Other Equipment

Pacemaker

WARNING

- Minute ventilation rate-adaptive implantable pacemakers can occasionally interact with certain cardiac monitoring and diagnostic equipment, causing the pacemakers to pace at their maximum programmed rate. The cardiac monitoring and diagnostic equipment may possibly send wrong information. If such event occurs, please disconnect the cardiac monitoring and diagnostic equipment, or follow the procedures described in the operation manual of the pacemaker. For more details, contact FUKUDA DENSHI personnel, your institution's professionals, or your pacemaker distributors.
- Rate meters may continue to count the pacemaker rate during occurrences of cardiac arrest or some arrhythmias. Do not rely entirely upon rate meter alarms. Keep pacemaker patients under close surveillance.

Reference

"Minute Ventilation Rate-Adaptive Pacemakers"

FDA alerts health professionals that minute ventilation rate-adaptive implantable pacemakers can occasionally interact with certain cardiac monitoring and diagnostic equipment, causing pacemakers to pace at their maximum programmed rate.

[Based on a safety bulletin issued by FDA Center for Devices and Radiological Health on October 14, 1998]

Non-Explosion Proof

DANGER

- Never operate the equipment in the presence of flammable anesthetics, high concentration of oxygen, or inside hyperbaric chamber. Also, do not operate the equipment in an environment in which there is a risk of explosion.

Explosion or fire may result.

Defibrillator

WARNING

- When defibrillating, keep away from the electrodes or medicament applied to the patient chest. If this is not possible, remove the electrodes or medicament before defibrillating.
If the defibrillator paddles are directly in contact with the electrodes or medicament, an electrical shock may result by the discharged energy.
- When defibrillating, make sure that the electrodes, sensor cables, or relay cables are firmly connected to the device.
Contacting the metal part of the disconnected cable may result in electrical shock from the discharged energy.
- When defibrillating, do not touch the patient and the metal part of the device or cables.
Electric shock may result from the discharged energy.
- This equipment will return to standard operating mode within 10 seconds after defibrillating. However, when in diagnosis mode, it may require 10 seconds or more after defibrillation to display the normal ECG waveform as the time constant setting is large.
The stored data will not be affected. The measurement accuracy will temporarily decrease during defibrillation, but it will not compromise the safety of patient and the equipment.
- The QRS synchronized signal is not intended to be used as synchronized signal for defibrillator.

Electrosurgical Instrument

WARNING

- The monitoring system contains protection against burn injury and interference generated by electrosurgical instruments. However, depending on the operating conditions, surgery site with respect to the location of ECG electrodes, ground plate attachment condition, or the type of instrument used, it may cause burn injury at the electrode site or noise on the ECG. The noise is generated at the tip of the electrical knife and is difficult to completely eliminate because of the frequency components of the ECG. To reduce electrosurgical interference, take the following precautions:

Location:

Locate the electrosurgical unit as far as possible from this equipment and the patient cable. This will help reduce interference on the ECG through the monitor or cables.

Power Supply:

Connect the electrosurgical unit to a power supply that is different from that of this equipment. This will help prevent interference through the power cable.

Electrode Placement

Place the ECG electrodes as far away as possible from the surgery site and the ground plate. Do not place electrodes in the path between the surgery site and the ground plate. Position (+) and (-) electrodes as close as possible to each other.

Ground Plate

When using electrosurgical instruments, make sure the contact between the patient and the ground plate is

secure. If the connection is incomplete, the patient may suffer from burn at the electrode site.

- ♦ The stored data will not be affected. The measurement accuracy will temporarily decrease during electrosurgery, but it will not compromise the safety of patient and the equipment.

MRI (Magnetic Resonance Imaging)

WARNING



MR-Unsafe -keep away from magnetic resonance imaging (MRI) equipment.

- ♦ Do not use this equipment in magnetic resonance imaging (MRI) environments.
- ♦ When conducting MRI test, remove the electrodes and sensors connected to the patient (test subject). This equipment may be pulled towards the MRI device. Also, the local heating caused by the induced electromotive force may cause burn injury to the patient (subject) or performance degradation of this equipment.

For details, refer to the operation manual for the MRI testing device.

Precautions about Connections to Peripheral Devices

In the interest of safe and sufficient performance of this equipment, the connection of other manufacturers' equipment to the monitor is not authorized, unless the connection is explicitly approved by Fukuda Denshi. It is the user's responsibility to contact Fukuda Denshi to determine the compatibility and warranty status of any connection made to another manufacturer's equipment.

WARNING

- ♦ When multiple equipments are connected to the patient, the total amount of leakage current may exceed the limit specified on IEC 60601-1.
- ♦ For the connector with  mark, only the peripheral devices specified by Fukuda Denshi should be connected with the given procedure. Use of an unspecified device may cause electric shock to the patient and/or operator due to excessive leakage current.

CAUTION

- ♦ Although the peripheral device connectors on the DS-8200 System are isolated from the power supply, the connecting peripheral devices should comply with IEC 60601-1 inside the patient environment. In other cases, to maintain operator and patient safety, consider the requirements of IEC 60601-1. It is the user's responsibility to ensure that the overall system provides a level of safety in compliance with IEC 60601-1.
- ♦ To prevent danger of electric shock, always position the peripheral devices away from the patient.
- ♦ Network equipment including printer and hub should be located outside the "Patient Environment". If located inside the "Patient Environment", it may result in electric shock to the patient or the operator.
- ♦ Combinations of medical equipment with non-medical equipment must comply with IEC 60601-1-1. Never use a multiple portable socket-outlet or extension cord when combining equipment unless the socket outlet is supplied specifically for use with that equipment.

Precautions for Using the Equipment

This System

DANGER

- When connecting to other equipments, contact your nearest representative.
Danger such as electric shock may result to the patient and operator.

WARNING

Warnings about the System

- Do not connect any damaged / unspecified equipment or cable to any I/O connector. If done so by mistake, the device cannot deliver its maximum performance and the connected units may be damaged, resulting in a safety hazard.
- If this equipment is used under an environment not fulfilling the specified condition, not only that the equipment cannot deliver its maximum performance, the equipment may be damaged and safety cannot be ensured. If using the equipment under condition other than specified, contact your nearest representative.
- Use only the supplied 3-way AC power cable. Use of other cables may result in electric shock to the patient and the operator.
- The power cable must be connected to a hospital grade outlet.
- When using multiple ME equipment simultaneously, perform equipotential grounding to prevent potential difference between the equipments. Even a small potential difference may result in electric shock to the patient and the operator.
- Carefully route cables to reduce the possibility of patient entanglement and strangulation.
- When lifting this equipment, hold it by the handle or the bottom part of the main unit.

WARNING

Warnings about the Monitoring

- The patient classification selection influences the precision of the QRS detection and NIBP measurement. Make sure the correct selection is made.
- The pacemaker use selection influences the precision of the QRS detection and arrhythmia analysis. Make sure the correct selection is made.
- If the QRS pace mask function is set to [OFF], [10ms] or [20ms], the pace pulse may be erroneously be detected as a QRS complex and HR, Asystole alarms may not generate due to incorrect HR (counting pace pulse as QRS complex). Select [OFF], [10ms], or [20ms] only if you are sure that pacing failure will not occur, or when the patient can be constantly monitored.
- When measuring the SpO₂ of patient with high fever or peripheral circulatory insufficiency, check the sensor attachment periodically and change the attachment site. The temperature of the attachment site will rise 2 to 3°C due to the sensor heat which may result in burn injury.
- For the following case, accurate measurement of SpO₂ may not be possible.
 - Patient with excessive abnormal hemoglobin (COHb, MetHb)
 - Patient with the pigment injected to the blood
 - Patient receiving CPR treatment
 - When a sensor is applied to a limb with NIBP cuff, arterial catheter, or intracatheter
 - When measuring at site with venous pulse
 - Patient with body motion
 - Patient with small pulse
- Before the NIBP measurement, make sure the patient classification ([Adult]/[Child]/[Neonate]) is properly

- selected. Otherwise, correct measurement cannot be performed, and congestion or other injury may result.
- ♦ When the system alarm is suspended, all the alarms will be suspended even if the parameter alarm is set to [ON]. Also, the alarms will not be stored as recall events.
 - ♦ If the upper/lower alarm limit of the parameter is set to [OFF], or arrhythmia alarm is set to [OFF], alarm will not function even if the system alarm is set to [ON]. Pay attention when setting them [OFF].
 - ♦ Objective and constant arrhythmia detection is possible through the fixed algorithm incorporated in this monitor. However, excessive waveform morphology change, motion artifact, or the inability to determine the waveform pattern may cause an error, or fail to make adequate detection. Therefore, physicians should make final decisions using manual recording, alarm recording and recall waveform for evaluation.
 - ♦ The RR/APNEA alarm will not be generated unless the parameter key (Numeric Data Box) corresponded to the selected RR/APNEA source is displayed. Make sure to display the parameter key (Numeric Data Box) for the RR/APNEA source.
 - ♦ When selecting [0] for "Volume" or [Timer] for "Display" for the Night Mode, pay attention not to miss any important alarm by simultaneously monitoring the patient on central monitor or other monitors.
 - ♦ When the alarm sound is suspended, the alarm sound will not generate for the fixed amount of time. Pay attention not to miss any important alarm by simultaneously monitoring the patient on central monitor or other monitors.

⚠️ WARNING Warnings about the SpO₂ Monitoring (HS-8312M)

- ♦ Pulse rate measurement is based on the optical detection of a peripheral flow pulse and therefore may not detect certain arrhythmias. The pulse oximeter should not be used as a replacement or substitute for ECG based arrhythmia analysis.
- ♦ A Pulse CO-Oximeter should be considered an early warning device. As a trend towards patient hypoxemia is indicated, blood samples should be analyzed by laboratory instruments to completely understand the patient's condition.
- ♦ For measurements of high or low SpHb readings, blood samples should be analyzed by laboratory instruments to completely understand the patient's condition.
- ♦ SpO₂ is empirically calibrated to functional arterial oxygen saturation in healthy adult volunteers with normal levels of carboxyhemoglobin (COHb) and methemoglobin (MetHb). A pulse oximeter can not measure elevated levels of COHb or MetHb. Increases in either COHb or MetHb will affect the accuracy of the SpO₂ measurement.
 - ♦ For increased COHb: COHb levels above normal tend to increase the level of SpO₂. The level of increase is approximately equal to the amount of COHb that is present.

NOTE

- ♦ High levels of COHb may occur with a seemingly normal SpO₂. When elevated levels of COHb are suspected, laboratory analysis (CO-Oximetry) of a blood sample should be performed.

-
- ♦ For increased MetHb: the SpO₂ may be decreased by levels of MetHb of up to approximately 10% to 15%. At higher levels of MetHb, the SpO₂ may tend to read in the low to mid 80s. When elevated levels of MetHb are suspected, laboratory analysis (CO-Oximetry) of a blood sample should be performed.
 - ♦ Interfering Substances: Dyes, or any substance containing dyes, that change usual blood pigmentation may cause erroneous readings.
 - ♦ Hemoglobin synthesis disorders may cause erroneous SpHb readings.
 - ♦ Elevated levels of Total Bilirubin may lead to inaccurate SpO₂, SpMet, SpCO, SpHb measurements.
 - ♦ Motion artifact may lead to inaccurate SpMet, SpCO, SpHb measurements.
 - ♦ Severe anemia may cause erroneous SpO₂ readings.
 - ♦ Very low arterial Oxygen Saturation (SpO₂) levels may cause inaccurate SpCO and SpMet measurements.

- ♦ With very low perfusion at the monitored site, the readings may read lower than core arterial oxygen saturation.
- ♦ Do not use tape to secure the sensor to the site; this can restrict blood flow and cause inaccurate readings. Use of additional tape can cause skin damage or damage the sensor.
- ♦ If the sensor is wrapped too tightly or supplemental tape is used, venous congestion/pulsations may occur causing erroneous readings.
- ♦ Venous congestion may cause under reading of actual arterial oxygen saturation. Therefore, assure proper venous outflow from monitored site. Sensor should not be below heart level (e.g. sensor on hand of a patient in a bed with arm dangling to the floor).
- ♦ Venous pulsations may cause erroneous low readings (e.g. tricuspid value regurgitation).
- ♦ Loss of pulse signal can occur when:
 - The sensor is too tight.
 - The patient has hypotension, severe vasoconstriction, severe anemia, or hypothermia.
 - There is arterial occlusion proximal to the sensor.
 - The patient is in cardiac arrest or is in shock.
- ♦ The pulsations from intra-aortic balloon support can be additive to the pulse rate on the oximeter pulse rate display. Verify patient's pulse rate against the ECG heart rate.
- ♦ Misapplied sensors or sensors that become partially dislodged may cause either over or under reading of actual arterial oxygen saturation.
- ♦ Avoid placing the sensor on any extremity with an arterial catheter or blood pressure cuff.
- ♦ High intensity extreme lights (including pulsating strobe lights) directed on the sensor may not allow the Pulse CO-Oximeter to obtain readings.
- ♦ The Pulse CO-Oximeter can be used during defibrillation, but the readings may be inaccurate for up to 20 seconds.
- ♦ Before use, carefully read the sensor's Directions for Use.
- ♦ Tissue damage can be caused by incorrect application or use of a sensor, for example by wrapping the sensor too tightly. Inspect the sensor site as directed in the sensor's Directions for Use to ensure skin integrity and correct positioning and adhesion of the sensor.
- ♦ The Pulse CO-Oximeter is NOT intended for use as an apnea monitor.
- ♦ To avoid cross contamination only use Masimo single use sensors on the same patient.
- ♦ Unless otherwise specified, do not sterilize sensors or patient cables by irradiation, steam, autoclave or ethylene oxide. See the cleaning instructions in the directions for use for the Masimo re-usable sensors.

⚠️ WARNING Warns about the CO₂ Monitoring (HPD-800/HPD-810, HCP-800/HCP-810)

- ♦ For HPD-800/HPD-810 with Capnostat 5;
 - ♦ Use only the specified airway adapter manufactured by Respiromedics Novametrics, LLC. Refer to the section on "Optional Accessories" for list of specified airway adapters.
(☞ Operation Manual "CO₂ Concentration Measurement (Respiromedics)" P13-6)
These accessories may be purchased from Fukuda Denshi or any authorized Respiromedics Novametrics, LLC distributor.
 - ♦ Always consider the circumference of the intubation tube when using the airway adapter. If inappropriate airway adapter is used for a patient with low ventilation, CO₂ may mix in to the inspired air resulting in incorrect measurement, or apnea detection may become difficult.
- ♦ For HCP-800/HCP-810;
 - ♦ When using a sampling line for intubated patients with a closed suction system, do not place the airway adapter between the suction catheter and endotracheal tube. This is to ensure that the airway adapter does not interfere with the functioning of the suction catheter.
 - ♦ Loose or damaged connections of the sampling line may compromise ventilation or cause an inaccurate

measurement of respiratory gases. Securely connect all components and check connections for leaks according to standard clinical procedures.

- ♦ Do not cut or remove any part of the sampling line. Cutting the sample line could lead to erroneous readings.
- ♦ If too much moisture enters the sampling line (i.e., from ambient humidity or breathing of unusually humid air), the message "Check Sample Line" will appear in the message area. Replace the sampling line once the "Check Sample Line" message appears.
- ♦ Carefully route the sampling line to reduce the possibility of patient entanglement or strangulation.
- ♦ Do not lift the HCP-800/HCP-810 by the sampling line, as the sampling line could disconnect from the equipment, causing the equipment to fall on the patient.
- ♦ CO₂ readings and respiratory rate can be affected by sensor application errors, certain ambient environmental conditions, and certain patient conditions.



WARNING Warnings about the 12-Lead ECG Analysis Function

- ♦ The 12-Lead ECG analysis function is designed to acquire and interpret ECG data from a resting, supine patient. If ECG signals from moving or shaking patients are acquired, erroneous 12-lead interpretation result may occur. Always ensure that the patient is kept motionless during 12-lead ECG signal acquisition and analysis.
- ♦ The 12-lead ECG analysis is intended for use with adult and pediatric patients.
- ♦ All computerized ECG analysis results should be reviewed by a physician before making decision for the patient treatment.



CAUTION Precautions about the System

- ♦ Do not assess the patient's condition by only information from this equipment. A clinical judgment based on the information from the equipment should be made by a doctor who fully understands functions of the equipment, in a comprehensive manner combined with clinical findings and other test results.
- ♦ Do not assess the patient's condition by only alarm from this equipment. When the alarm is set to OFF or low priority, a sudden change of the patient may not be noticed.
- ♦ If an alarm generates, check the patient's condition first and ensure the safety. Depending on the alarm, take appropriate measures to remove the problem. If the problem lies with the alarm setting, set the alarm properly.
- ♦ When measuring for a long period of time, make sure not to compress the patient with the lead cables and the electrodes. Compressing the same site for a long duration may inhibit the blood flow and generate compression necrosis and burn injury.
- ♦ Use only the spare parts specified for this equipment. Otherwise, proper function cannot be executed.
- ♦ Do not use the touch panel with the film attached. Malfunction of the touch panel or damage may result.
- ♦ Due to its material characteristic, the touch panel expands/contracts depending on the temperature/humidity. When the touch panel is left unused for a while, or when the ambient temperature is low, the surface film of the touch panel may expand, but this is not an abnormal condition. This expansion will be reduced in few hours or half a day after the power is turned ON.
- ♦ For quality improvement, specifications are subject to change without prior notice.
- ♦ The display unit utilizes LED for the backlight. Since this LED deteriorates by the life cycle, the display may become dark, scintillate, or may not light by the long term use. In such case, contact our service representative.
- ♦ This equipment is intended to be used for only one patient.
- ♦ The installation of this equipment should be performed by our service representative or a person who is well acquainted with this equipment.
- ♦ If the main unit will be unused for a long period, disconnect the power cable and the lithium-ion battery from the main unit.
- ♦ The lithium-ion battery can only be charged in the specified operating temperatures of the equipment. Refer to the operation manual of the lithium-ion battery (BTO-008) for details.

⚠ CAUTION**Precautions about the ECG Monitoring**

- ♦ If any electrodes get detached from the patient after being connected to the lead cable and patient monitor, pay attention that the metal part of the electrode does not get in touch with any metal parts of the bed or any conductive parts. Also, the operator should not touch any conductive parts with bare hands. Otherwise, it may result in electric shock to the patient and/or operator.
- ♦ The indication for continuous use of the electrode is about one day.
- ♦ Replace the electrode if the skin contact gets loosen due to perspiration, etc.
- ♦ When an electrode is attached to the same location for a long period, some patients may develop skin irritation. Check the patient's skin condition periodically and change the electrode site as required.
- ♦ For stable arrhythmia detection and ECG monitoring, verify proper electrode placement, lead, waveform size, and filter mode selection. If not properly selected, it may cause erroneous detection.
- ♦ The arrhythmia detection level is related with the displayed waveform size. Set a proper waveform size for monitoring.
 - ♦ When the ECG waveform size is x1/4, x1/2, or x1 the detection threshold is 250 µV.
 - ♦ When the ECG waveform size is x2, x4 the detection threshold is 150 µV.
- ♦ The arrhythmia detection leads, monitoring leads on the central monitor, recording leads are fixed as ECG1 and ECG2. Especially for arrhythmia detection, set the most appropriate leads with high QRS for ECG1 and ECG2.
- ♦ In ESIS Mode, although artifacts such as electrosurgical noise or EMG can be largely reduced, QRS amplitude attenuation, waveform distortion, or ST segment change may occur compared with other filter modes.
- ♦ There are some cases when the pacemaker pulse can not be detected depending on the pacemaker type, pulse voltage, pulse width, electrode lead type (unipolar, bipolar), or electrode placement which causes the pacemaker pulse amplitude to decrease and disables the pacemaker pulse detection.
- ♦ If signals similar to a pacemaker pulse are present, such as electric blanket noise or excessive AC frequency noise, these may be erroneously detected and displayed as a pacemaker pulse.
- ♦ When a spontaneous QRS and pacemaker pulse overlap (ex. fusion beat, etc.), QRS detection cannot be performed properly. In this case, the heart rate is degraded.
- ♦ If a pacemaker pulse is continuously detected due to AC frequency interference, QRS detection will be suspended and the heart rate will be reduced. Arrhythmia will not be detected either.

⚠ CAUTION**Precautions about the ST Measurement**

- ♦ The ST algorithm has been tested for accuracy of the ST segment data. The significance of the ST segment changes need to be determined by a clinician.
- ♦ For the lead which the electrode is detached, the reference waveform setup cannot be performed. Check if the electrode is appropriately attached, and perform the setup again.

⚠ CAUTION**Precautions about the 12-Lead Analysis**

- ♦ Interpretation and Minnesota codes given by this equipment do not instruct the physician as to the kind and degree of cardiac disease. Accordingly, four value judgements are given for ECG waveform and although "abnormal" indicates a large possibility of organic cardiac disease, there are cases where no cardiac disease exists despite an abnormal ECG (that is, an abnormal ECG may be caused by something other than heart). On the other hand, care should be taken in the event any preclinical coronary arteriosclerosis could be present despite a normal ECG interpretation.

Therefore, for a proper diagnosis, the ECG should be integrated with other interpretations.

- ♦ ECG Recording by the Mason-Likar System

The 12-lead ECG recorded with the torso placement of the limb leads (Mason-Likar 12-lead system) may differ from the standard 12-lead ECG. Moreover, waveforms may differ somewhat also in a supine position and a standing position (sitting position).

Fukuda Denshi recommends to carry out the recording of the ECG by taking into consideration the waveform differences according to electrode positions or postures.

- ♦ For the model installed with ECG analysis program
The ECG analysis program is intended to analyze the standard 12-lead ECG waveforms. Therefore, the analyzed result for waveforms recorded with the torso placement of the limb leads (Mason-Likar 12-lead system) may differ from that of the standard 12-lead ECG waveforms.
- ♦ Select "Used" for the pacemaker setting on the patient admit/discharge menu if a patient has a pacemaker.
- ♦ The threshold values for classification of 12-lead ECG interpretation and Minnesota code are set by age and sex as follows:
 1. Male and Female of ages 19 years old and above
 2. Male of age 12 through 18 years old
 3. Female of age 12 through 18 years old
 4. Male and Female of ages 3 through 11 years old
 5. Male and Female of ages below 2 years old
- ♦ If no patient information (i.e. Default : "Class." [Adult], "Sex": undetermined, and "Age" [0]) has been entered, the system algorithm will handle the patient as a "35 years old male".
- ♦ Before the analysis, make sure the patient classification ([Adult] / [Child]) is properly selected. If [Neonate] is selected, the 12-lead ECG analysis will not function.
- ♦ Enter the age of patient if known. If no age information (i.e. Default: [0]) has been entered, the system algorithm will handle the patient as "35 years old".
- ♦ Enter the sex of patient if known. If no sex information (i.e. Default: undetermined) has been entered, the system algorithm will handle the patient as "Male".
- ♦ If the patient classification is set as [Child] and no age (i.e. Default: [0]) has been entered, the system algorithm will handle the patient as "less than 2 years old."

CAUTION Precautions about the SpO₂ Monitoring

- ♦ Make sure to use only the specified sensor/relay cable. Otherwise inaccurate measurements may be caused.
- ♦ Discontinue use if patient sensor is damaged in anyway.
- ♦ If the nail is rough, dirty, or manicured, accurate measurement will not be possible. Change the finger or clean the nail before attaching the sensor.
- ♦ If irritation such as skin reddening appears with the sensor use, change the attachment site or stop using the sensor.
- ♦ Do not wrap the supplemental tape on the sensor too tight. At the same time, check the blood flow constantly so that congestion is not generated at the peripheral.
- ♦ Do not use tape to secure the sensor to the site.
- ♦ Even a short duration of attachment may inhibit the blood flow and generate compression necrosis and burn injury.
- ♦ Check the sensor attachment site constantly in every 4 hours when probes or reusable sensor are used, and at least every 8 hours when single patient use sensors are used. Be especially careful of a patient with bad perfusion. If the sensor attachment position is not changed constantly, skin irritation or skin necrosis due to compression may be developed. For the patient with bad perfusion, check the sensor attachment position at least every 2 hours.
- ♦ As skin for neonate/ low birth weight infant is immature, change the sensor attachment site more frequently depending on the condition.
- ♦ Direct sunlight to the sensor area can cause measurements error. Place a black or dark cloth over the sensor.
- ♦ When not performing the measurement, unplug the relay cable and sensor from the SpO₂ connector. Otherwise, the measurement data may be erroneously displayed by the ambient light.
- ♦ The pulse wave is normalized for SpO₂ measurement. It does not indicate perfused blood volume. Check proper probe attachment by observing the pulse wave.

- ♦ Precautions for Reusable Type Sensor

The light-emitting part of the sensor should be over the root of the fingernail. Do not insert the finger too far into the sensor as it may hurt the patient. For additional warnings, cautions, or contraindications when using sensors with Nellcor Unit (HS-8312N)/Masimo Unit (HS-8312M), refer to SpO₂ sensor instruction manual.

- ♦ Precautions for Single-Patient-Use Type Sensors

The sensor can be reused on the same patient as long as the adhesive tape attaches without slippage. But do not reuse on other patients to avoid cross contamination. It is intended for single patient use only. For additional warnings, cautions, or contraindications when using sensors with Nellcor Unit (HS-8312N)/Masimo Unit (HS-8312M), refer to SpO₂ sensor instruction manual.

- ♦ If " - - " is displayed for the SpO₂ numeric data, make sure that the sensor is properly attached.
- ♦ Measuring on a limb with NIBP cuff, arterial catheter, or intracatheter may result in incorrect measurement.
- ♦ Venous congestion may cause under reading of actual oxygen saturation. Therefore, assure proper venous outflow from monitored site. Sensor should not be below heart level (e.g. sensor on hand of a patient in a bed with arm dangling to the floor).

⚠ CAUTION Precautions about the SpO₂ Monitoring (HS-8312M)

- ♦ Do not use the Pulse CO-Oximeter or oximetry sensors during magnetic resonance imaging (MRI) scanning. Induced current could potentially cause burns. The Pulse CO-Oximeter may affect the MRI image, and the MRI unit may affect the accuracy of the oximetry measurements.
- ♦ If using pulse CO-oximetry during full body irradiation, keep the sensor out of the irradiation field. If the sensor is exposed to the irradiation, the reading might be inaccurate or the unit might read zero for the duration of the active irradiation period.
- ♦ Exercise caution when applying a sensor to a site with compromised skin integrity. Applying tape or pressure to such a site may reduce circulation and/or cause further skin deterioration.
- ♦ Circulation distal to the sensor site should be checked routinely.
- ♦ A functional tester cannot be utilized to assess the accuracy of the Pulse CO-Oximeter or any sensors.
- ♦ Do not modify or alter the sensor in any way. Alterations or modification may affect performance and/or accuracy.

⚠ CAUTION Precautions about the NIBP Monitoring

- ♦ Do not apply the NIBP cuff to site of injury. An injury may be worsened by the measurement.
- ♦ Do not apply the NIBP cuff to the arm on side treated axillary lymph nodes dissection. It may lead to lymphatic edema by the cuff pressure.
- ♦ Measuring on a limb with SpO₂ sensor, arterial catheter, or intracatheter may result in incorrect measurement.
- ♦ An operator must not get away from a patient during the NIBP measurement. However, when getting away from the patient is necessary, do not activate the Alarm Suspend and Silence functions in order not to miss any sudden changes in the patient's condition.
- ♦ Pay attention when measuring the NIBP of patient with bleeding disorders or hyper coagulation. The cuff inflation may cause petechia or circulatory failure by the blood clot.
- ♦ For the following situation, measurements will be terminated.
 - ♦ When the measurement time has exceeded 160 seconds for adult and child, 80 seconds for neonate.
 - ♦ When the inflation value has exceeded 300mmHg for adult, 210mmHg for child, and 150mmHg for neonate.
- ♦ If used with the incorrect patient classification, it will not only cause erroneous measurement, but the inflating level for the adult may be applied to child or neonate causing dangerous situation to the patient.
- ♦ The continuous measurement and 1-minute interval measurement will automatically stop after 12 minutes (maximum 15 minutes).
- ♦ If the mean MAP display is set to OFF, the MAP alarm will not be generated. Also the MAP data will not be displayed for the tabular trend or the NIBP list.



Precautions about the BP Monitoring

- ♦ Do not reuse / re-sterilize the disposable type transducers.
- ♦ If using a reusable blood pressure transducer, disinfect it according to the manufacturer's guidelines.
- ♦ The long-term use of the blood pressure transducer, tube and catheter may increase the risk of infection. Perform periodic replacement with new one. The guidelines of the CDC (Disease Control and Prevention) recommend replacing within 96 hours.
- ♦ If the ambient temperature of the blood pressure transducer has changed greatly, the zero balance may cause the drift. Perform the zero balance again.
- ♦ An operator must not get away from a patient during the BP measurement. However, when getting away from the patient is necessary, do not activate the Alarm Suspend and Silence functions in order not to miss any sudden changes in the patient's condition.
- ♦ Be sure to perform Daily Check. Use of faulty equipment might harm the patient or operator.
- ♦ If the Equipment Status Alarm occurs or if you feel the unusual operation of the equipment, perform the inspections to confirm the safety or contact our service representative.
- ♦ If the transducer get disconnected, pay attention that the metal part of the transducer does not get in touch with any metal parts of the bed or any conductive parts. Also, the operator should not touch the conductive parts with bare hands. Otherwise, it may result in electric shock to the patient and/or operator.
- ♦ When the power is turned ON, the BP value will not be displayed until zero balance is performed. Make sure to perform the zero balance. Once the zero balance is performed, the zero balance information will be maintained, and the BP value will be displayed.
- ♦ Each time the blood pressure transducer or tubing is replaced, the zero balance procedure is required to ensure accurate measurements.
- ♦ The zero balance procedure is required for the following case.
 - ♦ When starting the measurement.
 - ♦ When the position of the heart has changed due to body movement.
 - ♦ When the position of the transducer has changed.
 - ♦ When measuring for a long period of time and there is a possibility of measurement error due to change in ambient temperature, etc.
 - ♦ When a connector is connected/disconnected, or a transducer is replaced.
- ♦ Note that Systolic Pressure (SYS) = Peak Systolic Pressure (PSP) for the graphic trend, data base, and alarm setup.
- ♦ When ECG is not measured, Peak Diastolic Pressure (PDP) cannot be calculated.
- ♦ The undisplayed BP data (SYS/DIA/Mean) will not generate a BP alarm or be displayed in the tabular trend. Select the appropriate display type according to the monitoring purpose.



Precautions about the CO₂ Monitoring (HCP-800/HCP-810)

- ♦ Conduct CO₂ calibration for the following case.
If the CO₂ gas calibration is not performed at a specified interval, CO₂ measurement accuracy may be affected and also subsequent gas calibration may not be possible.
 - ♦ When the accumulated measurement time exceeds 1,200 hours from the first use.
However, if the first calibration was performed before the accumulated measurement time reaches 720 hours, another calibration is required when the accumulated measurement time exceeds 1,200 hours from the first calibration.
 - ♦ When 12 months has elapsed or the accumulated measurement time has exceeded 4,000 hours from the previous calibration.
 - ♦ When EtCO₂ measurement is not stable or accuracy is degraded compared with other measuring device.
 - ♦ When the patient monitor was not used for a while, or when EtCO₂ was not measured for a while.

- ♦ Perform the calibration 5 minutes after turning ON the power on the HCP-800/HCP-810.
- ♦ Do not disconnect the sampling tube during calibration. If disconnected, calibration will cease.
- ♦ Dispose of calibration gas according to the regulation of each medical institution.
- ♦ Microstream® EtCO₂ sampling tubes are designed for single patient use, and are not to be reused. Do not attempt to clean, disinfect, sterilize or flush any part of the sampling tube as this can cause damage to the monitor.
- ♦ Dispose of sampling tubes according to standard operating procedures or local regulations for the disposal of contaminated medical waste.
- ♦ Before use, carefully read the Directions for Use for the Microstream® EtCO₂ sampling tube.
- ♦ Only use Microstream® EtCO₂ sampling lines to ensure the monitor functions properly.

 CAUTION Precautions about the CO₂ Monitoring (HPD-800/810 Gas Unit I/F)

- ♦ The airway adapter should be attached with the thicker side facing to the patient. If attached oppositely, it may damage the CO₂ sensor or airway adapter.

 CAUTION Precautions about the Alarm

- ♦ Alarm messages will be displayed according to the priority. (Level S > Level H > Level M > Level L > Level N)
- ♦ For the same alarm priority, the alarm message for the newer alarm will be displayed.
- ♦ The alarm message for the arrhythmia alarm will continue to be displayed for 30 seconds after the alarm is resolved.
- ♦ While the "LEAD OFF" or "Check Electrodes" message is displayed, HR alarm and arrhythmia alarm will not function. Leaving this condition unresolved may result in missing a sudden change of the patient. Promptly check the electrodes when these messages are displayed.
- ♦ For the HPD-800/810 Gas Unit I/F and HCP-800/810 CO₂ Gas Unit, the upper EtCO₂ alarm will not generate if the upper limit is set to 100mmHg/13.4kPa and above as the measurement range is 0 to 99mmHg / 0 to 13.3kPa.
- ♦ Whether to use the SpO₂ second alarm function and its threshold selection should be based on the patient's clinical indication/potent and medical evaluation.
- ♦ If the SpO₂ alarm and second alarm setup is set to [OFF], the second alarm integral value will be set to 0.
- ♦ Pay attention not to set the alarm volume too low to avoid missing any important alarms.
- ♦ On a wired network, the alarm generated on the bedside monitor will be output to the network with a maximum delay of 1 second, and to the central monitor with a total delay of 2.5 seconds.
- ♦ If the same or similar equipments with different alarm settings are used in the same facility or same department, pay attention not to misjudge the alarms.

 CAUTION Precautions about the System Setup

- ♦ When the waveform and numeric data display for each parameter is set to OFF, the alarm and trend input will be also suspended.
- ♦ If the HR/PR source is set to [BP], and if BP waveform/numeric data is set to [Disp. OFF], the PR value will not be displayed.
- ♦ If the HR/PR source is set to [SpO₂], and if SpO₂ waveform/numeric data is set to [Disp. OFF], the PR value will not be displayed.
- ♦ If the RR source is set to [CO₂/GAS], and if CO₂ waveform/numeric data is set to [Disp. OFF], the RR value will not be displayed.
- ♦ Do not set the same remote control bed ID to more than one monitors on the same floor.
Otherwise, it may cause to remote control more than one monitor at the same time.
- ♦ After the remote control setup, check that the remote control unit is properly operating.
- ♦ If the time/date is not correctly set, or changed during monitoring, malfunction may occur with NIBP measurement, periodic recording, trend, NIBP list data, and age calculation from the birth date.

⚠ CAUTION Precautions about the Patient Admit/Discharge

- ♦ If monitoring of a new patient is started without discharging the previous patient, data of the new patient will be added to the data of the previous patient which will result in inaccuracy.
- ♦ The user mode setting (alarm/display configuration) will remain effective even when the power is turned OFF or when the patient is discharged. Before monitoring, make sure the current user mode is suitable for the patient's condition.
- ♦ Resuming monitoring will also resume the alarm in suspension.

⚠ CAUTION Precautions about the CF/SD Card

- ♦ Use only the specified CF/SD card.
- ♦ Use only the CF/SD card formatted with this equipment.
- ♦ Make sure to turn the power OFF and ON again after the setup data is read from the CF/SD card. The read setup data will become effective after the power is turned OFF and ON again.
- ♦ Reading the patient data from the CF/SD card will erase all previous patient data stored in the patient monitor.

⚠ CAUTION Precautions about the Maintenance

- ♦ When cleaning the touch panel, never use strong-acidic cleaning solution.
- ♦ A special coating is applied to the surface of the touch panel. Do not wipe the surface with a cloth or gauze with coarse texture. Wipe the surface with an eyeglass cleaning cloth.
- ♦ Clean the equipment frequently so stains can be removed easily.
- ♦ To prevent injury, it is recommended to wear gloves when cleaning the equipment.
- ♦ Do not allow liquids or cleaning solution to enter the equipment or connectors.
- ♦ Do not use organic solvents, thinner, toluene and benzene to avoid damaging the resin case.
- ♦ Do not polish the housing with abrasive or chemical cleaner.
- ♦ When sterilizing the entire room using a spray solution, pay close attention not to have liquids get into the equipment or connectors.
- ♦ The surface resin coating may be damaged, resulting in discoloration, scratches, or other problems.

Example:

Do not use chemical cloth, scrub brush, abrasive, polishing powder, hot water, volatile solvent and chemicals (cleanser, thinner, benzine, benzol, and synthetic detergent for house and furniture), or sharp-edged tools.

- ♦ Do not open the housing.
- ♦ Avoid alcohol or other liquids from getting into the equipment.
- ♦ Replace the periodic replacement parts periodically as specified.

Wired Network (DS-LANII/ DS-LANIII)

⚠ WARNING

- ♦ Do not connect unspecified device to the wired network.
- ♦ Do not mix devices with DS-LANII and DS-LANIII setting in the same wired network. The network may cease and proper monitoring may not be possible.

⚠ CAUTION

- ♦ When using the wired network transmission, configure the display so that the numeric data corresponded to the waveform is displayed. If not, the displayed waveform or numeric data may not be transmitted.
- ♦ The Bed ID is factory set to 000. If connected to the wired network with the ID unchanged, monitoring on the central monitor will not be possible.
- ♦ When connected to the wired network, make sure that there are no other bedside monitors with the same Bed ID. If there are more than one bedside monitors with the same Bed ID, the duplicated bedside monitors cannot

- be monitored on the central monitor.
- ♦ When connected to the DS-LANII network, set the Bed ID in the range from "001" to "048".
 - ♦ When connected to the DS-LANIII network, set the Bed ID in the range from "001" to "100".
 - ♦ There are following restrictions when connecting the DS-8200 System to the wired network.
 - ♦ The BP measurement unit setting should be the same for all central monitors and bedside monitors. If the BP measurement unit is different among the monitors, data such as BP waveform, BP numeric data, NIBP numeric data, NIBP list will not be transmitted. It will be treated as not measured data, and will not be displayed on the central monitor. Also, the alarm limit setup from the central monitor cannot be performed.
 - ♦ For the DS-LANII network, arrhythmia alarm of TACHY, BRADY, COUPLET, PAUSE, TRIGEMINY will not be transmitted.
 - ♦ For the DS-LANII network, arrhythmia alarm of "SLOW VT" will be transmitted as "VT".
 - ♦ For the wired network, waveform, numeric data, and alarm of TEMP3 to 6 will not be transmitted. Also, the displayable waveform, numeric data, and alarm will differ depending on the central monitor model type. Refer also to the operation manual for the respective central monitor.
 - ♦ The PR_IBP alarm will not be transmitted to the central monitor.
 - ♦ If the "RR/APNEA alarm source" is other than [Impedance] (or, if [Auto] selects a setting other than [Impedance]), the RESP waveform will not be transmitted on a wired network.
 - ♦ If the "RR/APNEA Alarm Source" setting is other than [CO₂] (Or, if [Auto] selects a setting other than [CO₂]), the CO₂ waveform will not be transmitted on a wired network.
 - ♦ For the numeric data displayed as "xxx", maximum or minimum value of measurable range will be transmitted.
 - ♦ The numeric data displayed as "---" will be treated as not measured data.
 - ♦ If the measurement unit of CO₂ concentration is mmHg and [99mmHg] is selected for "CO₂ (mmHg) Upper Limit of Transmission" ([Initial Settings]>[System]>[DS-LAN]), the CO₂ value of 100mmHg or above will be transmitted as 99mmHg.
 - ♦ As the DS-8200 System do not have the arrhythmia template display and 12-lead ST display function, waveforms and other data will not be displayed for these displays on the central monitor connected by the DS-LAN network.
 - ♦ When connected to the wired network, time/date will be synchronized with the central monitor. Even if the time/date is changed on the DS-8200 System, it will be corrected to the time/date of the central monitor.
 - ♦ Depending on the central monitor model type, the ST display will be distorted if the ECG lead (ECG1 or ECG 2) is changed on the DS-8200 System. Redrawing the ST display will return the display to normal.
 - ♦ On the central monitor, the respiration waveform and RR value based on the RR/APNEA alarm source selected on the DS-8200 System will be displayed. The RR and APNEA monitored on the central monitor and the DS-8200 System will be the same.

Wireless Network System

DANGER

- ♦ When monitoring a patient using wireless telemetry, make sure the patient data is properly received at the central monitor. Pay special attention when the channel ID at the bedside monitor is changed.

WARNING

- ♦ A password can be set to access the channel ID setup menu to allow only the telemetry channel administrator to change the channel ID.
- ♦ Some type of wireless combinations may generate interference with other telemetry.
- ♦ Before selecting a channel, verify it will not interfere with other channels.

- ♦ Inform the supervisor of the use of telemetry channels to avoid interference with other telemetry.
- ♦ If transmitters are used in a neighboring medical facility, your facility and the neighboring facility must make agreements on the setting of the telemetry channels to prevent telemetry interference.

CAUTION Precautions about the Telemetry

- ♦ When performing telemetry transmission, configure the display so that the numeric data corresponded to the waveform is displayed. If not, the displayed waveform or numeric data may not be transmitted.
- ♦ The setup of channel ID and group ID should be performed only by the telemetry channel administrator or our service representative. Users should not perform this procedure as malfunction may occur.
- ♦ When the measurement unit of BP is "kPa", corresponding waveform and numeric data will not be transmitted. When using a wireless network, use "mmHg" for the BP measurement unit.
- ♦ BP waveform with a scale above the set scale can not be properly transmitted. When transmitting the BP waveform, pay attention to the displayed BP scale.
- ♦ If the measurement unit of CO₂ concentration is mmHg and [99mmHg] is selected for "CO₂ (mmHg) Upper Limit of Transmission" ([Initial Settings]>[System]>[Telemeter]), the CO₂ value of 100mmHg or above will be transmitted as 99mmHg.

RTC and Data Backup

CAUTION

- ♦ This equipment is equipped with a built-in clock. When the power of this equipment is turned OFF, this clock is backed up by a lithium primary battery. If incorrect time is displayed when turning ON the power, a low battery may be the cause. In such case, contact Fukuda Denshi service representative for replacing the battery.
- ♦ To protect the data during voltage dip, short interruptions and voltage variations on power supply input lines or during short duration of power turned OFF, this equipment performs 5-minute (approx.) data backup using the secondary battery. The data may not be protected if the power is turned OFF within 30 minutes from power ON.

Precautions about the Ventilator Monitoring

WARNING

- ♦ The ventilator alarm sound is set to OFF at factory default setting.
The alarm sound can be turned ON on the Sound setup screen.
- ♦ If the DS-8200 System does not generate an alarm even though the ventilator is generating an alarm, or if any other malfunction occurs, immediately check the ventilator, DS-8200 System, cable, and replace the cable if necessary. If the malfunction persists, stop using the equipment.
- ♦ The alarm generation on the DS-8200 System is not assured if the alarm other than specified generates at the ventilator.
( Maintenance Manual "Ventilator Measurement and Alarm Input" P4-1)

CAUTION

- ♦ The ventilator operation should be performed by well-trained and authorized personnel.
- ♦ When connecting this equipment and the ventilator, use only the specified connection cable.
- ♦ Verify that this equipment and the ventilator are properly connected.
- ♦ When connecting the cable, verify that the main power of this equipment and the ventilator is OFF.

- When Servo-i/s or SV-300 is connected, RESISTANCE (Insp, Exp), COMPLIANCE, P-V loop, F-V loop display function is not available.

Precautions about the SpO₂ Sensor

⚠ DANGER Danger of Burn Injury Caused by the SpO₂ Sensor

- When monitoring SpO₂, make sure to use only the specified sensor/relay cable. If any other sensor/relay cable is used, a high temperature rise of the sensor may place the patient in danger of burns.
If there are any questions regarding the sensor/relay cable use for SpO₂ measurements of this equipment, please contact Fukuda Denshi service representative.

Precautions about the NIBP Cuff

⚠ CAUTION

- Some of the NIBP cuffs used for this equipment contain natural rubber latex which may cause allergic reactions.
(FDA: Medical Alert on Latex Products, "Allergic Reactions to Latex-Containing Medical Devices", Food & Drug Administration, 10903 New Hampshire Avenue, Silver Spring, MD 20993, 1991.)

Precautions about Disposing of the Equipment, Accessories, or Components

⚠ CAUTION

- When disposing of this equipment, accessories, or components, use an industrial waste distributor. Do not dispose of as ordinary waste.
- When disposing of the battery, separate it from other wastes and contact your nearest service representative.

Precautions about Transportation

⚠ CAUTION

- When transporting this equipment, pack it with specified packing materials.
Also, transport it under appropriate environment condition.
(Operation Manual "Specification" P14-1)

Monitoring after Power Failure

When the power failure is within 30 seconds, monitoring will resume with the display mode and patient information unchanged. When the power failure is 30 seconds or more, monitoring will resume with the default display mode of factory setting or user setting, or the display mode which was last set, only if the equipment was operated for 30 minutes or more before the power failure.

HPD-800/HPD-810, HCP-800/HCP-810 will start up from the warm-up mode. The warm-up time differs for each unit.

To Prepare for Emergency Use

Accessories/Optional Accessories

- The ECG electrodes are consumable products. Always prepare extra supplies of electrodes.

- ♦ Check once a week that there is no wire break on the patient cable.

Battery Pack

- ♦ Even if the battery pack is not in use, the remaining capacity decreases due to self-discharge. Make sure to verify periodically that the battery pack is fully charged
- ♦ To fully charge the empty battery pack, it takes 8 hours during operation, and 3.5 hours when the power is OFF and AC cable is connected.
- ♦ The performance of the battery deteriorates with repeated use. To ensure performance of the battery, it is recommended to replace it once a year.

Electromagnetic Compatibility

The performance of this device under electromagnetic environment complies with IEC 60601-1-2: 2007.

Precautions for Safe Operation under Electromagnetic Influence

If any sorts of electromagnetic wave, magnetic field, or static electricity exist around the device, noise interference or malfunction of the device may occur. If any unintended malfunction or noise occurs during monitoring, check the electromagnetic influence and take appropriate countermeasures.

The following are examples of the common cause and countermeasures.

⚠ DANGER Static Electricity

In a dry environment (room), static electricity is likely to occur. Take the following countermeasures.

- ♦ Both operator and patient should remove any static electricity before entering the room.
- ♦ Humidify the room.

⚠ WARNING Cellular Phone

- ♦ The radio wave may cause malfunction to the device.

Cellular phones and radio sets should be turned off in the room (building) where medical device is located.

⚠ CAUTION Lightning

A lightning nearby may induce excessive voltage to the equipment. If any danger is suspected;

- ♦ Use the uninterruptible power supply system.
- ♦ Use the battery.

⚠ CAUTION High frequency noise interference from other device through the power outlet

- ♦ Check where the noise is originated and remove it using filtering device, etc.
- ♦ Stop using the device that is originating the noise.
- ♦ Use other power outlet.

EMC Guidance

This equipment complies with IEC 60601-1-2: 2007. However, if portable transmitter or wireless LAN equipment is used extremely nearby, the electromagnetic influence may largely exceed the compliance level and may cause unexpected phenomenon such as noise interference on the waveform, etc.

This equipment should be used in a location specified by each medical institution.

If any unexpected noise interference on the waveform or failure to the peripheral device occurs, stop using the equipment and follow the instruction of the technical engineer.

The following is the information relating to EMC (Electromagnetic Compatibility).

(When using this equipment, verify that it is used within the environment specified below.)

Compliance to the Electromagnetic Emissions

The DS-8200 System is intended for use in the electromagnetic environment specified below. It should be assured that the device is used in such an environment.

When measuring only the vital parameters without connection to peripheral equipments (including HLX-801 and Display Unit Extension Cable)

| Guidance and Manufacturer's Declaration - Electromagnetic Emissions | | |
|---|------------|---|
| Emissions Test | Compliance | Electromagnetic Environment - Guidance |
| RF Emissions CISPR 11 | Group 1 | The DS-8200 System uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment. |
| RF Emissions CISPR 11 | Class B | |
| Harmonic Emissions IEC 61000-3-2 | Class A | The DS-8200 System is suitable for use in housing environment and establishments directly connected to the public low-voltage power supply network which is supplied to buildings in housing environment. |
| Voltage Fluctuations/ Flicker Emissions IEC 61000-3-3 | Complies | |

When measuring the vital parameters with connection to peripheral equipments (including HLX-801 and Display Unit Extension Cable)

| Guidance and Manufacturer's Declaration - Electromagnetic Emissions | | |
|---|------------|--|
| Emissions Test | Compliance | Electromagnetic Environment - Guidance |
| RF Emissions CISPR 11 | Group 1 | The DS-8200 System uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment. |
| RF Emissions CISPR 11 | Class A | |
| Harmonic Emissions IEC 61000-3-2 | Class A | The DS-8200 System is suitable for use in all establishments other than housing environment and those directly connected to the public low-voltage power supply network which is supplied to buildings in housing environment. |
| Voltage Fluctuations/ Flicker Emissions IEC 61000-3-3 | Complies | |

Compliance to the Electromagnetic Immunity (1)

The DS-8200 System is intended for use in the electromagnetic environment specified below. The customer or the user of the DS-8200 System should assure that it is used in such an environment.

| Guidance and Manufacturer's Declaration - Electromagnetic Immunity | | | |
|---|---|---|--|
| Immunity Test | IEC 60601-1-2 Test Level | Compliance Level | Electromagnetic Environment - Guidance |
| Electrostatic Discharge (ESD) IEC 61000-4-2 | ±6kV: contact ±8kV: air | ±6kV: contact ±8kV: air | Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%. |
| Electrical fast transient/burst IEC 61000-4-4 | ±2kV: power supply lines ±1kV: input/output lines | ±2kV: power supply lines ±1kV: input/output lines | Mains power quality should be that of a typical commercial or hospital environment. |
| Surge IEC 61000-4-5 | ±1kV: differential mode ±2kV: common mode | ±1kV: differential mode ±2kV: common mode | Mains power quality should be that of a typical commercial or hospital environment. |
| Voltage dips, short interruptions and voltage variations on power supply input lines. IEC 61000-4-11 | <5% U_T^* (>95% dip in U_T) for 0.5 cycles 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 sec. | <5% U_T (>95% dip in U_T) for 0.5 cycles 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 sec. | Mains power quality should be that of a typical commercial or hospital environment. If it is required to continuously operate the DS-8200 System during power failure, it is recommended to operate on an uninterrupted power supply. |
| Power Frequency (50/60Hz) Magnetic Field IEC 61000-4-8 | 3A/m | 3A/m | Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment. |

*: U_T is the AC mains voltage prior to application of the test level.

Compliance to the Electromagnetic Immunity (2)

The DS-8200 System is intended for use in the electromagnetic environment specified below. The customer or the user of the DS-8200 System should assure that it is used in such an environment.

| Guidance and Manufacturer's Declaration - Electromagnetic Immunity | | | |
|--|-----------------------------|---------------------|---|
| Immunity Test | IEC 60601-1-2 Test Level | Compliance Level | Electromagnetic Environment - Guidance |
| Conducted RF IEC 61000-4-6 | 3Vrms 150kHz to 80MHz | 3Vrms | Portable and mobile RF communications equipment should be used no closer to any part of the DS-8200 System, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended Separation Distance $d = 1.2 \sqrt{P}$ |
| Radiated RF IEC 61000-4-3 | 3V/m 80MHz to 2.5GHz | 3V/m | <p>$d = 1.2\sqrt{P}$ 80MHz to 800MHz $d = 2.3\sqrt{P}$ 800MHz to 2.5GHz</p> <p>Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey^{*1}, should be less than the compliance level in each frequency range^{*2}. Interference may occur in the vicinity of equipment marked with the following symbol:</p>  |
| <p>Note 1: At 80MHz and 800MHz, the separation distance for the higher frequency range applies.</p> <p>Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.</p> <p>*1: 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 can not 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 DS-8200 System is used exceeds the applicable RF compliance level above, the DS-8200 System should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the DS-8200 System.</p> <p>*2: Over the frequency range 150kHz to 80MHz, field strength should be less than 3V/m.</p> | | | |

Recommended Separation Distances between Portable and Mobile RF Communications Equipment and the DS-8200 System

The customer or the user of the DS-8200 System can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the DS-8200 System as recommended below, according to the maximum output power of the communications equipment.

| Recommended Separation Distances between Portable and Mobile RF Communications Equipment and the DS-8200 System | | | |
|---|---|---------------------------------------|--|
| Rated Maximum Output Power of Transmitter (W) | Separation Distance according to Frequency of Transmitter (m) | | |
| | 150kHz to 80MHz $d = 1.2 \sqrt{P}$ | 80MHz to 800MHz $d = 1.2 \sqrt{P}$ | 800MHz to 2.5GHz $d = 2.3 \sqrt{P}$ |
| 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 meters (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. P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

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

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

Essential Performance Statement

- ♦ This equipment complies with the requirements of 6.2.1.10 of IEC 60601-1-2:2007 and the accuracy requirements of heart rate range, accuracy and QRS detection range except sub clauses ESD and electrosurgery.
- ♦ This equipment will not change the operation state, lose or change any stored data, generate errors in control software that cause an unintended change in output, or cause errors in blood pressure readings that are outside of 6.2.1.10 of IEC 60601-1-2:2007 and the accuracy requirements of accuracy of systolic and diastolic pressure except for sub clauses ESD and electrosurgery. These criteria do not apply to ESD testing.<IBP>
- ♦ Pulse oximeter equipment meets the requirements of IEC 60601-1-2. <SpO₂>
- ♦ This equipment will not change the operation state, lose or change any stored data, generate errors in control software.<NIBP/TEMP/CO/RESP/EtCO₂>

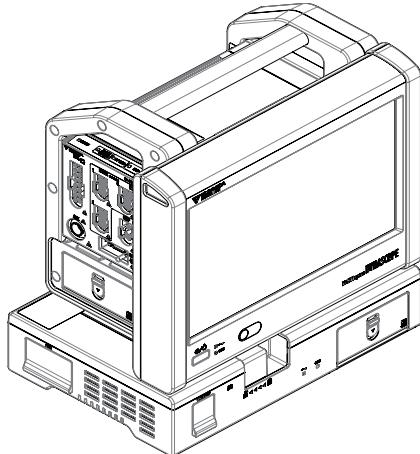
Chapter 1 General Description

| | |
|---|-----|
| Composition of the System..... | 1-1 |
| Outline of System Configuration Diagram | 1-2 |
| Features | 1-3 |
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Chapter 1 General Description

Composition of the System

The DS-8200 system is composed of Display Unit (LC-8210), HS Adapter (HSB-80), Base Unit (BS-8210), Super Unit (HS-8000 Series), Recorder Unit (HR-800) and Gas Unit.



Configuration Example of the DS-8200 system (LC-8210, HSB-80, BS-8210, HS-8000)

Lineup of Super Unit

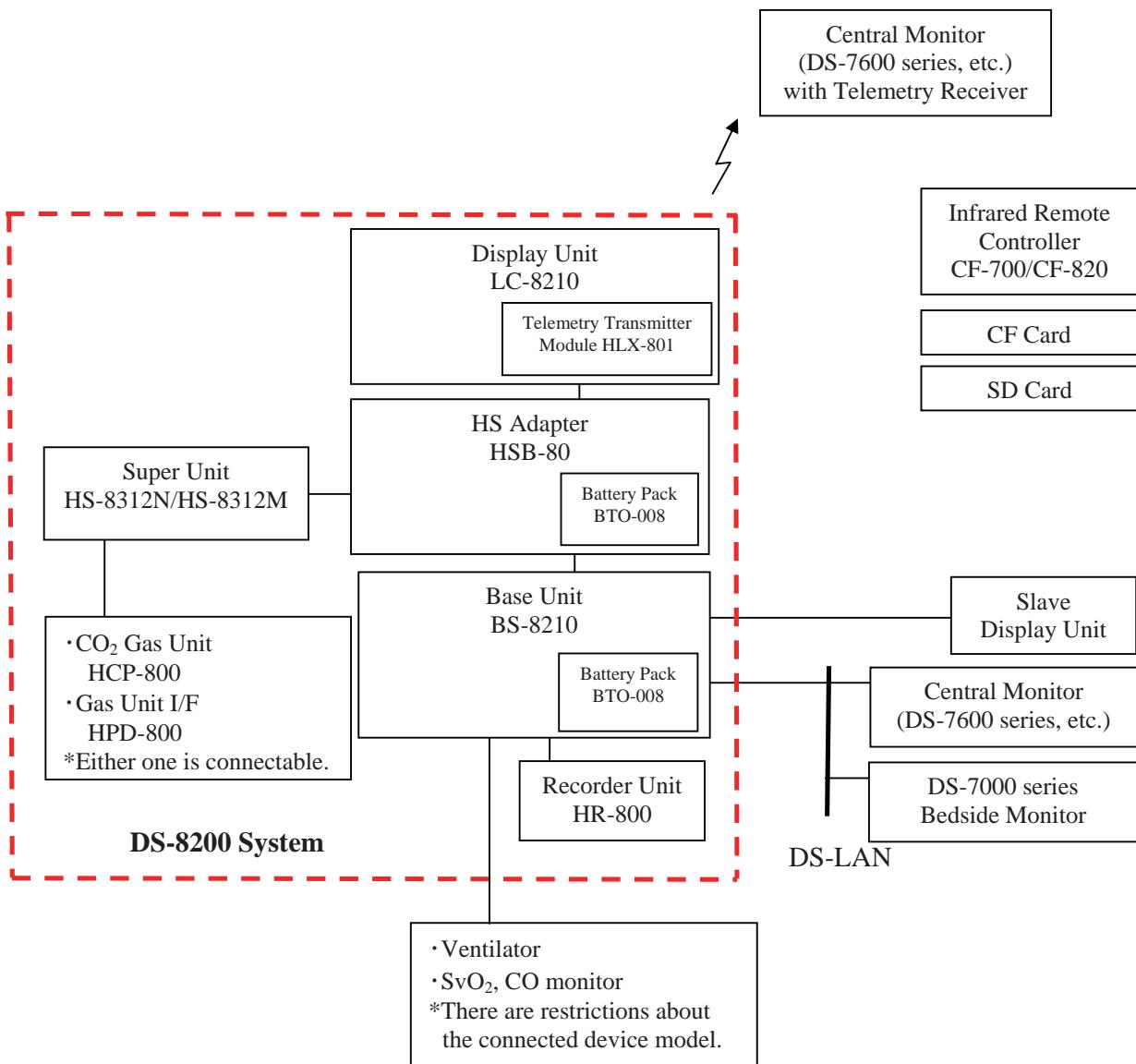
| Model Type | Fixed Parameters | SpO ₂ Unit | Multiparameter | CO ₂ Concentration Measurement (Optional) |
|------------|--|-----------------------|--|--|
| HS-8312N | ECG (Max.12-Leads), RESPx1, NIBPx1 SpO ₂ x1 | Nellcor | 3 port Temperature x6 (maximum) BP x6 (maximum) CO x1 (maximum) | Yes |
| HS-8312M | ECG (Max.12-Leads), RESPx1, NIBPx1 SpO ₂ x1, SpCO x1* SpMet x1*, SpHb x1* | Masimo | | Yes |

* Available only with HS-8312M. SpCO, SpMet and SpHb are available as option.

Lineup of Option Unit

| Model Type | Module | Parameter |
|------------|----------------------|--|
| HPD-800 | Gas Unit I/F | CO ₂ measurement with Mainstream method (Uses the RESPIRONICS® Capnostat 5) |
| HPD-810 | | |
| HCP-800 | CO ₂ Unit | CO ₂ measurement with Sidestream method (Incorporates Covidien's Microstream® technology) |
| HCP-810 | | |

Outline of System Configuration Diagram



Features

- ♦ The display unit can display maximum of 14 waveforms. Also, various displays such as enlarged numeric data, trend, or ventilator can be selected according to monitoring conditions.
- ♦ The operation can be performed with the touch panel. Also, frequently used keys can be assigned on the screen as user keys.
- ♦ The alarm indicator notifies the alarm with different flashing patterns corresponding to the alarm level so that the users can easily identify the alarm level of the generating alarm.
- ♦ Using the CF-820 IR Remote Control Unit allows to remotely control the patient monitor.
- ♦ Using the multiparameter amplifier, the HS-8000 series Super Unit is capable of monitoring parameters in combination of BP (max. 6 ch.), temperature (max. 6ch.), and CO (max. 1ch.).
- ♦ In addition to ECG, respiration, SpO₂ (pulse wave), BP, NIBP, temperature and CO, the measurement of CO₂ concentration is also available as optional function.
- ♦ For the SpO₂ measurement, two model types with different built-in SpO₂ modules are available, which are Covidien®/Nellcor™ and Masimo®.
- ♦ SpCO, SpMet, SpHb, and PVI are optional parameters which can be measured on the HS-8312M with the Masimo® built-in SpO₂ module.
- ♦ By connecting the ventilator to STATUS II port on the Base Unit, airway flow, airway pressure waveform, minute ventilation, airway resistance , etc. can be monitored. Also, ventilator alarm can be notified to the central monitor via telemetry system and wired network. The following ventilators can be connected.
 - ♦ SV-900C/900D/900E
 - ♦ SV-300/300A
 - ♦ Servo-i/Servo-s
 - ♦ PURITAN-BENNETT Ventilator 740/780, 840
 - ♦ Evita 4/Evita XL/Evita 2 dura
- ♦ Wired network (DS-LANII/DS-LANIII) construction is possible.
- ♦ DS-LANII is a network based on 10BASE-T with transmission speed of 10Mbps and maximum transmission distance of 100m. DS-LANIII is a network based on 100BASE-TX with transmission speed of 100Mbps and maximum transmission distance of 100m.
- ♦ Wireless network construction is possible using the optional HLX-801 Telemetry Transmitter Module.
- ♦ By using the optional recorder unit (HR-800), the measurement data can be output on the recorder.
- ♦ By connecting the Gas Unit I/F (HPD-800/HPD-810) or CO₂ Gas Unit (HCP-800/HCP-810) to the AUX connector on the HS-8000 series Super Unit, CO₂ concentration can be measured.
- ♦ By connecting the oximeter to the STATUS II port or COM1 port on the Base Unit, SvO₂ (mixed venous oxygen saturation), CO (cardiac output), etc. can be monitored. The following oximeter/CCO measurement devices can be connected.
 - ♦ Vigilance
 - ♦ Vigilance CEDV
 - ♦ Vigilance II
 - ♦ Vigileo by Edwards Lifesciences
- ♦ By connecting the A-2000 BIS Monitor (ASPECT® MEDICAL SYSTEMS) /BIS Vista A-3000 (Covidien®) to the STATUS II port or COM1 port on the Base Unit, the patient's wakeful state can be monitored.
- ♦ By connecting the INVOS 5100C Non-Invasive Cerebral Oximeter (Covidien®) to the STATUS II port or COM1 port on the Base Unit, regional cerebral oxygen saturation data can be monitored.

Menu Configurations

The menu configuration of the system is as follows.

□ Menu Screen

The menu screen is a group of shortcut keys to jump to each menu.

The menu is composed of the following 9 groups and can be accessed from the menu screen.

| Function Groups | Displayed Menu |
|------------------------------|---|
| Admit/Discharge | Admit/Discharge |
| Basic Setup | Maximum of 9 functions are displayed. |
| Alarm | Maximum of 9 functions are displayed. |
| Parameter | Maximum of 18 functions are displayed. |
| Data Review | Maximum of 9 functions are displayed. |
| Waveform Review | Maximum of 9 functions are displayed. |
| Calculation | Maximum of 5 functions are displayed. |
| Other Bed | Other bedside monitors connected to the DS-LAN will be displayed. |
| Initial Settings/Maintenance | Initial settings/maintenance menu will be displayed. |

REFERENCE

- Other than the "Initial Settings"/"Maintenance", the items to be displayed on the menu screen can be customized by groups.
(☞ Maintenance Manual "Menu Setup" P5-17)

□ Admit/Discharge

| | |
|-----------------|--|
| Admit/Discharge | Mode Select |
| | ID, Name, Classification, Sex, Team, Birth Date, Age, Height, Weight, BSA, Blood Type (ABO, Rh), Pacemaker, Impedance Meas., Admit Date/Time |
| | Monitor Suspend |
| | Discharge |

□ Basic Setup

| | |
|-----------------------|---|
| Display Configuration | Layout, Background, Palette, Detail Setup, Meas., Wave (Sweep Speed, Short Trend), User Key |
| Manual Printing | Basic (Rec. Select, Select Wave, Rec. Duration, Delay Time), 12-Lead (Rec. Format, Position, Wave Format, Print Calibration, Recorder Auto Scale), Other Setup (Graphic Recording, Recall Recording), Common (QRS Classification, Speed, Print Calibration, Record NIBP Data) |
| Auto Printing | Alarm Printing (Print, Printer, Waveform, Print Duration), Periodic Printing (Print, Printer, Periodic Interval, Waveform, Print Duration), Common (QRS Classific, Speed, Print Calibration, Print NIBP Data) |
| Sound | Vital Alarm Sound, Ventilator Alarm Sound, Status Alarm Sound, Tone Source, Key Sound, Other Bed Alarm Sound, Boot/Shutdown, Other |
| Time/Date | Time, Date |
| Color | Waveform/Numeric Data, Background, Palette, User Key |
| Brightness | Brightness |
| Night Mode | Night Mode, Detail Setup (Volume, Display, Alarm Indicator) |

□ Alarm

| | |
|------------------|--|
| Basic | The parameters to be displayed are selectable. |
| | Alarm Suspend, Mode Select, Print Setup, All Auto, Resume All Alarm Sound |
| Circulatory | Alarm setup for HR, SpO ₂ , PR_SpO ₂ , NIBP (S, M, D), PR_IBP, BP1 to 6 (S, M, D), TEMP1 to 6, Tb, SpCO, SpMet, SpHb |
| | Alarm Suspend, Mode Select, Print Setup, All Auto, Resume All Alarm Sound |
| Respiratory/Gas | Alarm setup for RR, APNEA, EtCO ₂ , InspCO ₂ |
| | Alarm Suspend, Mode Select, Print Setup, All Auto, Resume All Alarm Sound |
| Arrhythmia Alarm | Arrhythmia Alarm and details can be set. |
| ST | ST All Alarm, ST(II)Alarm, Waveform Review (ST), Basic Wave Refresh |
| List | List of alarm ON/OFF setting and lower/upper limits, Meas. List/All List, Print Setup, Recall Setup |
| Detail Setup | Suspend Time, Silence Time, Alarm Silence, Alarm Sound Suspend, Status Alarm Control, Alarm Limit Display |

□ Parameter

| | | |
|------------------|---|---|
| ECG | Arrhythmia Learn Arrhythmia Alarm Setup, ST Setup, HR | |
| | Size/Lead, Optimize Size, Alarm Assist, Disp. ON/OFF, HR/PR | |
| | Detail Setup (Filter, Sync.Mark/Tone, Pacemaker, Pace. Pulse, Pace Pulse Mask Time, HR Average, ECG Drift Filter, AC Filter, Auto Lead, 3Lead Override, ST/VPC/Arrhy. Alarm Display, ECG Analog Output, ECG waveform display during Lead-OFF, Noise Detection, Chest Lead-OFF) | |
| RESP | Size, Common Setup (RR Sync. Indicator, RR Alarm APNEA Source), Impedance Setup (CVA Detect, Impedance Measurement, Impedance Detection Lead), RR, APNEA, Alarm Assist, Disp. ON/OFF | |
| NIBP | NIBP Auto Mode, Detail Setup (Patient Classification, Dyna Alert, Oscillograph Display/Record, PR Display, NIBP Erase Time, Measure at Alarm, Quick Measurement, Sigh Inflation, MAP, End Tone, User Interval, Auto Mode with Start/Stop key, Time Display, Alarm Assist, Cancel Error, NIBP) | |
| BP | BP Zero (BP1 to BP6), BP1 to 6 | |
| | Scale Selection, Label, Detail Setup (Synchronized Mark/Tone, Display Type, Wave Filter, Mean Wave, Resp. Filter, IBP Analog Output, Alarm during NIBP), Alarm Assist, Display ON/OFF, HR/PR | |
| SpO ₂ | Size, Label, Alarm Assist, Display ON/OFF, HR/PR, SpO ₂ , PR_SpO ₂ | |
| | HS-8312N | Detail Setup (Alarm during NIBP, Synchronized Mark/Tone, Second Alarm) |
| | HS-8312M | Detail Setup (Alarm during NIBP, Synchronized Mark/Tone, SpO ₂ Averaging, Pulse Sensitivity, FAST SAT, PI Display, Signal IQ Wave) |
| Sp* | SpCO, SpMet, SpHb (Averaging), Alarm Assist | |
| TEMP | Label, ΔT, Alarm Assist, T1 to T6 Display ON/OFF, T1 to T6, Tb | |
| CO ₂ | Scale, Calibrate Airway Adapter, Detail Setup (EtCO ₂ Peak Duration, N ₂ O Compensation, Atmos. Pressure, O ₂ Compensation, Anesthetic Compensation), Alarm Assist, Display ON/OFF, EtCO ₂ , InspCO ₂ | |
| Ext. Device | Vigilace/Vigileo, VENT, STAT Mode, Index Display, INVOS, AWF Scale, AWP Scale, AWV Scale, P-V, F-V Scale, Lt-rSO ₂ , Rt-rSO ₂ , S1-rSO ₂ , S2-rSO ₂ | |

□ Data Review

| | |
|---------------|---|
| Graphic Trend | Latest Data, Alarm Review, Trend Group, Alarm Disp. Sel., Print |
| Tabular Trend | Latest Data, Alarm Review, List Group, Setup, Print, Print (All) |
| Recall | Latest Data, Display Selection, Print Selection, Select All, Setup, Delete Sel. |
| OCRG | Resp. Wave (Impedance, CO ₂), Latest Data, Resp. Wave Size, Print |
| Alarm History | Latest Data, Display Selection, Print |

□ Waveform Review

| | |
|-----------------|--|
| Zoom Wave | Latest Data, Alarm Review, Meas., Print, Delete* ¹ (When CF card for full disclosure waveform is inserted: Setup, Size/Scale) |
| ST | ST Wave, Reference Wave, Setup, Slide Show, Size, Latest Data, Print |
| 12-Lead | Latest Data, Review, Chest Lead/Limb Lead, Setup, Record * Start Analyze/In Progress, Dominant/Numeric, Real Time, Analyzed Wave/Result, Delete (at the time of ECG measurement only) |
| Full Disc. Wave | Latest Data, Alarm Review, Slide Show, Time Search, Size/Scale, Setup, Alarm Display, Print |

□ Calculation

| | |
|---------------|--|
| Hemodynamics | Input Data, Edit, list of the calculation results, New Regist., Index Disp, Record |
| Lung Function | Input Data, Edit, list of the calculation results, New Regist., Index Disp, Record |
| CO | Meas., Edit, Scale, Start, Print, Setup, Hemodynamics, Average CO Input, Delete Sel. |

□ Other Bed

| | |
|-----------|---|
| Other Bed | Area Selection (Area 1 to 4), Alarm Sound, Alarm Display, Area Setup (Area 1 to 4), Bed List, Area name / Color, Select All, Cancel All, Enter, All |
| | Area Selection (Area 1 to 4), Other Bed Alarm Silence, Waveform Selection |

Initial Settings

| | | |
|------------------------|---------------------|--|
| Alarm | - | Alarm System, Basic Alarm Parameter, Asystole/VF/VT Alarm, Buzzer Tone at Speaker Failure, Suspend Arrhy, Analysis during Noise Interference, Low Limit for Alarm Volume, Alarm Indicator, Alarm Level |
| Meas. | User Label | BP, TEMP |
| | Unit | CO ₂ , BP, CVP, TEMP, ST, Height/Weight |
| | Other | NIBP Start 5min.early, MAP Calculation (ART, NIBP), Arrhythmia Analysis Filter, Synchronized Mark/Tone Priority, HR/PR Source Priority |
| User I/F | Display/Print | Date Format, BP Alarm Increment, Trend Clip, BP Printing Scale, Night Mode Cancel, ST Display Lead Setup, Auto Display Configuration, Dim All Data Other than Numeric, All Window Opaque, Built-in Printer Message Display, Message Icon, Time Bar Scale, Notification when Changing Equipment Configuration, 12-lead Analysis Filter Display, Waveform Size Display, Slave Monitor Output, Shift Time(Day Shift, Twilight Shift, Night Shift), Key Group Setup, Event Label Setup |
| | Power ON/ Discharge | Check discharge at power ON, Discharge Mode, NIBP Resume Auto Mode by Manual Meas., Backup setting at Power ON/Discharge, Automatic Start by AC Connection, Automatic Start by M-LAN Connection |
| | Menu | Items to be displayed on the menu screen can be selected. |
| | Key Mask | Items not to be displayed on the menu screen can be selected. |
| | Remote Control | Remote Control Key Function, Room ID, Bed ID |
| | Operation | Auto Hide Window, Auto Minimize |
| External Device | Main Unit Port | COM, Status II Ventilator (SV-900, SV-300, Servo-i/s, PB, Evita), SvO ₂ /CCO(Vigilance), Other (PC Comm., BIS, INVOS) |
| | Network | Main Unit (IP Address, Sub-Network Mask, Default Gateway), Printer (Network Printer, IP Address, MAC Address, Printer Specification, Paper Size), Regist, Cancel, Test Print, General LAN/Moduloe LAN |
| | Status Output | Synchronized Signal Output Setup (HS-8000) Signal Output, Output Logic, Alarm Output (Status II -1) (Status II -2) Alarm Level, Output Logic |
| | Analog Output | Analog Output Setup (HS-8000) ECG, IBP Output1, IBP Output2 |
| System | DS-LAN | DS-LAN Setup, Room ID, Bed ID, DS-LAN Pat. ID Transmission Start Position, Synchronize Hemodynamic Data with the Central Monitor, CO ₂ (mmHg) Upper Limit of Transmission |
| | Telemeter | Telemeter, Channel/Group ID, Telemetry Wave, CO ₂ (mmHg) Upper Limit of Transmission |
| | Multiamplifier | Multiparameter connector for HS-8000 can be set |
| | Other | AC filter, Data Transfer, HS-8000 Data for Transfer, Numeric Data External Output |
| User Mode Registration | | Regist., Change, Initialize, Change Mode Name, Set All Modes, Initialize All Modes |
| Administrator Setup | Key Lock | Key lock for each function can be set. |
| | Password Setup | Password for each administrator level can be registered/changed. |

Maintenance

| | |
|-------------|---|
| Maintenance | Program Version, Card, Parts Usage Time, Install, Module Install, Test Menu |
|-------------|---|

Chapter 2 Name of Parts and Their Functions

| | |
|---|------|
| Name of Parts and Their Functions | 2-1 |
| Display Unit: LC-8210..... | 2-1 |
| HS Adapter: HSB-80 | 2-3 |
| Base Unit: BS-8210 | 2-4 |
| Super Unit: HS-8000 | 2-6 |
| Recorder Unit: HR-800 | 2-7 |
| CO2 Gas Unit: HCP-800 | 2-8 |
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| Gas Unit I/F: HPD-800..... | 2-10 |
| Gas Unit I/F: HPD-810..... | 2-11 |
| External Appearance | 2-12 |

Chapter 2 Name of Parts and Their Functions

Name of Parts and Their Functions

⚠️ WARNING

- Do not connect a unit or cable not authorized by Fukuda Denshi to any I/O connector. If done so by mistake, the equipment cannot deliver its maximum performance and the connected units may be damaged, resulting in a safety hazard.

Display Unit: LC-8210

Front Side

1 Standby Switch

Sets ON/OFF the Standby Mode.

2 Ambient Light Sensor

Detects the ambient light.

3 Remote Control Sensor

Receives the signal from the specified remote control.

4 Power Supply Indicator

Indicates the power supply status.

Lights when the AC power is supplied to the main unit and links with the standby switch.

- Orange: Standby Mode

- Green: In normal operation

- Light Off: In battery operation (AC power cable is not connected.)

5 Battery Charging LED

Indicates the battery-charging status.

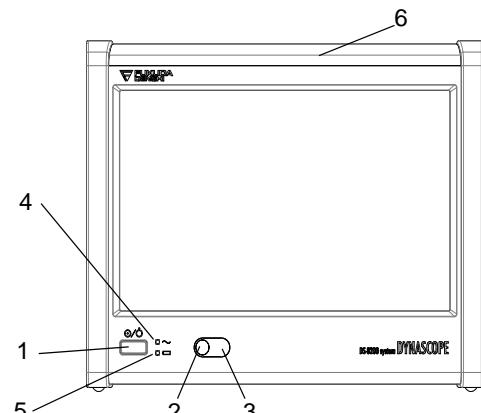
During battery operation, the LED will not light.

- Orange: Charging is in process

- Green: Charging is complete

- Light Off: During battery operation, or when battery is not installed, or when battery charging is ceased (due to temperature, etc.)

- Flash: Battery charging error



NOTE

- If the battery charging LED flashes, battery charging error is occurring. Remove the battery and install it again. If the error persists, contact your nearest service representative.

6 Alarm Indicator

Lights when an alarm generates or lights synchronizing to the heartbeat depending on the setup.

□ Rear Side**1 Maintenance Cover**

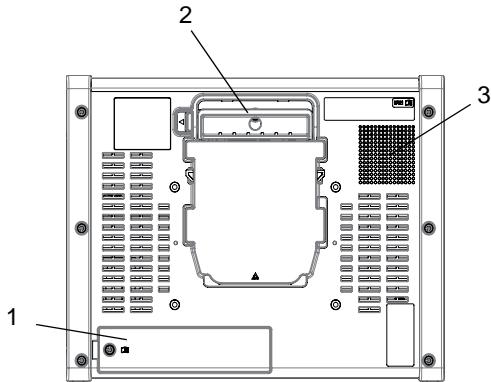
Used for replacing the short-term backup battery.

2 Display Unit Release Lever

Used for releasing the unit from the HS Adapter (HSB-80).

3 Speaker

Generates alarm sound, HR synchronized sound, etc.

**□ Right Side****1 HLX Storage Cover**

Stores the telemetry transmitter module (HLX-801).

2 CF Card Slot Connector (inside the cover)

Inserts the specified CF memory card.

3 CF Card Access Indicator (inside the cover)

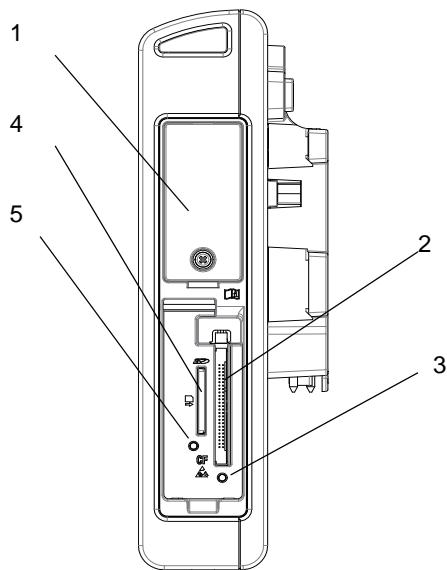
Indicates CF card access status.

4 SD Card Slot (inside the cover)

Inserts the specified SD memory card.

5 SD Card Access Indicator (inside the cover)

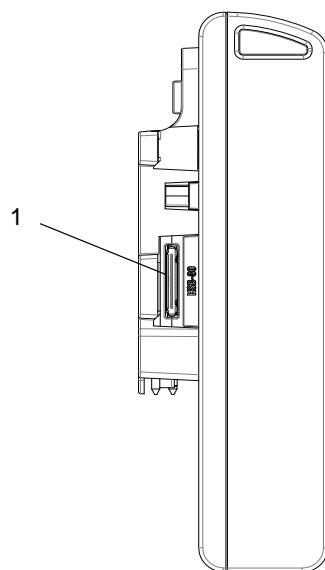
Indicates SD card access status.

**□ Left Side****1 Display Unit Extension Cable Connector**

Connects the HS Adapter with the display unit extension cable.

To use the display unit extension cable, the VESA

Attachment for LC-8210 (OAO-71A) is required. For details on how to attach the OAO-71A, refer to the OAO-71A Assembly Instruction.

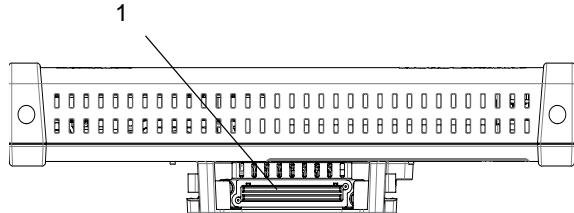


CAUTION

- Make sure that the power of DS-8200 system is turned OFF when connecting/disconnecting the display unit extension cable.

□ Bottom
1 HS Adapter Connector

Connects the HS Adapter (HSB-80).


HS Adapter: HSB-80
□ Front Side
1 Display Unit Connector

Connects the Display Unit (LC-8210).

2 Display Unit Extension Cable Connector

Connects the Display Unit (LC-8210) with the display unit extension cable.

To use the display unit extension cable, the VESA Attachment for LC-8210 (OAO-71A) is required. For details on how to attach the OAO-71A, refer to the OAO-71A Assembly Instruction.

3 Operation Mode Switch

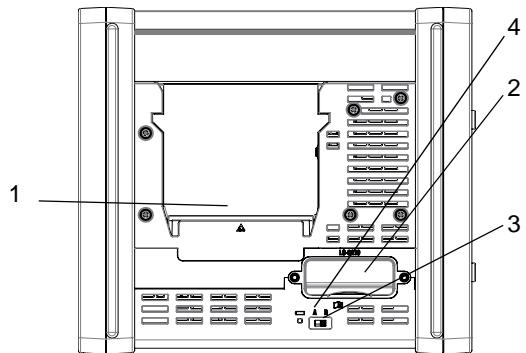
Used when connecting to other systems.

4 Battery Charging LED

Indicates the battery-charging status.

♦Orange: Charging is in process

♦Green: Charging is complete

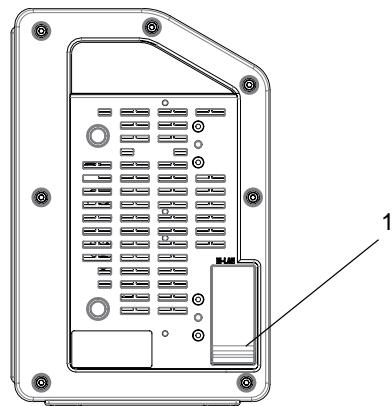

CAUTION

- Make sure that the power of DS-8200 system is turned OFF when connecting/disconnecting the display unit extension cable.

□ Right Side

1 Module-LAN Connector

Used when connecting to other systems.



□ Left Side

1 Super Unit Connector

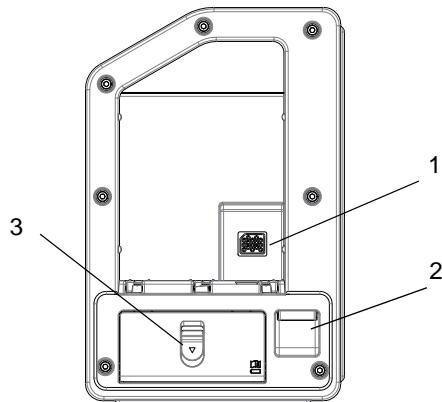
Connects the Super Unit (HS-8000).

2 Release Lever

Used for releasing the Super Unit (HS-8000).

3 Battery Cover

Used when replacing the battery pack with the cover open.



Base Unit: BS-8210

□ Front Side

1 Battery Cover

Used when replacing the battery pack with the cover open.

2 Power Supply Indicator

Indicates the power supply status.

Lights when the AC power is supplied to the main unit and links with the standby switch.

♦ Orange: Standby Mode

♦ Green: In normal operation

♦ Light Off: In battery operation (AC power cable is not connected.)

3 Battery Charging LED

Indicates the battery-charging status.

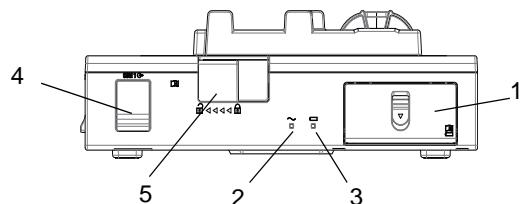
During battery operation, the LED will not light.

♦ Orange: Charging is in process

♦ Green: Charging is complete

♦ Light Off: During battery operation, or when battery is not installed, or when battery charging is ceased (due to temperature, etc.)

♦ Flash: Battery charging error



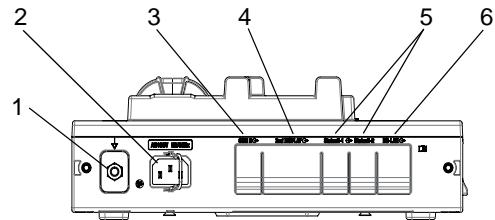
NOTE

- If the battery charging LED flashes, battery charging error is occurring. Remove the battery and install it again. If the error persists, contact your nearest service representative.

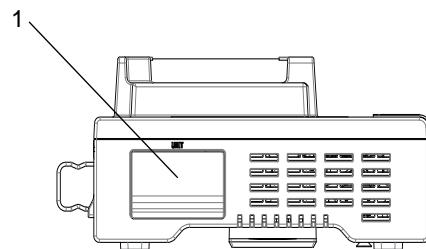
- 4 Serial Connector (COM1)
Connects the specified equipment.
- 5 HSB Release Lever
Used to remove the HS Adapter (HSB-80).

□Rear Side

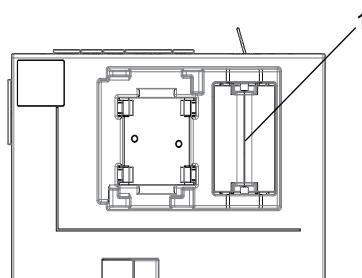
- 1 Potential Equalization Terminal
Used for equipotential connection.
- 2 Power Supply Connector
Connects the power supply cable.
- 3 Serial Connector (COM2)
Connects the specified equipment.
- 4 External monitor connector
Connects the external monitor.
- 5 Status Input/Output Connector (Status II-1/II-2)
Connects the specified equipment.
- 6 DS-LAN Connector
Connects to the wired network using the Branch Cable (CJ-520/CJ-522).

**□Left Side**

- 1 U-LINK Connector
Connects the Recorder Unit (HR-800).

**□Top View**

- 1 HS Adapter Connector
Connects the HS Adapter (HSB-80).



Super Unit: HS-8000

Front Side

1 NIBP Start/Stop Key

Starts/stops the NIBP measurement. The indicator lights during the NIBP measurement.

2 BP Zero Balance Indicator

Performs BP zero balance. The indicator lights during the BP zero balancing.

3 Alarm Silence Key

Silences the Alarm. The indicator lights during the alarm silence condition.

4 Power Supply LED

Indicates the power supply status.

5 ECG Connector

Connects the ECG cable.

6 AUX Connector

Connects the Gas Unit I/F (HPD-800/810) or the CO₂ Gas Unit (HCP-800/810).

7 Multiparameter Connector

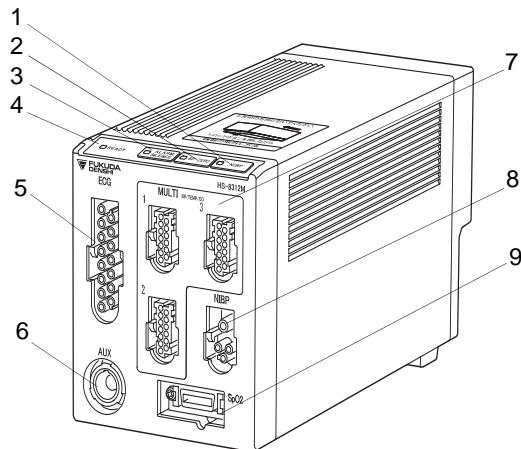
Connects the input cables for BP, TEMP or CO.

8 NIBP Connector

Connects the NIBP air hose.

9 SpO₂ Connector

Connects the SpO₂ sensor, or relay cable (patient cable).



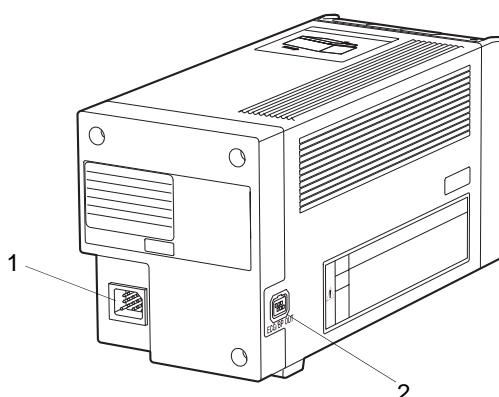
Rear Side

1 HS Adapter Connector

Connects the HS Adapter (HSB-80).

2 Analog Output Connector

Outputs the ECG and BP waveforms.



Recorder Unit: HR-800

□Front Side

1 Power Supply Indicator

Indicates the power ON/OFF status.

2 Printing Indicator

Lights during printing.

3 Record Key

Starts/stops the printing.

4 Paper Feed Indicator

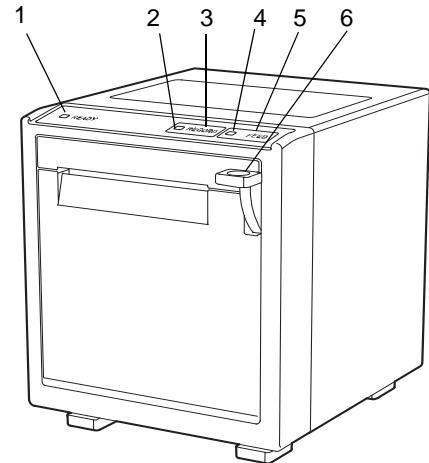
Lights during paper feeding.

5 Paper Feed Key

Feeds the paper.

6 Open/Close Lever

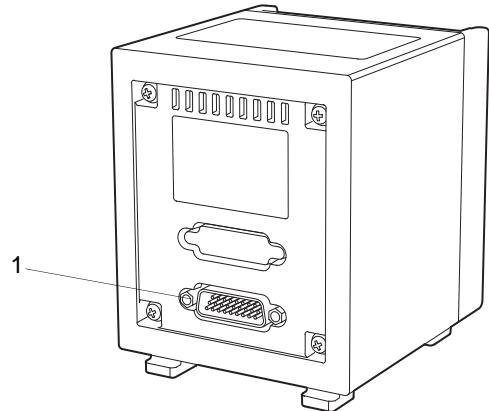
Opens the paper holder by pressing it.



□Rear Side

1 U-LINK Connector

Connects to the Base Unit (BS-8210).



CO₂ Gas Unit: HCP-800

□ Front Side

1 Power Supply Indicator

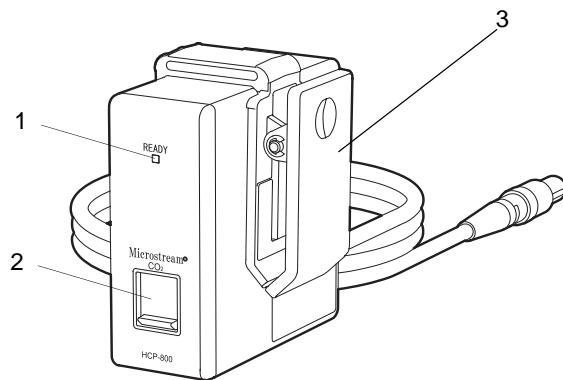
Indicates the power ON/OFF status. It will light in green while the power is ON.

2 Sampling Tube Connector

Connects the sampling tube manufactured by Covidien®.

3 Clip

Attaches to the bedside rail or headboard for bedside use.



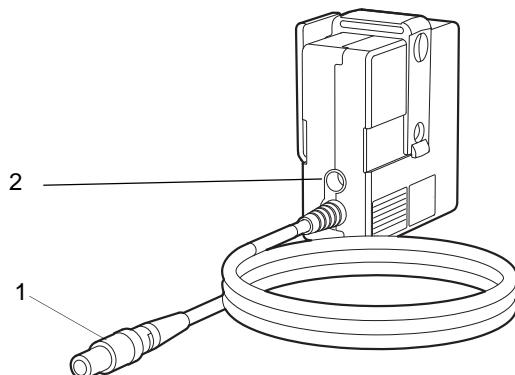
□ Rear Side

1 AUX Connector

Connects to the AUX connector of the HS-8000.

2 Exhaust Hole

Connects the gas exhaust system and exhausts sampling gas.



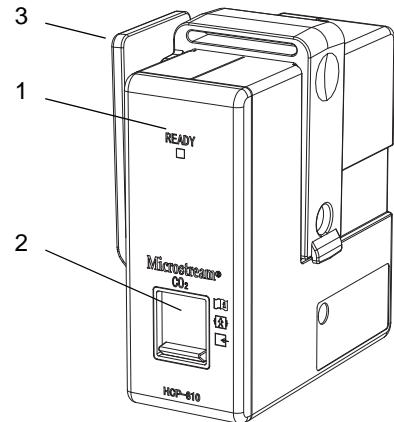
CAUTION

- Do not block the exhaust hole as it may cause damage to the equipment.

CO₂ Gas Unit: HCP-810

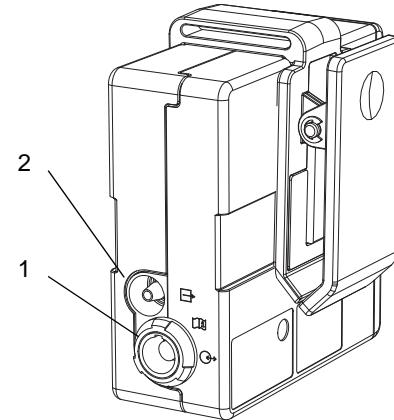
□ Front Side

- 1 Power Supply Indicator
Indicates the power ON/OFF status. It will light in green while the power is ON.
- 2 Sampling Tube Connector
Connects the sampling tube manufactured by Covidien®.
- 3 Clip
Attaches to the bedside rail or headboard for bedside use. (supplied as accessory)



□ Rear Side

- 1 AUX Connector
Connects to the AUX connector of HS-8000 with AUX connection cable, CJO-15RR0.65.
- 2 Exhaust Hole
Connects the gas exhaust system and exhausts sampling gas.



⚠ CAUTION

- ♦ Do not block the exhaust hole as it may cause damage to the equipment.

Gas Unit I/F: HPD-800

□Front Side

1 Power Supply Indicator

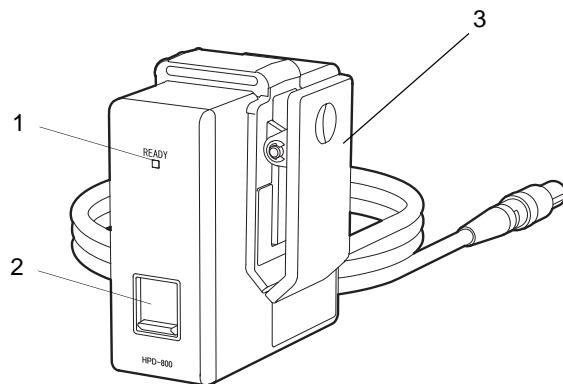
Indicates the power ON/OFF status. It will light in green while the power is ON.

2 CO₂ Connector

Connects to the Capnosta 5 manufactured by Respiration.

3 Clip

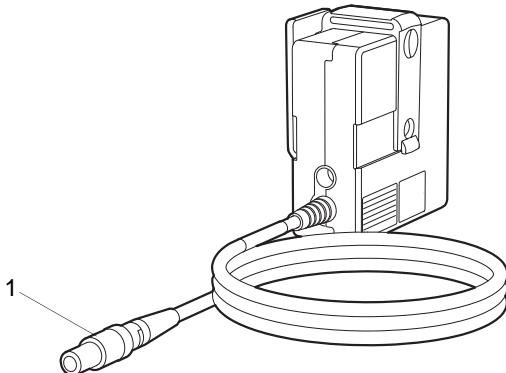
Attaches to the bedside rail or headboard for bedside use.



□Rear Side

1 AUX Connector

Connects to the AUX connector of the HS-8000.



Gas Unit I/F: HPD-810

□Front Side

1 Power Supply Indicator

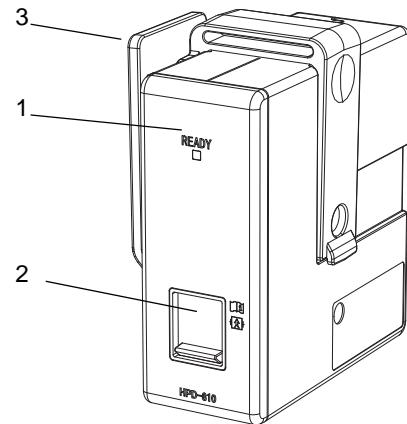
Indicates the power ON/OFF status. It will light in green while the power is ON.

2 CO₂ Connector

Connects to the Capnosta 5 manufactured by Respiromics.

3 Clip

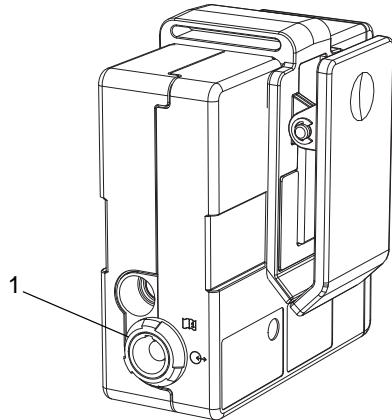
Attaches to the bedside rail or headboard for bedside use.



□Rear Side

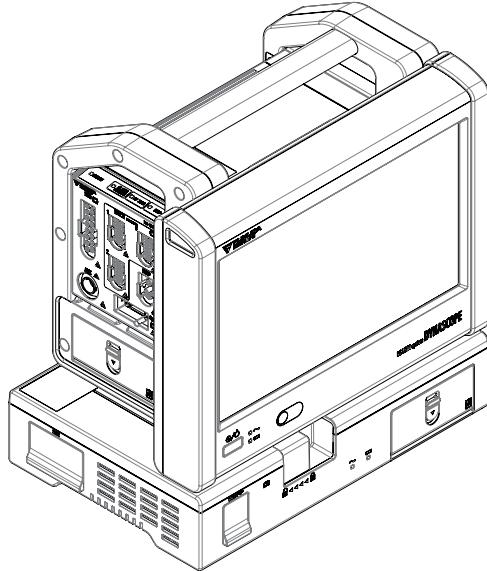
1 AUX Connector

Connects to the AUX connector of HS-8000 with AUX connection cable, CJO-15RR0.65.



