CE 2797

DYNASCOPE 8000 Series
Patient Monitor

DS-8200 system

Ver. 04

Operation Manual

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

FUKUDA

This manual is for the DS-8200 System Version 04.

CE 2797

This device bears the CE label in accordance with the provisions of Medical Device Directive 93/42/EEC.

This device bears the CE label in accordance with the provisions of RoHS Directive 2011/65/EU.

EC REP Emergo Europe
Prinsessegracht 20, 2514 AP The Hague, The Netherlands

Fukuda Denshi Co., Ltd.
3-39-4 Hongo, Bunkyo-ku, Tokyo, Japan

⚠ CAUTION (For USA)	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.

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

Contents

Preface

Safety

Chapter 1 General Description

Chapter 2 Name of Parts and Their Functions

Chapter 3 Operation Procedure and Screen Examples

Chapter 4 Preparation

Chapter 5 Admit/Discharge

Chapter 6 Alarm Function

Chapter 7 Monitoring

Chapter 8 Review Function

Chapter 9 Printing

Chapter 10 System Configuration

Chapter 11 Troubleshooting

Chapter 12 Setup Item/Default Value

Chapter 13 Accessories

Chapter 14 Specification

Preface

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 (SpO_2), carboxyhemoglobin saturation (SpCO), methemoglobin saturation (SpMet), and total hemoglobin concentration (SpHb), plethysmograph, temperature, invasive blood pressure (IBP), cardiac output, carbon dioxide concentration (CO_2), nitrous oxide concentration (N_2O), oxygen concentration (O_2), 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

(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) Fukuda Denshi USA, Inc.

17725-C NE 65th Street Redmond, WA 98052 USA
Toll Free: +1-800-365-6668
Local: +1-425-881-7737
Fax: +1-425-869-2018
Home Page: http://www.fukuda.com/index_usa.html

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, Magnetic card reader usage
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

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	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
⚠ WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

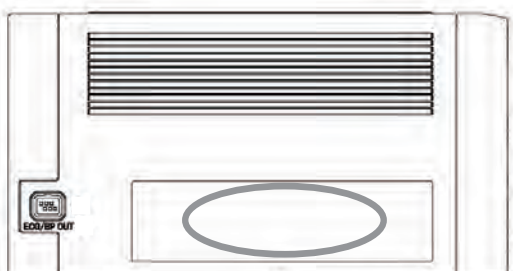
Warning Labels Attached to the Unit

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

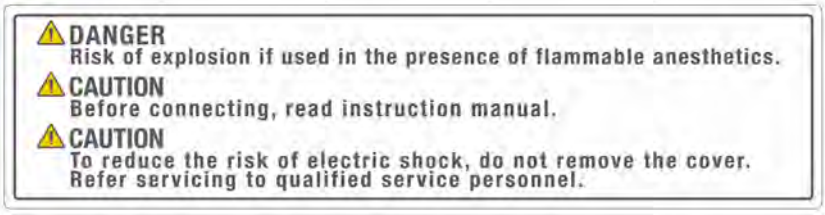
⚠ CAUTION

- 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)



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)
	Date of Manufacture Indicates the date of manufacture.
	Name and Address of Manufacturer Indicates the name and address of manufacturer.
	WEEE (Waste Electrical and Electronics Equipment) Indicates a separate collection for electrical and electronic equipment.

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 gases 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 "Coordinator"). However, when using such telemetry in a local medical institution, one person can perform both functions.
- Select a telemetry coordinator who understands the characteristics and functionality of telemetry systems, and is skilled in operating telemetry.
- When installing telemetry, the Coordinators have to understand the precautions for use of the telemetry in advance.
- The Coordinator takes responsibility of wireless channel management and transmitter storage for the whole Institution by giving proper instruction.
- The Coordinator 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 user.
- The Coordinator assumes responsibility for managing the wireless channels, storing, and managing telemetry.
- The Coordinator 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 Coordinator 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 Coordinators of the problems. The Coordinators 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 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 electrosurgical 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

  The amount of noise interference is considerably different depending on the electrode position and surgery site. 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. If the electrodes are placed in this path, the amount of interference will be quite large. 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 or performance degradation, failure, damage of this equipment.
  For details, refer to the operation manual for the MRI testing device.

Precautions about Connections to Peripheral Devices

To use the equipment safely and to ensure maximum performance of the equipment, connection of other manufacturer's equipment to this equipment 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, it may be necessary to take measures for connection (use of separation device), power supply (use of isolation power), grounding (additional protective earth). If these measures are not properly taken, a leakage current may flow between the equipments, or the total amount of leakage current may exceed the limit specified on IEC 60601-1-1.
- 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, with some exceptions, isolated from the power supply, the connecting peripheral devices should comply with IEC 60601-1. It is the user's responsibility to verify that the overall system complies with IEC 60601-1-1.
- 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 or IEC 60601-1. Never use a multiple portable socket-outlet or extension cable when connecting the equipments unless it 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 proper selection is made.
- The pacemaker usage setting 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]/[20ms], the pace pulse may be erroneously detected as a QRS complex and HR alarm or asystole alarm may not generate due to incorrect HR (counting pace pulse as QRS complex). Select [OFF], [10ms]/[20ms] only if you are sure that pacing failure will not occur, or when the patient can be constantly monitored.
- When measuring the SpO_2 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 due to the sensor heat which may result in burn injury.
- For the following case, accurate measurement of SpO_2 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
- When a patient is receiving a photodynamic therapy, measuring SpO_2 on a same site for a long duration may cause blisters from the irradiation light of the SpO_2 sensor. Make sure to periodically change the sensor

attachment site.

- 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.
- 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 individual 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 printing, alarm printing and recall waveform for evaluation.
- The RR/APNEA alarm will not be generated unless the numeric data box corresponded to the selected RR/APNEA alarm source is displayed.Make sure to display the numeric data box for the RR/APNEA alarm source.
- The SpO_2 respiration measurement function is not intended for use as an APNEA monitor.
- 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.
- If the safety of the patient cannot be ensured, do not suspend the alarm or decrease the alarm volume.

⚠ WARNING Warnings about the SpO_2 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.
- SpO_2 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 SpO_2 measurement.
  - For increased COHb: COHb levels above normal tend to increase the level of SpO_2. 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 SpO_2. When elevated levels of COHb are suspected, laboratory analysis (CO-Oximetry) of a blood sample should be performed.

  - For increased MetHb: the SpO_2 may be decreased by levels of MetHb of up to approximately 10% to 15%. At higher levels of MetHb, the SpO_2 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 SpO_2, SpMet, SpCO, SpHb measurements.

- Motion artifact may lead to inaccurate SpMet, SpCO, SpHb measurements.
- Severe anemia may cause erroneous SpO_2 readings.
- Very low arterial Oxygen Saturation (SpO_2) 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 to 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 Warnings about the CO_2 Monitoring (HCP-810, HPD-810)

- Only one of either HCP-810/HPD-810 can be connected.
- 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.
- To prevent cross-infection, do not allow the sampling gas to return to the breathing system.
- To protect the hospital staffs from unnecessary anesthetic agent when using the HCP-810, it is strongly recommended to connect the exhaust hole to the gas exhaust system in the hospital.
- 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. It could lead to erroneous readings.

- If too much moisture enters the sampling line (i.e., from ambient humidity or breathing of unusually humid air) when using the HCP-810, <Check Sample Line> will be displayed in the message area. Replace the sampling line once this message is displayed.
- Carefully route the sampling line to reduce the possibility of patient entanglement or strangulation.
- Do not lift the HCP-810 by the sampling line, as the sampling line could disconnect from the equipment, causing the equipment to fall on the patient.
- CO_2 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 function 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 cause electric shock to the patient and/or operator due to excessive leakage current.
- 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 threshold level for arrhythmia detection changes with ECG waveform size. Set a proper waveform size for monitoring.
  - When the ECG waveform size is x1/4, x1/2, or x1, the arrhythmia detection level is 250 μV.
  - When the ECG waveform size is x2 or x4, the arrhythmia detection level is 150 μV.
- 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. If the QRS amplitude for the set lead is low, it may cause erroneous arrhythmia detection.
- In ESIS Mode, artifacts such as electrosurgical noise or EMG can be largely reduced, but QRS amplitude attenuation, waveform distortion, or ST segment change may occur compared with other filter modes.
- The ESIS mode cannot completely reduce the electrical noise, and may erroneously detect the pacemaker spike. This mode should be selected only when a high frequency noise largely affects the HR measurement.
- There are some cases when the pacemaker pulse cannot 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 judgments 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 SpO_2 Monitoring

- Use only the sensor/relay cable specified by Fukuda Denshi. Otherwise, it may cause measurement error.If the sensor is damaged, stop using it.
- 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 apply the sensor too tight. At the same time, check the blood flow constantly so that congestion is not generated at the peripheral site.
- Do not use tape to attach the sensor.
- Even attachment for a short duration may inhibit the blood flow and generate compression necrosis or burn injury. Also, blood flow inhibition may prevent correct measurements.
- 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, premature infant is immature, change the sensor attachment site more frequently depending on the condition.
- Direct sunlight to the sensor area can cause a measurement error.Place a black or dark cloth over the sensor if using in direct sunlight.
- When not measuring, unplug the relay cable and sensor from the SpO_2 connector. Otherwise, the outside light may affect to falsely display measurements.
- The pulse wave is normalized for SpO_2 measurement, and does not indicate perfused blood volume. Check

proper probe attachment by observing the pulse wave.

- Precautions for Reusable Sensors
  The light-emitting part of the sensor should be over the root of the fingernail or as instructed per the related sensor instruction manual. Do not insert the finger too far into the sensor as it may hurt the patient. For details, refer to the SpO_2 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 details, refer to the SpO_2 sensor instruction manual.
- If "---" is displayed for the SpO_2 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 SpO_2 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 SpO_2 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.

⚠ CAUTION 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.

⚠ CAUTION Precautions about the CO_2 Monitoring (HCP-810)

- Conduct CO_2 calibration for the following case.
  If the CO_2 gas calibration is not performed at a specified interval, CO_2 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 $EtCO_2$ 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 $EtCO_2$ was not measured for a while.

- Perform the calibration 5 minutes after turning ON the power on the 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® $EtCO_2$ 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 or lead to cross-infection.
- 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® $EtCO_2$ sampling tube.
- Only use Microstream® $EtCO_2$ sampling lines to ensure the monitor functions properly.

⚠ CAUTION Precautions about the CO_2 Monitoring (HPD-810)

- The airway adapter should be attached with the thicker side facing to the patient. If attached oppositely, it may damage the CO_2 sensor or airway adapter.
- Dispose of calibration gas according to the regulation of each medical institution.

⚠ 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/HPD-810 Gas Unit I/F and HCP-800/HCP-810 CO_2 Gas Unit, the upper $EtCO_2$ 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 SpO_2 second alarm function and its threshold selection should be based on the patient's clinical indication/portent and medical evaluation.
- If the SpO_2 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 [SpO_2], and if SpO_2 waveform/numeric data is set to [Disp. OFF], the PR value will not be displayed.
- If the RR source is set to [CO_2/GAS], and if CO_2 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.
- To clean the touch panel, use an optional cleaning cloth, eyeglass cleaning cloth, soft cotton cloth, or non-woven cloth (pulp, rayon, polyethylene, etc.).
- Clean the equipment frequently so stains can be removed easily.
- To prevent injury, it is recommended to wear gloves when cleaning the equipment.
- Pay attention not to allow chemical solution to enter the equipment or connectors.
- Do not use organic solvents, thinner, toluene or benzene to avoid damaging the resin case.
- Do not polish the equipment with abrasive or chemical cleaner.
- When disinfecting the entire room using a spray solution, pay close attention not to get any solution into the equipment or connectors.
- Use only neutral detergent to clean the equipment. The surface resin coating may damage, resulting in discoloration, scratches, and malfunction.
  Example:
  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.
- Do not allow alcohol or other liquids to enter 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 default setting of bed ID is "000". If connected to a wired network with the bed ID unchanged, monitoring on the central monitor will not be possible.

- When connecting to a wired network, make sure that there are no other bedside monitors with the same ID. If there is more than one bedside monitor with the same bed ID, the duplicated bedside monitors cannot be monitored on the central monitor.
- When connected to the DS-LAN II network, set the bed ID in the range from "001" to "048" .
- When connected to the DS-LAN III 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 setting 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. The alarm limit setup from the central monitor cannot be performed either.
  - On the DS-LAN II network, the following arrhythmia alarms will not be transmitted.
    TACHY, BRADY, COUPLET, PAUSE, TRIGEMINY, TRIPLET, EXT TACHY, EXT BRADY, R on T, MULTIFORM, VENT RHYTHM, SVT, IRREGULAR RR, PROLONGED RR, S FREQUENT, S COUPLET, VPC, SVPC, PACER NOT CAPTURE, PACE NOT PACING
  - On the DS-LAN II network, arrhythmia alarm of "SLOW VT" will be transmitted as "VT".
  - On a wired network, numeric data and alarm of TEMP3 to 6 will not be transmitted. Also, the displayable waveform, numeric data, alarm differs depending on the connected central monitor. 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" 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.
  - If the "RR/APNEA Alarm Source" setting is other than [CO_2] (Or, if [Auto] selects a setting other than [CO_2]), the CO_2 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 CO_2 concentration is mmHg and [99 mmHg] is selected for "Upper Limit of CO_2 (mmHg) Transmission" under [Initial Settings>System>DS-LAN], the CO_2 value of 100 mmHg or above will be transmitted as 99 mmHg.
- 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 to the DS-LAN network.
- When connected to a wired network, the time/date will synchronize 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.
- The ST display will be distorted on the central monitor 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 monitored RR and APNEA will be the same for the central monitor and the DS-8200 System.

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 CO_2 concentration is mmHg and [99mmHg] is selected for "CO_2 (mmHg) Upper Limit of Transmission" ([Initial Settings]>[System]>[Telemeter]), the CO_2 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 your nearest 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, the data is backed up using the secondary battery.The data may not be protected if the power is turned OFF within 30 minutes from power ON, as the secondary battery may not be sufficiently charged.
  The data will be protected during the standby state (approx. one hour) with AC power or battery operation.

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 Tone/Volume 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 guaranteed 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.
- When FLOW-i is connected, P-V loop, F-V loop display function is not available.

Precautions about the SpO_2 Sensor

⚠ DANGER Danger of Burn Injury Caused by the SpO_2 Sensor

- When monitoring SpO_2, 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 SpO_2 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.
- Verify that there is no wire break on the patient cable once a week.

Battery Pack

- Even if the battery pack is not in use, the remaining capacity decreases due to self-discharge.Make sure to verify once a week 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 equipment under electromagnetic environment complies with IEC 60601-1-2: 2007.

⚠ CAUTION

Do not use any unauthorized equipment or cables as they may not comply with the EMC standard.

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.

Also, if this equipment is installed close to, or stacked with other equipment, malfunction may occur. Make sure to verify that the equipment operates properly in a used location.

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/HLX-801(G), HTC-702 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	The DS-8200 System is suitable for use in hosing environment and establishments directly connected to the public low-voltage power supply network which is supplied to buildings in housing environment.
Harmonic Emissions IEC 61000-3-2	Class A	
Voltage Fluctuations/ Flicker Emissions IEC 61000-3-3	Complies	

When measuring the vital parameters with connection to peripheral equipments (including HLX-801/HLX-801(G), HTC-702 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	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.
Harmonic Emissions IEC 61000-3-2	Class A	
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
			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
Conducted RF IEC 61000-4-6	3Vrms 150kHz to 80MHz	3Vrms	$d = 1.2\sqrt{P}$
Radiated RF IEC 61000-4-3	3V/m 80MHz to 2.5GHz	3V/m	$d = 1.2\sqrt{P}$ 80MHz to 800MHz $d = 2.3\sqrt{P}$ 800MHz to 2.5GHz 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: 

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.

*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.

*2: Over the frequency range 150kHz to 80MHz, field strength should be less than 3V/m.

❑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. 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.			

Chapter 1 General Description

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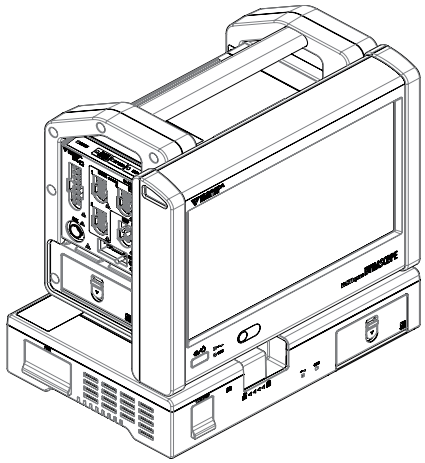
Composition of the System

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

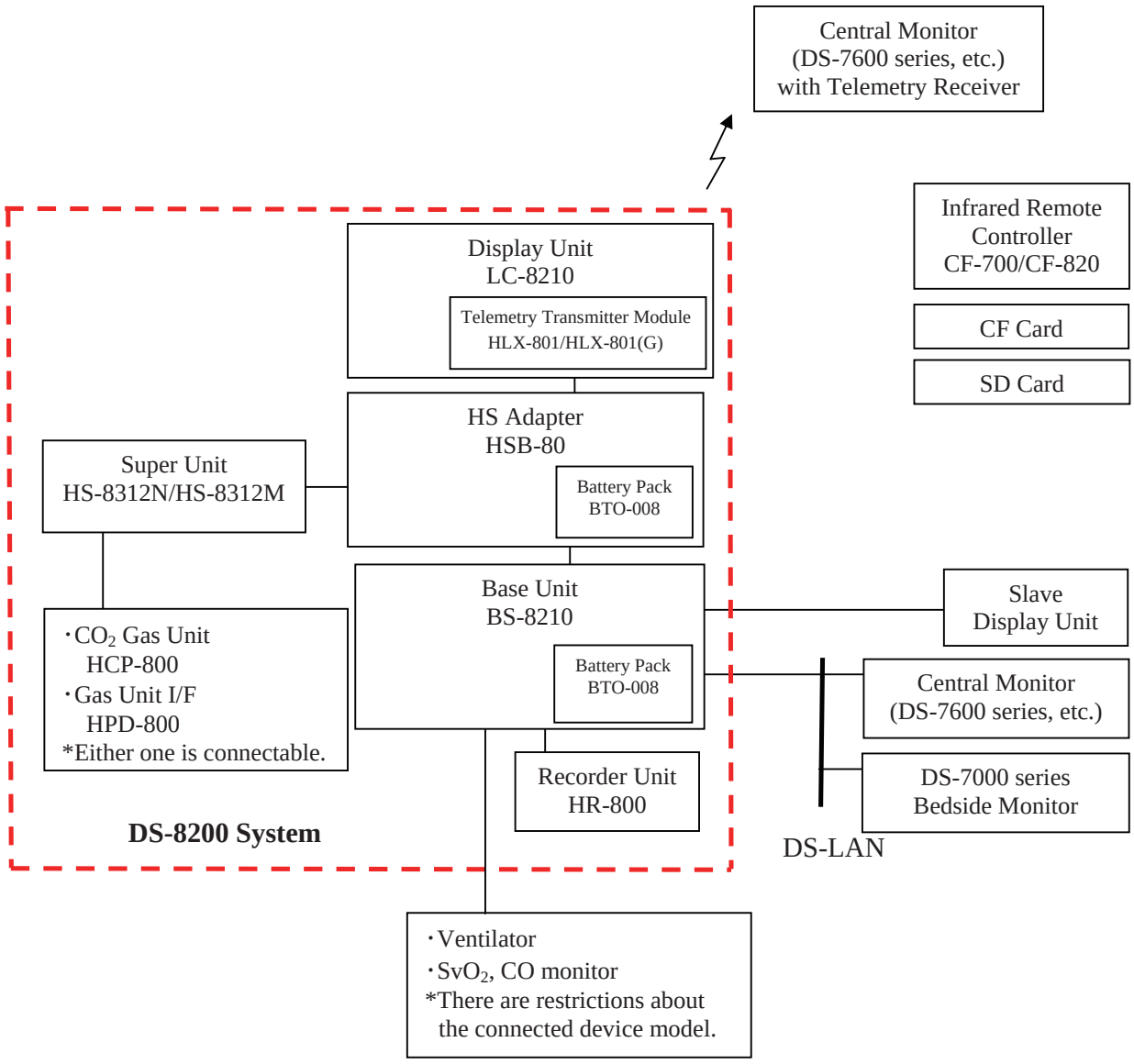
Model Type	Fixed Parameters	SpO_2 Unit	Multiparameter	CO_2 Concentration Measurement (Optional)
HS-8312N	ECG (Max.12-Leads), RESPx1, NIBPx1 SpO_2x1	Nellcor	3 port Temperature x6 (maximum) BP x6 (maximum) CO x1 (maximum)	Yes
HS-8312M	ECG (Max.12-Leads), RESPx1, NIBPx1 SpO_2x1, SpCO x1* SpMet x1*, SpHb 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, SpO_2 (pulse wave), BP, NIBP, temperature and CO, the measurement of CO_2 concentration is also available as optional function.

- For the SpO_2 measurement, two model types with different built-in SpO_2 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 SpO_2 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
  - VELIA, ASTRAL, VS ULTRA
- 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/HLX-801(G) Telemetry Transmitter Module.
- The following operation is possible by using the optional Bidirectional Wireless Communication Module (HTC-702).
  - Transmits the measurement data of the DS-8200 system to the central monitor.
  - Allows to mutually set the alarm limit from both the bedside monitor and the central monitor.
  - Allows to operate NIBP measurement from the central monitor
- 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 CO_2 Gas Unit (HCP-800/HCP-810) to the AUX connector on the HS-8000 series Super Unit, CO_2 concentration can be measured.
- By connecting the oximeter to the STATUS II port or COM1 port on the Base Unit, SvO_2 (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 APENEA 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, Sight 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, ARTCatheter Check Message), 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_2O Compensation, Atmos. Pressure, O_2 Compensation, Anesthetic Compensation) , Alarm Assist, Display ON/OFF, $EtCO_2$, $InspCO_2$
Ext. Device		Vigilance/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, 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., Barcode, Magnetic Card, BIS, INVOS)
	Magnetic Card	Data digits for each patient information, Auto Reference to Central Monitor when Reading Patient ID
	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/Module 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

Chapter 2 Name of Parts and Their Functions

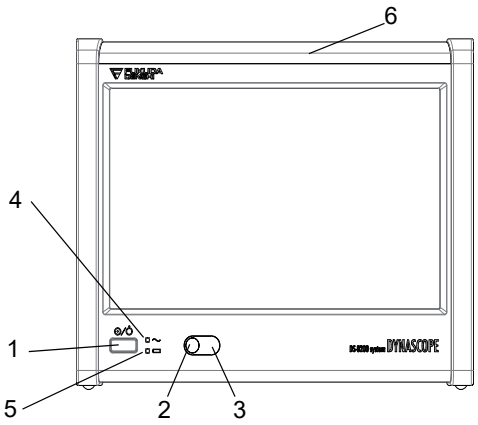
Name of Parts and Their Functions

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.

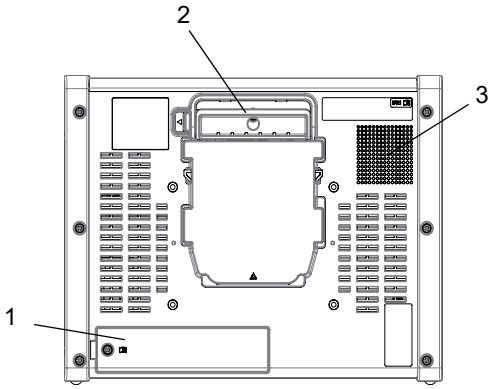
- Orange: Charging is in process
- Green: Charging is complete
- Light Off: During battery operation, or when battery is not installed, or when battery charging is ceased (due to temperature, etc.)
- Flash: Battery charging error

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

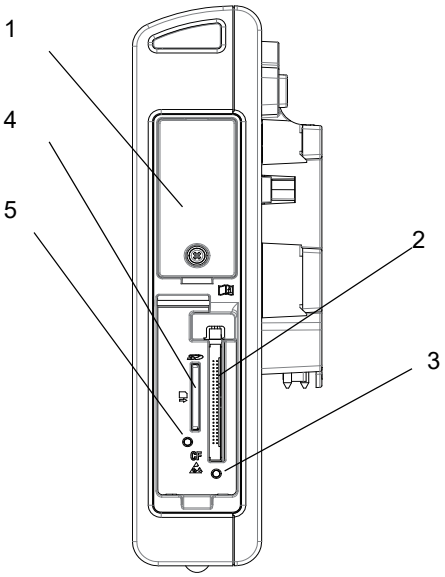


1 Maintenance Cover
Used for replacing the short-term backup battery.

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/HLX-801(G)).

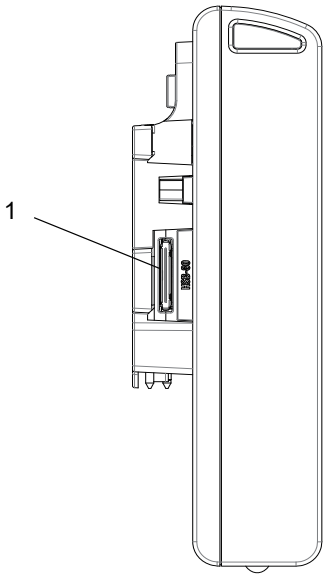
2 CF Card Slot Connector (inside the cover)
Inserts the specified CF memory card.

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.

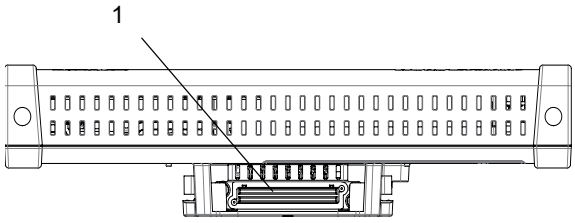
⚠ CAUTION

- 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

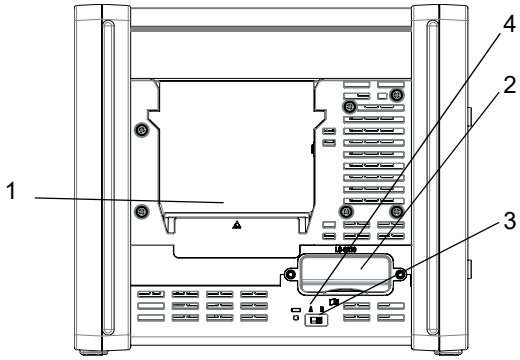
Connects the Display Unit (LC-8210) with the display unit extension cable.

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



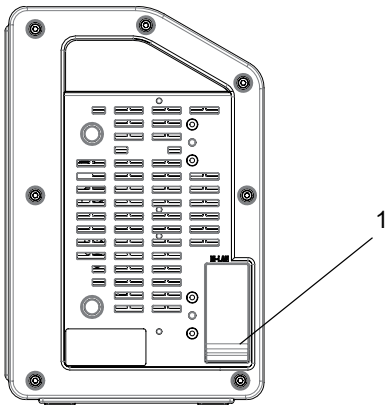
⚠ CAUTION

- 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

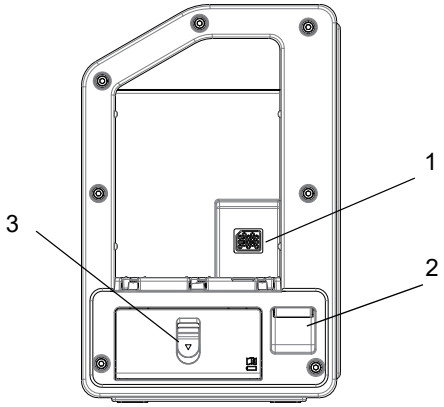
Connects the Super Unit (HS-8000).

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

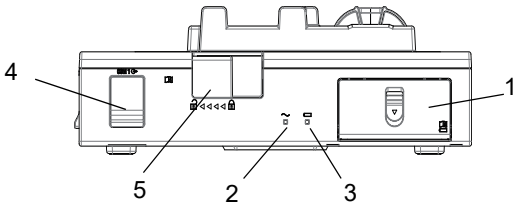
❑Front Side

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

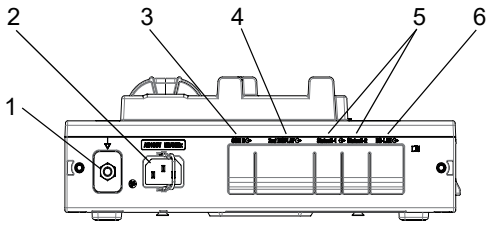
NOTE

- 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.

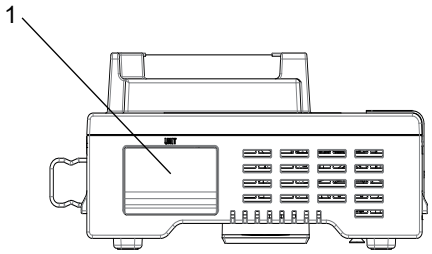
3 Serial Connector (COM2)
Connects the specified equipment.

4 External monitor connector
Connects the external monitor.

5 Status Input/Output Connector (Status II-1/II-2)
Connects the specified equipment.

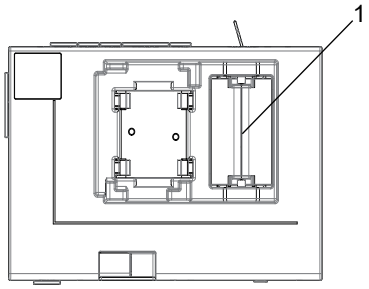
6 DS-LAN Connector
Connects to the wired network using the Branch Cable (CJ-520/CJ-522).

❑Left Side



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

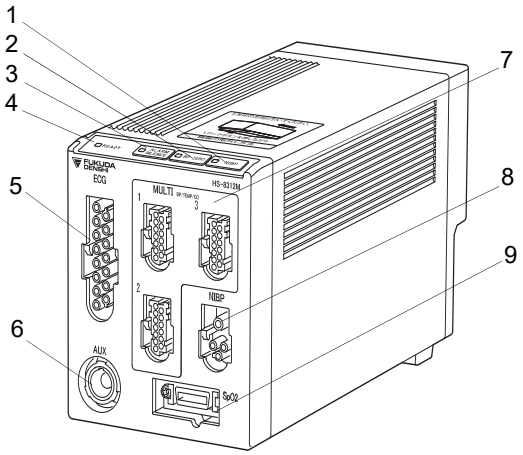
❑Top View



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/HPD-810) or the CO_2 Gas Unit (HCP-800/HCP-810).

7 Multiparameter Connector

Connects the input cables for BP, TEMP or CO.

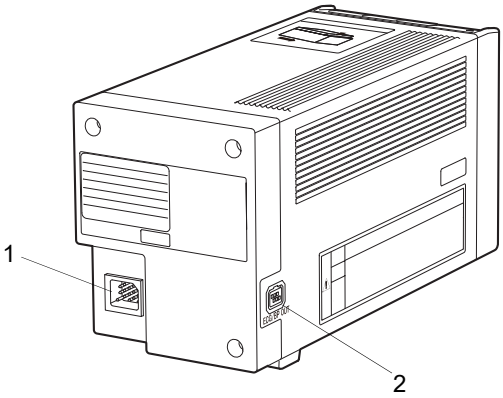
8 NIBP Connector

Connects the NIBP air hose.

9 SpO_2 Connector

Connects the SpO_2 sensor, or relay cable (patient cable).

❑Rear Side



1 HS Adapter Connector

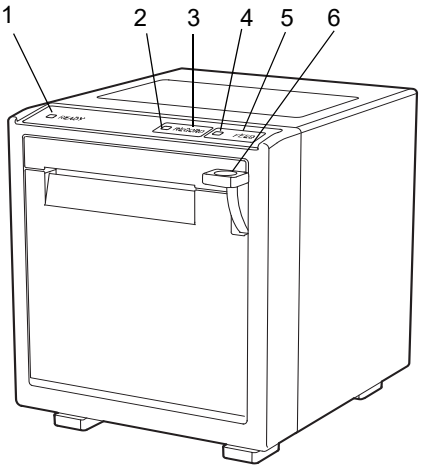
Connects the HS Adapter (HSB-80).

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.

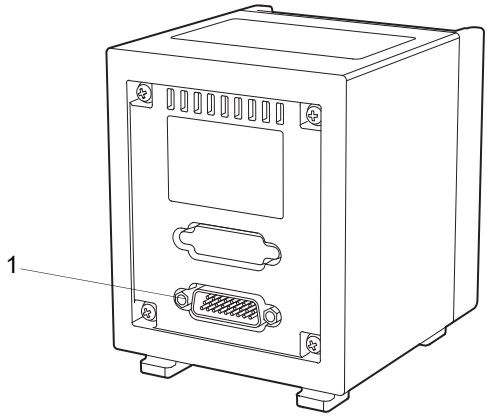
3 Record Key
Starts/stops the printing.

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.

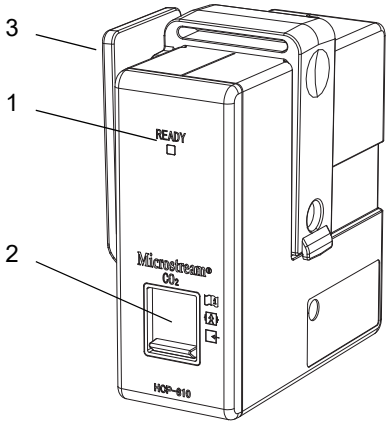
❑Rear Side



1 U-LINK Connector
Connects to the Base Unit (BS-8210).

CO_2 Gas Unit: HCP-810

❑Front Side

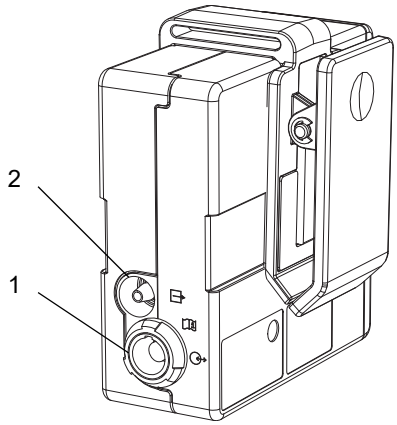


1 Power Supply LED
Indicates the power ON/OFF status. It will light in green while the power is ON.

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 HS-8000 with AUX connection cable.

2 Exhaust Hole

Connects the gas exhaust system and exhausts sampling gas.

NOTE

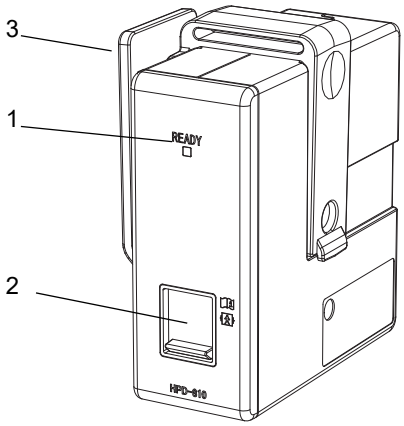
- The usable AUX connection cable differs depending on the connecting equipment. For the combination of the AUX connection cable and the connecting equipment, refer to the section on "Optional Accessories".

⚠ CAUTION

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

Gas Unit I/F: HPD-810

❑Front Side



1 Power Supply LED

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

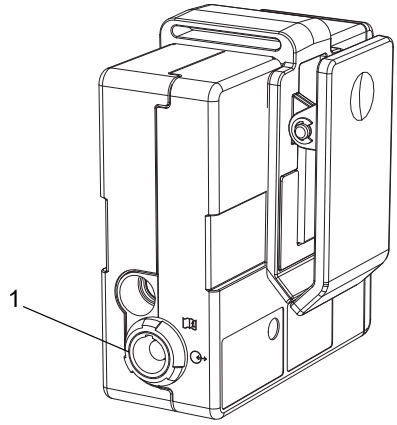
2 CO_2 Connector

Connects to the Capnostat 5 (Philips).

3 Clip

Attaches to the bedside rail or headboard for bedside use.

❑Rear Side



1 AUX Connector

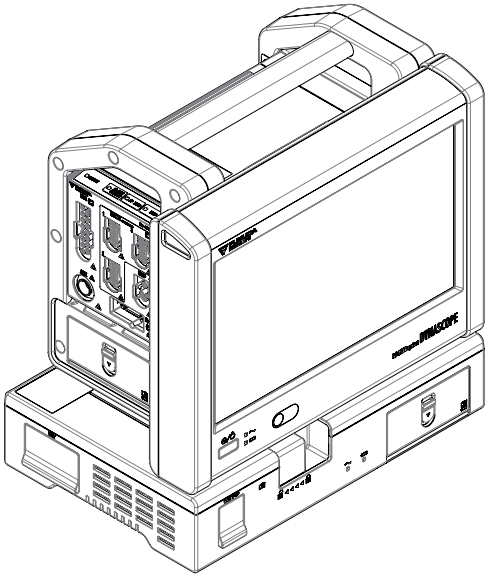
Connects to the AUX connector of HS-8000 with AUX connection cable.

NOTE

- The usable AUX connection cable differs depending on the connecting equipment. For the combination of the AUX connection cable and the connecting equipment, refer to the section on "Optional Accessories".

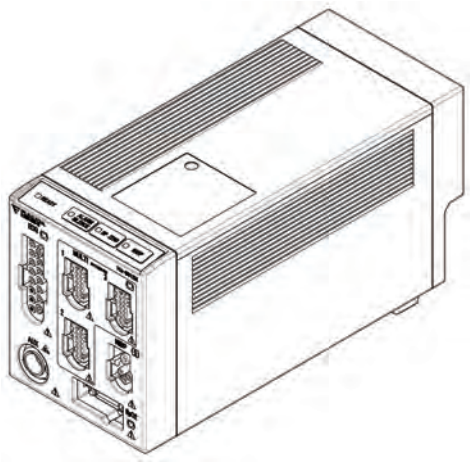
External Appearance

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



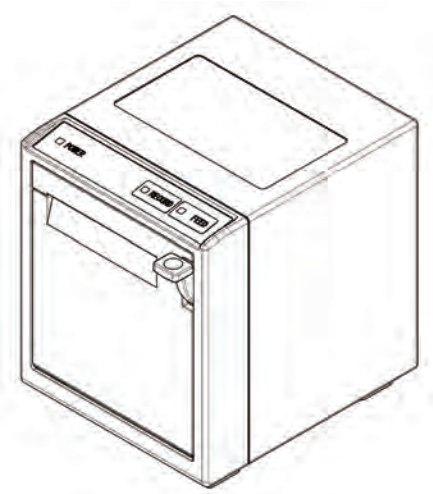
270(W) x 201(D) x 302(H) mm (not including the protrusion) Weight: 7.0kg

❑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

Chapter 3 Operation Procedure and Screen Examples

Operation Procedure

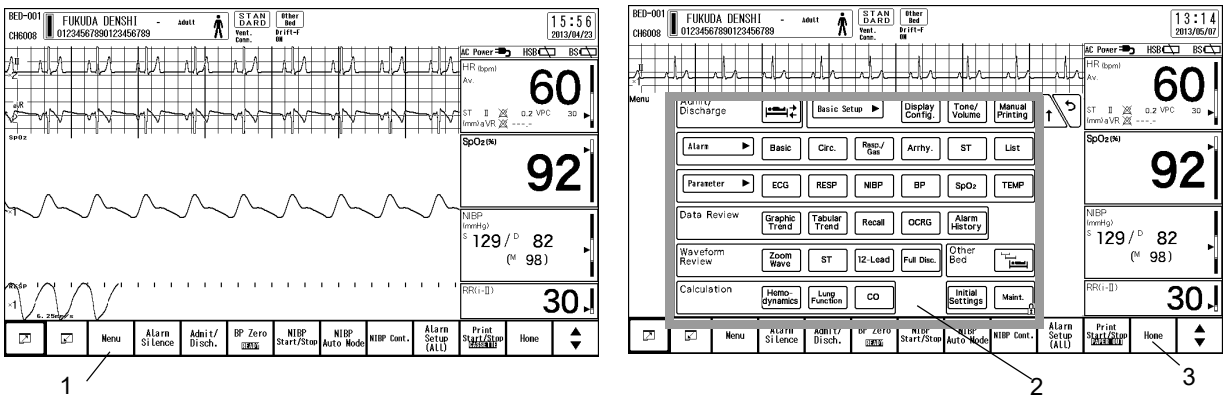
The operations of this equipment are performed using fixed keys. Remote control is also possible using the remote control unit.

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



1 Pressing the [Menu] key will switch the display with a pip sound.

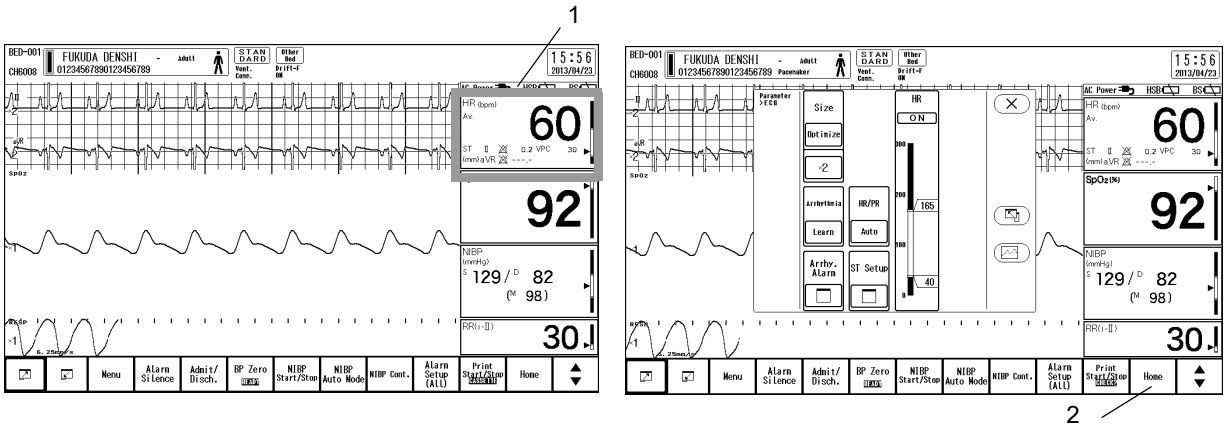
2 The touch key will respond by pressing any part of the key.

3 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" P10-5)

❑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)

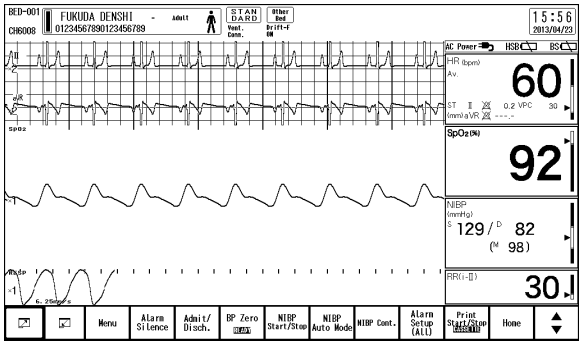
Home Display

About the Home Display

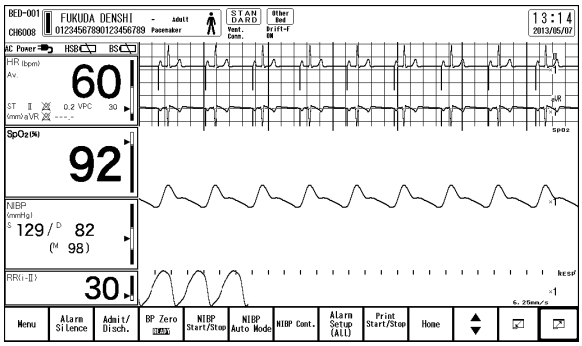
The display can be configured according to the monitoring purpose.

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".

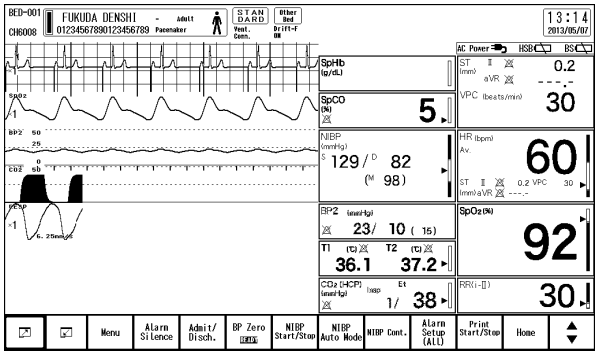
Display Example:



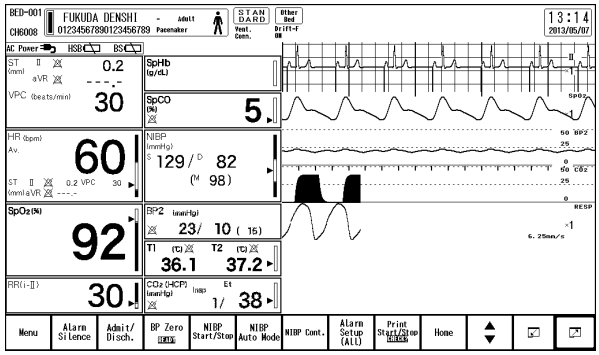
Numeric Data: Standard/Right



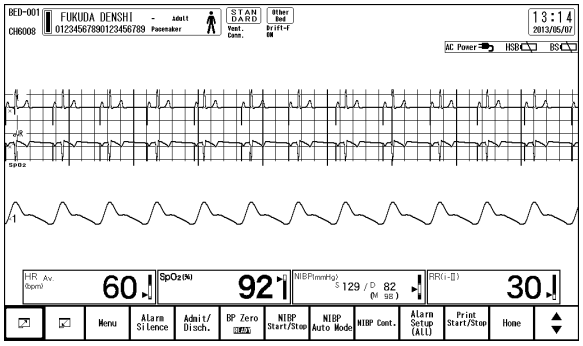
Numeric Data: Standard/Left



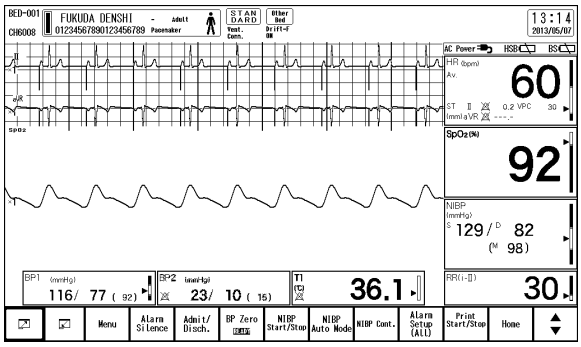
Numeric Data: Standard/Right (Large)



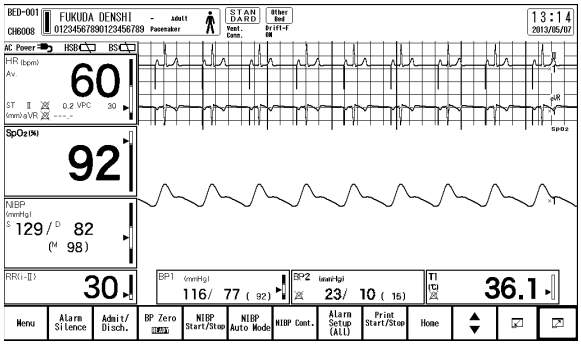
Numeric Data: Standard/Left (Large)



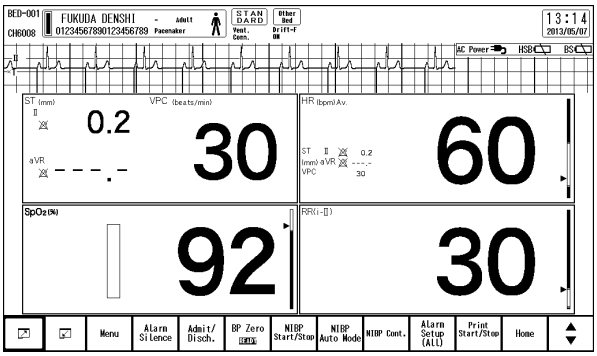
Numeric Data: Standard/Bottom



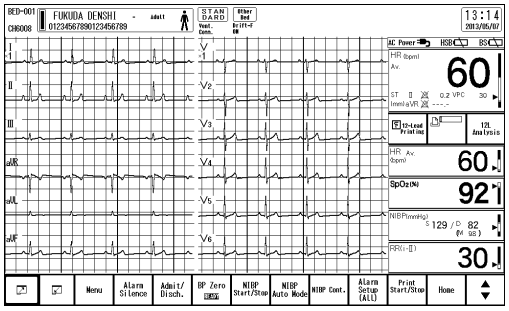
Numeric Data: Standard&Bottom/Right



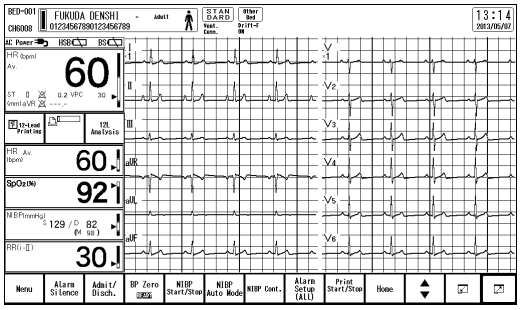
Numeric Data: Standard&Bottom/Left



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" P10-5)

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.

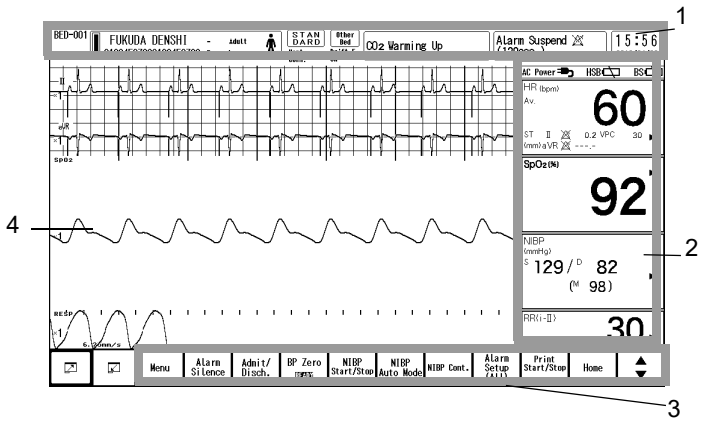
1 Information Display Area

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

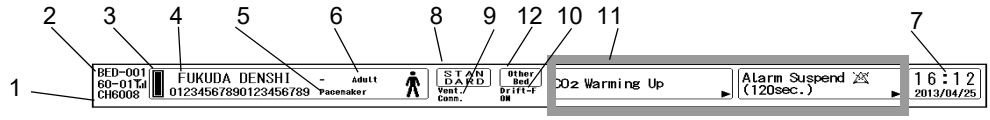
2 Numeric Data Area

3 User Key Area

4 Waveform Area



❑Information Display Area



1 Telemetry Channel (When HLX-801/HLX-801(G) 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.

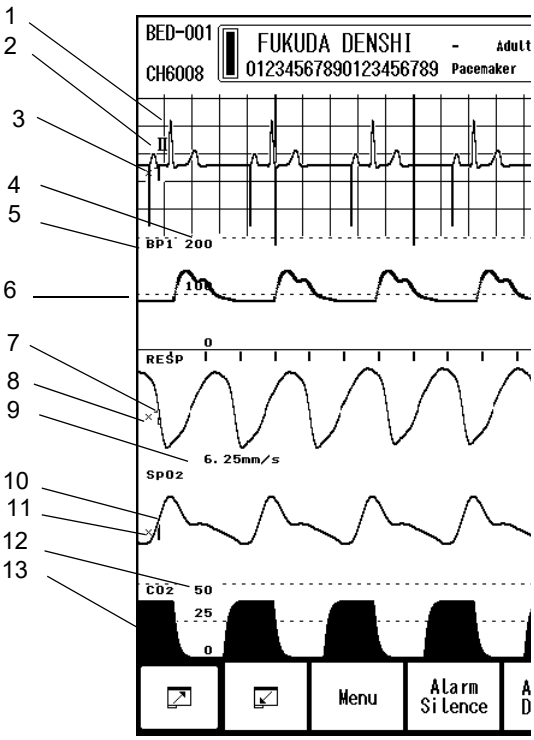
By pressing the message display area, the alarm message history can be verified.

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, SpO_2 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

9 Respiratory Sweep Speed

Displays the sweep speed for the impedance respiration waveform, CO_2 waveform, AWP, AWF waveform.

10 SpO_2 Waveform

11 SpO_2 Waveform Size

12 CO_2 Scale

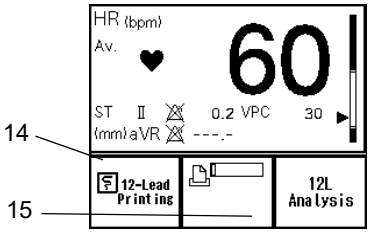
13 CO_2 Waveform

14 [12-Lead Print] Key

Displayed when ECG 12-lead waveform is displayed. The 12-lead waveform will be output to the recorder.
(☞"12-lead Waveform Printing" P9-9)

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

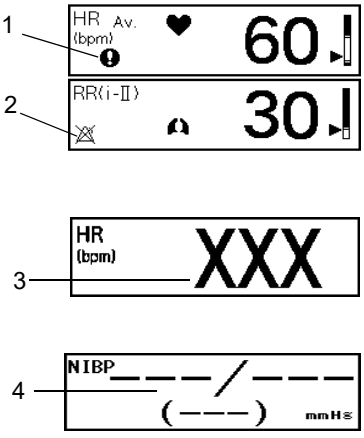
Displayed when the alarm is set to OFF.

3 Out of Measurement Range (XXX)

The measurement is out of range.

4 Measurement Error (---)

Displayed when the NIBP measurement ended erroneously.

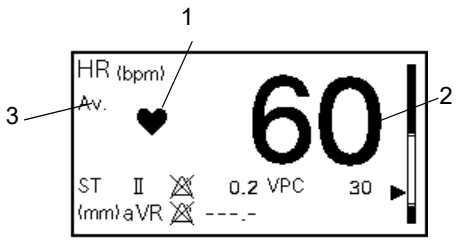


❑Numeric Data Box Display (for each parameter)

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.

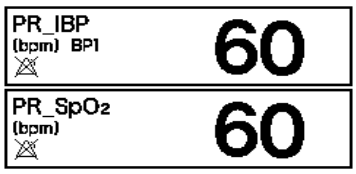
2 Heart Rate / Pulse Rate

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.)

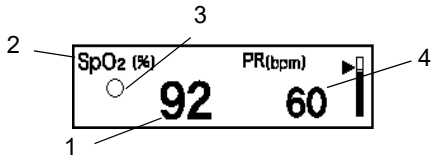
PR, HR/PR



1 Pulse Rate (BP)

2 Pulse Rate (SpO_2)

SpO_2



1 SpO_2 Value

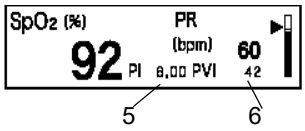
The arterial oxygen saturation will be displayed.

2 SpO_2 Label

The label set for SpO_2 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 SpO_2 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)

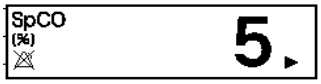
The perfusion index will be displayed.

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.

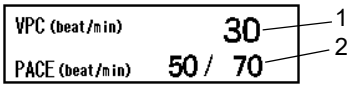
SpHb Value (Masimo only, optional)

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.



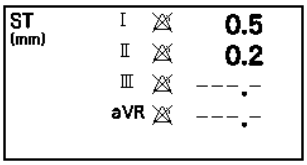
2 Pace Beats (1 minute) / Total Beats (1 minute)

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.

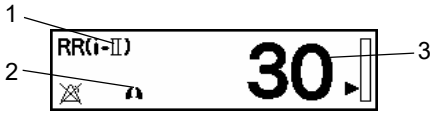
REFERENCE

- 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 CO_2/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, CO_2 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.