External Appearance

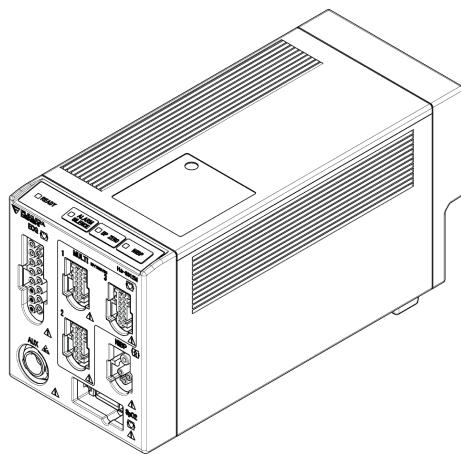
- DS-8200 System
(LC-8210 Display Unit, HSB-80 HS Adapter, BS-8200 Base Unit)



270(W) x 201(D) x 302(H) mm (not including the protrusion)

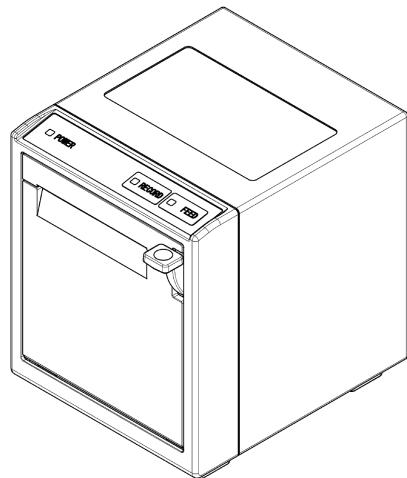
Weight: 7.0kg

- Super Unit: HS-8000



85(W) x 200(D) x 100(H) mm (not including the protrusion)

Weight: 1.2kg

Recorder Unit: HR-800

87(W) x 100(D) x 108.5(H) mm (not including the protrusion)

Weight: 0.54kg

Chapter 3 Operation Procedure and Screen Examples

| | |
|---|------|
| Operation Procedure | 3-1 |
| Touch Key | 3-1 |
| Home Display | 3-2 |
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| Displayed Items | 3-4 |
| Description of the Display..... | 3-13 |
| Messages and Sound..... | 3-14 |
| Window Display | 3-16 |
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| To Delete the Unnecessary Keys (Key Mask) | 3-23 |
| Display on the External Monitor..... | 3-23 |
| External Monitor Display..... | 3-23 |

Chapter 3 Operation Procedure and Screen Examples

Operation Procedure

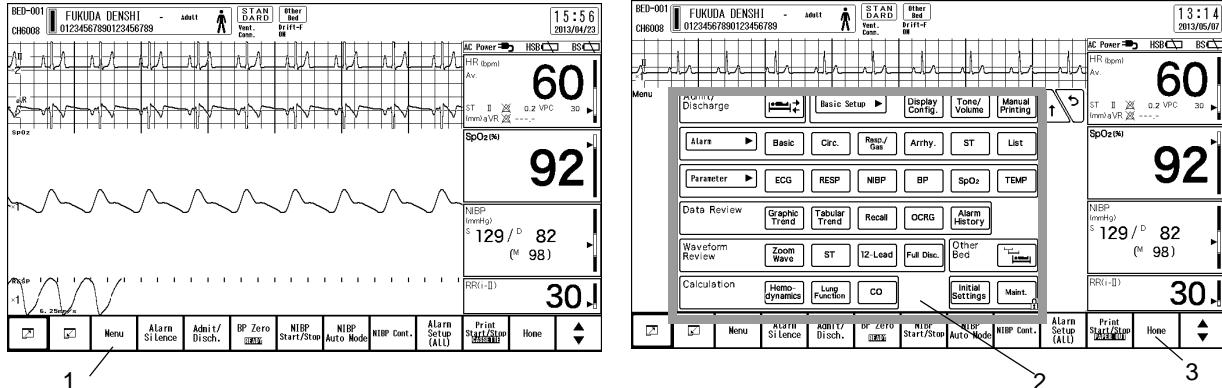
The operations of this equipment are performed using fixed keys. Remote control is also possible using the remote control unit.

Touch Key

CAUTION

- Do not use the touch panel with the film attached. Malfunction of the touch panel or damage may result.
- Due to its material characteristic, the touch panel expands/contracts depending on the temperature/humidity. When the touch panel is left unused for a while, or when the ambient temperature is low, the surface film of the touch panel may expand, but this is not an abnormal condition. This expansion will be reduced in few hours or half a day after the power is turned ON.

General Key Control

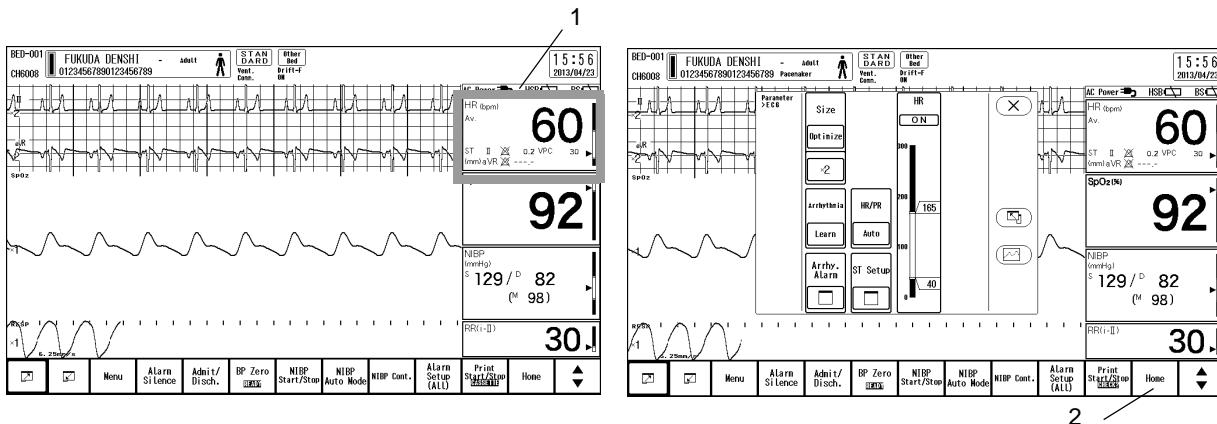


- Pressing the [Menu] key will switch the display with a pip sound.
- The touch key will respond by pressing any part of the key.
- Pressing the [Home] key at any time will return the display to the home display.

REFERENCE

- The above is an example of the screen. The user keys can be customized and can be placed to any position.
(☞ "To Configure the Display" P10-4)

□ Key Control for Each Parameter



- 1 Touch on the numeric data box.
The touch key will respond by pressing any part of the numeric data box.
- 2 Pressing the [Home] key at any time will return the display to the home display.

REFERENCE

- ♦ Frequently used touch keys can be programmed as user key. The user key can be positioned to the user keys display area at the bottom of the screen and also on the numeric data area.
(☞ "For Easier Use" P3-22)

Home Display

About the Home Display

The display can be configured according to the monitoring purpose.

There are 3 types of basic display layout, which are "Standard", "Standard & Bottom" and "12-Lead".

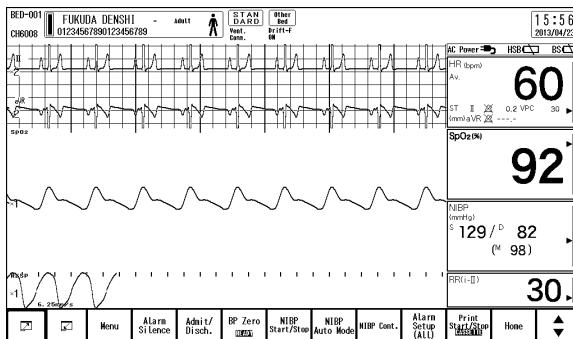
"Standard" is the most basic layout.

"Standard & Bottom" is the layout with numeric data box at the bottom, which allows it to increase the number of measurement parameter to be displayed.

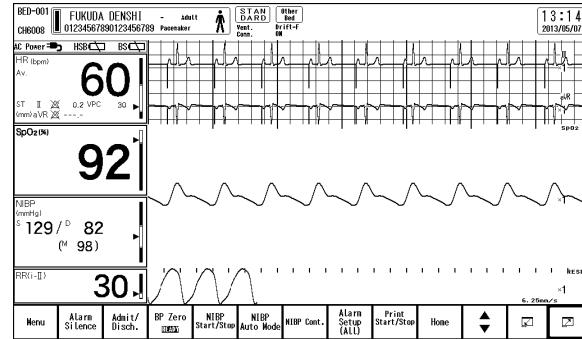
"12-Lead" is the layout for monitoring the 12-lead ECG. 12-lead ECG and other waveforms will be displayed.

The numeric data box area can be selected from "Right", "Bottom/Right", "Left", "Bottom/Left", "Bottom", "Left (Large)", "Right (Large)" and "Numeric/Max. Size".

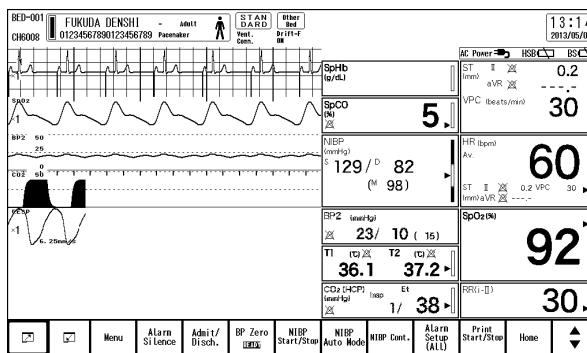
Display Example:



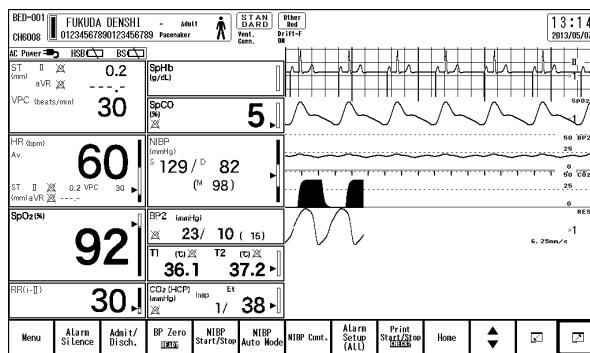
Numeric Data: Standard/Right



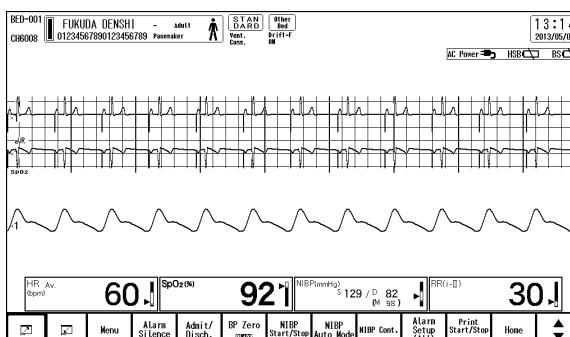
Numeric Data: Standard/Left



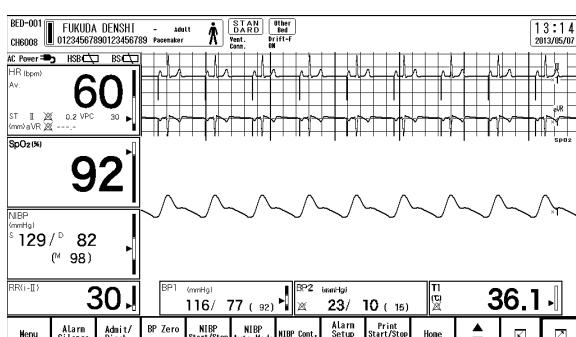
Numeric Data: Standard/Right(Large)



Numeric Data: Standard/Left(Large)

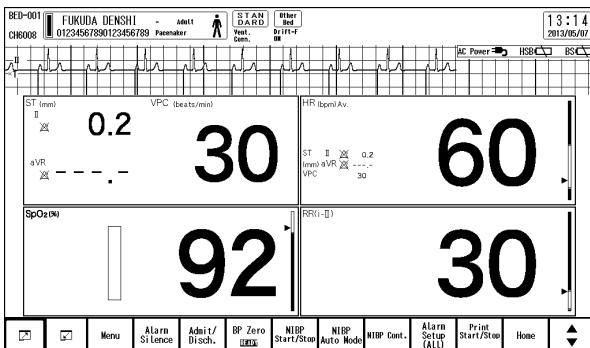


Numeric Data: Standard/Bottom

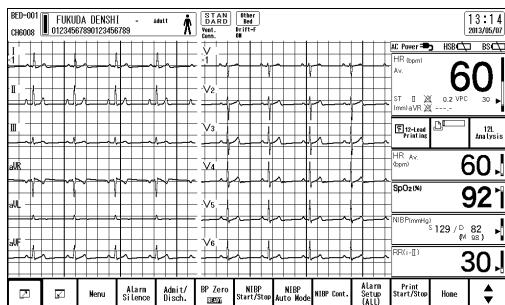


Numeric Data: Standard&Bottom/Right

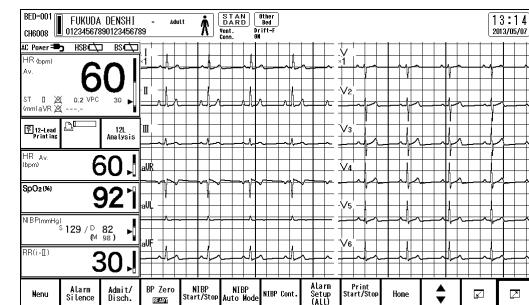
Numeric Data: Standard&Bottom/Left



Numeric Data: Maximum Size



Layout: 12-Lead , Numeric Data: Right



Layout: 12-Lead , Numeric Data: Left

REFERENCE

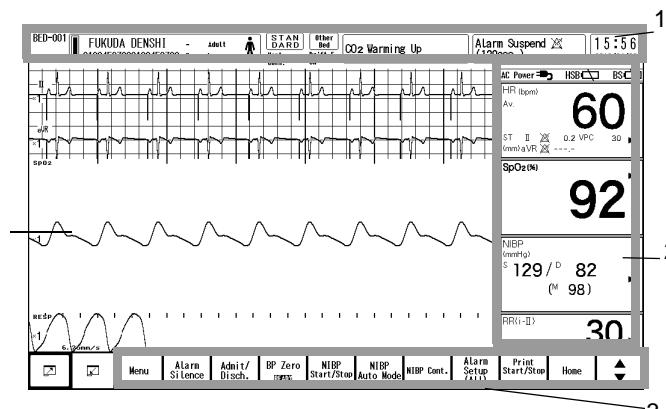
- The display layout can be configured and registered as necessary.
(☞ "To Configure the Display" P10-4)

Displayed Items

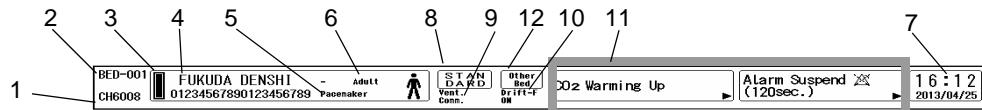
Other than waveforms and numeric data, patient name, alarm message, status message, etc. will be displayed on the screen.

□ Numeric Data, Waveform, Patient Name, etc.**1 Information Display Area**

Room/Bed ID, Patient Name, Patient Class., current time, messages, etc., will be displayed.

2 Numeric Data Area**3 User Key Area****4 Waveform Area**

□ Information Display Area



- 1** Telemetry Channel (When HLX-801 is connected)

Displays the telemetry channel ID.

- 2** Room/Bed ID

Displays the 3-digit Room ID and 3-digit (000–999) Bed ID.

- 3** Nurse Team Color

Displays the color of the nurse team set on the "Admit/Discharge" menu.

- 4** Patient Name

Displays the patient name set on the "Admit/Discharge" menu.

- 5** Pacemaker Usage

When [Used] is set for "Pacemaker" on the "Admit/Discharge" menu, <Pacemaker> will be displayed.

- 6** Patient Classification

Displays the patient classification (Adult, Child, Neonate) set on the "Admit/Discharge" menu.

- 7** Date / Time

Displays the current date (month, day) and time (hour, minute).

- 8** Set Mode

Displays the user mode currently set.

- 9** Ventilator Connection Status

Displays the connection status to the ventilator.

<Vent. Comm.>: Communication with the ventilator is in progress.

<Vent. Offline>: Communication with the ventilator is interrupted.

<Vent. Disable>: Communication with the ventilator is disabled.

- 10** Drift Filter

When drift filter is set to ON, "Drift-F ON" will be displayed.

- 11** Message Area

Displays the message when an alarm generates.

By pressing the message display area, the alarm message history can be verified.

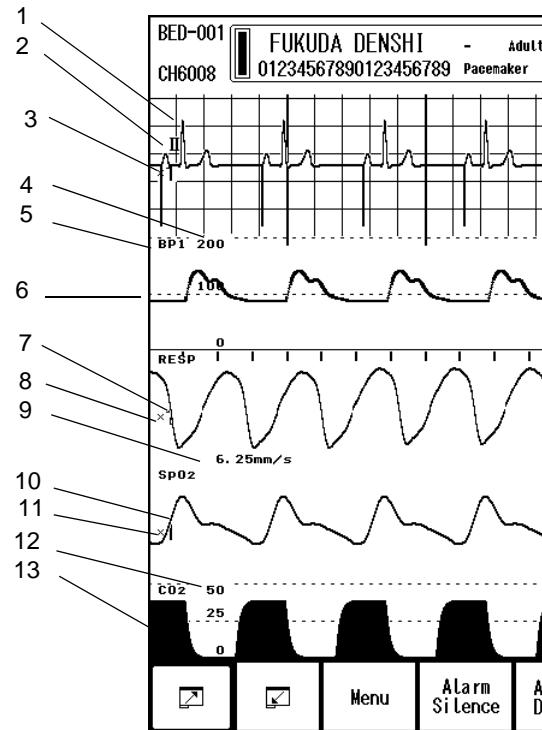
- 12** Other Bed Status

Displayed when connected to central monitor.

Pressing the [Other Bed] key will display the Other Bed display.

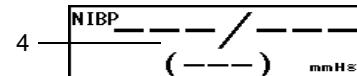
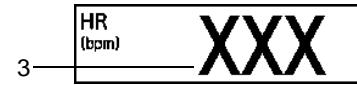
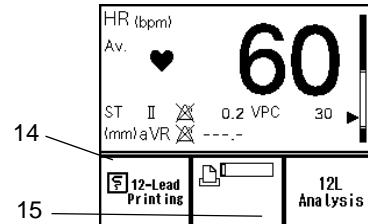
Waveform Area

- 1 ECG
- 2 ECG Lead
- 3 ECG Size
The waveform size of ECG, RESP, SpO₂ can be displayed in numeric or bar.
( Maintenance Manual "Display/Print Setup" P5-12)
- 4 BP Scale
- 5 BP Label
- 6 BP Waveform
- 7 Respiration Waveform
- 8 Respiration Waveform Size
6.25mm/s
- 9 Respiratory Sweep Speed
Displays the sweep speed for the impedance respiration waveform, CO₂ waveform, AWP, AWF waveform.
- 10 SpO₂ Waveform
- 11 SpO₂ Waveform Size
- 12 CO₂ Scale
- 13 CO₂ Waveform
- 14 [12-Lead Print] Key
Displayed when ECG 12-lead waveform is displayed. The 12-lead waveform will be output to the built-in recorder.
( "12-lead Waveform Printing" P9-8)
- 15 [Cancel Printing] Key
If laser printer is set for the 12-lead waveform output, the printing in progress/standby will be cancelled.



Numeric Data Box Display (for all parameters)

- 1 Message Icon
When the numeric data box size is too small to display the message inside, a message icon will be displayed instead to indicate that message is present.
( Maintenance Manual "Display/Print Setup" P5-12)
- 2 Alarm OFF Mark
Displayed when the alarm is set to OFF.
- 3 Out of Measurement Range (XXX)
The measurement is out of range.
- 4 Measurement Error (---)
Displayed when the NIBP measurement ended erroneously.



□ Numeric Data Box Display (for each parameter)

REFERENCE

- The following numeric data box is displayed when the corresponding parameter is selected on the "Numeric Data Selection" window under "Display Config.". (☞ "Numeric Data Selection" P10-3)

HR, HR/PR

1 HR / PR Synchronization Mark

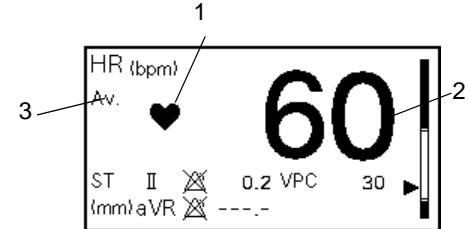
When HR or PR according to the setting of "Synchronized Mark/Tone" is detected, HR/PR synchronized mark will be displayed inside the corresponding numeric data box.

2 Heart Rate / Pulse Rate

Heart rate and pulse rate will be displayed. When the value exceeds the measurable range, "xxx" will be displayed.

3 HR Average (Instant / Average)

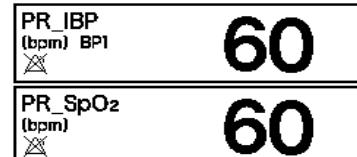
Displays the averaging method of HR. ("HR Average" setting on ECG setup.)



PR, HR/PR

1 Pulse Rate (BP)

2 Pulse Rate (SpO₂)



SpO₂

1 SpO₂ Value

The arterial oxygen saturation will be displayed.

2 SpO₂ Label

The label set for SpO₂ will be displayed.

3 Second Alarm Indicator

When the second alarm is set, the second alarm indicator is displayed. The second alarm will only be valid with HS-8312N equipped with SpO₂ Unit manufactured by Nellcor™.

4 Pulse Rate

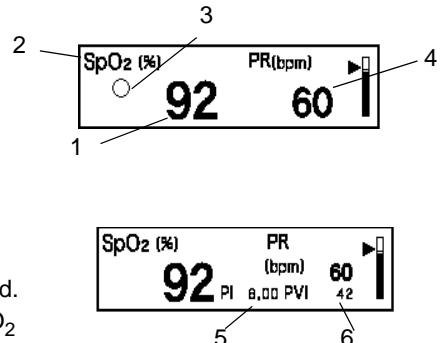
Pulse rate will be displayed. When the value exceeds the measurable range, "xxx" will be displayed.

5 PI Value (Masimo only)

The perfusion index will be displayed.

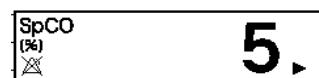
6 PVI Value (Masimo only, optional)

The pleth variability index will be displayed.



SpCO Value (Masimo only, optional)

SpCO Value: The carboxyhemoglobin concentration will be displayed.



SpMet Value (Masimo only, optional)

SpMet Value: The methemoglobin concentration will be displayed.

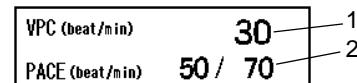


SpHb Value (Masimo only, optional)

SpHb Value: The total hemoglobin concentration will be displayed.

**VPC****1 VPC (1 min)**

The VPC rate for the last 1 minute will be displayed. "---" will be displayed during arrhythmia learning.

**2 Pace Beats (1 minute) / Total Beats (1 minute)**

Pace beats and total beats for the last 1 minute will be displayed. During arrhythmia learning, "---" will be displayed.

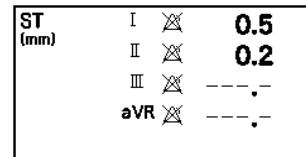
ST:**ST Level**

The ST value for 4 leads can be displayed in the ST data box.

3 groups (A, B, C) of lead combination can be programmed.

For the following case, "---" will be displayed.

- ♦ During "Arrhythmia Learn" condition
- ♦ During "Lead OFF" condition
- ♦ When "N" or "S" is not detected for QRS within 30 seconds.
- ♦ When reference waveform is not set for ST measurement.

**REFERENCE**

- ♦ The leads displayed inside the ST level box can be changed.
(Maintenance Manual "Display/Print Setup" P5-12)

RR**1 RR Source**

A source of RR measurement will be displayed in accordance with the "RR/APNEA Alarm Source" setup. "i" for the impedance measurement, "GAS" for the CO₂/GAS measurement, and "VENT" for the ventilator measurement will be displayed. A detection lead (I/II) will also be displayed for the impedance measurement.

**2 RR Sync. Indicator**

Synchronizing to the set RR/APNEA alarm source, a mark will be displayed inside the numeric data box.

3 Respiration Rate

Impedance RR, CO₂ RR, ventilator RR will be displayed. When the value exceeds the measurable range, "xxx" will be displayed.

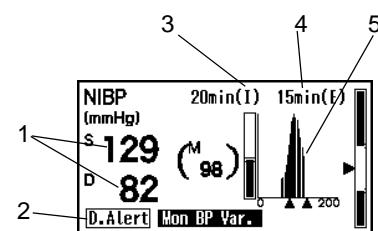
When the impedance measurement is set to OFF, impedance RR will not be displayed.

NIBP**1 NIBP Value/Cuff Pressure**

The NIBP measurement value (SYS / DIA / MAP) will be displayed.

On the "NIBP Setup", ON/OFF of mean NIBP display can be selected. The value will be displayed as "---" when the preprogrammed NIBP erase time has elapsed.

During measurement, a cuff pressure will be displayed.

**2 Dyna Alert Message**

This message will be displayed when the Dyna Alert is effective.

3 NIBP Measurement Interval

The NIBP measurement interval will be displayed.

4 Elapsed Time/Measured Time

The elapsed time or measured time will be displayed.

The display can be switched in accordance with the setting made for "Time Display" under NIBP setup.

5 Oscillation Graph

The horizontal axis in the graph shows the cuff pressure, and vertical axis shows the pulse amplitude with reference to maximum pulse amplitude.

6 NIBP List

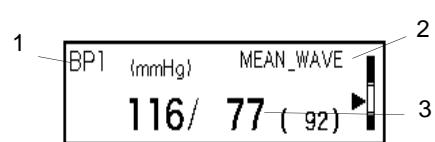
The NIBP list of latest 3/6/9/12/18 data and the measured date/time will be displayed. The number of displaying data depends on the size of numeric data box.

| | |
|---|---|
| 6 | 9/24 09:15 110 / 64 (90) 09:10 ---- / --- (---) 09:05 ---- / --- (---) |
|---|---|

BP Value

1 BP Label

The BP label setup for the blood pressure will be displayed.



2 "MEAN_WAVE"

The message "MEAN_WAVE" is displayed when mean waveform is set ON on the "BP detail setup".

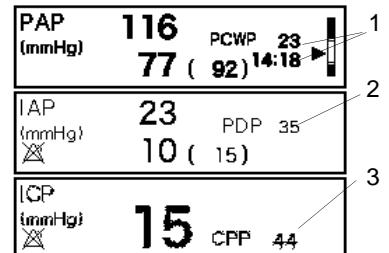
3 BP

The BP measurement value (systolic(SYS)/diastolic(DIA)/mean(MEAN)) will be displayed. On the BP setup, the display type(S/D/M, S/D, M) can be selected. When the value exceeds the measurable range, "xxx" will be displayed. If BP zero balance is not performed, "---" will be displayed, and if transducer is not connected, nothing will be displayed.

PAP/ IAP/ ICP

1 PCWP Value, PCWP Measured Time

When the BP label is PAP, PCWP (Pulmonary Capillary Wedge Pressure) and measured time can be displayed.



2 PDP Value

When the BP label is IAP, PDP (Peak Diastolic Pressure) of IABP can be measured. Note that Systolic Pressure (SYS) = Peak Systolic Pressure (PSP).

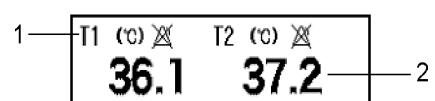
3 CPP Value

When the BP label is ICP, labeling the artery pressure as ART will allow measuring the CPP (Cerebral Perfusion Pressure). (CPP = Mean Arterial Pressure – Mean Intracranial Pressure) If the CPP value is negative value, or zero balance has not been performed for ICP or ART, "---" will be displayed, and if ICP or ART has not been measured, nothing will be displayed.

Temperature

1 TEMP Label

The label set for the temperature will be displayed.



2 TEMP Value

Temperature value will be displayed. The 400 series temperature sensor can be used. When the value exceeds the measurable range, "xxx" will be displayed. When 700 series is connected, "---" will be displayed.

Blood Temperature

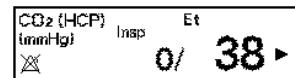
When using the thermodilution catheter for the CO measurement, blood temperature will be displayed. When the value exceeds the measurable range, "xxx" will be displayed.



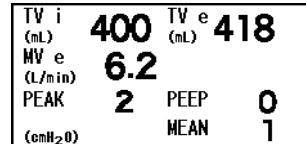
EtCO₂/ InspCO₂**EtCO₂ Value/ InspCO₂ Value**

The end-tidal CO₂ concentration and inspiratory CO₂ concentration measurement value will be displayed.

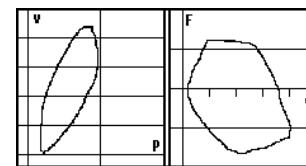
The measurement unit can be selected from mmHg / kPa / % under the "Initial Settings" menu.

**Ventilator****Ventilator Data**

When ventilator is connected, the ventilator measurement data will be displayed.

**P-V, F-V****P-V, F-V Loop**

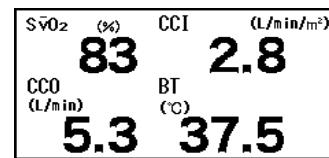
When a ventilator is connected, P-V loop (airway pressure / ventilation) and F-V loop (airway flow / ventilation) will be displayed.


⚠ CAUTION

- When Servo-i/s or SV-300 is connected, RESISTANCE (Insp, Exp), COMPLIANCE, P-V loop, F-V loop display function is not available.

Oximeter/CCO Measurement Device:**Oximeter Data**

When oximeter/CCO measurement device (Vigilance/Vigilance CEDV / Vigilance/Vigileo) is connected, the measured data (SvO₂, CO, etc.) will be displayed. The displayed data will differ depending on the used oximeter/CCO measurement device.

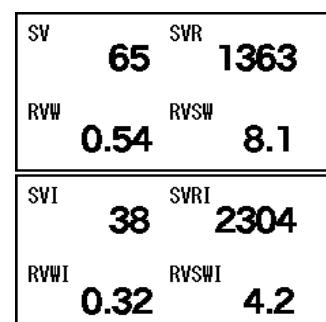


| Oximeter/CCO Measurement Device | Displayed Data | | | |
|--|---------------------------------------|----------|-----------|----|
| Vigilance (CCO mode/STAT OFF/Index OFF) | SvO ₂ (ScvO ₂) | CCO | EDV | BT |
| Vigilance (CCO mode/STAT ON/Index OFF) | SvO ₂ (ScvO ₂) | CCO STAT | EDV STAT | BT |
| Vigilance (CCO mode/STAT OFF/Index ON) | SvO ₂ (ScvO ₂) | CCI | EDVI | BT |
| Vigilance (CCO mode/STAT ON/Index ON) | SvO ₂ (ScvO ₂) | CCI STAT | EDVI STAT | BT |
| Vigilance (ICO mode) | SvO ₂ (ScvO ₂) | CO AVG | CI AVG | - |

Hemodynamic Data**Hemodynamic Data (Vigilance)**

Based on the CCO data measured by the Vigilance (or Vigilance CEDV / Vigilance / Vigileo), the following hemodynamic data are calculated and displayed every second based on the following condition.

- It is measured on Vigilance with CCO mode. (It will not be displayed during ICO mode.)
- SvO₂ parameter key (oximeter numeric data box) is displayed.
- BP label is set as ART, PAP, CVP.



(If the unit is "kPa", the data is converted to "mmHg" for calculation.)

| Data | Description | Formula |
|-------|--|--|
| SV | Stroke Volume (mL/beat) | $\frac{CCO \times 1000}{HR}$ |
| SVR | Systemic Vascular Resistance (dynes·sec·cm ⁻⁵) | $\frac{(MAP - CVP) \times 79.90}{CCO}$ |
| RVW | Right Ventricular Work (kg·m) | CCOx(MPAP-CVP)x0.0136 |
| RVSW | Right Ventricular Stroke Work (g·m) | SVx(MPAP-CVP)x0.0136 |
| SVI | Stroke Volume Index (mL/beat/m ²) | $\frac{SV}{BSA}$ |
| SVRI | Systemic Vascular Resistance Index (dynes·sec·cm ⁻⁵ ·m ²) | SVRxBSA |
| RVWI | Right Ventricular Work Index (kgm/m ²) | $\frac{RVW}{BSA}$ |
| RVSWI | Right Ventricular Stroke Work Index (g·m/m ²) | $\frac{RVSW}{BSA}$ |

NOTE

- The calculated hemodynamic data will not be stored as Vigilance list data. For the Vigilance list, the actual measured data will be stored.

TIMER

Stopwatch Key

Functions as stopwatch.

| | |
|--------|----------|
| TIMER1 | 00:00:00 |
| TIMER2 | 00:00:00 |

BIS

BIS Value

When the A-2000 BIS Monitor is connected to the multiport module, BIS data (BIS, SQI, EMG, SR) will be displayed.

If SQI value is below 50%, the background color will turn gray.

If SQI value is below 15%, BIS value and SR value will disappear.

| | |
|-----|--------------|
| BIS | SQI (%) 87 |
| 58 | SR (%) --- |
| | EMG (dB) --- |

INVOS

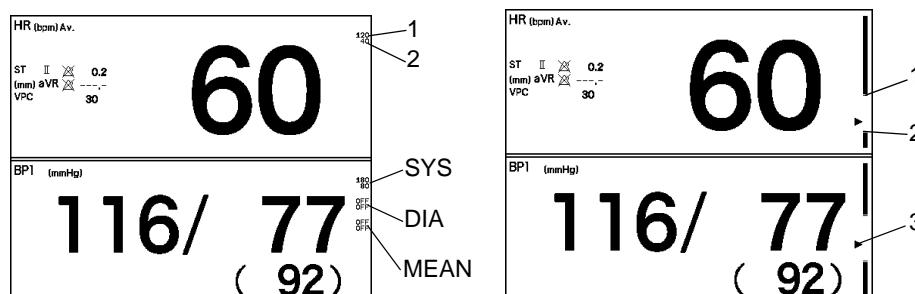
INVOS 5100C Measurement Data

When connected to INVOS 5100C, regional cerebral oxygen saturation value will be displayed.

Lt- indicates left brain, and Rt- indicates right brain.

| | |
|-------------------------|-------------------------|
| Lt-rSO ₂ (%) | Rt-rSO ₂ (%) |
| 83 | 86 |

□ Alarm Limit Display



The alarm limit can be displayed beside each measurement value. The display type can be selected from [Graph]/[Numeric]/[OFF] ("Alarm Limit Display") under [Menu>Alarm>Detail Setup].

If ON is selected for the individual alarm, the alarm limit will be displayed.

The upper and lower limit will be displayed at upper and lower row respectively.

For BP and NIBP, each alarm limit of SYS, DIA, mean BP/MAP will be displayed from the top.

ON/OFF of alarm limit display can be selected.

(☞ "List of Alarm Settings" P6-5)

1 Upper Alarm Limit

2 Lower Alarm Limit

3 Current numeric data (SYS)

NOTE

- If alarm limit display for BP is [Graph], systolic value will be displayed.
- Depending on the numeric data box type, alarm limit may not be displayed.

□ Short Trend Display

1 Short Trend Display

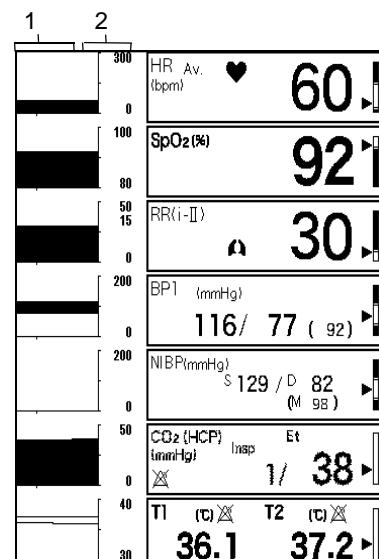
Short trend will be displayed beside the numeric data.

Pressing the waveform display area will change the displayed trend time to the pressed position. The trend display is in 5-minute increment from 0 minute to 30 minutes.

A red vertical bar indicates the alarm occurrence. Pressing the short trend on a parameter which is set as recall data will display the "recall" screen.

2 Trend Scale

The short trend scale will be displayed between the short trend and numeric data. The displayed scale will be in accordance with the scale set on the "Trend" screen.



□ Displayed number of waveform and numeric data

| Display | Maximum Waves Displayed | Display Duration (25mm/s) | Maximum Displayed Boxes |
|--------------------------------|-------------------------|-----------------------------|-------------------------|
| Standard (Right/Left) | 14 | 6 seconds and above | 7 |
| Standard & Bottom (Right/Left) | 12 | 6 seconds and above | 10 |
| Standard (Right/Left)/Large | 14 | 4 seconds and above | 14 |
| Bottom (1 rows) | 12 | 8 seconds and above | 4 |
| Bottom (2 rows) | 10 | 8 seconds and above | 8 |
| Bottom (3 rows) | 8 | 8 seconds and above | 12 |
| 12-Lead (Right/Left) | ECG 12-Lead+8 | ECG 12-Lead: About 4.7 sec. | 21 |
| Numeric/Max. Size | 1 | 8 seconds and above | 4 |

NOTE

- The maximum number differs according to the waveform and numeric data to be displayed. (For example, if ECG waveform is selected, it will require at least 2 rows of display area on the screen.)

Description of the Display

Refer to the following for the meaning of the symbol indicated on the equipment.

| Symbol | Description |
|--------|--|
| | Alarm OFF Indicates the alarm is OFF. |
| | Pulse Tone This mark flashes synchronizing to the heartbeat. |
| | RR Sync. Indicator This mark flashes synchronizing to the inspiration. |
| | Message Icon This mark will be displayed inside the parameter key when an alarm message is present for that parameter. Whether or not to display this icon can be selected on the Initial Settings. |
| | Key Lock Mark Indicates that the item requires password input when changing its setting. |
| | Key Unlocked Mark Indicates that the key is unlocked |
| | Indicates that AC power is connected. |
| | Displays the remaining battery level. This icon (full green) indicates that the battery is fully charged. *The icon flashes while charging and the flashing icon varies depending on the remaining battery level. |
| | This icon (2/3 green) indicates that the battery is less than full, but still usable. |
| | This icon (1/3 yellow) indicates that the battery is low and needs to be charged. |
| | This icon (1/3 red) indicates that the battery is very low and flashes to alert the low battery status. Immediate battery charge is required. Technical alarm will generate. |
| | This icon (red frame) indicates that the battery is very low and it flashes for alert to charge. Make sure to charge the battery at the point when this icon appears. The remaining operable time is about 5 minutes. The remaining operable time is based on when measurement of NIBP 15 minutes interval, ECG, SpO ₂ is performed with a new battery pack. It will vary depending on the optional unit composition, NIBP measurement interval, recorder operating condition, etc. |
| | This icon (black frame with a slash) indicates that the battery is not installed. Pay attention as power will not be supplied if AC power cable is disconnected during this state. |

Messages and Sound

This section explains about the message displayed on the home display.

There are vital alarm message and equipment status alarm message which will be displayed at the top of the home display.

The alarms are classified in Level S (top priority), Level H (high priority, life threatening), Level M (medium priority, cautionary), Level L (low priority, treatment needed), and Notification, and the message will be displayed according to the priority of Level S>Level H> Level M> Level L> Notification.

The displayed messages will flash in red and white for Level S, red for Level H, yellow for Level M, blue for Level L, and white for Notification.

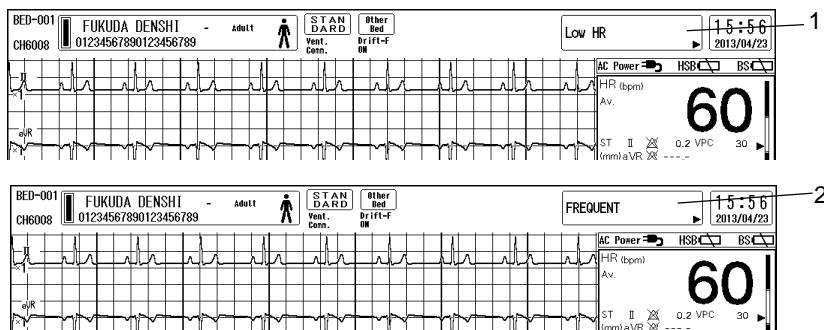
| Alarm Priority, Level | | Details | Sound | Displayed Color |
|-----------------------|---|------------------------|---------------------|-----------------|
| Top Priority | S | Top Priority Alarm | Continuous | Red/white |
| High Priority | H | Life Threatening Alarm | Continuous | Red |
| Medium Priority | M | Cautionary Alarm | 5 seconds interval | Yellow |
| Low Priority | L | Treatment Needed Alarm | 15 seconds interval | Blue |
| Notification | N | Notification Alarm | Display Only | White |

CAUTION

- When more than one alarms are generated in the same priority level, the newer alarm message will be prioritized.

Vital Alarm Message

The vital alarm message is generated when a measurement exceeds the alarm limit, or when arrhythmia is detected.



1 Numeric Alarm Message

2 Arrhythmia Alarm Message

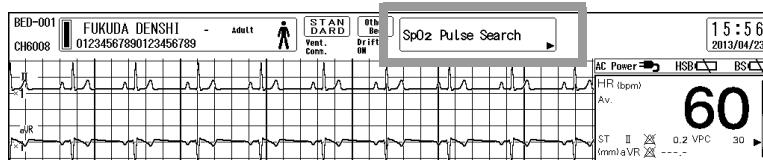
There are 2 types of vital alarm messages; numeric data alarm and arrhythmia alarm. If both alarms occur at the same time, the numeric alarm message and arrhythmia alarm message will be displayed alternately in 2-seconds intervals. The alarm messages will be displayed according to the priority. If the priority level is the same, the newer alarm message will be prioritized.

CAUTION

- The arrhythmia alarm message will continue to be displayed for 30 seconds after the alarm is resolved.

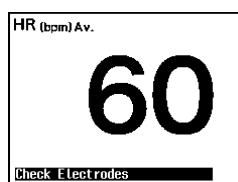
□ Equipment Status Alarm Message

The equipment status alarm message will be displayed when proper monitoring cannot be performed. The alarm messages will be displayed according to the priority. If the priority level is the same, the newer alarm message will be prioritized.



□ Numeric Data Box Message

The measurement status of each parameter will be displayed inside the corresponding numeric data box.

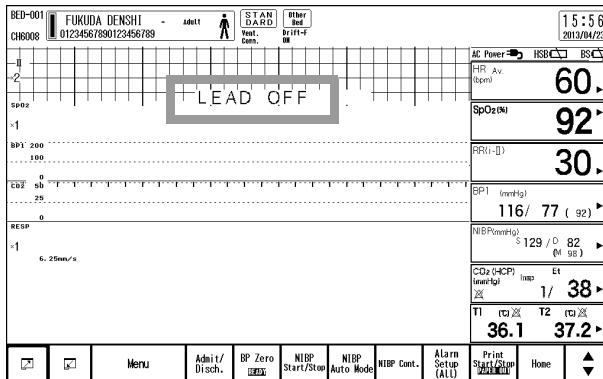


□ Lead-Off Message

If the ECG electrodes used for HR measurement or arrhythmia analysis are detached, the status will be notified.

⚠ WARNING

- While the "LEAD OFF" message is displayed, HR alarm and arrhythmia alarm will not function. Leaving this condition unresolved may result in missing a sudden change of the patient. Promptly check the electrodes when this message is displayed.



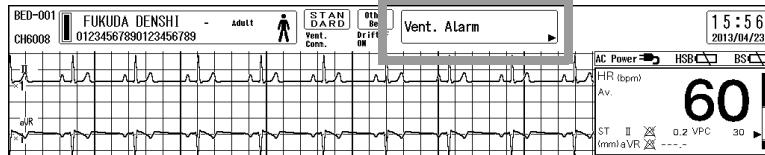
□ Ventilator Alarm Message

When a ventilator is connected to this equipment, ventilator alarm and connection status alarm will be displayed on the equipment status alarm message area.

The alarm message with the higher alarm level will be displayed.

⚠ WARNING

- The ventilator alarm sound is set to OFF at factory default setting.
- The alarm sound can be turned ON on the "Tone/Volume" menu.
(⇒ "Tone/Volume" P10-17)



■ Ventilator Alarm Factor Message

For the SV-300, Servo-i, Servo-s, ventilator alarm factor if specified will be notified and displayed on the central monitor.

⚠ CAUTION

- For the SV-900 ventilator, alarm factor will not be transmitted to the central monitor.
- Depending on the central monitor type and software version, ventilator alarm factor may not be displayed. For details, refer to our service representative.
- The ventilator alarm factors are displayed only on the central monitor. These will not be displayed on the bedside monitor.

Window Display

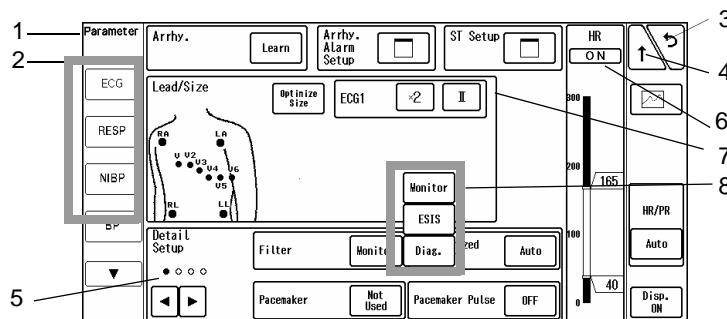
About the Window Display

The screens that are displayed when operating this system are referred to as windows. (The windows that appear by pressing the numeric data area are called floating windows, as they can be moved to any desired position.)

The target window can be displayed by using various method, such as selecting the menu items, pressing a parameter key or using a short cut key such as user key.

Display

The items displayed on the window depend on the parameter, but there are some common items displayed which are explained below.



1 Hierarchical Level Display

The hierarchical level of the current window is displayed. The level is expressed using the ">" symbol.

2 Tab Display Area

The screens belonging to the same hierarchical level can be switched from each other in one-touch operation without returning to the "Menu".

For example, when changing the blood pressure scale after changing the ECG waveform size, it is not necessary to return to "Menu".

Additionally, since the data presented on review screens are linked to the time information, it is possible to view multiple data for the same hour in graphic or tabular format, or check their waveforms in a one-touch operation.

3 Previous Display

Pressing this key will return the display to the previous window.

4 Up One Level Key

Pressing this key will cause the display to move up one level in the hierarchy.

5 Page Switch Key

This key will appear when the setup items or display data are on multiple pages.

The currently displayed page is indicated by "●".

6 Key Lock Icon

Key lock icon will be displayed for the setup item that is locked.

Password input is required to unlock these locked items.

It will be locked if 30 seconds has elapsed without key operation.

- ♦  : Locked item
- ♦  : Unlocked item

NOTE

- ♦ The color of each key lock icon indicates its administrative level, and a higher level password must be entered to unlock it.

7 Setup Item

Most setup items are selected from their corresponding dropdown list.

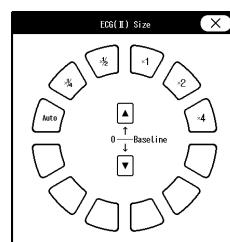
The dropdown list will close once a setup item has been selected.

Pressing the item again or selecting a different item will also close the list.

Some items will show a sub window in which the setup operation is performed.

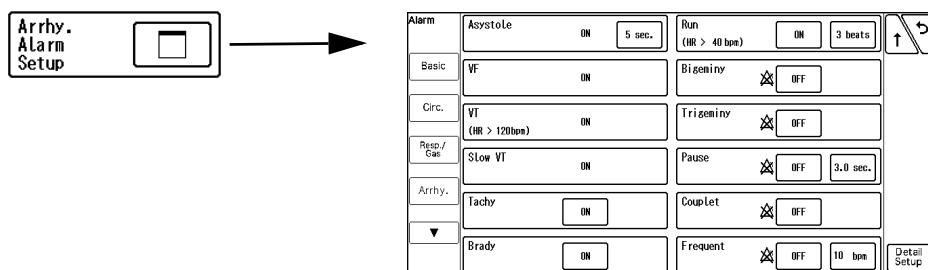
To close the sub window, press either the  key, [Home] or [Prev. Disp.] key.

- ♦ <Sub window example>



When the key with the  icon is pressed, another screen will be displayed. To return to the original screen, either press the  key or "Prev. Disp." key.

- ♦ Example of screens which make a transition to another screen



8 Dropdown List

Select one from the displayed selection list.

Floating Window Screen Display

The descriptions of the floating window which is displayed by pressing the numeric data area are as follows.

The displayed items on the floating window depends on the parameter, but there are some common items as follows.

1 Window Title

The windows can be moved to any desired position by dragging the window title.

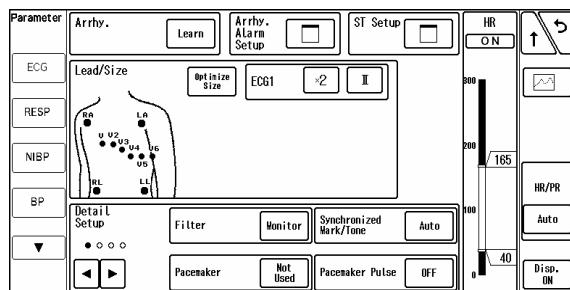
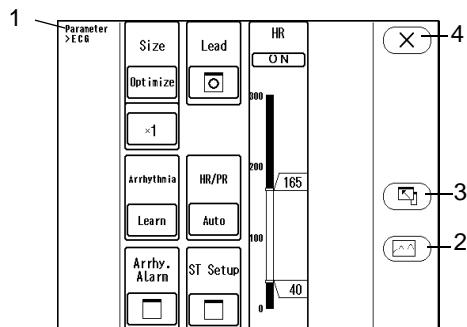
2 Alarm Assist Key

Displays the alarm assist screen. On the alarm assist screen, maximum of 24 hours of trend data for the corresponding parameter will be displayed.

(☞ "Alarm Assist Screen" P6-12)

3 Detail Key

On the floating window, minimum items are displayed. Press the  key to display more detailed items.



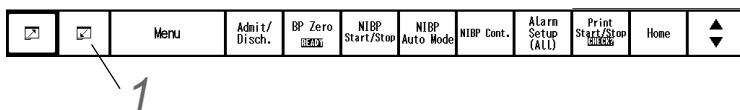
4 Close Key

Pressing the  key will close the window. The window can also be closed by pressing the fixed key, [Prev. Disp.] or [Home].

Minimize Window

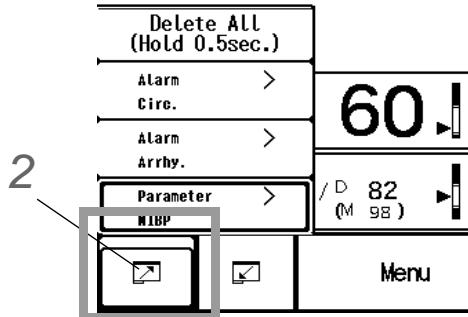
To temporarily display the home display during the setup, press the  (Minimize) key. The current window will be minimized. By pressing the  (Restore Window) key, the window will be redisplayed.

1 Press the key.



► The window will be minimized.

- 2** To restore the minimized window, press the  (Restore Window) key and select the window to be displayed from the list.



▶ The original window will be displayed again.

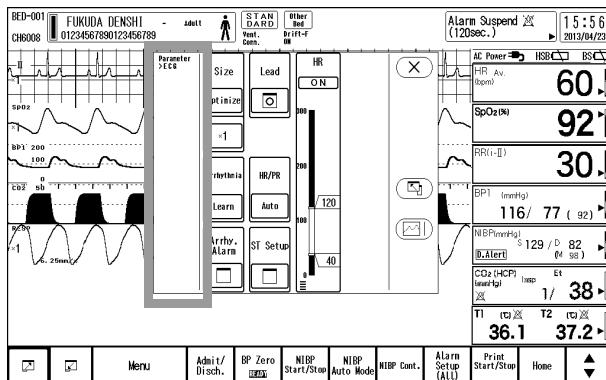
NOTE

- Maximum of 9 windows can be minimized. If exceeded, the oldest window will be deleted.
- To delete all minimized window, press the [Delete All] key which will be displayed when  is pressed for more than 1 second.
- The window which has been automatically erased after fixed amount of time can be remained minimized by selecting [ON] for "Auto Minimize" ([Initial Settings] > [User I/F] > [Operation]).

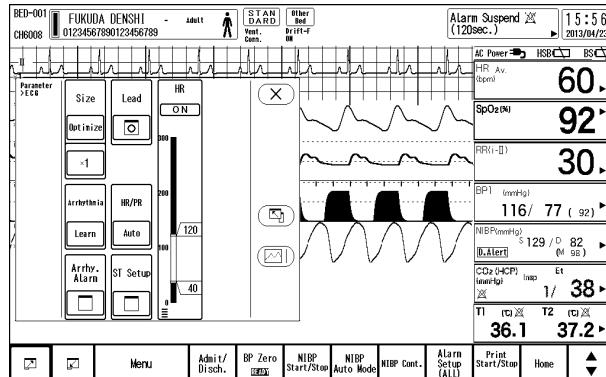
Transfer Window

The floating window which is displayed by pressing the numeric data area can be moved by dragging the window title bar on the left. This operation is possible on the touch panel.

- 1** Press the title bar.



2 Place the finger on the window title and drag to the desired position.



NOTE

- The floating window cannot be overlapped to the numeric data area or information display area.
- The window which is displayed from "Menu" cannot be moved.
- The displayed position of the floating window will be stored until the power is turned OFF.

Operation Restriction

To restrict the operator to change the setup items, key lock function can be used.

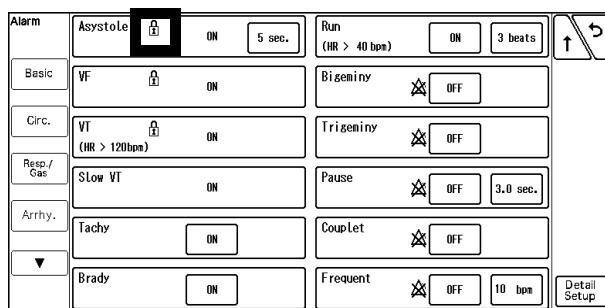
(Maintenance Manual "Key Lock" P5-2)

For the items that are key locked, the settings cannot be changed unless the password is entered.

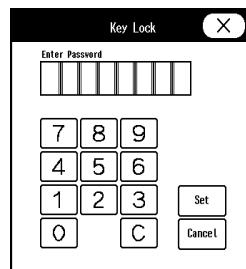
The unlocked condition will return to locked condition if operation has not been performed for about 30 seconds.

For the key locked item, icon will be displayed.

When the password is entered and key is unlocked, the icon will change to .



Example of Key Locked Item



Password Window

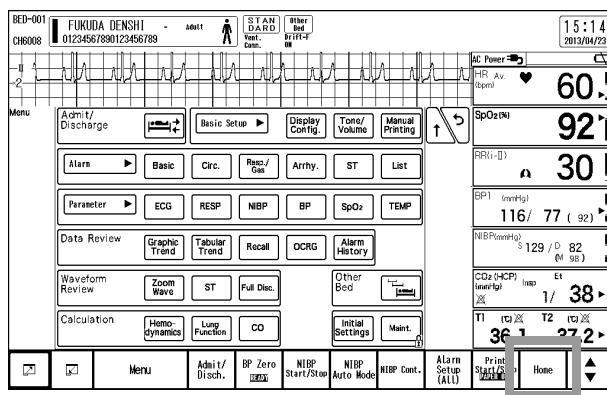
NOTE

- There are 3 key lock levels.
- The level is distinguished by the color of  which are "Red (Manager)">"Yellow (Administrator)">"Green (User)", and the upper level password can unlock the lower level key lock.

Procedure to Return the Display

To Return to Home Display

Pressing the fixed key, [Home] or the user key, [Home] will display the home display.



To Return to One Previous Display

Pressing the fixed key, "Prev. Disp." or "" shown in each setup window will return the display to the previous window.

For Easier Use

The user keys and menu can be customized according to the monitoring purpose.

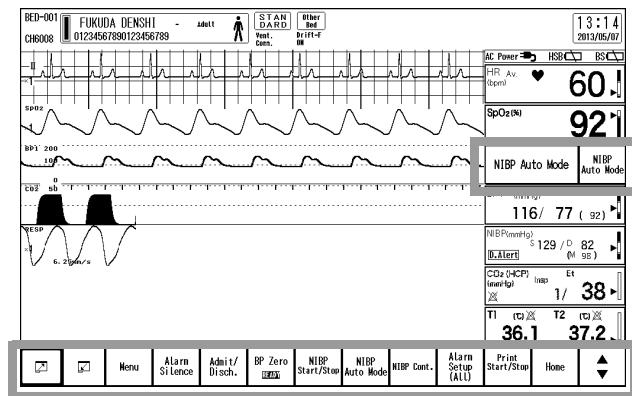
REFERENCE

- From the preprogrammed user mode, the display configuration and alarm settings can be selected according to the monitoring purpose.
(Maintenance Manual "User Mode Registration" P5-25)

User Key

The user keys can be customized according to the monitoring purpose.

("To Configure the Display" P10-4)



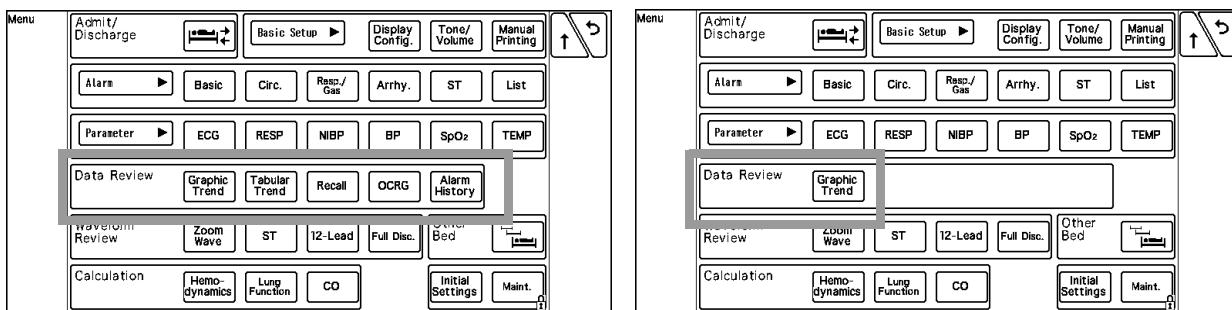
By assigning the [User Key] to the user key area, 2 pages of user keys can be registered. Press the [User Key] to switch the pages. The user key can be enlarged by using 2 display areas.

The user key can be also assigned to the numeric data area. It is useful if the key related to numeric data is assigned near the numeric data.

Menu Screen

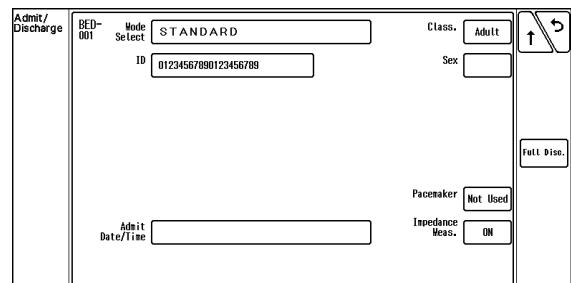
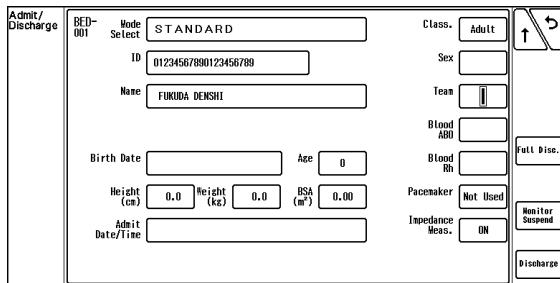
The key position can be changed and unnecessary keys can be deleted on the "Menu" screen.

(Maintenance Manual "Display/Print Setup" P5-12)

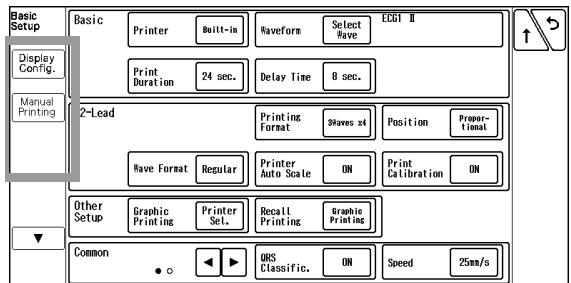
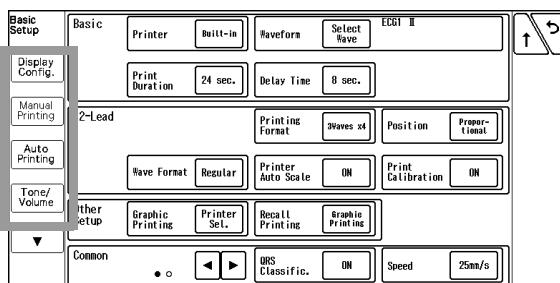


To Delete the Unnecessary Keys (Key Mask)

Unnecessary keys, items, tabs can be deleted.
(Maintenance Manual "Key Mask" P5-18)



Example on "Admit/Discharge" Screen

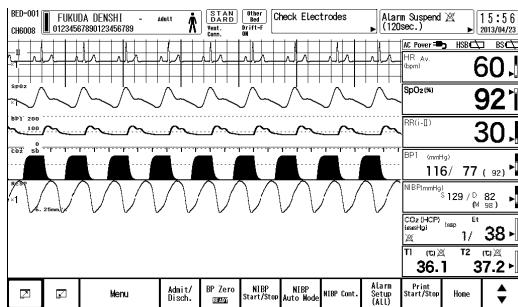


Example on Tab Display

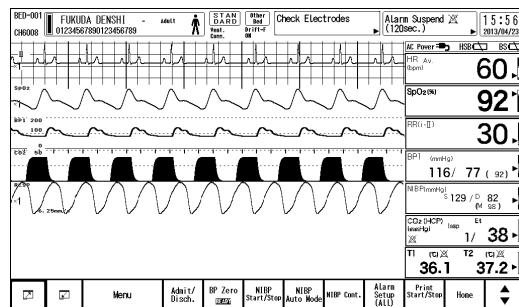
Display on the External Monitor

External Monitor Display

The monitoring can be performed on two display units.
However, operation is not possible on the external monitor.



<Main Display>



Display on the External Monitor

CAUTION

- With the default setting, menu cannot be displayed on the external monitor even if it is displayed on the main display. To display the menu on the external monitor, contact your

nearest service representative.

Chapter 4 Preparation

| | |
|---|-----|
| Daily Check | 4-1 |
| To Start Monitoring | 4-3 |
| Check Discharge When Start Monitoring a New Patient | 4-4 |
| Data Transfer Function Using the Super Unit..... | 4-5 |
| To Stop Monitoring | 4-7 |
| Clock Setup | 4-7 |
| Installing the Recording Paper | 4-8 |

Chapter 4 Preparation

Daily Check

Conduct the following daily check before using the equipment.

Daily Check List

| Checked Date: Day Month Year | Checked by: | No. Location: |
|------------------------------|---|---|
| Model Type (Display Unit) | Serial Number: | Date of Purchase: Day Month Year |
| Model Type (HS Adaptor) | Serial Number: | Date of Purchase: Day Month Year |
| Model Type (Super Unit) | Serial Number: | Date of Purchase: Day Month Year |
| Model Type (Base Unit) | Serial Number: | Date of Purchase: Day Month Year |
| Model Type (Module) | Serial Number: | Date of Purchase: Day Month Year |
| Model Type (Module) | Serial Number: | Date of Purchase: Day Month Year |
| Model Type (Module) | Serial Number: | Date of Purchase: Day Month Year |
| | | |
| Item | Check Details | Criteria |
| External appearance | Visually check the exterior for scratches, cracks, and rust. | No abnormality should be found. |
| Installation | Check whether the equipment is installed on a level surface. | The installation area must be level and free from vibration and shock. |
| | Check whether the equipment is installed in a place susceptible to adverse environment. | The environmental condition (e.g. temperature, humidity) of the installed unit should be as specified. The equipment should not be subjected to splashing water or chemicals. |
| Function | Turn ON the power of the display unit, and check whether it operates normally. | The home display should appear, and the power LED located at the lower left of the display unit should light. The date and time should be correct. |
| | Turn ON the power of the display unit, and check whether it operates normally. | The power LED of the display unit should light. |
| | (When HS-8000/HSB-80 is used) | The home display should appear, and the power LED of the HS-8000 should light. |
| | (When HS-8000 is used) | With BP relay cable and BP transducer connected, pressing the BP Zero Balance Switch should start the zero balance. |
| | (When HS-8000 is used) | Pressing the NIBP Start/Stop key should inflate the NIBP cuff. |
| | (When HS-8000 is used) | Connecting the SpO ₂ sensor should light the sensor LED. |

| Item | Check Details | Criteria | OK / NG |
|---|---|---|---------|
| Function | (When HR-800 is used) | The [READY] indicator on the HR-800 should light in green. | OK / NG |
| | (When HR-800 is used) | Pressing [RECORD] on the HR-800 should start the waveform recording. When pressed again, the recording should stop. | OK / NG |
| | (When HR-800 is used) | Pressing [FEED] on the HR-800 while not printing should feed the paper. | OK / NG |
| | (When HPD-800/810, HCP-800/810 is used) | The home display should appear, and power LED should light in green. | OK / NG |
| | (When HCP-800/810 is used) | When the sampling tube is connected, "0" should be displayed in the numeric data box. | OK / NG |
| Cables | Visually check all cables for any damage. | No damage should be found. | OK / NG |
| CO ₂ Calibration (When HCP-800/810 is used) | Check the date of the previous calibration. Previous Date: Day Month Year (*Refer to the following caution.) | Should be within 1 year. | OK / NG |
| | Check the remaining time until the next calibration. [Menu] [CO ₂] [CO ₂ Cal.] Remaining Time until Next Calibration: hrs. | Should not be 0 hrs. | OK / NG |
| Alarm Indicator | Check the alarm indicator operation by pressing the [Pattern Test] key. | It should light with the set pattern. | OK / NG |
| Alarm Sound | Check the alarm sound by pressing the [Test] key. ([Menu] -> [Tone/Volume]) | The alarm sound should be properly generated from the speaker. | OK / NG |
| Periodic Check | Check the date of the previous periodic inspection. Previous Periodic Check Date: Day Month Year | Should be within 1 year. | OK / NG |

Comment

 **CAUTION**

- If the CO₂ gas calibration is not performed at a specified interval, CO₂ measurement accuracy may be affected and also subsequent gas calibration may not be possible.

To Start Monitoring

This section explains about the procedure to turn the power ON and start monitoring.

CAUTION

- If the system will be unused for a long period, disconnect the power cable and lithium-ion battery from the system.

1

If operating with AC power supply, verify that the power supply cable is properly connected to the rear side of the Base Unit.

If operating with battery, verify that the lithium-ion battery is properly installed in the Base Unit or the HS Adapter.

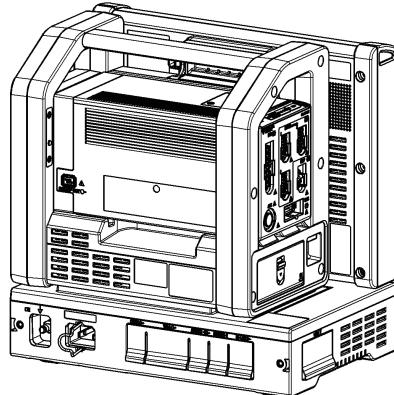
(☞ Maintenance Manual "Power Connection of the Main Unit" P1-12)

(☞ Maintenance Manual "Installing the Lithium-Ion Battery Pack (BTO-008)" P1-14)

► When connected to the AC power source with battery installed, charging will automatically start.

1 Rapid Charge (when the equipment is not in operation): 3.5 hours

2 Normal Charge (when the equipment is operating): 8 hours



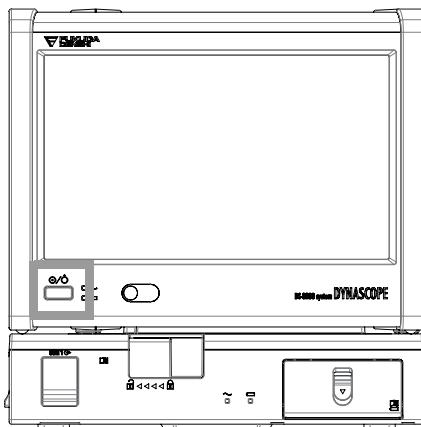
WARNING

- Do not connect a battery other than the lithium-ion battery (BTO-008).

2

Turn ON the standby button on the display unit.

► The system will turn ON and monitoring will start.

**NOTE**

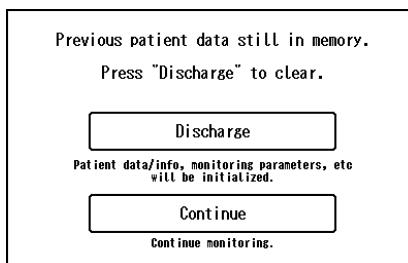
- The operation after the power is turned ON will be according to the setting made on [Initial Settings] > [User I/F] > [Power ON/Discharge]. However, if the power was turned OFF for less than 30 seconds, the setting before the power was turned OFF will remain.

REFERENCE

- The power of the Super Unit interlocks with the standby switch operation (ON/OFF) on the display unit.

Check Discharge When Start Monitoring a New Patient

The trend data, tabular trend data, recall, ST measurement, OCRG data will be stored for 5 minutes even after the standby switch is turned OFF. If the previous data is remained when the standby switch is turned ON again, the discharge confirmation screen will be displayed.

**□ Check Discharge****1**

Select from [Discharge] / [Continue].

- ▶ [Discharge]: The previous data will be deleted.
- ▶ [Continue]: The monitoring will start with the previous data retained.

NOTE

- If the standby switch was turned OFF for less than 30 seconds, the discharge confirmation screen will not be displayed. To perform the discharge procedure, press the [Discharge] key on the "Admit/Discharge" screen.
(☞ "Discharge" P5-6)
- To start monitoring a new patient, select [Discharge] and enter the new patient information

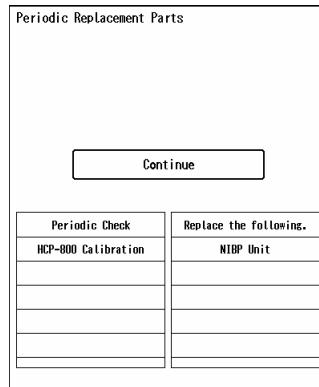
on the "Admit/Discharge" screen.

REFERENCE

- Whether or not to display the discharge confirmation screen can be selected.
( Maintenance Manual "Power ON/Discharge" P5-14)

Periodic Replacement Message

When the periodic replacement period approaches for each part, a message will be displayed on the discharge confirmation screen to notify the user.



REFERENCE

- The parts which the replacement period will be notified are the NIBP unit in the Super Unit and the CO₂ unit in the HCP-800.
( Maintenance Manual "Periodic Replacement" P7-1)
- Even if it is set not to display the discharge confirmation screen, it will be displayed when the replacement period approaches.

Data Transfer Function Using the Super Unit

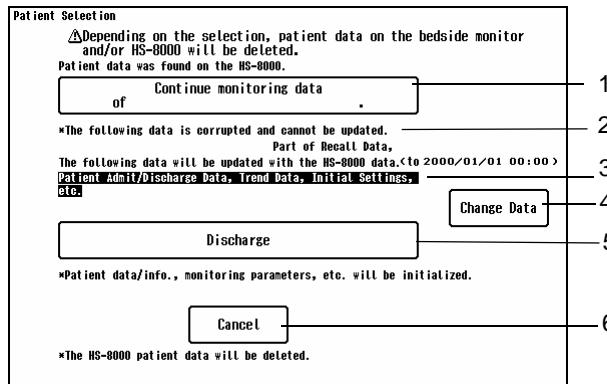
The patient data and settings are stored in the HS-8000 Series Super Unit.

When transferring the patient to another bed, patient data and settings can be transferred by transferring the patient along with the Super Unit.

1 Turn OFF the power of the DS-8200 System.

2 Connect the Super Unit which the patient was originally using to the DS-8200 System of the new bed, and turn the power ON.

- The "Patient Selection" window will be displayed.



- [Continue monitoring data of ***]: The patient data will be transferred and monitoring will resume.
- This will be displayed when the data is damaged and cannot be transferred.
- The data that can be transferred will be displayed. To change the transferring data, press the [HS-8000 Data Selection for Transfer] and change the setting.
- [Change Data] : The data to be transferred can be changed.
- [Discharge]: The data will not be transferred and monitoring of new patient will start.
- [Cancel]: The patient data and settings stored on the display unit will be used.

CAUTION

- After the data transfer process, make sure that the setting and patient data are correct.

NOTE

- During the data update process, the patient name on the home display will flash.
- When [Continue monitoring] is selected, the stored data on the display unit will be overwritten with that of the Super Unit.
If central monitor is connected, the data on the central monitor will be also deleted.
- When [Discharge] is selected, both data on the display unit and the Super Unit will be deleted/initialized.
- When [Cancel] is selected, the stored data on the Super Unit will be overwritten with that of the display unit.
- The data on the Super Unit will be updated if any of the [Continue monitoring]/[Discharge]/[Cancel] is selected. Do not disconnect the Super Unit during the update process. If disconnected, the data consistency may be lost.
- The BP zero balance value will not be cleared. After transferring the data, make sure to verify the BP zero balance value.
- The recall event generated during the data update process will not be stored.
- If the time setting is different between the data transferring monitors, the time of the recall data and trend data may not be correctly displayed on the monitor which the data was transferred.
- If the data transfer function is enabled and alarm sound suspend function is ON, the alarm sound will be automatically suspended for 5 minutes when the Super Unit is connected.

REFERENCE

- ON/OFF of data transfer function and the data selection to be transferred can be performed on the "Initial Settings" menu.

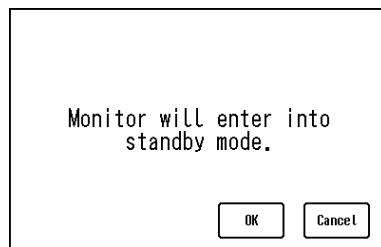
(Maintenance Manual "System Setup" P5-23)

To Stop Monitoring

This section explains about a procedure to stop monitoring.

- 1** Turn OFF the standby switch on the main unit.

► A standby confirmation message will appear.



- 2** Press the [OK] key.

► The display will turn OFF and monitoring will stop. The operation of the Super Unit will also stop.

CAUTION

- If the system will be unused for a long period, disconnect the power cable and lithium-ion battery from the system.

NOTE

- When the power is turned OFF, trend data, tabular trend data (Vigilance, respiration), recall, ST measurement, OCRG data will be erased after 5 minutes.

Clock Setup

This section explains about the clock setup procedure.

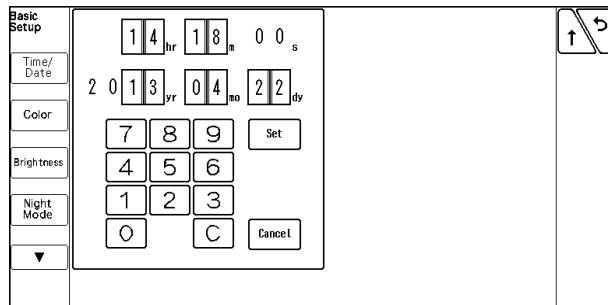
CAUTION

- If the time/date is not correctly set, or changed during monitoring, malfunction may occur with NIBP measurement, periodic recording, trend, list data, and age calculation from the birth date.
- If connected to a wired network system, time/date can not be set, thus it will be the same with the central monitor.
- If the date/time is changed, all the patient data stored such as the trend, NIBP list, recall data will also be changed.
The printed time/date before changing and the displayed time/date after changing will differ.

- 1** Press the [Menu], [Time/Date] ("Basic Setup") keys.

Or, press the time/date on the information display area at the upper part of the screen.

- Time/Date setup screen will be displayed.



2 Press on the area to perform the setup.

- A blue frame will be displayed on the selected area.

REFERENCE

- When the screen is first displayed, the blue frame will be positioned on "hour".

3 Use the numeric keys to change the numbers.

- The blue frame will automatically move to the next item.

4 Set to the current time and press [Set].

- The time/date will change to the entered time/date. (Seconds will be set to "00" sec.)
► Press [Cancel] to cancel the time/date setup.

Installing the Recording Paper

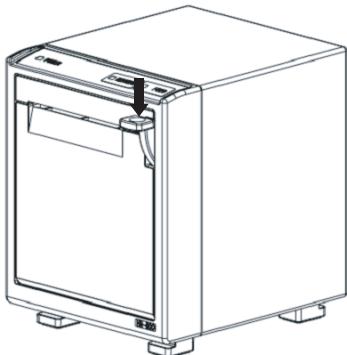
CAUTION

- Recording paper
 - Use only "OP050-01TDR" for the recording paper.
The surface treatment and thickness of the recording paper affects the printing quality.
- Storing the Recording Paper
As thermal type recording paper is used, improper storage may change the quality of the recorded content, and make it illegible.
When storing the recording paper, follow the precautions below.
 - Store in a place where light is shut off and avoid direct sunlight.
 - Do not leave the paper in a high temperature (50 °C/122 °F or above).
 - Do not store the paper in a polyvinyl chloride bag.
 - Do not superpose the papers until the diazo copy is completely dried.
 - Do not expose the paper to alcohol, hydrochloric acid, or ester ketone.
 - Avoid using adhesive agents other than water based glue.
- Installing the Recording Paper
 - When installing the recording paper, pay attention not to touch the thermal head or sensor. The temperature of those parts rises immediately after printing and may cause burn injury. Also, it may cause failure to the thermal head and sensor.

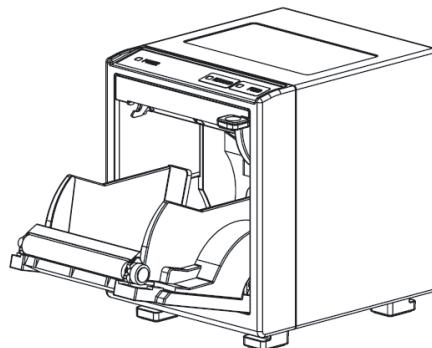
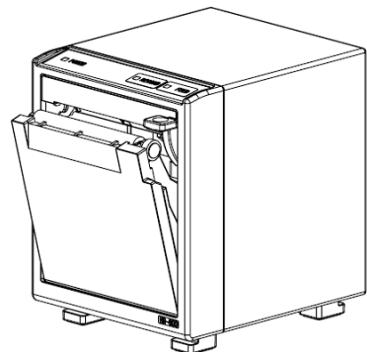
- ♦ Do not operate the equipment with wet hand. Doing so may short the thermal head.
-

Install the recording paper with the following procedure.

1 Press the Open/Close Lever.

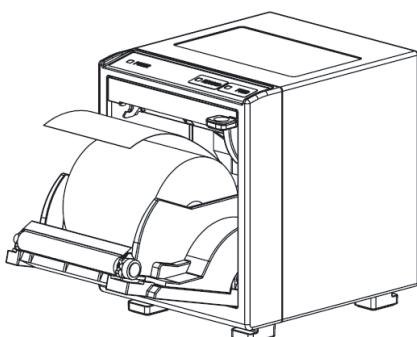


► The paper holder opens.



2 Set the recording paper.

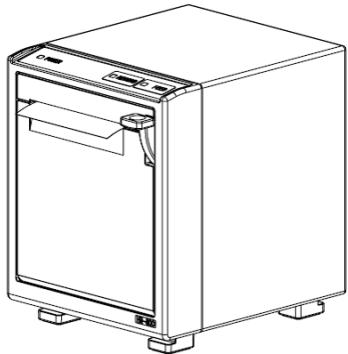
The outside surface of the paper is heat-sensitive. Make sure to place the outside surface of the paper facing up.



NOTE

- ♦ Place the paper so that the "FUKUDA DENSHI" logo is outside and facing up.
-

3 Close the paper holder.



NOTE

- ♦ Push until it locks into place with a click sound.

Chapter 5 Admit/Discharge

| | |
|---|-----|
| To Display the "Admit/Discharge" Screen | 5-1 |
| Admit | 5-1 |
| Entering the Patient Name | 5-1 |
| | 5-5 |
| Discharge | 5-6 |
| Discharging Procedure | 5-6 |
| User Mode | 5-7 |
| To Select the User Mode..... | 5-7 |
| Suspend Monitoring..... | 5-8 |
| To Suspend Monitoring | 5-8 |
| To Resume Monitoring | 5-9 |

Chapter 5 Admit/Discharge

This menu allows setup of admitting, discharging, suspend monitoring of a patient, and selection of the user mode (display configuration) according to the monitoring purpose.

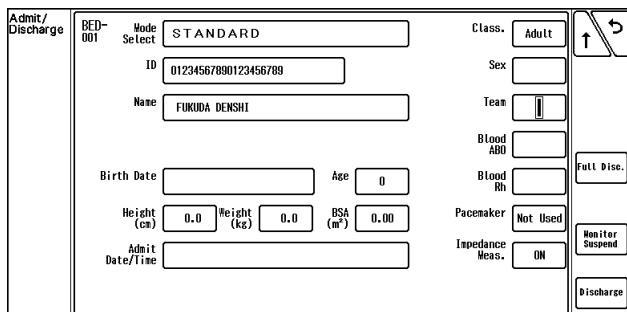
CAUTION

- If monitoring of new patient is started without performing a discharge procedure of the previous patient, new data will be added to the previous data which will result in inaccuracy.

To Display the "Admit/Discharge" Screen

- Press the [Menu], "Admit/Discharge" icon.

► The "Admit/Discharge" screen will be displayed.

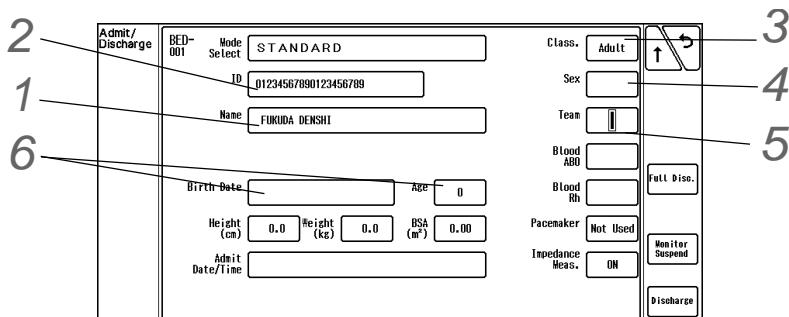


Admit

This section explains the admit procedure.

This menu allows entering of patient's name, ID, age, and selection of patient classification (adult, child, neonate) and pacemaker usage (used, not used) which affects the monitoring accuracy.

Entering the Patient Name



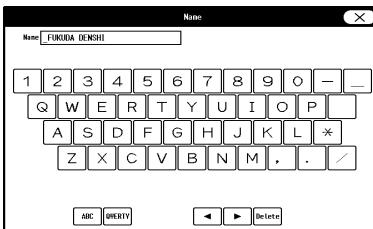
- Enter the patient name.

REFERENCE

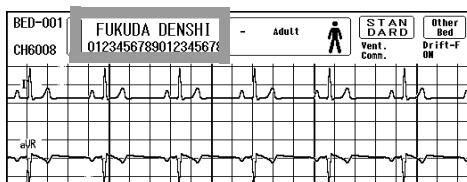
- Up to 16 alphanumeric characters can be entered. Symbols can be also used.
- When entering alphabets, numbers, or symbols, press [ABC] or [QWERTY] to switch the

displayed keyboard.

- 1** Press the entering space for "Name".
► The "Name" screen will be displayed.
- 2** Enter the name using the alphanumeric keypad.



- The entered patient's name will be displayed on the home display.



- 2** Enter the patient ID.

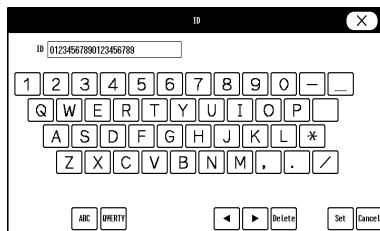
NOTE

- ♦ Enter the ID according to the monitoring purpose.
- ♦ On a wired network (DS-LANII/III), up to 10 digits of ID can be transmitted.
(☞ Maintenance Manual "DS-LAN Setup" P2-2)

REFERENCE

- ♦ Up to 20 characters of alphabets, numbers, or symbols can be used for the patient ID.
- ♦ The entered ID will be printed on the recording paper.

- 1** Press the key for "ID".
► "ID" window will be displayed.
- 2** Enter the ID using the alphanumeric keypad.



NOTE

- ♦ After entering the ID, press the [Input] key.
If the [Input] key is not pressed, the entered ID will not be finalized.

- 3** Enter the patient classification.

- ♦ The patient classification selection will affect the accuracy of NIBP, HR, RR measurement. It will also affect

the delay time of numeric data alarm.

- The alarm delay time is the function to prevent frequent generation of the measurement data alarm by holding the alarm generation for fixed duration.

The alarm delay functions for HR/PR, BP, RR, SpO₂, TEMP, EtCO₂/InspCO₂, TACHY, BRADY.

| | | Adult | Child | Neonate |
|------------------------|-----------|---|---------------|--------------------|
| NIBP Measurement Range | SYS | 30 to 280mmHg | 30 to 180mmHg | 30 to 130mmHg |
| | MAP | 15 to 235mmHg | 15 to 160mmHg | 15 to 100mmHg |
| | DIA | 10 to 200mmHg | 10 to 150mmHg | 10 to 90mmHg |
| HR | | 0bpm, 12 to 300bpm | | 0bpm, 30 to 300bpm |
| Filter | Monitor | 0.5 to 40Hz | | 1.6 to 40Hz |
| | ESIS | 1.6 to 15Hz | | 1.6 to 15Hz |
| | Diagnosis | 3-electrode: 0.05 to 100Hz 4, 5, 10 electrode: 0.05 to 150Hz | | |
| Impedance Respiration | | 1.5Hz | | 2.5Hz |
| Alarm Delay Time | | 5 sec. | | 0 sec. |

WARNING

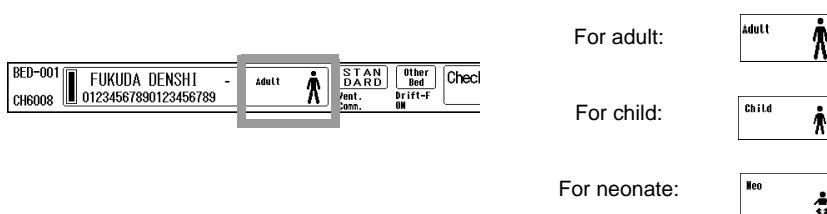
- The patient classification selection influences the precision of the QRS detection and NIBP measurement. Make sure the correct selection is made.
- To perform correct NIBP measurement, appropriate NIBP air hose corresponded to the set patient classification must be used. (However, if the patient classification is child, NIBP air hose for adult can be used.)

1 Press the key for "Class.".

- The patient classification dropdown list will be displayed.

2 Select from [Adult] / [Child] / [Neonate].

- The selected patient classification and icon will be displayed on the home display.



4 Select the patient's sex.

REFERENCE

- At default, no selection is made. The entered sex will be printed on the recording paper.
- This selection will not affect the measurement accuracy of the monitoring.

1 Press the key for "Sex".

- The dropdown list will be displayed.

2 Select [Male] or [Female].

5 Set the nurse team.

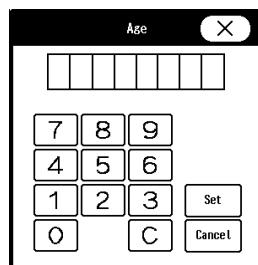
- 1 Press the key for "Team".
 - ▶ The dropdown list for nurse team will be displayed.

2 Select the color of the nurse team.**6** Enter the patient's age.**REFERENCE**

- ♦ There are two ways to enter the patient's age. One is to enter the birth date which will automatically calculate the age, and the other is to directly enter the age using the numeric keypad.
- ♦ If [Neonate] is selected for patient type, age will be displayed in days.

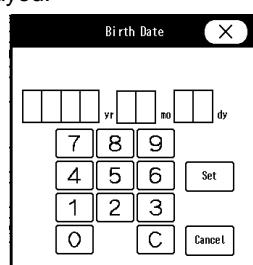
To Manually Enter the Age:

- 1 Press the key for "Age".
 - ▶ "Age" window will be displayed.

**2** Enter the age using the numeric keys.**3** Press the [Input] key.

To Calculate the Age from the Birth Date:

- 1 Press the key for "Birth Date".
 - ▶ "Birth Date" window will be displayed.

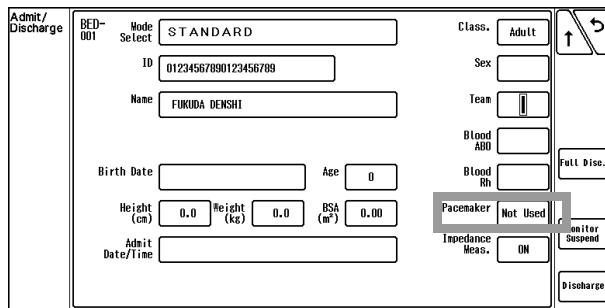
**2** Enter the year, month, day using the numeric keys.**3** Press the [Set] key.**REFERENCE**

- ♦ To change the entered birth date, select the entered area, and enter the correct birth date.

When Pacemaker is Used

⚠️ WARNING

- The pacemaker use selection influences the precision of the QRS detection and arrhythmia analysis. Make sure the correct selection is made.



If [Used] is selected for "Pacemaker", the monitor will detect the pacing pulse (pacemaker pulse) to perform the following process.

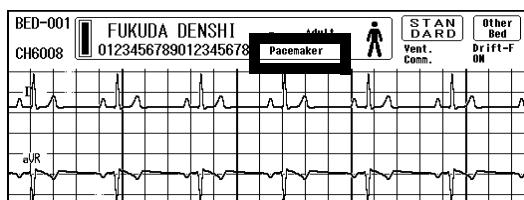
- The artificial pacemaker pulse will be displayed.
- When pacing waveform does not appear (pacing failure), erroneously detecting the pacemaker pulse as QRS will be prevented.
- The arrhythmia analysis will detect pacing beat as P (Pacemaker Beat) or F (Fusion Beat) to prevent erroneous judgment of VPC.

1 Press the key for "Pacemaker".

- The dropdown list will be displayed.

2 Select from [Used]/[Not Used].

- When [Used] is selected, "Pacemaker" will be displayed on the home display.



Discharge

This section explains about the discharge process.

This procedure will erase the patient name, ID, age, and past measurement data such as tabular / graphic trend, and recall.

By pressing the [Rapid Discharge] key preprogrammed as user key, a discharge process can be performed.

Discharging Procedure

CAUTION

- If monitoring of new patient is started without discharging the previous patient, the measurement data of the previous and new patient will become mixed up on the recall and trend data.
- When the discharge procedure is performed, patient data such as recall and trend will be initialized. The parameter and alarm will be reset according to the setting on [Menu]>[Initial Settings]>[User I/F]>[Power ON/Discharge].
( Maintenance Manual "Power ON/Discharge" P5-14)

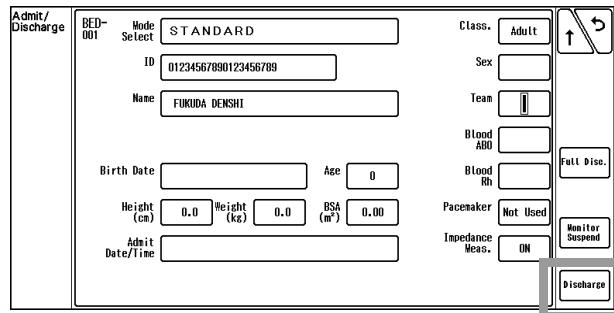
NOTE

- Depending on the setting made for "At Discharge" ([Initial Settings]>[User I/F]>[Power ON/Discharge]), some items may not be initialized.
( Maintenance Manual "Power ON/Discharge" P5-14)
- If discharge procedure is performed during stopwatch operation, the counting will stop and the stopwatch time will be reset to "00:00:00".

1

Press the [Menu], "Admit/Discharge" icon.

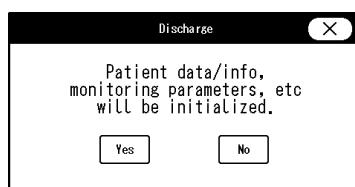
► The "Admit/Discharge" screen will be displayed.



2

Press the [Discharge] key.

► The discharge confirmation window will be displayed.



REFERENCE

- If [No] or [X] is pressed, the discharge process will be cancelled and the confirmation window will close.

3

Press the [Yes] key.

- ▶ The patient data, patient information will be initialized.
- ▶ The screen will return to the home display with the selected user mode.
- ▶ The alarm settings will be initialized to the settings of the selected "Alarm System".

| Data | Description |
|-----------------------|---|
| Patient Data | Trend, Tabular Trend, Recall, ST, OCRG, CO, Hemodynamics, Lung Function, P-V/F-V control data will be erased. The setup condition of recall, tabular trend, graphic trend, vigilance list will remain. |
| Patient Information | Erases the data of patient name, ID, sex, age. The patient classification will not be initialized. |
| Measurement Condition | The learned arrhythmia waveform will be erased. The BP zero-balance condition will be initialized. |

User Mode

This section explains about the user mode selection.

From the preprogrammed user mode, an appropriate user mode can be selected according to the monitoring purpose.

⚠ CAUTION

- The selected user mode will be stored even after the power is turned OFF or discharge process is performed.
Before monitoring, make sure the current user mode is suitable for the patient's condition.
(☞ Maintenance Manual "User Mode Registration" P5-25)

REFERENCE

- For the user mode, up to 9 main modes of display configuration and alarm settings can be registered according to the patient's age and monitoring purpose.
(☞ Maintenance Manual "User Mode Registration" P5-25)

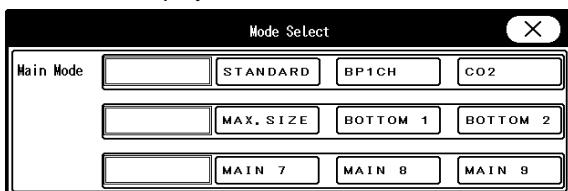
To Select the User Mode

1

Press the [Menu], "Admit/Discharge" icon, "Mode Select" key.

Or, press the mode key on the information display area at the upper part of the screen.

- ▶ The "Mode Select" window will be displayed.



⚠ WARNING

- After changing the mode, make sure that the monitoring setting is appropriate.
When the mode is changed, patient classification, alarm settings, etc. will be changed.

2 Select the main mode appropriate for the patient.**REFERENCE**

- The selected user mode will be stored even after the power is turned OFF. If a new patient is admitted without changing the user mode, the monitoring will start with the previous user mode.
- The mode setting after the discharge operation can be set under the [Initial Settings]>[User I/F]>[Power ON/Discharge].
- Refer to "Setup Item/Default Value" for the default setting of each mode.
( Maintenance Manual "User Mode Registration" P5-25)

Suspend Monitoring

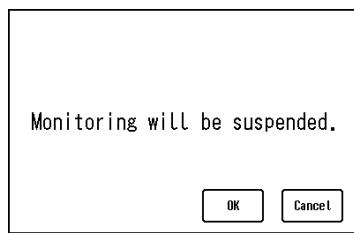
This section explains about the monitoring suspend/resume function.

Monitoring suspend function can be used when a patient temporarily leaves the bed. If the monitoring is ceased by turning the power OFF, recall and ST data will be erased.

By using the monitoring suspend function, measurement, alarm, printing will be suspended but data and settings will remain, which allows to resume monitoring smoothly.

To Suspend Monitoring**1** Press the [Menu], "Admit/Discharge" icon, [Monitor Suspend] keys.

- The monitor suspend confirmation window will be displayed.

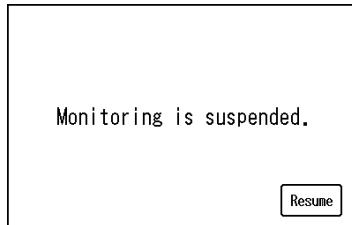
**REFERENCE**

- If [Cancel] is pressed, monitoring will not be suspended and the confirmation window will close.

2 Press the [OK] key.

- The screen will automatically return to the home display with "Monitoring is suspended" message and [Resume] key.

- On the home display, numeric data and waveform display will be suspended.



REFERENCE

- ♦ When the monitoring is suspended, telemetry transmission will cease. Note that the square wave will be displayed on the central monitor indicating the too far condition of the telemetry.
 - ♦ The stopwatch counting will continue even when the monitoring is suspended.
 - ♦ The setting can be changed even when the monitoring is suspended.
-

To Resume Monitoring

**!
CAUTION**

- ♦ Resuming monitoring will also resume the suspended alarm.
-

1

Press the [Resume] key.

- The "Monitoring is suspended" message will be erased and monitoring will resume.

Chapter 6 Alarm Function

| | |
|--|------|
| Alarm | 6-1 |
| To Set the Arrhythmia Alarm | 6-1 |
| SpO2 Second Alarm Setup | 6-2 |
| ST Alarm Setup | 6-4 |
| List of Alarm Settings..... | 6-5 |
| Detail Setup | 6-6 |
| Alarm Limit Setup | 6-7 |
| To Set the System Alarm (ON or Suspend) | 6-7 |
| To Silence or Suspend the System Alarm Sound | 6-8 |
| Alarm Limit Setup for Each Parameter..... | 6-10 |
| Alarm Assist Screen | 6-12 |

Chapter 6 Alarm Function

Alarm

To Set the Arrhythmia Alarm

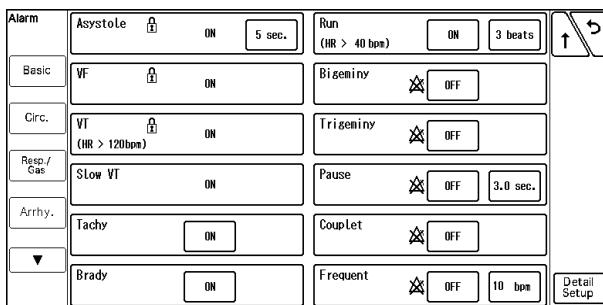
The arrhythmia alarm can be turned ON or OFF, and arrhythmia detection level can be set.

⚠ WARNING

- Set the appropriate upper and lower alarm limit for each parameter according to the monitoring condition.
- When the system alarm is suspended, all the alarm will be suspended even if the parameter alarm is set to ON. Also, the alarms will not be stored as recall events.
- If the upper/lower alarm limit of the parameter is set to OFF, or arrhythmia alarm is set to OFF, alarm will not function even if the system alarm is set to ON. Pay attention when setting them OFF.

1 Press the [Menu], [Arrhy.] ("Alarm") key.

► The arrhythmia alarm setup screen will be displayed.



2 Set ON/OFF of each arrhythmia.

- [ON]: Arrhythmia alarm will generate.
- [OFF]: Alarm will not generate.

NOTE

- The "ARRHY OFF" message will be displayed when the ASYSTOLE, VF, VT, SLOW_VT, and HR alarm is OFF.
- If [Always ON] is selected for "Asystole, VF, VT Alarm" under "Initial Settings", Asystole, VF, VT, Slow_VT alarm can not be set to OFF.
([Maintenance Manual "Alarm Related Setup" P5-5](#))

REFERENCE

- The arrhythmia detection level for tachycardia (Tachy) and bradycardia (Brady) alarm links with the upper and lower alarm limit for HR/PR.
- The tachycardia (Tachy) alarm generates when the measurement exceeds the HR/PR upper alarm limit. When the upper alarm limit is OFF, alarm will not generate.

- The bradycardia (Brady) alarm generates when the measurement is below the HR/PR lower alarm limit. When the lower alarm limit is OFF, alarm will not generate.

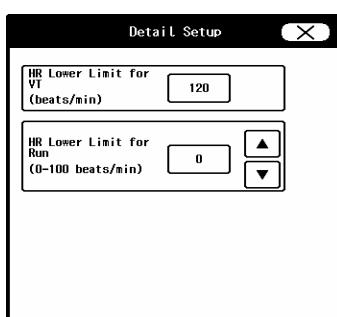
3 Select the level to detect each arrhythmia.

- 1 Press the detection level key for each arrhythmia.
▶ The detection level dropdown list will be displayed.
- 2 Set the detection level.

| Item | Description |
|----------|--------------------|
| Asystole | 3 to 10 sec. |
| Run | 2 to 8 beats |
| Pause | 1.5 to 5 sec. |
| Frequent | 1 to 50 beats/min. |

4 Set the HR Lower Limit for VT and RUN.

- 1 Press the [Detail Setup] key.
▶ The "Detail Setup" window will be displayed.



- 2 Set the "HR Lower Limit for VT".
▶ Select the lower limit of HR value from 120 / 140bpm to generate VT.
▶ If the HR is below the selected value, Slow_VT will generate.
- 3 Set the "HR Lower Limit for RUN".
▶ If the HR is same or above the selected value, RUN will generate.

SpO₂ Second Alarm Setup

NOTE

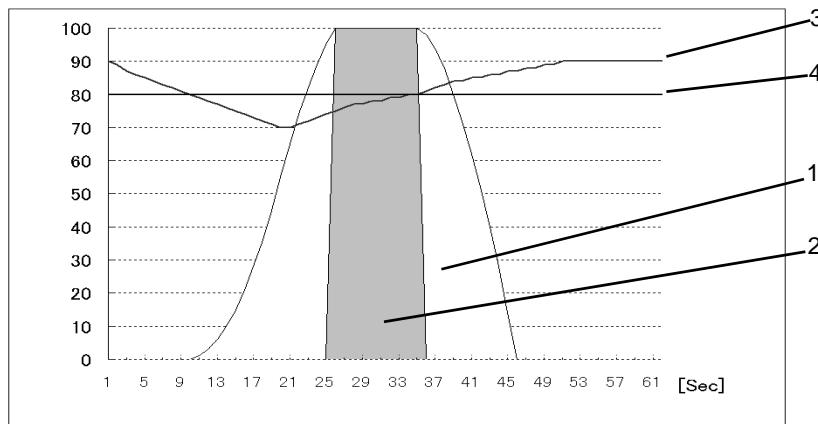
- The SpO₂ second alarm function utilizes SatSeconds™ technology of Covidien. SatSeconds™ is a trademark of Covidien.

The SpO₂ second alarm function is available when HS-8312N is connected.

When the SpO₂ value is unstable around the lower alarm limit, the frequently generated alarm may be bothersome. The second alarm function controls these frequent alarms.

This function generates the alarm only when the integral value (the accumulation of difference between the alarm limit and SpO₂ value at every second) reaches the preprogrammed second alarm threshold value.

The integral value of the second alarm is calculated as follows.



1 Integral Value

2 Alarm Generation

3 SpO₂ Value

4 Alarm Limit

On this graph, the second alarm threshold value is set as 100.

The SpO₂ value begins to fall below the alarm limit at approximately 10 seconds. At the same time, the integral value begins to increase. (Alarm limit) – (SpO₂ value) is accumulated each second.

At approximately 25 seconds, the integral value reaches 100 and the alarm is generated.

The SpO₂ value begins to fall below the alarm limit at approximately 36 seconds. At the same time, the integral value begins to decrease. [(Alarm limit) – (SpO₂ value)]x 2 is subtracted each second.

Also, there is a safety net when setting the second alarm function. This safety net is for the case when the SpO₂ value frequently falls below the alarm limit but does not last long enough to reach the second alarm threshold.

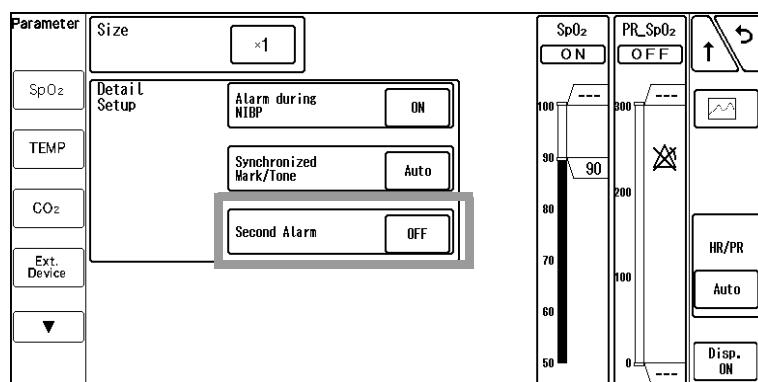
If the SpO₂ value falls below the limit 3 times or more during the last 60 seconds, an alarm will be generated even if the second alarm threshold is not reached.

⚠ CAUTION

- Whether to use the second alarm function and its threshold selection should be based on the patient's clinical indication portent and medical evaluation.
- If the SpO₂ alarm and second alarm setup is set to [OFF], the second alarm integral value will be set to 0.

1 Press the [Menu], [SpO₂]("Parameter") keys.

► The SpO₂ setup screen will be displayed.



2 Press the key for "Second Alarm".

- ▶ The "Second Alarm" screen will be displayed.

3 Select from [10]/[25]/[50]/[100]/[OFF].



- ▶ [10]/[25]/[50]/[100]: A circular second alarm indicator will be displayed inside the parameter key.
- ▶ [OFF]: Second alarm indicator will not be displayed.

REFERENCE

- ♦ As the integral value increases, the indicator will begin to fill, and when it is completely filled, an alarm will be generated.

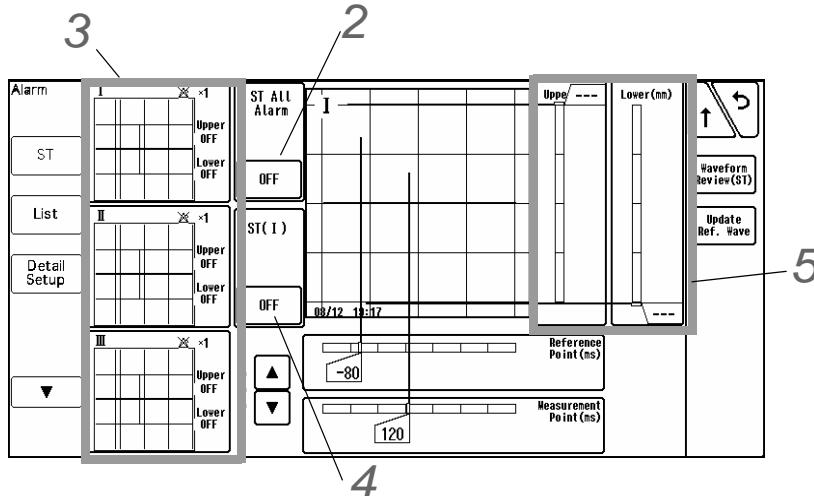
ST Alarm Setup

Set the ST upper limit and lower limit for the reference waveform.

The alarm value is to be set for each measurement unit (mm / mV). The upper/lower limit can be set in 1mm/0.1mV increments.

1 Press the [Menu], [ST] ("Alarm") key.

- ▶ The ST alarm setup screen will be displayed.



2 Select [ON]/[OFF] for "ST All Alarm".

- ▶ [OFF]: Alarms will not generate even if the alarm for each lead is set to ON.

3 Select the lead to set the alarm limit.

- ▶ The selected lead will be displayed large at the right.

4 Select [ON]/[OFF] of alarm for the selected lead.

5 Slide the \backslash XXX $/$ \backslash XXX $/$ and set the upper, lower limit ($\pm 20\text{mm} / \pm 2.0\text{mV}$).

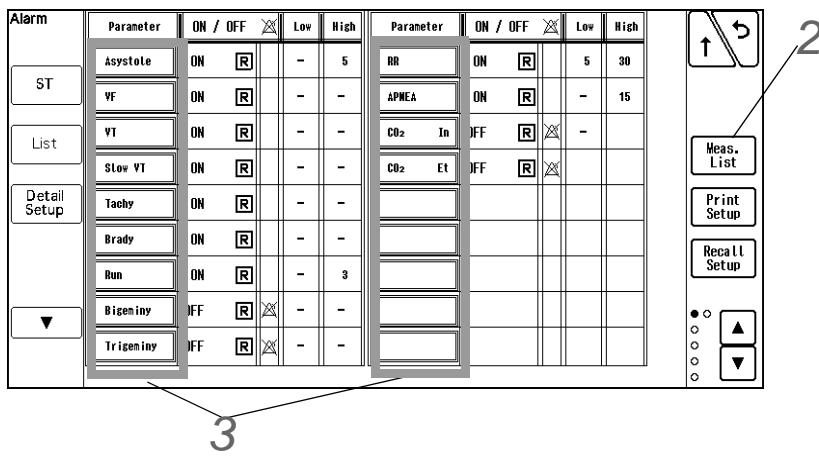
- ▶ Alarm will be set to OFF if the value -20mm / -2.0mV or lower is selected.
- ▶ Alarm will be set to OFF if the value +20mm / +2.0mV or above is selected.

List of Alarm Settings

The alarm settings can be verified in list format. The alarm settings for each parameter can be changed on this list.

- 1** Press the [Menu], [List] ("Alarm") key.

- ▶ The alarm settings list will be displayed.



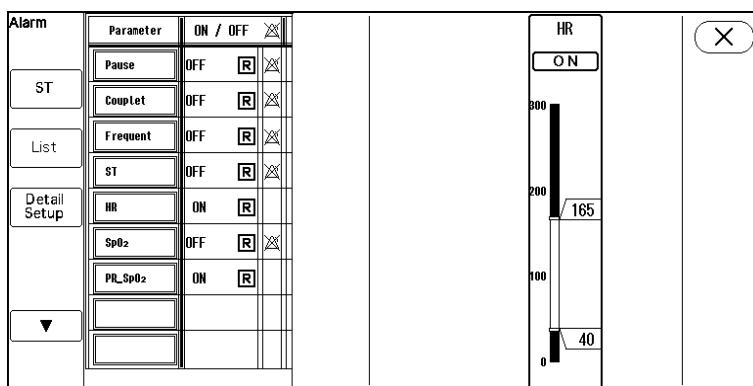
- 2** Select from [All List]/[Meas. List].

- ▶ [All List]: The settings for all the parameters will be displayed.
- ▶ [Meas. List]: The settings for only the measured parameters will be displayed.

- 3** Change the alarm threshold.

- 1** Select a parameter.

- ▶ The alarm setup screen will be displayed.



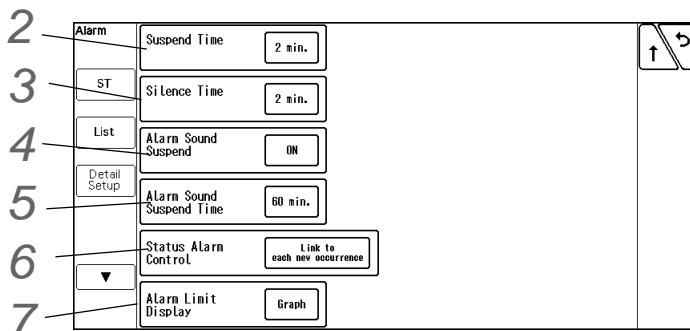
- 2** Press / to set the threshold level.

Detail Setup

The alarm-related setup such as alarm suspend duration and alarm silence duration can be performed.

- 1** Press the [Menu], [Detail Setup] ("Alarm") keys.

► The alarm detail setup screen will be displayed.



- 2** Press the key for "Suspend Time". (To change the setup, a password is required.)

► The dropdown list will be displayed.

- 1 Select from [1min.]/[2min.].

- 3** Press the key for "Silence Time". (To change the setup, a password is required.)

► The dropdown list will be displayed.

- 1 Select from [1min.]/[2min.].

- 4** Press the key for "Alarm Sound Suspend".

► The dropdown list will be displayed.

► [ON]: The alarm sound suspend function will turn ON.

► [OFF]: The alarm sound suspend function will turn OFF.

- 5** Press the key for "Alarm Sound Suspend Time". (To change the setup, a password is required.)

► The dropdown list will be displayed.

- 1 Select from [1min.] / [2min.] / [5min.] / [10min.] / [30min.] / [60min.] / [90min.] / [120min.].

- 6** Press the key for "Status Alarm Control".

► The dropdown list will be displayed.

REFERENCE

- ♦ The alarm silence time for the level L equipment status alarm ("Check electrodes", "NIBP Check patient type, air hose", etc.) can be set.
(☞ "Equipment Status Alarm Message" P11-6)

- 1 Select from [Link to Alarm Silence Time]/[Link to each new occurrence].

► [Link to Alarm Silence Time]: When the [Alarm Silence] key is pressed, alarm will be silenced for fixed amount of time set for "Silence Time".

If the alarm cause still remains at completion of silence time, the alarm sound will generate again.

If the same alarm occurs during the alarm silence time, the alarm sound will not generate.

If the new alarm occurs during the alarm silence time, the alarm sound for the new alarm will generate.

- ▶ [Link to each new occurrence]: When the [Alarm Silence] key is pressed, equipment status alarm will be silenced as long as the alarm cause remains regardless of the "Silence Time" setting.
While the same equipment status alarm is generated, alarm will remain silenced.
If the alarm cause is resolved during the alarm silence time, the alarm will be cancelled.
If the same alarm generates again during the alarm silence time, the alarm sound will generate.

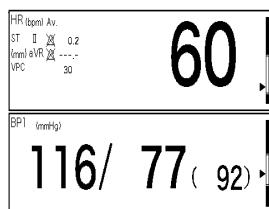
7

Press the key for "Alarm Limit Display".

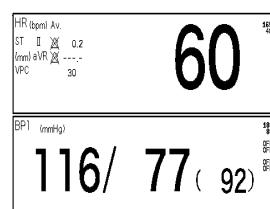
- ▶ The dropdown list will be displayed.

1 Select from [Graph] / [Numeric] / [OFF].

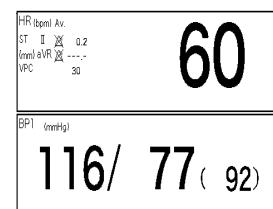
- ▶ The upper and lower alarm limit will be displayed on the home display.



Graph



Numeric



OFF

NOTE

- The alarm limit for the parameter with the alarm turned OFF will not be displayed regardless of this setup.
- If alarm limit display for BP is [Graph], systolic value will be displayed.
- Depending on the numeric data box type, alarm limit may not be displayed.

Alarm Limit Setup

This section explains the procedure for setting the alarm ON or Suspend, and setting the upper and lower limit to generate the alarm.

On this system, 9 modes can be preprogrammed according to the monitoring purpose. By preprogramming the alarm setting to each mode, the alarm setups at admittance of patient can be simplified by just selecting a mode. It is recommended to program the mode in rough classification such as patient's age, monitoring purpose (ICU or surgery), and if necessary, perform unique setup for each patient.

To Set the System Alarm (ON or Suspend)

The system alarm can be set to ON or suspend, but it cannot be turned OFF.



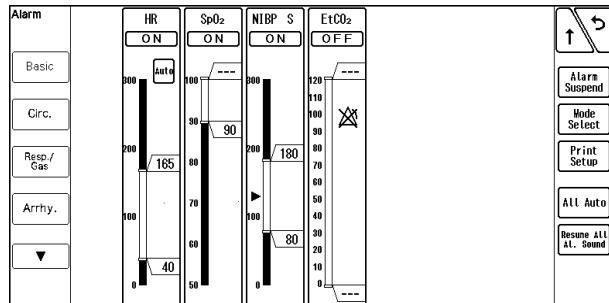
WARNING

- When the system alarm is suspended, all the alarm will be suspended even if the parameter alarm is set to ON. Also, the alarms will not be stored as recall events.
- If the upper/lower alarm limit of the parameter is set to OFF, or arrhythmia alarm is set to OFF, alarm will not function even if the system alarm is set to ON. Pay attention when setting them OFF.

1

Press the [Menu], [Basic] or [Circ.] or [Resp./Gas] ("Alarm") keys.

- ▶ The alarm setup screen will be displayed.

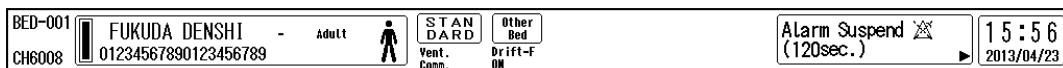


2 Select whether to turn ON or suspend the alarm.

<To Suspend the Alarm>

- 1 Press the [Alarm Suspend] key.

- ▶ The key will change to blue.
- ▶ The alarm will suspend temporarily.
- ▶ "Alarm Susp:xxxx" message will be displayed.



REFERENCE

- ♦ "xxxx" indicates the remaining time. The alarm will turn ON when the suspended time completes.

<To Turn ON the Alarm>

- 1 Press the [Alarm Suspend] key while in alarm suspended condition.
- ▶ The key will change to gray.
 - ▶ The set alarm limits for parameters and ON/OFF will be enabled.
 - ▶ The alarm suspend condition is cancelled.

To Silence or Suspend the System Alarm Sound

There are two functions to suspend the alarm sound for fixed amount of time, which are "Alarm Silence" and "Alarm Sound Suspend".

The "Alarm Silence" function suspends the alarm sound for fixed amount of time (1 or 2 min.).

The "Alarm Sound Suspend" function suspends the alarm generation at a time such as during operation when the alarm generation is expected. The alarm monitoring continues while in the "Alarm Sound Suspend" condition. The "Alarm Sound Suspend" time can be selected from 1/2/5/10/30/60/90/120/240/360 minutes.

- 1 To silence the alarm, press the [Alarm Silence] fixed key.

- ▶ The alarm sound will be silenced for fixed amount of time.
- ▶ If the alarm cause still remains at completion of the silence duration, the alarm sound will generate again.

REFERENCE

- ♦ The [Alarm Silence] can also be operated on user keys or remote control.

2

To suspend the alarm sound, press on the [Alarm Silence] key on the fixed keys for more than 3 seconds.

- ▶ The alarm sound will be suspended for fixed amount of time.
- ▶ If the same alarm occurs during the alarm sound suspend time, the alarm sound will not generate.

NOTE

- ♦ If the [Alarm Silence] key is pressed while the alarm sound is generated, it will bring the system to "Alarm Silence" condition and not the "Alarm Sound Suspend" condition.
- ♦ During the "Alarm Sound Suspend" duration, other bed alarm sound will not generate.

□Precautions about Silencing the Alarm

Alarm silence function is effective for each parameter. Once the alarm cause is resolved, the alarm silence condition for that parameter will be cancelled.

When [Fukuda Tone] is set for the "Alarm System", and if another alarm with the lower priority occurs during the alarm silence duration, alarm sound will not generate. The recall and alarm printing will function.

When [Fukuda Tone] is set for the "Alarm System" and equipment status alarm is silenced, the alarm sound for the lower priority numeric and arrhythmia alarm will generate.

When [Melodic Tone] or [Standard Tone] is set for the "Alarm System" and if another alarm with lower priority occurs, alarm sound will generate.

If the Alarm Silence key is pressed for the alarm of another parameter which occurred during the alarm silence time, the alarm silence time for the first alarm will not be extended.

The alarm silence condition for all parameters will be ceased in the event of any of the following.

- ♦ When the power is turned ON.
- ♦ When the system alarm status (ON/Suspend) is changed.
- ♦ When the monitoring is suspended on the "Admit/Discharge" screen.
- ♦ When the user mode is changed.
- ♦ When the patient is discharged.
- ♦ When [Resume All Al. Sound] key on the alarm setup screen is pressed.

The alarm silence condition for each parameter will be ceased in the event of any of the following.

- ♦ When the alarm cause is resolved for that parameter.
- ♦ When the alarm silence time for the parameter is completed.
- ♦ When automatic alarm is set for the parameter.
- ♦ When the alarm is turned OFF for the parameter.
- ♦ When the alarm cause is resolved for that parameter.

If [Linked to each new occurrence] is selected for "Status Alarm Control", the equipment status alarm sound will not resume after the alarm silence time unless a new status alarm generates.

□Precautions about Suspending the Alarm

If the same alarm occurs during the alarm sound suspend time, the recall or alarm printing will still function.

The alarm sound suspend condition will cease in the event of any of the following.

- ♦ Discharge
- ♦ When OFF is set for "Alarm Sound Suspend".

- When the ventilator alarm is generated.
- When resumed from monitor suspend condition.
- When the [Alarm Silence] key is pressed.

Alarm Limit Setup for Each Parameter

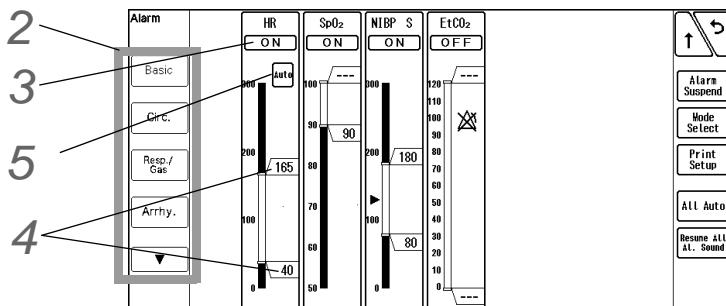
The alarm for each parameter can be turned ON or OFF, and upper and lower alarm limit can be set.

⚠ WARNING

- Set the appropriate upper and lower alarm limit for each parameter according to the monitoring condition.
- When the system alarm is suspended, all the alarm will be suspended even if the parameter alarm is set to ON. Also, the alarms will not be stored as recall events.
- If the upper/lower alarm limit of the parameter is set to OFF, or arrhythmia alarm is set to OFF, alarm will not function even if the system alarm is set to ON. Pay attention when setting them OFF.

1 Press the [Menu], [Basic] ("Alarm") key.

► The alarm setup screen will be displayed.



2 Select the parameter group from the tab.

REFERENCE

- The standard parameters will be displayed on the Menu screen. The parameters to be displayed here are selectable.
(Maintenance Manual "Alarm Related Setup" P5-5)

3 Select ON/ OFF for the individual alarm.

- [ON]: Alarm of the corresponding parameter will generate.
- [OFF]: Alarm of the corresponding parameter will not generate.

4 Set the upper/ lower limit.

- Slide on the right of the bar.
 - : Adjusts the upper limit.
 - : Adjusts the lower limit.

- When the finger is released from the key, the fine-tune button will appear for a fixed period of time.

REFERENCE

- indicates the current measurement value.

5 Adjust the limit or use [Auto] for automatic setup.

► **[Auto]**: Sets the upper and lower alarm limit automatically.

<To Store the Alarm Limit>

To maintain the alarm setting even after the power is turned OFF or after the discharge procedure, store the setting to one of the alarm modes, or select "Backup" for "Alarm" on the "Backup at Discharge" menu (Monitor Setup).

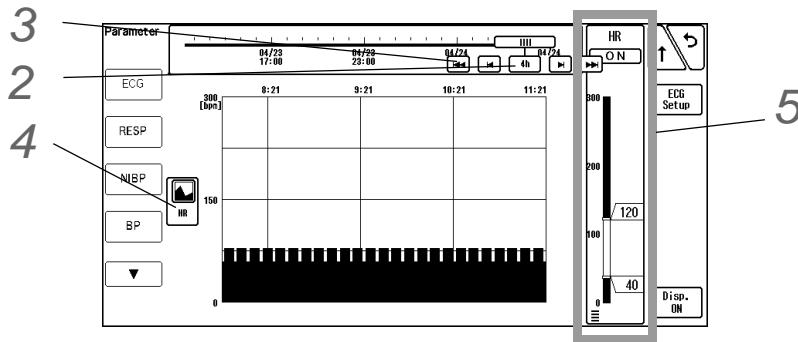
( Maintenance Manual "Display/Print Setup" P5-12)

| Alarm Limit Range | | |
|-----------------------------------|---------------|--|
| Item | Description | |
| HR/PR_IBP/PR_SpO ₂ | ON, OFF | 20 to 300bpm |
| ST1 to ST12 | ST All Alarms | ON/OFF |
| | ST1 to ST12 | ± 2.0mV, ± 20.0mm Indiv. Alarm ON, OFF |
| BP1 to BP6 | ON, OFF | 0 to 300mmHg 0 to 40.0kPa |
| SpO ₂ | ON, OFF | 50 to 100% |
| RR | ON, OFF | 5 to 150Bpm |
| APNEA (Upper Limit) | ON, OFF | 10 to 60 sec. |
| TEMP1 to TEMP6 | ON, OFF | 30 to 45°C |
| Tb | ON, OFF | 30 to 45°C |
| NIBP | ON, OFF | 10 to 300mmHg 1.5 to 40.0kPa |
| EtCO ₂ | ON, OFF | 1 to 100mmHg 0.1 to 13.3kPa 0.1 to 13.3% |
| InspCO ₂ (upper limit) | ON, OFF | 1 to 4mmHg 0.1 to 0.4kPa 0.1 to 0.4% |
| SpCO Value (Masimo only) | ON, OFF | 1 to 40% |
| SpMet Value (Masimo only) | ON, OFF | 1 to 15% |
| SpHb Value (Masimo only) | ON, OFF | 1.0 to 24.5g/dL |

Alarm Assist Screen

On the alarm assist screen, maximum of 24 hours of trend data for the corresponding parameter will be displayed. Alarm limit can be set by using the past trend data as reference.

- 1** To display the alarm assist screen, press [Menu], select a parameter, and press "Alarm Assist" on the corresponding parameter setup screen.
Or, press the numeric data box on the home display, and press "Alarm Assist" on the corresponding parameter setup screen.
- ▶ The alarm assist screen will be displayed.

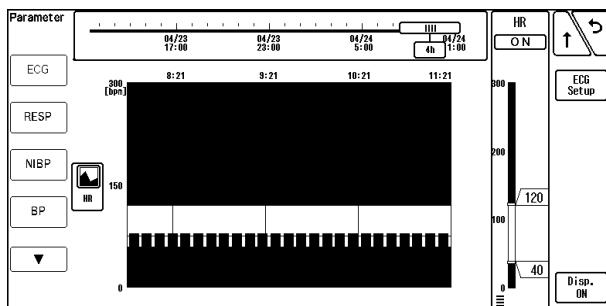


- 2** Select the display interval.
 - 1** Press the key on the time bar.
▶ The dropdown list will be displayed.
 - 2** Select from [24h]/[16h]/[12h]/[8h]/[4h]/[2h]/[1h]/[10min].

- 3** Scroll the displayed data.
 - 1** Scroll the slider left and right.
▶ Right: Scrolls to the newer data.
▶ Left: Scrolls to the older data.
 - 2** Press the **[◀]/[▶]** keys.
▶ The display will switch by page.
 - 3** Press the **[◀]/[▶]** keys.
▶ The display will switch by half page.

- 4** Select the trend display format.
 - 1** Press the key for display format selection.
▶ The dropdown list will be displayed.
 - 2** Select the display format from **[●]**, **[▲]**, **[▼]**, etc.
- 5** Set the upper and lower alarm limit.
 - 1** Press **[xxx]/[xxx]** on the right of the bar.

- Alarm zone will be displayed on the trend.



► The displayed alarm zone will slide by sliding the or .

► The displayed alarm zone will also slide by pressing the / .

- 2 Set the alarm limit by using the alarm trend as reference.

Chapter 7 Monitoring

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Chapter 7 Monitoring

To Display the Parameter Setup Screen

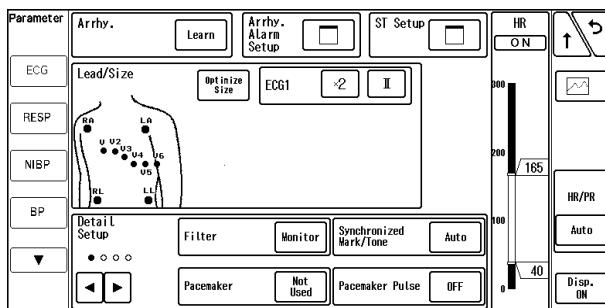
This section explains how to display the monitoring parameters setup screen.

1

Press the [Menu], and then select the parameter to perform the setup.

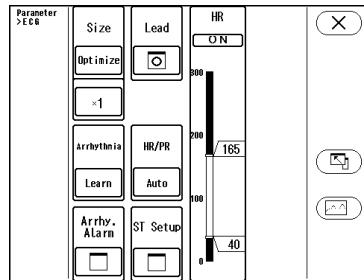
Or, press the numeric data box on the home display, and press  on the corresponding parameter setup screen.

► The "Parameter Setup" screen will be displayed.



NOTE

- When the numeric data box on the home display is pressed, a floating window for the basic setup such as size/scale will be displayed. To display the "Parameter Setup" screen for detailed setup, press .



ECG

This section explains the procedure for ECG measurement preparation and monitoring condition setup.

Before Attaching the Electrodes

CAUTION

- Make sure to use electrodes of the same type.
If different types of electrodes are used at the same time, the difference between the polarization potential from each electrode may interfere monitoring.
- ECG measurement part is Type CF applied part, but it is not intended to directly apply on

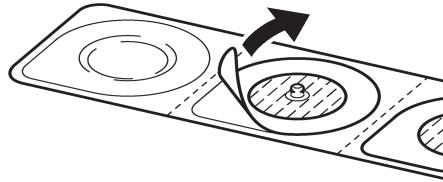
patient's heart.

- 1** If necessary, shave the electrode sites to remove excessive hair.



- 2** Clean the electrode sites with an alcohol swab or other skin preparation.

- 3** Peel off the backing of electrode, and attach to the patient.



NOTE

- ♦ Pay attention not to touch the electrode gel.

Electrode Placement

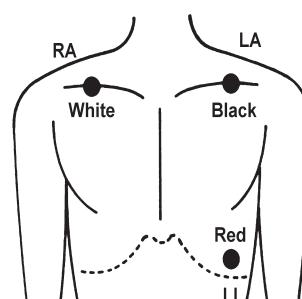
Depending on the lead cable type, 3-electrode/4-electrode/5-electrode/10-electrode placements are available. Using the 4-electrode, 5-electrode or 10-electrode application allows simultaneous monitoring of 2 ECG waveforms, and high accuracy of arrhythmia analysis can be attained. (1 to 12 waveforms can be displayed depending on the number of electrodes.)

Also, the displayed lead type can be changed.

For 3-electrode lead cable (1 waveform monitoring)

Lead Type: [I]/[II]/[III]

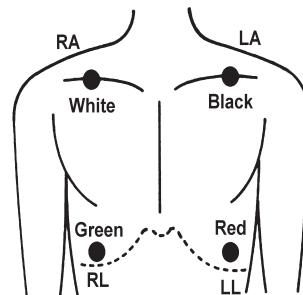
| Symbol | Color | Electrode Site |
|--------|-------|---|
| RA | White | On the right infraclavicular fossa |
| LA | Black | On the left infraclavicular fossa |
| LL | Red | On the left midclavicular line, near the suprasternal line. |



For 4-electrode lead cable (Maximum 6 waveforms monitoring)

Lead Type: [I]/[II]/[III]/[aVR]/[aVL]/[aVF]

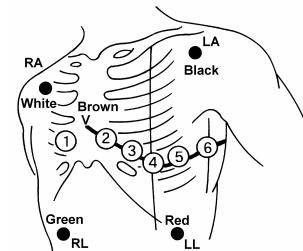
| Symbol | Color | Electrode Site |
|--------|-------|---|
| RA | White | On the right infraclavicular fossa |
| LA | Black | On the left infraclavicular fossa |
| LL | Red | On the left midclavicular line, near the supracrestal line. |
| RL | Green | On the right midclavicular line at the same height as LL. |



For 5-electrode lead cable (Maximum 7 waveforms monitoring)

Lead Type: [I]/[II]/[III]/[aVR]/[aVL]/[aVF]/[V]

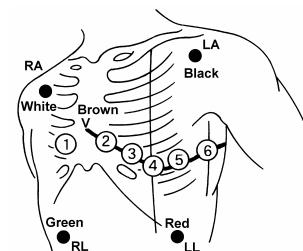
| Symbol | Color | Electrode Site |
|--------|-----------|---|
| RA | White | On the right infraclavicular fossa |
| LA | Black | On the left infraclavicular fossa |
| LL | Red | On the left midclavicular line, near the supracrestal line. |
| RL | Green | On the right midclavicular line at the same height as LL. |
| V | Red/Brown | Chest electrodes (V1 to V6) |



For 10-electrode lead cable (Maximum 12 waveforms monitoring)

Lead Type: [I]/[II]/[III]/[aVR]/[aVL]/[aVF]/[V1]/[V2]/[V3]/[V4]/[V5]/[V6]

| Symbol | Color | Electrode Site |
|--------|--------------|--|
| RA | White | On the right infraclavicular fossa |
| LA | Black | On the left infraclavicular fossa |
| LL | Red | On the left midclavicular line, near the supracrestal line. |
| RL | Green | On the right midclavicular line at the same height as LL. |
| V | Red/Brown | The fourth intercostal space at the right sternal border. |
| V2 | Yellow/Brown | The fourth intercostal space at the left sternal border. |
| V3 | Green/Brown | On the midway between V2 and V4. |
| V4 | Blue/Brown | The fifth intercostal space on the left midclavicular line. |
| V5 | Orange/Brown | On the left anterior axillary line at the same horizontal level as V4. |
| V6 | Violet/Brown | On the left midaxillary line at the same horizontal level as V4. |



NOTE

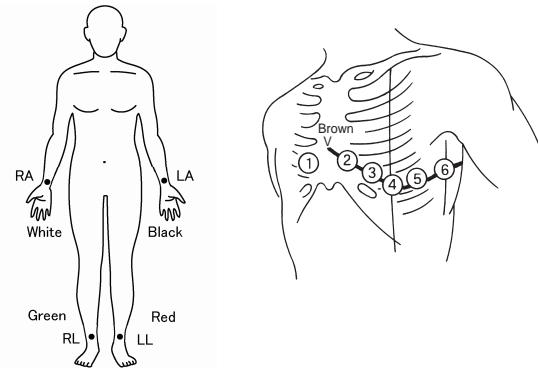
- Electrode Placement for 12-Lead ECG Analysis

When acquiring 12-lead ECG signals, Fukuda Denshi recommends placing the limb electrodes anywhere along the arms and legs as shown below.

However if it is difficult, use the Mason-Likar 12-lead system.

To reduce the waveform differences from the standard 12-lead, Fukuda Denshi recommends that the torso placement of the RA and LA electrodes be near as possible to each arm, in the infraclavicular fossae, within the area unaffected by myoelectricity.)

| Symbol | Color | Electrode Site |
|--------|--------------|--|
| RA | White | On the right arm |
| LA | Black | On the left arm |
| LL | Red | On the left leg. |
| RL | Green | On the right leg. |
| V | Red/Brown | The fourth intercostal space at the right sternal border. |
| V2 | Yellow/Brown | The fourth intercostal space at the left sternal border. |
| V3 | Green/Brown | On the midway between V2 and V4. |
| V4 | Blue/Brown | The fifth intercostal space on the left midclavicular line. |
| V5 | Orange/Brown | On the left anterior axillary line at the same horizontal level as V4. |
| V6 | Violet/Brown | On the left midaxillary line at the same horizontal level as V4. |



Type of Electrodes and Lead Cable

There are various types of disposable electrodes for ECG measurement depending on the connection method with the lead cable and materials which the electrodes are made of. Make sure to use the appropriate electrodes which will make full use of the characteristics.

Do not reuse/sterilize the disposable electrodes.

For details of usable lead cables, refer to "ECG, Impedance Respiration Measurement" P13-1

Connection to the Patient Monitor

CAUTION

- The indication for continuous use of the electrode is about one day.
- Replace the electrode if the skin contact gets loosen due to perspiration, etc.
- When an electrode is attached to the same location for a long period, some patients may develop skin irritation. Check the patient's skin condition periodically and change the electrode site as required.

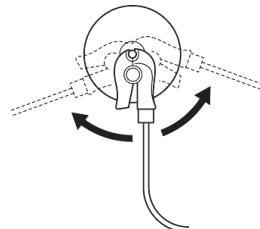
NOTE

- Use only the specified relay cables, lead cables, and electrodes.
- The conductive parts of electrodes and associated connectors for applied parts, including

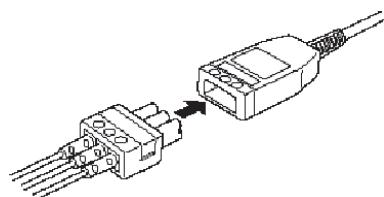
the neutral electrode, should not contact other conductive parts including earth.

1 Clip on the lead cable end to the electrode convex part.

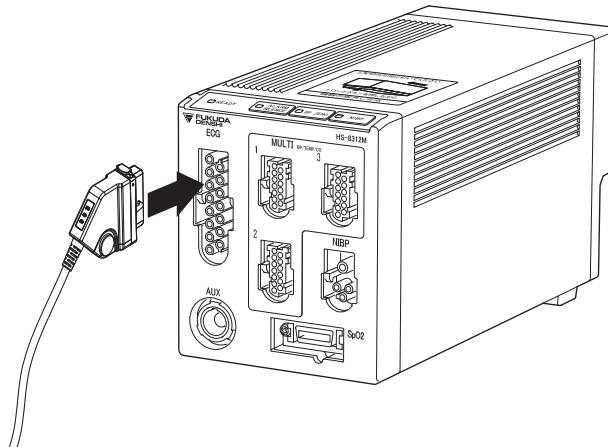
2 Turn right and left to verify that it is securely connected.



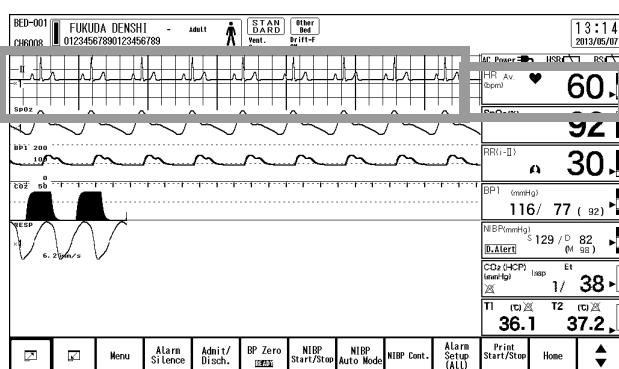
3 Connect the lead cable to the relay cable.



4 Plug in the relay cable to the ECG input connector (green) of the Super Unit.



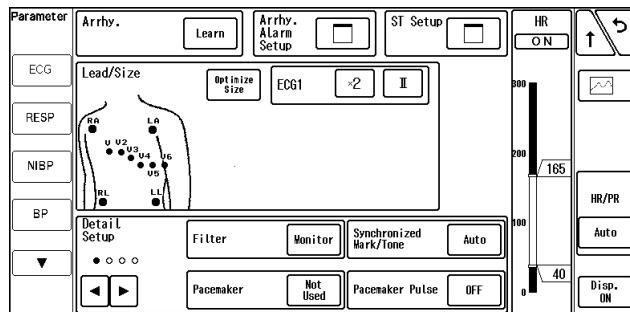
► ECG waveform and HR data will be displayed on the monitor.



5 Adjust the waveform size and position, and change the monitoring lead as necessary.
(☞ "ECG Parameter Setup" P7-6)

ECG Parameter Setup

Press the [Menu], [ECG] keys to display the "ECG" setup screen.



□ Adjustment of Waveform Size and Baseline Position

Adjust the waveform size and baseline position.

CAUTION

- The arrhythmia detection level and QRS detection changes with ECG waveform size. Set a proper waveform size for monitoring. When the waveform size is 1/4, 1/2, or 1, the detection level is 250 μ V. When the waveform size is 2 or 4, the detection level is 150 μ V.
- Automatic size/position of the ECG is effective only at the time the [Auto] key is pressed. This does not continually adjust size and position.
- The waveform size and position cannot be set if the waveform is not displayed. Refer to "To Configure the Display" P10-4, and change the display configuration as necessary.

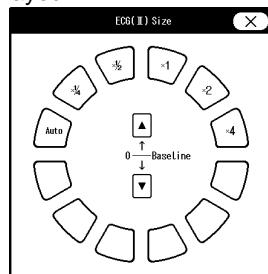
REFERENCE

- By setting the [ECG Size (All Leads)] key as user key, ECG size for all leads can be changed at once.
(☞ "User Key Setup" P10-10)

1

Press the key for "ECG1" to "ECG12".

- The "RESP Size" screen will be displayed.



- When the display layout is "12-Lead", the waveform size can be set differently for limb leads and chest leads.

2

Select the waveform size for displaying and recording.

- [Auto]: ECG amplitude will be automatically adjusted to 10mm.

The automatic adjustment is effective only when the [Auto] key is pressed.

| Waveform Size | x1/4 | x1/2 | x1 | x2 | x4 |
|----------------|------|------|-----|-------|-------|
| Voltage (10mm) | 4mV | 2mV | 1mV | 500μV | 250μV |

- 3** Use the **[▲]/[▼]** keys to adjust the baseline position.

REFERENCE

- If the waveform is difficult to see due to ECG amplitude, set the baseline position to 0mV. The baseline position for the waveform display and recording will be adjusted.
- When the display layout is set to "12-Lead", the baseline position cannot be changed.

□ Lead Selection

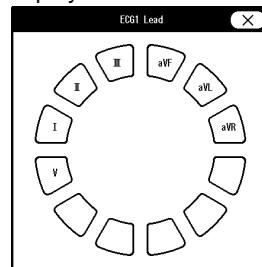
Set the monitoring lead.

! CAUTION

- The leads for arrhythmia detection, central monitor display, printing are fixed as ECG1 and ECG2. Set the most appropriate leads with high QRS for ECG1 and ECG2, especially for arrhythmia detection.
- Alarm for HR, Tachy, and Brady will not be generated when the electrode for ECG1 or ECG2 lead is detached, and for 30 seconds after the electrode is reattached.

- 1** Press the key for "ECG1" to "ECG12".

► The "Lead" selection window will be displayed.



► When the display layout is "12-Lead", select the lead for ECG1 and ECG2 on the lead selection window.

- 2** Select the ECG monitoring lead.

□ HR Alarm Setup

Set the HR alarm.

(☞ "Alarm Limit Setup for Each Parameter" P6-10)

NOTE

- Set the upper limit in the range of 22 to 300bpm. If the range is exceeded above 300bpm, the upper alarm will turn OFF.
- Set the lower limit in the range of 20 to 295bpm. If a value below 20bpm is set, the lower alarm will turn OFF.

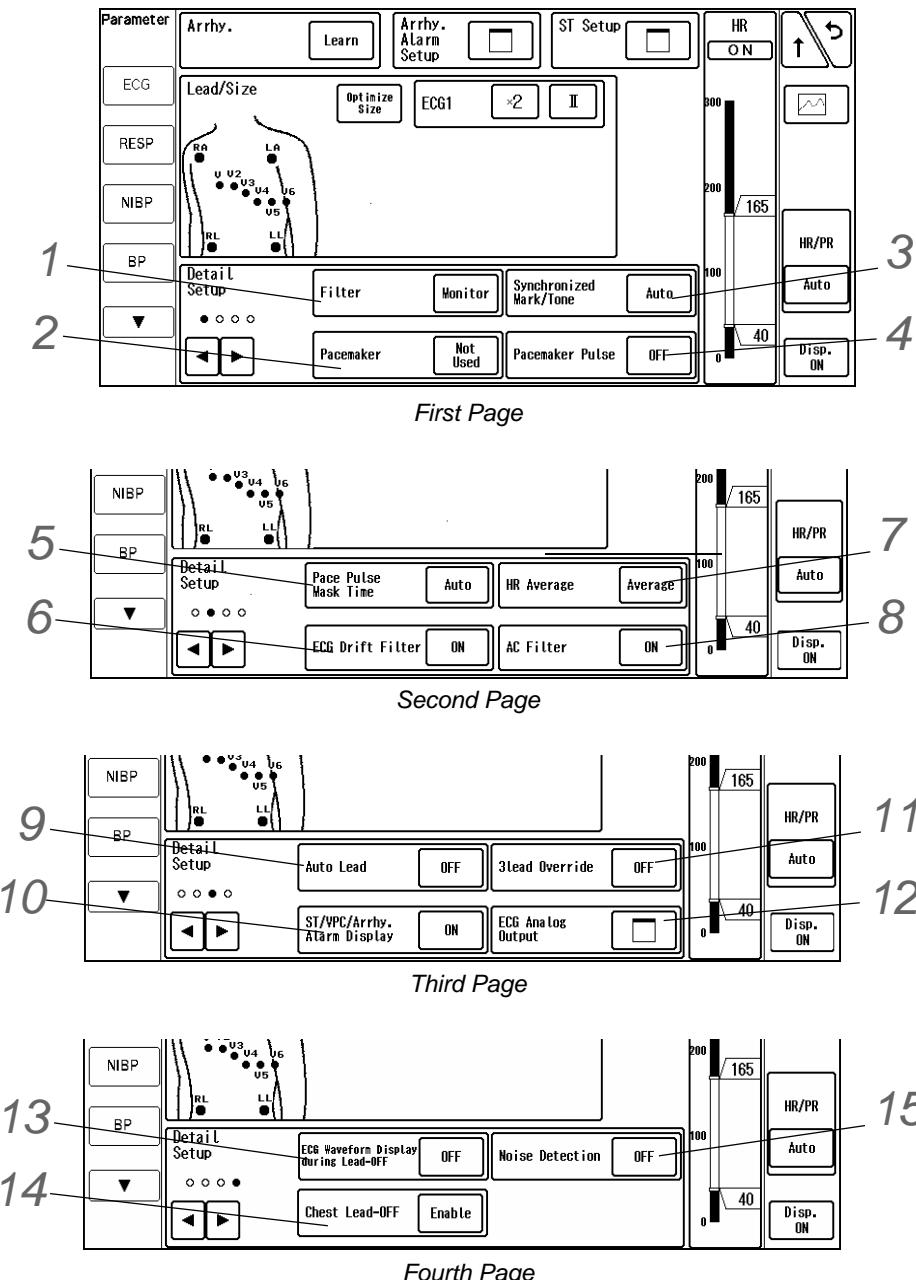
REFERENCE

- When [Auto] is set, the upper and lower limit will be automatically set to +40bpm and -40bpm to the current value respectively.

□ Arrhythmia Alarm Setup

Set the arrhythmia alarm.

(☞ "To Set the Arrhythmia Alarm" P6-1)

□ Detail Setup

- 1** Set the filter mode.

CAUTION

- The ESIS mode can largely reduce the artifact such as electrosurgery noise and EMG,

but it may also reduce the QRS amplitude.

Using the ESIS mode may erroneously detect the pacemaker spike.

- The ESIS mode should be selected only when a high frequency noise largely affects the HR measurement.

REFERENCE

- Select the filter mode from Monitor Mode, ESIS Mode, or Diagnosis Mode according to the monitoring purpose. Each mode has different frequency characteristic.
- The selected filter mode will be printed along with other data.

| | |
|--|---|
| Monitor Mode (Frequency Characteristic: Adult / Child 0.5-40Hz, Neonate 1.6-40Hz) | This is the standard mode for ECG monitoring. The highest frequency is set to 40Hz to reduce artifact caused by EMG, etc. |
| ESIS Mode (Frequency Characteristic: Adult/Child/Neonate 1.6-15Hz) | By selecting this mode during electrosurgery, noise can be largely reduced. |
| Diagnosis Mode (Frequency Characteristic: 3-electrode Adult/Child/Neonate 0.05-100Hz 4, 5, 10-electrode Adult/Child/Neonate 0.05-150Hz) | Select this mode if ST measurement or high frequency ECG monitoring is performed. As the lowest frequency is set to 0.05Hz, ST level can be accurately measured. |

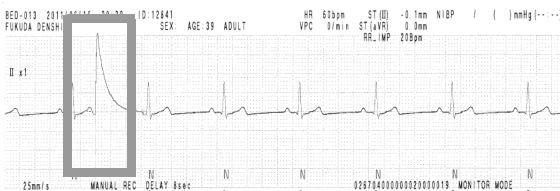
1 Press the key for "Filter".

► The dropdown list will be displayed.

2 Select from [Monitor]/[ESIS]/[Diag].

NOTE

- When the filter mode is changed, a notch will appear on the ECG waveform due to the change in frequency characteristic as shown below.



2 Select [Used]/[Not Used] for "Pacemaker".

1 Press the key for "Pacemaker".

► The dropdown list will be displayed.

2 Select from [Used]/[Not Used].

► [Used]: Pacemaker pulse will be detected and pace pulse mask function will be performed for set duration.

► [Not Used]: Pacemaker pulse will not be detected.

3 Set the "Synchronized Mark/Tone".

1 Press the key for "Synchronized Mark/Tone".

► The dropdown list will be displayed.

2 Select from [ECG]/[SpO₂]/[BP]/[Auto]/[OFF].

► [OFF]: Synchronized mark will not be displayed.

- ▶ [Auto]: The priority will be according to the setting of "Synchronized Mark/Tone Priority" [Menu>Initial Settings>Meas.>Other].

(☞ Maintenance Manual "Other Setup" P5-11)

[ECG]: The synchronizing priority will be set in the order of ECG>SpO₂>BP. The synchronized tone will be set to [ON].

[SpO₂]: The synchronizing priority will be set in the order of SpO₂>ECG>BP. The synchronized tone will be set to [ON].

- ▶ [ECG]: HR synchronized mark will be displayed. The synchronized tone will be set to ON.

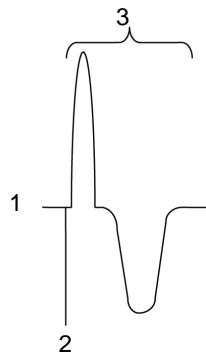
- ▶ [SpO₂]: SpO₂ synchronized mark will be displayed.

The synchronized tone will be set to ON.

- ▶ [BP]: BP synchronized mark will be displayed. The synchronized tone will be set to ON.



4 Set the "Pacemaker Pulse".



Pacemaker Pulse Detection Algorithm

1 ECG Signal Input

ECG signal will be input.

2 Pacemaker Pulse Detection and Suspension of QRS Detection

Detects the high frequency and large amplitude signal as pacemaker pulse.

When pacemaker pulse is detected, QRS detection will be suspended for fixed amount of time to avoid erroneous detection of pacemaker pulse as QRS.

3 Cancelling of Arrhythmia Detection

Arrhythmia detection of the waveform following the pacemaker pulse will be cancelled.

⚠ CAUTION

- ♦ Precautions about Pacemaker Pulse Detection
 - There are some cases when the pacemaker pulse can not be detected depending on the pacemaker type, pulse voltage, pulse width, electrode lead type (unipolar, bipolar), or electrode placement which causes the pacemaker pulse amplitude to decrease and disables the pacemaker pulse detection.
 - If signals similar to a pacemaker pulse are present, such as electric blanket noise or excessive AC frequency noise, these may be erroneously detected and displayed as a pacemaker pulse.
 - When a spontaneous QRS and pacemaker pulse overlap (ex. fusion beat, etc.), QRS detection cannot be performed properly. In this case, the heart rate is degraded.
 - If a pacemaker pulse is continuously detected due to AC frequency interference, QRS detection will be suspended and the heart rate will be reduced. Arrhythmia will not be

detected either.

1 Press the key for "Pacemaker Pulse."

► The dropdown list will be displayed.

2 Select from [ON] or [OFF].

► [ON]: The pacemaker artificial pulse will be displayed on to the ECG waveform with a different color.

► [OFF]: The pacemaker artificial pulse will not be displayed.

REFERENCE

- ♦ "Pacemaker Pulse" will be automatically set to [ON] when [Used] is selected for "Pacemaker" on the "Admit/Discharge" screen.

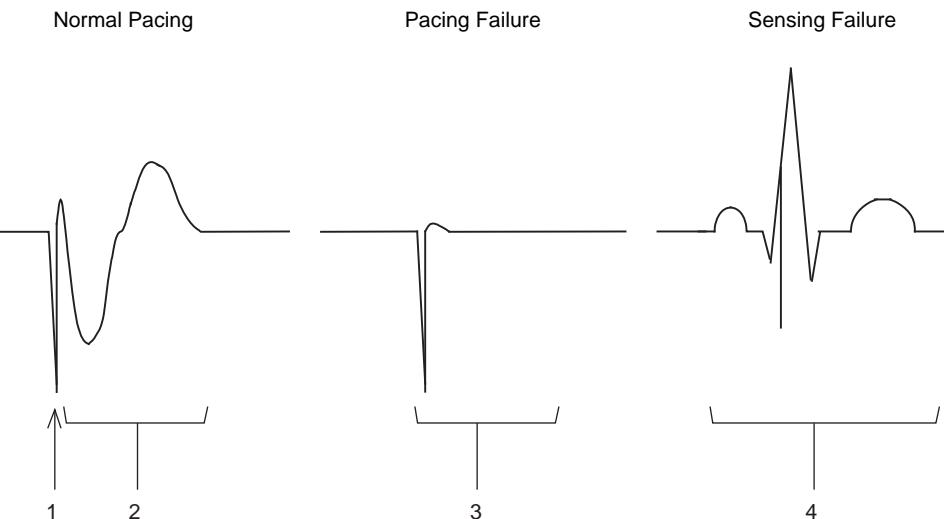
5 Set the "Pace Pulse Mask Time".

⚠ WARNING

- ♦ If the QRS pace mask function is set to [Auto]/ [10ms]/ [20ms]/ [40ms]/ [OFF], the pace pulse may be erroneously be detected as a QRS complex and HR, asystole alarms may not generate due to incorrect HR (counting pace pulse as QRS complex). Select [Auto]/ [10ms]/ [20ms]/ [40ms]/ [OFF] only if you are sure that pacing failure will not occur, or when the patient can be constantly monitored.

REFERENCE

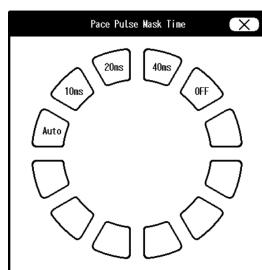
- ♦ For the patients using pacemakers, there are cases when the pacing waveform may not occur in spite of the pacing stimulus. This condition is called "pacing failure". To avoid detecting pacemaker pulses as a QRS complex, this monitor has a function to suspend QRS detection for a fixed amount of time starting from the detection of the pacing stimulus. This function is called "pace pulse mask".
But if the pacemaker does not detect the patient's spontaneous heartbeat (sensing failure), and the pacing stimulus is applied at the same timing as QRS, this pace mask function may erroneously mask the QRS and cause the heart rate measurement to decrease.
To avoid this, QRS pace pulse mask function can be set to [OFF]/ [10ms]/ [20ms] for correct measurement of the heart rate. (Default: Auto)



- 1 Pacemaker Pulse
- 2 Pacing waveform caused by pacemaker pulse
- 3 No waveform in spite of pacing stimulus
- 4 Pacemaker pulse and spontaneous heartbeat occurring at the same time

1 Press the key for "Pace Pulse Mask Time".

- ▶ The "Pace Pulse Mask Time" selection window will be displayed.



2 Select the mask time depending on the pace spike amplitude or presence of fusion beat.

- ▶ [Auto]: Pace pulse mask time will be automatically set according to the pace pulse amplitude.
- ▶ [OFF]: Pace pulse mask time will be set to 0ms.

6 Set the Drift Filter.

1 Press the key for "ECG Drift Filter".

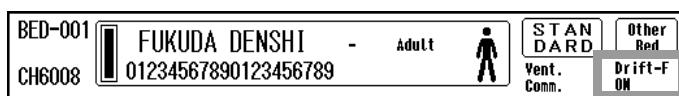
- ▶ The dropdown list will be displayed.

2 Select from [ON] or [OFF].

- ▶ [ON]: Only the amplitude with frequency component under 1Hz will be attenuated to prevent the ECG baseline drift.

The patient signal display will delay about 0.5 seconds.

On the information area of the home display, "Drift-F ON" will be displayed.



- ▶ [OFF]: ECG drift filter will not be set.

7 Set the "HR Average".

1 Press the key for "HR Average".

- ▶ The dropdown list will be displayed.

2 Select from [Inst.]/[Ave.].

- ▶ [Inst.]: HR measured from RR interval of each heartbeat will be displayed.
- ▶ [Ave.]: HR measured from 6 seconds of heartbeat for adult and child, and 3 seconds of heartbeat for neonate will be displayed.

8 Set the "AC Filter".

REFERENCE

- ♦ If the ECG waveform is interfered with AC noise, the AC filter cuts off the frequency component (50Hz or 60Hz).

1 Press the key for "AC Filter".

- ▶ The dropdown list will be displayed.

2 Select from [ON] or [OFF].

- ▶ [ON]: AC filter which attenuates the AC noise of 50 to 60Hz will be set.
- ▶ [OFF]: AC filter will not be set.

9 Set the "Auto Lead".

REFERENCE

- ♦ By setting "Auto Lead" to [ON], "LEAD OFF" message will be displayed and a new ECG lead will be automatically set when lead-off condition occurs.
The automatic lead switching will be performed for ECG 1 and ECG 2.

During Lead OFF

| Lead Cable Type | Detached Electrode | Auto Lead Selected | |
|-----------------|--------------------|--------------------|------|
| | | ECG1 | ECG2 |
| 4-electrode | RA | III | III |
| | LA | II | II |
| 5-electrode | RA/RA+V | III | III |
| | LA/LA+V | II | II |
| | V | II | aVR |
| 10-electrode | RA/RA+V | III | III |
| | LA/LA+V | II | II |
| | V,V2 to V6 | II | aVR |

1 Press the key for "Auto Lead".

- ▶ The dropdown list will be displayed.

2 Select from [ON] or [OFF].

- ▶ [ON]: When lead-off condition occurs, the lead will automatically switch.
The "LEAD OFF" message will be displayed.
- ▶ [OFF]: The lead will not automatically switch even when lead-off condition occurs.

10 Set the "ST/VPC/Arrhy. Alarm Display".

1 Press the key for "ST/VPC/Arrhy. Alarm Display".

- ▶ The dropdown list will be displayed.
- 2** Select from [ON] or [OFF].
- ▶ [ON]: If 2 or more boxes are used for ECG numeric data display, ST level, VPC, arrhythmia alarm factor will be displayed inside the ECG numeric data box.
 - ▶ [OFF]: ST level, VPC, arrhythmia alarm factor will not be displayed inside the ECG numeric data box.

11

Set the "3lead Override".

NOTE

- ♦ When a relay cable for 5-lead or 10-lead is used with a 3-lead cable, it will be judged as lead-off condition and "LEAD OFF" message will be displayed.
- If 3-lead cable is intentionally used, select [ON] for "3lead Override" to avoid displaying the "LEAD OFF" message.
- ♦ If [ON] is selected for "3lead Override" even though 4, 5, 10-electrode relay cable is used with all the lead cables and electrodes connected, it will be acknowledged as only 3 electrodes are used and only one waveform will be displayed.
- Also, artifact may interfere to the waveform or lead-off information may become incorrect. When using the "3lead Override" function, use only 3 electrodes of LA, RA and LL.

- 1** Press the key for "3lead Override".

- ▶ The dropdown list will be displayed.

- 2** Select from [ON] or [OFF].

12

Set the "ECG Analog Output".

- 1** Press the key for "ECG Analog Output".

- ▶ The "ECG Analog Output" window will be displayed.

- 2** Select the lead to output.

- ▶ [Disp. Lead]: The lead of the displayed waveform will be output.

- ▶ [Selected Lead]: The lead selected on "Output Lead Sel." window will be output.

13

Set the "ECG Waveform Display during Lead-OFF".

When the lead-OFF condition is detected, whether or not to display the waveform for detached lead can be selected.

- 1** Press the key for "ECG Waveform Display during Lead-OFF".

- ▶ The dropdown list will be displayed.

- 2** Select from [ON] or [OFF].

- ▶ [ON]: The input waveform will be displayed even during lead-off condition.

- ▶ [OFF]: Baseline will be displayed during lead-off condition.

14

Set the "Chest Lead-OFF".

Whether or not to detect the chest lead OFF condition can be selected. If set to [Enable], chest lead OFF condition will be notified by an alarm generation.

- 1** Press the key for "Chest Lead-OFF".

- ▶ The dropdown list will be displayed.

- 2** Select from [Enable] or [Disable].

- ▶ [Enable]: Chest lead OFF condition will be notified by an alarm generation.

- ▶ [Disable]: Chest lead OFF condition will not be notified by an alarm generation.

15 Set the "Noise Detection".

When a noise generating from electrosurgery, body motion, etc. is detected, whether or not to retain the HR data before the noise detection and to switch the synchronizing source to SpO₂/BP can be selected.

1 Press the key for "Noise Detection".

- ▶ The dropdown list will be displayed.

2 Select from [ON] or [OFF].

- ▶ [ON]: HR data before the noise detection will be retained, and synchronizing source will switch to SpO₂, BP.

- ▶ [OFF]: HR data before the noise detection will not be retained, and synchronizing source will not switch to SpO₂, BP.

NOTE

- Even if the synchronizing source is switched to SpO₂, the ECG tone will remain and not change.

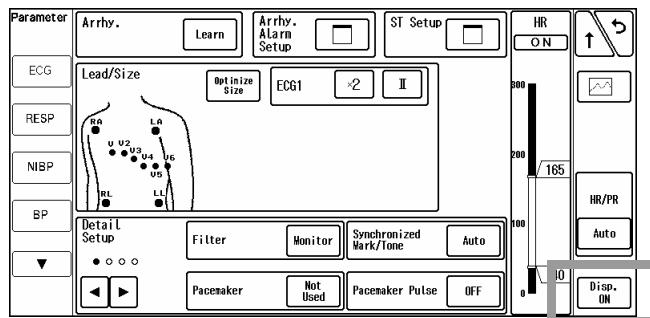
□ ON/OFF of Parameter Display

Select ON/OFF for parameter display.



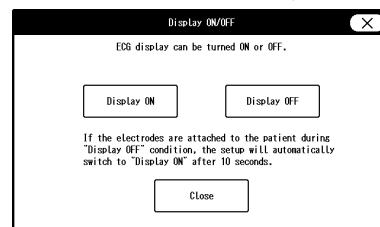
CAUTION

- When the waveform and numeric data display is set to OFF, the alarm generation and tabular trend input will also cease.



1 Press the [Disp. ON] key.

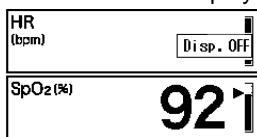
- ▶ The "Display ON/OFF" confirmation window will be displayed.



2 Select from [Display ON] or [Display OFF].

- ▶ [Display ON]: Waveform and numeric data will be displayed.

- [Display OFF]: Waveform and numeric data will not be displayed.
A message will be displayed inside the numeric data display area.



REFERENCE

- When ECG electrodes are attached to the patient with the ECG display set to OFF, the ECG waveform and numeric data will be automatically displayed after 10 seconds.

Respiration

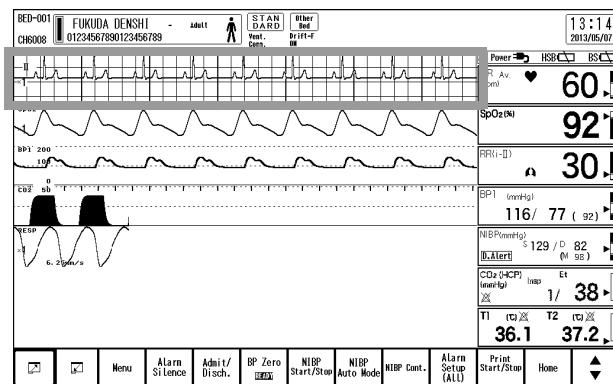
This section explains about the respiration measurement by the impedance, CO₂, or ventilator method and the measurement condition settings.

CAUTION

- When a defibrillator is used during respiration monitoring, a large offset voltage will be placed on the ECG electrodes, which may cause interruption of monitoring for a few seconds.

Respiration Monitoring (Impedance Method)

- 1 Check that the displayed ECG waveform is stable.

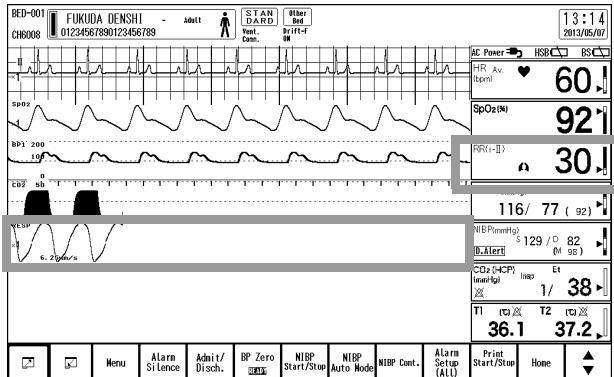


REFERENCE

- The respiration waveform is detected from ECG II or ECG I lead explained in the previous section. Therefore, a stable ECG waveform is necessary to acquire respiration waveform.

2

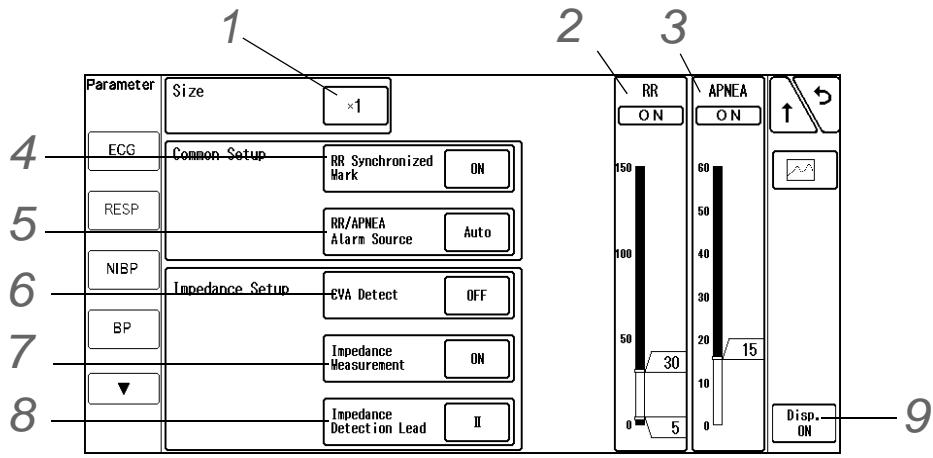
Verify that the respiration waveform and respiration rate is displayed on the home display.

**NOTE**

- Adjust the waveform size, baseline position and sweep speed as necessary.
(☞ "To Configure the Display" P10-4)

RESP Parameter Setup

Press the [Menu], [RESP] keys to display the "RESP" setup screen.



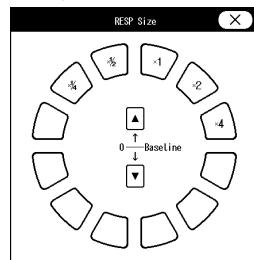
Example on Super Unit

1

Set the waveform size.

1 Press the key for "Size".

► The "RESP Size" screen will be displayed.



2 Select from [x1/4] / [x1/2] / [x1] / [x2] / [x4].

3 Use the ▲/▼ keys to adjust the baseline position.

REFERENCE

- ♦ If the waveform is difficult to see due to impedance waveform amplitude, set the baseline position to 0Ω . The baseline position for printing will not change.

2 Set the RR alarm.

(☞ "Alarm Limit Setup for Each Parameter" P6-10)

NOTE

- ♦ The same RR alarm setting will be applied for impedance, CO_2 , ventilator, and gas unit measurement.
- ♦ For RR measured from CO_2 waveform, alarm will not generate unless 2 or more respiration is detected within 30 seconds after the power is turned ON, monitoring is resumed, CO_2 unit is connected, or a patient is discharged.
- ♦ Set the upper limit within the following range for each patient classification.
Adult: 10 to 150Bpm
Child/Neonate: 4 to 150Bpm
The upper limit alarm will turn OFF if the value above 150Bpm is set.
- ♦ Set the lower limit within the following range for each patient classification.
Adult: 5 to 145Bpm
Child/Neonate: 2 to 148Bpm
If a value below 5Bpm/2Bpm is set, the lower alarm will turn OFF.
- ♦ For the impedance respiration, RR alarm will not generate when the electrode of detection lead is detached and for 30 seconds after the electrode is reattached.
- ♦ When Capnostat 5 is used, RR alarm will not generate unless 2 or more respiration is detected after completion of the airway adapter calibration.

REFERENCE

- ♦ When [Auto] is set, the upper and lower limit will be automatically set to +20bpm and -20bpm to the current value respectively.
- ♦ The adjustable increment for upper and lower limit depends on the patient classification.
Adult: 5Bpm increment
Child/Neonate: 2Bpm increment

3 Set the apnea alarm.

(☞ "Alarm Limit Setup for Each Parameter" P6-10)

⚠ WARNING

- ♦ The purpose of the apnea alarm is to alert the user to evaluate for the possible occurrence of apnea events by identifying the absence of respiration. It is not intended to be classified as an "Apnea Monitor" and will not identify the condition creating the possible event. (Central, Obstructive or Mixed.).

NOTE

- ♦ The same apnea alarm setting will be applied for impedance, CO_2 , and ventilator measurement.
- ♦ For apnea measured from CO_2 waveform, apnea alarm will not generate unless 2 or more respiration is detected within 30 seconds after the power is turned ON, monitoring is resumed, CO_2 unit is connected, or a patient is discharged.

- Set the upper limit in the range of 10 to 60 sec. If a value above 60 sec. is set, the upper alarm will turn OFF.
- For the impedance respiration, apnea alarm will not generate when the electrode of detection lead is detached and for 30 seconds after the electrode is reattached.
- When Capnostat 5 is used, apnea alarm will not generate unless 2 or more respiration is detected after completion of the airway adapter calibration.

REFERENCE

- If [Auto] is set, the apnea alarm setting registered for the currently selected mode will be applied.
- The upper limit can be set in 1-second increment. There is no lower limit.

4 Set the "RR Synchronized Mark".

1 Press the key for "RR Synchronized Mark".

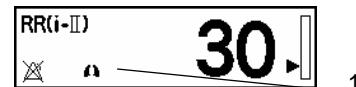
► The dropdown list will be displayed.

2 Select from [ON] or [OFF].

► [ON]: The mark synchronized to impedance respiration or CO₂ waveform will be displayed.

1 RR Synchronized Mark

► [OFF]: Synchronized mark will not be displayed.

**5** Set the "RR/APNEA Alarm Source".**WARNING**

- The RR/APNEA alarm will not be generated unless the numeric data box corresponding to the selected RR/APNEA alarm source is displayed. Make sure to display the numeric data box for the RR/APNEA source.

CAUTION

- If the "RR/APNEA Alarm Source" setting is other than [Impedance] (or, if [Auto] selects a setting other than [Impedance]), the RESP waveform will not be transmitted on a wired network.

REFERENCE

- The parameter to display the RR synchronized mark and to generate the RR/APNEA alarm can be selected from impedance, CO₂, and ventilator.

1 Press the key for "RR/APNEA Alarm Source".

► The dropdown list will be displayed.

2 Select a parameter.

- [Impedance]: RR alarm will be generated based on the impedance respiration curve. The RR synchronized mark based on impedance respiration will be displayed.
- [CO₂]: RR alarm will be generated based on the RR measured by the HPD-800/HPD-810 (Capnostat 5) or HCP-800/HCP-810. The RR synchronized mark based on CO₂ waveform will be displayed.
- [Ventilator]: RR alarm will be generated based on the RR measured by the ventilator. The RR synchronized mark based on ventilator measurement will be displayed.

- ▶ [Auto]: The measurable parameter will be automatically selected in the priority of $\text{CO}_2 >$ ventilator > impedance, and generates the alarm if the corresponding numeric data box is displayed on the home display.

6 Set the "CVA Detect".

REFERENCE

- When the amplitude of the respiration waveform decreases due to causes such as respiratory pause, the ECG waveform may be superimposed on to the respiration waveform, making the RR equal to the HR. This condition is called CVA (Cardio-Vascular Artifact), and is detected using the CVA detection function
- This function will be effective only when [Impedance] is set as the "RR/APNEA Alarm Source" or, when [Auto] selects impedance respiration.
- If the ECG waveform is superimposed on to the respiration waveform with HR (RR) of 30Bpm and above for more than 20 seconds (10 seconds for neonates) and if the "CVA Detect" is set to [ON], the <CVA detected> message will be displayed, and an alarm sound will be generated.

1 Press the key for "CVA Detect".

- ▶ The dropdown list will be displayed.

2 Select from [ON] or [OFF].

- ▶ [ON]: When CVA is detected, alarm will generate and message will be displayed.
- ▶ [OFF]: CVA detection will not be performed.

7 Set the "Impedance Measurement".

⚠ WARNING

- If a patient is using an adaptive (minute ventilation) pacemaker, "Impedance Measurement" should be set to OFF.
The respiration measurement using the impedance method conducts high-frequency and weak current between the ECG electrodes attached to the patient, and measures the potential difference between the electrodes caused by thoracic movement using the synchronous rectification system. For the patient using the adaptive (minute ventilation) pacemaker, the pacemaker measurement signal and the high-frequency current of this equipment interferes with each other which causes incorrect respiration measurement.

1 Press the key for "Impedance Measurement".

- ▶ The dropdown list will be displayed.

2 Select from [ON] or [OFF].

- ▶ [ON]: Standard impedance respiration measurement will be performed.
- ▶ [OFF]: Impedance respiration measurement will not be performed and impedance respiration waveform and RR data will not be displayed. A high-frequency current which is a measurement signal will not be conducted. "Suspended" will be displayed inside the numeric data box.

8 Set the "Impedance Detection Lead".

1 Select the respiration detection lead from [I] or [II].

NOTE

- If HLX is set, the lead will be fixed to [II].

9 Select ON/OFF for parameter display.
(☞ "ECG Parameter Setup" P7-6)**BP**

This section explains about the procedure of BP1 to BP 6 measurement preparation and measurement condition setup.

⚠ CAUTION

- Do not reuse / re-sterilize the disposable type transducers.
- If using a reusable blood pressure transducer, disinfect it according to the manufacturer's guidelines.
- The long-term use of the blood pressure transducer, tube and catheter may increase the risk of infection. Perform periodic replacement with new one. The guidelines of the CDC (Disease Control and Prevention) recommend replacing within 96 hours.
- If the ambient temperature of the blood pressure transducer has changed greatly, the zero balance may cause the drift. Perform the zero balance again.
- An operator must not get away from a patient during the BP measurement. However, when getting away from the patient is necessary, do not activate the Alarm Suspend and Silence functions in order not to miss any sudden changes in the patient's condition.
(☞ "To Set the System Alarm (ON or Suspend)" P6-7)
(☞ "To Silence or Suspend the System Alarm Sound" P6-8)
- Be sure to perform Daily Check. Use of faulty equipment might harm the patient or operator.
(☞ "Daily Check" P4-1)
- If the Equipment Status Alarm occurs or if you feel the unusual operation of the equipment, perform the inspections to confirm the safety or contact our service representative.
(☞ "Equipment Status Alarm Message" P11-6)
- The BP value will not be displayed until zero balance is performed after the power is turned ON. Make sure to perform the zero balance.
Once the zero balance is performed, the zero balance information will be maintained, and the BP value will be displayed.

BP Monitoring

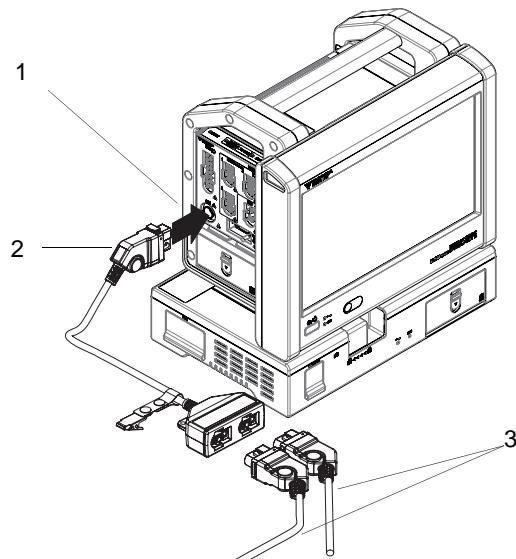
Super Unit utilizes multiparameter amplifier input method which allows monitoring of 2 channels of BP through the 2ch BP conversion cable, CJO-P01B-DJ0.5. The BP relay cable can be directly connected to the multiparameter connector.

- 1** Connect the BP interface cable to Super Unit.

For Connection via 2ch BP Conversion Cable (CJO-P01B-DJ0.5):

- 1** Connect the interface cable to the multiparameter connector via 2ch BP conversion cable (CJO-P01B-DJ0.5).

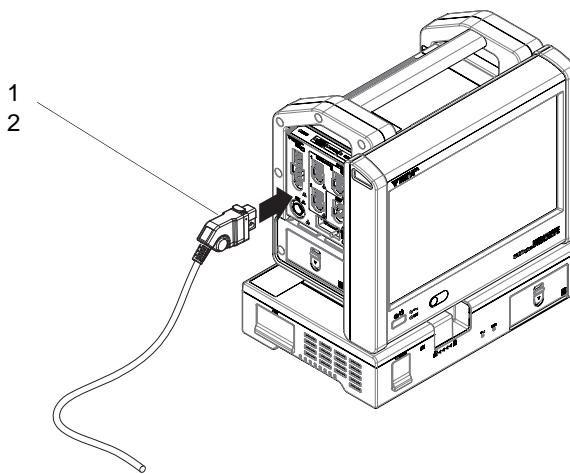
- 1 Multiparameter Connector
- 2 2ch BP Conversion Cable
CJO-P01B-DJ0.5
- 3 1ch BP Relay Cable
CJO-P01B-S**



For Direct Connection:

- 1** Connect the BP relay cable directly to the multiparameter connector.

- 1 1ch BP Relay Cable
CJO-P01B-S**
- 2 2ch BP Relay Cable
CJO-P01B-D**



- 2** Assemble the BP measurement device.

REFERENCE

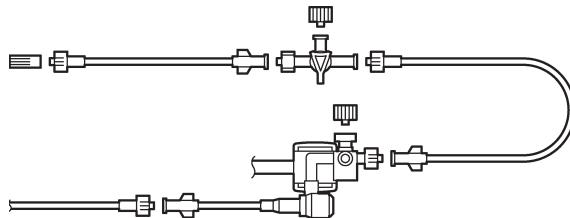
- ♦ The warm-up time is according to the specification of each blood pressure transducer for use. Refer to the manufacturer's instruction.
- ♦ Regarding the DS-8200 system specification, refer to the following.

(☞ "BP" P14-13)

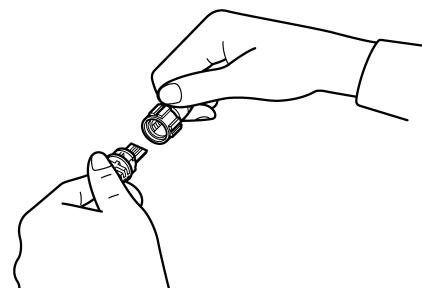
- The following procedure explains the case when a BP transducer (LS575 series) is used.
If using other transducers, refer to the operation manual for the corresponding transducer.
- (☞ "Invasive Blood Pressure Measurement" P13-2)

1 Inspect transducer packaging for damage prior to opening.

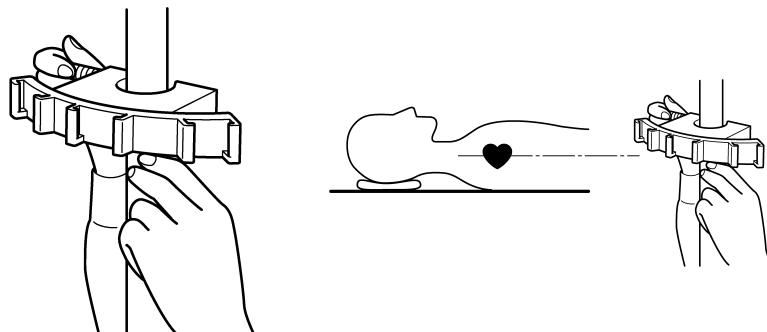
2 Verify that each connector is securely connected.



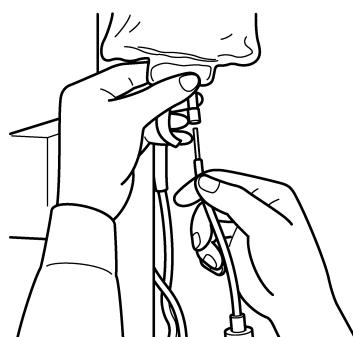
3 Connect the BP relay cable to the transducer.



4 Align the bracket to patient's heart position (about 1/2 of the chest depth).

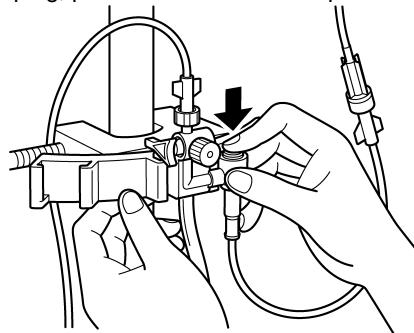


5 Inject 1000 units of heparin into the saline bag, mix thoroughly and puncture the infusion line through the same hole.

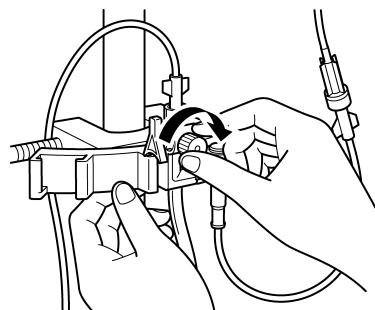


6 Set the saline bag to pressure bag, and hang from the infusion device. Fill saline to about 1/3 of the drip.

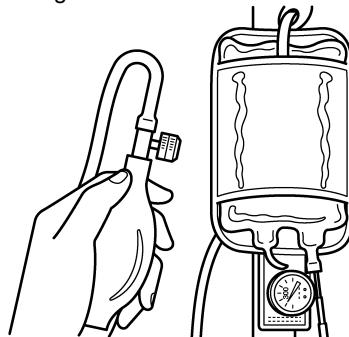
- 7 After loosening the zero-port plug, push the flash button to perform priming to remove air bubbles.



- 8 Verify that all air bubbles are removed, and tighten the zero-port plug. Turn on the zero-port plug side of the open-air three-way valve.



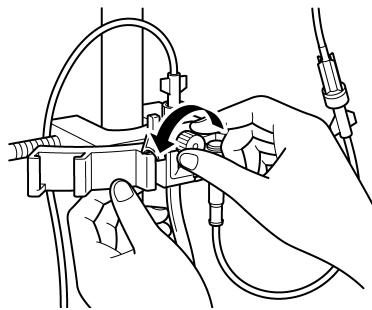
- 9 Inflate the pressure bag to 300mmHg.



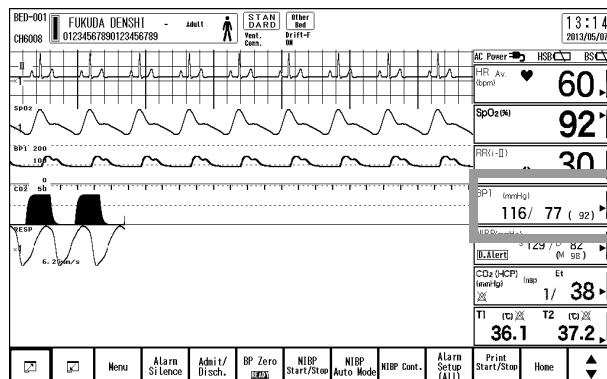
- 10 Set the BP device and wait for about 5 minutes.

3 Perform zero balance.

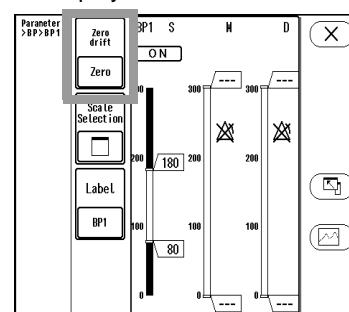
- 1 Loosen the zero-port plug on open-air three-way valve one-half turn.



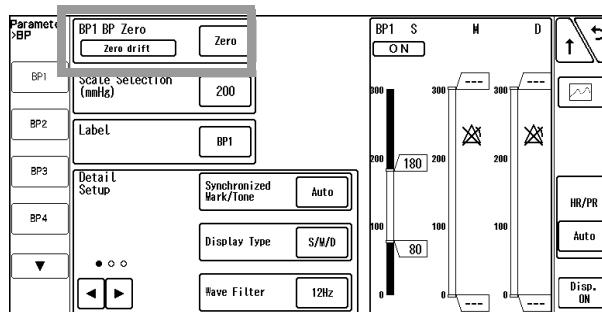
2 Press the BP numeric data box (parameter key) on the home display.



► The BP floating window will be displayed.

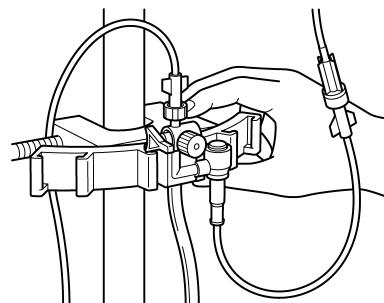


3 Press the [Zero] key on the BP floating window or BP parameter setup screen.

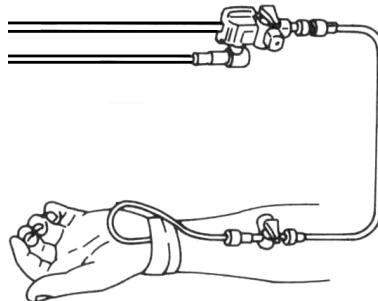


► Zero balance will start.

4 Turn off the zero-port plug side of the open-air three-way valve.



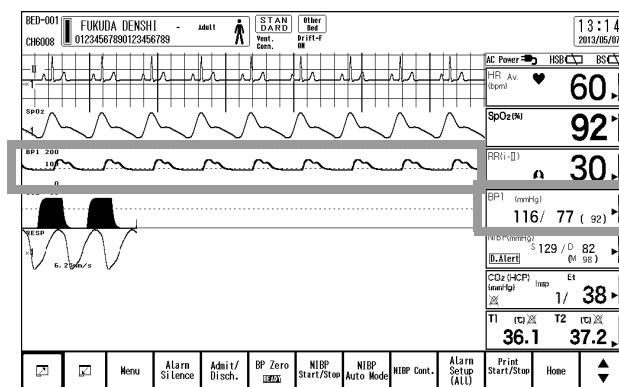
5 Connect the catheter to the end of monitoring line.



► The measurement preparation is completed, and BP measurement will start.

4 Press the [Home] key on the user key.

5 Verify that the BP waveform and numeric data is displayed on the home display.



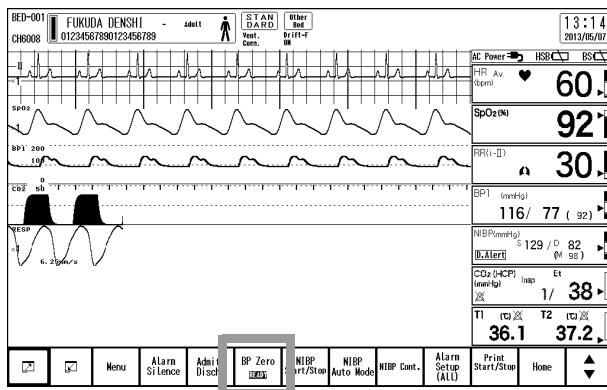
CAUTION

- ♦ The zero balance procedure is required for the following case.
 - ♦ When starting the measurement.
 - ♦ When the position of the heart has changed due to body movement.
 - ♦ When the position of the transducer has changed.
 - ♦ When measuring for a long period of time and there is a possibility of measurement error due to change in ambient temperature, etc.
 - ♦ When a connector is connected/disconnected, or a transducer is replaced.
 - ♦ When the power has been turned OFF for more than 5 minutes.

Zero Balance of All Pressure Lines (User Key)

The zero balance for all the displayed BP can be performed using the user key.

If any of the BP is in progress of measurement, perform the zero balance on each BP parameter setup screen.



1 Open the three-way valve of all the pressure transducers to air.

- ▶ A message, "READY" will be displayed inside the user key.

2 Press the [BP Zero] key on the user key.

3 Verify the BP waveform is positioned at zero, and "0" is displayed for the BP value.

- ▶ A message, "COMPLETE" will be displayed when the procedure is complete.
- ▶ A message, "FAILED" will be displayed when the process fails.
- ▶ A message, "DRIFT" will be displayed when the BP relay cable is not connected.

NOTE

- ♦ If a message, "FAILED" is displayed, the three-way valve may not be opened to air, artifact is present, or the transducer may be defective. Check the cause and try the zero balance procedure again.
- ♦ If a message, "DRIFT" is displayed, verify that all the connections are secure.

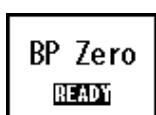
4 Close the three-way valve when the zero balance is complete.



CAUTION

- ♦ Each time the blood pressure transducer or tubing is replaced, the zero balance procedure is required to ensure accurate measurements.
- ♦ "READY" message will not be displayed unless the three-way valves of all pressure transducers are opened to air. If the status is not displayed, or if "MEASURE" message is displayed, check if the three-way valve of pressure transducers are opened to air.

BP zero status displayed inside the user key



| | |
|------------|---------------------------------|
| No display | :Open transducer to air |
| MEASURE | :Open transducer to air |
| READY | :Ready to perform zero balance. |
| BP ZERO | :BP zero in progress |
| FAILED | :Zero failed |
| COMPLETE | :Zero complete |
| DRIFT | :Zero drift |

Zero Balance of All Pressure Lines ([BP Zero] Key)

By using the [BP Zero] key on the Super Unit or on the user key area, zero balance can be performed for all the BP channels even if not displayed.

- ♦ When the BP zero balance properly completes, a beep sound will generate for 1 second and LED will light in blue.
- ♦ When the BP zero balance fails, a beep sound will generate for 3 seconds and LED will flash in blue.

NOTE

- ♦ Using the [BP Zero] key will allow to perform zero balance for all the BP even if not displayed on the home display.
- For the BP channel with the transducer in progress of measurement, zero balance will not be performed.

Zero Balance for Each Pressure Line

1

Open the three-way valve of the pressure transducer to air.

2

Verify that "Zero ready" is displayed on the BP parameter setup screen for BP1 to BP6, and press the [Zero] key.

3

Verify the BP waveform is positioned at zero, and "0" is displayed for the BP value.

- A message, "Zero complete" will be displayed when the procedure is complete.
- A message, "Zero failed" will be displayed when the process fails.
- A message, "Zero drift" will be displayed when the BP relay cable is not connected.

NOTE

- ♦ If a message, "Zero failed" is displayed, the three-way valve may not be opened to air, artifact is present, or the transducer may be defective. Check the cause and try the zero balance procedure again.
- ♦ If a message, "Zero drift" is displayed, verify that all the connections are secure.

4

Close the three-way valve when the zero balance is complete.

BP Parameter Setup

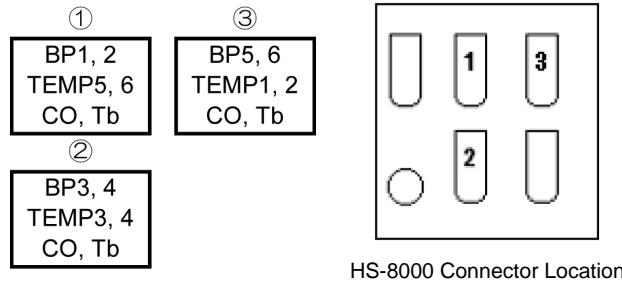
REFERENCE

- Regarding the default value of each setting, refer to the following.
(☞ "Setup Item/Default Value" P12-1)

□ Default BP Label

NOTE

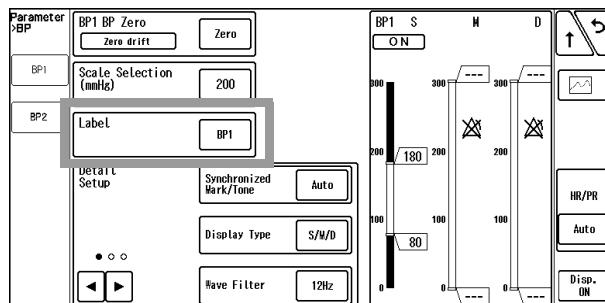
- If only the Super Unit is used and [Fixed] is selected on [Initial Settings>System>Unit Module], the default label will be automatically set according to the connector location.
(☞ "Multiparameter Connector Setup for BP, TEMP, CO Measurement" P7-88)



For example, if BP cable is connected to connector 1 and TEMP cable is connected to connector 3, the measured parameters are as follows.

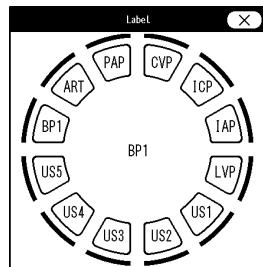
- BP1, 2 (BP1 if 2ch BP conversion cable is not used.)
- TEMP1, 2

□ Label Setup



1 Press key for "Label".

- The "Label" selection window will be displayed.



2 Select from [BPx]/[ART]/[PAP]/[CVP]/[ICP]/[IAP]/[LVP]/[USx].

REFERENCE

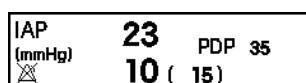
- ♦ Description of Each Label:
- ART (Arterial Pressure)
- PAP (Pulmonary Artery Pressure)
- CVP (Central Venous Pressure)
- ICP (Intra-cranial Pressure)
- IAP (Intra-aortic Balloon Pumping Pressure)
- LVP (Left Ventricular Pressure)
- US1 to US5: User labels (3 characters) which can be set on the "Initial Settings".
(Maintenance Manual "User Label Setup" P5-9)

NOTE

- ♦ US3 to US5 cannot be selected for the equipment connected to DS-LANII/III.

□ When the BP Label is IAP

PDP (Peak Diastolic Pressure) can be displayed in addition to systolic, diastolic, and mean pressure.
Note that Systolic Pressure (SYS) = Peak Systolic Pressure (PSP).



⚠ CAUTION

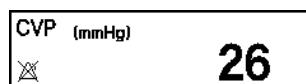
- ♦ Pay attention when monitoring graphic trend, data base, and alarm, as Systolic Pressure (SYS) = Peak Systolic Pressure (PSP).
- ♦ When ECG is not measured, PDP cannot be calculated.

□ When the BP Label is CVP

The measurement unit can be set to "mmHg", "kPa" or "cmH₂O".

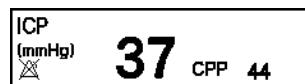
The measurement unit can be set on the "Initial Settings". The set measurement unit will be displayed on the BP numeric data box.

(Maintenance Manual "Measurement Unit" P5-10)

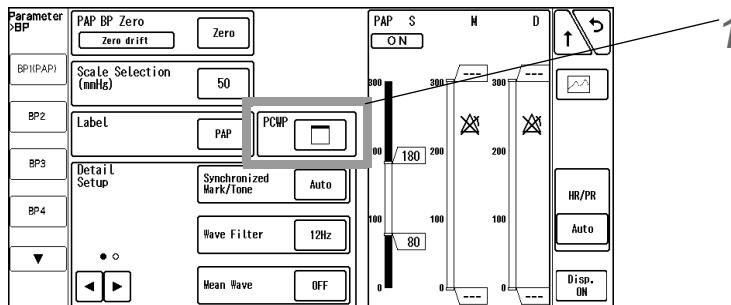


□ When the BP Label is ICP

CPP (Cerebral Perfusion Pressure) can be measured. (CPP = Mean Arterial Pressure – Mean Intracranial Pressure)
If the CPP value is negative value, the data will not be displayed. Also, alarm cannot be set for CPP.



□ PCWP Measurement

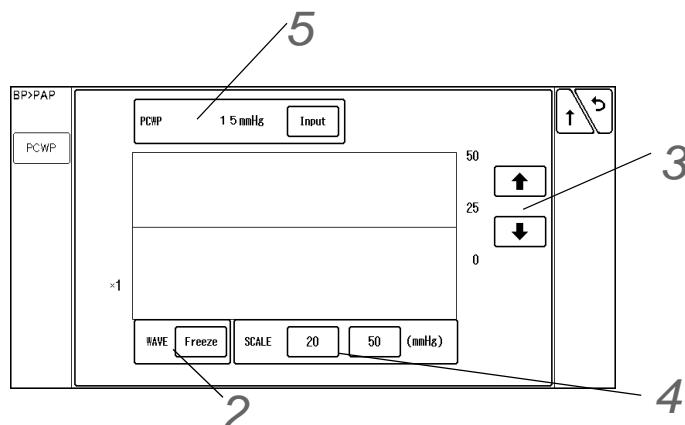


REFERENCE

- When PAP is set as BP label, the mean value can be displayed as PCWP (Pulmonary Capillary Wedge Pressure).
- On the PCWP display, the current BP waveform and RESP waveform will be displayed.

1 Press the key for "PCWP".

- PCWP measurement screen will be displayed.



2 Press the [Freeze] key.

- The displayed waveform will freeze and cursor will be displayed. The cursor position indicates the current mean blood pressure.

3 Use the \uparrow / \downarrow keys to set the PCWP value.

4 Select the waveform scale from [20]/[50] as necessary.

5 Press the [Input] key after setting the PCWP value.

- The PCWP value will be displayed inside the PAP (BP label) numeric data box with the measurement time.

It will be also displayed on the trend data.



Scale Setup

CAUTION

- When wireless network is used, BP waveform with a scale above the set scale will not be properly transmitted. The displayed BP scale should be within the set scale.

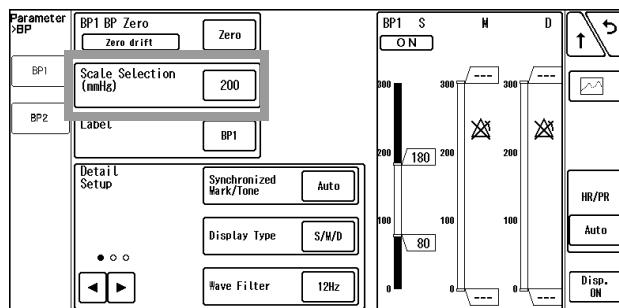
NOTE

- Select the full scale for displaying and printing.
- The scale selection will differ depending on the label as shown below.

| BP Label | Scale | | | | | | | | | | | | | | | |
|-----------------------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|--------------------|
| | 5 | 10 | 15 | 20 | 30 | 40 | 50 | 75 | 100 | 150 | 200 | 250 | 300 | mmHg | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 8 | 12 | 16 | 20 | 24 | 32 | 40 | kPa | | |
| | | | | | | | | | | | | | | 20 | 40 | cmH ₂ O |
| BP1 to BP6 User Label | | | | Yes | | | Yes | | | |
| ART, IAP, LVP | | | | | | | Yes | | | |
| PAP | | | | Yes | | Yes | | | |
| CVP | | Yes | | Yes | | Yes | Yes |
| ICP | Yes | Yes | Yes | Yes | | | Yes | | | |

REFERENCE

- The scale selection can be also displayed by pressing the BP scale on the home display.

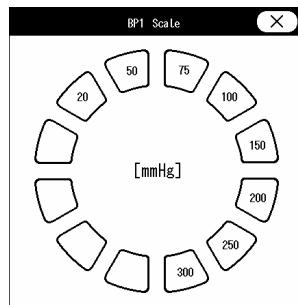


1

Press the key for "Scale Selection".

► The scale selection window will be displayed.

2 Select the scale from the displayed selection.



Alarm

REFERENCE

- For Other Bed Alarm, refer to the following.
(☞ "Other Bed Display" P8-52)
- No alarm sound generation is available, using the alarm suspend and silence functions, when performing the zero balance or replacing the transducer. After performing the zero balance or replacing the transducer, make sure not to activate the Alarm Suspend and Silence functions.
(☞ "To Silence or Suspend the System Alarm Sound" P6-8)

1 Set the BP alarm.

(☞ "Alarm Limit Setup for Each Parameter" P6-10)

NOTE

- Set the upper limit in the range of 2 to 300mmHg/0.2 to 40.0kPa. If a value above 300mmHg/40.0kPa is set, the upper alarm will turn OFF.
- Set the lower limit in the range of 0 to 295mmHg/0 to 39.5kPa. If a value below 0mmHg/0kPa is set, the lower alarm will turn OFF.
- Alarm will not generate until 30 seconds has passed after the zero balance or after the transducer has been opened to air.

REFERENCE

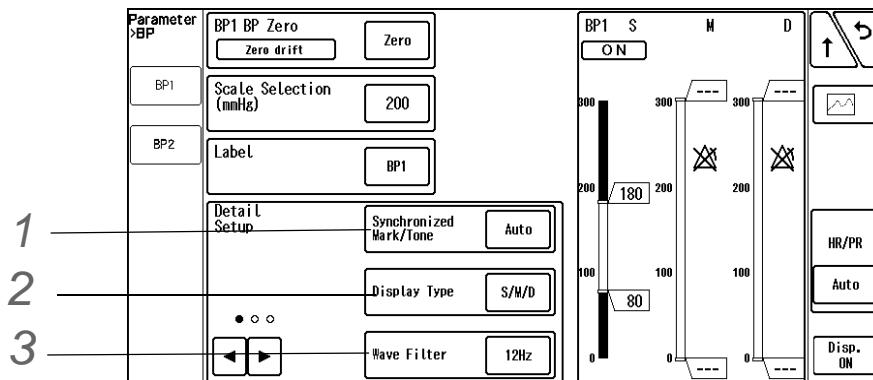
- Select ON/OFF of BP alarm and set the upper and lower alarm limit for systolic (S), diastolic (D), and mean (M) BP.
- The alarm limit should be set for each unit (mmHg/kPa).
- The adjustable increment will be according to the "BP Alarm Increment" setting. (Normal / Small).
(☞ Maintenance Manual "Display/Print Setup" P5-12)
- The adjustable increment for upper and lower limit changes from 50mmHg/7kPa.
- When the BP label is BP1/ART, the upper and lower limit will be automatically set to +40mmHg/+5kPa and -20mmHg/-3kPa respectively to the current value.
- When the BP label is other than BP1/ART, the upper and lower limit will be automatically set to +20%, -20% respectively to the current value.

| | "BP Alarm Increment" Setup | |
|---------------|----------------------------|-------------------------|
| | If [Normal] is selected; | If [Small] is selected; |
| 0 to 50mmHg | 2mmHg increment | 1mmHg increment |
| 50 to 300mmHg | 5mmHg increment | |
| 0 to 7.1kPa | 0.2kPa increment | 0.1kPa increment |
| 7 to 40.0kPa | 0.5kPa increment | |

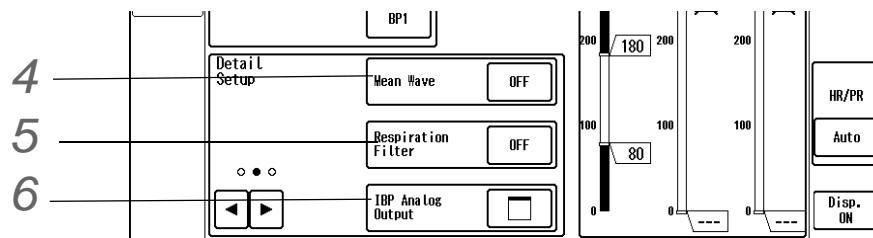
Detail Setup (BP Parameter)

Press the [Menu], [BP] keys to display the "BP" setup screen.