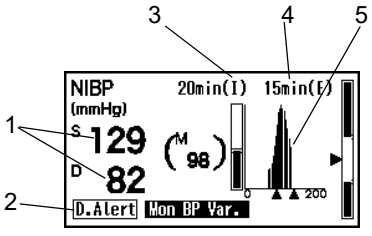
NIBP

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

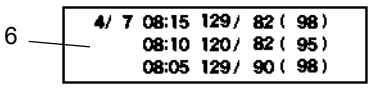
The elapsed time or measured time will be displayed.
The display can be switched in accordance with the setting made for "Time Display" under NIBP setup.

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.



BP Value

1 BP Label

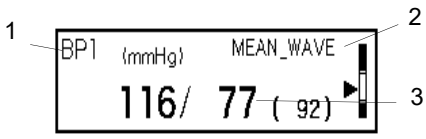
The BP label setup for the blood pressure will be displayed.

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.



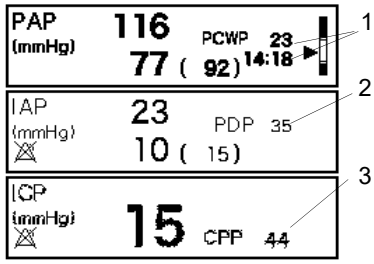
PAP/ IAP/ ICP

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.

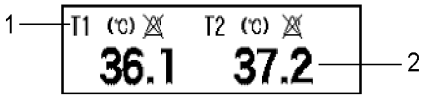
Temperature

1 TEMP Label

The label set for the temperature will be displayed.

2 TEMP Value

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

$EtCO_2$/ $InspCO_2$

$EtCO_2$ Value/ $InspCO_2$ Value

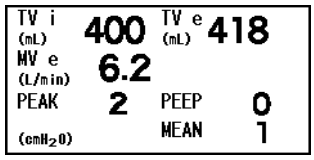
The end-tidal CO_2 concentration and inspiratory CO_2 concentration measurement value will be displayed.

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

Ventilator

Ventilator Data

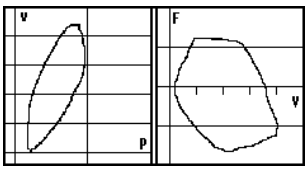
When ventilator is connected, the ventilator measurement data will be displayed.



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.



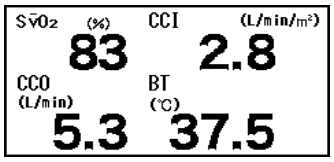
⚠ CAUTION

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

SvO_2/CCO Monitor

SvO_2/CCO Monitor Data

When the SvO_2/CCO Monitor (Vigilance/Vigilance CEDV/Vigilance/ Vigileo) is connected, the SvO_2/CCO data (SvO_2, CO) will be displayed.The displayed data will differ depending on the used SvO_2/CCO Monitor.



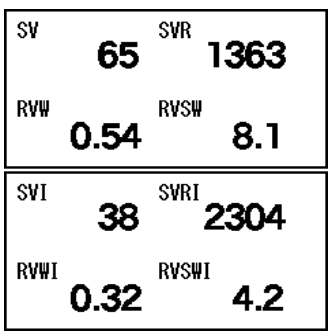
SvO_2/CCO Monitor	Displayed Data			
Vigilance (CCO mode/STAT OFF/Index OFF)	SvO_2 ($ScvO_2$)	CCO	EDV	BT
Vigilance (CCO mode/STAT ON/Index OFF)	SvO_2 ($ScvO_2$)	CCO STAT	EDV STAT	BT
Vigilance (CCO mode/STAT OFF/Index ON)	SvO_2 ($ScvO_2$)	CCI	EDVI	BT
Vigilance (CCO mode/STAT OFF/Index OFF)	SvO_2 ($ScvO_2$)	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. However the following condition should be met.

- It is measured on Vigilance with CCO mode. (It will not be displayed during ICO mode.)
- SvO_2 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)	$\frac{RVSW}{BSA}$

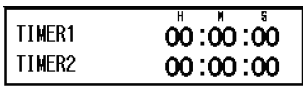
NOTE

- The hemodynamic data based on Vigilance data will not be stored in the list. For the Vigilance list, the data directly acquired from the Vigilance will be stored.

TIMER

Stopwatch Key

Functions as stopwatch.



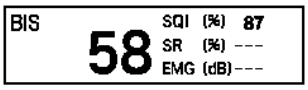
BIS

BIS Value

By connecting the BIS monitor to the serial connector or Status II connector, BIS data will be displayed.

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

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

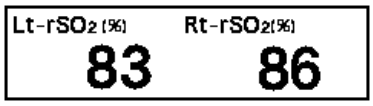


INVOS

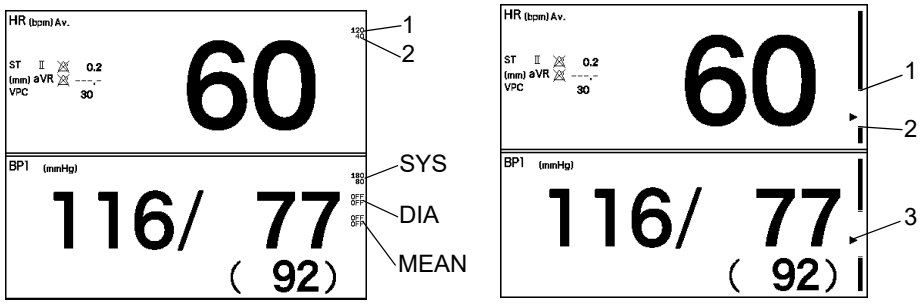
INVOS 5100C Measurement Data

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

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



❑Alarm Limit Display



The alarm limit can be displayed beside each numeric data. 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

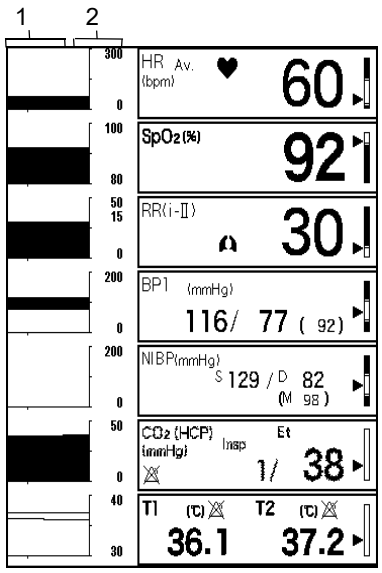
2 Lower Alarm Limit

3 Current Measurement Value (SYS)

NOTE

- If the 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 for the parameter which is set as recall factor 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

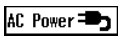
Display	Maximum Waves Displayed	Display Duration (25mm/s)	Maximum Displayed Boxes
Standard (Right/Left)	14	6 seconds and above	7
Standard & Bottom (Right/Left)	12	6 seconds and above	10
Standard (Right/Left)/Large	14	4 seconds and above	14
Bottom (1 rows)	12	8 seconds and above	4
Bottom (2 rows)	10	8 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.
	HR Synchronized Mark This mark flashes synchronizing to the heartbeat.
	RR Synchronized Mark 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 to Level S (top priority), Level H (high priority, urgent), Level M (medium priority, caution), Level L (low priority, status), 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.

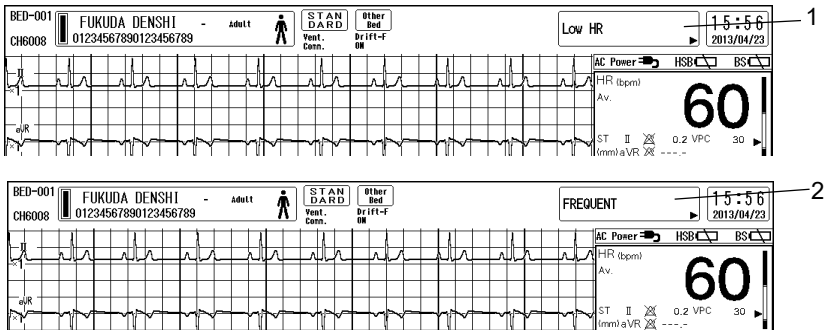
Alarm Priority, Level		Description	Tone/Volume	Displayed Color
Top Priority	S	Top Priority Alarm	Continuous	Red/White
High Priority	H	Life Threatening Alarm	Continuous	Red
Medium Priority	M	Cautionary Alarm	5 seconds interval	Yellow
Low Priority	L	Status Alarm	15 seconds interval	Blue
Notification	N	Message (Notification)	Display Only	White

⚠ CAUTION

- When multiple alarms of the same priority are generated, the newer alarm message will be displayed.

❑Vital Alarm Message

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



1 Numeric Data Alarm Message

2 Arrhythmia Alarm Message

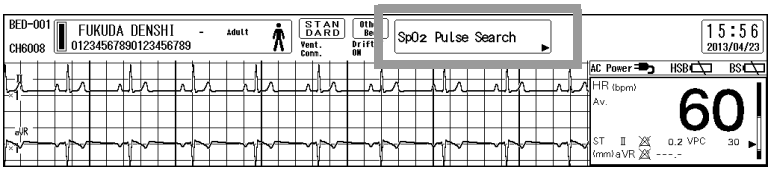
There are 2 types of vital alarm messages; numeric data alarm and arrhythmia alarm. If both alarms occur at the same time, the numeric alarm message and arrhythmia alarm message will be displayed alternately in 2 seconds interval. The alarm messages will be displayed according to the priority. If the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

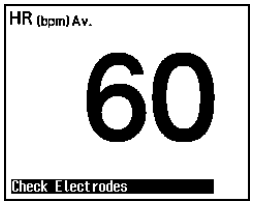
❑Equipment Status Alarm Message

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.

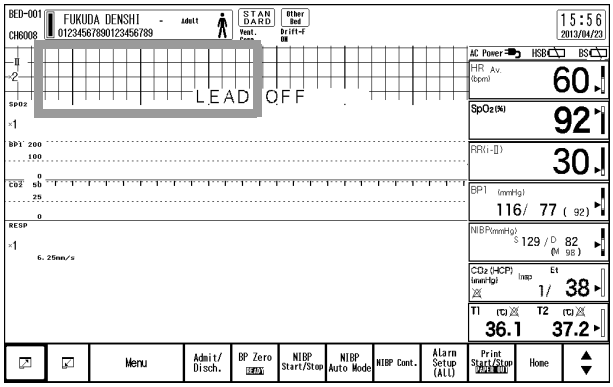


❑Lead-Off Message

When the ECG electrodes used for HR measurement or arrhythmia analysis are detached, it will be notified by "LEAD OFF" message display.

⚠ WARNING

- When <Lead Off> is displayed, HR alarm or arrhythmia alarm will not generate. If this condition is left unresolved, a sudden change of the patient may not be noticed. Take prompt action when the lead-off condition is detected.



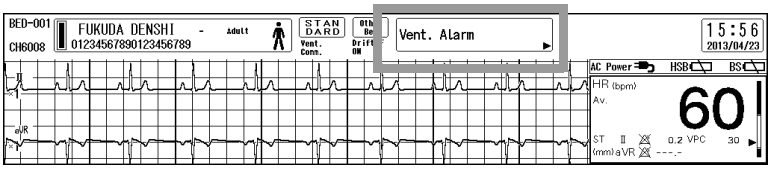
❑Ventilator Alarm Message

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 (factory default).
- The alarm sound can be turned ON under [Menu>Tone/Volume]. (☞"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.

⚠ WARNING

- When the VELIA, ASTRAL, VS ULTRA ventilator is connected, and the ventilator power is turned OFF, alarm will not generate. If the connection cable is disconnected from the ventilator, <Vent. Alarm> will generate, but <VENT_COMM> alarm will not generate on the DS-8200 System.

⚠ CAUTION

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

Window Display

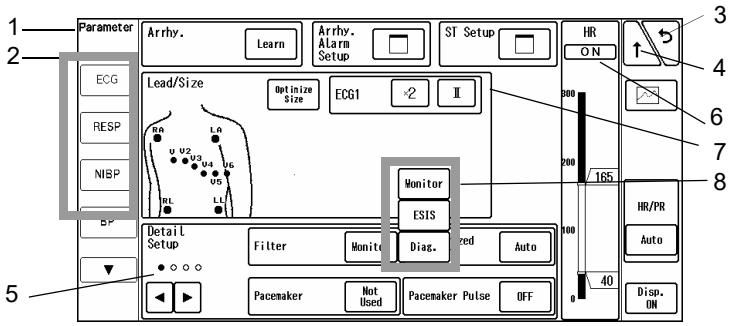
About the Window Display

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

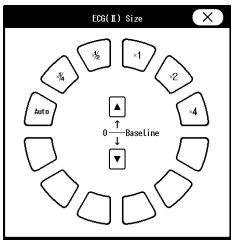
- The color of each key lock icon indicates its administrative level, and a higher level password must be entered to unlock it.

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.

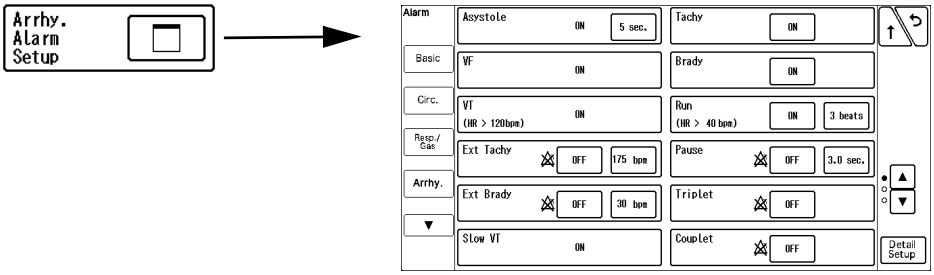
Some items will show a sub window in which the setup operation is performed.
To close the sub window, press either the key, [Home] or [Prev. Disp.] key.

- <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

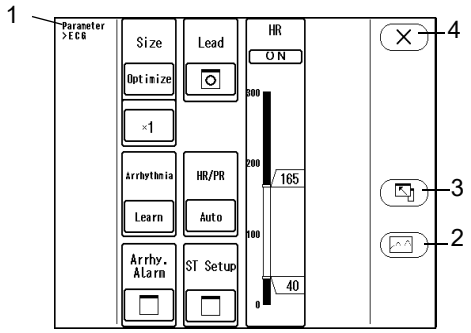
The windows can be moved to any desired position by dragging the window title.

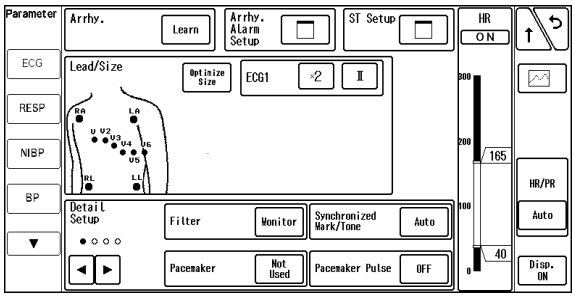
2 Alarm Assist Key

The alarm assist screen will be displayed. On the alarm assist screen, maximum of 24 hours of trend data for the corresponding parameter will be displayed, and alarm threshold can be adjusted by checking the trend data. (☞"Alarm Assist Screen" P6-12)

3 Detail Key

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





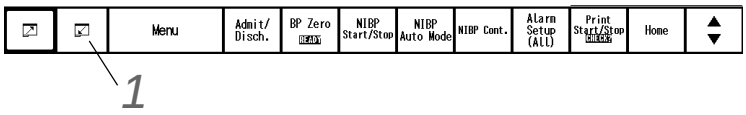
4 Close Key

Press the (×) key to close the window. The window can also be closed by pressing the fixed key, [Prev. Disp.] or [Home].

Minimize Window

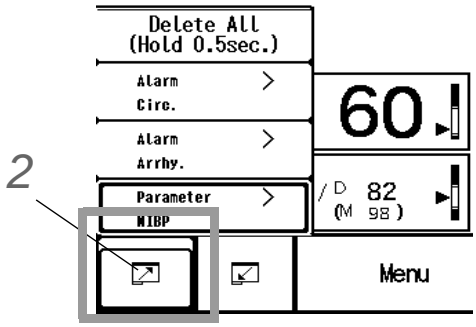
To temporarily display the home display during the setup, press the (Minimize) key. The current window will be minimized. By pressing the (Restore Window) key, the window will be redisplayed.

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.

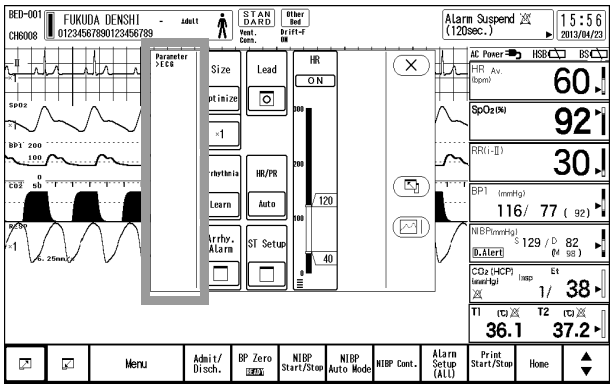
NOTE

- 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]).

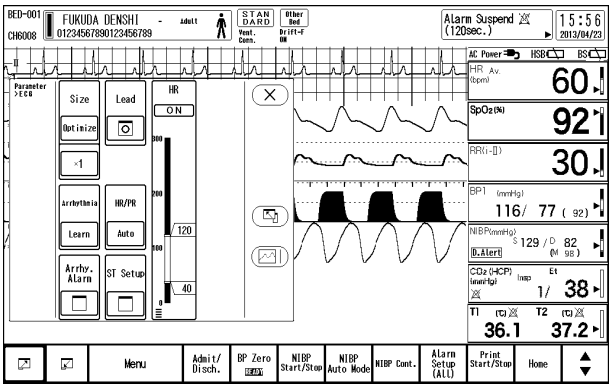
Transfer Window

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.

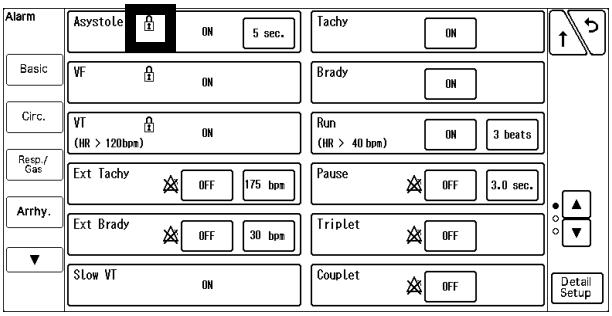


NOTE

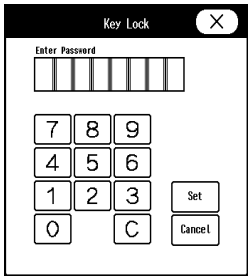
- The floating window cannot be overlapped to the numeric data area or information display area.
- The window which is displayed from "Menu" cannot be moved.
- The displayed position of the floating window will be stored until the power is turned OFF.

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

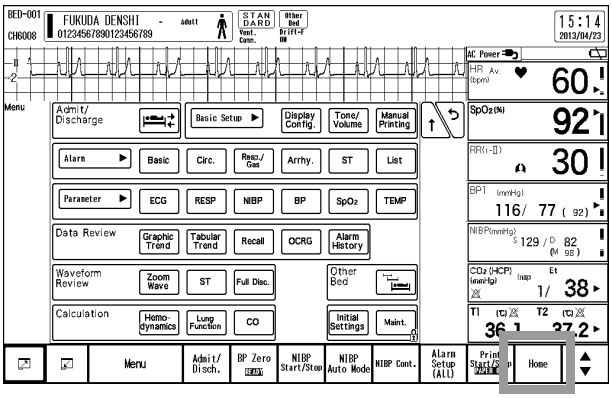
NOTE

- 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

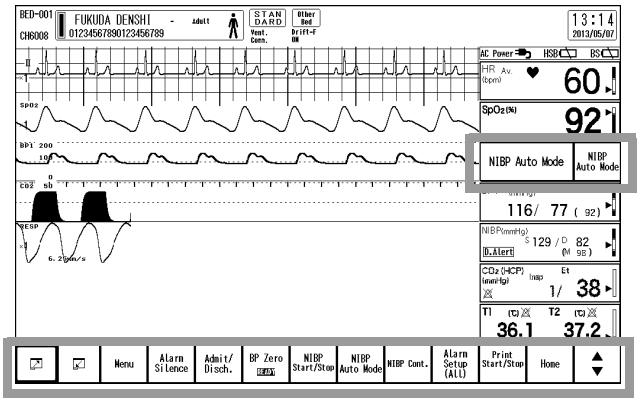
The user keys and menu can be customized according to the monitoring purpose.

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" P5-26)

User Key

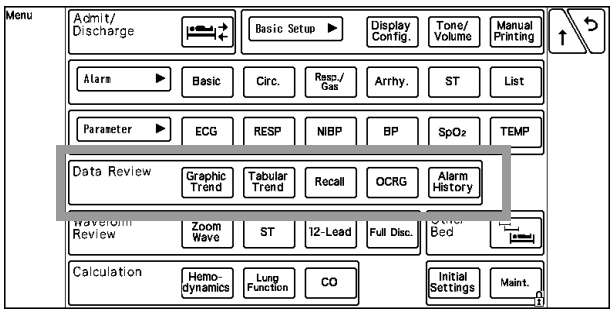
The user keys can be customized according to the monitoring purpose.
(☞"To Configure the Display" P10-5)

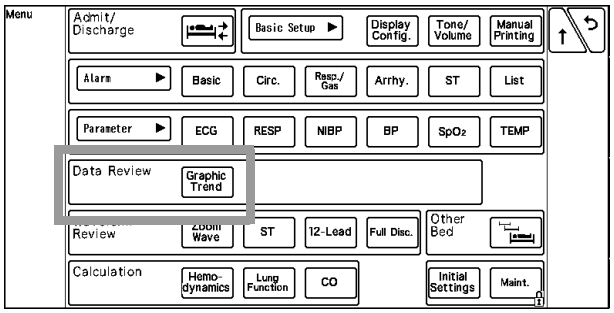


By assigning the [User Key ▲▼] to the user key area, 2 pages of user keys can be registered. Press the [User Key ▲▼] to switch the pages. The user key can be enlarged by using 2 display areas.
The user key can be also assigned to the numeric data area. It is useful if the key related to numeric data is assigned near the numeric data.

Menu Screen

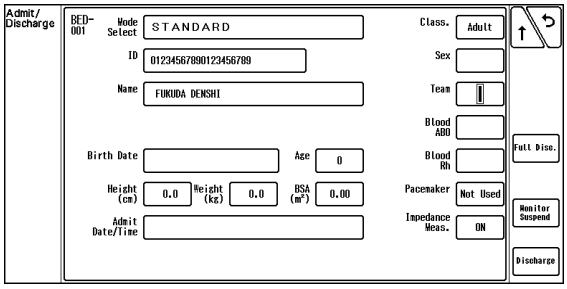
The key position can be changed and unnecessary keys can be deleted on the "Menu" screen.
(☞Maintenance Manual "Display/Print Setup" P5-12)

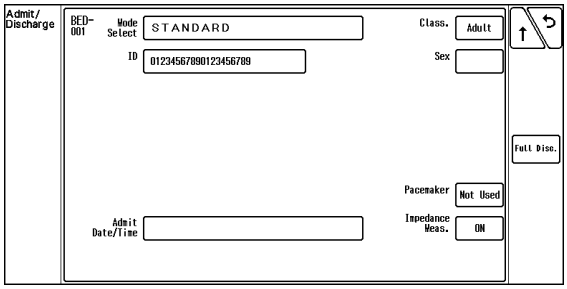




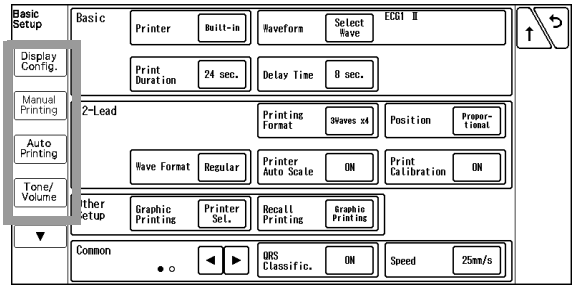
To Delete the Unnecessary Keys (Key Mask)

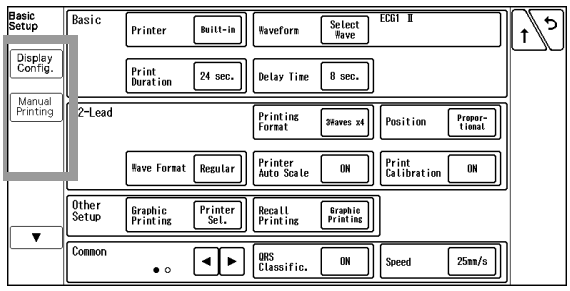
Unnecessary keys, items, tabs can be deleted.
(☞Maintenance Manual "Key Mask" P5-18)





Example on "Admit/Discharge" Screen





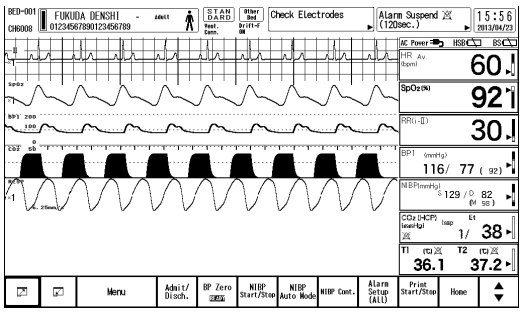
Example on Tab Display

Display on the External Monitor

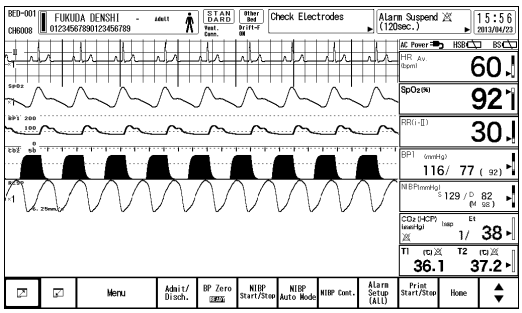
For the DS-8200 System, in addition to the main display, another display unit can be used for extended display.

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

Chapter 4 Preparation

Daily Check

Conduct the following daily check before using the equipment.

Daily Check List

		No.
Checked Date: Day Month Year	Checked by:	Location:
Model Type (Display Unit)	Serial Number:	Date of Purchase: Day Month Year
Model Type (HS Adapter)	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	OK / NG
External appearance	Visually check the exterior for scratches, cracks, and rust.	No abnormality should be found.	OK / NG
Installation	Check whether the equipment is installed on a level surface.	The installation area must be level and free from vibration and shock.	OK / NG
	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.	OK / NG
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.	OK / NG
		The date and time should be correct.	OK / NG
	Turn ON the power of the display unit, and check whether it operates normally.	The power LED of the display unit should light.	OK / NG
	(When HS-8000/HSB-80 is used)	The home display should appear, and the power LED of the HS-8000 should light.	OK / NG
	(When HS-8000 is used)	With BP relay cable and BP transducer connected, pressing the BP Zero Balance Switch should start the zero balance.	OK / NG
	(When HS-8000 is used)	Pressing the NIBP Start/Stop key should inflate the NIBP cuff.	OK / NG
	(When HS-8000 is used)	Connecting the SpO_2 sensor should light the sensor LED.	OK / NG

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/HPD-810, HCP-800/HCP-810 is used)	The home display should appear, and power LED should light in green.	OK / NG
	(When HCP-800/HCP-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/ HCP-810)	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 CO_2 gas calibration is not performed at a specified interval, CO_2 measurement accuracy may be affected and also subsequent gas calibration may not be possible.

To Start Monitoring

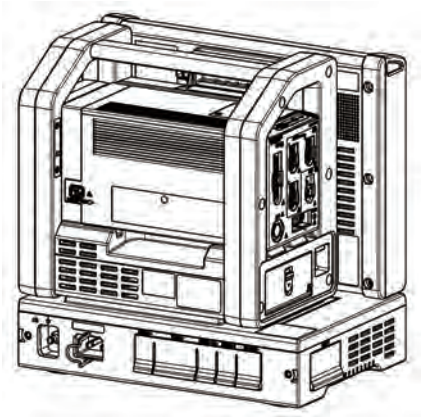
This section explains about the procedure to turn the power ON and start monitoring.

⚠ 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)" P1-15)

▸ 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

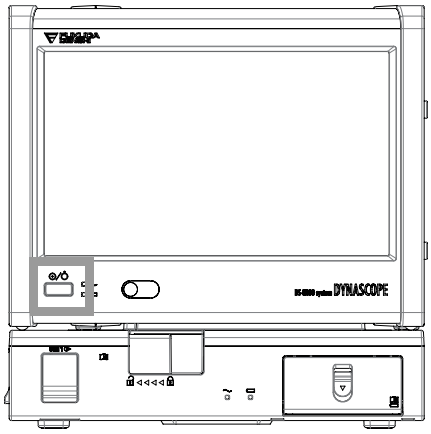


⚠ WARNING

- 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

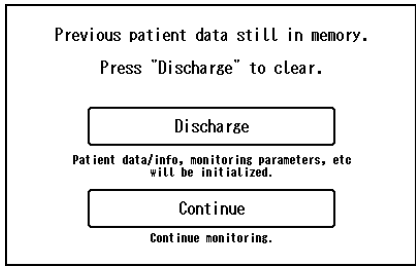
- The operation after the power is turned ON will be according to the setting made on [Initial Settings] > [User I/F] > [Power ON/Discharge]. However, if the power was turned OFF for less than 30 seconds, the setting before the power was turned OFF will remain.

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" P5-8)

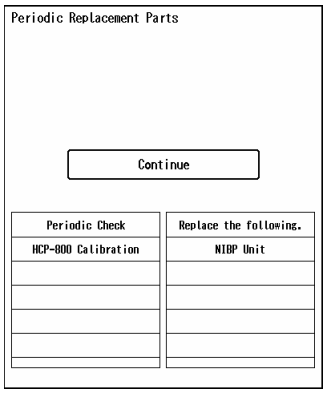
- To start monitoring a new patient, select [Discharge] and enter the new patient information on the "Admit/Discharge" screen.

REFERENCE

- Whether or not to display the discharge confirmation screen can be selected.
(☞Maintenance Manual "Power ON/Discharge" P5-15)

❑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

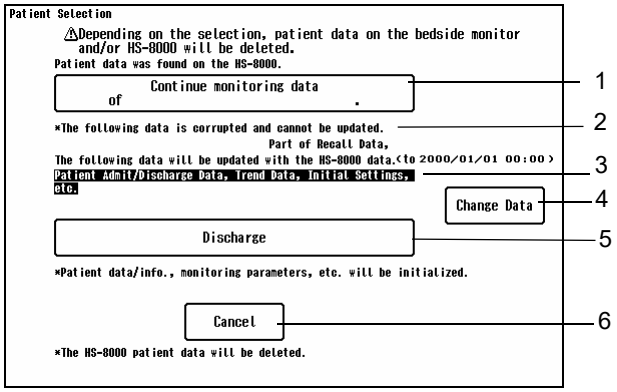
- The parts which the replacement period will be notified are the NIBP unit in the Super Unit and the CO_2 unit in the HCP-800.
(☞Maintenance Manual "Periodic Replacement" P7-1)
- Even if it is set not to display the discharge confirmation screen, it will be displayed when the replacement period approaches.

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.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.



1 [Continue monitoring data of ***]: The patient data will be transferred and monitoring will resume.

2 This will be displayed when the data is damaged and cannot be transferred.

3 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.

4 [Change Data] : The data to be transferred can be changed.

5 [Discharge]: The data will not be transferred and monitoring of new patient will start.

6 [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

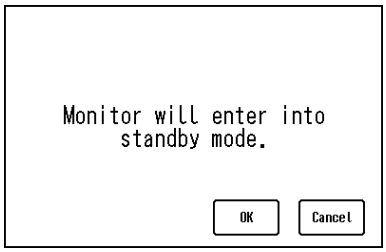
- ON/OFF of data transfer function and the data selection to be transferred can be performed on the "Initial Settings" menu.
  (☞Maintenance Manual "System Setup" P5-24)

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

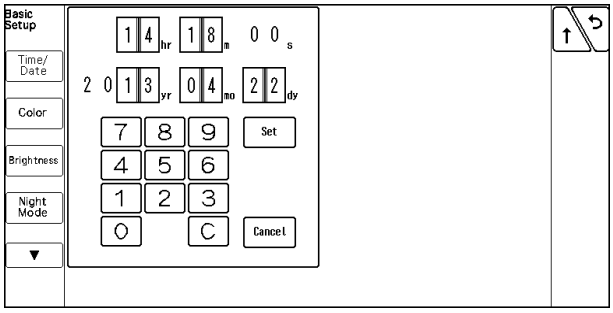
This section explains about the clock setup procedure.

⚠ 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.

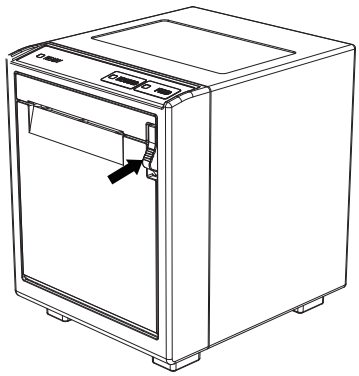
Installing the Recording Paper

⚠ CAUTION

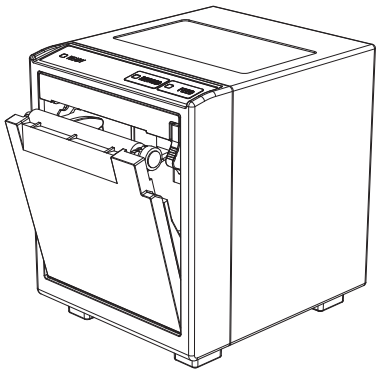
- About the Recording Paper
  - Use only "OP050-01TDR" for the recording paper.
    If the surface treatment and thickness of the recording paper are different, it may result in poor print quality.
- Storing the Recording Paper
  Since the recording paper is thermal type, inappropriate storage may change the quality of the printed 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 and 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.

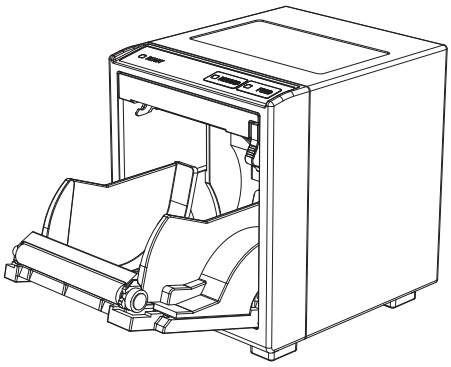
Install the recording paper with the following procedure.

1 Press the Open/Close Lever.



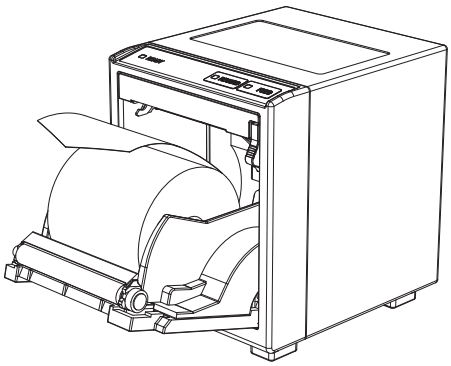
▸ The paper holder will open.





2 Set the Paper.

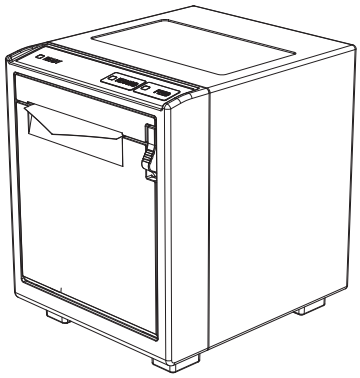
The outside surface of the paper is heat-sensitive. Make sure to place the outside surface of the paper facing up.



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

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.

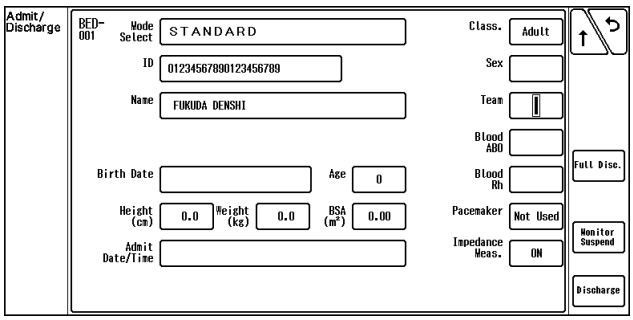
⚠ CAUTION

- 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

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

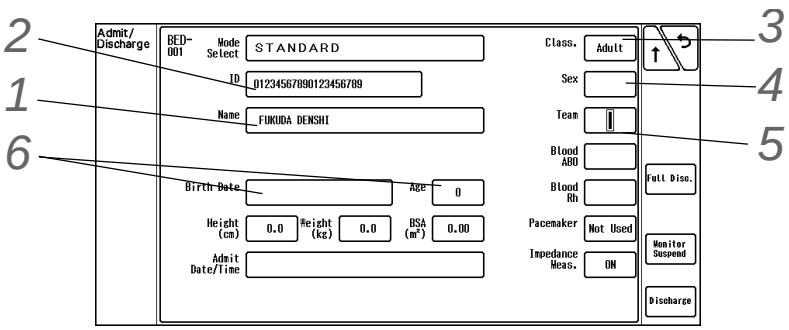
▸ The "Admit/Discharge" screen will be displayed.



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 Information



1 Enter the patient name.

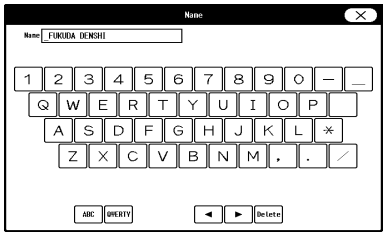
REFERENCE

- 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.

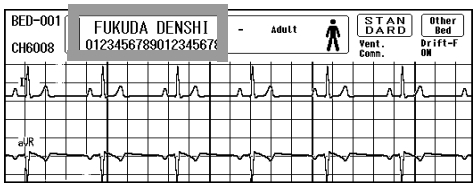
1 Press the entering space for "Name".

▸ 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)

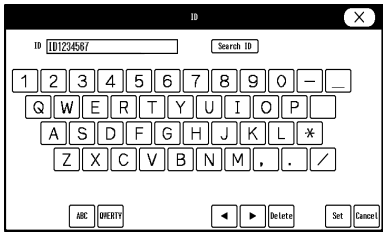
REFERENCE

- 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, SpO_2, TEMP, $EtCO_2$/$InspCO_2$, 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

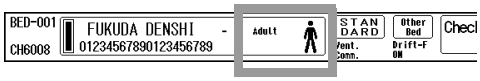
- The patient classification selection influences the precision of the QRS detection and NIBP measurement. Make sure the correct selection is made.
- To perform correct NIBP measurement, appropriate NIBP air hose corresponded to the set patient classification must be used. (However, if the patient classification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

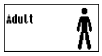
1 Press the key for "Class.".

▸ The patient classification dropdown list will be displayed.

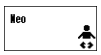
2 Select from [Adult] / [Child] / [Neonate].

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



For adult: 

For child: 

For neonate: 

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.

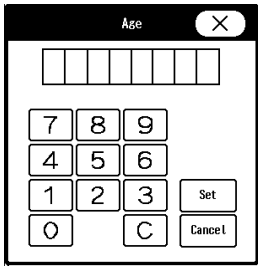
REFERENCE

- 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.



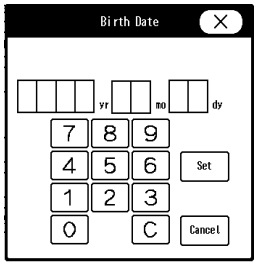
2 Enter the age using the numeric keys.

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.

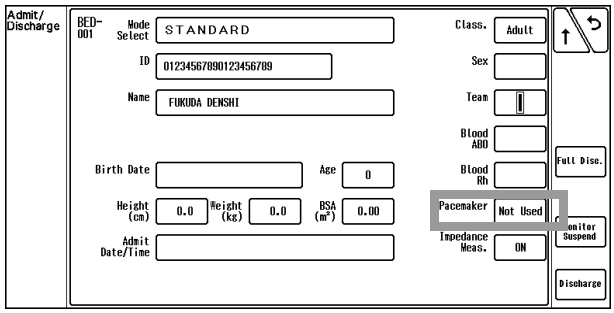
REFERENCE

- 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.

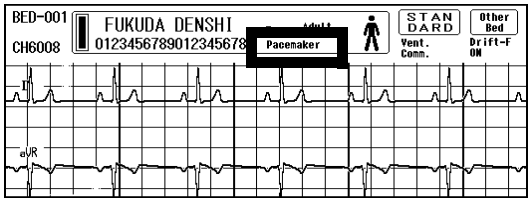
- The artificial pacemaker pulse will be displayed.
- When pacing waveform does not appear (pacing failure), erroneously detecting the pacemaker pulse as QRS will be prevented.
- The arrhythmia analysis will detect pacing beat as P (Pacemaker Beat) or F (Fusion Beat) to prevent erroneous judgment of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



Entering Patient Information from the Magnetic Card

By using the magnetic card reader, patient information can be entered from the magnetic card. The admittance process will speed up compared to manually entering each information.

NOTE

- To automatically enter the patient information from the magnetic card or barcode, it is necessary to perform the setup in advance. (☞Maintenance Manual "Using the Magnetic Card Reader" P4-14)

1 Read the data from the magnetic card or barcode.

▸ The acquired data will be displayed.

2 Press the [Change only patient info.]/[Cancel] key.

- [Change only patient info.] : Replaces the current patient information with the newly acquired information.
- [Cancel] : Cancels the acquired data.

NOTE

- Make sure the patient is discharged before replacing the patient information.
- The item which the information was not acquired from the magnetic card or barcode will be left blank. For the blank item, manually enter the information.

Entering Patient Information from the Patient Data Server (When DS-LANIII is used)

When the central monitor is connected to the patient data server, and the DS-LANIII network is used, patient information can be automatically entered by searching on the patient data server.

NOTE

- When a DS-LAN II network is used, patient information cannot be entered from the patient data server.

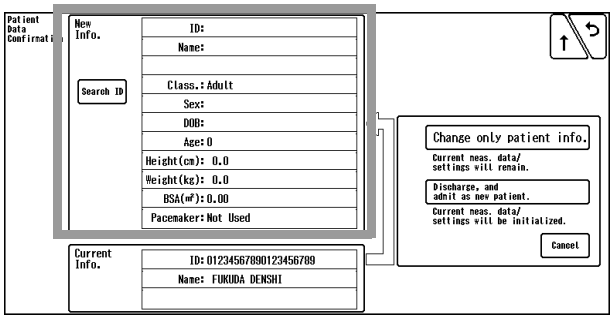
❑When Using the Patient Data Server and Magnetic Card Reader (or Barcode Reader)

NOTE

- Select [ON] for "Auto Reference to Central Monitor when Reading Patient ID" under [Initial Settings>Magnetic Card Reader] in advance.
  (☞Maintenance Manual "Magnetic Card Reader Setup" P4-14)

1 Read the data from the magnetic card or barcode.

2 The acquired patient information from the patient data server will be displayed in the "New Information" area.



If there is no applicable patient information, current patient information will be displayed in the "New Information" area.

3 Select whether or not to enter the searched patient information.

Select from [Change only patient info.] / [Discharge and admit as new patient.] / [Cancel].

[Change only patient info.] will replace the current patient information to the newly acquired information.

[Discharge and admit as new patient.] will initialize the current patient data/monitoring condition and admit the searched patient as new patient.

[Cancel] will invalidate the acquired data.

NOTE

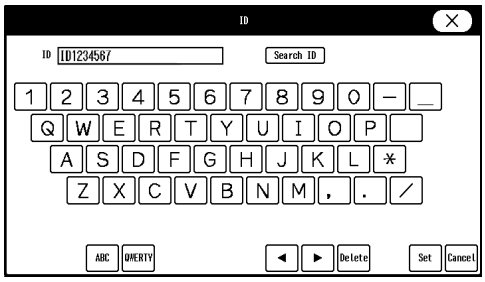
- If the ID is searched through the DS-LAN III network, make sure the patient is discharged before replacing the patient information.
- The item not acquired from the patient data server will be left blank.
- For the blank item, manually enter the information.

❑When Magnetic Card Reader (or Barcode Reader) is not Used

1 Press the MENU (fixed key), [Admit/Discharge], "ID" edit box.
"ID" window will be displayed.

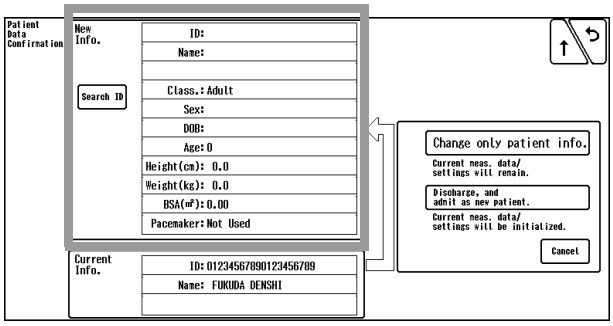
2 Enter the patient ID.

3 Press the [Search ID] key and start searching on the patient data server.



1 Use the touch keys to enter the ID.

2 Based on the entered patient ID, patient information will be searched on the patient data server through the DS-LANIII network.
The searched patient information will be displayed in the "New Information" .



4 Select whether or not to enter the searched patient information.

Select from [Change only patient info.] / [Discharge and admit as new patient.] / [Cancel]. [Change only patient info.] will replace the current patient information to the newly acquired information. [Discharge and admit as new patient.] will initialize the current patient data/monitoring condition and admit the searched patient as new patient. [Cancel] will invalidate the acquired data.

The item not acquired from the patient data server will be left blank. For the blank item, manually enter the information.

NOTE

- If the ID is searched through the DS-LAN III network, make sure the patient is discharged before replacing the patient information.

- The item not acquired from the patient data server will be left blank.
- For the blank item, manually enter the information.

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

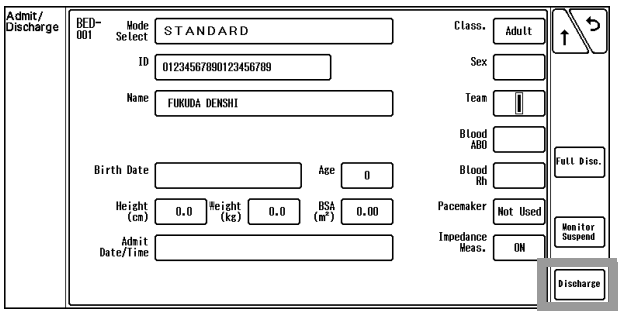
- If monitoring of new patient is started without discharging the previous patient, the measurement data of the previous and new patient will become mixed up on the recall and trend data.
- When the discharge process is performed, patient data such as recall and trend will be initialized. The parameter and alarm settings will be reset, backed up, or initialized according to the settings made under [Menu>Initial Settings>User I/F>Power ON/Discharge).
  When the discharge process is performed on the central monitor, alarm will be reset according to the setting on "Admit Setup" of the central monitor.
  (☞Maintenance Manual "Power ON/Discharge" P5-15)

NOTE

- Depending on the setting made for "At Discharge" under ([Initial Settings>User I/F>Power ON/Discharge], some items may not be initialized.
  (☞Maintenance Manual "Power ON/Discharge" P5-15)
- If the discharge procedure is performed during stopwatch operation, the counting will stop and will be reset to "00:00:00".

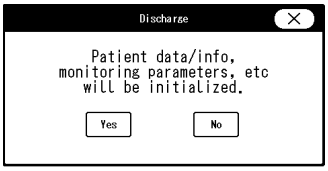
1 Press the MENU (fixed key) > [Admit/Discharge] key.

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



2 Press the [Discharge] key.

▸ The discharge confirmation window will be displayed.



REFERENCE

- To cancel the discharge process, press the [No] key or close the discharge confirmation window.

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.

Data	Description
Patient Data	Trend, Tabular Trend, Recall, ST, OCRG, CO, Hemodynamics, Lung Function, P-V/F-V control data will be erased. The settings for 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 data will be deleted. 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" P5-26)

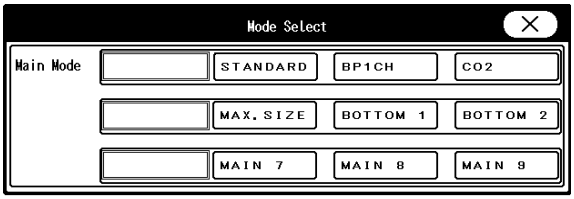
REFERENCE

- 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" P5-26)

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" P5-26)

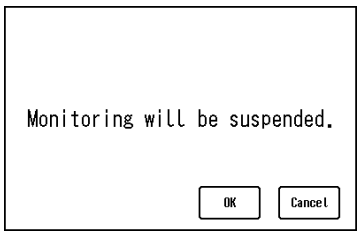
Suspend Monitoring

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.



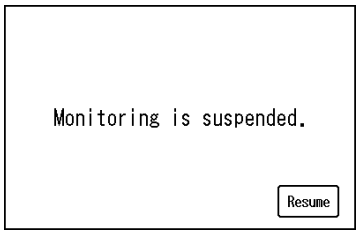
REFERENCE

- 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 disappear and monitoring will resume.

Chapter 6 Alarm Function

Chapter 6 Alarm Function

Alarm

To Set the Arrhythmia Alarm

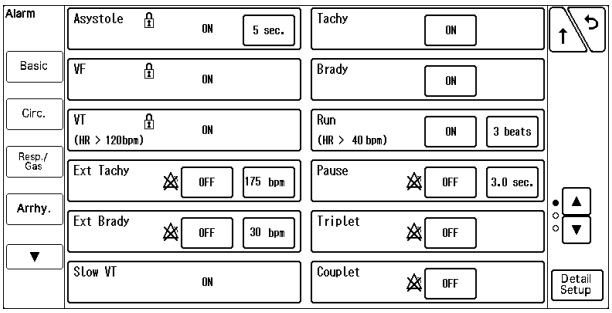
The arrhythmia alarm can be turned ON or OFF, and arrhythmia detection level can be set.

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 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 if arrhythmia alarm is set to OFF, alarm will not function even if the system alarm is enabled. 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, Tachy, Brady, Ext Tachy, Ext Brady, and HR alarm is OFF.
- If [Always ON] is selected for "Asystole, VF, VT Alarm" under "Initial Settings", Asystole, VF, VT alarm can not be set to OFF.
  (☞Maintenance Manual "Alarm Related Setup" P5-5)

REFERENCE

- The arrhythmia detection level for tachycardia (Tachy), bradycardia (Brady), extreme tachycardia (Ext Tachy), extreme bradycardia (Ext Brady) alarms link with the upper and lower alarm limit for HR/PR.
  - The tachycardia (Tachy) alarm generates when the value exceeds the HR/PR upper alarm limit. When the upper alarm limit is OFF, alarm will not generate.
  - For the Ext Tachy alarm, the alarm threshold level cannot be set below that of Tachy alarm.
  - The bradycardia (Brady) alarm generates when the value exceeds the HR/PR lower alarm limit. When the lower alarm limit is OFF, alarm will not generate.
  - For the Ext Brady alarm, the alarm threshold level cannot be set above that of Brady alarm.

3 Select the level to detect each arrhythmia.

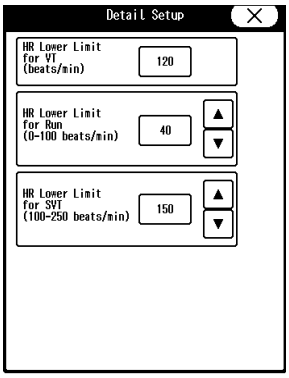
Item	Description
Asystole	3 sec. to 10 sec.
Run	2 beats to 8 beats
Pause	1.5 sec. to 5 sec.
Frequent	1 bpm to 50 bpm
Ext Tachy	22 bpm to 300 bpm
Ext Brady	20 bpm to 295 bpm

Item	Description
R on T	200 ms to 600 ms
SVT	2 beats to 10 beats
Irregular RR	10, 15, 20%
S Frequent	1 bpm to 50 bpm
Pacer Not Capture	80 ms to 480 ms
Pacer Not Pacing	20 bpm to 200 bpm

4 Set the HR Lower Limit for VT, RUN, SVT.

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 bpm / 140 bpm 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.

4 Set the "HR Lower Limit for SVT" .

▸ If the HR is same or above the selected value, SVT will generate.

SpO_2 Second Alarm Setup

NOTE

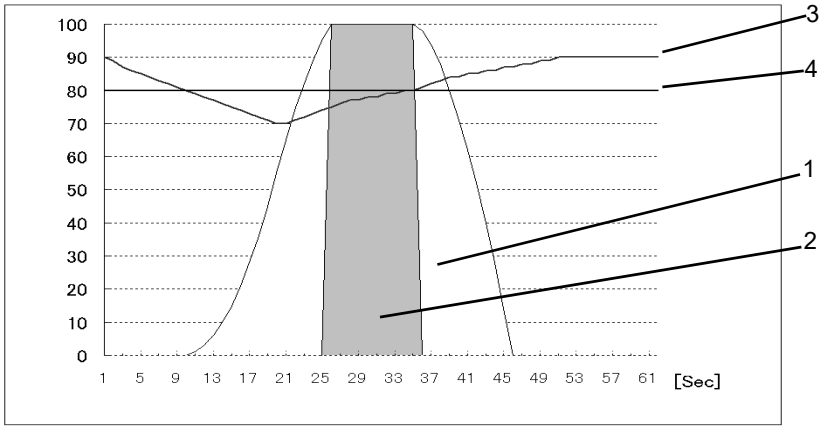
- The SpO_2 second alarm function utilizes SatSeconds™ technology of Covidien. SatSeconds™ is a trademark of Covidien.

The SpO_2 second alarm function is available when HS-8312N is connected.

When the SpO_2 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 SpO_2 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 SpO_2 Value

4 Alarm Limit

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

The SpO_2 value begins to fall below the alarm limit at approximately 10 seconds. At the same time, the integral value begins to increase. (Alarm limit) – (SpO_2 value) is accumulated each second.

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

The SpO_2 value begins to fall below the alarm limit at approximately 36 seconds. At the same time, the integral value begins to decrease. [(Alarm limit) – (SpO_2 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 SpO_2 value frequently falls below the alarm limit but does not last long enough to reach the second alarm threshold.

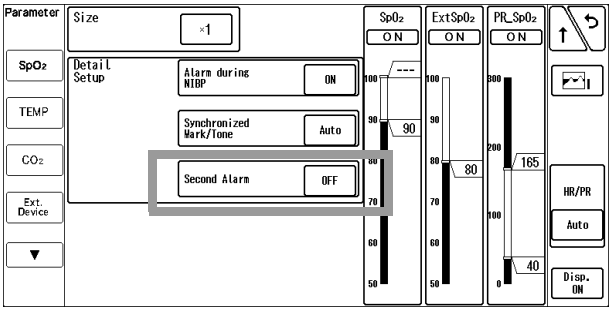
If the SpO_2 value falls below the limit 3 times or more during the last 60 seconds, an alarm will be generated even if the second alarm threshold is not reached.

⚠ 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 SpO_2 alarm and second alarm setup is set to [OFF], the second alarm integral value will be set to 0.

1 Press the [Menu], [SpO_2] ("Parameter") keys.

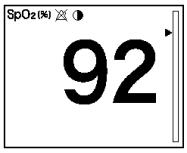
- The SpO_2 setup screen will be displayed.



2 Press the key for "Second Alarm".

- The "Second Alarm" screen will be displayed.