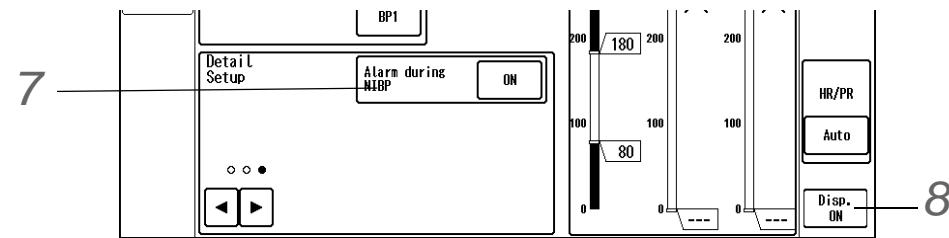
The "BP" setup screen can be also displayed by pressing the detail key  on the BP floating window.



Display Example when BP Label is BP1/ART: First Page



Second Page



Third Page

- 1 Set the "Synchronized Mark/Tone" (BP1/ART).

REFERENCE

- The parameter to display the HR synchronized mark can be selected from ECG/SpO₂/BP (BP1 or ART). If BP1 and ART is simultaneously measured, ART will be prioritized.

- 1 Press the key for "Synchronized Mark/Tone".

► The dropdown list will be displayed.

- 2 Select from [ECG]/[SpO₂]/[BP]/[Auto]/[OFF].

- ▶ [Auto]: The synchronized mark will be displayed in the priority of "ECG>SpO₂>BP".
- ▶ [ECG]: HR synchronized mark will be displayed.
- ▶ [SpO₂]: SpO₂ synchronized mark will be displayed.
- ▶ [BP]: BP synchronized mark will be displayed.
- ▶ [OFF]: Synchronized mark will not be displayed.

NOTE

- If the corresponding BP (BP1/ART) is not measured, PR (BP) will be displayed as "---".

2 Set the "Display Type".

⚠ CAUTION

- The undisplayed BP data will not generate a BP alarm or be displayed in the tabular trend. Select the appropriate display type according to the monitoring purpose.

NOTE

- The display type of BP numeric data can be selected from [S/M/D]/[S/D]/[M]. The undisplayed BP data will not generate a BP alarm.
- If the BP label is CVP, IAP, PAP, ICP, the display type is fixed.

1 Press the key for "Display Type".

- ▶ The dropdown list will be displayed.

2 Select from [S/M/D]/[S/D]/[M].

- ▶ [S/M/D]: The systolic/mean/diastolic BP value will be displayed.

BP1 (mmHg)
116/ 77 (92)

- ▶ [S/D]: The systolic/diastolic BP value will be displayed.

BP1 (mmHg)
116/ 77

- ▶ [M]: The mean BP value will be displayed.

BP1 (mmHg)
92

3 Set the "Wave Filter".

REFERENCE

- Select the appropriate low-pass filter from 6Hz, 8Hz, 12Hz, 40Hz. An artifact may interfere on the BP waveform depending on the combination of BP measurement circuit.

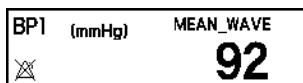
1 Press the key for "Wave Filter".

- ▶ The dropdown list will be displayed.

2 Select from [6Hz]/[8Hz]/[12Hz]/[40Hz].

4 Set the "Mean Wave".

- 1 Press the key for "Mean Wave".
 - ▶ The dropdown list will be displayed.
- 2 Select from [ON] or [OFF].
 - ▶ [ON]: The mean BP waveform will be displayed and "MEAN_WAVE" will be displayed inside the numeric data box.



5 Set the "Respiration Filter".

REFERENCE

- ♦ The BP waveform baseline drift caused by the respiration influence can be prevented by setting ON the respiration rejection filter.

- 1 Press the key for "Respiration Filter".
 - ▶ The dropdown list will be displayed.
- 2 Select from [ON] or [OFF].
 - ▶ [ON]: Respiration Filter will turn ON.
 - ▶ [OFF]: Respiration Filter will turn OFF.

6 Set the "IBP Analog Output".

- 1 Press the key for "IBP Analog Output".
 - ▶ The "IBP Analog Output" window will be displayed.
- 2 Select the signal to output.

7 Set the "Alarm during NIBP".

- 1 Press the key for "Alarm during NIBP".
 - ▶ The dropdown list will be displayed.
- 2 Select from [ON] or [OFF].
 - ▶ [ON]: BP alarm will generate even during NIBP measurement.
 - ▶ [OFF]: BP alarm will not generate during NIBP measurement and for 30 seconds after the measurement.

8 Select ON/OFF for parameter display.

(☞ "ECG Parameter Setup" P7-6)

CAUTION

- ♦ When the waveform and numeric data display is set to OFF, the alarm generation and tabular/graphic trend input will also cease.
- ♦ If the display of waveform/numeric data labeled as BP1/ART is set to OFF, the BP pulse rate will not be displayed.

Pulse Oximetry

This section explains the process and settings of SpO₂ monitoring condition when the SpO₂ Unit (HS-8312N / HS-8312M) manufactured by Nellcor_{TM} or Masimo is used.

( Maintenance Manual "Unit Module Setup" P4-12)

SpO₂ Monitoring

WARNING

- ♦ Pulse oximeter should not be used as a replacement or substitute for ECG based arrhythmia analysis.
- ♦ When measuring the SpO₂ of patient with high fever or peripheral circulatory insufficiency, check the sensor attachment periodically and change the attachment site. The temperature of the attachment site will rise 2 to 3°C due to the sensor heat which may result in compression necrosis and burn injury.
- ♦ For the following case, accurate measurement may not be possible.
 - ♦ Patient with excessive abnormal hemoglobin (COHb, MetHb)
 - ♦ Patient with excessive total bilirubin
 - ♦ Patient with the pigment injected to the blood
 - ♦ Patient receiving CPR treatment
 - ♦ When a sensor is applied to a limb with NIBP cuff, arterial catheter, or intracatheter
 - ♦ When measuring at site with venous pulse
 - ♦ Patient with body motion
 - ♦ Patient with small pulse
- ♦ For the following case, loss of pulse signal can occur.
 - ♦ Sensor is too tight.
 - ♦ Patient has hypotension, severe vasoconstriction, severe anemia, or hypothermia.
 - ♦ There is arterial occlusion proximal to the sensor.
 - ♦ Patient is in cardiac arrest or is in shock.
- ♦ Do not connect a sensor or cable not authorized by Fukuda Denshi to any I/O connector. If done so by mistake, the equipment cannot deliver its maximum performance and the connected equipments may be damaged, resulting in a safety hazard.

CAUTION

- ♦ Make sure to use only the specified sensor/relay cable. Otherwise inaccurate measurements may be caused.
- ♦ Discontinue use if patient sensor is damaged in anyway.
- ♦ If irritation such as skin reddening appears with the sensor use, change the attachment site or stop using the sensor.
- ♦ When attaching the sensor with tape, do not wrap the tape too tight. At the same time, check the blood flow constantly so that congestion is not generated at the peripheral.
- ♦ Even a short duration of attachment may inhibit the blood flow and generate compression

necrosis and burn injury.

- ♦ Check the sensor attachment site constantly in every 4 hours when probes or reusable sensor are used, and at least every 8 hours when single patient use sensors are used. Be especially careful of a patient with bad perfusion. If the sensor attachment position is not changed constantly, skin irritation or skin necrosis due to compression may be developed. For the patient with bad perfusion, check the sensor attachment position at least every 2 hours.
 - ♦ As skin for neonate/ low birth weight infant is immature, change the sensor attachment site more frequently depending on the condition.
 - ♦ Venous congestion may cause under reading of actual oxygen saturation. Therefore, assure proper venous outflow from monitored site. Sensor should not be below heart level (e.g. sensor on hand of a patient in a bed with arm dangling to the floor).
 - ♦ Direct sunlight to the sensor area can cause measurements error. Place a black or dark cloth over the sensor.
 - ♦ When not performing the measurement, unplug the relay cable and sensor from the SpO₂ connector. Otherwise, the measurement data may be erroneously displayed by the ambient light.
 - ♦ The pulse wave is normalized for SpO₂ measurement. It does not indicate perfused blood volume. Check proper probe attachment by observing the pulse wave.
 - ♦ Precautions for Reusable Type Sensor
The light-emitting part of the sensor should be over the root of the fingernail. Do not insert the finger too far into the sensor as it may hurt the patient.
For additional warnings, cautions, or contraindications when using sensors with Nellcor Unit (HS-8312N)/Masimo Unit (HS-8312M), refer to each SpO₂ sensor instruction manual.
 - ♦ Precautions for Single-Patient-Use Type Sensors
The sensor can be reused on the same patient as long as the adhesive tape attaches without slippage. But do not reuse on other patients to avoid cross contamination. It is intended for single patient use only.
For additional warnings, cautions, or contraindications when using sensors with Nellcor Unit (HS-8312N)/Masimo Unit (HS-8312M), refer to each SpO₂ sensor instruction manual.
 - ♦ If "——" is displayed for the SpO₂ numeric data, make sure that the sensor is properly attached.
-

1

Prepare an appropriate probe or sensor for the patient.

(☞ "Pulse Oximetry Measurement (Nellcor)" P13-3)

(☞ "Pulse Oximetry Measurement (Masimo)" P13-4)

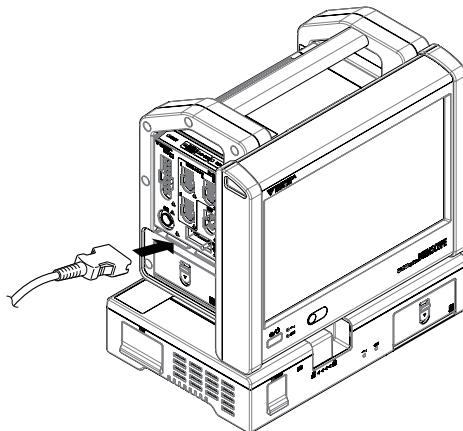
2

Connect the sensor to Super Unit.

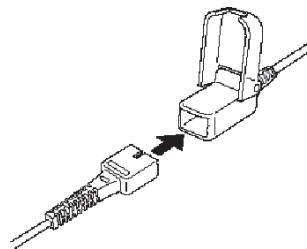
In Case of Nellcor Unit:

1 Connect the DOC-10 SpO₂ Relay Cable to the SpO₂ connector on the HS-8312N.

The illustration is example of connection with DS-8200.



- 2** Insert the sensor into the SpO₂ relay cable connector, and lock it with the transparent cover.



In Case of Masimo Unit:

- 1** Connect the SpO₂ patient cable (LNOP®, LNCS®, Rainbow®) to the SpO₂ connector on the HS-8312M.
- 2** Connect the patient cable and the sensor.
Face the metallic side of the sensor upward and align the logo with that of the patient cable.
Then, insert the sensor connector to the patient cable until a click sound is heard.



CAUTION

- The SpO₂ patient cables (LNOP®, LNCS®, Rainbow®) are for Masimo SET sensor only. Connect them only to the HS-8312M. Otherwise, the equipment will not properly function.

NOTE

- Pull the connector slowly to ensure it is securely connected.
- If necessary, fixate the cable to the patient.

- 3** Attach the sensor to the patient.



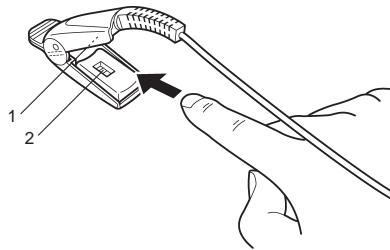
CAUTION

- If the nail is rough, dirty, or manicured, accurate measurement will not be possible.
Change the finger or clean the nail before attaching the probe or sensor.

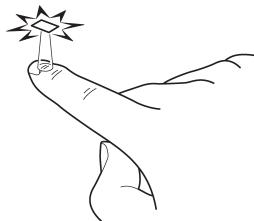
Probe Type Sensor

- 1** As shown below, the probe cable should be on the nail side.

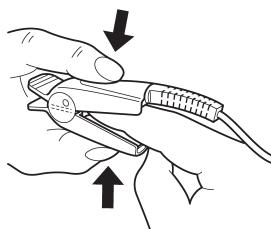
- 1 Light Emitting Part
- 2 Light Receiving part



- 2 Adjust the sensor so that the light-emitting part (on cable side) touches the root of the nail, and close the probe.



- 3 Press the probe lightly so that the finger and the rubber cover are appressed.



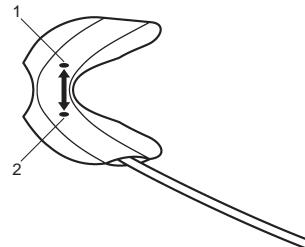
REFERENCE

- This is to stabilize the probe, and to avoid ambient light.

Single-use Type

- 1 Clean the attachment site with alcohol, etc.
- 2 Align the light emitting element and light receiving element of the sensor with the measuring site in between when attaching the sensor to patient.

- 1 Light Emitting Element
- 2 Light Receiving Element



3 Secure the cable with surgical tape so that the sensor does not come off when the cable is pulled.

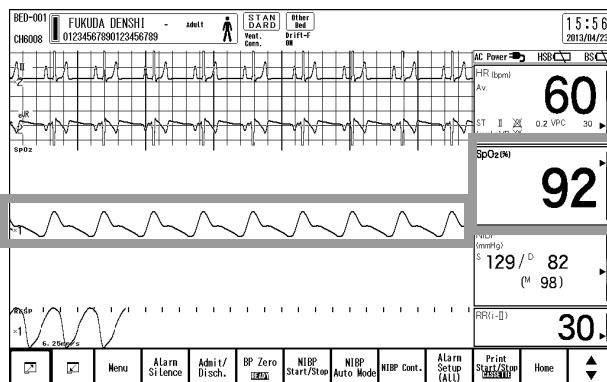


Attachment to the toe



Attachment to the finger

4 Verify that the SpO₂ measurement and SpO₂ waveform are displayed on the home display.



SpCO, SpMet, SpHb Measurement (Masimo)

This section explains the SpCO, SpMet, SpHb measurement procedure when using the HS-8312M.

CAUTION

- The SpCO, SpMet, SpHb can be measured only when using the Rainbow series sensor. However, SpCO, SpMet, SpHb measurements are not possible for some Rainbow series sensor.
- SpCO and SpHb cannot be measured at the same time for all the sensors. By using the sensor for SpCO, SpMet, SpHb, carboxyhemoglobin concentration (SpCO [%]), methemoglobin concentration (SpMet [%]), total hemoglobin concentration (SpHb [g/dL]) can be measured.
- For details, please refer to our service representative.

REFERENCE

- SpCO, SpMet, SpHb measurements are optional function.
- SpCO is a value that represents the percentage of carboxyhemoglobin saturation within the blood.
(☞ "SpO₂ Parameter Setup (Masimo)" P7-45)
- SpMet is a value that represents the percentage of methemoglobin saturation within the blood.
(☞ "SpO₂ Parameter Setup (Masimo)" P7-45)
- SpHb is a measure of the total hemoglobin (SpHb) concentration in arterial blood. It relies on the same principles of pulse oximetry to determine the SpHb measurement.
(☞ "SpO₂ Parameter Setup (Masimo)" P7-45)

1 Select the Rainbow sensor for the patient.

(☞ "Pulse Oximetry Measurement (Masimo)" P13-4)

2 The measurement procedure is the same with that of the SpO₂.

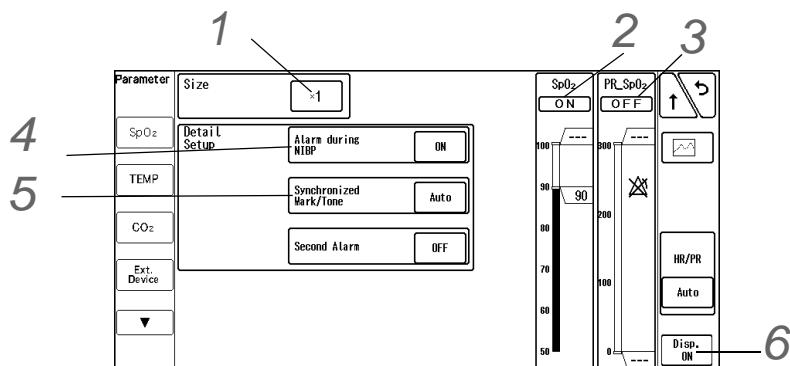
Verify that the SpCO, SpMet, SpHb value is displayed on the monitor.

(☞ "SpO₂ Monitoring" P7-37)

SpO₂ Parameter Setup (Nellcor)

This section explains the measurement procedure when using the HS-8312N.

Press the [Menu], [SpO₂] keys to display the "SpO₂" setup screen.

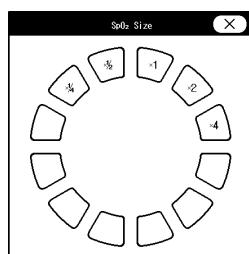


When Using the HS-8312N

1 Set the waveform size.

1 Press the key for "Size".

► The "Size" screen will be displayed.



2 Select from[1/4]/[x1/2]/[x1]/[x2]/[x4].

2 Set the SpO₂ alarm.

(☞ "Alarm Limit Setup for Each Parameter" P6-10)

NOTE

- ♦ Whether to use the SEC alarm function and its threshold selection should be based on the patient's clinical indication portent and medical evaluation.
- ♦ Set the upper limit in the range of 51 to 100%. If a value above 100% is set, the upper alarm will turn OFF.
- ♦ Set the lower limit in the range of 50 to 99%. If a value below 50% is set, the lower alarm will turn OFF.

REFERENCE

- Also, when the SpO₂ value is unstable around the lower alarm limit, the frequently generated alarm can be corrected by setting the second alarm function.
(☞ "SpO₂ Second Alarm Setup" P6-2)
- When the limit is automatically set, the upper limit will be OFF, and the lower limit will be 90%.
- The upper/ lower limit can be set in 1% increment.
- indicates the current measurement value.
- The following delay occurs for the SpO₂ alarm depending on the patient classification and second alarm setting. (For Nellcor)

| | Second Alarm Setup | Patient Classification | |
|-------------------------------------|--------------------|------------------------|---------------------|
| | | Adult/Child | Neonate |
| SpO ₂ Alarm Status Delay | For all settings | About 7 to 9 sec. | About 7 to 9 sec. |
| SpO ₂ Alarm Signal Delay | OFF | About 5 sec. | 0 sec. |
| | 10 | About 5 to 7 sec. | About 5 to 7 sec. |
| | 25 | About 11 to 13 sec. | About 11 to 13 sec. |
| | 50 | About 19 to 22 sec. | About 19 to 22 sec. |
| | 100 | About 36 to 38 sec. | About 36 to 38 sec. |

3 Set the PR alarm.

(☞ "Alarm Limit Setup for Each Parameter" P6-10)

NOTE

- Set the upper limit in the range of 22 to 300bpm. If the range is exceeded above 300bpm, the upper alarm will turn OFF.
- Set the lower limit in the range of 20 to 295bpm. If a value below 20bpm is set, the lower alarm will turn OFF.

REFERENCE

- When [Auto] is set, the upper and lower limit will be automatically set to +40bpm and -40bpm to the current value respectively.
- The upper and lower limit can be set in 5 bpm increments. It can be set in 1 bpm increment if 25 bpm or below.
- The following delay occurs for the PR alarm depending on the patient classification. (For Nellcor)
 - PR Alarm Status Delay: <Adult/Child/Neonate> About 5 to 6 sec.
 - PR Alarm Signal Delay: <Adult/Child> About 5 sec., <Neonate> 0 sec.

4 Set the "Alarm during NIBP".**NOTE**

- During the NIBP measurement, the cuff inflation restricts the blood flow which disables the correct detection of the SpO₂ and PR, and may generate an improper alarm.
- Selecting [OFF] for "Alarm during NIBP" will not generate the SpO₂, PR, SpCO (Masimo only), SpMet (Masimo only), SpHb (Masimo only) alarm until the NIBP measurement is

complete.

REFERENCE

- This setup can be used when the SpO₂ sensor and the NIBP cuff is placed on the same limb for measurement.

1 Press the key for "Alarm during NIBP".

▶ The dropdown list will be displayed.

2 Select from [ON] or [OFF].

▶ [ON]: Alarm will be generated even during NIBP measurement.

▶ [OFF]: SpO₂, PR alarm will not be generated during NIBP measurement.

5 Set the "Synchronized Mark/Tone".

(☞ "BP Parameter Setup" P7-29)

6 Select ON/OFF for parameter display.

(☞ "ECG Parameter Setup" P7-6)

⚠ CAUTION

- When the waveform and numeric data display is set to OFF, the alarm generation and tabular/graphic trend input will also cease.
- When the waveform and numeric data display is set to OFF, the pulse rate measured by SpO₂ will not be displayed either.

REFERENCE

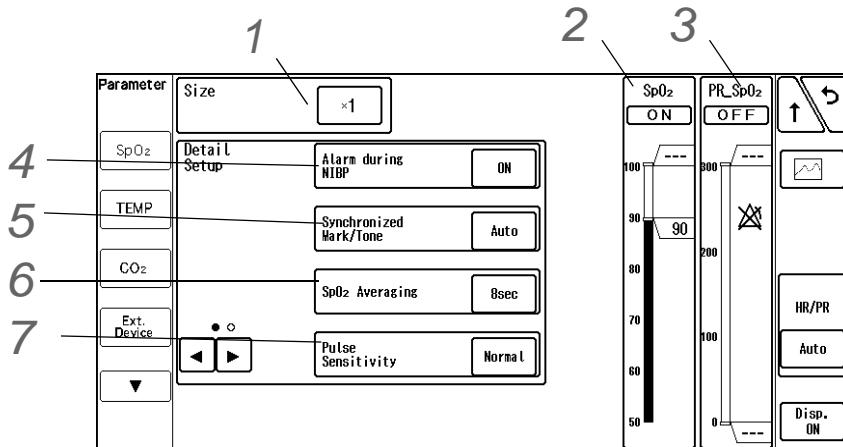
- When SpO₂ sensor is attached to the patient with the SpO₂ display set to OFF, and SpO₂ is measured for 10 seconds, the pulse wave and numeric data will be automatically displayed.

SpO₂ Parameter Setup (Masimo)

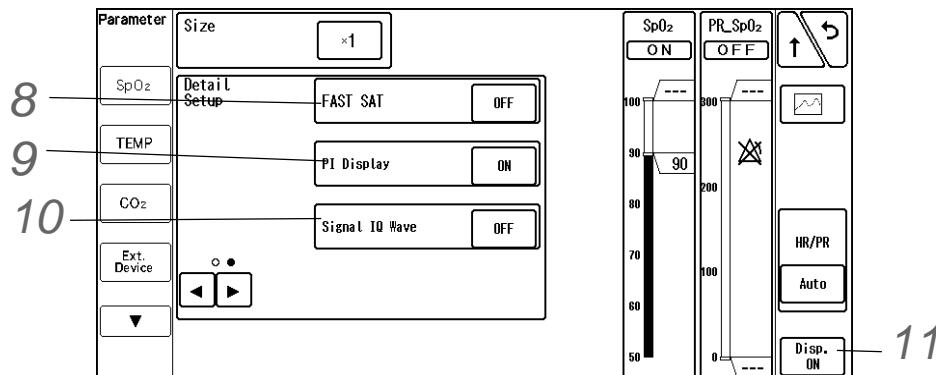
This section explains the procedure to set the monitoring condition when using the HS-8312M. Press the [Menu], [SpO₂] keys to display the "SpO₂" setup screen.

REFERENCE

- This setting is available when using the HS-8312M. PVI, SpCO, SpMet, SpHb measurements are optional functions.



When Using the HS-8312M SpO₂ Setup: 2nd Page



SpO₂ Setup: 2nd Page

1 Select the waveform size.

(☞ "SpO₂ Parameter Setup (Nellcor)" P7-42)

2 Set the SpO₂ alarm.

(☞ "SpO₂ Parameter Setup (Nellcor)" P7-42)

REFERENCE

- The following delay occurs for the SpO₂ alarm depending on the patient classification and SpO₂ averaging duration setting. (For Masimo)

| | SpO ₂ Averaging | Patient Classification | |
|-------------------------------------|----------------------------|------------------------|-------------------|
| | | Adult/Child | Neonate |
| SpO ₂ Alarm Status Delay | For all settings | About 7 to 9 sec. | About 7 to 9 sec. |
| SpO ₂ Alarm Signal Delay | For all settings | About 5 sec. | 0 sec. |

3 Set the PR alarm.

(☞ "SpO₂ Parameter Setup (Nellcor)" P7-42)

REFERENCE

- ♦ The following delay occurs for the PR alarm depending on the patient classification. (For Masimo)
 - ♦ PR Alarm Status Delay: <Adult/Child> About 8 to 10 sec. <Neonate> About 7 to 9 sec.
 - ♦ PR Alarm Signal Delay: <Adult/Child> About 5 sec., <Neonate> 0 sec.

4 Set the "Alarm during NIBP".

(☞ "SpO₂ Parameter Setup (Nellcor)" P7-42)

NOTE

- ♦ Selecting [OFF] for "Alarm during NIBP" will not generate the SpO₂, PR, SpCO, SpMet, SpHb alarm until the NIBP measurement is complete.

5 Set the "Synchronized Mark/Tone".

(☞ "BP Parameter Setup" P7-29)

6 Set the "SpO₂ Averaging".

⚠ WARNING

- ♦ Be careful when setting the "SpO₂ Averaging" duration as the SpO₂ alarm is based on the displayed SpO₂ value which is averaged from the duration set in "SpO₂ Averaging". The alarm occurrence time will be affected or may not occur for the transient value of SpO₂ depending on the set duration.

1 Press the key for "SpO₂ Averaging".

- ▶ The dropdown list will be displayed.

2 Select from [2-4sec.]/[4-6sec.]/[8sec.]/[10sec.]/[12sec.]/[14sec.]/[16sec.]

NOTE

- ♦ To pick up the abrupt change of the value sooner, and to take advantage of the qualities of FAST SAT mode, SpO₂ averaging time will be fixed at [2-4 sec.] when FAST SAT is set ON.

7 Set the pulse detection sensitivity.

1 Press the "Pulse Sensitivity" key.

- ▶ The pulse sensitivity dropdown list will be displayed.

2 Select from [High]/[Normal].

⚠ CAUTION

- ♦ If [High] is selected for pulse sensitivity, sensor-detached detection will become

somewhat inaccurate.

NOTE

- To improve the low perfusion condition, or to perform fast tracking when the SpO₂ value changes abruptly, select [High].
- For standard use, select [Normal].

8 Set the "FAST SAT".

NOTE

- To pick up the abrupt change of the value sooner, and to take advantage of the qualities of FAST SAT mode, SpO₂ averaging time will be fixed at [2-4 sec.] when FAST SAT is set ON.

1 Press the key for "FAST SAT".

► The dropdown list will be displayed.

2 Select from [ON] or [OFF].

► [ON]: Abrupt change of the SpO₂ value can be monitored.

► [OFF]: FAST SAT will be cancelled.

9 Set the "PI (Perfusion Index) Display".

NOTE

- The perfusion index is calculated by pulsatile signal divided by apulsatile signal times 100, and indicates patient's circulation condition.
- This can be used to find a good perfusion site to attach the sensor. Also, it can be used as diagnosis index to predict the patient's critical condition when at low perfusion.

1 Press the key for "PI Display".

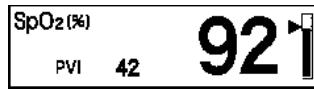
► The dropdown list will be displayed.

2 Select from [ON] or [OFF].

► [ON]: PI will be displayed.



► [OFF]: PI will not be displayed.



REFERENCE

- Perfusion Index (PI) is a relative assessment of the pulse strength at the monitoring site. It is a ratio of the pulsatile and the non-pulsatile blood flow at the monitoring site. It can be used to find the most appropriate sensor application site by finding the site with the highest PI. Perfusion Index (PI) is displayed in the range from 0.02% to 20%, and the recommended value is 1% or above.
- Pleth Variability Index (PVI) is an index of the change in PI that occurs during the

respiratory cycle. It is calculated by measuring the changes in PI over a time interval where one or more complete respiratory cycles have occurred. Pleth Variability Index (PVI) is displayed in the range from 0% to 100%.

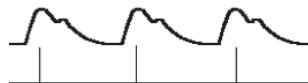
10 Set the signal IQ wave display.

NOTE

- The signal IQ wave cannot be printed.

REFERENCE

- The signal IQ wave indicates the signal force and pulse wave timing. The vertical length indicates the signal quality. A low vertical line indicates a bad signal quality.



1 Press the key for "Signal IQ Wave".

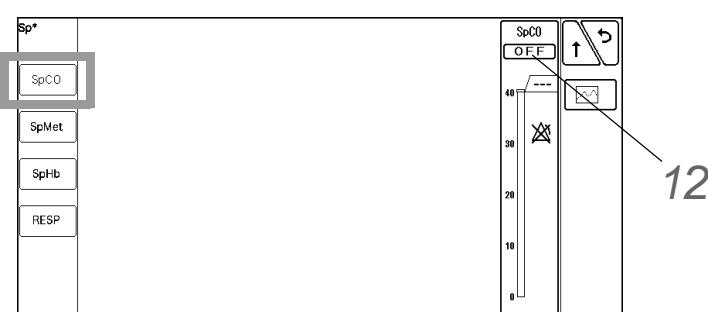
- The dropdown list will be displayed.

2 Select from [ON] or [OFF].

11 Select ON/OFF for parameter display. (☞ "SpO2 Parameter Setup (Nellcor)" P7-42)

12 Set the SpCO alarm.

[Press the [▶], [Sp*], [SpCO] keys to display the SpCO alarm setup screen.]



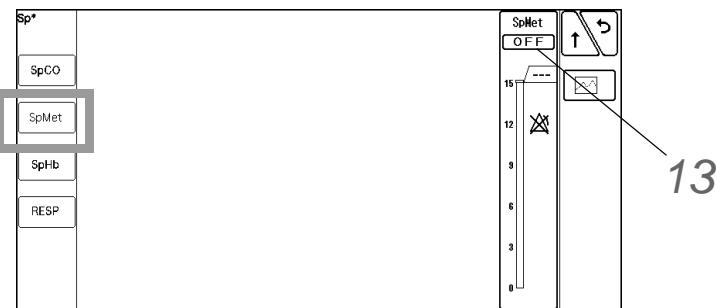
CAUTION

- Set the upper limit in the range of 1 to 40%. If a value above 40% is set, the upper alarm will turn OFF.
- The lower limit cannot be set.
- The automatic alarm cannot be set.

13 Set the SpMet alarm.

Press the [SpMet] key to display the SpMet alarm setup screen. Set the alarm in the same procedure as SpCO.

[Press the [▶], [Sp*], [SpMet] keys to display the SpMet alarm setup screen.]



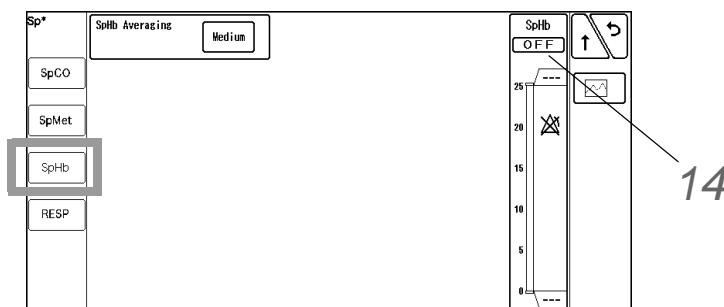
⚠ CAUTION

- Set the upper limit in the range of 1 to 15%. If a value above 15% is set, the upper alarm will turn OFF.
- The lower limit cannot be set.
- The automatic alarm cannot be set.

14 Set the SpHb alarm.

Press the [SpHb] key to display the SpHb alarm setup screen. Set the alarm in the same procedure as SpCO.

[Press the [▶], [Sp*], [SpHb] keys to display the SpHb alarm setup screen.]



⚠ CAUTION

- Set the upper limit in the range of 2.0 to 24.5g/dL. If a value above 24.5g/dL is set, the upper alarm will turn OFF.
- Set the lower limit in the range of 1.0 to 24.0g/dL. If a value below 1.0g/dL is set, the lower alarm will turn OFF.
- The automatic alarm cannot be set.

Non-Invasive Blood Pressure

The procedure of NIBP measurement and measurement condition setup are explained.

CAUTION

- ♦ For the following situation, measurements will be terminated.
 - ♦ When the measurement time has exceeded 160 seconds for adult and child, 80 seconds for neonate.
 - ♦ When the inflation value has exceeded 300mmHg for adult, 210mmHg for child, and 150mmHg for neonate.
- ♦ If used with incorrect patient classification, it will not only cause erroneous measurement, but the inflating level for the adult may be applied to child or neonate which will compromise the safety of the patient.

Lineup of Cuffs

REFERENCE

- ♦ According to the AHA (American Heart Association) guideline, the appropriate cuff width is 40% of the arm circumference.
Select the appropriate cuff from the following selections.
For other usable cuffs, refer to the section on "Optional Accessories".
( "Non-Invasive Blood Pressure Measurement" P13-2)

NIBP Monitoring

WARNING

- ♦ Before the measurement, make sure the patient classification (Adult / Child / Neonate) is properly selected. Otherwise, correct measurement cannot be performed, and congestion or other injury may result.

CAUTION

- ♦ Correct NIBP measurement cannot be performed if artificial heart lung machine is used or if the pulse is difficult to detect.
- ♦ Pay attention when measuring the NIBP of patient with bleeding disorders or hyper coagulation. The cuff inflation may cause petechia or circulatory failure by the blood clot.
- ♦ The following factors may affect the NIBP value.
 - ♦ Body motion, arrhythmia, convulsion
 - ♦ Continuous noise such as cardiac massage
 - ♦ Periodic electromagnetic noise
- ♦ Do not apply the cuff to the arm or thigh where vein is secured. The blood may backflow causing the chemical injection to cease.

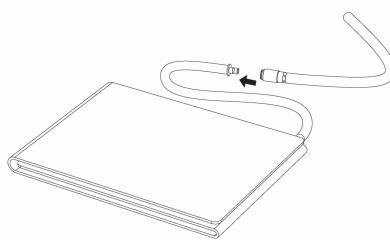
- ♦ Properly arrange the cuff and air hose.
- ♦ Check the condition of cuff-applied part on the patient during measurement so that the blood circulation will not be blocked over long period of time by the squashed or bent cuff hose.
- ♦ Check the patient's condition constantly while measuring over a long period of time with interval of 2.5 minutes or less. Also, periodically check the blood circulation while performing periodic measurement over a long period of time. Congestion or rash may occur at the measuring site.
- ♦ Make sure to check the patient's condition constantly when repeatedly using the NIBP continuous measurement mode as it may cause dysfunction of patient's circulation.
- ♦ When the cuff is not applied to the patient, pay attention not to leave the cuff unattended. If periodic or continuous measurement is set, the cuff will automatically inflate and may cause the rubber bag inside the cuff to burst. When not performing the NIBP measurement, set the NIBP measurement interval OFF and disconnect the air hose from the NIBP connector.
- ♦ Do not apply the NIBP cuff to site of injury. An injury may be worsened by the measurement.
- ♦ Do not apply the NIBP cuff to the arm on side treated axillary lymph nodes dissection. It may lead to lymphatic edema by the cuff pressure.
- ♦ Measuring on a limb with SpO₂ sensor, arterial catheter, or intracatheter may result in incorrect measurement.
- ♦ An operator must not get away from a patient during the NIBP measurement. However, when getting away from the patient is necessary, do not activate the Alarm Suspend and Silence functions in order not to miss any sudden changes in the patient's condition.
(☞ "To Set the System Alarm (ON or Suspend)" P6-7)
(☞ "To Silence or Suspend the System Alarm Sound" P6-8)

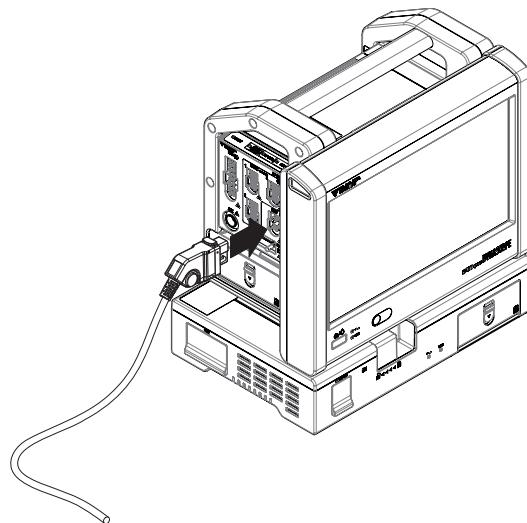
1 Select the appropriate cuff type for the patient.
(☞ "Lineup of Cuffs" P7-50)

CAUTION

- ♦ Select the appropriate cuff size which best fits the arm circumference.
If the cuff size is inappropriate, it may cause measurement error.
- ♦ Do not use a cuff which is worn out.
The cuff may burst during inflation.

2 Connect the cuff to the air hose.

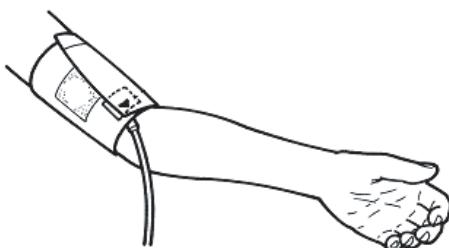


3 Connect the air hose to the NIBP connector on the Super Unit.**CAUTION**

- Make sure that the cuff hose connection is secure.
If there is any air leakage, correct NIBP measurement cannot be performed.

NOTE

- The neonate cuff should be connected to air hose for neonate. Other cuffs should be connected to air hose for general use.
The Super Unit automatically determines the patient classification (neonate or adult/child) according to the connected air hose. If the air hose is not connected to the cuff connection connector, the measurement will not start.

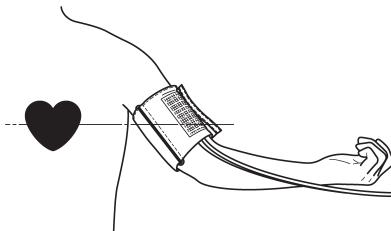
4 Apply cuff to the patient.**NOTE**

- Position the ARTERY ▼ mark over the artery on the patient's arm and wrap the cuff around.
- One or two fingers should just fit in between the cuff and arm.

REFERENCE

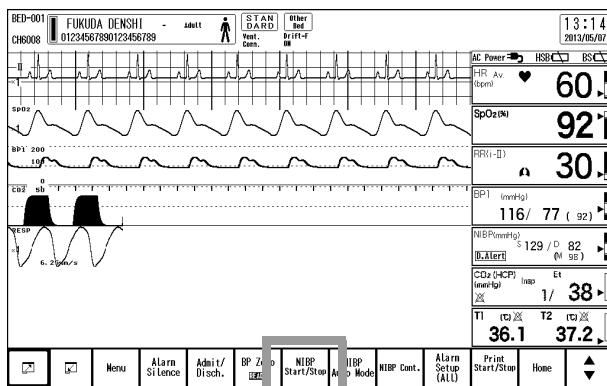
- Align the cuff height and heart position to eliminate an error caused by the blood weight.
It is most appropriate to measure with the patient lying down and arms naturally

extended.



- Note the following points about the patient position.
 - Comfortably seated
 - Legs uncrossed
 - Feet flat on the floor
 - Back and arm supported
- To perform accurate measurements, from 5 minutes before the start of NIBP measurement, keep patient at rest and maintain a steady pulse rate and blood pressure.
- During the NIBP measurement, maintain the patient position as comfortable as possible, without such conversation.

5 Press [NIBP Start/Stop] of the user key.



- ▶ Cuff inflation and measurement will start.
- ▶ Upon completion, the measured value will be displayed inside the NIBP numeric data box. The measurement can be also started by pressing the [NIBP Start/Stop] key on the Super Unit. The blue LED will light during the measurement. After the measurement, the LED will turn OFF, a beep tone will generate for 1 second and the measurement result will be displayed on the monitor.

REFERENCE

- About the Oscillometric Method
- The oscillometric method measures the blood pressure by detecting the pulse oscillation change by the cuff pressure. The cuff connects to the NIBP connector via the air hose. The air pressure inside the cuff is converted to voltage by the pressure sensor, converted to digital signal (A/D conversion), and transmitted to the CPU. The measurement is performed with the following process.
 - The cuff inflates to the set value and inhibits the arterial blood flow at the measured site.
 - The cuff gradually deflates.

- ♦ The arterial blood flow of the patient will return when the cuff pressure is decreased sufficiently.
- ♦ The oscillation (pulse signal) caused by the restricted blood circulation is transmitted to the pressure sensor via the air hose, and converted to an electric signal.
- ♦ From the pulse signal and cuff pressure detected at the pressure measurement circuit, the systolic, diastolic, average blood pressure and pulse rate will be measured at the CPU.
- ♦ The systolic, diastolic, mean blood pressure will be displayed on the monitor. The measurement will start with the following factor.
 - ♦ When the [NIBP Start/Stop] key (User Key) is pressed.
 - ♦ At the selected measurement interval.
 - ♦ For fixed amount of time after the NIBP Cont. key (user key) is pressed. (Max. 15 min.)
 - ♦ If "NIBP Measurement at Alarm Occurrence" is set ON, and the set parameter generates an alarm.
 - ♦ When the change in patient's circulation condition is detected from the time difference of ECG and SpO₂ waveform.

Inflation Mode Setup

The maximum inflation value and measurement duration needs to be changed according to the patient classification. Set the appropriate inflation mode (Adult/Child/Neonate) according to the used cuff size on "Admit/Discharge" screen or NIBP parameter setup screen.

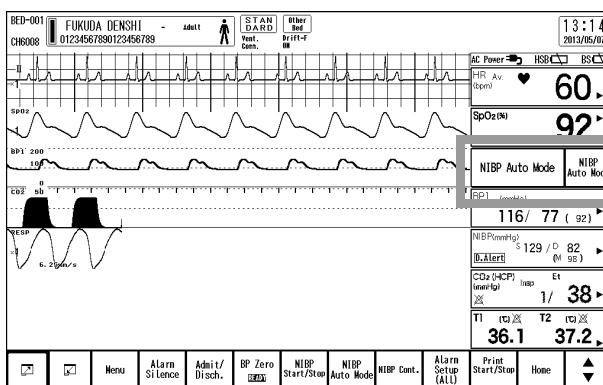
The NIBP measurement on this equipment is provided with forced exhaust system for safety purpose. When the maximum inflation value is reached or when the fixed measurement duration is exceeded, the system will automatically start to exhaust. The maximum inflation value, maximum measurement duration, initial inflation value for this exhaust system is fixed according to the patient classification (Adult/Child/Neonate) (☞ "NIBP (Non-Invasive Blood Pressure) (AAMI SP10: 2002+A1: 2003+A2:2006+(R) 2008 Manual, electronic or automated sphygmomanometers)" P14-13).

| Inflation Mode | Initial Inflation Value | Maximum Inflation Value | Maximum Measurement Duration |
|----------------|-------------------------|-------------------------|------------------------------|
| Adult | 180mmHg | 300mmHg | 160 sec. |
| Child | 140mmHg | 210mmHg | 160 sec. |
| Neonate | 110mmHg | 150mmHg | 80 sec. |

NIBP Auto Mode Setup

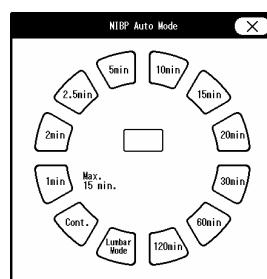
Non-invasive blood pressure can be measured automatically at selected time intervals.

If continuous measurement is started during the NIBP auto mode, the auto mode will automatically resume when the continuous measurement completes.



1 Press the [NIBP Auto Mode] key on the home display.

► The "NIBP Auto Mode" window will be displayed.



2 Select the measurement interval from the displayed selection.

⚠ CAUTION

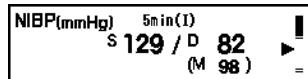
- When [1min] is selected, the 1-minute interval measurement will start from the time the selection is made.
- The 1-minute interval measurement will automatically stop after 12 minutes (maximum of 15 minutes when re-measured), and 2.5-minutes interval measurement will start.
- The continuous mode will continuously measure for 12 minutes (maximum of 15 minutes when re-measured). When the measurement completes, 2.5 minute interval measurement will start. The measurement will start at the time the continuous mode is selected.
- When using the continuous mode or Lumbar mode for measurement, make sure that the setting is according to the intended purpose.
(☞ "About the Lumbar Mode" P7-56)
- The Lumbar mode should be used with sufficient safety measures.

NOTE

- If [1] minute is selected, 1-minute interval measurement cannot be stopped by pressing the [NIBP Start/Stop] key (User Key). To stop the 1-minute interval measurement, select [OFF] or other interval on "NIBP Auto Mode" window.

- When the NIBP auto mode interval is [Cont.]/[1min]/[2min]/[2.5min]/[5min]/[Lumbar Mode], NIBP measurement cannot be started from the central monitor.

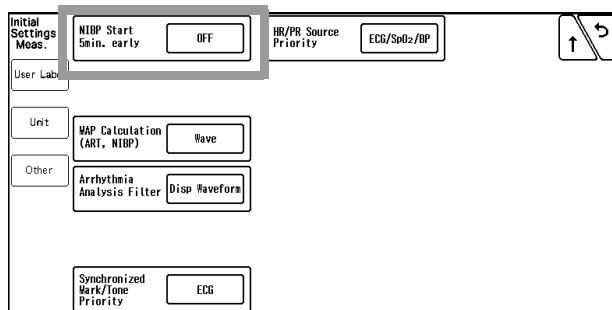
- The measurement will automatically start at selected interval.
- The selected interval will be displayed inside the numeric data box.



REFERENCE

- Select [OFF] if not performing the auto mode measurement.
- The measurement time will be integral multiple of the selected interval starting from 0 minute.
Ex.) If the current time is 13:14, the measurement time will be as follows for each interval.
2 min.: 13:16, 13:18, 13:20, ...
2.5 min.: 13:15, 13:17:30, 13:20, ...
5 min.: 13:15, 13:20, 13:25, ...
120min.: 14:00, 16:00, 18:00, ... (The measurement will start at every even hours.)
- When [60min] or [120min] is selected for the interval, the measurement will start 5 minutes before the measurement time. If outputting the data to PC or other external device using the PC communication function of this system, an error may be generated to the NIBP measurement time depending on the input interval of the external device. This system outputs the data at completion of NIBP measurement, and if the external device inputs the data at 60 minutes interval, 60 minutes time lag will occur. By starting the measurement 5 minutes early, this time lag between the external device can be minimized.

[Menu > Initial Settings > Meas. > Other]

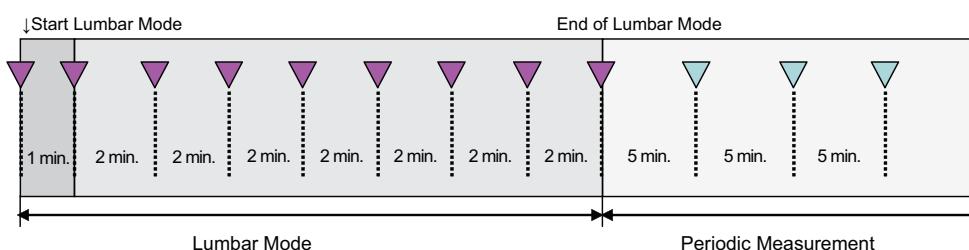


- On the "Initial Settings", whether or not to backup the NIBP measurement interval at discharge/power ON can be selected. (OFF/Backup/OFF→2.5min./OFF→5min.)

About the Lumbar Mode

The Lumbar mode is intended for use during spinal anesthesia.

The Lumbar mode performs the measurement as follows.



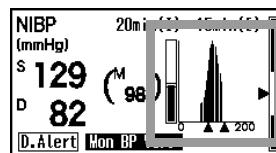
If [Lumbar] is selected when the measurement is not performed, the first measurement will start. If [Lumbar] is selected during the measurement, the current measurement will be counted as the first measurement. The second measurement will start after 1 minute, and after 7 times of 2-minute interval measurement, the Lumbar mode will end. The Lumbar mode can be manually stopped by selecting other interval or selecting [Lumbar] again. When the Lumbar mode ends, 5-minute interval measurement will automatically start.

CAUTION

- Pressing the [NIBP Start/Stop] key during measurement will only stop the measurement and not the Lumbar mode. To stop the Lumbar mode, select other interval or select [Lumbar] again.
- The manual measurement can be performed in between the Lumbar mode measurement. The Lumbar mode measurement will not start if the manual measurement is still in progress when the next Lumbar mode measurement time arrives.

Oscillation Graph Display

When the NIBP numeric data box size is 2-box size or larger, and "Oscillograph" is set to ON on the "NIBP" setup screen, the oscillation graph will be displayed inside the NIBP numeric data box.
(☞ "NIBP Parameter Setup" P7-59)

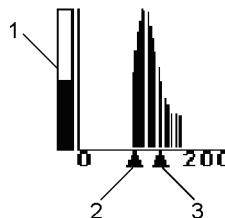


The description of the oscillation graph is as follows.

The horizontal axis shows the cuff pressure, and vertical axis shows the pulse amplitude with reference to maximum pulse amplitude.

The bar graph shown at left indicates the size of maximum pulse amplitude compared with the reference value. For example, if the maximum pulse amplitude is 1/2 of the reference value, the bar graph will be half filled in.

- 1 Bar Graph
- 2 DIA Value
- 3 SYS Value



Dyna Alert Function Status

The Dyna Alert function is a technology to prevent accidents which may occur by sudden BP change during the non-measured duration by estimating the variation of circulatory dynamics.

This function is available for the HS-8312N with built-in Nellcor™ module.

When [ON] is selected for "Dyna Alert", NIBP measurement will automatically start when the Dyna Alert estimated value exceeds the alarm limit. The function will activate with the following condition.

(☞ "Dyna Alert" P7-61)

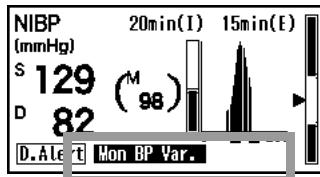
- Patient Classification: Adult (20kg or above)
- Cuff Applied Site: Upper Arm

- ♦ SpO₂ Sensor Attachment Site: Fingertip
- ♦ NIBP Measurement Interval: 5 to 60 minutes

CAUTION

- ♦ When the SpO₂ sensor is applied to the toe or forehead, the circulatory dynamics variation monitoring by the Dyna Alert may not properly function.
- ♦ The circulatory dynamics variation monitoring by the Dyna Alert is effective only on the HS-8312N with built-in Nellcor™ module.

In the NIBP numeric data box, the following mark and message indicating the status of the Dyna Alert function will be displayed.



| D.Alert Color of Mark | Message | Status | Dyna Alert Function Status*1 |
|--------------------------|-------------------|---|------------------------------|
| Gray | DA Setup: OFF | Dyna Alert (DA) is set to OFF. | Disable |
| | Patient: Child | NIBP measurement is performed on child. | Disable |
| | Patient: Neonate | NIBP measurement is performed on neonate. | Disable |
| | Pacemaker: ON | Pacemaker setting is set to ON. | Disable |
| | Interv.: <5min. | NIBP interval is set to Cont., 1min, 2min, or 2.5min. | Suspended |
| | Interv.: >60min. | NIBP interval is set to 120min. | Suspended |
| | Interv.: OFF | NIBP interval is set to OFF. | Suspended |
| | Measuring BP*2 | Invasive blood pressure is measured. | Suspended |
| Yellow | Measure NIBP | Initialization of Dyna Alert is complete, and the NIBP measurement has not been performed since the power is turned ON. | Suspended |
| | Poor ECG Signal | ECG signal failure due to lead-off, noise, etc. | Disable |
| | Poor PTG Signal | PTG (Photoplethysmograph) signal failure due to sensor off, noise, severe low perfusion, etc. | Disable |
| | DA-NIBP Suspended | Within 2.5 minutes from previous Dyna Alert NIBP measurement. | Suspended |
| | Measuring NIBP | NIBP measurement other than Dyna Alert is in progress. | Disable |
| | Initializing | Waiting for stable signal after starting Dyna Alert. | Disable |
| Green | PTG Low Perfusion | PTG amplitude is 200unit or above, and below 800unit. | Enable |
| | Mon. Variation | Dyna Alert is properly monitoring circulatory dynamics variation. | Enable |
| Pink | Measuring DA-NIBP | Dyna Alert NIBP measurement is in progress. | Disable |

*1: Disable: Circulatory dynamics variation is not monitored.

Suspended: Circulatory dynamics variation is monitored. But the display control software suspends the measurement even when the NIBP measurement is requested. When the suspending factor is resolved, the measurement will resume as quickly as possible.

Enable: Circulatory dynamics variation is monitored. The display control software responds to NIBP measurement request as quickly as possible.

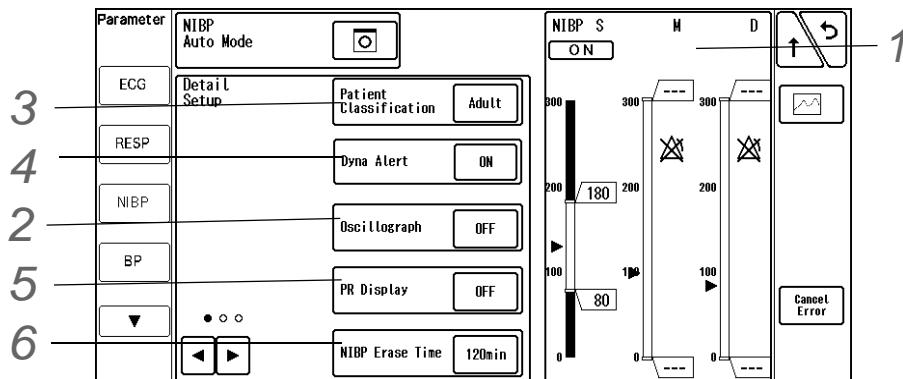
*2: "Measuring BP" indicates the status when IBP (BP1 or ART) measurement is possible and can be displayed on the monitor.

CAUTION

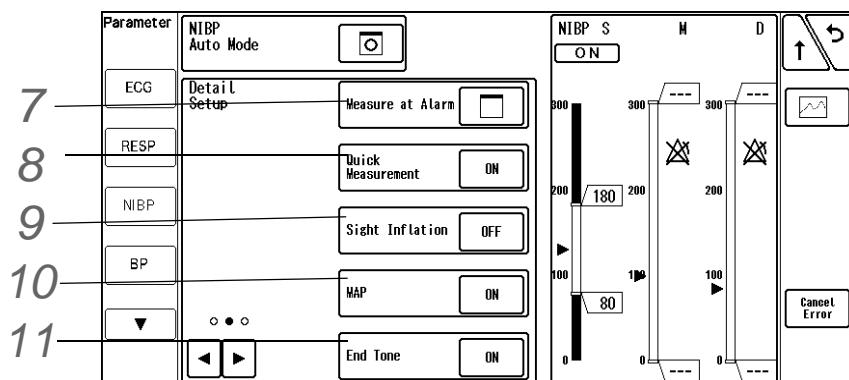
- When using the Dyna Alert function, be aware of these risks and do not increase the NIBP interval time by relying only on the Dyna Alert function.
- After the Dyna Alert NIBP measurement, the next Dyna Alert NIBP measurement cannot be performed for 2.5 minutes.
- The Dyna Alert will not properly function for the following cases.
 - If peripheral circulatory insufficiency or very low BP is developed.
 - If highly-frequent arrhythmia is generated.
 - If an artificial heart lung machine is used.
 - If a large noise from body movement or electric surgery equipment is interfering.
 - If autonomic nerve or circulatory dynamics is largely affected by medication.

NIBP Parameter Setup

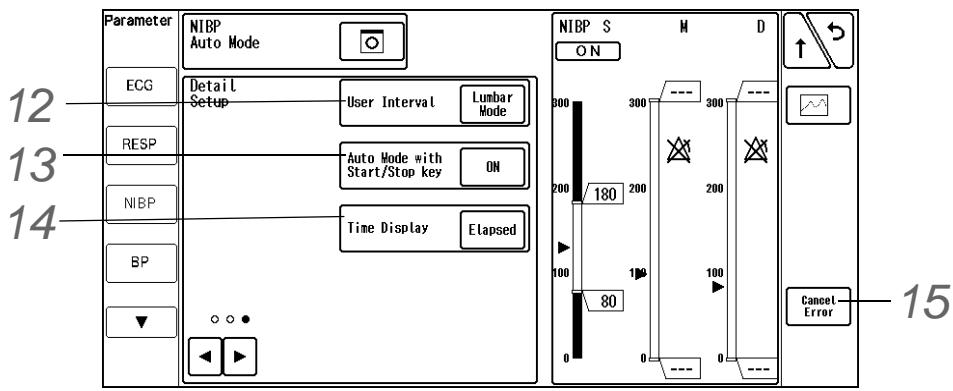
Press the [Menu], [NIBP] keys to display the "NIBP" setup screen.



NIBP Setup: 1st Page



NIBP Setup: 2nd Page



NIBP Setup: 3rd Page

1 NIBP Alarm

(☞ "Alarm Limit Setup for Each Parameter" P6-10)

NOTE

- Set the upper limit in the range of 15 to 300mmHg/2.0 to 40.0kPa. If a value above 300mmHg/40.0kPa is set, the upper alarm will turn OFF.
- Set the lower limit in the range of 10 to 295mmHg/1.5 to 39.5kPa. If a value below 10mmHg/1.5kPa is set, the lower alarm will turn OFF.

REFERENCE

- Set ON/OFF of NIBP alarm, upper and lower alarm limits of systolic (S), diastolic (D), mean (M) NIBP.
- When [Auto] is selected, upper alarm limit will be set to +40mmHg/+5kPa to the current value, and the lower alarm limit will be set to -20mmHg/-3kPa to the current value.
- The alarm limit should be set for each unit (mmHg/kPa).
- The upper and lower limit can be set in 5mmHg/0.5kPa increment.

2 Oscilograph Display/Print

[ON]: Oscillation graph will be displayed inside the numeric data box.
[Oscill. Print] key will be also displayed.

[Oscill. Print]: Oscillation graph will be output on the HR-800 Recorder Unit.

NOTE

- The oscillation graph can be displayed when the NIBP numeric data box size is 2-box size or larger, and "Oscillograph" is set to ON on the "NIBP" setup screen.

3 Patient Classification

The patient classification setting is linked with that on the "Admit/Discharge" screen. The inflation value and measurement duration will differ according to the patient classification setting.

(☞ "Inflation Mode Setup" P7-54)

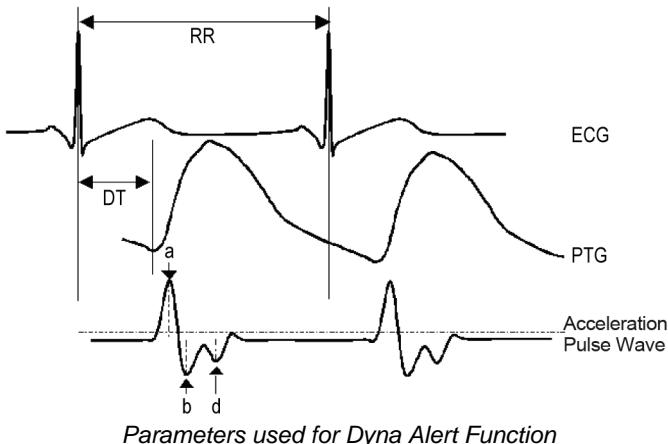
⚠ WARNING

- The patient classification selection influences the precision of the QRS detection and NIBP measurement. Make sure the correct selection is made.
- To perform correct NIBP measurement, appropriate NIBP air hose corresponded to

the set patient classification must be used. (However, if the patient classification is child, NIBP air hose for adult can be used.)

4 Dyna Alert

[ON]: Dyna Alert function will turn ON when HS-8312N is used.



CAUTION

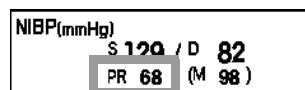
- When the PTG(SpO_2) sensor is applied to the toe or forehead, the circulatory dynamics variation monitoring by the Dyna Alert may not properly function.
- The circulatory dynamics variation monitoring by the Dyna Alert is effective only on the HS-8312N with built-in Nellcor™ module.

REFERENCE

- About the Dyna Alert:
Using a cuff allows to measure the blood pressure noninvasively, but on the other hand, there is a demerit of not being able to perform the measurement continuously. Therefore, there is always a risk of sudden blood pressure change in between the periodic measurements.

5 PR Display

[ON]: PR will be displayed.



NOTE

- PR will be only displayed. It will not generate alarm, or be displayed for the list function.

6 NIBP Erase Time

NIBP data will be erased after the set duration (60min/120min).

7 Measure at Alarm

NIBP measurement will start at alarm generation.

Select [ON] for "NIBP Measurement at Alarm Occurrence", and select the alarm factor to start the NIBP measurement.

CAUTION

- If the NIBP measurement has not been performed since the power was turned ON, NIBP measurement at alarm occurrence will not be performed.

REFERENCE

- More than one parameters can be selected.

8 Quick Measurement

[ON]:NIBP measurement will be performed in duration of about 20 to 25 seconds in case of adult patient.

NOTE

- The quick measurement can be performed only if the patient classification is adult or child. For neonate, normal measurement will be performed regardless of this setting.

9 Sight Inflation

[ON] : Sight inflation function will turn ON.

The inflation target level will be automatically estimated during the inflation, and starts to deflate after the target level is reached.

[OFF]: Sight inflation function will turn OFF.

It will inflate to the target level set according to the previous measurement result.

NOTE

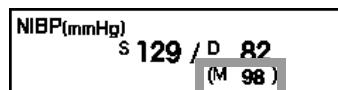
- The sight inflation function can be used only during the NIBP auto mode measurement.
- The sight inflation function cannot be used when the patient classification is "Neonate".
- The sight inflation function cannot be used when performing the 1-minute interval measurement or continuous measurement.
- When performing manual measurement/measurement at alarm occurrence, it will inflate to the fixed value (Adult: 180mmHg, Child: 140mmHg, Neonate: 110mmHg) regardless of the sight inflation setting.

REFERENCE

- If [ON] is selected for "Sight Inflation", the target inflation value will be increased in case such as sudden increase of blood pressure to prevent the re-inflation.

10 Mean BP (MAP) Display

[ON]: Mean BP (MAP) value will be displayed.



CAUTION

- If the mean BP (MAP) value is not displayed, the mean BP (MAP) alarm will not be

generated.

11 End Tone

[ON]: A buzzer tone will be generated when the NIBP measurement completes.

12 User Interval

The interval is fixed as "Lumbar Mode".

(☞ "About the Lumbar Mode" P7-56)

13 Auto Mode with Start/Stop Key

NIBP measurement will be performed automatically at selected time intervals.

- ▶ [OFF]: When the power is turned ON, NIBP auto mode will resume even when the new patient is not admitted.
- ▶ [ON]: When the power is turned ON, NIBP auto mode will resume by starting a manual measurement for the newly admitted patient. Until the NIBP auto mode is resumed or the interval is changed, "Standby" will be displayed inside the NIBP numeric data box.

14 Time Display

The time for NIBP measurement will be displayed.

- ▶ [Elapsed]: The elapsed time from the previous NIBP measurement will be displayed.
- ▶ [Meas.]: The NIBP measured time will be displayed.

15 Cancel Error

By pressing [Cancel Error] , the measurement error can be cancelled.

NOTE

- ◆ Make sure that the NIBP measurement can be properly performed after solving the cause of the NIBP system error message.
If the message still remains, equipment failure can be considered.

(☞ "Non-Invasive Blood Pressure" P11-28)

Temperature

This section explains the measurement procedure and measurement condition setup of temperature (T1 to T6).

TEMP Monitoring

- 1** Select the appropriate probe for the patient.

Probe Type

| Reusable Type | |
|---|---|
|  | Rectal Temperature Probe (for adult)401 |
|  | Rectal Temperature Probe (for child)402 |
|  | Body Surface Probe 409B |

NOTE

- ♦ 700 series series temperature probe cannot be used.

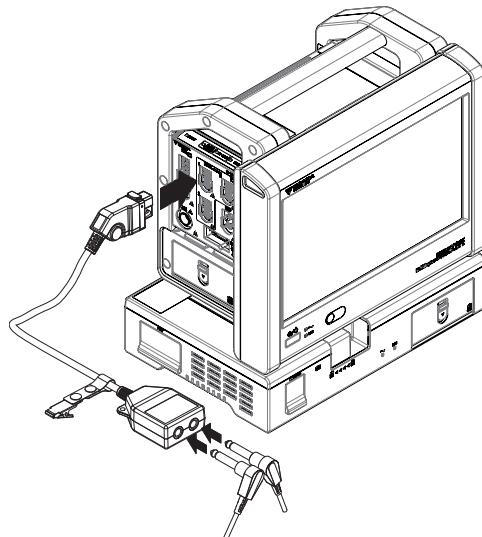
- 2** Connect the probe to Super Unit.

REFERENCE

- ♦ The Super Unit utilizes multiparameter amplifier input method which allows monitoring of 2 channels of temperature through the 2ch temperature relay cable (CJO-P01T-DA**) connected to the Super Unit connector.

- 1** Connect the 2ch temperature relay cable (CJO-P01T-DA**) to the multiconnector of the Super Unit.

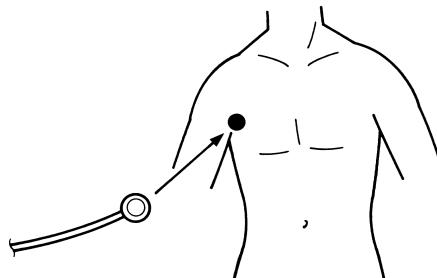
-
- 2** Connect the temperature probe to the 2ch temperature relay cable.



- 3** Attach the probe to the patient.

In Case of Body Surface Probe 409B:

- 1** Attach the probe to the body surface, and secure with surgical tape.

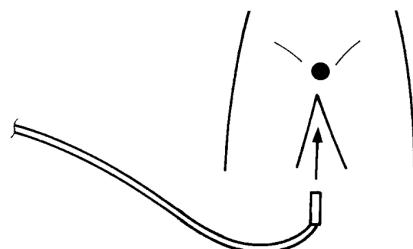


NOTE

- The probe location shown above is an example. Adjust the probe location according to the patient's condition.

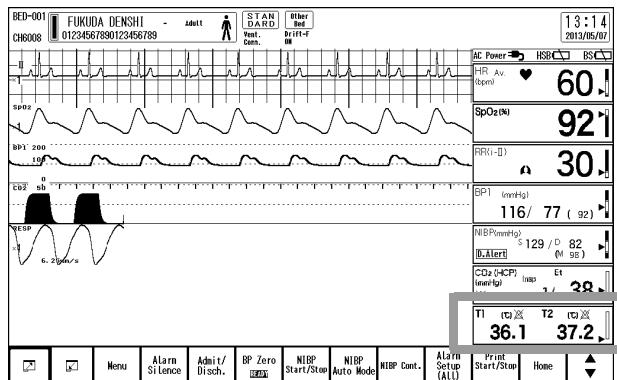
In Case of Rectal Temperature Probe 401, 402:

- 1** Clean/Disinfect/Sterilize the probe according to the guidelines provided with the probe product.
- 2** Insert the probe into the rectum about 3 to 7 cm deep.
- 3** Secure the probe to inner thigh with surgical tape.



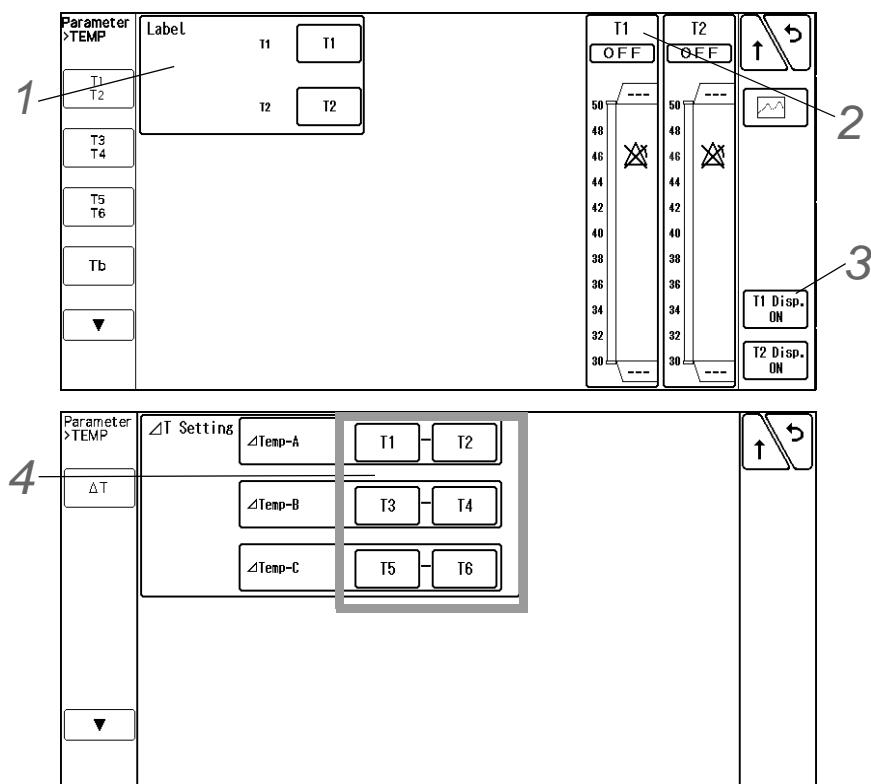
- 4** Check that the temperature is displayed.

- 1 Press the [Home] key on the user key.
- 2 Verify that the measured data is displayed on the home display.
If the measured data is not displayed during the 1 channel temperature measurement, the temperature probe may be connected to incorrect channel. Connect the probe to the correct channel and verify that the measured data is displayed.



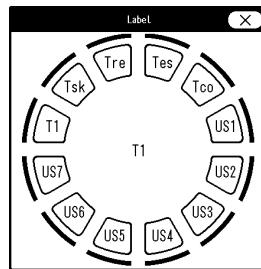
TEMP Parameter Setup

Press the [Menu], [TEMP] keys to display the "TEMP" setup screen.



1 TEMP Label

Select the label from [Tx] to [US7].



REFERENCE

- Description of Each Label:
T1-T6 (Default)
Tsk (Skin Temperature)
Tre (Rectal Temperature)
Tes (Esophageal Temperature)
Tco (Core Temperature))
US1 to US7: User labels (3 characters) which can be set on the "Initial Settings".
(☞ Maintenance Manual "User Label Setup" P5-9)

NOTE

- US3 to US7 cannot be selected for the equipment connected to DS-LANII/III.

2 Temperature Alarm

(☞ "Alarm Limit Setup for Each Parameter" P6-10)

NOTE

- Set the upper limit in the range of 31.0 to 45.0°C. If a value above 45.0 °C is set, the upper alarm will turn OFF.
- Set the lower limit in the range of 30.0 to 44.0°C. If a value below 30.0°C is set, the lower alarm will turn OFF.

REFERENCE

- The upper and lower limit can be set in 0.5°C increments.
- When [Auto] is set, the upper and lower limit will be automatically set to +2.0°C and -2°C to the current value respectively.

3 Display ON/OFF

(☞ "ECG Parameter Setup" P7-6)

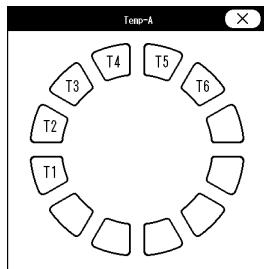
CAUTION

- When the parameter display is set to OFF, the alarm generation and tabular/graphic trend input will also cease.

4 ΔT Display

[ΔT]: ΔT setting screen will be displayed.

Select the parameter for each ΔT .



REFERENCE

- For ΔT , the difference of temperature will be displayed.
- Maximum of 3 types of ΔT ($\Delta T_{\text{Temp-A to C}}$) can be registered and displayed.

NOTE

- To display on the home display, the setup on the "Display Config." is necessary.
(["To Configure the Display" P10-4](#))
- The alarm can not be set for ΔT .

Cardiac Output and Blood Temperature

When thermodilution catheter is used to measure the cardiac output, the blood temperature (T_b) can be monitored. The CO measurement can be performed using the multiparameter connector on the Super Unit.
(["Cardiac Output \(CO\)" P8-46](#))

Connecting the Super Unit

- 1 Select the catheter relay cable.

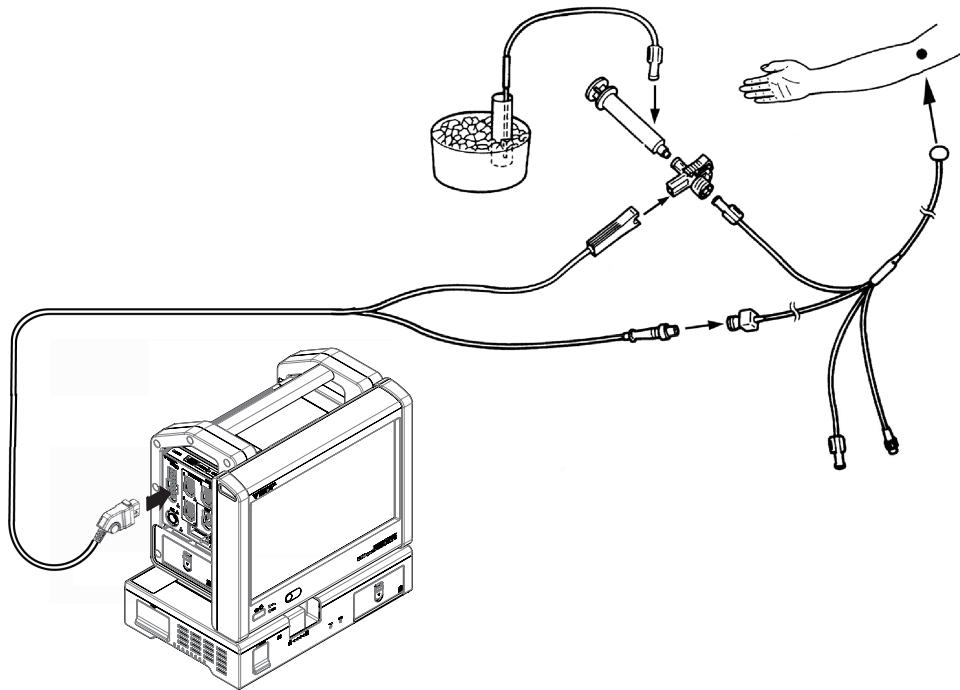
NOTE

- The usable catheter relay cable depends on the injectate temperature measurement method. Select the appropriate cable according to the method.

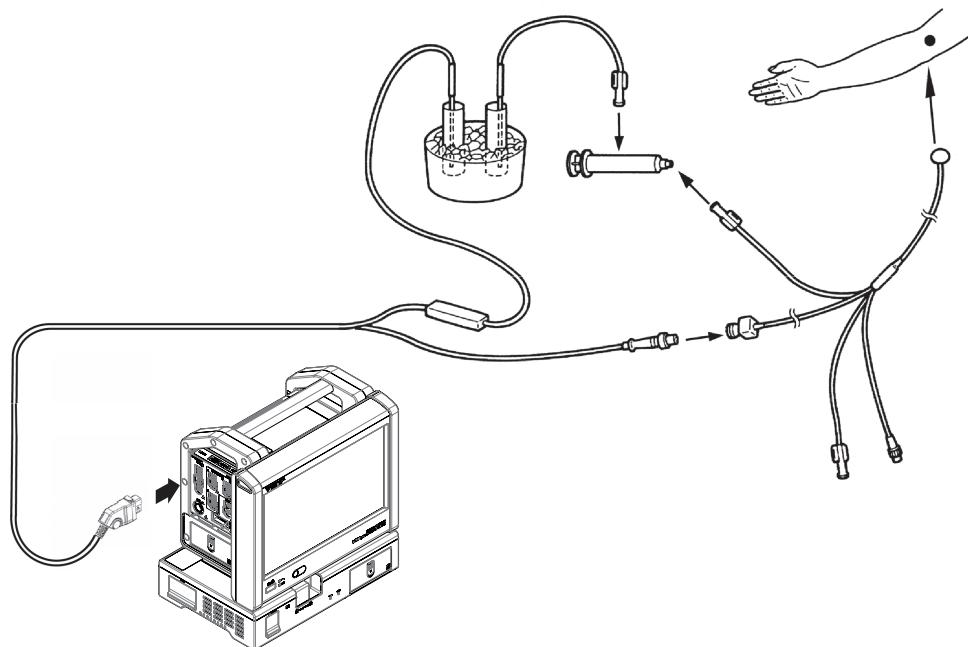
| Measurement Method | Catheter Relay Cable |
|-----------------------------|----------------------|
| 0°C/24°C Temperature | CJO-P01C-C2.4 |
| Flow-through Sensor | CJO-P01C-F2.4 |
| In-line Sensor | CJO-P01C-L2.4 |
| Injectate Temperature Probe | CJO-P01C-T2.4 |

- 2 Connect the catheter relay cable to the HS-8000 Super Unit, and connect the catheter to the catheter relay cable.

Example of In-line System



Example of Injectate Probe



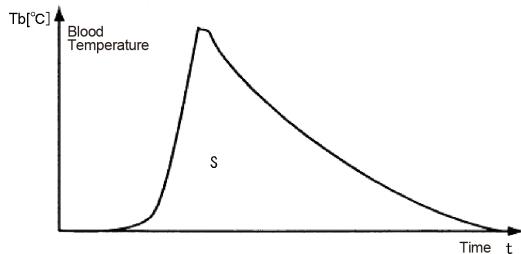
Cardiac Output Measurement Algorithm

Cardiac output is measured using the thermodilution method.

Thermodilution Method

The thermodilution catheter is inserted from the vein through the right atrium, right ventricle, and pulmonary artery. From the side hole near the catheter tip, injectate is injected quickly to the right atrium. At this time, the heart contraction and heat diffusion mixes the injectate with blood, and causes blood temperature fall. Variable initiated by these effects are measured as time function at the pulmonary artery, and the following thermodilution curve can be drawn.

Cardiac output is calculated by applying this to the Stewart-Hamilton formula shown below.



$$CO = 60 \cdot Vi \cdot \frac{Si \cdot Ci}{Sb \cdot Cb} \cdot \frac{Ct(Tb-Ti)}{S} = CC \cdot \frac{Tb-Ti}{S}$$

CO : Cardiac Output [L/min]

Vi : Injectate Volume [L]

Tb : Blood Temperature [°C]

Ti : Injectate Temperature [°C]

Ct : Correction coefficient for injectate temperature rise inside catheter

60 : seconds

S : Area of thermodilution curve $\int_0^{\infty} \Delta Tb(t) dt$ [°C sec]

$\Delta Tb(t)$: Temperature change of Tb after "t" seconds. [°C]

CC : Catheter Constant (Computation Constant: CC value)

Si : Specific Gravity of Injectate [g/cm³]

Sb : Specific Gravity of Blood [g/cm³]

Ci : Specific Heat of Injectate [cal/(g/°C)]

Cb : Specific Heat of Blood [cal/(g/°C)]

As shown above, cardiac output is directly proportional to the Injectate Volume (Vi) and the difference between Blood Temperature and Injectate Temperature (Tb - Ti), and is inversely proportional to the area of the thermodilution curve (S).

Hematocrit Value

Hematocrit value of 45%, $(Si \cdot Ci) / (Sb \cdot Cb) = 1.08$ is programmed for this equipment.

NOTE

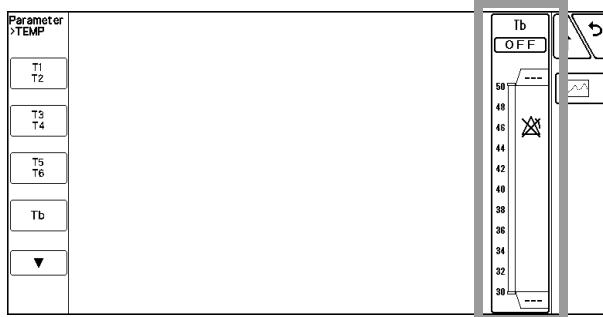
- If the hematocrit value is different, an error may be caused in cardiac output measurement.

Blood Temperature Alarm Setup

1 Press the [TEMP], [Tb] keys.

(☞ "To Display the Parameter Setup Screen" P7-1)

► The alarm setup screen will be displayed.



2 Select ON/OFF of blood temperature alarm and set the upper and lower alarm limits.

(☞ "Alarm Limit Setup for Each Parameter" P6-10)

NOTE

- Set the upper limit in the range of 31.0 to 45.0°C. If a value above 45.0 °C is set, the upper alarm will turn OFF.
- Set the lower limit in the range of 30.0 to 44.0°C. If a value below 30.0 °C is set, the lower alarm will turn OFF.

REFERENCE

- The upper and lower limit can be set in 0.5°C increments.
- When [Auto] is set, the upper and lower limit will be automatically set to +2.0°C and -2.0°C to the current value respectively.

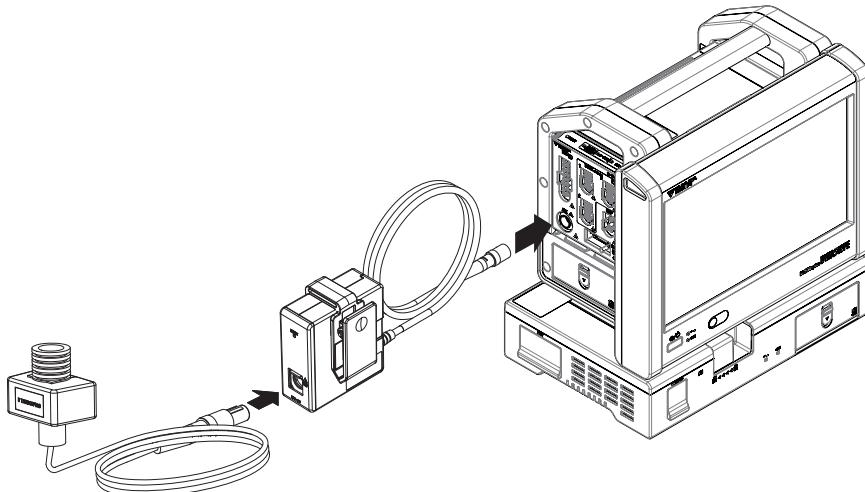
CO₂ Concentration (Mainstream Method)

This section explains about the CO₂ concentration measurement procedure and measurement condition setup when using the RESPIRONICS® Capnostat 5 (Mainstream Method, Gas Unit I/F HPD-800/HPD-810).

Patient Application and Display

By using the HPD-800/HPD-810 Gas Unit I/F, CO₂ measurement by the RESPIRONICS® Capnostat 5 (Mainstream Method) can be performed.

- 1** Connect the HPD-800/HPD-810 Gas Unit I/F to the AUX connector on the Super Unit and the CO₂ sensor (Capnostat 5) to the CO₂ connector on the HPD-800/HPD-810.



- ▶ The CO₂ sensor will automatically begin warming up.
- ▶ During the warm up period, the message "CO₂ Warming Up" will be displayed on the monitor.
- ▶ When the warm up completes, the message will disappear.

NOTE

- ♦ Warm up process will require minimum of 2 minutes.

REFERENCE

- ♦ The CO₂ sensor requires a warming up process to achieve stable operating temperature.

- 2** Prepare an airway adapter suitable for the patient.

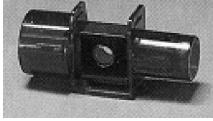
CAUTION

- ♦ The disposable airway adapter should be opened just before use.
- ♦ Do not reuse the disposable airway adapter. If sterilized, it will become unusable.

NOTE

- ♦ There are 4 types of airway adapters. Select the appropriate adapter according to the

used endo-tracheal tube size and operating environment.

| | |
|---|--|
|  | Airway Adapter (Adult) 7007 For patients using an endo-tracheal tube more than, or equal to 4.0 mm in diameter. Reusable Type |
|  | Airway Adapter (Neonate) 7053 For patients using an endo-tracheal tube less than, or equal to 4.0 mm in diameter. Reusable Type |
|  | Airway Adapter (Disposable, Adult) 6063 For patients using an endo-tracheal tube more than, or equal to 4.0 mm in diameter. Single-Use Type |
|  | Airway Adapter (Disposable, Neonate) 6312 For patients using an endo-tracheal tube less than, or equal to 4.0 mm in diameter. Single-Use Type |

- 3** Verify that the warm up is complete, and attach the CO₂ sensor to the airway adapter until a click sound is heard.

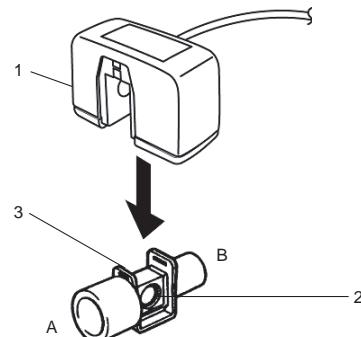
1 Capnostat 5 CO₂ Sensor

2 Window

3 Airway Adapter

A: Thick Side

B: Thin Side



CAUTION

- The airway adapter should be attached with the thicker side facing to the patient. If attached oppositely, it may damage the CO₂ sensor or airway adapter.

- 4** Perform the setting for the O₂ compensation, N₂O compensation, anesthetic gas compensation, atmospheric pressure
(☞ "CO₂ Parameter Setup" P7-75)

NOTE

- Set these items each time the condition changes.

- 5** Press the [Menu], [CO₂] ("Parameter"), [Calibrate Airway Adapter] keys to calibrate the airway adapter.

- Calibration will start.
- During calibration, "Zeroing" message will be displayed.
- Upon completion of calibration, a tone will be generated and "Cal. complete" message will be displayed.

- If the calibration fails, an error tone will be generated and "Cal. error" message will be displayed.

NOTE

- ◆ The airway adapter calibration must be performed before connecting to the respiration circuit.
- The airway adapter calibration should be also performed for the following case.
 - ◆ When the airway adapter is replaced.
 - ◆ When "Zero the CO₂ Adapter" or "Check airway adapter." message is displayed.
- ◆ A clean airway adapter must be used.
If reusing an airway adapter, clean and air-dry it. Then, wipe the window with a swab, and sterilize (EOG, etc.) before use.
- ◆ During the calibration, the measurement data will be displayed as "----". This may be included in the trend data causing discontinuity.
- ◆ Calibration cannot be performed if respiration is detected within 20 seconds before calibration. In such case, wait for next 20 seconds and perform calibration again.
- ◆ When "Cal. error" message is displayed, perform the airway adapter calibration again.

6 Verify that the airway adapter calibration is properly completed, disconnect the CO₂ sensor from the airway adapter temporarily, and attach the airway adapter to the patient's respiration circuit.

7 Connect the CO₂ sensor to the airway adapter.

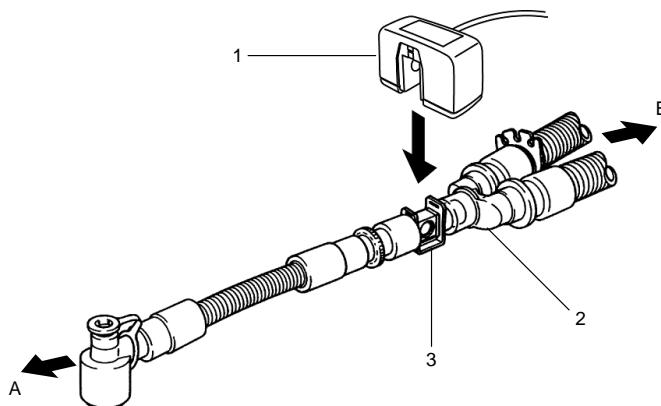
1 Capnostat 5 CO₂ Sensor

2 Y-Piece

3 Airway Adapter for Adult

A: Patient Side

B: Equipment Side

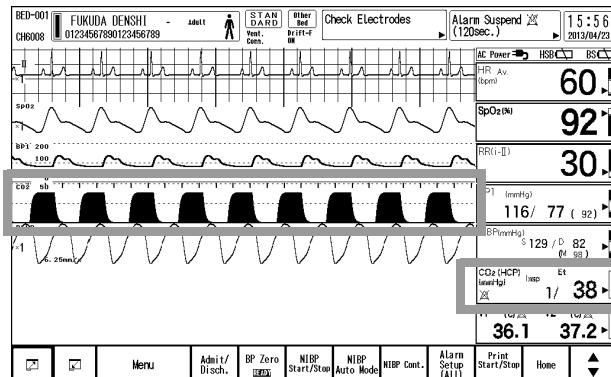


NOTE

- ◆ Attach the airway adapter between the patient's circuit Y-piece and intubation tube.
- ◆ The CO₂ sensor should be facing upward.

8

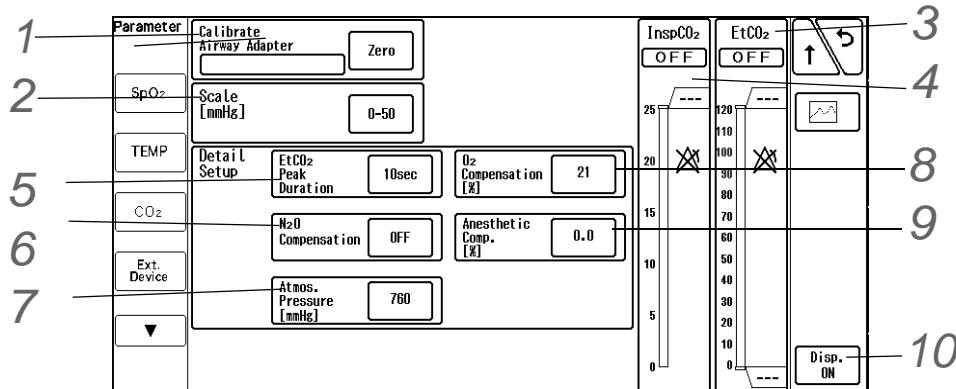
Verify that the CO₂ waveform, EtCO₂ value, InspCO₂ value are displayed.

**NOTE**

- Set the scale, measurement unit, alarm, etc. as necessary.

CO₂ Parameter Setup

Press the [Menu], [CO₂] keys to display the "CO₂" setup screen.

**1** Calibrate Airway Adapter

The airway adapter will be calibrated.

(☞ "Patient Application and Display" P7-72)

2 Scale

For the measurement unit in mmHg, select from [0-50]/[0-100], and for the unit in kPa or %, select from [0-4]/[0-8]/[0-10].

3 EtCO₂ (End-tidal CO₂)

(☞ "Alarm Limit Setup for Each Parameter" P6-10)

NOTE

- EtCO₂ alarm will not generate unless 2 or more respiration is detected within 30 seconds after power ON or after discharge.
- Set the upper limit in the range of 3 to 100mmHg/0.3 to 13.3kPa/0.3 to 13.3%. Setting a value above 100mmHg/13.3kPa/13.3% will turn OFF the alarm.
- Set the lower limit in the range of 1 to 98mmHg/0.1 to 13.1kPa/0.1 to 13.1%.

Setting a value below 1mmHg/0.1kPa/0.1% will turn OFF the alarm.

REFERENCE

- Set the alarm condition for each measurement unit (mmHg/kPa/%).
- The upper/lower limit can be set in 1mmHg/0.1kPa/0.1% increment.
- When [Auto] is selected, upper alarm limit will be set to +10mmHg/+1.3kPa/+1.3% , and the lower alarm limit will be set to -10mmHg/-1.3kPa/-1.3% to the current value.

4 InspCO₂ (Inspired CO₂)

(☞ "Alarm Limit Setup for Each Parameter" P6-10)

NOTE

- InspCO₂ alarm will not generate unless 2 or more respiration is detected within 30 seconds after power ON or after discharge.
- Set the upper limit in the range of 1 to 4mmHg/0.1 to 0.4kPa/0.1 to 0.4%. Setting a value equal to or above 4mmHg/0.4kPa/0.4% will turn the alarm OFF.

REFERENCE

- Set the alarm condition for each measurement unit (mmHg/kPa/%).
- The upper limit can be set in 1mmHg/0.1kPa/0.1% increment. There is no lower limit.
- When [Auto] is selected, upper alarm limit will be set to 3mmHg, 0.4kPa, 0.4%.

5 EtCO₂ Peak Duration

[10sec]/[20sec]: Maximum EtCO₂ value for the selected duration will be displayed.

[OFF]: EtCO₂ value for each respiration will be displayed.

NOTE

- As the EtCO₂ value display is updated each second, EtCO₂ value for each respiration cannot be displayed if respiration rate is 60Bpm and above.

6 N₂O Comp.

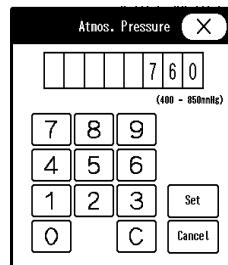
NOTE

- If N₂O is present in the respiration circuit, the CO₂ value tends to be displayed higher than the actual value. By setting the N₂O compensation ON, this can be adjusted.

7 Atmospheric Pressure

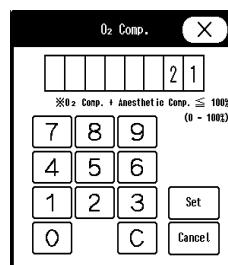
By entering the atmospheric pressure, the pressure difference will be compensated and allows more accurate measurement.

Enter the atmospheric pressure value on the "Atmos. Pressure" screen, and press the [Input] key.



8 O₂ Compensation

By entering the used O₂ concentration value, compensation can be made to display more accurate value.
Enter the O₂ compensation value on the "O₂" screen, and press the [Input] key.



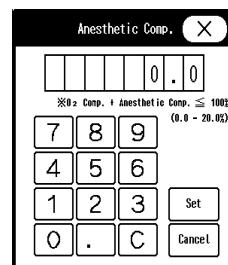
NOTE

- The value cannot be changed if the total value of O₂ compensation and anesthetic agent compensation exceeds 100%. In such case, change the O₂ compensation value after changing the anesthetic agent compensation value.

9 Anesthetic Agent Compensation

By entering the used anesthetic agent concentration value, compensation can be made to display more accurate value.

Enter the anesthetic compensation value on the "Agent" screen, and press the [Input] key.



NOTE

- The value cannot be changed if the total value of O₂ compensation and anesthetic agent compensation exceeds 100%. In such case, change the anesthetic agent compensation value after changing the O₂ compensation value.

10 Display ON/OFF

(☞ "ECG Parameter Setup" P7-6)

CAUTION

- When the waveform and numeric data display is set to OFF, the alarm generation and tabular trend input will also cease.

- When the waveform and numeric data display is set to OFF, the respiration rate measured by CO₂ will not be displayed either.

REFERENCE

- During "Display OFF" condition, the display will automatically return if the filter line is applied to the patient and more than 2 respirations are detected in 30 seconds.

CO₂ Concentration (Sidestream Method)

The HCP-800/HCP-810 is a CO₂ Gas Unit which measures CO₂ concentration by connecting it to the AUX connector on the HS-8000. The HCP-800/HCP-810 CO₂ Gas Unit incorporates Covidien's Microstream® technology for EtCO₂ (End-tidal CO₂ concentration) and InspCO₂ (Inspiratory CO₂ concentration) measurement. This section explains about the procedure and setup of the CO₂ concentration measurement of the HCP-800/HCP-810.

⚠ WARNING

- When using a sampling tube for intubated patients with a closed suction system, do not place the airway adapter between the suction catheter and endotracheal tube. This is to ensure that the airway adapter does not interfere with the functioning of the suction catheter.
- Loose or damaged connections may compromise ventilation or cause an inaccurate measurement of respiratory gases. Securely connect all components and check connections for leaks according to standard clinical procedures.
- Do not cut or remove any part of the sampling tube. It could lead to erroneous readings.
- If too much moisture enters the sampling tube (i.e., from ambient humidity or breathing of unusually humid air), the message "Check Sample Line" will appear in the message area. Replace the sampling tube when this message appears.
- Carefully route the filter line to reduce the possibility of patient entanglement or strangulation.
- Do not lift the HCP-800/HCP-810 by the filter line, as the filter line could disconnect from the equipment, causing the equipment to fall on the patient.
- CO₂ readings and respiration rate can be affected by sensor application, ambient environment, and patient conditions.

⚠ CAUTION

- Microstream® EtCO₂ sampling tubes are designed for single patient use, and are not to be reused. Do not attempt to clean, disinfect, sterilize or flush any part of the sampling tube as this can cause damage to the monitor.
- Dispose of sampling tubes according to standard operating procedures or local regulations for the disposal of contaminated medical waste.
- Before use, carefully read the Directions for Use for the Microstream® EtCO₂ sampling tube.
- Only use Microstream® EtCO₂ sampling tube to ensure the monitor functions properly.

NOTE

- During nebulization or suction for intubated patient, remove the sampling tube from the HCP-800/HCP-810 to avoid moisture buildup and sampling tube occlusion.

- Replace the sampling tube according to hospital protocol or when a blockage is indicated on the equipment. Excessive patient secretions or a buildup of liquids in the airway tube may occlude the sampling tube, requiring more frequent replacement.
- When connecting a sampling tube to the HCP-800/HCP-810, screw the sampling tube clockwise into the connector firmly to avoid inaccurate measurement which may be caused by gas leak from the connection point.
- When "Check Sample Line" message appears on the screen indicating that the filter line connected to the HCP-800/HCP-810 is blocked, the CO₂ pump will stop pumping the patient's breath to the monitor. In such case, follow the instructions in the "Troubleshooting" section of this manual. First, disconnect and reconnect the filter line. If the message still appears, disconnect and replace the filter line. Once a working filter line is attached, the pump will automatically resume operation.
- After connecting the CO₂ sampling tube to the HCP-800/HCP-810 and patient, check that CO₂ values appear on the monitor display.

Patient Application and Display

CO₂ concentration measurement can be performed by connecting the HCP-800/HCP-810 CO₂ Gas Unit to the AUX connector on the Super Unit.

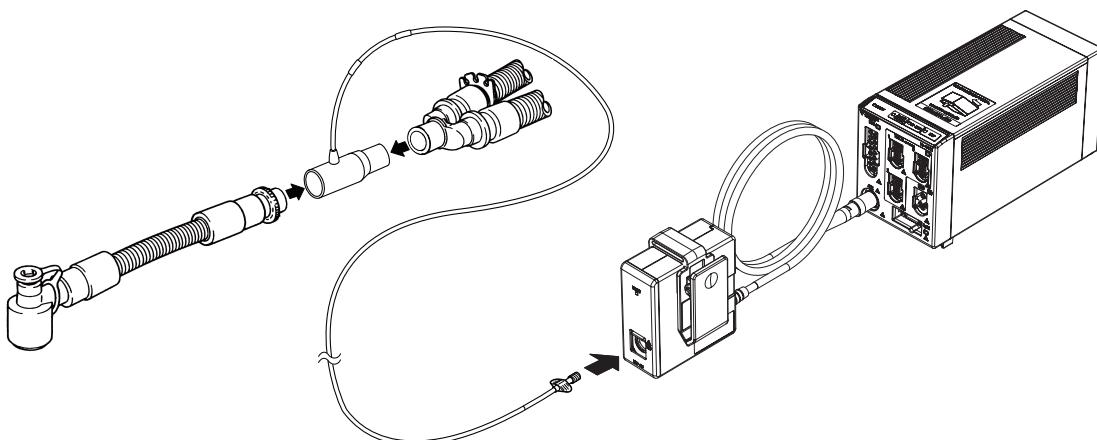
NOTE

- Accurate CO₂ concentration measurement can be acquired after 40 seconds from turning the power ON.