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



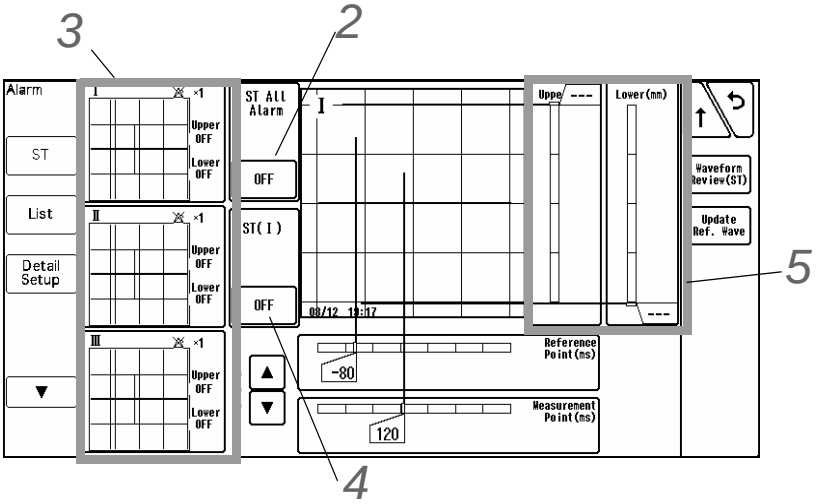
- Settings other than [OFF]: A circular second alarm indicator will be displayed inside the numeric data box.
- [OFF]: Second alarm indicator will not be displayed.
- As the integral value increases, the indicator will begin to fill, and when it is completely filled, an alarm will be generated.

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 /XXX/ / \XXX\ and set the upper, lower limit (±20mm / ±2.0mV).

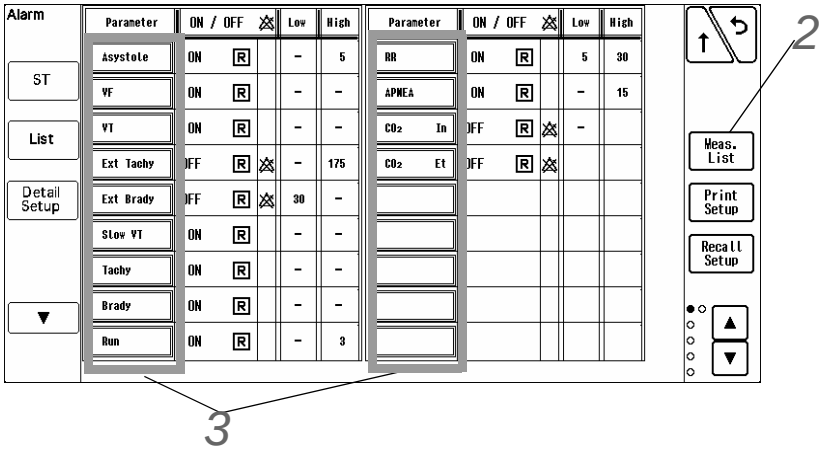
- Alarm will be set to OFF if the value –20mm / –2.0mV or lower is selected.
- Alarm will be set to OFF if the value +20mm / +2.0mV or above is selected.

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.



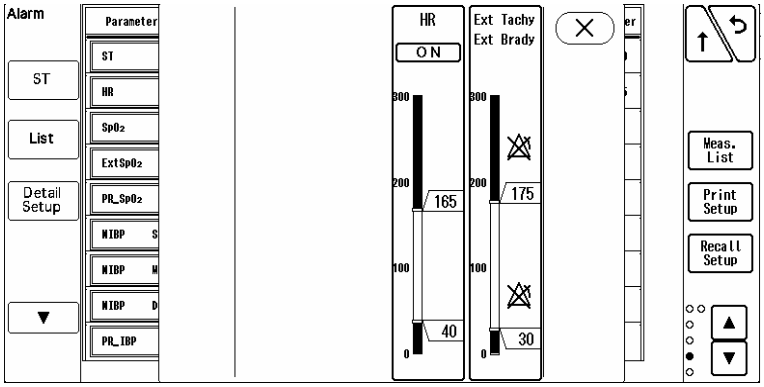
2 Select from [All List]/[Meas. List].

- [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.



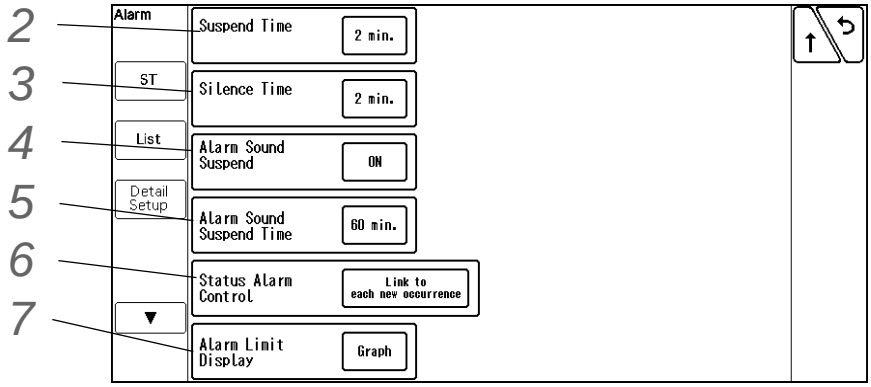
2 Press /XXX/ / \XXX\ to set the threshold level.

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" P11-7)

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 at occurrence of equipment status alarm, alarm will be silenced for fixed amount of time set for "Silence Time".
If the alarm factor 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 a new alarm occurs during the alarm silence time, the alarm sound for the new alarm will generate.

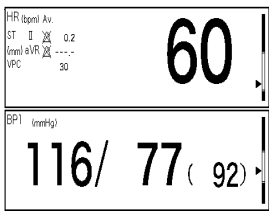
▸ [Link to each new occurrence]: When the [Alarm Silence] key is pressed at occurrence of equipment status alarm, the alarm will be silenced as long as the alarm factor remains regardless of the "Silence Time" setting.
While the same equipment status alarm is generated, the alarm will remain silenced.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

7 Press the key for "Alarm Limit Display".

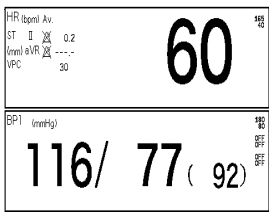
▸ The dropdown list will be displayed.

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

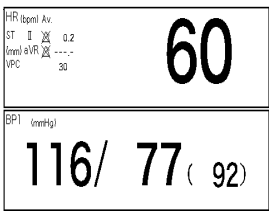
▸ The upper and lower alarm limit will be displayed on the home display.



Graph



Numeric



OFF

NOTE

- The alarm limit for the parameter with the alarm turned OFF will not be displayed regardless of this setup.
- If the 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)

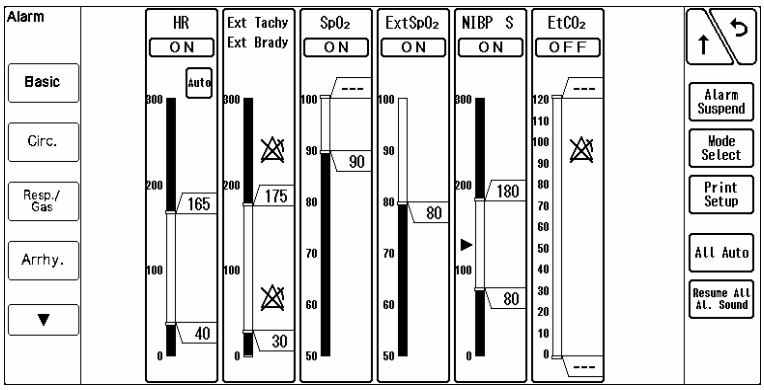
The system alarm can be enabled or suspended.
The system alarm enabled condition is when the alarm suspended condition is canceled, and alarm limit and alarm ON/OFF setting for each parameter are effective. The system alarm cannot be disabled.

WARNING

- 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 if arrhythmia alarm is set to OFF, alarm will not function even if the system alarm is enabled. 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 enable 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 Suspend (xxx sec.> will be displayed.

REFERENCE

- <xxx s> indicates the remaining time. The system alarm will be enabled when the suspended time completes.

<To Enable the Alarm>

1 Press the [Alarm Suspend] key while in alarm suspended condition.

- The key will change to gray.
- The alarm limits and ON/OFF settings for each parameter will become effective.
- The alarm suspended condition will be canceled.

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

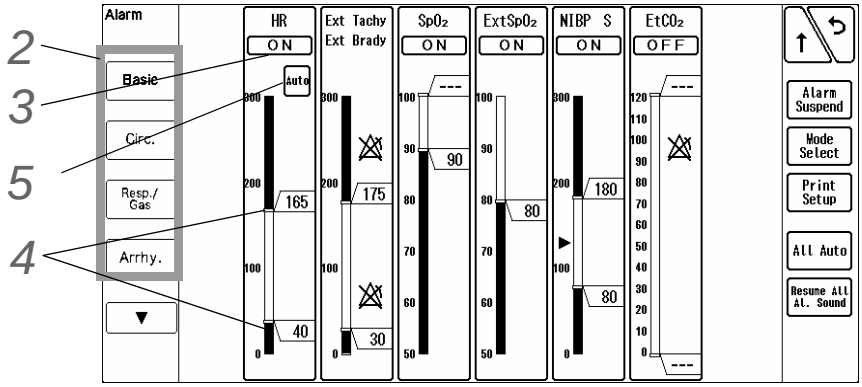
The alarm for each parameter can be turned ON or OFF, and upper and lower alarm limit can be set.

⚠ 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 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 if arrhythmia alarm is set to OFF, alarm will not function even if the system alarm is enabled. Pay attention when setting them OFF.

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

- The alarm setup menu 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.

1 Slide the /XXX/ \XXX\ keys on the right side of the bar.

- /XXX/ : Adjusts the upper limit.
- \XXX\ : Adjusts the lower limit.
- By releasing the finger from the key, fine-tune keys 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)

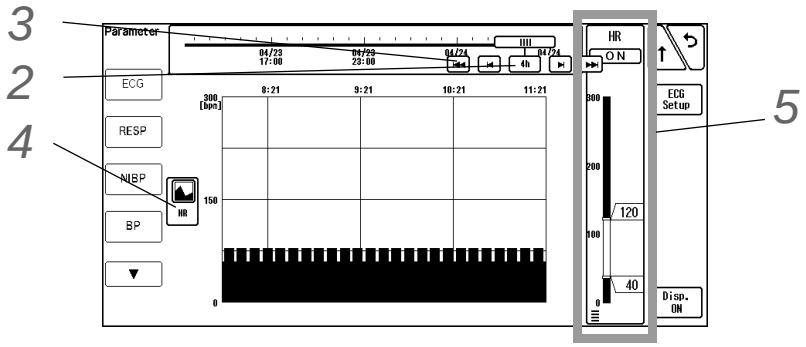
Numeric Data Alarm Adjustable Range		
Item	Description	
HR/PR_IBP/PR_SpO_2	ON, OFF	20 bpm to 300 bpm
ST1 to ST12	ST All Alarms	ON/OFF
	ST1 to ST12	±2.0mV, ±20.0mm Individual Alarm ON, OFF
BP1 to BP6	ON, OFF	0 mmHg to 300 mmHg 0 kPa to 40.0 kPa
SpO_2	ON, OFF	50%SpO_2 to 100%SpO_2
Ext SpO_2 (Lower Limit)	ON, OFF	50%SpO_2 to 98%SpO_2
RR	ON, OFF	5 Bpm to 150 Bpm
APNEA (Upper Limit)	ON, OFF	10 sec. to 60 sec.
TEMP1 to TEMP6	ON, OFF	30.0°C to 45.0°C/86.0°F to 113.0°F
Tb	ON, OFF	30.0°C to 45.0°C/86.0°F to 113.0°F
NIBP	ON, OFF	10 mmHg to 300 mmHg 1.5 kPa to 40.0 kPa
$EtCO_2$	ON, OFF	1 mmHg to 100 mmHg 0.1 kPa to 13.3 kPa 0.1% to 13.3%
$InspCO_2$ (upper limit)	ON, OFF	1 mmHg to 4 mmHg 0.1 kPa to 0.4 kPa 0.1% to 0.4%
SpCO Value (Masimo only)	ON, OFF	1%SpCO to 40%SpCO
SpMet Value (Masimo only)	ON, OFF	1%SpMet to 15%SpMet
SpHb Value (Masimo only)	ON, OFF	1.0 g/dL to 24.5 g/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.

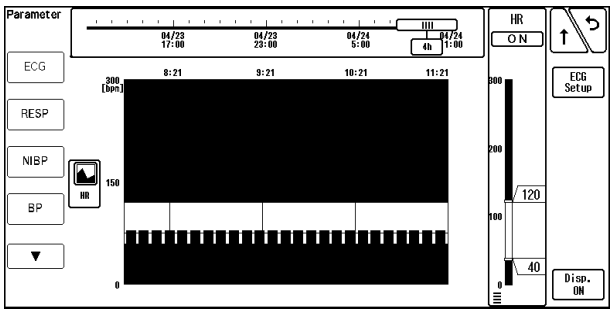
▸ The dropdown list will be displayed.

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 /XXX or \XXX.

▸ 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

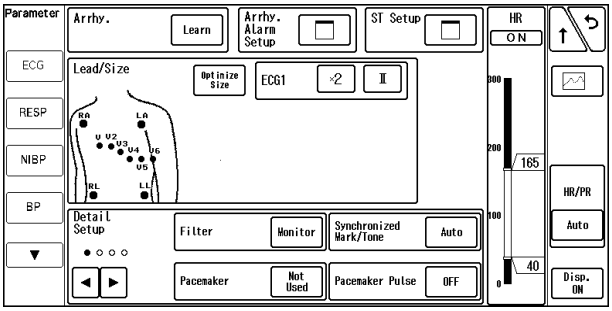
Chapter 7 Monitoring

To Display the Parameter Setup Screen

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

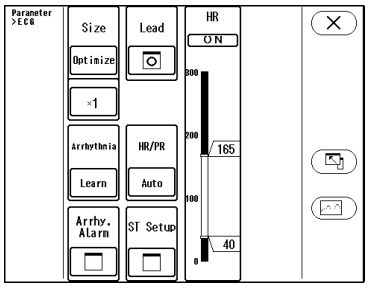
1 Press the [Menu], and then select the parameter to perform the setup.
Or, press the numeric data box on the home display, and press (Set) on the corresponding parameter setup screen.

▸ 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 (Set).



ECG

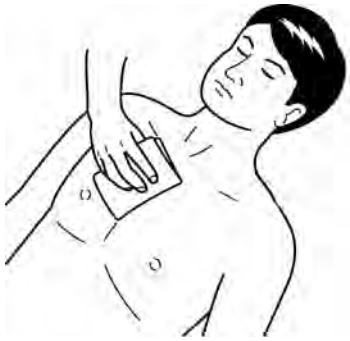
This section explains the procedure for ECG measurement preparation and monitoring condition setup.

Before Attaching the Electrodes

⚠ CAUTION

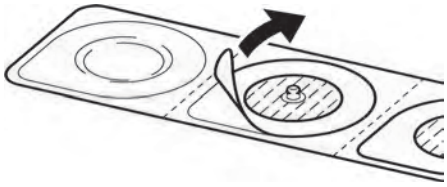
- Make sure to use electrodes of the same type.
  If different types of electrodes are used at the same time, the difference between the polarization potential from each electrode may interfere monitoring.
- ECG measurement part is Type CF applied part, but it is not intended to directly apply on patient's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

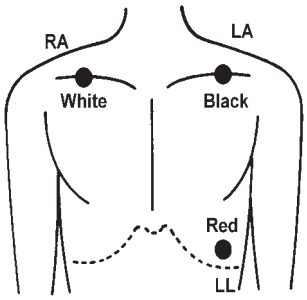
Electrode Placement

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]

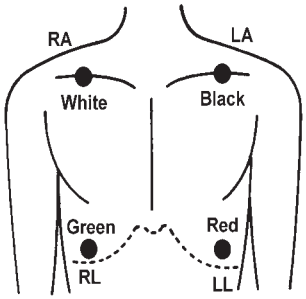
Symbol	Color	Electrode Site
RA	White	On the right infraclavicular fossa
LA	Black	On the left infraclavicular fossa
LL	Red	On the left midclavicular line, near the supracrestal line.



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

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

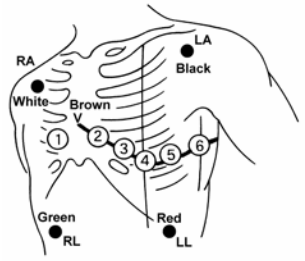
Symbol	Color	Electrode Site
RA	White	On the right infraclavicular fossa
LA	Black	On the left infraclavicular fossa
LL	Red	On the left midclavicular line, near the supracrestal line.
RL	Green	On the right midclavicular line at the same height as LL.



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

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

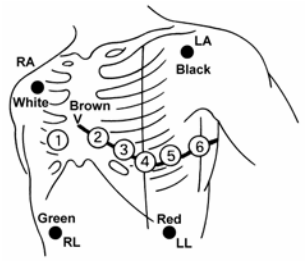
Symbol	Color	Electrode Site
RA	White	On the right infraclavicular fossa
LA	Black	On the left infraclavicular fossa
LL	Red	On the left midclavicular line, near the supracrestal line.
RL	Green	On the right midclavicular line at the same height as LL.
V	Red/Brown	Chest electrodes (V1 to V6)



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

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

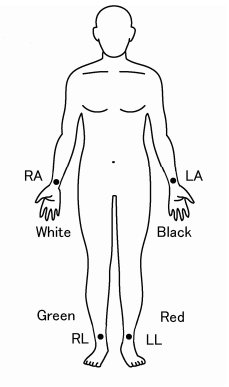
Symbol	Color	Electrode Site
RA	White	On the right infraclavicular fossa
LA	Black	On the left infraclavicular fossa
LL	Red	On the left midclavicular line, near the supracrestal line.
RL	Green	On the right midclavicular line at the same height as LL.
V	Red/Brown	The fourth intercostal space at the right 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.

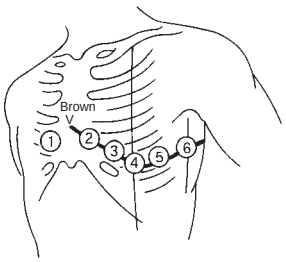


NOTE

- 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/resterilize the disposable electrodes.
For details of usable lead cables, refer to ☞"ECG, Impedance Respiration Measurement (Manufactured by Fukuda Denshi)" 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.

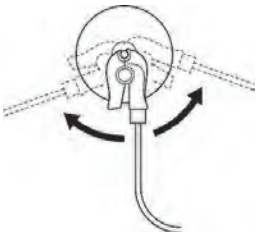
NOTE

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

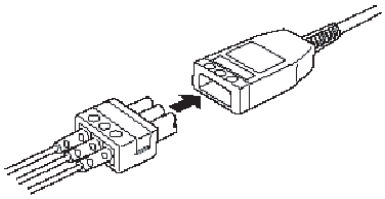
the neutral electrode, should not contact other conductive parts including earth.

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

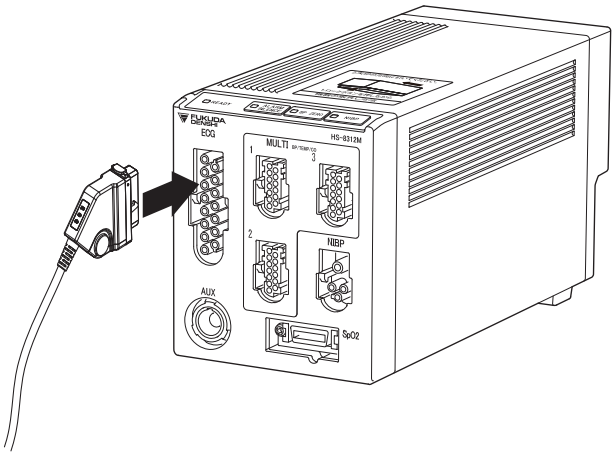
2 Turn right and left to verify that it is securely connected.



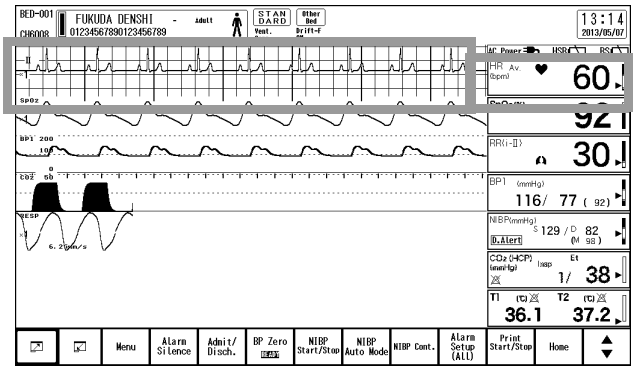
3 Connect the lead cable to the relay cable.



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



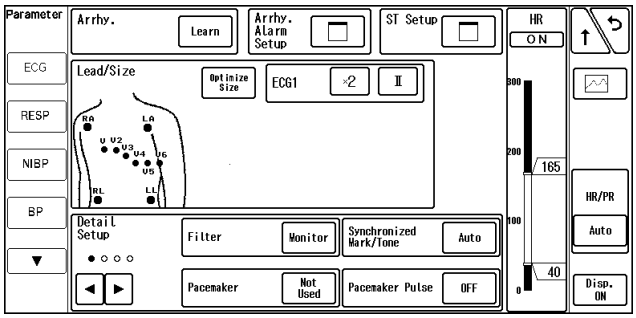
▸ ECG waveform and HR data will be displayed on the monitor.



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

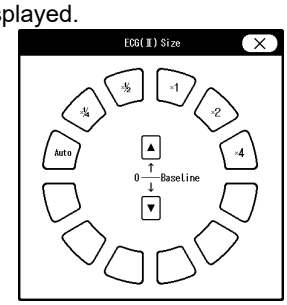
- The arrhythmia detection level and QRS detection changes with ECG waveform size. Set a proper waveform size for monitoring. When the waveform size is 1/4, 1/2, or 1, the detection level is 250μV. When the waveform size is 2 or 4, the detection level is 150μV.
- Automatic size/position of the ECG is 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" P10-5, 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

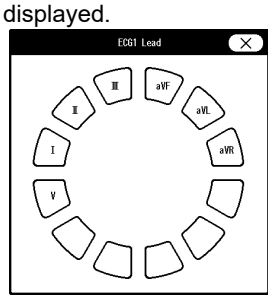
Set the monitoring lead.

⚠ 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.
- If the T wave is large and QRS wave is small, T wave may be erroneously detected as QRS wave. Change the lead or electrode site to increase the QRS wave and decrease the T wave.

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.

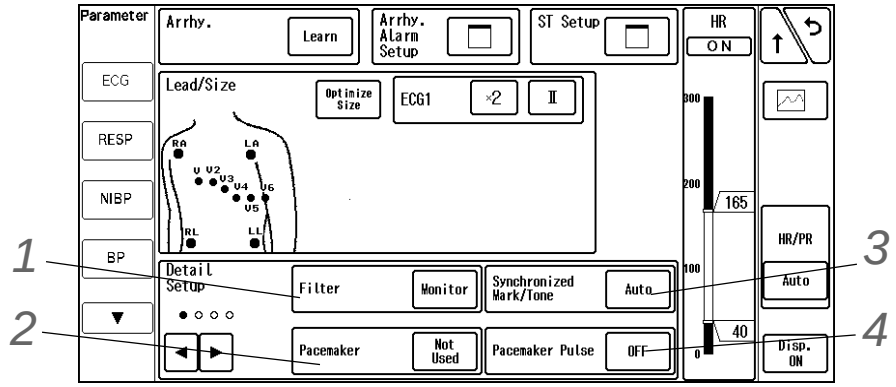
REFERENCE

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

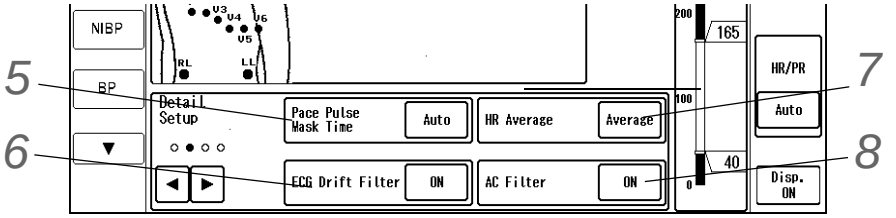
❑Arrhythmia Alarm Setup

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

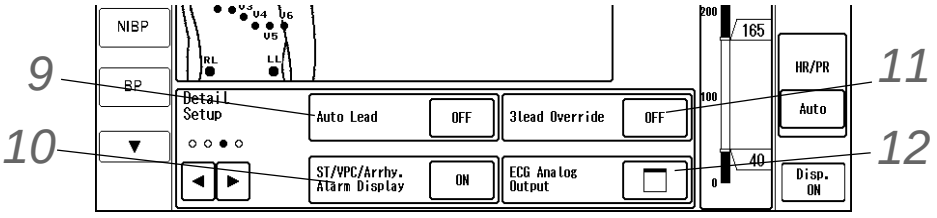
❑Detail Setup



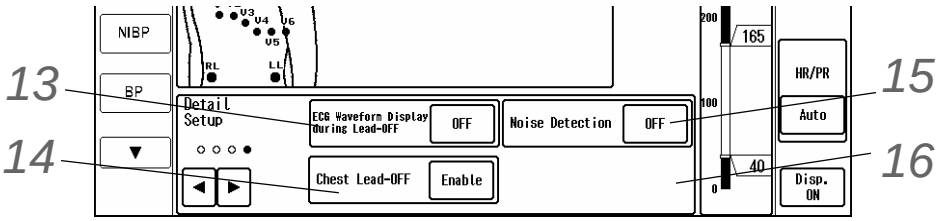
First Page



Second Page



Third Page



Fourth Page

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.

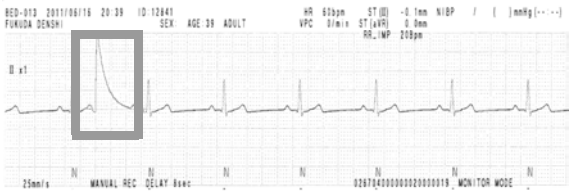
1 Press the key for "Filter".

▸ 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.

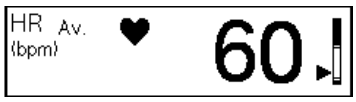
3 Set the "Synchronized Mark/Tone".

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

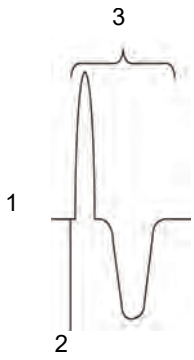
- The dropdown list will be displayed.

2 Select from [ECG]/ [SpO_2]/ [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" P19-11)
  [ECG]: The synchronizing priority will be set in the order of ECG>SpO_2>BP. The synchronized tone will be set to [ON].
  [SpO_2]: The synchronizing priority will be set in the order of SpO_2>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.
- [SpO_2]: SpO_2 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.

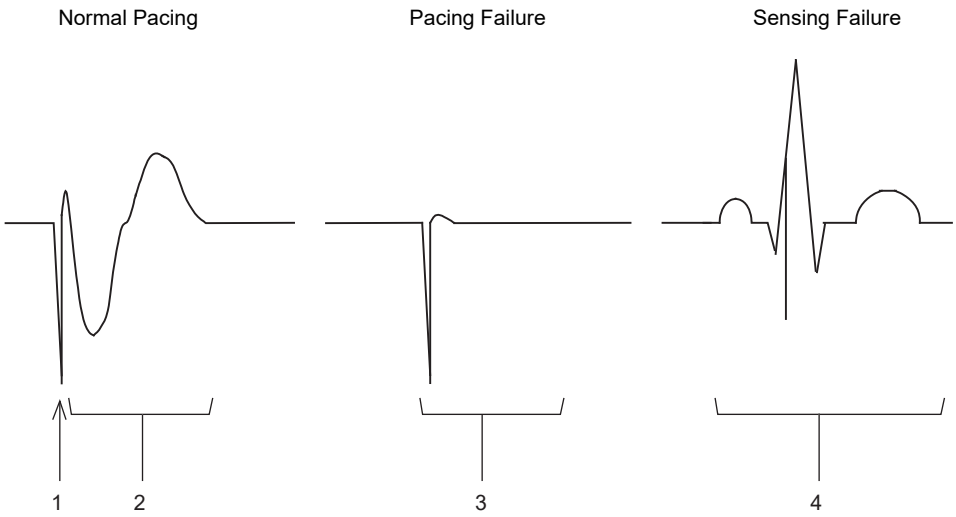
5 Set the "Pace Pulse Mask Time".

⚠ 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

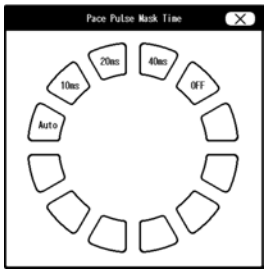
2 Pacing waveform caused by pacemaker pulse

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 "AC Filter".

REFERENCE

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

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 Hz to 60 Hz will be set.
- [OFF]: AC 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.
- [Av.]: HR measured from 6 seconds of heartbeat for adult and child, and 3 seconds of heartbeat for neonate will be displayed.

8 Set the "HR Delay".

- [OFF]: HR will be calculated based on the "HR Average" setting.
- [ON]: HR will be calculated based on the arrhythmia analysis. 5 seconds delay will occur compared to when [OFF] is selected. It may improve the HR detection when T wave or noise is interfering.
  When two ECG waveforms (ECG1 and ECG2) are measured, HR will be calculated by merging ECG1 and ECG2.
  If artifact is present on one of the waveforms, HR will be calculated using only the stable ECG waveform.
  If artifact is present on both of the waveforms, HR value will be displayed as "---".
  When ECG electrodes are detached, arrhythmia analysis cannot be performed, and <Lead OFF> message will be displayed. Alarm sound will be also generated.

NOTE

- When the patient classification is set to [Neonate], "HR Delay" will be set to [OFF].
- When the patient classification is set to [Adult] or [Child], and "HR Delay" is set to [ON], "Inst." or "Av." will not be displayed inside the HR or HR/PR numeric data box.

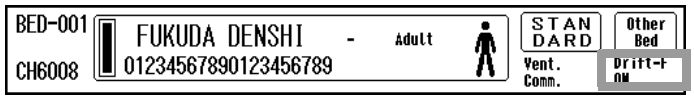
9 Set the "ECG Drift Filter".

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 1 Hz 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.

10 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	R	III	III
	L	II	II
5-electrode	R/R+C	III	III
	L/L+C	II	II
	C	II	aVR
10-electrode	R/R+C	III	III
	L/L+C	II	II
	C,C2 to C6	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.

11 Set the "3lead Override".

NOTE

- When a relay cable for 5-lead is used with a 3-lead cable, it will be judged as lead-off condition and <LEAD OFF> message will be displayed.
  If a 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 L, R and F.

1 Press the key for "3lead Override".

▸ The dropdown list will be displayed.

2 Select from [ON] or [OFF].

12 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.

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 SpO_2/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 SpO_2, BP.
- [OFF]: HR data before the noise detection will not be retained, and synchronizing source will not switch to SpO_2, BP.

NOTE

- Even if the synchronizing source is switched to SpO_2, the ECG tone will remain and not change.

16 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.

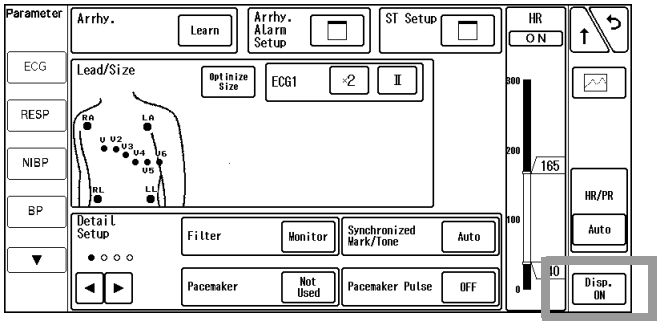
- [Disp. Lead]: The lead of the displayed waveform will be output.
- [Selected Lead]: The lead selected on "Output Lead Sel." window will be output.

❑ON/OFF of Parameter Display

Select ON/OFF for parameter display.

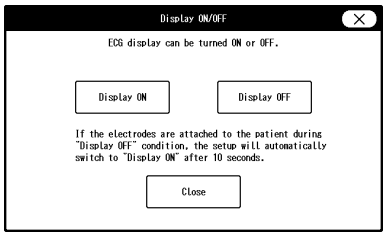
CAUTION

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



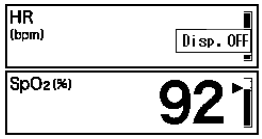
1 Press the [Disp. ON] key.

- 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

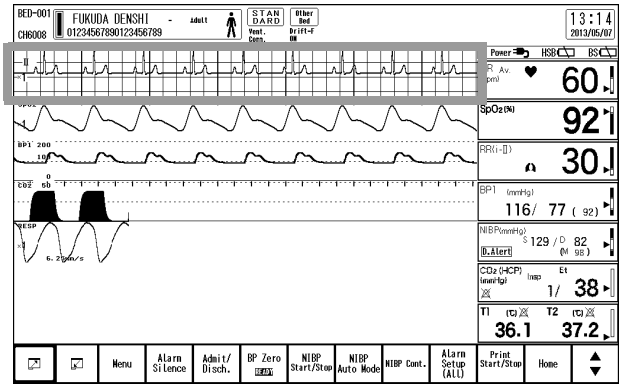
This section explains about the respiration measurement by the impedance, CO_2, or ventilator method and the measurement condition settings.

⚠ 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)

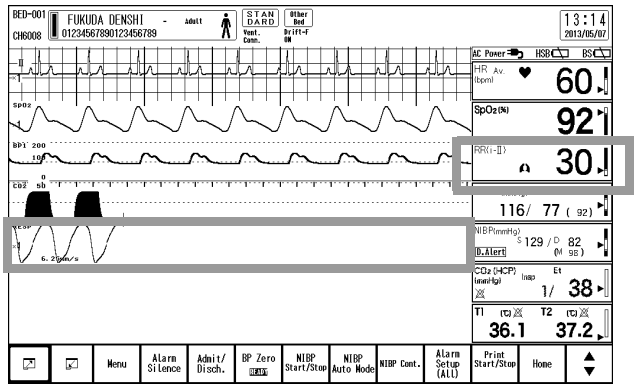
1 Check that the displayed ECG waveform is stable.



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.

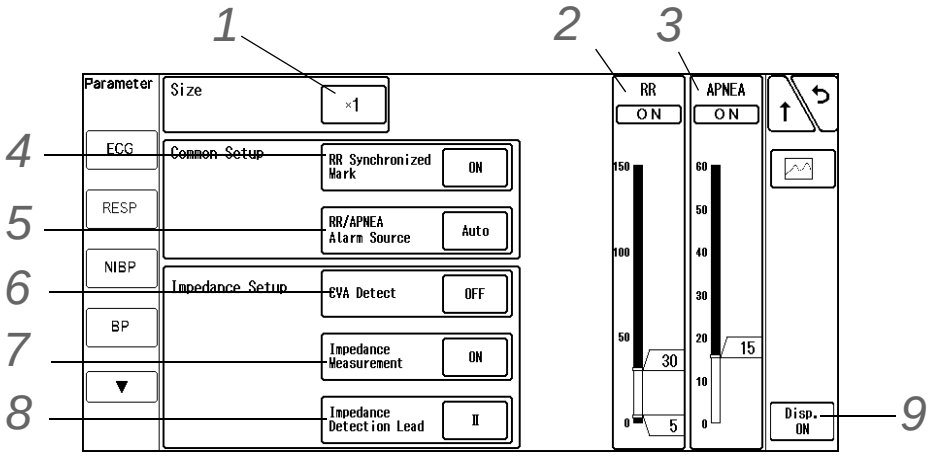


NOTE

- Adjust the waveform size, baseline position and sweep speed as necessary. (☞"To Configure the Display" P10-5)

RESP Parameter Setup

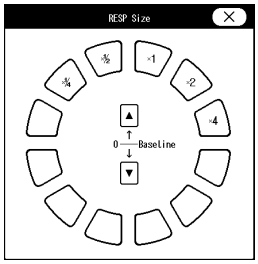
Press the [Menu], [RESP] keys to display the "RESP" setup screen.



1 Set the waveform size.

1 Press the key for "Size".

▸ The "Size" menu 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 Bpm to 150 Bpm
  Child/Neonate: 4 Bpm to 150 Bpm
  The upper limit alarm will turn OFF if the value above 150 Bpm is set.
- Set the lower limit within the following range for each patient classification.
  Adult: 5 Bpm to 145 Bpm
  Child/Neonate: 2 Bpm to 148 Bpm

If a value below 5 Bpm / 2 Bpm 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 +20 bpm and -20 bpm to the current value respectively.
- The adjustable increment for upper and lower limit depends on the patient classification and "RR Alarm Increment" setting under "Initial Settings" > "User I/F".

	Alarm Increment (Initial Settings > User I/F)	
	Normal	Small
Adult	5 Bpm increment	1 Bpm increment
Child/Neonate	2 Bpm increment	1 Bpm 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.
- If the alarm is based on the apnea time 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 sec. 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

- When [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".

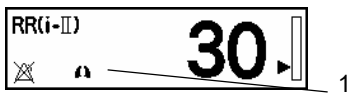
1 Press the key for "RR Synchronized Mark".

▸ The dropdown list will be displayed.

2 Select from [ON] or [OFF].

▸ [ON]: The mark synchronized to impedance respiration or CO_2 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 corresponded to the selected RR/APNEA alarm source is displayed.Make sure to display the numeric data box for the parameter set as the RR/APNEA alarm 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, CO_2, 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.

▸ [CO_2]: RR alarm will be generated based on the RR measured by the HPD-810 (Capnostat 5) or HCP-810. The RR synchronized mark based on CO_2 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 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 30 Bpm or above for 20 seconds (10 seconds for neonates) or more 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)" P6-8)
  (☞"To Silence or Suspend the System Alarm Sound" P6-9)
- 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" P11-7)
- 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

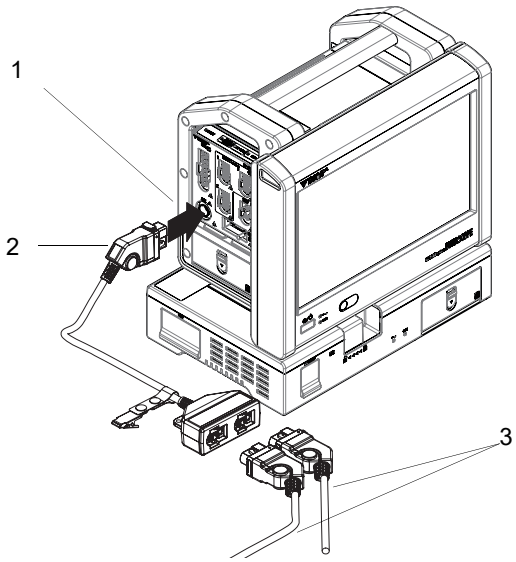
Super Unit utilizes multiparameter amplifier input method which allows monitoring of 2 channels of BP through the 2ch BP conversion cable, CJO-P01B-DJ0.5. The BP relay cable can be directly connected to the multiparameter connector.

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).

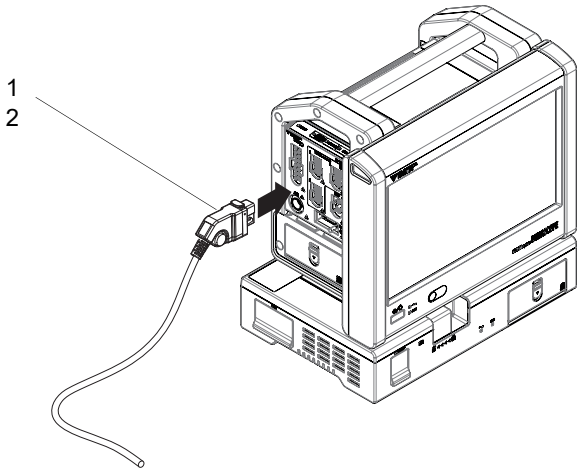
1 Multiparameter Connector
2 2ch BP Conversion Cable CJO-P01B-DJ0.5
3 1ch BP Relay Cable CJO-P01B-S**



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.

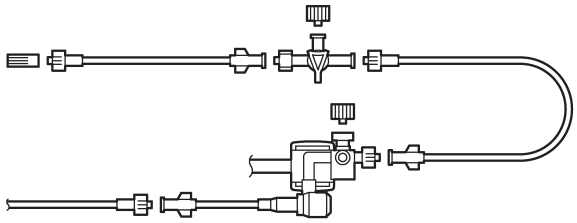
REFERENCE

- 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" P14-11)

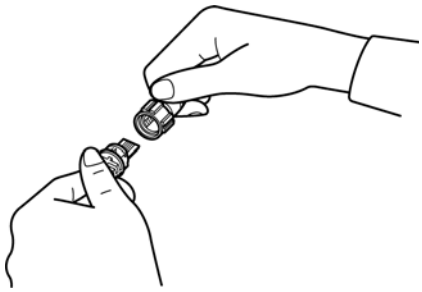
- The following procedure explains the case when a BP transducer (LS575 series) is used. If using other transducers, refer to the operation manual for the corresponding transducer.
  (☞"Invasive Blood Pressure Measurement (Manufactured by Fukuda Denshi)" P13-2)

1 Inspect transducer packaging for damage prior to opening.

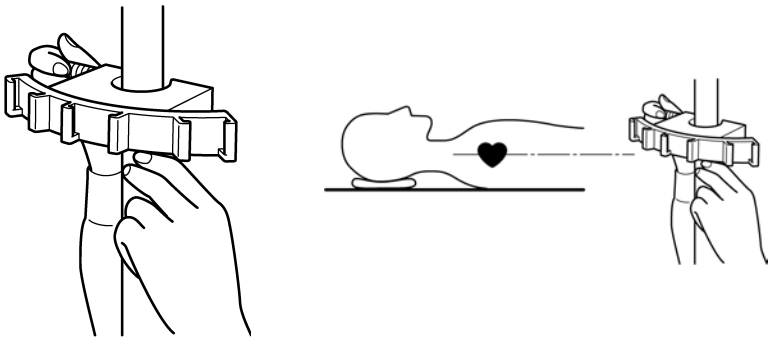
2 Verify that each connector is securely connected.



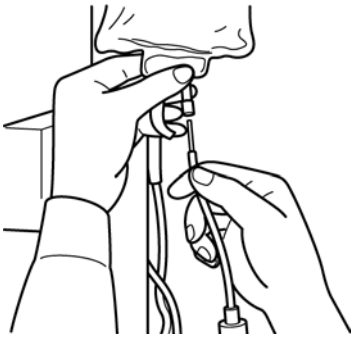
3 Connect the BP relay cable to the transducer.



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

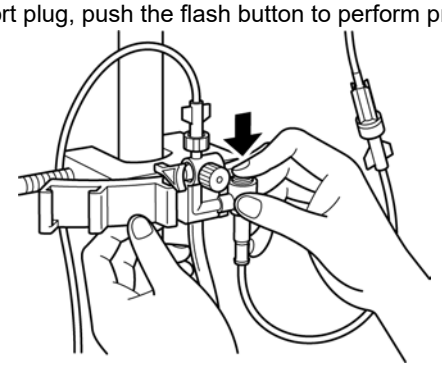


5 Inject 1000 units of heparin into the saline bag, mix thoroughly and puncture the infusion line through the same hole.

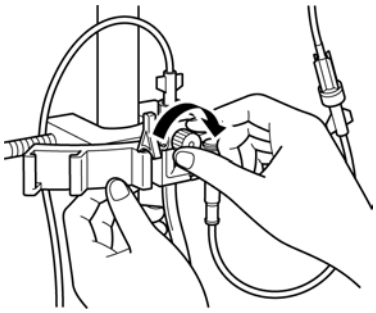


6 Set the saline bag to pressure bag, and hang from the infusion device. Fill saline to about 1/3 of the drip.

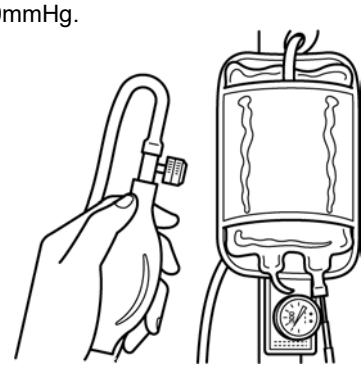
7 After loosening the zero-port plug, push the flash button to perform priming to remove air bubbles.



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.



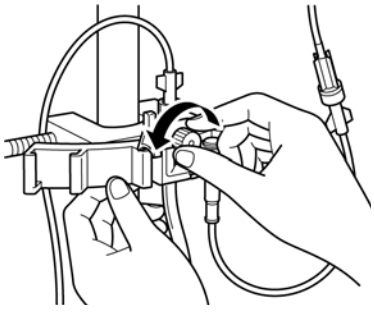
9 Inflate the pressure bag to 300mmHg.



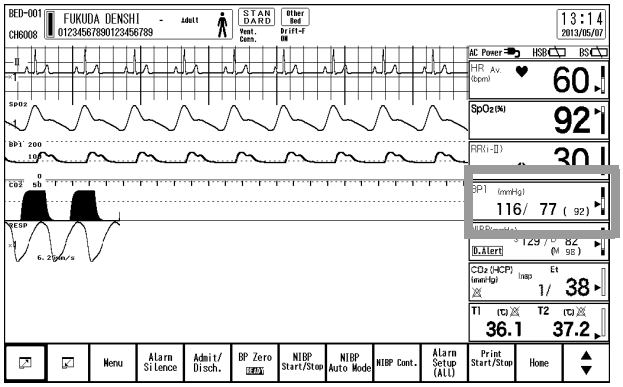
10 Set the BP device and wait for about 5 minutes.

3 Perform zero balance.

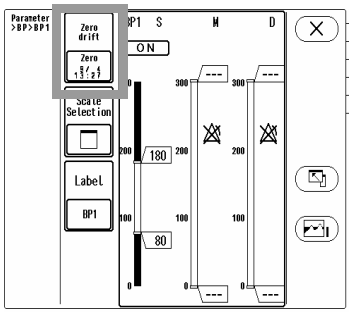
1 Loosen the zero-port plug on open-air three-way valve one-half turn.



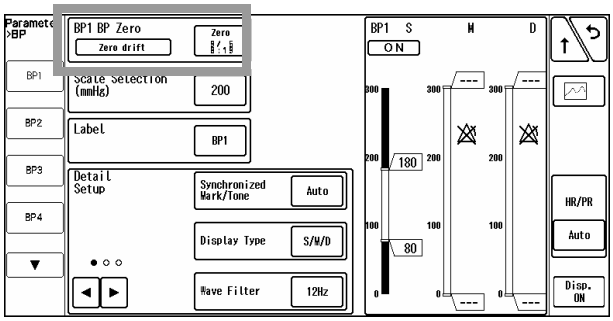
2 Press the BP numeric data box (parameter key) on the home display.



▸ The BP floating window will be displayed.

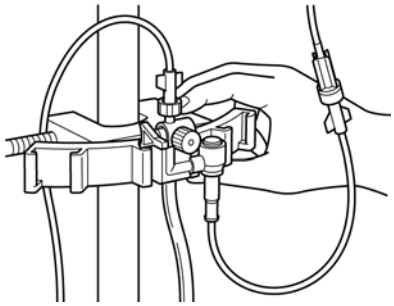


3 Press the [Zero] key on the BP floating window or BP parameter setup screen.

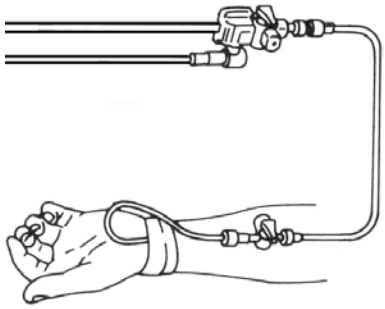


▸ Zero balance will start.

4 Turn off the zero-port plug side of the open-air three-way valve.



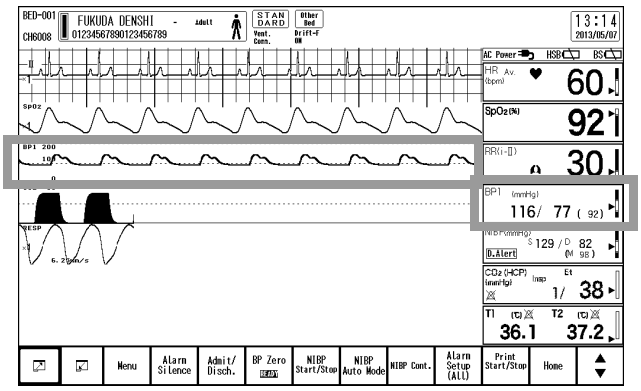
5 Connect the catheter to the end of monitoring line.



▸ 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.

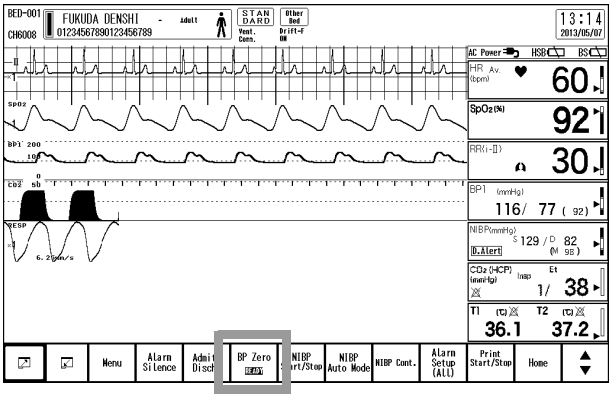


CAUTION

- 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

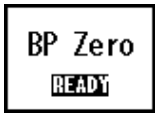
- If a message, "FAILED" is displayed, the three-way valve may not be opened to air, artifact is present, or the transducer may be defective. Check the cause and try the zero balance procedure again.
- If a message, "DRIFT" is displayed, verify that all the connections are secure.

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

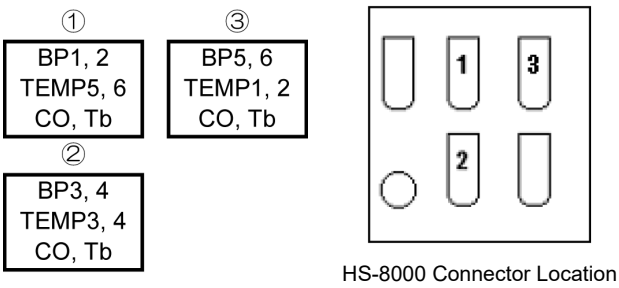
REFERENCE

- 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" P7-90)

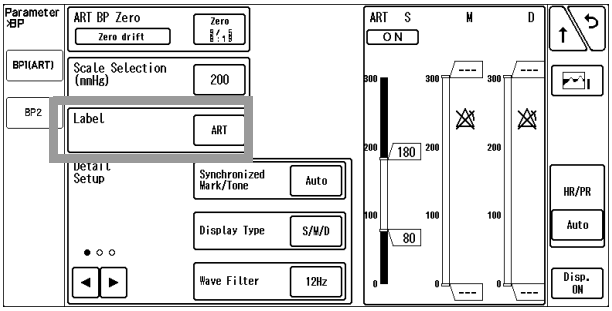


HS-8000 Connector Location

For example, if BP cable is connected to connector 1 and TEMP cable is connected to connector 3, the measured parameters are as follows.

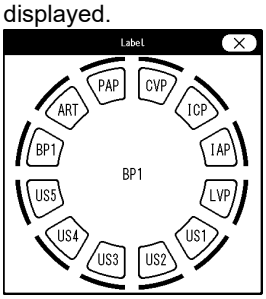
- BP1, 2 (BP1 if 2ch BP conversion cable is not used.)
- TEMP1, 2

❑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

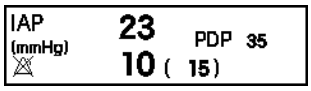
- US3 to US5 cannot be selected for the equipment connected to DS-LANII/III.

❑When the BP Label is ART

By selecting [ON] for "ART Catheter Check Message" [Menu>Parameter>BP1 (ART)>Detail Setup], an alarm will be generated when the catheter is disconnected.
(☞"Set the "ART Catheter Check Message"." P7-37)

❑When the BP Label is IAP

PDP (Peak Diastolic Pressure) of IABP can be displayed in addition to systolic, diastolic, and mean pressure. Note that Systolic Pressure (SYS) = Peak Systolic Pressure (PSP).

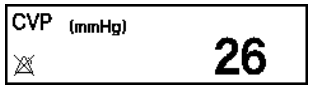


⚠ CAUTION

- Note that Systolic Pressure (SYS)=Peak Systolic Pressure (PSP) when reviewing graphic trend, data base, or when setting the alarm.
- When ECG is not measured, PDP cannot be calculated.

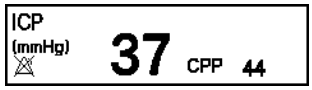
❑When the BP Label is CVP

The measurement unit can be selected from "mmHg", "kPa" or "cmH_2O".
The measurement unit can be selected on the "Initial Settings" menu. The selected unit will be displayed on the BP numeric data box.
(☞Maintenance Manual "Measurement Unit" P5-10)

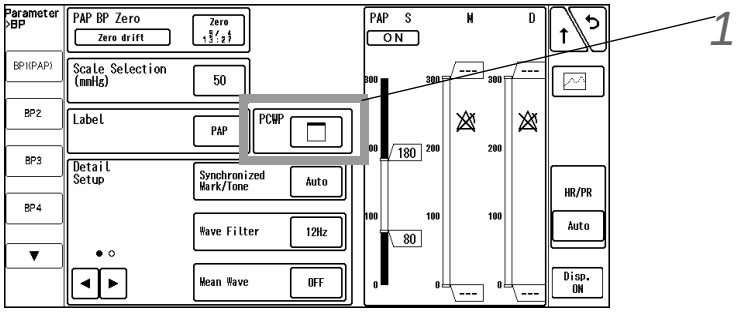


❑When the BP Label is ICP

CPP (Cerebral Perfusion Pressure) can be measured.
CPP = Mean Arterial Pressure – Mean Intracranial Pressure
If the CPP value is negative, the data will not be displayed. Also, alarm cannot be set for CPP.



❑PCWP Measurement

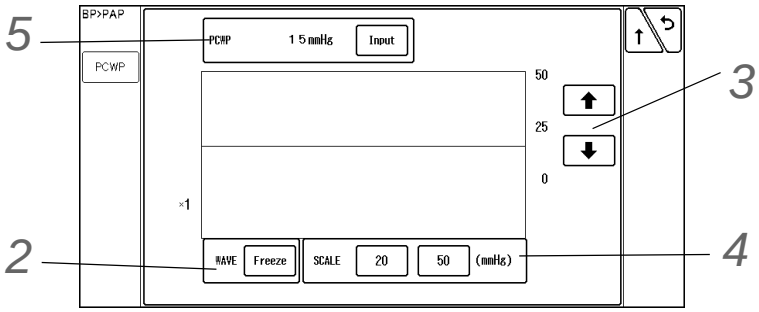


REFERENCE

- When PAP is set as BP label, the mean value can be displayed as PCWP (Pulmonary Capillary Wedge Pressure).
- On the PCWP screen, 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.

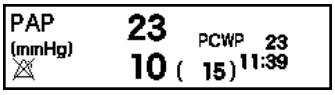
▸ The displayed waveform will freeze and cursor will be displayed. The cursor point indicates the current mean pressure.

3 Use the [↑] / [↓] 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.

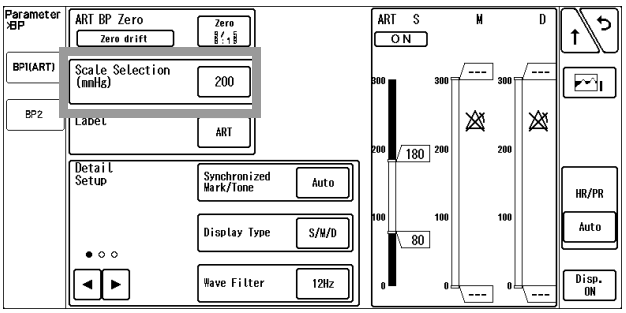
NOTE

- 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_2O
BP1 to BP6 User Label				○			○	○	○	○	○	○	○			
ART, IAP, LVP							○	○	○	○	○	○	○			
PAP				○		○	○	○	○	○	○	○	○			
CVP		○		○	○	○	○	○	○	○	○	○	○	○	○	
ICP	○	○	○	○			○	○	○	○	○	○	○			

REFERENCE

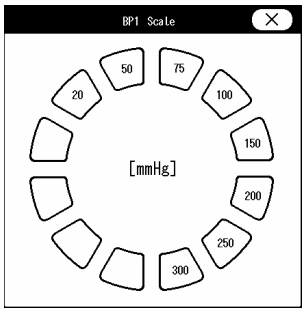
- The scale selection can be also displayed by pressing the BP scale on the home display.



1 Press the key for "Scale Selection".

▸ The scale selection window will be displayed.

2 Select the scale from the displayed selection.



❑Alarm Setup

1 Set the BP alarm.

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

NOTE

- Set the upper limit in the range of 2 mmHg to 300 mmHg / 0.2 kPa to 40.0 kPa. If a value above 300 mmHg / 40.0 kPa is set, the upper alarm will turn OFF.
- Set the lower limit in the range of 0 mmHg to 295 mmHg / 0 kPa to 39.5 kPa. If a value below 0 mmHg / 0 kPa 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.

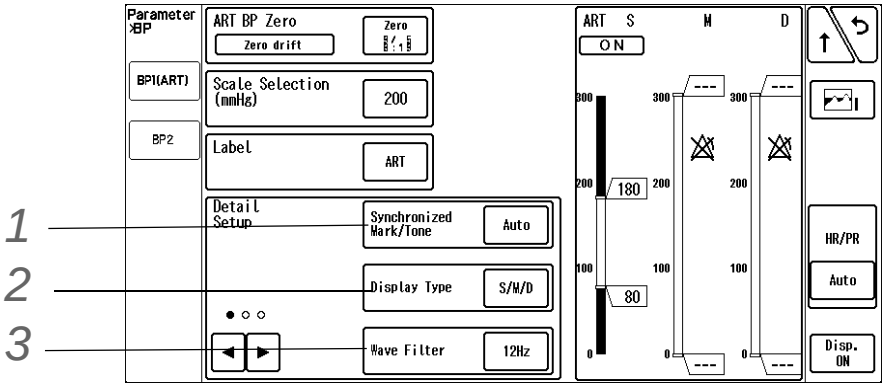
REFERENCE

- 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 50 mmHg / 7 kPa.
- When [Auto] is set for the BP label of BP1/ART, the upper and lower limit will be automatically set to +40 mmHg / +5 kPa and -20 mmHg / -3 kPa respectively to the current value.
- When [Auto] is set for the BP label other than BP1/ART, the upper and lower limit will be automatically set to +20%, –20% respectively to the current value.

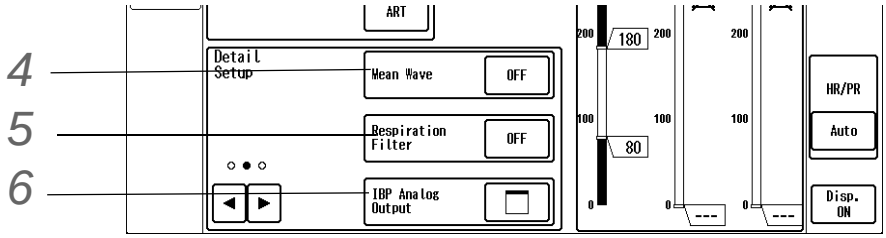
	"BP Alarm Increment" Setup	
	If [Normal] is selected;	If [Small] is selected;
0 mmHg to 50 mmHg	2 mmHg increment	1 mmHg increment
50 mmHg to 300 mmHg	5 mmHg increment	
0 kPa to 7 kPa	0.2 kPa increment	0.1 kPa increment
7 kPa to 40.0 kPa	0.5 kPa increment	

❑Detail Setup (BP Parameter)

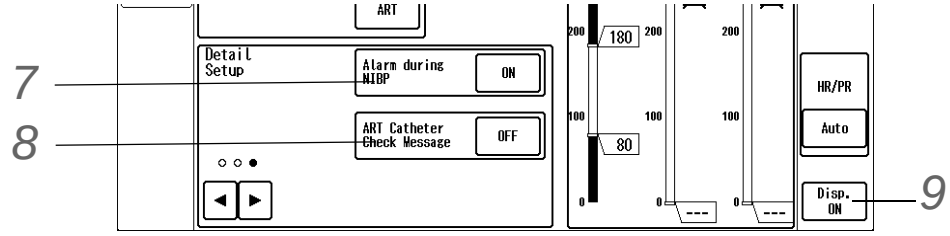
Press the [Menu], [BP] keys to display the BP setup screen.
The "BP" setup screen can be also displayed by pressing the detail key on the BP floating window.



Display Example when BP Label is BP1/ART: First Page



Second Page



Third Page

1 Set the "Synchronized Mark/Tone Priority". (BP1/ART)

REFERENCE

- The parameter to display the HR synchronized mark can be selected from ECG, SpO_2, and BP (BP1 or ART).If BP1 and ART are measured simultaneously, ART will be prioritized.

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

▸ The dropdown list will be displayed.

2 Select from [ECG]/ [SpO_2]/ [BP]/ [Auto]/ [OFF].

▸ [Auto]: The synchronized mark will be displayed in the priority of "ECG>SpO_2>BP".

▸ [ECG]: HR synchronized mark will be displayed.

▸ [SpO_2]: SpO_2 pulse wave 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

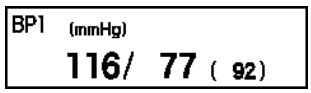
- The display type of numeric data can be selected from [S/M/D]/[S/D]/[M]. The BP alarm will not be generated unless the data is displayed.
- If the BP label is CVP, IAP, PAP, ICP, the display type is fixed.

1 Press the key for "Display Type".

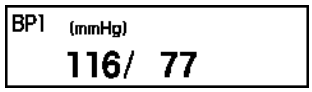
▸ The dropdown list will be displayed.

2 Select from [S/M/D]/ [S/D]/ [M].

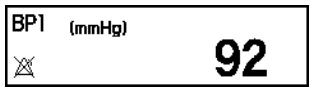
▸ [S/D/M]: The systolic/diastolic/mean BP value will be displayed.



▸ [S/D]: The systolic/diastolic BP value will be displayed.



▸ [M]: The mean BP value will be displayed.



3 Set the "Wave Filter".

REFERENCE

- Select an 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".

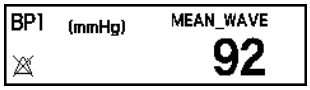
1 Press the key for "Mean Wave".

▸ 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 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 Set the "ART Catheter Check Message".

- [ON]: When the BP label is "ART" and the catheter is disconnected, check message will be displayed.
- [OFF]: ART catheter check message will not be displayed.

⚠ CAUTION

- The setting is common for all BP channels. When setting is changed for BP1, the same setting will be applied for BP2 to 6.

9 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 SpO_2 monitoring condition when the SpO_2 Unit (HS-8312N / HS-8312M) manufactured by Nellcor$_{TM}$ or Masimo is used.
(☞Maintenance Manual "Unit Module Setup" P4-11)

SpO_2 Monitoring

⚠ WARNING

- When measuring the SpO_2 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 due to the sensor heat which may result in burn injury.
- For the following case, accurate measurement 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
- When a patient is receiving a photodynamic therapy, measuring SpO_2 on a same site for a long duration may cause blisters from the irradiation light of the SpO_2 sensor. Make sure to periodically change the sensor attachment site.
- Do not connect unspecified sensor or cable to any I/O connector. If done so by mistake, not only that the equipment cannot deliver its maximum performance, the equipment may be damaged and safety cannot be ensured.
- If any measurement seems questionable, first check the patient's vital signs by alternate means and then check the pulse co-oximeter for proper functioning.
- For the following case, accurate measurement of SpO_2 may not be possible.
  - Improper sensor application
  - Elevated levels of COHb or MetHb: High levels of COHb or MetHb may occur with a seemingly normal SpO_2. When elevated levels of COHb or MetHb are suspected, laboratory analysis (CO-Oximetry) of a blood sample should be performed.
  - Elevated levels of bilirubin
  - Elevated levels of dyshemoglobin
  - Vasospastic disease, such as Raynaud's, and peripheral vascular disease
  - Hemoglobinopathies and synthesis disorders such as thalassemias, Hb s, Hb c, sickle cell, etc.
  - Hypocapnic or hypercapnic conditions
  - Severe anemia
  - Very low arterial perfusion
  - Extreme motion artifact
  - Abnormal venous pulsation or venous constriction

- Severe vasoconstriction or hypothermia
- Arterial catheters and intra-aortic balloon
- Intravascular dyes, such as indocyanine green or methylene blue
- Externally applied coloring and texture, such as nail polish, acrylic nails, glitter, etc.
- Birthmark(s), tattoos, skin discolorations, moisture on skin, deformed or abnormal fingers. etc.

- Dyes or any substance containing dyes that change usual blood pigmentation may cause erroneous readings.
- The SpO_2 data should not be used as the sole basis for diagnosis or therapy decisions. It must be used in conjunction with clinical signs and symptoms.
- Do not use the SpO_2 data to monitor apnea condition.
- This equipment may be used during defibrillation, but this may affect the accuracy or availability of the SpO_2 parameters and measurements.
- This equipment may be used during electrocautery, but this may affect the accuracy or availability of the SpO_2 parameters and measurements.
- The SpO_2 data cannot be used for arrhythmia analysis.
- SpO_2, SpCO, SpMet, and SpHb are empirically calibrated in healthy adult volunteers with normal levels of carboxyhemoglobin (COHb) and methemoglobin (MetHb).

⚠ CAUTION

- 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 site.
- Even attachment for a short duration may inhibit the blood flow and generate compression necrosis or burn injury. Also, blood flow inhibition may prevent correct measurements.
- If SpO_2 values indicate hypoxemia, a laboratory blood sample should be taken to confirm the patient's condition.
- If the <SpO_2 Low Perfusion> message is frequently displayed, find a better perfused monitoring site. In the interim, assess the patient and, if indicated, verify oxygenation status through other means.
- Change the application site or replace the sensor and/or patient cable when a <Replace Sensor>, <Replace Cable>, <Low Signal IQ> is displayed on the monitor. These messages may indicate that patient monitoring time is exhausted on the patient cable or sensor.
- Replace the cable or sensor when a <Replace Sensor> or <Low Signal IQ> message is consistently displayed while monitoring consecutive patients after completing troubleshooting steps listed in this manual.
- If using pulse oximetry during full body irradiation, keep the sensor out of the radiation field. If the sensor is exposed to the radiation, the reading might be inaccurate or the device might read zero for the duration of the active irradiation period.
- The device must be configured to match your local power line frequency to allow for the cancelation of noise introduced by fluorescent lights and other sources.
- Variation in hemoglobin measurements may be profound and may be affected by sampling technique as well as the patient's physiological conditions. Any results exhibiting inconsistency with the patient's clinical status should be repeated and/or supplemented with additional test data. Blood samples should be analyzed by laboratory devices prior to clinical decision making to completely understand the patient's condition.
- 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.

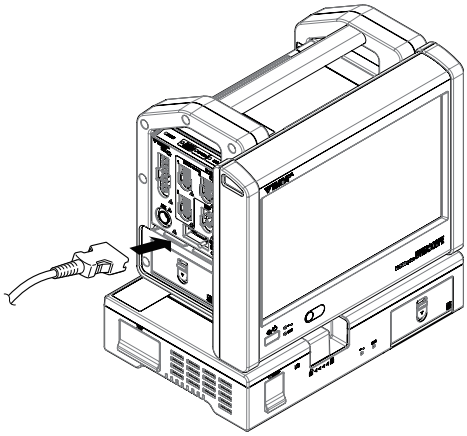
- As skin for neonate, premature infant is immature, change the sensor attachment site more frequently depending on the condition.
- Direct sunlight to the sensor area can cause a measurement error. Place a black or dark cloth over the sensor if using in direct sunlight.
- When not measuring, unplug the relay cable and sensor from the SpO_2 connector.Otherwise, the outside light may affect to falsely display measurements.
- If "– – –" is displayed for the numeric data, make sure that the sensor is properly attached.
- Before bathing the patient, make sure to remove the sensor and equipment from the patient.

1 Prepare an appropriate probe or sensor for the patient.
(☞"Pulse Oximetry Measurement (Manufactured by Covidien)" P13-3)
(☞"Pulse Oximetry Measurement (Manufactured by Masimo)" P13-4)

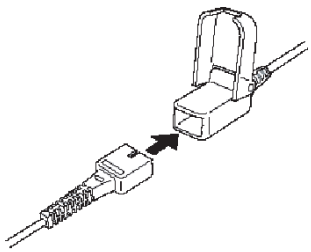
2 Connect the sensor to Super Unit.

In Case of Nellcor Unit:

1 Connect the DOC-10 SpO_2 Relay Cable to the SpO_2 connector on the HS-8312N.
The illustration is example of connection with DS-8200.



2 Insert the sensor into the SpO_2 relay cable connector, and lock it with the transparent cover.



In Case of Masimo Unit:

1 Connect the SpO_2 patient cable (LNOP®, LNCS®, Rainbow®) to the SpO_2 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 SpO_2 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.

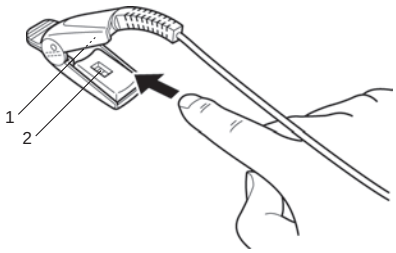
⚠ CAUTION

- 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

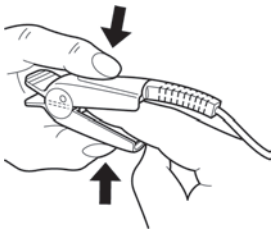
1 As shown below, the probe cable should be on the nail side.

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

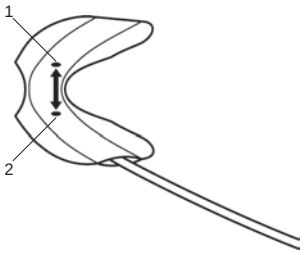
- This is to stabilize the probe, and to avoid ambient light.

Single-use Type

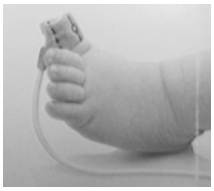
1 Clean the attachment site with alcohol, etc.

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.

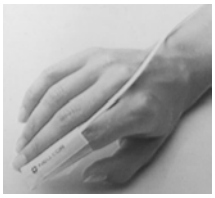
1 Light Emitting Element
2 Light Receiving Element



3 Secure the cable with surgical tape so that the sensor does not come off when the cable is pulled.

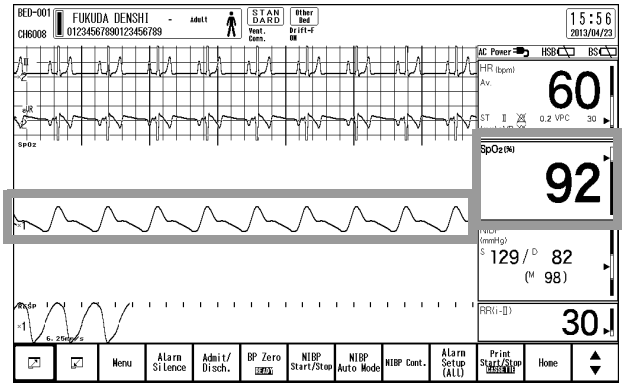


Attachment to the toe



Attachment to the finger

4 Verify that the SpO_2 measurement and SpO_2 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 measurements are provided only with specific Rainbow series sensors supporting specific parameter combinations. SpHb/SpMet and SpCO/SpMet are each valid sensor combinations which also support PVI. SpCO/SpHb is not a valid sensor combination.
- For details, contact your nearest service representative.

REFERENCE

- SpCO, SpMet, SpHb measurements are optional function.
  SpCO is a value (%SpCO) that represents the percentage of carboxyhemoglobin saturation

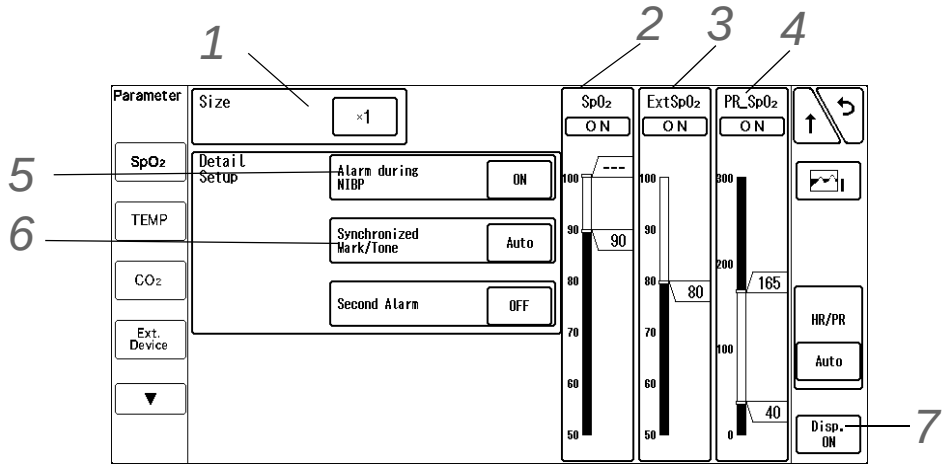
within the blood.
SpCO is a value (%SpMet) that represents the percentage of methemoglobin saturation within the blood.
SpHb is a value (g/dL) that represents the percentage of total hemoglobin saturation within the blood.
(☞"SpO_2 Parameter Setup (Masimo)" P7-46)

1 Select the Rainbow sensor for the patient.
(☞"Pulse Oximetry Measurement (Manufactured by Masimo)" P13-4)

2 The measurement procedure is the same with that of the SpO_2.
Verify that the SpCO, SpMet, SpHb value is displayed on the monitor.
(☞"SpO_2 Monitoring" P7-38)

SpO_2 Parameter Setup (Nellcor)

This section explains the measurement procedure when using the HS-8312N.
Press the [Menu], [SpO_2] keys to display the "SpO_2" setup screen.

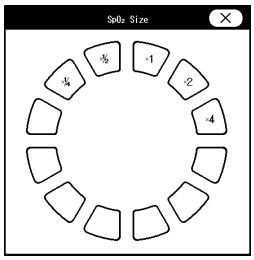


When Using the HS-8312N

1 Set the waveform size.

1 Press the key for "Size".

▸ The "Size" menu will be displayed.



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

2 Set the SpO_2 alarm.
(☞"Alarm Limit Setup for Each Parameter" P6-10)

NOTE

- Whether to use the second 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%SpO_2 to 100%SpO_2. If a value above 100%SpO_2 is set, the upper alarm will turn OFF.
- Set the lower limit in the range of 50%SpO_2 to 99%SpO_2. If a value below 50%SpO_2 is set, the lower alarm will turn OFF.

REFERENCE

- Also, when the SpO_2 value is unstable around the lower alarm limit, the frequently generated alarm can be corrected by setting the second alarm function.
  (☞"SpO_2 Second Alarm Setup" P6-3)
- When [Auto] is set, the upper limit will be turned OFF and the lower limit will be set to 90%SpO_2.
- The upper/lower limit can be set in 1%SpO_2 increment.
- ▶ indicates the current measurement value.
- The following delay occurs for the SpO_2 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 sec. to 9 sec.	About 7 sec. to 9 sec.
SpO_2 Alarm Signal Delay	OFF	About 5 sec.	0 sec.
	10	About 5 sec. to 7 sec.	About 5 sec. to 7 sec.
	25	About 11 sec. to 13 sec.	About 11 sec. to 13 sec.
	50	About 19 sec. to 22 sec.	About 19 sec. to 22 sec.
	100	About 36 sec. to 38 sec.	About 36 sec. to 38 sec.

3 Set the ExtSpO_2 alarm.
(☞"Alarm Limit Setup for Each Parameter" P6-10)

NOTE

- Set the lower limit in the range of 50%SpO_2 to 98%SpO_2. If a value below 50%SpO_2 is set, the lower alarm will turn OFF.
- The lower limit of ExtSpO_2 cannot be set above the lower limit of SpO_2.

REFERENCE

- When [Auto] is set, the lower limit will be set to "SpO_2 lower limit - 10%SpO_2".
- The lower limit can be set in 1%SpO_2 increment.
- ▶ indicates the current measurement value.
- The following delay occurs for the ExtSpO_2 alarm depending on the patient classification

and second alarm setting.

	Patient Classification	
	Adult/Child	Neonate
SpO_2 Alarm Status Delay	About 7 sec. to 9 sec.	About 7 sec. to 9 sec.
SpO_2 Alarm Signal Delay	About 5 sec.	0 sec.

4 Set the PR alarm.

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

NOTE

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

REFERENCE

- When [Auto] is set, the upper and lower limit will be automatically set to +40 bpm and -40 bpm 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 for 25 bpm and 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 sec. to 6 sec.
  - PR Alarm Signal Delay: <Adult/Child> About 5 sec., <Neonate> 0 sec.

5 Set the "Alarm during NIBP".

NOTE

- During the NIBP measurement, the cuff inflation restricts the blood flow which disables the correct detection of the SpO_2 and PR, and may generate an improper alarm.
- Selecting [OFF] for "Alarm during NIBP" will not generate the SpO_2, 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 SpO_2 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]: will not generate the SpO_2/ PR alarm during NIBP measurement.

6 Set the "Synchronized Mark/Tone".
(☞"BP Parameter Setup" P7-30)

7 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 SpO_2 will not be displayed either.

REFERENCE

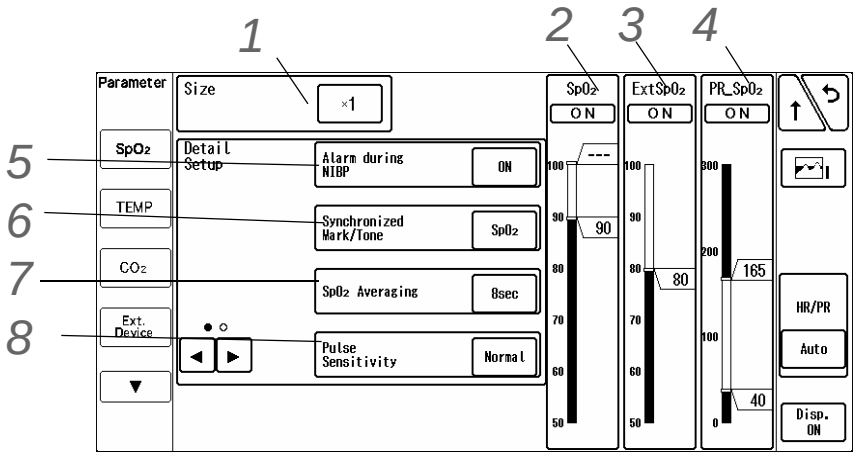
- When SpO_2 sensor is attached to the patient with the SpO_2 display set to OFF, and SpO_2 is measured for 10 seconds, the pulse wave and numeric data will be automatically displayed.

SpO_2 Parameter Setup (Masimo)

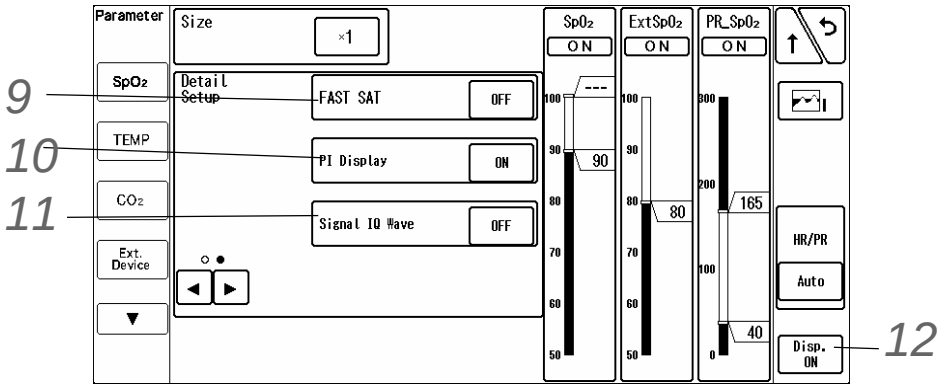
This section explains the procedure to set the monitoring condition when using the HS-8312M. Press the [Menu], [SpO_2] keys to display the "SpO_2" setup screen.

REFERENCE

- This setting is available when using the HS-8312M. PVI, SpCO, SpMet, SpHb measurements are optional functions.



When Using the HS-8312M SpO_2 Setup: 2nd Page



SpO_2 Setup: 2nd Page

1 Select the waveform size.

(☞"SpO_2 Parameter Setup (Nellcor)" P7-43)

2 Set the SpO_2 alarm.

(☞"SpO_2 Parameter Setup (Nellcor)" P7-43)

REFERENCE

- The following delay occurs for the SpO_2 alarm depending on the patient classification and SpO_2 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 ExtSpO_2 alarm.

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

NOTE

- Set the lower limit in the range of 50%SpO_2 to 98%SpO_2. If a value below 50%SpO_2 is set, the lower alarm will turn OFF.
- The lower limit of ExtSpO_2 cannot be set above the lower limit of SpO_2.

REFERENCE

- When [Auto] is set, the lower limit will be set to "SpO_2 lower limit - 10%SpO_2".
- The lower limit can be set in 1%SpO_2 increment.
- ▶ indicates the current measurement value.
- The following delay occurs for the ExtSpO_2 alarm depending on the patient classification and second alarm setting.

	Patient Classification	
	Adult/Child	Neonate
SpO_2 Alarm Status Delay	About 7 sec. to 9 sec.	About 7 sec. to 9 sec.
SpO_2 Alarm Signal Delay	About 5 sec.	0 sec.

4 Set the PR alarm.
(☞"SpO_2 Parameter Setup (Nellcor)" P7-43)

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.

5 Set the "Alarm during NIBP".
(☞"SpO_2 Parameter Setup (Nellcor)" P7-43)

NOTE

- Selecting [OFF] for "Alarm during NIBP" will not generate the SpO_2, PR, SpCO, SpMet, SpHb alarm until the NIBP measurement is complete.

6 Set the "Synchronized Mark/Tone".
(☞"BP Parameter Setup" P7-30)

7 Set the "SpO_2 Averaging".

⚠ WARNING

- Be careful when setting the "SpO_2 Averaging" duration as the SpO_2 alarm is based on the displayed SpO_2 value which is averaged from the duration set in "SpO_2 Averaging". The alarm occurrence time will be affected or may not occur for the transient value of SpO_2 depending on the set duration.

1 Press the key for "SpO_2 Averaging".
▸ The dropdown list will be displayed.

2 Select from [2-4sec.]/ [4-6sec.]/ [8sec.]/ [10sec.]/ [12sec.]/ [14sec.]/ [16sec.].

8 Set the pulse detection sensitivity.

1 Press the "Pulse Sensitivity" key.
▸ The pulse sensitivity dropdown list will be displayed.

2 Select from [High] /[Normal] /[APOD].

⚠ CAUTION

- If [High] is selected for pulse sensitivity, probe-off detection will become somewhat inaccurate.

NOTE

- To improve the low perfusion condition, or to perform fast tracking when the SpO_2 value changes abruptly, select [High] .

- For standard use, select [Normal].
- If accurate probe-off detection is necessary, select [APOD]. (APOD: Adaptive Probe-Off Detection)
  [APOD] function is available from HS-8000 V05-07. For prior version, [Normal] will be set if [APOD] is selected.

9 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, SpO_2 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 SpO_2 value can be monitored.

▸ [OFF]: FAST SAT will be cancelled.

10 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.

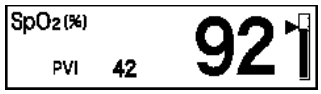
1 Press the key for "PI Display".

▸ 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%.

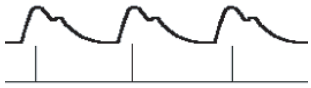
11 Set the signal IQ wave display.

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.

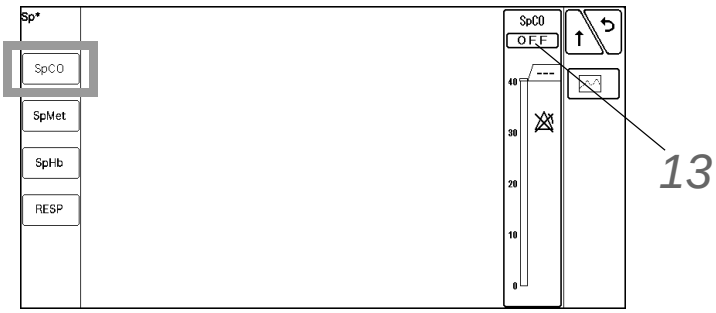
2 Select from [ON] or [OFF].

12 Select ON/OFF for parameter display.

(☞"SpO_2 Parameter Setup (Nellcor)" P7-43)

13 Set the SpCO alarm.

[Press the [▶], [Sp*], [SpCO] keys to display the SpCO alarm setup screen.



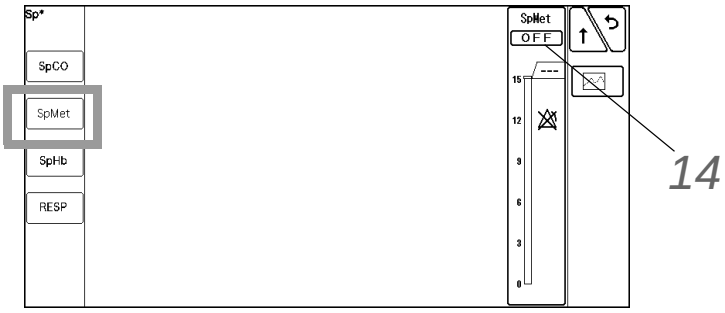
CAUTION

- 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.

14 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.



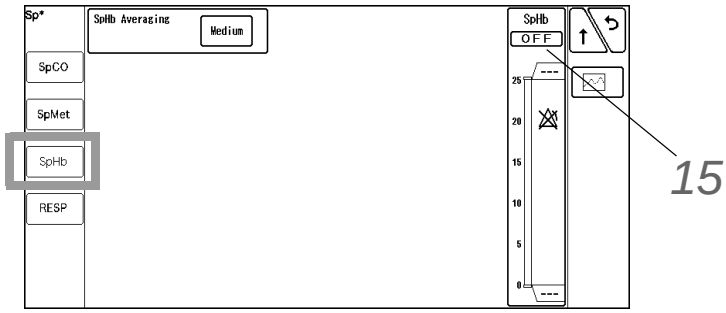
CAUTION

- 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.

15 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 300 mmHg for adult, 210 mmHg for child, and 150 mmHg 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 following factors may affect the NIBP value.
  - Body motion, arrhythmia, convulsion, low pulse pressure, slow pulse
  - Continuous noise such as cardiac massage
  - Noise from the electrosurgical instrument

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 (Manufactured by Fukuda Denshi)" P13-2)

NIBP Monitoring

⚠ WARNING

- Before the NIBP measurement, make sure the patient classification ([Adult]/[Child]/[Neonate]) is properly selected on the "Admit/Discharge" menu. Otherwise, correct measurement cannot be performed, and congestion or other injury may result.

⚠ CAUTION

- Correct NIBP measurement cannot be performed if oxygenator is used or if the pulse is difficult to detect.
- Pay attention when measuring the NIBP of patient with bleeding disorders or hypercoagulation.The cuff inflation constricting the arm may cause petechia or circulatory failure with blood clot.
- Do not apply the cuff to the arm or thigh where vein is secured. The blood may backflow causing the chemical injection to cease.

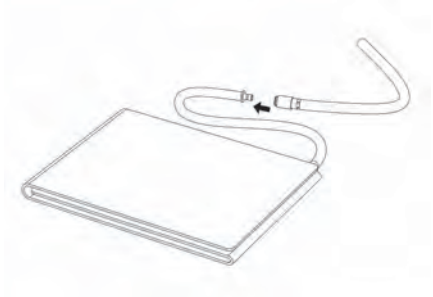
- Properly arrange the cuff and air hose.
- Check the condition of cuff-applied part on the patient during measurement so that the blood circulation will not be blocked over long period of time by the squashed or bent cuff hose.
- Check the patient's condition constantly while measuring over a long period 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 continuous measurement 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.
- The following factors may affect the NIBP value.
  - Body motion, arrhythmia, convulsion
  - Continuous noise such as cardiac massage
  - Periodic electromagnetic noise
- If the cuff inflation may adversely affect the patient's blood flow or wound, attach the cuff to an appropriate position under physician's instruction.
- Do not apply the NIBP cuff to the arm of the mastectomized side. It may cause swelling or other circulatory failure.
- It is not intended for measuring the NIBP of pregnant patient, including pre-eclamptic. It may cause incorrect NIBP measurement.
- Pay attention when measuring the NIBP of pregnant (including pre-eclamptic) patient. It may affect the NIBP value.

1 Select the appropriate cuff type for the patient.
(☞"Lineup of Cuffs" P7-52)

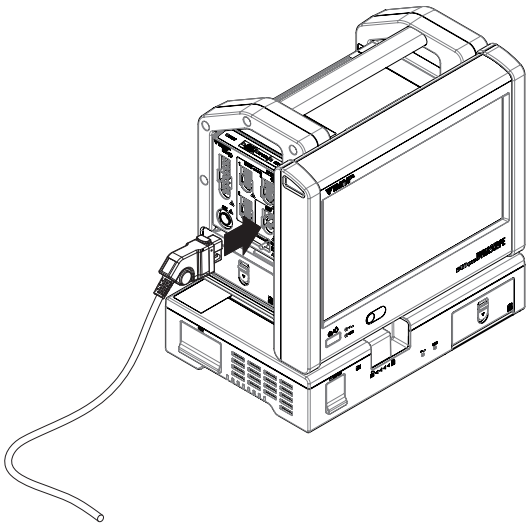
⚠ CAUTION

- 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.



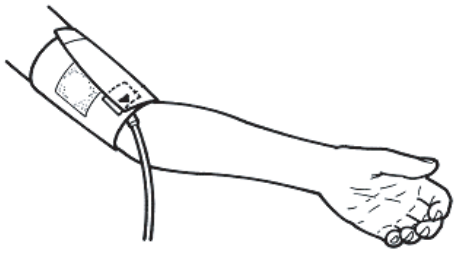
⚠ CAUTION

- 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.

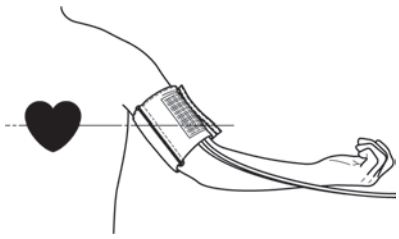


NOTE

- 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.

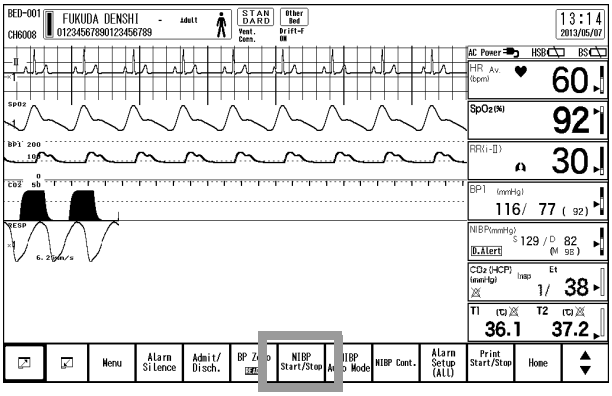
REFERENCE

- 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 SpO_2 waveform.

Inflation Mode Setup

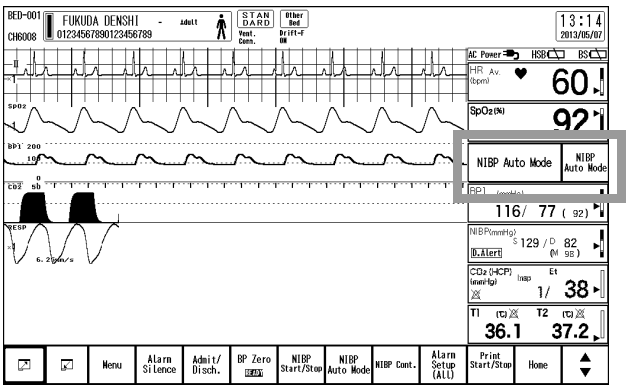
The maximum inflation value and measurement duration needs to be changed according to the patient classification. The inflation mode will automatically change according to the patient classification setting. Set the appropriate patient classification on "Admit/Discharge" menu or "Detail Setup" menu under NIBP parameter setup.

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, measurement range, and alarm limit range for this exhaust system is set according to the patient classification setting.

Patient Classification	Initial Inflation Value	Maximum Inflation Value	Maximum Measurement Duration
Adult	180 mmHg	300 mmHg	160 sec.
Child	140 mmHg	210 mmHg	160 sec.
Neonate	110 mmHg	150 mmHg	80 sec.

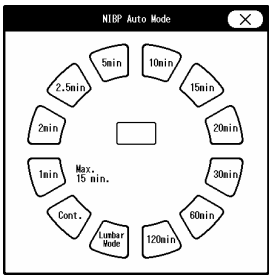
NIBP Auto Mode Setup

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" P7-59)
- The Lumbar mode should be used with sufficient safety measures.

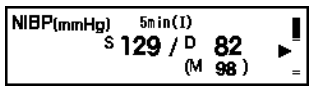
NOTE

- 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.

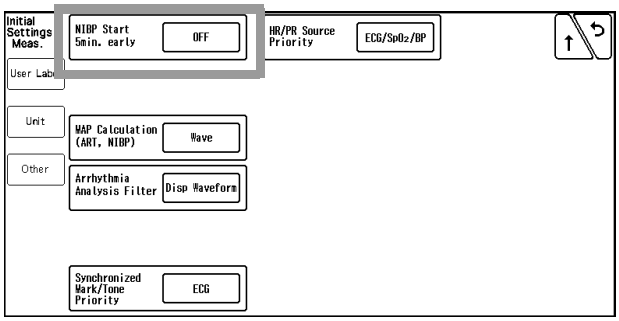
▸ The measurement will automatically start at selected interval.

▸ 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]

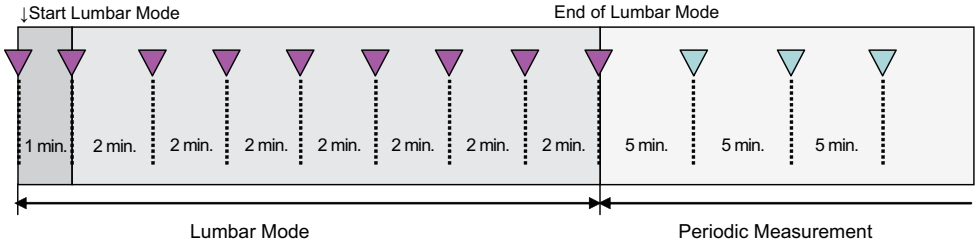


- On the "Initial Settings", whether or not to backup the NIBP measurement interval at discharge/power ON can be selected. (OFF/Backup/OFF→2.5min./OFF→5min.)

❑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.

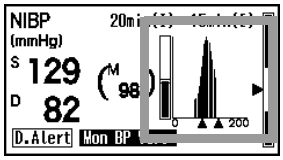
When the Lumbar mode ends, 5-minute interval measurement will automatically start.

⚠ 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" P7-61)



The description of the oscillation graph is as follows.

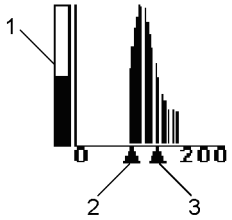
The horizontal axis shows the cuff pressure, and vertical axis shows the pulse amplitude with reference to maximum pulse amplitude.

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 the Nellcor SpO_2 module.

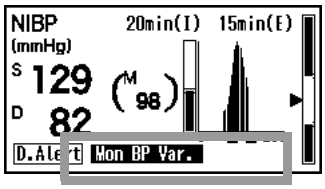
When [ON] is selected for "Dyna Alert", NIBP measurement will automatically start when the Dyna Alert estimated value exceeds the alarm limit. The function will activate with the following condition.
(☞"NIBP Parameter Setup" P7-61)

- Patient Classification: Adult (20 kg or above)
- Cuff Applied Site: Upper Arm
- SpO_2 Sensor Attachment Site: Fingertip
- NIBP Measurement Interval: 5 minutes to 60 minutes

⚠ CAUTION

- When the 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 the Nellcor SpO_2 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

D.Alert Color of Mark	Message	Status	Dyna Alert Function Status*1
Green	PTG Low Perfusion	PTG amplitude is 200unit or above, and below 800unit.	Enable
	Mon. BP Var.	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 suspends the measurement when 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.

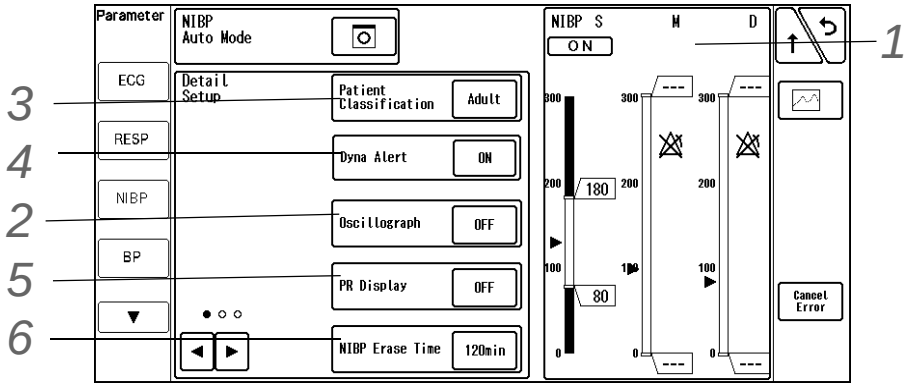
*2: "Measuring BP" indicates the status when IBP (BP1 or ART) measurement is possible and can be displayed on the monitor.

⚠ CAUTION

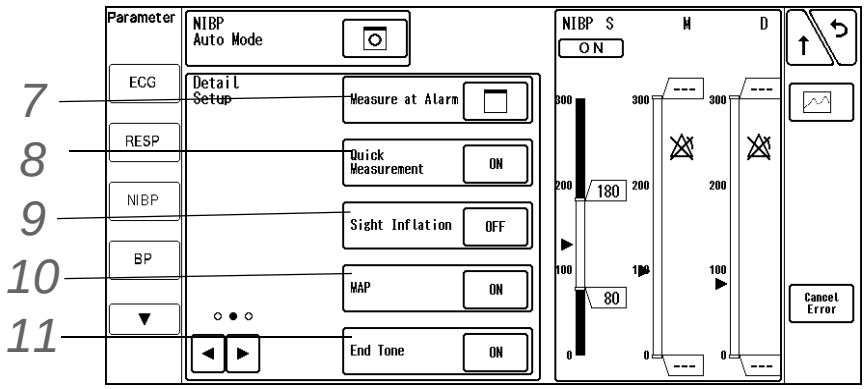
- When using the Dyna Alert function, be aware of these risks and do not increase the NIBP interval time by relying only on the Dyna Alert function.
- After the Dyna Alert NIBP measurement, the next Dyna Alert NIBP measurement cannot be performed for 2.5 minutes.
- The Dyna Alert will not properly function for the following cases.
  - If peripheral circulatory insufficiency or very low BP is developed.
  - If highly-frequent arrhythmia is generated.
  - If an oxygenator 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

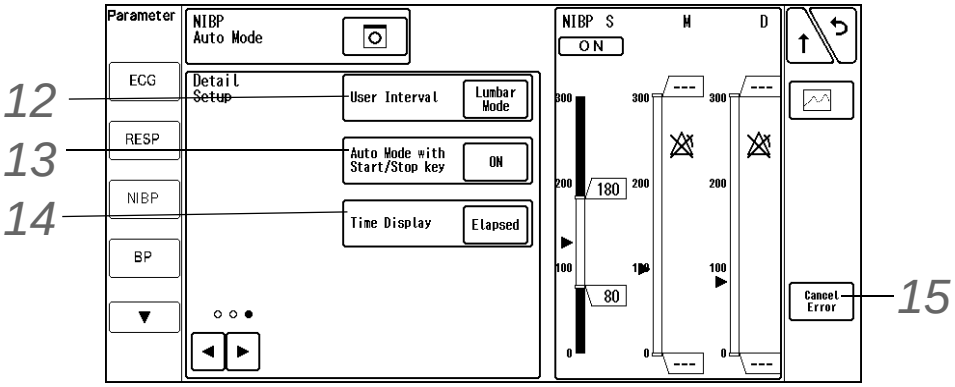
Press the [Menu], [NIBP] keys to display the NIBP setup menu.



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 mmHg to 300 mmHg / 2.0 kPa to 40.0 kPa. If a value above 300 mmHg / 40.0 kPa is set, the upper alarm will turn OFF.
- Set the lower limit in the range of 10 mmHg to 295 mmHg / 1.5 kPa to 39.5 kPa. If a value below 10 mmHg / 1.5 kPa 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 set, the upper and lower limit will be automatically set to +40 mmHg / +5 kPa and -20 mmHg / -3 kPa respectively to the current value.
- The alarm limit should be set for each unit (mmHg/kPa).
- The upper/lower limit can be set in 5 mmHg / 0.5 kPa increment.

2 Oscillation Graph 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.

[Real Time]: Oscillation graph will be updated during the measurement.

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.

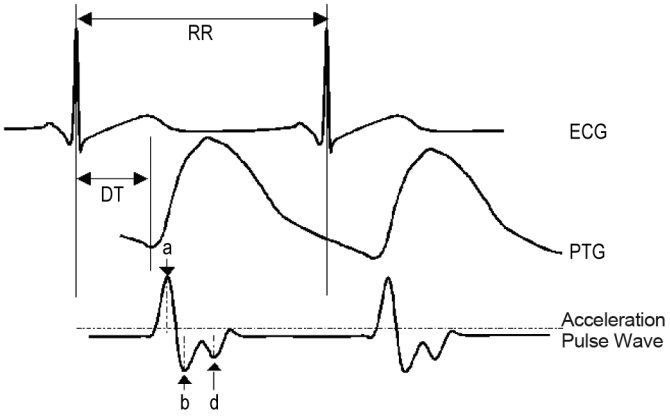
(☞"Inflation Mode Setup" P7-56)

⚠ WARNING

- The patient classification selection influences the precision of the QRS detection and NIBP measurement. Make sure the correct selection is made.
- The NIBP air hose corresponded to the set patient classification must be used to perform NIBP measurement. 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.



Parameters used for Dyna Alert Function

⚠ CAUTION

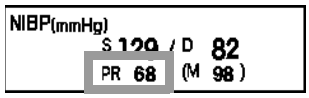
- When the PTG (SpO_2) sensor is applied to the toe or forehead, the circulatory dynamics variation monitoring by the Dyna Alert may not properly function.
- The circulatory dynamics variation monitoring by the Dyna Alert is effective only on the HS-8312N with the Nellcor SpO_2 module.

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 displayed only. It will not generate alarm, or be displayed for the tabular trend.

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

- Multiple parameters can be selected.

8 Quick Measurement

[ON]: NIBP measurement will be performed in duration of about 20 seconds 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

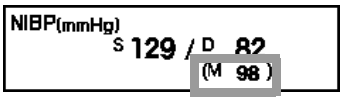
inflate to the fixed value (Adult: 180 mmHg, Child: 140 mmHg, Neonate: 110 mmHg) regardless of the sight inflation setting.

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 MAP

[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" P7-59)

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 after the patient is discharged regardless of whether the next patient is admitted or not.
- [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 the 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 canceled.

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" P11-33)

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.

⚠ CAUTION

- Before the measurement, make sure that the specified probe/relay cable is used. If unspecified probe/relay cable is used, measurement error may occur.
- Stop using the probe if it is damaged.

NOTE

- 700 series temperature probe cannot be used.

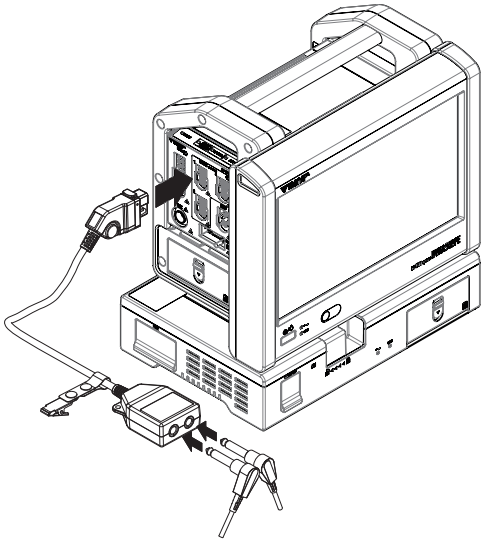
2 Connect the probe to Super Unit.

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.

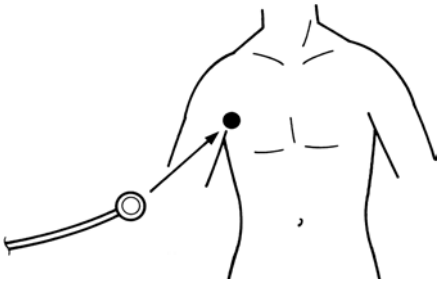
2 Connect the temperature probe to the 2ch temperature relay cable.



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

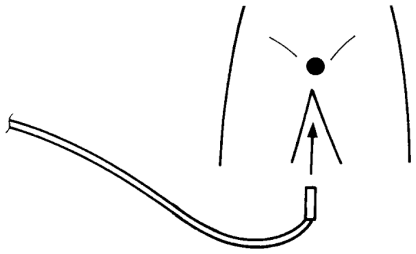
- The probe location shown above is an example. Adjust the probe location according to the patient's condition.

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.

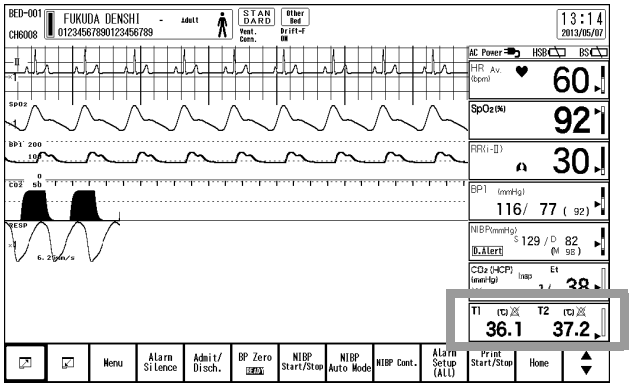
3 Secure the probe to inner thigh with surgical tape.



4 Check that the temperature is displayed.

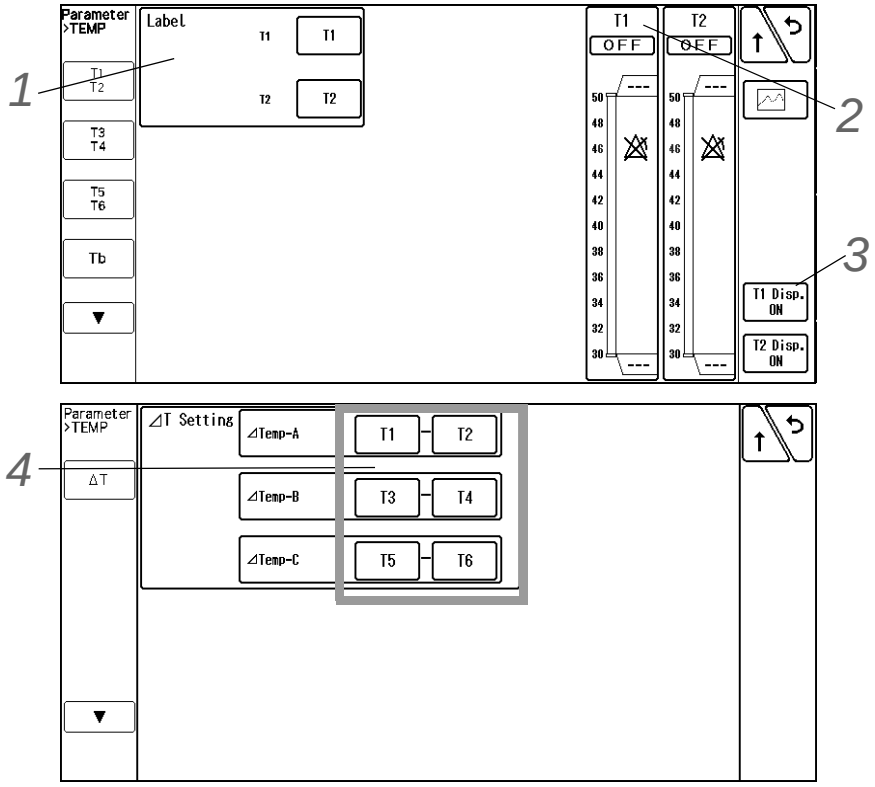
1 Press the [Home] key on the user key.

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.



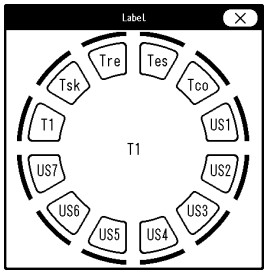
TEMP Parameter Setup

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)

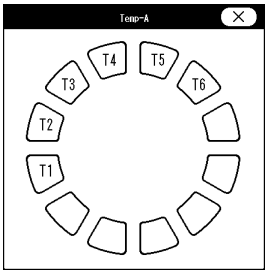
⚠ CAUTION

- 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 (ΔTemp-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" P10-5)
- 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 (Tb) 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.

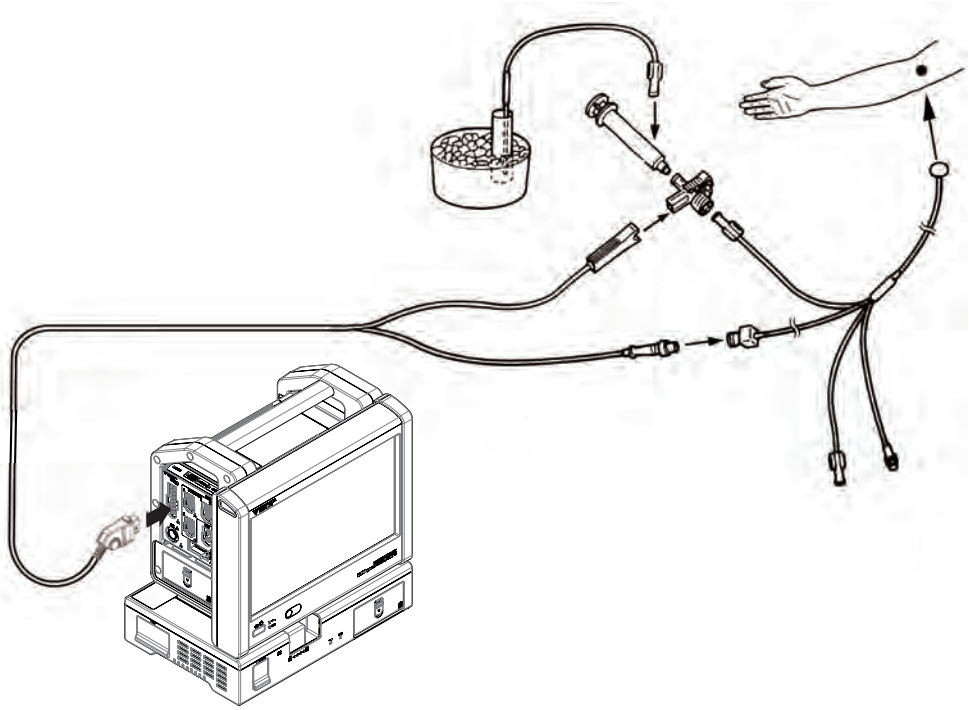
NOTE

- The usable catheter relay cable depends on the injectate temperature measurement method. Select the appropriate cable according to the method.