1 Connect the HCP-800/HCP-810 CO₂ Gas Unit to the AUX connector on the Super Unit.

2 Attach the airway adapter, oral/nasal sampling line or nasal sampling line to the patient.

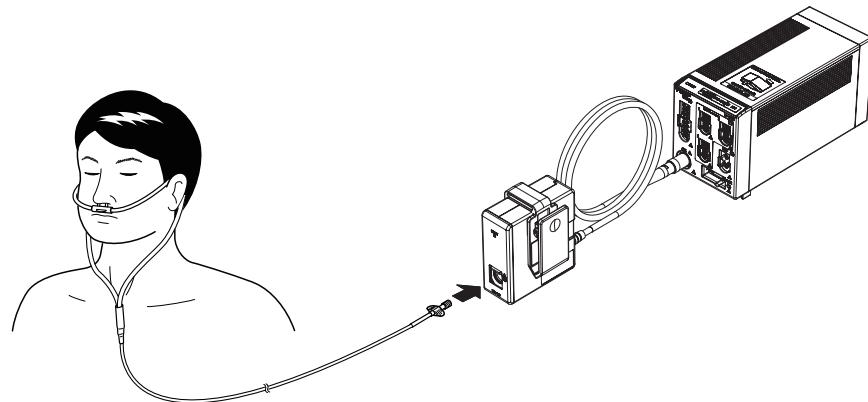
For intubated patient



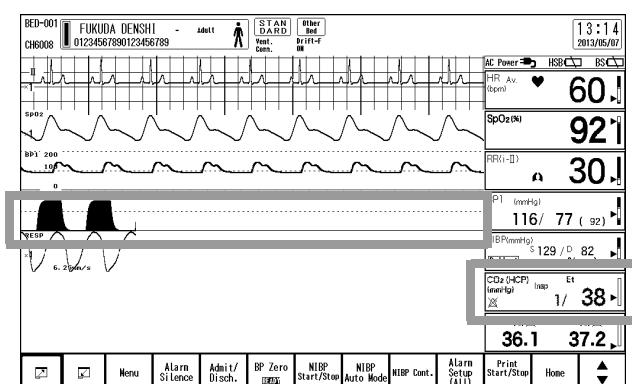
1 Attach the airway adapter to respiration circuit.

2 Connect one end of the sampling tube to the connector on the HCP-800/HCP-810. Verify that all the tubes are properly connected.

For patient using the nasal prong



- 1 Attach the nasal or oral/nasal patient interface of the sampling line to the patient as described in the sampling line directions for use.
 - 2 Connect the sampling tube to the connector on the HCP-800/HCP-810. Verify that all the tubes are properly connected.
- 3** Start the CO₂ concentration measurement.

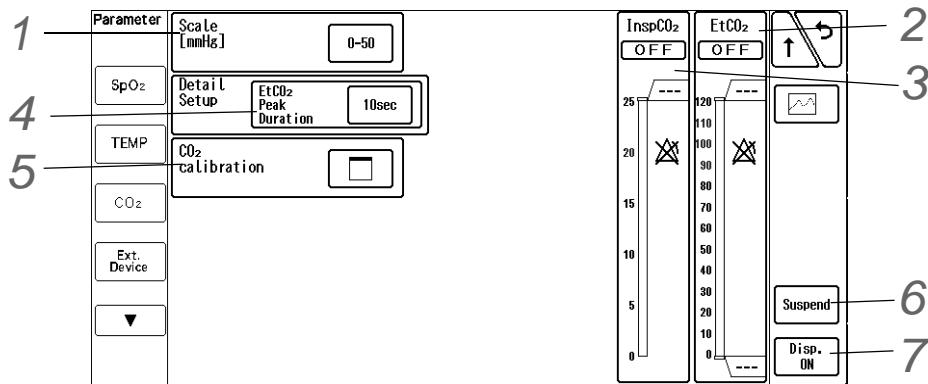


- Verify that the CO₂ waveform, EtCO₂ value, InspCO₂ value are displayed.

NOTE

- ♦ Connecting a sampling tube or nasal prong to the HCP-800/HCP-810 will automatically start the sampling pump. To prevent the pump from deteriorating, disconnect the sampling tube and nasal prong from the HCP-800/HCP-810 when not measuring the CO₂ concentration.
- ♦ Set the scale, measurement unit, alarm, etc. as necessary.
- ♦ When ambient temperature or atmospheric pressure changes significantly, auto zeroing will function. During auto zeroing, "---" will be displayed inside the CO₂ numeric data box and CO₂ measurement cannot be performed.
- ♦ If the power supply is interrupted due to power failure, etc., HCP-800/HCP-810 will be initialized even if the power interruption was within 30 seconds.

CO₂ Parameter Setup



1 Scale

For the measurement unit in mmHg, select from [0-50]/[0-100], and for the unit in kPa or %, select from [0-4]/[0-8]/[0-10].

2 EtCO₂ (End-tidal Carbon Dioxide)

(☞ "Alarm Limit Setup for Each Parameter" P6-10)

NOTE

- EtCO₂ alarm will not generate unless 2 or more respiration is detected within 30 seconds after power ON or after discharge.
- Set the upper limit in the range of 3 to 100mmHg/0.3 to 13.3kPa/0.3 to 13.3%. Setting a value above 100mmHg/13.3kPa/13.3% will turn OFF the alarm.
- Set the lower limit in the range of 1 to 98mmHg/0.1 to 13.1kPa/0.1 to 13.1%. Setting a value below 1mmHg/0.1kPa/0.1% will turn OFF the alarm.

REFERENCE

- Set the alarm condition for each measurement unit (mmHg/kPa/%).
- The upper/lower limit can be set in 1mmHg/0.1kPa/0.1% increment.
- When [Auto] is selected, upper alarm limit will be set to +10mmHg/+1.3kPa/+1.3%, and the lower alarm limit will be set to -10mmHg/-1.3kPa/-1.3% to the current value.

3 InspCO₂ (Inspired Carbon Dioxide)

(☞ "Alarm Limit Setup for Each Parameter" P6-10)

NOTE

- InspCO₂ alarm will not generate unless 2 or more respiration is detected within 30 seconds after power ON or after discharge.
- Set the upper limit in the range of 1 to 4mmHg/0.1 to 0.4kPa/0.1 to 0.4%. Setting the value above 4mmHg/0.4kPa/0.4% will turn OFF the alarm.

REFERENCE

- Set the alarm condition for each measurement unit (mmHg/kPa/%).
- The upper limit can be set in 1mmHg/0.1kPa/0.1% increment. There is no lower limit.

- When [Auto] is selected, upper alarm limit will be set to 3mmHg, 0.4kPa, 0.4%.

4 EtCO₂ Peak Duration

[10sec]/[20sec]: Maximum EtCO₂ value for the selected duration will be displayed.

[OFF]: EtCO₂ value for each respiration will be displayed.

NOTE

- As the EtCO₂ value display is updated each second, EtCO₂ value for each respiration cannot be displayed if respiration rate is 60Bpm and above.

5 CO₂ Calibration

CO₂ calibration can be performed.

(☞ Maintenance Manual "CO₂ Calibration (HCP-800/HCP-810)" P9-3)

6 Suspend CO₂

[Suspend]: The pump operation will stop, CO₂ waveform and numeric data display will disappear, and "Suspended" will be displayed inside the CO₂ numeric data box.

[Resume]: Resumes CO₂ monitoring. This key will be displayed when the measurement is suspended.

⚠ CAUTION

- When the measurement is suspended, the alarm generation and trend input will be also suspended.

7 Display ON/OFF

(☞ "ECG Parameter Setup" P7-6)

⚠ CAUTION

- When the waveform and numeric data display is set to OFF, the alarm generation and tabular trend input will also cease.
- When the waveform and numeric data display is set to OFF, the respiration rate measured by CO₂ will not be displayed either.

REFERENCE

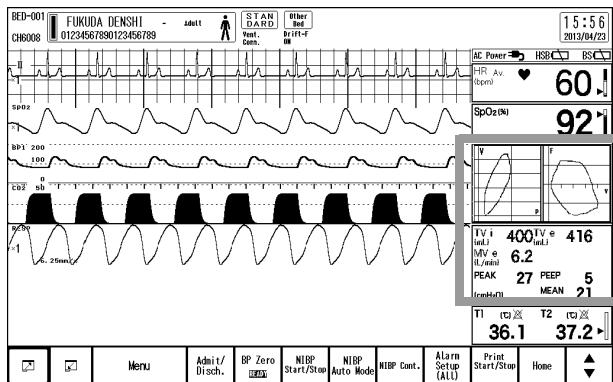
- During "Display OFF" condition, the display will automatically return if the filter line is applied to the patient and more than 2 respirations are detected in 30 seconds.

Ventilator

By connecting a ventilator, numeric data and waveform measured by the ventilator can be displayed on the DS-8200 System.

(Maintenance Manual "Ventilator Connection" P4-3)

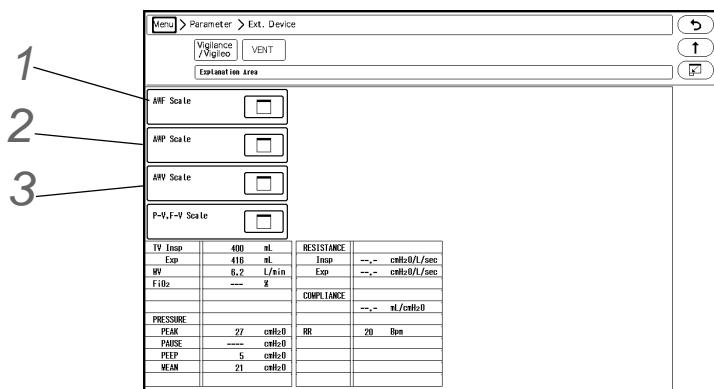
By assigning [P-V/F-V] to numeric data box, P-V (pressure-volume) loop/F-V (flow-volume) loop can be also displayed.



This section explains about the AWP/AWF/AWV scale setup procedure and P-V/F-V screen operation.

AWP/AWF/AWV Scale Setup

Press the [Menu], [Ext. Device], ("Parameter), [VENT] key to display the "VENT" screen.
AWF / AWP / AWV / P-V, F-V scale can be set.



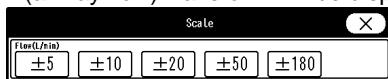
REFERENCE

- The scale setup window can be also displayed by pressing the scale on the waveform display area or [Scale] on the user key.

1 Set the AWF scale.

1 Press the key for [AWF Scale].

- The scale selection for AWF (airway flow) waveform will be displayed.



2 Select from [±5]/[±10]/[±20]/[±50]/[±180](L/min).

2 Set the AWP scale.

1 Press the key for [AWP Scale].

- The scale selection for AWP (airway pressure) waveform will be displayed.

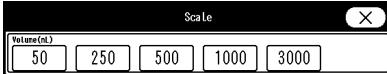


2 Select from [10]/[20]/[30]/[50]/[120](cmH₂O).

3 Set the AWV scale.

1 Press the key for [AWV Scale].

- The scale selection for AWV (airway volume) waveform will be displayed.



2 Select from [50]/[250]/[5000]/[1000]/[3000](mL).

P-V/F-V Loop Display

The ventilator data can be displayed in P-V/F-V loop for review.

⚠ CAUTION

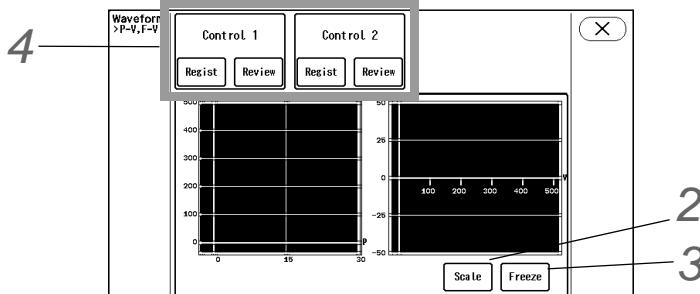
- When Servo-i/s or SV-300 is connected, RESISTANCE (Insp, Exp), COMPLIANCE, P-V loop, F-V loop display function is not available.

⚠ CAUTION

- For PURITAN-BENNETT ventilator, P-V loop and F-V loop cannot be displayed or printed.

1 Press the P-V/F-V numeric data box.

- The P-V/F-V review screen will be displayed.



- P-V (pressure-volume) loop/F-V (flow-volume) loop is sampled each 60ms and displayed for each respiration. The beginning of the loop is displayed in cyan, and the rest of the loop is displayed in white.
- For the P-V loop, the horizontal axis shows AWP (unit: cmH₂O), and vertical axis shows volume (unit: mL).
- For the F-V loop, the horizontal axis shows volume (unit: mL), and vertical axis shows AWF (unit: L/min).

2 Set the P-V/F-V scale. Press the [Scale] key.

- P-V/F-V scale selection screen will be displayed. Select the scale.

3 To stop the loop drawing, press the [Freeze] key.

- ▶ The loop drawing will stop.
- ▶ To resume the loop drawing, press the [Freeze] key again.

4 A control loop can be registered to see the change in P-V/F-V loop.

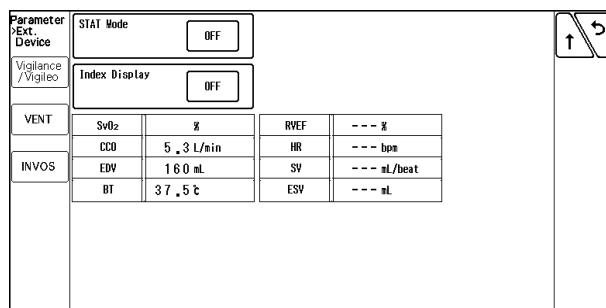
- ▶ Press the [Regist] key to store the displayed P-V/F-V loop as a control loop.
- ▶ Press the [Review] key to display the registered control loop.
The control loop 1 will be displayed in yellow, and control loop 2 will be displayed in green.

SvO₂/CCO Data

The DS-8200 System can display the Vigilance data by connecting the oximeter (Edwards Lifescience)/CCO measurement device (Vigilance, VigilanceCEDV, VigilanceII, Vigileo).

(☞ Maintenance Manual "SvO₂/CCO Monitor Connection" P4-6)

On the Vigilance data screen, the numeric data display can be changed.



Display Example for ICO Mode

STAT Mode: When the Vigilance is in CCO mode, STAT mode display can be set ON or OFF.

Index Display: When the Vigilance is in CCO mode, Index Display can be set ON or OFF.

When the Vigilance is in ICO mode, the 6 latest data of ICO (Intermittent Cardiac Output) and ICI (Intermittent Cardiac Index) will be displayed.

STAT Mode / Index Display

1 Press the [Menu], [Ext. Device] ("Parameter") keys.

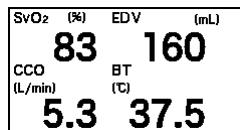
- ▶ The Vigilance screen will be displayed.

NOTE

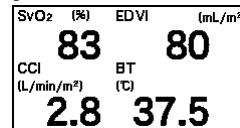
- STAT Mode: When Vigilance is in CCO mode, STAT mode display can be set ON or OFF.
- Index Display: When Vigilance is in CCO mode, Index display can be set ON or OFF.
- When the Vigilance is in ICO mode, the 6 latest data of ICO (Intermittent Cardiac Output) and ICI (Intermittent Cardiac Index) will be displayed.

2 Select [ON]/[OFF] for "STAT Mode" and "Index Disp.".

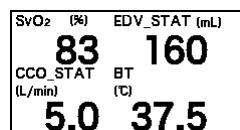
- STAT Mode [OFF], Index Display [OFF]: SvO₂(or ScvO₂), CCO, EDV, BT will be displayed inside the SvO₂+CO numeric data box.



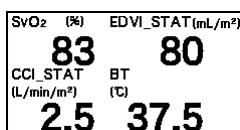
- STAT Mode [OFF], Index Display [ON]: CCI and EDVI will be displayed instead of CCO and EDV.



- STAT Mode [ON], Index Display [OFF]: CCO_STAT and EDV_STAT will be displayed instead of CCO and EDV.



- STAT Mode [ON], Index Display [ON]: CCI_STAT and EDVI_STAT will be displayed instead of CCO and EDV.



NOTE

- STAT mode can be changed only when Vigilance is connected.

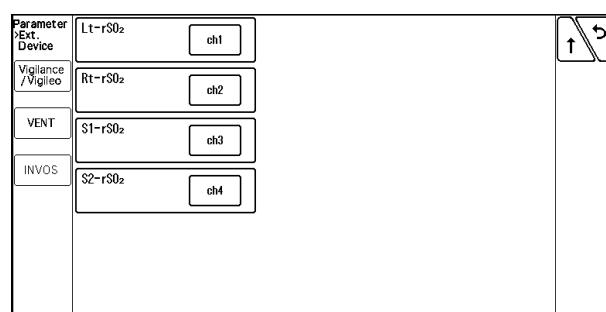
INVOS Data

By connecting the INVOS 5100C Cerebral Oximeter (Covidien®), regional cerebral oxygen saturation (rSO₂) can be monitored non-invasively on the DS-8200 System.

(☞ Maintenance Manual "Connecting to the INVOS" P4-10)

On the INVOS screen, the channel can be changed for each INVOS data.

Lt-rSO₂/Rt-rSO₂ data of the selected channel will be displayed inside the INVOS numeric data box.



INVOS Screen

Channel Number Setup for INVOS Data

In the INVOS numeric data box, measurement data of Lt-rSO₂/Rt-rSO₂ will be displayed.
On the INVOS screen, the channel for Lt-rSO₂/Rt-rSO₂ data can be selected.

- 1** Press the [Menu], [Ext. Device] ("Parameter"), [INVOS] keys.
 - ▶ The INVOS screen will be displayed.
- 2** Press the [ch*] key for the INVOS label ("Lt-rSO₂" / "Rt-rSO₂" / "S1-rSO₂" / "S2-rSO₂") to set the channel.
 - ▶ The dropdown list will be displayed.
- 3** Select the channel from [ch1]/[ch2]/[ch3]/[ch4].

Stopwatch

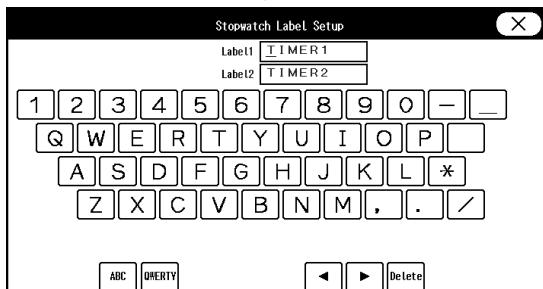
The stopwatch function can be used by setting the [Stopwatch] key on the numeric data box or on the user key.

- 1** Press the [Stopwatch] key on the numeric data box or on the user key.
 - ▶ The "Stopwatch" window will be displayed.



Label Setup

- 1** Press the [Label] key on the "Stopwatch" window.
 - ▶ The stopwatch label setup window will be displayed.



- 2** Enter 8 characters using alphanumeric keypad.

Start/Stop

- 1** Press the [Start]/[Stop]/[Reset] key on the "Stopwatch" window.

- ▶ [Start]: The stopwatch will start.
- ▶ [Stop]: The stopwatch will suspend/resume.
- ▶ [Reset]: The stopwatch will reset to "00:00:00". If pressed during stopwatch operation, counting will resume from "00:00:00".

NOTE

- ♦ If the discharge procedure is performed during stopwatch operation, the counting will stop and will be reset to "00:00:00".
- ♦ The stopwatch counting will continue even when the monitoring is suspended.

Multiparameter Connector Setup for BP, TEMP, CO Measurement

The quantities of multiparameter connectors on the Super Unit are as follows.

| Multiparameter Connectors | Super Unit |
|---|--------------------|
| 3 port Temperature x6 (maximum) BP x6 (maximum) CO x1 (maximum) | HS-8312N, HS-8312M |

By using the multiparameter connector, any combination of BP, TEMP and CO measurement can be performed according to the monitoring purpose.

By using the 2ch TEMP relay cable, 2ch BP relay cable, or 2ch BP conversion cable, 2 channels of temperature and BP can be monitored through one multiparameter connector.

The multiparameter connector setup can be performed on the "Initial Settings" menu.
( Maintenance Manual "Unit Module Setup" P4-12)

For HS-8312N, HS-8312M

Combination of BP, TEMP, CO Channels

| 3 Ports | BP | TEMP | CO |
|---------|--------------|------|-----|
| BP | 6ch (3ch) | N/A | N/A |
| BP | | | |
| BP | | | |
| BP | 4ch (2ch) | 2ch | N/A |
| BP | | | |
| TEMP | | | |
| BP | 2ch (1ch) | 4ch | N/A |
| TEMP | | | |
| TEMP | | | |

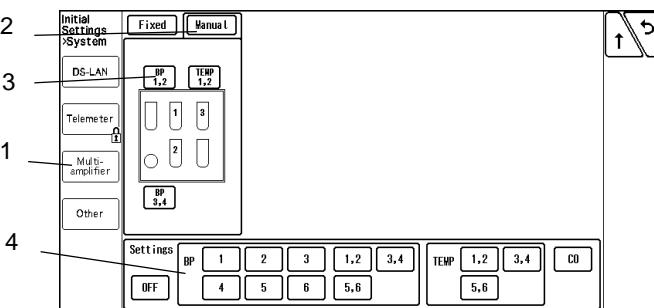
Combination of BP, TEMP, CO Channels

| 3 Ports | BP | TEMP | CO |
|---------|--------------|------|-----|
| TEMP | | | |
| TEMP | N/A | 6ch | N/A |
| TEMP | | | |
| BP | | | |
| TEMP | 2ch (1ch) | 2ch | 1ch |
| CO | | | |
| BP | | | |
| BP | 4ch (2ch) | N/A | 1ch |
| CO | | | |
| TEMP | | | |
| TEMP | N/A | 4ch | 1ch |
| CO | | | |

* the quantity of channel inside the brackets is the quantity when using the 1ch BP relay cable.

Multiparameter Connector Setup

Connecting the relay cable to the multiparameter connector on the HS-8000 series Super Unit will automatically set the measuring parameter.



- 1 Press the [Menu], [Initial Settings], [System], [Unit Module] , [Multiampmifier] keys.
- 2 Press the [Manual] key.
- 3 Select the multiparameter connector location. The selected location will be displayed in blue.
- 4 Press the assigning parameter.

The parameter will be assigned to the selected connector.



CAUTION

- The same parameter cannot be set to more than one connectors.
- By setting [OFF] for one of the connector, it will become selectable on another connector.
- If the parameter assigned to the multiparameter connector and the connected relay cable does not match, the connector location will be displayed in red and the connected relay cable type will be displayed.

Chapter 8 Review Function

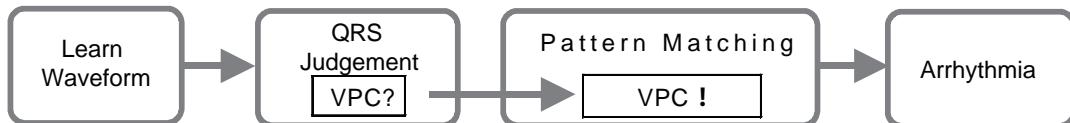
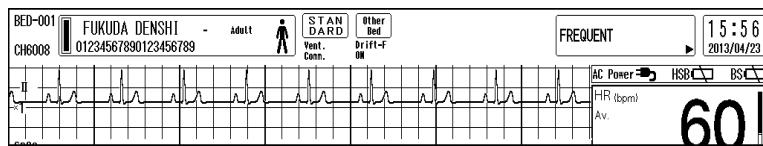
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Chapter 8 Review Function

Arrhythmia Analysis

This section explains about the arrhythmia analysis.

Arrhythmia Definition



The arrhythmia detection is performed by learning the normal waveform of the patient, and determines the VPC by comparing the waveform (QRS pattern) and R-R interval for each heartbeat.

The parameters such as QRS amplitude, QRS width, QRS polarity, RR interval are compared with the normal waveform to extract the abnormal QRS.

Then, the QRS with suspected VPC is pattern matched to distinguish the noise and VPC. This will finally determine the VPC and generate the arrhythmia alarm.

⚠ WARNING

- Objective and constant arrhythmia detection is possible through the fixed algorithm incorporated in this monitor.
- However, excessive waveform morphology change, motion artifact, or the inability to determine the waveform pattern may cause an error, or fail to make adequate detection.
- Therefore, physicians should make final decisions by closely checking the data obtained by manual printing, alarm printing and recall waveform.

⚠ CAUTION

- For stable arrhythmia detection and ECG monitoring, verify proper electrode placement, lead, waveform size, and filter mode selection. If not properly selected, detection failure or detection error may occur.

□ QRS Classification

Each QRS will be classified to the following pattern.

| | |
|-----------------------|--|
| N (Normal) | Normal QRS beat |
| V (VPC) | Ventricular extrasystole |
| P (Pacing Beat) | Pacing beat |
| F (Fusion Beat) | Fusion beat of pacing and spontaneous beat |
| S (SVPC) | Supraventricular extrasystole |
| ? (Undetermined Beat) | Learning arrhythmia, or unmatched beat |

□ Arrhythmia Type

With the QRS judgment, the following 12 types of arrhythmia alarm will be generated.

| Arrhythmia | Details | Detection Criteria |
|------------|----------------------------------|--|
| Asystole | Cardiac Arrest | Cardiac arrest is detected for more than preprogrammed time. |
| VF | Ventricular Fibrillation | A random, rapid electrical activity of the heart is detected. |
| VT | Ventricular Tachycardia | 9 or more continuous ventricular beats are detected.*1 |
| Slow_VT | | 9 or more continuous ventricular beats are detected.*2 |
| TACHY | Tachycardia | HR is over the upper alarm limit. |
| BRADY | Bradycardia | HR is below the lower alarm limit. |
| RUN | Consecutive VPC | Continuous VPC exceeding the preprogrammed value is detected. |
| Couplet | Couplet Ventricular Extrasystole | 2 continuous VPC beats are detected. |
| PAUSE | | Cardiac arrest exceeding the preprogrammed duration is detected. |
| Bigeminy | Ventricular Bigeminy | 3 or more continuous QRS pattern of V-N is detected. |
| Trigeminy | Ventricular Trigeminy | 3 or more continuous QRS pattern of V-N-N is detected. |
| Frequent | Frequent VPC | VPC exceeding the preprogrammed value is detected within 1 minute. |

*1: HR: 140bpm / 120bpm or over

*2: HR: below 140bpm / 120bpm
 (☞ "To Set the Arrhythmia Alarm" P6-1)

Arrhythmia Alarm Setup

Arrhythmia alarm setup procedure is explained below.

ON/OFF of arrhythmia alarm and arrhythmia detection level can be set.

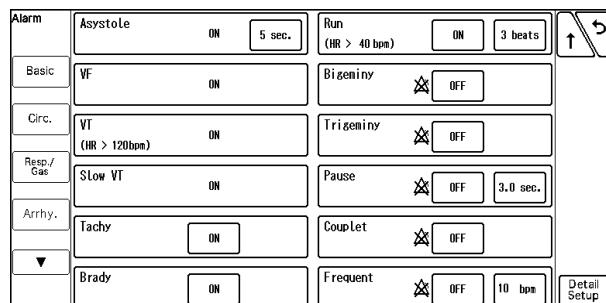
When the measured value exceeds the set arrhythmia detection level, arrhythmia alarm will generate.

Arrhythmia Detection Level Setting

| Arrhythmia | Range | Default | Selection |
|------------|---------------|---------|---------------|
| Asystole | 3 to 10 sec. | 5 sec. | Dropdown List |
| RUN | 2 to 8 beats | 3 beats | Dropdown List |
| PAUSE | 1.5 to 5 sec. | 3 sec. | Dropdown List |
| Frequent | 1 to 50 bpm | 10 bpm | Numeric Keys |

1 Press the [Menu], [Arrhy.] ("Alarm") key.

► The arrhythmia alarm setup screen will be displayed.



2 Set the detection level.

For Asystole, Run, Pause:

1 Press the key for detection level.

► The dropdown list will be displayed.

2 Select the detection level.

For Frequent:

1 Press the key for detection level.

► The "Frequent" screen will be displayed.

2 Use the numeric keys to enter the detection level.

3 Press the [Input] key.

3 Select ON/OFF for the alarm.

1 Select [ON]/[OFF] for each alarm.

► The dropdown list will be displayed.

2 Select from [ON] or [OFF].

► [ON]: Alarm will generate.

► [OFF]: Alarm will not generate.

NOTE

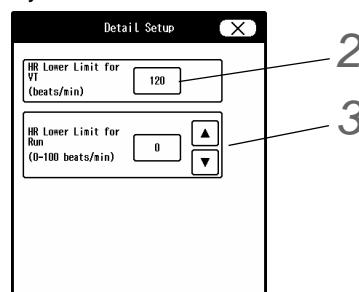
- If the patient classification is adult or child, Asystole, VF, VT, SlowVT alarm cannot be turned OFF unless [ON/OFF] is selected for "Asystole, VF, VT Alarm" under "Initial Settings".
- If the patient classification is neonate, VF, VT, SlowVT can be turned OFF regardless of the setting for "Asystole, VF, VT Alarm" under "Initial Settings".

□ Arrhythmia Alarm Detail Setup

HR Lower Limit for VT and RUN can be set on the Arrhythmia Alarm "Detail Setup" screen.

1 Press the [Menu], [Arrhy.] ("Alarm"), [Detail Setup] key.

► The "Detail Setup" screen will be displayed.



2 Set the "HR Lower Limit for VT".

REFERENCE

- Select the HR lower limit to detect VT from 120 or 140bpm. If the HR is same or above the selected value, VT will be detected. If the HR is below the selected value, Slow_VT

will be detected.

- 1** Press the key for "HR Lower Limit for VT".
► The dropdown list will be displayed.
- 2** Select from [120] or [140] (beats/min.).
- 3** Set the "HR Lower Limit for RUN".

REFERENCE

- ♦ Set the HR lower limit to detect RUN. If the HR is same or above the set value, RUN will be detected.

- 1** Press the **▲/▼** key for "HR Lower Limit for RUN".
- 2** Set the HR in the range from 0 to 100 (beats/min.).

Arrhythmia Learn

Learning the normal ECG largely affects the accuracy of arrhythmia analysis.

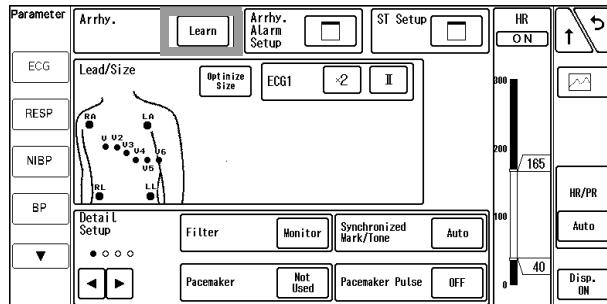
If any error occurs in arrhythmia detection and QRS judgment, performing arrhythmia learning will recover the original analyzing accuracy.

Arrhythmia learning will be performed for about 20 beats for the normal ECG, but it may take longer if the heartbeat is unstable.

During arrhythmia learning, arrhythmia alarm other than ASYSTOLE, VF, VT, TACHY, BRADY will not be generated.

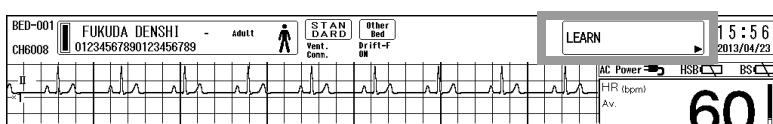
- 1** Press the [Menu], [ECG] "Parameter" keys.
Or, press the HR numeric data box , and press **[EN]**.

- The ECG setup screen will be displayed.



- 2** Press the [Learn] key while displayed in white.

- The key will change to blue.
- Arrhythmia learning will start.
- During arrhythmia learning, a message will be displayed.



NOTE

- If [Used] is selected for "Pacemaker", [Learn] key will not change to blue and "LEARN" message will not be displayed, but learning process will be performed.
- Pressing the key while arrhythmia learning is in process will not stop the process.

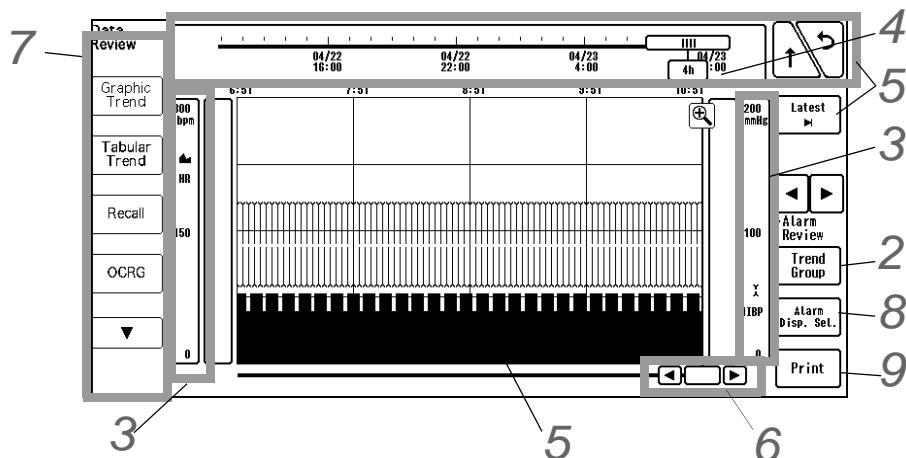
Graphic Trend

This section explains the graphic trend function and printing procedure.

If the numeric data is displayed on the home display, 24 hours of data will be automatically stored and displayed as trend data.

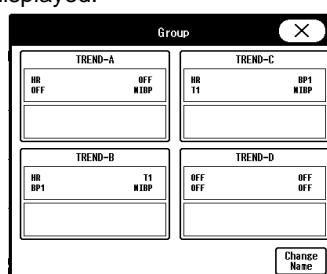
Graphic Trend Setup

- 1 Press the [Menu], [Trend] ("Data Review") keys.
Or, press the [Trend] key on the user key area.
▶ The graphic trend will be displayed.



- 2 Select the trend group.

- 1 Press the [Trend Group] key.
▶ The "Group" window will be displayed.



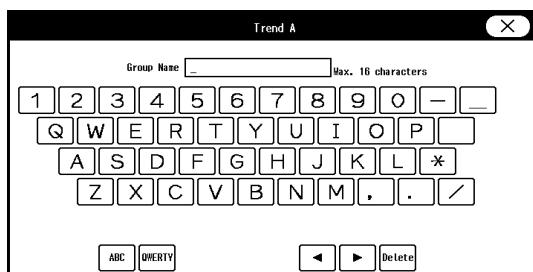
- 2 Select the group.

REFERENCE

- Maximum of 4 groups with 4 parameters each can be registered, and can be selected according to the monitoring purpose.

3 To change the name of trend group, press the [Change Name] key.

► Window to enter the name of trend group will be displayed.



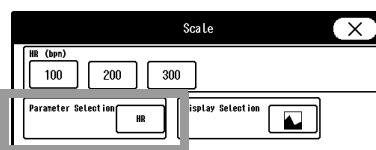
4 Enter the name of trend group in alphanumeric characters.

5 After entering the name, press to close the window.

3 Set the parameter, display type, scale.

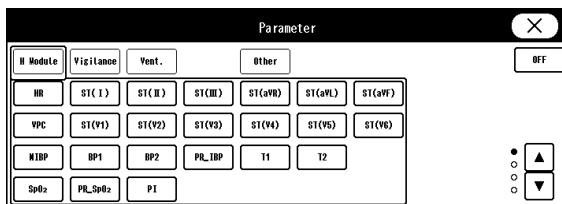
1 Press the scale area for each parameter.

► The "Scale" selection window will be displayed.



2 Press the key for "Parameter Selection".

► The "Parameter" selection window will be displayed.



3 Select a parameter.

NOTE

- The selected parameter will be also registered for the trend group.
- The apnea duration will be stored when it exceeds the alarm threshold level. If lower than the alarm threshold level, it will be stored as "0 (zero)".
- If "GAS" is selected as the RR/APNEA source, the apnea duration will not be stored for the graphic trend.

4 Select the scale.

5 Press the key for "Display Selection".

► The dropdown list will be displayed.

6 Select the display format.

4 Select the display interval.

1 Press the key on the time bar.

► The dropdown list will be displayed.

2 Select the display interval.

REFERENCE

- The displayed data is compressed as follows depending on the display interval.
 VPC: Maximum value within the display interval
 APNEA: Maximum value within the display interval
 Other than above: Latest value within the display interval
 For example, if the 24-hour trend for the parameter with minimum resolution of 1 minute is displayed, one mark will be displayed for the 12-minute (720-second) data.
- If the display resolution is higher than the minimum resolution of the data, the same data is repeated to match the display resolution.
 Refer to the following table for resolution. The resolution will differ depending on the parameter.

Display Resolution

| Time Span | Minimum Resolution | | | |
|-----------|--------------------|----------------|----------------|----------------|
| | Line Display | | Mark Display | |
| | 10 sec. Sample | 30 sec. Sample | 10 sec. Sample | 30 sec. Sample |
| 10 min | 10 sec. | 30 sec. | 10 sec. | 30 sec. |
| 1 hours | 10 sec. | 30 sec. | 30 sec. | 30 sec. |
| 2 hours | 10 sec. | 30 sec. | 60 sec. | 60 sec. |
| 4 hours | 20 sec. | 60 sec. | 120 sec. | 120 sec. |
| 8 hours | 40 sec. | 120 sec. | 240 sec. | 240 sec. |
| 12 hours | 60 sec. | 120 sec. | 360 sec. | 360 sec. |
| 16 hours | 80 sec. | 240 sec. | 480 sec. | 480 sec. |
| 24 hours | 120 sec. | 240 sec. | 720 sec. | 720 sec. |

Data Resolution

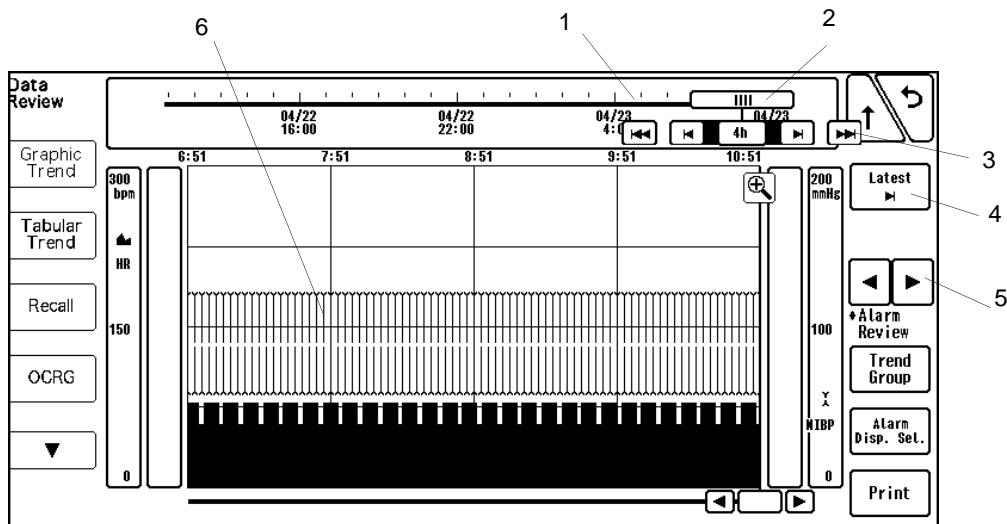
| Minimum Resolution | Parameter |
|--------------------|---|
| 10 sec. | HR, ST, SpO ₂ , PR_SpO ₂ , BP1, BP2 |
| 30 sec. | Other than above (Excluding NIBP*) |

* Actual measured data will be displayed for NIBP.

5 Scroll the displayed data.

NOTE

- 24 hours of data will be stored regardless of the time bar display range.



1 Pressing the time bar will display the data at pressed time.

2 Scroll the slider left and right.

▶ Right: Scrolls to the newer data.

▶ Left: Scrolls to the older data.

3 Press the **◀ / ▶** keys.

▶ The time display will switch by page.

4 Press **Latest**.

▶ The latest data will be displayed.

5 Press **◀ / ▶** for "Alarm Review".

▶ The cursor will move to the alarm generated time.

6 The graph can be scrolled by dragging inside the graph.

6 Move the cursor.

1 Press the center part of **◀ / ▶**.

▶ The trend data at cursor position will be displayed.

2 Scroll **□** left and right.

▶ The cursor will move to left and right.

3 Press the **◀ / ▶** keys.

▶ The cursor position can be adjusted.

REFERENCE

- The data display at cursor position will be automatically erased after fixed duration.

4 Press **🕒**.

▶ 10-minute trend data before and after the cursor position will be displayed.

5 Press **🕒**.

▶ The displayed time range will return to the previous time range.

7

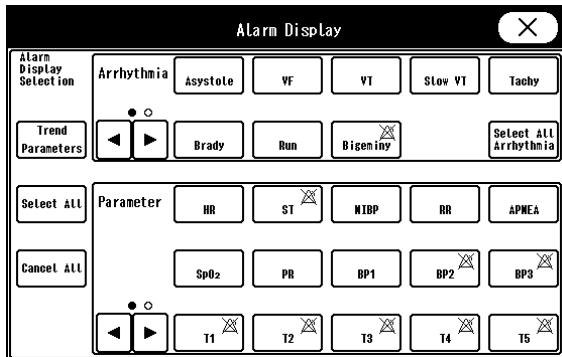
To refer to other review data of the same time, press the tab key on the left side.

8

Select the alarm display status.

1 Press the [Alarm Disp. Sel.] key.

► The "Alarm Display" window will be displayed.



2 Select the alarm display status.

- [Trend Parameters]: The displayed trend parameters will be selected.
- [Select All]: All parameters including arrhythmia will be selected.
- [Cancel All]: All selections will be cancelled.
- [Select All Arrhythmia]: All arrhythmia will be selected.
- Each parameter key: Each time the key is pressed, selected/unselected status will change.

REFERENCE

- If the alarm for the selected arrhythmia, parameter is generated during the displayed time range, it will be indicated in red at the alarm status display area.

9

Press the [Print] key.

► To print the trend data, press the [Print] key, select the parameter, and press the [Enter] key.

Description for Each Parameter

| Numeric Data | Details | Scale | Unit |
|--|-----------------------------|--------------------------------|------|
| HR | HR | 100, 200, 300 | bpm |
| VPC | VPC Counts | 20, 50, 100 | - |
| ST (I, II, III, aVR, aVL, aVF, V1 to V6) | ST Level | ±0.2, ±0.5, ±1.0, ±2.0 | mV |
| | | ±2, ±5, ±10, ±20 | mm |
| SpO ₂ | SpO ₂ Value | 0 to 100, 50 to 100, 80 to 100 | % |
| PR_SpO ₂ | SpO ₂ Pulse Rate | 100, 200, 300 | bpm |
| NIBP | NIBP Value (SYS / DIA) | 100, 150, 200, 300 | mmHg |
| | | 16, 20, 24, 40 | kPa |

| Numeric Data | Details | Scale | Unit |
|---|--|--------------------------------|----------------------|
| BP1 to 6 | Blood Pressure (Systolic / Mean / Diastolic) | 20, 50, 100, 150, 200, 300 | mmHg |
| | | 4, 8, 16, 20, 24, 40 | kPa |
| | | 20, 40 | cmH ₂ O |
| PDP | Peak Diastolic Pressure of IABP | 20, 50, 100, 150, 200, 300 | mmHg |
| | | 4, 8, 16, 20, 24, 40 | kPa |
| CPP | Cerebral Perfusion Pressure | 20, 50, 100, 150, 200, 300 | mmHg |
| | | 4, 8, 16, 20, 24, 40 | kPa |
| PAP | Pulmonary Artery Pressure | 20, 50, 100, 150, 200, 300 | mmHg |
| | | 4, 8, 16, 20, 24, 40 | kPa |
| PR_IBP | BP Pulse Rate (BP1/ART) | 100, 200, 300 | bpm |
| T1 to 6 | TEMP | 20 to 45, 30 to 40 | °C |
| Tb | Blood Temperature (Cardiac Output Measurement) | 20 to 45, 30 to 40 | °C |
| ΔTEMP-A to C | Temperature Difference | ±10, ±25 | °C |
| RR_IMP | Impedance Respiration Rate | 50, 100, 150 | Bpm |
| APNEA | Apnea (Impedance, CO ₂ , Ventilator) | 15, 30 | s (second) |
| EtCO ₂ , InspCO ₂ | Gas Unit CO ₂ Concentration | 50, 100 | mmHg |
| | | 4, 8, 10 | kPa, % |
| RR_GAS | Gas Unit Respiration Rate | 50, 100, 150 | Bpm |
| BIS | BIS Monitor Data | 25, 50, 75, 100 | - |
| SvO ₂ | Mixed Venous Oxygen Saturation | 0 to 100, 50 to 100, 80 to 100 | % |
| ScvO ₂ | Central Venous Oxygen Saturation | 0 to 100, 50 to 100, 80 to 100 | % |
| CCO | Continuous Cardiac Output | 6, 12, 20 | L/min |
| CCI | Continuous Cardiac Index | 6, 12, 20 | L/min/m ² |
| BT | Blood Temperature (Vigilance Data) | 20 to 45, 30 to 40 | °C |
| RR_VENT | Ventilator Respiration Rate | 50, 100, 150 | Bpm |
| SpCO | Carboxyhemoglobin Concentration | 20, 40, 100 | % |
| SpMet | Methemoglobin Concentration | 10, 15, 100 | % |
| SpHb | Total Hemoglobin Concentration | 10 to 20, 0 to 25 | g/dL |
| PI | Perfusion Index | 10, 20 | % |
| PVI | Pleth Variability Index | 30, 60, 100 | % |
| Lt-rSO ₂ | regional cerebral oxygen saturation | 20 to 100 | % |
| Rt-rSO ₂ | | | |
| S1-rSO ₂ | | | |
| S2-rSO ₂ | | | |

NOTE

- The apnea duration will be stored when it exceeds the alarm threshold level. If lower than the alarm threshold level, it will be stored as "0 (zero)".
- If "GAS" is selected as the RR/APNEA source, the apnea duration will not be stored for the graphic trend.

Tabular Trend

This section explains the tabular trend function and printing procedure.

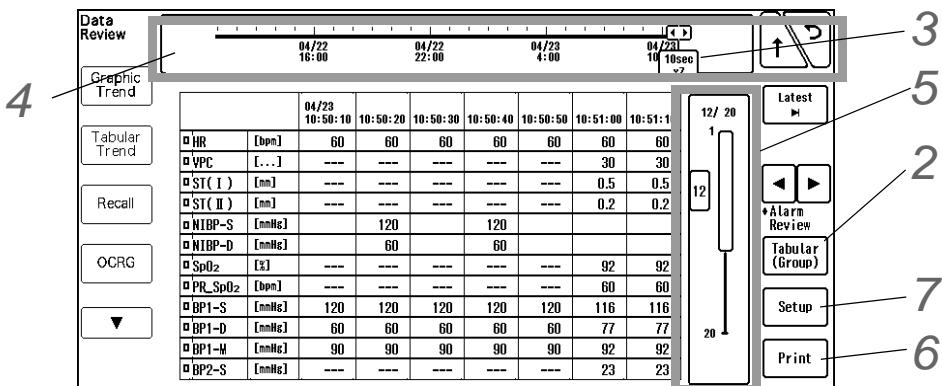
If the numeric data is displayed on the home display, 24 hours of data will be automatically stored and displayed in 10 seconds / 30 seconds interval.

To Display/Print the Tabular Trend

- 1 Press the [Menu], [Tabular Trend] ("Data Review") keys.

Or, press the [Tabular Trend] key on the user key area.

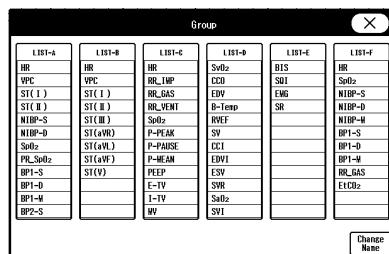
► The tabular trend will be displayed.



- 2 Change the trend group.

- 1 Press the [Trend Group] key.

► The "Group" window will be displayed.



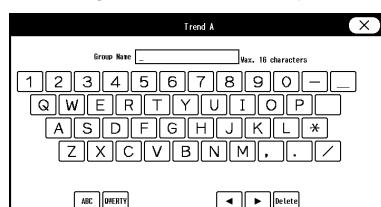
REFERENCE

- Maximum of 6 different groups of parameters can be registered to be selected according to the monitoring purpose.

- 2 Select a group from [A]/[B]/[C]/[D]/[E]/[F].

- 3 To change the name of trend group, press the [Change Name] key.

► Window to enter the name of trend group will be displayed.



4 Enter the name of trend group in alphanumeric characters.

5 After entering the name, press to close the window.

3 Select the display interval.

1 Press the key at the right side of the time bar.

► The dropdown list will be displayed.

2 Select the display interval.

► [NIBP]: The tabular trend display interval will be according to the NIBP measurement time.

NOTE

- ♦ If the display resolution is higher than the minimum resolution of the data, the same data is repeated to match the display resolution.
- ♦ The data resolution differs according to the parameter.
- ♦ 24 hours of data will be stored regardless of the time bar display range.

Data Resolution

| Minimum Resolution | Parameter |
|--------------------|---|
| 10 sec. | HR, ST, SpO ₂ , PR_SpO ₂ , BP1, BP2 |
| 30 sec. | Other than above |

4 Scroll the displayed data.

("Graphic Trend Setup" P8-5 "5. Scroll the displayed data")

5 Shift the displayed page.

1 Drag the slider on the scroll bar up or down.

► When the slider is released, / will be displayed for a fixed amount of time.

2 Press the / keys.

► The display will switch by page.

6 Press the [Print] key.

► [Print]: The currently displayed tabular trend will be printed.

► [Print (All)]: All data for 12 parameters (which fits in 1 page) will be printed.

7 Set the parameters for the tabular trend.

("Parameter Setup for Tabular Trend" P8-13)

The Description of the Display

If the measured data is not displayed on the home display, or if BP zero balance is not performed, the data will be displayed as "---".

The alarm generated data will be displayed with red background.

The date column of alarm generated data will be also displayed with red background.

NOTE

- ♦ The red background for the alarm generated bed will be displayed for each parameter.
- ♦ The alarm display for the expiratory and inspiratory parameter such as EtCO₂ and InspCO₂ will be the same.

For example, if the alarm is generated for BP-S, the background color of BP1-S, BP1-M, BP1-D will be displayed in red.

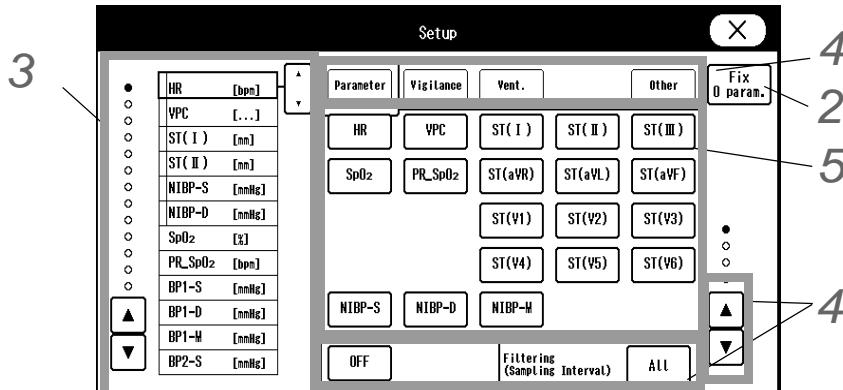
| | 04/23 10:50:10 | 10:50:20 | 10:50:30 | 10:50:40 | 10:50:50 | 10:51:00 | 10:51:10 |
|---------------|-------------------|----------|----------|----------|----------|----------|----------|
| HR [bpm] | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| VPC [...] | --- | --- | --- | --- | --- | 30 | 30 |
| ST(I) [mm] | --- | --- | --- | --- | 0.5 | 0.5 | |
| ST(II) [mm] | --- | --- | --- | --- | 0.2 | 0.2 | |
| NIBP-S [mmHg] | 120 | 120 | | | | | |
| NIBP-D [mmHg] | 60 | 60 | | | | | |
| SpO2 [%] | --- | --- | --- | --- | 92 | 92 | |
| PR_SpO2 [bpm] | --- | --- | --- | --- | 60 | 60 | |
| BP1-S [mmHg] | 120 | 120 | 120 | 120 | 116 | 116 | |
| BP1-D [mmHg] | 60 | 60 | 60 | 60 | 77 | 77 | |
| BP1-M [mmHg] | 90 | 90 | 90 | 90 | 92 | 92 | |
| BP2-S [mmHg] | --- | --- | --- | --- | 23 | 23 | |

On the left side of the parameter, the color assigned for the corresponding parameter will be displayed.

Parameter Setup for Tabular Trend

1 Press the [Menu], [Tabular Trend] ("Data Review"), [Setup] keys.

► The tabular trend setup screen will be displayed.



2 Select the number of fixed parameters.

1 Press the [Fix x param.] key.

► The dropdown list will be displayed.

2 Select from [0 param.] to [6 param.].

► The selected numbers of parameters will be fixed on the tabular trend display, and these data will be remained displayed even when scrolled.

3 Select the location for the parameter to be displayed.

► The selected location will be displayed with blue frame and will be displayed at the side.

REFERENCE

- To change the location, directly press the desired location or drag the key up or down.
- To change the displayed page, press the / keys at the left side of the screen.

4 Select the parameters.

1 Filter the data by sampling interval.

- ▶ [OFF]: The line where [OFF] is selected will not be displayed.
- ▶ [10 sec.]: Only the data with 10 sec. sampling interval will be displayed.
- ▶ [All]: All data will be displayed.

2 Select the category and displaying page.

- ▶ [H Module]/ [Vigilance]/ [Vent.]/ [Other]: The parameters for the corresponding category will be displayed.
- ▶ /: The displaying page for the parameters can be selected.

Parameters for each Category

| | |
|------------|--|
| H Module | HR, VPC, ST, SpO ₂ , PR_SpO ₂ , NIBP, BP1 to 6, PR-IBP, PDP, PCWP, CPP, T1 to 6, Tb, CO, EtCO ₂ , InspCO ₂ , RR-GAS, RR-IMP, RR-VENT, APNEA, PI, PVI, SpCO, SpMet, SpHb |
| Vigilance | SvO ₂ , ScvO ₂ , SaO ₂ , O ₂ EI, B-Temp, CCO, CCO-STAT, CCI, CCI-STAT, DO ₂ , RVEF, RVEF-STAT, VO ₂ , SV, SV-STAT, SVI, SVI-STAT, SVR, SVRI, SVV, EDV, EDV-STAT, EDVI, EDVI-STAT, MAP, ESV, ESVI |
| Ventilator | E-TV, I-TV, MV, SMV, P-PEAK, P-PAUSE, PEEP, P-MEAN, E-RES, I-RES, COMP, FiO ₂ |
| Other | BIS, SQI, EMG, SR, SEF, TOTPOW, IMP, Lt-rSO ₂ , Rt-rSO ₂ , S1-rSO ₂ , S2-rSO ₂ |

NOTE

- The apnea duration will be stored when it exceeds the alarm threshold level. If lower than the alarm threshold level, it will be stored as "0 (zero)".

REFERENCE

- "H Module" means HS-8000 series.

5 Select the parameter to be displayed for the selected location.

- ▶ The blue frame will move to one row below.

Recall

This section explains about the recall function and the setup procedure.

To Display the Recall Waveform

1 Time at Alarm Occurrence

2 Recall Factor

3 Recall Waveform (Compressed: 12 sec.)

4 Diamond Mark



When the alarm for the specified recall factor occurs, maximum of 2 waveforms (12 seconds) and numeric data for each recall factor will be stored for up to 200 data. The recall data to be displayed can be selected. 5 compressed recall waveforms will be displayed. The waveform can be enlarged by pressing the waveform display area.

If the recall data exceeds 200, the data will be erased from the oldest one.

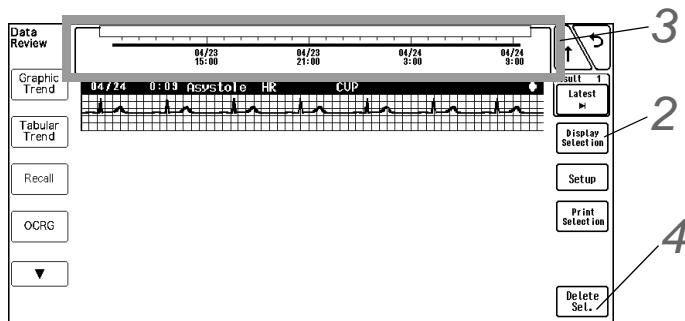
The recall waveform will be acquired from the point prior to alarm occurrence so that alarm-generated point will be displayed at 7 to 8 seconds point on the 12-seconds recall waveform.

A diamond mark indicates the alarm generated point.

- 1** Press the [Menu], [Recall] ("Data Review") keys.

Or, press the [Recall] key on the user key area.

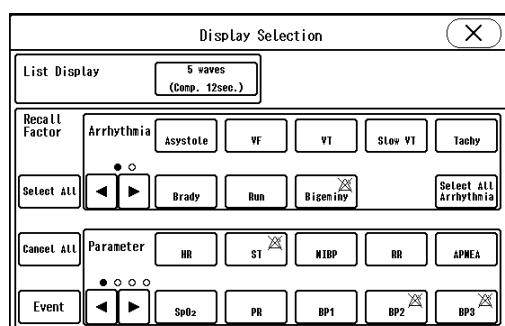
- ▶ Recall screen will be displayed.
- ▶ 5 compressed waveforms (12 sec. per each waveform) will be displayed.
- ▶ The alarm occurrence time, the recall factor occurred at the same time, and the compressed waveform of recall waveform 1 will be displayed.



- 2** Select the recall factor to display on the recall screen.

- 1** Press the [Display Selection] key.

- ▶ The "Display Selection" window will be displayed.



- 2** Select the recall factor.

- ▶ The key will be displayed in blue to indicate that the alarm for the selected parameter will be displayed.
- ▶ [Select All]: All parameters including arrhythmia will be selected.
- ▶ [Select All Arrhythmia]: All arrhythmia will be selected.
- ▶ [Cancel All]: All selections will be cancelled.

- 3** Switch the displayed data on the recall screen.

- 1** Scroll the slider left and right.

- ▶ Right: Scrolls to the newer data.
- ▶ Left: Scrolls to the older data.

- 2** Press the / keys.

- ▶ The display will switch by page.

3 Press  .

- ▶ The latest data will be displayed.

4 Delete the recall waveform.

1 Press the [Delete Sel.] key.

2 Select the parameter to delete. For the selected parameter, "x" will be displayed.

To delete all displayed waveforms, press the [Select All] key.

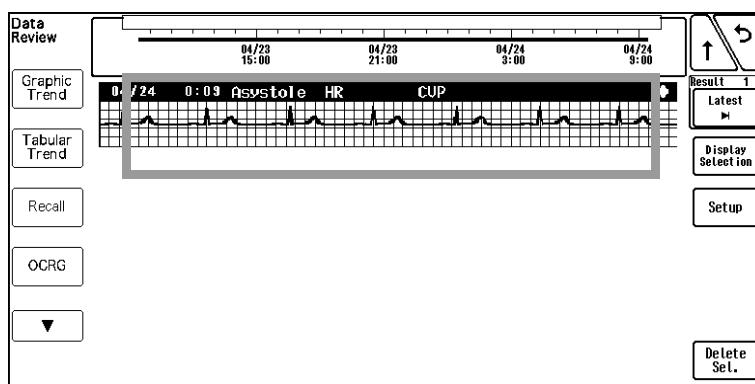
If the parameter with "x" is selected, "x" will be erased and will be removed from the deleting parameters.

3 Press the [Delete] key, and then the [Delete OK] key to delete the parameters with "x" mark.

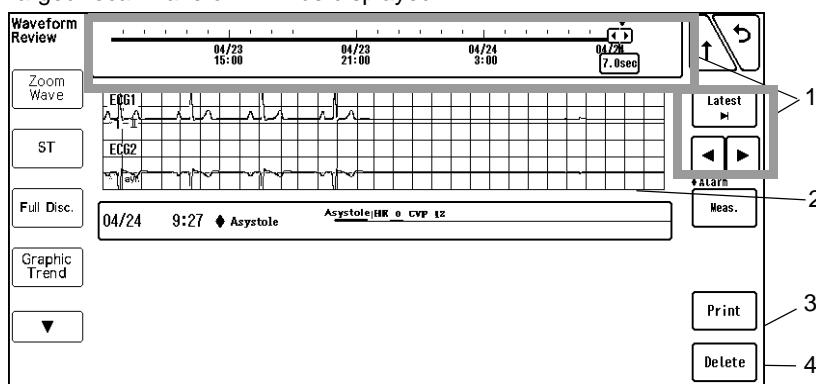
To Display/Print the Enlarged Recall Waveform

On the enlarged recall waveform display, the recall waveform will be displayed in 25mm/s and by using the cursor, the data before and after the alarm occurrence can be checked.

1 Press the waveform display area on the recall screen.



- ▶ The enlarged recall waveform will be displayed.



1 Shifts the recall waveform display.

2 Recall Waveform

The waveform can be dragged to left and right.

3 Prints the recall waveform.

The displayed enlarged waveform and numeric data will be printed. The output printer can be selected on the "Manual Printing" setup.

( "Printing Setup" P9-1)

4 Deletes the recall waveform.

The displayed recall waveform will be deleted.

Recall Setup

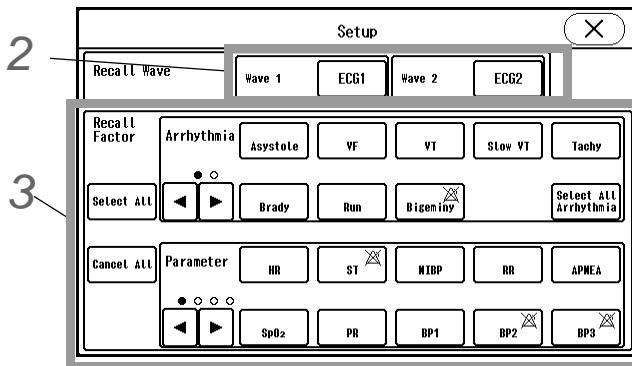
The storing condition at alarm occurrence can be set for the recall function.

The recall waveform and recall factor (numeric data, arrhythmia) can be selected.

1 Press the [Setup] key on the recall screen.

(☞ "To Display the Recall Waveform" P8-14)

► The "Setup" window will be displayed.



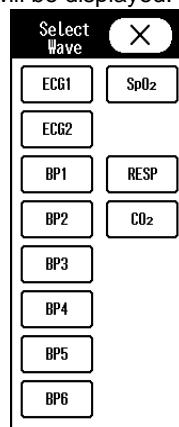
2 Select the recall waveform.

REFERENCE

- Up to 2 waveforms can be selected for the recall waveform.

1 Select from "Wave 1" or "Wave 2".

► The "Waveform Selection" window will be displayed.



2 Select the parameter for "Wave 1" and "Wave 2".

3 Select the recall factor.

(☞ "To Display the Recall Waveform" P8-14)

NOTE

- The recall waveform will start with the following delay time tracing back from the alarm

occurrence.

| | Adult | Child | Neonate | |
|------------|---------|---------|--------------------|------------------|
| | | | Numeric Data Alarm | Arrhythmia Alarm |
| Delay Time | 12 sec. | 12 sec. | 8 sec. | 12 sec. |

OCRG

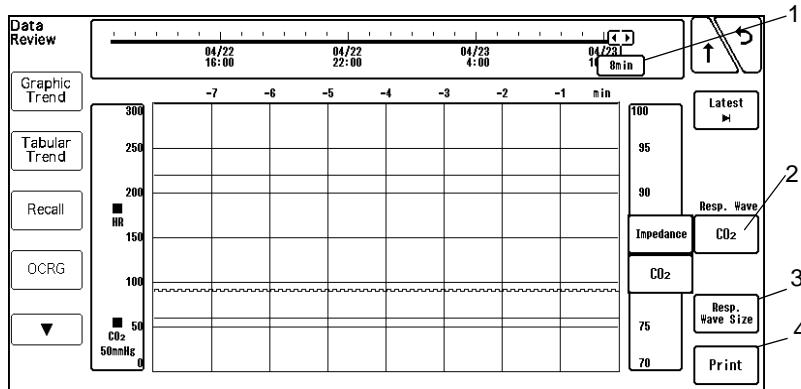
This section explains about the OCRG display.

On the OCRG display, compressed respiration waveform, HR trend and SpO₂ trend are displayed simultaneously. The trend scale is fixed as follows.

- ♦ HR: 0 to 300bpm
- ♦ SpO₂: 70 to 100%

1 Press the [Menu], [OCRG] ("Data Review") keys.

► OCRG screen will be displayed.



1 Display Time

Select from [8min]/[16min].

2 Respiration Waveform

Select from [Impedance]/[CO₂].

3 Respiration Waveform Size

Select the waveform size for the respiration compressed waveform.



| Respiration Waveform | Size/Scale |
|----------------------|---|
| Impedance RESP | [x1/4]/[x1/2]/[x1]/[x2]/[x4] |
| CO ₂ | [50]/[100] (unit : mmHg) [4]/[8]/[10] (unit: % or kPa) |

4 Printing

The currently displayed trend and compressed waveform on the OCRG screen will be printed.

Alarm History

This section explains the alarm history function and printing procedure.

The alarm generation of numeric data, arrhythmia, equipment status and change in alarm settings can be stored as alarm history. Maximum of 1599 data can be stored.

NOTE

- When the alarm history exceeds 1600 data, the data will be deleted from the oldest one.

Alarm History Setup

- Press the [Menu], [Alarm History] ("Data Review") keys.

► The alarm history screen will be displayed.

The screenshot shows the 'Data Review' screen with the title 'Alarm History'. The main area displays a table of alarm events with columns for Time, Code, Factor, sec., and M. The table data is as follows:

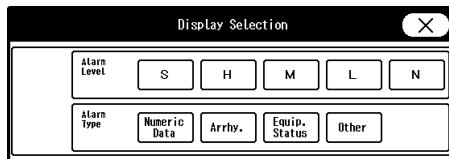
| Time | Code | Factor | sec. | M |
|----------------|------|------------|-----------|------|
| 08/12 19:16:00 | 00E9 | High PEAK | 1 > 2 | 20 M |
| 19:15:00 | 00E8 | High MAC | 0,1 > 0,2 | 20 M |
| 19:14:00 | 00E7 | High M20-I | 0 > 0 | 20 M |
| 19:13:00 | 00E6 | High M20-E | 0 > 0 | 20 M |
| 19:12:00 | 00E5 | High O2-I | 0 > 0 | 20 M |
| 19:11:00 | 00E4 | High O2-E | 0 > 0 | 20 M |
| 19:10:00 | 00E3 | High DES-I | 0,1 > 0,2 | 20 M |
| 19:09:00 | 00E2 | High DES-E | 0,1 > 0,2 | 20 M |
| 19:08:00 | 00E1 | High SEV-I | 0,1 > 0,2 | 20 M |
| 19:07:00 | 00E0 | High SEV-E | 0,1 > 0,2 | 20 M |
| 19:06:00 | 00F | High ENF-I | 0,1 > 0,2 | 20 M |
| 19:05:00 | 00E | High ENF-E | 0,1 > 0,2 | 20 M |

On the right side of the screen, there are three buttons labeled 3, 2, and 4, each pointing to a specific button: 'Latest', 'Display Selection', and 'Print' respectively.

- Select the items to be displayed on the alarm history.

- Press the [Display Selection] key.

► The "Alarm Level", "Alarm Type" selection window will be displayed.



- Select the alarm level to be displayed.

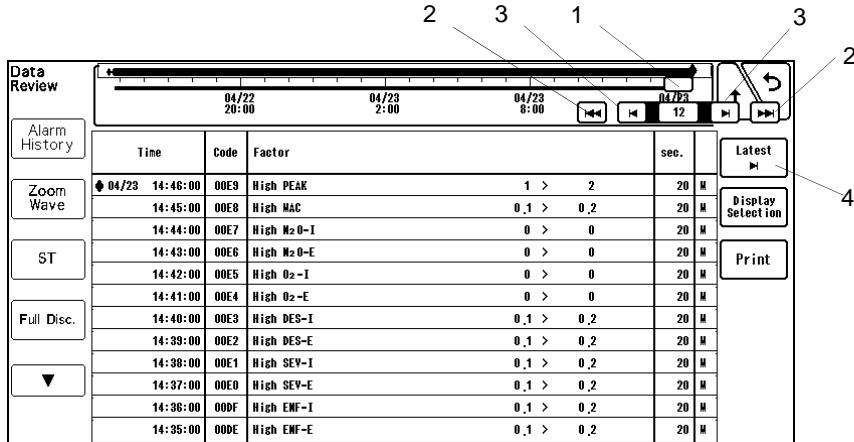
The selected item will be displayed in blue.

- Select the alarm type to be displayed.

The selected item will be displayed in blue.

3

Switch the displayed data on the alarm history screen.

**1** Scroll the slider left and right.

▶ Right: Scrolls to the newer data.

▶ Left: Scrolls to the older data.

2 Press the [◀] / [▶] keys.

▶ The data will switch by page.

3 Press the [◀] / [▶] keys.

▶ The data will switch by half page.

4 Press **Latest**.

▶ The latest data will be displayed.

4

Press the [Print] key.

▶ The currently displayed alarm history will be printed.

Description for Each Item

The descriptions of each item are as follows.

| Item | Details |
|-----------------|---|
| Time | The alarm generated time or alarm setting changed time will be displayed. |
| Code | The code related to alarm generation or alarm setting change will be displayed in hexadecimal. |
| Factor | <p>The factor for alarm generation and alarm setting change will be displayed.</p> <p>In case of numeric data/arrhythmia alarm, the numeric data and alarm setting at alarm generation will be also displayed.</p> <p>In case of equipment status alarm, a detailed code may be also displayed.</p> <p>In case of alarm setting change, the changed value will be also displayed.</p> |
| Duration (sec.) | The duration of numeric data/arrhythmia/equipment status alarm generation, alarm suspend, monitor suspend, night mode will be displayed in seconds. The maximum displayable value is 99999 sec. It will not be displayed for the alarm setting change. |

Print Output Example

| BED-013 2011/06/16 20:47 FUKUDA DENSHI ID:12841 | | | SEX: AGE:39 ADULT | ALARM HISTORY 1/2 |
|---|------|-------------------------------|-------------------|-------------------|
| TIME | CODE | FACTOR | DURA. | |
| 11/06/16 20:46:49 | 2091 | Printer Busy | 5 | N |
| 11/06/16 20:46:43 | 2091 | Printer Busy | 5 | N |
| 11/06/16 20:46:05 | 4001 | Alarm Suspend | 119 | |
| 11/06/16 20:46:05 | 3A00 | Tachy Setting Changed | 120 | |
| 11/06/16 20:46:05 | 3203 | RR (GAS) Lower Limit Changed | 5 | |
| 11/06/16 20:46:05 | 3202 | RR (VENT) Lower Limit Changed | 5 | |
| 11/06/16 20:46:05 | 320E | RR (IMP) Lower Limit Changed | 5 | |
| 11/06/16 20:46:05 | 3003 | RR (GAS) Upper Limit Changed | 30 | |
| 11/06/16 20:46:05 | 3002 | RR (VENT) Upper Limit Changed | 30 | |
| 11/06/16 20:46:05 | 300F | Apnea Upper Limit Changed | 15 | |
| 11/06/16 20:46:05 | 300E | RR (IMP) Upper Limit Changed | 30 | |
| 11/06/16 20:46:05 | 3001 | HR Upper Limit Changed | 120 | |
| SH11/06/16 20:46:04 | 4003 | Discharge | | |
| BED-013 2011/06/16 20:47 FUKUDA DENSHI ID:12841 | | | SEX: AGE:39 ADULT | ALARM HISTORY 2/2 |
| TIME | CODE | FACTOR | DURA. | |
| 11/06/16 20:45:15 | 3A00 | Tachy Setting Changed | 190 | |
| 11/06/16 20:45:15 | 3001 | HR Upper Limit Changed | 190 | |
| 11/06/16 20:45:12 | 0800 | TACHY | 60 > 50 | 3 H |
| 11/06/16 20:45:12 | 0001 | Upper HR | 60 > 50 | 3 H |
| 11/06/16 20:45:09 | 3A00 | Tachy Setting Changed | 50 | |

OP050-01TD LOT No. 4920  FUKUDA DENSHI CO., LTD.

ST Measurement

This section explains about the ST measurement and ST alarm function.

To Display/Print the ST Measurement

On the ST display, ECG for the selected time duration (10 sec./1 min./5 min./10 min.) will be displayed overlapped in 1 block.

If 3-lead cable is used, maximum of 8 hours of ST waveform will be displayed.

NOTE

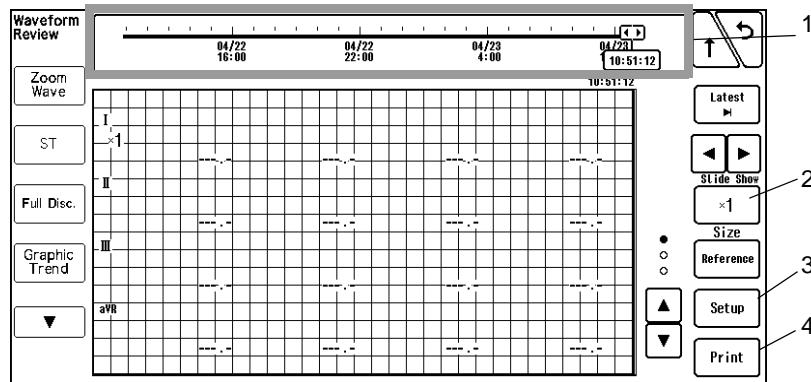
- ♦ If 3-lead cable is used, the measurement will be performed for only the displayed leads.
- ♦ For the following case, ST level will not be displayed.
 - ♦ When learning arrhythmia.
 - ♦ When the lead is off.
 - ♦ When the reference waveform is not set.
 - ♦ When "N" or "S" is not detected for QRS within 30 seconds.

1

Press the [Menu], [ST] ("Waveform Review") key.

Or, press the [ST] key on the user key area.

► ST screen will be displayed.



1 Select the displaying time.

/: The latest time of the ST waveform will be displayed by sliding it left/right and releasing it.

/: The display will change by one page.

: The latest data will be displayed.

2 Select the waveform size for the overlapped waveform.

Select from [x1/4]/[x1/2]/[x1]/[x2]/[x4]. The same waveform size will be applied to all the leads. The selected size will not be applied to the ECG waveform on the home display.

3 Change the time for the displayed block.

The "Setup" window will be displayed and "Slide Show" (1 sec./5 sec./10 sec./20 sec./30 sec.) can be selected.

REFERENCE

- When 3-lead cable is used, 36 blocks of ST waveform will be displayed. When 4, 5, 10-electrode cable is used, 3 blocks of ST waveform for each lead will be displayed.
- The duration of each block can be selected from [10 sec.]/[1 min.]/[5 min.]/[10 min.]. For the selections other than [10 sec.], the overlap waveform for the selected duration will be displayed.

4 Printing

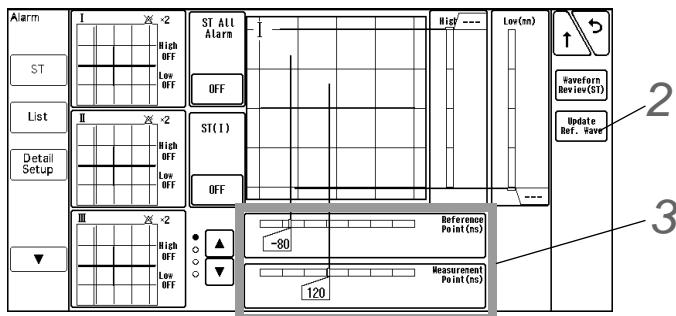
The currently displayed ST waveform will be printed.

Reference Waveform Setup

The ST reference waveform will be automatically set after learning the arrhythmia.
The reference waveform can be updated manually.

- 1** Press the [Menu], [ST] ("Alarm") key.

► The ST alarm setup screen will be displayed.



- 2** Update the ST reference waveform.

CAUTION

- If the lead is off, the reference waveform cannot be set. Check if the electrode is properly attached, and perform the setup again.

- 1** Press the [Update Ref. Wave] key.

- 16 beats average of the ECG judged as normal QRS by arrhythmia analysis will be set as the reference waveform.
► While updating the reference waveform, the [Update Ref. Wave] key will be displayed in blue.
► The updated time of the reference waveform will be displayed.

NOTE

- While learning arrhythmia, or if VPC is present, it will take more than 16 beats to set the reference waveform.
- When the number of electrode is changed, the reference waveform will be automatically updated.
- In case such as when the patient is discharged, the reference waveform will be automatically set.

- 3** Set the reference point and measurement point.

- 1** Slide the for reference point left and right.
2 Slide the for measurement point left and right.

NOTE

- Set the reference point in the range of -240 to 0ms in increments of 10ms from the peak of QRS to the P wave direction.
- Set the measurement point in the range of 0 to 560ms in increments of 10ms from the

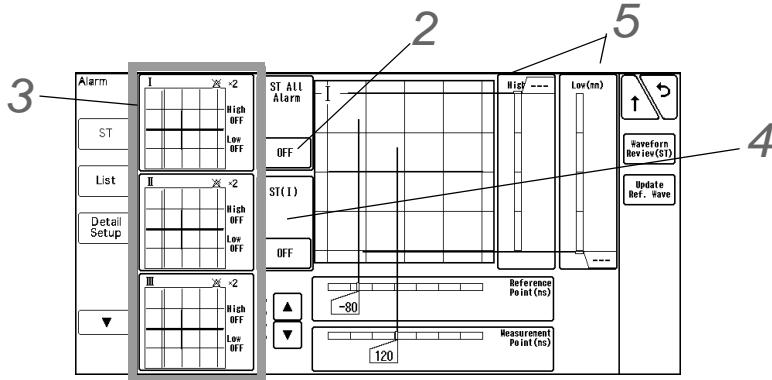
peak of QRS to the T wave direction.

ST Alarm Setup

Set the ST upper limit and lower limit for the reference waveform.

- 1 Press the [Menu], [ST] ("Alarm") key.

► The ST alarm setup screen will be displayed.



- 2 Select [ON]/[OFF] for "ST All Alarm".

► [OFF]: Alarms will not generate even if the alarm for each lead is set to ON.

- 3 Select the lead to set the alarm limit.

► The selected lead will be displayed large at the right.

- 4 Select [ON]/[OFF] of alarm for the selected lead.

- 5 Set the upper and lower alarm limit.

(☞ "Alarm Limit Setup for Each Parameter" P6-10)

NOTE

- Set the upper limit in the range from -18mm to +20mm/-1.8mV to +2.0mV. If a value above +20mm/+2.0mV is set, the upper alarm will turn OFF.
- Set the lower limit in the range from - 20mm to +18mm/ - 2.0mV to +1.8mV. If a value below -20mm/-2.0mV is set, the lower alarm will turn OFF.

REFERENCE

- The upper and lower limit can be set in 1mm / 0.1mV increment.

12-Lead Analysis

This section explains about the 12-lead analysis function. By using the 10-electrode cable, 12-lead ECG can be displayed, analyzed, stored, and printed. Maximum of 10 analyzed results can be stored.



WARNING

- The 12-Lead ECG analysis function is designed to acquire and interpret ECG data from a resting, supine patient. If ECG signals from moving or shaking patients are acquired, erroneous 12-lead interpretation result may occur. Always ensure that the patient is kept motionless during 12-lead ECG signal acquisition and analysis.
- The 12-lead ECG analysis is intended for use with adult and pediatric patients.
- All computerized ECG analysis results should be reviewed by a physician before making decision for the patient treatment.



CAUTION

- Interpretation and Minnesota codes given by this equipment do not instruct the physician as to the kind and degree of cardiac disease. Accordingly, four value judgements are given for ECG waveform and although "abnormal" indicates a large possibility of organic cardiac disease, there are cases where no cardiac disease exists despite an abnormal ECG (that is, an abnormal ECG may be caused by something other than heart).
On the other hand, care should be taken in the event any preclinical coronary arteriosclerosis could be present despite a normal ECG interpretation.
Therefore, for a proper diagnosis, the ECG should be integrated with other interpretations.
- ECG Recording by the Mason-Likar System
The 12-lead ECG recorded with the torso placement of the limb leads (Mason-Likar 12-lead system) may differ from the standard 12-lead ECG. Moreover, waveforms may differ somewhat also in a supine position and a standing position (sitting position).
Fukuda Denshi recommends to carry out the recording of the ECG by taking into consideration the waveform differences according to electrode positions or postures.
- About the ECG analysis program
The ECG analysis program is intended to analyze the standard 12-lead ECG waveforms. Therefore, the analyzed result for waveforms recorded with the torso placement of the limb leads (Mason-Likar 12-lead system) may differ from that of the standard 12-lead ECG waveforms.
- Select "Used" for the pacemaker setting on the patient admit/discharge menu if a patient has a pacemaker.
- The threshold values for classification of 12-lead ECG interpretation and Minnesota code are set by age and sex as follows:
 1. Male and Female of ages 19 years old and above
 2. Male of age 12 through 18 years old
 3. Female of age 12 through 18 years old
 4. Male and Female of ages 3 through 11 years old
 5. Male and Female of ages below 2 years old
- If no patient information (i.e. Default : "Class." [Adult], "Sex": undetermined, and "Age" [0]) has been entered, the system algorithm will handle the patient as a "35 years old male".
- Before the analysis, make sure the patient classification ([Adult] / [Child]) is properly selected. If [Neonate] is selected, the 12-lead ECG analysis will not function.
- Enter the age of patient if known. If no age information (i.e. Default: [0]) has been entered, the system algorithm will handle the patient as "35 years old".
- Enter the sex of patient if known. If no sex information (i.e. Default: undetermined) has been entered, the system algorithm will handle the patient as "Male".

- If the patient classification is set as [Child] and no age (i.e. Default: [0]) has been entered, the system algorithm will handle the patient as "less than 2 years old."

NOTE

- Electrode Placement for 12-Lead ECG Analysis

When acquiring 12-lead ECG signals, Fukuda Denshi recommends placing the limb electrodes anywhere along the arms and legs. (☞ "Electrode Placement" P7-2)

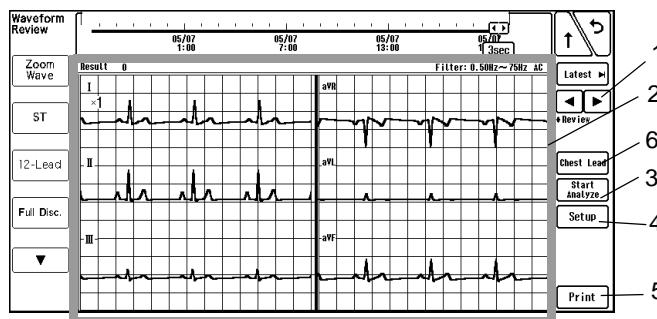
However if it is difficult, use the Mason-Likar 12-lead system. To reduce the waveform differences from the standard 12-lead, Fukuda Denshi recommends that the torso placement of the RA and LA electrodes be near as possible to each arm, in the infraclavicular fossae, within the area unaffected by myoelectricity.)

12-Lead ECG Display

1

Press the [Menu], [12-Lead] ("Waveform Review") key.

► The 12-lead screen will be displayed.

**1 Analyzed Result Display**

- The analyzed result can be displayed.
(☞ "12-Lead Analyzed Result Display of the Past Data" P8-31)

2 The real-time waveforms are displayed.

- The 12-lead analysis will be performed based on the displayed waveforms.

REFERENCE

- Pacemaker pulse will not be displayed on the 12-lead analysis screen.
- Pacemaker pulse will not be displayed on the 12-lead analysis screen even if [ON] is selected for "Pacemaker Pulse".
- For DS-8200, chest lead waveform and limb lead waveform will be displayed on 2 screens.

3 Start Analyze

- The 12-lead analysis will start.
(☞ "12-Lead ECG Analysis" P8-29)

REFERENCE

- If a lead cable other than 10-electrode is used, [Start Analyze] will not be displayed regardless of the patient classification. When the patient classification is [Neonate], [Start Analyze] will not be displayed. (12-lead analysis function is not available.)

- If the HS-8000 is not connected or if the HS-8000 software version is V01, [Start Analyze] will not be displayed. (12-lead analysis function is not available.)

4 Setup

- ▶ The setup screen will be displayed.
- ▶ On the setup screen, 12-lead waveform size, filter, ECG Analysis can be set.
(☞ "12-Lead Analysis Setup" P8-27)

5 Print

- ▶ The currently displayed waveform can be printed.
- ▶ The output printer can be selected from [Built-in]/[Laser]. (Menu>Manual Printing (Basic Setup)>Graphic Printing (Other Setup)>Printer Sel.>12-Lead Waveform)
(☞ "Manual Printing (Other Setup)" P9-4)

6 Chest Lead/Limb Lead

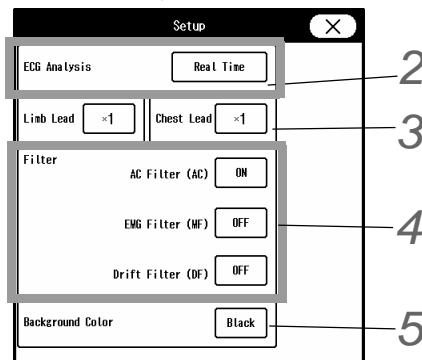
REFERENCE

- For DS-8200, chest lead waveform and limb lead waveform will be displayed on 2 screens.

12-Lead Analysis Setup

1 Press the [Menu], [12-Lead] ("Waveform Review"), [Setup] key.

- ▶ The 12-lead analysis setup screen will be displayed.



2 ECG Analysis

- ▶ The timing to read the waveform for ECG analysis can be set.
 - [Real Time]
The waveform of 10 seconds after the [Start Analyze] key is pressed will be analyzed.
 - [Review]
The waveform of 10 seconds before the [Start Analyze] key is pressed will be analyzed.

3 Waveform Size

- ▶ The waveform size for the real-time waveform displayed on the 12-lead screen can be set.
 - Limb Lead
The waveform size for the limb lead can be changed.
 - Chest Lead

The waveform size for the chest lead can be changed.

4 Filter

► The setup for the AC Filter, EMG Filter, Drift Filter can be set.

- ♦ AC Filter
If AC noise is present, select [ON]/[OFF] for "AC Filter".
If [ON] is selected, cut-off frequency will be 75Hz.
- ♦ EMG Filter
If EMG noise is present, select [Strong (25Hz)]/[Weak (35Hz)]/[OFF] for "EMG Filter".
- ♦ Drift Filter
If base line drift is present, select [Strong (0.50Hz)]/[Weak (0.25Hz)]/[OFF] for "Drift Filter".

CAUTION

- ♦ Time constant (low frequency response) for the 12-lead display depends on the "Drift Filter" setting.
 - ♦ A baseline or notch will be generated on the ECG waveform (display, print, recall) during the filter setting (up to about 2.4 seconds).
-

5 Background Color

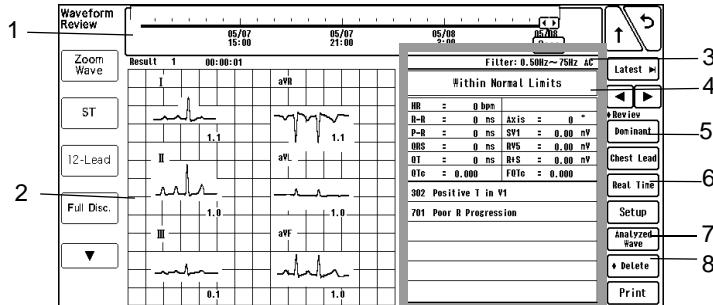
► The background color for the 12-lead display can be set.

- ♦ [White]
Similar display with the electrocardiograph.
Background Color: White
Grid Color: Orange
Waveform Color: Black (Fixed)
- ♦ [Black]
Conventional color
Background Color: Black
Grid Color: Gray
Waveform Color: Green (Fixed)

12-Lead ECG Analysis

Press the [Menu], [12-Lead] ("Waveform Review"), [Start Analyze] key.

- ▶ When the analysis completes, the analyzed result will be displayed.
On the analyzed result screen, dominant waveform and analyzed result will be displayed.
- ▶ Abnormal region will be indicated by highlight display.



1 Analyzed Time

- ▶ The analyzed time will be displayed.

REFERENCE

- ◆ During the analysis, [Start Analyze] key will change to [In Progress].
The analysis can be suspended by pressing the [In Progress] key.

2 Dominant Waveform

- ▶ The reference waveform used for the analysis will be displayed.
- ▶ Pressing the [Dominant] key will display the dominant waveform screen.

NOTE

- ◆ For the DS-8200, the dominant waveform display can be switched by pressing the [Chest Lead]/[Limb Lead] keys.
- ◆ For DS-8200, rhythm waveform will not be displayed.
Press the [Analyzed Wave] key to view the analyzed waveform.

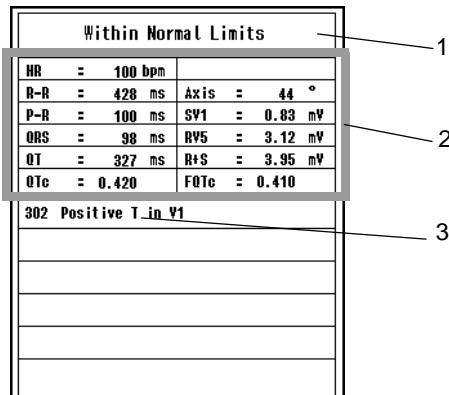
3 Filter Information

- ▶ The filter used for analysis will be displayed.

4 Analyzed Result

- ▶ For the analyzed result, overall judgment, numeric data, finding will be displayed.

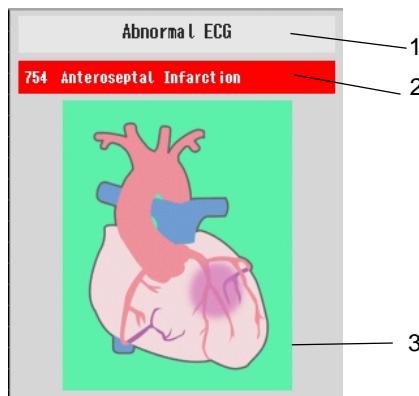
- When the dominant waveform is displayed, pressing the [Numeric] key will display the analyzed result.



- Overall Judgement: The highest grade judgement will be displayed.
- Numeric Data: Main numeric data used for ECG analysis will be displayed.
The abnormal numeric data with the highest grade finding will be highlighted in red.
- Finding: The findings by the ECG analysis will be displayed. These will be classified by colors according to the grade specified for each finding.
Grade 6: Red
Grade 4: Blue
Grade 2, 0: Black
The highest grade finding will be highlighted in color specified for each abnormality level.

5 Panorama Display

- Pressing the [Dominant] key will display the [Panorama] key.
- By pressing the [Panorama] key, overall judgment, finding, abnormal site will be indicated by heart illustration.



- During the panorama display, [Panorama] key will change to [Numeric].
By pressing the [Numeric] key, the analyzed result display will change to numeric data format.

- Overall Judgement: The highest grade judgement will be displayed.
- Finding: The ECG analysis finding of highest grade will be displayed.
- Abnormal Site: The finding indicated at 2 will be displayed by a heart illustration.

6 Analyze Real Time Waveform

- (☞ "To Analyze the Real Time Waveform" P8-31)

7 Analyzed Waveform

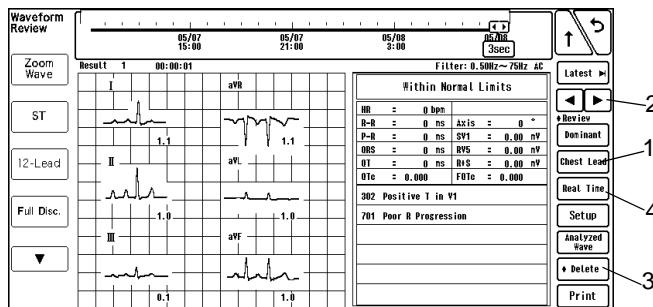
- (☞ "To Display the Analyzed Waveform" P8-31)

8 Delete Analyzed Result

- (☞ "To Delete the Analyzed Result" P8-31)

To Display the Analyzed Waveform

- 1 Press the [Analyzed Wave] key on the analyzed result screen.



- 1 [Chest Lead]: Chest lead (V1 to V6 lead) waveform will be displayed.
[Limb Lead]: Limb lead (I to aVF lead) waveform will be displayed.
- 2 The analyzed waveform can be scrolled by 2 seconds using the / key above "Review".

To Delete the Analyzed Result

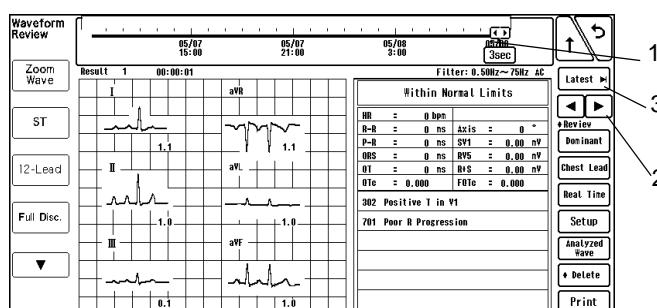
- 3 Press the [Delete] then [Delete OK] key to delete the displayed analyzed result.
[Cancel] will cancel the delete process.

To Analyze the Real Time Waveform

- 4 Press the [Real Time] key to return to the 12-lead analyzed result screen.
Press the [Start Analyze] key on the 12-lead analyzed result screen.

12-Lead Analyzed Result Display of the Past Data

- 1 On the 12-lead screen, scroll on the slide bar, or press the / key for "Review".
▶ Maximum of 10 analyzed results can be displayed.



- 1 Scroll the slider left and right.
Right: Scrolls to the newer data.
Left: Scrolls to the older data.
- 2 Press the / key for "Review".
The data will be displayed one by one.
- 3 Press the [Latest] key.
The latest data will be displayed.

12-Lead Analyzed Result Output Example

Press the [Print] key on the analyzed result screen or analyzed waveform screen.

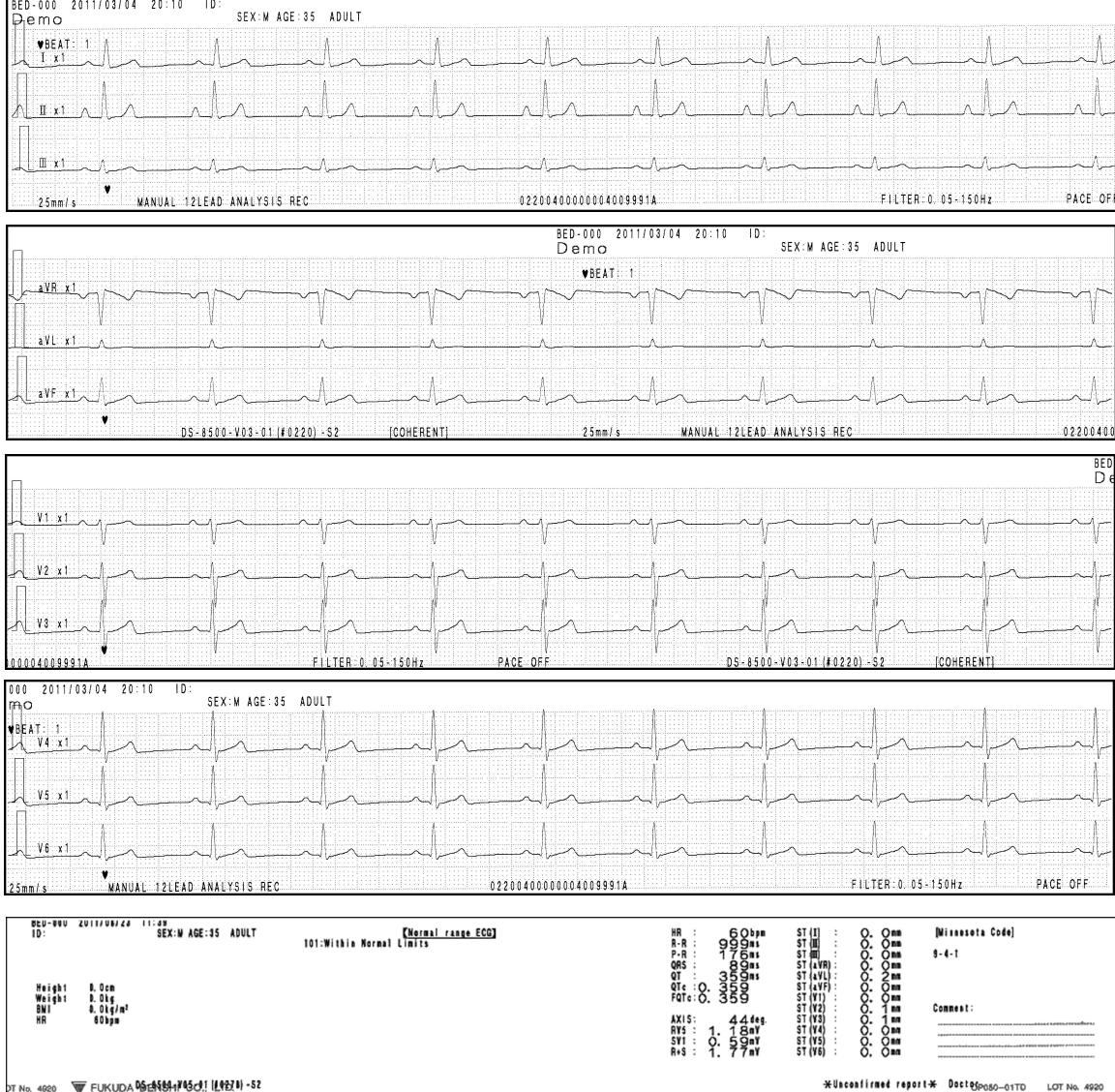
There are following types of analyzed result printing.

| Displayed key when [Print] key is pressed | Printer Selection for Manual Printing >Graphic Printing | | Key Display | Note |
|---|--|----------|-------------|--|
| Waveform Report | 12-Lead Waveform | Built-in | Yes | 12 lead waveform printing Prints the analyzed waveform. |
| | | Laser | Yes | |
| Panorama Report | 12-Lead Analysis Result | Built-in | No | Panorama Report Displayed only when [Laser] is set as the printer for graphic printing. |
| | | Laser | Yes | |
| Analyzed Report | 12-Lead Analysis Result | Built-in | Yes | Analyzed result printing Prints the waveform and analyzed result. |
| | | Laser | Yes | |

□ Output Example of Built-in Recorder

- When [Built-in] is set for the "12-Lead Waveform" (Menu>Manual Printing>Graphic Printing), pressing [Print] will display [Waveform Report]/[Analyzed Report] keys.

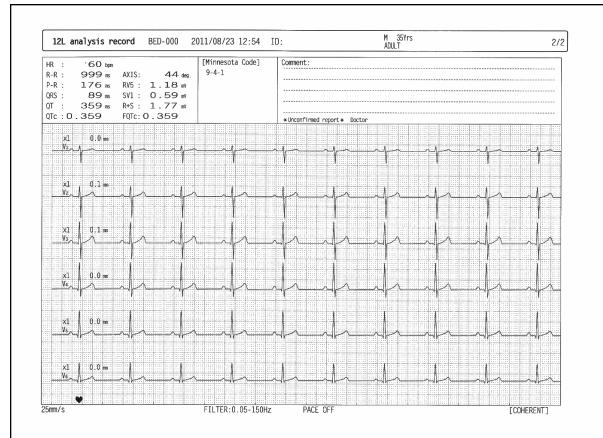
- The following is the output example when [Analyzed Report] key is pressed.