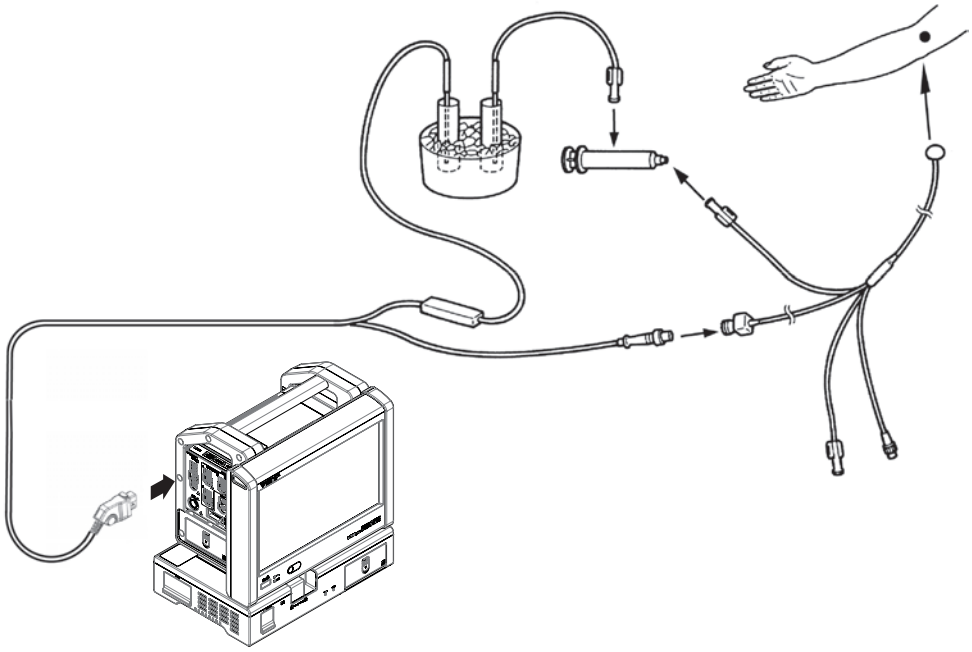
Measurement Method	Catheter Relay Cable
0°C/24°C Temperature	CJO-P01C-C2.4
Flow-through Sensor	CJO-P01C-F2.4
In-line Sensor	CJO-P01C-L2.4
Injectate Temperature Probe	CJO-P01C-T2.4

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

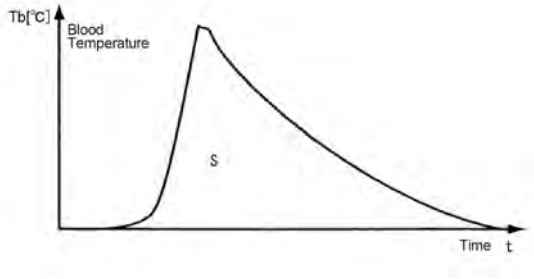


Cardiac Output Measurement Algorithm

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]
		ΔTb(t) : Temperature change of Tb after "t" seconds. [°C]
CC	:	Catheter Constant (Computation Constant: CC value)
Si	:	Specific Gravity of Injectate [g/cm^3]
Sb	:	Specific Gravity of Blood [g/cm^3]
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*Ci)/(Sb*Cb) = 1.08 is programmed for this equipment.

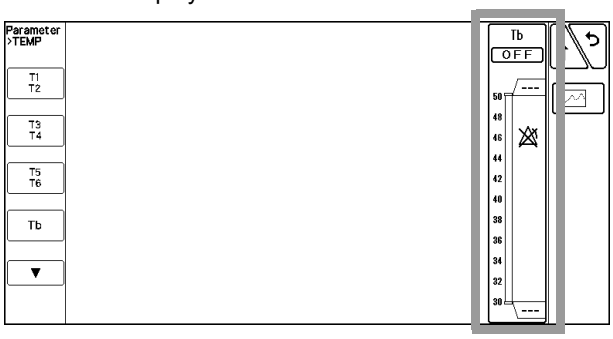
NOTE

- 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°C to 45.0°C/88.0°F to 113.0°F. If a value above 45.0°C/113.0°F is set, the upper alarm will turn OFF.
- Set the lower limit in the range of 30.0°C to 44.0°C/86.0°F to 111.0°F. If a value below 30.0°C/86.0°F is set, the lower alarm will turn OFF.

REFERENCE

- The upper and lower limit can be set in 0.5°C/1.0°F increments.
- When [Auto] is set, the upper and lower limit will be automatically set to +2.0°C/+4.0°F and -2.0°C/-4.0°F to the current value respectively.

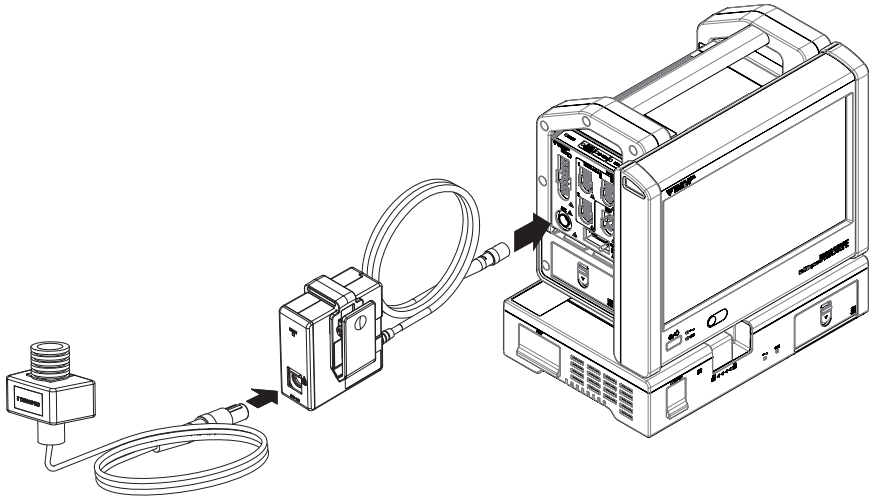
CO_2 Concentration (Mainstream Method)

This section explains about the CO_2 concentration measurement procedure and measurement condition setup when using the Philips Capnostat 5 (Mainstream Method, Gas Unit I/F HPD-810) .

Patient Application and Display

By using the HPD-800/HPD-810 Gas Unit I/F, CO_2 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 CO_2 sensor (Capnostat 5) to the CO_2 connector on the HPD-800/HPD-810.



- The CO_2 sensor will automatically begin warming up.
- During the warm up period, the message "CO_2 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 CO_2 sensor requires a warming up process to achieve stable operating temperature.

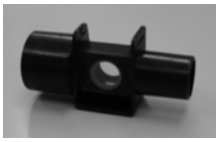
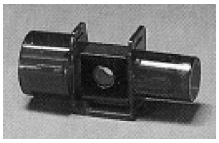
2 Prepare an airway adapter suitable for the patient.

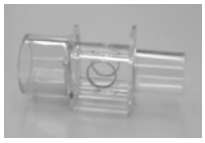
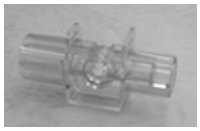
⚠ CAUTION

- 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 CO_2 sensor to the airway adapter until a click sound is heard.

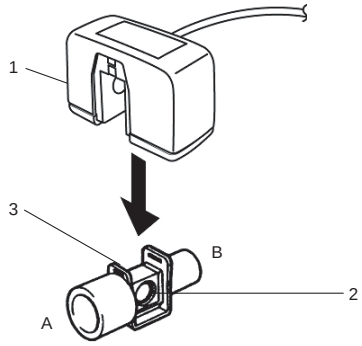
1 Capnostat 5 CO_2 Sensor

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 CO_2 sensor or airway adapter.

4 Perform the setting for the O_2 compensation, N_2O compensation, anesthetic gas compensation, atmospheric pressure

(☞"CO_2 Parameter Setup" P7-77)

NOTE

- Set these items each time the condition changes.

5 Press the [Menu], [CO_2] ("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 CO_2 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 CO_2 sensor from the airway adapter temporarily, and attach the airway adapter to the patient's respiration circuit.

7 Connect the CO_2 sensor to the airway adapter.

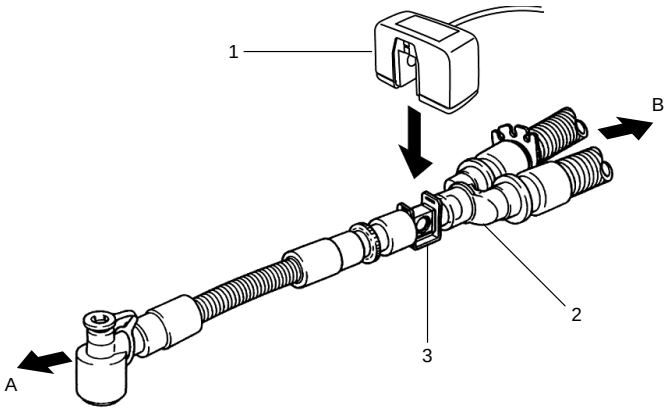
1 Capnostat 5 CO_2 Sensor

2 Y-Piece

3 Airway Adapter for Adult

A: Patient Side

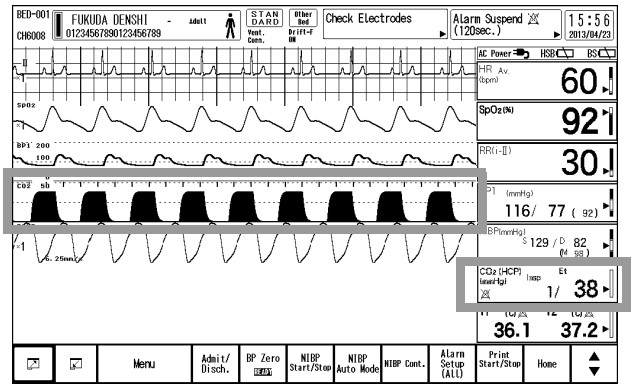
B: Equipment Side



NOTE

- Attach the airway adapter between the patient's circuit Y-piece and intubation tube.
- The CO_2 sensor should be facing upward.

8 Verify that the CO_2 waveform, EtCO_2 value, InspCO_2 value are displayed.

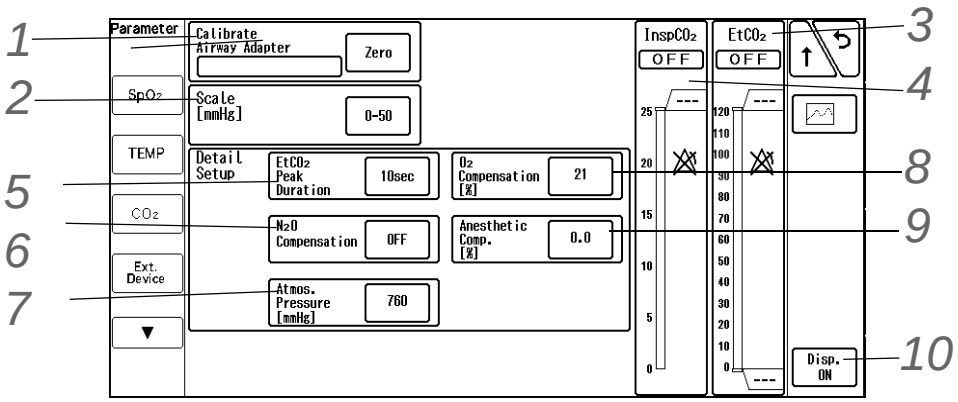


NOTE

- Set the scale, measurement unit, alarm, etc. as necessary.

CO_2 Parameter Setup

Press the [Menu], [CO_2] keys to display the "CO_2" setup screen.



1 Calibrate Airway Adapter

The airway adapter will be calibrated.

(☞"Patient Application and Display" P7-73)

2 Scale

Select from [0-50]/[0-100] if the measurement unit is mmHg, and from [0-4]/[0-8]/[0-10] if the unit is kPa or %.

3 $EtCO_2$ (End-tidal CO_2)

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

NOTE

- $EtCO_2$ 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 mmHg to 100 mmHg/0.3 kPa to 13.3 kPa/0.3% to 13.3%.
  Setting a value above 100 mmHg/3.3 kPa/13.3% will turn OFF the alarm.
- Set the lower limit in the range of 1 mmHg to 98 mmHg/0.1 kPa to 13.1 kPa/0.1% to 13.1%.
  Setting a value below 1 mmHg/0.1 kPa/0.1% will turn OFF the alarm.

REFERENCE

- The alarm limit should be set for each unit (mmHg/kPa/%).
- The upper/lower limit can be set in 1 mmHg/0.1 kPa/0.1% increment.
- When [Auto] is set, the upper and lower limit will be automatically set to +10 mmHg / +1.3 kPa / +1.3%, and -10 mmHg / -1.3 kPa / -1.3% respectively to the current value.

4 $InspCO_2$ (Inspired CO_2)

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

NOTE

- $InspCO_2$ 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 mmHg to 4 mmHg/0.1 kPa to 0.4 kPa/0.1% to

0.4%.
Setting a value equal to or above 4 mmHg/0.4 kPa/0.4% will turn OFF the alarm.

REFERENCE

- The alarm limit should be set for each unit (mmHg/kPa/%).
- The upper limit can be set in 1 mmHg/0.1 kPa/0.1% increments. There is no lower limit.
- When [Auto] is set, the upper limit will be set to 3 mmHg / 0.4 kPa / 0.4%.

5 $EtCO_2$ Peak Duration

[10sec]/[20sec]: Maximum $EtCO_2$ value for the selected duration will be displayed.
[OFF]: $EtCO_2$ value for each respiration will be displayed.

NOTE

- As the $EtCO_2$ value display is updated each second, $EtCO_2$ value for each respiration cannot be displayed if respiration rate is 60 Bpm and above.
- For the $InspCO_2$ value, minimum value of 20 seconds will be displayed regardless of the setting.

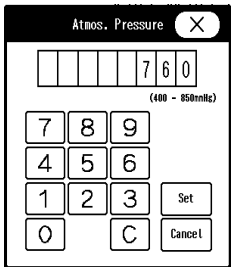
6 N_2O Compensation

NOTE

- If N_2O is present in the respiration circuit, the CO_2 value tends to be displayed higher than the actual value. By setting the N_2O compensation to [ON], this can be adjusted.

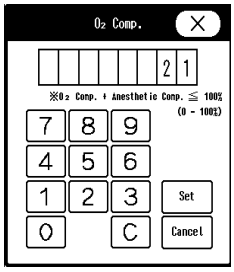
7 Atmospheric Pressure

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 [Set] key.



8 O_2 Compensation

By entering the used O_2 concentration value, compensation can be made to display more accurate value.
Enter the O_2 compensation value on the "O_2" screen, and press the [Set] key.

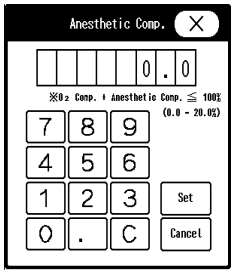


NOTE

- The value cannot be changed if the total value of O_2 compensation and anesthetic agent compensation exceeds 100%. In such case, change the O_2 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 [Set] key.



NOTE

- The value cannot be changed if the total value of O_2 compensation and anesthetic agent compensation exceeds 100%. In such case, change the anesthetic agent compensation value after changing the O_2 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 CO_2 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.

CO_2 Concentration (Sidestream Method)

The HCP-810 is a CO_2 Gas Unit which measures CO_2 concentration by connecting to the AUX connector on the HS-8000. The HCP-810 CO_2 Gas Unit incorporates Microstream technology of Covidien for $EtCO_2$ (End-tidal CO_2 concentration) and $InspCO_2$ (Inspiratory CO_2 concentration) measurement. This section explains about the procedure and setup of the CO_2 concentration measurement of the HCP-810.

⚠ WARNING

- 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 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. It could lead to erroneous readings.
- If too much moisture enters the sampling line (i.e., from ambient humidity or breathing of unusually humid air), <Check Sample Line> will appear in the message area. Replace the sampling line when this message appears.
- Carefully route the filter line to reduce the possibility of patient entanglement or strangulation.
- Do not lift the HCP-810 by the filter line, as the filter line could disconnect from the equipment, causing the equipment to fall on the patient.
- CO_2 readings and respiration rate can be affected by sensor application, ambient environment, and patient conditions.

⚠ CAUTION

- The Microstream $EtCO_2$ sampling lines 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 line as this can cause damage to the monitor.
- Dispose of sampling lines 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 $EtCO_2$ sampling line.
- Use only the Microstream $EtCO_2$ sampling line to ensure proper function of the monitor.
- During nebulization or suction for intubated patient, remove the sampling line from the HCP-810 to avoid moisture buildup and sampling line occlusion.
- Replace the sampling line 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 line, requiring more frequent replacement.

NOTE

- When connecting a sampling line to the HCP-810, screw the sampling line clockwise into the connector firmly to avoid inaccurate measurement which may be caused by gas leak from the connection point.
- When <Check Sample Line> appears on the screen indicating that the filter line connected to the HCP-810 is blocked, the CO_2 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 CO_2 sampling line to the HCP-810 and patient, check that CO_2 values appear on the monitor display.
- The $EtCO_2$ accuracy is checked according to the test method of ISO 80601-2-55: 2011 (Medical electrical equipment - Part 2-55: Particular requirements for the basic safety and essential performance of respiratory gas monitors) .
- The waveform sampling rate is 20 samples per second.
- When using the module with a ventilator, under high over pressures close to 10 kPa (100 cmH_2O), the module may enter into a blockage mode in order to protect the module from damage.

Patient Application and Display

CO_2 concentration measurement can be performed by connecting the HCP-810 CO_2 Gas Unit to the AUX connector on the Super Unit.

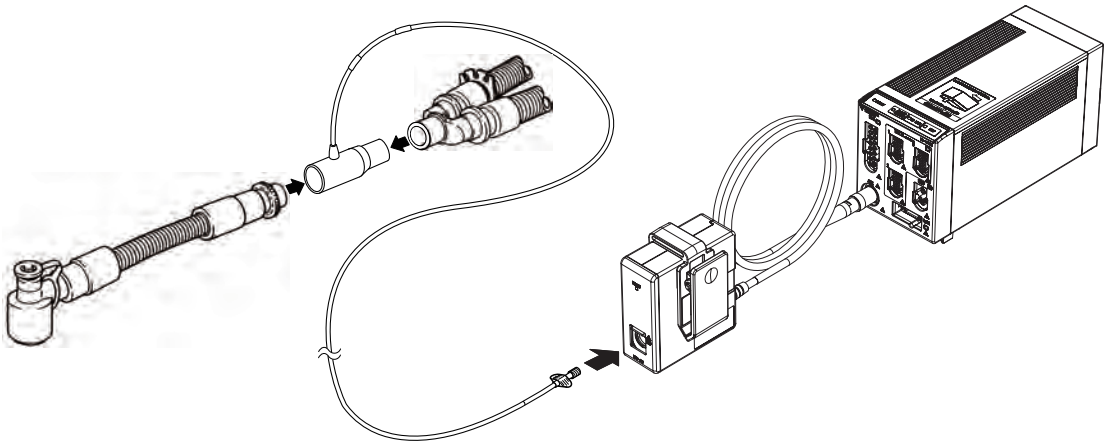
NOTE

- Accurate CO_2 concentration measurement can be acquired after 40 seconds from turning the power ON.

1 Connect the HCP-810 CO_2 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.

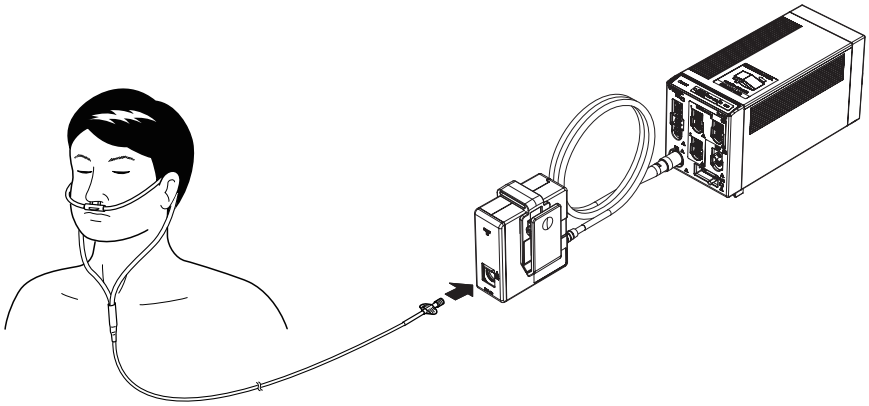
For intubated patient



1 Attach the airway adapter to respiration circuit.

2 Connect one end of the sampling tube to the connector on the HCP-810. Verify that all the tubes are properly connected.

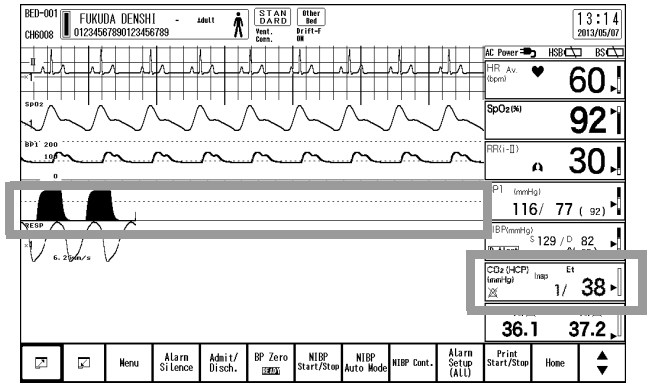
For patient using the nasal prong



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-810.
Verify that all the tubes are properly connected.

3 Start the CO_2 concentration measurement.

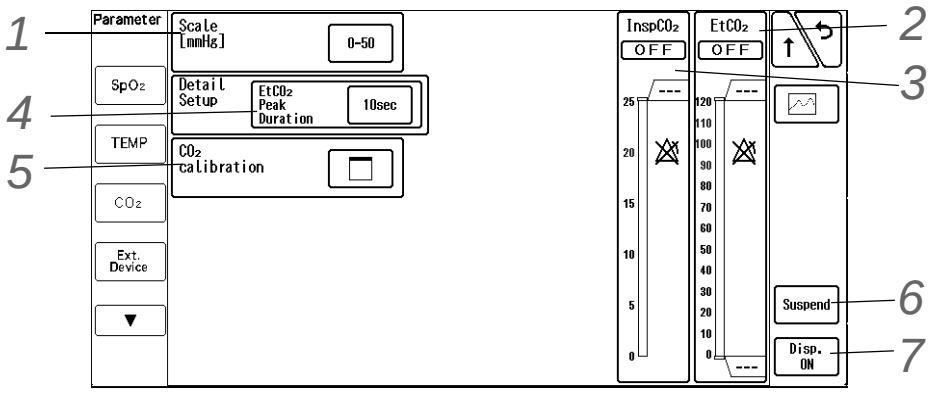


- Verify that the CO_2 waveform, $EtCO_2$ value, $InspCO_2$ value are displayed.

NOTE

- Connecting a sampling tube or nasal prong to the HCP-810 will automatically start the sampling pump. To prevent the pump from deteriorating, disconnect the sampling tube and nasal prong from the HCP-810 when not measuring the CO_2 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 CO_2 numeric data box and CO_2 measurement cannot be performed.
- If the power supply is interrupted due to power failure, etc., HCP-810 will be initialized even if the power interruption was within 30 seconds.

CO_2 Parameter Setup



1 Scale

Select from [0-50]/[0-100] if the measurement unit is mmHg, and from [0-4]/[0-8]/[0-10] if the unit is kPa or %.

2 $EtCO_2$ (End-tidal Carbon Dioxide)

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

NOTE

- $EtCO_2$ 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 mmHg to 100 mmHg/0.3 kPa to 13.3 kPa/0.3% to 13.3%.
  Setting a value above 100 mmHg/3.3 kPa/13.3% will turn OFF the alarm.
- Set the lower limit in the range of 1 mmHg to 98 mmHg/0.1 kPa to 13.1 kPa/0.1% to 13.1%.
  Setting a value below 1 mmHg/0.1 kPa/0.1% will turn OFF the alarm.

REFERENCE

- The alarm limit should be set for each unit (mmHg/kPa/%).
- The upper/lower limit can be set in 1 mmHg/0.1 kPa/0.1% increment.
- When [Auto] is set, the upper and lower limit will be automatically set to +10 mmHg / +1.3 kPa / +1.3%, and -10 mmHg / -1.3 kPa / -1.3% respectively to the current value.

3 $InspCO_2$ (Inspired Carbon Dioxide)

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

NOTE

- $InspCO_2$ 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 mmHg to 4 mmHg/0.1 kPa to 0.4 kPa/0.1% to 0.4%.
  Setting a value above 4 mmHg / 0.4 kPa / 0.4% will turn OFF the alarm.

REFERENCE

- The alarm limit should be set for each unit (mmHg/kPa/%).
- The upper limit can be set in 1 mmHg/0.1 kPa/0.1% increments. There is no lower limit.
- When [Auto] is set, the upper limit will be set to 3 mmHg / 0.4 kPa / 0.4%.

4 $EtCO_2$ Peak Duration

[10sec]/[20sec]: Maximum $EtCO_2$ value, minimum $InspCO_2$ value for the selected duration will be displayed.

[OFF]: $EtCO_2$ value, $InspCO_2$ value for each respiration will be displayed.

NOTE

- As the $EtCO_2$ value display is updated each second, $EtCO_2$ value for each respiration cannot be displayed if respiration rate is 60 Bpm and above.

5 CO_2 Calibration

CO_2 calibration can be performed.

(☞Maintenance Manual "CO_2 Calibration (HCP-810)" P9-2)

6 Suspend

[Suspend]: The pump operation will stop, CO_2 waveform and numeric data display will disappear, and "Suspended" will be displayed inside the CO_2 numeric data box.

[Resume]: Resumes CO_2 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

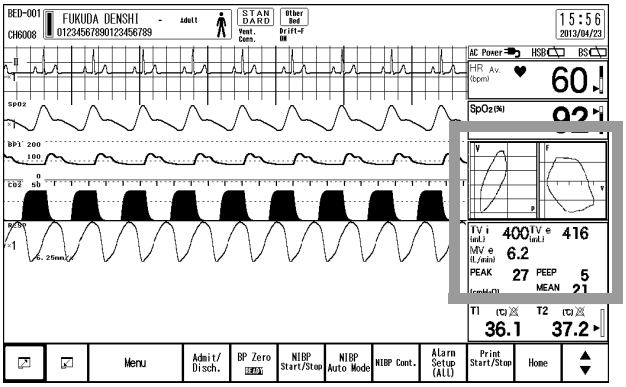
- When the waveform and numeric data display is set to OFF, the alarm generation and tabular trend input will also cease.
- When the waveform and numeric data display is set to OFF, the respiration rate measured by CO_2 will not be displayed either.

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

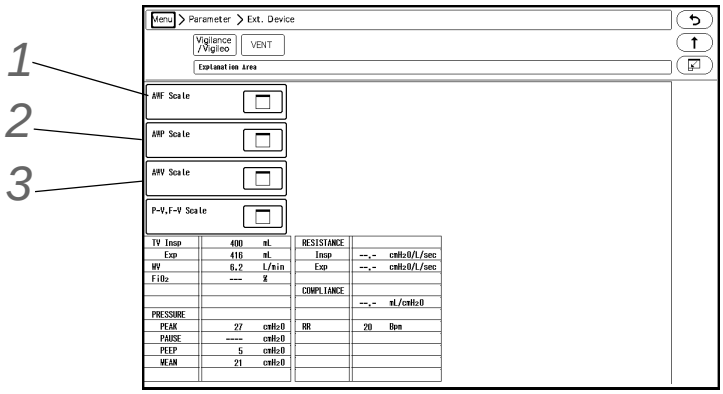
By connecting a ventilator, numeric data and waveform measured by the ventilator can be displayed on the DS-8200 System.
(☞Maintenance Manual "Ventilator Connection" P4-3)
By assigning [P-V/F-V] to numeric data box, P-V (pressure-volume) loop/F-V (flow-volume) loop can be also displayed.



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.



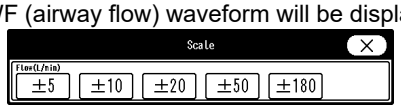
REFERENCE

- 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].

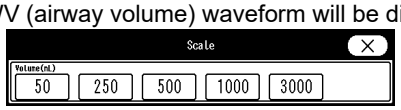
▸ The scale selection for AWP (airway pressure) waveform will be displayed.

2 Select from [10]/[20]/[30]/[50]/[120](cmH_2O).

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

⚠ 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.

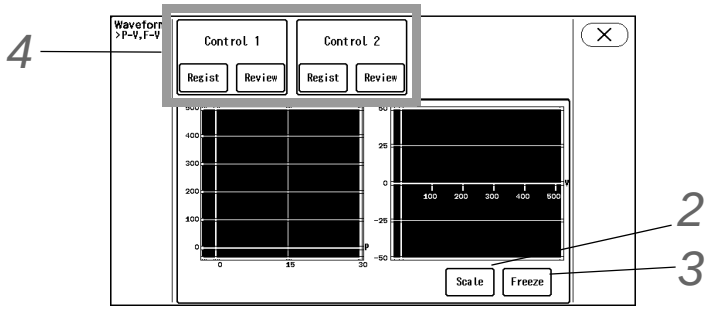
The ventilator data can be displayed in P-V/F-V loop for review.

⚠ 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: cmH_2O), 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.

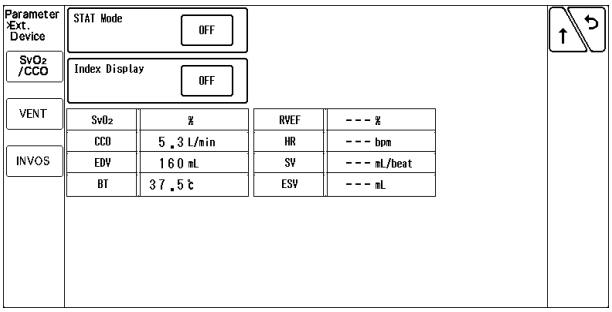
- The loop drawing will stop.
- To resume the loop drawing, press the [Freeze] key again.

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 monitoring data of SvO_2/CCO measurement device, Vigilance, Vigilance CEDV, Vigilance II, Vigileo (Edwards Lifescience).
(☞Maintenance Manual "SvO_2/CCO Monitor Connection" P4-5)
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.

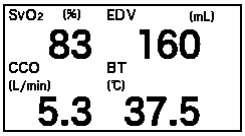
▸ The "SvO_2/CCO" screen will be displayed.

NOTE

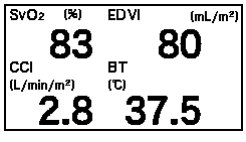
- STAT Mode: When the Vigilance is in CCO mode, STAT mode display can be set ON or OFF.
- Index Display: When the Vigilance is in CCO mode, Index Display can be set ON or OFF.
- When the Vigilance is in ICO mode, the 6 latest data of ICO (Intermittent Cardiac Output) and ICI (Intermittent Cardiac Index) will be displayed.

2 Select [ON]/[OFF] for "STAT Mode" and "Index Display".

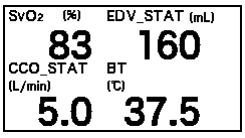
▸ STAT Mode [OFF], Index Display [OFF]: SvO_2 (or $ScvO_2$) , CCO, EDV, BT will be displayed inside the SvO_2+CO numeric data box.



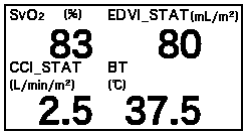
▸ STAT Mode [OFF], Index Display [ON]: CCI and EDVI will be displayed instead of CCO and EDV.



- 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

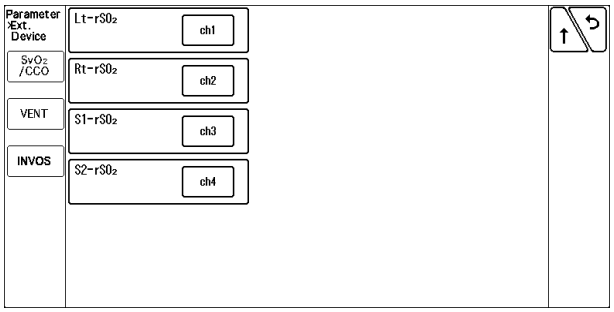
- ON/OFF of STAT mode can be changed only when Vigilance is connected.

3 Short Trend Selection

- Select the short trend parameter from [CO+SVV], [CO], [SVV].

INVOS Data

By connecting the INVOS 5100C Cerebral Oximeter (Covidien®), regional cerebral oxygen saturation (rSO_2) can be monitored non-invasively on the DS-8200 System.
(☞Maintenance Manual "Connecting to the INVOS" P4-9)
On the INVOS screen, the channel can be changed for each INVOS data.
Lt-rSO_2/Rt-rSO_2 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-rSO_2/Rt-rSO_2 will be displayed.
On the INVOS screen, the channel for Lt-rSO_2/Rt-rSO_2 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-rSO_2" / "Rt-rSO_2" / "S1-rSO_2" / "S2-rSO_2") to set the channel.

▸ The dropdown list will be displayed.

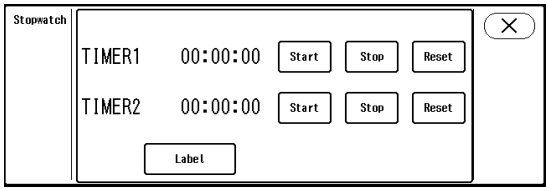
3 Select the channel from [ch1]/[ch2]/[ch3]/[ch4].

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.

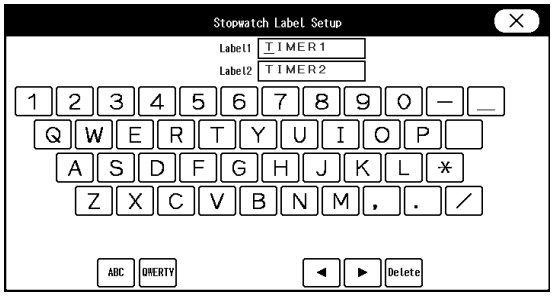
▸ The "Stopwatch" window will be displayed.



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" P4-11)

❑For HS-8312N, HS-8312M

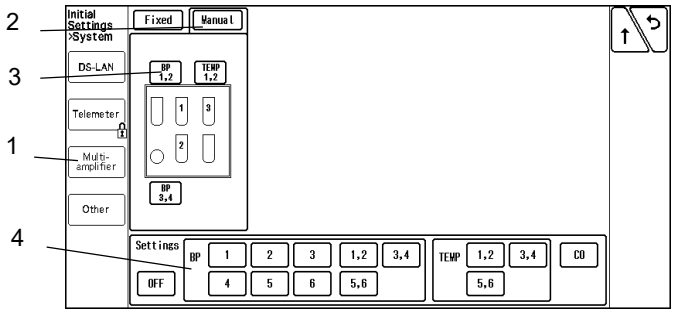
Combination of BP, TEMP, CO Channels

3 Ports	BP	TEMP	CO
BP BP BP	6ch (3ch)	N/A	N/A
BP BP TEMP	4ch (2ch)	2ch	N/A
BP TEMP TEMP	2ch (1ch)	4ch	N/A
TEMP TEMP TEMP	N/A	6ch	N/A
BP TEMP CO	2ch (1ch)	2ch	1ch
BP BP CO	4ch (2ch)	N/A	1ch
TEMP TEMP CO	N/A	4ch	1ch

* 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] , [Multiamplifier] 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.

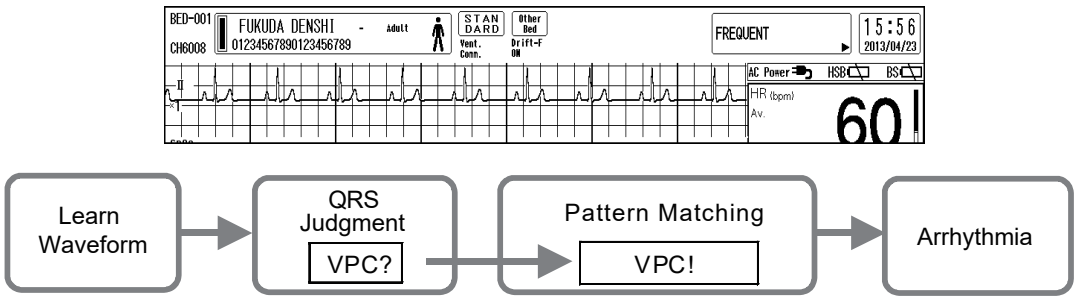
Chapter 8 Review Function

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 27 types of arrhythmia alarm will be generated.

Arrhythmia	Detection Criteria
Asystole	Cardiac arrest is detected for more than preprogrammed time.
VF	A random, rapid electrical activity of the heart is detected.
VT (Ventricular Tachycardia)	9 or more continuous VPC beats are detected.*1
Slow VT	9 or more continuous VPC beats are detected.*2
Run (Consecutive VPC)	Continuous VPC exceeding the preprogrammed value (2 beats to 8 beats) is detected.*3
Couplet (Couplet VPC)	2 continuous VPC beats are detected.
Pause	Cardiac arrest exceeding the preprogrammed duration is detected.
Bigeminy (Ventricular Bigeminy)	QRS pattern of V-x-V-x-V-x is detected.*4
Trigeminy	QRS pattern of x-x-V-x-x-V is detected.*4
Frequent (Frequent VPC)	VPC exceeding the preprogrammed value is detected within 1 minute.
Tachy(Tachycardia)	The upper HR alarm limit is exceeded.
Brady (Bradycardia)	The lower HR alarm limit is exceeded.
Ext Tachy (Extreme Tachycardia)	The upper alarm limit of extreme tachycardia is exceeded.
Ext Brady (Extreme Bradycardia)	The lower alarm limit of extreme bradycardia is exceeded.
R on T (R on T VPC)	VPC is detected within the preprogrammed RR interval (200 ms to 600 ms).
Multiform (Multiform VPC)	2 different forms of VPC beats are detected within 4 minutes.
Vent Rhythm (Ventricular Rhythm)	Continuous VPC beats with HR below the set value for "HR Lower Limit for Run" (0 bpm to 100 bpm), and same or above value of the set beats for Run (2 beats to 8 beats) are detected.
SVT (Supraventricular Tachycardia)	Continuous SVPC exceeding the preprogrammed value (2 beats to 10 beats) is detected.
Irregular RR (Irregular RR Interval)	RR interval variability exceeding the preprogrammed value (10% to 20%) is detected.
Prolonged RR (Prolonged RR Interval)	RR interval of 1.75 times longer than the normal RR interval is detected.
Pacer Not Capture (Non-Capture)	HR is not detected from the pacing pulse within the set duration.
Pacer Not Pacing (Oversensing)	Pacing pulse and HR are not detected during the set instant HR.
Triplet (Triplet VPC)	3 continuous VPC beats are detected.
S Frequent (Frequent SVPC)	SVPC exceeding the preprogrammed value is detected within 1 minute.
S Couplet (Couplet SVPC)	2 continuous SVPC beats are detected.
VPC (Ventricular Extrasystole)	VPC is detected.
SVPC (Supraventricular Extrasystole)	SVPC is detected.

*1: HR of 140 bpm/120 bpm and above

*2: HR of 100 bpm to 140 bpm or 100 bpm to 120 bpm

*3: HR of same or above the set value of "HR Lower Limit for RUN" (0 bpm to 100 bpm)

*4: * indicates N, P, F, ?.

Arrhythmia Alarm Setup

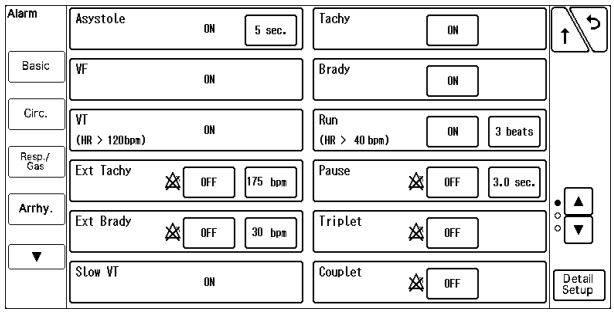
Arrhythmia alarm setup procedure is explained below.
ON/OFF of arrhythmia alarm and arrhythmia detection level can be set.
When the measured value exceeds the set arrhythmia detection level, arrhythmia alarm will generate.

Arrhythmia Detection Level Setting

Arrhythmia	Range	Default	Entering Method of Detection Level
Asystole	3 sec. to 10 sec.	5 sec.	Dropdown List
Run	2 beats to 8 beats	3 beats	Dropdown List
Pause	1.5 sec. to 5 sec.	3 sec.	Dropdown List
Frequent	1 bpm to 50 bpm	10 bpm	Numeric Keys
Ext Tachy	21 bpm to 300 bpm	150 bpm	Alarm Setup Window
Ext Brady	20 bpm to 295 bpm	30 bpm	Alarm Setup Window
R on T	200 ms to 600 ms	320 ms	Up/Down Keys
SVT	2 beats to 10 beats	6 beats	Up/Down Keys
Pacer Not Capture	80 ms to 480 ms	320ms	Up/Down Keys
Pacer Not Pacing	20 bpm to 200 bpm	50 bpm	Up/Down Keys
S Frequent	1 beats to 50 beats	10 beats	Numeric Keys

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

- The arrhythmia alarm setup screen will be displayed.



2 Set the detection level.

- Select from the dropdown list, or set using the up/down keys.
- In case of numeric keys, enter the number and press the [Set] key.
- In case of Ext Tachy and Ext Brady, alarm setup window will be displayed.
  Set the detection level for Ext Tachy and Ext Brady using the upper limit key (/XXX) and lower limit key (\XXX) respectively.

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

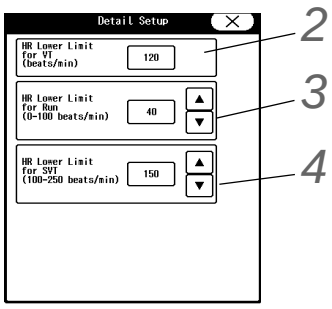
- If the patient classification is "Adult" or "Child", Asystole, VF, VT, Slow_VT alarm cannot be turned OFF unless [ON/OFF] is selected for "Asystole, VF, VT Alarm" under "Initial Settings".
- If the patient classification is "Neonate", VF, VT, Slow_VT can be turned OFF regardless of the setting for "Asystole, VF, VT Alarm" under "Initial Settings".

❑Arrhythmia Alarm Detail Setup

On the "Detail Setup" of arrhythmia alarm, HR Lower Limit for VT, RUN, and SVT can be set .

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

- The "Detail Setup" window for arrhythmia alarm will be displayed.



2 Set the "HR Lower Limit for VT".

- Set the VT analyzing condition for the arrhythmia analysis. VT alarm will generate if the HR is same or above the set value (120 bpm/140 bpm). Slow_VT alarm will generate when the HR is below the set value.
- Select from [120] or [140] (bpm).

3 Set the "HR Lower Limit for Run".

- Set the Run analyzing condition for the arrhythmia analysis. Run alarm will generate if the HR is same or above the set value.
- Press the [▲]/[▼] keys for "HR Lower Limit for Run" to set the HR in the range from 0 bpm to 100 bpm.

4 Set the "HR Lower Limit for SVT".

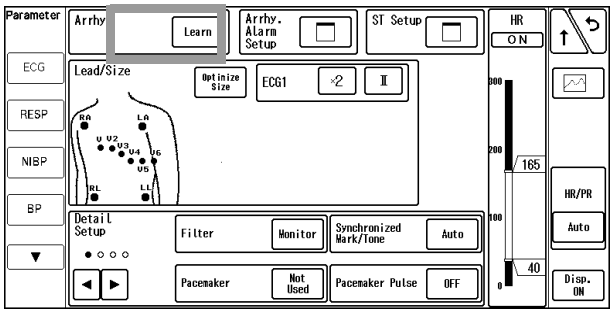
- Set the SVT analyzing condition for the arrhythmia analysis. SVT alarm will generate if the HR is same or above the set value.
- Press the [▲]/[▼] keys for "HR Lower Limit for SVT" to set the HR in the range from 100 bpm to 250 bpm.

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, Tachy, Brady, Ext Tachy, Ext Brady will not generate.

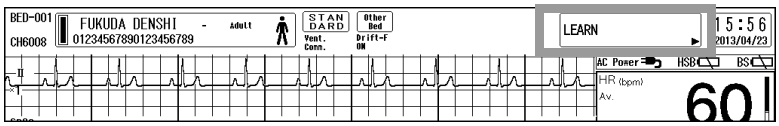
1 Press the [Menu], [ECG] "Parameter" keys.
Or, press the HR numeric data box , and press .

- 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", the [Learn] key will not change to blue and <LEARN> will not be displayed, but the learning process will be performed.
- Pressing the key while arrhythmia learning is in process will not stop the process.

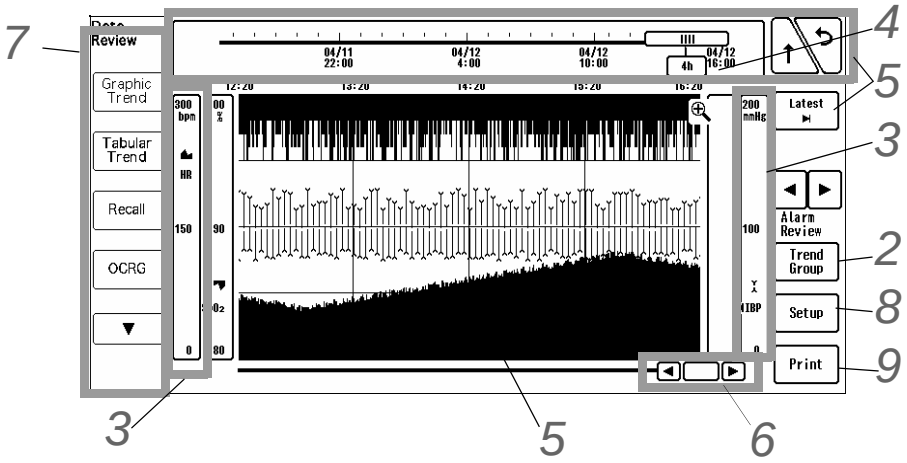
Graphic Trend

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 [Graphic Trend] key on the user key area.

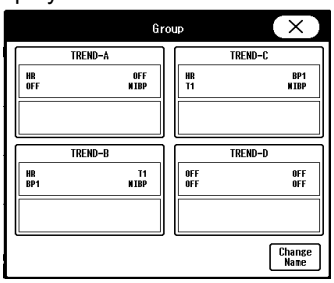
▸ The graphic trend will be displayed.



2 Select the trend group.

1 Press the [Trend Group] key.

▸ The "Group" window will be displayed.



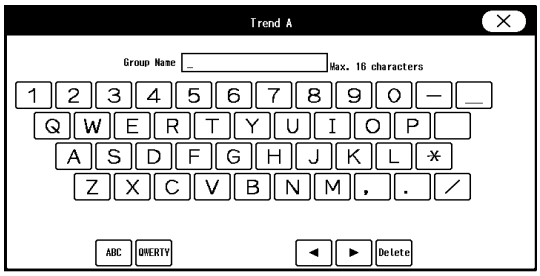
2 Select the group.

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.

▸ The window to enter the name of trend group will be displayed.



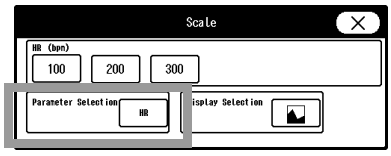
4 Enter the name of trend group in alphanumeric characters.

5 After entering the name, press (X) to close the window.

3 Set the parameter, display type, scale.

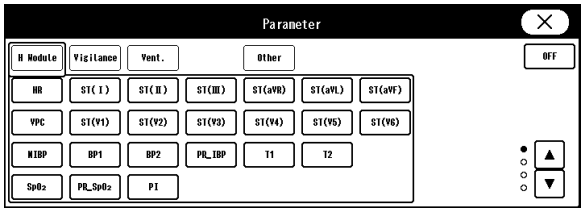
1 Press the scale area for each parameter.

▸ The "Scale" selection window will be displayed.



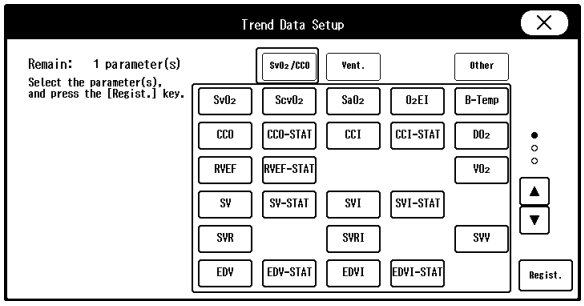
2 Press the key for "Parameter Selection".

▸ The "Parameter" selection window will be displayed.



3 Select a parameter.

Press the [Trend Data Setup] to select the parameters for the connected external device. Up to 50 parameters can be selected.



NOTE

- The selected parameter will be also registered for the trend group.
- The apnea duration will be stored when it exceeds the upper 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 data resolution differs according to 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

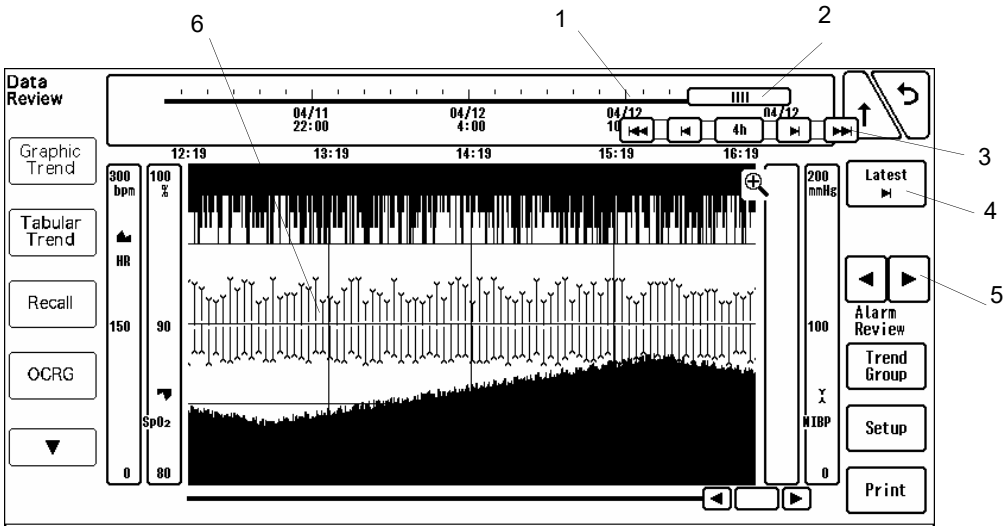
Minimum Resolution	Parameter
10 sec.	HR, ST, SpO_2, PR_SpO_2, BP1, BP2
30 sec.	Other than above (Excluding NIBP*)

* 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 Drag the slider to 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 Drag ▭ to 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 .

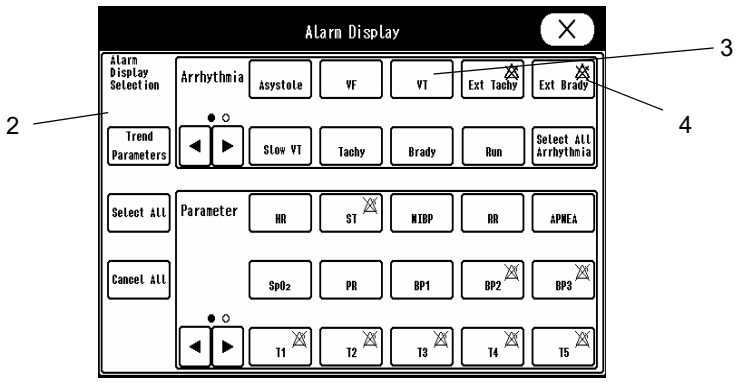
▸ The displayed time range will return to the previous time range.

7 To refer to other review data of the same time, press the tab key on the left side.

8 Perform the setup for trend display.

1 Press the [Set] key.

▸ The "Setup" window will be displayed.



2 Alarm Display Selection

Select the alarm display status.

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.

▸ [Trend Parameters]: The displayed trend parameters will be selected.

▸ [Select All]: All parameters including arrhythmia will be selected.

▸ [Cancel All]: All selections will be canceled.

▸ [Select All Arrhythmia]: All arrhythmia will be selected.

▸ Each parameter key: Each time the key is pressed, selected/unselected status will change.

3 Background Color

▸ Select the background color of the graphic trend from [White]/[Black]/[Gray].

4 Mark

▸ Select the mark size on the graphic trend from [Small]/[Big].

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
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_2O
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	%

Numeric Data	Details	Scale	Unit
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.

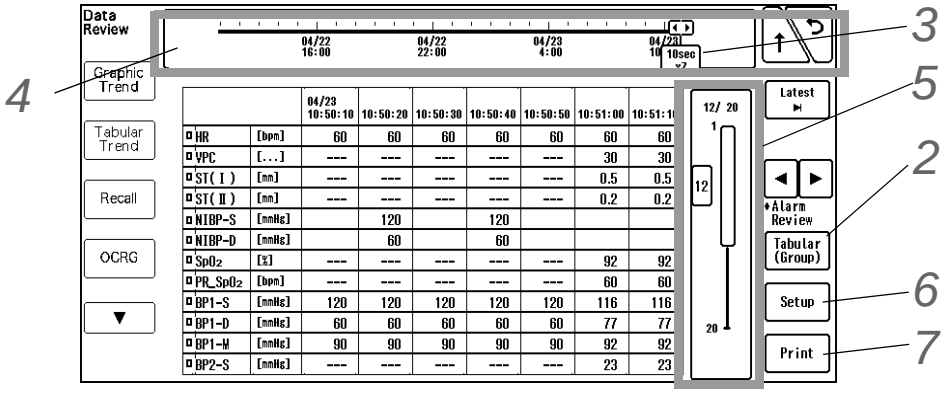
Tabular Trend

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.

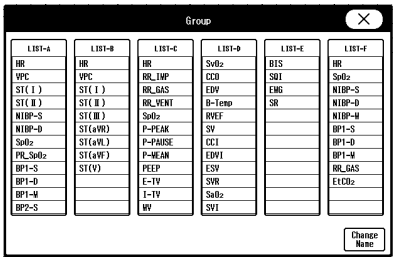
▸ The tabular trend will be displayed.



2 Change the trend group.

1 Press the [Tabular (Group)] key.

▸ The "Group" window will be displayed.



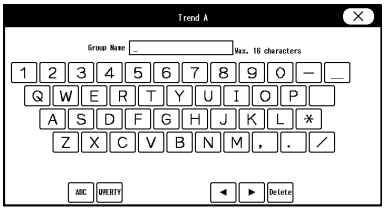
REFERENCE

- Maximum of 6 different groups of parameters can be registered 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 [X] 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" P8-6 "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 Set the parameters for the tabular trend.

(☞"Parameter Setup for Tabular Trend" P8-14)

7 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.

The Description of the Display

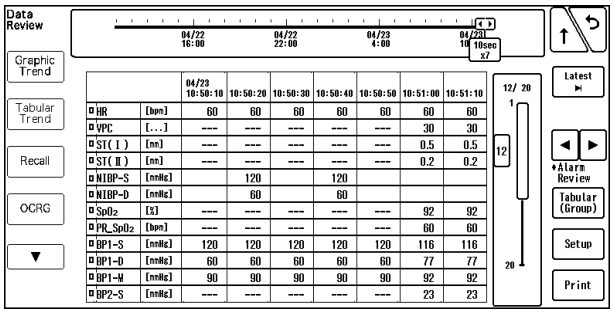
If the measured data is not displayed on the home display, or if BP zero balance is not performed, the data will be displayed as "---".

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 $EtCO_2$ and $InspCO_2$ 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.

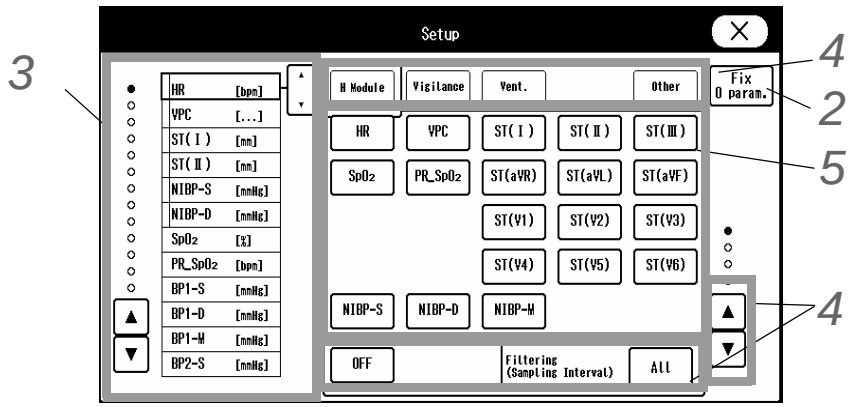


On the left side of the parameter, the color assigned for the corresponding parameter will be displayed.

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_2EI, 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.

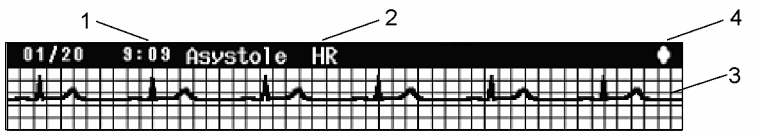
To Display the Recall Waveform

1 Date/Time at Alarm Occurrence

2 Recall Factor

3 Recall Waveform (Compressed: 12 sec.)

4 ◆Mark



When the alarm for the specified recall factor occurs, waveforms (max. 2 waveforms/12 seconds) and numeric data for each recall factor will be stored up to 200 data. On the display selection menu, the data to be displayed can be selected from the stored recall data. 5 compressed recall waveforms will be displayed. Pressing the waveform area will display the enlarged waveform.

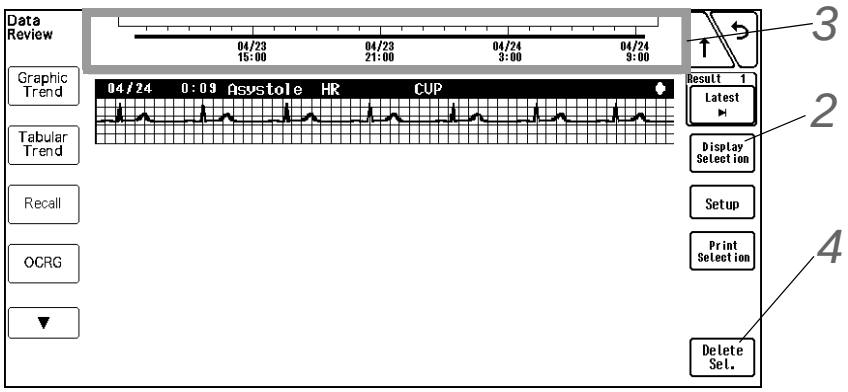
If the recall data exceeds 200, the data will be erased from the oldest one.

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.◆ mark indicates the alarm generated point.

1 Press the [Menu], [Recall] ("Data Review") keys.

Or, press the [Recall] key on the user key area.

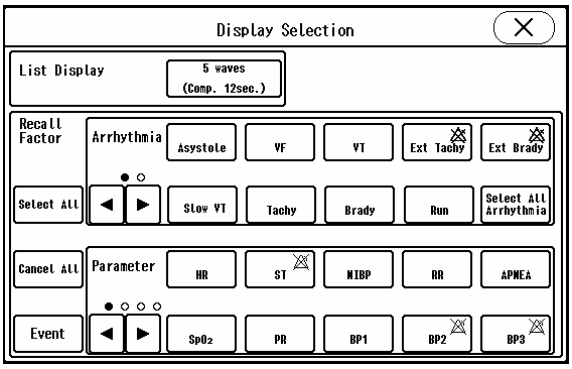
- Recall screen will be displayed.
- 5 compressed waveforms (12 sec. per each waveform) will be displayed.
- The alarm occurrence time, the recall factor occurred at the same time, and the compressed waveform of recall waveform 1 will be displayed.



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 turn blue to indicate that it is selected as the recall factor.
- [Select All]: All parameters including arrhythmia will be selected.
- [Select All Arrhythmia]: All arrhythmia will be selected.
- [Cancel All]: All selections will be canceled.

3 Switch the displayed data on the recall screen.

1 Drag the slider to 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 [Latest ⏭].

- The latest data will be displayed.

4 Deleting All Recall Waveform

1 Press the [Delete Sel.] key.

2 Select the parameters to delete. For the selected parameter, "x" will be displayed.

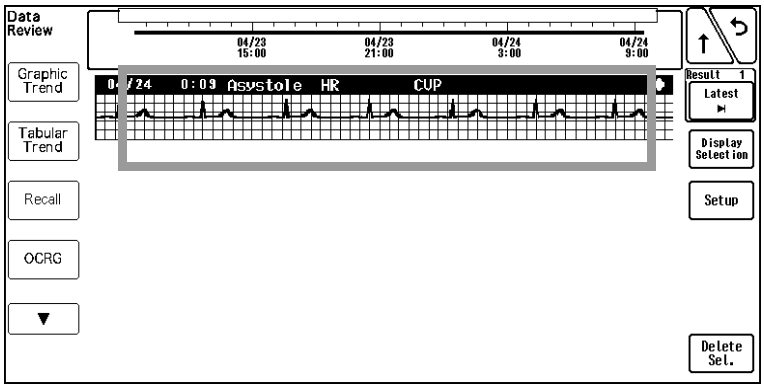
To select all displayed waveforms, press the [Select All] key.
To cancel the selection, select again the parameter with "x" mark. "x" mark will be cleared indicating that it has been removed from the deleting parameter selection.

3 Press [Delete]>[Delete OK] keys to delete the parameters with "x" mark.

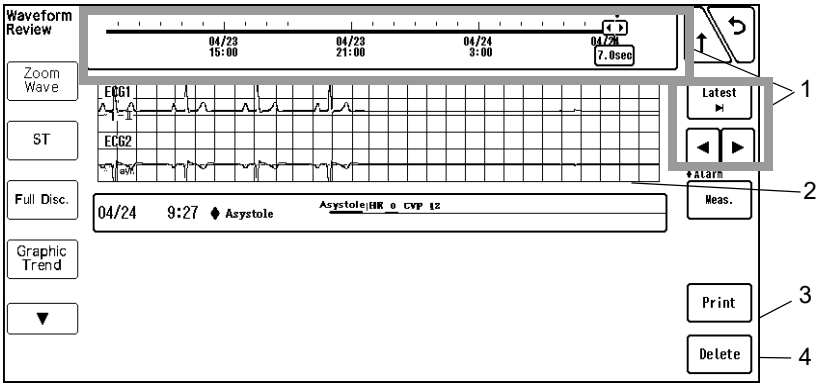
To Display/Print the Enlarged Recall Waveform

On the enlarged recall waveform display, the recall waveform will be displayed in 25 mm/s, and the data before and after the alarm occurrence can be checked using a cursor.

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 Printing 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 Deleting the Recall Waveform

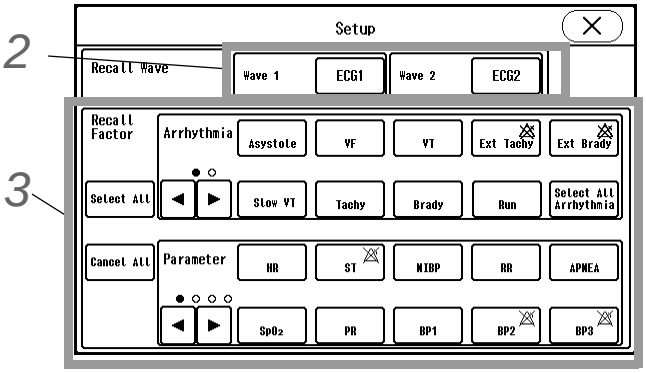
The displayed recall waveform will be deleted.

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" P8-16)

▸ The "Setup" window will be displayed.



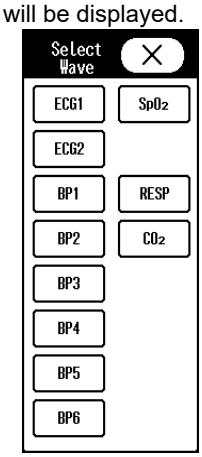
2 Select the recall waveform.

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" P8-16)

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.

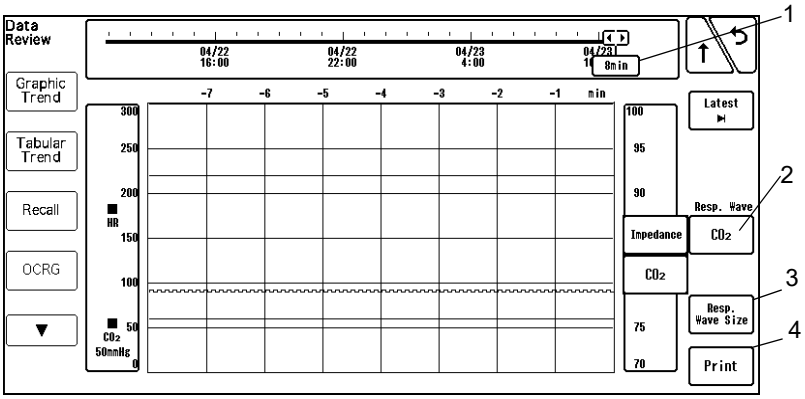
OCRG

This section explains about the OCRG display.
On the OCRG display, compressed respiration waveform, HR trend and SpO_2 trend are displayed simultaneously. The trend scale is fixed as follows.

- HR: 0 bpm to 300 bpm
- SpO_2: 70%SpO_2 to 100%SpO_2

1 Press the [Menu], [OCRG] ("Data Review") keys.

▸ OCRG screen will be displayed.



1 Display Duration

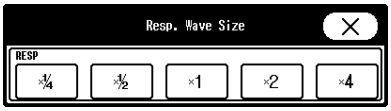
Select from [8min]/[16min].

2 Respiration Waveform

Select from [Impedance]/[CO_2].

3 Respiration Waveform Size

Select the waveform size for the compressed respiration 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.

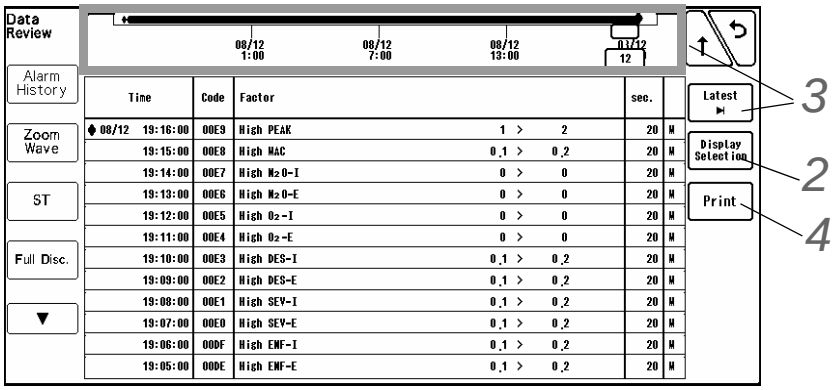
NOTE

- The alarm history cannot be deleted manually. When 1600 data is exceeded, the data will be deleted from the oldest one.

Alarm History Setup

1 Press the [Menu], [Alarm History] ("Data Review") keys.

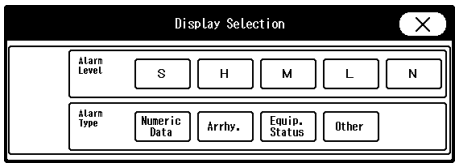
▸ The alarm history screen will be displayed.



2 Select the items to be displayed on the alarm history.

1 Press the [Display Selection] key.

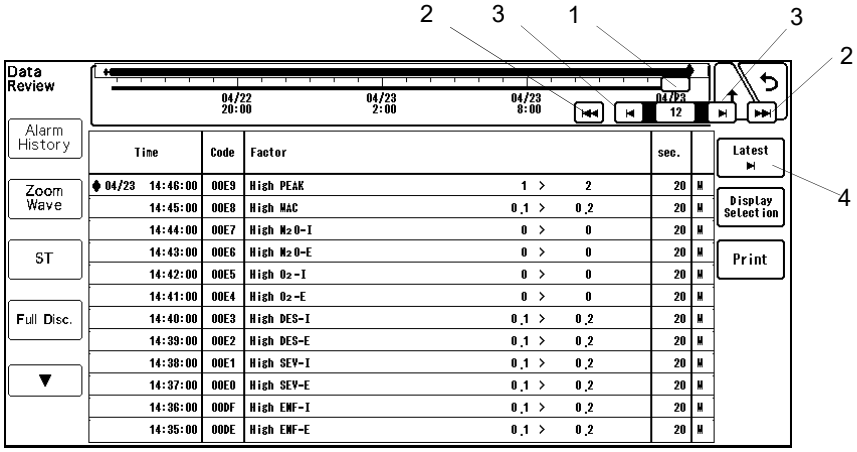
▸ The "Alarm Level", "Alarm Type" selection window will be displayed.



2 Select the alarm level to be displayed.
The selected item will be displayed in blue.

3 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 Drag the slider to 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.

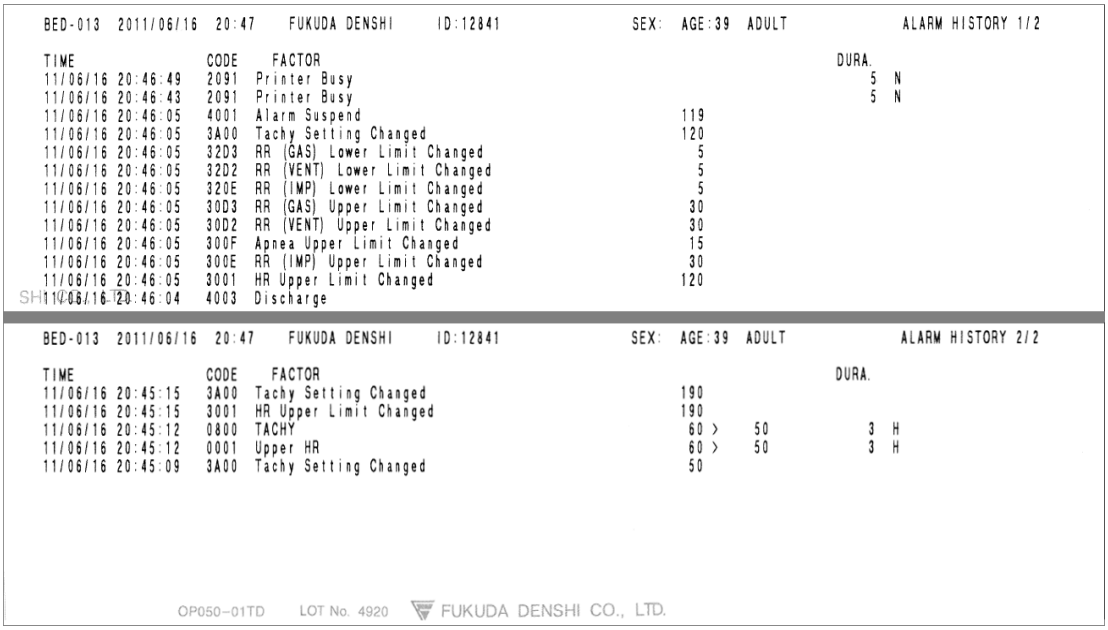
- The currently displayed alarm history will be printed.

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	The factor for alarm generation and alarm setting change will be displayed.
	In case of numeric data/arrhythmia alarm, the numeric data and alarm setting at alarm generation will be also displayed.
	In case of equipment status alarm, a detailed code may be also displayed.
	In case of alarm setting change, the changed value will be also displayed.
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	32D3	RR (GAS) Lower Limit Changed	5	
11/06/16 20:46:05	32D2	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	30D3	RR (GAS) Upper Limit Changed	30	
11/06/16 20:46:05	30D2	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	
11/06/16 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	

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ST Measurement

This section explains about the ST measurement and ST alarm function.

To Display/Print the ST Measurement

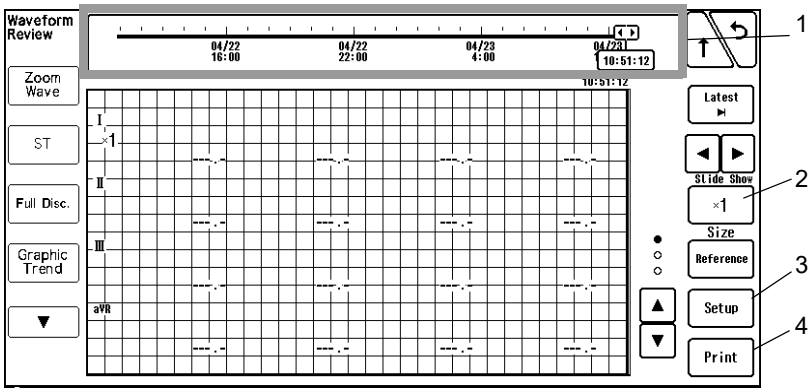
On the ST display, ECG for the selected time duration (10 sec./1 min./5 min./10 min.) will be displayed overlapped in 1 block.
If 3-lead cable is used, maximum of 8 hours of ST waveform will be displayed.

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.

Latest ⏭: The latest data will be displayed.

2 Changing the waveform size of 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 Changing the Displayed Block Duration

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 overlapped waveform for the selected duration will be displayed.

4 Printing

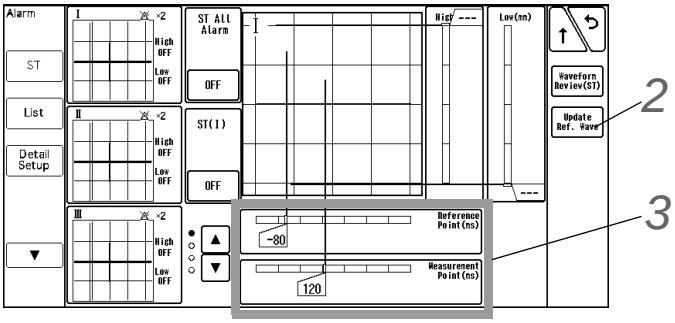
The currently displayed ST waveform will be printed.

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 xxx for reference point left and right.

2 Slide the xxx for measurement point left and right.

NOTE

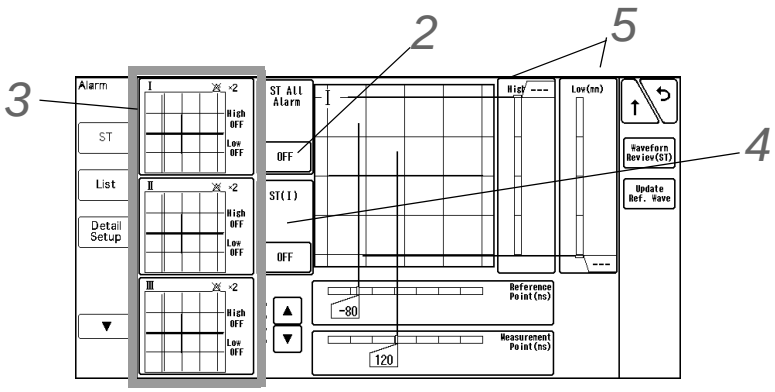
- Set the reference point in the range of –240 to 0ms in increments of 10ms from the peak of QRS to the P wave direction.
- Set the measurement point in the range of 0 to 560ms in increments of 10ms from the peak of QRS to the T wave direction.

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 judgments 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."

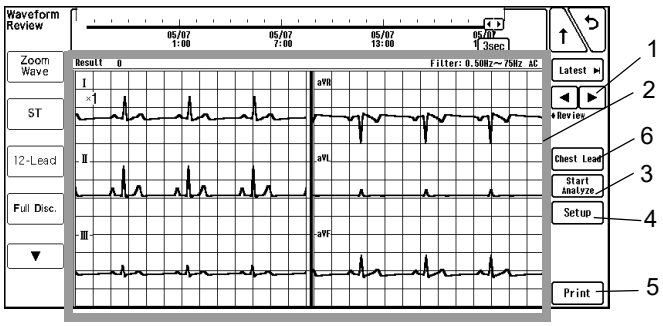
NOTE

- 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 Past Data" P8-33)

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" P8-30)

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" P8-29)

5 Print

- The currently displayed waveform can be printed.
- The output printer can be selected from [Bedside]/[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

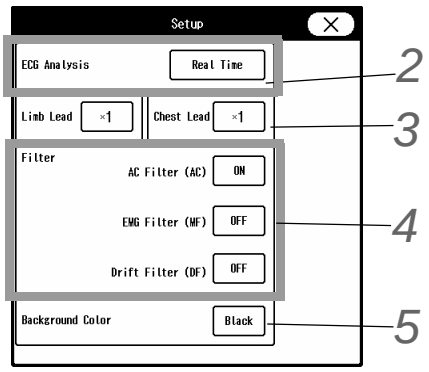
REFERENCE

- 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 performed.

- AC Filter
  If AC noise is present, select [ON]/ [OFF] for "AC Filter".
  If [ON] is selected, cut-off frequency will be 75 Hz.
- EMG Filter
  If EMG noise is present, select [Strong (25Hz)]/ [Weak (35Hz)]/ [OFF].
- Drift Filter
  If base line drift is present, select [Strong (0.50Hz)]/ [Weak (0.25Hz)]/ [OFF].

⚠ CAUTION

- A baseline or notch will be generated on the ECG waveform (display, print, recall) during the filter setting (up to about 2.4 seconds).
- This equipment complies to the distortion test of IEC 60601-2-25 when all the filters are set to OFF. The frequency characteristic is 0.05 Hz to 150 Hz when all the filters are set to OFF.

5 Background Color

▸ The background color for the 12-lead display can be set.

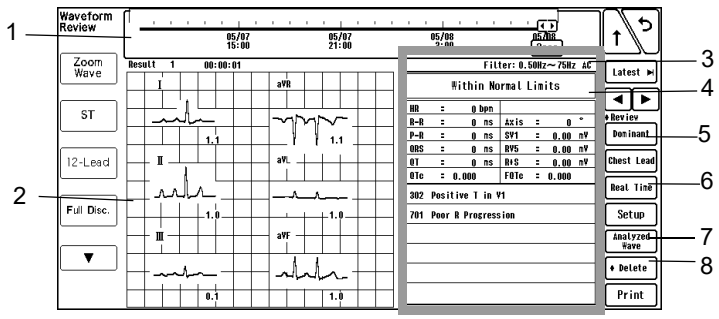
- [White]
  Similar display with the electrocardiograph.
  Background Color: White
  Grid Color: Orange
  Waveform Color: Black (Fixed)
- [Black]
  Conventional color
  Background Color: Black
  Grid Color: Gray
  Waveform Color: Green (Fixed)

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

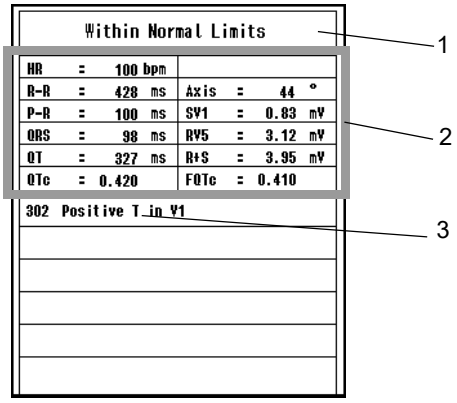
- For the DS-8200, the dominant waveform display can be switched by pressing the [Chest Lead]/[Limb Lead] keys.
- For DS-8200, rhythm waveform will not be displayed. Press the [Analyzed Wave] key to view the analyzed waveform.

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.



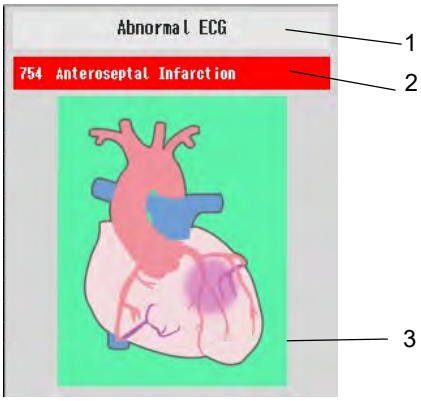
1 Overall Judgment: The highest grade judgment will be displayed.

2 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.

3 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.

1 Overall Judgment: The highest grade judgment will be displayed.

2 Finding: The ECG analysis finding of highest grade will be displayed.

3 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" P8-33)

7 Analyzed Waveform

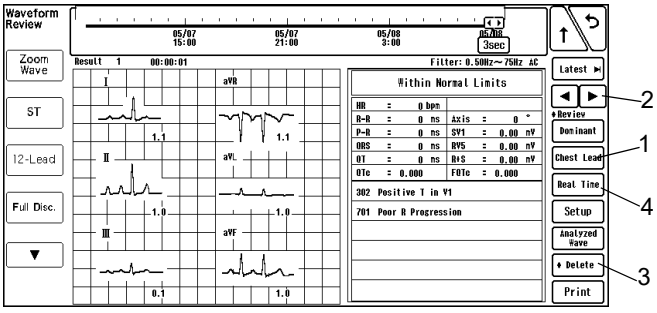
- (☞"To Display the Analyzed Waveform" P8-32)

8 Delete Analyzed Result

- (☞"To Delete the Analyzed Result" P8-32)

❑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.

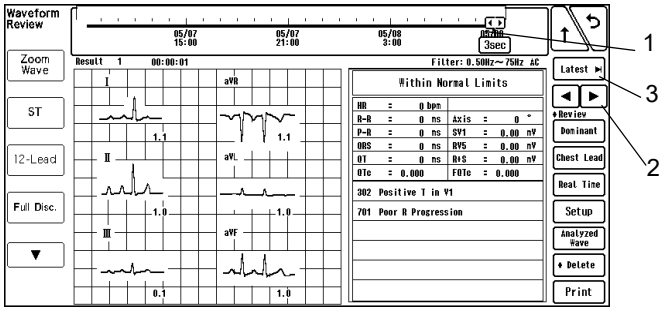
❑To Analyze the Real Time Waveform

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 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.

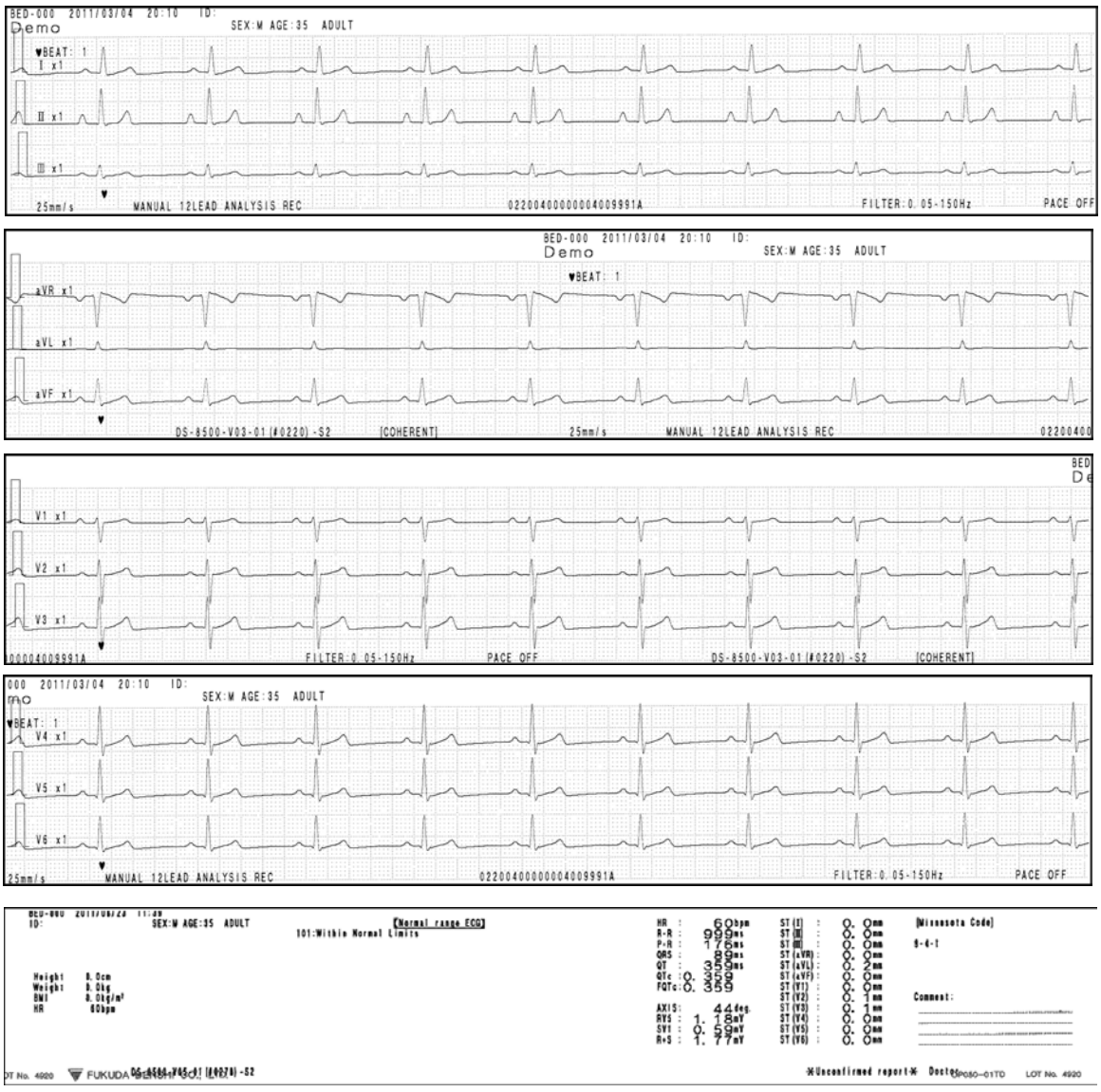
12-Lead Analyzed Result Output Example

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	Bedside	Yes	12 lead waveform printing Prints the analyzed waveform.
		Laser	Yes	
Panorama Report	12-Lead Analysis Result	Bedside	No	Panorama Report Displayed only when [Laser] is set as the printer for graphic printing.
		Laser	Yes	
Analyzed Report	12-Lead Analysis Result	Bedside	Yes	Analyzed result printing Prints the waveform and analyzed result.
		Laser	Yes	

❑Output Example of Bedside Recorder

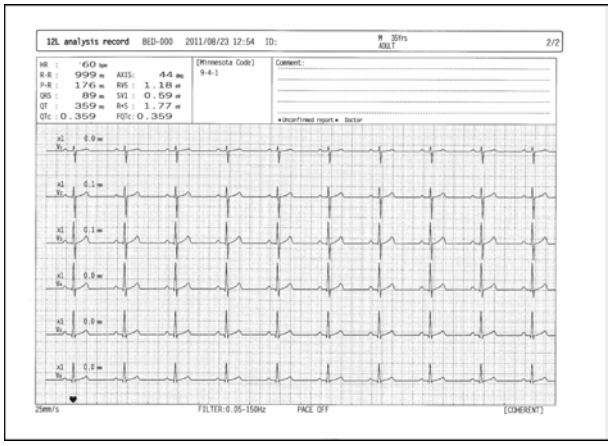
- When [Bedside] is set for the "12-Lead Waveform" (Menu>Manual Printing>Graphic Printing), pressing [Print] will display [Waveform Report]/[Analyzed Report] keys.
- The following is the output example when [Analyzed Report] key is pressed.



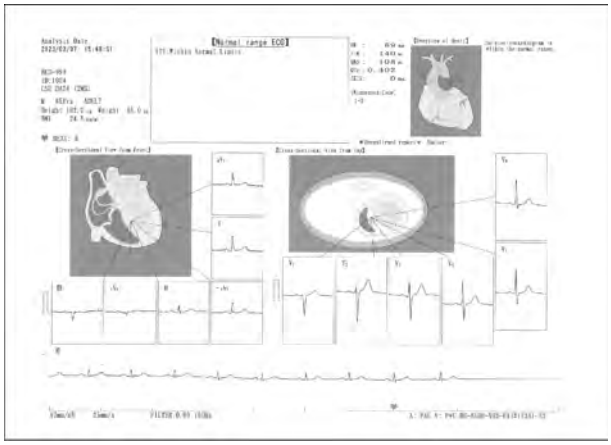
- When [Waveform Report] is pressed, the analyzed waveform will be output in a conventional format.

❑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" P5-8)

To Format the CF Card

REFERENCE

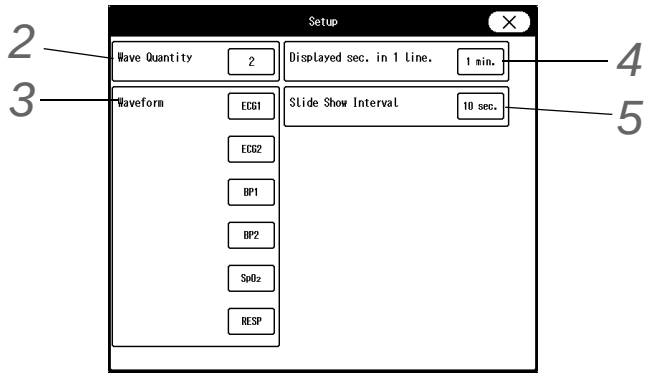
- To save the full disclosure waveform, the CF card needs to be formatted for the full disclosure waveform. (☞Maintenance Manual "Using the CF card" P3-1)

Waveform Setup

The displaying/printing waveform 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/printed.

1 Press the key for "Wave Quantity".

▸ The dropdown list will be displayed.

2 Select from [1]/ [2]/ [3]/ [4]/ [5]/ [6].

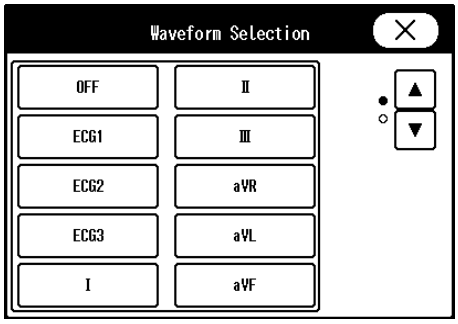
NOTE

- The maximum waveform quantity that can be printed differs depending on the output printer.

3 Select the parameter for the displaying/printing waveform.

1 Press the key for "Waveform".

▸ The "Waveform Selection" window will be displayed.



2 Select the parameter for the displaying/printing waveform.

4 Select the waveform displaying duration 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".

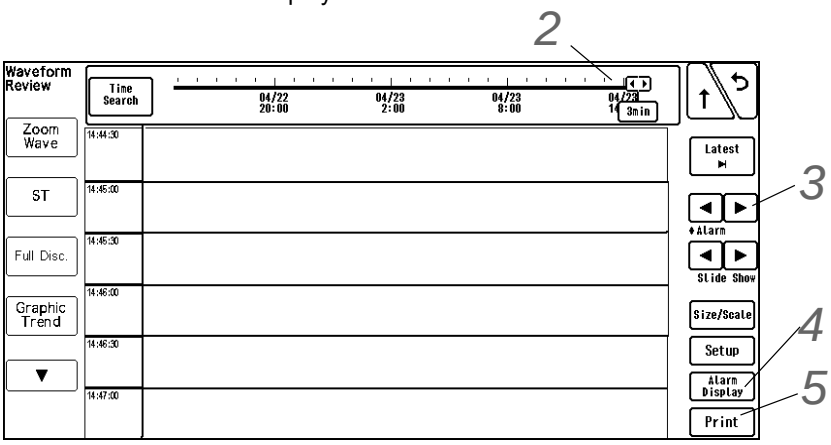
▸ The dropdown list will be displayed.

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.

▸ The full disclosure waveform will be displayed.



2 Scroll the displayed data.

(☞"Alarm History Setup" P8-21)

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 waveform at alarm occurrence can be changed.

NOTE

- On the full disclosure waveform display, the arrhythmia occurrence point will be displayed 7 seconds before the actual arrhythmia occurrence time.

5 Press the [Print] key.

▸ The currently displayed waveform will be output on the printer.

REFERENCE

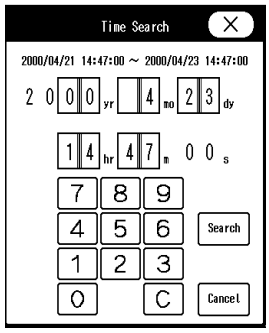
- The parameter selected for "Waveform" will be printed. The waveform quantity that can be printed differs depending on the output printer.Maximum of 3 waveforms for the bedside monitor printer, and maximum of 6 waveforms for the laser printer can be printed.

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)	$h^{0.725}xw^{0.425}x71.84x10^{-4}$ (Dubois Formula)
CI	Cardiac Index (L/min/m^2)	$\frac{CO}{BSA}$
SV	Stroke Volume (mL/beat)	$\frac{CO\,x\,1000}{HR}$
SVI	Stroke Volume Index (mL/beat/m^2)	$\frac{SV}{BSA}$
SVR	Systemic Vascular Resistance (dynes·sec·cm^{-5})	$\frac{(MAP-CVP)\,x\,79.90}{CO}$
SVRI	Systemic Vascular Resistance Index (dynes·sec·cm^{-5}•m^2)	SVRxBSA
PVR	Pulmonary Vascular Resistance (dyn·sec·cm^{-5})	$\frac{(MPAP-PCWP)\,x\,79.90}{CO}$
PVRI	Pulmonary Vascular Resistance Index (dyn·sec·cm^{-5}•m^2)	PVRxBSA
LVW	Left Ventricular Work (kg·m)	COx(MAP-PCWP)x0.0136
LVWI	Left Ventricular Work Index (kg·m^2)	$\frac{LVW}{BSA}$
LVSW	Left Ventricular Stroke Work (g·m)	SVx(MAP-PCWP)x0.0136
LVSWI	Left Ventricular Stroke Work Index (g·m/m^2)	$\frac{LVSW}{BSA}$
RVW	Right Ventricular Work (kg·m)	COx(MPAP-CVP)x0.0136
RVWI	Right Ventricular Work Index (kg•m/m^2)	$\frac{RVW}{BSA}$
RVSW	Right Ventricular Stroke Work (g·m)	SVx(MPAP-CVP)x0.0136
RVSWI	Right Ventricular Stroke Work Index (g·m/m^2)	$\frac{RVSW}{BSA}$

NOTE

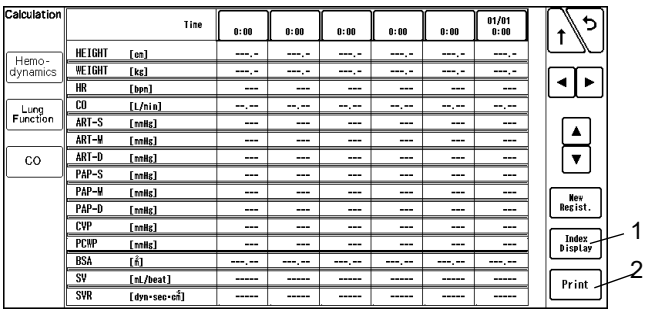
- The blood pressure unit for hemodynamics is "mmHg". If the unit is "kPa" or "cmH_2O", it will be converted to "mmHg" when calculating.

To Display/Print the Hemodynamics Data

10 hemodynamic data can be viewed in list format.

1 Press the [Menu], [Hemodynamics] ("Calculation") keys.

▸ The hemodynamics screen will be displayed.



1 [Index Disp] key

The display will alternately switch between "BSA, SV, SVR, PVR, LVW, LVSW, RVW, RVSW" and "CI, SVI, SVRI, PVRI, LVWI, LVSWI, RVWI, RVSWI".

2 [Print] key

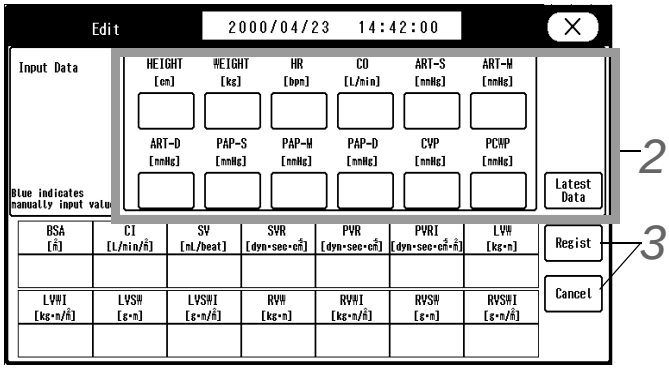
The currently displayed hemodynamic data will be printed.

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.

1 Press the [Menu], [Hemodynamics] ("Calculation"), [New Regist.] keys.

▸ The "Edit" window will be displayed.



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
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.

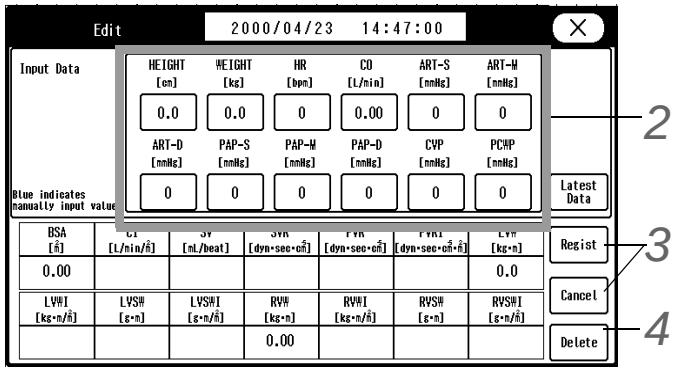
- The edited data will be also displayed in blue on the list.

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" P8-40)

3 Register the edited data.

(☞"New Input of Hemodynamics Calculation" P8-40)

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)	$h^{0.725}xw^{0.425}x71.84x10^{-4}$
CaO_2	Arterial Oxygen Content (mL/dL)	$CaO_2=1.34xHbxSaO_2+0.003xPaO_2$
$C\bar{v}O_2$	Mixed Venous Oxygen Content (mL/dL)	$C\bar{v}O_2=1.34xHbxS\bar{v}O_2+0.003xP\bar{v}O_2$
a-vDO_2	Arteriovenous Oxygen Content Difference (vol %)	a-$vDO_2=CaO_2-C\bar{v}O_2$
DO_2	Oxygen Transport(mL/min)	$DO_2=CaO_2xCOx10$
DO_2I	Oxygen Transport Index(mL/min/m^2)	$DO_2I=CaO_2xCIx10$

Data	Item	Formula
$\dot{V}O_2$	Oxygen Consumption(mL/min)	$\dot{V}O_2=a\text{-}vDO_2xCOx10$
$\dot{V}O_2I$	Oxygen Consumption Index(mL/min/m^2)	$\dot{V}O_2I=a\text{-}vDO_2xCIx10$
O_2ER	Oxygen Extraction Rate (%)	$O_2ER=(CaO_2-C\bar{v}O_2)/CaO_2x100$
$AaDO_2$	Alveolar-Arterial Oxygen Difference (Torr)	$AaDO_2=P_AO_2-PaO_2$ $P_AO_2=P_IO_2-(P_ACO_2/R)x(1-F_IO_2x(1-R))$ R:Respiration Quotient (0.8 for this equipment) $P_IO_2=(P_B-47)xF_IO_2$
$\dot{Q}_s/\dot{Q}_t$	Shunt Rate (%)	$\dot{Q}_s/\dot{Q}_t=(C\acute{c}O_2-CaO_2)/(C\acute{c}O_2-C\bar{v}O_2)$ $C\acute{c}O_2=1.34xHb+0.003xP_AO_2$

REFERENCE

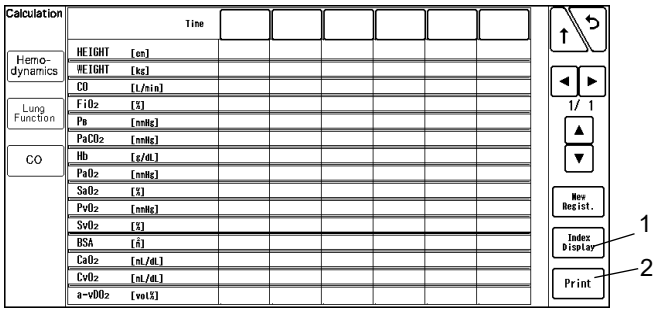
- The blood pressure unit for lung function calculation is "mmHg". If the unit is other than "mmHg", it will be converted to "mmHg" when calculating.

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, CaO_2, CvO_2, a-vDO_2, DO_2, VO_2, O_2ER, $AaDO_2$, Qs/Qt will alternately switch with that of CI, DO_2I, VO_2I.

2 [Print] key

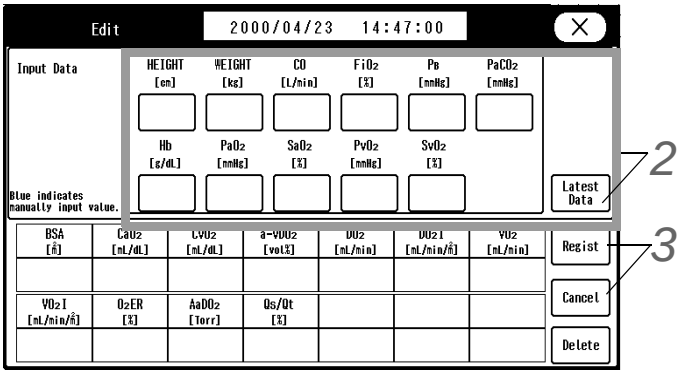
The currently displayed lung function data will be printed.

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)

Input Data

Data	Item (Unit)
SaO_2	Arterial Oxygen Saturation(%)
$P\bar{v}O_2$	Partial Pressure of Mixed Venous Oxygen (mmHg)
$S\bar{v}O_2$	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

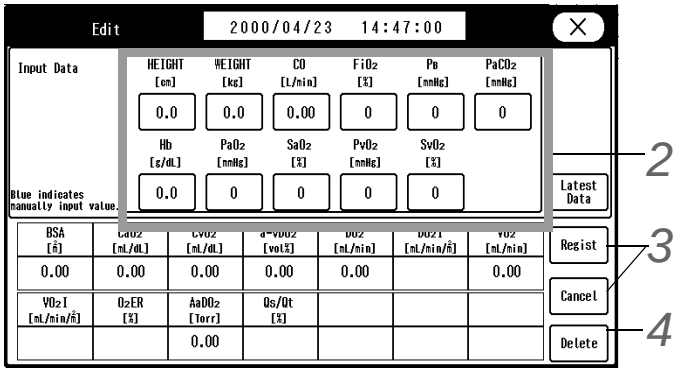
- The calculation result will not be displayed if sufficient data is not input.
- Maximum of 256 data can be registered. If exceeded, the oldest data will be deleted.
- The edited data will be also displayed in blue on the list.

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.



2 Edit the data.
(☞"New Input of Lung Function Calculation" P8-44)

3 Register the lung function list.
(☞"New Input of Lung Function Calculation" P8-44)

4 Delete the data.
(☞"New Input of Lung Function Calculation" P8-44)

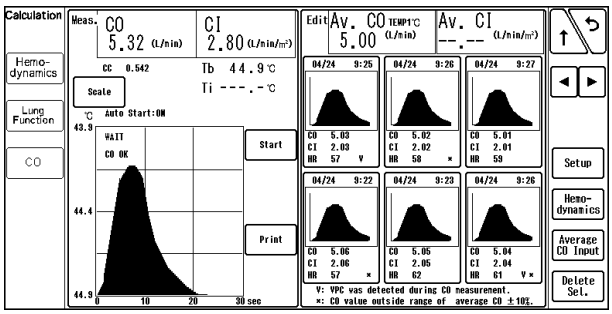
Cardiac Output (CO)

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

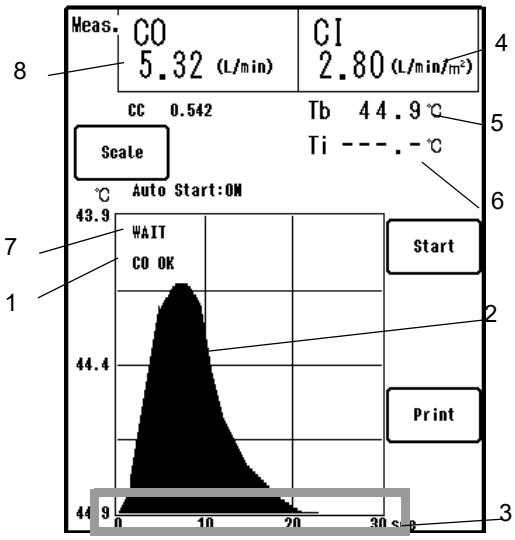
1 Press the [Menu], [CO] ("Calculation") keys.
Or, press the [Cardiac Output] key on the user key area.

- 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" P11-17)



❑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)

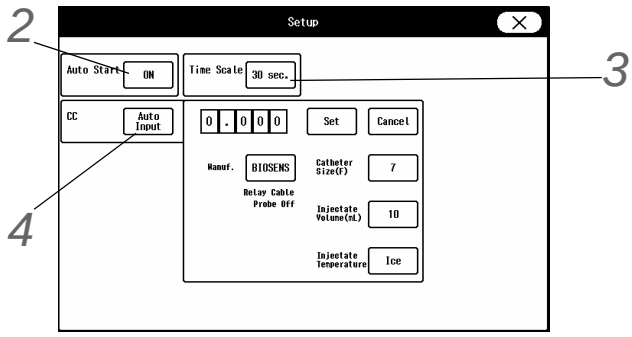


Cardiac Output Setup

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.

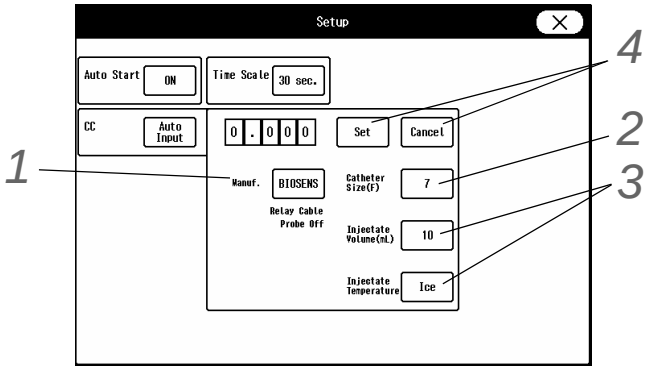
1 Press the key for "CC".

- 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/32.0°F.

▸ [Room]: The measurement will be performed at room temperature (24°C/75.2°F).

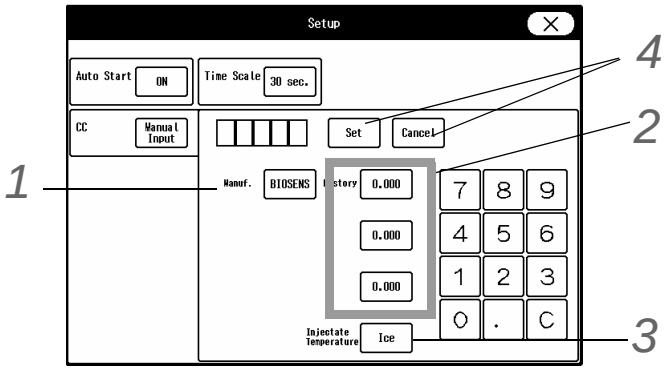
4 Press the [Input]/[Cancel] key.

▸ [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 the 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)

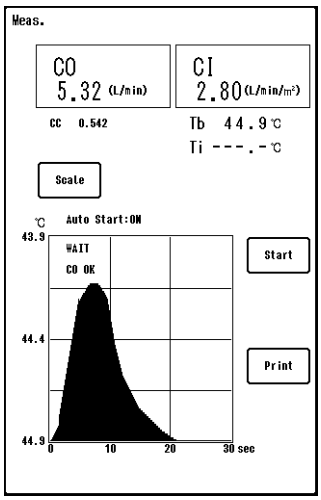
4 Press the [Input]/[Cancel] key.

▸ [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 Information" 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.

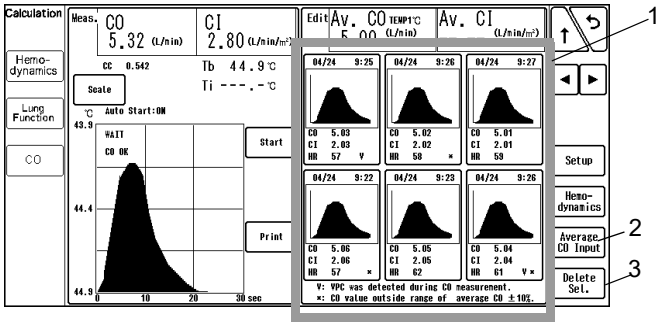
To Edit the CO Measurement Result

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 ±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

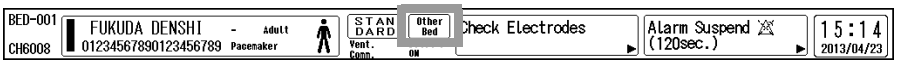
- On the DS-LANII network system, maximum of 3 monitors (including the central monitor) can display the data of this monitor using the other bed display function.
  However, there is no restriction of numbers for the DS-7000 series central monitors and DS-5700. These monitors will be counted as 1 monitor 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

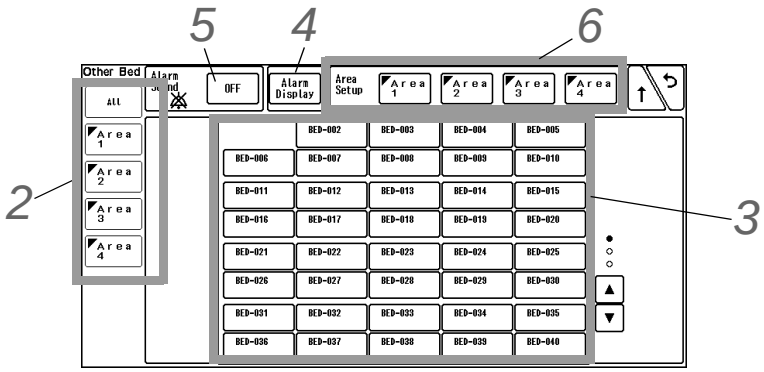
- This equipment cannot connect to a wired network of AU-5500N 8ch Recorder set as the administrator.
  Even if connected, other bed display, printing and other function cannot be used.

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.