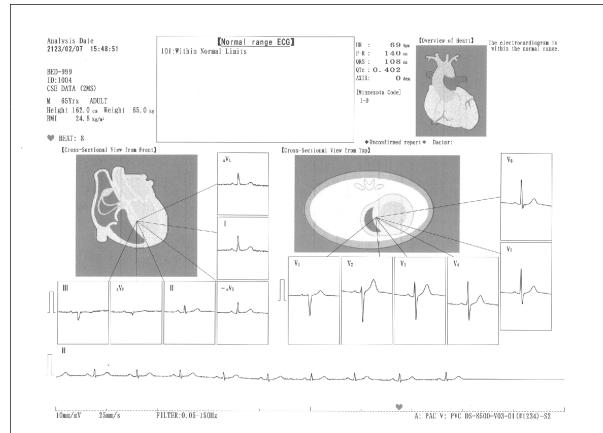
- When [Waveform Report] is pressed, the analyzed waveform will be output in a conventional format.

Output Example of Laser Printer

- When [Laser] is set for the "12-Lead Waveform", pressing [Print] will display [Waveform Report]/[Analyzed Report]/[Panorama Report] keys.
- The following is the output example when [Analyzed Report] key is pressed.



- The following is the output example when [Panorama Report] key is pressed.



NOTE

- To print out the 12-lead analysis panorama report in color, use a laser printer with LIPS IV as the page description language. If a printer with other page description language is used, the printout will be in black and white.

Full Disclosure Waveform (Optional Function)

By using the optional CF card(FCF-16GA:16GB), 48 hours of full disclosure waveform data can be stored.

Maximum of 6 waveforms can be displayed. The alarm event and time will be also stored which allows to search the waveform by each factor.

CAUTION

- ♦ Use only the specified CF card.
- ♦ Turn OFF the power before removing the CF card.
- ♦ Check that the CF card indicator is not lit in red when turning OFF the power of the main unit.
- ♦ The CF card can be used only on the unit where it was formatted.
- ♦ It will take about 5 minutes to format the full disclosure waveform card. Do not format the card during monitoring as all operation will not be possible during the format process.
- ♦ The CF card formatted for the central monitor full disclosure waveform data cannot be used on the DS-8200 System.

NOTE

- ♦ When the full disclosure waveform data exceeds the capacity of the CF card, the data will be deleted from the old one.
- ♦ To delete the full disclosure waveform data, perform the discharge procedure.
( "Discharge" P5-6)

To Format the CF Card

REFERENCE

- ♦ To store the full disclosure waveform data, it is necessary to format the CF card for the full disclosure waveform.
( Maintenance Manual "Using the CF card" P3-1)

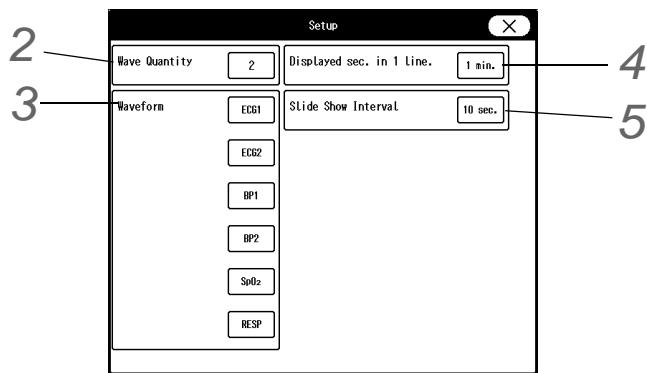
Waveform Setup

The quantity and type of storing waveform, display duration (sec.) per line for the full disclosure waveform can be preprogrammed.

1

Press the [Menu], [Full Disc.] ("Waveform Review"), [Setup] key.

- The "Setup" window for full disclosure waveform will be displayed.

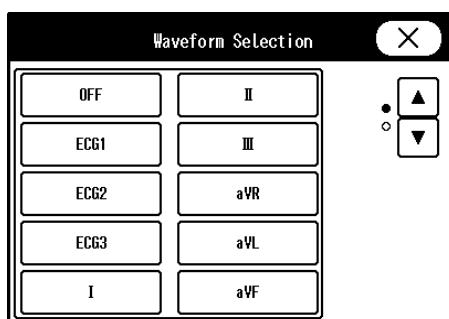


2 Set the quantity of waveforms to be displayed.

- 1 Press the key for "Wave Quantity".
- The dropdown list will be displayed.
- 2 Select from [1]/[2]/[3]/[4]/[5]/[6].

3 Select the displaying waveform.

- 1 Press the key for "Waveform".
- The "Waveform Selection" window will be displayed.



2 Select the parameter.

4 Set the display duration (sec.) per line.

- 1 Press the key for "Time per Line".
- The dropdown list will be displayed.
- 2 Select from [10 sec.]/[30 sec.]/[1 min].

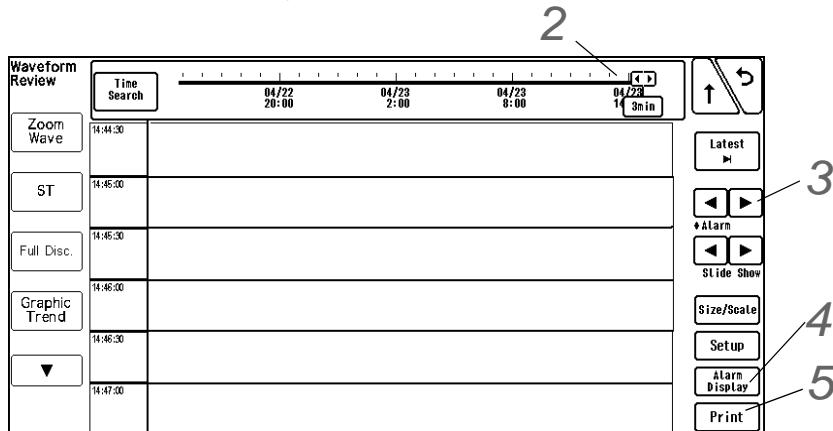
5 Set the time interval for slide show.

- 1 Press the key for "Slide Show Interval".
- The dropdown list will be displayed.
- 2 Select from [1 sec.]/[5 sec.]/[10 sec.]/[20 sec.]/[30 sec.].

Description of the Full Disclosure Waveform Display

1 Press the [Menu], [Full Disc.] ("Waveform Review") key.

- ▶ Full disclosure waveform will be displayed.



2 Scroll the displayed data.

(☞ "Alarm History Setup" P8-19)

3 Press **<**/**>** for "Alarm Review".

- ▶ The full disclosure waveform at alarm-generated point can be searched.

4 Press the [Alarm Display] key.

- ▶ The background color of the alarm-generated waveform can be changed.

5 Press the [Print] key.

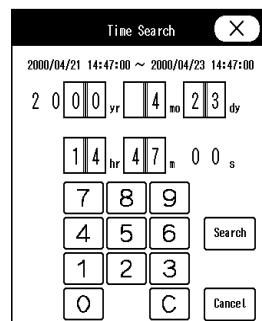
- ▶ The currently displayed waveform will be output on the printer.

To Search by Time

The full disclosure waveform of the specified time can be displayed.

1 Press the [Search] key on the full disclosure waveform display.

- ▶ The "Time Search" window will be displayed.



2

Enter the search date/time using the numeric keys and press the [Search] key.

- ▶ Searching will start.
- ▶ The searched waveform will be displayed on the full disclosure waveform display.

Hemodynamics

This section explains the procedure for hemodynamics calculation and printing.

NOTE

- If the equipment is connected to DS-LAN, and [ON] is selected for "Synchronize Hemodynamic Data with the Central Monitor", 5 latest hemodynamic data will be synchronized between this monitor and the central monitor. Other hemodynamic data will be deleted. For the 5 latest data, the hemodynamic data edited on this monitor will be also reflected on the central monitor, and vice versa.
- If the equipment is connected to DS-LAN, and [OFF] is selected for "Synchronize Hemodynamic Data with the Central Monitor", 5 latest data will be transmitted to the central monitor, but the data will not be synchronized between this monitor and the central monitor. The hemodynamic data edited on the central monitor will be deleted. The hemodynamic data edited on this monitor will be transmitted to the central monitor.

Calculation Data

| Data | Item | Formula |
|-------|--|--|
| BSA | Body Surface Area (m^2) | $h^{0.725} \times w^{0.425} \times 71.84 \times 10^{-4}$ (Dubois Formula) |
| CI | Cardiac Index (L/min/ m^2) | $\frac{CO}{BSA}$ |
| SV | Stroke Volume (mL/beat) | $\frac{CO \times 1000}{HR}$ |
| SVI | Stroke Volume Index (mL/beat/ m^2) | $\frac{SV}{BSA}$ |
| SVR | Systemic Vascular Resistance (dynes·sec·cm ⁻⁵) | $\frac{(MAP - CVP) \times 79.90}{CO}$ |
| SVRI | Systemic Vascular Resistance Index (dynes·sec·cm ⁻⁵ · m^2) | SVR \times BSA |
| PVR | Pulmonary Vascular Resistance (dyn·sec·cm ⁻⁵) | $\frac{(MPAP - PCWP) \times 79.90}{CO}$ |
| PVRI | Pulmonary Vascular Resistance Index (dyn·sec·cm ⁻⁵ · m^2) | PVR \times BSA |
| LVW | Left Ventricular Work (kg·m) | CO \times (MAP-PCWP) \times 0.0136 |
| LVWI | Left Ventricular Work Index (kg·m/ m^2) | $\frac{LVW}{BSA}$ |
| LVSW | Left Ventricular Stroke Work (g·m) | SV \times (MAP-PCWP) \times 0.0136 |
| LVSWI | Left Ventricular Stroke Work Index (g·m/ m^2) | $\frac{LVSW}{BSA}$ |
| RVW | Right Ventricular Work (kg·m) | CO \times (MPAP-CVP) \times 0.0136 |
| RVWI | Right Ventricular Work Index (kg·m/ m^2) | $\frac{RVW}{BSA}$ |
| RVSW | Right Ventricular Stroke Work (g·m) | SV \times (MPAP-CVP) \times 0.0136 |

| Data | Item | Formula |
|-------|---|--------------------|
| RVSWI | Right Ventricular Stroke Work Index (g·m/m ²) | $\frac{RVSW}{BSA}$ |

NOTE

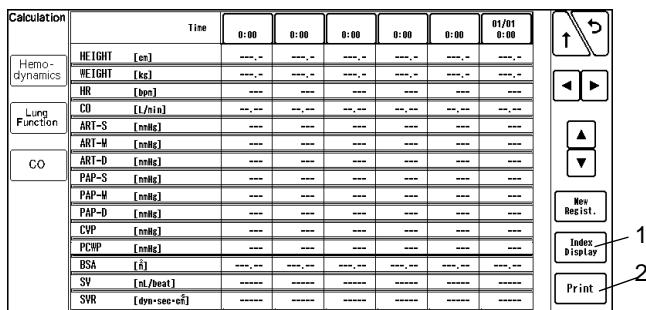
- The blood pressure unit for hemodynamics is "mmHg". If the unit is "kPa" or "cmH₂O", it will be converted to "mmHg" when calculating.

To Display/Print the Hemodynamics Data

10 hemodynamic data can be viewed in list format.

- Press the [Menu], [Hemodynamics] ("Calculation") keys.

► The hemodynamics screen will be displayed.



- [Index Disp] key

The display will alternately switch between "BSA, SV, SVR, PVR, LVW, LVS, RVW, RVS, and CI, SVI, SVRI, PVRI, LVWI, LWSWI, RVWI, RWSWI".

- [Print] key

The currently displayed hemodynamic data will be printed.

New Input of Hemodynamics Calculation

The hemodynamics calculation can be performed using the newly input data.

The data can be manually input using the numeric keys, or the current measurement data can be automatically input.

- Press the [Menu], [Hemodynamics] ("Calculation"), [New Registr.] keys.

- The "Edit" window will be displayed.

| Input Data | | HEIGHT [cm] | WEIGHT [kg] | HR [bpm] | CO [L/min] | ART-S [mmHg] | ART-M [mmHg] |
|------------|--|--------------------------------|------------------------------|-------------------------------|------------------------------------|------------------------------------|-------------------------------------|
| | | | | | | | |
| | | ART-D [mmHg] | PAP-S [mmHg] | PAP-M [mmHg] | PAP-D [mmHg] | CVP [mmHg] | PCP [mmHg] |
| | | | | | | | |
| | | BSA [m ²] | CI [L/min/㎡] | SV [ml/beat] | SVR [dyn·sec·cm ⁻⁵] | PVR [dyn·sec·cm ⁻⁵] | PVRI [dyn·sec·cm ⁻⁵] |
| | | | | | | | |
| | | LWH [kg·m ⁻² /s] | LVS# [g·m ⁻¹] | LVSII [g·m ⁻¹] | RW# [kg·m ⁻¹] | RWII [kg·m ⁻¹] | RVS# [g·m ⁻¹] |
| | | | | | | | |
| | | | | | | | |

Latest Data 2 3 Register Cancel

REFERENCE

- The current time will be displayed at the upper area.
- Unmeasured data will be left blank.

2 Enter the calculation data.

- 1 Press the [Latest] key.

- The measured data will be displayed.

To Edit the Data:

- 2 Select the data to edit.

- The numeric keys will be displayed.

- 3 Enter the value using the numeric keys.

- 4 Press the [Input] key.

- The edited data will be displayed in blue.

NOTE

- If the height, weight, BSA is changed on the "Admit/Discharge" screen, average CI will be recalculated. However, the hemodynamic result will not be recalculated with the new average CI.

Input Data

| Data | Item (Unit) | Editing Range |
|--------|---|-----------------------------|
| HEIGHT | Height (cm) | 0 to 300cm |
| WEIGHT | Weight (kg) | 0 to 350kg |
| BSA | Body Surface Area (m ²) | 0 to 9.99m ² |
| CO | Cardiac Output (L/min) | 0.00 to 20.00L/min |
| HR | Heart Rate (bpm) | 0 to 350bpm |
| ART S | Systolic Arterial Pressure (mmHg / kPa) | 0 to 350mmHg / 0 to 46.6kPa |
| ART M | Mean Arterial Pressure (mmHg / kPa) | 0 to 350mmHg / 0 to 46.6kPa |
| ART D | Diastolic Arterial Pressure (mmHg / kPa) | 0 to 350mmHg / 0 to 46.6kPa |
| PAP S | Systolic Pulmonary Artery Pressure (mmHg / kPa) | 0 to 100mmHg / 0 to 13.3kPa |

Input Data

| Data | Item (Unit) | Editing Range |
|-------|--|-----------------------------|
| PAP M | Mean Pulmonary Artery Pressure (mmHg / kPa) | 0 to 100mmHg / 0 to 13.3kPa |
| PAP D | Diastolic Pulmonary Artery Pressure (mmHg / kPa) | 0 to 100mmHg / 0 to 13.3kPa |
| CVP | Central Venous Pressure (mmHg / kPa) | 0 to 100mmHg / 0 to 13.3kPa |
| PCWP | Pulmonary Capillary Wedge Pressure(mmHg / kPa) | 0 to 100mmHg / 0 to 13.3kPa |

3 Press the [Regist.]/[Cancel] key.

- ▶ [Regist]: The calculation will be performed using the newly input data, and the input data and calculation result will be registered on the list.
- ▶ [Cancel]: The input data will be deleted.

REFERENCE

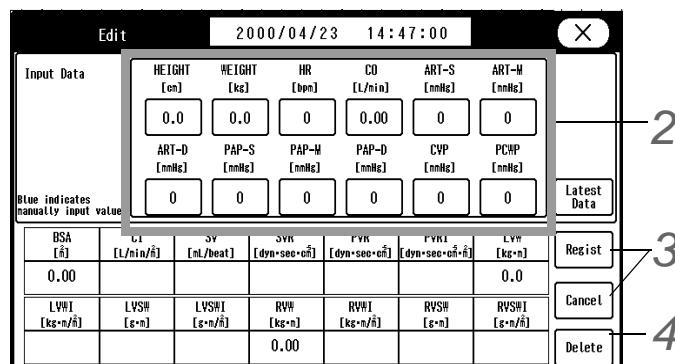
- ♦ The calculation result will not be displayed if sufficient data is not input.
- ♦ Maximum of 10 data can be registered. If exceeded, the oldest data will be deleted.
- ♦ The edited data will be also displayed in blue on the list.

To Edit the Hemodynamics Input Data

The input data which has been already calculated can be edited or deleted.

1 Press the [Menu], [Hemodynamics] ("Calculation"), and then the date/time display area for the data to edit.

- ▶ The "Edit" window will be displayed.



2 Edit the data.
(☞ "New Input of Hemodynamics Calculation" P8-39)

3 Register the edited data.
(☞ "New Input of Hemodynamics Calculation" P8-39)

4 Delete the data.

- 1 Press the [Delete] key.
► The "Delete" window will be displayed.
- 2 Press the [YES] key.

Lung Function

This section explains the procedure for lung function calculation and printing.

Calculation Data

| Data | Item | Formula |
|--------------------------------|--|---|
| BSA | Body Surface Area (m ²) | $h^{0.725} \times w^{0.425} \times 71.84 \times 10^{-4}$ |
| CaO ₂ | Arterial Oxygen Content (mL/dL) | $CaO_2 = 1.34 \times Hb \times SaO_2 + 0.003 \times PaO_2$ |
| CvO ₂ | Mixed Venous Oxygen Content (mL/dL) | $CvO_2 = 1.34 \times Hb \times CvO_2 + 0.003 \times PvO_2$ |
| a-vDO ₂ | Arteriovenous Oxygen Content Difference (vol %) | $a-vDO_2 = CaO_2 - CvO_2$ |
| DO ₂ | Oxygen Transport(mL/min) | $DO_2 = CaO_2 \times CO \times 10$ |
| DO ₂ I | Oxygen Transport Index(mL/min/m ²) | $DO_2I = CaO_2 \times Cl \times 10$ |
| VO ₂ | Oxygen Consumption(mL/min) | $VO_2 = a-vDO_2 \times CO \times 10$ |
| VO ₂ I | Oxygen Consumption Index(mL/min/m ²) | $VO_2I = a-vDO_2 \times Cl \times 10$ |
| O ₂ ER | Oxygen Extraction Rate (%) | $O_2ER = (CaO_2 - CvO_2) / CaO_2 \times 100$ |
| AaDO ₂ | Alveolar-Arterial Oxygen Difference (Torr) | $AaDO_2 = PAO_2 - PaO_2$ $PAO_2 = PI_O_2 - (PA CO_2 / R) \times (1 - F_I O_2 \times (1 - R))$ R:Respiration Quotient (0.8 for this equipment) $PI_O_2 = (P_B - 47) \times F_I O_2$ |
| Q _s /Q _t | Shunt Rate (%) | $\dot{Q}_s / \dot{Q}_t = (CcO_2 - CaO_2) / (CcO_2 - CvO_2)$ $CcO_2 = 1.34 \times Hb + 0.003 \times PAO_2$ |

REFERENCE

- The blood pressure unit for lung function calculation is "mmHg". If the unit is other than "mmHg", it will be converted to "mmHg" when calculating.

To Display/Print the Lung Function Data

256 lung function data can be viewed in list format.

- 1** Press the [Menu], [Lung Function] ("Calculation") keys.

► The lung function list will be displayed.

- 1** [Index Disp] key

The display of BSA, CaO₂, CvO₂, a-vDO₂, DO₂, VO₂, O₂ER, AaDO₂, Qs/Qt will alternately switch with that of CI, DO₂I, VO₂I.

- 2** [Print] key

The currently displayed lung function data will be printed.

New Input of Lung Function Calculation

The lung function calculation can be performed using the newly input data.

The data can be manually input using the numeric keys, or the current measurement data can be automatically input.

- 1** Press the [Menu], [Lung Function] ("Calculation"), [New Regist.] keys.

► The "Edit" window will be displayed.

- 2** Enter the calculation data.

- 1** Press the [Latest] key.

► The input data for HEIGHT, WEIGHT, and measured data for CO will be displayed.

To Edit the Data:

- 2** Select the data to edit.

- ▶ The numeric keys will be displayed.

3 Enter the value using the numeric keys.

4 Press the [Input] key.

- ▶ The edited data will be displayed in blue.

NOTE

- ♦ If the height, weight, BSA is changed on the "Admit/Discharge" screen, average CI will be recalculated. However, the lung function result will not be recalculated with the new average CI.

Input Data

| Data | Item (Unit) |
|-------------------|---|
| HEIGHT | Height (cm) |
| WEIGHT | Weight (kg) |
| BSA | Body Surface Area (m ²) |
| CO | Cardiac Output (L/min) |
| FIO ₂ | Fraction of Inspiratory Oxygen(%) |
| P _B | Atmospheric Pressure (mmHg) |
| PaCO ₂ | Partial Pressure of Arterial Carbon Dioxide(mmHg) |
| Hb | Hemoglobin Concentration (g/dL) |
| PaO ₂ | Partial Pressure of Arterial Oxygen(mmHg) |
| SaO ₂ | Arterial Oxygen Saturation(%) |
| PvO ₂ | Partial Pressure of Mixed Venous Oxygen (mmHg) |
| SvO ₂ | Mixed Venous Oxygen Saturation(%) |

3 Press the [Regist.]/[Cancel] key.

- ▶ [Regist]:The calculation will be performed using the newly input data, and the input data and calculation result will be registered on the list.
- ▶ [Cancel]: The input data will be deleted.

REFERENCE

- ♦ The calculation result will not be displayed if sufficient data is not input.
- ♦ Maximum of 256 data can be registered. If exceeded, the oldest data will be deleted.
- ♦ The edited data will be also displayed in blue on the list.

To Edit the Lung Function Input Data

The input data which has been already calculated can be edited or deleted.

- 1** Press the [Menu], [Lung Function] ("Calculation"), and then the date/time display area for the data to edit.

► The "Edit" window will be displayed.

| Input Data | | | | | |
|----------------|----------------------------|-------------------------|----------------------------|-------------------------|-----------------------------|
| HEIGHT [cm] | WEIGHT [kg] | CO [L/min] | FiO ₂ [%] | Pb [mmHg] | PaCO ₂ [mmHg] |
| 0.0 | 0.0 | 0.00 | 0 | 0 | 0 |
| Hb [g/dL] | PaO ₂ [mmHg] | SaO ₂ [%] | PvO ₂ [mmHg] | SvO ₂ [%] | |
| 0.0 | 0 | 0 | 0 | 0 | |

Blue indicates manually input value.

| BSA [m ²] | CaO ₂ [ml/dL] | CvO ₂ [ml/dL] | d-vvO ₂ [wt%] | VO ₂ [ml/min] | VO ₂ I [ml/min/Δ] | VO ₂ |
|---|-----------------------------|-----------------------------|-----------------------------|-----------------------------|---------------------------------|-----------------|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | 0.00 |
| V _O ₂ I [ml/min/Δ] | O ₂ ER [%] | AaDO ₂ [Torr] | Qs/Qt [%] | | | |
| | | 0.00 | | | | |

- 2** Edit the data.

(☞ "New Input of Lung Function Calculation" P8-43)

- 3** Register the lung function list.

(☞ "New Input of Lung Function Calculation" P8-43)

- 4** Delete the data.

(☞ "New Input of Lung Function Calculation" P8-43)

Cardiac Output (CO)

This section explains about the cardiac output measurement using the thermodilution method, setup procedure for catheter type, etc., and procedure for editing the measurement result.

To Display the CO Measurement Screen

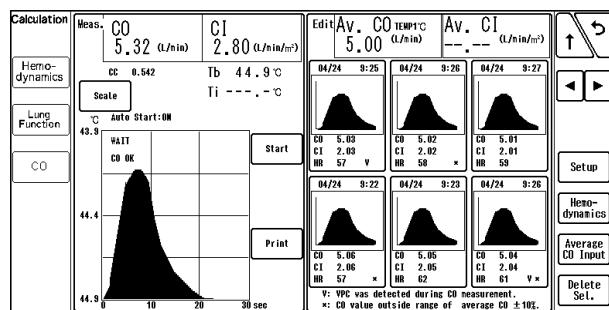
1 Press the [Menu], [CO] ("Calculation") keys.

Or, press the [Cardiac Output] key on the user key area.

► The CO measurement screen will be displayed.

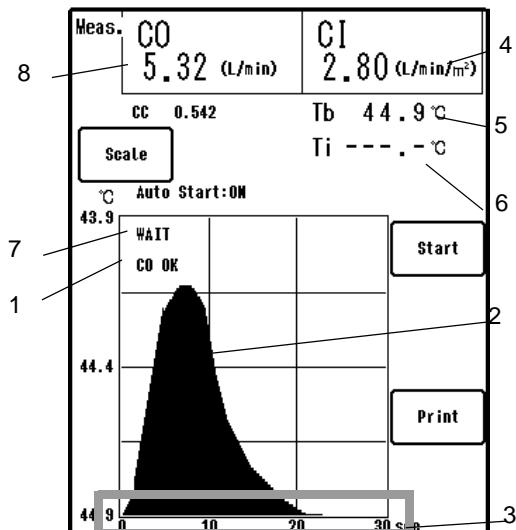
► The message according to the status will be displayed, and if "READY" is displayed, the measurement can be started.

(☞ "Cardiac Output Message" P11-15)



□ The Description of the CO Measurement Screen

- 1 Result Status
- 2 Thermodilution Curve
- 3 Time Scale
- 4 Cardiac Index (CI)
- 5 Blood Temperature
- 6 Injectate Temperature
- 7 Status Message
- 8 Cardiac Output (CO)

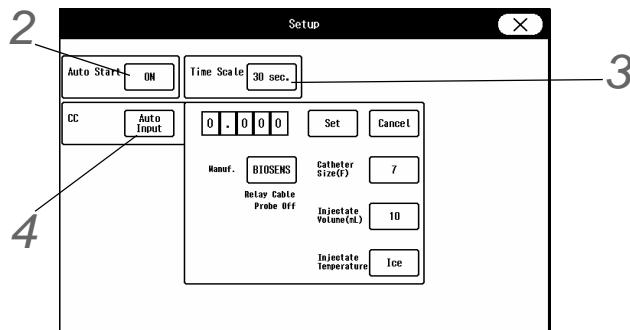


Cardiac Output Setup

Before measuring the cardiac output, set the measurement condition such as ON/OFF of auto start, time scale for thermodilution curve, injection condition, etc.

- 1** Press the [Menu], [CO] ("Calculation"), [Setup] keys.

► The "Setup" window will be displayed.



- 2** Set ON/OFF of "Auto Start".

- 1** Press the key for "Auto Start".

► The dropdown list will be displayed.

- 2** Select from [ON] or [OFF].

► [ON]: The measurement will automatically start when the injectate is injected.

► [OFF]: The measurement will start by pressing the [Start] key.

REFERENCE

- ♦ Even when [ON] is selected, the measurement can be manually started by pressing the [Start] key.

- 3** Set the time scale.

- 1** Press the key for "Time Scale".

► The dropdown list will be displayed.

- 2** Select from [30 sec.]/[60 sec.].

- 4** Set the computation constant.

- 1** Press the key for "CC".

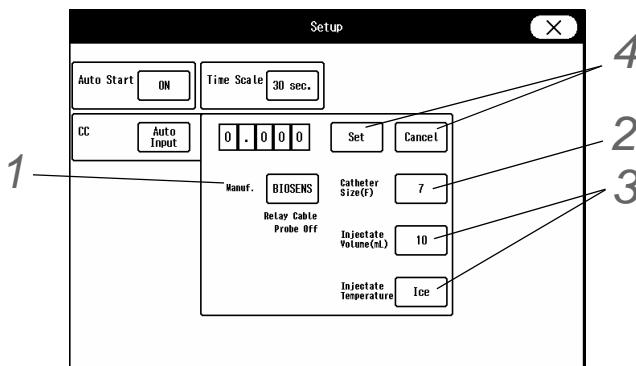
► The dropdown list will be displayed.

- 2** Select from [Auto Input]/[Manual Input].

► [Auto Input]: The computation constant will be automatically set according to the catheter size and the injection volume.

► [Manual Input]: The computation constant for the used catheter can be manually input with the numeric keys.

□ Auto Input of Computation Constant



- 1** Select the catheter manufacturer from [BIOSENS]/[ARGON]/[EDWARDS].

REFERENCE

- ♦ ARGON: Argon Medical Devices Japan, K.K. (formerly Becton, Dickinson and Company)
- ♦ The manufacturer name can be changed on "Catheter Manufacturer for CC Input" setting (Menu>Initial Settings>Meas.>Other).

- 2** Select the "Catheter Size (F)" from [5]/[6]/[7]/[7.5].

- 3** Select the "Injectate Volume (mL)" from [3]/[5]/[10].

- ▶ When the above items are selected, the computation constant will be automatically set.

When the CJ0-P01C-C2.4 Catheter Relay Cable is used:

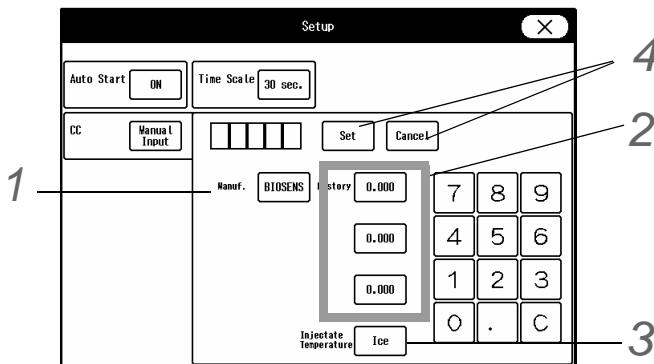
- 1** Select the "Injectate Temperature" from [Ice]/[Room].
- ▶ [Ice]: The measurement will be performed at 0°C.
 - ▶ [Room]: The measurement will be performed at room temperature (24°C).
- 4** Press the [Input]/[Cancel] key.

- ▶ [Input]: The computation constant will be finalized.

NOTE

- ♦ If the CC value does not correspond to the used catheter, or to return to the previous CC value, press the [Cancel] key, and input the value manually.
- ♦ To automatically input the computation constant, the catheter relay cable needs to be connected.

□ Manual Input of Computation Constant



1 Select the catheter manufacturer from [BIOSENS]/[ARGON]/[EDWARDS].

2 Up to 3 types of CC value can be programmed for each manufacturer.

When the programmed history is present:

1 Press the key for "History".

When the programmed history is not present:

1 Use the numeric keys to enter the CC value.

3 Set the "Injectate Temperature".

(☞ "Auto Input of Computation Constant" P8-48)

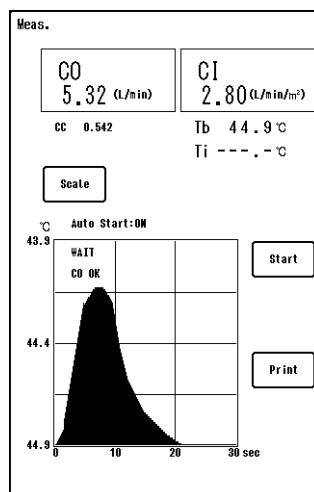
4 Press the [Input]/[Cancel] key.

▶ [Input]: The computation constant will be finalized.

CO Measurement

1 Press the [Menu], [CO] ("Calculation") keys.

▶ The CO measurement screen will be displayed.



▶ The displayed message will change from "WAIT" to "READY".

NOTE

- While "WAIT" is displayed, the measurement cannot be started. Wait until "READY" is displayed.

2 Verify that "READY" is displayed, and press the [Start] key.

- ▶ Pressing the key will generate a sound.

3 Inject as soon as the sound generates.

- ▶ When the measurement is complete, CO and CI value will be displayed.

REFERENCE

- If "Auto Start" is ON, the measurement will automatically start at injection by detecting the blood temperature.

4 Press the [Print] key.

- ▶ The displayed thermodilution curve, CO, CI value will be printed.

NOTE

- When "WAIT" message is continuously displayed, verify that catheter relay cable is properly connected to the cardiac output module, and thermodilution catheter is securely connected.
- Before injecting, check that the Ti (injectate temperature) setting is correct.
- When repeatedly performing the measurement, inject at intervals of 30–60 seconds
- The CI value will not be displayed unless height/weight or BSA value is input on the "Admit/Discharge" screen.
(☞ "Entering the Patient Name" P5-1)
- For the following cases, measurements may be inaccurate.
 - Shunt disease, tricuspid regurgitation or pulmonic regurgitation.
 - During exercise stress
As body temperature varies non-continuously and unevenly by exercise, constant CO value cannot be measured.
 - Excessive Arrhythmia
As blood volume varies non-continuously due to arrhythmia, accurate CO value cannot be measured.

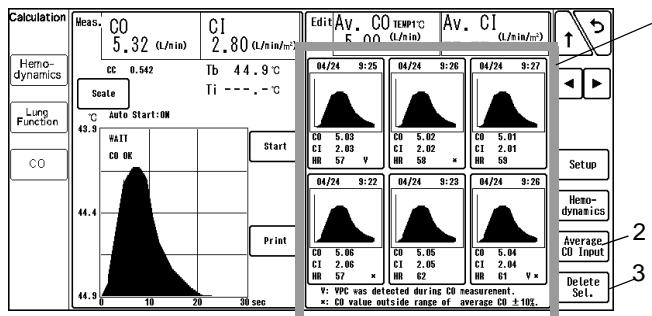
To Edit the CO Measurement Result

The average CO and average CI can be calculated by performing the CO measurement continuously and editing the measurement result.

1 Press the [Menu], [CO] ("Calculation") keys.

- ▶ The CO measurement screen will be displayed.

- The average CO and average CI value obtained from the measurement result will be displayed.



1 To Change the Selected Status

The selected data for the average value will be displayed in blue.

Press the graph area to change the selected status.

V Mark: VPC detected during CO measurement.

*: CO value exceeding the average CO value $\pm 10\%$.

2 [Average CO Input] key

The displayed average CO value will be input to the list.

NOTE

- If the height, weight, BSA is changed on the "Admit/Discharge" screen, average CI will be recalculated.
- As the CI will not be recalculated after the hemodynamic calculation, store the average CI by hemodynamic calculation before changing the height, weight, and BSA.

3 [Delete Sel.] key ([Delete] key)

The [Delete Sel.] key will change to [Delete] key and allows to delete the data.

x mark will be displayed for the data to be deleted, and pressing the [Delete] key will delete the data.

Other Bed Display

This section explains about the function to display the waveform and numeric data of other bedside monitors and to set the alarms for other bedside monitors.

The other bed alarm function generates the alarm sound for the other bed on this monitor. To use this function, wired network (DS-LANII or DS-LANIII) connection is required.

CAUTION

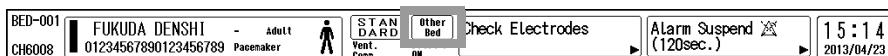
- On the DS-LANII network system, maximum of 3 monitors (including the central monitor) can display the data of this monitor using the other bed display function. However, there is no restriction of numbers for the DS-7000 series central monitors and DS-5700. These monitors will be counted as 1 monitor regardless of the numbers.
Ex. 1) In case of 1 central monitor and 5 bedside monitors (A to E):
The total number of monitors that can display the data of Bedside Monitor A is 3 monitors which consist of 1 central monitor and 2 out of 4 bedside monitors (B to E).
Ex. 2) In case of 3 central monitors (DS-7000 series or DS-5700) and 5 bedside monitors (A to E):
The total number of monitors that can display the data of Bedside Monitor A is 5 monitors which consist of 3 central monitors and 2 out of 4 bedside monitors (B to E).
- If the number of bedside monitors displaying the same bed exceeds the limit, the bedside monitor with smaller ID will be prioritized.
- If monitoring 12-lead waveform on the central monitor, the total numbers of monitors that can display the same bed will be reduced by 1.

NOTE

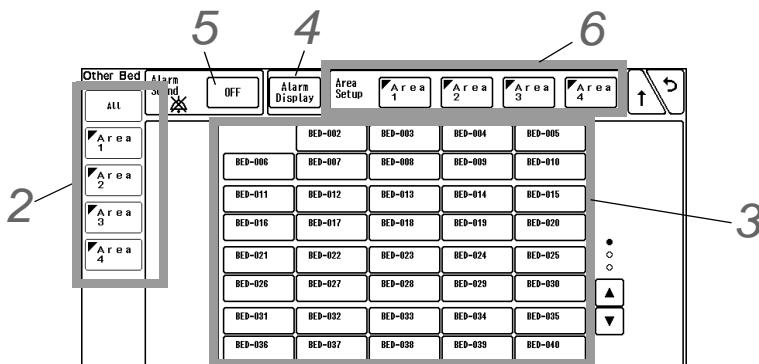
- This equipment cannot connect to a wired network of AU-5500N 8ch Recorder set as the administrator.
Even if connected, other bed display, printing and other function cannot be used.

Other Bed Display/Alarm

The other bed display can be accessed from the menu or from the preprogrammed user key. Also, by setting the other bed alarm [ON], [Other Bed Alarm] key will be displayed when other bedside monitor generates an alarm. By pressing this [Other Alarm] key, the display for the other bed can be accessed.



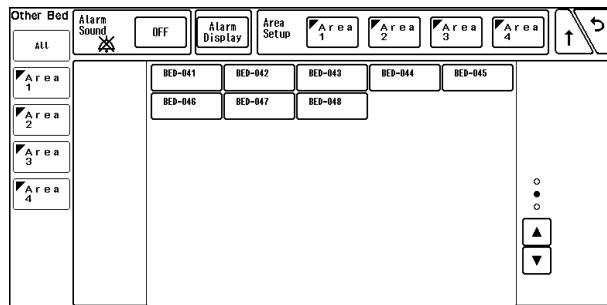
1 Press the [Menu], [Other Bed] keys.



- On the other bed selection screen, select the bed from the maximum of 100 beds (DS-LANIII) connected to the wired network. The bed ID/room ID for the alarm generated bed will be displayed in red. For the alarm generated bed, icon  will be displayed.

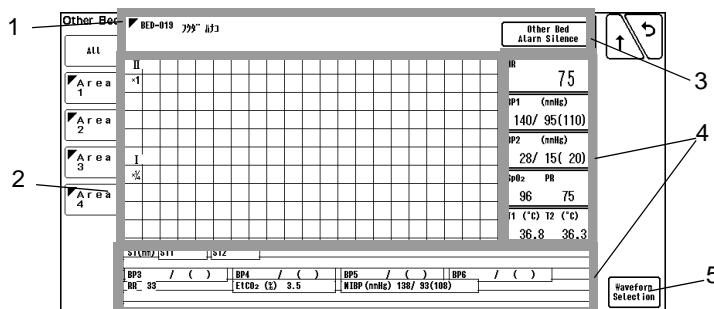
2 Select the area.

- Select the area to be displayed.
 - ▶ [All]: The beds for all the area connected to the network will be displayed.
 - ▶ [Area 1 to 5]: The beds for the selected area will be displayed.



3 Press the Room / Bed ID key and access the display for the other bed.

The waveforms and numeric data for the selected bed will be displayed. If the alarm is generated for that bed, numeric data alarm, arrhythmia alarm message will be displayed.



1 Message Area

The message for the other bed will be displayed.

2 Waveform Display Area

Maximum of 6 waveforms for the DS-LANIII network, and maximum of 2 waveforms for the DS-LANII network can be displayed.

3 By pressing the [Other Bed Alarm Silence] key on the other bed display, the alarm sound for the displayed bed can be silenced.

4 Numeric Data Area

The numeric data will be displayed at the right and bottom (if not enough space at the right) of the screen.

5 Press the [Waveform Selection] key to select the waveforms.

- ▶ Waveform 1 is fixed as ECG, but other waveforms can be selected.

Maximum of 6 waveforms for the DS-LANIII network, and maximum of 2 waveforms for the DS-LANII network can be displayed.

Select the waveform from the waveform selection window.

4 Set the other bed alarm.

Press the [Alarm Display] key to change the screen to other alarm setup mode. When the mode is changed, the [Alarm Display] key will be displayed in blue. To return to the original mode, press the [Alarm Display] key again.

Select the bed to generate the other bed alarm.

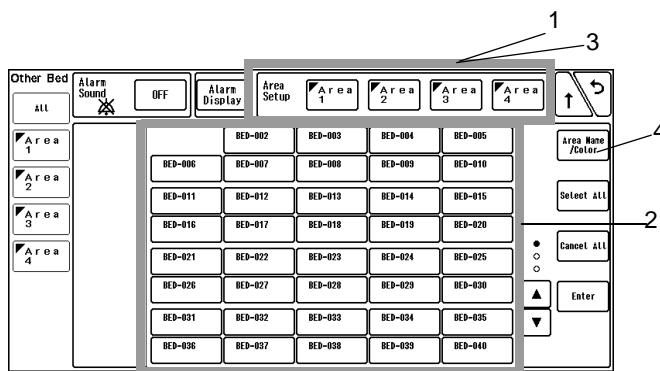
- ▶ Select the room/bed ID for the bed to generate the alarm. The selected bed will be indicated by blue frame. To cancel the selection, press the key for the bed again.
- ▶ [Select All], [Cancel All]: Selection/cancellation for all the beds can be performed at once.
- ▶ [Enter]: The selection will be finalized.

5 Turn ON the other bed alarm.

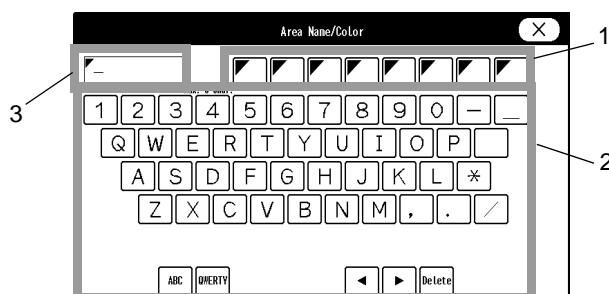
- ▶ [ON]: Other bed alarm will be generated.
- ▶ [OFF]: Other bed alarm will not be generated.

6 Set the area.

All the beds connected to the network can be displayed, but it is also possible to divide the beds by areas, which allows to display the beds by each area.



- 1 Press the key for "Area Setup" to change the screen to area setup mode. When the mode is changed, the key for "Area Setup" will be displayed in blue. To return to the original mode, press the key for "Area Setup" again.
- 2 Select the room/bed ID for the bed to assign to the area. The selected bed will be indicated by blue frame. To cancel the selection, press the key for the bed again.
 - ▶ [Select All], [Cancel All]: Selection/cancellation for all the beds can be performed at once.
 - ▶ [Enter]: The selection will be finalized.
- 3 Press the key for "Area Setup" to change the area setup mode.
- 4 Press the [Area Name/Color] key.



- 1 Select the color to distinguish the area.
A triangle mark with the selected color will be displayed at the corner of the room/bed ID key.
- 2 Enter the area name using the numeric keys.
- 3 Maximum of 8 characters can be set for the area name.

Chapter 9 Printing

| | |
|--|-----|
| Printing Setup | 9-1 |
| Manual Printing (Basic) | 9-1 |
| Manual Printing (12-Lead) | 9-2 |
| Manual Printing (Other Setup) | 9-4 |
| Automatic Printing (Alarm Printing) | 9-4 |
| Automatic Printing (Periodic Printing) | 9-6 |
| Common Setup for Printing | 9-7 |
| Freeze Printing | 9-8 |
| 12-lead Waveform Printing | 9-8 |

Chapter 9 Printing

Printing Setup

This section describes the procedure for printing.

For the DS-8200 System, the following can be performed.

- ♦ Manual Printing
- ♦ Automatic Printing (Periodic Printing)
- ♦ Automatic Printing (Alarm Printing)
- ♦ Freeze Printing
- ♦ Graphic Printing (Trend, Tabular Trend, Recall, etc.)

REFERENCE

- ♦ The printed HR/PR data depends on the ECG/SpO₂/BP selection for "Synchronized Mark/Tone" (Menu>Parameter>ECG, SpO₂, BP).
☞ "Synchronized Mark/Tone" 7-9)

1 Press the [Menu], [Manual Printing] or [Auto Printing] ("Basic Setup") keys.

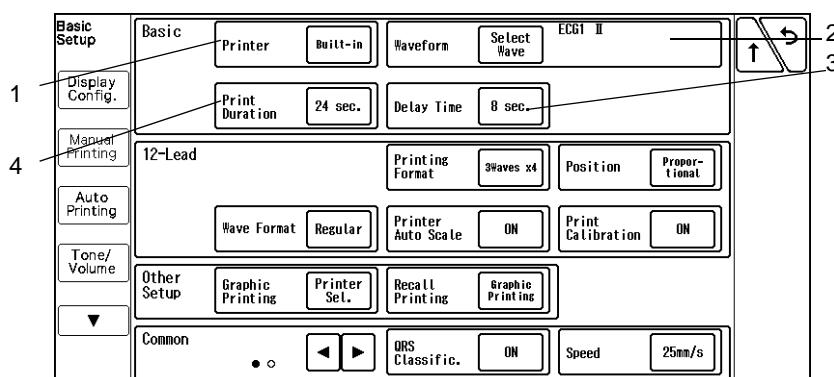
► The manual printing or automatic printing setup screen will be displayed.

Manual Printing (Basic)

The manual printing can be set to start from the time the key is pressed, or 8 sec./16 sec. prior to the time the key is pressed.

Also, the printing can be set to automatically stop after 24 seconds, or continue to print until the "Print Start/Stop" key is pressed again.

The printer can be selected from built-in printer or central monitor printer.



1 Printer

[Built-in]: Data will be printed on the HR-800.

[Central]: Data will be printed on the central monitor printer.

2 Waveform

On the "Select Wave" window, 3 waveforms can be selected for printing.

The key for the selected waveform will be displayed in blue.

3 Delay Time

[None]: Printing will start from the point the [Print Start/Stop] key is pressed.

[8 sec.]/[16 sec.]: Printing will start 8 sec. or 16 sec. prior from the point the [Print Start/Stop] key is pressed.

NOTE

- If [None] is selected for the manual printing delay time, QRS classification symbol will not be printed. To print the QRS symbol, set the delay time to [8 sec.] or [16 sec.].

4 Print Duration

[24sec.]: Printing will automatically stop after 24 seconds.

[Cont.]: Printing will continue until the [Print Start/Stop] key is pressed again or until paper runs out.

To Start/Stop the Printing

1

Press [Print Start/Stop] of the user key.

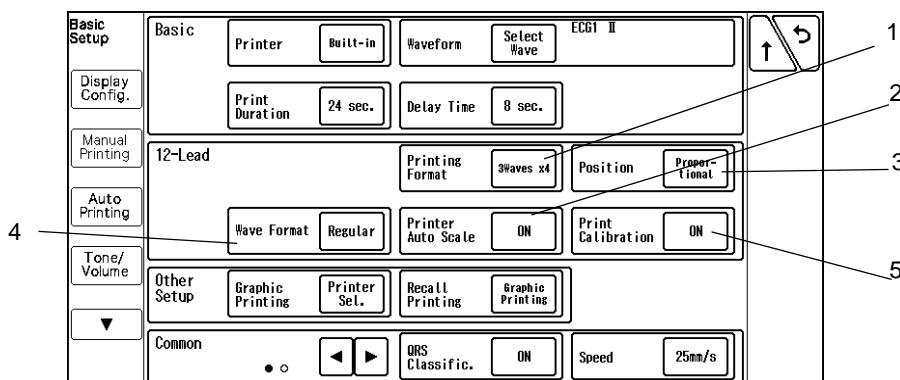
- ▶ Pressing this key during periodic printing, alarm printing, graphic printing, or recall printing will cease the printing in process.
- ▶ Inside the [Print Start/Stop] key, the output printer status for manual printing will be displayed.



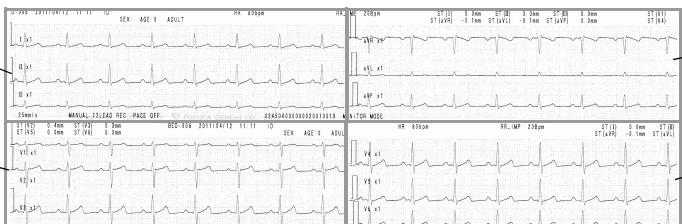
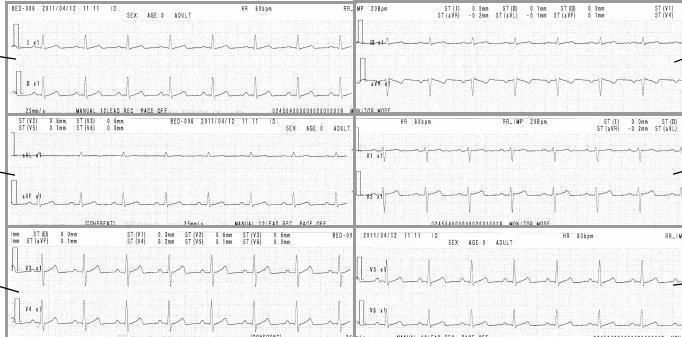
| Message | Details |
|-----------|-------------------------------|
| None | Normal Operation |
| PAPER OUT | The recorder is out of paper. |
| CASSETTE | Check the cassette. |
| CHECK? | Other abnormality is found. |

Manual Printing (12-Lead)

The monitoring 12-lead waveform can be printed on the built-in printer. The delay time is 6 seconds. The 12-lead waveform cannot be printed on the central monitor printer.



1 Printing Format

| Output Example | Waveform Layout | Length of Each Waveform |
|---|--|-------------------------|
| 3Wavesx4  | 1st column: I,II,III 2nd column: aVR, aVL, aVF 3rd column: V1, V2, V3 4th column: V4, V5, V6 | 6 sec. |
| 2Wavesx6  | 1st column: I,II 2nd column: III, aVR 3rd column: aVL, aVF 4th column: V1, V2 5th column: V3, V4 6th column: V5, V6 | 6 sec. |

2 Printer Auto Scale

NOTE

- The Printer Auto Scale will be adjusted in the range of x1, x1/2, x1/4. It will not be adjusted to x2, x4 even if the amplitude is small.

REFERENCE

- When position adjustment is [OFF], select whether or not to automatically adjust the scale.

[ON]: Printing scale will be automatically adjusted.

[OFF]: Recording will be performed with the displayed scale.

3 Position

[Center]: Equalizes the printing width of each lead so that the waveform baseline will be at the center. The printing scale of the waveform will be also automatically adjusted.

[Proportional]: Equalizes the blank space between each lead to avoid overlapping of the waveforms. The printing scale of the waveform will be also automatically adjusted.

[OFF]: Waveform position will not be adjusted when printing.

4 Waveform Format

[Regular]: Printing will start from the limb leads. (In the order of I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6)

[Reverse]: Printing will start from the chest leads. (In the order of V1, V2, V3, V4, V5, V6, I, II, III, aVR, aVL, aVF)

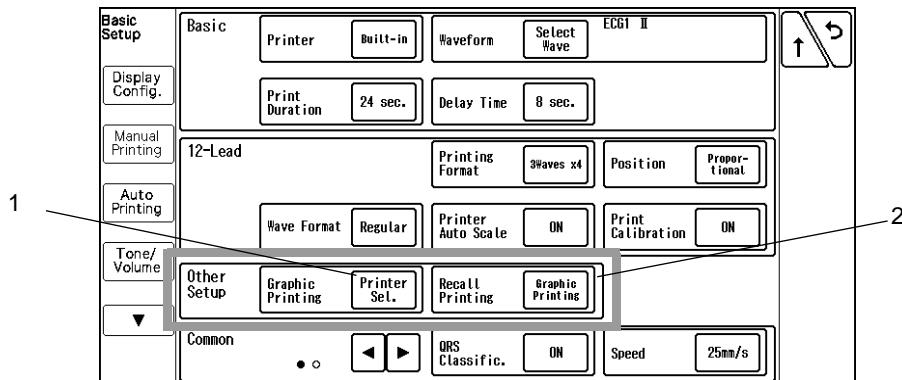
5 Print Calibration

[ON]: Calibration waveform will be printed.

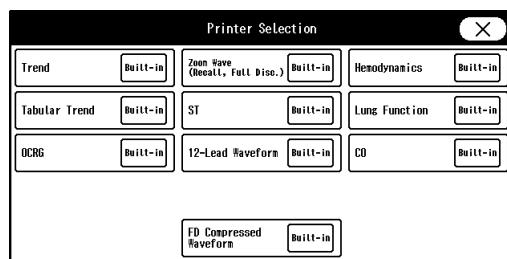
[OFF]: Calibration waveform will not be printed.

Manual Printing (Other Setup)

Select the printer for graphic printing and recall printing.



- 1 Press the key for [Graphic Printing] to display the "Printer Selection" window.



- ▶ [Built-in]: Data will be printed on the HR-800.
- ▶ [Central]: Data will be printed on the central monitor printer.
- ▶ [Laser]: Data will be printed on the laser printer.

REFERENCE

- ◆ Graphic printing is a printing performed from the data review screen such as graphic trend and tabular trend.
- ◆ To select laser printer, it is necessary to select [ON] or [DS-LAN] for "Network Printer" under [Menu > Initial Settings > External Device > Network] in advance.
(Maintenance Manual "Laser Printer Setup" P4-16)

- 2 Recall Printing

- ▶ [Graphic Printing]: Recall data will be output on the printer selected for "Graphic Printing".
- ▶ [Manual Printing]: Recall data will be output on the printer selected for "Printer" under "Basic".

Automatic Printing (Alarm Printing)

The data will be automatically printed at occurrence of numeric alarm or arrhythmia alarm.

NOTE

- ◆ The alarm detection is performed each second, and if more than one alarm occurs at the same time, one data will be stored according to the alarm priority.
- ◆ Maximum of 3 alarm data can be stored. If more than 3 alarms generate, the higher priority alarm will replace the previously stored lower priority alarm. The stored data will be deleted once it is printed.

- Priority of alarm printing factor ;

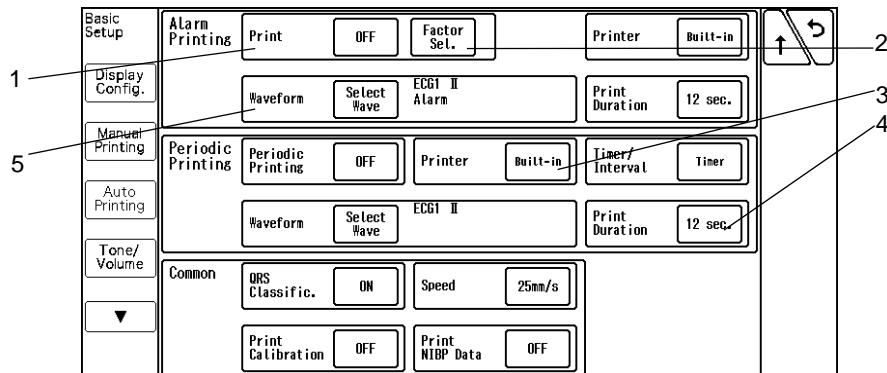
ASYSTOLE > VF > VT > SLOW VT > TACHY > BRADY > RUN >

HR (HR / PR_SpO₂ / PR_IBP) > APNEA > BP1 (or ART) > SpO₂ >

NIBP > RR (RR_IMP / RR_GAS / RR_VENT) > EtCO₂ >

PAUSE > COUPLET > BIGEMINY > TRIGEMINY > FREQUENT > BP2 > BP3 > BP4 > BP5

> BP6 > ST > TEMP > Tb > InspCO₂

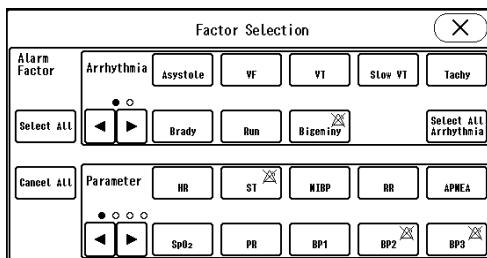


1 Alarm Printing

[ON]: Printing will automatically start at alarm occurrence.

[OFF]: Printing will not start at alarm occurrence.

2 Alarm Factor Selection



The "Factor Selection" window will be displayed.

The selected alarm factor key will be displayed in blue.

The alarm OFF mark ~~XX~~ will be displayed inside the key for the parameter in alarm OFF condition.

[Select All Arrhythmia]: All arrhythmia will be selected as alarm factor.

[All ON]: All parameters will be selected as alarm factor.

[All OFF]: All selections for the alarm factor will be cancelled.

3 Printer

[Built-in]: Data will be printed on the HR-800.

[Central]: Data will be printed on the central monitor printer.

4 Print Duration

(☞ "Manual Printing (Basic)" P9-1)

NOTE

- The delay time differs depending on the print duration.

| Print Duration | Delay Time | | | | |
|----------------|------------|---------|--------------|-------|------------------|
| | Adult | Child | Neonate | | Arrhythmia Alarm |
| | | | Numeric Data | Alarm | |
| 12 sec. | 12 sec. | 12 sec. | 8 sec. | | 12 sec. |

| | | | | |
|---------|---------|---------|---------|---------|
| 24 sec. | 16 sec. | 16 sec. | 16 sec. | 16 sec. |
|---------|---------|---------|---------|---------|

5 Waveform

(☞ "Manual Printing (Basic)" P9-1)

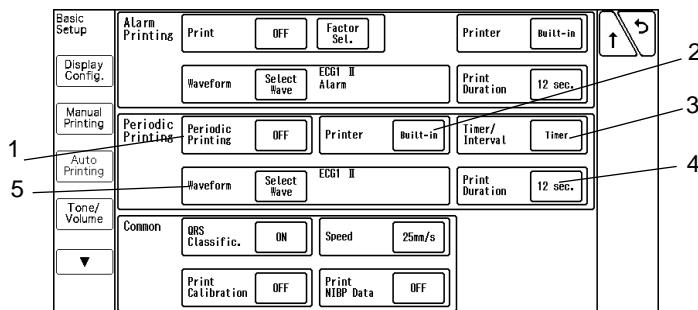
[Alarm]: Prints the waveform of the alarm factor.

Automatic Printing (Periodic Printing)

The printing will be automatically performed with the selected interval.

NOTE

- ♦ If the periodic printing is interrupted due to paper out, etc., the latest periodic printing will be performed when the printing is resumed.
- ♦ QRS classification symbol will not be printed for periodic printing.



1 Periodic Printing

[ON]: Printing will automatically start at fixed interval.

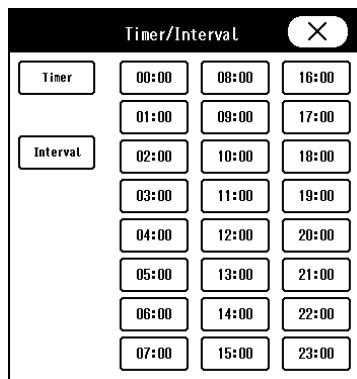
[OFF]: Turns OFF the periodic printing function.

2 Printer

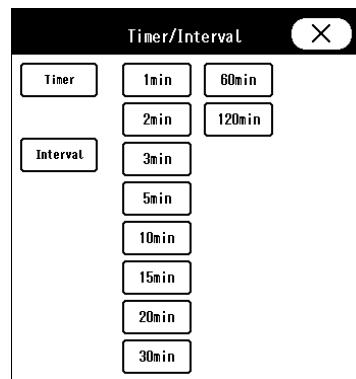
[Built-in]: Data will be printed on the HR-800.

[Central]: Data will be printed on the central monitor printer.

3 Periodic Interval



Display Example for "Timer"



Display Example for "Interval"

[Timer]: Printing will automatically start at selected time.

[Interval]: Printing will automatically start at selected interval.

REFERENCE

- If [5 min.] is selected for [Interval], printing will start at 10:00, 10:05, ...10:25. If [60 min.] is selected, printing will start at 10:00, 11:00, 12:00,

4 Print Duration

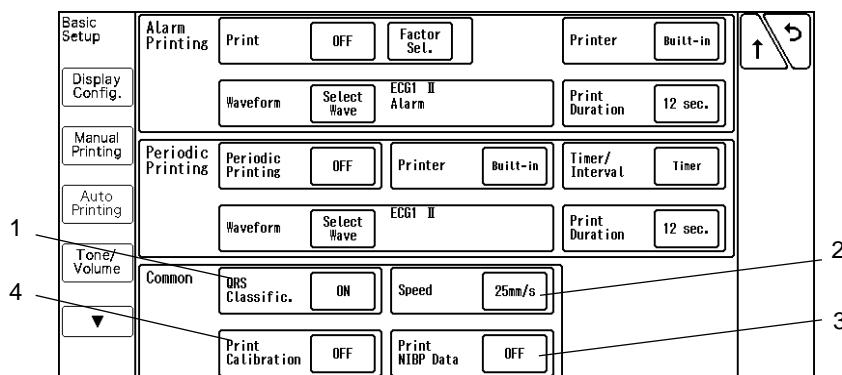
The printing will automatically stop after the selected duration.

5 Waveform

(☞ "Manual Printing (Basic)" P9-1)

Common Setup for Printing

The printing condition common for manual printing and automatic printing can be set.



Display Example for Automatic Printing

Display Example for Automatic Printing**1 QRS Classification**

[ON]: QRS classification symbol will be printed with the ECG waveform.

| Symbol | Details |
|-----------------------|--|
| N (Normal) | Normal QRS beat |
| V (VPC) | Ventricular extrasystole |
| S (SVPC) | Supraventricular extrasystole |
| P (Pacing Beat) | Pacing beat |
| F (Fusion Beat) | Fusion beat of pacing and spontaneous beat |
| ? (Undetermined Beat) | Learning arrhythmia, or unmatched beat |

[OFF]: QRS classification symbol will not be printed.

NOTE

- The QRS symbol cannot be printed for manual printing if delay time is "none" and for periodic printing. To print the QRS symbol, set the delay time to [8 sec.] or [16 sec.].
- The "S" (QRS symbol) will be printed as "N" on the central printer.

2 Printing Speed

[25mm/s]: The printing speed will be set to 25mm/s.

[50mm/s]: The printing speed will be set to 50mm/s.

3 Print NIBP Data

[ON]: Oscillation graph and NIBP data will be printed after the waveform.

[OFF]: Oscillation graph and NIBP data will not be printed.

4 Print Calibration

[Top]: Calibration waveform will be printed at the beginning of the waveform.

[Each Page]: Calibration waveform will be printed in 18.75cm interval.

[OFF]: Calibration waveform will not be printed.

Freeze Printing

The waveform trace can be suspended and printed from 12 seconds prior to the point the waveform trace was stopped.

The waveform selected for manual printing will be printed. The print duration is 12 seconds.

To freeze the waveform display, the [Freeze] key needs to be assigned as user key.

(☞ "To Configure the Display" P10-4)

1

Press the [Freeze] key on the user key.

► The waveform trace will stop.

2

Press the [Print Start/Stop] key.

► The displayed waveform will be printed.

► Freeze printing will be output on the built-in printer. The waveforms selected for manual printing will be printed.

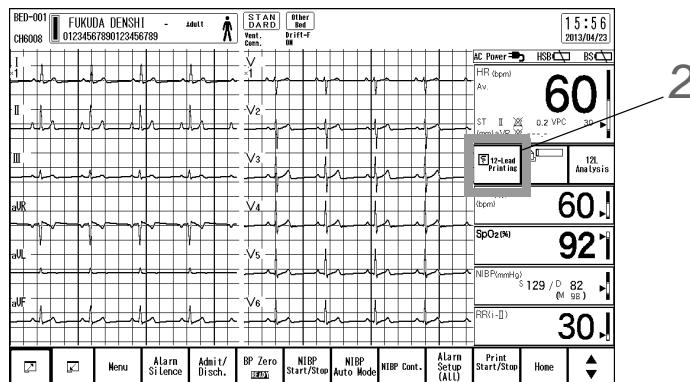
12-lead Waveform Printing

When the display layout is "12-Lead", pressing the [12-Lead Print] key will start 12-lead waveform printing.

1

Select "12-Lead" for the display layout.

(☞ "To Configure the Display" P10-4)



2

Press the [12-Lead Print] key.

► Printing will start.

- The printing duration of the waveforms for each format are as follows.

| | Printing Format | Printing Duration | Delay Time |
|---|-------------------|-------------------|------------|
| In Case of built-in printer | 3Wavesx4 | 6 sec. | 6 sec. |
| | 2Wavesx6 | | |
| When the output recorder is laser printer | 3Wavesx4*1 | 2.5 sec. | 10 sec. |
| | 6Wavesx2*1 | 5 sec. | |
| | 3Wavesx4+Rhythm*1 | 12.5 sec. | |
| | 12 Waves*2 | 10 sec. | |

*1 [CONTINUOUS]: The waveform output will be in the time sequence of waveform block order.

*2 [COHERENT]: The waveform output will be in the same time phase for all waveforms.

Chapter 10 System Configuration

| | |
|--------------------------------|-------|
| Display Configuration | 10-1 |
| Numeric Data Selection..... | 10-3 |
| To Configure the Display | 10-4 |
| Waveform Selection | 10-13 |
| User Key Selection | 10-14 |
| Tone/Volume | 10-17 |
| Color | 10-20 |
| Brightness..... | 10-22 |
| Night Mode | 10-23 |
| Night Mode | 10-24 |

Chapter 10 System Configuration

Display Configuration

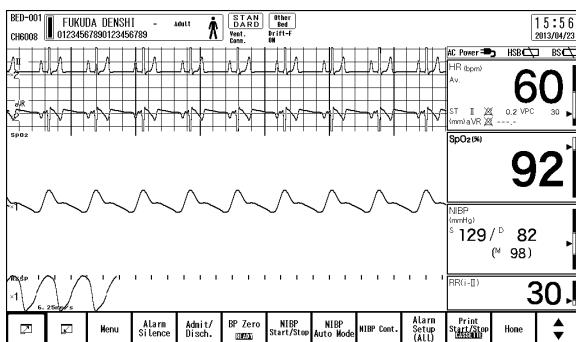
This section describes about the display configuration type and the procedure to configure the display.

The monitoring display can be configured according to the monitoring purpose. There are following types of basic display layout.

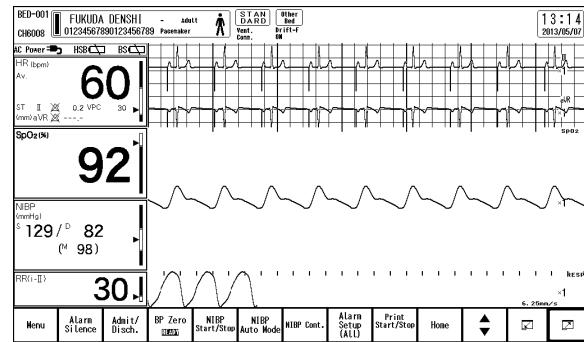
- Standard
- Standard&Bottom
- Numeric/Maximum Size

If ECG cascade or block cascade is selected, full disclosure waveform can be displayed. It is also possible to assign user keys to the numeric data area.

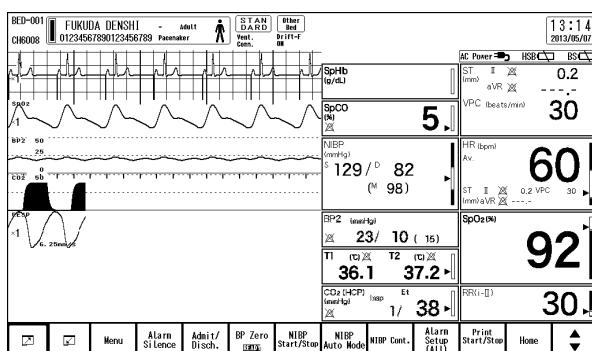
□ Display Example



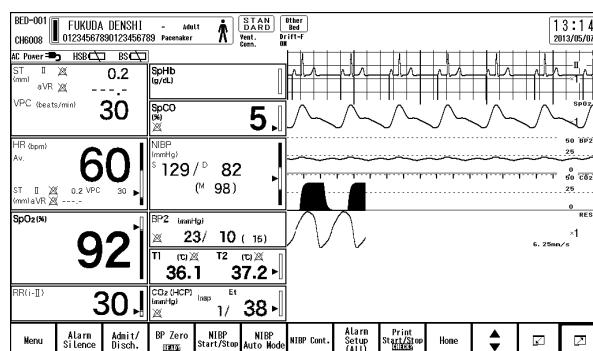
Numeric Data: Standard/Right



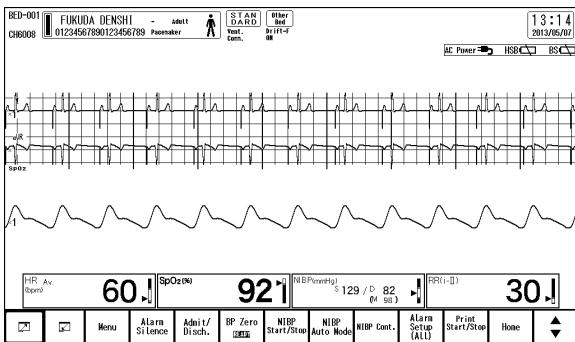
Numeric Data: Standard/Left



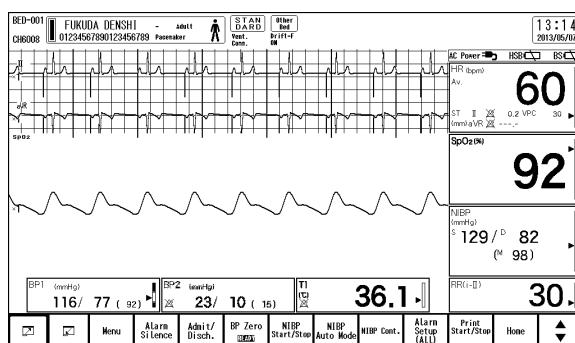
Numeric Data: Standard/Right(Large)



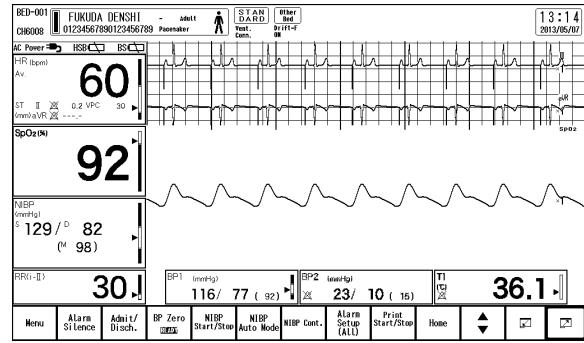
Numeric Data: Standard/Left(Large)



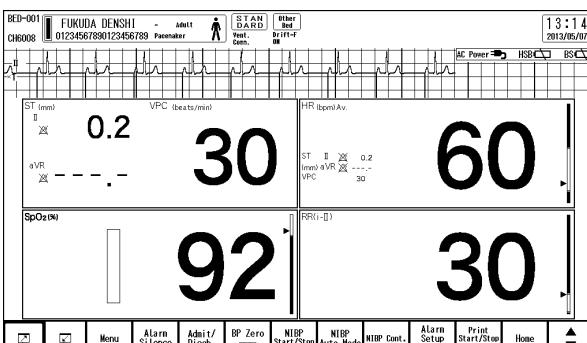
Numeric Data: Standard/Bottom



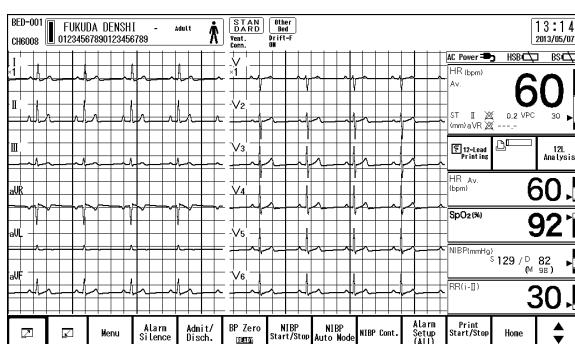
Numeric Data: Standard&Bottom/Left



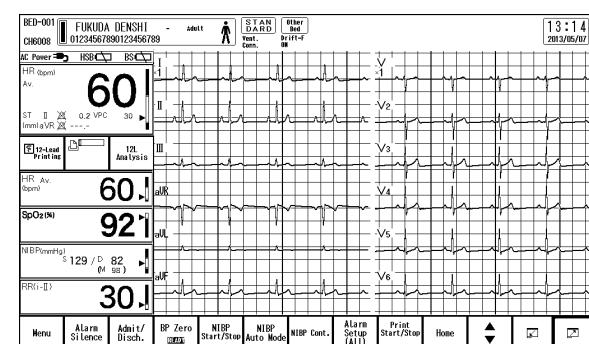
Numeric Data: Standard&Bottom/Right



Numeric Data: Maximum Size



12-Lead (Box Layout: Right)



12-Lead (Box Layout: Right&Bottom)

9 main modes can be preprogrammed according to the monitoring purpose.

By preprogramming the configuration to each mode, the display configuration setups at admittance of patient can be simplified by just selecting one of the modes.

(☞ "To Select the User Mode" P5-7)

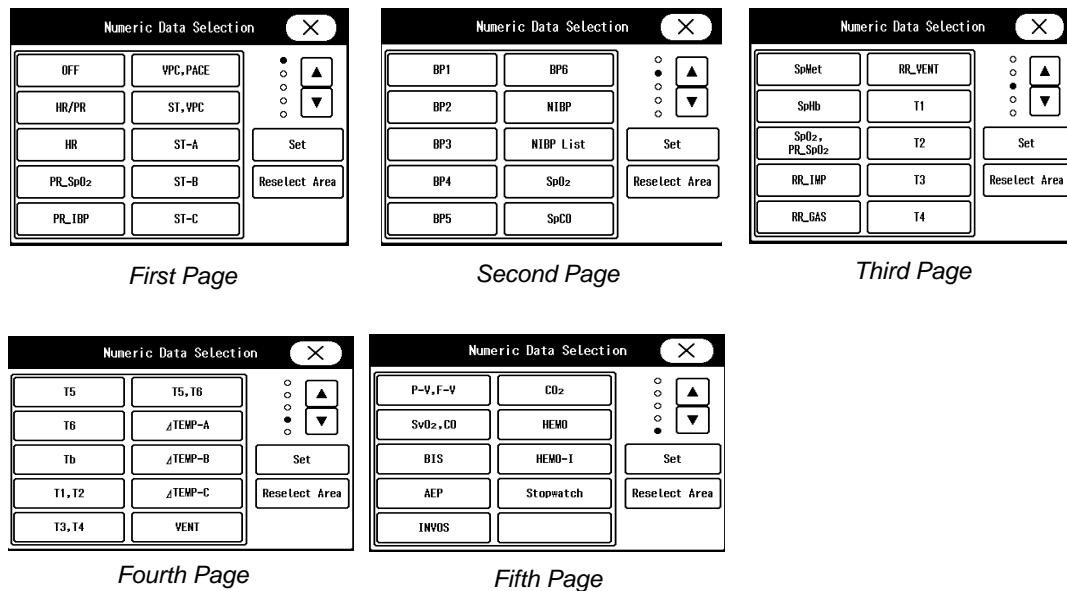
It is recommended to program the mode in rough classification such as patient's condition, monitoring purpose (ICU or surgery), and if necessary, perform unique setup for each patient.

Numeric Data Selection

The numeric data to be displayed can be selected on the "Numeric Data Selection" window.

By selecting a parameter on the "Numeric Data Selection" window, it will be assigned to the numeric data box on the home display.

(☞ "Numeric Data Box Display (for each parameter)" P3-7)



The Numeric Data Box Size for Each Parameter

| Numeric Data | Numeric Data Box Size | | | | | | | |
|--|-----------------------|------|-----|-----|-----|------------------|-----|-----|
| | Width ^{*1} | W1/2 | W1 | | | W2 ^{*3} | | |
| | Height ^{*2} | H1 | H1 | H2 | H3 | H1 | H2 | H3 |
| HR/PR | | No | Yes | Yes | Yes | Yes | Yes | Yes |
| HR | | No | Yes | Yes | Yes | Yes | Yes | Yes |
| PR_SpO ₂ | | No | Yes | Yes | Yes | Yes | Yes | Yes |
| PR_IBP | | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| VPC, PACE | | No | Yes | Yes | Yes | Yes | Yes | Yes |
| ST, VPC | | No | Yes | Yes | Yes | Yes | Yes | Yes |
| ST-A, ST-B, ST-C | | No | No | Yes | Yes | No | Yes | Yes |
| BP1 to BP6 | | No | Yes | Yes | Yes | Yes | Yes | Yes |
| NIBP | | No | Yes | Yes | Yes | Yes | Yes | Yes |
| NIBP List | | No | Yes | Yes | Yes | Yes | Yes | Yes |
| SpO ₂ | | No | Yes | Yes | Yes | Yes | Yes | Yes |
| SpO ₂ , PR_SpO ₂ | | No | Yes | Yes | Yes | Yes | Yes | Yes |
| SpCO | | No | Yes | Yes | Yes | Yes | Yes | Yes |

The Numeric Data Box Size for Each Parameter

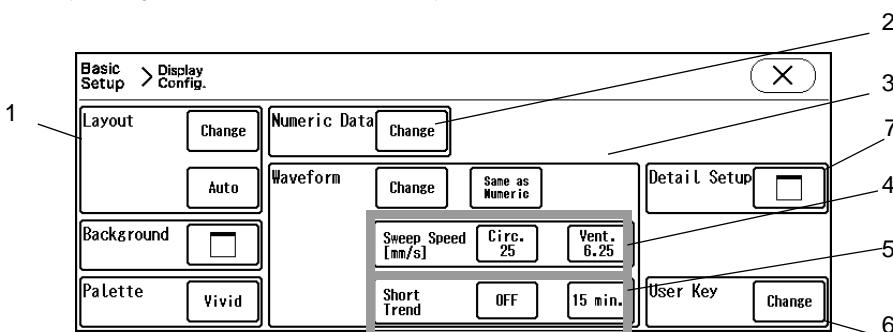
| Numeric Data | Numeric Data Box Size | | | | | | | |
|------------------------------|-----------------------|------|-----|-----|-----|------------------|-----|-----|
| | Width ^{*1} | W1/2 | W1 | | | W2 ^{*3} | | |
| | Height ^{*2} | H1 | H1 | H2 | H3 | H1 | H2 | H3 |
| SpMet | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| SpHb | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| RR_IMP, RR_GAS, RR_VENT | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| T1 to T6, Tb | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| T1/T2, T3/T4, T5/T6 | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| ΔTEMP-A, ΔTEMP-B, ΔTEMP-C | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| VENT | No | No | Yes | Yes | No | Yes | Yes | Yes |
| P-V, F-V | No | No | Yes | Yes | No | Yes | Yes | Yes |
| SvO ₂ , CO | No | No | Yes | Yes | No | Yes | Yes | Yes |
| BIS | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| CO ₂ | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| INVOS | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| HEMO | No | No | Yes | Yes | No | Yes | Yes | Yes |
| HEMO-I | No | No | Yes | Yes | No | Yes | Yes | Yes |
| Stopwatch | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

*1: W1/2 is about 34mm, W1 is about 69mm, W2 is about 138mm
 *2: H1 is about 17mm, H2 is about 36mm, H3 is about 55mm (H1 is the same length as waveform area)
 *3: W2 size can be set only for "Bottom 1 row/2 rows" layout.

To Configure the Display

- 1 Press the [Menu], [Display Config.] ("Basic Setup") keys.

► The display configuration menu will be displayed.



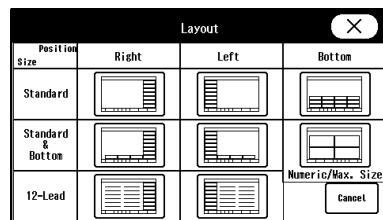
- 1 Layout
(☞ "Changing the Layout" P10-5)
- 2 Numeric Data
(☞ "To Change the Displayed Numeric Data" P10-5)
- 3 Waveform
(☞ "To Change the Displayed Waveform" P10-7)
- 4 Sweep Speed
(☞ "Sweep Speed" P10-9)

- 5 Short Trend
(☞ "To Display the Short Trend" P10-8)
 - 6 User Key
(☞ "User Key Setup" P10-10)
 - 7 Detail Setup
(☞ "Detail Setup" P10-11)

□ Changing the Layout

The layout can be changed with the following procedure.

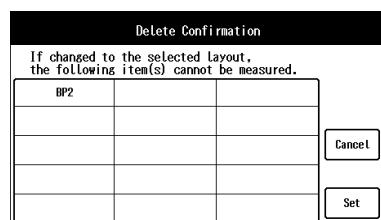
- 1 Press [Change] for "Layout".
▶ The "Layout" window will be displayed.



- 2 Select the layout to be displayed.
 - 3 Check the home display to see if the selected layout is properly displayed.

If there are parameters that cannot be displayed:

- ▶ The "Delete Confirmation" window will be displayed.



NOTE

- The displayed parameters will be automatically located with the selected layout.

- 4** If not changing the layout, press the [Cancel] key.

To Change the Displayed Numeric Data

The displayed numeric data can be changed with the following procedure.

CAUTION

- When performing telemetry transmission or wired network communication, configure the display so that the numeric data corresponding to the waveform is displayed. If not, the displayed waveform or numeric data may not be transmitted.

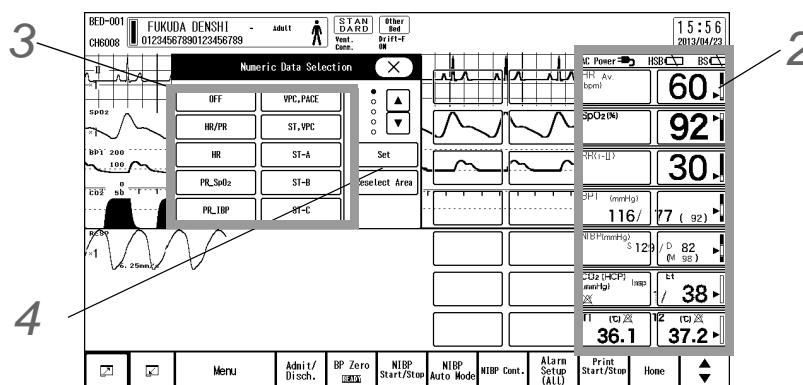
NOTE

- For HR/PR data, an alarm will be generated only for the current parameter displayed in the HR/PR numeric data box.
- The parameter for the HR/PR numeric data box can be selected by pressing the key for "HR/PR" on the ECG, BP, SpO₂ parameter setup window/floating window or by pressing the [HR/PR] user key.

1

Press the [Change] key for "Numeric Data".

- The display will change to numeric data selection mode.
- If the layout is "Numeric/Max. Size", the "Numeric Data Selection" window will be different from that of other layouts.
- The "Numeric Data Selection" window will be displayed.

**2**

Press the numeric data display area to change the parameter.

- By pressing the selected area again, the selection will be cancelled.

NOTE

- To restart from the beginning, press the [Reselect Area] key.
- Adjust the size of the selected area which will be indicated in blue frame.

3

Select the parameter on the "Numeric Data Selection" window.

NOTE

- Press the **▲** / **▼** keys to switch the displayed parameters.
(☞ "Numeric Data Selection" P10-3)

4

Press the [Set] key.

- The setup will be finalized.

NOTE

- The selected parameter may not be displayed depending on the size.
In such case, "Size Error" will be displayed in numeric data area. Adjust the size.
(☞ "Numeric Data Selection" P10-3)

□ To Change the Displayed Waveform

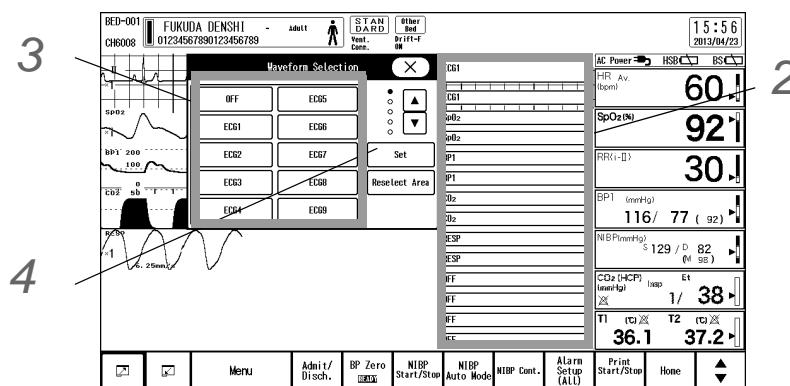
The displayed waveform can be changed with the following procedure.

CAUTION

- When performing telemetry transmission or wired network communication, configure the display so that the numeric data corresponding to the waveform is displayed. If not, the displayed waveform or numeric data may not be transmitted.

1 Press [Change] for "Waveform".

- The display will change to waveform selection mode.
- The "Waveform Selection" window will be displayed.



2 Press the waveform display area to change the parameter.

- By pressing the selected area again, the selection will be cancelled.

NOTE

- To restart from the beginning, press the [Reselect Area] key.
- Adjust the size of the selected area which will be indicated in blue frame.

3 Select the parameter on the "Waveform Selection" window.

NOTE

- Press the **[▲]** / **[▼]** keys to switch the displayed parameters.
(☞ "Waveform Selection" P10-13)

4 Press the [Set] key.

- The setup will be finalized.

□ To Display the Short Trend

The short trend display can be set with the following procedure.

REFERENCE

- The short trend can be displayed on the home display with the waveforms and numeric data.
- As the alarm generated data are displayed in red (with white frame), the alarm data of up to 30 minutes can be verified on the home display.

NOTE

- When 12-lead layout is displayed, ST value of each lead can be displayed in short trend.
- The short trend cannot be displayed when the following numeric data layouts are used:
 - 1) Standard&Bottom
 - 2) Standard/Left(Large)
 - 3) Standard/Right(Large)
 - 4) Numeric Data/Maximum Size

1 Press the key for "Short Trend".

- ▶ The dropdown list will be displayed.

2 Select from [ON] / [OFF] / [Overlap].

- ▶ [ON]: Short trend will be displayed on the home display.
- ▶ [OFF]: Short trend will not be displayed on the home display.
- ▶ [Overlap]: Short trend will be displayed overlapped with the waveform.

When [ON] or [Overlap] is selected:

3 Press the [0 min.] key for "Short Trend".

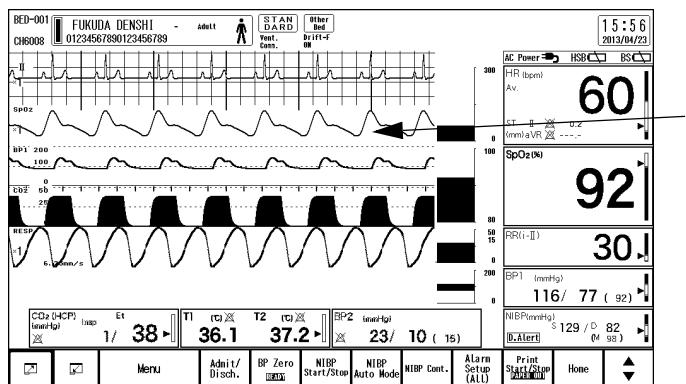
- ▶ The dropdown list will be displayed.

4 Select from [0 min.] to [30 min.].

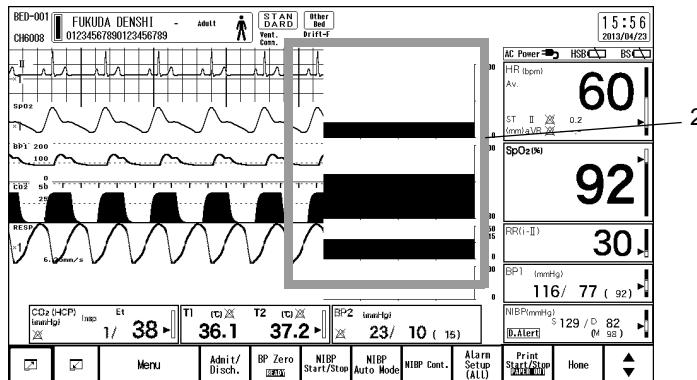
- ▶ The short trend can be displayed in 5 minutes increments from 0 minute to 30 minutes.

5 Select the display duration for the short trend.

1 Press the waveform display area on the home display.



2 The trend display time will change to the time of the pressed position.



NOTE

- When the alarm is generated for the recall alarm factor, recall screen can be displayed by pressing the short trend display area.

□ Sweep Speed

The sweep speed can be set with the following procedure.

REFERENCE

- The sweep speed can be set separately for ECG/BP/SpO₂ waveform and RESP waveform.

1 Press [Circ.] for "Sweep Speed (mm/s)".

▶ The dropdown list will be displayed.

2 Select from [6.25]/[12.5]/[25]/[50].

3 Press the [Vent.] key.

▶ The dropdown list will be displayed.

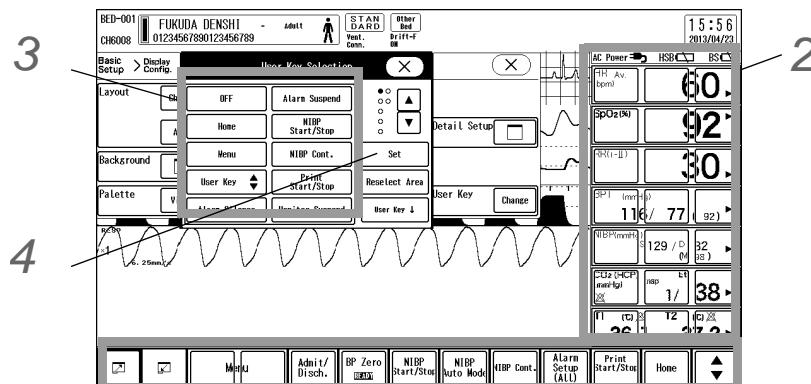
4 Select from [6.25]/[12.5]/[25].

User Key Setup

The user key can be set with the following procedure.

1 Press [Change] for "User Key".

- ▶ The display will change to user key selection mode.
- ▶ The "User Key Selection" window will be displayed.



2 Select the area to change the user key.

- ▶ By pressing the selected area again, the selection will be cancelled.

NOTE

- ♦ To restart from the beginning, press the [Reselect Area] key.
- ♦ Adjust the size of the selected area which will be indicated in blue frame.

3 Select the user key on the "User Key Selection" window.

NOTE

- ♦ The displayed user key can be switched between 2 displays using the [User Key Up] and [User Key Down] keys.
- ♦ Press the **▲** / **▼** keys to switch the user key selection.
(☞ "User Key Selection" P10-14)

4 Press the [Set] key.

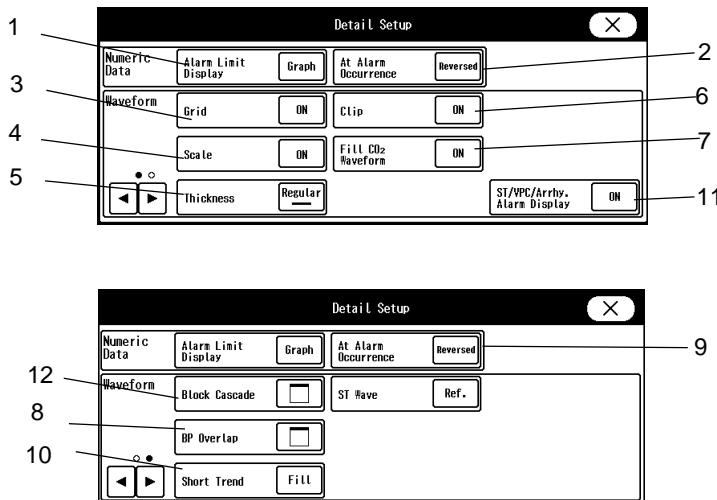
- ▶ The setup will be finalized.

□ Detail Setup

1

Press the key for "Detail Setup".

► The "Detail Setup" window will be displayed.



1 Alarm Limit Display

The alarm limit can be displayed inside the numeric data box.

[Graph]: Alarm limit will be displayed in bar graph.

[Numeric]: Alarm limit will be displayed in numeric format.

[OFF]: Alarm limit will not be displayed.

2 At Alarm Occurrence

The numeric data display format at alarm occurrence can be selected.

[Reversed]: The numeric data will be displayed reversed (highlighted) at alarm occurrence.

[3D]: The numeric data will be displayed in 3D at alarm occurrence.

3 Grid

The ECG waveform can be displayed on the grid.

[ON]: Grid will be displayed.

[Bold]: Grid will be displayed in bold format.

[OFF]: Grid will not be displayed.

REFERENCE

- Short trend and grid cannot be displayed overlapped.

4 Scale

The scale can be selected from [ON]/[Bold1]/[Bold2].

5 Thickness

The thickness of the displayed waveforms can be selected from [Thin] [Regular] [Thick].

6 Clip

Whether or not to clip the overlapped waveforms of the neighboring display area can be selected.

7 Fill CO₂ Waveform

Whether or not to fill in the CO₂ waveform from the baseline can be selected.

8 BP Overlap

The overlapping BP waveforms can be set.

9 ST Wave

The ST waveform to be displayed for the 12-Lead layout can be set.

[Ref.]: The ST reference waveform will be displayed.

[Average]: The average waveform will be displayed.

10 ST Short Trend

The display format for the ST short trend can be selected from [Plot]/[Fill]/[OFF].

11 ST/VPC/Arrhy. Alarm Display

Whether or not to display the ST value, VPC (integrated value of 1 minute), arrhythmia alarm message inside the HR numeric data box can be selected.

12 Block Cascade

The waveform combination for block cascade display can be set.

REFERENCE

- ♦ If multiple block cascades are selected for the waveform display areas, long duration waveform can be displayed.

2

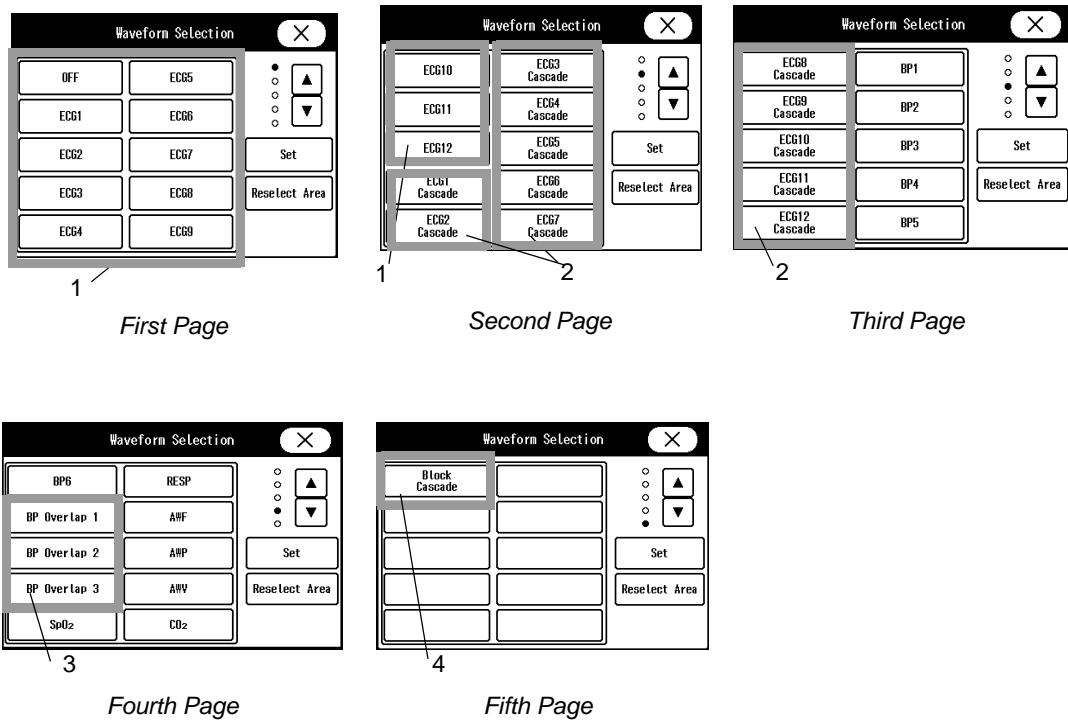
Press the [Home] key to check the configured display.

NOTE

- ♦ After configuring the display, press the [Home] key and verify the configured display.
- ♦ To maintain the configured display even after the power is turned OFF or after the discharge procedure, store the configuration to one of the user modes, or select [Backup] for "Display Configuration" under Initial Settings>User I/F>At Power ON/At Discharge. (☞ "To Select the User Mode" P5-7)

Waveform Selection

The waveform to be displayed can be selected on the "Waveform Selection" window. In this section, the details of the displayed waveforms are explained.



1 ECG1 to ECG12

The ECG waveform of the specified channel will be displayed. Minimum of 2 blocks are required to display the ECG waveform.

2 ECG1 to ECG12 Cascade

The ECG waveform of the specified channel will be displayed in cascade. Minimum of 2 blocks are required to display in cascade.

3 BP Overlap 1 to 3

The BP waveform (BP1 to BP6) set on "BP Overlap Setup" will be displayed.

If the waveform display area is too small to display the assigned BP waveforms, it will be displayed in the priority from smaller channel numbers.

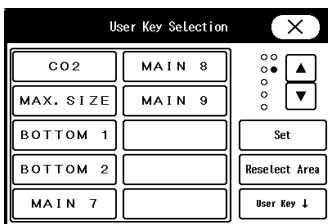
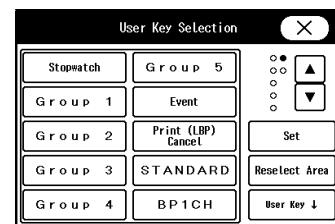
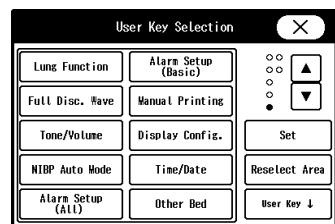
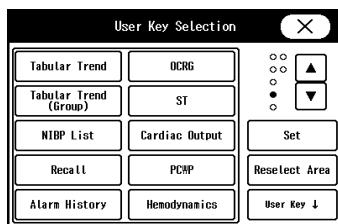
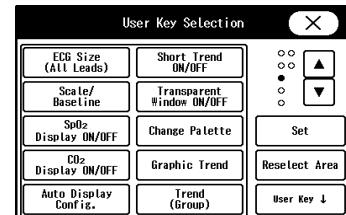
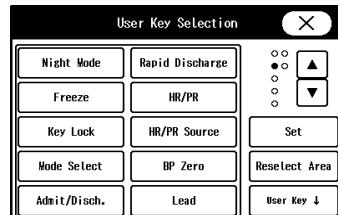
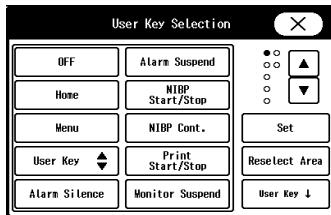
4 Block Cascade

The waveforms (2 to 6) set on the "Block Cascade Setup" will be displayed in one block.

Other than the waveforms explained above, the selected waveform on the "Waveform Selection Window" will be displayed.