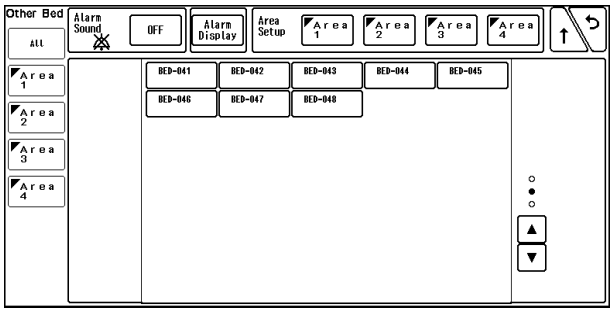
1 Press the [Menu], [Other Bed] keys.



- 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.

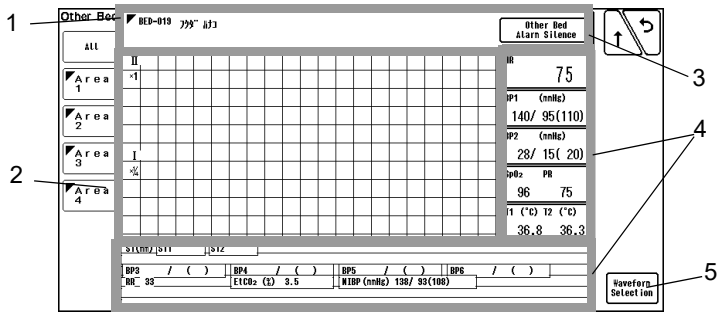
2 Select the area.

- 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.

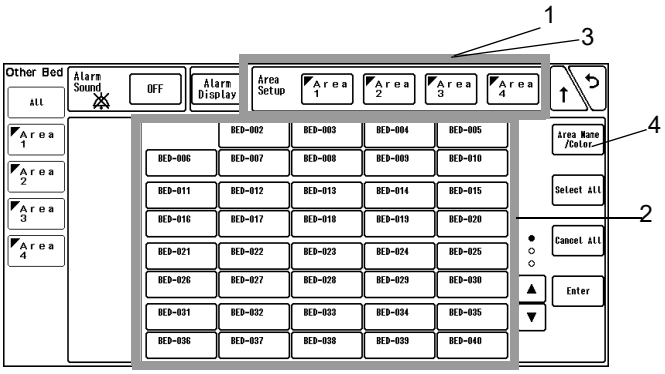
- Select the room/bed ID for the bed to generate the alarm. The selected bed will be indicated by blue frame. To cancel the selection, press the key for the bed again.
- [Select All], [Cancel All]: Selection/cancellation for all the beds can be performed at once.
- [Enter]: The selection will be finalized.

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.



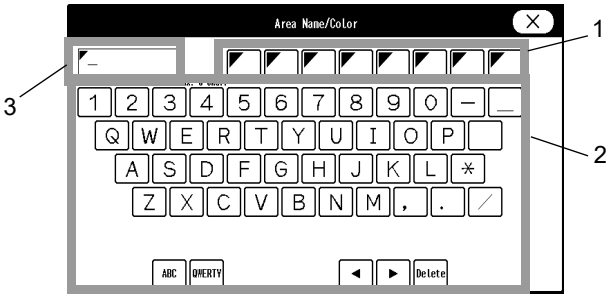
1 Press the key for "Area Setup" to change the screen to area setup mode. When the mode is changed, the key for "Area Setup" will be displayed in blue. To return to the original mode, press the key for "Area Setup" again.

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

Chapter 9 Printing

Printing Setup

This section describes the procedure for printing and recording.
For the DS-8200 System, the following type of printing/recording can be performed.

- Manual Printing
- Automatic Printing (Periodic Printing)
- Automatic Printing (Alarm Printing)
- Freeze Printing
- Graphic Printing (Trend, Tabular Trend, Recall, etc.)

REFERENCE

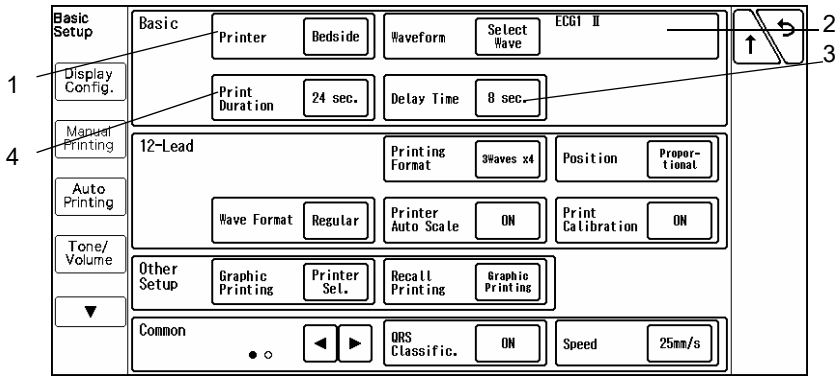
- The printed HR/PR data depends on the ECG/SpO_2/BP selection for "Synchronized Mark/Tone" under [Menu>Parameter>ECG (SpO_2, BP)]. (☞"Synchronized Mark/Tone Setup" P7-10)
- Under the following condition, the amplitude value will be printed for the ECG calibration waveform.
  *[Bar (10mm)] is set for "Waveform Size Display" under [Initial Settings>User I/F>Display/Print].
  *[ON] is set for "Print Calibration" under [Manual Printing>Common]

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 bedside printer or central monitor printer.



1 Printer

[Bedside]: Data will be printed on the HR-800 of the bedside monitor.

[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.].

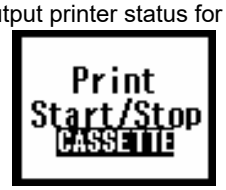
4 Print Duration

[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.

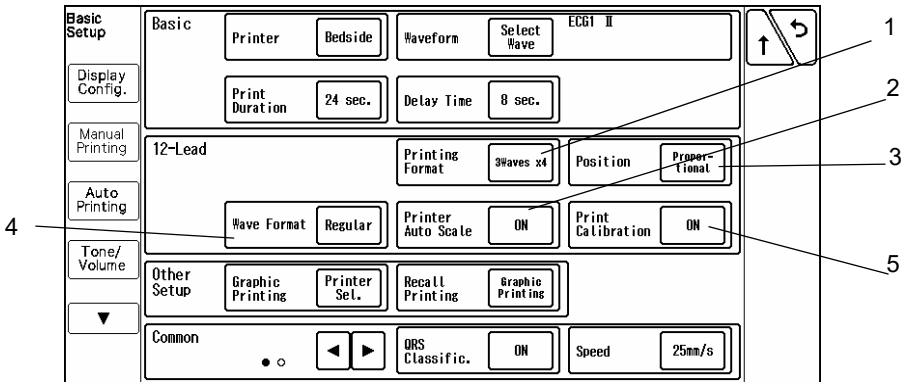
- Pressing this key during periodic printing, alarm printing, graphic printing, or recall printing will cease the printing in process.
- Inside the [Print Start/Stop] key, the output printer status for manual printing will be displayed.



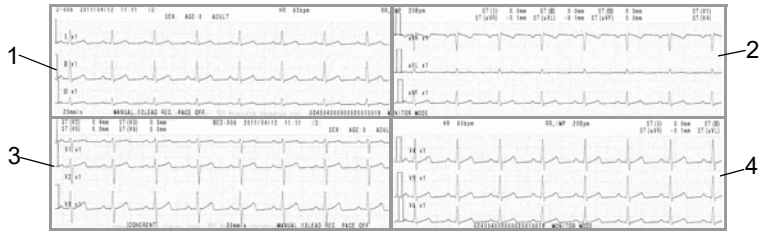
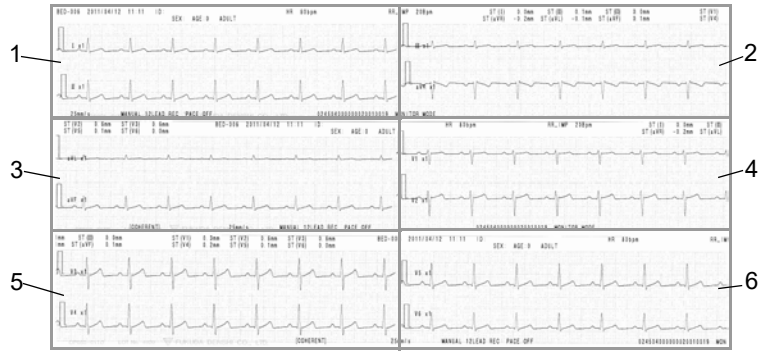
Message	Description
None	Normal Operation
PAPER OUT	There is no thermal paper.
CASSETTE	Check the cassette.
CHECK?	Other abnormality is found.

Manual Printing (12-Lead)

The monitoring 12-lead waveform can be printed on the bedside 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)

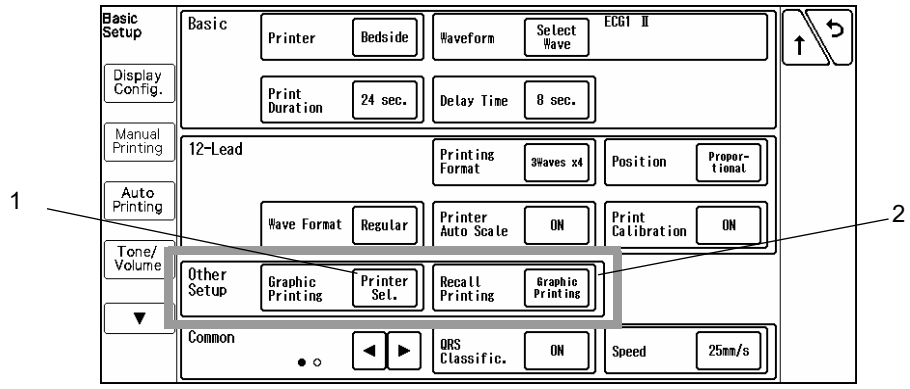
5 Print Calibration

[ON]: Calibration waveform will be printed.

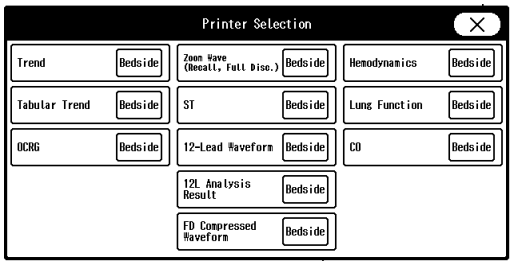
[OFF]: Calibration waveform will not be printed.

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.



- [Bedside]: 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" P4-19)

2 Recall Printing

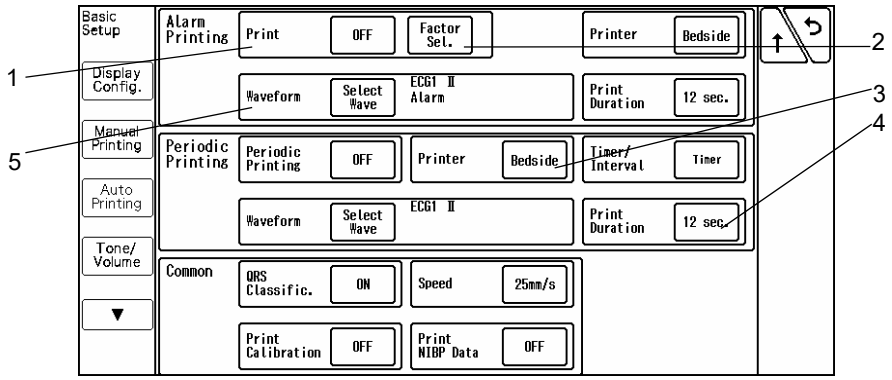
- [Graphic Printing]: Recall data will be output on the printer selected for "Graphic Printing".
- [Manual Printing]: Recall data will be output on the printer selected for "Printer" under "Basic".

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 > Ext Tachy > Ext Brady > SLOW VT > TACHY > BRADY > RUN > HR (HR / PR_SpO_2 / PR_IBP) > APNEA > BP1 (or ART) > SpO_2 > NIBP > RR (RR_IMP / RR_CO_2 / RR_GAS / RR_VENT) > $EtCO_2$ > GAS (CO_2-E / CO_2-I / AGT-E / AGT-I / O_2-E / O_2-I / N_2O-I) > MAC > MV > PAUSE > COUPLET > BIGEMINY > TRIGEMINY > FREQUENT > BP2 > BP3 > BP4 > BP5 > BP6 > BP7 > BP8 > ST > TEMP > Tb > InspCO_2 > SpCO > SpMet > SpHb > PEAK > PEEP > BIS

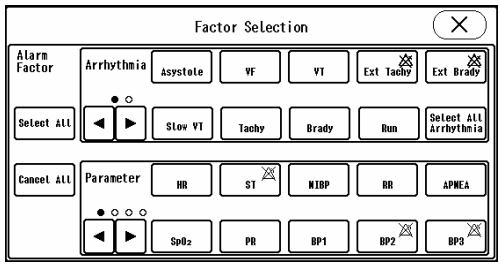


1 Alarm Printing

[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 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

[Bedside]: 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	
			Numeric Data Alarm	Arrhythmia Alarm
12 sec.	12 sec.	12 sec.	8 sec.	12 sec.
24 sec.	16 sec.	16 sec.	16 sec.	16 sec.

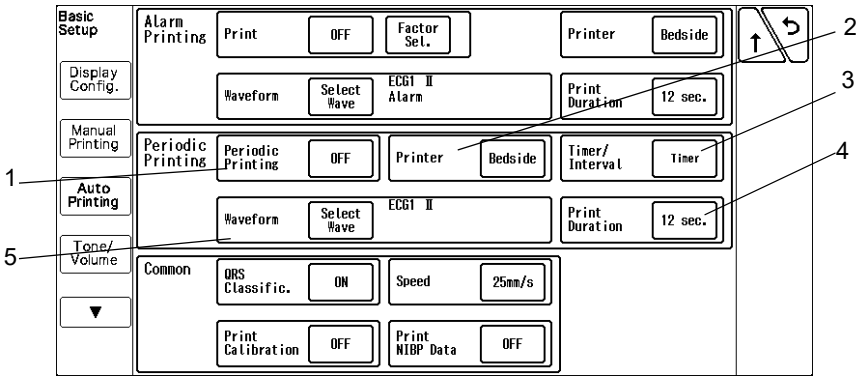
5 Waveform
(☞"Manual Printing (Basic)" P9-1)
[Alarm]: Prints the waveform of the alarm factor.

Automatic Printing (Periodic Printing)

The printing will be automatically performed with the selected interval.

NOTE

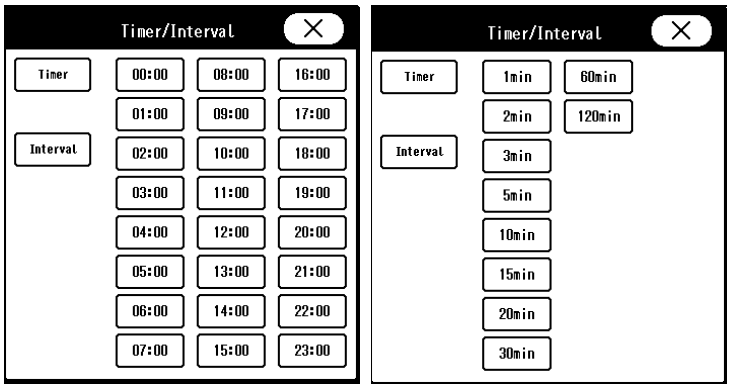
- If the periodic printing is interrupted due to paper out, etc., the latest periodic printing will be performed when the printing is resumed.
- QRS classification symbol will not be printed for periodic printing.



1 Periodic Printing
[ON]: Printing will automatically start at fixed interval.
[OFF]: Turns OFF the periodic printing function.

2 Printer
[Bedside]: Data will be printed on the HR-800 of the bedside monitor.
[Central]: Data will be printed on the central monitor printer.

3 Timer/Interval for Periodic Printing



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], the time will be displayed in real time such as 10:00, 10:05, ...10:25. If [60 min.] is selected, it will be displayed as 10:00, 11:00, 12:00.

4 Print Duration

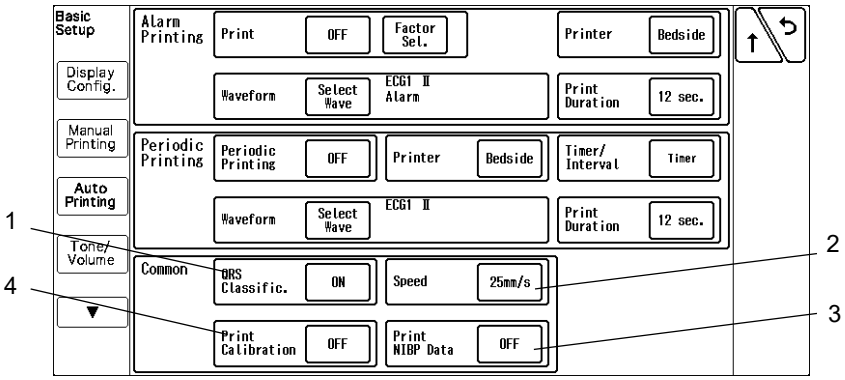
The printing will automatically stop after the selected duration.

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	Description
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 the "Delay Time" is set to [None], and for periodic printing. To print the QRS symbol, set the "Delay Time" to [8 sec.] or [16 sec.] for manual printing.
- 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 25 mm/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 18.75 cm 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" P10-5)

1 Press the [Freeze] key on the user key.

▸ The waveform trace will stop.

2 Press the [Print Start/Stop] key.

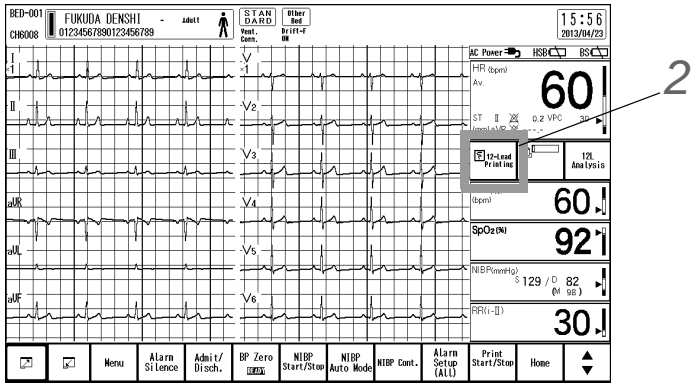
▸ The displayed waveform will be printed.

▸ Freeze printing will be output on the bedside monitor 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" P10-5)



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 bedside 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

Chapter 10 System Configuration

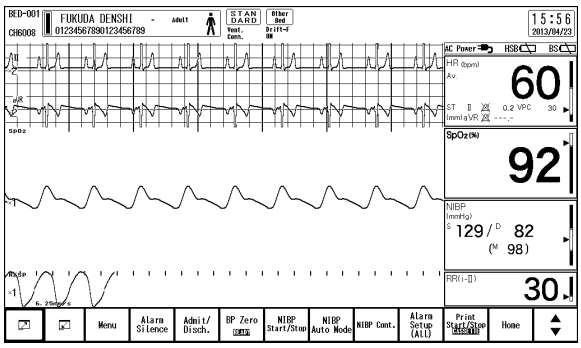
Display Configuration

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.

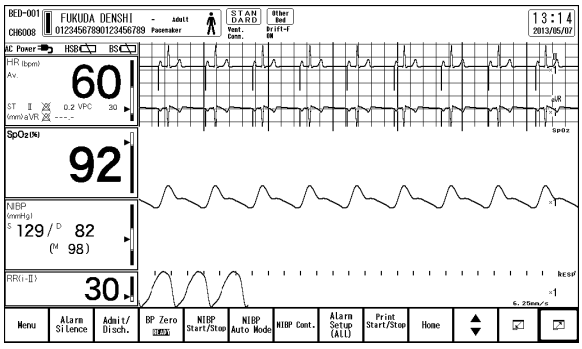
- Standard
- Standard&Bottom
- Numeric/Maximum Size

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.

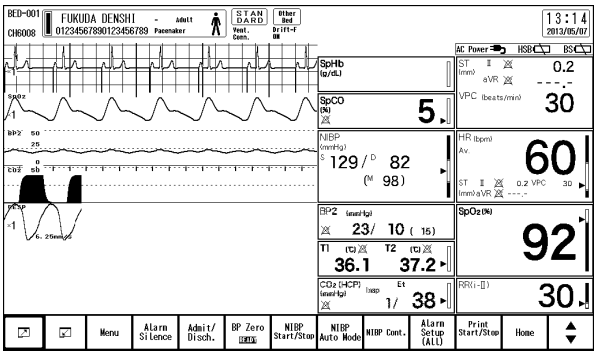
❑Display Example



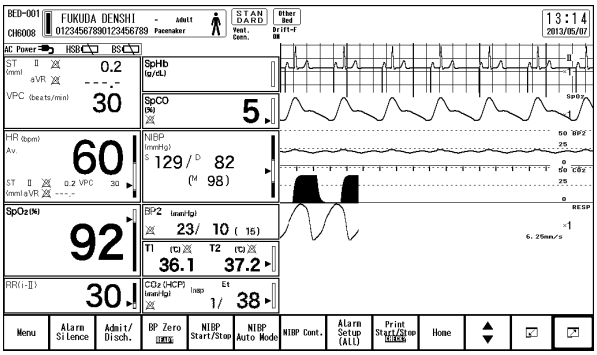
Numeric Data: Standard/Right



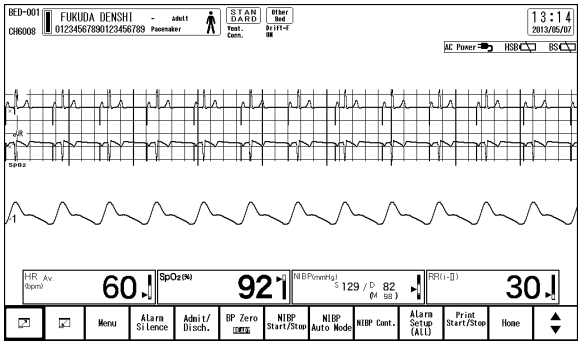
Numeric Data: Standard/Left



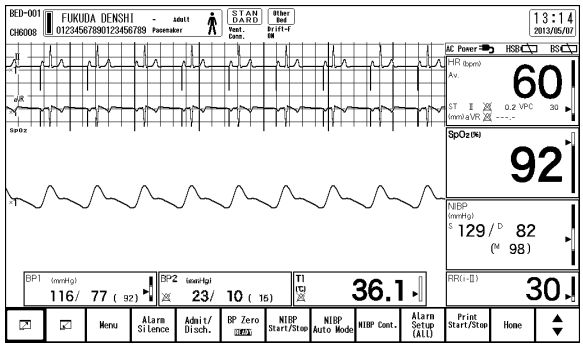
Numeric Data: Standard/Right(Large)



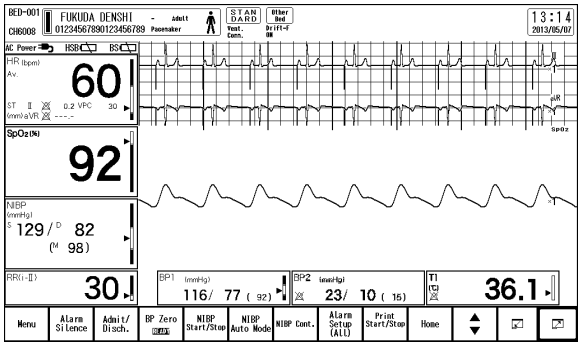
Numeric Data: Standard/Left(Large)



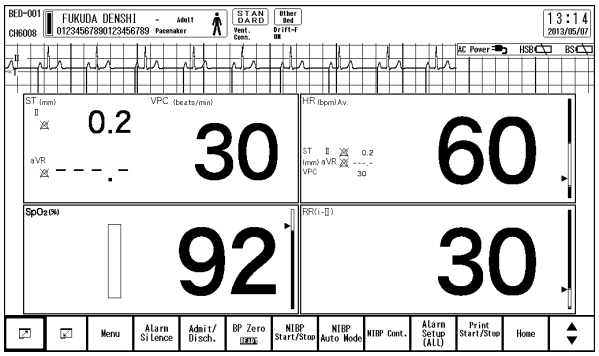
Numeric Data: Standard/Bottom



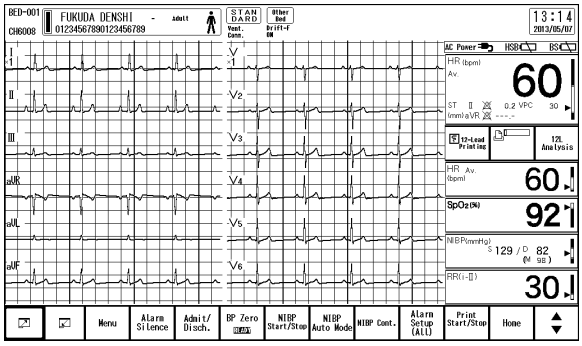
Numeric Data: Standard&Bottom/Right



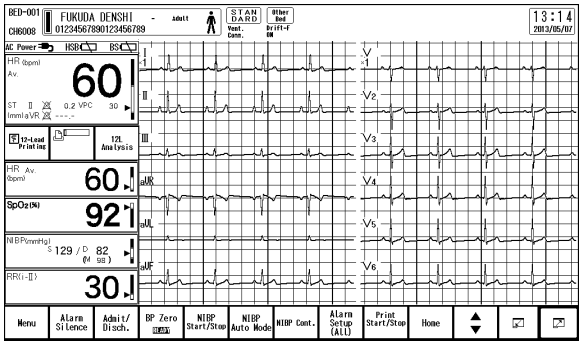
Numeric Data: Standard&Bottom/Left



Numeric Data: Maximum Size



12-Lead (Box Layout: Right)

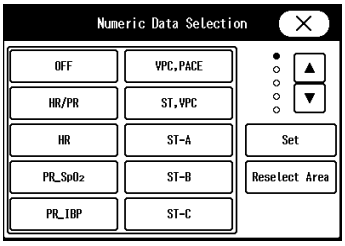


12-Lead (Box Layout: Right&Bottom)

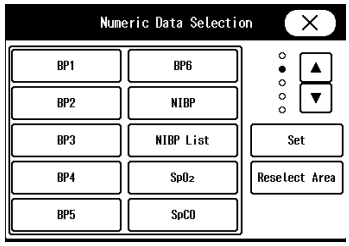
9 main modes can be preprogrammed according to the monitoring purpose.
By preprogramming the configuration to each mode, the display configuration setups at admittance of patient can be simplified by just selecting one of the modes.
(☞"To Select the User Mode" P5-10)
It is recommended to program the 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

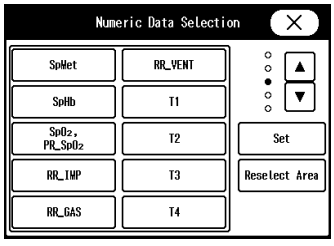
The numeric data to be displayed can be selected on the "Numeric Data Selection" window.
By selecting a parameter on the "Numeric Data Selection" window, it will be assigned to the numeric data box on the home display.
(☞"Numeric Data Box Display (for each parameter)" P3-7)



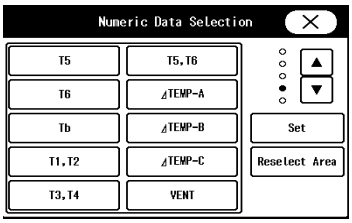
First Page



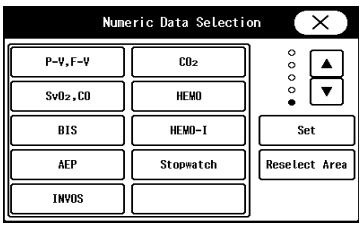
Second Page



Third Page



Fourth Page



Fifth Page

The Numeric Data Box Size for Each Parameter

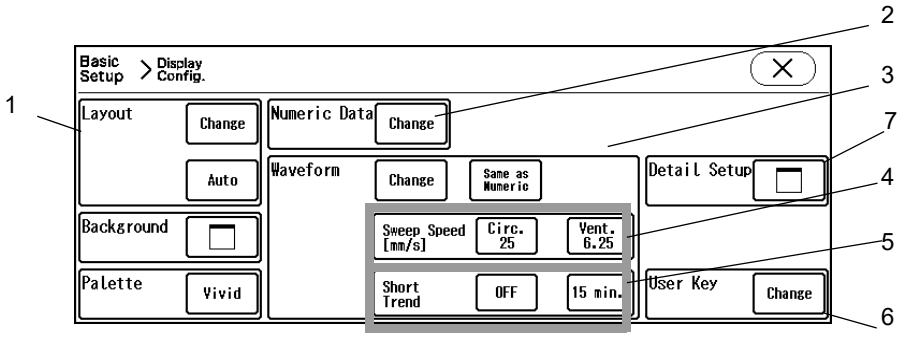
Numeric Data	Numeric Data Box Size							
	Width*1	W1/2	W1			W2*3		
	Height*2	H1	H1	H2	H3	H1	H2	H3
HR/PR		No	Yes	Yes	Yes	Yes	Yes	Yes
HR		No	Yes	Yes	Yes	Yes	Yes	Yes
PR_SpO_2		No	Yes	Yes	Yes	Yes	Yes	Yes
PR_IBP		Yes	Yes	Yes	Yes	Yes	Yes	Yes
VPC, PACE		No	Yes	Yes	Yes	Yes	Yes	Yes
ST, VPC		No	Yes	Yes	Yes	Yes	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
SpMet		No	Yes	Yes	Yes	Yes	Yes	Yes
SpHb		No	Yes	Yes	Yes	Yes	Yes	Yes
RR_IMP, RR_GAS, RR_VENT		Yes	Yes	Yes	Yes	Yes	Yes	Yes
T1 to T6, Tb		Yes	Yes	Yes	Yes	Yes	Yes	Yes
T1/T2, T3/T4, T5/T6		No	Yes	Yes	Yes	Yes	Yes	Yes
ΔTEMP-A, ΔTEMP-B, ΔTEMP-C		Yes	Yes	Yes	Yes	Yes	Yes	Yes
VENT		No	No	Yes	Yes	No	Yes	Yes
P-V, F-V		No	No	Yes	Yes	No	Yes	Yes
SvO_2, CO		No	No	Yes	Yes	No	Yes	Yes
BIS		No	Yes	Yes	Yes	Yes	Yes	Yes
CO_2		No	Yes	Yes	Yes	Yes	Yes	Yes
INVOS		No	No	Yes	Yes	Yes	Yes	Yes
HEMO		No	No	Yes	Yes	No	Yes	Yes
HEMO-I		No	No	Yes	Yes	No	Yes	Yes
Stopwatch		No	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 areax2)*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" P10-6)

3 Waveform
(☞"To Change the Displayed Waveform" P10-7)

4 Sweep Speed
(☞"Sweep Speed" P10-10)

5 Short Trend
(☞"To Display the Short Trend" P10-8)

6 User Key
(☞"User Key Setup" P10-10)

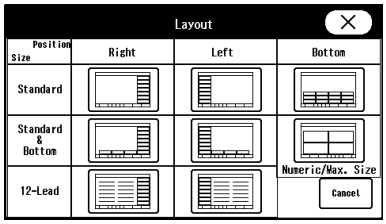
7 Detail Setup
(☞"Detail Setup" P10-11)

❑Changing the Layout

The layout can be changed with the following procedure.

1 Press [Change] for "Layout".

▸ The "Layout" window will be displayed.

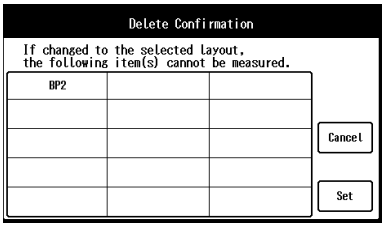


2 Select the layout to be displayed.

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.

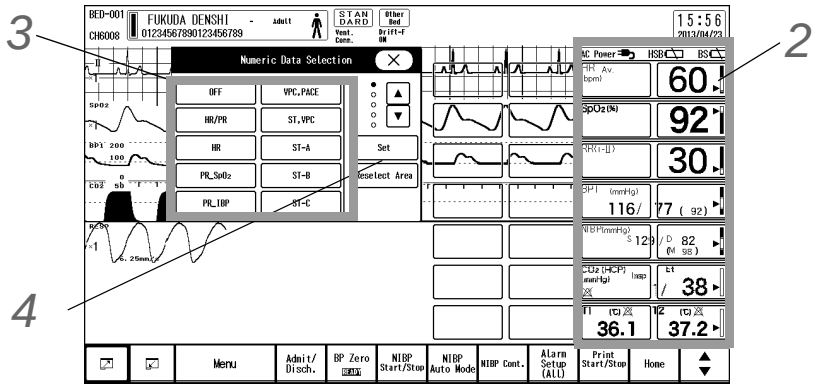
NOTE

- 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, SpO_2 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.

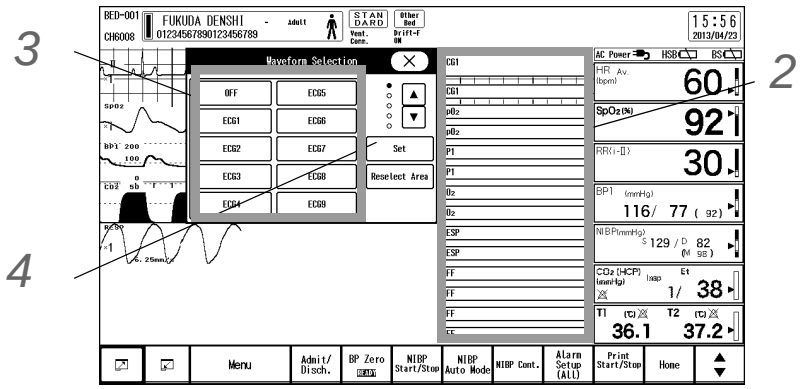
⚠ CAUTION

- 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".

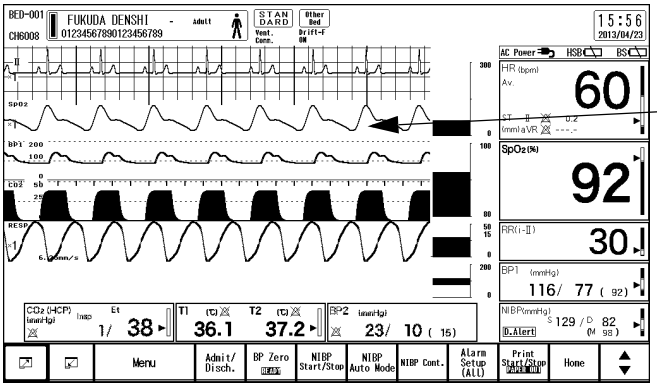
- The dropdown list will be displayed.

4 Select from [0 min.] to [30 min.].

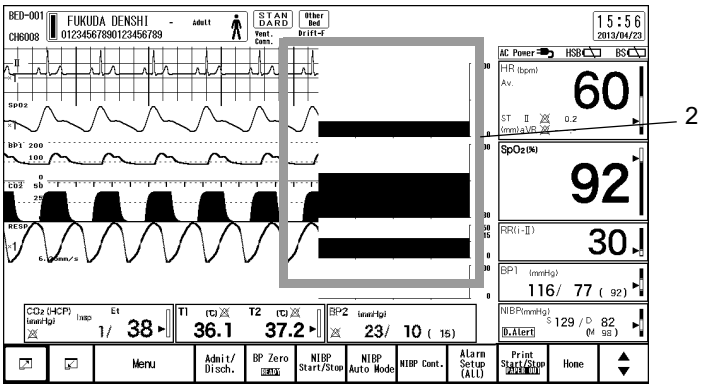
- The short trend can be displayed in 5 minutes increments from 0 minute to 30 minutes.

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/SpO_2 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].

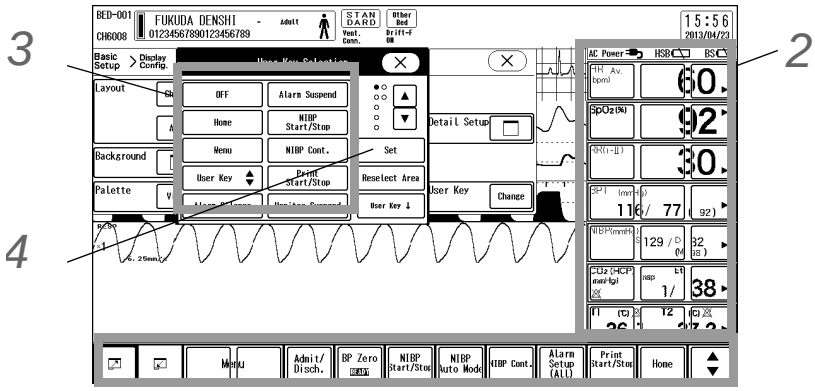
❑User Key Setup

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.

❑Sweep Speed

The sweep speed can be set with the following procedure.

REFERENCE

- The sweep speed can be set separately for ECG/BP/SpO_2 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.

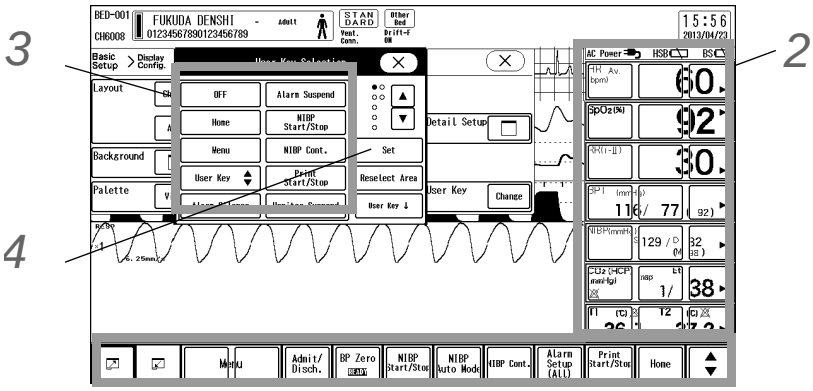
4 Select from [6.25]/ [12.5]/ [25].

❑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)

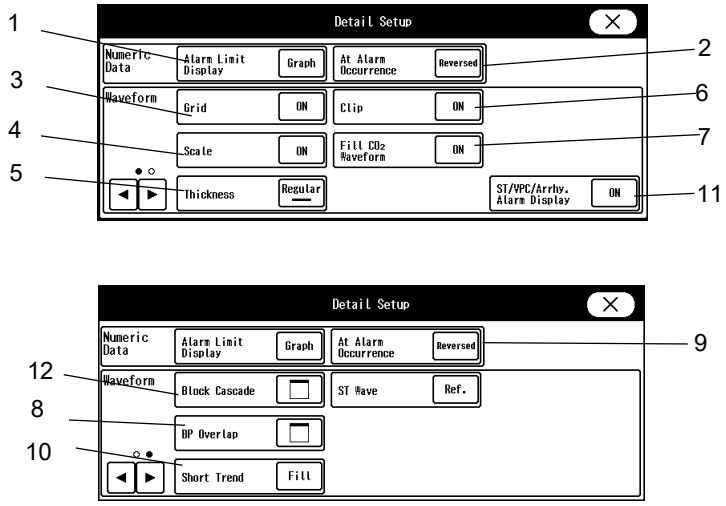
4 Press the [Set] key.

▸ 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

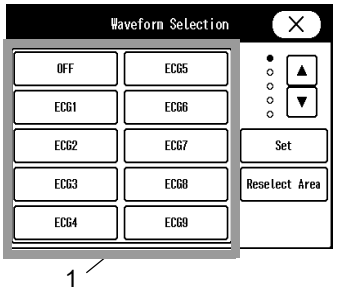
The scale can be selected from [ON]/[Bold1]/[Bold2].

5 Thickness

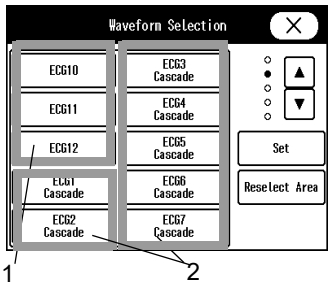
The thickness of the displayed waveforms can be selected from [Thin] [Regular] [Thick].

Waveform Selection

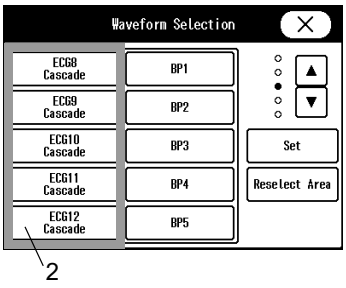
The waveform to be displayed can be selected on the "Waveform Selection" window.
In this section, the details of the displayed waveforms are explained.



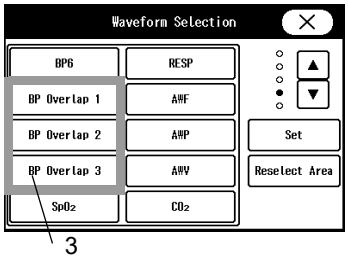
First Page



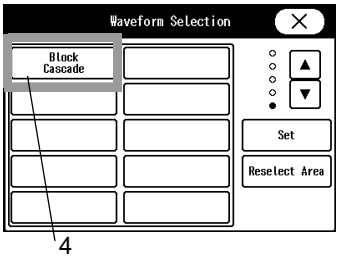
Second Page



Third Page



Fourth Page



Fifth Page

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.

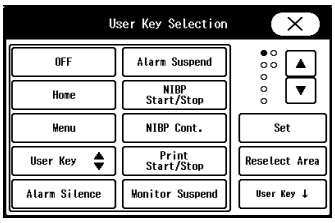
4 Block Cascade

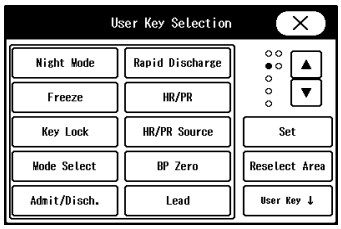
The waveforms (2 to 6) set on the "Block Cascade Setup" will be displayed in one block.

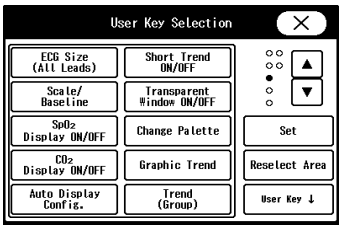
Other than the waveforms explained above, the selected waveform on the "Waveform Selection Window" will be displayed.

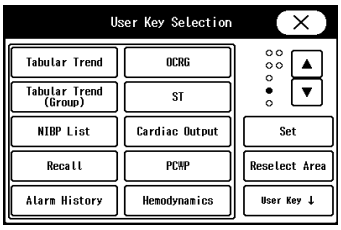
User Key Selection

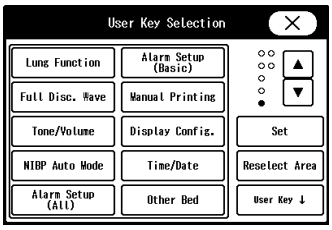
The user keys can be set on the "User Key Selection" window.
In this section, the user key function is explained.

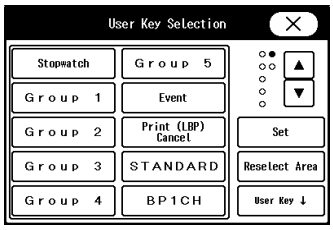


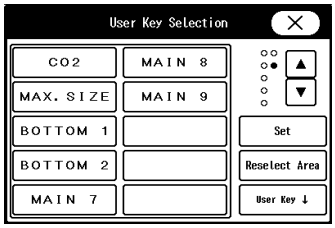












OFF	Blank key will be displayed.
Home	The display will return to the home display.
Menu	The menu screen will be displayed.
User Key ▲▼	The first and second page of the user key area will switch. This key will be located at the same position for both first and second page.
Alarm Silence	Alarm sound will 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" P5-27)

⚠ 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

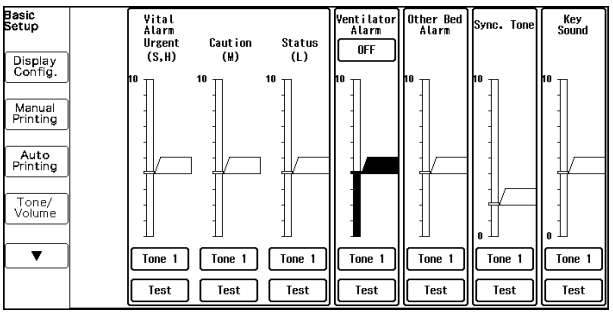
In this section, tone/volume setup procedure for alarm sound, HR synchronized sound, key sound, boot/shutdown sound is explained. The tone/volume setup screen also allows to turn OFF the ventilator alarm sound. The volume of BP zero balance and NIBP measurement end sound can be changed on "Other" setting.

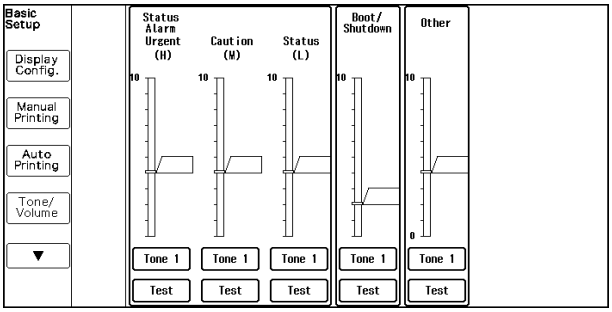
NOTE

- The tone setup for synchronized sound is effective only for HR and BP synchronized sound. The tone for SpO_2 synchronized sound will change according to the SpO_2 value. The tone will increase as the SpO_2 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, SpO_2, CO_2 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 System

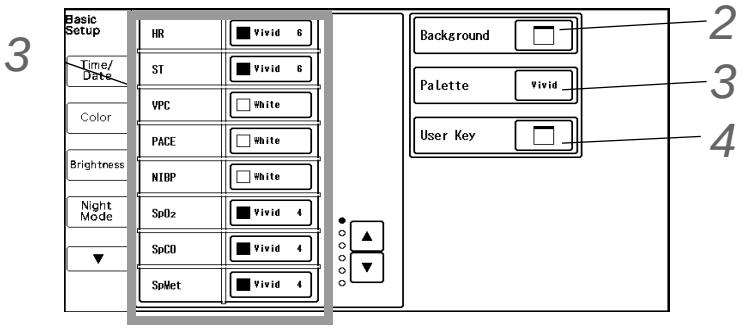
Alarm System	Fukuda Tone (1) Tone 1 to 4 (2) Tone 5 to 8	Melodic Tone	Standard Tone
Vital Alarm Sound			
Level H	(1) Continuous melodic tone (2) Continuous rapid tone	ECG: Continuous melodic tone with rising pitch SpO_2, O_2: Continuous melodic tone with falling pitch CO_2: Continuous melodic tone with 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 Level M Level L	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.	
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.



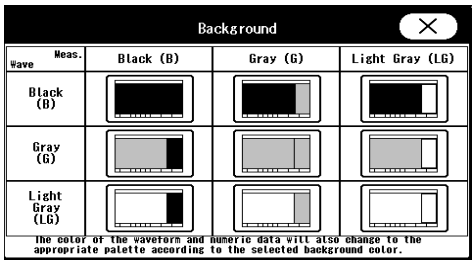
2 Set the background color.

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.

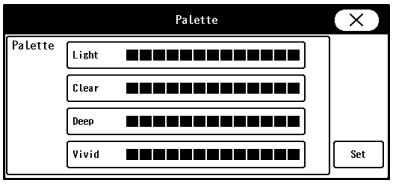
3 Set the color of numeric data and waveform.

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].

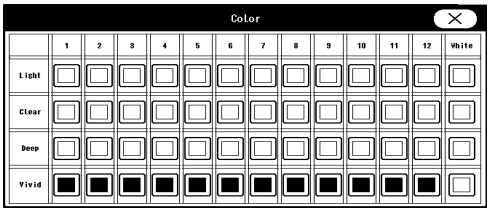
▸ The color of the numeric data and waveform will change to the selected palette color.

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.



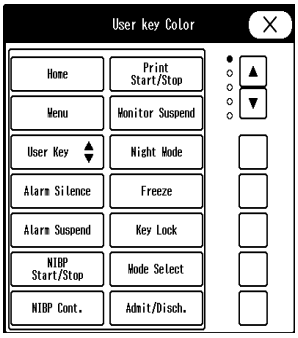
5 Select a color.

▸ 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

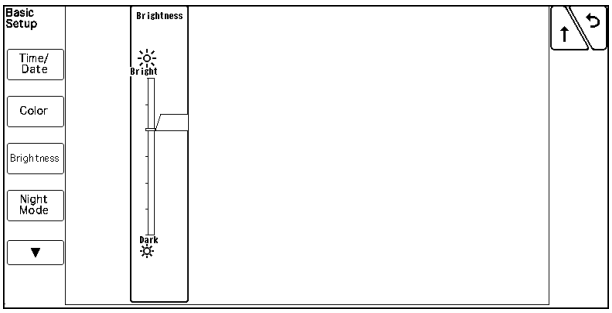
In this section, brightness adjustment of the monitor display is explained.

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.

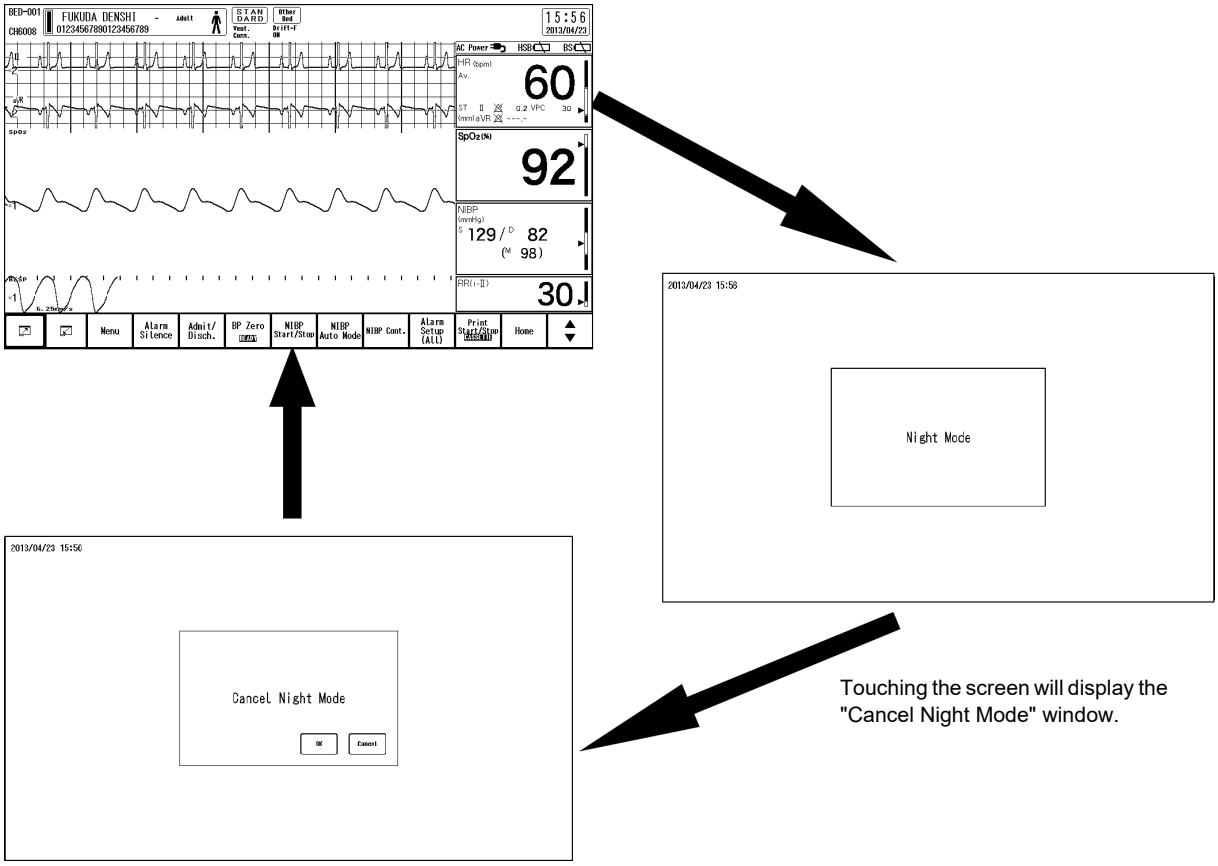
Night Mode

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.

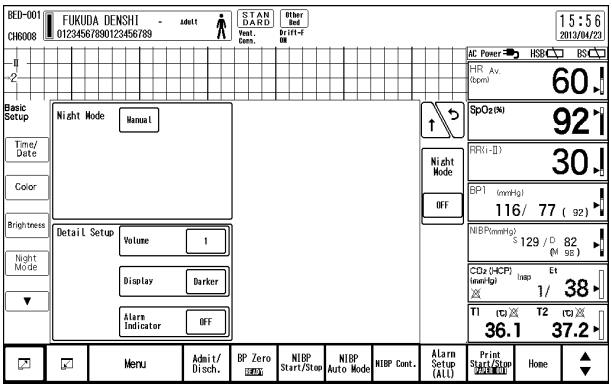
The night mode can be manually set to ON, or automatically set to ON by preprogramming the time to turn ON/OFF the night mode.

❑Operation flow when the night mode is set to "Timer"



❑Operation flow when the night mode is set to [Darker] or [Dark]

1 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

1 [Any Key]: The night mode can be cancelled by pressing any key on the screen.

2 [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

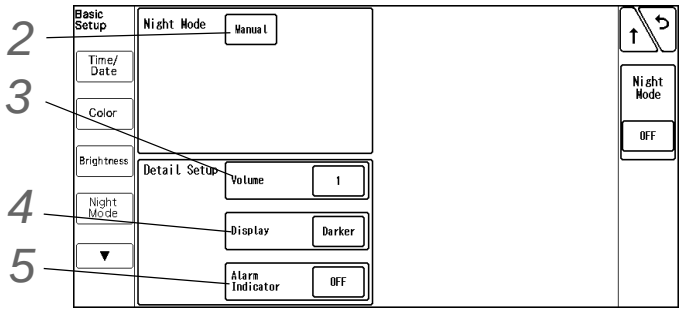
- The night mode can be manually turned ON from the menu, user key, or remote control even when the night mode is set to automatically turn ON. The night mode will automatically turn OFF at the set "End Time".
- The night mode cannot be set when the ventilator alarm is generated.

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.

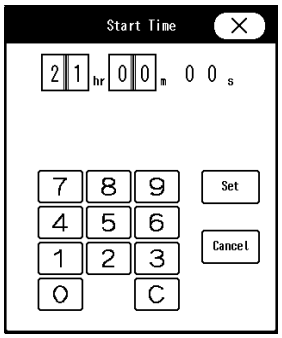
REFERENCE

- 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

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
  However, for HR alarm, there is no delay time for adult/child if "HR Delay" is set to ON.
- 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".

❑Top Priority Alarm (Alarm Level S)

This level can be selected 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)

Measuring Parameters	Message
Respiration (Impedance, CO_2, Ventilator)	<Apnea>
SpO_2	<Lower Ext SpO_2 Alarm>
Arrhythmia	<Asystole>
	<VF>
	<VT>
	<Slow VT>
	<Tachy>
	<Brady>
	<Ext Tachy>
	<Ext Brady>

❑Cautionary Alarm (Alarm Level M)

Measuring Parameters	Message
HR	<Lower HR Alarm>
	<Upper HR Alarm>
Blood Pressure	<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>
	<Pause>

*: * indicates the label of BP, TEMP.

❑Treatment Needed Alarm (Alarm Level L)

Measuring Parameters	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>
Temperature (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	<Couplet>
	<Bigeminy>
	<Trigeminy>
	<Frequent>
	<Triplet>
	<R on T>
	<Multiform>
	<Vent. Rhythm>
	<SVT>
	<Irregular RR>
	<Prolonged RR>
	<S Frequent>
	<S Couplet>
	<VPC>
	<SVPC>
	<Pacer not Capture>
	<Pacer not Pacing>

* indicates the channel number of BP, TEMP.

❑Message (Notification)

Measuring Parameters	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, Tachy, Brady, Ext Tachy, Ext Brady 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".

❑Top Priority Alarm (Alarm Level S)

This level can be selected only when [Fukuda Tone] is selected for the "Alarm System" under [Menu>Setup>Initial Settings>Alarm]. It cannot be selected when the "Alarm System" is [Melodic Tone] or [Standard Tone].

❑Life Threatening Alarm (Alarm Level H)

Measuring Parameters	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>
Blood Pressure	<Lower BP1 Alarm>
	<Upper BP1 Alarm>
	<Lower ART Alarm>
	<Upper ART Alarm>
Non-Invasive Blood Pressure	<Lower NIBP Alarm>
	<Upper NIBP Alarm>
Respiration (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>
	<Slow VT>
	<Tachy>
	<Brady>
	<Run>
	<Ext Tachy>
	<Ext Brady>

❑Cautionary Alarm (Alarm Level M)

Measuring Parameters	Message
Blood Pressure	<Lower BP2 Alarm> or <Lower (label other than ART) Alarm>*
	<Upper BP2 Alarm> or <Upper (label other than ART) 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>
	<Triplet>
	<R on T>
	<Multiform>
	<Vent. Rhythm>
	<SVT>
	<Irregular RR>
	<Prolonged RR>
	<S Frequent>
	<S Couplet>
	<VPC>
	<SVPC>
	<Pacer not Capture>
	<Pacer not Pacing>

* indicates the channel number of BP, TEMP.

❑Message (Notification)

Measuring Parameters	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, Tachy, Brady, Ext Tachy, Ext Brady 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-810-810)	"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(Notificaton).(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 Cable Near Expiration"	3
	"SpO_2 Sensor Near Expiration"	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>
<Check the catheter.>
<Out of Range>

❑Pulse Rate (BP Source)

Message
<Upper PR Alarm> (BP)
<Lower PR Alarm> (BP)
<Check the catheter.>
<Out of Range>

❑NIBP

If <NIBP Meas. Error> is displayed, the message can be canceled by pressing [Cancel Error] on the NIBP setup screen, or [NIBP Start/Stop] key (user key), or [NIBP START/STOP] key (fixed key).

If the same message is repeatedly displayed, a failure of the equipment can be considered. Cease the measurement, and contact your nearest service representative.

(☞"<NIBP Unit Error (E**-**)> is displayed." P11-37)

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>

❑SpO_2 (Nellcor Unit)

Message
<Unit Failure>
<Lower ExtSpO_2 Alarm>
<Lower SpO_2 Alarm>
<Upper SpO_2 Alarm>
<Replace Sensor>
<Check Sensor Attach.>
<No Pulse Detected>
<Motion Artifact>
<Pulse Search>

❑SpO_2/SpCO/SpMet/SpHb (Masimo Model)

Message
<Lower ExtSpO_2 Alarm>
<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.>
<Zeroing Sensor>
<SpO_2 only mode>
<Low Signal IQ>
<Low Confidence>

❑PR-SpO_2

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>

❑CO_2 (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.>
<Zeroing>

Message
<GAS Warm Up>
<Zero CO_2 Adapter>
<Unknown Sensor>
<Out of Range>

❑CO_2 (HCP-810)

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)

Item	Message
Ventilator	<Vent. Alarm>
Ventilator	<VENT COMM>

⚠ WARNING

- When the VELIA, ASTRAL, VS ULTRA ventilator is connected, and the ventilator power is turned OFF, alarm will not generate on the DS-8200. If the connection cable is disconnected from the ventilator, <Vent. Alarm> will generate, but <VENT_COMM> alarm will not generate on the DS-8200.
- The ventilator alarm sound is set to OFF (factory default).
- The alarm sound can be turned ON on the "Tone/Volume" menu. (☞"Tone/Volume" P10-17)

Ventilator Alarm Factor

⚠ CAUTION

- For the ventilators other than Servo ventilators, ventilator alarm factor will not be notified to the central monitor.
- Depending on the central monitor type and software version, ventilator alarm factor may not be displayed. For details of the central monitor type and software version, refer to your nearest 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	Remarks
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 • 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 • 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 • 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 • The thermistor connector and relay cable are not securely connected. • The sensor or relay cable is defective.
OVER RANGE	Measurement error • 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 if the electrodes are properly attached.
Replace the electrodes.
Make sure that the lead cable or relay cable is not 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 0.25 mV or below for the waveform size of x1, x1/2, x1/4, and 0.15 mV 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, move it away from the patient as far 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, move it away from the patient as far 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 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 in the baseline position.

The lead-off condition may have occurred by the following causes.

Cause 1

Electrode is detached.

Solution

Place the electrodes again.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 can be considered. Contact

your nearest 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 same type of electrodes .
(☞"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 failure of the ECG unit can be considered. Contact your nearest service representative.

❑The measurement data is displayed as "xxx".

Cause

The heart 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 and relay cable.

❑Heart rate is not counted. Heart rate is low.

Cause

The ECG waveform amplitude is below the QRS detection level (0.3 mV).

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 and 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 if the electrodes are properly attached.
  (☞"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" menu.

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

The pacemaker pulse is detected 16 pulses or more per second.

Solution 1

- 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 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 using 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. The message will disappear, and the alarm will be silenced.

❑<Cannot analyze> is displayed.

Cause

"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.

❑Arrhythmia cannot be detected, or is judged as "?".

Cause 1

The amplitude of ECG1 or ECG2 is below the QRS detection level (250 μV and below).

Solution

Change the electrode site, or select a lead with higher QRS amplitude for both ECG1 and ECG2.When the electrode site is changed, perform the arrhythmia learn process.

Cause 2

The shapes of normal heartbeat and arrhythmia are similar.

Solution

Change the electrode site or select a lead which shows a clear difference between a normal heartbeat and arrhythmia. When the electrode site is changed, perform the arrhythmia learn process.

Cause 3

Noise is interfering with the ECG.

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.

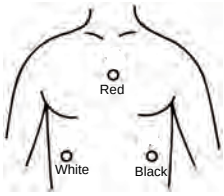
Cause

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 [II].
- 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. The message will disappear, and the alarm will be silenced.

Solution 2

Connect the transducer.

Solution 3

The BP relay cable or transducer may be defective. Replace the BP relay cable or 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 nor 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. The message will disappear, and the alarm will be silenced.

Solution 2

To continue monitoring, plug in the BP interface cable or 2ch BP conversion cable. The message will disappear, and the alarm will be silenced.

❑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.

❑<Transducer Voltage Failure> is displayed.

Cause 1

The BP relay cable or transducer is defective.

Solution

Replace the BP relay cable or transducer.

Cause 2

A hardware failure has occurred.

Solution

Immediately turn OFF the power and cease the operation. Contact your nearest service representative.

❑<Check the ART catheter.> is displayed.

Cause 1

During the measurement, ART catheter was disconnected.

Solution

Connect the ART catheter securely. Make sure that the ART catheter is not loose.

Cause 2

The BP relay cable or transducer is defective.

Solution

Replace the BP relay cable or transducer.

SpO_2 Measurement (HS-8312N)

❑<SpO_2 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.

❑<SpO_2 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.

❑<SpO_2 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.

❑<SpO_2 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: <SpO_2 Check Sensor Attach.> 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

SpO_2 sensor is not firmly connected to the connector.

Solution

Make sure the SpO_2 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.

❑SpO_2 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 SpO_2 Failure> is displayed.

Cause 1

The sensor is defective.

Solution

Replace the sensor.

Cause 2

Communication error has occurred with the SpO_2 unit.

Solution

A defective cable or SpO_2 unit failure can be considered.
Contact your nearest service representative.

❑<SpO_2 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 details of the usable sensors, refer to your nearest service representative.

❑<SpO_2 Disconnected> is displayed.

Cause

The SpO_2 relay cable is disconnected during SpO_2 monitoring.

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 SpO_2 relay cable. The message will disappear, and the alarm will be silenced.

SpO_2 Measurement (HS-8312M)

❑<SpO_2 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 (Manufactured by Masimo)" P13-4)

Cause 4

The sensor is used beyond its expected life.

Solution

Replace the sensor.

NOTE

- The X-Cal function automatically monitors the Active Monitoring Time (actual time of SpO_2 monitoring) for each sensor and cable.
- Even if the sensor is used beyond its expected life, the measurement will not cease unless the power is turned OFF, sensor is disconnected from the cable, cable is disconnected from the monitor, or the sensor is reattached.
- When a measurement with a sensor that has reached its end of life is suspended for certain amount of time, and resumed with the same sensor, a message to replace the sensor will be displayed.
- Depending on the equipment, some sensors may not be recognized.

❑<SpO_2 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.

❑<SpO_2 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.

❑<SpO_2 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.

❑<SpO_2 Noise Interference> is displayed.

Cause

External signal or energy is interfering with the measurement.

Solution

Remove the external interference or apply ambient shielding.

❑<SpO_2 Check Sensor>, <SpO_2 Replace Cable>, or <SpO_2 Check Cable> is displayed.

Cause 1

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 SpO_2 sensor and patient cable.

Replace with a Fukuda Denshi specified patient cable and sensor.

(☞"Pulse Oximetry Measurement (Manufactured by Masimo)" P13-4)

Cause 2

The cable is used beyond its expected life.

Solution

Replace the patient cable.

NOTE

- The X-Cal function automatically monitors the Active Monitoring Time (actual time of SpO_2 monitoring) for each sensor and cable.
- Even if the cable is used beyond its expected life, the measurement will not cease unless the power is turned OFF or the cable is reconnected.
- When a measurement with a cable that has reached its end of life is suspended for certain amount of time, and resumed with the same cable, a message to replace the cable will be displayed.
- Depending on the equipment, some cable may not be recognized.

❑<HS-8000 SpO2 Failure> is displayed.

Cause

Communication error has occurred with the SpO_2 unit.

Solution

A defective cable or SpO_2 unit failure can be considered. Contact your nearest service representative.

❑<SpO_2 Disconnected> is displayed.

Cause

The SpO_2 relay cable is disconnected during SpO_2 monitoring.

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 SpO_2 relay cable. The message will disappear, and the alarm will be silenced.

❑<SpO_2 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 SpO_2 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, contact your nearest 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, contact your nearest 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 application is proper, and if the cuff size corresponds with the selected patient type.

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 leakage inside the HS-8000 can be considered.
Contact your nearest 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 the connection is loose or disconnected, securely connect it and perform the measurement again.

If the same message is displayed again, internal air leakage can be considered. Cease the measurement, and contact your nearest service representative.

Cause 2

The cuff is compressed.

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 repeatedly displayed, air system may be clogged. Cease the measurement, and contact your nearest service representative.

Cause 3

The cuff size is not suitable for the patient.

Solution

Check that the cuff size is appropriate for the patient, and that the cuff is properly attached, and measure again.

Cause 4

The cuff size and the patient classification setting do not match.

Solution

Make sure that the appropriate cuff size is used according to the patient classification setting.

❑<NIBP measurement failed (Cxx-xx)> is displayed.

Error code condition (phenomenon, or situation) and its cause are indicated below.

C02-00 When "Quick Measurement" is [OFF], the data could not be measured.

Cause 1

The blood pressure may not be correctly measured due to the patient's condition.

Solution

Check the patient's condition, and measure again.

Cause 2

The cuff application has become loose.

Solution

Check that the cuff size is appropriate for the patient, and then measure again after attaching the cuff properly.

C02-01 When "Quick Measurement" is [ON], the data could not be measured.

Cause 1

The blood pressure may not be correctly measured due to the patient's condition.

Solution

Check the patient's condition, set "Quick Measurement" to OFF, and measure again.

Cause 2

The cuff application has become loose.

Solution

Check that the cuff size is appropriate for the patient, and then measure again after attaching 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, an 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 your nearest service representative and notify the error code.

C04-xx The cuff inflation was insufficient for the patient's 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 many times, correct measurement cannot be performed.Measure when arrhythmia is not frequently occurring.

C07-00 The measurement time has exceeded the allowable time.

Cause

Measurement is automatically repeated due to body motion or insufficient inflation.

Solution

Check the cuff application and size, and measure while keeping the patient still as much as possible.

C08-00 The detected 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 allowable maximum value.

Cause

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.

C10-xx The detected pulse amplitude was abnormal.

Cause

The cuff size is not suitable for the patient.

Solution

Check that the cuff size is appropriate for the patient, and that the cuff is properly attached, and measure again.

❑The time of measurement disappears and the numeric data is displayed as " - - - ".

Cause

The preprogrammed time to clear the NIBP data has elapsed.

Solution

The "NIBP Erase Time" can be selected from [60 min.], [120 min.], and after the set duration, the NIBP data will be displayed as "---".
Select the appropriate time which best fits the monitoring purpose.

❑The NIBP periodic measurement is ceased.

Cause

<NIBP Meas. Error (Exx-xx)> is displayed during the measurement.

Solution

When <NIBP Meas. Error (Exx-xx)> is displayed, the NIBP periodic measurement will be canceled. To resume the measurement, press the [NIBP Start/Stop] key and check that the measurement is properly performed.

❑<NIBP Unit Error (E**-**)> 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: Zero Calibration 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 was started before zero calibration

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 1

These errors can be cleared by pressing the [Cancel Error] on the NIBP setup menu 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 your nearest service representative.

Solution 2

When <NIBP Unit Error (Exx-xx)> is displayed, make sure that the congestion is not generated, and remove the cuff if necessary.

Temperature

❑<T* Unknown Sensor> is displayed.

Cause 1

700 series temperature probe 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 probe 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 probe. The message will disappear, and the alarm will be silenced.

❑<HS-8000 TEMP Unit Failure> is displayed.

Cause

An error was detected on the temperature unit.

Solution

A unit failure can be considered.Cease the measurement, and contact your nearest service representative.

Cardiac Output (CO)

❑When measured consecutively, the measurement value varies. (±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 (Tb), injectate temperature (Ti) 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.

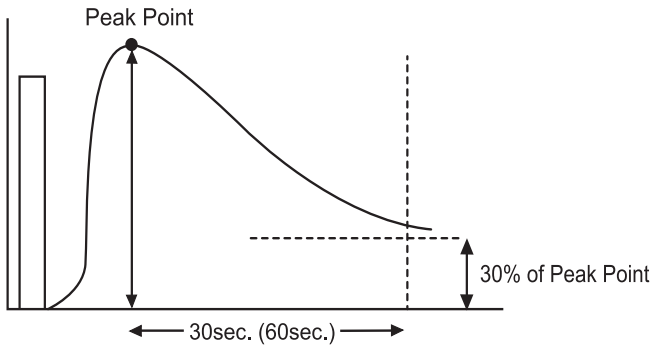
Solution

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).

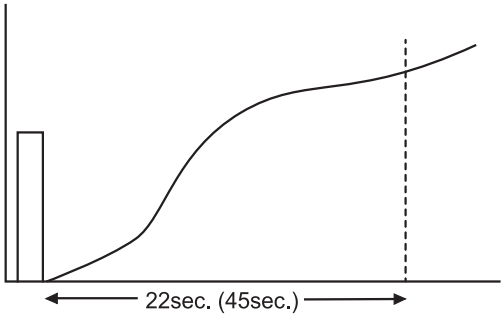
Solution

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").

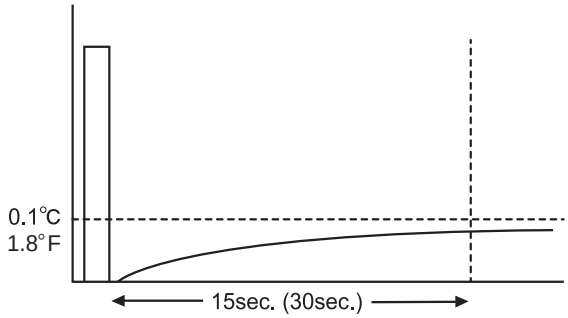
Solution

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 /1.8°F 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.

CO_2 Measurement (HCP-810)

❑<CO_2 Check Sample Line> is displayed.

Cause

The sampling tube is clogged.

Solution

Replace the sampling tube.

❑<Initializing> displayed inside the numeric data box does not disappear.

Cause

An error has occurred during the initialization at power ON.

Solution

The CO_2 unit failure can be considered.

❑<CO_2 Unit Error> is displayed.

Cause

Communication error has occurred with the CO_2 unit.

Solution

A cable disconnection or CO_2 unit failure can be considered. Contact your nearest 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 CO_2 calibration value is not appropriate.

Solution

Perform the CO_2 calibration again.

❑<CO_2 Disconnected> is displayed.

Cause

When the filter line is disconnected during CO_2 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.

CO_2 Measurement (HPD-810)

❑<CO_2 Sensor Failure> is displayed.

Cause 1

The CO_2 sensor temperature has increased above 40°C/104°F.

Solution

Remove any heat generating source around the sensor.

Cause 2

The CO_2 sensor is malfunctioning.

Solution 1

Replace the CO_2 sensor.

Solution 2

If the error persists, the failure of HPD-810 can be considered. Stop using the unit and contact our service representative.

❑<Zero the CO_2 Adapter> is displayed.

Cause

The CO_2 sensor is not zero balanced.

Solution

Perform the zero calibration of the sensor.
(☞"CO_2 Concentration (Mainstream Method)" P7-73)

❑<Check CO_2 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 CO_2 Sensor> is displayed.

Cause

Unsupported CO_2 sensor is connected.

Solution

Connect the specified CO_2 sensor.

❑<CO_2 Disconnected> is displayed.

Cause

When the cable is disconnected during CO_2 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.

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 CO_2 waveform is not displayed on the central monitor although the CO_2 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 [CO_2] for "RR/APNEA Alarm Source" on the RESP setup screen.
In this case, RR and apnea alarm will be generated based on CO_2 measurement.

❑The impedance respiration waveform is not displayed on the central monitor although the RR numeric data is displayed.

Cause 1

[CO_2] 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 [CO_2] is set for "RR/APNEA Alarm Source". AWF, AWP waveform will be displayed.
- The CO_2 waveform will not be displayed if [Impedance] is set for "RR/APNEA Alarm Source". AWF, AWP waveform will be displayed.
- The CO_2 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 (HLX-801)

❑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

[CO_2] 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

This is a normal operation which indicates the data updating process.

❑An error occurs during the data update process.

Cause

The 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 your nearest service representative.

Solution 2

If the error occurs during the write process on the DS-8200 System, start again from the read process on the original patient monitor. If the same error persists, refer to your nearest 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. 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, and format it.

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, FiO_2
- 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/s

- No network setting.

PB-740/760/840

- Baud Rate: 9600 bps
- Parity Bit: None
- Stop Bit: 1
- Data Bit: 8

Evita4/2dura/XL

- Communication Protocol: Medibus
- Baud Rate: 19200 bps
- Parity Bit: Even
- Stop Bit: 1

SvO_2/CCO Monitor

❑The numeric data is not displayed.

Cause 1

The cable is not properly connected.

Solution

Connect the following cable securely.

SvO_2/CCO Monitor	Connection Cable	
	For Status II Connector	For Serial Connector
Vigilance	CJ-406RI-70Vigi (x1)	CJO-04RS4
Vigilance CEDV	CJ-406RI-70Vigi (x1)	CJO-04RS4
Vigilance II	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 corresponding external device.

Solution

The measurement data of SvO_2, 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 CCO/CCI data will be displayed on this equipment only when CCO is measured on each external device.

Cause 5

The network setting of the monitor does not match with each 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 equipment is in default setting.

In Case of Vigilance/Vigileo:

Make sure that 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: 19200 bps
- 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.

Magnetic Card Reader/Barcode Reader

❑The magnetic card reader or barcode reader does not function.

Cause

The conversion cable (CJ-756) is not connected.

Solution

If the magnetic card reader or barcode reader is connected directly to the serial port on this equipment without the conversion cable, it will not function. Make sure to use the conversion cable.

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

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		Initialize
Height	0.0 to 300.0cm / 0.0 to 118.1in	0.0cm / 0.0in		
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	Description	Default	At Power ON	At Discharge
System Alarm	Suspend, ON	Suspend	-	-
HR PR_SpO_2, PR_IBP	ON, OFF 20 bpm to 300 bpm	40 bpm to 165 bpm	Depends on the setting under [Initial Settings>User I/F>Power ON/Discharge].	
Asystole[*1]	ON, OFF 3 sec. 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 beats to 8 beats	ON 3 beats		
Couplet	ON, OFF	OFF		
Pause	ON, OFF 1.5 sec. to 5 sec.	OFF 3.0 sec.		
Bigeminy	ON, OFF	OFF		
Trigeminy	ON, OFF	OFF		
Frequent	ON, OFF 1 bpm to 50 bpm	OFF, 10 bpm		
Tachy	ON, OFF	ON		
Brady	ON, OFF	ON		
Ext Tachy	ON, OFF 22 bpm to 300 bpm	OFF		
Ext Brady	ON, OFF 20 bpm to 295 bpm	OFF		
Triplet	ON, OFF	OFF		
R on T	ON, OFF 200 ms to 600 ms	OFF		
Multiform	ON, OFF	OFF		
Vent Rhythm	ON, OFF	OFF		
SVT	ON, OFF 2 beats to 10 beats	OFF		
Irregular RR	ON, OFF 10% to 20%	OFF		
Prolonged RR	ON, OFF	OFF		
S Frequent	ON, OFF 1 bpm to 50 bpm	OFF		
S Couplet	ON, OFF	OFF		
VPC	ON, OFF	OFF		
SVPC	ON, OFF	OFF		
Pacer not Capture	ON, OFF 80 ms to 480 ms	OFF		
Pacer not Pacing	ON, OFF 20 bpm to 200 bpm	OFF		
HR Lower Limit for VT	120 bpm, 140 bpm	120		
HR Lower Limit for RUN	0 bpm to 100 bpm	40		
HR Lower Limit for SVT	100 bpm to 250 bpm	160		
ST1 to ST12(mm)[*2]	ST All Alarm ON, OFF Individual Alarm ON, OFF ±20mm	ST All Alarm OFF Individual Alarm OFF OFF to OFF		
ST1 to ST12(mV)[*2]	ST All Alarm ON, OFF Individual Alarm ON, OFF ±2.00mV	ST All Alarm OFF Individual Alarm OFF OFF to OFF		

Item	Description	Default	At Power ON	At Discharge
BP1 (mmHg)	ON, OFF 0 mmHg to 300 mmHg	ON SYS: 80 to 180 DIA: OFF to OFF MEAN: OFF to OFF	Depends on the setting under [Initial Settings>User I/F>Power ON/Discharge].	
BP1 (kPa)	ON, OFF 0 kPa to 40.0 kPa	ON SYS: 10.0 to 24.0 DIA: OFF to OFF MEAN: OFF to OFF		
BP2 to BP6 (mmHg)	ON, OFF 0 mmHg to 300 mmHg	OFF SYS: OFF to OFF DIA: OFF to OFF MEAN: OFF to OFF		
BP2 to BP6 (kPa)	ON, OFF 0 kPa to 40.0 kPa	OFF SYS: OFF to OFF DIA: OFF to OFF MEAN: OFF to OFF		

*1: Select [ON/OFF] for "Asystole, VF, VT Alarm" under [Menu<Initial Settings<Alarm] in advance.

*2: The same setting applies for "mm" and "mV".

Item	Description	Default	At Power ON	At Discharge
CVP (mmHg) (kPa)	ON, OFF 0 mmHg to 300 mmHg 0 kPa to 40 kPa	OFF	Depends on the setting under [Initial Settings>User I/F>Power ON/Discharge].	
CVP (cmH_2O)	ON, OFF 0 cmH_2O to 40 cmH_2O	OFF		
RR_IMP RR_VENT RR_GAS	ON, OFF 5 Bpm to 150 Bpm	ON 5-30		
Apnea	ON, OFF 10 sec. to 60 sec.	ON 15 sec.		
SpO_2	ON, OFF 50%SpO_2 to 100%SpO_2	ON 90 to OFF		
EXT SpO_2	ON, OFF 50%SpO_2 to 90%SpO_2	ON 80%SpO_2		
SpCO	ON, OFF 1%SpCO to 40%SpCO	OFF		
SpMet	ON, OFF 1%SpMet to 15%SpMet	OFF		
SpHb	ON, OFF 1.0 g/dL to 24.5 g/dL	OFF		
NIBP (mmHg)	ON, OFF 10 mmHg to 300 mmHg	ON SYS: 80 to 180 DIA: OFF to OFF MAP: OFF to OFF		
NIBP (kPa)	ON, OFF 1.5 kPa to 40.0 kPa	ON SYS: 10.0 to 24.0 DIA: OFF to OFF MAP: OFF to OFF		
TEMP1 to TEMP6 (°C, °F)	ON, OFF 30.0°C to 45.0°C/86.0°F to 113.0°F	OFF, OFF to OFF		
Tb (°C, °F)	ON, OFF 30.0°C to 45.0°C/86.0°F to 113.0°F	OFF, OFF to OFF		
CO_2-Et (mmHg)	ON, OFF 1 mmHg to 100 mmHg	OFF		
(kPa)	ON, OFF 0.1 kPa to 13.3 kPa	OFF		
(%)	ON, OFF 0.1% to 13.3%	OFF		
CO_2-Insp (mmHg)	ON, OFF 1 mmHg to 4 mmHg	OFF		
(kPa)	ON, OFF 0.1 kPa to 0.4 kPa	OFF		
(%)	ON, OFF 0.1% to 0.4%	OFF		

Item		Description	Default	At Power ON	At Discharge
Alarm Setup (Setup)	Alarm Suspend Time	1 min., 2 min.	2 min.	Backup	
	Alarm Silence Time	1 min., 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

- By selecting [Backup] for "Power ON" and "Discharge" under [Initial Settings>User I/F >Power ON/Discharge], the settings will be retained at "Power ON" and "Discharge" respectively. If [Initialize] is selected, the settings will be initialized 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

ECG

Item	Details	Default	At Power ON	At Discharge
HR Average	Instant, Average	Average	Backup	
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		
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].	

SpO_2 (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		

SpO_2 (Nellcor Unit)

Item	Details	Default	At Power ON	At Discharge
SpO_2 SEC Alarm	OFF, 10, 25, 50, 100	OFF	Backup	

SpO_2 (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, APOD	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].	
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	Backup	
Sight Inflation	ON, OFF	OFF		
Oscillograph	ON, OFF, Real Time	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, Ext Tachy, Ext Brady, Slow VT, Run, Bigeminy, Trigeminy, Pause, Couplet, Tachy, Brady, Frequent, Triplet, R on T, Multiform, Vent Rhtm, SVT, Ireg RR, Prolong RR, S Frequent, S Couplet, VPC, SVPC, Not Capt, Not Pacing	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.			

BP1 to 6

Item	Details	Default	At Power ON	At Discharge
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	

ΔTEMP-A to TEMP-C

Item	Details	Default	At Power ON	At Discharge
ΔTemp-A	(T1 to T6) - (T1 to T6)	T1-T2	Backup	
ΔTemp-B	(T1 to T6) - (T1 to T6)	T3-T4		
ΔTemp-C	(T1 to T6) - (T1 to T6)	T5-T6		

CO_2 (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_2O 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		

CO_2 (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_2O	50cmH_2O	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_2O 250, 500, 700, 1000mL ±20, ±50, ±180L/min	30cmH_2O 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

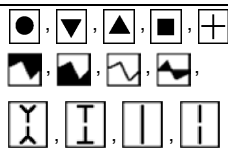
Item	Details	Default	At Power ON	At Discharge
Lt-rSO_2	ch1, ch2, ch3, ch4	ch1	Backup	
Rt-rSO_2	ch1, ch2, ch3, ch4	ch2		
S1-rSO_2	ch1, ch2, ch3, ch4	ch3		
S2-rSO_2	ch1, ch2, ch3, ch4	ch4		

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_2S1-rSO_2, S2-rSO_2		HR, SpO_2, OFF, NIBP	Backup	
Trend B			HR, BP1, T1, NIBP		
Trend C			HR, T1, BP1, NIBP		
Trend D			OFF, OFF, OFF, OFF		
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	[H Module] OFF, HR, VPC, ST (I to V6) , SpO_2, PR_ SpO_2, NIBP-S/D/M, BP1 to 6- S/D/M, PR_IBP, PDP, PCWP, CPP, TEMP1 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_2EI, 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, P-PEAK, P-PAUSE, PEEP, P-MEAN, E-RES, I-RES, COMP, FiO_2, SEF, TOTPOW, IMP			
	[Other] BIS, SQI, EMG, SR, Lt-rSO_2, Rt-rSO_2 S1-rSO_2, S2-rSO_2			
	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	Backup	
	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	Description	Default	At Power ON	At Discharge
Waveform	ECG1, ECG2, BP1 to 6, SpO_2, RESP, CO_2, RR_GAS	ECG1, ECG2	Backup	Backup

Recall

Item	Description	Default	At Power ON	At Discharge
Recall Factor	Asystole, VF, VT, Slow VT, Run, Bigeminy, Trigeminy, Pause, Couplet, Tachy, Brady, Frequent, ExtTachy, ExtBrady, RR IREG, Prolong RR , R ON T, TRIPLET, MLTIFORM , VENT RHYTHM, NOT CAPT , NOT PACING, S COUPLET, VPC, SVT, SVPC, S FREQUENT, HR, ST, NIBP, RR, APNEA, SpO_2, PR, BP1 to 6, TEMP1 to 6, Tb, CO_2, SpCO, SpMet, SpHb	All ON	Backup	Backup
List	5 Waves (Compressed: 12 sec.)	5 Waves (Compressed: 12 sec.)	Backup	Backup
Recall Display Selection	Asystole, VF, VT, Slow VT, Run, Bigeminy, Trigeminy, Pause, Couplet, Tachy, Brady, Frequent, ExtTachy, ExtBrady, RR IREG, Prolong RR , R ON T, TRIPLET, MLTIFORM , VENT RHYTHM, NOT CAPT , NOT PACING, S COUPLET, VPC, SVT, SVPC, S FREQUENT, HR, ST, NIBP, RR, APNEA, SpO_2, PR, BP1 to 6, TEMP1 to 6, Tb, CO_2, Event 1 to 8, SpCO, SpMet, SpHb	All ON	Backup	Backup

ST Measurement

Item	Description	Default	At Power ON	At Discharge
Measurement Point	0 ms to 560 ms	120 ms	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/ Discharge].	Initialize
Reference Point	0 ms to -240 ms	-80 ms		Initialize
ST Waveform Size	x1/4, x1/2, x1, x2, x4	x1	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/ Discharge].	
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 saved even after the power is turned OFF.
- The recall, ST, OCRG data will be saved even after about one hour of standby mode (AC power or battery operation).

12-lead Display

Item		Description	Default	At Power ON	At Discharge
ECG Analysis		Real Time, Review	Real Time	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/ Discharge].	Initialize
Limb Lead Size		x1/4, x1/2, x1, x2, x4	x1		
Chest Lead Size		x1/4, x1/2, x1, x2, x4	x1		
Filter	AC Filter	ON, OFF	OFF		
	EMG Filter	OFF, Strong (25Hz), Weak (35Hz)	OFF		
	Drift Filter	OFF, Strong (0.50Hz), Weak (0.25Hz)	0.50 Hz		

12-lead Display

Item	Description	Default	At Power ON	At Discharge
Background Color	White, Black	Black	Depends on the "Main Mode" setting under [Initial Settings>User I/F>Power ON/ Discharge].	

Basic Setup

Tone/Volume

Item	Description		Default	At Power ON	At Discharge
Vital Alarm Sound	Urgent	Volume: 11 levels	4	Depends on the "Main Mode" setting under [Setup>Initial Settings>User I/F>Power ON/ Discharge].	
		Tone: 5 types*	1		
	Caution	Volume: 11 levels	4		
		Tone: 5 types*	1		
	Status	Volume: 11 levels	4		
		Tone: 4 types*	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		
Sync. Tone	Volume: 11 levels		2		
	Tone: 5 types		1		
	Sync. Tone: Selected Tone, Sync. with SpO_2 Value		Selected Tone		
Key Sound	Volume: 11 levels		4		
	Tone: 3 types		1		
Other Bed Alarm	Volume: 11 levels		4		
	Tone: 1 type		1		
Boot/Shutdown Sound	Volume: 11 levels		2		
	Tone: 3 types		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.				
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, ΔTEMP-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, CO2, 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	Bedside, Cent.	Bedside	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		
	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	Bedside, Central, Laser	Bedside		
	Tabular Trend	Bedside, Central, Laser	Bedside		
	OCRG	Bedside, Laser	Bedside		
	Zoom Wave (Recall, Full Disc.)	Bedside, Central, Laser	Bedside		
	ST	Bedside, Central, Laser	Bedside		
	12-Lead Waveform	Bedside, Laser	Bedside		
	12-Lead Analysis Result	Bedside, Laser	Bedside		
	Full Disc. Compressed Wave	Bedside, Laser	Bedside		
	Hemodynamics	Bedside, Central, Laser	Bedside		
	Lung Function	Bedside, Central, Laser	Bedside		
	CO	Bedside, Central, Laser	Bedside		
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	Bedside, Cent.	Bedside		
	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		
	Printer	Bedside, Cent.	Bedside		
	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	Backup	
	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		

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

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 (Manufactured by Fukuda Denshi)

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 (Manufactured by Fukuda Denshi)

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 (Manufactured by Fukuda Denshi)

Item	Model Type	Note
Infant Cuff	CUF-8501	Latex-free, Arm Circumference 8 cm to 13 cm
Pediatric Cuff	CUF-8502	Latex-free, Arm Circumference 12 cm to 19 cm
Adult Cuff (Small)	CUF-8503	Latex-free, Arm Circumference 17 cm to 25 cm
Adult Cuff (Medium)	CUF-8504	Latex-free, Arm Circumference 23 cm to 33 cm
Adult Cuff (Large)	CUF-8505	Latex-free, Arm Circumference 31 cm to 40 cm
Adult Cuff (Thigh)	CUF-8506	Latex-free, Arm Circumference 38 cm to 50 cm
Neonatal Cuff* Neonate #1	98-0400-80	Disposable, Latex-Free Arm Circumference 3 cm to 6 cm
Neonatal Cuff* Neonate #2	98-0400-81	Disposable, Latex-Free Arm Circumference 4 cm to 8 cm
Neonatal Cuff Neonate #3	98-0400-82	Disposable, Latex-Free Arm Circumference 6 cm to 11 cm
Neonatal Cuff Neonate #4	98-0400-83	Disposable, Latex-Free Arm Circumference 7 cm to 13 cm
Neonatal Cuff Neonate #5	98-0400-84	Disposable, Latex-Free Arm Circumference 8 cm to 15 cm
Air Hose (1.5m) General	OA-80APR1.5	For CUF-8501/8502A/8503/8504/8505
Air Hose (3.5m) General	OA-80APR3.5	For CUF-8501/8502A/8503/8504/8505
Air Hose (1.5m) Neonate	OA-80NE1.5	For Neonatal Cuff
Air Hose (3.5m) Neonate	OA-80NE3.5	For Neonatal Cuff

*Neonatal Cuffs, manufactured by SUN-TECH Medical Products Corporation.

Temperature Measurement (Manufactured by Fukuda Denshi)

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 (Manufactured by Covidien)

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 (Manufactured by Masimo)

❑SpO_2, PR, PI, PVI Measurement

Item	Model Type	Note
Masimo SET Sensor	LNCS DCI	Reusable Sensor for Adult
Masimo SET Sensor	LNCS Adtx	Adhesive Sensor for Adult
Masimo SET Sensor	LNCS Pdtx	Adhesive Sensor for Pediatric
Masimo SET Sensor	LNCS Neo-L	Adhesive Sensor (L-Shape) for Neonate
Masimo SET Sensor	LNCS Inf-L	Adhesive Sensor (L-Shape) for Infant

Item	Model Type	Note
Masimo SET Sensor	LNCS NeoPt-L	Adhesive Sensor (L-Shape) for Premature Neonate
Masimo RD SET Sensor	RD SET DCI	Reusable Sensor for Adult
Masimo RD SET Sensor	RD SET Adt	Adhesive Sensor for Adult
Masimo RD SET Sensor	RD SET Pdt	Adhesive Sensor for Pediatric
Masimo RD SET Sensor	RD SET Inf	Adhesive Sensor for Infant
Masimo RD SET Sensor	RD SET Neo	Adhesive Sensor for Neonate
Masimo RD SET Sensor	RD SET NeoPt	Adhesive Sensor for Premature Neonate
LNCS Patient Cable	Red LNC-04	For LNCS sensor, 1.2m
LNCS Patient Cable	Red LNC-10	For LNCS sensor, 3.0m
LNCS Patient Cable	Red LNC-14	For LNCS sensor, 4.2m
RD Patient Cable	RD SET MD20-1.5	For RD SET sensor, 0.5m
RD Patient Cable	RD SET MD20-05	For RD SET sensor, 1.5m
RD Patient Cable	RD SET MD20-12	For RD SET sensor, 3.7m

❑SpO_2, PR, PI, PVI, SpMet, SpCO Measurement

Item	Model Type	Note
Masimo Rainbow Sensor	Rainbow DCI-dc3	Reusable Direct Connect Sensor for Adult (0.9m)
Masimo Rainbow Sensor	Rainbow DCI-dc8	Reusable Direct Connect Sensor for Adult (2.4m)
Masimo Rainbow Sensor	Rainbow DCI-dc12	Reusable Direct Connect Sensor for Adult (3.6m)
Masimo Rainbow Sensor	Rainbow R25	Adhesive Sensor for Adult
Masimo Rainbow Sensor	Rainbow R25-L	Adhesive Sensor (L-Shape) for Adult/Neonate
Masimo Rainbow Sensor	Rainbow R20	Adhesive Sensor for Pediatric
Masimo Rainbow Sensor	Rainbow R20-L	Adhesive Sensor (L-Shape) for Pediatric/Infant
Rainbow RC Patient Cable	Rainbow RC-1	For Rainbow Sensor, 0.3m
Rainbow RC Patient Cable	Rainbow RC-4	For Rainbow Sensor, 1.2m
Rainbow RC Patient Cable	Rainbow RC-12	For Rainbow Sensor, 3.6 m
RD Rainbow Patient Cable	RD Rainbow SET MD20-1.5	For RD SET sensor, 0.5m
RD Rainbow Patient Cable	RD Rainbow SET MD20-05	For RD SET sensor, 1.5m
RD Rainbow Patient Cable	RD Rainbow SET MD20-12	For RD SET sensor, 3.7m

❑SpO_2, PR, PI, PVI, SpMet, SpHb Measurement

Item	Model Type	Note
Masimo Rainbow ReSposable Sensor System (For Adult)	Rainbow ReSposable R2-25	ReSposable Sensor Cable (For Adult) x1 ReSposable Sensor (Adhesive Tape for Adult) x10
Masimo Rainbow ReSposable Sensor System (For Child)	Rainbow ReSposable R2-20	ReSposable Sensor Cable (For Child) x1 ReSposable Sensor (Adhesive Tape for Child) x10
Masimo Rainbow ReSposable Sensor Tape (For Adult)	Rainbow ReSposable R2-25a	To be used with ReSposable sensor (adhesive tape for adult), ReSposable sensor cable (for adult), 25 per box
Masimo Rainbow ReSposable Sensor Tape (For Child)	Rainbow ReSposable R2-20a	To be used with ReSposable sensor (adhesive tape for child), ReSposable sensor cable (for child), 25 per box
Masimo Rainbow ReSposable Sensor Cable (For Adult)	Rainbow ReSposable R2-25r	To be used with ReSposable sensor tape (for adult), 5 per box
Masimo Rainbow ReSposable Sensor Cable (For Child)	Rainbow ReSposable R2-20r	To be used with ReSposable sensor tape (for child), 5 per box

Item	Model Type	Note
Rainbow RC Patient Cable	Rainbow RC-1	For Rainbow Sensor, 0.3m
Rainbow RC Patient Cable	Rainbow RC-4	For Rainbow Sensor, 1.2m
Rainbow RC Patient Cable	Rainbow RC-12	For Rainbow Sensor, 3.6 m
RD Rainbow Patient Cable	RD Rainbow SET MD20-1.5	For RD SET sensor, 0.5m
RD Rainbow Patient Cable	RD Rainbow SET MD20-05	For RD SET sensor, 1.5m
RD Rainbow Patient Cable	RD Rainbow SET MD20-12	For RD SET sensor, 3.7m

NOTE

- SpCO and SpHb cannot be measured at the same time for all the sensors.

NOTE

- There are various types of sensors available.For details, contact your nearest service representative.

CO Measurement (Manufactured by Fukuda Denshi)

Item	Model Type	Note
Catheter Relay Cable	CJO-P01C-C2.4	
Flow-through Sensor Relay Cable	CJO-P01C-F2.4	
In-line Sensor Relay Cable	CJO-P01C-L2.4	
Injectate Probe Relay Cable	CJO-P01C-T2.4	

CO_2 Concentration Measurement (Manufactured by Philips)

❑For HPD-810 Gas Unit I/F with Capnostat 5 CO_2 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.

CO_2 Concentration Measurement (Manufactured by Covidien)

❑For HCP-810 CO_2 Gas Unit

Sampling Devices

Item	Model Type	Note
Intubated $EtCO_2$		
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 $EtCO_2$		
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 (Manufactured by Fukuda Denshi)

Item	Model Type	Note
Power Supply Cable	CS-34	
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
Magnetic Card Reader	CRF-700S-2004	
Barcode Reader	HS-505FD	
Countertop for DS-8200	OAO-68A	For fixing the Base Unit on a shelf For BS-8210
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

Item	Model Type	Note
Gas Unit / External Output Box Mounting Bracket	OAO-72A	For fixing the Gas Unit / External Output Box to the HSB-80
HTC Attachment Case for DS-8200	OAO-73A	For fixing the HTC-702 to the BS-8210
Recorder Mounting Bracket for Countertop	OAO-74A	For fixing the HR-800 to the BS-8210
Bidirectional Wireless Communications Module	HTC-702	
Telemetry Transmitter Module	HLX-801	
Telemetry Transmitter Module	HLX-801(G)	
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

Item	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
VELIA/ASTRAL	CJO-23DR2	For Status II Connector
VS ULTRA	CJO-24DR2	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-407-RI-70BIS	For Status II Connector
	CJO-03RS4	For Serial Connector
INVOS 5000C	CJ-406RI-70Vigi	For Status II Connector
	CJO-04RS4	For Serial Connector
Magnetic Card Reader/Barcode Reader	CJ-756	For Serial Connector

Chapter 14 Specification

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°C to 40°C
Operating Humidity	30% to 85% (non-condensing)
Transport / Storage Temperature	-10°C 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	70 kPa to 106 kPa
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°C to 40°C
Operating Humidity	30% to 85% (non-condensing)
Transport / Storage Temperature	-10°C 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	70 kPa to 106 kPa
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

2.5 kg (not including the accessory)

Environmental Conditions

Operating Temperature	10°C to 40°C
Operating Humidity	30% to 85% (non-condensing)
Transport / Storage Temperature	-10°C 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	70 kPa to 106 kPa
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 100-240
Frequency	50 Hz / 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	1.2 kg (not including the accessory)

Environmental Conditions

Operating Temperature	10°C to 40°C
Operating Humidity	30% to 85% (non-condensing)
Transport / Storage Temperature	-10°C 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	70 kPa to 106 kPa
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. (☞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	0.54 kg (not including the accessory)

Environmental Conditions

Operating Temperature	10°C to 40°C/50°F to 104°F
Operating Humidity	30% to 85% (non-condensing)
Transport / Storage Temperature	-10°C to 60°C/14°F to 140°F
Transport / Storage Humidity	10% to 95% (40°C/104°F) (non-condensing)
Storage Atmospheric Pressure	70 kPa to 106 kPa

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 basic safety and essential performance - Collateral standard: Electromagnetic compatibility - Requirements and tests)
Type of protection against electric shock	Class I Equipment (During AC power operation) Internally Powered Equipment (During battery operation)
Waterproof/Dustproof	IPX0
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) x 91(H) x 87(D) mm (not including the protrusion)

Weight

HPD-800	0.3 kg (not including the accessory)
HPD-810	0.18 kg (not including the accessory)
HCP-800	0.4 kg (not including the accessory)
HCP-810	0.22 kg (not including the accessory)

Environmental Conditions

Operating Temperature	10°C to 40°C
Operating Humidity	30% to 85% (non-condensing)
Transport / Storage Temperature	-10°C to 60°C
Transport / Storage Humidity	10% to 95% (40°C) (non-condensing)
Storage Atmospheric Pressure	70 kPa to 106 kPa

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/HCP-810: DC12V HPD-800/HPD-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	1024×600 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/Undershoot Capable to reject pulses of pulse width 0.1 to 2ms, amplitude ±2 to ±700mV b) Pacemaker Pulse with Over/Undershoot Rejection is not possible. c) Pacer Pulse Detector Rejection of Fast ECG Signals Slew Rate 3.5V/S

Respiration

Method	Impedance Method
Frequency Characteristic	1.5 Hz (adult, child) / 2.5 Hz (neonate)
Current	100 μA and below (at 66.65 kHz±5%)
Measurement Range	0, 4 Bpm to 150 Bpm
Measurement Accuracy	±3 Bpm

TEMP

Measurement Method	Thermistor Method
Probe	400 only
Measurement Range	0°C to 45°C/32°F to 113°F
Measurement Accuracy	±0.2°C at 25°C to 45°C/±0.4°F at 77°F to 113°F when outside above range
No. of Channels	Maximum 6 channels
Temperature Delay Time (From temperature probe to monitor display)	6 sec. or less (Not including the time constant of temperature probe.)

SpO_2 (Arterial Oxygen Saturation)

Measurement Value Update Rate	1 sec.

Nellcor Unit

Measurement Method	2 Wavelength Pulse Wave Method Wavelength: Approx. 660 nm (red light) Approx. 890 nm (infrared light) Output: 15 mW and below
Measurement Range	1%SpO_2 to 100%SpO_2
Resolution	1%SpO_2
Measurement Accuracy	Adult: ±3%SpO_2 when 70%SpO_2 to 100%SpO_2 (When DS-100A is used) Neonate: ±2%SpO_2 when 70%SpO_2 to 100%SpO_2
PR Measurement Range	20 bpm to 250 bpm
PR Accuracy	± 3 bpm when 20 bpm to 250 bpm
Measurement Response Time	6 sec. to 7 sec.

Masimo Unit

Measurement Method	2 Wavelength Pulse Wave Method Masimo LNOP/LNCS Sensor Wavelength: Approx. 660 nm (red light) Approx. 905 nm (infrared light) Output: 15 mW and below Masimo Rainbow Sensor Wavelength: 12 different wavelengths are used within the range of 620 nm to 1270 nm Output: 25 mW and below
SpO_2	
Measurement Range	1%SpO_2 to 100%SpO_2
Resolution	1%SpO_2
Measurement Accuracy	Adult: ±2%SpO_2 when 70%SpO_2 to 100%SpO_2 Neonate: ±3%SpO_2 when 70%SpO_2 to 100%SpO_2
SpCO	
Measurement Range	1%SpCO to 99%SpCO
Resolution	1%SpCO
Measurement Accuracy	±3%SpCO (SpCO: 1%SpCO to 40%SpCO)
SpMet	
Measurement Range	1%SpMet to 99.9%SpMet
Resolution	0.1%SpMet
Measurement Accuracy	±1%SpMet (SpMet: 1%SpMet to 15%SpMet)
SpHb	
Measurement Range	0 g/dL to 25.0 g/dL
Resolution	0.1 g/dL
Measurement Accuracy	±1 g/dL (SpHb: 8 g/dL to 17 g/dL)
PI (Perfusion Index)	
Measurement Range	0.02 to 20%
PVI (Pleth Variability Index)	
Measurement Range	0 to 100%

Pulse Rate

Measurement Range	26 bpm to 239 bpm
Measurement Accuracy	± 3 bpm when 26 bpm to 239 bpm (without body motion)
Measurement Response Time	7 levels 2 to 4 sec., 4 to 6 sec., 8 sec., 10 sec., 12 sec., 14 sec., 16 sec. (averaging duration)

NOTE

- The SpO_2 measurement accuracy is determined based on the values of the root-mean-square (rms) difference between SpO_2 readings of the pulse oximeter equipment and values of SpO_2 determined with a CO-oximeter, by healthy adult volunteers. The pulse oximeter equipment measurements are statistically distributed; ±2% measurement accuracy means that only about two-thirds of pulse oximeter equipment measurements can be expected to fall within ±2% of the value measured by a CO-oximeter.
- PVI, SpCO, SpMet, SpHb measurements are optional functions.

BP

Transducer Sensitivity	5 μV / V / mmHg
Measurement Range	-50 mmHg to 300 mmHg
Frequency Characteristic	DC 6 Hz / 8Hz / 12Hz / 40Hz
Measurement Accuracy	Within ±2% or ±1mmHg of full scale, whichever is greater
Zero Balance Range	Within ±150 mmHg
PR Measurement Range	Adult: 12 bpm to 300 bpm Neonate: 30 bpm to 300 bpm
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 mmHg to 280 mmHg / 1.3 kPa to 37.3 kPa Child: 10 mmHg to 180 mmHg / 1.3 kPa to 24.0 kPa Neonate: 10 mmHg to 130 mmHg / 1.3 kPa to 17.3 kPa
Resolution	1 mmHg
Static Pressure Accuracy	±3 mmHg / 0.4 kPa
BP Measurement Error according to the Clinical Performance Test	
Mean Error	Within ±5 mmHg
Standard Deviation of Error	8 mmHg or below
Error of Cuff Pressure Display	Within ±3mmHg
PR Measurement Range	40 bpm to 240 bpm
PR Accuracy	±2% or ±2 bpm (whichever greater)
Deflation Speed	5±1 mmHg/sec. (Quick Measurement OFF) 10±2 mmHg/sec. (Quick Measurement ON)
Safety Mechanism	Adult: 300 mmHg or above Child: 210 mmHg or above Neonate: 150 mmHg 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.

CO_2 (Carbon Dioxide Concentration)

Philips Capnostat 5 (Gas Unit I/F and Mainstream Module)

Measurement Method	Infra-Red Solid-State Method, Mainstream Method
Measurement Range	0 mmHg to 150 mmHg
Measurement Accuracy	0 mmHg to 40 mmHg: ±2 mmHg 41 mmHg to 70 mmHg: ±5% 71 mmHg to 100 mmHg: ±8% 101 mmHg to 150 mmHg: ±10%
CO_2 value error compensation when interference gas is present	
	0 mmHg to 40 mmHg: Additional error of ±1mmHg 41 mmHg to 70 mmHg: Additional error of ±2.5% 71 mmHg to 100 mmHg: Additional error of ±4% 101 mmHg to 150 mmHg: Additional error of ±5% These are maximum error only if compensation of atmospheric pressure, O_2, N_2O, anesthetic agent are properly performed.
RR Measurement Range	0 Bpm to 150 Bpm
RR Measurement Accuracy	±1 Bpm
Rise Time	60 ms and below

Covidien Unit

Measurement Method	Infra-Red Solid-State Method, Microstream Method
Measurement Range	0 mmHg to 99 mmHg
Measurement Accuracy	0 mmHg to 38 mmHg: ±2 mmHg 39 mmHg to 99 mmHg: ± { 0.05 x displayed value +0.08x (displayed value - 39 mmHg) } : (RR: 80 Bpm and below) : The larger of ± 4 mmHg or ±12% : (RR: over 80 Bpm)
Variation of Measurement Accuracy	±2 mmHg (Within 6 hours after power ON)
CO_2 measurement accuracy when interference gas is present	
	0 mmHg to 38 mmHg: ± (2 mmHg + 0.04 x displayed value) 39 mmHg to 99 mmHg: ± { 0.09 x displayed value + 0.08 x (displayed value - 39 mmHg) }
RR Measurement Range	0 Bpm to 150 Bpm
RR Measurement Accuracy	0 Bpm to 70 Bpm: ±1 Bpm 71 Bpm to 120 Bpm: ±2 Bpm 121 Bpm to 150 Bpm: ±3 Bpm
Flow Rate	50 mL/min +15, –7.5 mL/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 L/min to 20 L/min

Measurement Range and Accuracy	
Blood Temperature	±0.3°C at 17°C to 45°C/±0.5°F at 63°F to 113°F
Injectate Temperature	±0.5°C at -1°C to 35°C/±0.9°F at 30°F to 86°F

Printing (Recorder Unit)

Printing Speed	50 mm/s, 25 mm/s (Error: within ±5%)
Resolution	Head Direction: 8 dots/mm Feed Direction: 40 lines/mm (at printing speed of 25mm/s)
Printing Waveforms	3 waveforms
Printing Type	Waveform, List, Graphic
Detection	Paper out, printhead temperature
Protective Circuit	Provided

Analog Waveform Output

Output Voltage	ECG Output 1 V/mV (fixed), BP Output 1 V/100 mmHg (fixed)
Output Voltage Accuracy	within ±10% (Both ECG and BP output)
Analog Output Frequency Range	ECG Output: 0.5 Hz to 40 Hz
	BP Output: DC to 40 Hz
Delay Time	35 ms and below (ECG waveform) 35 ms and below (BP waveform: when 40 Hz is set for waveform filter)
Output Impedance	100Ω±10%
Load Impedance	1kΩ to ∞
Pacemaker Pulse	None

QRS Synchronization Output

Output Waveform	Square Wave (Positive/negative logic can be selected.)
Output Voltage	+4.3 V to +5.0 V (High Level) +0.3 V and below (Low Level)
Synchronized Signal Width	100 ms
Delay Time	35 ms and below (when the "Filter" setting is [Monitor] or [Diag.])
Output Impedance	Open Collector Output (with +5 V 500Ω 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. For details, refer to your nearest service representative.
- The QRS synchronized signal is not intended to be used as synchronized signal for defibrillator. When using the QRS synchronized signal, refer to your nearest service representative.

Measurement Unit for Each Parameter

The measurement units of the displayed numeric data for this equipment are as follows.

Description	Parameter	Display	Unit	Default
HR/PR Value	ECG	HR	bpm (beats per minute)	
	Blood Pressure	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	RR_GAS	Bpm	
Apnea Duration	Impedance	Apnea	s (second)	
	CO_2	Apnea	s (second)	
	Ventilator	Apnea	s (second)	
Blood Pressure	Blood Pressure	BP	mmHg, kPa cmH_2O (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	SpHb	SpHb	g/dL	
Temperature	Temperature	TEMP	°C	
End Tidal CO_2 Concentration	CO_2	$EtCO_2$	mmHg, kPa, %	mmHg
Inspiratory CO_2 Concentration	CO_2	$InspCO_2$	mmHg, kPa, %	mmHg
CO	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_2O	
Ventilatory Volume	Ventilatory Volume	AWV	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	

Description	Parameter	Display	Unit	Default
Compliance	Compliance	COMP	mL/cmH_2O	
Airway Resistance	Expiratory Resistance	E-RES	cmH_2O/L/sec	
	Inspiratory Resistance	I-RES	cmH_2O/L/sec	
Airway Pressure	Mean Airway Pressure	MEAN	cmH_2O	
	Peak Airway Pressure	PEAK	cmH_2O	
	Pause Airway Pressure	Pause	cmH_2O	
	Plateau Pressure	PLATEAU	cmH_2O	
Peak End Expiratory Pressure	Peak End Expiratory Pressure	PEEP	cmH_2O	
Fraction of Inspiratory Oxygen	Fraction of Inspiratory Oxygen	FIO_2	%	

Description	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_2EI	%	
	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, °F	°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	%	

Description	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	%	

Index

Index

FUKUDA DENSHI CO.,LTD.

3-39-4 Hongo, Bunkyo-ku, Tokyo, Japan
Tel: +81-3-5684-1455 Fax: +81-3-3814-1222
http://www.fukuda.com

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