User Key Selection

The user keys can be set on the "User Key Selection" window.
In this section, the user key function is explained.



| | |
|--|---|
| OFF | Blank key will be displayed. |
| Home | The display will return to the home display. |
| Menu | The menu screen will be displayed. |
| User Key  | The first and second page of the user key area will switch. This key will be located at the same position for both first and second page. |
| Alarm Silence | Alarm sound will be suspended for fixed amount of time. By pressing the key for more than 3 seconds while the alarm is not generated, it will bring the system to "Alarm Sound Suspend" condition. |
| Alarm Suspend | Alarm (sound and display) will be suspended for fixed amount of time. |
| NIBP Start/Stop | NIBP measurement will start/stop. |
| NIBP Cont. | NIBP continuous measurement will start/stop. |
| Print Start/Stop | Manual printing will start/stop. |
| Monitor Suspend | Confirmation window to suspend monitoring will be displayed. |
| Night Mode | Night mode will turn ON/OFF. |
| Freeze | Waveform trace will freeze for fixed amount of time. Pressing the [Print Start/Stop] key while in freeze condition will print the frozen waveform. Pressing the key again will start the waveform trace again. |
| Key Lock | Touch key operation will turn ON/OFF. It can be used when cleaning the display panel. |
| Mode Select | User mode selection screen will be displayed. |
| Admit/Discharge | Admit/Discharge screen will be displayed. |
| Rapid Discharge | Confirmation window to erase the data will appear. |
| HR/PR | The HR/PR numeric data box will be switched between HR and PR. |
| HR Source | The parameter for HR/PR Source will be automatically selected. |
| Zero Balance | Zero balance of BP1 to BP6 will be performed. |
| Lead | List of lead groups will be displayed, and selecting a lead group will display the lead selection window. 2 blocks of user key area are required to assign this key. It cannot be assigned to the numeric data area. |
| ECG Size (All Leads) | The waveform size for all ECG leads can be changed. |
| Scale | The home display will change to scale selection mode. |
| SpO ₂ Display ON/OFF | SpO ₂ display will turn ON/OFF. |
| CO ₂ Display ON/OFF | CO ₂ display will turn ON/OFF. |
| Auto Display Config. | The display will be automatically configured with the currently measured parameters. |
| Short Trend ON/OFF | Short Trend display will turn ON/OFF. |
| Transparent Window ON/OFF | Transparent window will turn ON/OFF. |
| Change Palette | Palette selection window will be displayed. |
| Graphic Trend | The graphic trend will be displayed. |
| Trend (Group) | List of trend groups will be displayed, and selecting a trend group will display the graphic trend. |
| Tabular Trend | The tabular trend will be displayed. |
| Tabular Trend (Group) | List of tabular trend groups will be displayed, and selecting a trend group will display the tabular trend. |
| NIBP List | NIBP list will be displayed. |
| Recall | Recall screen will be displayed. |

| | |
|--------------------------------|--|
| Alarm History | Alarm history will be displayed. |
| OCRG | OCRG screen will be displayed. |
| ST | ST screen will be displayed. |
| Cardiac Output | CO measurement screen will be displayed. |
| PCWP | PCWP measurement screen will be displayed. If BP labeled as PAP is not measured, this screen will not be displayed. |
| Hemodynamics | Hemodynamics screen will be displayed. |
| Lung Function | Lung Function screen will be displayed. |
| Full Disc. Wave | Full disclosure waveform will be displayed. |
| Tone/Volume | The tone/volume setup screen will be displayed. |
| NIBP Auto Mode | NIBP Auto Mode window will be displayed. |
| Alarm Setup (All) | Alarm settings for all parameters will be displayed. |
| Alarm Setup (Basic) | Alarm settings for basic parameters will be displayed. |
| Manual Printing | Manual printing setup screen will be displayed. |
| Display Configuration | The display configuration window will be displayed. |
| Time/Date | Time/Date setup screen will be displayed. |
| Other Bed | Other bed screen will be displayed. |
| Stopwatch | Stopwatch screen will be displayed. |
| Group 1 to 5 | Selection list of key group 1 to 5 will be displayed. |
| Event | Event selection list will be displayed. The selected event will be stored as recall waveform. |
| Print (LBP) Cancel | Printing on the laser printer will be cancelled. |
| Main Mode 1 (Standard) | Standard will be set as the monitoring mode. |
| Main Mode 2 (BP1CH) | BP1CH will be set as the monitoring mode. |
| Main Mode 3 (CO ₂) | CO ₂ will be set as the monitoring mode. |
| Main Mode 4 (Maximum) | Maximum will be set as the monitoring mode. |
| Main Mode 5 (Bottom 1) | Bottom 1 will be set as the monitoring mode. |
| Main Mode 6 (Bottom 2) | Bottom 2 will be set as the monitoring mode. |
| Main Mode 7 (Standard) | Standard will be set as the monitoring mode. |
| Main Mode 8 (Standard) | Standard will be set as the monitoring mode. |
| Main Mode 9 (Standard) | Standard will be set as the monitoring mode. |

* Default user mode names are displayed inside the brackets. The mode names can be changed.

( Maintenance Manual "To Program the User Mode" P5-26)

WARNING

- ♦ After changing the mode, make sure that the monitoring setting is appropriate.
When the mode is changed, patient classification, alarm settings, etc. will be changed.

Tone/Volume

In this section, tone/volume setup procedure for alarm sound, HR synchronized sound, key sound, boot/shutdown sound is explained. The tone/volume setup screen also allows to turn OFF the ventilator alarm sound. The volume of BP zero balance and NIBP measurement end sound can be changed on "Other" setting.

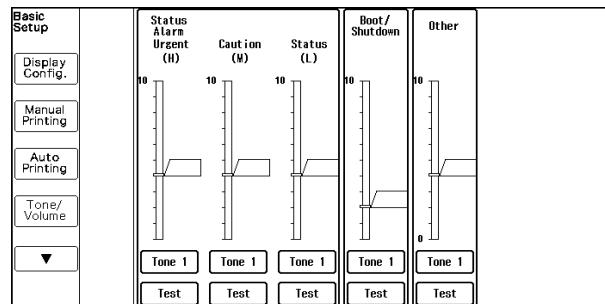
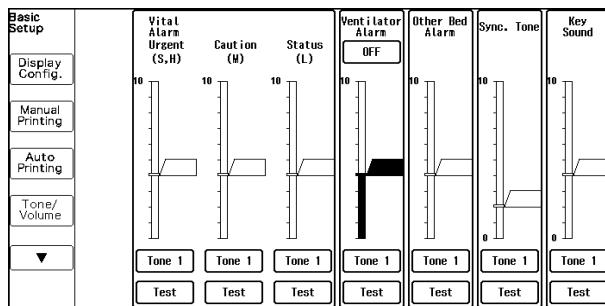
NOTE

- The tone setup for synchronized sound is effective only for HR and BP synchronized sound. The tone for SpO₂ synchronized sound will change according to the SpO₂ value. The tone will increase as the SpO₂ value increases, and vice versa.

1

Press the [Menu], [Sound] ("Basic Setup") keys.

- The tone/volume setup screen will be displayed.



2

Set the volume.



WARNING

- Changing the setting for "Alarm System" (Initial Settings>Alarm) will also change the alarm volume and tone setting. Make sure to check the volume and tone when the setting is changed.



CAUTION

- If the alarm volume is set too low, alarm occurrence may not be recognized. Alarm sound for ECG, SpO₂, CO₂ will be different from the test sound. The set volume will be applied but the set tone will not be applied to these parameters.
- When [Standard Tone] is set for the "Alarm System", the alarm volume and tone for the ventilator alarm and equipment status alarm will be the same with that of the vital alarm.

REFERENCE

- The volume above the set minimum alarm volume can be set.
( Maintenance Manual "Alarm Related Setup" P5-5)

1 Slide the  up or down.

► When the slider is released, / will be displayed.

2 Press the / keys.

► The volume will be adjusted.

REFERENCE

- The order of alarm priority is Urgent (H) > Caution (M) > Status (L).
The volume is also set according to the alarm priority.
The volume for high priority alarm cannot be set lower than the lower priority alarm, and vice versa.

3 Set the tone.

1 Press the [Tone] key.

► The dropdown list will be displayed.

2 Select the tone level.

NOTE

- The tone selection is different for synchronized sound, alarm sound, and key sound.

4 Press the [Test] key to check the set volume/tone.

5 Set ON/OFF for ventilator alarm sound.

1 Press the key for "Ventilator Alarm".

► The dropdown list will be displayed.

2 Select from [ON] or [OFF].

Alarm Behavior Setup

| Alarm Operation | Fukuda Tone (1) Tone 1 to 4 (2) Tone 5 to 8 | Melodic Tone | Standard Tone |
|-------------------------------------|--|--|--------------------------|
| Vital Alarm Sound | | | |
| Level H | (1) Continuous melodic tone (2) Continuous rapid tone | ECG: Continuous melodic tone with rising pitch SpO ₂ , O ₂ : Continuous melodic tone with falling pitch CO ₂ : Continuous melodic tone with mixed low and high pitch Other than above: Continuous melodic tone | Continuous tone |
| Level M | (1) Alternate high and low pitch in 5 seconds interval (2) Rapid tone in 5 seconds interval | ECG: Rising pitch in 4 seconds interval melodic tone SpO ₂ , O ₂ : Falling pitch in 4 seconds interval melodic tone CO ₂ : Mixed low and high pitch sound in 4 seconds interval melodic tone Other than above: 4 seconds interval melodic tone | 4 seconds interval tone |
| Level L | (1) 15 seconds interval melodic tone (2) 15 seconds interval tone | 17 seconds interval melodic tone | 17 seconds interval tone |
| Equipment Status Alarm Sound | | | |
| Level H | (1) Continuous melodic tone (2) Continuous rapid tone | Continuous melodic tone | Continuous tone |
| Level M | (1) Alternate high and low pitch in 5 seconds interval (2) Rapid tone in 5 seconds interval | 4 seconds interval melodic tone | 4 seconds interval tone |
| Level L | (1) 15 seconds interval melodic tone (2) 15 seconds interval tone | 17 seconds interval tone | 17 seconds interval tone |
| Volume Setup | | | |
| Level H, M, L | The volume for low level alarm cannot be set higher than the higher level alarm. | | |
| Tone Setup | | | |
| Level H | Vital Alarm: Setup can be performed. Equipment Status Alarm: Setup can be performed. | Vital Alarm: Setup can be performed. Equipment Status Alarm: Setup cannot be changed. | |
| Level M | | | |
| Level L | | | |
| Setup other than above | | | |
| Other Bed Alarm | Sound: Continuous tone Tone: Cannot be changed. Volume: Can be adjusted. | Sound: Continuous tone Tone: Cannot be changed. Volume: Can be adjusted. | |
| Ventilator Alarm Sound | Sound: Continuous tone Tone: Cannot be changed. Volume: Can be adjusted. | Sound: Continuous melodic tone Tone: Cannot be changed. Volume: Can be adjusted. | Continuous tone |

Color

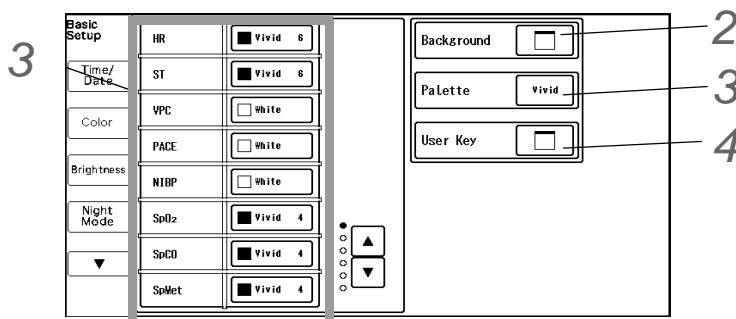
In this section, setup procedure for the color of background, numeric data, waveform is explained.

The colors of the background, numeric data, waveform, user key can be customized.

The colors can be customized according to the various monitoring scene such as recognizable colors from a far distance or colors which will not strain your eyes by the long time monitoring.

- 1** Press the [Menu], [Color] ("Basic Setup") keys.

► The "Color" selection window will be displayed.



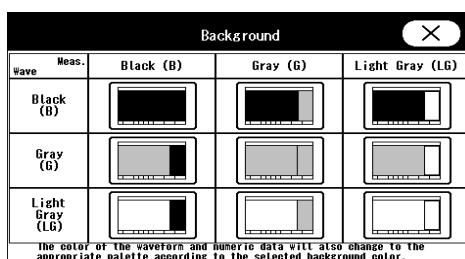
- 2** Set the background color.

REFERENCE

- ♦ The background color for the numeric data area and waveform area can be selected from three colors (black, gray, light gray).
- ♦ The background color can be also set by pressing the [Menu], [Display Config.]("Basic Setup"), "Background" keys.

- 1** Press the key for "Background".

► The "Background" color selection window will be displayed.



- 2** Select the background color.

► The selected background color will be immediately reflected.

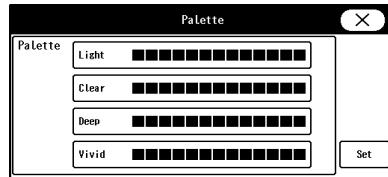
- 3** Set the color of numeric data and waveform.

REFERENCE

- ♦ The color can be set for each parameter. 12 colors (+white) for each palette are selectable.

- 1** Press the key for [Palette].

- The "Palette" selection window will be displayed.



2 Select the palette from [Light]/[Clear]/[Deep]/[Vivid], and press [Set].

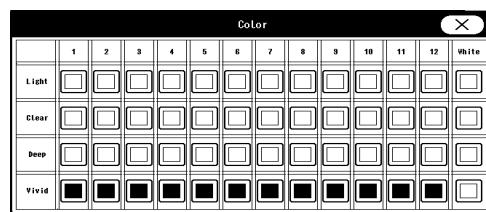
- The color of the numeric data and waveform will change to the selected palette color.

3 Press the keys.

- The page will switch.

4 Press the key for the parameter to change the color.

- The "Color" selection window will be displayed.



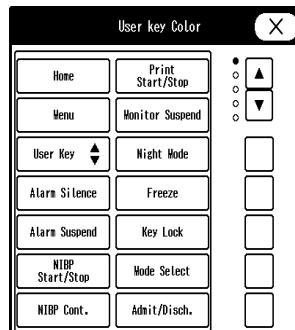
5 Select a color.

- The assigned color for the parameter will be also applied to the graphic trend and tabular trend data.

4 Set the color of the user key.

1 Press the key for "User Key".

- The "User Key Color" selection window will be displayed.



2 Press the keys.

- The page will switch.

3 Select the user key to change the color.

- Pressing the key again will cancel the selection.

4 Select the color displayed on the right.

- The color of the user key will change.

Brightness

In this section, brightness adjustment of the monitor display is explained.

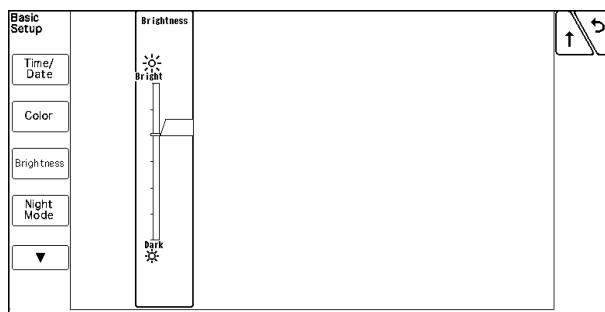
⚠ CAUTION

- The display panel utilizes LED for the backlight. Since this LED deteriorates by the life cycle, the display may become dark, scintillate, or may not light by the long term use. In such case, contact your nearest service representative.

1

Press the [Menu], [Brightness] ("Basic Setup") keys.

- ▶ The brightness setup screen will be displayed.



2

Slide the  up or down.

- ▶ When the slider is released, / will be displayed.

3

Press the / keys.

- ▶ The brightness will be adjusted.

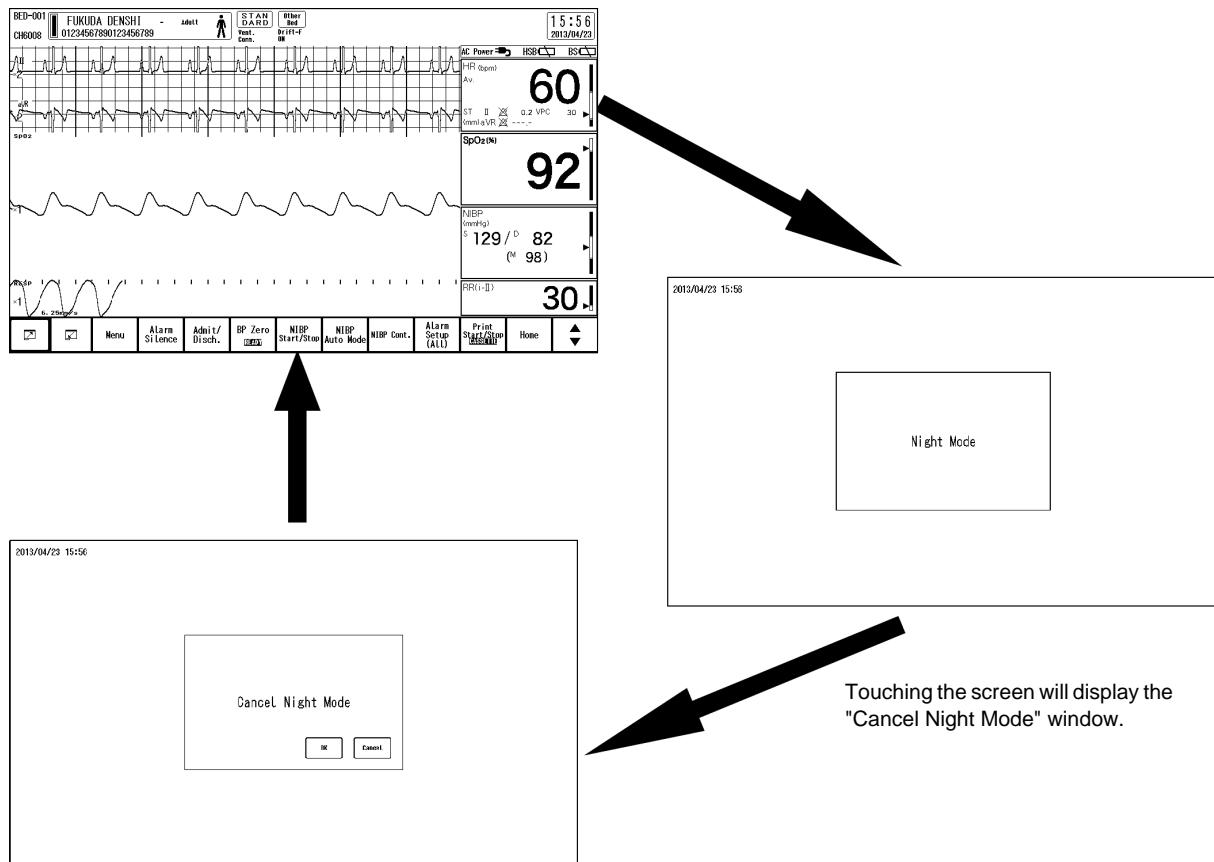
Night Mode

In this section, the procedure to set the night mode is explained.

The night mode is a function to preset the screen brightness and alarm volume when turning OFF the light of the ward or when the patient is asleep, etc.

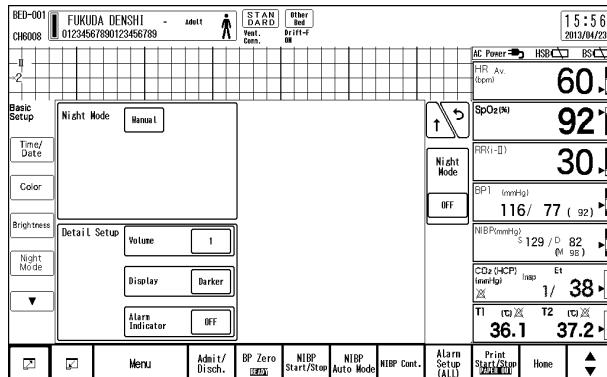
The night mode can be manually set to ON, or automatically set to ON by preprogramming the time to turn ON/OFF the night mode.

Operation flow when the night mode is set to "Timer"



Operation flow when the night mode is set to [Darker] or [Dark]

- To manually set the night mode, select [ON] for "Night Mode" or press [Night Mode] set as user key.



- During the night mode, "Night Mode Active" message will be displayed.

NOTE

- When the timer is set, the night mode will automatically start at the set "Start Time".

2 Cancel the night mode.

▶ Press the key for "Night Mode Cancel" under Menu>Initial Settings>User I/F. The dropdown list will be displayed. Select from [Any Key]/[Night Mode Key].

• Night Mode Cancel

- [Any Key]: The night mode can be cancelled by pressing any key on the screen.
- [Night Mode Key]: The night mode can be cancelled by pressing the [Night Mode] key on the user key or on the menu screen.

▶  Maintenance Manual "Display/Print Setup" P5-12

NOTE

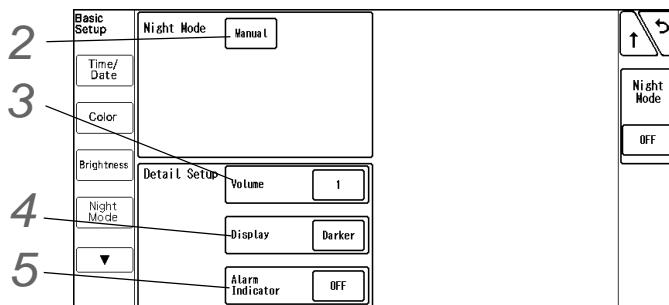
- The night mode can be manually turned ON from the menu, user key, or remote control even when the night mode is set to automatically turn ON. The night mode will automatically turn OFF at the set "End Time".
- The night mode cannot be set when the ventilator alarm is generated.

Night Mode

The time to start and end the night mode, and the night mode display can be set.

1 Press the [Menu], [Night Mode] ("Basic Setup") keys.

▶ The Night Mode setup screen will be displayed.

**2** Set the "Start Time" and "End Time" for the night mode.**1** Press the key for "Night Mode".

▶ The dropdown list will be displayed.

2 Select from [Manual]/[Timer].

▶ [Manual]: The night mode can be turned ON or OFF manually using the user key.

▶ [Timer]: The night mode will automatically turned ON or OFF at the preprogrammed time.

REFERENCE

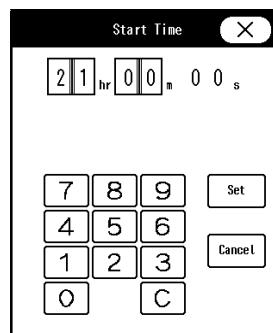
- The night mode can be manually turned ON from the user key or remote control even

when the [Timer] is set.

When [Timer] is selected:

3 Press the key for "Start Time".

► The "Start Time" window will be displayed.



4 Use the numeric keys to enter the time.

5 Press the [Set] key.

6 Set the "End Time" with the same procedure from Step 3 to 5.

3 Set the volume.

⚠ WARNING

- When selecting [Silence], pay attention not to miss any important alarm by simultaneously monitoring the bed on other monitors such as central monitor.
-

1 Press the key for "Volume".

► The dropdown list will be displayed.

2 Select from [No Change]/[3]/[1]/[0].

- [No Change]: Standard volume will be set.
- [3]: Third level from the minimum volume will be set.
- [1]: Minimum volume will be set.
- [0]: Sound will be silenced.

4 Set the brightness.

⚠ WARNING

- When selecting [Timer], pay attention not to miss any important alarm by simultaneously monitoring the patient on other monitors such as central monitor.
-

1 Press the key for "Display".

► The dropdown list will be displayed.

2 Select from [No Change]/[Dark]/[Darker]/[Timer].

- [No Change]: Brightness will not change
- [Dark]: 80% of the maximum brightness will be set.

- ▶ [Darker]: 50% of the maximum brightness will be set.
- ▶ [Timer]: Only the time will be displayed. The message will disappear after 1 minute from starting the night mode.

5 Set the alarm indicator operation.

- 1 Press the key for "Alarm Indicator".
 - ▶ The dropdown list will be displayed.
- 2 Select from [ON] or [OFF].
 - ▶ [ON]: The alarm indicator will light even during the night mode.
 - ▶ [OFF]: The alarm indicator will not light during the night mode.

Chapter 11 Troubleshooting

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Chapter 11 Troubleshooting

Message List

This section lists the alarm messages for each parameter.

For the vital alarm message, there are numeric data alarm and arrhythmia alarm, and the delay time are as follows.

- Numeric Data Alarm: Adult/Child: 5 sec., Neonate: none
- Arrhythmia Alarm: Adult/Child/Neonate: none

Vital Alarm Message

CAUTION

- The alarm message for the arrhythmia alarm will continue to be displayed for 30 seconds after the alarm is resolved.
- The alarm level shown below is the standard level set by Fukuda Denshi.
- The alarm level can be changed on the "Initial Settings".
- When connected to DS-LANII, the alarm level will be fixed to DS-LANII alarm level and cannot be changed.

Top Priority Alarm (Alarm Level S)

This level can be selected for some parameters only when [Fukuda Tone] is selected for the "Alarm System"("Initial Settings"). It cannot be selected when the "Alarm System" is [Melodic Tone] or [Standard Tone].

Life Threatening Alarm (Alarm Level H)

| Parameter | Message |
|--|----------|
| Respiration (Impedance, CO ₂ , Ventilator) | Apnea |
| Arrhythmia | ASYSTOLE |
| | VF |
| | VT |
| | TACHY |
| | BRADY |

Cautionary Alarm (Alarm Level M)

| Parameter | Message |
|--|---|
| HR | Lower HR Alarm |
| | Upper HR Alarm |
| BP | Lower BP# Alarm or Lower (label) Alarm* |
| | Upper BP# Alarm or Upper (label) Alarm* |
| Pulse Rate (BP) | Lower PR Alarm |
| | Upper PR Alarm |
| SpO ₂ | Lower SpO ₂ Alarm |
| | Upper SpO ₂ Alarm |
| Pulse Rate (SpO ₂) | Lower PR Alarm |
| | Upper PR Alarm |
| Non-Invasive Blood Pressure | Lower NIBP Alarm |
| | Upper NIBP Alarm |
| Respiration (Impedance, CO ₂ , Ventilator) | Lower RR Alarm |
| | Upper RR Alarm |
| Gas | Lower CO ₂ -E Alarm |
| | Upper CO ₂ -E Alarm |
| | Upper CO ₂ -I Alarm |
| Arrhythmia | RUN |

*: # indicates the label of BP, TEMP.

Treatment Needed Alarm (Alarm Level L)

| Parameter | Message |
|----------------------|---|
| ST1 to 12 | Lower ST(Lead Type) Alarm" |
| | Upper ST(Lead Type) Alarm" |
| SpCO | Upper SpCO Alarm" |
| SpMet | Upper SpMet Alarm" |
| SpHb | Lower SpHb Alarm" |
| | Upper SpHb Alarm |
| TEMP (TEMP1 to 6) | Lower TEMP# Alarm or Lower (label) Alarm* |
| | Upper TEMP# Alarm or Upper (label) Alarm* |
| Blood Temperature | Upper Tb Alarm |
| | Lower Tb Alarm |
| Arrhythmia | PAUSE |
| | COUPLET |
| | BIGEMINY |
| | TRIGEMINY |
| | FREQUENT |

*: # indicates the channel number of BP, TEMP.

Notification Alarm

| Parameter | Message |
|---------------------|--------------------------|
| All Alarm | Alarm Suspend (xxx sec.) |
| Alarm Sound Suspend | Alarm Silence (xxx min.) |
| Arrhythmia | LEARN |
| | ARRHY. OFF |

NOTE

- (xxx sec) of the "Alarm Suspend (xxx sec)" message indicates the remaining time of alarm suspended duration.
- (xxx min.) of the "Alarm Silence (xxx min.)" message indicates the remaining time of alarm sound suspended duration.
- The "ARRHY OFF" message will be displayed when the Asystole, VF, VT, Slow_VT, and HR alarm is OFF.

Vital Alarm Message (DS-LAN Standard Setup)

CAUTION

- The alarm message for the arrhythmia alarm will continue to be displayed for 30 seconds after the alarm is resolved.
- The alarm level shown below is the standard level set by Fukuda Denshi.
- The alarm level can be changed on the "Initial Settings".
- When connected to DS-LANII, the alarm level is fixed and cannot be changed.

Top Priority Alarm (Alarm Level S)

This level can be selected for some parameters only when [Fukuda Tone] is selected for the "Alarm System"("Initial Settings"). It cannot be selected when the "Alarm System" is [Melodic Tone] or [Standard Tone].

Life Threatening Alarm (Alarm Level H)

| Parameter | Message |
|---|--------------------------------|
| HR | Lower HR Alarm |
| | Upper HR Alarm |
| Pulse Rate (SpO ₂) | Lower PR Alarm |
| | Upper PR Alarm |
| Pulse Rate (BP) | Lower PR Alarm |
| | Upper PR Alarm |
| SpO ₂ | Lower SpO ₂ Alarm |
| | Upper SpO ₂ Alarm |
| BP | Lower BP1 Alarm |
| | Upper BP1 Alarm |
| | Lower ART Alarm |
| | Upper ART Alarm |
| Non-Invasive Blood Pressure | Lower NIBP Alarm |
| | Upper NIBP Alarm |
| (Impedance, CO ₂ , Ventilator) | Lower RR Alarm |
| | Upper RR Alarm |
| | Apnea Alarm |
| Gas | Lower CO ₂ -E Alarm |
| | Upper CO ₂ -E Alarm |
| | Upper CO ₂ -I Alarm |
| Arrhythmia | ASYSTOLE |
| | VF |
| | VT |
| | TACHY |
| | BRADY |
| | RUN |

Cautionary Alarm (Alarm Level M)

| Parameter | Message |
|-------------------|---|
| BP | Lower BP2 Alarm or Lower (label) Alarm* |
| | Upper BP2 Alarm or Upper (label) Alarm* |
| ST1 to 12 | Lower ST(Lead Type) Alarm |
| | Upper ST(Lead Type) Alarm |
| SpCO | Upper SpCO Alarm |
| SpMet | Upper SpMet Alarm |
| SpHb | Lower SpHb Alarm |
| | Upper SpHb Alarm |
| TEMP (TEMP1 to 6) | Upper TEMP# Alarm or Upper (label) Alarm* |
| | Lower TEMP# Alarm or Lower (label) Alarm* |
| Blood Temperature | Upper Tb Alarm |
| | Lower Tb Alarm |
| Arrhythmia | PAUSE |
| | COUPLET |
| | BIGEMINY |
| | TRIGEMINY |
| | FREQUENT |

*: # indicates the channel number of BP, TEMP.

Notification Alarm

| Parameter | Message |
|---------------------|--------------------------|
| All Alarm | Alarm Suspend (xxx sec.) |
| Alarm Sound Suspend | Alarm Silence (xxx min.) |
| Arrhythmia | LEARN |
| | ARRHY. OFF |

NOTE

- (xxx sec) of the "Alarm Suspend (xxx sec)" message indicates the remaining time of alarm suspended duration.
- (xxx min.) of the "Alarm Silence (xxx min.)" message indicates the remaining time of alarm sound suspended duration.
- The "ARRHY OFF" message will be displayed when the Asystole, VF, VT, Slow_VT, and HR alarm is OFF.

Equipment Status Alarm Message

□ Top Priority Alarm (Alarm Level S)

| Item | Message | Delay Time (sec.) |
|------------|---------------|-------------------|
| Ventilator | "Vent. Alarm" | 1 |
| | "VENT COMM" | 1 |

□ Life Threatening Alarm (Alarm Level H)

| Item | Message | Delay Time (sec.) |
|------------|------------------------------------|-------------------|
| Main Unit | "DS-8200 Failure" | 10 |
| | "DS-8200 Speaker Failure" | 10 |
| Super Unit | "HS-8000 Failure" | 3 |
| | "ECG Unit Error" | 5 |
| | "HS-8000 Multiamp. Failure" | 3 |
| | "NIBP Meas. Error (###-##)"* | 10 or 3 |
| | "GAS Unit I/F Failure" | 3 |
| | "HS-8000 SpO ₂ Failure" | 5 or 1 |
| HS Adapter | "HSB-80 Failure" | 10 |
| | "Fan Failure" | 3 |
| | "Charge the battery." | 10 |
| Base Unit | "BS-8200 Failure" | 10 |
| | "DS-8200 Check Battery (BS)" | 10 |

*: # indicates an error code.

□ Cautionary Alarm (Alarm Level M)

| Item | Message | Delay Time (sec.) |
|--|---|-------------------|
| NIBP | "NIBP meas. failed. (###-##)"*1 | 1 |
| CO ₂ (HCP-800/HCP-810) | "CO ₂ Check Sample Line " | 1 |
| | "CO ₂ Check Exhaust Port" | 1 |
| | "CO ₂ Unit Failure" | 1 |
| | "CO ₂ Cal. Required" | 1 |
| Capnostat 5 CO ₂ (Gas Unit I/F and Mainstream Module) | "CO ₂ Sensor Failure" | 1 |
| Main Unit | "DS-8200 Check Short-Term Battery" | 10 |
| | "DS-8200 Check Long-Term Battery" | 10 |
| Super Unit | "HS-8000 Out of Operating Temp. Range" | 3 |
| | "HS-8000 Analog Unadjusted" | 3 |
| Display Unit | "Display Unit Failure" | 3 |
| Full Disc. Wave | "Failed to write full disclosure to the CF card." | 1 |

*1: On "Initial Settings" menu, the alarm level can be selected from Level M/L/N(Notification).(Default: Level M)

If "Alarm Silence" key is pressed during Level M/L alarm generation, the alarm level will change to Level N (notification).

indicates an error code.

Treatment Needed Alarm (Alarm Level L)

| Item | Message | Delay Time (sec.) |
|--|---|---------------------------------|
| ECG | "Check Electrodes (#, #, #)"*1 | 3 |
| | "ECG Check Electrodes Attachment." | 3 |
| | "Cannot Analyze" | 1 |
| | "ECG Pacing Detection Error" | 1 |
| | "ECG Artifact" | 3 |
| | "ECG Only 5 electrodes are used." | 1 |
| Impedance | "RR meas. range is exceeded." | 3 |
| | "CVA detected" | Adult/Child: 20, Neonate: 10 |
| SpO ₂ (Masimo Unit) | "SpO ₂ Check Sensor Attach." | 3 |
| | "SpO ₂ Replace Sensor" | 1 |
| | "SpO ₂ Low Perfusion" *2 | 1 |
| | "SpO ₂ Pulse Search" | 1 |
| | "SpO ₂ Noise Interference" | 1 |
| | "SpO ₂ Check Sensor Attach." | 1 |
| | "SpO ₂ Replace Cable" | 3 |
| | "SpO ₂ Check Cable" | 3 |
| | "SpO ₂ Check Sensor Conn." | 3 |
| | "SpO ₂ only mode" | 1 |
| SpO ₂ (Nellcor Unit) | "SpO ₂ Check Sensor Attach." | 3 |
| | "SpO ₂ Replace Sensor" | 1 |
| | "SpO ₂ No Pulse Detected" | 1 |
| BP | "BP # Transducer OFF" *3 | 5 |
| TEMP | "T ## Unknown Sensor" *4 | 3 |
| Non-Invasive Blood Pressure | "Check NIBP cuff, hose" *5 | 3 |
| | "NIBP Check patient type, air hose" | 3 |
| Capnostat 5 CO ₂ (Gas Unit I/ F and Mainstream Module) | "CO ₂ Check airway adapter." | 1 |
| Connector Off | "ECG Disconnected" | 3 |
| | "BP # Disconnected" *3 | 3 |
| | "SpO ₂ Disconnected" | 3 |
| | "T ## Disconnected" *4 | 3 |
| | "CO Disconnected" | 3 |
| | "CO ₂ Disconnected" | 3 |
| Main Unit | "DS-8200 Check Unit" | 10 |
| | "DS-8200 Out of Operating Temp. Range" | 10 |
| | "DS-8200 Check Battery (HSB)" | 3 |
| | "Check Option Unit" | 10 |
| | "Check Option Unit Connection" | 3 |
| | "Charge the battery (HSB)." | 10 |
| Super Unit | "HS-8000 Check Conn." | 3 |
| | "HS-8000 Check SD Card" | 3 |

| Item | Message | Delay Time (sec.) |
|---|--|-------------------|
| | "HS-8000 Check DIP SW" | 3 |
| | "HS-8000 TEMP Unit Failure" | 3 |
| | "HS-8000 data transfer failed." | 3 |
| HS Adapter | "HSB-80 Check Unit" | 10 |
| Base Unit | "BS-8200 Check Unit" | 10 |
| | "DS-8200 Check Battery (BS)" | 3 |
| | "Charge the battery (BS)." " | 10 |
| | "BS-8200 Check Conn." | 3 |
| Check Connection, Check Reception, Interference | "Check Oximeter Conn." | 1 |
| | "Check BIS Conn." | 1 |
| | "Check INVOS Connection" | 1 |
| | "Check Printer Conn." | 3 |
| | "Chk DS-LAN Comm" | 3 |
| | "Check HLX Conn." | 3 |
| | "Check System Conn." | 3 |
| | "Check Printer Comm" | 1 |
| Full Disc. Wave | "Wrong CF card for full disclosure." | 1 |
| | "Failed to read full disclosure from the CF card." | 1 |
| | "Check CF card for full disclosure." | 1 |

*1: # indicates an electrode type.

*2: On "Initial Settings" menu, the alarm level can be selected from Level L/N. (Default: Level L)

*3: # indicates the label of BP.

*4: # indicates the label of TEMP.

*5: On "Initial Settings" menu, the alarm level can be selected from Level M/L/N. (Default: Level L)

If "Alarm Silence" key is pressed during Level M/L alarm generation, the alarm level will change to Level N (notification).

NOTE

- ♦ "NIBP meas. failed", "Check NIBP cuff, hose", "Connector Off", "ECG Only 5 electrodes are used.", "Check xx Conn.", "Check xx Comm." alarms will be cancelled when [Alarm Silence] key is pressed. Pay attention not to cancel the important alarm.

Notification Alarm

| Item | Message | Delay Time (sec.) |
|---|---|-------------------|
| Operation | "Waveform Frozen (xxsec.)" ^{*1} | 1 |
| | "Key Locked (xxsec.)" ^{*1} | 1 |
| | "Night Mode Active" | 1 |
| ECG | "ECG Low Amplitude" | 3 |
| | "ECG Artifact" | 3 |
| | "ECG EMG Interference" | 3 |
| | "Check Electrodes" ^{*5} | 3 |
| BP | "BP # Zeroing Required" ^{*2} | 1 |
| TEMP | "T # Unknown Sensor" ^{*3} | 1 |
| SpO ₂ (Masimo Unit) | "SpO ₂ Demo Mode" | 1 |
| | "SpO ₂ Initializing" | 1 |
| | "SpO ₂ Check Sensor Attach." ^{*5} | 3 |
| SpO ₂ (Nellcor Unit) | "SpO ₂ Motion Artifact" | 1 |
| | "SpO ₂ Check Sensor Attach." ^{*5} | 1 |
| Capnostat 5 CO ₂ (Gas Unit I/F and Mainstream Module) | "CO ₂ Warming Up" | 1 |
| | "Zero the CO ₂ Adapter" | 1 |
| | "Unknown CO ₂ Sensor" | 1 |
| CO ₂ (HCP-800) | "CO ₂ Suspended" | 1 |
| | "CO ₂ Zeroing" | 1 |
| Non-Invasive Blood Pressure | "Initializing NIBP" | 3 |
| Printer | "Check Printer" ^{*4} | 3 |
| | "Check Paper" ^{*4} | 3 |
| | "Printer Busy" ^{*4} | 1 |
| | "Check Cassette" ^{*4} | 3 |
| Central Printer (Built-in Printer) | "Check Paper (Central)" ^{*4} | 3 |
| | "Check Cassette" ^{*45} | 3 |
| | "Printer Busy (Central)" ^{*4} | 1 |
| | "Check Central Printer" ^{*4} | 3 |
| Central Printer (Laser Printer) | "Central Printer Check Connection" | 1 |
| | "Central Printer Check Setting" | 1 |
| | "Check Central ID" | 1 |
| | "Chk DS-LAN Comm" | 1 |
| Main Unit | "DS-8200 Check Rotary SW" | 1 |
| | "DS-8200 Check DIPSW" | 1 |
| Base Unit | "Charge the battery (BS)." ^{*6} | 10 |
| System Configuration | "Check Equip. Config." | 1 |
| | "Connecting to DS-8500" | 3 |

*1: xx indicates the remaining time.

*2: # indicates the channel number of BP.

*3: # indicates the channel number of TEMP.

*4: On "Initial Settings" menu, the alarm level can be selected from Level M/L/N. (Default: N)

- *5: The alarm generation can be inhibited depending on the setting.
- *6: Displayed when lead-off or sensor-off condition remains after the power is turned ON, monitoring is resumed, or a patient is discharged.
- *7: Displayed when the battery capacity of the BS-8210 becomes low in case when a battery is also installed in the HSB-80.

Numeric Data Box Message

HR

| Message |
|------------------------------|
| Unit Failure |
| Upper HR Alarm |
| Lower HR Alarm |
| Lower ST Alarm |
| Upper ST Alarm |
| Cannot Analyze |
| Check Electrodes |
| Check Electrodes Attachment. |
| Pacing Detection Error |
| Only 5 electrodes are used. |
| Out of Range |
| Low Amplitude |
| Noise Interference |
| Artifact |

ST

| Message |
|----------------|
| Lower ST Alarm |
| Upper ST Alarm |

BP1 to 6

Level H for BP1 and ART, Level M for other label

| Message |
|----------------|
| Lower BP Alarm |
| Upper BP Alarm |
| Zero Required |
| Out of Range |

Pulse Rate (BP Source)

| Message |
|---------------------|
| Upper PR Alarm (BP) |
| Lower PR Alarm (BP) |
| Out of Range |

NIBP

If "NIBP Meas. Error" is displayed, the message can be cancelled by pressing [Cancel Error] on the NIBP setup screen, or [NIBP Start/Stop] key (user key).

If the same message is repeatedly displayed, a failure of the equipment can be considered. Cease the measurement and contact our service representative.

(☞ "<NIBP Meas. Error (Exx-xx)> is displayed." P11-32)

| Message |
|------------------------------|
| NIBP Meas. Error |
| Upper NIBP Alarm |
| Lower NIBP Alarm |
| Measurement Failed. |
| Check NIBP cuff, hose |
| Check patient type, air hose |
| Initializing |
| Out of Range |

 SpO₂ (Nellcor Model)

| Message |
|------------------------------|
| Unit Failure |
| Lower SpO ₂ Alarm |
| Upper SpO ₂ Alarm |
| Replace Sensor |
| Check Sensor Attach. |
| No Pulse Detected |
| Motion Artifact |
| Pulse Search |

 SpO₂/SpCO/SpMet/SpHb (Masimo Model)

| Message |
|------------------------------|
| Lower SpO ₂ Alarm |
| Upper SpO ₂ Alarm |
| Upper SpCO Alarm |
| Upper SpMet Alarm |
| Lower SpHb Alarm |
| Upper SpHb Alarm |
| Replace Sensor |
| Check Sensor Attach. |
| Low Confidence |
| Pulse Search |
| Noise Interference |
| Check Sensor |
| Replace Cable |
| Check Cable |
| Check Sensor Conn. |

| Message |
|----------------------------|
| Zeroing Sensor |
| SpO ₂ only mode |
| Low Signal IQ |
| Low Confidence |

□ PR-SpO₂

| Message |
|------------------------------------|
| Upper PR alarm (SpO ₂) |
| Lower PR alarm (SpO ₂) |
| Out of Range |

□ TEMP1 to 6

| Message |
|-------------------|
| Upper TEMP alarm |
| Lower TEMP alarm |
| TEMP Unit Failure |
| Unknown Sensor |
| Out of Range |

□ Tb

| Message |
|----------------|
| Lower Tb Alarm |
| Upper Tb Alarm |
| Out of Range |

□ RR (Impedance)

| Message |
|-----------------------------|
| Apnea Alarm |
| Upper RR Alarm |
| Lower RR Alarm |
| CVA detected |
| RR meas. range is exceeded. |
| Out of Range |
| Suspended |

□ RR (Ventilator)

| Message |
|----------------|
| Apnea Alarm |
| Upper RR Alarm |
| Lower RR Alarm |

RR (Gas)

| Message |
|----------------|
| Apnea Alarm |
| Upper RR Alarm |
| Lower RR Alarm |
| Out of Range |

 CO₂ (Gas Unit I/F and Mainstream Module)

| Message |
|--------------------------------------|
| Upper CO ₂ -E Alarm |
| Lower CO ₂ -E Alarm |
| Upper CO ₂ -I Alarm |
| Check airway adapter. |
| Zero Calibration is being performed. |
| Warming Up |
| Zero CO ₂ Adapter |
| Unknown Sensor |
| Out of Range |

 CO₂(When HCP-800/HCP-810 is used)

| Message |
|--------------------------|
| Initializing |
| Check Sample Line |
| Zeroing |
| Check the Exhaust Port |
| Perform calibration. |
| GAS Unit I/F Failure |
| Out of Range |
| Upper CO ₂ -E |
| Lower CO ₂ -E |
| Upper CO ₂ -I |

Ventilator Alarm Message

Top Priority Alarm (Alarm Level S)

| Parameter | Message |
|------------|-------------|
| Ventilator | Vent. Alarm |
| Ventilator | VENT_COMM |

WARNING

- The ventilator alarm sound is set to OFF at factory default setting.
 - The alarm sound can be turned ON on the "Sound" ("Basic Setup") menu.
( "Tone/Volume" P10-17)
-

Ventilator Alarm Factor

CAUTION

- For the SV-900 ventilator, alarm factor cannot be transmitted to the central monitor.
 - Depending on the central monitor type and software version, ventilator alarm factor may not be displayed. For details, refer to our service representative.
 - The ventilator alarm factors are displayed only on the central monitor. These will not be displayed on the bedside monitor.
-

| Displayed Alarm Message | Note |
|-----------------------------|--|
| VENT AWP | Airway Pressure Alarm |
| VENT MV | Minute Ventilation Alarm |
| VENT APNEA | Apnea Alarm |
| VENT CONT. HP | Continuous High Pressure Alarm |
| Upper VENT_FiO ₂ | FiO ₂ Upper Limit Alarm |
| Lower VENT_FiO ₂ | FiO ₂ Lower Limit Alarm |
| Upper VENT_CO ₂ | EtCO ₂ Upper Limit Alarm |
| Lower VENT_CO ₂ | EtCO ₂ Lower Limit Alarm |
| Upper VENT_RR | RR Upper Limit Alarm |
| Lower VENT_RR | RR Lower Limit Alarm |
| VENT_PEEP | PEEP Low Alarm |
| VENT_COMM | Power OFF, cable disconnected, standby condition, etc. |
| VENT_URGENT | Other high level alarm |
| Ventilator | Other ventilator alarm |

Cardiac Output Message

Status Message

| Message | Details |
|---------|--|
| WAIT | Preparing for measurement. It will be also displayed when catheter relay cable is not connected to the CO module, or when thermodilution catheter is not connected. |
| READY | Ready to start the measurement. |
| BUSY | In process of measurement. |
| END | Measurement is completed. |

Result Status

The result status will be displayed for 30 seconds after completion of measurement.

| Message | Details |
|--------------|--|
| CO_OK | CO is correctly measured. |
| UPPER_FAULT | Measurement error <ul style="list-style-type: none"> After the injection, the blood temperature is out of the measurement range. The thermistor connector and relay cable are not securely connected. The sensor or relay cable is defective. |
| PEAK_FAULT | Measurement error <ul style="list-style-type: none"> The peak of the thermodilution curve can not be detected. The thermistor connector and relay cable are not securely connected. The sensor or relay cable is defective. |
| LOWER_FAULT | Measurement error <ul style="list-style-type: none"> The blood temperature has not returned to stable condition after the measurement. The thermistor connector and relay cable are not securely connected. The sensor or relay cable is defective. |
| SENSOR_ERROR | Measurement error <ul style="list-style-type: none"> The thermistor connector and relay cable are not securely connected. The sensor or relay cable is defective. |
| OVER RANGE | Measurement error <ul style="list-style-type: none"> The CO value is out of the calculation range. |

Troubleshooting

This section explains the troubleshooting for each case.

ECG

□<Check Electrodes> or <LEAD OFF> is displayed.

Cause 1

The electrode is detached, or is not making good electrical contact with the skin.

Solution

Check the electrode attachment.

Replace the electrodes.

Check if the lead cable or relay cable is defective (wire break, etc.).

(☞ "Before Attaching the Electrodes" P7-1)

(☞ "Electrode Placement" P7-2)

Cause 2

Even though the "3-lead Override" (ECG Parameter Setup) is set to [ON], electrodes other than LA, RA, LL are connected.

Solution

Set the "3-lead Override" to [OFF].

Or, detach the electrodes other than LA, RA, LL.

□<ECG Low Amplitude> is displayed.

Cause 1

The ECG amplitude is 0.25mV or below for the waveform size of x1, x1/2, x1/4, and 0.150mV or below for the waveform size of x2, x4.

Solution

Change the electrode site, or select a lead with higher QRS amplitude.

NOTE

- ♦ Using 4-electrode or 5-electrode instead of 3-electrode allows more accurate QRS detection.

Cause 2

The electrode contact is poor.

Electrical blanket or other noise source is near the patient.

Solution

Attach the electrodes firmly. Or, replace the electrodes.

- ♦ If the lead cable or relay cable is defective (wire break, etc.), replace it.
- ♦ If any noise source is near the patient, locate it away from the patient as much as possible.

Cause 3

Even though the "3-lead Override" (ECG Parameter Setup) is set to [ON], electrodes other than LA, RA, LL are

connected.

Solution

Set the "3-lead Override" to [OFF]. Or, detach the electrodes other than LA, RA, LL.

<ECG Artifact> is displayed.

Cause 1

The electrode contact is poor.

Electrical blanket or other noise source is near the patient.

Solution

Attach the electrodes firmly.

- ♦ If the lead cable or relay cable is defective (wire break, etc.), replace it.
- ♦ If any noise source is near the patient, locate it away from the patient as much as possible.

Cause 2

EMG is interfering.

Solution

- ♦ Change the electrode site to a location where the myoelectricity will be less likely to interfere.
- ♦ Select ESIS for the filter mode.



CAUTION

- ♦ Selecting a ESIS for the filter mode will decrease the QRS amplitude and may result in not counting the heart rate.

Cause 3

Even though the "3-lead Override" (ECG Parameter Setup) is set to [ON], electrodes other than LA, RA, LL are connected.

Solution

Set the "3-lead Override" to [OFF]. Or, detach the electrodes other than LA, RA, LL.

The ECG waveform is displayed in baseline.

The lead-off condition may have occurred by the following causes.

Cause 1

Electrode is detached.

Solution

Reattach the electrode. If the electrode contact is poor, replace the electrode.

(☞ "Before Attaching the Electrodes" P7-1)

(☞ "Electrode Placement" P7-2)

Cause 2

The lead cable is disconnected from the electrode terminal.

Solution

Securely connect the lead cable.

REFERENCE

- ♦ If the error persists, wire break of the lead cable or relay cable may be considered. Contact our service representative.

□<Check Electrodes Attachment> is displayed.

Cause 1

The electrode contact with the skin is poor. There is substantial contact resistance between the electrodes.

Solution

Replace all the electrodes. Make sure to use the electrodes of the same type.

(☞ "Before Attaching the Electrodes" P7-1)

(☞ "Electrode Placement" P7-2)

Cause 2

Even though the "3-lead Override" (ECG Parameter Setup) is set to [ON], electrodes other than LA, RA, LL are connected.

Solution

Set the "3-lead Override" to [OFF]. Or, detach the electrodes other than LA, RA, LL.

□<ECG Unit Error> is displayed.

Cause

A communication error has occurred between the ECG measuring unit.

Solution

A wire break or failure of the ECG unit can be considered. Contact our service representative.

□The measurement data is displayed as "xxx".

Cause

The heart rate is outside the measurement range.

Solution

- ♦ Check the electrode attachment.
(☞ "Before Attaching the Electrodes" P7-1)
(☞ "Electrode Placement" P7-2)
- ♦ Replace the electrode, or check the lead cable and relay cable.

□The heart rate is not counted. The heart rate is low.

Cause

The ECG waveform amplitude is below the QRS detection level (0.3mV).

Solution 1

Change the electrode site, or select a lead with higher QRS amplitude.

CAUTION

- ♦ Using 4-electrode or 5-electrode instead of 3-electrode allows more accurate QRS detection.
- ♦ Also, if large amount of noise is interfering, the noise may be erroneously detected as QRS. Change the electrode site to increase the ECG amplitude.

Solution 2

Increase the displayed waveform size. By increasing the waveform size, small QRS wave will become detectable. However, noise may be also detected.

Heart rate is not counted, and <LEAD OFF> is displayed.

Cause 1

The electrode of the displayed lead type is detached, or is not making good electrical contact with the skin.

Solution

- ♦ Check the electrode attachment.
(☞ "Before Attaching the Electrodes" P7-1)
(☞ "Electrode Placement" P7-2)
- ♦ Replace the electrode, or check the lead cable and relay cable.

Cause 2

Even though the "3-lead Override" (ECG Parameter Setup) is set to [ON], electrodes other than LA, RA, LL are connected.

Solution

Set the "3-lead Override" to [OFF]. Or, detach the electrodes other than LA, RA, LL.

Artificial pacemaker pulse is not displayed.

Cause 1

[Not Used] is selected for "Pacemaker" on the "Admit/Discharge" screen.

Solution

Select [Used] for "Pacemaker".

Cause 2

"Pacemaker Pulse" is set to [OFF] (ECG Parameter Setup).

Solution

Select [ON] for "Pacemaker Pulse".

Cause 3

The electrode attachment site is not appropriate.

Solution

Check the electrode attachment site.

- (☞ "Before Attaching the Electrodes" P7-1)
(☞ "Electrode Placement" P7-2)

<ECG Pacing detection error> is displayed.

Cause 1

The pacemaker pulse is detected 16 pulses or more per second.

Solution 1

- ♦ Check the electrode attachment.
(☞ "Before Attaching the Electrodes" P7-1)
(☞ "Electrode Placement" P7-2)
- ♦ Replace the electrode, or check the lead cable and relay cable.
- ♦ If any noise source is near the patient, move it away from the patient as far as possible.

Solution 2

If the patient is not wearing a pacemaker, select [Not Used] for "Pacemaker" ("Admit/Discharge").

□<ECG Disconnected> is displayed.

Cause

While monitoring the ECG, the relay cable was unplugged.

Solution 1

To cease monitoring, press the [Alarm Silence] key. The message will disappear, and the alarm will be silenced.

Solution 2

To continue monitoring, plug in the ECG relay cable. This will clear the message and silence the alarm.

□<Cannot Analyze> is displayed.

Cause

A noise is interfering on the ECG and arrhythmia analysis is suspended for more than 30 seconds.

"Suspend Arrhy, Analysis during Noise Interference" ("Initial Settings") is set to ON, and arrhythmia analysis is suspended for more than 30 seconds due to continuous noise or EMG interference.

Solution

Check the electrode attachment, and remove the noise source.

- ♦ Check the electrode attachment , lead cable and relay cable.
- ♦ If the electrode, lead cable, or relay cable is defective, replace them.
- ♦ If any noise source is near the patient, move it away from the patient as far as possible.
If EMG is interfering, change the electrode site to a location where EMG will less likely to interfere.

Respiration

□<CVA detected> message is displayed.

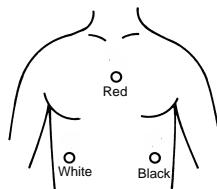
Cause

Heartbeat is interfering and superimposed on the respiration waveform.

Solution

Place the electrode as shown below where the heartbeat will be less likely to interfere.

Or, select a lead where the heartbeat will be less likely to interfere.



□<RR meas. range is exceeded.> message is displayed.

Cause 1

Electrode is detached.

Solution

Reattach the electrode. If the electrode contact is poor, replace the electrode.

(☞ "Before Attaching the Electrodes" P7-1)

(☞ "Electrode Placement" P7-2)

Cause 2

The electrode contact impedance is high.

Solution 1

Reattach the electrode. If the electrode contact is poor, replace the electrode.

(☞ "Before Attaching the Electrodes" P7-1)

(☞ "Electrode Placement" P7-2)

Solution 2

Change the lead for respiration measurement.

- "0" is displayed for respiration rate, or apnea alarm is generated.

Cause

The amplitude of the respiration waveform is too low.

Solution 1

Change the electrode site, or select a lead with higher QRS amplitude.

Solution 2

Increase the displayed waveform size.

- The respiration waveform and respiration rate is not displayed.

Cause

The impedance respiration measurement is ceased.

Solution

Select [ON] for "Impedance Measurement" on "Admit/Discharge" or "RESP" setup screen.

**CAUTION**

- ♦ If the pacemaker with the minute ventilation measuring function is used, turn OFF the impedance respiration measurement. Otherwise, both the pacemaker and this monitor will not be able to perform accurate measurement.

- The measurement data is displayed as "xxx".

Cause

The respiration rate is outside the measurement range.

Solution

- ♦ Check if the electrodes are properly attached.
(☞ "Before Attaching the Electrodes" P7-1)
(☞ "Electrode Placement" P7-2)
- ♦ Replace the electrode, or check the lead cable.
- ♦ Change the lead for respiration measurement.

- The lead for respiration measurement cannot be changed.

Cause

HLX is used.

Solution

- ♦ If HLX is set, the lead will be fixed to [III].
- ♦ If the respiration amplitude for lead II is small, check the electrode attachment.

(☞ "Before Attaching the Electrodes" P7-1)
(☞ "Electrode Placement" P7-2)

Invasive Blood Pressure

❑ <BP# Transducer OFF> is displayed.

Cause

The BP (1 to 6) transducer is not connected.

Solution 1

To cease monitoring, press the [Alarm Silence] key. This will clear the message and silence the alarm.

Solution 2

Connect the transducer.

❑ <BP# Zero Required> is displayed.

Cause

The BP zero balance has not been performed since the power is turned ON.

Solution

Open the three-way valve of the transducer to air and perform zero balance.

❑ The measurement data is displayed as "----".

Cause

The BP zero balance has not been performed since the power is turned ON.

Solution

Open the three-way valve of the transducer to air and perform zero balance.

❑ BP value and waveform are not displayed properly.

Cause

The BP zero-balance is unstable.

Solution 1

Open the three-way valve of the transducer to air and perform zero balance.

Solution 2

Disconnect the BP transducer from the BP relay cable, and check if there is any abnormality on the connector terminal. Make sure that there is no distortion or no substance (such as blood, medicament) attached which may cause contact failure.

If any abnormality is found, replace the BP transducer or BP relay cable.

❑ The measurement data is displayed as "xxx".

Cause

The BP value is outside the measurement range.

Solution

- ♦ Perform BP zero-balance again.
- ♦ Check if the measurement data is within the measurement range.
- ♦ Check the BP relay cable and BP transducer.

<BP# Disconnected> is displayed.

Cause

While monitoring the blood pressure, BP relay cable was disconnected from the 2ch BP conversion cable.

Solution 1

To cease monitoring, press the [Alarm Silence] key. This will clear the message and silence the alarm.

Solution 2

To continue monitoring, plug in the BP interface cable or 2ch BP conversion cable. This will clear the message and silence the alarm.

The zero balance process fails.

Cause

The three-way valve may not be opened to air, or artifact is present due to movements, etc.

Solution

Check if the three-way valve is opened to air. Verify that "Zero ready" is displayed on the parameter setup screen, or "READY" is displayed on the user key before starting the zero balance.

SpO₂ Measurement (HS-8312N)

<SpO₂ Check Sensor Attach.> is displayed.

Cause

The sensor is detached from the patient.

Solution 1

Check if the sensor is properly attached to the patient.

Solution 2

Check that the light emitting and receiving parts of the sensor LED are aligned.

<SpO₂ Pulse Search> is displayed.

Cause 1

The amplitude of the pulse waveform is too low, or the sensor is not positioned correctly.

Solution

Check that the light emitting and receiving parts of the sensor LED are aligned.

Cause 2

The sensor has not been attached long enough to obtain stable measurement.

Solution

After the sensor attachment, wait and see for about one minute until the waveform stabilizes.

<SpO₂ No Pulse Detected> is displayed.

Cause

The amplitude of the pulse waveform is too low, or the sensor is not positioned correctly.

Solution

Check that the light emitting and receiving parts of the sensor LED are aligned.

Avoid the sensor from exposure to ambient light.

❑ <SpO₂ Motion Artifact> is displayed.**Cause**

There is excessive body motion from the patient.

Solution

Relocate the sensor to which body motion will have less influence.

❑ The pulse waveform is not displayed, or interrupted.

Situation: The "SpO₂ Check Sensor Attach." message is displayed.

Cause 1

The amplitude of the pulse waveform is too low, or the sensor is not positioned correctly.

Solution

Check that the light emitting and receiving parts of the sensor LED are aligned.

Cause 2

The sensor is defective.

Solution

Replace the sensor.

Cause 3

SpO₂ sensor is not firmly connected to the connector.

Solution

Make sure the SpO₂ sensor is firmly connected.

Cause 4

Sensor is exposed to light.

Solution

Place a black or dark cloth over the sensor to avoid direct sunlight. When not using the sensor for measurement, avoid placing the sensor in light or unplug the sensor from the connector.

❑ SpO₂ value is unstable.**Cause 1**

There is excessive body motion from the patient which disables correct measurement.

Solution 1

Have the patient lie still.

Solution 2

Relocate the sensor, or change the sensor to which the body motion will have less influence.

Cause 2

The probe size is not appropriate.

Solution

Select a probe size which is appropriate for the patient.

Cause 3

Sensor is exposed to light.

Solution

Place a black or dark cloth over the sensor to avoid direct sunlight.

❑ <HS-8000 SpO₂ Failure> is displayed.

Cause 1

The sensor is defective.

Solution

Replace the sensor.

Cause 2

Communication error has occurred with the SpO₂ unit.

Solution

A defective cable or SpO₂ unit failure can be considered.

Contact our service representative.

❑ <SpO₂ Replace Sensor> is displayed.

Cause 1

The sensor is not connected securely.

Solution

Connect the sensor securely.

Cause 2

The sensor is defective.

Solution

Replace the sensor.

Cause 3

A wrong sensor is used.

Solution

Replace the sensor.

For the available sensors, refer to our service representative.

❑ <SpO₂ Disconnected> is displayed.

Cause

The SpO₂ relay cable is disconnected during SpO₂ monitoring.

Solution 1

To cease monitoring, press the [Alarm Silence] key. This will clear the message and silence the alarm.

Solution 2

To continue monitoring, plug in the SpO₂ relay cable. This will clear the message and silence the alarm.

SpO₂ Measurement (HS-8312M)

❑ <SpO₂ Replace Sensor> is displayed.

Cause 1

The sensor is not connected securely.

Solution

Connect the sensor securely.

Cause 2

The sensor is defective.

Solution

Replace the sensor.

Cause 3

A wrong sensor is used.

Solution

Replace the sensor.

(☞ "Pulse Oximetry Measurement (Masimo)" P13-4)

□<SpO₂ Check Sensor Attach.> is displayed.

Cause 1

The sensor is detached from the patient.

Solution 1

Check if the sensor is properly attached to the patient.

Solution 2

Check that the light emitting and receiving parts of the sensor LED are aligned.

Cause 2

The sensor is exposed to too much ambient light. The detecting part of the sensor is not covered appropriately.

Solution 1

Turn down or turn off the light.

Solution 2

Avoid the sensor from exposure to ambient light.

Solution 3

Relocate the sensor position.

□<SpO₂ Low Perfusion> is displayed.

Cause

The amplitude of the pulse waveform is too low, or the sensor is not positioned correctly.

Solution

Check that the light emitting and receiving parts of the sensor LED are aligned.

□<Low Confidence> is displayed.

Cause

The amplitude of the pulse waveform is too low, or the sensor is not positioned correctly.

Solution

Check that the light emitting and receiving parts of the sensor LED are aligned.

□<SpO₂ Pulse Search> is displayed.

Cause 1

The amplitude of the pulse waveform is too low, or the sensor is not positioned correctly.

Solution

Check that the light emitting and receiving parts of the sensor LED are aligned.

Cause 2

The sensor has not been attached long enough to obtain stable measurement.

Solution

After the sensor attachment, wait and see for about one minute until the waveform stabilizes.

 <SpO₂ Noise Interference> is displayed.**Cause**

External signal or energy is interfering with the measurement.

Solution

Remove the external interference.

 <SpO₂ Check Sensor>, <SpO₂ Replace Cable>, or <SpO₂ Check Cable> is displayed.**Cause**

Unrecognizable sensor is connected.

A wrong patient cable is used.

When attached to the patient, the sensor was exposed to high-intensity light which lead to false recognition.

Solution

Reattach the SpO₂ sensor and patient cable.

Replace with a Fukuda Denshi specified patient cable and sensor.

(☞ "Pulse Oximetry Measurement (Masimo)" P13-4)

 <HS-8000 SpO₂ Failure> is displayed.**Cause**

Communication error has occurred with the SpO₂ unit.

Solution

A broken wire or failure of the SpO₂ unit can be considered. Contact our service representative.

 <SpO₂ Disconnected> is displayed.**Cause**

The SpO₂ relay cable is disconnected during SpO₂ monitoring.

Solution 1

To cease monitoring, press the [Alarm Silence] key. This will clear the message and silence the alarm.

Solution 2

To continue monitoring, plug in the SpO₂ relay cable. This will clear the message and silence the alarm.

 <SpO₂ only mode> is displayed.**Cause**

When the Rainbow sensor is used, SpCO, SpMet or SpHb parameter cannot be measured.

Solution 1

Remove the sensor from the patient's finger, and then reattach it.

Solution 2

Remove the sensor or patient cable from the Super Unit, and then reconnect it to the SpO₂ connector.

❑ <Low Signal IQ> is displayed.

Cause

There is excessive body motion or sensor attached position is not appropriate.

Solution 1

Check that the light emitting and receiving parts of the sensor LED are aligned.

Solution 2

Relocate the sensor to which body motion will have less influence.

❑ PVI, SpCO, SpMet, SpHb cannot be measured.

Cause 1

PVI, SpCO, SpMet, SpHb measurements are optional functions.

Solution

It is necessary to add these as the measuring parameters.

For details, please refer to our service representative.

Cause 2

The used sensor cannot measure the PVI, SpCO, SpMet, SpHb.

Solution

Use the sensor which can measure the PVI, SpCO, SpMet, SpHb.

For details, please refer to our service representative.

Non-Invasive Blood Pressure

❑ The cuff is not inflated although the pump is operating.

Cause 1

The air hose is not firmly connected, and the air is leaking.

Solution

Check if the air hose is properly connected.

Cause 2

The cuff size does not match the selected patient type.

Solution

Use the cuff with correct size for the selected patient type.

❑ The pump is not operating.

Cause

The air hose is disconnected from the NIBP Connector.

Solution

Check if the air hose is properly connected.

The measurement data is displayed as "---".

Cause 1

The measurement accuracy is not reliable due to body motion artifact.

Solution

During the measurement, have the patient stay still.

Cause 2

The pulse is too small to acquire reliable measurement accuracy.

Solution

Check if the cuff is properly attached to the patient, or cuff size is correct.

Cause 3

The air hose is disconnected.

Solution

Check if the air hose is tightly connected, and then measure again. If the same message is displayed again, air may be internally leaked.

Contact our service representative.

<Check NIBP cuff, hose> is displayed.

Cause 1

The connection between the cuff and air hose or the air hose and NIBP connector is loose or disconnected.

Solution

If connection is loose or disconnected, securely connect it and perform the measurement again.

If the same message is displayed again, air may be internally leaked. Cease the measurement and contact our service representative.

Cause 2

The cuff was subjected to compression.

Solution

Make sure that the cuff is not subjected to compression, and measure with the patient arms extended as much as possible.

If the same message is displayed again, a blockage in the air system can be considered. Cease the measurement and contact our service representative.

<NIBP measurement failed (Cxx-xx)> is displayed.

Error code condition (phenomenon, or situation) and its cause are indicated below.

C02-00 When not performing quick measurement, the data could not be measured.

Cause 1

According to the patient condition, the blood pressure may not be correctly measured.

Solution

Check the patient condition, and measure again.

Cause 2

The cuff application is loose.

Solution

Check that the cuff size is appropriate for the patient, and then measure again after wrapping the cuff properly.

C02-01 When performing quick measurement, the data could not be measured.**Cause 1**

According to the patient condition, the blood pressure may not be correctly measured.

Solution

Check the patient condition, set the quick measurement to OFF, and measure again.

Cause 2

The cuff application is loose.

Solution

Check that the cuff size is appropriate for the patient, and then measure again after wrapping the cuff properly.

C02-02 The air hose was disconnected from the NIBP connector during the measurement.**Cause**

The air hose was disconnected from the NIBP connector during the measurement.

Solution

Connect the air hose to the NIBP Connector, and then measure again.

C03-xx The exhaust ventilation has ceased, or the target deflation speed was not achieved.**Cause 1**

During measurement, the artifact such as body motion may have interfered.

Solution

Keep the patient still as much as possible, and measure while the patient is not moving. When performing the measurement during surgery, avoid artifact caused by the surgery.

Cause 2

During the measurement, air hose was bent or occluded by the compression.

Solution

Make sure that the air hose is not bent or compressed before the measurement.

If the error persists and C03-xx error is frequently displayed, contact our service representative and notify the error code.

C04-xx The inflation was insufficient for the patient blood pressure.**Cause**

The blood pressure has significantly increased from the previous measurement.

Solution

Check the cuff application and size and perform the manual measurement.

C06-xx The pulse signal detected during the measurement was unstable.Cause 1

During the measurement, the patient has trembled or moved.

Solution

Keep the patient still as much as possible, and measure while the patient is not trembling or moving.

Cause 2

Arrhythmia has frequently occurred during the measurement.

Solution

If arrhythmia occurs frequently, correct measurement cannot be performed. Measure when arrhythmia is not frequently occurring.

C07-00 The measurement time has exceeded the allowed time.Cause

Measurement is automatically repeated because the body motion is detected or inflation is insufficient.

Solution

Check the cuff application or size, measure by keeping the patient still without body motion.

C08-00 Measured PR value was abnormal.Cause

The patient has trembled or moved.

Solution

Keep the patient still as much as possible, and measure while the patient is not moving.

C09-00 The inflation value has exceeded the allowed maximum value.Cause

The cuff was subjected to compression.

Solution

Check that the cuff is not subjected to compression, and measure with the patient arms extended as much as possible.

C10-xx Measured pulse amplitude was abnormal.Cause

The cuff size does not match the patient.

Solution

Check if the cuff size is appropriate for the patient and that the cuff is properly wrapped before the measurement.

- The time of measurement disappears and the numeric data is displayed as " - - - ".

Cause

The preprogrammed time to clear the NIBP data has elapsed.

Solution

Select the appropriate time for "NIBP Erase Time" from [60min], [120min] which best fits the monitoring purpose.

❑ The NIBP periodic measurement is ceased.

Cause

The "NIBP Meas. Error (Exx-xx)" occurred during the measurement.

Solution

When "NIBP Meas. Error (Exx-xx)" occurs, the NIBP periodic measurement will be cancelled. To resume the measurement, press the [NIBP Start/Stop] key and check that the measurement is properly performed.

❑ <NIBP Meas. Error (Exx-xx)> is displayed.

Cause

An error has occurred on the NIBP unit.

E08-01: Communication Error (Sub CPU)
E08-02: WatchDog Timeout
E08-03: Pressure Offset Error
E08-04: Pressure Comparison Error
E08-05: Sub CPU Power Supply Failure
E08-06: Pressure Sensor 2 Power Supply Failure
E08-07: Pressure Sensor 1 A/D Reference Power Voltage Failure
E08-08: Rapid Exhaust Error
E08-09: Air Hose Identification Error
E09-A: Exceeded Maximum Cuff Pressure
E09-B: Inflation Timeout
E09-C: Quick Mode Timeout
E09-D: Measurement started during the long pause
E09-E: Measurement Timeout
E09-F: Main CPU Pressure Data Transmission Timeout
E09-G: Pressure Sensor 1 +5V Power Supply Failure
E09-H: Zeroing Timeout
E09-I: ROM Test Error
E09-J: RAM Test Error
E09-L: Clock Transmission Ceased
E09-M: Communication Failure at Power ON
E09-N: Pressure Comparison Error
E09-O: Maximum Inflation Timeout
E09-Q: Measurement started before zeroing
E09-R: Zeroing Error
E09-S: WatchDog Timeout
E09-T: +5V Digital Power Supply Failure
E09-U: Main CPU Power Supply Failure
E09-V: Pump Control Signal Failure
E09-W: Quick Exhaust Valve Control Signal Failure
E09-X: Sub CPU Constant Exhaust Valve Control Signal Failure
E09-Y: Main CPU Constant Exhaust Valve Control Signal Failure

Solution

The error message can be cancelled by pressing [Cancel Error] on the NIBP parameter setup screen or [NIBP Start/Stop] key (User Key). If the same message is repeatedly displayed, a failure of the equipment can be considered. Cease the measurement and contact our service representative.

Temperature

- ❑ <T* Unknown Sensor> is displayed.

Cause 1

The 700 series is used.

Solution

Use the 400 series temperature probe for measurement.

Cause 2

There is a contact failure of the temperature probe.

Solution

Check if the temperature probe is properly inserted.

- ❑ The measurement data is displayed as "xxx".

Cause

The temperature measurement is outside the measurement range.

Solution

Check if the temperature probe is properly inserted.

Replace the temperature probe, or check the temperature probe.

- ❑ <T* Disconnected> is displayed.

Cause

While monitoring the temperature, the temperature sensor was unplugged.

Solution 1

To cease monitoring, press the [Alarm Silence] key. The message will disappear, and the alarm will be silenced.

Solution 2

To continue monitoring, plug in the temperature sensor. This will clear the message and silence the alarm.

- ❑ <HS-8000 TEMP Unit Failure> is displayed.

Cause

An error was detected on the temperature unit.

Solution

A failure of the equipment can be considered. Cease the measurement and contact our service representative.

Cardiac Output (CO)

- ❑ When measured consecutively, the measurement value varies. ($\pm 10\%$ or more)

Cause 1

The injection method is not appropriate.

Solution

Inject within 1 to 3 seconds.

Cause 2

Injection temperature is not appropriate.

Solution

If iced injectate is used, pay attention not to warm the injector with hands.

Cause 3

The thermistor location is not appropriate.

Solution

Reposition the thermistor.

Cause 4

Arrhythmia event has occurred during the measurement.

Solution

Wait until the patient has stable heart rhythm.

Cause 5

There was patient's body movement during the measurement.

Solution

Have the patient stay still during the measurement.

Cause 6

The patient's hemodynamics changed during the measurement.

Solution

Wait until the patient has stable hemodynamics.

 Abnormal measurement value is displayed.**Cause**

The catheter size, injectate volume, catheter constant (CC) is not correct.

Solution

Set the proper condition, CC value for the used catheter.

 The blood temperature (T_b), injectate temperature (T_i) is not displayed.**Cause**

The catheter is not properly connected.

Solution

Securely connect the catheter.

 The thermodilution curve is deformed.**Cause**

The injection is not smooth, steady motion.

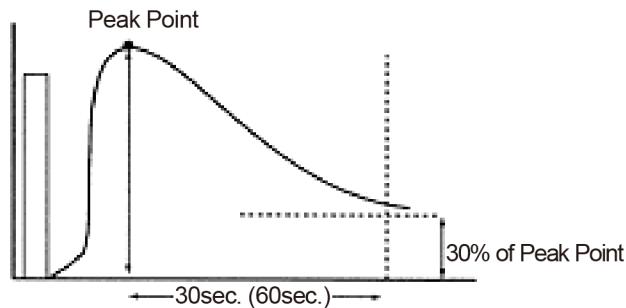
Solution

Inject promptly within 1 to 3 seconds.

- The baseline of the thermodilution curve is displaced to the minus side. <LOWER FAULT> is displayed.

Cause

The blood temperature has not returned to stable condition after the measurement.



The thermodilution curve did not return to the cut off point soon enough. The temperature must return to a point that is 30% of the peak value within 30 seconds (or 60 seconds depending on the setup).

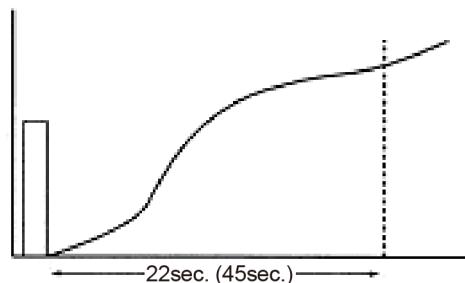
Solution

If performing continuous measurement, wait for 30 to 60 seconds and check that "Ready" is displayed before performing the next measurement.

- The thermodilution curve is low. <PEAK FAULT> is displayed.

Cause

The peak of the thermodilution curve can not be detected.



After the measurement is started, the peak of the thermodilution curve was not determined within 22 seconds (when the time scale is "30 sec") or 45 seconds (when the time scale is "60 sec").

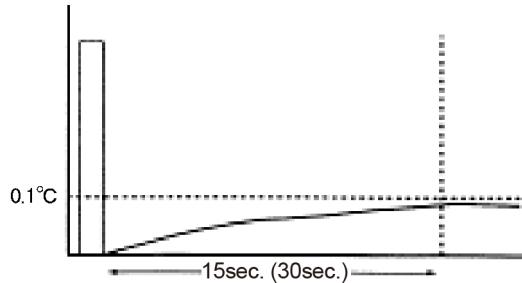
Solution

The thermistor may be contacting the pulmonary artery wall. Reposition the thermistor and measure again.

<UPPER FAULT> message is displayed.

Cause

After the injection, the blood temperature is out of the measurement range.



After the measurement is started, the change in blood temperature is less than 0.1°C for more than 15 seconds (when the time scale is "30 sec") or 30 seconds (when the time scale is "60 sec").

Solution

Use the iced injectate, and measure again.

<OVER RANGE> is displayed.

Cause

The CO value is out of the calculation range.

Solution

The area of the thermodilution curve is too large to calculate. Start the measurement again.

The measurement is interrupted, and the error message, <UPPER_FAULT>, <PEAK_FAULT>, <LOWER_FAULT> , <SENSOR_ERROR> is displayed.

Cause 1

The thermistor connector and relay cable is not securely connected.

Solution

Correct measurement cannot be performed unless the thermistor connector and relay cable is securely connected. Check the connection and perform the measurement again.

Cause 2

The sensor or relay cable is defective.

Solution

If the sensor or cable is defective, measurement can not be performed. Replace the sensor or cable and perform the measurement again.

<CO Disconnected> message is displayed.

Cause

The catheter relay cable was disconnected while monitoring the cardiac output.

Solution 1

To cease monitoring, press the [Alarm Silence] key. The message will disappear, and the alarm will be silenced.

Solution 2

To continue monitoring, plug in the catheter relay cable. This will clear the message and silence the alarm.

CO₂ Measurement (HPD-800/HPD-810)

□<CO₂ Sensor Failure> is displayed.

Cause 1

The CO₂ sensor temperature has increased above 40°C.

Solution

Remove any heat generating source around the sensor.

Cause 2

The CO₂ sensor is malfunctioning.

Solution 1

Replace the CO₂ sensor.

Solution 2

If the error persists, the failure of HPD-800/HPD-810 can be considered. Stop using the unit and contact our service representative.

□<Zero the CO₂ Adapter> is displayed.

Cause

The CO₂ sensor is not zero balanced.

Solution

Perform the zero calibration of the sensor.

(☞ "CO₂ Concentration (Mainstream Method)" P7-72)

□<Check CO₂ Airway Adapter> is displayed.

Cause 1

The airway adapter is unclean.

Solution

A clean airway adapter must be used. If reusing an airway adapter, clean and air-dry it. Then, wipe the window with swab, and sterilize (EOG, etc.) before use.

Cause 2

The airway adapter is disconnected from the sensor.

Solution 1

Securely connect the airway adapter to the sensor.

Solution 2

If error persists, perform the airway adapter calibration again.

□<Unknown CO₂ Sensor> is displayed.

Cause

Unsupported CO₂ sensor is connected.

Solution

Connect the specified CO₂ sensor.

❑ <CO₂ Disconnected> is displayed.Cause

When the cable is disconnected during CO₂ monitoring, this message will be displayed.

Solution 1

To cease monitoring, press the [Alarm Silence] key to clear the message and silence the alarm.

Solution 2

To continue monitoring, plug in the cable. This will clear the message and silence the alarm.

CO₂ Measurement (HCP-800/HCP-810)

❑ <CO₂ Check Sample Line> is displayed.Cause

The sampling tube is clogged.

Solution

Replace the sampling tube.

❑ <Initializing> inside the numeric data box does not disappear.Cause

An error has occurred during the initialization at power ON.

Solution

The CO₂ unit failure can be considered.

❑ <CO₂ Unit Error> is displayed.Cause

Communication error has occurred with the CO₂ unit.

Solution

A broken wire or failure of the CO₂ unit can be considered. Contact our service representative.

❑ There is substantial measurement error.Cause 1

20 minutes have not yet elapsed since the power is turned ON.

Solution

For 20 minutes from turning ON the power, there will be a substantial measurement error.

Cause 2

The CO₂ calibration value is not appropriate.

Solution

Perform the CO₂ calibration again.

❑ <CO₂ Disconnected> is displayed.

Cause

When the filter line is disconnected during CO₂ monitoring, this message will be displayed.

Solution 1

To cease monitoring, press the [Alarm Silence] key to clear the message and silence the alarm.

Solution 2

To continue monitoring, plug in the filter line. This will clear the message and silence the alarm.

Recorder Unit (HR-800)

❑ <Check Paper> is displayed and printing cannot be performed.

The power supply indicator on the HR-800 is lit in orange.

<PAPER OUT> is displayed inside the [Print Start/Stop] user key.

Cause

There is no paper in the printer.

Solution

Set the paper in the paper holder.

❑ <Check Cassette> is displayed and printing cannot be performed.

The power supply indicator on the HR-800 is lit in orange.

<CASSETTE> is displayed inside the [Print Start/Stop] user key.

Cause

The paper holder is open.

Solution

Firmly close the paper holder.

❑ Although the paper is fed, printing is not performed.

Cause

The paper is not correctly installed. The front and backside of the paper is set oppositely.

Solution

Set the paper in the paper holder so that the logo, FUKUDA DENSHI CO.,LTD appears on the upper surface.

❑ The second and third waveforms are not printed for manual printing or alarm printing.

Cause

The second and third waveforms are not set on the printing setup screen.

Solution

Set the second and third waveform on the corresponding printing setup screen.

- <Check Printer> is displayed and printing cannot be performed.
The power supply indicator on the HR-800 is lit in orange.
<CHECK?> is displayed inside the [Print Start/Stop] user key.

Cause 1

The paper is jammed.

Solution

Open the paper holder and properly set the paper.

Cause 2

The thermal head temperature has increased or other failure exists.

Solution

A damage to the thermal head or other failure can be considered. Contact our service representative.

Network Printer

- <Central Printer Check Connection> is displayed and printing cannot be performed.

Cause

The central monitor selected as the output destination is not connected to the printer.

Solution

Check the printer setting on the central monitor, and make sure the communication with the printer is established.

- <Central Printer Check Setting> is displayed and printing cannot be performed.

Cause

The central monitor selected as the output destination does not support the network printing function.

Or, the printer setting is set to [OFF] on the central monitor selected as the output destination.

Solution

Use the DS-7700/DS-7700W system with the software version of V06 and newer, and set the printer setting to [ON].

- <Check Central ID> is displayed and printing cannot be performed.

Cause

The central monitor selected as the output destination does not support the network printing function.

Solution

Select the central monitor which supports the network printing function.

Wired Network (DS-LANII/ DS-LANIII)

- The data is not displayed on the central monitor.

Cause 1

The DS-LAN setup is not correct.

Solution

Make sure that the DS-LAN Setup (DS-LANII/DS-LANIII) for all bedside monitors and central monitors in the same

network are the same. If the DS-LAN setting is changed, make sure to restart the system.

Cause 2

A central monitor which is not compatible is used.

Solution

The following central monitors can not be used on the DS-LANIII network.

- DS-5700
- DS-5800N/NX/NX^{MB}
- DS-7600/7600W with software version V05 and prior

When using these central monitors, all monitors in the same network should be set to DS-LANII.

Cause 3

Inappropriate HUB is used.

Solution

For the DS-LANII network, use the repeater HUB.

For the DS-LANIII network, use the switching HUB.

Cause 4

The bed ID is duplicated in the same network.

Solution

If bedside monitors with the same bed ID exist in the same network, communication is not possible. Make sure to set a unique bed ID for each bedside monitor.

Cause 5

An equipment not specified by Fukuda Denshi is connected to the network.

Solution

Do not connect PC, printer, or other unspecified equipment to the DS-LAN network.

Cause 6

The DS-LAN cable is not properly connected.

Solution

The DS-LAN connection will be performed by our service representative. Contact our service representative.

The CO₂ waveform is not displayed on the central monitor although the CO₂ numeric data is displayed.

Cause 1

[Impedance] is selected for "RR/APNEA Alarm Source" on the RESP setup screen.

Cause 2

[Ventilator] is selected for "RR/APNEA Alarm Source" on the RESP setup screen.

Solution

Select [CO₂] for "RR/APNEA Alarm Source" on the RESP setup screen.

In this case, RR and apnea alarm will be generated based on CO₂ measurement.

The impedance respiration waveform is not displayed on the central monitor although the RR numeric data is displayed.

Cause 1

[CO₂] is selected for "RR/APNEA Alarm Source" on the RESP setup screen.

Cause 2

[Ventilator] is selected for "RR/APNEA Alarm Source" on the RESP setup screen.

Solution

Select [Impedance] for "RR/APNEA Alarm Source" on the RESP setup screen.

NOTE

- The impedance respiration waveform will not be displayed if [CO₂] is set for "RR/APNEA Alarm Source". AWF, AWP waveform will be displayed.
- The CO₂ waveform will not be displayed if [Impedance] is set for "RR/APNEA Alarm Source". AWF, AWP waveform will be displayed.
- The CO₂ waveform and impedance waveform will not be displayed if [Vent.] is set for "RR/APNEA Alarm Source".

□<Check DS-LAN Comm> is displayed.

Cause 1

The LAN cable is loose, or contact failure has occurred. The power of the central monitor has been turned OFF.

Solution

Check the LAN connection on both the main unit and wall side. Disconnect and connect it again to make sure that it is firmly connected

Check the LAN connection on the central monitor. Disconnect and connect it again to make sure that it is firmly connected.

Turn ON the power of the central monitor.

Telemeter

□The data cannot be received at the telemetry center.

Cause

The channel ID or group ID is not corresponded with the telemetry receiver.

Solution

Set the correct channel ID and group ID.

□The impedance respiration waveform cannot be received at the telemetry center.

Cause 1

[CO₂] is selected for "RR/APNEA Alarm Source" on the RESP setup screen.

Cause 2

[Ventilator] is selected for "RR/APNEA Alarm Source" on the RESP setup screen.

Solution

Select [Impedance] for "RR/APNEA Alarm Source" on the RESP setup screen.

□The BP waveform of 100mmHg or above cannot be properly received.

Cause

The BP waveform and scale are not the same.

Solution

When the BP waveform is above 100mmHg, set the BP scale above 100mmHg.

<Check HLX Conn.> is displayed.

Cause

The connection with the HLX is interrupted.

Solution

Initial Settings>System>Telemeter

Check the setting for "Channel" and "Group ID" and verify that [ON] is set for "Telemeter".

If the "Check HLX Conn." message still persists, contact your nearest service representative.

<Check HLX Ver> is displayed.

Cause

Installation Failed

Solution

Check the software version of the HLX.

If "HLX-801 V99-99" is displayed, perform a re-installation.

Remote Control

The remote control does not function.

Cause 1

The remote control bed ID is not correct.

Solution

Set the correct remote control ID.

Cause 2

The section number is not correct.

Solution

Set the correct section number.

The remote control does not properly function.

Cause

The remote control setting on the monitor does not correspond to the function key on the remote control unit.

Solution

Make sure the remote control setting on the monitor and the function key on the remote control unit is corresponded.

General

Nothing is displayed on the screen, and the power supply indicator is not lit.

Cause 1

The display unit is not properly connected.

Solution

Properly connect the display unit to the main unit.

( Maintenance Manual "System Construction" P1-2)

Cause 2

The display unit failure has occurred.

Solution

Immediately turn OFF the power and cease the operation. Contact our service representative.

The data is initialized each time the power is turned ON.

Cause 1

The internal switch setting is incorrect.

Solution

The internal switch setting needs to be changed. Contact our service representative.

Cause 2

The battery for the backup memory is depleted.

Solution

The battery needs to be replaced. Contact our service representative.

The display is dark, or cannot be seen clearly.

Cause 1

The night mode is set.

Solution

Cancel the night mode.

Cause 2

The display brightness is not adjusted.

Solution

Due to the LCD characteristic, the visible range is limited.

Adjust to the appropriate brightness on the Brightness setup screen under "Basic Setup".

Cause 3

The service life of the LCD backlight has expired.

Solution

The backlight unit or LCD unit needs to be replaced. Contact our service representative.

CAUTION

- ♦ The display unit utilizes LED for the backlight.
Since this LED deteriorates by the life cycle, the display may become dark, scintillate, or may not light by the long term use. In such case, contact our service representative.

The system does not start although the standby switch is turned ON.

Cause 1

The power cable is not connected.

Solution

Turn OFF the power and connect the power cable.

Cause 2

Incorrect CF card is inserted.

Solution

Remove the CF card, turn OFF the power, and turn ON the power again.

Cause 3

The control board is in the disabled state.

Solution 1

When the battery is installed: Reconnect the power code and hold down the standby switch for 7 seconds.

After 2 to 3 seconds, turning ON the standby switch again will restart the system.

Solution 2

When the battery is NOT installed: Reconnect the power code and hold down the standby switch for 7 seconds.

The system will automatically restart.

Cause 4

ON for the standby switch cannot be detected, because the battery is suddenly inserted/pulled or replaced.

Solution

Remove the battery. After 3 to 4 seconds, install it again. Then turning ON the standby switch will properly restart the system.

 <Check Standby> is not displayed although the standby switch is turned ON.**Cause**

The control board is in the disabled state.

Solution 1

When the battery is installed: Reconnect the power code and hold down the standby switch for 7 seconds.

After 2 to 3 seconds, turning ON the standby switch again will restart the system.

Solution 2

When the battery is NOT installed: Reconnect the power code and hold down the standby switch for 7 seconds.

The system will automatically restart.

 The clock is often delayed.**Cause**

The battery for the backup memory is depleted.

Solution

Check if the time is delayed when the power is turned OFF.

The battery needs to be replaced. Contact our service representative.

 There is an offset in the touch panel.**Cause**

The detecting location is misaligned due to change over time.

Solution

Calibration needs to be performed. Contact our service representative.

 CAUTION

- Calibration will be performed by our service representative. Users should not attempt it as incorrect calibration may cause malfunction to the equipment.

□ The touch panel does not function properly.

Cause

A scratch on the touch panel surface or foreign object entering the touch panel junction is causing misdetection of the key area.

Solution

The touch panel needs to be replaced. Contact our service representative.

□ <DS-8200 Failure> , <DS-8200 Check Unit>, <DS-8200 Out of Operating Temp. Range>, <HSB-80 Failure>, <HSB-80 Check Unit>, <BS-8200 Failure>, or <BS-8200 Check Unit> is displayed.

Cause

The hardware failure has occurred.

Solution

Immediately turn OFF the power and cease the operation. Contact our service representative.

□ <DS-8200 Check Rotary SW> is displayed.

Cause

The rotary switch setting is incorrect.

Solution

If the rotary switch is not set to "0", the equipment will not function properly.

Immediately turn OFF the power and cease the operation. Contact our service representative.

□ <The settings have been changed. Reboot the unit.> is displayed when the power is turned ON.

Cause

Rebooting of the system is required.

Solution

Reboot the system. If the same message is repeatedly displayed, turn OFF the power and contact our service representative.

□ <DS-8200 Check Short-Term Battery> or <DS-8200 Check Long-Term Battery> is displayed.

Cause

The battery is depleted or malfunctioning.

Solution

The battery needs to be replaced. Contact our service representative.

□ <Check Equip. Config.> is displayed.

Cause 1

The measured parameter is not set to be displayed.

Solution

On the "Display Config." setting, select the measured parameter to be displayed.

Cause 2

The "Multiamplifier" setting does not correspond to the connected cable.

Solution

Check the "Multiamplifier" setting (Initial Settings>System>Unit Module>Multiamplifier), and make sure that the setting corresponds to the connected cable.

□ <DS-8200 Check Battery (BS)> is displayed.

Cause

The battery was inserted immediately after it was removed from the Base Unit.

Solution

After removing the battery from the Base Unit, wait for 3 to 4 seconds before installing the battery.

□ <BS-8200 Check Conn.> is displayed.

Cause 1

The Base Unit (BS-8210) is not properly connected to HS Adapter (HSB-80).

Solution

Make sure that the Base Unit (BS-8210) is properly connected to HS Adapter (HSB-80).

Cause 2

The HS Adapter (HSB-80) was disconnected from the Base Unit (BS-8210) during operation.

Solution

If the HS Adapter (HSB-80) was disconnected intentionally, press the [Alarm Silence] key and clear the message. However, to use the function of HR-800 printing, external monitor display, and DS-LAN communication, it is necessary to connect the HS Adapter (HSB-80) and Base Unit (BS-8210).

Cause 3

The power cable of the Base Unit (BS-8210) was disconnected during operation.

Solution

Securely connect the power cable of the Base Unit (BS-8210).

When the power cable is disconnected, it will switch to battery operation. If it does not switch to battery operation, remove the battery from the Base Unit and insert it again. Also, make sure that the battery of the Base Unit (BS-8210) is fully charged.

Cause 4

The Base Unit (BS-8210) is not functioning.

Solution

While continuing monitoring using the battery of HS Adapter (HSB-80), disconnect the power cable and battery from the Base Unit (BS-8210) and connect them again.

If the message is still displayed, the failure of Base Unit (BS-8210) can be considered. Stop using the Base Unit (BS-8210), and contact your nearest service representative.

Super Unit

□ The system does not start although the power is turned ON.

The power supply indicator of the Super Unit does not light in green.

<HS-8000 Check Conn.> is displayed.

Cause 1

The power cable of the main unit is not connected.

Solution

Turn OFF the power and connect the power cable.

Cause 2

The fuse inside the Super Unit has blown out.

Solution

Immediately turn OFF the power and cease the operation. Contact our service representative.

Cause 3

The Super Unit is not properly connected to the HSB-80 Adapter.

Solution

Insert the Super Unit into the HSB-80 until a click sound is heard.

<HS-8000 Out of Operating Temp. Range> is displayed.

Cause

The temperature inside the Super Unit has exceeded the operating temperature range.

Solution

The operation cannot be guaranteed. Immediately turn OFF the power and cease the operation. Contact our service representative.

<HS-8000 Analog Unadjusted> is displayed.

Cause

One of ECG, respiration, or BP is not adjusted.

Solution

Correct measurement cannot be performed if not adjusted. Contact our service representative.

<HS-8000 Check DIP SW> is displayed.

Cause

The DIP switch setting has been changed.

Solution

Contact our service representative.

<HS-8000 Check SD Card> is displayed.

Cause

The SD Card is defective or the Super Unit is malfunctioning.

Solution

Contact our service representative.

Data Transfer Function

The patient name is flashing.

Cause 1

This is a normal operation which indicates the data updating process.

An error occurs during the data update process.

Cause

HS-8000 is disconnected during the data update process.

Solution 1

Do not disconnect the HS-8000 during the data update process. If the same error persists, refer to our service representative.

Solution 2

If the error occurs during the write process, start again from the read process.

If the same error persists, refer to our service representative.

Cause 2

The module connection cable is not properly connected.

Solution

Turn OFF the power, and make sure that the module connection cable is securely connected. Reconnect the cable if necessary. If the knob is loose, tighten it securely.

When the HS-8000 is connected, the alarm sound is suspended.

Cause

This is a normal operation. To not suspend the alarm sound, set the alarm sound suspend function OFF.

The recall data cannot be transferred.

Cause 1

The SD card is not inserted to the Super Unit.

Solution

Insert the SD card to the Super Unit.

Cause 2

The SD card is not formatted.

Solution

Format the SD card.

Ventilator

<Vent. Alarm> is displayed.

Cause

The following alarm has generated on the ventilator.

- ♦ Parameter alarm such as AWP, MV, FiO₂
- ♦ Technical alarm such as battery replacement of the ventilator

Solution

Check the alarm cause of the ventilator, and take appropriate action.

❑ <Vent. Offline> is displayed.
<VENT COMM> is displayed on the monitor and the ventilator.

Cause 1

The cable between the DS-8200 System and the ventilator is disconnected or not securely connected.

Solution

Make sure the cable is properly connected.

Cause 2

The power of the ventilator is turned OFF.

Solution

Turn ON the power of the ventilator.

Cause 3

The ventilator is in standby mode.

Solution

Start the ventilation on the ventilator.

Cause 4

The network setting of the monitor does not match with the ventilator.

Solution

Make sure that the network setting of the connecting equipments are as follows.

[SV-900/SV-300/Servo-i/Servo-s]

- ♦ No network setting.

[PB-740/760/840]

- ♦ Baud Rate: 9600bps
- ♦ Parity Bit: None
- ♦ Stop Bit: 1
- ♦ Data Bit: 8

[Evita4/2dura/XL]

- ♦ Protocol : Medibus
- ♦ Baud Rate: 19200bps
- ♦ Parity Bit: Even
- ♦ Stop Bit: 1

SvO₂/CCO Monitor

- The numeric data is not displayed.

Cause 1

The cable is not properly connected.

Solution 1

Connect the following cable securely.

| Oximeter, CCO Measurement Device | Connection Cable | |
|-------------------------------------|-------------------------|----------------------|
| | For STATUS II Connector | For Serial Connector |
| Vigilance | CJ-406RI-70Vigi (x1) | CJO-04RS4 |
| Vigilance CEDV | CJ-406RI-70Vigi (x1) | CJO-04RS4 |
| Vigilancell | CJ-402RI-70SVi (x1) | CJ-502 |
| Vigileo | CJ-402RI-70SVi (x1) | CJ-502 |

Cause 2

The "External Device" setting is not correct.

Solution

Select [Vigilance/Vigileo] for the port function on the "External Device" setup screen.

Cause 3

The measurement data is not displayed on the external device.

Solution

The measurement data of SvO₂, CO, etc. will not be displayed on the monitor unless the data is displayed on the used external device. Check if the data is displayed on the used external device.

Cause 4

The CCO is not measured.

Solution

The monitor will display CCO/CCI data only if CCO is measured on the external device.

Cause 5

The network setting of the monitor does not correspond with that of the external device.

Solution

The network setting of the monitor is fixed to the default setting of each external device and cannot be changed. Make sure that the network setting of the connecting oximeter is in default setting.

In Case of Vigilance/Vigileo:

Check if the network is set as follows.

For procedure to check the Vigilance/Vigileo network setting, refer to the operation manual for the Vigilance/Vigileo.

- ♦ Device: IFM Out
- ♦ Baud Rate: 19200bps
- ♦ Parity Bit: none
- ♦ Stop Bit: 1
- ♦ Data Bit: 8

- ♦ Flow Control: 2 sec.

Cause 6

The software version of Vigilance does not correspond.

Solution

If the Vigilance without the STAT function is connected, the STAT data will not be displayed. Check the software version of the Vigilance.

BIS Monitor (A-2000/A-3000)

- The numeric data is not displayed.

Cause 1

If the SQI value is lower than 15, BIS data and SR data will not be displayed.

Solution

Refer to the BIS monitor operation manual and set the SQI value above 15.

Cause 2

The communication setting of the BIS monitor is incorrect.

Solution

ASCII should be set to communicate with this system.

Make sure that ASCII is set on the BIS monitor communication setting.

Refer to the BIS monitor operation manual for procedures.

- <Check BIS Conn.> is displayed.

Cause

The cable is disconnected or not properly connected.

Solution

Securely connect the connection cable to the serial connector of the Base Unit (BS-8210), or Status II connector and BIS monitor connector .

INVOS

- The numeric data is not displayed. <Check INVOS Connection> is displayed.

Cause

The cable is disconnected or not properly connected.

Solution

Securely connect the connection cable to the serial connector of the Base Unit (BS-8210), or STATUS II connector and INVOS 5100C connector.

PC Communication

- <Check System Conn.> is displayed.

Cause 1

The cable is disconnected or not properly connected. The power is not supplied to the communication port.

Solution

Connect the cable securely. Check if the power is supplied to the communication port by checking the communication indicator.

Cause 2

Communication with the PC is not performed. The communication is ceased.

Solution

Resume the communication with the PC. The communication time out period is about 1 minute.

CF/SD Card

- <There is no card in the slot.> is displayed.

Cause

CF/SD card is not inserted or not correctly set in the CF/SD card slot.

Solution

Set the CF/SD card into the CF/SD card slot.

- <Data Read Error. Model type or software version is not compatible. Do you want to read only the common data?> is displayed.

Cause 1

There is no data on the CF/SD card.

Solution 1

Check if the CF/SD card is readable. Or, check if the data is present on the CF/SD card. Pressing "Yes" will not start the reading process of compatible data. Error message will be displayed instead.

Cause 2

Error is detected during the read process.

Solution 2

The data may not be correctly written on the CF/SD card. Format the card again on the used equipment and try the write/read process again. Pressing "Yes" will not start the reading process of compatible data.

- <CF card access error.> is displayed.

Cause 1

There is not enough capacity on the CF/SD card to write the data.

Solution 1

Format the card again on the used equipment and try the write/read process again.

Cause 2

Error is detected during the write process.

Solution 2

Make sure that the CF/SD card is properly inserted and try the write process again. Format the card again on the used equipment and try the write/read process again.

Cause 3

Unspecified CF/SD card is used.

Solution 3

Use the specified CF/SD card.

- ❑ <Wrong CF card for full disclosure.>, <Failed to read full disclosure from the CF card.> is displayed.

Cause

Specified memory card is not used.

The card is not formatted.

The data stored in the card is damaged. The card has been already used on another equipment.

Solution 1

Use the recommended memory card.

Disconnect and connect the full disclosure waveform card again to make sure that it is properly inserted.

Format the card on the used equipment. (All previous data will be deleted.)

Solution 2

If the error persists, contact our service representative.

- ❑ The SD card does not function when inserted to the card slot.

Cause 1

The SD card is not properly inserted.

Solution

Make sure that the SD card is properly inserted.

Cause 2

The SD card is write-protected.

Solution

Move the lock slide and release the write-protect.

Chapter 12 Setup Item/Default Value

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Chapter 12 Setup Item/Default Value

This section lists selection, default setting, and backup status for each setup item.
The following indicates the selection, default setting and backup status for each setup item.

Patient Admit / Discharge

| Item | Details | Default | At Power ON | At Discharge |
|------------------------|--|---------------------|---|--------------|
| Mode Select | Main Mode 1 to 9 | 1 | Backup | Backup |
| ID | Numeric, Alphabet, Symbol (20 characters) | Blank | | Initialize |
| Patient Name | Numeric, Alphabet, Symbol (16 characters) | Blank | | |
| Patient Classification | Adult, Child, Neonate | Adult | Depend on the "Power ON/Discharge" setup under [Initial Settings]>[User I/F]. | |
| Sex | Male, Female | No selection | Backup | Initialize |
| Team | Red, Orange, Yellow, Yellow-green, Green, Light Blue, Blue, Purple | Red | | Backup |
| Birth Date | Birth Date | Blank | | Initialize |
| Year, Month, Day | Year, Month, Day | Blank | | Backup |
| Age | 0 to 150 years or 0 to 999 days | 0 year | | |
| Height | 0.0 to 300.0cm / 0.0 to 118.1in | 0.0cm / 0.0in | | Initialize |
| Weight | 0.0 to 350.0kg / 0.0 to 771.6lb | 0.0kg / 0.0lb | | |
| BSA | 0.00 to 9.99m ² | 0.00 m ² | | |
| Blood Type | A, B, O, AB Rh +/- | Blank | | |
| Pacemaker | Used, Not used | Not Used | Depend on the "Power ON/Discharge" setup under [Initial Settings]>[User I/F]. | |
| Impedance Measurement | ON, OFF | ON | | |
| Admit Date | Year, Month, Day | Blank | Backup | Initialize |

Alarm

| Item | Details | Default | At Power ON | At Discharge |
|------------------------------------|---|--|--|--------------|
| System Alarm | Suspend, ON | Suspend | - | - |
| HR PR_SpO ₂ , PR_IBP | ON, OFF 20 to 300bpm | 40 to 165bpm | | |
| Asystole* ¹ | ON, OFF 3 to 10 sec. | ON 5 sec. | | |
| VF* ¹ | ON, OFF | ON | | |
| VT* ¹ | ON, OFF | ON | | |
| Slow_VT* ¹ | ON, OFF | ON | | |
| Run | ON, OFF 2 to 8 beats | ON 3 beats | | |
| Couplet | ON, OFF | OFF | | |
| Pause | ON, OFF 1.5 to 5 sec. | OFF 3.0 sec. | | |
| Bigeminy | ON, OFF | OFF | | |
| Trigeminy | ON, OFF | OFF | | |
| Frequent | ON, OFF 1 to 50 beats/min. | OFF, 10 beats/min. | | |
| Tachy | ON, OFF | ON | | |
| Brady | ON, OFF | ON | | |
| HR Lower Limit for VT | 120, 140 bpm/min. | 120 | | |
| HR Lower Limit for RUN | 0 to 100 beats/min. | 40 | | |
| ST1 to ST12(mm)* ² | ST All Alarm ON, OFF Indiv. Alarm ON, OFF ±20mm | ST All Alarm OFF Indiv. Alarm OFF OFF to OFF | Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F]. | |
| ST1 to ST12(mV)* ² | ST All Alarm ON, OFF Indiv. Alarm ON, OFF ±2.00mV | ST All Alarm OFF Indiv. Alarm OFF OFF to OFF | | |
| BP1 (mmHg) | ON, OFF 0 to 300mmHg | ON SYS:80-180 DIA:OFF-OFF MEAN:OFF-OFF | | |
| BP1 (kPa) | ON, OFF 0 to 40.0kPa | ON SYS:10.0-24.0 DIA:OFF-OFF MEAN:OFF-OFF | | |
| BP2 to BP6 (mmHg) | ON, OFF 0 to 300mmHg | OFF SYS:OFF-OFF DIA:OFF-OFF MEAN:OFF-OFF | | |
| BP2 to BP6 (kPa) | ON, OFF 0 to 40.0kPa | OFF SYS:OFF-OFF DIA:OFF-OFF MEAN:OFF-OFF | | |

*1: Select [ON/OFF] for "Asystole, VF, VT Alarm" (Menu<Initial Settings<Alarm) in advance.

*2: The same setting applies for "mm" and "mV".

| Item | Details | Default | At Power ON | At Discharge |
|--|--|---|--|--------------|
| CVP(mmHg) (kPa) | ON, OFF 0 to 300mmHg 0 to 40kPa | OFF | | |
| CVP(cmH ₂ O) | ON, OFF 0 to 40cmH ₂ O | OFF | | |
| RR_IMP RR_VENT RR_GAS | ON, OFF 5 to 150Bpm | ON 5 to 30 | | |
| APNEA | ON, OFF 10 to 60 sec. | ON 15 sec. | | |
| SpO ₂ | ON, OFF 50 to 100% | ON 90 to OFF | | |
| SpCO | ON, OFF 1 to 40% | OFF | | |
| SpMet | ON, OFF 1 to 15% | OFF | | |
| SpHb | ON, OFF 1.0 to 24.5g/dL | OFF | | |
| NIBP (mmHg) | ON, OFF 10 to 300mmHg | ON SYS:80-180 DIA:OFF-OFF MAP:OFF-OFF | Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F]. | |
| NIBP (kPa) | ON, OFF 1.5 to 40.0kPa | ON SYS:10.0-24.0 DIA:OFF-OFF MAP:OFF-OFF | | |
| TEMP1 to TEMP6 (°C) | ON, OFF 30 to 45°C | OFF OFF-OFF | | |
| Tb (°C) | ON, OFF 30 to 45°C | OFF OFF-OFF | | |
| CO ₂ -Et (mmHg) (kPa) (%) | ON, OFF 1 to 100mmHg ON, OFF 0.1 to 13.3kPa ON, OFF 0.1 to 13.3% | OFF OFF OFF | | |
| CO ₂ -Insp (mmHg) (kPa) (%) | ON, OFF 1 to 4mmHg ON, OFF 0.1 to 0.4kPa ON, OFF 0.1 to 0.4% | OFF OFF OFF | | |
| Alarm Detail Setup | Alarm Suspend Time | 1, 2 min. | 2 min | Backup |
| | Alarm Silence Time | 1, 2 min. | 2 min | |
| | Alarm Sound Suspend | ON, OFF | ON | |
| | Alarm Sound Suspend Time | [1min.] / [2min.] / [5min.] / [10min.] / [30min.] / [60min.] / [90min.] / [120min.] | 60 min | |
| | Status Alarm Control Status Alarm Control | Link to alarm silence time, Link to each new occurrence | Link to each new occurrence | |
| | Alarm Limit Display | Graph, Numeric, OFF | Graph | |

NOTE

- Selecting [Backup] for "Power ON" and "Discharge" under [Initial Settings] > [User I/F] > [Power ON/Discharge] will retain the setting at "Power ON" and "Discharge" respectively. If [Initialize] is selected, the setting will be initialized with the selected mode at "Power ON" and "Discharge".

Parameter

ECG

| Item | Details | Default | At Power ON | At Discharge |
|---|---|--|-------------|---|
| Lead | I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6 | ECG1: II ECG2: aVR ECG3: I ECG4: III ECG5: aVL ECG6: avF ECG7: V1 ECG8: V2 ECG9: V3 ECG10: V4 ECG11: V5 ECG12: V6 | | Depend on the "Power ON/Discharge" setup under [Initial Settings]>[User I/F]. |
| Size | Auto, x1/4, x1/2, x1, x2, x4 | ECG1 to ECG12 x1 | Backup | Initialize |
| Filter | Monitor, Diagnosis, ESIS | Monitor | | Backup |
| Synchronized Mark/Tone | ECG, SpO ₂ , BP, Auto, OFF | Auto | | |
| Pacemaker | *Same with "Patient Admit/Discharge" section. | | | |
| Pacemaker Pulse | ON, OFF | OFF | | Backup |
| Pace Pulse Mask Time | Auto, 10ms, 20ms, 40ms, OFF | Auto | Backup | Initialize |
| HR Average | Instant, Average | Average | | |
| Drift Filter | ON, OFF | OFF | | |
| AC Filter | ON, OFF | ON | | |
| Automatic Lead Switch | ON, OFF | OFF | | |
| 3-lead Override | ON, OFF | OFF | | |
| ST/VPC/Arrhy. Alarm Display | ON, OFF | ON | | Backup |
| ECG Analog Output | Disp. Lead, Selected Lead | Disp. Lead | | |
| ECG Waveform Display during Lead-OFF | ON, OFF | OFF | | |
| Noise Detection | ON, OFF | OFF | | |
| Chest Lead-OFF | Enable, Disable | Enable | | |

RESP

| Item | Details | Default | At Power ON | At Discharge |
|---------------------------|---|---------|---|--------------|
| Size | x1/4, x1/2, x1, x2, x4 | x1 | Backup | Initialize |
| RR Sync. Indicator | ON, OFF | ON | | Backup |
| RR Alarm, APNEA Source | Auto, Impedance, Ventilator, CO ₂ | Auto | | |
| CVA Detect | ON, OFF | OFF | Depend on the "Power ON/Discharge" setup under [Initial Settings]>[User I/F]. | |
| Impedance Measurement | *Same with "Patient Admit/Discharge" section. | | | |
| Impedance Detect. Lead | I, II | II | Depend on the "Power ON/Discharge" setup under [Initial Settings]>[User I/F]. | |

SpO₂ (General)

| Item | Details | Default | At Power ON | At Discharge |
|------------------------|-------------------------------------|---------|-------------|--------------|
| Size | x1/4, x1/2, x1, x2, x4 | x1 | Backup | Initialize |
| Synchronized Mark/Tone | *Same with selection for ECG Setup. | | | |
| Alarm during NIBP | ON, OFF | ON | Backup | |
| Label | None/Auto/RH/LH/RF/LF/OT | none | | |

SpO₂ (Nellcor Unit)

| Item | Details | Default | At Power ON | At Discharge |
|----------------------------|----------------------|---------|-------------|--------------|
| SpO ₂ SEC Alarm | OFF, 10, 25, 50, 100 | OFF | Backup | |

SpO₂ (Masimo Unit)

| Item | Details | Default | At Power ON | At Discharge |
|----------------------------|--|---------|-------------|--------------|
| SpO ₂ Averaging | 2–4sec, 4–6sec, 8sec, 10sec, 12sec, 14sec, 16sec | 8 sec. | Backup | |
| Pulse Sensitivity | Normal, High | Regular | | |
| FAST SAT | ON, OFF | OFF | | |
| Perfusion Index | ON, OFF | ON | | |
| Signal IQ Wave | ON, OFF | OFF | | |

NIBP

| Item | Details | Default | At Power ON | At Discharge |
|-------------------------------|---|--------------|---|--------------|
| Patient Classification | *Same with "Patient Admit/Discharge" section. | | | |
| Quick Meas. | ON, OFF | ON | Depend on the "Power ON/Discharge" setup under [Initial Settings]>[User I/F]. | Backup |
| NIBP Auto Mode | Cont., 1min, 2min, 2.5min, 5min, 10min, 15 min, 20min, 30min, 60min, 120min, Lumbar Mode, OFF | OFF | | |
| Dyna Alert (Nellcor™ only) | ON, OFF | ON | | |
| Sight Inflation | ON, OFF | OFF | | |
| Oscillograph | ON, OFF | OFF | | |
| MAP | ON, OFF | ON | | |
| PR | ON, OFF | OFF | | |
| End Tone | ON, OFF | ON | | |
| NIBP Erase Time | 60min., 120min. | 120 min | | |
| User Interval | Lumbar Mode | Lumbar Mode | | |
| Measure at Alarm | ON, OFF | OFF | | |
| | Asystole, VF, VT, Slow VT, Run, Bigeminy, Trigeminy, Pause, Couplet, Tachy, Brady, Frequent | No Selection | | |
| | HR, ST, RR, APNEA, SpO ₂ , BP1, BP2, BP3, BP4, BP5, BP6, T1, T2, T3, T4, T5, T6, Tb, CO ₂ , SpCO, SpMet, SpHb | No Selection | | |
| Auto Mode with Start/Stop key | ON, OFF | ON | | |
| Time Display | Elapsed, Meas. | Elapsed | | |

BP1 to 6

| Item | Details | Default | At Power ON | At Discharge |
|------------------------|---|--------------------------|---|--------------|
| Scale* | 20, 50, 75, 100, 150, 200, 250, 300mmHg | 200mmHg 50mmHg (BP2) | Depend on the "Power ON/Discharge" setup under [Initial Settings]>[User I/F]. | |
| | 4, 8, 12, 16, 20, 24, 32, 40kPa | 24.3kPa 8kPa (BP2) | | |
| Label | BP#, ART, PAP, CVP, ICP, IAP, LVP, US1 to US5 | BP# indicates BP1 to BP6 | Backup | |
| Synchronized Mark/Tone | *Same with selection for ECG Setup. | | | |
| Display Type | S/D/M, S/D, M | S/D/M | Backup | |
| Wave Filter | 6, 8, 12, 40Hz | 12Hz | | |
| Mean Wave | ON, OFF | OFF | | |
| Resp. Filter | ON, OFF | OFF | | |
| Alarm during NIBP | ON, OFF | ON | | |

*: The scale selection will differ depending on the label.

TEMP1 to 6

| Item | Details | Default | At Power ON | At Discharge |
|-------|------------------------------------|---------------|-------------|--------------|
| Label | T#, Tsk, Tre, Tes, Tco, US1 to US7 | T# (T1 to T6) | Backup | |

 Δ TEMP-A to TEMP-C

| Item | Details | Default | At Power ON | At Discharge |
|-----------------|-------------------------|---------|-------------|--------------|
| Δ Temp-A | (T1 to T6) - (T1 to T6) | T1-T2 | Backup | |
| Δ Temp-B | (T1 to T6) - (T1 to T6) | T3-T4 | | |
| Δ Temp-C | (T1 to T6) - (T1 to T6) | T5-T6 | | |

CO₂ (Capnostat 5/HPD-800/HPD-810)

| Item | Details | Default | At Power ON | At Discharge |
|---------------------------------|--------------------------------------|---------------------|---|--------------|
| Scale | 0-50, 0-100mmHg | 0-50 | Depend on the "Power ON/Discharge" setup under [Initial Settings]>[User I/F]. | |
| | 0-4, 0-8, 0-10kPa | 0-4 | | |
| | 0-4, 0-8, 0-10% | 0-4 | | |
| EtCO ₂ Peak Duration | 10, 20sec, OFF | 10 sec. | | |
| O ₂ Comp. | 0-100% | 21% | Backup | |
| N ₂ O Comp. | ON, OFF | OFF | | |
| Anesthetic Gas Comp. | 0.0-20.0% | 0.0% | | |
| Atmospheric Pressure | 400 to 850mmHg 53.4 to 113.3.0kPa | 760mmHg 101.3kPa | | |

CO₂ (Covidien/HCP-800/HCP-810)

| Item | Details | Default | At Power ON | At Discharge |
|---------------------------------|-------------------|---------|---|--------------|
| Scale | 0-50, 0-100mmHg | 0-50 | Depend on the "Power ON/Discharge" setup under [Initial Settings]>[User I/F]. | |
| | 0-4, 0-8, 0-10kPa | 0-4 | | |
| | 0-4, 0-8, 0-10% | 0-4 | | |
| EtCO ₂ Peak Duration | 10, 20sec, OFF | 10 sec. | | |

Ventilator

| Item | Details | Default | At Power ON | At Discharge |
|----------------|---|---|---|--------------|
| AWP Scale | 10, 20, 30, 50, 120cmH ₂ O | 50cmH ₂ O | Depend on the "Power ON/Discharge" setup under [Initial Settings]>[User I/F]. | |
| AWF Scale | 5, 10, 20, 50, 180 L/min | 50.0L/min | | |
| AWV Scale | 50, 250, 500, 1000, 3000mL | 500mL | | |
| P-V, F-V Scale | 10, 20, 30, 50, 120cmH ₂ O 250, 500, 700, 1000mL ±20, ±50, ±180L/min | 30cmH ₂ O 500mL ±50L/min | | |

Cardiac Output (CO)

| Item | Details | Default | At Power ON | At Discharge |
|------------|------------|---------|-------------|--------------|
| Auto Start | ON, OFF | ON | Backup | |
| Time Scale | 30, 60 sec | 30 sec. | | |

Sp*

| Item | Details | Default | At Power ON | At Discharge |
|-------|---------------------|---------|-------------|--------------|
| SpCO | - | - | Backup | |
| SpMet | - | - | | |
| SpHb | Medium, Short, Long | Medium | | |

Vigilance/Vigileo

| Item | Details | Default | At Power ON | At Discharge |
|-------------|---------|---------|-------------|--------------|
| STAT Mode | ON, OFF | OFF | Backup | |
| Index Disp. | ON, OFF | OFF | | |

INVOS

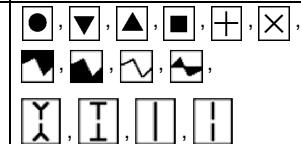
| Item | Details | Default | At Power ON | At Discharge |
|---------------------|--------------------|---------|-------------|--------------|
| Lt-rSO ₂ | ch1, ch2, ch3, ch4 | ch1 | Backup | |
| Rt-rSO ₂ | ch1, ch2, ch3, ch4 | ch2 | | |
| S1-rSO ₂ | ch1, ch2, ch3, ch4 | ch3 | | |
| S2-rSO ₂ | ch1, ch2, ch3, ch4 | ch4 | | |

Stopwatch

| Item | Details | Default | At Power ON | At Discharge |
|---------|---------------------------|---------|-------------|--------------|
| Label 1 | 8 alphanumeric characters | TIMER1 | Backup | |
| Label 2 | | TIMER2 | | |

Data Review

Graphic Trend

| Item | Details | | Default | At Power ON | At Discharge |
|--------------------------|--|--|---|-------------|--------------|
| Trend A | HR, ST (I to V6) , SpO ₂ , PR_SpO ₂ , VPC, NIBP, BP1 to 6, PR_IBP, PDP, CPP, TEMP1 to 6, Tb, ΔTEMP-A to C, RR_IMP, APNEA, EtCO ₂ , InspCO ₂ , RR_GAS, BIS, SvO ₂ , ScvO ₂ , CCO, CCI, BT, RR_VENT, PI, PVI, SpCO, SpMet, SpHb, Lt-rSO ₂ , Rt-rSO ₂ S1-rSO ₂ , S2-rSO ₂ | HR, SpO ₂ , OFF, NIBP HR, BP1, T1, NIBP HR, T1, BP1, NIBP OFF, OFF, OFF, OFF | Backup | | |
| Trend B | | | | | |
| Trend C | | | | | |
| Trend D | | | | | |
| Time | 10min, 1h, 2h, 4h, 8h, 12h, 16h, 24h | 4 hours | | | |
| Display Selection |  | | | | |
| Scale, Display Selection | HR, PR_SpO ₂ , PR_IBP | 100, 200, 300bpm | 300bpm  | Backup | |
| | ST(V) | ±0.2, ±0.5, ±1.0, ±2.0mV ±2.0, ±5.0, ±10.0, ±20.0mm | ±0.5mV ±5.0mm  | | |
| | VPC | 20, 50, 100 beats | 20 beats  | | |
| | BP1 to BP6 | 20, 50, 100, 150, 200, 300mmHg 4.0, 8.0, 16.0, 20.0, 24.0, 40.0kPa | 200mmHg 24.0kPa  | | |
| | PDP, CPP | 20, 50, 100, 150, 200, 300mmHg 4.0, 8.0, 16.0, 20.0, 24.0, 40.0kPa | 200mmHg 24.0kPa  | | |
| | NIBP | 100, 150, 200, 300mmHg 16.0, 20.0, 24.0, 40.0kPa | 200mmHg 24.0kPa  | | |
| | TEMP1 to TEMP6 | 20.0-45.0, 30.0-40.0°C | 30.0-40.0°C  | | |
| | Tb | 20.0-45.0, 30.0-40.0°C | 20.0-45.0°C  | | |
| | ΔTEMP-A to C | ±10.0, ±25.0°C | ±10.0°C  | | |
| | SpO ₂ | 0-100, 50-100, 80-100% | 80-100%  | | |
| | SpCO | 20, 40, 100% | 20%  | | |
| | SpMet | 10, 15, 100% | 10%  | | |
| | SpHb | 10-20, 0-25(g/dL) | 10-20  | | |
| | RR_IMP, RR_VENT, RR_GAS | 50, 100, 150Bpm | 50Bpm  | | |
| | APNEA | 15, 30 sec | 15 sec.  | | |

Graphic Trend

| Item | Details | | Default | At Power ON | At Discharge |
|--------------------------------|--------------------------------------|---|------------------------------|-------------|--------------|
| Scale, Display Selection | CO ₂ | 50, 100mmHg 4.0, 8.0, 10.0kPa 4.0, 8.0, 10.0% | 50mmHg 4.0kPa 4.0% | | Backup |
| | PI | 10,20% | 10% | | |
| | PVI | 30,60, 100% | 30% | | |
| | SvO ₂ , ScvO ₂ | 0-100, 50-100, 80-100% | 0-100% | | |
| | CCO | 6.0, 12.0, 20.0L/min | 6.0L/min | | |
| | CCI | 6.0, 12.0, 20.0L/min/m ² | 6.0L/min/m ² | | |
| | BT | 20.0-45.0, 30.0-40.0°C | 20.0-45.0 °C | | |
| | BIS | 25, 50, 75, 100 | 100 | | |
| | Lt-rSO ₂ | 20-100(%) | 20-100% | | |
| | Rt-rSO ₂ | 20-100(%) | 20-100% | | |
| | S1-rSO ₂ | 20-100(%) | 20-100% | | |
| | S2-rSO ₂ | 20-100(%) | 20-100% | | |

Tabular Trend

| Item | Details | Default | At Power ON | At Discharge |
|-------------------------------|--|--|-------------|--------------|
| Time | 10sec., 30sec., 1min., 2min., 2.5min., 5min., 10min., 15min., 30min., 60min., NIBP | 5 min | Backup | |
| Group | A to F | A | | |
| Fixed Parameters | 0 to 6 param. | 0 param. | | |
| List Selection | <p>[H Module] OFF, HR, VPC, ST (I to V6) , SpO₂, PR_SpO₂, NIBP-S/D/M, BP1 to 6- S/D/M, PR_IBP, PDP, PCWP, CPP, TEMP1 to 6, Tb, CO, EtCO₂, InspCO₂, RR_GAS, RR_IMP, RR_VENT, APNEA, PI, PVI, SpCO, SpMet, SpHb</p> <p>[Vigilance] SvO₂, ScvO₂, SaO₂, O₂El, B-Temp, CCO, CCO_STAT, CCI, CCI-STAT, DO₂, RVEF, RVEF-STAT, VO₂, SV, SV-STAT, SVI, SVI-STAT, SVR, SVRI, SVV, EDV, EDV-STAT, EDVI, EDVI-STAT, MAP, ESV, ESVI</p> <p>[Ventilator] E-TV, I-TV, MV, P-PEAK, P-PAUSE, PEEP, P-MEAN, E-RES, I-RES, COMP, FiO₂, SEF, TOTPOW, IMP</p> <p>[Other] BIS, SQI, EMG, SR, Lt-rSO₂, Rt-rSO₂ S1-rSO₂, S2-rSO₂</p> | | | |
| | Group A | HR, VPC, ST (I) , ST (II) , NIBP-S, NIBP-D, SpO ₂ , PR_SpO ₂ , BP1-S, BP1-D, BP1-M, BP2-S, BP2-D, BP2-M, EtCO ₂ , RR_GAS, RR_IMP, APNEA, T1, T2 | | |
| | Group B | HR, VPC, ST(I) to ST(V6) | | |
| | Group C | HR, RR_IMP, RR_GAS, RR_VENT, SpO ₂ , P-PEAK, P-PAUSE, P-MEAN, PEEP, E-TV, I-TV, MV, E-RES, I-RES, COMP, EtCO ₂ , APNEA | | |
| | Group D | SvO ₂ , CCO, EDV, B-Temp, RVEF, SV, CCI, EDVI, ESV, SVR, SaO ₂ , SVI, ESVI, SVRI, CCO_STAT, EDV_STAT | | |
| | Group E | BIS, SQI, EMG, SR | | |
| | Group F | HR, SpO ₂ , NIBP-S, NIBP-D, NIBP-M, BP1-S, BP1-D, BP1-M, RR_GAS, EtCO ₂ | | |
| Filtering (Sampling Interval) | 10sec., All | All | Initialize | |

OCRG

| Item | Details | Default | At Power ON | At Discharge |
|---------------------------|----------------------------|-----------|-------------|--------------|
| Display Time | 8, 16 min | 8 min | Backup | |
| Waveform | Impedance, CO ₂ | Impedance | | |
| Respiration Waveform Size | x 1/4, x1/2, x1, x2, x4 | x1 | | |

Recall

| Item | Details | Default | At Power ON | At Discharge |
|--------------------------|--|-------------------------------|-------------|--------------|
| Waveform Selection | ECG1, ECG2, BP1 to 6, SpO ₂ , RESP, CO ₂ , RR_GAS | ECG1, ECG2 | All ON | Backup |
| Recall Factor | Asystole, VF, VT, Slow VT, Run, Bigeminy, Trigeminy, Pause, Couplet, Tachy, Brady, Frequent HR, ST, NIBP, RR, APNEA, SpO ₂ , PR, BP1 to 6, TEMP1 to 6, Tb, CO ₂ , SpCO, SpMet, SpHb | All ON | | |
| List Display | 5 Waves (Compressed: 12 sec.) | 5 Waves (Compressed: 12 sec.) | | |
| Recall Display Selection | Asystole, VF, VT, Slow VT, Run, Bigeminy, Trigeminy, Pause, Couplet, Tachy, Brady, Frequent HR, ST, NIBP, RR, APNEA, SpO ₂ , PR, BP1 to 6, TEMP1 to 6, Tb, CO ₂ , EVENT1 to 8, SpCO, SpMet, SpHb | All ON | | |

ST Measurement

| Item | Details | Default | At Power ON | At Discharge |
|----------------------|----------------------------------|---------|-------------|--------------|
| Meas. Point | 0 to 560ms | 120ms | All ON | Backup |
| Ref. Point | 0 to -240ms | -80ms | | |
| ST Wave Size | x1/4, x1/2, x1, x2, x4 | x1 | | |
| Slide Show Interval | 1, 5, 10, 20, 30 sec. | 5 sec. | | |
| ST Waveform Interval | 10 sec., 1 min., 5 min., 10 min. | 10 sec. | | |

NOTE

- The graphic trend, tabular trend, alarm history will be stored even when the power is turned OFF.
- The ST data, OCRG data, Recall data will be stored for 5 minutes after the power is turned OFF.

12-lead Display

| Item | Details | Default | At Power ON | At Discharge |
|------------------|------------------------|-------------------------------------|-------------|--------------|
| ECG Analysis | Real Time, Review | Real Time | Backup | Backup |
| Limb Lead Size | x1/4, x1/2, x1, x2, x4 | x1 | Backup | Backup |
| Chest Lead Size | x1/4, x1/2, x1, x2, x4 | x1 | Backup | Backup |
| Filter | AC Filter | ON, OFF | ON | Backup |
| | EMG Filter | OFF, Strong (25Hz), Weak (35Hz) | OFF | Backup |
| | Drift Filter | OFF, Strong (0.50Hz), Weak (0.25Hz) | 0.50Hz | Backup |
| Background Color | White, Black | Black | Backup | Backup |

Basic Setup

Tone/Volume

| Item | Details | | Default | At Power ON | At Discharge |
|--|---|-------------------|---------------|-------------|--------------|
| Vital Alarm Sound | Urgent | Volume: 11 levels | 4 | Backup | |
| | | Tone: 5 type* | 1 | | |
| | Caution | Volume: 11 levels | 4 | | |
| | | Tone: 5 type* | 1 | | |
| | Status | Volume: 11 levels | 4 | | |
| | | Tone: 4 type* | 1 | | |
| Ventilator Alarm Sound | ON/OFF | | OFF | | |
| | Volume: 11 levels | | 4 | | |
| | Tone: 1 type | | 1 | | |
| Status Alarm Control Alarm Sound | Urgent | Volume: 11 levels | 4 | | |
| | | Tone: 1 type* | 1 | | |
| | Caution | Volume: 11 levels | 4 | | |
| | | Tone: 1 type* | 1 | | |
| | Status | Volume: 11 levels | 4 | | |
| | | Tone: 1 type* | 1 | | |
| Pulse Tone | Volume: 11 levels | | 2 | | |
| | Tone: 5 type | | 1 | | |
| | Sync. with SpO ₂ Value: Selected Tone, Sync. with SpO ₂ Value | | Selected Tone | | |
| Key Sound | Volume: 11 levels | | 4 | | |
| | Tone: 3 type | | 1 | | |
| Other Bed Alarm | Volume: 11 levels | | 4 | | |
| | Tone: 1 type | | 1 | | |
| Boot Sound Shutdown Sound | Volume: 11 levels | | 2 | | |
| | Tone: 3 type | | 1 | | |
| Other | Volume: 11 levels | | 4 | | |
| | Tone: 1 type | | 1 | | |

* When [Fukuda Tone] is selected for "Alarm System", the tone can be selected from 8 levels.

Display Configuration

| Item | Details | Default | At Power ON | At Discharge |
|---------------------|---|----------------------------------|--|--------------|
| Layout | Numeric Data: Standard/Right Numeric Data: Standard/Left Numeric Data: Standard/Bottom (1row, 2rows, 3rows) Numeric Data: Standard&Bottom/Right Numeric Data: Standard&Bottom/Left Numeric Data: Standard/Right(Large) Numeric Data: Standard/Left(Large) Numeric/Max. Size 12-Lead/Right 12-Lead/Left | Numeric Data: Standard/ Right | Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F]. | |
| Background Color | Refer to the Color Setup. | | | |

Display Configuration

| Item | Details | Default | At Power ON | At Discharge |
|----------------------|--|---|-------------|---|
| Palette | Refer to the Color Setup. | | | |
| Numeric Data | OFF, HR/PR, HR, PR_IBP, VPC/PACE, ST/VPC, ST-A to C, BP1 to 6, NIBP, NIBP List, SpO ₂ , PR_SpO ₂ , (SpO ₂ , PR_SpO ₂), RR_IMP, RR_GAS, RR_VENT, Tb, TEMP1 to 6, TEMP1/2, TEMP3/4, TEMP5/6, ATEMP-A to C, VENT, P-V/F-V, SvO ₂ /CO, BIS, CO ₂ , HEMO, HEMO-I, Stopwatch, INVOS, SpCO, SpMet, SpHb | HR/PR, SpO ₂ , NIBP, RR_IMP | | Depend on the "Power ON/Discharge" setup under [Initial Settings]>[User I/F]. |
| Waveform | OFF, ECG1 to 12, ECG1 to 12 Cascade, BP1 to 6, BP Overlap 1to 3, SpO ₂ , RESP, AWF, AWP, AWV, CO ₂ , Block Cascade | ECG1, SpO ₂ , RESP | | |
| User Key | OFF, Home, Menu, User Key Up/Down, Alarm Silence, Alarm Suspend, NIBP Start/Stop, NIBP Cont., Print Start/Stop, Monitor Suspend, Night Mode, Freeze, Key Lock, Mode Select, Admit/Disch., Rapid Discharge, HR/PR, HR/PR Source, BP Zero, Lead, ECG Size (All Leads), Scale/Baseline, SpO ₂ Display ON/OFF, CO ₂ Display ON/OFF, Auto Display Config., Short Trend ON/OFF, Transparent Window ON/OFF, Change Palette, Graphic Trend, Trend (Group), Tabular Trend, Tabular Trend (Group), NIBP List, Recall, OCRG, ST, Cardiac Output, PCWP, Hemodynamics, Lung Function, Full Disc. Wave, Tone/Volume, NIBP Auto Mode, Alarm Setup (Basic), Alarm Setup (All), Manual Printing, Display Config., Time/Date, Stopwatch, Group 1, Group 2, Group 3, Group 4, Group 5, Event, Print (LBP) Cancel, Alarm History, Other Bed, Standard, BP 1ch, CO ₂ , Maximum, Bottom 1, Bottom 2, Main 7, Main 8, Main 9 | User Key Down 1/2 Menu, Alarm Silence, Admit/Disch., BP Zero, NIBP Start/Stop, NIBP Auto Mode, NIBP Cont., Alarm Setup (All), Print Start/Stop, User Key Up/Down, Home, User Key Down 2/2 Menu, Alarm Silence, Trend Group, Tabular Trend Group, Night Mode, Key Lock, Print Start/Stop, User Key Up/Down, Home | | Depend on the "Power ON/Discharge" setup under [Initial Settings]>[User I/F]. |
| Sweep Speed | Circ.: 6.25, 12.5, 25, 50 Vent.: 6.25, 12.5, 25 | Circ.: 25 Vent.: 6.25 | | |
| Short Graphic Trend | ON, OFF, Overlap Display Length: 0, 5, 10, 15, 20, 25, 30 min. | OFF 15 min. | | |
| Detail Setup (Meas.) | Alarm Limit Display | Graph, Numeric, OFF | Graph | |
| | At Alarm Occurrence | Reversed, 3D | Reversed | |
| | ST/VPC/Arrhy. Alarm Display | ON, OFF | ON | Backup |

Display Configuration

| Item | Details | | Default | At Power ON | At Discharge |
|------------------------|-------------------------------|--|--|--|--------------|
| Detail Setup (Wave) | Grid | Standard, OFF, Bold | Regular | Depend on the "Power ON/ Discharge" setup under [Initial Settings]>[User I/F]. | |
| | Scale | ON, Bold1, Bold2 | Regular | | |
| | Thickness | Thin, Regular, Thick | Regular | | |
| | Clip | ON, OFF | ON | | |
| | Fill CO ₂ Waveform | ON, OFF | ON | | |
| | BP Overlap 1 | BP1 to 6 | BP1 to 4 | | |
| | BP Overlap 2 | BP1 to 6 | (No setting) | | |
| | BP Overlap 3 | BP1 to 6 | (No setting) | | |
| | Block Cascade | Waveform Quantity: 2 to 6 Displayed Waveform: OFF, ECG1 to 12, BP1 to 6, SpO ₂ , RESP, AWF, AWP, CO ₂ , | Waveform Quantity: 2 Displayed Waveforms: ECG1, ECG2 | | |
| | ST Short Trend | Plot, Fill, OFF | Fill | | |
| | ST Wave | Ref., Average | Ref. | | |

NOTE

- For "Display Config.", selecting [Backup] for "Power ON" and "Discharge" under [Initial Settings] > [User I/F] > [Power ON/Discharge] will retain the setting at "Power ON" and "Discharge" respectively. If [Initialize] is selected, the setting will be initialized with the selected mode at "Power ON" and "Discharge".

Manual Printing

| Item | | Details | Default | At Power ON | At Discharge |
|----------------------------------|-----------------------------------|--|------------------|-------------|--------------|
| Basic | Printer | Built-in, Cent. | Built-in | | Backup |
| | Waveform Selection | ECG1, ECG2, ECG3, BP1 to 6, SpO ₂ , RESP, CO ₂ , AWF, AWP, AWV | ECG1 | | |
| | Print Duration | 24 sec., Cont. | 24 sec. | | |
| | Delay Time | None, 8sec., 16 sec. | 8 sec. | | |
| 12-Lead | Printing Format | 3 waves x 4, 2 waves x 6 | 3 waves x 4 | | Backup |
| | Position | Center, Proportional, OFF | Proportional | | |
| | Wave Format | Regular, Reverse | Standard | | |
| | Printer Auto Scale | ON, OFF | ON | | |
| | Print Calibration | ON, OFF | ON | | |
| Other Setup: Graphic Printing | Graphic Trend | Built-in, Central, Laser | Built-in | | Backup |
| | Tabular Trend | Built-in, Central, Laser | Built-in | | |
| | OCRG | Built-in, Laser | Built-in | | |
| | Zoom Wave (Recall, Full Disc.) | Built-in, Central, Laser | Built-in | | |
| | ST | Built-in, Central, Laser | Built-in | | |
| | 12-Lead Waveform | Built-in, Laser | Built-in | | |
| | 12-Lead Analysis Result | Built-in, Laser | Built-in | | |
| | Full Disc. Compressed Wave | Built-in, Laser | Built-in | | |
| | Hemodynamics | Built-in, Central, Laser | Built-in | | |
| | Lung Function | Built-in, Central, Laser | Built-in | | |
| | CO | Built-in, Central, Laser | Built-in | | |
| | Other Setup: Recall Printing | Graphic Printing, Manual Printing | Graphic Printing | | |

Auto Printing

| Item | | Details | Default | At Power ON | At Discharge |
|-------------------|--------------------|--|--------------------|-------------|--------------|
| Alarm Printing | Print | ON, OFF | OFF | | Backup |
| | Factor | Alarm for each arrhythmia, parameter | All | | |
| | Printer | Built-in, Cent. | Built-in | | |
| | Waveform Selection | ECG1, ECG2, ECG3, BP1 to 6, SpO ₂ , RESP, CO ₂ , AWF, AWP, AWV, Alarm Factor | ECG1, Alarm Factor | | |
| | Print Duration | 12, 24 sec | 12 sec. | | |
| Periodic Printing | Periodic Printing | ON, OFF | OFF | | Backup |
| | Printer | Built-in, Cent. | Built-in | | |
| | Waveform Selection | ECG1, ECG2, ECG3, BP1 to 6, SpO ₂ , RESP, CO ₂ , AWF, AWP, AWV | ECG1 | | |
| | Periodic Interval | Inter., Timer | Timer | | |
| | Interval | 1, 2, 3, 5, 10, 15, 20, 30, 60, 120 min. | 120 min | | |
| | Timer | 0:00 to 23:00 (1:00 interval) | none | | |
| | Print Duration | 6, 12, 24 sec. | 12 sec. | | |

Common Setup for Printing

| Item | Details | Default | At Power ON | At Discharge |
|--------------------|---------------------|---------|-------------|--------------|
| QRS Classification | ON, OFF | ON | Backup | |
| Speed | 50mm/s, 25mm/s | 25mm/s | | |
| Print Calibration | Top, Each Page, OFF | OFF | | |
| Print NIBP Data | ON, OFF | OFF | | |

Other Setup

| Item | Details | Default | At Power ON | At Discharge |
|------------|-----------------|------------------------------------|-------------------|--------------|
| Night Mode | Mode | Manual, Timer | Manual | Backup |
| | Start Time | 00:00 to 23:59 | Start Time: 21:00 | |
| | End Time | 00:00 to 23:59 | End Time: 07:00 | |
| | Volume | No Change, 3, 1, 0 | 1 | |
| | Display | No Change, Dark, Darker, Time Only | Darker | |
| | Alarm Indicator | ON, OFF | OFF | |

Other Setup

| Item | Details | Default | At Power ON | At Discharge |
|-----------------------------------|---|---|-------------|--------------|
| Color | Background Color (Meas.) Background Color (Wave) | Black, Gray, Light Gray Meas: Black Wave: Black | | |
| Palette | Light, Clear, Deep, Vivid | Vivid | | |
| HR | 12 colors + White | 6 | | |
| ST | | 6 | | |
| VPC | | White | | |
| PACE | | White | | |
| NIBP | | White | | |
| SpO ₂ | | 4 | | |
| SpCO | | 4 | | |
| SpMet | | 4 | | |
| SpHb | | 4 | | |
| CO ₂ | | 8 | | |
| RESP | | White | | |
| BP1 | | 1 | | |
| ART | | 1 | | |
| PAP | | 4 | | |
| CVP | | 8 | | |
| ICP | | 8 | | |
| IAP | | 12 | | |
| LVP | | 2 | | |
| US1(BP) | | White | | |
| US2 (BP) | | White | | |
| US3 (BP) | | White | | |
| US4 (BP) | | White | | |
| US5 (BP) | | White | | |
| BP2 | | 8 | | |
| BP3 | | 4 | | |
| BP4 | | 6 | | |
| BP5 | | 2 | | |
| BP6 | | 12 | | |
| TEMP1 to 6, Tb | | 2 | | |
| Tsk, Tre, Tes, Tco, US1 to US7 | | 2 | | |
| AWF | | 6 | | |
| AWP | | 4 | | |
| AWV | | 8 | | |
| BIS | | White | | |
| INVOS | | White | | |
| SvO ₂ , CO | | White | | |
| Stopwatch | | White | | |

Backup

Other Setup

| Item | | Details | Default | At Power ON | At Discharge |
|-----------------|------------|---------------------------|--------------|-------------|--------------|
| Brightness | Brightness | 7 levels | 3rd from top | Backup | |
| Stopwatch Label | 1 | 8 alphanumeric characters | TIMER1 | | |
| | 2 | | TIMER2 | | |

Chapter 13 Accessories

| | |
|---|------|
| Accessories | 13-1 |
| Optional Accessories | 13-1 |
| ECG, Impedance Respiration Measurement..... | 13-1 |
| Invasive Blood Pressure Measurement..... | 13-2 |
| Non-Invasive Blood Pressure Measurement | 13-2 |
| Temperature Measurement..... | 13-3 |
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Chapter 13 Accessories

Accessories

This section lists the accessories for the DS-8200 system.

CAUTION

- Use only the spare parts specified for this equipment. Otherwise, proper function cannot be executed.
- For quality improvement, specifications are subject to change without prior notice.

- DS-8200 System Operation Manual (This Manual): Supplied with the Display Unit (LC-8210)
- DS-8200 System Maintenance Manual: Supplied with the Display Unit (LC-8210)
- Parts Replacement Label: Supplied with the Display Unit (LC-8210)

Optional Accessories

The following products are available as optional accessories for the DS-8200 System.
Purchase them as required.

CAUTION

- Use only the accessories specified for this system. Otherwise, proper function cannot be executed.
- For quality improvement, specifications are subject to change without prior notice.

ECG, Impedance Respiration Measurement

| Item | Model Type | Note |
|------------------------|-----------------|--|
| ECG Lead Cable | CMO-07FT-3NAB | 3-electrode AAMI, clip type |
| ECG Lead Cable | CMO-07FT-4NAB | 4-electrode AAMI, clip type |
| ECG Lead Cable | CMO-07FT-5NAB | 5-electrode AAMI, clip type |
| ECG Relay Cable | CIO-07CTP-3NA | 3-electrode AAMI, standard type |
| ECG Relay Cable | CIO-07CTP-4NA | 4-electrode AAMI, standard type |
| ECG Relay Cable | CIO-07CTP-5NA | 5-electrode AAMI, standard type |
| ECG Lead Patient Cable | CMO-07FTP-10NAB | 10-electrode AAMI, clip, type, standard type |

Invasive Blood Pressure Measurement

| Item | Model Type | Note |
|-------------------------|----------------|--|
| BP Relay Cable | CJO-P01B-SA3.6 | 1 channel, 3.6m For use with Argon Medical Devices CDX III/Press Disposable Pressure Transducers |
| BP Relay Cable | CJO-P01B-SB3.6 | 1 channel, 3.6m For use with Argon Medical Devices DTX Plus Disposable Pressure Transducers |
| 2ch BP Relay Cable | CJO-P01B-DA0.8 | 2 channels, 0.8m For use with Argon Medical Devices CDX III/Press Disposable Pressure Transducers |
| 2ch BP Relay Cable | CJO-P01B-DA4.3 | 2 channels, 4.3m For use with Argon Medical Devices CDX III/Press Disposable Pressure Transducers |
| 2ch BP Relay Cable | CJO-P01B-DB0.8 | 2 channels, 0.8m For use with Argon Medical Devices DTX Plus Disposable Pressure Transducers |
| 2ch BP Relay Cable | CJO-P01B-DB4.3 | 2 channels, 4.3m For use with Argon Medical Devices DTX Plus Disposable Pressure Transducers |
| 2ch BP Conversion Cable | CJO-P01B-DJ0.5 | 2 channel-1 channel Conversion Relay Cable |

REFERENCE

- Argon Medical Devices: Former Becton Dickinson

Non-Invasive Blood Pressure Measurement

| Item | Model Type | Note |
|---|-------------|-----------------------------------|
| Adult Cuff (Large) | CUF-7101 | Width 17cm, Reusable, Latex |
| Adult Cuff (Medium) | CUF-7102A | Width 14.5cm, Reusable, Latex |
| Adult Cuff (Small) | CUF-7103 | Width 11cm, Reusable, Latex |
| Pediatric Cuff | CUF-7104 | Width 10.5cm, Reusable, Latex |
| Infant Cuff | CUF-7105 | Width 8.5cm, Reusable, Latex |
| Tempa-Kuff® Neonatal Cuff Infant #5 | 99750 | Disposable, Latex-Free, 40/box |
| Tempa-Kuff® Neonatal Cuff Neonatal Extra Large #4 | 99848 | Disposable, Latex-Free, 40/box |
| Tempa-Kuff® Neonatal Cuff Neonatal Large #3 | 99729 | Disposable, Latex-Free, 40/box |
| Tempa-Kuff® Neonatal Cuff Neonatal Medium #2 | 99890 | Disposable, Latex-Free, 40/box |
| Tempa-Kuff® Neonatal Cuff Neonatal Small #1 | 99801 | Disposable, Latex-Free, 40/box |
| Air Hose (1.5m) General | OA-80APL1.5 | For CUF-7101/7102A/7103/7104/7105 |
| Air Hose (3.5m) General | OA-80APL3.5 | For CUF-7101/7102A/7103/7104/7105 |
| NIBP Extension Hose (1.5m) | OA-7110A | For CUF-7101/7102A/7103/7104/7105 |
| NIBP Extension Hose (3.5m) | OA-7110B | For CUF-7101/7102A/7103/7104/7105 |

| Item | Model Type | Note |
|-------------------------|------------|-------------------------------|
| Air Hose (1.5m) Neonate | OA-80NE1.5 | For Tempa-Kuff® Neonatal Cuff |
| Air Hose (3.5m) Neonate | OA-80NE3.5 | For Tempa-Kuff® Neonatal Cuff |

*Tempa-Kuff® Neonatal Cuffs, manufactured by TRIMLINE Medical Products Corporation.

Temperature Measurement

| Item | Model Type | Q'ty | Note |
|--|----------------|------|------|
| Rectal Temperature Probe (for adult) | 401 | 1 | |
| Rectal Temperature Probe (for pediatric) | 402 | 1 | |
| Body Surface Probe | 409B | 1 | |
| 2ch Temperature Relay Cable | CJO-P01T-DA0.5 | 1 | 0.5m |
| 2ch Temperature Relay Cable | CJO-P01T-DA4.0 | 1 | 4m |

* 400 series general purpose temperature probe, manufactured by Measurement Specialities, Inc.

Pulse Oximetry Measurement (Nellcor)

| Item | Model Type | Note |
|------------------------------|------------|---|
| DURASENSOR | DS-100A | Reusable For adult finger (weight of 40kg and over) |
| OxiMax | MAX-N | Single-Patient-Use For neonate foot/adult finger (Neonate: weight of less than 3kg, Adult: weight of 40kg and over) |
| OxiMax | MAX-I | Single-Patient-Use For infant toe (weight of 3 to 20kg) |
| OxiMax | MAX-P | Single-Patient-Use For pediatric finger (weight of 10 to 50kg) |
| OxiMax | MAX-A | Single-Patient-Use For adult finger (weight of 30kg and over) |
| OxiMax | MAX-R | Single-Patient-Use For adult nose (weight of 50kg and over) |
| OxiMax | MAX-FAST | Single-Patient-Use For adult/pediatric forehead (weight of 10kg and over) |
| SpO ₂ Relay Cable | DOC-10 | 3m |

NOTE

- There are various types of sensors available. For details, refer to your nearest service representative.

Pulse Oximetry Measurement (Masimo)

SpO₂, PR, PI, and PVI Measurement

| Item | Model Type | Note |
|------------------------|---------------------|---|
| Masimo SET Sensor | LNOP DCI (1269) | Reusable, Adult, Weight: > 30 kg |
| Masimo SET Sensor | LNOP Adt (1001) | Single Patient Use, Adult, Weight: > 30 kg |
| Masimo SET Sensor | LNOP Pdt (1025) | Single Patient Use, Pediatric, Weight: 10 kg - 50 kg |
| Masimo SET Sensor | LNOP Inf-L (1800) | Single Patient Use, Infant, Weight: 3 kg - 20 kg |
| Masimo SET Sensor | LNOP Neo-L (1798) | Single Patient Use, Neonatal/Adult, Weight: < 3 kg or > 40 kg |
| Masimo SET Sensor | LNOP NeoPt-L (1651) | Single Patient Use, Neonatal, Weight: < 1 kg |
| Masimo SET Sensor | LNOP Blue (1970) | Adhesive Sensors for Neonatal/Infant/Pediatrics, Weight 2.5-30 kg |
| Masimo SET Sensor | LNCS DCI (1863) | Reusable, Adult, Weight: > 30 kg |
| Masimo SET Sensor | LNCS Adtx (1859) | Single Patient Use, Adult, Weight: > 30 kg |
| Masimo SET Sensor | LNCS Pdt (1860) | Single Patient Use, Pediatric, Weight: 10 - 50 kg |
| Masimo SET Sensor | LNCS Inf-L (1861) | Single Patient Use, Infant, Weight: 3 kg - 20 kg |
| Masimo SET Sensor | LNCS Neo-L (1862) | Single Patient Use, Neonatal/Adult, Weight: < 3 kg or > 40 kg |
| Masimo SET Sensor | LNCS NeoPt-L (1901) | Single Patient Use, Neonatal, Weight: < 1 kg |
| LNOP Red Patient Cable | Red PC-04 (2058) | For LNOP sensor, 1.2m |
| LNOP Red Patient Cable | Red PC-08 (2059) | For LNOP sensor, 2.4m |
| LNOP Red Patient Cable | Red PC-12 (2060) | For LNOP sensor, 3.6m |
| LNCS Red Patient Cable | Red LNC-04 (2055) | For LNCS sensor, 1.2m |
| LNCS Red Patient Cable | Red LNC-10 (2056) | For LNCS sensor, 3.0m |
| LNCS Red Patient Cable | Red LNC-14 (2057) | For LNCS sensor, 4.2m |

SpO₂, PR, PI, PVI, SpMet, and SpCO Measurement

| Item | Model Type | Note |
|------------------------------|-------------------------|---|
| Masimo Rainbow Sensor | Rainbow DCI-dc3 (2201) | Reusable, Adult, 0.9m, Weight: >30kg |
| Masimo Rainbow Sensor | Rainbow DCI-dc8 (2407) | Reusable, Adult, 2.4m, Weight: >30kg |
| Masimo Rainbow Sensor | Rainbow DCI-dc12 (2202) | Reusable, Adult, 3.6m, Weight: >30kg |
| Masimo Rainbow Sensor | Rainbow R25 (2221) | Single Patient Use, Adult, Weight: >30kg |
| Masimo Rainbow Sensor | Rainbow R25-L (2219) | Single Patient Use, Adult/Neonatal, Weight: <3kg or >30kg |
| Masimo Rainbow Sensor | Rainbow R20 (2222) | Single Patient Use, Pediatric, Weight: 10kg - 50kg |
| Masimo Rainbow Sensor | Rainbow R20-L (2220) | Single Patient Use, Infant, Weight: 3kg - 30kg |
| Masimo Rainbow Patient Cable | Rainbow RC-1 (2405) | For Rainbow Sensor, 0.3m |
| Masimo Rainbow Patient Cable | Rainbow RC-4 (2406) | For Rainbow Sensor, 1.2m |
| Masimo Rainbow Patient Cable | Rainbow RC-12 (2404) | For Rainbow Sensor, 3.6m |

SpO₂, PR, PI, PVI, SpMet, and SpHb Measurement

| Item | Model Type | Note |
|----------------------------------|---|---|
| Masimo Rainbow ReSposable Sensor | Rainbow ReSposable R2-25 Sensor System (3457) | Single Patient Use, Adult, Weight > 30 kg, R2-25a adhesive sensors & R2-25r reusable sensors 10-R2-25a /box, 2-R2-25r /box |
| Masimo Rainbow ReSposable Sensor | Rainbow ReSposable R2-20 Sensor System (3458) | Single Patient Use, Pediatric, Weight 10 kg - 50 kg, R2-20a adhesive sensors & R2-20r reusable sensors 10-R2-20a /box, 2-R2-20r /box |
| Masimo Rainbow ReSposable Sensor | Rainbow ReSposable R2-25a Sensors (2753) | Single Patient Use, Adult, Weight > 30 kg, R2-25a adhesive sensors For use with R2-25r, 25-R2-25a /box |
| Masimo Rainbow ReSposable Sensor | Rainbow ReSposable R2-20a Sensors (2755) | Single Patient Use, Pediatric/Slender Digit, Weight 10 - 50 kg R2-20a adhesive sensors For use with R2-20r, 25-R2-20a /box |
| Masimo Rainbow ReSposable Sensor | Rainbow ReSposable R2-25r Sensors (2754) | Single Patient Use, Adult, Weight > 30 kg, R2-25r reusable sensors For use with R2-25a, 5-R2-25r /box |
| Masimo Rainbow ReSposable Sensor | Rainbow ReSposable R2-20r Sensors (2756) | Single Patient Use, Pediatric/Slender Digit, Weight 10 - 50 kg R2-20r reusable sensors For use with R2-20a, 5-R2-20r /box |
| Masimo Rainbow Patient Cable | Rainbow RC-1 (2405) | For Rainbow Sensor, 0.3m |
| Masimo Rainbow Patient Cable | Rainbow RC-4 (2406) | For Rainbow Sensor, 1.2m |
| Masimo Rainbow Patient Cable | Rainbow RC-12 (2404) | For Rainbow Sensor, 3.6m |

NOTE

- SpCO and SpHb cannot be measured at the same time for all the sensors.

NOTE

- The number inside the brackets indicates Masimo PN.
- SpCO and SpHb cannot be measured at the same time for all the sensors.
- There are various types of sensors available. For details, refer to our service representative.

CO Measurement

| Item | Model Type | Note |
|-----------------------------|---------------|------|
| Catheter Relay Cable | CJO-P01C-C2.4 | |
| Injectate Probe Relay Cable | CJO-P01C-T2.4 | |

CO₂ Concentration Measurement (Respironics)

For HPD-800/HPD-810 Gas Unit I/F with Resironics Novametrix, LLC. Capnostat 5 CO₂ Sensor

| Item | Model Type | Note |
|--|--------------------|--|
| Capnostat 5 CO ₂ Sensor | 1015928 | |
| Single-Patient Use Adult Airway Adapter | 6063-00 | Single patient use, for ET tube sizes > 4.0 mm (10 per box) |
| Single-Patient Use Neonatal Airway Adapter | 6312-00 | Single patient use, for ET tube sizes = < 4.0 mm (10 per box) |
| Reusable Adult Airway Adapter | 7007-00 7007-01 | Reusable, for ET tube sizes > 4.0 mm (7007-00: 10 per box, 7007-01: 1 per box) |
| Reusable Neonatal Airway Adapter | 7053-00 7053-01 | Reusable, for ET tube sizes = < 4.0 mm (7053-00: 10 per box, 7053-01: 1 per box) |

NOTE

- There are various types of sampling device available. For details, refer to our service representative.

CO₂ Concentration Measurement (Covidien)

For HCP-800/HCP-810 CO₂ Gas Unit

Sampling Devices

| Item | Model Type | Note |
|--|------------|--------------------------------|
| Intubated EtCO₂ | | |
| Filter Line H Set (Adult/Pediatric) | XS04624 | For long term use |
| Filter Line H Set (Infant/Neonate) | 006324 | For long term use |
| Vital Line H Set (Adult/Pediatric) | 010787 | For long term use |
| Vital Line H Set (Infant/Neonate) | 010807 | For long term use |
| Non-Intubated EtCO₂ | | |
| Smart CapnoLine Plus (Adult/Intermediate) | 009818 | For oral/nasal, short term use |
| Smart CapnoLine Plus O ₂ (Adult/Intermediate) | 009822 | For oral/nasal, short term use |
| Smart CapnoLine (Pediatric) | 007266 | For oral/nasal, short term use |
| Smart CapnoLine H Plus O ₂ (Adult/Intermediate) | 010433 | For oral/nasal, long term use |
| Smart CapnoLine H (Pediatric) | 010581 | For oral/nasal, long term use |
| Smart CapnoLine H/O ₂ (Pediatric) | 010582 | For oral/nasal, long term use |
| CapnoLine H (Adult) | 008177 | For nasal, long term use |
| CapnoLine H (Pediatric) | 008178 | For nasal, long term use |
| CapnoLine H (Infant/Neonate) | 008179 | For nasal, long term use |
| Smart CapnoLine H/O ₂ (Adult) | 008180 | For nasal, long term use |
| CapnoLine H/O ₂ (Pediatric) | 008181 | For nasal, long term use |

*Packaged in 25 units unless otherwise specified.

NOTE

- There are various types of sampling device available. For details, refer to our service representative.

Others

| Item | Model Type | Note |
|-------------------------------------|--------------|--|
| Power Supply Cable | CS-34 | |
| Ground Cable | CE-11 | |
| Ground Cable | CE-01A | |
| Remote Control Unit | CF-820 | |
| Recording Paper | OP050-01TDR | 10 per box |
| Lithium-Ion Battery Pack | BTO-008 | |
| Ethernet Branch Cable | CJ-522A | Length 1m (For DS-LAN) |
| Ethernet Branch Cable | CJ-522B | Length 2m (For DS-LAN) |
| Ethernet Branch Cable | CJ-522C | Length 4m (For DS-LAN) |
| Ethernet Branch Cable | CJ-522D | Length 10m (For DS-LAN) |
| Ethernet Branch Cable | CJ-522E | Length 20m (For DS-LAN) |
| RS-232C Cable | CJ-725 | Cross Cable with Core |
| CF Card | FCF-16GA | 16GB |
| CF Card | FCF-1000 | 1GB |
| CF Card | FCF-128 | 128MB |
| SD Card | SD-1G | 1GB |
| SD Card | SD-8G | 8GB |
| Unit Connection Cable | CJO-09SS0.3 | U-Link Cable 0.3m |
| Unit Connection Cable | CJO-09SS1.5 | U-Link Cable 1.5m |
| Unit Connection Cable | CJO-09SS5 | U-Link Cable 5m |
| Network Cable (1.5m) | CJO-14SS1.5 | Module-LAN-RJ-45 Conversion Cable |
| Network Cable (2.5m) | CJO-14SS2.5 | Module-LAN-RJ-45 Conversion Cable |
| Network Cable (5m) | CJO-14SS5 | Module-LAN-RJ-45 Conversion Cable |
| Network Cable (10m) | CJO-14SS10 | Module-LAN-RJ-45 Conversion Cable |
| Display Unit Extension Cable (1.5m) | CJO-16SS1.5 | 1.5m-extension cable used when installing the HSB-80 away from the LC-8210 This cable can be used to connect the external monitor. |
| Display Unit Extension Cable (3.0m) | CJO-16SS3 | 3.0m-extension cable used when installing the HSB-80 away from the LC-8210 This cable can be used to connect the external monitor. |
| Display Unit Extension Cable (5.0m) | CJO-16SS5 | 5.0m-extension cable used when installing the HSB-80 away from the LC-8210 This cable cannot be used to connect the external monitor. |
| AUX Connection Cable (0.65m) | CJO-15RR0.65 | Relay cable for HCP-810/HPD-810 |
| Countertop for DS-8200 | OAO-68A | For fixing the Base Unit on a shelf For BS-8210 |

| Item | Model Type | Note |
|---|----------------|--|
| Bed Mount for DS-8200 | OAO-69A | For attaching the HSB-80 on a bed |
| GCX Attachment for Monitor | OAO-70A | For attaching the BS-8210 on the GCX arm |
| VESA Attachment for LC-8210 | OAO-71A | For attaching the Display Unit on a VESA standard arm For LC-8210 |
| Gas Unit / External Output Box Mounting Bracket | OAO-72A | For fixing the Gas Unit / External Output Box to the HSB-80 |
| Recorder Mounting Bracket for Countertop | OAO-74A | For fixing the HR-800 to the BS-8210 |
| Telemetry Transmitter Module | HLX-801 | |
| HLX-801 Installation Cover | OAT-02A | For fixing the HLX-801 to the LC-8210 |
| External Output Box | CJO-C01Q-SJ0.3 | For HS-8000 series |
| DS-8200 12-lead Analysis Optional Software | DS-8200-12LA | For 12-lead ECG analysis function |

NOTE

- To connect the external monitor, use the CJO-16SS1.5 or CJO-16SS3 cable.

□ External Equipment Connection Cable

| External Device | Model Type | Note |
|---------------------------|-----------------|-------------------------|
| SV-300 | CJ-401RI-70SV3 | For Status II Connector |
| Servo-i/Servo-s | CJ-402RI-70SVi | For Status II Connector |
| PB 740/760/840 | CJ-403RI-70PB | For Status II Connector |
| Evita XL/4/dura | CJ-402RI-70SVi | For Status II Connector |
| Vigilance, Vigilance CEDV | CJ-406RI-70Vigi | For Status II Connector |
| | CJO-04RS4 | For Serial Connector |
| Vigilance II, Vigileo | CJ-402RI-70SVi | For Status II Connector |
| | CJ-502 | For Serial Connector |
| BIS | CJ-407RI-70BIS | For Status II Connector |
| | CJO-03RS4 | For Serial Connector |
| INVOS 5000C | CJ-406RI-70Vigi | For Status II Connector |
| | CJO-04RS4 | For Serial Connector |

Chapter 14 Specification

| | |
|--|-------|
| Specification | 14-1 |
| Display Unit: LC-8210..... | 14-1 |
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Chapter 14 Specification

Specification

This section states the specification of this equipment.

Display Unit: LC-8210

Size

270(W)×66(D)×210(H)mm (not including the protrusion)

Weight

1.8kg (not including the accessory)

Environmental Conditions

| | |
|---------------------------------|--|
| Operating Temperature | 10 to 40°C |
| Operating Humidity | 30 to 85 % (non-condensing) |
| Transport / Storage Temperature | -10 to 60°C |
| Transport / Storage Humidity | 10 to 95% (40°C) (non-condensing) However, for the CF-820 IR Remote Control Unit, the following condition applies. 10 to 90% (38°C) (non-condensing) |
| Storage Atmospheric Pressure | 700 to 1060hPa |
| Vibration Proof | Comply with MIL-STD-810G:2008 METHOD514.6 VIBRATION |

Safety

| | |
|---|--|
| General Standard | IEC 60601-1:1988+A1:1991+A2:1995 (Medical Electrical Equipment- Part 1: General Requirements for Safety) IEC 60601-1-1:2000 (Medical Electrical Equipment- Part 1-1: General Requirements for Safety- Collateral standard: Safety Requirements for Medical Electrical Systems) |
| EMC Standard | IEC 60601-1-2: 2007 (Medical Electrical Equipment- Part 1-2: General Requirements for Safety – Electromagnetic Compatibility – Requirements and Tests) |
| Type of protection against electric shock | Class I Equipment (During AC power operation) Internally powered Equipment (During battery operation) |
| Operation Mode | Continuous Operating Equipment |
| The degree of protection against ingress of water | Combination of LC-8210, HSB-80, HS-8000 and BS-8210: IPX1 Other situation: IPX0 |
| Protection against Ignition of Flammable Gas | Not provided |

Power Supply (During AC power operation)

| | |
|--------------|-----------------------|
| Power Supply | Supplied from BS-8210 |
| Voltage | DC18V |

Power Supply (During battery operation)

| | |
|---------|--|
| Voltage | DC14.8V (Lithium-Ion Battery Pack BTO-008) |
|---------|--|

Usable Life

| | |
|---------|--|
| 6 years | According to self-certification. (☞ Maintenance Manual "Periodic Replacement" P7-1) |
|---------|--|

HS Adapter: HSB-80**Size**

230(W)×135(D)×210(H)mm (not including the protrusion)

Weight

1.5kg (not including the accessory)

Environmental Conditions

| | |
|---------------------------------|--|
| Operating Temperature | 10 to 40°C |
| Operating Humidity | 30 to 85 % (non-condensing) |
| Transport / Storage Temperature | -10 to 60°C |
| Transport / Storage Humidity | 10 to 95% (40°C) (non-condensing) However, for the CF-820 IR Remote Control Unit, the following condition applies. 10 to 90% (38°C) (non-condensing) |
| Storage Atmospheric Pressure | 700 to 1060hPa |
| Vibration Proof | Comply with MIL-STD-810G:2008 METHOD514.6 VIBRATION |

Safety

| | |
|--|--|
| General Standard | IEC 60601-1:1988+A1:1991+A2:1995 (Medical Electrical Equipment- Part 1: General Requirements for Safety) IEC 60601-1-1:2000 (Medical Electrical Equipment- Part 1-1: General Requirements for Safety- Collateral standard: Safety Requirements for Medical Electrical Systems) |
| EMC Standard | IEC 60601-1-2: 2007 (Medical Electrical Equipment- Part 1-2: General Requirements for Safety – Electromagnetic Compatibility – Requirements and Tests) |
| Type of protection against electric shock | Class I Equipment (During AC power operation) Internally powered Equipment (During battery operation) |
| Operation Mode | Continuous Operating Equipment |
| The degree of protection against ingress of water | Combination of LC-8210, HSB-80, HS-8000 and BS-8210: IPX1 Other situation: IPX0 |
| Protection against Ignition of Flammable Gas | Not provided |

Power Supply (During AC power operation)

| | |
|--------------|-----------------------|
| Power Supply | Supplied from BS-8210 |
| Voltage | DC18V |

Power Supply (During battery operation)

| | |
|------------------------|--|
| Voltage | DC14.8V (Lithium-Ion Battery Pack BTO-008) |
| Power Consumption | When LC-8210, HSB-80, and HS-8000 are connected: 35W (Power will not be supplied to BS-8210.) |
| Battery Operation Time | One battery (HSB-80): 2.5 hours (during measurement of NIBP 15min. interval, ECG, SpO ₂) Two batteries (HSB-80 and BS-8210): 5 hours (during measurement of NIBP 15min. interval, ECG, SpO ₂) The battery of BS-8210 will be used in priority. |
| Battery Charging Time | Rapid Charge (when the equipment is not operating): 3 hours Normal Charge (when the equipment is operating): 8 hours During AC power operation, batteries of HSB-80 and BS-8210 will be charged simultaneously. |

Usable Life

| | |
|---------|---|
| 6 years | According to self-certification. ( Maintenance Manual "Periodic Replacement" P7-1) |
|---------|---|

Base Unit: BS-8210**Size**

270(W)×180(D)×92(H)mm (not including the protrusion)

Weight

2.5kg (not including the accessory)

Environmental Conditions

| | |
|---------------------------------|--|
| Operating Temperature | 10 to 40°C |
| Operating Humidity | 30 to 85 % (non-condensing) |
| Transport / Storage Temperature | -10 to 60°C |
| Transport / Storage Humidity | 10 to 95% (40°C) (non-condensing) However, for the CF-820 IR Remote Control Unit, the following condition applies. 10 to 90% (38°C) (non-condensing) |
| Storage Atmospheric Pressure | 700 to 1060hPa |
| Vibration Proof | Comply with MIL-STD-810G:2008 METHOD514.6 VIBRATION |

Safety

| | |
|---|--|
| General Standard | IEC 60601-1:1988+A1:1991+A2:1995 (Medical Electrical Equipment- Part 1: General Requirements for Safety) IEC 60601-1-1:2000 (Medical Electrical Equipment- Part 1-1: General Requirements for Safety- Collateral standard: Safety Requirements for Medical Electrical Systems) |
| EMC Standard | IEC 60601-1-2: 2007 (Medical Electrical Equipment- Part 1-2: General Requirements for Safety – Electromagnetic Compatibility – Requirements and Tests) |
| Type of protection against electric shock | Class I Equipment (During AC power operation) Internally powered Equipment (During battery operation) |
| Operation Mode | Continuous Operating Equipment |
| The degree of protection against ingress of water | Combination of LC-8210, HSB-80, HS-8000 and BS-8210: IPX1 Other situation: IPX0 |
| Protection against Ignition of Flammable Gas | Not provided |

Power Supply (During AC power operation)

| | |
|-------------------|-------------|
| Voltage | AC 100-240V |
| Frequency | 50/60 Hz |
| Power Consumption | 80VA |

Power Supply (During battery operation)

| | |
|------------------------|--|
| Voltage | DC14.8V (Lithium-Ion Battery Pack BTO-008) |
| Power Consumption | When LC-8210, HSB-80, HS-8000 and BS-8210 are connected: 70W |
| Battery Operation Time | One battery (HSB-80): 2.5 hours (during measurement of NIBP 15min. interval, ECG, SpO ₂) Two batteries (HSB-80 and BS-8210): 5 hours (during measurement of NIBP 15min. interval, ECG, SpO ₂) The battery of BS-8210 will be used in priority. |
| Battery Charging Time | Rapid Charge (when the equipment is not operating): 3.5 hours Normal Charge (when the equipment is operating): 8 hours During AC power operation, batteries of HSB-80 and BS-8210 will be charged simultaneously. |

Usable Life

| | |
|---------|---|
| 6 years | According to self-certification. ( Maintenance Manual "Periodic Replacement" P7-1) |
|---------|---|

Super Unit: HS-8000 series**Size**

| | |
|----------------|--|
| HS-8312N/8312M | 85 (W) x200 (D) x100 (H) mm (not including the protrusion) |
|----------------|--|

Weight

| | |
|----------------|-------------------------------------|
| HS-8312N/8312M | 1.2kg (not including the accessory) |
|----------------|-------------------------------------|

Environmental Conditions

| | |
|---------------------------------|--|
| Operating Temperature | 10 to 40°C |
| Operating Humidity | 30 to 85 % (non-condensing) |
| Transport / Storage Temperature | -10 to 60°C |
| Transport / Storage Humidity | 10 to 95% (40°C) (non-condensing) However, for the CF-820 IR Remote Control Unit, the following condition applies. 10 to 90% (38°C) (non-condensing) |
| Storage Atmospheric Pressure | 700 to 1060hPa |
| Vibration Proof | Comply with MIL-STD-810G:2008 METHOD514.6 VIBRATION (When using with DS-8200 system) |

Safety

| | |
|--|---|
| General Standard | IEC 60601-1:1988+A1:1991+A2:1995 (Medical Electrical Equipment- Part 1: General Requirements for Safety) |
| | IEC 60601-1-1:2000 (Medical Electrical Equipment- Part 1-1: General Requirements for Safety- Collateral standard: Safety Requirements for Medical Electrical Systems) |
| EMC Standard | IEC 60601-1-2: 2007 (Medical Electrical Equipment- Part 1-2: General Requirements for Safety – Electromagnetic Compatibility – Requirements and Tests) |
| Type of protection against electric shock | Class I Equipment (During AC power operation) Internally powered Equipment (During battery operation) |
| Degree of protection against electric shock | ECG /RESP (Impedance), SpO ₂ , SpCO*, SpMet*, SpHb*, TEMP, BP, CO: Type CF Applied Part NIBP:Type BF Applied Part *: For HS-8312M only |
| The degree of protection against ingress of water | Combination of LC-8210, HSB-80, HS-8000 and BS-8210: IPX1 Other situation: IPX0 |
| Protection against Ignition of Flammable Gas | Not provided |

Power Supply

| | |
|--------------|----------------------|
| Power Supply | Supplied from HSB-80 |
| Voltage | DC12V |

Usable Life

| | |
|---------|---|
| 6 years | According to self-certification. (参照 Maintenance Manual "Periodic Replacement" P7-1) |
|---------|---|

Recorder Unit: HR-800**Size**

| | |
|----------------------|--|
| HR-800 Recorder Unit | 87 (W) x109 (H) x100 (D) mm (not including the protrusion) |
|----------------------|--|

Weight

| | |
|--------|--------------------------------------|
| HR-800 | 0.54kg (not including the accessory) |
|--------|--------------------------------------|

Environmental Conditions

| | |
|---------------------------------|-----------------------------------|
| Operating Temperature | 10 to 40°C |
| Operating Humidity | 30 to 85 % (non-condensing) |
| Transport / Storage Temperature | -10 to 60°C |
| Transport / Storage Humidity | 10 to 95% (40°C) (non-condensing) |
| Storage Atmospheric Pressure | 700 to 1060hPa |

Safety

| | |
|--|--|
| General Standard | IEC 60601-1:1988+A1:1991+A2:1995 (Medical Electrical Equipment- Part 1: General Requirements for Safety) |
| | IEC 60601-1-1:2000 (Medical Electrical Equipment- Part 1-1: General Requirements for Safety- Collateral standard: Safety Requirements for Medical Electrical Systems) |
| EMC Standard | IEC 60601-1-2: 2007 (Medical Electrical Equipment- Part 1-2: General Requirements for Safety – Electromagnetic Compatibility – Requirements and Tests) |
| Type of protection against electric shock | Class I Equipment (During AC power operation) Internally Powered Equipment (During battery operation) |
| Protection against Ignition of Flammable Gas | Not provided |

Power Supply (During AC power operation)

| | |
|--------------|-----------------------|
| Power Supply | Supplied from BS-8210 |
| Voltage | DC18V |

Usable Life

| | |
|---------|----------------------------------|
| 6 years | According to self-certification. |
|---------|----------------------------------|

Gas Unit I/F: HPD-800/HPD-810 and CO₂ Gas Unit: HCP-800/HCP-810**Size**

36(W)x91(H)x87(D) mm (not including the protrusion)

Weight

| | |
|---------|--------------------------------------|
| HPD-800 | 0.3kg (not including the accessory) |
| HPD-810 | 0.18kg (not including the accessory) |
| HCP-800 | 0.4kg (not including the accessory) |
| HCP-810 | 0.22kg (not including the accessory) |

Environmental Conditions

| | |
|---------------------------------|-----------------------------------|
| Operating Temperature | 10 to 40°C |
| Operating Humidity | 30 to 85 % (non-condensing) |
| Transport / Storage Temperature | -10 to 60°C |
| Transport / Storage Humidity | 10 to 95% (40°C) (non-condensing) |
| Storage Atmospheric Pressure | 700 to 1060hPa |

Safety

| | |
|--|--|
| General Standard | IEC 60601-1:1988+A1:1991+A2:1995 (Medical Electrical Equipment- Part 1: General Requirements for Safety) |
| | IEC 60601-1-1:2000 (Medical Electrical Equipment- Part 1-1: General Requirements for Safety- Collateral standard: Safety Requirements for Medical Electrical Systems) |
| EMC Standard | IEC 60601-1-2: 2007 (Medical Electrical Equipment- Part 1-2: General Requirements for Safety – Electromagnetic Compatibility – Requirements and Tests) |
| Type of protection against electric shock | Class I Equipment (During AC power operation) Internally powered Equipment (During battery operation) |
| Degree of protection against electric shock | CO ₂ : Type BF Applied Part |
| Protection against Ignition of Flammable Gas | Not provided |

Power Supply

| | |
|--------------|---|
| Power Supply | Supplied from the HS-8000 series |
| Voltage | HCP-800/810: DC12V HPD-800/810: DC5V/12V |

Usable Life

| | |
|---------|---|
| 6 years | According to self-certification. ( Maintenance Manual "Periodic Replacement" P7-1) |
|---------|---|

Performance

This section states the performance of the DS-8200 System.

Display

| | |
|------------------|---|
| Device | 10.2 inch color LCD |
| Resolution | 1024x600 pixel, refresh frequency 60Hz |
| Function Control | Touch Screen Method |
| Waveform Trace | Stationary Trace |
| Sweep Speed | ECG / SpO ₂ / BP (6.25mm/s, 12.5mm/s, 25mm/s, 50mm/s) RESP/CO ₂ (6.25mm/s, 12.5mm/s, 25mm/s) |

Operation

| | |
|-------------|-----------------------|
| Touch Panel | Resistive Touchscreen |
| Fixed Keys | Standby Switch |

Sound Pressure

| | |
|------------------------------------|--------------------------------|
| Alarm (Standard Tone) | Maximum 82.0dB, Minimum 43.0dB |
| HR Synchronized Tone | Maximum 84.0dB, Minimum 30.0dB |
| SpO ₂ Synchronized Tone | Maximum 72.0dB, Minimum 41.0dB |

Clock Accuracy

±2 min. per year (25°C)

ECG

| | |
|--|---|
| Lead Type | Wired 3, 4, 5, 10-electrode |
| Frequency Characteristic | 150Hz/40Hz/15Hz(4, 5, 10-electrode) 100Hz/40Hz/15Hz(3-electrode) |
| Input Impedance | 2.5MΩ or above |
| Maximum Input Voltage | 10mVp-p |
| Polarization Voltage | ± 825mV or above |
| Common Mode Rejection Ratio | 90 dB or above |
| HR Measurement Range | Adult/Child: 0, 12 to 300bpm Neonate: 0, 30 to 300bpm |
| HR Measurement Accuracy | ±3bpm |
| HR Display Response Time | Adult/Child: 6 sec., Neonate: 3 sec. |
| Instant HR | Calculated each second based on the latest RR interval. |
| Waveform Size Selection | 1/4, 1/2, 1, 2, 4 |
| Accuracy of Input Signal Reproduction | Overall system error and frequency response is set using method A, B, C, and D. |
| Defibrillation Proof | Provided |
| Heart rate meter accuracy and response to irregular rhythm | 80bpm Ventricular Bigeminy : 80bpm  60bpm Ventricular Bigeminy : 60bpm  120bpm Ventricular Bigeminy : 120bpm  90bpm Bidirectional Systoles : 90bpm  |

Response time of heart rate meter to change in heart rate

HR change from 80bpm to 120bpm:
Range 6.1 to 6.5 sec., Average 6.3 sec.

HR change from 80bpm to 40bpm:
Range 5.8 to 6.5 sec., Average 6.2 sec.

Time to ALARM for tachycardia

Ventricular Tachycardia 1mVpp, 206bpm:
Range 8.2 to 9.1 sec., Average 8.5 sec.



Ventricular Tachycardia 2mVpp, 206bpm:
Range 7.5 to 8.8 sec., Average 8.0 sec.

Ventricular Tachycardia 0.5mVpp, 206bpm:
Range 10.8 to 13.0 sec., Average 11.9 sec.

Ventricular Tachycardia 2mVpp, 195bpm:
Range 7.4 to 9.1 sec., Average 8.6 sec.



Ventricular Tachycardia 4mVpp, 195bpm:
Range 8.1 to 9.1 sec., Average 8.8 sec.

Ventricular Tachycardia 1mVpp, 195bpm:
Range 9.3 to 11.0 sec., Average 10.3 sec.

Active Noise Suppression

RL DRIVE Max. 12.8mV

Tall T-wave Rejection Capability

1.2mV T-wave can be removed when tested according to IEC 60601-2-27.

Transient Characteristic

3.2 sec, 0.3 sec, 0.1 sec (time constant can be changed)

Rejection of Pacemaker Pulse

a) Pacemaker Pulse without Over/Ubershoot

Capable to reject pulses of pulse width 0.1 to 2ms, amplitude ± 2 to ± 700 mV

b) Pacemaker Pulse with Over/Ubershoot
Rejection is not possible.

c) Pacer Pulse Detector Rejection of Fast ECG Signals
Slew Rate 3.5V/S

Respiration

Method

Impedance Method

Frequency Characteristic

1.5Hz (adult, child) / 2.5Hz (neonate)

Current

100 μ A and below (at 66.65kHz $\pm 5\%$)

Measurement Range

0, 4 to 150Bpm

Measurement Accuracy

± 3 Bpm

TEMP

Measurement Method

Thermistor Method

Probe

400 series only

Measurement Range

0 to 45°C

Measurement Accuracy

25 to 45°C $\pm 0.2^\circ$ C
Outside above range $\pm 0.4^\circ$ C

No. of Channels

Maximum 6 channels

Temperature Delay Time
(From temperature probe to monitor display)

6sec. or less
(Not including the time constant of temperature probe.)

Pulse Oximeter

Measurement Update Rate

1 sec.

Nellcor Unit (HS-8312N)

| | |
|---------------------------|--|
| Measurement Method | 2 Wavelength Pulse Wave Method Wavelength: Approx. 660nm (red light) Approx. 890nm (infrared light) Output: 15mW or below |
| Measurement Range | 1 to 100% |
| Resolution | 1% |
| Measurement Accuracy | Adult: $\pm 3\%$ when 70 to 100% (DS-100A) Neonate: $\pm 2\%$ when 70 to 100% |
| PR Measurement Range | 20 to 250bpm |
| PR Resolution | 1bpm |
| PR Accuracy | $\pm 3\text{bpm}$ when 20 to 250bpm |
| Measurement Response Time | 6 to 7 sec. (averaging duration) |

NOTE

- The SpO₂ measurement accuracy is determined based on the values of the root-mean-square (rms) difference between SpO₂ readings of the pulse oximeter equipment and values of SaO₂ determined with a CO-oximeter, by healthy adult volunteers. The pulse oximeter equipment measurements are statistically distributed; $\pm 2\%$ measurement accuracy means that only about two-thirds of pulse oximeter equipment measurements can be expected to fall within $\pm 2\%$ of the value measured by a CO-oximeter.

| | |
|---------------------------|--|
| Masimo Unit (HS-8312M) | |
| Measurement Method | <p>2 Wavelength Pulse Wave Method Masimo LNOP/LNCS Sensor Wavelength: Approx. 660nm (red light) Approx. 905nm (infrared light) Output: 15mW or below</p> <p>Masimo Rainbow Sensor Wavelength: 7 or more different wavelengths are used within the range of 500nm to 1400nm Output: 25mW or below</p> |
| SpO ₂ | <p>Measurement Range 1 to 100%</p> <p>Resolution 1%</p> <p>Measurement Accuracy</p> <ul style="list-style-type: none"> Adult: ±2% when 70 to 100% (No motion) ±3% when 70 to 100% (Motion) ±2% when 70 to 100% (Low perfusion) <p>Neonate: ±3% when 70 to 100% (No motion / Motion / Low perfusion)</p> |
| PI (Perfusion Index) | |
| Measurement Range | 0.02 to 20% |
| PVI | |
| Measurement Range | 0 to 100% |
| SpCO | <p>Measurement Range 0 to 99%</p> <p>Resolution 1%</p> <p>Measurement Accuracy</p> <ul style="list-style-type: none"> Adult: ±3% when 1 to 40% |
| SpMet | <p>Measurement Range 0 to 99.9%</p> <p>Resolution 0.1%</p> <p>Measurement Accuracy</p> <ul style="list-style-type: none"> Adult/Neonate: ±1% when 1 to 15% |
| SpHb | <p>Measurement Range 0 to 25.0 g/dL</p> <p>Resolution 0.1g/dL</p> <p>Measurement Accuracy</p> <ul style="list-style-type: none"> Adult: ±1g/dL when 8 to 17 g/dL |
| Pulse Rate | |
| Measurement Range | 26 to 239bpm |
| Measurement Accuracy | ± 3bpm when 26 to 239bpm (No motion)± 5bpm when 26 to 239bpm (Motion / Low perfusion) |
| Measurement Response Time | <p>7 levels</p> <p>2 to 4 sec., 4 to 6 sec., 8 sec., 10 sec., 12 sec., 14 sec., 16 sec. (averaging duration)</p> |

NOTE

- The SpO₂ measurement accuracy is determined based on the values of the root-mean square (rms) difference between SpO₂ readings of the pulse oximeter equipment and values of SaO₂ determined with a CO-oximeter, by healthy adult volunteers. The pulse oximeter equipment measurements are statistically distributed; $\pm 2\%$ measurement accuracy means that only about two-thirds of pulse oximeter equipment measurements can be expected to fall within $\pm 2\%$ of the value measured by a CO-oximeter.
 - PVI, SpCO, SpMet, SpHb measurements are optional function.
 - SpO₂, SpCO and SpMet accuracy was determined by testing on healthy adult volunteers in the range of 60-100% SpO₂, 0-40% SpCO, and 0-15% SpMet against a laboratory CO-Oximeter. SpO₂ and SpMet accuracy was determined on 16 neonatal NICU patients ranging

in age from 7-135 days old and weighting between 0.5-4.25kg. Seventy-nine (79) data samples were collected over a range of 70-100% SaO₂ and 0.5-2.5% MetHb with a resultant accuracy of 2.9% SpO₂ and 0.9% SpMet.

- ♦ The Masimo sensors have been validated for no motion accuracy in human blood studies on healthy adult male and female volunteers with light to dark skin pigmentation in induced hypoxia studies in the range of 70-100% SpO₂ against a laboratory CO-Oximeter and ECG monitor. This variation equals plus or minus one standard deviation. Plus or minus one standard deviation encompasses 68% of the population.
- ♦ The Masimo sensors have been validated for motion accuracy in human blood studies on healthy adult male and female volunteers with light to dark skin pigmentation in induced hypoxia studies in the range of 70-100% SpO₂ against a laboratory CO-Oximeter and ECG monitor. This variation equals plus or minus one standard deviation which encompasses 68% of the population.
- ♦ The Masimo SET Technology has been validated for low perfusion accuracy in bench top testing against a Bioteck Index2 simulator and Masimo's simulator with signal strengths of greater than 0.02% and transmission of greater than 5% for saturations ranging from 70 to 100%. This variation equals plus or minus one standard deviation which encompasses 68% of the population.
- ♦ The Masimo sensors have been validated for pulse rate accuracy for the range of 25-240 bpm in benchtop testing against a Bioteck Index2 simulator. This variation equals plus or minus one standard deviation which encompasses 68% of the population.
- ♦ SpHb accuracy has been validated on healthy adult male and female volunteers and on surgical patients with light to dark skin pigmentation in the range of 8-17g/dL SpHb against a laboratory CO-oximeter. This variation equals plus or minus one standard deviation which encompasses 68% of the population. The SpHb accuracy has not been validated with motion or low perfusion.
- ♦ The following substances may interfere with pulse CO-Oximetry measurements:
 - Elevated levels of Methemoglobin (MetHb) may lead to inaccurate SpO₂ and SpCO measurements
 - Elevated levels of Carboxyhemoglobin (COHb) may lead to inaccurate SpO₂ measurements.
 - Very low arterial Oxygen Saturation (SpO₂) levels may cause inaccurate SpCO and SpMet measurements
 - Severe anemia may cause erroneous SpO₂ readings.
 - Dyes, or any substance containing dyes, that change usual blood pigmentation may cause erroneous readings.
 - Elevated levels of total bilirubin may lead to inaccurate SpO₂, SpMet, SpCO and SpHb readings.

For more details, see the "Specifications" of the following operation manuals.

- ♦ Covidien (Nellcor) OxiMax N-600x Pulse Oximeter
- ♦ Masimo Radical-7 Pulse CO-Oximeter

BP

| | |
|--------------------------|--|
| Transducer Sensitivity | 5µV / V / mmHg |
| Measurement Range | -50 to 300mmHg |
| Frequency Characteristic | DC 6Hz / 8Hz / 12Hz / 40Hz |
| Measurement Accuracy | Within ±2% or ±1mmHg of full scale, whichever is greater |
| Zero Balance Range | Within ±150mmHg |
| PR Measurement Range | Adult: 12 to 300bpm Neonate: 30 to 300bpm |
| PR Accuracy | Within ± 3% or 1bpm, whichever is greater |
| No. of Channels | Maximum 6 channels |

NIBP (Non-Invasive Blood Pressure) (AAMI SP10: 2002+A1: 2003+A2:2006+(R) 2008 Manual, electronic or automated sphygmomanometers)

| | |
|---|---|
| Measurement Method | Oscillometric Method |
| Measurement Range | Adult: 10 to 280mmHg/1.3 to 37.3kPa Child: 10 to 180mmHg/1.3 to 24.0kPa Neonate: 10 to 130mmHg/1.3 to 17.3kPa |
| Resolution | 1mmHg |
| Static Pressure Accuracy | ±3mmHg/0.4kPa |
| BP Measurement Error according to the Clinical Performance Test | |
| Mean Error | Within ±5mmHg |
| Standard Deviation of Error | 8mmHg or below |
| Error of Cuff Pressure Display | Within ±3mmHg |
| PR Measurement Range | 40 to 240bpm |
| PR Accuracy | ±2% or ±2bpm (whichever greater) |
| Deflation Speed | 5±1mmHg/sec. (Quick Measurement OFF) 10±2mmHg/sec. (Quick Measurement ON) |
| Safety Mechanism | Adult: 300mmHg or above Child: 210mmHg or above Neonate: 150mmHg or above |

NOTE

- Blood pressure measurements determined with this device are equivalent to those obtained by a trained observer using the cuff/stethoscope auscultation method, within the limits prescribed by the American National Standard, Electronic or automated sphygmomanometers.

CO₂ (Carbon Dioxide Concentration)

RESPIRONICS® Capnostat 5 (Gas Unit I/F and Mainstream Module)

| | |
|-----------------------------------|---|
| Measurement Method | Infra-Red Solid-State Method, Mainstream Method |
| Measurement Range | 0 to 150mmHg |
| Measurement Accuracy | 0 to 40mmHg: $\pm 2\text{mmHg}$ 41 to 70mmHg: $\pm 5\%$ 71 to 100mmHg: $\pm 8\%$ 101 to 150mmHg: $\pm 10\%$ |
| RR Measurement Range | 0 to 150Bpm |
| RR Measurement Accuracy | $\pm 1\text{Bpm}$ |
| Response Time | 60ms and below |
| Covidien® Unit | |
| Measurement Method | Infra-Red Solid-State Method, Microstream® Method |
| Measurement Range | 0 to 99mmHg |
| Measurement Accuracy | 0 to 38mmHg: $\pm 2\text{mmHg}$ 39 to 99mmHg: $\pm [5 + 0.08 \times (\text{displayed value}-39)]\%$: (RR: 80Bpm and below) : The larger of $\pm 4\text{mmHg}$ or $\pm 12\%$: (RR: over 80Bpm) |
| Variation of Measurement Accuracy | $\pm 2\text{mmHg}$ (Within 6 hours after power ON) |
| RR Measurement Range | 0 to 150Bpm |
| RR Measurement Accuracy | 0 to 70Bpm: $\pm 1\text{Bpm}$ 71 to 120Bpm: $\pm 2\text{Bpm}$ 121 to 150Bpm: $\pm 3\text{Bpm}$ |
| Flow Rate | 50mL/min +15, -7.5mL/min. |
| System Response Time | 4.2 sec. |
| Delay Time | 4.0 sec. |
| Rise Time | 0.2 sec. |

CO

| | |
|--------------------------------|------------------------------------|
| Measurement Method | Thermodilution Method |
| Measurement Range | 0.1 to 20L/min |
| Measurement Range and Accuracy | |
| Blood Temperature | 17 to 45°C $\pm 0.3^\circ\text{C}$ |
| Injectate Temperature | -1 to 35°C $\pm 0.5^\circ\text{C}$ |

Recording (Recorder Unit)

| | |
|---------------------|---|
| Recording Speed | 50mm/s, 25mm/s (Error: within $\pm 5\%$) |
| Resolution | Head Direction: 8 dots/mm Feed Direction: 40 lines/mm (at recording speed of 25mm/s) |
| Recording Waveforms | 3 waveforms |
| Recording Type | Waveform Recording, List Recording, Graphic Recording |
| Detection | Paper out, printhead temperature |
| Protective Circuit | Provided |

Analog Waveform Output

| | |
|-------------------------------|---|
| Output Voltage | ECG output 1V/mV (fixed), BP output 1V/100mmHg (fixed) |
| Output Voltage Accuracy | within $\pm 10\%$ (Both ECG and BP output) |
| Analog Output Frequency Range | ECG Output 0.5 to 20Hz BP Output DC to 40Hz |
| Delay Time | 35ms and below (ECG waveform) 35ms and below (BP waveform: when 40Hz is set for waveform filter) |
| Output Impedance | $100\Omega \pm 10\%$ |
| Load Impedance | $1k\Omega$ to ∞ |
| Pacemaker Pulse | none |

QRS Synchronization Output

| | |
|---------------------------|--|
| Output Waveform | Square Wave (Positive/negative logic can be selected.) |
| Output Voltage | +4.3V to +5.0V (High Level) +0.3V and below (Low Level) |
| Synchronized Signal Width | 100ms |
| Delay Time | 35ms and below (when the "Filter" setting is [Monitor] or [Diag.]) |
| Output Impedance | Open Collector Output (+5V 500 Ω pull-up resistor) |

NOTE

- The delay time of analog waveform output and QRS synchronization output depends on the filter setting and the input waveform type of the patient monitor. For detailed information of the delay time, refer to Fukuda Denshi service representative.
- The QRS synchronized signal is not intended to be used as synchronized signal for defibrillator. For details, refer to Fukuda Denshi service representative.

Measurement Unit for Each Parameter

The measurement units for this equipment are as follows.

| Details | Parameter | Display | Unit | Default |
|---|-------------------------------|---------------------|--|---------|
| Heart Rate / Pulse Rate | ECG | HR | bpm (beats per minute) | |
| | BP | PR_IBP | bpm | |
| | SpO ₂ | PR_SpO ₂ | bpm | |
| ST Level | ECG | ST | mm, mv | mm |
| VPC | ECG | VPC | beat/minute | |
| | | PACE | beat/minute | |
| Respiration Rate | Impedance | RR_IMP | Bpm (breaths per minute) | |
| | Ventilator | RR_VENT | Bpm | |
| | CO ₂ , Gas Module | RR_GAS | Bpm | |
| Apnea | Impedance | APNEA | s (second) | |
| | CO ₂ | APNEA | s (second) | |
| | Ventilator | APNEA | s (second) | |
| Blood Pressure | BP | BP | mmHg, kPa cmH ₂ O (CVP only) | mmHg |
| Non-Invasive Blood Pressure | Non-Invasive Blood Pressure | NIBP | mmHg, kPa | mmHg |
| Arterial Oxygen Saturation | SpO ₂ | SpO ₂ | % | |
| Perfusion Index | Perfusion Index | PI | % | |
| | Pleth Variability Index | PVI | % | |
| Carboxyhemoglobin Concentration | SpCO | SpCO | % | |
| Methemoglobin Concentration | SpMet | SpMet | % | |
| Total Hemoglobin Concentration | SpHb | SpHb | g/dL | |
| Temperature | TEMP | TEMP | °C, °F | °C |
| End Tidal CO ₂ Concentration | CO ₂ | EtCO ₂ | mmHg, kPa, % | mmHg |
| Inspiratory CO ₂ Concentration | CO ₂ | InspCO ₂ | mmHg, kPa, % | mmHg |
| Cardiac Output | CO | CO | L/minute | |
| Blood Temperature | Blood Temperature | Tb | °C | |
| Injectate Temperature | Injectate Temperature | Ti | °C | |
| Airway Flow | Airway Flow | AWF | L/minute | |
| Airway Pressure | Airway Pressure | AWP | cmH ₂ O | |
| Ventilatory Volume | Ventilatory Volume | AVV | mL | |
| Tidal Volume | Expiratory Tidal Volume | E-TV | mL | |
| | Inspiratory Tidal Volume | I-TV | mL | |
| | Ventilatory Volume per second | TV/1Sec | % | |
| Minute Ventilation Volume | Minute Ventilation Volume | MV | L/minute | |
| | Spontaneous Minute Volume | SMV | L/minute | |

| Details | Parameter | Display | Unit | Default |
|------------------------------|------------------------------|------------------|--------------------------|---------|
| Compliance | Compliance | COMP | mL/cmH ₂ O | |
| Airway Resistance | Expiratory Resistance | E-RES | cmH ₂ O/L/sec | |
| | Inspiratory Resistance | I-RES | cmH ₂ O/L/sec | |
| Airway Pressure | Mean Airway Pressure | MEAN | cmH ₂ O | |
| | Peak Airway Pressure | PEAK | cmH ₂ O | |
| | Pause Airway Pressure | PAUSE | cmH ₂ O | |
| | Plateau Pressure | PLATEAU | cmH ₂ O | |
| Peak End Expiratory Pressure | Peak End Expiratory Pressure | PEEP | cmH ₂ O | |
| Inspired Oxygen | Inspired Oxygen | FIO ₂ | % | |

| Details | Parameter | Display | Unit | Default |
|--|--|-------------------|---|---------|
| Vigilance Data Vigilance Vigilance CEDV Vigilance II Vigileo | Mixed Venous Oxygen Saturation | SvO ₂ | % | |
| | Central Venous Oxygen Saturation | ScvO ₂ | % | |
| | Arterial Oxygen Saturation | SaO ₂ | % | |
| | Oxygen Uptake Index | O ₂ EI | % | |
| | Oxygen Transport | DO ₂ | mL/minute | |
| | Oxygen Consumption | VO ₂ | mL/minute | |
| | Stroke Volume | SV | mL/beat | |
| | Stroke Volume (STAT Mode) | SV_STAT | mL | |
| | Stroke Volume Index | SVI | mL/m ² | |
| | Stroke Volume Index (STAT Mode) | SVI_STAT | mL/m ² | |
| | HR | HR | bpm (beats per minute) | |
| | Mean Arterial Pressure | MAP | mmHg | |
| | Central Venous Pressure | CVP | mmHg | |
| | Continuous Cardiac Output | CCO | L/minute | |
| | Continuous Cardiac Output (STAT Mode) | CCO_STAT | L/minute | |
| | Continuous Cardiac Index | CCI | L/minute/m ² | |
| | Continuous Cardiac Index (STAT Mode) | CCI_STAT | L/minute/m ² | |
| | Systemic Vascular Resistance | SVR | dyn-sec-cm ⁻⁵ | |
| | Systemic Vascular Resistance Index | SVRI | (dyn-sec-cm ⁻⁵ -m ²) | |
| | Blood Temperature | BT | °C | |
| | Ejection Fraction | RVEF | % | |
| | Ejection Fraction (STAT Mode) | RVEF_STAT | % | |
| | End-Diastolic Volume | EDV | mL | |
| | End-Diastolic Volume (STAT Mode) | EDV_STAT | mL | |
| | End-Diastolic Volume Index | EDVI | mL/m ² | |
| | End-Diastolic Volume Index (STAT Mode) | EDVI_STAT | mL/m ² | |
| | End-Systolic Volume | ESV | mL | |
| | End-Systolic Volume Index | ESVI | mL/m ² | |
| | Stroke Volume Variance | SVV | % | |

| Details | Parameter | Display | Unit | Default |
|--------------------------|---|---------------------|-----------|---------|
| BIS Data | Bispectral Index | BIS | (no unit) | |
| | Signal Quality Index | SQI | % | |
| | Electromyograph | EMG | dB | |
| | Suppression Ratio | SR | % | |
| | Spectral Edge Frequency | SEF | Hz | |
| | Total Power | TOTPOW | dB | |
| | Impedance | IMP | Kohms | |
| INVOS 5100C Monitor Data | Regional Cerebral Oxygen Saturation (Left) | Lt-rSO ₂ | % | |
| | Regional Cerebral Oxygen Saturation (Right) | Rt-rSO ₂ | % | |

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